SOUTHERN UNIVERSITY AND A&M COLLEGE
BATON ROUGE CAMPUS

REQUEST FOR BID

Bid Number 10370

BOILER & PUMP REPLACEMENT

LOCATION: PBS PINCHBACK HALL

NOVEMBER 30, 2026-10:30 AM

Project #01-107-25-05, F.01004689

Engineering Firm: Parish Engineering
1450 Seaboard Drive, Baton Rouge, LA 70810 Ph. 225-332-0222
Grant McIntyre, P.E. Email: gmcintyre@parisheng.com & Amy Deshotel, Office Manager
Email: adeshotel@parisheng.com

DATE ADVERTISED (LAPAC): **OCTOBER 28, 2026**
THE ADVOCATE **OCTOBER 28, 2026 & NOVEMBER 4 & 11, 2026**

MANDATORY PRE—BID CONFERENCE
AND SITE VISIT: **NOVEMBER 16, 2026 @ 10:30 AM**
LOCATION:
Physical Plant Department
Benjamin H. Kraft Building
515 James L. Hunt Street
Southern University
Baton Rouge Campus 70813
Site Telephone No. 225-771-4741 or
225-771-6241

DEADLINE TO SUBMIT INQUIRIES: **NOVEMBER 19, 2026 by 5:00 PM**
SUBMIT INQUIRIES TO: **Linda Antoine**
Email: linda_antoine@subr.edu

DEADLINE TO RESPOND TO INQUIRIES **November 23, 2026 by 5:00 PM**
Note: Responses to inquiries/addenda are pasted on LAPAC (La State Procurement website) LAPAC website:
https://wwwcfprd.doa.louisiana.gov/OSP/LaPAC/Agency/outMain.cfm
It is the responsibility of the vendor to check LAPAC for addenda.

DEADLINE TO SUBMIT BID: **NOVEMBER 30, 2026 @ 10:30 AM**
SUBMIT BID TO:
Linda Antoine, Director
Southern University Purchasing
Department-P. O. Box 9534 or
James L. Prestage Drive
J. S. Clark Adm. Bldg. Annex, 1st Floor
Baton Rouge, LA 70813
Telephone 225-771-2804 or 771-

As an alternative
Use link to submit bid online:
http://www.sus.edu/bidcertification

Note: Bid shall be delivered or uploaded to link no later than 10:30 AM on November 30, 2026

Construction Documents for
PBS Pinchback Boiler and Pump Replacement
Southern University, Baton Rouge LA
Project #01-107-25-05, F.01004689

SOUTHERN UNIVERSITY AND A&M COLLEGE
KENNETH DAWSON
SYSTEM DIRECTOR OF FACILITY PLANNING

PARISH ENGINEERING
1450 SEABORD DR.
BATON ROUGE, LA 70810
225.332.0222

October 5, 2026

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ADVERTISEMENT
REQUEST FOR BID
BID #50016-10370
BOILER & PUMP REPLACEMENT
LOCATION: PBS PINCHBACK HALL
OWNER: SOUTHERN UNUVERSITY AND A&M COLLEGE
BATON ROUGE CAMPUS
STATE BUILDING ID # S12942
STATE PROJECT NO. 01-107-25-05, F.01004689
BID DATE AND TIME: NOVEMBER 30, 2026 @ 10:30 AM

Sealed bids will be received by Southern University, Baton Rouge, Louisiana, in the Purchasing Department, 8100 James L. Prestage Drive, PO Box 9543, J. S. Clark Administration Building Annex, South Entrance, First Floor East, Baton Rouge, LA 70813. Bids will be opened and read aloud in a public meeting in the Southern University Purchasing Department.

Use link to submit bid online: *http://www.sus.edu/bidcertification*

MAIL, HAND-DELIVER OR UPLOAD BID TO PURCHASING DEPARTMENT NO LATER THAN 10:30 AM-on NOVEMBER 30, 2026

Bidders are solely responsible for ensuring timely delivery of their bids. The Southern University Purchasing Department is not responsible for any delays caused by bidders' chosen means of delivery. Failure to meet the bid deadline submittal date and time shall result in rejection of bid.

Engineer Firm: Parish Engineering
1450 Seaboard Drive
Baton Rouge, LA 70810
Ph.225- 332-0222
Emails: adeshotel@parisheng.com
gmcintyre@parisheng.com

ALL BID SPECIFICATIONS AND ADDENDA CAN BE OBTAINED BY ACCESSING THE LA STATE PROCUREMENT WEBSITE
https://wwwcfprd.doa.louisiana.gov/osp/lapac/pubMain.cfm.
(Search by bid # 50016-10370)
We highly recommend registering your company with Louisiana State Procurement/LAPAC.

Mandatory Pre-Bid Conference & Site Visit: NOVEMBER 16 , 2026 @ 10:30 AM
Conference & Site Visit Location: Physical Plant Department (Southern University Campus)
Benjamin H. Kraft Building, 515 James L. Hunt Street
Baton Rouge, La 70813
Site Visit Location Telephone Number: 225-771-4741 or 225-771-6241

Participants shall be in attendance by 10:30 a.m. and sign sheet provided by the Purchasing Department.

Bidders shall visit the site and be familiarized with the local conditions under which the work is to be performed. No additional compensation will be granted because of unusual difficulties, which may be encountered in the execution of any portion of the work.

Inquiries will be accepted until November 19, 2026 by 5:00 p.m. Inquiries shall be submitted to Linda Antoine at linda_antoine@subr.edu

Responses to inquiries will be posted on LAPAC-LA State Procurement website by November 23, 2026 by 5:00 PM

Any person requiring special accommodation should notify the Purchasing Office of the type(s) of accommodation required not less than seven (7) days before the bid opening date. Additional contact is Henry Thurman, Southern University Safety Department henry_thurman@subr.edu or 225-771-4741.

5% Security

All bids must be accompanied by bid security equal to **five (5%) percent of the sum of the base bid and all alternates, if applicable** and must be in the form of a certified/official check, cashier's check or bid bond, made payable to Southern University and A & M College. Surety represents that it is listed on the current U.S. Department of the Treasury Financial Management Service list of approved bonding companies and that is listed thereon as approved for amount equal to or greater than the amount for which it obligates itself in this instrument. No bid bond indicating an obligation of less than five percent (5%) by any method is acceptable.

Performance & Payment Bond

Successful Proposer shall be required to furnish a performance (surety) bond. The amount will be determined during contract negotiations for the period the contract is in effect. The Bond should be made payable to Southern University. Any performance bond furnished shall be written by a surety or insurance company currently on the U.S. Department of the Treasury Financial Management Service list of approved bonding companies which is published annually in the *Federal Register*, or by a Louisiana domiciled insurance company with at least an A-:VI rating or higher in the latest printing of the A.M. Best's Key Rating Guide or by an insurance company that is either domiciled in Louisiana or owned by Louisiana residents and is licensed to write surety bonds.

No surety or insurance company shall write a performance bond which is in excess of the amount indicated as approved by the U.S. Department of the Treasury Financial Management Service list or by a Louisiana domiciled insurance company with an A-:VI rating by A.M. Best up to a limit of 10 percent of policyholders' surplus as shown by A.M. Best; companies authorized by this Paragraph who are not on the treasury list shall not write a performance bond when the penalty exceeds 15 percent of its capital and surplus, such capital and surplus being the amount by which the company's assets exceed its liabilities as reflected by the most recent financial statements filed by the company with the Department of Insurance.

In addition, any performance bond furnished shall be written by a surety or insurance company that is currently licensed or authorized to do business in the State of Louisiana. The bond must be received within twelve (12) working days from the date of notification.

Bidders shall include the following on envelopes of choice: company's name, address, Louisiana contractor's license number, bid number, name of bid, bid opening date and time.

Bids may be withdrawn by written, telegraphic fax notice or email and received at the address or email address designated in the Invitation to Bid prior to the time set for bid opening, as recorded by date stamp at the Purchasing Office. Bids received after closing time will be returned unopened. Evidence of authority to submit the bid shall be required in accordance with R.S. 38:2212(a)(1)(c) and/or R.S. 39:1594(c)(2)(d).

The Southern University System is a participant in the Louisiana for the Small Entrepreneurships Program (the Hudson Initiative) and the Louisiana Initiative for Veterans and Service-Connected Disabled Veterans-Owned Business Small Entrepreneurships. Bidders are encouraged to consider participation. A list of certified vendors and additional information can be obtained from website http://www.ledsmallbiz.com. Potential participants may also register at this website.

Any questions concerning bid documents, please contact Mary Jane Spruel, Assistant Director of Purchasing at (225) 771-2800 or email to maryjane_spruel@subr.edu

No bid may be withdrawn for a period of forty-five (45) days after receipt of bids, except under the provisions of LA. R.S. 38:2214. Bidder is required to comply with provisions and requirements of LA R.S. 38:2212(B)(5).

The University reserves the right to reject all bids and to waive any informalities incidental thereto.

Bids shall be accepted from Contractors who are licensed under LA. R.S. 37:2150-2192 for the classification of 40000000 Distribution, Conditioning Systems and Equipment and Comp.; 40100000 Heating and Ventilation and Air Circulation; 40102000 Boilers

SOUTHERN UNIVERSITY & A&M COLLEGE
AN EQUAL OPPORTUNITY EMPLOYER
Linda A. Antoine, Director of Purchasing

DATES ADVERTISED
OCTOBER 28, 2026, NOVEMBER 4 & 11, 2026

SOUTHERN UNIVERSITY AND A&M COLLEGE
BATON ROUGE CAMPUS
REQUEST FOR BID
GENERAL CONDITIONS

PROJECT: *BOILER & PUMP REPLACEMENT*
LOCATION: *PBS PINCHBACK HALL*
Project #01-107-25-05, F.01004689

BID DUE DATE AND TIME: NOVEMBER 30, 2026 @ 10:30 AM
BID # 50016-10370

Bids submitted are subject to provisions of but not limited to La.R.S.38:2212 Purchasing Rules and Regulations; Executive Orders; and the General Terms and Conditions, listed in this Invitation for Bid. Southern University reserves the right to award items separately, grouped or on an all or none basis and to reject any or all bids and waive any informalities.

BIDS MAY BE SENT BY MAIL, HAND-DELIVERED or UPLOADED TO:

Bids should be mailed to:
Southern University
Purchasing Department
Post Office Box 9534
Baton Rouge, LA 70813

As an alternative, bids may be hand delivered to:
Southern University
Purchasing Department
1st Floor East-James L. Prestage Drive
J. S. Clark Administration Building
Baton Rouge, LA 70813

As an alternative:
Use link to submit bid online:
http://www.sus.edu/bidcertification

The Southern University Purchasing Department is not responsible for any delays caused by bidders' chosen means of delivery. Failure to meet the bid deadline submittal date and time shall result in rejection of bid.

Engineering Firm: Parish Engineering
1450 Seaboard Drive, Baton Rouge, LA 70810 Ph. 225-332-0222
Grant McIntyre, P.E. Email: gmcintyre@parisheng.com &
Amy Deshotel, Office Manager
Email: adeshotel@parisheng.com

MANDATORY PRE-BID CONFERENCE & SITE VISIT: NOVEMBER 16, 2026 @ 10:30 AM
LOCATION: Physical Plant Department
Benjamin H. Kraft Building
515 James L. Hunt Street
Southern University SUBR Campus
Site Telephone No. 225-771-4741

Deadline to submit inquiries: November 16, 2026 by 5:00 PM
Deadline to respond to inquiries: November 23, 2026 by 5:00 PM

INQUIRIES:
No negotiations, decisions, or actions will be executed by any bidder as a result or any oral discussion with any University employee or State Consultant. Only those transactions which are in writing, sent to **Linda A. Antoine, Director of Purchasing, will be considered as valid.**
Send inquiries to linda_antoine@subr.edu

INSTRUCTIONS TO BIDDERS

1. **Bid Forms**

Document will be included with the successful vendor's contact.

All written bids, unless otherwise provided for, must be submitted on, and in accordance with forms provided and properly signed in ink. Bids submitted in the following manner will not be accepted:
Bid containing no signature indicating intent to be bound
(1) Bid filled out in pencil
(2) Bid not submitted on university standard forms
Bids must be received at the address specified in the Invitation for Bid or uploaded prior to bid opening time to be considered.

2. Envelope (if mailed)

Bidders are requested to submit bid package in a sealed envelope of your choice that is clearly marked identifying the ***company's name, complete address, bid number, time and date of bid opening, and license number, if applicable.***
Bidder is responsible for means of delivery of bid.
Louisiana Contractors License Number shall be placed on the outside of the envelope.

3. Standards of Quality

Any product or service bid shall conform to all applicable federal, state and local laws, regulations and the specifications contained in the IFB. Unless otherwise specified in the IFB, any manufacturer's name, trade name, brand name, or catalog numbers used in the specifications is for the purpose of describing the quality level, performance and characteristics required. Bidder must specify the brand and model number of the product offered in his/her bid. Bids not specifying brand and model numbers will be considered as offering the exact product(s) specified in the IFB.

4. Descriptive Information

Bidders proposing an equivalent brand or model should submit information with bid (such as illustrations, descriptive literature, technical data) sufficient for the University to evaluate quality, suitability and compliance with the specifications in the IFB. Failure to submit descriptive information may cause bid to be rejected. Any change made to a manufacturer's published specification submitted for a product should be verifiable by the manufacturer. If item(s) bid do not fully comply with specifications (including brand and/or product number), bidder must state in what respect the item(s) deviate. Failure to note exceptions on the bid form will not relieve the successful bidder(s) from supplying the actual products requested.

5. INSURANCE:

A current insurance certificate with Southern University as the certificate holder shall be sent to the Purchasing Department before starting project. Contractor shall maintain insurance coverage until project is completed.

6. Prices

Unless otherwise specified by the Purchasing Department, bid prices must be complete, including transportation, prepaid by bidder to destination. In the event of extension errors, the unit price shall prevail.

7. Payment Terms

Payment is to be made within thirty (30) days after receipt of properly executed invoice, or delivery and acceptance, whichever is later. Delinquent payment penalties are governed by **L.R.S. 39:1695**.

8. Deliveries

Bids may be rejected if the delivery or completion time indicated is longer than that specified in the bid.

9. Vendor Invoices

Invoices or AIA payment form shall reference the Southern University purchase/release order number, vendor's packing list/delivery ticket, ticket number, shipping/delivery date, etc. Invoices are to be itemized and billed in accordance with the order and should show the amount of any prompt payment discount and submitted on the vendor's own invoice form. Invoices submitted by the vendor's supplier will not be accepted. Terms are net 30.

10. Tax Information/State of Louisiana

Vendor is responsible for including all applicable taxes in the bid prices. Southern University is exempt from all Louisiana state and local sales and use taxes. By accepting an award, resident and non-resident firms acknowledge their responsibility for the payment of all taxes duly accessed by the State of Louisiana and its political subdivisions for which they are liable, including but not limited to: franchise taxes, privilege taxes, sales taxes, use taxes, ad valorem taxes, etc. In accordance with Act Number 1029 of the 1991 Regular Session, effective September 1, 1991 state agencies will no longer be required to pay state sales tax.

11. New Products

Unless specifically called for, all products for purchases must be new (never previously used) and the current model and/or packaging. The manufacturer's standard warranty will apply unless otherwise specified in the IFB.

12. Contract Cancellation

Document will be included with the successful vendor's contact.

Southern University has the right to cancel any contract, in accordance with Purchasing Rules and Regulations, for cause, including but not limited to, the following: (1) failure to deliver within time specified in the contract; (2) failure of the product or service to meet specifications, conform to sample quality or to be delivered in good condition;(3) misrepresentations by the contractor;(4) fraud, collusion, conspiracy or other unlawful means of obtaining any contract with the state; (5) conflict of contract provisions with constitutional or statutory provision of state or federal law; (6) any other breach of contract.

13. **AWARD AND EXECUTION OF CONTRACT**:
The owner shall incur no obligation to the contractor until the contract between the owner and contractor is duly executed. If the contractor is notified of the acceptance of the bid within thirty (30) days of the opening bid date, contractor agrees to execute and deliver to owner, Performance and Payment Bond and Certificate of Insurance, a copy of which is attached to the Contract Documents, within ten (10) working days after notice from the Owner that the instrument is ready for signature.

14. **Fiscal Funding Clause (Renewal Contracts Only)**
In accordance with LA R.S.39:1615 (c) and (e), any contract entered into by the State of Louisiana and Southern University shall include the following Fiscal Funding Clause:
C. Termination due to unavailability of funds in succeeding years. When funds are not appropriated to support continuation of performance in a subsequent year of a multiyear contract, the contract for such subsequent year shall be terminated. When a contract is terminated under these conditions, no additional funds shall be paid to the contractor as a result of such action. **E.** With respect to all multiyear contracts, there shall be no provisions for a penalty to the state for the cancellation or early payment of the contract. The continuation of this contract is contingent upon the appropriation of funds to fulfill the requirements of the contract by the legislature. All proposers should be aware that our legislative process is such that it is often impossible to give prior notice of the non-appropriation of funds.

15. **Default of Contactor**
Failure to deliver within the time specified in the bid will constitute a default and may cause cancellation of the contract. Where the state had determined the contractor to be in default, the state reserves the right to purchase any or all products or services covered by the contract on the open market and to charge the contractor with cost in excess of the contract price. Until such assessed charges have been paid, no subsequent bid from the defaulting contractor will be considered.

16. **Order of Priority**
In the event there is a conflict between the Instructions to Bidders the General Terms and Conditions will govern.

17. **Applicable Law**
All contracts will be construed in accordance with and governed by the laws of State of Louisiana. Vendors shall be in compliance with applicable laws of the State of Louisiana and Federal Laws where applicable, to include licenses, fees and permits. Vendors are responsible for the cost of licenses, fees and permits.

18. **Certification of No Suspension or Debarment ($25,000 or more)**
By signing and submitting this bid, bidder certifies that its company, any subcontractors, or principals thereof, are not suspended or debarred under federal or state laws or regulations. A list of parties who have been suspended or debarred by federal agencies is maintained by the General Services Administration and can be viewed on the internet at www.sam.gov.
____Federal Funded **__XXNon-Federal Funded**

19. **E-VERIFY** (verification of employees)
Contractor acknowledges and agrees to comply with the provisions of La R.S. 38:2212.10 and federal law pertaining to E-Verify in the performance of services under this contract.

20. **Prohibited Contractual Arrangements**
Per Louisiana R.S. 42:1113.a, no public servant, or member of such public servant's immediate family, or legal entity in which he is a controlling interest shall bid on or enter into any contract, subcontract, or other transaction that is under the supervision or jurisdiction of the agency of such public servant. See statute for complete law, exclusions and provisions.

21. **Discriminatory Boycotts of Israel**
This section applies to procurements with a value of $100,000 or more and for vendors with five (5) or more employees
Prohibition of Discriminatory Boycotts of Israel
In accordance with R.S. 39:1602.1, for any contract for $100,000 or more and for any contractor with five or more employees, the Contractor certifies that neither it nor its subcontractors are engaged in a boycott of Israel, and that the Contractor and any subcontractors shall, for the duration of this contract, refrain from a boycott of Israel. The State reserves the right to terminate this contract if the Contractor, or any Subcontractor, engages in a boycott of Israel during the term of this contract.

Document will be included with the successful vendor's contact.

22. **Prohibition of Companies That Discriminate Against Firearm and Ammunition Industries**

In accordance with La. R.S. 39:1602.2, the following applies to any competitive sealed bids, competitive sealed proposals, or contract(s) with a value of $100,000 or more involving a for-profit company with at least fifty full-time employees:

Unless otherwise exempted by law, by submitting a response to this solicitation or entering into this contract, the Bidder, Proposer or Contractor certifies the following:

The company does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association based solely on the entity's or association's status as a firearm entity or firearm trade association;

The company will not discriminate against a firearm entity or firearm trade association during the term of the contract based solely on the entity's or association's status as a firearm entity or firearm trade association

23. **Mutual Indemnification**

Each party hereto agrees to indemnify, defend and hold the other, its officers, directors, agents and employees harmless from and against any and all losses, liabilities and claims, including reasonable attorney's fees arising out of or resulting from the willful act, fault, omission, or negligence of the indemnifying party or of its employees, contractors, or agents in performing its obligations under this agreement, provided however, that neither party hereto shall be liable to the other for any consequential damages arising out of its willful act, fault, omission, or negligence.

24. **Fair Labor Standards Act**

Contractor shall be in compliance with the **Fair Labor Standards Act 29 USC 201-6;** Establishes minimum wage, overtime pay, equal pay, recordkeeping, and child labor standards for employees or in the production of goods for interstate commerce. **By signing and submitting this bid, bidder certifies that its company, any subcontractors, or principals thereof** is in accordance with said compliance. **United States Department of Labor website: www.dol.gov/esa**

25. **Davis-Bacon Act ($2,000 or more)**

Contractor shall be in compliance with the **Davis-Bacon Act, 40 USC 276A-7;** ensures that laborers and mechanics employed pursuant to federally funded construction contracts, subcontracts and construction under Federal grants, will be paid wages as determined by the U.S. Secretary of Labor. **By signing and submitting this bid, bidder certifies that its company, any subcontractors, or principals thereof** is in accordance with said compliance. **United States Department of Labor website: www.dol.gov/esa**

____Federal Funded ___XXX__Non-Federal Funded

26. **Small Business Entrepreneurship Programs**

The Southern University System is a participant in the Louisiana for the Small Entrepreneurships Program (the Hudson Initiative) and the Louisiana Initiative for Veterans and Service-Connected Disabled Veterans-Owned Business Small Entrepreneurships. Bidders are encouraged to consider participation. A list of certified vendors and additional information can be obtained from website http://www.ledsmallbiz.com. Potential participants may also register at this website. Businesses include minority and women.

27. **Public Works Projects (R.S. 38:2227)**

In accordance with the provisions of R.S. 38:2227; in awarding public works projects, any public entity is authorized to reject a proposal or bid, or not award the contract, to a business in which any individual with an ownership interest of ten percent (10%) or more, has been convicted, or has entered a plea of guilty or nolo contenere to any state felony or equivalent federal felony crime.

28. **Tobacco-Free Policy**

The use of tobacco products on any Southern University campus is prohibited by students, staff, faculty or visitors in all campus buildings, facilities, or property owned or leased by Southern University System and outside areas of the campus where non-smokers cannot avoid exposure to smoke; on campus grounds, facilities, or vehicles that are the property of the University; and at lectures, conferences, meetings, and social and cultural events held on school property or school grounds. The sale or free distribution of tobacco products, including merchandise on campus or at school events is prohibited.

29. **Equal Opportunity Employer**

Southern University and A&M College Systems of the State of Louisiana is an equal opportunity employer and looks to its contractors, sub-contractors, vendors, and suppliers to take affirmative action to effect this commitment in its operations. By submitting and signing this bid, the bidder certifies that he agrees to adhere to the mandates dictated by Title VI and VII of the Civil Rights Act of 1964, as amended; the Vietnam Era Veterans' Readjustment Assistance Act of 1974; Section 303 of the Rehabilitation Act of 1973; Section 202 of Executive Orderll24b,as amended; and the Americans with Disabilities Act of 1990. Bidder agrees that he will not discriminate in the rendering of services to and/or employment of individuals because of race, color, religion, sex, age, national origin, handicap, disability, veteran status, or any other non-merit factor. Bidder further agrees to keep informed of and comply with all Federal, State, and local laws, ordinances, and regulations which affect his employees or prospective employees. Any person who is a "Qualified Individual with a Disability" as defined by 42 USC 12131 of the American with Disabilities Act who has submitted a bid on this procurement and who desires to attend the bid opening, must notify this office in writing no later than seven

(7) working days prior to the bid opening date of their need for special accommodations. If the requested accommodations cannot be reasonably provided, the individual will be so informed prior to the bid opening.

30. Code of Ethics

The contractor acknowledges that Chapter 15 of Title 42 of the Louisiana Revised Statutes (R.S. 42:1101 et. seq., Code of Governmental Ethics) applies to the Contracting Party in the performance of services called for in this contract. The contractor agrees to immediately notify the state if potential violations of the Code of Governmental Ethics arise at any time during the term of this contract.

31. Vendor Forms/SU Signature Authority

The terms and conditions of the SU solicitation and purchase order/contract shall solely govern the purchase agreement, and shall not be amended by any vendor contract, form, etc. The University's chief procurement officer, or designee, is delegated sole authority to execute any vendor contracts, forms, etc. Departments are prohibited from signing any vendor forms.

32. Prosecution of Work

The work is to be done when Southern University is in operation. The contractor shall, therefore, plan the repairs and installation in specifications so as not to interfere with normal operations of the facility and shall exert effort to expedite completion of the work once it has started. It is intended that the work shall be done during normal working hours, however, should work require overtime (Saturday, Sunday and/or night working hours), the cost must be borne by the contractor at no extra compensation from the Owner (Southern University).

33. On-Campus Attendance Requirements (COVID-19)

The Center for Disease and Control (CDC) recommends social distancing and wearing of masks to prevent the spread of the Coronavirus (COVID19). Persons visiting Southern University are required to wear a mask/face covering and stay at least 6 feet between yourself and others, even when you wear a face covering.

34. Termination of the Contract for Convenience

The State/University may terminate the contract at any time by giving thirty (30) days written notice to the Contractor of such termination or negotiating an effective date with the Contractor. The Contractor shall be entitled to payment for deliverables in progress, to the extent work has been performed satisfactorily.

35. Termination for Cause

The State may terminate this Contract for cause based upon the failure of the Contractor to comply with the terms and/or conditions of the Contract; provided that the State shall give the Contractor written notice specifying the Contractor's failure. If within thirty (30) days after receipt of such notice, the Contractor shall not have either corrected such failure or thereafter proceeded diligently to complete such correction, then the State may, at its option, place the Contractor in default and the Contract shall terminate on the date specified in such notice. The Contractor may exercise any rights available to it under Louisiana law to terminate for cause upon the failure of the Owner to comply with the terms and conditions of this contract; provided that the Contractor shall give the State, written notice specifying the State's failure and a reasonable opportunity for the Owner to cure the defect.

36. Auditors

It is hereby agreed that the Legislative Auditor of the State of Louisiana and/or the Office of the Governor, Division of Administration auditors shall have the option of auditing all accounts of contractor which relate to this contract.

37. Awarded Products/Unauthorized Substitutions

Only those awarded brands and numbers stated in the SU contract are approved for delivery, acceptance, and payment purposes. Any substitution requires prior approval of the Purchasing Office. Unauthorized product substitutions are subject to rejection at time of delivery, post-return at vendor's expense, and non-payment.

38. Acceptance

Upon written notice by the Owner, a Notice by Owner of Acceptance of Work will be executed and forwarded to the Contractor for recording with the Clerk of Court in the parish in which the work has been performed and shall furnish a clear Lien Certificate from the Clerk of Court (to the owner along with final invoice) forty-five (45) days after recordation of acceptance. Final payment of ten percent (10%) will be made at this time.

39. Guarantee

It is the intention of the specifications to secure a first-class permanent material and construction and to this end, Contractor will be held responsible for and must correct defects discovered in the work within one (1) year from acceptance. Should any materials or methods be called for, of such nature to render this guarantee impossible, written notice to this effect should be given Owner (Southern University) before signing contract and/or beginning of work; failure to do this will be construed as agreement to the strictest terms of the guarantee.

Document will be included with the successful vendor's contact.

40. Clean-Up

The Contractor will be directed during the progress of work to remove and properly dispose of the resultant and debris. Upon completion, Contractor shall remove all equipment, unused materials and debris and will leave the premises in a clean and first-class condition.

41. Examination of Site

Each bidder will visit the site of the proposed project and will fully acquaint himself with conditions relating to construction and labor so that he may fully understand the facilities, difficulties and restrictions attending the execution of work under this contract. No consideration or allowance will be granted the Contractor for failure to visit the site or for any alleged misunderstanding of the materials to be furnished or the work to be done.

42. *Anti-Kickback Clause*

The Contractor hereby agrees to adhere to the mandate dictated by The Copeland "Anti-Kickback" ACT which provides that each Contractor or Subgrantee shall be prohibited from inducing, by any means, any person employed in the completion of work, to give up any part of the compensation to which he is otherwise entitled.

43. Clean Air Act

The Contractor hereby agrees to adhere to the provisions which require compliance with all applicable standards, orders or requirements issued under Section 306 of the CLEAN AIR ACT which prohibits the use under non-exempt contracts, grants or loans of facilities included on the EPA list of Violating Facilities.

44. Clean Water Act

The Contractor hereby agrees to adhere to the provisions which require compliance with all applicable standards, orders or requirements issued under Section 508 of the Clean Water Act which prohibits the use under non-exempt federal contracts, grants or loans of facilities included on the EPA list of Violating Facilities.

45. Energy Policy and Conservation Act

The Contractor hereby recognizes the mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (P.L. 94-163).

46. *Anti-Lobbying and Debarment Act*

The Contractor will be expected to comply with federal statutes in the Anti-Lobbying Act and The Debarment Act.

47. *Signature Authority*

A CORPORATE RESOLUTION OR WRITTEN EVIDENCE OF THE AUTHORITY OF THE PERSON SIGNING THE BID FOR THE PUBLIC WORK AS PRESCRIBED BY LOUISIANA REVISED STATUTE 38:2212 (B)(5)

A copy of the applicable signature authority document/Board Resolution or LA Secretary of State Registration must be submitted with bid.

48. ADITIONAL REQUIREMENTS

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE PLANS; THE PROJECT SPECIFICATIONS, AND HALL COMPLY WITH APPLICALBE LOCAL AND STATE BUILDING CODES AS WELL AS ANY AND ALL REGULATORY AGENCY REQUIREMENTS AND LAWS, INCLUDING BUT NOT LIMIOTED TO OSHA, ETC. GENERAL NOTES SHALL APPLY TO ALL DRAWINGS.
2. CONTRACTOR SHALL NOTIFY THE ENGINEER/ARCHITECT, IF APPLICABLE, OF ALL CONFLICTS OR DISCRENPENSIES PRESENTED IN THESE PLANS PRIOR TO THE START OF WORK.
3. ALL WORK, WHETHER SHOWN OR IMPLIED, UNLESS SPECIFICALLY QUESTIONED SHALL BE CONSIDERED UNDERSTOOD IN ALL RESPECTS BY THE GENERAL CONTRATOR AND WHO WILL BE RESPOSIBLE FOR ANY MISINTERPRETATIONS AND CONSEQUENCES THEREOF.
4. ANY UTILITIES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.
5. ENGINEER/ARCHITECT SHALL BE NOTIFIED IMMEDIATELY OF ALL IDENTIFIED EXISTING UTILITIES NOT INDENTIFIED IN THE PLANS.
6. OWNER SHALL PROVIDE WATER FOR CLEANING OPERATIONS FROM ANY FIRE HYDRANT AT NO COST TO THE CONSULTANT.

49. PUBLIC AWARENESS – 192.616

Southern University Baton Rouge owns and operates a master meter natural gas distribution system on the school campus. The gas system consists of an underground network of pipelines. The purpose of the gas system is to provide a reliable and safe economical source of energy for heating purposes. The pipeline system has the capacity to reliably deliver natural gas.

The hazards of natural gas are odorless, colorless, tasteless, lighter than air and can ignite and/or explode with tremendous force when mixed with the right amount of air.

Measures taken include:

- Adding odorant to the gas to give it that distinctive smell, like rotten eggs, to warn us of its presence.

Document will be included with the successful vendor's contact.

- Testing the odorant level each calendar quarter,
- Performing annual gas leakage surveys, and
- Conducting periodic pipeline patrols.

The following are signs that may indicate a gas leak:

- A hissing or roaring sound (caused by escaping gas)
- A patch of dead or discolored vegetation in an otherwise green setting along a pipeline route
- Blowing dirt, grass or leaves near a pipeline,
- Continuous bubbling in wet, flooded areas,
- A "gas small" like rotten eggs.

Anyone who may smell this odor or notice any unusual conditions on or near gas mains, vents, service lines, meter sets, or especially inside of a building should call the maintenance office immediately. If you smell a strong gas odor inside a building, notify everyone in the building to leave. Do not operate any switches or use the phone. Go a safe distance away upwind of the smell of the gas and call the maintenance office. With any gas leak protect life first, then property, then notify the maintenance office.

State and federal laws require excavators to notify LA One-Call 2 days before digging. If any excavation is planned, you must notify LA One-Call which will notify the Southern University to locate the gas lines.

To obtain additional information or report a gas related issue call Southern University Baton Rouge Maintenance Office. The Southern University Maintenance Office phone number is 225-771-4741. The LA One-Call Center phone number is 811.

Document will be included with the successful vendor's contact.

EXHIBIT D

INSURANCE REQUIREMENTS
FOR NEW CONSTRUCTION, ADDITIONS AND LARGE RENOVATIONS

The Contractor shall purchase and maintain without interruption for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the work hereunder by the Contractor, its agents, representatives, employees or subcontractors, or anyone employed directly or indirectly by any of them. The duration of the contract shall be from the inception of the contract until the date of final payment.

A. MINIMUM SCOPE AND LIMITS OF INSURANCE

1. **Workers Compensation**
   Workers Compensation insurance shall be in compliance with the Workers Compensation law of the State of the Contractor's headquarters. Employers Liability is included with a minimum limit of $1,000,000 per accident/per disease/per employee. If work is to be performed over water and involves maritime exposure, applicable LHWCA, Jones Act, or other maritime law coverage shall be included. A.M. Best's insurance company rating requirement may be waived for workers compensation coverage only.

2. **Commercial General Liability**
   a. Commercial General Liability insurance, including Personal and Advertising Injury Liability and Products and Completed Operations Liability, shall have a minimum limit per occurrence based on the project value. The Insurance Services Office (ISO) Commercial General Liability occurrence coverage form CG 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. Claims-made form is unacceptable.

   b. The aggregate loss limit must apply to each project. ISO form CG 25 03 (current form approved for use in Louisiana), or equivalent, shall also be submitted. The State project number, including part number, and project name shall be included on this endorsement.

   c. COMBINED SINGLE LIMIT (CSL) PER OCCURRENCE

Type of Construction	Projects up to $1,000,000	Projects over $1,000,000 up to $10,000,000	Projects over $10,000,000
New Buildings:			
Each Occurrence Minimum Limit	$1,000,000	$2,000,000	$4,000,000
Per Project Aggregate	$2,000,000	$4,000,000	$8,000,000
	The building(s) value for the Project is		
Renovations:	**		
Each Occurrence Minimum Limit	$1,000,000 **	$2,000,000 **	$4,000,000 **
Per Project Aggregate	2 times per occur limit **	2 times per occur limit **	2 times per occur limit **

** While the minimum Combined Single Limit of $1,000,000 is required for any renovation, the limit

is calculated by taking 10% of the building value and rounding it to the nearest $1,000,000 to get the insurance limit. Example: Renovation on a $33,000,000 building would have a calculated $3,000,000 combined single limit of coverage (33,000,000 times .10 = 3,300,000 and then rounding down to $3,000,000). If the calculated limit is less than the minimum limit listed in the above chart, then the amount needed is the minimum listed in the chart. Maximum per occurrence limit required is $10,000,000 regardless of building value. The per project aggregate limit is then calculated as twice the per occurrence limit.

3. **Automobile Liability**
Automobile Liability Insurance shall have a minimum combined single limit per accident of $1,000,000. ISO form number CA 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. This insurance shall include third-party bodily injury and property damage liability for owned, hired and non-owned automobiles.

4. Excess Umbrella
Excess Umbrella insurance may be used to meet the minimum requirements for Commercial General Liability and Automobile Liability only.

5. Builder's Risk

a. Builder's Risk Insurance shall be in an amount equal to the amount of the construction contract including any amendments and shall be upon the entire work included in the contract. The policy shall provide coverage equivalent to the ISO form number CP 10 20, Broad Form Causes of Loss (extended, if necessary, to include the perils of wind, earthquake, collapse, vandalism/malicious mischief, and theft, including theft of materials whether or not attached to any structure). The policy must include architects' and engineers' fees necessary to provide plans, specifications and supervision of work for the repair and/or replacement of property damage caused by a covered peril, not to exceed 10% of the cost of the repair and/or replacement.

b. Flood coverage shall be provided by the Contractor on the first floor and below for all projects, except as otherwise noted. The builder's risk insurance policy, sub-limit for flood coverage shall not be less than ten percent (10%) of the total contract cost per occurrence. If flood is purchased as a separate policy, the limit shall be ten percent (10%) of the total contract cost per occurrence (with a max of $500,000 if NFIP). Coverage for roofing projects shall **not** require flood coverage.

c. A Specialty Contractor may provide an installation floater in lieu of a Builders Risk policy, with the similar coverage as the Builder's Risk policy, upon the system to be installed in an amount equal to the amount of the contract including any amendments. Flood coverage is not required.

d. The policy must include coverage for the Owner, Contractor and any subcontractors as their interests may appear.

6.* Pollution Liability *(required when asbestos or other hazardous material abatement is included in the contract)

Pollution Liability insurance, including gradual release as well as sudden and accidental, shall have a minimum limit of not less than $1,000,000 per claim. A claims-made form will be acceptable. A policy period inception date of no later than the first day of anticipated work under this contract and an expiration date of no earlier than 30 days after anticipated completion of all work under the contract shall be provided. There shall be an extended reporting period of at least 24 months, with full reinstatement of limits, from the expiration date of the policy if policy is not renewed. The policy shall not be cancelled for any reason, except non-payment of premium.

B. DEDUCTIBLES AND SELF-INSURED RETENTIONS

Any deductibles or self-insured retentions must be declared to and accepted by the Agency. The Contractor shall be responsible for all deductibles and self-insured retentions.

C. OTHER INSURANCE PROVISIONS

The policies are to contain, or be endorsed to contain, the following provisions:

1. Workers Compensation and Employers Liability Coverage

   To the fullest extent allowed by law, the insurer shall agree to waive all rights of subrogation against the Agency, its officers, agents, employees and volunteers for losses arising from work performed by the Contractor for the Agency.

2. Commercial General Liability Coverage

   a. The Owner, its officers, agents, employees and volunteers are to be added as additional insureds as respects liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor, premises owned, occupied or used by the Contractor. ISO Forms CG 20 10 (for ongoing work) AND CG 20 37 (for completed work) (current forms approved for use in Louisiana), or equivalent, are to be used.

   b. The Contractor's insurance shall be primary as respects the Agency, its officers, agents, employees and volunteers for any and all losses that occur under the contract. The coverage shall contain no special limitations on the scope of protection afforded to the Agency, its officers, officials, employees or volunteers. Any insurance or self-insurance maintained by the Agency shall be excess and non-contributory of the Contractor's insurance.

3. Builder's Risk

   The policy must include an endorsement providing the following:

   In the event of a disagreement regarding a loss covered by this policy which may also be covered by a State of Louisiana self-insurance or commercial property policy through the Office of Risk Management (ORM), Contractor and its insurer agree to follow the following procedure to establish coverage and/or the amount of loss:

   Any party to a loss may make written demand for an appraisal of the matter in disagreement. Within 20 days of receipt of written demand, the Contractor's insurer and either ORM or its commercial insurance company shall each select a competent and impartial appraiser and notify the other of the appraiser selected. The two appraisers will select a competent and impartial umpire. The appraisers will then identify the policy or policies under which the loss is insured and, if necessary, state separately the value of the property and the amount of the loss that must be borne by each policy. If the two appraisers fail to agree, they shall submit their differences to the umpire. A written decision by any two shall determine the policy or policies and the amount of the loss. Each insurance company agree that the decision of the appraisers and the umpire if involved will be binding and final and that neither party will resort to litigation. Each of the two parties shall pay its chosen appraiser and bear the cost of the umpire equally.

4. All Coverages

   a. All policies must be endorsed to require 30 days written notice of cancellation to the Agency. Ten-day written notice of cancellation is acceptable for non-payment of premium. Notifications shall comply with the standard cancellation provisions in the Contractor's policy. In addition, Contractor is required to notify Agency of policy cancellations or reductions in limits.

b. Neither the acceptance of the completed work nor the payment thereof shall release the Contractor from the obligations of the insurance requirements or indemnification agreement.

c. The insurance companies issuing the policies shall have no recourse against the Agency for payment of premiums or for assessments under any form of the policies.

d. Any failure of the Contractor to comply with reporting provisions of the policy shall not affect coverage provided to the Agency, its officers, agents, employees and volunteers.

D. ACCEPTABILITY OF INSURERS

1. All required insurance shall be provided by a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located. Insurance shall be placed with insurers with an A.M. Best's rating of **A-:VI or higher**. This rating requirement may be waived for workers compensation coverage only.

2. If at any time an insurer issuing any such policy does not meet the minimum A.M. Best rating, the Contractor shall obtain a policy with an insurer that meets the A.M. Best rating and shall submit another Certificate of Insurance within 30 days.

E. VERIFICATION OF COVERAGE

1. Contractor shall furnish the Agency with Certificates of Insurance reflecting proof of required coverage. The Certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The Certificates are to be received and approved by the Agency before work commences and upon any contract renewal or insurance policy renewal thereafter.

2. The Certificate Holder Shall be listed as follows:

   State of Louisiana
   Agency Name, Its Officers, Agents, Employees and Volunteers
   Address, City, State, Zip
   Project or Contract #:

3. In addition to the Certificates, Contractor shall submit the declarations page and the cancellation provision for each insurance policy. The Agency reserves the right to request complete certified copies of all required insurance policies at any time.

4. If the Contractor does not meet the insurance requirements at policy renewal, at the option of the Agency, payment to the Contractor may be withheld until the requirements have been met, OR the Agency may pay the renewal premium and withhold such payment from any monies due the Contractor, OR the contract may be suspended or terminated for cause. Failure of the Contractor to purchase and/or maintain any required insurance shall not relieve the Contractor from any liability or indemnification under the contract.

F. SUBCONTRACTORS

1. Contractor shall include all subcontractors as insureds under its policies OR shall be responsible for verifying and maintaining the Certificates provided by each subcontractor. Subcontractors shall be subject to all of the requirements stated herein. The Agency reserves the right to request copies of subcontractor's Certificates at any time.

2. If Contractor does not verify subcontractors' insurance as described above, Agency has the right to withhold payments to the Contractor until the requirements have been met.

G. WORKERS COMPENSATION INDEMNITY

In the event Contractor is not required to provide or elects not to provide workers compensation coverage, the parties hereby agree that Contractor, its owners, agents and employees will have no cause of action against, and will not assert a claim against, the State of Louisiana, its departments, agencies, agents and employees as an employer, whether pursuant to the Louisiana Workers Compensation Act or otherwise, under any circumstance. The parties also hereby agree that the State of Louisiana, its departments, agencies, agents and employees shall in no circumstance be, or considered as, the employer or statutory employer of Contractor, its owners, agents and employees. The parties further agree that Contractor is a wholly independent Contractor and is exclusively responsible for its employees, owners, and agents. Contractor hereby agrees to protect, defend, indemnify and hold the State of Louisiana, its departments, agencies, agents and employees harmless from any such assertion or claim that may arise from the performance of this contract.

H. INDEMNIFICATION/HOLD HARMLESS AGREEMENT

1. Contractor agrees to protect, defend, indemnify, save, and hold harmless, the State of Louisiana, all State Departments, Agencies, Boards and Commissions, its officers, agents, servants, employees, and volunteers, from and against any and all claims, damages, expenses, and liability arising out of injury or death to any person or the damage, loss or destruction of any property which may occur, or in any way grow out of, any act or omission of Contractor, its agents, servants, and employees, or any and all costs, expenses and/or attorney fees incurred by Contractor as a result of any claims, demands, suits or causes of action, except those claims, demands, suits, or causes of action arising out of the negligence of the State of Louisiana, all State Departments, Agencies, Boards, Commissions, its officers, agents, servants, employees and volunteers.

2. Contractor agrees to investigate, handle, respond to, provide defense for and defend any such claims, demands, suits, or causes of action at its sole expense and agrees to bear all other costs and expenses related thereto, even if the claims, demands, suits, or causes of action are groundless, false or fraudulent. The State of Louisiana may, but is not required to, consult with the Contractor in the defense of claims, but this shall not affect the Contractor’s responsibility for the handling of and expenses for all claims.

INSTRUCTIONS TO BIDDERS

COMPLETION TIME:

The Bidder shall agree to fully complete the contract within (**270**) consecutive calendar days, subject to such extensions as may be granted under Paragraph 8.3, in the General Conditions and the Supplementary Conditions, and acknowledges that this construction time will start on or before the date specified in the written "Notice to Proceed" from the Owner.

LIQUIDATED DAMAGES:

The Bidder shall agree to pay as Liquidated Damages the amount of (**Five Hundred**) Dollars (**$500.00**) for each consecutive calendar day for which the work is not complete, beginning with the first day beyond the contract completion date stated on the "Notice to Proceed" or as amended by change order.

ARTICLE 1

DEFINITIONS

1.1 The Bid Documents include the following:

Advertisement for Bids
Instructions to Bidders
Bid Form
Bid Bond
General Conditions of the Contract for Construction,
AIA Document A201, 2017 Edition
Supplementary Conditions
Contract Between Owner and Contractor and Performance and Payment Bond
Affidavit
User Agency Documents (if applicable)
Change Order Form
Partial Occupancy Form
Recommendation of Acceptance
Asbestos Abatement (if applicable)
Other Documents (if applicable)
Specifications & Drawings
Addenda issued during the bid period and acknowledged in the Bid Form

1.2 All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201 and the Supplementary Conditions are applicable to the Bid Documents.

1.3 Addenda are written and/or graphic instruments issued by the Architect prior to the opening of bids, which modify or interpret the Bid Documents by additions, deletions, clarifications, corrections and prior approvals.

1.4 A bid is a complete and properly signed proposal to do the work or designated portion thereof for the sums stipulated therein supported by data called for by the Bid Documents.

1.5 Base bid is the sum stated in the bid for which the Bidder offers to perform the work described as the base, to which work may be added, or deleted for sums stated in alternate bids.

1.6 An alternate bid (or alternate) is an amount stated in the bid to be added to the amount of the base bid if the corresponding change in project scope or materials or methods of construction described in the Bid Documents is accepted.

1.7 A Bidder is one who submits a bid for a prime Contract with the Owner for the work described in the Bid Documents.

1.8 A Sub-bidder is one who submits a bid to a Bidder for materials and/or labor for a portion of the work.

1.9 Where the word "Architect" is used in any of the documents, it shall refer to the Prime Designer of the project, regardless of discipline.

ARTICLE 2

PRE-BID CONFERENCE

2.1 A Pre-Bid Conference shall be held at least 10 days before the date for receipt for bids. The Architect shall coordinate the setting of the date, time and place for the Pre-Bid Conference with the User Agency and shall notify in writing the Owner and all who have received sets of the Bid Documents to

attend. The purpose of the Pre-Bid Conference is to familiarize Bidders with the requirements of the Project and the intent of the Bid Documents, and to receive comments and information from interested Bidders. If the Pre-Bid Conference is stated in the Advertisement for Bids to be a Mandatory Pre-Bid Conference, bids shall be accepted only from those bidders who attend the Pre-Bid Conference. Contractors who are not in attendance for the **entire** Pre-Bid Conference will be considered to have not attended.

2.2 Any revision of the Bid Documents made as a result of the Pre-Bid Conference shall not be valid unless included in an addendum.

ARTICLE 3

BIDDER'S REPRESENTATION

3.1 Each Bidder by making his bid represents that:

3.1.1 He has read and understands the Bid Documents and his bid is made in accordance therewith.

3.1.2 He has visited the site and has familiarized himself with the local conditions under which the work is to be performed.

3.1.3 His bid is based solely upon the materials, systems and equipment described in the Bid Documents as advertised and as modified by addenda.

3.1.4 His bid is not based on any verbal instructions contrary to the Bid Documents and addenda.

3.1.5 He is familiar with Code of Governmental Ethics requirement that prohibits public servants and/or their immediate family members from bidding on or entering into contracts; he is aware that the Designer and its principal owners are considered Public Servants under the Code of Governmental Ethics for the limited purposes and scope of the Design Contract with the State on this Project (see Ethics Board Advisory Opinion, No. 2009-378 and 2010-128); and neither he nor any principal of the Bidder with a controlling interest therein has an immediate family relationship with the Designer or any principal within the Designer's firm (see La. R.S. 42:1113). Any Bidder submitting a bid in violation of this clause shall be disqualified and any contract entered into in violation of this clause shall be null and void.

3.2 The Bidder must be fully qualified under any State or local licensing law for Contractors in effect at the time and at the location of the work before submitting his bid. In the State of Louisiana, Revised Statutes 37:2150, et seq. will be considered, if applicable.

The Contractor shall be responsible for determining that all of his Sub-bidders or prospective Subcontractors are duly licensed in accordance with law.

ARTICLE 4

BID DOCUMENTS

4.1 Copies

4.1.1 Bid Documents may be obtained from the Architect for a deposit as stated in the Advertisement for Bids. The deposit will be refunded as stated in the Advertisement for Bids. No deposits will be refunded on Bid Documents returned later than ten days after receipt of bids.

4.1.1.2 As an alternative method of distribution, the Designer may provide the Bid Documents in electronic format. They may be obtained without charge and without deposit as stated in the Advertisement for Bids.

4.1.1.2.1 If electronic distribution is available, printed copies will not be available from the Designer, but arrangements can be made to obtain them through most reprographic firms and/or plan rooms.

4.1.1.2.2 If electronic distribution is available, the reproduction cost on the first paper plan set acquired by bona fide prime bidders will be fully refunded by the Designer upon delivery of the documents to the Designer in good condition no later than ten days after receipt of bids.

4.1.1.2.3 If electronic distribution is available, all other plan holders are responsible for their own reproduction costs.

4.1.2 Complete sets of Bid Documents shall be used in preparing bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.

4.1.3 The Owner or Architect in making copies of the Bid Documents available on the above terms, do so only for the purpose of obtaining bids on the work and do not confer a license or grant for any other use.

4.2 Interpretation or Correction of Bid Documents

4.2.1 Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bid Documents or of the site and local conditions.

4.2.2 Bidders requiring clarification or interpretation of the Bid Documents shall make a written request to the Architect, to reach him at least seven days prior to the date for receipt of bids.

4.2.3 Any interpretation, correction or change of the Bid Documents will be made by addendum. Interpretations, corrections or changes of the Bid Documents made in any other manner will not be binding and Bidders shall not rely upon such interpretations, corrections and changes.

4.3 Substitutions

4.3.1 The materials, products and equipment described in the Bid Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. No substitutions shall be allowed after bids are received.

4.3.2 No substitution will be considered unless written request for approval has been submitted by the Proposer and has been received by the Architect at least seven (7) working days prior to the opening of bids. (La. R.S. 38:2295(C)) Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including model numbers, drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. It shall be the responsibility of the proposer to include in his proposal all changes required of the Bid Documents if the proposed product is used. Prior approval, if given, is contingent upon supplier being responsible for any costs which may be necessary to modify the space or facilities needed to accommodate the materials and equipment approved.

4.3.3 If the Architect approves any proposed substitution, such approval shall be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

4.4 Addenda

4.4.1 Addenda will be transmitted to all who are known by the Architect to have received a complete set of Bid Documents.

4.4.2 Copies of addenda will be made available for inspection wherever Bid Documents are on file for that purpose.

4.4.3 Except as described herein, addenda shall not be issued within a period of seventy-two (72) hours prior to the advertised time for the opening of bids, excluding Saturdays, Sundays, and any other legal holidays. If the necessity arises of issuing an addendum modifying plans and specifications within the seventy-two (72) hour period prior to the advertised time for the opening of bids, then the opening of bids shall be extended at least seven but no more than twenty-one (21) working days, without the requirement of re-advertising. Southern University shall be consulted prior to issuance of such an addendum and shall approve such issuance. The revised time and date for the opening of bids shall be stated in the addendum.

4.4.4 Each Bidder shall ascertain from the Architect prior to submitting his bid that he has received all addenda issued, and he shall acknowledge their receipt on the Bid Form.

4.4.5 The Owner shall have the right to extend the bid date by up to (30) thirty days without the requirement of re-advertising. Any such extension shall be made by addendum issued by the Architect.

ARTICLE 5

BID PROCEDURE

5.1 Form and Style of Bids

5.1.1 Bids shall be submitted on the Louisiana Uniform Public Work Bid Form provided by the Architect for this project.

5.1.2 The Bidder shall ensure that all applicable blanks on the bid form are completely and accurately filled in.

5.1.3 Bid sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written words shall govern.

5.1.4 Any interlineation, alteration or erasure must be initialed by the signer of the bid or his authorized representative.

5.1.5 Bidders are cautioned to complete all alternates should such be required in the Bid Form. Failure to submit alternate prices will render the bid non responsive and shall cause its rejection.

5.1.6 Bidders are cautioned to complete all unit prices should such be required in the Bid Form. Unit prices represent a price proposal to do a specified quantity and quality of work. Unit prices are incorporated into the base bid or alternates, as indicated on the Unit Price Form, but are not the sole components thereof.

5.1.7 Bidder shall make no additional stipulations on the Bid Form nor qualify his bid in any other manner.

5.1.8 Written evidence of the authority of the person signing the bid for the public work shall be submitted in accordance with La. R.S. 38:2212 (B)(5).

5.1.9 On any bid in excess of fifty thousand dollars ($50,000.00), the Contractor shall certify that he is licensed under La. R.S. 37: 2150-2173 and show his license number on the bid above his signature or his duly authorized representative.

5.2 Bid Security

5.2.1 No bid shall be considered or accepted unless the bid is accompanied by bid security in an amount of five percent (5.0%) of the base bid and all alternates.

The bid security shall be in the form of a certified check or cashier's check drawn on a bank insured by the Federal Deposit Insurance Corporation, or a Bid Bond written by a surety company licensed to do business in Louisiana and signed by the surety's agent or attorney-in-fact. The Bid Bond shall be written on the Bid Bond Form, and the surety for the bond must meet the qualifications stated thereon. The Bid Bond shall include the legal name of the bidder and shall be accompanied by appropriate power of attorney. The Bid Bond must be signed by both the bidder/principal and the surety in the space provided on the Bid Bond Form. Failure by the bidder/principal or the surety to sign the bid bond shall result in the rejection of the bid.

Bid security furnished by the Contractor shall guarantee that the Contractor will, if awarded the work according to the terms of his proposal, enter into the Contract and furnish Performance and Payment Bonds as required by these Bid Documents, within fifteen (15) days after written notice that the instrument is ready for his signature.

Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as penalty.

5.2.2 The Owner will have the right to retain the bid security of Bidders until either (a) the Contract has been executed and bonds have been furnished, or (b) the specified time has elapsed so that bids may be withdrawn, or (c) all bids have been rejected.

5.3 Submission of Bids

5.3.1 The Bid shall be sealed in an opaque envelope. The bid envelope shall be identified on the outside with the name of the project, and the name, address, and license number of the Bidder.
The envelope shall not contain multiple bid forms, and will be received until the time specified and at the place specified in the Advertisement for Bids. It shall be the specific responsibility of the Bidder to deliver his sealed bid to Southern University Purchasing Department at the appointed place and prior to the announced time for the opening of bids. Late delivery of a bid for any reason, including late delivery by United States Mail, or express delivery, shall disqualify the bid.

If the bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "Bid Enclosed" on the face thereof. Such bids shall be sent by Registered or Certified Mail, Return Receipt Requested, addressed to:

Southern University
Purchasing Department
P. 0. Box 9534
Baton Rouge, Louisiana, 70810.

Bids sent by express delivery shall be delivered to:

Southern University
Purchasing Department
8100 James L. Prestage Drive
J.S. Clark Administration Building Annex
South Entrance, First Floor East
Baton Rouge, Louisiana 70810

5.3.2 Bids shall be deposited at the designated location prior to the time on the date for receipt of bids indicated in the Advertisement for Bids, or any extension thereof made by addendum. Bids received after the time and date for receipt of bids will be returned unopened.

5.3.3 Bidder shall assume full responsibility for timely delivery at location designated for receipt of bids.

5.3.4 Oral, telephonic or telegraphic bids are invalid and shall not receive consideration. Owner shall not consider notations written on outside of bid envelope which have the effect of amending the bid. Written modifications enclosed in the bid envelope, and signed or initialed by the Contractor or his representative, shall be accepted.

5.4 Modification or Withdrawal of Bid

5.4.1 A bid may not be modified, withdrawn or canceled by the Bidder during the time stipulated in the Advertisement for Bids, for the period following the time and bid date designated for the receipt of bids, and Bidder so agrees in submitting his bid, except in accordance with R.S. 38:2214 which states, in part, "Bids containing patently obvious, unintentional, and substantial mechanical, clerical, or mathematical errors, or errors of unintentional omission of a substantial quantity of work, labor, material, or services made directly in the compilation of the bid, may be withdrawn by the contractor if clear and convincing sworn, written evidence of such errors is furnished to the public entity within forty-eight hours of the bid opening excluding Saturdays, Sundays, and legal holidays".

5.4.2 Prior to the time and date designated for receipt of bids, bids submitted early may be modified or withdrawn only by notice to the party receiving bids at the place and prior to the time designated for receipt of bids.

5.4.3 Withdrawn bids may be resubmitted up to the time designated for the receipt of bids provided that they are then fully in conformance with these Instructions to Bidders.

5.4.4 Bid Security shall be in an amount sufficient for the bid as modified or resubmitted.

5.5 Prohibition of Discriminatory Boycotts of Israel

By submitting a bid, the bidder certifies and agrees that the following information is correct:

In preparing its bid, the bidder has considered all proposals submitted from qualified, potential subcontractors and suppliers, and has not, in the solicitation, selection, or commercial treatment of any subcontractor or supplier, refused to transact or terminated business activities, or taken other actions intended to limit commercial relations, with a person or entity that is engaging in commercial transactions in Israel or Israel-controlled territories, with the specific intent to accomplish a boycott or divestment of Israel. The bidder has also not retaliated against any person or other entity for reporting such refusal, termination, or commercially limiting actions. The state reserves the right to reject any bid if this certification is subsequently determined to be false and to terminate any contract awarded based on such a false response.

ARTICLE 6

CONSIDERATION OF BIDS

6.1 Opening of Bids

6.1.1 The properly identified Bids received on time will be opened publicly and will be read aloud, and a tabulation abstract of the amounts of the base bids and alternates, if any, will be made available to Bidders.

6.2 Rejection of Bids

6.2.1 The Owner shall have the right to reject any or all bids and in particular to reject a bid not accompanied by any required bid security or data required by the Bid Documents or a bid in any way incomplete or irregular.

6.3 Acceptance of Bid

6.3.1 It is the intent of the Owner, if he accepts any alternates, to accept them in the order in which they are listed in the Bid Form. Determination of the Low Bidder shall be on the basis of the sum of the base bid and the alternates accepted. However, the Owner shall reserve the right to accept alternates in any order which does not affect determination of the Low Bidder.

ARTICLE 7

POST-BID INFORMATION

7.1 Submissions

7.1.1 At the Pre-Construction Conference, the Contractor shall submit the following information to the Architect.

7.1.1.1 A designation of the work to be performed by the Contractor with his own forces.

7.1.1.2 A breakdown of the Contract cost attributable to each item listed in the Schedule of Values Form (attached). No payments will be made to the Contractor until this is received.

7.1.1.3 The proprietary names and the suppliers of principal items or systems of material and equipment proposed for the work.

7.1.1.4 A list of names and business domiciles of all Subcontractors, manufacturers, suppliers or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the work. It is the preference of the Owner that, to the greatest extent possible or practical, the Contractor utilize Louisiana Subcontractors, manufacturers, suppliers and labor.

7.1.2 The General Contractor shall be responsible for actions or inactions of Subcontractors and/or material suppliers.

The General Contractor is totally responsible for any lost time or extra expense incurred due to a Subcontractor's or Material Supplier's failure to perform. Failure to perform includes, but is not limited to, a Subcontractor's financial failure, abandonment of the project, failure to make prompt delivery, or failure to do work up to standard. Under no circumstances shall the Owner mitigate the General Contractor's losses or reimburse the General Contractor for losses caused by these events.

7.1.3 The lowest responsive and responsible bidder shall submit to the Architect and the Owner within ten days after the bid opening a letter/letters from the manufacturer stating that the manufacturer will issue the roof system guarantee complying with the requirements based on the specified roof system and include the name of the applicator acceptable to the manufacturer at the highest level of certification for installing the specified roof system. This manufacturer shall be one that has received prior approval or is named in the specifications.

In accordance with La. R.S. 38:2227 [references La R.S. 38:2212(A)(3)(c)(ii), which has since been renumbered as La R.S. 38:2212(B)(3)], La. R.S. 38:2212.10 and La. R.S. 23:1726(B) the apparent low bidder on this project shall submit the completed Attestations Affidavit (Past Criminal Convictions of Bidders, Verification of Employees and Certification Regarding Unpaid Workers Compensation Insurance) form found within this bid package to Southern University Purchasing Department within 10 days <u>after</u> the opening of bids**.**

ARTICLE 8

PERFORMANCE AND PAYMENT BOND

8.1 Bond Required

8.1.1 The Contractor shall furnish and pay for a Performance and Payment Bond written by a company licensed to do business in Louisiana, which shall be signed by the surety's agent or attorney-in-fact, in an amount equal to 100% of the Contract amount. Surety must be listed currently on

the U. S. Department of Treasury Financial Management Service List (Treasury List) as approved for an amount equal to or greater than the contract amount, or must be an insurance company domiciled in Louisiana or owned by Louisiana residents. If surety is qualified other than by listing on the Treasury list, the contract amount may not exceed fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance and may not exceed the amount of $500,000. However, a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A. M. Best's Key Rating Guide shall not be subject to the $500,000 limitation, provided that the contract amount does not exceed ten percent of policyholders' surplus as shown in the latest A. M. Best's Key Rating Guide nor fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance. The Bond shall be signed by the surety's agent or attorney-in-fact. The Bond shall be in favor of Southern University.

8.2 Time of Delivery and Form of Bond

8.2.1 The Bidder shall deliver the required bond to the Owner simultaneous with the execution of the Contract.

8.2.2 Bond shall be in the form furnished by Southern University, entitled CONTRACT BETWEEN OWNER AND CONTRACTOR AND PERFORMANCE AND PAYMENT BOND, a copy of which is included in the Bid Documents.

8.2.3 The Bidder shall require the Attorney-in-Fact who executes the required bond on behalf of the surety to affix thereto a certified and current copy of his power of Attorney.

ARTICLE 9

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

9.1 Form to be Used

9.1.1 Form of the Contract to be used shall be furnished by Southern University Purchasing Department, an example of which is bound in the Bid Documents.

9.2 Award

9.2.1 After award of the Contract, the successful Bidder, if a corporation, shall furnish to the Owner the most current copy of a Disclosure of Ownership Affidavit on file with the Secretary of State.

9.2.2 In accordance with Louisiana Law, when the Contract is awarded, the successful Bidder shall, at the time of the signing of the Contract, execute the Non-Collusion Affidavit included in the Contract Documents

9.2.3 When this project is financed either partially or entirely with State Bonds, the award of this Contract is contingent upon the sale of bonds by the State Bond Commission. The State shall incur no obligation to the Contractor until the Contract Between Owner and Contractor is duly executed.

Bid Form #: SU 004

JOB SITE VISIT

PROJECT: BOILER & PUMP REPLACEMENT
LOCATION OF PROJECT: PBS PINCHBACK HALL
BID NUMBER 50016-10370
MANDATORY SITE VISIT DATE: NOVEMBER 16, 2026 @ 10:30 AM
LATE ARRIVALS CANNOT PARTICIPATE IN THE BID PROCESS

It is the responsibility of the bidder to inspect job site verify any measurements and/or supplies needed prior to submitting a bid price on this project. Each bidder shall fully acquaint himself with conditions relating to construction and labor so that he may fully understand the facilities, difficulties and restrictions attending the execution of work under this contract. If vendor finds conditions that disagree with the physical layout as described in the bid, or any other features of the specifications that appear to be in error, same shall be noted on proposal. Failure to do so will be interpreted as specified. No consideration or allowance will be granted the Contractor for failure to visit the site or for any alleged misunderstanding of the materials to be furnished or the work to be done.

JOB SITE VISIT LOCATION:

Physical Plant Department
Benjamin H. Kraft Building
515 James L. Hunt Street
Southern University
Baton Rouge Campus
Site Telephone No. 225-771-4741 or 771-6241

The signed statement certifies the vendor's name listed below, has visited the proposed site and is familiar with all conditions surrounding fulfillment of the specifications for this project.

*COMPANY*_____

*BY*_____

*DATE*_____

***Note**: Questions not answered at Site Visit or any additional questions shall be submitted in writing to the Director of Purchasing, Linda A. Antoine at linda_antoine@subr.edu.*

Note: Responses to inquiries/Addenda are posted on LaPAC (LA Procurement Website)
LA State Procurement website:

https://wwwcfprd.doa.louisiana.gov/OSP/LaPAC/Agency/outMain.cfm

It is the responsibility of the vendor to check LAPAC for addenda.

JOB SITE VERIFIED BY DESIGNATED SOUTHERN UNIVERSITY EMPLOYEE:

_____

SIGNATURE

This is not a state required form, however return this sheet with bid for information purpose

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: **Southern University and A&M College**
Post Office Box 9534
James J. Prestage Dr-J.S. Clark Adm. Bldg. Annex
Baton Rouge, LA 70813

BID FOR: Bid Number 10370
Boiler & Pump Replacement
PBS Pinchback Hall
Southern University and A&M College
Baton Rouge Campus

The undersigned bidder hereby declares and represents that she/he: a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: *Parish Engineering*

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) _____ .

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____Dollars ($ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description, ***not applicable***

Alternate No. 1 f***or the lump sum of:***
_____Dollars ($ _____)

Alternate No. 2 ***for the lump sum of:***
_____Dollars ($ _____)

Alternate No. 3 ***for the lump sum of:***
_____Dollars ($ _____)

NAME OF COMPANY: _____

ADDRESS OF BIDDER:_____

_____

EMAIL_____

PHONE_____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

PRINT NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER: _____

DATE: _____

Completion Time: 270 consecutive calendar days, or within the time that may be extended as stipulated in the contract.
Liquidated Damages $500.00
5% Bid Security: XX YES (shall be included with bid)
(check here) _____ Bid Security included. Bid Security shall be total of 5% for base bid and alternates.
Successful bidder will be notified by letter to secure Performance and Payment Bond up to 100% of cost.
(check here) _____ Board Resolution included or Secretary of State Registration

A CORPORATE RESOLUTION OR WRITTEN EVIDENCE of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5) or Secretary of State verification.
BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA RS 38: 2218.A is attached to and made a part of this bid.

The Unit Price Form shall be used if the contract includes unit prices. *Otherwise it is not required and need not be included with the bid.* The number of unit prices that may be included is not limited and additional sheets may be included if needed.

LOUISIANA UNIFORM PUBLIC WORK BID FORM
UNIT PRICE FORM

TO: **Southern University and A&M College**
Post Office Box 9534-Purchasing
James J. Prestage Dr-J. S. Clark Administration Bldg. Annex
Baton Rouge, LA 70813

BID FOR: Bid Number 50016-10370

BID 10370-BOILER & PUMP REPLACEMENT-PBS PINCHBACK HALL

UNIT PRICES: This form shall be used for any and all work required by the Bidding Documents and described as unit prices. Amounts shall be stated in figures and only in figures.

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

DESCRIPTION:	❑ Base Bid or ❑ Alt.# ___			
REF. NO.	QUANTITY:	UNIT OF MEASURE:	UNIT PRICE	UNIT PRICE EXTENSION *(Quantity times Unit Price)*

Wording for "DESCRIPTION" is to be provided by the Owner.
All quantities are estimated. The contractor will be paid based upon actual quantities as verified by the Owner.

BID BOND

Date: _____

KNOW ALL MEN BY THESE PRESENTS:

That_____of_____, as Principal, and_____, as Surety, are held and firmly bound unto _____(Obligee), in the full and just sum of five (5%) percent of the total amount of this proposal, including all alternates, lawful money of the United States, for payment of which sum, well and truly be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally firmly by these presents.

Surety represents that it is listed on the current U. S. Department of the Treasury Financial Management Service list of approved bonding companies as approved for an amount equal to or greater that the amount for which it obligates itself in this instrument or that it is a Louisiana domiciled insurance company with at least an A - rating in the latest printing of the A. M. Best's Key Rating Guide. If surety qualifies by virtue of its Best's listing, the Bond amount may not exceed ten percent of policyholders' surplus as shown in the latest A. M. Best's Key Rating Guide.

Surety further represents that it is licensed to do business in the State of Louisiana and that this Bond is signed by surety's agent or attorney-in-fact. This Bid Bond is accompanied by appropriate power of attorney.

THE CONDITION OF THIS OBLIGATION IS SUCH that, whereas said Principal is herewith submitting its proposal to the Obligee on a Contract for:

_____

NOW, THEREFORE, if the said Contract be awarded to the Principal and the Principal shall, within such time as may be specified, enter into the Contract in writing and give a good and sufficient bond to secure the performance of the terms and conditions of the Contract with surety acceptable to the Obligee, then this obligation shall be void; otherwise this obligation shall become due and payable.

_____

PRINCIPAL (BIDDER) SURETY

BY: _____ BY:_____

AUTHORIZED OFFICER-OWNER-PARTNER AGENT OR ATTORNEY-IN-FACT(SEAL)

FOR INFORMATION ONLY

This document will be prepared by Southern University Purchasing Office in the form appropriate for the project.

STATE OF LOUISIANA
PARISH OF **«PARISH_OF_PROJECT»**

CONTRACT BETWEEN OWNER AND CONTRACTOR
AND PERFORMANCE AND PAYMENT BOND

This agreement entered into this _____ day of _____, 2025, by **«Contractor»** hereinafter called the "Contractor", whose business address is **«Contractor_Address», «Contractor_City», «Contractor_State» «Contractor_Zip»**, and the State of Louisiana Division of Administration, herein represented by the contracting officer executing this contract, hereinafter called the "Owner".

Witnesseth that the Contractor and the Owner, in consideration of premises and the mutual covenants; consideration and agreement herein contained, agree as follows:

Statement of Work: The contractor shall furnish all labor and materials and perform all of the work required to build, construct and complete in a thorough and workmanlike manner:

«Project_Reference_1»
«Project_Reference_2»
«Project_Reference_3»
«Project_City», Louisiana
Project No.: «ProjectNo», «Part_No»«WBS»;
«Supplement_Project_No», Part «Supplement_Part_No»
(«Supplement_WBS»)(Supplement)
State ID No.: «StateID» Site Code: «SiteCode»

in strict accordance with Contract Documents prepared by:

«Designer»
«Designer_Address»
«Designer_City», «Designer_State» «Designer_Zip»

It is recognized by the parties herein that said Contract Documents including by way of example and not of limitation, the Drawings and Specifications dated **«Drawings_and_Specs_Date»**, Addenda number(s) **«Addenda_No»**, the Instruction to Bidders, Bid Form, General Conditions, Supplementary Conditions, any Addenda thereto, impose duties and obligations upon the parties herein, and said parties thereby agree that they shall be bound by said duties and obligations. For these purposes, all of the provisions contained in the aforementioned Construction Documents are incorporated herein by reference with the same force and effect as though said Construction Documents were herein set out in full.

Time for Completion: The work shall be commenced on a date to be specified in a written order of the Owner and shall be completed within **«Time_Completion_Days» («Time_Completion_Days»)** consecutive calendar days from and after the said date.

Liquidated Damages: Contractor shall be assessed Liquidated Damages in the amount of **«Liquidated_Damages_Cost_Per_Day»** per day for each consecutive calendar day which work is not complete beginning with the first day beyond the completion time.

Compensation to be paid to the Contractor: The Owner will pay and the Contractor will accept in full consideration for the performance of the contract the sum of **«Contract_Amount_Words» and No/100 Dollars («Contract_Amount_Numeral»)** which sum represents the **«Base_Bid_Only_or_Plus_Alternates»**

Taxes: Contractor hereby agrees that the responsibility for payment of taxes from the funds thus received under this Contract and/or legislative appropriation shall be contractor's obligation and identified under Federal tax identification number _____.

Performance and Payment Bond: To these presents personally came and intervened _____, herein acting for _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Louisiana, as surety, who declared that having taken cognizance of this contract and of the Construction Documents mentioned herein, he hereby in his capacity as its Attorney in Fact obligates his said company, as Surety for the said Contractor, unto the said Owner, up to the sum of **«Contract_Amount_Words» and No/100 Dollars («Contract_Amount_Numeral»)**. By issuance of this bond, the surety acknowledges they are in compliance with R.S. 38:2219.

The condition of this performance and payment bond shall be that should the Contractor herein not perform the contract in accordance with the terms and conditions hereof, or should said Contractor not fully indemnify and save harmless the Owner, from all cost and damages which he may suffer by said Contractor's non-performance or should said Contractor not pay all persons who have and fulfill obligations to perform labor and/or furnish materials in the prosecution of the work provided for herein, including by way of example workmen, laborers, mechanics, and furnishers of materials, machinery, equipment and fixtures, then said Surety agrees and is bound to so perform the contract and make said payment(s).

Provided, that any alterations which may be made in the terms of the contract or in the work to be done under it, or the giving by the Owner of any extensions of time for the performance of the contract, or any other forbearance on the part of either the Owner or the Contractor to the other shall not in any way release the Contractor or the Surety from their liability hereunder, notice to the Surety of any such alterations, extensions or other forbearance being hereby waived.

Contractor acknowledges and agrees to comply with the provisions of La. R.S. 38:2212.10 and federal law pertaining to E-Verify in the performance of services under this Contract.

It is hereby agreed that the Legislative Auditor of the State of Louisiana and/or the Office of the Governor, Division of Administration auditors shall have the option of auditing all accounts of contractor which relate to this contract.

The continuation of this contract is contingent upon the appropriation of funds to fulfill the requirements of the contract by the legislature. If the legislature fails to appropriate sufficient monies to provide for the continuation of the contract, or if such appropriation is reduced by the veto of the Governor or by any means provided in the appropriations act to prevent the total appropriation for the year from exceeding revenues for that year, or for any other lawful purpose, and the effect of such reduction is to provide insufficient monies for the continuation of the contract, the contract shall terminate on the date of the beginning of the first fiscal year for which funds are not appropriated.

The contractor agrees to abide by the requirements of the following as applicable: Title VI of the Civil Rights Act of 1964 and Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972, Federal Executive Order 11246 as amended, the Rehabilitation Act of 1973, as amended, the Vietnam Era Veteran's Readjustment Assistance Act of 1974, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1975, the Fair Housing Act of 1968 as amended, and contractor agrees to abide by the requirements of the Americans with Disabilities Act of 1990.

Contractor agrees not to discriminate in its employment practices, and will render services under this contract without regard to race, color, religion, sex, sexual orientation, national origin, veteran status, political affiliation, disability, or age in any matter relating to employment. Any act of discrimination committed by Contractor, or failure to comply with these statutory obligations when applicable shall be grounds for termination of this contract.

In accordance with R.S. 39:1602.1, effective May 22, 2018, for any contract for $100,000 or more and for any contractor with five or more employees, Contractor, or any Subcontractor, shall certify it is not engaging in a boycott of Israel, and shall, for the duration of this contract, refrain from a boycott of Israel. The State reserves the right to terminate this contract if the Contractor, or any Subcontractor, engages in a boycott of Israel during the term of the contract.

In accordance with La. R.S. 39:1602.2, the following applies to any competitive sealed bids, competitive sealed proposals, or contract(s) with a value of $100,000 or more involving a for-profit company with at least fifty full-time employees:

Unless otherwise exempted by law, by submitting a response to this solicitation or entering into this contract, the Bidder, Proposer or Contractor certifies the following:

1. The company does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association based solely on the entity's or association's status as a firearm entity or firearm trade association;
2. The company will not discriminate against a firearm entity or firearm trade association during the term of the contract based solely on the entity's or association's status as a firearm entity or firearm trade association.

The State reserves the right to reject the response of the Bidder, Proposer or Contractor if this certification is subsequently determined to be false, and to terminate any contract awarded based on such a false response or if the certification is no longer true.

Contractor has a continuing obligation to disclose any suspensions or debarment by any government entity, including but not limited to General Services Administration (GSA). Failure to disclosed may constitute grounds for suspension and/or termination of the Contract and debarment from future Contracts.

Contractor, and each tier of Subcontractors, shall certify that it is not on the List of Parties Excluded from Federal Procurement or Nonprocurement Programs promulgated in accordance with E.O.s 12549 and 12689, "Debarment and Suspension," as set forth at 24 CFR part 24.

In Witness whereof, the parties hereto on the day and year first above written have executed this agreement in six (6) counterparts, each of which shall, without proof or accountancy for the other counterparts, be deemed an original thereof.

THUS DONE AND SIGNED at Baton Rouge, Louisiana, on the day, month, and year first written above.

WITNESSES:

SOUTHERN UNIVERSITY
BATON ROUGE CAMPUS

_____
Southern University Witness #1 Sign Here

BY: _____
DENNIS J. SHEILDS,
PRESIDENT-CHANCELLOR, SUS

_____
Southern University Witness #2 Sign Here

_____
Contractor Witness #1 Sign Here

BY: _____
«CONTRACTOR»

_____
Contractor Witness #2 Sign Here

SURETY:

_____
Surety Witness #1 Sign Here

BY: _____
ATTORNEY IN FACT

_____
Surety Witness #2 Sign Here

_____
ADDRESS

_____
TELEPHONE NUMBER

STATE OF LOUISIANA
PARISH OF **«PARISH_OF_CONTRACTOR»**

PROJECT NO.:«ProjectNo», «Part_No»«WBS»;
«Supplement_Project_No», Part
«Supplement_Part_No» («Supplement_WBS»)(Supplement)
NAME: «Project_Reference_1»
«Project_Reference_2»
«Project_Reference_3»
LOCATION: «Project_City»

NON-COLLUSION AFFIDAVIT

Before me, the undersigned authority, duly commissioned and qualified within and for the State and Parish aforesaid, personally came and appeared _____ representing **«Contractor»** who, being by me first duly sworn deposed and said that he has read this affidavit and does hereby agree under oath to comply with all provisions herein as follows:

PART I.

Section 2224 of Part II of Chapter 10 of Title 38 of the Louisiana Revised Statutes, as amended.

(1) That affiant employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for affiant; and

(2) That no part of the Contract price received by affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the Contract, other than the payment of their normal compensation to persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for affiant.

PART II.

Section 2190 of Part I of Chapter 10 of Title 38 of the Louisiana Revised Statutes, as amended.

That affiant, if an architect or engineer, or representative thereof, does not own a substantial financial interest, either directly or indirectly, in any corporation, firm, partnership, or other organization which supplies materials for the construction of a public work when the architect or engineer has performed architectural or engineering services, either directly or indirectly, in connection with the public work for which the materials are being supplied.

For the purposes of this Section, a "substantial financial interest" shall exclude any interest in stock being traded on the American Stock Exchange or the New York Stock Exchange.

That affiant, if subject to the provisions of this section, does hereby agree to be subject to the penalties involved for the violation of this section.

_____
AFFIANT

SWORN TO AND SUBSCRIBED BEFORE ME THIS _____ DAY OF _____, 2025.

_____
NOTARY

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

PBS Pinchback Boiler and Pump Replacement
Southern University, Baton Rouge LA
Project: F.01004689

THE OWNER:
(Name, legal status and address)

Southern University A & M College
Purchasing Department
PO Box 9534
Baton Rouge, LA 70810

THE ARCHITECT:
(Name, legal status and address)

Parish Engineering
1450 Seabord Drive
Baton Rouge, LA 70810

TABLE OF ARTICLES

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10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

13 MISCELLANEOUS PROVISIONS

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set

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forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

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§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately

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suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

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§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

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§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

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§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not

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have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

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§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will

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similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the

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Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

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.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor

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change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

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§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot

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be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

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§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

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§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

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§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents;

.3 terms of special warranties required by the Contract Documents; or

.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

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§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

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ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

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§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to

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the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

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§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

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

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

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ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,

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the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

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§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- **.1** damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- **.2** damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

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Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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SUPPLEMENTARY CONDITIONS

These Supplementary Conditions modify, change, delete from or add to the General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition. Where any Article of the General Conditions is modified or any Section, Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Section, Article, Paragraph, Subparagraph or Clause shall remain in effect.

Articles, Sections, Paragraphs, Subparagraphs or Clauses modified or deleted have the same numerical designation as those occurring in the General Conditions.

ARTICLE 1

GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1. The Contract Documents

In Section 1.1.1 delete the third sentence, and add the following sentence:
The Contract Documents shall include the Bid Documents as listed in the Instructions to Bidders and any modifications made thereto by addenda.

1.1.8 Initial Decision Maker

Delete all after the words, "shall not show partiality to the Owner or Contractor".

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE [REFER TO *La R.S. 38:2317*]

1.5.1 Delete the first sentence of the paragraph.

1.5.1 In the third sentence: delete the remainder after the word "publication".

1.7 DIGITAL DATA USE AND TRANSMISSION

In the first sentence after the words, "in digital form" delete ". The parties will use AIA Document E203 2013, Building Information Modeling and Digital Data Exhibit".

1.8 BUILDING INFORMATION MODELS USE AND RELIANCE

Delete Section 1.8.

ARTICLE 2

OWNER

2.2 EVIDENCE OF THE OWNER'S FINANCIAL ARRANGEMENTS

Delete Section 2.2.

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.3.1 In the first sentence, delete: all before "the Owner shall secure…"

Delete Section 2.3.2 and substitute the following:

2.3.2 The term Architect, when used in the Contract Documents, shall mean the prime Designer (Architect, Engineer, or Landscape Architect), or his authorized representative, lawfully licensed to practice architecture, engineering, or landscape architecture in the State of Louisiana, identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number.

2.3.3 Delete the words: "to whom the Contractor has no reasonable objection and".

ARTICLE 3

CONTRACTOR

3.4 LABOR AND MATERIALS

3.4.2 Delete Section 3.4.2.

Delete Section 3.4.3 and substitute with the following:

3.4.3 Contractor and its employees, officers, agents, representatives, and Subcontractors shall conduct themselves in an appropriate and professional manner, in accordance with the Owner's requirements, at all times while working on the Project. Any such individual who behaves in an inappropriate manner or who engages in the use of inappropriate language or conduct while on Owner's property, as determined by the Owner, shall be removed from the Project at the Owner's request. Such individual shall not be permitted to return without the written permission of the Owner. The Owner shall not be responsible or liable to Contractor or any Subcontractor for any additional costs, expenses, losses, claims or damages incurred by Contractor or its Subcontractor as a result of the removal of an individual from the Owner's property pursuant to this Section. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

3.5 WARRANTY

3.5.2 Replace reference to "Section 9.8.4" with "Section 9.8.6".

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS (La R.S. 40:1724[A])

3.7.1 Delete Section 3.7.1.

3.7.2 In Section 3.7.2, replace the word "public" with the word "State".

Delete Section 3.7.5 and substitute the following:

3.7.5 If, during the course of the Work, the Contractor discovers human remains, unmarked burial or archaeological sites, burial artifacts, or wetlands, which are not indicated in the Contract Documents, the Contractor shall follow all procedures mandated by State and Federal law, including but not limited to La R.S. 8:671 et seq., the Office of Coastal Protection and Restoration, and Sections 401 & 404 of the Federal Clean Water Act. Request for adjustment of the Contract Sum and Contract Time arising from the existence of such remains or features shall be submitted in writing to the Owner pursuant to the Contract Documents.

3.8 ALLOWANCES

Delete Sections 3.8.1, 3.8.2, and 3.8.3 in their entirety and add the following new Section 3.8.1:

3.8.1 Allowances shall not be made on any of the Work.

3.9 SUPERINTENDENT

3.9.1 Add the following to the end of the paragraph:
Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULES

3.10.1 Add the following: For projects with a contract sum greater than $1,000,000.00, the Contractor shall include with the schedule, for the Owner's and Architect's information, a network analysis to identify those tasks which are on the critical path, i.e., where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. A revised schedule shall be submitted with each Application and Certificate for Payment. No payment shall be made until this schedule is received.

3.10.3 In the first sentence, delete the word "general".

After the first sentence, add the following:
If the Work is not on schedule, as determined by the Architect, and the Contractor fails to take action to bring the Work on schedule, then the Contractor shall be deemed in default under this Contract and the progress of the Work shall be deemed unsatisfactory. Such default may be considered grounds for termination by the Owner for cause in accordance with Section 14.2.

Add the following Sections:

3.10.4 Add the following: Submittal by the contractor of a schedule or other documentation showing a completion date for his Work prior to the completion date stated in the contract shall not impose any obligation or responsibility on the Owner or Architect for the earlier completion date.

3.10.5 In the event the Owner employs a commissioning consultant, the Contractor shall cooperate fully in the commissioning process and shall require all subcontractors and

others under his control to cooperate. The purpose of such services shall be to ensure that all systems perform correctly and interactively according to the provisions of the Contract Documents.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following: This requirement is of the essence of the contract. The Architect shall determine the value of these documents and this amount shall not be approved for payment to the Contractor until all of the listed documents are delivered to the Architect in good order, completely marked with field changes and otherwise complete in all aspects.

ARTICLE 4

ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

4.2.1 In the first sentence, delete the phrase: "the date the Architect issues the final Certificate for Payment" and replace with the phrase "final payment is due, and with the Owner's concurrence, from time to time during the one year period for correction of Work described in Section 12.2."

4.2.2 In the first sentence, after the phrase: "become generally familiar with"; insert the following: "and to keep the Owner informed about".

In the first sentence, after the phrase "portion of the Work completed", insert the following: "to endeavor to guard the Owner against defects and deficiencies in the Work,"

4.2.4 In the first sentence, delete all after "The Owner and Contractor", and add the following "may communicate directly with each other, when deemed necessary by the Owner, and the Owner will notify the Architect of any decision."

4.2.10 Add the following sentence to the end of Section 4.2.10: There shall be no restriction on the Owner having a Representative.

4.2.11 Add the following sentence to the end of Section 4.2.11:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

4.2.14 Insert the following sentence between the second and third sentences of Section 4.2.14:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

ARTICLE 5

SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Section 5.2.1, and substitute the following:

5.2.1 Unless otherwise required by the Contract Documents, the Contractor shall furnish at the Pre-Construction Conference, to the Owner and the Architect, in writing, the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. No Contractor payments shall be made until this information is received.

Delete Section 5.2.2, and substitute the following:

5.2.2 The Contractor shall be solely responsible for selection and performance of all subcontractors. The Contractor shall not be entitled to claims for additional time and/or an increase in the contract sum due to a problem with performance or nonperformance of a subcontractor.

Delete Sections 5.2.3 and 5.2.4 and substitute the following:

5.2.3 The Contractor shall notify the Architect and the Owner when a subcontractor is to be changed and substituted with another subcontractor.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Delete Sections 5.4, 5.4.1, 5.4.2 and 5.4.3

ARTICLE 7

CHANGES IN THE WORK

7.1 GENERAL

Add the following Sections:

7.1.4 As part of the pre-construction conference submittals, the Contractor shall submit the following prior to the Contractor's initial request for payment:

7.1.4.1 Fixed job site overhead cost itemized with documentation to support daily rates.

7.1.4.2 Bond Premium Rate with supporting information from the General Contractor's carrier.

7.1.4.3 Labor Burden by trade for both Subcontractors and General Contractor. The Labor Burden shall be supported by the Worker's Compensation and Employer's Liability Insurance Policy Information Page. Provide for all trades.

7.1.4.4 Internal Rate Charges for all significant company owned equipment.

7.1.5 If the General Contractor fails to submit the aforementioned documentation as part of the pre-construction submittals, then pay applications shall not be processed until such time as the Owner receives this information.

7.2 CHANGE ORDERS

Delete Section 7.2.1, and substitute the following Sections:

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, the Architect, and the Contractor issued after execution of the Contract, authorizing a change in the Work and/or an adjustment in the Contract Sum and/or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time. Any reservation of rights, stipulation, or other modification made on the change order by the contractor shall have no effect.

7.2.2 "Cost of the Work" for the purpose of Change Orders shall be the eligible costs required to be incurred in performance of the Work and paid by the Contractor and Subcontractors which eligible costs shall be limited to:

7.2.2.1 Actual wages paid directly to labor personnel, with a labor burden markup exclusively limited to applicable payroll taxes, worker's compensation insurance, unemployment compensation, and social security taxes for those labor personnel performing the Work. Wages shall be the basic hourly labor rate paid an employee exclusive of fringe benefits or other employee costs. The labor burden percentage for the "Cost of the Work" is limited to categories listed herein. Employer-provided health insurance, fringe benefits, employee training (whether a requirement of employment or not), vacation pay, etc., are examples of ineligible labor burden costs which ***shall not*** be included, as these costs are already compensated by the Overhead and Profit markup.

Supervision shall not be included as a line item in the "Cost of the Work", except when the change results in a documented delay in the critical path, as described in Section 7.2.7.

7.2.2.2 Cost of all materials and supplies necessary and required to perform the Work, identifying each item and its individual cost, including taxes. Incidental consumables are not eligible costs and shall not be included.

7.2.2.3 Cost of each necessary piece of machinery and equipment required to perform the Work, identifying each item and its individual cost, including taxes. Incidental small tools of a specific trade (i.e., shovels, saws, hammers, air compressors, etc.,) and general use vehicles, such as pickup trucks even for

moving items around the site, fuel for these general use vehicles, travel, lodging, and/or meals are not eligible and shall not be included.

7.2.2.4 Eligible Insurance costs shall be limited to documented increases in "Builder's Risk" insurance premium / costs only. Commercial General Liability, Automobile Liability, and all other required insurances, where referenced in the Contract shall be considered part of normal overhead. These costs are already compensated by the Overhead and Profit markup.

7.2.2.5 Cost for the General Contractor Performance and Payment Bond premium, where the documented cost of the premiums have been increased due to the Change Order.

7.2.3 Overhead and Profit - The Contractor and Subcontractor shall be due home office fixed overhead and profits on the Cost of the Work, but shall not exceed a total of 16% of the direct cost of any portion of Work.

The credit to the Owner resulting from a change in the Work shall be the sum of those items above, including overhead and profit. Where a change results in both credits to the Owner and extras to the Contractor for related items, overhead and profit shall be computed for credits to the Owner and extras to the Contractor. The Owner shall receive full credit for the computed overhead and profit on credit change order items.

7.2.4 The cost to the Owner resulting from a change in the Work shall be the sum of: Cost of the Work (as defined at Section 7.2.2) and Overhead and Profit (as defined at Section 7.2.3), and shall be computed as follows:

7.2.4.1 When all of the Work is General Contractor Work; 8% markup on the Cost of the Work.

7.2.4.2 When the Work is all Subcontract Work; 8% markup on the Cost of the Work for Subcontractor's Overhead and Profit, plus 8% markup on the Cost of the Work, not including the Subcontractor's Overhead and Profit markup, for General Contractor's Overhead and Profit.

7.2.4.3 When the Work is a combination of General Contractor Work and Subcontract Work; that portion of the direct cost that is General Contract Work shall be computed per Section 7.2.4.1 and that portion of the direct cost that is Subcontract Work shall be computed per Section 7.2.4.2.

Premiums for the General Contractor's bond may be included, but after the markup is added to the Cost of the Work.
Premiums for the Subcontractor's Bond shall not be included.

7.2.4.4 Subcontract cost shall consist of the items in Section 7.2.2 above plus Overhead and Profit as defined in Section 7.2.3.

7.2.5 Before a Change Order is prepared, the Contractor shall prepare and deliver to the Architect the following information concerning the Cost of the Work, not subject to waiver, within a reasonable time after being notified to prepare said Change Order:

A detailed, itemized list of labor, material and equipment costs for the General Contractor's Work including quantities and unit costs for each item of labor, material and equipment.

An itemized list of labor, material and equipment costs for each Subcontractor's and/or Sub-Subcontractor's Work including quantities and unit costs for each item of labor, material and equipment.

7.2.6 After a Change Order has been approved, no future requests for extensions of time or additional cost shall be considered for that Change Order.

7.2.7 Extended fixed job-site costs are indirect costs that are necessary to support the work in the field. Examples of fixed job-site costs are field office rental, salaries of field office staff, field office utilities, and telephone.

Extended fixed job-site costs or equitable adjustment may be included in a Change Order due to a delay in the critical path, with the exception of weather related delays. In the event of a delay in the critical path, the Contractor shall submit all changes or adjustments to the Contract Time **within twenty-one (21) days** of the event giving rise to the delay. The Contractor shall submit documentation and justification for the adjustment by performing a critical path analysis of its most recent schedule in use prior to the change, which shows an extension in critical path activities.

The Contractor shall notify the Architect in writing that the Contractor is making a claim for extended fixed job-site overhead as required by Section 15.1.2. The Contractor shall provide proof that the Contractor is unable to mitigate financial damages through Alternate Work within this Contract or replacement work. "Replacement Work" is that work which the Contractor is obligated to perform under any construction contract separate from this Contract. Reasonable proof shall be required by the Architect that the delays affected the Completion Date.

7.2.8 "Cost of the Work" whether General Contractor cost or Subcontractor cost shall not apply to the following:

7.2.8.1 Salaries or other compensation of the Contractor's personnel at the Contractor's principal office and branch offices.

7.2.8.2 Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Work.

7.2.8.3 Overhead and general expenses of any kind or the cost of any item not specifically and expressly included above in Cost of the Work.

7.2.8.4 Cost of supervision refer to section 7.2.2.1, with exception as provided in Section 7.2.7.

7.2.9 When applicable as provided by the Contract, the cost to Owner for Change Orders shall be determined by quantities and unit prices. The quantity of any item shall be as

submitted by the Contractor and approved by the Architect. Unit prices shall cover cost of Material, Labor, Equipment, Overhead and Profit.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3 In the first sentence after "following methods" insert: ", but not to exceed a specified amount".

7.3.4 From .1 of the list, delete all after "Costs of labor, including" and substitute the following "social security, old age and employment insurance, applicable payroll taxes, and workers' compensation insurance;"

Delete the following from .4 of the list: "permit fees,"

Delete Section 7.3.9 and substitute the following:

7.3.9 Pending final determination of the total costs of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs.

ARTICLE 8

TIME

8.1 DEFINITIONS

Add the following:

8.1.5 The Contract Time shall not be changed by the submission of a schedule that shows an early completion date unless specifically authorized by change order.

8.2 PROGRESS AND COMPLETION

Add to Section 8.2.1 the following:

Completion of the Work must be within the Time for Completion stated in the Agreement, subject to such extensions as may be granted under Section 8.3. The Contractor agrees to commence Work not later than fourteen (14) days after the transmittal date of Written Notice to Proceed from the Owner and to substantially complete the project within the time stated in the Contract. The Owner will suffer financial loss if the project is not substantially complete in the time set forth in the Contract Documents. The Contractor and the Contractor's Surety shall be liable for and shall pay to the Owner the sum stated in the Contract Documents as fixed, agreed and liquidated damages for each consecutive calendar day (Saturdays, Sundays and holidays included) of delay until the Work is substantially complete. The Owner shall be entitled to the sum stated in the Contract Documents. Such Liquidated Damages shall be withheld by the Owner from the amounts due the Contractor for progress payments.

Delete Section 8.2.2.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 In the first sentence after the words "Owner pending" delete the words "mediation and binding dispute resolution" and add the word "litigation", and delete the last word "determine" and add the following: "recommend, subject to Owner's approval of Change Order. If the claim is not made within the limits of Article 15, all rights for future claims for that month are waived."

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

Delete Section 9.1.2.

Delete Section 9.2 and substitute the following:

9.2 SCHEDULE OF VALUES

At the Pre-Construction Conference, the Contractor shall submit to the Owner and the Architect a Schedule of Values prepared as follows:

9.2.1 The attached Schedule of Values Format shall be used. If applicable, the cost of Work for each section listed under each division, shall be given. The cost for each section shall include Labor, Materials, Overhead and Profit.

9.2.2 The Total of all items shall equal the Total Contract Sum. This schedule, when approved by the Architect, shall be used as a basis for the Contractor's Applications for Payment and it may be used for determining the cost of the Work in deductive change orders, when a specific item of Work listed on the Schedule of Values is to be removed. Once the Schedule of Values is submitted at the Pre-Construction Conference, the schedule shall not be modified without approval from the Owner and Architect.

9.3 APPLICATIONS FOR PAYMENT

Delete Sections 9.3.1, 9.3.1.1, and 9.3.1.2 and substitute the following:

9.3.1 Monthly, the Contractor shall submit to the Architect an – Application and Certification for Payment form, supported by any additional data substantiating the Contractor's right to payment as the Owner or the Architect may require. Application for Payment shall be submitted on or about the first of each month for the value of labor and materials incorporated into the Work and of materials, suitably stored, at the site as of the twenty-fifth day of the preceding month, less normal retainage as follows, per La R.S. 38:2248:

9.3.1.1 Projects with Contract price up to $500,000.00 – 10% of the Contract price.

9.3.1.2 Projects with Contract price of $500,000.00, or more – 5% of the Contract price.

9.3.1.3 No payment shall be made until the revised schedule required by Section 3.10.1 is received.

9.3.1.4 The normal retainage shall not be due the Contractor until after substantial completion and expiration of the forty-five day lien period and submission to the Architect of a clear lien certificate, consent of surety, and invoice for retainage.

Delete Section 9.3.2 and substitute the following:

9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. Payments for materials or equipment stored on the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, including applicable insurance.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Section 9.5.1.7: Delete the word "repeated".

Delete Section 9.5.4.

9.6 PROGRESS PAYMENTS

Delete Section 9.6.1 and substitute the following:

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment within twenty days except for projects funded fully or in part by a Federal reimbursement program. For such projects the Owner will make payment in a timely manner consistent with reimbursement.

9.6.2 Delete the phrase: "no later than seven days" from the first sentence.

After the end of the second sentence, add the following:

La R.S. 9:2784 (A) and (C) require a Contractor or Subcontractor to make payment due to each Subcontractor and supplier within fourteen (14) consecutive days of the receipt of payment from the Owner. If not paid, a penalty in the amount of ½ of 1% per day is due, up to a maximum of 15% from the expiration date until paid. The contractor or subcontractor, whichever is applicable, is solely responsible for payment of a penalty.

9.6.4 Delete the first two sentences of Section 9.6.4 and add the following to the end of the Section:

Pursuant to La. R.S. 38:2242 and La. R.S. 38:2242.2, when the Owner receives any claim of nonpayment arising out of the Contract, the Owner shall deduct 125% of such claim from the Contract Sum. The Contractor, or any interested party, may deposit security, in accordance with La. R.S. 38:2242.2, guaranteeing payment of the claim with the recorder of mortgages of the parish where the Work has been done. When the Owner receives

original proof of such guarantee from the recorder of mortgages, the claim deduction will be added back to the Contract Sum.

Delete Section **9.7 FAILURE OF PAYMENT**.

Delete Section 9.8 and substitute the following:

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The Architect shall determine if the project is substantially complete in accordance with this Section.

9.8.2 When the Contractor considers that the Work is Substantially Complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

9.8.3 Upon receipt of the Contractor's list, the Architect shall make an inspection to determine whether the Work is substantially complete. A prerequisite to the Work being considered as substantially complete is the Owner's receipt of the executed Roofing Contractor's and Roofing Manufacturer's guarantees, where roofing Work is part of the Contract. Prior to inspection by the Architect, the Contractor shall notify the Architect that the project is ready for inspection by the State Fire Marshal's office. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use, the Contractor shall, before the Work can be considered as Substantially Complete, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

9.8.4 When the Architect determines that the project is Substantially Complete, he shall prepare a punch list of exceptions and the dollar value related thereto. The monetary value assigned to this list will be the sum of the cost estimate for each particular item of Work the Architect develops based on the mobilization, labor, material and equipment costs of correcting the item and shall be retained from the monies owed the contractor, above and beyond the standard lien retainage. The cost of these items shall be prepared in the same format as the schedule of values. At the end of the forty-five day lien period payment shall be approved for all punch list items completed up to that time. After that payment, none of the remaining funds shall be due the contractor until all punch list items are completed and are accepted by the Architect. If the dollar value of the punch list exceeds the amount of funds, less the retainage amount, in the remaining balance of the Contract, then the Project shall not be considered as substantially complete. If funds remaining are less than that required to complete the Work, the Contractor shall pay the difference.

9.8.5 When the preparation of the punch list is complete the Architect shall prepare a Recommendation of Acceptance incorporating the punch list and submit it to the Owner.

Upon approval of the Recommendation of Acceptance, the Owner may issue a Notice of Acceptance of Building Contract which shall establish the Date of Substantial Completion. The Contractor shall record the Notice of Acceptance with the Clerk of Court in the Parish in which the Work has been performed. If the Notice of Acceptance has not been recorded seven (7) days after issuance, the Owner may record the Acceptance at the Contractor's expense. All additive change orders must be processed before issuance of the Recommendation of Acceptance. The Owner shall not be responsible for payment for any Work associated with change orders that is not incorporated into the contract at the time of the Recommendation of Acceptance.

9.8.6 Warranties required by the Contract Documents shall commence on the date of Acceptance of the Work unless otherwise agreed to in writing by the Owner and Contractor. Unless otherwise agreed to in writing by the Owner and Contractor, security, maintenance, heat, utilities, damage to the Work not covered by the punch list and insurance shall become the Owner's responsibility on the Date of Substantial Completion.

9.8.7 If all punch list items have not been completed by the end of the forty-five (45) day lien period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within forty-five (45) days after notification, the Surety has not completed the punch list, through no fault of the Architect or Owner, the Owner may, at his option, contract to have the balance of the Work completed and pay for such Work with the unpaid funds remaining in the Contract sum. Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future state contracts. If the surety fails to complete the punch list within the stipulated time period, the Owner may not accept bonds submitted, in the future, by the surety.

9.9 PARTIAL OCCUPANCY OR USE

Delete Section 9.9.1 and substitute the following:

9.9.1 Partial Occupancy is that stage in the progress of the Work when a designated portion of the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the designated portion of the Work for its intended use. The Owner may occupy or use any substantially completed portion of the Work so designated by separate agreement with the Contractor and authorized by public authorities having jurisdiction over the Work. Such occupancy or use may commence provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers the designated portion substantially complete the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Delete Section 9.10.4 and replace with the following:

9.10.4 The making of final payment shall not constitute a waiver of Claims by the Owner for the following:

9.10.4.1 Claims, security interests, or encumbrances arising out of the Contract and unsettled;

9.10.4.2 failure of the Work to comply with the requirements of the Contract Documents irrespective of when such failure is discovered;

9.10.4.3 terms of special warranties required by the Contract Documents; or

9.10.4.4 audits performed by the Owner, after final payment.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.2 In the first sentence, between the words: "bearing on" and "safety", add the words: "the health and,"

10.3 HAZARDOUS MATERIALS

10.3.1 In the second sentence after (PCB) add: "or lead".

10.3.2 After the first sentence, delete all remaining sentences.

Add at the end: "The Contract time shall be extended appropriately."

Delete Section 10.4 and substitute the following:

10.4 EMERGENCIES

In an emergency affecting the safety of persons or property, the Contractor shall notify the Owner and Architect immediately of the emergency, simultaneously acting at his discretion to prevent damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency Work shall be determined as provided in Article 15 and Article 7.

ARTICLE 11

INSURANCE AND BONDS

AIA A101 – 2017 Exhibit A is not a part of these documents. Delete all of Sections 11.1, 11.2, 11.3, 11.4, and 11.5, and substitute the following:

INSURANCE REQUIREMENTS FOR
NEW CONSTRUCTION, ADDITIONS AND RENOVATIONS

11.1 CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall purchase and maintain without interruption for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, its agents, representatives, employees or subcontractors. The duration of the contract shall be from the inception of the contract until the date of final payment.

11.2 MINIMUM SCOPE AND LIMITS OF INSURANCE

11.2.1 Worker's Compensation

Worker's Compensation insurance shall be in compliance with the Worker's Compensation law of the Contractor's headquarters. Employers Liability is included with a minimum limit of $1,000,000 per accident/per disease/per employee. If Work is to be performed over water and involves maritime exposure, applicable LHWCA, Jones Act or other maritime law coverage shall be included. A.M. Best's insurance company rating requirement may be waived for Worker's compensation coverage only.

11.2.2 Commercial General Liability

Commercial General Liability insurance, including Personal and Advertising Injury Liability and Products and Completed Operations Liability, shall have a minimum limit per occurrence based on the project value. The Insurance Services Office (ISO) Commercial General Liability occurrence coverage form CG 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. Claims-made form is unacceptable.

The aggregate loss limit must apply to each project. ISO form CG 25 03 (current form approved for use in Louisiana), or equivalent, shall also be submitted. The State project number, including part number, and project name shall be included on this endorsement.

COMBINED SINGLE LIMIT (CSL) PER OCCURRENCE

Type of Construction	**Projects up to $1,000,000**	**Projects over $1,000,000 up to $10,000,000**	**Projects over $10,000,000**
New Buildings:			
Each Occurrence Minimum Limit	$1,000,000	$2,000,000	$4,000,000
Per Project Aggregate	$2,000,000	$4,000,000	$8,000,000
Renovations:	**The building(s) value for the Project is $_____.**		
Each Occurrence Minimum Limit	$1,000,000**	$2,000,000**	$4,000,000**
Per Project Aggregate	2 times per	2 times per	2 times per

occur limit** occur limit** occur limit**

**While the minimum Combined Single Limit of $1,000,000 is required for any renovation, the limit is calculated by taking 10% of the building value and rounding it to the nearest $1,000,000 to get the insurance limit. Example: Renovation on a $33,000,000 building would have a calculated $3,000,000 combined single limit of coverage (33,000,000 times .10 = 3,300,000 and then rounding down to $3,000,000). If the calculated limit is less than the minimum limit listed in the above chart, then the amount needed is the minimum listed in the chart. Maximum per occurrence limit required is $10,000,000 regardless of building value. The per project aggregate limit is then calculated as twice the per occurrence limit.

11.2.3 Automobile Liability

Automobile Liability Insurance shall have a minimum combined single limit per occurrence of $1,000,000. ISO form number CA 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. This insurance shall include third-party bodily injury and property damage liability for owned, hired and non-owned automobiles.

11.2.4 Excess Umbrella

Excess Umbrella Insurance may be used to meet the minimum requirements for General Liability and Automobile Liability only.

11.2.5 Builder's Risk

11.2.5.1 Builder's Risk Insurance shall be in an amount equal to the amount of the construction contract including any amendments and shall be upon the entire Work included in the contract. The policy shall provide coverage equivalent to the ISO form number CP 10 20, Broad Form Causes of Loss (extended, if necessary, to include the perils of wind, earthquake, collapse, vandalism/malicious mischief, and theft, including theft of materials whether or not attached to any structure). The policy must include architects' and engineers' fees necessary to provide plans, specifications and supervision of Work for the repair and/or replacement of property damage caused by a covered peril, not to exceed 10% of the cost of the repair and/or replacement.

11.2.5.2 Flood coverage shall be provided by the Contractor on the first floor and below for all projects, except as otherwise noted. The builder's risk insurance policy, sub-limit for flood coverage shall not be less than ten percent (10%) of the total contract cost per occurrence. If flood is purchased as a separate policy, the limit shall be ten percent (10%) of the total contract cost per occurrence (with a max of $500,000 if NFIP). Coverage for roofing projects shall **not** require flood coverage.

11.2.5.3 A Specialty Contractor may provide an installation floater in lieu of a Builder's Risk policy, with the similar coverage as the Builder's Risk policy, upon the system to be installed in an amount equal to the amount of the contract including any amendments. Flood coverage is not required.

11.2.5.4 The policy must include coverage for the Owner, Contractor and any subcontractors as their interests may appear.

11.2.6 Pollution Liability *(required when asbestos or other hazardous material abatement is included in the contract)*

Pollution Liability insurance, including gradual release as well as sudden and accidental, shall have a minimum limit of not less than $1,000,000 per claim. A claims-made form will be acceptable. A policy period inception date of no later than the first day of anticipated Work under this contract and an expiration date of no earlier than 30 days after anticipated completion of all Work under the contract shall be provided. There shall be an extended reporting period of at least 24 months, with full reinstatement of limits, from the expiration date of the policy if the policy is not renewed. The policy shall not be cancelled for any reason, except non-payment of premium.

11.2.7 Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared to and accepted by the Owner. The Contractor shall be responsible for all deductibles and self-insured retentions.

11.3 OTHER INSURANCE PROVISIONS

11.3.1 The policies are to contain, or be endorsed to contain, the following provisions:

11.3.1.1 Worker's Compensation and Employers Liability Coverage

11.3.1.1.1 To the fullest allowed by law, the insurer shall agree to waive all rights of subrogation against the Owner, its officers, agents, employees and volunteers for losses arising from Work performed by the Contractor for the Owner.

11.3.1.2 Commercial General Liability Coverage

11.3.1.2.1 The Owner, its officers, agents, employees and volunteers are to be added as additional insureds as respects liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor, premises owned, occupied or used by the Contractor. ISO Form CG 20 10 (for ongoing work) AND CG 20 37 (for completed work) (current forms approved for use in Louisiana), or equivalent, are to be used.

11.3.1.2.2 The Contractor's insurance shall be primary as respects the Owner, its officers, agents, employees and volunteers for any and all losses that occur under the contract. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees or volunteers. Any insurance or self-insurance maintained by the Owner shall be excess and non-contributory of the Contractor's insurance.

11.3.1.3 Builder's Risk

The policy must include an endorsement providing the following:

In the event of a disagreement regarding a loss covered by this policy, which may also be covered by a State of Louisiana self-insurance or commercial property policy through the Office of Risk Management (ORM), Contractor and its insurer agree to follow the following procedure to establish coverage and/or the amount of loss:

Any party to a loss may make written demand for an appraisal of the matter in disagreement. Within 20 days of receipt of written demand, the Contractor's insurer and either ORM or its commercial insurance company shall each select a competent and impartial appraiser and notify the other of the appraiser selected. The two appraisers shall select a competent and impartial umpire. The appraisers shall then identify the policy or policies under which the loss is insured and, if necessary, state separately the value of the property and the amount of the loss that must be borne by each policy. If the two appraisers fail to agree, they shall submit their differences to the umpire. A written decision by any two shall determine the policy or policies and the amount of the loss. Each insurance company agrees that the decision of the appraisers and the umpire if involved shall be binding and final and that neither party will resort to litigation. Each of the two parties shall pay its chosen appraiser and bear the cost of the umpire equally.

11.3.1.4 All Coverages

11.3.1.4.1 All policies must be endorsed to require 30 days written notice of cancellation to the Agency. Ten-day written notice of cancellation is acceptable for non-payment of premium. Notifications shall comply with the standard cancellation provisions in the Contractor's policy. In addition, Contractor is required to notify Agency of policy cancellations or reductions in limits.

11.3.1.4.2 Neither the acceptance of the completed Work nor the payment thereof shall release the Contractor from the obligations of the insurance requirements or indemnification agreement.

11.3.1.4.3 The insurance companies issuing the policies shall have no recourse against the Owner for payment of premiums or for assessments under any form of the policies.

11.3.1.4.4 Any failure of the Contractor to comply with reporting provisions of the policy shall not affect coverage provided to the Owner, its officers, agents, employees and volunteers.

11.3.2 Acceptability of Insurers

All required insurance shall be provided by a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located. Insurance shall be placed with insurers with an A.M. Best's rating of **A-: VI or higher**. This rating requirement may be waived for Worker's compensation coverage only.

If at any time an insurer issuing any such policy does not meet the minimum A.M. Best rating, the Contractor shall obtain a policy with an insurer that meets the A.M. Best rating and shall submit another certificate of insurance within 30 days.

11.3.3 Verification of Coverage

Contractor shall furnish the Owner with Certificates of Insurance reflecting proof of required coverage. The Certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The Certificates are to be received and approved by the Owner before Work commences and upon any contract renewal or insurance policy renewal thereafter. The Certificate Holder must be listed as follows:

State of Louisiana
Name of Owner
Owner Address
City, State, Zip
Attn: Project # _____

The Owner reserves the right to request complete certified copies of all required insurance policies at any time.

Upon failure of the Contractor to furnish, deliver and maintain required insurance, this contract, at the election of the Agency, may be suspended, discontinued, or terminated. Failure of the Contractor to purchase and/or maintain any required insurance shall not relieve the Contractor from any liability or indemnification under the contract.

If the Contractor does not meet the insurance requirements at policy renewal, at the option of the Owner, payment to the Contractor may be withheld until the requirements have been met, OR the Owner may pay the renewal premium and withhold such payment from any monies due the Contractor, OR the contract may be suspended or terminated for cause.

11.3.4 Subcontractors

Contractor shall include all subcontractors as insureds under its policies OR shall be responsible for verifying and maintaining the certificates provided by each subcontractor. Subcontractors shall be subject to all of the requirements stated herein. The Owner reserves the right to request copies of subcontractor's certificates at any time.

If Contractor does not verify subcontractors' insurance as described above, Owner has the right to withhold payments to the Contractor until the requirements have been met.

11.3.5 Worker's Compensation Indemnity

In the event Contractor is not required to provide or elects not to provide Worker's compensation coverage, the parties hereby agree the Contractor, its Owners, agents and employees shall have no cause of action against, and shall not assert a claim against, the State of Louisiana, its departments, agencies, agents and employees as an employer, whether pursuant to the Louisiana Worker's Compensation Act or otherwise, under any circumstance. The parties also hereby agree that the State of Louisiana, its departments, agencies, agents and employees shall in no circumstance be, or considered as, the employer or statutory employer of Contractor, its Owners, agents and employees. The parties further agree that Contractor is a wholly independent Contractor and is exclusively responsible for its employees, Owners, and agents. Contractor hereby agrees to protect, defend, indemnify and hold the State of Louisiana, its departments, agencies, agents and employees harmless from any such assertion or claim that may arise from the performance of this contract.

11.3.6 Indemnification/Hold Harmless Agreement

Contractor agrees to protect, defend, indemnify, save, and hold harmless, the State of Louisiana, all State Departments, Agencies, Boards and Commissions, its officers, agents, servants, employees and volunteers, from and against any and all claims, damages, expenses and liability arising out of injury or death to any person or the damage, loss or destruction of any property which may occur, or in any way grow out of, any act or omission of Contractor, its agents, servants and employees, or any and all costs, expenses and/or attorney fees incurred by Contractor as a result of any claims, demands, suits or causes of action, except those claims, demands, suits or causes of action arising out of the negligence of the State of Louisiana, all State Departments, Agencies, Boards, Commissions, its officers, agents, servants, employees and volunteers.

Contractor agrees to investigate, handle, respond to, provide defense for and defend any such claims, demands, suits or causes of action at its sole expense and agrees to bear all other costs and expenses related thereto, even if the claims, demands, suits, or causes of action are groundless, false or fraudulent. The State of Louisiana may, but is not required to, consult with the Contractor in the defense of claims, but this shall not affect the Contractor's responsibility for the handling and expenses of all claims.

11.4 PERFORMANCE AND PAYMENT BOND

11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

11.4.3 Recordation of Contract and Bond [La R.S. 38:2241 thru 38:2241.1]

The Owner shall record within thirty (30) days the Contract Between Owner and Contractor and Performance and Payment Bond with the Clerk of Court in the Parish in which the Work is to be performed.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

12.2.1 Before Substantial Completion

At the end of the paragraph, add the following sentences:
"If the Contractor fails to correct Work identified as defective within a thirty (30) day period, through no fault of the Designer, the Owner may hold the Contractor in default. If the Owner finds the Contractor in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the nonconforming Work, through no fault of the Architect or Owner, the Owner may contract to have nonconforming Work corrected and hold the Surety and Contractor responsible for the cost, including architectural fees and other indirect costs. If the Surety fails to correct the Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may elect not to accept bonds submitted in the future by the Surety. Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future state contracts.

12.2.2 After Substantial Completion

12.2.2.1 At the end of the paragraph delete the last sentence and add the following sentences:
"If the Contractor fails to correct nonconforming Work, or Work covered by warranties, within a thirty (30) day period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the non-conforming or warranty Work, through no fault of the Architect or Owner, the Owner may contract to have the nonconforming or warranty Work corrected and hold the Surety responsible for the cost including architects fees and other indirect costs. Corrections by the Owner shall be in accordance with Section 2.4. If the Surety fails to correct the nonconforming or warranty Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may not accept bonds submitted, in the future, by the Surety."

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Delete all after the word "located".

13.2 SUCCESSORS AND ASSIGNS

13.2.1 In the second sentence, delete "Except as … 13.2.2"

Delete Section 13.2.2.

13.3 RIGHTS AND REMEDIES

Add the following Section 13.3.3:

13.3.3 The Nineteenth Judicial Court in and for the Parish of East Baton Rouge, State of Louisiana shall have sole jurisdiction and venue in any action brought under this contract.

13.4 TESTS AND INSPECTIONS

In Section 13.4.1, delete the second sentence and substitute the following:

The Contractor shall make arrangements for such tests, inspections and approvals with the Testing Laboratory provided by the Owner, and the Owner shall bear all related costs of tests, inspections and approvals.

Delete the last two sentences of Section 13.4.1.

13.5 INTEREST

Delete Section 13.5.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

Delete Section 14.1.1.4.

In Section 14.1.3, after the word "profit," delete the words "on Work not executed" and substitute the following: "for Work completed prior to stoppage".

14.2 TERMINATION BY THE OWNER FOR CAUSE

Add the following Section:

14.2.1.5 failure to complete the punch list within the lien period as provided in 9.8.7.

14.2.3 Add the following sentence:

"Termination by the Owner shall not suspend assessment of liquidated damages against the Surety."

Add the following Section:

14.2.5 If an agreed sum of liquidated damages has been established, termination by the Owner under this Article shall not relieve the Contractor and/or Surety of his obligations under the liquidated damages provisions and the Contractor and/or Surety shall be liable to the Owner for per diem liquidated damages.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

In Section 14.4.3, delete all after "incurred by reason of the termination," and add "along with reasonable profit on the Work not executed."

ARTICLE 15

CLAIMS AND DISPUTES

15.1 CLAIMS

Delete Section 15.1.2, **Time Limit on Claims,** (See La R.S. 38:2189, and 38:2189.1).

15.1.3.1 Add the following to the end of the paragraph:
"A Reservation of Rights and similar stipulations shall not be recognized under this contract as having any effect. A party must make a claim as defined herein within the time limits provided."

15.1.4.2 In the first sentence of the Section, delete "Initial Decision Maker's" and replace with "Architect's". In the second sentence of the Section, delete "the decision of the Initial Decision Maker" and replace with: "his/her decision".

Delete Section 15.1.6.2 and substitute the following:

15.1.6.2 If adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that weather conditions had an adverse effect on the scheduled construction. An increase in the contract time due to weather shall not be cause for an increase in the contract sum. At the end of each month, the Contractor shall make one Claim for any adverse weather days occurring within the month. The Claim must be accompanied by sufficient documentation evidencing the adverse days and the impact on construction. Failure to make such Claim within **twenty-one (21) days** from the last day of the month shall prohibit any future claims for adverse days for that month. No additional adverse weather days shall be granted after the original or extended contract completion date, except those adverse weather days associated with a National Weather Service named storm or federally declared weather related disaster directly affecting the project site.

Add the following Section:

15.1.6.3 The following are considered reasonably anticipated days of adverse weather on a monthly basis:

January	11 days	July	6 days
February	10 days	August	5 days

March	8 days	September	4 days
April	7 days	October	3 days
May	5 days	November	5 days
June	6 days	December	8 days

The Contractor shall ask for total adverse weather days. The Contractor's request shall be considered only for days over the allowable number of days stated above.

Note: Contract is on a calendar day basis.

15.2 INITIAL DECISION

15.2.1 In the second sentence, delete the word "will" and replace with: "shall always".

In the second sentence, delete the phrase: ", unless otherwise indicated in the Agreement."

In the third sentence, delete the word "mediation" and replace with: "litigation".

At the end of the third sentence, add: "arising prior to the date final payment is due".

Delete the fourth sentence.

15.2.5 In the middle of the first sentence, delete all after the phrase: "rejecting the Claim".

In the second sentence, delete the phrase: "and the Architect, if the Architect is not serving as the Initial Decision Maker,".

In the third sentence, delete all after: "binding on the parties" and add the following: "except that the Owner may reject the decision or suggest a compromise or both".

Delete Section 15.2.6.

Delete Section 15.2.6.1.

15.3 MEDIATION

Delete Section 15.3.

15.4 ARBITRATION

Delete Section 15.4.

SCHEDULE OF VALUES

The Contractor is to use the following format. The total Contract Cost is to be itemized in each Subsection listed (as applicable)

	Quantity	Cost
DIVISION 01 – GENERAL REQUIREMENTS		
01 00 00 General Requirements	_____	_____
01 32 50 Record Drawings, Shop Drawings, Product Data, Samples and other submittals.	_____	_____
	TOTAL	_____
DIVISION 02 – EXISTING CONDITIONS		
02 30 00 Subsurface Investigation	_____	_____
02 41 00 Demolition	_____	_____
	TOTAL	_____
DIVISION 03 – CONCRETE		
	_____	_____
03 01 00 Maintenance of Concrete	_____	_____
03 11 00 Concrete Forming	_____	_____
03 15 00 Concrete Accessories	_____	_____
03 20 00 Concrete Reinforcing	_____	_____
03 30 00 Cast-in-place Concrete	_____	_____
03 40 00 Precast Concrete	_____	_____
03 50 00 Cast Decks & Underlayment	TOTAL	_____
DIVISION 04 – MASONRY		
	_____	_____
04 01 00 Maintenance of Masonry	_____	_____
04 05 13 Masonry Mortaring	_____	_____
04 05 19 Masonry Anchorage & Reinforcing	_____	_____
04 05 23 Masonry Accessories	_____	_____
04 20 00 Unit Masonry	TOTAL	_____
DIVISION 05 – METALS		
	_____	_____
05 05 23 Metal Fastenings	_____	_____
05 10 00 Structural Metal Framing	_____	_____
05 20 00 Metal Joists	_____	_____
05 30 00 Metal Decking	_____	_____
05 50 00 Metal Fabrications	_____	_____
05 58 00 Formed Metal Fabrications	TOTAL	_____
DIVISION 06 – WOOD, PLASTICS, & COMPOSITES		
	_____	_____
06 05 23 Fastening and Adhesives	_____	_____
06 10 00 Rough Carpentry	_____	_____
06 13 00 Heavy Timber	_____	_____
06 17 00 Shop-fabricated Structural Wood	_____	_____
06 20 00 Finish Carpentry	SUB-TOTAL	_____

DISISION 06 – WOOD, PLASTICS, &
COMPOSITES (CONTINUES)

06 40 00	Architectural Woodwork	_____	_____
06 60 00	Plastic Fabrications	_____	_____
06 80 00	Composite Fabrications	_____	_____
		TOTAL	_____

DIVISION 07 – THERMAL AND MOISTURE
PROTECTION

07 10 00	Dampproofing and Waterproofing	_____	_____
07 18 00	Traffic Coatings	_____	_____
07 19 00	Water Repellents	_____	_____
07 21 00	Thermal Insulation	_____	_____
07 24 00	Exterior Insulation & Finish Systems	_____	_____
07 25 00	Weather Barriers	_____	_____
07 31 00	Shingles and Shakes	_____	_____
07 32 00	Roof Tiles	_____	_____
07 40 00	Roofing and Siding Panels	_____	_____
07 50 00	Membrane Roofing	_____	_____
07 60 00	Flashing and Sheet Metal	_____	_____
07 61 00	Sheet Metal Roofing	_____	_____
07 70 00	Roof & Wall Specialties and Accessories	_____	_____
07 80 00	Fire and Smoke Protection	_____	_____
07 90 00	Joint Protection	_____	_____
07 95 00	Expansion Control	_____	_____
		TOTAL	_____

DIVISION 08 – OPENINGS

08 11 00	Metal Doors and Frames	_____	_____
08 14 00	Wood Doors	_____	_____
08 15 00	Plastic Doors	_____	_____
08 30 00	Specialty Doors and Frames	_____	_____
08 41 00	Entrances and Storefronts	_____	_____
08 44 00	Curtain Wall and Glazed Assemblies	_____	_____
08 51 00	Metal Windows	_____	_____
08 52 00	Wood Windows	_____	_____
08 53 00	Plastic Windows	_____	_____
08 56 00	Special Function Windows	_____	_____
08 60 00	Roof Windows and Skylights	_____	_____
08 70 00	Hardware	_____	_____
08 80 00	Glazing	_____	_____
08 90 00	Louvers and Vents	_____	_____
		_____	_____
		TOTAL	_____

DIVISION 09 – FINISHES

09 22 00	Supports for Plaster and Gypsum Board	_____	_____
09 23 00	Gypsum Plastering	_____	_____
09 24 00	Portland Cement Plastering	_____	_____
09 29 00	Gypsum Board	_____	_____
09 30 00	Tiling	_____	_____
		SUB-TOTAL	_____

DIVISION 09 – FINISHES (CONTINUED)

09 50 00	Acoustical Ceilings	_____	_____
09 54 00	Specialty Ceilings		
	Quantity	_____	_____
09 61 00	Flooring Treatment	_____	_____
09 62 00	Specialty Flooring	_____	_____
09 63 00	Masonry Flooring	_____	_____
09 64 00	Wood Flooring	_____	_____
09 65 00	Resilient Flooring	_____	_____
09 66 00	Terrazzo Flooring	_____	_____
09 68 00	Carpeting	_____	_____
09 69 00	Access Flooring	_____	_____
09 97 00	Wall Finishes	_____	_____
09 91 00	Painting	_____	_____
09 97 00	Special Coatings	_____	_____
		TOTAL	_____

DIVISION 10 – SPECIALTIES

10 11 00	Visual Display Surfaces	_____	_____
10 14 00	Signage	_____	_____
10 21 00	Compartments and Cubicles	_____	_____
10 22 00	Partitions	_____	_____
10 26 00	Wall and Door Protection	_____	_____
10 28 00	Toilet, Bath, and Laundry Accessories	_____	_____
10 44 00	Fire Protection Specialties	_____	_____
10 51 00	Lockers	_____	_____
10 56 00	Storage Assemblies	_____	_____
10 82 00	Grilles and Screens	TOTAL	_____

DIVISION 11 – EQUIPMENT

11 15 00	Security, Detention, and Banking Equipment	_____	_____
11 19 00	Detention Equipment	_____	_____
11 23 00	Commercial Laundry and		
	Dry Cleaning Equipment	_____	_____
11 26 00	Unit Kitchens	_____	_____
11 27 00	Photographic Processing Equipment	_____	_____
11 40 00	Foodservice Equipment	_____	_____
11 51 00	Library Equipment	_____	_____
11 52 00	Audio-Visual Equipment	_____	_____
11 53 00	Laboratory Equipment	_____	_____
11 61 00	Theater and Stage Equipment	_____	_____
11 65 00	Athletic and Recreational Equipment	_____	_____
11 70 00	Healthcare Equipment	_____	_____
		TOTAL	_____

DIVISION 12 – FURNISHINGS

12 20 00	Window Treatments	_____	_____
12 30 00	Casework	_____	_____
12 40 00	Furnishings and Accessories	_____	_____
12 50 00	Furniture	_____	_____
		TOTAL	_____

DIVISION 13 –SPECIAL CONSTRUCTION

13 10 00	Special Facility Components		
13 34 00	Fabricated Engineered Structures		
13 49 00	Radiation Protection		
		TOTAL	

DIVISION 14 – CONVEYING EQUIPMENT

14 20 00	Elevators		
14 30 00	Escalators and Moving Walks		
14 40 00	Lifts		
14 80 00	Scaffolding		
		TOTAL	

DIVISION 21 – FIRE SUPPRESSION

21 10 00	Water-Based Fire-Suppression Systems Piping		
21 20 00	Fire-Extinguishing Systems		
21 30 00	Fire Pumps		
		TOTAL	

DIVISION 22 – PLUMBING

22 07 00	Plumbing Insulation		
22 11 00	Facility Water Distribution		
22 13 00	Facility Sanitary Sewerage		
22 14 00	Facility Storm Drainage		
22 30 00	Plumbing Equipment		
22 40 00	Plumbing Fixtures		
		TOTAL	

DIVISION 23 – HEATING, VENTILATING, & AIR-CONDITIONING

23 05 93	Testing, Adjusting, & Balancing for HVAC		
23 07 00	HVAC Insulation		
23 09 00	Instrumentation & Control for HVAC		
23 13 00	Facility Fuel-Storage Tanks		
23 20 00	HVAC Piping and Pumps		
23 30 00	HVAC Air Distribution		
23 40 00	HVAC Air Cleaning Devices		
23 50 00	Central Heating Equipment		
23 60 00	Central Cooling Equipment		
23 70 00	Central HVAC Equipment		
		TOTAL	

DIVISION 26 – ELECTRICAL

26 09 00	Instrumentation & Control for Electrical Systems		
26 10 00	Medium-Voltage Electrical Distribution		
26 20 00	Low-Voltage Electrical Transmission		
26 27 00	Low-Voltage Distribution Equipment		
26 30 00	Facility Electrical Power Generating & Storage Equipment		
26 40 00	Electrical and Cathodic Protection		
26 50 00	Lighting		
		TOTAL	

DIVIASION 27 – COMMUNICATIONS

27 10 00	Structured Cabling	_____	_____
27 20 00	Data Communications	_____	_____
27 30 00	Voice Communications	_____	_____
27 40 00	Audio-Video Communications	_____	_____
27 50 00	Distributed Communications & Monitoring Systems	_____	_____
		TOTAL	_____

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 10 00	Electronic Access Control & Intrusion Detection	_____	_____
28 20 00	Electronic Surveillance	_____	_____
28 30 00	Electronic Detection and Alarm	_____	_____
28 40 00	Electronic Monitoring and Control	_____	_____
		TOTAL	_____

DIVISION 31 – EARTHWORK

31 10 00	Site Clearing	_____	_____
31 20 00	Earth Moving	_____	_____
31 31 00	Soil Treatment	_____	_____
31 32 00	Soil Stabilization	_____	_____
31 40 00	Shoring and Underpinning	_____	_____
31 50 00	Excavation Support and Protection	_____	_____
31 60 00	Special Foundations and Load-Bearing Elements	_____	_____
		TOTAL	_____

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 10 00	Bases, Ballasts, and Paving	_____	_____
32 30 00	Site Improvements	_____	_____
32 90 00	Planting	_____	_____
		TOTAL	_____

DIVISION 33 – UTILITIES

33 10 00	Water Utilities	_____	_____
33 30 00	Sanitary Sewerage Utilities	_____	_____
33 40 00	Storm Drainage Utilities	_____	_____
33 50 00	Fuel Distribution Utilities	_____	_____
33 60 00	Hydronic & Steam Energy Utilities	_____	_____
33 70 00	Electrical Utilities	_____	_____
33 80 00	Communications Utilities	_____	_____
		TOTAL	

DIVISION 34 – TRANSPORTATION

34 00 00	Transportation	_____	_____
		TOTAL	_____

DIVISION 35 – WATERWAY AND MARINE CONSTRUCTIONS

35 00 00	Waterway and Marine construction	_____	_____
		TOTAL	_____

DIVISION 40-43 – PROCESS EQUIPMENT

DIVISION 44 – POLLUTION CONTROL EQUIPMENT

44 40 00	Water Treatment Equipment	_____	_____
44 41 00	Packaged Water Treatment Plants	_____	_____
44 50 00	Solid Waste Control	_____	_____
		TOTAL	_____

DIVISION 45 – INDUSTRY SPECIFIC MANUFACTURING EQUIPMENT

DIVISION 48 – ELECTRICAL POWER GENERATION

48 10 00	Electrical Power Generation Equipment	_____	_____
48 70 00	Electrical Power Generation Testing	_____	_____
		TOTAL	_____

CHANGE ORDER

PROJECT NAME: _____ CHANGE ORDER No. _____

PROJECT NUMBER: _____ WBS No. _____ CONTRACT DATE: _____

CONTRACTOR: _____ CFMS / SRM No(s). _____

SITE CODE: _____ STATE ID: _____ NOTICE TO PROCEED DATE: _____

You are directed to make the following change(s) in this contract. Attach SUMMARY, BREAKDOWN and/or UNIT PRICE BREAKDOWN forms as required and give a brief description of the change(s) below.

The Original Contract Sum		
Total Changes by Previous Change Order(s)		
Current Contract Sum		
Contract Sum will be (increased) (decreased) (unchanged) by this Change Order		
New Contract Sum		
The Original Contract Completion Date and Contract Time.	Date: _____	_____ DAYS
Total Time extended by Previous Change Order(s)		_____ DAYS
Contract Time will be (increased) (decreased) (unchanged) by this Change Order		_____ DAYS
New Contract Completion Date & Revised Contract Time	Date: _____	_____ DAYS
Added Building Area		_____ (Sq. Ft.)

NOTE*: *No additional increase in time or money will be considered for a Change Order item after it has been executed.

RECOMMENDED	**ACCEPTED**	**APPROVED**
Designer's Name:	Contractor's Name:	Project Manager:
Address:	Address:	Southern University
Email Address:	Email Address:	
By:	By:	By:
Date:	Date:	Date:

Construction Contract Change Order
SUMMARY

Item No. _____

RFI No. (or COR, CPR, etc.) _____

Project No. _____ Date: _____

WBS No. _____

Project Name: _____

Contractor Name: _____

Description of Work: _____

_____

_____

General Contractor Direct Costs - Breakdown No. ____ _____
(See attached breakdown)

Total General Contractor Cost ____ % _____
(General Contract Direct Cost plus OH&P) (Max: 8%)

Subcontractor Cost Breakdowns
(See attached.)

Subcontractor Name	Breakdown No.	A Total Direct Cost	B OH&P (Max 8%)	C Total A+(A X B)
			%	
			%	
			%	
			%	
			%	
			%	
			%	
			%	

Subcontractor Direct Costs Total $ -
(Sum column A)

Subcontractor Direct Costs + Subcontractor OH&P
(Sum column C)

General Contractor OH&P on Subcontractor Direct Cost at ____ % _____
(Sum column A times General Contractor OH&P rate.) (Max: 8%)

Total Subcontractor Costs _____
(Subcontractor Direct Costs + OH&P + General Contractor OH&P)

Change Order Subtotal _____
(Sum of Total General Contractor Costs and Total Subcontractor Costs)

Performance and Payment Bond at ____ %
(Change Order Subtotal times Performance and Payment Bond rate)

Amount will be ☐ increased ☐ decreased ☐ unchanged by _____
(Sum of Change Order Subtotal and Performance and Payment Bond)

Days will be ☐ increased ☐ decreased ☐ unchanged by _____
(Attach supporting data such as meteorological reports)

Construction Contract Change Order

BREAKDOWN

Breakdown No. _____

Item No. _____

Project No. _____ RFI No. (or COR, CPR, etc.) _____

WBS No. _____ Date: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Direct Cost of Work :

A. Labor Check here if explained on the Comment Sheet ➧

		Hourly Wage Rate	Hours	Total Cost
1	☐			
2	☐			
3	☐			
4	☐			
5	☐			
6	☐			
7	☐			
	Add Labor Burden @		____ %	
	LABOR TOTAL			

B. Material

		Unit Price	Unit	Units	Total Cost
1	☐				
2	☐				
3	☐				
4	☐				
5	☐				
6	☐				
7	☐				
(Copies of invoices may be required.)		Add Tax @		____ %	
		MATERIAL TOTAL			

C. Equipment

		Unit Rate	Unit	Units	Total Cost
1	☐				
2	☐				
3	☐				
4	☐				
5	☐				
6	☐				
7	☐				
(Copies of invoices may be required.)		Add Tax @		____ %	
		EQUIPMENT TOTAL			

TOTAL DIRECT COST FOR THIS BREAKDOWN:
(Sum A, B & C)

Construction Contract Change Order

BREAKDOWN COMMENT SHEET

Breakdown No. _____
Item No. _____
Project No. _____ RFI No. (or COR, CPR, etc.) _____
WBS No. _____ Date: _____
Project Name: _____

Contractor/Subcontractor Name: _____

A. Labor

No. (From BREAKDOWN Sheet)

___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____

B. Material

___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____

C. Equipment

___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____
___ _____

Construction Contract Change Order
UNIT PRICE BREAKDOWN

Breakdown No. _____
Item No. _____
Project No. _____ RFI No. (or COR, CPR, etc.) _____
WBS No. _____ Date: _____
Project Name: _____

Contractor/Subcontractor Name: _____

Unit Price Tabulation

(Unit prices must be included in the bid or clearly defined in a standard, industry recognized pricing reference. The pricing reference shall be identified herein.)

Unit Price Description	Reference*	Unit Price	Units	Total

* Reference Legend: _____

_____

_____

Unit Price Total:
(Sum Total column)

Instructions for Change Order Back Up Forms

The General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition, and the Supplementary Conditions provide for changes in the contract in the form of change orders. The costs of such changes must be carefully, clearly and accurately documented. This is a set of forms to be used to provide this documentation in a consistent format that is in accordance with the Contract Documents.

Change orders will typically contain one or more items of work. Each item of work will typically include work by the general contractor and/or one or more subcontractors. The documentation begins with a breakdown of the work of the contractor and each subcontractor. This is prepared using the form entitled "BREAKDOWN." One form for the General Contractor and one for each subcontractor. Each breakdown will be summarized on the form entitled "SUMMARY." Each item of work will, in turn, be summarized on the change order itself. This should be on the face of the change order.

The forms are available as a Microsoft Excel worksheet for ease of preparation, with formulas established for mark-ups and other basic mathematical operations.
These forms are to be used as provided. Any alteration to the forms may cause the change order to be rejected.

GENERAL:

(Refer to Article 7 of the Supplementary and General Conditions)

Forms - There are five forms to be used for all change orders: CHANGE ORDER form, SUMMARY, BREAKDOWN, BREAKDOWN COMMENT SHEET and UNIT PRICE BREAKDOWN. The CHANGE ORDER form is the highest level and is the official, signed document. A CHANGE ORDER form may include one or more items of work, each of which is backed up by a SUMMARY. Each SUMMARY will be backed up with one or more BREAKDOWNs. Any unusual rates, unit costs or quantities may be explained on the COMMENT SHEET. It's simple. The BREAKDOWN form must be used for the general contractor and any subcontractor, at any level, that is to get OH&P. Use as many as needed.

Unit Pricing - Labor, material and equipment breakdown is the standard method of pricing change orders. However, unit pricing may be considered in some circumstances if the unit prices are clearly established such as by unit prices that were included in the bid. These prices may also be derived from a construction industry standard reference such as R.S. Means. If unit prices were included in the bid they are acceptable for pricing change order work and, in fact, must be used for any work that is included in the change order for which they were established . The UNIT PRICE BREAKDOWN is provided for this purpose.

CHANGE ORDER:

Project identification information: Complete as required. The Site Code, State ID and CFMS / SRM No(s). (contract numbers) can be obtained from the Project Manager.

Description: This will include a list of each attached SUMMARY that makes up this change order and a brief statement of the work included in each.

New Contract Sum: Calculate the new contract amount using the original contract amount, previous change orders and the new change order. Select the appropriate word for increase, decrease or unchanged, and delete the terms that don't apply.

New Contract Completion Date and Revised Time: Calculate the new contract time using the original Contract Completion Date and Contract Time, previous changes in time and the change in time by this change order. Select the appropriate word for increase, decrease or unchanged and delete the terms that don't apply. Show days in the main column and the date in the blank indicated.

Added Building Area: Show any building area added by this change order. If none, enter "None."

RECOMMENDED: Show the Designer's name and address, sign on the line indicated as "By:" and date on the indicated line.

ACCEPTED: Show the Contractor's name and address, sign on the line indicated as "By:" and date on the indicated line.

APPROVED: For approval by owner.

SUMMARY:

(Refer to Article 7 of the Supplementary and General Conditions)

Item No.: Show the Item number as it will appear on the CHANGE ORDER Form. Note: This may be one of several items included in one CHANGE ORDER form.

RFI No.: Show the number of the request for information. This may be known by another name such as COR (Change Order Request,) CPR (Change Proposal Request,) etc.

Project No., WBS No., Date, Project Name. Complete as appropriate.

Contractor: Name of General Contractor.

Description of Work: Give a brief description of the work included in this **Item**.

General Contractor Direct Costs: Show the total General Contractor Cost from the BREAKDOWN and show the Breakdown No. in the space provided.

General Contractor Total Cost: Show the total General Contractor Cost plus the General Contractor's overhead and profit. The overhead and profit shall not exceed 8% of the Direct Cost.

Subcontractor Cost Breakdowns: List each subcontractor, Breakdown No. and Total Direct Cost (in column "A") from the attached BREAKDOWN sheets. Show the subcontractor's overhead and profit percentage in column "B" and show the calculated total of the direct cost plus the percentage of the direct cost in column "C." If the electronic version of the form is being used, column "C" will be automatically calculated. The overhead and profit shall not exceed 8% of the Total Direct Cost.

Subcontractor Direct Costs Total: Sum of column "A." This will be used to calculate the General Contractor's overhead and profit on the subcontractors' work. If the electronic version is being used, this will be an automatic calculation.

Subcontractor Direct Costs + Subcontractor OH&P: Sum of column "C." This represents the total amount that subcontractors will be paid. Automatic calculation.

General Contractor OH&P on Subcontractor Direct Cost at ___%. The contractors overhead and profit on the subcontractors' direct cost (without subcontractor OH&P.) Enter the percentage of the contractor's OH&P on the subcontractors' work (not to exceed 8%) and show the calculated total of the subcontractors' direct cost plus the percentage of the direct cost in the space. Automatic calculation.

Total Subcontractor Costs: Total of the last two spaces.

Change Order Subtotal: Total of change order except bond.

Performance and Payment Bond at ____%: Enter bond percentage (from amount provided by the contractor at the Pre-Construction Conference) and calculate the amount for the bond.

Amount will be (increased) (decreased) (unchanged) by: Add bond and calculate total change order amount. Indicate "increase," "decrease" or "unchanged", and **delete the terms that don't apply**.

Days will be (increased) (decreased) (unchanged) by: Show the number of days to be added or deleted from the contract, if any, due to changes in scope, adverse weather, unusual delays or other factors, **only** if it is proven the critical path is affected. Note that a change in scope does not necessarily indicate a change in time. Indicate "increased," "decreased" or "unchanged", and **delete the terms that don't apply**.

BREAKDOWN:

Item No. Show the Item number as it will appear on the CHANGE ORDER Form and the SUMMARY. Note: This may be one of several items included in one CHANGE ORDER form.

RFI No.: Show the number of the request for information. This may be known by another name such as COR (Change Order Request,) CPR (Change Proposal Request,) etc.

Project No., WBS No., Date, Project Name. Complete as appropriate.

Contractor: Name of General Contractor or Subcontractor.

Direct Cost of Work:

Check here if explained on the Comment Sheet: If rates, unit costs or quantities may appear unreasonable compared to standard costs or quantities the reasons may be explained on the attached comment sheet and the box checked to indicate that there is an explanation.

A. Labor: Include the "wages paid" hourly direct labor and/or foreman necessary to perform the required change. "Wages paid" is the amount actually paid the employee, not the fully burdened charge rate used in the bid, etc. Supervisory personnel in district or home office shall not be included. Do not include the project superintendent, except as permitted by Section 7.2 of Supplementary Conditions. Supervisory personnel on the job-site, but with broad supervisory responsibility shall not be included as Direct Labor, except as permitted by Section 7.2 of Supplementary Conditions. Typically there will be only one superintendent on the job and his/her time shall not be included, except as permitted by Section 7.2 of Supplementary Conditions. Typically all other employees are eligible for inclusion. List by job title each person employed on the work, his/her hourly rate, the number hours work and the extended Total Cost. Do not list crews unless the rates for them are readily available in standard cost estimating references such as R. S. Means. Add the labor burden that was provided at the Pre-Construction conference and in compliance with the Contract Documents, and total the amounts in LABOR TOTAL.

B. Material: Include the acquisition cost of all materials directly required to perform the required change. List each material used in the work, the price per unit, name of the unit, the number of units used and the extended Total Cost. Add the tax rate and tax and total the amounts in MATERIAL TOTAL.

C. Equipment: Include the rental cost of equipment items necessary to perform the change. For company-owned equipment items, include documentation of internal rental rates submitted at the pre-construction conference. Charges for small tools, and craft specific tools are not allowed. List each piece of equipment used in the work, the rate by units of time (hour, day, week, etc.,) number of units of time the piece was in service on the work and the extended total cost. Add the tax rate, calculate the tax and total the amounts in EQUIPMENT TOTAL.

TOTAL DIRECT COST FOR THIS BREAKDOWN: Total of A. Labor, B. Material and C. Equipment. This is the amount that will be carried forward to the SUMMARY Sheet. This amount does **NOT** include Overhead and Profit. This will be added on the SUMMARY Sheet.

COMMENTS SHEET:

The COMMENTS SHEET uses the same heading as the SUMMARY and BREAKDOWN.

The COMMENTS SHEET includes three sections, one each for A. Labor, B. Materials and C. Equipment. These correspond to the sections in the BREAKDOWN. Each comment should be entered in the section to which it corresponds on the BREAKDOWN and numbered to correspond to the appropriate line. Comments are to used only to explain unusual rates, costs or quantities.

UNIT PRICE BREAKDOWN:

The UNIT PRICE BREAKDOWN uses the same heading as the BREAKDOWN.

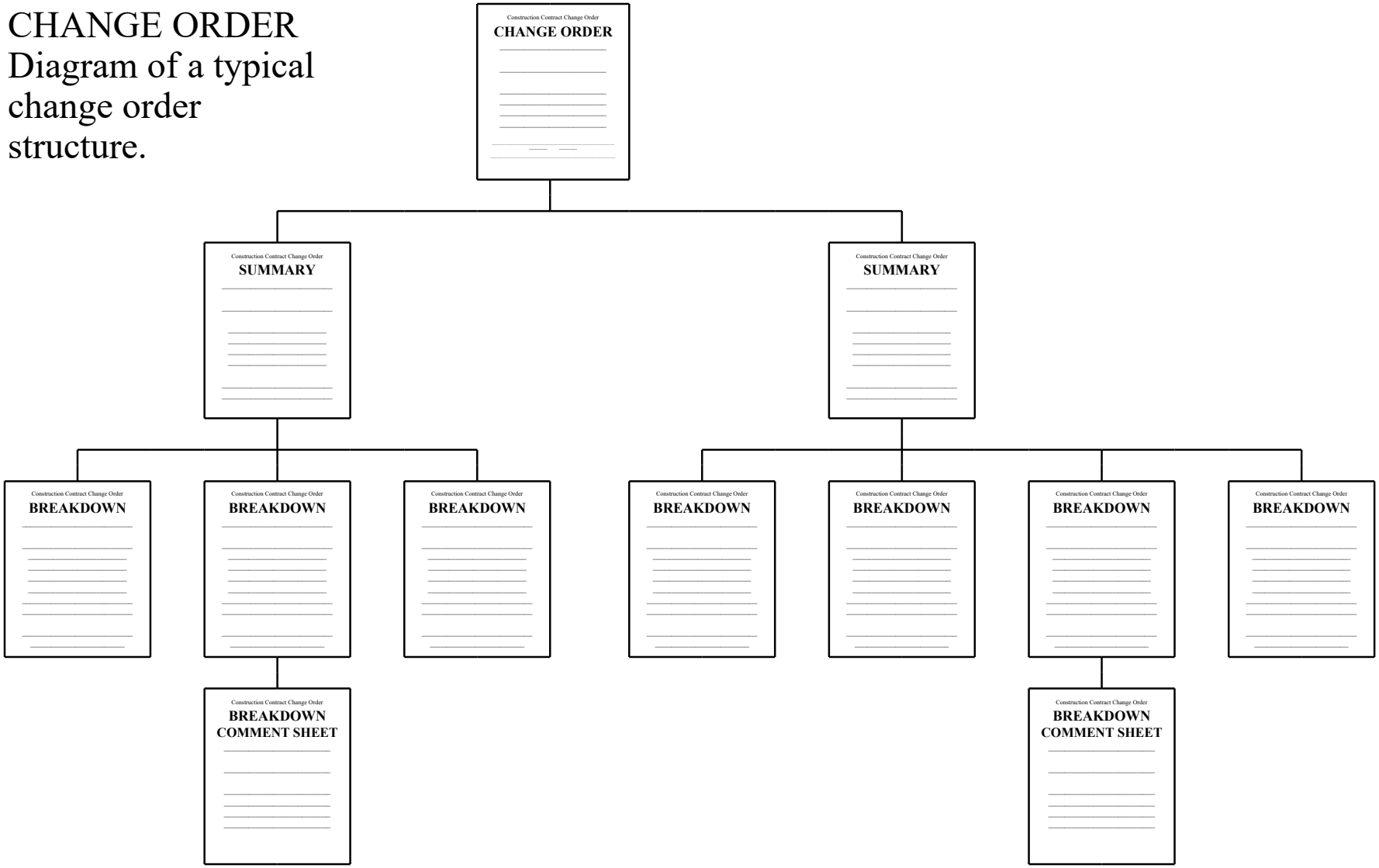
The UNIT PRICE BREAKDOWN is similar to the BREAKDOWN.

Unit Price Tabulation: Each unit price is listed along with its corresponding price and the number of units used in the work. The price and number of units are multiplied to provide the total cost of each unit price item. The pricing reference, such as the bid form for the project or a construction industry standard reference, must be cited for each unit price. This may be more fully described in "Reference Legend,"

Unit Price Total: Sum the unit prices to obtain the total cost for unit prices.

CHANGE ORDER

Diagram of a typical change order structure.



❖ **NOT FOR RECORDATION PURPOSES** ❖

RECOMMENDATION OF ACCEPTANCE

TO: SOUTHERN UNIVERSITY AND A&M COLLEGE
PURCHASING DEPARTMENT
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____
_____
_____
_____
Design Firm Name and Address

DATE: _____

PROJECT NAME: _____

PROJECT NUMBER: _____ WBS No. _____

SITE CODE: _____ STATE ID: _____ CFMS/SRM #: _____

CONTRACTOR: _____
_____

ORIGINAL CONTRACT AMOUNT: $ _____

FINAL CONTRACT AMOUNT: $ _____

FINAL BUILDING AREA (SQ. FEET):_____

I certify that, to the best of my knowledge and belief, this project is substantially complete in accordance with the Plans and Specifications to the point where it can be used for the purpose which was intended. It is recommended that it be accepted.

DATE OF ACCEPTANCE:_____

CONTRACT DATE OF COMPLETION:_____

NUMBER OF DAYS (OVERRUN) (UNDERRUN) (As of Acceptance Date)_____

LIQUIDATED DAMAGES PER DAY STIPULATED IN CONTRACT $_____

VALUE OF PUNCH LIST $_____*(Attach punch list)*

Was part of project occupied prior to Acceptance?

PORTION OCCUPIED: *(Attach Partial Occupancy Forms)*

ROOF GUAR-MANUF: _____ START DATE: _____ END DATE:

ROOFER: _____ START DATE: _____ END DATE:

Signed:_____
DESIGNER

FOR USE OF PROJECT MANAGER:

Signed:_____
PROJECT MANAGER

c: User Agency

❖ **NOT FOR RECORDATION PURPOSES** ❖

CERTIFICATE OF COMPLIANCE

with

Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines

TO: SOUTHERN UNIVERSITY AND A&M COLLEGE
PURCHASING DEPARTMENT
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

_____

_____

Design Firm Name and Address

PROJECT NAME: _____

_____

PROJECT No.: _____

WBS No.: _____

SITE CODE: _____ STATE ID: _____

DATE OF ACCEPTANCE: _____

I, _____ certify that, to the best of my knowledge and belief, this project has been constructed in compliance with the Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines as reviewed by the fire marshal.

_____ Date: _____

Designer Signature

CERTIFICATE OF COMPLIANCE

with

Louisiana Building Code for State Owned Buildings

TO: SOUTHERN UNIVERSITY AND A&M COLLEGE
PURCHASING DEPARTMENT
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

_____

_____

(Design Firm or Owner/User Name and Address)

PROJECT NAME: _____

_____

PROJECT No.: _____

WBS No.: _____

DATE OF ACCEPTANCE: _____

I, _____ certify that, to the best of my knowledge and belief, this project has been constructed in compliance with the construction documents determined to be satisfactory by Southern University.

_____ Date: _____

(*Signature of Designer or Owner/User)*

_____ _____

Name of Project **Project No.**

STATE OF _____

PARISH OF _____

ATTESTATIONS AFFIDAVIT

Before me, the undersigned notary public, duly commissioned and qualified in and for the parish and state aforesaid, personally came and appeared Affiant, who after being duly sworn, attested as follows:

LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:

(a) Public bribery (R.S. 14:118)
(b) Corrupt influencing (R.S. 14:120)
(c) Extortion (R.S. 14:66)
(d) Money laundering (R.S. 14:230)

B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:

(a) Theft (R.S. 14:67)
(b) Identity Theft (R.S. 14:67.16)
(c) Theft of a business record (R.S.14:67.20)
(d) False accounting (R.S. 14:70)
(e) Issuing worthless checks (R.S. 14:71)
(f) Bank fraud (R.S. 14:71.1)
(g) Forgery (R.S. 14:72)
(h) Contractors; misapplication of payments (R.S. 14:202)
(i) Malfeasance in office (R.S. 14:134)

LA. R.S. 38:2212.10 Verification of Employees

A. At the time of bidding, Appearer is registered and participates in a status verification system to verify that all new hires in the state of Louisiana are legal citizens of the United States or are legal aliens.

B. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.

C. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

Name of Project	**Project No.**

LA. R.S. 23:1726(B) Certification Regarding Unpaid Workers Compensation Insurance

A. R.S. 23:1726 prohibits any entity against whom an assessment under Part X of Chapter 11 of Title 23 of the Louisiana Revised Statutes of 1950 (Alternative Collection Procedures & Assessments) is in effect, and whose right to appeal that assessment is exhausted, from submitting a bid or proposal for or obtaining any contract pursuant to Chapter 10 of Title 38 of the Louisiana Revised Statutes of 1950 and Chapters 16 and 17 of Title 39 of the Louisiana Revised Statutes of 1950.

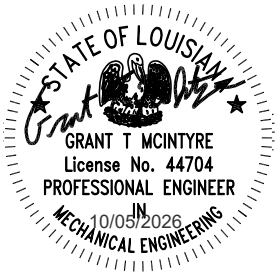
B. By signing this bid /proposal, Affiant certifies that no such assessment is in effect against the bidding / proposing entity.

NAME OF BIDDER	**NAME OF AUTHORIZED SIGNATORY OF BIDDER**
DATE	**TITLE OF AUTHORIZED SIGNATORY OF BIDDER**

SIGNATURE OF AUTHORIZED
SIGNATORY OF BIDDER/AFFIANT

Sworn to and subscribed before me by Affiant on the _____ day of _____ , 20___ .

_____
Notary Public



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 00 00 – BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Refer also to General Requirements Division 01 Specification Sections and all other Division 23 Specification Sections included in this contract.

1.2 SUMMARY

A. This specification section provides basic and supplemental requirements common to HVAC work.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the Contract DocumentS.

C. Reference:
1. AGA – American Gas Association Publications: Directory of Approved Gas Appliances and Tested Accessories.
2. AMCA – Air Moving and Conditioning Association: applicable manuals and standards.
3. ANSI B9.1 – Safety Code for Mechanical Refrigeration.
4. ANSI B31.1 – Power Piping
5. ANSI B31.9 – Building Systems Piping
6. ANSI Z9.5 – Laboratory Ventilation
7. API/PIP – American Petroleum Institute/Process Industry Practices: Recommended Practice 686 – Recommended Practice for Machinery Installation and Installation Design (UEM equipment only).
8. ARI – Air Conditioning and Refrigeration Institute Standards: all standards related to refrigeration, air conditioning equipment and piping furnished under these Specifications.
9. ASHRAE 55 – Thermal Environmental Conditions for Human Occupancy.
10. ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality.
11. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings.
12. ASME – American Society of Mechanical Engineers: Boiler and Pressure Vessel Codes.
13. ASTM – American Society of Testing Materials: applicable manuals and standards.
14. FP&C – Facility Planning & Control
15. IMC – International Mechanical Code
16. IBC – International Building Code
17. IECC – International Energy Conservation Code

18. NEMA – National Electrical Manufacturers' Association: applicable manuals and standards.
19. NFPA 1 – Fire Code
20. NFPA 45 – Fire Protection for Laboratories
21. NFPA 90A – Installation of Air Conditioning and Ventilating Systems
22. NFPA 91 – Blower & Exhaust Systems
23. NFPA 101 – Life Safety Code
24. NFPA 200 Series – Building Construction
25. NFPA 241 – Standard for Safeguarding Construction, Alteration and Demolition Operations
26. NFPA 255 – Method of Test of Surface Burning Characteristics of Building Materials
27. NFPA 258 – Standard Research Test Method for Determining Smoke Generation of Solid Materials
28. OSHA – Occupational Safety and Health Act.
29. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA): applicable manuals and standards.
30. UL – Underwriters Laboratories.

1.4 DEFINITIONS

A. These definitions are included to clarify the direction and intention of these Specifications. For further clarification, contact the Architect/Engineer. Please also see Division 01 for additional definitions.
   1. Concealed / Exposed: "Concealed" areas are those areas that cannot be seen by the building occupants. "Exposed" areas are all areas which are exposed to view by the building occupants, including under counters, inside cabinets and closets, plus all mechanical rooms. “Exterior” areas are those that are outside the building exterior envelope and exposed to the outdoors.
   2. Furnish: The term "furnish" is used to mean "supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
   3. Install: The term "install" is used to describe operations at Project Site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
   4. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use.

1.5 QUALITY ASSURANCE

A. Mechanical systems shall be coordinated with other associated systems as required by the construction documents to provide complete working services to other systems and trades, including but not limited to: fire suppression, plumbing, electrical systems, fire alarm, security systems, transport systems, telephone and data systems.

B. Verification of Dimensions: The Contractor shall be responsible for the coordination and proper relation of Contractor’s Work to the building structure and to the Work of all trades. The Contractor shall visit the premises and become thoroughly familiar with all details of

the Work and working conditions, to verify all dimensions in the field, and to advise the Architect/Engineer of any discrepancy before performing any Work. Adjustments to the Work required in order to facilitate a coordinated installation shall be made at no additional cost to the Owner or the Architect/Engineer.

C. All dimensional information related to new structures shall be taken from the appropriate Drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the Site.

D. The Drawings are subject to the requirements of Reference Standards, structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of Work. Work shall be organized and laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. All exposed Work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.

E. When the Drawings do not give exact details as to the elevation of pipe and ducts, the Contractor shall physically arrange the systems to fit in the space available at the elevations intended with proper grades for the functioning of the system involved. Piping and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner. The Drawings do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas.

F. Where core drilling of floor or wall penetrations is required, Work shall be performed in accordance with Division 03 Specifications. Where applicable Division 03 Specifications are not included in the Project, core drilling shall be in accordance with generally accepted standards, and be performed by licensed personnel where applicable.

G. Contractor shall use ground penetrating radar (GPR) to scan areas of concrete core drilling or saw cutting for embedments. Contractor shall clearly mark locations of embedments for inspection by UT site construction representative before core drilling or saw cutting.

H. Certify in writing that neither the Contractor nor any of Contractor's subcontractors or suppliers will supply any materials that contain any asbestos in any form for this Project.

I. Contractor shall verify all associated existing systems, pipe and duct sizes, etc. before starting work. Contractor shall verify that new systems can be properly connected to existing systems as indicated on construction documents before starting work.

J. Exposed piping and ductwork in building occupied areas: Where the minimum overhead piping and ductwork elevations are not provided, contractor shall coordinate with building owner prior to installation to identify any specific clearance restrictions and requirements in these areas before starting work.

1.6 DELIVERY, STORAGE AND HANDLIING

A. All equipment, ductwork, and materials shall be delivered to the Project Site clean and sealed for protection.

B. Take particular care not to damage the existing construction in performing Work. All finished floors, step treads and finished surfaces shall be covered to prevent any damage by workers or their tools and equipment during the construction of the Project.

C. Equipment and materials shall be protected from rust and dust/debris both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these Specifications.

D. All material affected by weather shall be covered and protected to keep the material free from damage while material is being transported to the Site and while stored at the Project Site.

E. Cap and seal all open ends of piping and conduit during construction to prevent the entrance of foreign matter.

F. All equipment shall be protected during the execution of the Work. All ductwork and equipment shall be sealed with heavy plastic and tape to prevent build-up of dust and debris.

G. All ductwork and air handling equipment shall be wiped down with a damp cloth immediately before installation to ensure complete removal of accumulated dusts and foreign matter.

H. Follow manufacturer's instructions for long and short term storage of materials and equipment.

1.7 SUBMITTALS

A. Product Data: Provide coordination Drawings with submittals as required by Division 01.

B. Record Documents: All material submitted as final record products, including approved Shop Drawings and submittals, shall be submitted to the Owner in its original electronic file format. Material may be scanned into electronic file format where necessary. Include PDF (.pdf) versions of all files.

C. Submit the following in addition to and in accordance with the requirements of Division 01 for submittal requirement.
   1. Include inspection and permit certificates and certificates of final inspection and acceptance from the authority having jurisdiction.
   2. Manufacturer's standardized schematic diagrams and catalog cuts shall not be acceptable unless applicable portions of it are clearly indicated and non-applicable portions clearly deleted or crossed out.
   3. For mechanical systems requiring electrical connections, provide schematic, connection and/or interconnection diagrams in accordance with the latest edition of NEMA.
   4. Provide submittals as required by individual specification sections.

D. Provide the following with each submittal:
   1. Catalog cutsheets with the manufacturer's name clearly indicated, as well as either

the equipment tag shown on the schedule, or the applicable specification paragraph number. Applicable portions shall be circled and non-applicable portions shall be crossed out.

1.8 WARRANTIES

A. All warranties shall start on acceptance date unless approved otherwise by FP&C.

1.9 SUBSTITUTION OF MATERIALS AND EQUIPMENT

A. Refer to General Requirements, Division 01, for substitution of materials and equipment.

B. The “basis of design” (BOD) products are the specific products shown on the Drawings and indicated as such in the specifications.

C. It is not the intent of the Drawings and/or Specifications to limit products to any particular manufacturer nor to discriminate against an "approved equal" product as produced by another manufacturer. Some proprietary products are mentioned to set a definite standard for acceptance and to serve as a reference in comparison with other products. When a manufacturer's name appears in these Specifications, it is not to be construed that the manufacturer is unconditionally acceptable as a provider of equipment for this project. The successful manufacturer or supplier shall meet all of the provisions of the appropriate specification(s).

D. For consideration of alternate and/or “or equal” products, the contractor must submit a list of end users who have had multiple years of good experience using the product. The contractor must provide the contact names and phone numbers of these end users in order for the product to be considered. The submittal of this list of end users does not ensure that any substitution will be allowed by the owner.

E. The long and short term storage of all equipment must be in accordance with the equipment manufacturer’s recommendations.

F. The specified products have been used in preparing the Drawings and Specifications and thus establish the minimum attributes that substitutes must to be considered acceptable. The burden of proof of equality rests with the Contractor. The decision of the designer is final.

G. When requested by the Architect/Engineer, the Contractor shall provide a sample of the proposed substitute item. In some cases, samples of both the specified item and the proposed item shall be provided for comparison purposes.

H. Should a substitution be accepted, and should the substitute material prove defective, or otherwise unsatisfactory for the service intended within the guarantee period, this material or equipment shall be replaced with the material or equipment specified at no additional cost to the Owner.

I. Electrical Requirements: The electrical design and Drawings are based on the equipment scheduled and indicated on the Drawings. If the Contractor provides any equipment differing from the basis of design that requires changes to the electrical design, the

Contractor shall make the required electrical changes at no cost to the Owner.

J. Certification: The Contractor shall carefully examine all data forwarded for approval and shall sign a certificate to the effect that the data has been carefully checked and found to be correct with regard to dimensions, available space, and all requirements listed in the Drawings and Specifications.

K. Space Requirements:

1. Physical Size of Equipment: Space is critical. Equipment that is larger than shown on the plans, even if it is provided by the specified manufacturer, will not be acceptable unless the Contractor can demonstrate that ample space exists for its proper installation, operation, and maintenance.
2. All equipment shall be installed so that all surfaces can be accessed. Install all valves, motors, drives, filters, and other accessory items where they can be removed for service without disassembling any other part. Any component within a duct shall have an adequately sized access panel located nearby for easy service access.
3. The Contractor shall relocate equipment up to five (5) feet from its position shown on the plans at no additional cost to the Owner if field conditions require the change and if directed by the Architect/Engineer.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. All equipment installed shall have local representation, local factory authorized service, and a local stock of repair parts.

C. Responsibility for furnishing proper equipment and/or material and ensuring that equipment and/or material is installed as intended by the manufacturer rests entirely upon the Contractor. If needed, the Contractor shall request advice and supervisory assistance from the specific manufacturer’s representative during the installation.

D. All materials, unless otherwise specified, shall be new, free from all defects, suitable for the intended use and of the best quality. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by workers skilled in their respective trades, and the installations shall provide a neat, precise appearance. Materials and/or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the job site but shall be replaced with new materials and/or equipment.

E. Prevention of Rust: Standard factory finish will be acceptable on equipment specified by model number; otherwise, surfaces of ferrous metal shall be given a rust inhibiting coating.

2.2 NAMEPLATES

A. Each major equipment component shall have a manufacturer's nameplate with the

manufacturer's address and model number securely attached to the equipment. All data on nameplates shall be legible at the time of Final Inspection.

B. For associated mechanical equipment without manufacturer nameplates which require nameplates (such as a control panels), nameplates shall be installed with stainless steel self-tapping screws or epoxy adhesive.

2.3 WALL, FLOOR AND CEILING PLATES (ESCUTCHEONS)

A. Except as otherwise noted, provide stainless steel or chrome plated brass floor and ceiling plates around all pipes passing exposed through walls, floors or ceilings, in any spaces except underfloor and plenum spaces.

B. Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines that are insulated and positively secured to such pipe or insulation.

C. For finished ceiling installation, secure escutcheons to ceiling with escutcheon fasteners

2.4 ROOF PENETRATIONS AND FLASHING

A. Roof Systems Penetrations and Flashings – Installation shall comply with the roof manufacturer's requirements, specifications and installation details as required to maintain the roof warranties. Contractor shall verify roof manufacturer requirements for maintaining roof warranties before starting work.

2.5 ACCESS DOORS

A. General: This Contractor shall provide wall or ceiling access doors for unrestricted access to all concealed items of mechanical equipment or devices.

B. Doors: Where not otherwise specified, access doors mounted in painted surfaces shall be of Milcor (Inland Ryerson Construction Products Company) manufacture, Style K for plastered surfaces and Style M or DW for non-plastered surfaces. The Style K doors shall be set so that the finished surface of the door is even with the finished surface of the adjacent finishes. Access doors mounted on tile surfaces shall be of similar construction as noted above, except they shall be of stainless steel materials. Access doors shall be a minimum of 12" x 12" in size.

PART 3 - EXECUTION

3.1 PREPARATION

A. Cooperate with trades of adjacent, related or affected materials or operations, and with trades performing continuations of this Work in order to effect timely and accurate placing of Work and to coordinate, in proper and correct sequence, the Work of such trades.

B. The size of equipment indicated on the Drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine that the equipment proposed will fit in the space.

C. All mechanical equipment shall be installed in a location that permits access and operation of all associated controls, valves, etc, and allows for the maintenance of equipment and all other associated appurtenances.

3.2 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards – Division 01 Codes, Standards, and Regulations, and conform to codes and ordinances of the authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Piping may be run exposed in rooms typically without ceilings such as mechanical rooms, janitor's closets, tight against pan soffits in exposed "tee" structures, or storage spaces, but only where necessary. Shutoff and isolation valves shall be easily accessible.

D. All pipe, shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All pipes run exposed in machinery and equipment rooms shall be installed parallel to the building lines, except that piping shall be sloped to obtain the proper pitch. Piping run in furred ceilings, etc., shall be similarly installed, except as otherwise shown. All pipe openings shall be kept closed until the systems are closed with final connections.

E. Prior to the installation of any ceiling or wall surfaces the Contractor shall notify the Owner's Project Manager so that an inspection can be made of the areas about to be "sealed" off. The Contractor shall provide written notification to the Owner at least seven (7) working days prior to the inspection.

F. Precedence of Materials:
   1. The Specifications determine the nature and setting of materials and equipment. The Drawings establish quantities, dimensions and details.
   2. If interference is encountered, the following installation precedence of materials shall guide the Contractor to determine which trade shall be given the "Right of Way":
      a. Building lines
      b. Structural members
      c. Structural support frames supporting ceiling equipment
      d. Soil and drain piping
      e. Vent piping
      f. Cable tray
      g. Supply, return and outside air ductwork
      h. Exhaust ductwork
      i. HVAC water and steam piping
      j. Condensate piping
      k. Fire protection piping
      l. Natural gas piping
      m. Medical/Laboratory gases
      n. Domestic water (cold and hot, softened, treated)
      o. Refrigerant piping

p. Electrical conduit

G. Coordinate mechanical systems with transport systems as required to maintain transport systems right-of-way.

H. Provide concrete housekeeping pads and equipment bases for the following: outdoor equipment on grade, indoor floor mounted equipment in mechanical rooms and penthouse equipment rooms. Housekeeping pads shall be four inches high, or taller where needed to meet requirements for condensate drains. Housekeeping pads shall extend a minimum 6 inches beyond the equipment or supported member in all directions. Provide pads with half-inch chamfer on all exposed edges, placed and finished smooth and level to ensure proper and continuous support for the bearing surfaces of equipment. Housekeeping pads shall be constructed out of 3000 psi minimum, standard weight concrete internally reinforced with rebar. Refer to structural drawings for additional requirements.

I. Provide prefabricated, factory insulated curbs for roof-mounted equipment, a minimum of 12 inches in height above finished roof surface. Provide curb pitches to match roof slope where required.

J. Where piping or ductwork penetrates a floor, ceiling or wall, provide fire stopping insulation, sealed airtight, to close off penetration space between pipe, ductwork, and adjacent work. Provide escutcheon covers at both sides of penetration.

3.3 CUTTING AND PATCHING

A. General: Cut and patch walls, floors, etc., resulting from work in existing construction or by failure to provide proper openings or recesses in new construction.

B. Methods of cutting: Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations approved by the Architect/Engineer. Impact type equipment shall not be used except where specifically approved by the Architect/Engineer. Openings in precast concrete slabs for pipes, etc., shall be core drilled to exact size.

C. Restoration: All openings shall be restored to "as new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.

D. Masonry: Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner approved by the Architect/Engineer.

E. Plaster: All mechanical work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.

F. Special Note: No cutting, boring, or excavating which will weaken the structure shall be undertaken.

3.4 PAINTING

A. Paint exposed equipment and materials per the contract documents and the requirements of Division 09 – Finishes.

3.5 CONNECTIONS FOR OTHERS

A. The Mechanical Contractor shall rough in for and make all process water, chilled water, hot water, steam, and ventilation connections to all fixtures, equipment, machinery, etc., provided by others in accordance with detailed roughing in Drawings provided by the equipment suppliers, by actual measurements of the equipment connections, or as detailed.

B. After the equipment is set in place, this Contractor shall make all final connections and shall provide all required pipe, fittings, valves, traps, etc.

C. Install a shutoff valve in each service line connected to a piece of equipment.

D. All pipe fittings, valves, traps, etc., exposed in finished areas and connected to chrome plated lines provided by others shall be chrome plated to match.

E. Provide all sheet metal ductwork, transition pieces, etc., required for a complete installation of vent hoods, fume hoods, etc., provided by others

3.6 ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

A. The electrical trades shall provide all interconnecting wiring for the installation of all power. The electrical trades shall provide all disconnect switches as required for proper operation, as indicated on the Drawings or required by applicable code. All motor starters not specifically scheduled or specified as being provided by the equipment manufacturer under the scope of Division 23 shall be provided under the scope of Division 26.

B. The Mechanical Trades shall provide complete wiring diagrams indicating power wiring and interlock wiring. Diagrams shall be submitted to the Architect/Engineer for review within thirty (30) days after the submittals for equipment have been reviewed. Diagrams shall be based on accepted equipment and shall be complete full phase and interlock control Drawings, not a series of manufacturer's individual diagrams. After these diagrams have been reviewed by the Architect/Engineer, copies shall be transmitted to the Electrical Trades by the Contractor. They shall be followed in detail.

3.7 DEMOLITION AND RELOCATION

A. The Contractor shall modify, remove, and/or relocate all materials and items so indicated on the Drawings or required by the installation of new facilities. All removals and/or dismantling shall be conducted in a manner as to produce maximum salvage. Salvage materials shall remain the property of the Owner, and shall be delivered to such destination or otherwise disposed of as directed by the Owner. Materials and/or items scheduled for relocation and which are damaged during dismantling or reassembly operations shall be repaired and restored to good operative condition. The Contractor may, at his discretion, and upon the approval of the Owner, substitute new materials

and/or items of like design and quality in lieu of materials and/or items to be relocated.

B. All items which are to be relocated shall be carefully removed in reverse to original assembly or placement and protected until relocated. The Contractor shall clean and repair and provide all new materials, fittings, and appurtenances required to complete the relocations and to restore to good operative order. All relocations shall be performed by workmen skilled in the work and in accordance with standard practice of the trades involved.

C. When items scheduled for relocation and/or reuse are found to be in damaged condition before work has been started on dismantling, the Contractor shall call the attention of the Owner to such items and receive further instructions before removal. Items damaged in repositioning operations are the Contractor's responsibility and shall be repaired or replaced by the Contractor as approved by the Owner, at no additional cost to the Owner.

D. Service lines and wiring to items to be removed, salvaged, or relocated shall be removed to points indicated on the Drawings, specified, or acceptable to the Owner. Service lines and wiring not scheduled for reuse shall be removed to the points at which reuse is to be continued or service is to remain. Such services shall be sealed, capped, or otherwise tied off or disconnected in a safe manner acceptable to the Owner. All disconnections or connections into the existing facilities shall be done in such a manner as to result in minimum interruption of services to adjacent occupied areas. Services to existing areas or facilities which must remain in operation during the construction period shall not be interrupted without prior specific approval of the Owner as hereinbefore specified.

3.8 TESTING

A. When any piece of mechanical equipment is operable and it is to the advantage of the Contractor to operate the equipment, Contractor may do so, provided that Contractor properly supervises the operation, and has the Owner’s written permission to do so. The warranty period shall start on acceptance date unless approved otherwise by FP&C.

B. Regardless of whether or not the equipment has or has not been operated, the Contractor shall properly clean the equipment, install clean filter media, properly adjust, and complete all deficiency list items before final acceptance by the Owner. The date of acceptance and performance certification will be the same date.

C. Check inspections shall include piping, equipment, insulation, controls, wiring and such other items and systems components hereinafter specified or specifically designated by the Architect/Engineer.

D. The Contractor shall execute, at no additional cost to the Owner, any tests required by the Owner or the National Fire Protection Association, ASTM, etc. Standards listed. The Contractor shall provide all equipment, materials and labor for making such tests. The Owner will pay reasonable amounts of fuel and electrical energy costs for system tests. Fuel and electrical energy costs for system adjustment and tests, which follow Substantial Completion by the Owner, will be borne by the Owner.

E. Notify the Owner’s Project Manager and the Architect/Engineer in writing at least seven (7) working days prior to each test and prior to other Specification requirements requiring

Owner and Architect/Engineer to observe and/or approve tests.

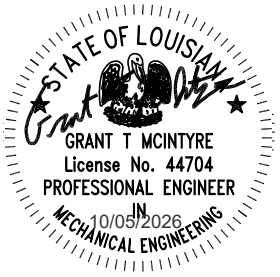
F. All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel performing, observing and inspecting, description of the test and extent of system tested, test conditions, test results, specified results an other pertinent data. Data shall be delivered to the Architect/Engineer as specified under "Requirements for Final Acceptance." The Contractor or Contractor's authorized job superintendent shall legibly sign all Test Log entries. For pipe testing requirements see the specific piping specification or standard.

3.9 TRAINING

A. Operating and Maintenance Manuals and instruction shall be provided as specified under General Requirements, Division 01.

B. Specific training and operating instructions for individual equipment components shall be as specified in the individual Specification Sections.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Motors.
2. Alignment guides and anchors.
3. Sleeves without waterstop.
4. Sleeves with waterstop.
5. Stack-sleeve fittings.
6. Sleeve-seal systems.
7. Grout.
8. Escutcheons.
9. Sight flow indicators.

1.2 ACTION SUBMITTALS

A. Product Data:
1. For each type of product, excluding motors which are included in Part 1 of HVAC equipment Sections.
a. Include construction details, material descriptions, and dimensions of individual components, and finishes.
b. Include operating characteristics and furnished accessories.

B. Delegated Design Submittals: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.
1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter.

B. Welding certificates.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of expansion joint, meter, and gauge to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 MOTORS

A. Motor Requirements, General:
   1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
   2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
   3. Comply with NEMA MG 1 unless otherwise indicated.
   4. Comply with IEEE 841 for severe-duty motors.

B. Motor Characteristics:
   1. Duty: Continuous duty.
   2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Polyphase Motors:
   1. Description: NEMA MG 1, Design B, medium induction motor.
   2. Efficiency: Premium Efficient, as defined in NEMA MG 1.
   3. Service Factor: 1.15.
   4. Multispeed Motors: Variable torque.
      a. For motors with 2:1 speed ratio, consequent pole, single winding.
      b. For motors with other than 2:1 speed ratio, separate winding for each speed.

5. Multispeed Motors, Two Winding: Separate winding for each speed.
6. Rotor: Random-wound, squirrel cage.
7. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
8. Temperature Rise: Match insulation rating.
9. Insulation: Class F.
10. Code Letter Designation:
    a. Motors 15 Hp and Larger: NEMA starting Code F or Code G.
    b. Motors Smaller Than 15 Hp: Manufacturer's standard starting characteristic.
11. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

D. Additional Requirements for Polyphase Motors:
1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
2. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    a. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time-rise pulses produced by pulse-width-modulated inverters.
    b. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    c. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    d. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:
1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:
    a. Permanent-split capacitor.
    b. Split phase.
    c. Capacitor start, inductor run.
    d. Capacitor start, capacitor run.
2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
4. Motors 1/20 hp and Smaller: Shaded-pole type.
5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.

2.2 EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

A. Performance Requirements:
1. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.

2. Capability: Provide products and installations that will accommodate maximum axial movement as scheduled or indicated on Drawings.

B. Alignment Guides and Anchors:
1. Source Limitations: Obtain alignment guides from single manufacturer.
2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe. Provide dielectric spacer for use with copper tubing/piping.
3. Anchor Materials:
a. Steel Shapes and Plates: ASTM A36/A36M.
b. Bolts and Nuts: ASME B18.10 or ASTM A183, steel hex head.
c. Washers: ASTM F844, steel, plain, flat washers.
d. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
1) Stud: Threaded, zinc-coated carbon or stainless steel.
2) Expansion Plug: zinc-coated carbon or stainless steel.
3) Washer and Nut: zinc-coated carbon or stainless steel.
e. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
1) Bonding Material: ASTM C881/C881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
2) Stud: ASTM A307, zinc-coated carbon or stainless steel with continuous thread on stud, unless otherwise indicated.
3) Washer and Nut: zinc-coated carbon or stainless steel.

2.3 SLEEVES AND SLEEVE SEALS

A. Sleeves without Waterstop:
1. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron, with plain ends.
2. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
3. Steel Sheet Sleeves: ASTM A653/A653M, 24 gauge minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.
4. PVC Pipe Sleeves: ASTM D1785, Schedule 40.
5. Molded-PVC Sleeves: With nailing flange.
6. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange.

B. Sleeves with Waterstop:
1. Description: Manufactured PVC/HDPE, sleeve-type, waterstop assembly, made for imbedding in concrete slab or wall.

C. Stack-Sleeve Fittings:
1. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
a. Hydrostatic seal: 20 psig.

b. Sealing Elements: EPDM-rubber or High-temperature-siliconeinterlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
c. Pressure Plates: Carbon steel or Stainless steel.
d. Connecting Bolts and Nuts: Carbon steel, with zinc coating of length required to secure pressure plates to sealing elements.

D. Grout:
1. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
3. Design Mix: 5000 psi, 28-day compressive strength.
4. Packaging: Premixed and factory packaged.

2.4 ESCUTCHEONS

A. Escutcheon Types:
1. One-Piece, Steel Type: With polished, chrome-plated] finish and setscrew fastener.
2. One-Piece, Stainless Steel Type: With polished stainless steel finish.
3. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
4. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
5. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
6. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; exposed rivet hinge; and spring-clip fasteners.

B. Floor Plates:
1. Split Floor Plates: Steel with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION OF EXPANSION JOINTS - GENERAL

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

3.2 INSTALLATION OF ALIGNMENT GUIDES AND ANCHORS

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe, and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:
1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9.
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-58, Type 24; U bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
3. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

3.3 INSTALLATION OF SLEEVES - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.
a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
3. Using grout, seal space outside of sleeves in floors/slabs/walls without sleeve-seal system. Select to maintain fire resistance of floor/slab/wall.

D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and

walls. Position waterstop flange centered across width of concrete slab or wall.

C. Secure nailing flanges to wooden concrete forms.

D. Using [grout][or][silicone sealant], seal space around outside of sleeves.

3.5 INSTALLATION OF STACK-SLEEVE FITTINGS

A. Install stack-sleeve fittings in new slabs as slabs are constructed.
   1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
   2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."
   3. Install section of cast-iron soil pipe to extend sleeve to 3 inches above finished floor level.
   4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
   5. Using silicone sealant, seal space between top hub of stack-sleeve fitting and pipe.

B. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.6 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.7 INSTALLATION OF ESCUTCHEONS

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

3.8 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow space for service and maintenance of meters, gauges, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.9 FIELD QUALITY CONTROL

A. Sleeves and Sleeve Seals:
   1. Perform the following tests and inspections:
      a. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
      b. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.
   2. Prepare test and inspection reports.

B. Escutcheons:
   1. Using new materials, replace broken and damaged escutcheons and floor plates.

3.10 SLEEVES APPLICATION

A. Use sleeves and sleeve seals for the following piping-penetration applications:
   1. Exterior Concrete Walls above and below Grade:
      a. Sleeves with waterstops.
         1) Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve-seal system.
   2. Concrete Slabs-on-Grade:
      a. Sleeves with waterstops.
         1) Select sleeve size to allow for 1 inch annular clear space between piping and sleeve for installing sleeve-seal system.
   3. Concrete Slabs above Grade:
      a. Sleeves with waterstops or stack-sleeve fittings.
   4. Interior Walls and Partitions:
      a. Sleeves without waterstops.

3.11 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:
   1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
   2. Insulated Piping:
      a. One piece, steel with polished, chrome-plated finish.
      b. One piece, stainless steel with polished stainless steel finish.
      c. One piece, cast brass with polished, chrome-plated finish.
      d. One piece, stamped steel or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
   3. Bare Piping at Wall and Floor Penetrations in Finished Spaces:
      a. One piece, steel with polished, chrome-plated finish.
      b. One piece, stainless steel with polished stainless steel finish.
      c. One piece, cast brass with polished, chrome-plated finish.
      d. One piece, stamped steel or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
   4. Bare Piping at Ceiling Penetrations in Finished Spaces:

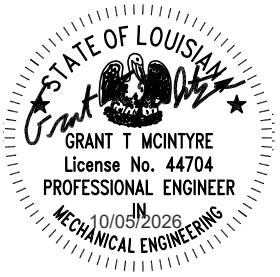
a. One piece, steel with polished, chrome-plated finish.
b. One piece, stainless steel with polished stainless steel finish.

5. Bare Piping in Unfinished Service Spaces:
   a. One piece, steel with polished, chrome-plated finish.
   b. One piece, cast brass with rough-brass finish.
6. Bare Piping in Equipment Rooms:
   a. One piece, steel with polished, chrome-plated finish.
   b. One piece, stamped steel or split plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.

B. Install floor plates for piping penetrations of equipment-room floors.

C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
   1. New Piping and Relocated Existing Piping: Split floor plate.
   2. Existing Piping to Remain: Split floor plate.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 05 19 – METERS AND GAUGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all labor, materials, equipment, tools and services and perform all the operations required in connection with, or associated with, the construction of complete hydronic piping systems, including chilled and heating hot water piping, condenser water piping process chilled or hot water piping, condensate drain piping and generator cooling water piping systems as indicated on the Drawings.

B. Section Includes:
1. Glass Thermometers
2. Bimetallic Thermometers
3. Thermowells
4. Pressure Gages
5. Pressure and Temperature Taps
6. Electromagnetic Flow Meters

1.2 SUBMITTALS

A. Product Data:
1. Measurement tolerances.
2. Range.
3. Accuracy.
4. Device dimensions and connection sizes (include schedule indicating stem length versus pipe diameter).
5. Scales.
6. Materials of construction.
7. Valves that will be used for isolating gauges.
8. Submit a schedule for each device to be installed, including:
a. Location.
b. Pressure or temperature range of device and fluid measured
c. Pipe size and bulb length of thermometers
d. Type of valve used with the pressure gauge

B. Operation and Maintenance Data:
1. Manufacturer's O&M manual

1.3 QUALITY ASSURANCE

A. Thermometers: ASME B40.200, calibrate against standards traceable to the NIST and guaranteed accurate to plus or minus one scale division.

B. Pressure Gages: ASME B40.1, Grade 2A accuracy, 0.5 percent of scale range.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products meeting all requirements of this specification Section of the following manufacturers are acceptable:
   1. Thermometers: Ashcroft, Dwyer, Marsh Instrument, Trerice, Weiss, Weksler
   2. Pressure Gages: Ametek, Ashcroft, Dwyer, Trerice, Weiss, Weksler.
   3. Pressure/Temperature Taps: Peterson Engineering Company, Sisco or Trerice

2.2 GLASS THERMOMETERS

A. Construction: Provide mercury free liquid in glass thermometer with a cast aluminum case.

B. Window: Shatter proof glass designed for all angle reading.

C. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

D. Scale: 9-inches long, white scale with black graduations and figures.

E. Stem: Aluminum, stainless steel, or brass, thermowell installation, ¼-inch diameter, minimum 3-1/2 inch straight or angle to suit installation.

F. Accuracy: +/- 1% of full scale.

G. Furnish thermometers for services in the following ranges and divisions:
   1. Chilled Water: 0–100 degrees F or 0–120 degrees F, 1 degree divisions
   2. Heating Hot Water: 30–240 degrees F, 2 degree divisions

2.3 BIMETALLIC THERMOMETERS

A. Construction: Dial with hermetically sealed stainless steel stem and case, NEMA 4X enclosure.

B. Window: Shatter proof glass.

C. Connector: Adjustable viewing angle type.

D. Accuracy and Ranges: same as Glass Thermometers, above.

2.4 THERMOWELLS

A. Manufacturers: Same as manufacturer of thermometer being used.

B. Description: Brass or stainless steel with pressure and temperature ratings suitable for their application. Wells for insulated piping shall have a 2-1/2 inch lagging protrusion.

2.5 PRESSURE GAGES

A. Construction: Provide direct-mounting, dial-type pressure gages with indicating-dial type

complying with ASME B40.100.

B. Case: Liquid-filled type, polypropylene, polycarbonate, or aluminum case, 4-1/2-inch diameter, solid front with blow-out/pressure-relief back.

C. Bourdon Tube: Bronze or 316 stainless steel with brass or stainless steel socket.

D. Movement: Stainless steel rotary type with stainless steel bushings

E. Dial: White face with black figures.

F. Pointer: Red or black, micro adjustable.

G. Window: Shatter proof glass.

H. Gage ranges
   1. Provide 0 - 160 psi gages for 150 psi chilled/hot water service.
   2. Provide 0 - 100 psi gages for process and medium temperature chilled water service.
   3. Accuracy: Grade 2A, plus or minus 0.5% percent of span.

I. Provide liquid filled gages for all pressure gages upstream and downstream of pumps.

J. Pressure-gage fittings:
   1. Valves: NPS 1/4 brass or stainless-steel needle type.
   2. Siphons: NPS 1/4 coil of brass or stainless steel tubing with threaded ends.
   3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.6 PRESSURE AND TEMPERATURE TAPS:

A. Taps. Provide 1/2" solid brass fittings which will receive either a pressure or temperature probe, with valve core of Nordel and fitted with a color coded cap and gasket. P/T Taps shall be rated for 275 degrees F. and 1000 psig. Provide long stem type for insulated pipe.

B. Instruments:
   1. Provide two No. 500 "Pete's Plug" pressure gage adapters with four gages and probes and four 5" stem pocket thermometers where systems are being provided as part of this project.
   2. Provide two thermometers for chilled water and heating hot water systems where systems are being provided as part of this project.

2.7 ELECTROMAGNETIC FLOW METERS

A. Acceptable Manufacturers:
   1. Onicon, Inc
   2. Foxoboro
   3. Badger Meter

B. Description: Insertion electromagnetic flowmeter with NIST traceable, wet calibrated flow

measuring element, remote transmitter, installation valves, adjustable installation depth gauge and calibration certificate.

C. Flow Range: 0.1 fps – 20 fps

D. Accuracy: 1%

E. Max Pressure Rating = 400 psig

F. Fluid Temperature Rating = 15 – 250°F

G. Calibration: Each flowmeter shall receive a wet calibration within the expected operating range against a volumetric standard that is traceable to NIST.

H. Outputs:
   1. 3 Analog
   2. 3 Digital
      a. Isolated solid state dry contacts
      b. Totalization
      c. Meter Master Alarm
   3. Warranty: one year no fault and three year manufacturing warranty.

PART 3 - EXECUTION

3.1 THERMOMETER INSTALLATIONS

A. Provide thermometers and thermometer wells in the following locations:
   1. Inlet and outlet of each evaporator and condenser for each chiller.
   2. Inlet and outlet of each pump.
   3. Main secondary branch piping supply and return.
   4. As shown on drawings and control schematics.

B. Install direct-mounting thermometers and adjust vertical and tilted positions.

C. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees where thermometers are indicated.

D. Locate thermometer wells so the sensing bulb will give a true and correct reading.

E. Install thermometer so as not to cause undue restriction in small piping. Where thermowells are located in pipelines 1-1/2 inch and smaller, provide a section of pipe of such diameter that the net area of the pipeline will not be reduced by the thermometer well.

3.2 PRESSURE GAGE INSTALLATIONS

A. Provide pressure gages in the following locations:
   1. Suction and discharge side of each pump.
   2. Suction and discharge side of the evaporator and condenser of each chiller.
   3. Main secondary branch piping supply and return (three separate campus loops).
   4. Each expansion tank.

5. Inlet and outlet of each air handling unit coil.
6. Supply and return piping connections of air handling unit coils (where shown on details).
7. Inlet and outlet of each heat exchanger vessel.
8. As shown on drawings and control schematics.

B. Install direct-mounting pressure gages in piping tees with pressure gage located on pipe at most readable position.

C. Install needle-valve in piping for each pressure gage.

D. Install snubber for gages associated with pumps.

E. Install siphons on all gages installed on hot water piping.

F. Provide fittings as necessary to install pressure gage in the vertical position.

3.3 PRESSURE AND TEMPERATURE TAP INSTALLATIONS

A. Provide pressure and temperature taps at the following locations:
1. Inlet and outlet of each coil connection.
2. Inlet and outlet of each hydronic control valve
3. Inlet and outlet of for supply and return connections of each heat exchanger.
4. Where shown in details on mechanical drawings.

B. Provide liquid filled gages upstream and downstream of all pumps.

3.4 CONNECTIONS

A. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.

3.5 FLOWMETER INSTALLATION

A. Provide flowmeters in the following locations:
1. Main condenser water supply and return piping.
2. Chilled water makeup water piping.
3. Condenser water makeup water piping.
4. Main primary chilled water supply and return piping.
5. Main secondary chilled water supply and return piping (three separate campus loops).

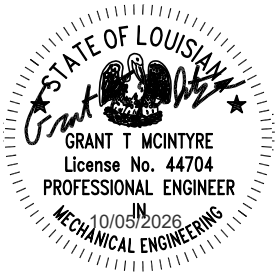
B. Interface with BAS system. Coordinate with controls contractor for installation.

C. Coordinate with university staff for make up water data for sewer impact fee reduction.

3.6 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 05 23 - VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes requirements for furnishing and installing manual valves for building chilled water, heating hot water, steam, and condensate, and direct-buried valves used in chilled water supply and return service.. Automatic building control valves are specified in Section 23 09 23.

B. Section Includes:
1. Globe valves.
2. Ball valves.
3. Butterfly valves.
4. Check valves.
5. Gate valves.
6. Plug valves.
7. Underground Butterfly Valves
8. Chainwheels.

1.2 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
1. API 609 – Butterfly Valves: Double Flanged, Lug, and Wafer Type
2. API 598 – Valve Inspection and Testing
3. API 600 – Steel Gate Valves
4. API 602 – Globe, Gate, and Check Valves for sizes NPS 4 and smaller
5. ASME American Society of Mechanical Engineers – Pressure vessels and hydro-pneumatic expansion tanks, piping and pumps.
6. ASME Boiler and Pressure Vessel Code (BPVC)
7. ASME B1.20.1 – Pipe Threads
8. ASME B16.5 – Pipe Flanges and Flanged Fittings
9. ASME B16.10 – Face-to-Face and End-to-End Dimensions of Valves
10. ASME B16.10 – Face-to-Face and End-to-End Dimensions of Valves.
11. ASME B16.34 – Valves Flanged, Threaded, and Welding End.
12. ASME B31.1 – Power Piping.
13. ASME B31.9 – Building Services Piping.
14. ASTM A126 – Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings.
15. ASTM A182 – Standard Specification for Forged or Rolled Alloy and Stainless-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature

Service.

16. ASTM B43 – Standard Specification for Seamless Red Brass Pipe, Standard Sizes for Steam or Valve Bronze Castings.
17. AWWA C606 – Grooved and Shouldered Joints
18. IMC – International Mechanical Code
19. MSS SP-25 – Standard Marking System for Valves, Fittings, Flanges, and Unions
20. MSS-SP-45 – Bypass and Drain Connections
21. MSS-SP-80 – Bronze Globe, Gate, Angle, and Check Valves
22. Hydraulic Institute Standards.

1.3 QUALITY ASSURANCE

A. Manufacturer's name and pressure rating shall be permanently marked on valve body.

B. Install all valves according to the manufacturer's instructions.

C. Protect all piping, valves, fittings, etc. before installation in accordance with manufacturer's written instructions.

D. All valves must be hydro-tested using 150# water from both sides prior to shipment to the job site. An acceptable leak rate is zero (bubble tight).

E. Gear actuators, when fitted, shall be attached at the vendor's facility prior to testing. If the gear actuators are removed after testing, the valve shall be retested to ensure that the valve has a leak rate of zero (bubble tight).

F. Valves shall be designed to allow dead-end pressure on either side of the valve without leak or damage to the valve.

G. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.

H. All valves shall conform to the latest edition of applicable ANSI, ASTM, NEMA, API, ASME, and MSS standards.

I. ASME Compliance: ASME B16.10 and ASME B16.34 for valve dimensions and design criteria.

J. Installer Qualifications: Company shall have minimum three years documented experience specializing in performing the work of this section.

1.4 SUBMITTALS

A. Product Data:
   1. Code and Standards compliance, manufacturer's data for fittings, valves and all other products included within this specification section.
   2. Manufacturer's shop drawings
   3. Pressure/temperature rating
   4. Valve materials
   5. Manufacturer's installation instructions.

6. Port Style
7. Cv or K flow capacity factors for all valves submitted. Acceptance of valve design by the Owner and Engineers will include consideration of these factors.
8. Manufacturer's catalog information, with identification of options selected
9. Any and all compliance certificates, inspection reports, hydrostatic tests, material certificates, maintenance manuals, installation procedures/manuals and spare parts listing/catalog associated with the valves must be forwarded in a manufacturer's data book to Purchaser at time of shipment.

B. Manufacturer's certificate: Certify that products meet or exceed specified requirements.

C. Record Documents:
1. Record actual locations of valves, etc. and prepare valve charts.
2. Test reports and inspection certification for all systems listed herein.
3. Submit proposed location of access panels which vary from quantities or locations indicated on Contract Drawings.
4. Provide full written description of manufacturer's warranty.

D. Operation and Maintenance Data:
1. Include components of system, servicing requirements, Record Drawings, inspection data, installation instructions, exploded assembly views, replacement part numbers and availability, location and contact numbers of service depot.
2. Include material descriptions and dimensions of individual components.
3. Include operating characteristics and furnished accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be new, undamaged, and free of rust.

B. Accept valves on Site in shipping containers and maintain in place until installation.

C. Protect all piping, valves, fittings, etc. before installation in accordance with manufacturer's written instructions. All piping shall be sent from the factory with capped ends and shall be stored on supports off of the ground with ends covered to prevent nesting of insects, birds and other animals, or the accumulation of dirt and debris in and around the piping components.

D. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.

E. Provide temporary end caps and closures on pipe and fittings. Maintain in place until installation.

F. Protect installed piping, valves and associated materials during progression of the construction period to avoid clogging with dirt, and debris and to prevent damage, rust, etc. Remove dirt and debris and repair materials as work progresses and isolate parts of completed system from uncompleted parts.

G. Protect all materials that are to be installed within this project from exposure to rain, freezing temperatures and direct sunlight.

H. O&M's including:
1. Components of product
2. Servicing/maintenance requirements
3. Inspection data
4. Installation instructions
5. Exploded assembly views
6. Parts list, replacement part numbers and availability
7. Location and contact numbers of manufacturer's service depot
8. Record actual locations of valves and prepare valve charts.
9. Test reports and inspection certification for all systems listed herein.
10. Submit proposed location of access panels which vary from quantities or locations indicated on contract drawings.
11. Provide full written description of manufacturer's warranty

I. WARRANTY
1. Refer to general warranty requirements in Division 01 and in Section 23 00 00.

J. EXTRA MATERIALS
1. Provide two repacking kits for each size valve.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ball Valve: Apollo, DeZurik, Kitz, Milwaukee, Nibco, or Watts.
2. Check Valves: Apco, Milwaukee, Mueller, Nibco, Powell, or Weco.
3. Gate and Globe Valves: Milwaukee, Nibco, or Powell.
4. Butterfly Valves: Bray, Demco, DeZurik, Kitz, Milwaukee, or Pratt.
5. Underground Plug and Butterfly Valves: Pratt, DeZurik, Nordstrom

B. All valves must be of welded end, threaded, or flanged type. No solder connected or grooved fitting valves shall be used on this project.

C. Each valve style shall be the product of a single manufacturer (i.e. all butterfly valves shall be the same manufacturer, all ball valves shall be the same manufacturer, etc.).

D. All gate valves, globe valves, and shutoff valves of every character shall have malleable iron hand wheels, except iron body valves 2-1/2" and larger which may have either malleable iron or ASTM A126 Class B, gray iron hand wheels.

E. Packing for all valves shall be free of asbestos fibers and selected for the pressure/temperature service of the valve. It is incumbent upon the manufacturer to select the best quality standard packing for the intended valve service. Before the end of the warranty period spot checks may be made, and should the packing show signs of hardening or causing stem corrosion, then all valves supplied by the manufacturer shall be repacked by the Contractor, at no expense to the Owner, with a packing material selected by the Owner.

F. Valves 12" and larger located with stem in horizontal position shall be drilled and tapped in accordance with MSS SP-45 to accommodate a drain valve and equalizing by-pass valve assembly.

G. Valves shall be dimensioned per ASME B16.10.

H. Flanges shall be dimensioned per ASME B16.5.

I. Valves shall conform to ASME B16.34 pressure-temperature rating.

J. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

K. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

L. Valve Sizes: Same as upstream piping unless otherwise indicated.

M. Wrench: Furnish Owner with one wrench for every 20 plug valves, for each size square plug-valve head.

N. Valve Actuator Type:
1. Gear Actuator: For quarter-turn ball valves NPS 4 and larger.
2. Hand Lever: For quarter-turn ball valves smaller than NPS 4.

O. Handwheels: Handwheels shall be A47 Grade 35018 malleable iron or ductile iron ASTM A536.

P. Valve Bonnet/Cover Joints:
1. Joints between bodies and bonnets of flanged or butt-welded gate and globe valves shall be flanged joints, except where special joints may be specified elsewhere or shown on the drawings.
2. Socket welding end or screwed end steel gate or globe shall be welded bonnet joint type. All such valves shall have back seats. Loose back seats may be used only if the specific design has the approval of the Engineer.
3. Joints between flanged or butt-welding end check valve bodies and covers shall be flanged joints.
4. Studs for bonnet or cover joints shall be as specified for flanged joints in the line in which the valves are installed.

Q. Supplier shall furnish all special appurtenances for valves as specified and/or shown on the drawings, including chain wheels, chain guides, chains, extension stems, gear drives, floor stands, locks., or any other accessory required for ease of operation as dictated by piping arrangement, valve location, system design conditions or valve design. Chain wheel operators shall be furnished on all manual valves for which their handwheels/actuators are seven (7) feet or more from the nearest access point (e.g. floor, platform, or possible lift location).

R. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide

necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

S. Use flanges downstream of valves and at equipment or apparatus connections. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

T. Valves in Insulated Piping:
1. Provide 2-inch extended neck stems.
2. Provide extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Provide memory stops that are fully adjustable after insulation is applied.

2.2 BALANCING VALVES

A. Provide ball valves with venturis or globe valves meeting the requirements of the following sections.

B. All balancing and/or shutoff valves must be capable of providing a bubble tight seal at 200 psi for valves up to 12", and 150 psi for larger valves, when used for end of line service, without requiring the installation of a blind flange on the downstream side.

C. All balancing valves must be provided with a memory stop.

2.3 BALL VALVES

A. Valves 2-1/2” and smaller provide two-piece ball valve, full port, FNPT x FNPT, bronze or forged brass body, stainless steel ball and stem, teflon seats, packing and gasket, plastic sheathed steel lever type handle, class 150 SWP/600 WOG. Provide extension stem and insulated handle for valves installed in insulated piping. Where ball valves are used as balancing valves, provide valve with memory stop.

2.4 CHECK VALVES

A. Valves 2" and smaller shall have bronze bodies and a regrinding disc and seat with screw-in cap.

B. Valves 2 1/2" and larger shall have iron bodies and be non-slam wafer type with stainless pins and springs, and bronze or stainless steel plates.

C. For pipe 2 inches in diameter and smaller, provide 150-pound (class 150) screwed, horizontal, swing check valve, all bronze construction, with screwed cap.

D. For pipe 2-1/2 to 10 inches in diameter, provide 125-pound (class 125), lugged style, drill and tapped, double door valve, with cast iron body and aluminum bronze or stainless-steel doors, Buna-N or EPDM seat, and Type 316 stainless steel spring.

E. For pipe 10 inches in diameter and larger, provide 125-pound (class 125), raised-face, lugged style silent check valve, with cast iron body and aluminum bronze twin disc, Buna-N seat, steel lifting eye bolt, and Type 316 stainless steel hinge pin, stop pin, thrust

bearing and spring.

2.5 GATE VALVES

A. Provide union bonnet design.

B. Gate valves 2” or smaller used in low pressure steam systems shall be Class 300 SWP and shall be constructed of all ASTM B61 composition. Metal used in the stems of all bronze gate valves shall conform to ASTM B371 Alloy 694, ASTM B99 Alloy 651, or other corrosion resistant equivalents. Written approvals must be secured for the use of alternative materials.

C. Gate valves 2 1/2” or larger used in low pressure steam systems shall be Class 150 and shall have the body constructed of ASTM A395 ductile iron. All iron body valves shall have the pressure containing parts constructed of ASTM A126 class B iron. Stem material shall meet ASTM B16 Alloy 360, ASTM 371 Alloy 876 silicon bronze, ASTM B584, or their equivalent. Gate valves shall be bolted bonnet with OS&Y (outside screw and yoke) and rising stem design. A lubrication fitting is preferred on yoke cap for maintenance lubrication of the yoke bushing.

2.6 GLOBE VALVES

A. For pipe 2 inches in diameter and smaller, provide 150-pound (class 150) globe valves, screwed, rising stem, bronze body, TFE seals (hard faced trim for steam), and union bonnet.. Metal used in the stems of all bronze globe valves shall conform to ASTM B371 Alloy 694, ASTM B99 Alloy 651, or other corrosion resistant equivalents. Written approvals must be secured for the use of alternative materials.

B. For pipe 2-1/2 through 10 inches in diameter, provide 125-pound (class 125) flanged, OS&Y globe valve, with cast iron body, renewable bronze trim. All iron body valves shall have the pressure containing parts constructed of ASTM A126 class B iron. Stem material shall meet ASTM B16 Alloy 360, ASTM 371 Alloy 876 silicon bronze, ASTM B584, or their equivalent. Globe valves shall be bolted bonnet with OS&Y (outside screw and yoke) and rising stem design. A lubrication fitting is preferred on yoke cap for maintenance lubrication of the yoke bushing.

C. Coil packs/kits or combination balancing valve/strainer kits are not allowed.

2.7 BUTTERFLY VALVES

A. For pipe 2-1/2 through 12 inches in diameter, provide 200-pound flanged or tapped lug type butterfly valve with ductile iron body, stainless steel stem, aluminum-bronze or stainless-steel disc with EPDM liner. Provide lever-operated valves 6 inches and smaller.

B. Provide valves 8 inches and larger with totally enclosed worm gear operators. Provide valves with enclosed worm gear operators with chain wheel and chain on valves installed higher than 84 inches above floor. Use valves designed for drip-tight shutoff in dead end service against 200 psi.

C. For 14-inch diameter pipe and larger, provide 150-pound, full-flanged or tapped lug

butterfly valve with ductile iron body, 17-4 stainless steel stem, and aluminum bronze or stainless-steel disc with EPDM liner. Provide totally enclosed worm gear operators for all valves. Provide valves with enclosed worm gear operators with chain wheel and chain on valves 84 inches above floor or as indicated on drawings. Provide valves designed for drip tight shutoff in dead end service against 150 psi.

D. Where balancing valve is shown, provide butterfly valve with position lock operator (memory stop) for valves 6 inches and smaller and worm gear operator with memory stop for valves 8 inches and larger.

2.8 UNDERGROUND PLUG & BUTTERFLY VALVES:

A. General Requirements:
1. Manual buried service actuator specifically designed for buried service, packaged full of grease. Provide 2" square operating nut at actuator enclosed within an adjustable cast iron valve box with cast iron lid with appropriate label per system. Provide traffic rated box and lid if located in roadway. Valve box shall be Tyler 6850 or approved equal. Design shall be submitted to, and approved by A/E and Owner.
2. Coating: The valve and operator will be blasted and coated with Manufacturer's standard epoxy coating, holiday free.
3. All hardware and bolting shall be corrosion resistant. 300 series stainless steel hardware used for valves in hot water service shall be 316SS
4. Bearing material for valves sizes 3"-20" shall be suitable for service. Proposed material shall be submitted to A/E and Owner for approval.
5. Grease for chilled water valve actuators, when fitted, shall be suitable for operation at chilled water supply temperatures (40°F).
6. Grease for hot water valve actuators, when fitted, shall be suitable for operation at hot water supply temperatures (180°F).

B. Buried Service Plug Valves (2 inches and smaller)
1. Basis of Design: Henry Pratt Company – Pratt Ballcentric Plug Valves
2. General: Non-lubricating, eccentric type, working pressure of 175 psi.Tight shut off at rated pressure, round port design.
3. Valve Body: Cast iron ASTM A126 Class B with welded in overlay of at least 95% nickel alloy content on all surfaces contacting the face of the plug.
   a. Sprayed, plated, nickel welded rigns or seats screwed in the body are not acceptable.
4. Valve Plug: Ductile iron ASTM A-536, Grade 65-45-12, with Buna N resilient seating surface to mate with the body seat.
5. Valve Bearings: Permanantly lubricated sleeve type bearings conforming to AWWA C517/ Bearings shall be of sintered, oil impregnated type 316 stainless steel ASTM A-743 Grade CF-8M or bronze ASTM B-127.
6. Valve Shaft Seals: Valves shaft seals shall be of the "U" cup type, in accordance with AWWA C517. Seals shall be self-adjusting and re-packable without moving the bonnet from the valve.
7. Valve Actuators: All buried valves shall be provided with worm and gear actuators suited for the intended service. Valve actuators shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop

which will withstand an input torque of 450 lbs. against the stop. The actuator shall be able to provide 1.25 times the required operating torque under full rated line pressure combined with a flow velocity of 8 feet per second. Stainless steel extension stems shall be provided for manual actuation.

8. Ground Level Position Indicator: Provide with Pratt Diviner or approved equal position indicator. Identifies valve position and direction and number of turns to fully close or open. Constructed of non-metallic material, hermetically sealed that protects internal gearing with a clear tough plastic. Cast iron adapters, cap screws, guide bushings, position indicator, flexible washers, two inch square AWWA nut with set screws. Adapter fits standard 5-1/4" or 45 inch cast iron soil pipe bell utilizing a cast cover with a skirt depth of 1" or less. Extension stems. Shipped for field assembly.

C. Buried Service Butterfly Valves (4 inches and larger)

1. Basis of Design: Henry Pratt Groundhog® as manufactured by the Henry Pratt Company.
2. General: All butterfly valves shall be manufactured in accordance with the latest revision of AWWA C504 for Class 150B service. Valves shall have 304 stainless steel trim.
3. Valve Body: Valve body shall be constructed of cast iron ASTM A-126 Class B and conform to AWWA C504 in terms of laying lengths and minimum body shell thickness. End connections shall be flanged to match the piping end flange.
4. Valve Disc: Valve disc shall also be made from cast iron ASTM A-126 Class B in sizes 20" and smaller. Sizes 24" and larger shall be built from ductile iron in conformance to ASTM A-536. Disc shall be furnished with Type 316 stainless steel seating edge to mate with the rubber seat on the body.
5. Valve Seat: Valve seat shall be Buna-N rubber located on the valve body. In sizes 20" and smaller, valves shall have bonded seats that meet test procedures outlined in ASTM D-429 Method B. Sizes 24" and larger shall be retained in the valve body by mechanical means without use of metal retainers or other devices located in the flow stream.
6. Valve Shaft: The shaft shall be Type 304 stainless steel conforming to ASTM A-276. Shaft seals shall be standard self-adjusting split V packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.
7. Valve Bearings: Bearings shall be sleeve type that is corrosion resistant and self-lubricating.
8. Valve Actuators: Actuators shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft. lbs. against the stop. The traveling nut shall engage alignment grooves in the housing. The actuators shall have a built in packing leak bypass to eliminate possible packing leakage into the actuator housing. Stainless steel extension stems shall be provided for manual actuation.
9. Painting: The Valve Interior and Exterior Surfaces except for seating shall be coated with Ameron Amerlock 370 in accordance with AWWA C550 and C504. All internal and/or external surfaces shall be covered with a polyamide cured epoxy coating applied over a sand blasted "new white metal surface" per SSPC-SP10 to a minimum of 6 mils in compliance with AWWA C550.

2.9 VALVE IDENTIFICATION SYSTEM:

A. All valves shall be tagged with the service (CHW or HW) and valve tag number, affixed to the valve at time of shipment.

B. A normal flow arrow shall be marked on each valve.

2.10 STANDARDS OF QUALITY FOR VALVES:

A. Note:
1. * Requires extended stems in insulated pipes.
2. Valves 8 inch and larger, and valves used for balancing service regardless of size, shall have heavy duty weatherproof encased gear operators.

Size	Service	Media	Class	Milwaukee	Nibco	KITZ
* 2" & smaller	Ball Valve for Shutoff	Recirculating chilled water	150	BA-300S	T-595-Y-66	68M
* 2" & smaller	Ball Valve for Shutoff	Recirculating hot water	150	BA-300S	T-595-Y-66	68M
2" & smaller	Globe & Balancing Valve	Chilled Water, Hot Water	150	590T	T-235-Y	#09
2-1/2" & larger	Globe & Balancing Valve	Chilled Water, Hot Water	125	F-2981A	F-718-B	#76
2-1/2" & larger	Butterfly Valve for Shutoff	Recirculating Chilled and Heating Water	150	ML233E (Lever); ML333 (Gear)		6153 or 6151
2" & smaller	Check Valve	All Water Systems	150	510T	T-433-Y	#29
2-1/2" & larger	Check Valve	All Water Systems	125	8800*	W-920-W	7032

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for

proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Examine press fittings to verify they have been properly pressed.

F. Do not attempt to repair defective valves; replace with new valves. Remove defective valves from site.

3.2 INSTALLATION OF VALVES

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown. When joining dissimilar metals, use dielectric nipples or couplings, or dielectric flange kits on larger piping. Dielectric unions are not permitted.

B. Valves shall be installed as nearly as possible to the locations indicated in the Construction Drawings. Any change in valve location must be so indicated on the Record Drawings.

C. All valves shall be located such that the removal of their bonnets is possible.

D. Locate valves for easy access and provide separate support where necessary. Locate valves where not blocked by equipment, other piping, or building components.

E. Provide clearance for full stem turn and access to valves, fittings and equipment for operation and maintenance.

F. In horizontal piping install valves with the stem between the 9 o'clock and 3 o'clock position, and if possible so that the valve/actuator position can be seen from the floor.

G. Install chain wheels on operators for butterfly gate and globe valves NPS 4 and larger and more than 84 inches above floor. Extend chains to 60 inches above the finished floor.

H. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

I. Check Valves. Install lugged check valves between flat flange and full-face gasket. Install check valves a minimum three to four pipe diameters downstream of pump discharge or elbows to avoid flow turbulence.

J. Install check valves for proper direction of flow and as follows:
   1. Check Valves: Center-guided type, in horizontal or vertical position, between flanges.
   2. Check Valves, Swing Type: In horizontal position with hinge pin level.
   3. Check Valves, Lift Type: With stem upright and plumb.

K. Check Valves. Install lugged check valves between flat flange and full-face gasket. Install check valves a minimum three to four pipe diameters downstream of pump discharge or elbows to avoid flow turbulence.

L. If installing butterfly valves onto slip-on flanges, verify that the valve seats correctly onto

the flange. Slip on flanges have slightly different face dimensions.

M. Provide support of piping adjacent to valves such that no force is imposed upon valves.

N. Verify that joints of each valve have been properly installed and sealed to ensure that there is no leakage or damage.

3.3 ISOLATION VALVES

A. Provide piping systems with line size shutoff valves located at the risers, each main loop riser, each piece of equipment, each underground branch to building, at main branch connections at each floor and at branch takeoffs serving equipment, and at other locations as indicated and required for isolation of piping or equipment.

B. At air handling units, where multicoil (stacked) arrangement is used, provide each supply and return line to and from each stacked coil section with valves for isolation of each coil.

3.4 DIRECT BURIED VALVES

A. Install all direct-buried butterfly valves as specified on plans and to a method approved by the A/E and manufacturer's requirements.

B. The valve operator gearbox operating nut shall be oriented as shown on the drawings received at the time of the order.

3.5 DRAIN VALVES AND VENTS

A. Install drain valves at all local low points and at base of all risers of water piping systems so that these systems can be entirely drained.

B. Install drain valves at all low points in mains, branch lines, and at the base of all risers of water piping systems so that these systems can be entirely drained.

C. Install 2" drain valve, nipple, and cap for pipes larger than 6".

D. Install a 3/4" drain valve, 3/4" nipple, and cap for pipes 6" and smaller.

E. Provide hose adapter and plug or cap on all drain lines.

F. Provide automatic vents with root isolation valves at locations as indicated on Contract Drawings and all high points in piping systems. Provide manual vents as indicated on Contract Drawings for maintenance service.

G. The location of the high point vents and low point drains shall be approved by the Engineer.

H. Provide a building isolation valve and drain valve so that the system can be fully drained.

3.6 TESTING

A. Apply a hydraulic pressure 1-1/2 times the operating pressure, 150-psig minimum, and

carefully check all valves and fittings for leaks. Follow the pressure testing instructions in the Division 23 piping sections.

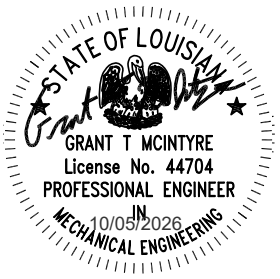
B. Remove or isolate valves, expansion joints, strainers and equipment that are rated at pressures less than test pressure.

C. Repair all leaks and retest the system until proven leak tight.

3.7 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service, but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

A. Perform all Work required to provide and install supports, hangers, anchors, sleeves and bases for all pipe, duct, equipment, system components and accessories, indicated by the Contract Documents with all supplementary items necessary for complete, code compliant and approved installation.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
1. ASME B31.2 Fuel Gas Piping.
2. ASME B31.9 Building Services Piping.
3. ASTM F708 Design and Installation of Rigid Pipe Hangers.
4. AWS D1.1 – Structural Welding Code
5. MSS SP58 Pipe Hangers and Supports Materials, Design and Manufacturer.
6. MSS SP69 Pipe Hangers and Supports Selection and Application.
7. MSS SP89 Pipe Hangers and Supports Fabrication and Installation Practices.
8. MSS SP-90 Guidelines on Terminology for Pipe Hangers and Supports.
9. International Fuel Gas Code.
10. International Mechanical Code
11. International Plumbing Code
12. NFPA 13 Installation of Sprinkler Systems.
13. NFPA 14 Installation of Standpipe and Hose Systems.
14. NFPA 54 Fuel Gas Code.
15. NFPA 99 Standard for Health Care Facilities.
16. UL 203 Pipe Hanger Equipment for Fire Protection Service.
17. SMACNA HVAC Duct Construction Standards.

18. Underwriters Laboratories Standards and Listings.

1.4 QUALITY ASSURANCE

A. Materials and application of pipe hangers and supports shall be in accordance with MSS-SP-58 and SP-69 unless noted otherwise.

B. Support and sleeve materials and installation shall not interfere with the proper functioning of equipment.

C. Contractor shall be responsible for structural integrity of all hangers, supports, anchors, guides, inserts and sleeves. All structural hanging materials shall have a minimum safety factor of five.

D. Installer Qualifications: Utilize an installer experienced in performing Work of this Section who is experienced in installation of Work similar to that required for this Project and per the minimum requirements of MSS SP-89. Field welding of supports shall be by certified welders qualified in accordance with ASME Boiler and Pressure Vessel Code, Section IX using welding procedures per the minimum requirements of MSS SP-58.

E. Structural-Steel Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."

F. Pipe Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer’s catalog data including code compliance, load capacity, and intended application.

B. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

C. Shop Drawings: Submit detailed Drawings of all shop or field fabricated supports, anchors and sleeves for 4" pipe and greater. Indicate size and characteristics of components and fabrication details and all loads exceeding 250 pounds imposed on the base building structure.

D. Delivery, Storage and Handling

E. Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.

F. Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact. Maintain in place until installation.

G. Store materials protected from exposure to harmful weather conditions.

H. Product Data: For each type of product. Provide manufacturer's catalog data including code compliance, load capacity, and intended application.

I. Welding certificates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers or equivalent as applicable:
   1. Hangers: Anvil International, Inc., Kindorf, Cooper B-Line.
   2. Trapeze Hangers: Superstrut, Unistrut, and Power-Strut pipe support systems
   3. Fire Stopping: Specified Technologies, Inc.
   4. Pipe Shields/Sleeves: Pipe Shields, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for HVAC piping and equipment are to withstand the effects of gravity loads and stresses within limits and under conditions indicated in accordance with ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

2.3 PIPE HANGERS AND SUPPORTS

A. Individual hangers for insulated and non-insulated pipes: Provide galvanized carbon steel adjustable clevis hangers. Anvil Fig. 260 or equal.

B. Multiple or trapeze hangers: Provide Galvanized steel channels with welded spacers and hanger rods. Anvil Fig. 45 or 46 or equal.

C. Wall supports: Provide galvanized welded steel brackets and galvanized wrought steel clamp, galvanized adjustable steel yoke and cast iron roll. Anvil Fig. 194, 195, 199 as required by pipe size and weight. Submit to structural engineer for approval detailing method of attachment to wall.

D. Vertical support: Provide galvanized riser clamp with field welded shear lugs. Anvil Fig 261 or Fig 40 as required by installation and loads to be supported. Refer to mechanical details for main riser supports.

E. Floor supports for pipe sizes to 4 inches and all cold pipe sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange and steel support. Anvil Figures 264 or 265 as required.

F. Floor supports for Hot pipe 6 inches and larger: Provide adjustable cast iron roller and stand, adjusting screws and steel support, all galvanized. Anvil Fig. 274.

G. Copper Piping Supports and Hangers: Provide copper plated carbon steel clevis hanger. Anvil Fig. Anvil CT-65.

H. Provide galvanized hangers and supports for all piping and ductwork located in pipe shafts and chases and above suspended ceiling spaces. Use stainless steel hangers and supports within the crawl space.
   1. Provide hanger rods, bolts and nuts and all metal parts coated with same material as hangers.
   2. Prime coat and paint exposed steel hangers and supports.

2.4 PIPE SHIELDS

A. Provide pipe shields for piping 2 inches and smaller fabricated of 20 gauge galvanized steel over insulation in 180 degree segments, minimum 12-inches long.

B. Provide pipe shields for piping 2-1/2 inches and larger fabricated of galvanized steel over insulation in 180 degree segment as follows:

PIPE SIZE	METAL GAUGE	SHIELD LENGTH
2-1/2 to 6 inches	18	12 inches
8 to 16 inches	16	18 inches
18 inches and larger	12	24 inches

C. Provide high density segment of insulation at shields at least two inches longer than shield. Foamglas blocks (HLB 1600) or factory made insulation shields as made by Pipe Shields, Inc. are acceptable. High density insulation segment shall be of sufficient compressive strength to prevent indentation of insulation jacket. Submit data indicating compressive strength of insulation segment. Furnish vapor barrier and sealant where used on low temperature service (below 100°F).

D. Secure insulation shields to insulation jacket with adhesive as recommended by insulation manufacturer or 2 stainless steel bands, 1/2 inch wide by 0.015 inch thick with matching seals

2.5 HANGER RODS

A. Provide cadmium plated steel, with both ends threaded, and sized for the supported load. Use stainless steel hanger rods for all supports in the unconditioned mechanical rooms.

2.6 CONCRETE INSERTS

A. Provide malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded rods. For concrete anchors in tension, use anchors rated for cracked concrete for loads greater than 250 pounds.

B. Submit data to structural engineer for approval. Anvil Fig. 282

2.7 PIPE SLEEVES

A. Provide sleeves on all pipes passing through gyp board, masonry and concrete construction.

B. Sleeves in floors and walls of mechanical rooms, pump rooms, etc., and sleeves in all load bearing surfaces shall be constructed of schedule 40 steel carbon steel pipe.

C. Sleeves in walls and floors outside of mechanical room type spaces shall be constructed of the following:
   1. Pipes 2 inch diameter smaller: Provide sleeves constructed of galvanized EMT conduit.
   2. Pipes larger than 2 inches: Provide sleeves constructed of rolled 20 gauge galvanized steel with welded seam. All galvanizing shall be done after welding.

D. Sleeves in floors shall be provided with a 1-1/2 inches wide center flange welded to the sleeve and centered in slab. Refer to Drawings for additional requirements.

E. Sleeves thru roofs shall be schedule 40 galvanized steel pipe.

F. Caulk all sleeves water and air tight. Provide UL listed sealant between pipe and sleeve as required by code.
   1. Where piping or ductwork penetrates a floor, ceiling or wall, provide fire stopping insulation, sealed airtight, to close off penetration space between pipe, ductwork, and adjacent work. Provide escutcheon covers at both sides of penetration.
   2. Where piping or ductwork penetrates a fire rated floor, wall, or ceiling, provide fire-safe insulation so that the assembly, when complete, is UL listed and equals the fire rating of constructed penetrated.

G. Sleeves below grade in outside walls are detailed on drawings. Provide Link Seal casings at sleeves at all exterior walls above and below grade. Use stainless steel retainers, nuts and bolts in sleeves below grade. Size sleeves in accord with Link Seal recommendations.

H. Size sleeves one pipe size larger than the pipe it serves, including insulation thickness as appropriate.

I. Extend each sleeve through the floor or wall. Cut the sleeve 1/2 inch beyond flush from each surface in hidden locations. In exposed locations, extend floor sleeves 2 inches above finished floor line.

J. Caulk all sleeves to be water and air tight. Provide UL listed sealant between pipe and sleeve as required by code.

K. Provide a chrome escutcheon around pipe penetrations in all finished areas

2.8 PIPE STANCHIONS

A. Malleable iron, ASTM A47 or carbon steel ASTM A36. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.

B. Use stanchions of same type and material where vertical adjustment is required for stationary pipe.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

2.10 FASTENER SYSTEMS

A. Fastener System - Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities required for supported loads and building materials where used.

B. Fastener System - Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities required for supported loads and building materials where used.
   1. Indoor Applications: Zinc-plated or Stainless steel steel.
   2. Outdoor Applications: Stainless steel.

2.11 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.12 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M, carbon-steel plates, shapes, and bars; galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATION

A. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static loads within specified loading limits. Minimum static design load used for strength determination is to include weight of supported components plus 200 lb.

B. Specific hanger and support requirements are specified in Sections for piping systems and equipment.

C. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system sections.

D. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

E. Use copper hangers with copper pipe and nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing. As an alternate, tape copper pipe at all points contacting steel hangers, structural members or sleeves. Use a dual wrap of polyvinyl tape.

F. Use padded hangers for piping that is subject to scratching.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

B. Install lateral bracing with pipe hangers and supports to prevent swaying.

C. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Coordinate location of concrete inserts before concrete is placed.

D. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

E. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

F. Unless noted otherwise, support horizontal steel piping on center as follows:

PIPE SIZE	MAX HANGER SPACING
1/2 to 1-1/4 inches	6 feet
1-1/2 to 2 inches	10 feet
2-1/2 to 6 inches	10 feet
6 to 12 inches	10 feet
14 inches and larger	10 feet

G. Provide pipe hangers within 6 inches of each elbow or change in direction and provide hangers on both sides of line valves.

H. Provide hangers with vertical adjustment of 1-1/2 inches minimum.

I. For copper piping up to 1-inch place hangers not more than 5 feet 0 inches apart, for 1-1/4 inch to 1-1/2 inch piping, place hangers not more than 7 feet 0 inches apart and for 2-inch to 3-inch piping not more than 9 feet 0 inches apart.

J. Larger Sizes: Support as recommended by manufacturer.

K. Submit manufacturer's support and hanging recommendations.

L. Support piping from structure independent from other piping installed above.

M. Support risers as detailed on drawings at each floor and independently from connected horizontal pipe.

N. Where insulation occurs, design hangers to protect insulation from damage. Pipe saddles and insulation shields, where required, are specified above. Provide a continuous, unbroken, vapor seal on all cold pipe surfaces. Guides and anchors secured directly to cold surfaces shall be adequately insulated and vapor sealed to prevent condensation. Pipe Insulation shall run continuously through supports and hangers. Use high compression strength insulation section at support hanger and cover with galvanized steel shield.

O. Perforated bar hangers, straps, wires or chains are not permitted.

P. Support piping from precast and pan joist structure as detailed on drawings.

Q. Provide vertical piping support at each floor. For pipe risers exceeding three floors, evaluate pipe supports for longitudinal expansion and support requirements. Support riser piping independently of connected horizontal piping.

R. Powder actuated anchors are not permitted.

S. Sleeves penetrating beams must be submitted for approval by Structural Engineer.

T. Refer to Ductwork specification for supports for ductwork and accessories.

U. Pipe Stand Installation:
   1. Pipe Stand Types: Assemble components and mount on 6” concrete pad minimum 12 inches all around bottom support. Do not penetrate roof membrane.

V. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

W. Equipment Support Installation:
   1. Fabricate from welded-structural-steel shapes.
   2. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
   3. Grouting: Place grout under supports for floor-mounted equipment, and make bearing surface smooth.
   4. Provide lateral bracing, to prevent swaying.
   5. Hot dip galvanize after fabrication.

3.3 CONCRETE PADS

A. Air handling units, pumps, heat exchangers and other large HVAC equipment shall be installed on concrete pads with adequately sized neoprene isolation pads at each air support point.

B. Provide housekeeping pads for air handling units are high enough to provide a condensate drain trap deep enough to override the air handler static pressure.

C. Pour 4-inch pads on roughened floor slabs unless otherwise noted. Install pump bases on 6 inch pads.

D. Slabs shall be placed and finished smooth and level to ensure proper and continuous support for the bearing surfaces of equipment.

E. Extend outer edges of pads a minimum of 6 inches beyond equipment.

F. Provide ½ inch chamfer on all exposed edges of pads.

G. Secure equipment with anchor bolts in accordance with equipment installation instructions.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

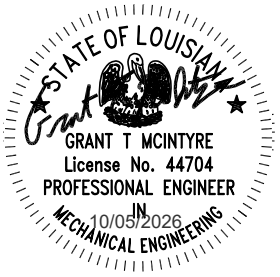
A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup:
1. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   a. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
2. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780/A780M.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.

1.2 SUMMARY

A. Perform all Work required to provide and install equipment tags, valve tags, duct stencils, and pipe markers indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Contractor shall make it possible for Owner's operations and maintenance personnel to readily identify the various pieces of equipment, ductwork, valves, and piping by marking them in accordance with this Specification.

C. Clearly mark all items of equipment, including but not limited to fans, pumps, terminal units, and valves using equipment tags/nameplates as specified in this Section. The nameplate information shall correspond to the same tag/mark as shown on the Drawings and as listed in this specification.

1.3 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
   1. ASME A13.1 – Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

A. Product Data:
   1. Provide manufacturer's catalog literature for each product.
   2. Include a listing of all equipment to be labeled with the proposed content for each label.
   3. Valve numbering scheme.

B. Samples:
   1. Color, letter style, and graphic representation required for each identification material and device.

C. Record Documents:
   1. Submit Equipment Matrix with Valve and Fire Damper schedules completed.
   2. Valve tag schedule for each piping system to be included in maintenance manuals.
      a. Valve Schedules: Provide for each piping system. Include in operation and maintenance manuals.
      b. Valve Drawing Indicator: Provide 11x17, 36x48 and electronic format drawing indicating Valve ID, tag and schedule with valve ID, manufacturer, location, model and size.
   3. Equipment-Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Manufacturers:
   1. Seton
   2. Brady
   3. Approved equal

B. Description: Laminated three layer plastic with engraved black letters on light contrasting background color. Predrilled for stainless steel rivets or self-tapping screws.

C. Dimensions: Minimum 1/16" thick.

D. Lettering: engraving shall be condensed Gothic, at least 1/2" high, appropriately spaced.

E. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information. Equipment to be labeled shall include but not be limited to the following:
   1. Cooling Towers
   2. Chillers
   3. Fans
   4. Pumps
   5. Terminal units
   6. Air handling units
   7. Fan coil units
   8. Heat Exchangers
   9. DDC panels
   10. VFDs
   11. Equipment Disconnects
   12. Expansion tanks
   13. Louvers

14. Unit Heaters

2.2 VALVE AND VALVE BOX TAGS

A. Manufacturers:
   1. Seton
   2. Brady
   3. Approved equal

B. Metal Tags: Brass with stamped and black filled letters; tag size minimum 1 1/2-inch diameter with smooth edges.

C. Service designations shall be 1/4-inch letters, and valve numbers shall be 1/2-inch letters. Service designations shall be approved by Architect/Engineer.

D. Chart: Typewritten letter size list in anodized aluminum frame.

E. Provide valve boxes with permanent fixed nameplate tag matching equipment label requirements.

F. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Include valve-tag schedule in operation and maintenance data.
   2. Valve schedule shall include valve ID, location, manufacturer / model, valve type and size.

2.3 PIPE LABELS

A. Manufacturers:
   1. Manufacturers:
   2. Seton
   3. Brady
   4. Approved equal

B. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

C. Color: Conform to ASME A13.1.

D. Plastic Pipe Markers: Factory fabricated, flexible, semi rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

E. Labels for pipe 6” and larger shall be attached to pipe with nylon cable ties.

F. Pipe markers and arrow markers shall be provided on the piping of the following systems:

1. Primary Chilled Water Supply/Return
2. Secondary Chilled Water Supply/Return
3. Tertiary Chilled Watery Supply/Return
4. Condenser Water Supply/ Return
5. Heating Hot Water Supply/Return
6. Makeup Water
7. Drain
8. Bypass

G. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:
   1. Pipe size.
   2. Flow-Direction Arrows: Include flow-direction arrows on distribution piping. Arrows may be either integral with label or applied separately.
   3. Lettering Size: Size letters in accordance with ASME A13.1 for piping, at least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.

2.4 CEILING TACKS

A. Manufacturers:
   1. MSI
   2. Approved equal

B. Description: Steel with 3/4-inch (20 mm) diameter color coded head.

C. Color code as follows:
   1. Yellow – HVAC equipment
   2. Red – Fire dampers/smoke dampers
   3. Blue – Heating/cooling valves

2.5 DUCT AND ACCESS DOOR LABELS

A. Identify ductwork and access doors with stencil.

B. Letter Color: Black. (Similar to Sherwin-Williams 4090)

C. Lettering Size: At least 1-1/2 inches high.

D. Paint: Shall meet VOC requirements per Division 09 painting specifications.

E. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

F. Access Door Label Contents: Identify access doors with indicated equipment to be accessed.

2.6 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8-inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black. (Similar to Sherwin-Williams SW 4090)

C. Background Color: Background to contrast with letter color.

D. Maximum Temperature: Able to withstand temperatures up to 160°F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2-inch x 3/4-inch.

F. Minimum Letter Size: 1/4-inch for name of units if viewing distance is less than 24 inches, 1/2- inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering 2/3 to 3/4 the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

J. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA70E and other applicable codes and standards.

K. Refrigerant Detection Warning Signs: Provide refrigerant detection warning signs in machinery rooms.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

A. Permanently fasten labels on each item of mechanical equipment with corrosive resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion.

B. Locate equipment labels where accessible and visible.

C. Arc-Flash Warning Signs: Provide arc-flash warning signs on electrical disconnects and other equipment where arc-flash hazard exists, as indicated on Drawings, and in accordance with requirements of OSHA and NFPA 70E, and other applicable codes and standards.

D. Refrigerant Machinery Room and Detection Warning signs.

3.4 INSTALLATION OF WARNING TAPE

A. Warning Tape Color and Pattern: Yellow background with black diagonal stripes.

B. Install warning tape 24” above underground pipe.

3.5 INSTALLATION OF PIPE LABELS

A. Piping Color Coding: In accordance with ASME A13.1 where not indicated elsewhere.

B. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

C. Stenciled Pipe Label Option: Stenciled labels showing service and flow direction may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.
   1. Identification Paint: Use for contrasting background.
   2. Stencil Paint: Use for pipe marking.

D. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Within 3 ft. of each valve and control device.
   2. At access doors, manholes, and similar access points that permit view of concealed piping.
   3. Within 3 ft. of equipment items and other points of origination and termination.
   4. Spaced at maximum intervals of 25 ft along each run. Reduce intervals to 10 ft in areas of congested piping, ductwork, and equipment.

E. Flow-Direction Arrows: Use arrows to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

F. Pipe Color and Label Color Schedule:
   1. Pipe Label Colors:
      a. Chilled, Condenser & Potable / Makeup Water: White letters on ANSI Z535.1 safety-green background.
   2. Pipe, Jacket, Insulation Color Schedule:
      a. Chilled Water:
         1) Supply – Dark blue.
         2) Return – Light blue.
      b. Condenser Water:
         1) Supply – Dark Green.
         2) Return – Light Green.
      c. Potable and Makeup Water:
         1) Cyan.

3.6 INSTALLATION OF VALVE TAGS

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule in the operating and maintenance manual.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in "Valve-Tag Size and Shape" Subparagraph below.
   1. Valve-Tag Size and Shape:
      a. 1-1/2” Round or Square

   2. Valve-Tag Colors:
      a. For each piping system, use the same lettering and background coloring system on valve tags as used for the Pipe Label Schedule text and background.
      b. Valve Box Cover Nameplates shall have valve tag on permanent affixed and engraved cover.

3.7 INSTALLATION OF CEILING TACKS

A. Provide ceiling tacks to locate valves, dampers or other concealed equipment above T bar type panel ceilings. Locate in corner of panel closest to equipment.

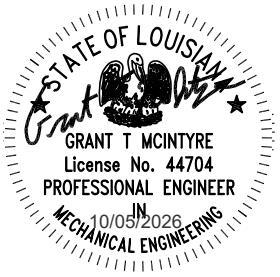
3.8 INSTALLATION OF WARNING TAGS

A. Warning Tag Color: Black letters on an ANSI Z535.1 safety-yellow background.

B. Attach warning tags, with proper message, to equipment and other items where indicated

on Drawings and Specifications and required.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Uniform General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Testing, adjusting and balancing (TAB) of the air conditioning and hydronic systems and related ancillary equipment will be performed by an impartial technically qualified TAB firm selected and employed by the Owner, separate and apart from the construction contract.

B. The firm shall be capable of performing the services specified at the location of the facility described within the time specified, of preparing and submitting the detailed report of the actual field work performed, and following up the basic work as may be required.

C. Section Includes:
1. Testing, Adjusting, and Balancing of Air Systems:
a. Constant-volume air systems.
2. Testing, Adjusting, and Balancing of Hydronic Piping Systems:
a. Constant-flow hydronic systems.
b. Variable-flow hydronic systems.
c. Primary-secondary hydronic systems.
3. Testing, adjusting, and balancing of equipment.
4. Sound tests.
5. Vibration tests.
6. Pipe leakage tests verification.
7. HVAC-control system verification.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

G. UFAD: Underfloor air distribution.

1.4 PREINSTALLATION MEETINGS

A. TAB Conference: Conduct a TAB conference at Project site after approval of the TAB strategies and procedures plan, to develop a mutual understanding of the details. Provide a minimum of 14 days' advance notice of scheduled meeting time and location.
   1. Minimum Agenda Items:
      a. The Contract Documents examination report.
      b. The TAB plan.
      c. Needs for coordination and cooperation of trades and subcontractors.
      d. Proposed procedures for documentation and communication flow.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 90 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 90 days of Contractor's Notice to Proceed, submit the Contract Documents review report, as specified in Part 3.

C. Strategies and Procedures Plan: Within 120 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures, as specified in "Preparation" Article.

D. System Readiness Checklists: Within 120 days of Contractor's Notice to Proceed, submit system readiness checklists, as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Sample report forms.

H. Instrument calibration reports, to include the following:
   1. Instrument type and make.
   2. Serial number.
   3. Application.
   4. Dates of use.
   5. Dates of approval within 30 days after award of Contract.

K. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Mechanical Engineer.
   2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   3. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
d. Final test report forms to be used.
e. False loading of systems to complete TAB work, if required.
f. Procedures for formal deficiency reports, including scope, frequency and distribution.

L. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

M. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies to Mechanical Engineer and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in I-P (inch-pound) units only.
6. Include the following on the title page of each report:
a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Engineer.
g. Project Contractor.
h. Report date.

N. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.6 FINAL REPORT TIMELINE AND ADDITIONAL REQUIREMENTS

A. The TAB report shall be submitted and reviewed by the Mechanical Engineer prior to acceptance of the project. TAB report can not be a punch list item.

B. At the time of final inspection, the TAB agency may be required to recheck, in the presence of the Owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the Owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck,

specific plus random, shall not exceed 10% of the total number tabulated in the report.

C. Coordination between TAB firm shall be responsibility of the general contractor.

D. TAB shall require coordination and demonstration to the commissioning authority as required.

1.7 QUALITY ASSURANCE

A. TAB Specialists Qualifications, Certified by AABC:
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.
   2. TAB Technician: Employee of the TAB specialist and certified by AABC.

B. TAB Specialists Qualifications, Certified by NEBB or TABB:
   1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
   2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB.

C. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

D. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

E. Code and AHJ Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.8 FIELD CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 Perform total system balance in accordance with one of the following:

A. AABC (NSTSB), AABC National Standards for Total System Balance.

B. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

C. SMACNA (TAB).

3.2 Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

3.3 TAB Agency Qualifications:

A. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

B. Having minimum of three years documented experience.

C. Certified by one of the following:
1. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
2. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
3. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

3.4 TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.5 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine equipment performance data, including fan and pump curves.
1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

I. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainer baskets are installed and clean.

J. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.

K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

L. Examine system pumps to ensure absence of entrained air in the suction piping.

M. Examine operating safety interlocks and controls on HVAC equipment.

N. Examine control dampers for proper installation for their intended function of isolating, throttling, diverting, or mixing air flows.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.6 PREPARATION

A. Prepare a TAB plan that includes the following:
   1. Equipment and systems to be tested.
   2. Strategies and step-by-step procedures for balancing the systems.
   3. Instrumentation to be used.
   4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
   1. Airside:
      a. Clean filters are installed.
      b. Fans are operating, free of vibration, and rotating in correct direction.
      c. Variable-frequency controllers' startup is complete and safeties are verified.
      d. Automatic temperature-control systems are operational.
      e. Suitable access to balancing devices and equipment is provided.
   2. Hydronics:
      a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
      b. Piping is complete with terminals installed.
      c. Water treatment is complete.
      d. Systems are flushed, filled, and air purged.
      e. Strainers are pulled and cleaned.

f. Control valves are functioning in accordance with the sequence of operation.
g. Shutoff and balance valves have been verified to be 100 percent open.
h. Pumps are started and proper rotation is verified.
i. Pump gauge connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
j. Variable-frequency controllers' startup is complete and safeties are verified.
k. Suitable access to balancing devices and equipment is provided.

3.7 GENERAL PROCEDURES FOR TESTING AND BALANCING

3.8 TESTING, ADJUSTING, AND BALANCING OF HVAC EQUIPMENT

A. Test, adjust, and balance HVAC equipment indicated on Drawings, including, but not limited to, the following:
1. Motors.
2. Pumps.
3. Fans and ventilators.
4. Water chillers.
5. Cooling towers.

3.9 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' Record drawings duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

3.10 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and equipment flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' Record drawings piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
   1. Check expansion tank for proper setting.
   2. Check highest vent for adequate pressure.
   3. Check flow-control valves for proper position.
   4. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
   5. Verify that motor controllers are equipped with properly sized thermal protection.
   6. Check that air has been purged from the system.

D. Measure and record upstream and downstream pressure of each piece of equipment.

E. Measure and record upstream and downstream pressure of pressure-reducing valves.

F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.
   1. Check settings and operation of each safety valve. Record settings.

3.11 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Adjust pumps to deliver total design flow.
   1. Measure total water flow.
      a. Measure flow by main flow meter, if installed.
      b. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
   2. Measure pump TDH as follows:
      a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
      b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
      c. Convert pressure to head and correct for differences in gauge heights.
      d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
      e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.
   3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

B. Adjust flow-measuring devices installed in mains and branches to design water flows.
   1. Measure flow in main and branch pipes.
   2. Adjust main and branch balance valves for design flow.
   3. Re-measure each main and branch after all have been adjusted.

C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
   1. Measure flow at terminals.
   2. Adjust each terminal to design flow.
   3. Re-measure each terminal after it is adjusted.
   4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
   5. Perform temperature tests after flows have been balanced.

D. For systems with pressure-independent valves at terminals:
   1. Measure differential pressure and verify that it is within manufacturer's specified range.
   2. Perform temperature tests after flows have been verified.

E. For systems without pressure-independent valves or flow-measuring devices at terminals:
   1. Measure and balance coils by either coil pressure drop or temperature method.
   2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:
   1. Re-measure and confirm that total water flow is within design.
   2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
   3. Mark final settings.

G. Verify that memory stops have been set.

3.12 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:
   1. Verify that the pressure-differential sensor(s) is located as indicated.
   2. Determine whether there is diversity in the system.

C. For systems with no flow diversity:
   1. Adjust pumps to deliver total design flow.
      a. Measure total water flow.
         1) Position valves for full flow through coils.
         2) Measure flow by main flow meter, if installed.
         3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
      b. Measure pump TDH as follows:
         1) Measure discharge pressure directly at the pump outlet flange or

in discharge pipe prior to any valves.
2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
3) Convert pressure to head and correct for differences in gauge heights.
4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

2. Adjust flow-measuring devices installed in mains and branches to design water flows.
   a. Measure flow in main and branch pipes.
   b. Adjust main and branch balance valves for design flow.
   c. Re-measure each main and branch after all have been adjusted.
3. For systems with pressure-independent valves:
   a. Measure differential pressure and verify that it is within manufacturer's specified range.
   b. Perform temperature tests after flows have been verified.
4. For systems without pressure-independent valves:
   a. Measure and balance coils by either coil pressure drop or temperature method.
   b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
5. Prior to verifying final system conditions, determine the system pressure-differential set point(s).
6. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
7. Mark final settings and verify that all memory stops have been set.
8. Verify final system conditions as follows:
   a. Re-measure and confirm that total flow is within design.
   b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
   c. Mark final settings.

D. For systems with flow diversity:
1. Determine diversity factor.
2. Simulate system diversity by closing required number of control valves, as approved by Engineer.
3. Adjust pumps to deliver total design flow.
   a. Measure total water flow.

1) Position valves for full flow through coils.
2) Measure flow by main flow meter, if installed.
3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

b. Measure pump TDH as follows:
1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
3) Convert pressure to head and correct for differences in gauge heights.
4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

4. Adjust flow-measuring devices installed in mains and branches to design water flows.
a. Measure flow in main and branch pipes.
b. Adjust main and branch balance valves for design flow.
c. Re-measure each main and branch after all have been adjusted.

5. For systems with pressure-independent valves:
a. Measure differential pressure, and verify that it is within manufacturer's specified range.

b. Perform temperature tests after flows have been verified.

6. For systems without pressure-independent valves or flow-measuring devices:
a. Measure and balance coils by either coil pressure drop or temperature method.
b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

7. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.

8. Prior to verifying final system conditions, determine system pressure-differential set point(s).

9. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.

10. Mark final settings and verify that memory stops have been set.

11. Verify final system conditions as follows:
a. Re-measure and confirm that total water flow is within design.

b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
c. Mark final settings.

3.13 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

A. Balance the primary circuit flow first.

B. Balance the secondary circuits after the primary circuits are complete.

C. Adjust pumps to deliver total design flow.
1. Measure total water flow.
a. Position valves for full flow through coils.
b. Measure flow by main flow meter, if installed.
c. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
2. Measure pump TDH as follows:
a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
c. Convert pressure to head and correct for differences in gauge heights.
d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
e. With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.
3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

D. Adjust flow-measuring devices installed in mains and branches to design water flows.
1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

E. For systems with pressure-independent valves:
1. Measure differential pressure and verify that it is within manufacturer's specified range.
2. Perform temperature tests after flows have been verified.

F. For systems without pressure-independent valves or flow-measuring devices:
1. Measure and balance coils by either coil pressure drop or temperature method.
2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

G. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
3. Mark final settings.

H. Verify that memory stops have been set.

3.14 PROCEDURES FOR MOTORS

A. Motors 1 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter size and thermal-protection-element rating.
8. Service factor and frame size.

B. Motors Driven by Variable-Frequency Controllers: Test manual bypass of controller to prove proper operation.

3.15 PROCEDURES FOR WATER CHILLERS

A. Water-Cooled Chillers: Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow, with all pumps operating. With only one chiller operating in a multiple-chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:
1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. Condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.
7. Efficiency: Calculate operating efficiency for comparison to submitted equipment.

3.16 PROCEDURES FOR COOLING TOWERS

A. Open-Circuit Cooling Towers: Balance total condenser-water flows to towers and cells. Measure and record the following data:
1. Condenser-water flow to each cell of the cooling tower.
2. Pressure at each inlet connection.
3. Entering- and leaving-water temperatures.

4. Range.
5. Makeup-water flow rate.
6. Makeup water temperature.
7. Wet- and dry-bulb temperatures of entering air.
8. Wet- and dry-bulb temperatures of leaving air.
9. Approach.
10. Barometric pressure, wind speed, and wind direction.
11. Fan, motor, and motor controller operating data.
12. Heater operating data.

3.17 SOUND TESTS

A. After systems are balanced and Substantial Completion, measure and record sound levels at four locations as designated by the Engineer (cooling tower and chiller measurement only).

B. Instrumentation:
1. The sound-testing meter shall be a portable, general-purpose testing meter consisting of a microphone, processing unit, and readout.
2. The sound-testing meter shall be capable of showing fluctuations at minimum and maximum levels, and measuring the equivalent continuous sound pressure level (Leq).
3. The sound-testing meter must be capable of using one-third octave band filters to measure mid-frequencies from 31.5 Hz to 8000 Hz.
4. The accuracy of the sound-testing meter shall be plus or minus one decibel.

C. Test Procedures:
1. Perform test at quietest background noise period. Note cause of unpreventable sound that affects test outcome.
2. Equipment should be operating at design values.
3. Calibrate the sound-testing meter prior to taking measurements.
4. Use a microphone suitable for the type of noise levels measured that is compatible with meter. Provide a windshield for outside or in-duct measurements.
5. Record a set of background measurements in dBA and sound pressure levels in the eight unweighted octave bands 63 Hz to 8000 Hz (NC) with the equipment off.
6. Take sound readings in dBA and sound pressure levels in the eight unweighted octave bands 63 Hz to 8000 Hz (NC) with the equipment operating.
7. Take readings no closer than 36 inches from a wall or from the operating equipment and approximately 60 inches from the floor, with the meter held or mounted on a tripod.
8. For outdoor measurements, move sound-testing meter slowly and scan area that has the most exposure to noise source being tested. Use A-weighted scale for this type of reading.

D. Reporting:
1. Report shall record the following:
    a. Location.
    b. System tested.

c. dBA reading.
d. Sound pressure level in each octave band with equipment on and off.

2. Plot sound pressure levels on Noise Criteria (NC) worksheet with equipment on and off.

3.18 VIBRATION TESTS

A. After systems are balanced and Substantially Completion, measure and record vibration levels on equipment having motor horsepower equal to or greater than 50 HP.

B. Instrumentation:
1. Use portable, battery-operated, and microprocessor-controlled vibration meter with or without a built-in printer.
2. The meter shall automatically identify engineering units, filter bandwidth, amplitude, and frequency scale values.
3. The meter shall be able to measure machine vibration displacement in mils of deflection, velocity in inches per second, and acceleration in inches per second squared.
4. Verify calibration date is current for vibration meter before taking readings.

C. Test Procedures:
1. To ensure accurate readings, verify that accelerometer has a clean, flat surface and is mounted properly.
2. With the unit running, set up vibration meter in a safe, secure location. Connect transducer to meter with proper cables. Hold magnetic tip of transducer on top of the bearing, and measure unit in mils of deflection. Record measurement, then move transducer to the side of the bearing and record in mils of deflection. Record an axial reading in mils of deflection by holding nonmagnetic, pointed transducer tip on end of shaft.
3. Change vibration meter to velocity (inches per second) measurements. Repeat and record above measurements.
4. Record CPM or rpm.
5. Read each bearing on motor, fan, and pump as required. Track and record vibration levels from rotating component through casing to base.

D. Reporting:
1. Report shall record location and the system tested.
2. Include horizontal-vertical-axial measurements for tests.
3. Verify that vibration limits follow Specifications, or, if not specified, follow the General Machinery Vibration Severity Chart or Vibration Acceleration General Severity Chart from AABC's "National Standards for Total System Balance." Acceptable levels of vibration are normally "smooth" to "good."
4. Include in General Machinery Vibration Severity Chart, with conditions plotted.

3.19 PIPE LEAKAGE TESTS

A. Witness the pipe pressure testing performed by Installer.

B. Verify that proper test methods are used and that leakage rates are within specified limits.

C. Report deficiencies observed.

3.20 HVAC CONTROLS VERIFICATION

A. In conjunction with system balancing, perform the following:
   1. Verify HVAC control system is operating within the design limitations.
   2. Confirm that the sequences of operation are in compliance with Contract Documents.
   3. Verify that controllers are calibrated and function as intended.
   4. Verify that controller set points are as indicated.
   5. Verify the operation of lockout or interlock systems.
   6. Verify the operation of valve and damper actuators.
   7. Verify that controlled devices are properly installed and connected to correct controller.
   8. Verify that controlled devices travel freely and are in position indicated by controller: open, closed, or modulating.
   9. Verify location and installation of sensors to ensure that they sense only intended temperature, humidity, or pressure.

B. Reporting: Include a summary of verifications performed, remaining deficiencies, and variations from indicated conditions.

3.21 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
   1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent. If design value is less than 100 cfm, within 10 cfm.
   2. Chilled and Condenser-Water Flow Rate: Plus or minus 5 percent. If design value is less than 10 gpm, within 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.22 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for system-balancing devices. Recommend changes and additions to system-balancing devices, to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance-measuring and -balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.23 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
   1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
   2. Include a list of instruments used for procedures, along with proof of calibration.
   3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:
   1. Pump curves.
   2. Fan curves.
   3. Manufacturers' test data.
   4. Field test reports prepared by system and equipment installers.
   5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:
   1. Title page.
   2. Name and address of the TAB specialist.
   3. Project name.
   4. Project location.
   5. Engineer's name and address.
   6. Contractor's name and address.
   7. Report date.
   8. Signature of TAB supervisor who certifies the report.
   9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
   10. Summary of contents, including the following:
   a. Indicated versus final performance.
   b. Notable characteristics of systems.
   c. Description of system operation sequence if it varies from the Contract Documents.
   11. Nomenclature sheets for each item of equipment.
   12. Notes to explain why certain final data in the body of reports vary from indicated values.
   13. Test conditions for pump performance forms, including the following:
      a. Variable-frequency controller settings for variable-flow hydronic systems.
      b. Settings for pressure controller(s).
      c. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
   1. Water flow rates.
   2. Pipe and valve sizes and locations.
   3. Balancing stations.
   4. Position of balancing devices.

E. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves,

and include the following:

1. Unit Data:
    a. Unit identification.
    b. Location.
    c. Service.
    d. Make and size.
    e. Model number and serial number.
    f. Water flow rate in gpm.
    g. Water pressure differential in feet of head or psig.
    h. Required net positive suction head in feet of head or psig.
    i. Pump speed.
    j. Impeller diameter in inches.
    k. Motor make and frame size.
    l. Motor horsepower and rpm.
    m. Voltage at each connection.
    n. Amperage for each phase.
    o. Full-load amperage and service factor.
    p. Seal type.
2. Test Data (Indicated and Actual Values):
    a. Static head in feet of head or psig.
    b. Pump shutoff pressure in feet of head or psig.
    c. Actual impeller size in inches.
    d. Full-open flow rate in gpm.
    e. Full-open pressure in feet of head or psig.
    f. Final discharge pressure in feet of head or psig.
    g. Final suction pressure in feet of head or psig.
    h. Final total pressure in feet of head or psig.
    i. Final water flow rate in gpm.
    j. Voltage at each connection.
    k. Amperage for each phase.

F. Instrument Calibration Reports:
1. Report Data:
    a. Instrument type and make.
    b. Serial number.
    c. Application.
    d. Dates of use.
    e. Dates of calibration.

3.24 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Engineer and Commissioning Authority.

B. Engineer and Commissioning Authority shall have option to randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to the lesser of either 5 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 20 percent of the total measurements checked during the final inspection, the TAB shall be considered incomplete and shall be rejected.

E. If recheck measurements find the number of failed measurements noncompliant with requirements indicated, proceed as follows:
   1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection. All changes shall be tracked to show changes made to previous report.
   2. If the second final inspection also fails, Owner may pursue others Contract options to complete TAB work.

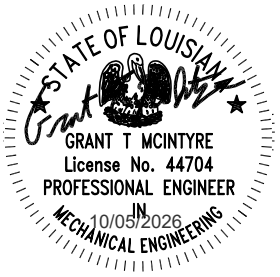
F. Prepare test and inspection reports.

3.25 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Perform all Work required to provide and install piping insulation, jackets and accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Section Includes:
1. Piping insulation
2. Jackets and accessories

1.2 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:
1. ASHRAE 90.1 – Energy Standard for Buildings Except Low Rise Residential Buildings
2. ASTM B209 – Aluminum and Aluminum Alloy Sheet and Plate.
3. ASTM C168 – Terminology Relating to Thermal Insulation Materials.
4. ASTM C177 – SteadyState Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus.
5. ASTM C195 – Mineral Fiber Thermal Insulating Cement.
6. ASTM C335 – SteadyState Heat Transfer Properties of Horizontal Pipe Insulation.
7. ASTM C449 – Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
8. ASTM C518 – Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
9. ASTM C533 – Calcium Silicate Block and Pipe Thermal Insulation.
10. ASTM C534 – Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
11. ASTM C547 – Mineral Fiber Pipe Insulation.
12. ASTM C552 – Cellular Glass Thermal Insulation.
13. ASTM C578 – Rigid, Cellular Polystyrene Thermal Insulation.
14. ASTM C585 – Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
15. ASTM C591 – Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
16. ASTM C610 – Molded Expanded Perlite Block and Pipe Thermal Insulation.
17. ASTM C921 – Jackets for Thermal Insulation.

18. ASTM C1126 – Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
19. ASTM C795 – Insulation for Use over Austenitic Steel.
20. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer.
21. ASTM D1056 – Flexible Cellular Materials Sponge or Expanded Rubber.
22. ASTM D1667 – Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).
23. ASTM D2842 – Water Absorption of Rigid Cellular Plastics.
24. ASTM D5590 – Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
25. ASTM E84 – Surface Burning Characteristics of Building Materials.
26. ASTM E96 – Water Vapor Transmission of Materials.
27. NFPA 255 – Surface Burning Characteristics of Building Materials.
28. UL 723 – Surface Burning Characteristics of Building Materials.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or craft training program.

B. All piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials shall be applied and finished as described in these Specifications.

C. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material shall be used that, when tested by the ASTM E8489 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

D. Application Company Qualifications: Company performing the Work of this Section shall have minimum three (3) years' experience specializing in the trade.

E. All insulation shall be applied by mechanics skilled in this particular work and regularly engaged in such occupation.

F. Unsightly, inadequate, or sloppy work will not be acceptable, and all such work shall be removed and replaced as many times as necessary to achieve an acceptable installation.

G. Insulation materials shall not contain asbestos.

H. Use low level VOC products wherever possible.

1.4 SUBMITTALS

A. Product Data: For each type of product. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied, if any).

B. Product Data:

C. Product Data:

D. Provide product information for all products provided under this section.

E. Schedule of insulation products to be provided for each specific service type on the project, including the following information
   1. Insulation type
   2. Insulation thickness
   3. Service application
   4. Product description and manufacturer's product number
   5. Mastics to be used
   6. Jacketing to be used
   7. Adhesives to be used
   8. Sealants to be used

F. Insulation product cutsheets containing the following information:
   1. Product description and manufacturer's product number
   2. Material
   3. "k" value at mean temperature range
   4. Thickness for each service and location.
   5. Product density
   6. Compressive strength (where specified)
   7. Compliance with applicable standards
   8. ASTM E84 flame spread/smoke developed ratings

G. Product cutsheets for mastics, adhesives, and sealants, containing the following information:
   1. Recommended service
   2. Temperature ratings
   3. Vapor permeance or permeability ratings
   4. ASTM E84 flame spread/smoke developed ratings
   5. Compliance with applicable standards
   6. Description of application (I.e. thickness of layers to be applied, form of the product)
   7. Uninstalled product storage requirements
   8. Safety Data Sheets (SDS)

H. Product cutsheets for jacketing, containing the following information:
   1. Material
   2. Thickness/gauge
   3. Liner properties
   4. Banding information/width and gauge

5. Installation description

I. Product cutsheets for the following:
   1. Pipe shields
   2. High compressive strength insulation inserts, including manufacturer's sizing guidelines
   3. Gauge and material for wiring used to attach insulation

J. Shop Drawings/Details:
   1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Attachment and covering of heat tracing inside insulation.
   3. Insulation application at pipe expansion joints for each type of insulation.
   4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   5. Removable insulation at piping specialties, equipment connections, and access panels.
   6. Application of field-applied jackets.
   7. Application at linkages of control devices.
   8. Field application for each equipment type.
   9. Calculations for insulation compressive forces at supports due to the weight of full pipes

K. Samples: when requested, submit three (3) samples of any representative size illustrating each insulation type to EH&S for testing.

L. Mockups: Before installing insulation, build mockups for each type of piping insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Owner. Use materials indicated for the completed Work. Mockups shall remain on project site for reference during construction.

M. Operation and Maintenance Data:
   1. Provide manufacturer's recommendations for care and protection.
   2. Provide manufacturer's installation instructions and specific installation procedures for each type of mechanical insulation.

N. Qualification Data: For qualified Installer.

O. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

P. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 23 00 00.

B. Deliver materials to the Project Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.

C. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemicals, and mechanical damage.

D. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

E. All insulation materials to be asbestos free.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing system. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84 by a testing agency acceptable to authority having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
   1. All Insulation: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

B. Adhesives shall be compatible to mechanical surfaces, insulations, and jackets to which they are applied in both wet and dry state.

C. Materials shall be fire-retardant, moisture resistant, mildew-resistant, and vermin proof.

D. Materials shall be suitable for temperature of systems to which they are applied.

E. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials are applied.

F. Products do not contain asbestos, lead, mercury, or mercury compounds.

G. Products that come into contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

H. Insulation materials for use on austenitic stainless steel are qualified as acceptable in accordance with ASTM C795.

I. Foam insulation materials do not use CFC or HCFC blowing agents in the manufacturing process.

2.2 CALCIUM SILICATE

A. Thermal Conductivity: k-value of 0.40 BTU-In/Hr.-degree F or less at 100°F and 0.50 BTU-In/Hr.-degree F or less at 400°.

B. Rated Maximum Service Temperature: 1200°F (650°C).

C. Maximum Density: 15 lbs/ft³

D. Compressive Strength: 100 psi minimum when tested in accordance with ASTM C165.

E. Composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) rated as 0 flame spread and 0 smoke developed when tested in accordance with ASTM E84 or UL 723. Certified to meet the requirements of ASTM C795 for use over stainless steel.

F. Rated as noncombustible when tested in accordance with ASTM E136.

G. Effective corrosion inhibitor is equal to or better then DI water standard when tested in accordance with ASTM C1617.

H. Insulation shall meet or exceed the requirements of ASTM C533, Type I.

I. High compressive strength inserts:

J. High compressive strength inserts shall be of similar material, with the following differences:
   1. Thermal Conductivity: k-value of 0.32 BTU-In/Hr.-degree F or less at 75°F
   2. Compressive strength of 118 psi minimum when tested in accordance with ASTM C165

2.3 FIBERGLASS

A. Acceptable Manufacturers:
   1. Owens Corning
   2. Johns Manville
   3. Approved equal

B. Provide with all service jacket (ASJ).

C. Thermal conductivity: k-value of 0.54 Btu-in./hr-degree F or less at 500°F and 0.23 Btu-in./hr-degree F or less at 75°F.

D. Rated maximum service temperature of 1000°F.

E. Rated maximum jacket temperature: 150°F.

F. Insulation shall be rated as 25 flame spread and 50 smoke developed when tested in accordance with ASTM E84 or UL 723.

2.4 HIGH TEMPERATURE BLANKET INSULATION

A. Acceptable Manufacturers: Products meeting all requirements of this specification section made by the following manufacturers are acceptable:
   1. Johns Manville Insulthin HT
   2. Approved equal

B. Type: Hydrophobic, microporous, high temperature blanket insulation

C. Thermal Conductivity: k-value of 0.183 BTU-In/Hr.-degree F or less at 200°F and 0.264 BTU-In/Hr.-degree F or less at 600°

D. Rated maximum service temperature of 1200°F.

E. Composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) rated as 0 flame spread and 0 smoke developed when tested in accordance with ASTM E84 or UL 723.

F. Certified to meet the requirements of ASTM C795 for use over stainless steel.

G. Insulation shall have absorbance and water retention per ASTM C1104 and ASTM C1511 of less than 5%.

H. Insulation shall meet or exceed the requirements of ASTM C1676 Type II, Grade 2B.

2.5 CELLULAR GLASS:

A. Acceptable Manufacturers: Products meeting all requirements of this specification section made by the following manufacturers are acceptable:
   1. Foamglas One Insulation manufactured by Pittsburgh Corning Corporation and fabricated by a Pittsburgh Corning Corporation-approved fabricator
   2. Approved equal

B. Type: Cellular glass insulation

C. Thermal Conductivity: k-value of 0.29 BTU-In/Hr.-degree F or less at 75°F

D. Water vapor permeability: 0.00 perm-in.

E. Rated maximum service temperature of 900°F.

F. Maximum density of 7.2 lbs/ft³

G. Compressive strength of 90 psi minimum when tested in accordance with ASTM C165.

H. Composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) rated as 0 flame spread and 0 smoke developed when tested in accordance with ASTM E84 or UL 723.

I. Certified to meet the requirements of ASTM C795 for use over stainless steel.

J. Rated as noncombustible when tested in accordance with ASTM E136.

K. Shall meet or exceed requirements of ASTM C552, Type II.

L. Provide all service jacket (ASJ) on insulation.

M. High compressive strength inserts shall be of similar material, with the following differences:
   1. Thermal Conductivity: k-value of 0.32 BTU-In/Hr.-degree F or less at 75°F
   2. Compressive strength of 118 psi minimum when tested in accordance with ASTM C165.

2.6 PHENOLIC FOAM

A. Acceptable Manufacturers: Products meeting all requirements of this specification section made by the following manufacturers are acceptable:
   1. John Manville Supercel Phenolic Foam Trymer
   2. Kingspan Kooltherm
   3. Approved equal

B. Type: Phenolic foam pipe insulation.

C. Thermal Conductivity: k-value of 0.22 BTU-In/Hr.-degree F or less at 75°F.

D. Rated maximum service temperature of 257°F.

E. Density: 3.75 lbs/ft³

F. Compressive strength of 45 psi minimum when tested in accordance with ASTM C165.

G. Composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) rated as maximum 25 flame spread and 50 smoke developed when tested in accordance with ASTM E84 or UL 723.

H. Certified to meet the requirements of ASTM C795 for use over stainless steel.

I. Rated as noncombustible when tested in accordance with ASTM E136.

J. Insulation shall be CFC free and meet the requirements of ASTM C1126, TYPE III, Grade 1.

K. Provide all service jacket (ASJ) on insulation.

L. High compressive strength inserts shall be of similar material, with the following differences:
   1. Thermal Conductivity: k-value of 0.30 BTU-In/Hr.-degree F or less at 75°F
   2. Compressive strength: 140 psi minimum when tested in accordance with ASTM D1621.
   3. Density: 7.5 lb/cu. ft.

2.7 CLOSED CELL ELASTOMERIC

A. Acceptable Manufacturers: Products meeting all requirements of this specification section made by the following manufacturers are acceptable:
   1. Armacell AP Armaflex (1" and thinner) or AP Armaflex FS (thicker than 1")
   2. Approved equal
B. Thermal Conductivity: k-value of 0.28 BTU-In/Hr.-degree F or less at 75 F
C. Vapor transmission: 0.08 perm-in according to ASTM E96, procedure A.
D. Rated maximum service temperature of 300°F.
E. Composite mechanical insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) rated as 25 flame spread and 50 smoke developed when tested in accordance with ASTM E84 or UL 723.
F. Certified to meet the requirements of ASTM C795 for use over stainless steel.
G. Rated as noncombustible when tested in accordance with ASTM E136.
H. Elastomeric products shall be supplied in a pre-slit tubular form with a pressure sensitive adhesive system for closure and vapor sealing of the longitudinal joint.
I. Shall meet or exceed requirements of ASTM C534, Type I, tubular grade.
J. High compressive strength inserts are not applicable. Do not install hangers where they will compress Type UEM P6 insulation.

2.8 FITTINGS

A. Provide pre-molded fittings and elbows molded in two matching half sections of same insulation thickness as adjoining piping. As an alternative, provide mitered sections of insulation equivalent in thickness and composition to that installed on straight pipe runs. No insert or blanket insulation allowed.

2.9 WIRING FOR SECURING INSULATION

A. Wiring for securing insulation shall be the following:
   1. 16-gauge type 304 stainless steel wire

2.10 BANDING FOR SECURING INSULATION

A. Banding for securing insulation shall be the following:
   1. 3/4-inch x 0.0.020 inch, ASTM B209 aluminum or 304 stainless steel strapping and seals

2.11 PIPE PRIMER

A. Polyguard RG-CHW for surface temperatures less than 130F, RG-2400 LT for piping with surface temperatures between 130F and 250F. Application thickness shall be 25 mils.

B. Global Encasement Rust Inhibition Primer. Application thickness shall be minimum 3 mils (dry)

C. Sherwin Williams Pro-Cryl Universal Acrylic Primer. Application thickness shall be minimum 3 mils (dry).

2.12 ADHESIVES, CEMENT, COATINGS AND PRIMER

A. Materials are compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Calcium Silicate:
1. Insulating Cement: Use CalCoat-127 or approved equal insulating cement to point up insulation on pipe to form a smooth, even surface.
2. Coating: Provide Childers Ak-Cryl CP-9 reinforced with 10 inch x 10 inch glass cloth as a final finish where jacketing is not specified.
3. Adhesive: CalBond Gold High Temperature Glue or approved equal to adhere insulation sections to each other where required at fittings, valves, and joints as required where banding will not secure insulation seams. Adhering insulation to piping is not permitted.

C. Cellular-Glass:
1. All Service Jacket (ASJ) Vapor Retarder:
   a. Childers CP-35
   b. Approved equal
2. Joint Mastic: Used at valves, fittings, moisture dams, and where insulation is terminated. Sealant is brush applied to end of insulation and continued along pipe surface.
   a. Childers CP-76
   b. Foster 30-45
   c. Mon-Eco Industries 44-05
   d. Pittseal 444N Sealant by Pittsburgh Corning Corporation.
   e. Approved equal
3. Primer: Note that the asphaltic material specified in this paragraph is intended to be an exception to the flame spread and smoke generation limitations found elsewhere in this specification.
   a. Pittcote 300
   b. Polygard RG-2400 CHW-1
   c. Approved equal asphaltic primer

D. Fiberglass
1. Lap Adhesive. Furnish Childers CP82 or Foster 85-20 to seal longitudinal laps of the vapor barrier jacket and to adhere butt joint covers.
2. Finish: Furnish Childers CP10/11 or Foster 46-50 weather barrier mastic with reinforcing mesh.
3. Cement: Furnish Ryder One Coat on insulated fittings, flanges and valves.
4. Primer and Finish: Furnish Childers CP-50A MV1 diluted 50% with water to prime cement prior to applying coating.
5. Lagging Adhesive: Used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 Sealfas, Childers CP-50AMV1 Chil Seal or approved equal.

E. Elastomeric
   1. Adhesive: Furnish Armaflex 520 BLV Low VOC Adhesive, Foster 85-75, or Childers CP-82 to seal longitudinal labs and to adhere butt joint covers.

F. PVC Jacket Adhesive: Compatible with PVC jacket.
   1. Adhesive: As recommended by Adhesive - PVC Jacket manufacturer and with a VOC content of 50 g/L or less.

2.13 MASTICS AND COATINGS

A. Materials are compatible with insulation materials, jackets, and substrates.
   1. Mastics: As recommended by insulation manufacturer and with a VOC content of 50 g/L or less.

B. Vapor-Retarder Mastic, Solvent Based, Indoor Use: Suitable for indoor use on below-ambient services.
   1. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
   2. Service Temperature Range: 0 to 180 deg F.
   3. Color: White.

C. Vapor-Retarder Mastic, Solvent Based, Outdoor Use: Suitable for outdoor use on below-ambient services.
   1. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
   2. Service Temperature Range: Minus 50 to plus 220 deg F.
   3. Color: White .

2.14 SEALANTS

A. Materials are as recommended by the insulation manufacturer and are compatible with insulation materials, jackets, and substrates.

B. Joint Sealants:
   1. Permanently flexible, elastomeric sealant.
      a. Service Temperature Range: Minus 150 to plus 250 deg F.
      b. Color: White or gray.
   2. Sealant shall have a VOC content of 420 g/L or less.

C. FSK and Metal Jacket Flashing Sealants:
   1. Fire- and water-resistant, flexible, elastomeric sealant.
   2. Service Temperature Range: Minus 40 to plus 250 deg F.
   3. Color: Aluminum.
   4. Sealant shall have a VOC content of 420 g/L or less.

D. ASJ Flashing Sealants and PVDC and PVC Jacket Flashing Sealants:
   1. Fire- and water-resistant, flexible, elastomeric sealant.
   2. Service Temperature Range: Minus 40 to plus 250 deg F.
   3. Color: White.
   4. Sealant shall have a VOC content of 420 g/L or less.

2.15 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
   2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
   3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.
   4. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
   5. PSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C1136, Type II.

2.16 FIELD-APPLIED JACKETS

A. Field-applied jackets comply with ASTM C1136, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Adhesive: As recommended by jacket material manufacturer.
   2. Color: Color-code jackets based on system.
   3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
      a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Metal Jacket:
   1. Acceptable Manufacturers:
      a. Childers.
      b. Pabco
      c. Insul-Mate
      d. Manville Corporation.
      e. Premetco.
   2. Provide prefabricated jacket of either:
      a. ASTM B209 aluminum, 0.020-inch thick, smooth finish, with factory-applied moisture barrier.
      b. Type 304 stainless steel; 0.010-inch thick; smooth finish, with factory applied moisture barrier.
   3. Jacketing Moisture barrier
      a. Interior: 3-mil thick heat-bonded polyethylene and kraft paper
      b. Exterior: 2.5-mil thick polysurlyn

4. Valves, Fittings and Flanges. Provide covers for all valves, fittings and flanges of the same material, finish, and thickness as the piping jacketing. Provide factory formed covers unless not available.
5. Straps and Seals (i.e., metal banding). Provide metal banding specified above for applying jacket and covers to provide completely weather tight covering of all insulation including caps, flanges and end of lines. Strapping material shall match jacket material.
6. Metal Jacketing Sealant: Provide 1/8" bead of Everkem Trusil 100 or Dow Corning 736 underneath all metal jacketing laps to prevent water entry on outdoor applications and on all chilled water applications.

2.17 INSULATION SHIELDS

A. Provide shields constructed of G60 or G90 galvanized steel.

B. Shields shall be curved 180°.

C. Shields shall have radius equal to the exterior radius of the pipe insulation.

D. Required metal shield sizes shall be as follows:

Nominal IPS	Metal Thickness of Shield	Lengths
3"	18 gauge	12"
4"	16 gauge	12"
6"	16 gauge	18"
8" through 14"	14 gauge	24"
16" through 24"	12 gauge	24"

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

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

C. General Piping Insulation Installation:

D. Pressure testing of piping systems shall be complete prior to application of insulation.

E. Prior to insulating piping,
1. Remove all oil, grease, cutting oils, dirt and other contaminants. Use suitable solvents, steam cleaning with detergent, or fresh water wash with detergent. Follow with thorough fresh water rinse.
2. Provide primer coat on all chilled and heating hot water steel piping in accordance

with manufacturer's recommendations, to include field welds and over factory applied paint/coating, in total compliance with mechanical identification section and compatible with and approved by the insulation manufacturer. Painting must be completed and approved prior to installation of insulation.

F. On exposed piping, locate insulation and cover seams in least visible locations, but not higher than at the side of the pipe at the 90° position, with the seam lapped such that the lap is directed down.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

H. For insulated pipes conveying fluids above ambient temperature:
1. Provide standard jackets, with or without vapor barrier, factory applied or field applied.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
3. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

I. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

J. For hot piping conveying fluids above 140 degrees F, insulate flanges and unions, including those at equipment, but label the insulation to indicate a concealed flange or union.

K. Provide aluminum jackets for exterior pipe and equipment insulation covers. For interior piping in mechanical rooms or exposed locations, provide aluminum or PVC jackets for all piping. Locate seams on bottom side of horizontal pipe.

L. For outdoor installations, seal jacket lap with 1/8" bead of metal jacketing sealant underneath each lap to prevent infiltration of water beneath jacket. On horizontal piping place over lap at side of pipe arranged so that water will run off of jacket and not into seam lap.

M. Insulate drains, vents, gauges, thermometers, and strainers with same insulation as piping.

N. Self-sealing lap and butt joints will not be acceptable as the only seal on piping insulation joints. Self-sealing lap and butt joints may be utilized only if the joints are additionally secured with field applied vapor barrier adhesive (on piping systems requiring vapor barriers) or staples and field applied adhesive (on piping system which do not require a vapor barrier jacket). Mechanical fasteners shall be used whenever possible to assure permanent installation.

O. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

P. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

Q. Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
   1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
   2. Carbon Steel: Coat carbon steel operating at a service temperature of between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

R. Insulate all components on CHW systems, including but not limited to the following:
   1. Drains
   2. Vents
   3. Instrument connections/taps
   4. Flow meters
   5. Strainers
   6. Unions
   7. Flanges
   8. Valves
   9. Stanchions

S. Insulation Type – Calcium Silicate:
   1. Pipe insulation shall be firmly wired in place by the use of no less than six (6) loops of No. 16 annealed copper clad iron wire per three-foot section of insulation. These sections shall be staggered. The ends of these loops shall be twisted together tightly and bent over and hammered into the insulation so as to leave no projection. Bands shall be 0.020" thick, ¾" wide, 3 bands per section of insulation. Fittings, valves, etc., shall have bands on each side.
   2. Insulation shall be applied to piping with all joints tightly fitted to eliminate voids. Stagger joints and butt insulation firmly together. Where necessary, point up joints with insulating cement to form a smooth even surface.
   3. Joints shall be sealed and fastened in place with ¾" wide x 0.020" stainless steel bands. Fittings and valves shall be insulated with the same thickness as that applied to the adjacent pipe and shall have an outer removable covering of aluminum.
   4. All fittings on pipe 4" and larger shall be covered with the same material as the pipe, mitered and smoothed, and securely wired to the pipe.
   5. Fittings and valves for pipe smaller than 4" shall be insulated with insulating finishing cement and each application shall be in layers not thicker than ½". Each layer shall be allowed to dry before the next layer is applied.
   6. All cracks and voids in this insulation shall be filled carefully with insulating finishing cement so that the resulting surface is smooth and continuous.
   7. At all pipe flanges, the insulation shall be beveled in such a manner that access may be had to the bolt studs and nuts without injuring the insulation where removable covers have been specified.
   8. A layer of 40-pound rosin-size paper or ¾ pound deadening felt shall be wrapped around the insulation before an 8 ounce canvas jacket is pasted in place. This

canvas jacket shall be pasted onto the covered pipe valves and fittings (where insulated) in a neat and workmanlike fashion, using adhesive.

9. All flanges, valves, pressure regulating valves, strainers, and any other hot surfaces shall be covered with a removable covering as specified above.
10. Aluminum jacketing shall be applied with all laps positioned to shed water and seams filled with silicone sealant. All laps shall be a minimum of 2 inches. Aluminum jacketing shall be secured using bands and seals as specified. Band spacing shall be two bands equally spaced per section of insulation. This will usually mean 9 inches or 12 inches on center.

T. Insulation Type – Cellular Glass

1. Prior to application of any insulation, all metal surfaces shall be thoroughly cleaned. The metal shall then be primed with an asphaltic primer consisting of one (1) coat of Foster No. 6026 Primer or Pittcote 300 Primer. (Note that the asphaltic material specified in this paragraph is intended to be an exception to the flame spread and smoke generation limitations found elsewhere in this specification.)
2. Foamglas insulation shall be applied to the piping with butt joints staggered and all joints tightly butted and sealed with a ¼" bead of joint sealer ½" from outside edge. Hold in place with stainless steel bands.
3. All insulation joints (longitudinal and butt) shall be buttered with vapor sealant mastic then pressed firmly together. After insulation has been wired in place, a 1/16" minimum thick, 3" wide band of vapor seal mastic shall be brushed or troweled on the outside of the insulation at the approximate location of the stainless-steel bands. Aluminum jacketing shall then be fitted to the O.D. of the insulation and applied over the insulated pipe with 3" end and side caps secured with aluminum bands on 12" centers. The longitudinal joint of the aluminum jacketing shall be oriented so that the seam is at the bottom of pipe. Any voids in the completed installation of the insulation shall not be filled with vapor seal coating but shall be eliminated by refitting or replacing insulation. Foamglas insulation on flanges, valves and other fittings shall consist of prefabricated fitting covers of the same thickness as specified for adjoining pipe insulation.
4. Fitting covers shall be applied in same manner as pipe application except that 16-gauge aluminum wire may be used to secure screwed fitting covers. Protruding metal parts (such as valve stems) shall be completely sealed off.
5. Fitting covers shall be built up of shaped segments of Foamglas. These fitting covers shall be adhered in place using specified vapor seal, then smoothly covered by a one quarter inch (1/4") thick application of one coat white insulating cement. All this piping and fittings shall be finished with an 8 ounce canvas jacket neatly applied using adhesive.
6. Valves, fittings, etc., in congested areas around coil and heat exchanger equipment, etc., shall be insulated by building up fitting segments and pre-molded sections, plus white vapor seal mastic, plus finishing cement to smooth surfaces, plus canvas applied and sized for painting with fire resistant adhesive. In addition, all manufactured vapor barrier jacketing in mechanical rooms and finished spaces shall be finished with canvas applied and sized for painting with fire resistant adhesive.
7. No chilled water pipe supporting structures shall pierce the insulation except as anchor points as shown on the Drawings. At these points, the anchor member

shall occur on the bottom of the piping to allow condensation to drain.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with the Contract Documents, unless otherwise approved by the engineer of record.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
   3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of

compression in the insulation.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.
4. For below-ambient services, apply vapor-barrier mastic over staples.
5. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor

insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using prefabricated fitting insulation or mitered or routed fittings made from same material and density as that of adjacent pipe insulation. Each piece is butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with prefabricated fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using prefabricated fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using prefabricated fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient

services, provide a design that maintains vapor barrier.

6. Insulate flanges, mechanical couplings, and unions using a section of oversized preformed pipe insulation to fit. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated and where required for access, service and maintenance. Installation conforms to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as that of adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union at least 2 times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and

protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install prefabricated pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as that of pipe insulation. Where voids are difficult to fill with block insulation, fill the voids with a fibrous insulation material suitable for the specific operating temperature.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered or routed sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF GLASS-FIBER AND MINERAL WOOL INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install prefabricated pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral-wool blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FIELD-APPLIED JACKETS

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated and for horizontal applications, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless steel bands 12 inches o.c. and at end joints.

3.8 INSERTS, SUPPORTS AND SHIELDS

A. Application: Piping 3/4 inch diameter or larger for all systems except direct buried.

B. Shields:
1. Install between pipe hangers or pipe hanger rolls and inserts.
2. Hangers shall be on the outside of the insulation and shall not be in contact with the pipe. Curved metal shields shall be used between the hangers or support points and the bottom of the insulated pipe for insulated pipes 3/4" and larger.
3. Curved metal shields shall be designed to limit the bearing stress on the insulation to 35 psi and shall be curved to fit up to mid-perimeter of the insulated pipe.
4. Shields shall be made of galvanized steel. Required metal shield sizes are as follows:

Nominal IPS	Metal Thickness of Shield	Lengths
up thru 2"	14 gauge	12"
thru 6"	12 gauge	16"
and above	10 gauge	20"

C. Inserts:
1. Insert Location: Provide inserts between support shield and piping and under the finish jacket.
2. Insert Configuration: Minimum 2" inches longer than length of shield, of same thickness and contour as adjoining insulation. Inserts may be factory fabricated.
3. Insert Material: Heavy density insulating material suitable for the planned temperature range, and the weight of the pipe. Provide calculations demonstrating that inserts are capable of supporting the weight of the filled pipe without exceeding their published maximum compression strength.
4. The shields at support points shall be secured with ½" x 0.016" stainless steel bands and seals.
5. Finish insulation at supports, protrusions, and interruptions.

D. In lieu of the above, the following system of support may be used:
1. At the pipe support positions, the insulation and vapor barrier shall be continuous and shall not be punctured by the support.
2. The Insulation at supports shall be Foamglas HLB 800 inserts (or equal). HLB 800 inserts shall be faced with factory applied ASJ vapor barrier and fitted with a galvanized steel saddle bonded to the bottom section of the HLB Block for all pipe sizes 1 1/2" and larger.
3. The vapor barrier shall be completed by the use of ASJ overlap and factory applied self-seal lap tape and sealed with vapor barrier adhesive.
4. The load bearing insulation at the support shall be capable of withstanding the maximum static compressive loads generated by pipe supported at the centers and support lengths shown in the HLB Block Support Centers Table below. The support centers are based on the weight of Sch 80 pipe filled with water.
5. The inserts at the support shall be the full circumference of material to withstand

the bearing loads transmitted from the pipe to the support. The insert shall extend for at least 1" on either side of the support to allow sealing of the joints with the pipe insulation jacket.

6. At all support positions, other than those where the insulated pipe support block is surrounded by a clip or saddle in direct contact with the block, a block designed to accept the loads generated by the pipe shall be presented to the engineer for approval.
7. In all cases where roller supports are used, the length of the insulation and the wearing plate where fitted shall extend beyond the limits of the pipe movement.
8. Variations: Pipe loads greater than those generated at the support centers shown in the HLB Block Support Centers Table shall be referred to the manufacturer to establish the length and density of the insulated support block.

E. HLB Block Support Centers Table:

Nominal Pipe Size (Inches)	3/4	1	1 1/4	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24
Max support centers (feet) Sch 80 pipe filled with water covered with 1" of Standard Insulation	6.5	6.5	6.5	10	10	10	10	10	14	14	14	20	20	20	20	20
Metal Saddle Gauge (Galvanized Steel)	22	22	22	20	20	20	16	14	14	14	14	14	14	14	14	14
Length of HLB Block (inches)	6	6	6	6	6	6	6	9	9	9	9	9	9	12	12	12

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below.
   1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
      a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: As specified in Section 230553 – Identification for HVAC Piping and Equipment.. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless steel jackets.

3.10 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Engage a qualified testing agency to perform tests and inspections.

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

D. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer or Commissioning Authority, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection is limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

E. All insulation applications will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Insulation conductivity and thickness per pipe size comply with schedules in this Section or with requirements of authorities having jurisdiction, whichever is more stringent.

B. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

C. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Underground piping.
   2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Chilled Water and below:
   1. NPS 3 to NPS 12 and Smaller: Insulation is one of the following:
      a. Cellular Glass: 1-1/2 inch thick.
   2. NPS 14 and Larger: Insulation is one of the following:
      a. Cellular Glass: 2 inches thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water:
   1. All Pipe Sizes: Insulation is one of the following:
      a. Cellular Glass: 3 inches thick.

3.14 OUTDOOR, UNDERGROUND, PIPING INSULATION SCHEDULE

A. Insulation for belowground piping is specified in Section 232113.13 "Underground Hydronic Piping".

B. Chilled Water, All Sizes: Cellular glass, 2 inches thick.

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:
   1. PVC, Color-Coded by System: 20 mils thick.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping:
   1. Painted Aluminum, Smooth: 0.020 inches thick.

3.17 EXISTING INSULATION REPAIR

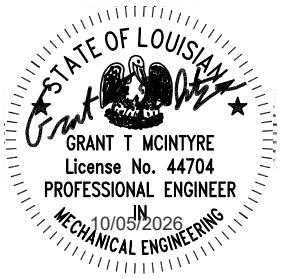
A. Insulation which has been wet, whether dried or not, is considered damaged and shall be replaced.

B. Replace damaged sections of existing mechanical insulation, both previously damaged, and damaged during this construction period, with new materials. Use insulation of same thickness as existing insulation, install new jacket lapping and seal over existing.

C. Protection and Replacement: Replace all damaged insulation which cannot be repaired satisfactorily, including insulation with vapor barrier damage.

D. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 09 00 – BUILDING AND AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Refer also to General Requirements Division 01 Specification Sections and all other Division 23 Specification Sections included in this contract.

1.2 SUMMARY

A. Furnish a totally native BACnet-based system. The system shall integrate with the Alerton Compass BAS workstation, located on the Southern University Baton Rouge Server. Coordinate with SUBR IT for IT connection to system. All systems shall interface with existing control system for complete energy optimization. See sequence of operations for details. The operator's workstation, all building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135–2008, BACnet. In other words, all workstations and controllers, including unitary controllers, shall be native BACnet devices. No gateways shall be used for communication to controllers installed under this section.

B. The existing tertiary Alerton VIP controllers at included buildings are to remain. Expansion Modules to be added where existing VIP controllers are in place. If a controller is not present in tertiary or hot water mechanical room, add a VIP and expansion module(s) as needed. Replace any VLC controllers to VIP/VXIO controllers for consistency.

C. Provide a BAS that can perform monthly backups of system, including firmware and DDC in field controllers, through duration of warranty. This function shall be performed through Compass and saved on server. Contractor shall also maintain a copy.

D. Provide necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including terminal device or unitary controllers and space temperature sensors.

E. Gateways may be used for communication to new and existing boilers, chillers, or large self-contained Air Handlers installed under other sections. However, the Gateways shall be provided by Alerton or developed specifically for equipment provided. Third-party and private labeled third-party gateways are not allowed.

F. Existing operator workstation to remain. BAS contractor to provide training on new system and confirm that mobile workstations (iPads) can see new controllers. SUBR IT Department to coordinate remote connections and IT drops if necessary.

G. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

H. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

I. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

J. Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.

K. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.

L. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

M. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.

N. Provide a comprehensive operator and technician training program as described herein. The installing contractor shall have at least 5 ACE certified engineers on staff at all times.

O. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

P. Provide new sensors, dampers, valves, flow meters, energy meters and install only new electronic actuators. No used components shall be used as any part or piece of installed system unless otherwise noted.

1.3 QUALITY ASSURANCE

A. The DDC Controls utilizing BACnet over IP shall be the following system that interfaces with the campus wide Energy Management / Temperature Control System:
   1. Alerton

B. The Installer shall be authorized representative of the Control System Manufacturer and has been installing automation/temperature controls systems for a minimum of (5) years.

C. All products used shall be new, currently under manufacture and be standard off the shelf products. This installation shall not be a test site unless approved by the Engineer in writing. Spare parts shall be available for at least 5 years after completion of this contract. Single source responsibility of the controls contractor shall include installation, calibration, programming, and check-out of the stand-alone subsystems, as well as the complete operation of the integrated system.

D. Contractors Qualifications: Temperature controls contractor shall have a local office within 70 miles of the project for at least 5 years, staffed by trained personnel capable of providing instruction, routine maintenance and emergency service on systems. Provide proof of qualifications within 14 days of award of the contract to the BAS contractor.

E. Provide record of successful installation of similar size, performed by Contractor submitting the tender, showing successful experience with similar mechanical equipment, systems and Direct Digital Controls.

F. Provide proof of having access to local supplies of essential parts and provide 7 year guarantee of availability of compatible spare parts after manufacturer's declaration of obsolescence.

G. Provide proof of having in-house staff with expertise in pneumatic controls where applicable.

H. The Energy Management Control System (EMCS) shall be designed, installed, commissioned, and serviced by manufacturer authorized and trained personnel. System provider shall have a local in-place support facility site with technical staff, spare parts inventory, and necessary test and diagnostic equipment.

I. The Bidder shall be regularly engaged in the design, installation and maintenance of BAS systems and shall have demonstrated technical expertise and experience in the design, installation and maintenance of BAS systems similar in size and complexity to this project.

J. A single EMCS Contractor shall be used on the project. The EMCS Contractor shall furnish and install all controllers, sensors, etc. unless factory affixed to the Mechanical Equipment.

K. All Control Valves shall be provided by the Controls Contractor with control wiring by the EMCS Contractor and installation of the valve by Mechanical. Electrical Wiring (if applicable) shall be by properly licensed contractor.

L. Responsibility: The EMCS Contractor shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished. The EMCS Contractor shall work with the Mechanical Equipment Startup Technician to furnish integration configuration information such as Devices Instance, Mac Address, Baud Rate, etc.

M. All Alarms from Compass Software to be field tested and verified by the Central Plant Manager, Mechanical Engineer, SU Facility Manager, and Controls Contractor before completion of job. A full list of Alarm Points to be requested from the Central Plant Manager in writing prior to commission of the system. Points not requested in advance of commissioning may not be programmed.

N. All engineering and drawings required for developing the EMCS and the related project submittal and installation packages shall be produced by the manufacturer or the EMCS Integrator.

O. Component Testing: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Each and every controller, sensor, and all other DDC components shall be individually tested by the manufacturer prior to shipment.

P. Tools, Testing and Calibration Equipment: The EMCS supplier shall provide all tools, testing, and calibration equipment necessary to ensure reliability and accuracy of the system.

Q. Conduct a Point to Point Testing of Graphics, Input/Outputs of Controllers and end devices in the presence of the Owner. Provide Commissioning Sheets for every point tested in the Final O&M Submittals.

R. The systems control contractor shall be the authorized installing contractor for the manufacturer of the BACnet components.

S. Materials and equipment shall be manufacturer's latest standard design that complies with the specification requirements.

T. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.

U. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

V. Control system shall be engineered, programmed and supported completely by representative's local office that must be within 70 miles of project site.

1.4 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. Reference:
1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
2. ANSI/ASHRAE Standard 135-2008, BACnet.
3. Uniform Building Code (UBC), including local amendments.
4. UL 916 Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
5. National Electrical Code (NEC).
6. FCC Part 15, Subpart J, Class A
7. EMC Directive 89/336/EEC (European CE Mark)
8. UL-864 UUKL listing for Smoke Controls for any equipment used in smoke control sequences.

C. City, county, state, and federal regulations and codes in effect as of contract date.

D. Except as otherwise indicated the system supplier shall secure and pay for all permits, inspections, and certifications required for his work and arrange for necessary approvals by the governing authorities.

1.5 SUBMITTALS

A. Drawings:
1. The system supplier shall submit engineered drawings, control sequence, and bill of materials for approval.
2. Drawings shall be submitted in the following standard sizes: 11" x 17" (ANSI B).
3. Eight complete sets (copies) of submittal drawings shall be provided.

4. One Set of Digital Drawings in PDF/Autocad format shall be provided on Flash Drive.

B. System Documentation – Include the following in submittal package:
   1. System configuration diagrams in simplified block format.
   2. All input/output object listings and an alarm point summary listing.
   3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
   4. Complete bill of materials, valve schedule and damper schedule.
   5. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
   6. Overall system operation and maintenance instructions—including preventive maintenance and troubleshooting instructions.
   7. For all system elements—operator's workstation(s), building controller(s), application controllers, routers, and repeaters,—provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135-2008.
   8. Provide complete description and documentation of any proprietary (non-BACnet) services and/or objects used in the system for Owner approval. Documentation shall include a list integration points.
   9. A list of all functions available and a sample of function block programming that shall be part of delivered system.
   10. Provide a Flash Drive with a copy of all programming files including DDC and Visio Drawings.
   11. File structure, Excel Template and PDF documents for:
      a. Installation and Operationonal Data
      b. Equipment Submittal Data
      c. Maintenance Log
         1) For each piece of equipment.
         2) Include recommended maintenance data.

C. Scheduling (Design, Engineering, Installation, Commissioning)
   1. The vendor shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases. Schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging, and commissioning.

1.6 DELIVERY, STORAGE AND HANDLIING

A. All equipment, ductwork, and materials shall be delivered to the Project Site clean and sealed for protection.

B. Take particular care not to damage the existing construction in performing Work. All finished floors, step treads and finished surfaces shall be covered to prevent any damage by workers or their tools and equipment during the construction of the Project.

C. Equipment and materials shall be protected from rust and dust/debris both before and after installation. Any equipment or materials found in a rusty condition at the time of final inspection must be cleaned of rust and repainted as specified elsewhere in these Specifications.

D. All material affected by weather shall be covered and protected to keep the material free from damage while material is being transported to the Site and while stored at the Project Site.

E. Cap and seal all open ends of piping and conduit during construction to prevent the entrance of foreign matter.

F. All equipment shall be protected during the execution of the Work. All ductwork and equipment shall be sealed with heavy plastic and tape to prevent build-up of dust and debris.

G. All ductwork and air handling equipment shall be wiped down with a damp cloth immediately before installation to ensure complete removal of accumulated dusts and foreign matter.

H. Follow manufacturer's instructions for long and short term storage of materials and equipment.

1.7 WARRANTY

A. Warranty shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from completion of system acceptance.

B. Warranty shall be extended and shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from the date of replacement of any items replaced under this warranty.

C. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours Monday through Friday, 48 hours on Saturday and Sunday.

D. Warranty support services shall be provide on-site by the BAS's INSTALLING (sub)contractor for the entire duration of all trouble shooting and all warranty repair services related to both installation and hardware/software issues for the full warranty period of all devices at no additional cost to Owner.

E. This warranty shall apply equally to both hardware and software.

1.8 RELATED WORK IN OTHER SECTIONS

A. Refer to Instructions to Bidders, Division 0 and Division 1, if included, for related contractual requirements.

B. Refer to Division 23, Heating, Ventilation and Air Conditions
   1. Installation of control valves by Mechanical Contractor
   2. Installation of Dampers or Air Flow Monitors or other Duct Related Devices shall be provided by the Sheet metal Contractor.
   3. Installation of sensor wells, pressure temperature sensors in piping, differential pressure sensors, flow meters, flow switches or other immersion type devices by Mechanical Contractor.

4. Integrated Equipment:
    a. VFD provided by the Mechanical Contractor shall have a BACnet protocol for integration of any/all points requested by this division.
    b. Any EMCS provided shall be integrated in the existing Compass system.

C. Refer to Division 26 Electrical
1. All power wiring to control panel to be supplied by Division 26
2. All power wiring to VAV, FCU or any other terminal unit to power the controls shall be provided by Division 26.
3. All 120 VAC wiring to be provided by Division 26.
4. All actuated valves with separate power source shall have a local disconnect switch mounted within 5 feet and line of site of the actuator.
5. Smoke Detectors for Air Moving Devices, supply and return by HVAC equipment manufacturer.
6. VFD provided by the Controls Contractor shall have a native on-board BACnet protocol for integration of any/all points requested by this division. Notify Owner's Representative in writing immediately upon discovery of any VFD that does not meet this requirement.

D. Refer to Division 28 Electronic Safety and Security
1. Fire Alarm System by Division 28.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Ascent Compass by Alerton

B. All Hot Water Plant controllers to match the current Alerton VIP + VXIO expandable format. Use a VXIO expansion module(s) to expand VIP controller where available.

2.2 ADVANCED WORKSTATION (AWS)

A. General structure of workstation interaction shall be a standard client/server relationship with web server embedded in the server for browser only access. Server shall be used to archive data and store system database. The Operator's Advanced Workstation in the District's Data Center maintained by Technology and Maintenance Departments shall be utilized without installation of any additional Integration / Management Software. The AWS shall support operation in a virtualized server environment. Thick and web clients shall access server for all archived data.
1. A single server license shall:
    a. Allow a minimum of 50 thick client seats/installations.
    b. Allow a minimum of 200 web client users.
    c. Not restrict system size based on point count (BACnet or Integration).

B. Data Displays
1. Data displays shall render all data associated with project as called outdrawings and/or object type list supplied. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD or Visio drawing files of field installation drawings, and wiring diagrams from as-built drawings.

2. Data displays shall render data using iconic graphic representations of all mechanical equipment. System shall be capable of displaying graphic file, text, trendlog, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user.
3. Data display frame shall allow user to change all field-resident AWS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc., from any screen, no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.
4. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic.
5. All displays and programming shall be generated and customized by the local use energy management and control system (EMCS) supplier and installer. Systems requiring factory development of graphics or programming of DDC logic are specifically prohibited.
6. AWS shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. AWS shall include a library of equipment graphic components to assemble custom graphics. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.
7. A navigation tree for building, equipment and system diagnostic centric display organization shall be available from data display view. The tree navigation contents shall be customizable on a per-user and per-group basis.
8. Each display may be protected from viewing unless operator credentials have the appropriate access level. An access level may be assigned to each display and system object. The menu label shall not appear on the graphic if the operator does not have the appropriate security level.
9. Data displays shall have the ability to link to content outside of the EMCS system. Such content shall include, but is not limited to launching external files in their native applications (for example, a Microsoft Word document).
10. A single system software license can support a minimum of 200 user accounts and web access. Data displays shall support:
    a. Graphic items with custom geometry that offer both color gradient shading and variable opacity in scale to system variables, both analog and digital, and color range settings. For example, rooms on a floor plan graphic can be made to indicate the space temperature by varying the color of that room.
    b. Clear and custom geometry navigation buttons to provide intuitive navigation to system display or external URLs.
    c. Graphic files in JPG, PNG, and GIF file types.
    d. Viewing of up to 1,024 system data points (Analog, Binary, and/or Multi-state) in a single screen.
    e. Customizable mouse-over tooltip information of graphic items or data 23 09 00-8 points can be displayed. The tooltips can be turned on and off. The default setting is off.

f. Right click capability to directly access system functionality, such as Schedule, Trendlogs, and Alarms associated with a display object selected.

g. Automatic zooming to the screen size detected to maximize the size of the display to match screen display area available. The zoom capability can be enabled or disabled, default is enabled. The background color, if solid, will be used to flood fill the remaining screen background.

h. Supports user configurable embedded Data Viewer for a persistent trend log data view to accompany system data and graphic information on a single display.

C. Password Protection

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's assigned functions when user is logged on. This includes displays as outlined above.
2. AWS shall provide security for a minimum of 200 users. Each user shall have an individual User ID, User Name, and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID, User Name, and Password shall be shall support a minimum of 40 characters. All user information and passwords shall be stored in an encrypted form.
3. Each user shall be allowed individual assignment of only those control functions, menu items, navigation tree, and user-specific system start display, as well as restricted access to discrete BACnet devices to which that user requires access.
4. All passwords, user names, and access assignments shall be adjustable via Server and Thick client. Password shall be adjustable via the web client.
5. Users shall also have a set access level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct access levels for assignment to users.
6. The AWS and Thick Client shall include an Auto Logout feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.
7. The system shall permit the assignment of an effective date range, as well as an effective time of day, that the User IDs are permitted to authenticate.

D. Operator Activity Log

1. An Operator Activity Log that tracks all operator changes and activities shall be included with AWS. System shall track what is changed in the system, who performed this change, date and time of system activity, and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation. Operator shall be able to print the Operator Activity Log display.
2. Log shall be gathered and archived to a hard drive on AWS as needed. Operator shall be able to export data for display and sorting in a spreadsheet.
3. System shall have the option to require user comment recording in the Operator Activity Log upon any system point change.
4. Operator Activity log shall be accessible via the Web Client for viewing, sorting, filtering, and Printing.

E. Scheduling

1. AWS, Thick Client and Web Client shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily, with events being the highest.
2. Holiday and special event schedules shall display data in calendar format. Operator shall be able to schedule holidays and special events directly from these calendars.
3. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate access privileges.
4. AWS and Thick Client shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.
5. Scheduling shall include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and history of previous starts. Each and every individual zone shall have optimum start time independently calculated based on all parameters listed. User shall input schedules to set time that occupied setpoint is to be attained. Optimum start feature shall calculate the startup time needed to match zone temperature to setpoint. User shall be able to set a limit for the maximum startup time allowed.
6. Schedule list shall show all schedules currently defined. This list shall include all standard, holiday and event schedules. In addition, user shall be able to select a list that shows all scheduled points and zones.
7. Display of all three schedules must show all ON times for standard, holiday and event schedules in different colors on a given day. In addition, OFF times for each must also be shown in additional colors. User shall be able to select from standard calendar what days are to be scheduled and same display shall show all points and zones affected. User shall be able to set time for one day and select all days of the week that shall be affected as a recurrence of that same schedule for that given day.
8. Any displayed data that is changeable by the operator may be selected using the right mouse button and the schedule shall then be selectable on the screen. Selection of the schedule using this method shall allow the viewing of the assigned schedule allow the point to be scheduled.
9. Schedule editor shall support drag-n-drop events and holidays onto the schedule calendar.
10. Schedule editor shall support drag-n-drop events default to a two-hour period, which can then be adjusted by the user.
11. Schedule editor shall support drag-n-drop holidays default for OFF all day and can be edited for multiple-day holidays.
12. Schedule editor shall support the view of affected zones when adding or editing timed events of a schedule.
13. The web client shall have the ability to search a list of all scheduled points and zones to access the schedule calendar.
14. Schedule time blocks shall present schedule detail via mouse-over information.

F. Alarm Indication and Handling

1. AWS shall provide visual, printed, and email means of alarm indication. Printout of alarms shall be sent to the assigned terminal and port. Alarm notification can be filtered based on the User ID's authorization level.
2. Web client shall display a persistent alarm state for the system regardless of the data view including points in alarm but not acknowledged, and points that have gone into alarm and returned to normal without being acknowledged.
3. Alarm History shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the AWS. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment, and identification of operator acknowledging alarm.
4. Alarm messages shall be in user-definable text (English or other specified language) and shall be delivered either to the operator's terminal, client or through remote communication using email (Authenticated SMTP supported).
5. AWS, Thick Client, and Web Client shall allow for set up of alarms. UI shall walk user through all steps necessary for alarm generation. Alarm creation may be started by right-clicking on value displayed on graphic and then selecting Alarm setup.
6. Web client shall support color-coded indication of current alarms as follows:
    a. Red indicator shows number of active alarms that have not been acknowledged.
    b. Yellow indicator shows number of alarms that are still active but have been acknowledged.
    c. Blue indicator shows number of alarms that have returned to normal but have not been acknowledged.
    d. Color-coded indicators, when selected by the user, navigate to a pre-filtered view of alarm history.
    e. Alarm history can be filtered by color-coded indicator states.
    f. Alarm annunciation includes navigation link to a user-selected display or URL.
    g. Any displayed data that is changeable by the operator may be selected using the right mouse button and the alarm shall then be selectable on the screen. Selection of the alarm using this method shall allow the viewing of the alarm history or allow the creation of a new alarm.

G. Trendlog Information

1. AWS shall periodically gather historically recorded data stored in the building controllers and store the information in the system database. Stored records shall be appended with new sample data, allowing records to be accumulated. Systems that write over stored records shall not be allowed unless limited file size is specified. System database shall be capable of storing up to 50 million records before needing to archive data. Samples may be viewed at the web client. All trendlog records shall be displayed in standard engineering units.
2. AWS shall be capable of trending on an interval determined by a polling rate, or change-of-value.
3. AWS, Thick client, or Web Client shall be able to add and edit trendlogs and the setup information. This includes the information to be logged as well as the interval

at which it is to be logged. All operations shall be password protected. Viewing may be accessed directly from any and all graphics on which a trended object is displayed.

4. AWS and Thick Client shall include a Trendlog Wizard for setup of multiple trend logs simultaneously. Wizard shall walk user through all necessary steps. Wizard shall have its own pull-down selection for startup, or may be started by right-clicking on value displayed on graphic, and then selecting Trendlogs from the displayed menu.
5. AWS shall operate on one virtualized server while the Microsoft SQL runs on a separate virtualized server for the system database. Provide all licensing necessary Microsoft SQL.
6. Any displayed data that is changeable by the operator may be selected using the right mouse button and the trendlog shall then be selectable from a menu on the screen. Selection of the trendlog using this method shall allow the viewing of the trendlog data in the DataViewer.
7. DataViewer shall provide:
    a. Software that is capable of graphing the trend-logged object data shall be included.
    b. Access and ability to create, edit and view are restricted to users by user account credentials
    c. Specific and repeatable URL defines the trendlog(s) views for browser bookmarking and email compatibility.
    d. Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
    e. Trendlog or Energy log and companion logs can be configured to display on one of two independent vertical scales embedded in the display.
    f. Click zoom for control of data set viewed along either graph axis.
    g. User-specifiable start and end dates as well as a fast scroll features that supports click zoom of macro scale view of the data for quickly finding data set based on visual signature.
    h. User export of the viewed data set to MS Excel.
    i. Web browser-based help.
    j. Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.

H. Energy Log Information

1. AWS shall be capable of periodically gathering energy log data stored in the field equipment and archive the information. Archive files shall be appended with new data, allowing data to be accumulated. Systems that write over archived data shall not be allowed unless limited file size is specified. Display all energy log information in standard engineering units.
2. All data shall be stored in database file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing operations.
3. AWS operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. System shall support using flow and temperature sensors for BTU monitoring.
4. AWS shall display data in tabular format form for both consumption and peak

values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.

5. Web client shall display data in tabular format and graphical format. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.

I. Demand Limiting

1. AWS shall include demand limiting program that includes two types of load shedding. One type of load shedding shall shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding shall adjust operator-selected control setpoints in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.
2. Binary shedding shall include minimum of five (5) priority levels of equipment shedding. All loads in a given priority level shall be shed before any loads in a higher priority level are shed. Load shedding within a given priority level shall include two methods. In one, the loads shall be shed/restored in a “first off-first on” mode, and in the other the loads are just shed/restored in a “first off-last on” (linear) fashion.
3. Analog shed program shall generate a ramp that is independently used by each individual zone or individual control algorithm to raise the appropriate cooling setting and lower appropriate heating setting to reduce energy usage.
4. AWS shall be able to display the status of each and every load shed program. Status of each load assigned to an individual shed program shall be displayed along with English description of each load.

J. Tenant Activity

1. AWS shall include program that monitors after-hours overrides by tenants, logs that data, and generates a bill based on usage and rate charged for each tenant space. Tenant Activity program shall be able to assign multiple zones, from a list of every zone connected to system, to a particular tenant. Every zone is monitored for after-hours override usage and that data logged in AWS. Operator may then generate a bill based on the usage for each tenant and the rate charged for any overtime use.
2. Configuration shall include entry of the following information for use in logging and billing:
    a. Tenant’s contact name and address
    b. One or multiple tenant zones that make up a total tenant space, including a separate billing rate for each separate zone
    c. Minimum and maximum values an event duration and event limit
    d. Property management information
    e. Overall billing rate
    f. Seasonal adjustments or surcharge to billing rate
    g. Billing notification type including, but not limited to printer, file and email
    h. Billing form template
3. Logging shall include recording the following information for each and every tenant event:
    a. Zone description
    b. Time the event begins

c. Total override time
d. Limits shall be applied to override time

4. A tenant bill shall be generated for a specific period using all the entered configuration data and the logged data. User with appropriate security level shall be able to view and override billing information. User shall be able to select a billing period to view and be able to delete events from billing and edit a selected tenant activity event's override time.

K. Reports

1. AWS shall be capable of periodically producing reports of trendlogs, alarm history, tenant activities, device summary, energy logs, and override points. The frequency, content, and delivery are to be user adjustable.
2. All reports shall be capable of being delivered in multiple formats including text- and comma-separated value (CSV) files. The files can be printed, emailed, or saved to a folder, either on the server hard drive or on any network drive location.

L. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable terminology with simple mouse/cursor key movements.
2. The building management system (BMS) shall operate the user interface in any region and support varying languages and locale settings, without the addition of special software. Localization tools shall be commonly available open sourced or purchased products, No BMS manufacturer specific software will be acceptable. The following localization capabilities shall be supported:
   a. Locale settings related to date, time and number formats
   b. Multiple left-to-right languages supported including Cyrillic languages
   c. On the fly locale change using browser language settings (multiple language and locale setting change)
   d. Default character encoding shall be UTF-8
   e. Each localized BMS element can be localized independently and operate autonomously

M. Field Engineering Tools

1. AWS shall include field engineering tools for programming all controllers supplied. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.
2. User shall be able to select a graphical function block from menu and place on screen. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.
3. Programming tools shall include a real-time operation mode. Function blocks shall display real-time data and be animated to show status of data inputs and outputs when in real-time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

4. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled. Supply minimum of 250 applications as part of workstation software.
5. Field engineering tool shall include Device Manager for detection of devices connected anywhere on the BACnet network by scanning the entire network. This function shall display device instance, network identification, model number, and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computer's hard drive. If needed, this file shall be downloaded to the appropriate controller using the mouse.
6. AWS shall automatically notify the user when a device that is not in the database is added to the network.
7. AWS shall include backup/restore function that will back up entire system to selected medium and then restore system from that medium. The system shall be capable of creating a backup for the purpose of instantiating a new client PC.
8. The system shall provide a means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.

N. Workstation Hardware
1. Owner shall provide virtualized server and Owner shall assist in installing software
on the server. EMCS Contractor Laptop Computer.

O. Software
1. At the conclusion of the project, contractor shall leave with owner a electronic copy
that includes the complete software operation system and project graphics, setpoints, system parameters, etc. This backup shall allow the owner to completely restore the system in the case of a computer malfunction.

P. Web Client
1. EMCS supplier shall provide an HTML5-based browser access to the AWS as part of standard installation. User must be able to access all displays of real-time data that are part of the AWS using a standard web browser. Web browser shall tie into the network through owner-supplied Ethernet network connection. The web client shall support a minimum of 200 users with a single license.
2. Browser shall be standard version of Microsoft Internet Explorer v10.0 or later, Firefox v19.0 or later, Chrome v24.0 or later, and Safari v7.1.1 or later. No special vendor-supplied software shall be needed on computers running browser. Data shall be displayed in real-time and update automatically without user interaction.
3. Web pages shall be automatically generated using HTML5 from the data display files that reside on the AWS. Any system that requires use of an HTML editor for generation of web pages shall not be considered.
4. Access through web client or thick client shall utilize the same hierarchical security scheme as the AWS. User shall be asked to log on once the client makes

connection to the AWS. Once the user logs on, any and all changes that are made shall be tracked by the AWS. The user shall be able to change only those items he or she has authority to change. A user activity report shall show any and all activity of the users who have logged on to the system, regardless of whether those changes were made using a web client, thick client or through the AWS.

5. Shall provide User Session Management including the ability to view all connected user sessions to the web client, see how long they have been active/inactive for each unique session, and force log-out for any or all sessions.
6. Shall provide menu-style navigation access to primary features, i.e. alarm history, DataViewer, Search scheduled points and Zones, System Activity, User Session Management, and Top Display
7. Web client shall, at a minimum, support the following tablets:
8. Android platform:
    a. Google Nexus
    b. Samsung Galaxy Note
9. Apple platform
    a. Ipad
    b. Apple Ipad Mini

Q. Equipment Folder Data:
1. Include in bid providing the following for the desktop PC:
    a. File Folder including equipment and material – labeled by equipment tag or material type and use:
        1) Installation and Operational Data
        2) Submittal Data
    b. Excel File and Sheets to Include:
        1) Maintenance data log.
        2) Recommended maintenance schedule.

2.3 BUILDING CONTROLLER

A. General Requirements
1. BACnet Conformance
    a. Building Controller shall be approved by the BTL as meeting the BACnet Building Controller requirements.
    b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
2. Building controller shall be of scalable design such that the number of trunks and protocols may be selected to fit the specific requirements of a given project.
3. The controller shall be capable of panel-mounted on DIN rail and/or mounting screws.
4. The controller shall be capable of providing global control strategies for the system based on information from any objects in the system, regardless if the object is directly monitored by the building controller module or by another controller.

5. The controller shall be capable of running up to six (6) independent control strategies simultaneously. The modification of one control strategy does not interrupt the function or runtime others.
6. The software program implementing the DDC strategies shall be completely flexible and user-definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, using a wide area network (WAN) or downloaded through remote communications are not acceptable. Changing global strategies using firmware changes is also unacceptable.
7. Programming shall be object-oriented using control function blocks and support DDC functions. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.
8. The programming tool shall provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed using the operator's workstation or field computer.
9. Controller shall have 6,000 Analog Values and 6,000 Binary Values.
10. Controller IP configuration can be done via a direct USB connect with an operator's workstation or field computer.
11. Controller shall have at a minimum a Quad Core 996Ghz processor to ensure fast processing speeds.
12. Global control algorithms and automated control functions shall execute using a 64-bit processor.
13. Controller shall have a minimum of 1 GB of DDR3 SDRAM on a 533Mhz bus to ensure high speed data recording, large data storage capacity and reliability.
14. Controller shall support two (2) on-board EIA-485 ports capable of supporting various EIA-485 protocols including, but not limited to BACnet MS/TP and Modbus.
    a. Ports are capable of supporting various EIA-485 protocols including, but not limited to BACnet MS/TP and Modbus.
15. Controller shall support two (2) ports—each of gigabit speed—Ethernet (10/100/1000) ports.
    a. Ports are capable of supporting various Ethernet protocols including, but not limited to BACnet IP, FOX, and Modbus.
16. All ports shall be capable of having protocol(s) assigned to utilize the port's physical connection.
17. The controller shall have at a minimum four (4) onboard inputs, two (2) universal inputs and two (2) binary inputs.
18. Schedules
    a. Building controller modules shall provide normal seven-day scheduling, holiday scheduling and event scheduling.
    b. Each building controller shall support a minimum of 380 BACnet Schedule Objects and 380 BACnet Calendar Objects.
19. Logging Capabilities
    a. Each building controller shall log as minimum 2,000 objects at 15-minute intervals. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
    b. Logs may be viewed both on-site or off-site using WAN or remote communication.

c. Building controller shall periodically upload trended data to networked operator's workstation for long¬term archiving if desired.
d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

20. Alarm Generation
    a. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
    b. Each alarm may be dialed out as noted elsewhere.
    c. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
    d. Controller must be able to handle up to 2,000 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.
21. Demand Limiting
    a. Demand limiting of energy shall be a built-in, user-configurable function. Each controller module shall support shedding of up to 1,200 loads using a minimum of two types of shed programs.
    b. Load shedding programs in building controller modules shall operate as defined in section 2.1.J of this specification.
22. Tenant Activity Logging
    a. Tenant Activity logging shall be supported by a building controller module. Each independent module shall support a minimum of 380 zones.
    b. Tenant Activity logging shall function as defined in section 2.1.K of this specification.

B. BACnet MS/TP
1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4Kbps
    a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum.
    b. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. BACnet IP
1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the local area network (LAN).
2. Must support interoperability on WANs and campus area networks (CANs), and function as a BACnet Broadcast Management Device (BBMD).
3. Each controller shall support at a minimum 128 BBMD entries.
4. BBMD management architecture shall support 3,000 subnets at a minimum.
5. Shall support BACnet Network Address Translation.
6. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

D. Expansion Ports
1. Controller shall support two (2) expansion ports.

a. Combining the two on-board EIA-458 ports with fully loaded expansion ports, the controller shall support six (6) EIA-485 trunks simultaneously.

2. Expansion cards that mate to the expansion ports shall include:
   a. Dual port EIA-485 card.
   b. LON network card.

E. Niagara Framework
1. Controller shall utilize the Tridium Niagara Framework.
   a. Niagara Framework shall be version 3.8 or newer.
   b. All Niagara licensing shall be stored on a removable MicroSD card for fast in-field replacement of controller.
2. The Niagara License for the controllers shall be an open license.
   a. The controller shall be programmable via Niagara Workplace programming tool.
   b. The controller shall be programmable via an Niagara embedded Workplace programming tool.

F. Power Supply
1. Input for power shall accept between 17 and 30VAC, 47 and 63Hz.
2. Optional rechargeable battery for shutdown of controller including storage of all data in flash memory.
3. On-board capacitor will ensure continuous operation of real-time clocks for minimum of 14 days.

G. Controller shall be in compliance with the following:
1. UL 916 for open energy management
2. FCC Class B
3. ROHS
4. IEC 60703
5. C-Tick Listed

H. Controller shall operate in the following environmental conditions:
1. -4 to 149 °F (-20 to 65 °C) without optional battery, or 32 to 122 °F (0 to 50 °C) with optional battery.
2. 0 to 95% relative humidity (RH), non-condensing.

2.4 CENTRAL PLANT AND AIR HANDLER APPLICATION CONTROLLERS

A. Provide one or more native BACnet application controllers for each air handler and provide native BACnet application controllers as needed for central plant control that adequately cover all objects listed in object list. All controllers shall interface to building controller through either MS/TP LAN using BACnet protocol, or Ethernet LAN using BACnet over Ethernet or BACnet TCP/IP. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable using graphical programming blocks. Programming tool shall be resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

B. BACnet Conformance

1. Application controllers shall be approved by the BTL as meeting the BACnet Advanced Application Controller requirements.
2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Multi-state Values, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0– 10VDC, Platinum 1000 ohm RTD, 0–5VDC, 4–20mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of three inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs with 12-bit resolution shall support either 0–10VDC or 0–20mA. Binary outputs shall have LED indication of status. Software shall include scaling features for analog outputs. Application controller shall include 20VDC voltage supply for use as power supply to external sensors.
1. All outputs must have onboard Hand-Off-Auto (HOA) switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.
2. The position of each and every HOA switch shall be available system wide as a BACnet object property.

D. All program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal.
1. The following control blocks shall be supported:
    a. Natural Log
    b. Exponential
    c. Log base 10
    d. X to the power of Y
    e. Nth square root of X
    f. 5th Order Polynomial Equations
    g. Astronomical Clock (sunrise/sunset calculation)
    h. Time based schedules

E. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely using modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on

screen. Application controller shall be programmed using programming tools as described in operator's terminal section.

F. Application controller shall include support for intelligent room sensor (see Section 2.10.B.) Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode, based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

G. Schedules
   1. The controller shall support a minimum of 3 BACnet Schedule Objects and have a real time clock on board with battery backup to maintain time through a power loss.

H. Logging Capabilities
   1. Controller shall support a minimum of 50 trendlogs. Any object in the controller (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
   2. Controller shall periodically upload trended data to system server for long-term archiving if desired. Archived data stored in (MS Jet Database or SQL) database form and shall be available for use in third-party spreadsheet or database programs.

I. Alarm Generation
   1. Alarms may be generated within the controller for any object change of value or state (either real or calculated). This includes things such as analog object value changes, and binary object state changes.
   2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
   3. Controller must be able to handle up to 25 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

J. The controller processor shall be a 32-bit processor.

K. The packaging of the controller shall provide operable doors to cover the terminals once installation is complete. The housing of the controller shall provide for DIN rail mounting and also fully enclose circuit board.

2.5 SENSORS AND MISCELLANEOUS DEVICES

A. Provide water flow (GPM) meters as required by the points list or the sequence of operations and sized as required for proper operation.
   1. Manufacture
      a. Onicon
   2. Provide snubbers for all water flow switches and water DP sensors.

B. All temperature sensors, including duct, immersion, wall or others shall be 10K type 2, no exceptions.

C. Provide status indication for all pump motors, fans and other load devices (including exhaust fans) with a field adjustable amp drop current transformer (CT) switch to detect belt loss, mechanical failure or sheared couplings.
   1. Manufacture:
      a. Veris Industries
   2. Self adjusting CTs are not allowed.
   3. Provide VFDs Compatible CTs capable of sensing amp draw over the full range of the VFD.
   4. CTs shall not include other on-board functions such as start/stop relay.

D. Provide a panel mount 100VA Power Supply at each controller panel for protection of all controllers in the panel.
   1. Manufacture:
      a. Functional Devices, Inc.
   2. Provide an over current protection.
   3. Provide primary power as 120 Vac and Secondary Power as 24Vac with LED Indicator
   4. Provide a 24Vac On /Off Switch and Breaker
   5. Provide onboard 10 amp main breaker to kill power to entire unit.

E. Provide a panel mounted 120 Vac Surge Arrestor for protection of all devices in any panel containing Global or Plant Controllers.
   1. Manufacture:
      a. Ditek Corporation (DTK-120 Model)

F. Provide a single Outside Air Temperature Sensor with Humidity tied to the BAS for a monitoring site conditions and enabling boilers, chillers, and/or cooling towers through the DDC.
   1. Provide a unit an operating temperature range from -10 F or lower to 120 F or higher with an accuracy of +/¬1F through out the specified range.
   2. Mount the unit in a location approved by the Owner. Location selected should be on the north side of a building, a minimum of 96 inches above grade, away from penetrations including doors and windows, and in an area with good air circulation.
   3. Provide an aluminum cover over the unit open on both sides for air circulation.
   4. Provide aluminum blocking with an air space or other suitable means of mounting the sensor to walls or soffits to prevent unit from picking up radiant heat from the building.
   5. Separate Outside Air Temperature sensors for boilers, chillers, cooling towers, etc. is NOT allowed.

L. Provide a self contained relay with a status light for all start/stop commands on motor starters or drives connected to pumps, chillers, boilers, and cooling towers, etc.
   1. Manufacture:
      a. Functional Devices (Relay in a Box or RIB)
   2. This device shall be visible for quick status indication by end user and shall not be mounted inside of any cabinets or panels.
   3. The installing (sub) contractor shall provide relays wherever necessary to allow for a complete installation of the system.

M. Provide dry contact type relays where necessary to complete installation.

1. Relays shall be full feature relays with LED status indicator, integral over ride lever and push to test feature.
2. Relay bases shall be mounted to cabinets using a DIN Rail system.
3. Relays shall have separate bases by same manufacture as the relay itself.
4. Relays used for On/Off control shall use momentary pulsed relays. Magnetically latched relays shall not be used.
5. The installing (sub) contractor shall provide relays wherever necessary to allow for a complete installation of the system.

2.6 ELECTRONIC CONTROL VALVES

A. Quality Assurance for electronic control valves
   1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
   2. NEMA 1 rated enclosures for inside mounting
   3. NEMA 4 rated enclosures for outside mounting or exposure.

B. Execution Details
   1. Each DDC analog output point shall have an actuator feedback signal, independent of control signal, wired and terminated in the control panel for true position information and troubleshooting. Or the actuator feedback signal may be wired to the DDC as an analog input for true actuator position status.
   2. Terminal Unit valves shall be Analog (2-10vdc, 4-20ma).
   3. Booster-heat valve actuation shall be Analog (2-10vdc, 4-20ma).
   4. Primary valve control shall be Analog (2-10vdc, 4-20ma).
   5. Valve Sizing for Water Coil
      a. On/Off Control Valves shall be line size.
      b. Modulating Control Valve Body Size may be reduced at most two pipe sizes from the line size or not less than 1/2 the pipe size. The BAS contractor shall size all water coil control valves for the application as follows:
         1) Booster-heat valves shall be sized not to exceed 4-9 PSI differential pressure. (Size valve for 50% valve authority). Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
         2) Primary valves shall be sized not to exceed 5-15 PSI differential pressure. (Size valve for 50% valve authority). Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
         3) Butterfly valves shall be sized for modulating service at 60-70 degree rotation. Design velocity shall be 12 feet per second or less when used with standard EPDM seats.
      c. Valve mounting arrangements shall comply with the following:
         1) Unions shall be provided on all ports of two-way and three-way valves.
         2) Install three-way equal percentage Characterized Control valves in a mixing configuration with the “A” port piped to the coil.
         3) Install 21/2 inch and above, Three-Way globe valves, as manufactured for mixing or diverting service to the coil.
         4) Two-Way valve shall be piped in the return side of the coil in order to minimize ambient heat at the

d. Manufacturers:
    1) Belimo (USA), Inc.
    2) Honeywell, Inc.

C. Control Valves: Factory fabricated of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

D. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.

E. Characterized Control Valves (CCV): Use on terminal units, VAV boxes reheat, fan coil units, blower coil units and unitary heating/cooling.
1. NPS 3" and Smaller: Nickel-plated forged brass body rated at no less than 400 PSI, stainless steel ball and stem, female, NPT union ends with a self-aligning, blowout proof, brass stem with a dual EPDM O-ring packing design. Fiberglas reinforced seats shall be used.
2. NPS 3/4" and Smaller: Nickel-plated forged brass body rated at no less than 600 PSI, chrome plated brass ball and stem, female, NPT union ends with a self-aligning, blowout proof, brass stem with a dual EPDM O-ring packing design. Fiberglas reinforced seats shall be used.
3. A TEFZEL, flow characterizing disc shall be installed in the inlet of two-way valves and in the control port of three-way valves.
4. Sizing:
    a. Two-Position: Line size.
    b. Two-Way Modulating: [3 PSIG] [5 PSIG] or twice the load pressure drop, whichever is more.
    c. Three-Way Modulating: Twice the load pressure drop, but not more than [3 PSIG] [5 PSIG]

F. Combination of actuator and valve shall provide a minimum close-off pressure of 100 PSI.

G. The actuator shall be directly coupled to the valve at the factory. Valve assemblies requiring an extended stem design for actuator coupling are not acceptable.

H. Valves shall have a four-bolt mounting flange to provide a 4 position, field changeable, electronic actuator mounting arrangement

I. Hydronic system globe valves shall have the following characteristics: Use on Chilled Water & Hot Water Bypass valves or modulating applications (do not use on Primary Air Handlers)
1. NPS 2 and Smaller: ANSI Class 250 bronze body, stainless steel stem, brass plug, bronze seat, and a TFE packing.
2. NPS 2-1/2 and Larger: ANSI Class 125 or 250 cast iron body, stainless steel stem, bronze plug, bronze seat, and a TFE V-ring packing.
3. Sizing:
    a. Two-Position: Line size.
    b. Two-Way Modulating: 3 PSIG or twice the load pressure drop, whichever is more.
    c. Three-Way Modulating: Twice the load pressure drop, but not more than 5 PSIG

d. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
e. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system head pressure for two-way valves and 100 percent of the total system differential pressure for three-way valves.
f. Two- and three-way globe valves shall be used only if characterized control valves do not fit the sizing criteria or application.

J. Butterfly Valves: Use on chilled/hot water plant isolation valves, cooling tower bypass valves (do not use on modulating applications other then cooling tower bypass control)
1. NPS 2 to 12: ANSI Class 125/150 and a body pressure rating of 200 PSI with a cast iron body, stainless steel disc, EPDM seat, and an extended neck. Disc-to-stem connection shall utilize an internal spleen. External mechanical methods to achieve this mechanical connection, such as pins or screws, are not acceptable.
2. NPS 14 and Larger: ANSI Class 125/150 and a body pressure rating of 150 PSI with a cast iron body, stainless steel disc, EPDM seat, and an extended neck. Disc-to-stem connection shall utilize a dual-pin method to prevent the disc from settling onto the liner, causing distortion. The shaft shall be supported at four locations by RPTFE bushings.
3. Sizing: Size for a maximum fluid velocity of 12 feet per second (fps).
a. Two-Position: Line size.
b. Modulating: [3 PSIG] [5 PSIG] or twice the load pressure drop, whichever is more. Size for the design flow with the disc in a 60-degree-open-position.
c. Flow Characteristics: Two-way valves shall be modified equal percentage; three-way valves shall be linear.
d. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum bubble-tight close-off rating of 150 percent of total system head pressure for two-way valves and 100 percent of the total system differential pressure for three-way valves.

2.7 ELECTRONIC ACTUATORS

A. Electronic Actuators: Directly couple and mount to a stem, shaft, or ISO-style mounting pad designed for minimum 60,000 full-stroke cycles at rated torque

B. Manufacturers:
1. Belimo (USA), Inc.
2. Honeywell, Inc.

C. Valves: Size for torque required for valve close off at 150 percent of total system (head) pressure for two-way valves; and 100 percent of pressure differential across the valve or 100 percent of total system (pump) head differential pressure for three-way valves.

D. Coupling: V-bolt and V-shaped, toothed cradle. Single point, bolt or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.

E. Mounting: Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required. Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function are not acceptable. Actuators in a tandem pair must be 'off the shelf' standard actuators.

F. Overload Protection: Electronic overload or digital rotation-sensing circuitry. End switches to deactivate the actuator at the end of rotation or magnetic clutches are not acceptable.

G. Fail-Safe Operation: Mechanical, spring-return mechanism. Actuators using internal chemical storage systems, capacitors, or other internal non-mechanical forms of fail-safe operation are unacceptable.

H. Power Requirements (Two-Position Spring Return): 24/120/230 V ac.

I. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.

J. Proportional Actuators shall be fully programmable. Control input, position feedback and running time shall be factory or field programmable by use of a handheld programming device or external computer software Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload and mechanical travel. Programming shall be through an EEPROM. Programming using actuator mounted switches are not acceptable.

K. Temperature Rating: Minus 22 to plus 122 deg F.

L. Noise Level: Non-spring return actuators shall conform to a maximum noise rating of 45dB(A). Spring return actuators shall not produce more than 62 dB(A).

M. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.

2.8 ENCLOSURES

A. All controllers, power supplies and relays shall be mounted in enclosures.

B. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment.

C. Enclosures shall have chrome plated hinges and hardware, powder coat painted white and labeled per the engineered drawings.

D. Provide laminated plastic nameplates for all enclosures in any mechanical room or electrical room. Include location and unit served on nameplate. Laminated plastic shall be 1/8" thick sized appropriately to make label easy to read.

E. All exterior panels shall have a NEMA 4X Stainless Steel Panel, no exceptions.
   1. Manufacturers:
      a. EMF Company
      b. Hoffman Company

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the owners' representative in writing of equipment that differs from the specified equipment or if conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved.

3.2 INSTALLATION (GENERAL)

A. Install in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.3 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 3'-0" clear access space in front of units. Obtain approval on locations from owner’s representative prior to installation.

B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections—sized to suit pipe diameter without restricting flow.

E. Room Temperature Sensor types, such as Stainless Steel Wall Plates with Push Button, VLDs, Microset II, Microset IV, or Micro-Touch Sensors shall be at the discretion of the owner, coordinate with the owner prior to installation.

F. Provide Stainless Steel Wall Plate Sensors with an integral over ride button shall be used in all high occupancy areas including gyms, dining rooms, hallways, etc.

G. On larger Automated Control Valves without an integral over-ride device, provide a 4x4 galvanized junction box rigidly connected directly to the valve actuator with a switch to disconnect power from the actuator allowing for ease of end user over-ride.

3.4 INTERLOCKING AND CONTROL WIRING

A. Furnish and install all wire, conduit, raceways and cable systems required for the complete operation of the Building Management and Control System as outlined in this section. All wiring shall be installed neatly and professionally with this section and in accordance with Division 26 and all National, state and local electrical codes.

B. Provide the completed graphics package prior to Testing and Commissioning the Controls. The EMCS Contractor shall perform a point to point check out and commissioning with the Owner or Owner's Controls Mechanic. The point to point shall begin with disconnecting and verifying every device point, graphic input and control function.

C. All wiring for the Building Management and Control System is specified in this section and includes, but is not limited to;
   1. Wiring of Control instruments
   2. Wiring of Control Panels
   3. Wiring of related power supplies, i.e. transformers.

D. Temperature control wiring shall be jacketed cables installed with or without conduit as specified below or single conductors installed in conduit. Control wiring shall have minimum 300V insulation for low voltage wiring and 600V insulation for line voltage wiring. Provide shielded low capacitance wire for all communications trunks.

E. Line and low voltage control wiring shall not be installed in the same raceway, magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.

F. All line voltage control wiring, and low voltage control wiring in the mechanical, electrical, telephone and boiler rooms shall be installed in raceways or conduit. Sensor wiring to wall sensor to be installed in raceway to the top of the wall cavity with a 90 degree bend for stress relief. All other wiring to be installed neatly and inconspicuously per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum rated cable (without conduit), provided that the wiring run without conduit is properly supported from the building structure on maximum 5' centers and does not depend upon the ceiling grid or the ceiling support system for support. In other words, do not lay the plenum cable on top of the ceiling grid or tile system. Wires shall be tie wrapped on 5' centers and identified at each termination point. All control wiring, either in conduit or plenum cable shall be installed parallel or perpendicular to building lines. Flexible conduits shall be restricted to lengths no longer than six (6) feet with all transitions to flexible conduit made with a junction box.

G. All control wiring exposed to the weather shall be installed in rigid galvanized schedule 40 conduit. Above ground control wiring shall be installed in rigid galvanized conduit. Below ground wiring shall be installed in schedule 40 PVC conduit.

H. All jacketed cables shall be plenum rated in conduit or in plenum areas.

I. All wiring associated with the Building Management and Control System shall have a unique insulation color and specifically labeled by application. All other wiring shall comply with Division 26 insulation identifiers.
   1. Yellow Jacket with "device' printed every 12 inches on center – 18 AWG 2 Conductors, stranded bare copper.
   2. Yellow Jacket with "device" printed every 12 inches on center – 18 AWG 3 Conductors, stranded bare copper.
   3. Raspberry Jacket with "MSTP" printed every 12 inches on center – 22 AWG shielded 2 conductors, stranded bare copper.

J. Panel Wiring:

1. All wiring in panel cans shall be run inside of plastic raceways (Panduit) with covers. (Plastic double sided sticky back's are NOT allowed)
2. All wires terminated to a panel device shall have a Dura-Label Brand Label (Model # DL-4TTP) with computerized printout of the following:
   a. Description of Device Wire
   b. I/O Point Name
   c. Terminal landing identifier.
   d. Stick on, roll tape or any other type of identifier shall not be allowed.
   e. Label Size to be a minimum of 1/2" wide by 2" long.
   f. Do not shrink the label on the wire, leave loose for future service.
   g. Hand written labels, of any type or forbidden.
3. Labels
   a. All panel cans shall have a Phenolic Label on the exterior of the panel can to clearly identify the panel as outlined in the engineered drawings.
   b. Label size minimum to be 2" x 3"
   c. Printed labels are not allowed on panel exteriors.
   d. Panel Labels to be riveted to the panel.
   e. Labels for devices on the panel interior shall be computer generated,
   f. Label each panel device.

PART 4 - SEQUENCE OF OPERATIONS

1. Boiler Manager (typical of 1) – Arts Loop
   a. Hot Water System - Boiler Manager - Run Conditions:
      The hot water system shall be enabled to run whenever:
      1) A call for heating is requested from a connected Building's HWS Pumps
      2) AND the outside air temperature is less than 54°F (adj.).
   b. To prevent short cycling, the boiler manager shall run for and be off for minimum adjustable times (both user definable).
   c. Each boiler shall run subject to its own internal safeties and controls.
   d. Boiler Staging - Three Equal Sized Hot Water Boilers Running in Parallel:
      This section refers to the staging and sequencing of each boiler "train". The sequence of operation for each individual boiler and its associated support equipment (such as pumps) are not included in this section. The Boiler Controls as provided by the Boiler Manufacturer shall enable/disable additional boilers in a "cascading manner" to meet the desired HW Supply Temperature
   e. The controller shall determine the facility heating load and shall stage the boilers on in sequence to meet rising heating demand and dropping main hot water supply temperature where:
   f. Main hot water supply temperature is measured at a point leaving the boiler plant and entering the facility. This point shall be downstream and common to all boilers.
   g. The controller shall determine the facility heating load from:
      1) hws temperature (main hws leaving boiler plant)
      2) hwr temperature (main hwr returning to boiler plant)
   h. The Boiler Management system shall enable/disable associated networked boilers as needed, determined by the load conditions leaving the HW Plant. Each boiler shall control its associated isolation valve when enabled. The Boiler Management System shall operate under it's own control sequences provided by the Boiler Manufacturer.

i. All alarms, and points shall be available for monitoring by the BMS via BACnet interface.

j. The boiler staging order shall be user definable. The designated lead boiler (user definable) shall rotate upon one of the following conditions (user selectable):
   1) manually through a software switch
   2) if boiler runtime (adj.) is exceeded
   3) daily
   4) weekly
   5) monthly

k. Each boiler shall run subject to its own internal safeties and controls. On failure of any boiler, the failed boiler shall be "removed" from operation and the next available piece of equipment as defined by the user shall be staged on in its place.

2. Alarms shall be provided as follows:
   a. Boiler1 Failure: Commanded on, but the status is off.
   b. Boiler2 Failure: Commanded on, but the status is off.
   c. Boiler3 Failure: Commanded on, but the status is off.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Boiler System Enable				X							X
Boiler System Supply Setpoint					X						X
Main Hot Water Return Temp	x								x		x
Main Hot Water Supply Flow	x								x		x
Main Hot Water Supply Temp	x								x		x
Outside Air Temp					x						x
Boiler 1 Failure										x	x
Boiler 2 Failure										x	x
Boiler 3 Failure										x	x
High Main Hot Water Return Temp										x	
High Main Hot Water Supply Temp										x	
Low Main Hot Water Return Temp										x	
Low Main Hot Water Supply Temp										x	
Totals	**3**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**3**	**7**	**7**

Total Hardware (3) **Total Software (11)**

	Hardware Points				Software Points						
Point Name	AI	AO	BI	BO	AV	BV	Loop	Sched	Trend	Alarm	Show On Graphic

3. Single Boiler System (typical of 1) – Engineer Loop
   a. Boiler System Run Conditions:
      The boiler system shall be enabled to run whenever:
      1) A call for heating is requested from a connected Building's HWS Pumps
      2) AND outside air temperature is less than 65°F (adj.).
   b. To prevent short cycling, the boiler system shall run for and be off for minimum adjustable times (both user definable), unless shutdown on safeties or outside air conditions.
   c. The boiler shall run subject to its own internal safeties and controls.
   d. The boiler system shall also run for freeze protection whenever outside air temperature is less than 38°F (adj.).
   e. Hot Water Pump Lead/Lag Operation:
      The two hot water pumps shall operate in a lead/lag fashion.
      1) The lead pump shall run first.
      2) On failure of the lead pump, the lag pump shall run and the lead pump shall turn off.
      3) On decreasing hot water differential pressure, the lag pump shall stage on and run in unison with the lead pump to maintain hot water differential pressure setpoint.
   f. The designated lead pump shall rotate upon one of the following conditions (user selectable):
      1) manually through a software switch
      2) if pump runtime (adj.) is exceeded
      3) daily
      4) weekly
      5) monthly
4. Primary Hot Water Loop Pumps (typical of 2) – Each Boiler Plant
   a. Hot Water Pump Run Conditions:
      The hot water pumps shall be enabled whenever:
   b. The HHWS Boilers are enabled
   c. The pumps shall run for freeze protection anytime outside air temperature is less than 38°F (adj.).
   d. To prevent short cycling, the pump shall run for a minimum time and be off for a minimum time (both user adjustable).
   e. Hot Water Pump Lead/Lag Operation:
      1) The two variable speed hot water pumps shall operate in a lead/lag fashion.
      2) The lead pump shall run first.
      3) On failure of the lead pump, the lag pump shall run and the lead pump shall turn off.
      4) On decreasing hot water differential pressure, the lag pump shall stage on and run in unison with the lead pump to maintain hot water differential pressure setpoint.

5) The designated lead pump shall rotate upon one of the following conditions (user selectable):
    1. manually through a software switch
    2. if pump runtime (adj.) is exceeded
    3. daily
    4. weekly
    5. monthly

f. Hot Water Differential Pressure Control:
1) The controller shall measure hot water differential pressure and modulate the hot water pump VFDs in sequence to maintain its hot water differential pressure setpoint.
    1. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.
        a) The controller shall modulate hot water pump speeds to maintain a hot water differential pressure of 12psi (adj.).
        b) The VFDs minimum speed shall not drop below 20% (adj.).
        c) The differential pressure setpoint at the Central Plant shall reset up and down between min and max values as determined by TAB.
        d) The DP setpoint will increase incrementally as determined by the Differential pressure Sensors at each Campus Side Decoupler. In the event any of the connected building's DP reading is below the Building DP Setpoint, the HWS Plant Differential Pressure Setpoint will increase at 1 psi (adj.) per minute until all Buildings DP setpoints are satisfied.
        e) The DP setpoint will reset downward if all Campus DP Sensors are 2psi (adj.) greater than the setpoint. The DP Setpoint will decrement at 0.5 psi (adj.) per 1 mins (adj.) until one Campus DP reading is at setpoint and none are below.
    2. On dropping hot water differential pressure, the VFDs shall stage on and run to maintain setpoint as follows:
        a) The controller shall modulate the lead VFD to maintain setpoint.
        b) If the lead VFD speed is greater than a setpoint of 90% (adj.), the lag VFD shall stage on.
        c) The lag VFD shall ramp up to match the lead VFD speed and then run in unison with the lead VFD to maintain setpoint.
    3. On rising hot water differential pressure, the VFDs shall stage off as follows:
        a) If the VFDs speeds drops back to 60% (adj.) below setpoint, the lag VFD shall stage off.
        b) The lead VFD shall continue to run to maintain setpoint.
2) Alarms shall be provided as follows:
    1. High Hot Water Differential Pressure: If 25% (adj.) greater than setpoint.

2. Low Hot Water Differential Pressure: If 25% (adj.) less than setpoint.

3) Hot Water Temperature Monitoring
   1. The following temperatures shall be monitored:
      a) Hot water supply.
      b) Hot water return.
   2. Alarms shall be provided as follows:
      a) High Hot Water Supply Temp: If the hot water supply temperature is greater than 200°F (adj.).
      b) Low Hot Water Supply Temp: If the hot water supply temperature is less than 100°F (adj.).

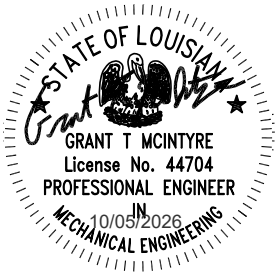
	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Primary Loop Differential Pressure	x								x		x
Primary Loop DP Setpoint					x				x		X
Hot Water Return Temp	x								x		X
Hot Water Supply Temp	x								x		x
Hot Water Primary Flow	x								x		X
Hot Water Pump 1 VFD Speed		x							x		x
Hot Water Pump 2 VFD Speed		x							x		x
Hot Water Pump 1 Status			x						x		x
Hot Water Pump 1 VFD Fault			x							x	x
Hot Water Pump 2 Status			x						x		x
Hot Water Pump 2 VFD Fault			x							x	x
Hot Water Pump 1 Start/Stop				x					x		x
Hot Water Pump 2 Start/Stop				x					x		x
Outside Air Temp					x						x
High Hot Water Supply Temp										x	
Hot Water Pump 1 Failure										x	
Hot Water Pump 1 Running in Hand										x	
Hot Water Pump 1 Runtime Exceeded										x	
Hot Water Pump 2 Failure										x	
Hot Water Pump 2 Running in Hand										x	

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Hot Water Pump 2 Runtime Exceeded										x	
Low Hot Water Differential Pressure										x	
Low Hot Water Supply Temp										x	

5. Building (Secondary) HW Pumps
   a. The controller shall measure hot water differential pressure and modulate the hot water pump VFDs in sequence to maintain its hot water differential pressure setpoint.
   b. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.
      1) The controller shall modulate hot water pump speeds to maintain a hot water differential pressure of 12 psi (adj.). The VFDs minimum speed shall not drop below 20% (adj.).
      2) On dropping hot water differential pressure, the VFDs shall stage on and run to maintain setpoint as follows:
         a. The controller shall modulate the lead VFD to maintain setpoint.
         b. If the lead VFD speed is greater than a setpoint of 90% (adj.), the lag VFD shall stage on.
         c. The lag VFD shall ramp up to match the lead VFD speed and then run in unison with the lead VFD to maintain setpoint.
      3) On rising hot water differential pressure, the VFDs shall stage off as follows:
         a. If the VFDs speeds drops back to 60% (adj.) below setpoint, the lag VFD shall stage off.
         b. The lead VFD shall continue to run to maintain setpoint.
   c. Alarms shall be provided as follows:
      4) High Hot Water Differential Pressure: If 25% (adj.) greater than setpoint.
      5) Low Hot Water Differential Pressure: If 25% (adj.) less than setpoint.
6. Decoupler Monitoring:
   a. HW Temperatures entering and leaving the campus side and building side of the decoupler piping shall be monitored and shared with the Central Boiler Plant Controller for staging.
   b. A differential Pressure Sensor upstream of the decoupler (Campus Side) shall monitor Differential Pressure and report back to the Central Boiler Plant for load management.

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Hot Water Differential Pressure (Building)	x								x		x
Hot Water Differential Pressure (Campus Side)	x								x		x
Campus Hot Water Return Temp	x								X		x
Campus Hot Water Supply Temp	x								X		x
Building Hot Water Return Temp	x								X		X
Building Hot Water Supply Temp	x								X		X
Hot Water Pump 1 VFD Speed		x							X		x
Hot Water Pump 2 VFD Speed		x							x		x
Hot Water Pump 1 Status			x						x		x
Hot Water Pump 1 VFD Fault			x							x	x
Hot Water Pump 2 Status			x						x		x
Hot Water Pump 2 VFD Fault			x							x	x
Circulation Pump Start/Stop				x					x		x
Hot Water Pump 1 Start/Stop				x							x
Hot Water Pump 2 Start/Stop				x							x
Hot Water Pump 2 Runtime Exceeded										x	
Low Hot Water Differential Pressure										x	
Low Primary Hot Water Supply Temp										x	

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 231123 - FACILITY NATURAL-GAS PIPING



PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Manual gas shutoff valves.
5. Motorized gas valves.
6. Earthquake valves.
7. Pressure regulators.
8. Service meters.
9. Dielectric fittings.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following:
1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters. Indicate[pressure ratings and] capacities. Include [bypass fittings] [bypass fittings and meter bars] [meter bars] [supports].
6. Dielectric fittings.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for

multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: [1/4 inch per foot (1:50)] <Insert scale>.
2. Detail mounting, supports, and valve arrangements for[service meter assembly and] pressure regulator assembly.

C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.

B. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

C. Qualification Data: For qualified professional engineer.

D. Welding certificates.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For [motorized gas valves] [pressure regulators] [and] [service meters] to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.9 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:
   1. Notify [Architect] [Construction Manager] [Owner] no fewer than [two] <Insert number> days in advance of proposed interruption of natural-gas service.
   2. Do not proceed with interruption of natural-gas service without [Architect's] [Construction Manager's] [Owner's] written permission.

1.10 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:
   1. Piping and Valves: [100 psig (690 kPa)] <Insert value> minimum unless otherwise indicated.
   2. Service Regulators: [65 psig (450 kPa)] [100 psig (690 kPa)] <Insert value> minimum unless otherwise indicated.
   3. Minimum Operating Pressure of Service Meter: [5 psig (34.5 kPa)] [10 psig (69 kPa)] [20 psig (138 kPa)] [65 psig (450 kPa)] <Insert value>.

B. Natural-Gas System Pressure within Buildings: [0.5 psig (3.45 kPa) or less] [More than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa)] [More than 2 psig (13.8 kPa) but not more than 5 psig (34.5 kPa)] <Insert pressure range>.

C. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa), and is reduced to secondary pressure of 0.5 psig (3.45 kPa) or less.

D. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 2 psig (13.8 kPa) but not more than 5 psig (34.5 kPa), and is reduced to secondary pressure of more than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa).

E. Natural-Gas System Pressures within Buildings: Three pressure ranges. Primary pressure is more than 2 psig (13.8 kPa) but not more than 5 psig (34.5 kPa), and is reduced to secondary pressures of more than 0.5 psig (3.45 kPa) but not more than 2 psig (13.8 kPa), and is reduced again to pressures of 0.5 psig (3.45 kPa) or less.

F. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   a. Material Group: 1.1.
   b. End Connections: Threaded or butt welding to match pipe.
   c. Lapped Face: Not permitted underground.
   d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
   e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.
5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
   a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
   6. Mechanical Couplings:
   a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
   b. [Stainless-steel] [Steel] flanges and tube with epoxy finish.
   c. Buna-nitrile seals.
   d. [Stainless-steel] [Steel] bolts, washers, and nuts.
   e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
   f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.

3. Coating: PE with flame retardant.
    a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
        1) Flame-Spread Index: [25] <Insert value> or less.
        2) Smoke-Developed Index: [50] [450] <Insert value> or less.
4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig (34.5 kPa).

C. Aluminum Tubing: Comply with ASTM B 210 and ASTM B 241/B 241M.
1. Aluminum Alloy: Alloy 5456 is prohibited.
2. Protective Coating: Factory-applied coating capable of resisting corrosion on tubing in contact with masonry, plaster, insulation, water, detergents, and sewerage.
3. Flare Fittings: Comply with ASME B16.26 and SAE J513.
    a. Copper-alloy fittings.
    b. Metal-to-metal compression seal without gasket.
    c. Dryseal threads shall comply with ASME B1.20.3.

D. Drawn-Temper Copper Tube: Comply with [ASTM B 88, Type K (ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)] [ASTM B 837, Type G].
1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Bronze Flanges and Flanged Fittings: ASME B16.24, Class 150.
    a. Gasket Material: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    b. Bolts and Nuts: ASME B18.2.1, carbon steel or stainless steel.
3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.

E. Annealed-Temper Copper Tube: Comply with [ASTM B 88, Type K (ASTM B 88M, Type A)] [ASTM B 88, Type L (ASTM B 88M, Type B)] [ASTM B 837, Type G].
1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
    a. Copper fittings with long nuts.
    b. Metal-to-metal compression seal without gasket.
    c. Dryseal threads complying with ASME B1.20.3.
3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch (0.56 mm) thick.

F. Tin-Lined Copper Tube: ASTM B 280, seamless, annealed, with interior tin-plated lining.
1. Flare Fittings: Comply with ASME B16.26 and SAE J513.

a. Copper fittings with long nuts.
b. Metal-to-metal compression seal without gasket.
c. Dryseal threads complying with ASME B1.20.3.

G. PE Pipe: ASTM D 2513, SDR 11.
1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.
   a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.
   b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering.[Vent casing aboveground.]
   c. Aboveground Portion: PE transition fitting.
   d. Outlet shall be threaded or flanged or suitable for welded connection.
   e. Tracer wire connection.
   f. Ultraviolet shield.
   g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
4. Transition Service-Line Risers: Factory fabricated and leak tested.
   a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
   b. Outlet shall be threaded or flanged or suitable for welded connection.
   c. Bridging sleeve over mechanical coupling.
   d. Factory-connected anode.
   e. Tracer wire connection.
   f. Ultraviolet shield.
   g. Stake supports with factory finish to match steel pipe casing or carrier pipe.
5. Plastic Mechanical Couplings, NPS 1-1/2 (DN 40) and Smaller: Capable of joining PE pipe to PE pipe.
   a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
   b. PE body with molded-in, stainless-steel support ring.
   c. Buna-nitrile seals.
   d. Acetal collets.
   e. Electro-zinc-plated steel stiffener.
6. Plastic Mechanical Couplings, NPS 2 (DN 50) and Larger: Capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
   a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
   b. Fiber-reinforced plastic body.
   c. PE body tube.
   d. Buna-nitrile seals.

e. Acetal collets.
f. Stainless-steel bolts, nuts, and washers.

7. Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
   a. <Double click here to find, evaluate, and insert list of manufacturers and products.>
   b. [Stainless-steel] [Steel] flanges and tube with epoxy finish.
   c. Buna-nitrile seals.
   d. [Stainless-steel] [Steel] bolts, washers, and nuts.
   e. Factory-installed anode for steel-body couplings installed underground.

2.3 PIPING SPECIALTIES

A. Appliance Flexible Connectors:
1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig (3.45 kPa).
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches (1830 mm.)

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:
1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Basket Strainers:
1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

E. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.4 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.5 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.
1. CWP Rating: [125 psig (862 kPa)] <Insert pressure>.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch (25 mm) and smaller.
6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.
1. CWP Rating: [125 psig (862 kPa)] <Insert pressure>.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Bronze Plug Valves: MSS SP-78.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

H. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

I. Cast-Iron, Lubricated Plug Valves: MSS SP-78.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

J. PE Ball Valves: Comply with ASME B16.40.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body: PE.
3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: [80 psig (552 kPa)] <Insert pressure>.
8. Operating Temperature: [Minus 20 to plus 140 deg F (Minus 29 to plus 60 deg C)] <Insert temperature range>.

9. Operator: Nut or flat head for key operation.
10. Include plastic valve extension.
11. Include tamperproof locking feature for valves where indicated on Drawings.

K. Valve Boxes:
1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.6 MOTORIZED GAS VALVES

A. Automatic Gas Valves: Comply with ANSI Z21.21.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body: Brass or aluminum.
3. Seats and Disc: Nitrile rubber.
4. Springs and Valve Trim: Stainless steel.
5. Normally closed.
6. Visual position indicator.
7. [Electrical] [Mechanical] operator for actuation by appliance automatic shutoff device.

B. Electrically Operated Valves: Comply with UL 429.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Pilot operated.
3. Body: Brass or aluminum.
4. Seats and Disc: Nitrile rubber.
5. Springs and Valve Trim: Stainless steel.
6. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
7. NEMA ICS 6, Type 4, coil enclosure.
8. Normally closed.
9. Visual position indicator.

2.7 EARTHQUAKE VALVES

A. Earthquake Valves, Maximum Operating Pressure of 5 psig (34.5 kPa): Comply with ASCE 25.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: 5 psig (34.5 kPa).
4. Cast-aluminum body with nickel-plated chrome steel internal parts.
5. Nitrile-rubber valve washer.

6. Sight windows for visual indication of valve position.
7. Threaded end connections complying with ASME B1.20.1.
8. Wall mounting bracket with bubble level indicator.

B. Earthquake Valves, Maximum Operating Pressure of 60 psig (414 kPa): Comply with ASCE 25.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.
3. Maximum Operating Pressure: [0.5 psig (3.45 kPa)] [7 psig (48 kPa)] [60 psig (414 kPa)].
4. Cast-aluminum body with stainless-steel internal parts.
5. Nitrile-rubber, reset-stem o-ring seal.
6. Valve position, open or closed, indicator.
7. Composition valve seat with clapper held by spring or magnet locking mechanism.
8. Level indicator.
9. End Connections: Threaded for valves NPS 2 (DN 50) and smaller; flanged for valves NPS 2-1/2 (DN 65) and larger.

2.8 PRESSURE REGULATORS

A. General Requirements:
1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Service Pressure Regulators: Comply with ANSI Z21.80.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: [100 psig (690 kPa)] <Insert pressure>.

C. Line Pressure Regulators: Comply with ANSI Z21.80.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: [2 psig (13.8 kPa)] [5 psig (34.5 kPa)] [10 psig (69 kPa)] <Insert pressure>.

D. Appliance Pressure Regulators: Comply with ANSI Z21.18.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: [1 psig (6.9 kPa)] [2 psig (13.8 kPa)] [5 psig (34.5 kPa)] <Insert pressure>.

2.9 SERVICE METERS

A. Diaphragm-Type Service Meters: Comply with [ANSI B109.1] [ANSI B109.2].
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Case: Die-cast aluminum.
3. Connections: Steel threads.
4. Diaphragm: Synthetic fabric.
5. Diaphragm Support Bearings: Self-lubricating.
6. Compensation: Continuous temperature[and pressure].
7. Meter Index: [Cubic feet] [Liters] [Cubic feet and liters].
8. Meter Case and Index: Tamper resistant.
9. Remote meter reader compatible.
10. Maximum Inlet Pressure: [100 psig (690 kPa)] <Insert pressure>.

11. Pressure Loss: Maximum [0.5-inch wg (124 Pa)] [2.0-inch wg (498 Pa)] <Insert pressure differential>.
12. Accuracy: Maximum plus or minus [1.0] <Insert number> percent.

B. Rotary-Type Service Meters: Comply with ANSI B109.3.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Case: Extruded aluminum.
3. Connection: Flange.
4. Impellers: Polished aluminum.
5. Rotor Bearings: Self-lubricating.
6. Compensation: Continuous temperature[and pressure].
7. Meter Index: [Cubic feet] [Liters] [Cubic feet and liters].
8. Tamper resistant.
9. Remote meter reader compatible.
10. Maximum Inlet Pressure: [100 psig (690 kPa)] <Insert pressure>.
11. Accuracy: Maximum plus or minus [2.0] <Insert number> percent.

C. Turbine Meters: Comply with ASME MFC-4M.
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Housing: Cast iron or welded steel.
3. Connection Threads or Flanges: Steel.
4. Turbine: Aluminum or plastic.
5. Turbine Bearings: Self-lubricating.
6. Compensation: Continuous temperature[and pressure].
7. Meter Index: [Cubic feet] [Liters] [Cubic feet and liters].
8. Tamper resistant.
9. Remote meter reader compatible.
10. Maximum Inlet Pressure: [100 psig (690 kPa)] <Insert pressure>.
11. Accuracy: Maximum plus or minus [2.0] <Insert number> percent.

D. Service-Meter Bars:
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Malleable- or cast-iron frame for supporting service meter.
3. Include offset swivel pipes, meter nuts with o-ring seal, and factory- or field-installed dielectric unions.
4. Omit meter offset swivel pipes if service-meter bar dimensions match service-meter connections.

E. Service-Meter Bypass Fittings:
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Ferrous, tee, pipe fitting with capped side inlet for temporary natural-gas supply.
3. Integral ball-check bypass valve.

2.10 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description:
a. Standard: ASSE 1079.
b. Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)] [150 psig (1035 kPa)] [250 psig (1725 kPa)].
c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description:
a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: [125 psig (860 kPa) minimum at 180 deg F (82 deg C)] [150 psig (1035 kPa)] [175 psig (1200 kPa)] [300 psig (2070 kPa)].
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. <Double click here to find, evaluate, and insert list of manufacturers and products.>
2. Description:
a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: [150 psig (1035 kPa)] <Insert pressure>.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

2.11 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

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

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to [NFPA 54] [the International Fuel Gas Code] to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with [NFPA 54] [the International Fuel Gas Code] requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with [NFPA 54] [the International Fuel Gas Code] for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least [36 inches (900 mm)] <Insert value> below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
   1. If natural-gas piping is installed less than 36 inches (900 mm) below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:
   1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
   2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
   3. Replace pipe having damaged PE coating with new pipe.

E. Copper Tubing with Protective Coating:
   1. Apply joint cover kits over tubing to cover, seal, and protect joints.
   2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

F. Install fittings for changes in direction and branch connections.

G. Install pressure gage [downstream] [upstream and downstream] from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.4 INDOOR PIPING INSTALLATION

A. Comply with [NFPA 54] [the International Fuel Gas Code] for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction

loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.

2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    a. Exception: Tubing passing through partitions or walls does not require striker barriers.
5. Prohibited Locations:
    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

Q. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

R. Connect branch piping from top or side of horizontal piping.

S. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

T. Do not use natural-gas piping as grounding electrode.

U. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

V. Install pressure gage [downstream] [upstream and downstream] from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

W. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.5 SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground[, on concrete bases].

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

F. Install service meters downstream from pressure regulators.

G. Install metal bollards to protect meter assemblies. Comply with requirements in Section 055000 "Metal Fabrications" for pipe bollards.

3.6 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

3.7 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:
   1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
   2. Cut threads full and clean using sharp dies.
   3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
   4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
   5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:
   1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
   2. Bevel plain ends of steel pipe.

3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

H. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.8 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).
5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).

D. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:
1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 and NPS 5/8 (DN 15 and DN 18): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 and NPS 7/8 (DN 20 and DN 22): Maximum span, 84 inches (2134 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 1 (DN 25): Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

E. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:
   1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
   2. NPS 1/2 (DN 15): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
   3. NPS 3/4 (DN 20) and Larger: Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.9 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.10 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.11 PAINTING

A. Comply with requirements in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.
   1. Alkyd System: MPI EXT 5.1D.
      a. Prime Coat: Alkyd anticorrosive metal primer.
      b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
      c. Topcoat: Exterior alkyd enamel [(flat)] [(semigloss)] [(gloss)].
      d. Color: [Gray] <Insert color>.

C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.
    a. Prime Coat: [Alkyd anticorrosive] [Quick-drying alkyd] metal primer.
    b. Intermediate Coat: Interior latex matching topcoat.
    c. Topcoat: Interior latex [(flat)] [(low sheen)] [(eggshell)] [(satin)] [(semigloss)] [(gloss)].
    d. Color: [Gray] <Insert color>.
2. Alkyd System: MPI INT 5.1E.
    a. Prime Coat: [Alkyd anticorrosive] [Quick-drying alkyd] metal primer.
    b. Intermediate Coat: Interior alkyd matching topcoat.
    c. Topcoat: Interior alkyd [(flat)] [(eggshell)] [(semigloss)] [(gloss)].
    d. Color: [Gray] <Insert color>.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.12 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base[according to seismic codes at Project].
1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on [18-inch (450-mm)] <Insert dimension> centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Use [3000-psig (20.7-MPa)] <Insert value>, 28-day, compressive-strength concrete and reinforcement as specified in [Section 033000 "Cast-in-Place Concrete."] [Section 033053 "Miscellaneous Cast-in-Place Concrete."]

3.13 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
1. Test, inspect, and purge natural gas according to [NFPA 54] [the International Fuel Gas Code] and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.14 DEMONSTRATION

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

3.15 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be[one of] the following:
   1. PE pipe and fittings joined by heat fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.
   2. Steel pipe with wrought-steel fittings and welded joints, or mechanical couplings. Coat pipe and fittings with protective coating for steel piping.
   3. [Annealed] [Drawn]-temper copper tube with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.

B. Aboveground natural-gas piping shall be[one of] the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with wrought-steel fittings and welded joints.
   3. [Annealed] [Drawn]-temper copper tube with wrought-copper fittings and brazed joints.

C. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper tube with wrought-copper fittings and [brazed] [flared] joints. Install piping embedded in concrete with no joints in concrete.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.16 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

A. Aboveground, branch piping [NPS 1 (DN 25)] <Insert pipe size> and smaller shall be[one of] the following:
   1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
   2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
   3. Annealed-temper, copper tube with wrought-copper fittings and [brazed] [flared] joints.
   4. Aluminum tube with flared fittings and joints.
   5. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be[one of] the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with wrought-steel fittings and welded joints.
   3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

C. Underground, below building, piping shall be[one of] the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with wrought-steel fittings and welded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.17 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG (3.45 kPa) AND LESS THAN 5 PSIG (34.5 kPa)

A. Aboveground, branch piping [NPS 1 (DN 25)] <Insert pipe size> and smaller shall be[one of] the following:
   1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
   2. Annealed-temper, tin-lined copper tube with flared joints and fittings.
   3. Annealed-temper, copper tube with wrought-copper fittings and [brazed] [flared] joints.
   4. Aluminum tube with flared fittings and joints.
   5. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be[one of] the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with steel welding fittings and welded joints.
   3. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

C. Underground, below building, piping shall be[one of] the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with wrought-steel fittings and welded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat underground pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.18 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 5 PSIG (34.5 kPa)

A. Aboveground Piping: Maximum operating pressure more than [5 psig (34.5 kPa)] <Insert pressure>.

B. Aboveground, Branch Piping: Steel pipe with steel welding fittings and welded joints.

C. Aboveground, distribution piping shall be[one of] the following:
   1. Steel pipe with steel welding fittings and welded joints.
   2. Drawn-temper copper tube with wrought-copper fittings and brazed joints.

D. Underground, below building, piping shall be[one of] the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

E. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

F. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.19 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.

B. Underground:
1. PE valves.
2. NPS 2 (DN 50) and Smaller: Bronze plug valves.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron, [lubricated] [nonlubricated] plug valves.

3.20 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be[one of] the following:
1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 (DN 65) and larger at service meter shall be[one of] the following:
1. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

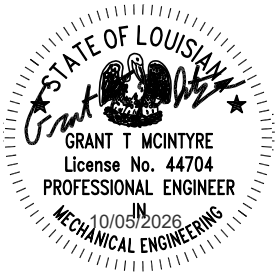
C. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be[one of] the following:
1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be[one of] the following:
1. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, [nonlubricated] [lubricated] plug valve.

E. Valves in branch piping for single appliance shall be[one of] the following:
1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, [full] [regular]-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 21 13 - HYDRONIC PIPING



PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install all labor, materials, equipment, tools and services and perform all the operations required in connection with, or associated with, the construction of complete hydronic piping systems, including chilled and heating hot water piping, condenser water piping process chilled or hot water piping, condensate drain piping and generator cooling water piping systems as indicated on the Drawings.

B. Section Includes:
1. Copper tube and fittings.
2. Steel pipe and fittings.
3. Piping joining materials.
4. Transition fittings.
5. Dielectric fittings.

1.2 ACTION SUBMITTALS

A. Product Data:
1. Submit product data on pipe materials, pipe fittings, valves, and accessories. Clearly indicate make, model, type, size, and pressure rating for each device.
2. Submittal data for all fittings shall include a letter signed by an official of the manufacturing company certifying compliance with these Specifications.

B. Record Documents:
1. Include welder's certification of compliance in accordance with ASME BPVC Sec. IX.

1.3 INFORMATIONAL SUBMITTALS

A. As built Drawings.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
1. Installers of Pressure-Sealed Joints: Installers are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
2. Installers of PP-RCT pipe shall be certified by manufacturer of pipes and fittings as having been trained and qualified to join polypropylene piping using fusion

weleding of same type specified and provided.

B. Steel Support Welding: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

C. Pipe Welding: Qualify procedures and operators in accordance with ASME Boiler and Pressure Vessel Code: Section IX.
   1. Comply with ASME B31.9 for materials, products, and installation.
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. Valves: Manufacturer's name and pressure rating shall be clearly marked on the outside of the valve body.

E. All grooved joint couplings, fittings, flanges, valves, and specialties of the same type shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

F. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

G. Welders Certification: Furnish in accordance with AWS D10.12 and ASME BPVC Sec. IX. Submit welder's certifications prior to any shop or field fabrication. Welder's certifications shall be current within six months of submission.

H. Each threaded fitting shall be stamped as specified by ANSI B16.3.

I. Each welded fitting shall be stamped as specified by ANSI B31.9.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 23 00 00.

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

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

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

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

1.6 WARRANTY

A. PP-R and PP-RCT Manufacturer's Warranty: Manufacturer agrees to repair or replace PP-R and PP-RCT pipe and fittings that fail in materials or workmanship within 10 years from date of acceptance unless approved otherwise by FP&C.
   1. Warranty is to cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system due to defects in materials or manufacturing.

2. Warranty is to be in effect only upon submission by Contractor to manufacturer of valid pressure/leak documentation indicating that the system was tested and passed manufacturer's pressure/leak test and any other manufacturer requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation are to be capable of withstanding the following minimum working pressures and temperatures unless otherwise indicated:
1. Chilled and Condenser-Water Piping: 150 psig at 73 deg F.
2. Makeup-Water Piping: 150 psig at 73 deg F.
3. Condensate-Drain Piping: 150 deg F.
4. Blowdown Drain Piping: 150 deg F.
5. Air-Vent Piping: 180 deg F.
6. Pressure-Relief-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

A. Pipe Size 2" and smaller: ASTM B88, hard drawn Type L seamless copper tube with wrought copper fittings meeting ASTM B16.22.

2.3 STEEL PIPE AND FITTINGS

A. For piping sized 2 ½" and larger, provide ASTM A 53, Grade B, schedule 40 seamless black steel pipe, conforming in all details to Standard ASTM Designation A53 and A106, latest revisions.

B. All weld fittings shall be wrought carbon steel buttwelding fittings conforming to ASTM A234 and ASME/ANSI B16.9, as made by Weldbend, Tube Turns, Hackney Ladish Inc. or equal. Each fitting shall be stamped as specified by ASME/ANSI B16.9 and, in addition, shall have the laboratory control number metal stenciled on each fitting for ready reference as to physical properties required for any fittings selected at random. Fittings which have been machined, remarked, re-printed, or otherwise re-produced will not be acceptable. Each fitting is to be marked in accordance with MSS SP25. Markings shall be placed on the fittings at the farthest point from the edge to be welded to prevent disfiguring from the welding process. Submittal data for these fittings shall include a letter signed by an official of the manufacturing firm certifying compliance with these specifications.

C. All screwed pattern fittings specifically called for shall be Class 150 (Class 300 for unions) malleable iron fittings manufactured by Grinnell Company or Crane Company or equal.

2.4 JOINTS

A. Threaded (Copper Piping and Steel Piping, 2" and smaller):
1. Make threaded joints using machine-cut ANSI taper pipe threads.
2. Apply suitable joint compound, such as Teflon tape to the male threads only.
3. Ream pipe to full inside diameter after cutting. All-thread nipples are not

permitted.

4. Before installing pipe that has been cut and threaded, the lengths of pipe shall be upended and hammered to remove all shavings and foreign material.

B. Soldered/Brazed (Copper Piping 2" and smaller):

1. Prior to making joints, cut pipe square and ream to full diameter. Clean exterior of pipe and socket. Apply thin coat of suitable fluxing compound to both pipe and socket, and fit parts together immediately.
2. Heat assembled joint only as required to cause the solder to flow. Run the joint full, slightly beaded on the outside, and wipe to remove excess solder.
3. Use lead-free solder only. Use either silver brazing alloy or Sil-Fos on heating hot water piping, on refrigerant piping, and on underground piping. Solder or silver brazing alloy or Sil-Fos may be used on chilled water piping.
4. Note: It is forbidden that lead in any form be used in any water system other than waste. If lead is used in the fabrication or installation of any water system other than waste, then all of the installed equipment and material, which may have come in contact with the lead, shall be marked with bright red or orange spray paint, and shall be removed from the project site. The system(s) shall then be restored and reinstalled using all new materials.

C. Welded (Steel Piping, 2-1/2" and larger):

1. Make welded joints as recommended by the standards of the American Welding Society.
2. Ensure complete penetration of deposited metal with base metal.
3. Provide filler metal suitable for use with base metal.
4. Keep inside of fittings free from globules of weld metal.
5. Do not use mitered joints.
6. Use standard weld elbow fittings for changes of direction or cut a standard elbow for odd angles.

D. Flanged:

1. Accurately center and align flanged joints to prevent mechanical pre-stressing of flanges, pipe and equipment. Align bolt holes to straddle the vertical, horizontal or north-south centerline. Do not exceed 3/64 inch per foot inclination of the flange face from true alignment.
2. Use flat-face companion flanges only with flat-faced fittings, valves or equipment. Otherwise, use raised-face flanges.
3. Install proper gaskets, suitable for intended service and factory cut to proper dimensions. Red rubber gaskets are not acceptable. Garlock gaskets or EPDM shall be used. Apply non-stick clean surface lubricant coating to both sides of gaskets.
4. Use ANSI nuts and bolts, galvanized or black to match flange material. Use galvanized steel nuts and bolts underground, coated with two coats of coal tar enamel. Tighten bolts progressively to prevent unbalanced stress. Draw bolts tight to ensure proper seating of gaskets. Use anti-seize compound on all bolts above and below grade. Bolt threads not to protrude more than 2 threads past nut.
5. Use carbon steel flanges conforming to ANSI B16.5 with materials conforming to ASTM A 105, Grade II or ASTM A 108, Grade II. Use welding neck type flanges at

all fittings and on all pipe.

6. Flanges for ductile iron pipe are specified in sections using that pipe.
7. Keep flange covers on equipment and shop-fabricated piping until ready to install in system.

E. Press fittings (Copper and Steel Chilled Water and Heating Hot Water Piping, ½" to 4"):
   1. Manufacturers:
      a. Viega Propress (Copper Piping) or MegaPress (Steel Piping) or approved equal.

F. Copper Piping:
   1. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
   2. Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

G. Steel Piping:
   1. Cold Press Mechanical Joint Fittings shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of IAPMO PS117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer.
   2. Cold Press Mechanical Joint Fittings shall be installed in accordance with the manufacturer's installation instructions. The protective corrosion coating shall be removed from the outside of the pipe end. The pipe shall be fully inserted into the fitting and the pipe marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the pipe to assure the pipe is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

H. Grooved Mechanical-Joint Fittings and Couplings:
   1. Source Limitations: Obtain grooved mechanical-joint fittings and couplings from single manufacturer.
   2. If the capability of the HVAC Subcontractor is demonstrated to the Engineer, at the HVAC Subcontractor's option, and as approved by the authorities having jurisdiction, grooved couplings and fittings may be used for 150 and 300 psig working pressure in lieu of welded or screwed joints as specified herein.
      a. Piping sizes 2" through 12": Victaulic Style 107 series "Quick Vic". UL listed painted ductile iron couplings with cut groove or roll groove may be used.
      b. For Flanges: Flange adapters shall be equal to Victaulic Style 741 or Style 743 galvanized or painted, ductile iron, with electroplated steel hinge bushings.
      c. For Strainers: Victaulic or equal galvanized or painted ductile iron Style

732 strainers with groove suitable for the design working pressure may be used.

d. Special Requirements: Victaulic or equal full flow fittings and couplings shall be made of ASTM A-395 Grade 65-45-15 ASTM A-536 Grade 65-45-12 ASTM A-536 Grade 65-45-12 ductile iron or ASTM A-53, Grade B steel with grooved ends.

e. A cut or roll groove machine shall be used for all grooves in piping. The groove machine shall be the same manufacturer as the couplings and fittings.

f. At the Subcontractor's option, factory built piping assemblies solutions where grooved piping is allowed, Victaulic manufactured catalog products may be used including Victaulic Series 380/381/382 Vibration Isolation Pumps, Series 385 Vibration Isolation AHU Drops, No. 26/No. 57 Vic-Headers.

I. Plain-End Mechanical-Joint Couplings:

1. Source Limitations: Obtain plain-end mechanical-joint couplings from single manufacturer.
2. Housing: ASTM A536, Grade 65-45-12 segmented ductile iron or Type 304 stainless steel.
3. Gasket: EPDM.
4. Sealing Mechanism: Double-lip sealing system or carbon steel case-hardened jaws.
5. Bolts, hex nuts, washers, or lock bars based on manufacturer's design.
6. Minimum Pressure Rating: Equal to that of the joined pipes.

J. Steel Pipe Nipples: ASTM A733, made of same materials and wall thicknesses as pipe in which they are installed.

2.5 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

D. Solder Filler Metals: ASTM B32, lead-free alloys.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

F. Flux: ASTM B813, water flushable.

G. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for PVC Piping: ASTM D2564. Include primer in accordance with ASTM F656.

I. Gasket Material: Thickness, material, and type suitable for fluid to be handled, and working temperatures and pressures.

2.6 TRANSITION FITTINGS

A. General Requirements:
1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.7 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Source Limitations: Obtain dielectric unions from single manufacturer.
2. Description:
a. Standard: ASSE 1079.
b. Pressure Rating: 150 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous. Solder joints are not to be used on pipe sizes greater than NPS 4.

C. Dielectric Flanges:
1. Source Limitations: Obtain dielectric flanges from single manufacturer.
2. Description:
a. Standard: ASSE 1079.
b. Factory-fabricated, bolted, companion-flange assembly.
c. Pressure Rating: 150 psig.
d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. Source Limitations: Obtain dielectric-flange insulating kits from single manufacturer.
2. Description:
a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.

c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:
1. Source Limitations: Obtain dielectric nipples from single manufacturer.
2. Description:
a. Standard: IAPMO PS 66.
b. Electroplated steel nipple, complying with ASTM F1545.
c. Pressure Rating: Minimum 300 psig and 220 deg F.
d. End Connections: Male threaded or grooved.
e. Lining: Inert and noncorrosive, propylene.

2.8 UNIONS

A. Use 150-pound standard (300-pound WOG) malleable iron, ground joint unions with bronze seat. Provide flanged union joints on piping larger than 2 1/2 inches.

2.9 BRANCH CONNECTIONS

A. Pipe 2 inches and smaller: use threaded fittings for steel pipe. For threaded piping, use straight size of reducing tee.

B. Pipe 2-1/2 Inches through 20 inches: for welded piping, when branch size is the same as and one size smaller than header size, use welding tee. Use Weldolet when branch is two or more sizes smaller than header. For threaded branch connections, use thread-o-let welded to header.

C. Pipe 20 inches and larger: provide welding tee for branch connections half the size of the main or larger. For branches smaller than half the size of the header size, use Weld-O-Let or Thread-O-Let fittings.

2.10 GASKETS

A. Provide gaskets between flanges of all flanged joints. Inside diameter of gaskets shall conform to nominal pipe size. Gaskets shall be ring type between raised face flanges and full face between flat face flanges with punched bolt holes and pipe opening.

B. Gaskets shall be cut from 1/8 inch thick non-metallic, non-asbestos gasket material suitable for operating temperatures from -150°F to +750°F. Garlock or equal. For pipe smaller than 6 inches, use 1/16 inch thick gasket.

2.11 FLOOR AND CEILING PLATES

A. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated.

B. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any.

C. Furnish cast brass or sheet brass pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.

2.12 SLEEVE SEALS

A. Sleeve Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Provide piping and fittings meeting the requirements of Part 2 as identified in the table below:

Service	Pipe Sizes	Pipe Material
Chilled Water Piping	2" and smaller	Copper
Chilled Water Piping	2-1/2" and larger	Steel
Heating Hot Water Piping	2" and smaller	Copper
Heating Hot Water Piping	2-1/2" and larger	Steel
Condensate Piping	All	Copper, Galvanized Steel
Condenser Water Piping	All	Steel
Makeup-Water Piping	All	Copper, Steel
Blowdown-Drain Piping	All	Steel
Air-vent Piping	All	Copper, Steel
Safety-valve inlet and outlet piping	All	Same as for piping system for which it is installed

B. Pressure-Relief-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed, with metal-to-plastic transition fittings for plastic piping systems, in accordance with piping manufacturer's written instructions.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the top of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

N. Install valves according to the appropriate section.

O. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

P. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

Q. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in

blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

R. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 expansion compensation section.

S. Identify piping as specified in the Division 23 identification section.

T. Support piping adequately to maintain line and grade, with due provision for expansion and contraction.

U. Use only long radius elbows on steel and copper piping unless a short radius elbow is specifically shown on the drawings.

V. Slope condensate drain piping at a minimum 1/8 inch per foot in the direction of flow.

W. Locate groups of pipes parallel to each other, spaced to permit applying full insulation, servicing of valves, and thermal expansion of piping systems.

X. Provide vents at high points and drains at low points in mains, risers, and branch lines consisting of a tee, reducing tee, weld-o-let, or soc-o-let fitting, applicable 3/4 inch shut-off valve, 3/4 inch nipple, and cap for pipe sizes 6 inches and smaller; provide 2 inch shut off valve, nipple, and cap for pipe sizes 8 inches and larger. All components shall conform to the piping systems described in this Section. The location of the high point vents and low point drains shall be approved by the Engineer.

Y. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals.

Z. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical rooms or electronic equipment spaces and enclosures. In no instance shall piping be routed above electrical equipment.

AA. Connections To Pumps, Tanks, and Equipment:

BB. Contractor shall erect and support piping in manner that shall not put undue strain on pumps, tanks, or equipment.

CC. The procedure for connection of piping to equipment shall be as follows:

1. After the equipment has been set and grouted, the Contractor shall run the pipe to the equipment without making any tight connections to flanges.
2. Flat faced flanges and full face gaskets shall be used on piping connecting to equipment with flat faced flanges. Raised faces of standard flanges may be machined off flat to accomplish this. Bolting for these joints shall be per ASME B31.1.
3. Flanges shall be checked by Contractor to assure that no strain is placed on the equipment. If pipe is not in correct alignment, the Contractor shall remove piping and correct. The correction in alignment shall not be made while the pipe is connected to the equipment.
4. After alignment is verified correct, the Contractor shall bolt up the flanges.

5. When required by the Engineer after the equipment has been in service, tested at operating temperatures, and with the lines and equipment still hot, the Contractor shall loosen flange connections to pumps, tanks, and equipment, and check for alignment, position, expansion, and strain applied to the equipment; make any adjustments necessary, and obtain approval of the Engineer before reconnecting.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints in accordance with ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.

D. Brazed Joints: Construct joints in accordance with AWS's "Brazing Handbook," "Pipe and Tube" chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E. Welded Joints: Construct joints in accordance with AWS D10.12M/D10.12, using qualified processes and welding operators in accordance with "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings in accordance with the following:
   1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Nonpressure Piping: Join in accordance with ASTM D2855.

H. Grooved Joints:
   1. Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.
   2. Training:
      a. A Victaulic factory trained representative (direct employee) shall provide on-site product training for contractor’s field personnel.
   3. Application:
      a. A Victaulic representative shall periodically visit the job site and review installation. Contractor shall remove and replace any improperly installed products.
   4. Grooved end product manufacturer to be ISO-9001 certified.

I. Plain-End Mechanical-Coupled Joints: Prepare, assemble, and test joints in accordance with manufacturer's written installation instructions.

J. Mechanically Formed Tee Fittings: Use manufacturer-recommended tools, procedure, and brazed joints.

K. Pressure-Seal Joints: Use manufacturer-recommended tools and procedure. Leave insertion marks on pipe after assembly.

3.4 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hangers, supports, and anchor devices.

B. Install hangers for copper tubing and steel piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Install hangers for plastic piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches of each fitting and coupling.

E. Support vertical runs of copper tubing and steel piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.6 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 230553 "Identification for HVAC Piping and Equipment."

3.7 WELDING

A. Piping shall be fabricated according to the latest ASME/ANSI B31 Code for Pressure Piping.

B. Set all fittings and joints square and true, and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

C. Do not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welds during welding operation.

D. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

E. Remove dirt, scale and other foreign matter from the inside of piping, by swabbing or flushing, prior to the connection of other piping sections, fittings, valves or equipment.

F. In no cases shall Schedule 40 pipe be welded with less than three passes, including one stringer/root, one filler, and one lacer. Schedule 80 pipe shall be welded with not less than four passes including one stringer/root, two filler, and one lacer. In all cases, the weld must be filled before the cap weld is added.

G. All pipe and all joints shall be aligned true before welding.

H. Except as specified otherwise, all changes in direction, intersection of lines, reduction in pipe size, and the like shall be made with factory-fabricated welding fittings.

3.8 OFFSETS AND FITTINGS

A. Because of the small scale of drawings, the indication of all offsets and fittings is not possible. Carefully investigate the structural and finish conditions affecting the work and take such steps as may be required to meet such conditions.

B. Install all piping close to walls, ceilings and columns so piping will occupy the minimum space. Provide proper space for covering and removal of pipe, special clearances, and for offsets and fittings.

C. Install piping as to not obstruct any equipment or architectural access doors.

3.9 EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to the above referenced specification section. Refer to drawings for additional requirements.

3.10 SYSTEM STARTUP

A. Perform the following before operating the system:
   1. Open manual valves fully.
   2. Inspect pumps for proper rotation.
   3. Set makeup pressure-reducing valves for required system pressure.
   4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
   5. Set temperature controls so all coils are calling for full flow.
   6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
   7. Verify lubrication of motors and bearings.

3.11 FIELD QUALITY CONTROL

A. Prepare hydronic piping in accordance with ASME B31.9 and as follows:
   1. Leave joints, including welds, uninsulated and exposed for examination during test.
   2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
   3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
   4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure is to be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
   5. Install pressure-relief valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

3.12 PIPE TESTING PROCEDURES

A. Pressure Testing – Apply a hydraulic pressure at 150% of the normal operating pressure or 125 psi, whichever is greater, not to exceed the working pressure rating of the lowest pressure rated component in the system (i.e. threaded components, flanges, unions, valves, etc.) for a minimum of 2 hours to carefully check all piping and every fitting for leaks. Codes and field conditions will be used by the PSP to verify the validity of numbers below. Repair each leak and retest until no leaks occur.

B. Pipe must be adequately anchored/restrained to prevent movement during testing.

C. Refer to the Commissioning Specification Sections for additional start-up, pre-functional and operational checkout, and for functional performance test procedures.

D. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.

E. Isolate expansion tanks and determine that hydronic system is full of water.

F. After hydrostatic test pressure has been applied for indicated testing time, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

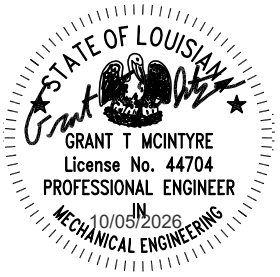
G. Prepare written report of testing.

H. Notify the Owner's Project Manager and the Architect/Engineer in writing at least seven (7) calendar days prior to each test and prior to other Specification requirements requiring Owner and Architect/Engineer to observe and/or approve tests.

I. All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel performing, observing and inspecting, description of the test and extent of system tested, test conditions, test results, specified results and other pertinent data. The data shall be delivered to the Architect/Engineer as specified under

"Requirements for Final Acceptance." The Contractor or Contractor's authorized job superintendent shall legibly sign all Test Log entries.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Hydronic specialty valves.
2. Air vents.
3. Expansion tanks and fittings.
4. Air/dirt separators and purgers.
5. Strainers.
6. Flexible connectors.

1.2 SUBMITTALS

A. Product Data:
1. Submit shop drawings and product data, including component sizes, rough-in requirements, service clearances, accessories, and finishes.
2. Submit inspection certificates for pressure vessels.
3. Submit manufacturer's installation instructions.
B. Submit operation and maintenance data under provisions of Section 23 00 00.

1.3 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators in accordance with ASME BPVC, Section IX.

B. Pressure-relief and safety-relief valves and pressure vessels bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME BPVC, Section VIII, Division 1.

C. Manufacturer: For each product specified, provide components by the same manufacturer throughout.

PART 2 - PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Automatic Flow-Control Valves:
1. Body: Brass or ferrous metal.
2. Combination Assemblies: Include bronze or brass-alloy ball valve.
3. Identification Tag: Marked with zone identification, valve number, and flow rate.
4. Size and Capacity: For each application, provide a valve with rated capacity equal to or greater than capacity of device being served.
5. Performance: Maintain constant flow within plus or minus 10 percent, regardless of system pressure fluctuations.
6. Minimum CWP Rating: 175 psig.

7. Maximum Operating Temperature: 200 deg F.

2.2 AIR VENTS

A. Manual Air Vents:
   1. Body: Bronze.
   2. Internal Parts: Nonferrous.
   3. Operator: Screwdriver or thumbscrew.
   4. Inlet Connection: Minimum NPS 1/2.
   5. Discharge Connection: NPS 1/8.
   6. CWP Rating: 150 psig.
   7. Maximum Operating Temperature: 225 deg F.

B. Automatic Air Vents:
   1. Body: Bronze or cast iron.
   2. Internal Parts: Nonferrous.
   3. Operator: Noncorrosive metal float.
   4. Inlet Connection: Minimum NPS 1/2.
   5. Discharge Connection: Minimum NPS 1/4.
   6. CWP Rating: 150 psig.
   7. Maximum Operating Temperature: 240 deg F.

2.3 EXPANSION TANKS AND FITTINGS

A. Bladder-Type ASME Expansion Tanks:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AMTROL, Inc.
      b. Armstrong Fluid Technology
      c. Bell & Gossett; a Xylem brand
      d. Taco Comfort Solutions
      e. WATTS; A Watts Water Technologies Company
   2. Tank: Welded steel, rated for 125 psig working pressure and 240 deg F maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled in accordance with ASME BPVC, Section VIII, Division 1.
   3. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity. Field-replaceable bladder.
   4. Sight glass.
   5. Tank drain plug.
   6. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

2.4 AIR/DIRT SEPARATORS AND PURGERS

A. Coalescing-Type Air and Dirt Separators:
   1. Tank: Fabricated steel tank; ASME constructed and stamped for 125 psig working pressure and 270 deg F maximum operating temperature.
   2. Coalescing Medium: Stainless Steel.
   3. Air Vent: Threaded to top of separator.

4. Inline Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; Class 150 flanged connections for NPS 2-1/2 and larger.
5. Blowdown Connection: Threaded to bottom of separator.
6. Size: Match system flow capacity.

B. Tangential-Type Air Separators:
1. Tank: Welded steel; ASME constructed and labeled for 125 psig minimum working pressure and 375 deg F maximum operating temperature.
2. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
4. Blowdown Connection: Threaded.
5. Size: Match system flow capacity.

C. In-Line Air Separators:
1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig.
3. Maximum Operating Temperature: Up to 300 deg F.

D. Air Purgers:
1. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
2. Maximum Working Pressure: 150 psig.
3. Maximum Operating Temperature: 250 deg F.

2.5 STRAINERS

A. Approved Manufacturers:
1. Mueller
2. Watts
3. Nibco
4. Keckley

B. Threaded steel (2” and smaller, steel piping only):
1. Cast iron wye-strainer, screw ends.
2. Rating: 250 lb nominal. 400 psi WOG at 150 F.
3. Body: ASTM A-126 Class B cast iron.
4. Cap: ASTM A-126 Class B cast iron.
5. Screen: Stainless Steel; 20 mesh.

C. Flanged steel (2 1/2” and larger):
1. Cast iron wye-strainer, ASME B16.1 flanged ends.
2. Rating: 125 lb nominal. 150 psi WOG at 150 deg F.
3. Body: ASTM A-126 Class B cast iron.
4. Cap: ASTM A-126 Class B cast iron.
5. Plug: ASTM A105 carbon steel.

6. Cap screws: Steel.
7. Screen: Stainless steel; standard catalogued screen gage for size and service (maximum 1/8” perforation size).

D. Threaded bronze (2” and smaller, copper piping only)
1. Cast bronze wye-strainer; threaded/screw ends.
2. Rating: 250 lb nominal. 400 psi WOG at 150 deg F.
3. Body: ASTM B 62 bronze.
4. Cap: ASTM B 62 bronze.
5. Screen: Stainless steel; standard catalogued screen gage for size and service (minimum 3/64” perforation size).

2.6 AUTOMATIC AIR VENTS

A. Approved Manufacturers:
1. Armstrong
2. APCO

B. Construction: Fixed pivot automatic float-type air vent.
1. Body: Cast iron, 250 psig maximum rated pressure.
2. Poppet valve: Stainless steel
3. Seat: Stainless steel with Viton insert
4. Leverage System: Stainless steel
5. Float: Stainless steel
6. Size: 3/4” inlet unless otherwise noted

2.7 SAFETY PRESSURE RELIEF VALVES

A. Approved Manufacturers:
1. Keckley
2. Watts

B. ASME Safety Relief Valve:
1. Operation: Diaphragm and spring
2. Body: Bronze or iron body
3. Trim: Stainless Steel
4. Diaphragm and seat: Non metallic.
5. Screw connections.
6. Rating: According to the pressure vessel or system being protected.

C. Certifications: Valve shall meet the requirements for pressure relief valves in ASME BPVC section VIII.

2.8 PRESSURE REDUCING VALVES

A. Approved Manufacturers:
1. Watts
2. Zurn

B. 2" and smaller:
1. Direct action pressure reducing valve with integral strainer:
2. Body: ASTM B 584, low lead cast bronze.
3. Caps/Ports: ASTM B 584, low lead cast bronze.
4. Stem and Plunger: Lead free cast bronze; or lead free copper silicon alloy.
5. Strainer: Stainless steel, 20 mesh.
6. Seat: Stainless steel.
7. Spring range: 10–35 psi, 25–75 psi or 75–125 psi as required.
8. Maximum working pressure: 300 psi at 140 deg F.
9. Provide union inlet connection and NPT threaded outlet.

2.9 FLEXIBLE CONNECTORS

A. Stainless Steel Bellows, Flexible Connectors:
1. Body: Stainless steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

B. Spherical, Rubber, Flexible Connectors:
1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

2.10 CHEMICAL POT FEEDERS

A. Approved Manufacturers:
1. Harmsco
2. Wingert
3. Neptune

B. Chemical shot feeder with filter housing:
1. Shot feeder tank: A513 ERW tube with welded semi-elliptical heads.
2. Capacity: 5 gallons.
3. Taps: Provide NPT tapped inlet, outlet, drain, and fill ports. Size per manufacturer's catalogued data.
4. Filter support: Stainless steel filter holder with stainless steel removal handle, configured so that personal shall not come in contact with vessel contents.
5. Filter Media: 20 micron high temperature re-usable pleated filter, stainless steel holder and stainless steel removal handle.
6. Lid: Steel, minimum 3-1/2" in diameter, with Buna-N O-ring seal.
7. Pressure rating: 200 psi at 200°F.
8. Coating: Provide minimum 2 mil epoxy coating on outside of filter housing.

9. Supports: Provide shot feeder with minimum of 3 carbon steel floor support legs.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all piping specialties for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Examine threads on all devices for form and cleanliness.

C. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

D. Do not attempt to repair defective piping specialties; replace with new devices. Remove defective piping specialties from site.

3.2 EXPANSION TANKS

A. Support tanks inside building from floor or overhead structure as shown on plans.

B. For floor mounted expansion tanks, provide a 4" housekeeping pad.

C. Support and install per manufacturer's instructions.

3.3 AIR, DIRT AND AIR/DIRT SEPARATORS

A. Support separator from floor or overhead structure as shown on plans.

B. Support and install per manufacturer's instructions.

3.4 AUTOMATIC AIR VENTS

A. Provide an automatic air vent at the highest overall point in the system. Pipe vent outlet to the nearest floor drain.

B. For automatic air vents in ceiling spaces or other concealed locations, extend vent tubing to nearest drain.

3.5 STRAINERS

A. Strainers shall be the same size as the connecting pipe, with ends matching piping system materials.

B. Threaded bronze strainers: provide soldered transition to male NPT fitting of same line size as pipe.

C. Orient/install strainers so that strainer caps and baskets can be removed for blowdown.

D. Do not install strainers in an upward pointing configuration unless explicitly shown on plans. Locate strainers either in horizontal runs of pipe or in downward flowing legs.

E. Sediment strainers shall be placed in piping systems wherever shown on the Drawings and at such other points as may be required for the removal of foreign material from the piping systems.

F. Provide full-size blow-down valves on the strainer blow-down connection. Valves shall be as specified in 23 05 23 – Valves for HVAC.

G. For strainers located in mechanical rooms, pipe strainer blow-down connection to the nearest floor drain. Drain piping shall be the same size as the strainer blow-down connection.

H. For strainers located outside of mechanical rooms, provide a capped hose adapter at the discharge of the strainer blow-down valve.

3.6 SAFETY PRESSURE RELIEF VALVES

A. Provide relief valves on all pressure vessels, expansion tanks, and heat exchangers, and on the low pressure side of reducing valves.

B. Pipe relief valve outlet to nearest floor drain. Drain piping shall be the same size as the relief valve outlet.

C. Select system relief valve capacity so that it is greater than makeup pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

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

E. Install per manufacturer’s instructions.

3.7 PRESSURE REDUCING VALVES

A. Install per manufacturer’s instructions.

3.8 CHEMICAL POT FEEDERS

A. Install shot feeders on a 4” housekeeping pad.

B. Install and pipe per manufacturer’s instructions.

3.9 INSTALLATION OF VALVES

A. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

B. Install pressure-relief and safety-relief valves at hot-water generators and elsewhere as

required by ASME BPVC. Pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME BPVC, Section VIII, Division 1, for installation requirements.

3.10 FLEXIBLE CONNECTORS:

A. Install flexible connectors at pump inlet and outlet piping connections.

3.11 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only.
   1. Provide air outlet drain line full size of air outlet to floor drain or to other point indicated on Drawings.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.

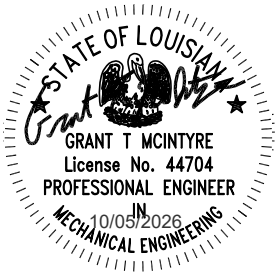
D. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve full size of separator outlet; extend full size to nearest floor drain.

E. Install expansion tanks having direct air/water interface above the air separator or air purger. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.
   1. Install tank fittings that are shipped loose.
   2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, and fittings, plus tank full of water. Do not overload building components and structural members.
   3. Install piping from air separator or air purger to expansion tank with a 2 percent upward slope toward tank to avoid air entrapment.

F. Install diaphragm- or bladder-type expansion tanks on the floor.

G. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install pumps and associated controls as indicated herein. This includes all required wiring between various components in the system, hardware and associated items for a complete operational system

1.2 QUALITY ASSURANCE

A. The equipment for each pumping system specified under this section shall be furnished by a single supplier and shall be products that the manufacturer regularly engages in. The supplier shall have sole responsibility for proper functioning of the equipment supplied.

B. The manufacturer of the pumping systems shall be responsible for compliance with all applicable codes and regulations, and be held accountable for the complete pump packages, and installation as specified herein.

C. Manufacturer's Qualifications: the manufacturer must specialize in manufacturing the products specified in this Section with minimum three years documented experience. The packaged system manufacturer shall have 24 hour local service available provided by a trained factory authorized representative.

D. Conductors shall be numbered and identified at all termination points. All wiring shall be installed in wire ways and secured with tie straps. All disconnects, transformers, controllers, control devices, selector switches, and indicator lights package shall be labelled with their respective function and/or identification. Permanently affix a factory wiring schematic to the inside of cabinet door. The entire control panel shall bear the UL Label for enclosed industrial control panels.

E. Installer's Qualifications: The system shall be installed by a firm having minimum three years of experience regularly engaged in the installation of pumps or pumping packages similar to the ones specified herein.

F. Certification shall be obtained by the manufacturer indicating that the function and performance characteristics of all products and materials have been determined by testing and ongoing surveillance by an approved third-party certification agency. Assertion of certification shall be in the form of identification in accordance with the requirements of the third-party certification agency.

1.3 SUBMITTALS

A. Product Data:
1. Submit shop drawings and product data sheets.
2. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Clearly indicate which equipment and options

are to be provided

3. Indicate pump's operating point on curves. Include NPSH curve when applicable.
4. Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
5. Submit information on electric motors per requirements and indicate compliance with the Division 23 motor specification and ASHRAE 90.1. Motor data must be submitted with the pump submittal.

B. Record Documents:

1. Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve. For each pump with a motor horsepower greater than 10, submit a certified shop performance test curve indicating capacity, head, horsepower and flow rates from shutoff to 125 percent of design flow.
2. For centrifugal pumps, include certification that pump impeller diameter is less than 85 percent of the diameter of the maximum impeller possible (not to exceed cutwater diameter) for the pump casing, and that fabricated structural steel base is of sufficient strength to prevent vibration, warping or misalignment of the pump.

C. Operation and Maintenance Data:

1. Submit operation and maintenance data under provisions of Section 23 00 00.
2. Include installation instructions, maintenance instructions, repair parts list, assembly views, and assembly drawings for each device, including pumps, motors and variable speed drives as scheduled. Drawings and literature provided shall relate to the actual units being furnished.
3. Include a copy of the approved submittal, vibration test results, and certified pump curve with final balancing point indicated.
4. Include a letter of certification from pump manufacturer stating that pump was factory assembled by pump manufacturer.

1.4 EXTRA MATERIALS

A. Provide one extra set of mechanical seals for each pump.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products meeting all requirements of this specification section of the following manufacturers are acceptable:

1. Armstrong Pumps
2. Aurora
3. Bell & Gossett
4. Taco
5. Grundfos/Paco

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Service: Pump shall meet the duty and service condition described on the attached Data Sheets. The SELLER is not to include manufacturer's margins to the specified duty for the design of the pump.

C. Pumps shall, as a minimum, meet the requirements of the Hydraulic Institute Standard and the standards herein.

D. Pumps shall be end-suction overhung vertical split-case, or horizontal split-case double suction as appropriate for the service conditions.

E. Piping design, materials, joint fabrication, examination, and inspection shall conform to ASME B31.1.

F. Provide pumps and associated equipment suitable for continuous operation with no cyclic or hydraulic limitations at the design conditions.

G. Pumps shall be capable of operating continuously over their full operating range without overheating, cavitating, excessive noise or vibration, surging or instability when operating in single or in parallel with other pumps.

H. Pumps shall have stable head/capacity curves (continuous rise to shutoff). For parallel operation, head rise shall be at least 10% of the head at rated capacity. Discharge orifices shall not be used as a means of providing a continuous rise to shutoff.

I. The rated operating point shall be at or near, but less than the best efficiency point (BEP) for the pumps.

J. All auxiliary connections shall be pre-piped prior to assembly for shipment.

K. Provide drain and vent connections on pump casings.

L. Pumps shall be designed to operate without the need for an external cooling source.

M. Suitable surfaces shall be provided to accommodate vibration readings (x, y) utilizing portable data collector (Owner has Enpac 2500).

N. No wetted surfaces shall be lined.

O. A minimum corrosion allowance of 1/8 inch (3 mm) shall be provided on non-corrosion resistant materials.

P. Lifting lugs or tapped holes for eyebolts shall be provided on the pump case (top half for horizontal split-case pumps) and motor to facilitate installation and maintenance.

Q. Pumps shall be self-venting or vent connection shall be provided.

R. Statically and dynamically balance rotating parts.

S. Construction shall permit complete servicing (including removal of bearing housings and impeller assembly) without disconnecting piping or disturbing motor.

T. Pumps shall operate at 1,800 RPM or less, unless otherwise noted on data sheet.

U. Hydraulic fit (rated capacity vs BEP capacity) and power consumption will be included in the criteria to determine best value for long term cost of ownership during the selection process.

V. Pumps with suction specific speeds greater than 11,000 require approval of the Owner.

W. NPSHR for pump shall be no more than 70% of NPSHA, minimum 5 ft margin.

X. Maximum sound pressure level for pumps and drivers shall be 85 dBA at 3 feet (1 m).

Y. Pumps shall be provided with variable speed capability.

Z. Select pumps conservatively for scheduled conditions. Furnish pumps which have reasonably high efficiencies, with peak efficiency at or near rated conditions. Select pumps that will operate stably at 15 foot suction lift despite substantial reduction in head or substantial increase in delivery.

AA. Ensure pumps operate at specified system fluid temperatures without cavitation or vapor binding. Pumps shall be non-overloading in parallel or individual operation. Pumps shall operate within 10 percent of midpoint of published maximum efficiency curve.

BB. Provide motor driven pumps of the type and speed scheduled. Select pumps that are not overloaded throughout the entire range of pump operation. Provide pump connection sizes as scheduled.

CC. If the pumps proposed are not considered suitable, submit manufacturer's data on other pumps for review.

DD. Unless otherwise indicated the pump motor selections shall be limited to 60 HZ maximum.

EE. Pumps with integral frequency controls shall only be permitted on EC Motors 2 hp or below that do not require BAS control. All pumps greater than 2 hp shall be externally controlled.

2.3 MATERIALS

A. All materials furnished by the manufacturer shall be new, free of defects or damage.

B. Products that contain asbestos, lead, and mercury are prohibited. This prohibition includes items such as packing or gaskets even though the item is encapsulated or the asbestos fibers are impregnated with binder material.

C. Materials shall be identified by ASTM Specification Number, AISI type number, or other industry recognized means of identifying the composition and properties of the material.

D. The manufacturer shall be responsible for the proper selection of non-wetted parts of the pump assembly to ensure compatibility of the pumped fluid and the environment. Alternate materials can be offered for consideration.

E. All materials of construction shall be those proven by service in similar pump designs and

for similar operating conditions. Materials to be used are identified in this specification and also in the data sheets.

F. All austenitic stainless steel shall be furnished in the solution annealed, unsensitized condition.

2.4 CASINGS

A. Casing materials shall be ductile iron. Cast iron casing materials may be approved on a case-by-case basis, but only if the working pressure of the casing is suitable for shutoff conditions at maximum suction pressure.

B. Fully enclosed cored voids, including voids closed by plugging, shall not be permitted.

C. Maximum allowable working pressure (MAWP) shall apply to all parts referred to in the definition of pressure casing.

D. Casing shall be rated for full working discharge pressure at shutoff and maximum suction pressure conditions. Normally the MAWP should be 175 psig, but this could be higher based on selected pump shutoff pressure. Suction pressures routinely exceed 100 psig in certain parts of the UT-Austin main campus chilled water loop.

E. Renewable bronze wear ring design shall be utilized for closed impeller design.

F. Iron castings may be repaired by plugging within the limits of the applicable ASTM standards. Holes drilled for plugs shall be carefully examined, using liquid penetrant, to ensure that all defective material has been removed. All repairs that are not covered by ASTM standards shall be subject to the BUYER's approval.

G. All casing weld repairs must be approved by BUYER prior to repair. Failure to do so could result in rejection of pump by BUYER.

H. If approved by the BUYER, weld repairs may be made using the supplier's proven weld procedures. Weld repair procedures shall be part of standard procedures and shall be documented. The procedure and qualification reports shall be submitted with the proposal, if requested.

I. All flanges shall conform to ASME B16.1 or B16.5 for the design pressures and temperatures.

2.5 IMPELLER

A. Bronze material, dynamically balanced.

B. Impellers shall have solid hubs and be keyed to shaft.

C. Shafts shall be sized to transmit the maximum horsepower required by the largest size diameter impeller available for the pump size and shall be solid.

D. For between bearing pumps, bronze shaft nuts shall hold impeller and allow adjustment for centering impeller in casing.

E. Replaceable sleeves are required for all pumps. Sleeves shall be locked to the shaft mechanically and sealed to prevent leakage between shaft and sleeve. Hook sleeves shall not be used. There shall not be a “sleeve over sleeve” design used if cartridge mechanical seals are employed.

F. Austenitic stainless steel sleeves shall not be used. 400 series SS or bronze sleeves shall be utilized, or as specified on the data sheets.

G. Rated impeller diameter shall not be greater than 95% of maximum in given casing size.

2.6 MECHANICAL SEALS

A. Cartridge-type mechanical seals shall be used on pumps sized up to 50 HP. Balanced mechanical seals shall be used on pumps larger than 50 HP. Pumps shall be self-flushing with process fluid whenever possible.

B. Chilled water service normally has iron corrosion products present in the system. Seal chamber/flush plan shall be designed to maximize seal life in this environment.

C. Seals shall be suitable for the MAWP of the pressure casing. If the seals do not meet this requirement, this shall be noted along with the maximum dynamic and static pressure ratings.

D. Seal chambers shall be provided with an internal passage or external connection to permit complete venting of the chamber before startup.

E. Mechanical seal shall be compatible with service fluid for pH and corrosion resistance. The chilled water system utilizes untreated domestic water with a normal pH range of 7-9.5.

F. Mechanical seals shall be removable without disturbing motor.

G. Single mechanical seals shall be of the pusher or multi-spring type, designed to permit operation to the maximum continuous speed without resulting in unwinding or off-center operation.

H. Seal Materials:
   1. Carbon vs Silicon Carbide or Carbon vs Tungsten Carbide
   2. Elastomers: Compatible with fluid and application, normally Buna-N

I. Cartridge seals shall use setting clips that are set screwed into the seal. Wear away or plastic setting clips are acceptable. These clips shall be installed prior to shipment of the pumps to the site.

J. Plan 11 flush piping shall be self-venting. Provide flow control orifice as required. Tubing shall be 3/8” 304SS tubing 0.049” wall.

K. Seal Manufacturer: Flowserve or John Crane.

2.7 BEARINGS

A. Base mounted horizontal centrifugal pumps:
   1. Provide grease lubricated to meet specified L10 life below. Exxon Mobil lubricants are preferred.
   2. Provide roller and/or ball bearing, with grease change frequency greater than or equal to 6 months.
   3. Single or double row ball bearings shall be Conrad type (no filling slots).

B. Pump bearings shall have a minimum L10 bearing life of 60,000 hours. Bid tabulations may include a bearing size and shaft stiffness (L3/D4 calculations) in the criteria to determine best value for long term cost of ownership.

C. Preferred bearing manufacturers: Timken, FAG, SKF, Fafnir

D. All bearing housings shall have a grease fitting and drain plug, to allow for lubrication without disassembly. Bearing housings shall be fitted with labyrinth-type positive sealing for the protection of the lubricant and bearings.

E. Bearing housing design shall permit easy inspection of bearings without major disassembly.

2.8 PIPE CONNECTIONS

A. Pump suction and discharge nozzles:
   1. ¾" : Threaded or flanged
   2. 1"-2": Flanged.
   3. 3" or larger: Flanged.
   4. Flanged nozzles shall be of equal rating
   5. Flanges shall be designed for through bolting.

B. Auxiliary connections: Threaded or flanged. 1/2" minimum, ¾" preferred.
   1. Tapped openings not connected shall be plugged with a material that has a corrosion resistance equal to, or better than, the part to which the plug is connected.

2.9 COUPLINGS

A. See PIP (Process Industry Practices) RESP002, latest edition, for baseplate design guidelines for general purpose pumps.

B. All metal facing and load carrying surfaces shall be machined. Baseplates of welded steel construction are preferred. If furnished they shall be:
   1. Provided with a raised rim for retaining drips.
   2. Extended under all parts of the equipment mounted thereon.
   3. Sloped to a tapped drain connection at one or both ends.
   4. Provided with anchor bolt holes and grout holes.
   5. Designed to accommodate all equipment on a single base.
   6. Prepared for use with epoxy grout.
   7. Coated with manufacturer's standard coating system.

C. The baseplate shall be designed to withstand all mechanical forces that could cause misalignment of the equipment such as those due to piping strains, thermal expansion, and hydraulic piping thrust.

D. There shall be sufficient holes in any baseplate furnished to allow for grout filling and air venting, providing a sound foundation. The actual base or baseplate stiffness shall be incorporated in the lateral and torsional analysis of the rotating elements. The analysis shall take into account the form of support and its stiffness.

E. Provide a piped full size connection to floor drain with ANSI Schedule 40 galvanized pipe from baseplate.

F. Baseplate shall be designed so that the natural frequency of the base/pump/motor system is outside the normal operating speed and multiples thereof to minimize vibration. Baseplates and pump system design shall be designed for 0-100% variable speed operation without excessive vibration, even if not specified on the data sheets.

G. Baseplate should be fitted with alignment screws for longitudinal and lateral alignment when motor rating exceeds 40 HP.

2.10 MOTORS

A. Motors located outdoors, or those located indoors that could get contaminated with water shall be TEFC enclosure.

B. Motor nameplate rating, excluding service factor, shall be sized for the higher of the following: 1.15 times the highest horsepower required for any process condition from shutoff to rated flow, or runout at rated impeller size. For these purposes, runout is defined as 120% of BEP. An alternate consideration of 110% of BEP may be considered in cases where the hydraulic fit of the pump warrants.

2.11 SHOP CLEANING/SHIPMENT PREPARATION

A. A complete cleaning and drying of internal and external surfaces shall be performed.

B. Mechanical seals shall be suitably prepared to prevent damage to the seal faces during shipment.

C. Cleaning of surfaces, which are not to be painted or coated, shall be done according to the manufacturer's recommended practice. All cleaning operations shall be conducted such that stainless steel and nickel alloys are not contaminated with lead, copper, mercury, and/or other low melting point metals; chlorides, sulfur, halogens, as well as ferritic steel materials.

D. Machined or mating surfaces, as well as pipe and components for lube oil systems, shall be free of rust. All internal surfaces shall be cleaned of all particulate and contaminates, such as sand, metal chips, weld slag, etc. Additionally, the surface shall be free of organic contaminates such as oil, paint, and preservatives as determined by a visual examination.

E. External non-corrosion resistant metallic surfaces of pumps and motors shall be primed

and finished in accordance with the manufacturer's standards, with the exception that coatings shall not contain lead or chromates. All assemblies shall be flushed and cleaned prior to packaging. Stainless steel and similar corrosion-resistant materials shall not be treated or painted with a rust preventative. All non-corrosion resistant materials shall be provided with a high-grade primer and top-coat over a blast clean and smooth surface prior to packaging for shipment.

F. All internal parts, including the seal chamber, shall be coated with a suitable rust preventative.

G. Desiccants or VPI should be used to avoid condensation. These shall be attached in an accessible area for removal, and location shall be indicated on the outside of the casing with a durable tag or label.

H. Internal areas of bearing housings shall be coated with a suitable oil-soluble rust preventative compatible with the recommended lubricant. Bearings that are pre-greased at the factory comply with this requirement.

I. After cleaning and preservation methods are complete, exposed openings shall be covered/blocked with rigid covers. Flange facings shall be protected to prevent damage during shipment.

2.12 IDENTIFICATION AND TAGGING

A. Each part of the complete assembly shall be permanently marked in accessible locations. There shall be large, visible nameplates that identify:
   1. Equipment Model and Type.
   2. Tag No.
   3. Service Conditions: Capacity, TDH, Fluid Temperature, Rotational Speed, BHP (kW).
   4. Hydrostatic test pressure
   5. Impeller diameter.
   6. Year Built.
   7. Serial numbers and shop order numbers.

B. Rotation arrows shall be cast or attached to each major item of rotating equipment at a readily visible location.

C. Nameplates and rotation arrows (if attached) shall be austenitic stainless steel or nickel-copper alloy (Monel or equivalent). Attachment pins shall be of the same material as the nameplate. Welding of nameplates and rotation arrows is prohibited.

2.13 SPECIAL TOOLS

A. Provide special tools, jigs, fixtures, and lifting tackle which are necessary for assembly, erection, operation, maintenance, and repair of equipment. Special tools shall become property of BUYER.

B. Special tools and devices are of design, purpose, and use of which are peculiar to equipment furnished and which are not available from normal wholesale or retail outlets.

Standard general-purpose tools are not included in this requirement.

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

A. Comply with HI 1.4 and HI 2.4.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

E. Pump piping shall include a line-sized pump bypass to allow the building to be served when differential pressure of the campus system is sufficient to meet the demand. At a minimum, the bypass shall include an isolation valve, strainer, check valve, drain valve, and discharge isolation valve.

F. Install pumps according to the pump manufacturer's printed recommendations and pipe as shown on drawings. Install pumps with minimum 30” access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

G. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

H. The Contractor shall level each pump and grout each pump base.

I. Route drain from drip pan to nearest floor drain.

J. Stored pumps shall have shafts rotated at least once a month.

K. Name Plates: Install spare nameplate as required in Part 2 of this Specification.

L. Provide sectional valves on each hydronic pump branch riser, suction and discharge. Provide pump inlet strainer and discharge check valve. Provide pump suction and discharge pipe braided stainless steel flex connectors.

M. Install pump inlet pipe to provide a straight horizontal suction with a minimum of five pipe diameters in length.

N. Suction diffusers are only allowed if space constraints require their use.

O. Pipe taps shall be constructed of 3/4" Schedule 80 Thread-o-Let, 3/4" 304/316 stainless steel nipples, and 3/4" bronze gate valve or approved ball valve.

P. Unless otherwise indicated on plans and details, pipe directional changes off pumps shall use long radius reducing elbows or eccentric reducers to reduce and minimize turbulence.

Provide piping support such that piping weight is not transferred to pump flanges or casing. Provide supports under elbows and horizontal pipe.

Q. Provide drain valves on pump suction and discharge pipe, located to completely drain equipment for service or repair.

R. Provide base-mounted pumps on minimum of 4" high concrete base equal or greater than 3 times total weight of pump and motor, with anchor bolts poured in place.

3.2 ALIGNMENT

A. Lubricate pumps prior to start-up. Provide manufacturer's factory representative certification for alignment of the pumps. Factory technician shall inspect pump installation after grouting is complete and certify pump alignment is in accordance with manufacturer's instructions and that the installations comply with the manufacturer's warranty requirements.

B. Align the pump and motor shafts and piping connections after setting on the foundation, grout has been set, foundation bolts have been tightened, and piping connections have been made.

C. Comply with pump and coupling manufacturers' written instructions.

D. Adjust pump and motor shafts for angular and offset alignment by methods specified in Hydraulic Institute 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."

E. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with non-shrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.3 CONNECTIONS

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

B. Install piping adjacent to pump to allow access for service and maintenance.

C. Connect piping to the pumps. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

D. Install isolation valves that are the same size as the piping connected to pumps.

E. Install inlet and discharge isolation valves, flex connectors, inlet strainers, discharge check valves, straight pipe runs, and pipe supports according to the pump manufacturer's installation instructions.

F. Install pressure gages on pump suction and discharge at integral pressure gage taps, or install single gage with multiple input selector valve.

G. Connect wiring according to Division 26, Insulated Conductors.

3.4 VIBRATION TESTING

A. Vibration velocity readings shall be taken at all bearing locations of all pumps. Pumps driven by variable speed drives shall be tested throughout their range of speeds. Vibration shall not exceed 0.15 inch/second (peak). Record and deliver copies of the test report to the Owner and include the report in the O&M Manual.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

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

C. Perform tests and inspections with the assistance of a factory-authorized service representative.

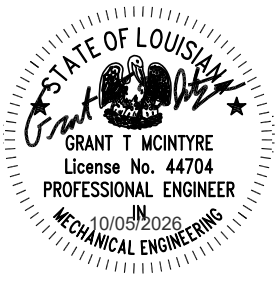
D. Hydronic pumps will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 23 2 513 - WATER TREATMENT FOR HYDRONIC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section contains procedures for cleaning, passivating, and final treatment of new chilled or hot water piping.

B. Procedures for cleaning, passivating, and final treatment of new chilled/hot water piping for campus distribution piping. Campus distribution piping may include piping that is in the building up to and including heat exchangers and pumps. This procedure has been written assuming that the piping will be hydrotested prior to cleaning, and that there will be some time between hydrotesting and cleaning in which the lines will stay full and blocked. The cleaning/flushing procedures should be performed as close to commissioning as possible to minimize corrosion. Any deviations to this scope shall be reviewed by the Owner and the Owner's water treatment supplier.

C. Chemicals shall be provided by Contractor. Contractor is responsible for performance of all flushing/cleaning/passivating and final treatment activities unless noted herein. The flushing and final treatment procedures shall apply to all piping systems in chilled/hot water service that contain any carbon steel or iron (piping, or steel body/iron valves). The cleaning/passivation procedures apply to carbon steel piping systems and carbon steel piping systems that are connected to HDPE piping systems. For HDPE piping systems that contain carbon steel/iron body valves, it may not be necessary to perform the cleaning and passivation step if the piping is not contaminated and can be adequately cleaned through flushing. Contact the Owner for further clarification.

D. Handle, use, store and dispose of all chemicals according to the federally required Material Safety Data Sheets (MSDS) instructions and local requirements.

1.2 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for the following products:
   1. Chemical types and quantities.
   2. Initial and final water quality test by owner's water treatment contractor.
   3. Water meters.

B. Equipment Recommend Water Quality Data:
   1. Provide to the engineer and owner's water treatment contractor, a separate submittal including manufacturer recommended water quality levels for the following:
      a. Underground piping.
      b. Cooling Tower.
      c. Water Cooled Chillers.
      d. Piping Accessories & Valves (where applicable).

1.3 PRE-INSTALLATION MEETING

A. Schedule a meeting with the university staff, mechanical engineer and owner's water treatment contractor within one month of project award.

B. Owner's Water Treatment Contractor:
   1. Thornton Musso & Bellemin, Inc.
      a. Lee Thorton
      b. Office Number: 225-654-4955
      c. Email: mlt@tmbwater.com
   2. Contractor will coordinate water treatment with TMB water and relocation of existing automatic chemical feed system. Contractor shall provide chemicals to TMB for water treatment.
   3. Contractor shall make all field piping and connections as required for relocating existing automatic chemical feed system. Provide Unistrut supports as required for relocation.
   4. Contractor shall provide flushing and cleaning and coordinate with TMB as required.

C. Estimated Chemicals Required:
   1. Based on estimated water volume of piping.
   2. 825 gallons (3 totes) of chemicals of TMB 533.
   3. Contractor shall be responsible for providing additional chemicals specified elsewhere in contract documents and additional chemical required for treating the new water where the estimated amount is not sufficient.

PART 2 - PRODUCTS

2.1 Chemicals - Figure in bid providing 825 gallons (3 totes):

A. Trade Name: TMB 533

B. Mixture:
   1. Sodium Hydroxide
      a. CAS Number: 1310-73-2
      b. Percent Composition: 0-2
   2. Benzotriazole
      a. CAS Number: 95-14-7
      b. Percent Composition: 0-2
   3. Sodium Borate Pentahydrate
      a. CAS Number: 1330-43-4
      b. Percent Composition: 1-5
   4. Sodium Nitrite:
      a. CAS Number: 7632-00-00
      b. Percent Composition:15-25

PART 3 - EXECUTION

3.1 FLUSHING

A. The Mechanical Contractor shall meet with Owner and Owner's water treatment supplier prior to start of cleaning/passivating to review procedures and also circulation routing through the piping.

B. Ensure that water that meets water quality specifications for hydrotesting will be used to fill and flush the system. Ensure that backflow prevention is adequate.

C. Do not flush or clean the piping through heat exchangers, pumps, cooling coils, air handlers, or any other equipment. Heat exchangers must be bypassed and left dry until the piping has been cleaned and passivated.

D. Where permanent strainers are not already in-place, temporary strainers shall be installed in the system to protect chilled water pumps, and to prevent contamination of the existing system from the new chilled water lines. If the air handlers do not have permanent strainers, temporary strainers shall be installed to protect those as well.

E. Temporary strainers shall be installed for the flushing sequence that shall collect all debris in the flushing loop. The maximum mesh size for the start of flushing shall be as recommended by the pump manufacturer. Progressively smaller sizes shall be installed as the flushing is performed, with the end point being a 40 mesh screen size. During the flushing procedure, strainers shall be cleaned as often as necessary to remove debris, and, in any event, all strainers shall be cleaned by physically removing the strainer screen from the body of the strainer at the end of the flushing. Replace strainer and gasket after each cleaning of strainer.

F. Flush and drain loops to remove debris. Temporary pumps and piping will need to be furnished and installed by contractor to circulate through the new system. The new piping shall not be directly connected to the existing chilled water loop until it has been cleaned and passivated. System shall ultimately be circulated at 10 ft/s. Repeat until strainers are free of large particles. Owner's representatives will make the determination that the system is ready to proceed to the cleaning phase.

3.2 CLEANING & PASSIVATION

A. Ensure that strainers are cleaned prior to adding cleaning chemicals. Check with Owner to determine proper mesh size for strainers.

B. Once the system has been readied for the cleaning process, start the circulation pumps and add 2 gallons of Apollo CTW-2000 and 2 gallons of Apollo AWS-2005 for every 1000 gallons of system volume.

C. Add 2 ounces of Apollo CTW-7000 antifoam per 1000 gallons of system volume.

D. Add chemicals using either a metering pump, temporary by-pass pot feeder, or by a vacuum into the suction side of the circulation pump.

E. Circulation rate shall be in the range of 3 – 5 ft/s.

F. After adding chemicals, circulate for a minimum of 24 hours and sample. At this time the Owner's representatives will determine if additional circulation time is needed. Once circulation has started for cleaning, system shall circulate continuously (24 hours/day).

G. If necessary, add additional chemicals to meet desired concentration.

H. Circulate solution at 3 – 5 ft/s for 48-72 hours.

I. Sample cleaning solution. Results will be analyzed and reviewed by Owner's representatives. Circulation shall continue throughout this process.

J. When indicated, drain system, refill, sample, and repeat until system is clean. The methodology to determine the end point of the flushing is testing the conductivity, iron level, and phosphate level.

K. Coordinate with the owner and engineer for intent to drain and drain location minimum 2 weeks prior to draining.

L. If acceptable to TMB, an alternate flush method would be to flush continuously with fresh water until samples indicate that pipe has been cleaned. The flush must be conducted while circulating at 3-5 ft/s continuously.

M. Clean strainers at the completion of the cleaning cycle.

3.3 FINAL TREATMENT

A. Once pipe is clean, refill and immediately add 32 oz. of Apollo CLP-2500 and 32 oz of Apollo CLP-0380 inhibitor for every 1000 gallons of system volume.

B. Circulate for 4 hours, sample, then shut down pumps and shut in system after satisfactory sample results have been obtained.

C. Provisions will need to be made to allow for intermittent circulation and analytical testing if pipe is projected to stay full and idle longer than 2 weeks.

D. For each step in the process (flushing, cleaning, passivating, & final treatment) the Owner, Owner's water treatment supplier, and Owner's representatives shall review and approve results prior to proceeding to the next step.

E. Once the system is readied for the tie-in to the main chilled water system, no further action is required.

F. In the event that HDPE or PP piping will be filled with city water and left for longer than 2 weeks, treatment and/or circulation may be required. Flushing of lines prior to commissioning will be required.

3.4 INSTALLATION

A. Install chemical-application equipment on concrete bases, level and plumb. Maintain

manufacturer's recommended clearances. Arrange units, so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate. Install all chemical application equipment within a spill-containment area without floor drain.

B. Install water-testing equipment on wall near water-chemical-application equipment.

C. Install interconnecting control wiring for chemical-treatment controls and sensors.

D. Mount sensors and injectors in piping circuits.

E. Bypass Feeders: Install in closed hydronic systems, and equip with the following:
   1. Install bypass feeder in a bypass circuit around circulating pumps unless indicated otherwise on Drawings.
   2. Install water meter in makeup-water supply.
   3. Install test-coupon assembly in bypass circuit around circulating pumps unless otherwise indicated on Drawings.
   4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below the feeder inlet.
   5. Install a swing check on the inlet after the isolation valve.

F. Relocated existing automatic chemical feed system and include all piping, accessories and components as required, including new Unistrut supports.

3.5 FIELD QUALITY CONTROL

A. Testing Agency:
   1. Engage a qualified testing agency to perform tests and inspections, coordinate with .

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

C. Perform tests and inspections[with the assistance of a factory-authorized service representative].

D. Tests and Inspections:
   1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
   2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
   3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of hydronic systems' startup procedures.
   4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
   5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered

or concealed before it has been tested and approved.

7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials, and retest piping until no leaks exist.

E. Equipment will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. At 4 week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis, advising Owner of changes necessary to adhere to "Performance Requirements" Article.

H. Comply with ASTM D3370 and with the following standards:
1. Silica: ASTM D859.
2. Acidity and Alkalinity: ASTM D1067.
3. Iron: ASTM D1068.
4. Water Hardness: ASTM D1126.

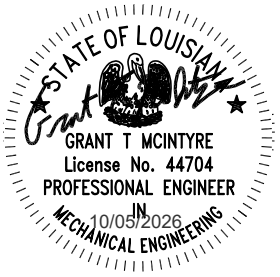
3.6 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals to maintain water conditions required above, to inhibit corrosion and scale formation for hydronic piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion and shall include the following:
1. Initial water analysis and HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment.

END OF SECTION



DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING
SECTION 235216 – CONDENSING BOILERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manufactured units.

B. Boiler construction.

C. Boiler trim.

D. Fuel burning system.

E. Factory installed controls.

F. Combustion make-up air system.

G. Magnetic filters.

1.2 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete.

B. Section 230913 - Instrumentation and Control Devices for HVAC.

C. Section 232114 - Hydronic Specialties.

D. Section 232123 - Hydronic Pumps.

E. Section 232500 - HVAC Water Treatment.

F. Section 235100 - Breechings, Chimneys, and Stacks.

G. Section _____ - _____: Installation of indoor/outdoor reset controller.

H. Section 251400 - Integrated Automation Local Control Units.

I. Section 251500 - Integrated Automation Software.

J. Section 253500 - Integrated Automation Instrumentation and Terminal Devices for HVAC.

K. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); Current Edition.

B. AHRI 1500 - Performance Rating of Commercial Space Heating Boilers; 2015.

C. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2022.

D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. ASHRAE Std 103 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2022.

F. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata (2023).

G. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.

H. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.

I. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2023.

J. Bluetooth CS - Bluetooth Core Specification; 2016, Addendum 2017.

K. IEEE 802.11 - IEEE Standard for Information Technology--Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Networks--Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications; 2020 (Corrigendum 2022).

L. IEEE 802.15.4 - IEEE Standard for Low-Rate Wireless Networks; 2020, with Corrigendum (2022).

M. LonMark Interoperability Guide - LonMark Application-Layer Interoperability Guide and LonMark Layer 1-6 Interoperability Guide; Version 3.4; 2005.

N. Modbus (PS) - The Modbus Organization Communications Protocol.; Latest Update.

O. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI); Current Edition.

P. NFPA 31 - Standard for the Installation of Oil-Burning Equipment; 2024.

Q. NFPA 54 - National Fuel Gas Code; 2024.

R. NFPA 58 - Liquefied Petroleum Gas Code; 2024.

S. SCAQMD 1146.1 - Emissions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters; 1990, with Amendment (2018).

T. SCAQMD 1146.2 - Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters; 1998, with Amendment (2018).

U. UL 507 - Electric Fans; Current Edition, Including All Revisions.

V. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting<< one week; at least one week; _____; or None - N/A>> prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements, and service connections.

C. Manufacturer's Installation Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.

D. Manufacturer's Factory Inspection Report: Submit boiler inspection prior to shipment.

E. Manufacturer's Field Reports: Burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.
   1. Indicate compliance with specified performance and efficiency.
   2. Provide results of the following combustion tests:
      a. Boiler firing rate.
      b. Over fire draft.
      c. Gas flow rate.
      d. Heat input.
      e. Burner manifold gas pressure.
      f. Percent carbon monoxide.
      g. Percent oxides of nitrogen.
      h. Percent oxygen.
      i. Percent excess air.
      j. Flue gas temperature at outlet.
      k. Ambient temperature.
      l. Net stack temperature.
      m. Percent stack loss.
      n. Percent combustion efficiency.
      o. Heat output.

F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

H. Software: Copy of software provided under this section.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum << three; or _____>> years of<< documented; _____; or None - N/A>> experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect boilers from damage by leaving factory inspection openings and shipping packaging in place until final installation.

1.8 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide a << five; or ____>> year warranty to include coverage for heat exchanger.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

A. New Products: _____.

B. Existing Products: _____.

2.2 MANUFACTURERS

A. Natural Gas, Propane, or Combination Natural Gas/Propane for Indoor Applications:
1. Bosch Thermotechnology<< ; _____; or None - N/A>>: www.bosch-thermotechnology.us/#sle.
2. Bradford White Corporation<< ; _____; or None - N/A>>: www.bradfordwhite.com/#sle.
3. LAARS Heating Systems Company<< ; _____; or None - N/A>>: www.laars.com/#sle.
4. Lochinvar LLC<< ; _____; or None - N/A>>: www.lochinvar.com/#sle.
5. The Fulton Companies<< ; _____; or None - N/A>>: www.fulton.com/#sle.
6. _____.
7. Substitutions: << See Section 016000 - Product Requirements; or Not permitted>>.

B. Modular Condensing Hot Water Boiler for Indoor Applications:
1. Bosch Thermotechnology<< ; CM Series, Instant Flow; ; ERB Series, Large Capacity; ; _____; or None - N/A>>: www.bosch-thermotechnology.us/#sle.

2. Lochinvar LLC<< ; _____; or None - N/A>>: www.lochinvar.com/#sle.
3. _____.
4. Substitutions: << See Section 016000 - Product Requirements; or Not permitted>>.

C. Natural Gas, Propane, or Combination Natural Gas/Propane for Outdoor Applications:
1. Bradford White Corporation<< ; _____; or None - N/A>>: www.bradfordwhite.com/#sle.
2. LAARS Heating Systems Company<< ; _____; or None - N/A>>: www.laars.com/#sle.
3. Lochinvar LLC<< ; _____; or None - N/A>>: www.lochinvar.com/#sle.
4. The Fulton Companies<< ; _____; or None - N/A>>: www.fulton.com/#sle.
5. _____.
6. Substitutions: << See Section 016000 - Product Requirements; or Not permitted>>.

D. No.2 Fuel Oil, Combination Natural Gas/No. 2 Fuel Oil, or Combination Propane/No. 2 Fuel Oil for Indoor or Outdoor Applications:
1. The Fulton Companies<< ; _____; or None - N/A>>: www.fulton.com/#sle.
2. _____.
3. Substitutions: << See Section 016000 - Product Requirements; or Not permitted>>.

2.3 MANUFACTURED UNITS

A. Factory assembled, factory fire-tested, self-contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

B. Unit: Metal membrane wall, water or fire tube, condensing boiler on integral structural steel frame base with integral fuel burning system, firing controls, boiler trim, insulation, and removable jacket, suitable for << indoor; outdoor; or _____>> application.

C. Electrical Characteristics:
1. ____ rated load amperes.
2. ____ VAC, << single; or three>> phase, 60 Hz.
3. Refer to Section 260583.

D. Annual Fuel Utilization Efficiency (AFUE): << 0.82; 0.95; or ___>> in accordance with ASHRAE Std 103.

E. Thermal Efficiency as defined by AHRI 1500: ____.

2.4 BOILER CONSTRUCTION

A. Comply with the minimum requirements of << ASME BPVC-IV; ANSI Z21.13; and _____>> for construction of boilers.

B. Assembly to bear the ASME "H" stamp and comply with the efficiency requirements of the latest edition of ASHRAE Std 90.1 I-P.

C. Required Directory Listings:
   1. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI) ; current edition at www.ahrinet.org.
   2. NBBI Manufacturer and Repair Directory - The National Board of Boiler and Pressure Vessel Inspectors (NBBI) ; current edition at www.nationalboard.org.

D. Heat Exchanger: Construct with materials that are impervious to corrosion where subject to contact with corrosive condensables.

E. Provide adequate tappings, observation ports, removable panels, and access doors for entry, cleaning, and inspection.

F. Insulate casing with insulation material, protected and covered by heavy-gauge metal jacket.

G. Factory apply boiler base and other components, that are subject to corrosion, with durable, << acrylic; powder coated; painted; weather-proofed; or _____>> finish.

2.5 BOILER TRIM

A. ASME rated pressure relief valve.

B. Flow switch.

C. Electronic Low Water Cut-off: Complete with test light and manual reset button to automatically prevent firing operation whenever boiler water falls below safe level.

D. Temperature and pressure gauge.

E. Pressure Switches:
   1. High gas pressure.
   2. Low gas pressure.
   3. Air pressure.

F. Manual reset high limit.

G. Boiler Pump (where required by boiler design):
   1. Primary pump, factory supplied and sized for field installation to ensure minimum, continuous circulation through boiler.
   2. Where pump is not provided by boiler manufacturer, provide pump in accordance with boiler manufacturer's recommendations.
   3. Pump time delay.

2.6 FUEL BURNING SYSTEM

A. Provide << forced draft automatic burner; pulse combustion; or _____>>, integral to boiler, designed to burn << natural gas; propane; No. 2 fuel oil; and _____>>, and maintain fuel-air ratios automatically.
   1. Blower Design: Statically and dynamically balanced to supply combustion air; direct connected to motor.

2. Forced Draft Design: Mixes combustion air and gas to achieve << 90; or ___>> percent combustion efficiency.
3. Pulse Combustion Design: Self-aspirating, not requiring blower for combustion.
4. Combustion Air Filter: Protects fuel burning system from debris.

B. Gas Train: Plug valve, safety gas valve, gas-air ratio control valve, and pressure regulator controls air and gas mixture.

C. Emission of Oxides of Nitrogen Requirements: Comply with << SCAQMD 1146.1; SCAQMD 1146.2; and _____>> for natural gas fired system, as applicable.

D. Intakes: Combustion air intake capable of accepting free mechanical room air or direct outside air through a sealed intake pipe.

2.7 FACTORY INSTALLED CONTROLS

A. Option for internal or external (0-10) VDC control.

B. Temperature Controls:
1. Automatic reset type to control fuel burning system << on-off; firing rate; and _____>> to maintain temperature.
2. Manual reset type to control fuel burning system to prevent boiler water temperature from exceeding safe system water temperature.
3. Low-fire start time delay relay.

C. Electronic PI setpoint/modulation control system.

D. Microprocessor-based, fuel/air mixing controls.

E. BAS, SCADA, or other Integrated Automation Link: << ASHRAE Std 135 BACnet IP; ASHRAE Std 135 BACnet MS/TP; ASHRAE Std 135 BACnet SC; Modbus (PS) Modbus IP; Modbus (PS) Modbus RTU; LonMark Interoperability Guide LonWorks; Bluetooth CS Bluetooth wireless; IEEE 802.11 Wi-Fi; IEEE 802.15.4 Zig-bee wireless; or _____>>.
1. External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.
2. Remotely coordinated by boiler plant demand optimization controller; see Section 251400.

2.8 COMBUSTION MAKE-UP AIR SYSTEM

A. Manufacturers:
1. Enervex, Inc<< ; _____; or None - N/A>>: www.enervex.com/#sle
2. US Draft Co, a division of RM Manifold Group, Inc<< ; Pressure Air Systems (PAS) ; ; _____; or None - N/A>>: www.usdraftco.com/#sle.
3. _____.
4. Substitutions: << See Section 016000 - Product Requirements; or Not permitted>>.

B. Controller:
   1. Pressure modulating using external bidirectional static pressure sensor rated for << minus 1 to 1 in-wc (minus 0.25 to 0.25 kPa); or _____>> service.
   2. Remote Monitoring: Provide hardwired or software interface to boiler controller.
   3. Remote Monitoring: Provide hardwired interface to controller, see Section 251400.
   4. Remote Monitoring: Provide compatible software interface, see Section 251500.

C. Direct Make-Up Air Supply:
   1. Duct-mounted inline << galvanized steel; stainless steel; or _____>> fan with inverter duty TEFC motor.
   2. << 800 cfm (22653,5 Lpm); 6,200 cfm (175564,4 Lpm); or _____>> at << 2 in-wc (497.6 Pa); 3 in-wc (746.5 Pa); or _____>> of static pressure, maximum.

D. Indirect Make-Up Air Supply:
   1. Surface-mounted << aluminum; stainless steel; or _____>> fan with inverter duty TEFC motor.
   2. << 6,000 cfm (169901,1 Lpm); 17,200 cfm (487049,8 Lpm); or _____>> at << 5 in-wc (1.2 kPa); 10 in-wc (2.5 kPa); or _____>> of static pressure, maximum.

E. Fan Assembly: Comply with UL 507 and UL 705 listings and ratings.

F. Maximum Service Temperature: << 350 degrees F (176.7 degrees C); or _____>>, continuous.

G. Accessories: Provide << encapsulated relay; gas-flow switch; pressure switch; outside air pressure sensor port; relay; tubing with fittings; and _____>>.

2.9 MAGNETIC FILTERS

A. Manufacturers:
   1. ADEY Innovation LLC<< ; _____; or None - N/A>>: www.adey.com/#sle.
   2. _____.
   3. _____.
   4. Substitutions: << See Section 016000 - Product Requirements; or Not permitted>>.

B. Description: ASME BPVC-VIII-1 compliant, packaged oxide filtration assembly configured to remove dissolved ferrous metals from hydronic systems.

C. In-line Filter Assembly:
   1. Magnetic belt surrounded by stainless steel vessel and << nonferrous; PVC; or _____>> casing.
   2. Provide filter assembly with automatic air vent and EPDM flange gaskets.
   3. Flange Connections: << 2 inches (50 mm, DN); 3 inches (75 mm, DN); 4 inches (100 mm, DN); or _____ inches (_____ mm, DN)>>, ASME B16.5 Class 150.
   4. Maximum Fluid Service Pressure: << 145 psi (1000 kPa); or _____ psi (_____ kPa)>>.

5. Maximum Temperature: << 212 degrees F (100 degrees C); or _____ degrees F (_____ degrees C)>>.

2.10 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide factory tests to check construction, controls, and operation of unit.
1. Tests will be witnessed by Architect at manufacturer's expense.

C. Manufacturer to conduct boiler inspection prior to shipment; submit copy of inspection report to Architect.

D. Non-Complying Work: See Section 014000.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.

C. Install boiler and provide connection of liquified petroleum gas service in accordance with requirements of NFPA 58 and applicable codes.

D. Install boiler and provide connection of No. fuel oil service in accordance with requirements of NFPA 31 and applicable codes.

E. Install boiler on concrete housekeeping base, sized minimum of 4 inches (100 mm) larger than boiler base in accordance with Section 033000.

F. Coordinate factory installed controls with Section 230913.

G. Coordinate provisions for water treatment in accordance with Section 232500.

H. Pipe relief valves to nearest floor drain.

I. Pipe cooled condensate produced by the combustion process from the boiler condensate connection and/or flue stack with suitable piping material to neutralizer prior to discharging into nearest floor drain.

J. Install primary boiler pump in accordance with Section 232123.

K. Provide piping connection and accessories in accordance with Section 232114.

L. Provide for connection to electrical service in accordance with Section 260583.

M. Connect vent combustion generated fumes to breeching, chimney or exhaust stack; see Section 235100.

N. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote << front-end interface; see Section 25 1500; software app or terminal; see Section 253500; or _____>>.

3.2 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Demonstrate proper operation of << equipment; or _____>> to Owner's designated representative.

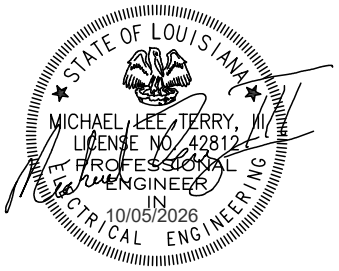
D. Demonstration: Demonstrate operation of system to Owner's personnel.
1. Use operation and maintenance data as reference during demonstration.
2. Conduct walking tour of project.
3. Briefly describe function, operation, and maintenance of each component.

E. Training: Train Owner's personnel on operation and maintenance of system.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of << two hours; one day; or _____>> of training.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site.
5. Location: Owner's offsite classroom facilities may be used.
6. Location: Provide local classroom facilities.
7. Location: At manufacturer's training facility; include travel expenses for << one member; two members; or _____ members>> of Owner's staff.

3.3 SCHEDULES

A. Condensing Boilers:
1. Drawing Code:
2. Location:
3. Manufacturer:
4. Model:
5. Fuel:
6. Input at Sea Level:
7. Output at Sea Level:
8. Working Pressure:
9. Blower Motor Horsepower (Where applicable):
10. Oil Pump Motor Horsepower (Where applicable):
11. Primary Boiler Pump (Where applicable):

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 260100 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. The work to be performed under these specifications shall include the furnishing of all labor, materials, equipment and services required for a complete electrical system as specified herein and as shown by the Drawings. A state of Louisiana licensed Electrical Contractor shall perform the work specified herein. The work includes but is not limited to:

1. Demolish the existing boiler equipment circuits as shown on the Drawings, including coordinating with other Disciplines.
2. Furnishing and installing disconnect switches for use within buildings.
3. Furnishing and installing receptacles and special outlet boxes for electrical systems shown on Drawings.
4. Furnishing and installing electrical conduit and wiring required for connection of mechanical equipment furnished under other sections of these specifications.
5. Furnishing and installing communications devices and wiring as shown on the Drawings.
6. Installation of temporary construction power required by the General Contractor and Sub-Contractors during the construction period.

1.2 GENERAL CONDITIONS

A. The General Conditions and Supplementary General Conditions are a part of this section of these Specifications. The Contractor is cautioned to read and be thoroughly familiar with all provisions of the General Conditions. These conditions shall be complied with in every aspect. The word "shall" where used, is to be understood, as mandatory and the word "should" as advisory. "May" is used in the permissive sense.

1.3 GENERAL REQUIREMENTS

A. The Contractor is referred to all of the Drawings for building construction as well as the electrical Drawings.

B. The Contractor shall examine the site and shall verify to his own satisfaction the location of all utilities, and shall adequately inform himself as to their relation to his work before entering into a Contract and he shall base his bid on any conditions, which may be encountered during the progress of the work.

C. The Contractor shall furnish and install properly all materials, devices, equipment, supports, controls, appurtenances, etc., mentioned or required to make complete or satisfactory installations in working order whether shown or not. All electrical equipment shall be connected in accordance with manufacturer's instructions. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance when completed.

1.4 MINIMUM STANDARDS

A. Applicable rules of the National Electrical Code apply as a minimum standard for this contract, but do not replace or reduce any specific requirement herein.

1.5 DRAWINGS

A. Plans and detail sketches are submitted to limit, explain, and define structural conditions, specified requirements, conduit sizes, and manner of erecting work. The Contractor is cautioned to field check and verify all existing conditions before bidding, as no extra compensation will be allowed for conditions found different than represented in the construction drawings and/or specifications. Written approval of the Engineer shall be obtained prior to any alterations or additions to specified work.

B. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required, but specified sizes and requirements necessary for satisfactory operations shall remain unchanged.

C. The drawings and these specifications are complementary to each other and what is called for by one shall be binding as if called for by both.

D. General arrangement of work is indicated on plans. Due to the small scale of the drawings, offsets, fittings, and boxes required are not all indicated; provide fittings, boxes, etc., as needed in accordance with codes and accepted practices.

1.6 SUPERVISION

A. The Contractor shall personally or through an authorized and competent representative, constantly supervise the work from beginning to completion and final acceptance. So far as possible, he shall keep the same foreman and workmen throughout the project duration.

B. During its progress, the work shall be subject to inspection by representatives of the Engineer, at which times the Contractor shall furnish required information.

C. It is not the Engineer's duty to direct or guarantee the work of the Contractor, but to assist the Owner in obtaining a complete building in accordance with plans, specifications and addenda and to furnish engineering services in accordance with recognized practices.

1.7 PRIOR APPROVALS

A. The Contractor shall base his proposal on materials as specified herein. Any references to a specific manufacturer or trade name is made to establish a standard of quality and to define a type of product and in no way is intended to indicate a preference for a particular manufacturer. It is the intent of these specifications to allow all manufacturers of equipment, products, etc., judged equal to the specified product to bid on a competitive basis.

1.8 MEASUREMENTS

A. The Contractor shall verify all measurements and shall be responsible for the correctness of same, before ordering any materials or doing any work. No extra charge or compensation will be allowed for any differences between the actual measurements and those indicated on the drawings.

1.9 LAWS, PERMITS AND FEES

A. The entire electrical work shall comply with the rules and regulations of the City, Parish, and State, including the State Fire Marshal and State Board of Health, whether so shown on plans or not. The Contractor shall pay fees for permits, inspections, etc., and shall arrange with the inspecting authorities all required inspections.

1.10 SITE INSPECTION

A. The Contractor shall visit the site and familiarize himself with difficulties attendant to the successful execution of the work before bidding. Failure to visit the site shall not relieve the Contractor of the extent or conditions of the work required of him.

PART 2 - PRODUCTS

2.1 MATERIAL AND EQUIPMENT

A. All materials, equipment, and accessories installed under this Contract, whether approved or not, shall be new and shall conform to all rules, codes, etc., as recommended or adopted by the National Association(s) governing the manufacture, rating and testing of such materials, equipment, and accessories.

2.2 SHOP DRAWINGS

A. The Contractor shall submit to the Engineer complete descriptive and dimensional data on the following items for review and approval:
1. Disconnect Switches
2. Conduit, Conduit Fittings, and Conduit Ground Bushings
3. Conductors
4. Data Cables and Jacks
5. Data Equipment (Racks, patch panels, etc.)
6. Boiler Equipment Electrical Information
7. Pump Electrical Information

PART 3 - METHODS OF INSTALLATIONS

3.1 CONTRACTOR COORDINATION

A. The Drawings are diagrammatic in nature. Cooperate with other trades so the interferences of facilities and equipment will be avoided.

3.2 OPENINGS, CUTTING AND PATCHING

A. Cut all openings as required for the electrical work. Patching will be done by the various crafts whose work is involved. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such times and in such a manner as not to delay or interfere with the work of other Contractors. Caulk, flash or otherwise make weatherproof all penetrations through the roof and exterior walls.

B. Where conduit, cable or other items that are provided for under this contract penetrate fire rated walls or floors, the Contractor is to seal around the item to maintain the integrity of the rated system.

3.3 PAINTING

A. Painting shall be performed as described in the painting specifications. No painting will be required by the Contractor except for touch-up of factory finishes on equipment furnished under this contract.

3.4 APPLICABLE GENERAL CODES AND REGULATIONS

A. All electrical work and equipment, in whole or in part, shall conform to the applicable portions of the following specifications, codes and regulations in effect on that date of invitation for bids, and shall form a part of this specification.
1. National Electrical Code, Latest Edition as accepted by the State Fire Marshal
2. National Electrical Manufacturers Association Standards
3. National Fire Protection Association Recommended Practices
4. Local, City and State Codes and Ordinances
5. National Board of Fire Underwriter's Recommended Practices
6. Life Safety Code, 2015 Edition
7. International Building Codes

B. Equipment that has been inspected and approved by the Underwriter's Laboratory shall bear its label or appear on its list of approved apparatus.

3.5 TESTS AND INSPECTIONS

A. The Contractor shall assist in making periodic inspections or tests required by the Engineer. When requested, the Contractor shall provide the assistance of foremen and qualified craftsmen for reasonable duration of each test, etc.

3.6 SAFETY PRECAUTIONS DURING CONSTRUCTION

A. It shall be the Contractor's responsibility to furnish and install proper guards and instruction signs for prevention of accidents and to provide and maintain for the duration of construction any installations needed for safety of life and property.

3.7 HEATING AND AIR CONDITIONING SYSTEM

A. This Contractor shall be responsible for providing electrical service to all devices of the heating and air conditioning system, and is referred to the mechanical plan for the exact location of the various devices.

3.8 EQUIPMENT NAMEPLATE

A. Each item of electrical equipment installed by the Contractor shall be provided with an engraved nameplate noting the equipment's function or designation. Nameplates shall be engraved laminated plastic with black letters on a white background. Letters shall be 1/4" high, all caps.

3.9 PANELBOARD SCHEDULES

A. The Contractor shall provide and affix typed panelboard schedules for each panelboard. Schedule will accurately list equipment served by each branch circuit, and not simply indicate “LIGHTING” or “RECEPTACLES”, etc. Schedules shall indicate rooms served and device or devices connected to the circuit.

B. Where new loads are connected to existing panels, and where loads are rearranged in existing panels as part of this project, the Contractor shall update the respective panel directory so as to provide a complete, accurate, and typewritten panel schedule. The new panel schedule shall incorporate all existing loads, including loads “existing to remain”. Provide all required testing and investigations necessary to accomplish this work.

3.10 COMPLETION

A. The Contractor shall leave all electrical equipment with proper connections, and in proper working order. He shall test the entire electrical system to show that it is properly installed. Contractor shall leave all panels and switches completely fused or complete with circuit breakers.

3.11 RECORD DRAWINGS

A. The Contractor shall furnish one (1) complete set of drawings on which any changes in the work shall be shown. These drawings must be turned over to the Engineer prior to final acceptance of the work.

3.12 GUARANTEE

A. The Contractor shall guarantee to keep the entire electrical system as installed by him or his subcontractors in repair and in perfect working order for one (1) year from the date of the final Certification of Final Acceptance, and shall furnish free of cost to the Owner, all material and labor necessary to comply with the above guarantee; said guarantee shall be based upon defective material and workmanship. In any case where equipment has a factory warranty exceeding this one-year limit, the full extent of the warranty shall apply.

3.13 CLEANING

A. When all work has been finally tested, the Contractor shall clean all fixtures, equipment, conduits, ducts, and all exposed work. All cover plates and other finished products shall be thoroughly cleaned.

3.14 INSTRUCTION MANUALS

A. The Contractor shall provide three (3) operating and maintenance instruction manuals on all systems and equipment installed in the electrical work.

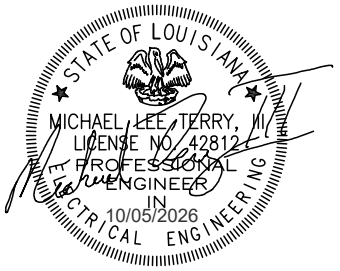
3.15 CONTRACTOR SPECIAL NOTE

A. The Contractor is again cautioned to refer to all parts of these Specifications and all Drawings, not just electrical sections, and the individual cross references made to other standard specifications or details describing any electrical work, which may be required under these other sections. The Contractor is cautioned to note carefully any other sections which may reference electrical work in order for this Contractor to fully understand the wiring requirements and electrical work that is required. Any conflicts found between the electrical sections of these Specifications or Drawings shall be immediately directed to the General Contractor for clarification.

B. These Specifications and the electrical Drawings size equipment, wire, conduit, etc. based on the horsepower of motors and/or wattages of equipment as shown on the plans or specified herein. The Contractor shall install electrical raceways, conductors, fuses, safety switches, breakers, contactors, starters or any other electrical equipment with the capacities to suit the horsepower and/or wattages of the equipment actually furnished and installed. The Contractor shall not furnish or install any electrical raceways, conductors, safety switches, contactors or motor starters of sizes smaller than those shown on the Drawings or specified herein. The Contractor shall coordinate with the various sections of the Specifications and/or Drawings and with the various Sub-Contractors to provide the properly sized equipment without additional cost to the Owner.

C. The Contractor shall be required to install electrical services underground. Existing underground utilities should be disconnected. Refer to the electrical and mechanical drawings for demolition plans. However, some existing underground utilities may remain in service at the site. Contractor is cautioned to exercise extreme care when digging to not damage any existing utilities or equipment. Contractor shall be required to repair any utilities or equipment he may damage during construction.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. All material furnished shall be new and shall conform to all rules and codes as recommended or adopted by the National Association governing the manufacture, rating and testing of the material. All electrical equipment shall be UL listed for the intended use.

PART 2 PRODUCTS

2.1 RACEWAYS AND FITTINGS

A. Raceways permitted on this project shall be hot dipped galvanized rigid steel conduit; electrical metallic tubing (EMT); flexible metallic tubing; liquid-tight flexible metal conduit; and rigid polyvinyl chloride (PVC) conduit. All conduits shall be new and shall bear the inspection label of the Underwriter's Laboratories, Inc.

B. Metallic conduit shall be metalized, or hot-dipped galvanized. Non-metallic conduit shall be schedule 40 PVC.

C. Fittings for conduit shall be an approved type specially designed and manufactured for their purpose. EMT fittings shall be watertight, compression type. Rigid metal conduit fittings, bushings, and other components shall be galvanized. All fittings for rigid steel or aluminum conduit shall be threaded and coupled unless specifically approved otherwise by the Engineer.

D. Where conduit connects to an outlet box, it shall have an insulated throat type connector.

2.2 EXPOSED CONDUIT

A. Exposed conduit shall be firmly supported on galvanized hangers; on brackets, hangers, or pipe straps; or by beam clamps. Conduit installed exposed shall be neatly aligned and run at right angles to the building walls or walls of the rooms in which installed. All exposed conduit shall be located to avoid all conflicts with architectural or mechanical components.

2.3 FLEXIBLE CONDUIT

A. Liquid-tight flexible metal conduit shall have a spiral wound, flexible, galvanized steel core and a tough extruded synthetic moisture-tight outer covering. All flexible conduits shall be UL listed.

2.4 GALVANIZED CONDUIT

A. Galvanized conduit furnished in accordance with these specifications shall be of mild steel piping, galvanized inside and outside, and shall conform in all respects to the American Standard Association Rigid Steel Conduit Specification C80.1-1959 and Underwriter's

Laboratories Specifications.

B. The galvanized coat of zinc shall be of uniform thickness applied by the hot-dipped process to not only the inside surfaces of the conduit, but also to the threads of the conduit. It shall be further dipped in a chromic acid bath to chemically form a corrosive resistant protective coating of zinc chromate over hot-dipped galvanized surface. Each piece of conduit shall be straight, free from blisters and other debris, cut square and taper reamed, and furnished with coupling in 10-foot length threaded each end. The interior threaded surface of each coupling shall be galvanized to insure 100% galvanic protection on all surfaces. The hot galvanized zinc chromate on the inside and outside surfaces shall be sufficiently elastic to prevent cracking or flaking when sample of finished conduit is bent 90° at a minimum temperature of 60°F, the inner edge of the bend having a radius of six (6) times the inside diameter of the conduit.

2.5 RACEWAYS

A. Lay-in duct, JIC Wireway and troughs shall be NEMA 1 for indoor application and NEMA 3R for outdoor or applications exposed to weather or water. Raceways shall be sized as noted on Drawings and shall have hinged or screw covers with captive screws. Finish shall be gray enamel. All components shall be UL listed for steel enclosed wireway or auxiliary gutter.

2.6 OUTLET AND SWITCH BOXES

A. Outlet boxes in concealed conduit systems shall be flush mounted. Boxes shall be galvanized steel of sufficient size to accommodate devices shown and shall have raised covers where required to meet requirements of NEC Article 314.

B. All boxes shall be stamped, one-piece, galvanized steel, of proper size and shape for conduits entering them, and shall be UL listed and NEC approved for the intended use. Boxes shall be installed so that device and/or coverplates shall be tight and plumb with wall finish, have all unused openings closed with knock-out plugs, and be weatherproof for exterior locations.

C. Boxes for lighting fixtures shall be 4 inches octagon, not less than 1-1/2 inches deep, with fixtures stud fastened through from back box. Where boxes are installed in a concrete slab, boxes designed for this application shall be used.

D. Outlet boxes for switches in concealed work shall be standard switch boxes of required number of gangs. Outlet boxes for receptacles, telephone, and communication use in concealed work shall be 4-inch square, not less than 1-1/2 inches deep. Outlet boxes for switches and receptacles installed in exposed conduit system shall be cast type FS or FD, number of gangs as required. Outlet boxes for telephone and communication use in exposed systems to be cast, 4 inches square, not less than 1-1/2 inches deep.

E. Boxes shall not to be installed back-to-back in walls. Offset with connecting conduit as specified. Do not use long, extended boxes that would effectively couple light and sound between adjoining spaces.

2.7 WIRE (600 VOLT AND BELOW)

A. All conductors used in the work shall be of soft drawn annealed copper having a conductivity of not less than 98% of that of pure copper. Conductors shall be standard code gauge in size, insulated and shall have insulation rated for use at 600 volts.

B. Unless noted otherwise or specified, insulation shall be type THW, THWN, or THHN for sizes up to and including No. 2 AWG. Insulation for wire sizes larger than No. 2 AWG shall be type THW, XHHW, or THHN. Lighting fixture wire shall be heat resistant type TF (150°C) with 300-volt insulation minimum. Wires shall be of the single conductor type. Sizes No.14 AWG and larger shall be stranded. No wire shall be single strand solid copper.

C. Throughout the system, all conductors shall be identified as to the phase and voltage of the system by color-coding in accordance with NEC 210.5. Color-coding shall be continuous the full length of the wire with surface printing at regular intervals on all conductors and for neutral conductors.

D. Color coding shall be as follows:

3phase, 480V System	3phase, 208V System
Phase 1-Brown	Phase 1-Black
Phase 2-Orange	Phase 2-Red
Phase 3-Yellow	Phase 3-Blue
Neutral-Gray	Neutral-White
Ground-Green	Ground-Green

1phase, 240V System
Phase 1-Black
Phase 2-Red
Neutral-White
Ground-Green

2.8 WEATHERPROOF RECEPTACLES

A. Weatherproof receptacles shall be GFCI duplex receptacles as specified under WIRING DEVICES, mounted in a cast iron type FD conduit box and fitted with gasketed metal cover with spring. Weatherproof receptacles shall be flush mounted in exterior walls.

2.9 WIRING DEVICES

A. Wiring devices shall be as listed. The color of device shall match color of outlet cover plate. It shall be the responsibility of the Contractor to provide plugs, receptacles and fittings required for any equipment furnished or installed or connected under the contract. Color as selected by the Engineer.

	Leviton	P & S	Hubbell
Toggle Switches: 20A 120/277V			
Single pole	1221-I	20AC1-I	1221-I
Three-way	1223-I	20AC3-I	1223-I

Duplex Receptacle: 20A, 125V, NEMA 5-20R	5362-I	5362-I	5363-I
Ground Fault Circuit Interrupter: 20A, 125V, Feed Through, NEMA 5-20R	6899-I	2091-S	GF-5362-I

B. Quad receptacles shall be 20-amp, 125 volt rated, NEMA 5-20R, with two (2) duplex receptacles or single four-plex device.

2.10 OUTLET COVER PLATES

A. Unless otherwise specified, all outlets shall be fitted with cover plates. Cover plates shall be standard size, uniform in design and finish for switches, receptacles and other outlets requiring cover plates. Plates shall be one piece of the required number of gangs. All cover plates shall be lexan unbreakable type. Engineer shall select coverplate color.

2.11 SPECIAL PURPOSE RECEPTACLE

A. Provide receptacles for special purpose devices as indicated on the plans. Refer to equipment specification for proper receptacle to be supplied. Provide stainless steel cover plate.

2.12 FIRESTOPPING PRODUCTS

A. The Contractor shall provide and install at all fire-rated wall through-penetrations, a non-hardening, conformable firestop system. The system shall consist of a water insoluble putty and suitable damming materials (where required). The non-hardening putty shall be a two-staged intumescent and capable of expanding up to 8 times its original volume. This putty shall contain no asbestos, no fiberglass, no solvents nor corrosive mineral salts of any kind. It shall remain soft during its installed life and shall be capable of being removed and reinstalled to facilitate the addition of cables or pipes. The putty shall exhibit aggressive adhesion to all common building materials and penetrants and shall allow reasonable movement of penetrants without being displaced. The firestop system shall be tested to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and classified for up to 3 hours.

2.13 GROUND ROD

A. Ground rods shall be pure copper with a minimum diameter of ¾" and 10' long. Erico LPC711 or equivalent.

2.14 TRAFFIC RATED IN GRADE PULL BOXES

A. Pull boxes shall be heavy duty, traffic bearing type. Boxes shall be polymer concrete and fiber reinforced polyester construction. Boxes shall be furnished complete with bottom and cover with logo. All pull boxes shall be sized 30" wide x 48" long x 36" deep. Pull boxes shall include two-piece cover with stainless steel bolts, POWER legend, and pull slots for lifting. Boxes shall be Tier 15 traffic rated. Boxes shall be factory assembled.

B. Boxes shall be Hubbell/CDR Systems Corporation Straight Wall Style (Stackable)

Assembly, or Quazite Composolite “PC” Style.

PART 3 EXECUTION

3.1 WIRING - GENERAL

A. Unless otherwise specified, all wiring shall be installed in conduit. No wire shall be smaller than No. 12 unless noted otherwise. Wiring for low voltage control may be #14 AWG. Wire for each branch circuit shall be of single size and type from the branch circuit protective device the last outlet of the circuit. BX wiring and MC cable shall not be allowed.

B. Feeders, motor circuit conductors and main service entrance conductors shall run their entire length without joints or splices. Wiring for branch circuits shall run the entire length without splices, with splices and joints made only at outlets or in accessible junction boxes only when absolutely necessary and approved by the Engineer. Joints and splices in branch circuit wiring shall be made with compression type solderless connectors.

C. Connectors of the non-metallic screw on type are not acceptable. Terminations or splices for conductors No. 6 AWG and larger shall utilize bolted connecting lugs. All splices and terminations shall be insulated in an approved manner by an integral or separate cover or by taping to provide insulating value equal to that of the conductors being joined.

D. Type THW or THWN conductors may be connected directly to recessed fixtures only when the fixtures are equipped with outlet boxes listed by Underwriter's Laboratories, Inc. for use with wire having insulation rated for maximum operating temperatures of 75°C (167°F); otherwise, for fixtures not rated for 75°C directly connection, use 125°C insulated conductors from the fixture to an outlet box placed at least one (1) foot, but not more than four (4) feet from the fixture.

E. Branch circuit home run numbers shown on the drawings shall be used as a guide for connection of circuit wiring to similarly number protective devices in branch circuit panelboards. Requests for changes in the plans shall be directed to the Engineer. No changes shall be made without approval from the Engineer.

F. Each circuit shall be furnished with its own neutral conductor. There shall be no sharing of neutral conductors.

G. In instances where a junction box, wireway, etc. contains three (3) or more branch circuits, the feeders shall be labeled within the junction box, wireway, etc. with circuit location, including panel name and breaker number. Labeling shall be neatly typed and affixed to each feeder. Labeling shall meet all applicable Code requirements.

H. No more than three (3) 20A/1P circuits may be installed in a single conduit. Circuits may not share grounds or neutrals. Conductors sharing raceways shall be derated per table 310.15(B)(3)(a) of the NEC.

3.2 ELECTRICAL SERVICE GROUNDING

A. Main electrical service equipment, conduit work, motors, panelboards and all other electrical equipment shall be effectively and permanently grounded. Grounding connections and conductor sizes shall be in accordance with requirements of the National Electrical Code, Article 250 and local or State ordinances.

B. Provide as part of the service grounding system an ufer ground in the building slab. The ufer ground shall be 20' long bare #4 copper wire and bonded to the main service ground lug with a grounding electrode cable of the size indicated on the drawings.

C. The building foundation steel and structural steel (if applicable) shall be connected to the service entrance ground lug with a grounding electrode cable of the size indicated on the drawings.

D. All ground lugs shall be properly torqued, as per the gear manufacturer's instructions and provide pictures of all ground connections to the Engineer for inspection before they are covered.

E. All grounding connections shall be mechanically made. Cadwell style connections are not permitted.

3.3 EQUIPMENT GROUNDING

A. All conduit entering panelboards shall be grounded to the panelboard by means of a grounding type locknut installed on the inside of the panelboard. Where the continuity of the metallic conduit system is interrupted by a section of non-metallic conduit, as separate grounding conductor, sized in accordance with NEC table 250.122 shall be installed in the conduit with the insulated conductors. A separate grounding conductor, as described above or as called for on the plans, shall be run in the conduit with the circuit conductors for all circuits serving multi-outlet assemblies.

B. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The grounding screw on all grounding type receptacles shall be securely grounded to the outlet box using a No. 12 green insulated conductor attached to the outlet box with lug screw.

C. The grounding screw on all grounding type receptacles shall be security grounded to the outlet box using a No. 12 green insulated conductor attached to the outlet box with lug screw. Ground screws shall be green.

D. All switch legs shall include a green ground conductor connected to the circuit ground conductor and terminated in the switch outlet box.

3.4 CONDUIT - MATERIALS AND METHODS

A. Conduit shall be installed as per NEC and NEMA regulations and the manufacturer's recommendations. Conduit shall be as follows:

B. Rigid Steel Conduit shall be used for all conduits exposed to the weather, and underground conduit except where non-metallic conduit is specified or approved.

Underground and under slab runs are to be watertight. All horizontal runs of underground conduit shall utilize rigid steel elbows on vertical risers. Conduits used for receptacles and run under the building slab shall be hot dipped galvanized rigid steel and shall be 3/4" minimum size.

C. All conduits routed underground shall not be placed in building slab. Conduits larger than 1" routed under building slab shall be routed below the vapor barrier. Minimum conduit size allowed to be routed underground shall be 3/4". Conduits routed under building slab may be PVC. All conduits rising vertically out of slab or out of ground shall be type RMC to 48” above finished floor.

D. Electrical Metallic Tubing or metal clad cabling (if permitted) shall be used for all other feeders, branch circuit and communications and control wiring where rigid steel or non-metallic conduit is not specified.

E. Non-metallic conduit, minimum schedule 40 PVC, shall be permitted to be installed underground. Non-metallic conduit shall not be used in any environmental air plenum. If PVC conduit is run, a full-sized grounding conductor shall be pulled with the circuit conductors. PVC conduit shall not be run exposed. Where PVC conduit is run underground, it shall be encased in concrete or run minimum 24" below grade, or at the depth below grade shown on the drawings.

F. Flexible metallic tubing and EMT shall only be permitted in spaces above finished ceilings and within enclosed walls within the interior of buildings. Flexible metallic tubing shall only be permitted for the final four (4) feet of conduit runs to fixtures located above finished ceilings. No flexible metallic tubing or EMT will be permitted exposed. Also, EMT may not be installed in or below concrete slabs.

G. Flexible metal conduit or liquid-tight flexible metal conduit shall be used for the final connection of runs to motors. Flexible conduit shall be at least twelve (12) inches, but not more than 48 inches long. Where used, an external grounding conductor shall be run with conduit unless conductor is made as a part of the conduit.

H. Conduits installed underground and used for communications system wiring shall be reviewed with the communications contractor prior to installation. As an example, conduits below the vapor barrier may require moisture proof wiring to comply with the structured connectivity solution or conduits may need to be installed above the vapor barrier to maintain connectivity solution compliance. All conduit shall conform to the requirements of the data manufacturer’s warranty and be accepted by the communications contractor.

I. Set screw conduit fittings shall not be permitted.

3.5 CONDUIT - GENERAL

A. Fittings for rigid steel conduits shall be hot-dipped galvanized steel and shall be of a type especially designed and manufactured for their purpose. Fittings for EMT shall be die cast zinc type. Rigid conduit joints for single conduit runs shall be made with threaded fittings made tight with at least five threads fully engaged. Fittings for rigid non-metallic conduit shall be solvent welded.

B. All conduits shall be installed concealed or as indicated or scheduled on the drawings and shall be of sufficient size to accommodate the required number of insulated conductors including equipment grounding conductor where such grounding conductor is required or specified.

C. Conduit runs shall be straight; elbows and bends shall be uniform, symmetrical and free from dents or flattening. Exposed conduit shall be firmly supported on galvanized hangers; on brackets, hangers, or pipe straps; or by beam clamps. Conduit installed exposed shall be neatly aligned and run at right angles to the building walls or walls of the rooms in which they are installed. All exposed conduit shall be located to avoid all conflicts with architectural or mechanical components.

D. Pull boxes shall be installed as required to permit proper installation of conductors and expansion fittings installed where conduit runs cross building expansion joints.

E. Conduit shall be run no closer than six (6) inches to covering of hot water or steam piping except where crossings are unavoidable. Conduit shall be kept at least one (1) inch from crossing steam and hot water piping.

F. Conduit shall be held securely in place by hangers and fasteners of appropriate design and dimensions for the particular application. Support shall be such that no strain will be transmitted to outlet box and pull box supports. Wire shall not be used, with or without spring steel fasteners, clips or clamps, for the support of any conduit. Conduit shall not be supported by or attached to duct work unless specifically allowed otherwise.

G. Hangers and other fasteners shall be supported on solid masonry with inserts or expansion sleeves and bolts, on wood with wood screws, hollow masonry with toggle bolts, on steel with machine screws or welded threaded studs. Fastenings shall be proof tested by the Contractor for secure mounting.

H. All conduits shall be cut square and reamed at the ends. The conduit system shall be complete and cleaned before any conductors are installed. Open ends of all conduits shall be capped until conductors are installed. A non-metallic fish wire shall be installed in all empty conduits. Empty conduit shall remain capped.

I. Contractor shall refer to National Electrical Code Appendix C, Conduit and Tubing Fill Tables for Conductors and Fixture Wire of the Same Size. Contractor shall refer to the appropriate table for the conduit and wire condition and shall install wiring in accordance with code requirements.

J. Conduits entering buildings from exterior mounted equipment or devices shall be properly sealed per NEC Section 300.7 requirements to avoid condensation build up.

K. Threaded hubs shall be utilized for conduits entering exterior mounted enclosures and shall be rated for outdoor installation.

3.6 FLEXIBLE CONDUIT

A. Flexible metal conduit may be used for short final connections to equipment where permitted by governing codes. Flexible metal conduit shall be sized and supported in accordance with Article 350 of the NEC or more stringent local codes. A separate equipment-grounding conductor sized in accordance with NEC Table 250.122 shall be installed in flexible conduit unless exceptions are allowed by governing codes and if the fittings used are UL listed for the purpose.

B. Liquid-tight flexible metal conduit shall be used where flexible conduit is permitted and desired and conditions of installation, operation, or maintenance require protection from liquids, vapors, or solids and in other hazardous locations where specifically approved. Flexible conduit for all exterior motor connections shall be liquid tight. Liquid-tight flexible conduit shall be used with terminal fittings approved for the purpose.

3.7 FIRE-RATED WALL AND FLOOR THROUGH-PENETRATIONS

A. All fire-rated walls or floors penetrated by this Contractor shall be properly sealed with fire stopping materials. All floor through-penetrations shall be fire stopped with a light-weight mortar material. Wall through-penetrations shall be fire stopped with a non-hardening putty material. Contractor shall see that all penetrations are fire stopped and seals are inspected.

3.8 SUPPORTS AND FITTINGS

A. The Contractor shall furnish and install all supports for equipment under this contract. Supports shall be spaced at intervals of eight (8) feet maximum for rigid conduit and five (5) feet maximum for EMT and as necessary to obtain rigid support. Perforated strap supports will not be permitted.

B. All conduits shall be firmly secured with pipe clamps, conduit straps, or suspension hangers as appropriate. Fasten to steel with screws in tapped holes, to wood with wood screws, and to masonry with expansion anchors. Expansion anchors shall have a minimum pull out load of 1,200 pounds and an ultimate shear load of 1,950 pounds.

C. All conduit, fixtures, and accessories shall be rigidly supported to form a firm, well-braced installation.

D. Joints shall be made tight with standard galvanized or sheradized couplings; corners turned with fittings, elbows, or long radius bends.

E. Low voltage wiring installed above accessible ceilings shall be supported on J-hooks. J-hooks installed for communications system wiring shall not be used for other low voltage system wiring (fire alarm, security, EMS controls, etc.).

3.9 WEATHERPROOF EQUIPMENT

A. All disconnect switches, starters, and other electrical equipment located on the exterior of the building or exposed to the outside shall be enclosed in a rain-tight enclosure.

B. All lighting fixtures or other devices located on an exterior wall of the building shall be

mounted on a flush-mounted, cast outlet box.

3.10 MOUNTING HEIGHTS

A. Unless otherwise noted on the drawings or required by the Engineer, the following mounting heights shall apply:

Receptacles	1'-6"
Panelboards	6'-0" to top
Telephone Outlets	1'-6" (48" for wall phone)
Safety Switches	5'-0" to top
Motor Control Equipment	5'-0" to top
Wiring Devices above counters	0'-6" above countertop

B. Upon permission of the Engineer, mounting heights may be adjusted to simplify cutting of masonry units or to facilitate furniture and cabinet arrangements. Dimensions above refer to the centerline of the device unless noted otherwise.

3.11 HOUSE KEEPING PADS

A. All floor and ground mounted electrical equipment - panels, switchboards, motor control centers, transformers, etc. shall be installed with a reinforced concrete housekeeping pad, whether shown on the drawings or not. The pad shall extend 4” above either the finished floor or final grade (as applicable), have 45-degree chamfered edges, and be constructed of 3000psi concrete. The pad shall extend 3” beyond the edge of the respective electrical equipment.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 260572 - OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Short-circuit study input data, including completed computer program input data sheets.
   2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Short-Circuit Study Specialist and Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. SKM Systems Analysis, Inc.
2. ETAP

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short-circuit ratings.
   2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
   3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
   4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
   5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:
   1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. Equivalent impedance.
   2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. Calculated asymmetrical fault currents:

1) Based on fault-point X/R ratio.
2) Based on calculated symmetrical value multiplied by 1.6.
3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. No AC Decrement (NACD) ratio.
   e. Equivalent impedance.
   f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
   g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.
   1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Engineer.
   2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
   3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.
   4. Obtain all arc flash information from the local utility in a timely manner. No extension of the contract time shall be permitted due to coordination with the local utility.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
   1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
   2. Obtain electrical power utility impedance at the service.
   3. Power sources and ties.
   4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
   5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.

6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:
1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:
1. Electric utility's supply termination point.
2. Incoming switchgear.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.
6. Control panels.
7. Standby generators and automatic transfer switches.
8. Branch circuit panelboards.
9. Disconnect switches.

3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 260573 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Coordination-study input data, including completed computer program input data sheets.
   2. Study and equipment evaluation reports.
   3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer

for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Coordination Study Specialist and Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. The following parts from the Protective Device Coordination Study Report:
         1) One-line diagram.
         2) Protective device coordination study.
         3) Time-current coordination curves.
      b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
   1 Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. SKM Systems Analysis, Inc.
      b. ETAP

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
   1. Optional Features:
      a. Arcing faults.
      b. Simultaneous faults.
      c. Explicit negative sequence.
      d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study:
   1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
      a. Phase and Ground Relays:
         1) Device tag.

2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value
3) Recommendations on improved relaying systems, if applicable.

e. Circuit Breakers:
1) Adjustable pickups and time delays (long time, short time, ground).
2) Adjustable time-current characteristic.
3) Adjustable instantaneous pickup.
4) Recommendations on improved trip systems, if applicable.

f. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:
   a. Power utility's overcurrent protective device.
   b. Medium-voltage equipment overcurrent relays.
   c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
   d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
   e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
   f. Cables and conductors damage curves.
   g. Ground-fault protective devices.
   h. Motor-starting characteristics and motor damage points.
   i. Generator short-circuit decrement curve and generator damage point.
   j. The largest feeder circuit breaker in each motor-control center and panelboard.
5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
6. Provide adequate time margins between device characteristics such that selective operation is achieved.
7. Comments and recommendations for system improvements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
   1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:
   1. To normal system low-voltage load buses where fault current is 10 kA or less.
   2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:
   1. Device shall not operate in response to the following:
      a. Inrush current when first energized.
      b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
      c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
   2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:
   1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
   2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the

fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
   1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:
   1. Electric utility's supply termination point.
   2. Switchgear.
   3. Unit substation primary and secondary terminals.
   4. Low-voltage switchgear.
   5. Motor-control centers.
   6. Standby generators and automatic transfer switches.
   7. Branch circuit panelboards.

M. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short-circuit ratings.
   2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3.3 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
   1. Determine load-flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
   2. Determine load-flow and voltage drop based on 80 percent of the design capacity of the load buses.
   3. Prepare the load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.4 MOTOR-STARTING STUDY

A. Perform a motor-starting study to analyze the transient effect of the system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of the motor starting on the power system stability.

B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141 and voltage sags so as not to affect the operation of other utilization equipment on the system supplying the motor.

3.5 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.
   1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Engineer.
   2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
   3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
   1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
   2. Electrical power utility impedance at the service.
   3. Power sources and ties.
   4. Short-circuit current at each system bus, three phase and line-to-ground.
   5. Full-load current of all loads.
   6. Voltage level at each bus.
   7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
   8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
   9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
   10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
   11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
   12. Maximum demands from service meters.
   13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
   14. Motor horsepower and NEMA MG 1 code letter designation.
   15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
   16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
   17.. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

a. Special load considerations, including starting inrush currents and frequent starting and stopping.
b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

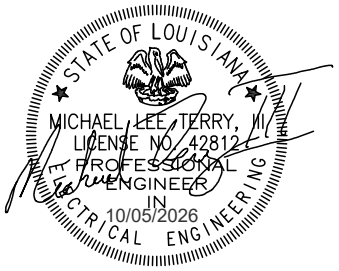
C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 260574 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Arc-flash study input data, including completed computer program input data sheets.
   2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Engineer

for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Specialist and Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. SKM Systems Analysis, Inc.
b. ETAP

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:
1. Protective device designations and ampere ratings.
2. Cable size and lengths.
3. Transformer kilovolt ampere (kVA) and voltage ratings.
4. Motor and generator designations and kVA ratings.
5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

G. Arc-Flash Study Output:
1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
a. Voltage.
b. Calculated symmetrical fault-current magnitude and angle.
c. Fault-point X/R ratio.
d. No AC Decrement (NACD) ratio.
e. Equivalent impedance.
f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis

H. Incident Energy and Flash Protection Boundary Calculations:
1. Arcing fault magnitude with and without required Arc Energy Reduction methods.
2. Protective device clearing time.
3. Duration of arc.
4. Arc-flash boundary.

5. Working distance.
6. Incident energy.
7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:
1. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 16402 "Overcurrent Protective Device Coordination Study."

C. Calculate maximum and minimum contributions of fault-current size.
1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.

2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
1. Fault contribution from induction motors should not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:
1. When the circuit breaker is in a separate enclosure.
2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Engineer.
2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.

1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.4 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:
1. Motor-control center.
2. Low-voltage switchboard.
3. Switchgear.
4. Medium-voltage switch.
5. Control panel.

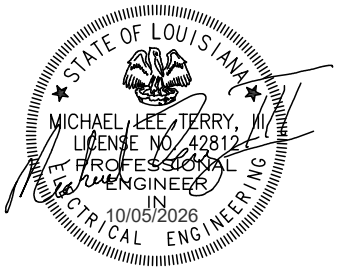
3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 262000 - SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.1 SYSTEM VOLTAGE

A. The existing building services are rated 277/480V, 3 phase, 4 wire and 120/208V, 3 phase, 4 wire.

1.2 TERMINATIONS

A. All wiring shall be sized based on 75°C rated conductors. All connectors shall be rated for 75°C in accordance with N.E.C. Article 110-14 requirements.

PART 2 PRODUCTS

2.1 SAFETY SWITCHES

A. Furnish and install safety switches as shown on the Drawings. All switches shall be fused NEMA Heavy Duty Type HD and Underwriter's Laboratories listed. All switches shall have blades that are fully visible in the "OFF" position with the door open. Switches shall be dead-front construction with permanently attached arc suppressers. Lugs shall be UL listed for copper and aluminum conductor and front removable. All current carrying parts shall be plated to resist corrosion. Switches shall be quick-make, quick-break type. During operation of the switch, the movable contacts shall not be able to be restrained by the handle once the closing or the opening action of the contacts has been initiated. Switches shall have cover interlocks to prevent opening of the switch door while the switch is in the "ON" position or closing the switch with the door open. Switch shall have padlocking capabilities in the "OFF" position.

B. Safety switches shall be rated 600 volts for 480 volt service and rated 240 volts for 208 volt service. Switches shall be motor rated when used for motor loads. Switches shall be NEMA 1 enclosed for indoor applications and NEMA 3R for outdoor or wet area locations.

C. Switches used for service entrance shall be service entrance rated. Safety switches shall be furnished complete with fuses.

D. Safety switches shall be Square D Heavy Duty Class 3110 type, Eaton Heavy Duty type, or prior approved equal.

2.2 FUSES

A. All fuse holders shall be provided with dual-element, time-lag fuses as scheduled on the Drawings or as recommended by the equipment manufacturer. Fuses shall be rated 200,000 AIC. Fuses shall be Buss Fusetron, Economy Econ, or Gould Shawmut Tri-Onic for component protection and Buss Limitron, Economy Econolin, or Gould Shawmut Amp-Trap for circuit protection.

2.3 CIRCUIT BREAKER PANELBOARDS

A. Panelboards shall be sized as shown on the drawings and schedules, and shall be the bolted breaker panelboard type. Panelboards shall have copper bussing. Panelboards shall have door-in-door trim.

B. All branch breakers are to be quick-make, quick-break (over center toggle device) with trip indication and common trip on all multiple breakers. Trip indication shall be clearly shown by breaker handle taking a position between "ON" and "OFF" position. Breakers shall be ambient compensated to carry full NEC load in 120 degree F room temperature. Panelboards shall have distributed phase busing throughout. Any two adjacent single pole breakers shall be replaceable by a two pole breaker, and any three adjacent single pole breakers shall be replaceable by a three pole breaker. All breakers shall be bolt on type.

C. Minimum interrupting capacity of breakers shall be as shown on panel schedules. No breakers shall be rated less than 10,000 RMS symmetrical amperes.

D. Branch breakers shall be numbered 1, 3, 5, etc. from top to bottom beginning at the top of the left hand column so that #1 shall be on phase A, #3 on phase B, and #5 on phase C.

E. Panelboards for 120/208 volt or 120/240 volt service shall be Square D type NQ, Eaton Pow-R-Line series, or prior approved equal. Panelboards for 480/277 volt service shall be Square D type NEHB, Eaton Pow-R-Line series, or prior approved equal.

F. Replacement breakers to be installed in existing panels shall be fully compatible with the existing panel and shall be sized as shown on the Drawings. Breakers shall be bolt-on breaker type to match existing breakers or plug-on breaker type if plug-on breakers are utilized in the panel. If both bolt-on and plug-on breakers exist in the panel, bolt-on breakers shall be installed.

PART 3 EXECUTION

3.1 COORDINATION

A. Contractor shall coordinate all service and distribution work with other crafts on the project.

3.2 TEST AND BALANCING

A. At such times as the Engineer directs, the Contractor shall conduct in the Engineer's presence operating tests to demonstrate the electrical systems are installed and will operate properly and in accordance with the requirements of the specifications. The Contractor shall furnish instruments and personnel required for such tests. Any work that is found to be defective, or material that are found to vary from the requirements of the drawings or specifications shall be replaced by the Contractor without additional cost of the Owner.

3.3 EMERGENCY CIRCUITS

A. All wiring for emergency power and lighting circuits shall be run in conduits independent of all other circuits or conductors. Emergency circuit installations shall be made in accordance with National Electrical Code Article 700.9.

3.4 EQUIPMENT FUSING

A. All equipment shall be furnished complete with fuses as described herein and/or as shown on the Drawings. Contractor shall furnish one set of spare fuses for each size fuse furnished on the project. Fuses shall be delivered to Owner prior to acceptance of project.

B. Fusing for protective equipment shall be of the type specifically designed for the intended application. Fuses for service entrance rated equipment shall be Class L. Fuses for branch circuit protection shall be Class RK5 unless specified otherwise. Provide protective fuses as specifically required by the equipment manufacturer.

3.5 INSTALLATION

A. The Electrical Contractor shall place a sign at the Main Switchboard indicating the type and location of the emergency generator in accordance with National Electrical Code Article 702.8(A) requirements.

B. Disconnecting means shall be provided for each motor and motor controller, and shall be located within site from the controller and motor locations in accordance with National Electrical Code Article 430.102 requirements.

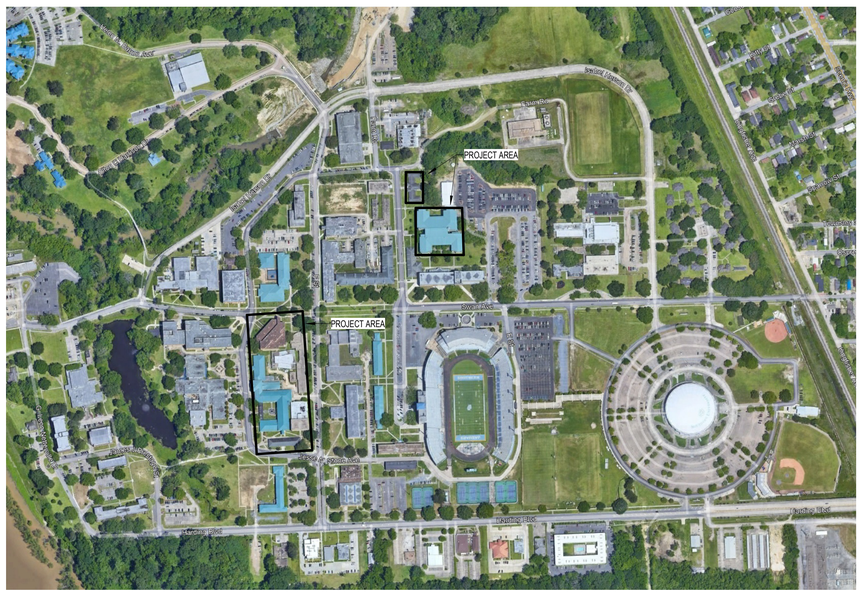
END OF SECTION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LA
PROJECT #01-107-25-05, F.01004689

SOUTHERN UNIVERSITY AND A&M COLLEGE
KENNETH DAWSON
SYSTEM DIRECTOR OF FACILITY PLANNING

CONSTRUCTION DOCUMENTS
OCTOBER 5, 2026



NORTH

1 VICINITY MAP
N.T.S.

PARISH ENGINEERING
1450 Seabord Drive
Baton Rouge, LA 70810
225.332.0222
parisheng.com

All drawings and written material appearing herein constitute original and unpublished work of the engineer and may not be duplicated, used, or disclosed without written consent of the engineer. Do not scale drawings. Contractor is responsible for verifying any and all quantities included in these documents when bidding and during construction.

SEAL

STATE OF LOUISIANA
GRANT T. McDONALD
LICENSED PROFESSIONAL ENGINEER
CHEMICAL ENGINEERING
10/05/2026

PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

DATE:	10/05/2026
DRAWN BY:	SPG
CHECKED BY:	SPG/GTM
PROJECT #:	25-157

SHEET NAME

COVER SHEET

SHEET NUMBER

COVER

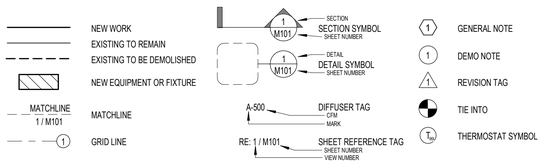
MECHANICAL GENERAL NOTES

1. ALL WORK BY CONTRACTORS SHALL CONFORM TO ALL APPLICABLE FEDERAL, STATE AND LOCAL BUILDING CODES, INCLUDING THE CURRENT INTERNATIONAL ENERGY CONSERVATION CODE.
2. MATERIALS FURNISHED UNDER THE CONTRACT SHALL BE NEW & SHALL BEAR THE UL LABEL WHERE APPLICABLE, UNLESS NOTED OTHERWISE. ALL WORK SHALL BE GUARANTEED AGAINST DEFECTIVE MATERIALS & WORKMANSHIP FOR A PERIOD OF NOT LESS THAN ONE YEAR AFTER COMPLETION & ACCEPTANCE BY THE OWNER, LONGER IF STATED OTHERWISE ELSEWHERE IN THE SPECIFICATION.
3. CONTRACTOR SHALL INSTALL SYSTEMS WITHOUT INTERFERENCE & PROVIDE MANUFACTURER'S RECOMMENDED AIR & SERVICE CLEARANCES. CONTRACTOR SHALL COORDINATE WITH ALL TRADES & DISCIPLINES.
4. MECHANICAL CONTRACTOR SHALL COORDINATE WITH GENERAL CONTRACTOR ON LOCATION OF ALL FIRE & SMOKE WALL PENETRATIONS. GENERAL CONTRACTOR SHALL FRAME OUT OPENING AS REQUIRED FOR LIFE SAFETY DAMPERS. PROVIDE LIFE SAFETY DAMPERS WHERE SHOWN ON DRAWINGS AND WHERE REQUIRED BY NFPA AND LOCAL BUILDING CODES.
5. ALL FIRE DAMPERS SHALL BE 2-HOUR RATED UNLESS SPECIFIED OR NOTED OTHERWISE ON DRAWINGS AND/OR SPECIFICATIONS.
6. SEAL ALL FIRE WALL PENETRATIONS (DUCT, PIPE, ETC.) WITH UL LISTED FIRE CAULK IN ACCORDANCE WITH NFPA 101.
7. MECHANICAL CONTRACTOR SHALL COORDINATE BETWEEN ELECTRICAL AND OTHER TRADES FOR PENETRATIONS AT WALLS, FLOORS AND ROOFS, EXACT EQUIPMENT LOCATIONS, AND REQUIRED EQUIPMENT SERVICE AND AIR FLOW CLEARANCE.
8. INSTALLATION OF DUCTWORK SHALL TAKE PRECEDENCE OVER INSTALLATION OF PLUMBING PIPING THAT IS NOT GRADE SENSITIVE (SEWER, STORM DRAINAGE, GREASE WASTE, ETC.) AND ELECTRICAL CONDUIT. CONTRACTOR TO COORDINATE CEILING SPACE AVAILABLE, EXACT MECHANICAL ROOM LAYOUT, DUCT AND PIPE ROUTING AND EXACT EQUIPMENT LOCATIONS WITH GENERAL, ELECTRICAL, STRUCTURAL AND PLUMBING CONTRACTORS. PROVIDE OFFSETS AND TRANSITIONS AT OBSTRUCTIONS WHERE REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
9. MECHANICAL CONTRACTOR SHALL COORDINATE WITH GENERAL CONTRACTOR AND ARCHITECT PRIOR TO INSTALLATION OF THERMOSTATS/TEMPERATURE SENSORS ON WALL. COORDINATE THERMOSTATS/TEMPERATURE SENSORS WITH ALL WALL MOUNTED FURNISHINGS (ART, SCREENS, FURNITURE, ETC.). LOCATE THERMOSTATS AND HUMIDISTATS 4' ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
10. CONTRACTOR SHALL VISIT THE SITE FOR INSPECTION REGARDING ANY WORK REQUIRED TO COMPLETE THE SCOPE OF WORK FOR THE PROJECT PRIOR TO BID. THERE SHALL BE NO ADDITIONAL COST TO THE OWNER FOR BIDDERS AWARDED THE WORK FOR FAILURE TO EXAMINE SITE PRIOR TO BID.
11. CONTRACTOR SHALL REVIEW THE CONTRACT DOCUMENTS AND VISIT THE SITE AND COORDINATE DUCT, PIPE AND EQUIPMENT SIZES AND ROUTING. CONTRACTOR SHALL NOTIFY THE ARCHITECT AND ENGINEER WHERE DISCREPANCIES OCCUR BETWEEN CONTRACT DOCUMENTS AND EXISTING CONDITIONS.
12. CONTRACTOR SHALL REVIEW CEILING SPACE AND MECHANICAL ROOM SPACE AVAILABLE FOR DUCT, PIPING AND EQUIPMENT AND MAKE REQUIRED ALLOWANCES FOR THE SIZE AND ROUTING OF DUCT, PIPING AND EQUIPMENT.
13. MECHANICAL CONTRACTOR TO REVIEW CEILING SPACE AVAILABLE AND VERIFY FIELD MEASUREMENTS AND COORDINATION DRAWINGS PRIOR TO FABRICATING DUCT. BRANCH DUCT RUNS SHOWN DIAGRAMMATICALLY; CONTRACTOR SHALL ROUTE BRANCH DUCT RUNS IN MOST DIRECT MANNER.
14. COORDINATE EXACT LOCATION OF ALL SLAB, FLOOR, WALL AND ROOF PENETRATIONS WITH EXISTING STRUCTURAL BEAMS, JOIST AND COMPONENTS. DO NOT CUT OR MODIFY EXISTING STRUCTURAL COMPONENTS WITHOUT APPROVAL FROM STRUCTURAL ENGINEER.
15. CONTRACTOR SHALL VERIFY EQUIPMENT TO BE SUPPLIED TO PROJECT CAN BE INSTALLED IN SPACE PROVIDED AND ALL SERVICE AND AIRFLOW CLEARANCES MAINTAINED PRIOR TO ORDERING EQUIPMENT. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY MODIFICATIONS REQUIRED FOR EQUIPMENT THAT IS SUPPLIED THAT IS DIFFERENT THAN EQUIPMENT THAT IS BASIS OF DESIGN.
16. UNDER NO CIRCUMSTANCES SHALL EQUIPMENT AND RELATED SYSTEM COMPONENTS FOUND POSITIVE FOR MOLD, MILDEW, ASBESTOS, HARMFUL BACTERIA OR ANY OTHER CONTAMINATION BE PLACED INTO SERVICE.
17. INSTALL DUCT SLEEVES IN WALLS AS HIGH AS POSSIBLE, DUCT SLEEVE SHALL EXTEND PAST WALL PENETRATION ON BOTH SIDES MINIMUM 24". RETURN AIR TRANSFER SLEEVES SHALL BE PROVIDED WITH TWO (2) DUCT ELBOWS.
18. COORDINATE ALL UNDERGROUND PIPING & WORK WITH EXISTING SYSTEMS, INCLUDING EXISTING UTILITIES, SEWER, GAS, DOMESTIC WATER, CHILLED/HEATING WATER, ELECTRIC DUCT BANKS AND POWER. NOT ALL EXISTING SYSTEMS SHOWN. COORDINATE ALL EXISTING SYSTEMS PRIOR TO BEGINNING WORK. MARKED UTILITIES AND EXISTING SYSTEMS DAMAGED BY THE CONTRACTOR SHALL BE REPLACED AND REPAIRED BACK TO ORIGINAL CONDITION BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE CONSTRUCTION CONTRACT.
19. MODEL NUMBERS SCHEDULED/SPECIFIED REPRESENT THE TYPE AND QUALITY OF EQUIPMENT REQUIRED TO MEET THE DESIGN REQUIREMENTS. CONTRACTOR SHALL REVIEW SUBMITTALS AND VERIFY EQUIPMENT SIZES, QUALITY AND PERFORMANCE REQUIREMENTS MEET SPECIFICATIONS PRIOR TO SUBMITTING FOR APPROVAL. EQUIPMENT THAT DIFFERS FROM BASIS OF DESIGN IS SUBJECT TO REJECTION. CONTRACTOR TO COORDINATE ALL DIFFERENCE IN EQUIPMENT WITH STRUCTURAL, ELECTRICAL AND PLUMBING CONTRACTORS.
20. ALL CONDENSATE LINES SHALL BE RIGID COPPER, INSULATED WITH CELLULAR FOAM UNLESS NOTED OTHERWISE OR SUBMITTED AND APPROVED BY MECHANICAL ENGINEER. SUPPORT WITH UNISTRUT PIPE EVERY 4' AND AT TURNS. PROVIDE NEOPRENE SLEEVES BETWEEN UNISTRUT AND COPPER CONDENSATE LINE.
21. DUCT SIZES SHOWN ARE SHEET METAL SIZES. ALLOWANCES HAVE BEEN INCLUDED FOR INTERNAL LINER WHERE APPLICABLE.
22. COORDINATE EXACT LOCATION OF AIR DEVICES WITH NEW AND EXISTING LIGHTS TO BE INSTALLED PRIOR TO CONSTRUCTION.
23. EXPOSED DUCTWORK SHALL BE PAINT GRIPPED SHEET METAL UNLESS INDICATED OTHERWISE. ALL EXPOSED DUCT TO BE PAINTED IN FIELD BY PAINTING CONTRACTOR DURING CONSTRUCTION. COORDINATE WITH ARCHITECT & MECHANICAL ENGINEER PRIOR TO INSTALLATION OF EXPOSED DUCT AND COLOR. EXPOSED DUCTWORK SHALL BE FREE OF SIZE MARKS OR ASSEMBLY CODE NUMBERS; ALL MARKS SHALL BE ON THE INSIDE OF DUCTWORK. KEEP OUTSIDE SURFACES OF DUCT CLEAN DURING FABRICATION. BANDS SHALL JOIN ON TOP. CONCEALED FROM NORMAL VIEW OF THE DUCT AND SPIRALS SHALL BE CONTINUOUS. THREADED RODS FROM HANGER STRAPS SHALL BE NEATLY CLIPPED AND SECURED WITHOUT EXCESS. GREATER ATTENTION TO APPEARANCE FOR EXPOSED DUCT IS EXPECTED AND DENTED/SCARRED DUCTS SHALL NOT BE ACCEPTABLE.
24. PROVIDE ELECTRICAL DISCONNECTS FOR MECHANICAL EQUIPMENT (VAV BOXES, FANS, VFDs, ETC.) FACTORY INSTALLED BY EQUIPMENT MANUFACTURER UNLESS NOTED OTHERWISE. COORDINATE WITH ELECTRICAL CONTRACTOR.
25. DO NOT ROUTE PIPING CONTAINING WATER OVER ELECTRICAL EQUIPMENT.
26. PROVIDE PERMANENT LABELS FOR ALL SCHEDULED EQUIPMENT. LABELS SHALL BE MINIMUM 3/8" ENGRAVED BLACK LETTERS ON WHITE BACKGROUND, CONSTRUCTED OF MINIMUM 1" WIDE, LENGTH AS REQUIRED LAMINATED PLASTIC. SECURELY FASTENED TO EQUIPMENT WITH STAINLESS STEEL OR NONCORRODING HARDWARE. STICK ON LABELS NOT ACCEPTABLE.
27. EXHAUST OUTLETS SHALL BE LOCATED MINIMUM 10' FROM ANY AIR INTAKE OR OPERABLE BUILDING OPENING.
28. INDOOR MINISPLITS, FAN COIL UNITS AND CEILING CASSETTES SHALL HAVE GRAVITY DRAINAGE WHERE POSSIBLE. PROVIDE WITH INTEGRAL CONDENSATE PUMPS WHERE NOT POSSIBLE.
29. PROVIDE RETURN AIR GRILLES OPEN TO RETURN AIR PLENUM WITH SOUND ATTENUATING BOOT ON REAR OF GRILLE (RIGID DUCT WITH INSULATED LINER & TWO ELBOWS, END OPEN TO RETURN AIR PLENUM). CONTRACTOR HAS OPTION TO PROVIDE PRICE MODEL #RAC RETURN AIR CANOPY ON REAR OF RETURN AIR GRILLES OPEN TO RA PLENUM IN LIEU OF SOUND ATTENUATING BOOT.
30. ELECTRONIC BALANCING DAMPERS - MANUAL DAMPER AT INACCESSIBLE LOCATIONS:
    - 30.1. PROVIDE REMOTE BALANCING DAMPER WITH POSITION INDICATOR AT INACCESSIBLE MANUAL VOLUME DAMPERS
    - 30.2. INACCESSIBLE LOCATIONS:
    - 30.2.1. ABOVE GYPSUM BOARD/HARD CEILING
    - 30.2.2. WHERE LOCATED HIGHER THAN 4'-0" ABOVE ACCESSIBLE CEILING TILE
    - 30.2.3. WHERE LOCATED ABOVE 14'-0" FROM FINISHED FLOOR
    - 30.2.4. REFER TO ARCHITECTURAL REFLECTED CEILING DRAWINGS FOR REFLECTED CEILING PLAN
    - 30.3. ELECTRONIC BALANCING DAMPER SHALL BE PROVIDED WITH POSITION INDICATOR AND SHALL BE GREENHECK MODEL RBDR-50 (ROUND) & RBD-10 (RECTANGULAR) OR APPROVED EQUAL, UNLESS INDICATED OTHERWISE.
    - 30.4. REMOTE BALANCING DAMPER SHALL BE 12 VOLT DC POWER BALANCE SYSTEM (DAMPER, PULSE ACTUATOR , CAT 5 CABLE, WALL OR CEILING PLATE AND HAND HELD POWER PACK). PROVIDE WALL/CEILING ACCESS PORT ON WALL WITHIN CLOSEST MECHANICAL ROOM OR ABOVE ACCESSIBLE CEILING MOUNTED ON WALL. ALL ACCESS PORTS TO BE PROPERLY LABELED NUMERICALLY PER RESPECTIVE AIR SYSTEM & ROOM DAMPER SERVES. COORDINATE WITH MECHANICAL ENGINEER PRIOR TO LABELING & COORDINATE LOCATION WITH MECHANICAL ENGINEER & ARCHITECT PRIOR TO INSTALLING ANY ACCESS PORT ABOVE ACCESSIBLE CEILINGS. PROVIDE TILE IDENTIFICATION WHERE LOCATED ABOVE CEILING, PROVIDE DRAWING IDENTIFYING PORT LOCATION & PORT SCHEDULE AS PART OF CLOSE OUT DOCUMENTS.
31. PROVIDE UL LISTED SMOKE DETECTORS IN THE MAIN SUPPLY DUCT AND RETURN ON THE DOWNSTREAM SIDE OF THE FILTERS IN ALL RECIRCULATING AIR SYSTEMS HANDLING OVER 2000 CFM NOTE: SMOKE DETECTORS TO BE WIRED TO BUILDING FIRE ALARM SYSTEM BY FIRE ALARM CONTRACTOR, FIRE ALARM CONTRACTOR IS TO PROVIDE AND INSTALL ALL WIRING, TERMINATIONS, ETC. TO PROVIDE A COMPLETE, PROPERLY FUNCTIONING AND OPERATING SYSTEM.
32. PROVIDE SMOKE DAMPER IN THE MAIN SUPPLY & RETURN DUCT IN ALL AIR HANDLING UNITS HANDLING OVER 15,000 CFM. SMOKE DAMPERS TO BE INTERCONNECTED TO SMOKE DETECTORS.
33. PROVIDE ACCESS PANELS FOR EQUIPMENT, VALVES, DAMPER, ETC. LOCATED ABOVE A NON-ACCESSIBLE CEILING. ACCESS PANELS SHALL BE LARGE ENOUGH FOR ALL REQUIRED MAINTENANCE, ADJUSTMENT, ETC. PROVIDE MULTIPLE ACCESS PANELS AS REQUIRED. COORDINATE COLOR AND LOCATIONS WITH ARCHITECT. PROVIDE FIRE AND/ OR SMOKE RATED ACCESS PANELS WHERE REQUIRED IN RATED CEILINGS. REFERENCE ARCHITECTURAL DRAWINGS FOR RATED CEILING LOCATIONS. WHERE ACCESS PANELS ARE SHOWN ON ARCHITECTURAL REFLECTED CEILING PLAN, COORDINATE EXACT LOCATION OF EQUIPMENT, DEVICES, ETC. WITH ACCESS PANEL LOCATIONS.
34. PROVIDE TEMPORARY CAPS/PLUGS/COVERING ON ALL OPEN ENDED PIPING & DUCT DURING CONSTRUCTION TO PREVENT DIRT/DEBRIS FROM ENTERING PIPE/DUCT SYSTEMS.
35. PROVIDE PROTECTIVE LOCKABLE THERMOSTAT COVERS FOR THERMOSTATS. COORDINATE WITH OWNER.
36. MECHANICAL CONTRACTOR SHALL COORDINATE WITH PLUMBING CONTRACTOR ON LOCATION OF ALL FLOOR DRAINS & HUB DRAINS AS NOT TO INTERFERE WITH EQUIPMENT & EQUIPMENT PADS. COORDINATE NEW FLOOR DRAIN & HUB LOCATION WHERE EQUIPMENT DOES NOT ALLOW FOR THE INSTALLATION SHOWN FOR DRAIN. COORDINATE HEIGHT OF HUB DRAINS FOR FAN COIL UNITS & CEILING CASSETTES.
37. PROVIDE TRANSITIONS FROM REAR OF ALL GRILLES TO BRANCH DUCTS AND TO ALL EQUIPMENT AS REQUIRED. REFER TO CONSTRUCTION DOCUMENTS FOR SIZES OF GRILLES AND DUCTS.
38. PRESSURE TEST ALL REUSED/REROUTED PIPING SYSTEMS. TESTING SHALL BE PERFORMED AT NORMAL SYSTEM OPERATING PRESSURE UNLESS INDICATED/SPECIFIED OTHERWISE. REPAIR AND RETEST AS REQUIRED UNTIL SYSTEMS ARE PROVEN TIGHT WITHOUT LEAKS.
39. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.
40. LOCATE ALL TEMPERATURE PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP AND DOWN STREAM AS RECOMMENDED BY THE MANUFACTURER.
41. REINFORCEMENT, DETAILING, AND PLACEMENT OF CONCRETE SHALL CONFORM TO ASTM 315 AND ACI 318. CONCRETE SHALL CONFORM TO ASTM C94. CONCRETE WORK SHALL CONFORM TO ACI318, PART ENTITLED "CONSTRUCTION REQUIREMENTS." COMPRESSIVE STRENGTH IN 28 DAYS SHALL BE 3,000 PSI. TOTAL AIR CONTENT OF EXTERIOR CONCRETE SHALL BE BETWEEN 5 AND 7 PERCENT BY VOLUME. SLUMP SHALL BE BETWEEN 3 AND 4 INCHES. CONCRETE SHALL BE CURED FOR 7 DAYS AFTER PLACEMENT.
42. COORDINATE ALL EQUIPMENT CONNECTION WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
43. MINIMUM CONCRETE PAD THICKNESS SHALL BE 4 INCHES. PAD SHALL EXTEND BEYOND THE EQUIPMENT A MINIMUM OF 6 INCHES ON EACH SIDE UNLESS OTHERWISE DIRECTED IN THESE DOCUMENTS 15 LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED. REFER TO TYPICAL DETAILS FOR DUCTWORK, PIPING, AND EQUIPMENT INSTALLATION.
44. INSTALL TRANSITION DUCT FROM INLET AND OUTLET OF EQUIPMENT TO DUCT SIZE SHOWN ON PLANS; CONSULT EQUIPMENT MANUFACTURER FOR INLET AND OUTLET SIZE.
45. ALL DUCT ELBOWS, BENDS, AND TEES SHALL BE PROVIDED WITH DOUBLE THICKNESS TURNING VANES OR RADIUS ELBOWS UNLESS SHOWN OR NOTED OTHERWISE. ELBOWS IN DISHWASHER, KITCHEN, AND LAUNDRY EXHAUST SHALL BE VANELESS SMOOTH RADIUS CONSTRUCTION WITH A RADIUS OF 1.5 TIMES THE WIDTH OF THE DUCT.
46. PROVIDE ESCUTCHEONS AT ALL EXPOSED LOCATIONS WHERE PIPE PENETRATES WALL.
47. THE CONDENSATE DRAIN LINE SHALL NOT DECREASE IN SIZE FROM THE DRAIN PAN CONNECTION TO THE FLOOR DRAIN; ELEVATE UNIT TO ACCOMMODATE P-TRAP.
48. ALL EQUIPMENT AND DEVICES TO BE FURNISHED AND INSTALLED PER THE REQUIREMENTS OF CONTRACT DRAWINGS, SPECIFICATIONS, MANUFACTURERS RECOMMENDATIONS, AND ACCORDING TO CODE.
49. PROVIDE FLEXIBLE CONNECTIONS IN ALL DUCTWORK SYSTEMS (SUPPLY, RETURN, AND EXHAUST) CONNECTED TO AIR HANDLING UNITS, FANS, AND OTHER EQUIPMENT WHICH REQUIRE VIBRATION ISOLATION. FLEXIBLE CONNECTIONS SHALL BE PROVIDED AT THE POINT OF CONNECTION TO THE EQUIPMENT UNLESS OTHERWISE DIRECTED IN THESE DOCUMENTS.
50. UNLESS OTHERWISE NOTED, ALL DUCTWORK IS OVERHEAD, TIGHT TO UNDERSIDE OF THE STRUCTURE, WITH SPACE FOR INSULATION.
51. ALL ROOF CURBS SHALL BE INSTALLED TO THE ROOFING STRUCTURE AND FINISH A MINIMUM 12" ABOVE THE FINISHED ROOF FOR COUNTER FLASH ENDORSED BY ROOF MANUFACTURER. ROOF CURBS SHALL BE PITCHED WHERE REQUIRED TO ENSURE EQUIPMENT IS INSTALLED LEVEL.
52. ALL MISCELLANEOUS ROOFTOP EQUIPMENT SUPPORTS SHALL BE ENDORSED BY BOTH THE RESPECTIVE EQUIPMENT MANUFACTURER AND ROOF SYSTEM MANUFACTURER.
53. ALL WALL APPLIED ITEMS SHALL BE INSTALLED PLUMB, LEVEL AND IN LOCATIONS DESIGNATED IN CONTRACT DOCUMENTS. ALL DEVICE COVERS AND TRIM SHALL FIT TIGHT TO WALL SURFACE ON ALL SIDES. WHERE SPECIFIC LOCATIONS FOR ITEMS NOT SHOWN OR CLEAR, CONTRACTOR SHALL OBTAIN CLARIFICATION AND DIRECTION FROM ARCHITECT AND MECHANICAL ENGINEER PRIOR TO INSTALLATION.
54. ALL FLEX DUCT SERVING DIFFUSERS SHALL BE LIMITED TO RUNS OF 6'. FLEX DUCT SHALL BE FLEXMASTER 1M-R6 OR APPROVED EQUAL AND USE STAINLESS STEEL (OR NYLON IF APPROVED BY MECHANICAL ENGINEER) TO CONNECT FLEX TO DUCT AND GRILLES.
55. FLEXIBLE DUCT NOT ACCEPTABLE FOR EXHAUST, RETURN AND FRESH AIR SYSTEMS UNLESS SPECIFIED OR NOTED OTHERWISE. FLEX DUCT SHALL NOT PENETRATE ANY WALLS UNLESS SUBMITTED AND APPROVED ON TO BOTH THE ARCHITECT AND MECHANICAL ENGINEER.
56. PROVIDE ADDITIONAL SUSPENDED SUPPORTS AS REQUIRED TO PREVENT FLEXIBLE DUCT FROM CONTACTING THE CEILING MATERIAL AND/OR CEILING FRAME/GRID ASSEMBLY.
57. ALL ROUND TAPS OFF RECTANGULAR DUCTWORK TO DIFFUSERS SHALL BE MADE WITH HIGH EFFICIENCY SIDE TAKEOFFS WITH 2" INSULATION STANDOFF BRACKETS AND LOCKING QUADRANT, FLEXMASTER MODEL STOD-BO3 OR APPROVED EQUAL.
58. ALL GRILLES LOCATED IN LAY-IN CEILINGS SHALL HAVE 24x24 FRAMES, STYLES TO FIT THE GRID TYPE, EITHER 15/16" OR 9/16" GRID, VERIFY GRID WITH ARCHITECTURAL DRAWINGS. PROVIDE PLASTER FRAMES FOR SURFACE MOUNT APPLICATIONS, PRICE MODEL AMF OR APPROVED EQUAL.
59. PROVIDE MANUAL VOLUME DAMPERS IN ALL BRANCH DUCT CONNECTIONS TO LOW PRESSURE MAIN DUCTS.
60. ALL EQUIPMENTS SUPPLIED TO THE PROJECT SHALL BE PER SPECIFICATIONS. OBTAINING APPROVED SUBMITTALS DOES NOT RELIEVE THE CONTRACTOR/SUPPLIER OF PROVIDING ALL FEATURES, OPTIONS AND ACCESSORIES INCLUDED WITHIN THE CONSTRUCTION DOCUMENTS.

MECHANICAL SYMBOL LEGEND

(REFER TO DRAWINGS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS)

GENERAL



INDEX - MECHANICAL SHEETS

M0.0	MECHANICAL COVER SHEET
M0.1	MECHANICAL SITE PLAN
M1.0	MECHANICAL PLANS - ENLARGED
M1.1	MECHANICAL PLANS - ENLARGED
M1.2	MECHANICAL PLANS - ENLARGED
M3.0	MECHANICAL DETAILS
M3.1	MECHANICAL DETAILS
M4.0	MECHANICAL SCHEDULES

ABBREVIATION LEGEND

AC	AIR CONDITIONING
ACCU	AIR COOLED CONDENSING UNIT
AFF	ABOVE FINISHED FLOOR
AFS	AIR FLOW STATION
AHU	AIR HANDLING UNIT
AMB	AMBIENT
AS	AIR SEPARATOR
AV	AIR VENT
BAS	BUILDING AUTOMATION SYSTEM
BDD	BACKDRAFT DAMPER
BFP	BACKFLOW PREVENTER
BOD	BOTTOM OF DUCT
BTUH	BRITISH THERMAL UNIT PER HOUR
CC	COOLING COIL
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CHWCF	CHILLED WATER CHEMICAL FEED
CHP	CHILLED WATER PUMP
CHR	CHILLED WATER RETURN
CHS	CHILLED WATER SUPPLY
COMP	COMPRESSOR
CP	CIRCULATING PUMP
CU	CONDENSING UNIT
CT	COOLING TOWER
CV	CONTROL VALVE
CW	COLD WATER
CWCF	CONDENSER WATER CHEMICAL FEED
CWR	CONDENSER WATER RETURN
CWP	CONDENSER WATER PUMP
CWS	CONDENSER WATER SUPPLY
DB	DRY BULB TEMP (DEG F)
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DP	DIFFERENTIAL PRESSURE
DPS	DIFFERENTIAL PRESSURE SWITCH
DWG	DRAWING
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EL	ELEVATION
ELEC	ELECTRICAL
ENT	ENTERING
ECU	ELECTRIC CONDENSING UNIT
ERU	ELECTRIC REFRIGERANT UNIT
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
EVAP	EVAPORATOR
EX	EXHAUST
EXT	EXTERNAL
FA	FRESH AIR
FC/FCU	FAN COIL UNIT
FD	FIRE DAMPER
FT	FEET
FLA	FULL LOAD AMPS
FPM	FEET PER MINUTE
FV	FACE VELOCITY
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
GPH	GALLONS PER HOUR
GUH	GAS UNIT HEATER
HC	HEATING COIL
HP	HORSEPOWER
HR	HOUR
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
ID	INSIDE DIAMETER
IN	INCHES
KW	KILOWATTS
LVG	LEAVING
MA	MIXED AIR
MAX	MAXIMUM
MD	MOTORIZED DAMPER
MECH	MECHANICAL
MFR	MANUFACTURER
NG	NATURAL GAS
MIN	MINIMUM
MVD	MANUAL VOLUME DAMPER
NC	NORMALLY CLOSED
NFPA	NATIONAL FIRE PROTECTION ASSOC.
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NOM	NOMINAL
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAF	OUTSIDE AIR FAN
OAU	OUTSIDE AIR UNITS
OS&Y	OUTSIDE STEM AND YOKE
OZ	OUNCES (PRESSURE)
PD	PRESSURE DROP
PTAC	PACKAGED TERMINAL AIR CONDITIONER
PSI	POUNDS PER SQUARE INCH
RA	RETURN AIR
REF	REFERENCE
RH	RELATIVE HUMIDITY
RHC	REHEAT COIL
RND	ROUND
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
SA	SUPPLY AIR
SD	SMOKE DAMPER
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SF	SUPPLY AIR FAN
SP	STATIC PRESSURE
SPEC	SPECIFICATIONS
TEMP	TEMPERATURE
TOD	TOP OF DUCT
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LISTED
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
W /	WITH
W / O	WITHOUT
WB	WET BULB (DEG F)

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PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

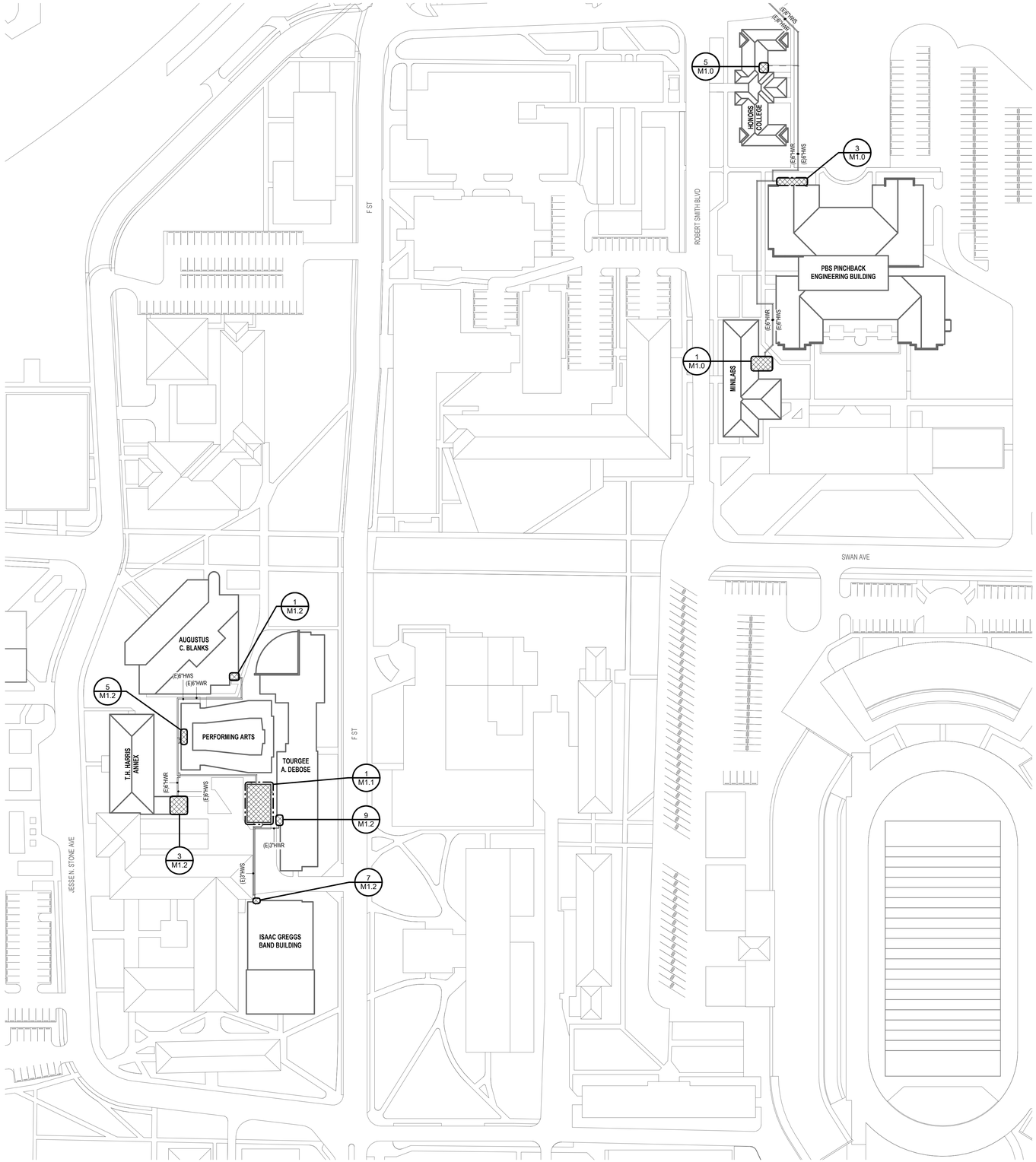
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SHEET NAME

MECHANICAL COVER SHEET

SHEET NUMBER

M0.0



N

1 OVERALL SITE PLAN
1" = 80'-0"

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STATE OF LOUISIANA
GRANT T. McDONALD
LICENSED
PROFESSIONAL
ENGINEER
10/05/2026

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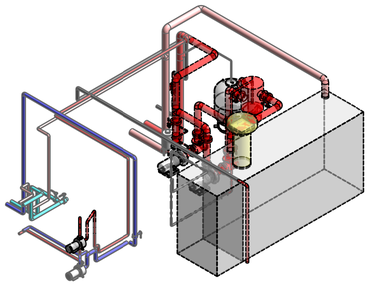
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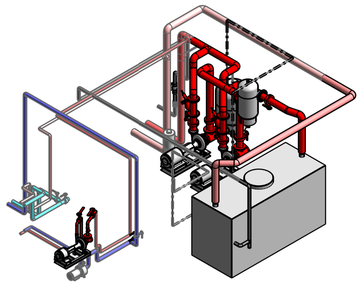
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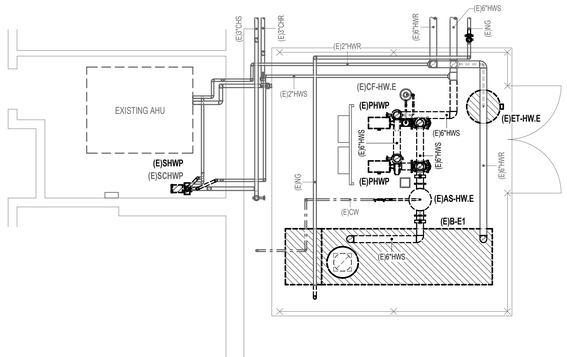
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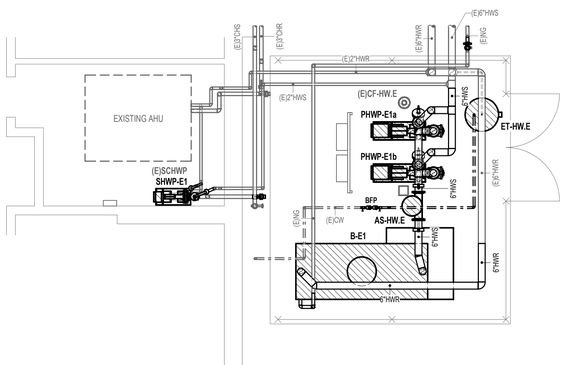
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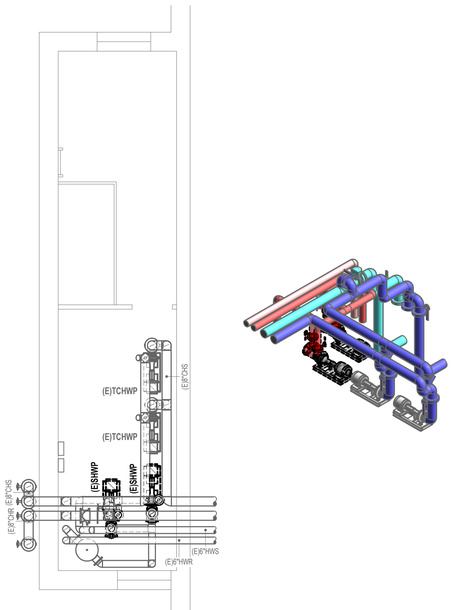




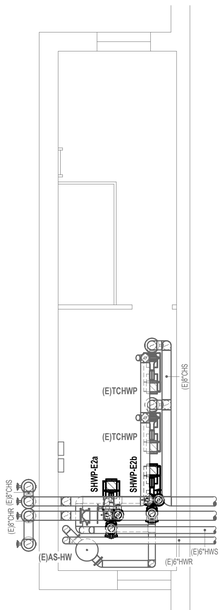


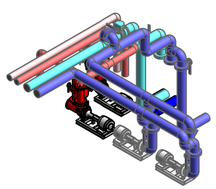
1 ENL - PUMP RM & MECH YARD - MINILABS - DEMO
3/16" = 1'-0"

2 ENL - PUMP RM & MECH YARD - MINILABS - RENO
3/16" = 1'-0"

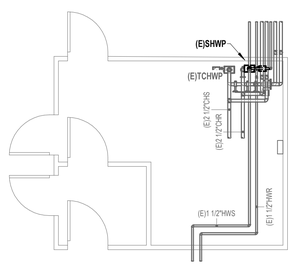


3 ENL - PUMP RM - PBS PINCHBACK - DEMO
3/16" = 1'-0"

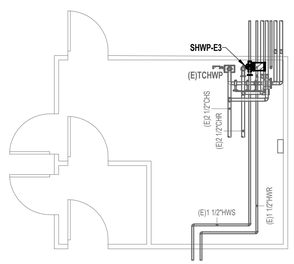




4 ENL - PUMP RM - PBS PINCHBACK - RENO
3/16" = 1'-0"



5 ENL - PUMP RM - HONORS COLLEGE - DEMO
3/16" = 1'-0"



6 ENL - PUMP RM - HONORS COLLEGE - RENO
3/16" = 1'-0"

MECHANICAL DEMOLITION KEYNOTES: (#)

1. REMOVE EXISTING HEATING WATER PUMP AS SHOWN. REMOVE ASSOCIATED PIPING AND ACCESSORIES AS SHOWN AND AS REQUIRED FOR INSTALLATION OF NEW PUMP. REFER TO RENOVATION PLANS.
2. REMOVE EXISTING BOILER AS SHOWN. REMOVE ASSOCIATED COMBUSTION & VENTILATION AIR DUCTS/PIPES. REMOVE ASSOCIATED HEATING WATER & NATURAL GAS PIPING AS SHOWN AND AS REQUIRED FOR INSTALLATION OF NEW BOILER. REFER TO RENOVATION PLANS.
3. REMOVE EXISTING AIR SEPARATOR. DISCONNECT ASSOCIATED PIPINGS AND PREPARE FOR CONNECTION TO NEW. REFER TO RENOVATION PLANS.
4. REMOVE EXISTING EXPANSION TANK. DISCONNECT ASSOCIATED PIPINGS AND PREPARE FOR CONNECTION TO NEW. REFER TO RENOVATION PLANS.
5. EXISTING ELECTRICAL RACK AND VFDs SHALL REMAIN AND BE REUSED. PROTECT DURING DEMOLITION. COORDINATE WITH ELECTRICAL CONTRACTOR.
6. EXISTING DRAIN SHALL REMAIN AND BE REUSED. CONTRACTOR SHALL SNAKE AND JET DRAIN PIPING OUT TO MAIN, COVER, AND PROTECT DURING DEMOLITION.
7. REMOVE EXISTING NATURAL GAS REGULATOR AND PORTION OF PIPING AS REQUIRED TO INSTALL NEW REGULATOR. REFER TO RENOVATION PLANS.
8. REMOVE EXISTING MAKEUP WATER LINE BACKFLOW PREVENTER AND DOWNSTREAM PIPING TO PREPARE FOR NEW.

MECHANICAL RENOVATION KEYNOTES: (1)

1. PROVIDE NEW BOILER. MODIFY EXISTING CONCRETE PAD AS REQUIRED FOR NEW BOILER INSTALLATION. PROVIDE NEW PRESSURE & TEMPERATURE GAGUES & SENSORS ON INLET & OUTLET PIPING.
2. PROVIDE NEW HYDRONIC PUMPS. MODIFY EXISTING CONCRETE PAD AS REQUIRED FOR NEW BOILER INSTALLATION. PROVIDE NEW PRESSURE & TEMPERATURE GAGUES & SENSORS ON INLET & OUTLET PIPING. SUPPORT ADS FROM GROUND PIPE SUPPORT. PROVIDE NEW ISOLATION VALVES, TEMP & PRESSURE GAUGES, STRAINER, CHECK VALVE & SUCTION DIFFUSER.
3. REPLACE EXISTING AIR SEPARATOR. PROVIDE GROUND MOUNTED PIPE SUPPORT.
4. PROVIDE NEW EXPANSION TANK. PROVIDE NEW CONCRETE REINFORCED HOUSEKEEPING PAD WITH CHAMEFERED EDGES. PROVIDE PIPING WITH ISOLATION VALVE.
5. EXISTING PUMP VFD(s) TO BE REUSED. RELOCATE EXISTING VFD(s) AS REQUIRED FOR INSTALLATION OF NEW EQUIPMENT. COORDINATE WITH ELECTRICAL CONTRACTOR PRIOR TO CONSTRUCTION.
6. CONNECT NEW 1-1/2" MAKEUP WATER LINE TO EXISTING MAKEUP WATER LINE & CONNECT. PROVIDE NEW INSULATION, ALUMINUM JACKET & HEAT TRACING. PROVIDE NEW BACKFLOW PREVENTER AS SHOWN. PROVIDE HEAT TRACING CONTROLLER IN HONORS COLLEGE MECHANICAL ROOM.
7. PROVIDE NEW BACKFLOW PREVENTER ON NEW MAKEUP WATER LINE AS SHOWN.
8. PROVIDE GROUND MOUNTED PIPE SUPPORTS & ROLLERS ON COCNRETE PADS SPACE MAXIMUM 10'-0" & AT ALL TURNS FOR EXTERIOR HEATING WATER PIPING ABOVE GRADE.
9. PROVIDE EXPANSION MODULE AS REQUIRED FOR TEMPERATURE CONTROLS.
10. REPLACE EXISTING HEATING WATER PUMP WITH NEW. FIELD VERIFY EXISTING CONDITIONS. SPACE LIMITED THIS AREA.
11. REPLACE EXISTING BOILER NATURAL GAS REGULATOR WITH NEW, SIZED TO HANDLE THE FUEL CONSUMPTION AND PRESSURE REQUIREMENTS OF THE NEW BOILER. REFER TO SCHEDULES.
12. RECONNECT EXISTING CHEMICAL FEEDER PIPING TO NEW HEATING WATER PIPING. EXTEND EXISTING OR PROVIDE NEW PIPING AND FITTINGS AS REQUIRED. REFER TO PIPING DIAGRAMS.

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10/05/2026

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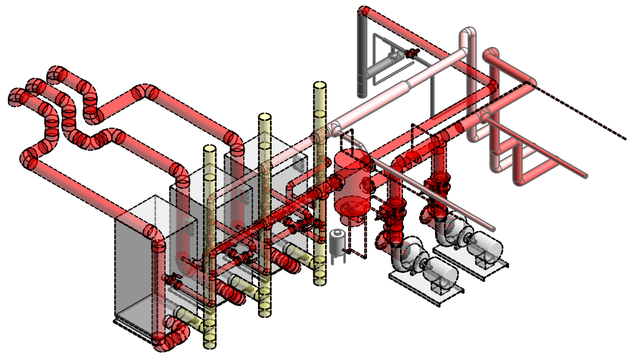
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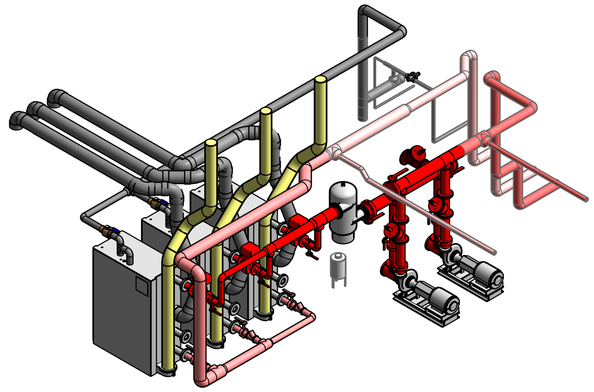
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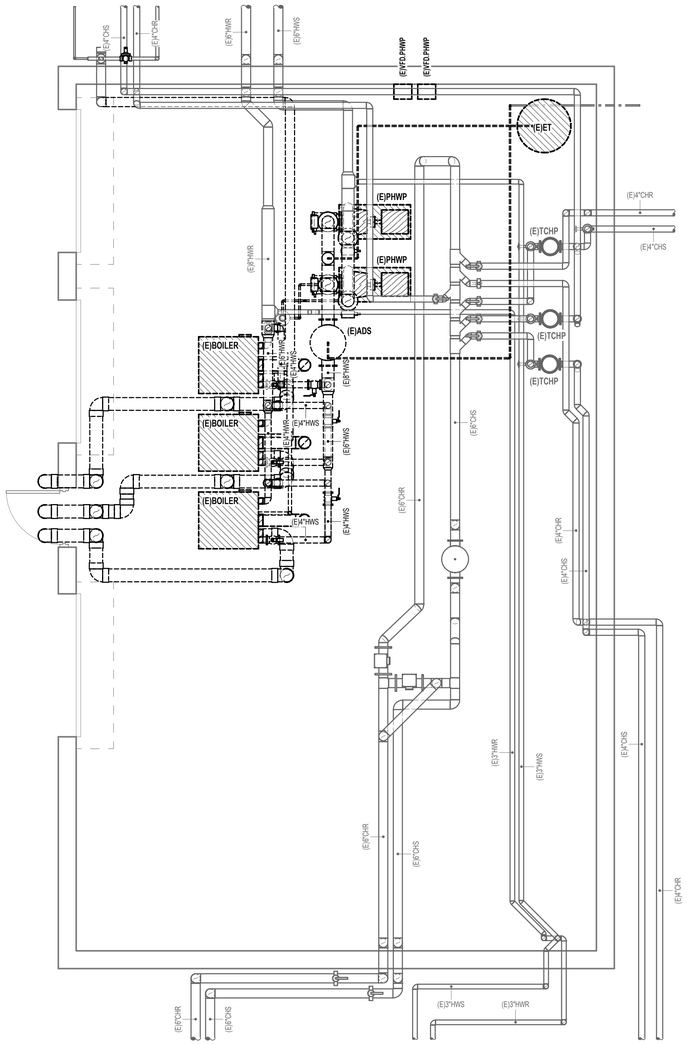
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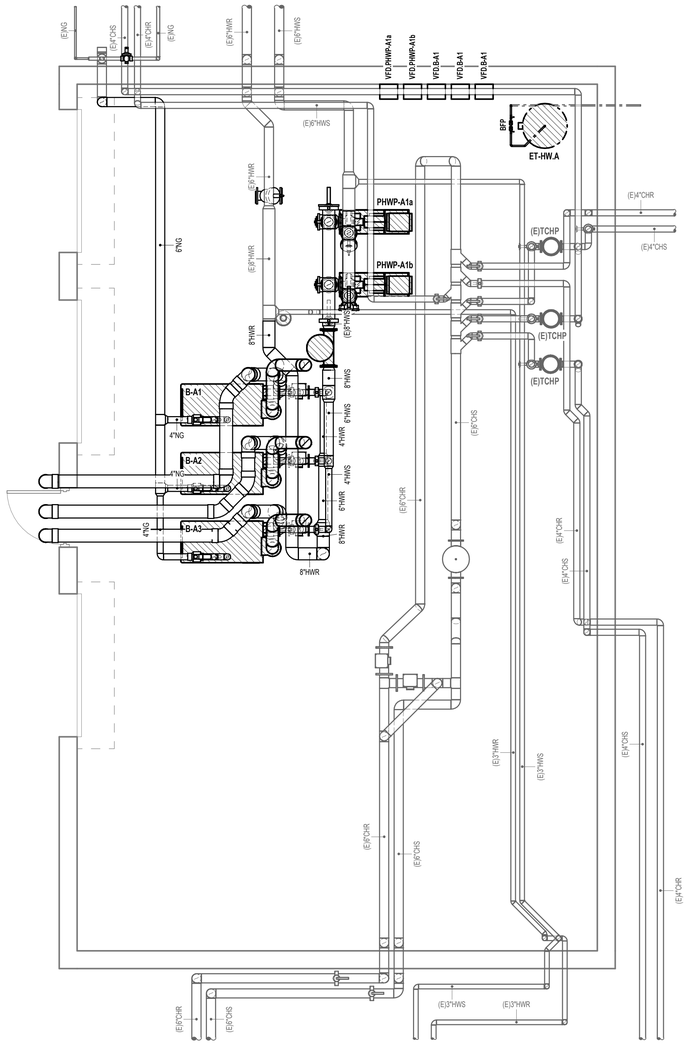
M1.0







1 **ENL - MECH BLDG - BAND/MUSIC/ARTS - DEMO**
1/4" = 1'-0"



2 **ENL - MECH BLDG - BAND/MUSIC/ARTS - RENO**
1/4" = 1'-0"

MECHANICAL DEMOLITION KEYNOTES: (#)

1. REMOVE EXISTING HEATING WATER PUMP AS SHOWN. REMOVE ASSOCIATED PIPING AND ACCESSORIES AS SHOWN AND AS REQUIRED FOR INSTALLATION OF NEW PUMP. REFER TO RENOVATION PLANS.
2. REMOVE EXISTING BOILER AS SHOWN. REMOVE ASSOCIATED COMBUSTION & VENTILATION AIR DUCTS/PIPES. REMOVE ASSOCIATED HEATING WATER & NATURAL GAS PIPING AS SHOWN AND AS REQUIRED FOR INSTALLATION OF NEW BOILER. REFER TO RENOVATION PLANS.
3. REMOVE EXISTING AIR SEPARATOR. DISCONNECT ASSOCIATED PIPINGS AND PREPARE FOR CONNECTION TO NEW. REFER TO RENOVATION PLANS.
4. REMOVE EXISTING EXPANSION TANK. DISCONNECT ASSOCIATED PIPINGS AND PREPARE FOR CONNECTION TO NEW. REFER TO RENOVATION PLANS.
5. REMOVE EXISTING NATURAL GAS REGULATOR TO BE REPLACED. MODIFY, PREPARE, AND/OR CAP PIPING AS REQUIRED IN PREPARATION FOR NEW NATURAL GAS REGULATOR IN SAME PLACE. TAKE NOTE OF REGULATOR INLET PRESSURE TO ENSURE NEW REGULATOR IS CORRECTLY SIZED.
6. REMOVE INTERIOR NATURAL GAS PIPING, ACCESSORIES, ETC. FROM EXISTING BOILERS BACK TO EXTERIOR WALL PENETRATION AS SHOWN AND PREPARE FOR NEW PIPING. REFER TO RENOVATION PLANS.
7. REMOVE EXISTING PHWP VFDs TO PREPARE FOR NEW. COORDINATE WITH ELECTRICAL CONTRACTOR PRIOR TO CONSTRUCTION.
8. REMOVE EXISTING MAKEUP WATER LINES FROM HOT WATER PIPING, DIRT SEPARATOR, AND EXPANSION TANK AS SHOWN BACK TO SHUTOFF VALVE AT INCOMING DOMESTIC WATER LINE STUBBED UP THROUGH SLAB.

MECHANICAL RENOVATION KEYNOTES: (1)

1. PROVIDE NEW BOILER. MODIFY EXISTING CONCRETE PAD AS REQUIRED FOR NEW BOILER INSTALLATION. PROVIDE NEW PRESSURE & TEMPERATURE GAGUES & SENSORS ON INLET & OUTLET PIPING. PROVIDE NEW BOILER FLUE & COMBUSTION AIR PIPE (MATERIAL AS RECOMMENDED BY MANUFACTURER). PROVIDE NEW NATURAL GAS PIPING AS SHOWN.
2. REPLACE EXISTING AIR SEPARATOR. PROVIDE GROUND MOUNTED PIPE SUPPORT.
3. PROVIDE NEW HYDRONIC PUMPS. MODIFY EXISTING CONCRETE PAD AS REQUIRED FOR NEW PUMP NSTALLATION. PROVIDE NEW PRESSURE & TEMPERATURE GAGUES & SENSORS ON INLET & OUTLET PIPING. SUPPORT ADS FROM GROUND PIPE SUPPORT. PROVIDE NEW ISOLATION VALVES, TEMP & PRESSURE GAUGES, STRAINER, CHECK VALVE & SUCTION DIFFUSER.
4. PROVIDE NEW HEATING WATER PIPING AS SHOWN. NEW SYSTEM SHALL HAVE REVERSE RETURN PIPING.
5. PROVIDE NEW EXPANSION TANK. PROVIDE NEW CONCRETE REINFORCED HOUSEKEEPING PAD WITH CHAMEFERED EDGES. PROVIDE PIPING WITH ISOLATION VALVE.
6. PROVIDE NEW NATURAL GAS REGULATOR WITH INLET PRESSURE MATCHING EXISTING AND 7-11 in-wg OUTLET PRESSURE, SIZED TO ACCOMMODATE INPUT CFH OF BOILERS SUBMITTED TO BE PROVIDED TO PROJECT. REFER TO BOILER SCHEDULE FOR BASIS OF DESIGN.
7. PROVIDE NEW VFDs FOR NEW PUMPS AND BOILERS AS SHOWN. COORDINATE WITH ELECTRICAL CONTRACTOR PRIOR TO CONSTRUCTION. REFER TO SPECIFICATIONS FOR EXACT REQUIREMENTS.
8. CONNECT NEW 3/4" MAKEUP WATER LINE TO EXISTING MAKEUP WATER LINE & CONNECT. PROVIDE NEW INSULATION, ALUMINUM JACKET & HEAT TRACING. PROVIDE NEW BACKFLOW PREVENTER AS SHOWN. PROVIDE HEAT TRACING CONTROLLER ON WALL NEARBY. COORDINATE EXACT LOCATION OF CONTROLLER IN FIELD WITH EXISTING CONDITIONS AND ELECTRICAL CONTRACTOR.

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STATE OF LOUISIANA
GRANT T. MCDONALD
LICENSED PROFESSIONAL ENGINEER
CHANGE ENGINEERING
ALL END
10/05/2026

PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

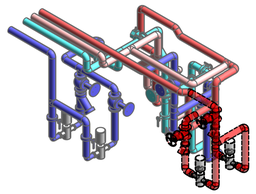
DATE:	10/05/2026
DRAWN BY:	DKD
CHECKED BY:	GTM
PROJECT #:	25-157

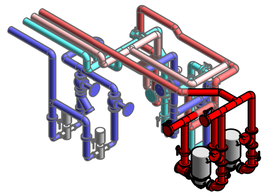
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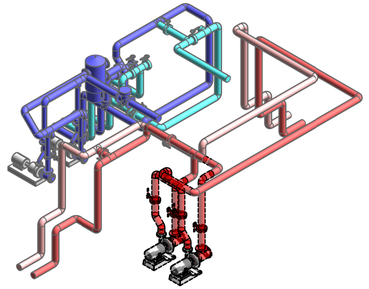
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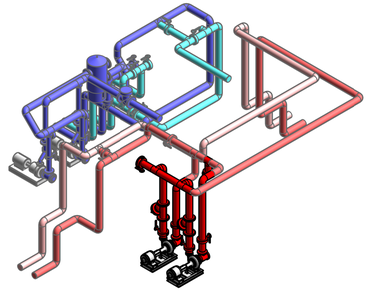
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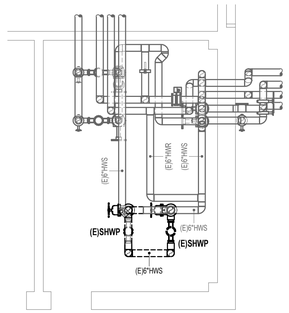
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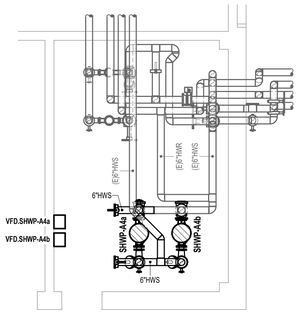


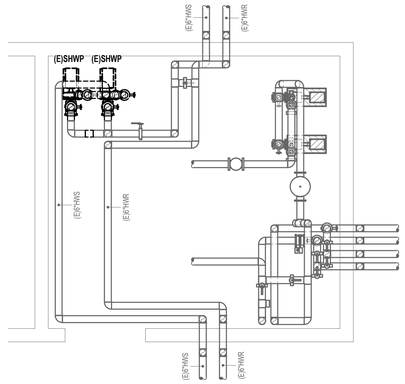


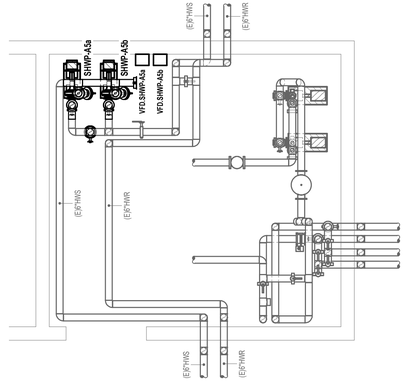










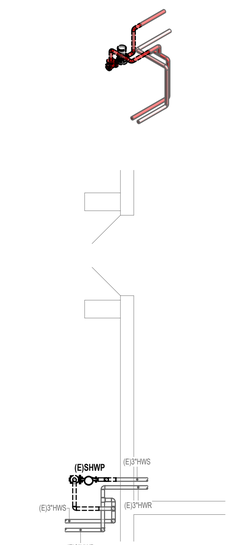


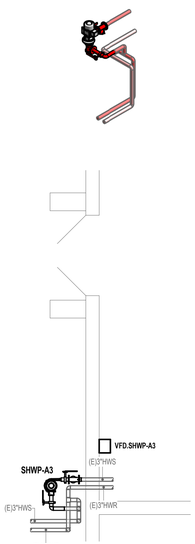
1 ENL - PUMP RM - AUGUSTUS C. BLANKS - DEMO
3/16" = 1'-0"

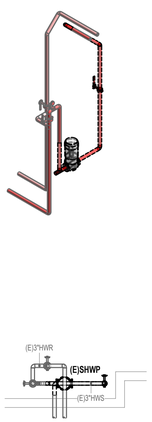
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3/16" = 1'-0"

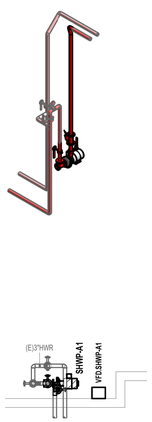
3 ENL - PUMP RM - T.H. HARRIS ANNEX - DEMO
3/16" = 1'-0"

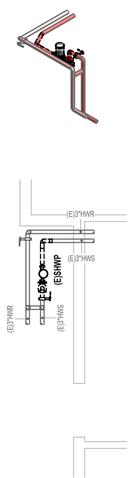
4 ENL - PUMP RM - T.H. HARRIS ANNEX - RENO
3/16" = 1'-0"

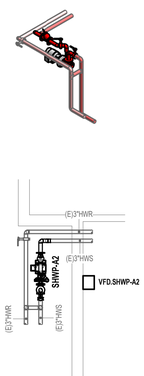












5 ENL - PUMP RM - PERFORMING ARTS - DEMO
3/16" = 1'-0"

6 ENL - PUMP RM - PERFORMING ARTS - RENO
3/16" = 1'-0"

7 ENL - THWP - ISAAC GREGGS - DEMO
3/16" = 1'-0"

8 ENL - THWP - ISAAC GREGGS - RENO
3/16" = 1'-0"

9 ENL - PUMP RM - T. A. DEBOSE - DEMO
3/16" = 1'-0"

10 ENL - PUMP RM - T. A. DEBOSE - RENO
3/16" = 1'-0"

MECHANICAL DEMOLITION KEYNOTES: (#)

1. REMOVE EXISTING HEATING WATER PUMPS , PIPING DOWN TO PUMPS & PUMP ACCESSORIES.

MECHANICAL RENOVATION KEYNOTES: (1)

1. PROVIDE NEW HYDRONIC PUMPS. MODIFY EXISTING CONCRETE PAD AS REQUIRED FOR NEW PUMP NSTALLATION. PROVIDE NEW PRESSURE & TEMPERATURE GAGUES & SENSORS ON INLET & OUTLET PIPING. SUPPORT ADS FROM GROUND PIPE SUPPORT. PROVIDE NEW ISOLATION VALVES, TEMP & PRESSURE GAUGES, STRAINER, CHECK VALVE & SUCTION DIFFUSER.

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GRANT T. MCDONALD
PROFESSIONAL ENGINEER
CHANNEL ENGINEERING
10/05/2026

PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

DATE:	10/05/2026
DRAWN BY:	DKD
CHECKED BY:	GTM
PROJECT #:	25-157

SHEET NAME

MECHANICAL PLANS - ENLARGED

SHEET NUMBER

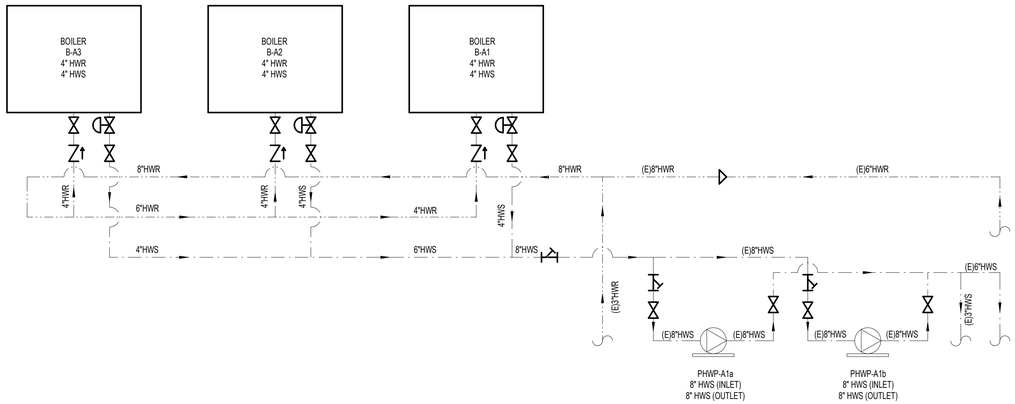
M1.2

EQUIPMENT POINT LIST - INCLUDES BUT NOT LIMITED TO:

1. COOLING TOWERS (EACH CELL):
   - A. VFD START /STOP
   - B. VFD SPEED
   - C. VFD ALARM STATUS
   - D. VFD SPEED
   - E. BASIN TEMPERATURE
   - F. HIGH WATER LEVEL
   - G. HIGH WATER LEVEL CUTOFF
   - H. LOW WATER LEVEL
   - I. LOW WATER LEVEL CUTOFF
   - J. LOW MAKEUPWATER
   - K. BASIN HEATER CONTROL
   - L. WATER LEVEL CONTROL
   - M. BASIN TEMPERATURE
   - N. CWS CONTROL VALVE STATUS
   - O. CWS CONTROL VALVE COMMAND
   - P. CWR CONTROL VALVE STATUS
   - Q. CWR CONTROL VALVE COMMAND
   - R. EQUALIZER CONTROL VALVE STATUS
   - S. EQUALIZER CONTROL VALVE COMMAND
   - T. RUNTIME
2. CONDENSER WATER PUMPS (EACH):
   - A. VFD START /STOP
   - B. VFD SPEED
   - C. VFD ALARM STATUS
   - D. VFD SPEED
   - E. PUMP RUNTIME
3. CONDENSER WATER SYSTEM:
   - A. CWS TEMPERATURE
   - B. CWR TEMPERATURE
   - C. CONDENSER WATER BYPASS VALVE STATUS
   - D. CONDENSER WATER VALVE PERCENT OPEN
   - E. CONDENSER WATER BYPASS VALVE COMMAND SETPOINT
   - F. CWS PRESSURE
   - G. CWR PRESSURE
   - H. MAKEUP WATER FLOW
4. BASIN SWEEPER PUMPS (EACH):
   - A. PUMP STATUS
   - B. PUMP RUNTIME
5. PRIMARY CHILLED WATER SYSTEM & CHILLERS (EACH):
   - A. VFD START /STOP
   - B. VFD SPEED
   - C. VFD ALARM STATUS
   - D. VFD SPEED
   - E. PUMP RUNTIME
   - F. CHILLER STATUS
   - G. CHILLER COMMAND
   - H. CHILLER RUN TIME
   - I. CHS FLOW SWITCH
   - J. CHS TEMPERATURE
   - K. CHR TEMPERATURE
   - L. CWDIFFERENTIAL PRESSURE
   - M. CWS TEMPERATURE
   - N. CWR TEMPERATURE
   - O. CHS CONTROL VALVE STATUS
   - P. CHS CONTROL VALVE COMMAND
   - Q. CWS CONTROL VALVE STATUS
   - R. CWS CONTROL VAVLE COMMAND
   - S. MAKEUP WATER FLOW
6. SECONDARY CHILLED WATER SYSTEM (EACH):
   - A. VFD START /STOP
   - B. VFD SPEED
   - C. VFD ALARM STATUS
   - D. VFD SPEED
   - E. PUMP RUNTIME
   - F. CHILLED WATER BRANCH SUPPLY FLOW METER
   - G. CHILLED WATER BRANCH SUPPLY TEMPERATURE
   - H. CHILLED WATER BRANCH DIFFERENTIAL PRESSURE
   - I. CHILLED WATER RETURN TEMPERATURE
   - J. CHILLED WATER RETURN PRESSURE
7. CHILLED WATER PLANT:
   - A. OUTSIDE AIR TEMPERATURE
   - B. INDOOR AIR TEMPERATURE
   - C. REFRIGERANT ALARM STATUS
   - D. EXHAUST FAN STATUS
   - E. EXHAUST FAN COMMAND
   - F. EXHAUST FAN RUN TIME
   - G. LOUVER MOTORIZED DAMPER STATUS
   - H. LOUVER MOTORIZED DAMPER COMMAND
   - I. CHILLED WATER PLANT EQUIPMENT ENERGY CONSUMPTION

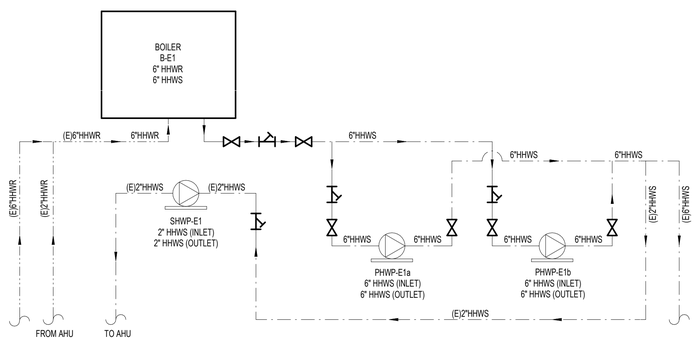
SYMBOL LEGEND

CHS	CHILLED WATER SUPPLY
CHR	CHILLED WATER RETURN
CWS	CONDENSER WATER SUPPLY
CHR	CONDENSER WATER RETURN
(E)	EXISTING
PW	POTABLE WATER
BSWS	BASIN SWEEPER SUPPLY
BSWR	BASIN SWEEPER RETURN
SD	STORM DRAIN
EQP	EQUALIZER PIPING
BYP	BYPASS PIPING
NC	NORMALLY CLOSED
	PIPE EXPANSION
	ISOLATION VALVE
	CONTROL VALVE
	STRAINER
	CHECK VALVE
FM	FLOW METER / SENSOR
PS	PRESSURE / DIFFERENTIAL PRESSURE SENSOR
TS	TEMPERATURE SENSOR
	FLOW ARROW



1 PIPING DIAGRAM - PBS PINCHBACK BOILERS

3/16" = 1'-0"



2 PIPING DIAGRAM - PUMP RM & MECH YARD

3/16" = 1'-0"

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GRANT T. McDONALD
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CHEMICAL ENGINEERING
10/05/2026

PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

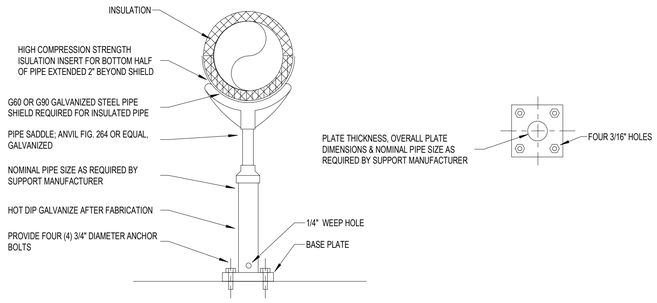
DATE:	10/05/2026
DRAWN BY:	DKD
CHECKED BY:	GTM
PROJECT #:	25-157

SHEET NAME

MECHANICAL DETAILS

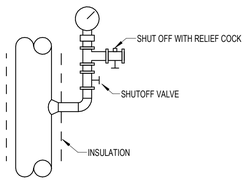
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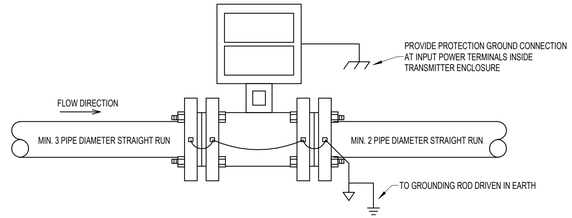
GENERAL NOTES:
1. ADJUSTBLE STANCHIONS REQUIRED TO BE LOCKED IN PLACE AFTER ALIGNMENT.
2. REFER TO SPECIFICATIONS FOR ADDITIONAL SHIELD REQUIREMENTS.

1 DETAIL - ADJUSTABLE PIPE FLOOR STAND
N.T.S.



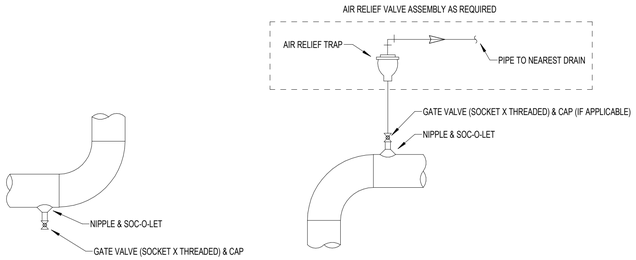
GENERAL NOTES:
1. ISOLATION VALVES MAY BE NEEDLE VALVES OR TEE-HANDLE COCKS.
2. PROVIDE FILTER TYPE PRESSURE SNUBBER AT PRESSURE GAUGE CONNECTION.
3. PIPE CONNECTION MAY BE THREAD-O-LET OR TEE.
4. PROVIDE 1/4" PIPING & NIPPLES.
5. PROVIDE PRESSURE GAUGES ON INLET & OUTLET OF ALL PUMPS & CHILLERS.

2 DETAIL - PRESSURE GAUGE, TYPICAL
N.T.S.



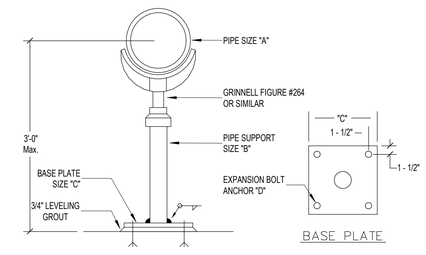
GENERAL NOTES:
1. MAKEUP WATER FLOW METER SHALL BE ELECTRONMAGNETIC FLOW METER SHALL BE ONICON FT-3100 OR EQUAL.
2. FLOW RATE DATA & TOTAL WATER CONSUMPTION DATA SHALL BE INTERCONNECTED TO BAS.
3. COORDINATE WITH TEMPERATURE CONTROLS & ELECTRICAL CONTRACTOR.

3 DETAIL - WATER METER AT MAKEUP WATER LINE
N.T.S.



GENERAL NOTES:
1. DRAIN & VENT ASSEMBLIES SHALL BE:
   A. 3/4" FOR PIPES 6" & SMALLER
   B. 2" FOR PIPES LARGER THAN 6"
2. VALVE SHALL BE ORIENTED SO A HOSE CAN BE CONNECTED TO DRAIN.

4 DETAIL - HYDRONIC DRAIN, VENT & AIR RELIEF VALVE
N.T.S.

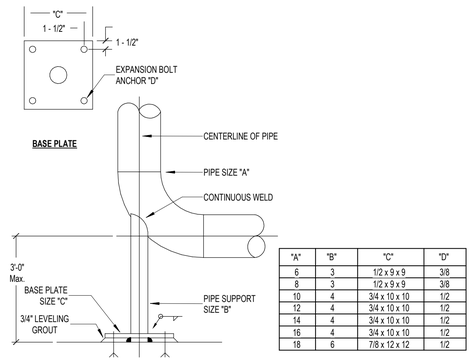


BASE PLATE

"A"	"B"	"C"	"D"	Max Weight (lb.)
3	2 - 1/2	1/2 x 9 x 9	3/8	170
4	3	1/2 x 9 x 9	3/8	330
6	3	1/2 x 9 x 9	3/8	780
8	3	1/2 x 9 x 9	3/8	1240
10	4	3/4 x 10 x 10	1/2	2200
12	4	3/4 x 10 x 10	1/2	2280
14	4	3/4 x 10 x 10	1/2	2640
16	4	3/4 x 10 x 10	1/2	3260
18	6	7/8 x 12 x 12	1/2	4940
20	6	7/8 x 12 x 12	1/2	5890
24	6	7/8 x 12 x 12	1/2	8010

GENERAL NOTES:
1. ALL DIMENSIONS IN INCHES.
2. CONCRETE FLOOR SLAB TO HAVE MIN 3500 PSI.
3. SUPPORT PIPE TO BE ASME A53, GRADE B, TYPE E OR S, STANDARD WEIGHT, BLACK STEEL.
4. EXPANSION BOLTS TO HAVE ICBO OR EQUIVALENT LISTING.

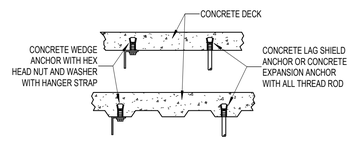
5 DETAIL - FLOOR PIPE SUPPORTS, TYPICAL
N.T.S.



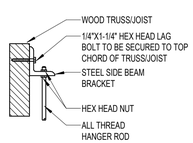
BASE PLATE

"A"	"B"	"C"	"D"
6	3	1/2 x 9 x 9	3/8
8	3	1/2 x 9 x 9	3/8
10	4	3/4 x 10 x 10	1/2
12	4	3/4 x 10 x 10	1/2
14	4	3/4 x 10 x 10	1/2
16	4	3/4 x 10 x 10	1/2
18	6	7/8 x 12 x 12	1/2

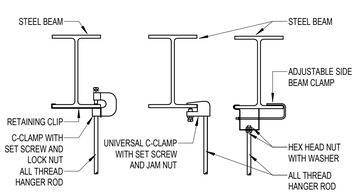
GENERAL NOTES:
1. ALL DIMENSIONS IN INCHES.
2. CONCRETE FLOOR SLAB TO HAVE MIN 3500 PSI.
3. SUPPORT PIPE TO BE ASME A53, GRADE B, TYPE E OR S, STANDARD WEIGHT, BLACK STEEL.
4. EXPANSION BOLTS TO HAVE ICBO OR EQUIVALENT LISTING.



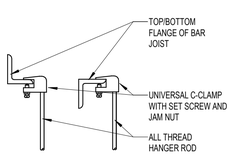
CONCRETE DECK ANCHORS



WOOD ANCHORS



I-BEAM ANCHORS



BAR JOIST ANCHORS

6 DETAIL - DUCT/PIPE HANGER ANCHORS
N.T.S.

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SEAL



PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

DATE:	10/05/2026
DRAWN BY:	DKD
CHECKED BY:	GTM
PROJECT #:	25-157

SHEET NAME

MECHANICAL DETAILS

SHEET NUMBER

M3.1

SCHEDULE - BOILERS

MARK	DESCRIPTION	CAPACITY			WATER				DUCT SIZE		ELECTRICAL SERVICE				EFFICIENCY		WEIGHT	MANUFACTURER / MODEL (OR PRIOR APPROVED EQUAL)
		MAXIMUM																
		INPUT	OUTPUT	MINIMUM INPUT	EWT	LWT	FLOW	PD @ 250 GPM	VENTILATION	COMBUSTION	VOLTS	PH	FREQ	FLA	THERMAL	COMBUSTION		
ARTS LOOP																		
B-A1	CONDENSING BOILER	3,000,000 Btu/h	2,880,000 Btu/h	200,000 Btu/h	120 °F	160 °F	258 GPM	3.2 psi	8"	8"	208 V	3	60 Hz	10 A	94.6%	98%	2500 lb	AERCO BENCHMARK 3000
B-A2	CONDENSING BOILER	3,000,000 Btu/h	2,880,000 Btu/h	200,000 Btu/h	120 °F	160 °F	258 GPM	3.2 psi	8"	8"	208 V	3	60 Hz	10 A	94.6%	98%	2500 lb	AERCO BENCHMARK 3000
B-A3	CONDENSING BOILER	3,000,000 Btu/h	2,880,000 Btu/h	200,000 Btu/h	120 °F	160 °F	258 GPM	3.2 psi	8"	8"	208 V	3	60 Hz	10 A	94.6%	98%	2500 lb	AERCO BENCHMARK 3000
ENGINEERING LOOP																		
B-E1	ATMOSPHERIC BOILER	6,000,000 Btu/h	4,800,000 Btu/h	0 Btu/h	140 °F	160 °F	600 GPM	0 psi	26"	26"	120 V	1	60 Hz	8 A	0%	0%	10000 lb	RITE MPW600ATM A4

NOTES:

1. ROUTE BOILER COMBUSTION AIR AND VENTILATION AIR INTAKE AND EXHAUST INDIVIDUALLY THROUGH ROOF (ROOF TERMINATIONS SHALL BE APPROVED BY THE BOILER MANUFACTURER) IN STRICT ACCORDANCE WITH THE BOILER MANUFACTURER'S RECOMMENDATIONS AND INSTALLATION INSTRUCTIONS.
2. PROVIDE EXHAUST AND OUTSIDE AIR INTAKE MUFFLERS.
3. PROVIDE CONDENSATE NEUTRALIZER KITS.
4. COORDINATE CONCRETE HOUSEKEEPING PAD WITH MANUFACTURER OF EXACT BOILER SUPPLIED TO PROJECT.
5. PROVIDE WITH FACTORY MOUNTED BACNET COMMUNICATIONS INTERFACE TO COMMUNICATE WITH BAS SYSTEM.

SCHEDULE - HYDRONIC PUMPS, HEATING WATER

MARK	SERVICE	PUMP TYPE	FLOW	HEAD	NPSHr	MOTOR		ELECTRICAL SERVICE			WEIGHT	MANUFACTURER / MODEL (OR PRIOR APPROVED EQUAL)
						HP	RPM	VOLTS	PH	FREQ		
ARTS LOOP												
PHWP-A1a	PRIMARY - ARTS LOOP	BASE MOUNTED END SUCTION	400 GPM	110 ftH2O	6.36 ftH2O	20 hp	1728	480 V	3	60 Hz	650 lb	BELL & GOSSETT BG-E1510-3EB-SS-256T-L
PHWP-A1b	PRIMARY - ARTS LOOP	BASE MOUNTED END SUCTION	400 GPM	110 ftH2O	6.36 ftH2O	20 hp	1728	480 V	3	60 Hz	650 lb	BELL & GOSSETT BG-E1510-3EB-SS-256T-L
SHWP-A1	ISAAC GREGGS	CLOSE-COUPLED END SUCTION	70 GPM	70 ftH2O	7.38 ftH2O	3 hp	1699	480 V	3	60 Hz	275 lb	BELL & GOSSETT BG-E1531-125BC-182-SS
SHWP-A2	TOURGEE A. DEBOSE	CLOSE-COUPLED END SUCTION	110 GPM	85 ftH2O	6.5 ftH2O	5 hp	1727	480 V	3	60 Hz	300 lb	BELL & GOSSETT BG-E1531-150BC-184-SS
SHWP-A3	PERFORMING ARTS	CLOSE-COUPLED END SUCTION	50 GPM	80 ftH2O	6.92 ftH2O	3 hp	1745	480 V	3	60 Hz	275 lb	BELL & GOSSETT BG-E1531-125BC-182-SS
SHWP-A4a	AUGUSTUS C. BLANKS	CLOSE-COUPLED IN-LINE MOUNTED	310 GPM	85 ftH2O	5.65 ftH2O	15 hp	1718	480 V	3	60 Hz	600 lb	BELL & GOSSETT BG-E80-4x4x9.5B-SS254JM-1-IN
SHWP-A4b	AUGUSTUS C. BLANKS	CLOSE-COUPLED IN-LINE MOUNTED	310 GPM	85 ftH2O	5.65 ftH2O	15 hp	1718	480 V	3	60 Hz	600 lb	BELL & GOSSETT BG-E80-4x4x9.5B-SS254JM-1-IN
SHWP-A5a	T.H. HARRIS ANNEX	BASE MOUNTED END SUCTION	150 GPM	50 ftH2O	3.67 ftH2O	5 hp	1524	480 V	3	60 Hz	325 lb	BELL & GOSSETT BG-E1510-2BD-SS-184T-S
SHWP-A5b	T.H. HARRIS ANNEX	BASE MOUNTED END SUCTION	150 GPM	50 ftH2O	3.67 ftH2O	5 hp	1524	480 V	3	60 Hz	325 lb	BELL & GOSSETT BG-E1510-2BD-SS-184T-S
ENGINEERING LOOP												
PHWP-E1a	PRIMARY - ENGINEERING LOOP	BASE MOUNTED END SUCTION	300 GPM	115 ftH2O	5.57 ftH2O	20 hp	1711	480 V	3	60 Hz	650 lb	BELL & GOSSETT BG-E1510-3EB-SS-256T-L
PHWP-E1b	PRIMARY - ENGINEERING LOOP	BASE MOUNTED END SUCTION	300 GPM	115 ftH2O	5.57 ftH2O	20 hp	1711	480 V	3	60 Hz	650 lb	BELL & GOSSETT BG-E1510-3EB-SS-256T-L
SHWP-E1	MINILABS	BASE MOUNTED END SUCTION	25 GPM	30 ftH2O	2.53 ftH2O	0.75 hp	1606	208 V	3	60 Hz	175 lb	BELL & GOSSETT BG-E1510-1P25ADES-SS-56
SHWP-E2a	PBS PINCHBACK	BASE MOUNTED END SUCTION	250 GPM	60 ftH2O	6.58 ftH2O	7.5 hp	1641	480 V	3	60 Hz	425 lb	BELL & GOSSETT BG-E1510-2P5BB-SS-213T-S
SHWP-E2b	PBS PINCHBACK	BASE MOUNTED END SUCTION	250 GPM	60 ftH2O	6.58 ftH2O	7.5 hp	1641	480 V	3	60 Hz	425 lb	BELL & GOSSETT BG-E1510-2P5BB-SS-213T-S
SHWP-E3	HONORS COLLEGE	CLOSE-COUPLED IN-LINE MOUNTED	20 GPM	40 ftH2O	3.11 ftH2O	1 hp	1725	208 V	3	60 Hz	0 lb	BELL & GOSSETT BG-E90-150AB-100-1725-3

NOTES:

1. PROVIDE VARIABLE SPEED/FREQUENCY DRIVES FOR ALL PUMPS.
2. PROVIDE WITH SHAFT GROUNDING RINGS.
3. PROVIDE WITH MINIMUM 6" TALL REBAR REINFORCED CONCRETE HOUSEKEEPING PAD MINIMUM 6" ALL AROUND PUMP FOOTPRINT.
4. PROVIDE ALL PUMPS WITH CONCRETE INERTIA BASES.
5. PROVIDE SUCTION DIFFUSERS (WITH INTEGRAL STRAINERS, INLET VANES, SUPPORT LEGS & DRAIN VALVE WITH HOSE END) & TRIPLE DUTY VALVES FOR ALL PUMPS.
6. PROVIDE WITH FLANGE SUPPORTS & VIBRATION ISOLATION PAD UNDER ENTIRE SUPPORT & CONCRETE HOUSEKEEPING PAD CONNECTION.
7. PROVIDE ISOLATION VALVES ON PUMP INLET & DISCHARGE PIPING (UPSTREAM OF SUCTION DIFFUSER & DOWNSTREAM OF TRIPLE DUTY VALVE).
7. PROVIDE 12" SPOOL PIECE ON PUMP SUCTION & DISCHARGE PIPING.
8. PROVIDE THERMOMETER & PRESSURE GAUGES & PUMP SUCTION & DISCHARGE PIPING.T/P PORTS ONLY NOT ACCEPTABLE.
9. PUMP STRAINERS: TWO REQUIRED FOR EACH PUMP; A FINE MESH START UP AND ANORMAL OPERATION STRAINER WITH 1/8" DIAMETER HOLES.
10. SUPPORT PIPING SO PIPE WEIGHT IS NOT SUPPORTED BY PUMPS.
11. PROVIDE INSULATED BOX, STAINLESS STEEL IMPELLERS.
12. PRIOR APPROVED MANUFACTURERS: ARMSTRONG, PATTERSON, TACO, AURORA, GRUNDFOS

SCHEDULE - AIR SEPARATORS

MARK	SERVICE	FLUID	MAX FLOW	PIPE SIZE (IN)	WEIGHT	MANUFACTURER / MODEL (OR PRIOR APPROVED EQUAL)
AS-HW.A	HEATING WATER - ARTS LOOP	WATER	850 GPM	6"	600 lb	BELL & GOSSETT RL-6F
AS-HW.E	HEATING WATER - ENGINEERING LOOP	WATER	850 GPM	6"	600 lb	BELL & GOSSETT RL-6F

1. SEPARATOR CONSTRUCTION:
   A. SELF-SUPPORTING IN PIPING SYSTEM - MANUFACTURER REVIEW REQUIRED IF ANY PIPING LOADS SHALL BE PRESENT
   B. CARBON STEEL SHELL
   C. 304 STAINLESS STEEL SYSTEM STRAINER WITH 3/16" PERFORATIONS AND 51% OPEN AREA
   D. DESIGNED AND CONSTRUCTED PER ASME SECTION VIII, DIVISION 1
2. STANDARD DESIGN PRESSURE AND TEMPERATURE SHALL BE 125 PSI AT 350°F.

SCHEDULE - PRESSURIZED EXPANSION TANKS

MARK	SERVICE	PIPE SIZE (IN)	TANK CAPACITY	FLOODED WEIGHT	MANUFACTURER / MODEL (OR PRIOR APPROVED EQUAL)
ET-HW.A	HEATING WATER - ARTS LOOP	1 1/2"	400.0 gal	1200 lb	BELL & GOSSETT B-400
ET-HW.E	HEATING WATER - ENGINEERING LOOP	1 1/2"	400.0 gal	1200 lb	BELL & GOSSETT B-400

NOTES:

1. PROVIDE MINIMUM 6" TALL REBAR REINFORCED CONCRETE HOUSEKEEPING PAD WITH CHAMFERED EDGES MINIMUM 6" ALL AROUND TANK FOOTPRINT.
2. EXPANSION TANK CONSTRUCTION:
   A. FORGED STEEL SYSTEM CONNECTION
   B. CARBON STEEL SHELL
   C. HEAVY DUTY BUTYL RUBBER BLADDER (REMOVABLE FOR INSPECTION)
   D. DESIGNED AND CONSTRUCTED PER ASME SECTION VIII, DIVISION 1
3. STANDARD DESIGN PRESSURE AND TEMPERATURE SHALL BE 125 PSI AT 240°F.
4. PRIOR APPROVED MANUFACTURERS: WESSELS, TACO

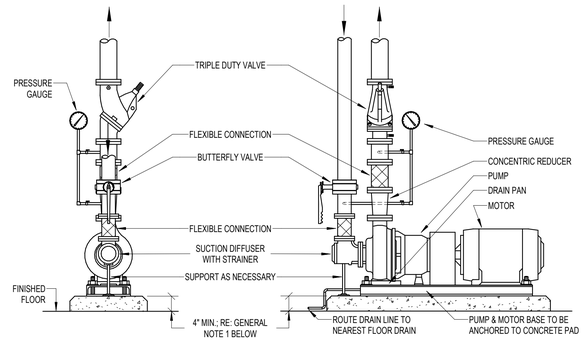
SCHEDULE - PIPE & INSULATION

PIPE					INSULATION		
LOCATION	SYSTEM	ABBREVIATION	MATERIAL	SIZE	TYPE	COLOR CODE	THICKNESS
ABOVE GROUND, INTERIOR	HEATING WATER	HWS, HWR	TYPE K COPPER	1/2" - 2"	CELLULAR GLASS PIPE INSULATION, FACTORY ASJ JACKET, FIELD-APPLIED PVC COLOR CODED JACKET, PIPE LABELS, FLOW DIRECTION ARROWS.	LIGHT & DARK RED	1-1/2"
ABOVE GROUND, INTERIOR	HEATING WATER	HWS, HWR	SCH 40 BLACK STEEL	2-1/2"+	CELLULAR GLASS PIPE INSULATION, FACTORY ASJ JACKET, FIELD-APPLIED 20 MIL PVC COLOR CODED JACKET, PIPE LABELS, FLOW DIRECTION ARROWS.	LIGHT & DARK RED	2"
ABOVE GROUND, EXTERIOR	HEATING WATER	HWS, HWR	**	ALL	CELLULAR GLASS PIPE INSULATION, FACTORY ASJ JACKET, FIELD-APPLIED 20 MIL ALUMINUM JACKET, PIPE LABELS, FLOW DIRECTION ARROWS.	NONE	3"

NOTES:

1. ** EXTERIOR, ABOVE GROUND HEATING WATER PIPING MATERIAL SHALL BE THE SAME AS INTERIOR (1/2" - 2": TYPE K COPPER; 2-1/2"+: SCH 40 BLACK STEEL).
2. TYPE K COPPER:
   A. ASTM B 88, WROUGHT COPPER UNION, BRAZED JOINTS.
3. SCH 40 BLACK STEEL:
   A. SCHEDULE 40 ASTM A53 STEEL PIPE, CLASS 150, MALLEABLE IRON FITTINGS, WELDED AND/OR FLANGED6. JOINTS.
4. SCH 80 BLACK STEEL:
   A. SCHEDULE 80 ASTM A53 GRADE B STEEL PIPE, BEVELED FOR WELDING OR GROOVED FOR GASKETED COUPLING & FITTINGS.
5. METAL PIPE JOINTS & FITTINGS:
   A. 4" & SMALLER: WELDED, BRAZED AND/OR PRO-PRESS.
   B. 6" & LARGER: WELDED, FLANGED, AND/OR GASKETED COMPRESSION

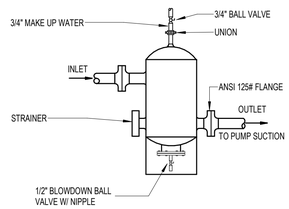
   PRE-FORMED PIPE INSULATION:
   A. FIBROUS GLASS PRE-FROMED PIPE INSULATION WITH ASJ VAPOR BARRIER JACKET & PVC COLOR CODED JACKET.
8. PVC JACKET:
   A. COLOR CODED PVC JACKET WITH PIPE LABELS & DIRECITON FLOW ARROWS WHERE INSTALLED WITHIN MECHANICAL ROOMS.



GENERAL NOTES:
1. PUMP TO BE MOUNTED ON A MINIMUM 4" THICK CONCRETE PAD WITH CHAMFERED EDGES TO EXTEND A MINIMUM OF 6" ALL AROUND PUMP.

1 DETAIL - END SUCTION PUMP
N.T.S.

2 DETAIL - IN-LINE PUMP
1/4" = 1'-0"



3 DETAIL - AIR SEPERATOR
1/4" = 1'-0"

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PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

DATE:	10/05/2026
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MECHANICAL SCHEDULES

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M4.0

ELECTRICAL SYMBOL LEGEND

(REFER TO DRAWINGS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS)

GENERAL

1	KEYNOTE
A-1,3	CIRCUIT TAG; PANEL AND CIRCUIT DESIGNATION AS INDICATED; E.G. PANEL "A", CIRCUIT #1,3

WIRE, CONDUIT, AND RACEWAY

———	ABOVE-SLAB CONDUIT & WIRE/CABLING
— — —	BELOW-SLAB CONDUIT & WIRE/CABLING; 3/4" MINIMUM CONDUIT SIZE UON
⌒	HOMERUN TO PANEL; TICK MARKS INDICATED NUMBER OF WIRES

DISTRIBUTION

▭	PANELBOARD, SWITCHBOARD, OR OTHER DISTRIBUTION EQUIPMENT AS NOTED; INSTALL WITH SUFFICIENT WORKING SPACE AND CLEARANCES TO MEET ALL REQUIREMENTS OF NEC SECTION 110.26.
GEN-ANNC	GENERATOR REMOTE ANNUNCIATOR PANEL; PROVIDE CONDUIT/CABLING TO GENERATOR AS REQUIRED PER THE MANUFACTURER'S SPECIFICATIONS.

EQUIPMENT CONNECTIONS

(PROVIDE CONDUIT AND WIRE PER THE PANEL SCHEDULE)

▭	FUSED SAFETY DISCONNECT SWITCH; LOCATE WITHIN SIGHT OF THE EQUIPMENT SERVED WITH 36" MINIMUM CLEAR WORKING SPACE IN FRONT OF THE SWITCH; DO NOT MOUNT DIRECTLY TO EQUIPMENT
J	JUNCTION BOX
M	JUNCTION BOX FOR MOTORIZED DAMPER
S^{M}	MOTOR RATED SWITCH WITH THERMAL OVERLOAD; LOCATE WITHIN SIGHT OF THE EQUIPMENT SERVED; DO NOT MOUNT DIRECTLY TO EQUIPMENT; WHEN LOCATED ABOVE CEILING, MOUNT TO STRUCTURAL MEMBER NEARBY.
6	ELECTRICAL MOTOR, HORSEPOWER AS NOTED

POWER DEVICES

(PROVIDE CONDUIT AND WIRE PER THE PANEL SCHEDULE)

⊖	DUPLEX RECEPTACLE
⊖	DUPLEX RECEPTACLE MOUNTED FLUSH TO CEILING OR MOUNTED TO STRUCTURE IN AREAS WITH NO CEILING; SUBSCRIPT (WHEN USED): CR - CORD REEL
⊖	ABOVE-COUNTER DUPLEX RECEPTACLE; MOUNT AT 4" ABOVE COUNTER OR BACKSPLASH OR 44" (WHICHEVER IS LOWER)
●	GFCI DUPLEX RECEPTACLE
●	ABOVE-COUNTER GFCI DUPLEX RECEPTACLE; MOUNT AT 4" ABOVE COUNTER OR BACKSPLASH OR 44" (WHICHEVER IS LOWER)
⊕	QUADRAPLEX RECEPTACLE
⊕	ABOVE-COUNTER QUADRAPLEX RECEPTACLE; MOUNT AT 4" ABOVE COUNTER OR BACKSPLASH OR 44" (WHICHEVER IS LOWER)
⊘	SPECIAL PURPOSE RECEPTACLE; VERIFY NEMA CONFIGURATION WITH THE MANUFACTURER OF THE EQUIPMENT SERVED
⊖▼	VOICE/DATA/POWER FLUSH FLOOR BOX
⊖	DUPLEX RECEPTACLE FLUSH FLOOR BOX
⊕	QUADRAPLEX RECEPTACLE FLUSH FLOOR BOX
◒	RECEPTACLE SWITCHING; EDGE SHADING INDICATES: NONE - DEVICE NOT SWITCHED LEFT - BOTTOM (DUPLEX) OR LEFT TWO (QUAD) SWITCHED RIGHT - TOP (DUPLEX) OR RIGHT TWO (QUAD) SWITCHED

PUBLIC ADDRESS

(PROVIDE 3/4"EC WITH PULL STRING FROM THE DEVICE LOCATION SHOWN ON THE DRAWINGS TO AN ACCESSIBLE LOCATION ABOVE CEILING)

PA	PA SYSTEM SPEAKER
V	PA SYSTEM SPEAKER VOLUME CONTROL
I	PA SYSTEM SPEAKER MOUNT CALL-IN SWITCH

TELECOMMUNICATIONS

(JACKET COLORS TO BE PER THE OWNER'S STANDARDS IF APPLICABLE)

▭	TELECOM TERMINAL BOARD; 0'-1" THICK AC INDOOR GRADE, FIRE RETARDANT PLYWOOD, PAINTED AS SPECIFIED BY THE ARCHITECT OR OWNER
◀	DUPLEX DATA OUTLET; PROVIDE 1"C TO AN ACCESSIBLE LOCATION ABOVE CEILING, TWO (2) BLUE CAT 6 CABLES FROM THE OUTLET TO THE TELECOM TERMINAL BOARD
◀	DUPLEX DATA OUTLET, AS ABOVE, MOUNTED FLUSH TO CEILING OR MOUNTED TO STRUCTURE IN AREAS WITH NO CEILING
◀	DUPLEX DATA OUTLET, AS ABOVE, MOUNTED ABOVE COUNTER
◀	DATA/VOICE OUTLET; PROVIDE 1"C TO AN ACCESSIBLE LOCATION ABOVE CEILING, ONE (1) BLUE AND ONE (1) WHITE CAT 6 CABLES FROM THE OUTLET TO THE TELECOM TERMINAL BOARD
◁	VOICE OUTLET; PROVIDE 1"C TO AN ACCESSIBLE LOCATION ABOVE CEILING, ONE (1) WHITE CAT 6 CABLE FROM THE OUTLET TO THE TELECOM TERMINAL BOARD
◀	DUPLEX DATA FLUSH FLOOR BOX; PROVIDE 1"C TO AN ACCESSIBLE LOCATION ABOVE CEILING, ONE (1) BLUE CAT 6 CABLE FROM THE OUTLET TO THE TELECOM TERMINAL BOARD
WAP	WIRELESS ACCESS POINT (BY OWNER); PROVIDE 1"C TO AN ACCESSIBLE LOCATION ABOVE CEILING, ONE (1) BLUE CAT 6 CABLE FROM THE ACCESS POINT LOCATION TO THE TELECOM TERMINAL BOARD
TV	LEGRAND EVOLUTION 4-GANG OR APPROVED EQUAL TV WALL BOX WITH ONE DUPLEX RECEPTACLE, ONE DUPLEX DATA OUTLET, ONE COAX OUTLET, AND ONE SPARE GANG; PROVIDE 1"C, TWO (2) BLUE CAT 6 CABLES AND 1"C, ONE (1) CATV CABLE FROM THE BOX TO THE TELECOM TERMINAL BOARD; PROVIDE CONDUIT AND WIRE FOR POWER PER THE PANEL SCHEDULE.
TV	LEGRAND EVOLUTION 4-GANG OR APPROVED EQUAL COMBO RECESSED FLOOR BOX WITH TWO (2) DUPLEX RECEPTACLES, FOUR (4) DATA OUTLETS (UNDER A SINGLE PLATE), AND SPEAKER CONNECTIONS; PROVIDE 1-1/4"C TO AN ACCESSIBLE LOCATION ABOVE CEILING, FOUR (4) BLUE CAT 6 CABLES FROM THE BOX TO THE TELECOM TERMINAL BOARD. ROUTE 1"EC WITH PULLSTRING FROM THE BOX TO THE TV WALL BOX IN THE SAME ROOM FOR SPEAKER CABLING. PROVIDE CONDUIT AND WIRE FOR POWER PER THE PANEL SCHEDULE.

LIGHTING

(PROVIDE CONDUIT AND WIRE PER THE PANEL SCHEDULE FOR POWER AND PER THE MANUFACTURER'S SPECIFICATIONS FOR CONTROLS)

Aa	LIGHT FIXTURE; UPPERCASE LETTER(S) INDICATE FIXTURE TYPE; LOWERCASE LETTER(S) INDICATE ASSOCIATED CONTROLS ID; SEE LIGHTING FIXTURE SCHEDULE FOR FIXTURE DESCRIPTIONS AND MOUNTING TYPES
⊠X	EXIT LIGHT FIXTURE. ARROWS (IF USED) INDICATE DIRECTION. FILLED IN QUADRANT(S) INDICATE NUMBER AND ORIENTATION OF ILLUMINATED FACES. LETTER(S) INDICATE FIXTURE TYPE. SEE LIGHTING FIXTURE SCHEDULE FOR FIXTURE DESCRIPTION.
OS	CEILING MOUNTED OCCUPANCY SENSOR WITH 360° COVERAGE. LOCATE AND INSTALL PER THE MANUFACTURER'S RECOMMENDATIONS; TEST AND ADJUST SENSITIVITY AFTER INSTALLATION AND SET TIME DELAY AS REQUIRED BY THE OWNER
DH	CEILING MOUNTED DAYLIGHT HARVESTING SENSOR, LOCATED AND INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS; TEST AND ADJUST SENSITIVITY AFTER INSTALLATION AND SET TIME DELAY AS REQUIRED PER CODE
VS	CEILING MOUNTED OCCUPANCY SENSOR, AS ABOVE, CONFIGURED FOR VACANCY OPERATION
P	PHOTOELECTRIC CELL, EXTERIOR RATED; AIM AND SHIELD SENSOR FROM INTERIOR AND EXTERIOR ARTIFICIAL LIGHT SOURCES
S	SWITCH; SUBSCRIPT (WHEN USED): NONE - SINGLE POLE TOGGLE SWITCH 3 - THREE-WAY SWITCH D - LINEAR SLIDE DIMMER SWITCH 3D - THREE-WAY LINEAR SLIDE DIMMER SWITCH O - WALL MOUNTED OCCUPANCY SENSOR 3O - THREE-WAY SWITCH WITH OCCUPANCY SENSOR a,b,c etc. - SWITCH ID

FIRE ALARM

(PROVIDE CONDUIT AND WIRE PER THE PANEL SCHEDULE FOR POWER AND CONDUIT AND CABLING PER THE MANUFACTURER'S SPECIFICATIONS)

FACP	FIRE ALARM CONTROL PANEL
F	FIRE ALARM SYSTEM PULL STATION
☐◁	FIRE ALARM SYSTEM STROBE
C◁	FIRE ALARM SYSTEM CHIME/STROBE
H◁	FIRE ALARM SYSTEM HORN/STROBE
S◁	FIRE ALARM SYSTEM SPEAKER/STROBE
○◁	FIRE ALARM SYSTEM CEILING MOUNT STROBE
Ⓒ◁	FIRE ALARM SYSTEM CEILING MOUNT CHIME/STROBE
Ⓗ◁	FIRE ALARM SYSTEM CEILING MOUNT HORN/STROBE
Ⓢ◁	FIRE ALARM SYSTEM CEILING MOUNT SPEAKER/STROBE
Ⓒ	FIRE ALARM SYSTEM CARBON MONOXIDE DETECTOR
Ⓣ	FIRE ALARM SYSTEM THERMAL DETECTOR
Ⓓ	FIRE ALARM SYSTEM DUCT SMOKE DETECTOR
Ⓢ	FIRE ALARM SYSTEM SMOKE DETECTOR

SECURITY (EQUIPMENT PROVIDED BY OWNER/OTHERS)

(EQUIPMENT PROVIDED BY OTHERS)

KP	JUNCTION BOX FOR KEYPAD; INSTALL 48" AFF AND PROVIDE 3/4"EC WITH PULL STRING FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING
DC	JUNCTION BOX FOR DOOR CONTACT (MAGNETIC LOCK); PROVIDE 3/4"EC WITH PULL STRING FROM THE DOOR FRAME TO THE JUNCTION BOX AND FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING
CR	JUNCTION BOX FOR CARD READER; PROVIDE 3/4"EC WITH PULL STRING FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING
ES	JUNCTION BOX FOR ELECTRIC STRIKE LOCK; PROVIDE 3/4"EC WITH PULL STRING FROM THE DOOR FRAME TO THE JUNCTION BOX AND FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING
⊡	JUNCTION BOX FOR DOOR OPERATOR; PROVIDE 3/4"EC WITH PULL STRING FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING NEAR THE CONTROLLED DOOR
MD◁	JUNCTION BOX FOR MOTION DETECTOR; PROVIDE 3/4"EC WITH PULL STRING FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING
▭◁	JUNCTION BOX FOR CEILING MOUNTED CAMERA; PROVIDE 3/4"EC WITH PULL STRING FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING
⊢▭◁	JUNCTION BOX FOR WALL MOUNTED CAMERA; PROVIDE 3/4"EC WITH PULL STRING FROM THE JUNCTION BOX TO AN ACCESSIBLE LOCATION ABOVE CEILING

SOUND

(PROVIDE 1"EC WITH PULL STRING FROM THE DEVICE LOCATION SHOWN ON THE DRAWINGS TO AN ACCESSIBLE LOCATION ABOVE CEILING)

M	FLOOR MOUNTED MICROPHONE OUTLET
SP	CEILING MOUNTED SPEAKER
SP	WALL MOUNTED SPEAKER

HEALTHCARE

(PROVIDE 1"EC WITH PULL STRING FROM THE DEVICE LOCATION SHOWN ON THE DRAWINGS TO AN ACCESSIBLE LOCATION ABOVE CEILING)

D	DOCTOR'S DICTATION
⊢●	NURSE CALL SYSTEM EMERGENCY CALL-IN STATION
⊢⊖	NURSE CALL SYSTEM BEDSIDE PATIENT STATION
S⊖	NURSE CALL SYSTEM STAFF STATION
⊢N	NURSE CALL SYSTEM CORRIDOR DOME LIGHT
B	NURSE CALL SYSTEM CODE BLUE STATION

ELECTRICAL GENERAL NOTES

1. ALL ELECTRICAL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE AS ADOPTED BY THE AHJ.
2. THE WORDS "PROVIDE" AND "PROVIDED" AS USED HEREIN SHALL BE UNDERSTOOD TO MEAN, "PROVIDE COMPLETE IN PLACE," THAT IS "FURNISH AND INSTALL". EQUIPMENT AND MATERIAL INDICATED TO BE PROVIDED SHALL BE NEW UNLESS OTHERWISE NOTED AND SHALL BE OF THE MOST SUITABLE GRADE FOR THE PURPOSE INTENDED.
3. ROUTE NEW CONDUIT AND WIRING CONCEALED IN WALLS AND CEILING WHERE POSSIBLE. COORDINATE INSTALLATION OF EXPOSED CONDUIT AND WIRING WITH THE ARCHITECT.
4. CONTRACTOR SHALL PROVIDE ELECTRICAL SERVICE TO NEW HVAC UNITS AS FURNISHED BY THE MECHANICAL CONTRACTOR. VERIFY THE EXACT ELECTRICAL REQUIREMENTS WITH THE REVIEWED HVAC SUBMITTALS PRIOR TO ORDERING ELECTRICAL EQUIPMENT.
5. BEFORE INSTALLATION, CONTRACTOR SHALL SUBMIT DETAILED DRAWINGS TO THE ENGINEER FOR REVIEW COVERING PROPOSED LOCATIONS, MOUNTING, AND ROUTING FOR ALL CONDUITS, SERVICES, FITTINGS, GROUND RODS, SUPPORTS, ETC.
6. CONTRACTOR IS RESPONSIBLE FOR OVER-CURRENT PROTECTIVE DEVICE SHORT CIRCUIT, COORDINATION, AND ARC-FLASH STUDIES.
7. MATERIALS AND MANUFACTURERS NOTED ON DRAWINGS ARE TO BE USED AS BASIS OF DESIGN TO ESTABLISH QUALITY AND PERFORMANCE STANDARDS AND SHALL BE PROVIDED AS SPECIFIED. SUBSTITUTIONS WILL BE CONSIDERED WHERE SUFFICIENT PRODUCT INFORMATION IS PROVIDED TO MAKE A PROPER EVALUATION. REVIEW OF A SUBSTITUTION IS AT THE SOLE DISCRETION OF THE PROFESSIONAL.
8. THE CONTRACTOR SHALL SUBMIT COPIES OF THE PRODUCT DATA, SHOP DRAWINGS, ETC. OF ALL MATERIALS NOTED ON THE DRAWINGS. ALL SUBMITTED PRODUCT DATA, SHOP DRAWINGS, ETC. SHALL BE MARKED WITH THE NAME OF THE PROJECT AND SHALL BEAR THE STAMP OF APPROVAL OF THE CONTRACTOR AS EVIDENCE THAT THE MATERIAL HAS BEEN CHECKED BY THE CONTRACTOR.
9. DRAWINGS SPECIFIC TO THIS TRADE DO NOT LIMIT THE RESPONSIBILITY OR WORK REQUIRED BY THE CONTRACT DOCUMENTS. REFER TO DRAWINGS AND SPECIFICATIONS OF OTHER TRADES FOR COMPLETE INFORMATION PRIOR TO BID.
10. WHERE CONFLICTS EXIST AMONG DRAWINGS, SPECIFICATIONS, AND EQUIPMENT SCHEDULES, THE MOST STRINGENT REQUIREMENT OR QUANTITY SHALL APPLY. NOTIFY THE ARCHITECT/ENGINEER OF ALL CONFLICTS FOR RESOLUTION OR INTERPRETATION.
11. NO EQUIPMENT SHALL BE ORDERED OR INSTALLED UNTIL THE PROJECT ENGINEER HAS RECEIVED A COPY STAMPED "NO EXCEPTIONS TAKEN." "NO EXCEPTIONS TAKEN" DOES NOT RELIEVE THE CONTRACTOR FROM CONFORMANCE WITH THE CONTRACT, EXTEND TO QUANTITIES OR DIMENSIONS, IMPLY THAT THE EQUIPMENT CAN BE INSTALLED OR OPERATE SATISFACTORILY, THAT THE EQUIPMENT CONTAINS ALL NECESSARY COMPONENTS, OR THAT IT WILL COORDINATE WITH OTHER REVIEWED ITEMS.
12. OMISSION FROM THIS SHEET OF ANY ITEM SHOWN ELSEWHERE IN THE PLANS DOES NOT RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY FOR ANY ASSOCIATED WORK.
13. COORDINATE INSTALLATION OF NEW ITEMS AND EQUIPMENT WITH THE OWNER'S REPRESENTATIVE AND THE WORK OF OTHER TRADES. THE CONTRACTOR SHALL INCUR ALL COSTS ASSOCIATED WITH THE RELOCATION OF EQUIPMENT CONFLICTING WITH NEW WORK BY OTHER TRADES THAT HAS NOT BEEN COORDINATED.
14. COORDINATE ALL ASPECTS OF NEW SERVICE WITH UTILITY COMPANY AND INCLUDE ALL COSTS IN BID.
15. WARNING TAPE SHALL BE INSTALLED 12 TO 18 INCHES BELOW GRADE OVER ALL CONDUITS.
16. PROVIDE 1/4" MINIMUM DIAMETER PULL ROPE. PULL ROPE SHALL NOT BE NYLON STRING.
17. FOR SERVICE ENTRANCE CONDUITS, UTILIZE LONG RADIUS (36") CONDUIT BENDS.
18. ALL CONDUIT RISERS FROM UNDERGROUND SHALL HAVE RIGID METAL ELLS AND RISERS.
19. PRIOR TO CONSTRUCTION, VERIFY THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES. AVOID DISTURBANCE OF EXISTING UTILITIES NOT INCLUDED IN THIS PROJECT.
20. SET SCREW CONDUIT FITTINGS SHALL NOT BE PERMITTED.

LIGHTING GENERAL NOTES

1. VERIFY THE EXACT LOCATION OF ALL LIGHTING SWITCHES WITH THE ARCHITECT PRIOR TO ROUGH-IN.
2. VERIFY THE EXACT LOCATION OF ALL LIGHTING FIXTURES WITH THE ARCHITECTURAL REFLECTED CEILING PLAN PRIOR TO ROUGH-IN.
3. VERIFY THE EXACT LOCATION OF CEILING MOUNTED OCCUPANCY SENSORS WITH THE MANUFACTURER'S SPECIFICATIONS PRIOR TO INSTALLATION FOR MAXIMUM PERFORMANCE.
4. EMERGENCY FIXTURES AND EXIT FIXTURES SHALL BE CONNECTED TO THE NEAREST LIGHTING CIRCUIT. BRANCH CIRCUIT WIRING TO EXIT FIXTURES AND TO BATTERY INVERTERS WITHIN FIXTURES WITH INTEGRAL BATTERY UNITS SHALL BE UNSWITCHED, CONNECTED AHEAD OF ANY CONTROL SWITCHING.
5. WALL MOUNT TYPE "Z" FIXTURES ABOVE DOOR AS SHOWN ON DRAWINGS. COORDINATE WITH THE ARCHITECT PRIOR TO ROUGH-IN.
6. MOUNT TYPE "EM" FIXTURES 8'-0" AFF UNLESS OTHERWISE NOTED.
7. VERIFY THE CEILING TYPES FOR ALL LIGHT FIXTURES TO BE FLUSH MOUNTED OR SUSPENDED AND ADJUST FIXTURE MOUNTING TYPES IN ACCORDANCE WITH THE CEILING TYPE, AS REQUIRED. CONTRACTOR SHALL PROVIDE ALL REQUIRED MOUNTING HARDWARE.
8. ALL VANITY FIXTURES SHALL BE MOUNTED WITH 0'-3" OF SPACE BETWEEN THE BOTTOM OF THE FIXTURE AND THE TOP OF THE MIRROR UNLESS OTHERWISE NOTED.
9. VERIFY THE EXACT MOUNTING LOCATION FOR ANY PHOTOELECTRIC CELLS WITH THE ARCHITECT PRIOR TO ROUGH-IN. ALL PHOTOELECTRIC CELLS MUST FACE NORTH.
10. CONTRACTOR SHALL CONFIRM COMPATIBILITY OF ALL LIGHTING CONTROL DEVICES/SWITCHES/DIMMERS WITH LIGHTING FIXTURES AND BALLASTS/DRIVERS PRIOR TO SUBMITTAL.
11. COORDINATE LOCATION OF LIGHT FIXTURES IN MECHANICAL ROOMS WITH DIVISION 15/23 PLANNED EQUIPMENT LOCATION AND DUCT INSTALLATION. WALL MOUNT LIGHTS OR PROVIDE PENDANT MOUNTING AS REQUIRED TO ILLUMINATE THE SPACE.
12. WHERE MULTIPLE OCCUPANCY SENSORS ARE SHOWN IN THE SAME AREA, MOTION DETECTION BY ONE SENSOR SHALL ILLUMINATE ALL LIGHTING IN THE RESPECTIVE AREA.

TELECOMMUNICATIONS GENERAL NOTES

1. PROVIDE 1" CONDUIT AND TWO (2) CAT 6 CABLES AT EACH DATA OUTLET SHOWN. ROUTE TO ABOVE CEILING AND ROUTE TO TELEPHONE BACKBOARD IN IT ROOM. TERMINATE AND CONNECT STATION CABLES TO PATCH PANEL, FOLLOWING THE OWNER'S LABELING CONVENTIONS FOR ALL HORIZONTAL CABLING.
2. OWNER SHALL PROVIDE THE WALL MOUNT DATA RACK, ALL ITEMS INCLUDED IN THE DATA RACK, AND ANY NECESSARY TELEPHONE EQUIPMENT.
3. PLYWOOD FOR BACKBOARDS SHALL BE 0'-1" AC INDOOR GRADE, FIRE RETARDANT, AND PAINTED AS SPECIFIED.
4. COMMON BOND RACKS, PATCH PANELS, CABLE SHIELDS, PROTECTORS, AND THE BUILDING MAIN ELECTRICAL GROUNDING CONDUCTORS SHALL BE, AT MINIMUM, #6 AWG INSULATED AND STRANDED COPPER. FASTENERS SHALL BE RECESSED AND ANCHORED.
5. SUBMIT DIGITAL PHOTOGRAPHS OF ALL TERMINATIONS TO MAIN ELECTRICAL SERVICE GROUNDING MEANS.
6. ALL BACKBOARDS SHALL BE EQUIPPED WITH D-RINGS SPACED AT 1'-0" APART AROUND ALL EDGES OF THE PLYWOOD TO SUPPORT CABLE AND WIRE.
7. CAT 6 CABLES FOR DATA OUTLETS SHALL HAVE BLUE JACKETS AND CAT 6 CABLES FOR VOICE OUTLETS SHALL HAVE WHITE JACKETS.

SPECIAL SYSTEMS GENERAL NOTES

1. VERIFY EXACT LOCATION, VOLTAGE, PHASE, AMPERAGE, ETC. OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING ELECTRICAL GEAR.
2. INTERCONNECT THE HOOD EXHAUST AND SUPPLY FANS WITH HOOD EXTINGUISHING SYSTEM SUCH THAT WHEN HOOD EXTINGUISHING SYSTEM IS ACTIVATED, THE EQUIPMENT BELOW THE HOOD AND HOOD SUPPLY FAN ARE DE-ENERGIZED AND THE HOOD EXHAUST FAN WILL START IF NOT RUNNING.
3. INTERCONNECT THE HOOD EXTINGUISHING SYSTEM WITH THE FIRE ALARM SYSTEM IF APPLICABLE.
4. FOR ALL CAMERA LOCATIONS, PROVIDE ONE (1) GREEN JACKETED CAT 6 CABLE IN 3/4" CONDUIT BACK TO ASSOCIATED DATA CLOSET.
5. FOR ALL WIRELESS ACCESS POINT LOCATIONS, PROVIDE ONE (1) YELLOW JACKETED CAT 6 CABLE IN 3/4" CONDUIT BACK TO ASSOCIATED DATA CLOSET.
6. PROVIDE AN ADDITIONAL 10%, OR ONE (1), WHICHEVER IS GREATER, OF THE FOLLOWING DEVICES WHICH ARE INCLUDED IN THE PROJECT, AND INSTALL THEM AT THE DIRECTION OF THE ARCHITECT, ENGINEER, OR AHJ DURING THE COURSE OF THE PROJECT. PROVIDE ALL REQUIRED CONDUIT, INTERCONNECTIONS, CONDUCTORS, PROGRAMMING, ETC. AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER: INITIATING DEVICES (PULL STATIONS, SMOKE DETECTORS, THERMAL DETECTORS, ETC.), NOTIFICATION APPLIANCES (STROBES, HORN STROBES, SPEAKER STROBES, SPEAKERS, DUCT DETECTORS, ETC.), AND MONITORING MODULES.
7. VERIFY REQUIRED QUANTITY OF DUCT DETECTORS WITH DUCTWORK CONFIGURATION AS IT IS ACTUALLY INSTALLED. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.

DEMOLITION GENERAL NOTES

1. THE LOCATIONS OF EXISTING CIRCUITS AND EQUIPMENT ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING ELECTRICAL DEVICES, EQUIPMENT, AND WIRING BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSE BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL EXISTING PORTIONS OF THE ELECTRICAL SYSTEMS.
2. THE CONTRACTOR SHALL REMOVE SUCH EXISTING WORK AS CALLED FOR ON THE DRAWINGS OR AS REQUIRED TO CLEAR THE AREAS OF NEW CONSTRUCTION.
3. ALL EQUIPMENT REMOVED THAT IS NOT BEING REUSED SHALL REMAIN THE PROPERTY OF THE OWNER OR SHALL BE DISPOSED OF AS REQUIRED.
4. EXCEPT AS OTHERWISE NOTED, ALL EXISTING ELECTRICAL WORK WHICH WILL NOT BE RENDERED OBSOLETE AND WHICH MAY BE DISTURBED DUE TO ANY CHANGES REQUIRED UNDER THIS CONTRACT, SHALL BE RESTORED TO ITS ORIGINAL OPERATING CONDITION. OTHER ELECTRICAL WORK OR MATERIAL RENDERED OBSOLETE SHALL BE ABANDONED WHERE CONCEALED AND REMOVED WHERE EXPOSED. OLD, UNUSED WIRING AND DEVICES SHALL BE REMOVED FROM THE ABANDONED (CONCEALED) CONDUITS. OUTLETS SHALL BE PROVIDED WITH BLANK COVERS. ANY CONDUITS STUBBED OUT OF MASONRY SURFACE SHALL BE CUT INTO SURFACE AND PATCHED.
5. WHERE EXISTING ELECTRICAL WORK INTERFERES WITH NEW WORK AND WHERE SUCH INSTALLATIONS ARE TO REMAIN IN USE, THE INSTALLATIONS SHALL BE DISCONTINUED AND RELOCATED AND/OR RECONNECTED TO COORDINATE WITH THE WORK INDICATED ON THE CONTRACT DRAWINGS AS SPECIFIED.
6. WHERE EXISTING RACEWAYS THAT ARE NOT TO BE REUSED INTERFERE WITH NEW WORK, THESE RACEWAYS SHALL BE REMOVED BACK TO THE NEAREST JUNCTION BOX OR PULL BOX AND THE OPENINGS BLANKED.
7. CONTRACTOR SHALL MAINTAIN CONTINUITY OF BRANCH CIRCUITS SERVING MULTIPLE ITEMS OF WHICH ONE OR MORE ARE BEING DEMOLISHED. CONDUCTORS AND CONDUITS FOR THOSE ITEMS BEING DEMOLISHED SHALL BE REMOVED AS FAR AS PRACTICABLE.
8. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REMOVE ALL EXISTING ELECTRICAL EQUIPMENT AND DATA WIRING NOT REUSED OR NOT NECESSARY FOR THE COMPLETION OF THIS PROJECT.
9. IF ANY BRANCH CIRCUIT WIRING FEEDING EQUIPMENT TO REMAIN IN PLACE FOR REUSE IS DAMAGED DURING CONSTRUCTION, THE CONTRACTOR SHALL REPLACE THE NEW BRANCH CIRCUIT WIRING OF THE SAME SIZE AND TYPE AS THAT OF THE EXISTING AT NO COST TO THE OWNER.
10. EXISTING DEVICES ARE SHOWN IN GRAY. CONDUIT AND WIRING ARE NOT GENERALLY SHOWN AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. ADDITIONAL DEMOLITION WORK AND CLARIFICATION OF INDICATED WORK WILL BE GIVEN BY RFI.
11. COORDINATE THE REMOVAL AND REINSTALLATION (OR PROTECTION IN PLACE) OF EXISTING ELECTRICAL EQUIPMENT AND DEVICES WITH THE WORK OF OTHER TRADES TO REPLACE OR REFINISH EXISTING WALLS AND CEILINGS.
12. WHERE EXISTING CIRCUITS ARE BEING REMOVED IN EXISTING PANELS, PROVIDE A NEW, NEATLY TYPED DIRECTORY WHICH INDICATES WHERE "SPARE" BREAKERS ARE LOCATED. ANY EXISTING BREAKERS THAT ARE NOT FEEDING DEVICES SHALL REMAIN AND BE LABELED AS A "SPARE."
13. WHERE NEW LOADS ARE CONNECTED TO EXISTING PANELS, AND WHERE LOADS ARE REARRANGED IN EXISTING PANELS AS PART OF THIS PROJECT, UPDATE THE RESPECTIVE PANEL DIRECTORY SO AS TO PROVIDE A COMPLETE, ACCURATE, AND TYPEWRITTTEN PANEL SCHEDULE. THE NEW PANEL SCHEDULE SHALL INCORPORATE ALL EXISTING LOADS, INCLUDING LOADS "EXISTING TO REMAIN". PROVIDE ALL REQUIRED TESTING AND INVESTIGATIONS NECESSARY TO ACCOMPLISH THIS WORK.

INDEX - ELECTRICAL SHEETS

COVER	COVER SHEET
E0.0	ELECTRICAL COVER SHEET
E0.1	ELECTRICAL DEMOLITION PLANS
E1.0	ELECTRICAL PLANS
E2.0	ELECTRICAL DETAILS

ABBREVIATIONS

A	AMPERE(S)	CATV	CABLE TELEVISION	EF	EXHAUST FAN	FOC	FIBER OPTIC CABLE	MCB	MAIN CIRCUIT BREAKER	NO	NORMALLY OPEN	SF	SUPPLY FAN	UGS	UNDERGROUND SECONDARY
AC	ABOVE COUNTER (6" ABOVE BACKSPLASH)	CB	CIRCUIT BREAKER	EGC	EQUIPMENT GROUNDING CONDUCTOR	G, GND	GROUND	MCM/KCMIL	1,000 CIRCULAR MILS	NU	WEATHERPROOF IN-USE COVER	S/N	SOLID NEUTRAL	UH	UNIT HEATER
AF	AMPERE(S) FUSED	CKT	CIRCUIT	EMER.	EMERGENCY	GEC	GROUNDING ELECTRODE CONDUCTOR	MECH.	MECHANICAL	OH	OVERHEAD	SPD	SURGE PROTECTIVE DEVICE	UL	UNDERWRITER'S LABORATORY, INC.
AFCI	ARC FAULT CIRCUIT INTERRUPTER	CLG	CLG	EMT	ELECTRICAL METALLIC TUBING	GFCI	GROUND FAULT CIRCUIT INTERRUPTER	MH	MANHOLE	OHE	OVERHEAD ELECTRICAL	STD	STANDARD	UON	UNLESS OTHERWISE NOTED
AFF	ABOVE FINISHED FLOOR	CORR	CORRIDOR	EQ	EQUAL	GRS	GALVANIZED RIGID STEEL	MLO	MAIN LUGS ONLY	OSP	OUTSIDE PLANT	TEL	TELEPHONE	V	VOLTS
AFG	ABOVE FINISHED GRADE	CT	CURRENT TRANSFORMER	EQUIP.	EQUIPMENT	HH	HANDHOLE	MOCP	MAXIMUM OVERCURRENT PROTECTION	UPP	UTILITY POWER POLE	TELECOM	TELECOMMUNICATIONS	VAC	VOLTS ALTERNATING CURRENT
AIC	AMP SYMMETRICAL INTERRUPTING CAPACITY RMS	CTRL	CONTROLLER	EWC	ELECTRIC WATER COOLER	HP	HORSEPOWER	MTD	MOUNTED	PB	PULL BOX	TGB	TELECOMMUNICATIONS GROUND BUS	VDC	VOLTS DIRECT CURRENT
AT	AMPERE(S) TRIP	D	TO BE DEMOLISHED	EWH	ELECTRIC WATER HEATER	KAIC	1,000 AMP SYMMETRICAL INTERRUPTING CAPACITY RMS	MTG	MOUNTING	PH	PHASE	TMGB	TELECOMMUNICATIONS MAIN GROUND BUS	VFD	VARIABLE FREQUENCY DRIVE
AWG	AMERICAN WIRE GAUGE	DISC.	DISCONNECT	EXIST.	EXISTING	KWH	1,000 WATT HOURS	NC	NORMALLY CLOSED	PNL	PANEL	TTB	TELECOM TERMINAL BOARD	WH	WATER HEATER
BG	BELOW GRADE	DIST.	DISTRIBUTION	FACP	FIRE ALARM CONTROL PANEL	KVA	1,000 VOLT AMPERES	NEC	NATIONAL ELECTRICAL CODE	PV	PHOTOVOLTAIC	TV	TELEVISION	WP	WEATHERPROOF
BLDG	BUILDING	DWG	DRAWING	FACPRA	FIRE ALARM CONTROL PANEL REMOTE ANNUNCIATOR	LAN	LOCAL AREA NETWORK	NEU	NEUTRAL	PVC	POLYVINYL CHLORIDE	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION	XFMR	TRANSFORMER
BKR	BREAKER	E	EXISTING TO REMAIN	FC	FOOTCANDLE	LC	LIGHTING CONTACTOR	NF	NON-FUSED	QTY	QUANTITY	TYP.	TYPICAL		
C	CONDUIT	EC	EMPTY CONDUIT	FCU	FAN COIL UNIT	LTG	LIGHTING	NIC	NOT IN CONTRACT	RCPT	RECEPTACLE	UG	UNDERGROUND		
CAT	CATEGORY	ECB	ENCLOSED CIRCUIT BREAKER	FLA	FULL LOAD AMPERE(S)	MCA	MINIMUM CIRCUIT AMPACITY	NL	NIGHT LIGHT	REQ'D	REQUIRED	UGP	UNDERGROUND PRIMARY		

ALL SYMBOLS, ABBREVIATIONS, AND NOTES ABOVE ARE TYPICAL AND ARE NOT NECESSARILY USED IN THESE CONSTRUCTION DOCUMENTS

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SEAL

MICHAEL LEE TERRY, III
LICENSE NO. 42812
10/05/2026

PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

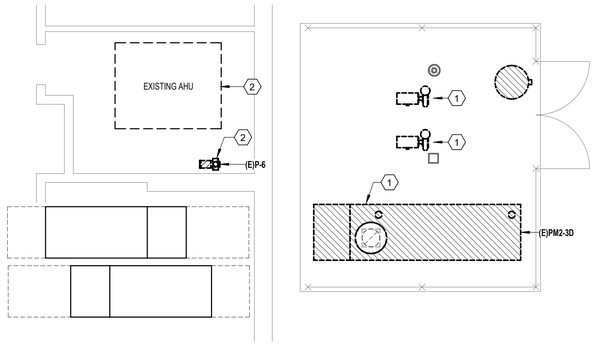
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DRAWN BY:	MRQ
CHECKED BY:	SPG
PROJECT #:	25-157

SHEET NAME

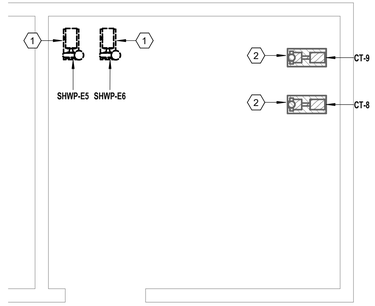
ELECTRICAL COVER SHEET

SHEET NUMBER

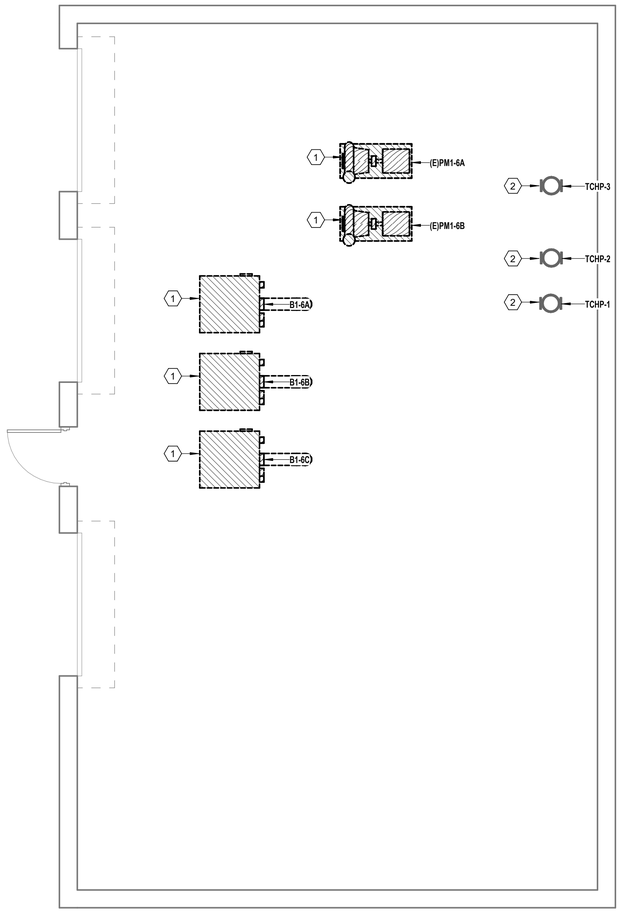
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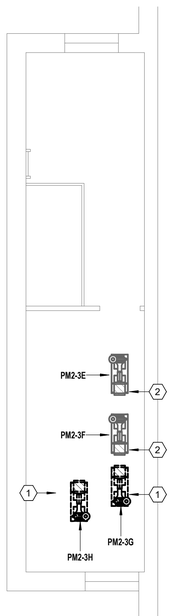
1 PUMP RM & MECH YARD - MINILABS - DEMO
3/16" = 1'-0"



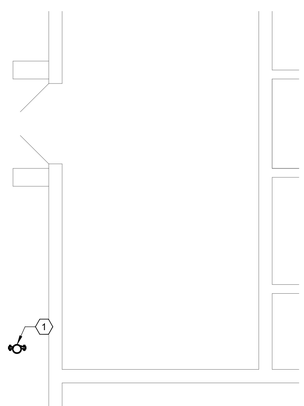
2 PUMP RM - T.H. HARRIS ANNEX - DEMO
3/16" = 1'-0"



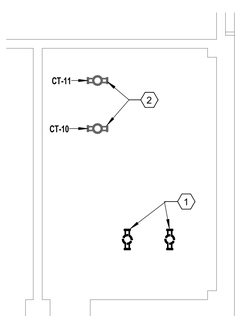
3 MECH BLDG - BAND/MUSIC/ARTS - DEMO
1/4" = 1'-0"



4 PUMP RM - PBS PINCHBACK - DEMO
3/16" = 1'-0"



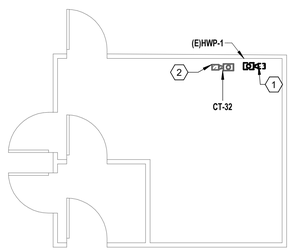
5 PUMP RM - PERFORMING ARTS - DEMO
3/16" = 1'-0"



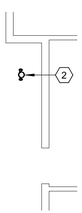
6 PUMP RM - AUGUSTUS C. BLANKS - DEMO
3/16" = 1'-0"



7 THWP - ISAAC GREGGS BAND BLDG - DEMO
3/16" = 1'-0"



8 PUMP RM - HONORS COLLEGE - DEMO
3/16" = 1'-0"



9 TOURGEE A. DEBOSE - DEMO
1/8" = 1'-0"

ELECTRICAL DEMO NOTES: (#)

1. DISCONNECT AND REMOVE ALL POWER DEVICES, DISCONNECT SWITCH, ASSOCIATED CONDUIT, AND CONDUCTORS SERVING MECHANICAL EQUIPMENT SCHEDULED FOR DEMOLITION. REMOVE DEVICES AND WIRING BACK TO THE SOURCE OR TO THE NEAREST JUNCTION BOX REMAINING IN SERVICE, AS APPLICABLE. COORDINATE LOCATIONS AND EXTENT OF DEMOLITION WITH ARCHITECT PRIOR TO COMMENCEMENT OF WORK. ALL EXISTING ELECTRICAL EQUIPMENTS, DEVICES, ETC. NOT IN SCOPE TO REMAIN AND MAINTAIN ORIGINAL FUNCTIONALITY.
2. EXISTING TO REMAIN. COORDINATE LOCATIONS AND EXTENT OF DEMOLITION WITH ARCHITECT PRIOR TO COMMENCEMENT OF WORK. ALL EXISTING ELECTRICAL EQUIPMENTS, DEVICES, ETC. NOT IN SCOPE TO REMAIN AND MAINTAIN ORIGINAL FUNCTIONALITY.

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SEAL

STATE OF LOUISIANA
MICHAEL R. CURRY, III
LICENSED PROFESSIONAL ENGINEER
10/05/2026

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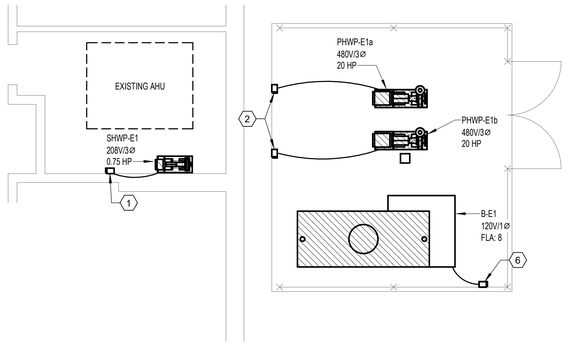
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PROJECT #:	25-157

SHEET NAME

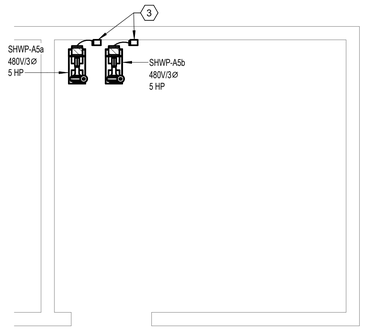
ELECTRICAL DEMOLITION PLANS

SHEET NUMBER

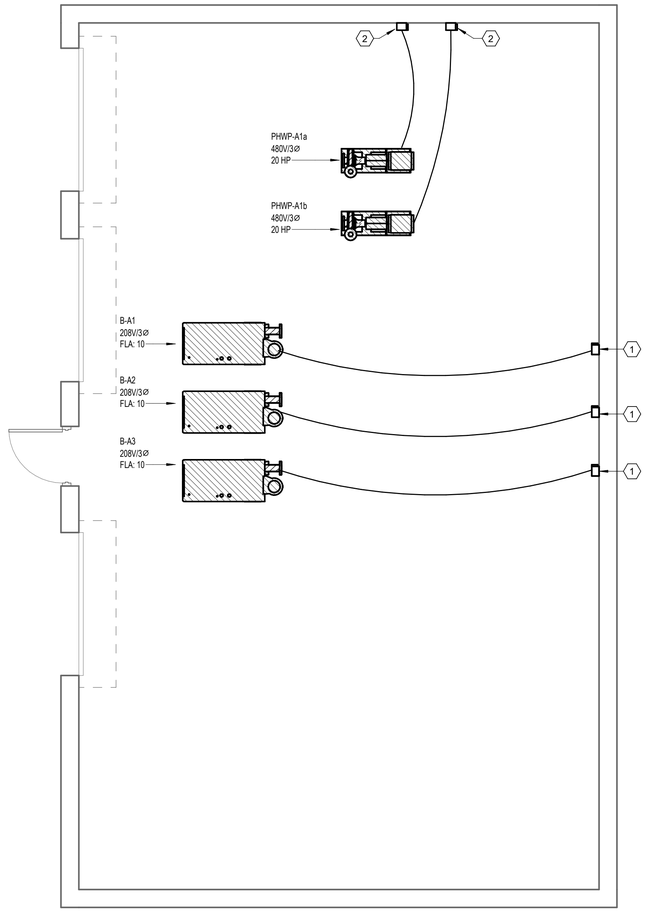
E0.1



1 PUMP RM & MECH YARD - MINILABS - ELEC RENO
3/16" = 1'-0"



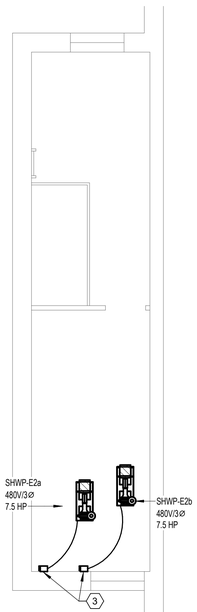
2 PUMP RM - T.H. HARRIS ANNEX - RENO
3/16" = 1'-0"



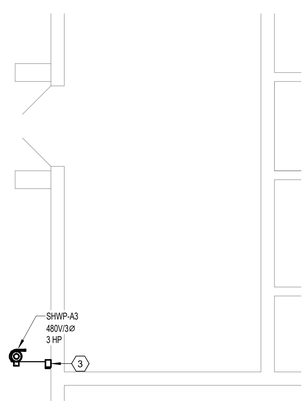
3 MECH BLDG - BAND/MUSIC/ARTS - RENO
1/4" = 1'-0"

ELECTRICAL KEYNOTES: (#)

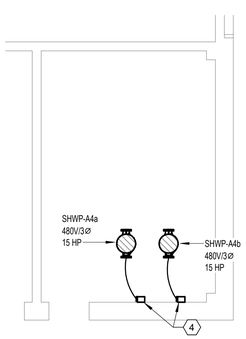
1. PROVIDE AND CONNECT NEW 20 AMP FUSED DISCONNECT SWITCH TO NEAREST 208V/3Ø PANEL. PROVIDE 3/4"C, 4#12 THWN, #12 GND.
2. PROVIDE AND CONNECT NEW 60 AMP FUSED DISCONNECT SWITCH TO NEAREST 480V/3Ø PANEL. PROVIDE 1"C, 4#6 THWN, #10 GND.
3. PROVIDE AND CONNECT NEW 20 AMP FUSED DISCONNECT SWITCH TO NEAREST 480V/3Ø PANEL. PROVIDE 3/4"C, 4#12 THWN, #12 GND.
4. PROVIDE AND CONNECT NEW 40 AMP FUSED DISCONNECT SWITCH TO NEAREST 480V/3Ø PANEL. PROVIDE 3/4"C, 4#8 THWN, #10 GND.
5. PROVIDE AND CONNECT NEW 25 AMP FUSED DISCONNECT SWITCH TO NEAREST 208V/3Ø PANEL. PROVIDE 3/4"C, 4#10 THWN, #10 GND.
6. PROVIDE AND CONNECT NEW 20 AMP FUSED DISCONNECT SWITCH TO NEAREST 120V/1Ø PANEL. PROVIDE 3/4"C, 2#12 THWN, #12 GND.



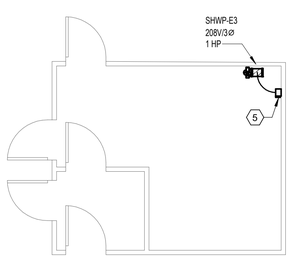
4 PUMP RM - PBS PINCHBACK - ELEC RENO
3/16" = 1'-0"



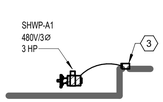
5 PUMP RM - PERFORMING ARTS - RENO
3/16" = 1'-0"



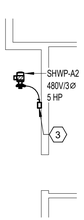
6 PUMP RM - AUGUSTUS C. BLANKS - RENO
3/16" = 1'-0"



7 PUMP RM - HONORS COLLEGE - ELEC RENO
3/16" = 1'-0"



8 THWP - ISAAC GREGGS BAND BLDG - RENO
3/16" = 1'-0"



9 TOURGEE A. DEBOSE - RENO
1/8" = 1'-0"

PARISH ENGINEERING
1450 Seabord Drive
Baton Rouge, LA 70810
225.332.0222
parisheng.com

All drawings and written material appearing herein constitute original and unpublished work of the engineer and may not be duplicated, used, or disclosed without written consent of the engineer. Do not scale drawings. Contractor is responsible for verifying any and all quantities included in these documents when bidding and during construction.

SEAL

STATE OF LOUISIANA
MICHAEL R. QUERY, III
LICENSED PROFESSIONAL ENGINEER
10/05/2026

PROJECT INFORMATION

PBS PINCHBACK BOILER AND PUMP REPLACEMENT

SOUTHERN UNIVERSITY, BATON ROUGE, LOUISIANA
PROJECT #01-107-25-05, F.01004689

REVISIONS

SHEET INFORMATION

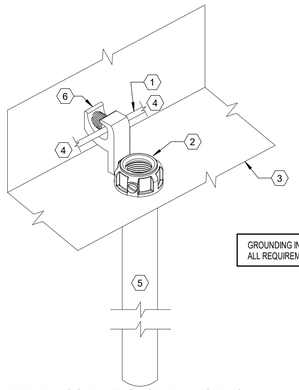
DATE:	10/05/2026
DRAWN BY:	MRQ
CHECKED BY:	SPG
PROJECT #:	25-157

SHEET NAME

ELECTRICAL PLANS

SHEET NUMBER

E1.0

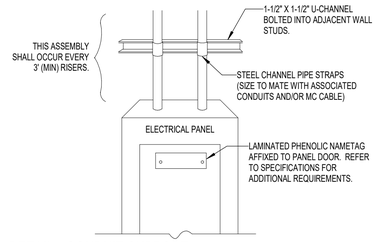


DETAIL KEYNOTES

1. SUPPLY SIDE EQUIPMENT BONDING JUMPER.
2. UL 467 LISTED GROUNDING BUSHING BY APPLETON, EATON, OR APPROVED EQUIVALENT.
3. ENCLOSURE.
4. TO ENCLOSURE GROUND BUS OR ADDITIONAL CONDUITS (AS REQUIRED).
5. INCOMING CONDUIT.
6. INTEGRAL BRACKET FOR ATTACHMENT OF BONDING JUMPER.

GROUNDING INSTALLATION SHALL MEET ALL REQUIREMENTS OF NEC 250.92.

1 DETAIL - CONDUIT GROUND BUSHING
N.T.S.



2 DETAIL - CONDUIT SUPPORT
N.T.S.

TYPICAL PANELBOARD PLAQUE

(INDICATE PANEL DESIGNATION)

__/__ VOLTS __ PHASE __ WIRE
__ AMPS MAIN __
FED FROM
(INDICATE FEEDER ORIGINATION I.D.)
(PANEL AND CIRCUIT NO.)

TYPICAL DISCONNECT PLAQUE

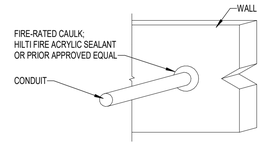
(INDICATE EQUIPMENT DESCRIPTION)

FUSED AT __ AMPERES
FED FROM
(INDICATE FEEDER ORIGINATION I.D.)
(PANEL AND CIRCUIT NO.)

SEE SPECIFICATIONS FOR MATERIALS, COLORS SIZE LETTERING, ETC.

ATTACH PLAQUES USING INDUSTRIAL GRADE DOUBLE FACE ADHESIVE.

3 DETAIL - EQUIPMENT SIGNAGE
N.T.S.



ALL PENETRATIONS THROUGH FIRE-RATED WALLS SHALL UTILIZE FIRE-RATED CAULK OR PRIOR APPROVED FIRE-STOPPING MATERIAL WITH BACKING MATERIAL.

4 DETAIL - FIRE-RATED WALL PENETRATION
N.T.S.

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CHECKED BY:	SPG
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SHEET NAME

ELECTRICAL DETAILS

SHEET NUMBER

E2.0