CITY OF GREELEY
INVITATION FOR BID

RECREATION CENTER VAV BOX REPLACEMENTS
FA19-03-031

DUE APRIL 18, 2019 BEFORE 2:00 P.M.

Serving Our
Community
It's A Tradition

The Office of Purchasing is a service division established to build effective partnerships through efficient and responsive procurement processes to obtain high quality goods and services for the best value.

SECTION 00110
BID #FA19-03-031
INVITATION FOR BID

The City of Greeley, Colorado is requesting **sealed** bids for the Recreation Center VAV Box Replacements **before April 18, 2019 before 2:00 p.m**. at the Public Works Building, 1001 9th Avenue, Greeley, Colorado 80631 at which time and place all bids will be publicly opened and read aloud. No late, faxed or electronic bids will be accepted.

The City of Greeley disseminates all bids and requests for proposals through the Rocky Mountain E-Purchasing System site. Go to http://www.RockyMountainBidSystem.com, then "Bid Opportunities" and then select "The City of Greeley". Bids submitted to the City of Greeley must include Sections 00120, 00130, 00140 and 00160. Addenda must be acknowledged in Section 00120 of the bidding documents. Bidders failing to acknowledge any and all addenda may be considered non-responsive.

A pre-bid meeting will be held on April 4, 2019 at 10:30 am at the Public Works Building, 1001 9th Avenue, 1st Floor Conference Room, Greeley, Colorado. All prospective bidders are encouraged to attend.

Each bid shall be accompanied, in a separate sealed envelope, by a certified check drawn on a bank which is insured by the Federal Deposit Insurance corporation or a bidder's bond executed by a surety company authorized to do business in Colorado, made payable to the City of Greeley, Colorado, in an amount not less than five percent (5%) of the proposal sum as security that the successful bidder will enter into a contract to construct this project in accordance with the plans and specifications, and give bonds in the sum as hereafter provided. Checks accompanying bids not accepted will be returned.

The successful responsive and responsible bidder will be required to furnish a satisfactory performance bond and payment bond in the amount of the contract sum.

No bid shall be withdrawn after the opening on the bids without the consent of the City of Greeley, Colorado, for a period of sixty (60) days after the scheduled time of the receiving the bids.

The City of Greeley retains the right to reject any and all bids and to waive any informality as deemed in the best interest of the city.

Questions pertaining to the project may be directed to Dale Blehm at 970-350-9253.

Adela R. Gain

Section 00120

BID PROPOSAL

PROJECT: RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031

The Undersigned, having become familiar with the local conditions affecting the cost of the work, plans, drawings, and specifications attached herewith, and with advertisement for bids, the form of bid and proposal, form of bond, all of which are issued and attached and on file in the office of the Project Manager, hereby bid and propose to furnish all the labor, materials, necessary tools, and equipment and all utility and transportation service necessary to perform and complete in a workmanlike manner all of the work required in connection with the construction of the items listed on the bidding schedule in accordance with the plans and specifications as prepared by the City of Greeley, Colorado, for the sums set forth in the Bidding Schedule.

The total bid shall be the basis for establishing the amount of the Performance and Payment Bond for this project. The total bid is based on the quantities shown in the bid proposal form and the dimensions shown on the plans.

The undersigned has carefully checked the Bidding Schedule quantities against the plans and specifications before preparing this proposal and accepts the said quantities as substantially correct, both as to classification and the amounts, and as correctly listing the complete work to be done in accordance with the plans and specifications.

The undersigned, agrees to complete and file a Performance and Payment Bond and further agrees to complete the contract within one-hundred twenty (120) Calendar Days from Notice to Proceed. Official notice to proceed will not be issued until adequate Performance and Payment Bonds and other required documents are on file with the City of Greeley.

NOTE: Bidders should not add any conditions or qualifying statements to this bid as otherwise the bid may be declared irregular as being non responsive to the Invitation for bids. The following numbered Addenda have been received and the bid, as submitted, reflects any changes resulting from those Addenda: _____

_____ ATTEST

_____ DATE

_____ COMPANY NAME

_____ BY

_____ SIGNATURE

_____ TITLE

Rec.Center Variable Air Volume Boxes Replacement
Recreation Center @ 651 10th Avenue
Greeley, Colorado

Bid Form - 00130

City Of Greeley

Bid Item	Description		Unit	Unit Cost	Total Cost
1	Base bid per drawing/specs.				
1	Bid Alternate #1 - new ceiling tiles				

Lump Sum Grand Total _____

TOTAL PROPOSAL **dollars**

Total Proposal (Written Out)

Company Name: _____

Submitted By: _____

Title: _____

Address_____

Phone Number_____

Email Address_____

COOPERATIVE PURCHASING STATEMENT

The City of Greeley encourages and participates in cooperative purchasing endeavors undertaken by or on behalf of other governmental jurisdictions. To the extent, other governmental jurisdictions are legally able to participate in cooperative purchasing endeavors; the City of Greeley supports such cooperative activities. Further, it is a specific requirement of this proposal or Request for Proposal that pricing offered herein to the City of Greeley may be offered by the vendor to any other governmental jurisdiction purchasing the same products. The vendor(s) must deal directly with any governmental agency concerning the placement of purchase orders, contractual disputes, invoicing, and payment. The City of Greeley shall not be liable for any costs or damages incurred by any other entity.

SECTION 00140

BID BOND

KNOW ALL MEN BY THESE PRESENT, that we, the undersigned _____ as Principal, and _____ as Surety, are hereby held and firmly bound unto the City of Greeley, Colorado, as Owner, in the penal sum of _____ for the Payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors, and assigns.

THE CONDITION of this obligation is such that whereas the Principal has submitted to the City of Greeley, Colorado, the accompanying bid and hereby made a part hereof to enter into a Contract Agreement for the construction of City of Greeley Project,

RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031

WHEREAS, the Owner, as condition for receiving said bid, requires that the Principal to deposit with the Owner as Bid Guaranty equal to five percent (5%) of the amount of said bid.

NOW, THEREFORE,

(a) If said bid shall be rejected; or in the alternate,

(b) If said bid shall be accepted and the Principal shall execute and deliver a Contract Agreement (properly completed in accordance with said bid) and shall furnish a Performance and Payment Bond upon the forms prescribed by the Owner for the faithful performance of said Agreement; and shall in all other respects perform the agreement created by the acceptance of said bid;

then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Owner may accept such bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals this _____ day of _____, 20_____, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

PRINCIPAL	SURETY
Name: _____	_____
Address: _____	_____
By: _____	_____
Title: _____	Attorney In-Fact: _____
(Seal)	(Seal)

NOTE: Surety Companies executing bonds must be authorized to transact business in the State of Colorado and be accepted to the Owner.

SECTION 00160

NOTICE OF PRE-BID CONFERENCE

RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031

A pre-bid conference will be held:

On April 4, 2019 at 10:30 a.m., 1001 9th Avenue, Greeley, Colorado 80631. All bidders are highly encouraged to attend.

Representatives of the City of Greeley will be present to answer questions.

Each bidder shall submit the following declaration of attendance, along with the other bid documents.

****

I have attended the pre-bid conference _____

I have not attended the pre-bid conference _____

_____
Name of Contracting Organization

_____
Authorized Signature Date

SECTION 00210

NOTICE OF AWARD

DATE:

TO:

Re: **RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031**

Dear Contractor:

The City of Greeley, Colorado (hereinafter called "the Owner") has considered the bids submitted for referenced work in response to its Invitation for Bids. You are hereby notified that your bid has been accepted for items and prices stated in the Bid Schedule in the amount of $_____. You are required to execute the Contract Agreement, provide the necessary insurance certificates, the Performance and Payment Bonds within ten (10) days from the date of this Notice. If you fail to execute said Contract Agreement and furnish the necessary insurance certificates and bonds within the time allotted from this date, the Owner will be entitled to consider your rights arising out of the Owner's acceptance of your bid as abandoned and to demand payment of bid guaranty as damages. The Owner will be entitled to such other rights as may be granted by law. You are required to return an acknowledged copy of this Notice of Award and enclosures to Purchasing.

CITY OF GREELEY, COLORADO

By: Joel Hemesath

Title: Director of Public Works

ACKNOWLEDGMENT: Receipt of the foregoing Notice of Award accompanied with a Performance and Payment Bond form and a signed copy of the Contract Document is hereby acknowledged this _____ day of _____, 20_____.

Bidder: _____

By: _____

SECTION 00310

CONTRACT

THIS AGREEMENT made and entered into this _____ day of _____, 20__, by and between the City of Greeley, Colorado, and under the laws of the state of Colorado, party of the first part, termed in the Contract Documents as the "Owner" and _____ party of the second part, termed in the Contract Documents as "Contractor."

WITNESSETH: In consideration of monetary compensation to be paid by the Owner to the Contractor at the time and in the manner hereinafter provided, the said Contractor has agreed, and does hereby agree, to furnish all labor, tools, equipment and material and to pay for all such items and to construct in every detail, to wit:

PROJECT: **RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031**

at the price bid on the Proposal Form of $ _____ all to the satisfaction and under the general supervision of the Project Manager for the City of Greeley, Colorado.

The Contract Documents consist of this Agreement, the Conditions of the Contract (General, Supplementary and other Conditions), the Drawings, the Specifications, all Addenda issued prior to and all Modifications issued after execution of this Agreement. These form the Contract, and all are as fully a part of the Contract as if attached to this Agreement or repeated herein.

The Project Manager named herein shall interpret and construe the Contract Documents, reconciling any apparent or alleged conflicts and inconsistencies therein; and all of the work and all details thereof shall be subject to the approval and determination of the Project Manager as to whether or not the work is in accordance with Contract Documents. Said City Project Manager shall be the final arbiter and shall determine any and all questions that may arise concerning the Contract Documents, the performance of the work, the workmanship, quality of materials and the acceptability of the completed project. The decision of the Project Manager on all questions shall be final, conclusive and binding.

AND FOR SAID CONSIDERATION IT IS FURTHER PARTICULARLY AGREED BETWEEN THE PARTIES TO THIS AGREEMENT.

1. That construction and installation of the above enumerated work for the Owner shall be completed and ready for use in accordance with the time of completion described in the Bid form of this Contract. That the above enumerated work shall begin within ten (10) days of the official "Notice to Proceed". (Contract shall become void if work is not started at specified time.)

2. That said work and materials for the project covered by the Contract Documents shall be completely installed and delivered to the Owner, within the time above stated, clear and free from any and all liens, claims, and demands of any kind.

3. The full compensation to be paid the Contractor by the Owner pursuant to the terms of this Contract shall be payable as provided in the Contract Documents.

4. This Contract consists of the following component parts, all of which are as fully a part of the Contract as herein set out verbatim, or if not attached, as if hereto attached:

Section 00110: Invitation for Bid
Section 00120: Bid Proposal
Section 00130: Bid Schedule
Section 00140: Bid Bond
Section 00160: Pre-bid meeting
Section 00210: Notice of Award
Section 00310: Contract
Section 00320: Performance Bond
Section 00330: Payment Bond
Section 00340: Certificate of Insurance
Section 00350: Lien Waiver Release
Section 00360: Debarment/Suspension Certification Statement
Section 00410: Notice to Proceed
Section 00420: Project Manager Notification
Section 00430: Certificate of Substantial Completion
Section 00440: Final Completion
Section 00510: General Conditions of the Contract
Section 00520: Subcontractors List
Section 00620: Special Provisions

Addenda Number _____ Inclusive

Any modifications, including change orders, duly delivered after execution of this Agreement.

IN WITNESS WHEREOF, the parties have caused this instrument to be executed as of the day and year first above written.

City of Greeley, Colorado

Approved as to Substance

_____
City Manager-Roy Otto

Reviewed as to Legal Form
OFFICE OF THE CITY ATTORNEY

By: _____
City Attorney-Doug Marek

Certification of Contract
Funds Availability

_____
Director of Finance-Renee Wheeler

Contractor

_____
Authorized Signature

_____
Printed Name

_____
Title

SECTION 00320

PERFORMANCE BOND

Bond No._____

KNOWN ALL MEN BY THESE PRESENTS: that

(Firm) _____

(Address) _____

(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm) _____

(Address) _____

hereinafter referred to as "the Surety", are held and firmly bound unto the CITY OF GREELEY, 1000 10th Street, Greeley, CO. 80631, a Municipal Corporation, hereinafter referred to as "the Owner" in the penal sum of _____ in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these present.

THE CONDITIONS OF THIS OBLIGATION are such that whereas the Principal entered into a certain Contract Agreement with the Owner, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the performance of City of Greeley Project,

RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said Contract Agreement during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without Notice to the Surety and during the life of the guaranty period, and if he shall satisfy all claims and demands incurred under such Contract Agreement, and shall fully indemnify and save harmless the Owner from all cost and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, and then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Agreement or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond; and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Agreement or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed this _____ day of _____, 20____.

PROVIDED, FURTHER, that no final settlement between the Owner and Contractor shall abridge the right of any beneficiary hereunder, whose claims may be unsatisfied.

IN PRESENCE OF: PRINCIPAL

_____ By: _____

_____ _____

_____ _____

(Corporate Seal) (Address)

IN PRESENCE OF: OTHER PARTNERS

_____ By: _____

_____ By: _____

By: _____

IN PRESENCE OF: SURETY

_____ By: _____

(Attorney-in-Fact)

_____ _____

_____ _____

(SURETY SEAL) (Address)

NOTE: Date of Bond must not be prior to date of Contract Agreement. If Contractor is Partnership, all partners should execute bond.

IMPORTANT: Surety Company must be authorized to transact business in the State of Colorado and be acceptable to the Owner.

SECTION 00330

PAYMENT BOND

Bond No._____

KNOWN ALL MEN BY THESE PRESENT: that
(Firm) _____

(Address)_____
(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and
(Firm) _____

(Address)_____

hereinafter referred to as "the Surety", are held and firmly bound unto the CITY OF GREELEY, 1000 10th Street, Greeley, Co. 80631, a Municipal Corporation, hereinafter referred to as "the Owner", in the penal sum of
_____ in
lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION are such that whereas the Principal entered into a certain Contract Agreement with the Owner, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the performance of

RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031

NOW, THEREFORE, if the Principal shall make payment to all persons, firms, subcontractors and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such Contract Agreement, and any equipment and tools, consumed, rented or used in connection with the construction of such work and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Agreement or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond; and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Agreement or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed this _____ day of _____, 20____.

PROVIDED, FURTHER, that no final settlement between the Owner and Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN PRESENCE OF: PRINCIPAL

_____ By: _____

_____ _____

_____ _____
(Corporate Seal) (Address)

IN PRESENCE OF: OTHER PARTNERS

_____ By: _____

_____ By: _____

By: _____

IN PRESENCE OF: SURETY

_____ By: _____
(Attorney-in-Fact)

_____ _____

_____ _____
(SURETY SEAL) (Address)

NOTE: Date of bond must not be prior to date of Contract Agreement. If Contractor is Partnership, all partners should execute Bond.

IMPORTANT: Surety Company must be authorized to transact business in the State of Colorado and be acceptable to the Owner.

Client#: 12170 GRECI

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 05/14/2013

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
ABC Insurance Company P. O. Box 1234 Anywhere, USA	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	PRODUCER CUSTOMER ID #:	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Sample Certificate	INSURER A : Financial Rating of A	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$1,000,000
	X COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$100,000
	CLAIMS-MADE X OCCUR						MED EXP (Any one person)	$5,000
							PERSONAL & ADV INJURY	$1,000,000
							GENERAL AGGREGATE	$2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$2,000,000
	POLICY PRO-JECT LOC							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	ALL OWNED AUTOS						BODILY INJURY (Per accident)	$
	SCHEDULED AUTOS						PROPERTY DAMAGE (Per accident)	$
	X HIRED AUTOS							$
	X NON-OWNED AUTOS							$
	UMBRELLA LIAB OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$
	DEDUCTIBLE							$
	RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						X WC STATU-TORY LIMITS OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? **(Mandatory in NH)**	N/A					E.L. EACH ACCIDENT	$100,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$100,000
							E.L. DISEASE - POLICY LIMIT	$500,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

City of Greeley is named as Additional Insured on General Liability. Waiver of subrogation is included on Work Compensation. This insurance is primary and noncontributory to insurance policies held by the City.

CERTIFICATE HOLDER

City of Greeley
1000 10th St
Greeley, CO 80631-3808

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

DSM

SECTION 00350

LIEN WAIVER RELEASE

TO: City of Greeley, Colorado (hereinafter referred to as "the OWNER".)

FROM: (hereinafter referred to as “the CONTRACTOR”)

PROJECT: **RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031**

1. The CONTRACTOR does hereby release all Mechanic's Liens Rights, Miller Act Claim (40 USCA 270), Stop Notice, Equitable Liens and Labor and Material Bond Rights resulting from labor and/or materials, subcontract work, equipment or other work, rents, services or supplies heretofore furnished in and for the construction, design, improvement, alteration, additions to or repair of the above described project.

2. This release is given for and in consideration of the sum of $ and other good and valuable consideration. If no dollar consideration is herein recited, it is acknowledged that other adequate consideration has been received by the CONTRACTOR for this release.

3. In further consideration of the payment made or to be made as above set forth, and to induce the OWNER to make said payment, the CONTRACTOR agrees to defend and hold harmless the OWNER, employees, agents and assigns from any claim or claims hereinafter made by the CONTRACTOR and/or its material suppliers, subcontractors or employees, servants, agents or assigns of such persons against the project. The CONTRACTOR agrees to indemnify or reimburse all persons so relying upon this release for any and all sums, including attorney's fees and costs, which may be incurred as the result of any such claims.

4. It is acknowledged that the designation of the above project constitutes an adequate description of the property and improvements for which the CONTRACTOR has received consideration for this release.

5. It is further warranted and represented that all such claims against the CONTRACTOR or the CONTRACTOR's subcontractors and/or material suppliers have been paid or that arrangements, satisfactory to the OWNER and CONTRACTOR, have been made for such payments.

6. It is acknowledged that this release is for the benefit of and may be relied upon by the OWNER, the CONTRACTOR, and construction lender and the principal and surety on any labor and material bond for the project.

7. In addition to the foregoing, this instrument shall constitute a *** (full, final and complete) ***(partial) release of all rights, claims and demands of the CONTRACTOR against the OWNER arising out of or pertaining to the above referenced project. If partial, all rights and claims on the project are released up to and including the day of Month, 20 .

Dated this _____ day of _____, 20____.

CONTRACTOR

By: _____

Title: _____

STATE OF_____)
)ss.
COUNTY OF_____)

The foregoing instrument was acknowledged before me this _____day of _____,

20___ by _____.

My Commission expires:

_____
Notary Public

***Strike when not applicable

SECTION 00360

RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031

Debarment/Suspension Certification Statement

The proposer certifies that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded from participation in this transaction by any Federal, State, County, Municipal or any other department or agency thereof. The proposer certifies that it will provide immediate written notice to the City if at any time the proposer learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstance.

DUNS # (Optional) _____

Name of Organization_____

Address_____

Authorized Signature_____

Title_____

Date_____

SECTION 00410

NOTICE TO PROCEED

Month , 20

TO: NAME

PROJECT: **RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031**

To Whom It May Concern:

You are hereby notified to commence work on the above-referenced project in accordance with the Contract Agreement dated Month , 20 .

You are to complete this project by Month , 20

CITY OF GREELEY, COLORADO

By: _____

Title: _____

_____
Signature

SECTION 00420

PROJECT MANAGER NOTIFICATION

_____, 20_____

TO:

PROJECT: **RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031**

The Owner hereby designates Dale Blehm as its Project Manager and authorizes this individual, under the authority of the Director of Public Works to make all necessary and proper decisions with reference to the project. Contract interpretations, change orders and other requests for clarification or instruction shall be directed to the Project Manager. The Director of Public Works shall be authorized to bind the Owner with respect to any decision made in accordance with the contract document.

SECTION 00430

CERTIFICATE OF SUBSTANTIAL COMPLETION

TO: **CONTRACTOR**

PROJECT: **RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031**

Project or designated portion shall include: Describe Scope.

The work performed under this contract has been reviewed and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby established as Month , 20 .

The date of commencement of applicable warranties required by the Contract Documents is stipulated in Section 00440 - Certificate of Final Acceptance.

DEFINITION OF DATE OF SUBSTANTIAL COMPLETION

The Date of Substantial Completion of the Work or designated portion thereof is the date certified by the Project Manager when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended, as expressed in the Contract Documents.

A list of items to be completed or corrected, prepared by the Contractor and verified and amended by the Project Manager is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. The date of commencement of warranties for items on the attached list is as stipulated in Section 00440 – Certificate of Final Acceptance.

The Owner shall operate and maintain the Work or portion of the Work described above from the Date of Substantial Completion and be responsible for all costs associated with the completed work excluding cost related to warrantee work.

The Contractor will complete or correct the Work on the list of items attached hereto within days from the above Date of Substantial Completion.

_____
Contractor

_____
Owner

(Note--Owner's and Contractor's legal and insurance counsel should review and determine insurance requirements and coverage; Contractor shall secure consent of surety company, if any.)

SECTION 00440

CERTIFICATE OF FINAL ACCEPTANCE

TO: **CONTRACTOR**

PROJECT NAME: **RECREATION CENTER VAV BOX REPLACEMENTS-FA19-03-031**

The work performed under this contract has been reviewed and found to meet the definition of final acceptance. This Certificate of Final Acceptance applies to the whole of the work.

The Date of Final Acceptance of the Project designated above is hereby established as: Month , 20 at 2:00 pm. This date is also the date of commencement of applicable warranties associated with the Project described above and as required by the Contract Documents.

DEFINITION OF DATE OF FINAL ACCEPTANCE

The Date of Final Acceptance of the Work is the date certified by the City of Greeley's Project Manager when the work is 100% complete, in accordance with the Contract Documents, as amended by change order(s), or as amended below:

Amendment to the Certificate of Final Completion (if any): Decribe Ammendments.

The Contractor and/or the City Of Greeley shall define any claims or requests for additional compensation above (or as attachments to this document).

Final Acceptance shall not be achieved until the Contractor provides the City Of Greeley with all contract specified Contractor and Sub-contractor close out documents including final lien waivers, releases, insurances, manuals, training, test results, warranties, and other documents required by the Contract Documents, as amended.

Upon issuance of the Certificate of Final Acceptance the Contractor may submit an application for payment requesting final payment for the entire Work. Liquidated damages (if any) will be assessed at this time.

Contractor's acceptance of the final payment shall constitute a waiver by the Contractor of all claims arising out of or relating to the Work; except as noted under 'Amendment to the Certificate of Final Acceptance' above.

Agreed:

_____	_____20	_____	_____20
Contractor's Representative	DATE	Project Manager (COG)	DATE

SECTION 00510

CITY OF GREELEY
GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION
(REVISED NOVEMBER 2016)

ARTICLE 1
DEFINITIONS

1.1 **Bidder**: An architect, engineer, individual, firm, partnership, corporation or combination thereof, submitting a Bid for the Work.

1.2 **Change Notice**: A document issued to the Contractor specifying a proposed change to the Contract Documents. Unless otherwise expressly stated on the face of the Change Notice, a Change Notice is a proposal which may result in a Change Order.

1.3 **Change Order**: A document issued to the Contractor modifying the Contract.

1.4 **Construction Contract**: The Contract Documents, including the Contract for construction (hereinafter "the contract") executed by the Contractor and the Owner covering the performance of the Work including the furnishing of labor, superintendence, materials, tools and equipment as indicated in the Contract Documents.

1.5 **Contract Documents**: Documents applicable to and specific to the construction of an individual Project, including the Contract and all other documents executed by the Contractor and Owner covering the performance of the work including but not limited to Specifications, Insurance Requirements, Contract Drawings, Conditions of the Contract (General and Supplementary), Owner-Contractor Agreement, all Addenda, all change orders issued after execution of the Contract, Performance and Payment Bonds, and any other special provisions.

1.6 **Contract Drawings(Project Drawings)**: Contract drawings, The plans, to include but not limited to plans, profiles, typical cross sections, general cross-sections, elevations, schedules, schematics, notes and details which show locations, character, dimensions, and details of the Work.

1.7 **Contractor:** The individual, firm, partnership, or corporation, or combination thereof, private, municipal, or public, including joint ventures, which, as an independent contractor, has entered into a contract with the Owner, who is referred to throughout the Contract Documents by singular number and masculine gender.

1.8 **Days**: Unless otherwise designated, days mean calendar days.

1.9 **Extra Work**: Work not provided for in the Contract as awarded but found to be essential to the satisfactory completion of the Contract, within its intended scope. Reimbursement for extra work is governed by Article 28, CHANGES, or Article 31, CONTRACTOR PROPOSALS.

1.10 **Field Order**: A written order issued to a contractor by the Owner, or Project Manager, effecting a minor change or clarification with instructions to perform work not included in the contract. The work will eventually become a Change Order. A field Order is an expedient process used in an emergency or need situation that in many cases does not involve an adjustment to the contract sum or an extension of the contract sum or an extension of the contract time.

1.11 **Final Acceptance**: The formal written acceptance by the Owner of the completed Work.

1.12 **Force Account**: A method of payment, other than lump sum or unit price, for Work ordered by Change Order or by written notice from the Owner. Reimbursement for force account work is governed by Article 36, FORCE ACCOUNT WORK.

1.13 **Furnishing**: Manufacturing, fabricating and delivering to the site of the Work materials, plant, power, tools, patterns, supplies, appliances, vehicles and conveyances necessary or required for the completion of the Work.

1.14 **General Conditions (GC)**: A section of the Contract Documents which specifies, in general, the contractual conditions.

1.15 **General Terms**: Directed, required, permitted, ordered, designated, selected, prescribed or words of like import shall be understood to mean the direction, requirement, permission, order, designation, selection or prescription of the Project Manager. Approved, satisfactory, equal, necessary or words of like import shall be understood to mean approved by, acceptable to, satisfactory to, equal, necessary in the opinion of the Project Manager.

1.16 **Indicated**: A term meaning as shown on the Contract Drawings, or as specified and detailed in the Contract Documents.

1.17 **Installation, Install, or Installing**: Completely assembling, erecting and connecting material, parts, components, appliances, supplies and related equipment specified or required for the completion of the Work.

1.18 **Limit of Work**: Boundary within which the Work, excepting utility and drainage work in Public Right Of Way and Easements, is to be performed.

1.19 **Notice to Proceed**: Written notice from the Owner to the Contractor to proceed with the Work.

1.20 **Notice of Termination**: Written notice from the Owner to the Contractor to stop work under the Contract on the date and to the extent specified in the Notice of Termination.

1.21 **Owner**: The City of Greeley.

1.22 **Permanent Drainage Easement**: Area required to construct and maintain permanent drainage facilities for retention, release, and passage of surface water.

1.23 **Permanent Utility Easement**: Area required to construct and maintain utility facilities.

1.24 **Project**: That specific portion of the Work indicated in the Contract Documents.

1.25 **Project Manager**: The Owner's designated representative. The Project Manager has the authority to delegate portions of his responsibilities to others.

1.26 **Provide**: In reference to work to be performed by the Contractor, provide means furnish and install completely in place.

1.27 **Punch List**: Work determined to be incomplete or unacceptable at time of inspection for substantial completion.

1.28 **Samples**: Physical examples which illustrate materials, equipment, fixtures and workmanship which establish standards by which the Work will be judged.

1.29 **Schedule**: Acceptable schedules are BAR or GANTT Chart or CPM schedule.

1.30 **Shop Drawings**: Documents furnished by the Contractor to illustrate specific portions of the Work. Shop Drawings include drawings, diagrams, illustrations, schedules, charts, brochures, tables and other data describing fabrication and installation of specific portions of the Work.

1.31 **Specifications**: A document applicable to construction contracts containing the Technical Provisions.

1.32 **Subcontractor**: Any person, firm or corporation, other than the employees of the Contractor, who contracts with the Contractor to furnish labor, material or labor and materials, under this Contract.

1.33 **Special Provisions**: Provisions especially applicable to this Contract which invoke, modify and supplement the General Conditions which are included in the Contract Documents.

1.34 **Substantial Completion**: The state in the progress of Work when the Work, or a designated portion thereof, is sufficiently complete in accordance with the Contract Documents, so that Owner may access, occupy, use, and enjoy the Project, or designated portion thereof, for its intended purpose. Substantial Completion shall not occur until a temporary or permanent Certificate of Occupancy is issued and only minor punch list items remain for such Work.

1.35 **Technical Provisions**: Those provisions which specify the materials and execution of construction for work entering into the project.

1.36 **Work**: The construction, labor, materials, equipment, and contractual requirements as indicated in the Contract Documents, including alterations, amendments, or extensions thereto made by authorized changes.

1.37 **Work Site**: The area enclosed by the Limit of Work indicated in the Project Drawings and boundaries of local streets and public easements in which the Contractor is to perform work under the Contract. It shall also include areas obtained by the Contractor for use in connection with the Contract, when contiguous to the Limit of Work.

ARTICLE 2
INTERPRETATION

2.1 The documents comprising the Contract Documents are complementary and indicate the construction and completion of the Work. Anything mentioned in the Contract Specifications and not shown on the Contract Drawings, or shown on the Contract Drawings and not mentioned in the Contract Specifications, shall be of like effect as if shown or mentioned in both.

2.2 Where "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the specifications or drawings accompanying this Contract unless stated otherwise.

2.3 References to Articles or Sections include sub articles or subsections under the Article Reference (for example, a reference to Article 2 is also a reference to 2.1 through 2.9, and references to paragraphs similarly include references to subparagraphs).

2.4 Referenced Standards: Material and workmanship specified by the number, symbol, or title of a referenced standard shall comply with the latest edition or revision thereof and amendments and supplements thereto in effect on the date of the Invitation to Bid except where a particular issue is indicated.

2.5 Precedence of Contract Documents: Except as provided by Paragraph 2.1 of this Article, the Construction Contract governs over other Contract Documents, except that a Change Order governs over the Contract and previously issued Change Orders. The Contract Conditions govern over the General Conditions.

2.6 Explanations: Should it appear that the Work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply to the Owner for such explanation provided as part of the Contract. Disputes over questions of fact which are not settled by agreement shall be decided by Owner. Such decision thereon will be final, subject to remedies under Article 35, DISPUTES.

2.7 Should there be any conflict, detailed instructions govern over general instructions, detail drawings have precedence over small scale drawings, and dimensions have precedence over scale.

2.8 Omissions and Misdescriptions: The Contractor shall carefully study and compare all drawings, specifications, Contract Documents and other instructions; shall verify all dimensions on the Contract Drawings before laying out the Work; shall notify the Project Manager of all errors, inconsistencies or omissions which he may discover; and obtain specific instructions in writing before proceeding with the Work. The Contractor shall not take advantage of apparent errors or omissions which may be found in the Contract Documents, but the Project Manager shall be entitled to make such corrections therein and interpretations thereof as he may deem necessary for the fulfillment of their intent. The Contractor shall be responsible for all errors in construction which could have been avoided by such examination and notification, subject to remedies under Article 35, Disputes.

ARTICLE 3
ENTITY OF CONTRACTOR

3.1 If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder.

ARTICLE 4
LIABILITY AND INDEMNIFICATION

4.1 It is agreed that the Contractor assumes responsibility and liability for damages, loss or injury of any kind or nature whatever to persons or property caused by or resulting from or in connection with any act, action, neglect, omission, or failure to act when under a duty to act on the part of the Contractor or any of his officers, agents, employees, or subcontractors in his or their performance of the Work. The Contractor shall indemnify and hold harmless the Government, the State, the Owner and the Project Manager and their members, officers, agents, or employees from claims, losses, damages, charges, costs, or expenses, including attorney's fees, whether direct or indirect, to which they or any of them may be put or subjected to by reason of any such loss or injury.

ARTICLE 5
PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES, AND IMPROVEMENTS AND LAND SURVEY MONUMENTS

5.1 A Contractor shall preserve and protect existing vegetation such as trees, shrubs, and grass on or adjacent to the work site which are not indicated to be removed and which do not unreasonably interfere with the construction work and he shall replace in kind any vegetation, shrubs and grass damaged by him at his own expense.

5.2 The Contractor shall protect from damage all utilities, structures, or improvements on or near the site of the Work and shall repair or restore any damage to such utilities, structures, or improvements resulting from failure to comply with the requirements of the Contract or the failure to exercise reasonable care in the performance of the Work. If the Contractor fails or refuses to repair any such damage promptly, the Owner may have the necessary work performed and charge the cost thereof to the Contractor.

5.3 All land survey monuments shall be protected from any damage by any work and/or shall be replaced by a licensed land surveyor licensed in the state of Colorado at the contractor’s expense before final acceptance is issued.

ARTICLE 6
CONTRACTUAL RELATIONSHIPS

6.1 No contractual relationship will be recognized under the Contract other than the contractual relationship between the Owner and the Contractor.

ARTICLE 7
ASSIGNMENT

7.1 The performance of the Work under the Contract shall not be assigned except upon written consent of the Owner. Consent will not be given to any proposed assignment which would relieve the Contractor or his surety of their responsibilities under the Contract. The Contractor shall not assign any monies due or to become due to him under the Contract without the previous written consent of the Owner.

ARTICLE 8
SUBCONTRACTORS

8.1 Unless otherwise required by the Contract Documents or the Bidding Documents, the Contractor, as soon as practicable after the award of the Contract, not to exceed 3 days, shall furnish to the Owner and the Project Manager, in writing the names of the subcontractors, 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. The Project Manager will promptly reply to the Contractor in writing whether or not the Owner or the Project Manager, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Project Manager to reply promptly shall constitute notice of no reasonable objections.

ARTICLE 9
CONDITIONS AFFECTING THE WORK

9.1 The Contractor shall be responsible for taking steps reasonably necessary to ascertain the nature and location of the Work, and the general and local conditions which can affect the Work or the cost thereof. Failure by the Contractor to do so will not relieve him from responsibility for successfully performing work without additional expense to the Owner. The Owner will not be responsible for any understanding or representations concerning conditions, unless such understanding or representations are expressly stated in the Contract.

ARTICLE 10
GRATUITIES AND CONFLICTS OF INTEREST

10.1 The Owner may, by written notice to the Contractor terminate the right of the Contractor to proceed under this Contract if it is found that gratuities (in the form of entertainment, gifts, or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor or any director, officer or employee of the Owner or its Project Manager with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performance of such contract. The Owner's determination shall be final subject only to judicial review.

10.2 In the event this Contract is terminated for any reason, the Owner shall be entitled to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the Contract by the Contractor.

10.3 No member, officer or employee of the Owner or of a local public body during his tenure or for one year thereafter shall have any interest, direct or indirect, in this Contract or the proceeds thereof. "Local public body" means the State, any political subdivision of the State, or any agency of the State or any political subdivision thereof.

10.4 The rights and remedies of the Owner provided in this article are not exclusive and are in addition to any other rights and remedies provided by law or under the Contract.

ARTICLE 11
WARRANTY OF WORK

11.1 Except where longer periods of warranty are indicated for certain items, the Contractor warrants work under the Contract to be free from faulty materials and workmanship for a period of not less than two years from date of Final Acceptance, which two year period shall be covered by the Performance Bond and Payment Bond as specified in this Contract. The Contractor shall immediately remedy, repair, or replace, without cost to the Owner and to the entire satisfaction of the Owner, defects, damages, or imperfections due to faulty materials or workmanship appearing in said work within said period of not less than two years. Remedied work shall carry the same warranty as the original work starting with the date of acceptance of the replacement or repair. Payment to the Contractor will not relieve him of any obligation under this Contract.

11.2 The Contractor, at no additional expense to the Owner, shall also remedy damage to equipment, the site, or the building or the contents thereof which is the result of any failure or defect in the Work, and restore any work damaged in fulfilling the requirements of the Contract. Should the Contractor fail to remedy any such failure or defect within a reasonable time but no longer than ten (10) days after receipt of notice thereof, the Owner will have the right to replace, repair, or otherwise remedy such failure or defect at the Contractor's expense.

11.3 Subcontractors', manufacturers', and suppliers' warranties and guarantees, expressed or implied, respecting any part of the Work and any material used therein shall be deemed obtained and shall be enforced by the Contractor for the Benefit of the Owner without the necessity of separate transfer or assignment thereof.

11.4 The rights and remedies of the Owner provided in this Article are in addition to and do not limit any rights and remedies afforded by the Contract or by law.

ARTICLE 12
MATERIAL

12.1 Unless otherwise indicated in this Contract, equipment, material and products incorporated in the Work covered by this Contract shall be new and of the grade specified in the Contract for the purpose intended. Unless otherwise specifically indicated, reference to equipment, material, product or patented process by trade names, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition, and the Contractor may, at his option, use any equipment, material, article, or process which is equivalent to that named, subject to the requirements of Paragraph 12.2 of this Article.

12.2 Within the scope of his authority, the Project Manager shall be the sole judge of the quality and suitability of proposed alternative equipment, material, article or process. The burden of proving the quality and suitability of the alternative shall be upon the Contractor. Information required by the Project Manager in judging an alternative shall be submitted for approval by the Contractor at the Contractor's expense prior to installation.

12.3 Where use of an alternative material involves redesign of or changes to other parts of the Work, the cost and the time required to affect such redesign or change will be considered in evaluating the suitability of the alternative material. Redesign and changes in other parts of the Work shall be at the Contractor's expense.

12.4 No action relating to the approval of alternative materials will be taken by the Project Manager until the request for substitution is made in writing by the Contractor accompanied by complete data as to the quality and suitability of the materials proposed. Such request shall be made in ample time to permit approval without delaying the Work.

12.5 Disposal of material outside the Work Site: The Contractor shall make his own arrangements for legally disposing of waste and excess materials outside the Work Site and he shall pay costs therefore.

12.6 Property rights in materials: The Contractor shall have no property right in materials after they have been attached or affixed to the Work or the soil, or after payment has been made by the Owner to the Contractor for materials delivered to the site of the Work, or stored subject to or under the control of the Owner as provided in Article 24, PROGRESS PAYMENTS.

ARTICLE 13
WORKMANSHIP AND UNAUTHORIZED WORK

13.1 Work under this Contract shall be performed in a skillful and workmanlike manner. The Project Manager may, in writing, require the Contractor to remove from the work any employee the Project Manager determines incompetent, careless or otherwise objectionable.

13.2 Unauthorized work: Work performed beyond the lines and grades shown on the Contract Drawings, approved Working and Shop Drawings and Extra work done without written authorization, will be considered as unauthorized work, and the Contractor will receive no compensation therefore. If required by the Owner, unauthorized work shall be remedied, removed, or replaced by the Contractor at the Contractor's expense. Upon failure of the Contractor to remedy, remove or replace unauthorized work, the Owner may take courses of action set out in Paragraph 15.3 of Article 15, INSPECTION.

ARTICLE 14
SUPERINTENDENCE BY CONTRACTOR

14.1 The Contractor shall give his personal superintendence to the Work or have a competent foreman or superintendent, hereinafter designated his authorized representative, satisfactory to the Owner, on the Work Site at all times during progress, with authority to act for him. There shall be provided at all times, a reasonable method of communication directly to the Contractor if the Owner experiences any problems or difficulties with the Superintendent.

ARTICLE 15
INSPECTION/TESTING

15.1 Work (which term includes but is not restricted to materials, workmanship and manufacture and fabrication of components) will be subject to inspection and test by the Project Manager at all reasonable times and at all places prior to acceptance. Such inspection and test is for the sole benefit of the Owner and shall not relieve the Contractor of the responsibility of providing quality control measures to assure that the Work strictly complies with the Contract Documents. No inspection or test by the Project Manager shall be construed as constituting or implying acceptance. Inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the Owner after acceptance of the completed Work.

15.2 The Contractor shall, at his own expense, replace any material or correct any workmanship found not to conform to the contract requirements, unless the Owner consents in writing to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises at his own expense.

15.3 If the Contractor does not promptly replace rejected material or correct the rejected workmanship, the Owner (1) may, by separate contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with Article 38, TERMINATION FOR DEFAULT--DAMAGES FOR DELAY--TIME EXTENSIONS.

15.4 The Contractor shall give the Project Manager ample notification of inspections and tests, and the Project Manager will perform, except as otherwise specifically provided, said inspections and tests in such manner as not to unnecessarily delay the work. The Owner will have the right to charge to the Contractor any additional cost of inspection or test or when reinspection or retest is necessitated by prior rejection.

15.5 Should it be considered necessary, before acceptance of the entire work, to make an examination of work already completed by removing or tearing out same, the Contractor shall on request promptly furnish all necessary facilities, labor and material therefore. If such work is found to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the Contract, an equitable adjustment will be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction. If completion for the work has been delayed thereby, he will, in addition, be granted an equitable extension of time.

15.6 The Project Manager shall have access to the work during its construction. Work done and materials provided will be subject to the Project Manager's on-site and off-site inspection and approval. When work is to be performed during hours other than during his normal schedule, the Contractor shall so advise the Project Manager not less than 24 hours in advance. The Contractor shall provide access to the work for authorized representatives of the Owner.

15.7 The Project Manager's inspection and approval of work or materials shall not relieve the Contractor of any of his obligations to fulfill the requirements of the Contract Documents. Work and materials not meeting the requirements of the Contract shall not be incorporated in the Work. Unsuitable or substandard work or materials may be rejected by the Project Manager, notwithstanding that such work or materials may have been previously inspected by the Project Manager, or that payment therefore has been included in a progress payment.

ARTICLE 16
PERMITS AND COMPLIANCE WITH LAWS

16.1 The Contractor shall without additional expense to the Owner be responsible for obtaining necessary licenses and permits and for complying with applicable Federal, State, County and Municipal laws, codes and regulations in connection with the commencement of the work. The Contractor is required to supply the Project Manager with complete and final copies of license and permits including final inspection documentation. The Contractor shall be required to obtain permits at his own expense. The Contractor shall protect, indemnify and hold harmless the Owner and the Project Manager and their members, officers, agents and employees against claims and liabilities arising from or based on the violation of requirements of law or permits whether by the Contractor, his employees, agents or subcontractors.

ARTICLE 17
RIGHTS IN LAND IMPROVEMENT

17.1 The Contractor shall make no arrangements with any person to permit occupancy or use of any land, structure or building within the work site for any purpose whatsoever, either with or without compensation, in conflict with any agreement between the Owner and any owner, former owner or tenant of such land, structure or building. The Contractor shall not occupy Owner property outside the work site without obtaining prior written approval from the Owner.

ARTICLE 18
DAMAGE TO THE WORK AND RESPONSIBILITY FOR MATERIALS

18.1 The Contractor shall be responsible for materials delivered and work performed until completion and final acceptance of the entire construction thereof.

18.2 The Contractor shall bear the risk of injury, loss or damage to any and all parts of the work for whatever cause, whether arising from the execution or from the non-execution of work. The Contractor shall rebuild, repair or restore work and materials which have been damaged or destroyed from any cause before completion and acceptance of the work and shall bear the expense thereof. The Contractor shall provide security and drainage and erect temporary structures as necessary to protect the work and materials from damage.

18.3 The Contractor shall be responsible for materials not delivered to the site for which any progress payment has been made to the same extent as if the materials were so delivered.

ARTICLE 19
EMERGENCIES

19.1 In an emergency affecting the safety of life, the work, or adjacent property, the Contractor shall notify the Project Manager as early as possible that an emergency exists. In the meantime, without special instruction from the Project Manager as to the manner of dealing with the emergency, the Contractor shall act at his own discretion to prevent such threatened loss or injury. As emergency work proceeds, the Project Manager may issue instruction, which the Contractor shall follow. The amount of compensation to which Contractor is entitled on account of emergency work will be determined in accordance with Article 28, CHANGES.

ARTICLE 20
NOTICE TO PROCEED

20.1 The Owner will issue a Notice to Proceed to the Contractor within 15 days after the Contractor has executed the Contract and has delivered the specified bonds and Certificates of Insurance as required by the Owner. Except as specifically authorized in writing by the Owner, the Contractor is not authorized to perform work under the Contract until the effective date of the Notice to Proceed. Within 10 days after the effective date of such Notice to Proceed, the Contractor shall commence work and shall diligently prosecute the Work to completion within the time limits specified. These time periods may be modified by mutual written agreement of both the Owner and Contractor.

ARTICLE 21
PROGRESS SCHEDULE AND REQUIREMENTS FOR MAINTAINING PROGRESS

21.1 The Contractor shall, at the pre-construction meeting, prepare and submit to the Project Manager for approval a practicable schedule, showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The Contractor shall update the chart with the actual progress monthly or at such intervals as directed by the Project Manager, and shall immediately deliver three copies thereof. If the Contractor fails to submit a progress schedule within the time herein prescribed, the Project Manager may withhold approval of progress payment estimates until such time as the Contractor submits the required progress schedule.

21.2 The Contractor shall prosecute the work in accordance with the latest approved Progress Schedule. In the event, that the progress of items along the critical path is delayed, the Contractor shall revise his planning to include additional forces, equipment, shifts or hours as necessary to meet the time or times of completion specified in this Contract. Additional costs resulting therefrom will be borne by the Contractor. The Contractor shall make such changes when his progress at any check period does not meet at least one of the following two tests:

21.2.1 The percentage of dollar value of completed work with respect to the total amount of the Contract is within ten percentage points of the percentage of the Contract time elapsed, or;

21.2.2 The percentage of dollar value of completed work is within ten percentage points of the dollar value which should have been performed according to the Contractors own network analysis previously approved by the Project Manager.

21.3 Failure of the Contractor to comply with the requirements under this provision will be grounds for determination that the Contractor is not prosecuting the work with such diligence as will ensure completion within the time of completion specified in this Contract. Upon such determination, the Owner may terminate the Contractor's right to proceed with the work, or any separate part thereof, in accordance with Article 38, TERMINATION FOR DEFAULT--DAMAGES FOR DELAY--TIME EXTENSIONS of these General Conditions.

ARTICLE 22
SUSPENSION OF WORK

22.1 The Owner reserves the right to suspend, delay or interrupt execution of the whole or any part of the work for such period of time as he may determine to be appropriate for his convenience.

22.2 If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Owner in the administration of this Contract or by his failure to act within the time specified in this Contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this Contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed or interrupted by any other cause, including the fault or negligence of the Contractor or (2) for which an equitable adjustment is provided for or excluded under any other provision of this Contract.

22.3 No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Owner in writing of the act of failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the Contract.

ARTICLE 23
FINAL INSPECTION AND ACCEPTANCE

23.1 Final inspection: When the Contractor notifies the Project Manager in writing that the work has been completed, the Owner will make the final inspection for the purpose of ascertaining that the work has been completed in accordance with the requirements of the Contract Documents.

23.2 Acceptance of the work: When the Owner has made the final inspection and has determined that the work has been completed in accordance with the Contract Documents, the Owner will accept the work. Immediately upon and after Final Acceptance, the Contractor will be relieved of the duty of maintaining and protecting the work as a whole. The Contractor will be relieved of his responsibility for injury to persons or property or damage to the work which occurs after Final Acceptance, except that the Contractor will not be relieved of his responsibility for injury to persons or property arising from his duties and obligations under Article 4, LIABILITY AND INDEMNIFICATION.

23.3 Final Acceptance shall be final and conclusive, and no further performance of work shall be required except with regards to latent defects, fraud or such gross mistakes as may amount to fraud, or with regard to the Owner's rights under any warranty or guarantee. All punch list items must be completed and building permits provided to Owner before final acceptance is issued.

23.4 Date of Substantial Completion for all Work shall be within the number of calendar days bid by the Contractor on the Bid proposal.

23.5 Date of Final Completion shall be the date specified on the Certificate of Final Completion.

ARTICLE 24
PROGRESS PAYMENTS

24.1 The Owner will make progress payments monthly as the work proceeds, on estimates approved by the Project Manager. Payment will be made within 15 days after progress estimates are approved by the Project Manager and Department Head. On request of the Project Manager, the Contractor shall furnish a detailed estimate of the total contract price each showing the amount included therein for each principal category of the work, to provide a basis for determining the amount of progress payments. In the preparation of estimates, the Owner, at its sole discretion, may authorize material delivered on the site and preparatory work done to be taken into consideration which is to be submitted at the pre-construction meeting.

24.2 In making such progress payments, five percent of the estimated amount will be retained until Final Acceptance of the Contract work; in addition, the Owner shall retain from all Progress payments an amount equal to all statutory claims filed against the Contractor. Also, whenever the work is substantially complete, the Owner if it considers the amount retained to be in excess of the amount adequate for its protection, may release to the Contractor all or a portion of such excess amount. Substantial completion as used in this Paragraph 24.2 shall mean the following: Substantial completion of the work or a portion thereof shall be when, as determined by both the Project Manager and the Owner, the construction is sufficiently completed in accordance with the Contract Documents and any modification thereto as provided in the Contract to permit the Owner to occupy the work or a portion of the work for the use which it is intended.

24.3 Material and work covered by progress payments shall become the sole property of the Owner. This provision shall not be construed as relieving the Contractor from the sole responsibility for material and work upon which payments have been made, the restoration of damaged work or as waiving the right of the Owner to require the fulfillment of the terms of the Contract.

ARTICLE 25
PAYMENT TO SUBCONTRACTORS

25.1 The Contractor shall pay all subcontractors for and on account of work performed by such subcontractors in accordance with the terms of their respective subcontract. Prior to final payment an unconditional lien waiver release form will be required by the Owner.

ARTICLE 26
PAYMENT OF TAXES

26.1 The price or prices for the work will include full compensation for taxes that the Contractor is or may be required to pay. The Contractor shall bear the risk of any added or increased taxes occurring during the prosecution of the work. A change in taxes shall under no circumstances entitle the Contractor to an adjustment under the Contract.

26.2 The Contractor's attention is directed to the fact that this project is exempt from payment of City of Greeley Sales and Use taxes, and such taxes must not be included in the amount of bid.

26.3 The Contractor shall pay all sales and use taxes required to be paid, shall maintain such records in respect of his work, which shall be separate and distinct from all other records maintained by the Contractor and shall be available for inspection by the Owner at any and all reasonable times, and shall furnish the Owner with such data, as may be necessary to enable the Owner to obtain any refunds of such taxes which may be available to the Owner under the laws, ordinances, rules or regulations applicable to such taxes. The Contractor shall require each of his subcontractors to pay all sales and use taxes required to be paid and to maintain such records and furnish the Contractor with such data as may be necessary to enable the Owner to obtain a refund of the taxes paid by such subcontractors.

ARTICLE 27
FINAL PAYMENT

27.1 After the Work has been accepted by the Owner, subject to the provisions of Article 11, WARRANTY OF WORK and Article 23, FINAL INSPECTION AND ACCEPTANCE of these General Conditions, a final payment due the Contractor under this Contract shall be paid upon the presentation of properly executed voucher and after the Contractor shall have furnished the Owner with a release of all claims against the Owner arising by virtue of this Contract, other than claims in stated amounts as may be specifically excepted by the Contractor from the operation of the release. If the Contractor's claim to amounts payable under the contract has been assigned under the assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), a release may also be required of the assignee.

27.2 If any mechanic's or material man’s lien or notice of claim of such lien is filed or recorded against the project for labor, materials, supplies or equipment claimed to have been furnished to or incorporated into the Work, or for other alleged contribution thereto, the Owner will have the right to retain from payments otherwise due the Contractor, in addition to other amounts properly withheld under this Article or under other provisions of the Contract, an amount equal to such lien or liens claimed.

27.3 Further, the Owner will have the right to retain from final payment an amount equal to all liquidated damages claimed by the Owner.

27.4 Retainages held by the Owner for any state or federal statutory claim arising out of the project will be held by the Owner in addition to all retainages held under the provisions of the Contract.

ARTICLE 28
CHANGES

28.1 The Owner may, at any time, without notice to the sureties, by written notice or order designated or indicated to be a Change Notice or Change Order, make any change in the work within the general scope of the Contract in accordance with all of the Owner's processes and procedures whether or not set forth herein, including but not limited to changes:

28.1.1 In the Contract (including drawings and designs);

28.1.2 In the method or manner of performance of the work;

28.1.3 In Owner furnished facilities, equipment, materials, services, or site; or

28.1.4 Directing acceleration in performance of the work.

28.2 Any other order (which terms as used in Paragraph 28.2 of this Article shall include direction, instruction, interpretation, or determination) from the Project Manager, which causes any change, shall be treated as a Change Notice under this Article provided that the Contractor gives the Project Manager written notice stating the date, circumstances and source of the order, and that the Contractor regards the order as a Change Notice. The Contractor shall notify the Project Manager when he receives direction, instruction, interpretation or determination from any source which may cause any change in the work. Such notification shall be given to the Project Manager before the Contractor acts on said direction, instruction, interpretation or determination.

28.3 Except as herein provided, no order, statement, or conduct of the Architect/ Project Manager or any other person shall be treated as a change under this Article or entitle the Contractor to an equitable adjustment hereunder.

28.4 If any change under this Article causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the Work under this Contract, whether or not changed by an order, an equitable adjustment will be made and the Contract modified accordingly by a written Change Order; provided, however, that except for claims based on errors in the Contract Documents, no claim for change under Paragraph 28.2 of this Article will be allowed for costs incurred more than 20 days before the Contractor gives written notice as herein required; and provided that in the case of errors in the Contract Documents for which the Owner is responsible, the adjustment will include increased cost, reasonably incurred by the Contractor in attempting to comply with such errors in the Contract Documents. No claim shall be made for the type of errors in the Contract Documents which are set forth in Article 2, INTERPRETATION.

28.5 If the Contractor intends to assert a claim for an equitable adjustment under this Article, he shall, within 30 days after receipt of a written Change Order under Paragraph 28.1 of this Article or the furnishing of a written notice under Paragraph 28.2 of this Article, submit to the Project Manager a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended in writing by the Owner. The statement of claim hereunder may be included in the notice under Paragraph 28.2 of this Article.

28.6 No claim by the Contractor for an equitable adjustment hereunder will be allowed unless asserted as described in Paragraphs 28.4 and 28.5 above.

28.7 Payment will not be made under the provisions of this Article for such work or materials which are so required to be done or furnished in or about or for the performance of the Work and which are not mentioned, specified or indicated or otherwise provided for in this Contract or in the Contract Documents so far as such work or materials may be, in the opinion of the Project Manager, susceptible of classification under or reasonably inferred to be included in the Bid Items of the Bid Form.

28.8 In case the Contractor is ordered to perform work under this Article for which payments are not determined under Paragraph 28.7 of this Article, which in the opinion of the Owner it is impracticable to have performed by the Contractor's own employees, the Contractor will, subject to the approval of the Owner, be paid the actual cost to him of such work and, in addition thereto, a negotiated amount to cover the Contractor's superintendence, administration and other overhead expenses. The terms and conditions of any subcontract which the Contractor may propose to enter into in connection with work under the provision of this Article shall be subject to the written approval of the Project Manager before such subcontract is made. The contractor shall be responsible for the work of the subcontractors and shall be liable therefore as if he had performed the work directly.

28.9 In cases other than those described in Paragraphs 28.7 and 28.8 above, the Owner and the Contractor (on his own behalf and on behalf of his subcontractors) shall endeavor to negotiate a reasonable contract price and line adjustment in a Change Order on terms appropriate to the changed work. The Contractor will be required to submit a sufficiently detailed price proposal supported with sufficient documentation that (1) the Owner can determine that the proposal reflects all impacts on the Contract from work additions, deletions and modifications shown in the Change Notice being priced, (2) the proposed prices are set out in such a way that their reasonableness can be evaluated against prices based on adequate price competition, bid unit prices, established catalog or market prices of commercial items sold in substantial quantities to the general public, prices set by law or regulation, recognized published price lists and indices, independently developed cost estimates and other appropriate price comparisons, and (3) contract provisions relating to Contract changes costing over $100,000.00 are complied with. If any prices or other aspects are conditional, such as on firm orders being made by a certain date or the occurrence or nonoccurrence of an event, the Contractor shall identify these aspects in his proposal. A negotiated Change Order shall set out prices, scheduling requirements, time extensions and all costs of any nature arising out of the issuance of a Change Notice except for those cost and time aspects explicitly reserved on the face of the Change Order. Except for these explicit reservations, the execution of a Change Order by both parties will be deemed accord and satisfaction of all claims of any nature arising from the issuance of the Change Notice negotiated.

28.10 In the event the Contractor and the Owner are unable to agree upon the Contractor's entitlement to an equitable adjustment or upon the amount thereof, or in the event that it is in the best interest of the Owner to have the Work proceed pending negotiation of amount of an equitable adjustment, the Owner may direct the Contractor to perform the Work in accordance with the Owner order, direction, instruction, interpretation, or determination, with any Contract price adjustments and progress payments for the Work to be determined on a Force Account basis in accordance with Article 36. The Contractor shall continue diligently to perform the Contract in accordance with the Owner's order, direction, instruction, interpretation, or determination during negotiations with respect to the Contractor's entitlement to an equitable adjustment hereunder or to the amount of any Contract price adjustment or time extension. The Contractor and the Owner may agree on certain aspects of an equitable adjustment and take those aspects out of operation of Force Account provisions. In the

event a mutually agreeable equitable adjustment cannot be made, the Contractor shall continue diligently to perform the orders as he proceeds with his remedies under Article 35, DISPUTES, and shall continue to receive compensation on a Force Account basis.

28.11 For contract changes, the Owner, State and Government or their representative shall have the audit and inspection rights as described below:

28.11.1 Where the agreed payment method for any contract changes is to be by cost reimbursement, time and material, labor hours or any combination thereof, the Contractor shall maintain and the Owner or its representatives shall have the right to examine books, records, documents and other evidence and accounting principles and practices sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of the contract changes under this sub article.

28.11.2 Contract changes exceeding $100,000.00 in cost: For submitted cost and pricing data in connection with pricing a contract modification referred to in this sub article, unless such pricing is based on bid unit prices, adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the public, or prices set by law or regulation, the Owner or his representatives and the Comptroller General of the United States and his representatives who are employees of the United States shall have the right to examine all books, records, documents and other data of the Contractor related to the negotiation of or performance under the contract Change Orders for the purpose of evaluating the accuracy, completeness and currency of the cost or pricing data submitted. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used therein.

28.11.3 Contract changes exceeding $10,000.00 but not $100,000.00 in cost: The Owner or his representatives prior to the execution of any contract Change Order in this sub article or for a period of twelve months after execution shall, unless such pricing is based on bid unit prices, adequate price competition, established catalog of market prices or commercial items sold in substantial quantities to the public, or prices set by law or regulation, have the right to examine all books, records, documents, and other data of the Contractor relating to the negotiation and contract Change Order for the purpose of evaluating the accuracy, completeness, and currency of the data is submitted upon which negotiation is or has been based. To the extent the examination reveals inaccurate, incomplete or noncurrent data, the Project Manager may renegotiate the contract Change Order price based on such data.

28.11.4 Contract changes of less than $10,000.00 in cost: The Owner may require from the Contractor appropriate documentation to support the prices being negotiated for contract changes under this sub article, and may refuse to complete negotiations until satisfactory documentation is submitted.

28.11.5 Availability: The materials described in Paragraphs 28.11.1 and 28.11.2 above shall be available at the office of the Contractor at all reasonable times for inspection, audit or reproduction until three years from the date of final payment under this Contract and for records which relate to Article 35, DISPUTES, or litigations or the settlement of claims arising out of the negotiation or the performance of contract changes over 100,000.00, records shall be made available until such litigations or claims have been resolved.

28.11.6 The Contractor shall insert a clause containing all the provisions in this Paragraph 28.11, including this subparagraph 28.11.6, in all subcontracts hereunder except altered as necessary for proper identification of the contracting parties and Owner.

28.11.7 For the purposes of Paragraph 28.11 of this Article, costs shall include liquidated damages which would be assessed if extension(s) of time were not granted by contract Change Order.

28.11.8 The requirements of this audits and records article are in addition to other audit, inspection and record keeping provisions elsewhere in the Contract Documents.

28.12 Changes involving aggregate increases and decreases in excess of $100,000.00 shall be subject to the following:

28.12.1 A change involves aggregate increases and decreases in excess of $100,000.00 if the total value of work affected, without regard to the arithmetic sign, exceeds this amount; for example, a change order adding work in the amount of $75,000.00 and deleting work in the amount of $50,000.00 will be considered to involve aggregate increases and decreases of $125,000.00.

28.12.2 The Contractor shall submit in support of all items not based upon unit prices or lump sum prices contained in the Contract or upon the established prices at which commercial items are sold in substantial quantities to the public, statements by his vendors that the prices charged the Contractor are not greater than the prices charged by the respective vendors to their most favored customers for the same items in similar quantities.

28.12.3 Price reductions for Defective Cost or Pricing Data--Pricing Adjustments: If any price, including profit and fee, negotiated in connection with any price adjustment was increased by any significant sums because:

28.12.3.1 The Contractor furnished cost or pricing data which were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data;

28.12.3.2 A subcontractor, pursuant to Paragraph 28.13 of this Article entitled Subcontractor Cost or Pricing Data--Pricing Adjustments or any subcontract provision therein required, furnished costs or pricing data which were not complete, accurate, and current as certified in the Subcontractor's Certificate of Current Cost or Pricing Data;

28.12.3.3 The subcontractor or his prospective subcontractor furnished cost or pricing data which were required to be complete, accurate, and current and to be submitted to support a subcontract cost estimate furnished by the Contractor but which were not complete, accurate, and current as of the date certified in the Contractor's Certificate of Current Cost or Pricing Data; or

28.12.3.4 The Contractor or a subcontractor or his prospective subcontractor furnished any data, not within subparagraphs 28.12.3.1, 28.12.3.2, or 28.12.3.3 above, which were not complete, accurate, and current as submitted, the price shall be reduced accordingly and the Contract shall be modified in writing as may be necessary to reflect such reduction. Any reduction in the Contract Price due to defective subcontract data of a prospective subcontractor, when the subcontract was not subsequently awarded to such subcontractor, will be limited to the amount (plus applicable overhead

and profit markup) by which the actual subcontract, or actual cost to the Contractor if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor, provided the actual subcontract price was not affected by defective cost or pricing data.

28.13 Subcontract Cost of Pricing Data-- Pricing Adjustment:

28.13.1 When negotiating a change involving increases or decreases in excess of $100,000.00, the Contractor shall require subcontractors hereunder to submit cost or pricing data under the following circumstances. Prior to award of any cost-reimbursement type, incentive or price redeterminable subcontract;

28.13.1.2 Prior to the award of any subcontract the price of which is expected to exceed $100,000.00;

28.13.1.3 Prior to the pricing of any subcontract change modifications for which the price is expected to exceed $100,000.00, except in the case of 28.13.1.2 and 28.13.1.3 where the price is based on adequate price competition, established catalog or market prices, commercial items sold in substantial quantities to the general public, or prices set by law or regulation.

28.13.2 The Contractor shall require subcontractors to certify to the best of their knowledge and belief that the cost and pricing data submitted under subparagraph 28.13.1 of this Article are accurate, complete, and current as of the date of execution, which date shall be as close as possible to the date of agreement on the negotiated price of the contract Change Order.

28.13.3 The Contractor shall insert the substance of Paragraph 28.13 of this Article, including this subparagraph 28.13.3, in each subcontract hereunder which exceeds $100,000.00.

ARTICLE 29
PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

29.1 The Contractor shall furnish a Performance Bond in the amount equal to one hundred percent (100%) of the Contract Sum as security for the faithful performance of this Contract and also a Labor and Material Payment Bond in an amount not less than one hundred percent (100%) of the Contract Sum or in a penal sum not less than that prescribed by State, or local law, as security for the payment of all persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract. The Performance Bond and the Labor and Material Payment Bond may be in one or in separate instruments in accordance with local law and shall be delivered to the Owner not later than the date of execution of the Contract.

29.2 Performance Bonds, Labor and Material Payment Bonds and other such sureties shall provide that the surety and the Contractor are both jointly and severally liable and obligated under respective Bond or other surety agreement and shall incorporate acknowledge of applicable provisions of state law into all documents furnished in connection with the project.

ARTICLE 30
DIFFERING SITE CONDITIONS

30.1 The Contractor shall within 10 days of actual or constructive notice of a differing site condition, promptly, and before such conditions are disturbed, notify the Project Manager in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in

the Contract Documents, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract. The Project Manager will promptly investigate the conditions, and if such conditions materially differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under the Contract, whether or not changed as a result of such conditions, an equitable adjustment may be made subject to Owner's approval and the Contract modified in writing accordingly.

30.2 No claim of the Contractor under this Article will be allowed unless the Contractor has given the notice required in Paragraph 30.1 of this Article.

30.3 No claim by the Contractor for an equitable adjustment hereunder will be allowed if asserted after final payment under this Contract.

ARTICLE 31
CONTRACTOR PROPOSALS

31.1 The Contractor may at any time submit to the Project Manager for his review proposed modifications to the Contract Documents, supported by a cost/price proposal. Upon acceptance of the proposed modifications by the Owner, a Change Order will be issued. Denial of the proposed modification will neither provide the Contractor with any basis for claim for damages nor release the Contractor from contractual responsibilities. An equitable adjustment in the form of a contract price reduction will be made if the change results in a reduction of the cost of performance and the Contractor will not be entitled to share in said savings unless the proposal is made under Paragraph 31.2 of this Article. Except as provided in Paragraph 31.2 of this Article, the Contractor will not be compensated for any direct, incidental or collateral benefits or savings the Owner receives as a result of the proposal.

31.2 Value Engineering Change Proposals: The Contractor may submit to the Project Manager one or more cost reduction proposals for changing the Contract requirements. The Proposals shall be based upon a sound study made by the Contractor indicating that the proposal:

31.2.1 Will result in a net reduction in the Total Contract amount;

31.2.2 Will not impair any essential function or characteristic of the Work such as safety, service life, reliability, economy of operation, ease of maintenance and necessary standardized features.

31.2.3 Will not require an unacceptable extension of the contract completion time; and

31.2.4 Will require a change in the Contract Documents and such change is not already under consideration by the Owner.

31.3 The Owner may accept in whole or in part any proposal submitted pursuant to the previous Paragraph 31.2 by issuing a Change Order which will identify the proposal on which it is based. The Change Order will provide for an equitable adjustment in the Contract Price and will revise any other affected provisions of the Contract Documents. The equitable adjustment in the Contract price will be established by determining the net savings resulting from the accepted change. The net savings resulting from the change will be shared between the Contractor and the Owner on the basis of 50 percent for the Contractor and 50 percent for the Owner and will be limited to this

contract for any one Value Engineering Change Proposal. Net savings will be determined by deducting from the estimated gross savings, the Contractor's costs of developing and implementing the proposal (including any amount attributable to a subcontractor) and the estimated amount of increased costs to the Owner resulting from the change, such as evaluation, implementation, inspection, related items, and the Owner-furnished material. Estimated gross savings will include Contractor's labor, material, equipment, overhead, profit and bond. The Contract price will be reduced by the sum of the Owner's costs and share of the net savings. For the purpose of this Article, the applicable provisions of Article 28, CHANGES, shall be used to determine the equitable adjustment to the Contract price.

31.4 The Owner will not be liable for delay in acting upon, or for failure to act upon, any proposal submitted pursuant to Paragraph 31.2 of this Article. The decision of the Owner as to the Acceptance or rejection of any such proposal under the Contract will be final. The submission of a proposal by the Contractor will not in itself affect the rights or obligations of either party under the Contract.

31.5 The Contractor shall have the right to withdraw part or all of any proposal he may make under Paragraph 31.2 of this Article at any time prior to acceptance by the Owner. Such withdrawal shall be made in writing to the Project Manager. Each such proposal shall remain valid for a period of 60 days from the date submitted. If the Contractor wishes to withdraw the proposal prior to the expiration of the 60-day period, he will be liable for the cost incurred by the Owner in reviewing the proposal.

31.6 The Contractor shall specifically identify any proposals under Paragraph 31.2 of this Article with the heading "Value Engineering Change Proposal", or the proposal will be considered as made under Paragraph 31.1 of this Article.

31.7 The Contractor, in connection with each proposal he makes for a Contract Change Notice under this Article shall furnish the following information:

31.7.1 a description of the difference between the existing Contract requirement and the proposed change, and the comparative advantages and disadvantages of each, justification when a function or characteristic of an item is being altered, and the effect of the change on the performance of the end item;

31.7.2 an analysis and itemization of the requirements of the Contract which must be changed if the Value Engineering Change Proposal is accepted and a recommendation as to how to make each such change (e.g., a suggested specification revision);

31.7.3 a separate detailed cost estimate for both the existing Contract requirement and the proposed change to provide an estimate of the reduction in costs, if any, that will result from acceptance of the Value Engineering Change Proposal taking into account the costs of development and implementation by the Contractor;

31.7.4 a prediction of any effects the proposed change would have on collateral costs to the Owner such Government-furnished property costs, costs of related items, and costs of maintenance and operation;

31.7.5 a statement of the time by which a contract modification accepting the Value Engineering Change Proposal must be issued so as to obtain the maximum cost reduction, noting any effect on the contract completion time or delivery schedule; and

31.7.6 identification of any previous submission of the Value Engineering Change Proposal to the Owner, including the dates submitted, the numbers of contracts involved, and the previous actions by the Owner, if known.

ARTICLE 32
EXTENSION OF TIME

32.1 In addition to the provisions stated in Article 38, the Contractor will be granted an extension of time and will not be assessed liquidated damages for any portion of the delay in completion of the Work, performed under the latest approved progress schedule, arising from acts of God, war, fires, floods, epidemics, quarantine restrictions, freight embargoes, or weather more severe than the norm, provided that the aforesaid causes were not foreseeable and did not result from the fault or negligence of the Contractor, and provided further that the Contractor has taken reasonable precautions to prevent further delays owing to such causes, and has notified the Project Manager in writing of the cause or causes of delay within five days from the beginning of any such delay. Within 15 days after the end of the delay, the Contractor shall furnish the Project Manager with detailed information concerning the circumstances of the delay, the number of days actually delayed, the appropriate Contract Document references, and the measures to be taken to prevent or minimize the delay. Failure to submit such information will be sufficient cause for denying the delay claims. The Owner will ascertain the facts and the extent of the delay, and its findings thereon will be final and conclusive to provisions under Article 35, DISPUTES. The extension of time granted for these reasons shall not be the basis for additional compensation for any costs incurred during the time of delay.

32.1.1 Every effort shall be made by the Contractor to complete the project within the “Contract Time”. The “Contract Time” anticipates “Normal” weather and climate. The Contractor’s schedule must anticipate normal adverse weather delays on all weather dependent activities. The following specifies the procedure for determining time extensions for unusually severe weather. Listed below are the anticipated numbers of calendar days lost to normal adverse weather for each month.

Monthly Anticipated Calendar Days Lost to Adverse Weather Conditions

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(7)	(4)	(4)	(4)	(6)	(3)	(4)	(2)	(3)	(3)	(2)	(5)

The above schedule of anticipated adverse weather days will constitute the base line for monthly (or portion thereof) weather time evaluations. It is assumed that the work will be carried out Mondays through Fridays (holidays excepted) unless and approved construction schedule or written authorization from the Owner indicates otherwise.

An actual adverse weather day must prevent work for 50 percent or more of the Contractor’s workday. When the Contractor anticipates documenting a weather day, he/she shall first notify the Project Manager or his/her designee observing the construction to determine whether or not work can proceed or if work is delayed due to adverse weather or the effects thereof. If in agreement, the Contractor shall formally request a weather day in writing to the Owner’s Project Manager or his/her designee. The Contractor shall also notify the Owner’s Project Manager in writing or his/her

designee of any disagreement as to whether or not work could have proceeded on a given date within 2 calendar days of that date. The final decision regarding an adverse weather day will be made by the Project Manager or his/her designee.

The number of workdays delayed due to adverse weather or the effects thereof will then be converted to Calendar Days. Weekends and holidays will only count as calendar day delays if a workday delayed due to adverse weather is counted before and after the weekend/holiday. The number of calendar days of delay due to adverse weather or the impact thereof will then be compared to the monthly adverse weather schedule above. The Contract time period will then be increased by change order for the number
of calendar days that are in excess of the above schedule and a new Contract Completion day and date will be set.

32.1.2 An extension of time will not be granted for a delay caused by a shortage of materials, except Owner-furnished materials, unless the Contractor furnishes to the Project Manager documentary proof that he has diligently made every effort to obtain such materials from every known source within reasonable reach of the Work. The Contractor shall also submit proof that the inability to obtain such materials when originally planned did in fact cause a delay in final completion of the Work which could not be compensated for by revising the sequence of his operations. Only the physical shortage of material will be considered under these provisions as a cause for extension of time. No consideration will be given to any claim that material could not be obtained at reasonable, practical, or economical costs, unless it is shown to satisfaction of the Project Manager that such material could have been obtained only at exorbitant prices, entirely inconsistent with current rates taking into account the quantities involved and the usual practices in obtaining such quantities.

32.2 A Change Order will be furnished to the Contractor within a reasonable period of time after approval of a request for extension of time, specifying the number of days allowed, if any, and the new date for completion of the Work or specified portions of the Work.

32.3 See also Article 38, TERMINATION FOR DEFAULT--DAMAGES FOR DELAY--TIME EXTENSIONS.

ARTICLE 33
NOTICE OF POTENTIAL CLAIM

33.1 The Contractor will not be entitled to additional compensation otherwise payable for an act or failure to act by the Owner, the happening of any event or occurrence, or any other cause, unless he shall have given the Project Manager a written notice of potential claim therefore as specified in this Article.

33.2 The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation will or may be due, the nature of the costs involved, and insofar as possible, the amount of the potential claim. If based on an act or failure to act by the Owner, such notice shall be given to the Project Manager prior to the time that the Contractor has started performance of work giving rise to the potential claim for additional compensation. Notice shall be given within five days after the happening of the event or occurrence giving rise to the potential claim.

33.3 It is the intention of this Article that differences between the parties arising under and by virtue of the contract shall be brought to the attention of the Project Manager at the earliest possible time in order that such matters may be settled, if possible, or other appropriate action promptly taken.

33.4 The notice requirements of this Article are in addition to those required in other Articles of the General Conditions.

ARTICLE 34
SUBMITTAL OF CLAIMS

34.1 Claims filed by the Contractor shall contain sufficient detail to enable the Owner to ascertain the basis and amount of said claims. The Owner will review and evaluate the Contractor's claims. It will be the responsibility of the Contractor to furnish when requested by the Project Manager such further information and details as may be required to determine the facts or contention involved in his claims. Failure to submit such information and details will be sufficient cause for denying the Contractor's claims.

34.2 Each claim the Contractor may make for equitable adjustment on account of delay for any cause shall be accompanied by a progress schedule reflecting the effects of the delay and proposals to minimize these effects. If no progress schedule has been submitted to the Project Manager reflecting conditions prior to the delay for which relief is sought, then a progress schedule so reflecting these conditions shall be prepared and submitted with the claim.

34.3 Depending upon the grounds for relief and the nature of relief sought, additional submittals and conditions upon submitting claims may be required elsewhere in these General Conditions.

34.4 In no event shall claims be made after final payment is made under Article 27, FINAL PAYMENT, of these General Conditions.

34.5 Inasmuch as notice of potential claim requirements of Article 33, NOTICE OF POTENTIAL CLAIM, are intended to enable the Project Manager to investigate while facts are fresh and to take action to minimize or avoid a claim which might be filed thereafter, the Contractor's failure to make the required notice on time is likely to disadvantage the Owner. Therefore no claim for which a notice of potential claim is required will be considered unless the Contractor has complied with the notice of Article 33, NOTICE OF POTENTIAL CLAIM.

ARTICLE 35
DISPUTES

35.1 General: Notwithstanding any other provisions of this Contract, disputes and disagreements by and between the Owner and the Contractor shall be resolved through progressive, sequential process of negotiation, mediation, and in certain cases, arbitration. For contracts which are for $250,000 or less, amounts in dispute which are less than $10,000 shall not progress beyond negotiation and shall ultimately be decided by the Owner if not by mutual agreement. For contracts which are for more than $250,000, amounts in dispute which are less than $25,000 should not progress beyond negotiation. For all contracts, amounts in dispute greater than those amounts set forth above, but less than $100,000 shall be resolved through a sequential process of negotiation, mediation, and binding arbitration. Amounts in dispute which are $100,000 or more shall be resolved through a sequential process of negotiation, mediation, and thence either arbitration or litigation.

35.2 Negotiation: In the event of disputes, unsettled claims, questions or disagreements between the contractor and the City relating to or arising out of the provisions of this Contract, the representatives of those parties shall meet promptly in recognition of mutual interests and in a good

faith effort to resolve the dispute. Either the Contractor or the City shall arrange for this meeting at a time and place within the City of Greeley, mutually acceptable to both parties, within fifteen (15) days of notification of the dispute, unsettled claim, question, or disagreement between the parties. Seven (7) days prior to the meeting, the initiating party shall deliver to the other party, a written and complete summary of the evidence and arguments substantiating its claim. If the parties do not reach a solution within thirty (30) days after said initial meeting, then upon notice of either party to the other, the dispute, claim, question, or difference, may be referred to a mediator pursuant to Section 35.3. The parties can extend the negotiation period by mutual written agreement.

35.3 Mediation: If the dispute, claim, question, or difference is not resolved by negotiation within thirty (30) days after the initial meeting between the parties or within the extended period agreed upon, the parties agree to next request that the American Arbitration Association provide a mediator to assist the Owner and Contractor in resolving the dispute, claim, question, or difference. The rules of mediation shall be the Construction Industry Mediation Rules of the American Arbitration Association. A different mediation/dispute resolution agency may be selected for mediation upon the mutual written agreement between the parties. The dispute resolution agency shall select a qualified mediator who shall have a background in construction. The selected mediator may be rejected by the parties only for bias. The mediator shall have thirty (30) days from the time of appointment to meet with the parties and sixty (60) days from the time of the appointment to resolve the dispute unless the parties mutually consent to an extension of the sixty day deadline. All reasonable fees, costs, and expenses of the mediator, the mediator's association and the mediation agency, shall be borne equally by the parties. Each party shall bear the expense of its own counsel, experts, witnesses, and preparation and presentation of proofs at mediation.

The Contractor shall not cause a delay of work during mediation proceedings except by mutual agreement. All mediation proceedings shall be conducted in the City of Greeley, unless an alternate location is agreed upon in writing by the Owner and the Contractor.

Amounts in dispute which are less than $10,000 shall not progress beyond mediation.

35.4 Litigation prerequisites: The procedures enumerated in Sections 35.2 and 35.3 shall be a prerequisite to the filing of any litigation between the parties to the Contract. Failure of the Contractor to follow the provisions of Section 35.2 and Section 35.3 shall be a complete defense, and grounds for immediate dismissal of any litigation filed prior to Contractor engaging in negotiation and mediation with the City of Greeley as provided above. Litigation may be filed only if the amount in dispute is $100,000 or more. In the event litigation is filed by and between the parties after mediation, venue and jurisdiction of any and all suits and causes of action in connection with this Contract shall lie exclusively in Weld County, Colorado.

35.5 Arbitration: After mediation, instead of litigation, any remaining unresolved controversy or claim arising out of or relating to this Contract or the performance or breach thereof, may be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association. For amounts in dispute which are $100,000 or more, arbitration shall be engaged only upon mutual written agreement by the Owner and the Contractor, and the written agreement shall specify whether the arbitration shall be binding or nonbinding; however, amounts in dispute which are less than $100,000 shall necessarily be settled by binding arbitration. The sole arbitrator shall be appointed by the Arbitration Association, unless a different arbitrator or dispute resolution agency is mutually agreed upon. The award of the arbitrator shall be accompanied by a reasoned opinion, and shall include findings of fact and conclusions. All fees and expenses of

the arbitration, including the expense of each party's counsel, experts, witnesses, and preparation and presentation of proofs, shall be borne by the party against whom arbitration judgment is made.

35.6 Litigation: Each party shall bear its own litigation fees and expenses, including the expense of its counsel, experts, witnesses, and preparation and presentation of proofs, regardless of the prevailing party.

ARTICLE 36
FORCE ACCOUNT WORK

36.1 This Article shall become operative upon failure of the Contractor and the Owner to arrive at an amount of compensation under Article 28, CHANGES. In the event that no equitable adjustment is arrived at either by mutual agreement or pursuant to the Article 35, DISPUTES, the compensation paid hereunder will be the total compensation.

36.2 Work Performed by or for Contractor: The Contractor will be paid for labor, materials, and equipment as hereinafter provided, except where agreement has been reached to pay in accordance with Paragraph 36.3 of this Article. The following percentages, as full compensation for profit, overhead and small tools, will be added to the totals computed as provided in subparagraphs 36.2.1 through 36.2.3 of this Article.

Labor	25 percent
Materials	20 percent
Equipment	10 percent

Labor, materials, and equipment shall be furnished by the Contractor or by a subcontractor. When work paid on a force account basis is performed by forces other than the Contractor's, the Contractor shall reach agreement with such other forces as to the distribution of the payment made by the Owner for such work and, except as specified herein, no additional payment therefore will be made by the Owner by reason of performance of work by a subcontractor or by others. In addition to the markups, if any, for labor, equipment, and materials, for subcontracted work, the Contractor may add an additional five percent markup. The cost of subcontracted work will be the actual cost to the contractor for work performed by a subcontractor as computed in accordance with this Paragraph 36.2 and its subparagraphs 36.2.1, 36.2.2, and 36.2.3.

36.2.1 Labor: The cost of labor used in performing the work, whether the employer is the Contractor or a subcontractor, will be the sum as determined on the basis of the following three subparagraphs:

36.2.1.1 The gross actual wages, including income tax withholdings but not including employer payments to or on behalf of workmen for health and welfare, pension, vacation, insurance and similar purposes.

36.2.1.2 To the gross actual wages, as defined in the previous subparagraph,

36.2.1.1, will be added a percentage based upon current State and Federal laws and applicable labor contracts concerning payments made to or on behalf of workmen other than actual wages, which percentage will constitute full compensation for all payments imposed by State and Federal laws and for all other payments made to or on behalf of the workmen, other than actual wages as defined in the previous subparagraph 36.2.1.1 and the subsistence and travel allowance as specified

in the following subparagraphs 36.2.1.3. The Contractor shall compute a separate percentage for each craft, or a composite percentage for all crafts, if so approved by the Owner. Computed percentages shall be submitted to the Project Manager for approval by the Owner.

36.2.1.3 Subsistence and travel allowance paid to workmen as required by established agreements.

36.2.1.4 The charges for labor shall include all classifications up to but not including foremen, and when authorized by the Owner, shall include foremen engaged in the actual and direct performance of the work. Labor charges shall not include charges for assistant superintendents, office personnel, timekeepers, and maintenance mechanics, unless authorized by the Owner in advance of the start of work.

36.2.2 Materials: The cost of materials required for the accomplishment of the work will be delivered cost to the purchaser, whether contractor or subcontractor, from the supplier thereof, except as the following are applicable:

36.2.2.1 If a cash or trade discount by the actual supplier is offered or available to the Contractor, it shall be credited to the Owner notwithstanding the fact that such discount may not have been taken.

36.2.2.2 If materials are procured by the Contractor by a method which is not a direct purchase from and a direct purchase from and a direct billing by the actual supplier, the cost of such materials will be deemed to be the price paid to the actual supplier, as determined by the Owner. No additional markup for supplier work will be allowed except to the extent of actual cost to the Contractor in handling the material, not to exceed five percent of the price paid to actual supplier.

36.2.2.3 If the materials are obtained from a supply or source owned wholly or in part by the Contractor, payment therefore will not exceed the price paid for similar materials furnished from said source on Contract Items or the current wholesale price for such materials delivered to the work site, whichever price is lower.

36.2.2.4 If the cost of the materials is, in the opinion of Owner, excessive, then the cost of such materials will be deemed to be the lowest current wholesale price at which such materials are available in the quantities concerned, delivered to the job site, less discounts as provided in subparagraph 36.2.2.1 of this Article.

36.2.2.5 If the Contractor does not furnish satisfactory evidence of the cost of such materials from the actual supplier thereof, the cost will be determined in accordance with subparagraph 36.2.2.4 of this Article.

36.2.2.6 The Contractor shall have no claims for costs and profit on Owner-furnished materials.

36.2.3 Equipment: The Contractor will be paid for the use of contractor-owned or rented equipment at the rental rates shown in the Colorado State Department of Highways Construction Equipment Rental Rate Schedule, except as modified below, which edition shall be the latest edition in effect at the time of commencement of the Force Account work. For equipment used in excess of eight hours per day, the rental rate shall be 60 percent of the listed hourly rate. If it is deemed

necessary by the Contractor to use equipment not listed in the C.D.O.H. Construction Equipment Rental Rate Schedule, the Contractor shall furnish the necessary cost data and paid invoices to the Project Manager for his use in establishment of such rental rate.

36.2.3.1 The rates paid as above provided will include the cost of fuel, oil, lubricants, supplies, small tools, necessary attachments, repairs and maintenance, depreciation, storage, insurance and incidentals.

36.2.3.2 Equipment operators will be paid for as stipulated in subparagraph 36.2.1 of this Article.

36.2.3.3 Equipment shall be in good working condition and suitable for the purpose for which the equipment is to be used.

36.2.3.4 Unless otherwise specified, manufacturer-approved modifications shall be used to classify equipment for the determination of applicable rental rates. Equipment which has no direct power unit shall be powered by a unit of at least the minimum rating recommended by the manufacturer of that equipment.

36.2.3.5 Individual pieces of equipment or tools having a net individual value of $300 or less, whether or not consumed by use, will be considered to be small tools and no payment will be made therefore.

36.2.3.6 Compensation will not be allowed while equipment is inoperative due to breakdown. Except as specified in paragraph 36.2.3.7 of this Article, time will be computed in half and full hours. In computing the time for use of equipment, less than 30 minutes shall be considered one half hour.

36.2.3.7 Equipment at the Work Site: The time to be paid for use of equipment on the work site will be the time the equipment is in operation on the force account work being performed. The time will include the time required to move the equipment to location of the force account work and return it to the original location or to another location requiring no more time than that required to return it to its original location. Moving time will not be paid for if the equipment is used at the site of the force account work on other than such force account work. Loading and transporting costs will be allowed, in lieu of moving time, when the equipment is moved by means other than its own power. No payment for loading and transporting will be made if the equipment is used at the site of the force account work on other than such force account work.

36.3 Special Items of Work: If the Owner and the Contractor, by agreement, determine that (a) an item of force account work does not represent a significant portion of the total Contract price, and (b) such items of work cannot be performed by the forces of the Contractor or the forces of any of his subcontractors, and (c) it is not in accordance with the established practice of the industry involved to keep the records which the procedure outlined in Paragraph 36.2 of this Article would require, charges for such special force account work items may be made on the basis of invoices for such work without complete itemization of labor, materials, and equipment rental costs. To such invoiced price, less a credit to the Owner for any cash or trade discount offered or available, will be added five percent of the discounted price, in lieu of the percentages provided in Paragraph 36.2 of this Article. In no event will the price paid exceed the current fair market value of such work plus five percent.

36.4 Records: The Contractor shall maintain his records to provide a clear distinction between the direct costs of work paid for on a force account basis and costs of other operations.

36.4.1 The Contractor shall prepare and furnish to the Project Manager, on the following work day, report sheets in duplicate of each day's work paid for on a force account basis. The daily report sheets shall itemize the materials used and shall cover the direct cost of labor and the charges for equipment, whether furnished by the Contractor, subcontractor, or other forces, except for charges described in Paragraph 36.3 of this Article. The daily report sheets shall provide names or identifications and classifications of workmen and the hourly rate of pay and hours worked. In addition, a report of the size, type and identification number of equipment and hours operated shall be furnished to the Project Manager. Daily report sheets shall be signed by the Contractor or his authorized agent.

36.4.2 Material changes shall be substantiated by valid copies of vendor's invoices or conformed copies, certified true by the Contractor. Such invoices shall be submitted with the daily report sheets. Should the vendor's invoices not be submitted within 20 days after the date of delivery of the material or 15 days after acceptance of the work, whichever comes first, the Owner reserves the right to establish the cost of such materials at the lower current wholesale prices at which such materials are available in the quantities concerned delivered to the location of the work, less any discounts provided in subparagraph 36.2.1. of this Article.

36.4.3 The Project Manager will compare his records with the daily report sheets furnished by the Contractor, make any necessary adjustment and compile the costs of work paid for on a force account basis on daily force account work report forms. When these daily reports are agreed upon and signed by the Project Manager, they shall become the basis of payment for the work performed, but shall not preclude subsequent adjustment based on a later audit.

36.4.4 The Contractor's original cost records pertaining to work paid for a on a force account basis shall be retained and shall be open to inspection and audit as required by Article 28, CHANGES, and any other provisions of the Contract.

36.5 If, in the Project Manager's opinion, the Contractor or any of his subcontractors, in performing Force Account work, is not making efficient use of labor, material or equipment or is proceeding in a manner which makes Force Account work unnecessarily more expensive to the Owner, the Project Manager may, in whole or part, direct the Contractor in the deployment of labor, material and equipment. By way of illustration, inefficiency may arise in the following ways: (1) the timing of the work, (2) the use of unnecessary labor or equipment, (3) the use of a higher percentage of apprentices than in non-force account work, (4) failure to procure materials at the lowest price, or (5) using materials of quality higher than necessary.

ARTICLE 37
TERMINATION FOR CONVENIENCE OF THE OWNER

37.1 The performance of Work under this contract may be terminated by the Owner in accordance with this Article in whole, or from time to time in part, whenever such termination is in the best interest of the Owner. Such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of work under the Contract is terminated, and the date upon which such termination becomes effective.

37.2 After receipt of a Notice of Termination, and except as otherwise directed by the Owner, the Contractor shall:

37.2.1 Stop work under the Contract on the date and to the extent specified in the Notice of Termination.

37.2.2 Place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the Contract as is not terminated;

37.2.3 Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination;

37.2.4 Assign to the Owner in the manner, at the times, and to the extent directed by it, all of the rights, title and interest of the Contractor under the orders and subcontracts so terminated, in which case the Owner will have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

37.2.5 Settle outstanding liabilities and claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Owner to the extent it may require, which approval or ratification shall be final for the purposes of this Article;

37.2.6 Transfer title and deliver to the Owner in the manner, at the times, and to the extent, if any directed by it, (a) the fabricated or unfabricated parts, work in process, completed work, supplies and other material procured as part of, or acquired in connection with the performance of, the work terminated by the Notice of Termination, and (b) the completed or partially completed plans, drawings, information, and other property, which, if the Contract had been completed, would have been required to be furnished to the Owner;

37.2.7 Use his best efforts to sell, in the manner, at the times, to the extent, and at the price or prices direction or authorized by the Owner, property of the types referred to in (37.2.5) above; provided, however, that the Contractor (a) shall not be required to extend credit to any purchaser and (b) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Owner; provided further that the proceeds of any such transfer or disposition will be applied in reduction of any payments to be made by the Owner to the contractor under this Contract or will otherwise be credited to the price or cost of the work covered by this Contract or paid in such other manner as the Owner may direct;

37.2.8 Complete performance of each part of the work as shall not have been terminated by the Notice of Termination; and

37.2.9 Take such action as may be necessary, or as the Project Manager may direct, for the protection and preservation of the property related to this Contract which is in the possession of the Contractor and in which the Owner has or may acquire an interest.

37.3 After receipt of a Notice of Termination, the Contractor shall submit to the Project Manager his termination claim, in the form and with certification prescribed by the Owner. Such claims shall be submitted promptly but in no event later than the earliest of the following: (1) one year from the effective date of termination or (2) thirty days after the remainder of the project has been accepted by the owner.

37.4 Subject to the provision of Paragraph 37.3, the contractor and the Owner may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reason of the total or partial termination of work pursuant to this Article, which amount or amounts may include an allowance for profit on work done; provided that such agreed amount or amounts, exclusive of settlement costs, shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the Contract price of work terminated. The Contract will be amended accordingly, and the Contractor will be paid the agreed amount.

37.5 In the event of failure of the Contractor and the Owner to agree, as provided in Paragraph 37.4, upon the whole amount to be paid the Contractor by reason of the termination of work pursuant to this Article, the Owner will pay the Contractor the amounts determined by the Owner as follows, but without duplication of any amounts agreed upon in accordance with Paragraph 37.4;

37.5.1 With respect to contract work performed prior to the effective date of the Notice of Termination, the total (without duplication of any items) of:

37.5.1.1 The cost of such work;

37.5.1.2 The cost of settling and paying claims arising out of the termination of work under subcontracts or orders as provided in subparagraph 37.2.5 above, exclusive of the amounts paid or payable on account of supplies or materials delivered or services furnished by the subcontractor prior to the effective date of the Notice of Termination of work under this Contract, which amounts shall be included in the cost on account of which payment is made under 37.5.1 above.

37.5.1.3 A sum, as profit on 37.5.1.1 above, determined by the Owner to be fair and reasonable; provided, however, that if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed under this subparagraph 37.5.1.3 and an appropriate adjustment shall be made by reducing the amount of the settlement to reflect the indicated rate of loss.

37.5.2 The reasonable cost of the preservation and property incurred pursuant to subparagraph 37.2.9 and any other reasonable cost incidental to termination of work under this Contract, including expense incidental to the determination of the amount due to the Contractor as the result of the termination of work under this Contract.

37.5.3 The total sum to be paid to the contractor under paragraph 37.5.1 above will not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the Contract price of the work terminated.

37.6 In arriving at the amount due the Contractor under this Article, there will be deducted (1) any claim which the Owner may have against the Contractor in connection with this Contract, (2) the agreed price for, or the proceeds of sale, of materials, supplies or other things acquired by the contractor or sold, pursuant to the provisions of this Article, and not otherwise recovered by or credited to the Owner and (3) the full amount of any statutory or other claim against the Contractor filed with the Owner.

37.7 Unless otherwise provided for in this Contract, or by applicable statute, the Contractor, from the effective date of termination and for a period of three years after final settlement under this Contract, shall preserve and make available to the Owner at all reasonable times at the office of the Contractor but without direct charge to the Owner, all his books, records, documents, electronic/digital media and other evidence bearing on the costs and expenses of the Contractor under this Contract and related to the work terminated hereunder, or to the extent approved by the Owner, or other authentic reproductions thereof.

37.8 The Contractor shall insert in all subcontracts that the subcontractor shall stop work on the date of and to the extent specified in a Notice of Termination from the Owner and shall require that any tier subcontractors insert the same provision in any tier subcontracts.

37.9 Under no circumstances is the Contractor entitled to anticipatory, unearned profits or consequential damages as a result of a termination or partial termination under this Article.

ARTICLE 38
TERMINATION FOR DEFAULT

38.1 If, in the opinion of the Owner, the Contractor has failed to prosecute work, the Owner will notify the Contractor. The Contractor will then have 5 days to remedy the failure to prosecute work or to obtain the Owner's authorization for the delay or an extension of time as set forth in Article 32.

38.2 If the Contractor refuses or fails after reasonable notice as set forth above to prosecute Work, or any separable part thereof, with such diligence as will insure its completion within the time specified in this Contract, or refuses or fails to complete said Work within such time, the Owner may, by written notice to the Contractor, terminate for default his right to proceed with the Work or such part of the Work as to which there has been unauthorized delay. In such event the Owner may take over the work and prosecute the same to completion, by Contractor or otherwise, and may take possession of and utilize in completing the Work such materials, appliances, and plant as may be on the Work Site and necessary therefore. Whether or not the Contractor's right to proceed with the Work is terminated, he and his sureties shall be liable for any damage to the Owner resulting from his refusal or failure to complete the Work in the specified time.

38.3 If the Owner so terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such time as may be required for final completion of the Work together with any increased costs incurred by the Owner in completing the Work as further set forth in Article 41.

38.4 If, after Notice of Termination of the Contractor's right to proceed under the provisions of this Article, it is determined for any reason that the Contractor was not in default under the provisions of this Article or that the Contractor was entitled to an extension of time under Article 32,

EXTENSION OF TIME, the rights and obligations of the parties shall be the same as if the Notice of Termination had been issued pursuant to Article 37, TERMINATION FOR CONVENIENCE OF THE OWNER.

38.5 The right to terminate for default and any other rights and remedies of the Owner provided in this clause are in addition to any other rights and remedies provided by law or under this Contract.

ARTICLE 39
TERMINATION OF RIGHT TO PROCEED FOR CERTAIN DEFAULTS

39.1 In addition to the Owner's right to terminate for default under other Articles of this Contract, the Owner will have the right to terminate the Contractor's performance of work in whole or in part for default for any of the following reasons:

39.1.1 The Contractor's or subcontractor's performance of work is in violation of the terms of the Contract.

39.1.2 The Contractor or subcontractor has violated an authorized order or requirement of the Owner.

39.1.3 Abandonment of Contract.

39.1.4 Assignment or subcontracting of the Contract or any work under the Contract without approval of the Owner.

39.1.5 Bankruptcy or appointment of a receiver for the Contractor's property.

39.1.6 Performance of the Contractor in bad faith.

39.1.7 Contractor allowing any final judgment to stand against him for a period of 48 hours (excluding weekends and legal holidays).

39.2 If, in the opinion of the Owner, the Contractor is in default of the Contract, the Owner will notify the Contractor. If the Contractor fails to remedy or commence to remedy the default within five days after receipt of such notice, the Owner may terminate the Contractor's right to proceed with the Work or that portion of the Work which the Owner determines is most directly affected by the default.

39.3 If, after Notice of Termination of Contractor's right to proceed under this Article it is determined for any reason Contractor was not in default, the rights and obligations of the parties shall be the same as if the Notice of Termination had been issued pursuant to Article 37, TERMINATION FOR CONVENIENCE OF THE OWNER.

ARTICLE 40
RIGHTS AND OBLIGATIONS OF PARTIES AT TERMINATION FOR DEFAULTS

40.1 This Article shall apply to terminations for defaults covered in Article 15, 38, and 39 of these General Conditions.

40.2 On receipt of a Notice of Termination from the Owner, the Contractor shall:

40.2.1 Stop all work under the Contract on the date and to the extent specified in the Notice of Termination.

40.2.2 Place no further orders or subcontracts for materials, equipment or services except as they relate to the performance of work covered by the Notice of Termination.

40.2.3 Cancel or terminate all orders or subcontracts to the extent that they relate to the performance of work covered by the Notice of Termination.

40.2.4 Comply with all other requirements of the Owner as may be specified in the Notice of Termination.

40.3 Upon the Owner termination of the Contractor's right to proceed with the Work because of the Contractor's default under the Contract, the Owner will have the right to complete the Work by whatever means and method it deems advisable. The Owner shall have the right to take possession of and use any or all the Contractor's materials, plat, tools, equipment and property of any kind provided by or on behalf of the Contractor for the purpose of the Work, or a portion of them, without being responsible to the Contractor for fair wear and tear. The Contractor shall have no rights in such property during their use by the Owner. The Owner will not be required to obtain the lowest prices for completing the Work but shall make such expenditures as, in the Owner's sole judgment, best accomplish such completion.

40.4 The expense of completing the Work, together with a reasonable charge for engineering, managerial and administrative services, as certified by the Owner, will be charged to the Contractor and the expense so charged will be deducted by the Owner out of such monies as may be due or may at any time thereafter become due to the Contractor. In case such expense is in excess of the sum which otherwise would have been payable to the Contractor under the Contract, the Contractor or his surety shall promptly pay the amount of such excess to the Owner upon notice from the Owner of the excess so due. The Owner may, in its sole discretion, withhold all or any part of any progress payments otherwise due the Contractor until completion and final settlement of the Work covered by the Notice of Termination of Contractor's right to proceed.

40.5 The Contractor shall insert in all subcontracts that the subcontractor will stop work on the date of or to the extent specified in a Notice of Termination from the Owner and shall require the subcontractors to insert the same provision in any tier subcontracts.

40.6 The Contractor shall immediately upon receipt communicate any Notice of Termination issued by the Owner to the affected subcontractors and suppliers at any tier.

40.7 Rights of Surety: The Surety on the Performance Bond provided for in this Contract shall not be entitled to take over the Contractor's performance of work in case of termination under this Article, except with the consent of the Owner.

ARTICLE 41
LIQUIDATED DAMAGES

41.1 Time is of the essence of the Contract. In the event the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, or fails to meet any other time requirement or the time limit set forth in the Contract, after due allowance for any extension or extensions of time made in accordance with the Contract, the Contractor shall pay to the Owner as fixed, agreed and liquidated damages, pursuant to the clause of the Contract entitled TERMINATION FOR DEFAULT—DAMAGES FOR DELAY—TIME EXTENSIONS, the sum of $500.00 for each calendar day of delay unless otherwise stated in the Special Provisions. Such liquidated damages shall be assessed for each and every day that the Contractor shall be in default. The Owner shall have the right to deduct said liquidated damages from any amount due or that may become due the Contractor, or to collect such liquidated damages from the Contractor or its surety.

41.2 Liquidated damages in the amount stipulated do not include any sums of money to reimburse the City for actual damages which may be incurred between Substantial Completion and Final Completion because of the Contractor's failure to achieve Final Completion within the Contract Time. For such delay in Final Completion, the Contractor shall reimburse the City, as a mitigation of City damages and not as a penalty, those administrative costs incurred by the City as a result of such failure.

41.3 Liquidated damages in the amounts stipulated do not include any sums of money to reimburse the City for extra costs which the City may become obligated to pay on other contracts which were delayed or extended because of the Contractor's failure to complete the Work within the Contract Time. Should the City incur additional costs because of delays or extensions to other contracts resulting from the Contractor's failure of timely performance, the City will assess these extra costs against the Contractor, and these assessments will be in addition to the stipulated liquidated damages.

41.4 The City reserves all of its rights to actual damages from the Contractor for injury or loss suffered by the City from actions or omissions of the Contractor, including but not limited to any other breach or default of the Contract, outside of the scope of the above sections.

ARTICLE 42
USE AND POSSESSION PRIOR TO COMPLETION

42.1 The Owner shall have the right to take possession of or use any completed or partially completed parts of the Work. Such possession or use will not be deemed an acceptance of Work not completed in accordance with the Contract. While the Owner is in such possession, the Contractor, notwithstanding the provisions of Article 18, DAMAGE TO WORK AND RESPONSIBILITIES FOR MATERIALS, will be relieved of the responsibility for loss or damage to the work other than that resulting from the Contractor's fault or negligence or breach of warranty. If such prior possession or use by the Owner delays the progress of the Work or causes additional expense to the Contractor, an equitable adjustment in the Contract price or the time of completion will be made, and the Contract will be modified in writing accordingly.

ARTICLE 43
RIGHTS IN SHOP DRAWINGS AND WORKING DRAWINGS

43.1 Shop Drawings and Working Drawings, submitted to the Project Manager by the Contractor, subcontractor or any lower tier subcontractor pursuant to the Work, may be duplicated by the Owner and the Owner may use and disclose, in any manner and for any purpose, Shop Drawings and Working Drawings delivered under this Contract.

43.2 This Article, including this Paragraph 43.2, shall be included in all subcontracts hereunder at all tiers.

ARTICLE 44
PATENT AND COPYRIGHT

44.1 The Contractor shall warrant that the materials, equipment or devices used on or incorporated in the Work shall be delivered free of any rightful claim of any third party for infringement of any United States patent or copyright. If notified promptly in writing and given authority, information and assistance, the Contractor shall defend, or may settle, at his expense, any suit or proceeding against the Owner or the Project Manager based on a claimed patent or copyright infringement which would result in a breach of his warranty. The Contractor shall pay all damages and costs awarded therein against the Owner or the Project Manager due to such breach. If any use of materials, equipment or devices is held to constitute an infringement and such use is enjoined, the Contractor shall, at his expense and option, either procure for the Owner the right to continue using said materials, equipment or devices, or replace same with noninfringing materials, equipment or devices, or modify same so it becomes noninfringing. The Contractor shall report to the Owner promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Contract of which the Contractor has knowledge. In the event of any claim or suit against the Owner on account of any alleged patent or copyright infringement arising out of the performance of this Contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Owner when requested by the Owner, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Owner except where the Contractor has agreed to indemnify the Owner. This clause shall be included in all subcontracts.

ARTICLE 45
HISTORICAL, SCIENTIFIC AND ARCHAEOLOGICAL DISCOVERIES

45.1 All articles of historical, scientific or archaeological interest uncovered by the Contractor during progress of the Work shall be preserved in accordance with applicable law and reported immediately to the Project Manager. Further operations of the Contractor with respect to the find, including disposition of the articles, will be decided by the Owner in accordance with applicable law.

ARTICLE 46
SUBSTITUTIONS

46.1 Where reference is made to one or more proprietary products but restrictive descriptive material of only one manufacturer is used, it is understood that the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the plans and

specifications and are compatible with the intent and purpose of the design, subject to the written approval of the Owner and the Project Manager. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design.

46.2 The Contractor may propose the substitutions of any material as a supplement to his bid with the monetary amount, additive or deductive as may be the case, clearly stated. Manufacturer's information, catalog numbers, and complete descriptive information shall be included with the proposed substitution. This shall be completely apart and separate from the base bid quotation and shall be solely for the information of the Owner, and the use of such proposed substitutions shall be strictly at the decision of the Owner. If substitution is accepted by the Owner, the Contract sum shall be adjusted from the base bid either up or down as indicated on the supplementary list.

ARTICLE 47
INSURANCE

47.1 General

47.1.1 The Contractor shall provide from insurance companies, acceptable to the Owner, the insurance coverage designated hereinafter and pay all costs. The Contractor also indemnifies the Owner as further described in Article 4.

47.1.2 Before commencing work under this Agreement, the Contractor shall furnish the Owner with certificates of insurance specified herein showing the type, amount, class of operations covered, effective dates, and date of expiration of policies. Furthermore, each such certificate shall contain a valid provision or endorsement that the policy may not be cancelled, terminated, changed or modified without first giving ten (10) days written notice to the Owner, which notice must be sent registered mail, return receipt requested, to the Project Manager.

47.1.3 In case of the breach of any provision of this Article, the Owner, at his option, may take out and maintain, at the expense of the Contractor, such insurance as the Owner may deem proper at the Contractor’s expense and may deduct the cost of such insurance from any monies which may be due or become due the Contractor under this Agreement.

47.1.4 The Contractor shall either: (1) require each of his subcontractors to procure and maintain during the life of his subcontract, subcontractors' comprehensive General Liability, Automobile Liability and Property Damage Liability Insurance of the type and in the same amounts as specified in this subparagraph, or (2) insure the activity of his subcontractors in his own policy.

47.1.5 Co-Insurance: The Contractor herein agrees to name the Owner as an insured party on all liability insurance policies provided for by this Article 47, INSURANCE.

47.1.6 No insurance shall be cancelled or otherwise voided during the Contract period, without at least 10 days prior written notice to the Owner, nor shall any insurance be invalidated should the insured waive any or all right of recovery against any party.

47.1.7 Liability insurance may be arranged by Comprehensive General Liability and Comprehensive Automobile Liability policies for the full limits required; or by a combination of underlying Comprehensive Liability policies for lesser limits with the remaining limits provided by an Excess or Umbrella Liability policy.

47.1.8 The Owner shall purchase and maintain such boiler and machinery insurance as may be required by the Contract Documents or by law. This insurance shall include the interest of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.

47.1.9 Any loss insured under Article 47 is to be adjusted with the Owner and made payable to the Owner as trustee for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause. The Contractor shall pay each subcontractor a just share of any insurance monies received by the Contractor, and by appropriate share of any insurance monies received by the Contractor, and by appropriate agreement, written where legally required for validity, shall require each subcontractor to make payments to his subcontractors in similar manner.

47.1.10 If the Contractor requests in writing that insurance for risks other than those described in this Article or other special hazards be included in the Owner’s property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

47.1.11 The Owner as trustee shall have power to adjust and settle any loss with the insurers.

47.1.12 If the Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion thereof, such occupancy or use shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the insurance company or companies providing the property insurance have consented by endorsement to the policy or policies. This insurance shall not be cancelled or lapsed on account of such partial occupancy or use. Consent of the Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.

47.2 Workmen's Compensation and Employer's Liability Insurance:

47.2.1 The Contractor shall provide coverage and amounts as required by the Workmen's Compensation Act of the State of Colorado.

47.2.2 The Contractor shall provide Employer's Liability Insurance in an amount not less than $100,000 for each occurrence.

47.2.3 The Contractor shall require any subcontractor to provide Workmen's Compensation and Employer's Liability Insurance in the same amounts for all of the subcontractor's employees to be engaged in work under this Agreement.

47.3 General Liability

47.3.1 General Liability Insurance shall be on a Comprehensive General Liability form and shall provide coverage for the following: Premises and Operations, Owners and Contractors Protective, Elevators, Independent Contractors, Products and Completed Operations, Contractual, Personal Injury, and Broad Form Property Damage; "XCU" exclusions must be deleted.

47.3.2 Minimum requirements for Comprehensive General Liability are: bodily injury, $1,000,000.00 each person, $2,000,000.00 each occurrence; property damage, $1,000,000.00 each occurrence.

47.4 Automobile Liability

47.4.1 Comprehensive Automobile Liability Insurance shall include coverage for all owned motor vehicles and hired and non-owned motor vehicles.

47.4.2 Minimum requirements for Comprehensive Automobile Insurance are: bodily injury, $1,000,000.00 each person, $2,000,000.00 each occurrence; property damage, $1,000,000.00 each occurrence.

47.5 Property Insurance:

47.5.1 The Owner may require the Contractor to purchase and maintain "Builder's Risk" Property Insurance for all work at the site to the full insurable value thereof. The Owner and the Project Manager shall be named as co-insured.

ARTICLE 48
UNCOVERING AND CORRECTION OF WORK

48.1 During construction, whenever materials requiring inspection in place by the Project Manager and the Owner to be permanently covered up, it shall be Contractor's responsibility to notify the Project Manager at least 24 hours in advance of commencement of such covering operation. In the event of failure by Contractor to give such notification, Contractor shall, at his own expense, uncover such portions of work as required by the Project Manager or the Owner, and reinstall such covering after satisfactory inspection and correction of any and all deficiencies.

ARTICLE 49
EQUAL OPPORTUNITY

49.1 The Contractor agrees to comply with the letter and spirit of the Colorado Anti-discrimination Act of 1957, as amended, and other applicable laws respecting discrimination and unfair employment practices (24-34-402, CRS 1973, as amended). The Contractor shall be responsible for any discriminatory or unfair employment practices of his subcontractors. Neither the Contractor nor any subcontractor will discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, religion, ancestry, mental or physical handicap, or age. Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, creed, color, national origin, sex, religion, ancestry, mental or physical handicap, or age. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment, or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

49.2 Contractor and all subcontractors shall, in all solicitations or advertisement for employees placed by them or on their behalf, state that qualified applicants will receive consideration for employment without regard to race, creed, color, national origin, sex, religion, ancestry, mental or physical handicap, or age.

ARTICLE 50
CLAIMS

50.1 The Contractor shall not assert any claim arising out of any act or omission by any officer, agent or employee of the Owner in the execution or performance of this Contract against such officer, agent or employee in his or her individual or official capacities.

50.2 The Contractor shall require each Separate Contract Design Professional or Contractor to agree in his Contract not to make any claim against the Owner, its officers, agents or employees, by reason of such Contract with the contractor.

50.3 Nothing in this Contract shall be construed to give any person other than the Owner and the Contractor any legal or equitable right, remedy or claim under this Contract; and it shall be held to be for the sole and exclusive benefit of the Owner and the Contractor.

ARTICLE 51
NOTICES

51.1 Except as otherwise provided herein, any notice, approval, acceptance, request, bill, demand or statement hereunder from either party to the other shall be in writing and shall be deemed to have been given when either delivered personally or deposited in a U.S. mailbox in a postage-prepaid envelope, addressed to the other party via certified mail. Notices to the Owner shall be addressed to the Project Manager by name. Either party may at any time change such address by delivering or mailing, as aforesaid, to the other party a notice stating the change and the changed address.

ARTICLE 52
LEGAL INSERTIONS, ERRORS, INCONSISTENCIES, OR DISCREPANCIES IN CONTRACT

52.1 It is the intent and understanding of the parties to this Contract that each and every provision of law required to be inserted in this Contract shall be and is inserted herein. Furthermore, it is hereby stipulated that every such provision is deemed to be inserted herein, and if through mistakes or otherwise, any such provision is not inserted in correct form, then this Contract shall upon application of either party, be amended by such insertion so as to comply strictly with the law and without prejudice to the right of either party.

52.2 If this Contract contains any errors, inconsistencies, ambiguities, or discrepancies, including typographical errors, the Contractor shall request a clarification of same by writing to the Project Manager whose decision shall be binding upon the parties.

ARTICLE 53
CAPTIONS OR HEAD NOTES

53.1 The captions or head notes on articles or sections of this Agreement, and marginal notes are intended for convenience and reference purposes only and in no way define, limit or describe the scope or intent hereof, or of this Agreement not in any way affect this Agreement.

ARTICLE 54
EFFECTIVE AND BINDING

54.1 This Contract shall not become effective or binding upon the Owner unless it has been authorized and executed in accordance with the ordinances of the City of Greeley.

ARTICLE 55
CONTRACTOR

55.1 All personnel assigned to the Project by the Contractor shall be required to cooperate fully with personnel of the Owner and if in the sole discretion of the Owner the Contractor's personnel fails so to cooperate, the Contractor shall relieve them of their duties on the Project when required by the Owner.

55.2 Within seven (7) consecutive calendar days after date of written notice to commence work, the Contractor shall designate in writing one person who, on his behalf, shall be responsible for coordinating all of the services to be rendered by the Contractor hereunder. Such designee shall be subject to the approval of the Owner. Any change to the approved designee shall be proposed in writing seven (7) days in advance and subject to Owner approval.

55.3 The Contractor shall engage, at his sole expense, all engineers, architects, cost estimators, lawyers, experts and Contractors as may be required for the proper performance of the Contract. The Contractor shall be responsible for the performance of the work of all architects, engineers, cost estimators, lawyers, experts and Contractors so engaged by him, including maintenance of schedules, correlation of their work and resolution of all difference between them. It is understood that all architects, engineers, cost estimators, lawyers, experts and Contractors are employees of the Contractor and not of the Owner, and the Contractor alone is responsible for their work.

55.4 All drawings, tracings, specifications, digital media/electronic files and other material prepared and furnished under and for this Contract shall become the property of the Owner upon substantial completion and/or their acceptance by the Owner and/or upon termination of the services of the Contractor. Such documents shall be promptly delivered to the Owner upon demand and thereafter may be used by the Owner in whole or in part or in modified form, for those purposes it may deem advisable without further employment of, or payment of additional compensation to, the Contractor.

55.5 The Contractor shall not, without the prior written approval of the Owner, specify for the project, or necessarily imply the required use of any article, product, material, fixture or form of construction, the use of which is covered by a patent, or which is otherwise exclusively controlled by a particular firm or group of firms.

55.6 Should any claim be made or any action brought against the Owner relating to the design and satisfactory operation of the Project herein, the Contractor shall diligently render to the Owner without additional compensation any and all assistance which may be requested by the Owner.

55.7 The Owner's Project Manager's decision shall be final and binding upon the Contractor as to all matters arising in connection with or relating to this Contract. The Project Manager shall determine the amount, quality, acceptability and fitness of the work being performed hereunder and shall determine all matters relative to the fulfillment of this Contract on the part of the Contractor and such determination shall be final and binding on the Contractor. Acceptance by the Owner of any document hereunder and all supporting documents shall not relieve the Contractor of sole responsibility for work performed under this contract, including, but not limited to, the final design of the Project, including the plans, specifications and all supporting documents, except as to any feature thereof which the Owner had specifically directed in writing to be included over the written objection of the Contractor. In case any question shall arise, the decision of the Owner's Project Manager, who is hereby accepted by the Contractor as the arbiter, shall be a condition precedent to the right of the Contractor to receive any money under this Contract.

ARTICLE 56
APPEALS

56.1 Except as otherwise provided in this Contract, any dispute concerning a question of fact arising under this Contract which is not disposed of by Agreement shall be decided by the Project Manager, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Project Manager shall be final and conclusive unless, within fifteen (15) days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Project Manager a written notice of appeal.

56.2 In the event a decision of the Project Manager is the subject of an appeal, such dispute may be settled by appropriate legal proceeding, or, if the parties mutually agree, through arbitration or administrative process. Pending any binding arbitrative or administrative decision, appeal, or judgment referred to in this section or the settlement of any dispute arising under this Contract, the Contractor shall proceed diligently with the performance of this Contract.

56.3 Venue and jurisdiction of any suit, right, or cause of action arising under or in connection with this Contract shall lie exclusively in Weld County, Colorado.

ARTICLE 57
PROHIBITED INTEREST

57.1 No member, officer or employee of the City of Greeley shall have any financial or pecuniary interest, direct or indirect, in this Contract or the proceeds thereof.

ARTICLE 58
FINDINGS CONFIDENTIAL

58.1 Any reports, information, data, etc., available to or prepared or assembled by Contractor under this Contract shall not be made available to any individual or organization by Contractor without consent in writing from the Owner subject to applicable law.

ARTICLE 59
GENERAL PROVISIONS

59.1 Services and work performed by Contractor under this Contract shall conform to reasonable and normal professional standards known and accepted within the community.

59.2 No reports, graphics or other material produced directly or indirectly for the Owner under this Contract shall be the subject of an application for copyright or trademark by or on behalf of Contractor.

59.3 The laws of the State of Colorado and applicable Federal, state and local laws, regulations and guidelines shall govern hereunder.

59.4 The headings of the articles, clauses, and paragraphs of this Contract are inserted for reference purposes only and are not restrictive as to content.

59.5 This Contract and any subsequent amendment shall be deemed an original having identical legal effect, and all of which together constitute one and the same instrument.

59.6 Nothing contained herein shall be deemed to give any third party any claim or right of action against the Owner which does not otherwise exist without regard to this Contract.

59.7 Where a number of days is specified in this Contract it shall mean calendar days unless otherwise specified.

59.8 This Contract shall not be assigned, in whole or in part, without the written consent of the Project Manager and Contractor.

59.9 The Owner certifies the following;

A. An amount of money equal to or greater than the Contract amount has been appropriated and budgeted for the Project which this Contract concerns.

B. No Change Order which requires additional compensable work to be performed by the Contractor will be issued by the Owner unless an amount of money has been appropriated and budgeted sufficient to compensate the Contractor for such additional compensable work unless such work is covered under the remedy-granting provisions of this Contract.

C. As used in this paragraph, "remedy granting provision" shall mean any clause of this Contract which permits additional compensation in the event of a specific contingency or event occurs. This term shall include, but not be limited to, change clauses, differing site conditions clauses, variation in quantities clauses, and termination for convenience clauses.

ARTICLE 60
CONTRACTOR ACCEPTANCE

60.1 The acceptance by the Contractor, his successors or assigns of any payment made on the final acceptance of the Project under this Contract or of any final payment due on termination of this Contract, shall constitute a full and complete release of the Owner from any and all claims, demands and causes of action whatsoever which the Contractor, his successors or assigns have or may have against the Owner under the provisions of this Contract.

60.2 No action shall be maintained by the Contractor, its successors or assigns, against the Owner on any claims based upon or arising out of this Contract or out of anything done in connection with this Contract unless such action shall be commenced within 180 days after the date of filing of the voucher for final payment hereunder in the office of the Finance Director, or within 180 days of the termination of this Contract.

ARTICLE 61
SUCCESSORS AND ASSIGNS

61.1 The Contractor binds itself, its partners, successors, assigns and legal representatives to the other party to this Contract and to the partners, successors, assigns and legal representatives of such other party with respect of all covenants of this Agreement. The Contractor shall not transfer, assign, or subcontract any interest in this Agreement.

ARTICLE 62
SEVERABILITY CLAUSE

62.1 If any provision of this Agreement is subsequently declared by legislative or judicial authority to be unlawful, unenforceable, or not in accordance with applicable laws, statutes, and regulations of the United States of America and the State of Colorado, all other provisions of this Agreement shall remain in full force and effect.

ARTICLE 63

63.1 This Agreement represents the entire and integrated Agreement between the Owner and the Contractor and supersedes all prior negotiations, representations or agreements, either written or oral. This Agreement may be amended only by written instrument signed by both Owner and Contractor.

ARTICLE 64

64.1 In accordance with C.R.S. §8-17-101, all parties contracting with the City of Greeley on public works projects shall employ Colorado labor to perform the work to the extent of not less than eighty percent (80%) of each type or class of labor in the several classifications of skilled and common labor employed on this project.

ARTICLE 65

65.1 The Contract Documents may be executed in two or more counterparts, each of which shall be deemed an original but all of which together shall constitute one and the same document. The Contract Documents, including all component parts set forth above, may be executed and delivered by electronic signature by any of the parties and all parties consent to the use of electronic signatures.

SECTION 520
SUBCONTRACTORS/MATERIALS SUPPLIERS AND RELATED DATA

Firm Name:_____City Contractors License #_____
Primary Contractor_____
PROJECT:_____ Address:_____
_____

For each Subcontractor and/or Materials Suppliers to be utilized, please provide the following information (use additional sheets as necessary):

Phone Number:_____Fax Number:_____
Proposed work and percentage of total work to be assigned_____
_____Percentage:_____%

Firm Name:_____City Contractors License #_____
Address:_____
Phone Number:_____Fax Number:_____
Proposed work and percentage of total work to be assigned_____
_____Percentage:_____%

Firm Name:_____City Contractors License #_____
Address:_____
Phone Number:_____Fax Number:_____
Proposed work and percentage of total work to be assigned_____
_____Percentage:_____%

Firm Name:_____City Contractors License #_____
Address:_____
Phone Number:_____Fax Number:_____
Proposed work and percentage of total work to be assigned_____
_____Percentage:_____%

Firm Name:_____City Contractors License #_____
Address:_____
Phone Number:_____Fax Number:_____
Proposed work and percentage of total work to be assigned_____
_____Percentage:_____%

If the Primary Contractor adds any Subcontractors or Materials Suppliers during the duration of the project, the Primary Contractor will supply the City with an updated form before the Subcontractor or Materials Supplier will be allowed to work on the project.

SECTION 00620

SPECIAL PROVISIONS
HVAC Heating & Cooling Variable Air Volume Box Replacement
At the Recreation Center
Greeley, Colorado

DESCRIPTION OF THE PROJECT:

The intent of this project is replace all Variable Air Volume boxes on the first and second floor at the Rec.Center. This includes all new DDC control devices associated with the VAV box. Existing ductwork remain in use. Removal of first floor ceiling to be re-used and second floor ceiling removed and new tiles to be re-installed.

LOCATION OF WORK:

All work is located at **Recreation Center, 651 10th Avenue**

SPECIFICATIONS:

This project subject to the following specifications: See attached Specifications and Drawings provided by Yancy Schneider with COR Engineering (Electrical Engineering) and Justin H. Montgomery with Design Point Engineering (Mechanical Engineer) at 970/430-9375

1. Construction scheduled time frame is to August 31, 2019.
2. Work hours are 7:00 AM to 5:00 pm, unless coordinated with Facilities Division
3. Restroom facilities will be available within the facility.
4. All HVAC equipment shall **be replaced and operating** by August 31, 2019.
5. Parking will be available on the west of the facility parking lot off 11th avenue and 7th street during construction.
6. (2) Facility keys and (2) Prox cards will be issued for access to the facility. Shall returned upon completion of project and final payment.
7. Contractor must obtain all necessary permits. (**Mechanical contractor must be licensed with the City of Greeley)**
8. All electrical power shutdown lockout of electrical power for this project during construction period shall completed by a licensed electrical contractor.
9. **Contact person for Facilities Division. (Dale Blehm 970/539-6230) for issues during project.**

10. Per-bid meeting and walk-through is highly recommended in order to bid this project.
11. The Contractor must have a service department with a minimum of four service technicians, has been in business for 7 years doing this type of commercial work, be located within 1 hour from job site and provide three references.
12. All work must be completed including other trades by completion date. August 31, 2019
13. All work areas shall be cleaned up at the end each workday.
14. Contractor will be responsible for the removal of ceiling tiles and some ceiling grid. These items will be re-used, Contractor will be responsible for all damaged ceiling tiles and grid if not reusable to re-install.
15. City will provide storage areas to store ceiling tiles and new equipment on each floor.
16. Contractor will need to provide floor protection during construction where work being done throughout the building.

PERMITS:

The Contractor must be licensed with City of Greeley. Contractor will obtain necessary permits for work in public facilities. City will waive permit fees.

CONTRACT TIME, LIQUIDATED DAMAGES, DELAYS:

Work shall be completed within one hundred (120) days, calendar days of the Notice to Proceed. The Notice to Proceed will be issued after a meeting with the selected contractor, and that contractor has an opportunity to schedule this work.

Liquidated damages will be withheld from the final payment to the Contractor for each day that the project's substantial completion is delayed beyond the contract completion date (120 calendar days plus any additional time allowed by the City per change orders).

Liquidated damage amount will be $500.00 per calendar day.

Liquidated damages are based on additional costs to the City of Greeley for delay of project completion and are not a "late penalty".

Additional time will be allowed for formal seasonal "bad weather" days. The Contractor shall provide documentation of weather history as described below when submitting requests for additional time for severe weather. An actual adverse weather day must prevent work for 50 percent or more of the

CONTRACTOR'S workday, delay work critical to the timely completion of the project, and must be documented by the CONTRACTOR. The OWNER'S representative observing the construction shall determine on a daily basis whether or not work can proceed or if work is delayed due to adverse weather or the effects thereof. The CONTRACTOR shall notify the OWNER'S representative in writing of any disagreement as to whether or not work can proceed on a given date, within two (2) calendar days of that date. The OWNER'S representative will use the above written notification in determining the number of working days for which work was delayed during each month.
While extensions of time shall be granted for "unusually severe" weather or climate conditions, no monetary compensations shall be made by the OWNER for any costs to the CONTRACTOR arising out of such delays. The CONTRACTOR shall comply with the portions of these contract documents relating to his project schedule and amendments thereto which result from "unusual severe" weather condition.

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Work Hours:

The Contractor is limited to working between 7.00 am to 5:00 pm or per-determined after hours. The work must be coordinated with Jimmy Trujillo @ 970/539-6231 Mechanical Control Technician or Dale Blehm @ 970/539-6230 Project Manager with Facilities Division

MEASUREMENT AND PAYMENTS:

This contract is a for Lump sum price for construction etc. No additional payment for work not described in these documents will be allowed, whether a bid item exists or not. The Contractor shall include the costs of all incidentals of construction, labor, equipment, and materials in the appropriate bid item.

FINAL CLEAN UP:

At the completion of the contract and prior to submittal of final pay request, the Contractor shall clean up all construction material and debris. The Contractor shall notify the City when final cleanup is ready for inspection.

POST CONSTRUCTION INSPECTION AND WARRANTY:

Please see General conditions 501 article 11

.

END OF SECTION 00620

PERMIT SET
03.04.2019

PROJECT MANUAL FOR:

CITY OF GREELEY
RECREATION CENTER VAV REPLACEMENT
PROJECT# 18001834

CITY OF GREELEY
PUBLIC WORKS
1300 A. STREET, BLDG B.
GREELEY, COLORADO 80631

PRIME CONSULTANT /
ELECTRICAL ENGINEER:

COR Engineering LLC

Fort Collins, CO 80525
970.658.9887

COLORADO LICENSED
NANCY E. SCHNEIDER
2018-0044
0048556
2019.03.04
PROFESSIONAL ENGINEER

Division 26

MECHANICAL ENGINEER:

DESIGNPOINT ENGINEERING

19 Old Town Square, Ste 238
Fort Collins, CO 80524
970.430.5783

COLORADO LICENSED
KEITH MONTGOMERY
42193
3-4-19
PROFESSIONAL ENGINEER

Divisions 01 thru 23

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SECTION 011000 – SUMMARY OF WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. For this Section and all Specification Sections of the Project Manual, the above stated paragraph shall be deemed to also include all of Division 00, Bidding Requirements and Contract Conditions, as indexed in the Project Manual.

C. See Division 00 Sections “Instructions to Bidders” and “Supplementary Conditions-Modifications to AIA Doc 201-2007” for related information on work restrictions and project schedule requirements.

1.2 PROJECT SUMMARY

A. The mechanical contractor shall be the prime bidding contractor. As the prime contractor, the mechanical contractor is responsible for hiring qualified and licensed sub-contractors for any other trades required by the contract documents, such as a sub-contractor for electrical, temperature controls, test & balance, and ceiling replacement work. The mechanical contractor is responsible to secure and pay for all permits, fees, taxes, licenses, and inspections in connection with the work.

B. The mechanical contractor shall be pre-qualified prior to bidding. See Paragraph 1.3 below.

C. The primary scope of the project is to replace the existing variable air volume (VAV) boxes connected to the existing air handling units (AC-2 & AC-3) serving the 1st and 2nd floors on the east end of the building. The existing VAV boxes did not have reheat coils. The new VAV boxes will have hot water reheat coils therefore new hydronic piping will be required to feed the new boxes.

D. The new VAV boxes will have new direct-digital controls (DDC) which will new VAV controllers, reheat control valve, and room temperature sensors. The existing pneumatic controls serving the existing boxes and thermostats shall be completely removed.

E. Miscellaneous wall cutting/patching, ceiling modifications/replacement, and painting are required for the project. The prime mechanical contractor shall employ a licensed general contractor for this work.

1.3 QUALITY ASSURANCE

A. The prime mechanical contractor shall submit pre-qualifications to the engineer 7-day minimum prior to the bid. Only bids from pre-qualified contractors will be accepted. Pre-qualifications letters shall be limited to 10 pages maximum which shall be sent to the engineer via email listed later in this Section. Minimum requirements are as follows:

1. The contracting firm shall have a service department with a minimum of four service technicians.
2. The contracting firm has been in business doing similar type and size of commercial work for a minimum of 7 years.

1.4 CONTRACT DESCRIPTION

A. Project will be constructed under a single general construction contract.

1.5 OWNER OCCUPANCY OF THE SITE

A. General: Owner will be occupying the project site and buildings for the duration of the project, including the following areas:
   1. Entire project site for full operations, including Owner's entire site.

B. Contractor shall coordinate all work to allow Owner full access to the project site.

C. Emergency Building Exits During Construction: Keep all exits required by code open during construction period.

D. Contractor shall maintain site utilities in service to the local utility companies and Owner's on-site utilities, and the Owner's buildings and facilities on the project site at all times, unless approved otherwise by the Owner.

E. Storage and parking on the project site will be at the approval of the Owner.

1.6 WORK SEQUENCE

A. Contractor shall submit a schedule for completion of the work within a Final Completion Date determined by the Owner. The schedule shall be submitted for review by the Engineer and approval by the Owner. The schedule shall be updated during construction at the beginning of each month and sent to the Engineer for review/approval. Substantial Completion shall be 14 days before the Final Completion Date.

B. The contractor shall submit a plan on required system shutdowns for tie-ins. The plan shall be coordinated and approved by the Engineer and Owner.

C. Coordination with the Owner is very important in order to keep the disruption to the building at a minimum.

D. The Contractor shall cover and protect the existing furniture, equipment, etc. in spaces during construction as specified on the Drawings. Contractor shall clean all spaces of work at the end of each day.

1.7 INSTRUCTIONS TO BIDDERS

A. EXAMINATION OF SITE: Prior to submittal of a proposal, each bidder shall make and will be deemed to have made, a thorough examination of the site related to the work and all conditions existing thereon.

B. EXAMINATION OF CONTRACT DOCUMENTS: Before submitting proposals, bidders shall carefully examine the complete Contract Documents, including the drawings and specifications, and shall bring any discrepancies to the attention of the Engineer.

C. CONDITIONS OF THE WORK: Each bidder shall inform himself fully of the condition of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of the Contract.

D. LAWS AND REGULATIONS: The bidders attention is directed to the fact that all applicable State laws, municipal ordinances, and rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

E. INTERPRETATION OF CONTRACT DOCUMENTS: If a person contemplating the submission of a proposal for the proposed Contract is in doubt as to the meaning of any part of the drawings and project manual, or other proposed Contract Documents, or should errors, omissions or discrepancies in or between drawings and specifications exist or appear to exist, he shall submit to the Engineer a request for interpretation or clarification of the Contract Documents. **Such request shall be made in writing and shall be transmitted by email** and will be addressed by addendum duly issued, and a copy of such addendum will be mailed or emailed to each person receiving a set of documents. Interpretations, corrections, clarifications or changes of the Contract Documents made by any other means except by Addendum shall not be binding and Bidders shall not rely on them. Failure of a bidder to receive any such addendum or interpretation shall not relieve such bidder from obligation under his bid as submitted. The sole test for the validity of any clarification or interpretation of the Contract Documents shall be its appearance in an Addendum to the Contract Documents. The Owner will not be responsible for any other explanation or interpretation of the Contract Documents. All requests shall be directed (written or otherwise) to the Engineer, Justin Montgomery, P.E. Requests for clarification must be received at least ten (10) days prior to the date of receipt of bids. Receipt of addendum by bidders shall be acknowledged on the bid proposal. No oral explanation or interpretation will be made or acknowledged by the Engineer. **Engineer's email address is:** **jmontgomery@designpointengineering.com**

F. INSURANCE REQUIREMENTS: Provide the types and minimum insurance limits required by the Owner's contract requirements.

1.8 WORK UNDER OTHER CONTRACTS

A. Separate Contract: Owner has not awarded any separate contracts for other construction operations at Project site at the time of the bid opening. Owner reserves the right to do so if deemed necessary, either on the Project site or adjacent to the Project site.

B. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.9 ENGINEER'S SERVICES PERFORMED FOR THE OWNER

A. The engineer's services to be provided pursuant to the Owner/Engineer's Agreement are being performed solely for the benefit of the Owner, and no benefit is meant to be conferred upon any person or entity not a party to such Agreement, and no such person or entity should rely

upon this Engineer's performance of those services to the Owner; and no claim against the Engineer shall accrue to any Contractor, Subcontractor, Sub-subcontractor, consultant, architect, supplier, fabricator, manufacturer, tenant, surety, or any third party as a result of this Agreement or the performance or nonperformance of engineering services on this project.

B. The parties noted in the preceding Subparagraph accept the terms noted and accept such terms as binding on one and all.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION 011000

SECTION 013300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

B. Related Sections include the following:

1. Division 01 Section "Summary of the Work".
2. Division 01 Section "Quality Requirements".
3. Division 01 Section “Product Substitutions”.
4. Division 01 Section "Project Closeout".

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Engineer's responsive action.

B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Engineer for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in other Division 01 Sections for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Engineer's receipt of submittal.

1. Initial Review: Allow at least 10 business days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Allow at least 5 days for processing each re-submittal.
4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, or for delay in return of approved submittals by the Engineer.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space on submittal to record Contractor's review and approval markings and action taken by Contractor.
3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Engineer.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Unique identifier, including revision number.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Other necessary identification.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return submittals, without review, received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.

2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents. Proposal Request Form: Use Contractors standard form (digital) as approved by Engineer for Proposal Requests, and as follows:
3. Transmittal Form:
    a. All forms, including related attachments, shall be submitted to Engineer as a digital PDF format file(s) by email to allow email distribution of the request to Owner and Consultants in a timely manner. Individual file size shall not exceed 15MB per transmittal, unless advised otherwise by the Engineer or Owner. Large files shall be bookmarked in the PDF file to allow searching thru major headings (topics) as approved by Engineer.
    b. Submittals that include product cut sheets shall be generated using original PDFs by the manufacturer. Cut sheets that have been printed and then re-scanned by the Contractor are not acceptable as it reduces the overall quality of the submittal. Re-scanned submittals will not be accepted.
    c. Paper (hard) copies will not be accepted, unless advised otherwise by the Engineer or Owner for specific items.
    d. Transmittal Form inclusions: Contractors digital form as approved by Engineer, and provide locations on form for the following information:
        1) Project name.
        2) Date.
        3) Destination (To:).
        4) Source (From:).
        5) Names of subcontractor, manufacturer, and supplier.
        6) Category and type of submittal.
        7) Submittal purpose and description.
        8) Submittal and transmittal distribution record.
        9) Remarks.
        10) Signature of transmitter.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals with mark indicating action taken by Engineer in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. CONTRACTOR SHALL BE ADVISED THAT A COPY OF **ALL** SUBMITTALS SHALL BE RETAINED BY THE CONTRACTOR TO BE INCLUDED IN THE OPERATION AND MAINTENANCE MANUALS. NO EXCEPTIONS. Contractor shall duplicate such submittals into paper (hardcopies) at contractor's expense after reviewed digital submittals are returned to the Contractor from the Engineer.

1. Number of Copies: Submit 1 digital PDF file of each submittal, as follows, unless otherwise indicated:

    a. Initial Submittal: Comply with requirements of Final Submittals below unless approved otherwise by Engineer.
    b. Final Submittal: Submit 1 digital PDF file of each submittal to allow the following action to be taken on each submittal:
        1) Engineer review and optional Owner review.
        2) Subconsultant review (as needed).

C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
    1. Mark each copy of each submittal to show which products and options are applicable.
    2. Include the following information, as applicable:

        a. Manufacturer's written recommendations.
        b. Manufacturer's product specifications.
        c. Manufacturer's installation instructions.
        d. Standard color charts.
        e. Manufacturer's catalog cuts.
        f. Wiring diagrams showing factory-installed wiring.
        g. Printed performance curves.
        h. Operational range diagrams.
        i. Standard product operating and maintenance manuals.
        j. Compliance with recognized trade association standards.
        k. Compliance with recognized testing agency standards.
        l. Application of testing agency labels and seals.
        m. Notation of coordination requirements.

D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

    1. Preparation: Include the following information, as applicable:

        a. Dimensions.
        b. Identification of products.
        c. Fabrication and installation drawings.
        d. Roughing-in and setting diagrams.
        e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
        f. Shopwork manufacturing instructions.
        g. Templates and patterns.
        h. Schedules.
        i. Design calculations.
        j. Compliance with specified standards.
        k. Notation of coordination requirements.
        l. Notation of dimensions established by field measurement.

    2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches to allow printing of submittals by the Contractor after reviews are completed.
4. Number of Copies: Submit copies of each submittal, as follows:

    a. Initial Submittal: Submit one digital PDF file. Engineer will return the PDF file.
    b. Final Submittal: Submit one digital PDF file. Engineer will return the PDF file. Contractor shall make prints or copies as required for operation and maintenance manuals, subcontractors and suppliers, etc.

E. Samples: Prepare physical units of materials or products, including the following:

1. Comply with requirements in Division 01 Section "Quality Requirements" as required.
2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

F. Submittals Schedule: Comply with other additional requirements in other Division 01 sections.

G. Application for Payment: Comply with requirements in Division 01 Section "Application and Certificate for Payment."

H. Schedule of Values: Comply with requirements in Division 01 Section "Application and Certificate for Payment."

I. Subcontract List: Comply with requirements set forth in the General Conditions and Supplementary Conditions.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of engineers and owners, and other information specified.

C. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.

I. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

J. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

M. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 01 Section "Project Closeout”.

N. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

O. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Sequence of installation.
2. Required installation tolerances.

3. Required adjustments.
4. Recommendations for cleaning and protection.

P. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents. Absence of this certification by the Contractor on the submittal does not relieve Contractor of required compliance with this paragraph.

3.2 ENGINEER'S ACTION

A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Engineer will stamp each submittal with an action stamp (or an attached cover sheet) and will mark stamp appropriately to indicate action taken, as follows (or in similar manner):

ENGINEER'S PROCESSING:
NO EXCEPTIONS TAKEN_____ APPROVED AS NOTED_____

REJECTED_____

REVISE AND RESUBMIT_____ SUBMIT SPECIFIED ITEM_____

Engineer's processing is for general conformance with the design concept and contract documents. Markings or comments shall not be construed as relieving the contractor from compliance with the project plans and specifications, nor departures therefrom. The contractor remains responsible for details and accuracy for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly, and for performing his work in a safe manner.

C. Informational Submittals: Engineer will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:
1. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities (when applicable).
2. Divisions 02 through 27 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.

1.5 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

1. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.7 QUALITY CONTROL

A. Contractor Responsibilities: Unless otherwise indicated, Contractor shall provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Special Tests and Inspections: Contractor will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction.

1. Testing agency will notify Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Engineer, with copy to Contractor and to authorities having jurisdiction.
3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
5. Testing agency will retest and reinspect corrected work.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents. For testing that is designated as the Contractors responsibility, cost of such retesting shall be born by the Contractor.

E. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
5. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field-curing of test samples.
5. Delivery of samples to testing agencies (when required).
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching, and/or comply with the Contract Document requirements for Division 01 Section "Cutting and Patching," whichever is greater.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

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SECTION 016000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:
   1. Division 01 Section "Project Closeout" for submitting warranties for contract closeout.
   2. Divisions 02 through 27 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

D. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

A. Substitution Requests: Submit copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use Contractors standard form (digital) as approved by Engineer for Substitution Requests, and as follows:

a. All forms, including related attachments, shall be submitted to Engineer as a digital PDF format file(s) by email to allow email distribution of the request to Owner and Consultants in a timely manner. Individual file size shall not exceed 10MB per transmittal, unless advised otherwise by the Engineer or Owner. Large files shall be bookmarked in the PDF file to allow searching thru major headings (topics) as approved by Engineer.
b. Paper (hard) copies will not be accepted, unless advised otherwise by the Engineer or Owner for specific items.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
   a. Form of Acceptance: Approval of submitted materials and/or a Change Order when required.
   b. Use product specified if Engineer cannot make a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Engineer will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products to allow for inspection and measurement of quantity or counting of units.
6. Store materials in a manner that will not endanger Project structure.
7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on

product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: Where required, forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 27 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Project Closeout."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Engineer's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Prior Approved Equal: Where products are specified by name and accompanied by the term "Prior approved equal" the contractor shall submit prior to the bid the alternate product that they want to use. Substitutions to an alternate manufacturer after the bid is not allowed.

B. Product Selection Procedures: Procedures for product selection include the following:

1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.

    a. Substitutions may be considered, unless otherwise indicated.

2. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.

a. Substitutions may be considered, unless otherwise indicated.

3. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

   a. Substitutions may be considered, unless otherwise indicated.

4. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
5. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
7. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches satisfactorily.

   a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

8. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.

   a. Standard Range: Where Specifications include the phrase "standard range of colors," or similar phrase, Engineer will select color from manufacturer's product line that does not include premium items.
   b. Full Range: Where Specifications include the phrase "full range of colors" or similar phrase, Engineer will select color from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. All requests for substitutions shall be in accordance with the General Conditions and Supplementary Conditions, and as stated below, whichever is more stringent.

B. Timing: Engineer will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Engineer.

C. Conditions: Engineer will consider Contractor's request for substitution when the following additional conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

2.3 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
1. Evidence that the proposed product does not require extensive revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017000 – EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Starting of systems.

C. Demonstration and instructions.

D. Testing, adjusting, and balancing.

E. Project record documents.

F. Operation and maintenance data.

G. Product warranties and product bonds.

H. Examination.

I. Preparation.

J. Execution.

K. Cutting and patching.

L. Protecting installed construction.

M. Final cleaning.

1.2 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
   1. Submit maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
   2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
   3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
   4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
   5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.

6. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
7. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:
   1. When Contractor considers Work to be substantially complete, submit to /Engineer:
      a. Written certificate that Work, or designated portion, is substantially complete.
      b. List of items to be completed or corrected (initial punch list).
   2. Upon receipt of request for Substantial Completion, Engineer will make site observation to determine whether Work or designated portion is substantially complete.
   3. Should the Engineer/Owner determine that Work is not substantially complete:
      a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
      b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer/Owner.
      c. Engineer/Owner will re-observe the Work.
      d. Redo of Deficient Work: Repeated until Work passes Engineer's/ Owner's approval.
   4. When Engineer/Owner finds that Work is substantially complete, Engineer will:
      a. Prepare Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
      b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
   5. After Work is substantially complete, Contractor shall:
      a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
      b. Complete Work listed for completion or correction within time period stipulated.
   6. Owner will occupy all portions of building as specified in Section 011000 - Summary.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
   1. When Contractor considers Work to be complete, submit written certification that:
      a. Contract Documents have been reviewed.
      b. Work has been examined for compliance with Contract Documents.
      c. Work has been completed according to Contract Documents.
      d. Work is completed and ready for final inspection.
   2. Submittals: Submit following:
      a. Final punch list indicating all items have been completed or corrected.
      b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
      c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
      d. Accounting statement for final changes to Contract Sum.
      e. Contractor's affidavit of payment of debts and claims on AIA G706 - Contractor's Affidavit of Payment of Debts and Claims.
      f. Contractor affidavit of release of liens on AIA G706A - Contractor's Affidavit of Release of Liens.
      g. Consent of surety to final payment on AIA G707 - Consent of Surety to Final Payment Form.
   3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:
   1. Should Engineer/Owner consider Work to be incomplete or defective:
      a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
      b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.

1.3 STARTING OF SYSTEMS

A. Coordinate schedule for startup of various equipment and systems.

B. Notify Engineer/Owner seven days prior to startup of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.

G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation. Manufacturer start-up forms shall be included in the final O&M manuals.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of final inspection.

B. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

C. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment location.

D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

E. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

1.5 TESTING, ADJUSTING, AND BALANCING

A. Independent firm will perform services specified in Section 230593 - Testing, Adjusting, and Balancing for HVAC.

B. Reports will be submitted by independent firm to Engineer indicating observations and results of tests and indicating compliance or noncompliance with requirements of Contract Documents.

1.6 PROJECT RECORD DOCUMENTS

A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, product data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates used.
   3. Changes made by Addenda and modifications.

F. Record Drawings: Legibly mark each item to record actual construction as follows:
   1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
   2. Include locations of concealed elements of the Work.
   3. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   4. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   5. Field changes of dimension and detail.
   6. Details not on original Drawings.

G. Submit marked-up paper copy documents and PDF electronic files to Engineer before Substantial Completion.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit in PDF composite electronic indexed file.

B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.

C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
      g. Safety precautions to be taken when operating and maintaining or working near equipment.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop Drawings and product data.
      b. Test & balance reports.
      c. Certificates.
      d. Copy of the approved equipment submittals.
      e. Product warranties.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

D. Verify that utility services are available with correct characteristics and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
   1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
   2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
   3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Architect/Engineer for final decision.

E. Allow for expansion of materials and building movement.

F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
   1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
   2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.

G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
   1. Refer questionable mounting heights choices to Architect/Engineer for final decision.

H. Adjust operating products and equipment to ensure smooth and unhindered operation.

I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

3.4 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching. See Section 017310.

3.5 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.
   1. Employ experienced personnel or professional cleaning firm.

B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces.

C. Clean equipment to sanitary condition with appropriate cleaning materials.

D. Clean debris from roofs, gutters, downspouts, and drainage systems.

E. Clean Site; sweep paved areas, rake clean landscaped surfaces.

F. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION 017000

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SECTION 017310 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:
   1. Divisions 02 through 27, for additional specific requirements and limitations applicable to cutting and patching individual parts of the Work.

      a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 23 and 26 Sections for other additional requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Engineer’s opinion, reduce the building's

aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 017310

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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. Acoustical panels for installation in existing suspended ceiling grid system.

B. Related Requirements:
   1. Division 23 - Heating, Ventilating and Air Conditioning.
   2. Division 26 - Electrical.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel - 6-inch- square sample of each type, color, pattern, and texture.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   1. Suspended ceiling components.
   2. Structural members to which suspension systems will be attached.
   3. Size and location of initial access modules for acoustical panels.
   4. Items penetrating finished ceiling including the following:
      a. Lighting fixtures.
      b. Air outlets and inlets.
      c. Speakers.
      d. Sprinklers.
      e. Access panels.
   5. Perimeter moldings, if applicable.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Panels: Full-size panels equal to one percent of quantity installed, but not less than 10 units, and rounded up to the next full carton for each type, style and color of panel used.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way. Damaged materials shall be cause for rejection.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 50 or less.

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations:
   1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling panel system from single source from single manufacturer.

D. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

E. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance unless otherwise indicated.

F. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL CEILING MATERIALS

A. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

1. **AC-1, typical**: 2 feet x 4 feet x 3/4 inch, mineral fiber, beveled tegular edge. NRC 0.65, CAC 35, light reflectance 0.85 (min), non-directional fissured panel, scored (nominal 24” x 24” squares), medium texture. Field verify if 9/16” or 15/16” product before ordering. Will be placed in existing suspended grid. Color: white
   a. Armstrong "Cirrus Second Look”.
   b. Prior approved equal.

2.4 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

2.5 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

2.6 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
   1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Install acoustical panels with undamaged edges and fit accurately into existing suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. Install panels with pattern running in one direction parallel to **long** axis of space.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
   3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
   5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
   6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
      a. Install hold-down clips on panels within 10 feet of an exterior door.
   7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.
   8. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

2.7 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

2.8 MODIFICATIONS AT EXISTING SUSPENDED ACOUSTICAL CEILINGS

A. Clean existing grid as required prior to installation of new ceiling tiles.

2.9 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.
   4. Manual balancing valves.

B. Related Sections:
   1. Section 230529 - Hangers and Supports for HVAC Piping and Equipment: Product and installation requirements for pipe hangers and supports.
   2. Section 230700 - HVAC Insulation: Product and installation requirements for insulation for valves.
   3. Section 232113 - Hydronic Piping: Product and installation requirements for piping used in hydronic piping systems.
   4. Section 232116 - Hydronic Piping Specialties: Product and installation requirements for piping specialties used in hydronic piping systems.

1.3 SUBMITTALS

A. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves.

1.5 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 BALL VALVES

A. Manufacturers:

1. Apollo Valve.
2. Crane.
3. Hammond Valve.
4. Milwaukee Valve.
5. Nibco, Inc.
6. Prior approved equal.

B. 2 inches and Smaller: MSS SP 110, 600 psi WOG, two piece bronze body, chrome plated brass ball, full port, teflon seats, blow-out proof stem, threaded ends, lever handle. Provide extended handle as required to move freely with the pipe insulation.

2.2 BUTTERFLY VALVES

A. Manufacturers:
1. Crane Valve, North America.
2. Hammond Valve.
3. Keystone Valve.
4. Milwaukee Valve Company.
5. NIBCO, Inc.
6. Stockham Valves & Fittings.
7. Prior approved equal.

B. 2-1/2 inches and Larger: MSS SP 67, Class 150.
1. Body: Cast iron, lug ends, stainless steel stem, extended neck.
2. Disc: Aluminum bronze.
3. Seat: Resilient replaceable EPDM.
4. Handle and Operator: 10 position lever handle.

2.3 CHECK VALVES

A. Horizontal Swing Check Valves:

1. Manufacturers:
   a. Crane Valve, North America.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. NIBCO, Inc.
   e. Stockham Valves & Fittings.
   f. Prior approved equal.

B. 2 inches and Smaller: MSS SP 80, Class 125, bronze body and cap, Y-pattern, bronze regrinding disc, solder or threaded ends.

C. 2-1/2 inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze disc, bronze seat, flanged ends.

D. Spring Loaded Check Valves:

1. Manufacturers:
   a. Crane Valve, North America.
   b. Hammond Valve.
   c. Milwaukee Valve Company.
   d. NIBCO, Inc.
   e. Stockham Valves & Fittings.
   f. Prior approved equal.

2. 2 inches and Smaller: MSS SP 80, Class 125, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends.

3. 2-1/2 inches and Larger: MSS SP 125, Class 125, cast iron body, bronze disc, stainless steel spring, bronze seat, flanged ends.

2.4 MANUAL BALANCING VALVES

A. Manufacturers:
1. IMI Hydronic Engineering (Flow Design) – Basis of Design.
2. Griswold Controls.
3. Nexus.
4. Victaulic.
5. Prior approved equal.

B. 2 inches and Smaller: Valve shall be Venturi type with a throttle valve with a memory stop on the downstream side of the venture. Valve body shall be brass. The ball valve shall be bronze blowout proof stem, virgin Teflon seats, brass stem, EPDM O-ring and Teflon steam seals and steel handle. All ball valves shall conform to MSS-SP-110 standard. Ratings: 600 psig at 250 degrees F.

C. 2-1/2” and Larger: Valve shall be Venturi type with a throttle valve with a memory stop on the downstream side of the venture. Valve body shall be steel and shall be flanged. The full lug type butterfly valve shall be ductile iron with stainless steel stem, nylon bearings, and aluminum bronze disc. All ball valves shall conform to MSS-SP-110 standard. Ratings: 600 psig at 250 degrees F.

PART 3 - EXECUTION

3.1 INSTALLATION

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

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access. Refer to Section 230700.

E. Provide flush access panels where valves and fittings are not accessible. Paint to match existing surface.

F. Refer to Section 230529 for pipe hangers.

G. For installation of valves in heating water piping systems refer to Section 232113.

3.2 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.

B. Install valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install spring loaded check valves on discharge of water pumps.

D. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

E. Install ball or butterfly valves in heating water systems for shut-off service.

F. Install manual balancing valves for throttling service.

END OF SECTION 230523

SECTION 230529 - 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 and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe hangers and supports.
2. Hanger rods.
3. Sleeves.
4. Formed steel channel.

B. Related Requirements:
1. Section 230700 - HVAC Insulation: Piping and accessory insulation as required by this Section.

1.3 REFERENCES

A. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.4 SUBMITTALS

A. Product Data:

1. Hangers and Supports: Submit manufacturer's catalog information, including load capacity.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
1. Anvil International.
2. Cooper Industries.
3. Hilti, Inc.
4. Prior approved equal.

B. Hydronic Piping:

1. Conform to MSS SP58, MSS SP69, and MSS SP89.
2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches:

a. Material: Malleable iron.
b. Type: Adjustable swivel and split ring.

3. Hangers for Pipes Sizes 2 Inches and Larger:

a. Material: Carbon steel.
b. Type: Adjustable; clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

5. Wall Support for Pipe Sizes 3 Inches and Smaller: Cast-iron hooks.
6. Wall Support for Pipe Sizes 4 Inches and Larger: Welded steel bracket and wrought steel clamp.

7. Vertical Support: Steel riser clamp.
8. Floor Support for Pipes:

a. Pipe Saddle: Cast iron; adjustable.
b. Support: Concrete pier or steel column.
c. Furnish lock nut, nipple, and floor flange.

9. Copper Pipe Support: Copper-plated carbon-steel ring.

C. Accessories:

1. Hanger Rods: Mild steel threaded both ends or continuously threaded.

2.2 SLEEVES

A. Pipes through Non-fire-rated Floors:

1. Material: Galvanized steel.
2. Thickness: 18 gage.

B. Pipes through Non-fire-rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18-gage galvanized steel.

C. Round Ductwork: Galvanized steel.

D. Rectangular Ductwork: Galvanized steel.

E. Sealant:
   1. Material: Acrylic.

2.3 FORMED STEEL CHANNEL

A. Description:

   1. Material: Galvanized 12-gage steel.
   2. Thickness: 12 gage.
   3. Hole Spacing: 1-1/2 inches o.c.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that openings are ready to receive sleeves.

3.2 INSTALLATION

A. Pipe Hangers and Supports:
   1. Comply with MSS SP-58.
   2. Support horizontal piping in accordance with MSS SP-69 & SP-58 for the material and pipe size used.
   3. Minimum Hanger Spacing: 1/2 inch between finished covering and adjacent Work.
   4. Place hangers within 12 inches of each horizontal elbow.
   5. Minimum Vertical Hanger Adjustment: 1-1/2 inches.
   6. Support vertical piping at every floor.
   7. If piping is installed in parallel and at same elevation, provide multiple-pipe or trapeze hangers.
   8. Support riser piping independently of connected horizontal piping.
   9. Provide sheet-lead packing between hanger or support and piping.
   10. Design hangers for pipe movement without disengagement of supported pipe.

   11. Insulation:

      a. Provide clearance in hangers and from structure and other equipment for installation of insulation.
      b. As specified in Section 230700 - HVAC Insulation.

B. Sleeves:
   1. Set sleeves in position in forms and provide reinforcing around sleeves.
   2. Sizing:

      a. Size sleeves large enough to allow for movement due to expansion and contraction.
      b. Provide for continuous insulation wrapping.

   3. Extend sleeves through floors 1 inch above finished floor level, and calk sleeves.
   4. Spaces:

      a. If piping or ductwork penetrates a rated floor, ceiling, or wall, close off space between pipe or duct and adjacent Work with stuffing or firestopping insulation and calk airtight.
      b. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.
      c. Install stainless-steel escutcheons for piping and ductwork at finished surfaces.

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Nameplates.
2. Tags.
3. Pipe markers.
4. Ceiling tacks.
5. Labels.

1.3 REFERENCES

A. American Society of Mechanical Engineers:

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

1.4 SUBMITTALS

A. Product Data: Submit manufacturers catalog literature for each product required.

B. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.6 QUALITY ASSURANCE

A. Conform to ASME A13.1 for color scheme for identification of piping systems and accessories.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Manufacturers:
   1. Brady ID.
   2. Craftmark Pipe Markers.
   3. Marking Services Inc.
   4. Seton Identification Products.
   5. Prior approved equal.

B. Product Description: Laminated three-layer plastic with engraved black letters on a white background.

2.2 TAGS

A. Metal Tags

   1. Manufacturers:
      a. Brady ID.
      b. Craftmark Pipe Markers.
      c. Marking Services Inc.
      d. Seton Identification Products.
      e. Prior approved equal.
   2. Stainless Steel with stamped letters; tag size minimum 1-1/2 inches diameter with finished edges.

2.3 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Tape Pipe Markers

   1. Manufacturers:
      a. Brady ID.
      b. Craftmark Pipe Markers.
      c. Marking Services Inc.
      d. Seton Identification Products.
      e. Prior approved equal.

   2. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.4 CEILING TACKS

A. Manufacturers:
   1. Brady ID.
   2. Craftmark Pipe Markers.

3. Marking Services Inc.
4. Seton Identification Products.
5. Prior approved equal.

B. Description: Steel with 3/4 inch diameter color-coded head.

C. Color code as follows:

1. HVAC equipment: Yellow.
2. Heating/cooling valves: Blue.

2.5 LABELS

A. Description: Laminated Mylar, size 1.9 x 0.75 inches, adhesive backed with printed identification.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces for stencil painting.

3.2 INSTALLATION

A. Install identifying devices after completion of coverings and painting.

B. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive.

C. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer. For unfinished canvas covering, apply paint primer before applying labels.

D. Install tags using corrosion resistant chain. Number tags consecutively by location.

E. Identify mechanical equipment including but not limited to VAV boxes and pumps with plastic nameplates. Identify small in-line pumps with tags.

F. Identify control panels and major control components outside panels with plastic nameplates.

G. Identify piping, concealed or exposed, with plastic tape pipe markers. Identify service and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 SCHEDULES

A. Heating Water Supply Piping:
   1. Name: “HEATING WATER SUPPLY”
   2. Background Color: Green.
   3. Lettering Color: White.

B. Heating Water Return Piping:
   1. Name: “HEATING WATER RETURN”
   2. Background Color: Green.
   3. Lettering Color: White.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Testing adjusting, and balancing of air systems.
2. Testing adjusting, and balancing of hydronic systems.
3. Measurement of final operating condition of HVAC systems.

B. Related Sections:
1. Section 230923 - Direct-Digital Control System for HVAC: Requirements for coordination between DDC system and testing, adjusting, and balancing work.

1.3 REFERENCES

A. Associated Air Balance Council:

1. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.

C. Natural Environmental Balancing Bureau:

1. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

D. Testing Adjusting and Balancing Bureau:

1. TABB - International Standards for Environmental Systems Balance.

1.4 SUBMITTALS

A. Prior to commencing Work, submit proof of latest calibration date of each instrument.

B. Test Reports: Indicate data on AABC MN-1 National Standards for Total System Balance forms, forms prepared following ASHRAE 111, NEBB Report forms, TABB Report Forms, forms containing information indicated in Schedules.

C. Field Reports: Indicate deficiencies preventing proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

D. Submit draft copies of report for review prior to final acceptance of Project.

E. Furnish reports in PDF format complete with table of contents page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of balancing dampers and valves and rough setting.

B. Operation and Maintenance Data: Furnish final copy of testing, adjusting, and balancing report inclusion in operating and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AABC MN-1 National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111, NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems, or TABB International Quality Assurance program.

B. Prior to commencing Work, calibrate each instrument to be used.

1.7 QUALIFICATIONS

A. Agency: Company specializing in testing, adjusting, and balancing of systems specified in this section with minimum three years' experience and be certified by AABC, NEBB, or TABB.

PART 2 - PRODUCTS

2.1 Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions.

B. Verify systems are complete and operable before commencing work. Verify the following:

1. Systems are started and operating in safe and normal condition.
2. HVAC control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place or in normal position.
15. Service and balancing valves are open.

3.2 PREPARATION

A. Furnish instruments required for testing, adjusting, and balancing operations.

B. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
1. Exhaust or outside air: Adjust to within plus 10 percent of design.

B. Air Outlets and Inlets: Adjust to within plus or minus 10 percent of design.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4 ADJUSTING

A. Verify recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted. If disrupted, verify correcting adjustments have been made.

D. Report defects and deficiencies noted during performance of services, preventing system balance.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to obtain required or design supply, return, outside air, and exhaust air quantities at site altitude.

B. Make air flow rate measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain:
   1. Minimal objectionable drafts.

E. Use volume control devices to regulate air quantities only to extent adjustments do not create objectionable air motion or sound levels. Effect volume control by using volume dampers located in ducts.

F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed or adjust VFDs. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. At modulating damper locations, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.

K. Measure building static pressure and adjust supply, return, and exhaust air systems to obtain required relationship between each to maintain approximately 0.05 inches differential static pressure near building entries.

L. For variable air volume system powered units set volume controller to airflow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable-air-volume temperature control.

M. Provide a main duct traverse measurement and compare to the outlet air flow data to show amount of duct leakage.

N. Coordinate with the temperature controls contractor (TCC) to calibrate the outside air damper control to vary with fan speed. Set the minimum outside air as scheduled on the Drawings at minimum/maximum supply airflows. Indicate set point in the TAB report.

O. Coordinate with the temperature controls contractor (TCC) to calibrate and set the duct static pressure sensor for the variable volume system. The TAB contractor shall help minimize/optimize this set point for proper VAV box control and system fan energy savings. Indicate set point in the TAB report. Maximum set point to be 1.2" w.c.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems, after air balancing, to obtain design quantities.

B. Use calibrated Venturi tubes and pressure gauges to determine flow rates for system balance.

C. Confirm air bleeds indicate system is full of water.

D. Adjust systems to obtain specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

E. Perform system balance with automatic control valves fully open, balancing valves fully open, and pump VFDs at 100 percent speed.

F. Confirm pump rotation and differential pressure at full flow.

G. Perform adjustment of water distribution systems by the following measures:

1. Reduce total system flow rate first by reducing speed of VFD.
2. Use balancing valves.

H. Do not use service or shut-off valves for balancing unless designed for balancing and shut-off functions.

3.7 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing:
1. Existing air handling units (AC-2 & AC-3) including supply, return, outside, and relief air quantities.
2. HVAC Pumps.
3. VAV boxes including reheat coils.
4. Air Filters.
5. Air Inlets and Outlets.

B. Report Forms

1. Title Page:

a. Name of Testing, Adjusting, and Balancing Agency
b. Address of Testing, Adjusting, and Balancing Agency
c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
d. Project name
e. Project location

f. Project Architect
g. Project Engineer
h. Project Contractor
i. Project altitude
j. Report date

2. Summary Comments:

a. Design versus final performance
b. Notable characteristics of system
c. Description of systems operation sequence
d. Summary of outdoor and exhaust flows to indicate building pressurization
e. Nomenclature used throughout report
f. Test conditions

3. Instrument List:

a. Instrument
b. Manufacturer
c. Model number
d. Serial number
e. Range
f. Calibration date

4. Electric Motors:

a. Manufacturer
b. Model/Frame
c. HP/BHP and kW
d. Phase, voltage, amperage; nameplate, actual, no load
e. RPM
f. Service factor
g. Starter size, rating, heater elements
h. Sheave Make/Size/Bore

5. V-Belt Drive:

a. Identification/location
b. Required driven RPM
c. Driven sheave, diameter and RPM
d. Belt, size and quantity
e. Motor sheave diameter and RPM
f. Center to center distance, maximum, minimum, and actual

6. Pump Data:

a. Identification/number
b. Manufacturer
c. Size/model
d. Impeller
e. Service

f. Design flow rate, pressure drop, BHP and kW
g. Actual flow rate, pressure drop, BHP and kW
h. Discharge pressure
i. Suction pressure
j. Total operating head pressure
k. Shut off, discharge and suction pressures
l. Shut off, total head pressure

7. Heating Coil Data:

a. Identification/number
b. Location
c. Service
d. Manufacturer
e. Air flow, design and actual
f. Water flow, design and actual
g. Water pressure drop, design and actual
h. Entering water temperature, design and actual
i. Leaving water temperature, design and actual
j. Entering air temperature, design and actual
k. Leaving air temperature, design and actual
l. Air pressure drop, design and actual

8. Air Moving Equipment:

a. Location
b. Manufacturer
c. Model number
d. Serial number
e. Arrangement/Class/Discharge
f. Air flow, specified and actual
g. Return air flow, specified and actual
h. Outside air flow, specified and actual
i. Total static pressure (total external), specified and actual
j. Inlet pressure
k. Discharge pressure
l. Sheave Make/Size/Bore
m. Number of Belts/Make/Size
n. Fan RPM
o. Gas heating input (where applicable)

9. Return Air/Outside Air Data:

a. Identification/location
b. Design air flow
c. Actual air flow
d. Design return air flow
e. Actual return air flow
f. Design outside air flow
g. Actual outside air flow

10. Duct Traverse:

    a. System zone/branch
    b. Duct size
    c. Area
    d. Design velocity
    e. Design air flow
    f. Test velocity
    g. Test air flow
    h. Duct static pressure
    i. Air temperature
    j. Air correction factor

11. Air Distribution Test Sheet:

    a. Air terminal number
    b. Room number/location
    c. Terminal type
    d. Terminal size
    e. Design air flow
    f. Test (final) velocity
    g. Test (final) air flow
    h. Percent of design air flow.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. HVAC piping insulation, jackets and accessories.
2. HVAC ductwork insulation, jackets, and accessories.

1.3 SUBMITTALS

A. Product Data:
1. Submit product description, thermal characteristics.
2. List of materials and thickness for each service, and location.

1.4 QUALITY ASSURANCE

A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

D. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

1.5 QUALIFICATIONS

A. Applicator: Company specializing in performing Work of this section with minimum three years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

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

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Glass Fiber and Mineral Fiber Insulation

1. Manufacturers:
   a. Johns Manville.
   b. Knauf Insulation.
   c. Owens Corning.
   d. Prior approved equal.

2.2 PIPE INSULATION

A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation.

1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Operating Temperature Range: 0 to 850 degrees F.
3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
4. Jacket Temperature Limit: minus 20 to 150 degrees F.

2.3 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

D. Piping 2 inches diameter and larger: Calcium silicate insert. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

2.4 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.

1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Maximum Operating Temperature: 250 degrees F.
3. Density: 1.0 pound per cubic foot.
4. R-Value: 1-1/2” thick (R-4.5), 2” thick (R-6.0).

B. TYPE D-5: ASTM C1071, Type II, rigid, glass fiber duct liner with coated air side.

1. Thermal Conductivity: 0.23 at 75 degrees F.
2. Density: 3.0 pound per cubic foot.
3. Maximum Operating Temperature: 250 degrees F.
4. Maximum Air Velocity: 4,000 feet per minute.

2.5 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C. Adhesive: Waterproof, ASTM E162 fire-retardant type.

D. Liner Fasteners: Galvanized steel, impact applied with integral head.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify piping and ductwork has been tested before applying insulation materials.

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

3.2 INSTALLATION - PIPING SYSTEMS

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions.

C. Hot Piping Systems:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
3. Insulate flanges and unions at equipment.

D. Inserts and Shields:

1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.

    a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
    b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.

3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.

E. Insulation Terminating Points:

1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping insulation at union upstream of the coil control valve.

3.3 INSTALLATION - DUCTWORK SYSTEMS

A. Duct dimensions indicated on Drawings are finished inside dimensions. Where duct liner is specified, the sheet metal dimension shall increase to provide the clear inside area specified on the Drawings.

B. Insulated ductwork:

1. Provide insulation with vapor retarder jackets.
2. Finish with tape and vapor retarder jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. External Glass Fiber Duct Insulation:

1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
2. Secure insulation without vapor retarder with staples, tape, or wires.
3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.

4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

D. Duct Liner:

1. Adhere insulation with adhesive for 100 percent coverage.
2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

3.4 SCHEDULES

A. Heating Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS (Inches)
Heating Water Supply and Return	P-1	1-1/4 inches and smaller 1-1/2 inches and larger	1.5 2.0

B. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Rectangular Supply and Return Ducts	D-5	1.0
Round Supply and Return Ducts	D-1	1.5
Exposed spiral ducts in finished spaces	None	None
Bathroom exhaust ducts	None	None
Transfer Air Ducts	D-5	1.0

END OF SECTION 230700

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SECTION 230923 - DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. The General Provisions of the Contract, including General and Supplementary Conditions apply to work in this section. Consult them for further instructions and be governed by the requirements thereunder.

B. Temperature Control Drawings which include the Sequences of Operation, Points Lists, and Control Schematics.

1.2 DESCRIPTION

A. Work Included:
   1. Provide a Building Automation System (BAS) system of direct digital controls with solid state electronic to comprise a complete system, furnished and installed by the Temperature Control Manufacturer. The complete BAS system shall include all requirements set forth in this Section, and the Related Requirements in Division 23 and Division 26 documents.
   2. Direct Digital Control shall be defined as a control technique through which the process variable is continuously monitored by a digital microprocessor computer which accomplishes loop control by calculating a control solution for output to a control device.
   3. The entire system shall use BACnet protocol only.
   4. The controls contractor is responsible for all programming, color graphics, etc. at the existing front-end building controller.
   5. The Building Management System (BAS) shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BAS will perform in the Owner's environment without disruption to any of the other activities taking place on that LAN.
      a. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BAS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.
   6. The DDC system shall consist of independent, stand alone, control units and terminal control units. The control units shall contain their own microprocessors complete with all necessary software logic functions to perform all specified control sequences in a completely independent manner. Include all software packages detailed in this specification for current or future use. Provide all necessary wiring, hardware, software and accessories to tie all control units and terminal control units together through a communication network system for programming, data gathering, setpoint adjustment, alarming, trending, and system checkout at a single point in the building. The DDC system must meet current FCC requirements.
   7. The system shall be complete in all respects, put in operation and calibrated under occupied conditions. This contractor is responsible for providing all Sequences of

Operations specified in this section even if equipment and controls are furnished by others. For sequences specified in other sections, if equipment and controls are furnished by others, the temperature control contractor shall be responsible for verifying sequences of controls and coordination.

8. All temperature controls shall be provided by a single source responsibility.

B. General:
   1. All automatic control valves shall be furnished by the Temperature Control Contractor and installed under his supervision under the Mechanical Division 23.
   2. All automatic control dampers unless otherwise specified, shall be furnished by the Temperature Control Contractor and installed under his supervision under the Mechanical Division 23.

1.3 WIRING

A. All wiring shall comply with the National Electric Code (latest edition), local codes and the Electrical Division of these specifications.

B. All control interlocks and wiring done at the factory, and 120 volt power circuits to each control panel or control panels shall be wired by the Temperature Control Contractor, except control junction box shown on the plans and schedules. Power circuits shall be provided under the Electrical Division for control panels. The TCC is responsible for engaging an Electrical Contractor for this work.

C. If more 120 volt power circuits are required than shown on the drawings due to additional equipment required by the BAS Contractor, the cost of additional power circuits shall be the responsibility of the BAS Contractor.

1.4 SUBMITTALS

A. The BAS Contractor shall submit shop drawings of all components of the BAS System including all equipment, control panels, and wiring diagrams. Work shall not begin until acceptance of submittals has been obtained from the Engineer. Field wiring and installation of control components may begin prior to completion of the DDC System software, provided this portion has been accepted by the Engineer. Upon review and acceptance of the submittals, the BAS Contractor shall disperse the required information to all other trades involved in the work managed by the BAS system.

B. Shop drawings shall be submitted on reproducible 11"x17" sheets. These shall be corrected to "record" conditions at the end of the job and included with the mechanical "Record Drawings."

C. Shop drawings shall consist of engineering data on each control system component, control diagrams, wiring diagrams, damper schedule, automatic valve schedule with CVs, flows and pressure drop, sequence of operation, piping diagrams for all valves, control panels and panel layouts, installation and calibration instructions. Shop drawings shall include sufficient product information to determine compliance to these specifications. Control diagrams shall include:
   1. Schematic representation of system under control with field devices located and wired.
   2. Control panel layout showing instruments fully wired to numbered terminal strips.
   3. Front panel face layout with nameplate schedule, and location in building, for each panel.

4. Bill of Material; scheduling all items by using code abbreviation indicating quantity, manufacturer, manufacturer's code number, and full equipment descriptive literature, i.e., dampers, valves, relays, controllers, sensors and miscellaneous devices.
5. Written sequence of operation incorporating into the written sequence all functional devices using device code abbreviation or point number.
6. Calibration Schedule and set point for every device.

D. Final DDC programming will be developed as part of the system shop drawing review, during system startup and during final evaluation and set up of the project. The BAS Contractor must anticipate and provide at no additional cost some software changes required by the Engineer or Owner to bring the control system in line with optimum performance and energy efficiency.

E. Control Algorithms: All control sequences shall be descriptively shown by the use of logic flow charts incorporating the same point names as used in the program and giving all control equations used.

F. Operational and Maintenance Data: Submit the following:
1. General instruction sheets for all products and devices furnished under the BAS specifications.
2. Parts lists, availability (supplier name, telephone number and location), and guarantee of local stock for all products and devices furnished under the BAS specifications.
3. List of recommended spare equipment, along with quantities, the Owner should maintain on site.
4. Two copies of Operators and Programmers Manuals.
5. Final approved set of all shop drawing submittals.
6. Two copies of the final version of software on CD ROM in PDF format.
7. Record Drawings.
8. Point validation certification.

1.5 ADJUSTABILITY

A. All control components shall be completely adjustable, so that setpoints may be easily changed. All setpoints in the temperature control system shall be adjustable without the addition or modification of controls. Adjustable set point indicated in the “Sequence of Operation” shall be adjustable through the graphics screen without having to modify the programming.

1.6 DEMONSTRATION, TRAINING AND COMPLETION

A. Upon completion of the installation the BAS Contractor shall provide a complete system instruction and training to the owner's operating personnel. The training session(s) shall be conducted at the building in (1) session of (4) hours. Two copies of the Record Drawings and Operation and Maintenance manuals shall be provided at the training session.

B. The BAS Contractor shall submit a letter certifying completion of all temperature control work including training prior to final payment.

1.7 WARRANTY

A. The control system shall be warranted to be free from defects in workmanship and material for the period of **one year**. The BAS contractor shall make all necessary repairs, adjustments and replacement at no cost to the owner during the warranty period.

B. BAS contractor shall provide a verification check of all controls within a few weeks of the end of the warranty period. Recalibrate, readjust (after discussing any new setpoints with the Owner) and repair all faulty equipment.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND INSTALLERS

A. All controls shall be of the approved manufacturers. It is recognized that packaged equipment comes with other names or controls and that some functions are accomplished with other named components. This specification does not intend to prohibit this practice.

B. The BAS contractor is responsible for pre-assembling and installing panels and all hardware with his own employees, proving the system and training the Owner in its proper function and maintenance. BAS contractor may subcontract wiring, conduit placement, but shall make all wiring terminations and be responsible for his subcontractor's work.

C. Acceptable manufacturers and installers are listed below:

Manufacturer	Installer
Johnson Controls	Centennial Controls
Johnson Controls	Johnson Controls

2.2 LOW VOLTAGE POWER AND WIRING

A. All control devices and panels containing low voltage power sources shall inherently comply with NEC Class 2 requirements (current limiting), or shall be supplied with branch circuit fusing to limit control circuit current to NEC Class 2. All control transformers shall be of the inherent current limiting type, or shall be installed with primary disconnect and overload protection. All transformers shall be mounted in control panels at locations shown on the drawings.

B. Shielded Cable: Twisted shielded cable shall be used where called for and where required to properly protect the DDC system from false signals and electrical noise. Shielding shall be fine braided tinned copper (90% coverage) or aluminum foil (100% coverage).

C. All wiring and cables shall be plenum rated.

D. Minimum Requirements
   1. Communication Cable: Twisted shielded pair, 18 gauge.
   2. Analog Input: Twisted shielded two, three, or four-wire as required, 18 gauge.
   3. Binary Input: 18 gauge.
   4. Analog Output: Twisted shielded, 18 gauge.

5. Binary Output: 18 gauge.

E. Wiring shall follow a color scheme which shall be consistent throughout the entire project. Provide the color scheme in the shop drawings.

2.3 SENSORS

A. Electronic temperature sensors shall be platinum or nickel-iron RTD, thin film integrated circuit, or aged thermistors. Resistance change versus temperature shall be linear over the range of the application.

B. Sensor Accuracy:

SENSOR FUCTION	ACCURACY	RANGE
Outside Air Temperature	±2°F	-20°F to 110°F
Space Temperature	±1.5°F	40°F to 90°F
Duct Temperature	±1.0°F	40°F to 120°F
Heating Water Temperature	±2.0°F	80°F to 230°F

C. All office and conference room temperature sensors shall have adjustable setpoint potentiometer, no display.

D. Use flat wall stainless steel plate sensors for common areas such as corridors, restrooms, etc. Flat wall plates shall be labeled indicating the system they control.

E. Averaging Temperature Sensors: Shall be provided in all duct applications with cross section of over 10 sq. ft and for the preheat and mixed air temperature sensors in the air handling unit. Sensor shall be an averaging type capillary of not less than 15 feet. Capillary shall be serpentined across the duct for an average of one linear foot of capillary per one square foot of cross sectional duct area.

F. Outside air sensors shall be suitable for outdoor use. Install sensors with shield and located where unaffected by the sun.

G. Liquid sensors shall be provided with separable wells.

H. Pressure: Pressure sensors shall be temperature compensated for the expected temperatures of the application.
   1. Air Differential Pressure Switches: Shall be single contact for actuation on decreasing pressure (normally closed), 0.5" to 2.0" range. Relay rating of 15 amps at 120-480 VAC.

2.4 TRANSMITTERS

A. Transmitter output signal shall be directly proportional and linearized over the full range of the transmitter. The output shall be industry standard 0-10V, or 4-20ma. The transmitter shall be selected to match the applied control loop such that the setpoint falls approximately in the

center of its range. Electronic transmitters shall comply with the accuracy and repeatability requirements specified for sensors.

B. Differential Pressure Transmitters
   1. Fan inlet Transmitter: Shall be capable of receiving flow signals from air flow sensors and be able to measure static pressure, differential pressure or velocity pressure and provide an output of linearized voltage or current signal. Transmitter shall have an accuracy of ±1% of full span, including non-linearity, hysteresis, and non-repeatability; an overpressure and static pressure limit of 25 psig; 20°F to 120°F operating temperature limits; 0-95% RH, non-condensing humidity limits; 0-5 VDC and 0-10 VDC, 4 wire configuration and 4-20 mADC, 2 wire configuration analog outputs; and ±0.5% of full span stability for 6 months. Ashcroft or approved equivalent.

C. Ultra-Low Air Differential Pressure Transmitter: Variable capacitance sensor using glass-clad silicon chip. The Si-Glas sensor is composed of sputtered metals and glass molecularly bonded to silicon. No epoxies or other organics are permitted in the sensor that contribute to drift or mechanical change over time.
   1. Proof pressure 5 PSIG and Burst pressure 25 PSIG. Storage temperature -40 to 180°F. and operating temperature 0 to 160°F.
   2. Outputs are 4 to 20 mA 2 wire or 1-5VDC, 1-6VDC, 0-5VDC, 0-10VDC 3 wire. Unidirectional and bidirectional ranges as specified.
   3. Accuracy: 1%
      1/2% and 1/4%

2.5 ACTUATORS

A. Electronic Actuator (for dampers and valves)
   1. Electronic direct-coupled actuation shall be provided on all dampers. The fastening clamp shall attach to the damper shaft for maximum strength and eliminate slippage. Single bolt or setscrew type fasteners are not acceptable.
   2. Actuators shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the entire rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.
   3. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe are not acceptable. All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by simply changing the mounting orientation. All spring return actuators with greater than 60 in-lbs. of torque shall have an assembly of sufficient size to be directly mounted to an integral damper jackshaft of up to 1.05 inches when the damper is constructed in this manner.
   4. Proportional actuators shall be positive positioning and accept a 0-10 VDC or 0-20 mA control signal and provide a 2-10 VDC or 4-20 mA operating range. An actuator capable of accepting a pulse width modulation control signal and providing full proportional operation of the damper is acceptable. All proportional actuators shall be able to provide a 2-10 VDC-position feedback signal as required by control specification.
   5. All 24V AC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications.

6. Actuators with greater than 35 in-lb. of torque shall be provided with a conduit fitting and a minimum three-foot electrical cable that is pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
7. All actuators shall have a visual position indicator to indicate control position of the actuator.
8. Actuators shall be applied according to the valve or damper manufacturer's specifications.
9. Actuators shall be Underwriters Laboratories Standard 873 listed as meeting correct safety requirements and recognized industry standards. Actuators shall have a 2-year manufacturer's warranty, starting from the date of substantial completion.
10. Torque Requirements
    a. Damper actuators shall be sized with enough torque to provide a minimum of 5 inch-pounds of torque per square foot of damper face area.
    b. Valve actuators shall be sized to provide the minimum torque required for proper valve close-off for the required application.
11. Actuator Housings: Actuators shall be provided with proper weather, corrosive, or explosion-proof type housings as required by application.

B. When multiple damper sections are used, use one operator per section (at least one operator for each 30 square feet of damper or for each length greater than 48"). "Ganging" sections together through linkages and one actuator is not acceptable.

C. When application (see Sequence of Operation) requires normally open or normally closed damper position, actuator must have spring return. Non-mechanical forms of fail-safe operation are not acceptable.

D. Actuators providing control by temperature change of media within actuator are not acceptable.

E. Direct coupled actuators are permitted.

F. Size all valve actuators to be able to close valve tight against 150% of maximum available pumping head operating pressure.

G. When application (see Sequence of Operation) requires normally open or normally closed valve position, actuator must have spring return. Non-mechanical forms of fail-safe operation are not acceptable. The following shall be standard fail position unless noted otherwise:
1. Heating coils: Fail open.
2. Cooling coils: Fail closed.

2.6 VALVES

A. Manufacturers:
1. Belimo.
2. Bray.
3. Johnson Controls.
4. Prior approved equal

B. General: All valves to heating coils which are part of an air handling system which takes in outside air shall open for full supply water flow from heating generation plant whenever a loss of power or air supply to the valves occurs. All valves shall close against flow. All control

valves shall be single seat type, tight shut-off, unless otherwise indicated. All control valves shall be single seat type, tight shut-off, unless otherwise indicated.

C. Characterized Control Ball Valves:
   1. Valves 1/2 inch – 2 inches shall be forged brass body with nickel plating, NPT screw type. The operating temperature range shall be 0° to 212°F.
   2. The valves shall have an ISO type 4-bolt flange for mounting actuator in any orientation parallel or perpendicular to the pipe. A non-metallic thermal isolation adapter shall separate flange from actuator with high temperature materials rated for continual use at greater than the application temperature. Valve assemblies without thermal isolation as described are not acceptable.
   3. The isolation adapter shall also provide stable direct coupled mechanical connection between the valve body and actuator and prevent all lateral or rotational forces from affecting the stem and its packing O-rings.
   4. All control ball valves shall be furnished with a stainless steel ball & stem and fiberglass reinforced Teflon seats and seals. The valves shall have a blow-out proof stem design.
   5. Flow type for modulating two-way valves shall be equal percentage. All control ball valves shall have a flow-characterizing disk in the inlet of the valve to provide this true equal percentage flow response.
   6. Three-way valves shall have equal percentage control port. They shall have a modified linear bypass port which will yield 70% of the flow of the A port. The total flow remains near constant. Three-way valve shall be applicable for both mixing and diverting.
   7. The characterizing disk shall be held securely by a keyed ring.
   8. The stem packing shall consist of 2 O-rings designed for on-off or modulating service and requiring no maintenance.
   9. Characterized Control Ball Valves are acceptable for all terminal units (Terminal units and unit heaters).

D. Actuated Globe Valves: Two and three-way screwed valves 1/2" through 2"
   1. Valves 1/2 inch – 2 inches shall be bronze body, NPT screw type, and shall be rated for ANSI Class 250 working pressure. The operating temperature range shall be 20° to 280°F. Spring loaded TFE packing shall protect against leakage at the stem.
   2. The valves shall be provided with a metallic linkage. A thermal isolation adapter shall separate the valve bonnet from the linkage. Valve assemblies without thermal isolation as described are not acceptable.
   3. Flow type for two-way valves 1/2 inch – 6 inches shall be equal percentage.
   4. Flow type for modulating three-way mixing and diverting valves 1/2 inch – 6 inches shall be linear.
   5. Actuated Globe Valves are required for all air handlers and boiler applications.
   6. Globe valves shall be used for the heating coil in the air handling units.

E. Valves (2-way) shall be rated as follows:
   1. Body Static Pressure Rating: 250 psi.
   2. Close-off Rating: 1.5 times pump design operating head.
   3. Dynamic Rating: 1.5 times pump design operating head.

F. Valves shall be sized for pressure drops (psi) as follows:
   1. Terminal unit reheat coils, 3 PSI
   2. Heating water coil at air handling unit, 3 PSI

2.7 WELLS

A. Metal to be compatible with the pipe it is to be installed in (generally brass or bronze).

2.8 CURRENT SENSOR

A. Current sensor of the induction type shall be located between the motor starter and the motor on one leg of the motor wiring. Power for the sensor shall be induced from the monitored load. Sensor shall be capable of detecting belt, bearing or coupling loss. An adjustable trip set point of ±1% on a range suitable for the monitored load shall be provided along with an LED for sensor output status. The sensor shall be a normally open switch and shall produce a 0.1 amp signal when closed. Provide with an adjustable mounting bracket for installation in motor starter cabinet.
   1. MAMAC.
   2. Hawkeye or approved equivalent.

2.9 SMOKE DETECTORS

A. Smoke detectors to be provided under Electric Division 26.

2.10 TERMINAL CONTROL UNITS

A. General:
   1. Each VAV shall be locally controlled by a terminal control unit (TCU). Each TCU shall be remotely addressable over a multidrop pair of wires by the DDC System higher level control units.

B. Each TCU shall regulate zone (room) temperature by regulating the volume of air supplied to the zone and modulating heating valve(s) (where valve(s) are required). This shall be accomplished by controlling zone air velocity at an appropriate setpoint which is reset by the space temperature. A PID type control algorithm shall reduce offset and overshoot. Proportional only control is not acceptable. Each controller shall be stand-alone and have the following independently adjustable setpoints:
   1. Heating temperature
   2. Cooling temperature
   3. Maximum cooling velocity (for VAV boxes)
   4. Minimum cooling velocity (for VAV boxes)

C. Isolation: Control, communication, and power circuits for each controller shall be electrically isolated to protect against transients and steady state pick-up, spikes and power surges.

D. Power: Each TCU shall incorporate a single point electrical power connection. The BAS contractor shall provide a 120V/24V transformer at each unit for power. Coordinate with the E.C. for 120V power to transformer.

E. Air Velocity Sensor (VAV units):
   1. Velocity sensor shall be either hot wire anemometer or multipoint flow sensor with differential pressure transmitter which transmits velocity pressure to the TCU. Range shall be 50 to 2500 FPM accurate to ±25 FPM. It is the ATC contractors responsibility to verify and supervise that the velocity sensor location and type, along with the actual

VAV control unit inlet configuration for all VAV control units, will function satisfactorily to provide accurate pressure independent control.

2. The BAS contractor shall instruct and supervise the balancing contractor on how to set minimum and maximum air volume settings.

F. Morning Warm-Up Sensor (VAV units): Where a higher level control unit is not available to communicate to the appropriate TCUs that the VAV system is in morning warm- up, supply air temperature sensors shall be provided so that the TCU will know when to go into its' morning warm-up sequence.

G. TCUs are to meet UL and local jurisdictional requirements for environmental air plenum applications.

H. Responsibility: The BAS contractor shall provide and be responsible for the complete temperature control system including VAV control units.

PART 3 EXECUTION

3.1 ACCESSIBILITY

A. Install all control devices in "Readily Accessible" locations as defined by Chapter 1, Article 100, Part A of the National Electric Code.

3.2 CONTROL PANELS

A. Provide and install local control panels for each Mechanical System. Group these together into one panel when multiple systems are located in one equipment room.

B. The panels shall be totally enclosed with hinged door and containing associated control components such as controllers, relays, switches, microprocessor, communication interface, override timers, etc. Panel to meet NEMA 1 requirements with proper bracing for rigid wall mounting.

C. Mark each control device on the panel with engraved plastic laminate nameplates describing its function and cross-referencing it to control diagrams. Mark items within panel plainly and permanently as to its identification on the control drawings.

D. Each electrical wire shall be labeled at each end and terminate at a bulkhead, terminal strips, or control instrument. All wires and tubes shall be organized in a bundle or wire mold rack and tied. Terminal shall be numbered to match control diagrams.

3.3 WIRING OF CONTROL DEVICES BY OTHERS

A. Control devices carrying full load current furnished by Mechanical and wired by Electrical shall be located at the device being controlled, unless shown on the drawings or mutual agreement is made between the contractors with no change in the contract price.

3.4 WIRING

A. Installation of wiring, cable, conduit, etc. shall conform to Division 26. In case of conflict between this Division and Division 26, the most stringent requirements shall be met.

B. All wiring shall be installed in a neat and workmanlike manner, parallel to building lines and suspended neatly from the overhead structure (do not lay wiring on top of ceiling tiles).

C. All wiring shall be run in metal conduit (flexible conduit shall be limited to 3 foot lengths maximum). Exceptions:
   1. NEC Class 2 low voltage wiring where not exposed to view such as above suspended ceilings, in shafts, etc., may be run in cable tested in accordance with test methods of NFPA 262 for installation in environmental air plenums or standard cable when not exposed in environmental air plenums.
   2. Wiring enclosed in Temperature Control panels.

D. All control wiring to wall mounted sensors shall be recessed in the walls. Where wiring cannot be recessed without extensive damage to an existing wall, surfaced mounted conduit shall be used. The controls contractor shall coordinate locations where conduit needs to be used with the Engineer and Owner prior to the start of work. All surface mounted conduit shall be painted to match the existing wall.

E. Communication Circuits: Cable shall not be installed closer than six feet from high power transformers or run parallel within six feet of electrical high power cables. Care shall be taken to route the cable as far from interference generating devices as possible.

F. Splices: Splices in shielded cables shall consist of terminations and the use of shielded cable couplers which maintain the integrity of the shielding. Terminations shall be in accessible locations.

G. Grounding
   1. All communication cable shall be grounded at one point only, to eliminate ground loops. Earth grounding shall be single point to main water piping. All non-current caring metallic parts (for example, lightning arresters, metallic raceways, equipment enclosures) of the DDC system shall be grounded in this way.
   2. Analog shields shall be ground to internal analog (nonearth) ground.

H. Temperature control wiring shall not be run in conduit with power wiring. Analog or communication wiring shall not be run in the same conduit which has highly inductive loads such as contactors or coils.

3.5 IDENTIFICATION AND DIAGRAMS

A. Identification: Tag or color-code all tubing and wiring at each end and necessary junction points and match the tagging numbers or color- coding shown on the control drawings.

B. Provide control diagrams laminated between rigid plastic mounted on a supporting back board for each system control panel. Mount the diagrams near the control panels or where directed. Identify all devices on the diagrams with the same terminology used for the nameplates. Diagram shall be a permanent as-built drawing.

3.6 SENSORS

A. Sensors shall be installed to be readily accessible and to permit quick and easy replacement. Flush mount with metal covers suitable for painting to match finished surface.

B. Duct sensors shall be installed to sense the correct temperature of the air only, within the vibration and velocity limits of the sensing element. Thermally isolate elements from brackets and supports to respond to air temperature only. Seal all duct penetrations air tight.

C. Install liquid temperature sensors inside of pipe wells with an appropriate heat transfer compound inside the well.

D. Provide wind dampening "Weatherhead" on each atmospheric pressure sensing point. Locate above wind eddies carried by the building structure and roof equipment.

3.7 PRESSURE CONTROLS

A. Static and differential pressure controllers and indicators shall be transmitter and panel mounted receiver controller type, unless specified otherwise.

3.8 THERMOSTATS

A. Low Temperature Detection Thermostats: Each supply system with water coils taking outside air shall have a low temperature detection thermostat (set at 35^{o}F) located where shown on the Drawings. Wire thermostats to protect unit in both hand and automatic operation. When temperature drops below setpoint, thermostat shall stop fan(s) and close outside air damper(s).

3.9 ROOMS SENSORS

A. Locate room temperature sensors where they won’t be affected by the sun. Avoid mounting on outside walls. Refer to the Drawings for sensor locations. The TCC shall review the sensor locations and if a different location is desired, get prior approval from the Engineer.

B. Room temperature sensors shall be located not more than 48” above finished floor unless noted otherwise.

3.10 SMOKE DETECTORS

A. Location of smoke detectors shall be as shown on drawings, provided by Division 26, installed by Division 23.

B. Wiring of detectors to fire alarm panel by Division 26. Control wiring of detectors (i.e. fan shut down, etc.) by this Division.

C. Wire smoke detectors to protect the unit in both hand and automatic operation.

D. On signal from smoke detector, supply fan and exhaust fan shall be shut off and outside air and return air dampers shall close.

3.11 CURRENT SENSOR

A. Current sensor shall be mounted in the starter cabinet of the controlled equipment. After controlled equipment has received factory start-up, provide adjustment on current sensor set point. For controlled equipment which operates with varying current draw (e.g. heating water pumps in systems with two-and three-way valves) set point shall be made so that the full operating range of the current draw does not cause spurious trips of the status point. If necessary, install the sensor with multiple wraps of power wiring through the sensor to amplify the change in current in order to detect belt, bearing or coupling loss.

3.12 RELATED WORK IN OTHER SECTIONS.

A. Coordinate all work performed under Division 23 Mechanical including:
   1. Piping
      a. Install automatic valves and separable wells that are supplied under this Section.
      b. Install separable wells that are supplied under this Section.
      c. Furnish and install necessary pressure taps, water, drain and overflow connections and piping.
      d. Furnish and install necessary piping connections required for flow devices.
   2. Sheet Metal
      a. Install automatic dampers and provide necessary blank-off plates or transitions required to install dampers that are smaller than duct size.
      b. Provide access doors or other approved means of access through ducts for service to control equipment.
   3. Test and Balance
      a. Work with the Test and Balance (TAB) contractor to set the duct static pressure set point for proper VAV control. See Section 230593.
      b. Work with the TAB contractor to set the AHU outside air minimum set points and test at min/max supply air flows including economizer model. Verify building static pressure during balancing to ensure that the building is kept slightly positive as compared to the outside as specified in the Sequence of Operation.

3.13 LIMIT AND SAFETY CONTROLS

A. Temperature controls for limit and safety controls must function independently of the DDC system controls. This includes controls for mixed air low limit, coil low temperature detection and smoke detection.

3.14 COMPLETION SERVICES

A. Point Validation: Upon the completion of the installation, completely validate the proper operation and labeling of all input and output points. Validation shall be done by physically effecting the I/O points while the person on the other end observes for proper response. Contractor shall include validation certification in O & M manuals. Adjust all thermostats, valves, dampers, etc. provided. Final adjustment shall be performed dynamically on operating system(s).

B. Demonstrations: At the completion of the work, instruct the Owner's operating personnel and demonstrate to the Engineer the proper operation of the control systems. The BAS Contractor shall provide system instruction to the Owner as specified earlier in this Section. Explain the operation of the control system, the function of each component, the programming procedure,

maintenance procedures and cautions, and be prepared to answer questions from the operating staff. In addition, be available for telephone consultation during the warranty period to answer questions from the operating staff concerning the control equipment, such consultation shall be at no cost to the Owner. Include a full and detailed explanation on how the system is programmed initially so all parties fully understand the form and function of the control system. Prior to the instruction period, the Owner will furnish the names of those individuals for whom training will be provided.

C. Coordinate with the Owner's commissioning agent for further commissioning requirements.

3.15 SEQUENCE OF CONTROL AND SYSTEM POINT REQUIREMENTS

A. See drawings for Control Sequences and minimum point requirements. If more points are required to provide the sequences specified, it is the BAS Contractor's responsibility to furnish the additional equipment necessary to perform these sequences.

B. Room Setpoints: Initial room setpoints are included with the sequence of control. The BAS Contractor shall discuss with the Owner setting desired for all setpoints and make settings as directed

C. The TCC shall work with the Owner to setup minimum alarms, trends, and schedules for the entire system. Train the Owner how to manipulate, add/delete, and change the alarms, trends, and schedules.

D. The TCC shall set up the system to contact the Owner's designated personnel to alert them when critical alarms occur. Coordinate with the Owner on how to transmit the alarms (text message and/or email). Train the Owner on how to add/delete alarm notifications and how to add/delete personnel.

END OF SECTION 230923

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Heating water piping, above ground.
   2. Equipment drains and over flows.
   3. Unions and flanges.

B. Related Sections:
   1. Section 230523 - General-Duty Valves for HVAC Piping: Product requirements for valves for placement by this section.
   2. Section 230529 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for pipe hangers and supports, sleeves, for placement by this section.
   3. Section 230553 - Identification for HVAC Piping and Equipment: Product requirements for pipe identification for placement by this section.
   4. Section 230700 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.
   5. Section 232116 - Hydronic Piping Specialties: Product and execution requirements for piping specialties used in heating and cooling piping systems.
   6. Section 232123 - Hydronic Pumps: Product and execution requirements for pumps used in heating and cooling piping systems.

1.3 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals.

B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Flexible Connectors: Use at or near pumps where piping configuration does not absorb vibration.

1.4 SUBMITTALS

A. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.

B. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

C. Welders' Certificate: Include welder’s certification for welding hydronic piping.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves, piping, equipment and accessories.

B. Operation and Maintenance Data: Submit instructions for installation and changing components, spare parts lists, exploded assembly views.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASME B31.1, ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.

B. Perform Work in accordance with AWS D1.1 for welding hanger and support attachments to building structure.

1.7 QUALIFICATIONS

A. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years' documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 - PRODUCTS

2.1 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.

1. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

B. Copper Tubing: ASTM B88, Type L, drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.
2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
3. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: ASTM B88, Type L, drawn.

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

2.3 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.
2. Copper Piping: Class 150, bronze unions with soldered.
3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
2. Copper Piping: Class 150, slip-on bronze flanges.
3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

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

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

E. After completion, fill, clean, and treat systems.

3.3 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. Contractor has the choice of pipe materials as approved earlier in this Section. Where more than one piping system material is used, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals.

B. Route piping parallel to building structure and maintain gradient.

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

D. Group piping whenever practical at common elevations.

E. Sleeve pipe passing through partitions, walls and floors. Refer to Section 230529.

F. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.

G. Install pipe identification in accordance with Section 230553.

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

I. Provide panels access where valves and fittings are not exposed.

J. Slope hydronic piping and arrange systems to drain at low points.

K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

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

M. Insulate piping; refer to Section 230700.

3.4 FIELD QUALITY CONTROL

A. Test heating water piping system in accordance with the International Mechanical Code and per the authority having jurisdiction (AHJ). Notify the AHJ to witness the pressure tests.

END OF SECTION 232113

SECTION 232116 - HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Pressure gages.
2. Pressure gage taps.
3. Test plugs.
4. Flexible connectors.
5. Air vents.
6. Strainers.

B. Related Sections:

1. Section 232113 - Hydronic Piping: Execution requirements for piping connections to products specified by this section.
2. Section 232123 - Hydronic Pumps: Execution requirements for piping connections to products specified by this section.

1.3 PERFORMANCE REQUIREMENTS

A. Flexible Connectors: Provide at or near pumps and equipment where piping configuration does not absorb vibration.

1.4 SUBMITTALS

A. Product Data: Submit for manufactured products and assemblies used in this Project.

1. Manufacturer’s data indicating use, operating range, total range, accuracy, and location for manufactured components.
2. Submit product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each piping specialty.
4. Submit electrical characteristics and connection requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of actual locations of components and accessories.

B. Operation and Maintenance Data: Submit instructions for calibrating instruments, installation instructions, assembly views, servicing requirements, lubrication instruction, and replacement parts list.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept piping specialties on site in shipping containers with labeling in place. Inspect for damage.

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

C. Protect systems from entry of foreign materials by temporary covers, caps and closures, completing sections of the work, and isolating parts of completed system until installation.

PART 2 - PRODUCTS

2.1 PRESSURE GAGES

A. Manufacturers:
1. Ashcroft.
2. Miljoco.
3. Trerice
4. Wika
5. Prior approved equal

B. ASME B40.1 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
1. Case: Stainless steel.
2. Bourdon Tube: Phosphor bronze.
3. Dial Size: 4-1/2” inch.
4. Mid-Scale Accuracy: One percent.
5. Scale: PSI.

2.2 PRESSURE GAGE TAPS

A. Same as pressure gage manufacturer.

B. Needle Valve: Brass.

C. Pulsation Damper: Pressure snubber, brass with ¼ inch NPT connections.

2.3 TEST PLUGS

A. 1/4 inch NPT or 1/2 inch NPT brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with:
   1. Neoprene core for temperatures up to 200 degrees F.
   2. Nordel core for temperatures up to 350 degrees F.
   3. Viton core for temperatures up to 400 degrees F.

2.4 FLEXIBLE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure 300 psig.

2.5 AIR VENTS

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

B. Float Type:

   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.6 STRAINERS

A. Size 2 inch and Smaller:

   1. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 2-1/2 inch to 4 inch:

   1. Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

PART 3 - EXECUTION

3.1 INSTALLATION - GAGES

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.

B. Install gage taps in piping

C. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Extend nipples to allow clearance from insulation.

D. Provide instruments with scale ranges selected according to service with largest appropriate scale.

E. Install gages in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

F. Adjust gages to final angle, clean windows and lenses, and calibrate to zero.

3.2 INSTALLATION - HYDRONIC PIPING SPECIALTIES

A. Locate test plugs adjacent to thermometers and thermometer sockets, adjacent to pressure gages and pressure gage taps, and as indicated on Drawings.

B. Install manual air vents at system high points.

C. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain.

D. Provide drain and hose connection with valve on strainer blow down connection.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not install hydronic pressure gauges until after systems are pressure tested.

END OF SECTION 232116

SECTION 232123 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. In-line circulators.

B. Related Sections:
   1. Section 230523 - General-Duty Valves for HVAC Piping: Product requirements for valves used in hydronic piping systems.
   2. Section 232113 - Hydronic Piping: Execution requirements for connection to pumps specified by this section.
   3. Section 232116 - Hydronic Piping Specialties: Product and execution requirements for piping specialties installed in hydronic systems adjacent to pumps.

1.3 PERFORMANCE REQUIREMENTS

A. Provide pumps to operate at system fluid temperatures indicated on Drawings without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.4 SUBMITTALS

A. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.

B. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit installation instructions, servicing requirements, assembly views, lubrication instructions, and replacement parts list.

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 IN-LINE CIRCULATORS

A. Manufacturers:
   1. Bell & Gossett.
   2. Grundfos.
   3. Taco.
   4. Prior approved equal.

B. Type: Horizontal shaft, single stage, close-coupled, with resiliently mounted motor for in-line mounting, oil lubricated, for 150 psi maximum working pressure. Permanently lubricated. Dual pressure taps, suction/discharge.

C. Casing: Cast iron, with flanged pump connections.

D. Impeller: 30% glass-filled Noryl.

E. Bearings: Two, oil lubricated bronze sleeves.

F. Shaft: Stainless steel.

G. Mechanical seal: Carbon/silcon-carbide.

H. Performance: As indicated on the Drawings.

I. Electrical Characteristics and Components: As indicated on the Drawings.
   1. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

B. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings.

C. Install flexible connectors at or near pumps. Refer to Section 232116.

D. Provide line sized shut-off valve and strainer pump suction fitting on pump suction, and line size check valve, balancing valve, and shut-off valve on pump discharge as indicated on the Drawings.

E. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and larger.

F. Provide 4-1/2 dial pressure gauges on each base mounted pump piped to the inlet and outlet pump flanges. The gauge shall be isolated from each flange via a ball valve. The gauge is to be used to take the differential pressure across the pump.

G. Provide a blowdown valve on each strainer and terminate with hose thread.

END OF SECTION 232123

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SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Duct materials.
2. Insulated flexible ducts.
3. Single-wall, spiral round ducts.
4. Transverse duct connection system.
5. Ductwork fabrication.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer information for insulated flexible duct and take-off fittings.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents:

1. Record actual locations of ducts and duct fittings.
2. Record changes in fitting location and type.
3. Show additional fittings used.

1.5 QUALITY ASSURANCE

A. Perform Work according to SMACNA.

1.6 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

B. Store materials according to manufacturer instructions.

C. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.8 AMBIENT CONDITIONS

A. Minimum Conditions: Do not install duct sealant when temperatures are less than those recommended by sealant manufacturer.

B. Subsequent Conditions: Maintain temperatures during and after installation of duct sealant.

PART 2 - PRODUCTS

2.1 DUCTS

A. Materials:

B. Galvanized-Steel Ducts:

1. Material: ASTM A653 galvanized-steel sheet.
2. Quality: Lock forming.
3. Finish: G90 zinc coating according to ASTM A90.

C. Hanger Rod:

1. Material: Galvanized steel.
2. Comply with ASTM A36.
3. Type: Threaded both ends or continuously.

2.2 INSULATED FLEXIBLE DUCTS

A. Description:

1. Product Description: UL-181 listed, two ply vinyl film supported by helical wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film. NFPA 90A & 90B approval.
2. Pressure Rating: 12 inches wg positive and 0.75 inches wg negative.
3. Maximum Velocity: 4000 fpm.
4. Temperature Range: -20 degrees F to 140 degrees F.

5. Thermal Resistance: R-6.0 square feet-hour-degree F per BTU.
6. Surface burning characteristics:
    a. Flame spread: Less than 25. Smoke developed: Less than 50.

2.3 SINGLE-WALL, SPIRAL ROUND DUCTS

A. Description:

1. UL 181, Class 1, round spiral lockseam duct.
2. Material: Galvanized steel.

B. Minimum Duct Wall Thicknesses:

1. Diameter 2 to 14 Inches: 26 gage.
2. Diameter 16 to 26 Inches: 24 gage.
3. Diameter 28 to 36 Inches: 22 gage.
4. Diameter 38 to 50 Inches: 20 gage.

C. Minimum Fittings Wall Thicknesses:

1. One gage thicker than the duct wall gage listed above.

2.4 TRANSVERSE DUCT CONNECTION SYSTEM

A. Description:

1. Interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.
2. Rigidity Class Connection: SMACNA recommended.
3. Sealing materials meet NFPA 90A & B, Class 1.

2.5 FABRICATION

A. Rectangular Ducts:

1. According to SMACNA and as indicated on Drawings.
2. Provide duct material, gages, reinforcing, and sealing for indicated operating pressures.

B. Round Ducts:

1. Provide spiral round ductwork as indicated on the Drawings.
2. Provide duct material, gages, reinforcing, and sealing for indicated operating pressures.

C. Tees, Bends, and Elbows:

1. Minimum Radius:

    a. 1-1/2 times centerline duct width.
    b. If not possible or if rectangular elbows are used, provide airfoil turning vanes.

D. Divergence:

1. Increase duct sizes gradually, not exceeding 15 degrees of divergence wherever possible.
2. Upstream of Equipment: Maximum 30 degrees.
3. Downstream of Equipment: Maximum 45 degrees.

E. Welding:

1. Continuously Welded Round Duct Fittings: Two gages heavier than duct gages according to SMACNA 1966.
2. Cemented Slip Joints:

    a. Minimum 4 inches.
    b. Brazed or electric welded.

3. Prime coat welded joints.

F. Takeoffs:

1. Provide standard 45-degree lateral wye takeoffs.

G. Sealing:

1. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems, or tape.
2. Sealants, Mastics, and Tapes: Comply with UL 181A and provide products bearing appropriate UL 181A markings.

2.6 ACCESSORIES

A. Hangers and Supports:

1. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
2. Strap and Rod Sizes:

    a. Comply with SMACNA 1966.

3. Trapeze and Riser Supports:

    a. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify sizes of equipment connections before fabricating transitions. Where new equipment is being installed in existing ductwork, provide transitions as required for installation. This may include the need to demolish sections of duct to provide adequate clearance, space, or straight runs upstream and downstream of equipment.

3.2 PREPARATION

A. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.

B. Install temporary closures of metal or taped PE on open ductwork to prevent construction dust from entering ductwork system.

3.3 INSTALLATION

A. Install and seal ducts according to SMACNA.

B. Insulated Flexible Duct Fittings:

1. Join each flexible duct section to main trunk duct through sheet metal fittings.
2. Material: Galvanized steel.

C. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8 inches and smaller.

D. Hanger and Supports:

1. Fabricate and support ducts according to SMACNA.
2. Threaded Rods: Provide double nuts and lock washers.
3. Building Attachments:

    a. Provide structural-steel fasteners appropriate for construction materials to which hangers are being attached.

4. Hanger Spacing:

    a. Comply with SMACNA.
    b. Install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
    c. Extend strap supports down both sides of ducts and turn under bottom at least 1 inch.
    d. Secure hanger to sides and bottom of ducts with sheet metal screws.

5. Hangers Exposed to View: Provide threaded rod and angle or channel supports.
6. Vertical Ducts:

    a. Support with steel angles or channel secured to sides of duct with welds, bolts, sheet metal screws, or blind rivets.
    b. Support at each floor and at maximum intervals of 16 feet.

7. Upper Attachments:

    a. Attach to structures.
    b. Selection and Sizing: Provide pull-out, tension, and shear capacities as required for supported loads and building materials.

8. Penetrations:

    a. Avoid penetrations of ducts with hanger rods.

E. Interface with Other Work:

1. Install openings in ductwork as required to accommodate thermometers and controllers.
2. Install pitot tube openings for testing of systems, complete with metal can with spring device or screw to prevent air leakage.
3. If openings are provided in insulated ductwork, install insulation material inside metal ring.
4. Connect air outlets and inlets to supply ducts with 6-foot maximum length of insulated flexible duct.

3.4 ATTACHMENTS

A. Ductwork Material Schedule:

1. All ductwork (except for dishwasher exhaust): Galvanized steel.

B. Ductwork Pressure Class Schedule:
1. Ductwork upstream of VAV boxes: 3-inch wg.
2. Ductwork downstream of VAV boxes: 2-inch wg.

END OF SECTION 233100

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Duct access doors.
   2. Volume control dampers.
   3. Flexible duct connections.

B. Related Sections:
   1. Section 233100 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.

1.3 SUBMITTALS

A. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
   1. Volume control dampers.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of access doors and manual volume dampers.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

B. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

C. Storage: Store materials in a dry area indoor, protected from damage.

D. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

PART 2 - PRODUCTS

2.1 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.

1. Less than 12 inches square, secure with sash locks.
2. Up to 18 inches Square: Furnish two hinges and two sash locks.
3. Up to 24 x 48 inches: Three hinges and two compression latches.
4. Access panels with sheet metal screw fasteners are not acceptable.

2.2 VOLUME CONTROL DAMPERS

A. Manufacturers:
1. Greenheck.
2. Nailor.
3. Pottorff.
4. Ruskin.
5. Prior approved equal.

B. Round Single Blade Damper: 1.0 in. w.g. pressure differential at 2000 FPM velocity. Rated for 180° F temperature. Tested and rated in accordance with AMCA Standard 500-D.
1. Frame: Galvanized steel, 20 ga. frame thickness.
2. Blade: Galvanized steel, 20 ga. blade thickness.
3. Axle: ½" inch plated steel.
4. Operator: 3/8" sq. locking manual quadrant.

C. Rectangular Single Blade Damper: 1.0 in. w.g. pressure differential at 2000 FPM velocity. Rated for 180° F temperature. Tested and rated in accordance with AMCA Standard 500-D.
1. Frame: Galvanized steel, 18 ga. frame thickness.
2. Blade: Galvanized steel, 20 ga. blade thickness.
3. Axle: ½" inch plated steel.
4. Operator: 3/8" sq. locking manual quadrant.

D. Rectangular Multi-Blade Damper: 1.0 in. w.g. pressure differential at 2000 FPM velocity. Rated for 180° F temperature. Tested and rated in accordance with AMCA Standard 500-D.
1. Frame: Galvanized steel, 16 ga. frame thickness.
2. Blade: Galvanized steel, 16 ga. blade thickness.
3. Axle: 1/2" inch plated steel.
4. Operator: 1/2" sq. locking manual quadrant.

E. Quadrants:

1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches furnish regulator at both ends.

2.3 FLEXIBLE DUCT CONNECTIONS

A. Connector: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A.
2. Net Fabric Width: Approximately 6 inches wide.
3. Metal: 3 inch wide, 24 gage galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify ducts and equipment installation are ready for accessories.

B. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.2 INSTALLATION.

A. Follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 233100 for duct construction and pressure class.

B. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access.

C. Install temporary duct test holes and required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

D. Round branch duct take-offs shall be provided with a round manual balancing damper as specified in this section. Duct take-off fittings with integral balancing dampers are not acceptable.

END OF SECTION 233300

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SECTION 233600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Variable volume terminal units.

B. Related Sections:
   1. Section 230923 - Direct-Digital Control System for HVAC: Controls remote from unit.

1.2 REFERENCES

A. American Refrigeration Institute:

   1. ARI 880 - Air Terminals.
   2. ARI 885 -Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

B. National Fire Protection Association:

   1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

C. Underwriters Laboratories Inc.:

   1. UL 181 - Factory-Made Air Ducts and Connectors.

1.3 SUBMITTALS

A. Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, heating coil capacity and NC designation.

B. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of units and controls components.

B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.

1.5 QUALITY ASSURANCE

A. Test and rate air terminal units performance for air pressure drop, flow performance, and acoustical performance in accordance with ARI 880 and ARI 885. Attach ARI seal to each terminal unit.

PART 2 - PRODUCTS

2.1 SINGLE DUCT VARIABLE VOLUME AIR TERMINAL UNITS

A. Manufacturers:

1. Enviro-Tec.
2. Krueger.
3. Johnson Controls.
4. Titus.
5. Price.
6. Prior approved equal.

B. Product Description: Variable air volume terminal units for connection to central air systems, with hot water heating coils. DDC controls by the temperature controls contractor. See Section 230923.

C. Identification: Furnish each air terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.

D. Basic Assembly:

1. Casings: Minimum 22 gage galvanized steel.
2. Lining: Minimum 1/2 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements.
3. Plenum Air Inlets: S slip and drive connections for duct attachment.
4. Plenum Air Outlets: S slip-and-drive connections.

E. Basic Unit:

1. Configuration: Air volume damper assembly inside unit casing. Locate control components inside protective metal shroud.
2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow.

F. Hot Water Heating Coil:

1. Construction: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
2. Capacity: As indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify ductwork is ready for air terminal installation. Where installing new terminal units in existing ductwork, the contractor shall modify the existing ductwork to the new unit connections. This may include removing sections of the existing ductwork, moving branch take-offs, etc. to provide the required straight inlet/outlet runs required for the terminal units.

3.2 INSTALLATION

A. Connect to ductwork in accordance with Section 233100.

B. Install ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork.

D. Support air terminal units connected by flexible duct independently of flexible duct connectors. The use of insulated flexible duct on the inlet is prohibited.

E. Install transition piece to match flexible duct size to inlet or outlet of variable air volume terminal.

3.3 ADJUSTING

A. Coordinate with the TAB contractor and the temperature controls contractor to set min/max cooling, min/max heating set points.

END OF SECTION 233600

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SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Grilles, Registers, and Diffusers.

1.3 SUBMITTALS

A. Product Data:
1. Submit sizes, finish, and type of mounting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of air outlets and inlets.

B. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams for louver motorized dampers.

1.5 QUALITY ASSURANCE

A. Test and rate diffuser, register, and grille performance in accordance with ASHRAE 70.

PART 2 - PRODUCTS

2.1 GRILLES, REGISTERS, AND DIFFUSERS

A. Manufacturers:
1. Krueger.
2. Nailor.
3. Price.
4. Titus.
5. Prior approved equal.

B. See the Grilles, Registers, and Diffusers Schedule on the Drawings for size, duty, type, construction, color, and accessories.

C. If the contractor elects to use one of the above approved manufacturer instead of the manufacturer listed on the Drawings, then they shall provide equal construction, type, size, performance, etc. to those specified in the Schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify inlet and outlet locations.

B. Verify ceiling and wall systems are ready for installation.

3.2 INSTALLATION

A. Install diffusers to ductwork with airtight connection.

B. Install balancing dampers on duct take-off to diffusers, grilles, and registers as indicated on the Drawings. Refer to Section 233300.

C. Paint visible portion of ductwork behind air outlets and inlets matte black.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION 233700

SECTION 260000 – ELECTRICAL SPECIFICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Specifications include electrical material specifications and installation information.

1.3 DEFINITION

A. GRC: Galvanized rigid steel conduit.

B. GFCI: Ground-fault circuit interrupter.

C. SPD: Surge protective device.

1.4 INFORMATION SUBMITTALS

A. CONDUCTORS
1. All conductors to be copper unless specified otherwise. Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors, and NFPA70 and RoHS compliant. Aluminum, complying with ASTM B 800, ASTM B 801, NFPA70 and RoHS compliant.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
4. Type XHHW-2: Comply with UL 44.
5. Type MTW: Comply with UL 1063.
6. Type FTP: Shielded Twisted Pairs with UL AWM Style 20253.

B. SUPPORTS
1. All supports for raceways, enclosures, boxes and panelboards to be bolted together slotted pre-manufactured assemblies equivalent to UNISTRUT or BLINE and to be attached to support expected load with a 4 times safety factor. Channel to be 1-5/8 inches wide. Installation to comply with NECA 101 and spacing as scheduled in NECA 1 Table 1.

C. PANELBOARDS - Panelboard is existing onsite. New equipment to match existing manufacturer. Type 12 panels to be used in areas with potential dust buildup to minimize housekeeping issues.

1.5 BREAKERS - New breakers to match existing breaker ratings and panel manufacturer. Breakers must maintain existing panel ratings.PRODUCTSCONDUCTORS

A. Insulation types as called out in Feeder or Panel Schedule.

B. Feeders and Branch Circuits to be solid #14 AWG and smaller with stranded for #12 AWG and larger.

C. Feeders and Branch Circuits to be inside conduit routed either surface mount or underground.

D. Control wiring to be concealed in conduit or within panels.

2.2 GROUNDING AND BONDING

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction (AHJ). Stranded Conductors: ASTM B 8. Solid Conductors: ASTM B 3

B. Grounding Bus: Pre-drilled rectangular bars of annealed copper, 1/4”x2”x6” with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

C. Bus-Bar Connectors: Compression type, copper or copper alloy, with two hole lugs and long barrels.

D. Cold Water Pipe Grounding Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

E. Ground Rods: Copper-clad steel 3/4 inch by 10 feet to be driven until 2 inches below grade.

F. Ground Rod, Building Steel, and All Exterior Ground Connections: Use smokeless exothermic welds.

G. Installations to comply with TIA-607-B and BICSI ITBIMM CH 5 and IEEE C2.

2.3 CONDUITS

A. Listing and Labelling: Listed and labelled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. EMT: Comply with ANSI C80.3 and UL 797. Only to be used inside structures where free from damage above ground. All connectors to be compression rain tight type of made of steel.

C. GRC: Comply with ANSI C80.1 and UL 6. To be used above ground.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit: Comply with NEMA RN 1. Coating Thickness: 0.040 inch (1 mm), minimum. To be used as transition between GRC and RNC from above ground to below. Alternately, Taped GRC may be used.

E. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated. To be used below ground.

F. Connections to boxes and panels to be gasketed type to maintain rating of enclosures.

2.4 BOXES

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

C. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

D. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

E. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 4 with continuous-hinge cover with flush keyed latch unless otherwise indicated.

F. Cabinets: NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Metal barriers to separate wiring of different systems and voltage. Accessory feet where required for freestanding equipment. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

H. Nonmetallic Enclosures: Fiberglass.

I. Interior Panels: Steel; all sides finished with manufacturer's standard coating.

2.5 PANELBOARDS

A. All panelboards are existing and contain the currently needed breakers for this project. Contact the Engineer immediately if this is unclear or if the contractor feels the need for a new panel.

B. Ratings shall match those called out on the respective panel schedules and one line. Bussing shall be tin plated aluminum or copper.

C. Panelboards are to be fully hinged doors with keyed latches. All panelboards are to be keyed alike.

D. Finishes are to be manufactures base coating interior and out.

E. Incoming feeds to match field configuration.

F. Grounding, Neutral and Bonding to be adequate for all conductors to be connected to them per the panel and feeder schedules.

G. Neutral bus to be full sized.

H. All Panelboards to include an SPD (UL 1449 VPR) external to the panel with a peak surge current rating of 100kA and Line to Neutral, Line to Ground, and Neutral to Ground of 700V and 1200V for Line to Line. SPD shall have LED indication protection and errors for replacement. SPD must be modular MOV based and repairable by replacing failed cards.

2.6 BREAKERS: Manufacture and ratings to match the panel breaker is to be installed within and as called out on Panel Schedule.

2.7 RECEPTACLES: Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.8 GFCI RECEPTACLES: 125 V, 20 A, straight blade, feed-through type. Comply with NEMA WD 1, NEMAWD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

2.9 TWIST-LOCKING RECEPTACLES: Twist-Lock, Single Convenience Receptacles: Ratings as noted on drawings; comply with NEMA WD 1, NEMA WD 6, and UL 498. Grounding: Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.10 LIGHTING SWITCHES: Comply with NEMA WD 1, UL 20, and FS W-S-896. Switches, 120/277 V, 20 A

PART 3 - EXECUTION

3.1 INSTALLATION

A. CONNECTIONS: All connections of conductors, conduits or panels to be compliant with manufactures recommendations including torqueing and connection means to maintain ratings of equipment and components.

B. CONDUCTORS: Complete raceways prior to pulling conductors. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation or harden after installation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

C. CONTROL, COMMUNICATION, AND BONDING CABLES: Comply with TIA-568-C Series of standards.
1. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
2. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
3. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
4. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bar and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
8. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
9. Support: Do not allow cables to lie on removable ceiling tiles.
10. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
11. Provide strain relief.
12. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
13. Use insulated spade lugs for wire and cable connection to screw terminals.

D. GROUNDING AND BONDING:
1. GROUNDING: For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding " Section.
2. Install insulated equipment grounding conductors with all feeders and branch circuits.
3. BOND ALL METAL STRUCTURES with minimum #8AWG insulated conductor.
4. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
5. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
6. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
7. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.
8. Use exothermic-welded connectors for outdoor locations and building steel; if a disconnect-type connection is required, use a bolted clamp.

E. RACEWAYS AND BOXES:
1. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
2. Support conduit within 12 inches of enclosures to which attached.

3. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
4. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
5. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
6. Expansion-Joint Fittings: Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits. Install expansion fittings at all locations where conduits cross building or structure expansion joints. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
7. Fasten junction and pull boxes to or support from facility structure. Do not support boxes by conduits.
8. Direct-Buried Conduit: Excavate trench bottom to provide firm and uniform support for conduit. Install 3 inches minimal pea-gravel or sand backfill prior to installing conduit and after installing conduit. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction. Underground installations to include a traceable tape that is 3” wide and 8 mils thick, reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright-colored, compounded for direct-burial service.

F. PANELBOARDS
1. Panelboards shall be mounted with the highest handle lest than 6 foot 6 inches.
2. Computer generated panel schedules shall be provided with each panelboard. Handwritten panel schedules are unacceptable.

G. IDENTIFICATION
1. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.
2. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.
3. Sleeves, penetration and firestopping shall be numbered with a brass tag identifying each penetration.

4. Raceways carrying 600V or less shall be identified with voltage and service type inside each enclosure raceway terminates in.
5. Power Wiring shall be color coded as follows: Colors for 208/120-V Circuits: Phase A, B, C, N : Black, Blue, Red, White Respectively.
6. Color for Equipment Grounds: Green.
7. Colors for Isolated Grounds: Green with white stripe.
8. Equipment Identification Labels: Black Letters on a white field.
9. Warning Label Colors: Identify system voltage with black letters on an orange background.
10. Control and Power Cables: Cables shall be bundled and labeled with From and To and Voltage or Signal Type on printed wrap around labels. Labels shall be Heat Shrink Preprinted Flame-retardant polyolefin tubes with machine printed identification labels sized to suit diameter of cables and shrunk to fit firmly.

H. SLEEVE AND SLEEVE SEAL
1. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.
2. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
3. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
4. Grout penetrations with Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
5. Sleeve installation to comply with NECA 1 for conduits and NEMA VE 2 for cables and cable trays. Provide 1/4” clear for sealing.

I. FIRESTOPPING
1. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.
2. Installation to match manufacturer's recommendations and must be a minimum F rating of the barrier being penetrated.
3. Comply with TIA-569-D, Annex A, "Firestopping."
4. Comply with BICSI TDMM, "Firestopping" Chapter.
5. Contractor to provide complete schedule of all Firestopping seals installed. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency. 3.4.6 All Firestop Seals to be tested by qualified testing agency. Penetration Firestopping systems and installations shall bear classification marking of a qualified testing agency.

J. FIELD QUALITY CONTROL
1. Perform tests and inspections.
2. All installations to be tested per NETA standards.
3. Inspect installation of all components for physical and correct connections according to one-line and industry standard wiring practices.
4. Test all electrical power and control connections with point to point and for high resistance using a low resistance ohmmeter.

K. CONTROL AND COMMUNICATION CABLES:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. End-to-end cabling will be considered defective if it does not pass tests and inspections.

L. GROUNDING AND BONDING:
1. Grounding system will be considered defective if it does not pass tests and inspections.
2. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
3. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
4. Test ground resistance at service disconnect grounding terminal. Make sure to test ground rods and UFER ground terminal prior to connecting wiring. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by fall-of-potential method according to IEEE 81.
5. Report measured ground resistances that exceed the following values: Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
6. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

M. LOAD BALANCING:
1. After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding. 3.1.9. Measure loads during period of normal facility operations.
2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

N. ROOF PENETRATIONS: Contractor to coordinate with Roofing Contractor to ensure roof penetrations maintain existing roofing warranty. Contractor to coordinate with other trades to minimize the number of penetrations and to locate them such that all equipment is accessible and penetrations are accessible for future inspections and maintenance.

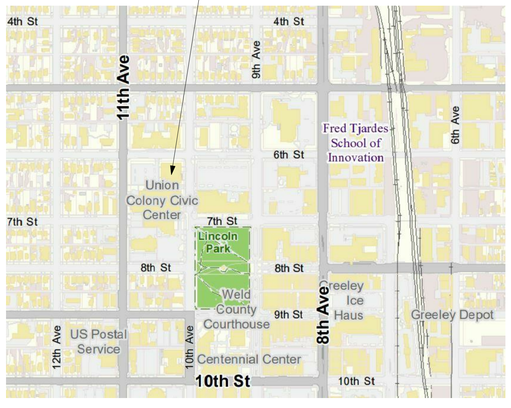
END OF ELECTRICAL SPECIFICATIONS SECTION

VAV REPLACEMENT
FOR GREELEY RECREATION CENTER
GREELEY, COLORADO

CITY OF GREELEY PUBLIC WORKS
1300 A STREET, BLDG B
GREELEY, CO 80631

VICINITY MAP

GREELEY RECREATION CENTER
651 10th STREET
GREELEY, CO 80631



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INDEX OF SHEETS

REV	DATE	DESCRIPTION
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WARNING

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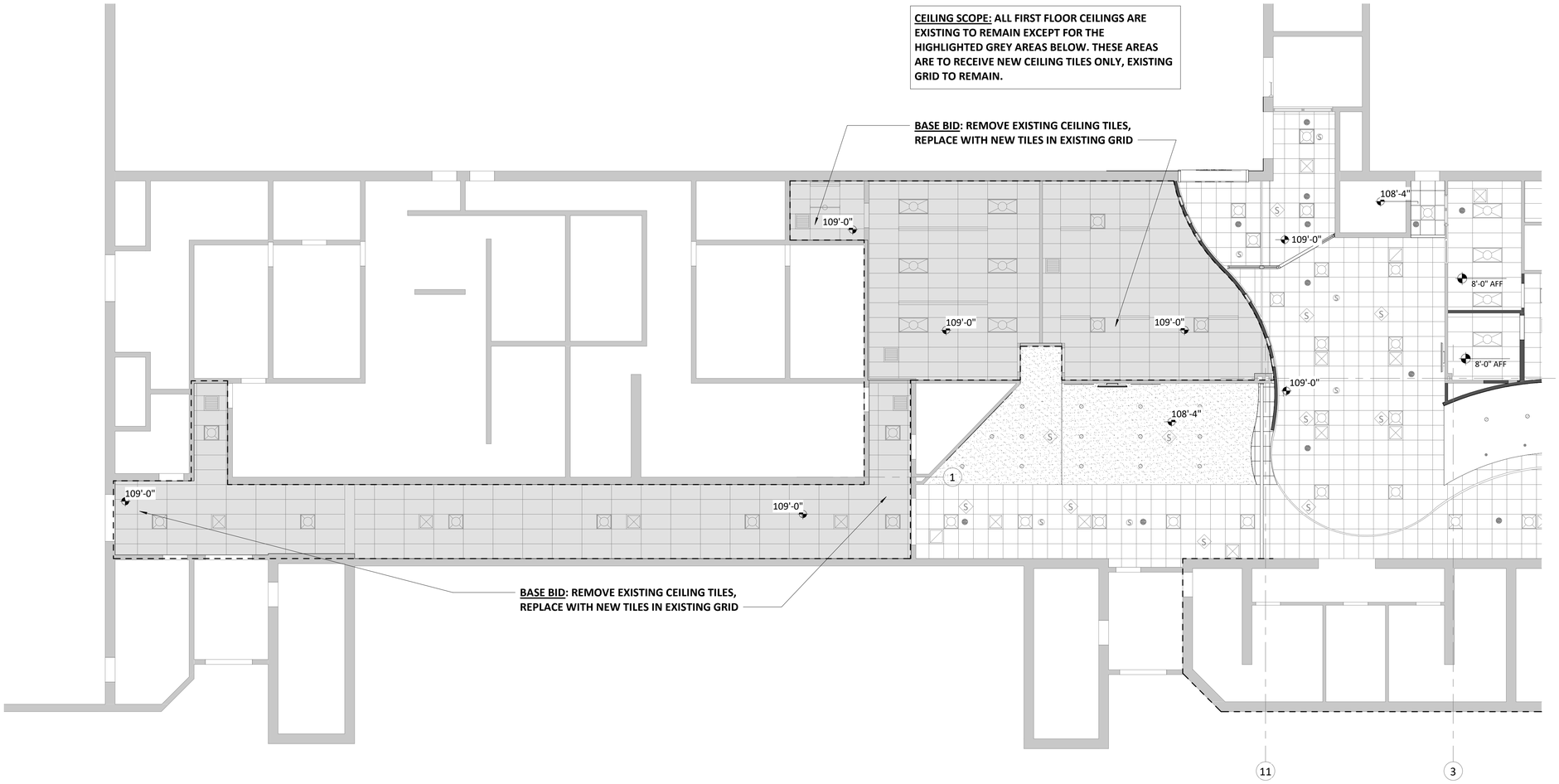
GENERAL NOTES - REFLECTED CEILING PLAN

1. FIELD VERIFY ALL EXISTING CONDITIONS



LEGEND - REFLECTED CEILING PLAN

	09 51 13	ACOUSTICAL CEILING
	09 29 00	GYPSUM WALLBOARD CEILING
		RECESSED TROFFER LIGHT FIXTURE
		LINEAR PENDANT LIGHT
		LINEAR WALL-MOUNTED LIGHT FIXTURE
		UTILITY LIGHT FIXTURE
		RECESSED CAN LIGHT
		SUPPLY AIR DIFFUSER
		RETURN AIR DIFFUSER
		TUBULAR SKYLIGHT
		SPEAKER
		SMOKE DETECTOR
		SPRINKLER HEAD

1 LEVEL 1 - EXISTING CEILING PLAN
1/8" = 1'-0"

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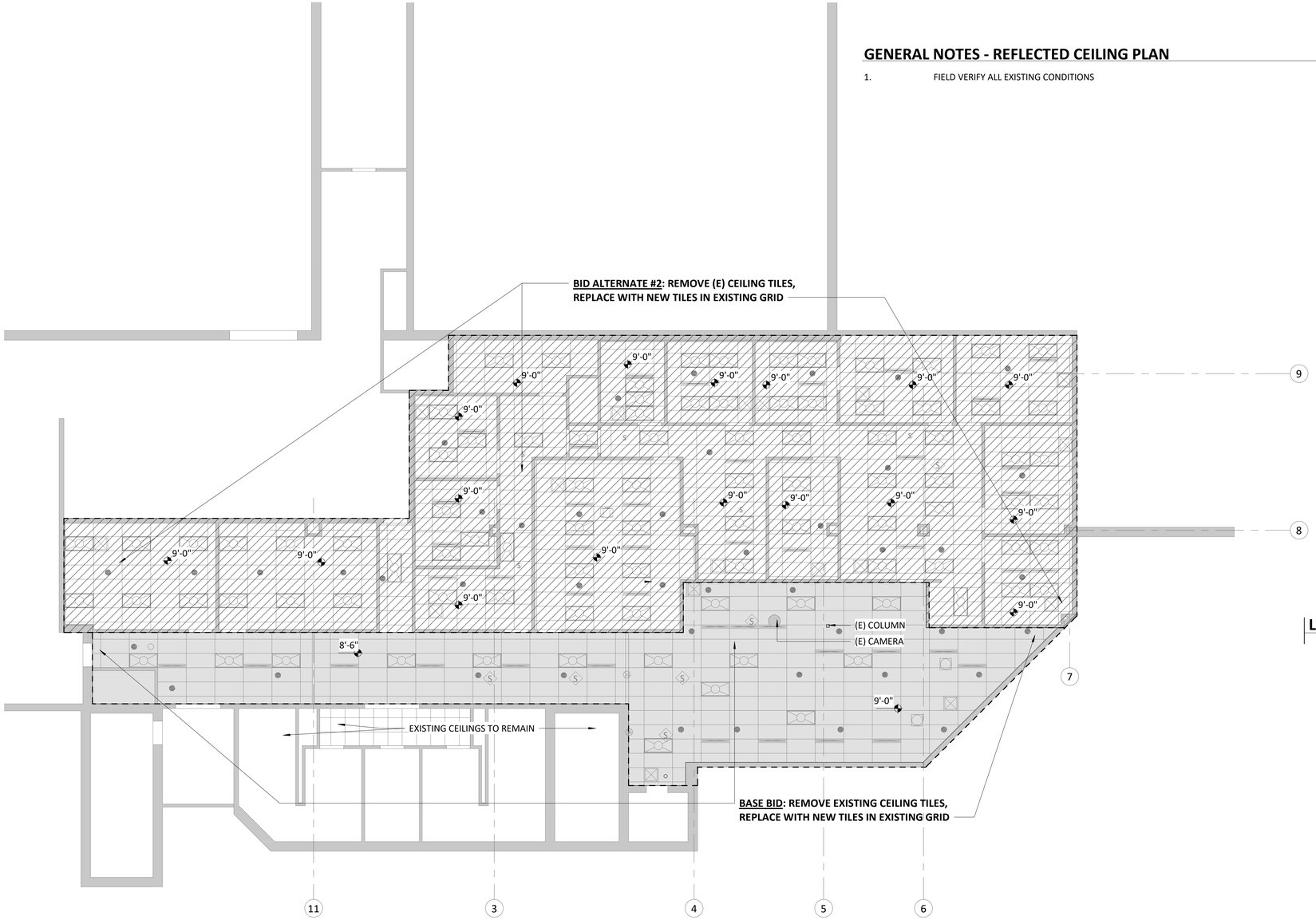
GENERAL NOTES - REFLECTED CEILING PLAN

1. FIELD VERIFY ALL EXISTING CONDITIONS



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- SUPPLY AIR DIFFUSER
- RETURN AIR DIFFUSER
- TUBULAR SKYLIGHT
- SPEAKER
- SMOKE DETECTOR
- SPRINKLER HEAD

A1 LEVEL 2 - EXISTING CEILING PLAN

1/8" = 1'-0"

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MECHANICAL GENERAL NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE LOCAL AND STATE CODES INCLUDING BUT NOT LIMITED TO THE 2015 INTERNATIONAL BUILDING, FIRE, MECHANICAL, PLUMBING, FUEL GAS, AND ENERGY CONSERVATION CODES (IBC, IFC, IMC, IPC, IFGC, IECC) WITH LOCAL AMENDMENTS.
2. THE CONTRACTOR IS RESPONSIBLE TO SECURE AND PAY FOR ALL PERMITS, FEES, TAXES, LICENSES, AND INSPECTIONS IN CONNECTION WITH THE WORK.
3. CONTRACTOR AND SUB-CONTRACTORS SHALL PROVIDE ALL LABOR, MATERIAL AND EQUIPMENT TO COMPLETE ALL WORK SHOWN ON PLANS, CALLED FOR IN SPECIFICATIONS, OR REASONABLY IMPLIED FOR A COMPLETE INSTALLATION.
4. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS ON DRAWINGS WITH ACTUAL FIELD CONDITIONS. COORDINATE DRAWINGS WITH ACTUAL FIELD CONDITIONS. COORDINATE WORK LAYOUTS AND LOCATIONS OF OPENINGS THROUGH FLOORS, WALLS, CEILINGS AND ROOFS WITH DRAWINGS OR OTHER REQUIREMENTS. VERIFY ALL DIMENSIONS AND CONDITIONS PRIOR TO FABRICATION OR CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES.
5. MECHANICAL DRAWINGS ARE DIAGRAMMATIC AND DO NOT NECESSARILY INDICATE EVERY REQUIRED OFFSET, FITTING, ETC. DO NOT SCALE DRAWINGS, USE DIMENSIONS ONLY. ALL DIMENSIONS/LAYOUTS SHOWN ARE APPROXIMATE, FIELD VERIFY ALL WORK PRIOR TO ORDERING MATERIALS OR INSTALLING WORK
6. KEEP SITE AND BUILDING ACCESSIBLE AND SAFE TO CONTRACTOR'S PERSONNEL, OWNER'S EMPLOYEES AND PUBLIC AT ALL TIMES. CONTRACTOR SHALL ENSURE SAFETY OF PERSONNEL, OWNER AND PUBLIC DURING ALL WORK AND COMPLY WITH ALL APPLICABLE REGULATIONS AND ORDINANCES PERTAINING TO SAFETY OF PERSONS AND PROPERTY.
7. INSTALL ALL WORK IN STRICT ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS, ANCHORING ALL COMPONENTS PLUMB, LEVEL, SQUARE, AND FIRMLY INTO PLACE IN FIRST CLASS MANNER AND WORKMANSHIP ACCORDING TO STANDARD CONSTRUCTION PRINCIPLES & AS APPROVED BY ENGINEER.
8. THROUGHOUT THE WORK, CAULK AND SEAL ALL JOINTS AS REQUIRED TO PROVIDE A POSITIVE BARRIER AGAINST THE PASSAGE OF AIR AND MOISTURE.
9. PROTECT EXISTING OR ADJACENT SITE IMPROVEMENTS, EXISTING FLOOR, WALL, CEILING AND ROOF FINISHES, FURNISHINGS AND EQUIPMENT TO REMAIN DURING CONSTRUCTION. REPLACE OR REPAIR ANY DAMAGED IMPROVEMENTS, MATERIALS, FINISHES, FURNISHINGS OR EQUIPMENT TO SATISFACTION OF ARCHITECT/ENGINEER.
10. REPLACE OR REPAIR ANY DAMAGED SURFACES, FILL AND PATCH HOLES, ETC., TO MATCH ADJACENT SURFACES AFTER ALL ALTERATIONS AND OTHER WORK IS COMPLETED, TO SATISFACTION OF ARCHITECT/ENGINEER.
11. PRIOR TO THE DEMOLITION OF ANY EXISTING EQUIPMENT, COORDINATE WITH THE OWNER TO DETERMINE WHAT EQUIPMENT THEY MAY WANT TO KEEP. ANY EQUIPMENT NOT WANTED BY THE OWNER SHALL BECOME THE PROPERTY OF THE GENERAL CONTRACTOR AND SUBCONTRACTORS AND SHALL BE REMOVED FROM THE PROJECT SITE AND DISPOSED OF IN A LAWFUL MANNER.
12. CONTRACTOR MUST COORDINATE THE WORK SO AS NOT TO EXTENSIVELY DISRUPT OWNERS OCCUPANCY OF ADJACENT AREAS AS APPROVED BY OWNER.
13. THE ENGINEER HAS ENDEAVORED TO LOCATE AND IDENTIFY THE MECHANICAL EQUIPMENT AND PIPING IN THE SCOPE OF WORK INCLUDING IDENTIFYING SIZES. HOWEVER, IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO BID. THE CONTRACTOR SHALL INCLUDE IN THEIR BID ADDITIONAL MINOR MECHANICAL WORK THAT MAY NOT BE SHOWN IN ORDER TO PROVIDE A COMPLETE AND WORKING SYSTEM.
14. ASBESTOS MAY BE ENCOUNTERED DURING MECHANICAL WORK INCLUDING BUT NOT LIMITED TO PIPE INSULATION. IF THE CONTRACTOR DURING CONSTRUCTION ENCOUNTERS WHAT HE BELIEVES ARE ASBESTOS MATERIALS, HE SHALL NOTIFY THE ENGINEER IMMEDIATELY.
15. WHERE THE CEILING SPACE IS TO BE USED AS A RETURN AIR PLENUM, THE MECHANICAL CONTRACTOR SHALL VERIFY WITH OTHER TRADES TO ENSURE THAT ALL MATERIALS ARE NON-COMBUSTIBLE AND HAVE A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE DEVELOPED INDEX OF NOT MORE THAN 50.
16. TO PROVIDE ACCESS PANELS AS REQUIRED TO ACCESS VALVES, DAMPERS, CONTROL DEVICES, ETC. REQUIRED FOR THE PROPER MAINTENANCE OF THE MECHANICAL SYSTEMS.
17. PATCH OPENINGS IN DUCTS WHICH ARE TO REMAIN ACTIVE AND HAVE HAD SECTION REMOVED. ALSO REPAIR DUCT INSULATION SO THAT IT IS CONTINUOUS.
18. DO NOT RUN DUCTWORK/PIPES ABOVE ELECTRICAL PANELS OR EQUIPMENT. COORDINATE WITH THE E.C. FOR LOCATIONS PRIOR TO THE START OF WORK.
19. THERMOSTATS, TEMPERATURE SENSORS, SWITCHES, OR OTHER CONTROL DEVICES SHALL BE MOUNTED AT 48" ABOVE FINISHED FLOOR UNLESS NOTED OTHERWISE.
20. DUCTWORK DIMENSIONS LISTED ON THE DRAWINGS ARE CLEAR, INSIDE DIMENSIONS. WHERE DUCT LINER IS SPECIFIED, INCREASE THE OUTSIDE SHEETMETAL DIMENSIONS TO PROVIDE THE CLEAR INSIDE DIMENSIONS SPECIFIED.
21. ALL BRANCH DUCT TAKEOFFS SHALL BE 45° HIGH-EFF. TYPE AND SHALL HAVE A HEAVY DUTY MANUAL BALANCING DAMPER WITH MINIMUM 1/4" ROD AND LOCKING INDICATING QUADRANT. LIGHT-DUTY DAMPERS THAT ARE INTEGRAL TO TAKE-OFF FITTINGS ARE NOT ACCEPTABLE.
22. PROVIDE ISOLATION VALVES ON ALL BRANCH LINES WHETHER SHOWN ON THE PLANS OR NOT.
23. ONLY PART OF THE MECHANICAL SYSTEMS ARE SHOWN ON THE DRAWINGS. FOR FURTHER DETAILS REGARDING THE EXISTING MECHANICAL SYSTEMS REFER TO THE OWNER'S AS-BUILT DRAWINGS.
24. ALL AIR AND HYDRONIC SYSTEMS SHALL BE BALANCED TO THE QUANTITIES SHOWN. REFER TO SPECIFICATION SECTION 23 05 93.
25. REFER TO THE DIVISION 23 HVAC SPECIFATIONS FOR FURTHER REQUIREMENTS.

TEMPERATURE CONTROL GENERAL NOTES

1. NEW DIRECT DIGITAL CONTROLS (DDC) ARE TO BE INSTALLED TO PROVIDE THE SEQUENCE OF OPERATION AND POINTS SPECIFIED ON THE DRAWINGS AND PER SECTION 23 09 23. THE NEW DDC SYSTEM SHALL TIE INTO THE EXISTING FRONT-END. THE NEW CONTROLS SHALL USE BACNET COMMUNICATION PROTOCOL UNLESS OTHERWISE APPROVED BY THE OWNER.
2. THE TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE FULL COLOR GRAPHICS FOR EACH SYSTEM. ALL SET POINTS LISTED AS ADJUSTABLE SHALL BE EASILY ACCESSIBLE FROM THE GRAPHICS SCREEN FOR EACH SYSTEM. THE GRAPHICS SHALL ALSO INCLUDE NEW FLOOR PLANS OF THE BUILDING SHOWING EACH SYSTEM.
3. THE USER INTERFACE SHALL BE EASY ACCESS TO TRENDING, ALARMS, AND SCHEDULING.
4. THE TCC SHALL BE RESPONSIBLE FOR A COMPLETE WORKING SYSTEM AT THE END OF THE PROJECT, WHICH MAY INCLUDE ADDING ADDITIONAL POINTS AND SHALL BE INCLUDED IN THE BID. THE TCC SHALL COMMISSION ALL THE NEW CONTROLS TO VERIFY THAT THE ENTIRE SYSTEM IS PERFORMING PER THE SEQUENCE OF OPERATION. THE ENGINEER WILL PERFORM AN OPERATIONAL CHECK ON THE CONTROLS WITH THE TCC AFTER THE TCC HAS SENT NOTIFICATION IN WRITING THAT THE CONTROLS HAVE BEEN COMMISSIONED AND ALL SEQUENCES ARE WORKING.
5. AFTER COMPLETION OF THE COMMISSIONING BY THE TCC AND THE OPERATIONAL CHECK BY THE ENGINEER, THE TCC SHALL PROVIDE OWNER TRAINING PER SECTION 23 09 23.
6. THE TCC SHALL PROVIDE AN AS-BUILT SET OF TEMPERATURE CONTROLS DRAWINGS TO THE OWNER IN THE FINAL O&M MANUAL, PRINTED AND IN PDF FORMAT. THE TCC SHALL ALSO PROVIDE A PRINTED COPY OF THE AS-BUILT TEMPERATURE CONTROL DRAWINGS IN THE MECHANICAL ROOM NEAR THE NEW TEMPERATURE CONTROL PANEL.
7. PRIOR TO THE START OF WORK THE TCC SHALL WALK THE SITE WITH THE OWNER TO DETERMINE THE FINAL LOCATIONS OF THE TEMPERATURE SENSORS. MARK ANY CHANGES TO THE AS-BUILT DRAWINGS.

GENERAL CUTTING/PATCHING NOTES:

1. MECHANICAL/ELECTRICAL WORK EXPOSED IN FINISHED AND UNFINISHED AREAS, PATCH ALL WALLS, CEILINGS. FLOORS, ETC. AT INSTALLATION OF NEW OR ALTERED MECH/ELEC WORK TO MATCH EXISTING MATERIALS. GROUT, FIRETAPE, SEAL AND/OR FIRE CAULK AS REQUIRED ALL PENETRATIONS TO MEET MINIMUM 20-MINUTE SMOKE/SEAL REQUIREMENTS PER CURRENT CODES AND STANDARDS. FIRE CAULK MAY BE LEFT IN EXPOSED UNFINISHED MECHANICAL ROOM SPACES. NOTE THAT PATCHING OF SUBSTRAIGHT SURFACES DAMAGED AS A RESULT OF NEW MECH/ELEC WORK IS REQUIRED. PAINTING TO MATCH THE EXISTING IS REQUIRED.
2. MECHANICAL/ELECTRICAL WORK EXPOSED IN FINISHED SPACES - WIRE-MOLD, CONDUIT, OR BOXES SHALL BE PAINTED WHERE LOCATED IN FINISHED ROOMS, COLOR TO MATCH ADJACENT FINISHES (PAINTED SURFACES, FACTORY FINISHES, MASONRY, ETC.).
3. PATCH EXISTING THERMOSTAT LOCATIONS WHERE THE NEW THERMOSTAT IS GOING IN A DIFFERENT LOCATION. PATCH WALL TO MATCH ADJACENT FINISHES PER PARAGRAPH ABOVE.
4. CUTTING/PATCHING WORK TO BE DONE BY A QUALIFIED LICENSED GENERAL CONTRACTOR HIRED AS A SUBCONTRACTOR TO THE MECHANICAL CONTRACTOR. REFER TO SECTION 011000.

MODIFICATIONS TO EXISTING AIR HANDLING UNITS (AC-2 & AC-3)

THE SCOPE OF WORK IS PRIMARILY TO REPLACE THE EXISTING VAV BOXES SERVED BY AIR HANDLING UNITS AC-2 AND AC-3, BOTH OF WHICH ARE LOCATED IN THE BASEMENT. THE NEW VAV BOXES WILL RECEIVE NEW DIRECT-DIGITAL CONTROLS HOWEVER THE AIR HANDLING UNITS WILL REMAIN ON THEIR EXISTING CONTROLS WHICH ARE A COMBINATION OF DDC AND PNUEMATIC.

THE AIR HANDLING UNITS ARE TO RECEIVE NEW DIRECT-DIGITAL CONTROLS IN A FUTURE PROJECT. FOR THIS PROJECT THE AHUS WILL OPERATE WITHIN THEIR CURRENT PARAMETERS AND SEQUENCES.

TEMPERATURE CONTROLS CONTRACTOR REQUIREMENTS:
THE TEMPERTURE CONTROLS CONTRACTOR SHALL INCLUDE THEIR BID THE FOLLOWING IN ADDITION TO THE REQUIREMENTS OF SECTION 230923:

- RESET THE DISCHARGE AIR TEMPERATURE SET POINT OF THE AC-2 AND AC-3 TO 65° F. THIS SET POINT NEEDS TO BE ADJUSTABLE SO THAT THE OWNER MAY MODIFY AFTER THIS PROJECT IF THEY FIND THAT THIS TOO HIGH TO SATISIFY THE COOLING NEEDS. THE GOAL IS TO SET THE DISCHARGE AIR TEMPERATURE HIGHER TO SAVE CHILLER ENERGY AND MAINTAIN GOOD AIRFLOW IN THE SPACES SERVED BY THESE AHUS.
- COORDINATE WITH THE TEST & BALANCE CONTRACTOR TO RE-BALANCE THE SUPPLY/RETURN FANS, THE MININUM OUTSIDE AIR DAMPER, AND VAV BOXES. SEE AIRFLOW BELOW UNDER THE TAB CONTRACTOR SECTION.
- VERIFY THAT THE SUPPLY FAN VFD IS CONTROLLING PROPERLY BASED UPON DUCT STATIC PRESSURE SENSOR(S). COORDINATE WITH THE TAB CONTRACTOR TO MINIMIZE/OPTIMIZE THE DUCT STATIC PRESSURE SET POINT TO SAVE AS MUCH FAN ENERGY AS POSSIBLE.

TEST & BALANCE CONTRACTOR REQUIREMENTS:
THE TAB CONTRACTOR SHALL INCLUDE THEIR BID THE FOLLOWING IN ADDITION TO THE REQUIREMENTS IN SECTION 230593:

- RE-BALANCE THE SUPPLY/RETURN FANS AND THE MININUM OUTSIDE AIR DAMPER FOR EACH AHU AS FOLLOWS:
  - AC-2: MAX SUPPLY AIRFLOW: 20,205 CFM, MIN SUPPLY AIRFLOW = 6,525 CFM
  - AC-2: MIN OUTSIDE AIRFLOW = 2,795 CFM
  - AC-3: MAX SUPPLY AIRFLOW: 6,310 CFM, MIN SUPPLY AIRFLOW = 2,845 CFM
  - AC-3: MIN OUTSIDE AIRFLOW = 1,395 CFM
- VERIFY THAT THE SUPPLY FAN VFD IS CONTROLLING PROPERLY BASED UPON DUCT STATIC PRESSURE SENSOR(S). COORDINATE WITH THE TCC TO MINIMIZE/OPTIMIZE THE DUCT STATIC PRESSURE SET POINT TO SAVE AS MUCH FAN ENERGY AS POSSIBLE.

MECHANICAL LEGEND

	EXISTING DUCTWORK
	DUCTWORK DEMOLITION
	NEW DUCTWORK (SHADED)
	DUCT DOWN, DUCT UP
	DUCT RISERS (SUPPLY, RETURN, EXHAUST)
	90° ELBOW W/ TURNING VANES, 45° TAKE-OFF W/ MANUAL BALANCING DAMPER
	EXISTING PIPE
	PIPE DEMOLITION
DCW	DOMESTIC COLD WATER
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
L/S	REFRIGERANT PIPING (LIQUID/SUCTION)
	CHECK VALVE
	BALL VALVE, GATE VALVE
	2-WAY CONTROL VALVE, 3-WAY CONTROL VALVE
	BUTTERFLY VALVE, BALANCE VALVE
	PIPE UNION OR FLANGE
	ELBOW DOWN, TEE UP
	TEE DOWN, PIPE CONTINUATION
	REDUCER OR INCREASER
T	THERMOSTAT
TS	TEMPERATURE SENSOR
SW	SWITCH
SW EPO	SWITCH, EMERGENCY POWER OFF
S CO2	CO2 SENSOR
SD	SMOKE DETECTOR
FD	FIRE DAMPER
SD	FIRE SMOKE DAMPER
M	MOTORIZED DAMPER
	POINT OF CONNECTION
	LIMIT OF DEMOLITION

MECHANICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
BB	BASEBOARD HEATER
BLW	BELOW
CD	CEILING DIFFUSER
CU	CONDENSING UNIT
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
DN	DOWN
(E)	EXISTING
EA	EXHAUST AIR
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EG	EXHAUST GRILLE
ERV	ENERGY RECOVERY VENTILATOR
FCU	FAN COIL UNIT
FT	FINNED TUBE RADIANT HEATER
FUR	FURNACE
GUH	GAS UNIT HEATER
HUH	HYDRONIC UNIT HEATER
HWR	HEATING WATER RETURN
HWS	HEATING WATER SUPPLY
IRH	INFRARED RADIANT HEATER
MAU	MAKE-UP AIR UNIT
MC	MECHANICAL CONTRACTOR
(N)	NEW
OA	OUTSIDE AIR
POC	POINT OF CONNECTION
RA	RETURN AIR
RB	REBALANCE
REL	RELOCATED
RG	RETURN GRILLE
RTU	ROOFTOP UNIT
SA	SUPPLY AIR
SD	SUPPLY DIFFUSER
TA	TRANSFER AIR
TAB	TEST & BALANCE
TC	TEMPERATURE CONTROLS
TCC	TEMPERATURE CONTROLS CONTRACTOR
TCP	TEMPERATURE CONTROL PANEL
TSTAT	THERMOSTAT
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VAV	VARIABLE AIR VOLUME
W/	WITH
W/O	WITHOUT

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PLAN GENERAL NOTES

A. ALL EXISTING VAV BOXES AND ASSOCIATED PNEUMATIC THERMOSTATS SERVED BY AIR HANDLING UNITS AC-2 AND AC-3 ON THIS LEVEL TO BE REMOVED AND REPLACED WITH NEW. REFER TO REMODEL PLANS.

B. IN AREAS WHERE EXISTING CEILING GRID IS TO BE MODIFIED, ALL EXISTING DIFFUSERS/ GRILLES TO REMAIN ARE TO BE CAREFULLY REMOVED AND REINSTALLED IN SAME LOCATION. REFER TO ARCHITECTURAL FOR CEILING GRID MODIFICATIONS.

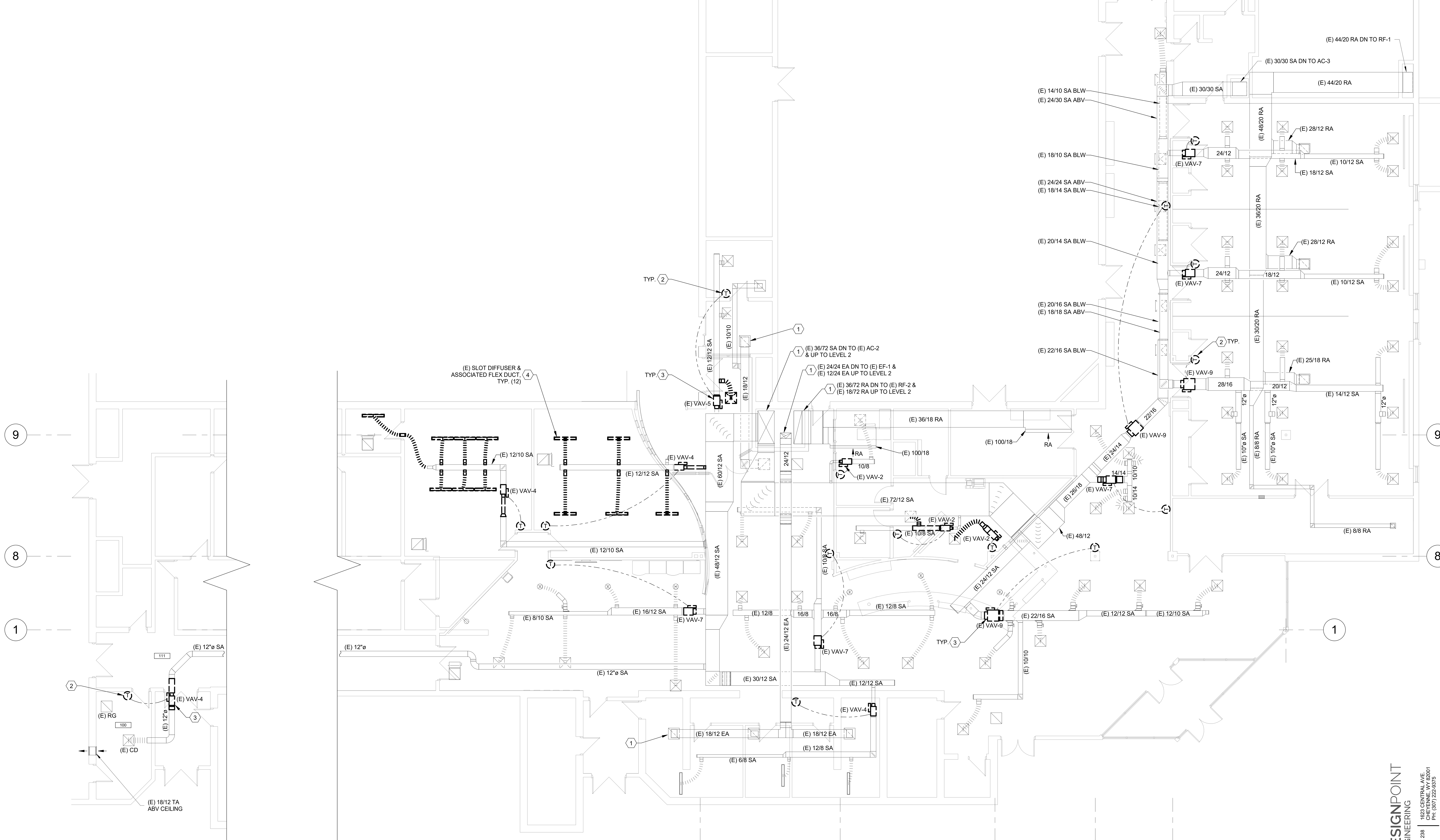
FLAG NOTES

1 EXISTING MECHANICAL WORK TO REMAIN AS IS.

2 EXISTING PNEUMATIC THERMOSTAT TO BE REMOVED.

3 EXISTING VAV BOX TO BE REMOVED INCLUDING APPLICABLE CONTROLS. CONTRACTOR TO REMOVE INLET/OUTLET DUCTWORK TO THE EXTENT REQUIRED FOR INSTALLATION OF THE NEW VAV BOX AND NEW INLET/OUTLET DUCTING PER THE NOTES/DETAILS ON THE REMODEL PLANS.

4 EXISTING MECHANICAL WORK TO BE REMOVED. CAP REMAINING AS REQUIRED. COORDINATE W/ G.C. TO PATCH AND/OR REPAIR FLOOR, WALLS, CEILING, AND/OR ROOF AS REQUIRED.



LEVEL 1 HVAC DEMO PLAN

1/8" = 1'-0"

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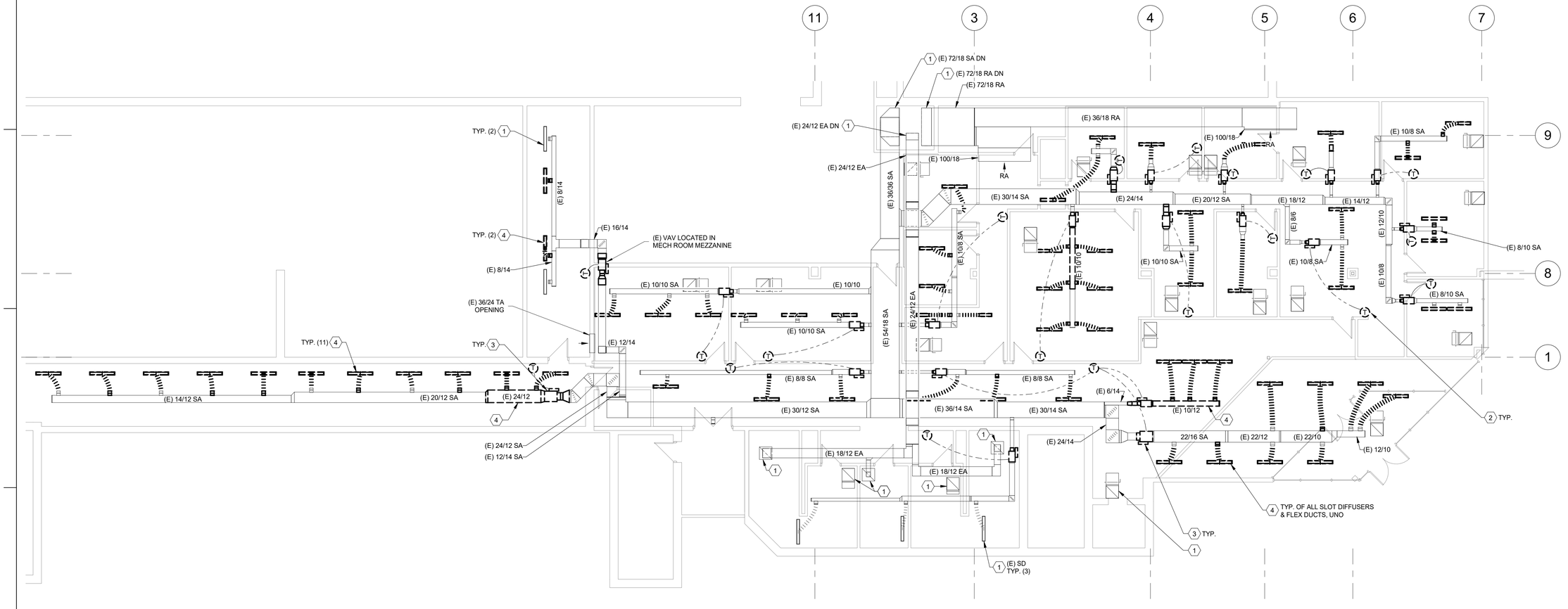

1 LEVEL 2 HVAC DEMO PLAN

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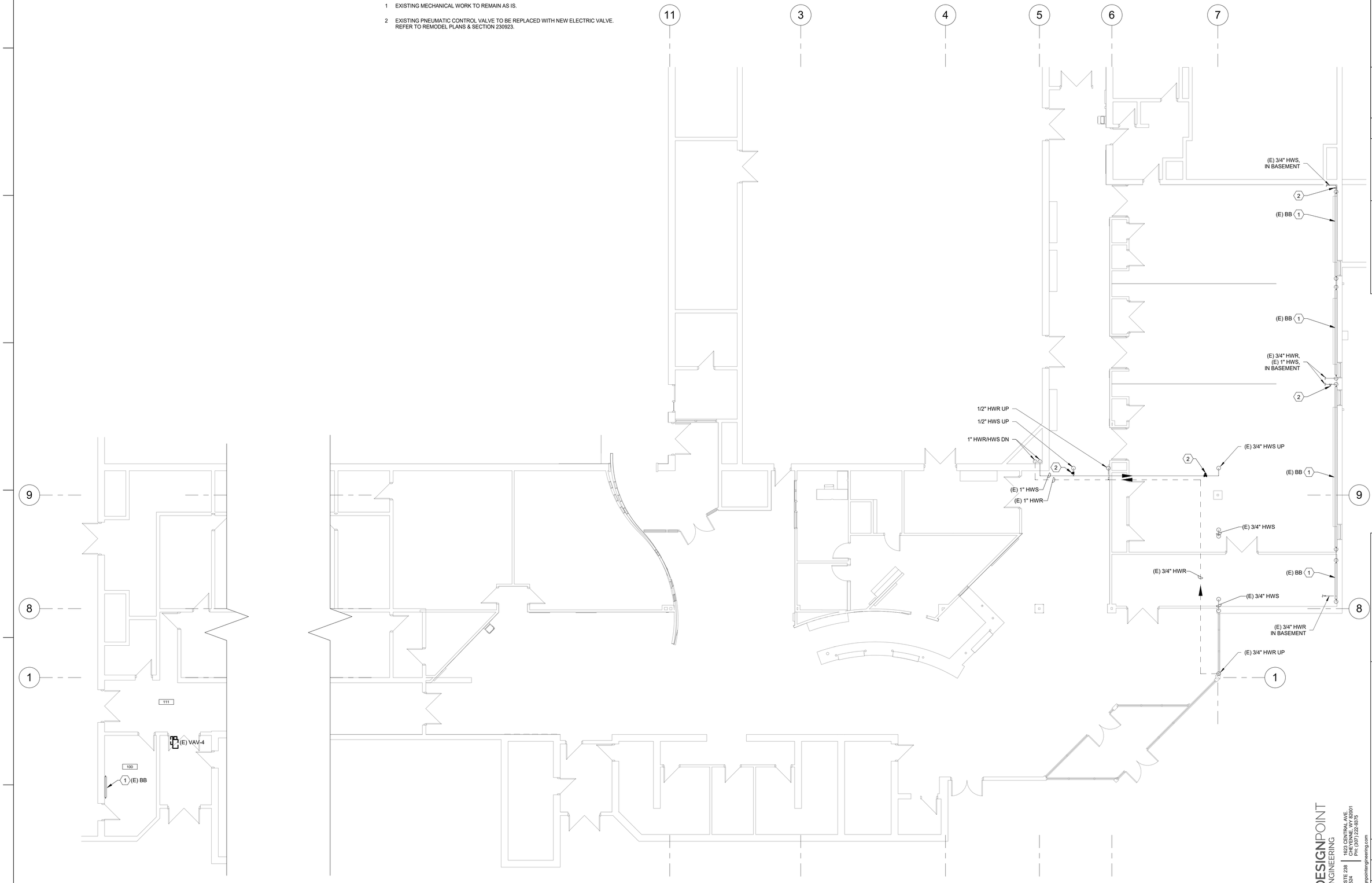
FLAG NOTES

1 EXISTING MECHANICAL WORK TO REMAIN AS IS.

2 EXISTING PNEUMATIC CONTROL VALVE TO BE REPLACED WITH NEW ELECTRIC VALVE. REFER TO REMODEL PLANS & SECTION 230923.



1 LEVEL 1 HYDRONIC DEMO PLAN
1/8" = 1'-0"

REV	DATE	DESCRIPTION
0	2019.03.04	ISSUE FOR PERMIT

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE. DRAWING INTENDED FOR 24x36

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VAV REPLACEMENT
GREELEY REC CENTER
LEVEL 1 HYDRONIC DEMO PLAN
ISSUE FOR PERMIT

18001834

2018-0044

M1.3

DESIGNPOINT ENGINEERING
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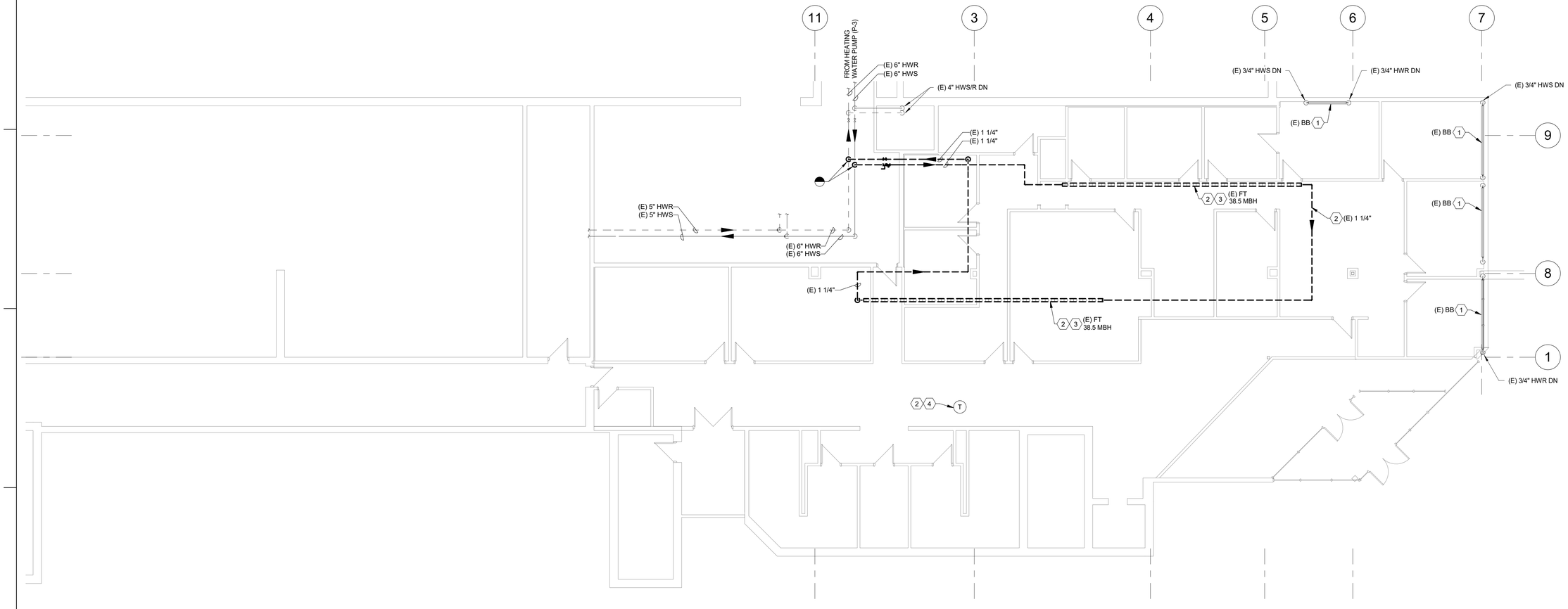
FLAG NOTES

1 EXISTING MECHANICAL WORK TO REMAIN AS IS.

2 EXISTING MECHANICAL WORK TO BE REMOVED. CAP REMAINING AS REQUIRED. COORDINATE W/ G.C. TO PATCH AND/OR REPAIR FLOOR, WALLS, CEILING, AND/OR ROOF AS REQUIRED.

3 EXISTING FINNED TUBE LOCATED ABOVE THE CEILING TO BE REMOVED INCLUDING APPLICABLE VALVE AND CONTROLS.

4 EXISTING THERMOSTAT LOCATED ABOVE CEILING TO CONTROL EXISTING FINNED TUBE TO BE REMOVED.



1 LEVEL 2 HYDRONIC DEMO PLAN
1/8" = 1'-0"

REV	DATE	DESCRIPTION
0	2019.03.04	ISSUE FOR PERMIT

WARNING

0 1/2 1

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VAV REPLACEMENT
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LEVEL 2 HYDRONIC DEMO PLAN
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2018-0044

M1.4

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PLAN GENERAL NOTES

A. IN AREAS WHERE EXISTING CEILING GRID IS TO BE MODIFIED, ALL EXISTING RETURN AIR GRILLES TO BE CAREFULLY REMOVED AND REINSTALLED IN SAME LOCATION. REFER TO ARCHITECTURAL FOR CEILING GRID MODIFICATIONS.

B. THE CONTRACTOR SHALL INCLUDE IN THEIR BID MODIFYING THE EXISTING DUCTWORK AT EACH VAV BOX LOCATION AS INDICATED IN THE "SINGLE-DUCT TERMINAL UNIT DETAIL," SHEET M3.0 WHICH INCLUDES NEW INLET DUCTWORK, A NEW LINED PLENUM DOWNSTREAM OF THE VAV BOX, DUCT TRANSITIONS AND OFFSET TO CONNECT THE NEW TO THE EXISTING, RELOCATING EXISTING TAKEOFFS IMMEDIATELY DOWNSTREAM OF THE VAV BOX, ETC. THE DRAWINGS DO NOT INDICATE ALL THIS WORK BUT SHALL BE REQUIRED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF LOCATIONS WHERE A COMPLETE NEW LINED PLENUM IS NOT REASONABLE AND THESE LOCATIONS CAN BE TAKEN ON A CASE BY CASE BASIS.

C. PROVIDE NEW FLEX DUCT WHERE EXISTING DIFFUSERS ARE BEING REPLACED WITH NEW. NOTIFY THE ENGINEER IF BALANCING DAMPERS ARE MISSING ON THE EXISITING TAKE-OFFS.

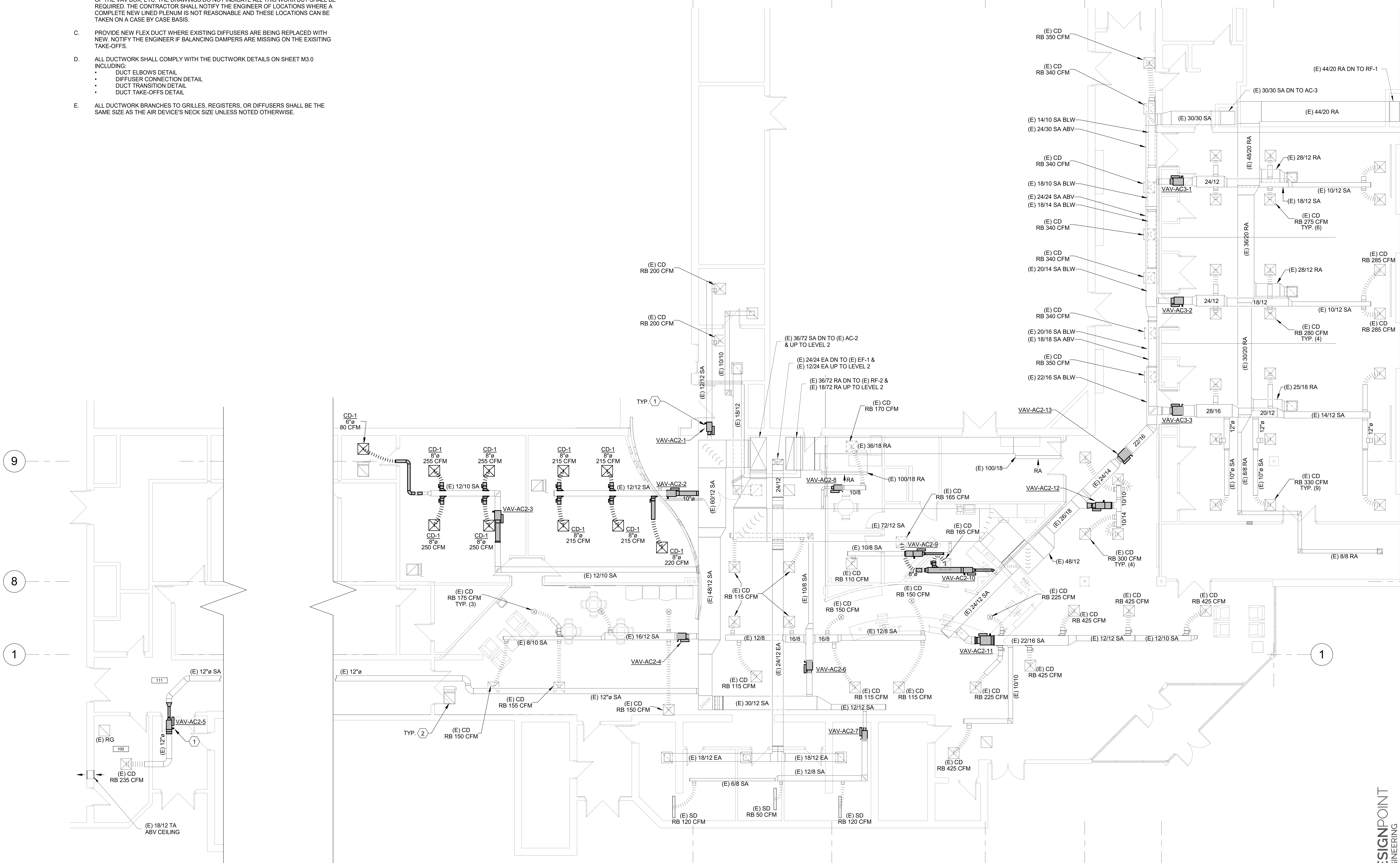
D. ALL DUCTWORK SHALL COMPLY WITH THE DUCTWORK DETAILS ON SHEET M3.0 INCLUDING:
- DUCT ELBOWS DETAIL
- DIFFUSER CONNECTION DETAIL
- DUCT TRANSITION DETAIL
- DUCT TAKE-OFFS DETAIL

E. ALL DUCTWORK BRANCHES TO GRILLES, REGISTERS, OR DIFFUSERS SHALL BE THE SAME SIZE AS THE AIR DEVICE'S NECK SIZE UNLESS NOTED OTHERWISE.

FLAG NOTES

1. NEW VAV BOX IN SAME LOCATION AS EXISTING. REFER TO PLAN GENERAL NOTE B, THIS SHEET.

2. RELOCATED EXISTING RETURN GRILLE WITH RETURN AIR BOOT. WHERE THE BOOT IS EQUIPPED WITH AN EXISTING MVD, BALANCE TO THE AIRFLOW INDICATED ON THE PLANS.



LEVEL 1 HVAC REMODEL PLAN

1/8" = 1'-0"

REV	DATE	DESCRIPTION
0	2019.03.04	ISSUE FOR PERMIT

WARNING

0 1/2 1

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VAV REPLACEMENT
GREELEY REC CENTER
LEVEL 1 HVAC REMODEL PLAN
ISSUE FOR PERMIT

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18001834

2018-0044

M2.1

PLAN GENERAL NOTES

A. IN AREAS WHERE EXISTING CEILING GRID IS TO BE MODIFIED, ALL EXISTING RETURN AIR GRILLES TO BE CAREFULLY REMOVED AND REINSTALLED IN SAME LOCATION. REFER TO ARCHITECTURAL FOR CEILING GRID MODIFICATIONS.

B. THE CONTRACTOR SHALL INCLUDE IN THEIR BID MODIFYING THE EXISTING DUCTWORK AT EACH VAV BOX LOCATION AS INDICATED IN THE "SINGLE-DUCT TERMINAL UNIT DETAIL," SHEET M3.0 WHICH INCLUDES NEW INLET DUCTWORK, A NEW LINED PLENUM DOWNSTREAM OF THE VAV BOX, DUCT TRANSITIONS AND OFFSET TO CONNECT THE NEW TO THE EXISTING, RELOCATING EXISTING TAKEOFFS IMMEDIATELY DOWNSTREAM OF THE VAV BOX, ETC. THE DRAWINGS DO NOT INDICATE ALL THIS WORK BUT SHALL BE REQUIRED. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF LOCATIONS WHERE A COMPLETE NEW LINED PLENUM IS NOT REASONABLE AND THESE LOCATIONS CAN BE TAKEN ON A CASE BY CASE BASIS.

C. PROVIDE NEW FLEX DUCT WHERE EXISTING DIFFUSERS ARE BEING REPLACED WITH NEW. NOTIFY THE ENGINEER IF BALANCING DAMPERS ARE MISSING ON THE EXISITING TAKE-OFFS.

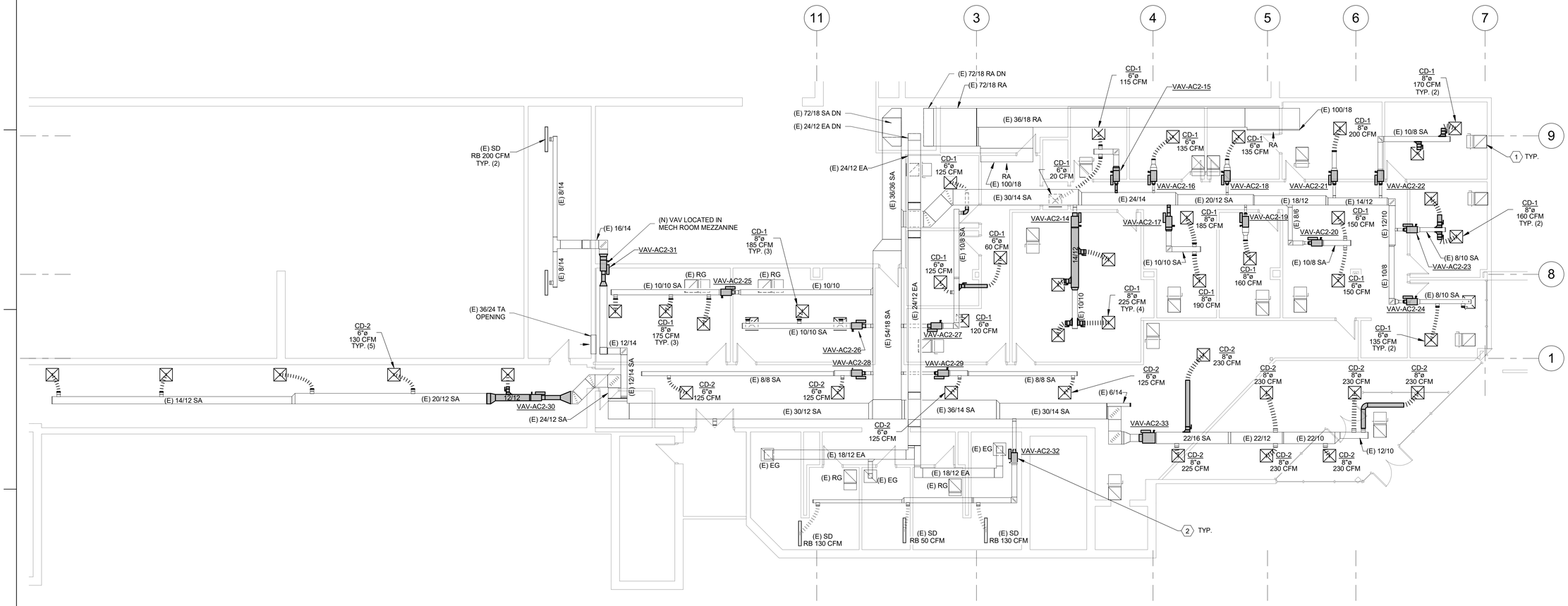
D. ALL DUCTWORK SHALL COMPLY WITH THE DUCTWORK DETAILS ON SHEET M3.0 INCLUDING:
- DUCT ELBOWS DETAIL
- DIFFUSER CONNECTION DETAIL
- DUCT TRANSITION DETAIL
- DUCT TAKE-OFFS DETAIL

E. ALL DUCTWORK BRANCHES TO GRILLES, REGISTERS, OR DIFFUSERS SHALL BE THE SAME SIZE AS THE AIR DEVICE'S NECK SIZE UNLESS NOTED OTHERWISE.

FLAG NOTES

1 RELOCATED EXISTING RETURN GRILLE WITH RETURN AIR BOOT. WHERE THE BOOT IS EQUIPPED WITH AN EXISTING MVD, BALANCE TO THE AIRFLOW INDICATED ON THE PLANS.

2 NEW VAV BOX IN SAME LOCATION AS EXISTING. REFER TO PLAN GENERAL NOTE B, THIS SHEET.



1 LEVEL 2 HVAC REMODEL PLAN
1/8" = 1'-0"

REV	DATE	DESCRIPTION
0	2019.03.04	ISSUE FOR PERMIT

WARNING

0 1/2 1

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LEVEL 2 HVAC REMODEL PLAN
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M2.2

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PLAN GENERAL NOTES

A. ALL COILS SHALL HAVE A 2-WAY MODULATING CONTROL VALVE, UNLESS NOTED OTHERWISE. SEE "2-WAY WATER COIL PIPING DETAIL", SHEET M3.0.

B. ALL PIPE BRANCHES TO VAV BOXES SHALL BE 3/4" MINIMUM UNLESS NOTED OTHERWISE.

FLAG NOTES

1 NEW DDC CONTROL VALVE. REFER TO SPECIFICATIONS.

2 NEW HWS/HWR UP TO SECOND FLOOR MECHANICAL ROOM. TIE INTO EXISTING 1-1/4" HWS/HWR SERVING GYMNASIUM.

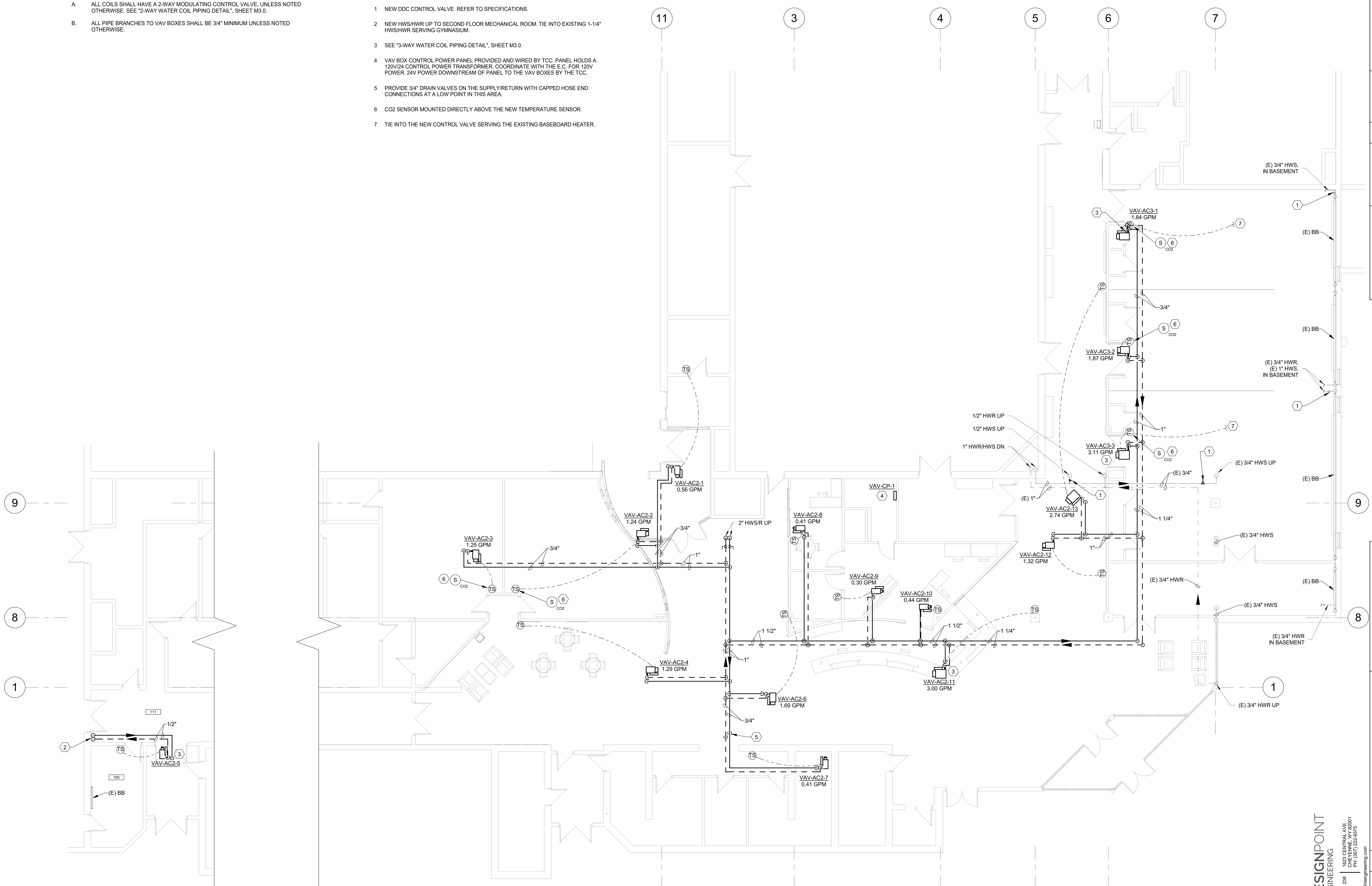
3 SEE "3-WAY WATER COIL PIPING DETAIL", SHEET M3.0.

4 VAV BOX CONTROL POWER PANEL PROVIDED AND WIRED BY TCC. PANEL HOLDS A 120V/24 CONTROL POWER TRANSFORMER. COORDINATE WITH THE E.C. FOR 120V POWER. 24V POWER DOWNSTREAM OF PANEL TO THE VAV BOXES BY THE TCC.

5 PROVIDE 3/4" DRAIN VALVES ON THE SUPPLY/RETURN WITH CAPPED HOSE END CONNECTIONS AT A LOW POINT IN THIS AREA.

6 CO2 SENSOR MOUNTED DIRECTLY ABOVE THE NEW TEMPERATURE SENSOR.

7 TIE INTO THE NEW CONTROL VALVE SERVING THE EXISTING BASEBOARD HEATER.



2 LEVEL 1 HYDRONIC REMODEL PLAN

1/8" = 1'-0"

REV	DATE	DESCRIPTION
0	2019.03.04	ISSUE FOR PERMIT

WARNING

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VAV REPLACEMENT

GREELEY REC CENTER

LEVEL 1 HYDRONIC REMODEL PLAN

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2018-0044

M2.3

PLAN GENERAL NOTES

A. ALL COILS SHALL HAVE A 2-WAY MODULATING CONTROL VALVE, UNLESS NOTED OTHERWISE. SEE "2-WAY WATER COIL PIPING DETAIL", SHEET M3.0.

B. ALL PIPE BRANCHES TO VAV BOXES SHALL BE 3/4" MINIMUM UNLESS NOTED OTHERWISE.

(#) FLAG NOTES

1 SEE "3-WAY WATER COIL PIPING DETAIL", SHEET M3.0.

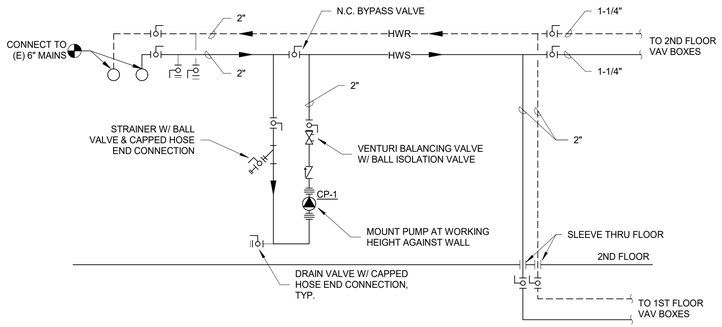
2 PROVIDE 3/4" DRAIN VALVES ON THE SUPPLY/RETURN WITH CAPPED HOSE END CONNECTIONS AT A LOW POINT IN THIS AREA.

3 CO2 SENSOR MOUNTED DIRECTLY ABOVE THE NEW TEMPERATURE SENSOR.

4 VAV BOX CONTROL POWER PANEL PROVIDED AND WIRED BY TCC. PANEL HOLDS A 120V/24 CONTROL POWER TRANSFORMER. COORDINATE WITH THE E.C. FOR 120V POWER. 24V POWER DOWNSTREAM OF PANEL TO THE VAV BOXES BY THE TCC.

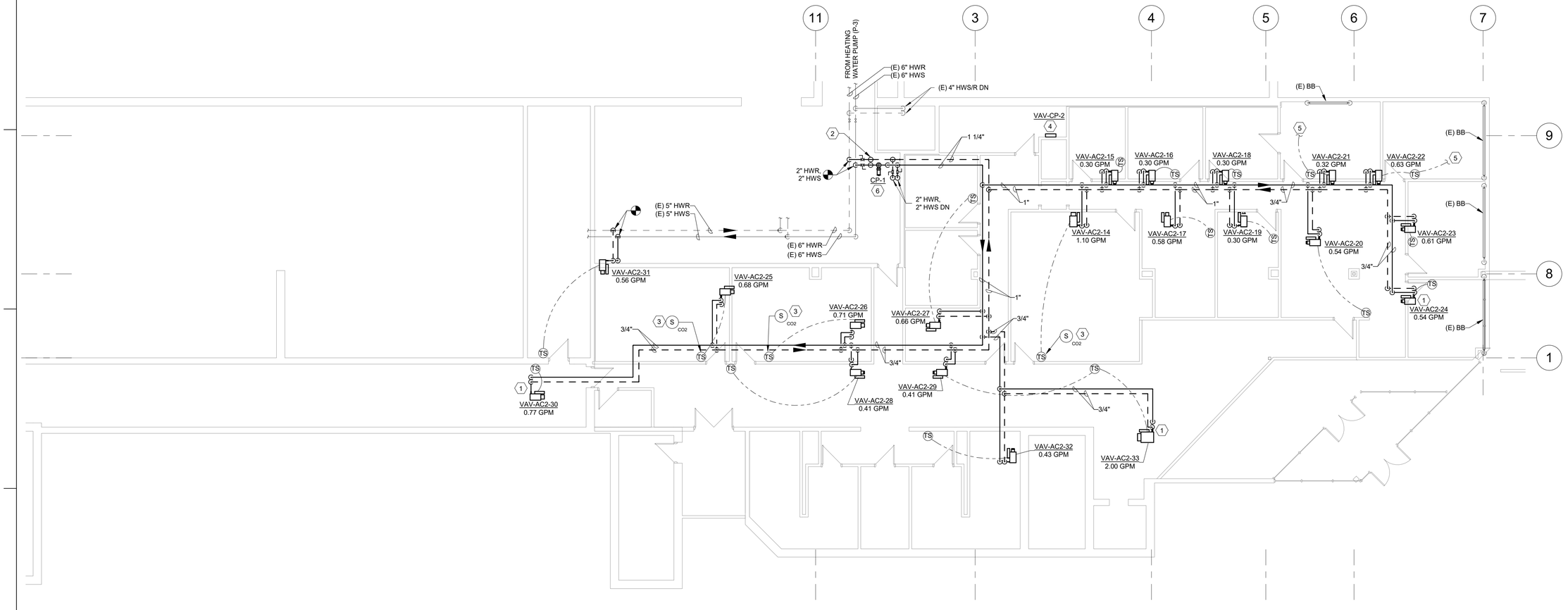
5 TIE INTO THE NEW CONTROL VALVE SERVING THE EXISTING BASEBOARD HEATER.

6 SEE "CIRCULATION PUMP (CP-1) PIPING SCHEMATIC," THIS SHEET.



CIRCULATION PUMP (CP-1) PIPING SCHEMATIC

SCALE: NONE



1 LEVEL 2 HYDRONIC REMODEL PLAN

1/8" = 1'-0"

REV	DATE	DESCRIPTION
0	2019.03.04	ISSUE FOR PERMIT

WARNING

0 1/2 1

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LEVEL 2 HYDRONIC REMODEL PLAN
ISSUE FOR PERMIT

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M2.4

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I/O POINTS LIST

TAG	TYPE	DESCRIPTION	UNITS	REMARKS
DA-T	AI	DISCHARGE AIR TEMPERATURE	°F	NONE
ZN-T / WC-ADJ	AI	ZONE TEMP / WARMER COOLER ADJ	°F	
DA-VP	AI	DISCHARGE AIR FLOW	CFM	
DPR-O	AO	DAMPER OUTPUT	%	
HTG-O	AO	VAV HEATING VALVE OUTPUT	%	

NOTES: THE TCC SHALL PROVIDE ANY ADDITIONAL POINTS REQUIRED TO MEET THE SEQUENCE OF OPERATION AND TO PROVIDE A FULLY FUNCTIONAL SYSTEM.

SEQUENCE OF OPERATION:

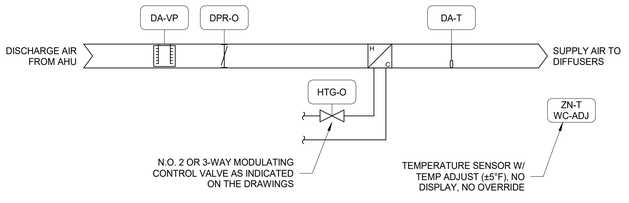
USE A DUAL MAXIMUM VAV BOX LOGIC AS DESCRIBED BELOW:

DISCHARGE AIR TEMP. SENSOR:
1. A DISCHARGE AIR TEMPERATURE SENSOR SHALL BE PROVIDED ON EACH BOX.

OCCUPIED MODE:
1. HEATING SET POINT = 70° F (ADJ.); COOLING SET POINT = 5° F (ADJ.) ABOVE HEATING SET POINT.
2. WHEN THE ZONE TEMPERATURE IS BETWEEN THE OCCUPIED HEATING AND COOLING SET POINTS, THE PRIMARY AIR DAMPER SHALL BE AT THE MINIMUM CFM, AND THE VAV HEATING VALVE SHALL BE FULLY CLOSED.
3. ON A RISE IN ZONE TEMPERATURE ABOVE THE COOLING SET POINT, THE PRIMARY AIR DAMPER SHALL MODULATE OPEN INCREASING THE CFM UP TO THE MAXIMUM CFM. THE VAV HEATING VALVE SHALL BE FULLY CLOSED.
4. ON A DROP IN ZONE TEMPERATURE BELOW THE HEATING SET POINT, THE PRIMARY AIR DAMPER SHALL BE AT THE MINIMUM CFM AND THE VAV HEATING VALVE SHALL MODULATE OPEN UNTIL IT REACHES THE MAXIMUM DISCHARGE AIR TEMPERATURE SET POINT OF 90° F (ADJ.). WHEN THE DISCHARGE AIR TEMPERATURE REACHES THE SET POINT AND THE ZONE REQUIRES ADDITIONAL HEATING, THE PRIMARY AIRFLOW DAMPER SHALL MODULATE OPEN WITH THE REHEAT VALVE MAINTAINING THE MAXIMUM DISCHARGE AIR TEMPERATURE SET POINT UP TO THE MAXIMUM HEATING CFM.

USER TEMPERATURE ADJUSTMENT:
1. THE TEMPERATURE SET POINT SHALL BE ADJUSTABLE ±5° F (ADJ.) VIA THE ZONE TEMPERATURE SENSOR.

ALARMS:
1. AN ALARM SHALL BE GENERATED AT THE DDC CENTRAL WORKSTATION WHEN THE ZONE TEMPERATURE FOR ANY ZONE IS ABOVE TO BELOW THE ALARM LIMITS (ADJ.).



SINGLE DUCT TERMINAL UNIT W/ HW REHEAT CONTROL SCHEMATIC

I/O POINTS LIST

TAG	TYPE	DESCRIPTION	UNITS	REMARKS
DA-T	AI	DISCHARGE AIR TEMPERATURE	°F	NONE
ZN-T / WC-ADJ	AI	ZONE TEMP / WARMER COOLER ADJ	°F	
DA-VP	AI	DISCHARGE AIR FLOW	CFM	
DPR-O	AO	DAMPER OUTPUT	%	
HTG-O	AO	VAV HEATING VALVE OUTPUT	%	
BBHV-O	AO	BASEBOAR HEATING VALVE OUTPUT	%	

NOTES: THE TCC SHALL PROVIDE ANY ADDITIONAL POINTS REQUIRED TO MEET THE SEQUENCE OF OPERATION AND TO PROVIDE A FULLY FUNCTIONAL SYSTEM.

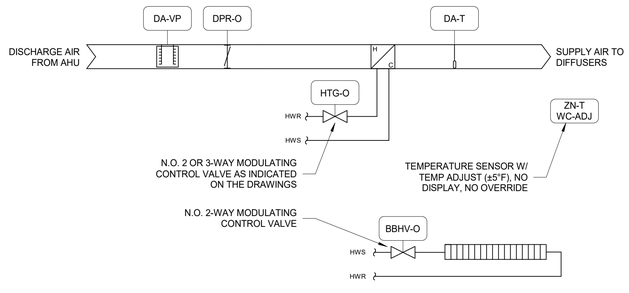
SEQUENCE OF OPERATION:

DISCHARGE AIR TEMP. SENSOR:
1. A DISCHARGE AIR TEMPERATURE SENSOR SHALL BE PROVIDED ON EACH BOX.

OCCUPIED MODE:
1. HEATING SET POINT = 70° F (ADJ.); COOLING SET POINT = 5° F (ADJ.) ABOVE HEATING SET POINT.
2. WHEN THE ZONE TEMPERATURE IS BETWEEN THE OCCUPIED HEATING AND COOLING SET POINTS, THE PRIMARY AIR DAMPER SHALL BE AT THE MINIMUM CFM, AND THE VAV AND BASEBOARD HEATING VALVES SHALL BE FULLY CLOSED.
3. ON A RISE IN ZONE TEMPERATURE ABOVE THE COOLING SET POINT, THE PRIMARY AIR DAMPER SHALL MODULATE OPEN INCREASING THE CFM UP TO THE MAXIMUM CFM. THE VAV AND BASEBOARD HEATING VALVES SHALL BE FULLY CLOSED.
4. ON A DROP IN ZONE TEMPERATURE BELOW THE HEATING SET POINT, THE PRIMARY AIR DAMPER SHALL BE AT THE MINIMUM CFM AND THE VAV HEATING VALVE SHALL MODULATE OPEN UNTIL IT REACHES A NEUTRAL DISCHARGE AIR TEMPERATURE SET POINT OF 70° F (ADJ.). IF THE ZONE REQUIRES ADDITIONAL HEATING, THE BASEBOARD HEATING VALVE SHALL MODULATE TO MAINTAIN THE HEATING SET POINT. IF ADDITIONAL HEAT IS REQUIRED THE VAV HEATING VALVE SHALL BE ALLOWED TO MODULATE OPEN TO PROVIDE ADDITIONAL HEAT.

USER TEMPERATURE ADJUSTMENT:
1. THE TEMPERATURE SET POINT SHALL BE ADJUSTABLE ±5° F (ADJ.) VIA THE ZONE TEMPERATURE SENSOR.

ALARMS:
1. AN ALARM SHALL BE GENERATED AT THE DDC CENTRAL WORKSTATION WHEN THE ZONE TEMPERATURE FOR ANY ZONE IS ABOVE TO BELOW THE ALARM LIMITS (ADJ.).



SINGLE DUCT TERMINAL UNIT W/ HW REHEAT & SUPPLEMENTAL BASEBOARD HEAT CONTROL SCHEMATIC

MISC. I/O POINTS LIST

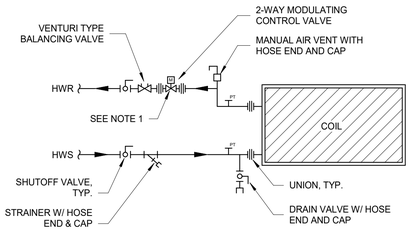
TAG	TYPE	DESCRIPTION	UNITS	REMARKS
ZN-Q	AI	ZONE CO2 AIR QUALITY	PPM	TYP. (8) - SEE PLANS

SEQUENCE OF OPERATION:

EACH ROOM CO2 SENSOR SHALL BE TIED INTO THE NEAREST VAV BOX CONTROLLER AND CONNECTED TO THE FRONT-END FOR MONITORING. AT THIS TIME THE AIR HANDLING UNITS DO NOT HAVE AN OVERRIDE SEQUENCE TO PROVIDE ADDITIONAL OUTSIDE AIR TO A ZONE THAT HAS A HIGH CO2 LEVEL. THIS SHALL BE ADDED TO THE FUTURE AIR HANDLER CONTROLS UPGRADE PROJECT.

AT THIS TIME THE DDC SYSTEM SHALL MONITOR EACH CO2 SENSOR AND PROVIDE AN ALARM IF THE CO2 LEVEL RISES ABOVE 1000 PPM (ADJ.) FOR A PERIOD OF 30 MIN (ADJ.).

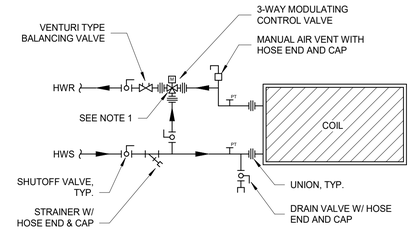
MISCELLANEOUS CONTROLS POINTS



NOTES:
1. CONTROL VALVE TO BE NORMALLY OPEN (NO) FOR HEATING COILS AND NORMALLY CLOSED (NC) FOR CHILLED WATER COILS.
2. ARRANGE PIPING TO ALLOW FOR COIL'S REMOVAL.

2-WAY WATER COIL PIPING DETAIL

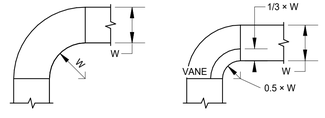
SCALE: NONE



NOTES:
1. CONTROL VALVE TO BE NORMALLY OPEN (NO) FOR HEATING WATER COILS AND NORMALLY CLOSED (NC) FOR CHILLED WATER COILS.
2. ARRANGE PIPING TO ALLOW FOR COIL'S REMOVAL.

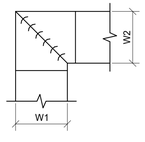
3-WAY WATER COIL PIPING DETAIL

SCALE: NONE



FULL RADIUS ELBOW — SHORT RADIUS ELBOW

NOTES:
1. FULL RADIUS ELBOWS SHALL BE USED AS THE STANDARD. SHORT RADIUS ELBOWS ARE ONLY PERMITTED WHERE FULL RADIUS ELBOWS WILL NOT FIT.
2. THE INTERIOR OF ALL RADIUS ELBOWS SHALL BE MADE ROUND.
3. VANES SHALL BE CONSTUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA.

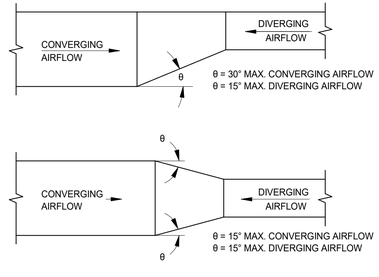


NOTES:
1. DIMENSIONS 'W1' AND 'W2' SHALL BE EQUAL ON SQUARE ELBOWS, UNLESS NOTED OTHERWISE ON THE DRAWINGS.
2. VANES SHALL BE AIRFOIL VANE TYPE. VANES SHALL BE CONSTRUCTED, SUPPORTED AND FASTENED AS RECOMMENDED BY SMACNA.

SQUARE ELBOW WITH TURNING VANES

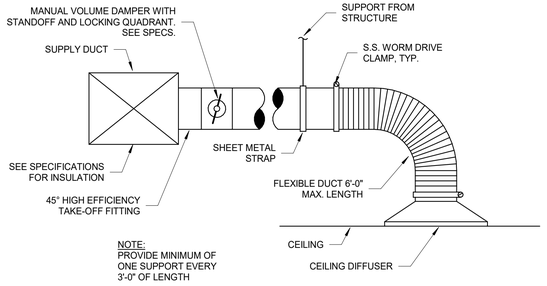
DUCT ELBOWS DETAIL

SCALE: NONE



DUCT TRANSITIONS DETAIL

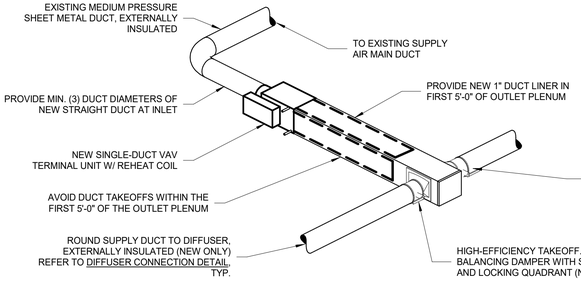
SCALE: NONE



NOTE:
PROVIDE MINIMUM OF ONE SUPPORT EVERY 3'-0" OF LENGTH

DIFFUSER CONNECTION DETAIL

SCALE: NONE



NOTES:
1. DUCT ROUTING MAY DIFFER FROM THAT SHOWN ABOVE. REFER TO FLOOR PLANS FOR ALL DUCT SIZES AND ROUTING.

SINGLE-DUCT VAV TERMINAL UNIT DETAIL

SCALE: NONE

REV	DATE	DESCRIPTION
0	2019.03.04	ISSUE FOR PERMIT

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE. DRAWING INTENDED FOR 24x36

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VAV REPLACEMENT
GREELEY REC CENTER
MECHANICAL DETAILS
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18001834

2018-0044

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SINGLE-DUCT TERMINAL UNIT SCHEDULE

TAG	MAKE	MODEL	AIRFLOW			INLET SIZE	OUTLET SIZE	HEATING WATER COIL DATA (100% WATER)								REMARKS
			MAX.	MIN.	HEATING			HTG CAPACITY	GPM	EWT	LWT	EAT	LAT	ROWS	COIL FLUID PD	MAX COIL APD	
VAV-AC2-1	PRICE	SDV5	400 CFM	120 CFM	120 CFM	7"	12/10	5,500 Btu/h	0.56 GPM	180 °F	160 °F	55 °F	104 °F	1	0.26 ftH2O	0.07 in-wg	
VAV-AC2-2	PRICE	SDV5	1080 CFM	325 CFM	325 CFM	10"	14/13	12,200 Btu/h	1.24 GPM	180 °F	160 °F	55 °F	95 °F	2	0.18 ftH2O	0.21 in-wg	
VAV-AC2-3	PRICE	SDV5	1090 CFM	330 CFM	330 CFM	10"	14/13	12,300 Btu/h	1.25 GPM	180 °F	160 °F	55 °F	95 °F	2	0.18 ftH2O	0.21 in-wg	
VAV-AC2-4	PRICE	SDV5	980 CFM	345 CFM	345 CFM	10"	14/13	12,600 Btu/h	1.29 GPM	180 °F	160 °F	55 °F	94 °F	2	0.19 ftH2O	0.18 in-wg	
VAV-AC2-5	PRICE	SDV5	235 CFM	70 CFM	70 CFM	5"	12/8	3,500 Btu/h	0.35 GPM	180 °F	160 °F	55 °F	107 °F	1	0.08 ftH2O	0.04 in-wg	
VAV-AC2-6	PRICE	SDV5	1105 CFM	550 CFM	550 CFM	10"	14/13	16,600 Btu/h	1.69 GPM	180 °F	160 °F	55 °F	87 °F	2	0.31 ftH2O	0.22 in-wg	
VAV-AC2-7	PRICE	SDV5	290 CFM	90 CFM	90 CFM	5"	12/8	4,100 Btu/h	0.41 GPM	180 °F	160 °F	55 °F	103 °F	1	0.10 ftH2O	0.06 in-wg	
VAV-AC2-8	PRICE	SDV5	170 CFM	60 CFM	85 CFM	4"	12/8	4,000 Btu/h	0.41 GPM	180 °F	160 °F	55 °F	104 °F	1	0.10 ftH2O	0.02 in-wg	
VAV-AC2-9	PRICE	SDV5	110 CFM	55 CFM	55 CFM	4"	12/8	3,000 Btu/h	0.30 GPM	180 °F	160 °F	55 °F	111 °F	1	0.06 ftH2O	0.01 in-wg	
VAV-AC2-10	PRICE	SDV5	330 CFM	100 CFM	100 CFM	5"	12/8	4,400 Btu/h	0.44 GPM	180 °F	160 °F	55 °F	101 °F	1	0.12 ftH2O	0.07 in-wg	
VAV-AC2-11	PRICE	SDV5	2575 CFM	775 CFM	1290 CFM	14"	20/18	35,100 Btu/h	3.00 GPM	180 °F	156 °F	55 °F	84 °F	2	1.29 ftH2O	0.29 in-wg	
VAV-AC2-12	PRICE	SDV5	1200 CFM	360 CFM	360 CFM	10"	14/13	13,000 Btu/h	1.32 GPM	180 °F	160 °F	55 °F	93 °F	2	0.20 ftH2O	0.25 in-wg	
VAV-AC2-13	PRICE	SDV5	2400 CFM	720 CFM	720 CFM	14"	20/18	26,700 Btu/h	2.74 GPM	180 °F	160 °F	55 °F	95 °F	2	1.09 ftH2O	0.26 in-wg	
VAV-AC2-14	PRICE	SDV5	900 CFM	270 CFM	270 CFM	9"	14/13	10,800 Btu/h	1.10 GPM	180 °F	160 °F	55 °F	98 °F	2	0.14 ftH2O	0.15 in-wg	
VAV-AC2-15	PRICE	SDV5	135 CFM	55 CFM	55 CFM	4"	12/8	3,000 Btu/h	0.30 GPM	180 °F	160 °F	55 °F	111 °F	1	0.06 ftH2O	0.02 in-wg	
VAV-AC2-16	PRICE	SDV5	135 CFM	55 CFM	55 CFM	4"	12/8	3,000 Btu/h	0.30 GPM	180 °F	160 °F	55 °F	111 °F	1	0.06 ftH2O	0.02 in-wg	
VAV-AC2-17	PRICE	SDV5	375 CFM	150 CFM	150 CFM	6"	12/8	5,700 Btu/h	0.58 GPM	180 °F	160 °F	55 °F	95 °F	1	0.19 ftH2O	0.09 in-wg	
VAV-AC2-18	PRICE	SDV5	135 CFM	55 CFM	55 CFM	4"	12/8	3,000 Btu/h	0.30 GPM	180 °F	160 °F	55 °F	111 °F	1	0.06 ftH2O	0.02 in-wg	
VAV-AC2-19	PRICE	SDV5	160 CFM	55 CFM	55 CFM	4"	12/8	3,000 Btu/h	0.30 GPM	180 °F	160 °F	55 °F	111 °F	1	0.06 ftH2O	0.02 in-wg	
VAV-AC2-20	PRICE	SDV5	300 CFM	135 CFM	135 CFM	5"	12/8	5,400 Btu/h	0.54 GPM	180 °F	160 °F	55 °F	97 °F	1	0.17 ftH2O	0.06 in-wg	
VAV-AC2-21	PRICE	SDV5	200 CFM	60 CFM	60 CFM	5"	12/8	3,200 Btu/h	0.32 GPM	180 °F	160 °F	55 °F	110 °F	1	0.07 ftH2O	0.03 in-wg	
VAV-AC2-22	PRICE	SDV5	340 CFM	105 CFM	170 CFM	5"	12/8	6,200 Btu/h	0.63 GPM	180 °F	160 °F	55 °F	93 °F	1	0.22 ftH2O	0.07 in-wg	
VAV-AC2-23	PRICE	SDV5	320 CFM	100 CFM	160 CFM	5"	12/8	6,000 Btu/h	0.61 GPM	180 °F	160 °F	55 °F	94 °F	1	0.21 ftH2O	0.07 in-wg	
VAV-AC2-24	PRICE	SDV5	270 CFM	85 CFM	135 CFM	5"	12/8	5,400 Btu/h	0.54 GPM	180 °F	160 °F	55 °F	97 °F	1	0.17 ftH2O	0.05 in-wg	
VAV-AC2-25	PRICE	SDV5	525 CFM	160 CFM	160 CFM	7"	12/10	6,700 Btu/h	0.68 GPM	180 °F	160 °F	55 °F	99 °F	1	0.37 ftH2O	0.11 in-wg	
VAV-AC2-26	PRICE	SDV5	555 CFM	170 CFM	170 CFM	7"	12/10	6,900 Btu/h	0.71 GPM	180 °F	160 °F	55 °F	98 °F	1	0.39 ftH2O	0.13 in-wg	
VAV-AC2-27	PRICE	SDV5	430 CFM	155 CFM	155 CFM	7"	12/10	6,500 Btu/h	0.66 GPM	180 °F	160 °F	55 °F	100 °F	1	0.35 ftH2O	0.08 in-wg	
VAV-AC2-28	PRICE	SDV5	250 CFM	90 CFM	90 CFM	5"	12/8	4,100 Btu/h	0.41 GPM	180 °F	160 °F	55 °F	103 °F	1	0.10 ftH2O	0.04 in-wg	
VAV-AC2-29	PRICE	SDV5	250 CFM	90 CFM	90 CFM	5"	12/8	4,100 Btu/h	0.41 GPM	180 °F	160 °F	55 °F	103 °F	1	0.10 ftH2O	0.04 in-wg	
VAV-AC2-30	PRICE	SDV5	650 CFM	195 CFM	195 CFM	8"	12/10	7,600 Btu/h	0.77 GPM	180 °F	160 °F	55 °F	96 °F	1	0.45 ftH2O	0.16 in-wg	
VAV-AC2-31	PRICE	SDV5	400 CFM	120 CFM	120 CFM	7"	12/10	5,500 Btu/h	0.56 GPM	180 °F	160 °F	55 °F	104 °F	1	0.26 ftH2O	0.07 in-wg	
VAV-AC2-32	PRICE	SDV5	310 CFM	95 CFM	95 CFM	5"	12/8	4,300 Btu/h	0.43 GPM	180 °F	160 °F	55 °F	102 °F	1	0.11 ftH2O	0.06 in-wg	
VAV-AC2-33	PRICE	SDV5	1605 CFM	485 CFM	800 CFM	14"	20/18	25,800 Btu/h	2.00 GPM	180 °F	154 °F	55 °F	89 °F	2	0.62 ftH2O	0.13 in-wg	
VAV-AC3-1	PRICE	SDV5	1650 CFM	495 CFM	495 CFM	12"	16/15	18,000 Btu/h	1.84 GPM	180 °F	160 °F	55 °F	94 °F	2	0.43 ftH2O	0.25 in-wg	
VAV-AC3-2	PRICE	SDV5	1690 CFM	510 CFM	510 CFM	12"	16/15	18,300 Btu/h	1.87 GPM	180 °F	160 °F	55 °F	93 °F	2	0.45 ftH2O	0.26 in-wg	
VAV-AC3-3	PRICE	SDV5	2970 CFM	890 CFM	890 CFM	14"	20/18	30,300 Btu/h	3.11 GPM	180 °F	160 °F	55 °F	91 °F	2	1.37 ftH2O	0.37 in-wg	

NOTE: CONTRACTOR TO COORDINATE RH/LH CONTROLS ENCLOSURE AND REHEAT COIL CONNECTIONS AS REQUIRED IN THE FIELD WHICH MAY DIFFER FROM THE DRAWINGS. VERIFY PROPER CLEARANCES FOR CONTROLS ENCLOSURE AND ACCESSIBILITY TO COILS, CONTROL VALVES, ETC.

PUMP SCHEDULE

TAG	MAKE	MODEL	GPM	HEAD (FT. OF W.C.)	FLUID TYPE	PUMP TYPE	VOLTAGE	PHASE	MOTOR HP	MOTOR RPM	BODY MATERIAL	IMPELLER MATERIAL	SUCTION SIZE	DISCHARGE SIZE	REMARKS
CP-1	TACO	1915	33.00 GPM	32	100% WATER	CLOSE-COUPLED IN-LINE	120 V	1	3/4	1760	CAST IRON	STAINLESS STEEL	1-1/2"	1-1/2"	1

1.) PROVIDE W/ COMBINATION MOTOR STARTER, FRANKLIN CONTROLS MODEL# BAS-1P. COORDINATE W/ E.C. FOR WIRING.

GRILLES, REGISTERS AND DIFFUSER SCHEDULE

TAG	MAKE	MODEL	APPLICATION	DAMPER	MOUNTING	MATERIAL	COLOR	DESCRIPTION
CD-1	PRICE	SCD	SUPPLY	NO	LAY-IN	STEEL	WHITE	24"x24" SQUARE THREE-CONE CEILING DIFFUSER. SEE PLANS FOR NECK SIZE AND CFM.
CD-2	PRICE	SCD	SUPPLY	NO	LAY-IN	STEEL	WHITE	24"x24" SQUARE THREE-CONE CEILING DIFFUSER. SEE PLANS FOR NECK SIZE AND CFM. PROVIDE WITH CEILING RADIATION DAMPER.

REV	DATE	DESCRIPTION
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VAV REPLACEMENT

GREELEY REC CENTER

MECHANICAL SCHEDULES

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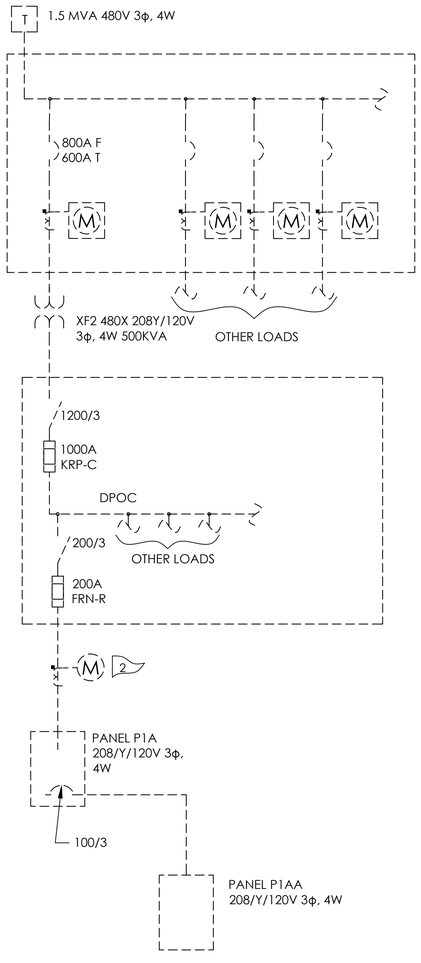
ELECTRICAL DRAWING NUMBER DESCRIPTION

FLAG NOTES

1. BREAKERS ARE EXISTING AND ARE TO BE RE-USED.
2. CONTRACTOR TO PROVIDE 30 DAYS OF AMPERE READINGS ON 15 MINUTE INTERVALS ON THE PANEL P1A TO CONFIRM MAXIMUM LOADING. PROVIDE THESE READINGS TO THE ENGINEER IN EXCEL FILE FORMAT PRIOR TO FINALIZING PROJECT.



1 PARTIAL ONE LINE

NTS NOTE: ALL EQUIPMENT EXISTING

GENERAL NOTES

1. COORDINATE EXACT EQUIPMENT LOCATIONS WITH OTHER TRADES PRIOR TO ROUGH-INS. REVIEW ENTIRE PROJECT PACKAGE INCLUDING OTHER TRADE DRAWING FOR COMPLETE UNDERSTANDING OF DESIGN.
2. THE OWNER AND ENGINEER ARE NOT RESPONSIBLE FOR THE CONTRACTORS SAFETY PRECAUTIONS OR TO MEANS, METHODS TECHNIQUES CONSTRUCTION SEQUENCES OR PROCEDURES REQUIRED TO PERFORM HIS WORK.
3. THE INTENT OF THE DRAWINGS IS TO PROVIDE AND INSTALL NEW COMPONENTS IN THE AREA OF CONSTRUCTION. CONTRACTOR SHALL PROVIDE A COMPLETE AND OPERABLE SYSTEM AFTER ALL CONNECTIONS TO NEW AND EXISTING EQUIPMENT ARE COMPLETED.
4. DIMENSIONS - CONTRACTOR/CUSTOMER TO VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO ENGINEER IMMEDIATELY.
5. ALL ELECTRICAL COMPONENTS TO BE UL LISTED FOR THEIR USE AND INSTALLED PER LOCAL ELECTRICAL CODE. ALL ELECTRICAL INSTALLATIONS LESS THAN 1000V SHALL BE IN ACCORDANCE WITH NFPA-70. ALL ELECTRICAL DEVICES ARE PER SCHEDULE AND DRAWINGS OR ENGINEER APPROVED EQUAL. COORDINATE WITH OWNER FOR EQUIPMENT COLORS.
6. ALL GROUNDING INCLUDING GROUND RODS AND UFER GROUNDS TO MEET NFPA-70 REQUIREMENTS. BOND METAL STRUCTURES TO GROUND ELECTRODE SYSTEM.

GENERAL NOTES CONTINUED

7. ALL WORK TO BE INSTALLED IN A NEED WORKMANLIKE MANNER. DIAGONAL RUNS ARE NOT ACCEPTABLE. ALL CONDUIT RUNS TO BE PARALLEL OR PERPENDICULAR TO STRUCTURE MOUNTED TO.
8. ALL RACEWAYS TO INCLUDE A GROUND CONDUCTOR AS SHOWN ON SCHEDULES. THE CONDUIT IS UNACCEPTABLE AS A GROUND CONDUCTOR. CONTRACTOR TO RUN DEDICATED NEUTRAL WITH ALL CIRCUITS REQUIRING NEUTRALS. SHARING NEUTRALS IS UNACCEPTABLE
9. RESULTS SHOWN IN PANEL AND FEEDERS SCHEDULES ARE BASED UPON ESTIMATED LENGTHS AND LOADS. ALTERATIONS TO ROUTING, LOADS OR LENGTHS MAY RENDER THE RESULTS INVALID. PLEASE VERIFY CHANGES WITH ENGINEER PRIOR TO CONSTRUCTION.
10. CONTRACTOR TO INSTALL WARNING LABELS PER NEC. EQUIPMENT TO BE LABELED WITH PANEL, CIRCUIT NUMBER .
11. LOAD SUMMARIES ARE BASED UPON THE SCHEDULES PROVIDED. C

GENERAL SCOPE

1. THE SCOPE OF WORK IS BASED UPON MECHANICAL PACKAGE AND FIELD INVESTIGATION TO REPLACE EXISTING VAV BOXES AND ADD HEAT TO THEM. ADDITIONALLY, THE CEILING TILES WILL BE REPLACED IN SOME AREAS.
2. A NEW CONTROLLER WILL BE INSTALLED ON THE FIRST AND SECOND FLOOR AND WILL BE POWERED FROM A PANEL ON THE FIRST FLOOR. CONTROLLERS TO BE PROVIDED BY CENTENNIAL CONTROLS. CONTRACTOR TO COORDINATE WITH THEM FOR DELIVERY.
3. NEW CONDUITS WILL BE INSTALLED IN THE CHASE BETWEEN FLOORS TO PROVIDE POWER TO THE UPSTAIRS CONTROLLER.
4. COORDINATE WITH CEILING TILE REPLACEMENT CONTRACTOR TO CONFIRM ELECTRICAL SCOPE NECESSARY TO FACILITATE TILE REPLACEMENT.
5. A NEW RECIRCULATION PUMP WILL BE INSTALLED IN 2ND FLOOR MECHANICAL ROOM. PROVIDE POWER CONDUIT, CABLE, AND FUSED DISCONNECT IF NOT PROVIDED WITH PUMP. COORDINATE LOCATION WITH MECHANICAL DESIGNERS AND OWNERS

PROJECT	GREELEY REC CENTER								
PANEL	P1AA				BUS 100 AMPS				
LOCATION	BEHIND RECEPTION AREA LEVEL 1				MAIN 100 AMPS				
VOLTAGE	208/120 - 3 PHASE 4 WIRE WYE				BRACING 10kA				
					COLOR CODE A-BLACK, B-RED, C-BLUE, N-WHITE				
DESCRIPTION	**BKR**	**PHASE**				**BKR**	**DESCRIPTION**		
VENDING	20/1	1	A	2		20/1	RECPT ABOVE COUNTER		
VENDING	20/1	3	B	4		20/1	RECEPT DISPLAY		
VENDING	20/1	5	C	6		20/1	RECEPT DESK		
VENDING	20/1	7	A	8		20/1	RECEPT DESK		
VENDING DISPLAY	20/1	9	B	10		20/1	RECEPT DESK		
MTG RM A113 SCREEN	20/1	11	C	12		20/1	RECEPT DESK		
MTG RM A114 SCREEN	20/1	13	A	14		20/1	RECEPT DESK		
MTG RM A115 SCREEN	20/1	15	B	16		20/1	COPY MACHINE		
MICR. RM A109	20/1	17	C	18		20/1	RECEPT RM A108		
MICR. RM A109	20/1	19	A	20		20/1	RECEPT RM A109		
UNKNOWN	20/1	21	B	22		20/1	MTG RM A113 PROJECTOR		
1 **HVAC CONTROL PANELS L1 & L2**	**20/1**	23	C	24		20/1	MTG RM A114 PROJECTOR		
SPARE	20/1	25	A	26		20/1	MTG RM A115 PROJECTOR		
SPARE	20/1	27	B	28		20/1	LIGHTS		
1 **CP-1 RECIRCULATION PUMP**	20/1	29	C	30			SPACE		
SPACE		31	A	32			SPACE		
SPACE		33	B	34			SPACE		
SPACE		35	C	36			SPACE		
SPACE		37	A	38			SPACE		
SPACE		39	B	40			SPACE		
SPACE		41	C	42			SPACE		
PANEL SCHEDULE NOTES									
1 BASED UPON EXISTING PANEL SCHEDULE LABELING									
2									

3 PANEL A SCHEDULE

NTS NOTE: GREYED OUT IS THE EXISTING ITEMS THAT WILL REMAIN AS FOUND. ITEMS IN DARK ARE THOSE AFFECTED BY DESIGN

PANEL P1AA LOAD SUMMARY					
PHASE	**VA**	**% LOAD**	**TYPE**	**DEMAND FACTOR**	**VA**
A	5350	8%	H	HEAT 125%	0
B	5102	6%	M	MOTOR 100%	0
C	2700	-12%	B	LARGEST M 125%	0
VOLTAGE	208 V		R	RECEPTACLE 100%	10760
RATING	100 AMPS		L	LIGHTING 125%	225
LARGEST MOTOR	0 HP		K	KITCHEN 125%	0
TOTAL MOTOR	0 HP		D	DEDICATED 125%	2250
TOTAL HEAT	0 KW		C	COOLING 125%	0
TOTAL LIGHTING	0.225 KVA		G	GENERAL 100%	0
			E	EXISTING 100%	0
			P	POWER FACTOR 90%	
				TOTAL VA	**14706**
				TOTAL AMPS	**41**
				LOADING	**41%**

2 LOAD SUMMARY

NTS NOTE: LOAD SUMMARY BASED UPON 2017 DESIGN

POWER FEEDER SCHEDULE (X) FEEDER IDENTIFIER

CONDUIT ID	PARALLEL RUNS	SIZE	TYPE	FROM	TO	MAX LENGTH	CABLE(S) CABLE OR CIRCUITS	FEEDER NOTES
A	1	3/4"	EMT	P1AA	VAV-CP-1	70'	2-#12 AWG CU THHN W/ #12 AWG GND.	1
B	1	3/4"	EMT	VAV-CP-1	VAV-CP-2	40'	2-#12 AWG CU THHN W/ #12 AWG GND.	2
C	1	3/4"	EMT	P1AA	DISCONNECT P-1	100'	2-#10 AWG CU THHN W/ #10 AWG GND.	3
D	1	3/4"	FMC	DISCONNECT P-1	PUMP P-1	20'	2-#10 AWG CU THHN W/ #10 AWG GND.	4

FEEDER NOTES

1 ROUTE CONDUIT UP FROM P1AA INTO DROP CEILING THEN OVER AND DOWN TO NEW HVAC CONTROL PANEL AT LEVEL 1.
2 ROUTE CONDUIT UP FROM NEW HVAC CONTROL PANEL AT LEVEL 1 TO NEW HVAC CONTROL PANEL AT LEVEL 2. A VERTICAL ROUTE SHOULD BE ACCESSABLE.
3 ROUTE CONDUIT UP FROM P1AA INTO DROP CEILING THEN OVER AND DOWN TO NEW HVAC CONTROL PANEL AT LEVEL 1.
4 ROUTE CONDUIT UP FROM NEW HVAC CONTROL PANEL AT LEVEL 1 TO NEW HVAC CONTROL PANEL AT LEVEL 2. A VERTICAL ROUTE SHOULD BE ACCESSABLE.

4 POWER FEEDER SCHEDULE

NTS

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0	2019.03.04	ISSUE FOR PERMIT

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0 1/2 1

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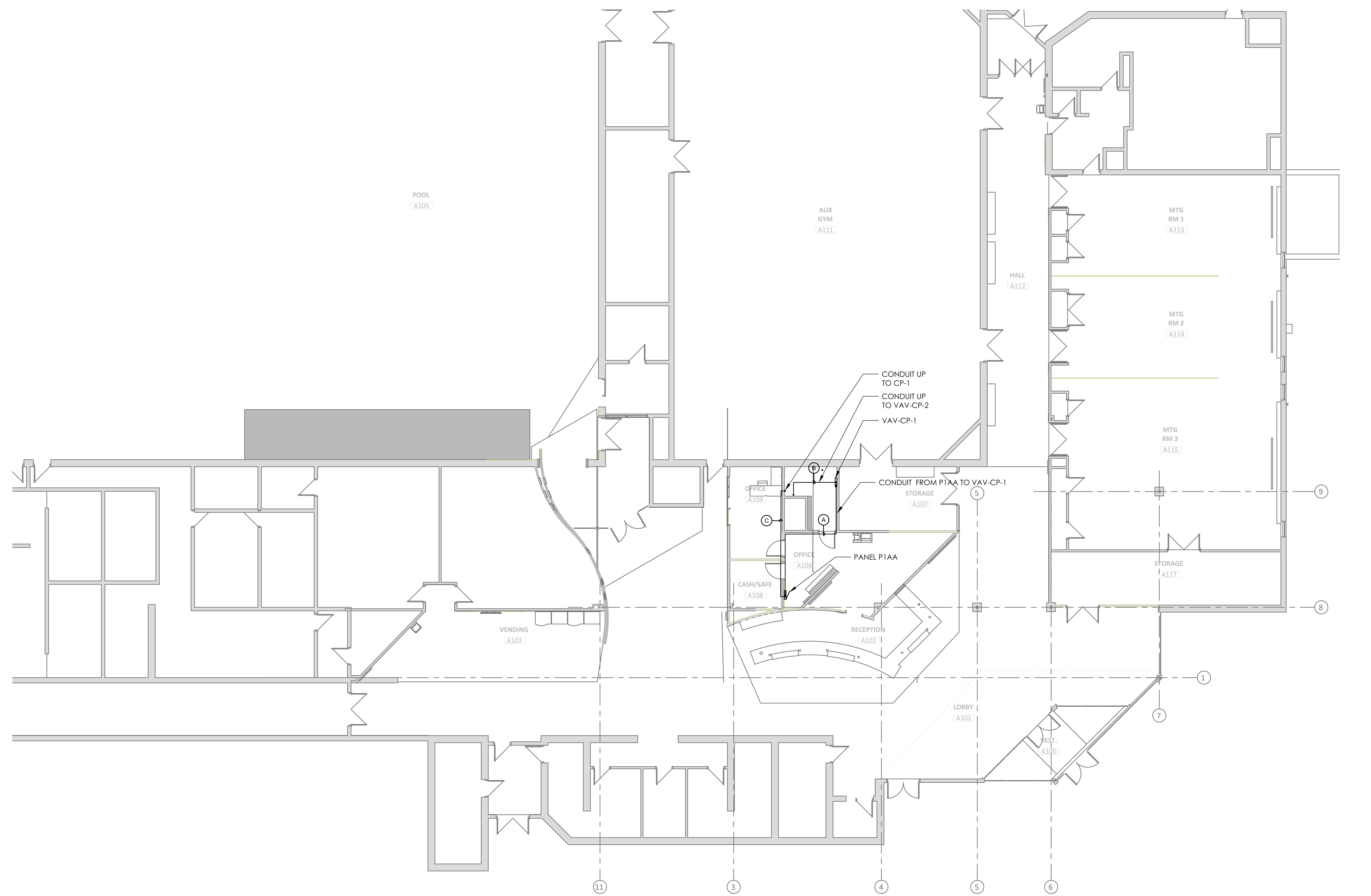

LEVEL 1 POWER PLAN

SCALE 1/8" = 1'

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0	2019.03.04	ISSUE FOR PERMIT

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E - LEVEL 1 POWER PLAN

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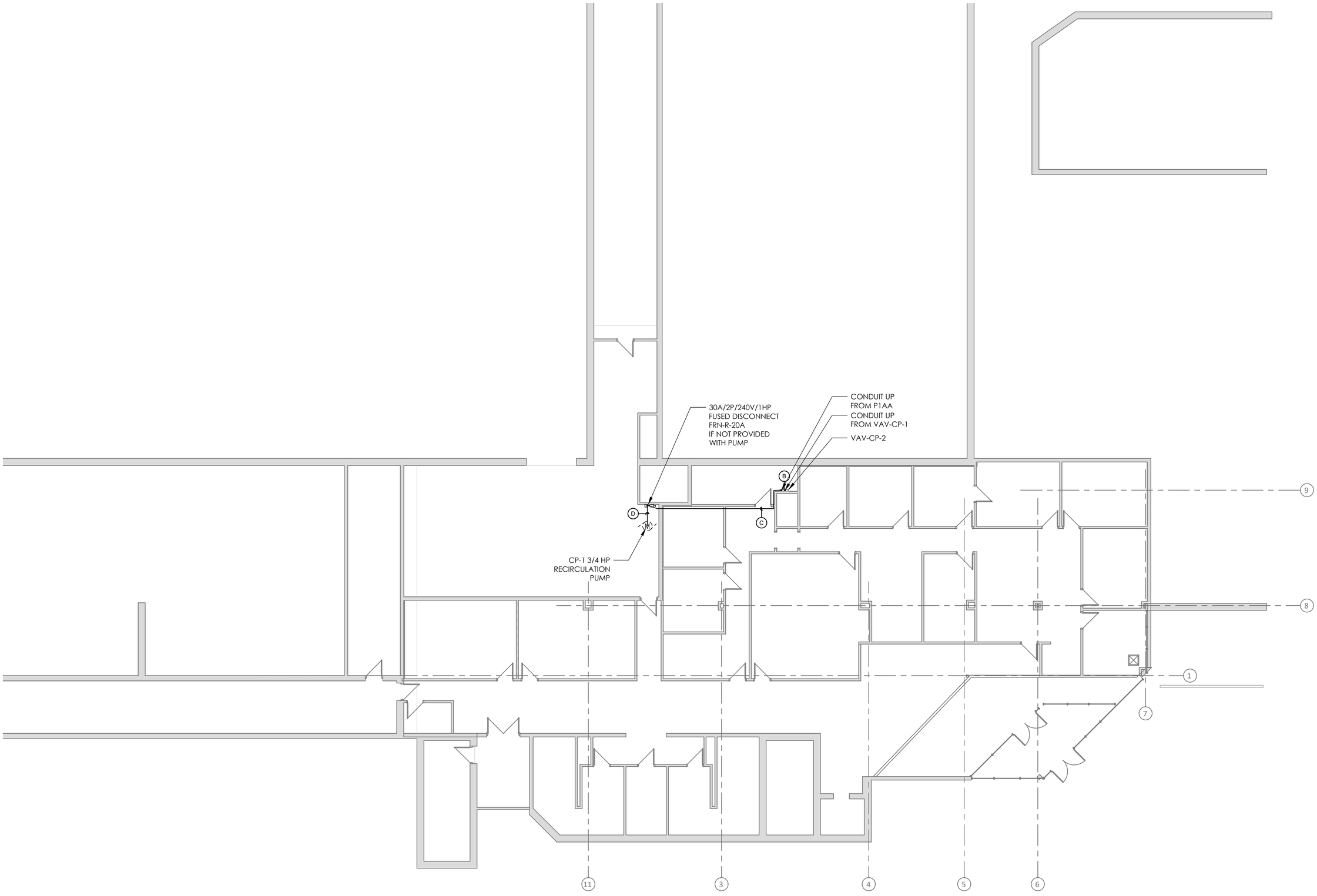
EP-01



1 LEVEL 2 POWER PLAN

SCALE 1/8" = 1'

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VAV REPLACEMENT
GREELEY REC CENTER
E - LEVEL 2 POWER PLAN
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