ADDENDUM TO RFP DOCUMENTS

	ADDENDUM #003
2.02	Project: HVAC and Roofing Replacement Solano Community College District Project Number: 23-002
SOLANO	Date: 8/1/2022
COMMUNITY COLLEGE	

Addendum # 003 – The following clarifications are provided based on questions received and must be added/considered when completing your submittal: Acknowledgement of receipt of this <u>ADDENDUM</u> is required in the proposal's cover letter of introduction. Please clearly note the addendum date and number.

ITEM:

- 1. Base bid for roofing has been changed from TPO roof membrane to PBC material. Revision has been updated in drawings and spec 07 53 00.
- 2. Bid alternates #2 and #3 have been removed. Bid alternate #4 has been consolidated into alternate #1 (Which is the only bid alternate remaining). 17 of the 24 drawings have been updated to reflect this change ONLY.
- 3. Added clarification on duct riser transitions to rooftop HVAC units.
- 4. Commissioning, factory startup for HVAC units, and training specifications have been added to sections 23 05 93 (TAB), 23 09 23 (DDC Controls), and 23 74 14 (Packaged Outdoor HVAC Units).
- 5. Updated Bid Form 00 41 13, Summary of Work 01 11 00, Agreement 00 52 13, Notice to Bidders 00 11 16

BID PHASE SCHEDULE

- Mandatory Pre-Bid Conference (web-based meeting via Microsoft Teams): <u>Thursday, July 14th</u>, <u>at 11:00 am</u>.
 - o Interested Parties need to send a meeting request to <u>Kristoffer.Bridges@solano.edu</u>
- Last date to submit questions to <u>Kristoffer.Bridges@solano.edu</u> : <u>By Thursday, July 21st, 2022,</u> <u>2:00 pm.</u>
- Last addendum will be issued: <u>By Monday, August 1st, 2022, 2:00 pm.</u>
- Bids Due: By Thursday, August 11th, 2022, 2:00 pm.
- Mandatory Post Bid Interview: <u>Friday</u>, August 12th, 2022, Time TBD.
- Solano Community College Board of Trustees Approval: Wednesday, September 7th, 2022
- Notice of Award: Anticipated by Thursday, September 8th, 2022.
- Notice to Proceed: <u>Anticipated by Friday, September 9th, 2022.</u>

CONSTRUCTION SCHEDULE

• Project Duration: May 30th, 2023 – August 14th, 2023

DOCUMENT 00 11 16

NOTICE TO BIDDERS

 Notice is hereby given that the governing board ("Board") of the Solano Community College District ("District") will receive sealed bids for the following project, Bid No. 23-002 ("Project" or "Contract"):

ANNEX HVAC and Roofing Project

2. The Project Scope of Work includes, but is not limited to:

All labor, materials, equipment, and supplies necessary for the removal, and replacement of the existing 3 ply built up roof system. The scope of work for the project is further defined in the contract documents but contains other DFOW's (Definable Features of Work) including; installation of OSHA compliant railings/gate at Roof hatches, modifications to existing utility elevations to match new flashing height, demolition and install of 10 new package rooftop units, removal and re-install of existing plumbing vents, all mechanical, patching, repair, rigging, controls and balance work with corresponding report, pre and post construction air balance reports, install of new district standard Delta DDC System, cleaning of new ductwork systems, demo and provide power to new HVAC equipment, fire alarm work in support of new HVAC scope.

The project includes 1 alternate (additive).

- 3. To bid on this Project, the Bidder is required to possess one or more of the following State of California contractor license(s):
 - A General Engineering Contractor

and/or

B – General Building Contractor

The Bidder's license(s) must remain active and in good standing throughout the term of the Contract.

- 4. To bid on this Project, the Bidder is required to be registered as a public works contractor with the Department of Industrial Relations pursuant to the Labor Code.
- 5. Contract Documents will be available on or after Wednesday July 6th, 2022, and may be viewed and/or downloaded from the District's website at; <u>http://www.solano.edu/measureg/vendor.php</u>

6. Sealed Bids will be received until 2:00 p.m. Thursday August 11th, 2022, at Solano Community College, 4000 Suisun Valley Road, Fairfield, California 94534, at or after which time the bids will be opened and publicly read aloud. Any bid that is submitted after this time shall be non-responsive and returned to the bidder. Any claim by a bidder of error in its bid must be made in compliance with section 5100, et seq. of the Public Contract Code.

If mailing, the District suggests delivery one day prior to bid date to allow for sufficient time for receiving, processing and delivery to the appropriate department. It is each bidder's sole responsibility to ensure its bid is delivered timely and received at the location designated as specified. The District will not be responsible for errors in delivery, including not receiving bids via email under any circumstance. Any bid received at the designated location after the scheduled closing time for receipt of bids shall be returned to the bidder unopened.

Bidders choosing to mail bids shall send them to;

Attn: Kristoffer Bridges, Kitchell Annex HVAC and Roofing Project, Bid #23-002 4000 Suisun Valley Road, Building 1102 (Kitchell Bond Office) Fairfield, CA 94534

Due to the impacts of COVID-19, an in-person Bid Opening will not be held. The Bid Opening will be conducted in the District's Board Room and will be live streamed over the internet. This will take place at approximately 2:30pm, on the bid due date. Potential bidders can view the live opening on the District's website on the following link:

https://welcome.solano.edu/liveevents/

- 7. All bids shall be on the form provided by the District. Each bid must conform and be responsive to all pertinent Contract Documents, including, but not limited to, the Instructions to Bidders.
- 8. A bid bond by an admitted surety insurer on the form provided by the District, or a cashier's check or a certified check, drawn to the order of the Solano Community College District, in the amount of ten percent (10%) of the total bid price, shall accompany the Bid Form and Proposal, as a guarantee that the Bidder will, within seven (7) calendar days after the date of the Notice of Award, enter into a contract with the District for the performance of the services as stipulated in the bid.
- 9. One Virtual Mandatory Pre-Bid Conference (via Microsoft Teams) will be held on <u>Thursday</u>, July 14th, at 11:00 a.m. All interested parties must send a request to participate to <u>Kristoffer.Bridges@Solano.edu</u>. Independent Site-Visits must also be conducted by potential bidders during the bidding period. Failure to attend or tardiness will render bid ineligible.

All participants are encouraged to sign-up for the free Microsoft Teams application prior to the meeting <u>https://www.microsoft.com/en-us/microsoft-teams/group-chat-software</u>.

- All pre-bid questions must be submitted in writing to the Project Manager, Kristoffer Bridges, at Kristoffer.Bridges@Solano.edu. Pre-Bid questions must be submitted on or before 2:00 p.m., Thursday, July 21st, 2022
- 11. The successful Bidder shall be required to furnish a 100% Performance Bond and a 100% Payment Bond if it is awarded the contract for the Work.
- 12. The successful Bidder may substitute securities for any monies withheld by the District to ensure performance under the Contract, in accordance with the provisions of section 22300 of the Public Contract Code.
- 13. The successful bidder will be required to certify that it either meets the Disabled Veteran Business Enterprise ("DVBE") goal of three percent (3%) participation or made a good faith effort to solicit DVBE participation in this Contract if it is awarded the contract for the Work.
- 14. The Contractor and all Subcontractors under the Contractor shall pay all workers on all work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to section 1770, et seq. of the California Labor Code. Prevailing wage rates are also available from the District or on the Internet at: http://www.dir.ca.gov.
- 15. This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and subject to the requirements of Title 8 of the California Code of Regulations. The successful Bidder shall comply with all requirements of Division 2, Part 7, Chapter 1, Articles 1-5 of the Labor Code.
- 16. The Contractor and all Subcontractors under the Contractor shall comply with applicable federal, State, and local requirements relating to COVID-19 or other public health emergency/epidemic/pandemic including, if required, preparing, posting, and implementing a Social Distancing Protocol. Contractor shall further comply with the California Department of Public Health's August 11, 2021, Order requiring workers on District sites to be fully vaccinated against COVID-19, or else subject to weekly testing for COVID-19.
- 17. The District shall award the Contract, if it awards it at all, to the lowest responsive responsible bidder based on:
 - A. The base bid amount only.
- 18. The Board reserves the right to reject any and all bids and/or waive any irregularity in any bid received. If the District awards the Contract, the security of unsuccessful bidder(s) shall be returned within sixty (60) days from the time the award is made. Unless otherwise required by law, no bidder may withdraw its bid for ninety (90) days after the date of the bid opening.

END OF DOCUMENT

DOCUMENT 00 41 13 BID FORM AND PROPOSAL

To: Solano Community College District ("District" or "Owner")

From:

(Proper Name of Bidder)

The undersigned declares that Bidder has read and understands the Contract Documents, including, without limitation, the Notice to Bidders and the Instructions to Bidders, and agrees and proposes to furnish all necessary labor, materials, and equipment to perform and furnish all work in accordance with the terms and conditions of the Contract Documents, including, without limitation, the Drawings and Specifications of **Bid No. 23-002**, for the following project known as: <u>Annex HVAC and Roofing Project</u>

("Project" or "Contract") and will accept in full payment for that Work the following total lump sum amount, all taxes included:

BASE BID	_ dollars	\$
5% Owner's Allowance of Base Bid	_ dollars	\$
	_ dollars	\$
TOTAL BID AMOUNT (CUMULATIVE TOTAL OF BASE BID AMOUNT AND 5% OWNER'S ALLOWANCE)		
Bidder acknowledges and agrees that all Allowance(s).	the Total Bi	d Amount accounts for any and
Additive/Deductive Alternates: Refere	ence Sheet G	-0.0 of Contract Documents
Additive/Deductive Alternates: Refere	ence Sheet G	-0.0 of Contract Documents

Additive re-roofing at the south roof. Do provide bolt-on, OSHA compliant railing at roof hatch.

Demolish the existing exhaust fan (EF-1) and fresh air intake (FAI) hood on the south roof, condensing unit (CU-1) on north roof, and the fan coil unit (FC-1) in the firs floor attic space. Provide (RTU-11), utility connections, and the fan coil unit controls as indicated. Recover and recycle refrigerant from FC-1 and CU-1 split system.

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BID FORM AND PROPOSAL DOCUMENT 00 41 13-1 Descriptions of alternates are primarily scope definitions and do not necessarily detail the full range of materials and processes needed to complete the construction.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

Additional Detail Regarding Calculation of Base Bid

1. <u>**Owner's Allowance**</u>. The Bidder's Base Bid shall include a five percent (5%) allowance for the Owner's use. <u>Do not include alternates when calculating the Allowance Amount.</u>

The above allowance shall only be used by authorization by the Owner. Contractor shall not bill for or be due any portion of this allowance unless the District has identified specific work, Contractor has submitted a price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has prepared an Allowance Expenditure Directive incorporating that work. Contractor hereby authorizes the District to execute a unilateral deductive change order at or near the end of the Project for all or any portion of the allowance not allocated. Any unused portion of the allowance will revert back to the District documented by a deductive change order.

- 2. The undersigned has reviewed the Work outlined in the Contract Documents and fully understands the scope of Work required in this Proposal, understands the construction and project management function(s) is described in the Contract Documents, and that each Bidder who is awarded a contract shall be in fact a prime contractor, not a subcontractor, to the District, and agrees that its Proposal, if accepted by the District, will be the basis for the Bidder to enter into a contract with the District in accordance with the intent of the Contract Documents.
- 3. The undersigned has notified the District in writing of any discrepancies or omissions or of any doubt, questions, or ambiguities about the meaning of any of the Contract Documents, and has contacted the Construction Manager before bid date to verify the issuance of any clarifying Addenda.
- 4. The undersigned agrees to commence work under this Contract on the date established in the Contract Documents and to complete all work within the time specified in the Contract Documents.
- 5. The liquidated damages clause of the General Conditions and Agreement is hereby acknowledged.
- 6. It is understood that the District reserves the right to reject this bid and that the bid shall remain open to acceptance and is irrevocable for a period of ninety (90) days.
- 7. The following documents are attached hereto:
 - Bid Bond on the District's form or other security
 - Designated Subcontractors List
 - Site Visit Certification
 - Non-Collusion Declaration

8. Receipt and acceptance of the following Addenda is hereby acknowledged:

No, Dated	No, Dated
No, Dated	No, Dated
No, Dated	No, Dated

- Bidder acknowledges that the license required for performance of the Work is a; A-General Engineering Contractor License or B-General Building Contractor License.
- 10. Bidder hereby certifies that Bidder is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work.
- 11. Bidder specifically acknowledges and understands that if it is awarded the Contract, that it shall perform the Work of the Project while complying with all requirements of the Department of Industrial Relations.
- 12. Bidder hereby certifies that its bid includes sufficient funds to permit Bidder to comply with all local, state or federal labor laws or regulations during the Project, including payment of prevailing wage, and that Bidder will comply with the provisions of Labor Code section 2810(d) if awarded the Contract.
- 13. The Bidder represents that it is competent, knowledgeable, and has special skills with respect to the nature, extent, and inherent conditions of the Work to be performed. Bidder further acknowledges that there are certain peculiar and inherent conditions existent in the construction of the Work that may create, during the Work, unusual or peculiar unsafe conditions hazardous to persons and property.
- 14. Bidder expressly acknowledges that it is aware of such peculiar risks and that it has the skill and experience to foresee and to adopt protective measures to adequately and safely perform the Work with respect to such hazards.
- 15. Bidder expressly acknowledges that it is familiar with and capable of complying with applicable federal, State, and local requirements relating to COVID-19 or other public health emergency/epidemic/pandemic including, if required, preparing, posting, and implementing a Social Distancing Protocol.
- 16. Bidder expressly acknowledges that it is aware that if a false claim is knowingly submitted (as the terms "claim" and "knowingly" are defined in the California False Claims Act, Gov. Code, § 12650 et seq.), the District will be entitled to civil remedies set forth in the California False Claim Act. It may also be considered fraud and the Contractor may be subject to criminal prosecution.
- 17. The undersigned Bidder certifies that it is, at the time of bidding, and shall be throughout the period of the Contract, licensed by the State of California to do the type of work required under the terms of the Contract Documents and registered as

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BID FORM AND PROPOSAL DOCUMENT 00 41 13-4 a public works contractor with the Department of Industrial Relations. Bidder further certifies that it is regularly engaged in the general class and type of work called for in the Contract Documents.

Furthermore, Bidder hereby certifies to the District that all representations, certifications, and statements made by Bidder, as set forth in this bid form, are true and correct and are made under penalty of perjury.

Dated this	day of			20
Name of Bidder:				
Type of Organization:				
Signature:				
Print Name:				
Title:				
Address of Bidder:				
Taxpayer Identification No.	of Bidder:			
Telephone Number:		Fax Number:		
E-mail:		Web Page:		
Contractor's License No(s):	No.:	_ Class:	_ Expiration Date:	
	No.:	_ Class:	_ Expiration Date:	
	No.:	_ Class:	_ Expiration Date:	
Public Works Contractor Re	gistration No.:			

END OF DOCUMENT

DOCUMENT 00 52 13

AGREEMENT

THIS AGREEMENT IS MADE AND ENTERED INTO THIS _____ DAY OF _____, 20___, by and between the **Solano Community College District** ("District") and _____ ("Contractor")

("Agreement").

WITNESSETH: That the parties hereto have mutually covenanted and agreed, and by these presents do covenant and agree with each other, as follows:

1. The Work: Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor, and material necessary to perform and complete in a good and workmanlike manner, the work of the following project:

Annex HVAC and Roofing

("Project" or "Contract" or "Work")

It is understood and agreed that the Work shall be performed and completed as required in the Contract Documents including, without limitation, the Drawings and Specifications and submission of all documents required to secure funding or by the Division of the State Architect for close-out of the Project, under the direction and supervision of, and subject to the approval of, the District or its authorized representative.

- 2. The Contract Documents: The complete Contract consists of all Contract Documents as defined in the General Conditions and incorporated herein by this reference. Any and all obligations of the District and Contractor are fully set forth and described in the Contract Documents. All Contract Documents are intended to cooperate so that any Work called for in one and not mentioned in the other or vice versa is to be executed the same as if mentioned in all Contract Documents.
- 3. **Interpretation of Contract Documents**: Should any question arise concerning the intent or meaning of Contract Documents, including the Drawings or Specifications, the question shall be submitted to the District for interpretation. If a conflict exists in the Contract Documents, valid, written modifications, beginning with the most recent, shall control over this Agreement (if any), which shall control over the Special Conditions, which shall control over any Supplemental Conditions, which shall control over the General Conditions, which shall control over the remaining Division 0 documents, which shall control over Division 1 Documents which shall control over Division 2 through Division 49 documents, which shall control over figured dimensions, which shall control over large-scale drawings, which shall control over small-scale drawings. In the case of a discrepancy or ambiguity solely between and among the Drawings and Specifications, the discrepancy or ambiguity shall be resolved in favor of the interpretation that will provide District with the functionally complete and operable Project described in the Drawings and Specifications. In no case shall a document calling for lower quality and/or quantity material or workmanship control. The decision of the District in the matter shall be final.

- Time for Completion: It is hereby understood and agreed that the Work under this Contract shall be completed by <u>August 14th, 2023</u> ("Contract Time").
- 5. Completion Extension of Time: Should the Contractor fail to complete this Contract, and the Work provided herein, within the time fixed for completion, due allowance being made for the contingencies provided for herein, the Contractor shall become liable to the District for all loss and damage that the District may suffer on account thereof. The Contractor shall coordinate its Work with the Work of all other contractors. The District shall not be liable for delays resulting from Contractor's failure to coordinate its Work with other contractors in a manner that will allow timely completion of Contractor's Work. Contractor shall be liable for delays to other contractors caused by Contractor's failure to coordinate its Work with the Work of other contractors.
- 6. Liquidated Damages: Time is of the essence for all work under this Agreement. It is hereby understood and agreed that it is and will be difficult and/or impossible to ascertain and determine the actual damage that the District will sustain in the event of and by reason of Contractor's delay; therefore, Contractor agrees that it shall pay to the District the sum of two thousand dollars (\$2000) per day as liquidated damages for each and every day's delay beyond the time herein prescribed in completion of the work.

It is hereby understood and agreed that this amount is not a penalty.

In the event that any portion of the liquidated damages is not paid to the District, the District may deduct that amount from any money due or that may become due the Contractor under this Agreement, and such deduction does not constitute a withholding or penalty. The District's right to assess liquidated damages is as indicated herein and in the General Conditions.

The time during which the Contract is delayed for cause, as hereinafter specified, may extend the time of completion for a reasonable time as the District may grant, provided that Contractor has complied with the claims procedure of the Contract Documents. This provision does not exclude the recovery of damages by either party under other provisions in the Contract Documents.

- 7. Loss Or Damage: The District and its agents and authorized representatives shall not in any way or manner be answerable or suffer loss, damage, expense, or liability for any loss or damage that may happen to the Work, or any part thereof, or in or about the same during its construction and before acceptance, and the Contractor shall assume all liabilities of every kind or nature arising from the Work, either by accident, negligence, theft, vandalism, or any cause whatsoever; and shall hold the District and its agents and authorized representatives harmless from all liability of every kind and nature arising from accident, negligence, or any cause whatsoever.
- **8. Limitation Of District Liability:** District's financial obligations under this Contract shall be limited to the payment of the compensation provided in this Contract. Notwithstanding any other provision of this Contract, in no event shall District be liable, regardless of whether any claim is based on contract or tort, for any special, consequential, indirect or incidental damages, including, but not limited to, lost profits or revenue, lost bonding capacity, arising out of or in connection with this Contract.

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AGREEMENT DOCUMENT 00 52 13-2

- **9. Insurance and Bonds**: Prior to issuance of the Notice to Proceed by the District, Contractor shall provide all required certificates of insurance, insurance endorsements, and payment and performance bonds as evidence thereof.
- **10. Prosecution of Work**: If the Contractor should neglect to prosecute the Work properly or fail to perform any provisions of this Contract, the District, may, pursuant to the General Conditions and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor.
- **11. Authority of Architect, Project Inspector, and DSA**: Contractor hereby acknowledges that the Architect(s), the Project Inspector(s), and the Division of the State Architect ("DSA") have authority to approve and/or suspend Work if the Contractor's Work does not comply with the requirements of the Contract Documents, Title 24 of the California Code of Regulations, and all applicable laws and regulations. The Contractor shall be liable for any delay caused by its non-compliant Work.
- **12. Assignment of Contract**: Neither the Contract, nor any part thereof, nor any moneys due or to become due thereunder, may be assigned by the Contractor without the prior written approval of the District, nor without the written consent of the Surety on the Contractor's Performance Bond (the "Surety"), unless the Surety has waived in writing its right to notice of assignment.
- **13. Classification of Contractor's License**: Contractor hereby acknowledges that it currently holds valid Type "A" or "B" Contractor's license(s) issued by the State of California, Contractors' State License Board, in accordance with division 3, chapter 9, of the Business and Professions Code and in the classification called for in the Contract Documents.
- **14. Registration as Public Works Contractor**: The Contractor and all Subcontractors currently are registered as public works contractors with the Department of Industrial Relations, State of California, in accordance with Labor Code section 1771.1.
- **15. Payment of Prevailing Wages**: The Contractor and all Subcontractors shall pay all workers on all Work performed pursuant to this Contract not less than the general prevailing rate of per diem wages and the general prevailing rate for holiday and overtime work as determined by the Director of the Department of Industrial Relations, State of California, for the type of work performed and the locality in which the work is to be performed within the boundaries of the District, pursuant to sections 1770 et seq. of the California Labor Code.
- **16.** Labor Compliance Monitoring and Enforcement: This Project is subject to labor compliance monitoring and enforcement by the Department of Industrial Relations pursuant to Labor Code section 1771.4 and Title 8 of the California Code of Regulations. Contractor specifically acknowledges and understands that it shall perform the Work of this Agreement while complying with all the applicable provisions of Division 2, Part 7, Chapter 1, of the Labor Code, including, without limitation, the requirement that the Contractor and all of its Subcontractors shall timely submit complete and accurate electronic certified payroll records as required by the Contract Documents, or the District may not issue payment.

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AGREEMENT DOCUMENT 00 52 13-3 **17. Contract Price**: In consideration of the foregoing covenants, promises, and agreements on the part of the Contractor, and the strict and literal fulfillment of each and every covenant, promise, and agreement, and as compensation agreed upon for the Work and construction, erection, and completion as aforesaid, the District covenants, promises, and agrees that it will well and truly pay and cause to be paid to the Contractor in full, and as the full Contract Price and compensation for construction, erection, and completion of the Work hereinabove agreed to be performed by the Contractor, the following price:

		DOLLARS
AND xx/100 (\$)	-

in lawful money of the United States, which sum is to be paid according to the schedule provided by the Contractor and accepted by the District and subject to additions and deductions as provided in the Contract. This amount supersedes any previously stated and/or agreed to amount(s).

18. Owner's Allowance: Included in the Contract Price above is a five percent (5% Percent) allowance for the Owner's use only, for the following price:

		DOLLARS
AND xx/100 (\$)	

The above allowance shall only be used by authorization by the Owner. Contractor shall not bill for or be due any portion of this allowance unless the District has identified specific work, Contractor has submitted price for that work or the District has proposed a price for that work, the District has accepted the cost for that work, and the District has prepared a change order incorporating that work. Contractor hereby authorizes the District to execute a unilateral deductive Change Order at or near the end of the Project for all or any portion of the Allowance no allocated.

19. ALTERNATE #01: Additive re-roofing at the south roof. Do provide bolt-on, OSHA compliant railing at roof hatch.

Demolish the existing exhaust fan (EF-1) and fresh air intake (FAI) hood on the south roof, condensing unit (CU-1) on north roof, and the fan coil unit (FC-1) in the firs floor attic space. Provide (RTU-11), utility connections, and the fan coil unit controls as indicated. Recover and recycle refrigerant from FC-1 and CU-1 split system.

for the following price:

DOLLARS AND xx/100 (\$_____)

20. No Representations: No representations have been made other than as set forth in writing in the Contract Documents, including this Agreement. Each of the Parties to this Agreement warrants that it has carefully read and understood the terms and conditions of this Agreement and all Contract Documents, and that it has not relied upon the representations or advice of any other Party or any attorney not its own.

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- **21. Entire Agreement**: The Contract Documents, including this Agreement, set forth the entire agreement between the parties hereto and fully supersede any and all prior agreements, understandings, written or oral, between the parties hereto pertaining to the subject matter thereof.
- **22. Severability**: If any term, covenant, condition, or provision in any of the Contract Documents is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remainder of the provisions in the Contract Documents shall remain in full force and effect and shall in no way be affected, impaired, or invalidated thereby.
- **23. Authority of Signatories**: Each party has the full power and authority to enter into and perform this Contract, and the person signing this Contract on behalf of each party has been properly authorized and empowered to enter into this Contract. This Contract may be executed in one or more counterparts, each of which shall be deemed an original. For this Agreement, and for all Contract Documents requiring a signature, a facsimile or electronic signature shall be deemed to be the equivalent of the actual original signature. All counterparts so executed shall constitute one Contract binding all the Parties hereto.

[SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, accepted and agreed on the date indicated above:

CONTRACTOR	SOLANO COMMUNITY COLLEGE DISTRICT
Ву:	By:
Title:	Title:

NOTE: If the party executing this Contract is a corporation, a certified copy of the by-laws, or of the resolution of the Board of Directors, authorizing the officers of said corporation to execute the Contract and the bonds required thereby must be attached hereto.

END OF DOCUMENT

DOCUMENT 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS AND PROVISIONS

All Contract Documents should be reviewed for applicable provisions related to the provisions in this document, including without limitation:

- A. General Conditions, including, without limitation, Site Access Conditions and Requirements;
- B. Special Conditions.

1.02 SUMMARY OF WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of this Contract consists of the following:

All labor, materials, equipment, and supplies necessary for the removal, and replacement of the existing 3 ply built up roof system. The scope of work for the project is further defined in the contract documents but contains other DFOW's (Definable Features of Work) including; installation of OSHA compliant railings/gate at Roof hatches, modifications to existing utility elevations to match new flashing height, demolition and install of 10 new package rooftop units, removal and re-install of existing plumbing vents, all mechanical, patching, repair, rigging, controls and balance work with corresponding report, pre and post construction air balance reports, install of new district standard Delta DDC System, cleaning of new ductwork systems, demo and provide power to new HVAC equipment, fire alarm work in support of new HVAC scope.

The project includes 1 Bid alternate.

1.03 CONTRACTS

A. Perform the Work under a single, fixed-price Contract.

1.04 WORK BY OTHERS

- A. Work on the Project that will be performed and completed prior to the start of the Work of this Contract:
 - (1) None Identified.
- B. Work on the Project that will be performed by others concurrent with the Work of this Contract:

(1) None Identified.

1.05 CODES, REGULATIONS, AND STANDARDS

- A. The codes, regulations, and standards adopted by the state and federal agencies having jurisdiction shall govern minimum requirements for this Project. Where codes, regulations, and standards conflict with the Contract Documents, these conflicts shall be brought to the immediate attention of the District and the Architect.
- B. Codes, regulations, and standards shall be as published effective as of date of bid opening, unless otherwise specified or indicated.

1.06 PROJECT RECORD DOCUMENTS

- A. Contractor shall maintain on Site one set of the following record documents; Contractor shall record actual revisions to the Work:
 - (1) Contract Drawings.
 - (2) Specifications.
 - (3) Addenda.
 - (4) Change Orders and other modifications to the Contract.
 - (5) Reviewed shop drawings, product data, and samples.
 - (6) Field test records.
 - (7) Inspection certificates.
 - (8) Manufacturer's certificates.
- B. Contractor shall store Record Documents separate from documents used for construction. Provide files, racks, and secure storage for Record Documents and samples.
- C. Contractor shall record information concurrent with construction progress.
- D. Specifications: Contractor shall legibly mark and record at each product section of the Specifications the description of the actual product(s) installed, including the following:
 - (1) Manufacturer's name and product model and number.
 - (2) Product substitutions or alternates utilized.
 - (3) Changes made by Addenda and Change Orders and written directives.

1.07 EXAMINATION OF EXISTING CONDITIONS

- A. Contractor shall be held to have examined the Project Site and acquainted itself with the conditions of the Site and of the streets or roads approaching the Site.
- B. Prior to commencement of Work, Contractor shall survey the Site and existing buildings and improvements to observe existing damage and defects such as cracks, sags, broken, missing or damaged glazing, other building elements and Site improvements, and other damage.
- C. Should Contractor observe cracks, sags, and other damage to and defects of the Site and adjacent buildings, paving, and other items not indicated in the Contract Documents, Contractor shall immediately report same to the District and the Architect.

1.08 CONTRACTOR'S USE OF PREMISES

- A. If unoccupied and only with District's prior written approval, Contractor may use the building(s) at the Project Site without limitation for its operations, storage, and office facilities for the performance of the Work. If the District chooses to beneficially occupy any building(s), Contractor must obtain the District's written approval for Contractor's use of spaces and types of operations to be performed within the building(s) while so occupied. Contractor's access to the building(s) shall be limited to the areas indicated.
- B. If the space at the Project Site is not sufficient for Contractor's operations, storage, office facilities and/or parking, Contractor shall arrange and pay for any additional facilities needed by Contractor.
- C. Contractor shall not interfere with use of or access to occupied portions of the building(s) or adjacent property.
- D. Contractor shall maintain corridors, stairs, halls, and other exit-ways of building clear and free of debris and obstructions at all times.
- E. No one other than those directly involved in the demolition and construction, or specifically designated by the District or the Architect shall be permitted in the areas of work during demolition and construction activities.
- F. The Contractor shall install the construction fence and maintain that it will be locked when not in use. Keys to this fencing will be provided to the District.

1.09 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Drawings show above-grade and below-grade structures, utility lines, and other installations that are known or believed to exist in the area of the Work. Contractor shall locate these existing installations before proceeding with excavation and other operations that could damage same; maintain them in service, where appropriate; and repair damage to them caused by the performance of the Work. Should damage occur to these existing

installations, the costs of repair shall be at the Contractor's expense and made to the District's satisfaction.

B. Contractor shall be alert to the possibility of the existence of additional structures and utilities. If Contractor encounters additional structures and utilities, Contractor will immediately report to the District for disposition of same as indicated in the General Conditions.

1.10 UTILITY SHUTDOWNS AND INTERRUPTIONS

- A. Contractor shall give the District a minimum of three (3) days written notice in advance of any need to shut off existing utility services or to effect equipment interruptions. The District will set exact time and duration for shutdown, and will assist Contractor with shutdown. Work required to reestablish utility services shall be performed by the Contractor.
- B. Contractor shall obtain District's written approval as indicated in the General Conditions in advance of deliveries of material or equipment or other activities that may conflict with District's use of the building(s) or adjacent facilities.

1.11 STRUCTURAL INTEGRITY

- A. Contractor shall be responsible for and supervise each operation and work that could affect structural integrity of various building elements, both permanent and temporary.
- B. Contractor shall include structural connections and fastenings as indicated or required for complete performance of the Work.

PART 2 – PRODUCTS Not Used.

PART 3 – EXECUTION Not Used.

END OF DOCUMENT

SECTION 00 91 11

ADDENDUM NUMBER 1

PARTICULARS

- 1.01 DATE: 07/28/22
- 1.02 PROJECT: 2100987 VACAVILLE ANNEX HVAC AND ROOFING REPLACEMENT
- 1.03 OWNER: SOLANO COMMUNITY COLLEGE DISTRICT
- 1.04 ENGINEER: SALAS O'BRIEN ENGINEERS, INC.
- TO: PROSPECTIVE BIDDERS:
- 2.01 THIS ADDENDUM FORMS A PART OF THE CONTRACT DOCUMENTS AND MODIFIES THE BID DOCUMENTS DATED 07/06/22 WITH AMENDMENTS AND ADDITIONS NOTED BELOW.
- 2.02 ACKNOWLEDGE RECEIPT OF THIS ADDENDUM IN THE SPACE PROVIDED IN THE BID FORM. FAILURE TO DO SO MAY DISQUALIFY THE BIDDER.
- 2.03 THIS ADDENDUM CONSISTS OF 79 PAGES AND THE FOLLOWING DRAWINGS:
 - A. Sheet G-0.0
 - B. Sheet G-0.2
 - C. Sheet AD-1.2
 - D. Sheet A-1.2
 - E. Sheet A-5.1
 - F. Sheet A-5.2
 - G. Sheet MD-1.1
 - H. Sheet M-1.1
 - I. Sheet MD-1.2
 - J. Sheet M-1.2
 - K. Sheet M-5.1
 - L. Sheet M-6.1
 - M. Sheet M-6.2
 - N. Sheet MI-6.1
 - O. Sheet MI-6.2
 - P. Sheet PD-1.1
 - Q. Sheet P-1.1
 - R. Sheet P-1.2
 - S. Sheet ED-1.1
 - T. Sheet E-1.1
 - U. Sheet ED-1.2
 - V. Sheet FA-1.1
 - W. Sheet S-1.1

CHANGES TO THE PROJECT MANUAL - SPECIFICATIONS:

3.01 SECTION 07 53 00 - THERMOPLASTIC SINGLE-PLY ROOFING AND INSULATION

A. Replace Section 07 53 00 in it's entirety.

3.02 SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING FOR HVAC

- A. Paragraph 3.07 Scope
 - 1. Added Paragraph D. Commissioning:

a. Added Paragraph 1. as follows: See specification 01 91 00 for additional requirements pertaining to the responsibilities of the TAB agency for commissioning.

3.03 SECTION 23 09 23 - DIGITAL CONTROL SYSTEM AND EQUIPMENT

- A. Added Paragraph 3.16 Commissioning:
 - 1. See specification 01 91 00 for additional requirements pertaining to the responsibilities of the DDC Controls Contractor for commissioning.

3.04 SECTION 23 74 14 - PACKAGED OUTDOOR CENTRAL STATION AIR

- A. Replace Paragraph 3.03.A in it's entirety as follows: Provide certified manufacturer startup of equipment and adjust for proper operation as defined in the contract documents.
- B. Added Paragraph 3.03.B as follows: Certified Manufacturer startup technician shall coordinate with DDC Controls Contractor and TAB Agency during the factory startup of equipment.
- C. Added Paragraph 3.06 COMMISSIONING
 - 1. Added Paragraph A. as follows: See specification 01 91 00 for additional requirements pertaining to the responsibilities of the HVAC Manufacturer for commissioning.
- D. Added Paragraph 3.07 TRAINING
 - 1. Added Paragraph A. as follows: HVAC Equipment controller set-up, adjustments and units operation training shall be provided to the Owner's representative(s).
 - 2. Added Paragraph B. as follows: HVAC Equipment Manufacturer's Representative(s) to provide training to Owner's representative(s) for control board replacements and reconfiguration to the original operational settings etc.

CHANGES TO DRAWINGS:

4.01 DRAWING G-0.0 - COVER SHEET

- A. Removed Bid Alternate #2 and Bid Alternate #3.
- B. Bid Alternate #4 consolidated into Bid Alternate #1 for South Roof HVAC and Roof Replacement scope of work.
- C. Roof membrane changed from TPO to PVC in Roofing Summary of Work.

4.02 DRAWING G-0.2 - GENERAL CAMPUS SITE MAP

- A. Reference to Bid Alternates deleted at North end of North Roof.
- 4.03 DRAWING AD-1.2 ARCHITECTURAL ROOF PLAN DEMO
 - A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.04 DRAWING A-1.2 - ARCHITECTURAL ROOF PLAN - NEW

A. Reference Sheet Note #14 has been revised, deleting differentiation of Bid Alternates that no longer exist.

4.05 DRAWING A-5.1 - ARCHITECTURAL DETAILS

A. Detail notes revised to reflect PVC roof membrane in lieu of TPO. Transition between new PVC roof membrane and existing TPO surfaces provided in detail 7.

4.06 DRAWING A-5.2 - ARCHITECTURAL DETAILS

A. Detail notes revised to reflect PVC roof membrane in lieu of TPO.

4.07 DRAWING MD-1.1 - MECHANICAL FIRST FLOOR PLAN - DEMO

- A. Replaced Reference Sheet Note #1.
- B. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.08 DRAWING M-1.1 - MECHANICAL FIRST FLOOR PLAN - NEW

- A. Replaced Reference Sheet Note #1.
- B. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.09 DRAWING MD-1.2 - MECHANICAL ROOF PLAN - NEW

A. General Note 'G' revised, deleting differentiation of Bid Alternates that no longer exist.

B. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.10 DRAWING M-1.2 - MECHANICAL ROOF PLAN - NEW

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.11 DRAWING M-5.1 - MECHANICAL DETAILS

- A. Detail 5 revised, changing roof membrane from TPO to PVC.
- B. Detail 7 revised to clarify scope of work at duct risers connecting to rooftop HVAC units.

4.12 DRAWING M-6.1 - MECHANICAL CONTROLS POINTS LIST & SEQUENCES OF OPERATIONS

A. Note 15 of the Rooftop Packaged HVAC Unit Schedule revised to change reference to Bid Alternate #4 to Bid Alternate #1.

4.13 DRAWING M-6.2 - MECHANICAL SCHEDULES - FOR REFERENCE ONLY

A. Reference to Bid Alternate #4 changed to Bid Alternate #1 for Existing Fan Coil Unit, Condensing Unit, Exhaust Fan, and Gravity Air Intake equipment Schedules.

4.14 DRAWING MI-6.1 - MECHANICAL CONTROLS POINTS LIST AND SEQUENCES OF OPERATION

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.15 DRAWING MI-6.2 - MECHANICAL CONTROL, SYSTEM ARCHITECTURE & SCHEMATICS

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.16 DRAWING PD-1.1 - PLUMBING FIRST FLOOR PLAN - DEMO

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.17 DRAWING P-1.1 - PLUMBING FIRST FLOOR PLAN

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.18 DRAWING P-1.2 - PLUMBING ROOF PLAN - NEW

A. Reference to Bid Alternate #4 deleted.

4.19 DRAWING ED-1.1 - ELECTRICAL FIRST FLOOR PLAN - DEMO

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.20 DRAWING E-1.1 - ELECTRICAL FIRST FLOOR PLAN - NEW

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.21 DRAWING ED-1.2 - ELECTRICAL FIRST FLOOR PLAN - DEMO

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.22 DRAWING E-1.2 - ELECTRICAL ROOF PLAN - NEW

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.23 DRAWING FA-1.1 - FIRE ALARM ROOF PLAN

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

4.24 DRAWING S-1.1 - STRUCTURAL GENERAL NOTES & ABBREVIATIONS

A. Reference to Bid Alternate #4 changed to Bid Alternate #1.

END OF SECTION

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SECTION 07 53 00 (ADDENDUM 1)

THERMOPLASTIC SINGLE-PLY ROOFING AND INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Provide a watertight, wind resistant, external fire rated, long lasting single ply roofing and insulation assembly with related work.
- B. Section Includes:
 - 1. Inspection and preparation of surfaces.
 - 2. Roof: Remove and replace roof coverings with:
 - a. Ridged 2 ½ inch isocyanurate or 3 ½ inch MEPS polystyrene insulation mechanically attached.
 - b. Gypsum barrier board adhered using low rise spray foam.
 - c. **PVC** single ply roof membrane fully adhered. (ADDENDUM 1)
 - d. Flashings consisting of PVC.
 - 3. Coordination of work with other trades.
 - 4. Protection of adjacent surfaces, the ground, and the public.
 - 5. Provision of all necessary equipment, to perform the specified work.
 - 6. Incidentals for roof system.

1.02 REFERENCES

- A. SPRI.
- B. American Society of Civil Engineers (ASCE) 7-16 Minimum Design of Loads for Buildings and Other Structures.
- C. Factory Mutual (FM Global) Approval Guide.
- D. Factory Mutual Standard 4470 Approval Standard for Class 1 Roof Covers.
- E. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual.
- F. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Architectural Sheet Metal Manual.
- G. Underwriters Laboratories (UL) Roofing Systems and Materials Guide (TGFU R1306).
- H. Applicable AQMD.
- I. Roofing Terminology: Refer to the following publications for definitions of roofing work related terms used in this Section:
 - 1. ASTM D 1079 "Terminology Relating to Roofing and Waterproofing."
 - 2. IIBEC "Glossary of Roofing Terms."

1.03 SYSTEM REQUIREMENTS

- A. Reroofing Performance Requirements:
 - 1. Provide long term, low maintenance, roof covering.
 - 2. Installed roofing membrane and base flashing systems shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.
 - 3. Integrate roof system with walls and other components in a weathertight and wind resistant manner.
 - 4. Comply with NRCA Roofing and Waterproofing Manual, SMACNA Architectural Sheet Metal Manual, and Manufacturer's Instructions.
 - 5. Composition of roof covering, and flashing assembly shall match tested, rated requirements for water resistance, fire resistance, attachment, and adhesion.
 - a. External Fire UL 790 (ASTM E 108), Class A.
 - b. Thermal Resistance Minimum R14 LTTR minimum (roof covering alone).
 - c. Comply with emittance and reflectivity requirements of the California Energy Code.

- d. Wind Loads ASCE 7-16, Occupancy Category III allowable stress design (equivalent to nominal 95 mph), terrain exposure B, calculated via NRCA Roof System Design Wind-Load Analysis software with a mean roof height of 20 feet, perimeter curbs/parapets less than 3 fee (south roof), for a building approximately 162 x 215 feet in size.
- e. Tested Wind Resistance FM 4474.
 - 1) Minimum wind resistance:
 - (a) Center (Zone 1'): 7.3 psf x safety factor of 2 = 14.7 psf utilizing FM 1-60 attachment patterns.
 - (b) Field (Zone 1): 12.7 psf x safety factor of 2 = 25.4 psf utilizing FM 1-60 attachment patterns (note Zone 1' area not used).
 - (c) Perimeter (Zone 2): 16.8 psf x safety factor of 2 = 33.6 psf utilizing FM 1-60 attachment patterns.
 - (d) Corner (Zone 3): 22.9 psf x safety factor of 2 = 45.8 psf utilizing FM 1-60 attachment patterns.
- f. Membrane and insulation securement FM LPDS 1-29.
- g. Hail Resistance Moderate.
- h. Corrosion Resistance High.
- i. Warranty Manufacturer's "full system" NDL warranted performance including membrane, insulation, south roof copings, and fasteners, against leakage, premature degradation, and displacement from wind speeds up to and including
- j. Roof covering assembly composition shall match tested, rated requirements for water resistance, fire resistance, attachment, and adhesion.
- k. Consider requirements in other Sections. Adjust installations, as needed, to assure water tightness and comply with manufacturer warranty requirements.
- 6. Aesthetic: Neat and clean finished installation approved by the Owner's Project Manager.

1.04 SUBMITTALS

- A. Prior to the start of work.
 - 1. Materials list of items proposed to be provided under this Section:
 - a. Manufacturer's product data and installation instructions showing that materials meet or exceed specified requirements.
 - b. Material Safety Data Sheets.
 - 2. Approved applicator letter from the Manufacturer.
 - 3. Certifications by manufacturers of roofing, barrier board, and insulating materials that the materials supplied comply with the requirements of the project documents including the identified ASTM and other industry standards or practices.
 - 4. Shop Drawings:
 - a. Fastening patterns for insulation boards in the different wind resistance areas of the roofs.
 - b. Transition flashings if different than that shown on the drawings or if needed to supplement details on the drawings.
 - 5. Sample warranty and manufacturer's review.
 - a. Sample copy of Manufacturer's warranty.
 - b. Signed copy of roof materials manufacturer's request for warranty that indicates the Corporate Technical Department has reviewed and approved the roof project according to the information submitted on the request for warranty form.
 - c. Manufacturer's letter indicating review (and comments if any) of specifications and drawings.
- B. At Project Date of Completion, submit the following:
 - 1. Record drawings.
 - 2. Instructions on inspection, maintenance, and repair.
 - 3. Contractor Guaranty.
 - 4. Manufacturer Warranty.
 - 5. Letter certifying installation and materials are in compliance with Contract Documents.

1.05 QUALITY CONTROL

- A. Provide quality control equipment, tools, and personnel to meet Contract Requirements.
- B. Applicators:
 - 1. Licensed roofing contractor with a minimum of five (5) years' experience installing the type of roof system specified for this project in California.
 - 2. Approved by Manufacturer to install their warranted system.
 - 3. Sufficient size, and capable of maintaining the schedule, coordinating, supervising, and performing quality control.
- C. Maintain a full-time supervisor/foreman on the job site during times that work is in progress.
- D. Use an adequate number of skilled workers and foremen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- E. Arrange for quality assurance/warranty inspections by the Technical Service Department of the manufacturer.
- F. Pre-Installation Meeting:
 - 1. Arrange and attend a meeting at job site.
 - 2. Personnel to attend:
 - a. Owner's Representative.
 - b. Contractor's Project Manager.
 - c. Contractor's Full-time Foreman.
 - d. Sub-contractor's (if any for this section) Project Manager.
 - e. Sub-contractor's (if any for this section) Full-time Foreman.
 - f. Roofing Consultant.
 - g. Roofing Observer (if authorized).
 - h. Others as requested.
 - 3. General installation practices will be discussed, as well as scheduling and other procedures.

1.06 PROJECT DELIVERY, STORAGE AND HANDLING

- A. Protect materials against damage and moisture.
- B. Replace non-conforming, moist, wet, damaged, defective materials (including wrinkled, flattened, or creased rolls of membrane) at no cost to the Owner.
- C. Delivery:
 - 1. Deliver materials in Manufacturer's original, unopened packaging, with labels intact, showing date of manufacture, and directions for storage. Rolled roof products, adhesives, barrier boards, and insulation boards shall bear Underwriters Laboratories (UL) labels.
 - 2. Verify materials have been adequately protected from moisture while in transit.
 - 3. Deliver materials in quantities sufficient to allow continuity of application.
- D. Storage:
 - 1. Label materials with Manufacturer's or supplier's name, brand name, and control number and hazard warning labels where appropriate.
 - Store roofing, insulation, and barrier board materials on pallets, off ground or roof deck.
 a. Store rolls of membrane lying down.
 - b. Protect moisture sensitive materials and allow for adequate ventilation.
 - 3. Store flammable materials in a cool, dry area away from sparks and open flames. Follow precautions in manufacturer's Material Safety Data Sheets.
 - 4. Store adhesives and sealants safely between 50° F and 80°F prior to use.
- E. Handling:
 - 1. Utilize appropriate means for transporting materials to and upon roof.
 - 2. Handle materials in a manner to prevent damage to new and existing work.
 - 3. Exercise caution so as not to overload structure, or to cause damage to new roof membrane.

- F. Confine equipment, storage of materials and debris, and operations and movements of workers within limits as indicated or as directed by the Owner's Representative.
- G. Replace damaged, wet, or non-compliant materials at no cost to the Owner.

1.07 PROJECT CONDITIONS

- A. Comply with AQMD Requirements.
- B. Weather: Proceed with work of this section when existing and forecast weather conditions permit work to be performed in accordance with Manufacturer's recommendations.
 - 1. Do not install roofing during rain, snow, or winds that will affect an appropriate installation.
 - 2. Monitor substrate temperature and material temperature, as well as environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade.
 - a. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials.
 - 1) Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials.
 - 2) Ensure roofing materials, insulations, and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
 - b. Adjust materials and methods as necessary to accommodate varying project conditions.
 - c. Proceed with work only when existing and forecasted weather conditions permit work to be performed in accordance with Manufacturer's recommendations.
 - d. Do not install materials when conditions are unacceptable to achieve the specified results.
 - 3. Adhesive:
 - a. Primer, where used, shall be fully dry before proceeding.
 - b. Apply adhesive at 70° -- 100°F (21° 38°C) at point of contact with the membrane.
 - 1) Use bulk warmers, inline heaters, or other pre-heating equipment to maintain the proper viscosity of the adhesive in cool temperatures.
 - c. When conditions are hot and humid, modified asphalt adhesive cures and skins-over quickly. Store pails in cool, dry storage areas, away from direct sun.
 - d. Suspend application in situations where the adhesive cannot be kept at temperatures allowing for even distribution.
- C. Conditions: Conditions that will adversely affect the long-term performance of the system shall be immediately brought to the attention of the Owner's Representative for consideration.
 - 1. Recommend corrective action.
 - 2. Document the recommendation for corrective action in writing.

1.08 SEQUENCING/SCHEDULING

- A. Scheduling:
 - 1. Give a minimum of one (1) week notice to the Owner's Representative and Manufacturer prior to commencing any work and notify Owner's Representative on a daily basis of any change in work schedule.
- B. Sequencing:
 - 1. Perform work in a coordinated, organized, systematic manner to attain best job possible.
 - 2. Proceed with work when previous trades have completed work requiring intercoordination.
- C. Coordination:
 - 1. Coordinate with the Owner's Representative regarding access, security, protective measures, clean-up, and expected weather.
 - 2. Coordinate to provide the best possible job.

1.09 WARRANTY/GUARANTY

- A. Roofing Manufacturer's Warranty:
 - 1. Provide, single source, full system, no dollar limit (NDL), no penal sum manufacturer's warranty, without deductibles or limitations on coverage amount, for workmanship and material coverage for new components of the roof assembly (membrane, insulation, adhesive, barrier board, fasteners, flashings, new copings, sealant, etc.), against leakage, premature degradation, and Code level windstorm displacement (95 mph).
 - a. The guaranty shall be a term type, without deductibles or limitations on coverage amount.
 - b. This warranty shall not exclude random areas of localized ponding from coverage.
 - 2. Warranty Duration: Thirty (30) years.
- B. Guaranty: Five (5) years against defects in workmanship and against leakage or Code level (95 mph) wind damage. Guaranty shall include and provide for repair and replacement of materials and systems that leak, are displaced by wind (up to code level) or are defective.
 - 1. Comply with the provisions of the Guaranty at the end of this Section.

PART 2 PRODUCTS

2.01 GENERAL

- A. Obtain components from the single source roofing system manufacturer warranting the roofing system. Products used in the system shall be labeled by the single source roofing system manufacturer issuing the warranty.
 - 1. Provide secondary materials only as recommended by the Manufacturer of the primary materials.
 - 2. Provide incidental products related to installation of the listed products and Manufacturers.
- B. Reference to a specific product name or type is intended to reflect quality standards and establish typical requirements, including, but not limited to water resistance, reinforcement, strength, flexibility, adhesion, fire resistance, wind resistance, compatibility, durability, appearance, maintainability, risk or hazard of installation or lack thereof, reliability and quality of similar installations, and warranties.
- C. Materials shall be asbestos-free.

2.02 BOARD PRODUCTS

- A. Ridged Board Insulation, either MEPS or Isocyanurate:
 - 1. MEPS Rigid Roof Insulation, flat or tapered.
 - a. Molded expanded polystyrene insulation board.
 - 1) Conform to ASTM C-578, Type II.
 - 2) FM wind uplift classification suitable for uplift pressures at the site.
 - 3) 15 psi compressive strength.
 - 4) Minimum board density of 1.35 lbs. per cubic foot.
 - 5) Maximum water absorption of 3.0-percent by volume.
 - 6) R value of 4.0 per inch at 75-degrees F.
 - b. Products and Manufacturers:
 - 1) InsulFoam EPS Tapered Roof Insulation by InsulFoam.
 - 2) Foam-Control EPS Tapered Roof Insulation by ACH Foam Technologies.
 - 3) Thermal Star XT 15 Tapered Roof Insulation by Atlas Roofing Corp.
 - 4) Or Equivalent.
 - 2. Polyisocyanurate Rigid Roof Insulation, flat or tapered.
 - a. Panels composed of a closed cell, rigid polyisocyanurate foam core material, integrally laminated between glass fiber facers.
 - 1) Conform to ASTM C 1289, Type II, Class 2, Grade 2, 20 psi.
 - 2) FM wind uplift classification suitable for uplift pressures at the site.
 - 3) Minimum R 5 per inch at 75 degrees F.
 - b. Products and Manufacturers:
 - 1) Sopra-Iso Plus by Soprema. (ADDENDUM 1)

- 2) Sarnatherm Insulation ACFoam IV by Sika/Sarnafil. (ADDENDUM 1)
- 3) Or Equivalent.
- B. Cover Board Under the Roof Membrane:
 - 1. Gypsum Board:
 - a. Non-structural, glass mat-embedded front and back, silicone treated core, waterresistant gypsum core panel, UL-classified Type DGG, ASTM C1278 or ASTM C1177/C1177M as applicable.
 - 1) Over roof insulation: **1/4**-inch thick. (ADDENDUM 1)
 - b. Products and Manufacturers:
 - 1) DensDeck Prime by G-P Gypsum Products.
 - 2) Securock Gypsum Fiber by USG.
- C. Tapered Edge Panels and Cant Strips:
 - 1. Tapered Edge Strip and Boards:
 - a. Expanded perlite, blended with binders and fibers.
 - 1) Meets or exceeds ASTM C728.
 - 2) Dimensions: Size as required; 6 in x 1/2 in, 12 in x 1 in, 12 in x 1-1/2 in, 18 in x 1 in, or 18 in x 1-1/2 in.
- D. Adhesive for Cover Board:
 - 1. Two (2) component, polyurethane foam adhesive. Moisture cured or catalyst cured.
 - Highly elastomeric, VOC compliant, all-purpose foamable adhesive that sets in minutes. Products:
 - a. Duotack 365 by Soprema. (ADDENDUM 1)
 - b. AD Board Adhesive by Sika/Sarnafil (ADDENDUM 1)
 - c. Or Equivalent.

2.03 ROOF MEMBRANE

2.

- A. Sheet Materials:
 - 1. Thermoplastic Roofing Membrane and base flashing membrane, provide either PVC membrane compliant with ASTM D4434 or a PVC membrane containing KEE and compliant with ASTM D4434: (ADDENDUM 1)
 - a. Polyvinyl Chloride (PVC) membrane, reinforced with a fiberglass or polyester fabric, fleece backed, exceeding: (ADDENDUM 1)
 - 1) ASTM D4434 "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II or III. (ADDENDUM 1)
 - 2) Membrane thickness: nominal 80-mils plus or minus 10%. (ADDENDUM 1)
 - 3) Membrane color shall be White.
 - 4) Solar reflectance of and emittance compliant with the California Energy Code.
 - 5) Products and Manufacturers:
 - (a) Sentinel P200 HFB Fleece Back by Soprema. (ADDENDUM 1)
 - (b) Sarnafil G410-20 Fleece Back by Sika/Sarnafil. (ADDENDUM 1)
 - (c) Or Equivalent.
 - 2. "T" Joint Cover:
 - a. Thermoplastic membrane compatible with the field membrane suitable for sealing over "T" joints.
 - b. Products and Manufacturers:
 - 1) Sentinel T-Joint Patches By Soprema (ADDENDUM 1)
 - 2) SarnaCircles by Sika/Sarnafil. (ADDENDUM 1)
 - 3) Or Equivalent.
 - 3. Formable Flashing: Non-reinforced, flexible, heat weldable PVC sheet.
 - a. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent.
 - b. Color: Same as field membrane.
 - c. Products and Manufacturers:
 - 1) Sentinel G150 By Soprema (ADDENDUM 1)

- 2) Sarnafil G410-20 By Sika/Sarnafil (ADDENDUM 1)
- 3) Or Equivalent.
- 4. Adhesives:
 - a. Adhesives for Fleece Backed Field Membrane:
 - 1) Provide solvent based or waterborne adhesive as available from the manufacturer of the membrane. Provide vertical grade versions of adhesives as recommended by the membrane manufacturer.
 - 2) Spatter or ribbon pattern low rise foam adhesive.
 - (a) Low pressure, two-component spray polyurethane foam adhesive designed for bonding fleece back thermoplastic membranes.
 - (b) Products and Manufacturers:
 - (1) Duotack SPF by Soprema. (ADDENDUM 1)
 - (2) Stabond U-148A Adhesive by Sika/Sarnafil. (ADDENDUM 1)
 - (3) Or Equivalent. (ADDENDUM 1)
 - b. Adhesives for Smooth Backed flashing membrane:
 - 1) VOC compliant, aerosol contact adhesive.
 - 2) Products and Manufacturers:
 - (a) Sentinel S Bonding Adhesive By Soprema (ADDENDUM 1)
 - (b) Sarnacol 2121 Adhesive by Sika/Sarnafil. (ADDENDUM 1)
 - (c) Or Equivalent.
- B. TPO flashing tie in strips to existing TPO compliant with ASTM D 6878 "Standard Specification For Thermoplastic Polyolefin Based Sheet Roofing". (ADDENDUM 1)
 - 1. Formable Flashing: Non-reinforced, flexible, heat weldable TPO sheet. (ADDENDUM 1)
 - a. Thickness: 0.060 inch (1.52 mm) plus/minus 10 percent. (ADDENDUM 1)
 - b. Color: Same as field membrane. (ADDENDUM 1)
 - c. Products and Manufacturers: (ADDENDUM 1)
 - 1) .060 Flashing by Carlisle SynTec. (ADDENDUM 1)
 - 2) Or Equivalent. (ADDENDUM 1)
- C. Thermoplastic membrane coated sheet metal flashing. (ADDENDUM 1)
 - 1. 24 ga G-90 galvanized sheet metal with thermoplastic membrane bonded to it in the factory.
 - a. Color: Same as wall membrane. (ADDENDUM 1)
 - b. Products and Manufacturers: (ADDENDUM 1)
 - 1) TPO manufacturer supplied clad metal as applicable. (ADDENDUM 1)
 - 2) PVC manufacturer supplied clad metal as applicable. (ADDENDUM 1)
- D. Catalyzed Acrylic Resin Flashing System:
 - 1. A specialty flashing system, liquid-applied, fully reinforced, multi-component, polyurethane resin membrane installed over a prepared or primed substrate.
 - a. The flashing system consists of a catalyzed resin primer, basecoat, and topcoat, combined with a non-woven polyester fleece.
 - b. The resin and catalyst are pre-mixed immediately prior to installation.
 - c. Topcoat shall be white.
 - 2. Membrane:
 - a. Alsan RS 230 Flash by Soprema. (ADDENDUM 1)
 - b. Liquid Flashing SW or WW as appropriate by Sika/Sarnafil. (ADDENDUM 1)
 - c. Or Equivalent.
 - 3. Catalyst
 - a. Alsan RS Catalyst Powder by Sika/Sarnafil (ADDENDUM 1)
 - b. Liquid Flashing Catalyst by Sika/Sarnafil (ADDENDUM 1)
 - c. Or Equivalent.
 - 4. Fabric Reinforcement:
 - a. Alsan RS Fleece by Soprema (ADDENDUM 1)

- b. Liquid Flashing Fleece by Sika/Sarnafil. (ADDENDUM 1)
- c. Or Equivalent.
- 5. Primer for Metal
 - a. Alsan RS Metal Primer by Soprema. (ADDENDUM 1)
 - b. Or Equivalent.
- 6. Cleaner:
 - a. Alsan RS cleaner by Soprema. (ADDENDUM 1)
 - b. Seam Cleaner by Sika/Sarnafil (ADDENDUM 1)
 - c. Or Equivalent.

2.04 FASTENERS

- A. Insulation Fasteners:
 - 1. #12 corrosion resistant screws with 3-inch insulation plates.
 - a. Corrosion resistant to FM 4470.
 - 2. Products and Manufacturers:

a. Screws per membrane manufacturer. (ADDENDUM 1)

- B. Plates for fasteners at perimeters and adjoining penetrations.
 - 1. FM Approved corrosion resistant metal plates.
 - a. 3-inch insulation plates per membrane manufacturer. (ADDENDUM 1)
 - b. Or equivalent.
- C. Termination bar:
 - 1. Aluminum: Minimum 1/8-inch x 1 inch x 10 ft. 6060-T5 extruded aluminum bar with prepunched fastener slots.
 - a. TB-125 Termination Bar by TruFast.
 - b. Or equivalent.

2.05 MISCELLANEOUS

- A. Traffic Walk Protection Panels:
 - 1. Thermoplastic slip resistant panels 36-inch wide.
 - a. Products and Manufacturers:
 - 1) Sarnatred-V by Sika/Sarnafil (ADDENDUM 1)
 - 2) Sentinel Walk Pad By Soprema (ADDENDUM 1)
 - 3) Or equivalent.
- B. Sealant:
 - 1. Concealed sealant; Provide butyl or urethane sealant at concealed locations.
 - a. Urethane: One-component gun-grade polyurethane sealant requirements of Fed Spec. No. TT-S-00230C and ASTM C 920, Type S, Grade NS, Class 25, roof materials manufacturer approved.
 - 1) Products and Manufacturers:
 - (a) Sika Flex 1a by Sika/Sarnafil. (ADDENDUM 1)
 - (b) Sopramastic SP-1 by Soprema. (ADDENDUM 1)
 - (c) Or equivalent.
 - b. Butyl: One-component butyl sealant for membrane edges meeting the requirements of Fed Spec. TT-C-1796A, Type II, Class B roof materials and approval from the approved membrane manufacturer. (ADDENDUM 1)
 - 1) Minimum 3/4 inch wide. (ADDENDUM 1)
 - 2) **Products and manufacturers: (ADDENDUM 1)**
 - (a) TFC butyl tape-seal by Triangle Fastener Corp as purchased through the membrane manufacturer. (ADDENDUM 1)
 - (b) Or equivalent. (ADDENDUM 1)
- C. Band clamps: Stainless steel hose clamps, adjustable.
- D. Water cut off seal: Temporary seal for roofing components that have open and incomplete portions at the end of a workday or for a temporary weather seal.

- 1. Effective means and methods approved by the roofing membrane manufacturer.
- 2. Products and Manufacturers.
 - a. Effective means and methods approved by the roofing membrane manufacturer. (ADDENDUM 1)

PART 3 EXECUTION

3.01 GENERAL

- A. General:
 - 1. Comply with manufacturer's instructions, project documents, references, and Code requirements.

3.02 PROTECTION

- A. Provide protection for the public and workers.
- B. Protect new and existing work from damage.
 - 1. Schedule and execute work without exposing the interior building areas, and existing components, to the effects of inclement weather. The existing building and its contents shall be protected against risks.
 - a. Take adequate precautions if inclement weather is anticipated during the work to ensure materials and building interiors are protected from moisture.
 - 2. Ensure adhesive or welding fumes are not drawn into the building.
 - 3. Adequately limit traffic or material storage on newly installed roof surfaces. When unavoidable, provide walk treads, insulation boards or plywood with underlying protection.
 - 4. Provide protection on exterior walls to prevent marking or scoring.
 - 5. Precautions shall be taken when using adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building.
 - a. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building.
 - b. Keep lids on unused cans at all times.
 - 6. Verify that roof drain lines are functioning correctly (not clogged or blocked) before starting work.
 - a. Report blockages in writing to the Owner's Representative (with a letter copy to the roof manufacturer) for corrective action prior to the installation of the roof system.
 - 7. Check drains each night prior to leaving the site and remove any debris.
 - 8. Secure new and temporary construction, including equipment and accessories in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
- C. Limited Access: Prevent access by the public to materials, tools, and equipment during the course of the project.

3.03 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Inspect surfaces prior to application to ensure that they are acceptable. Notify Owner's Representative, immediately, in writing, of any condition that may adversely affect quality of specified work.
 - a. Carefully inspect existing conditions and installed work, prior to work of this section, and verify that such work is complete and ready for commencement of roofing work.
 - b. Verify roof covering removal is complete in the area of application.
 - c. Verify work of other trades penetrating roof deck or roof covering are complete or ready to receive roofing and flashing.
 - d. Check surfaces for inadequate anchorage, foreign materials, moisture, or unevenness preventing execution and quality performance of roof system.
 - 1) Verify insulation is adequately dry in accordance with manufacturer instructions.
 - 2) Obtain roof manufacturer approval of substrate prior to installation.
 - 2. Do not proceed until unsatisfactory conditions are corrected.

3.04 PREPARATION

- A. Remove existing roofing material(s) and flashing:
 - 1. Legally dispose of offsite.
 - 2. Remove debris daily from the project site.
 - 3. Ensure the exposed area can be made watertight at the end of the day or first sign of inclement weather.
- B. Provide cleaned and properly prepared surfaces in accordance with the Manufacturer's instructions and Project Requirements.
 - 1. Adequately clean surfaces and remove loose material before installation of roof system.
 - a. Clean vents, pipes, conduits, tubes, stacks, and other metal substrates to bare metal where membrane will be adhered.
 - 2. Surfaces shall be free of any standing water, dew, ice, loose debris or any other contaminate that could impair the quality of the installation.
 - 3. Substrate shall be adequately smooth, clean, and free of sharp edges and or projections and obvious depressions that would interfere with the installation and performance of the assembly.

3.05 CONSTRUCTION

- A. General:
 - 1. Comply with Manufacturer's recommendations, unless specified more stringently herein.
 - 2. Take necessary precautions regarding worker health and safety when using solvents, fumes, and adhesives.
 - Install fasteners straight, tight, and perpendicular to the substrates, complying with minimum penetration requirements of the manufacturer for specific substrate types.
 a. Do not over torque or over drive fasteners.
- B. Daily Completion:
 - 1. Complete the roof assembly and related flashings each day that insulation and barrier board is installed.
 - a. Work as long as necessary to complete the insulation, coverboard, membrane, base flashings, and penetration flashings.
 - 1) Do not leave the site until membrane and flashing work is complete.
 - 2) Membrane seams shall be heat welded before leaving the job site each day.
 - 2. Uninterrupted water stops shall be installed at the end of each day's work.
 - a. Completely remove water stops before proceeding with the next day's work.
 - b. Water stops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses.
 - c. Contaminated membrane shall be replaced at no cost to the Owner.
- C. Insulation Board Application:
 - 1. Insulation replacement:
 - a. Provide insulation or where indicated or needed.
 - 2. Insulation Application:
 - a. Install insulation board with the long dimension of the board(s) running in parallel alignment. Stagger end joints of insulation boards a minimum of six (6) inches.
 - b. Layout and install so that the minimum size board is 24 inches x 48 inches.
 - Miter and fill the edges of the insulation boards at ridges, valleys, and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
 - 2) Damaged corners and boards shall be cut out and replaced with a piece a minimum of 24 x 48 inches.
 - c. Install insulation board with tightly butted joints.
 - 1) Maximum joint gap shall be 1/4 inch.
 - 2) Fill gaps in excess of 1/4 inch with tightly fitted matching insulation material.

- d. Securely *mechanically* fasten in accordance with tested fastening patterns for the various wind uplift zones. (*ADDENDUM 1*)
- D. Gypsum Cover Board Application:
 - 1. Install boards with the long dimension of the board(s) running in parallel alignment and the short dimensions staggered typically ½ board, and a minimum of twelve (12) inches.
 - a. Offset cover board joints at least 6-inches from insulation joints below.
 - b. Layout and install so that the minimum size board is 48-inches x 48-inches.
 - 1) Do not kick barrier boards into place.
 - 2) Damaged corners and boards shall be cut out and replaced with a piece a minimum of 48-inches x 48-inches.
 - c. Install cover board with tightly butted joints.
 - 1) Maximum joint gap shall be 1/4 inch.
 - 2) If there are gaps wider than 1/4 inch remove the board(s) and refit them.
 - d. Extend to walls, drains, curbs, and penetrations to create sound surface.
 - 2. Adhesion:
 - a. Adhere in patterns and quantities' matching the membrane manufacturer's published instructions for the specified uplift resistance requirements and cover board thickness.
 - 1) Secure according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
 - 2) Securely adhere in accordance with tested fastening patterns for the various wind uplift zones.
 - (a) Apply board adhesive in uniform patterns.
 - (1) Minimum board adhesive ribbon spacing: Four (4) inches on-centers for all areas.
 - (b) Immediately install boards into adhesive.
 - (1) Adequately weight down the boards until the adhesive sets.
 - (2) Ensure boards maintain full contact with adhesive for complete adhesion.
 - (3) Do not allow adhesive to skin-over before placing the boards into the adhesive.
- E. Fleeceback PVC Membrane Application:
 - 1. Membrane Layout:
 - a. Place membrane so that wrinkles and buckles are not formed. Wrinkles or buckles must be removed from the sheet prior to attachment.
 - b. Use widths of membrane appropriate for the center, field, perimeter, and corner regions of roof.
 - c. Lay out membrane in straight rows:
 - 1) Field and perimeter sheets shall be shingled or run parallel to the slope of the roof to avoid the restraint of water flow.
 - 2) Extend field membrane to bases of walls and curbs.
 - d. Measure and snap a chalk line as needed to establish proper alignment of the sheet as needed.
 - e. Place the roll on the line and unroll the roll its entire length and allow the membrane to relax. The relaxation time required is dependent on the ambient air temperature.
 - f. Provide four (4) inch minimum end laps and side laps.
 - 1) Stagger end laps at least twelve (12) inches.
 - 2. Warning Strip Membrane:
 - a. Provide 4-inch-wide yellow warning strip PVC membrane placed 6-feet in from perimeter walls that are less that 42-inches high. (South roof only).
 - 3. Membrane Securement:
 - a. Fully adhere membrane to barrier board.
 - 1) Fully adhere membrane in accordance with the manufacturer's instructions.
 - (a) Provide adhesive ribbon spacing: Four (4) Inches at all areas.

- (1) Prevent seam contamination by keeping the adhesive application from the seam area.
- (2) Apply adhesive in smooth, even coats with no gaps, globs, or similar inconsistencies.
- (b) Verify conformance to the specified adhesive rate.
 - (1) Keep a written log of the amount of adhesive used each day and the square footage of the membrane that was adhered each day.
 - (2) Review log with Owner's Representative each day of application.
- 2) Curing or drying time of the adhesive will be affected by ambient temperatures and must be taken into consideration when determining flashing lengths.
 - (a) Humidity can affect the drying time of solvent borne adhesives and/or cause condensation to form on the newly applied adhesive.
 - (1) Do not install when air temperature is within 5° of dew point.
 - (b) Moisture may not be present on the adhesive prior to mating or application of Membrane Roofing System.
 - (c) Care must be taken to ensure that the adhesive has not dried too much before the membrane is laid in place. This is especially important during hot temperatures.
- 3) Roll membrane with a weighted roller to ensure complete bonding between adhesive and membrane.
- b. Mechanically attach the adhered membrane in selected locations.
 - 1) Install fasteners straight, tight, and perpendicular to the substrate:
 - (a) Install fasteners so that the plate or bar is drawn down tightly to the membrane surface.
 - (b) Do not over torque fasteners.
 - (1) Properly installed fasteners will not allow the plate or termination bar to move (as will under-driven fasteners) and will not cause wrinkling of the membrane (as will over driven fasteners).
 - (c) Comply with manufacturer's minimum deck penetration requirements of fasteners.
 - 2) Mechanically fasten membrane at perimeters, where the angle of the substrate or cricket valley is more than five (5) degrees (1-inch in 12-inches), around pipes and around conduits.
 - 3) At perimeters, curbs, and bases of walls, fasten in patterns recommended by the roofing manufacturer for the various uplift zones of the roof.
 - 4) Secure the roof membrane at penetrations.
 - (a) Provide a minimum of *four (4)* fasteners and 3-inch plates through the membrane around penetrations before installing flashing. *(ADDENDUM 1)*
 - (b) Fasteners and plates must be installed no closer than 1/2 inch from the field membrane edge.
 - 5) Cover exposed rows of fasteners with strip of welded membrane of adequate width.
- 4. Hot Air Welding:
 - a. General:
 - 1) Mechanics performing welding or operating welding equipment shall have successfully completed a training course provided by the manufacturer's Technical Service Representative prior to welding.
 - 2) Radius cut corners of exposed sheets, flashings and patches a minimum 1inch radius.
 - 3) Field seams must be clean and dry prior to initiating any field welding.
 - (a) Clean dirty seam surfaces with a clean, dry, or damp cotton rag and, if necessary, with mild detergent and water. Remove detergent residue. Dry surfaces thoroughly before heat welding.
 - 4) Welds shall be continuous, without voids or partial welds.
- (a) Hot air welding equipment shall be allowed to warm up for at least one minute prior to welding.
- (b) Welds shall be free of burns and scorch marks.
- 5) Field seams exceeding 10 feet in length shall be welded with an approved automatic welder.
- 6) Welding shall be performed by qualified personnel to ensure the quality and continuity of the weld.
- 7) Complete the seam welding each day.
- b. Automatic Machine Welding:
 - 1) Follow Manufacturer's instructions for the safe operation of the automatic welder.
 - 2) Follow local code requirements for electric supply, grounding, and surge protection.
 - 3) Automatic Machine welded seams shall utilize a suitably wide nozzle to create a homogeneous weld, a nominal one and one half (1-1/2) inches in width.
 - 4) Perform test cut of membrane weld at the beginning of every day.
- c. Hand Welding:
 - 1) The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
 - 2) Hand welded seams shall utilize a suitably wide nozzle to create a homogeneous weld, a nominal two (2) inches in width.
 - (a) The nozzle shall be inserted into the seam at a 45-degree angle to the edge of the membrane.
 - (b) Once the proper welding temperature has been reached and the membrane begins to "flow", the hand roller is positioned perpendicular to the nozzle and rolled lightly.
 - (1) For straight seams utilize a suitably wider nozzle.
 - (2) For corners and compound connections a narrower nozzle shall be used.
- d. Repair openings and "fishmouths" with a welder fitted with a tubular or pencil tip nozzle and roller.
 - 1) Patch over openings and "fishmouths" where needed and required.
- e. Weld minimum 3-inch circles of membrane over "T" joints.

5. Flashing:

- a. General:
 - 1) Flashings shall be installed concurrently with the roof membrane as the job progresses.
 - (a) No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the Manufacturer.
 - (1) Such Approval shall only be for specific locations on specific dates.
 - (b) If water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at no cost to the Owner.
 - 2) Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces.
 - 3) Provide separation as needed between bitumen and membrane.
 - 4) Base flashings and wall flashings.
 - (a) The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
 - (b) Extend membrane flashing a minimum of 6 inches out on to the plane of the roof.
 - (c) Extend vertical flashing a minimum of 8 inches above the plane of the roof surface.
 - (d) Fully adhere base flashing membrane to walls.

- (1) Fully adhere membrane in accordance with the manufacturer's instructions.
- (2) Curing or drying time of the adhesive will be affected by ambient temperatures and must be taken into consideration when determining flashing lengths.
- (3) Humidity can affect the drying time of adhesives and/or cause condensation to form on the newly applied adhesive.
- (4) Do not allow moisture on the adhesive prior to mating or application of membrane roofing system.
- (e) Secure the tops of base flashings at walls using termination bar and fasteners or using screws and plates.
- (f) Caulk and seal top edge of membrane flashing and termination bar in sealant or butyl tape.
- 5) Provide pre-formed corners and flashings from the manufacturer where possible. Field fabricate other flashings using manufacturer approved field fabrication details.
- 6) Roof Drains:
 - (a) Extend the roofing membrane over the drain opening.
 - (1) Locate the drain and cut a hole in the roofing membrane directly over the drain opening.
 - (2) Provide a 1/2 inch of membrane flap extending past the drain flange into the drain opening.
 - (3) Punch holes through the roofing membrane at drain bolt locations.
 - (b) Embed the roofing membrane in a full bed of sealant/adhesive on the drain flange prior to securement with the compression clamping ring.
 - (1) Typical adhesive application is one 10.5-ounce cartridge per drain.
 - (c) Lap seams shall not be located within the sump area.
 - (1) Where lap seams will be located within the sump area, a separate roof membrane drain flashing a minimum of 12 inches larger than the sump area must be installed.
 - (2) The roof membrane shall be mechanically attached 12 inches on center around the drain with screws and plates.
 - (3) The separate roof drain flashing shall be heat welded to the roof membrane beyond the screws and plates, extended over the drain flange, and secured as above.
 - (d) Tighten the drain compression ring in place.
- b. Pipe and Conduit Flashing:
 - 1) Caulk and seal tops of pipe flashings to clean metal.
 - (a) Embed top of membrane in manufacturer approved sealant.
 - (b) Secure the tops of pipe and conduit flashings using stainless steel hose clamps.
 - 2) Provide storm collar counterflashings at the top of pipe and conduit flashings of minimum four (4) inch wide roof membrane.
 - (a) Caulk and seal tops of storm collars to clean metal using silicone sealant.
 - (b) Secure the tops of storm collars using hose clamps.
- c. Liquid Applied PMMA flashings:
 - 1) Provide PMMA flashing membrane as needed for odd or complex flashings.:
 - 2) Prepare surfaces:
 - (a) Clean metal surfaces with solvent wipe.
 - (b) Prime as needed.
 - (c) Lightly sand rigid PVC and plastic surfaces. Extend surface preparation a minimum of 1/8" (3 mm) beyond the termination of the flashing. (ADDENDUM 1)
 - 3) Application:

- (a) Mixing:
 - (1) Thoroughly mix membrane and catalyst.
 - (2) Mix membrane just prior to use.
 - (3) Do not mix more than can be used in a short period of time.
- 4) Installation:
 - (a) After mixing fully adhere PMMA to the roof membrane and the penetration.
 - (b) Apply an even coat of catalyzed PMMA over membrane and substrates at manufacturer's recommended rates.
 - (1) While the PMMA is wet fully embed fleece reinforcement in membrane using roller or brush.
 - (2) Ensure no air is trapped beneath the fleece.
 - (3) Lap fleece a minimum of 2-inches. Apply catalyzed PMMA in laps.
 - (4) Apply an even coat of catalyzed PMMA over fleece while the first coat of PMMA is still wet. Apply at manufacture recommended rates.
 - (c) Pipe, conduit, overflow, and penetration flashings:
 - (1) Extend PMMA at least:
 - (2) 8 inches up pipes and penetrations.
 - (3) 6 inches onto the SBS membrane.
 - (4) 4 inches onto wall around outside of overflow scupper.
- 5) Wrap fleece around pipes, conduits, penetrations, and the insides of scuppers embedded in fresh PMMA and then coat fleece with PMMA.
 - (a) Finger cut fleece at base and extend fingers at least 2-inches onto the field of the roof membrane.
 - (b) Apply target sheet of fleece (in PMMA) over fingers extending at least 6 inches onto the field of the SBS membrane.
- 6) Metal flashing joints:
 - (a) Clean and prepare metal surfaces.
 - (b) Install reinforced PMMA to seal joints.
- F. Walkways:
 - 1. Provide walk pads in locations indicated.
 - a. Minimum walk pad size 2 1/2-foot x 6 foot.
 - b. Spacewalk pads four (4) inches apart to allow drainage.
 - c. Continuously weld walk pad perimeters to the roof membrane.
 - 2. Weld walk pads to roof membrane as recommended by manufacturer.
- G. Roof Protection:
 - 1. Protect partially and fully completed roofing work from damage and other trades until completion.
 - 2. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
 - a. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
 - 3. Temporary water stops shall be installed at the end of each workday and removed prior to commencement of work the following day.
 - a. At the end of each working day or at the sign of rain, install temporary, 100% watertight seal(s) at incomplete edges and portions of the work.
 - b. If water is allowed to enter beneath the newly completed roofing, remove and replace the affected area(s).
 - c. Remove temporary water stops prior to the commencement of work at the beginning of the next workday.

3.06 FIELD QUALITY CONTROL

- A. Provide quality control equipment, tools, and supervisory personnel to meet Project Requirements.
 - 1. Initiate and maintain a QC program.
 - a. The QC program will include, but is not limited to, the supervision, inspection, and probing of all heat welding incorporated within the Membrane Roofing System.
 - b. Weld Inspection:
 - Initiate daily inspections of all completed work which shall include, but is not limited to, the probing of all field welding with a dull pointed instrument to assure the quality of the application and ensure that any equipment or operator deficiencies are immediately resolved.
 - 2) Ensure that all aspects of the installation (sheet layout, attachment, welding, flashing details, etc.) are in accordance with the Manufacturer's instructions.
 - 3) Excessive patching of field seams because of inexperienced or poor workmanship is not acceptable. Remove and replace such membrane.
 - c. Maintain a written log of adhesive application vs square footage of membrane.
 - 1) Update daily.
 - 2) Submit to Owner at progress meetings or as requested.
 - d. If inconsistencies in the quality of the application of the assembly, membrane and/or welds are found, cease work until corrective actions are taken to ensure the continuity of the installation.
- B. Site Tests:
 - 1. Provide tests required by the Manufacturer, as specified, and as requested by the Owner's Representative.
 - 2. Cooperate with testing and inspecting agencies engaged or required to perform services during installation of the roofing assembly.
 - 3. Test Work for Compliance with Project Requirements.
 - a. Test work at appropriate intervals for compliance with Project Requirements.
 - 1) Test applications periodically for appropriate application rates, seam widths, offsets, adhesion, etc.
 - 2) Adjust materials and procedures and repeat tests until successful.
 - b. Weld Tests:
 - 1) Probe welded seams for continuity using a rounded screwdriver.
 - 2) Smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark gray material from the underside of the top membrane is visible evidence that welding is proceeding correctly.
 - 3) On site test cut sampling of welded seams shall be made daily by the Applicator.
 - (a) Take one (1) inch wide cross-section samples of welded seams at least four (4) times a day.
 - (1) Take at least two (2) test cuts in machine welded joints and at least two (2) test cuts in hand welded joints.
 - (2) Take cuts soon after welding commences in the morning, and after lunch.
 - (3) Test cuts to be one by four (1×4) inches in size.
 - (4) Verify welding meets requirements by attempting to pull apart the weld.
 - (5) Compliant welds display failure from shearing of the membrane prior to separation of the weld.
 - (b) Label test cuts with the day and time and retain in a binder on site.
 - (c) Patch test cuts at no cost to the Owner.
 - 4) The Owner's Representative and Membrane Manufacturer will have the right to request additional cuts be taken by the Contractor and repaired as specified herein or otherwise indicated by the Membrane Manufacturer and approved by the Owner's Representative at no cost to the Owner.

- 4. Conduct additional tests and repairs at the request of the Owner's Representative or Manufacturer, as specified herein, or as otherwise indicated by the Manufacturer and approved by the Owner's Representative at no cost to the Owner.
- C. Compliance:
 - 1. Assembly must be in accordance with Contract Documents and approved by the Owner's Representative and Manufacturer.
 - 2. Corrective action shall be one (1) of following at the option of the Owner's Representative.
 - a. Perform repairs to bring Work into compliance with Contract Documents.
 - b. Completely remove and replace faulty assembly; or
 - c. Perform repairs in accordance with Manufacturer's recommendations as specified herein and provide extended Contractor guaranty of duration as determined by the Owner's Representative.
- D. Manufacturer's Technical Services:
 - 1. Provide Manufacturer field services.
 - 2. Provide for all Manufacturer inspection, fees, and if necessary, re-inspection.
 - 3. Provide Manufacturer review of substrates, mockups, tests, and application.
 - 4. Provide at least weekly visits by the Manufacturer during application.
 - 5. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
 - 6. Provide Manufacturer's comprehensive final inspection after completion of the roof system of each building.

3.07 WARRANTY INSPECTION

- A. Upon the date of completion of the project, the authorized roofing contractor shall complete and submit the Manufacturer's Project Completion Notice.
- B. Upon receipt of the notice of completion, a Technical Representative of the Manufacturer shall schedule an inspection with a representative of the roofing contractor to thoroughly review the installation and verify compliance with Manufacturer's project documents.
- C. Corrections or modifications necessary for compliance with the specifications and acceptance for warranty (punch list) will be noted on the Final Inspection for Warranty Form.
- D. Provide Manufacturer's warranty upon completion of all punch list items and final acceptance of the installation.

3.08 ADJUSTING AND CLEANING

- A. Work areas are to be kept clean, clear, and free of debris.
- B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- C. Collect tools and unused materials at the end of each workday and store properly off the finished roof surface and protected from exposure to the elements.
- D. Dispose of or recycle trash and excess material in a manner conforming to current Owner and EPA regulations and local laws.
- E. Clean and restore damaged surfaces to their original condition.
- F. Upon completion of the Work, remove excess materials from the job site and sweep clean the public surfaces below.
 - 1. Properly clean the finished roof surface after completion, and make sure the drains are not clogged.
 - 2. Leave site, building, and grounds in a condition comparable to what existed prior to the Work.
 - 3. Repairs and clean-up work shall be done to the satisfaction of the Owner's Representative at the sole expense of the Contractor to restore to the pre-existing Owner.

For Reviewer's Use 3.09 SUBMITTAL SCHEDULE Incomplete or Not Received Apparently Compliant Re-Submit Literature Received Sample MSDS R = RequiredA = As Needed Section 075300 Minimum seven (7) days prior to application and prior to pre-1 application meeting. Approved applicator letter from Manufacturer. R a. Manufacturer's letter indicating review of specifications and b. intent to issue specified warranty, including: Product name, project address, and project size; Manufacturer's additional R requirements (if any); Contractor's additional requirements, (if any). Sample copy of Manufacturer's warranty with wind rider. R c. Complete list of materials proposed with Membrane d. Manufacturer general recommendations and application R instructions. 1) Insulation Boards, flat and tapered. R R 2) Perlite Tapered Edge Insulation. R R 3) Gypsum Cover Board. R R 4) 3 in plates *and screws* for supplemental fasteners of R membrane (ADDENDUM 1) 5) Termination bar fasteners R 6) Termination bar R 7) Spray foam adhesive for cover board R R 8) Adhesive for fleece backed PVC, water based or spray foam R R 9) Adhesive for smooth-backed PVC flashing R R 10)PVC fleece backed roofing membrane R R 11)PVC smooth backed flashing membrane R R 12)Preformed PVC flashings R R 13)Sealant R R 14)PVC clad metal (ADDENDUM 1) R R **15)TPO clad metal (ADDENDUM 1)** R R 16) TPO flashing membrane (ADDENDUM 1) R R 17)Walk pad R R 18)Hose clamps for boot flashings R 19)Water cut off seal R R 20)PMMA membrane R R 21)PMMA catalyst R R 22)PMMA fabric reinforcement R R 23)PMMA primers R R 24)PMMA cleaner R R 25)Membrane cleaner for tie-in. R R 2. During construction: Written log of adhesive application vs square footage of a. R membrane 3. Closeout:

Instructions on inspection, maintenance, and repair

a.

R

R = Required A = As Needed	Literature	MSDS	Sample	Received	Incomplete or Not Received	Apparently Compliant	Re-Submit
b. Contractor Guaranty	R						
c. Manufacturer Warranty	R						
d. Project Record Documents	R						
e. Letter certifying installation and materials are in compliance with Contract Documents	R						

GUARANTY

Solano County Community College Annex Bldg., 2000 N. Village Parkway, Vacaville, California.

Contractor:		
Address:		Phone:
City:	State:	Zip Code:

Contractor represents to Owner that the Work has been installed in accordance with Contract Documents.

If within five (5) years after the date of final acceptance, any of the work of this Contract is found to be defective, or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so and replace all component materials or systems that are structurally unsound, which admit water, or otherwise malfunction, including damaged components and elements which require frequent repair or service calls. The obligation of this guaranty shall be the Contractor's and shall be enforced by the Owner against the Contractor and shall survive the termination of the Contract. Final payment is not acceptance "as is" and is not to be construed as relieving the Contractor from the responsibility to have properly installed the systems and related work. The Owner has the right, in the case of emergency at any time during this five (5)-year period and without invalidating this guaranty, to make any temporary repairs that are required in order to protect the building and the contract of the building from damage due to leaking. The cost of such emergency repairs shall be paid by the Contractor except for items stated below.

For the five (5) year period from the date of completion and Owner's acceptance, the Contractor shall agree to inspect and make necessary repairs to defects or leaks in the work of this Contract. Emergency calls will be attended to within one (1) day from receipt of notice from Owner. As soon as weather permits, the Contractor shall restore affected areas to standards of this Contract and repair any damages from these items without cost to Owner, except for damage caused by fire, structural failure, acts or omissions of Owner's subsequent contractors, foundation settlement, failure or cracking of unrepaired substrates and structure, leaks through unrepaired areas, floods, lightning, earthquakes, or damage from code level winds. The manufacturer's representations and warranties do not release or waive any of the Contractor's obligations.

At 12 months the Contractor, Manufacturer (at the Owner's option) and Owner's Representative shall make an inspection of the work of this Contract. All deficiencies and all other defects shall be repaired by the Contractor at their own expense.

IN WITNESS WHEREOF, this instrument has been duly executed this _____ day of ______, 2022.

D	
Rv	
Dy.	

Corporate Officer of Contractor

Title

END OF SECTION

SECTION 23 05 93 (ADDENDUM 1)

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. AABC MN-1 AABC National Standards for Total System Balance; 2002.
- C. ASHRAE Std 111 Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- D. NEBB (TAB) Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.
- E. SMACNA (TAB) HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

- A. See Division 1 for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Engineer.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. Include at least the following in the plan:
 - a. Preface: An explanation of the intended use of the control system.
 - b. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - d. Identification and types of measurement instruments to be used and their most recent calibration date.
 - e. Final test report forms to be used.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Test Instruments:
 - Balancing Contractor shall provide all necessary test instruments required to take readings including, but not limited to: Pressure gauges, thermometers, humidity instruments, sling psychrometers, flow meter read out instruments (differential pressure gauges, etc.), air flow hoods, pitot tubes, anemometers, ammeters, voltmeters, tachometers, sound level meters, vibration analyzers, etc., as required to perform measurements required to perform the work of this section and applicable Commissioning specifications. These instruments are considered to be the property of the balancing

contractor and required for usual performance of testing and balancing work. No allowance will be made for contractor's failure to provide adequate test instruments.

- B. Incidental Equipment and Materials:
 - Balancing Contractor shall provide at his own expense incidental and/or temporary equipment required to make such readings as required for the performance of this work. Such incidentals include but are not limited to: pipe nipples, couplings, tees, elbows, plugs and caps, gauge valves, teflon tape, and other miscellaneous fittings required to make readings required for balancing work. Incidental materials and fittlings shall be removed and the facility restored to 'as found' condition after completion of readings and balancing activities.
- C. Tools and Labor:
 - 1. Balancing Contractor shall provide all tools and labor required to effect necessary readings for balancing work, including but not limited to electric drill and bits, wrenches, pliers, screwdrivers, teflon tape, flashlights, rags, pocket knife or leatherman, pencils, pens, test forms, paper, and other minor tools required for work of this section.
 - 2. Provide labor to alter minor piping and other systems to allow temporary installation of test gages and thermometers, etc., required to make necessary readings. This includes removal of plugs on pump castings and temporary installation of piping, valves, gauges and nipples required to attach pressure gauges for readings, drilling required holes in ductwork and subsequent installation of plugs to allow ductwork pitot tube traverses, connections to flow elements, including a reasonable effort to clear obstructions from test ports, etc. Remove temporary fittings, valves and gauges at completion of readings and restore equipment to 'as found' condition.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
 - 4. SMACNA (TAB).
 - 5. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

- 1. Systems are started and operating in a safe and normal condition.
- 2. Temperature 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.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

3.03 PREPARATION

- A. Hold a pre-balancing meeting prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced. Required attendance by personnel that will actually be performing the balancing work.
- B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

- A. After systems are balanced, work with the controls contractor to determine optimal final setpoint of fan system static pressure controls. Final setpoint shall be determined by supplying design airflow to all zones with no boxes throttling.
- B. Measure air quantities at air inlets and outlets.
- C. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- D. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required, including sheaves and labor. Vary branch air quantities by damper regulation.

- E. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- F. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- H. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- I. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- J. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.03 inches positive static pressure at each classroom, lounge, and office related space.

3.07 SCOPE

- A. Pre-construction air balance for the existing air systems prior to the removal of the existing mechanical equipment, listing the following (but not limited to) items:
 - 1. Existing system designation such as nameplate, model number, serial number, size, tag.
 - 2. Type of control the system was under at the time of testing
 - 3. Outside air temperature
 - 4. System fan motor nameplate data and related electrical characteristics
 - 5. Fan data
 - 6. ESP, ISP, and TSP data
 - 7. Floorplan indicating measured airflows at existing air outlets/inlets (i.e. diffusers, grilles, or registers)
- B. Post-construction air balance for the new air systems after installation of new mechanical equipment, listing the following (but not limited to) items:
 - 1. System designation such as nameplate, model number, serial number, size, tag.
 - 2. Type of control the system was under at the time of testing
 - 3. Outside air temperature
 - 4. System fan motor nameplate data and related electrical characteristics
 - 5. Fan data
 - 6. ESP, ISP, and TSP data
 - 7. Floorplan indicating measured airflows at existing and new air outlets/inlets (i.e. diffusers, grilles, or registers)
- C. Test, adjust, and balance the following:
 - 1. Packaged Roof Top Heating/Cooling Units.
 - 2. Fans.
 - 3. Air Inlets and Outlets.
- D. Commissioning (ADDENDUM 1)
 - 1. See Specification 01 91 00 for additional requirements pertaining to the responsibilities of the TAB agency for commissioning.

3.08 MINIMUM DATA TO BE REPORTED

- A. Electric Motors (RTU Supply and Powered Exhaust Fan, and; Exhaust Fan):
 - 1. Manufacturer.
 - 2. Model/Frame.
 - 3. HP/BHP.
 - 4. Phase, voltage, amperage; nameplate, actual, no load.
 - 5. RPM.
 - 6. Service factor.
 - 7. Starter size, rating, heater elements.

- 8. Sheave Make/Size/Bore.
- B. Air Cooled Condensers:
 - 1. Identification/number.
 - 2. Location.
 - 3. Manufacturer.
 - 4. Model number.
 - 5. Entering DB air temperature, actual.
 - 6. Leaving DB air temperature, actual.
 - 7. Number of compressors.
- C. Cooling Coils:
 - 1. Location.
 - 2. Service.
 - 3. Manufacturer.
 - 4. Air flow, design and actual.
 - 5. Entering air DB temperature, design and actual.
 - 6. Entering air WB temperature, design and actual.
 - 7. Leaving air DB temperature, design and actual.
 - 8. Leaving air WB temperature, design and actual.
 - 9. Air pressure drop, design and actual.
- D. Rooftop Package Units:
 - 1. Location.
 - 2. Manufacturer.
 - 3. Model number.
 - 4. Serial number.
 - 5. Arrangement/Class/Discharge.
 - 6. Supply air flow, specified and actual.
 - 7. Return air flow, specified and actual.
 - 8. Outside air flow, specified and actual.
 - 9. Exhaust/relief air flow, actual
 - 10. Total static pressure (total external), specified and actual.
 - 11. Inlet pressure.
 - 12. Discharge pressure.
 - 13. Sheave Make/Size/Bore.
 - 14. Number of Belts/Make/Size.
 - 15. Fan RPM.
 - 16. Gas flow rate.
 - 17. Heat input.
 - 18. Burner manifold gas pressure.
 - 19. Percent carbon monoxide (CO).
 - 20. Percent carbon dioxide (CO2).
 - 21. Percent oxygen (O2).
 - 22. Percent excess air.
 - 23. Flue gas temperature at outlet.
 - 24. Ambient temperature.
 - 25. Percent combustion efficiency.
 - 26. Heat output.
- E. Return Air/Outside Air:
 - 1. Identification/location.
 - 2. Design air flow.
 - 3. Actual air flow.
 - 4. Design return air flow.
 - 5. Actual return air flow.

- 6. Design outside air flow.
- 7. Actual outside air flow.
- 8. Return air temperature.
- 9. Outside air temperature.
- 10. Required mixed air temperature.
- 11. Actual mixed air temperature.
- 12. Actual outside/return air ratio.
- F. Exhaust Fans:
 - 1. Location.
 - 2. Manufacturer.
 - 3. Model number.
 - 4. Serial number.
 - 5. Air flow, specified and actual.
 - 6. Total static pressure (total external), specified and actual.
 - 7. Inlet pressure.
 - 8. Discharge pressure.
 - 9. Sheave Make/Size/Bore.
 - 10. Number of Belts/Make/Size.
 - 11. Fan RPM.
- G. Duct Leak Tests:
 - 1. Description of ductwork under test.
 - 2. Duct design operating pressure.
 - 3. Duct design test static pressure.
 - 4. Duct capacity, air flow.
 - 5. Maximum allowable leakage duct capacity times leak factor.
 - 6. Test static pressure.
 - 7. Leakage.

END OF SECTION

SECTION 23 09 23 (ADDENDUM 1)

DIGITAL CONTROL SYSTEM AND EQUIPMENT (DELTA)

PART 1: GENERAL

1.01 SECTION INCLUDES

- A. Description
- B. Approved Control System Contractors and Manufacturers
- C. Quality Assurance
- D. Codes and Standards
- E. System Performance
- F. Submittals
- G. Warranty
- H. Ownership of Proprietary Material

1.02 DESCRIPTION

- A. General: The control system shall be as shown and consist of a high-speed, peer-to-peer network of DDC controllers and an operator workstation residing and communicating on a BACnet internet work. Each mechanical system, building floor plan, and control device will be depicted by point-and-click graphics.
- B. The control system shall be supplied with a complete web enabled package. The system shall support unlimited users using standard web browsers such as Chrome or Firefox. The web server software shall operate on standard industry PC servers. Proprietary servers or "black boxes" are not acceptable. Web browser software shall be manufactured by the control system manufacturer and shall have the same look and feel as the operating system. Third party web software is not acceptable.
- C. The system will provide for future expansion to include monitoring of the card access, fire alarm, and lighting control systems

1.03 APPROVED CONTROL SYSTEM MANUFACTURERS

- A. The following are the approved Control System manufacturers:
- B. Delta Controls by ESI
 - 1. The Contractor shall use only products from the corresponding manufacturer and product line listed.
 - 2. The system shall connect to the existing Delta Controls System. New graphics shall be created at this server. The system shall be installed in to match the owners standards including installation methods, graphic screens, programming, alarms, and historical trending to match the existing Delta Control System installed by Environmental Systems, Inc.
 - 3. The above list of manufacturers applies to operator workstation software, controller software, the custom application programming language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (e.g., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.04 QUALITY ASSURANCE

- A. Contractor/Manufacturer Qualifications
 - 1. The Installer shall have an established working relationship with the Control System Manufacturer.
 - 2. The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.

3. All products used in this installation shall be new, currently under manufacture, and shall be applied in standard off the shelf products. This installation shall not be used as a test site for any new products unless explicitly approved by the Engineer in writing. Spare parts shall be available for at least 5 years after completion of this contract.

1.05 CODES AND STANDARDS

- A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:
 - 1. National Electric Code (NEC)
 - 2. Uniform Building Code (UBC)
 - a. Section 710.5, Wiring in Plenums
 - b. Section 1106 Refrigeration Machinery Rooms
 - c. Section 1107, Refrigeration Machinery Room Ventilation
 - d. Section 1108, Refrigeration Machinery Room Equipment and Controls
 - e. Section 1120, Detection and Alarm Systems
 - 3. Uniform Mechanical Code (UMC)
 - 4. ASHRAE 135-1995
 - 5. FCC Regulation, Part 15- Governing Frequency Electromagnetic Interference
 - 6. Underwriters Laboratories UL916

1.06 SYSTEM PERFORMANCE

- A. Performance Standards. The system shall conform to the following:
 - 1. Graphic Display. The system shall display a graphic with 20 dynamic points/objects with all current data within 10 seconds.
 - 2. Graphic Refresh. The system shall update a graphic with 20 dynamic points/objects with all current data within 8 seconds
 - 3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be less than 2 seconds. Analog objects should start to adjust within 2 seconds
 - 4. Object Scan. All changes of state and change of analog values will be transmitted over the high-speed Ethernet network such that any data used or displayed at a controller or workstation will have been current within the previous 2 seconds
 - 5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds
 - 6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 1 second. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control
 - 7. Performance. Programmable controllers shall be able to execute DDC PID control loops at a frequency of at least once per second. The controller shall scan and update the process value and output generated by this calculation at this same frequency
 - 8. Multiple Alarm Annunciations. All workstations on the network must receive alarms within 5 seconds of each other
 - 9. Reporting Accuracy. The system shall report all values with an end-to-end accuracy as listed or better than those listed in Table 1
 - 10. Stability of Control. Control loops shall maintain measured variable at setpoint within the tolerances listed in Table 2

1.07 TABLE 1: REPORTING ACCURACY

MEASURED VARIABLE SPACE TEMPERATURE DUCTED AIR OUTSIDE AIR DEWPOINT REPORTED ACCURACY ±0.5°C [±1°F] ±0.5°C [±1°F] ±1.0°C [±2°F] ±1.5°C [±3°F]

WATER TEMPERATURE
DELTA-T
RELATIVE HUMIDITY
WATER FLOW
AIRFLOW (TERMINAL)
AIRFLOW (MEASURING STATIONS)
AIR PRESSURE (DUCTS)
AIR PRESSURE (SPACE)
WATER PRESSURE
ELECTRICAL

CARBON MONOXIDE (CO) CARBON DIOXIDE (CO2)

NOTE 1: 10%-100% OF SCALE NOTE 2: FOR BOTH ABSOLUTE AND DIFFERENTIAL PRESSURE NOTE 3: NOT INCLUDING UTILITY-SUPPLIED METERS ±0.5°C [±1°F] ±0.15°C[±0.25°F] ±5% RH ±5% OF FULL SCALE ±10% OF FULL SCALE (SEE NOTE 1) ±5% OF FULL SCALE (SEE NOTE 1) ±5% OF FULL SCALE ±25 PA [±0.1 "W.G.] ±3 PA [±0.01 "W.G.] ±2% OF FULL SCALE (SEE NOTE 2) 5% OF READING (SEE NOTE 3) (A, V, W, POWER FACTOR) ±5% OF READING ±50 PPM

1.08 TABLE 2: CONTROL STABILITY AND ACCURACY

CONTROLLED VARIABLE	CONTROL ACCURACY	RANGE OF MEDIUM
AIR PRESSURE	±50 PA [±0.2" W.G.]	0-1.5 KPA [0-6" W.G.]
	±3 PA [±0.01" W.G.]	-25 TO 25 PA [-0.1 TO 0.1"
		W.G.]
AIRFLOW	±100 CFM	-
TEMPERATURE	±0.5°C [±1.0°F]	
HUMIDITY	±5% RH	
FLUID PRESSURE	±10 KPA [±1.5 PSI]	0-1 KPA [1-150 PSI]
	±250 PA [±1.0" W.G.]	0-12.5 KPA [0-50"Ŵ.G.]

1.09 SUBMITTALS

- A. Product Data and Shop Drawings: Contractor shall provide shop drawings or other submittals on all hardware, software, and installation to be provided. No work may begin on any segment of this project until submittals have been reviewed and approved for conformity with the design intent. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:
 - 1. Direct Digital Control System Hardware:
 - a. A complete bill of materials of equipment to be used shall be listed indicating quantity, manufacturer, model number, and other relevant technical data.
 - b. Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:
 - 1) Direct Digital Controller (controller panels)
 - 2) Transducers/Transmitters
 - 3) Sensors (including accuracy data)
 - 4) Actuators
 - 5) Valves
 - 6) Relays/Switches

- 7) Control Panels
- 8) Power Supply
- 9) Batteries
- 10) Operator Interface Equipment
- 11) Wiring
- 12) Wiring diagrams and layouts for each control panel. Show all termination numbers
- 13) Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware
- 2. Central System Hardware and Software
 - a. A complete bill of material of equipment used indicating quantity, manufacturer, model number, and other relevant technical data.
 - b. Manufacturer's description and technical data, such as product specification sheets and installation/maintenance instructions for the items listed below and other relevant items not listed below:
 - 1) Central Processing Unit
 - 2) Monitors
 - 3) Keyboard
 - 4) Power Supply
 - 5) Interface Equipment Between CPU and Control Panels
 - 6) Operating System Software
 - 7) Operator Interface Software
 - 8) Color Graphic Software
 - 9) Third-party Software
 - 10) A schematic diagram for all control wiring, communication wiring and power wiring shall be provided. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers, function and data link protocol(s). Show all interface wiring to the control system
 - 11) Provide detailed system architecture of wiring between central control unit, operator workstation(s), routers, gateways and all control panels
 - 12) A list of the color graphic screens shall be provided. For each screen, provide a conceptual layout of pictures and data, and show or explain which other screens can be directly accessed
- 3. Controlled Systems:
 - a. A schematic diagram of each controlled system. The schematics shall have all control points/objects labeled and with point/object names shown or listed. The schematics shall graphically show the location of all control elements in the system
 - b. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, it shall be labeled with the same name. All terminals shall be labeled
 - c. An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number
 - d. A mounting, wiring, and routing plan view drawing. The drawing shall be done in ¼" scale. The design shall take into account HVAC, electrical and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work
 - e. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system

- f. A point/object list for each system controller including both inputs and outputs (I/O), point/object number, the controlled device associated with the I/O point/object, and the location of the I/O device. Software flag points/objects, alarm points/objects, etc
- 4. Quantities of items submitted shall be reviewed, but are the responsibility of the Contractor
- 5. A description of the proposed process along with all report formats and checklists to be used in Part 3: "Control System Demonstration and Acceptance."
- 6. A BACnet Protocol Implementation Conformance Statement (PICS) for each type of controller and operator interface included in the submittal. PICS to include for each product, as a minimum, a list of BACnet functional groups supported, BACnet services supported, BACnet data link options available and BACnet objects provided
- B. Project Record Documents: Upon completion of installation, submit three copies of record (asbuilt) documents. The documents shall be submitted for approval prior to final completion and shall include:
 - 1. Project Record Drawings. These shall be as-built versions of the submittal shop drawings. One set of magnetic media including DXF drawing files also shall be provided
 - 2. Testing and Commissioning Reports and Checklists. Completed versions of all reports and checklists, used to meet the requirements of Part 3: "Control System Demonstration and Acceptance."
 - 3. Certification of the pressure test required in Part 3: "Control Air Tubing."
 - 4. Operation and Maintenance (O & M) Manual. This shall include as-built versions of the submittal product data. In addition to the information required for submittals, the O & M manual shall include:
 - a. Operators Manual with procedures for operating the control systems, including logging on/off, alarm handling, producing point/object reports, trending data, overriding computer control, and changing setpoints and other variables
 - b. One set of Programming Manuals with a description of the programming language (including syntax), statement descriptions (including algorithms and calculations used), point/object database creation and modification, program creation and modification, and use of the editor
 - c. A list of recommended spare parts with part numbers and suppliers
 - d. Licenses, guarantee, and warranty documents for all equipment and systems
 - e. Recommended preventive maintenance procedures for all system components, including a schedule of tasks (inspection, cleaning, calibration, etc.), time between tasks, and task descriptions
- C. Manuals: The Contractor shall provide manuals for all equipment provided.

1.10 WARRANTY

- A. Warrant all work as follows:
 - 1. Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after final completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during normal business hours.
 - 2. All work shall have a single warranty date, even when the Owner has received beneficial use due to an early system start-up. If the work specified is split into multiple contracts or a multi-phase contract, then each contract or phase shall have a separate warranty start date and period
 - 3. Operator workstation software, project-specific software, graphic software, database software, and firmware updates which resolve known software deficiencies as identified by the Contractor shall be provided at no charge during the warranty period. Any upgrades or functional enhancements associated with the above mentioned items also can be provided during the warranty period for an additional charge to the Owner by purchasing an in-warranty service agreement from the Contractor. Written authorization by the Owner must, however, be granted prior to the installation of any of the above mentioned items.

4. Exception: The Contractor shall not be required to warrant reused devices, except for those that have been rebuilt and/or repaired. The Contractor shall warrant all installation labor and materials, however, and shall demonstrate that all reused devices are in operable condition at the time of Engineer's acceptance.

1.11 OWNERSHIP OF PROPRIETARY MATERIAL

- A. All project-developed software and documentation shall become the property of the Owner. These include, but are not limited to:
 - 1. Project graphic images
 - 2. Record drawings
 - 3. Project database
 - 4. Project-specific application programming code
 - 5. All documentation

PART 2: PRODUCTS

2.01 SECTION INCLUDES

- A. Materials
- B. Communication
- C. Operator Workstation
- D. Controller Software
- E. Building Controllers
- F. Advanced Application Controllers
- G. Application Specific Controllers
- H. Input/ Output Interface
- I. Power Supplies and Line Filtering
- J. Auxiliary Control Devices
- K. Wiring and Raceways
- L. Fiber Optic Cable System

2.02 MATERIALS

A. All products used in this project installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of two years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's Representative in writing. Spare parts shall be available for at least five years after completion of this contract.

2.03 COMMUNICATION

- A. All control products provided for this project shall comprise a BACnet internetwork. Communication involving control components (i.e., all types of controllers and Operator Workstations) shall conform to ANSI/ASHRAE Standard 135-2001, BACnet.
- B. Each BACnet device shall operate on the BACnet Data Link/Physical layer protocol specified for that device as defined in this section.
- C. The Contractor shall provide all communication media, connectors, repeaters, bridges, hubs, switches, and routers necessary for the internetwork.
- D. All controllers shall have a communication port for connections with the Operator Workstations using the BACnet Data Link/ Physical layer protocol.
- E. Communication services over the internetwork shall result in operator interface and value passing that is transparent to the internetwork architecture as follows:
 - 1. Connection of an Operator Workstation device to any one controller on the internetwork will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software,

custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the internetwork.

- 2. All database values (e.g., objects, software variables, custom program variables) of any one controller shall be readable by any other controller on the internetwork. This value passing shall be automatically performed by a controller when a reference to an object name not located in that controller is entered into the controller's database. An operator/installer shall not be required to set up any communication services to perform internetwork value passing.
- F. The time clocks in all controllers shall be automatically synchronized daily. An operator change to the time clock in any controller shall be automatically broadcast to all controllers on the network.

2.04 OPERATOR WORKSTATION. NOT NEEDED, INTERFACE WITH EXISTING PC-BASED SYSTEM.

A. System Graphics. The existing operator workstation software shall be expanded to include new graphics to match the remodeled systems.

2.05 CONTROLLER SOFTWARE

- A. Furnish the following applications software for building and energy management. All software applications shall reside and operate in the system controllers. Editing of applications shall occur at the operator workstation
- B. System Security
 - 1. User access shall be secured using individual security passwords and user names.
 - 2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
 - 3. User Log On/Log Off attempts shall be recorded.
- C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each schedule shall consist of the following:
 - 1. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop and optimal start. Each schedule may consist of up to 10 events. When a group of objects are scheduled together, provide the capability to adjust the start and stop times for each member.
 - 2. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.

2.06 BUILDING CONTROLLERS

- A. General. Provide an adequate number of Building Controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.
 - 1. The Energy Management and Control System shall be comprised of one or more independent, standalone, microprocessor-based Building Controllers to manage the global strategies described in the System Software section.
 - 2. The Building Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 - 3. Data shall be shared between networked Building Controllers.
 - 4. The operating system of the Building Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms.
 - 5. Controllers that perform scheduling shall have a real-time clock.
 - 6. The Building Controller shall communicate with other BACnet objects on the internetwork using the Read (Execute and Initiate) and Write (Execute and Initiate) Property services as defined in ASHRAE Standard 135-2020.

- 7. BACnet Functional Groups. The Building Controller shall support the following BACnet functional groups: Clock, Event Initiation, COV Event Response, Files, Device Communication and Time Master.
- B. Communication
 - 1. Each Building Controller shall support BACnet[™] over Ethernet and BACnet[™] over IP. The Building Controller shall be connected to the BACnet network using the ISO 8802-3 (Ethernet) Data L/ Physical layer protocol.
 - 2. Each Building Controller with a communications card shall perform BACnet routing if connected to a network of Custom Application and Application Specific Controllers.
 - 3. The Building Controller secondary communication network shall support BACnet MS/TP.
- C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
 - Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 0°C to 40°C [32°F to 100°F] and 10 to 90% RH.
 - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C [32°F to 120°F].
- D. Building Controllers shall be fully peer to peer.
- E. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field- removable, modular terminal strips.
- F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. The Building Controller shall maintain all database information including BIOS and programming information in the event of a power loss for at least 72 hours. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft].
- G. Inputs/Outputs.
 - 1. Inputs. Controller input/output board shall support dry contact, 0-5 VDC and 0-10 VDC-voltage, 4-20 mA- current and thermistor-resistive signal types (10K ohm) on an individual basis for connecting any status or sensing device.
 - 2. Outputs. Output supported shall be 0-10 VDC, 24 VAC triac, 24 VAC dry contact. All HOA's shall be supervised.
 - 3. Diagnostics. Controller input/output board shall have red LEDs providing input status indication.
 - 4. Building Controller shall have the capability to create, delete and support the following BACnet Objects:
 - a. ANALOG INPUT, ANALOG OUTPUT AND ANALOG VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; COV Increment; Out of Service and Units. In addition, these objects shall support the properties: Device type; Reliability; Min./Max. Values; Update Interval and Resolution.
 - b. BINARY INPUT, BINARY OUTPUT AND BINARY VALUE: These objects shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Default Value; Min On/Off and Out of Service. In addition, these objects shall support the properties: Device Type; Reliability; Active/Inactive Texts; Update Interval; Resolution; Change-of-State Time; Count Times and Time Reset.
 - c. CALENDAR: This object shall have the following writeable properties: Object Name; Object Value; Description; and Date List.
 - d. DEVICE: This object shall have the following writeable properties: Object Name; Description; Location; and UTC Offset.
 - e. EVENT ENROLMENT: This object shall have the following writeable properties: Object Name; Object Value; Description; Out-of-Service; Event & Notify Types; Parameters; Property Ref; Enable; and Notification Class.
 - f. FILE: This object shall have the following writeable properties: Object Name; Description; File Type; and File Access.

- g. LOOP (PID): This object shall have the following writeable properties: Object Name; Object Value; Description; Polarity; Output and Input Refs.; Input Value & Units; Setpoint Value; PID Values; Bias; Write Priority and COV Increment. In addition, this object shall support the properties: Reliablity; Update Interval; Proportional Constant & Units; Derviative Constant & Units.
- h. NOTIFICATION CLASS: This object shall have the following writeable properties: Object Name; Object Value; Description; Priority and Ack Required.
- i. PROGRAM: This object shall have the following writeable properties: Object Name; Object Value and Description. In addition, this object shall support the property Reliability.
- j. SCHEDULE: This object shall have the following writeable properties: Object Name; Object Value and Description; Effective period; Schedule; Exception; Controlled Properties and Write Properties.
- k. TREND LOG: This object shall have the following writeable properties: Object Name; Description; Log Enable; Start/stop Times; Log Device Object Property; Log Interval; Stop When Full; Buffer Size; and Record Count.

2.07 ADVANCED APPLICATION CONTROLLERS

- A. General. Provide an adequate number of Programmable Application Controllers to achieve the performance specified in the Part 1 Article on "System Performance." Each of these panels shall meet the following requirements.
 - 1. The Advanced Application Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 - 2. Advanced Application Controllers shall be fully peer to peer.
 - 3. The operating system of the Controller shall manage the input and output communication signals to allow distributed controllers to share real and virtual object information, and allow central monitoring and alarms.
 - 4. Both firmware and controller database shall be loadable over the network.
- B. Communication.
 - 1. Each Advanced Application Controller shall reside on a BACnet network using the MS/TP or Ethernet Data Link/ Physical layer protocol.
 - 2. The controller shall provide a service communication port using BACnet Data Link/ Physical layer protocol for connection to portable operators' workstation and allow access to the entire network.
- C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
 - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at 0°C to 40°C [32°F to 100°F].
 - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].
- D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips or to a termination card connected by a ribbon cable.
- E. Memory. The Advanced Application Controller shall be non-volatile FLASH memory.
- F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

2.08 APPLICATION SPECIFIC CONTROLLERS

- A. General. Application Specific Controllers (ASCs) are microprocessor-based DDC controllers which through hardware or firmware design are able to control a wide variety of equipment. They are fully user-programmable, and are not restricted to any one type of equipment.
 - 1. Each ASC shall be capable of standalone operation and shall continue to provide control functions without being connected to the network

- 2. Each ASC will contain sufficient I/O capacity to control the target system.
- 3. Both firmware and controller database shall be loadable over the network
- 4. Application Specific Controllers shall be fully peer to peer
- 5. ASC's shall come with an integrated housing to allow for easy mounting and protection of the circuit board. Only wiring terminals shall be exposed.
- B. Communication
 - 1. The controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol.
 - 2. Each controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown and allow access to the entire network.
 - 3. Each controller shall have a secondary sub network for communicating sensors or I/O expansion modules
- C. Environment. The hardware shall be suitable for the anticipated ambient conditions.
 - Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at -40°C to 65°C [-40°F to 150°F] and/or suitably installed in a heated or fan cooled enclosure
 - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C [32°F to 120°F].
- D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips.
- E. Memory. The Application Specific Controller shall use non-volatile memory and maintain all BIOS and programming information in the event of a power loss.
- F. Immunity to power and noise. ASC shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m [3 ft].
- G. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.
- H. Input/Output. ASC shall support as a minimum, directly connected, a combination of analog outputs and binary outputs and universal software selectable analog or digital inputs. ASC inputs shall support 0-5 VDC-voltage, 4-20mA-current, thermistor-resistance and dry contacts. ASC outputs shall support 0-10 VDC-voltage, digital triac rated at 0.5 amps at 24 VAC

2.09 AUXILIARY CONTROL DEVICES

- A. Existing auxiliary control devices, wiring, and panels may be utilized when possible.
- B. Motorized control dampers, unless otherwise specified else-where, shall be furnished by the controls contractor.
- C. Electric damper/valve actuators.
 - 1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
 - 2. Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing.
 - 3. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 7 N⋅m [60 in-lb] torque capacity shall have a manual crank for this purpose.
- D. Control valves.
 - 1. Control valves shall be two-way or three-way type for two-position or modulating service as shown.
 - 2. Water Valves:

- a. Body and trim style and materials shall be per manufacturer's recommendations for design condi-tions and service shown, with equal percentage ports for modu-lating service.
- 3. Steam Valves:
 - a. Body and trim materials shall be per manufac-turer's recommendations for design conditions and service. Linear ports for modulating service.
- E. Binary Temperature Devices
 - 1. Low-limit thermostats. Low-limit thermostats shall be vapor pressure type with an element 6 m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any 30 cm [1 ft] section. The low-limit thermostat shall be manual reset only and be supplied as DPST.
- F. Temperature sensors.
 - 1. Temperature sensors shall be thermistors.
 - 2. Space sensors shall be equipped with the following:
 - a. programmable buttons for setpoint adjustment and override
 - b. 3-value, 96-segment LCD display
 - 3. Provide matched temperature sensors for differential temperature measurement.
- G. Humidity sensors.
 - 1. Duct and room sensors shall have a sensing range of 0% to 100%.
 - 2. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of -40°C to 75°C [-40°F to 170°F].
 - 3. Humidity sensor's drift shall not exceed 3% of full scale per year.
- H. Flow switches.
 - 1. Flow-proving switches shall be either paddle or differential pressure type
- I. Local control panels
 - 1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with [hinged door], and removable sub-panels.
 - 2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings

2.10 WIRING AND RACEWAYS

- A. General: Provide copper wiring, plenum cable, and raceways in accordance to local code.
- B. Existing wiring and raceways may be reused where possible.

PART 3: EXECUTION

3.01 SECTION INCLUDES

- A. Examination
- B. Protection
- C. Coordination
- D. General Workmanship
- E. Field Quality Control
- F. Existing Equipment
- G. Wiring
- H. Communication Wiring
- I. Fiber Optic Cable
- J. Control Air Tubing
- K. Installation of Sensors

- L. Flow Switch Installation
- M. Actuators
- N. Warning Labels
- O. Identification of Hardware and Wiring
- P. Controllers
- Q. Programming
- R. Control System Checkout and Testing
- S. Control System Demonstration and Acceptance
- T. Cleaning

3.02 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started
- B. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started
- C. The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate or if any discrepancies occur between the plans and the Contractor's work, and the plans and the work of others the Contractor shall report these discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by and at the expense of this Contractor.

3.03 PROTECTION

- A. The Contractor shall protect all work and material from damage by its work or employees, and shall be liable for all damage thus caused
- B. The Contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted. The Contractor shall protect any material that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects

3.04 COORDINATION

- A. Site
 - 1. Where the mechanical work will be installed in close proximity to, or will interfere with work of other trades, the Contractor shall assist in working out space condi-tions to make a satisfac-tory adjustment. If the Contractor installs its work before coordinating with other trades, so as to cause any inter-ference with work of other trades.
 - 2. Coordinate and schedule work with all other work in the same area, or with work which is dependent upon other work, to facilitate mutual progress.

3.05 GENERAL WORKMANSHIP

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment
- C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electrical Code (NEC).
- D. All wiring shall be verified for its integrity to ensure continuity and freedom from shorts and grounds

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.06 FIELD QUALITY CONTROL

- A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship
- C. Contractor shall have work inspected by local and/or state/provincial authorities having jurisdiction over the work

3.07 EXISTING EQUIPMENT

- A. Wiring: The contractor may reuse any abandoned wires. The integrity of the wire and its proper application to the installation is the responsibility of the Contractor. The wire shall be properly identified and tested as per this specification. Unused or redundant wiring must be properly identified as such.
- B. Local Control Panels: The Contractor may reuse any existing local control panel to locate new equipment. All redundant equipment within these panels must be removed. Panel face cover must be patched to fill all holes caused by removal of unused equipment, or replaced with new, Existing panels become the property of the Contractor.
- C. Unless otherwise directed, the Contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the Contractor find existing equipment which requires maintenance, the Owner is to be notified immediately.
- D. Temperature Sensor Wells: The Contractor may reuse any existing wells in piping for temperature sensors. These wells shall be modified as required for proper fit of new sensors
- E. Room Thermostats: Shall be removed and become the property of the Owner, unless otherwise noted
- F. Electronic Sensors and Transmitters: Unless specifically noted otherwise Shall be removed and become the property of the Owner, unless otherwise noted

3.08 WIRING

- A. All control and interlock wiring shall comply with national and local electrical codes.
- B. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)

3.09 ACTUATORS

- A. Mount and link control damper actuators per manufacturer's instructions.
 - 1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage
 - 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
 - 3. Provide all mounting hardware and linkages for actuator installation.
- B. Electric/Electronic
 - 1. Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer's recommendations
 - 2. Valves: Valves controlled as part of this project will be provided by EMCS contractor for installation by others.

3.10 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 5 cm [2"] of termination with the DDC address or termination number.
- B. Permanently label or code each point/object of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1 cm $[\frac{1}{2}]$ letters on laminated plastic nameplates.
- D. Identify all other control components with permanent labels. All plug-in components shall be labeled such that removal of the component does not remove the label.
- E. Identify room sensors relating to terminal box or valves with nameplates.

3.11 CONTROLLERS

- A. Building Controllers and Advanced Application Controllers shall be selected to provide a minimum of 15% spare I/O point/object capacity for each point/object type found at each loca-tion. If input /objects are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point/object used.
 - 1. Future use of spare capacity shall require providing the field device, field wiring, point/object database definition, and custom software. No additional controller boards or point/object modules shall be required to implement use of these spare points

3.12 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free for future use.
- B. Point/object Naming: System point/object names shall be modular in design, allowing easy operator interface without the use of a written point/object index. Use the following naming convention:
- C. Software Programming
 - Provide programming for the system and adhere to the sequences of operation provided. The Contractor also shall provide all other system programming necessary for the operation of the system, but not specified in this document. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:
 - a. Text-based:
 - 1) must provide actions for all possible situations
 - 2) must be modular and structured
 - 3) must be commented
 - 4) Parameter-based
 - (a) must provide actions for all possible situations
 - (b) must be documented
- D. Operator Interface
 - 1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point/object information on the graphic displays shall dynamically update. Show on each graphic all input and output points/objects for the system. Also show relevant calculated points/objects such as setpoints
 - 2. The Contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all Operator Workstation software and their functions as described in this section. This includes any operating system software, the Operator Workstation database, and any third-party software installation and integration required for successful operation of the operator interface

3.13 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Start-up Testing: All testing listed in this article shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner's Representative is notified of the system demonstration.
 - 1. The Contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification
 - 2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight
 - 3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers' recommendations
 - 4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct
 - 5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel
 - 6. Verify that the system operation adheres to the Sequences of Operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum Start/Stop routines.
 - 7. Alarms and Interlocks
 - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm
 - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
 - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action

3.14 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration

- 1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed its own tests
- 2. The tests described in this section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, startup, and debugging process and as specified in the "Control System Checkout and Testing" Article in Part 3 of this specification.
- 3. The demonstration process shall follow that approved in Part 1: "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration
- 4. The Contractor shall provide a person equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point/object and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.
- 5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
- 6. Demonstrate compliance with Part 1: "System Performance
- 7. Demonstrate compliance with Sequences of Operation through all modes of operation
- 8. Demonstrate complete operation of Operator Workstation
- 9. Additionally, the following items shall be demonstrated:

- a. DDC Loop Response. The Contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
- b. Demand limiting. The Contractor shall supply a trend data output showing the action of the demand-limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting setpoint, and the status of shed-able equipment outputs.
- c. Optimum Start/Stop. The Contractor shall supply a trend data output showing the capability of the algorithm.
- d. Interface to the building fire alarm system if applicable
- e. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.
- B. Acceptance
 - 1. All tests described in this specification shall have been performed to the satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting the requirements of Completion. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Engineer. Such tests shall then be performed as part of the warranty.
 - 2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1: "Submittals."

3.15 CLEANING

- A. The Contractor shall clean up all debris resulting from its activities daily. The Contractor shall remove all cartons, containers, crates, etc., under its control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At the completion of work in any area, the Contractor shall clean all of its work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
- C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas

3.16 COMMISSIONING (ADDENDUM 1)

A. See Specification 01 91 00 for additional requirements pertaining to the responsibilities of the DDC Controls Contractor for commissioning.

END OF SECTION

SECTION 23 74 14 (ADDENDUM 1)

PACKAGED OUTDOOR CENTRAL-STATION AIR HANDLING UNITS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Rooftop HVAC Units (RTU) (Heat Pump with Auxillary Natural Gas Heating)

1.02 REFERENCES

- A. AFBMA 9 Load Ratings and Fatigue Life for Ball Bearings.
- B. AMCA 99—Standards Handbook
- C. AMCA 210—Laboratory Methods of Testing Fans for Rating Purposes
- D. AMCA 500—Test Methods for Louver, Dampers, and Shutters.
- E. AHRI 340/360 Unitary Large Equipment
- F. NEMA MG1—Motors and Generators
- G. National Electrical Code.
- H. NFPA 70—National Fire Protection Agency.
- I. SMACNA—HVAC Duct Construction Standards—Metal and Flexible.
- J. UL 900—Test Performance of Air Filter Units.

1.03 SUBMITTALS

- A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements.
- B. Product Data:
 - 1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, and electrical characteristics and connection requirements.
 - 2. Provide computer generated fan curves with specified operating point clearly plotted.
 - 3. Manufacturer's Installation Instructions.

1.04 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Provide instructions for installation, maintenance and service

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.
- B. Startup must be done by trained personnel experienced with rooftop equipment.
- C. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters and remote controls are in place, bearings lubricated, and manufacturers' installation instructions have been followed.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.
- B. Accept products on site and inspect for damage.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Daikin Applied
 - 1. No known equals [Deducts for alternative equipment will be considered.]

2.02 GENERAL DESCRIPTION

- A. Daikin Applied Rebel Single zone Heating and Cooling Unit(s), model DPS. The Daikin Rebel DPS unit(s) utilize heat pump technology with hybrid heating (auxillary natural gas heating), variable speed ECM motors, and modulating variable speed inverter scroll compressor(s). Furnish as shown on plans. Unit performance and electrical characteristics shall be per the job schedule.
- B. Configuration: Fabricate as detailed on prints and drawings:
 - 1. Return plenum / economizer section
 - 2. Filter section
 - 3. Cooling coil section
 - 4. Supply fan section
 - 5. Exhaust fan section
 - 6. Gas heating section.
 - 7. Condensing unit section
- C. The complete unit shall be cETLus listed.
- D. The unit shall be ASHRAE 90.1-2019 compliant and labeled.
- E. Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Each unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-410 Refrigerant and oil.
- F. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test and a final unit inspection.
- G. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
- H. Performance: All scheduled EER, IEER, capacities and face areas are minimum accepted values. All scheduled amps, kW, and HP are maximum accepted values that allow scheduled capacity to be met.
- I. Warranty: The manufacturer shall provide 12-month parts only warranty. Defective parts shall be repaired or replaced during the warranty period at no charge. The warranty period shall commence at startup or six months after shipment, whichever occurs first.

2.03 CABINET, CASING, AND FRAME

- A. Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 1" thick with an R-value of 7.0, and shall be 2 part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.
- B. Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-quality polyester resin topcoat. Finished, unabraded panel surfaces shall be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16" at 1,000 hours minimum exposure to an ASTM B117 salt spray environment. Measurements of results shall be quantified using ASTM D1654 in conjunction with ASTM D610 and ASTM D714 to evaluate blister and rust ratings.
- C. Service doors shall be provided on the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.

D. The unit base shall overhang the roof curb for positive water runoff and shall seat on the roof curb gasket to provide a positive, weathertight seal. Lifting brackets shall be provided on the unit base to accept cable or chain hooks for rigging the equipment.

2.04 OUTDOOR/RETURN/EXHAUST AIR SECTION

- A. Unit shall be provided with an outdoor air economizer section. The economizer section shall include outdoor, return, and exhaust air dampers. The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be parallel blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 1.5 cfm / square foot of damper area at 1" differential pressure in according with testing defined in AMCA 500. A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges. Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.
- B. Economizer assembly Fault Detection and Diagnostics (FDD) shall be 90.1, IECC, and California Title 24 compliant. MicroTech III controls shall display a warning, and write a warning to the BAS, if the economizer malfunctions in accordance with 90.1, IECC, and Title 24 specifications.

2.05 EXHAUST FAN

- A. Exhaust fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The exhaust fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.
- B. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
- C. The unit DDC controller shall provide building static pressure control. The unit controller shall provide proportional control of the exhaust fans from 25% to 100% of the supply air fan designed airflow to maintain the adjustable building pressure setpoint. The field shall mount the required sensing tubing from the building to the factory mounted building static pressure sensor.

2.06 FILTERS

A. Unit shall be provided with a draw-through filter section. The filter rack shall be designed to accept a 2" prefilter and a 4" final filter. The unit design shall have a hinged access door for the filter section. The manufacturer shall ship the rooftop unit with 2" MERV 8 and 4" MERV 14 filters.

2.07 COOLING COIL

- A. The indoor coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with a factory piped cooling coil and an ASHRAE 62.1 compliant double sloped drain pan.
- B. The direct expansion (DX) cooling coils shall be fabricated of seamless high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a

multi-row, staggered tube design with a minimum of 3 rows. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face active at all load conditions. All coils shall be factory leak tested with high pressure air under water.

- C. The cooling coil shall have an electronic controlled expansion valve. The unit controller shall control the expansion valve to maintain liquid subcooling and the superheat of the refrigerant system.
- D. The refrigerant suction lines shall be fully insulated from the expansion valve to the compressors.
- E. The drain pan shall be stainless steel and positively sloped. The slope of the drain pan shall be in two directions and comply with ASHRAE Standard 62.1. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall extend beyond the leaving side of the coil. The drain pan shall have a threaded drain connection extending through the unit base.

2.08 SUPPLY FAN

- A. Supply fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with fan blades that are continuously welded to the hub plate and end rim. The supply fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additonal maintenance.
- B. All fan assemblies shall be statically and dynamically balanced at the factory, including a final trim balance, prior to shipment.
- C. Supply fan and motor assembly combinations larger than 8 hp or 22" diameter shall be internally isolated on 1" deflection, spring isolators and include removable shipping tie downs.
- D. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
- E. The supply fan shall be capable of airflow modulation from 30% to 100% of the scheduled designed airflow. The fan shall not operate in a state of surge at any point within the modulation range.

2.09 VARIABLE AIR VOLUME CONTROL

A. The unit controller shall proportional control the ECM motors on the supply fan based on space temperature. The unit controller shall increase/decrease the speed of the supply fan in order to maintain the space temperature within its setpoint and deadband. The unit controller shall provide discharge air temperature control with the compressor modulation.

2.10 HEATING SECTION

- A. The rooftop unit shall include a natural gas heating section. The gas furnace design shall be one natural gas fired heating module factory installed downstream of the supply air fan in the heat section. The heating module shall be a tubular design with in-shot gas burners.
- B. Natural gas heating shall be factory programmed to be the primary/lead source for heating.
- C. The module shall be complete with furnace controller and control valve capable of 5:1 modulating operation.
- D. The heat exchanger tubes shall be constructed of stainless steel.
- E. The module shall have an induced draft fan that will maintain a negative pressure in the heat exchanger tubes for the removal of the flue gases.
- F. Each burner module shall have two flame roll-out safety protection switches and a high temperature limit switch that will shut the gas valve off upon detection of improper burner manifold operation. The induced draft fan shall have an airflow safety switch that will prevent the heating module from turning on in the event of no airflow in the flue chamber.

G. The factory-installed DDC unit control system shall control the gas heat module. Field installed heating modules shall require a field ETL certification. The manufacturer's rooftop unit ETL certification shall cover the complete unit including the gas heating modules.

2.11 HEAT PUMP HEATING

- A. Heat pump heating is to be factory programmed to the on-board controller, interfaced with the Delta DDC control system, and shall be factory programmed to be the secondary/auxiliary source for heating. The unit shall be factory provided with a natural gas furnace. The natural gas furnace shall be factory programmed to be primary/lead source for heating.
 - 1. The evaporator coil, condenser coil, compressors and refrigerant circuit shall be designed for heatpump operation. The refrigerant circuit shall contain a 4 way reversing valve for the heatpump operation. The outdoor coil shall have an electronic expansion valve to control the refrigerant flow. The unit controller shall modulate the expansion valve to maintain compressor operation within the compressor operational envelope.
 - 2. The refrigerant system shall have a pump-down cycle.
 - 3. The unit shall have a natural gas furnace for primary/lead heating. The heat pump heating operation shall be secondary/lag heating and shall be rotated to primary/lead heating if either of the following conditions occur:
 - a. If OAT is greater than or equal to a user defined/adjustable setpoint (see sequences of operation) and space temperature is less than setpoint, then natural gas heating cycle shall turndown and disable (if enabled) and heat pump heating cycle shall be iniated. See sequences of operation MI-6.1.
 - b. If fault occurs to gas furnace heating, heat pump heating cycle shall be initiated until fault and alarm is cleared. See sequences of operation MI-6.1.

2.12 CONDENSING SECTION

- A. Outdoor coils shall be cast aluminum, micro-channel coils. Plate fins shall be protected and brazed between adjoining flat tubes such that they shall not extend outside the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil. Each outdoor air coil shall be factory leak tested with high-pressure air under water.
- B. Fan motors shall be an ECM type motor for proportional control. The unit controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit from ambient condition of 25~120°F. Mechanical cooling shall be provided to 25° F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.
- C. The condenser fan shall be low noise blade design. Fan blade design shall be a dynamic profile for low tip speed. Fan blade shall be of a composite materia
- D. The unit shall have scroll compressors. One of the compressors shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the compressor to maintain the discharge air temperature. The inverter compressor shall have a separate oil pump and an oil separator for each compressor that routes oil back to the compressor instead of through the discharge line.
- E. Pressure transducers shall be provided for the suction pressure and head pressure. Temperature sensor shall be provided for the suction temperature and the refrigerant discharge temperature of the compressors. All of the above devices shall be an input to the unit controller and the values be displayed at the unit controller.
- F. Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for low head pressure compressor starting and increased compressor reliability. When there is a call for mechanical cooling the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.
- G. Each circuit shall be dehydrated and factory charged with R-410A Refrigerant and oil.

2.13 ELECTRICAL

- A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color-coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply fan motors shall have contactors and external overload protection. Knockouts shall be provided in the bottom of the main control panels for field wiring entrance.
- B. A GFI receptacle shall be unit mounted that is field powered.
- C. A single fused disconnect switch shall be provided for disconnecting electrical power at the unit. Disconnect switches shall be mounted internally to the control panel and operated by an externally mounted handle.

2.14 CONTROLS

- A. Provide a complete integrated microprocessor based Direct Digital Control (DDC) system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.
- B. The stand-alone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate stand alone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.
- C. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.
- D. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip.
- E. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to insure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.
- F. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:
 - 1. Return air temperature.
 - 2. Discharge air temperature.
 - 3. Outdoor air temperature.
 - 4. Space air temperature.
 - 5. Outdoor enthalpy, high/low.
- 6. Compressor suction temperature and pressure
- 7. Compressor head pressure and temperature
- 8. Expansion valve position
- 9. Condenser fan speed
- 10. Inverter compressor speed
- 11. Dirty filter indication.
- 12. Airflow verification.
- 13. Cooling status.
- 14. Control temperature (Changeover).
- 15. VAV box output status.
- 16. Cooling status/capacity.
- 17. Unit status.
- 18. All time schedules.
- 19. Active alarms with time and date.
- 20. Previous alarms with time and date.
- 21. Optimal start
- 22. Supply fan and exhaust fan speed.
- 23. System operating hours.
 - a. Fan
 - b. Exhaust fan
 - c. Cooling
 - d. Inndividual compressor
 - e. Heating
 - f. Economizer
 - g. Tenant override
- G. The user interaction with the keypad shall provide the following:
 - 1. Controls mode
 - a. Off manual
 - b. Auto
 - c. Heat/Cool
 - d. Cool only
 - e. Heat only
 - f. Fan only
 - 2. Occupancy mode
 - a. Auto
 - b. Occupied
 - c. Unoccupied
 - d. Tenant override
 - 3. Unit operation changeover control
 - a. Return air temperature
 - b. Space temperature
 - c. Network signal
 - 4. Cooling and heating change-over temperature with deadband
 - 5. Cooling discharge air temperature (DAT)
 - 6. Supply reset options
 - a. Return air temperature
 - b. Outdoor air temperature
 - c. Space temperature
 - d. Airflow (VAV)
 - e. Network signal
 - f. External (0-10 vdc)
 - g. External (0-20 mA)
 - 7. Temperature alarm limits

- a. High supply air temperature
- b. Low supply air temperature
- c. High return air temperature
- Lockout control for compressors.
- 9. Compressor interstage timers
- 10. Night setback and setup space temperature.
- 11. Building static pressure.
- 12. Economizer changeover
 - a. Enthalpy

8.

- b. Drybulb temperature
- 13. Currently time and date
- 14. Tenant override time
- 15. Occupied/unoccupied time schedule
- 16. One event schedule
- 17. Holiday dates and duration
- 18. Adjustable set points
- 19. Service mode
 - a. Timers normal (all time delays normal)
 - b. Timers fast (all time delays 20 sec)
- H. If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:
 - 1. Zone sensor with tenant override switch
 - 2. Zone sensor with tenant override switch plus heating and cooling set point adjustment. (Space Comfort Control systems only)
- I. To increase the efficiency of the cooling system the DDC controller shall include a discharge air temperature reset program for part load operating conditions. The discharge air temperature shall be controlled between a minimum and a maximum discharge air temperature (DAT) based on one of the following inputs:
 - 1. Airflow
 - 2. Outside air temperature
 - 3. Space temperature
 - 4. Return air temperature
 - 5. External signal of 1-5 vdc
 - 6. External signal of 0-20 mA
 - 7. Network signal

2.15 ROOF CURB

- A. A prefabricated heavy gauge galvanized steel, mounting curb shall be provided for field assembly on the roof decking prior to unit shipment. The roof curb shall be a full perimeter type with complete perimeter support of the air handling section and condensing section. The curb shall be a minimum of 14" high and include a nominal 2" x 4" wood nailing strip. Gasket shall be provided for field mounting between the unit base and roof curb.
- B. Roof mounting curb shall be factory built to match the slope of the existing roof deck. Existing roof slopes to be field verified by contractor.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

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- B. Install in accordance with NFPA 90A.
- C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb (sloped to match the existing roof deck) so that top face of curb is level.
- D. Locate remote panels where indicated on drawings.

3.03 SYSTEM STARTUP

- A. Prepare and start equipment. Adjust for proper operation. Provide certified manufacturer startup of equipment and adjust for proper operation as defined in the contract documents. (ADDENDUM 1)
- B. Certified Manufacturer startup technician shall coordinate with DDC Controls Contractor for TAB Agency during the factory startup of equipment. (ADDENDUM 1)

3.04 CLOSEOUT ACTIVITIES

A. See Division 1 for closeout submittals.

3.05 MAINTENANCE

- A. Provide service and maintenance of packaged roof top units for one year from Date of Substantial Completion.
- B. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.

3.06 COMMISSIONING (ADDENDUM 1)

A. See Specification 01 91 00 for additional requirements pertaining to the responsibilities of the HVAC Manufacturer for commissioning.

3.07 TRAINING (ADDENDUM 1)

- A. HVAC Equipment controller set-up, adjustments and units operation training shall be provided to the Owner's representative(s).
- B. HVAC Equipment Manufacturer's Representative(s) to provide training to Owner's Representative(s) for control board replacements and re-configuration to the original operational settings etc.

END OF SECTION



VACAVILLE ANNEX HVAC AND ROOFING REPLACEMENT DSA APPL #02-119811



SOLANO COMMUNITY COLLEGE DISTRICT 2000 NORTH VILLAGE PARKWAY

VACAVILLE, CA 95688

CHOOL EQUIPMENT ANCHORAGE	DSA ADMINISTRATIVE REQUIREMENTS
CHOOL EQUIPMENT ANOCHOCKAGE MPONENT ANCHORAGE NOTE: ICAL PLUMBING, AND ELECTRICAL COMPONENTS SHALL BE ANCHORED AND INSTALLED IS ANAPPROVED CONSTRUCTION DOCUMENTS. THE FOLLOWING SHALL BE ANCHORED ON BRACED TO MEET THE PORCE AND DISFLACEMENT SHALL BE ANCHORED ON BRACED TO MEET THE PORCE AND DISFLACEMENT SHALL BE ANCHORED ON BRACED TO MEET THE PORCE AND DISFLACEMENT SHALL BE ANCHORED ON BRACED TO MEET THE PORCE AND DISFLACEMENT SHALL BE ANCHORED ON BRACED TO MEET THE PORCE AND DISFLACEMENT SHALL BE ANCHORED ON BRACED TO MEET THE PORCE AND DISFLACEMENT SHALL BE ANCHORED ON BOBLE COUPMENT THAT IS PERMANENTLY ATTACHED (E.C. MIENTY ATTACHED SHALL NOLLDE ALL ELECTRICAL CONNECTION EXCEPT PLUGS FOR US VOLT RECEPTACLES HANN A FLEXIBLE CABLE. RARY, MOVABLE OR MOBILE COUPMENT SHILL IS HEAVIER THAN 400 POUNDS OR HAS TAT DIRECTLY SUPPORT THE COMPONENT IS REQUIRED TO BE RESTRAINED IN A US VOLT RECEPTACLES AND A FLEXIBLE CABLE. NOR MECHANICAL AND ELECTRICAL COMPONENTS SHALL BE POSITIVELY ATTACHED TO BE BUT RED TO DEMOSTRIATE DESIGN COMPLIANCE WITH THE REPRENCES NOTE BUT DIRED DUCTWORK, PIPING, AND CONDUIT, FLEXIBLE CONNECTIONS MUST MENT IN BOTH TRANSVERSE AND LONGTUDNAL DIRECTIONS. NENTS WEIGHING LESS THAN 400 POUNDS AND HAVING A CENTER OF MASS LOCATED DUCTWORK, PIPING, AND CONDUT, FLEXIBLE CONNECTIONS MUST MENT IN BOTH TRANSVERSE AND LONGTUDNAL DIRECTIONS. NENTS WEIGHING LESS THAN 400 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR IN THE CASE OF DISTRIBUTED SYSTEMS, NENTS WEIGHING LESS THAN 20 POUNDS, OR INTEL CASE OF DISTRIBUTION S	 DSA ADJMINIST RATIVE REQUIRENTS A COPY OF PARTS 1 THRU 6, TILE 24, C.G.R. SHALL BE KEPT ON THE JOB SITE AT ALL TIMES. ALL CONSTRUCTION CHANGE DOCUMENTS AND ADDENDA TO BE SIGNED BY THE ARCHITECT AND THE OWNER AND APPROVED BY DSA. CONSTRUCTION CHANGE DOCUMENTS ARE NOT VAUD UNTIL APPROVED BY DSA SECTION 4-335, FART 1, TILE 24. ALL TESTS TO CONFORM TO THE REQUIREMENTS OF SECTION 4-335, PART 1, TILE 24, AND APPROVED BY TA 1 ESTICE 24. ALL TESTS TO CONFORM TO THE REQUIREMENTS OF SECTION 4-335, PART 1, TILE 24, AND THE DISTIRCT SHALL BE UN ACCORDANCE WITH SECTION 4-335 OF PART 1, TILE 24, AND THE DISTIRCT SHALL BELING ON AND PART THE LABORATORY. COSTS OF RACT 1, TILE 24, AND THE DISTIRCT SHALL BELING ON AND PART TO THE PLACEMENT OF CONNERTE THAT BE BEACH 04-331, TART 1, TILE 24. INSPECTOR SHALL BE APPROVED BY DSA. INSPECTION SHALL BE IN ACCORDANCE WITH SECTION 4-342, PART 1, TILE 24. INSPECTOR SHALL BE APPROVED BY DSA. INSPECTION SHALL BE IN ACCORDANCE WITH SECTION 4-342, PART 1, TILE 24. CONTRACTOR, INSPECTOR, ARCHITECT AND ENGINEERS SHALL SUBMIT VERIFIC REPORTS (FORM SSS-6) IN ACCORDANCE WITH SECTION 4-343, PART 1, TILE 24. CONTRACTOR, INSPECTOR, ARCHITECT AND ENGINEERS SHALL SUBMIT VERIFIC REPORTS (FORM SSS-6) IN ACCORDANCE WITH SECTION 4-343, PART 1, TILE 24. CONTRACTOR, INSPECTOR, AND DOTIS TILE 24, CALIFORNIA CODE OF REGULATIONS (CCF). CHARGES TO THE APPROVED BY THE 24, CALIFORNIA CODE OF THE SIGNE OF THE STATE ARCHITECT, AS REQUIRED BY SECTION 4-336, PART 1, TILE 24, COR. A DSA CERTIFICTION CHARGED DOCUMENT (CCC) APPROVED BY THE DISTIRCT (OWNER) AND APPROVED BY THE DISTIRCT OWNER) AND AP
	 20. PROJECT INSPECTOR WILL COLLECT THE FORMS TO CONFIRM THAT THE REQUIRED ACCEPTANCE TESTS HAVE BEEN COMPLETED. 21. ENVELOPE AND PROCESS EQUIPMENT ACCEPTANCE TESTS SHALL BE PERFORMED BY THE INSTALLING CONTRACTOR, ENGINEER/ARCHITECT OF RECORD OR THE OWNER'S AGENT.
DEFERRED APPROVAL	BUILDING DATA
CODETECTION WILLE ANNEX BUILDING IS AN EXISTING BUILDING THAT WAS CONSTRUCTED PRIOR TO IR 9–2 SECTION 2.2 FOR EXISTING BUILDINGS, THE ROOFTOP HVAC REPLACEMENT NORTH ROOF THAT SERVE CLASSROOMS IS AN EQUAL REPLACEMENT OF RNING FORCED-AIR FURNACE EQUIPMENT AND THEREFORE CO DETECTION IS NOT	 LOCATION: 2000 NORTH VILLAGE PARKWAY APPLICANT: SOLANO COMMUNITY COLLEGE DISTRICT NUMBER OF STORIES: 1 CONSTRUCTION TYPE: V-B OCCUPANCY GROUPS: B / A-3 ROOF CLASSIFICATION: CLASS 'A' USE: CLASSROOM AREA: 16,400 S.F. (& 5,112 SF OF EXTERIOR COVERED WALKWAY) TOTAL AREA: 21,512 S.F. NOTES: 1.) FOR INFORMATION ONLY PER "VACAVILLE CLASSROOM BUILDING (ANNEX) RENOVATION PROJECT" (DSA APPL#: 02-116082). 2.) THE OCCUPANCY OF EXISTING STRUCTURES AS DESCRIBED IN THE PROJECT INFORMATION CONTINUE WITHOUT CHANGE PER THE APPROVED DSA APPLICATION NUMBER (CBC 102.6). 3.) NO OCCUPANCY CHANGE, SIGNIFICANT ALTERATION, OR INCREASE IN SQUARE FOOTAGE IS PROPOSED FOR THIS PROJECT SCOPE OF WORK. 4.) BUILDINGS DO NOT REQUIRE THE ADDITION OF SPRINKLERS. EXISTING BUILDING CONDITIONS AND CONSTRUCTION TYPE WILL BE MAINTAINED. 5.) PROJECT SCOPE WILL NOT TRIGGER ANY STRUCTUREAL IMPROVEMENTS BEYOND STRUCTUREAL
(BID-ALTERNATE #1) SERVES OFFICE SPACES AND DOES NOT REQUIRE CO DETECTION.	 ROOF FRAMING FOR HVAC RELATED EQUIPMENT. SCOPE IS LIMITED TO ROOF AND HVAC REPLACEMENTS. 6.) BUILDING REHABILITATION HAS NOT BEEN REQUESTED BY THE DISTRICT. THE SCOPE FOR THE REHABILITATION PROJECT REFERENCED IN NOTE #1, BROUGHT EXISTING BUILDING IN COMPLIANCE WITH 2016 CBC. 7.) SEISMIC MITIGATION IS NOT INCLUDED IN THE SCOPE OF THIS PROJECT.
BID-ALTERNATE #1) SERVES OFFICE SPACES AND DOES NOT REQUIRE CO DETECTION.	 ROOF FRAMING FOR HVAC RELATED EQUIPMENT. SCOPE IS LIMITED TO ROOF AND HVAC REPLACEMENTS. BUILDING REHABILITATION HAS NOT BEEN REQUESTED BY THE DISTRICT. THE SCOPE FOR THE REHABILITATION PROJECT REFERENECED IN NOTE #1, BROUGHT EXISTING BUILDING IN COMPLIANCE WITH 2016 CBC. SEISMIC MITIGATION IS NOT INCLUDED IN THE SCOPE OF THIS PROJECT.
BID-ALTERNATE #1) Serves office spaces and does not require co detection. BID-ALTERNATE #1) Serves office spaces and does not require co detection. BID-ALTERNATE #1) Serves office spaces and does not require co detection. BID-ALTERNATE #1) Serves office spaces and does not require co detection. BID-ALTERNATE #1) Serves office spaces and does not require co detection. BID-ALTERNATE #1) Serves office spaces and does not require co detection. INDEX DRAWINGS SPECIFICATIONS AND/OR CALCULATIONS FOR THE ITEMS LISTED BELOW PREPARE DOCUMENTS HAVE BEEN COORDINATES OR CONSULTANTS WHO ARE LICENSED INDEX DRAWINGS HAVE BEEN COORDINATED WITH MY PLANS AND SPECIFICATIONS AND ABLE FOR INCORPORATION INTO THE CONSTRUCTION OF THIS PROJECT FOR WHICH I HAVE ATED RESPONSIBILITY FOR THIS PORTION OF THE WORK) IMALE BID BID INDEX DRAWINGS HAVE BEEN COORDINATED WITH MY PLANS AND SPECIFICATIONS AND ABLE FOR INCORPORATION INTO THE CONSTRUCTION OF THIS PROJECT FOR WHICH I HAVE ATED RESPONSIBILITY FOR THIS PORTION OF THE WORK) Imale BID BID Iter Architect/Engineer Date Iter Architect/Engineer Imale Imale Imale Expiration Date	 ROOF FRAMING FOR HVAC RELATED EQUIPMENT. SCOPE IS LIMITED TO ROOF AND HVAC REPLACEMENTS. BUILDING REHABILITATION HAS NOT BEEN REQUESTED BY THE DISTRICT. THE SCOPE FOR THE REHABILITATION PROJECT REFERENCED IN NOTE #1, BROUGHT EXISTING BUILDING IN COMPLIANCE WITH 2016 CBC. SEISMIC MITIGATION IS NOT INCLUDED IN THE SCOPE OF THIS PROJECT. SPECIAL REQUIRED FOR BOTH FIRE SPRINKLERS AND FIRE ALARM SYSTEM – IF SPRINKLER HEADS AND FIRE ALARM DEVICES ARE BEING REMOVED AND REINSTALLED. A FIRE WATCH WILL BE REQUIRED IN AN OCCUPIED BUILDING WHEN THE FA AND/OR FS SYSTEM HAS IMPAIRMENTS. SYSTEMS OUT OF SERVICE SHALL MEET ALL REQUIREMENTS OF CFC 901.7 AND PROJECT SHALL HAVE AN ASSIGNED IMPAIRMENT COORDINATOR PER CFC 901.7.1. FA/FS IMPAIRMENT PLAN SHALL BE CONSULTED AND SUBMITTED TO LOCAL SFM DEPUTY ASSIGNED TO PROJECT. FIRE PROOFING - TYPE IIA (ONE HOUR) - EXISTING FIRE PROOFING DAMAGE DUE TO REMODELING/TENANT IMPROVEMENTS WILL NEED TO BE REPAIRED AND WILL BE REQUIRED TO HAVE SPECIAL INSPECTION PER CBC 1705.14. DISTRICT SHALL BE NOTIFIED OF HVAC AND POWER OUTAGES. A DETAILED OUTAGE PLAN SHALL BE SUBMITTED TO THE DISTRICT A MINIMUM OF TWO WEEKS PRIOR TO THE SHUTDOWN. REFER TO BID ALTERNATE SCOPE OF WORK ON THIS SHEET.

ROOFING SUMMARY OF WORK	DRAWING INDEX (38 SHEETS)
ROOFING:	SHEET NO. DESCRIPTION
 ROOFING: REMOVE EXISTING 3 PLY BUILT UP ROOF (MECHANICALLY ATTACHED ½ INCH FIBERBOARD, 2 PLY SHEETS IN HOT ASPHALT, AND CAP SHEET SURFACING IN HOT ASPHALT). PROVIDE MINIMUM 2–1/2 INCHES OF POLYISOCYANURATE INSULATION OR 3–1/2 INCHES OF MEPS INSULATION TO MEET CALIFORNIA ENERGY CODE REQUIREMENTS. PROMS TAPERED INSULATION CRICKETS TO PROMOTE OPTIMUM DRAINAGE. ADHERE MINIMUM 1/4 NICH THICK REINFORCED GYPSUM BOARD OVER THE INSULATION USING RIBBONS OF LOW ARSE SPRAY FOAM. SECURE IN ACCORDANCE WITH FM AND MANUFACTURER APPROVED FASTENING PATTERNS BASED ON UPLIFT CALCULATIONS IN ACCORDANCE WITH ASCE 7–16. PROVIDE FULLY ADHERED 80 MIL FLEECE BACK PVC SINGLE PLY ROOFING OVER THE GYPSUM BOARD AND INSULATION. SECURE IN ACCORDANCE WITH MANUFACTURER. MEET OR EXCEED REFLECTIVITY AND EMITTANCE REQUIREMENTS OF THE CALIFORNIA ENERGY CODE. ELEVATE PIPES, CONDUITS, CURBS, PLATFORMS, AND COUNTERFLASHINGS AS NEEDED TO PROVIDE MINIMUM 8 INCH HIGH ROOF BASEFLASHINGS. PROVIDE COUNTER FLASHING AS INDICATED. PROVIDE SHEET METAL CHASE FLASHINGS FOR GANGED PIPES, CONDUITS, AND CONTROLS IN ACCORDANCE WITH NRCA ROOFING AND WATERPROOFING MANUAL. PROVIDE SHEET METAL CHASE FLASHINGS FOR GANGED PIPES, CONDUITS, AND CONTROLS IN ACCORDANCE WITH NRCA ROOFING AND WATERPROOFING MANUAL. PROVIDE SHEET METAL (MINIMUM 22 GA GSM) UNDER CAP BETWEEN MECHANICAL PACKAGE UNITS AND THEIR SUPPORT CURBS TO COLLECT WATER THAT MAY INTRUDE THROUGH MECHANICAL UNITS AND DIRECT THE WATER TO THE EXTERIOR. PROVIDE OSHA COMPLIANT RAILING AND GATE AT THE ROOF HATCHES. PROVIDE SHEET METAL COPINGS (24 GA GSM WITH KYNAR FINISH, COMPLIANT WITH ANSI/SPRI 	SHEET NO. DESCRIPTION G-0.0 GENERAL COVER SHEET G-0.1 GENERAL NOTES G-0.2 GENERAL CAMPUS SITE MAP A-0.0 ARCHITECTURAL SYMBOLS & ABBREVIATIONS A-0.1 ARCHITECTURAL ROOF WIND UPLIFT ZONES AD-1.2 ARCHITECTURAL ROOF PLAN - DEMO A-1.2 ARCHITECTURAL ROOF PLAN - NEW A-5.1 ARCHITECTURAL DETAILS A-5.2 ARCHITECTURAL DETAILS M-0.0 MECHANICAL FIRST FLOOR PLAN - NEW M-1.1 MECHANICAL FIRST FLOOR PLAN - DEMO M-1.2 MECHANICAL ROOF PLAN - DEMO M-1.2 MECHANICAL ROOF PLAN - NEW MD-1.2 MECHANICAL ROOF PLAN - NEW MD-1.2 MECHANICAL ROOF PLAN - NEW MD-1.2 MECHANICAL SCHEDULES M-6.1 MECHANICAL SCHEDULES M-6.2 MECHANICAL CONTROL SYSTEM ARCHITECTURE & SCHEMATICS P-0.0 PLUMBING GENERAL NOTES, SYMBOLS & ABBREVIATIONS PD-1.1 PLUMBING FIRST FLOOR PLAN - NEW PD-1.2 PLUMBING ROOF PLAN - NEW PD-1.2 PLUMBING ROOF PLAN - NEW PD-1.2 PLUMBING ROOF PLAN - NEW PD-1.2
ES-1) FOR THE UPPER ROOF. 10. PROVIDE A 30 YEAR NDL MANUFACTURER'S WARRANTY WITH COVERAGE FOR CODE LEVEL WINDS (NOMINAL 95 MPH) AND INCLUDES THE SHEET METAL COPINGS IN THE COVERAGE.	E-1.1ELECTRICALFIRSTFLOORPLAN-NEW $ED-1.2$ ELECTRICALROOFPLAN -DEMO $E-1.2$ ELECTRICALROOFPLAN -NEW $E-5.1$ ELECTRICALDETAILS $E-6.1$ ELECTRICALSCHEDULES $E-7.1$ ELECTRICALSINGLEELECTRICALSINGLELINEDIAGRAM
MECHANICAL: 1. BEFORE REMOVAL OF ANY EXISTING ROOFTOP MECHANICAL EQUIPMENT, FIELD SURVEY ALL INVOLVED RELATED EXISTING CONDITIONS. 2. DEMOLISH EXISTING, PROVIDE AND INSTALL NEW TEN (10) PACKAGE ROOFTOP UNITS (RTU'S), AND ONE (1) EXHAUST FAN. COORDINATE WORK WITH CONCURENT ROOFING REPACEMENT PROJECT BY OTHERS.	S-0.1 STRUCTURAL GENERAL NOTES & ABBREVIATIONS S-1.1 STRUCTURAL EXISTING ROOF FRAMING PLAN - NEW WORK S-5.1 STRUCTURAL DETAILS S-5.2 STRUCTURAL DETAILS
 REMOVE EXISTING ROOFTOP PLUMBING VENTS AND REINSTALL AT A MINIMUM HEIGHT OF 12" ABOVE THE FINISHED ROOFTOP SURFACE. RELOCATE ROOFTOP PLUMBING VENTS TO A MINIMUM OF 10 FEET AWAY FROM AC-UNIT OUTSIDE AIR INTAKE HOODS AS NEEDED. ALL MECHANICAL, PATCHING, REPAIR, RIGGING, CONTROLS & BALANCE WORK & REPORT RELATED TO THE ABOVE. PROVIDE PRE AND POST-CONSTRUCTION AIR BALANCE AND AIR BALANCE REPORT(S) FOR ALL INVOLVED AIR SYSTEMS, IN ACCORDANCE WITH AIRFLOW VALUES LISTED IN MECHANICAL SCHEDULES, AND BASED ON ENGINEER'S REVIEW/RECOMMENDATIONS OF THE PRE-CONSTRUCTION AIR BALANCE REPORT(S). PROVIDE NEW DISTRICT STANDARD DELTA DDC SYSTEM INFRASTRUCTURE INCLUDING (BUT NOT LIMITED TO) CONTROL PANEL(S), CONTROLLERS, DEVICES, SENSORS, CONTROL WIRING/CONDUITS, PROGRAMMING, FRONT END GRAPHICS AND CONTROL INTERFACE(S) WITH NEW HVAC EQUIPMENT AS REFLECTED ON DRAWINGS AND IN BOOK SPECIFICATIONS. 	 PROVIDE LONG TERM, LOW MAINTENANCE, ROOF COVERING. INSTALLED ROOFING MEMBRANE AND BASE FLASHING SYSTEMS SHALL REI WATERTIGHT: AND RESIST SPECIFIED WIND UPLIFT PRESSURES, THERMALL' INDUCED MOVEMENT, AND EXPOSURE TO WEATHER WITHOUT FAILURE. INTEGRATE ROOF SYSTEM WITH WALLS AND OTHER COMPONENTS IN A WEATHERTIGHT AND WIND RESISTANT MANNER. COMPLY WITH NRCA ROOFING AND WATERPROOFING MANUAL, SMACNA ARCHITECTURAL SHEET METAL MANUAL, AND MANUFACTURER'S INSTRUCTIC COMPOSITION OF ROOF COVERING, AND FLASHING ASSEMBLY SHALL MATC TESTED, RATED REQUIREMENTS FOR WATER RESISTANCE, FIRE RESISTANC ATTACHMENT, AND ADHESION.
	A. EXTERNAL FIRE – UL 790 (ASTM E 108), CLASS A. B. THERMAL RESISTANCE – MINIMUM R14 LTTR MINIMUM (ROOF COVERIN
ELECTRICAL SUMMARY OF WORK	ALONE). C. COMPLY WITH EMITTANCE AND REFLECTIVITY REQUIREMENTS OF THE CALIFORNIA ENERGY CODE.
 <u>ELECTRICAL</u>: 1. DEMO POWER TO EXISTING HVAC EQUIPMENT INCLUDING DISCONNECT SWITCH AND BREAKERS. 2. PROVIDE POWER TO NEW HVAC EQUIPMENT, INCLUDING NEW BREAKERS, FEEDERS, DISCONNECTS, AND MISC COMPONENTS REQUIRED TO FACILITATE POWER CONNECTIONS. 	 D. WIND LOADS – ASCE 7–16, OCCUPANCY CATEGORY III ALLOWABLE STRESS DESIGN (EQUIVALENT TO NOMINAL 95 MPH), TERRAIN EXPOSU B, CALCULATED VIA NRCA ROOF SYSTEM DESIGN WIND-LOAD ANALYSIS SOFTWARE WITH A MEAN ROOF HEIGHT OF 20 FEET, PERIMETER CURBS/PARAPETS LESS THAN 3 FEET (SOUTH ROOF), FOR A BUILDIN APPROXIMATELY 162 X 215 FEET IN SIZE. E. TESTED WIND RESISTANCE – FM 4474.
FIRE ALARM SUMMARY OF WORK	1) MINIMUM WIND RESISTANCE: A) CENTER (ZONE 1'), Z 3 DSE V SAFETY FACTOR OF $2 - 14.7$ (
FIRE ALARM: 1. FIRE ALARM WORK IN SUPPORT OF NEW HVAC EQUIPMENT. 2. MODIFICATIONS TO EXISTING FIRE ALARM SYSTEM IN SUPPORT OF MECHANICAL WORK.	 B) FIELD (ZONE 1): 7.0 FOR X ON ETT FACTOR OF 2 = 14.7 FOUNDATION OF 2 = 14.7 FOUNDATION OF 2 = 25.5 PS UTILIZING FM 1-60 ATTACHMENT PATTERNS (NOTE ZONE 1' ARE NOT USED). C) PERIMETER (ZONE 2): 16.8 PSF X SAFETY FACTOR OF 2 = 33 PSF UTILIZING FM 1-60 ATTACHMENT PATTERNS. D) CORNER (ZONE 3): 22.9 PSF X SAFETY FACTOR OF 2 = 45.8 UTILIZING FM 1-60 ATTACHMENT PATTERNS. F. MEMBRANE INSULATION SECUREMENT - FM LPDS 1-29.
BID ALTERNATES	G. HAIL RESISTANCE – MODERATE. H. CORROSION RESISTANCE – HIGH.
ALTERNATES AFFECTING DSA REGULATED ITEMS ARE TO BE FULLY DETAILED ON PLANS. ALTERNATE #1 - ADDITIVE RE-ROOFING AT THE SOUTH ROOF. DO PROVIDE BOLT-ON, OSHA COMPLIANT RAILING AT ROOF HATCH. DEMOLISH THE EXISTING EXHAUST FAN (EF-1) AND FRESH AIR INTAKE (FAI) HOOD ON THE SOUTH ROOF, CONDENSING UNIT (CU-1) ON NORTH ROOF, AND THE FAN COIL UNIT (FC-1) IN THE FIRST FLOOR ATTIC SPACE. PROVIDE RTU-11, UTILITY CONNECTIONS, AND THE FAN COIL UNIT CONTROLS AS INDICATED. RECOVER AND RECYCLE REFRIGERANT FROM FC-1 AND CU-1 SPLIT SYSTEM.	 WARRANTY - MANUFACTURER'S "FULL SYSTEM" NDL WARRANTED PERFORMANCE INCLUDING MEMBRANE, INSULATION, SOUTH ROOF COPIL AND FASTENERS, AGAINST LEAKAGE, PREMATURE DEGRADATION, AND DISPLACEMENT FROM WIND SPEED UP TO AND INCLUDING 95 MPH. ROOF COVERING ASSEMBLY COMPOSITION SHALL MATCH TESTED, RATEL REQUIREMENTS FOR WATER RESISTANCE, FIRE RESISTANCE, ATTACHMEN AND ADHESION. K. CONSIDER REQUIREMENTS IN OTHER SECTIONS. ADJUST INSTALLATIONS NEEDED, TO ASSURE WATER TIGHTNESS AND COMPLY WITH MANUFACTI WARRANTY REQUIREMENTS. AESTHETIC: NEAT AND CLEAN FINISHED INSTALLATION APPROVED BY THE OWNER'S PROJECT MANAGER.





GENERAL NOTES

THE POT IDENTIFIED IN THESE CONSTRUCTION DOCUMENTS MEETS THE REQUIREMENTS OF THE CURRENT APPLICABLE CALIFORNIA BUILDING CODE (CBC) ACCESSIBILITY PROVISIONS FOR PATH OF TRAVEL REQUIREMENTS FOR ALTERATIONS, ADDITIONS AND STRUCTURAL REPAIRS. AS PART OF THE DESIGN OF THIS PROJECT, THE POT WAS EXAMINED AND ANY ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WERE DETERMINED TO NON-COMPLIANT WITH THE CBC HAVE BEEN IDENTIFIED AND THE CORRECTIVE WORK NECESSARY TO BRING THEM INTO COMPLIANCE HAS BEEN INCLUDED WITHIN THE SCOPE OF THIS PROJECT'S WORK THROUGH DETAILS, DRAWINGS AND SPECIFICATIONS INCORPORATED INTO THESE CONSTRUCTION DOCUMENTS. ANY NONCOMPLIANT ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WILL NOT BE CORRECTED BY THIS PROJECT BASED ON VALUATION THRESHOLD LIMITATIONS OR A FINDING OF UNREASONABLE HARDSHIP ARE INDICATED IN THESE CONSTRUCTION DOCUMENTS.

DURING CONSTRUCTION, IF POT ITEMS WITHIN THE SCOPE OF THE PROJECT REPRESENTED AS CBC COMPLIANT ARE FOUND TO BE NONCONFORMING BEYOND REASONABLE CONSTRUCTION TOLERANCES, THE ITEMS SHALL BE BROUGHT INTO COMPLIANCE WITH THE CBC AS PART OF THIS PROJECT BY MEANS OF A CONSTRUCTION CHANGE DOCUMENT.

PATH OF TRAVEL, TECHNICAL REQUIREMENTS FOR ACCESSIBLE ROUTE ACCESSIBLE PATH OF TRAVEL AS INDICATED ON PLAN IS A BARRIER-FREE ACCESS ROUTE WITHOUT ABRUPT LEVEL CHANGES EXCEEDING 1/2" IF BEVELED AT 1:2

MAXIMUM SLOPE OR VERTICAL LEVEL CHANGES NOT EXCEEDING 1/4" MAXIMUM AND AT LEAST 48" IN WIDTH. SURFACE IS STABLE, FIRM AND SLIP-RESISTANT. CROSS-SLOPE SHALL NOT BE STEEPER THAT 1:48 AND SLOPE IN THE DIRECTION OF TRAVEL SHALL NOT BE STEEPER THAT 1:20. ACCESSIBLE PATH OF TRAVEL SHALL BE MAINTAINED FREE OF OVERHANGING OBSTRUCTIONS TO 80" MINIMUM AND FREE OF OBJECTS PROTRUDING MORE THAN 4" FROM THE WALL ABOVE 27" AND LESS THAN 80" ABOVE FLOOR.





 ARCHITECTURAL ROOF PLAN - DEMO

 SCALE: 1/8" = 1' - 0"

GENERAL NOTES

- A. DEMOLITION NOTES ARE GUIDELINES. SPECIFIC QUANTITIES AND SPECIFIC LOCATIONS OF ITEMS TO BE REMOVED SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO FIELD VERIFY.
- B. FURNISH, INSTALL AND MAINTAIN TEMPORARY BARRIERS, FENCES, GUARD RAILS, BARRICADES, AND WARNING DEVICES FOR PEDESTRIANS AND WORKERS AS MAY BE REQUIRED BY GOVERNING AUTHORITIES TO THIS PROJECT.
- PROVIDE DUST BARRIERS AROUND OPENINGS TO AND FROM AREA OF CONSTRUCTION. COORDINATE LOCATIONS WITH OWNER'S REPRESENTATIVE.
- . REMOVE DEBRIS FROM SITE AND LEAVE CONSTRUCTION AREA BROOM CLEANED DAILY.
- . UNLESS NOTED OTHERWISE, DAMAGE TO EXISTING WALLS, CEILINGS, AND/OR ROOF STRUCTURES DUE TO THIS CONSTRUCTION SHALL BE REPAIRED TO MATCH ORIGINAL EXISTING CONDITION.
- SCHEDULE THE WORK AND PROVIDE PROTECTION FOR THE INTERIOR OF THE BUILDING FROM DUST AND RAIN AT ALL TIMES. ENSURE WATER DOES NOT FLOW BENEATH OR WICK INTO ANY COMPLETED SECTION OF THE ROOF AND BUILDING ENVELOPE.
- G. VERIFY IN FIELD EXISTING ROOF DECK SLOPE FROM EXISTING ROOF RIDGE(S). H. SEE BID ALTERNATES ON COVER SHEET, G-0.0

REFERENCE SHEET NOTES (#)

- . DEMOLISH EXISTING ROOF MEMBRANE, BUILT UP ROOFING, AND INSULATION.
- 2. DEMOLISH EXISTING CRICKETS, BUILT UP ROOFING, AND INSULATION.
- 3. DEMOLISH EXISTING ROOF PLATFORMS AT EXISTING MECHANICAL HVAC UNITS.
- 4. DEMOLISH EXISTING AC UNIT ROOF CURB, ROOFING, AND FLASHING.
- 5. TEMPORARILY REMOVE EXISTING ACCESS HATCH FOR RE-ROOF.
- 6. DEMOLISH PIPE FLASHING.
- 7. TEMPORARILY REMOVE FOR RE-ROOF.
- 8. DEMOLISH EXISTING EF-2 ROOF CURB, ROOFING, AND FLASHING.

ALTERNATE BID ITEM (#1:

GUTTER (TYP)

- 21. DEMOLISH EXISTING EF-1 ROOF CURB, ROOFING, AND FLASHING.
- 22. DEMOLISH EXISTING GAI HOOD ROOF CURB, ROOFING, AND FLASHING.
- 23. DEMOLISH EXISTING CU-1 SLEEPERS/PLATFORM, ROOFING, AND FLASHING.







 ARCHITECTURAL ROOF PLAN - NEW

 SCALE: 1/8" = 1' - 0"

	GENERAL NUTES
A.	METAL ROOFING AND GUTTERS ARE NOT IN CONTRACT.
В.	FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3 OR $4/A-5.1$ AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL $1/A-5.2$.
C.	PROVIDE DUST BARRIERS AROUND OPENINGS TO AND FROM AREA OF CONSTRUCTION. COORDINATE LOCATIONS WITH OWNER'S REPRESENTATIVE.
D.	REMOVE DEBRIS FROM SITE AND LEAVE CONSTRUCTION AREA BROOM CLEAN DAILY.
E.	UNLESS NOTED OTHERWISE, DAMAGE TO EXISTING WALLS, CEILINGS, AND/OR ROOF STRUCTURES DUE TO THIS CONSTRUCTION SHALL BE REPAIRED TO MATCH ORIGINAL EXISTING CONDITIONS.
F.	SCHEDULE THE WORK AND PROVIDE PROTECTION FOR THE INTERIOR OF THE BUILDING FROM DUST AND RAIN AT ALL TIMES. ENSURE WATER DOES NOT FLOW BENEATH OR WICK INTO ANY COMPLETED SECTION OF THE ROOFING A BUILDING ENVELOPE.
G.	SEE BID ALTERNATES ON COVER SHEET, G-0.0.
Η.	ALL PLUMBING VENTS SHALL BE A MINIMUM OF 10 FEET FROM AIR INTAKES
١.	SEE REROOFING PERFORMANCE REQUIREMENTS ON G-0.0.
	REFERENCE SHEET NOTES
1.	REMOVE AND REINSTALL EXISTING ACCESS HATCH AS NEEDED. PROVIDE OSH COMPLIANT GUARDRAIL WITH HINGED GATE. PROVIDE FLASHING AT ROOF HAT CURB AS PER DETAIL 4/A-5.2.
2.	MINIMUM 1/4:12 COUNTER SLOPE FOR CRICKETS (TYP), REFER TO DETAIL 9/A-5.1.
3.	PROVIDE ROOF DRAINS AND OVERFLOWS AS INDICATED AND AS PER DETAIL & 2B/A-5.1.
4	
4.	PROVIDE DRAIN SUMP AS PER DETAIL 10/A–5.1.
4. 5.	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1.
4. 5. 6.	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1.
4. 5. 6. 7.	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1.
 4. 5. 6. 7. 8. 	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1. WALL FLASHING AS PER DETAIL 7/A-5.1.
4. 5. 6. 7. 8. 9.	 PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1. WALL FLASHING AS PER DETAIL 7/A-5.1. PROVIDE HOOD FLASHING OVER EXISTING ATTIC WALL VENTS (TYP) AS PER 3/A-5.2.
 4. 5. 6. 7. 8. 9. 10. 	 PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1. WALL FLASHING AS PER DETAIL 7/A-5.1. PROVIDE HOOD FLASHING OVER EXISTING ATTIC WALL VENTS (TYP) AS PER 3/A-5.2. PROVIDE ROOF TO STUCCO WALL FLASHING AS PER DETAIL 5/A-5.2.
 4. 5. 6. 7. 8. 9. 10. 11. 	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1. WALL FLASHING AS PER DETAIL 7/A-5.1. PROVIDE HOOD FLASHING OVER EXISTING ATTIC WALL VENTS (TYP) AS PER 3/A-5.2. PROVIDE ROOF TO STUCCO WALL FLASHING AS PER DETAIL 5/A-5.2. FLASH SOFFIT AS PER DETAIL 2/A-5.2.
 4. 5. 6. 7. 8. 9. 10. 11. 12. 	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1. WALL FLASHING AS PER DETAIL 7/A-5.1. PROVIDE HOOD FLASHING OVER EXISTING ATTIC WALL VENTS (TYP) AS PER 3/A-5.2. PROVIDE ROOF TO STUCCO WALL FLASHING AS PER DETAIL 5/A-5.2. FLASH SOFFIT AS PER DETAIL 2/A-5.2. PROVIDE FLASHING AT SOUTH ROOF PERIMETER WALL AS PER DETAIL 7/A-5
 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1. WALL FLASHING AS PER DETAIL 7/A-5.1. PROVIDE HOOD FLASHING OVER EXISTING ATTIC WALL VENTS (TYP) AS PER 3/A-5.2. PROVIDE ROOF TO STUCCO WALL FLASHING AS PER DETAIL 5/A-5.2. FLASH SOFFIT AS PER DETAIL 2/A-5.2. PROVIDE FLASHING AT SOUTH ROOF PERIMETER WALL AS PER DETAIL 7/A-3 PROVIDE FLASHING AT SOUTH METAL ROOF TO SINGLE PLY ROOF AS PER DETAIL 6/A-5.2.
 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 	PROVIDE DRAIN SUMP AS PER DETAIL 10/A-5.1. PROVIDE ROOF COVERING ASSEMBLY AS PER DETAIL 1/A-5.1. PROVIDE RTU UNIT EQUIPMENT ROOF CURB. FLASH RTU UNIT CURB AS PER DETAIL 5/A-5.1. PROVIDE EF-2 EQUIPMENT ROOF CURB. FLASH EXHAUST FAN CURB AS PER DETAIL 6/A-5.1. WALL FLASHING AS PER DETAIL 7/A-5.1. PROVIDE HOOD FLASHING OVER EXISTING ATTIC WALL VENTS (TYP) AS PER 3/A-5.2. PROVIDE ROOF TO STUCCO WALL FLASHING AS PER DETAIL 5/A-5.2. FLASH SOFFIT AS PER DETAIL 2/A-5.2. PROVIDE FLASHING AT SOUTH ROOF PERIMETER WALL AS PER DETAIL 7/A-5 PROVIDE FLASHING AT SOUTH METAL ROOF TO SINGLE PLY ROOF AS PER DETAIL 6/A-5.2. PROVIDE WALK PADS FROM THE ROOF ACCESS HATCH TO ALL MECHANICAL HVAC UNITS. WALK PADS TO BE MAXIMUM 30" WIDE WITH 4" GAPS EVERY 6







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 MECHANICAL FIRST FLOOR PLAN - DEMO

 SCALE: 1/8" = 1' - 0"

GENERAL NOTES

- A. REFER TO GENERAL NOTES ON G-0.0.
- B. REFER TO ARCHITECTURAL DRAWINGS FOR THE WORK RELATED TO ROOFING. CEILING TILES SHALL BE REMOVED WITHOUT DAMAGE PRIOR TO CONDUCTING CONSTRUCTION ACTIVITIES IN THE CEILING SPACE. PRESERVE AND PROTECT CEILING TILES FOR INSTALLATION UPON COMPLETION OF NEW WORK. DAMAGED CEILING TILES ARE TO BE REPLACED BY CONTRACTOR.
- CONTRACTOR TO VERIFY THE OPERATION OF THE EXISTING MOTORIZED CONTROL DAMPERS AT FC-1 ZONES AND NOTIFY ENGINEER OF CURRENT CONDITION (I.E. ARE THEY OPERATIONAL OR NOT?). IF THE MOTORIZED CONTROL DAMPERS ARE NOT OPERATIONAL, THEY SHALL BE REPLACED.
- PROVIDE PRE-CONSTRUCTION AIR BALANCE REPORT FOR THE AIR SYSTEMS INVOLVED BEFORE THE EXISTING MECHANICAL EQUIPMENT REMOVAL, LISTING THE FOLLOWING (BUT NOT LIMITED TO) ITEMS: (1) EXISTING SYSTEM DESIGNATION SUCH AS NAMEPLATE, MODEL #, SN #, SIZE; (2) TYPE OF CONTROL THE SYSTEM WAS UNDER AT THE TIME OF TESTING; (3) OUTSIDE AIR TEMPERATURE; (4) SYSTEM FAN MOTOR NAME PLATE DATA AND RELATED ELECTRICAL CHARACTERISTICS; (5) FAN DATA; (6) ESP, ISP AND TSP DATA; (7) FLOORPLAN INDICATING MEASURED AIRFLOWS AT EXISTING AIR OUTLETS/INLETS (I.E. DIFFUSERS, GRILLES, OR REGISTERS).
- . SEE BID ALTERNATES ON COVER SHEET, G-0.0.
- BASE BID 'DEMO WORK' FOR OFFICES, ADMINISTRATION, AND CONFERENCE ROOM AREAS AT SOUTH SIDE OF BUILDING SHALL BE AS FOLLOWS: ALL EXISTING CONTROLS AT EXISTING TO REMAIN SPLIT SYSTEM FC-1/CU-1 AND EF-1 SHALL BE DEMOLISHED, SUCH AS DEMOLISH EXISTING ZONE, BYPASS, AND ECONOMIZER DAMPER ACTUATORS FOR EXISTING TO REMAIN CONTROL DAMPERS AND ASSOCIATED CONTROLLER, ZONE T-STATS, BYPASS CONTROLLER, AND ASSOCIATED SYSTEM/EQUIPMENT CONTROLLER.

REFERENCE SHEET NOTES

- MECHANICAL DEMO PORTION OF THE EXISTING SUPPLY AND RETURN DUCT RISERS THRU THE EXISTING TO BE REMOVED ROOF CURB DOWN TO ATTIC SPACE. SUPPORT REMAINING PORTIONS OF THE EXISTING SUPPLY AND RETURN DUCT RISERS LEOR RECONNECTION TO NEW DUCT RISERS IN ATTIC
- DEMOLISH SUPPLY AIR DUCT, BALANCING DAMPERS, HANGERS, BRACING, AND DIFFUSERS.
- DEMOLISH RETURN AIR DUCT, BALANCING DAMPERS, HANGERS, BRACING, AND REGISTERS/GRILLES.
- . PRESERVE AND PROTECT IN PLACE SUPPLY AND RETURN AIR DUCT AND BALANCING DAMPERS BETWEEN THE DUCT RISERS AND THE DIFFUSERS, REGISTERS, AND GRILLES.

CONTROLS:

- DEMOLISH EXISTING THERMOSTATS ASSOCIATED WITH AC-1 THROUGH AC-7. DEMOLISH CONTROLS CABLE BETWEEN AC UNIT AND THERMOSTAT.
- . DEMOLISH THE THREE EXISTING THERMOSTATS ASSOCIATED WITH FC-1 MOTORIZED ZONE DAMPERS. DEMOLISH THERMOSTAT CONTROL WIRING.
- . EXISTING DUCT DETECTOR TO BE DISCONNECTED AND PROTECTED DURING CONSTRUCTION BY MECHANICAL CONTRACTOR. EXISTING DUCT DETECTOR, CONDUIT, WIRES, CIRCUITRY, AND CONNECTION TO FACP ARE TO BE REUSED. SEE FIRE ALARM DRAWINGS.

ALTERNATE BID ITEM (#

MECHANICAL:

- 20. DEMOLISH EXISTING FC-1 UNIT AND EQUIPMENT SUPPORTS/BRACING WITHIN THE ATTIC SPACE. RECOVER AND RECYCLE REFRIGERANT AND DEMOLISH REFRIGERANT PIPING FROM FC-1 TO CU-1, SEE MD-1.2.
- 21. DEMOLISH EXISTING BYPASS AIR DUCT, EXHAUST AIR DUCT, AND OUTSIDE AIR INTAKE DUCTWORK. DEMOLISH ASSOCIATED DUCT SUPPORTS/BRACING.

CONTROLS:

- 30. DEMOLISH EXISTING FC-1 ECONOMIZER MOTORIZED DAMPERS AT BYPASS, EXHAUST, AND OUTSIDE AIR INTAKE DUCTWORK. DEMOLISH ASSOCIATED SIGNAL WIRF
- 31. DEMOLISH EXISTING BYPASS CONTROLLER AT FC-1 SUPPLY DUCTWORK. DEMOLISH ASSOCIATED SIGNAL WIRE.
- 32. EXISTING DUCT DETECTOR TO BE DISCONNECTED AND PROTECTED DURING CONSTRUCTION BY MECHANICAL CONTRACTOR. EXISTING DUCT DETECTOR, CONDUIT, WIRES, CIRCUITRY, AND CONSTRUCTION TO FACP ARE TO BE REUSED. SEE FIRE ALARM DRAWINGS.

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 MECHANICAL FIRST FLOOR PLAN - NEW

 SCALE: 1/8" = 1' - 0"

GENERAL NOTES

- REFER TO GENERAL NOTES ON G-0.0, MECHANICAL ROOF PLAN M-1.2, MECHANICAL DETAILS ON M-5.1, MECHANICAL SCHEDULES ON M-6.1, AND CONTROLS ON M-7.1.
- . PROVIDE POST-CONSTRUCTION AIR BALANCE REPORT FOR THE AIR SYSTEMS INVOLVED AFTER EQUIPMENT INSTALLATION, LISTING THE FOLLOWING (BUT NOT LIMITED TO) ITEMS: (1) SYSTEM DESIGNATION SUCH AS NAMEPLATE, MODEL # SN#, SIZE; (2) TYPE OF CONTROL THE SYSTEM WAS UNDER AT THE TIME OF TESTING; (3) OUTSIDE AIR TEMPERATURE; (4) SYSTEM FAN MOTOR NAME PLATE DATA AND RELATED ELECTRICAL CHARACTERISTICS; (5) FAN DATA; (6) ESP, ISP AND TSP DATA; (7) FLOOR PLAN INDICATING MEASURED AIRFLOWS AT EXISTING
- AND NEW AIR OUTLETS/INLETS (I.E. DIFFUSERS, GRILLES, OR REGISTERS). REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR THE WORK RELATED TO ROOF FRAMING, NEW ROOF CURBS, ROOF FLASHING, AND ROOF
- DRAINS. D. REFER TO BOOK SPECIFICATIONS.
- CEILING TILES SHALL BE REMOVED WITHOUT DAMAGE PRIOR TO CONDUCTING CONSTRUCTION ACTIVITIES IN THE CEILING SPACE. PRESERVE AND PROTECT CEILING TILES FOR INSTALLATION UPON COMPLETION OF NEW WORK. DAMAGED CEILING TILES ARE TO BE REPLACED.
- FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3 OR 4/A-5.1 AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL 1/A-5.2.
- G. SEE BID ALTERNATES ON COVER SHEET, G-0.0.
- . DUCT SUPPORTS SHALL BE PROVIDED AS DETAILED ON M-5.1. REFER TO DUCT SUPPORT DETAILS FOR SPACING REQUIREMENTS AND INSTALLATION. BASE BID 'NEW WORK' FOR OFFICES, ADMINISTRATION, AND CONFERENCE ROOM
- AREAS AT SOUTH SIDE OF BUILDING SHALL BE AS FOLLOWS: PROVIDE MAINTENANCE TO EXISTING SPLIT SYSTEM FC-1/CU-1 AND EF-1 EQUIPMENT.
- PROVIDE AND INSTALL NEW CONTROLS FOR EXISTING TO REMAIN SPLIT SYSTEM FC-1/CU-1 AND EF-1, SUCH AS NEW ZONE, BYPASS, AND ECONOMIZER DAMPER ACTUATORS FOR EXISTING TO REMAIN CONTROL DAMPERS, ZONE T-STATS, SUPPLY AND RETURN AIR TEMPERATURE TRANSMITTERS, DUCT STATIC PRESSURE SENSOR, AND DIGITAL LOGIC CONTROLLER FOR SYSTEM OPERATION. PROGRAM CONTROLS AS PER SEQUENCES OF OPERATION ON MI-6.1.

REFERENCE SHEET NOTES

MECHANICAL:

PROVIDE AND INSTALL NEW SUPPLY AND RETURN DUCT RISERS TO BE CONNECTED TO NEW AC UNITS THROUGH NEW ROOF CURB (WITH DUCT CAPS) AND CONNECT TO REMAINING EXISTING SUPPLY AND RETURN DUCT RISERS IN ATTIC. PROVIDE OFFSETS IN THE RISERS AS REQUIRED FOR PROPPER

- CONNECTIONS. PROVIDE ASSOCIATED DUCT SUPPORTS. REFER TO SHEET NO 1/M-1.2 AND DETAIL 7/M-5.1. -----
- PROVIDE VOLUME BALANCING DAMPER ON DUCT TAKE-OFFS TO DIFFUSERS, GRILLES, AND REGISTERS. INSTALL A MINIMUM OF TWO DUCT DIAMETERS FROM THE DUCT TAKEOFF AND A MINIMUM OF SEVEN FEET FROM THE DIFFUSER, GRILLE, OR REGISTER.
- INSTALL FLEXIBLE DUCT TO THE AIR DIFFUSER, GRILLE OR REGISTER WITH 5 FEET MAXIMUM LENGTH. SEE DETAIL 3/M-5.1.
- PROVIDE SUPPLY AIR DUCT, TRANSITIONS, FLEXIBLE DUCT, DIFFUSERS, AND SUPPORTS. SEE DETAIL 3/M-5.1 FOR CEILING DIFFUSER MOUNTING AND DETAIL 6/M-5.1 FOR DUCT SUPPORTS.
- PROVIDE RETURN AIR DUCT, TRANSITIONS, FLEXIBLE DUCT, AND REGISTERS/GRILLES. SEE DETAIL 3/M-5.1 FOR CEILING REGISTER/GRILLE MOUNTING AND DETAIL 6/M-5.1 FOR DUCT SUPPORTS.

<u>CONTROLS:</u>

- 10. PROVIDE AND INSTALL MASTER THERMOSTATS RTU—1 THROUGH RTU—10. T'STATS FOR CLASSROMS SHALL BE EQUIPED WITH HUMIDITY SENSORS (READ ONLY) AND AN INPUT FROM THE RTU'S FACTORY PROVIDED AND DDC VENDOR INSTALLED CO2 SENSORS FOR DEMAND CONTROL VENTILATION. INTEGRATE WITH RESPECTIVE ROOFTOP UNIT(S) CONTROLS AND CONNECT TO NEW DELTA BMS.
- INSTALL (RTU) FACTORY PROVIDED STATIC PRESSURE SAMPLING TUBING. COORDINATE WITH MECHANICAL SUBCONTRACTOR FOR THE ROUTING AND INSTALLATION OF THE FACTORY PROVIDED STATIC PRESSURE TUBING. STATIC PRESSURE TUBING SHALL BE ROUTED TO THE SPACE, DRILL THROUGH CEILING TILE WHERE NECESSARY. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. INTEGRATE WITH ROOFTOP RTU UNIT AND CONNECT TO NEW DELTA BMS.
- 2. RECONNECT DUCT SMOKE DETECTOR TO EXISTING FIRE ALARM CIRCUIT. CONNECT TO NEW RTU'S CONTROLS RELAY FOR FAN SHUTDOWN OPERATION. RETEST DUCT DETECTOR UPON REINSTALLATION. SEE FIRE ALARM DRAWINGS
- 3. PROVIDE AND INSTALL ROOM SENSORS FOR EXISTING FCU-1 ZONES AND INTEGRATE CONTROLS WITH NEW DELTA MOTORIZED ZONE DAMPER CONTROLLERS. CONNECT THERMOSTATS TO NEW DELTA BMS.
- 4. PROVIDE AND INSTALL DELTA MOTORIZED DAMPER CONTROLLERS AND INTEGRATE WITH THERMOSTATS. CONNECT DAMPER CONTROLLERS TO NEW DELTA BMS. (IF DAMPER ASSEMBLIES ARE DETERMINED TO BE NON-OPERATIONAL, ENTIRE DAMPER ASSEMBLY TO BE REPLACED PER GENERA NOTE ON MD-1.1)
- 15. PROVIDE AND INSTALL READ ONLY SPACE STATIC PRESSURE SENSOR AND CONNECT TO NEW DELTA BMS.
- 16. PROVIDE AND INSTALL NEW DELTA CONTROLS DDC TEMPERATURE CONTROL PANEL IN IDF ROOM AS SHOWN. COORDINATE ELECTRICAL POWER REQUIREMENTS WITH ELECTRICAL SUB-CONTRACTOR.

ALTERNATE BID ITEM #1: Y

- MECHANICAL:
- 20. PROVIDE SUPPLY AIR DUCT, TRANSITIONS, FLEXIBLE DUCT, DIFFUSERS, AND SUPPORTS. SEE DETAIL 3/M-5.1 FOR CEILING DIFFUSER MOUNTING AND DETAIL 6/M-5.1 FOR DUCT SUPPORTS.
- 1. PROVIDE RETURN AIR DUCT, TRANSITIONS, FLEXIBLE DUCT, AND REGISTERS/GRILLES. SEE DETAIL 3/M-5.1 FOR CEILING REGISTER/GRILLE MOUNTING AND DETAIL 6/M-5.1 FOR DUCT SUPPORTS.

<u>CONTROLS:</u>

- 30. PROVIDE AND INSTALL STATIC PRESSURE SENSOR IN MAIN SUPPLY AIR DUCT OF RTU-11, UPSTREAM OF TRANSITIONS TO DUCT BRANCHES. CONNECT TO NEW DELTA BMS.
- . RECONNECT DUCT SMOKE DETECTOR TO EXISTING FIRE ALARM CIRCUIT. CONNECT TO NEW RTU'S CONTROLS RELAY FOR FAN SHUTDOWN OPERATION. RETEST DUCT DETECTOR UPON REINSTALLATION. SEE FIRE ALARM DRAWINGS.
- 32. INTEGRATE RTU-11 ZONE ROOM SENSORS WITH ROOFTOP RTU UNIT, MOTORIZED ZONE DAMPERS, AND CONNECT TO NEW DELTA BMS.
- 33. PROVIDE AND INSTALL MASTER THERMOSTAT. INTEGRATE WITH RTU-11 AND CONNECT TO THE NEW DELTA BMS.
- 34. INSTALL (RTU) FACTORY PROVIDED STATIC PRESSURE SAMPLING TUBING. COORDINATE WITH MECHANICAL SUBCONTRACTOR FOR THE ROUTING AND INSTALLATION OF THE FACTORY PROVIDED STATIC PRESSURE TUBING. STATIC PRESSURE TUBING SHALL BE ROUTED TO THE SPACE, DRILL THROUGH CEILING TILE WHERE NECESSARY. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. INTEGRATE WITH ROOFTOP RTU UNIT AND CONNECT TO NEW DELTA BMS.
- 35. PROVIDE AND INSTALL READ ONLY SPACE STATIC PRESSURE SENSOR AND CONNECT TO NEW DELTA BMS.

1 MECHANICAL ROOF PLAN - DEMO SCALE: 1/8" = 1' - 0"

GENERAL NOTES

Α.	REFER TO GENERAL NOTES ON G-0.0,
В.	COORDINATE HVAC UNITS DEMO/DISPOSAL WITH THE BUILDING'S FACILITIES OPERATIONS AND RE-ROOFING. BUILDING SHALL BE WATER TIGHT AT THE OF EACH DAY.
C.	PROVIDE PRE-CONSTRUCTION AIR BALANCE REPORT FOR THE AIR SYSTEMS INVOLVED BEFORE THE EXISTING MECHANICAL EQUIPMENT REMOVAL, LISTING THE FOLLOWING (BUT NOT LIMITED TO) ITEMS: (1) EXISTING SYSTEM DESIGNATION SUCH AS NAMEPLATE, MODEL #, SN #, SIZE; (2) TYPE OF CONTROL THE SYSTEM WAS UNDER AT THE TIME OF TESTING; (3) OUTSIDE TEMPERATURE; (4) SYSTEM FAN MOTOR NAME PLATE DATA AND RELATED ELECTRICAL CHARACTERISTICS; (5) FAN DATA; (6) ESP, ISP AND TSP DATA; FLOORPLAN INDICATING MEASURED AIRFLOWS AT EXISTING AIR OUTLETS/INL (I.E. DIFFUSERS, GRILLES, OR REGISTERS).
D.	REFER TO PLUMBING DRAWINGS FOR EXTENT OF CONDENSATE DRAIN AND DEMOLITION.
Ε.	REFER TO ARCHITECTURAL DRAWINGS FOR THE WORK RELATED TO ROOFING
F.	SEE BID ALTERNATES ON COVER SHEET, G-0.0.
G.	BASE BID 'DEMO WORK' FOR OFFICES, ADMINISTRATION, AND CONFERENCE ROOM AREAS AT SOUTH SIDE OF BUILDING SHALL BE AS FOLLOWS:
<u>م</u>	EXISTING GAI-AND EE-1-TO-REMAIN
7	
#	REFERENCE SHEET NOTES

- 1. DISCONNECT FROM EXISTING DUCTWORK, ROOF CURB AND UTILITIES' CONNECTIONS AND DEMOLISH EXISTING AC UNITS.
- 2. DISCONNECT FROM EXISTING DUCTWORK, ROOF CURB AND ELECTRICAL CONNECTIONS AND DEMOLISH EXISTING EXHAUST FAN, EF-2
- 3. DEMOLISH EXISTING AC UNITS AND EXHAUST FAN ROOF CURBS. PRESERVE AND PROTECT DUCT RISERS.

ALTERNATE BID ITEM #1: 1

- 20. DISCONNECT FROM EXISTING DUCTWORK, ROOF CURB AND ELECTRICAL CONNECTIONS AND DEMOLISH EXISTING EXHAUST FAN, EF-1.
- 21. DISCONNECT FROM EXISTING DUCT WORK AND ROOF CURB AND DEMOLISH FAI HOOD.
- 22. DEMOLISH EXISTING EXHAUST FAN ROOF CURB. DEMOLISH DUCT RISER TO BELOW ROOF DECK AND CAP ROOF OPENING.23. DEMOLISH EXISTING FAI HOOD ROOF CURB. PRESERVE AND PROTECT DUCT
- RISERS. 24. DISCONNECT FROM EXISTING REFRIGERANT PIPING, SUPPORTS, AND ELECTRICAL CONNECTIONS AND DEMOLISH EXISTING CONDENSING UNIT, CU-1.
- 25. RECOVER AND RECYCLE REFRIGERANT AND DEMOLISH REFRIGERANT PIPING FROM CU-1 TO FC-1, SEE ALSO MD-1.1.

 MECHANICAL ROOF PLAN - NEW

 SCALE: 1/8" = 1' - 0"

GENERAL NOTES

- A. REFER TO GENERAL NOTES ON G-0.0, MECHANICAL FLOOR PLAN M-1.1, MECHANICAL DETAILS ON M-5.1, MECHANICAL SCHEDULES ON M-6.1, AND CONTROLS ON MI-6.1 AND MI-6.2.
- B. PROVIDE POST-CONSTRUCTION AIR BALANCE REPORT FOR THE AIR SYSTEMS INVOLVED AFTER EQUIPMENT INSTALLATION, LISTING THE FOLLOWING (BUT NOT LIMITED TO) ITEMS: (1) EXISTING SYSTEM DESIGNATION SUCH AS NAMEPLATE, MODEL #, SN#, SIZE; (2) TYPE OF CONTROL THE SYSTEM WAS UNDER AT THE TIME OF TESTING; (3) OUTSIDE AIR TEMPERATURE; (4) SYSTEM FAN MOTOR NAME PLATE DATA AND RELATED ELECTRICAL CHARACTERISTICS; (5) FAN DATA; (6) ESP, ISP AND TSP DATA; (7) LIST/TABLE OF EXISTING AIR OUTLETS AND
- INLETS MEASURED AIR FLOWS AND ASSOCIATED SCHEMATICS.C. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR THE WORK RELATED TO ROOF FRAMING, NEW ROOF CURBS, ROOF FLASHING, AND ROOF DRAINS.
- D. REFER TO BOOK SPECIFICATIONS.
 E. REFER TO PLUMBING DRAWINGS FOR CONDENSATE DRAIN, HOSE BIBB, AND GAS DESIGN.
- F. FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3 OR 4/A-5.1 AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL 1/A-5.2.
- G. SEE BID ALTERNATES ON COVER SHEET, G-0.0.
- H. ALL PLUMBING VENTS SHALL BE A MINIMUM OF 10 FEET FROM AIR INTAKES.
 I. BASE BID 'NEW WORK' FOR OFFICES, ADMINISTRATION, AND CONFERENCE ROOM AREAS AT SOUTH SIDE OF BUILDING SHALL BE AS FOLLOWS:
 PROVIDE MAINTENANCE TO EXISTING SPLIT SYSTEM FC-1/CU-1 AND EF-1 EQUIPMENT.

REFERENCE SHEET NOTES

MECHANICAL:

- 1. PROVIDE AND INSTALL NEW PACKAGE RTU. PROVIDE AND INSTALL NEW, INSULATED SUPPLY AND RETURN DUCT RISERS. PROVIDE DUCT TRANSITIONS IN RISERS AS REQUIRED. WHERE EXISTING DUCT RISERS WERE PROTECTED IN PLACE, PROVIDE AND INSTALL DUCT TRANSITIONS FOR CONNECTION OF RTU TO EXISTING SUPPLY AND RETURN AIR DUCT RISERS. COORDINATE WITH ELECTRICAL, CONTROLS AND ROOFING SUBCONTRACTORS.
- 2. PROVIDE AND INSTALL NEW EXHAUST FAN ON NEW RAISED ROOF CURB AT THE SAME LOCATION. PROVIDE NEW VERTICAL EXHAUST DUCT EXTENSION AND RECONNECT TO EXISTING EXHAUST DUCT BELOW ROOF. COORDINATE WITH ELECTRICAL, CONTROLS AND ROOFING SUBCONTRACTORS. SEE DETAIL 10/M-5.1.

CONTROLS:

- 10. PROVIDE DDC CONTROL POINTS AND CONTROL WIRING AS REQUIRED. PROGRAM NEW RTU AND EXHAUST FAN UNITS AS REQUIRED PER SEQUENCE OF OPERATION. COORDINATE WITH MECHANICAL, ELECTRICAL AND BALANCING SUB-CONTRACTORS.
- 11. PROVIDE NEW FRONT-END SYSTEM/SOFTWARE AND ASSOCIATED GRAPHICS AS REQUIRED TO ACCOMMODATE NEW CONTROL POINTS AND RELATED SEQUENCE OF OPERATION.
- 12. PROVIDE AND INSTALL GLOBAL OUTSIDE AIR TEMPERATURE SENSOR FOR INTEGRATED RTU'S ECONOMIZER CONTROL AND CONNECT TO BMS SYSTEM BY DELTA CONTROLS.

ALTERNATE BID ITEM #1:

MECHANICAL:

20. PROVIDE AND INSTALL NEW PACKAGE UNIT, RTU-11. PROVIDE AND INSTALL NEW, INSULATED RETURN DUCT RISER. EXISTING FRESH AIR INTAKE (FAI) DUCT RISER TO BE USED AS SUPPLY DUCT FOR RTU-11, PROVIDE NEW INSULATION LINER. PROVIDE DUCT TRANSITIONS IN RISERS AS REQUIRED FOR CONNECTION TO RTU AND TO EXISTING DUCT. COORDINATE WITH ELECTRICAL, CONTROLS, AND ROOFING SUBCONTRACTOR.

CONTROLS:

21. PROVIDE DDC CONTROL POINTS AND CONTROL WIRING AS REQUIRED. PROGRAM NEW RTU-11 AS REQUIRED PER SEQUENCE OF OPERATION, SEE MI-6.1. COORDINATE WITH MECHANICAL, ELECTRICAL, AND BALANCING SUBCONTRACTORS.

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MARK	SERVICE	ROOM FUNCTION	MAKE	MODEL	NOM. TONS	MIN OA CFM	CFM	SUPPLM ESP (IN. WG)	Y FAN HP	FLA (AMPS)	P CFM	OWERED H ESP (IN. WG)	EXHAUST HP	FAN FLA (AMPS)	COO SENS. (BTU/HR)	DLING TOTAL (BTU/HR)	INPUT (BTU/HR)	GA OUTPUT (BTU/HR)	AS HEATING EAT (F)	LAT (F)	EFF. %	HEA CAPACITY (BTU/HR)	T PUMP H EAT (F)	EATING - (LAT (F)	FOR FUTURE AMBIENT (F)	E) COP AT 47F	VOLT/PH/ HERTZ	MCA (AMPS)	FLA (AMPS)	MOCP (AMPS)	EER/ SEER	REF.	OPER. WEIGHT (LBS)	NOTES
RTU-1	RM. 101	CLASSROOM	DAIKIN	DPS004A	4.0	375	1,830	0.75	2.3	2.3	1,740	0.50	1.3	1.4	46,600	49,163	80,000	64,000	60.0	92.2	80%	42,453	70	91.2	47.0	3.94	460/3/60	9.7	8.6	15	11.8/16.2	2 R-410	1,422	1 - 14, 16
RTU-2	RM. 102	CLASSROOM	DAIKIN	DPS003A	3.0	380	995	0.75	2.3	2.3	945	0.50	1.3	1.4	32,000	35,214	80,000	64,000	60.0	119.3	80%	42,453	70	99.1	47.0	4.06	460/3/60	8.5	7.6	15	12.6/16.1	I R-410	1,407	1 - 8, 10 - 14, 16
RTU-3	RM. 103	CLASSROOM	DAIKIN	DPS005A	5.0	750	1,465	0.75	4.0	4.0	1,390	0.50	1.3	1.4	53,200	67,784	80,000	64,000	60.0	100.3	80%	52,380	70	102.7	47.0	3.98	460/3/60	13	11.7	15	12.5/17.0	5 R-410	1,487	1 - 14, 16
RTU-4	RM. 104	CLASSROOM	DAIKIN	DPS005A	5.0	750	1,465	0.75	4.0	4.0	1,390	0.50	1.3	1.4	53,100	67,784	80,000	64,000	60.0	100.3	80%	52,380	70	102.7	47.0	3.98	460/3/60	13	11.7	15	12.5/17.0	5 R-410	1,487	1 - 8, 10 - 14, 16
RTU-5	RM. 105	CLASSROOM	DAIKIN	DPS005A	5.0	750	1,345	0.75	4.0	4.0	1,280	0.50	1.3	1.4	50,500	67,249	80,000	64,000	60.0	103.9	80%	51,553	70	105.1	47.0	3.98	460/3/60	13	11.7	15	12.5/17.0	5 R-410	1,487	1 - 8, 10 - 14, 16
RTU-6	RM. 106	COMPUTER LAB	DAIKIN	DPS007A	7.5	1,050	2,680	0.75	2.3	2.3	2,545	0.50	2.3	2.3	85,700	91,716	200,000	160,000	60.0	115.0	80%	78,096	70	96.6	47.0	3.58	460/3/60	17	15.7	20	11.7/18.8	8 R-410	2,232	1 - 14, 16
RTU-7	RM. 120	LOUNGE	DAIKIN	DPS006A	6.0	795	2,380	1.50	4.0	4.0	2,260	0.50	2.3	2.3	71,400	78,346	80,000	64,000	60.0	84.8	80%	65,632	70	95.2	47.0	3.69	460/3/60	15.7	14	20	11.2/18.8	8 R-410	1,502	1 - 14
RTU-8	MAIN CORRIDOR & RM. 111, 112, 114-119	ADMIN, OFFICES, MEN/WOMEN TOILETS, & MAIN CORRIDOR	DAIKIN	DPS006A	6.0	410	1,680	1.50	4.0	4.0	1,595	0.50	1.3	1.4	72,100	71,130	80,000	64,000	60.0	95.1	80%	62,674	70	104.1	47.0	3.69	460/3/60	14.8	13.1	20	11.2/18.8	8 R-410	1,487	1 - 14
RTU-9	RM. 107	CLASSROOM	DAIKIN	DPS005A	5.0	750	1,765	0.75	4.0	4.0	1,675	0.50	1.3	1.4	58,200	68,831	80,000	64,000	60.0	93.4	80%	53,933	70	97.9	47.0	3.98	460/3/60	13	11.7	15	12.5/17.0	5 R-410	1,487	1 - 8, 10 - 14, 16
RTU-10	RM. 108	CLASSROOM	DAIKIN	DPS006A	6.0	750	2,165	0.75	4.0	4.0	2,055	0.50	1.3	1.4	65,600	77,267	80,000	64,000	60.0	87.2	80%	64,951	70	97.4	47.0	3.69	460/3/60	14.8	13.1	20	11.2/18.8	8 R-410	1,487	1 - 14, 16
RTU-11	RM. 121 - 129	RECEPTION, CONFERENCE RM'S, COPY ROOM, OFFICES, & TOILETS	DAIKIN	DPS007A	7.5	760	3,290	1.50	4.0	4.0	3,125	0.50	2.3	2.3	88,300	90,968	200,000	160,000	60.0	104.8	80%	79,395	70	92.1	47.0	3.63	460/3/60	18.8	17.4	20	12.1/19.3	3 R-410	2,257	1 - 15

1) RTU UNITS ARE EQUIPPED WITH HEAT PUMP TECHNOLOGY WITH AUXILIARY GAS HEATING. GAS HEATING SHALL BE PROGRAMMED AS THE PRIMARY SOURCE OF HEATING, HEAT PUMP HEATING SHALL BE PROGRAMMED AS THE SECONDARY/AUXILIARY HEATING CYCLE. 2) UNIT EQUIPPED WITH GAS HEAT. INCOMING GAS PRESSURE TO BE MIN. 5 IN W.C. AND MAX. 14 IN W.C.. GAS HEAT TURNDOWN MODULATION = 5:1 **3) POWERED, DIRECT DRIVE, ECM EXHAUST FAN TO MODULATE WITH BUILDING PRESSURE CONTROL.** 4) DIRECT DRIVE ECM SUPPLY FAN

5) PROVIDE MIN. 14" HIGH (ABOVE ROOF DECK) PRE-FABRICATED EQUIPMENT CURB SLOPED TO MATCH THE <E> ROOF DECK 6) 0-100% ECONOMIZER WITH DRY BULB CONTROL. ECONOMIZER DAMPER ACTUATORS AND LINKAGES ARE TO BE PROVIDED BY THE FACTORY. 7) AIR OPENINGS TO BE AT THE BOTTOM OF THE RTU FOR DOWN DISCHARGE.

8) FACTORY INSTALLED SENSORS INCLUDE: LEAVING COIL/ENTERING FAN TEMPERATURE SENSOR, DUCT HIGH LIMIT SWITCH, BACNET/MSTP CARD, RAT & DAT SENSOR, DIRTY FILTER ON/OFF SWITCH, SUPPLY FAN PROVING VIA MODBUS, DUCT STATIC PRESSURE, BUILDING STATIC PRESSURE. 9) EXISTING DUCT SMOKE DETECTOR IN THE MAIN SUPPLY-AIR DUCT TO BE REUSED. AUTOMATIC SHUTOFF SHALL BE ACCOMPLISHED BY INTERRUPTING THE POWER SOURCE OF THE RTU UPON DETECTION OF SMOKE. RTU(S) WITH LESS THAN 2,000 CFM WILL REUSE EXISTING DETECTORS, WHERE OCCURS, AS AN ADDITIONAL BENEFIT. 10) EER AND SEER ARE BASED ON AHRI 210 CERTIFIED DATA AND STANDARD CONDITIONS

11) COMPRESSOR(S) TO BE INVERTER SCROLL TYPE WITH MODULATING CONTROL VIA INVERTER

12) EXTERIOR CONSTRUCTION TO BE PAINTED GALVANIZED STEEL. THE INSULATION AND LINERS ARE TO BE COMPOSED OF 1" INJECTED FOAM, R-7, WITH GALVANIZED STEEL LINER.

13) FACTORY PROVIDED FUSED DISCONNECT.

14) FACTORY PROVIDED, FIELD POWERED 115V GELOUTLET (15) BID ALTERNATE #1. PROVIDE FACTORY INSTALLED OAT SENSOR IN ADDITION TO THE SENSORS DESCRIBED IN NOTE 8. 16) FACTORY PROVIDED CO2 SENSOR FOR DEMAND CONTROL VENTILATION SHALL BE INCLUDED FOR ALL RTU'S SERVING CLASSROOMS.

					EXHA	AUST	FAN S	CHEI	DULE						
	MARK	SERVICE	ROOM FUNCTION	MAKE	MODEL	CFM	RPM	ESP	HP	VOLT/PH/ HERTZ	MCA (AMPS)	MOCP (AMPS)	FLA (AMPS)	OPER. WEIGHT (LBS)	NOTES
	EF-2	RM. 109, 110, 111, 112	JANITOR CLOSET, ELECTRICAL, MEN/WOMEN TOILETS	GREENHECK	G-140-VG	1,600	1275	0.83	3/4	115/60/1	11	20	8.8	79	1 - 10
T	NOTES.														

1) HOUSING, BACKWARD INCLINED WHEEL, AND CURB CAP TO BE ALUMINUM CONSTRUCTION. CURB CAP FACTORY SUPPLIED WITH PREPUNCHED MOUNTING HOLES. 2) GALVANIZED BIRDSCREEN WITH NOMINAL 84% FREE AREA

3) BALL BEARING MOTOR

4) MOTOR ISOLATED ON SHOCK MOUNTS

5) CORROSION RESISTANT FASTENERS

6) VARI-GREEN ECM MOTOR 7) 0-10VDC CONTROL INPUT.

8) CONTROL DIAL FOR BALANCING

9) BACKDRAFT DAMPER SHIPPED LOOSE, MODEL: BD-100-PB-16X16, GRAVITY OPERATED, NON COATED. 10) ROOF CURB, MODEL GPI-22, 22"x22"x14" (LxWxH)

	DI	FFUSE	R & GRIL	LE SCHEDU	LE	
MARK	MAKE	MODEL	MODULE SIZE (IN)	CONFIGURATION	NECK SIZE (IN)	NOTES
CD-1	TITUS	MCD	24" x 24"	4-WAY	6" x 6"	1, 2, 5
CD-2	TITUS	MCD	24" x 24"	4-WAY	8" x 8"	1, 2, 5
CD-3	TITUS	MCD	24" x 24"	4-WAY	10" x 10"	1, 2, 5
CD-4	TITUS	MCD	24" x 24"	4-WAY	12" x 12"	1, 2, 5
RG-1	TITUS	50F	24" x 24"	EGGCRATE	-	3, 4, 5

NOTES:

1) PROVIDE BORDER TYPE 3 - LAY IN TYPE - CEILING DIFFUSERS FOR T-BAR CEILINGS

2) PROVIDE DUCT TRANSITION BETWEEN CEILING DIFFUSER AND FLEX DUCT AS PER DETAIL 3/M-5.1

3) PROVIDE BORDER TYPE 3 - LAY IN TYPE - RETURN GRILLES FOR T-BAR

CEILINGS 4) PROVIDE SQUARE TO ROUND ADAPTER (SRG) FOR TRANSITION BETWEEN **RETURN GRILLE AND ROUND DUCT**

5) FINISH TO MATCH EXISTING CEILING

MADIZ			HEATD	NG PER	FORMAN	NCE	COOLIN	NG PERFO	ORMAN	CE - A	RI	FA	N PERF	ÖRN	IAN
MAKK	MFG & MODEL No "TRANE"		HEATIN PUT (MI	G BH)	HEAT	ING (MBH)	COOLING (MBH) SEI	OUTPUT NSIBLE /	CO	OOLIN ENCY	G EER /	CFM	E.S.F (IN. WC		RPM
(E)AC-1	YHDO74		_		_		-	AL		<u>–</u>		2,400) –	<u>,</u>	-
(E)AC-2	YHD074		_		_		_			_		2,400) –		_
(E)AC-3	YCC036		_		_		_			_		1,200) –		_
(E)AC-4	310N UNI1 YCD091 7-1/2TON						_			_		3.000) –		
	UNIT YHD074											2,000			
(E)AC-5	6TON UNIT YHD074		_				_			_		2,400) –	_	_
(E)AC-6	6TON UNIT YHD074		_							_		2,400) –		
NOTES: 1 2 3 4 5 6 7	:) MERV 8 AIR I) MIN. OSA 75() MIN. OSA 30() SMOKE DETH) MIN. OSA 50() TO BE DEM() RECOVER A	FILTER) CFM) CFM ECTOR) CFM) CFM) LISHI ND RE	IN SUPF E D CYCLE	PLY DU ALL RH	CT FOR F E friger	AN SHU ANT	IDOWN								
							EX	ISTIN	G FAI	N CO	DIL U	JNI	T SCI	HEI	DU
	MANUFACTU	RE	HEA	TING P	ERFORM	IANCE		COOLIN LING OU	G PERI TPUT	ORM	ANCE -	ARI		FA	N P
WARK	R & MODEL N	NO. HI	LATING (MB	INPUT H)	HEATI (]	NG OUTI MBH)	(MB	H) SENSI <u>TOT</u> AL	BLE /		LING H EER /	LFFIC SEE	JENCY R	CFN	1
(E)FC-1	"CARRIER" 7-1/2TON					_		_						###	#
(E)FC-2	"MITSUBISH 2TON	I"				_		_						700)
			FVI	TINI											
MARK	MFGR MODEL NO	PERI	ARI FORMA	NCE	SOUND 1	IDENS RATING FREE	SING UN	T SCI	HEDU DATA POWE	JLE R	WEIGH	IT SE	ERVICE	REM	AR
MARK	MFGR MODEL NO.	PERI TOTA (M	ARI FORMA L CAP. BH)	NCE	SOUND I BELS	IDENS RATING FREE FIELD dBA	SING UN ELEA V/PH/H	IT SCI ctricai z mc	HEDU , data powei a moci	JLE R P FLA	WEIGH (LBS)	IT) SF	ERVICE	REM	[AR
MARK (E)CU-1	MFGR MODEL NO. "CARRIER" 38AQS008 7-1/2TON	PERI TOTA (M	ARI FORMA L CAP. BH)	NCE SEER –	SOUND I BELS	IDENS RATING FREE FIELD dBA	SING UN ELE V/PH/H	TT SCI	HEDU DATA POWE A MOC	JLE R P FLA -	WEIGF (LBS) –	HT) SE	ERVICE E)FC-1	REM	[AR 1
MARK (E)CU-1 (E)CU-2	MFGR MODEL NO. "CARRIER" 38AQS008 7-1/2TON "MITSUBISHI "MUZ-GL24 2TON DEMOLISH F	PERI TOTA (M	ARI FORMA L CAP. BH) -	NCE SEER - -	SOUND I BELS - -	IDENS RATING FREE FIELD dBA -	SING UN ELEA V/PH/H –	IT SCI CTRICAL Z MC -	HEDU DATA POWEI A MOC	JLE R P FLA -	WEIGH (LBS) –	HT) (I (I	ERVICE E)FC-1 E)FC-2	REM	[AR 1 2
MARK (E)CU-1 (E)CU-2 NOTES: 1 2) MARK	MFGR MODEL NO. "CARRIER" 38AQS008 7-1/2TON "MITSUBISHI "MUZ-GL24 2TON DEMOLISH F PROTECTIN E MANUFACTU & MODEL I "GREENHE	PERI TOTA (M OR BII PLACE	ARI FORMA L CAP. BH) - - - - - - - - - - - - - - - - - - -	NCE SEER - - RNATE ROON EXH FAN	SOUND I BELS - - #1 + AUST SONES	IDENS RATING FREE FIELD dBA - - FAN S MC HP	SING UN ELEA V/PH/H – – SCHEDU SCHEDU DTOR ELECTRICA	JLE OPERA WEIG	HEDU DATA POWEI A MOC - - - -			IT SE	ERVICE E)FC-1 E)FC-2	REM	[AR 1 2
MARK (E)CU-1 (E)CU-2 NOTES: 1 2) 2 MARK EF-1 EF-2	MFGR MODEL NO. "CARRIER" 38AQS008 7-1/2TON "MITSUBISHI "MUZ-GL24 2TON DEMOLISH F PROTECTIN E MANUFACTI & MODEL I "GREENHE G-183-VC DX10B	PERI TOTA (M OR BII PLACE	ARI FORMA L CAP. BH) - - - - - - - - - - - - - - - - - - -	NCE SEER - - RNATE ROON EXH FAN FAN 930 -	SOUND I BELS #1 #1 AUST SONES 	IDENS RATING FREE FIELD dBA - FAN S MC HP 3/4 -	SING UN ELEA V/PH/H - - - - - - - - - - - - - - - - - -	IT SCI CTRICAL Z MC - - JLE JLE OPERA WEIC LB 200 -		JLE R P FLA - - 1, 2, 3 5	WEIGH (LBS) 	IT SE	ENVICE E)FC-1 E)FC-2	REM	[AF 1 2
MARK (E)CU-1 (E)CU-2 NOTES: 1 (E)CU-2 NOTES: 1 (E)CU-2 (E)CU-	MFGR MODEL NO. "CARRIER" 38AQS008 7-1/2TON "MITSUBISHI "MUZ-GL24 2TON DEMOLISH F PROTECTIN EXISTING BALANCE (E) TO BE DEMO	PERI TOTA (M OR BII PLACE	ARI FORMA L CAP. BH) - - O ALTER CFM FORTING IFC-1 ECFM SI #### 1 #### 0 ALTER O ALTER	NCE SEER - - - RNATE ROON EXH FAN FAN 930 - - CONOM AFLDA RPM SATE CONOM	SOUND I SOUND I BELS - + + AUST SONES - - + + + + + + + +	ATING FREE FIELD dBA - - FAN S MC HP E 3/4 - 3/4 - 3/4 - 3/4 - 3/4 - 4 KF	SING UN ELEA V/PH/H - - SCHEDU SCHEDU SCHEDU DTOR ELECTRICA 115/1/60 -	TT SCI CTRICAL Z MC - - JLE JLE OPERA WEIC LB 200 -	HEDU DATA POWEI A MOC - - - -	JLE R P FLA - - 1, 2, 3 5		IT SE	E)FC-1 E)FC-2	REM	[AR 1 2
MARK (E)CU-1 $(E)CU-2$ $MARK$ $EF-1$ $EF-1$ $EF-2$ NOTES: 1) 1 (3) 4) 5) (1) (3) (1) (1) (3) (1) (1) (3) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	MFGR MODEL NO. "CARRIER" 38AQS008 7-1/2TON "MITSUBISHI "MUZ-GL24 2TON DEMOLISH F PROTECTIN EXISTING G-183-VC DX10B INTERLOCKEI W/PRE-FABC DEMOLISH F BALANCE (E) TO BE DEMO	PERI TOTA (M OR BII PLACE CXIST RER NO. CK" G CK" G CK" G CK" CK" CK" CK" CK" CK" CK" CK" CK" CK"	ARI FORMA I. CAP. BH) -	NCE SEER SEER - - RNATE ROON EXH FAN 930 - CONOM AFT DA SP Q G	SOUND I BELS - - - - - - - - - - - - - - - - - - -	ATING FREE FIELD dBA	SING UN ELEA V/PH/H - - - SCHEDU SCHEDU SCHEDU DTOR ELECTRICA L POWER 115/1/60 - -	TT SCI CTRICAL Z MC - - - JLE OPERA WEIC LB 200 -	HEDU DATA POWEI A MOC - - - - -	JLE R P FLA - - 1, 2, 3 5			ENVICE E)FC-1 E)FC-2		[AR 1 2
MARK E)CU-1 E)CU-2 NOTES: 1 1 2 NOTES: 1 2 3 4 5 5 4 5 5 1 1 2 3 4 5 1 1 3 4 5 3 4 5 3 4 5 5 1 1 1 1 2 3 3 4 5 3 4 5 1 1 1 1 1 1 1 1	MFGR MODEL NO. "CARRIER" 38AQS008 7-1/2TON "MITSUBISHI "MUZ-GL24 2TON DEMOLISH F PROTECTIN EMANUFACTI & MODEL I "GREENHE G-183-VC DX10B INTERLOCKEI W/ PRE-FAB C DEMOLISH F BALANCE (E) TO BE DEMO	PERI TOTA (M OR BII PLACE CXIST RER NO. CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" G CK" CK	ARI FORMA FORMA L CAP. BH) - - OALTER OALTER FOR GOO GOO GOO GOO	NCE SEER SEER - - - RNATE ROOM FAN 930 - SP RPM 930 - CONOM AFT DA RPM 930 - CONOM AFT DA CONOM AFT DA CONOM	SOUND I BELS 	ATING RATING FREE FIELD dBA - - - FAN S MC HP E 3/4 - SIRD SCF AKE AKE	SING UN ELE V/PH/H - - SCHEDU SCHEDU SCHEDU TOR ELECTRICA L POWER 115/1/60 -	TT SCI CTRICAL Z MC - - - JLE OPERA WEIC LB 200 -	HEDU DATA POWEI A MOC - - - -	JLE R P FLA - - 1, 2, 3 5			ENVICE E)FC-1 E)FC-2		[AR 1 2

IANCE	COOLING PERFO	ORMANCE - ARI	FAN	PERFOR	RMAN	CE	ELECTRICA	L DA	FA		
CATING UT (MBH)	COOLING OUTPUT (MBH) SENSIBLE / TOTAL	COOLING EFFICIENCY EER / SEER	CFM	E.S.P. (IN. WG.)	RPM	внр	NOM. VOLTAGE V-PH-HZ	MCA	моср	WEIGHT (LBS)	COMMENT
_	_	_	2,400	_	-	_	—	_	-	—	1, 2, 4, 6, 7
_	_	_	2,400	_	_	_	_	_	_	_	1, 2, 4, 6, 7
_	_	_	1,200	_	_	_	_	_	_	_	1, 3, 6, 7
_	_	_	3,000	_	_	_	_	_	_	_	1, 4, 5, 6, 7
_	_	_	2,400	_		_	_	_	_	_	1, 4, 5, 6, 7
_	_	_	2,400	_	-	_	_	_	_	_	1, 4, 5, 6, 7
_	-	-	2,400	_	_	_	_	_	_	_	1, 2, 4, 6, 7
	I										

RMANCE	COOLING PERF	ORMANCE - ARI	FAN	PERFOR	MAN	CE	ELECTRIC	CAL DAT	A		
ATING OUTPUT (MBH)	COOLING OUTPUT (MBH) SENSIBLE / TOTAL	COOLING EFFICIENCY EER / SEER	CFM	E.S.P. (IN. WG.)	RPM	HP	NOM. VOLTAGE V-PH-HZ	MCA (AMP)	MOCP (AMP)	WEIGHT (LBS)	COMMENTS
-	_	_	####	_	_	_	_		_	_	1, 2, 3
_	_	_	700	_	_	_	_	_		_	1, 4

FOR REFERENCE ONLY

- 2. FC-1 SUPPLY FAN OPERATION: ON COMMAND FROM DDC, IN ACCORDANCE WITH THE OCCUPANCY SCHEDULE, FC-1 SUPPLY FAN SHALL RUN CONTINUOUSLY, WITH SUPPLY FAN'S SPEED SET TO MAINTAIN A CONSTANT SUPPLY DUCT STATIC PRESSURE SET-POINT OF 1" W.C. (ADJUSTABLE AS DETERMINED BY POST-CONTRUCTION AIR-BALANCE REPORT), CYCLING CU-1 D/X COOLING COMPRESSOR BASED ON THE SPACE COOLING DEMAND. DURING UNOCCUPIED SCHEDULE, THE FC-1 SHALL BE OFF. DURING UNOCCUPIED/NIGHT-SETBACK TIME SCHEDULE, DDC WILL MONITOR THE "UNOCCUPIED" SPACE TEMPERATURE SET POINT OF 80°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FAN STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 2°F (ADJUSTABLE) ABOVE THE "UNOCCUPIED" SET POINT, THE FC-1 WILL BE COMMANDED ON.
- D/X COOLING OPERATION: DDC WILL MONITOR THE "OCCUPIED" SPACE TEMPERATURE AND COMPARE IT TO THE SPACE TEMPERATURE SET POINT OF 74°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FAN STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 1°F (ADJUSTABLE) ABOVE THE "OCCUPIED" SET POINT, THE CU-1 COMPRESSOR WILL BE COMMANDED ON. DDC SYSTEM WILL MONITOR THE SUPPLY TEMPERATURE ENSURING FREEZE PROTECTION OF THE FC-1 D/X COIL DUE TO OVERCOOLING THE SUPPLY AIR. THE CU-1 COMPRESSOR WILL HAVE A MINIMUM ON/OFF RUN TIME (15 MIN. ADJUSTABLE) TO AVOID SHORT CYCLING. DURING UNOCCUPIED/NIGHT-SETBACK TIME SCHEDULE, DDC WILL MONITOR THE "UNOCCUPIED" SPACE TEMPERATURE SET POINT OF 80°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FAN STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 2°F (ADJUSTABLE) ABOVE THE "UNOCCUPIED" SET POINT, THE COMPRESSOR WILL BE COMMANDED ON. CU-1 COOLING SHALL BE LOCKED OUT WHEN THE FC-1 SUPPLY FAN IS NOT IN OPERATION (NO FAN SP).
- 4. HEATING OPERATION: DDC WILL MONITOR THE SPACE TEMPERATURE AND COMPARE IT TO THE SPACE TEMPERATURE SET POINT OF 70°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FC-1 STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 2°F (ADJUSTABLE) BELOW THE SET POINT, THE CU-1 HEAT PUMP HEATING CYCLE WILL BE INITIATED TO MAINTAIN HEATING SPACE TEMPERATURE SET-POINT.
- 5. WHERE INDICATED ON PLANS, REUSE EXISTING DUCT SMOKE DETECTOR TO BE INSTALLED THE FC-1 MAIN SUPPLY DUCTWORK. WIRE DIRECTLY TO FC-1 FAN FOR SHUT DOWN, SEND ALARM TO DDC AND EXISTING FIRE ALARM PANEL. DSD TO BE INSTALLED BY MECHANICAL SUB-CONTRACTOR AND WIRED TO FAN SHUT DOWN BY ELECTRICAL SUBCONTRACTOR. COMPLY WITH CBC (F) 907.1.3. DDC TO MONITOR AN ALARM TO FRONT-END.
- 6. ECONOMIZER OPERATION: OUTSIDE AIR SHALL BE USED FOR COOLING WHENEVER IT IS 2 DEGREES OR MORE COOLER THAN THE ROOM TEMPERATURE. THE NEW DDC CONTROLS LOGIC CONTROLLER SHALL INITIATE INTERLOCKED EXISTING OA, RA AND EA DAMPERS WITH NEW DAMPER ACTUATORS, OPERATE EXISTING POWER EXHAUST EF-1, AND LOCK OUT CU-1 COOLING CYCLE, MAINTAINING AN "ECONOMIZER" ZONE TEMPERATURE SETPOINT. THIS SETPOINT SHALL BE 6 DEGREES (VIRTUAL POINT, ADJUSTABLE) LOWER THAN THE "MECHANICAL COOLING" ZONE TEMPERATURE SETPOINT. THE MECHANICAL COOLING SETPOINT SHALL BE INITIALLY SET AT 74 DEGREES. PROVIDE FAULT DETECTION AND DIAGNOSTICS LOGIC CONTROLLER, DETECTING ECONOMIZER THAT FAILS TO CLOSE, FAILS TO OPEN, IS STUCK FULLY OPEN, AND FAILS TO FULLY OPEN. MINIMUM POSITION FOR EXISTING OA SHALL BE SET TO ALLOW 760 CFM OF OUTSIDE AIR INTAKE AS DETERMINED BY POST CONSTRUCTION AIR BALANCE REPORT.
- 7. SUPPLY DUCT TEMPERATURE SENSORS (AVERAGING TYPE) SHALL BE USED TO MONITOR SUPPLY AIR TEMPERATURE (SAT) WIITH USER-DEFINED ALARM PARAMETERS.
- 8. EXISTING ZONE DAMPERS WITH NEW CONTROLS ACTUATORS SHALL MODULATE UPON USER'S TEMPERATURE SET POINT ADJUSTMENTS VIA NEW ROOM'S TEMPERATURE SENSORS. HEATING AND COOLING MODES OF OPERATION ARE TO BE DETERMINED BY NEW MASTER THERMOSTAT.
- 9. UPON AN INCREASE OF THE SUPPLY DUCT STATIC PRESSURE ABOVE SET POINT DUE TO MODULATING ZONE DAMAPERS OPERATONS, THE EXISTING BY-PASS DAMPER WITH NEW DAMPER ACTUATOR WILL MODUALTE OPEN ALLOWIING FRACTION OF THE SUPPLY AIR TO BY-PASS BACK TO THE RETURN AIR DUCTWORK.
- 10. GLOBAL OUTSIDE AIR TEMPERATURE (OAT) SENSOR MOUNTED TO BUILDING EXTERIOR ON NORTH ROOF SHALL CONTROLL FC-1 ECONOMIZER.
- 11. EXISTING EXHAUST FAN EF-1 OPERATION SHALL BE INITIATED BY DDC AND BE ITERLOCKED WITH ECONOMIZER CYCLE OF FC-1.

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THIS DRAWING IS 30" X 42" AT FULL SIZE, 15" X 21" AT HALF SIZE. ◎ 2015 BY SALAS O'BRIEN ENGINEERS, IN 2 3 4 5 10 15 20 0 1 2 3 4 5 6 7 8 9

	SEQUENCE OF OPERATION RTU-1, 2, 3, 4, 5, 6, 7, 8, 9 & 10
1.	DDC SYSTEM WILL MONITOR THE TEMPERATURE OF THE CONTROLLED SPACE BASED ON THE CONTROL TEMPERATURE SET POINT(S). DDC SYSTEM THROUGH RELAY LOGIC AND VIA INTEGRATON WITH FACTORY'S PROVIDED UNITARY CONTROL DDC BOARD WILL MONITOR THE COOLING/HEATING OPERATIONS OF THE PACKAGE RTU UNIT TO CONTROL SPACE TEMPERATURE WITH A CAPABILITY OF OVERRIDING THE SUPPLY FAN AND COMPRESSOR(S) OPERATIONS (FOR MAINTENANCE PURPOSE). THE DDC SYSTEM WILL ALSO MONITOR THE FOLLOWING RTU POINTS: SUPPLY FAN STATUS, EXHAUST/RELIEF FAN(S) STATUS AND COMRESSOR(S) STATUS. DDC WILL PROVIDE THE FOLLOWING HARD WIRED CONTROL POINTS: DISCHARGE AIR TEMPERATURE, AND FILTERS STATUS. THE DDC SYSTEM LOW VOLTAGE CONTROL WIRES WILL TERMINATE TO THE PACKAGE RTU FACTORY'S PROVIDED BACNET IP DDC CONTROL BOARD. NEW PACAKGE RTU'S CONTROL BOARD TO PERFORM ALL MAIN UNITS OPERATION CONTROLS FUNCTIONS. ALL FACTORY RECOMMENDED SAFETIES, INCLUDING COMPRESSORS AND THE OPERATION OF THE PROVIDED FAULT DETECTION ECONOMIZER DAMPERS OPERATION, WILL NEED TO BE IN PLACE.
2.	FAN OPERATION: ON COMMAND FROM DDC, IN ACCORDANCE WITH THE OCCUPANCY SCHEDULE, RTU SUPPLY FAN SHALL MODUALTE, MAINTAINING SPACE TEMPERATURE SET POINT, MODULATING D/X COOLING COMPRESSOR BASED ON THE SPACE COOLING DEMAND. DURING UNOCCUPIED SCHEDULE, THE RTU SHALL BE OFF. DURING UNOCCUPIED/NIGHT-SETBACK TIME SCHEDULE, DDC WILL MONITOR THE "UNOCCUPIED" SPACE TEMPERATURE SET POINT OF 80°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FAN STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 2°F (ADJUSTABLE) ABOVE THE "UNOCCUPIED" SET POINT, THE RTU WILL BE COMMANDED ON WITH RTU'S ECM MOTOR MAINTAINING 50% OF DESIGN SUPPLY AIR FLOW.
3.	COOLING OPERATION: DDC WILL MONITOR THE "OCCUPIED" SPACE TEMPERATURE AND COMPARE IT TO THE SPACE TEMPERATURE SET POINT OF 74°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FAN STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 1°F (ADJUSTABLE) ABOVE THE "OCCUPIED" SET POINT, THE COMPRESSOR WILL BE COMMANDED ON. DDC SYSTEM WILL MONITOR THE SUPPLY TEMPERATURE ENSURING FREEZE PROTECTION OF THE RTU UNIT DUE TO OVERCOOLING THE SUPPLY AIR. THE COMPRESSOR WILL HAVE A MINIMUM ON/OFF RUN TIME TO AVOID SHORT CYCLING. DURING UNOCCUPIED/NIGHT-SETBACK TIME SCHEDULE, DDC WILL MONITOR THE "UNOCCUPIED" SPACE TEMPERATURE SET POINT OF 80°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FAN STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 2°F (ADJUSTABLE) ABOVE THE "UNOCCUPIED" SET POINT, THE COMPRESSOR WILL BE COMMANDED ON.
4.	HEATING OPERATION: DDC WILL MONITOR THE SPACE TEMPERATURE AND COMPARE IT TO THE SPACE TEMPERATURE SET POINT OF 70°F (ADJUSTABLE). UPON POSITIVE CONFIRMATION OF THE FAN STATUS, IF THE SPACE TEMPERATURE DEVIATES MORE THAN 2°F (ADJUSTABLE) BELOW THE SET POINT, THE GAS HEATING CYCLE WILL BE INITIATED, MODULATING GAS HEAT TO MAINTAIN HEATING SPACE TEMPERATURE SET-POINT. IF OAT IS GREATER THAN OR EQUAL TO 55F (ADJUSTABLE) AND SPACE TEMPERATURE IS LESS THAN SET POINT, THEN GAS HEATING CYCLE SHALL DISABLE (IF ENABLED) AND HEAT PUMP HEATING CYCLE SHALL BE INITIATED. IF CONDITIONS ARE NO LONGER MET, OR SET POINT IS SATISFIED, HEAT PUMP HEATING SHALL DISABLE AND RETURN TO SECONDARY HEATING DESIGNATION. IF FAULT OCCURS TO GAS FURNACE HEATING, GENERATE ALARM AND DISABLE GAS HEATING CYCLE. THEN, HEAT PUMP HEATING CYCLE SHALL BE INITIATED UNTIL FAULT IS REMEDIED AND ALRAM IS CLEARED.
5.	WHERE INDICATED ON PLANS, REUSE EXISTING DUCT SMOKE DETECTOR TO BE INSTALLED THE RTU'S MAIN SUPPLY DUCTWORK. WIRE DIRECTLY TO RTU CONTROL BOARD RELAY TO SHUT DOWN RTU UNIT DIRECTLY, SEND ALARM TO DDC AND EXISTING FIRE ALARM PANEL. DSD TO BE INSTALLED BY MECHANICAL SUB-CONTRACTOR AND WIRED TO FAN SHUT DOWN BY CONTROLS SUBCONTRACTOR. COMPLY WITH CBC (F) 907.1.3. DDC TO MONITOR AN ALARM TO FRONT-END.
6.	ECONOMIZER OPERATION: OUTSIDE AIR SHALL BE USED FOR COOLING WHENEVER IT IS 2 DEGREES OR MORE COOLER THAN THE ROOM TEMPERATURE. THE ECONOMIZER SHALL MODULATE INTERLOCKED OA AND RA DAMPERS TO MAINTAIN AN "ECONOMIZER" ZONE TEMPERATURE SETPOINT. THIS SETPOINT SHALL BE 6 DEGREES (VIRTUAL POINT, ADJUSTABLE) LOWER THAN THE "MECHANICAL COOLING" ZONE TEMPERATURE SETPOINT. THE MECHANICAL COOLING SETPOINT SHALL BE INITIALLY SET AT 74 DEGREES. POWER EXHAUST FAN SHALL MODULATE TO MAINTAIN A SPACE STATIC PRESSURE SET-POINT OF 0.03" W.C (ADJUSTABLE). INTEGRATE FACTORY PROVIDED FAULT DETECTION AND DIAGNOSTICS LOGIC CONTROLLER DETECTING ECONOMIZER

7. FACTORY PROVIDED DIFFERENTIAL PRESSURE SWITCH SHALL BE USED FOR MONITORING ACROSS FILTER BANK TO INDICATE DIRTY FILTER STATUS/ALARM FOR FILTERS (SET-POINT 0.18"W.C. ADJUSTABLE).

THAT FAILS TO CLOSE, FAILS TO OPEN, IS STUCK FULLY OPEN, AND FAILS TO FULLY OPEN.

- 8. FACTORY PROVIDED DUCT TEMPERATURE SENSORS (AVERAGING TYPE) SHALL BE USED TO MONITOR SUPPLY AIR TEMPERATURE (SAT) WITH USER-DEFINED ALARM PARAMETERS.
- 9. PROVIDE SHIELDED OUTSIDE AIR TEMPERATURE (OAT) SENSOR MOUNTED TO BUILDING EXTERIOR.
 10. EXHAUST FAN EF-2 OPERATION SHALL BE INITIATED BY DDC AND RUN CONTINUOUSLY DURING OCCUPANCY. INTERLOCK WITH
- RTU-7, 8. DURING UNOCCUPIED NIGHT SETBACK, REDUCE EF-2 FLOW TO 50% OF DESIGN.
 11. FACTORY PROVIDED AND DDC VENDOR INSTALLED SPACE CO2 SENSOR SHALL BE USED FOR DEMAND CONTROL VENTILATION, MODUALTING OA INTAKE DAMPER, ALLOWING OA INTAKE TO MAINTAIN NO MORE THAN 600 PPM (ADJUSTABLE) SPACE CO2 LEVEL CONCENTRATION.

ID.ZONE SENSOR SENSOR DDC CONTH DDC CONTH DDC CONTH DDC CONTH DDC CONTH DDC CONTH DDC CONTH DDC CONTH DDC CONTH DDC CONTH PACAKGE F*ZONE SENSOR DDC CONTH DDC CONTH DDC CONTH PACAKGE F(S/S)FACTORY C FACTORY C CURRENT S DUCT TEMPP1)FACTORY C CURRENT S DUCT TEMPP1)FACTORY C CURRENT S DUCT TEMPP1)FACTORY C CURRENT S DUCT TEMPP1)FACTORY C CURRENT S DUCT TEMPP2)FACTORY C CURT STATIN DAMPER AC DUCT TEMP	CONTROL DEVICE	CONTROL DESCRIPTION SPACE TEMPERATURE SPACE STATIC PRESSURE OUTSIDE AIR INTAKE TEMPERATURE AFTER HOUR TIMER UNOCCUPIED STATUS SPACE HEATING STATUS SPACE HEATING STATUS ECONOMIZER STATUS SPACE TEMPERATURE RTU UNIT ECM MOTOR START/STOP RTU UNIT GENERAL FAULT RTU UNIT ECM MOTOR SPEED	CONTROL DEVICE LOCATON MASTER T'STAT IN SPACE PACKAGE RTU PACKAGE RTU MASTER T'STAT IN SPACE MASTER T'STAT IN SPACE MASTER T'STAT IN SPACE PACKAGE RTU ZONE T'STAT IN SPACE PACKAGED UNIT	AI AO 1	D I 1	DO VP 1 1 1 1 1 1 1 1 1	COMMENTS COMM. INTERFACE INTEGRATION COMM. INTERFACE INTEGRATION	POINT I.D. ZN-TMP ZN-SCH ZN-UNC ZN-HTG ZN-CLG	CONTROL DEVICE ZONE SENSOR DDC CONTROLLER DDC CONTROLLER DDC CONTROLLER	CONTROL DESCRIPTION SPACE TEMPERATURE AFTER HOUR TIMER UNOCCUPIED STATUS SPACE HEATING STATUS	CONTROL DEVICE LOCATONAIMASTER T'STAT IN SPACE1MASTER T'STAT IN SPACE1MASTER T'STAT IN SPACE1	AO	DI 1	0	COMMENTS
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ZONE SENSS/S)FACTORY CFACTORY CFACTORY CSPD)FACTORY CCURRENT SDUCT TEMP1)FACTORY C1)FACTORY C2)FACTORY C2)FACTORY C2)FACTORY CDUCT STATIPR*DAMPER ACDUCT TEMP	INSOR CONTROL MODULE CONTROL MODULE CONTROL MODULE SENSOR IP. TRMTR SENSOR-AVG.	SPACE TEMPERATURE RTU UNIT ECM MOTOR START/STOP RTU UNIT GENERAL FAULT RTU UNIT ECM MOTOR SPEED	ZONE T'STAT IN SPACE PACKAGED UNIT	3	1 1	1	COMM. INTERFACE INTEGRATION	FC-1 (ALM)	RELAY	FC UNIT GENERAL FAULT	FC UNIT		1		
S/S) FACTORY C FACTORY C FACTORY C CURRENT S DUCT TEMP 1) FACTORY C 2) FACTORY C 2 ST) FACTORY C DUCT STATI PR* DAMPER AC DUCT TEMP	CONTROL MODULE CONTROL MODULE CONTROL MODULE SENSOR IP. TRMTR SENSOR-AVG.	RTU UNIT ECM MOTOR START/STOP RTU UNIT GENERAL FAULT RTU UNIT ECM MOTOR SPEED	PACKAGED UNIT					FC-1 RET-DMPR	DAMPER ACTUATOR	RETURN AIR DAMPER POSITION	RETURN DUCT	1			
SPD) FACTORY C FACTORY C CURRENT S DUCT TEMP 1) FACTORY C 2) FACTORY C 2 ST) FACTORY C DUCT STATI PR* DAMPER AC DUCT TEMP	CONTROL MODULE CONTROL MODULE SENSOR IP. TRMTR SENSOR-AVG.	RTU UNIT GENERAL FAULT RTU UNIT ECM MOTOR SPEED	-			1** 1	COMM. INTERFACE INTEGRATION	FC-1 OA-DMPR	DAMPER ACTUATOR	OUTSIDE AIR DAMPER POSITION	OUTSIDE AIR DUCT	1			
SPD) FACTORY C CURRENT S DUCT TEMP 1) FACTORY C 2) FACTORY C 2 ST) FACTORY C DUCT STATI DAMPER AC DUCT TEMP	CONTROL MODULE SENSOR IP. TRMTR SENSOR-AVG.	RTU UNIT ECM MOTOR SPEED	PACKAGED UNIT			1	COMM. INTERFACE INTEGRATION	FC-1 EA-DMPR	DAMPER ACTUATOR	OUTSIDE AIR DAMPER POSITION	EXHAUST AIR DUCT				
CURRENT S DUCT TEMP 1) FACTORY C 1 ST) FACTORY C 2) FACTORY C 2 ST) FACTORY C DUCT STATI DAMPER AC DUCT TEMP	SENSOR IP. TRMTR SENSOR-AVG.		PACKAGED UNIT			1	COMM. INTERFACE INTEGRATION	FC-1 BP-DMPR	DAMPER ACTUATOR	BY-PASS AIR DAMPER POSITION	BY-PASS AIR DUCI	1			
DUCT TEMP 1) FACTORY C 1 ST) FACTORY C 2) FACTORY C 2 ST) FACTORY C DUCT STATI DAMPER AC DUCT TEMP	IP. TRMTR SENSOR-AVG.	SUPPLY FAN STATUS	PACKAGED UNIT				MONITORING	FC-1 RA-TMP	DUCT TEMP. TXMTR-AVG.	RETURN AIR TEMPERATURE	RETURN DUCT 1				
1) FACTORY C 1 ST) FACTORY C 2) FACTORY C 2 ST) FACTORY C DUCT STATI DAMPER AC DUCT TEMP	MF. INMIN SENSON-AVG.					1		FC-1 (SAT)	DUCT TEMP. TXMTR-AVG.	SUPPLY AIR TEMP	SA DUCT 1				
1) FACTORY C FACTORY C 2) FACTORY C 2 ST) FACTORY C DUCT STATI DAMPER AC DUCT TEMP		SUFFET AIR DISCHARGE TEMP	SUPPLI DUCI, RIU WIRED				COMM. INTERFACE INTEGRATION	FC-1 (PT)	DUCT STATIC PRESSURE TRANSMITTER	DUCT STATIC PRESSURE	SA DUCT 1				
P 1 ST) FACTORY C P 2) FACTORY C P 2 ST) FACTORY C DUCT STATI PR* DAMPER AC DUCT TEMP	CONTROL MODULE	COMPRESSOR START/STOP	PACKAGED UNIT			1** 1	COMM. INTERFACE INTEGRATION								
2) FACTORY C 2 ST) FACTORY C DUCT STATI PR* DAMPER AC DUCT TEMP	CONTROL MODULE	COMPRESSOR STATUS	PACKAGED UNIT			1	COMM. INTERFACE INTEGRATION	CU-1 (S/S)	COMPESSOR STARTER	CPMPRESSOR START/STOP	CU UNIT			1	
2 ST) FACTORY C DUCT STATI R* DAMPER AC DUCT TEMP	CONTROL MODULE	COMPRESSOR START/STOP	PACKAGED UNIT			1** 1	COMM. INTERFACE INTEGRATION	CU-1 (ALM) CU-1 (CST)	RELAY CURRENT SWITCH	CU GENERAL FAULI/ALARM COMPORESSOR STATUS	CU UNIT		1		
) DUCT STATI PR* DAMPER AC DUCT TEMP	CONTROL MODULE	COMPRESSOR STATUS	PACKAGED UNIT			1	COMM. INTERFACE INTEGRATION								
PR* DAMPER AC DUCT TEMP	ATIC PRESSURE TRANSMITTER	DUCT STATIC PRESSURE	SA DUCT			1	COMM. INTERFACE INTEGRATION	EF-1 (S/S) FF-1 (ALM)	FAN MOTOR STARTER RELAY	EXHAUST FAN START/STOP EXHAUST FAN GENERAL FAULT/ALARM	EF UNIT FF UNIT		1	1	
DUCT TEMP	ACTUATOR (2)	RA & OA AIR DAMPER POSITION	PACKAGE UNIT*			1	COMM. INTERFACE INTEGRATION*	EF-1 (FST)	CURRENT SENSOR	EXHAUST FAN STATUS	EF UNIT		1		
	MP. TRMTR-AVG.	RETURN AIR TEMPERATURE	PACKAGE UNIT			1	COMM. INTERFACE INTEGRATION	ZONE DAMPER 1		EXISTING ZONE DAMPER POSITION		1			
PRESS. DIF	NFF. SWITCH	DIRTY PRE-FILTER ALARM	PACKAGE UNIT FILTER BANK			1	COMM. INTERFACE INTEGRATION	ZONE DAMPER 2	DAMPER ACTUATOR	EXISTING ZONE DAMPER POSITION	SUPLY DUCTWORK				
(S) FACTORY C		EXHAUST FAN FCM START/STOP	PACKAGED UNIT			1	COMM INTERFACE INTEGRATION	ZONE DAMPER 2	DAMPER ACTUATOR	EXISTING ZONE DAMPER POSITION	SUPLY DUCTWORK	1			
_M) FACTORY C	CONTROL MODULE	EXHAUST FAN ECM GENERAL FAULT	PACKAGED UNIT				COMM. INTERFACE INTEGRATION								
PD) FACTORY C	CONTROL MODULE	EXHAUST FAN ECM SPEED	PACKAGED UNIT			1	COMM. INTERFACE INTEGRATION	SPACE-SP	STATIC PRESSURE SENSOR	SPACE INTERIOR AIR PRESSURE	SPACE INTERIOR 1			R	EFERECE ONLY
ST) CURRENT S	SENSOR	EXHAUST FAN STATUS	PACKAGED UNIT		1		MONITORING		RFLAY	SMOKE ALARM STATUS	DDC PANEL		1	N	
RELAY		SMOKE ALARM STATUS	DDC. PANFI				MONITORING								
R I DAMPER ACT	CTUATOR	EXISTING ZONE DAMPER POSITION	SUPLY DUCTWORK												
R 2 DAMPER ACT	CIUATOR	EXISTING ZONE DAMPER POSITION	SUPLY DUCIWORK												
ER 2 DAMPER ACT	CTUATOR	EXISTING ZONE DAMPER POSITION	SUPLY DUCTWORK	1											
STATIC PRES	ESSURE SENSOR	SPACE INTERIOR AIR PRESSURE	SPACE INTERIOR	1			REFERENCE/READ ONLY								
		•	NEW HARD WIRED POINTS	5 3	3 4	4 20	NEW INEGRATED VP POINTS		•	-	NEW HARD WIRED POINTS	8 7	7	6	
FENANCE OVERRIDE			TOTAL:	16		TOT	ĀL: 20				TOTAL:	28			
RFACE COMMUNICATION	DAMPER ACTUATORS. E ONLY.	HEATING ELINCTIONALITY				-		_							

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POINT I.D.	CONTROL DEVICE	CONTROL DESCRIPTION	CONTROL DEVICE LOCATON	AI	AO	DI	DO	VP	COMMENTS
ZN-TMP	ZONE SENSOR	SPACE TEMPERATURE	MASTER T'STAT IN SPACE	1					
ZN-SP	SENSOR	SPACE STATIC PRESSURE	PACKAGE RTU					1	COMM. INTERFACE INTEGRATION
ZN-HUM	ZONE SENSOR	SPACE HUMIDITY	MASTER T'STAT IN SPACE	1					READ ONLY
ZN-SCH		AFTER HOUR TIMER	MASTER I'STAT IN SPACE			1			
		UNUCCUPIED STATUS	MASTER I STAT IN SPACE					1	
		SPACE MEATING STATUS	MASTER I STAT IN SPACE						COMM. INTERFACE INTEGRATION
	PACAKGE RTU BOARD	FCONOMIZER STATUS	MASTLIC I STAT IN SPACE						COMM. INTERFACE INTEGRATION
ZN-CO2	ZONE SENSOR (FACTORY SUPPLIED)	CO2 CONCENTRATION	ON WALL IN SPACE	1				1	INTEGRATE WITH MASTER T'STAT
		DTU UNIT FOM MOTOR START (STOR					1 * *	1	
RTU FAN (5/5)	FACTORY CONTROL MODULE	RTU UNIT ECM MOTOR START/STOP	PACKAGED UNIT				1 * *		COMM. INTERFACE INTEGRATION
RIU (ALM)	FACTORY CONTROL MODULE	RTU UNIT GENERAL FAULT	PACKAGED UNIT						COMM. INTERFACE INTEGRATION
RTU FAN (SPD)	FACTORY CONTROL MODULE	RTU UNIT ECM MOTOR SPEED	PACKAGED UNIT					1	COMM. INTERFACE INTEGRATION
RTU (FST)	CURRENT SENSOR	SUPPLY FAN STATUS	PACKAGED UNIT			1			MONITORING
RTU (SAT)	DUCT TEMP. TRMTR SENSOR-AVG.	SUPPLY AIR TEMP	SUPPLY DUCT	1					
RTU (COMP 1)	FACTORY CONTROL MODULE	COMPRESSOR START/STOP	PACKAGED UNIT				1**	1	COMM. INTERFACE INTEGRATION
RTU (COMP 1 ST)	FACTORY CONTROL MODULE	COMPRESSOR STATUS	PACKAGED UNIT					1	COMM. INTERFACE INTEGRATION
RTU (COMP 2)	FACTORY CONTROL MODULE RTU-6	COMPRESSOR START/STOP RTU-6	PACKAGED UNIT RTU-6				1**	1	COMM. INTERFACE INTEGRATION
RTU (COMP 2 ST)	FACTORY CONTROL MODULE RTU-6	COMPRESSOR STATUS RTU-6	PACKAGED UNIT RTU-6					1	COMM. INTERFACE INTEGRATION
RTU (DSPT)	DUCT STATIC PRESSURE TRANSMITTER	DUCT STATIC PRESSURE	SA DUCT					1	COMM. INTERFACE INTEGRATION
RA/OA-DMPR*	DAMPER ACTUATOR (2)	RETURN AIR & OUTSIDE AIR DAMPER POSITION	PACKAGE UNIT*					1	COMM. INTERFACE INTEGRATION *
RA-TMP	DUCT TEMP. TRMTR-AVG.	RETURN AIR TEMPERATURE	PACKAGE UNIT					1	COMM. INTERFACE INTEGRATION
FILTER ALM	PRESS. DIFF. SWITCH	DIRTY PRE-FILTER ALARM	PACKAGE UNIT FILTER BANK			1			
RTU EF (S/S) RTU EF (ALM)	FACTORY CONTROL MODULE FACTORY CONTROL MODULE	EXHAUST FAN ECM START/STOP EXHAUST FAN ECM GENERAL FAULT	PACKAGED UNIT PACKAGED UNIT					1 1	COMM. INTERFACE INTEGRATION COMM. INTERFACE INTEGRATION
RTU EF (SPD)	FACTORY CONTROL MODULE	EXHAUST FAN ECM SPEED	PACKAGED UNIT					1	COMM. INTERFACE INTEGRATION
RTU EF (FST)	CURRENT SENSOR	EXHAUST FAN STATUS	PACKAGED UNIT			1			MONITORING
EF-2 (S/S)	ECM MOTOR START/STOP	EXHAUST FAN ECM START/STOP	EF UNIT				1		
EF-2 (ALM)	RELAY	EXHAUST FAN GENERAL FAULT/ALARM	EF UNIT			1			
EF = 2 (SPEED)	ECM MOTOR	EXHAUST FAN ECM SPEED	EF UNIT		1	1			
LF-2 (FST)	CORRENT SENSOR								
ALRM	RELAY	SMOKE ALARM STATUS	DDC PANEL						MONITORING
SPACE-SP	STATIC PRESSURE SENSOR	BUILDING INTERIOR AIR PRESSURE	SPACE INTERIOR	1					REFERENCE ONLY
OA-TMP	AIR TEMP SENSOR	OUTSIDE AIR TEMPERATURE	BUILDING EXTERIOR	1					
* FACTORY'S F	PROVIDED DAMPER ACTUATORS.		NEW HARD WIRED POINTS	42	<u> </u> 1	52	41	180	NEW INEGRATED VP POINTS
** MAINTENANCI *** INTERFACE C	E OVERRIDE ONLY. COMMUNICATION RELATED TO HEAT PUMP	HEATING FUNCTIONALITY.	IOIAL:	136)			101/	AL: IOU

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CONTROLS SCHEMATIC EXISTING FC-1/CU(HP)-1/EF-1 - BASE BID

		CONTROLS SUMMARY OF WORK
	1.	THE BUILDING HAS EXISTING STAND ALONE CONTROLS FOR HVAC EQUIPMENT TO BE REPLACED. PROVIDE AND INSTALL NEW DDC CONTROLS SYSTEM BASED ON FACILITY'S STANDARD DELTA CONTROLS SYTEM. CONTACT ENVIRONMENTAL SYSTEM, INC KEVIN HAYES (916) 956–2194 (KHAYES@ESITE.NET) AND LANDON NORMAN (916) 201–7550 (LNORMAN@ESITE.NET).
	2.	REMOVE EXISTING STAND ALONE CONTROLS SERVING EXISTING TO BE REPLACED AC'S, FC UNIT SPLIT SYSTEM AND EF'S. CONTROLS CONTRACTOR SHALL VERIFY SITE CONDITIONS AND LOOK AT THE EXISTING CONTROLS WIRING CONNECTIONS INSIDE THE UNITS AND DISCONNECT PRIOR TO RIGGING UNITS. ALL EXISTING STAND ALONE THERMOSTATS/CONTROLLERS AND ZONE DAMPERS ACTUATORS TO BE REMOVED.
	3.	PROVIDE AND INSTALL NEW CONTROLS/CONTROLLERS WITHIN THE NEW RTU'S ENCLOSURES FOR INTEGRATION VIA BACNET MS/TP APPLICATION NETWORK WITH FACTORY'S PROVIDED DDC CONTROL BOARDS FOR ALL NEW RTU'S. COORDINATE/VERIFY WITH THE RTU'S INSTALLATION INSTRUCTIONS AND WIRING DIAGRAMS. INTEGRATE FACTORY'S CONTROLS AND PROVIDE NEW HARD WIRED CONTROLS/POINTS AS REQUIRED (RTU-11 BID ALT #1).
	4.	PROVIDE CONTROLS FOR EXISTING TO REMAIN $EF-1$ AND NEW $EF-2$.
	5.	PROVIDE CONTROLS FOR EXISTING TO REMAIN FC-1/CU-1 SPLIT SYSTEM AND NEW ACTUATORS FOR ASSOCIATED SYSTEM'S EXISTING TO REMAIN CONTROL DAMPERS, AS WELL AS FOR THE EXISTING TO REMAIN ZONE CONTROL DAMPERS.
	6.	PROVIDE NEW DAMPER ACTUATORS FOR EXISTING TO REMANN ZONE CONTROL DAMPERS AND ASSOCIATED CONTROLS INTERFACE WITH NEW RTU-11 OPERATION PER BID ALT (BID ALTERNATE #1).
ΓING	7.	PROVIDE NEW CONTROL WIRING AS REQUIRED. PROVIDE NEW GLOBAL TEMPERATURE CONTROL PANEL AND ZONE FIELD CONTROLLERS AS NEEDED TO ACCOMMODATE ALL NEW CONTROL POINTS. PROGRAM ALL NEW HVAC EQUIPMENT AS REQUIRED PER THIS SHEET AND SEQUENCES OF OPERATION. COORDINATE WITH MECHANICAL AND ELECTRICAL SUB-CONTRACTORS.
	8.	PROVIDE NEW FRONT-END SYSTEM/SOFTWARE, ASSOCIATED GRAPHICS AND PROGRAMMING AS REQUIRED TO ACCOMMODATE NEW CONTROL POINTS AND RELATED SEQUENCE OF OPERATIONS.
	9.	CONTROLS CONTRACTOR TO PROVIDE NEW CONTROL DEVICES, SENSORS, ZONE THERMOSTATS, NEW WIRING AND COUNDUITS, LOW VOLTAGE TRANSFORMERS ETC. AS REQUIRED TO DELIVER SEAMLESS INTEGRATION WITH NEW HVAC EQUIPMENT AND A FULLY OPERATIONAL HVAC CONTROLS SYSTEM FOR THE FACILITY.
) 20M	10.	COORDINATE WITH BALANCING CONTRACTOR TO PROVIDE CONTROLS ACCESS TO ALLOW THE BALANCERS TO COMPLETE THEIR TEST AND BALANCE WORK.
	11.	PROVIDE COMPLETE RECORD CONTROL DRAWINGS. PROVIDE SYSTEMS TRAINING WITH THE FACILITIES MAINTENANCE PERSONAL, AND GRAPHICS USER INTERFACE AS REQUIRED AND AS IT TIES INTO THE OVERALL DDC MONITORING OPERATION.
	12.	INSTALL COMMUNICATION WIRING TO ALL NEW DDC CONTROLLERS. COMM WIRING SHALL BE IN CONDUIT. REQUIRED NEW CONDUITS AND WIRE TO BE PROVIDED AND INSTALLED BY CONTROLS CONTRACTOR.
	13.	VERIFY ON SITE EXISTING CONDITIONS AS REQUIRED.
	14.	REFER TO MECHANICAL SCHEDULES ON M-6.1, MECHANICAL SPECIFICATIONS SECTION 23 74 14, AND MECHANICAL EQUIPMENT INSTALLATION INSTRUCTIONS FOR REFERENCE. COORDINATE WITH MECHANICAL AND ELECTRICAL SUBCONTRACTORS.
	15.	ALLOW FOR CHANGING ALL VIRTUAL SET POINTS DURING THE FIRST YEAR OF OPERATION AS REQUESTED BY THE FACILITY'S ENGINEER.
	16.	NEW RTU'S SHALL BE PROGRAMMED TO HAVE THE NATURAL GAS FURNACE AS THE PRIMARY HEATING CYCLE AND THE HEAT PUMP HEATING CYCLE SHALL BE SECONDARY/AUXILIARY. CONTROLS SUB-CONTRACTOR TO COORDINATE WITH FACTORY REPRESENTATVE, ENSURING ALL RTU'S WARRANTY IS MAINTAINED FOR THE OWNER.
	17.	PROVIDE COMMUNICATION LINK OVER IP TO DISTRICT'S FACILITY CONTROL/MONITORING OFFICE.
		BY ELECTRICAL CONTRACTOR:
		PROPVIDE 20 AMP, 120 VOLT SINGLE PHASE CIRCUIT TO POWER ALL NEW DDC CONTROLLERS.
		EXTEND POWER TO THE NEW TEMPERATURE CONTROL PANEL(S) AS REQUIRED. COORDINATE TERMINATION WITH CONTROLS CONTRACTOR.
		PROVIDE NEW JUNCTION BOXES WITHIN 3 FEET OF EACH NEW DDC CONTROLLER/PANEL.
6)		
X		ACTUATOR SCHEDULE FOR RTU-11 ZONE DAMPERS - (BID ALTERNATE #1)
8)		
		RIES LF INF (REFERENCE UNLY) AF (REFERENCE UNLY)

SERIES	LF	NF (REFERENCE ONLY)	AF (REFERENCE ONL
MANUFACTURER	BELIMO	BELIMO	BELIM
FORCE	35 IN-LB	60 IN-LB	133 IN-L
CONTROL	2-10 VDC	2-10 VDC	2-10 VD
MAXIMUM DAMPER SIZE	4 SQ. FT.	8 SQ. FT.	16 SQ. F

1) CONFIRM ALL DAMPERS HAVE EDGE SEALS. 2) COMFIRM ALL DAMPERS SHALL HAVE SPRING RETURN TO OPEN IN CASE OF DAMPER FAILURE.

3) ALL DAMPER'S ACTUATORS REFLECTED IN CONTROLS SCHEMATICS ARE NEW

(REFER TO MECHANICAL SUMMARY OF WORK ON G-0.0 AND MECHANICAL SCHEDULES ON M-6.1).

GENERAL NOTES

- A. FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3 OR 4/A-5.1 AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL 1/A-5.2.
- B. SEE BID ALTERNATES ON COVER SHEET, G-0.0.

REFERENCE SHEET NOTES

- DEMOLISH EXISTING GAS PIPING IN THE ATTIC SPACE TO FACILITATE THE NEW CONSTRUCTION OF THE NEW RTU UNITS AND DUCTWORK. 2. DEMOLISH SECTION OF EXISTING RAIN CONDUCTOR PIPE IN THE ATTIC SPACE FOR CONNECTION OF NEW RAIN CONDUCTOR PIPE.
- 3. TEST EXISTING GAS PRESSURE DOWNSTREAM OF THE GAS METER AND PRESSURE REGULATORS. NOTIFY THE ENGINEER OF EXISTING GAS PRESSURE READING.

11. DEMOLISH EXISTING 1-1/2" GAS PIPING IN THE ATTIC SPACE TO PROVIDE FOR ADDITIONAL BRANCH FOR RTU-11.

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	GENERAL NOTES
А.	FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3 OR $4/A-5.1$ AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL $1/A-5.2$.
В. С.	SEE BID ALTERNATES ON COVER SHEET, G-0.0. PIPE SUPPORTS SHALL BE PROVIDED AS DETAILED ON P-5.1. REFER TO PIPE SUPPORT DETAILS FOR SPACING REQUIREMENTS AND INSTALLATION.
#	REFERENCE SHEET NOTES
1.	PROVIDE AND CONNECT 1" GAS PIPE TO EXISTING GAS PIPE WITHIN THE ATTIC SPACE. GAS PIPING SHALL PENETRATE THROUGH THE ROOF FOR CONNECTION TO RTU UNIT. SEE P -1.2 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOF PENETRATION FLASHING. PROVIDE PIPE SUPPORTS AS PER DETAIL $1/P-5.1$.
2.	PROVIDE AND INSTALL 4" RAIN CONDUCTOR PIPE IN THE ATTIC SPACE. CONNECT PIPING TO NEW ROOF DRAIN AT ROOF AND ROUTE PIPING TO EXISTING RAIN CONDUCTOR PIPE. MAINTAIN A MINIMUM SLOPE $\frac{1}{4}$ " PER FOOT. CONNECT TO EXISTING CONDUCTOR PIPE USING LINE SIZED TEE. PROVIDE PIPE SUPPORTS AS PER DETAIL 1/P-5.1.
3.	PROVIDE AND INSTALL CLEANOUT AT THE BASE OF THE CONDUCTOR PIPE BEFORE CONNECTION TO THE HORIZONTAL PIPE.
4.	PROVIDE AND INSTALL 4" DOWNSPOUT. PENETRATE THROUGH EXTERIOR WALL AND TERMINATE PIPE WITH PLAIN ENDS 6" FROM FACE OF EXTERIOR WALL.
5.	GAS PRESSURE DOWNSTREAM OF THE GAS METER AND PRESSURE REGULATORS SHALL BE NO LESS THAN 8 INCHES W.C. AND NO GREATER THAN 14 INCHES W.C. ADJUST PRESSURE REGULATORS AS NECESSARY TO ACHIEVE IDEAL GAS PRESSURE FOR THE NEW RTU'S
<u>ALT</u>	TERNATE BID ITEM #1:
11.	PROVIDE AND INSTALL A NEW 1" GAS BRANCH. CONNECT TO EXISTING $1-1/2$ " GAS PIPE USING A $1-1/2$ " TO 1" REDUCING TEE AND ROUTE 1" GAS PIPE TO ROOF PENETRATION FOR CONNECTION TO RTU-11 ABOVE. SEE P-1.2 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOF PENETRATION FLASHING.
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 A. CONDENSATE DRAIN PIPING SHALL MAINTAIN A DOWINWARD SLOPE OF NOT LESS THAN 1/4 INCH PER FOOT OR 1 PERCENT SLOPE TOWARDS THE TERMINATION AT ROOF DRAIN. B. FLASH EPHETRATIONS THROUGH ROOF AS PER DETAIL 3 OR 4/A-5.1 AS APPLICABLE FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL 1/A-5.2. C. STE BD ALTERNATES ON COVER SHETL 0-0.0. D. ALL PLUWRING VENTS SHALL BE A MINIMUM OF 10 FEET FROM AR INTAKES. P. PEE SUPPORTS SHALL BE PROVIDED AS DETALED ON P-5.1. REFER TO PIPE SUPPORT DETAILS FOR SPACING REQUIREMENTS AND INSTALLATION. PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPAG TO NEW RTU UNITS AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE 2⁺ PER TOOT AND PROVIDE CLEARAURED, SA REQUIRE SEED OTALL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORT DETAILS FOR SPACING REQUIREMENTS AND INSTALL CAS COCK AND FLEXELE PIPING AT CONNECTION TO ROW RTU UNITS. SEE ARCHEED URAL CONNECTION TO THE RTU UNIT, SEE DETAIL 3/P-5.1 FOR DIPE SUPPORT DETAILS PIPING SPIKENT INF. ROOF PREIRRATION AND THE CONNECTION TO THE RTU UNIT, SEE DETAIL 3/P-5.1. FOR DOWING AND INSTALL CAS EPING. PROVIDE AND INSTALL CAS COCK AND FLEXELE PIPING AT CONNECTION TO RUM PILL UNITS. SEE ARCHEED URAL DRAIN PIPING AT CONNECTION TO RUM PILL ON SEE ARCHEED URAL DRAIN DECOMPRESSION OF THE RTU UNITS. SEE ARCHEED URAL DRAIN DECOMPRESSION OF THE RTU UNITS. SEE ARCHEED URAL DRAIN DECOMPRESSION OF DRAIN OF OF ORDERATE DRAIN UNIT. PIPING AT CONNECTION TO RUM AND THE AN AIR GAR. PROVIDE AND INSTALL COOF DRAIN IN DRAIN SUMP, SEE P-1.1 FOR CONTINUATION. SEE ARCHIECTURAL DRAININGS FOR ROOFING. PROVIDE AND INSTALL ROOF DRAIN IN DRAIN SUMP, SEE P-1.1 FOR CONTINUATION. SEE ARCHIECTURAL DRAININGS FOR ROOFING. PROVIDE AND INSTALL ROOF SURFACE. COORDINATE WITH AN AIR GAR. PROVIDE AND INSTALL ROOF SURFACE. COORDINATE WITH AN AIR GAR. PROVIDE AND INSTALL ROOF SURFACE. CONDENTIES TO AMENDAT		GENERAL NOTES
 A ROOT DAWN. FLASH PRETRAINONS THROUGH ROOF AS PER DETAIL 3 OR 4/A=5.1 AS APPLICABLE. FOR CANCED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL 1/A=5.2. SEE BID ALTERNATES ON COVER SHEET, G=0.0. ALL PLUMBING VENTS SHALL BE A MINIMUM OF 10 FEET FROM AR INTAKES. PRE SUPPORT SHALL BE PROVIDED AS DETAILED ON P=5.1, REFER TO PIPE SUPPORT DETAILS FOR SPACING REQUIREMENTS AND INSTALLATION. PROVIDE AND INSTALL COMENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RIU UNITS AND ROUTE TO ROOF BANN. SLOPE NEW CONDENSATE PIPE 1/ PER FOOT AND PROVIDE CLEMOUT(S) AS REQUIRED. SEE DETAIL 2/P=5.1 FOR CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RIU UNITS AND ROUTE TO ROOF BANN. SLOPE NEW CONDENSATE PIPE 1/ PER FOOT AND PROVIDE CLEMOUT(S) AS REQUIRED. SEE DETAIL 2/P=5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P=5.1 FOR PIPE SUPPORTS. PROVIDE AND INSTALL CAS PIPING. PROVIDE AND INSTALL GAS COOK AND FLEXELE PIPING AT CONTROL ROOF PIPINT PROVIDE OLE PIPE SUPPORT IN. AT THE RIDD CAS PIPING. PROVIDE AND INSTALL CAS COOK AND FLEXELE PIPING AT CONTROL ROOF PIPINT PARTICID. AND THE CONTROL PIPING AT CONTROL ROOF DRAIN TO ROOF DRAIN WITH AN AR CAR. PROVIDE AND INSTALL COF DRAIN IN DRAIN SUMP. SEE P=1.1 FOR CONTROL PIPING ROOFTOP PILUMBING VENTS TO A MINIMUM OF 12" MONTE THE NEW FINISHED ROOF SUFFACE. COORDINATE WITH AN AR CARTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. PROVIDE AND INSTALL OVERFLOW SUMPACE AND PIPING. POOLED CONTRACTOR. PROVIDE AND INSTALL OVERFLOW SUMPACE AND PIPING. CONTRACTOR. PROVIDE AND INSTALL OWERFLOW SUMPACE AND PIPING ROOFING. PROVIDE AND INSTALL OWERFLOW SUMPACE AND PIPING ROOFING. PROVIDE AND INSTALL OWERFLOW OF SUMPACE. COORDINATE WITH AN AR CARTINUATED. SEE ARCHITE	Α.	CONDENSATE DRAIN PIPING SHALL MAINTAIN A DOWNWARD SLOPE OF NOT LESS THAN 1/4 INCH PER FOOT OR 1 PERCENT SLOPE TOWARDS THE TERMINATION
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PROVIDE AND INSTALL COMPENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO INEW RTU UNITS AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE J' FER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR TOP PIPE SUPPORTS. PROVIDE AND INSTALL GAS PIPING PROVED AND INSTALL GAS COCK AND FLICKIBLE PIPING AT CONNECTION TO NEW RTU UNITS. SEE ARCHTECTURAL DRAWINGS FOR GAS PIPING PROVED HER ROOF PENETRATION. PROVIDE ONE PIPE SUPPORTS. PROVIDE AND INSTALL GAS PIPING ENVERTITIE NOT PIPE SUPPORTS. PROVIDE AND INSTALL GAS PIPING ENVERTITIE NOT PENETRATION AND THE CONNECTION TO THE RTU UNIT, SEE DETAIL 3/P-5.1. PROVIDE AND INSTALL ROOF DEGREE ELBOW TO ROOF DRAIN WITH AN AIR GR. PROVIDE AND INSTALL ROOF DRAIN IN DRAIN SUMP. SEE P-1.1 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. PROVIDE AND INSTALL ROOF DRAIN IN DRAIN SUMP. SEE P-1.1 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. PROVIDE AND INSTALL ROOF DRAIN IN DRAIN SUMP. SEE P-1.1 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. PROVIDE AND INSTALL ROOF DRAIN AT DRAIN SUMP. SEE P-1.1 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. PROVIDE AND INSTALL ROOF DROFTOP PLUMBING VENTS TO A NUMIUM OF 12" ABOVE THE INSEED ROOF SUBFRACE. COORDINATE WITH ROOFING CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. PROVIDE AND INSTALL HOSE BIBB ON NORTH ROOF CONNECT TO NERREST DOMESTIC WATER UNE IN THE ATTIC SPACE AND PENERATE THROUGH THE ROOF AS INDICATED HOSE BIBB NOZZLE SHALL BE A MINIMUM OF 12" ABOVE THE INNEED ROOF SUBFRACE WITH LEAD FREE BALLAULE UPSTREAM OF HOSE BIBB INZEL SEE DETAIL 5/P-S.1 AND SEE ARCHTECTURAL DRAWINGS FOR ROOF ASCURSES VATCH AND A MINIMUM OF 10 FEET FROM THE CONDENSATE DRESS FURCH THE AND MINIMUM OF 10 FEET FROM THE CONDENSATE DRESS FURCH THE AND MINIMUM OF 10 FEET FROM THE CONDENSATE DRESS FURCE WITH LEAD FREE BALL AS A DENDREC CONDENSATE CONDENSATE WITH ROOFING CONTRACTOR. PROVIDE AND INSTALL HOSE BIBB NOZZLE SHALL BE A MINIMUM OF 12' ABOVE T	C. D. E.	SEE BID ALTERNATES ON COVER SHEET, G-0.0. ALL PLUMBING VENTS SHALL BE A MINIMUM OF 10 FEET FROM AIR INTAKES. PIPE SUPPORTS SHALL BE PROVIDED AS DETAILED ON P-5.1. REFER TO PIPE SUPPORT DETAILS FOR SPACING REQUIREMENTS AND INSTALLATION.
 ■ REFERENCE SHEET NOTES ■ PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW KITU UNITS AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE ‡" PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS. ■ PROVIDE AND INSTALL GAS PIPING. PROVIDE AND INSTALL GAS COCK AND FLEXIBLE PIPING AT CONNECTION TO NEW RTU UNITS. SEE ARCHITECTURAL DRAININGS FOR GAS PIPING ROOF PENETRATION. PROVIDE ONE PER SUPPORT MIN. AT THE RIDD CAS PIPING BETWEEN THE ROOF PENETRATION AND THE CONNECTION TO THE RTU UNIT, SEE DETAIL 3/P-5.1. ■ PROVIDE AND INSTALL 90 DEGREE ELBOW TO END OF CONDENSATE DRAIN LINE. DRAIN DISCHARGE SHALL BE DOWNWARD INTO ROOF DRAIN WITH AN AIR GAP. ■ PROVIDE AND INSTALL ROOF DRAIN IN DRAIN SUMP. SEE P-1.1 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. ■ PROVIDE AND INSTALL OVERFLOW DRAIN AT DRAIN SUMP. SEE P-1.1 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. ■ PROVIDE AND INSTALL OVERFLOW DRAIN AT DRAIN SUMP. SEE P-1.1 FOR CONTINUATION. SEE ARCHITECTURAL DRAWINGS FOR ROOFING. ■ PROVIDE AND INSTALL HOSE BIBB ON NORTH ROOF. CONNECT TO NEAREST DOMESTIC WATER LINE IN THE ATTIC SPACE AND DENETRATE THROUGH THE ROOF AS INDICATED. HOSE BIBB NO XZILE SHALL BE A MINIMUM OF 12" ABOVE THE FINISHED ROOF SURFACE WITH LEAD FREE BALL VALVE UPSTREAM OF HOSE BIBB NOZZLES ED ETAIL 5/P-5.1 AND SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING. RELOCATE PLUMBING VENT A MINIMUM OF 10 FEET FROM THE EDGE OF THE ROOF AS INDICATED. HOSE BIBB NO SOUTH ROOF. CONNECT TO NEAREST DOMESTIC WATER LINE IN THE ATTIC SPACE WITH A 45 DECREE ELBOW AND EXTENDED TOT THE NEW YENT SHALL BE RECONNECTED TO EXISTING ROOF ACCESS HATCH AND NEW WENT SHALL BE RECONNECTED TO EXISTING ROOF ACCESS HATCH AND NEW WITH SHALL BE RECONNECTED TO EXISTING ROOF ACCESS HATCH AND VENT SHALL BE RECONNECTED TO EXISTING ROOF ACCESS HATCH AND VENT SHALL BE		
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 ALTERNATE BID ITEM #1: 10. RELOCATE PLUMBING VENT A MINIMUM OF 6 FEET FROM THE EDGE OF THE EXISTING ROOF ACCESS HATCH AND A MINIMUM OF 10 FEET FROM THE OUTSIDE AIR INTAKE OF RTU-11. NEW VENT SHALL BE RECONNECTED TO EXISTING PLUMBING VENT PIPE IN ATTIC SPACE WITH A 45 DEGREE ELBOW AND EXTENDED TO THE NEW VENT LOCATION. NEW ROOF VENTS SHALL TERMINATE A MINIMUM OF 12" ABOVE THE NEW FINISHED ROOF SURFACE. COORDINATE WITH ROOFING CONTRACTOR. 11. PROVIDE AND INSTALL HOSE BIBB ON SOUTH ROOF. CONNECT TO NEAREST DOMESTIC WATER LINE IN THE ATTIC SPACE AND PENETRATE THROUGH THE ROOF AS INDICATED. HOSE BIBB NOZZLE SHALL BE A MINIMUM OF 12" ABOVE THE FINISHED ROOF SURFACE WITH LEAD FREE BALL VALVE UPSTREAM OF HOSE BIBB NOZZLE. SEE DETAIL 5/P-5.1 AND SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING. 12. PROVIDE AND INSTALL 1" GAS PIPING. PROVIDE AND INSTALL GAS COCK AND FLEXIBLE PIPING AT CONNECTION TO RTU-11. SEE ARCHITECTURAL DRAWINGS FOR GAS PIPING ROOF PENETRATION. 13. PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RTU-11 AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE ‡" PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS. 	7.	PROVIDE AND INSTALL HOSE BIBB ON NORTH ROOF. CONNECT TO NEAREST DOMESTIC WATER LINE IN THE ATTIC SPACE AND PENETRATE THROUGH THE ROOF AS INDICATED. HOSE BIBB NOZZLE SHALL BE A MINIMUM OF 12" ABOVE THE FINISHED ROOF SURFACE WITH LEAD FREE BALL VALVE UPSTREAM OF HOSE BIBB NOZZLE. SEE DETAIL $5/P-5.1$ AND SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING.
 10. RELOCATE PLUMBING VENT A MINIMUM OF 6 FEET FROM THE EDGE OF THE EXISTING ROOF ACCESS HATCH AND A MINIMUM OF 10 FEET FROM THE OUTSIDE AR INTAKE OF RTU-11. NEW VENT SHALL BE RECONNECTED TO EXISTING PLUMBING VENT PIPE IN ATTIC SPACE WITH A 45 DEGREE ELBOW AND EXTENDED TO THE NEW VENT LOCATION. NEW ROOF VENTS SHALL TERMINATE A MINIMUM OF 12" ABOVE THE NEW FINISHED ROOF SURFACE. COORDINATE WITH ROOFING CONTRACTOR. 11. PROVIDE AND INSTALL HOSE BIBB ON SOUTH ROOF. CONNECT TO NEAREST DOMESTIC WATER LINE IN THE ATTIC SPACE AND PENETRATE THROUGH THE ROOF AS INDICATED. HOSE BIBB NOZZLE SHALL BE A MINIMUM OF 12" ABOVE THE FINISHED ROOF SURFACE WITH LEAD FREE BALL VALVE UPSTREAM OF HOSE BIBB NOZZLE. SEE DETAIL 5/P-5.1 AND SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING. 12. PROVIDE AND INSTALL 1" GAS PIPING. PROVIDE AND INSTALL GAS COCK AND FLEXIBLE PIPING AT CONNECTION TO RTU-11. SEE ARCHITECTURAL DRAWINGS FOR GAS PIPING ROOF PENETRATION. 13. PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RTU-11 AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE ¹/₄" PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS. 	<u>ALT</u>	ERNATE BID ITEM #1:
 11. PROVIDE AND INSTALL HOSE BIBB ON SOUTH ROOF. CONNECT TO NEAREST DOMESTIC WATER LINE IN THE ATTIC SPACE AND PENETRATE THROUGH THE ROOF AS INDICATED. HOSE BIBB NOZZLE SHALL BE A MINIMUM OF 12" ABOVE THE FINISHED ROOF SURFACE WITH LEAD FREE BALL VALVE UPSTREAM OF HOSE BIBB NOZZLE. SEE DETAIL 5/P-5.1 AND SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING. 12. PROVIDE AND INSTALL 1" GAS PIPING. PROVIDE AND INSTALL GAS COCK AND FLEXIBLE PIPING AT CONNECTION TO RTU-11. SEE ARCHITECTURAL DRAWINGS FOR GAS PIPING ROOF PENETRATION. 13. PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RTU-11 AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE ¹/₄" PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS. 	10.	RELOCATE PLUMBING VENT A MINIMUM OF 6 FEET FROM THE EDGE OF THE EXISTING ROOF ACCESS HATCH AND A MINIMUM OF 10 FEET FROM THE OUTSIDE AIR INTAKE OF RTU-11. NEW VENT SHALL BE RECONNECTED TO EXISTING PLUMBING VENT PIPE IN ATTIC SPACE WITH A 45 DEGREE ELBOW AND EXTENDED TO THE NEW VENT LOCATION. NEW ROOF VENTS SHALL TERMINATE A MINIMUM OF 12" ABOVE THE NEW FINISHED ROOF SURFACE. COORDINATE WITH ROOFING CONTRACTOR.
 12. PROVIDE AND INSTALL 1" GAS PIPING. PROVIDE AND INSTALL GAS COCK AND FLEXIBLE PIPING AT CONNECTION TO RTU-11. SEE ARCHITECTURAL DRAWINGS FOR GAS PIPING ROOF PENETRATION. 13. PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RTU-11 AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE ‡" PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS. 	11.	PROVIDE AND INSTALL HOSE BIBB ON SOUTH ROOF. CONNECT TO NEAREST DOMESTIC WATER LINE IN THE ATTIC SPACE AND PENETRATE THROUGH THE ROOF AS INDICATED. HOSE BIBB NOZZLE SHALL BE A MINIMUM OF 12" ABOVE THE FINISHED ROOF SURFACE WITH LEAD FREE BALL VALVE UPSTREAM OF HOSE BIBB NOZZLE. SEE DETAIL 5/P-5.1 AND SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING.
 PROVIDE AND INSTALL I GAS PIPING. PROVIDE AND INSTALL GAS COCK AND FLEXIBLE PIPING AT CONNECTION TO RTU-11. SEE ARCHITECTURAL DRAWINGS FOR GAS PIPING ROOF PENETRATION. PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RTU-11 AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE ¹/₄" PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS. 		
13. PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RTU-11 AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE ¹ / ₄ " PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS.	12.	PROVIDE AND INSTALL 1 GAS PIPING. PROVIDE AND INSTALL GAS COCK AND FLEXIBLE PIPING AT CONNECTION TO RTU-11. SEE ARCHITECTURAL DRAWINGS FOR GAS PIPING ROOF PENETRATION.
	13.	PROVIDE AND INSTALL CONDENSATE DRAIN PIPING. CONNECT CONDENSATE DRAIN PIPING TO NEW RTU-11 AND ROUTE TO ROOF DRAIN. SLOPE NEW CONDENSATE PIPE $\frac{1}{4}$ " PER FOOT AND PROVIDE CLEANOUT(S) AS REQUIRED. SEE DETAIL 2/P-5.1 FOR CONDENSATE TRAP. SEE DETAIL 3/P-5.1 FOR PIPE SUPPORTS.

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GENERAL NOTES

- A. PREPARE A SPECIAL METHOD OF PROCEDURE & COORDINATE SHUTDOWN OF ANY DEVICE WITH SOLANO COMMUNITY COLLEGE DISTRICT. SHUTDOWN MUST BE PERFORMED AFTER HOURS. PROVIDE TEMPORARY POWER & LIGHTING AS NEEDED.
 B. ELECTRICAL EQUIPMENT SHALL BE TESTED AS REQUIRED BY MANUFACTURER, SOLANO COMMUNITY COLLEGE DISTRICT & PER NETA ATS. PRIOR TO ENERGIZING NEW LOADS,
- CONTRACTOR SHALL HAVE A THIRD PARTY TESTING AGENCY PERFORM TESTS FOR ALL NEW EQUIPMENT & EXISTING EQUIPMENT WHICH HAS BEEN AFFECTED BY NEW WORK. BEFORE RUNNING ANY CONDUCTORS TO PANELS BEING RE-CIRCUITED CONFIRM
- CONDUCTOR SIZE & ARRANGEMENT (1ø, 3ø, 3W, 4W,). REPORT ANY DISCREPANCY TO THE ENGINEER PRIOR TO CHANGING OUT CONDUCTORS.D. DEVICES SHOWN AS EXISTING SHALL REMAIN CONNECTED UNLESS OTHERWISE NOTED.
- WIRING DEVICES THAT MAY BE AFFECTED BY DEMOLITION OR REWIRING SHALL BE RECONNECTED.E. DEVICE LOCATION SHOWN IS DIAGRAMMATIC. FIELD VERIFY EXACT LOCATION & COUNT.
- ADJUST LOCATION +/- 10' AT NO ADDITIONAL COST. F. FIRE SEAL ALL RATED PENETRATIONS.
- G. WEATHER SEAL ALL BUILDING PENETRATIONS. SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING.
- H. PATCH & REPAIR ALL PAVING DISTURBED BY ALL TRADES.
- I. CONTRACTOR SHALL BE RESPONSIBLE FOR RETURNING ANY SURFACE DISTURBED BY CONSTRUCTION TO THE CONDITION & FINISH OF THE ADJACENT SURFACES.
- J. ALL ROOF CONDUITS SHALL BE SUPPORTED 18" ABOVE FINISHED ROOF MINIMUM.K. PROVIDE BLACK OR WHITE BAKELITE NAMEPLATE FOR CIRCUIT BREAKERS IDENTIFYING
- THE EQUIPMENT BEING SERVED. L. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DUST PROTECTION MEASURES TO ALL EXISTING CRITICAL EQUIPMENT FOR DURATION OF CONSTRUCTION.
- M. EXTERIOR CONDUITS SHALL BE RIGID STEEL CONDUIT.N. ALL CONDUITS SHALL BE COMPRESSION TYPE FITTINGS. SET SCREW FITTINGS NOT
- ACCEPTABLE.
 FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3/A-5.1 OR 4/A-5.1 AS
- P. SEE BID ALTERNATES ON COVER SHEET, G-0.0.

REFERENCE SHEET NOTES

- 1. EXISTING PANEL TO BE MODIFIED. SEE PANEL SCHEDULE FOR MORE
- INFORMATION.
 EXISTING MECHANICAL EQUIPMENT TO BE DEMOLISHED BY MECHANICAL CONTRACTOR. COORDINATE DEMOLITION OF ELECTRICAL COMPONENTS WITH MECHANICAL CONTRACTOR. EXISTING CONDUIT & CONDUCTOR TO BE
- DEMOLISHED BACK TO SOURCE AND BREAKER TO BE RELABELED AS 'SPARE'.3. EXISTING ZONE DAMPER FEEDERS TO BE DISCONNECTED AND PRESERVED FOR REUSE IN NEW WORK. SEE NEW WORK FOR MORE INFORMATION.

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GENERAL NOTES

- A. PREPARE A SPECIAL METHOD OF PROCEDURE & COORDINATE SHUTDOWN OF ANY DEVICE WITH SOLANO COMMUNITY COLLEGE DISTRICT. SHUTDOWN MUST BE PERFORMED AFTER HOURS. PROVIDE TEMPORARY POWER & LIGHTING AS NEEDED.
 B. ELECTRICAL EQUIPMENT SHALL BE TESTED AS REQUIRED BY MANUFACTURER, SOLANO
- COMMUNITY COLLEGE DISTRICT & PER NETA ATS. PRIOR TO ENERGIZING NEW LOADS, CONTRACTOR SHALL HAVE A THIRD PARTY TESTING AGENCY PERFORM TESTS FOR ALL NEW EQUIPMENT & EXISTING EQUIPMENT WHICH HAS BEEN AFFECTED BY NEW WORK.
- C. BEFORE RUNNING ANY CONDUCTORS TO PANELS BEING RE-CIRCUITED CONFIRM CONDUCTOR SIZE & ARRANGEMENT (10, 30, 3W, 4W,). REPORT ANY DISCREPANCY TO THE ENGINEER PRIOR TO CHANGING OUT CONDUCTORS.
- D. DEVICES SHOWN AS EXISTING SHALL REMAIN CONNECTED UNLESS OTHERWISE NOTED. WIRING DEVICES THAT MAY BE AFFECTED BY DEMOLITION OR REWIRING SHALL BE RECONNECTED.
- E. DEVICE LOCATION SHOWN IS DIAGRAMMATIC. FIELD VERIFY EXACT LOCATION & COUNT. ADJUST LOCATION +/- 10' AT NO ADDITIONAL COST.
 F. FIRE SEAL ALL RATED PENETRATIONS.
- G. WEATHER SEAL ALL BUILDING PENETRATIONS. SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING.
- H. PATCH & REPAIR ALL PAVING DISTURBED BY ALL TRADES.
- I. CONTRACTOR SHALL BE RESPONSIBLE FOR RETURNING ANY SURFACE DISTURBED BY CONSTRUCTION TO THE CONDITION & FINISH OF THE ADJACENT SURFACES.
- J. ALL ROOF CONDUITS SHALL BE SUPPORTED 18" ABOVE FINISHED ROOF MINIMUM.K. PROVIDE BLACK OR WHITE BAKELITE NAMEPLATE FOR CIRCUIT BREAKERS IDENTIFYING
- THE EQUIPMENT BEING SERVED. L. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DUST PROTECTION MEASURES TO ALL EXISTING CRITICAL EQUIPMENT FOR DURATION OF CONSTRUCTION.
- M. EXTERIOR CONDUITS SHALL BE RIGID STEEL CONDUIT.N. ALL CONDUITS SHALL BE COMPRESSION TYPE FITTINGS. SET SCREW FITTINGS NOT
- ACCEPTABLE. O. FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3/A-5.1 OR 4/A-5.1 AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL
- 1/A-5.2.P. SEE BID ALTERNATES ON COVER SHEET, G-0.0.

REFERENCE SHEET NOTES

- 1. EXISTING PANEL TO BE MODIFIED. SEE PANEL SCHEDULE FOR MORE
- INFORMATION.
 RECONNECT EXISTING FEEDERS FROM DEMOLITION TO ZONE DAMPER ACTUATORS. SEE SHEET M-1.1 FOR EXACT LOCATIONS. COORDINATE FINAL CONNECTIONS WITH CONTROLS CONTRACTOR.
- 3. NEW DDC PANEL PROVIDED AND INSTALLED BY OTHERS. CONTRACTOR TO PROVIDE ELECTRICAL COMPONENTS NECESSARY TO POWER NEW PANEL. SEE PANEL SCHEDULE FOR MORE INFORMATION.

1 ELECTRICAL ROOF PLAN - DEMO

GENERAL NOTES

- PREPARE A SPECIAL METHOD OF PROCEDURE & COORDINATE SHUTDOWN OF ANY DEVICE WITH SOLANO COMMUNITY COLLEGE DISTRICT. SHUTDOWN MUST BE PERFORMED AFTER HOURS. PROVIDE TEMPORARY POWER & LIGHTING AS NEEDED. ELECTRICAL EQUIPMENT SHALL BE TESTED AS REQUIRED BY MANUFACTURER, SOLANO COMMUNITY COLLEGE DISTRICT & PER NETA ATS. PRIOR TO ENERGIZING NEW LOADS, CONTRACTOR SHALL HAVE A THIRD PARTY TESTING AGENCY PERFORM TESTS FOR ALL NEW EQUIPMENT & EXISTING EQUIPMENT WHICH HAS BEEN AFFECTED BY NEW WORK. BEFORE RUNNING ANY CONDUCTORS TO PANELS BEING RE-CIRCUITED CONFIRM CONDUCTOR SIZE & ARRANGEMENT (10, 30, 3W, 4W,). REPORT ANY DISCREPANCY TO THE ENGINEER PRIOR TO CHANGING OUT CONDUCTORS. DEVICES SHOWN AS EXISTING SHALL REMAIN CONNECTED UNLESS OTHERWISE NOTED. WIRING DEVICES THAT MAY BE AFFECTED BY DEMOLITION OR REWIRING SHALL BE RECONNECTED.
- DEVICE LOCATION SHOWN IS DIAGRAMMATIC. FIELD VERIFY EXACT LOCATION & COUNT. ADJUST LOCATION +/- 10' AT NO ADDITIONAL COST. FIRE SEAL ALL RATED PENETRATIONS.
- WEATHER SEAL ALL BUILDING PENETRATIONS. SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING.
- PATCH & REPAIR ALL PAVING DISTURBED BY ALL TRADES.
- CONTRACTOR SHALL BE RESPONSIBLE FOR RETURNING ANY SURFACE DISTURBED BY CONSTRUCTION TO THE CONDITION & FINISH OF THE ADJACENT SURFACES.
- ALL ROOF CONDUITS SHALL BE SUPPORTED 18" ABOVE FINISHED ROOF MINIMUM. PROVIDE BLACK OR WHITE BAKELITE NAMEPLATE FOR CIRCUIT BREAKERS IDENTIFYING
- THE EQUIPMENT BEING SERVED. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DUST PROTECTION MEASURES TO ALL EXISTING CRITICAL EQUIPMENT FOR DURATION OF CONSTRUCTION.
- M. EXTERIOR CONDUITS SHALL BE RIGID STEEL CONDUIT. ALL CONDUITS SHALL BE COMPRESSION TYPE FITTINGS. SET SCREW FITTINGS NOT ACCEPTABLE.
- FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL 3/A-5.1 OR 4/A-5.1 AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL 1/A-5.2.
- P. SEE BID ALTERNATES ON COVER SHEET, G-0.0.

REFERENCE SHEET NOTES EXISTING MECHANICAL EQUIPMENT TO BE DEMOLISHED BY MECHANICAL

- CONTRACTOR. COORDINATE DEMOLITION OF ELECTRICAL COMPONENTS WITH MECHANICAL CONTRACTOR. EXISTING CONDUIT AND CONDUCTORS TO BE CAPTURED BELOW ROOF AND REUSED WITH NEW EQUIPMENT.
- 2. EXISTING MECHANICAL EQUIPMENT TO BE DEMOLISHED BY MECHANICAL CONTRACTOR. COORDINATE DEMOLITION OF ELECTRICAL COMPONENTS WITH MECHANICAL CONTRACTOR. EXISTING CONDUIT & CONDUCTOR TO BE DEMOLISHED BACK TO SOURCE AND BREAKER TO BE RELABELED AS 'SPARE'.
- 3. EXISTING RECEPTACLE TO BE RELOCATED AS PART OF WORK. CAPTURE EXISTING FEEDER BELOW REROOF AND MOVE TO LOCATION SHOWN ON NEW WORK.

 ELECTRICAL ROOF PLAN - NEW

 SCALE: 1/8" = 1' - 0"

	Α.	PREPARE A SPECIAL METHOD OF PROCEDURE & COORDINATE SHUTDOWN OF ANY DEVICE WITH SOLANO COMMUNITY COLLEGE DISTRICT. SHUTDOWN MUST BE PERFORMED AFTER HOURS. PROVIDE TEMPORARY POWER & LIGHTING AS NEEDED.
	В.	ELECTRICAL EQUIPMENT SHALL BE TESTED AS REQUIRED BY MANUFACTURER, SOLANO COMMUNITY COLLEGE DISTRICT & PER NETA ATS. PRIOR TO ENERGIZING NEW LOADS, CONTRACTOR SHALL HAVE A THIRD PARTY TESTING AGENCY PERFORM TESTS FOR ALL NEW EQUIPMENT & EXISTING EQUIPMENT WHICH HAS BEEN AFFECTED BY NEW WORK.
	C.	BEFORE RUNNING ANY CONDUCTORS TO PANELS BEING RE-CIRCUITED CONFIRM CONDUCTOR SIZE & ARRANGEMENT (1ø, 3ø, 3W, 4W,). REPORT ANY DISCREPANCY TO THE ENGINEER PRIOR TO CHANGING OUT CONDUCTORS.
	D.	DEVICES SHOWN AS EXISTING SHALL REMAIN CONNECTED UNLESS OTHERWISE NOTED. WIRING DEVICES THAT MAY BE AFFECTED BY DEMOLITION OR REWIRING SHALL BE RECONNECTED.
	E.	DEVICE LOCATION SHOWN IS DIAGRAMMATIC. FIELD VERIFY EXACT LOCATION & COUNT. ADJUST LOCATION $+/-$ 10' AT NO ADDITIONAL COST.
	F.	FIRE SEAL ALL RATED PENETRATIONS.
	G.	WEATHER SEAL ALL BUILDING PENETRATIONS. SEE ARCHITECTURAL DRAWINGS FOR ROOF FLASHING.
	Н.	PATCH & REPAIR ALL PAVING DISTURBED BY ALL TRADES.
	Ι.	CONTRACTOR SHALL BE RESPONSIBLE FOR RETURNING ANY SURFACE DISTURBED BY CONSTRUCTION TO THE CONDITION & FINISH OF THE ADJACENT SURFACES.
	J.	ALL ROOF CONDUITS SHALL BE SUPPORTED 18" ABOVE FINISHED ROOF MINIMUM.
	К.	PROVIDE BLACK OR WHITE BAKELITE NAMEPLATE FOR CIRCUIT BREAKERS IDENTIFYING THE EQUIPMENT BEING SERVED.
	L.	CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DUST PROTECTION MEASURES TO ALL EXISTING CRITICAL EQUIPMENT FOR DURATION OF CONSTRUCTION.
	М.	EXTERIOR CONDUITS SHALL BE RIGID STEEL CONDUIT.
	N.	ALL CONDUITS SHALL BE COMPRESSION TYPE FITTINGS. SET SCREW FITTINGS NOT ACCEPTABLE.
	0.	FLASH PENETRATIONS THROUGH ROOF AS PER DETAIL $3/A-5.1$ OR $4/A-5.1$ AS APPLICABLE. FOR GANGED PENETRATIONS, PROVIDE FLASHING AS PER DETAIL $1/A-5.2$.
	Ρ.	SEE BID ALTERNATES ON COVER SHEET, G-0.0.
ľ		REFERENCE SHEET NOTES
	1.	RECONNECT EXISTING FEEDER FROM DEMOLISHED UNIT TO NEW UNIT. EXTEND EXISTING FEEDER AS NECESSARY TO CONNECT TO NEW FUSED DISCONNECT PROVIDED WITH NEW HVAC UNIT.
	2.	NEW HVAC FEEDER FROM PANEL LISTED. COORDINATE ROOF PENETRATION LOCATION WITH ROOF INSTALLER. CONNECT NEW FEEDER TO NEW FUSED DISCONNECT PROVIDED WITH NEW HVAC UNIT.
	3.	NEW GFCI WEATHER RESISTANT DUPLEX RECEPTACLE PROVIDED FROM FACTORY, RATED 20 AMPS, 115 VOLTS, WITH A WEATHERPROOF WHILE-IN-USE COVER. PROVIDE POWER FROM CIRCUIT INDICATED.
	4.	EXISTING RECEPTACLE PRESERVED FROM DEMOLITION. EXTEND EXISTING FEEDER AS NECESSARY TO CONNECT TO EXISTING RECEPTACLE IN NEW LOCATION.

GENERAL NOTES

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			SYMBOL	LEGEND		GENERAL NOTES
						A. SEE DSA APPL #02-116082 FOR FIRE ALARM SYSTEM ARCHITECTURE, INTERCONNECTIONS AND RISER DIAGRAM.
SYMBO		MANUFACTURER CATALOG #	DESCRIPTION	BACK BOXES (PROVIDED BY ELECTRICAL CONTRACTOR) MOUNTING (PROVIDED BY ELECTRICAL CONTRACTOR)	C.S.F.M.	B. PRIOR TO ROUGH-IN, CONTRACTOR SHALL REVIEW FIRE ALARM DEVICES LOCATION: WITH ENGINEER. CONTRACTOR SHALL NOT INSTALL DEVICES UNTIL ROUGH-IN
	7	EDWARDS SIGA-SD	INTELLIGENT SUPERDUCT SMOKE DETECTOR	EXISTING DUCT SMOKE DETECTOR TO BE REUSED 3	3242-1657:0223	C. FIRE ALARM DEVICES SHALL BE MOUNTED TO MEET ADA REQUIREMENTS.
	7	EDWARDS SIGA-T60	60-INCH SAMPLING TUBE	EXISTING DUCT SMOKE TUBES TO BE REUSED -		D. FIRE ALARM CONDUIT ROUTING IS DIAGRAMMATIC. ROUTING SHOWN MINIMIZES AMOU OF EXPOSED RACEWAYS IN INTERIOR SPACES AND DISTANCES ARE WITHIN ALLOWA VOLTAGE DROPS CONTRACTOR SHALL PLAN ROUTING IN ADVANCE AND PROVIDE
(ARM)	7	EDWARDS SIGA-CR	CONTROL RELAY MODULE	2-1/4" DEEP 4" SQ BOX W/DOUBLE GANG MUD RING 7	7300–1657:0121	ROUTING PLAN TO ENGINEER FOR REVIEW.
						E. FIRE ALARM RACEWAYS SHALL BE CONCEALED. PATCH AND PAINT WALL/CEILING AFFECTED. USE 3/4"C. U.O.N.
						F. VERIFY AVAILABLE SYSTEM ADDRESSES.
						G. FIRE ALARM SYSTEM FUNCTIONALITY SHALL BE TESTED AND INSPECTED UPON WOR COMPLETION IN ACCORDANCE WITH NFPA 72 CHAPTER 14 (2016) EDITION.
						H. ALL DEVICE ADDRESSES AND ADDRESSABLE POINTS ARE SUBJECT TO FIELD VERIFICATION. CONTRACTOR SHALL PLAN DEVICE ADDRESSES RELOCATION. ALL CHANGES SHALL BE SHOWN ON AS-BUILT RECORD DRAWINGS.
						I. PAINT ALL EXPOSED CONDUITS TO MATCH ADJACENT SURFACE.
Ê			(F)	G		J. ANY DISCREPANCIES OR NON DOCUMENTED FIRE ALARM DEVICES AND CONTROLS EQUIPMENT NOT SHOWN ON THE DRAWINGS SHALL BE BROUGHT TO THE ENGINEE ATTENTION BEFORE WORK STARTS.
						K. FOR CLARIFICATION RTU-6, 7, 10 & 11 HAVE SUPPLY AIRFLOW GREATER THAN 2,000 CFM AND REQUIRE DUCT DETECTORS PER CODE. OTHER RTU'S UTILIZING EXISTING DUCT DETECTORS ARE TO DO SO AS ADDITIONAL FIRE, LIFE AND SAFETY FEATURE. SEE RTU SCHEDULE ON M-6.1.
						L. SEE BID ALTERNATES ON COVER SHEET, G-0.0.
						REFERENCE SHEET NOTES
RTU 5			RTU 6			 EXISTING DUCT DETECTOR AND MODULE TO BE PROTECTED DURING CONSTRUCTION AND REUSED. DISCONNECT FIRE ALARM DEVICE DURING CONSTRUCTION, REINSTALL AND RECONNECT TO EXISTING FIRE ALARM LOOP. FIRE ALARM SYSTEM SHALL BE TESTED AND INSPECTED UPON WORK COMPLETION IN ACCORDANCE WITH NFPA 72 CHAPTER 14 (2016) EDITION. EXTEND CONDUITS AND WIRES AS NECESSARY.

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NOTES

1. FOR GENERAL NOTES, SEE DRAWING S-0.1.

LEGEND

DENOTES (N) STRUCTURE DENOTES (N) 14" x 14GA MFR CURB BENEATH UNIT

agency
SALASO'BRIEN expect a difference 305 South 11th Street San Jose, California 95112-2218 877.725.2755 877.925.1477 (f) WWW.SALASOBRIEN.COM National Strength. Local Action.
SS27 MT. DIABLO BOULEVARD #137, LAFAYETTE, CA 94549 (925) 265-2229 WWW.CPS-GLOBAL.COM
SOLANO COMMUNITY COLLEGE DISTRICT
SOLANO
COMMUNITY COLLEGE 2000 NORTH VILLAGE PARKWAY VACAVILLE, CA 95688
VACAVILLE ANNEX HVAC AND ROOFING REPLACEMENT
ISSUE
MARK DATE DESCRIPTION 11/05/21 SCHEMATIC DESIGN 12/15/21 DSA PROGRESS SET 03/02/22 DSA SUBMITTAL
03/15/22 DSA RESUBMITTAL 05/02/22 DSA BACKCHECK 06/01/22 DSA BACKCHECK RESUBMITTAL 1 08/01/22 ADDENDUM 1
SOBE PROJECT NO: 2100987 DATE: 8/30/21 DRAWN BY: TD CHECKED BY: TCE
APPROVED BY: TCE
SHEET TITLE STRUCTURAL EXISTING ROOF FRAMING PLAN NEW WORK
SCALE: THIS DRAWING IS 30" X 42" AT FULL SIZE