MAYOR
DAVID R. MARTIN

PURCHASING MANAGER
ERIK J. LARSON

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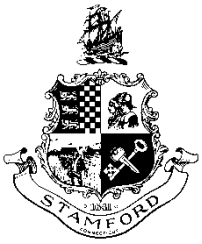


CITY OF STAMFORD
OFFICE OF ADMINISTRATION
888 WASHINGTON BOULEVARD
P.O. BOX 10152
STAMFORD, CONNECTICUT 06904-2152

ADDENDUM NO. 3
(September 20, 2019)

Bid No. S-6722
Alterations at Westover Magnet Elementary School

Addendum No. 3 is being issued to all potential bidders to provide the items and attachments set forth herein which shall act to qualify, clarify, or otherwise modify the Contract Documents previously issued regarding the above referenced project. These items, whether of omission, addition, substitution, or clarification, shall be incorporated into the proposals submitted by all bidders, and receipt of this document and its attachments must be acknowledged, either in the space provided on the Bid Form or on the Contractor's Form of Proposal. Failure to do so may subject the Bidder to disqualification.

The items and references:

1. The original Bid Price Form is hereby deleted and the (Attachment "A") **Revised Bid Price Form V-3 (9-20-19)** is substituted therefor.

2. The Bid Due Date and Time remains the same, namely: Sept. 25, 2019 at 11:00 AM.

3. There shall be no further Addendums

SPECIFICATION MANUAL Changes:

Part 1 Division #00 & 01 Bidding and Contract Requirements

1. Section 01 10 00 Description of Work

   a. Part 1.01.B Under Interior Alteration – Scope, after "Refer to drawings" Add - "**Refer to City of Stamford General Specifications, specifically Article #19 Scope of Work found on pages 6 & 7 of 57**.

   b. Part 1.01.F Delete entire paragraph.

   c. Part 1.01.G 2nd and 3rd sentences to read "**The Owner is responsible for hiring and paying the special inspector. The Owner shall hire the special inspectors and shall be responsible for the cost of special inspections and the Contractor is responsible for coordination, scheduling, providing access to the work to be inspected and for the cost of**

any re-inspections due to late cancellations or retesting due to faulty workmanship or improper materials."

d. Part 1.04 – Construction Time and Phasing Requirements

   i. Sub Part A – Delete the entire 2nd sentence that starts with " Attention is directed to Article 3.13…."

   ii. Sub Part C.1

      1. b - to read "Saturdays during the hours of 8:00 AM to 8:00 PM

      2. Add sub heading C as follows: c. Sundays during the hours of 10:00 AM to 8:00 PM

e. Part 1.06 Intent of Documents – 1st sentence to read "**Refer to City of Stamford General Specifications, specifically Article #70 Coordination of Plans/Specifications found on pages 35 of 57**.

f. Part 1.08 Initial Submittal Requirements –

   i. Sub Part A - Delete reference to sections 005000, 007000, 013300 and 013200.

   ii. Sub Part B.2 – Change "Owner Contractor Agreement" to read "**Bid Opening"**

g. Part 1.12 Schedules and Milestones

   i. Sub Part A.3 – Change "Article 14.2" to read "**General Specifications**" and Delete "**Article 2.4**"

   ii. Sub Part B – Change TBD to read "**Refer to City of Stamford General Specifications,"**

h. Part 1.13 Additional Requirements

   i. Sub Part F – Add the following to precede the existing paragraph "**After the facility is turned back over to the owner, if the contractor needs to perform punch list or corrective work"**

i. Part 1.14 Mold Mitigation Requirements

   i. Sub Part A shall read "Supply return air ductwork and all exhaust air ductwork to be sealed tight with plastic."

   ii. Sub Part D – Change 078400 to read "07 84 13"

2. Section 01 15 00 Special Project Requirements

   a. Part 1.10.B.3 – change the word "nay" to "any"

3. Section 01 31 14 Coordination Drawings and Procedures

a. Part 1.01.A – Delete reference to "(Section 00 70 00)

b. Part 1.01.D – Sentence to read "Definitions as apply to "Contractors" involved with the work of this Project shall be as set forth in Article 1.01 of Section 01 32 00, and the General Conditions of the Contract."

4. Section 01 31 19 Project Meetings

a. Part 1.01.A - Delete "(Section 00 70 00)"

b. Part 1.01.C - Delete "(Section 00 70 00)"

5. Section 01 32 00 Scheduling and Progress

a. Part 1.01.A - Delete "(Section 00 70 00)"

b. Part 1.01.C.1 shall read **""Contractor for General Construction (CGC)" meaning the party responsible for the preparation of, and monitoring of, the coordinated project progress schedule (CPPS) prepared in consort with the "Prime Contractors" as defined below:"**

c. Part 1.03.A - change "Within three (3) working days after notification from Architect, and before the Contract is executed, three (3) apparent low bidders must submit to the Architect," to read "**Within five (5) working days after notification from the City of Stamford Purchasing Agent, and before the Contract is executed, the apparent low bidder must submit to the City of Stamford Construction Manager and the Architect,"**

d. Part 1.03.A - BOLD the last sentence

e. Part 1.03.B – Change 'The apparent low bidders" to read "The apparent low bidder"

f. Part 1.03.C – BOLD the entire paragraph.

g. Part 1.04.A – Delete 'Notice to Proceed, and/or Execution of the Contract,"

h. Part 1.08 Time of Completion - Change "Coordinate with Article 8 of the General Conditions of Contract for Construction (Section 00 70 00)" to read "**Coordinate with the General Conditions of Contract for Construction"**

6. Section 01 33 00 Submittal Requirements

a. Part 1.01.A – delete "(Section 00 70 00)"

b. Part 1.01.C – Change "and Article 1 of the General conditions of the Contract (Section 00 70 00)" to read "and the General Conditions of the Contract."

c. Part 1.09.A – Change "requirements for sample submittals as covered in Article 3.12 of the General Conditions (Section (00 70 00)" to read "requirements for sample submittals as covered in the General Conditions."

7. Section 01 33 06 Certification of Specification Compliance – Change “412 Stillwell Avenue” to read “412 Stillwater Avenue”

8. Section 01 35 29 Health and Safety Plan

    a. Part 1.01.A – Delete (Section 00 70 00)

    b. Part 1.01.C – Change “Article 1 of the General Conditions of the Contract (Section 00 70 00) to read “the General conditions of the Contract.

9. Section 01 41 00 Permits and Compliance

    a. Part 1.01.A – Delete (Section 00 70 00)

    b. Part 1.01.C – Change “Article 1 of the General Conditions of the Contract (Section 00 70 00) to read “the General conditions of the Contract.”

    c. Part 1.06.B – Delete entire part.

10. Section 01 42 26 Testing Services

    a. Part 1.01.A – Delete (Section 00 70 00)

    b. Part 1.01.C – Change “Article 1 of the General Conditions of the Contract (Section 00 70 00) to read “the General conditions of the Contract.”

    c. Part 1.01.E – Change 2nd sentence to read “In such event of a failure, the Contractor shall pay for the retests, after the removal of all work and material so failing to conform, REPLACE with work and materials which are in full conformity.”

11. Section 01 43 39 Mockup Requirements

    a. Part 1.01.A – Delete (Section 00 70 00)

    b. Part 1.01.C – Change “Article 1 of the General Conditions of the Contract (Section 00 70 00) to read “the General conditions of the Contract.”

12. Section 01 45 00 Pipe Scaffolding and Sidewalk Sheds

    a. Part 1.01.A – Delete (Section 00 70 00)

13. Section 01 50 00 Temporary Facilities

    a. Part 1.01.A – Delete (Section 00 70 00)

    b. Part 1.03 Field Office – Change “provide a job site trailer to be used as an office for his use,” to read “will have use of a room as an office within the project site as directed by the City of Stamford for his use,”

14. Section 01 57 13 Temporary Erosion and Sediment Control

a. Part 1.01.A – Delete (Section 00 70 00)

15. Section 01 61 00 Material and Equipment

a. Part 1.01.A – Delete (Section 00 70 00)

b. Part 1.03.E – Change "coordinate with Article 5 of Section 00 70 00" to read " coordinate with General Specifications"

16. Section 01 73 29 Cutting and Patching

a. Part 1.01.A – Delete (Section 00 70 00)

b. Part 1.01.C – Change "Article 1 of the General Conditions of the Contract (Section 00 70 00) to read "the General conditions of the Contract."

17. Section 01 74 19 Construction Waste Management

a. Part 1.01.A – Delete (Section 00 70 00)

18. Section 01 77 00 Project Close Out

a. Part 1.01.A – Delete (Section 00 70 00)

b. Part 1.01.C – Change "Article 1 of the General Conditions of the Contract (Section 00 70 00) to read "the General conditions of the Contract."

19. Section 01 77 19 Project Record Documents

a. Part 1.01.A – Delete (Section 00 70 00)

b. Part 1.01.C – Change "Article 1 of the General Conditions of the Contract (Section 00 70 00) to read "the General conditions of the Contract."

20. Section 01 78 23 Operation and Maintenance Requirements

a. Part 1.01.A – Delete (Section 00 70 00)

b. Part 1.01.C – Change "Article 1 of the General Conditions of the Contract (Section 00 70 00) to read "the General conditions of the Contract."

c. Part 1.02 – Add sub section "D. Coordination and correction of deficient operations as determined by the City of Stamford Commissioning Consultant – **Sustainable Engineering Solutions, Berlin, CT**

Part 2 Technical Changes, Architectural, Structural and Civil

1. Section 02 41 19 Selective Demolition

a. Part 1.06 – Add sub part B as follows: "B. Prior to disturbance of any existing materials, both interior and exterior to the building, review all testing reports provided in Section 2 of project specifications.

b. Part 1.7.C.1 – Add to the beginning of the sentence "With the Owners permission:"

2. Section 03 35 43 Concrete Topping Compound

a. Part 1.2.A – Add "2. Undercutting existing doors to accommodate new floor level"

b. Part 3.2.A.2 – Change "Mechanically clean, if necessary, using shot-blasting or other." to read "After removal of all identified 1st floor finishes, mechanically clean all exposed 1st floor concrete surfaces using shot-blasting"

c. Part 3.6.A Door Undercutting – Add the following: "A. Undercut all existing doors affected by new concrete topping or floor moisture remediation compounds per NFPA 80 for fire rated doors and AWI Section 9 for non-rated doors."

3. Section 03 92 50 Moisture Remediation – Add entire section

4. Section 08700 Door Hardware

a. Part 3.8.B - Add the following 2 sets as noted below

Hardware Set 3 - Door 102E - paired 6'-0"x6'-8" aluminum

2 Continuous Hinge CFM-HD1 Series PE
1 Removable Mullion L980 PC SA
1 Exit Device 16 43 8804 US32D SA
1 Exit Device (exit only) 16 43 8810 US32D SA
4 Cylinders AS REQUIRED (match & expand on facility standard)
2 Door Closer UNI7500
2 Door Pulls US32D RO
2 Position Switch DPS-M (or) W-BK SU
1 Threshold Per architects details
1 Gasketing and weather stripping by door supplier

Notes:

Operation

- **Free egress at all times**
- **Door normally closed and secured**
- **Entry also possible via key override**
- **Auxiliary door position switches monitor door status**

Hardware Set 4 - Door 102E1 - single 3'-0"x6'-8" aluminum

1 Continuous Hinge CFM-HD1 SER12 Series PE

1 Exit Device 16 43 56 8804 862 US32D SA
2 Cylinder AS REQUIRED (match & expand on facility standard)
1 Door Closer UNI7500
1 Door Pulls US32D RO
1 eLynx Frame Harness QC-1500P MK
1 eLynx Door Harness QC-C* (Length / Type as Required) MK**
1 Position Switch DPS-M (or) W-BK SU
1 Card Reader Provided by security vendor 00
1 Power Supply BPS (size & type as required) SU
1 Threshold Per architects details
1 Gasketing and weather stripping by door supplier

Notes:
Operation

- **Free egress at all times**
- **Door normally closed and secured**
- **VLid credential at card reader retracts the latch on the exit device allowing entry.**
- **Entry also possible via key override**
- **Integrated request to exist switch signals an authorized egress**
- **Door position switches monitor door status**

5. Section 09 51 13 Acoustical Panel Ceilings

    a. Part 2.1.A – Change "Dune No. 1851" to "**Dune No. 1773"**

    b. Part 2.1.C – add the following part – "Media Center, Circulation Desk, Media Classroom: Provide 3/4" thick, 24" x 48" mineral fiber panels equal to "DUNE Second Look", 2722 with tegular edge, as manufactured by Armstrong Work Industries, or equal made by Roxul Rockfon or USG Interiors, Inc. Panels shall have factory applied white finish with light reflectance value of 0.83. Panels shall meet ASTME1264, Type III, Form 2, Pattern II, Class A, with UL flame spread of 25 or less and smoke developed of 50 or less per ASTM E84

6. Section 09 65 19 Resilient Tile Flooring

    a. Part 2.2.E – Delete entire paragraph.

Part 3 Technical Changes, Plumbing, Mechanical and Electrical

1. Section 22 13 19 Sanitary Waste and Vent Piping Specialties

    a. Replace Paragraph 2.11 with the following:

2.11. GREASE INTERCEPTORS

A. Grease Interceptors:

1. Based on Thermaco Trapzilla. Model No. on drawings, linear low-density rotationally molded polyethylene grease interceptors.

2. Standard: ASME A112.14.3 and PDI-G101, for intercepting and retaining fats, oils, and greases from food preparation.

3. Plumbing and Drainage Institute Seal: Required.

4. Unit shall include: Flat grease separation efficiency curve, crush-resistant cylindrical walls, twin integral portals for access by grease pump truck for grease removal, single separate integral portal for vacuum access for removal of solids, self guiding pipe for pump truck access/solids removal, integral non-floatation anchor ring for in-ground installation, integral horizontal baffle, laminar inlet flow diverter, integral vessel vent, separate storage compartments for grease and solids, and including as an integral part of the unit an integral gas trap and a fully removable polyethylene self-positioning keyed cover equipped with sealed thread fasteners.

2. Section 23 05 00 Common Work Results for HVAC

a. Add the following Paragraphs

3.23 TRAINING REQUIREMENTS FOR OWNER'S PERSONNEL

3.23.1. The contractor and subcontractors shall be responsible for coordinating, scheduling and completing operations and maintenance training for the Owners designated personnel on all systems and equipment. The design team shall be responsible for including training requirements in the contract documents.

3.23.2. There will be service contract agreement for boilers and RTUs. City BOE custodians will be trained on new equipment and systems.

3.23.3. All new equipment and systems being installed require system-specific O&M training for custodial staffs.

3.23.4. Training materials shall be provided in both searchable PDF and hard-copy formats. Three (3) hard copies will be provided.

3.23.5. The following Training Requirements Outline shall be included in the project specifications as basis of training:

Training Requirements Outline

1. General familiarization and operating procedures for each of the building's s ystem installations.

2. Routine maintenance procedures for equipment.

3. Specific operating and maintenance procedures for:

    a. Mechanical Systems

    b. Electrical Systems

    c. Plumbing Systems

    d. Fire Protection Systems

    e. Direct Digital Control Systems

    f. Envelope Systems

4. Maintenance Procedures: Include manufacturer's written recommendations and th e following:

    a. Inspection procedures.

    b. Types of cleaning agents to be used and methods of cleaning.

    c. List of cleaning agents and methods of cleaning detrimental to product.

    d. Schedule for routine cleaning and maintenance.

    e. Repair instructions.

5. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

6. Quantity of training: The maintenance personnel shall be trained on the various building systems in sessions of not less than (8) hours of training time. The training shall be of a sufficient extent to allow the trained staff, to train their peers and to demonstrate the training sessions were effective. Training time shall be provided at Owner's discretion.

3.24 WARRANTY REQUIREMENTS

3.24.1. Warranty durations have been defined below and shall be provided for the entire building and shall commence on a single date for all the building systems which shall be the Owner determined date of Substantial Completion. Manufacturer's warranties shall not start until the date of Substantial Completion. The fire protection, plumbing, HVAC and electrical contractors shall include in their base bid any additional cost for

extending manufacturer's warranties until the date of Substantial Completion. In general, the warranties shall not be less than the following:

3.24.1.1. 12 months industry standard on all mechanical systems.

3.24.1.2. 30 years industry standard warranty on the roof.

3.25 SYSTEMS AND ENERGY MANAGEMENT MANUAL: As part of the Contractor's Operations and Maintenance (O&M) Requirements for an O&M Manual, the following shall be included as the Systems and Energy Management Manual:

Systems & Energy Management Manual Outline

Executive Summary (Brief description of manual contents and intention)
Owner's Project Requirements (Provided by Commissioning Agent)
Basis of Design (Provided by Commissioning Agent)
Construction Record Documents (As-builts, TAB Final report, BMS as-built, approved submittals)
Project Operations and Maintenance Manuals

The Systems and Energy Management Manual shall be compiled in electronic format, shall be unprotected and shall be searchable. Documents within manual shall be easy to navigate (provided with table of contents, filed individually tabbed and bookmarked)

3. Section 23 07 19 HVAC Piping Insulation

   a. Add the following in Paragraph 3.05: **Dual Temperature Piping shall be insulated as per Hot Water Piping**

4. Section 23 09 93 Sequence of Operation

   a. Replace Section with attached Section 23 09 93.

5. Section 23 34 23 HVAC Power Ventilators

   a. Add the following Paragraph 3.5: **Train Owner's maintenance personnel to adjust, operate, and maintain unit ventilators.**

6. Section 26 32 13 Engine Generators

   a. Add the following in Paragraph 3.5:

   11. The project commissioning agent (Sustainable Engineering Solutions) shall be notified of tests and inspections at least one week in advance.

DRAWING Changes:

1. Drawings A100-A106
    a. Demolition Key Notes #4 change to read "REMOVE & DISPOSE EXIST FLOOR FINISH & RELATED BASE – **BEAD BLAST AND** PREP FOR…..".
    b. Demolition Notes - change Note #7 to read "EXCLUSIVE OF ALL MATERIALS & EQUIPMENT LOCATED IN THE EXISTING GYMNASIUM, **MEDIA CENTER**, CAFETERIA & 2ND FLOOR HALLWAY"
    c. Demolition Notes – Delete Note #8. (GC responsible for removal of all demolition and construction debris)
2. Drawings A101 & A104
    a. Delete Demolition Key #16 from Lobby 102 and Hall 241 respectively. Existing ceramic floor tile is to remain and be protected during all phases of construction.
3. Drawing M214A, M503
    a. Note Revision #4 changes
4. Drawing M501, M502, M601, M602, M702 & M703
    a. Note Revision #5 changes
5. Drawing E702
    a. Detail 3 Notes #3 – change "Detail #4" to read **"Detail #1"**

Questions & Answers of the Potential Bidders

Q-20: Please clarify if the Owner or Contractor coordinates and pays for the cost of demolition and construction debris?

A-20: ***Demolition Note – 8 is deleted on all Contract Drawings****. It is in the Contractor's Scope to coordinate and pay all costs for debris and waste management of* ***all*** *debris & waste materials generated from the Building and Sitework Demolition and Construction tasks.*

Q-21: Spec section 03 35 43 indicates the requirement of cement topping compound. Please clarify where is that required / at what locations?

A-21: *This specification section is included as a reference to specification sections 09 65 19 Resilient Tile Flooring – Part 3 Execution, Part 3.3.C and 09 68 13 Carpet Tile – Part 3 Execution.*

Q-22: Please provide spec section 08 71 00 Door Hardware schedule.

A-22: *The door hardware schedule is located at the end of specification section 08700 – Door Hardware. There are 2 new hardware sets for the Security Vestibule – Add/Alt #3. As follows:*

Hardware Set 3 - Door 102E - paired 6'-0"x6'-8" aluminum

2	Continuous Hinge	CFM-HD1 Series	PE	
1	Removable Mullion	L980	PC	SA
1	Exit Device	16 43 8804	US32D	SA
1	Exit Device (exit only)	16 43 8810	US32D	SA
4	Cylinders	AS REQUIRED (match & expand on facility standard)		
2	Door Closer	UNI7500		
2	Door Pulls	US32D	RO	
2	Position Switch	DPS-M (or) W-BK	SU	
1	Threshold	Per architects details		
1	Gasketing and weather stripping by door supplier			

Hardware Set 4 - Door 102E1 - single 3'-0"x6'-8" aluminum

1	Continuous Hinge	CFM-HD1 SER12 Series	PE	
1	Exit Device	16 43 56 8804 862	US32D	SA
2	Cylinder	AS REQUIRED (match & expand on facility standard)		
1	Door Closer	UNI7500		
1	Door Pulls	US32D	RO	
1	eLynx Frame Harness	QC-1500P	MK	
1	eLynx Door Harness	QC-C*** (Length / Type as Required)	MK	
1	Position Switch	DPS-M (or) W-BK	SU	
1	Card Reader	Provided by security vendor	00	
1	Power Supply	BPS (size & type as required)	SU	
1	Threshold	Per architects details		
1	Gasketing and weather stripping by door supplier			

Q-23: Drawing C-100 items 3, 4 and 5 are the playground equipment to be removed, section 01 10 00 scope of the exterior site renovation calls for refurbished playgrounds, please clarify and provide playground equipment list with alternative vendor.

A-23: *As a clarification to Section 01 10 00, Article 1.01.A.B, Exterior Site Renovation Work, the existing playground equipment shall be removed, and will be replaced with new playground equipment as shown on Drawings C800 and C810. The existing wood chip playground surfaces will also be replaced with a poured-in-place resilient surface. Note the dimensions of some of the playgrounds will change along with the enclosing fencing as shown in the plans to accommodate other proposed site improvements.*

Playground equipment is called out on Drawings C800 and C810. The following listing is provided as a convenience, and it is the Contractor's responsibility to confirm all equipment on Drawings C800 and C810 is included in their bid. Substitutions may be made from alternative vendors provided that such substitutions match the age level and type of equipment and do not adversely impact the thickness of the poured in place surfacing for fall protection. All Substitutions shall be made in accordance with the procedure outlined in the Construction Documents.

Southwest Playground
Welcome Sign, 5 – 12 Years
Chill Spinner (2)
Cozy Dome
Bongo Reach Panel
Rail/Handloop Assembly
Overhead Parallel Bars/Horizontal Ladder
Vertical Ladder
Right Transfer Module
Pipe Barrier w/Wheel
Mini Summit Climber
Double Swoosh Slide
Logo Climber
Arch Bridge w/ Barrier
Grid Walk w/ Barriers
Geoplex Climber
Lollipop Climber
Whooshwinder
Loop Seat
Pipe Barrier
Cliff Climber
Slidewinder2
8" Rise Kickplate (2)
6"/8" Rise Kickplate (2)

Southeast Playground
Oodle Swing
Swiggle Stix
E-Pod
Blender
Bridge/Ramp Transition
Fish Net Climber
Boogie Board
Rectangle Climber w. Permanent Handholds
Welcome Sign (5-12 Years)
Tight Rope
Overhead Trekker

Surf Slide
Curved Balance Beam
Omni Spin Spinner
Roller Table
Curva Spinner
Skyrail Climber

North Playground
Curva Spinner
Welcome Sign (5-12 Years)
Venti
Overhead Ladder
Square Steppers
Turning Bar
Tight Rope
Cargo Net
Belt Bridge
Chinning Bar
Single Poly Slide
Vertical Panel Climber
Firepole
Panel Maze
Wood Plank Ladder
Belt Hammock
Swiggle Stix
Square Look Vertical Climber
Inclined Cable Walk
Cabin Seating Area
Square Loop Incline Climber
Double Swoosh Poly Slide
Topsyturny Spinner
Jigjag Climber Double
Ring A Bell Reach Panel
Optigear Panel
Navigator Reach Panel
Boogie Board (2)
Star Seeker
Oodle Swing
Zipkrooz

Q-24: **The finish Plan shows Lobby 102 as "Existing Tile" but the demo plan calls for removal of existing flooring/base and the finish schedule calls for New Porcelain Tile flooring/base. Please clarify if Lobby 102 will receive new floor/base finishes. If the answer is yes, please provide a porcelain tile spec as there is not one currently included in the book.**

A-24: *Please delete Demolition Key #16 from Lobby 102 and Hall 241 as shown on A101 & A104 respectively. Existing ceramic floor tile is to remain and be protected during all phases of construction.*

Q-25: **Spec 096519/2.2/E lists an acoustical underlayment. Can you please clarify where this should be carried?**

A-25: *This has been deleted from the specifications*

Q-26: **Can you please confirm Moisture mitigation is not required to be carried in the bid for this project? Specs appear to call for moisture testing only.**

A-26: *Moisture mitigation is required in the entire 1st floor. See Specification Section 03 92 50 that has been added to this Addendum.*

Q-27: **Spec section 033543 calls out Ardex SD-T which is a sealed, walkable, exposed concrete surface. I don't see any exposed concrete called out on the plans. Can you please clarify if/where this product will be used?**

A-27: *Ardex is specified for floor leveling. There are no identified areas that will have exposed finished concrete other than existing back of house areas, ie. garage, sprinkler room, etc. We have an "Allowance Price", if the Owner directs the Contractor to perform additional work within the building*

Q-28: **Please clarify if any additional floor prep will need to be carried in the base bid above and beyond the patching of low spots, cracks, small depressions and sanding of minor bumps and ridges as stated in the material specs for resilient tile and carpet.**

A-28: *Please see information provided in Addendum #3 for shot-blasting and moisture remediation of 1st floor.*

Q-29: **Who is responsible for the 2 coats of sealer on the VCT post installation? Will this be done by the school maintenance staff or the contractor?**

A-29: *The Contractor is responsible for turning over a completely clean project, including but not limited to full dusting and washing (and sealer) of all surfaces.*

Q-30: Will the class A Dune 1773 be accepted in lieu of the 1851 Fire Rated, Armstrong is telling me they have gotten requests for the 1773 pricing and they are trying to confirm with the architect.

A-30: *Yes, ACT #1773 is replacing the specified ACT #1851.*

Q-31: In the Acoustic Ceiling Spec it calls out for 2 types of ceilings and the finish schedule has 3 types, they show ACT which I assume is the basic Dune 1851 in the spec and then they have ACT2 in the Media Area but nothing called out for in the spec and then they Have ACT3 which is in the Kitchen area which is the Ultima Healthzone, Please find out what type of tile they want in the Media Areas that call out for type 2?

A-31: *ACT 2 for the Media Area is to be Armstrong Dune Second Look – 24"x48" with a scored surface. See notes above in Addendum #3*

Q-32: Roof detail 19/A252 calls for existing standing seam metal roof to remain, spec section 075419 1.02, A, 4 calls for décor ribs on the sloped roof sections. Please confirm if the existing standing seam roof is to remain or if décor ribs are not in scope of work.

A-32: *Detail 19/A252 EXISTING GUTTER EAVE @ SLOPED ROOF, calls for "2-1/2" Standing Seam Metal Roof to Remain – Refasten Loose Sections" Detail 20/A252 shows the new PVC roofing system over (2) new layers of isocyanurate insulation placed on top of the existing standing seam metal roofing. Included in the new sloped roof system, as noted in specification section 07 54 19, Part 1.02.A.4 are the "Décor Ribs on the sloped sections of the roof". These Décor Ribs are to be placed to match the existing standing seam roof system rib spacing – 24" +/-*

Q-33: I know that you are requesting a $2mm umbrella but we carry a minimum of $5MM at all times. Would that cover the additional liability?

A-33: Yes a combination of primary, excess, and umbrella coverages that in totality meet the minimum insurance requirements would be acceptable to the City.

ATTACHMENTS

- **Revised Bid Price Form V-3 (9-16-19)**
- **Section 03 92 50 Moisture Remediation**

- **Section 23 09 93 Sequence of Operations**

- **Drawings M214A, M501, M502, M503, M601, M602, M702 & M703**

All other terms and conditions of **Bid No. S-6722** remain the same.

Erik Larson
Purchasing Agent

cc: Jeff Brown, Construction Manager
Purchasing Department File

S-6722 REVISED BID PRICE FORM V3

Bidder shall complete the Work as specified in the Contract Documents for the following I. BASE BID lump sum and II. ALLOWANCES unit price items (use itemized table below).
Only the apparent Low Bidder shall be required to submit within 5 business days from the Bid opening; a Project Baseline Schedule showing their Plan to complete the Project by the required Scheduled Milestones and complete a Project Payment Form in which the pay items are broken down for **L&E = labor & equipment and M = materials** before the CONTRACT is signed.

Base Bid – ALTERATIONS at WESTOVER MAGNET ELEMENTARY SCHOOL Project

I. BASE BID CONTRACT PRICE:

Subtotal LUMP SUM Cost of Project: (including all scope items depicted on the Contract Plans and mentioned in the Contract Specifications Manual, excluding Allowances, local building permits fees and State of CT sales tax)

Numerical $ _____

Written _____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

II. Schedule of ALLOWANCES: (Unit Prices) for items to be added or deleted to the price of the Work above

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total in Figures
A	**Replacement of Ceiling Grid, as directed that was damaged before Contractor took over the jobsite and could not be cleaned or reused & not part of the Base Bid** for the Unit Price of : _____dollars and _____cents	SF	25,0000	$_____	$_____
B	**Replacement of Duct Insulation, as directed & not part of the Base Bid** for a Unit price of: _____dollars and _____cents	SF	5,000	$_____	$_____
C	**Replacement of Pipe Insulation below 2 inch dia., as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	LF	2,500	$_____	$_____
D	**Replacement of Pipe Insulation above 2 inch dia., as directed & not part of the Base Bid** for the Unit Price of: _____dollars and_____ cents	LF	2,500	$_____	$_____
E	**Replacement of Room Signage , as directed that was damaged before Contractor took over the jobsite and could not be cleaned and reused** for the Unit Price of: _____dollars and _____cents	EA	20	$_____	$_____
F	**Replacement, as directed Metal Roof Decking with 22 gauge galvanized steel, configuration to match existing & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	SF	200	$_____	$_____

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total in Figures
G	**Replacement, as directed of deteriorated roof blocking, on a board foot Basis. New PT Wood blocking to be #2 or better Douglas Fir lumber or APA rated plywood configuration and thickness to match existing & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	BF	500	$_____	$_____
H	**Replacement, as directed of existing plumbing fixtures – lavs & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	10	$_____	$_____
I	**Replacement, as directed of existing plumbing fixtures – water closets & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	10	$_____	$_____
J	**Furnish & Install, as directed Building Monitoring System (DDC) Points & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	25	$_____	$_____
K	**Furnish & Install, as directed Condensate Pump for Unit Ventilator & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
L	**Furnish & Install Unit Ventilator Size UV-1, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	3	$_____	$_____

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total in Figures
M	**Furnish & Install Supply Diffuser 24x24 , as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
N	**Furnish & Install Return Register 12x12, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
O	**Furnish & Install Fire Damper for 18 x 18 Duct, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
P	**Furnish & Install Smoke Damper for 18 x 18 Duct, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
Q	**Furnish & Install CFSD for 18 x 18 Duct, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
R	**Furnish & Install Control Valve under 2 inch dia. , as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
S	**Furnish & Install Control Valve over 2 inch dia. , as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total in Figures
T	**Furnish & Install Sprinkler Head + 10 ft of armover piping, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
U	**Furnish & Install Sprinkler Cover Plates, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	10	$_____	$_____
V	**Furnish & Install Temperature Sensor, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	5	$_____	$_____
W	**Furnish & Install Tamperproof Duplex Receptacle with 75ft of circuitry, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	10	$_____	$_____
X	**Furnish & Install Area Smoke Detectors, wiring programming and testing, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	7	$_____	$_____
Y	**Furnish & Install Area Heat Detectors, wiring programming and testing, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	4	$_____	$_____
Z	**Furnish & Install Duct Detectors, wiring programming and testing, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	6	$_____	$_____

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total in Figures
AA	**Furnish & Install Fire Alarm Audio Visual Device, wiring, programming and testing, as directed & not part of the Base Bid** for the Unit Price of: _____dollars and _____cents	EA	8	$_____	$_____
BB	**Removal of Rock and transport off site is covered in the Lump Sum Price stated in Section I. This Line covers areas, as directed beyond those currently depicted on the Plans & Specifications that can not be removed by the ripping force of a CAT235 or (equivalent machine)** for the Unit Price of: _____dollars and _____cents	CY	150	$_____	$_____
CC	**Removal, Transport and Disposal of Impacted & Hazardous Soil is covered in the Lump Sum Price stated in Section I. This Line covers areas, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	Tons	480	$_____	$_____
DD	**Removal, Transport, Disposal and Replacement of 2 layers of Asphalt Pavement is covered in the Lump Sum Price stated in Section I. This Line covers areas, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	SYD	125	$_____	$_____
EE	**Removal, Transport, Disposal and Replacement of Reinforced w/ WWF - 5 inch depth - Concrete sidewalk (broom finish) is covered in the Lump Sum Price stated in Section I. This Line covers areas, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	SYD	67	$_____	$_____

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total in Figures
FF	**Furnish & Install "W", Wall Outlet, including up to 280ft Category 6, plenum cable, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____
GG	**Furnish & Install "1D", 1 Data Outlet, including up to 280ft Category 6, plenum cable, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____
HH	**Furnish & Install "2D", 2 Data Outlet, including up to 280ft Category 6, plenum cable, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____
II	**Furnish & Install "1V2D", 1 Voice – 2 Data Outlet, including up to 280ft Category 6, plenum cable, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____
JJ	**Furnish & Install "2V2D", 2 Voice – 2 Data Outlet, including up to 280ft Category 6, plenum cable, as directed beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____
KK	**Furnish & Install "AP", Wireless Access Point – Ceiling Mounted, including up to 280ft Category 6, plenum cable, as direct beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total in Figures
LL	**Furnish & Install "MON", Monitor location, including up to 280ft Category 6, plenum cable, as direct beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____
MM	**Furnish & Install Wireless Clock, as direct beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	12	$_____	$_____
NN	**Removal and Disposal of Trees under 12 inch caliper, as direct beyond those currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	EA	6	$_____	$_____
OO	**Clearing, Grubbing and Disposal of Debris, as direct beyond those areas currently depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	SF	2,000	$_____	$_____
PP	**Relocate Furniture/Materials to be saved, as direct to one of the four areas depicted on the Plans & Specifications** for the Unit Price of: _____dollars and _____cents	Man Hrs.	200	$_____	$_____
QQ	**Furnish & Install specified or approved floor leveling material, as Directed on existing floors that do not meet specifications for levelness** for the Unit Price of: _____dollars and _____cents	SF	5,400	$_____	$_____

I & II: Total Cost of Project: (excluding local building permits fees and State of CT sales tax, without awarding any Alternates)

Numerical $ ____

Written ____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Schedule of Bid Alternates: Prices for items to be added depending on Project Funding to the TOTAL COST of Project above.

ADD ALTERNATE 1: Shown on the Plans and Depicted in the Specifications Manual as "A" Boiler Replacement and Oil Tank Removal & all associated piping and equipment for the Lump Sum of:

Numerical $ ___________________________________

Written ____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

ADD ALTERNATE 2: Shown on the Plans and Depicted in the Specifications Manual as "B" Auditorium AHU & Connections Replacement for the Lump Sum of:

Numerical $ ___________________________________

Written ____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

ADD ALTERNATE 3: Shown on the Plans and Depicted in the Specifications Manual as "E" New Main Entry Security Vestibule with bullet /intrusion resistant film. Main Office Casework and Armotex transaction Window WM-TW-HM-SWW and Bullet Resistant Glass for the Lump Sum of:

Numerical $ _____

Written _____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

ADD ALTERNATE 4: Shown on the Plans and Depicted in the Specifications Manual as "C" Stand By Generator, Pad and ALL Connections to Building Electrical and Control Systems for the Lump Sum of:

Numerical $ _____

Written _____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

ADD ALTERNATE 5: Shown on the Plans and Depicted in the Specifications Manual as "G" Roof Warranty Upgrade – 30 year in lieu of 20 year for the Lump Sum of:

Numerical $ _____

Written _____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

ADD ALTERNATE 6: Shown on the Plans and Depicted in the Specifications Manual as "D" 2nd Floor Rooms, Hallways, Stair towers (treads & risers and landing) including the moving/protection of stored furniture for the Lump Sum of:

Numerical $ _____

Written _____

Show amount in both words and figures. In case of discrepancy, the amount shown in words will govern.

Company_____

Address_____

Phone # (_____) _____ Fax # (_____)_____ Federal Tax I.D.#_____

– This is a Prevailing Wage Project.

This document, in order to be considered a valid bid, must be signed by a principal officer or owner of the company who is submitting the bid. Such signature will attest to the fact that all terms, conditions and specifications have been read, understood and accepted by the person(s) submitting this proposal.

Any entries on these pages other than those provided in the underlined blanks constitute invalid entries. They will not be considered by the City in making an award and, in the sole discretion of the City, may constitute grounds for disqualifying the Proposer.

Signify if all (**Give the Numbers**) _____addenda were received: YES / NO (circle one)

BY: _____(print name)

TITLE: _____

DATE: _____

SIGNITURE: _____

SECTION 039250

MOISTURE REMEDIATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the moisture remediation as specified herein on the entire 1st floor after removal of all identified floor finishes, including but not limited to back of house areas including Boiler Room, Garage areas, Sprinkler closet, etc.

1.3 RELATED SECTIONS

A. Selective Demolition – Section 02 41 19

B. Concrete work - Section 03 35 43.

1.4 REFERENCES

A. AASHTO M148 – Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete (same as ASTM C 309).

B. ASTM C 309 – Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.

C. ASTM C 1107 – Standard Specification for Packaged Dry, Hydraulic Cement Grout (non-shrink).

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.

3. Installation methods.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications; Minimum 5 years manufacturing concrete resurfacing and rehabilitation products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent based materials, and materials used with solvent based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: MAPEI Corp. or floor finish manufacturer's approved equal which maintains floor finish manufacturer's warranty.

2.2 PRODUCTS

A. Moisture Reduction Barrier: Suitable Moisture Reduction barrier to treat substrate moisture levels that exceed the manufacturers of subsequent flooring recommendations.

1. Acceptable product Planiseal EMB – A high-performance, 100% solids, two part epoxy, one coat moisture barrier system for concrete slabs that exhibit moisture vapor emission rates (MVERs) up to 20 lbs. per 1,000 sq. ft. (9.07 kg per 92.9 m2) per 24 hours and reduces transmission rates to less than 3 lbs. (1,36 kg). Planiseal EMB unique formulation penetrates into the concrete substrate while creating a solid film layer on the surface for the ultimate in moisture transmission reduction.

a. Testing: Prior to use of Planiseal EMB test for Calcium Chloride per ASTM F 1869.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION

SECTION 230993

SEQUENCE OF OPERATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sequence of operation:
1. Summer winter change over
2. Boiler Plant
3. Chiller Plant
4. Dual Temperature Variable Speed Pumping System Control
5. Packaged Rooftop Air Conditioning Units, HV Unit
6. VAV Boxes with and without Reheat
7. Cabinet Heaters and Unit Heaters
8. Fin Tube Radiation
9. Cabinet Convectors
10. Exhaust fans
11. Unit Ventilators and Relief Fans
12. Ductless split systems
13. Air Conditioning Condensate Pumps
14. Miscellaneous Plumbing Equipment
15. Kitchen Exhaust Fan and Make-up Air Unit
16. Existing Fan Coil Units

1.03 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

B. Provide DDC based electronic controls, panels, wiring and all accessories required to achieve the specified control sequences and establish a complete independent system for all new equipment and existing equipment. In general the equipment shall be controlled through Standalone Digital Control Units (SDCUs).

BMS shall include status of all motorized valves, dampers, equipment, pumps such that operation and position of all equipment is visible at BMS front end.

Provide the necessary quantity and types of SDCUs to meet the requirements of the project for mechanical equipment control including air handlers, central plant control, and terminal unit control. Each SDCU will operate completely

standalone, containing all of the I/O and programs to control its associated equipment.

Certain controls are specified to be furnished with the equipment. This contractor shall provide all components to communicate with factory furnished controls and connect them to the building automation control system. This contractor shall be responsible to review equipment submittals and review and review the controls provided with all packaged equipment to insure that the equipment is ordered with eh appropriate gateways and MPTP controllers for integration to the BMS (Building Management System) system. The contractor shall also provide all controls, wiring and auxiliaries required to operate equipment not furnished with factory controls. Work required includes, but is not limited to the following:

1. Control wiring between factory mounted unit panels and factory supplied remote panels.
2. Installation and wiring for factory supplied devices requiring field installation.
3. Panel mounted transformers and control power wiring for all controllers and control devices.
4. Control wiring to each remote device (room thermostats, outdoor air sensors, static pressure controllers, control actuators, control panels, etc.).
6. All control valves, motorized dampers thermostats, relays, sensors, etc. unless furnished as an integral part of the equipment.
7. All interlock control wiring (24 volt and 120 volt) between units, fans, etc.

C. All control and interlock wiring shall be run in EMT for indoor locations and in galvanized conduit for outdoor locations.

1.04 SUBMITTALS FOR REVIEW

A. Division 1 - Submittals: Procedures for submittals.

B. Shop Drawings: Indicate mechanical system controlled and control system components.

1. Label with settings, adjustable range of control and limits. Include written description of control sequence.
2. Include flow diagrams for each control system, graphically depicting control logic.
3. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
4. Submit a complete written sequence of operation for each and every controlled piece of equipment.

1.05 SUBMITTALS AT PROJECT CLOSEOUT

A. Operation and Maintenance Data.

B. Project Record Documents: Record actual locations of components and set-points of controls, including changes to sequences made after submission of shop drawings.

1.06 QUALITY ASSURANCE

A. Design system under direct supervision of a Professional Engineer experienced in design of this Work and licensed in the State of Connecticut.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.01 Summer/Winter Change Over

The Building Management System (BMS) shall index the hot water heating system and chilled water cooling system into either summer or winter control based upon outdoor air temperature. Note system is a 2 pipe system. Owner shall index system via BMS to Winter or Summer Mode.

Winter Mode:
When indexed to Winter Mode, the air conditioning shall be disabled. During Winter Mode, Automatic Changeover valves shall operate such that Dual Temperature water does not pass thru the air cooled chiller. Sequence operation of the valves to prevent deadheading. Water shall not be allowed to cycle through the boilers until minimum hot water temperature (adjustable) is reached.

Summer Mode:
When indexed to Summer Mode, the hot water system shall disabled. During Summer Mode, Automatic Changeover valves shall operate such that Dual Temperature water does not pass thru the boilers. Sequence operation of the valves to prevent deadheading. Water shall not be allowed to cycle through the chiller until maximum water temperature (adjustable) for chiller is reached. Contractor shall note hot water terminal units and associated control valves must close during Summer Mode. Refer to Sequences below.

The system operator shall have capacity of over riding the system for manual forced change over. A minimum time delay, (adjustable), between summer/winter changes over shall prevent cycling between the 2 modes. During heating mode, the DX cooling (air cooled chiller) shall be locked out except for supplemental cooling systems.

Base Bid Valve Sequence for Summer/Winter Autochangeover:
Winter Mode:

When indexed to Winter Mode, new 2-way Automatic Hot Water Valves shall open to allow operation of boilers. Boiler controls shall modulate boilers to maintain desired hot water temperature. New 2-way Automatic CHW Valves shall close such that water shall not be diverted to chiller.

Summer Mode:
When indexed to Summer Mode, new 2-way Automatic CHW Valves shall open to allow operation of chiller. Chiller controls shall modulate chiller to maintain desired chilled water temperature. New 2-way Automatic Hot Water Valves shall close such that water shall not be diverted to boilers.

Alternate A New Boiler Plant Valve Sequence for Summer/Winter Autochangeover:
Provide (2) two-way automatic isolation valves on piping to the boiler and (2) two-way automatic isolation valves on piping to the chiller.

Winter Mode:
When indexed to Winter Mode, new 2-way automatic isolation valves on piping to boilers shall open to allow operation of boilers. Two 3-way motorized valves shall modulate to maintain desired dual temperature water setpoint. New 2-way isolation valves on piping to chiller shall close such that water does not flow to chillers. Pump(s) and Boiler(s) operation shall be as noted herein.

Summer Mode:
When indexed to Summer Mode, new 2-way automatic isolation valves on piping to chiller shall open to allow operation of chiller. Two 3-way motorized valves shall modulate to maintain desired dual temperature water setpoint. New 2-way isolation valves on piping to chiller shall close such that water does not flow to boilers. Pump(s) and Boiler(s) operation shall be as noted herein.

Control Points:
- Summer/Winter Status/Enable
- Valve(s) position, all
- Dual Temperature Water Supply Setpoint / Temperature
- Dual Temperature Water Return Setpoint / Temperature

Alarms:
- BMS status and alarms;
- Temperature out of bounds

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

3.02 Boiler Plant:

Depending if the Boiler Replacement Alternate is selected, boilers may be existing or may be new. Contractor to provide pricing for both base bid (boilers to remain) and the appropriate alternate (new boiler plant). Refer to Drawings for scope of work for Base Bid and Alternates.

The hot water (HW) system is made up of two condensing boilers (provided with factory controls), two variable speed system loop pumps, HW loop bypass valve, and loop pressure controls. The control system will monitor the boiler factory controls and provide setpoint adjustment via BACnet MS/TP network communications.

Base Bid: Boiler plant consists of the existing multiple boilers, new Automatic Changeover Valves/Piping and existing dual temperature water pumps. This Contract shall include new interface with boiler manufacturer unitary controller to allow for full control, status, operation and alarms from existing boilers to new BMS. Operation of Boiler Plant shall be via new BMS.

Alternate:
The hot water (HW) system is made up of two condensing boilers (provided with factory controls), two boiler pumps, two variable speed system dual temperature pumps, HW loop bypass valve, and pressure controls. The control system will monitor the boiler factory controls and provide setpoint adjustment via BACnet MS/TP network communications.

Boilers shall be operated through an application specific unitary controller that will sequence boilers, pumps dampers, valves and fans. Refer to Section 235216 for all safeties and combustion control sequences. The controller shall be microprocessor-based system engineered and programmed exclusively for the operation of multiple hot water boilers.

The communications protocol for the boiler controls shall be based on ASHRA/ANSI BACNET Standard 135-1995. Provide required modules to allow open communication, integration and interoperability with other DDC system. The BMS contractor and boiler manufacturer shall coordinate their work to insure compatibility prior to installation.

Base Bid and Alternate: The BMS system shall enable the hot water system when indexed to Winter Mode. After the minimum dual temperature loop temperature is reached for boiler operation, and automatic changeover valves have switched to Winter Mode, the hot water primary, (HWP P-4 and P-5), circulation pumps shall be interlocked to run continuously when boilers are started. Furnish a flow switch in each of the primary supply water headers and the secondary loop arranged to prevent

boiler operation if flow is not proved.

The BMS shall sequence the hot water boilers to maintain the secondary hot water loop temperature set-point. The set-point shall be reset by the outdoor air temperature sensor. Reset schedule (adjustable) to be 180 F to 120 F hot water supply temperature as outside air varies from 10 F to 55 F (adjustable). Lead boiler selection shall be made by the BMS according to a rotating schedule.

The glycol makeup pumps shall be arranged to automatically maintain hot water system pressure in the boiler system. The make up water pumps shall be arranged to alternate through the alternating pump controller.

Control Points:

Hot Water System enable/disable
Boiler Water Supply Setpoint / Temperature, each boiler
Boiler Water Return Setpoint / Temperature, each boiler
Boiler Run Status, each
Make up water Flow Meter (gpm flow meter)
Burner Shutdown, each
Pump On/Off, Status, each pump
VFD Speed Control, each
Valve(s) position, all
Flow Switch in Supply Line
Outside Air Temperature and Humidity
End Switch Position for Combustion Air Dampers
Hot Water Supply Setpoint / Temperature
Hot Water Return Setpoint / Temperature
Pump Speed, VFD, Enable

Alarms:

BMS status and alarms;
Common failure alarm for each boiler.
High temperature
Low temperature
Fuel oil pump failure
Primary pump failure
Secondary pump failure
Make up pump failure
Low water level
High water level
Temperature out of bounds

Boiler Room Manual Shutdown
A boiler room shutdown station will be located just outside each of the doors entering the Boiler Room. If this button is pushed, then the boilers and domestic HW heaters will be shut down.

Alarms and Graphics
Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

3.03 Chiller Plant:

Chiller plant consists of the existing air cooled chiller and an existing chilled water pump. Alternate A includes a new chilled water pump. This Contract shall include new interface with existing chiller manufacturer unitary controls to allow for full control, status, operation and alarms from existing chiller to new BMS. For Base Bid and Alternate, provide controls such that chilled water pump shall operate when indexed to by the chiller when in summer mode and there is a call for cooling.

BMS shall enable the chiller when the system is in Summer Mode and any zone is in occupied mode after maximum loop temperature is reached for chiller operation.

Control Points:

- Chiller enable/disable
- Chilled Water Supply Setpoint / Temperature
- Chilled Water Return Setpoint / Temperature
- Pump On/Off, Status
- VFD Speed Control
- Valve(s) position
- Flow Switch in Return Line

Alarms:

- BMS status and alarms
- High temperature
- Low temperature

Chiller shall be shunted via the BMS system at a loss of power prior to generator initiation.

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control

signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

3.04 Dual Temperature Variable Speed Pumping System Control

The lead variable speed pump will be enabled to operate at its lowest speed setting, (35% of maximum flow). If the lead variable speed drive pump fails to operate the lag variable speed pump will start and an alarm will be generated at the pump control panel and the BMS. Furnish a flow switch in the header of each secondary pump with adjustable time delay. The ATC system shall rotate the lead and lag pumps for equal running time on a weekly or daily basis, (adjustable).

Differential pressure, shall be measured across the supply and return of the two-pipe secondary system using a five-point manifold differential pressure sensor. The differential pressure will be measured at the ends of the piping where indicated on the floor plans (generally located at the end of the piping loop on the first floor). The speed of the pump will be controlled to maintain the differential pressure at (28 psi adjustable). If the differential pressure drops below set point, the pump speed shall increase proportionately, if differential pressure rises above set point, the pump speed shall be decreased proportionately. The minimum speed set point shall be determined such that the speed corresponds to 30% of the maximum flow at 28 psi differential. The actual set point shall be determined in the field when all water balancing has been completed. DP set point shall be determined when design flow is achieved at the lowest available pump speed. Furnish and install a 2 1/2" differential by pass valve on the HW system in the boiler room arranged to open and allow minimum flow through the secondary pumps, if they slow to minimum speed and DP is still above 28psi setpoint.

Control Points:

- Differential Pressure Setpoint summer
- Differential Pressure Setpoint winter
- Differential Pressure
- Pump On/Off, Status
- Valve(s) position
- Pump Speed

Alarms:

- BMS status and alarms
- High temperature
- Low temperature

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

3.04 Packaged Rooftop and Air Conditioning Units

3.04.1 RTU-1: Media

RTU-1 is a variable air volume roof top unit with supply fan, power exhaust, full economizer dampers, and a DX cooling coil that supplies air to duct mounted heating coils. Space also has Finned Tube Radiation.

3.04.2 RTU-2: Auditorium (Review Alternate List – Alternate B)

RTU-2 is an existing constant air volume roof top unit with supply and return fans, full economizer dampers, energy recovery, hot water heating coil and a DX cooling coil.

3.04.3 RTU-3: Dance/Drama/Music

RTU-3 is a variable air volume roof top unit with supply fans, power exhaust, full economizer dampers, energy recovery and a DX cooling coil that supplies air to VAV boxes with heating coils. Space also has Finned Tube Radiation.

3.04.4 RTU-4: Administration Offices

RTU-4 is a variable air volume roof top unit with supply fan, power exhaust, full economizer dampers, and a DX cooling coil that supplies air to VAV boxes with heating coils. Space also has Finned Tube Radiation.

3.04.5 RTU-5: Hall

RTU-5 is a variable air volume roof top unit with supply fan, full economizer dampers, duct mounted heating coils and a DX cooling coil.

3.04.6 RTU-6: Cafeteria

RTU-6 is a variable air volume roof top unit with supply and return fans, energy recovery, full economizer dampers, hot water heating coil and a DX cooling coil.

3.04.7 RTU-7: Computer Room

RTU-7 is a variable air volume roof top unit with supply fan, full economizer dampers, duct mounted heating coil and a DX cooling coil.

3.04.8 RTU-8: Lobby

RTU-8 is a variable air volume roof top unit with supply fan, full economizer dampers, duct mounted heating coil and a DX cooling coil.

3.04.9 HV-1: Gymnasium

HV-1 is an existing to remain constant air volume unit mounted in Gym ceiling with supply fan and hot water coil. Provide all new controls.

Occupancy, Scheduling and Commands (Typical for all RTUs and HV Unit. All references to RTU below includes all RTU's and HV units unless otherwise noted)

Scheduling

The RTU and the area(s) service by the unit will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the Owner).

Optimum Start

Optimum start prepares the space for occupancy in advance of the occupied period. By starting heating or cooling at the optimum time before the occupied period begins, the controller provides a comfortable space ready for occupancy without wasting energy. The system will maintain statistics comparing the outside temperature to the time required for the space to reach the occupied set points. The system uses these statistics to calculate the length of time required for optimum start. The user can enable or disable the optimum start feature by setting the user adjustable Optimum Start Option. The user can also limit the maximum time that the unit will start be for its occupied state by setting an adjustable Optimum Max Time to 60 minutes.

Whenever the RTU called to run during optimum start mode the controller will operate as if it was occupied but the minimum outside air ventilation will be disabled and free cooling will take place if the outside air enthalpy (OAE) is less than the return air enthalpy (RAE). If all the areas served by the RTU are satisfied 15 minutes before the occupied mode starts, then the RTU will go into a purge mode and the outside air damper will be set to a minimum of an adjustable Purge OA Damper Position of 30% open position. Note that the damper is allowed to be above this setpoint if the cooling demand is greater. Once the unit enters into the occupied state the controller will allow the dampers to return to normal operation as detailed below.

Local User Override

VAV boxes located in the Administration Area (served by RTU-4) will have smart wall sensors that can be configured to will allow the local user (someone in the space) to override their VAV box into an occupied mode. Whenever the RTU controller detects that one of the boxes has been overridden into an occupied mode then the RTU will

switch into an occupied mode and operate as detailed below. Note that in all other areas this option will be disabled.

Unit Shutdown

Whenever the unit shuts down, the fans will cycle OFF, all the dampers will return to their failsafe position (outside and exhaust will close and return will open), DX cooling will be off, and the hot water (HW) valve will modulate to maintain its exiting coil duct air temperature to an adjustable HW Valve Unit OFF Setpoint of 50 DEG (F).

Staggered Unit Startup

Whenever the unit starts up (scheduled or after a power failure) the controller will wait for an adjustable Unit Start Delay Timer to count down before the controller will allow the startup sequence to begin. These timers will be set such that equipment throughout the facility will startup at staggered times to prevent pieces of lager equipment from starting up at the same time.

Emergency Shutdown

Unit controls will include hardwired safeties that will automatically force the RTU into a shutdown mode if any of them go into alarm. The hardwired safeties will also be monitored by the controller and will report the alarm condition to the front-end server. The emergency shutdown safeties would be as follows:

- Duct Smoke(s) Alarm
- Fire Alarm Emergency Shutdown Command
- Supply Fan High Pressure Cutout
- Supply Fan Low Pressure Cutout
- Return Fan High Pressure Cutout
- Return Fan Low Pressure Cutout
- Low Limit Freeze Stat Alarm

Note that many of these hardwired safeties will need to be manually reset in the field so to promote a physical inspection of the RTU equipment and controls before returning the unit back to normal operation.

User Selectable Command State

In addition to these hardwired safeties, the use can select to operate the RTU in one of the following four (4) states from the front-end:

Automatic (default): The RTU controller will operate based on its assigned schedule and as detailed throughout this sequence.

Occupied (24/7): When the user chooses to force the RTU controls into the occupied state the RTU will remain occupied 24/7 and operate as detailed throughout this sequence.

Unoccupied (24/7): When the user chooses to force the RTU controls into the unoccupied state the RTU will remain unoccupied 24/7 and operate as detailed throughout this sequence.

Shutdown (24/7): When the user chooses to force the RTU controls into a shutdown state the RTU will cycle OFF and remain shut down with all of its controls in their failsafe positions and/or modes.

Damper Control

Minimum OA Damper

Whenever the RTU is operating in an occupied state the controller will modulate the normally closed minimum outside air damper to maintain the minimum outside air flow to the adjustable OA Min CFM Setpoint (min OA noted on Drawings). When the unit is operating in an unoccupied state the controller will set the minimum outside air damper to the fully closed position. Note that this occupied setpoint will be adjusted and finalized with the balancer during the startup phase of the project. Airflow Monitoring Station shall monitor outdoor air cfm on all RTU's. Status and alarms shall be communicated to BMS.

Economizer Dampers

The economizer dampers are made up from the normally closed maximum outside air damper, the normally open return air damper, and the normally closed exhaust air (or relief) air damper.

Free Cooling: Whenever the outside air enthalpy (OAE) drops more than 1 BTU below the return air enthalpy (RAE) and there is a call for cooling then the Free Cooling PID loop will be enabled to modulate the and maintain the mixed air temperature to the active supply air temperature setpoint as detailed above.

On a call for cooling when outdoor air conditions permit, (56 deg adjustable), and below the enthalpy, controller shall modulate the outside air intake, exhaust and return air dampers, to maintain SA temp set point. Override DCV (if applicable) as required. Heating coil control valve shall be closed. Control action shall be that an increase in SA temperature will cause the outside air and exhaust air dampers to modulate towards the open position and the return air damper to modulate towards the closed position. A drop in below set point temperature will cause the reverse to take place. When the outdoor air damper reaches the fully open position a further call for cooling shall cause DX system to operate. When ambient conditions are no longer suitable for economizer operation the unit controls shall revert to normal summer operation. The power exhaust fan shall run continuously, if applicable.

HW Valve: System in Winter Mode (typical for all coils – duct, unit and VAV)

Whenever the RTU is running then the controller will modulate the hot water (HW) valve to maintain the active supply air temperature setpoint when there is no call for cooling (free cooling or DX). Whenever the unit is off or shutdown then the controller will modulate the HW valve to maintain the heat coil exiting temperature to and adjustable Heat Coil Air Temp Setpoint of 50 DEG (F) and the HW return temperature above an adjustable HWR Temperature Setpoint of 45 DEG (F). The freeze stat will be mounted on the discharge face of the HW coil and will be set to 35 DEG (F) (adjustable). During Summer Mode, automatic isolation hot water valves shall shut

close to prevent chilled water from entering. This applies to all duct, unit and VAV hot water coils.

Filter Bank Monitoring

Dirty Filter Status

The controller will monitor the pressure across each filter bank and alarm the front-end whenever the pressure drop across the filters exceed an adjustable Dirty Filter Setpoint. Note that this setpoint will be adjusted and finalized with the balancer during the startup phase of the project.

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

General:

The units shall be supplied with, and operated through a factory mounted DDC unitary control panel, capable of providing set-point adjustments and all programming control sequences. Coordinate with RTU and equipment manufacturer proper BACNet interface.

Controls shall include all motorized dampers and valves, damper motors, motor starters, wiring, fans and sensors and all hardware accessories for a complete system. Furnish wall mounted room thermostats with automatic summer/winter change over, and temperature adjustments.

Summer Operation: Upon start up, the control circuits shall be energized. The supply fan, and power exhaust fan (as applicable), energy recovery wheel (RTU-2, RTU-3 and RTU-6 only) shall run continuously. The outside air intake, and relief air dampers shall open to minimum position the return damper shall open to the maximum position. Bypass air dampers on energy recovery wheel shall close (RTU-2, RTU-3 and RTU-6). Refer to VAV Sequence below for Static Pressure Controls.

VAV systems RTU-3, RTU-4:

A temperature sensor in the unit discharge duct shall be reset by a return air temperature sensor, (master-sub-master), arranged to modulate the DX coil capacity to maintain a constant discharge air temperature. Set the discharge temperature at 56°F to 60°F range (adjustable). Refer to VAV Sequence

below for Static Pressure Controls. Hot water heating coil control valve shall be closed. VAV boxes shall operate in the summer mode.

Single zone systems AC-1, AC-2, RTU -1, RTU-2, RTU-5, RTU-6, RTU-7 and RTU-8:

A temperature sensor in the unit discharge duct shall be reset by a return air temperature sensor, (master-sub-master), arranged to modulate the DX coil capacity to maintain a constant discharge air temperature. Set the discharge temperature at 56°F to 60°F range (adjustable). Hot water heating coil control valve shall be closed.

The fan speed shall be reset to modulate with space load based on a comparison of return temperature. Upon a drop-in space load, (either heating or cooling) the fan speed shall be reset be reset lower. Fan speed shall be reduced no lower than 75%, (or as limited by the manufacture).

Provide freeze stat on the cooling coil to over ride fan speed reduction.

HV-1: during occupied mode, OA damper and relief air damper shall open. Motorized valve (valve is in addition to control and isolation valve) on HW coil shall close.

Winter Operation: Upon start up, the control circuits shall be energized. The supply fan and power exhaust, energy recovery wheel (RTU-2, RTU-3 and RTU-6 only) and return fans, shall run continuously. The outside air intake, and relief air dampers shall open to minimum position the return damper shall open to the maximum position. Bypass air dampers on energy recovery wheel shall close (RTU-2, RTU-3 and RTU-6). The heating coil valve shall be arranged to maintain a discharge temperature at 75°F (adjustable). VAV boxes shall operate in the winter mode. Refer to VAV Sequence below for Static Pressure Controls.

Economizer Operation: On a call for cooling when outdoor conditions permit, the enthalpy based control shall modulate the outside air intake, exhaust, and return air dampers to maintain discharge air temperature. Control action shall be that an increase in discharge air temperature shall cause the outside air damper to modulate towards the open position and the return air damper to modulate towards the closed position. A drop in discharge temperature shall cause the reverse to occur. When the outdoor air damper reaches the full open position, a call for cooling shall enable the DX cooling. When ambient conditions are no longer suitable for economizer operation the unit controls shall revert to normal summer operation.

Exhaust or Return Fan: Provide a static pressure sensor in return air plenum of associated RTU. Exhaust or return fan speed shall modulate to maintain static pressure setpoint. (adjustable).

Unoccupied Operation: Unit supply/return fans and heating coils and DX cooling shall cycle on a call for cooling or heating. During this cycle the unit shall operate with 100% re-circulated air. Unit controls shall allow complete shutdown if desired. Set point shall be 65˚ in the heating season and 95 in the cooling season. The spill fan (power exhaust) shall be off, if applicable. Return fans shall run.

Limit Controls: Provide a High/low limit control(s) in the supply fan discharge arranged to override temperature controls and prevent discharge temperature from dropping below 50°F and rising above 110°F(adjustable). Provide limit control on fan speed for CV units to limit speed reduction to 75% of air flow.

Freezestat: Provide each air RTU with a manual reset type freezestat, (set at 35° adjustable),arranged to shut down the unit and sound an audio and visual alarm at the BMS operator station should the set point be reached. The freezestat element shall be the capillary type with lowest point temperature sensing. It shall be resettable from the BMS.

Energy Wheel Defrost (Energy Wheel Only): When return and outside air conditions promote frosting of energy wheel, reduce energy wheel speed such that exhaust air defrosts the energy wheel.

Static Pressure Controls VAV Units: RTU-3, RTU-4
Provide static pressure sensors in the supply ductwork for each ac unit located approximately two-thirds downstream of the unit. Sensors shall be arranged to vary the speed of the supply in response to supply duct static pressure. An increase in static pressure shall cause the fans to slow down a decrease shall cause the fans to speed up. The outside air dampers shall be arranged to modulate open from the minimum position as fan speed decreases. Corresponding return or spill air fans in each RTU shall be arranged to maintain a positive pressure of .1" sp in their respective zones. On a drop-in zone pressure the fan shall be arranged to slow down, on a rise in SP above set point the fan shall be arranged to speed up. (open oa damper)

Demand Controlled Ventilation: Furnish CO2 sensors in supply duct, except HV-1. Furnish one CO2 sensor located outdoors on the roof. The outdoor air CO2 sensor shall be used to establish a base line for outdoor CO2 levels, approximately 400 PPM. The CO2 sensors in each space shall have a set point no greater then 400 PPM above the base line, approximately 800 PPM. The air-handling unit's unitary control panel shall calculate outside air intake damper positioning in response to space CO2 levels. Control action shall be that when the space CO2 level rises to within 100 PPM of set point, the outside air intake and exhaust dampers shall modulate toward open and the RA damper shall modulate toward closed. Upon a drop in space CO2 levels below set point, the opposite shall take place. For VAV systems the zone with the highest demand shall control until satisfied.

The outside air intake dampers normal minimum positions shall be established based on the schedules contained on the plans. When operating in demand-controlled ventilation mode (normal occupied mode) the outside air damper minimum position may be reset according to the above with a lower minimum as per the schedule.

Hot Gas Reheat:
Provide hot gas reheat controls based on return air RH for VAV systems and based on space RH for single zone systems. RH set point shall be in the range of 50%-55%. If zone set point is met, and the RH is above set point, the units shall be arranged to provide sub cooling of SA and energize hot gas reheat to reheat the SA to maintain space set point.

Miscellaneous: Whenever units are shutdown the outside air intake, return air and exhaust air dampers shall be closed. The power exhaust fan shall be energized by a space static pressure sensor set at +.1". The fan shall be arranged to cycle when static pressure increases above set point.

- Low temperature detection (freezestat)
- Return/exhaust fan failure
- Supply fan failure (current relay or sail switch)
- Hi discharge air temperature (temperature sensor)
- Low discharge air temperature (temperature sensor)
- Dirty filter
- Smoke detection

Purge cycle (Energy Recovery Wheel): shall be initiated manually at the unitary controller panel. During this cycle the supply fan and exhaust fan shall operate at 100% capacity. The outside air and exhaust air dampers shall be fully opened. The return air damper shall be closed.

3.06 VAV Boxes with Reheat Coil:

Occupancy, Scheduling and Commands

Schedule:

The VAV box controller will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the customer).

VAV Box and Reheat Coil Control

Occupied

While occupied, the VAV box controller will modulate its primary air damper between an adjustable Cooling Minimum CFM and an adjustable Cooling Maximum CFM to maintain the space temperature at or below an adjustable Occ Space Cooling Setpoint of 75 DEG (F).

When the space temperature drops below an adjustable Occ Space Heating Setpoint of 70 DEG (F) then the controller will modulate its primary air damper to maintain an adjustable Heating Minimum CFM (set to the same value as the cooling minimum CFM). If additional heat is required then the reheat coil valve will be allowed to modulate to satisfy the heating demand, but limited to an adjustable Discharge Air High Limit of 85DEG (F). If the reheat valve moves to a fully open position or is at its discharge high limit and additional heat is still required then the primary air damper will index the active airflow setpoint up as needed, but will be limited to an adjustable Heating Maximum CFM.

During Summer Mode, automatic isolation hot water valves shall shut close to prevent chilled water from entering. This automatic valve is in addition to the control valve and the manual isolation valves. This applies to all duct, unit and VAV hot water coils.

Unoccupied

While unoccupied, the VAV box controller shall operate as detailed above whenever the RTU serving the VAV box is running, however the minimum airflow setpoint will be 0 CFM (adjustable) and the space will be maintained between an adjustable Unocc Space Heating Setpoint of 60 DEG (F) and an adjustable Unocc Space Cooling Setpoint of 82 DEG (F). CO2 demand ventilation is disabled during the unoccupied state.

Duct-In Temperature

The VAV box controller will continually monitor the associated RTU supply air temperature as the "duct-in temperature" to ensure proper primary air damper control. If the duct-in temperature drops below the current space temperature then the controller will assume that the primary air can be used for cooling, heating via the reheat coil and demand ventilation. If for any reason the duct-in temperature moves above the current space temperature then the controller will assume that the primary air can only be used for heating and demand ventilation. During this condition the controller will remain at its minimum air flow setpoint even if there is a call for cooling. The intent is not to over heat the space with warm primary air in the case of mechanical or free cooling failure.

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

3.07 Cabinet Heaters and Unit heaters (hot water) Both noted as UH below:

Occupancy, Scheduling and Commands

Scheduling

The area related to the UH will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the customer).

Heater Operation

Occupied

While occupied if the space temperature drops below an adjustable Occ Space Heating Setpoint of 70 DEG (F) then the HW valve will be called to open (*or the*

electric heating element shall be energized in stages). When the aquastat installed on the coil HWR line detects that there is HW in the system then the heater fan will cycle ON. When the space temperature moves above this setpoint then the valve will close (or electric heating element shall be deenergized in stages) and the fan will cycle OFF.

During Summer Mode, automatic isolation hot water valves shall shut close to prevent chilled water from entering. This automatic valve is in addition to the control valve and the manual isolation valves. This applies to all duct, unit and VAV hot water coils.

Unoccupied
While unoccupied if the space temperature drops below an adjustable Unocc Space Heating Setpoint of 60 DEG (F) then the HW valve will be called to open (*or the electric heating element shall be energized in stages*). When the aquastat installed on the coil HWR line detects that there is HW in the system then the heater fan will cycle ON. When the space temperature moves above this setpoint then the valve will close (or electric heating element shall be deenergized in stages) and the fan will cycle OFF.

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

All control valves positions shall be monitored and indicated on the BMS. Hot water valves to cabinet heaters and Unit Heaters shall close during summer operation to prevent chilled water from entering equipment. Status of valves shall be indicated on BMS graphics.

3.08 Finned Tube Radiation:

General Notes

Fin tube radiation will be controlled by a modulating HW valve. The controller will be setup to modulation control.

Occupancy, Scheduling and Commands

Scheduling

The area related to the radiant heat will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the customer).

Operation

Occupied

While occupied the controller will modulate the radiant heat HW valve to maintain the space temperature to an adjustable Occ Space Heating Setpoint of 70 DEG (F). For those zones served by VAV boxes and FTR controls shall be arranged to operate the VAV box and FTR in sequence. FTR shall be primary source of heat. All control valves positions shall be monitored and indicated on the BMS.

Status of valves shall be indicated on BMS graphics.

During Summer Mode, automatic isolation hot water valves shall shut close to prevent chilled water from entering. This automatic valve is in addition to the control valve and the manual isolation valves. This applies to all duct, unit and VAV hot water coils.

Unoccupied

While unoccupied the controller will modulate the radiant heat HW valve to maintain the space temperature to an adjustable Unocc Space Heating Setpoint of 60 DEG (F)

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

All control valves positions shall be monitored and indicated on the BMS. Hot water valves to Finned Tube Radiaion shall close during summer operation to prevent chilled water from entering equipment. Status of valves shall be indicated on BMS graphics.

3.09 Cabinet Convectors:

General Notes

Cabinet convectors will be controlled by a modulating HW valve. The controller will be setup to modulation control.

Occupancy, Scheduling and Commands

Scheduling

The area related to the cabinet convector will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the customer).

Operation

Occupied

While occupied the controller will modulate the convector HW valve to maintain the space temperature to an adjustable Occ Space Heating Setpoint of 70 DEG (F). For those zones served by VAV boxes and cabinet convectors, controls shall be arranged to operate the VAV box and cabinet convector in sequence. Cabinet convector shall be primary source of heat. All control valves positions shall be monitored and indicated on the BMS. Status of valves shall be indicated on BMS graphics.

During Summer Mode, automatic isolation hot water valves shall shut close to prevent chilled water from entering. This automatic valve is in addition to the control valve and the manual isolation valves. This applies to all duct, unit and VAV hot water coils.

Unoccupied

While unoccupied the controller will modulate the radiant heat HW valve to maintain the space temperature to an adjustable Unocc Space Heating Setpoint of 60 DEG (F)

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

All control valves positions shall be monitored and indicated on the BMS. Hot water valves to Cabinet Convectors shall close during summer operation to prevent chilled water from entering equipment. Status of valves shall be indicated on BMS graphics.

3.10 Exhaust Fans:

General Notes

Exhaust fan with speed control signal and damper(s).

Occupancy, Scheduling and Commands

Scheduling

The area related to the exhaust fan will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the customer).

Exhaust Fan Operation

Occupied

While occupied the controller will open the exhaust fan isolation damper, wait for the damper end switch to verify that the damper is fully open, enable the exhaust fan to run. Note that the exhaust fan speed for each will be adjusted and finalized with the balancer during the startup phase of the project.

Additional controls:

Classroom Relief Air Fans, EXF-1 thru EXF-6: Fans shall operate during Occupied Mode continuously. If any area served by a Relief fan is changed to occupied, that relief fan shall operate.

EXF-7: Interlocked to operate with UV and dampers serving Green Room.

Kiln Room Fan: Existing kiln room fan shall be interlocked with Kiln controls such that damper open and fan operation must be proven prior to kiln operating. Alarms shall be sent to BMS if fan, motorized damper or kiln do not operate.

Unoccupied

While unoccupied the controller will cycle the exhaust fan OFF and close the isolation dampers.

Continuous Fan Operation:

EF-17: Provide thermostat in electric room. If room temperature rises above setpoint, motorized damper on gravity ventilator shall prove open and EF-17 shall cycle on. Upon a drop in temperature below setpoint, fan shall cycle off and damper shall close. Provide low and high temperature alarms to BMS.

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

3.11 Unit Ventilators and Relief Fans:

General Notes

Unit Ventilators (UV) are a constant air volume unit with supply fan, dual temperature coil and outdoor air dampers.

Occupancy, Scheduling and Commands

Scheduling

The area related to this UV will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the customer).

Optimum Start

Optimum start prepares the space for occupancy in advance of the occupied period. By starting heating or cooling at the optimum time before the occupied period begins, the controller provides a comfortable space ready for occupancy without wasting energy. The system will maintain statistics comparing the outside temperature to the time required for the space to reach the occupied set points. The system uses these statistics to calculate the length of time required for optimum start. The user can enable or disable the optimum start feature by setting the user adjustable Optimum Start Option. The user can also limit the maximum time that the unit will start be for its occupied state by setting an adjustable Optimum Max Time to 60 minutes. Whenever the UV is called to run during optimum start mode the controller will operate as if it was occupied.

Local User Override

The associated wall thermostat will allow the local user (someone in the space) to override the UV into an occupied mode. Whenever the UV controller detects this override then the UV will switch into an occupied mode and operate as detailed below

Unit Shutdown

Whenever the unit shuts down the fan will cycle OFF, chilled water (CHW) coil valve will be closed, the hot water (HW) coil valve will modulate to maintain the active space heating setpoint as detailed below. If the condensate pan high water level goes into alarm then the controller will fully close the CHW valve, command the supply fan OFF, and report the alarm condition to the front-end.

Staggered Unit Startup

Whenever the unit starts up (scheduled or after a power failure) the controller will wait for an adjustable Unit Start Delay Timer to count down before the controller will allow the startup sequence to begin. These timers will be set such that equipment throughout the facility will startup at staggered times to prevent pieces of equipment from starting up at the same time.

Unit Ventilator Operation

Occupied:

UV outdoor air damper shall open to its minimum position. While occupied the controller will enable the supply fan to operate at its adjustable Supply Fan Minimum Speed of 50%. Note that the controller will also provide an adjustable Supply Fan Maximum Speed of 90% limits, which will be coordinated and set with the balancer during startup. The minimum and maximum speed setpoints are intended to limit fan airflow to the designed scheduled values. The BMS controller shall modulate the outdoor air dampers and the heating/coil valve beyond minimum setting to maintain desired space temperature. Exhaust Fans shall operate when the UV zones are in Occupied Mode. Classrooms shall have positive space pressurization.

Summer Mode:

Whenever the supply fan is running then the controller will modulate the Dual Temperature coil valve to maintain the space temperature to an adjustable Occ Space Cooling Setpoint of 74 DEG (F). If the valve modulates up to a fully open position and cannot satisfy the cooling demand then the controller will modulate the supply fan speed between its minimum and maximum speeds as needed to satisfy the space temperature.

Winter Mode:

Whenever the supply fan is running then the controller will modulate the Dual Temperature coil valve to maintain the space temperature to an adjustable Occ Space Heating Setpoint of 70 DEG (F). If the valve modulates up to a fully open position and cannot satisfy the heating demand then the controller will modulate the supply fan speed between its minimum and maximum speeds as needed to satisfy the space temperature.

Economizer Mode:

Whenever the UV controls allow for unit to operate in Economizer Mode, Exhaust fans shall remain on and relief air damper shall modulate to allow for proper space pressurization. Classrooms shall have positive space pressurization.

Unoccupied
Winter Mode:

While unoccupied and if the space is satisfied the supply fan will cycle OFF, the dual temperature valve(s) will modulate and maintain the space to unoccupied space heating setpoint.

Summer Mode:

If the space temperature moves above an adjustable Unocc Space Cooling Setpoint of 85 DEG (F) then the UV will cycle ON and run at its maximum speed and the dual temperature valve will move to a fully open position to cool the room quickly and minimize equipment runtime. When the space temperature drops 4 DEG (F) below this setpoint then the valve will close and the UV will cycle OFF.

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules,

sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

General:

All Unit Ventilators operate with Dual Temperature Water. Provide thermostat for each Unit Ventilator.

Provide low-limit thermostat (freezestat) which shall de-energize fan, shall open the heating valve, and close the outdoor air damper if the air temperature decreases to below 36F (adjustable). Alarm, visual and audible, shall indicate on BMS.

Relief Fans for Classrooms shall operate continuously when building is in occupied mode. Dampers shall open and fan shall energize during occupied mode. If system is in unoccupied mode and a classroom sensor is indexed to occupied, that associated relief fan's dampers shall open and fan shall cycle on. During unoccupied mode, dampers shall shut and fans shall cycle off.

3.12 Ductless Split Systems:

General Notes:

Ductless split system AC units (AC Unit) will be provided with factory controls that will operate and maintain all aspects of this equipment (refer to the manufactures submittal package for all related details).

Shall be started and stopped through a space mounted electronic microcomputer-based room thermostat, by the equipment manufacture. The room thermostat (lockable cover) shall be capable of providing set-point adjustments and all programming control sequences. Each evaporator shall have a separate thermostat. Each evaporator's fan and compressors shall cycle to maintain room temperature set point 75˚ when indexed to the auto mode. All condenser, and compressor operations shall be controlled by the AC unit's built in unitary controller. Provide a separate room temperature sensor provide by the BMS contractor for each evaporator. The sensor shall be report status, room high and low temperatures and enable alarms at the BMS work station for unit failure, high and low temperatures, water detection.

As stated above, the manufacture supplied factory controls will operate and maintain all aspects of the equipment associated to each AC unit. We will provide all low voltage control and interlock wiring as well as the mounting and wiring of the associated factory supplied wall sensors.

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

3.13 Air conditioning condensate pumps:

Provide connection to the overflow switch in each condensate pump tank arranged to annunciate an alarm at the BMS and shut down the respective RTU/AC unit if water is detected.

Provide a secondary high level float switch in each packaged roof top unit condensate pan and each split system air handling unit condensate pan arranged to annunciate an alarm at the BMS and shut down the respective RTU/AC unit if water is detected.

3.14 Miscellaneous Plumbing Equipment: Provide Control Points (status/setpoints/alarms) for items noted below in sequence.

Domestic Hot Water Heater: When the domestic hot water heater calls for heat, the combustion air dampers will open and the domestic hot water heater shall not operate until the dampers have been proven open via a damper end swtich.

Domestic hot water pump: The BMS system shall be arranged to operate the domestic hot water recirculation pump. The pump shall be operated based on return water temperature. When return water temperature drops below setpoint (110 deg F) the pump shall be started.

Domestic hot water mixing valves: Domestic hot water mixing valves shall be 3-way mixing valves arranged to maintain the maintain domestic water to the building at 120°F maximum. The actual setpoint shall be 110°F. The second 3-way mixing valve shall be at the kitchen. This shall be arranged to maintain the domestic water to the pot sinks at 140°F maximum. In both cases there shall be secondary aquastats on the respective hot water pipes arranged to close a solenoid valve in each of the hot water lines. Provide monitoring and set point adjustment at the BMS work station. Alarm high temperature at the BMS.

Elevator pit sump pumps: provide an interface to the sump pump control panel. The panel alarm output shall be monitored and annunciated at the BMS. The oil minder pump control panel has a discriminating alarm output for oil detection.

3.15 Kitchen Exhaust Fan and Make-up Air Unit

Kitchen Exhaust Fan and Make Up Air Unit are existing equipment to remain. Provide connection to controls for both. BMS shall monitor operation and alarms for both.

Kitchen Hood shall be interlocked such that operation shall not be permitted unless Exhasut Fan and Make Up Air unit are proven to be operational. Provide alarms at BMS should system vary from normal operating conditions.

Control Points:

Kitchen Exhaust Fan Run Status/Speed
Hood Switch

Dishwasher Fan Run Status
Space Temperature (provide new Thermostat)
Make-up Air Unit Status
Make-up Air Supply Setpoint / Temperature
Make-up Air Return Setpoint / Temperature

Alarms:

BMS status and alarms
Fan Failure
High temperature
Low temperature

3.16 Existing Fan Coil Units (FCU)

There are Fan Coil units that are to remain. Provide new controller and connection to BMS. BMS shall monitor operation and alarms.

Provide alarms at BMS should system vary from normal operating conditions.

General Notes

Fan Coil units are a constant air volume unit with supply fan, cooling coil, heating coil and outdoor air dampers.

Occupancy, Scheduling and Commands

Scheduling

The area related to this FCU will be assigned to a fully user adjustable occupancy schedule (schedule to be coordinated with the customer).

Optimum Start

Optimum start prepares the space for occupancy in advance of the occupied period. By starting heating or cooling at the optimum time before the occupied period begins, the controller provides a comfortable space ready for occupancy without wasting energy. The system will maintain statistics comparing the outside temperature to the time required for the space to reach the occupied set points. The system uses these statistics to calculate the length of time required for optimum start. The user can enable or disable the optimum start feature by setting the user adjustable Optimum Start Option. The user can also limit the maximum time that the unit will start be for its occupied state by setting an adjustable Optimum Max Time to 60 minutes. Whenever the FCU is called to run during optimum start mode the controller will operate as if it was occupied.

Local User Override

The associated wall thermostat will allow the local user (someone in the space) to override the FCU into an occupied mode. Whenever the FCU controller detects this override then the FCU will switch into an occupied mode and operate as detailed below

Unit Shutdown

Whenever the unit shuts down the fan will cycle OFF, chilled water (CHW) coil valve will be closed, the hot water (HW) coil valve will modulate to maintain the active space heating setpoint as detailed below. If the condensate pan high water level goes into alarm then the controller will fully close the CHW valve, command the supply fan OFF, and report the alarm condition to the front-end.

Staggered Unit Startup

Whenever the unit starts up (scheduled or after a power failure) the controller will wait for an adjustable Unit Start Delay Timer to count down before the controller will allow the startup sequence to begin. These timers will be set such that equipment throughout the facility will startup at staggered times to prevent pieces of equipment from starting up at the same time.

Unit Ventilator Operation

Occupied:

FCU outdoor air damper shall open to its minimum position. While occupied the controller will enable the supply fan to operate at its adjustable Supply Fan Minimum Speed of 50%. Note that the controller will also provide an adjustable Supply Fan Maximum Speed of 90% limits, which will be coordinated and set with the balancer during startup. The minimum and maximum speed setpoints are intended to limit fan airflow to the designed scheduled values. The BMS controller shall modulate the outdoor air dampers and the heating/coil valve beyond minimum setting to maintain desired space temperature.

Summer Mode:

Whenever the supply fan is running then the controller will modulate the CHW coil valve to maintain the space temperature to an adjustable Occ Space Cooling Setpoint of 74 DEG (F). If the CHW modulates up to a fully open position and cannot satisfy the cooling demand then the controller will modulate the supply fan speed between its minimum and maximum speeds as needed to satisfy the space temperature.

Winter Mode:

Whenever the supply fan is running then the controller will modulate the HW coil valve to maintain the space temperature to an adjustable Occ Space Heating Setpoint of 70 DEG (F). If the HW coil valve modulates up to a fully open position and cannot satisfy the heating demand then the controller will modulate the supply fan speed between its minimum and maximum speeds as needed to satisfy the space temperature.

Unoccupied

Winter Mode:

While unoccupied and if the space is satisfied the supply fan will cycle OFF, the CHW valve will close, and the heating valve(s) will modulate and maintain the space to unoccupied space heating setpoint.

Summer Mode:

If the space temperature moves above an adjustable Unocc Space Cooling Setpoint of 85 DEG (F) then the FCU will cycle ON and run at its maximum speed and the CHW valve will move to a fully open position to cool the room quickly and minimize

equipment runtime. When the space temperature drops 4 DEG (F) below this setpoint then the valve will close and the FCU will cycle OFF.

Alarms and Graphics

Alarms

All of the inputs on this controller will be monitored by the front-end web server and will provide alarm notification upon detection of an alarm condition (via the alarm log, email and/or text). The controller will also verify the input status to the output control signals and provide alarm notification to the system upon detection of an alarm condition. This alarming should be understood throughout the system, even if they are not all specifically detailed within this sequence of operations.

Graphics

The front-end web-based system will include a complete graphical representation of this control system and all of its associated points, alarms, setpoints, schedules, sequences as detailed within this sequence and the HVAC Controls portion of the project plans, as well as what is required to make this system fully operational and user friendly.

General:

All FCUS operate with hot water in Winter Mode and Chilled water in Summer Mode. Provide thermostat for each FCU.

Provide low-limit thermostat (freezestat) which shall de-energize fan, shall open the heating valve, and close the outdoor air damper if the air temperature decreases to below 36F (adjustable). Alarm, visual and audible, shall indicate on BMS.

3.17 Miscellaneous

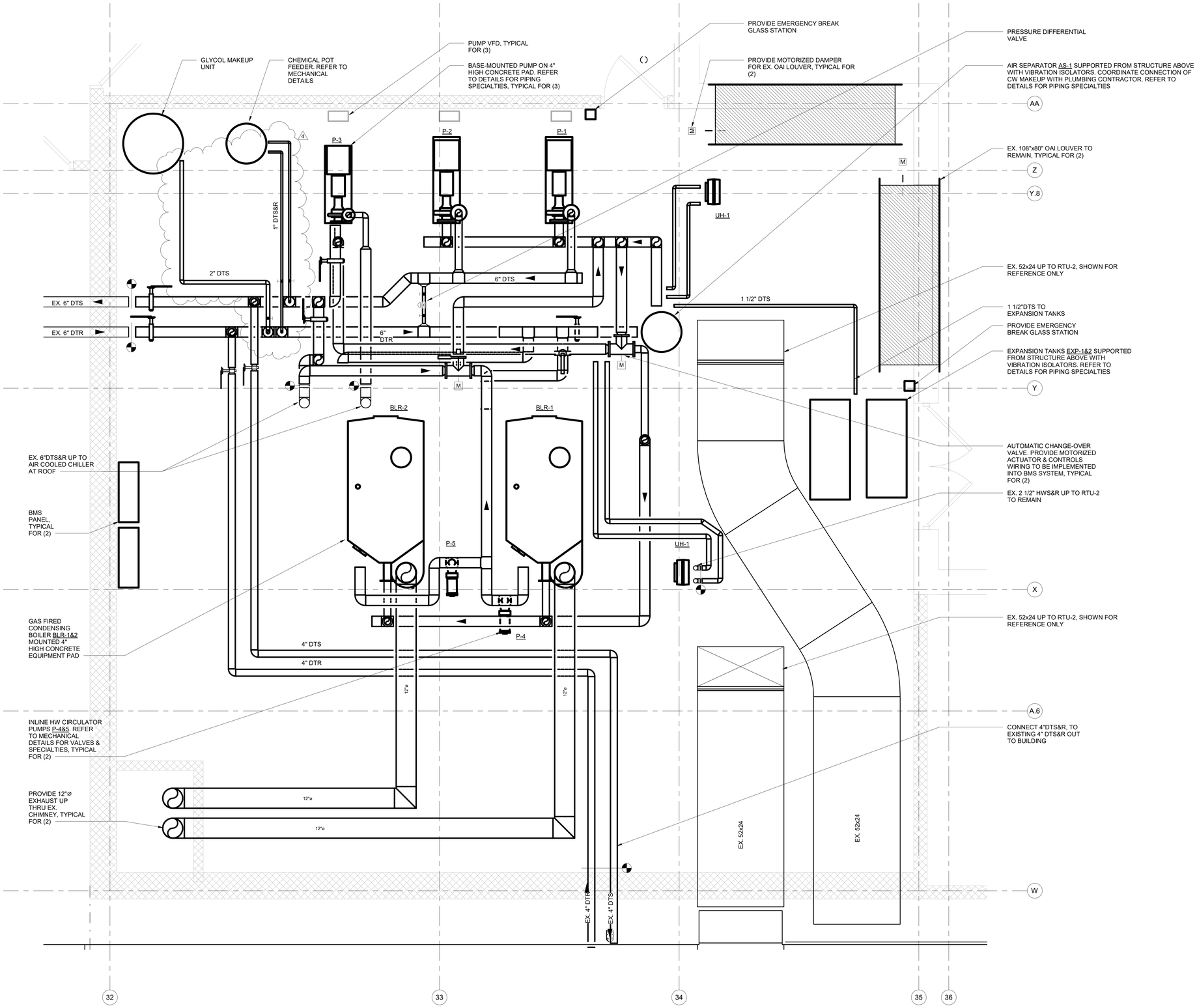
All safety devices shall be interlocked with “hand” and “Automatic” positions in series with motor controller holding coil circuit. Interlocking with other fans and equipment of system shall be through “Automatic” position “Hand” position shall be for maintenance only. Remote starting shall be from through “automatic” position only.

For all RTUs, UVs and HVs, low limit thermostats (freezestats) shall de-energize supply fan is supply air temperature decreases below 38 degrees F (ADJUSTABLE). This shall alarm at BMS.

All air handling units 2,000 cfm or greater shall have a duct mounted smoke detector arranged to stop the unit and position all dampers and valves in the “unit off” sequence as described in this section, upon detecting smoke.

All air handling units, unit ventilators, cabinet unit heaters, unit heaters, fans, and fan coil units, shall be interlocked to the building fire alarm system. Upon building fire alarm all units shall shut down and damper and valves shall go to “unit off” positions.

END OF SECTION



1 MECHANICAL BOILER ROOM NEW WORK PLAN - ALTERNATE A

SCALE: 1/2" = 1'-0"

NORTH

MECHANICAL NEW WORK GENERAL NOTES	
1	PROVIDE NEW DUCTWORK INSULATION ON ALL SUPPLY & RETURN DUCTWORK THROUGHOUT ENTIRE BUILDING UNLESS OTHERWISE NOTED
2	PROVIDE NEW DUAL TEMPERATURE SUPPLY & RETURN PIPE INSULATION COMPLETE THROUGHOUT ENTIRE BUILDING
3	ALL EXISTING TO REMAIN AIR OUTLETS WITHIN CEILINGS BEING REPLACED SHALL BE REMOVED AND CLEANED AS PER SPECIFICATIONS. TYPICAL UNLESS OTHERWISE NOTED

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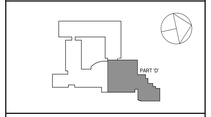


Professional Seal

No.	Date	Issue
4	9/19/2019	ADDENDUM 3
3	8/6/2019	ISSUED FOR BID
2	6/5/2019	CLIENT REVIEW SET
1	5/15/2019	ISSUED FOR PRICING

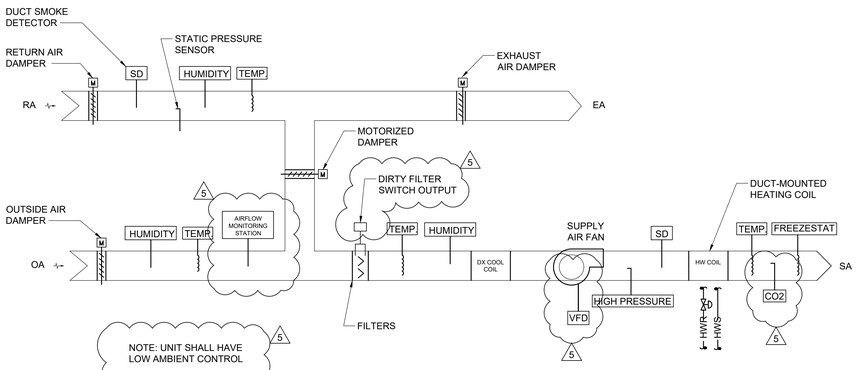
Sheet Title

MECHANICAL BOILER ROOM NEW WORK PLAN - ALTERNATE A

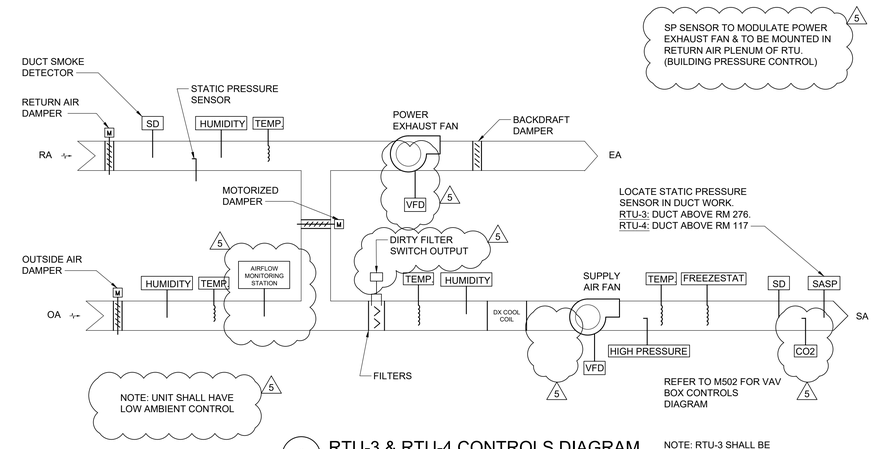
Job No.	Date
NKGD0206.00	08/06/2019
Scale	Drawn / Checked
AS NOTED	Author Checker

Sheet Number

M214A

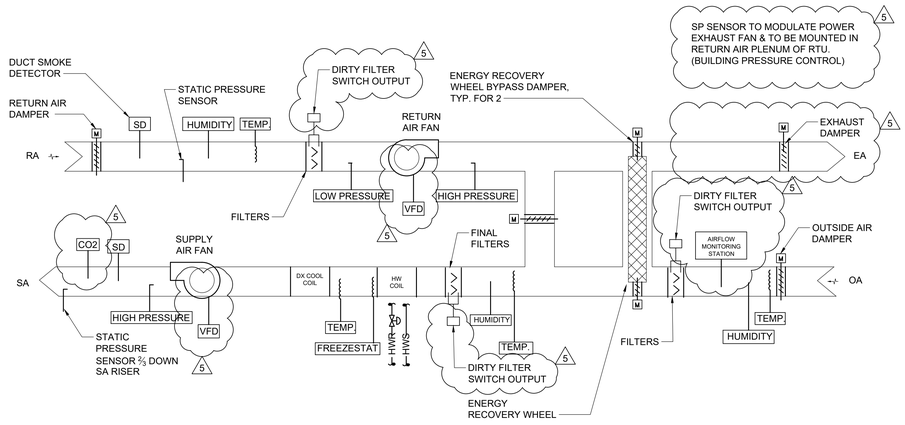


6 RTU-7 AND RTU-8 CONTROLS DIAGRAM
SCALE: NONE



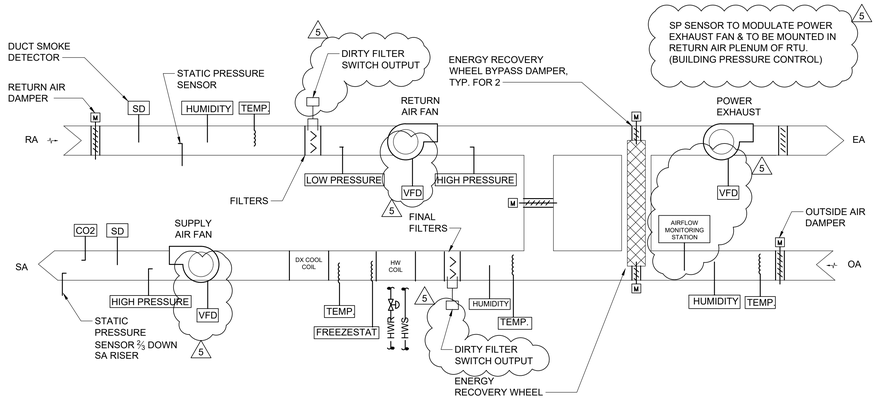
3 RTU-3 & RTU-4 CONTROLS DIAGRAM
SCALE: NONE

NOTE: RTU-3 SHALL BE PROVIDED WITH ENERGY RECOVERY



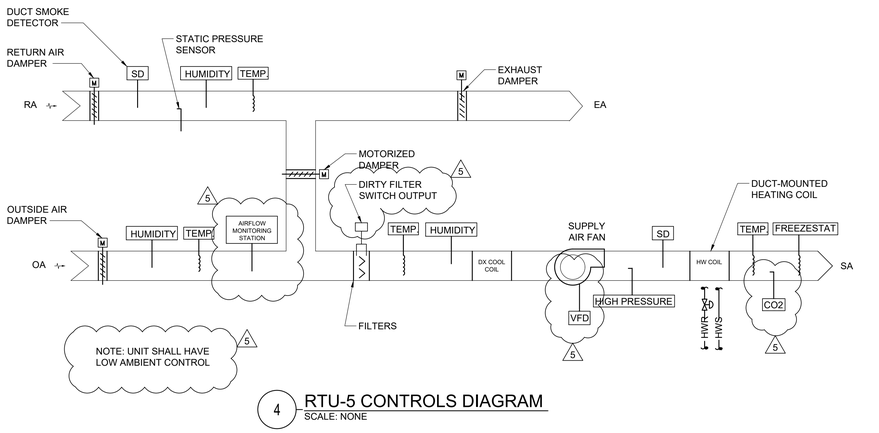
5 RTU-6 CONTROLS DIAGRAM
SCALE: NONE

NOTE: UNIT SHALL BE PROVIDED WITH ENERGY RECOVERY & LOW AMBIENT CONTROLS

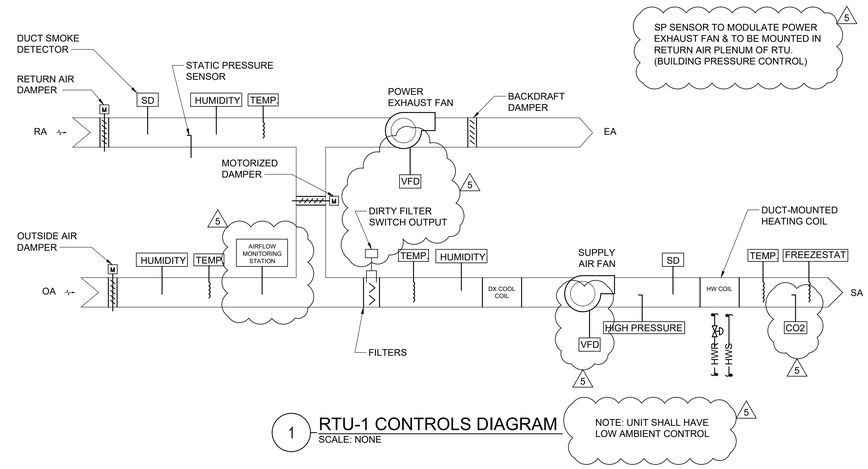


2 RTU-2 CONTROLS DIAGRAM
SCALE: NONE

NOTE: UNIT SHALL BE PROVIDED WITH ENERGY RECOVERY & LOW AMBIENT CONTROL



4 RTU-5 CONTROLS DIAGRAM
SCALE: NONE



1 RTU-1 CONTROLS DIAGRAM
SCALE: NONE

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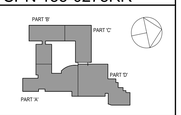


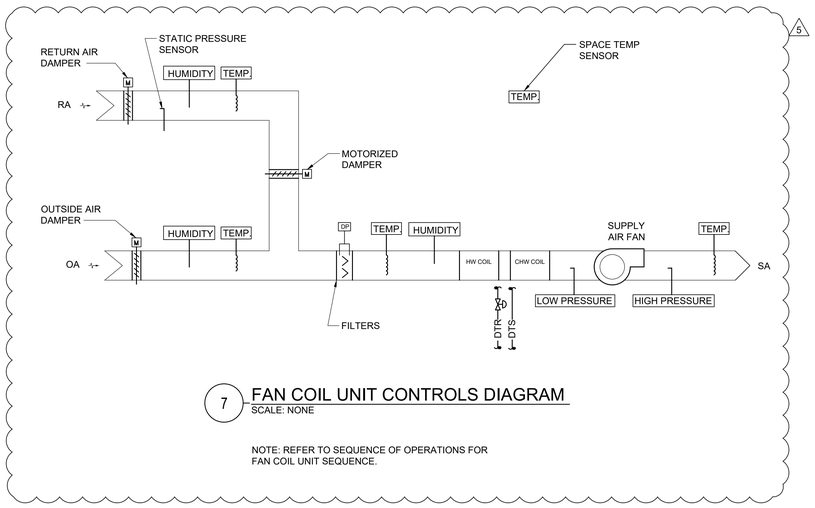
Professional Seal

No.	Date	Issue
5	9/19/2019	ADDENDUM 3
4	9/13/2019	ADDENDUM 2
3	8/6/2019	ISSUED FOR BID
2	6/5/2019	CLIENT REVIEW SET
1	5/15/2019	ISSUED FOR PRICING

Sheet Title
CONTROLS DIAGRAMS 1 OF 3

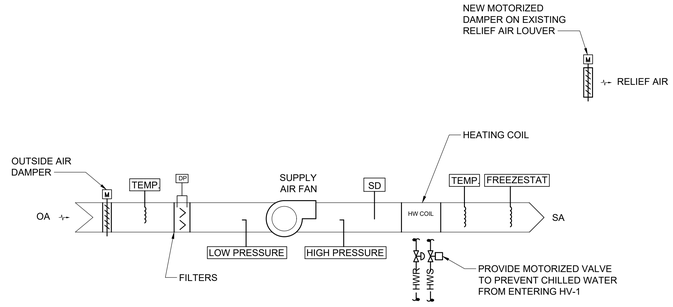
Job No.	Date
NKGD0206.00	08/6/2019
Scale: AS NOTED	Drawn / Checked

Sheet Number
M501



7 FAN COIL UNIT CONTROLS DIAGRAM
SCALE: NONE

NOTE: REFER TO SEQUENCE OF OPERATIONS FOR FAN COIL UNIT SEQUENCE.



4 HV-1 CONTROLS DIAGRAM
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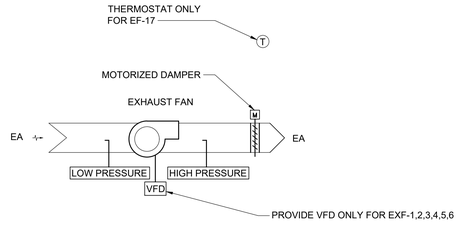
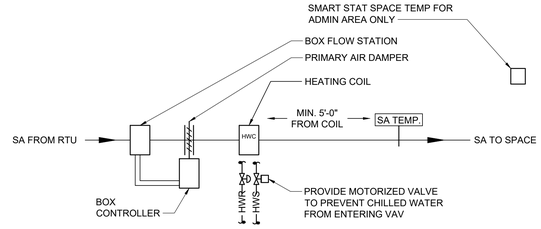
NOTE: REFER TO SEQUENCE OF OPERATIONS FOR HV-1 SEQUENCE



6 EXHAUST FAN CONTROLS DIAGRAM
SCALE: NONE

NOTE: REFER TO SEQUENCE OF OPERATIONS FOR SPECIFIC INFORMATION ON FANS & INTERLOCKS.



3 VAV BOX CONTROLS DIAGRAM
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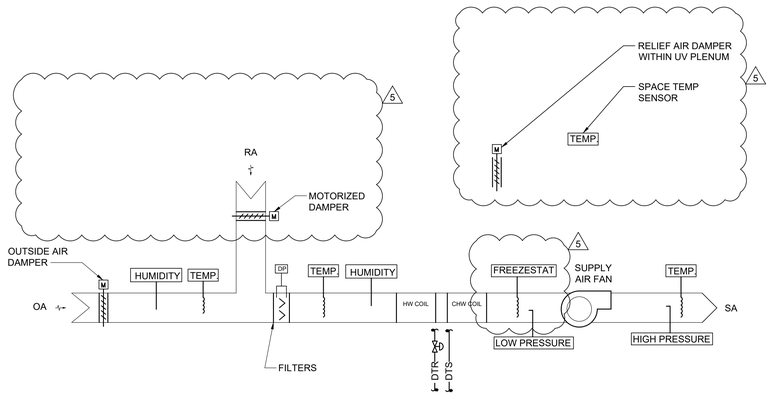
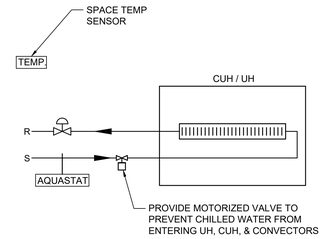
NOTE: REFER TO SEQUENCE OF OPERATIONS FOR VAV SEQUENCE



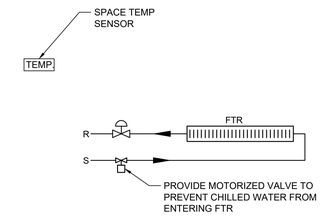
5 UNIT VENTILATOR CONTROLS DIAGRAM
SCALE: NONE

NOTE: REFER TO SEQUENCE OF OPERATIONS FOR UNIT VENTILATOR SEQUENCE.



2 UH & CUH CONTROLS DIAGRAM
SCALE: NONE

NOTE: REFER TO SEQUENCE OF OPERATIONS FOR UH & CUH SEQUENCE



1 FTR CONTROLS DIAGRAM
SCALE: NONE

NOTE: REFER TO SEQUENCE OF OPERATIONS FOR FTR SEQUENCE

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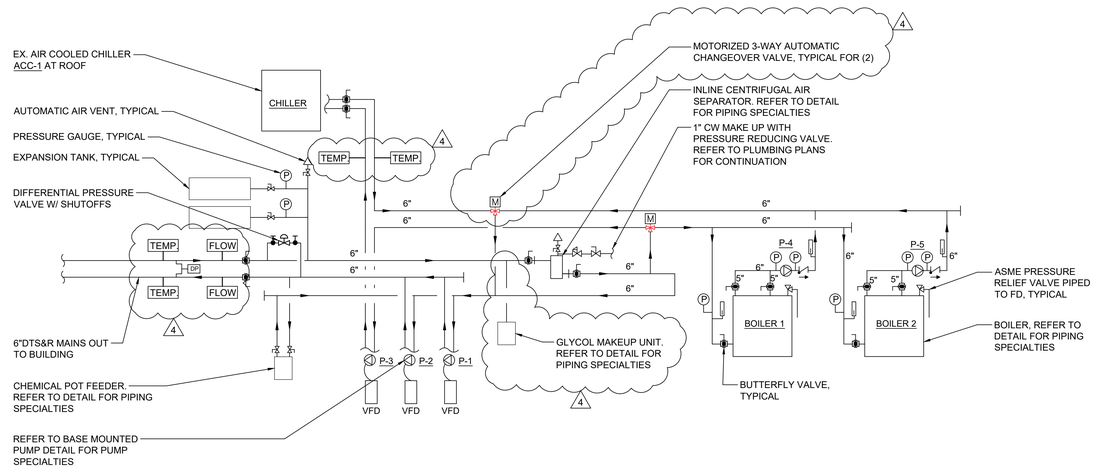
5	9/19/2019	ADDENDUM 3
4	9/13/2019	ADDENDUM 2
3	8/6/2019	ISSUED FOR BID
2	6/5/2019	CLIENT REVIEW SET
1	5/15/2019	ISSUED FOR PRICING

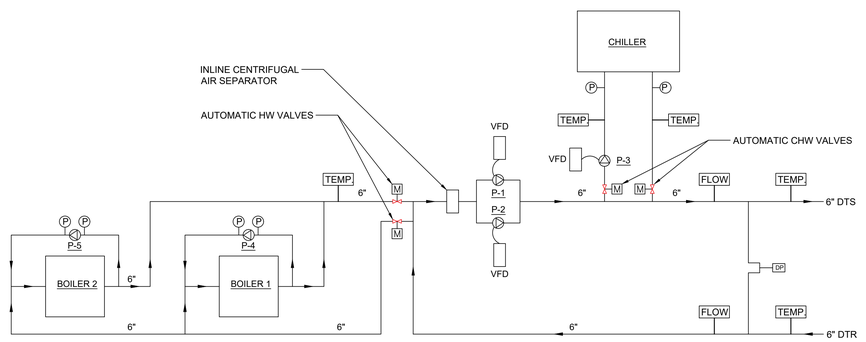
Sheet Title
CONTROLS DIAGRAMS 2 OF 3

Job No.	Date
NKGD0206.00	08/6/2019
Scale: AS NOTED	Drawn / Checked

Sheet Number
M502



2 DUAL TEMPERATURE SCHEMATIC - ALTERNATE A
SCALE: NONE



1 DUAL TEMPERATURE SCHEMATIC - BASE BID
SCALE: NONE

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1	5/15/2019	ISSUED FOR PRICING

Sheet Title

CONTROLS DIAGRAMS 3 OF 3

Job No.	Date
NKGD0206.00	08/6/2019
Scale: AS NOTED	Drawn / Checked

Sheet Number

M503

PACKAGED ROOFTOP AC UNIT SCHEDULE

		TAG	RTU-1 (Media Center)	RTU-2 (Auditorium)	RTU-3 (Dance Room)	RTU-4 (Office Wing)	RTU-5 (North Lobby)	RTU-6 (Cafeteria)	RTU-7 (Computer Room)	RTU-8 (South Lobby)
		Weight(lbs)	3463	8845	3463	2409	2021	3576	2021	2021
		Qty	1	1	1	1	1	1	1	1
		Model	DPS020A	RPS042D	DPS018A	DPS015A	DPS007A	DPS020A	DPS007A	DPS007A
Westover Elementary School	Unit	Electrical — Voltage	460/60/3	460/60/3	460/60/3	460/60/3	460/60/3	460/60/3	460/60/3	460/60/3
		Electrical — MCA (A)	50.8	103.2	41.8	31.8	16.4	53.6	16.4	16.4
		Electrical — MROPD (A)	80	125	60	40	20	80	20	20
		Efficiency — EER / SEER	10.6	10.1	11.4	11.1	12.3	10.6	12.3	12.3
		Efficiency — IEER	19.7		20.2	18	20.3	19.7	20.3	20.3
		Supply Fan — Airflow (CFM)	8000	14000	7000	6000	3000	8000	3000	3000
		Supply Fan — Min OA (CFM)	2200	4860	2500	475	65	4055	300	100
		Supply Fan — ESP (inH_2O)	1.5	2	1.5	1.5	1.5	1.5	1.5	1.5
		Supply Fan — TSP (inH_2O)	2.36	4.52	2.25	2.53	1.77	2.88	1.77	1.77
		Supply Fan — Altitude (ft)	0	0	0	0	0	0	0	0
		Supply Fan — Motor Size (HP)	7.5	15	7.5	8	4	10	4	4
		Return/Exhaust Fan — Airflow (CFM)	6000	9100	4500	5000	N/A	4110	N/A	N/A
		Return/Exhaust Fan — ESP (inH_2O)	1	1	1	0.5	N/A	1	N/A	N/A
		Return/Exhaust Fan — Motor Size(HP)	4	5	4	4	N/A	3	N/A	N/A
		Filters — Face Area (ft)	27	60	27	18	18	27	18	18
		Filters — Efficiency	2" MERV 8	MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8	2" MERV 8
	Cooling	EAT — EDB (°F)	79.6	82	82.1	78.3	76	84.7	77	76
		EAT — EWB (°F)	65.3	66.9	66.9	64.4	62.7	68.6	63.4	62.7
		LAT — LDB (°F)	54.8	56.9	57.7	54.7	52.6	58.3	53.4	52.6
		LAT — LWB (°F)	54.6	56.2	57.5	54.6	52.5	58.1	53.2	52.5
		Total	257675	467579	208627	174901	88248	273438	89403	88248
		Sensible	217510	384273	186733	155071	76671	230906	77567	76671
		Compressor — Ambient DB (°F)	95	95	95	95	95	95	95	95
		Compressor — Stages	Modulating	Modulating	Modulating	Modulating	Modulating	Modulating	Modulating	Modulating
		Compressor — Qty	1	3	1	2	2	1	2	2
		Compressor Power (kW)	18	33	12.6	12.5	5.6	18	5.6	5.6
		Refrigerant	R410A	R410A	R410A	R410A	R410A	R410A	R410A	R410A
	Hot Water Heating	Type		Hot Water				Hot Water		
		FPI		9				12		
		Rows		2				2		
		Total Capacity (Btu/hr)		496110				300369		
		EDB (°F)		50				70		
		LDB (°F)		95				104.3		
	Energy Recovery	Summer — Sens. Effectiveness		92.57	90.02			89.06		
		Summer — Total Effectiveness		91.08	89.5			87.49		
		Summer — Sens. Recovered Capacity (MBH)		59.9	46.6			57.7		
		Summer — Total Recovered Capacity (MBH)		130.4	95.2			125.3		
		Winter — Sens. Effectiveness		93.7	91.31			90.27		
		Winter — Total Effectiveness		93.1	90.7			89.73		
		Winter — Sens. Recovered Capacity (MBH)		191.2	161.2			184.2		
		Winter — Total Recovered Capacity (MBH)		224.9	186.9			216.7		

NOTES:
1. UNITS BASED ON DAIKIN.
2. PROVIDE THE FOLLOWING OPTIONS FOR ALL UNITS:
- HIGH STATIC DRIVE MOTOR. COORDINATE LEFT/RIGHT HAND FAN DRIVE IN FIELD.
- UNITS SHALL BE HIGH EFFICIENCY.
- 100% MODULATING ECONOMIZER OPERATION WITH DIFFERENTIAL ENTHALPY CONTROL.
- FURNISH EXTRA DRIVE BELT AND EXTRA FILTER SET FOR EACH UNIT.
- UNIT SHALL BE MOUNTED ON 24" HIGH VIBRATION ISOLATION ROOF CURB. (HEIGHT INCLUDES BASE CURB AND VIBRATION ISOLATION RAILS.)
- POWERED CONVENIENCE OUTLET

4. PROVIDE THE FOLLOWING MOTOR CONTROL OPTIONS FOR ALL UNITS:
- UNITARY CONTROLLER BY AUTOMATIC TEMPERATURE CONTROLS MANUFACTURER, COMPATIBLE WITH THE BUILDING AUTOMATION SYSTEM.
- ALL MOTORS 1 HP OR GREATER SHALL BE PREMIUM EFFICIENCY. ALL MOTORS FURNISHED WITH VARIABLE FREQUENCY DRIVES SHALL BE INVERTER DUTY RATED & APPROVED FOR VARIABLE SPEED AND TORQUE APPLICATIONS.
- SINGLE POINT EXTERNAL POWER CONNECTION AT UNIT, UNIT-MOUNTED DISCONNECT SWITCH, AND FACTORY INSTALLED MOTOR STARTERS. VAV UNITS SHALL HAVE FACTORY MOUNTED VFD'S WITH H-O-A.

5. PROVIDE POWER EXHAUST FOR THE FOLLOWING UNITS: RTU-1, RTU-3, RTU-4
6. PROVIDE ENERGY RECOVERY FOR THE FOLLOWING UNITS: RTU-2, RTU-3, RTU-6

UNIT VENTILATOR SCHEDULE

DESIGNATION:	UV-1	UV-2
LOCATION	SEE PLAN	SEE PLAN
MANUFACTURER	DAIKIN	DAIKIN
MODEL	UAVS9H15	UAVS9H07
UNIT DIMENSIONS - WIDTH x HEIGHT x DEPTH (IN)	98.00 X 30.13 X 21.88	62.00 X 30.13 X 21.88
QUANTITY	53	15
WEIGHT (LBS)	600	370
HOT WATER COIL:		
NO. ROWS	5	5
E.W.T./L.W.T. (°F)	140/90.1	140/84.8
E.A.T/L.A.T. DB (°F)	48.9/108.6	39.9/107.9
FLUID TYPE	30% PROPYLENE GLYCOL	30% PROPYLENE GLYCOL
CAPACITY (MBH) (TOTAL)	93.5	55.2
GPM	3.75	2
W.P.D. (FT H_2O)	1.29	0.81
COOLING COIL:		
NO. ROWS	5	3
E.A.T. DB/WB (°F)	78.6/65.3	82.2/67.2
L.A.T. DB/WB (°F)	58.6/55.7	65.3/60.1
CAPACITY (MBH) (TOTAL/SENS.)	42.8/31.3	18.4/13.8
FLOW RATE (GPM)	11.84	4.52
WPD (FT H_2O)	15.66	3.89
SUPPLY FAN:		
CFM	1444	748
OAI CFM	-	-
FAN MOTOR HP	0.250	0.333
VOLTS/Ø/Hz	115/60/1	115/60/1
MCA/MFA	6.3/15	6.3/15

NOTES:
1. CONFIGURATION SHALL BE AS FOLLOWS:
- VERTICAL UNIT.
- TOP BAR GRILLE SUPPLY AIR OUTLET.
- REAR DUCT COLLAR OUTSIDE AIR INLET.
- FACTORY INSTALLED MOTORIZED DAMPERS FOR OAI & RA.

2. PROVIDE THE FOLLOWING FEATURES & OPTIONS FOR EACH UNIT:
- UNITARY CONTROLLER BY AUTOMATIC TEMPERATURE CONTROLS MANUFACTURER, COMPATIBLE WITH THE BUILDING AUTOMATION SYSTEM.
- COORDINATE RIGHT-HAND/LEFT-HAND COIL CONNECTIONS IN THE FIELD.
- OPTIONAL PIPE TUNNEL TO ALLOW PIPING ACROSS THE UNIT.
- KEY LOCK ACCESS DOORS.
- FURNISH 2-WAY MODULATING CONTROL VALVE FOR EACH COIL, WITH PIPING PACKAGE AS PER DETAIL. 5 PSI MAX AT CONTROL VALVE.
- FREEZE STAT ARRANGED TO OVERRIDE THE COIL CONTROL VALVE & SHUT DOWN UNIT AS PER THE SEQUENCE OF OPERATIONS
- WALL MOUNTED THERMOSTAT.
- FACTORY FURNISHED LOCAL DISCONNECT SWITCH.
- END COVERS.
- FULLY MODULATING ASHRAE CYCLE II RA&OA DAMPERS AND ACTUATORS.
- DISCONNECT SWITCH.
- 4" SUB-BASE.
- OPTIONAL 14 GAGE FRONT PANEL.
- UNITS SHALL BE UL LISTED.
- 100% OUTSIDE AIR ECONOMIZER, WITH DIFF. ENTHALPY CONTROL.
- (2) SETS OF SPARE FILTERS FOR EACH UNIT.
- FINISH SHALL BE CUSTOM ENAMEL - SUBMIT COLOR CHART FOR APPROVAL.
- FIELD MOUNTED RETURN AIR SMOKE DETECTOR.
- FACTORY PROVIDED OUTSIDE AIR LOUVER: HORIZONTAL TYPE WITH FLANGE FRAME, COORDINATE STYLE AND COLOR WITH ARCHITECT. WALL OPENINGS: 48½" LONG X 10⅝" HIGH FOR UV-A; 60½" LONG X 10⅝" HIGH FOR UV-B.

PUMP SCHEDULE

DESIGNATION	P-1&2	P-3	P-4&5
LOCATION	BOILER ROOM	BOILER ROOM	BOILER ROOM
SYSTEM SERVED	DTS&R	DTS&R	BOILER
ARRANGEMENT	BASE MOUNTED	BASE MOUNTED	INLINE
MANUFACTURER	BELL & GOSSETT	BELL & GOSSETT	BELL & GOSSETT
MODEL	e-1510 4EB	e-1510 3BD	e-90 2AAC
TYPE	END SUCTION	END SUCTION	INLINE
IMPELLER DIA. (IN.)	11	9.5	5.25
GPM	750	610	70
TOTAL DYNAMIC HEAD (FT H_2O)	90	70	20
RPM	1800	1800	1800
NPSH (FT. H_2O)	10.9	9.28	5.61
MOTOR HP	25	15	0.75
VOLTAGE/Ø/Hz	460/3/60	460/3/60	460/3/60
STARTER TYPE	VFD	VFD	-
STARTER LOCATION	MECHANICAL ROOM	MECHANICAL ROOM	MECHANICAL ROOM
INTERLOCK	-	ACC-1	BLR-1&2

NOTES:
1. ALL PUMPS SHALL BE CAST IRON BODY, BRONZE FITTED, BRONZE IMPELLER. REFER TO SPECIFICATION FOR PUMP CONSTRUCTION.
2. ALL MOTORS 1 HP OR GREATER SHALL BE PREMIUM EFFICIENCY.
3. ALL MOTORS FURNISHED WITH VARIABLE FREQUENCY DRIVES SHALL BE INVERTER DUTY RATED & APPROVED FOR VARIABLE SPEED AND TORQUE APPLICATIONS.
4. MOTOR STARTERS AND DISCONNECT SWITCHES SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR AND INSTALLED BY THE ELECTRICAL CONTRACTOR.

CEILING DIFFUSER SCHEDULE

DESIGNATION	CD-1			
MODEL	OMNI			
MAX CORE VEL (FT/MIN)	550			
MAX NC	25			
CONSTRUCTION	STEEL			
FRAME	LAY-IN			
DEFLECTION	4 WAY			
FACE SIZE	24x24 / 12x12			
	CFM RANGE	NECK SIZE Ø	CFM RANGE	NECK SIZE Ø
	0-100	6"	0-100	6"
	101-200	8"	101-200	8"
	201-350	10"	201-350	10"
	351-450	12"	351-450	12"
	451-600	14"	451-600	14"
	601-700	15"	601-700	15"

NOTES:
1. CEILING SUPPLY DIFFUSERS ARE BASED ON TITUS.
2. ALL DIFFUSERS SHALL BE EQUIPPED WITH AN OPPOSED BLADE VOLUME DAMPER.
3. COORDINATE COLOR SELECTION WITH ARCH PLANS.
4. SUPPLY DIFFUSERS SHALL HAVE FRAMES AND BORDERS SUITABLE FOR THE CONSTRUCTION IN WHICH THEY WILL BE INSTALLED, CONTRACTOR TO COORDINATE.
5. ALL LAY-IN DIFFUSERS SHALL HAVE A MODULE SIZE OF 24x24. FACE SIZES SHOWN IN SCHEDULE ARE FOR SURFACE MOUNT DIFFUSERS. NECK SIZES VARY ACCORDING TO THE SCHEDULE.
6. DIFFUSER BLOW PATTERN IS AS SHOWN ON DRAWINGS.

DUCTLESS SPLIT-SYSTEM AC UNIT SCHEDULE

INDOOR/OUTDOOR UNIT DESIGNATION	AC-1 / ACCU-1	AC-2 / ACCU-2	AC-3 / ACCU-3	AC-4 / ACCU-4
MANUFACTURER	MITSUBISHI	MITSUBISHI	MITSUBISHI	MITSUBISHI
NOMINAL COOLING CAPACITY (TONS)	2.5	1	1	1
COOLING CAPACITY (BTU/HR)	30,000	12,000	12,000	12,000
CFM (LO-MID-HI)	635-705-775	320-370-425	320-370-425	320-370-425
SEER	15.5	15.2	15.2	15.2
RS PIPE SIZE (IN)	⅝"	½"	½"	½"
RL PIPE SIZE (IN)	⅜"	¼"	¼"	¼"
CONDENSATE DRAIN PIPE SIZE (IN)	1"	1"	1"	1"
ELECTRICAL DATA:				
POWER INPUT - COOLING (WATTS)	4,130	1,190	1,190	1,190
VOLTS/Ø/Hz	208-230/1/60	208-230/1/60	208-230/1/60	208-230/1/60
BREAKER SIZE (AMPS) AT OUTDOOR UNIT	30A	15A	15A	15A
INDOOR EVAPORATOR UNIT DATA				
LOCATION	MEDIA INTEGRATION 104E	DATA 153	DATA 211	DATA 332A
MODEL	PKA-A30KA	PA-A12HA	PA-A12HA	PA-A12HA
HEIGHT x WIDTH x DEPTH (IN)	14.375x46x11.5	11.625x35.5x9.75	11.625x35.5x9.75	11.625x35.5x9.75
WEIGHT (LBS)	46	29	29	29
TYPE	WALL MOUNTED	WALL MOUNTED	WALL MOUNTED	WALL MOUNTED
OUTDOOR CONDENSING UNIT DATA:				
LOCATION	ROOF	ROOF	ROOF	ROOF
MODEL	PUY-A30NHA3	PUY-A12NHA3	PUY-A12NHA3	PUY-A12NHA3
HEIGHT x WIDTH x DEPTH (IN)	37.25x37.5x13.25	23.5x31.5x13.25	23.5x31.5x13.25	23.5x31.5x13.25
WEIGHT (LBS)	163	90	90	90
REFRIGERANT TYPE	R410A	R410A	R410A	R410A

NOTES:
1. PROVIDE THE FOLLOWING OPTIONS FOR EACH UNIT:
- 0° LOW AMBIENT KIT & CONTROLS.
- 7-DAY PROGRAMMABLE SYSTEM CONTROLLER.

2. FIELD SUPPLIED LOCAL DISCONNECT SWITCH AT EACH INDOOR UNIT SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR & INSTALLED BY THE ELECTRICAL CONTRACTOR.
3. FIELD SUPPLIED WEATHERPROOF LOCAL DISCONNECT SWITCH AT EACH OUTDOOR UNIT SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR & INSTALLED BY THE ELECTRICAL CONTRACTOR.
4. SINGLE POINT EXTERNAL POWER CONNECTION FOR EACH INDOOR/OUTDOOR SET OF UNITS SHALL BE AT THE OUTDOOR UNIT. THE ELECTRICAL CONTRACTOR SHALL PROVIDE POWER WIRING FROM THE OUTDOOR UNIT TO THE INDOOR UNIT.
5. THE AUTOMATIC TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE CONTROL WIRING BETWEEN THE OUTDOOR UNIT AND INDOOR UNIT.
6. OUTDOOR UNIT SHALL BE INSTALLED ON 24" HIGH ROOF CURB

RETURN REGISTER / TRANSFER GRILLE SCHEDULE

DESIGNATION	RR / TG			-
MODEL	3 FS			
MAX NK VEL (FT/MIN)	500			
MAX NC	25			
CONSTRUCTION	ALUMINUM			
BORDER/FRAME	SURFACE MOUNTED			
DEFLECTION	45° FIXED			
SPACING	¾"			
	CFM RANGE	NOMINAL NECK SIZE	CFM RANGE	NOMINAL NECK SIZE
	0-150	8x8		
	151-250	10x10		
	251-350	12x12		
	351-725	18x18		
	726-950	22x22		
	951-1100	24x24		
	1101-1400	24x30		

NOTES:
1. RETURN REGISTERS ARE BASED ON TITUS.
2. THE ABOVE SCHEDULE INDICATES NOMINAL REGISTER NECK SIZES. THE CONTRACTOR SHALL COORDINATE THE REGISTER SIZE IN THE FIELD ACCORDING TO THE ACTUAL DUCT DIMENSIONS AND MAINTAIN AN EQUIVALENT CORE AREA.
3. ALL REGISTERS SHALL BE EQUIPPED WITH AN OPPOSED BLADE VOLUME DAMPER.
4. SUBMIT COLOR CHART FOR REVIEW AND APPROVAL BY ARCHITECT.
5. RETURN REGISTERS SHALL HAVE FRAMES AND BORDERS SUITABLE FOR THE CONSTRUCTION IN WHICH THEY WILL BE INSTALLED. CONTRACTOR TO COORDINATE.

EQUIPMENT NOTES

1. PIPE PENETRATION ROOF CURBS: SHALL BE PATE MODEL PCA-5. PIPE CURB ASSEMBLY SHALL CONSIST OF 18 GAUGE GALVANIZED STEEL ROOF CURB, UNITARY CONSTRUCTION, WITH INTEGRAL BASE PLATE, 1-1/2" INSULATION, 2x2 TREATED WOOD NAILER, ACRYLIC CLAD THERMOPLASTIC COVER, FASTENING SCREWS, & GRADUATED STEP BOOTS WITH STAINLESS STEEL CLAMPS. CONTRACTOR TO SELECT CAP & BOOT PACKAGE BASED ON QUANTITY & SIZE OF PIPE PENETRATIONS. PROVIDE FLASHING AND COUNTER FLASHING FOR A WATERTIGHT SEAL. CURBS SHALL BE CUSTOM FABRICATED, SUCH THAT THE CAP IS MOUNTED LEVEL. CONTRACTOR TO VERIFY EXACT ROOF PITCH ANGLE IN FIELD.

2. DUCT SILENCERS: PROVIDE INLINE DUCT SILENCERS ON ALL PACKAGED ROOFTOP SA&RA DUCTWORK AND WHERE SHOWN ON PLAN. SILENCERS SHALL BE A MINIMUM OF 3' LONG. SIZE SHALL BE COORDINATED WITH DUCTWORK SO THAT THE FACE VELOCITY IS NO MORE THAN 750'/MIN. TRANSITION DUCTWORK SILENCER INLET & OUTLET AS REQUIRED. SILENCER SHALL BE VIBRO-ACOUSTICS MODEL RD-LV-F1

3. FIRE DAMPERS: SHALL BE RUSKIN MODEL DIBD-2, 1-1/2 HOUR UL555 RATED, SUITABLE FOR INSTALLATION IN WALL AND FLOOR PARTITIONS WITH FIRE RATINGS OF LESS THAN 3 HOURS. DAMPER SHALL BE A COMPLETE FACTORY PACKAGE INCLUDING U.L. APPROVED ANGLES, WALL SLEEVE, AND BREAKAWAY CONNECTIONS. DAMPER SHALL BE RATED FOR DYNAMIC AIRFLOW CONDITIONS OF 2,000 FPM AND 4.0" SP.

4. SMOKE DAMPERS: SHALL BE POTTORFF MODEL SD-141, CLASS 1 UL555S RATED, SUITABLE FOR INSTALLATION IN RATED WALL AND FLOOR PARTITIONS. DAMPER SHALL BE A COMPLETE FACTORY PACKAGE INCLUDING U.L. APPROVED ANGLES, WALL SLEEVE, AND BREAKAWAY CONNECTIONS. 120V POWER OPEN SPRING CLOSED ACTUATOR. PROVIDE CLOSURE DEVICE WITH MANUAL RESET (PROVIDE INDICATOR SWITCH PACKAGE). DAMPER SHALL BE RATED FOR DYNAMIC AIRFLOW CONDITIONS OF 2,000 FPM AND 4.0" SP. INSTALL DUCT SMOKE DETECTOR WITHIN 5' OF DAMPER. DUCT SMOKE DETECTOR SHALL BE PURCHASED BY THE ELECTRICAL CONTRACTOR AND INSTALLED BY THE MECHANICAL CONTRACTOR. DUCT SMOKE DETECTOR SHALL BE WIRED BY THE ELECTRICAL CONTRACTOR.

5. COMBINATION FIRE SMOKE DAMPERS: SHALL BE POTTORFF MODEL FSD-151, UL 555 CLASS I, WITH AIRFOIL BLADES. ACTUATOR AND CONTROLS SHALL BE SIDE MOUNT, 120V POWERED OPEN SPRING CLOSED, HORIZONTAL OR VERTICAL MOUNT, COORDINATE APPLICATION IN FIELD. OPTIONAL DRS-30 CLOSURE DEVICE WITH PI 50 INDICATOR SWITCH PACKAGE, OPTIONAL 18 GAGE SLEEVE COORDINATE LENGTH REQUIRED IN FIELD, (1) SIDE OR (2) SIDE RETAINING ANGLES. INSTALL DUCT SMOKE DETECTOR WITHIN 5' OF DAMPER. DUCT SMOKE DETECTOR SHALL BE PURCHASED BY THE ELECTRICAL CONTRACTOR AND INSTALLED BY THE MECHANICAL CONTRACTOR. DUCT SMOKE DETECTOR SHALL BE WIRED BY THE ELECTRICAL CONTRACTOR.

6. VOLUME CONTROL DAMPERS: FOR ALL ROUND & RECTANGULAR VOLUME CONTROL DAMPERS THAT ARE LOCATED ABOVE INACCESSIBLE CEILINGS, PROVIDE CABLE OPERATED DAMPERS. ROUND DAMPERS SHALL BE YOUNG BOWDEN MODEL 5020-CC. RECTANGULAR DAMPERS SHALL BE MODEL 830-CC2. CABLE CONTROLS SHALL BE MODEL 270-275 FOR CONCEALED LOCATIONS & MODEL 270-896C FOR LOCATIONS WHERE CABLES TERMINATE IN FINISHED SPACES. COORDINATE LOCATIONS IN THE FIELD.

7. MOTORIZED DAMPERS: SHALL BE RUSKIN MODEL CD40, 4" DEEP EXTRUDED ALUMINUM AIRFOIL DAMPER. DAMPER SHALL HAVE OPPOSED BLADES, MOTOR AND LINKAGE. DAMPERS SHALL BE 120V/1ϕ/60Hz, 3 AMPS MAX. FURNISH DISCONNECT SWITCH.

8. CONDENSATE PUMP (CP-1): SHALL BE LITTLE GIANT MODEL VCM-20ULS, RATED AT 25 GPH @ 15' HEAD, WITH 1/2 GALLON TANK, 3/8" DISCHARGE CONNECTION, & SHUT-OFF AT 20' HEAD. MOTOR SHALL 1/30 HP, 93 WATTS, 115V/1ϕ/60Hz, 1.5 AMPS. INCLUDE THE FOLLOWING OPTIONS: SAFETY SWITCH, 6' POWER CORD, THERMAL OVERLOAD PROTECTOR, NYLON SUMP PAN, POLYPROPYLENE CONTROL FLOAT, BUILT-IN CHECK VALVE, FILTER SCREEN, STAINLESS STEEL SHAFT.

9. LOUVERS: SHALL BE RUSKIN MODEL ELF375DX, 4" DEEP, WITH 54% FREE AREA, 6063T5 EXTRUDED ALUMINUM DRAINABLE BLADES AT 37.5° AND 5-3/32" SPACING, 4" DEEP 6063T5 EXTRUDED ALUMINUM FRAME. AND 1/2" GALVANIZED STEEL BIRD SCREEN. MINIMUM LOUVER SIZE 12"x12". ANODIZED CUSTOM COLOR TO BE SELECTED BY ARCHITECT. COORDINATE WITH ARCHITECTURAL PLANS.

FURNISH ALL REQUIRED PIPE AND ENCLOSURE SUPPORTS, BRACKETS, AND FASTENERS ETC. FURNISH VALVE ACCESS DOORS AND KNOCK OUT FOR ELECTRICAL RECEPTACLES. FURNISH END CAPS AND CORNER ANGLES, RUN ENCLOSURES CONTINUOUS WALL TO WALL. FINISH SHALL BE BAKED ON ENAMEL, SUBMIT COLOR CHART FOR REVIEW AND APPROVAL.

10. EXPANSION TANKS EXP-1&2: TO BE AMTROL MODEL AX-120V, 68 GALLON TANK AND 34 GALLON ACCEPTANCE VOLUME, 48" HIGH, 24" DIAMETER AND WEIGH APPROXIMATELY 515 POUNDS AT FULL CAPACITY.

11. AIR SEPARATOR AS-1: SHALL BE BELL & GOSSETT MODEL R-5F, 700 GPM MAXIMUM CAPACITY, 5" FLANGED INLET AND OUTLET, CV OF 398, REMOVABLE GALVANIZED STEEL SYSTEM STRAINER, INTERNAL STAINLESS STEEL AIR COLLECTOR TUBE WITH NPT CONNECTION AND BLOWDOWN CONNECTION. THE AIR SEPARATOR MUST BE DESIGNED, CONSTRUCTED, AND STAMPED FOR 125 PSIG @ 350°F IN ACCORDANCE WITH SECTION VIII, DIVISION I OF THE ASME BOILER AND PRESSURE VESSEL CODE, AND REGISTERED WITH THE NATIONAL BOARD OF BOILER AND PRESSURE VESSEL INSPECTORS. THE AIR SEPARATOR SHALL BE PAINTED WITH ONE SHOP COAT OF LIGHT GRAY AIR DRY ENAMEL.

12. GLYCOL MIXING TANK: GMU-1, SHALL BE WESSELS COMPANY MODEL GMPD-13050 WITH INDUSTRIAL GRADE GRADUATED POLYETHYLENE 50 GALLON TANK, OBSERVABLE FLUID LEVEL SCALE, & REMOVABLE LID. EQUIPPED WITH ONE (1) AUTOMATIC PUMPING ASSEMBLIES, RATED AT 1.8 GPM @ 70 PSI, 1/3 HP; FITTED WITH H-O-A CONTROLS, ADJUSTABLE PRV, PRESSURE GAUGE, HIGH LEVEL ALARM AND LOW-LEVEL ALARM WITH AUDIBLE AND VISUAL ALARMS. FURNISH DISCONNECT SWITCH FOR GMU PUMP FOR INSTALLATION BY THE ELECTRICAL CONTRACTOR. ELECTRICAL: 120/1/60. PROVIDE BMS PROTOCOL FOR CONNECTION/MONITORING TO BMS.

13. PROPYLENE GLYCOL: SHALL BE BASED ON DOW DOWFROST HD INHIBITED PROPYLENE GYLCOL-BASED HEAT TRANSFER FLUID. THE MECHANICAL CONTRACTOR SHALL PROVIDE PROPYLENE GLYCOL FOR DUAL TEMPERATURE WATER SYSTEM AS NOTED ON PLANS (30% CONCENTRATION).

14. BOILER VENT: SHALL BE BASED ON FASNSEAL W2 DOUBLE WALL GAS VENT SYSTEM. SUPER FERRITIC STAINLESS STEEL 0.16" INNER WALL & OUTER WALL. PROVIDE NECESSARY FITTINGS, IPS DRAIN FITTING, BIRD/INSECT SCREEN, WALL THIMBLE W/AVL, SUPPORT CLAMPS, TERMINATION CONE, STORM COLLAR, ETC. AS REQUIRED. REFER TO PLANS FOR VENT SIZES.

15. PIPE INSULATION JACKETING: SHALL BE WHITE ZESTON 2000 PVC COVERS FOR PIPING AND FITTINGS. JACKET ALL PIPING AND FITTING THAT ARE EXPOSED IN ANY ROOM.

16. PIPE LABELS: SHALL BE SETON ULTRA-MARK WEATHER RESISTANT FOR OUTDOOR APPLICATION AND OPTI-CODE FOR INDOOR APPLICATION. LETTERS AND ARROWS SHALL BE 2 1/2" HIGH AND SHALL BE WHITE ON A GREEN BACKGROUND AND SHALL CONFORM TO ANSI AND OSHA STANDARDS. APPLY OVER INSULATION ONLY.

17. ALL HVAC EQUIPMENT SHALL HAVE 3" HIGH BLACK LAMACOID NAME PLATES WITH WHITE ENGRAVED LETTERS PERMANENTLY FASTENED TO EQUIPMENT. TYPICAL FOR All BOILERS, PUMPS, AIR HANDLERS, AC UNITS AND CONDENSERS.

18. REFRIGERANT PIPE INSULATION: SHALL BE AP ARMAFLEX PIPE INSULATION. 1" THICK UNSLIT, TO BE INSTALLED BEFORE FINAL CONNECTION. FIELD FABRICATE FITTING INSULATION WITH MITER-CUTS. ALL BUTT JOINTS AND SEAMS ARE TO BE SEALED WITH ARMSTRONG 520 ADHESIVE. ALL INSULATION INSTALLED OUTDOORS SHALL BE COATED WITH ARMSTRONG ARMAFLEX FINISH, AS PER THE MANUFACTURERS RECOMMENDATIONS.

19. INTAKE VENTILATOR, IV-1: SHALL BE BASED ON GREENHECK MODEL FGI GRAVITY INTAKE VENTILATOR RATED FOR 600 CFM.

Westover Magnet Elementary School

City of Stamford - Stamford Public Schools

412 Stillwater Ave, Stamford, CT. 06902

PROJECT # S-6722

KG+D listen imagine build

KG+D , ARCHITECTS PC

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CONSTRUCTION DOCUMENTS

SPN 135-0278RR

Professional Seal

No.	Date	Issue
5	9/19/2019	ADDENDUM 3
4	9/13/2019	ADDENDUM 2
3	8/6/2019	ISSUED FOR BID
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Sheet Title

MECHANICAL SCHEDULES

Job No.	Date
NKGD0206.00	08/6/2019
Scale: AS NOTED	Drawn / Checked

Sheet Number

M601

HOT WATER BOILER SCHEDULE

DESIGNATION	BLR-1	BLR-2
LOCATION	BOILER ROOM	BOILER ROOM
MODEL	FBN4001	FBN4001
GPM (MIN/MAX)	41 / 350	41 / 350
WATER PRESSURE DROP (FT HD)	10.9	10.9
EWT/LWT (°F)	120/140	120/140
OPERATING WEIGHT (LBS)	5,200	5,200
GAS BURNER:		
GAS INPUT (MBH)	4,000	4,000
OUTPUT (MBH)	3,843	3,843
GAS CONNECTION	2½"	2½"
GAS PRESSURE MIN/MAX ("WC)	4 / 14	4 / 14
ELECTRICAL DATA:		
VOLTS/Hz/Ø	480/60/3	480/60/3
FLA / MCA	6 / 7.5	6 / 7.5

NOTES:
1. BOILERS BASED ON LOCHINVAR.
2. PROVIDE BOILERS WITH 75 PSI ASME RELIEF VALVES, 3-1/4" PRESSURE AND TEMPERATURE GAUGES, AUTOMATIC RESET HIGH LIMIT AQUA-STAT, MANUAL RESET HIGH LIMIT AQUA-STAT, LOW WATER CUT OFF, AQUA-STAT FOR SUPPLY WATER TEMPERATURE CONTROL, & LOW-LOSS Y-STRAINER.
3. PROVIDE CONDENSATE DRAIN KIT W/ PH NEUTRALIZATION TANK.
4. FURNISH DISCONNECT SWITCH FOR INSTALLATION BY THE ELECTRICAL CONTRACTOR.
5. WATER FLOW SWITCH.
6. OUTDOOR RESET.
7. HOT WATER BASED ON 30% POLYPROPYLENE GLYCOL.
8. BMS PROTOCOL GATEWAY. COORDINATE WITH AUTOMATIC CONTROLS CONTRACTOR. PROVIDE LOCHINVAR "SMART SYSTEM" INTEGRATED CONTROLS.
8. CONTROLS SHALL BE CAPABLE ON CONTROLLING:
A. SEQUENCING OF BOILERS VIA 2-WIRE DAISY CHAIN CONNECTION BETWEEN THE UNIT CONTROLLERS. MANUFACTURER TO PROVIDE SUPPLY MAIN TEMPERATURE SENSOR, CONTRACTOR SHALL FIELD INSTALL.
B. CONTROL OF BOILER MOTORIZED ISOLATION VALVE OR PRIMARY PUMP: CONTRACTOR TO FIELD INSTALL VALVE AND WIRE TO BOILER.
C. BOILER LEAVING WATER RESET BASED ON OUTSIDE AIR TEMPERATURE. BOILER MANUFACTURER TO PROVIDE SENSOR; CONTRACTOR SHALL FIELD INSTALL AND WIRE.
D. PROVIDE NIGHT-TIME SET BACK.
E. PROVIDE COLOR GRAPHIC DISPLAY FOR CUSTOMER INTERFACE. DISPLAY SHALL PROVIDE ENGLISH INSTRUCTIONS FOR CUSTOMER CONTROL OF SET-POINTS.
F. DISPLAY SHALL BE PASSWORD PROTECTED.
G. BOILER SYSTEM PUMP RELAY TO PROVIDE SIGNAL FOR SYSTEM PUMP OPERATION. SYSTEM PUMP TO BE POWERED REMOTELY.

HOT WATER UNIT HEATER SCHEDULE

DESIGNATION	UH-1
LOCATION	RE: PLAN
MANUFACTURER	AIRTHERM
MODEL	HA-136A
FAN:	
CFM	850
RPM	1000
MOTOR HP	1/20
HOT WATER COIL:	
CAPACITY (MBH)	35,900
E.A.T./L.A.T. (°F)	60/102
E.W.T./L.W.T. (°F)	140/120
GPM	3.6
ELECTRICAL DATA:	
VOLTS/Ø/Hz	115/1/60
AMPS	1.4

NOTES:
1. UNITS BASED ON AIRTHERM.
2. PROVIDE THE FOLLOWING FOR EACH UNIT:
   - DISCONNECT SWITCH.
   - THERMOSTAT

VARIABLE AIR VOLUME BOX SCHEDULE

DESIGNATION	V-1	V-2	V-3	V-4	V-5	V-6	V-7	V-8	V-9	V-10	V-11	V-12	V-13	V-14	V-15
INLET SIZE	6"Ø	6"Ø	6"Ø	8"Ø	10"Ø	10"Ø	8"Ø	8"Ø	10"Ø	8"Ø	10"Ø	10"Ø	8"Ø	8"Ø	10"Ø
AVAILABLE RANGE (CFM)	80-500	80-500	80-500	145-900	230-1400	230-1400	145-900	145-900	230-1400	145-900	230-1400	230-1400	145-900	145-900	230-1400
5 DESIGN CFM	500	500	500	700	1250	1000	860	800	1000	800	1200	1000	700	800	1000
MINIMUM CFM	80	80	80	145	230	230	145	145	425	305	495	375	250	320	335
HEATING CAPACITY (MBH)	6.3	6.3	6.3	8	12	11	7.6	7.6	19	15.1	23	19	13.2	15.1	19
E.W.T./L.W.T. (°F)	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120	140 / 120
E.A.T./L.A.T. (°F)	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92	55 / 92
GPM	.6	.6	.6	.6	.6	.6	1	1	1.4	.9	2.1	1.4	1.2	.9	1.4
ASSOCIATED AHU	RTU-4	RTU-4	RTU-4	RTU-4	RTU-4	RTU-4	RTU-4	RTU-4	RTU-3	RTU-3	RTU-3	RTU-3	RTU-3	RTU-3	RTU-3

NOTES:
1. VAV BOXES BASED ON TITUS DESV.
2. VAV BOXES SHALL BE SINGLE DUCT, COOLING ONLY OR COOLING/HOT WATER HEATING AS INDICATED WITH DIGITAL ELECTRONIC PRESSURE INDEPENDENT CONTROLS SUPPLIED BY CONTROLS CONTRACTOR AND MOUNTED BY THE TERMINAL UNIT MANUFACTURER. CONTROL ENCLOSURE SHALL NOT EXCEED 10.25" HEIGHT FOR A LOW HEIGHT OPTION.
3. CONTROLS SHALL BE COMPATIBLE WITH PNEUMATIC INLET VELOCITY SENSORS SUPPLIED BY THE TERMINAL MANUFACTURER. THE SENSOR SHALL BE MULTI-POINT CENTER AVERAGING TYPE, WITH A MINIMUM OF FOUR MEASURING PORTS PARALLEL TO THE TAKE-OFF POINT FROM THE SENSOR. SENSORS WITH MEASURING PORTS IN SERIES ARE NOT ACCEPTABLE. THE SENSOR MUST PROVIDE A MINIMUM DIFFERENTIAL PRESSURE SIGNAL OF 0.03 INCH WG. AT AN INLET VELOCITY OF 500 FPM.
4. THE TERMINAL CASING SHALL BE MINIMUM 22-GAUGE GALVANIZED STEEL, INTERNALLY LINED WITH 1-INCH MATTE FACED, NATURAL FIBER INSULATION THAT COMPLIES WITH UL 181 AND NFPA 90A. THE LINER SHALL COMPLY WITH ASTM G21 AND G22 FOR FUNGI AND BACTERIAL RESISTANCE. FIBERGLASS SHALL NOT BE ACCEPTED.
5. 30% PROPYLENE GLYCOL PROVIDED TO HOT WATER COILS.
6. THE TERMINAL MANUFACTURER SHALL PROVIDE A CLASS II 24 VAC TRANSFORMER AND DISCONNECT SWITCH; BOX SHALL BE U.L. LISTED AND LABELED. ELECTRICAL CONTRACTOR SHALL INSTALL & PROVIDE POWER/CIRCUITRY TO DISCONNECT SWITCH AND TRANSFORMER.
7. AUTOMATIC TEMPERATURE CONTROLS CONTRACTOR SHALL FURNISH AND INSTALL ALL VAV BOX CONTROLS & CONTROL WIRING.
8. MAXIMUM RADIATED NC-: 30, MAXIMUM DISCHARGE NC-: 28.
9. COORDINATE RIGHT HAND / LEFT HAND CONNECTIONS AND CONTROL PANEL IN FIELD.

FAN SCHEDULE

DESIGNATION	EXF-1	EXF-2	EXF-3	EXF-4	EXF-5	EXF-6	EXF-7	EF-1	EF-2	EF-6	EF-7	EF-8	EF-9	EF-17	EF-18	EF-19
LOCATION	1ST FLOOR	1ST FLOOR	2ND FLOOR	2ND FLOOR	2ND FLOOR	2ND FLOOR	ROOF	ROOF	ROOF	ROOF	ROOF	ROOF	ROOF	ROOF	ROOF	ROOF
AREA SERVED	SEE PLAN	SEE PLAN	SEE PLAN	SEE PLAN	SEE PLAN	SEE PLAN	GREEN ROOM	PART 'A' STORAGE	PART 'A' STORAGE	PART 'D' TOILETS	PART 'D' STORAGE	PART 'D' TOILETS	PART 'D' TOILETS	ELECTRIC ROOM	PART 'A' STORAGE	NURSE
MANUFACTURER	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK
MODEL	EQB-9-10	EQB-9-10	EQP-18-30	EQP-18-30	EQB-16-20	EQB-15-15	GB-071	GB-141	GB-141	GB-141	GB-161	GB-101	GB-081	GB-081	CUBE-099	GB-081
WEIGHT (LBS)	156	156	263	263	212	202	60	86	86	86	88	61	60	60	58	60
FAN TYPE	INLINE	INLINE	INLINE	INLINE	INLINE	INLINE	ROOF DOWNBLAST	ROOF DOWNBLAST	ROOF DOWNBLAST	ROOF DOWNBLAST	ROOF DOWNBLAST	ROOF DOWNBLAST	ROOF DOWNBLAST	ROOF DOWNBLAST	ROOF UPBLAST	ROOF DOWNBLAST
DRIVE TYPE	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT	BELT
CFM	1900	2710	4850	4500	3500	2450	75	1600	1800	1500	3000	1000	500	600	300	500
HP	0.78	1.08	1.78	1.78	1.37	1.08	⅛	½	¾	½	¾	¼	⅛	¼	¼	⅛
RPM	2922	2922	1454	1454	1521	1630	1000	1265	1550	1140	1250	1555	1490	1725	1140	1490
SP (IN H_2O)	1.5	1.5	1.5	1.5	1.5	1.5	.375	.75	1	.5	.75	.5	.5	.5	.5	.5
VOLTS/Ø/Hz	460/3/60	460/3/60	460/3/60	460/3/60	460/3/60	460/3/60	120/1/60	120/1/60	120/1/60	120/1/60	460/3/60	120/1/60	120/1/60	120/1/60	120/1/60	120/1/60
STARTER TYPE	VFD	VFD	VFD	VFD	VFD	VFD										

NOTES:
1. ALL MOTORS 1 HP OR GREATER SHALL BE PREMIUM EFFICIENCY.
2. ALL MOTORS FURNISHED WITH VARIABLE FREQUENCY DRIVES SHALL BE INVERTER DUTY RATED & APPROVED FOR VARIABLE SPEED AND TORQUE APPLICATIONS.
3. FURNISH RUBBER IN SHEAR OR SPRING VIBRATION ISOLATORS AS PER THE SPECIFICATION.
4. FURNISH WALL MOUNTED SPEED CONTROLLER OR THERMOSTAT AS INDICATED ON PLAN.
5. FURNISH MOTOR AND BELT GUARDS FOR ALL EXTERNAL MOTOR DRIVES.
6. MOTOR STARTER AND DISCONNECT SWITCH FOR EACH FAN SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR AND INSTALLED BY THE ELECTRICAL CONTRACTOR. EACH ROOFTOP FAN SHALL BE FURNISHED WITH WEATHERPROOF UNIT-MOUNTED LOCAL DISCONNECT SWITCH.
7. PROVIDE MOTORIZED DAMPER INTERLOCKED WITH EACH FAN
8. PROVIDE 24" HIGH ROOF CURB FOR ALL ROOFTOP FANS

Westover Magnet Elementary School

City of Stamford - Stamford Public Schools

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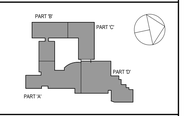

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MECHANICAL SCHEDULES

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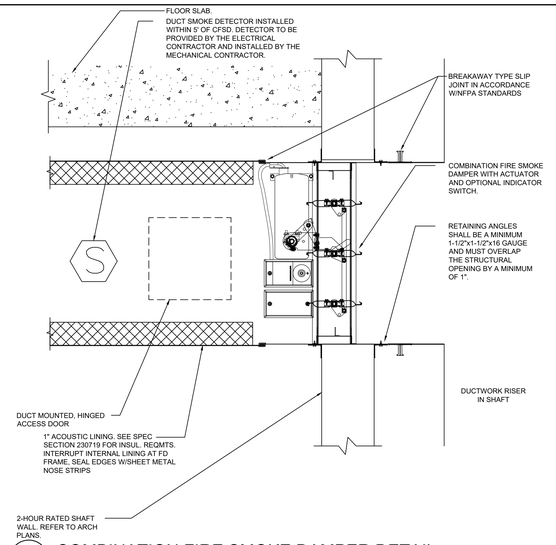
M602

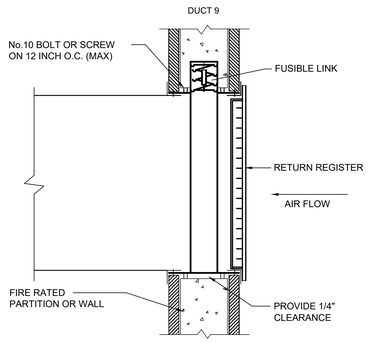
PIPE SIZE SCHEDULE										
PIPE SIZE	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6
MAX. GPM	2	3.5	7	13	22	45	70	130	260	480	750

NOTES:
1.) WHERE DUAL TEMPERATURE PIPE SIZES ARE NOT SPECIFICALLY CALLED OUT ON PLAN, PIPE SIZES SHALL BE BASED ON DESIGN FLOWRATE ACCORDING TO THIS CHART.

11 DUAL TEMPERATURE PIPE SIZE SCHEDULE
SCALE: NONE



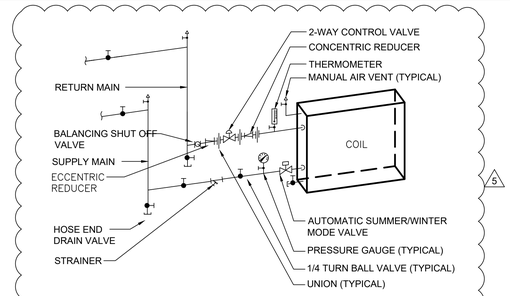
9 COMBINATION FIRE SMOKE DAMPER DETAIL
SCALE: NONE



NOTES:
1. FIRE DAMPERS TO BE CONSTRUCTED AND INSTALLED ACCORDING TO NFPA 90A UL LABELS.

2. MULTI-BLADE PIVOTED FIRE DAMPERS MEETING THE ABOVE STANDARD WILL BE ACCETABLE.

6 SHUTTER TYPE FIRE DAMPER AT RETURN REGISTER
SCALE: NONE



NOTES:
1.) LOCATE ALL COIL UNIONS CLOSE TO, AND CLEAR OF, COIL. ARRANGE PIPING SO AS NOT TO NOT INTERFERE WITH COIL REMOVAL.
2.) DETAIL IS TYPICAL FOR CONVECTORS, CABINET UNIT HEATERS, AND AIR HANDLING UNITS.
3.) PROVIDE FLEXIBLE CONNECTION FOR THOSE COILS MOUNTED IN UNITS ON VIBRATION ISOLATORS.
4.) AUTOMATIC SUMMER/WINTER MODE VALVE SHALL AUTOMATICALLY CLOSE ON HOT WATER ELEMENTS WHEN SYSTEM IS INDEXED TO SUMMER MODE AND SHALL AUTOMATICALLY CLOSE ON CHILLED WATER ELEMENTS WHEN SYSTEM IS INDEXED TO WINTER MODE.

PIPE SIZE SCHEDULE										
PIPE SIZE	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6
MAX. GPM	2	3.5	7	13	22	45	70	130	260	480	750

3 HYDRONIC COIL WITH 2-WAY VALVE PIPING SCHEMATIC
SCALE: NONE

10 CONDENSATE PUMP PIPING SCHEMATIC
SCALE: NONE

DESIGNER'S NOTE:

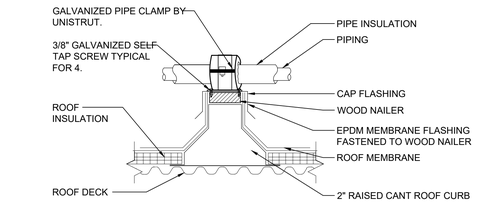
UNIT TYPE	A	B
DRAW THRU	2" (50 MM) PLUS X	X
BLOW THRU	1" (25 MM) MINIMUM	2X

WHERE X = STATIC PRESSURE IN PAN

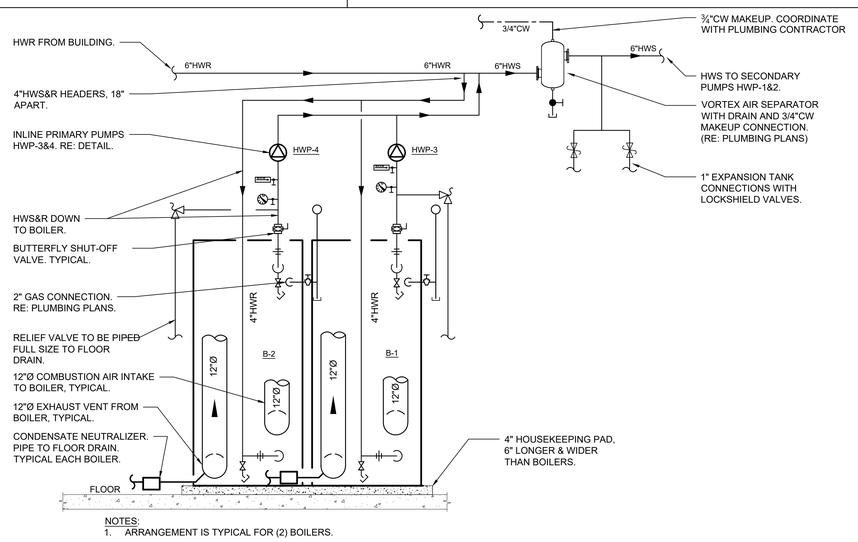
8 AIR HANDLING UNIT DRAIN TRAP DETAIL
SCALE: NONE

NOTES:
1.) VERTICAL RISERS FROM PUMPS SHALL CONNECT TO HORIZONTAL MAINS WITH 45° LATERAL FITTINGS OR 90° ELBOWS. 90° TEE FITTINGS SHALL NOT BE USED.
2.) REFER TO PLANS FOR PIPE SIZES.

5 TYPICAL BASE-MOUNTED END SUCTION PUMP SCHEMATIC
SCALE: NONE

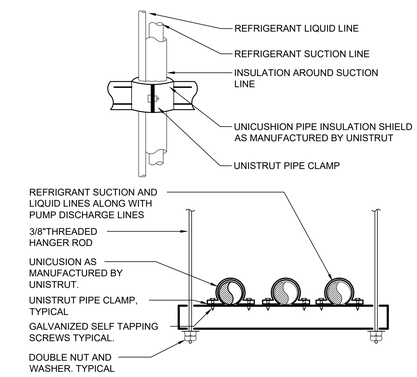


2 ROOF PIPE SUPPORT DETAIL
SCALE: NONE



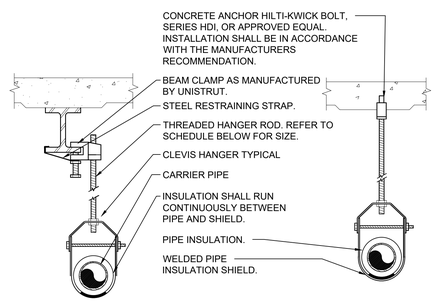
NOTES:
1. ARRANGEMENT IS TYPICAL FOR (2) BOILERS.

7 BOILER PIPING SCHEMATIC
SCALE: NONE



NOTES:
1.) LIQUID AND SUCTION LINES MAY BE ROUTED TOGETHER FOR CONVENIENCE, BUT MUST BE COMPLETELY INSULATED FROM EACH OTHER. DO NOT SOLDER LIQUID AND SUCTION LINES TOGETHER. DO NOT ALLOW METAL TO METAL CONTACT.
2.) LINES SHOULD BE INSTALLED WITH AS FEW BENDS AS POSSIBLE, ALLOWING SERVICE ACCESS TO THE INDOOR COIL.
3.) USE LONG RADIUS ELBOWS WHEREVER POSSIBLE, EXCEPT IN OIL RETURN TRAPS, WHERE SHORT RADIUS ELBOWS SHOULD BE USED.
4.) SLOPE HORIZONTAL SUCTION LINES 1 INCH EVERY 20 FEET TOWARD THE OUTDOOR UNIT.

4 REFRIGERANT PIPE SUPPORT DETAIL
SCALE: NONE



PIPE HANGER SCHEDULE					
PIPE DIA.	3/4"-2"	2 1/2"-3"	4"-5"	6"	8"-12"
HANGER DIA.	3/8"	1/2"	5/8"	3/4"	7/8"

NOTES:
1.) CLEVIS HANGERS WITH WELDED INSULATION SHEILDS SIMILAR TO RAUCH FIG. 100SH ON ALL PIPES LARGER THAN 1".
2.) FOR PIPES 1" OR SMALLER, A BAND HANGER WITH INSULATION SHEILD MAY BE USED SIMILAR TO RAUCH FIG. NO. 1ASH.
3.) FOR NONINSULATED PIPE, INSULATION SHEILDS MAY BE OMITTED.
4.) ALL PIPE HANGERS SHALL BE GALVANIZED STEEL OR FACTORY PAINTED BLACK WITH ENAMEL.
5.) FOR NON FERROUS PIPING WITHOUT INSULATION, ALL HANGERS SHALL BE COPPER PLATED OR FURNISHED WITH A DI-ELECTRIC BETWEEN PIPE AND HANGERS.

1 PIPE HANGER DETAIL
SCALE: NONE

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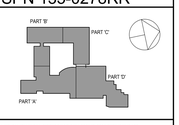

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MECHANICAL DETAILS

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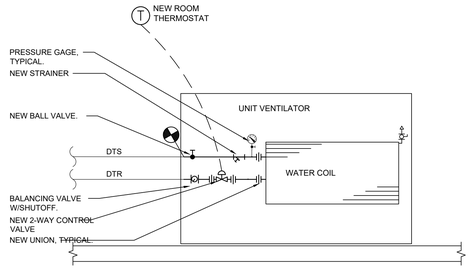
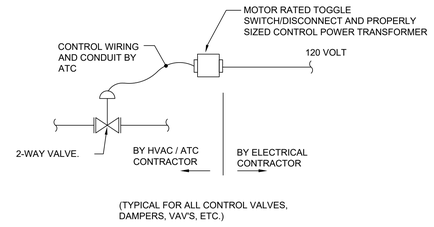
NKGD0206.00	08/6/2019
Scale: AS NOTED	Drawn / Checked

Sheet Number
M702



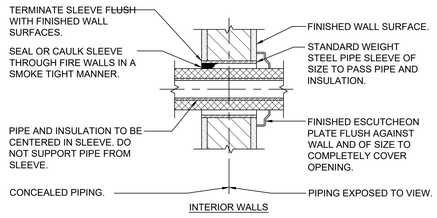
NOTES:
1. SCHEMATIC IS TYPICAL FOR PIPING FED FROM BELOW OR FROM THE CEILING ABOVE.
2. BALANCE COILS AS PER SCHEDULE.

9 UNIT VENTILATOR PIPING SCHEMATIC
SCALE: NONE

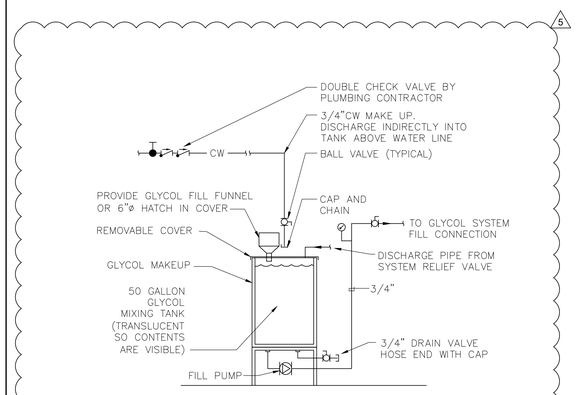


NOTE: MECHANICAL CONTRACTOR SHALL FURNISH MOTOR RATED TOGGLE SWITCH/DISCONNECT & PROPERLY SIZED TRANSFORMER TO BE INSTALLED & WIRED BY THE ELECTRICAL CONTRACTOR.

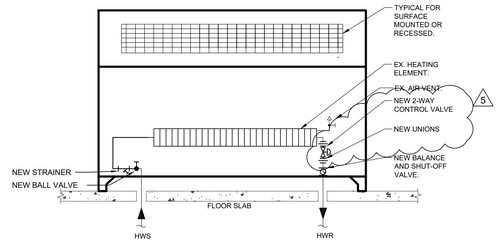
6 CONTROL VALVE WIRING SCHEMATIC
SCALE: NONE



3 PIPE WALL SLEEVE DETAIL FOR INTERIOR WALLS
SCALE: NONE

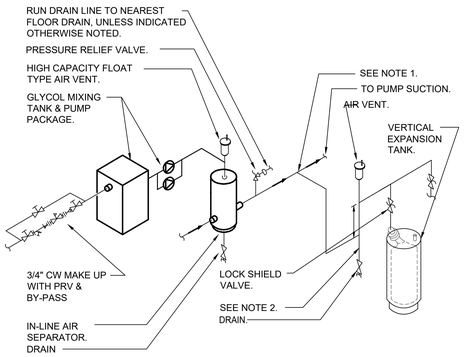


11 GLYCOL FILL SYSTEM
SCALE: NONE



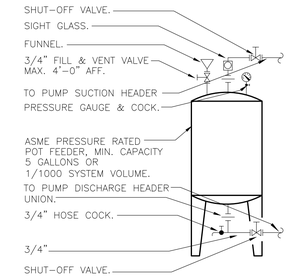
NOTES:
1.) REFER TO PLANS FOR DIRECTION OF FEED AND LOCATION OF MAINS.
2.) ARRANGEMENT IS SIMILAR FOR UP & DOWN FEED UNITS. COORDINATE VALVES WITH ACCESS PANELS.

8 CABINET CONVECTOR PIPING SCHEMATIC
SCALE: NONE

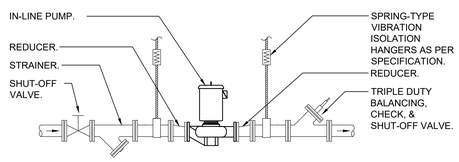


NOTES:
1.) CONNECT TO SIDE OF MAIN TO PREVENT AIR OR DEBRIS FROM ENTERING PIPE TO TANK, TOP OR BOTTOM CONNECTION NOT PERMITTED.
2.) PROVIDE 12" MINIMUM DROP ANTI-THERMOSYPHON LOOP TO PREVENT GRAVITY HEATING OF TANK.
3.) PROVIDE STRAINER IN AIR SEPARATOR WHEN INDICATED IN THE EXPANSION TANK EQUIPMENT NOTE.
4.) FOR HOT WATER AND CHILLED WATER SYSTEMS 2" AND SMALLER, USE AN IN-LINE AIR PURGER INSTEAD OF AN AIR SEPARATOR.
5.) SET THE PRESSURE REDUCING VALVE SO THAT THE PRESSURE AT HIGHEST POINT IN THE SYSTEM IS 4 PSIG.
6.) DASHED PIPING SHOWS BOTH HORIZONTAL AND VERTICAL DIAPHRAGM TYPE EXPANSION TANKS. PROVIDE ONLY THE TYPE OF TANK SELECTED AND THE ASSOCIATED PIPING.

5 EXPANSION TANK CONNECTION SCHEMATIC
SCALE: NONE

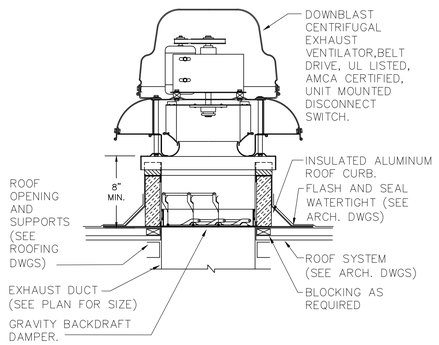


2 CHEMICAL POT FEEDER PIPING SCHEMATIC
SCALE: NONE

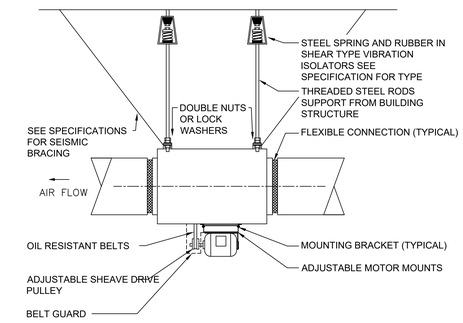


NOTES:
1.) HANG IN-LINE PUMP FROM BUILDING STRUCTURE WITH VIBRATION ISOLATORS.
2.) REFER TO PLANS FOR PIPE SIZES.

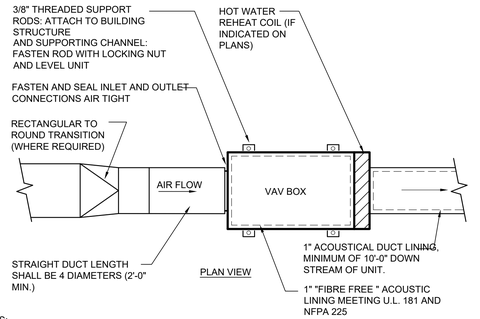
10 IN-LINE PUMP DETAIL
SCALE: NONE



7 TYPICAL EXHAUST FAN DETAIL
SCALE: NONE



4 IN-LINE FAN DETAIL
SCALE: NONE



NOTES:
1.) THE OPERATION OF VARIABLE VOLUME TERMINAL UNITS ARE AFFECTED BY EXCESSIVE TURBULENCE ON THE ENTERING SIDE OF EACH TERMINAL UNIT. THEREFORE, TERMINAL UNITS MUST NOT BE INSTALLED TO CLOSE TO MAIN DUCTS, ELBOWS AND FITTINGS.
2.) WHEN MINIMUM UPSTREAM STRAIGHT DUCT CONNECTION TO TERMINALS AS INDICATED ABOVE CANNOT BE MAINTAINED, PROVIDE ORIFICE PLATE, STRAIGHTENING VANES OR OTHER DEVICE AS RECOMMENDED BY TERMINAL UNIT MANUFACTURER AND SUBMIT TO ENGINEER FOR REVIEW PRIOR TO INSTALLATION.
3.) TERMINAL UNITS SHALL BE PROVIDED WITH CONTROLS ON LEFT OR RIGHT SIDE AS REQUIRED BY FIELD CONDITIONS. FOR UNITS WITH ELECTRONIC CONTROLS FURNISH NEMA 1 RATED ENCLOSURE AND U.L. II TRANSFORMER AND DISCONNECT SWITCH.
4.) ARRANGE ACCESS TO PERMIT EASY FIELD BALANCING AND MAINTENANCE.

PIPE SIZE SCHEDULE										
PIPE SIZE	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6
MAX. GPM	2	3.5	7	13	22	45	70	130	260	480	750

1 VARIABLE AIR VOLUME (VAV) BOX INSTALLATION DETAIL
SCALE: NONE

Westover Magnet Elementary School

City of Stamford - Stamford Public Schools

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PROJECT # S-6722

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CONSTRUCTION DOCUMENTS

SPN 135-0278RR

Professional Seal

No.	Date	Issue
5	9/19/2019	ADDENDUM 3
4	9/13/2019	ADDENDUM 2
3	8/6/2019	ISSUED FOR BID
2	6/5/2019	CLIENT REVIEW SET
1	5/15/2019	ISSUED FOR PRICING

Sheet Title

MECHANICAL DETAILS

Job No. NKGD0206.00	Date 08/6/2019
Scale AS NOTED	Drawn / Checked

Sheet Number

M703