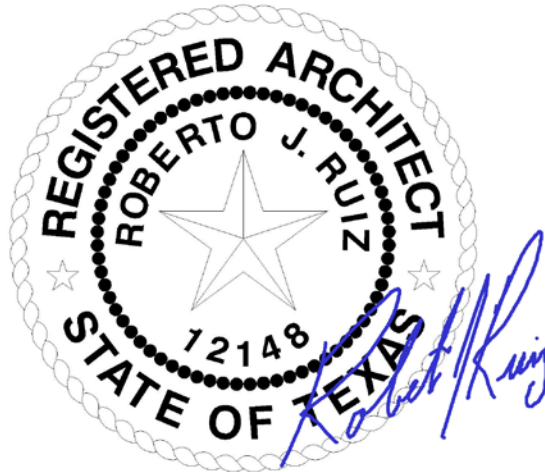


ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
PORT OF BROWNSVILLE ADDENDUM LIST
ADDENDUM NO. 1



11/10/16

THE FOLLOWING IS AN ADDENDUM TO THE CONTRACT DOCUMENTS DATED SEPTEMBER 30, 2016 FOR THE PROJECT NAMED ABOVE:			
ITEM	DATE RECEIVED	QUESTION	RESPONSE
1.	11/03/16	<p><u>INSTRUCTIONS TO BIDDERS:</u> SPEC SECTION "INSTRUCTIONS TO BIDDERS," PAGE 7 OF 10, ITEM 22, PARAGRAPH "A" STATES "IN ADDITION TO THE INFORMATION SUBMITTED ON THE PROPOSAL AND PROPOSAL DATA FORMS, EACH BIDDER SHALL SUBMIT ALL SPECIFICATIONS, PRELIMINARY DRAWINGS & SIMILIAR INFORMATION NECESSARY TO DESCRIBE COMPLETELY THE EQUIPMENT & MATERIALS HE PROPOSES TO FURNISH, IF APPLICABLE.</p> <p>Q: IS THIS REQUIREMENT FOR A DESIGN-BUILD PROJECT AND NOT THIS PROJECT?</p>	<p>PLEASE DISREGARD THE PARAGRAPH IN QUESTION. THIS IS APPLICABLE TO PORT PROJECTS THAT ARE DESIGNATED FOR A DIFFERENT TYPE OF PROPOSAL.</p>

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2.	11/03/16	<p><u>TESTING ALLOWANCE:</u> SPEC SECTION 012100-2, PARAGRAPH 1.5D CALLS FOR RETURNING UNUSED TESTING & INSPECTION ALLOWANCE TO THE OWNER. THERE'S NO TESTING ALLOWANCE AND SPEC SECTION 1.1A/014000-1 STATES TESTING IS BY OWNER.</p> <p>Q: IS TESTING BY THE OWNER?</p>	YES - ALL MATERIAL TESTING IS BY THE OWNER. TO BE CLEAR - ANY TESTING REQUIRED BY SPECIFIC SECTIONS, SUCH AS AIR BALANCE REPORTING BY A THIRD PARTY, HAS TO BEEN PROVIDED BY THE GENERAL CONTRACTOR UNDER THIS BID.
3.	11/03/16	<p><u>UNIT PRICING:</u> SPEC SECTION 012200-2 CALLS FOR SUBMITTING A LIST OF UNIT PRICES WITH THE BID PROPOSAL. PRICING VARIES GREATLY DEPENDING ON THE QUANTITY. FOR EXAMPLE, REPAIRING 10 S.F. OF CONCRETE SPALLING COSTS MUCH MORE PER S.F. THAN 1,000 S.F. CONTRACTORS HAVE A TENDENCY TO PRICE ALL OF THESE HIGH TO MAKE SURE THEY ARE COVERED.</p> <p>Q: ARE APPROXIMATE QUANTITIES AVAILABLE?</p>	PLAN SHEET S101, TABLE "ALLOWANCE" INDICATES THE QUANTITIES REQUIRED FOR BID.
4.	11/03/16	<p><u>TRAFFIC COATINGS:</u> SPEC SECTION 071800 "TRAFFIC COATINGS" SUMMARY, PARAGRAPH 1.1A.1, STATES: "FOR INTERIOR, PEDESTRIAN TRAFFIC."</p> <p>Q: IS THIS FOR AREAS SHOWN ON THE ROOM FINISH SCHEDULE LABELED "EXPOSED DECK COATING"?</p>	YES
5.	11/03/16	<p><u>ASBESTOS ABATEMENT:</u> PARAGRAPH 1.1.A ON 014000-1 STATES: "OWNER WILL ENGAGE A TESTING LABORATORY TO PERFORM TESTING UNDER THIS CONTRACT. OWNER HAS PERFORMED</p>	NO IDENTIFIED ASBESTOS MATERIALS HAVE BEEN REMOVED. OWNER HAS ENGAGED THE ASBESTOS CONSULTANT FOR THE ABATEMENT AIR MONITORING. GC TO INCLUDE THE ASBESTOS ABATEMENT

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		ALL ENVIRONMENTAL ABATEMENT." Q: HAS THE OWNER ACTUALLY REMOVED THE ASBESTOS? OR HAS HE ONLY PAID TO HAVE THE TESTING PERFORMED AND THE GC IS TO INCLUDE ASBESTOS ABATEMENT IN HIS BID? IF THE OWNER HAS ALREADY PERFORMED THE ABATEMENT, THEN THE FOLLOWING RFI'S ARE IRRELEVANT: 6, 7, 8, & 9.	COSTS BY A DSHS LICENSED CONTRACTOR IN THEIR BID.
6.	11/03/16	<u>ASBESTOS ABATEMENT</u> : APPENDIX B, INCLUDES A SEPARATE BID FORM FOR ABATEMENT WITH A NOTE THAT READS: "OWNER HAS THE RIGHT TO REJECT ALL BIDS." Q: IS THE ABATEMENT WORK BEING BID DIRECTLY TO THE OWNER BY ABATEMENT CONTRACTORS?	BID FORM NOT APPLICABLE FOR THIS PROJECT. GC TO INCLUDE THE ASBESTOS ABATEMENT COSTS BY A DSHS LICENSED CONTRACTOR IN THEIR BID.
7.	11/03/16	<u>ABESTOS ABATEMENT</u> : PAGE 2 OF 2 IN ASBESTOS ABATEMENT SPECS STATES: "AIR MONITORING TO BE DONE BY THE CONSULTANT." Q: IS THE OWNER PAYING FOR AIR MONITORING?	OWNER IS PAYING FOR THE AIR MONITORING.
8.	11/03/16	<u>ASBESTOS ABATEMENT</u> : PARAGRAPH 1.7.B.1 ON PAGE 5 OT 14 IN ASBESTOS ABATEMENT SPECS STATES ABATEMENT IS TO BE ACCOMPLISHED WITHIN THE TOTAL TIME OF THE PROJECT...AND TO BE DETERMINED BETWEEN THE ABATEMENT CONTRACTOR AND THE OWNER. Q: SINCE THE TIME IS DETERMINED BETWEEN THE ABATEMENT CONTRACTOR AND THE OWNER AND NOT THE G.C., IS THIS WORK TO BE PERFORMED PRIOR TO THE START OF THE 467 CALENDAR DAYS STATED ON THE GC'S BID FORM?	THE ASBESTOS ABATEMENT WORK WILL BE CONDUCTED PRIOR TO THE INTERIOR DEMOLITION (ESTIMATED 2 WEEKS) AND AS PART OF THE ROOFING REMOVAL (ESTIMATED 1 WEEK). THESE ACTIVITIES ARE TO BE INCLUDED IN THE 467 CALENDAR DAYS.
9.	11/03/16	<u>ASBESTOS ABATEMENT</u> :	ANY WORK THAT DOES NOT DISTURB THE

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		Q: IS ANY INTERIOR DEMOLITION WORK OR ANY SITEWORK ALLOWED TO BE PERFORMED WHILE THE ABATEMENT WORK IS BEING PERFORMED?	ROOFING ON BLDG A COULD BE PERFORMED. BLDGS A AND B CAN BE RELEASED AS ABATEMENT IS CLEARED.
10.	11/7/2016	BETTERMENT FUND: SPEC SECTION 012100 "ALLOWANCES" DOES NOT INCLUDE A BETTERMENT FUND/CONTINGENCY. Q: WILL ONE BE ESTABLISHED FOR THIS PROJECT?	NO
11.	11/7/2016	<u>TILING</u> : THE TYPES OF TILES ARE SHOWN AS GROUPS 1 THRU 5, WITH GROUP 1 BEING THE LEAST EXPENSIVE AND GROUP 5 BEING THE MOST EXPENSIVE. Q: HAS THE ARCHITECT CHOSEN GROUP NUMBERS FOR MOSAIC AND CERAMIC GLAZED TILE?	REFERENCE THE PRODUCT LITERATURE INFORMATION REGARDING THE WALL TILE, FLOOR TILE, AND MOSAIC TILE. BID SHOULD BE FOR MATERIAL EQUAL TO THAT SHOWN.
12.	11/7/2016	<u>TILING</u> : Q: WILL DIFFERENT MOSAIC AND CERAMIC TILE GROUPS BE USED FOR DIFFERENT AREAS? FOR EXAMPLE, COLUMN HALLS AND RESTROOMS.	YES - REFERENCE THE PRODUCT LITERATURE INFORMATION REGARDING THE WALL TILE, FLOOR TILE, AND MOSAIC TILE. BID SHOULD BE FOR MATERIAL EQUAL TO THAT SHOWN.
13.	11/7/2016	<u>TILING</u> : PAGE A7.5, DETAIL 1 SHOWS MOSAIC TILE AS WALL FINISH FOR COLUMN HALLS, BUT PAGE A10 ROOM FINISH SCHEDULE CALLS FOR CERAMIC TILE. Q: CAN YOU PLEASE CLARIFY WHICH ONE IS CORRECT?	MOSAIC TILE IS TO BE USED WHERE NOTED ON THE COLUMNS.
14.	11/7/2016	DAMPPROOFING: SPEC SECTION 071113-2, PARAGRAPH 3.2.B STATES: "APPLY DAMPPROOFING TO FOOTINGS AND FOUNDATION WALLS WHERE OPPOSITE SIDE OF WALL FACES BUILDING INTERIOR."	NO - IT'S TO BE APPLIED ON THE BOTTOM SIDE OF THE FLOOR ONLY IN THE CRAWL SPACE.

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		Q: IS THIS DAMPPROOFING TO BE APPLIED TO THE UNDERSIDE OF THE FLOOR SLABS AND SIDES OF THE PERIMETER AND/OR INTERIOR WALLS OF THE GRADE BEAMS IN THE CRAWL SPACES OF BUILDINGS A & B?	
15.	11/8/2016	SIGNAGE: SPEC SECTION 101400-1, PARAGRAPH 1.3.B.3 STATES TO SUBMIT WIRING DIAGRAMS THAT ARE TO INCLUDE POWER, SIGNAL, AND CONTROL WIRING. Q: SPECS CALL FOR PLAQUES, DIMENSIONAL CHARACTERS AND PANELS SIGNS. IS THERE LIGHTED SIGNAGE ON THIS PROJECT?	THE SIGNAGE DOES NOT HAVE TO BE LIT OR BACKLIT FROM WITHIN BY THE SIGN MANUFACTURER. THERE IS LIGHTING PLACED TO SHINE ON THE SIGNS - PLEASE REFERENCE ELECTRICAL SHEET ES1.1
16.	11/8/2016	<u>TERMITE TREATMENT</u> : Q: WILL TERMITE TREATMENT BE REQUIRED AT THE TWO EXISTING BUILDINGS OR ONLY AT THE TWO PROPOSED BUILDINGS?	ALL BUILDINGS (INCLUDING THE CRAWL SPACES OF THE EXISTING BUILDINGS) WILL REQUIRE TERMITE TREATMENT.
17.	11/8/2016	<u>TEMPORARY ROOFING</u> : SPEC SECTION 070150.19 CALLS FOR PROVIDING TEMPORARY ROOFING. THIS MAY HAVE BEEN REQUIRED DUE TO THE ORIGINAL THOUGHT OF THE OWNER OCCUPYING THE BUILDINGS DURING RE-ROOFING OPERATIONS. Q: IS TEMPORARY ROOFING REQUIRED ANY LONGER?	IT IS NOT MANDATORY TO PROVIDE TEMPORARY ROOFING - BUT, THE EXISTING ROOF NEEDS TO BE REMOVED IN A MANNER AND SEQUENCE THAT PREVENTS THE EXISTING LIGHT WEIGHT CONCRETE FROM BEING EXPOSED AND/OR GETTING WET. SEQUENCING IS CRITICAL FOR THE ROOFING CONTRACTOR.
18.	11/8/2016	<u>CRAWL SPACE WORK</u> : DETAIL 5/A21 CALLS FOR INSTALLING TREATED 2" X 4"S, RIGID INSULATION AND CEMENT BOARD BENEATH SLABS OF BUILDINGS A & B. Q: IS MASTIC REQUIRED TO BE APPLIED TO THE BOTTOM SIDE OF THE SLABS BEFORE INSTALLING THE RIGID INSULATION?	YES

ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS PORT OF BROWNSVILLE ADDENDUM LIST ADDENDUM NO. 1

19.	11/8/2016	<u>CRAWL SPACE DRAINS</u> : DETAIL 5/A21 CALLS FOR INSTALLING NEW AREA DRAINS IN THE CRAWL SPACES OF BUILDINGS A & B. Q: THERE APPEARS TO BE NO LAYOUT ON THE PLUMBING OR CIVIL DRAWINGS FOR THESE PROPOSED DRAINS. WERE THEY DELETED?	NO - THEY CAN BE FOUND ON CIVIL SHEETS C9, C9.1, AND C9.3
20.	11/7/2016	IF THE PERMIT/REC BUILDING ON PAGE A212 IS BASE BID, AND WE ADD THE PIERS FROM PAGE A202A, THE LAYOUT WILL BE DIFFERENT FROM THE LAYOUT PER PAGE A212A. CAN YOU CLARIFY HOW IS THIS GOING TO BE BID FOR THE ALTERNATE?	TO CLARIFY - THE SHEETS BEING REFERENCED IN THE QUESTION ARE "S" SHEETS - NOT "A" SHEETS. SHEET S212 IS THE BASE BID. SHEET S202A AND S212A ARE THE SAME. THE STRUCTURAL ENGINEER (FOR CLARITY) HAS SEPARATED THE PIERS ON SHEET S202A. SHEET S212A SHOWS THE COMPOSITE OF THE FOUNDATION AND THE PIERS. THE BASE BID IS SHEET S212. THE ALTERNATE FOR PIERS ARE SHEETS S202A AND S212A.
21.	11/7/2016	THERE ARE 2 TYPES OF ACOUSTICAL CEILING TILES BASED ON SPECS, BUT CAN YOU GIVE US A SPECIFIC TILE NUMBER FOR THE 2 TYPES OF ACOUSTICAL TILE CEILING BASED ON PROVIDED LITERATURE SPECS IN VOLUMN B? ALSO, WHICH ONE GOES WHERE BECAUSE ON THE FINISH SCHEDULE IT JUST SAYS S.A.C.?	REFERENCE THE PRODUCT LITERATURE FOR THE SUSPENDED ACOUSTICAL CEILING AND THE T-GRID. WE'RE CALLING FOR CEILING TILE FOR NON WET AREAS TO BE USED THROUGHOUT, EXCEPT FOR WET AREAS - I.E. RESTROOMS AND ANY ROOMS WHERE THE TILES COULD BE EXPOSED TO WATER CEILING TILES FOR WET AREAS.
22.	11/7/2016	CAN WE USE USG OR ARMSTRONG SUSPENSION SYSTEM, IN LIEU OF THE ONE SHOWN ON THE DRAWINGS FOR STUCCO SYSTEM?	NO - EXPOSED PLASTER AREAS ON THE EXTERIOR SHALL INCORPORATE PORTLAND CEMENT BASED PLASTER, GALVANIZED LATH, GALVANIZED C- RUNNING CHANNELS, AND BE SUSPENDED WITH WIRE SUPPORT AS SPECIFIED IN SECTION 92400 "PORTLAND CEMENT PLASTERING."
23.	11/7/2016	SUBCONTRACTOR NEEDS TO KNOW WHAT TYPE OF FINISH TEXTURE IS GOING TO BE USED FOR THE EIFS SYSTEM? THE PRICE FROM THE MANUFACTURERS ON SPEC VOLUME A	TEXTURE SHALL BE "MOJAVE" FINISH

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		& B VARIES A LOT.	
24.	11/9/2016	FIRE SPRINKLER MAIN & RISER: A NOTE ON SHEET PRG2 CALLS FOR THE PERMIT/RECORDS BUILDING TO BE FULLY SPRINKLED. Q: WHERE IS THE FIRE LINE LOCATION AND WHERE IS THE FIRE RISER TO BE LOCATED?	THERE IS NO FIRE SPRINKLER SYSTEM FOR THE PERMIT/RECORDS BUILDING. PLEASE DELETE NOTE ON SHEET PRG2.
25.	11/9/2016	IN ORDER FOR THE OWNER TO HAVE A COST FOR HVAC AUTOMATION CONTROL SYSTEM, CONTRACTOR IS TO PROVIDE AN ALTERNATE NO. 5	PLEASE REFERENCE ATTACHED REVISED BID FORM AND SPECIFICATION SECTION 012300 "ALTERNATES"
26.	11/3/2016	SHOULD METAL STUDS OR WOOD STUDS BE PROVIDED FOR DOOR AND WINDOW BACK UP?	CONTRACTOR SHALL USE WOOD FRAME FOR BOTH DOOR AND WINDOW BACK UP.
27.	11/3/2016	CLARIFICATION FOR LANDSCAPING PLANTER AREAS	BASE BID IS TO INCLUDE SOIL PREPARATION AND IRRIGATION SYSTEM FOR LANDSCAPING PLANTER AREAS AS SPECIFIED.
28.	11/3/2016	EXISTING SHRUBS?	EXISTING SHRUBS MAY BE REMOVED BY OWNER AT HIS DISCRETION. ANY REMAINING SHRUBS ARE TO BE DEMOLISHED.
29.	11/3/2016	WILL SECURITY AND I.D. BE REQUIRED?	SECURITY REQUIREMENTS WILL AFFECT THIS PROJECT ONLY IN THE AREAS INSIDE THE SECURED AREA OF THE PORT. I.D. WILL BE REQUIRED TO ACCESS INSIDE THE SECURED AREA. ONE DETENTION POND WILL BE INSIDE OF THE SECURED AREA.
30.	11/3/2016	WILL PLANS BE SUBMITTED TO THE COUNTY BUILDING OFFICIAL?	THE PORT WILL SUBMIT ONE SET TO THE BUILDING OFFICIAL FOR REVIEW ONLY. THE GENERAL CONTRACTOR WILL NEED TO PROVIDE ANY ADDITIONAL SETS (IF REQUIRED) FOR PERMITTING.
31.	11/8/2016	MORE INFORMATION ON THE DECKING - WHAT TYPE IT IS? TYPE 1.5B, 1.5F, 3M OR WHICH ONE, AND IT IS GALVANIZED DECKING OR PAINTED DECKING?	ROOF DECKING SHALL BE V1.5F OR 1.5B 30 GA GALVANIZED G90. SEE METAL DECK NOTES ON STRUCTURAL DRAWINGS FOR MORE INFORMATION.
32.	11/8/2016	DETAIL 4/A13	POST SHALL BE INFILLED WITH NON

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			SHRINK GROUT BELOW THE SMALL HOLE
33.	11/8/2016	LANDSCAPING CLARIFICATION	CONTRACTOR TO REFERENCE ATTACHED SHEET IR1, IR2, IR3.
34.	11/8/2016	SHEET L4 TITLE IS MISSING FROM THE INDEX?	PLEASE ADD TITLE OF SHEET L4 TO TABLE OF CONTENTS
35.	11/8/2016	STRUCTURAL SHEETS CLARIFICATION	CONTRACTOR TO REFERENCE ATTACHED SHEETS ADD01 SO1, SO2, SO3, SO4, SO5, SO6, SO7, AND SO8.
36.	11/8/2016	MEP ITEMS	CONTRACTOR TO REFERENCE ATTACHED ADDENDUM FROM TRINITY ENGINEERING (68 SHEETS)
37.	11/8/2016	SIGNAGE: SHEET GA2 CALLS FOR 1/4" ALUMINUM LETTERS OR .090 FABRICATED LETTERS. FABRICATED LETTERS ARE TYPICALLY LIGHTED; 1/4" LETTERS ARE TYPICALLY FLAT WITH NO AVAILABILITY FOR LIGHTING. Q: WHICH CONDITION ARE YOU LOOKING FOR?	REFERENCE SHEET GA3 - CONTRACTOR TO PROVIDE SOUTHWELL LETTERS AS SHOWN ON THE PHOTOGRAPH - THESE ARE CUT OUT LETTERS THAT ARE RAISED - NO LIGHT
38.	11/8/2016	SIGNAGE: THERE ARE NO SPECS FOR ADA RM SIGNS. Q: WHAT MATERIAL, COLOR AND SIZES ARE PREFERRED?	REFERENCE SPECIFICATION SIGNAGE - 101400 - SUB SECTION D AND ATTACHMENT
39.	11/8/2016	CARTON FORMS & RETAINERS: DETAIL 11/S401 SHOWS CARTON FORMS AND SOIL RETAINERS AT THE BOTTOM OF A CONCRETE GRADE BEAM. Q: IS THIS JUST A STANDARD DETAIL THAT IS NOT BEING USED ON THIS PROJECT?	THIS IS A REQUIREMENT FROM THE STRUCTURAL ENGINEER AND ARE PART OF THE BASE BID
		END OF ADDENDUM NO. 1	

Bid Proposal

ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS

Place: Board of Commissioners - Brownsville Navigation District
1000 Foust Road
Brownsville, Texas 78521

Due Date: Before 3:00 P.M. C.S.T.; November 16, 2016.

Proposal of _____ hereinafter called BIDDER, a corporation organized and existing under the laws of the State of _____, or a partnership or an individual doing business as _____.

To: The Brownsville Navigation District, Texas, hereinafter called OWNER.

Gentlemen:

The undersigned BIDDER proposes to furnish all labor, materials, tools, appliances and facilities to perform certain work and services required for the construction, accomplishment and completion in a workmanlike manner, in accordance with the Contract Documents dated September 30, 2016, prepared by ROBERTO J. RUIZ ARCHITECT, INC., for the **"BROWNSVILLE NAVIGATION DISTRICT, PORT OF BROWNSVILLE, BND ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS** project.

The undersigned BIDDER, having examined the proposed site, and being familiar with all conditions surrounding the construction Projects, including the availability of labor, utilities and materials;

that he will furnish all necessary bonds and insurance, machinery, tools, apparatus, and other means of constructions and will do all the work and furnish all materials required of him within the time and in the manner prescribed, and for the prices stated herein.

The undersigned BIDDER further declares that he understands the exact scope of the Project and the he is willing to perform any increase or any decrease in the work in accordance with the provisions of the Contract documents.

The undersigned BIDDER agrees to furnish all insurance policies of the types and in the amounts specified in the Supplementary Conditions, and furnish Performance and Payment Bonds equal to the amount of the Contract.

The undersigned BIDDER further agrees to complete the project and achieve Substantial Completion within 467 calendar days from the notice to proceed letter, unless such time is extended by the Brownville Navigation District and that Five Hundred Dollars and 00/100 (\$500.00) per calendar day will be the measure of liquidated damages assessed the undersigned for each calendar day in excess required to complete work under the contract for each portion of the project.

**BND ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS**

BID PROPOSAL

BASE BID: The basis of this BASE BID will be for all work as noted in the Contract Documents dated September 30, 2016. All work under the BASE BID shall be performed by the same General Contractor.

**PORT OF BROWNSVILLE
BND ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS**

BIDDER Agrees to perform all the work described in the Contract Documents for the following Lump Sum (which includes any and all applicable taxes and fees):

November 16, 2016

BASE BID:

DESCRIPTION	LUMP SUM
For the complete construction of the BND ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS	
TOTAL BASE BID AMOUNT (LUMP SUM):	

ALTERNATE BIDS:

ADD ALTERNATE NO. 1: Contractor to provide an ADD ALTERNATE (labor and material) for the addition of concrete piers and related foundation work as noted in Drawing Sheets S201A, S202A, S211A, and S212A.

_____) ADD (_____

ADD ALTERNATE NO. 2: : Contractor to provide an ADD ALTERNATE (labor and material) to provide a complete sliding file storage system including electrical and structural beams and connection support. Reference Product Literature, Structural Drawings, and Electrical Drawings.

**BND ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS**

BID PROPOSAL

ADD ()

ADD ALTERNATE NO. 3: Contractor to provide an ADD ALTERNATE (labor and material) to add additional plant material as designated in the Landscape Drawing Sheet No. L4 .

ADD ()

ADD ALTERNATE NO. 4: Contractor to provide an ADD ALTERNATE (labor and material) to add marker (sign) - 2 each. One located off of Foust Road and the other located off of FM 511 as indicated on Sheet GA3.

ADD ()

ADD ALTERNATE NO. 5: Contractor to provide cost to design and install a full building automation controls system as outlined on Specification Section 23 09 00. (Base Bid to include 7-day programmable thermostats.

ADD ()

UNIT COST: SECTION 012200 - UNIT PRICES -THIS SPECIFICATION SECTION MUST BE COMPLETED AND ATTACHED TO THE "BID FORM" AS PART OF THE BID SUBMITTAL.

ALLOWANCES: REFERENCE SPECIFICATION SECTION 012100 "ALLOWANCES"

If awarded this Contract, the undersigned will execute a satisfactory construction Contract, performance bond, labor and material payment bond and proof of insurance coverage, with the Owner for the entire work as per the Contract documents within ten (10) days after notice of award.

It is agreed that this proposal is subject to the Owner's acceptance within a period of ninety (90) days from the above date of bid opening.

The undersigned agrees to the following:

**BND ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS**

BID PROPOSAL

- A. To furnish all materials as shown and specified in the Contract Documents.
- B. To start work within 10 days after notice to proceed.
- C. The undersigned further agrees to complete the project and achieve substantial completion on or before 467 calendar days, unless such time is extended by the Owner and that liquidated damages in the amount of \$500.00 for each calendar day in excess thereof required to substantially complete or achieve 100% completion of the work in the required time under the contract shall be applied.
- D. Contractor is to pay for all fees and apply for permits required. BIDDER Acknowledges receipt of the following addenda:

BIDDER understands that the OWNER reserves the right to reject any or all bids and to waive any informalities in the bidding.

BIDDER agrees that this Bid shall be good and may not be withdrawn for a period of ninety (90) days after the scheduled closing time for receiving bids.

The undersigned hereby declares that only the persons or firms interested in the proposal as principal or principals are named herein, and that no other persons or firms than are herein mentioned have any interest in this Proposal or in the contract to be entered into; that this Proposal is made without connection with any other person, company, or parties likewise submitting a Bid or proposal; and that it is in all respects for and in good faith, without collusion or fraud.

Upon receipt of written notice of the acceptance of this Bid, BIDDER will execute the formal contract attached within ten (10) days and deliver the Performance and Payment Bond, the Insurance Certificates, and any other documents as required under the GENERAL CONDITIONS. The Bid security attached in the sum of

(\$ _____) and is to become the property of the OWNER in the event the contract, bonds, and insurance certificates are not executed or delivered within the time above set forth, as mutually agreed to liquidated damages and not as a penalty for the delay and additional administrative expense to the OWNER caused thereby; otherwise the Bid security will be returned upon the signing of the contract and delivering the approved bonds and insurance certificates.

**BND ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS**

BID PROPOSAL

Respectfully submitted,

By:

Signature

Title

Address

Seal affixed here
if BID is by a
Corporation

Attest: _____

**BND ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS**

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

**BND ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. One: Contractor to provide an ADD ALTERNATE (labor and material) for the addition of concrete piers and related foundation work as noted in Drawing Sheets S201A, S202A, S211A, and S212A.
- B. Alternate No. Two: Contractor to provide an ADD ALTERNATE (labor and material) to provide a complete sliding file storage system including electrical and structural beams and connection support. Reference Product Literature, Structural Drawings, and Electrical Drawings.
- C. Alternate No. Three: Contractor to provide an ADD ALTERNATE (labor and material) to add additional plant material as designated in the Landscape Drawing Sheet No. L4 .
- D. Alternate No. Four: Contractor to provide an ADD ALTERNATE (labor and material) to add marker (sign) - 2 each. One located off of Foust Road and the other located off of FM 511 as indicated on Sheet GA3.
- E. Alternate No. Five: Contractor to provide an ADD ALTERNATE (labor and material) to provide cost to design and install a full building automation controls system as outlined on Specification Section 23 09 00. (Base Bid to include 7-day programmable thermostats).

END OF SECTION 012300

Order Date: 7/29/13

Current Date: 7/29/2013

Salesperson: CH/JG

SCOTT
SIGN SYSTEMS, INC.

ORDER #: 53062

Customer name:
SIGNS & WONDERS

Art By: JK

8 in

4 in

A102

WAITING



COPY@5/8"

COPY@1/2"

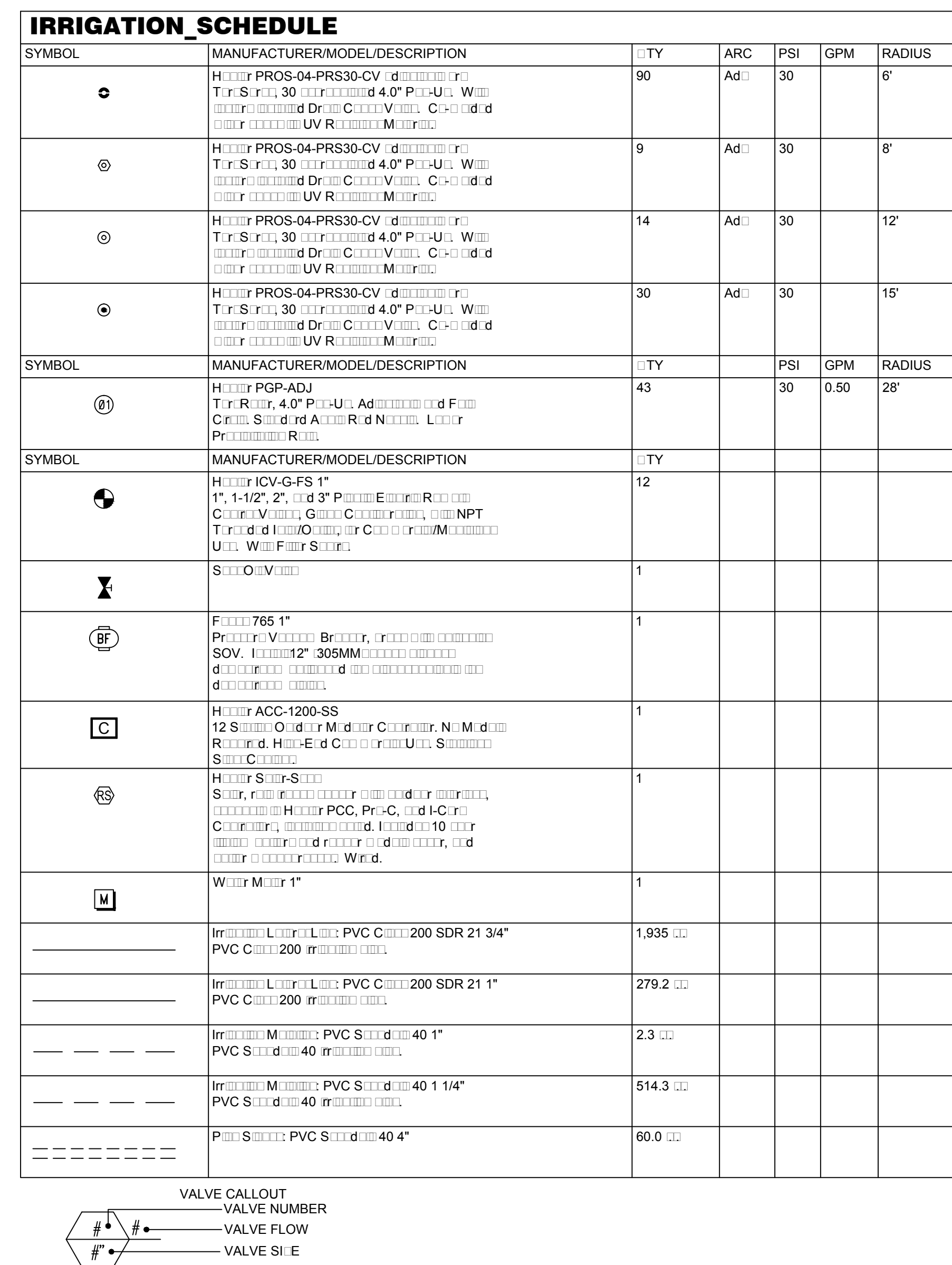
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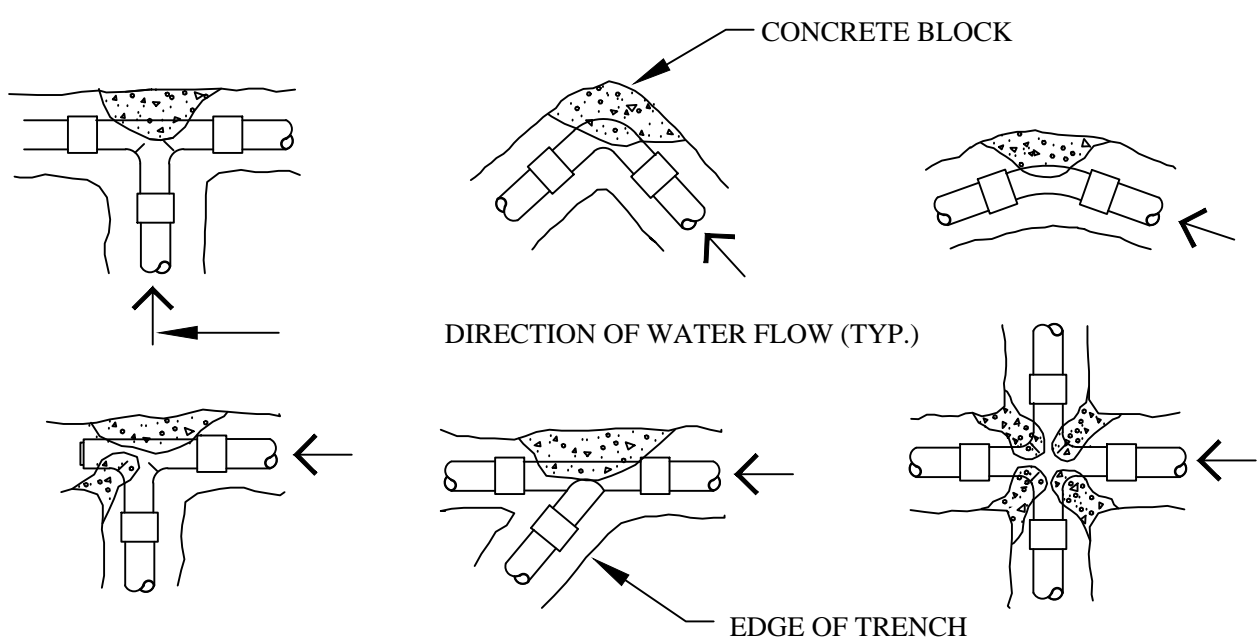
Sign Type: **A**

Fonts:
Helvetica-Regular

Materials Used In This Order:
ADA SUBSTRATE / APPLIQUE

Notes:



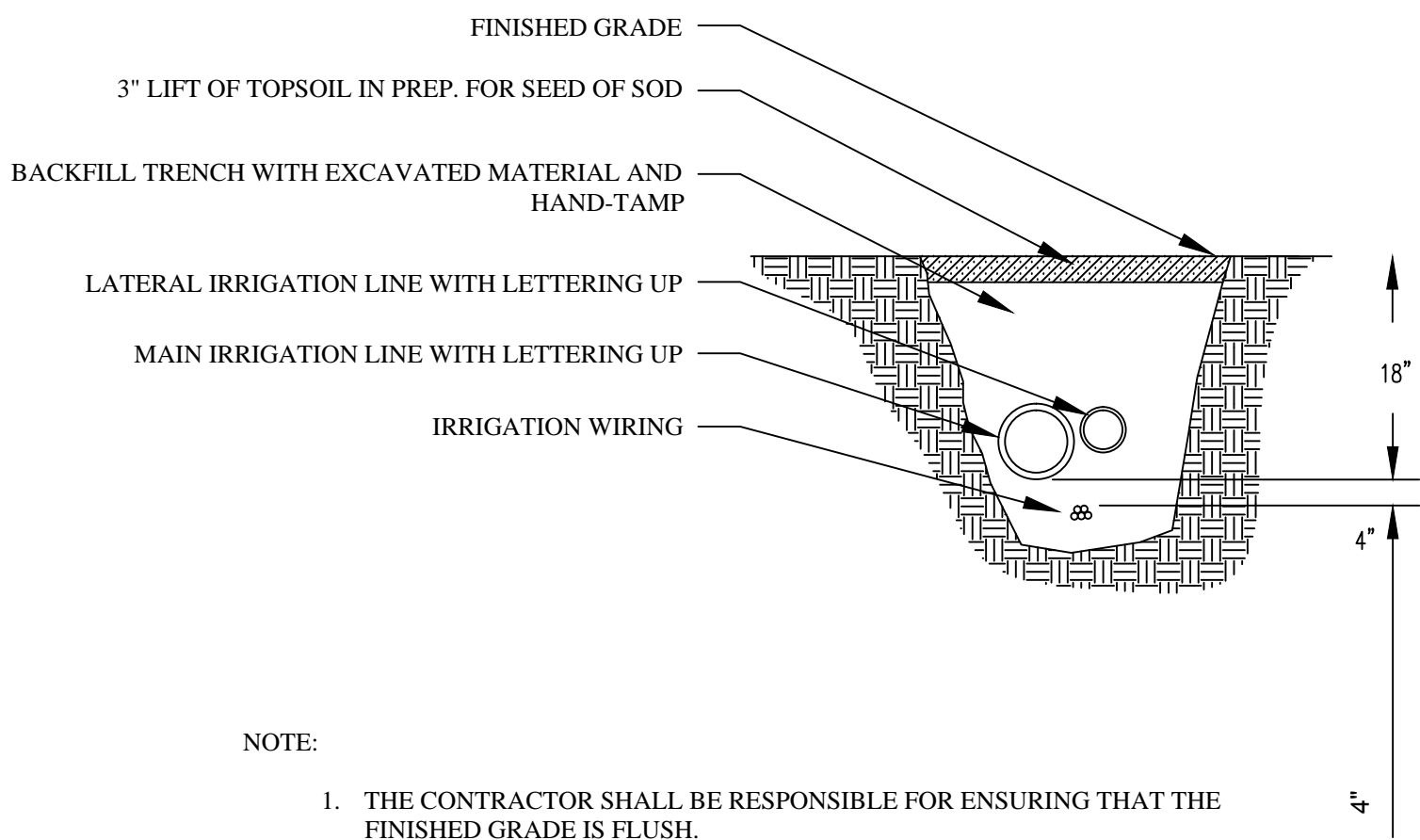


THRUST BLOCK REQUIREMENTS VS. FITTING TYPE				
	1 1/4" - 2 1/2"	3"	4"	6"
TEES/ELLS	1.00	1.00	1.40	3.2
90° BEND	1.00	1.25	2.00	4.5
45° BEND	1.00	1.00	1.00	2.4

- NOTES:
- THRUST BLOCKING TO BE PLACED AT ALL DEAD ENDS, TEES, BENDS, WYES AND REDUCERS AND ANY OTHER AREA AS DETERMINED BY THE ENGINEER/ARCHITECT.
 - MINIMUM AREAS SHOWN ARE IN SQUARE FEET.
 - BEARING MUST BE ON UNDISTURBED EARTH.
 - THRUST BLOCK SHALL BEAR ON FULL 180° OF PIPE CIRCUMFERENCE.
 - USE A MINIMUM OF ONE (1) CU. FT. OF 3000 PSI CONCRETE.

A THRUST BLOCKS

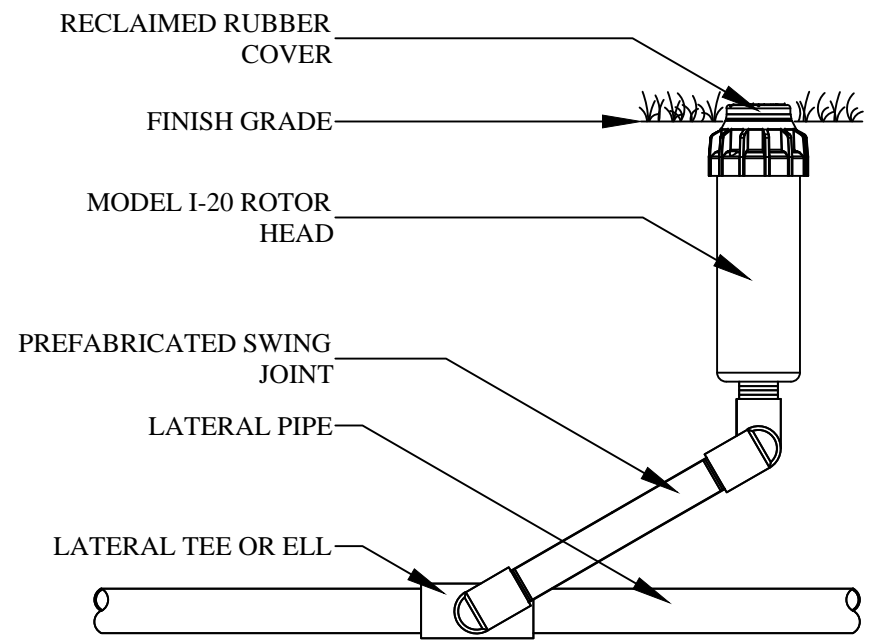
N.T.S.



- NOTE:
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT THE FINISHED GRADE IS FLUSH.
 - CONTRACTOR IS TO ENSURE ALL PIPING IS TO BE LAID WITH LETTERING UP.

D IRRIGATION MAINLINE, LATERAL LINE, AND WIRES

N.T.S.

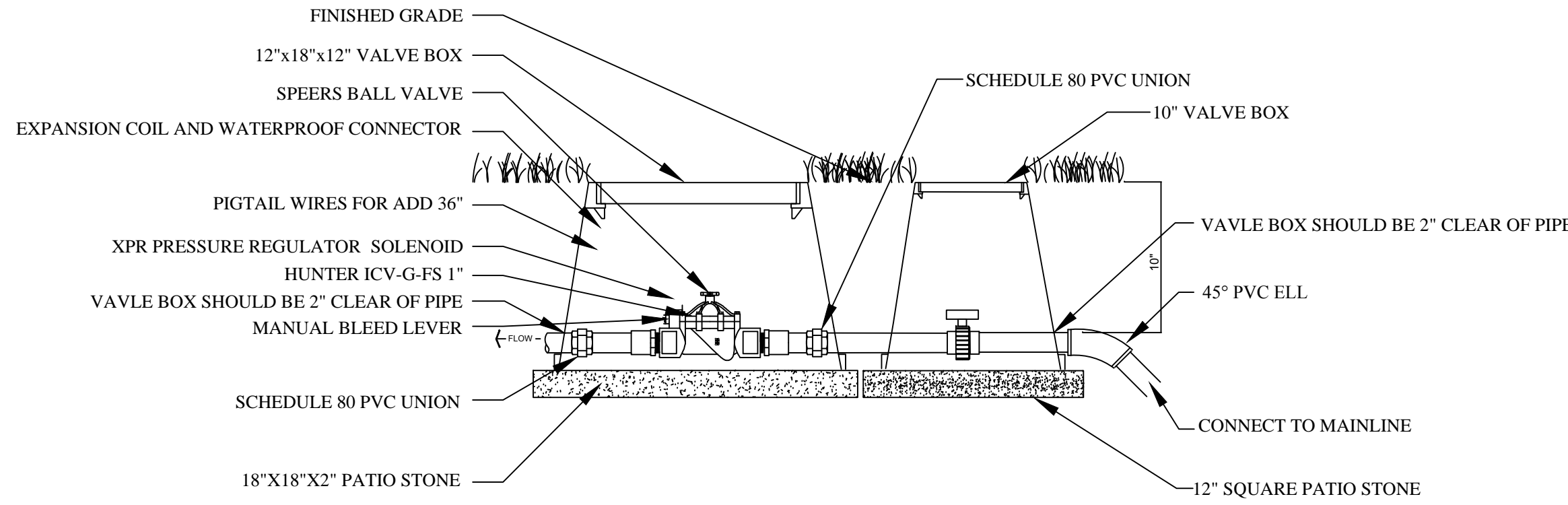


H HUNTER PGP-ADJ

N.T.S.

NOTES

- ALL IRRIGATION WORK TO BE PERFORMED BY A TEXAS LICENSED IRRIGATOR.
- INSTALL ALL VALVES IN AN ARMOR VALVE BOX WITH COVER OR EQUAL. VALVE SHOULD BE CENTERED IN BOX TO FACILITATE ACCESS TO SOLENOID ASSEMBLY AND MANUAL OPERATORS.
- PIPE AS SHOWN IS DIAGRAMMATIC BUT SHOULD BE REASONABLY FOLLOWED. LOCATION OF SPRINKLER HEADS SHALL BE ESTABLISHED BY THE CONTRACTOR BUT DESIGN SPACING MAY NOT BE EXCEEDED WITHOUT AUTHORIZATION FROM THE OWNER.
- ALLOW A MINIMUM OF 6" CLEARANCE FROM ANY STRUCTURE, INCLUDING SIDEWALKS, CURBS, BUILDINGS, ETC. WHEN INSTALLING SPRINKLER HEADS.
- ALL SLEEVES SHALL BE SCH. 40 PVC, SHALL EXTEND 12" BEYOND EDGE OF PAVEMENT OR STRUCTURE, SHALL BE PLACED 24" BELOW TOP OF PAVEMENT AND SHALL BE CAPPED WITH PVC CAPS. DO NOT PENETRATE STRUCTURES WITHOUT PRIOR APPROVAL. LOCATION OF SLEEVES TO BE MARKED IN PAVEMENT WITH AN "S" CONCRETE STAMP.
- AFTER INSTALLATION, SYSTEM MUST BE BALANCED BY ADJUSTING PRESSURE REGULATOR CONTROLS ON VALVES.
- SYSTEM SHALL REQUIRE A MINIMUM OF 50 LBS. STATIC PRESSURE FOR SYSTEM TO OPERATE PROPERLY. IRRIGATION CONTRACTOR SHALL NOTIFY THE OWNER OF PRESSURE DEFICIENCIES OR IF THE PRIMARY WATER SUPPLY LINES ARE SMALLER THAN 4" AND/OR LONGER THAN 120' FROM THE SOURCE. NOTIFY THE OWNER OF ANY OTHER SITE PROBLEMS THAT MAY ALTER THE EFFECTIVENESS OF THE SYSTEM.
- THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE SPECIFICATIONS FOR THE LANDSCAPE IRRIGATION SYSTEM.
- THE CONTRACTOR SHALL PREPARE "AS-BUILT" DRAWINGS IN AN AUTOCAD FORMAT WHICH SHALL SHOW LOCATIONS OF MAIN LINES, VALVES, CONTROLLERS AND SLEEVES. THE AUTOCAD DRAWINGS SHALL BE DELIVERED ON DISC TO THE OWNERS REPRESENTATIVE FOR REVIEW AND APPROVAL.
- ALL SPLICES ARE TO BE CAPPED WITH TANKING LOW VOLTAGE CONNECTORS. NO FIELD SPLICES WILL BE PERMITTED. WHERE SPLICES ARE NECESSARY ALL MUST BE IN VALVE BOXES.
- NO PIPE CROSSES ARE PERMITTED.
- HAND DIG TRENCHES WITHIN THE DRIP LINE OF EXISTING TREES.
- ALL MAIN LATERAL LINES SHALL BE SET AT A MINIMUM DEPTH OF 18" TO THE TOP OF THE PIPE. ALL LATERAL LINES SHALL BE SET AT A MINIMUM DEPTH OF 18" TO THE TOP OF THE PIPE. ALL ELECTRIC VALVES SHALL BE SET TO A DEPTH OF 18" TO THE TOP OF ADJACENT PIPE.
- ALL PIPING TO BE LAID WITH LETTERING UP.
- ALL 3/4" - 2" LATERAL PIPING SHALL BE CLASS 200 SOLVENT WELD PVC.
- PROVIDE THRUST BLOCKS AS PER DETAILS. ALL THRUST BLOCKING SHALL BE INSPECTED AND APPROVED BY THE OWNER PRIOR TO BACKFILL.
- ALL VALVE WIRING SHALL BE 14 AWG.
- PROVIDE PRESSURE GAUGE ON INLET AND OUTLET.
- PROVIDE UNICOUPLERS AS INDICATED.
- DO NOT LOCATE VALVE BOXES IN MULTI-USE ATHLETIC FIELD AREAS. ALL PIPES GOING TO AND FROM RP AND PUMP SHALL BE SCH. 80 PVC PIPE. WRAP PIPE WITH 1/8" 2" INSULATION TAPE - 4217-W3 BY NU-CALGON WHOLESALE INC. ST. LOUIS, MO. 63146.
- ALL SPRINKLER HEADS SHALL BE SET LEVEL TO FINISH GRADES, PLACED VERTICAL IN THE GROUND, ADJUSTED TO COVER HEAD TO HEAD WITH MINIMAL SPRAY IN AREAS NOT IRRIGATED.
- TEN (10) DAYS PRIOR TO START OF CONSTRUCTION THE CONTRACTOR SHALL VERIFY THE WATER STATIC PRESSURE. CONFIRM WITH OWNER THE WATER STATIC PRESSURE BEFORE COMMENCING WORK.
- THE CONTRACTOR SHALL PROVIDE TWO UNICOUPLERS TO MATCH UNICOUPLER SPECIFIED.
- THE CONTRACTOR SHALL OBTAIN THE PROPER PERMIT FOR IRRIGATION WORK FROM THE CITY OF BROWNSVILLE AND TxDOT PRIOR TO COMMENCING WORK.

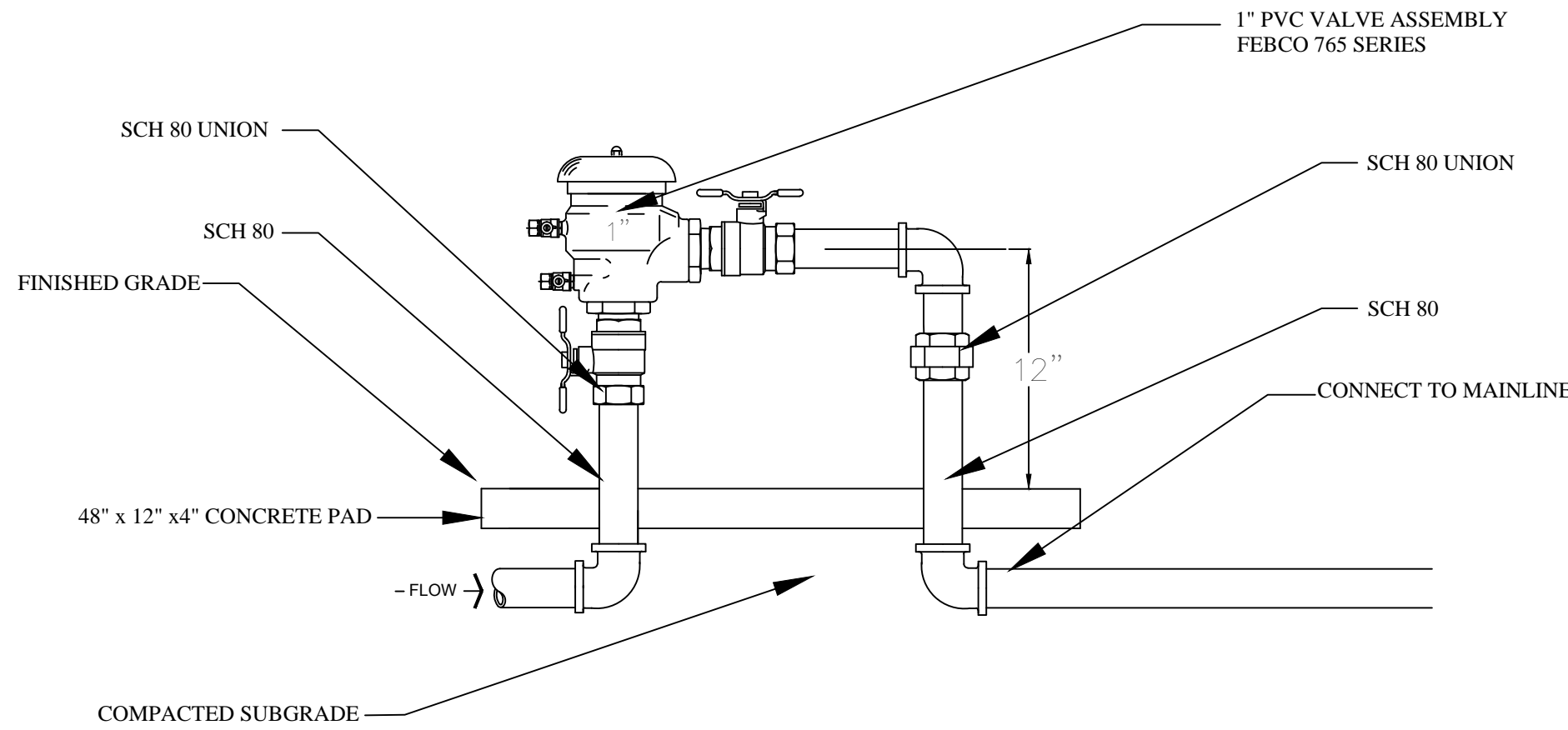


NOTES:

- MAINTAIN A 2"-3" GAP BETWEEN THE BOTTOM OF THE VALVE AND THE TOP OF THE PATIO STONE.
- PROVIDE 36" OF SLACK FOR CONTROL WIRES AND NEATLY COIL.
- PROVIDE ONE EXTRA 14 GA. RED WIRE AT EACH VALVE FOR FUTURE USE.

B HUNTER ICV-G-FS 1"

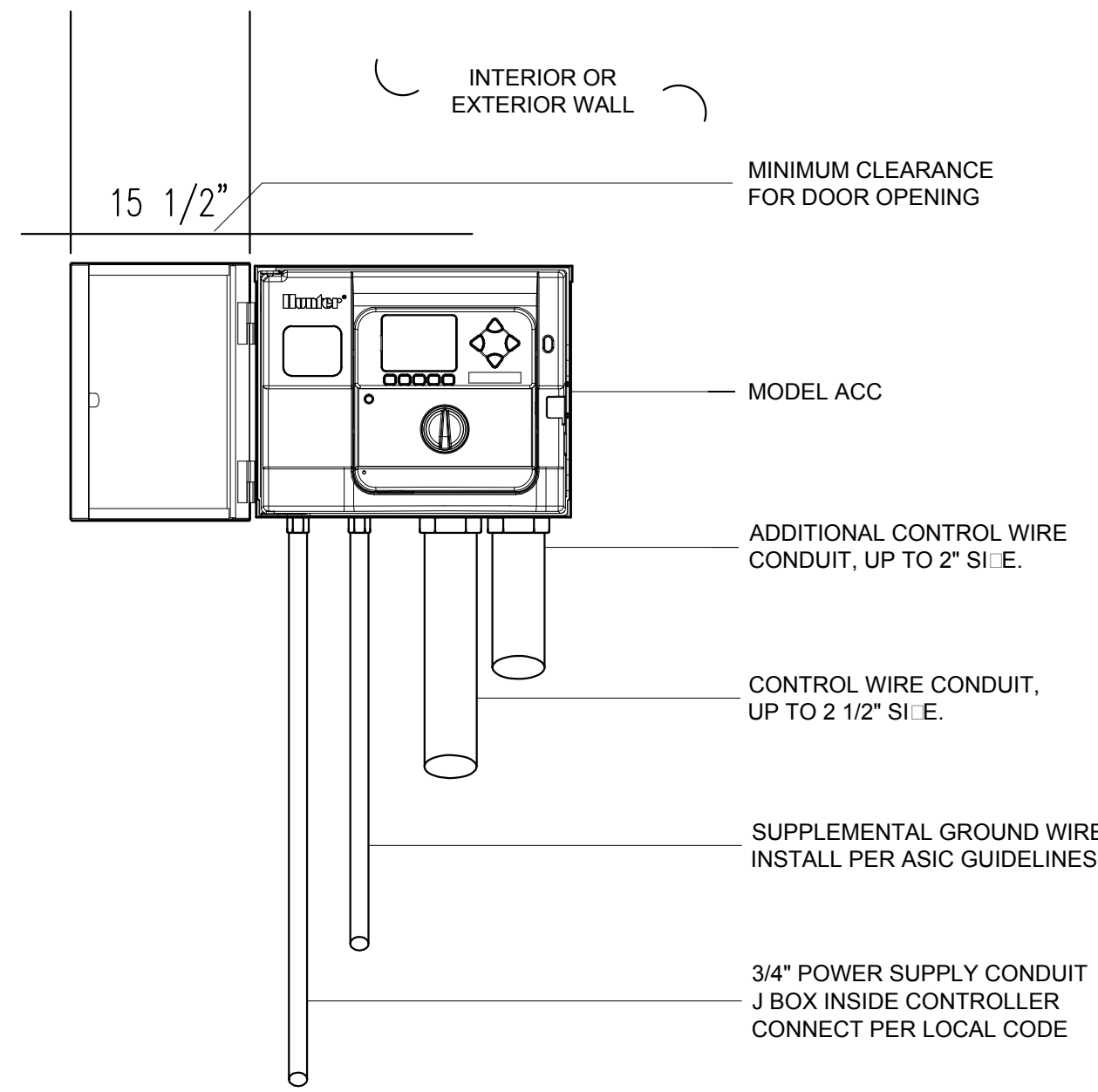
N.T.S.



- NOTES:
- INSTALL PVB 12" ABOVE THE HIGHEST DOWNSTREAM OUTLET AND THE HIGHEST POINT IN THE DOWNSTREAM PIPING.
 - CENTER PVB ON 4" CONCRETE PAD. VERIFY CONCRETE FORMS WITH OWNER PRIOR TO POUR.

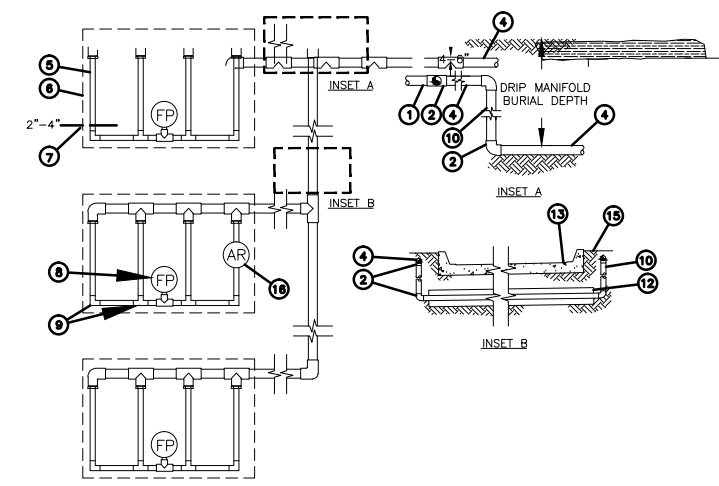
E 1" FEBCO PVB

N.T.S.



F HUNTER ACC-1200-SS

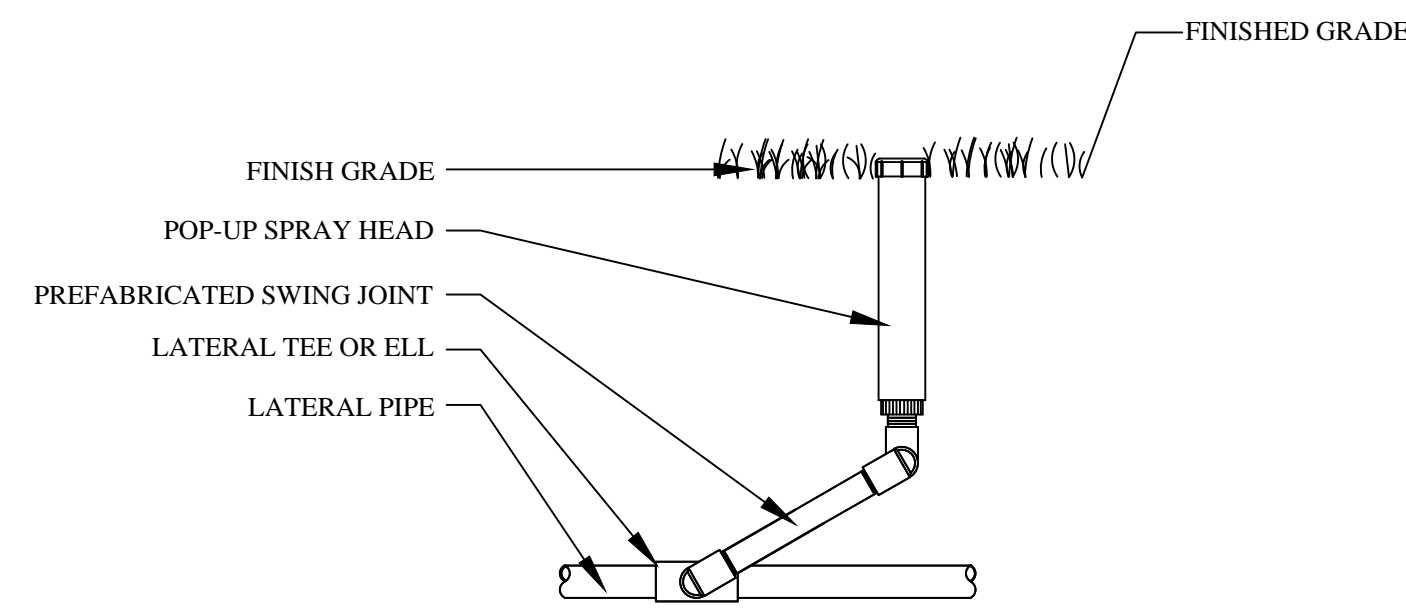
N.T.S.



- NOTES:
- DISTANCE BETWEEN LATERAL ROWS AND EMITTER SPACING TO BE BASED ON SOIL TYPE, PLANT MATERIALS AND CHANGES IN ELEVATION. SEE INSTALLATION SPECIFICATIONS ON RAIN BIRD WEB SITE (WWW.RAINBIRD.COM) FOR SUGGESTED SPACING.
 - LENGTH OF LONGEST DRIPLINE LATERAL SHOULD NOT EXCEED THE MAXIMUM SPACING SHOWN IN THE ACCOMPANYING TABLE.
 - INSTALL AIR RELIEF VALVE AT HIGH POINTS IN DRIP LATERAL.
 - WHEN USING 1/4" M INSERT FITTINGS WITH DESIGN PRESSURE OVER 50PSI, IT IS RECOMMENDED THAT STAINLESS STEEL CLAMPS BE INSTALLED ON EACH FITTING.
 - DRIP SHALL BE PLACED UNDER LANDSCAPE FABRIC IN LANDSCAPE BEDS WITH DECOMPOSED GRANITE.

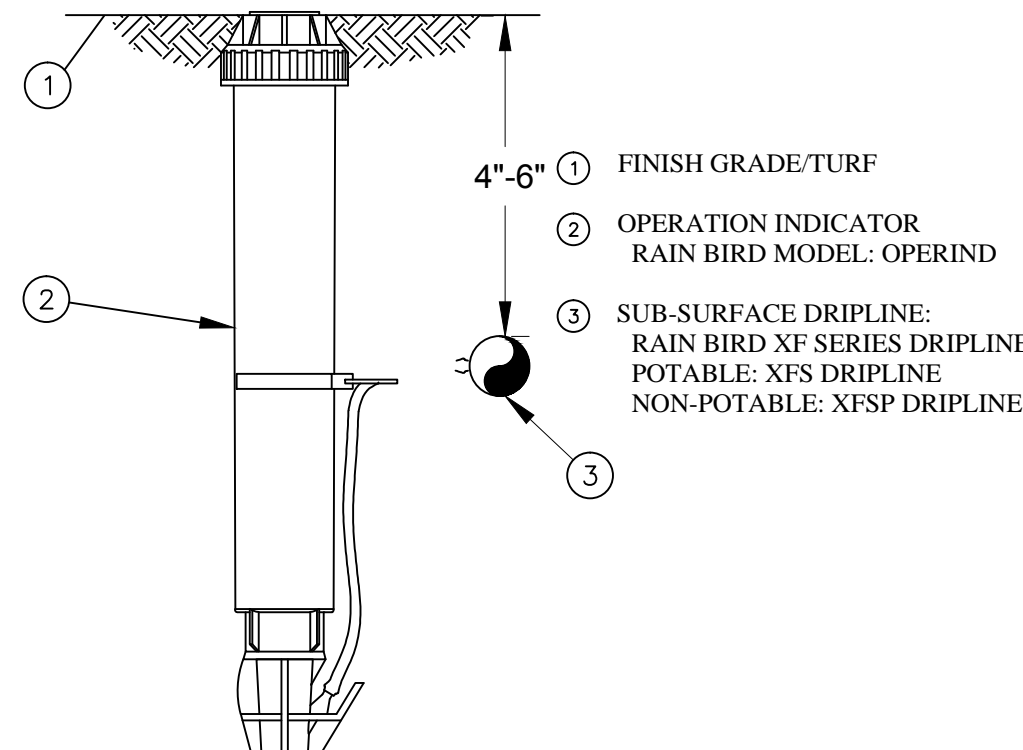
I RAINBIRD XFS DRIP LINE

N.T.S.



C HUNTER PRO SPRAYS

N.T.S.



- NOTE:
- INSERT BARB TRANSFER FITTING DIRECTLY INTO DRIPLINE TUBING.
 - VAN NOZZLE MAY BE SET TO CLOSED, OR IF IT IS DESIRED TO SEE SPRAY FROM THE NOZZLE, SET THE ARC TO 1/2 PATTERN. THE FLOW FROM THE NOZZLE @ 3 GPM SHOULD BE ACCOUNTED FOR IN THE SYSTEM DESIGN.

G RAINBIRD XFS DRIP INDICATOR

N.T.S.

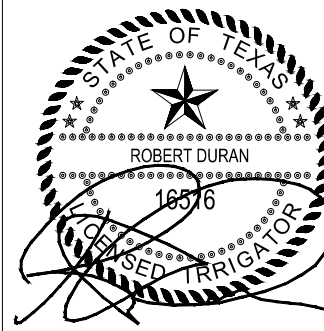
- PVC SUPPLY HEADER
- PVC SCH 40 TEE OR EL (TYPICAL)
- BARB X MALE FITTING
- RAIN BIRD XFF-MA FITTING (TYPICAL)
- PVC DRIP MANIFOLD FROM RAIN BIRD CONTROL ZONE
- VALVE KIT (SIZED TO MEET LATERAL FLOW DEMAND)
- SUB-SURFACE DRIPLINE: RAIN BIRD XF SERIES DRIPLINE (TYPICAL)
- POTABLE: XFS DRIPLINE
- NON-POTABLE: XFSP DRIPLINE
- PERIMETER OF AREA
- PERIMETER DRIPLINE PIPE TO BE INSTALLED 2"-4" FROM PERIMETER OF AREA
- FLUSH POINT (TYPICAL) - SEE RAIN BIRD XFS DETAILS FOR FLUSH POINT INSTALLATION
- BARB X BARB INSERT TEE OR EL: RAIN BIRD XFF-TEE OR RAIN BIRD XFF-ELBOW (TYPICAL)
- PVC RISER PIPE
- PVC SUPPLY MANIFOLD
- PVC SCH 40 SLEEVE PIPE SIZED TWICE THE SIZE OF MANIFOLD PIPE SIZE
- PAVEMENT AND CURB
- TURF OR MULCH
- FINISH GRADE
- 1/4" AIR RELIEF VALVE: RAIN BIRD MODEL: ARV050 SEE RAIN BIRD XFS DETAILS FOR AIR RELIEF INSTALLATION

SHEET TITLE:

IRRIGATION DETAILS

PROJECT: ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
OWNER: BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

BROWNSVILLE NAVIGATION DISTRICT
RAIN BIRD
PORT OF BROWNSVILLE
WORLD CLASS



DATE: 09-30-16

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ARCHITECT, INC.
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(361) 350-9196 FAX
ARCHRUIZ@AOL.COM

REVISED:

DATE: 9/30/2016
DRAWN BY: JRR
PROJECT NO.:

SET NUMBER

SHEET NO. IR3

SHEET

Add01
S01

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS

BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

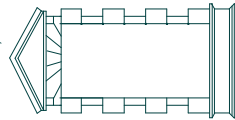
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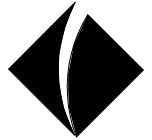


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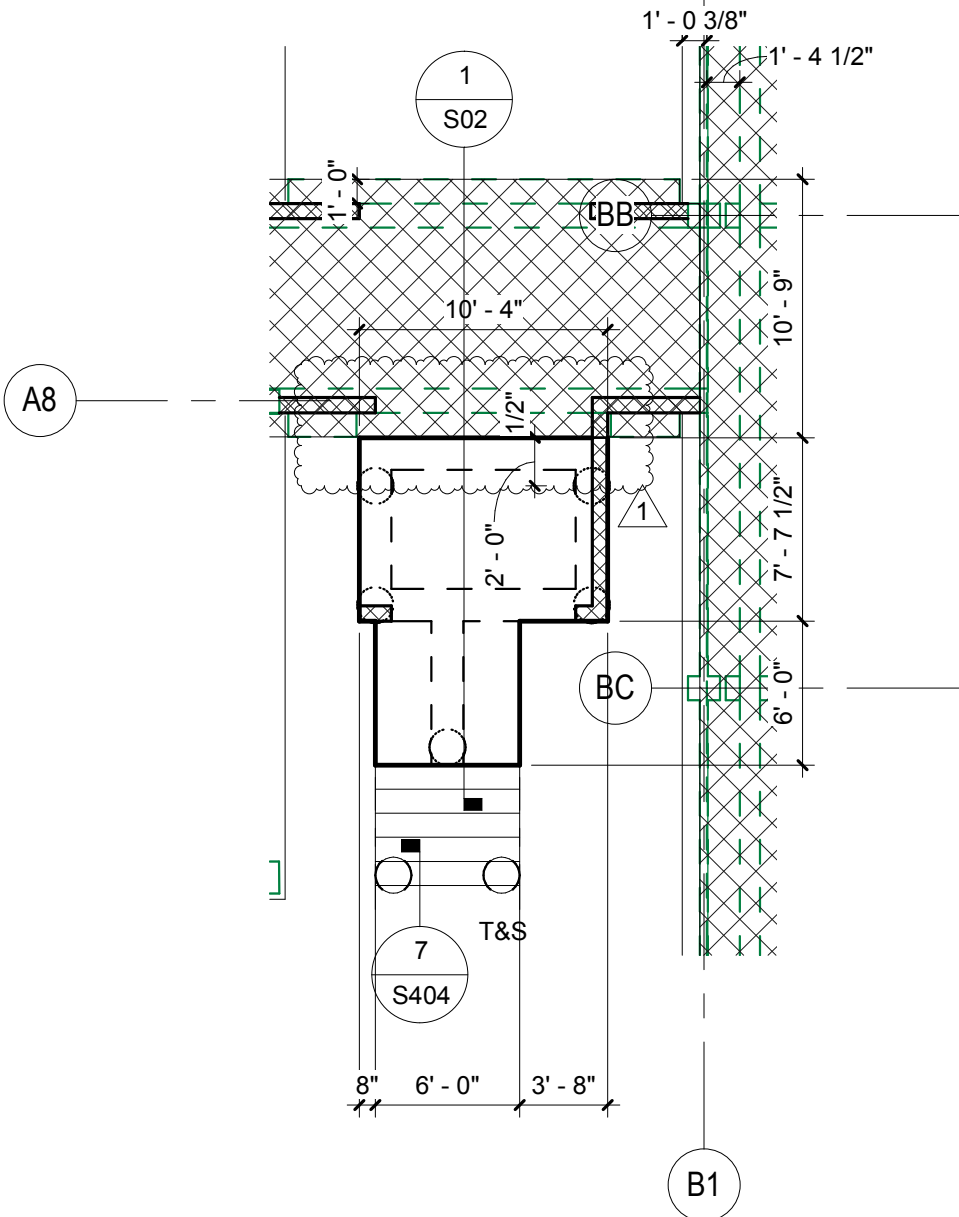


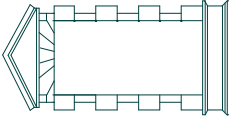

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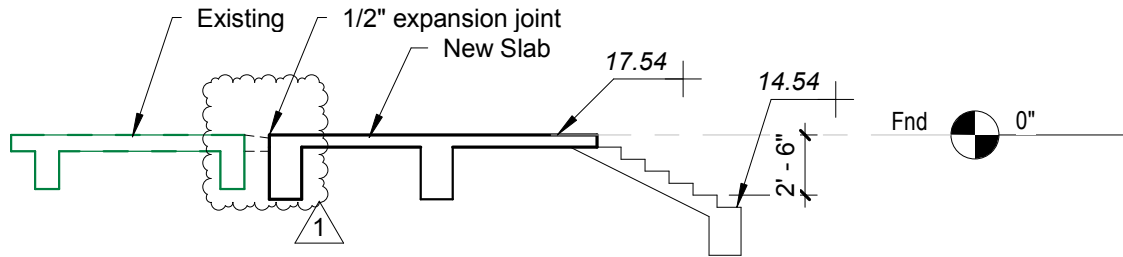
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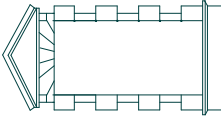

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① Stair at Entrance
1/8" = 1'-0"

Additional Items:

- A. Detail 13/S406 and 14/S406, add 1/2" dia. "U" bent bar welded to plate before galvanizing. See architectural for shape and size.
- B. Contractor shall provide design of attachment of mechanical unit to mechanical curb and mechanical curb to structural steel frame provided. Design shall be signed and sealed by a licensed Professional Engineer in the State of Texas.
- C. Contractor to provide attachment of metal roofing and metal wall panels to resist the wind pressures noted. Provide signed and sealed drawings by a licensed Professional Engineer in the State of Texas.

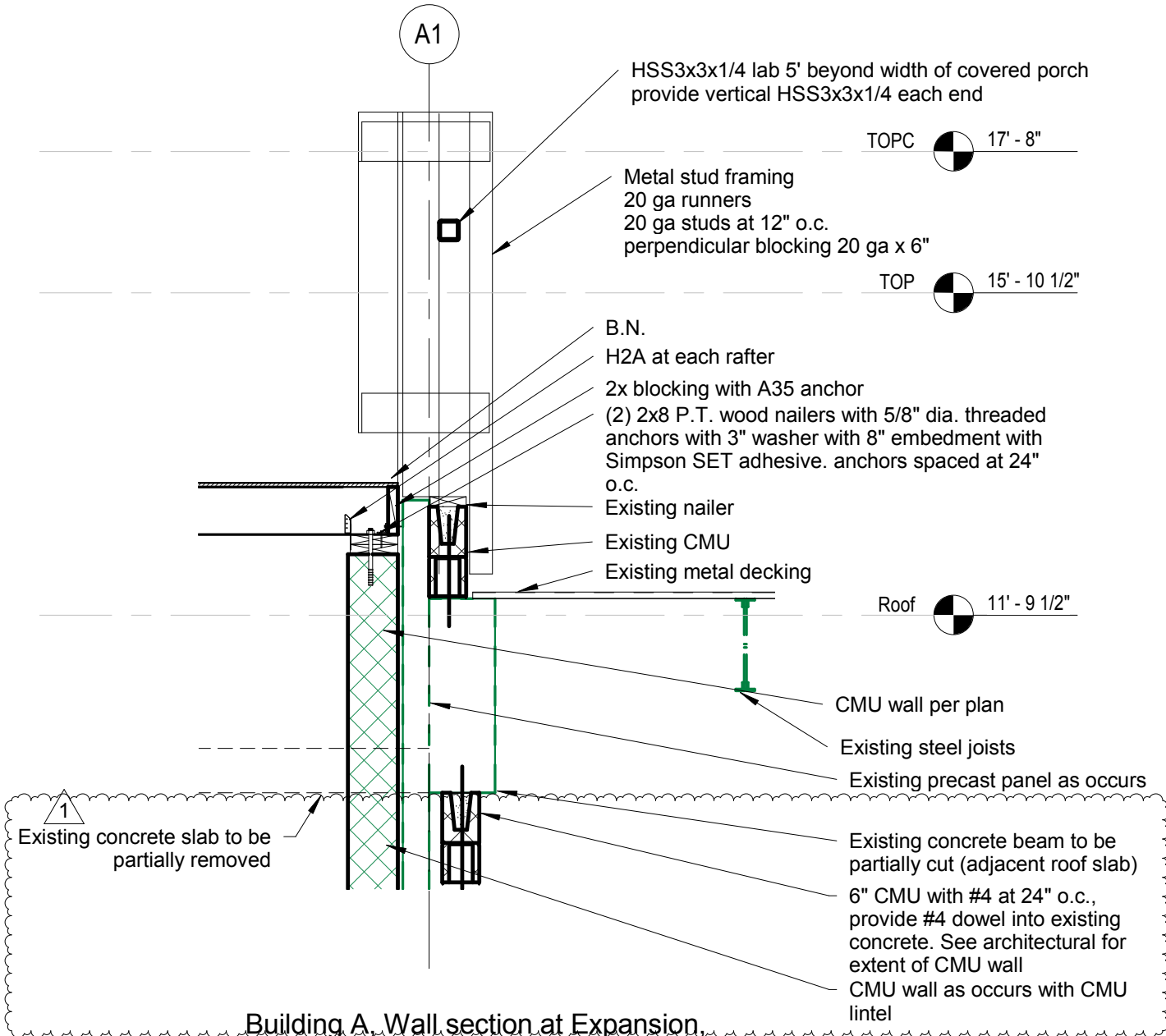
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Signature

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Building A. Wall section at Expansion.

① Revised detail 4/S502
1/2" = 1'-0"

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SHEET

Add01
S04

PROJECT:

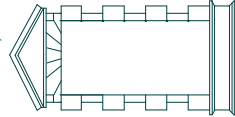
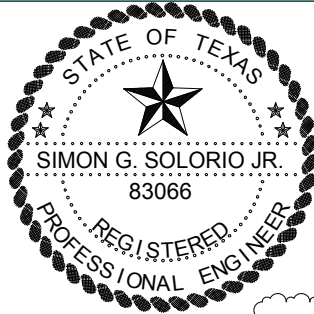
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REHABILITATION AND BUILDING ADDITIONSBROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

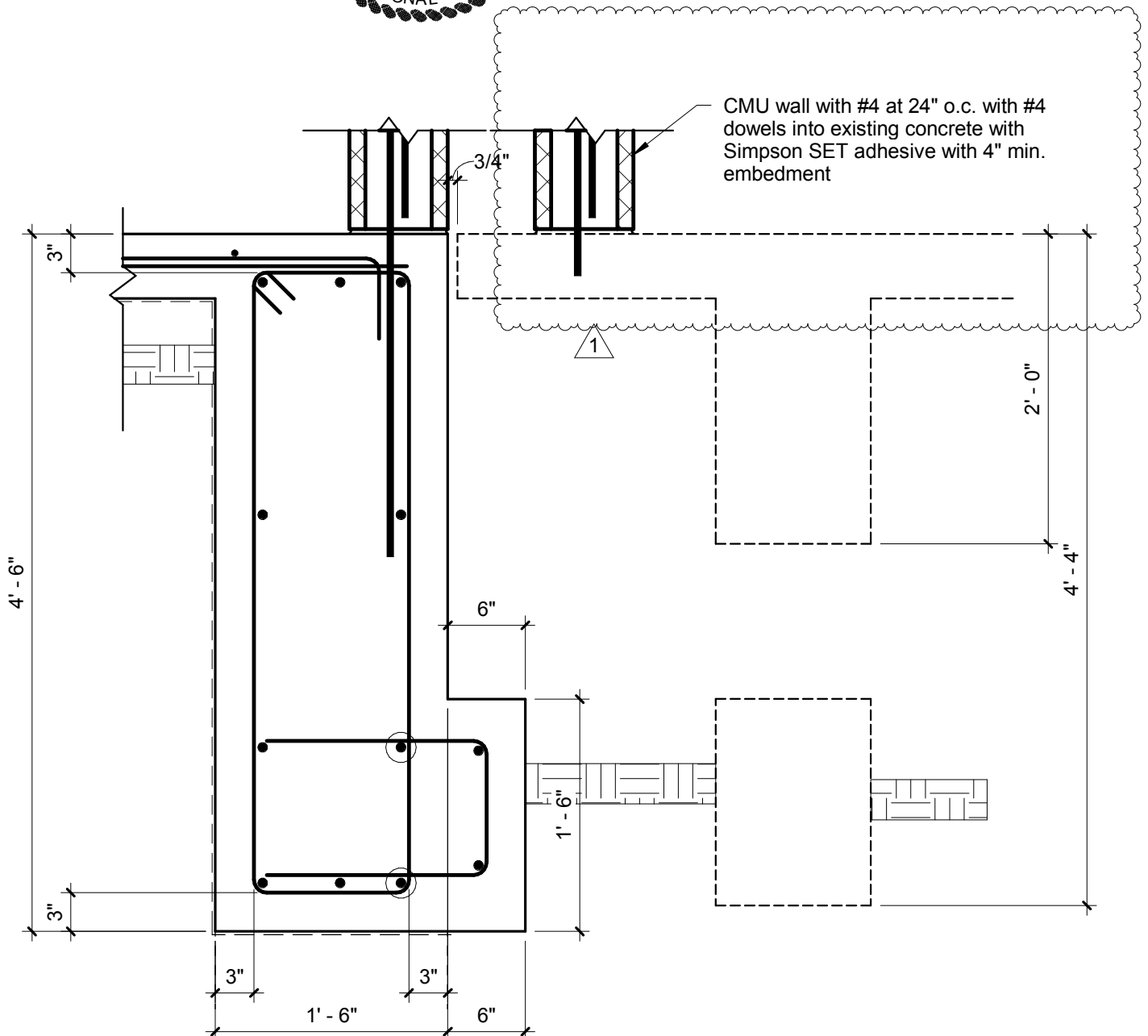
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① Footing SP, CMU at EJ. 8" 54"
1" = 1'-0"

SHEET

Add01
S05

PROJECT:

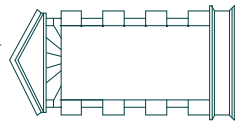
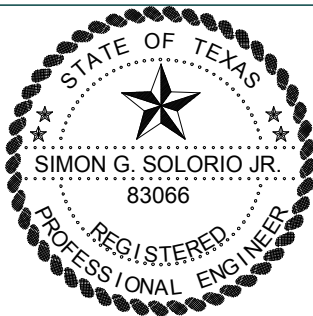
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REHABILITATION AND BUILDING ADDITIONSBROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

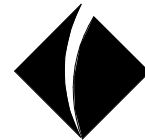
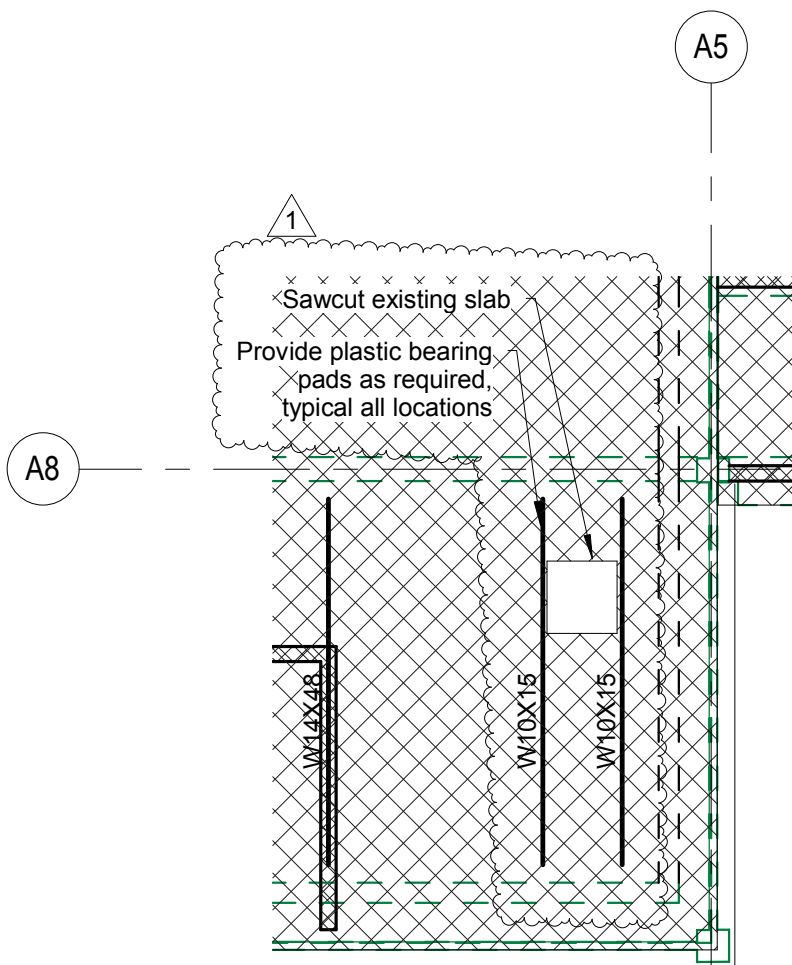
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1 Foundation Base - Building A - C
1/8" = 1'-0"

SHEET

Add01
S06

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS

BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

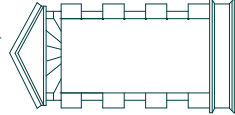
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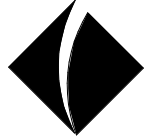


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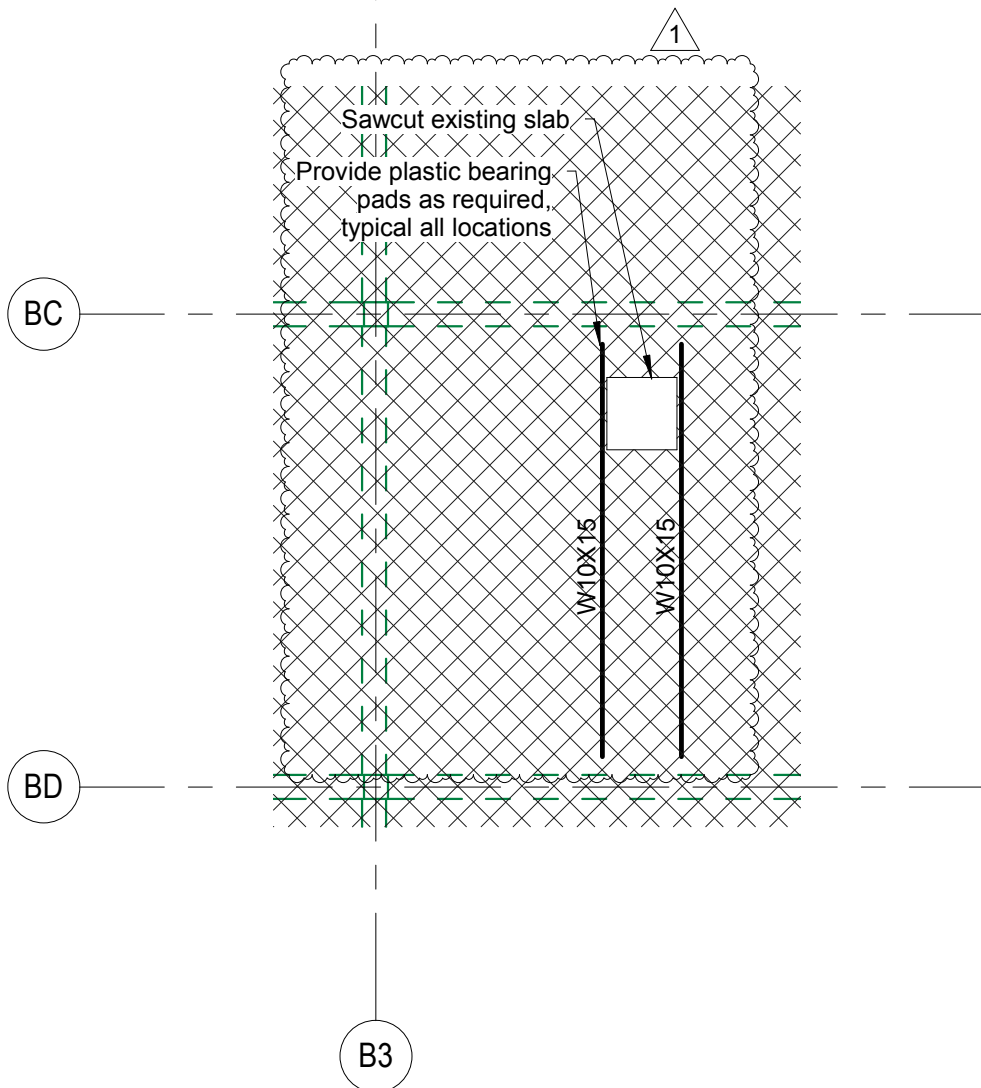


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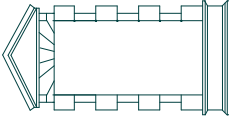

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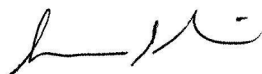


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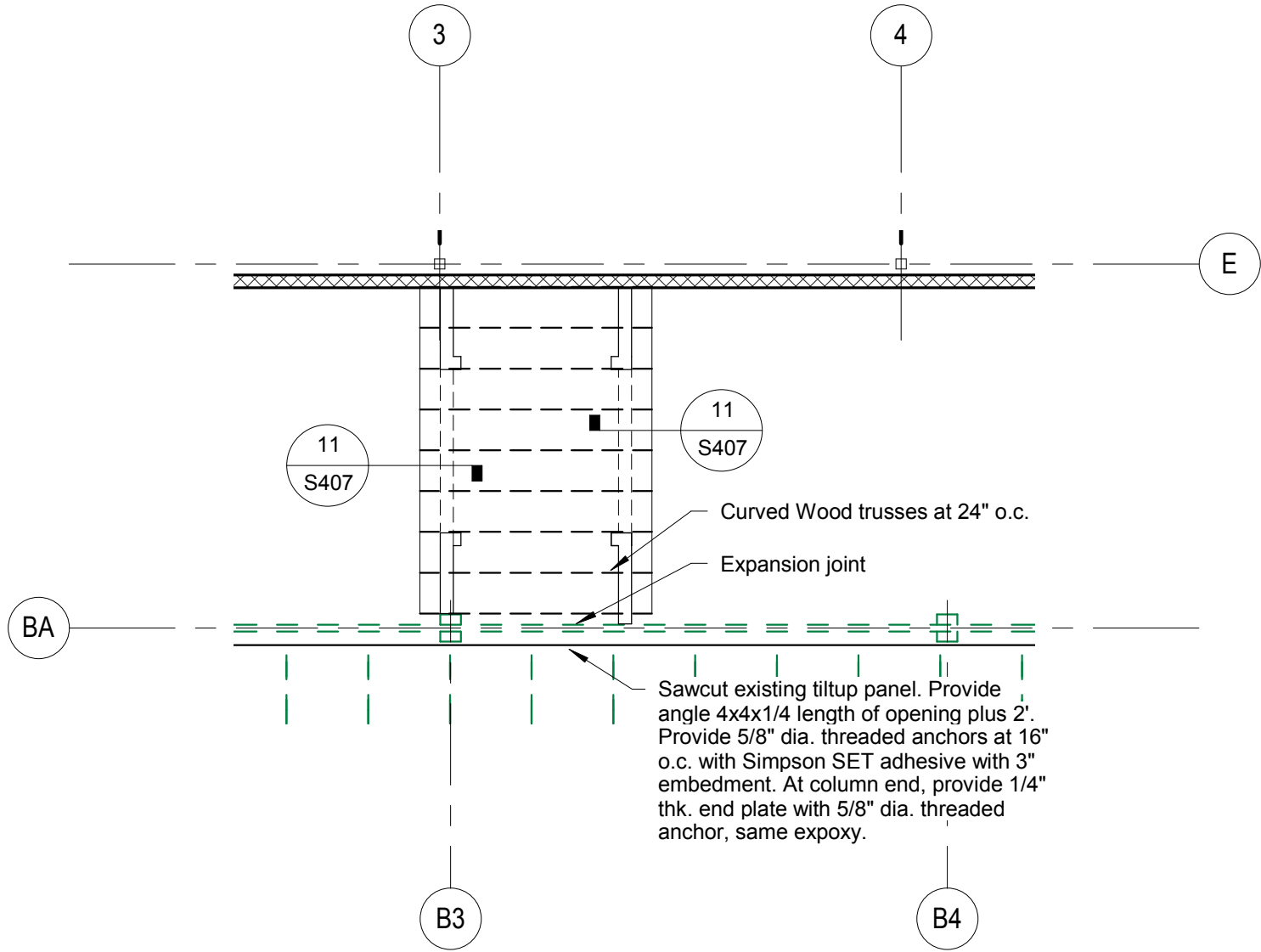
1 Foundation Base - Building A - C
1/8" = 1'-0"

SHEET Add01 S07	PROJECT: ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS		ROBERTO J. RUIZ ARCHITECT, INC.  615 W. TANDY ROAD BROWNSVILLE, TEXAS 78520 (956) 350-9195 OFFICE (956) 350-9196 FAX ARCH1RUIZ@AOL.COM
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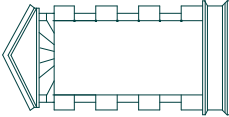




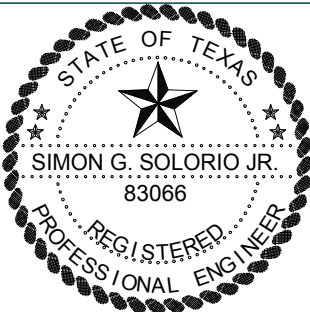
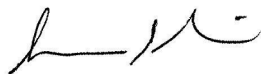
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1 Roof Framing Plan, Building A - C
1/8" = 1'-0"

SHEET Add01 S08	PROJECT: ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS		 ROBERTO J. RUIZ ARCHITECT, INC. 615 W. TANDY ROAD BROWNSVILLE, TEXAS 78620 (956) 350-9185 OFFICE (956) 350-9196 FAX ARCH1RUIZ@AOL.COM
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DATE: 09/30/2016			

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Wind Pressure on Components and Cladding (Ch 30 Part 1)

All pressures shown are based upon ASD Design, with a Load Factor of .6

Width of Pressure Coefficient Zone "a" = 6.80 ft

Description	Width ft	Span ft	Area ft^2	Zone GCp	Max GCp	Min psf	Max P	Min P
Zone 1	2.00	5.00	10.0	1	0.30	-1.00	9.88	-24.29
Zone 2	2.00	5.00	10.0	2	0.90	-1.80	22.23	-40.75
Zone 3	2.00	5.00	10.0	3	0.90	-1.80	22.23	-40.75
Zone 4	2.00	5.00	10.0	4	0.90	-0.99	22.23	-24.08
Zone 5	2.00	5.00	10.0	5	0.90	-1.26	22.23	-29.64
Zone 4	4.00	5.00	20.0	4	0.85	-0.94	21.24	-23.09
Zone 5	4.00	5.00	20.0	5	0.85	-1.16	21.24	-27.67
Zone 4	3.00	10.00	33.3	4	0.82	-0.91	20.52	-22.37
Zone 5	3.00	10.00	33.3	5	0.82	-1.09	20.52	-26.22
Zone 4	4.00	10.00	40.0	4	0.80	-0.89	20.26	-22.11
Zone 5	4.00	10.00	40.0	5	0.80	-1.07	20.26	-25.70

Khcc:Comp. & Clad. Table 6-3 Case 1
 Qhcc:.00256*V^2*Khcc*Kht*Kd

= 0.70
 = 20.58 psf

Parapets Components & Cladding (Ch 30 Part 4, Para 30.7.1.2)

Pressures taken from Table 30.7-2 at top of Parapet and multiplied by Exposure Adjustment Factor (EAF =0.694), Topographic Factor (Kzt = 1.00) and Reduction Factor (RF = 1.0). The effective area for the parapet is 10 sq ft [0.929 sq m] to be conservative, which makes the Reduction Factor 1.

Case A - Apply Positive Wall Pressure to Front & Negative Roof Pressure to Back.

- p1: Positive Wall Pressure on Front of Parapet (Zone 4) = 20.04 psf
- p1: Positive Wall Pressure on Front of Parapet (Zone 5) = 20.04 psf
- p2: Negative Roof Pressure on Back of Parapet (Zone 2) = -46.01 psf
- p2: Negative Roof Pressure on Back of Parapet (Zone 3) = -62.69 psf

Case B - Apply Positive Wall Pressure to Back & Negative Wall Pressure to the Front.

- p3: Positive Wall Pressure on Back of Parapet (Zone 4) = 20.04 psf
- p3: Positive Wall Pressure on Back of Parapet (Zone 5) = 20.04 psf
- p4: Negative Wall Pressure on Back of Parapet (Zone 4) = -20.04 psf
- p4: Negative Wall Pressure on Back of Parapet (Zone 5) = -36.72 psf



ADDENDUM # 1

Architect: Roberto J. Ruiz Architect

Project Name: Brownsville Navigation District Administration Complex

Project Number: 16.1.01

Date: 11-09-2016

Note: The work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Sum or Contract Time Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Sum or Contract Time.

I. Specifications:

- A. Section 23 09 00 – INSTRUMENTATION & CONTROLS FOR HVAC added, refer to attached.
- B. Section 23 73 12 – DX AIR HANDLING UNITS SINGLE ZONE VAV added, refer to attached.
- C. Section 23 74 00 – ROOFTOP UNITS SINGLE ZONE VAV added, refer to attached.
- D. Section 23 75 10 – INVERTER DRIVEN, DX, AIR COOLED HEAT PUMP SPLIT SYSTEM added, refer to attached.
- E. Section 26 09 26 – Add the following to the specifications:

Services Provided

SSS	SOS	SOSP
	✓	✓ Pre-Construction meeting with electrical contractor to review submittals and determine rough-in and wiring strategy
	✓	✓ Job Site Visit prior to start-up to confirm progress, address potential initial issues, and schedule start-up
✓	✓	✓ System Start-Up and Initialization
✓	✓	✓ End-User Training
	✓	✓ Field Report Generation
	✓	✓ Reporting to construction Team and specification channel with confirmation of system start-up and training
	✓	✓ 90 Day Follow Up Consultation with Owner's Rep

- | | |
|---|---|
| ✓ | 300 Day Job Site Visit to provide system programming adjustments, additional end-user training, verification of any warranty issues, final reporting to the construction team and specification channel |
|---|---|

II. General:

- A. Electrical – Contractor shall provide all cost in bid for all buildings for a complete Lightning Protection system to meet UL96A, LP1 175 and NFPA 780 standards.
Refer to specification 26 41 13.

III. Mechanical: N/A

- A. Sheet M1.1 – general revisions, sheet to be replaced, refer to attached.
- B. Sheet M1.2 – general revision, sheet to be replaced, refer to attached.
- C. Sheet M1.3 – various revisions, refer to attached.
- D. Sheet M1.4 – various revisions, refer to attached.
- E. Sheet M3.1:
 - 1. Various schedules have been revised, including:
 - a. AIR HANDLING UNIT SCHEDULE
 - b. ROOF TOP UNIT SCHEDULE
 - c. DX MINI-SPLIT SCHEDULE
 - d. FAN SCHEDULE
 - e. ROOF CAP SCHEDULE
 - 2. – Refer to attached.

IV. Electrical:

- A. Sheet ED1.1 – Revised layout, refer to attachment.
- B. Sheet ES1.1 – Revised layout, refer to attachment.
- C. Sheet ES2.1 – Revised layout, refer to attachment.
- D. Sheet E4.1 – Revised layout, refer to attachment.
- E. Sheet E5.1 – Revised layout, refer to attachment.
- F. Sheet E6.1 – Revise keyed note#3 from 1.25"C to 2"C. Route conduit to a full wall and to above ceiling level.
- G. Sheet E6.1 – Revised layout, refer to attachment.

- H. Sheet E7.1 – Revise keyed note #3 from 1.25" to 2"C. Route conduit to a full wall and to above ceiling level.
- I. Sheet E7.1 – Revised layout, refer to attachment.
- J. Sheet E8.1 - Electrical legend, revise model number for floor box from rectangular cover to round cover. The floobox new model number shall be CFB4G30RCR-CFBHUB2 with round cover # CFBS1R8CVRALU. Everything else stays the same.
- K. Sheet E8.1 – Lighting Control sensors legend device OS3 and OS4 shall require a $\frac{3}{4}$ "C.
- L. Sheet E9.1 – Existing Schematic diagram – Remove the phases. The project will not be done in phases. Coordinate all removal with owner prior to any work. The electrical gear keyed note#3 and 5 shall be return to owner.
- M. Sheet E9.1 – Panel-DPC, circuit serving RTU-C1 breaker shall be revise from 30Amp 3-pole to 45Amp 3-pole breaker. Circuit wiring shall be 4#6, 1#8G, 1"C.
- N. Sheet E9.1 – Panel-DPB, revise KAIC rating to 30. Circuit wiring serving RTU-B2,B3,B4,B5 shall be 4#6, 1#8G, 1"C.
- O. Sheet E9.1 – Panel-DPB, circuit serving RTU-B1 breaker shall be revise from 30Amp 3-pole to 45Amp 3-pole breaker. Circuit wiring shall be 4#6, 1#8G, 1"C.
- P. Sheet E9.1 – Panel-DPA, revise KAIC rating to 30.
- Q. Sheet E9.1 – Panel-DPA, circuit serving CU-A1 breaker shall be revise from 45Amp 3-pole to 60Amp 3-pole breaker. Circuit wiring shall be 3#6, 1#10G, 1"C.
- R. Sheet E9.1 – Panel-DPA, add circuit for FCCU-A2 on #28 and 30. Provide a 20Amp 2-pole breaker with circuit wiring 3#8, 1#10G, $\frac{3}{4}$ "C.
- S. Sheet E9.1 – Disconnect schedule – RTU-B1,C1 disconnect size shall be 60Amp, 3-phase, 4W, N4X, 208V, s/n, HD, fused.
- T. Sheet E9.1 – Disconnect schedule – Add FCCU-A2, provide a 30Amp, single phase, 3w, N4x, 208V, s/n, HD fused disconnect.
- U. Sheet E9.1 – Electrical schematic diagram – Add the following to keyed note#1, Switchboard shall include color coded Generator incoming power quick connect receptacles, male. The enclosure shall be nema-3R 304 stainless steel.
- V. Sheet E10.2 – panel DPR, circuit serving RTU-PR1, revise breaker size from 45Amp to 30Amp 3-pole breaker.

V. Plumbing: n/a

VI. Fire Protection: n/a

SECTION 23 09 00 – Instrumentation & Controls for HVAC

PART 1: GENERAL

1.0 SECTION INCLUDES

- .1 Products Furnished But Not Installed Under This Section
- .2 Products Installed But Not Furnished Under This Section
- .3 Products Not Furnished or Installed But Integrated with the Work of this Section
- .4 Related Sections
- .5 Description
- .6 Approved Control System Contractor
- .7 Quality Assurance
- .8 Codes and Standards
- .9 System Performance
- .10 Submittals
- .11 Warranty
- .12 Ownership of Proprietary Material

1.1 PRODUCTS THAT MAY BE FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Division 23 - Ductwork Accessories:
 - 1. Automatic Dampers Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
 - a) Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4" larger than damper dimensions and shall be square, straight, and level.
 - b) Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be equal $\pm 1/8"$.
 - c) Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
 - d) Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
 - e) Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
 - f) Provide a visible and accessible indication of damper position on the drive shaft end.
 - g) Support duct-work in area of damper when required to prevent sagging due to damper weight.
 - h) After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.
 - 2. Airflow Stations
 - 3. Terminal Unit Controls

1.2 RELATED SECTIONS

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- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and shall be used in conjunction with this Section as a part of the Contract Documents. Consult them for further instructions pertaining to this work.

1.3 DESCRIPTION

The system shall be a Trane Enterprise Server (ES) control system as indicated on the drawings and described in the specifications. Tie in of New SC Building Controllers to existing ES TRANE System at City of Brownsville. Control functions within a building site shall be performed by localized direct digital controls linked through a peer-to-peer network of building controllers. The system shall provide a web-based user interface and be designed to integrate multiple BACnet-based systems together, collect, store and display historical data and provide enterprise-wide or multiple building facilities management capabilities from a central storage and operational location.

An operator shall be able to logon to the system using a standard web browser, and without requiring system vendor-proprietary software installed on the user's PC to allow access to all appropriate data and control functions.

- A. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of systems defined for control on this project.
- B. The control system shall accommodate simultaneous multiple user operation. Access to the control system data should be limited by operator password. An operator shall be able to log onto any workstation of the control system and have access to all designated data.
- C. The control system shall be designed such that each mechanical system will operate under stand-alone control. As such, in the event of a network communication failure, or the loss of other controllers, the control system shall continue to independently operate the unaffected equipment.
- D. Communication between the control panels and all workstations shall be over a high-speed network. All nodes on this network shall be peers. A network communications card shall be provided for each building control panel provided as part of the system installation. All network protocol standards shall utilize ASHRAE BACnet MSTP at the controller level & BACnet IP at the Enterprise Level.

1.4 APPROVED CONTROL SYSTEM CONTRACTORS AND MANUFACTURERS

- A. Approved Control System Contractors and Manufacturer:
 - a. TRANE
 - b. SCHNEIDER TAC
 - c. AUTOMATED LOGIC CORP
 - d. JOHNSON CONTROLS
 - e. CLIMATECH
- 1. The above list of manufacturers applies to centralized server software, operator workstation configuration tool software, building controller software, the custom application programming language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.5 QUALITY ASSURANCE

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- A. System Installer Qualifications
1. The Installer shall have an established working relationship with the Control System Manufacturer of not less than three years.
 2. The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.
 3. The installer shall have an office within 30 miles of the project site and provide [24-hour] response in the event of a customer call.

1.6 CODES AND STANDARDS

- A. Work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of local, state and federal authorities. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:
1. National Electric Code (NEC)
 2. International Building Code (IBC)
 3. International Mechanical Code (IMC)
 4. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
 5. ANSI UL 864 UUKL Smoke Management

1.7 SYSTEM PERFORMANCE

- A. Data values displayed on web pages (that represent live data) shall automatically refresh at a minimum rate of every 10 seconds in the browser without refreshing the entire page.
- B. Data on web pages must be returned and updated on a given web page within 5 seconds on average after the web page is initially delivered, subject to network loading.
- C. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points with current data displayed within 10 seconds of the request.
- D. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
- E. Multiple Alarm Annunciations. Any authorized operator shall be able to view alarms through a web page interface, with up to 40 concurrent users accessing the system alarm data.
- F. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

Table 1
Reporting Accuracy

Measured Variable	Reported Accuracy
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Space Temperature	± 1° F
Ducted Air	± 2° F
Outside Air	± 2° F
Water Temperature	±1° F
Delta-T	±0.25° F
Relative Humidity	± 5% RH
Water Flow	± 5% of full scale
Air Flow (terminal)	± 10% of reading *Note 1
Air Flow (measuring stations)	± 5% of reading
Air Pressure (ducts)	± 0.1 "W.G.
Air Pressure (space)	± 0.01 "W.G.
Water Pressure	± 2% of full scale *Note 2
Electrical Power	± 5% of reading *Note 3
Carbon Monoxide (CO)	± 5% of reading
Carbon Dioxide (CO2)	± 50 PPM

Note 1: Within (10%-100% of scale)

Note 2: For both absolute and differential pressure

Note 3: Not including utility supplied meters

1.10 SUBMITTALS

- A. Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software to be provided. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications. **Six (6) copies** are required.
- B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the contractor from furnishing quantities required for completion.
- C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.
- D. Submit the following **within 60 days** of contract award:
 1. A complete bill of materials of equipment to be used indicating quantity, manufacturer and model number.
 2. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
 3. A schedule of all control dampers. This shall include the damper size, pressure drop, manufacturer and model number.
 4. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover. Include:

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- a) Centralized server hardware and software
 - b) Building Controllers
 - c) Custom Application Controllers
 - d) Application Specific Controllers
 - e) Operator Interface Computer(s) as specified
 - f) Configuration and service software programs
 - g) Portable Operator Workstation(s) or Service software PCs as specified
 - h) Auxiliary Control Devices
 - i) Proposed control system riser diagram showing system configuration, device locations, addresses, and cabling
 - j) Detailed termination drawings showing all required field and factory terminations. Terminal numbers shall be clearly labeled
 - k) Points list showing all system objects, and the proposed English language object names
 - l) Sequence of operations for each system under control. This sequence shall be specific for the use of the Control System being provided for this project
 - m) Provide a BACnet Product Implementation Conformance Statement (PICS) for each BACnet device type in the submittal
 - n) Color prints of proposed graphics with a list of points for display
- E. Project Record Documents. Upon completion of installation submit **three (3) copies** of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:
- 1. Project Record Drawings. These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .DWG or .DXF drawing files shall also be provided.
 - 2. Testing and Commissioning Reports and Checklists.
 - 3. Operating and Maintenance (O & M) Manual. These shall be as-built versions of the submittal product data. In addition to that required for the submittals, the O & M manual shall include:
 - a) Names, address and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representative of each.
 - b) Operators Manual with procedures of operating the control systems including logging on/off, alarm handling, producing point reports, trending data, overriding computer control, and changing set points and other variables.
 - c) Programming Manual with a description of the programming language including syntax, statement descriptions including algorithms and calculations used, point database creation and modification, program creation and modification, and use of the editor.
 - d) Engineering, Installation and Maintenance Manual(s) that explains how to design and install new points, panels, and other hardware; preventative maintenance and calibration procedures; how to debug hardware problems; and how to repair or replace hardware.
 - e) A listing and documentation of all custom software created using the programming language including the point database. One set of magnetic media containing files of the software and database shall also be provided.
 - f) One set of electronic media containing files of all color-graphic screens created for the project.
 - g) Complete original issue documentation, installation, and maintenance information for all third party hardware provided including computer equipment and sensors.
 - h) Complete original issue media for all software provided including operating systems, programming language, operator workstation software, and graphics software.
 - i) Licenses and warranty documents for all equipment and systems.

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- j) Recommended preventive maintenance procedures for all system components including a schedule of tasks, time between tasks, and task descriptions.
- F. Training Materials: The Contractor shall provide a course outline and training material for all training classes at least six weeks prior to the first class. The Owner reserves the right to modify any or all of the training course outline and training materials. Review and approval by Owner and Engineer shall be completed at least 3 weeks prior to first class.

1.11 WARRANTY

- A. Warrant all work as follows:
 - 1. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
 - 2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of warranty.
 - 3. Central server and configuration tool software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during warranty period. Written authorization by Owner must, however, be granted prior to the installation of such changes.
 - 4. The system provider shall provide a web-accessible on-line resource that provides the Owner access to a question/answer forum, graphics library, user tips, upgrades, and manufacturer training schedules.

1.12 OWNERSHIP OF PROPRIETARY MATERIAL

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

PART 2: PRODUCTS

2.0 SECTION INCLUDES

- .1 Materials
- .2 Communication
- .3 Operator Interface
- .4 Application and Control Software
- .5 Building Controllers
- .6 Custom Application Controllers

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- .7 Application Specific Controllers
- .8 Input/Output Interface
- .9 Auxiliary Control Devices

2.1 MATERIALS

All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations. The installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing. Spare parts shall be available for at least 5 years after completion of this contract

2.2 COMMUNICATION

A. Wireless equipment controllers and auxiliary control devices shall conform to:

1. IEEE 802.15.4 radios to minimize risk of interference and maximize battery life, reliability, and range.
2. Operating range shall be a minimum of 200 feet; open range shall be 2,500 ft. (762 m) with less than 2% packet error rate.
3. To maintain robust communication, mesh networking and two-way communications shall be used to optimize the wireless network health.
4. Certifications shall include FCC CFR47 - RADIO FREQUENCY DEVICES - Section 15.247 & Subpart E
5. Shall be ZigBee Building Automation Certified to allow wireless integration with products from multiple suppliers.
6. To support network setup and troubleshooting, service tools shall display link quality and hop quantities for each wireless device.
7. Wireless service tool access to comm link shall be provided to minimize installation and trouble shooting labor.

B. All database values (i.e., points, software variable, custom program variables) of any one building controller shall be readable by any other building controller on the internetwork. An operator/installer shall not be required to set up any communications services to perform internetwork value passing.

2.3 OPERATOR INTERFACE

A. PC-based workstations on the owner's intranet/internet shall have WEB based access to the system based on username & password authority levels.

B. Provide a web browser user interface. There shall be no vendor-proprietary software required to be installed on user PCs.

1. The system shall provide summary tables by equipment type per site. Room or space summary tables shall provide names, space temperatures, setpoints, and variance from setpoint. Provide a means to sort columns of data viewed by ascending or descending value for any chosen data type.
2. The system shall provide a user option to reformat summary tables and information for printing.
3. The central server shall be capable of presenting selected data parameters such that they may be viewed and changed by the user. For example, adjustable data parameters may include space temperature setpoints, relative humidity setpoints, discharge air setpoints, static pressure setpoints,

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4. Provide the ability to reset diagnostic messages and perform control overrides
- C. Central Server Components. The central server shall consist of the following (minimum):
1. System shall utilize a server class PC, tower or rack mounted
 2. Two Xeon 2.8GHz, 1MB L3 cache processors
 3. 2GB, DDR266 SDRAM memory
 4. Four (4) 73GB SCSI HD (each) in RAID 5 or RAID 10 configuration
 5. DVD+R/W or CD ROM
 6. Microsoft Windows Server 2003 (IIS 6.0)
 7. Microsoft SQL Server 2005
 8. NET Framework 1.1
 9. Furnish all required serial, parallel, and network communication ports, and all cables for proper system operation. The server shall include a minimum 17", color monitor with 1024 x 768 screen resolution.
- D. System Software
1. System Graphics. The operator interface shall provide graphically-oriented web pages as designated. Two dimensional graphics are strictly prohibited.
 - a) 3D Area Map
 - b) 3D Equipment Graphics with Animation
 - c) 3D Extruded Thermal Graphic Floor Plans showing ductwork runs, registers & equipment locations.
 - d) Lighting Floor Plan Graphics
 - e) Fire Alarm Floor Plan Graphics
 - f) Integrated System Graphics
 - g) Provide a method for the operator to easily move between graphic displays on the screen.
 - h) The system must dynamically generate and serve web pages based on standard or custom web page templates in combination with content derived from the database in any building control panel.
 - i) Dynamic points shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation of equipment.
 2. Engineering Units. Allow for selection of the desired engineering units (i.e. Inch pound or SI) in the system. Unit selection shall be able to be customized by user to select the desired units for each measurement.
 3. Site Management
 - a) The system must allow for grouping of the many sites in an enterprise in a logical manner.
 - b) The system shall provide a search function to allow users to search for sites or groups of sites by name or partial names.
 - c) The system must provide the necessary means to add, remove, and manage sites.
- E. System Applications. The central server shall serve operator interface web pages and provide off-line storage of system information. Provide the following applications within the system.
1. Automatic System Database Save and Restore. The central server shall store on the hard disk backup tables of data including trends, alarms, custom settings and user profiles. This data shall be backed up once a day. This database shall be updated whenever a change is made in the system. The storage of this data shall be automatic and not require operator intervention.
 2. Manual Database Save and Restore. A system operator with the proper password clearance shall be able to archive the database manually at any time.
 3. System Configuration. The central server shall serve web pages as the interface for configuring the operator-level functions of the system. A user with proper security shall be able to configure the system to allow for future changes or additions.

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4. On-Line Help and Training. Provide a context sensitive, on line help system to assist the operator in operation and editing of the system. On-line help shall be available for all system functions and shall provide the relevant data for that particular screen. Additional help shall be available through the use of hypertext links onscreen.
5. Security. The system shall support state-of-the-art encryption between server and web browser. Web browser interface shall utilize Secure Socket Layer SSLv3 encryption technology. Web server shall utilize TLS encryption. Server security shall accommodate a minimum of 1000 individually password protected users. Each user shall be assigned a user name and password and security level. User names and passwords shall be case sensitive and able to have up to 32 characters. User security shall be set up through the web browser as an administrative function. Each user will be assigned to a security level. Security levels shall be hierarchical in nature – the higher security levels have all rights of lower levels. There shall be at least four (4) user security levels corresponding to user roles. A System Administrator shall be able to define the data view and edit capabilities for each security level. Users shall be automatically logged off of the system after a specified period of inactivity.
6. System Diagnostics. The system shall automatically monitor the operation of all workstations, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
7. Alarm Management - The central server shall provide the following alarm handling functions:
 - a) Receiving alarms from each building panel.
 - b) The central server shall store specified alarms in an alarm log database.
 - c) Displaying an alarm log.
 - d) Forward alarms via e-mail as specified by the user.
 - e) Alarm sorting and/or filtering by alarm and/or site attribute.
 - f) Store alarm data in a standard format accessible to a user-specified peer database/server.
 - g) Storing and purging the alarm log.
 - h) Provide a means of acknowledging and deleting alarms from the viewable alarm log(s).
 - i) Provide a printer-friendly format for printing alarm logs.
8. Alarm and Event Log. The operator shall be able to view all logged system alarms and events from any location in the system. An operator with the proper security level may acknowledge and clear alarms. All that have not been cleared by the operator shall be archived to the hard disk on the central server.
9. Trend Logs. The operator shall be able to define a trend log for any data in the system. This definition shall include interval, start-time, and stop-time. Trend intervals of 1, 5, 15, 30, and 60 minutes as well as user-defined intervals shall be selectable. The system operator shall be able to determine how many samples are stored in each trend. Trend data shall be sampled and stored on the Building Controller panel, then harvested and be archived on the central server hard disk. Additionally, provide the capability to sample directly from the building controller database to the central server. Trend data shall be able to be viewed and printed from the operator interface web pages. Trends must be viewable in a text-based format or graphically. Trends shall also be storable in a tab delimited ASCII format for use by other industry standard word processing and spreadsheet packages, and be exportable to a file for use in other software tools, available in a non-proprietary file format to be used by another database.
10. Dynamic Graphical Trending. The system shall have the ability to display collected data in a graphical chart. Trend viewing capabilities shall include the ability to show up to 5 points on a chart. Each data point trend line shall be an individual color. Trend data shall be able to be stored indefinitely on the central server, based on server storage capacity and data archiving practices.
11. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object and property in the system.
12. Reports and Logs. Provide a reporting function that presents the system operator stored data in either a table format, as a chart, or as a report that can be printed. Data in a table format

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shall list the data values as well as a date and time stamp. Allow the user to present data log pages of a collection from a single piece of equipment or a building panel summary. Provide the ability to view data points on a static graph or configured for a specified length of time. The system shall be capable of storing trend data in a database, and providing an interface to allow for retrieval of data by network peer servers and databases.

- F. Workstation Applications Editors. The system web user interface shall support dedicated screens for editing of control system applications. The application programs shall be executed at the appropriate controller panels.
- G. Scheduling. An editor for an enterprise-wide scheduling application shall be provided. Provide a method by which a system operator can make permanent changes to one or many building schedules without the need to repeat any steps. The system shall provide temporary changes to one or more schedules at one or more building locations.
 - 1. Manual Control and Override. Provide a means of manually controlling analog and binary output points.
 - 2. Air System Equipment Coordination. Provide a control application and user interface pages that summarize the monitoring and control functions that group together and coordinates the operation of air handling equipment and associated VAV boxes as specified in the sequence of operations. For each air system, status pages shall include:
 - a) System mode of the air handling system
 - b) Listing and assignment of the associated air handler and VAV boxes
 - c) AHU supply air cooling and heating setpoints
 - d) AHU minimum, maximum and nominal static pressure setpoints
 - e) VAV box minimum and maximum flow
- H. Provide software configuration tools [installed on operator PCs and/or Portable Operator's Terminals as designated] to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. The system shall be fully operable while custom routines are edited, compiled, and downloaded.
- I. Mobil Access & Web Interface compatibility
 - 1. Provide access to an Apple Application from the Apple Store to view/modify schedules & setpoints remotely
 - 2. System shall be Safari compliant and shall be fully functional on Apple iPads, iPhones and other Safari devices
- J. Provide one Apple iPad with 64GB Memory, WYFY and Cellular capability for the owner to remotely view/modify system parameters.
- K. Portable Operator's Terminal. Furnish [1] Portable Operator's Terminal [including software configuration tools] that shall be capable of accessing all system data. This device may be connected to any point on the system internetwork or may be connected directly to any controller for programming, set-up, and troubleshooting.
 - 1. 1.7 GHz Intel Pentium Processor
 - 2. 512 MB RAM
 - 3. 40 Gigabyte Hard File
 - 4. 24X CD ROM Drive
 - 5. Windows XP Professional operating system
 - 6. 14" color display with minimum 1024 x 768 resolution

2.4 APPLICATION AND CONTROL SOFTWARE

- A. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at operator workstations served web-based user interface pages.
- B. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, and optimal start actions. When a group of objects are scheduled together, provide the capability to define advances and delays for each member.
- C. Optimal Start. The scheduling application shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less than and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.
- D. Demand Limiting. The demand limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter, or from a watt transducer or current transformer attached to the building feeder lines.
 - 1. The demand limiting program shall be based on a predictive sliding window algorithm. The sliding window duration and sampling interval shall be set equal to that of the local Electrical Utility.
 - 2. Control system shall be capable of demand limiting by resetting HVAC system setpoints to reduce load while maintaining a widened band of comfort control in the space.
 - 3. Input capability shall also be provided for an end-of-billing period indication.
- E. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts, and/or calendar date limits.
- F. PID Control. A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-wind-up shall be supplied. The algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs. The controlled variable, set-point, and PID gains shall be user-selectable. The setpoint shall optionally be chosen to be a reset schedule.
- G. Timed Override. A standard application shall be utilized to enable/disable temperature control when a user selects on/cancel at the zone sensor, workstation, or the operator display. The amount of time that the override takes precedence will be selectable from the workstation.
- H. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started; along with the time delay between starts shall be user-selectable.
- I. System Calculations. Provide software to allow instantaneous power (e.g. KW), flow rates (e.g. L/s [GPM]) to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window KW demand value. Provide an algorithm that calculates energy usage and weather data (heating and cooling degree days). These items shall all be available for daily, previous day, monthly and the previous month.
- J. Anti-Short Cycling. All binary output points shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

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K. Demand Control Ventilation

1. The AHU outdoor-air damper shall be controlled to deliver required outdoor airflow at all load conditions. The outdoor airflow setpoint shall be determined according to ASHRAE Standard 62-2001, Equation 6-1 [or ASHRAE Standard 62.1-2004, Equation 6-8 and Appendix A]The actual outdoor airflow shall be sensed at the outdoor air intake.
2. The BAS shall include a time-of-day schedule to indicate whether a zone is normally occupied or unoccupied. When the schedule indicates that the zone is normally unoccupied, the required outdoor airflow for the zone shall be zero. When the schedule indicates that the zone is normally occupied, the required outdoor airflow for the zone shall equal the design outdoor airflow (based on design occupancy), unless the zone is equipped with an occupancy sensor and/or a carbon dioxide (CO₂) sensor.
 - a. For those zones equipped with an occupancy sensor, the required outdoor airflow for the zone shall be continuously determined based on whether people are present or not. When the occupancy sensor indicates that people are present in the zone, the required outdoor airflow shall equal the design outdoor airflow. When the occupancy sensor indicates that no people are present in the zone, the required outdoor airflow shall equal the "occupied standby" outdoor airflow.
 - b. For those zones equipped with a CO₂ sensor, the required outdoor airflow for the zone shall be continuously calculated using the measured CO₂ concentration as an indicator of the current per-person ventilation rate.
3. The required outdoor-air fraction shall be continuously calculated for each VAV terminal zone. Outdoor-air fraction is defined as the current required outdoor airflow for the zone divided by the current primary airflow to the zone.
4. The BAS shall regularly determine the highest zone outdoor-air fraction, sum the outdoor airflow requirements for all VAV zones, and sum the current primary airflows for all VAV zones to determine the total system primary airflow. This information shall be used in Equation 6-1 of ASHRAE Standard 62-2001 [or Equation 6-8 and Appendix A of ASHRAE Standard 62.1-2004] to calculate the minimum required outdoor airflow for the system. This minimum outdoor airflow setpoint shall be recalculated every 15 minutes (adj).
5. The VAV Air System shall not request a higher percentage of outdoor air than the AHU is able to provide. This Ventilation Ratio Limit (adj.)of the AHU is dependent on the capacity of the AHU and the current outdoor air temperature and humidity conditions.
6. Prior to final system acceptance, a contractor shall provide a trend log of actual system operation to the engineer and owner. Operating conditions to be logged include: highest zone outdoor-air fraction, total system primary airflow, calculated outdoor airflow setpoint for the system, and the actual measured outdoor airflow. These conditions must be logged at 15-minute intervals over a typical 48-hour period.

L. Duct Static Pressure Optimization

1. The building automation system (BAS) shall continuously monitor the damper position of all VAV terminal units. The discharge duct static pressure shall be sensed directly at the discharge of each air handler. The sensor must be mounted in a non-turbulent location.
2. When any VAV damper is more than 75% (adj.) open, the supply fan discharge duct static pressure setpoint shall be reset upward by 0.1 in W.C. (adj.), at a frequency of 15 minutes (adj.), until no damper is more than 75% open or the static pressure setpoint has reset upward to the system maximum duct static pressure setpoint or the AHU variable-frequency drive is at the maximum speed setting.
3. When all VAV dampers are less than 65% (adj.) open, the supply fan discharge duct static pressure setpoint shall be reset downward by 0.1 in W.C.(adj.), at a frequency of 15 minutes (adj.), until at least one damper is more than 65% open or the static pressure setpoint has reset downward to the system minimum duct static pressure setpoint or the AHU variable-frequency drive is at the minimum speed setting.

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4. The control bands, setpoint increment values, setpoint decrement values and adjustment frequencies shall be adjusted to maintain maximum static pressure optimization with stable system control and maximum comfort control.
 5. The BAS shall have the capability to allow the operator to exclude “problem” zones that should not be considered when determining the optimized setpoint.
 6. The BAS shall also read the status of the supply air static pressure sensor and display the active duct static pressure reading on the status screen.
 7. The BAS shall have the ability to identify, and display to the user, the VAV box that serves the Critical Zone (that is, the zone with the most wide-open VAV damper). This information shall update dynamically as the location of the Critical Zone changes based on building load, and duct static pressure setpoint optimization control.
 8. During the commissioning process, the controls contractor shall demonstrate the performance of fan pressure optimization program report with associated balance parameters.
- M. The building automation system shall provide the ability to automatically commission and calibrate the VAV Air System. The following tests shall be performed, at a minimum:
1. Calibration of the air valve / damper
 2. Verification of air flow through the VAV box
 3. Verification of local reheat performance for Hydronic heating
 4. The building automation system (BAS) shall provide the ability to initiate the auto-commissioning /auto-calibration command directly from the user interface. Special service tools shall not be required.
 5. The BAS shall provide the ability to stagger the auto-commissioning /auto-calibration sequence for groups of VAV boxes to allow the sequence to be performed during occupied hours, if necessary.
 6. An auto-commissioning report for the VAV Air System shall be generated that contains the results of the auto-commissioning / auto-calibration tests. This report shall contain, at a minimum, the following information for each VAV box in the system:
 - a) Name of VAV box
 - b) Date and time the VAV box was tested
 - c) Presence of any alarms
 - d) Space temperature and setpoint
 - e) Active airflow (in CFM)
 - f) Air valve / damper position when the VAV box reaches 40% of the maximum cooling airflow setpoint
 - g) Air valve / damper position when the VAV box reaches 100% of the maximum cooling airflow setpoint

2.5 BUILDING GLOBAL CONTROLLERS

- A. General. Provide Building Controllers to provide the performance specified in section 1 of this division. Each of these panels shall meet the following requirements.
1. The Building Automation System shall be composed of one or more independent, standalone; microprocessor based Building Controllers to manage the global strategies described in System software section.

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2. **The Building Controller shall be UL 864 UUKL Certified for use in Smoke control systems. BUILDING CONTROLLERS THAT ARE NOT UL 864 CERTIFIED SHALL BE STRICTLY PROHIBITED.**
 3. The Building Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 4. The controller shall provide a communications port for connection of the Portable Operators Terminal.
 5. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
 6. Controllers that perform scheduling shall have a real time clock.
 7. Data shall be shared between networked Building Controllers.
 8. The Building Controller shall utilize industry recognized open standard protocols for communication to unit controllers.
 9. The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
 - a) Assume a predetermined failure mode.
 - b) Generate an alarm notification.
 - c) Create a retrievable file of the state of all applicable memory locations at the time of the failure.
 - d) Automatically reset the Building Controller to return to a normal operating mode.
- A. Communications. Each Building Controller shall reside on the enterprise-wide network, which is same high-speed network as the central server and PC workstations. The enterprise-wide network will be provided by the owner and supports the Internet Protocol (IP). Local connections of the Building Controller shall be on ISO 8802-3 (Ethernet). ***Each Building Controller shall support BACnet IP, BACnet MSTP & LON Protocols simultaneously. Building Controllers that cannot support both BACnet & LON protocols are strictly prohibited.***
- B. Controller hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at 0° C to 50° C [32° F to 120° F].
- C. Serviceability. Provide diagnostic LEDs for power, communications, and processor. The Building Controller shall have a display on the main board that indicates the current operating mode of the controller. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable. The primary logic board shall be removable without disconnecting field wiring.
- D. Memory. The Building Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
- E. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage.
- F. Building Controller Operator Display. Each building controller shall include an operator display allowing the user to perform basic daily operations tasks on the building automation system. At a minimum this operator display shall:
1. Be installed on the building controller and require no additional power source.
 2. Consist of a one-quarter VGA touch screen with 320 X 240-pixel resolution. The brightness and the contrast of the backlit touch screen shall be adjustable to allow for easy reading of information on the screen.
 3. Be capable of having unique user identification and passwords that can be programmed to limit access to the system and operator functions.

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4. Display the current state of an input/output point and equipment controller connected to the system.
5. Give the operator the ability to override the current state of an output point or HVAC equipment controller connected to the building controller.
6. Allow the operator to modify the start and stop times of any time-of-day schedule within the system.
7. Provide a visual indication that a system alarm exists and allow for an optional audible alarm annunciation.
8. Provide the ability to view and acknowledge alarms that are annunciated at that building controller.
9. Allow the operator to view custom graphical displays with dynamic status information.
10. Automatically update displayed system information every 10 seconds.

2.6 CUSTOM APPLICATION CONTROLLERS

- A. Provide Custom Application Controllers as needed to provide the performance specified in section 1 of this division. Each of these panels shall meet the following requirements.
 1. The Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 2. **Custom Application Controllers shall be UL 864 UUKL Certified for use in Smoke control systems. CUSTOM APPLICATION CONTROLLERS THAT ARE NOT UL 864 CERTIFIED SHALL BE STRICTLY PROHIBITED.**
 3. Controllers that perform scheduling shall have a real time clock.
 4. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
 5. The Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode, and generate an alarm notification.
- B. Controller hardware shall be suitable for the anticipated ambient conditions.
 1. Controller used in conditioned ambient shall be mounted in NEMA 1 type enclosures, and shall be rated for operation at 0° C to 50° C [32° F to 120° F].
 2. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° C to 70° C [-40° F to 158° F].
- C. Provide diagnostic LEDs for power, communications, and processor. All low voltage wiring connections shall be made such that the controller electronics can be removed and/or replaced without disconnection of field termination wiring.
- D. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.
- E. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.

2.7 APPLICATION SPECIFIC CONTROLLERS

- A. General. Application specific controllers (ASC) are microprocessor-based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user programmable, but are customized for operation within the confines of the equipment they are designed to serve.

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1. Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
 2. Each ASC will contain sufficient I/O capacity to control the target system.
- B. Application Specific Controllers shall be UL 864 UUKL Certified for use in Smoke control systems. APPLICATION SPECIFIC CONTROLLERS THAT ARE NOT UL 864 CERTIFIED SHALL BE STRICTLY PROHIBITED.**
- C. Environment.** The hardware shall be suitable for the anticipated ambient conditions.
1. Controller used in conditioned ambient spaces shall be mounted in NEMA 1 type rated enclosures. Controllers located where not to be disturbed by building activity (such as above ceiling grid), may be provided with plenum-rated enclosures and non-enclosed wiring connections for plenum cabling. All controllers shall be rated for operation at 0° C to 50° C [32° F to 120° F].
 2. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40° C to 65° C [-40° F to 150° F].
- D. Serviceability.** Provide diagnostic LEDs for power and communications. All wiring connections shall be clearly labeled and made to be field removable.
- E. Memory.** The Application Specific Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.
- F. Immunity to Power and noise.** Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%.
- G. Transformer.** Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

2.8 INPUT/OUTPUT INTERFACE

- A.** Hard-wired inputs and outputs may tie into the system through Building, Custom, or Application Specific Controllers.
- B.** All input points and output points shall be protected such that shorting of the point to itself, another point, or ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.
- C.** Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices.
- D.** Pulse accumulation input points. This type of point shall conform to all the requirements of Binary Input points, and also accept up to 3 pulses per second for pulse accumulation, and shall be protected against effects of contact bounce and noise.
- E.** Analog inputs shall allow the monitoring of low voltage (0-10 Vdc), current (4-20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.
- F.** Binary outputs shall provide for on/off operation. Terminal unit and zone control applications may use 2 outputs for drive-open, drive-close (tri-state) modulating control.

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- G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0-10 VDC or a 4-20 mA signal as required to provide proper control of the output device.

2.9 AUXILIARY CONTROL DEVICES

- A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:
1. Damper frames shall be 16 gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.
 2. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.
 3. Damper shaft bearings shall be as recommended by manufacturer for application.
 4. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.
 5. All leakage testing and pressure ratings will be based on AMCA Publication 500.
 6. Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.
- B. Control dampers shall be parallel or opposed blade types as scheduled on drawings.
- C. Electric damper/valve actuators.
1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
 2. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
 3. All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.
 4. Proportional actuators shall accept a 0-10 VDC or 0-20 mA control signal and provide a 2-10 VDC or 4-20 mA operating range.
 5. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
 6. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
 7. Actuators shall be Underwriters Laboratories Standard 873 listed.
 8. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.
- D. Control Valves
1. Control valves shall be two-way or three-way type for two-position or modulating service as scheduled or shown.
 2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - a) Water Valves:
 - i. Two-way: 150% of total system (pump) head.
 - ii. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 - b) Steam Valves: 150% of operating (inlet) pressure.

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3. Water Valves:

- a) Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
- b) Sizing Criteria:
 - i. Two-position service: Line size.
 - ii. Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or [5] psi, whichever is greater.
 - iii. Three-way Modulating Service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), [5] psi maximum.
 - iv. Valves 1/2" through 2" shall be bronze body or cast brass ANSI Class 250, spring loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.
 - v. 2-1/2" valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.
- c) Water valves shall fail normally open or closed as scheduled on plans or as follows:
 - i. Heating coils in air handlers - normally open.
 - ii. Chilled water control valves - normally closed.
 - iii. Other applications - as scheduled or as required by sequence of operation.
- d) Zone valves shall be sized to meet the control application and they shall maintain their last position in the event of a power failure.

4. Steam Valves:

- a) Body and trim materials shall be per manufacturer's recommendations for design conditions and service. Linear ports for modulating service.
- b) Sizing Criteria:
 - i. Two-position service: pressure drop 10% to 20% of inlet psig.
 - ii. Modulating service 15 psig or less: pressure drop 80% of inlet psig.
 - iii. Modulating service 16 to 50 psig: pressure drop 50% of inlet psig.
 - iv. Modulating service over 50 psig: pressure drop as scheduled on plans.

E. Binary Temperature Devices

1. Low-Voltage Space Thermostats shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented cover.
2. Line-Voltage Space Thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented cover.
3. Low-Limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

F. Temperature Sensors

1. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.
2. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 1.5m [5 feet] in length.
3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
4. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.1 C [0.2 F].
5. ***The space temperature, setpoint, and override confirmation will be annunciated by a digital display for each zone sensor. The setpoint will be selectable utilizing buttons.***

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G. Humidity Sensors

1. Duct and room sensors shall have a sensing range of 20% to 80% with accuracy of $\pm 5\%$ R.H.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% R.H. It shall be suitable for ambient conditions of -40°C to 75°C [-40°F to 170°F].
4. Humidity sensor's drift shall not exceed 1% of full scale per year.

H. Static Pressure Sensors

1. Sensor shall have linear output signal. Zero and span shall be field-adjustable.
2. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.
3. Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 mA output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.
4. Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 mA output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

I. Low Limit Thermostats

1. Safety low limit thermostats shall be vapor pressure type with an element 6m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any one foot section.
2. Low limit shall be manual reset only.

J. Carbon Dioxide (CO₂) Sensors

1. Carbon Dioxide sensors shall measure CO₂ in PPM in a range of 0-2000 ppm. Accuracy shall be $\pm 3\%$ of reading with stability within 5% over 5 years. Sensors shall be duct or space mounted as indicated in the sequence of operation.

K. Flow Switches

1. Flow-proving switches shall be either paddle or differential pressure type, as shown.
2. Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 Type enclosure unless otherwise specified.
3. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 Type enclosure, with scale range and differential suitable for intended application, or as specified.
4. Current sensing relays may be used for flow sensing or terminal devices.

L. Relays

1. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

M. Transformers and Power Supplies

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1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
3. Unit shall operate between 0° C and 50° C.
4. Unit shall be UL recognized.

N. Current Switches

1. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

O. Local Control Panels

1. All indoor control cabinets shall be fully enclosed NEMA 1 Type construction with hinged door, and removable sub-panels or electrical sub-assemblies.
2. Interconnections between internal and face-mounted devices shall be pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
3. Provide on/off power switch with over-current protection for control power sources to each local panel.

PART 3: EXECUTION

3.0 SECTION INCLUDES:

- .1 Examination
- .2 Protection
- .3 General Workmanship
- .4 Field Quality Control
- .5 Central Server Installation
- .6 Wiring
- .7 Fiber Optic Cable
- .8 Installation of Sensors
- .9 Flow Switch Installation
- .10 Actuators
- .11 Warning Labels
- .12 Identification of Hardware and Wiring
- .13 Controllers
- .14 Programming
- .15 Cleaning
- .16 Training
- .17 Acceptance

3.1 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

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- B. The contractor shall inspect the site to verify that equipment is installable as shown, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

3.2 PROTECTION

- A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 GENERAL WORKMANSHIP

- A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible location as defined by chapter 1 article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.4 FIELD QUALITY CONTROL

- A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.5 CENTRAL SERVER INSTALLATION

- A. The system installer shall perform complete installation and configuration of the following:
 - 1. Server hardware
 - 2. Server operating system
 - 3. Server database software
 - 4. Server application software

3.6 WIRING

- A. All control and interlock wiring shall comply with the national and local electrical codes and Division 16/26 of these specifications. Where the requirements of this section differ with those in Division 16/26, the requirements of this section shall take precedence.
- B. All 120VAC Power to control panels, equipment and ancillary devices shall be provided and installed by Division 16/26.
- C. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that circuits meet NEC Class 2 (current-limited) requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)
- D. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.
- E. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
- F. Where class 2 wiring is run exposed, wiring shall be run parallel along a surface or perpendicular to it, and bundled, using approved wire ties at no greater than 3 m [10 ft] intervals. Such bundled cable shall be fastened to the structure, using specified fasteners, at 1.5 m [5 ft] intervals or more often to achieve a neat and workmanlike result.
- G. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire-to-wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- H. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Control System Contractor shall provide step down transformers.
- I. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
- J. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations in accordance with other sections of this specification and local codes.
- K. Size of conduit and size and type of wire shall be the design responsibility of the Control System Contractor, in keeping with the manufacturer's recommendation and NEC.
- L. Control and status relays are to be located in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.
- M. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.
- N. Adhere to Division 16/26 requirements for installation of raceway.
- O. This Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

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- P. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3' in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.

3.7 FIBER OPTIC CABLE SYSTEM

- A. All cabling shall be installed in a neat and workmanlike manner. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.
- B. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post installation residual cable tension shall be within cable manufacture's specifications.
- C. Fiber optic cabinets, hardware, and cable entering the cabinet shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

3.8 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequate for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Install duct static pressure tap with tube end facing directly down-stream of air flow.
- F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
- G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.
- H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.
- I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.9 FLOW SWITCH INSTALLATION

- A. Use correct paddle for pipe diameter.
- B. Install and adjust flow switch in accordance with manufacturers' instructions.
- C. Assure correct flow direction and alignment.
- D. Mount in horizontal piping - flow switch on top of the pipe.

3.10 ACTUATORS

- A. Mount and link control damper actuators per manufacturer's instructions.
 - 1. To compress seals when spring return actuators are used on normally closed dampers, power actuator to approximately 5 degrees open position, manually close the damper, and then tighten the linkage.
 - 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
 - 3. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

3.11 WARNING LABELS

- A. Affix labels on each starter and equipment automatically controlled through the DDC System. Warning label shall indicate the following:

CAUTION
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

- B. Affix labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects. Labels shall indicate the following:

CAUTION
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

1.12 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1-cm (1/2") letters on nameplates.
- D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.13 CONTROLLERS

- A. Provide a separate Controller for each major piece of HVAC equipment. A custom application controller may control more than one system provided that all points associated with that system

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are assigned to the same controller. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.

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

3.14 PROGRAMMING

- A. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25% of available memory in building controllers free for future use.
- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.
- C. Software Programming
 - 1. Provide programming for the system as written in the specifications and adhere to the sequence strategies provided. All other system programming necessary for the operation of the system but not specified in this document shall also be provided by the Control System Contractor. Imbed into any custom-written control programs sufficient comment statements or inherent flow diagrams to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.
- D. Operators' Interface
 - 1. Enhanced Graphics. Provide graphics for each major piece of equipment and floor plan in the building as indicated in the graphics section.
 - 2. The controls contractor shall provide all the labor necessary to install, initialize, start-up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface database, and any third party software installation and integration required for successful operation of the operator interface.
- E. Demonstration: A complete demonstration and readout of the capabilities of the monitoring and control system shall be performed. The contractor shall dedicate a minimum of 16 hours on-site with the Owner and his representatives for a complete functional demonstration of all the system requirements. This demonstration constitutes a joint acceptance inspection, and permits acceptance of the delivered system for on-line operation.

3.15 CLEANING

- A. This contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.
- B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.

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- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.16 TRAINING

- A. Provide a minimum of [2] classroom training sessions, [4] hours each, throughout the contract period for personnel designated by the Owner.
- B. Train the designated staff of Owner's representative and Owner to enable them to proficiently operate the system; create, modify and delete programming; add, remove and modify physical points for the system, and perform routine diagnostic and troubleshooting procedures.
- C. Additional training shall be available in courses designed to meet objectives as divided into three logical groupings; participants may attend one or more of these, depending on the level of knowledge required:
 - 1. Day-to-day Operators
 - 2. Advanced Operators
 - 3. System Managers/Administrators
- D. Provide course outline and materials as per Part 1 of this Section. The instructor(s) shall provide one copy of training material per student.
- E. The instructor(s) shall be factory-trained instructors experienced in presenting this material.
- F. Classroom training shall be done using a network of working controllers representative of the installed hardware or at the customer's site.

3.17 ACCEPTANCE

- A. The control systems will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of both the Engineer and Owner. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

PART 4: BUILDING PERFORMANCE

4.1 SECTION INCLUDES:

- .1 Section Includes
- .2 Building Performance Intelligent Response Service
- .3 Dashboards & Interactive Educational Displays–
- .4 Utility Monitoring E-View System

4.2 BUILDING PERFORMANCE INTELLIGENT RESPONSE SERVICE

- A. **SUMMARY:** This specification will establish an HVAC design that provides Austin Central Library with a comfortable environment for building inhabitants and a system that is both energy efficient and easy to maintain. Upon completion of system installation, a thorough commissioning

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process will ensure that the design implementation is to the Engineers desired intentions and that the building system is placed into operation. A Building Performance (BP) system is necessary to ensure that through the lifecycle of the building, Austin Central Library system meets or exceeds its intended performance by implementing continuous collection and analysis of the most critical factors in its operational data. The use of this information will provide reports and actionable recommendations to optimize system performance by balancing occupant comfort, energy use, and operating cost. Expert identification of performance trends and deviations will allow for optimum building comfort, proactive operational adjustments, reduced risk of emergency maintenance or failure, and reduced energy consumption. The BP system must collect building data 24/7/365, submit a generated summary report to Austin Central Library on a monthly basis, and the selected DDC Contractor must meet with Austin Central Library on an annual basis to discuss system performance and indicate potential opportunities for operational improvement. Alarm notification and active monitoring are included with this package, whereby, a Building Performance Package ensures accurate, verifiable, and continual building commissioning to protect the initial design selected in this bid. The HVAC contractor must select one of these two methods for implementing a two-year BP contract listed next.

B. Remote Monitoring Facility & Staffing Minimum Requirements:

1. This specification requires that for *1 year Austin Central Library shall have 24/7/365 monitoring of up to 60* of their most critical alarms from a dedicated remote facility staffed with HVAC technical specialists.
2. The Original Equipment Manufacturer (OEM) Monitoring center must have full redundancy in systems at the data center level to fully support a 24/7/365 operation. This includes, but is not limited to, the following systems: electrical, phone, database, and support.
3. The center must have a staff of controls specialists with field expertise in HVAC applied systems operations.
4. Facility controls specialists must be factory-trained and certified in Building Automation Systems (BAS).
5. In the event of an outage at the primary remote center, a redundant site must be in place to provide additional backup and support.
6. To ensure quality standards, the center must have shift supervisors available for any escalated measures 24/7/365. Furthermore, it is required to record all telephone interactions with monitoring facility.
7. It will be the responsibility of the building owner to provide the connectivity medium required for remote monitoring to the DDC contractor, as well as the annual costs of maintaining that medium (*for example, phone line, internet, et cetera*). The ability to connect remotely is contingent on receiving permission for remote access from property owner.

C. Active Monitoring Response Requirements:

1. Upon receipt of an alarm through an owner-provided connectivity medium (*such as a phone line or internet access*), an HVAC specialist from the remote monitoring facility will diagnose the issue and troubleshoot from his/her interface to the system in order to attempt correct the

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problem without initiating any on-site requirement. This will prevent *Austin Central Library* from placing any service calls that are not 100% necessary.

2. If correcting the alarm remotely is not possible, the monitoring facility must intelligently dispatch a service technician with information about the issue and provide recommendations to correct the problem in the field.
3. Use telephone support to dispatch a service technician, as dictated by *the Austin Central Library* to ensure that only the most appropriate owner contacts, technicians, and field support personnel are always involved. This allows for smarter and more efficient service that ensures accurate calls in cases where this type of maintenance is completely required.
4. To guarantee continual monitoring, communication between the remote monitoring facility and the Austin Central Library control system must be tested and proven each **quarter**. Damage caused by missed alarms, due to lost connectivity in between tests, will not be the liability of the DDC contractor. It is required to each **quarter**, a record of this successful test, as well as a record of each automated critical alarm recorded (*and the actions associated with it*).
5. The remote facility must compile and store a history of all critical alarms, with this data being the owned property of the remote monitoring service provider, for further redundancy and protection from failures. During start-up and commissioning of the alarm reporting, *Austin Central Library* may trip an alarm to demonstrate remote capability prior to acceptance.

D. Building Performance Reporting Requirements

1. Prior to acceptance by *the Austin Central Library* the DDC contractor must run and provide one report that shows the baseline performance of the building.
2. Remote facility HVAC experts will translate the auto-generated raw system analytical data into reports for the customer that diagnoses system performance against expectations. In addition, electric and gas pulse meter data is gathered in order to track annual energy consumption for benchmarking purposes and reporting.
3. Reports will contain charts and graphs generated in real-time from actual building data to illustrate issues with performance and opportunities for improvement. These reports will be detailed and quantified by the DDC contractor account representative *monthly* subsequently, when pursuing changes, the change(s) effectiveness validation is done by the same auto-generated, real-time building data during future reports and meetings with the DDC contractor account representative.
4. In order to consider a Remote BP system acceptable, it must provide an automatic analysis capability.
5. Auto-generate charts and graphs from the remote monitoring analytics system so that no interpretation is necessary for any of the points listed in the **Capabilities and Testing** section of this specification, at a minimum.
6. Charts and graphs must be printable, implemented into a report, or exported into a matrix spreadsheet system like Microsoft Excel. For all of the points listed under **Capabilities and**

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Testing, the Remote BP system must be capable of indicating real evidence of failures and exceptions that could result in energy savings or improved performance.

7. Among these failures and exceptions, the Remote BP system must indicate the following in order to indicate the severity of the issue: most recent failure, count of failures and exceptions throughout building history for a particular point, most dramatic failure or exception for a particular point, first time the exception or failure was generated.
8. It will be the responsibility of the DDC contractor to illustrate the operating issues associated with the failure or exception and to share the opportunities to correct it. These custom reports, created by technical experts analyzing continuous building data and presented by the DDC contractor within the context of business objectives, will provide a pathway to a building that performs optimally in terms of comfort, energy-efficiency, and serviceability throughout its lifecycle.

4.3 DASHBOARDS & INTRACTIVE EDUCATIONAL DISPLAYS

- A. Furnish [1] PC based operator interface as shown on the system drawings. Each operator interface shall be able to access all information in the system. The operator interface shall reside on the enterprise-wide network, which must be the same high-speed network on which the System Controller(s) reside. The enterprise-wide network will be provided by the owner and must support the Internet Protocol (IP).
- B. Operator Interface
 1. The operator interface shall be accessible via a web browser.
 2. The operator interface shall support the following Internet web browsers:
 - a. Internet Explorer 8.0+
 - b. Firefox 4.0+
 - c. Chrome 10.0+
 3. The operator interface shall support the following mobile web browsers:
 - a. iOS (iPad/iPhone) V4.0+
 - b. Android (Tablet) V4.0+
 - c. Android (Phone) V2.3+
 4. System Security
 - a. Each operator shall be required to login to the system with a user name and password in order to view, edit, add, or delete data.
 - b. User Profiles shall restrict the user to only the objects, applications, and system functions as assigned by the system administrator.
 - c. Each operator shall be allowed to change their user password
 - d. The System Administrator shall be able to manage the security for all other users
 - e. The system shall include pre-defined “roles” that allow a system administrator to quickly assign permissions to a user.
 - f. User logon/logoff attempts shall be recorded.
 - g. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.
 - h. All system security data shall be stored in an encrypted format.
- C. Dashboard-style Graphics
 1. Graphics in the form of dashboards that provide “at-a-glance” views of operation shall be provided for controlled systems and subsystems.

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- a. Dashboards shall be provided in addition to standard operator interface screens that can be used for advanced-level diagnostics and system configuration.
 - b. Dashboards must allow, without any clicks, an operator to determine if the system depicted is operating as designed or if investigation is required.
 - c. Dashboards shall be customizable.
 - d. Dashboards shall reside in and be provided by enterprise-, system-, or equipment-level devices that are part of the automation system.
2. In support of dashboard customization, supplier shall provide a complete library of standard graphic elements for HVAC equipment.
 - a. The library shall include a minimum of 300 files available to depict equipment including
 - 1) Boilers
 - 2) Air handlers
 - 3) Terminal units
 - 4) Fan coils
 - 5) Unit Ventilators
 - 6) Fans
 - 7) Pumps
 - 8) Coils
 - 9) Valves
 - 10) Dampers
 - 11) Piping
 - 12) Ductwork
 - b. The library shall include both two-dimensional and three-dimensional depictions
 - c. The library shall be furnished in a file format compatible with the graphics generation package program.
3. System dashboards shall allow end users to continuously view, monitor, and track “at-a-glance” conditions in end user identified critical areas.
 - a. Building or area dashboards shall indicate location represented within the overall system with simple [shapes and color variations]. Status of critical systems within the building or area as defined by end user shall be represented using simple [icons, shapes, and colors].
 - b. Area or room dashboards shall indicate location represented within the building or area with simple [shapes and color variations]. Key parameters as defined by end user shall be depicted using [gauges].
 - c. Representative dashboard examples shall be shown to owner for approval.

4.4 UTILITY MONITORING E-VIEW SYSTEM

- A. Energy Reporting and Analysis Software information shall be able to be gathered by:
 1. Hardwire connection
 2. Communicated Building Automation System points
 - a. Any input or output point on the Building Automation System shall be available for monitoring and reporting through the Energy Reporting and Analysis Software.
 - b. Refer to the system points list for specific data points to be monitored as part of the utility monitoring service.
- B. Energy Reporting and Analysis Software shall reside on a central server.
- C. Energy Reporting and Analysis Software shall integrate and operate seamlessly with the Building Automation System architecture supporting an enterprise-wide metering application.
- D. Energy Reporting and Analysis Software shall provide comprehensive functionality to analyze both supply side and demand side energy use and costs, and shall validate performance of the building and its automation system by integrating electrical, gas, steam, chilled water meter data, and other Building Automation System points as noted.

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1. Energy Reporting and Analysis Software shall allow comparisons of energy use between systems or buildings based on a common energy measure such as BTUs or therms/square foot, or \$/square foot to allow data comparison and benchmarking.
2. Energy Reporting and Analysis Software shall provide weather data, and any point programmed in the Building Automation System for use in energy consumption evaluations and to provide degree-day calculation and reporting.
3. Energy Reporting and Analysis Software shall include ready to use templates and user configurable reporting capability to aid in analysis of data. User access to data and reports may be restricted based on company, site or individual meter.
4. Energy Reporting:
 - a. Energy usage and related costs shall be viewable in chart or table form on screen as well as PDF or in CSV export.
 - b. Energy Reporting and Analysis Software shall totalize energy usage for one or more meters, selectable to display in a day, week, month or year format.
 - c. Zooming and cross-hair views shall be provided on graphical line charts to pinpoint specific demand times and values.
 - d. Standard reports shall include site metering, site emissions, quarterly consumption versus cost, year versus budget cost, yearly cost, monthly and weekly meter reports, as well as yearly meter reports, and meter and user management reports.
5. Demand Profile Reports:
 - a. Provide calculation function for minimum demand, maximum demand, average demand and load factor for each meter associated with the system.
 - b. System shall calculate typical demand profiles for each meter filtered by day types including weekdays, weekends and holidays.
6. Alarming:
 - a. Software shall be capable of using email or SMS to alert user of energy use or cost outside of expected values.
 - b. Multiple types of alarms shall be available including profile, range, average, missing data and deviation. Reports can also be assigned to be transmitted with the alarms.
 - c. Alarms shall be able to be filtered by Acknowledged or Unacknowledged.
7. Dashboards:
 - a. Dashboards shall be created showing key information decided during consultation with the end user.
 - b. The dashboards shall include charts, gauges, web pages and text. Details shall be available with a single click on the dashboard.
 - c. These dashboards shall be available for use in kiosks and touchscreen displays.
8. Supplier shall provide [2] software licenses
9. Invoicing Reporting Tool:
 - a. Reporting tool shall include an invoicing tool that provides a utility bill verification, tenant billing or cost allocation reports based on individual meters, applying a specific utility rate to each meter.
 - b. System shall be able to aggregate loads into a single account and create cost allocation reports.
 - c. Reporting shall include a breakdown and summary of both energy usage and costs on the same report and shall be able to generate a bill in PDF format.
 - d. Bills shall be able to be split proportionally between tenants.
10. Forecasts:
 - a. The software shall contain a method for creating and analyzing budgets for a meter over the period of a year.
 - b. The budget values shall be able to be normalized by the following: performance line, degree days and production.
 - c. Budgets shall also be able to be imported using CSV format.
11. Advanced Reports:
 - a. Energy reporting and analysis software shall allow the user to create custom reports with easy to use wizards.

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- b. The reports shall capture and save parameters of selected meters, including energy, energy types, and date/time values based on a specified time interval.
- c. Software shall allow the user to quickly reorganize the energy dimensions displayed in the graph or grid such as by dragging and dropping the elements displayed in the report. Regression analysis showing the efficiency of a production process (i.e. How much feed water is required to produce steam) shall be available.

PART 5: SEQUENCE OF OPERATIONS

- 5.1 Refer to the mechanical plans for the associated sequences of operations, flow diagrams & points list for this project.**

SECTION 23 73 12 – DX AIR HANDLING UNITS SINGLE ZONE VAV

PART 1 GENERAL

- 1.01 Section Includes
 - A. Packaged air handling units.
 - B. Refrigeration components
- 1.02 RELATED SECTIONS
 - A. Section - Motors
 - B. Section - Vibration Isolation.
 - C. Section - Ductwork Insulation.
 - D. Section - Ductwork.
 - E. Section - Ductwork Accessories: Flexible duct connections.
 - F. Section - Controls and Instrumentation
 - G. Section - Equipment wiring systems.
- 1.03 REFERENCES
 - A. ASHRAE 90.1 ENERGY STANDARD FOR BUILDINGS EXCEPT LOW RISE RESIDENTIAL BUILDINGS
 - B. ANSI/AHRI 340/360 - PERFORMANCE RATING OF COMMERCIAL AND INDUSTRIAL UNITARY AIR CONDITIONING AND HEAT PUMP EQUIPMENT AND CONDENSING UNITS GREATER THAN 65,000BTU/h AND BELOW 250,000BTU/h
 - C. AHRI 340 - Commercial and Industrial Unitary Heat pump Equipment, (heat pumps above 135,000 Btu/h).
- 1.04 QUALITY ASSURANCE
 - A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product.
- 1.05 SUBMITTALS
 - A. Submit unit performance data including: capacity, nominal and operating performance.
 - B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
 - C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
 - D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
- 1.06 DELIVERY, STORAGE, AND HANDLING
 - A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
 - B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
- 1.07 ENVIRONMENTAL REQUIREMENTS
 - A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
- 1.08 WARRANTY
 - A. Provide one year parts warranty.

PART 2 PRODUCTS

- 2.01 SUMMARY
 - A. The contractor shall furnish and install air handling units(s) as shown as scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.
 - B. APPROVED MANUFACTURERS
 - 1. Trane:
 - 2. Carrier:
 - 3. Lennox:

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4.Substitutions: [prior approval required] as indicated under the general and/or supplemental conditions of these specifications.

2.02 GENERAL

- A. Provide indoor-mounted, draw-thru, packaged air handling unit(s). Unit(s) shall be factory-assembled including direct-expansion evaporator coil, expansion valve(s), check valves, condensate drain pan, centrifugal fan assembly with fan motor(s) and mounting bracket sheaves, drives and belts, filters, and electrical controls. Units shall be suitable for either horizontal or vertical airflow configuration and be used with or without ductwork.

2.03 CASING

- A. Unit casing shall be constructed of zinc-coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned and finished with a baked enamel finish.
- B. Unit casing shall be completely insulated with fire-retardant, permanent, foil-faced, odorless glass fiber material.

2.04 FANS

- A. Provide fan section with forward curved, double width, double inlet, centrifugal type fan.
- B. Provide self-aligning, grease lubricated, ball or roller bearings with permanent lubrication fittings.
- C. Factory mount motor on slide rails. Provide access to motor, drive, and bearings through removable casing panels.
- D. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
- E. Provide cast iron or steel variable and adjustable pitched sheaves, dynamically balanced, bored to fit shafts and keyed.

2.05 COILS

- A. Provide configured aluminum fin surface mechanically bonded to copper tubing coil. Enclose coils with headers and return bends fully contained within casing. Coil shall have factory installed expansion valves and factory pressure and leak tested at 375 psig.
- B. Provide double sloped condensate drain pan constructed of PVC with external connections on either side of unit. The drain pan shall be removable for cleaning.

2.06 MOTORS

- A. For additional static requirements, Odyssey Split Systems offer standard belt drive motors to meet and exceed a wide range of airflow needs.

2.07 FILTERS

- A. Provide one inch throwaway filters, factory installed. Provide access from side panel for removal. Filter rack shall be field convertible to two inch capability with field provided two inch throwaway filters.

2.08 CONTROLS

- A. Provide factory installed and wired controls including fan contactor, low voltage terminal strip and single point power entry.
- B. Provide factory installed FROSTAT to prevent coil freezing at low evaporator temperatures.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install unit on vibration isolators.

END OF SECTION

SECTION 23 74 00 - ROOF TOP UNITS, SINGLE ZONE VAV

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Packaged rooftop units and commercial packaged, electric/electric

1.2 REFERENCES

- A. Agency Listings:
 - 1. Intertek ETL
 - 2. Canadian Standards Association (CSA).
- B. Safety Standards:
 - 1. Underwriters Laboratories (UL).
 - 2. Underwriters Laboratories of Canada (ULC).
 - 3. National Electric Code (NEC).
 - 4. Canadian Electric Code (CEC).
- C. Air-Conditioning, Heating and Refrigeration Institute (AHRI):
 - 1. AHRI 340/360 Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.
 - 2. AHRI 370 Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.
 - 3. AHRI 210/240 Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment.
- D. All models are ASHRAE 90. 1-2010 compliant
- E. ISO 9001, Manufacturing Quality Systems
- F. Some units are ENERGY STAR® certified
- G. MSAV models meet California Code of Regulations, title 24 requirements for staged airflow

1.3 SUBMITTALS

- A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures
- B. Product Data: Submit product data for specified products
- C. Shop Drawings:
 - 1. Submit shop drawings
 - 2. Indicate:
 - a. Equipment, piping and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections
 - b. Piping, valves and fittings shipped loose showing final location in assembly
 - c. Control equipment shipped loose, showing final location in assembly
 - d. Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads
 - e. Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers
 - f. Fan performance curves
 - g. Details of vibration isolation

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- h. Estimate of sound levels to be expected across individual octave bands in db
 - i. Type of refrigerant used
 - j. Plan view, front view end view, back view and curb detail with dimensions
- D. Quality Assurance:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements
 - 3. Manufacturer's Instructions: Manufacturer's installation instructions
- E. Manufacturer's Field Reports: Manufacturer's field reports specified herein
- F. Closeout Submittals: Submit the following:
 - 1. Warranty: Warranty documents specified herein
 - 2. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance. Include names and addresses of spare part suppliers
 - 3. Provide brief description of unit, with details of function, operation, control and component service
 - 4. Provide equipment inspection report and equipment operation test report

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project
 - 2. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings).

1.7 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 1 Product Requirements
- B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays
- C. Packing, Shipping, Handling and Delivery:
 - 1. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact
 - 2. Ship, handle and unload units according to manufacturer's instructions
- D. Storage and Protection:
 - 1. Store materials protected from exposure to harmful weather conditions
 - 2. Factory shipping covers to remain in place until installation

1.08 PROJECT CONDITIONS

- A. Installation Location: **Brownsville, TX**

1.09 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
- C. Warranty Bond: Commencing on Date of Installation

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1. Limited 5 years on compressors
2. Limited 1 year all other covered components

PART 2 - PRODUCTS

2.1 PACKAGED ROOFTOP UNITS

- A. Manufacturer:
 1. Trane– Basis of Design
 2. Lennox Industries – Approved Equal
 3. Engineer must approve preliminary submittals before any substitutions can be used
- B. Proprietary Products/Systems:
 1. Cabinet:
 - a. Heavy gauge steel panels
 - b. Pre-painted steel panels
 - c. Full perimeter heavy gauge galvanized steel base rail
 - d. Rigging holes on all four corners
 - e. Forklift slots (on three sides, not directly below condenser coil) on base rail
 - f. Raised or flanged edges around duct and power entry openings
 - g. Electrical lines can be brought through the base of the unit or through horizontal knockouts
 - h. Insulation:
 1. All panels adjacent to conditioned air are fully insulated with non-hygroscopic fiberglass insulation
 2. Unit base is fully insulated
 3. Unit base insulation also serves as air seal to the roof curb
 - i. Access Panels: Hinged for compressor/controls/heating areas, blower access and air filter/economizer access; and, sealed with quarter-turn latching handles and tight air and water seal
 - j. Exterior panels constructed of heavy-gauge galvanized steel with two layer enamel paint finish
 - k. Corrosion resistant double sloped condensate Drain Pan
 - l. Service Valves
 2. Cooling System:
 - a. Refrigerant type: R-410A
 - b. Capable of operating from 0 to 125⁰ F (-18 to 52⁰ C) without installation of additional controls
 - c. Compressors:
 1. Scroll Type
 2. Resiliently mounted on rubber mounts for vibration isolation
 3. Overload Protected
 4. Internal excessive current and temperature protection
 5. Isolated from condenser and evaporator fan air streams
 6. Refrigerant cooled
 - d. Thermal Expansion Valve
 - e. Crankcase heaters

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- f. High capacity filter/driers
 - g. High pressure switches
 - h. Low pressure switches
 - i. Freezestats
3. Coil Construction:
- a. Tube and fin condensing/evaporator coil general construction:
 - 1. Aluminum Rippled and Lanced fins
 - 2. Copper tube construction
 - 3. Aluminum fins mechanically bonded to copper tubes
 - 4. All coils are high pressure leak tested at manufacturing facility
 - b. Environ condensing coil general construction:
 - 1. Aluminum/Aluminum construction
 - 2. Aluminum Lanced fins
 - 3. Aluminum fins thermally bonded to aluminum flat tube
 - 4. All coils are high pressure leak tested at manufacturing facility
 - c. Evaporator Coils:
 - 1. With balanced port thermal expansion valves, freeze protection on each compressor circuit, pressure and leak tested to 500 psi
 - d. Condenser Coils:
 - 1. Condenser coil coating with minimum 5,000 hour salt spray test per ASTM B 117
4. Wiring:
- a. Keyed and labeled field connections, color coded and continuously marked wire to identify point-to-point component connections
 - b. Not in contact with hot-gas refrigerant lines or sharp metal edges
5. Electric Heating System:
- a. Electrical resistance heater
 - b. Reset thermal limit protection
 - c. Single point power supply
 - d. Heater Element:
 - 1. Nickel chromium wire
 - 2. Individually fused
 - e. Electric heater slides out of unit for service
6. Heating Controls:
- b. Delay time of 30 seconds between low and high heat stages
7. Supply Air Fan Motor and Drives:
- a. Direct Drive ECM for 3-5 ton units, Single Zone VAV Belt drive for units above 5-tons
 - b. Permanently lubricated ball bearings (for belt drive motors)
 - c. Thermal overload protected motors with automatic reset
 - d. Adjustable sheaves on belt drive motors for blower speed adjustment
 - e. Optional low and high static motor/drive combinations and optional drive kits

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8. Supply Air Fan:
 - a. Double inlet type, galvanized steel with forward curved blades
 - b. Statically and dynamically balanced
 - c. Continuous or automatic control for occupied periods
9. Supply Air Filters:
 - a. Disposable 2 inch
10. Condenser Fan Motor:
 - a. ECM motors on 3-5 ton high efficiency models. PSC motors on 6-30 ton models.
 - b. Direct drive with permanently lubricated ball bearings.
 - c. Watertight with thermal overload protection and automatic reset
 - d. Motor mount isolated from fan safety guard
11. Condenser Fans:
 - a. Corrosion resistant propeller type
12. Unit Controller:
 - a. Solid state control board to operate unit
 - b. Scrolling digital display
 - c. Push button navigation
 - d. Guided menu setup
 - e. Shall provide a 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1 Energy Standard
 - f. Shall provide and display alarms, alarm history and system status
 - g. Component and cooling/heating mode run test capability
 - h. Shall accept input from a CO2 sensor
 - i. Economizer control
 - j. Blower on/off delay
 - k. 2-stage heat/4-stage cool compatible
 - l. Warm-up mode
 - m. Bacnet compatible
 - n. Indoor air quality input
 - o. Low ambient control down to 0°F
 - p. Component runtime and cycle count data collection
 - q. Blower proving switch strike 3
 - r. Phase/voltage monitoring/protection
 - s. Real time clock (timestamps)
 - t. USB interface with profiles and firmware upgrade capability
 - u. Economizer Fault Detection and Diagnostics
 - i. CO2 sensor error
 - ii. Outside Air Temperature sensor error
 - iii. Discharge Air sensor error
 - iv. Actuator over voltage
 - v. Actuator under voltage

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v. Controls Options:

1. CO2 Sensor: Field Mounted

14. Accessories:

- a. Economizer
- b. Hoods provided
 - i. Outside (fresh) Air damper Max Leakage Rate: 4 CFM/sq. ft. at 1" w.g.
 - ii. Return Air Max Leakage Rate: 4 CFM/sq. ft. at 1" w.g.
 - iii. Damper Reliability: 60,000 cycles minimum
 - iv. Economizer fault detection and diagnostics
 - vi. CO2 sensor error
 - vii. Outside Air Temperature sensor error
 - viii. Discharge Air sensor error
 - ix. Actuator over voltage
 - x. Actuator under voltage
- c. Economizer control: Single Enthalpy
- d. Dehumidification system with secondary coil 3-25 ton
- e. Roof curb
- f. Barometric relief damper
- g. Hail Guards
- h. GFCI Service Outlets (field wired)
- i. Condenser coil coating with minimum 5,000 hour salt spray test per ASTM B 117

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions and manufacturer's SPEC-DATA® sheets.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 INSTALLATION

- A. Install Packaged rooftop units in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 23 75 10 - Inverter Driven, DX, Air-Cooled Heat Pump Split System

Part 1 – GENERAL

SINGLE SPLIT AIR CONDITIONING

SPECIFICATION – Quaternity Heat Pump

1.01 SYSTEM DESCRIPTION

The variable capacity, heat pump air conditioning system shall be a Daikin Inverter Driven series (heat/cool model) dehumidifying and air cleaning Quaternity system. The system shall consist of a wall mounted evaporator model FTXG09HVJU exclusively matched to outdoor model RXG09HVJU, FTXG12HVJU exclusively matched to outdoor model RXG12HVJU, and FTXG15HVJU exclusively matched to outdoor model RXG15HVJU direct expansion (DX), air-cooled, Daikin swing, variable speed, inverter driven compressor using R-410A refrigerant. The system shall include dehumidification control and “Flash Streamer” air purification technology. The outdoor unit is a horizontal discharge, variable speed, single fan unit using a single phase power supply. The system shall have a self diagnostic function, 3-minute time delay mechanism and have a factory pre-charge of R-410A adequate for 33 feet of total length. The system shall have automatic restart capability after a power failure has occurred and a low voltage cut-off feature to prevent stalling during power supply issues.

1.02 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. Each combination shall be rated in accordance with Air Conditioning Refrigeration Institute’s (ARI) Standard 210/240 and bear the ARI label.
- D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. The outdoor unit will be factory charged for a length of 33 feet of refrigerant with R-410A refrigerant.
- F. A holding charge of dry nitrogen shall be provided in the evaporator.
- G. System efficiency shall meet or exceed:

System Model (Indoor/Outdoor)	SEER	EER	HSPF	COP
FTXG/RXG09HVJU	26.1	15.8	11.0	4.51
FTXG/RXG12HVJU	24.2	14.0	10.55	4.04
FTXG/RXG15HVJU	21	12.9	10.0	3.99

1.03 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer’s recommendations.

Part 2 – WARRANTY

2.01 LIMITED WARRANTY

Daikin AC (Americas), Inc. (“Daikin AC”) warrants to the customer who is the original owner and user of the Daikin AC products specified above (“Customer”) that under normal use and maintenance for comfort cooling and conditioning applications such products (the “Products”) will be free from defects in material or workmanship. This warranty applies to parts only and is limited in duration to five (5) years from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment by Daikin AC. Customer must present proof of the original date of receipt and of installation of the Product in

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order to establish the effective date of this warranty. Otherwise the effective date will be deemed to be the date of manufacture plus sixty (60) days. Repaired or replacement parts are warranted for the balance of the warranty period applicable to the original part following the date on which the repaired or replacement part is provided to the Customer.

2.02 EXTENDED WARRANTY

For its compressors only, Daikin AC provides the above warranty (which is applicable to parts only) for a seven (7) year period. This extended warranty for compressors is limited in duration to seven (7) years from the earlier to occur of (a) the date of original installation, whether or not actual use begins on that date, or (b) eighteen (18) months from the date of shipment by Daikin AC, and applies to the compressor and compressor parts only. The effective date of this extended warranty shall be established as above.

2.03 LIMITED LABOR WARRANTY

The above warranties (hereinafter, the "Warranty") apply with respect to parts only and not labor. Accordingly, subject to the conditions and limitations set forth herein, the Warranty entitles the Customer to receive, at the option of Daikin AC only, a repaired or replacement part and does not entitle Customer to installation thereof. However, for the first one (1) year only of the Warranty period, Daikin AC will provide labor services to repair a Product or install repaired or replacement parts at its designated repair facilities, or at its option, compensate its authorized dealer and authorized contractor at Daikin AC's standard fixed rates then in effect (irrespective of charges actually imposed and time actually expended) to provide such services.

2.04 INSTALLATION REQUIREMENTS

The system shall be installed by a Daikin factory trained contractor/dealer.

Part 3 – PERFORMANCE

- 3.01 The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance table below.

System Model (Indoor/Outdoor)	Cooling Capacity (min.~max.)	Heating Capacity (min.~max.)	Cooling Power (watts)	Heating Power (watts)	SEER	EER	HSPF	COP
FTXG/RXG09HVJU	5,300 ~12,300	4,400~18,000	250~900	220~1,900	22	15.8	11.0	4.51
FTXG/RXG12HVJU	5,300~15,700	4,400~19,100	260~1,300	220~2,100	22	14.0	10.55	4.04
FTXG/RXG15HVJU	5,300~18,000	4,400~21,200	260~1,930	230~2,120	21	12.9	10.0	3.99

The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB / 75°F WB for the outdoor unit and 25 feet of piping. The heating performance is based on 70°F DB / 60°F WB for the indoor unit and 47°F DB / 43°F WB for the outdoor unit and 25 feet of piping.

- 3.02 The system performance shall meet Energy Star CEE Tier 2 specifications.
- 3.03 The system cooling performance shall include dehumidification RH control settings for High (60%), Standard (55%), Low (50%) and Continuous.
- 3.04 The operating range in cooling will be 14°F DB ~ 109°F DB. The system will stop functioning below -4°F DB.
- 3.05 The operating range in heating will be -4°F DB ~ 75°F DB.
- 3.06 The system shall be capable of maximum refrigerant piping of 33 feet, with 26 feet maximum vertical difference, without any oil traps or additional components.

Part 4 – PRODUCTS

4.01 INDOOR UNIT

General:

The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.

A. Unit Cabinet:

1. The indoor unit shall have a white, "flat screen" finish.
2. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, and right bottom; and left side, left back, and left bottom).
3. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.

B. Fan:

1. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
3. The fan blades shall include "saw edge" indentations to reduce operation sound and increase the airflow rate.
4. An auto-swing louver for adjustable air flow (both vertically and horizontally) is standard via the wireless remote control furnished with each system.
5. The indoor fan shall offer a choice of five speeds, plus quiet and auto settings.

C. Filter:

1. The filter function shall include "Flash Streamer" air purification technology.
2. The return air pre-filter provided will be a mildew proof, removable and washable filter. Titanium apatite, photocatalytic air purifying and deodorizing filters are included as standard.
3. Microorganism reduction rates shall meet or exceed:

Microorganism Type	Microorganism	Test Period Minutes	Reduction Rate
Virus	MS2 coliphage	120	95.2%
Bacteria	E. coli	120	91.0%
Mold	Aspergillus	90	75.0%

D. Coil:

1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
2. The coil shall include a split heat exchanger for dehumidification with "re-warming" control.
3. All tube joints shall be brazed with silver alloy or phoscopper.
4. All coils will be factory pressure tested.
5. A condensate pan shall be provided under the coil with a drain connection. The drain pan shall include an antibacterial and antivirus agent designed to prevent mold proliferation.

E. Electrical:

1. The outdoor unit shall be powered with 208-230 volts, 1 phase, and 60 hertz power. The indoor unit shall receive 208-230 volt, 1 phase, 60 hertz power from the outdoor unit.
2. The allowable voltage range shall be 187 volts to 253 volts.

F. Control:

1. The unit shall have a wireless remote infra-red controller capable to operate the system. It shall have Cooling Operation, Heating Operation, Automatic Operation, Dry Operation, Dry Cooling Operation and Air Cleaning Operation.
2. The controller shall consist of an On/Off Power switch, Mode Selector, Fan Setting, Swing Louver, On/Off Timer Setting, Temperature Adjustment, °C or °F Temperature Display, Humidity Adjustment, Flash Streamer Air Cleaning, Comfort Airflow, Comfort Sleep, Cooling Breeze, Child Lock, Information and Powerful Operation.
 - i. On/Off switch powers the system on or off.
 - ii. Mode selector shall operate the system in auto, cool, heat, dry cooling, air cleaning or dry operation.

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- iii. Fan setting shall provide five fan speeds, plus quiet and auto settings.
 - iv. Swing louver shall adjust the airflow (horizontal and vertical) blades independently providing a 3D airflow.
 - v. On/Off timer is used for automatically switching the unit on or off.
 - vi. Temperature adjustment allows for the increase or decrease of the desired temperature.
 - vii. Humidity adjustment allows for the increase or decrease of the desired RH control settings for High (60%), Standard (55%), Low (50%) and Continuous.
 - viii. Flash Streamer Air Cleaning shall decompose and remove viruses, allergens and odors with a high speed electron discharge streamer unit.
 - ix. Comfort Airflow shall adjust the airflow direction and rate so that the air from the unit does not blow directly on the occupants of the room.
 - x. Comfort Sleep operation shall control the room temperature to support comfortable sleeping and a pleasant wake-up.
 - xi. Cooling Breeze shall oscillate the airflow in a 1Hz rhythm to ensure comfort even with a higher set-point temperature.
 - xii. Child Lock shall restrict the remote controller operations to avoid misuse by children.
 - xiii. Information shall display the current room temperature and humidity and outdoor temperature.
 - xiv. Powerful operation allows quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time period.
- 3. The remote control shall perform Fault Diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code.
 - 4. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode. Humidity settings on the remote control shall be High (60%), Standard (55%), Low (50%) and Continuous.
 - 5. The indoor unit microprocessor has the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.
- G. Sound:
- 1. Indoor unit sound levels shall not exceed:

Indoor Daikin Model	Cooling Mode Sound Level (H/M/L) dB(A)	Heating Mode Sound Level (H/M/L) dB(A)
FTXG09HVJU	42 / 33 / 26	42 / 35 / 28
FTXG12HVJU	43 / 35 / 27	43 / 36 / 29
FTXG15HVJU	45 / 37 / 29	44 / 38 / 31

*values are measured approximately 3 feet away.

4.02 OUTDOOR UNIT

General:

The outdoor unit shall be specifically matched to the corresponding indoor unit size (e.g. FTXG15HVJU/RXG15HVJU). The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.

A. Unit Cabinet:

The cabinet shall be ivory white with a finished powder coated backed enamel paint.

B. Fan:

- 1. The fan shall be a direct drive, propeller type fan.
- 2. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
- 3. The fan shall be capable of operating in "silent operation" which lowers the outdoor fan speed in either cool, heat or auto modes.
- 4. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
- 5. Airflow shall be horizontal discharge through a "twisted" grill for optimum airflow and lower operating sound.

C. Coil:

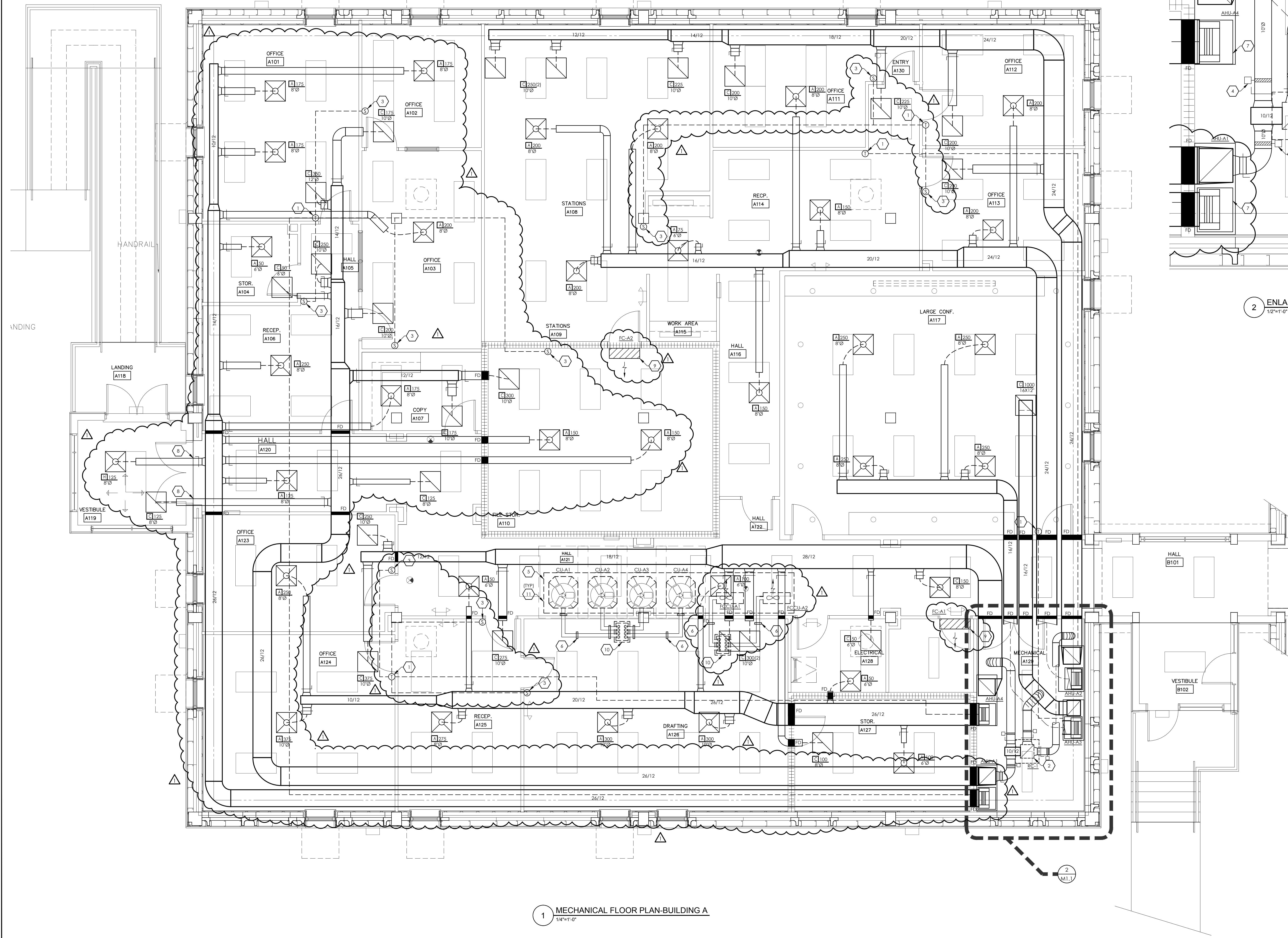
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1. The outdoor coil shall be nonferrous construction with corrugated fin tube.
 2. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
 3. Refrigerant flow from the condenser will be controlled via a metering device.
- D. Compressor:
1. The compressor shall be a Daikin swing, inverter-driven compressor.
 2. The outdoor unit shall have an accumulator, four-way reversing valve.
 3. The compressor shall have an internal thermal overload.
 4. The outdoor unit can operate with a maximum vertical height difference of 26 feet and overall maximum length of 33 feet without any oil traps or additional components.
- E. Electrical:
1. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
 2. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.
 3. The outdoor shall be controlled by a microprocessor located in the outdoor and indoor units via commands from the infrared remote controller.
 4. Dedicated EEV's shall be provided for capacity control during part load of the indoor unit.
- F. Sound:
1. Outdoor unit sound levels shall not exceed:

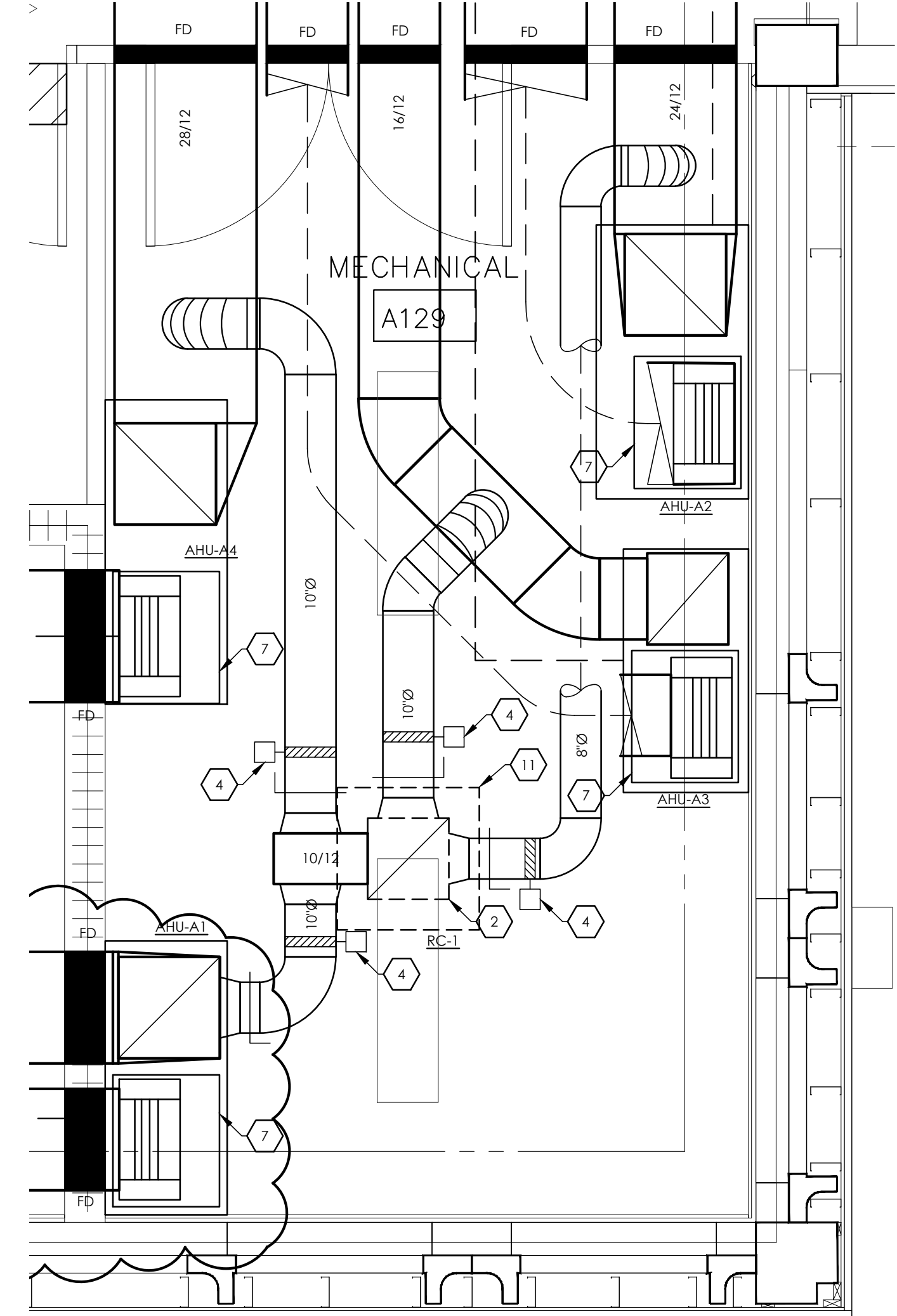
Outdoor Daikin Model	Cooling Mode Sound Level dB(A)	Heating Mode Sound Level dB(A)
RXG09HVJU	46	46
RXG12HVJU	49	48
RXG15HVJU	50	50

* values are based on high fan speed and are measured approximately 3 feet away.

END OF SECTION



1 MECHANICAL FLOOR PLAN-BUILDING A
1/4"=1'-0"



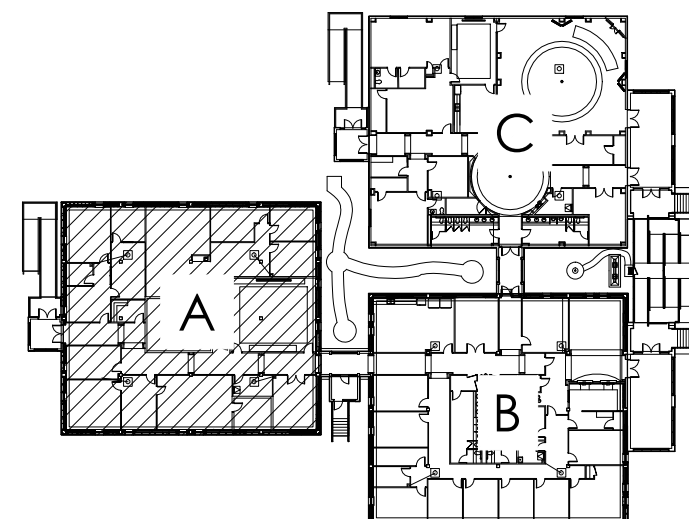
2 ENLARGED FLOOR PLAN-MECHANICAL ROOM
1/2"=1'-0"

GENERAL NOTE:

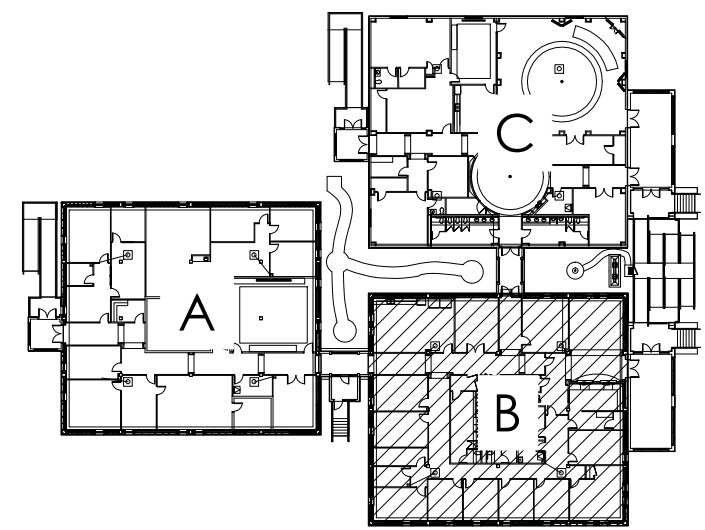
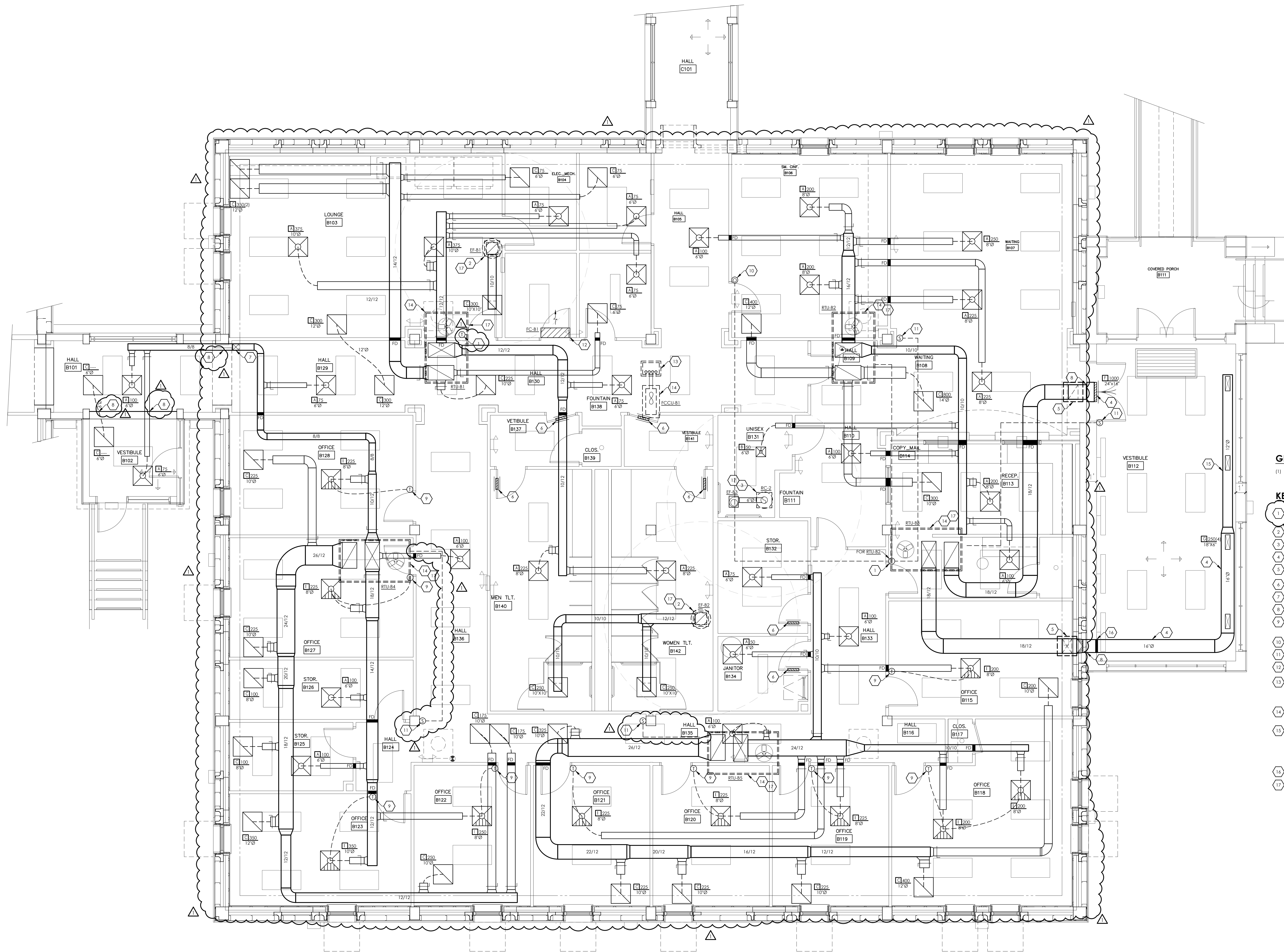
- (1) ALL DUCT INTERIOR SHALL BE PAINTED W/ GRAY RUST INHIBITOR PAINT.

KEYED NOTES: MECHANICAL

- 1 CONTROLS THERMOSTAT W/ A DIGITAL DISPLAY. MOUNT THERMOSTAT AT 48" ABOVE FINISHED FLOOR. PROVIDE WITH KEYS CLEAR PLASTIC COVER. PROVIDE W/ AVERAGING SENSORS AS INDICATED.
- 2 16" X 16" DUCT FOR CONDENSATE TO BE ROUTED DOWN INTO MECHANICAL ROOM.
- 3 1" STAT AVERAGING SENSOR. MOUNT 6" 48" A-1.
- 4 PROVIDE W/ MOTORIZED DAMPER W/ OPEN/CLOSE OPERATION. DAMPER TO BE ACTUATED TO MAX ONLY WHEN COMPRESSOR OR HEATER IS ENERGIZED & ACTUATED TO THE CLOSED POSITION @ ALL OTHER TIMES. PROVIDE W/ ADDITIONAL MANUAL BALANCING DAMPER TO BALANCE CFM AMOUNTS OF OUTSIDE AIR. MECHANICAL CONTRACTOR TO PROVIDE W/ ANY ELECTRICAL HARDWARE TO POWER DAMPER.
- 5 PROVIDE NEW ROOF CURB FOR CONDENSING UNITS. REFER TO ARCHITECTURAL DETAILS/DOCUMENTS FOR CURB TYPE & FLASHING. ANCHOR UNIT TO CURB AND CURB TO STRUCTURE.
- 6 PROVIDE ALUMINUM PIPING SUPPORTS AT EVERY 4' FEET. PROVIDE ALUMINUM JACKETING ON ALL LINES EXTERIOR TO THE BUILDING.
- 7 UNIT TO BE MOUNTED ON A 24" HIGH PLATFORM CONSTRUCTED OF 1-1/2" ANGLE (IRON) 1" SQUARE METAL TUBING. WRAP PLATFORM IN GALVANIZED SHEET METAL. LINE INTERIOR OF PLATFORM W/ 1" DUCT BOARD. W/ FOIL FACING AIRSTREAM. COAT INSIDE W/ MASTIC TO FACILITATE CLEANING & SEAL AIR TIGHT.
- 8 PROVIDE WITH FLEXIBLE DUCT CONNECTOR BETWEEN BUILDINGS. SEE DETAILS.
- 9 MOUNT AIR CONDITIONING UNIT CENTERED ABOVE DOOR. REFER TO PLUMBING PAGES FOR CONDENSATE ROUTING.
- 10 ROUTE REFRIGERANT LINES AND CONDENSER ELECTRICAL CONDUIT BELOW ROOF VIA A "ROOF PENETRATION HOUSING" EQUAL TO "MEDIUM VAULT" FROM "ROOFPENETRATIONHOUSING.COM" ROUTE REFRIGERANT LINES TO RESPECTIVE AIR HANDLER. ANCHOR LINES TO STRUCTURE AND SEAL ALL PENETRATIONS WATER TIGHT. ALL PIPING SUPPORTS & FASTENERS TO BE OF STAINLESS STEEL OR ALUMINUM. PROVIDE REF. PIPING W/ ALUMINUM JACKETING.
- 11 PROVIDE IBC 2015 COMPLIANT CURB AND ATTACHMENTS FROM UNIT TO CURB & CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:
A) ATTACHMENT OF EQUIPMENT TO CURB.
B) CURB TO STRUCTURE.
C) CURB AND ATTACHMENT HARDWARE STRENGTH.
REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR ROOF SUBSTRATE DETAILS. EQUIPMENT OR CURB MANUFACTURER ENGINEERED ANALYSIS & THE ENGINEERED INSTALLATION DRAWINGS SHALL BE PERFORMED SPECIFICALLY FOR THIS BUILDING & PROJECT SITE & STAMPED & SEALED BY A TEXAS LICENSED ENGINEER. SUBMITTALS WILL NOT BE APPROVED UNTIL ALL DOCUMENTATION LISTED ABOVE IS PROVIDED ACCURATELY.



KEY PLAN



KEY PLAN

GENERAL NOTE:

- (1) ALL DUCT INTERIOR SHALL BE PAINTED W/ GRAY RUST INHIBITOR PAINT.

KEYED NOTES: MECHANICAL

- 1 CONTROLS THERMOSTAT W/ A DIGITAL DISPLAY. MOUNT THERMOSTAT AT 48" ABOVE FINISHED FLOOR. PROVIDE WITH KEYS CLEAR PLASTIC COVER. PROVIDE W/ AVERAGING SENSORS AS INDICATED.
- 2 EXHAUST DUCT, UP TO ROOF, MOUNTED EXHAUST FAN.
- 3 6" ROUND DUCT FOR RESTROOM EXHAUST ROUTED UP TO ROOF CAP.
- 4 CENTER OF DUCT TO BE @ 14'-0".
- 5 RISER DUCTS ABOVE DECK THROUGH PARAPET VOID TO SERVE VESTIBULE. VOID TO BE 2'X2'.
- 6 MOUNT AIR TRANSFER LOUVER AT 4" FROM BOTTOM OF DOOR.
- 7 DUCT TO DROP DOWN TO LOWER CEILING.
- 8 PROVIDE WITH FLEXIBLE DUCT CONNECTOR BETWEEN BUILDINGS. SEE DETAILS.
- 9 THERMOSTAT FOR VAV DIFFUSERS TO BE MOUNTED @ 48" A.F.F. TO INCLUDE A DIGITAL READOUT & 35° OF INDIVIDUAL CONTROL. TO BE TIED INTO CONTROLS VIA BACKNET INTERFACE.
- 10 OVERRIDE TEMPERATURE SENSOR MOUNTED @ 48" A.F.F.
- 11 CONTROLS SENSOR FOR TEMP/HUMIDITY, MOUNTED @ 72" A.F.F.
- 12 MOUNT AIR CONDITIONING UNIT CENTERED ABOVE DOOR. REFER TO PLUMBING PAGES FOR CONDENSATE ROUTING. THE CONTROLS FOR STATUS & TEMPS.
- 13 ROUTE REFRIGERANT LINES AND CONDENSER ELECTRICAL CONDUIT BELOW ROOF VIA A "ROOF PENETRATION HOUSING" EQUAL TO "SMALL RPH" FROM ROOF PENETRATION HOUSING CO. ROUTE REFRIGERANT LINES TO RESPECTIVE AIR HANDLER. ANCHOR LINES TO STRUCTURE AND SEAL ALL PENETRATIONS WATER TIGHT.
- 14 PROVIDE NEW ROOF CURB FOR CONDENSING UNIT. REFER TO ARCHITECTURAL DETAILS/DOCUMENTS FOR CURB TYPE & FLASHING. ANCHOR UNIT TO CURB.
- 15 EXPOSED DUCT TO BE OF SINGLE WALL CONSTRUCTION. INTERNALLY LINE DUCT W/ 1" OF ACOUSTIC INSULATION EQUAL TO "KNAUF INSULATION" SONIC XP DUCT LINER OR EQUAL. DUCT TO BE GALVANIZED SHEET METAL PHOSPHATIZED (PAINT GRP) OR OF GALVANNEALED CONSTRUCTION & PREPARED FOR PAINTING. COORDINATE W/ ARCHITECT FOR PAINT COLOR. DUCT TO BE TIGHT TO STRUCTURE. ANCHORS & SUPPORTS SHALL BE OF PREMIUM GRADE NON-CORROSIVE MATERIALS.
- 16 PROVIDE W/ ROUND ESCUTCHEON PLATE WHERE DUCT PENETRATES WALL.
- 17 PROVIDE IBC 2015 COMPLIANT CURBS AND ATTACHMENTS FROM UNIT TO CURBS & CURBS TO STRUCTURE. EQUIPMENT OR CURBS MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:
A.) ATTACHMENT OF EQUIPMENT TO CURB.
B.) CURB TO STRUCTURE.
C.) CURB AND ATTACHMENT HARDWARE STRENGTH.
REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR ROOF SUBSTRATE DETAILS. EQUIPMENT OR CURB MANUFACTURER ENGINEERED ANALYSIS & THE ENGINEERED INSTALLATION DRAWINGS SHALL BE PERFORMED SPECIFICALLY FOR THIS BUILDING & PROJECT SITE & STAMPED & SEALED BY A TEXAS LICENSED ENGINEER. SUBMITTALS WILL NOT BE APPROVED UNTIL ALL DOCUMENTATION LISTED ABOVE IS PROVIDED ACCURATELY.

1 MECHANICAL FLOOR PLAN-BUILDING B
1/4"=1'-0"

SHEET NO. M1.2

or

SET NUMBER

REVISED:
ADD #1 11-9-16

DATE: 11/08/16
DRAWN BY: TC
PROJECT NO: 16.1.01

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11/09/16
STATE OF TEXAS
Willford L. McGee III
121839

BROWNSVILLE NAVIGATION DISTRICT
PROJECT: ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
OWNER: BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

SHEET TITLE:
MECHANICAL FLOOR PLAN - BUILDING B

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SHEET
AM1.3A

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

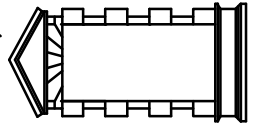
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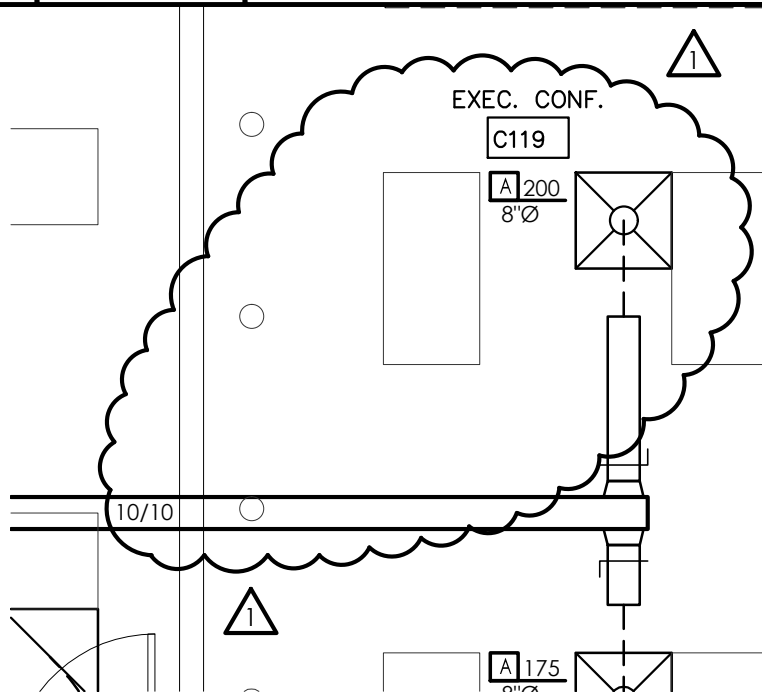
1 ADDENDUM #1 11-9-16

DATE: 11/09/16

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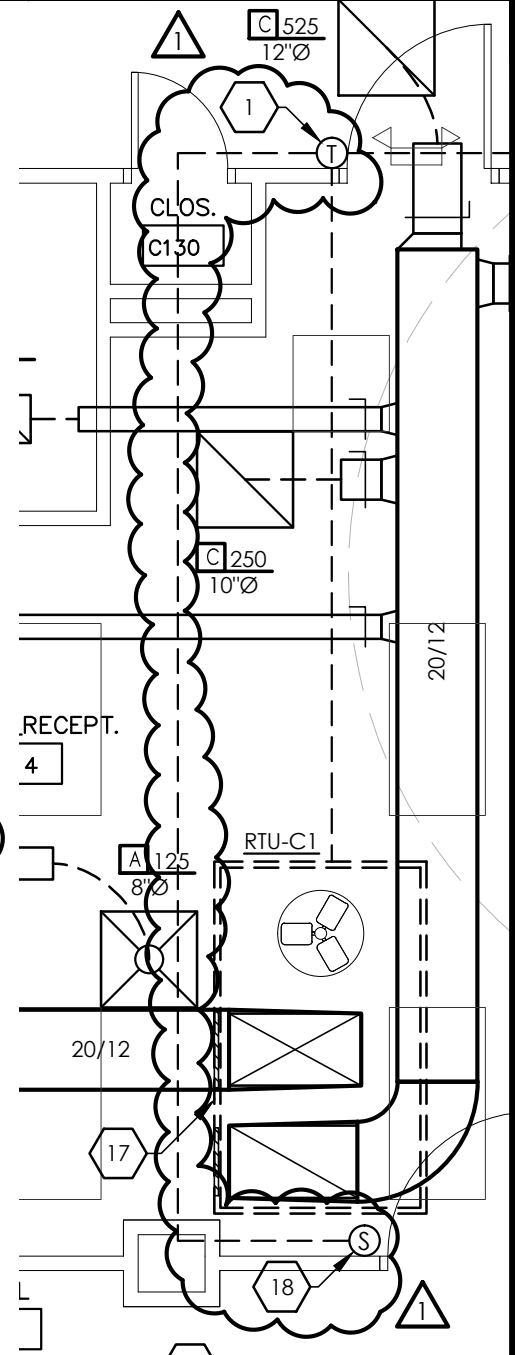
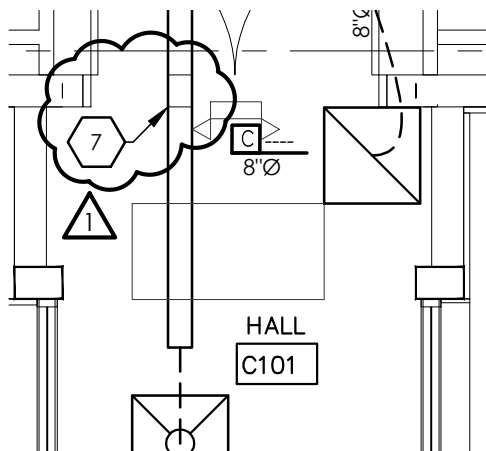
KEYED NOTES: MECHANICAL

1 CONTROLS THERMOSTAT W/ A DIGITAL DISPLAY. MOUNT THERMOSTAT AT 48" ABOVE FINISHED FLOOR. PROVIDE WITH KEYED CLEAR PLASTIC COVER. PROVIDE W/ AVERAGING SENSORS AS INDICATED.

2 DUCTWORK SHALL BE INSTALLED IN A MANNER THAT DOES NOT PENETRATE WALL

3 ABOVE IS PROVIDED ACCURATELY.

18 T-STAT AVERAGING SENSOR. MOUNT @ 48" A.F.F.



11/09/16

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SHEET
AM1.4A

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS

BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

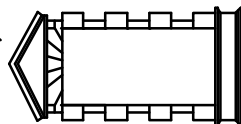
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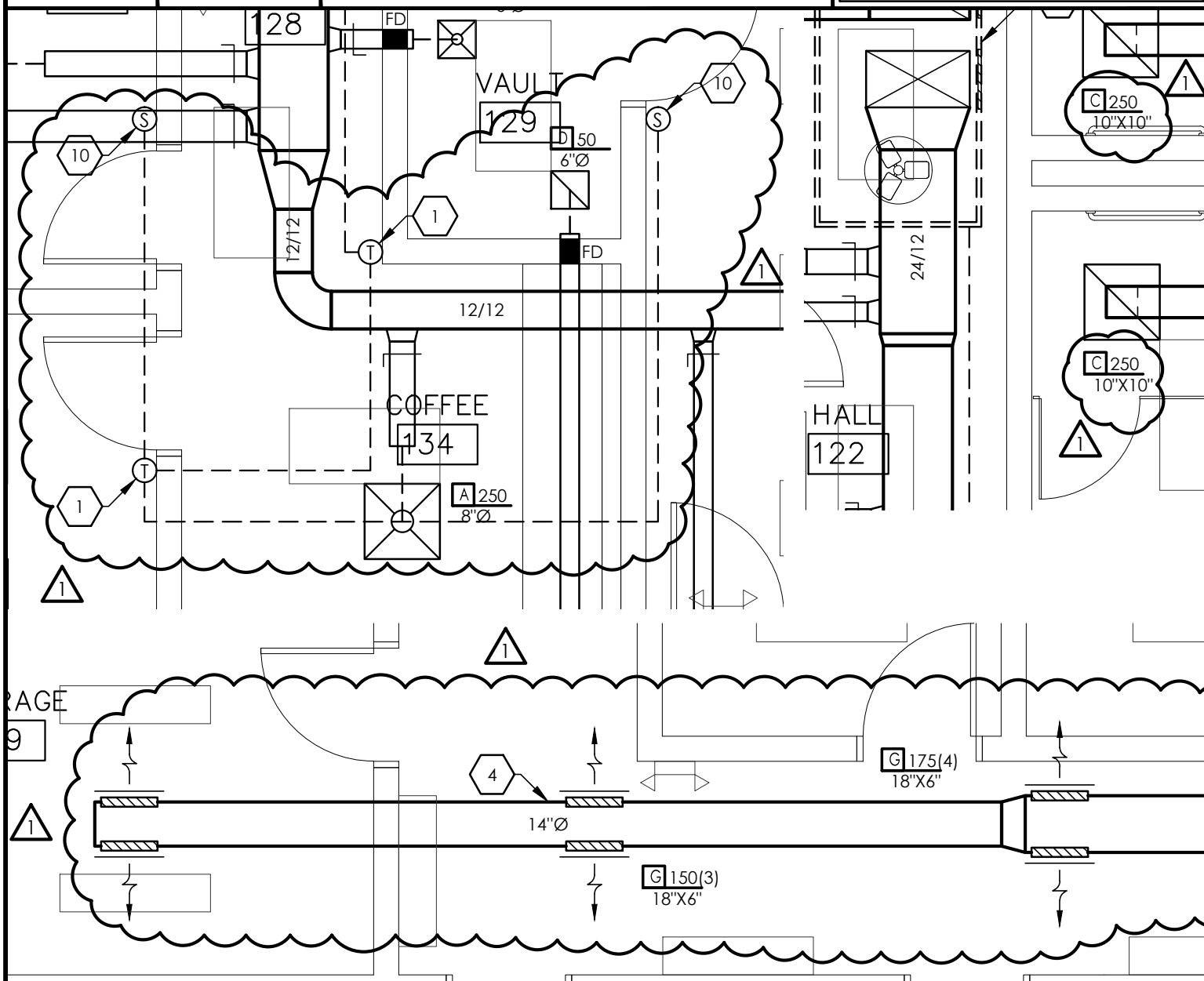
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KEYED NOTES: MECHANICAL

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ABOVE IS PROVIDED ACCURATELY.

10 T-STAT AVERAGING SENSOR. MOUNT @ 48" A.F.F.

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SHEET
AM1.4B

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

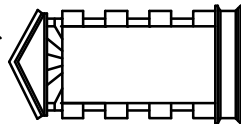
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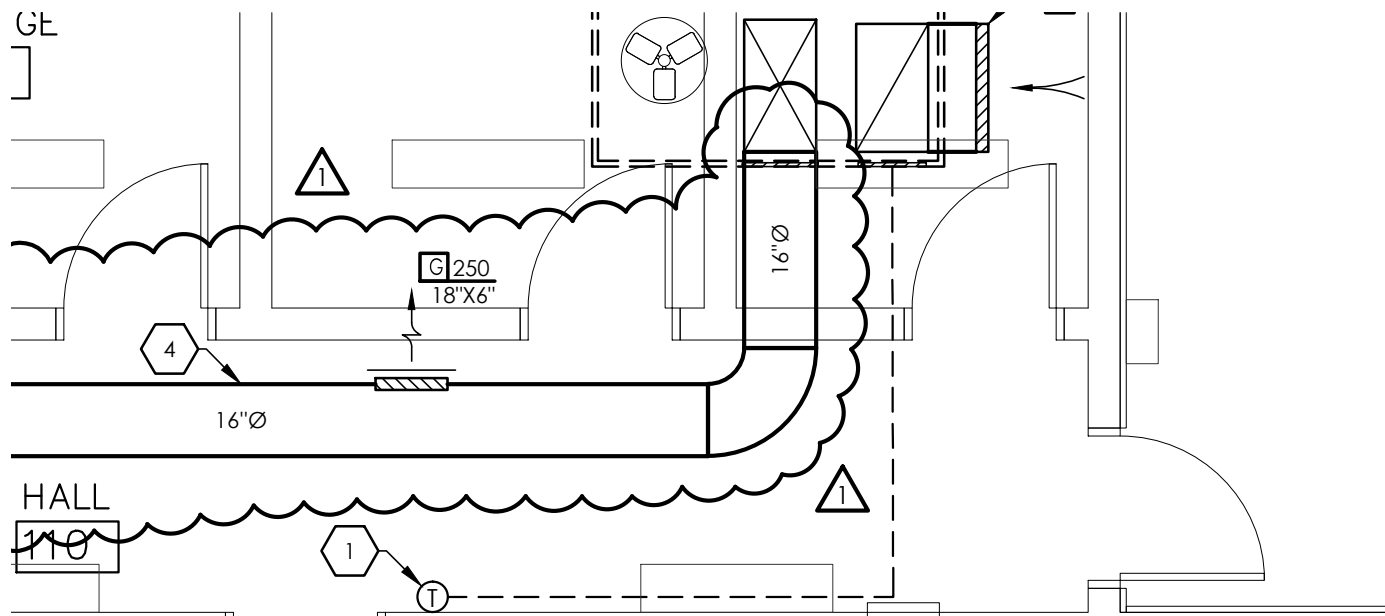
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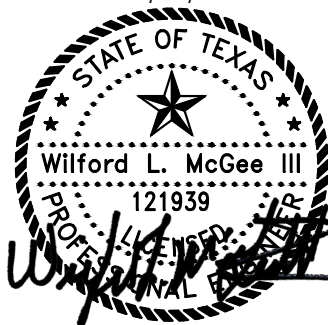
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SHEET
AM3.1A

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS

BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

DRAWN BY: TC

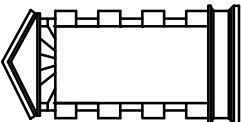
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AIR HANDLING UNIT SCHEDULE

TAG	AHU-A1,A4	AHU-A2	AHU-A3
TYPE	SNGL ZN VAV	SNGL ZN VAV	SNGL ZN VAV
FLOW CONFIGURATION	VERTICAL	VERTICAL	VERTICAL
AREA SERVED	OFFICES	OFFICES/RECEPTION	LARGE CONF
INDOOR UNIT FAN			
SUPPLY CFM	1750	1550	1050
MIN. OUTSIDE AIR (CFM)	250	150	200
EXT. STATIC INCHES WC	0.5	0.5	0.5
MIN FAN POWER	1.0 HP - ECM	3/4 HP - ECM	1/2 HP - ECM
INDOOR UNIT COOLING COIL			
ENTERING AIR DB/WB (°F)	76.8/65.6	75.5/63.4	78/65.6
LEAVING AIR DB/WB (°F)	56.1/54	54.7/53.3	56.5/54.7
MIN. TOTAL/SENSIBLE CAPACITY (MBH)	53/38	44/34	33/24
DESIGN RETURN AIR DB/WB (°F)	73/61	73/61	73/61
DESIGN OUTSIDE AIR DB/WB (°F)	99/81	99/81	99/81
INDOOR UNIT HEATING SELECTION			
HEATER TYPE/AMBIENT DESIGN DB (°F)	ELEC/33	ELEC/33	ELEC/33
HEAT INPUT/STAGE	10.8 KW/1	10.8 KW/1	7.2 KW/1
ENTERING/LEAVING DB (°F)	65/85	67/90	63/85
DETAILS AND ACCESSORIES			
VOLTAGE/PHASE	208/1	208/1	208/1
MCA/MOCP	75/80	73/80	48/50
MANUFACTURER	TRANE	TRANE	TRANE
MODEL	GAM5B0C60	GAM5B0C48	GAM5B0B36
NOMINAL UNIT SIZE TONNAGE	5.0 TONS	4.0 TONS	3.0 TONS
MAX WEIGHT (lbs)	175 lbs	175 lbs	150 lbs
NOTES	2,4,5	2,4,5	2,4,5

CONDENSING UNIT SCHEDULE

TAG	CU-A1,A4	CU-A2	CU-A3
OUTDOOR UNIT ELECTRICAL			
VOLTAGE/PHASE	208/1	208/1	208/1
MCA/MOCP	41/60	28/45	24/35
DETAILS AND ACCESSORIES			
MIN COOL/HEAT EFFICIENCY	17 SEER/-	17 SEER/-	17 SEER/-
COMPRESSOR QTY/STAGE QTY	1/2	1/2	1/2
COOL/HEAT AMBIENT DB (°F)	99/33	99/33	99/33
MANUFACTURER	TRANE	TRANE	TRANE
MODEL	4TTR7060	4TTR7048	4TTR7036
NOMINAL UNIT SIZE TONNAGE	5.0 TONS	4.0 TONS	3.0 TONS
MAX WEIGHT	325 lbs	325 lbs	300 lbs
NOTES	1,2,3,5	1,2,3,5	1,2,3,5

NOTES:

01. PROVIDE CONDENSER W/ FACTORY HAIL GUARDS & COIL E-COAT, 5,000 SALT SPRAY.

02. PROVIDE W/ SINGLE POINT POWER; TRANE, CARRIER, LENNOX ACCEPTABLE MANUFACTURERS.

03. PROVIDE IBC 2015 COMPLIANT CURB & ATTACHMENTS FROM UNIT TO CURB & CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:

A) ATTACHMENT OF EQUIPMENT TO CURB.

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C) CURB AND ATTACHMENT HARDWARE STRENGTH.

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04. PROVIDE EVAPORATOR COIL W/ E-COAT.

05. PROVIDE W/ HVAC CONTROLS INTERFACE CARD, COORDINATE W/ SUCCESSFUL CONTROLS MANUFACTURER.

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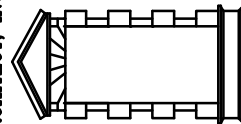


SHEET
AM3.1B

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

ROBERTO J. RUIZ
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ADDENDUM #1 11-9-16

DATE: 11/09/16

(ADJUSTABLE SINGLE BLADE BALANCING)

ROOF CAP SCHEDULE

TAG	RC-1	RC-2
TYPE	INTAKE	EXHAUST
SERVES	AHU's	RRs
LOCATION	ROOF	ROOF
DETAILS AND ACCESSORIES		
MAX AIR VOL. (CFM)	800	75
NECK SIZE (INCHES)	18"Lx18"Wx16"H	8.0
MAX PRESSURE DROP (IN WG)	0.05	0.05
MAX. THROAT VELOCITY (FPM)	400.00	250.00
INCLUDED SCREEN(S)	BIRD	BIRD
HOUSING MATERIAL	ALUMINUM	ALUMINUM
ROOF CURB HEIGHT	14" TDI CURB	14" TDI CURB
MANUFACTURER	GREENHECK	GREENHECK
MODEL	EHH-601PD	GRSR
NOTES	1	1

NOTES:

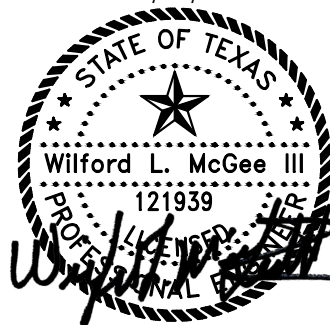
1. TO BE HIGH WIND RATED. SAME CURB REQUIREMENTS AS OTHER EQUIP.



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SHEET

AM3.1C

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS

BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

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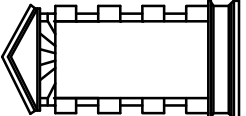
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ADDENDUM #1 11-9-16

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ROOF TOP

UNIT SCHEDULE

ROOF TOP

TAG	RTU-B1,C1	RTU-B2	RTU-B3,C3	RTU-B4,B5	RTU-C2	
V	TYPE	SNGL ZN VAV	SNGL ZN VAV	SNGL ZN VAV	MULTI ZN VAV	SNGL ZN VAV
	DISCHARGE CONFIGURATION	DOWNFLOW	DOWNFLOW	DOWNFLOW	DOWNFLOW	DOWNFLOW
F	AREA SERVED	OFFICES/STRG	WAITING	VESTIBULE	OFFICES	BOARDROOM
	FAN DATA					
	SUPPLY CFM	1300	1600	1000	1600	2400
	MIN. OUTSIDE AIR (CFM)	250	350	200	350	650
	EXT. STATIC INCHES WC	0.5	0.5	0.5	0.5	0.625
A	MIN FAN POWER	1.0 HP - ECM	1.0 HP - ECM	3/4 HP - VFD	1.0 HP - ECM	3.75 HP - VFD
	COOLING COIL					
	ENTERING AIR DB/WB (°F)	78/65.6	78.7/66.2	78.2/65.8	78.7/66.2	80/67.3
	LEAVING AIR DB/WB (°F)	54.9/53.7	55.8/54.9	56.3/54.8	55.8/54.9	56.4/55.7
	MIN. TOTAL/SENSIBLE CAPACITY (MBH)	45/32	54/39	32/23	54/39	85/61
	DESIGN RETURN AIR DB/WB (°F)	73/61	73/61	73/61	73/61	73/61
	DESIGN OUTSIDE AIR DB/WB (°F)	99/81	99/81	99/81	99/81	99/81
	DEHUMIDIFICATION SELECTION					
	TYPE	NONE	NONE	ON/OFF HGRH	NONE	NONE
	REHEAT CAPACITY	-	-	18 MBH	-	-
	LEAVING AIR DB/WB (°F)	-	-	73/61	-	-
	HEATING SELECTION					
	HEAT TYPE/AMBIENT DB (°F)	ELEC/33	ELEC/33	ELEC/33	ELEC/33	ELEC/33
	HEAT INPUT/STAGES	9 KW/2	9 KW/2	9 KW/2	9 KW/2	20.3 KW/2
	ENTERING/LEAVING DB (°F)	63/85	62/80	63/92	62/80	60/87
	DETAILS AND ACCESSORIES					
S	MIN COOL/HEAT EFFICIENCY	17 SEER/-	17 SEER/-	17 SEER/-	17 SEER/-	12.6 EER/-
	COMPRESSOR QTY/COOL STAGE QTY	1/2	1/2	1/2	1/2	2/2
	VOLTAGE/PHASE	208/3	208/3	208/3	208/3	208/3
	MCA/MOCP	43/45	43/45	41/45	43/45	81/90
	MOUNTING	14" CURB	14" CURB	14" CURB	14" CURB	14" CURB
	MANUFACTURER	TRANE	TRANE	TRANE	TRANE	TRANE
	MODEL	THC047	THC067	THC037	THC067	THC092
	NOMINAL UNIT SIZE TONNAGE	4.0 Tons	5.0 Tons	3.0 Tons	5.0 Tons	7.5 Tons
	MAX WEIGHT	950 lbs	1000 lbs	750 lbs	1000 lbs	1250 lbs
	NOTES:	1-7	1-7	1-8	1-7	1-7

01. PROVIDE W/ FACTORY INTEGRAL GFI DUPLEX 120V RECEPTACLE, FACTORY POWERED.
02. PROVIDE CONDENSING COILS W/ HAIL GUARDS & FACTORY CONDENSER E-COAT. PROVIDE EVAPORATOR COIL W/ FACTORY E-COAT.
03. PROVIDE W/ MOTORIZED OA DAMPER, DIFF ENTH ECON, & BARR RELIEF DAMPER.
04. UNIT TO HAVE SINGLE ZONE VAV CONTROL & CO2 DEMAND CONTROL VENTILATION.
05. PROVIDE IBC 2015 COMPLIANT CURB & ATTACHMENTS FROM UNIT TO CURB & CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR:
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06. TRANE, LENNOX, & CARRIER APPROVED AS MANUFACTURERS.
07. PROVIDE W/ HVAC CONTROLS INTERFACE CARD, COORDINATE W/ SUCCESSFUL CONTROLS MANUFACTURER.
08. UNIT TO HAVE ON/OFF HOT GAS REHEAT.
09. UNIT TO HAVE TRUE VAV CAPABILITIES: FAN SPEED TO BE CONTROLLED VIA DUCT STATIC PRESSURE & VARIABLE CAPACITY COMPRESSOR TO BE STABLE.

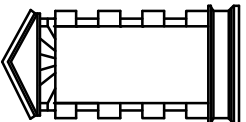
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
SHEET
AM3.1D

PROJECT:
ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

ROBERTO J. RUIZ
ARCHITECT, INC.

615 W. TANDY ROAD
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ARCH1RUIZ@AOL.COM

DRAWN BY: TC

REvised


 ADDENDUM #1 11-9-16

DATE: 11/09/16

DX MINI-SPLIT SCHEDULE			
INDOOR UNIT TAG		FC-A1,B1,C1,PR1	FC-A2
SERVES		IT ROOM	FILE STOR. A110
LOCATION		WALL	WALL
UNIT TYPE		WALL	WALL
FAN PROPERTIES			
MIN SUPPLY (CFM)		250	400
MINIMUM O/A (CFM)		0	0
UNIT CAPACITIES			
ENTERING AIR (DB/WB)		74/62	80/67
COOLING CAPACITY (BTUH)		9,000	9,000
HEATING CAPACITY (BTUH)		0	12,000
UNIT DETAILS			
VOLTAGE/PHASE		208/1	208/1
MANUFACTURER		DAIKIN	DAIKIN
MODEL NO.		FTXN09KEV	FTXG12HVJU
MAX WEIGHT (LBS)		25	50
CONDENSING UNIT TAG		FCCU-A1,B1,C1,PR1	FCCU-A2
DETAILS			
VOLTAGE/PHASE		208/1	208/1
MCA/MOCP		5/15	15/15
AMB. AIR TEMP. (CLG°F/HTG°F)		99/33	99/33
REFRIGERANT		R-410A	R-410A
COOLING MODE OPER. RANGE		15°F - 110°F	15°F - 110°F
HEATING MODE OPER. RANGE		N/A	5°F - 75°F
MANUFACTURER		DAIKIN	DAIKIN
MODEL NO.		RKN09KEV	RXG12HVJU
MAX WEIGHT (LBS)		75	100
MIN COOL/HEAT EFFICIENCY		18 SEER/-	26 SEER/11 HSPF
MAX EQUIV. LINE LENGTH (FT)		66	30
MAX. VERTICAL RISE (FT)		49	25
CONTROL TYPE		WL-RC	WL-RC
NOTES		1-9	1-9
NOTES:			
01. ELECTRICAL CONTRACTOR TO PROVIDE SINGLE CIRCUIT POWER FROM SERVICE TO OUTDOOR UNIT AND WIRE TO INDOOR UNIT.			
02. WIRELESS REMOTE CONTROLLER.			
03. PROVIDE INDOOR UNITS WITH MOUNTING BRACKETS IF REQUIRED.			
04. SEE PLUMBING FOR CONDENSATE ROUTING.			
05. PROVIDE IBC 2015 COMPLIANT CURB & ATTACHMENTS FROM UNIT TO CURB & CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:			
A) ATTACHMENT OF EQUIPMENT TO CURB.			
B) CURB TO STRUCTURE.			
C) CURB AND ATTACHMENT HARDWARE STRENGTH.			
REFER TO ARCHITECTURAL & STRUCTURAL DRAWINGS FOR ROOF SUBSTRATE DETAILS. EQUIPMENT OR CURB MANUFACTURER IS ALSO RESPONSIBLE FOR PROVIDING ENGINEERED INSTALLATION DRAWINGS FOR ITEMS 1 & 2 LISTED ABOVE. BOTH THE ENGINEERED ANALYSIS & THE ENGINEERED INSTALLATION DRAWINGS SHALL BE PERFORMED SPECIFICALLY FOR THIS BUILDING & PROJECT SITE & STAMPED & SEALED BY A TEXAS LICENSED ENGINEER. SUBMITTALS WILL NOT BE APPROVED UNTIL ALL DOCUMENTATION LISTED ABOVE IS PROVIDED ACCURATELY.			
06. CONTRACTOR TO PROVIDE LINE SETS.			
07. SIGHT GLASSES, FILTER DRYERS, & FIELD SUPPLIED EXPANSION VALVES ARE NOT TO BE USED ON THIS EQUIPMENT.			
08. INSTALL PER MANUFACTURERS INSTRUCTIONS & PIPING RECOMMENDATIONS.			
09. PROVIDE W/ CONTROLS INTERFACE CARD FOR STATUS & TEMPERATURES.			

ROOF TOP UNIT SCHEDULE				
RTU-B4,B5	RTU-C2	RTU-C4	RTU-C5,PR2,PR3	RTU-PR1
MULTI ZN VAV	SNGL ZN VAV	SNGL ZN VAV	SNGL ZN VAV	SNGL ZN VAV
DOWNFLOW	DOWNFLOW	DOWNFLOW	DOWNFLOW	DOWNFLOW
OFFICES	BOARDROOM	WAIT/REC.OFF/CONF	LOBBY/RRs	LNG.OFF/REC
1600	2400	1000	1750	1150
350	650	200	250	150
0.5	0.625	0.5	0.5	0.5
1.0 HP - ECM	3.75 HP - VFD	3/4 HP - VFD	1.0 HP - ECM	3/4 HP - ECM
78.7/66.2	80/67.3	78.2/65.8	76.7/65.5	76.4/64.2
55.8/54.9	56.4/55.7	56.3/54.8	55.5/53.9	56.6/54.3
54/39	85/61	32/23	54/40	33/24
73/61	73/61	73/61	73/61	73/61
99/81	99/81	99/81	99/81	99/81
NONE	NONE	NONE	NONE	NONE
-	-	-	-	-
-	-	-	-	-
ELEC/33	ELEC/33	ELEC/33	ELEC/33	ELEC/33
9 KW/2	20.3 KW/2	9 KW/3	9 KW/2	4.5 KW/1
62/80	60/87	63/92	65/82	67/80
17 SEER/-	12.6 EER/-	17 SEER/-	17 SEER/-	17 SEER/-
1/2	2/2	1/2	1/2	1/2
208/3	208/3	208/3	208/3	208/3
43/45	81/90	41/45	43/45	25/30
14" CURB	14" CURB	14" CURB	14" CURB	14" CURB
TRANE	TRANE	TRANE	TRANE	TRANE
THC067	THC092	THC037	THC067	THC037
5.0 Tons	7.5 Tons	3.0 Tons	5.0 Tons	3.0 Tons
1000 lbs	1250 lbs	750 lbs	1000 lbs	750 lbs
1-7	1-7	1-7	1-7	1-7
: COIL W/ FACTORY E-COAT.				
AGENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF				
MANUFACTURER IS ALSO RESPONSIBLE FOR PROVIDING ENGINEERED INSTALLATION DRAWINGS				
NGS SHALL BE PERFORMED SPECIFICALLY FOR THIS BUILDING & PROJECT SITE & STAMPED & SEALED				
BOVE IS PROVIDED ACCURATELY.				
:ER.				
BLE CAPACITY COMPRESSOR TO BE STAGED OFF OF COIL LEAVING AIR TEMPERATURE.				

11/09/16



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SHEET AM3.1E	PROJECT: <div style="text-align: center;"> ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS <hr/> BROWNSVILLE NAVIGATION DISTRICT PORT OF BROWNSVILLE BROWNSVILLE, TEXAS </div>	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; margin-right: 10px;"> ROBERTO J. RUIZ ARCHITECT, INC. </div> </div> <div style="font-size: small; margin-top: 5px;"> 615 W. TANDY ROAD BROWNSVILLE, TEXAS 77520 (956) 350-9195 OFFICE (956) 350-9196 FAX ARCH1RUIZ@AOL.COM </div>
DRAWN BY: TC	<div style="display: flex; align-items: center;"> <div style="margin-right: 20px;">REVISED</div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> 1 </div> <div>ADDENDUM #1 11-9-16</div> </div>	
DATE: 11/09/16		

FAN SCHEDULE

TAG	EF-B1	EF-B2	EF-B3,C3,C4,PR1	EF-C1	EF-C2	EF-PR2
SERVICE	B LOUNGE	B GANG RRs	SINGLE RRs	C LOUNGE	C GANG RRs	PR GANG RRs
LOCATION	ROOF	ROOF	CEILING	ROOF	ROOF	ROOF
FAN PROPERTIES						
CFM	300	500	75	250	400	500
FAN RPM	1579	1667	642	1514	1536	1667
EXT SP (IN WG)	0.5	0.5	0.15	0.5	0.5	0.5
FAN POWER	1/10 HP - ECM	1/10 HP - ECM	16 W	1/10 HP	1/10 HP	1/10 HP
VOLTS/PHASE	120/1	120/1	120/1	120/1	120/1	120/1
SOUND LEVEL	7.8 SONES	8.4 SONES	0.7 SONE	7.3 SONES	7.4 SONES	8.4 SONES
MOUNTING	14" TDI CURB	14" TDI CURB	CEILING	14" TDI CURB	14" TDI CURB	14" TDI CURB
MANUFACTURER	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK	GREENHECK
MODEL	G-085-VG	G-090-VG	SP-B90	G-085-VG	G-090-VG	G-090-VG
MAX WEIGHT	50 lbs	50 lbs	25 lbs	50 lbs	50 lbs	50 lbs
NOTES	1,2,3,6,7,9,10	1,2,3,7,8,9,10	1,2,3,4,5,7	1,2,3,6,7,9,10	1,2,3,7,8,9,10	1,2,3,7,8,9,10

NOTES:

01. PROVIDE W/ FAN SPEED CONTROLLER
02. PROVIDE WITH FACTORY INSTALLED DISCONNECT.
03. PROVIDE W/ BACKDRAFT DAMPER.
04. INTERLOCK FAN W/ LIGHTS.
05. PROVIDE W/ TIMED DELAY SHUTOFF.
06. PROVIDE FAN W/ WALL MOUNTED ROTARY TIME DIAL SWITCH, 0-60 MINS, LABELED "VENT FAN".
07. FAN TO BE MONITORED BY HVAC CONTROLS.
08. FAN OPERATION TO BE THROUGH HVAC CONTROLS
09. PROVIDE W/ LIFTING LUGS.
10. PROVIDE IBC 2015 COMPLIANT CURB & ATTACHMENTS FROM UNIT TO CURB & CURB TO STRUCTURE. EQUIPMENT OR CURB MANUFACTURER IS RESPONSIBLE FOR PROVIDING ENGINEERED DETAIL ANALYSIS OF:
 - ATTACHMENT OF EQUIPMENT TO CURB.
 - CURB TO STRUCTURE.
 - CURB & ATTACHMENT HARDWARE STRENGTH.

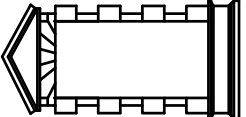

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SHEET AED1.1	PROJECT: ADMINISTRATION COMPLEX REHABILITATION AND BUILDING ADDITIONS		ROBERTO J. RUIZ ARCHITECT, INC.  615 W. TANDY ROAD BROWNSVILLE, TEXAS 77520 (956) 350-9195 OFFICE (956) 350-9196 FAX ARCH1RUIZ@AOL.COM
	BROWNSVILLE NAVIGATION DISTRICT PORT OF BROWNSVILLE BROWNSVILLE, TEXAS		
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DATE: 11/09/16			

KEYED NOTES: DEMOLITION

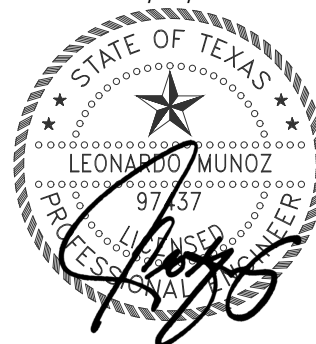
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- 1 ALL EXISTING LIGHT FIXTURES, LIGHTING DEVICES, ASSOCIATED CONDUIT AND WIRING SHALL BE REMOVED. THIS APPLIES FROM FINISH FLOOR TO MEZZANINE/ATTIC SPACE AND CRAWL SPACE.
- 2 ALL EXISTING ELECTRICAL EQUIPMENT, ELECTRICAL DEVICES, TELEPHONE DEVICES, DATA DEVICES AND ALL ASSOCIATED CONDUIT AND WIRING SHALL BE REMOVED. THIS APPLIES FROM FINISH FLOOR TO MEZZANINE/ATTIC SPACE AND CRAWL SPACE.
- 3 ALL EXISTING SECURITY AND FIRE ALARM DEVICES AND ASSOCIATED CONDUIT AND WIRING SHALL BE REMOVED. THIS APPLIES FROM FINISH FLOOR TO MEZZANINE/ATTIC SPACE AND CRAWL SPACE.

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SHEET
AES1.1A

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

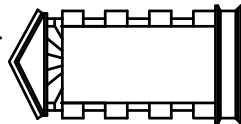
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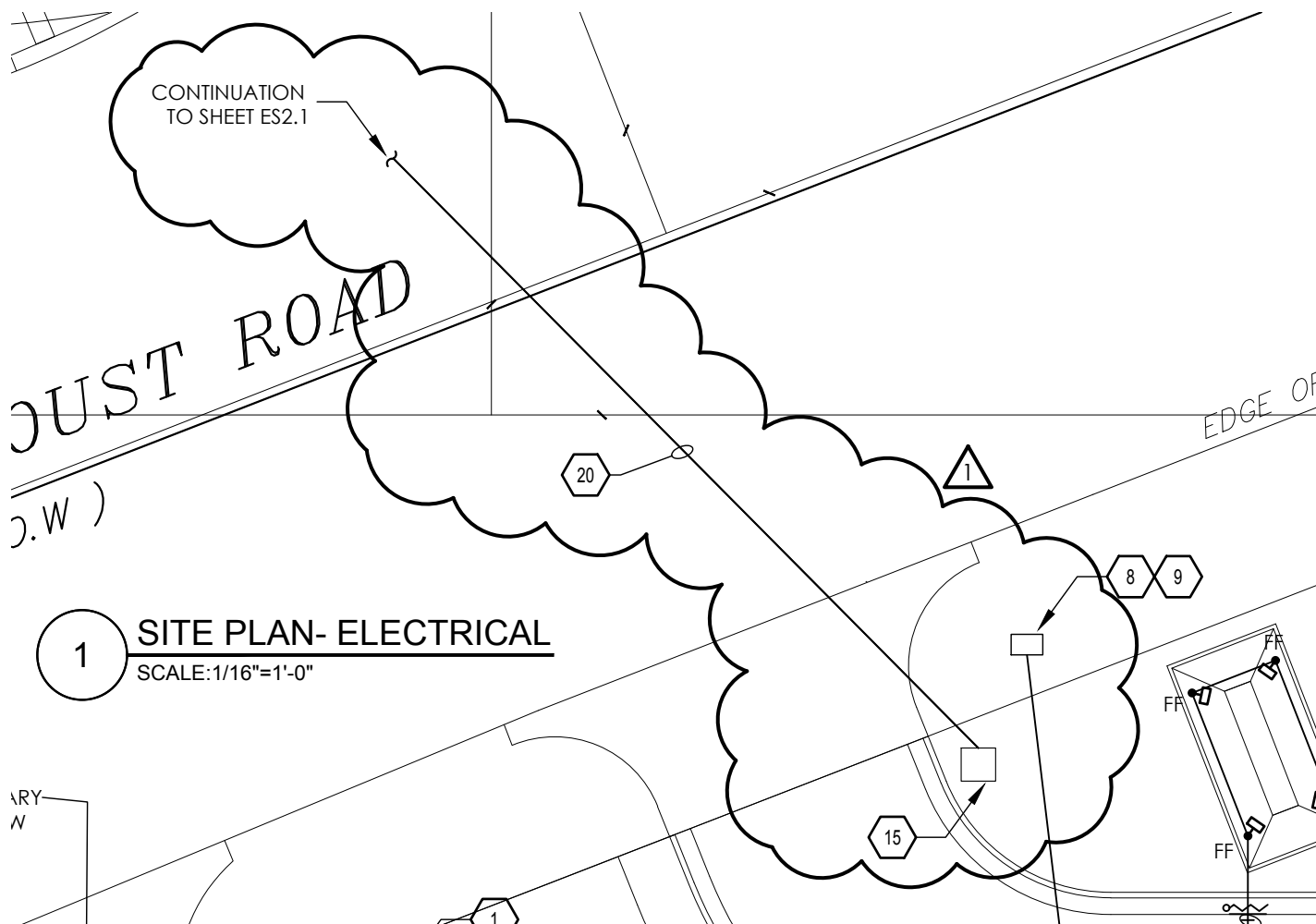


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1

SITE PLAN- ELECTRICAL

SCALE: 1/16"=1'-0"

12

EXISTING ELECTRICAL SERVICE TO EXISTING BUILDING-A/B LOCATION. FIELD VERIFY EXISTING CONDITIONS PRIOR TO ANY WORK. NOTE THE EXISTING ELECTRICAL SERVICE TO EXISTING BUILDING-B SHALL BE REMOVED.

13

CONTRACTOR IS RESPONSIBLE TO IDENTIFY EXISTING ELECTRICAL CONDUITS TO CONDUITS PRIOR TO ANY WORK.

15

NEW INGRADE PULLBOX. REFER TO DETAIL #13 SHEET E12.1

19

SHALL BE CONTROLLED VIA LIGHTING RELAY PANEL 'LCP2'.

20

CONTRACTOR SHALL INCLUDE ALL COST TO BORE UNDER EXISTING CAPTAIN D.L. FOUST ROAD FOR NEW CONDUITS.

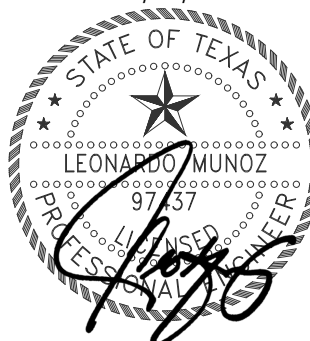
21

LOCATE NEW PULLBOX TO INTERSECT EXISTING FIBER OPTIC LINE.

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SHEET
AES1.1B

PROJECT:

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BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

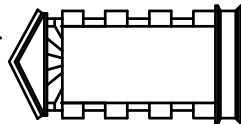
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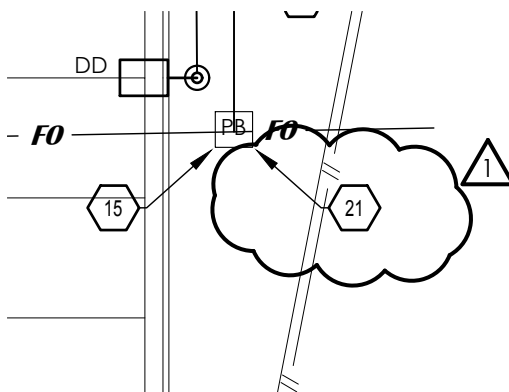


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GENERAL ELECTRICAL NOTES (TO ALL SHEETS)

- O. ALL EXTERIOR EXPOSED CONDUIT SHALL BE ELECTRICAL PVC TYPE AND ALL EXTERIOR CONDUIT SUPPORTS, STRAPS, FASTENERS SHALL BE STAINLESS STEEL TYPE.
- P. CONTRACTOR IS RESPONSIBLE TO DIG-TESS; 1-800-DIG-TESS 2-BUSINESS DAYS IN ADVANCE.
- Q. CONTRACTOR IS RESPONSIBLE TO VERIFY AND COORDINATE WITH EXISTING NEW UNDERGROUND UTILITIES PRIOR TO ANY WORK.

REVISION NOTES: ELECTRICAL



1

SITE PLAN- ELECTRICAL

SCALE: 1/16" = 1'-0"

- 19 SHALL BE CONTROLLED VIA LIGHTING RELAY PANEL 'LCP2'.
- 20 CONTRACTOR SHALL INCLUDE ALL COST TO BORE UNDER EXISTING CAPTAIN D.L. FOUST ROAD FOR NEW CONDUITS.
- 21 LOCATE NEW PULLBOX TO INTERSECT EXISTING FIBER OPTIC LINE.

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SHEET
AES2.1A

PROJECT:

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PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

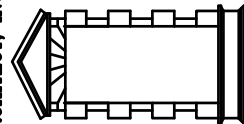
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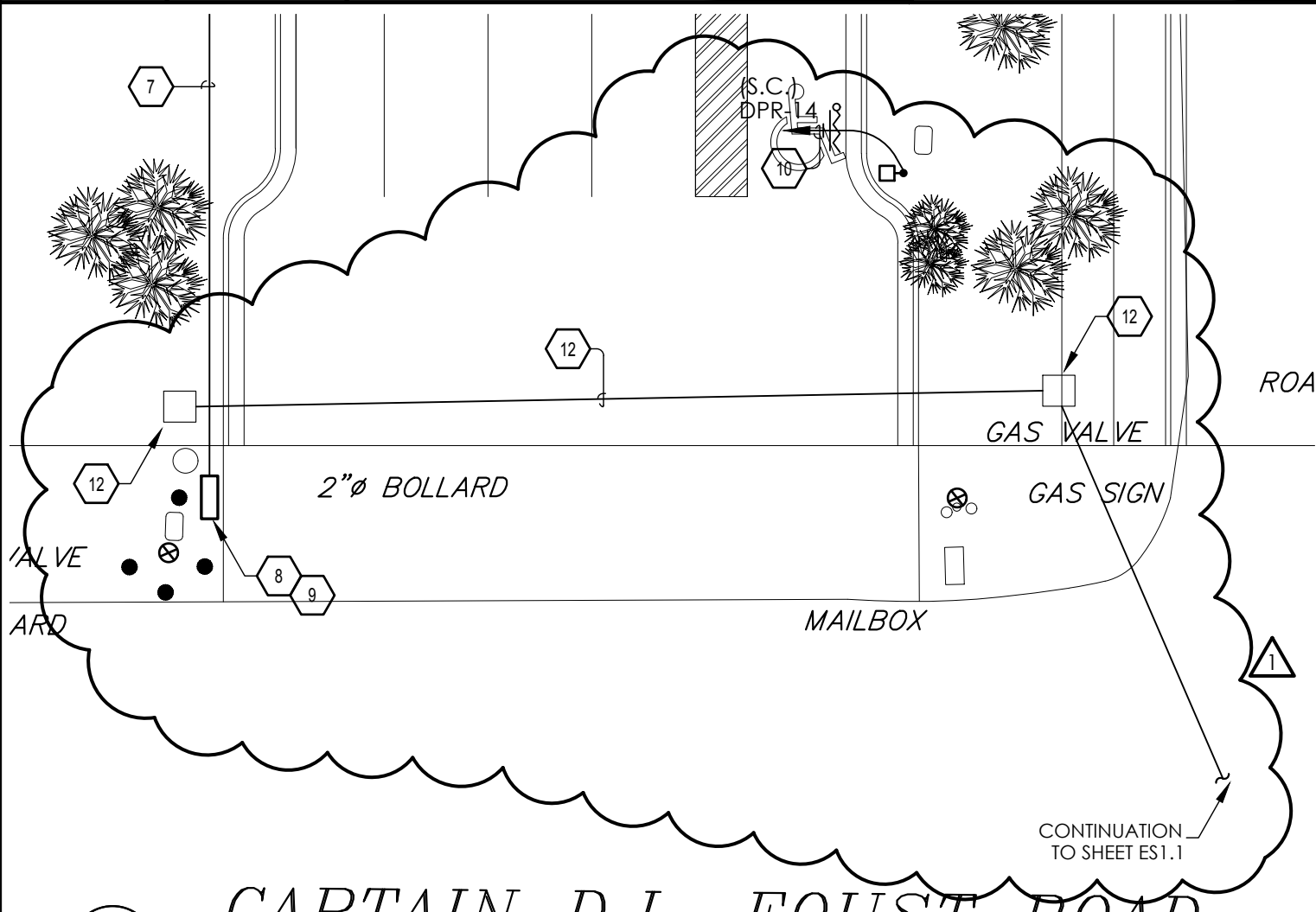


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1

SITE PLAN- BUILDING

1/16"=1'-0"

11 NEW INGRADE PULLBOX. REFER TO DETAIL #13 SHEET E12.1

12 CONTRACTOR TO PROVIDE AND INSTALL (1)-4" PVC CONDUIT FOR COMMUNICATION SERVICE EQUIPPED WITH PULLSTRING. DEPTH OF CONDUIT SHALL BE A MINIMUM OF 36". FIELD VERIFY ALL EXISTING UNDERGROUND CONDUITS PRIOR TO ANY WORK.

11/09/16

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SHEET
AES2.1B

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS

BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

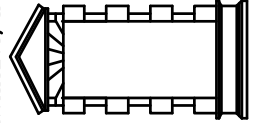
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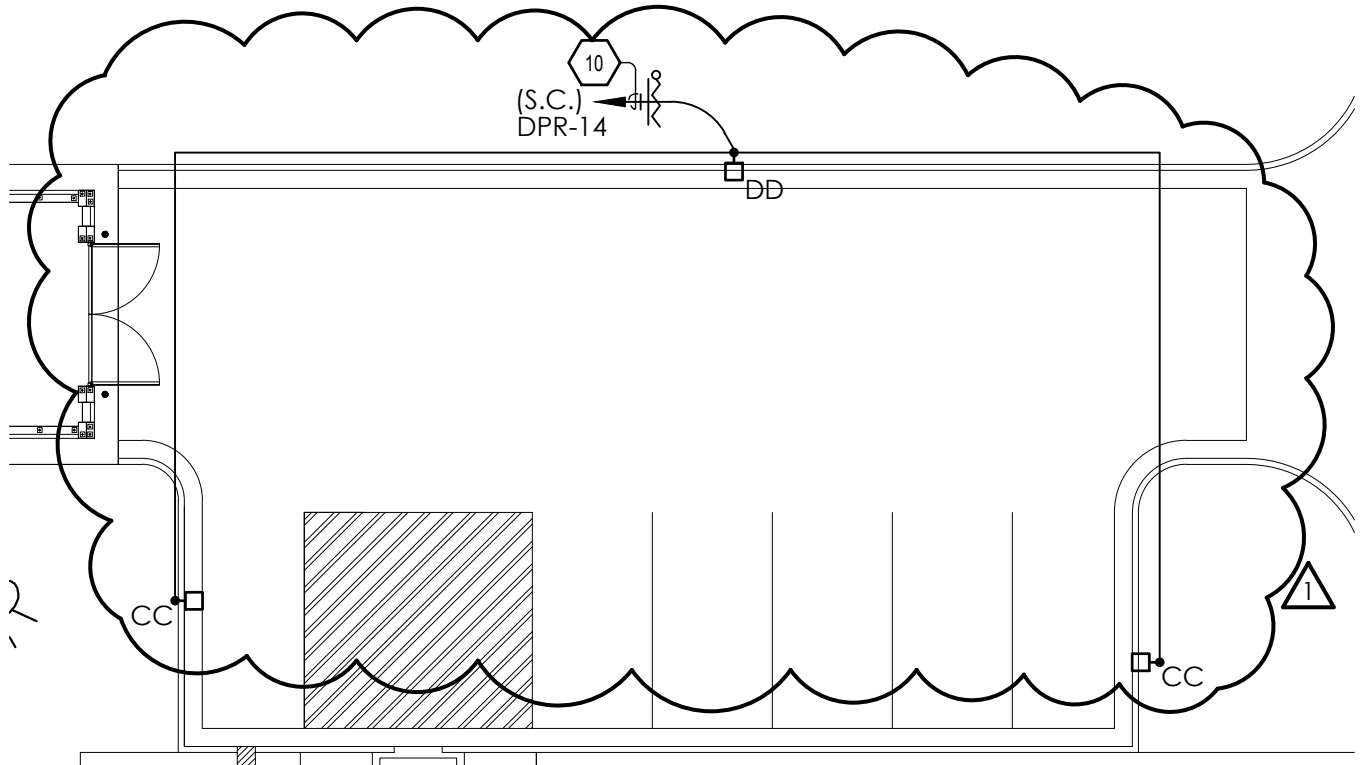


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1

SITE PLAN- BUILDING

1/16"=1'-0"

11/09/16

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SHEET
AE4.1

PROJECT:

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PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

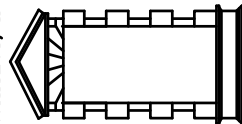
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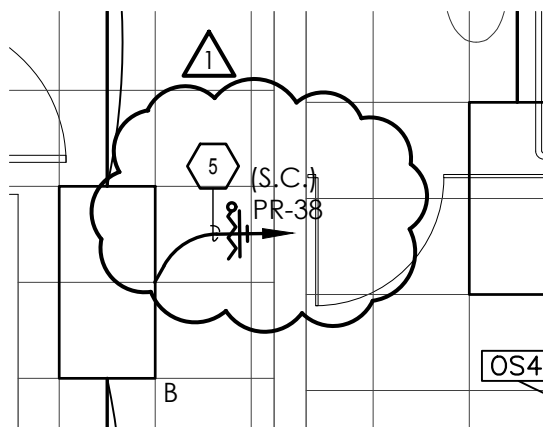
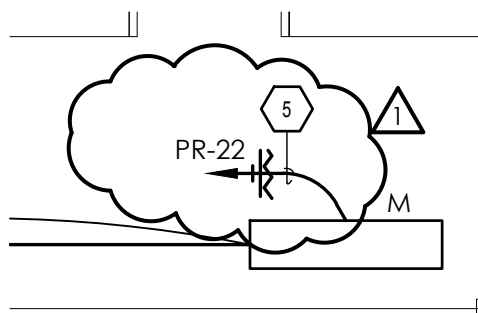


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1

ELECTRICAL LIGHTING FLOOR PLAN

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

11/09/16

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SHEET
AE5.1

PROJECT:

ADMINISTRATION COMPLEX
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BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

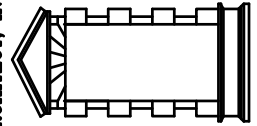
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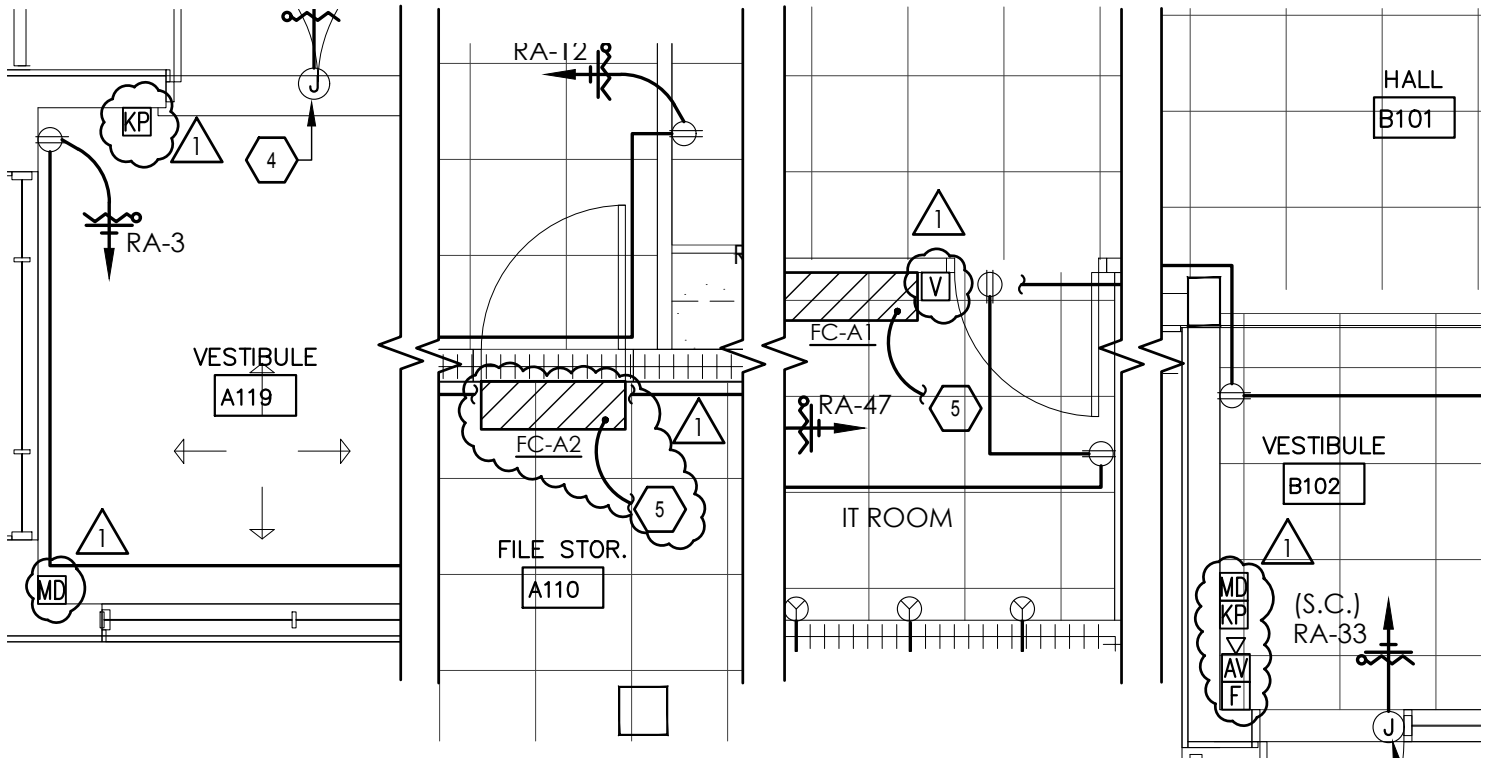


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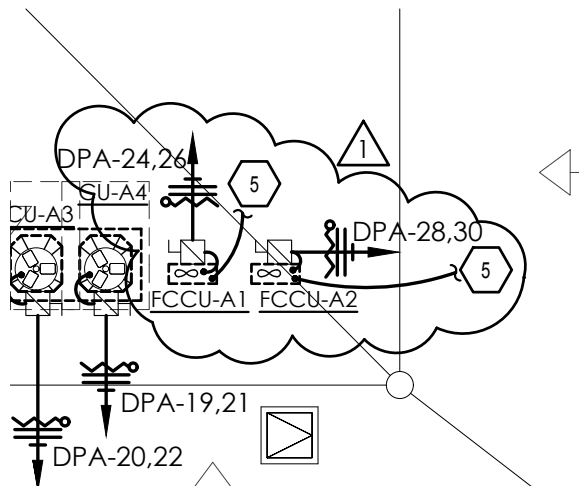
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1

ELECTRICAL FLOOR PLAN- BUILDING A

1/4"=1'-0"



2

ELECTRICAL ROOF PLAN- BUILDING A

3/32"=1'-0"

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SHEET
AE6.1

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BROWNSVILLE, TEXAS

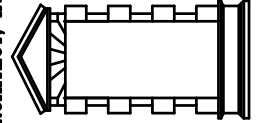
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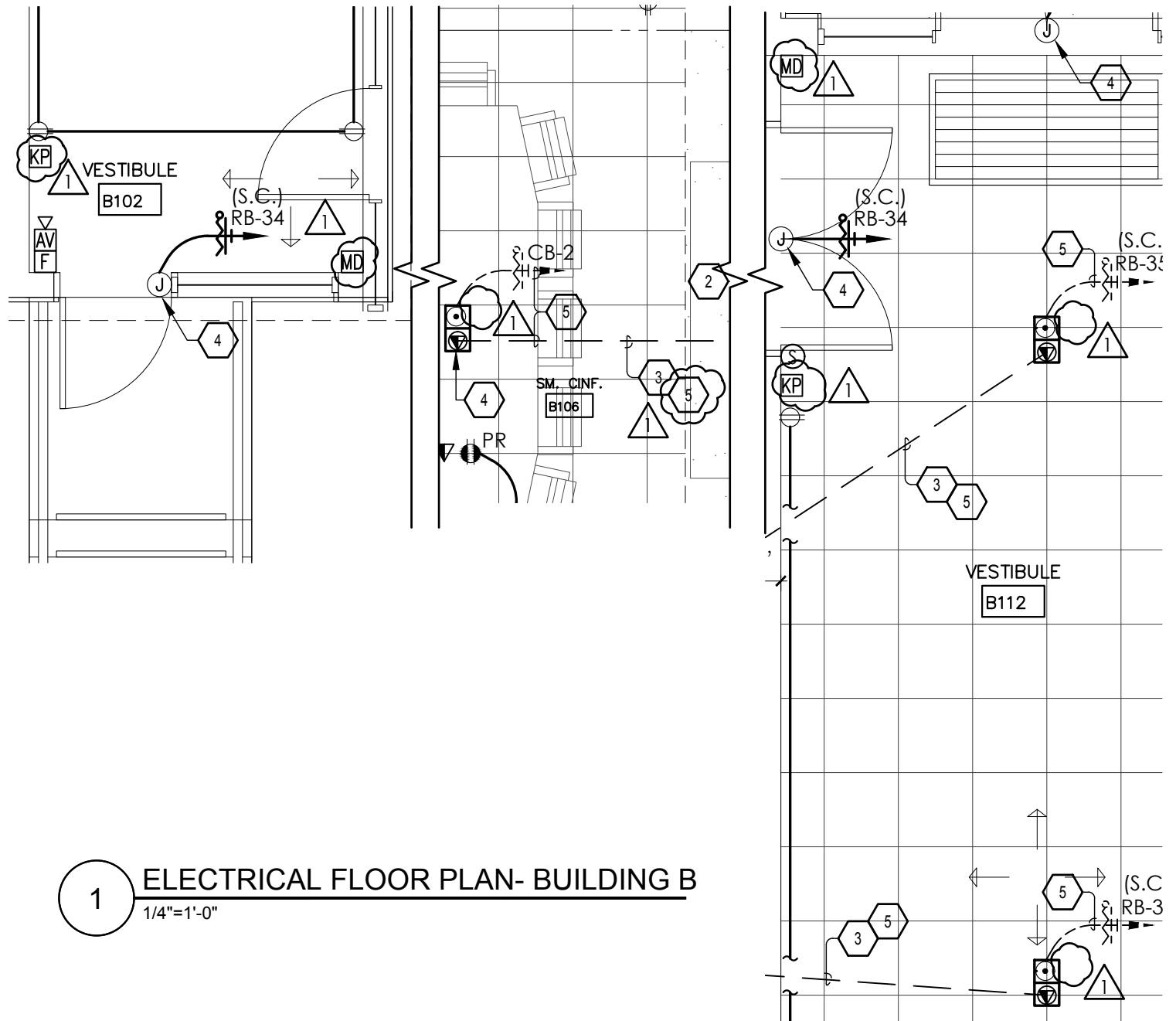


DATE: 11/09/16

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1

ELECTRICAL FLOOR PLAN- BUILDING B

1/4"=1'-0"

11/09/16

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SHEET
AE7.1

PROJECT:

ADMINISTRATION COMPLEX
REHABILITATION AND BUILDING ADDITIONS
BROWNSVILLE NAVIGATION DISTRICT
PORT OF BROWNSVILLE
BROWNSVILLE, TEXAS

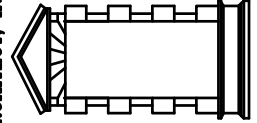
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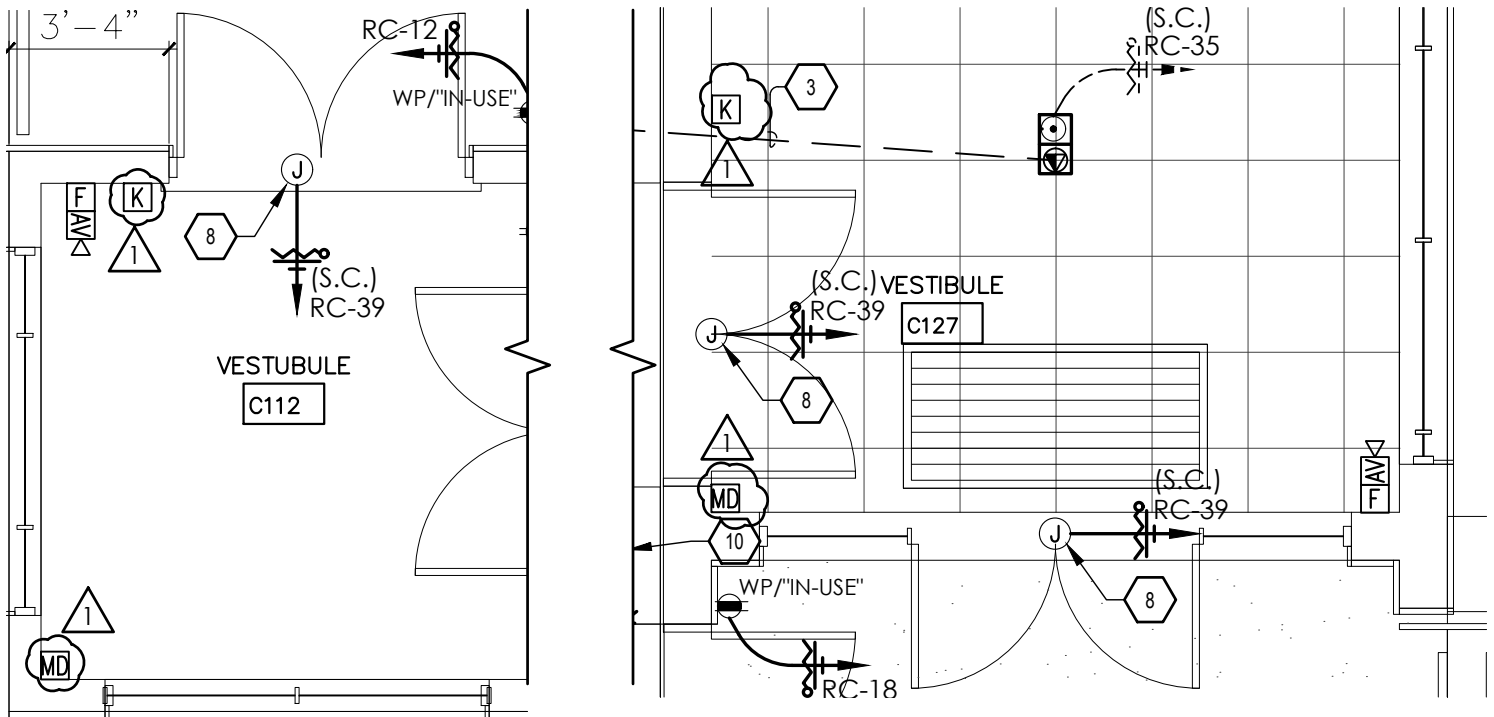


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1

ELECTRICAL FLOOR PLAN- BUILDING C

1/4"=1'-0"

11/09/16

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