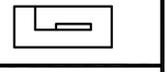


NO.	DATE	DESCRIPTION



THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Giipe Associates Inc.
Consulting Engineers
8719 Brooke Drive
Baltimore, MD 21286
Phone: 410/852-2420
Fax: 410/852-6398

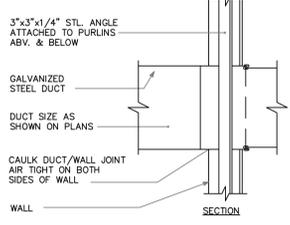
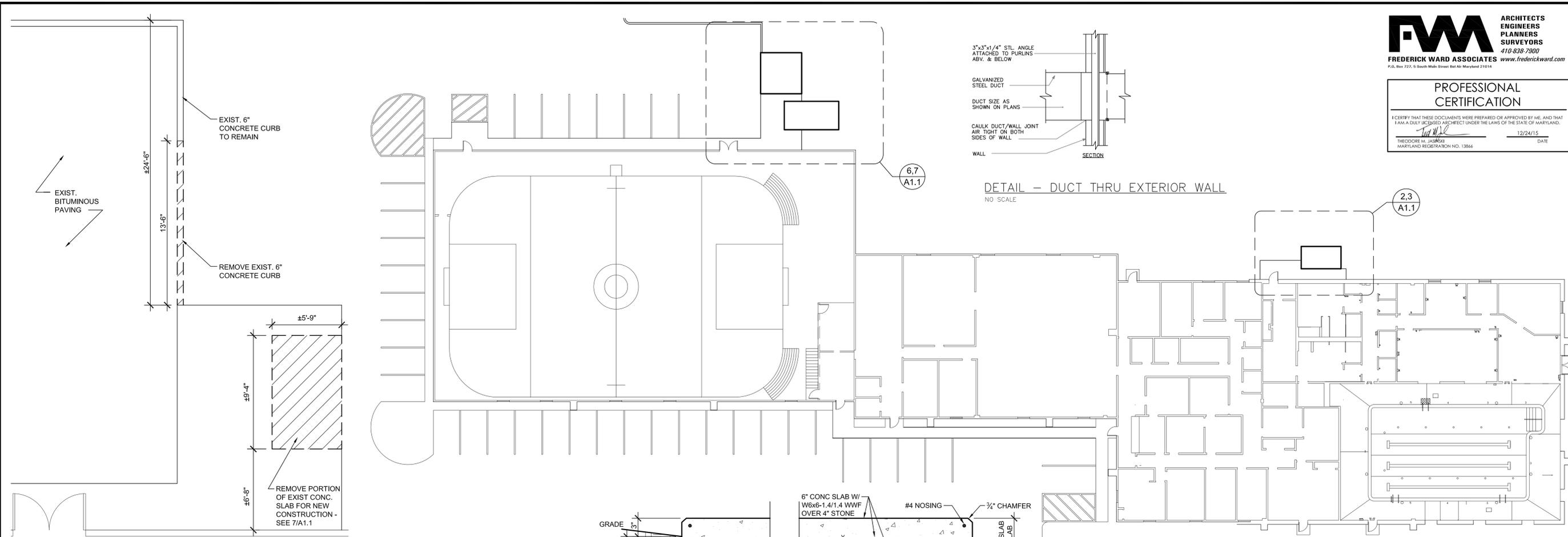


WO# 13072.B
PROJECT MANAGER MS
DESIGNER KSS
DATE 12/23/2015

ARCHITECTURAL PLANS
FOREST HILL REC. CENTER
FOREST HILL, MARYLAND

BID DOCUMENTS

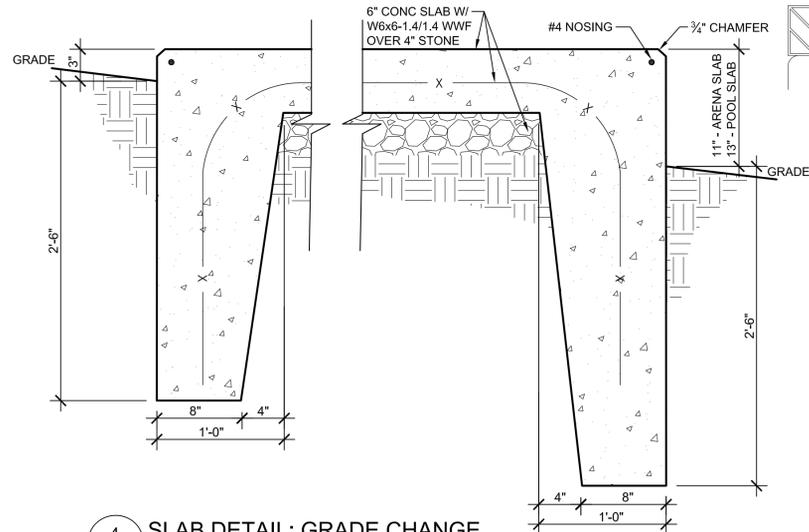
A1.1



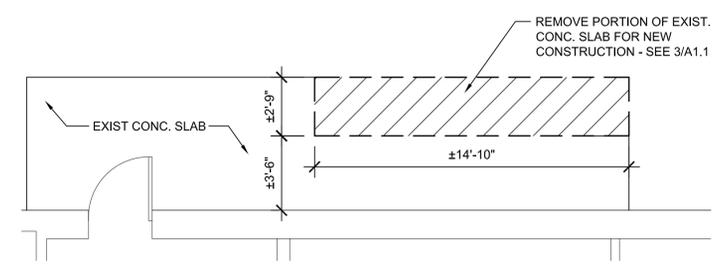
DETAIL - DUCT THRU EXTERIOR WALL
NO SCALE

6 ENLARGED DEMOLITION PLAN: ARENA
A1.1 SCALE: 1/2"=1'-0"

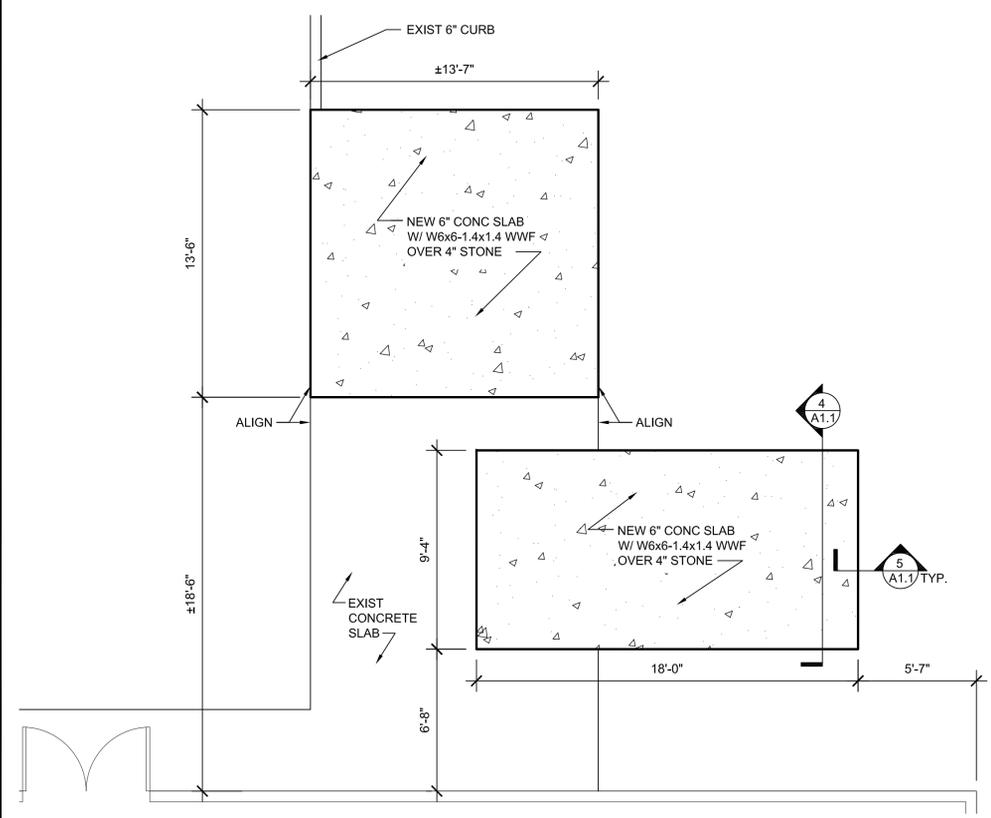
1 FLOOR PLAN
A1.1 SCALE: 1/16"=1'-0"



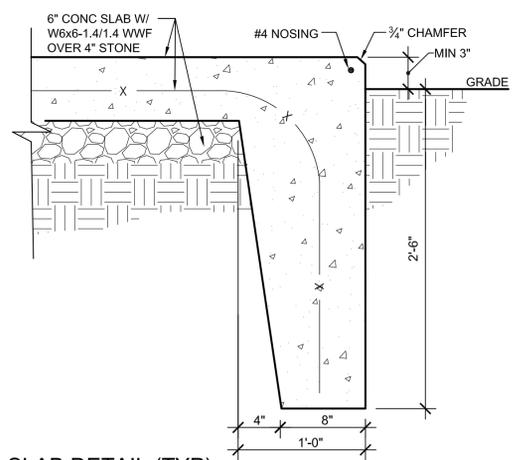
4 SLAB DETAIL: GRADE CHANGE
A1.1 SCALE: 1/2"=1'-0"



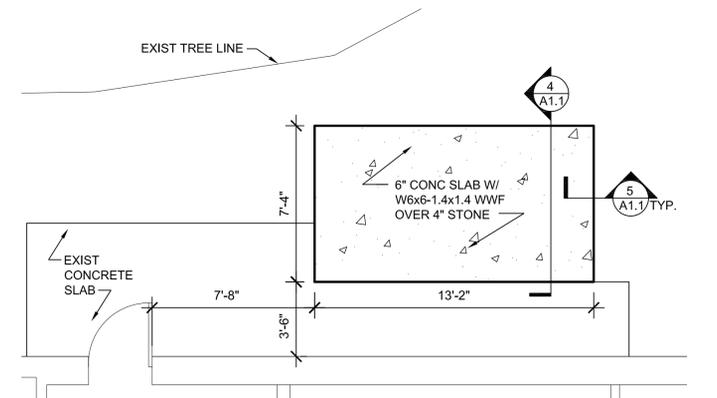
2 ENLARGED DEMOLITION PLAN: POOL AREA
A1.1 SCALE: 1/2"=1'-0"



7 ENLARGED PLAN: ARENA HVAC SLAB
A1.1 SCALE: 1/2"=1'-0"



5 SLAB DETAIL (TYP)
A1.1 SCALE: 1/2"=1'-0"



3 ENLARGED PLAN: POOL AREA HVAC SLAB
A1.1 SCALE: 1/2"=1'-0"

GENERAL NOTES:

1. THE ELECTRICAL CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE DRAWINGS OF ALL OTHER TRADES ON THE PROJECT. ELECTRICAL OR SYSTEMS CONNECTIONS INDICATED ON MECHANICAL, STRUCTURAL, AND ALL OTHER DRAWINGS WHICH ARE PART OF THIS PROJECT, SHALL BE CONSIDERED A PART OF THIS CONTRACT AND SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR AT NO EXTRA COST TO THE OWNER.
2. THE ELECTRICAL DRAWINGS ARE DIAGRAMMATIC IN NATURE AND AS SUCH SHALL NOT BE SCALED. COORDINATE LOCATIONS OF MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN OF SERVICE EQUIPMENT AND WIRING.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT ROUTING OF WIRING AND CONDUITS. CONTRACTOR SHALL SIZE CONDUIT TO ACCOMMODATE WIRING PER NEC. 20 AMPERE CIRCUITS SHALL BE SIZED AS FOLLOWS:

20 AMPERE CIRCUITS				
120 VOLT		277 VOLT		MINIMUM CONDUIT SIZE
WIRING LENGTH	WIRE SIZE	WIRING LENGTH	WIRE SIZE	
0' - 60'	#12	0' - 130'	#12	3/4"
60' - 100'	#10	130' - 210'	#10	3/4"
100' - 150'	#8	210' - 340'	#8	3/4"
150' - 240'	#6	340' - 540'	#6	3/4"
OVER 240'	#4	OVER 540'	#4	1"

NOTES:
BRANCH CIRCUITS IN PANELBOARDS WITH 200% RATED NEUTRAL BUS AND ALL DIMMED LIGHTING CIRCUITS SHALL HAVE DEDICATED NEUTRAL CONDUCTORS.

4. WIRING AND CONDUIT SIZES INDICATED IN PANEL SCHEDULES ARE MINIMUM ONLY. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING EXACT WIRING AND CONDUIT SIZES. CONTRACTOR SHALL PROVIDE SPLICE BLOCKS AND REDUCING PINS AS REQUIRED TO TERMINATE WIRING AND MAKE FINAL CONNECTIONS.
5. FEEDERS AND BRANCH CIRCUITS WHICH MUST BE RUN ACROSS FINISHED OPEN AREAS SHALL BE ROUTED AS DIRECTED BY THE ENGINEER AND OWNERS REPRESENTATIVE.
6. ELECTRICAL BOXES IN FIRE RATED PARTITIONS SHALL NOT EXCEED 16 SQUARE INCHES IN AREA (IF 4"x4"), SHALL BE MADE OF STEEL, AND SHALL BE SUCH THAT THE CUMULATIVE AREA OF BOX "CUTOUPS" IN THE FIREWALL DOES NOT EXCEED 100 SQUARE INCHES PER 100 SQUARE FEET OF WALL AREA. ELECTRICAL BOXES ON OPPOSITE SIDES OF THE SAME FIREWALL SHALL BE SEPARATED BY A HORIZONTAL AND VERTICAL DISTANCE OF NOT LESS THAN 24 INCHES. THE ELECTRICAL CONTRACTOR SHALL MAKE MINOR ADJUSTMENTS, AS NECESSARY, TO ELECTRICAL BOX LOCATIONS TO ENSURE COMPLIANCE WITH THIS REQUIREMENT SINCE BOX LOCATIONS ARE TYPICALLY NOT DIMENSIONED ON THE DRAWINGS. CONSULT ENGINEER IF CLARIFICATION IS REQUIRED.
7. PROPERLY SUPPORT ALL EXISTING LV CABLING, INCLUDING BUT NOT LIMITED TO CONTROLS, FIRE ALARM, ETC. ABOVE CEILINGS.
8. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE FOLLOWING SYSTEMS:
SECURITY/FIRE ALARM SYSTEM
CONTRACTOR MAY REQUEST DEMONSTRATION FROM OWNER, PRIOR TO CONSTRUCTION, THAT ALL SYSTEMS ARE FULLY FUNCTIONING WITHOUT ANY DEFICIENCIES. ANY DEFICIENCIES DURING AND AFTER CONSTRUCTION PERIOD SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR FOR REPAIR

DEMOLITION NOTES:

1. DEMOLITION DRAWING IS DIAGRAMMATIC IN NATURE; NO ATTEMPT HAS BEEN MADE TO SHOW ALL EXISTING ELECTRICAL WORK. IN AREAS INDICATED TO BE RENOVATED, ALL EXISTING ELECTRICAL WORK SHALL BE REMOVED AS INDICATED. WHERE AN ITEM IS INDICATED TO BE REMOVED, REMOVE ALL ASSOCIATED ELECTRICAL WORK BACK TO POINT OF SOURCE UON.
2. CEILING MOUNTED DEVICES INDICATED TO BE REMOVED, SHALL BE REMOVED AND RE-INSTALLED TO ACCOMMODATE ELECTRICAL AND MECHANICAL WORK. MAINTAIN ALL POWER CIRCUITS, LIGHTING, PUBLIC ADDRESS WIRING, FIRE ALARM WIRING, DATA WIRING, ETC.
3. WHERE WORK PASSES THROUGH THE RENOVATION AREA TO SERVE OTHER PORTIONS OF THE BUILDING, OR WORK IN THE RENOVATION AREA INDICATED TO REMAIN, IT SHALL BE SUITABLY RELOCATED AND THE SYSTEMS RESTORED TO NORMAL. COORDINATE ANY OUTAGES WITH OWNER 15 DAYS IN ADVANCE.
4. WORK INDICATED TO REMAIN SHALL BE SUITABLY PROTECTED AGAINST DAMAGE.
5. DISCONNECT AND REMOVE ALL ELECTRICAL CONNECTIONS ASSOCIATED WITH MECHANICAL EQUIPMENT INDICATED TO BE REMOVED UNDER DIVISION 15, UON.

ELECTRICAL LEGEND

LIGHTING

 1'x4' FLUORESCENT LIGHTING FIXTURE

SWITCHES

 TOGGLE SWITCH; SINGLE POLE, 3-WAY, 4-WAY; SUBSCRIPT INDICATES FIXTURES/OUTLETS CONTROLLED; MOUNT AT 4'-0" AFF

OUTLETS

 WP GFI
DUPLX RECEPCTACLE; 2P, 3W, 20A, 125V, NEMA 5-20R; MOUNT AT 1'-6" AFF UON; SUBSCRIPTS: GFI - GROUND FAULT INTERRUPTER, WP - WEATHERPROOF, CTR - MOUNT 6" ABOVE COUNTER BACKSPASH AS SHOWN. SUBSCRIPTS REFER TO ABBREVIATIONS

 DUPLX RECEPCTACLE; 2P, 3W, 20A, 125V, NEMA 5-20R; WATER PROOF GROUND FAULT INTERRUPTING MOUNT AT 3'-6" AFF UON. REFER TO ABBREVIATIONS.

POWER

 PANELBOARD; RECESSED, SURFACE MOUNTED; MOUNT AT 6'-6" AFF TO TOP OF PANEL.

 SINGLE POLE THERMAL MANUAL MOTOR STARTING SWITCH WITH HOA SWITCH; MOUNT AT 4'-0" AFF IN NEMA 1 ENCLOSURE UON MOTOR; AS NOTED

 UNIT HEATER

 SAFETY SWITCH, FUSED OR NON-FUSED, SIZE AS INDICATED ON DRAWINGS. ENCLOSURE SHALL BE NEMA 1 UNLESS OTHERWISE NOTED, MOUNT 5'-6" AFF TO TOP UNLESS OTHERWISE NOTED

 ENCLOSED CIRCUIT BREAKER, SIZE AND TYPE AS INDICATED ON DRAWINGS.

 JUNCTION BOX

 TO GROUND

 AUTOMATIC TEMPERATURE CONTROL PANEL (FURNISHED UNDER DIVISION 15).

CONDUIT

 HOMERUN TO PANELBOARD; NUMBER OF ARROWHEADS INDICATE NUMBER OF CIRCUITS; REFER TO PANEL SCHEDULES FOR MINIMUM WIRE AND CONDUIT SIZES

 BRANCH CIRCUIT CONDUIT AND WIRING CONCEALED IN CEILING OR WALL SPACE, OR SURFACE MOUNTED WHERE NO CEILING OR WALL SPACE EXISTS; REFER TO PANEL SCHEDULES FOR MINIMUM WIRE AND CONDUIT SIZES

 BRANCH CIRCUIT CONDUIT AND WIRING IN SLAB, UNDER FLOOR OR UNDERGROUND; REFER TO PANEL SCHEDULES FOR MINIMUM WIRE AND CONDUIT SIZES

FIRE ALARM

 DUCT TYPE SMOKE DETECTOR

 CONTROL MODULE

 MONITOR MODULE

 REMOTE TEST SWITCH.

 FIRE ALARM ANNUNCIATOR/FIRE ALARM CONTROL PANEL AS NOTED

MISCELLANEOUS

 REFERENCE TO DRAWING NOTE

 DETAIL REFERENCE: DETAIL NUMBER/DRAWING NUMBER

 ITEMS SHOWN DASHED/HEAVY ARE TO BE REMOVED AND REINSTALLED OR DEMOLISHED AS NOTED

 ITEMS SHOWN SOLID/LIGHT ARE EXISTING TO REMAIN

 ITEMS SHOWN SOLID/HEAVY ARE NEW WORK

ABBREVIATIONS

- A AMPERE, AMPERES
- AFF ABOVE FINISHED FLOOR
- AFS ABOVE FINISHED GRADE
- AHU AIR HANDLING UNIT
- AIC AMPERE INTERRUPTING CAPACITY
- ATS AUTOMATIC TRANSFER SWITCH
- AWG AMERICAN WIRE GAUGE
- CATV CABLE TELEVISION
- CCTV CLOSED CIRCUIT TELEVISION
- C CONDUIT
- CB CIRCUIT BREAKER
- CLG CEILING, CEILING MOUNTED
- CTR COUNTER TOP RECEPTACLE
- DIA DIAMETER
- DWG DRAWING
- EC ELECTRICAL CONTRACTOR
- ECB ENCLOSED CIRCUIT BREAKER
- EF EXHAUST FAN
- EPO EMERGENCY POWER OFF
- ETR EXISTING TO REMAIN
- EX EXISTING
- FAAP FIRE ALARM ANNUNCIATOR PANEL
- FACP FIRE ALARM CONTROL PANEL
- FT FEET
- FLA FULL LOAD AMPERES
- FSS FUSED SAFETY SWITCH
- G GROUND
- GFI GROUND FAULT INTERRUPTING
- GFPE GROUND FAULT PROTECTION OF EQUIPMENT
- HOA HAND-OFF-AUTOMATIC
- HP HORSEPOWER
- IDF INTERMEDIATE DISTRIBUTION FRAME
- IMC INTERMEDIATE METAL CONDUIT
- K KELVIN
- KCMIL THOUSAND CIRCULAR MILS
- KVA KILOVOLT-AMPERES
- KW KILOWATT
- LRA LOCKED ROTOR AMPERES
- MCA MINIMUM CIRCUIT AMPERES
- MCB MAIN CIRCUIT BREAKER
- MDF MAIN DISTRIBUTION FRAME
- MLO MAIN LUGS ONLY
- MTD MOUNTED
- MH MOUNTING HEIGHT/MANHOLE
- MUA MAKE UP AIR
- NEC NATIONAL ELECTRICAL CODE
- NEMA NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
- NFSS NONFUSED SAFETY SWITCH
- NIC NOT IN CONTRACT
- NO NUMBER
- OC ON CENTERS
- P POLE, POLES
- Ø PHASE
- PNL PANEL
- RAF RETURN AIR FAN
- PVC POLYVINYL CHLORIDE
- RGS RIGID GALVANIZED STEEL
- RX REMOVE EXISTING
- SPD SURGE PROTECTIVE DEVICE
- TR TAMPER RESISTANT
- TVSS TRANSIENT VOLTAGE SURGE SUPPRESSION
- TYP TYPICAL
- UH UNIT HEATER
- V VOLT, VOLTS
- VR VANDAL RESISTANT
- WP WEATHERPROOF
- W WATTS, WIRE, WIRES
- XFMR TRANSFORMER
- TTB TELEPHONE TERMINAL BOARD
- UTP UNSHIELDED TWISTED PAIR
- UON UNLESS OTHERWISE NOTED

NO.	DATE	DESCRIPTION	REVISIONS	
			NO.	DATE

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 35222, EXPIRATION DATE: 01/05/2014.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Palmyra Ave.
Baltimore, MD 21286
Phone: 410/882-8410
Fax: 410/882-8415

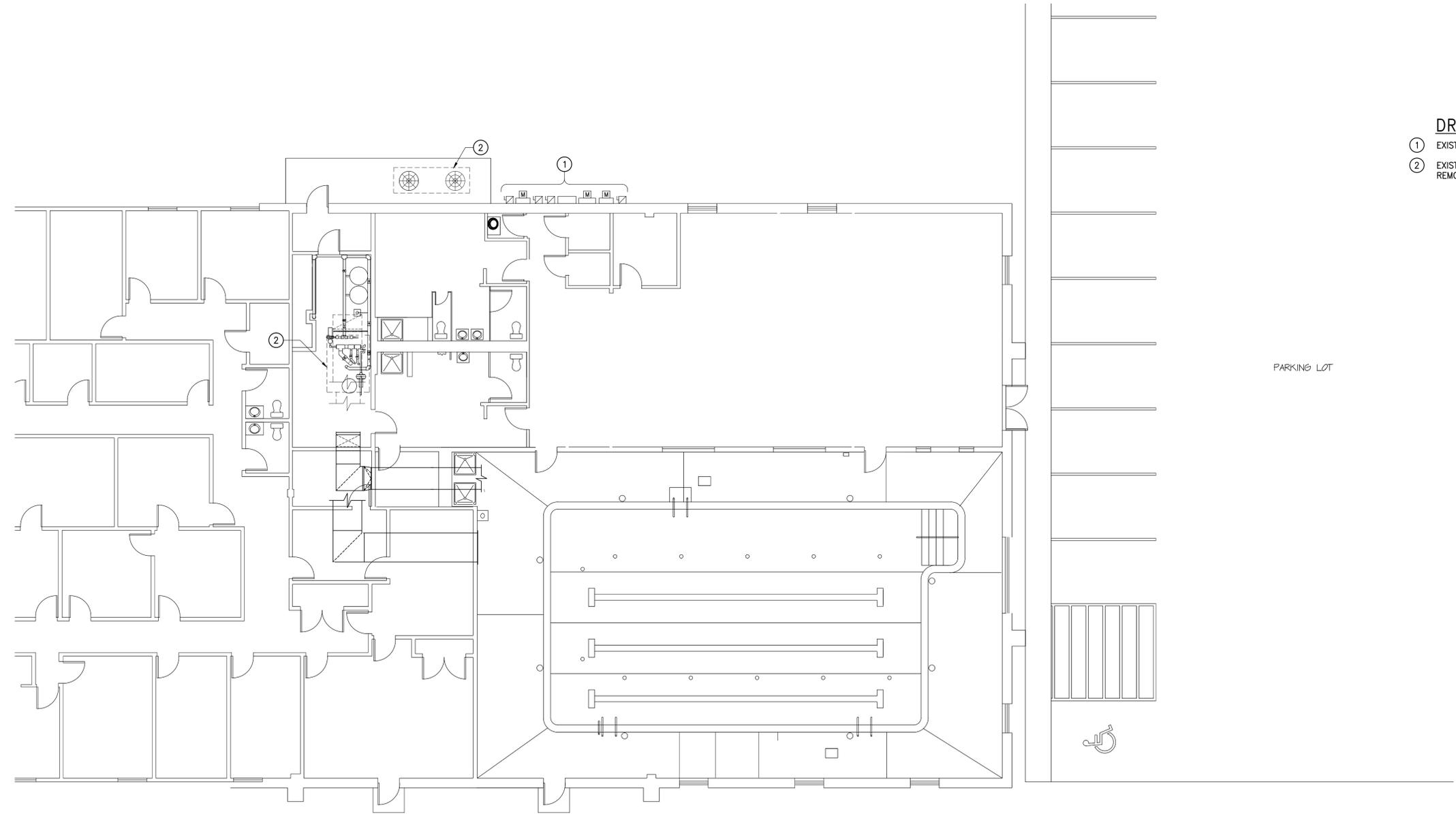
8719 Brooke Drive
Suite 2-5
Baltimore, Maryland 21001
Phone: 410/882-8000
Fax: 410/882-8006

WO# 13072.B
PROJECT MANAGER: MXN
DESIGNER: JVL
DATE: 12/23/2015

ELECTRICAL LEGEND AND GENERAL NOTES
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

E0.1



- DEMOLITION NOTES:**
1. FOR EXISTING EQUIPMENT INDICATED TO BE REMOVED: REMOVE CONDUIT TO POINT OF CONCEALMENT AND REMOVE CONDUCTORS TO SOURCE OF VOLTAGE.
 2. FOR EXISTING EQUIPMENT INDICATED TO BE REMOVED: REMOVE ASSOCIATED DISCONNECT SWITCHES, STARTERS AND CONTROLS ASSOCIATED WITH UNIT.

- DRAWING NOTES:**
- ① EXISTING ELECTRICAL SERVICES TO REMAIN UON.
 - ② EXISTING ELECTRICAL MATERIAL ASSOCIATED WITH EQUIPMENT INDICATED REMOVED BY OTHERS.

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2014.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
 Consulting Engineers
 849 Palmyra Point Ave.
 Baltimore, MD 21286
 Phone: 410/882-2415
 Fax: 410/882-8006

8719 Brooke Drive
 Suite 2-5
 Burton, Maryland 21001
 Phone: 410/882-2415
 Fax: 410/882-8006



WO# 13072.B

PROJECT MANAGER: MXN

DESIGNER: JVL

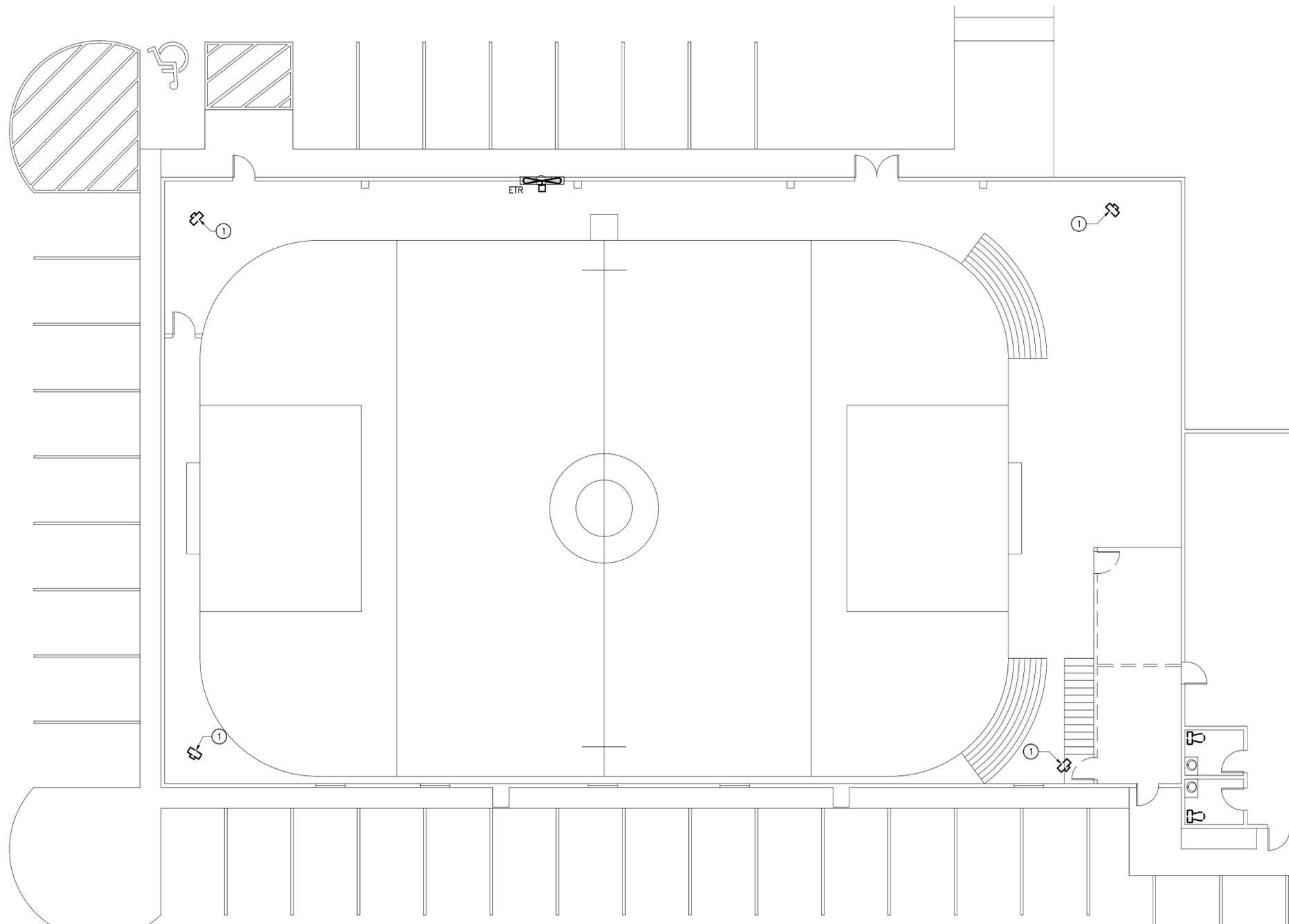
DATE: 12/23/2015

POOL AREA FIRST FLOOR PLAN
 - DEMOLITION
 FOREST HILL REC CENTER
 FOREST HILL, MARYLAND

BID SET

E1.1

POOL AREA FIRST FLOOR PLAN - DEMOLITION 
 SCALE: 1/8" = 1'-0"



ARENA AREA FIRST FLOOR PLAN – DEMOLITION
 SCALE: 1/8" = 1'-0" 

DEMOLITION NOTES:

1. FOR EXISTING EQUIPMENT INDICATED TO BE REMOVED: REMOVE CONDUIT TO POINT OF CONCEALMENT AND REMOVE CONDUCTORS TO SOURCE OF VOLTAGE.
2. FOR EXISTING EQUIPMENT INDICATED TO BE REMOVED: REMOVE ASSOCIATED DISCONNECT SWITCHES, STARTERS AND CONTROLS ASSOCIATED WITH UNIT.

DRAWING NOTES:

- ① REMOVE ELECTRICAL MATERIAL ASSOCIATED WITH EQUIPMENT INDICATED.

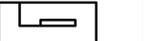
NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2014.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
 Consulting Engineers
 849 Palmyra Point Ave.
 Baltimore, MD 21286
 Phone: 410/882-2415
 Fax: 410/882-8098

8719 Brooke Drive
 Suite 2-5
 Burton, Maryland 21001
 Phone: 410/882-8098
 Fax: 410/882-8098



WO# 13072.B

PROJECT MANAGER MXN

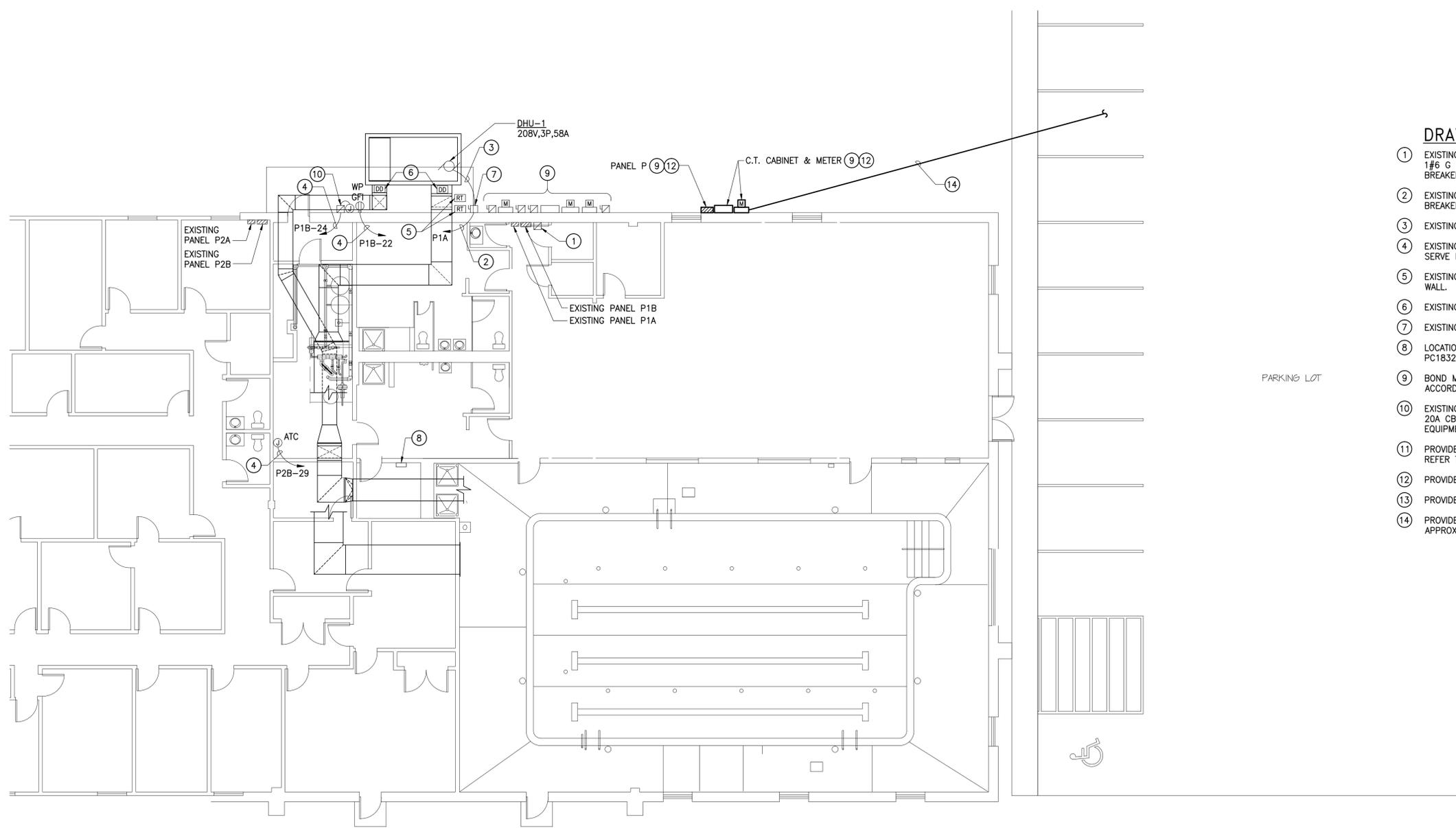
DESIGNER JVL

DATE 12/23/2015

ARENA AREA FIRST FLOOR
 PLAN – DEMOLITION
 FOREST HILL REC CENTER
 FOREST HILL, MARYLAND

BID SET

E1.2



POOL AREA FIRST FLOOR PLAN - EXISTING
 SCALE: 1/8" = 1'-0" 

GENERAL NOTES:

1. COORDINATE NEW ELECTRICAL SERVICE WITH BGE.
2. UPDATE PANEL DIRECTORIES TO REFLECT WORK OF THIS CONTRACT.

DRAWING NOTES:

- ① EXISTING UL LISTED TAP OF EXISTING PANEL P1A BUS WITH 3#1/0 AWG & 1#6 G IN 1 1/4" C. AND 3 POLE, 125 AMPERE ENCLOSED CIRCUIT BREAKER.
- ② EXISTING 3#1/0 AWG & 1#6 G IN 1 1/4" C. TO ENCLOSED CIRCUIT BREAKER.
- ③ EXISTING CONDUIT DIRECT BURIED. REFER TO DETAIL E4.1.
- ④ EXISTING 1 POLE, 20 AMPERE CIRCUIT BREAKER IN PANEL INDICATED TO SERVE LOAD INDICATED. EXISTING 2#12 AWG & 1#12G IN 3/4" C TO PANEL.
- ⑤ EXISTING REMOTE TEST SWITCHES FOR DUCT SMOKE DETECTORS MOUNTED TO WALL.
- ⑥ EXISTING DUCT SMOKE DETECTORS AT SUPPLY AND RETURN DUCTWORK.
- ⑦ EXISTING 3 POLE, 200 AMPERE, 208 VOLT DISCONNECT SWITCH.
- ⑧ LOCATION OF EXISTING FIRE ALARM/SECURITY PANEL. SYSTEM IS DSC MODEL PC1832.
- ⑨ BOND METAL ENCLOSURES, AND EXPOSED METAL PARTS IN THIS AREA IN ACCORDANCE WITH NEC.
- ⑩ EXISTING ENCLOSED GROUND-FAULT-EQUIPMENT CIRCUIT BREAKER WITH 1P, 20A CB AND 30MA GFPE. EXISTING CONNECTIONS TO HEAT TRACING EQUIPMENT.
- ⑪ PROVIDE C.T. CABINET AND METER IN ACCORDANCE WITH BGE STANDARDS. REFER TO RISER DIAGRAM E3.1.
- ⑫ PROVIDE PANEL AS INDICATED.
- ⑬ PROVIDE GROUND RODS AND TEST WELL. REFER TO DETAILS E4.1.
- ⑭ PROVIDE (2)4" C DIRECT BURIED FOR BGE SECONDARY CONDUCTORS. LENGTH: APPROXIMATELY 245FT.

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Giipe Associates Inc.
 Consulting Engineers
 849 Palmyra Point Ave.
 Baltimore, MD 21286
 Phone: 410/882-2415
 Fax: 410/882-8008

WO# 13072.B

PROJECT MANAGER MXN

DESIGNER JVL

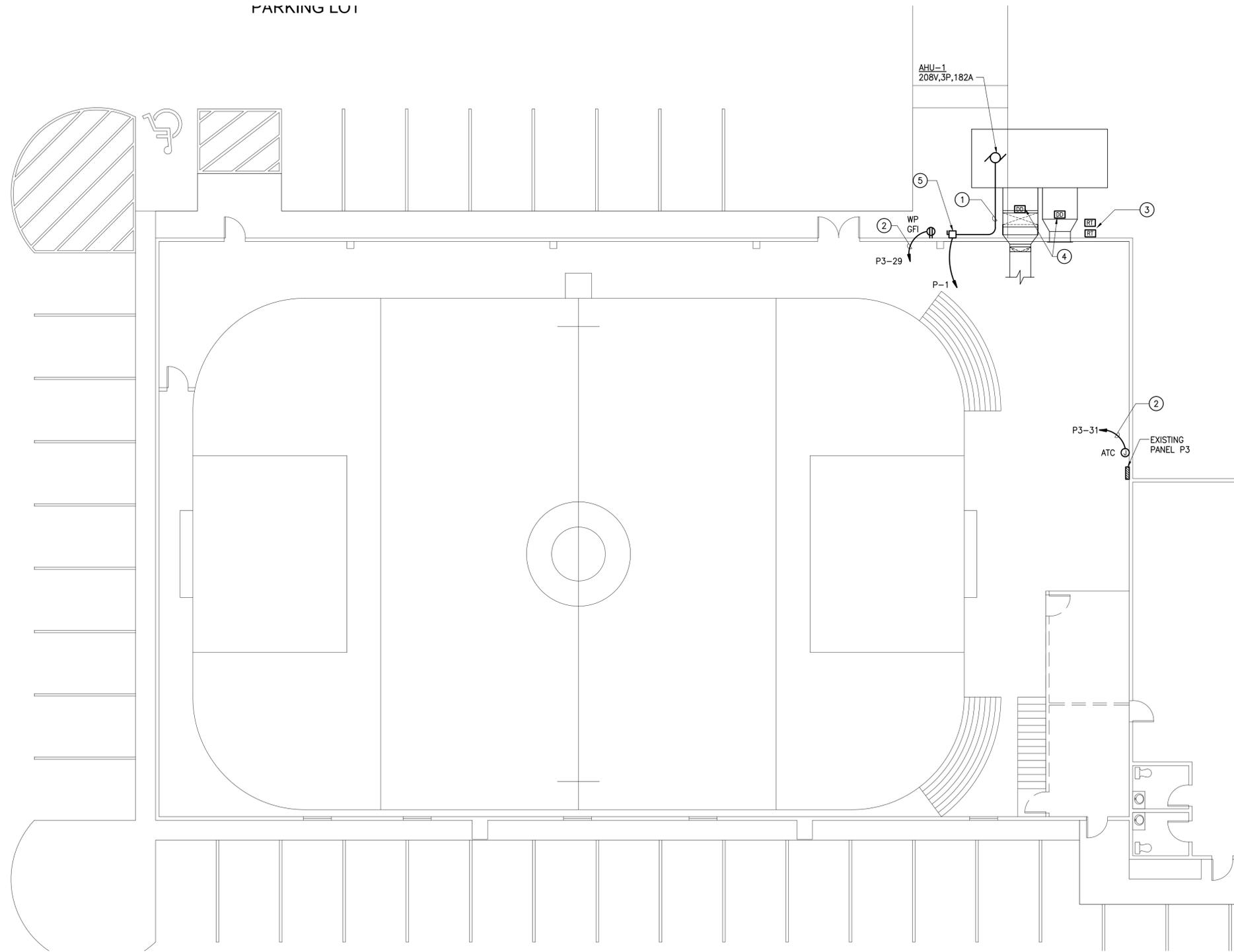
DATE 12/23/2015

POOL AREA FIRST FLOOR
 PLAN - EXISTING
 FOREST HILL REC CENTER
 FOREST HILL, MARYLAND

BID SET

E2.1

PARKING LOT



ARENA AREA FIRST FLOOR PLAN - NEW WORK
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. UPDATE EXISTING PANEL DIRECTORIES TO REFLECT WORK OF THIS CONTRACT.

DRAWING NOTES:

1. INSTALL CONDUIT DIRECT BURIED. REFER TO DETAIL E4.1.
2. PROVIDE 1 POLE, 20 AMPERE CIRCUIT BREAKER IN PANEL INDICATED TO SERVE LOAD INDICATED. PROVIDE 2#12 AWG & 1#12G IN 3/4" C TO PANEL.
3. PROVIDE REMOTE TEST SWITCHES FOR DUCT SMOKE DETECTORS MOUNTED TO WALL.
4. PROVIDE DUCT SMOKE DETECTORS AT SUPPLY AND RETURN DUCTWORK.
5. PROVIDE 3 POLE, 400 AMPERE, 208 VOLT DISCONNECT SWITCH.
6. BOND METAL ENCLOSURES, AND EXPOSED METAL PARTS IN THIS AREA IN ACCORDANCE WITH NEC.

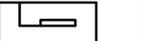
NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Palmyra Point Ave.
Baltimore, MD 21286
Phone: 410/882-2415
Fax: 410/882-2415

8719 Brooke Drive
Suite 2-5
Baton, Maryland 21001
Phone: 410/882-8008
Fax: 410/882-8008



WO# 13072.B

PROJECT MANAGER: MXN

DESIGNER: JVL

DATE: 12/23/2015

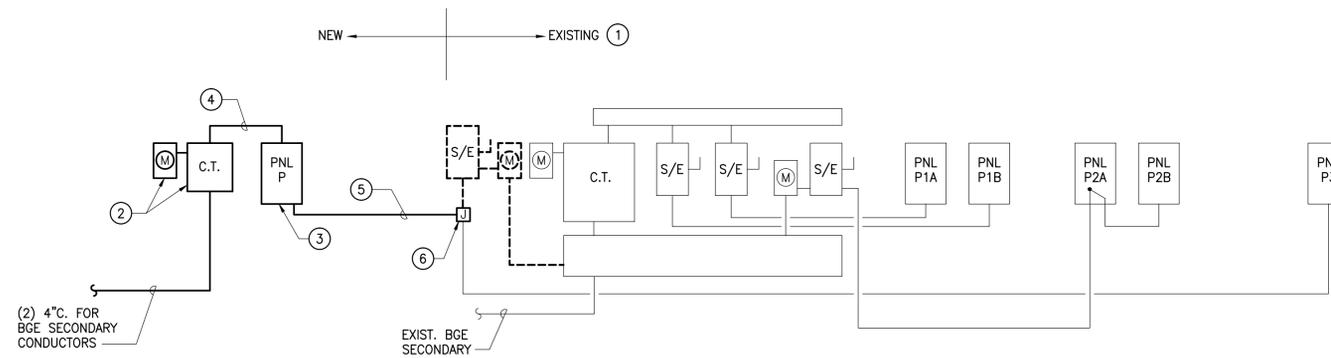
ARENA AREA FIRST FLOOR
PLAN - NEW WORK
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

E2.2

DRAWING NOTES:

- ① EXISTING ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT TO REMAIN UNO.
- ② PROVIDE C.T. CABINET AND METER IN ACCORDANCE WITH BGE STANDARDS.
- ③ PROVIDE PANEL AS INDICATED ON THIS SHEET.
- ④ 4-500KCMIL & 1#3G IN 3"Ø.
- ⑤ PROVIDE CONDUIT AND CONDUCTORS AS NOTED.
- ⑥ PROVIDE JUNCTION BOX AS REQUIRED TO SPLICE EXISTING FEEDER SERVING PANEL P3.



ONE LINE RISER DIAGRAM
NOT TO SCALE

CONN KVA		CKT	DESCRIPTION	BREAKER P	AMPS	BREAKER NO	CIRCUIT WIRING SIZE	GND	C	CONN KVA							
21.8	1	AHU-1 SOCCER ARENA	3	225	3	4/0	4	2	2	PANEL P3	3	200	3	3/0	6	2	13.8
21.8	3	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	13.8
21.8	5	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	13.8
0.1	7	SPD UNIT (TVSS)	3	60	-	-	-	-	8	SPACE	3	-	-	-	-	-	-
0.1	9	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-
0.1	11	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-
CONNECTED LOAD:				107.2 KVA				KVA PER PHASE:				A	35.7	B	35.7	C	35.7

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2014.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Palmyra Ave.
Baltimore, MD 21286
Phone: 410/882-2415
Fax: 410/882-8098

8719 Brooke Drive
Suite 2-5
Benton, Maryland 21601
Phone: 410/882-8098
Fax: 410/882-8098



WO# 13072.B

PROJECT MANAGER: MXN

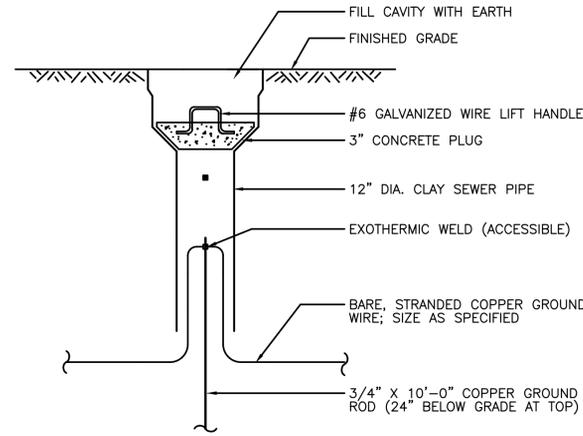
DESIGNER: JVL

DATE: 12/23/2015

RISER DIAGRAMS & SCHEDULES
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

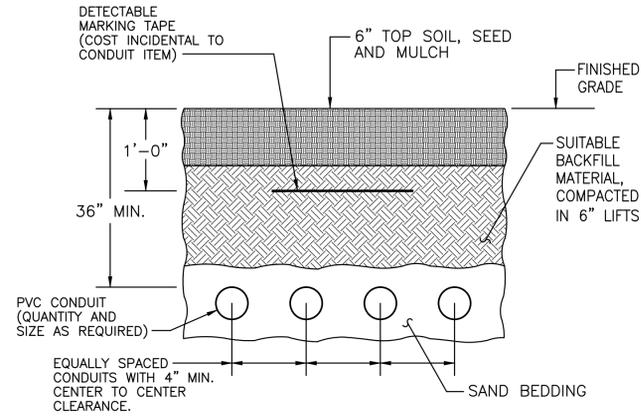
E3.1



NOTE:
1. PROVIDE ONE(1) TEST WELL MINIMUM.

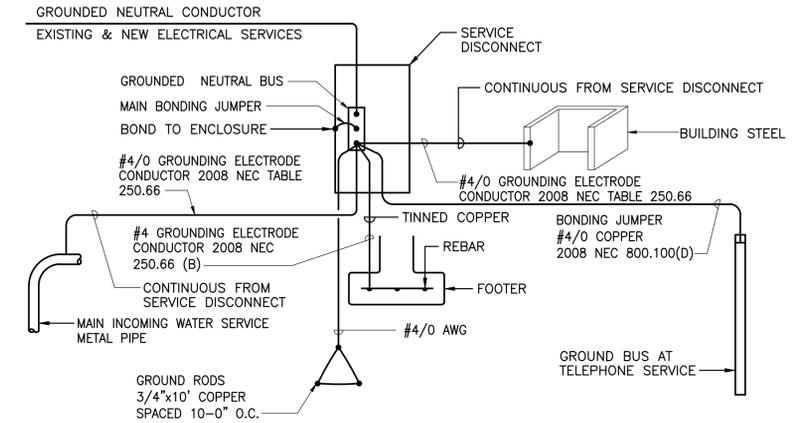
1 GROUND ROD TEST WELL

SCALE: NONE



2 DIRECT BURIED CONDUIT INSTALLATION

SCALE: NONE



3 SERVICE GROUNDING

SCALE: NONE

4

SCALE: NONE

5

SCALE: NONE

6

SCALE: NONE

7

SCALE: NONE

8

SCALE: NONE

9

SCALE: NONE

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 35222, EXPIRATION DATE: 01/05/2014.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Palmyra Point Ave.
Baltimore, MD 21286
Phone: 410/882-2415
Fax: 410/882-8008

8719 Brooke Drive
Suite 2-5
Baltimore, Maryland 21001
Phone: 410/882-8008
Fax: 410/882-8008



WO# 13072.B

PROJECT MANAGER	MXN
DESIGNER	JVL
DATE	12/23/2015

DETAILS
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

E4.1

GENERAL DEMOLITION NOTES:

1. ALL EQUIPMENT, DUCTWORK AND PIPING INDICATED TO BE REMOVED SHALL BE COMPLETELY REMOVED INCLUSIVE OF ALL HANGERS, SUPPORTS, DAMPERS, VALVING, FITTINGS, ANCHORS, GUIDES, INSULATION, AND ANY OTHER ASSOCIATED APPURTENANCES.
2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COMPLETELY DRAIN ALL FLUIDS FROM ALL PIPING SYSTEMS AND PROPERLY CONTAIN AND OR DISPOSE OF MATERIAL.
3. ALL RESULTING HOLES OR PENETRATIONS THRU EXISTING INTERIOR AND EXTERIOR WALLS AND ROOF SHALL BE COMPLETELY FILLED AND SEALED WITH FIRE-SAFE CAULKING.
4. ALL EXISTING ARCHITECTURAL ITEMS SHALL REMAIN, I.E. DOORS, WINDOWS, WALLS, ETC. ANY DAMAGE TO THESE ITEMS DURING THE ENTIRE CONSTRUCTION PERIOD SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REPAIRED OR REPLACED PRIOR TO THE END OF CONSTRUCTION.

GENERAL MECHANICAL NOTES:

1. UNLESS OTHERWISE NOTED, ALL PIPING AND DUCTWORK IS OVERHEAD, TIGHT TO UNDERSIDE OF SLAB AND STRUCTURE, WITH SPACE FOR INSULATION, IF REQUIRED.
2. INSTALL PIPING AND DUCTWORK SO THAT ALL VALVES AND DAMPERS ARE ACCESSIBLE.
3. COORDINATE ALL MECHANICAL WORK WITH ELECTRICAL WORK, ETC., SHOWN ON OTHER DRAWINGS.
4. EXCEPT AS OTHERWISE SHOWN, LOCATE ALL ROOM THERMOSTATS 4'-0" (TOP OF SWITCH BOX) ABOVE FINISHED FLOOR ON THE HORIZONTAL CENTERLINE OF THE ROOM LIGHT SWITCH. NOTIFY THE ENGINEER OF ANY ROOMS WHERE THE ABOVE LOCATION CANNOT BE MAINTAINED OR WHERE THERE IS A QUESTION ON LOCATION.
5. CERTAIN ITEMS SUCH AS ACCESS DOORS, RISES AND DROPS IN DUCTWORK, ETC., ARE INDICATED ON THE DRAWINGS FOR CLARITY OR A SPECIFIC LOCATION REQUIREMENT AND SHALL NOT BE INTERPRETED AS THE EXTENT OF THE REQUIREMENTS FOR THOSE ITEMS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THESE ITEMS AS REQUIRED ELSEWHERE IN THE CONTRACT DOCUMENTS.
6. EQUIPMENT CONNECTION SIZES MAY DIFFER FROM INDICATED DUCT OR PIPE SIZES. PROVIDE APPROPRIATE TRANSITIONS WHERE REQUIRED.
7. THESE DRAWINGS ARE DIAGRAMMATIC AND ALL OFFSETS, FITTINGS, TRANSITIONS AND ACCESSORIES ARE NOT NECESSARILY SHOWN. COORDINATE THE INSTALLATION OF ALL PIPING, DUCTWORK, EQUIPMENT AND OTHER WORK WITH ALL OTHER TRADES.
8. IT IS THE INTENT THAT ALL WORK SHALL BE COMPLETE IN EVERY RESPECT AND THAT MATERIAL OR WORK SPECIFICALLY NOT INDICATED ON THE DRAWINGS, BUT NECESSARY TO COMPLETE THE WORK, SHALL BE PROVIDED.
9. ALL BRANCH DUCT RUN-OUTS TO AIR DEVICES SHALL BE PROVIDED WITH VOLUME DAMPERS.
10. MATERIAL, EQUIPMENT, INSTALLATION, AND PROCEDURES SHALL BE IN STRICT ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF THE LATEST CURRENT EDITION OF THE REFERENCED DOCUMENTATION.
 - A. REGULATIONS OF LOCAL AUTHORITIES HAVING JURISDICTION.
 - B. NFPA-NATIONAL FIRE PROTECTION ASSOCIATION.
 - C. SMACNA-SHEET METAL AND AIR CONDITIONING NATIONAL ASSOCIATION.
 - D. ASME-AMERICAN SOCIETY OF MECHANICAL ENGINEERS.
 - E. ASTM-AMERICAN SOCIETY OF TESTING AND MATERIALS.
 - F. ASHRAE - AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS, INC.
11. PROVIDE DIRT POCKET AT EACH DROP IN GAS PIPING.
12. CONTRACTOR TO FIELD VERIFY TOP OF DUCT ELEVATIONS PRIOR TO INSTALLATION OF FABRIC DUCT.
13. FABRIC DUCT IS TO CONTAIN HIGH THROW ORIFICES, BE CONSTRUCTED OF DURATEX MATERIAL, AND CONTAIN AN INTERNAL HOOP SYSTEM WITH GALVANIZED CABLE TO ASSIST WITH INSTALLATION. COLOR OF FABRIC DUCT IS TO BE SPECIFIED BY OWNER.
14. IN THE ARENA, NETS SHALL BE DROPPED, NOT CUT, WHILE INSTALLING DUCTWORK OVER ARENA FIELD.

EXISTING HOT WATER HEATER:

HOT WATER HEATER #1 (DWH-1)

HOT WATER HEATER SHALL BE NATURAL GAS FIRED TANK TYPE. RATED FOR 150 PSI WORKING PRESSURE. TANK CAPACITY: 75 GALLONS. BURNER CAPACITY: 70,000 BTUH. RECOVERY RATE: 64 GPH @ 100°F RISE. 120v/1 PH/60Hz, UNIT SHALL BE UL LISTED AND SHALL MEET OR EXCEED ASHRAE/IES-90.1-1999 WITH A.G.A. RATED T & P VALVE. DIRECT-VENT DESIGN WITH AN AUTOMATIC BLOWER-POWERED, TWO-PIPE AIR INTAKE AND EXHAUST SYSTEM. AO SMITH MODEL BPD-75

EXISTING PUMP SCHEDULE

UNIT No.	AREA SERVED	GPM	FT OF HEAD	MOTOR				SIZE (SxDxH)	REMARKS	BASED ON (B&G)
				HP	RPM	V/ø/Hz	TYPE			
1	POOL HEAT RECOVERY	20	20	0.5	1725	120/3/60	ECM	1x1x5.25	INLINE CIRCULATOR	650S-ECM

EXISTING POOL DEHUMIDIFICATION UNIT SCHEDULE

UNIT NO. (PDH)	LOCATION	DESIGN DATA				SUPPLY AIR BLOWER				EXHAUST AIR FAN				PURGE FANS				COMPRESSOR				EVAPORATOR COIL				REHEAT				POOL HEATING				AUXILIARY HEAT				AIR-COOLED				ELECTRICAL DATA				BASED ON SERESCO MODEL No.
		OUTDOOR AIR CFM	DB (°F)	%RH	CFM	E.S.P. (IN H2O)	No. MOTORS	MOTOR (HP)	MOTOR FLA (A)	MOTOR DRIVE	CFM	No. MOTORS	MOTOR (HP)	MOTOR FLA	PURGE AIR (CFM)	No. MOTORS	MOTOR (HP)	MOTOR FLA (A)	TYPE	No. COMP.	REFRIGERANT	RLA	LRA	TOTAL CAPACITY (MBH)	SENSIBLE CAPACITY (MBH)	LATENT CAPACITY (LBS/H)	TOTAL HEAT REJECTION	CAPACITY (MBH)	FLOW RATE (GPM)	PRESSURE DROP (PSI)	CONN. (IN)	COIL LOCATION	TYPE	CAPACITY (MBH)	CONTROL	No. OF MOTORS	MOTOR (HP)	MOTOR FLA	V/ø/Hz	FLA	MCA	MOP				
1	ON GRADE	1550	84	58	4500	1.0	2.0	2.5	5.6	DIRECT	1705	1.0	2.5	5.6	2795	1.0	5.1	10.6	SCROLL	1.0	R410A	48.1	245	156.4	97.2	69.3	195.5	126	20	6	1	UNIT	GAS	220	MODULATED	2	0.78	3	208/3/60	70.9	83	125	NE-012			

AIR HANDLING UNIT SCHEDULE (ARENA AIR HANDLING UNIT INSTALLATION IS NOT PART OF THIS CONTRACT)

UNIT NO. (ERV)	SERVICE	LOCATION	SUPPLY FAN				EXHAUST FAN				ENERGY RECOVERY WHEEL PERFORMANCE								COOLING COIL								GAS HEATER				CONDENSOR FAN		COMBUSTION FAN		ELECTRICAL CHARACTERISTICS				MAX OPER. WEIGHT (LBS)	BASED ON AAON															
			CFM	E.S.P. (IN W.G.)	RPM	BHP	MOTOR (HP)	CFM	E.S.P. (IN W.G.)	RPM	BHP	MOTOR (HP)	SUMMER				WINTER				TOTAL				FACE				FLA	HP	FLA	HP	MIN. EER	V/ø/Hz	MCA	MOP																			
			OUTSIDE AIR		EXHAUST AIR		MOTOR		OUTSIDE		RETURN		SUPPLY		EXHAUST		OUTSIDE		RETURN		SUPPLY		EXHAUST		EAT		LAT		MIN. EER		SENS. CAP.		TOTAL CAP.		MAX FACE VELOCITY		LAT		LAT		TOTAL		TOTAL												
1	ARENA	ON GRADE	11800	3.3	1760	6.97	7.5 (2)	11800	1	1760	2.3	3.0 (2)	3200	250	3200	250	1/6 (2)	95.0	78	75	62	78.2	65.8	91.8	75.1	10	9	75	62	64.5	55	20.5	20.5	76	63.1	51	50.4	10	318.3	411.8	370.2	123	75.8	810	648	1080	3/4 (4)	3210	1/4 (3)	10	208/3/60	214	225	7421	RN-040

- NOTES:
1. EXTERNAL STATIC PRESSURE (E.S.P.) EQUALS THE STATIC PRESSURE REQUIRED AT THE CONNECTIONS OF DUCT WORK TO THE ENERGY RECOVERY VENTILATOR.
 2. INTERNAL PRESSURE DROP SHALL INCLUDE 1.0 INCHES STATIC PRESSURE FOR FILTER LOADING.
 3. UNIT TO INCLUDE A FACTORY MOUNTED NON-FUSED DISCONNECT.
 4. PROVIDE DUCT SMOKE DETECTORS IN BOTH SUPPLY AND RETURN DUCT.
 5. UNIT SHALL HAVE A SINGLE POINT ELECTRICAL CONNECTION.
 6. IN SUMMER CONDITIONS, SUPPLY AIR SHALL BE REHEATED TO 72°F. SUPPLY AIR TEMPERATURE SHALL BE 72°F FOR BOTH SUMMER AND WINTER CONDITIONS.
 7. UNIT SHALL HAVE R-410A REFRIGERANT.
 8. UNIT SHALL HAVE MODULATION CAPACITY COMPRESSORS FROM 10-100% AND INDEPENDENT REFRIGERATION CIRCUIT FOR EACH COMPRESSOR.

MECHANICAL LEGEND											
SYMBOL	ABBREV.	DEFINITION	SYMBOL	ABBREV.	DEFINITION	SYMBOL	ABBREV.	DEFINITION	SYMBOL	ABBREV.	DEFINITION
	S.A.	SUPPLY AIR DUCT UP,DOWN		SQ.	SQUARE		WTR.	WATER		OAT	OUTSIDE AIR TEMPERATURE
	R.A.	RETURN AIR DUCT UP,DOWN		T'STAT	THERMOSTAT		STD.	STANDARD		ΔT	TEMPERATURE DIFFERENCE PERCENT
	E.A.	EXHAUST AIR DUCT UP,DOWN		FAN SW	FAN SWITCH		EFF.	EFFICIENCY		ELECT. CHAR.	ELECTRICAL CHARACTERISTICS
	O.A.	OUTSIDE AIR DUCT UP,DOWN		DP	D.P.	D.P.	D.P.	DIFFERENTIAL PRESSURE CONTROLLER		CAP	CAPACITY
		RECT. TO ROUND TRANSITION		D.P.T.	D.P.T.	D.P.T.	D.P.T.	DIFFERENTIAL PRESSURE TRANSMITTER		SB	STAND-BY
		FLEXIBLE CONNECTION (DUCTWORK)		A.F.C.	A.F.C.	A.F.C.	A.F.C.	AUTOMATIC FLOW CONTROL VALVE		FT. H 2 O	FEET WATER GAUGE
		FLEXIBLE DUCT		FS	FS	FS	FS	FLOW SWITCH		IN. H 2 O	INCHES WATER GAUGE
	VD	MANUAL VOLUME DAMPER		S.P.	S.P.	S.P.	S.P.	STATIC PRESSURE CONTROLLER		ATC	AUTOMATIC TEMPERATURE CONTROL
	FD	FIRE DAMPER						PIPE ALIGNMENT GUIDE		EX.	EXISTING
	MOD	MOTOR OPERATED DAMPER		X	X	X	X	PIPE ANCHOR		R.X.	REMOVE EXISTING
	AMS	AIR MONITORING STATION						EXPANSION LOOP			CONNECT TO EXISTING
	SA	SOUND ATTENUATOR						UNIT HEATER			DEMOLITION ENDS HERE
	SD	DUCT SMOKE DETECTOR						PIPE-TURN DOWN		F&T	FLOAT AND THERMOSTATIC TRAP
		ELBOW W/ TURNING VANES						END CAP		VSD	VARIABLE SPEED DRIVE
		RADIUS ELBOW						DIRECTION OF FLOW		°F	DEGREES FAHRENHEIT
	FPTU	FAN POWERED VAV BOX W/ HEAT COIL		HPS	H.P.S.	H.P.S.	H.P.S.	HIGH PRESSURE STEAM		CFM	CUBIC FEET PER MINUTE
	SL	ACOUSTICAL SOUND LINING		LPS	L.P.S.	L.P.S.	L.P.S.	LOW PRESSURE STEAM		GPM	GALLONS PER MINUTE
		CHANGE IN ELEVATION RISE(D)DROP(D)		SC	SC	SC	SC	STEAM CONDENSATE		EAT	ENTERING AIR TEMPERATURE
		POWER ROOF VENTILATOR		HS(P)	H.S.(P)	H.S.(P)	H.S.(P)	HEATING SUPPLY (PRIMARY)		LAT	LEAVING AIR TEMPERATURE
		GATE VALVE		HR(P)	H.R.(P)	H.R.(P)	H.R.(P)	HEATING RETURN (PRIMARY)		EW	ENTERING WATER TEMPERATURE
		GLOBE VALVE		HS(S)	H.S.(S)	H.S.(S)	H.S.(S)	HEATING SUPPLY (SECONDARY)		LWT	LEAVING WATER TEMPERATURE
		BALL VALVE		HR(S)	H.R.(S)	H.R.(S)	H.R.(S)	HEATING RETURN (SECONDARY)		DB	DRY BULB
		BALANCING VALVE		CS	CS	CS	CS	CONDENSER WATER SUPPLY		WB	WET BULB
		MULTI-PURPOSE VALVE		CR	CR	CR	CR	CONDENSER WATER RETURN		PD	PRESSURE DROP
		CHECK VALVE		HS	HS	HS	HS	HEATING SUPPLY		WPD	WATER PRESSURE DROP
		BUTTERFLY VALVE		HR	HR	HR	HR	HEATING RETURN		APD	AIR PRESSURE DROP
		3-WAY MODULATING VALVE (ATC)		CHS	CHS	CHS	CHS	CHILLED WATER SUPPLY		SP	STATIC PRESSURE
		2-WAY MODULATING VALVE (ATC)		CHR	CHR	CHR	CHR	CHILLED WATER RETURN		ESP	EXTERNAL STATIC PRESSURE
	PRV	PRESSURE REDUCING VALVE		CW	CW	CW	CW	GOLD WATER		PSI	POUNDS PER SQUARE INCH
		NEEDLE VALVE		DHW	DHW	DHW	DHW	DOMESTIC HOT WATER		HP	HORSEPOWER
		PRESSURE RELIEF OR SAFETY VALVE		HWC	HWC	HWC	HWC	HOT WATER RECIRCULATING		BHP	BRAKE HORSEPOWER
	HED	HOSE END DRAIN VALVE		F	F	F	F	FIRE LINE		RPM	REVOLUTIONS PER MINUTE
		STRAINER W/HOSE END DRAIN VALVE AND CAP		SD	SD	SD	SD	STORM DRAIN		FPM	FEET PER MINUTE
		AUTOMATIC AIR VENT		SAN	SAN	SAN	SAN	SANITARY		V	VOLTS
		FLOW METER FITTING		V	V	V	V	VENT		NO.	NUMBER
		COMBINATION SHUT-OFF/BALANCING VALVE		D	D	D	D	DRAIN LINE		VAV	VARIABLE AIR VOLUME
		UNION		RAIR FLOW	RAIR FLOW	RAIR FLOW	RAIR FLOW	RETURN AIR REGISTER W/ BOOT		E.F.	EXHAUST FAN
		FLANGE		BTU	BTU	BTU	BTU	BRITISH THERMAL UNIT		FZ	FREEZE STAT
		CONCENTRIC REDUCER		MBH	MBH	MBH	MBH	BTU PER HOUR (THOUSAND)		SD	SMOKE DAMPER
		ECCENTRIC REDUCER		SENS.	SENS.	SENS.	SENS.	SENSIBLE		AHU	AIR HANDLING UNIT
		FLEXIBLE CONNECTION (PIPING)		BHP	BHP	BHP	BHP	BOILER HORSEPOWER		OAT	OUTSIDE AIR TEMPERATURE
		MANUAL AIR VENT		WG	WG	WG	WG	WATER GAUGE		SWT	SUPPLY WATER TEMPERATURE
		THERMOMETER		VEL	VEL	VEL	VEL	VELOCITY		E.M.S.	ENERGY MANAGEMENT SYSTEM
		PRESSURE GAUGE W/NEEDLE VALVE		FPM	FPM	FPM	FPM	FEET PER MINUTE		S.A.F.	SUPPLY AIR FAN
				LF	LF	LF	LF	LINEAR FOOT		O.A.F.	OUTSIDE AIR FAN
				KW	KW	KW	KW	KILOWATT		R.A.F.	RETURN AIR FAN
				MIN.	MIN.	MIN.	MIN.	MINIMUM		E.A.F.	EXHAUST AIR FAN
				MAX.	MAX.	MAX.	MAX.	MAXIMUM		Ø	DIAMETER
				NC	NC	NC	NC	NOISE CRITERIA			
				DB	DB	DB	DB	DECIBEL			
				LBS.	LBS.	LBS.	LBS.	POUNDS			
				TEMP.	TEMP.	TEMP.	TEMP.	TEMPERATURE			
				EXH. SPLY.	EXH. SPLY.	EXH. SPLY.	EXH. SPLY.	EXHAUST SUPPLY			
				TONS	TONS	TONS	TONS	TONS OF REFRIGERATION			

NOTE: NOT ALL SYMBOLS AND ABBREVIATIONS MAY BE USED

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 35222, EXPIRATION DATE: 01/05/2016.

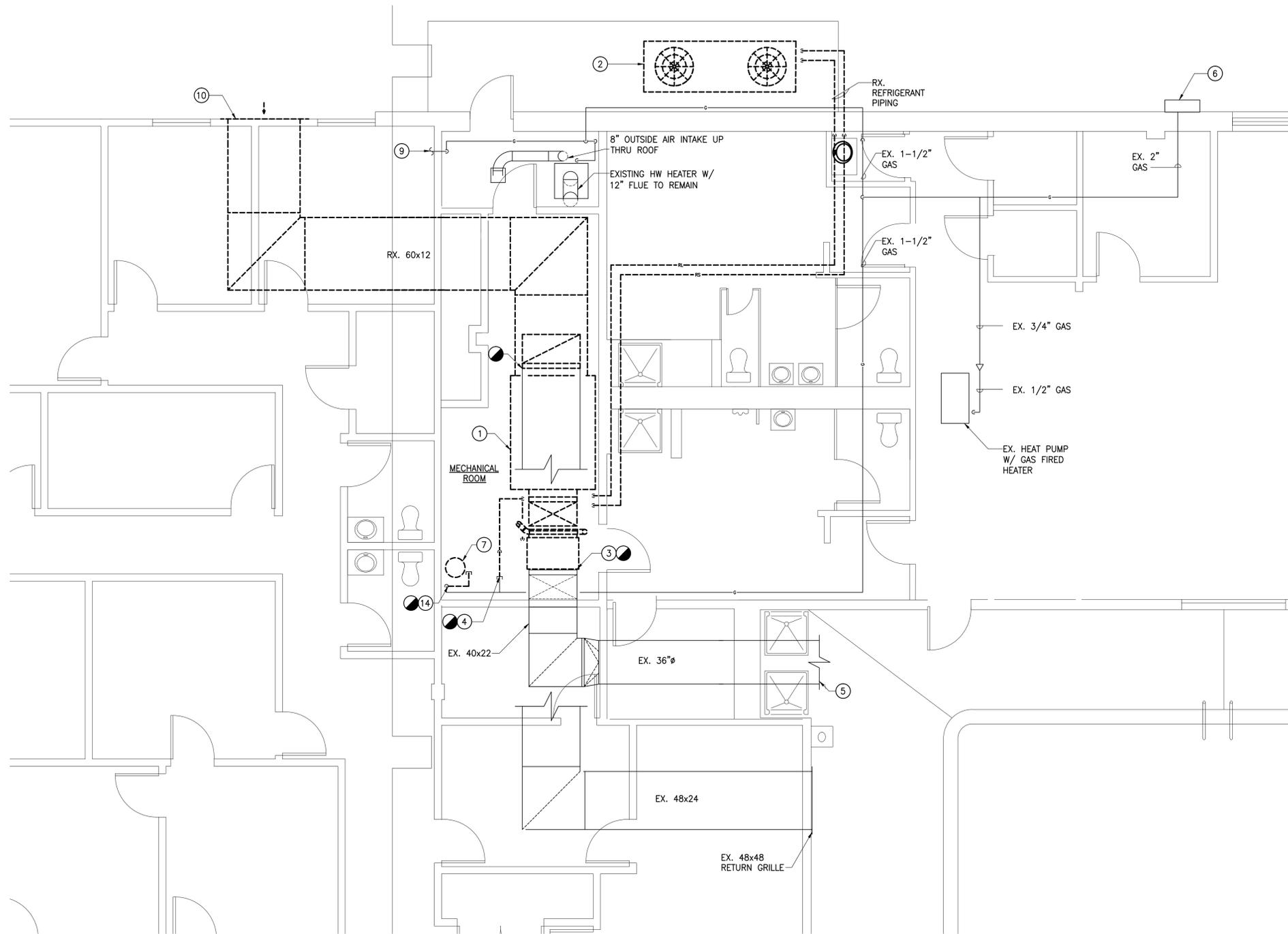
THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave.
Suite 2-5
Baltimore, MD 21206
Phone: 410/822-2900
Fax: 410/822-6008

PROJECT MANAGER: MXN
DESIGNER: SAS
DATE: 12/23/2015

MECHANICAL LEGEND, GENERAL NOTES & SCHEDULES
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

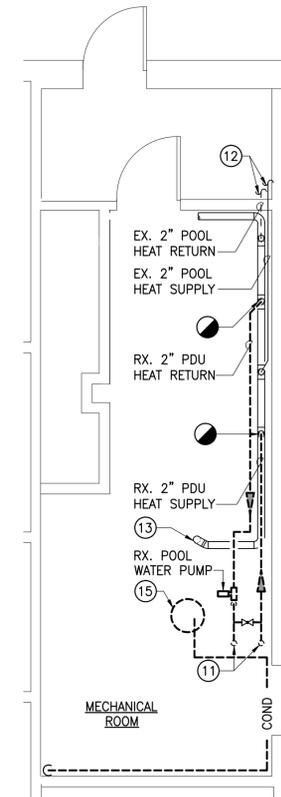
BID SET
M0.1



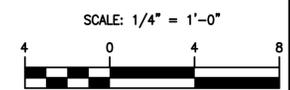
POOL FLOOR PLAN - DEMOLITION
SCALE: 1/4" = 1'-0"

DRAWING NOTES:

- ① REMOVE EXISTING POOL DEHUMIDIFICATION UNIT, PIPING, SUPPORTS, AND ALL ASSOCIATED APPURTENANCES.
- ② REMOVE EXISTING CONDENSING UNIT AND ALL ASSOCIATED REFRIGERANT PIPING. PATCH EXTERIOR PIPE PENETRATIONS TO MATCH EXISTING.
- ③ REMOVE EXISTING GAS-FIRED DUCT HEATER, FLUE, SUPPORTS, AND ALL ASSOCIATED APPURTENANCES. CAP EXISTING GAS PIPING.
- ④ REMOVE EXISTING 1" GAS PIPING AND CAP.
- ⑤ EXISTING 3/8" EXPOSED SUPPLY DUCTWORK TO SERVE POOL AREA.
- ⑥ EXISTING 2 PSI GAS SERVICE ASSEMBLY.
- ⑦ REMOVE EXISTING STATE DOMESTIC WATER HEATER, SUPPORT, FLUE, AND DOMESTIC COLD & HOT WATER VERTICAL RISERS UP TO HEATER. CAP DOMESTIC COLD AND HOT WATER PIPE FOR NEW FLOOR MOUNTED WATER HEATER CONNECTIONS.
- ⑧ EXISTING RAYPAK POOL WATER HEATER TO REMAIN.
- ⑨ 1-1/2" GAS TO SERVE ARENA.
- ⑩ REMOVE EXISTING OUTSIDE AIR INTAKE LOUVER. PATCH WALL TO MATCH EXISTING.
- ⑪ REMOVE EXISTING POOL HEATING WATER SUPPLY AND RETURN UP FROM EXISTING POOL DEHUMIDIFICATION UNIT (PDU) TO 4" POOL WATER SUPPLY CONNECTION. SALVAGE EXISTING PUMP FOR FUTURE.
- ⑫ EXISTING POOL HEATING WATER SUPPLY AND RETURN TO EXISTING POOL HEATER.
- ⑬ EXISTING 4" CPVC POOL WATER SUPPLY DOWN IN SLAB TO SERVE POOL.
- ⑭ REMOVE EXISTING 1/2" GAS PIPE TO WATER HEATER.
- ⑮ REMOVE EXISTING CONDENSATE COLLECTION TANK, SUMP PUMP, ELECTRICAL, AND PVC PIPING UP TO DOMESTIC WATER CONNECTION.



MECHANICAL ROOM - POOL WATER PIPING PART PLAN - DEMOLITION
SCALE: 1/4" = 1'-0"



NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave.
Suite 102
Baltimore, MD 21206
Phone: 410/832-2419
Fax: 410/832-2418

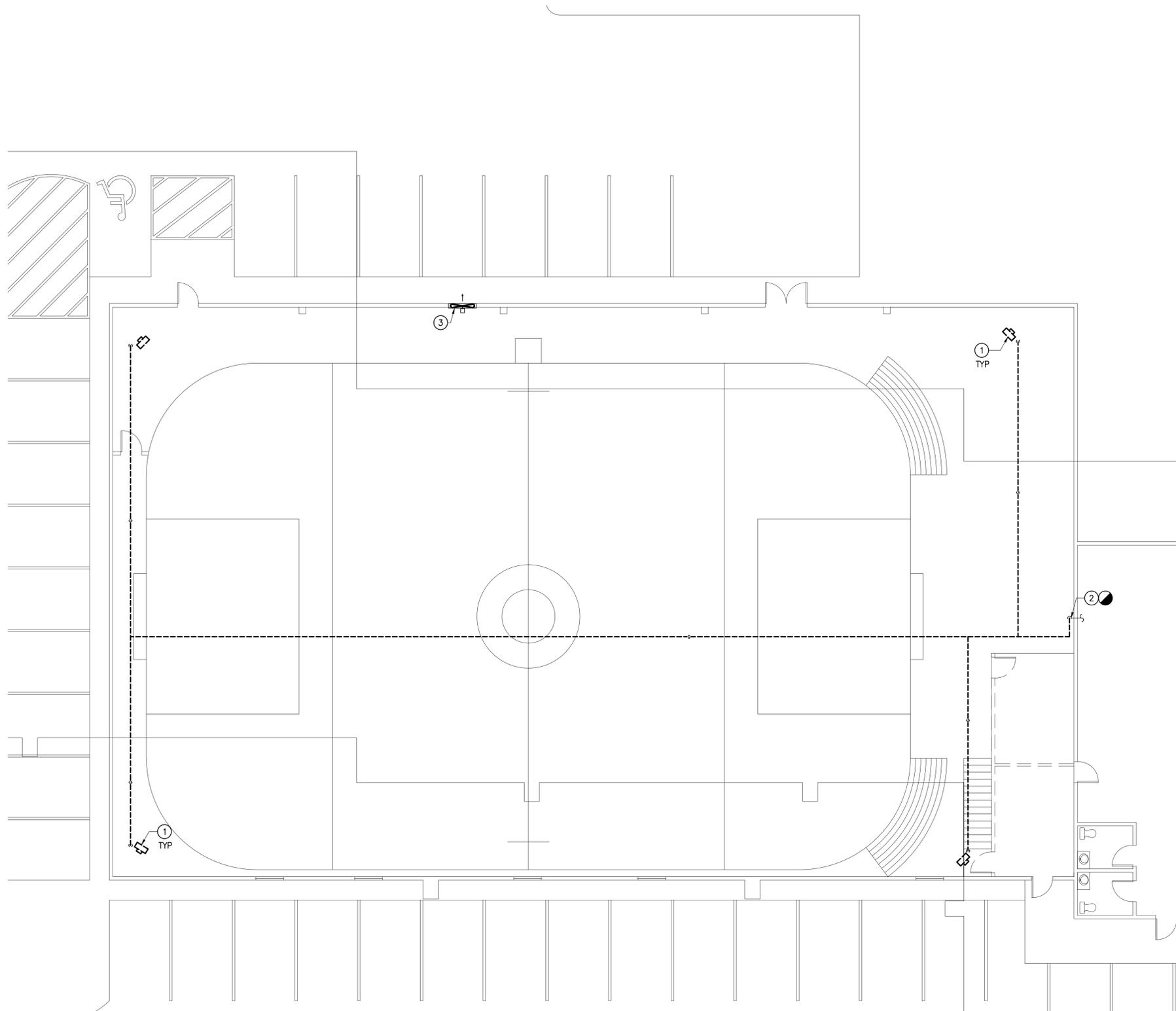
8719 Brooke Drive
Suite 2-5
Baltimore, MD 21286
Phone: 410/822-6800
Fax: 410/822-6808

WO# 13072.B
PROJECT MANAGER: MXN
DESIGNER: SAS
DATE: 12/23/2015

POOL FLOOR PLAN -
DEMOLITION
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

M1.1



DRAWING NOTES:

- ① REMOVE EXISTING GAS-FIRED UNIT HEATER, GAS PIPING, SUPPORTS AND ALL ASSOCIATED APPURTENANCES. PATCH EXISTING ROOF OPENING TO MATCH EXISTING.
- ② REMOVE EXISTING 1-1/2" GAS PIPING TO THIS POINT AND CAP FOR FUTURE CONNECTION.
- ③ EXISTING EXHAUST FAN TO REMAIN.

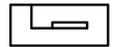
NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
 Consulting Engineers
 849 Fairmount Ave.
 Suite 102
 Baltimore, MD 21206
 Phone: 410/832-2419
 Fax: 410/832-2419

8719 Brooke Drive
 Suite 2-5
 Parkton, MD 21120
 Phone: 410/822-6308
 Fax: 410/822-6308



WO# 13072.B

PROJECT MANAGER MXN

DESIGNER SAS

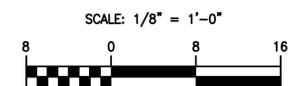
DATE 12/23/2015

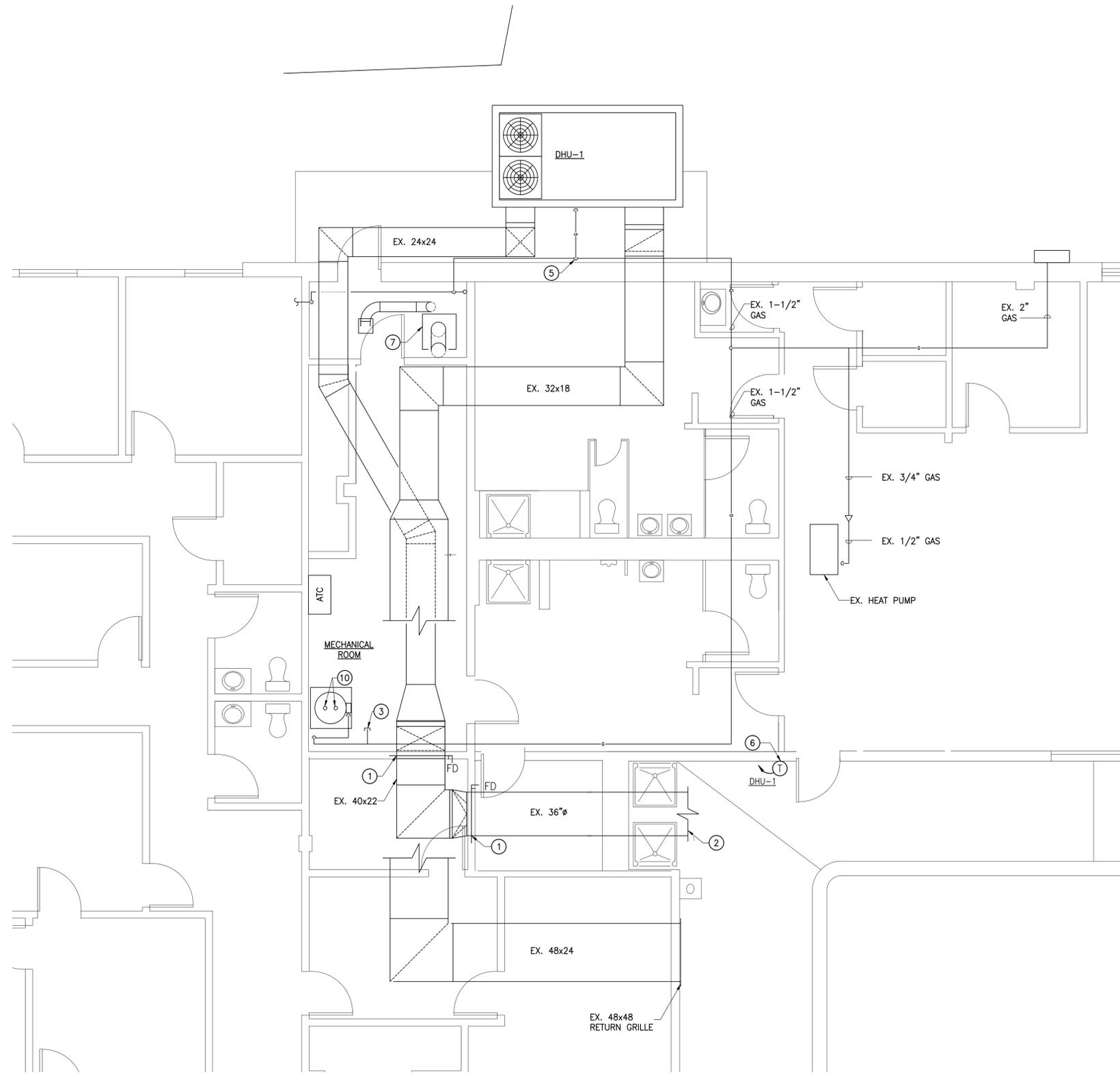
ARENA FLOOR PLAN -
 DEMOLITION
 FOREST HILL REC CENTER
 FOREST HILL, MARYLAND

BID SET

M1.2

ARENA FLOOR PLAN - DEMOLITION
 SCALE: 1/8" = 1'-0"



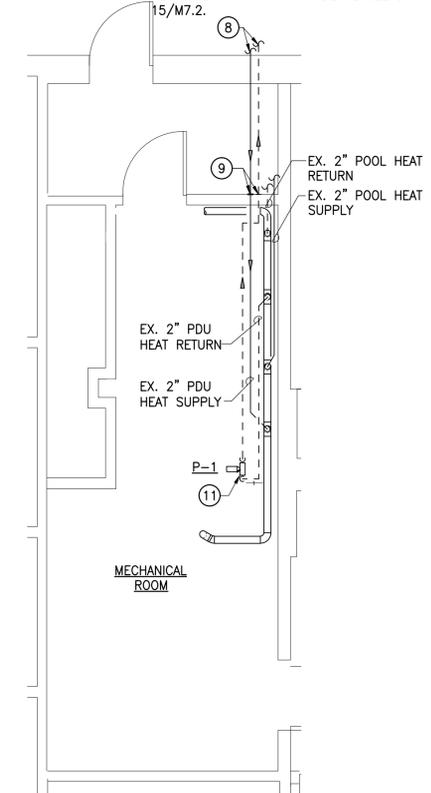


POOL FLOOR PLAN - EXISTING
SCALE: 1/4" = 1'-0"

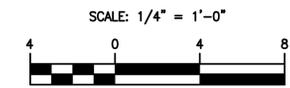


DRAWING NOTES:

- ① EXISTING DUCT PENETRATION THRU 2 HR FIRE RATED WALL SHALL CONTAIN A FIRE DAMPER. IF NO FIRE DAMPER EXISTS, CONTRACTOR SHALL INSTALL FIRE DAMPER AT FIRE WALL PENETRATION WITH ACCESS PANEL.
- ② EXISTING 36"Ø EXPOSED SUPPLY DUCTWORK CONTINUATION TO SERVE POOL AREA.
- ③ EXISTING 1" GAS PIPE CAPPED.
- ④ EXISTING 3/4" GAS PIPE FROM EXISTING GAS MAIN.
- ⑤ CONNECT EXISTING 3/4" GAS PIPE FROM EXISTING GAS LINE TO EXISTING DEHUMIDIFICATION UNIT.
- ⑥ PROVIDE REMOTE TEMPERATURE SENSOR ON EXISTING WALL. LCD THERMOSTAT CONTROL TO BE LOCATED IN MECHANICAL ROOM ADJACENT TO ATC PANEL.
- ⑦ EXISTING GAS-FIRED POOL WATER HEATER.
- ⑧ EXISTING 2" POOL DEHUMIDIFICATION UNIT HEATING WATER SUPPLY AND RETURN PIPING. CONNECT PIPING INTO EXISTING POOL WATER SUPPLY SYSTEM. MOUNT EXISTING POOL HEATING WATER RETURN TO EXISTING FLOOR MOUNTED CIRCULATION PUMP. EXTERIOR PIPING TO BE COPPER TYPE L. BALL VALVES SHALL BE 150 LBS BRASS OR BRONZE BODY, 2 PIECE BODY, VICPRESS THREADED END. INTERIOR PIPING SHALL BE CPVC SCHEDULE 80 PLASTIC PIPE. BALL VALVES SHALL BE 150 PSIG, 2 PIECE BODY, EPDM SEALS, AND TEE HANDLE WITH FLANGED CONNECTIONS. PIPING SHALL BE PROVIDED WITH 2" OF INSULATION AND INSTALLED PER SPECIFICATIONS. ALL EXTERIOR PIPING SHALL BE PROVIDED WITH AN ALUMINUM JACKET.
- ⑨ POOL SUPPLEMENTAL HEATING SUPPLY AND RETURN WATER SHALL BE HEAT TRACED TO AIR HANDLING UNIT. FOR MORE INFORMATION SEE SPECIFICATION SECTION 15600.
- ⑩ EXISTING 3" COMBUSTION AIR INTAKE AND EXHAUST DIRECT VENT PIPE. SCHEDULE 40 PVC PIPE SHALL BE RUN TO EXISTING ROOF PENETRATIONS.
- ⑪ EXISTING POOL WATER HEAT RECOVERY RECIRCULATOR PUMP. FOR DETAIL SEE DRAWING 15/M7.2.



MECHANICAL ROOM - POOL WATER PIPING PART PLAN - EXISTING
SCALE: 1/4" = 1'-0"



NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave.
Suite 102
Baltimore, MD 21206
Phone: 410/822-2200
Fax: 410/822-2419

8719 Brooke Drive
Suite 2-5
Baltimore, MD 21286
Phone: 410/822-6800
Fax: 410/822-6308



WO# 13072.B

PROJECT MANAGER MXN

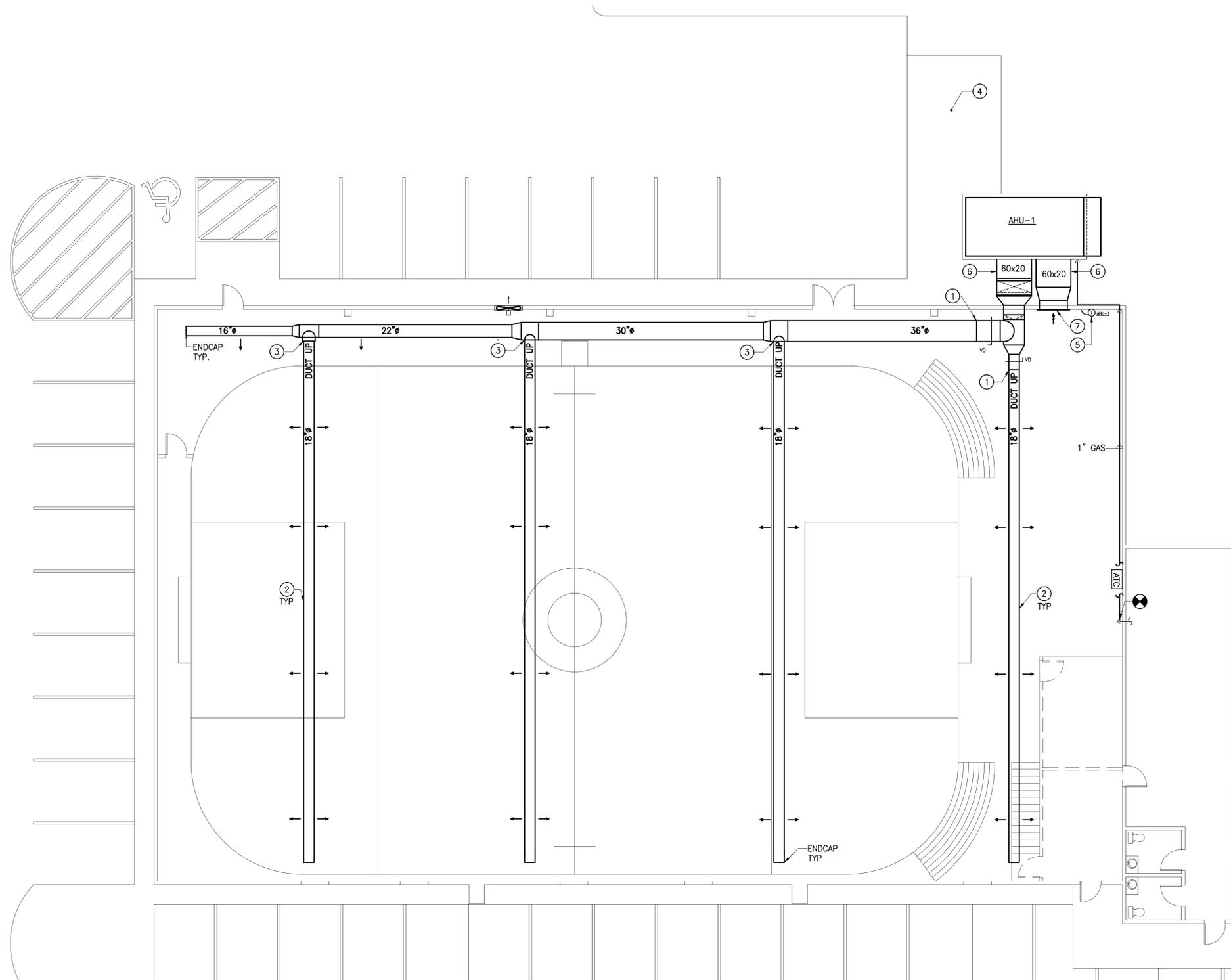
DESIGNER SAS

DATE 12/23/2015

POOL FLOOR PLAN -
EXISTING
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

M2.1



DRAWING NOTES:

- ① TRANSITION FROM ROUND METAL TO ROUND FABRIC DUCTWORK. FOR DETAIL SEE 12/M7.2.
- ② RUN DUCTWORK UP BETWEEN STRUCTURAL BEAMS. MANUFACTURER TO DESIGN AND DETERMINE AIRFLOW FOR ALL DUCT RUNS.
- ③ ADJUSTABLE FLOW DEVICE PROVIDED BY MANUFACTURER. TYPICAL FOR ALL DUCT BRANCHES.
- ④ RELOCATE DUMPSTERS TO NEW LOCATION.
- ⑤ THERMOSTAT WITH VANDAL PROOF CASE. CONTRACTOR TO PROVIDE NEW CASE IF EXISTING CANNOT BE REUSED.
- ⑥ ALL METAL SUPPLY AND RETURN DUCTWORK SHALL BE LINED.
- ⑦ 48x48 HEAVY DUTY RETURN GRILLE. INSTALL SO THAT BOTTOM OF GRILLE IS AT 2'-0" A.F.F. GRILLE SHALL BE HEAVY DUTY BAR TYPE BY TITUS, MODEL 33RFL. GRILLE SHALL BE ALL STEEL CONSTRUCTION, 16-GAUGE BORDER, 14-GAUGE BLADES, SUPPORT BARS 6 INCHES ON CENTER, FILTER HOUSING WITH ONE INCH FILTER FRAME AND OPPOSED BLADE DAMPER.

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
 I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
 Consulting Engineers
 8719 Brooke Drive
 Suite 2-5
 Parkton, MD 21120
 Phone: 410/822-6848
 Fax: 410/822-6308



WO# 13072.B

PROJECT MANAGER: MXN

DESIGNER: SAS

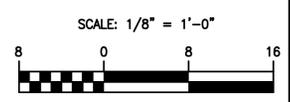
DATE: 12/23/2015

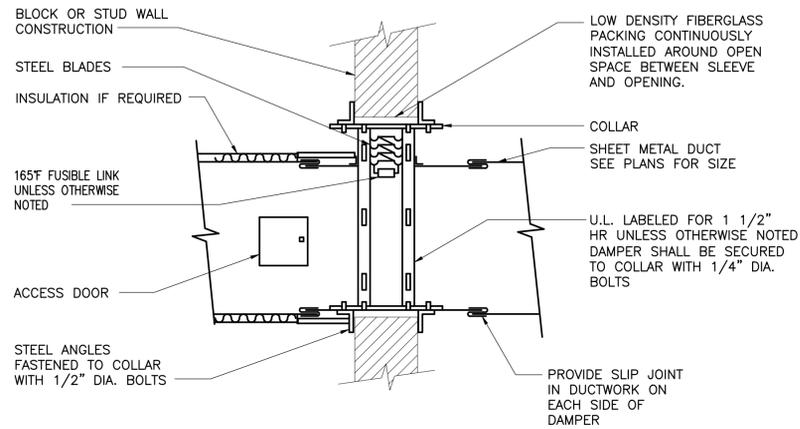
ARENA FLOOR PLAN -
 NEW WORK
 FOREST HILL REC CENTER
 FOREST HILL, MARYLAND

BID SET

M2.2

ARENA FLOOR PLAN - NEW WORK
 SCALE: 1/8" = 1'-0"

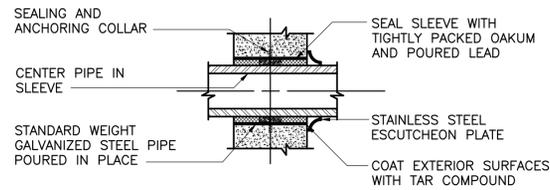




NOTE: INSTALLATION SHALL COMPLY WITH U.L. REQUIREMENTS

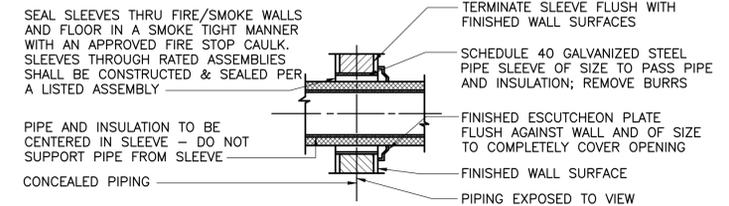
1 TYPICAL VERTICAL FIRE DAMPER DETAIL

SCALE: NONE



2 TYPICAL PIPE SLEEVE THRU EXTERIOR WALL ABOVE GRADE DETAIL

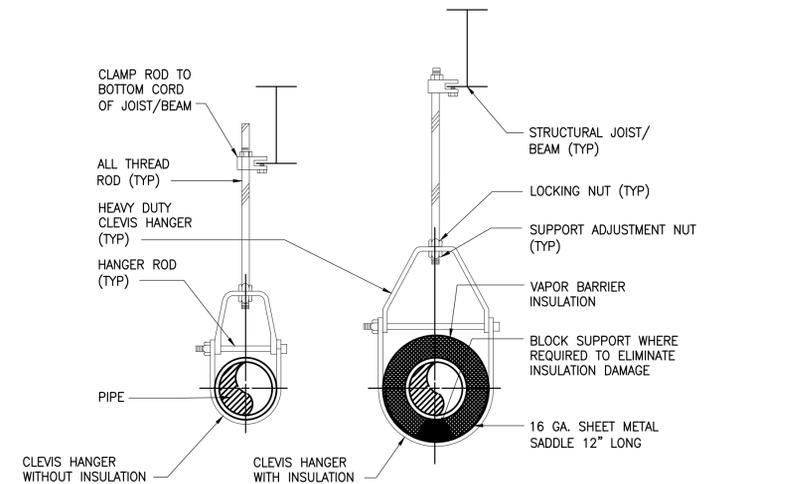
SCALE: NONE



NOTES: FOR INTERIOR FRAME PARTITIONS—PIPE SLEEVES MAY BE FABRICATED FROM GALVANIZED SHEET METAL; ROUND TUBE CLOSED WITH SNAPLOCK JOINT, WELDED SPIRAL SEAMS, OR WELDED LONGITUDINAL JOINT. FABRICATE FROM THE FOLLOWING GAUGES: 3" AND SMALLER, 20 GAUGE; 4" TO 6", 16 GAUGE; OVER 6", 14 GAUGE.

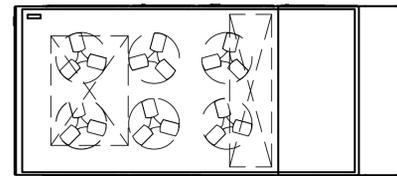
3 TYPICAL PIPE SLEEVE THRU INTERIOR WALL DETAIL

SCALE: NONE



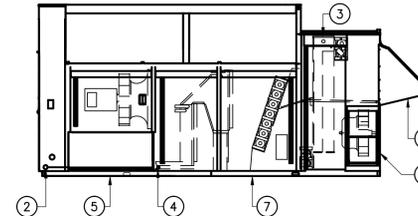
4 TYPICAL PIPE SUPPORT DETAIL

SCALE: NONE



PLAN VIEW

SERVES: AHU-1 ARENA
AAON UNIT SIZE
RN-031 - 7500 LBS



ELEVATION

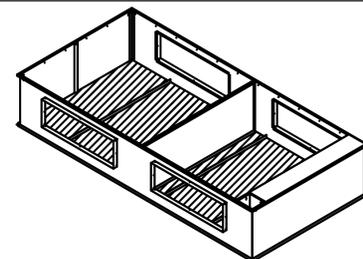
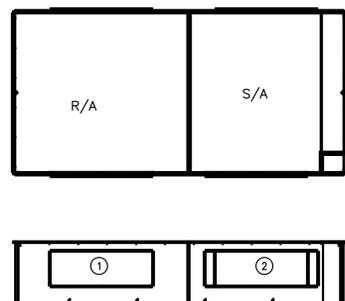
CONNECTION DIMENSIONS			
CONNECTION TYPE	LOCATION	WIDTH	HEIGHT
S/A	BOTTOM	65	46
R/A	BOTTOM	90	26
E/A	END	-	-
O/A	END	-	-

NOTES:

1. OUTSIDE AIR INLET
2. GAS ENTRY
3. ENERGY RECOVERY WHEEL
4. CONDENSATE DRAIN CONNECTION
5. SUPPLY OUTLET
6. EXHAUST OUTLET
7. RETURN AIR INLET

5 AIR HANDLING UNIT CONNECTION DETAIL

SCALE: NONE



NOTES:

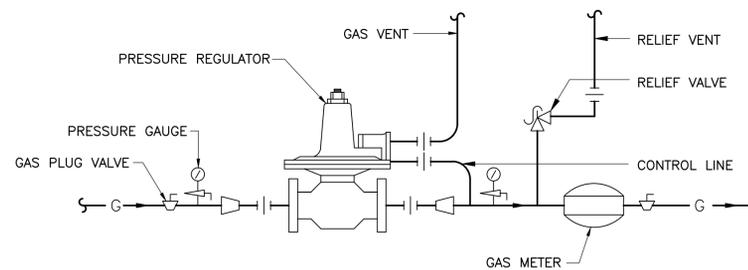
1. 60x20 RETURN AIR OPENING
2. 60x20 SUPPLY AIR OPENING
3. CURB SHIPPED FULLY WELDED, ONE PIECE
4. CURB MUST BE INSTALLED SQUARE AND LEVEL
5. MATERIAL IS GALVANIZED 14ga STEEL
6. FACTORY INSTALLED P.T. 1x4 WOOD NAILER
7. SUPPLIED WITH 1-1/2x1/2\"/>

6 ELEVATED CURB DETAIL

SCALE: NONE

GAS SERVICE:

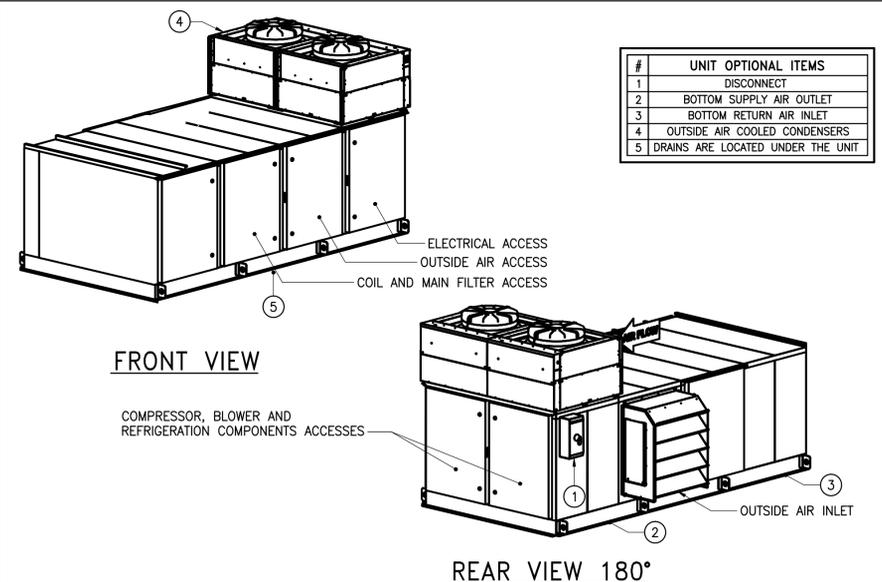
NATURAL GAS @ 2.0 LBS.
0.5 IN. WATER COLUMN
0.60 SPECIFIC GRAVITY
LENGTH - + OR -
- TOTAL CFH.
INLET PRESSURE:
OUTLET PRESSURE:



NOTE: PIPE REGULATORS TO IFGC 2009 410.2 AND 408, VENT TO 410.3

7 GAS PRESSURE REGULATOR DETAIL

SCALE: NONE



#	UNIT OPTIONAL ITEMS
1	DISCONNECT
2	BOTTOM SUPPLY AIR OUTLET
3	BOTTOM RETURN AIR INLET
4	OUTSIDE AIR COOLED CONDENSERS
5	DRAINS ARE LOCATED UNDER THE UNIT

8 EXISTING DEHUMIDIFICATION POOL UNIT CONNECTION DETAIL

SCALE: NONE

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave.
Suite 102
Baltimore, MD 21206
Phone: 410/682-2419
Fax: 410/682-2419



WO# 13072.B

PROJECT MANAGER MXN

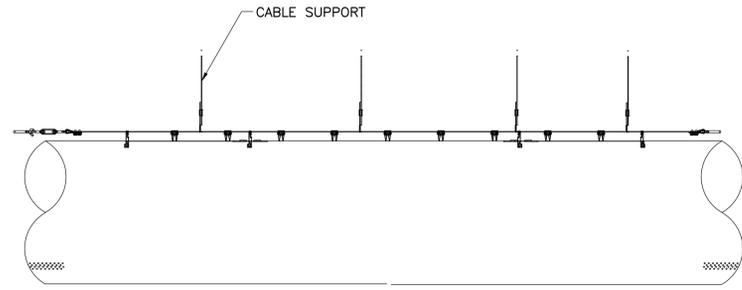
DESIGNER SAS

DATE 12/23/2015

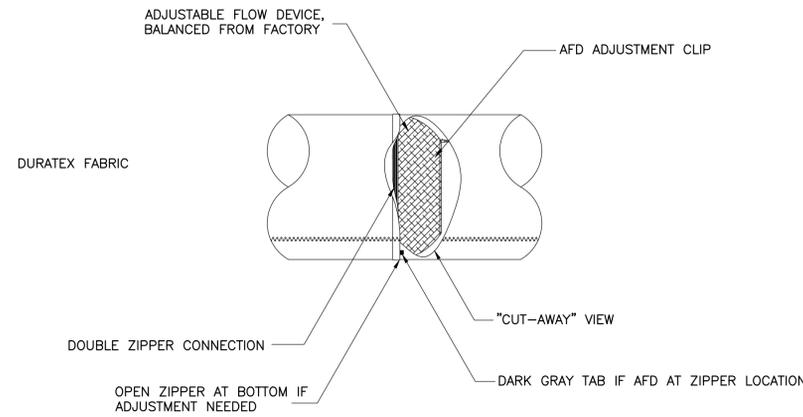
MECHANICAL DETAILS
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

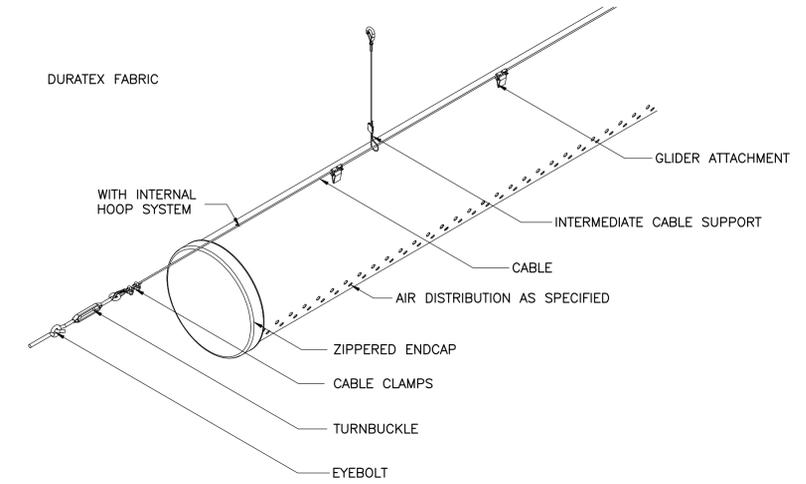
M7.1



SKELECORE PULL-TIGHT WITH CABLE SYSTEM DETAIL



INSTALLED AT ZIPPER LOCATION AT INLET OR AS SPECIFIED IN OTHER LOCATIONS. ZIPPER TO ZIPPER CONNECTION AS SHOWN. EXTERNAL LABEL IDENTIFIES LOCATION



1 ROW CABLE SUSPENSION AT 12 O'CLOCK HOOPS (IHS) CABLE

9 DUCTSOX - CUT AWAY VIEW OF SKELECORE (IHS) DETAIL

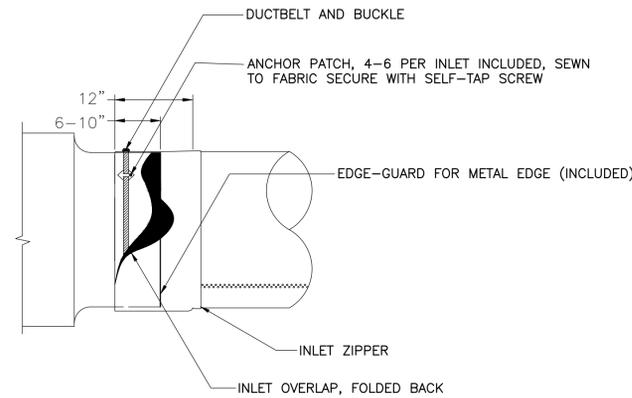
SCALE: NONE

10 DUCTSOX - ADJUSTABLE FLOW DEVICE (AFD) DETAIL

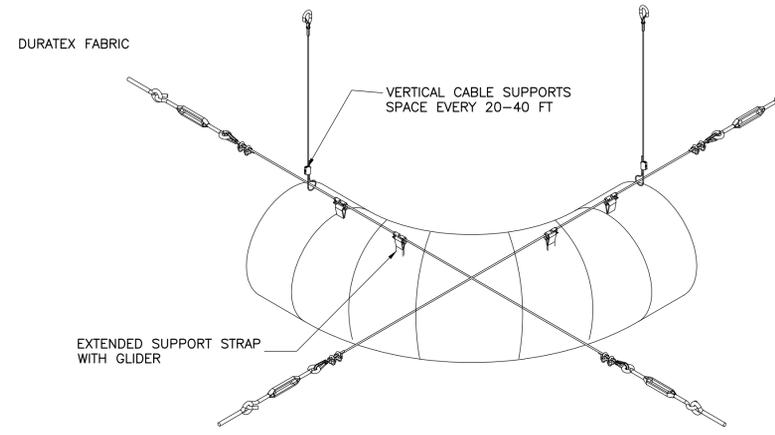
SCALE: NONE

11 DUCTSOX - SUSPENSION DETAIL

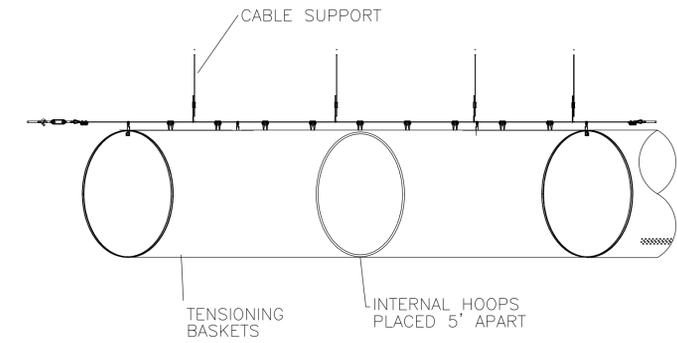
SCALE: NONE



DURATEX FABRIC



RADIUS ELBOW, 1 ROW CABLE SUSPENSION



TENSIONING BASKETS
INTERNAL HOOPS PLACED 5' APART

12 DUCTSOX - INLET ATTACHMENT DETAIL

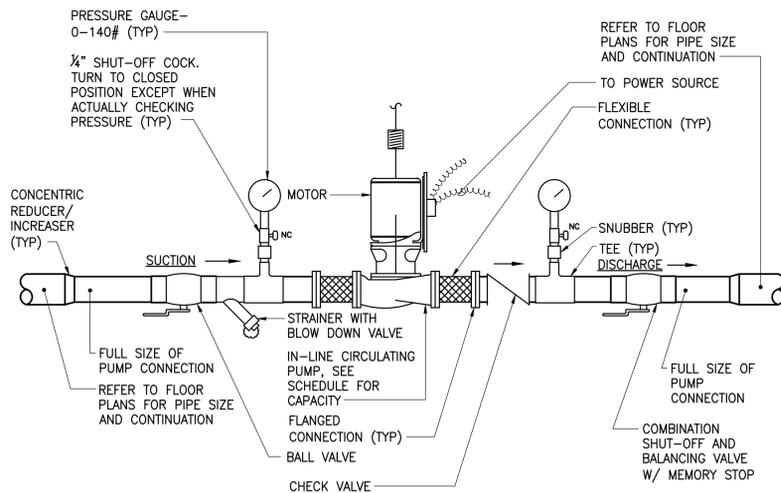
SCALE: NONE

13 DUCTSOX - SUSPENSION DETAIL

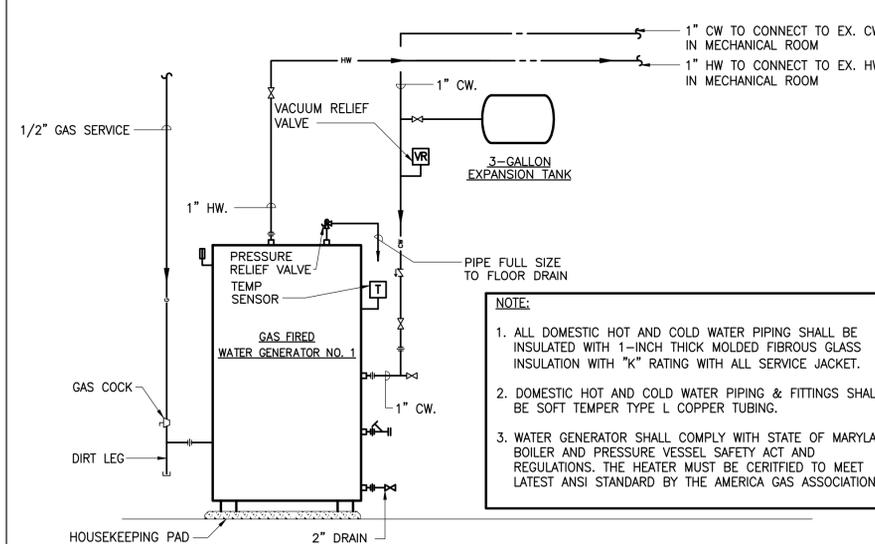
SCALE: NONE

14 DUCTSOX - HOOP DETAIL

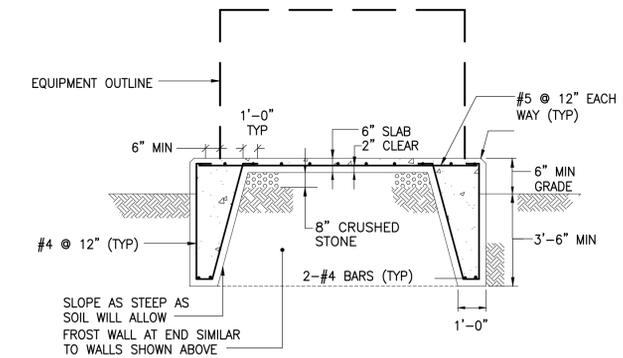
SCALE: NONE



NOTE: SUPPORT INLINE PUMP FROM THE FLOOR AND PROVIDE NEOPRENE ISOLATION PADS BENEATH SUPPORTS.



NOTE:
1. ALL DOMESTIC HOT AND COLD WATER PIPING SHALL BE INSULATED WITH 1-INCH THICK MOLDED FIBROUS GLASS INSULATION WITH "K" RATING WITH ALL SERVICE JACKET.
2. DOMESTIC HOT AND COLD WATER PIPING & FITTINGS SHALL BE SOFT TEMPER TYPE L COPPER TUBING.
3. WATER GENERATOR SHALL COMPLY WITH STATE OF MARYLAND BOILER AND PRESSURE VESSEL SAFETY ACT AND REGULATIONS. THE HEATER MUST BE CERTIFIED TO MEET LATEST ANSI STANDARD BY THE AMERICA GAS ASSOCIATION.



SLOPE AS STEEP AS SOIL WILL ALLOW
FROST WALL AT END SIMILAR TO WALLS SHOWN ABOVE

15 EXISTING IN-LINE CIRCULATOR PUMP DETAIL

SCALE: NONE

16 EXISTING DOMESTIC HOT WATER HEATER - DETAIL

SCALE: NONE

17 TYPICAL CONCRETE EQUIPMENT PAD DETAIL

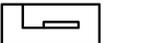
SCALE: NONE

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Giipe Associates Inc.
Consulting Engineers
8710 Peachtree Drive
Suite 205
Baltimore, MD 21286
Phone: 410/835-5430
Fax: 410/835-5416



WO# 13072.B

PROJECT MANAGER MXN

DESIGNER SAS

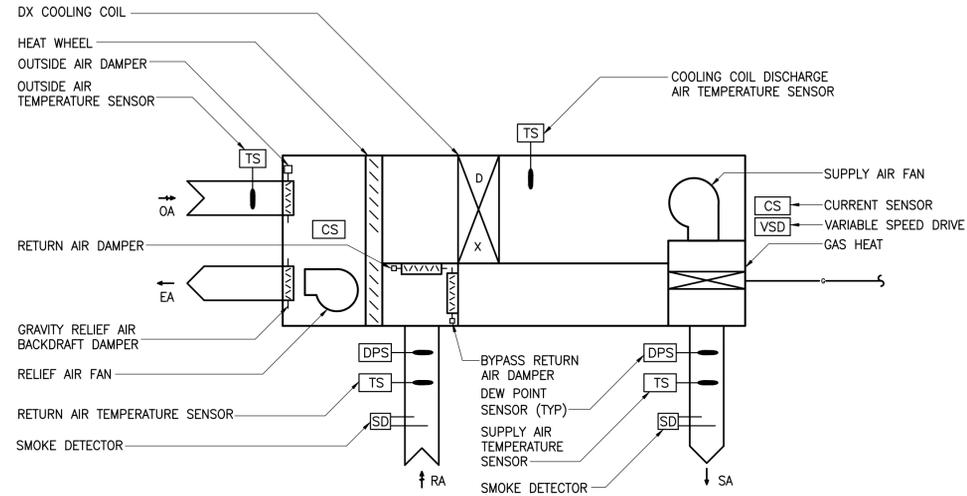
DATE 12/23/2015

MECHANICAL DETAILS
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

M7.2

- [EKS] — EMERGENCY KILL SWITCH
- [TS] — SPACE AIR TEMPERATURE SENSOR
- [RH] — SPACE RELATIVE HUMIDITY SENSOR
- [H-O-A] — SYSTEM HAND-OFF-AUTOMATIC SYSTEM AT UNIT



ARENA AC UNIT W/GAS HEAT AND ENERGY RECOVERY WHEEL (AHU-1) CONTROL DIAGRAM
SCALE: NONE

GENERAL:

- CONTROLS SHALL BE FACTORY PACKAGED WITH THE AIR HANDLER.
- ALL OTHER CONTROLS SUCH AS THERMOSTATS, WIRING INTERLOCKS, ETC. SHALL BE FIELD INSTALLED.
- ALL CONTROLS SHALL BE ELECTRONIC WITH ELECTRIC ACTUATORS.
- THE AIR HANDLER SHALL BE STARTED AND STOPPED THROUGH H-O-A SWITCH. WHEN INDEXED TO "ON", THE SYSTEM SHALL BE ENERGIZED AND OPERATE UNDER CONTROL SEQUENCE. WHEN INDEXED TO AIR HANDLER "OFF", UNIT SHALL DE-ENERGIZE.

STARTING AND STOPPING:

1. OCCUPIED CYCLE:

A. GENERAL:

- WHEN THE UNIT SUPPLY FAN IS ENERGIZED TO RUN, IT SHALL GO THROUGH A WARM-UP/PULL DOWN CYCLE. WHEN THE SYSTEM COMPLETES ITS WARM-UP/PULL-DOWN MODE OF OPERATION AND THE SYSTEM SWITCHES TO THE OCCUPIED MODE OF OPERATION, THE OUTSIDE AIR DAMPER SHALL OPEN TO ITS MINIMUM POSITION AND THE RETURN AIR DAMPER SHALL MODULATE TO ITS CORRESPONDING POSITION. THE RELIEF AIR FAN AND HEAT WHEEL SHALL ENERGIZE.
- THE SPACE TEMPERATURE IS CONTROLLED BY A SINGLE, ZONE MOUNTED TEMPERATURE SENSOR WITH SET POINT ADJUSTMENT. IF THE SET POINT FUNCTION OF THE TEMPERATURE SENSOR IS ENABLED, THE OCCUPANT IN THE SPACE WILL HAVE THE ABILITY TO ADJUST THE TEMPERATURE SET POINT FOR THE CONTROLLED ZONE. A NIGHT SETBACK OVERRIDE SWITCH, LOCATED AT THE ZONE TEMPERATURE SENSOR REACTIVATES THE OCCUPIED CYCLE FOR A PERIOD OF 2 HOURS (ADJ).
- WHEN THE SYSTEM IS PLACED IN OCCUPIED MODE, THE RELIEF FAN IS COMMANDED ON WHEN SUPPLY FAN RUN STATUS IS CONFIRMED AND THE OUTSIDE AIR DAMPER IS GREATER THAN THE EXHAUST AIR DAMPER ENABLE POSITION SET POINT OF 20% (ADJ) OR THE HEAT WHEEL HAS BEEN COMMANDED TO OPERATE.

B. WARM-UP/PULL DOWN:

THE UNIT CONTROL SHALL BE ARRANGED FOR A WINTER MORNING WARM-UP HEATING CYCLE AND SUMMER PULL DOWN COOLING CYCLE. DURING WARM-UP CYCLE THE OUTSIDE AIR DAMPER AND RELIEF AIR DAMPER SHALL REMAIN CLOSED, THE RETURN AIR DAMPER OPEN, AND THE AIR HANDLING UNIT HEAT COIL VALVE SHALL BE FULLY OPEN UNTIL THE RETURN AIR TEMPERATURE RISES TO 70°F. SIMILARLY FOR PULL DOWN CYCLE, THE COMPRESSORS SHALL BE STAGED UNTIL THE RETURN AIR TEMPERATURE DROPS TO 75°F. AT THAT POINT, THE OUTSIDE AIR DAMPER AND RELIEF AIR DAMPER SHALL OPEN, THE RETURN AIR DAMPER SHALL MODULATE TO ITS MINIMUM POSITION, THE RELIEF AIR FAN AND HEAT RECOVERY WHEEL SHALL ENERGIZE AS PREVIOUSLY DESCRIBED, AND THE HEATING AND COOLING CONTROL SHALL BE PLACED UNDER THE CONTROL OF THE TEMPERATURE SENSOR.

C. COOLING:

- COOLING IS ENABLED WHEN THE TEMPERATURE IS ABOVE THE COOLING SET POINT OF 75°F (ADJ) AND OUTSIDE AIR TEMPERATURE IS ABOVE THE COOLING LOCKOUT SET POINT OF 55°F (ADJ). THE UNIT SHALL SEQUENCE THE COOLING STAGES AS REQUIRED TO MAINTAIN THE SPACE TEMPERATURE SET POINT, MODULATING THE COMPRESSOR FROM 15% TO 100%. WHEN ADDITIONAL STAGES OF COOLING ARE AVAILABLE (I.E. MULTIPLE COMPRESSORS) THE MODULATING COMPRESSOR SHALL BE THE FIRST STAGE OF COOLING AND SEQUENTIALLY ENERGIZE ADDITIONAL STAGES OF COOLING. THE FIRST STAGE MODULATES TO MAINTAIN THE SPACE TEMPERATURE SETPOINT. A STAGING DELAY ON AND DELAY OFF SHALL PREVENT EACH STAGE OF MECHANICAL COOLING FROM ENABLING AND DISABLING AT THE SAME TIME. IF THERE ARE MULTIPLE STAGES OF MECHANICAL COOLING AVAILABLE (I.E. MULTIPLE COMPRESSORS) EACH STAGE SHALL SEQUENTIALLY ENABLE BASED ON A TIME DELAY OF 180 SECONDS (ADJ) AND DISABLE BASED ON A MINIMUM DELAY OFF OF 180 SECONDS (ADJ). PROVIDE A 15 MINUTE (ADJ) ANTI-SHORT CYCLE TIME DELAY BETWEEN COMPRESSOR CYCLES.

D. REFRIGERATION LOW LIMIT CONTROL:

- IF THE EVAPORATIVE LEAVING COIL FACE TEMPERATURE FALLS BELOW THE A LOW LIMIT SETPOINT OF 4 40°F, THE MECHANICAL COOLING WILL REVERT FROM TEMPERATURE CONTROL TO SEQUENTIALLY DISABLING STAGES OF MECHANICAL COOLING TO MAINTAIN THE LOW LIMIT TEMPERATURE SET POINT.

- IF THE EVAPORATIVE LEAVING COIL FACE TEMPERATURE FALLS BELOW 32°F, MECHANICAL COOLING WILL BE DISABLED. MECHANICAL COOLING WILL NOT BE COMMANDED TO RUN UNTIL THE EVAPORATIVE LEAVING COIL FACE TEMPERATURE RISES ABOVE 55°F AND THE COMPRESSOR MINIMUM OFF TIME HAS BEEN ACHIEVED.

E. DEHUMIDIFICATION CONTROL:

- DEHUMIDIFICATION IS ENABLED WHEN THE SUPPLY FAN IS OPERATING, SPACE TEMPERATURE IS AT OR ABOVE COOLING SET POINT AND THE OUTSIDE AIR TEMPERATURE IS ABOVE THE COMPRESSOR LOCKOUT POINT. SPACE RELATIVE HUMIDITY SENSOR SHALL INITIATE THE DEHUMIDIFICATION CONTROL SEQUENCE WHEN SPACE RELATIVE HUMIDITY REACHES ITS SETPOINT 50%RH(ADJ). DEHUMIDIFICATION MODE SHALL BE DISABLED IF EITHER THE SPACE RELATIVE HUMIDITY FALLS 5% (ADJ) BELOW THE SPACE DEHUMIDIFICATION SETPOINT OR THE SPACE TEMPERATURE FALLS 5°F (ADJ) BELOW THE OCCUPIED SPACE COOLING SETPOINT TEMPERATURE.
- WHEN THE UNIT IS IN DEHUMIDIFICATION MODE, THE COOLING SHALL REVERT FROM MAINTAINING SPACE TEMPERATURE COOLING SET POINT TO MAINTAINING A CONSTANT LEAVING COIL FACE TEMPERATURE AS DETERMINED BY A REFRIGERATION SUCTION PRESSURE SENSOR LOCATED ON THE FIRST STAGE OF COOLING. THE VARIABLE CAPACITY DIGITAL SCROLL COMPRESSOR WILL BE HELD TO A MINIMUM OF 20% CAPACITY. IF SENSOR SHALL BE LOCATED ON THE SECOND STAGE OF MECHANICAL COOLING. THE LOWER OF THE TWO SENSOR READINGS SHALL BE USED TO CALCULATE THE COIL FACE TEMPERATURE. IF OUTSIDE AIR TEMPERATURE IS ABOVE 65°F THE LEAVING COIL FACE TEMPERATURE SET POINT IS 45°F (ADJ). WHEN OUTSIDE AIR TEMPERATURE IS BELOW 65°F THE LEAVING COIL FACE TEMPERATURE SET POINT IS RAISED 10°F.

- RETURN AIR BYPASS DAMPER— IF THE SPACE TEMPERATURE FALLS BELOW THE SPACE OCCUPIED COOLING TEMPERATURE SET POINT DURING DEHUMIDIFICATION MODE AND THE FIRST STAGE OF MECHANICAL COOLING IS COMMANDED TO RUN, THE UNIT WILL MODULATE THE RETURN AIR BYPASS DAMPER OPEN UNTIL THE OCCUPIED SPACE TEMPERATURE SET POINT IS SATISFIED.

- LOW LIMIT CONTROL WITH A VARIABLE CAPACITY DIGITAL SCROLL COMPRESSOR— IF THE EVAPORATIVE LEAVING COIL FACE TEMPERATURE FALLS BELOW THE COIL FACE TEMPERATURE SET POINT OF 45°F (ADJ), THE VARIABLE CAPACITY DIGITAL SCROLL COMPRESSOR WILL MODULATE DOWN TO MAINTAIN THE COIL FACE TEMPERATURE SET POINT. IF THE COIL FACE TEMPERATURE CONTINUES TO STAY BELOW THE COIL FACE TEMPERATURE AND THE VARIABLE CAPACITY DIGITAL SCROLL IS AT 50% OF UNIT LOAD, THE BYPASS DAMPER WILL REVERT FROM TEMPERATURE CONTROL TO MODULATING TO MAINTAIN THE COIL FACE TEMPERATURE SET POINT OF 45°F. ONCE THE EVAPORATIVE LEAVING COIL FACE TEMPERATURE RISES ABOVE THE COIL FACE TEMPERATURE SET POINT, THE BYPASS DAMPER WILL RESUME TEMPERATURE CONTROL. IF THE EVAPORATIVE LEAVING COIL FACE TEMPERATURE CONTINUES TO FALL BELOW THE COIL FACE TEMPERATURE LOW LIMIT SET POINT AND THE BYPASS DAMPER IS CLOSED, THE MECHANICAL COOLING WILL BEGIN TO DISABLE STAGES UNTIL THE EVAPORATIVE LEAVING COIL FACE TEMPERATURE RISES ABOVE THE COIL FACE TEMPERATURE SET POINT.

F. COOLING WITH ECONOMIZER CONTROL:

- PROVIDE A "DISABLED-ENTHALPY ECONOMIZER-DRYBULB ECONOMIZER" SELECTOR SWITCH. WHEN INDEX TO DISABLED THE ECONOMIZER CYCLE SHALL BE LOCKED OUT. WHEN INDEXED TO ENTHALPY ECONOMIZER THE ECONOMIZER CYCLE SHALL BE ACTIVE WHENEVER THE ENTHALPY OF THE OUTSIDE AIR IS BELOW IT'S SETPOINT. WHENEVER THE SWITCH IS INDEXED TO DRYBULB ECONOMIZER, THE DRY BULB ECONOMIZER CYCLE SHALL BE ACTIVE. THE SUPPLY AIR TEMPERATURE SENSOR, THROUGH DRY BULB ECONOMIZER CONTROLLER SHALL MODULATE THE ECONOMIZER OUTSIDE AIR/RETURN AIR AND RELIEF AIR DAMPERS, IN SEQUENCE TO MAINTAIN 55°F (ADJUSTABLE) SUPPLY AIR TEMPERATURE. LOW LIMIT TEMPERATURE SENSOR SHALL OVERRIDE DISCHARGE TEMPERATURE SENSOR TO PREVENT THE MIXED AIR TEMPERATURE FROM FALLING BELOW ITS SETTING (45°F, ADJUSTABLE). ABOVE 60°F OUTSIDE AIR TEMPERATURE, SUPPLY AIR TEMPERATURE SENSOR THROUGH DRY BULB ECONOMIZER CONTROLLER SHALL MODULATE OUTSIDE AIR/RETURN AIR/RELIEF AIR DAMPERS IN SEQUENCE WITH COOLING COIL VALVE, TO MAINTAIN 55°F (ADJUSTABLE) SUPPLY AIR TEMPERATURE. ENTHALPY SHALL BE CALCULATED BY UTILIZING THE GLOBAL OUTSIDE AIR TEMPERATURE SENSOR AND DEWPOINT SENSOR.

G. HEATING:

- WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 40°F. (ADJUSTABLE) THE UNIT SHALL OPERATE UNDER ITS BUILT IN MICROPROCESSOR CONTROLS TO PROVIDE A LEAVING AIR TEMPERATURE AS SCHEDULED.

H. HEAT RECOVERY:

- THE ROTARY AIR-TO-AIR HEAT RECOVERY WHEEL SHALL OPERATE WHEN OUTSIDE AIR IS REQUIRED. THE HEAT WHEEL FURNISHED CONTROLS SHALL INCLUDE FROST CONTROL, CLEANING CYCLE, AND ROTATIONAL DETECTOR. THE HEAT WHEEL SHALL RUN AT FULL SPEED EXCEPT AT OUTSIDE AIR TEMPERATURES OF 50°F-65°F (ADJ-ECONOMIZER OPERATION) AND WHEN FROST OF THE WHEEL MAY OCCUR.

- THE HEAT WHEEL ACTS AS THE FIRST STAGE OF HEATING OR COOLING, WHEN THE UNIT IS PLACED IN OCCUPIED MODE, THE SUPPLY FAN RUN STATUS IS CONFIRMED AND THERE IS A CALL FOR MECHANICAL HEATING OR COOLING, THE HEAT WHEEL IS COMMANDED TO RUN. IF THE UNIT IS IN ECONOMIZER MODE OR THERE IS NOT A CALL FOR EITHER MECHANICAL HEATING OR COOLING THE HEAT WHEEL IS COMMANDED OFF. IF THE OUTSIDE AIR TEMPERATURE FALLS BELOW THE OUTSIDE AIR HEAT WHEEL DEFROST MODE ENABLE TEMPERATURE SET POINT OF 32°F (ADJ) AND EXHAUST FAN RUN STATUS IS CONFIRMED, THE HEAT WHEEL WILL OPERATE IN DEFROST MODE. DURING THIS MODE OF OPERATION, THE HEAT WHEEL WILL CYCLE ON FOR 30 MINUTES (ADJ), AND THEN CYCLE OFF FOR 2 MINUTES (ADJ) TO PREVENT ANY ICE BUILDUP. WHEN THE UNIT IS IN DEFROST MODE, THE OUTSIDE AIR DAMPER AND RETURN AIR DAMPER WILL MODULATE TO MAINTAIN A HEAT WHEEL SUPPLY AIR TEMPERATURE SET POINT OF 45°F (ADJ).

- OUTSIDE AIR CONTROL: THE OUTSIDE AIR DAMPER SHALL OPEN TO ITS SCHEDULED POSITION WHEN THE SYSTEM IS OPERATING IN THE OCCUPIED MODE OF OPERATION. RETURN AIR DAMPERS SHALL MODULATE ACCORDINGLY BASED ON THE OUTSIDE AIR DAMPER POSITION.

- PROVIDE A SUMMER/NIGHT UNOCCUPIED MODE OF OPERATION, WHICH THE OUTSIDE AIR DAMPER AND RELIEF AIR DAMPER REMAINS CLOSED, THE RELIEF AIR FAN AND HEAT RECOVERY WHEEL DE-ENERGIZE AND THE RETURN AIR DAMPER IS FULLY OPEN WHEN THE BUILDING IS UNOCCUPIED, HOWEVER THE UNIT OPERATES TO MAINTAIN THE OCCUPIED SPACE TEMPERATURE AND RELATIVE HUMIDITY. THIS MODE OF OPERATION SHALL MANUALLY BE COMMANDED ON OR SCHEDULED THROUGH THE PROGRAMMABLE THERMOSTAT.

2. UNOCCUPIED CYCLE:

A. GENERAL:

AFTER A FIVE MINUTE TIME DELAY THE SUPPLY FAN, ASSOCIATED RELIEF FAN, CONDENSING UNIT, AND HEAT RECOVERY WHEEL SHALL BE DE-ENERGIZED, OUTSIDE AIR DAMPER AND RELIEF AIR DAMPER SHALL BE CLOSED, THE HEATING COIL VALVE SHALL BE OPEN AND RETURN AIR DAMPER SHALL BE OPEN. SPACE TEMPERATURE SENSOR SHALL BE RESET TO 55°F (ADJ) IN THE HEATING MODE.

B. HEATING:

NIGHT SETBACK TEMPERATURE SHALL BE MAINTAINED BY CYCLING THE SUPPLY FAN AS RECIRCULATING UNIT HEATER. WHEN THE SPACE TEMPERATURE FALLS BELOW THE UNOCCUPIED SET POINT OF 62°F (ADJ), THE SUPPLY FAN SHALL START AND FULL HEATING SHALL BE ENABLED. HEATING IS DISABLED WHEN SPACE TEMPERATURE REACHES 2°F ABOVE SPACE TEMPERATURE SET POINT. THE SUPPLY FAN SHALL DE-ENERGIZE AFTER THE TIME DELAY TIMES OUT.

C. DEHUMIDIFICATION:

IF SPACE HUMIDITY LEVELS RISE ABOVE THE UNOCCUPIED HUMIDITY SET POINT OF 65% (ADJ), THE FAN SHALL START AND THE UNIT SHALL OPERATE IN THE DEHUMIDIFICATION MODE WITH THE OUTSIDE AIR DAMPER CLOSED. WHEN SPACE RELATIVE HUMIDITY FALLS 5% BELOW THE UNOCCUPIED DEHUMIDIFICATION SET POINT (60%RH - ADJ), THE DEHUMIDIFICATION MODE SHALL BE DISABLED AND THE FAN SHALL STOP.

D. MECHANICAL COOLING:

MECHANICAL COOLING IS DISABLED. IF THE UNIT IS MONITORING SPACE TEMPERATURE AND THE SPACE TEMPERATURE RISES ABOVE THE UNOCCUPIED COOLING TEMPERATURE SET POINT OF 80°F (ADJ), THE UNIT COOLING NIGHT CYCLE MODE IS ENABLED. ONCE THE SUPPLY FAN RUN STATUS IS CONFIRMED, THE UNIT OPERATES WITH THE ECONOMIZER DISABLED AND SEQUENTIALLY ENABLES 100% MECHANICAL COOLING CAPACITY. ONCE THE SPACE TEMPERATURE FALLS 2°F (ADJ) BELOW THE SPACE UNOCCUPIED COOLING TEMPERATURE SET POINT, THE COOLING NIGHT CYCLE MODE IS DISABLE. THE SUPPLY FAN IS DISABLED AFTER 120 SECONDS TIME DELAY TO ALLOW FOR MECHANICAL UNLOADING.

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave.
Suite 102
Baltimore, MD 21206
Phone: 410/682-2419
Fax: 410/682-2419

8719 Brooke Drive
Suite 2-5
Baltimore, MD 21286
Phone: 410/682-6868
Fax: 410/682-6808



WO# 13072.B

PROJECT MANAGER MXN

DESIGNER SAS

DATE 12/23/2015

SEQUENCE OF OPERATION
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

M8.2

MECHANICAL SPECIFICATIONS

SECTION 15100 - GENERAL MECHANICAL REQUIREMENTS

PART 1 - RELATED DOCUMENTS

1.1 SUMMARY:

A. ALL WORK UNDER DIVISION 15 IS SUBJECT TO THE GENERAL CONDITIONS, GENERAL REQUIREMENTS DIVISION 1 FOR THE ENTIRE CONTRACT.

B. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICES NECESSARY FOR AND INCIDENTAL TO THE COMPLETE INSTALLATION AND OPERATION OF ALL MECHANICAL WORK.

C. UNLESS OTHERWISE SPECIFIED, ALL SUBMISSIONS SHALL BE MADE TO, AND ACCEPTANCES AND APPROVALS MADE BY, THE ENGINEER THROUGH THE ARCHITECT.

D. CONTRACT DRAWINGS ARE GENERALLY DIAGRAMMATIC AND ALL OFFSETS, FITTINGS, TRANSITIONS AND ACCESSORIES ARE NOT NECESSARILY SHOWN. FURNISH AND INSTALL ALL SUCH ITEMS AS MAY BE REQUIRED TO FIT THE WORK TO THE CONDITIONS ENCOUNTERED, ARRANGE PIPING, DUCTWORK, EQUIPMENT, AND OTHER WORK GENERALLY AS SHOWN ON THE CONTRACT DRAWINGS, PROVIDING PROPER CLEARANCE AND ACCESS. WHERE DEPARTURES ARE PROPOSED BECAUSE OF FIELD CONDITIONS OR OTHER CAUSES, PREPARE AND SUBMIT DETAILED SHOP DRAWINGS FOR APPROVAL IN ACCORDANCE WITH "SUBMITTALS" SPECIFIED BELOW. THE RIGHT IS RESERVED TO MAKE REASONABLE CHANGES IN LOCATION OF EQUIPMENT, PIPING, AND DUCTWORK, UP TO THE TIME OF ROUGH-IN OR FABRICATION.

E. CONFORM TO THE REQUIREMENTS OF ALL RULES, REGULATIONS AND CODES OF LOCAL, STATE AND FEDERAL AUTHORITIES HAVING JURISDICTION.

F. BE RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, PROCEDURES AND PHASING SEQUENCES USED IN THE WORK. FURNISH ALL TOOLS, EQUIPMENT AND MATERIALS NECESSARY TO PROPERLY PERFORM THE WORK IN A FIRST CLASS, SUBSTANTIAL, AND WORKMANLIKE MANNER, IN ACCORDANCE WITH THE FULL INTENT AND MEANING OF THE CONTRACT DOCUMENTS.

G. WHERE A DISCREPANCY EXISTS WITHIN THE SPECIFICATIONS OR DRAWINGS OR BETWEEN THE SPECIFICATIONS AND DRAWINGS, THE MORE STRINGENT (OR COSTLY) REQUIREMENT SHALL APPLY UNTIL CLARIFICATION CAN BE OBTAINED FROM THE ENGINEER. FAILURE TO CLARIFY SUCH DISCREPANCIES WITH THE ENGINEER WILL NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY OF CONFORMING TO THE REQUIREMENTS OF THE CONTRACT.

1.2 PERMITS AND FEES:

A. OBTAIN ALL PERMITS AND PAY TAXES, FEES AND OTHER COSTS IN CONNECTION WITH THE WORK. FILE NECESSARY PLANS, PREPARE NOTICES, GIVE PROPER NOTICES AND OBTAIN NECESSARY APPROVALS. DELIVER INSPECTION AND APPROVAL CERTIFICATES TO OWNER PRIOR TO FINAL ACCEPTANCE OF THE WORK.

B. PERMITS AND FEES SHALL COMPLY WITH THE GENERAL REQUIREMENTS OF THE SPECIFICATION.

1.3 EXAMINATION OF SITE:

A. EXAMINE THE SITE, DETERMINE ALL CONDITIONS AND CIRCUMSTANCES UNDER WHICH THE WORK MUST BE PERFORMED, AND MAKE ALL NECESSARY ALLOWANCES FOR SAME. NO ADDITIONAL COST TO THE OWNER WILL BE PERMITTED FOR CONTRACTOR'S FAILURE TO DO SO.

1.4 SHOP DRAWINGS:

A. PREPARE AND SUBMIT SHOP DRAWINGS FOR ALL SPECIALLY FABRICATED ITEMS, MODIFICATIONS TO STANDARD ITEMS, SPECIALLY DESIGNED SYSTEMS WHERE DETAILED DESIGN IS NOT SHOWN ON THE CONTRACT DRAWINGS, OR WHERE THE PROPOSED INSTALLATION DIFFERS FROM THAT SHOWN ON CONTRACT DRAWINGS.

B. SUBMIT DATA AND SHOP DRAWINGS AS LISTED BELOW, IN ADDITION TO PROVISIONS OF PARAGRAPH 1 ABOVE. IDENTIFY ALL SHOP DRAWINGS BY THE NAME OF THE ITEM AND SYSTEM AND THE APPLICABLE SPECIFICATION PARAGRAPH NUMBER.

ITEMS AND SYSTEMS
ACCESS DOORS,
AS-BUILT DRAWINGS,
COORDINATED DRAWINGS,
FIRE MARSHAL APPROVALS,
FIRE STOPPING - METHODS AND MATERIALS,
IDENTIFICATION SYSTEM,
INSTALLATION AND COORDINATION DRAWINGS,
RECORD AND INFORMATION BOOKLET,
THERMAL INSULATION MATERIALS,
FIRE STOPPING - METHODS AND MATERIALS
PIPE MATERIALS
AIR HANDLING UNITS
AUTOMATIC TEMPERATURE CONTROL SYSTEMS
FABRIC DUCTWORK
EXTERIOR DUCTWORK AND PIPING SUPPORTS
VIBRATION ISOLATION

C. CONTRACTOR, ADDITIONALLY, SHALL SUBMIT FOR APPROVAL ANY OTHER SHOP DRAWINGS AS REQUIRED BY THE ARCHITECT. NO ITEM LISTED ABOVE SHALL BE DELIVERED TO THE SITE, OR INSTALLED, UNTIL APPROVED. AFTER THE PROPOSED MATERIALS HAVE BEEN APPROVED, NO SUBSTITUTION WILL BE PERMITTED EXCEPT WHERE APPROVED BY THE ENGINEER.

1.5 VIBRATION ISOLATION

A. FURNISH AND INSTALL VIBRATION ISOLATORS, FLEXIBLE CONNECTIONS, SUPPORTS, ANCHORS AND FOUNDATIONS REQUIRED TO PREVENT TRANSMISSION OF VIBRATION FROM EQUIPMENT, PIPING OR DUCTWORK TO BUILDING STRUCTURE.

1.6 CUTTING AND PATCHING:

A. ACCOMPLISH CUTTING AND PATCHING NECESSARY FOR THE INSTALLATION OF WORK UNDER DIVISION 15. DAMAGE RESULTING FROM THIS WORK TO OTHER WORK ALREADY IN PLACE SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE. WHERE CUTTING IS REQUIRED, PERFORM WORK IN NEAT AND WORKMANLIKE MANNER. RESTORE DISTURBED WORK TO MATCH AND BLEND WITH EXISTING, USING MATERIALS COMPATIBLE WITH THE ORIGINAL. USE MECHANICS SKILLED IN THE PARTICULAR TRADES REQUIRED.

1.7 PENETRATION OF WATERPROOF CONSTRUCTION:

A. COORDINATE THE WORK TO MINIMIZE PENETRATION OF WATERPROOF CONSTRUCTION, INCLUDING ROOFS, EXTERIOR WALLS, AND INTERIOR WATERPROOF CONSTRUCTION. WHERE SUCH PENETRATIONS ARE NECESSARY, FURNISH AND INSTALL ALL NECESSARY CURBS, SLEEVES, FLASHINGS, FITTINGS AND CAULKING TO MAKE PENETRATIONS ABSOLUTELY WATERTIGHT.

B. WHERE PLUMBING VENTS OR OTHER PIPES PENETRATE ROOFS, FLASH PIPE WITH STONE/MAN "STORMWITTE" OR APPROVED EQUAL, ROOF FLASHING ASSEMBLIES, WITH 4-POUND LEAD, 6-INCH SKIRT AND CAULKED COUNTERFLASHING SLEEVE SIMILAR TO NO. 1000_4.

C. FURNISH AND INSTALL PITCH POCKETS WHERE REQUIRED.

D. FURNISH AND INSTALL ROOF DRAINS, CURBS, VENT ASSEMBLIES, AND DUCT SLEEVES SPECIALLY DESIGNED FOR APPLICATION TO THE PARTICULAR ROOF CONSTRUCTION, AND INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS, THE NATIONAL ROOFING CONTRACTORS ASSOCIATION, AND AS REQUIRED BY OTHER DIVISIONS OF THIS SPECIFICATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SLEEVE SIZES AND LOCATIONS.

1.8 CONCRETE AND MASONRY WORK:

A. FURNISH AND INSTALL CONCRETE AND MASONRY WORK FOR EQUIPMENT FOUNDATIONS, SUPPORTS, PADS, AND OTHER ITEMS REQUIRED UNDER DIVISION 15. PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS OF OTHER APPLICABLE DIVISIONS OF THESE SPECIFICATIONS.

B. CONCRETE SHALL TEST NOT LESS THAN 3,000 PSI COMPRESSIVE STRENGTH AFTER 28 DAYS.

C. GROUT SHALL BE NON-SHRINK, HIGH STRENGTH MORTAR, FREE OF IRON OR CHLORIDES AND SUITABLE FOR USE IN CONTACT WITH ALL METALS, WITHOUT CAPS OR OTHER PROTECTIVE FINISHES. APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND STANDARD GROUTING PRACTICES.

SECTION 15100 - GENERAL MECHANICAL REQUIREMENTS - CONTINUED

1.9 CONNECTIONS AND ALTERATIONS TO EXISTING WORK

A. UNLESS OTHERWISE NOTED ON THE DRAWINGS, WHERE EXISTING MECHANICAL WORK IS REMOVED, PIPES, VALVES, DUCTWORK, ETC., SHALL BE REMOVED, INCLUDING HANGERS, TO A POINT BELOW FINISHED FLOORS OR BEHIND FINISHED WALLS AND CAPPED. SUCH POINT SHALL BE FAR ENOUGH BEHIND FINISHED SURFACES TO ALLOW FOR INSTALLATION OF NORMAL THICKNESS OF REQUIRED FINISH MATERIAL.

B. WHERE WORK SPECIFIED IN DIVISION 15 CONNECTS TO EXISTING EQUIPMENT, PIPING, DUCTWORK, ETC., CONTRACTOR SHALL PERFORM ALL NECESSARY ALTERATIONS, CUTTINGS, FITTINGS, ETC., OF EXISTING WORK AS MAY BE NECESSARY TO MAKE SATISFACTORY CONNECTIONS BETWEEN NEW AND EXISTING WORK AND TO LEAVE COMPLETED WORK IN A FINISHED AND WORKMANLIKE CONDITION.

C. WHERE THE WORK SPECIFIED UNDER DIVISION 15, OR UNDER OTHER DIVISIONS, REQUIRES RELOCATION OF EXISTING MECHANICAL EQUIPMENT, PIPING, DUCTWORK, ETC., THE CONTRACTOR SHALL PERFORM ALL WORK AND MAKE NECESSARY CHANGES TO EXISTING WORK AS MAY BE REQUIRED TO LEAVE COMPLETED WORK IN A FINISHED AND WORKMANLIKE CONDITION. WHERE EXISTING INSULATION IS DISTURBED, REPLACE INSULATION WHERE REMOVED OR DAMAGED EQUAL TO EXISTING IN TYPE, THICKNESS, DENSITY, FINISH AND THERMAL RESISTANCE (R-VALUE).

1.10 DEMOLITION:

A. DEMOLITION OF BUILDINGS IS SPECIFIED UNDER ANOTHER DIVISION.

B. TERMINATE SERVICES AND UTILITIES IN ACCORDANCE WITH LOCAL LAWS, ORDINANCES, RULES AND REGULATIONS.

C. WHERE PIPING AND/OR DUCTWORK IS REMOVED, REMOVE ALL PIPE OR DUCTWORK HANGERS WHICH WERE SUPPORTING THE REMOVED PIPING OR DUCTWORK. PATCH THE REMAINING PENETRATION VOIDS WITH LIKE MATERIALS TO MATCH EXISTING CONSTRUCTION.

PART 2 - ELECTRICAL REQUIREMENTS

2.1 SCOPE:

A. FURNISH AND INSTALL CONTROL AND INTERLOCK WIRING FOR THE EQUIPMENT FURNISHED. IN GENERAL, POWER WIRING AND MOTOR STARTING EQUIPMENT WILL BE PROVIDED UNDER DIVISION 16. CAREFULLY REVIEW THE CONTRACT DOCUMENTS TO COORDINATE THE ELECTRICAL WORK UNDER DIVISION 15 WITH THE WORK UNDER DIVISION 16. WHERE THE ELECTRICAL REQUIREMENTS OF THE EQUIPMENT FURNISHED DIFFER FROM THE PROVISIONS MADE UNDER DIVISION 16, MAKE THE NECESSARY ALLOWANCES UNDER DIVISION 15. WHERE NO ELECTRICAL PROVISIONS ARE MADE UNDER DIVISION 16, INCLUDE ALL NECESSARY ELECTRICAL WORK UNDER DIVISION 15.

B. ALL ELECTRICAL WORK PERFORMED UNDER DIVISION 15 SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF DIVISION 16.

PART 3 - EXECUTION

3.1 SUPPORTS, HANGERS AND FOUNDATIONS:

A. PROVIDE SUPPORTS, HANGERS, BRACES, ATTACHMENTS AND FOUNDATIONS REQUIRED FOR THE WORK. SUPPORT AND SET THE WORK IN A THOROUGHLY SUBSTANTIAL AND WORKMANLIKE MANNER WITHOUT PLACING STRAINS ON MATERIALS, EQUIPMENT, OR BUILDING STRUCTURE. SUBMIT SHOP DRAWINGS FOR APPROVAL. COORDINATE ALL WORK WITH THE REQUIREMENTS OF THE ARCHITECTURAL AND STRUCTURAL DIVISIONS.

B. SUPPORTS, HANGERS, BRACES, AND ATTACHMENTS SHALL BE STANDARD MANUFACTURED ITEMS OR FABRICATED STRUCTURAL STEEL SHAPES. ALL INTERIOR HANGERS SHALL BE GALVANIZED OR STEEL WITH RUST INHIBITING PAINT. FOR UNSULATED COPPER PIPING/TUBING, PROVIDE COPPER HANGER TO PREVENT CONTACT OF DISSIMILAR METALS. ALL EXTERIOR HANGERS SHALL BE CONSTRUCTED OF GALVANIZED OR STAINLESS STEEL UTILIZING GALVANIZED OR STAINLESS STEEL RODS, NUTS, WASHERS, BOLTS, ETC.

C. CONCRETE HOUSEKEEPING PADS AND FOUNDATIONS SHALL BE NOT LESS THAN 4 INCHES HIGH (6 INCHES HIGH FOR CHILLERS AND BOILERS) AND SHALL EXTEND A MINIMUM OF 6 INCHES BEYOND EQUIPMENT BASES. PROVIDE WIRE-MESH OR RE-BAR REINFORCEMENT; CHAMFER EXPOSED EDGES AND CORNERS; AND FINISH EXPOSED SURFACES SMOOTH.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. INSTALL EQUIPMENT TO PROVIDE MAXIMUM POSSIBLE HEADROOM, IF MOUNTING HEIGHTS ARE NOT INDICATED.

B. INSTALL EQUIPMENT ACCORDING TO APPROVED SUBMITTAL DATA. PORTIONS OF THE WORK ARE SHOWN ONLY IN DIAGRAMMATIC FORM. REFER CONFLICTS TO ARCHITECT/ENGINEER.

C. INSTALL EQUIPMENT LEVEL AND PLUMB, PARALLEL AND PERPENDICULAR TO OTHER BUILDING SYSTEMS AND COMPONENTS IN EXPOSED INTERIOR SPACES, UNLESS OTHERWISE INDICATED.

D. INSTALL MECHANICAL EQUIPMENT TO FACILITATE SERVICE, MAINTENANCE, AND REPAIR OR REPLACEMENT OF COMPONENTS. CONNECT EQUIPMENT FOR EASE OF DISCONNECTING, WITH MINIMUM INTERFERENCE, TO OTHER INSTALLATIONS. EXTEND GREASE FITTINGS TO ACCESSIBLE LOCATIONS.

E. INSTALL EQUIPMENT GIVING RIGHT OF WAY TO PIPING INSTALLED AT REQUIRED SLOPE.

F. INSTALL FLEXIBLE CONNECTORS ON EQUIPMENT SIDE OF SHUT-OFF VALVES, HORIZONTALLY AND PARALLEL TO EQUIPMENT SHAFTS, IF POSSIBLE.

3.3 WALL AND FLOOR PENETRATIONS:

A. PROVIDE SLEEVES FOR PIPES AND DUCTS PASSING THROUGH ROOFS, FLOORS, CEILING, WALLS, PARTITIONS, AIR HANDLING UNIT CASINGS, STRUCTURAL MEMBERS, AND OTHER BUILDING PARTS.

B. PENETRATIONS OF MECHANICAL ROOM PARTITIONS, WALLS, CEILINGS, AND FLOORS SHALL BE AS SPECIFIED IN SECTION 15975, "VIBRATION CONTROL".

C. PROVIDE ESCUTCHEONS FOR SLEEVED PIPES IN FINISHED AREAS.

3.4 PIPING SLEEVES:

1. GALVANIZED STEEL PIPE, STANDARD WEIGHT, WHERE PIPES ARE EXPOSED AND ON ROOFS AND IN CONCRETE AND MASONRY WALLS. ON EXTERIOR WALLS PROVIDE ANCHOR FLANGE WELDED TO PERIMETER.

2. TWENTY-TWO (22) GAUGE GALVANIZED STEEL ELSEWHERE.

E. DUCTWORK SLEEVES: 20 GAUGE GALVANIZED STEEL.

F. PENETRATIONS SHALL BE SEALED AND CAULKED AIRTIGHT FOR SOUND AND AIR TRANSFER CONTROL. VOIDS WHERE DUCTS AND PIPES PENETRATE FLOORS OR OTHER FIRE RATED ASSEMBLIES SHALL BE APPROPRIATELY FIRE-SEALED WITH AN APPROVED FIRE SEALANT (3M OR DOW CORNING FIRE SEALANT FOAM AND CAULK).

G. WHERE PIPING EXTENDS THROUGH EXTERIOR WALLS, PROVIDE LINK-SEAL OR EQUIVALENT.

3.4 RECORD DRAWINGS:

A. UPON COMPLETION OF THE MECHANICAL INSTALLATIONS, THE CONTRACTOR SHALL DELIVER TO THE ENGINEER ONE COMPLETE SET OF PRINTS OF THE MECHANICAL CONTRACT DRAWINGS THAT SHALL BE LEGIBLY MARKED IN RED PENCIL TO SHOW ALL CHANGES AND DEPARTURES OF THE INSTALLATION AS COMPARED WITH THE ORIGINAL DESIGN. THEY SHALL BE SUITABLE FOR USE IN PREPARATION OF RECORD DRAWINGS.

3.5 RECORD AND INFORMATION BOOKLET:

A. THE CONTRACTOR SHALL HAVE PREPARED THREE (3) COPIES OF THE RECORD AND INFORMATION BOOKLET AND DELIVER THESE COPIES OF THE BOOKLET TO THE OWNER. THE BOOKLET SHALL BE AS SPECIFIED HEREIN. THE BOOKLET MUST BE APPROVED AND WILL NOT BE ACCEPTED AS FINAL UNTIL SO STAMPED.

SECTION 15100 - GENERAL MECHANICAL REQUIREMENTS - CONTINUED

B. THE BOOKLET SHALL BE BOUND IN A THREE RING LOOSE-LEAF BINDER SIMILAR TO "NATIONAL" NO. 3881 WITH THE FOLLOWING TITLE LETTERED ON THE FRONT: "RECORD AND INFORMATION BOOKLET (INSERT NAME OF THE PROJECT)". NO SHEETS LARGER THAN 8-1/2" X 11" SHALL BE USED, EXCEPT SHEETS THAT MAY BE NEATLY FOLDED TO 8-1/2" X 11" AND USED AS A PULL-OUT.

C. PROVIDE THE FOLLOWING DATA IN THE BOOKLET:

1. CATALOG DATA ON EACH PIECE OF MECHANICAL EQUIPMENT FURNISHED.

2. MAINTENANCE OPERATION AND LUBRICATION INSTRUCTIONS ON EACH PIECE OF EQUIPMENT FURNISHED.

3. COMPLETE CATALOG DATA ON EACH PIECE OF HEATING AND AIR CONDITIONING EQUIPMENT EQUIPMENT FURNISHED WITH APPROVED SHOP DRAWING OR SUBMITTAL INCLUDING AUTOMATIC TEMPERATURE CONTROL (ATC).

4. MANUFACTURER'S AND CONTRACTOR'S GUARANTEES.

5. CHART FORM INDICATING TIME AND TYPE OF ROUTINE MAINTENANCE. THE CHART SHALL ALSO INDICATE TAG NUMBER, MODEL NUMBER OF EQUIPMENT, LOCATION AND SERVICE. FOR REPLACEMENT ITEMS SUCH AS FILTERS, INDICATE TYPE, SIZE AND QUANTITY OF THE REPLACEABLE ITEMS.

6. PROVIDE SALES AND SERVICE REPRESENTATIVES' NAMES AND PHONE NUMBERS OF ALL EQUIPMENT AND SUBCONTRACTORS.

7. CATALOG DATA OF ALL EQUIPMENT, VALVES, ETC., WHICH SHALL INCLUDE WIRING DIAGRAMS, PARTS LIST AND ASSEMBLY DRAWING.

8. PROVIDE VALVE CHART INCLUDING VALVE TAG NUMBER, VALVE TYPE, VALVE MODEL NUMBER, VALVE MANUFACTURER, STYLE, SERVICE AND LOCATION, ETC., AS SPECIFIED HEREINAFTER.

9. COPY OF THE APPROVED BALANCING REPORT.

10. ATC SYSTEMS INCLUDING AS-BUILT ATC DRAWINGS OF SYSTEMS, SEQUENCES OF OPERATION INCLUDING INTERNAL DEVICES, WIRING AND PNEUMATIC TUBING WITHIN PANELS.

SECTION 15200 - PIPING, FITTINGS, VALVES, ETC.

PART 1 - RELATED DOCUMENTS

1.1 SUMMARY:

A. ALL WORK UNDER THIS SECTION IS SUBJECT TO THE REQUIREMENTS OF SECTION 15100, "GENERAL MECHANICAL REQUIREMENTS".

1.2 DESCRIPTION:

A. PROVIDE ALL LABOR AND MATERIALS NECESSARY TO FURNISH AND INSTALL ALL PIPING SYSTEMS ON THIS PROJECT.

PART 2 - PRODUCTS

2.1 PIPE MATERIALS

A. ALL MATERIALS, UNLESS OTHERWISE SPECIFIED, SHALL BE NEW AND OF THE BEST QUALITY OF THEIR RESPECTIVE KINDS, AND SHALL CONFORM TO THE REQUIREMENTS AND ORDINANCES OF LOCAL AND INSURANCE AUTHORITIES HAVING JURISDICTION. VALVES SHALL BE MANUFACTURED BY NIBCO, CRANE, STOCKHAM, MILWAUKEE, JAMESBURRY, HAMMOND, DEZURICK, VICTAULG, OR KEYSTONE.

1. NATURAL GAS (ABOVE-GROUND):

PIPING: SCHEDULE 40 UNCOATED BLACK STEEL PIPE, ASTM A53.

FITTINGS: 150 LB. SCREWED MALLEABLE IRON FITTINGS UP TO 4", IRON PIPE SIZE. PIPING LARGER THAN 4" SHALL BE WELDED.

GATE VALVES: 2-1/2" & LARGER - 1BBM, NRS, FLANGED STOCKHAM FIGURE 328.

COCKS: 2" & SMALLER - BRONZE, CRANE 270.

GAS SHUT-OFF FITTING: PROVIDE APPROPRIATELY SIZED GAS SHUT-OFF FITTINGS EQUAL TO BRASSCRAFT EXCESS FLOW GAS VALVE, ON ALL CONNECTIONS TO APPLIANCES OR KITCHEN EQUIPMENT.

CONTRACTOR'S OPTION: FOR PIPING 2-1/2" & OVER, CONTRACTOR MAY USE WELDED JOINTS IN LIEU OF SCREWED JOINTS.

2. GAS PRESSURE REGULATOR

A. DEVICES AND INSTALLATION SHALL BE IN ACCORDANCE WITH NFPA 54, NATIONAL FUEL GAS CODE AND MANUFACTURER'S INSTRUCTIONS.

B. PROVIDE SELF-OPERATED SERVICE REGULATOR WITH BALANCING SYSTEM.

C. CONSTRUCTION FEATURES SHALL INCLUDE 125 LB. RATED CAST IRON BODY, ALUMINUM SEAT RING AND GAGE, NITRILE VALVE DISC AND O-RINGS, NITRILE NYLON DIAPHRAGMS, STAINLESS STEEL STEM AND STEM SLEEVE, STEEL DIAPHRAGM LATE, CONTROL LINE CONNECTION, VENT CONNECTION.

D. PROVIDE CONTROL LINE PIPING CONNECTED TO DISCHARGE LINE. PROVIDE VENT PIPING EXTENDED TO ATMOSPHERE WITH SCREEN AND WEATHER CAP.

E. PIPE RELIEF VALVE DISCHARGE TO ATMOSPHERE WITH SCREEN AND WEATHER CAP.

F. MANUFACTURERS: EQUIMETER, FISHER, ROCKWELL.

PART 3 - EXECUTION

3.1 PIPING, GENERAL:

A. ALL PIPES SHALL BE CUT ACCURATELY TO MEASUREMENTS ESTABLISHED AT THE BUILDING, AND SHALL BE WORKED INTO PLACE WITHOUT SPRINGING OR FORCING, PROPERLY CLEARING ALL WINDOWS, DOORS AND OTHER OPENINGS. EXCESSIVE CUTTING OR OTHER WEAKENING OF THE BUILDING STRUCTURE TO FACILITATE PIPING INSTALLATION WILL NOT BE PERMITTED. ALL PIPES SHALL BE SO INSTALLED AS TO PERMIT FREE EXPANSION AND CONTRACTION WITHOUT CAUSING DAMAGE. ALL PIPES SHALL BE RUN PARALLEL WITH THE LINES OF THE BUILDING AND AS CLOSE TO WALLS, COLUMNS AND CEILINGS AS MAY BE PRACTICAL, WITH PROPER PITCH. ALL PIPING SHALL BE ARRANGED SO AS NOT TO INTERFERE WITH REMOVAL OF OTHER EQUIPMENT ON DEVICES NOT TO BLOCK ACCESS TO DOORS, WINDOWS, MANHOLES, OR OTHER ACCESS OPENINGS. FLANGES OR UNIONS, AS APPLICABLE FOR THE TYPE OF PIPING SPECIFIED, SHALL BE PROVIDED IN THE PIPING AT CONNECTIONS TO ALL ITEMS OF EQUIPMENT, COILS, ETC., AND INSTALLED SO THAT THERE WILL BE NO INTERFERENCE WITH THE INSTALLATION OF THE EQUIPMENT, DUCTS, ETC. ALL VALVES AND SPECIFICATIONS SHALL BE PLACED TO PERMIT EASY OPERATION AND ACCESS AND ALL VALVES SHALL BE REGULATED, PACKED AND GLANDS ADJUSTED AT THE COMPLETION OF THE WORK BEFORE FINAL ACCEPTANCE. ALL PIPING SHALL BE INSTALLED SO AS TO AVOID AIR OR LIQUID POCKETS THROUGHOUT THE WORK. ENDS OF PIPE SHALL BE REMOVED SO AS TO REMOVE ALL BURRS. ALL EXTERIOR PIPING SHALL BE LABELED AND PAINTED YELLOW.

B. ALL PIPING SHALL BE RUN TO PROVIDE A MINIMUM CLEARANCE OF 1/2" BETWEEN FINISHED COVERING ON SUCH PIPING AND ALL ADJACENT WORK.

C. ROUGH-IN AND FINAL CONNECTIONS ARE REQUIRED TO ALL EQUIPMENT PROVIDED UNDER THIS CONTRACT.

SECTION 15300 - INSULATION

PART 1 - RELATED DOCUMENTS

1.1 REFERENCE:

A. ALL WORK UNDER THIS SECTION IS SUBJECT TO THE REQUIREMENTS OF SECTION 15100, "GENERAL MECHANICAL REQUIREMENTS".

1.2 DESCRIPTION:

A. ALL DUCTWORK INSTALLED UNDER THIS CONTRACT SHALL BE COVERED AS SPECIFIED.

PART 2 - PRODUCTS

2.1 GENERAL:

A. ALL MATERIALS TO BE INSULATED SHALL BE THOROUGHLY CLEANED, AFTER COMPLETION OF SUCCESSFUL TESTS, AND SHALL BE COVERED AS SPECIFIED BELOW. INSULATION SHALL BE OWENS-CORNING FIBERGLASS, MANVILLE, ARMSTRONG, P.P.G. OR KNAUF.

B. IN THE ABSENCE OF SPECIFIC REQUIREMENTS, INSULATION SHALL CONFORM TO ASHRAE STANDARD 90.1, LATEST EDITION.

2.2 DUCTWORK:

A. INSULATE ALL SUPPLY AND RETURN, AND DUCTWORK WITH FIBERGLASS EXTERIOR DUCT INSULATION WITH FACTORY-APPLIED FOIL FACING. [IN ADDITION, INSULATE EXHAUST AND RELIEF AIR DUCTS.] EXTERIOR INSULATION MAY BE OMITTED ON DUCTWORK WHERE THE DIFFERENCE BETWEEN THE CONVEYED AIR TEMPERATURE AND AMBIENT AIR TEMPERATURE SURROUNDING THE DUCT IS LESS THAN 15 DEGREES FAHRENHEIT.] EXPOSED FIBERGLASS DUCT INSULATION SHALL BE RIGID OR NON-FLEXIBLE BOARD TYPE 5.0 PCF MINIMUM DENSITY, 0.25 MAX. "K" FACTOR, WITH WHITE VINYL A.S.J. VAPOR BARRIER FACING. FOR SUPPLY AIR DUCTWORK FROM AIR HANDLING UNITS TO VARIABLE AIR VOLUME BOXES (PRIMARY AIR LESS THAN 50E/F) INSULATION SHALL BE FLEXIBLE BLANKET, 3.0 PCF MINIMUM DENSITY. ALL OTHER CONCEALED FIBERGLASS DUCT INSULATION SHALL BE FLEXIBLE BLANKET TYPE, 1.0 PCF MINIMUM DENSITY. ALL CONCEALED INSULATION SHALL HAVE 0.20 MAX. "K" FACTOR, WITH REINFORCED FOIL-SKIN/KRAFT VAPOR BARRIER FACING. RETURN DUCTWORK WITHIN RETURN AIR PLENUMS ARE NOT TO BE INSULATED UNLESS OTHERWISE INDICATED, TIGHTLY BUTT ALL EDGES AND SEAMS. SECURE INSULATION WITH FLUSH MECHANICAL FASTENERS SPACED NOT LESS THAN ONE PER SQUARE FOOT.

B. SCHEDULE OF APPLICATION:

1. SUPPLY AND RETURN AIR ARE TO RECEIVE 2" THICK INSULATION. FIELD FABRICATED PLENUM/CASINGS ARE TO RECEIVE 2" THICK INSULATION.

C. INSULATION COVERING:

1. ALL EXPOSED INSULATION (PIPING SYSTEMS, EQUIPMENT AND DUCTWORK) SHALL HAVE AN 8 OZ. CANVAS COVER NEATLY CUT AND PASTED OVER THE INSULATION. [COVERS SHALL BE PAINTED, COLOR-CODED, AND STENCILED IN ACCORDANCE WITH THE REQUIREMENTS OF SECTIONS 15100 AND 09900.] EXPOSED AREAS INCLUDE, BUT ARE NOT LIMITED TO, ALL MECHANICAL EQUIPMENT ROOMS / FAN ROOMS AND PIPING AND DUCTWORK EXPOSED IN AN OCCUPIED SPACE OR ATTIC SPACE. [WHEN COLOR-CODING IS REQUIRED, COLORED PRE-MOLDED PVC PIPE AND FITTING COVERS MAY BE PROVIDED IN LIEU OF CANVAS FINISH.]

2.3 EXTERIOR DUCTWORK INSULATION SYSTEM

A. INSULATE ALL EXTERIOR DUCTWORK WITH AN INTERLOCKING, FOUR-PIECE, TECHNADUC INSULATION PANEL SYSTEM AS MANUFACTURED BY P.T.M. MANUFACTURING, L.L.C., FABRICE AS MANUFACTURED BY COUNTY GROUP, OR FLEX CLAD - 400 JACKETING SYSTEM AS MANUFACTURED BY TRI-STATE INSULATION, OR AS APPROVED EQUAL. INSULATION SYSTEM SHALL BE CONSTRUCTED OF GLASS-REINFORCED POLYISOCYANURATE FOAM INSULATION ENCASED IN 1.25 MIL ALUMINUM FOIL VAPOR BARRIER FACING. ALL INSULATION SHALL BE A COMBINED MINIMUM THICKNESS OF 2-INCH RIGID OR NON-FLEXIBLE BOARD TYPE, 2.0 PCF MINIMUM DENSITY, 25 MAX "K" FACTOR AT 75 DEGREES FAHRENHEIT MEAN TEMPERATURE. EXTERIOR WEATHER BARRIER SHALL BE FABRICATED OF EMBOSSED ALUMINUM SHEETING, MINIMUM 0.032-INCHES IN THICKNESS, AND LAMINATED TO INSULATION FOIL FACING. TOTAL INSTALLED R-VALUE SHALL BE R-16 AT 2 INCH THICKNESS.

B. ALL EXTERIOR MOUNTED DUCTWORK SHALL MEET THE SPECIFICATIONS SET FORTH IN DIVISION 15700 SECTION, HVAC DISTRIBUTION BEFORE INSTALLATION OF THE INSULATION SYSTEM, TO INCLUDE SEALING OF JOINTS, TESTING AND DUCT LEAKAGE AND INSTALLATION OF DUCT ACCESSORIES.

C. ALL VAPOR BARRIER JOINTS, SEAMS, TEARS, PUNCTURES, AND OTHER PENETRATIONS SHALL BE CLOSED WITH 3-INCHES BY 1.25 MIL MINIMUM ALUMINUM FOIL FACED TAPE, AND/OR NON-SETTING VAPOR BARRIER COATING AS APPLICABLE. MATERIAL SHALL BE FITTED SO THAT THE VAPOR BARRIER SEAL IS CONTINUOUS AND DOES NOT ALLOW FOR WATER VAPOR INFILTRATION.

D. INSULATION PANEL SYSTEM SHALL BE FITTED INTO PLACE ON THE DUCTWORK. EACH INSULATION PANEL SHALL BE CONSTRUCTED SO THAT ALL VERTICAL AND HORIZONTAL INSULATION SEAMS SHALL HAVE AN INTERLOCKING AND OVERLAPPING SHIPLAP STYLE JOINT TO PROVIDE A THERMAL SEAL. THE OVERLAP SHALL BE A MINIMUM OF 2-INCHES THICK. FASTEN PANEL SYSTEM TOGETHER AT OVERLAPPING JOINTS USING #10 SELF TAPPING, STAINLESS STEEL, VAPOR SEAL SCREWS WITH WEATHER SEAL WASHERS ON A MAXIMUM OF 12-INCHES CENTER. FOR DUCTS WIDER THAN 48-INCHES, A BOTTOM FASTENER SHOULD BE UTILIZED.

E. ALL CIRCUMFERENTIAL JOINTS, APPLY BUTYL COMPOUND PUTTY USING A LAMINATE ROLLER. THE BUTYL COMPOUND SHALL BE COVERED WITH A 3-INCH WIDE CAP OF EMBOSSED ALUMINUM SHEETING, MINIMUM 0.032-INCHES IN THICKNESS. ALL SEAMS OF THE ALUMINUM CAP AND ALL WEATHER BARRIER ABUTMENTS SHALL BE SEALED WITH A BEAD OF RTV CAULK, COLORED TO MATCH THE PANEL SYSTEM.

F. INSULATION AND JACKETING SHALL COVER ALL DUCT FLANGES TO PREVENT COLLECTION OF WATER OR LEAKS.

G. ALL EXTERIOR ACCESS DOORS SHALL BE COVERED WITH REMOVABLE INSULATION SYSTEM AND SHALL BE LABELED.

SECTION 15500 - PERFORMANCE TESTING & BALANCING

PART 1 - GENERAL

1.1 GENERAL:

A. ALL WORK UNDER THIS SECTION IS SUBJECT TO THE REQUIREMENTS OF SECTION 15100 "GENERAL MECHANICAL REQUIREMENTS".

B. THIS SECTION COVERS PERFORMANCE TESTING AND BALANCING OF HEATING, VENTILATION, AIR CONDITIONING SYSTEM, AND DOMESTIC HOT WATER SYSTEM.

C. ALL TESTING AND BALANCING SHALL BE PERFORMED BY AN INDEPENDENT TEST AND BALANCE AGENCY THAT SPECIALIZES IN AND WHOSE BUSINESS IS LIMITED TO THE TESTING AND BALANCING OF MECHANICAL SYSTEMS. THE AGENCY MUST HAVE MEMBERSHIP IN THE "ASSOCIATED AIR BALANCE COUNCIL" AND HAVE A PROFESSIONAL ENGINEER CERTIFIED BY THE NATIONAL EXAMINING BOARD AND LICENSED IN THE STATE OF MARYLAND. ALL FINAL REPORTS SHALL BE SIGNED AND OFFICIALLY STAMPED BY THE CERTIFIED TEST AND BALANCE ENGINEER.

D. ACCEPTABLE AGENCIES: WEISMAN INC., BALTIMORE AIR BALANCE COMPANY, BAUMGARTNER, INC., AMERICAN TESTING, CHESAPEAKE TESTING & BALANCING, INC., ENVIRONMENTAL BALANCING CORPORATION, TESTING & BALANCING, INC., OR APPROVED EQUAL OF AABC OR NEBB.

PART 2 - PRODUCTS

THIS PART NOT USED.

SECTION 15500 - PERFORMANCE TESTING & BALANCING - CONTINUED

PART 3 - EXECUTION

3.1 REQUIREMENTS:

A. TEST AND BALANCE ALL HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS. THE WORK SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:

B. LEAK-TEST ALL DUCTWORK AND AIR DISTRIBUTION SYSTEMS, IN ACCORDANCE WITH REQUIREMENTS SPECIFIED IN SECTION 15700.

C. BALANCE AND ADJUST ALL AIR DISTRIBUTION SYSTEMS TO WITHIN 5% OF DESIGN AIR QUANTITIES INCLUDING MAXIMUM AND MINIMUM HEATING, COOLING, AND SETPOINTS OF AIR HANDLING UNITS, VARIABLE AIR VOLUME BOXES, AND FAN-COIL UNITS.

D. ADJUST ALL FANS TO REQUIRED SPEEDS FOR DESIGN AIR FLOW INCLUDING CHANGING SHEAVES AND DRIVES. ADJUST VARIABLE VOLUME FANS AND STATIC PRESSURE CONTROLS TO THE MINIMUM STATIC PRESSURE SETPOINT THAT WILL ACHIEVE DESIGN AIR FLOW RATES.

E. BALANCE AND ADJUST ALL WATER SYSTEMS FOR DESIGN CAPACITIES OR FLOW RATES. ADJUST VARIABLE FLOW PUMPS AND DIFFERENTIAL PRESSURE CONTROLS

MECHANICAL SPECIFICATIONS

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

PART 2 - PRODUCTS

2.1 PACKAGED AIR HANDLING UNIT (DX-COOLING, HOT GAS REHEAT, GAS HEATER)

A. PROVIDE AND INSTALL PACKAGED AIR CONDITIONING UNITS WITH GAS HEAT AS SHOWN AND SCHEDULED ON THE PLANS. THE UNITS SHALL BE INSTALLED IN A NEAT AND WORKMANSHIP LIKE MANNER IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND ALL APPLICABLE NATIONAL AND LOCAL CODES. PACKAGED UNITS SHALL BE MANUFACTURED BY YORK, TRANE, AAO OR APPROVED EQUAL.

B. GENERAL:

- EACH UNIT SHALL BE SPECIFICALLY DESIGNED FOR OUTDOOR INSTALLATION.
- THE UNITS SHALL BE FURNISHED COMPLETE WITH INSULATED CASING, CENTRIFUGAL FANS, COILS AS SCHEDULED, INSULATED DRAIN PAN, MOTOR, ADJUSTABLE DRIVES AND ACCESSORIES AS REQUIRED.
- ADEQUATE SPACE AROUND ALL SIDES OF THE UNITS SHALL BE PROVIDED FOR PROPER SERVICE AND MAINTENANCE.
- EACH UNIT SHALL BE COMPLETELY ASSEMBLED ON A RIGID BASE FOR ONE PIECE SHIPPING AND RIGGING.
- A/C CONDENSATE DRAIN FOR EACH UNIT SHALL BE AS INDICATED ON CONTRACT DRAWINGS. CONDENSATE DRAINS SHALL TERMINATE ON GRADE.
- UNITS SHALL BE DESIGN CERTIFIED BY UNDERWRITERS LABORATORY, U.L. IN ADDITION, UNITS WITH NATURAL GAS HEAT SHALL BE CERTIFIED BY A.G.A.
- EACH UNIT SHALL BE PIPED, WIRED, CHARGED AND TESTED BY THE MANUFACTURER BEFORE SHIPMENT. ONLY A MINIMUM OF FIELD WIRING, PIPING AND DUCT CONNECTION DATE BE REQUIRED PRIOR TO START-UP. CONDUIT CONNECTIONS ARE MADE AFTER SETTING UNIT ON THE UNIT CURB.
- EACH UNIT SHALL BE COVERED BY A ONE YEAR LIMITED PARTS WARRANTY ON THE COMPLETE UNIT AND A FIVE-YEAR WARRANTY ON THE COMPRESSOR. GAS HEAT EXCHANGES SHALL BE COVERED BY A TEN YEAR WARRANTY.
- PROVIDE N.F.P.A 90-A APPROVED FLEXIBLE DUCT CONNECTIONS ON SUPPLY AND RETURN DUCT CONNECTIONS AT UNIT.
- UNITS SHALL BE EQUIPPED WITH NATURAL GAS FIRED HEAT EXCHANGERS.

C. REFRIGERATION SYSTEM

- EACH UNIT SHALL CONTAIN A COMPLETE REFRIGERATION SYSTEM WITH A SINGLE REFRIGERANT CIRCUIT CONTAINING A HERMETIC COMPRESSOR, A CRANKCASE HEATER, A FILTER DRIER, A SUCTION LINE FREEZESTAT, COMPRESSOR MOTOR PROTECTION AND SCHRAEDER ACCESS VALVES.
- EVAPORATOR COILS SHALL BE DIRECT EXPANSION DRAW-THROUGH TYPE CONSTRUCTED OF COPPER TUBES MECHANICALLY EXPANDED IN ALUMINUM FINNS.
- CONDENSER COILS SHALL BE DRAW-THROUGH TYPE WITH A REFRIGERATION SYSTEM TO PROVIDE AT LEAST 15 DEGREES F OF SUB-COOLING AT DESIGN CONDITIONS. CONDENSER COILS SHALL BE CONSTRUCTED OF COPPER TUBES MECHANICALLY EXPANDED IN ALUMINUM FINNS.
- UNITS SHALL HAVE TWO (2) INDEPENDENT REFRIGERANT CIRCUITS EQUALLY SPLIT IN 50 PERCENT CAPACITY INCREMENTS.
- COMPRESSORS SHALL BE FULLY HERMETIC TYPE, DIRECT DRIVE, INTERNALLY PROTECTED WITH INTERNAL HIGH-PRESSURE RELIEF AND OVER TEMPERATURE PROTECTION. THE HERMETIC MOTOR SHALL BE SUCTION GAS COOLED AND HAVE A VOLTAGE RANGE OF + OR - 10 PERCENT OF THE UNIT NAMEPLATE VOLTAGE.
- COMPRESSORS SHALL HAVE INTERNAL SPRING ISOLATION AND SOUND MUFFLING TO MINIMIZE VIBRATION AND NOISE, AND BE EXTERNALLY ISOLATED ON A DEDICATED, INDEPENDENT MOUNTING.
- EVAPORATOR AND CONDENSER COILS SHALL HAVE ALUMINUM PLATE FINNS MECHANICALLY BONDED TO SEAMLESS INTERNALLY ENHANCED COPPER TUBES WITH ALL JOINTS BRAZED.
- EVAPORATOR AND CONDENSER COILS SHALL BE OF THE DIRECT EXPANSIONS, DRAW-THRU DESIGN.
- REFRIGERANT CIRCUIT AND REFRIGERANT SAFETY COMPONENTS SHALL INCLUDE:

A. INDEPENDENT FIXED-ORIFICE EXPANSION DEVICES.

B. FILTER DRIER/TRAINER TO ELIMINATE ANY MOISTURE OR FOREIGN MATTER.

C. ACCESSIBLE SERVICE GAGE CONNECTIONS ON BOTH SUCTION AND DISCHARGE LINES TO CHARGE, EVACUATE, AND MEASURE REFRIGERANT PRESSURE DURING ANY NECESSARY SERVICING OR TROUBLE SHOOTING, WITHOUT LOSING CHARGE.

10. FURNISH UNITS THAT ARE UTILIZED WITH A DE-HUMIDIFICATION CONTROL SEQUENCE WITH A LOW AMBIENT KIT TO ALLOW COOLING OPERATION DOWN TO 0 DEGREES F AMBIENT.

D. HEATING SYSTEM

- SHALL BE DESIGNED WITH INDUCED DRAFT COMBUSTION WITH POST PURGE LOGIC, ENERGY SAVING DIRECT, SPARK IGNITION, AND REDUNDANT MAIN GAS VALVE. VENTOR WHEEL SHALL BE CONSTRUCTED OF STAINLESS STEEL FOR CORROSION RESISTANCE.
- THE HEAT EXCHANGER SHALL BE OF THE TUBULAR TYPE CONSTRUCTED OF T1-40 ALUMINIZED STEEL FOR CORROSION RESISTANCE AND ALLOWING MINIMUM MIXED AIR ENTERING TEMPERATURE OF 25 DEGREES FAHRENHEIT.
- BURNERS SHALL BE OF THE IN-SHOT TYPE, CONSTRUCTED OF ALUMINUM COATED STEEL AND CONTAIN AIR MIXTURE ADJUSTMENTS.
- ALL GAS PIPING SHALL ENTER THE UNIT CABINET AT A SINGLE LOCATION, THROUGH EITHER THE SIDE OR BOTTOM, WITHOUT ANY FIELD MODIFICATIONS.
- AN INTEGRATED CONTROL BOARD SHALL PROVIDE TIMED CONTROL OF EVAPORATOR FAN FUNCTIONING AND BURNER IGNITION.

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

6. HEATING SECTION SHALL BE PROVIDED WITH THE FOLLOWING MINIMUM PROTECTION:

- PRIMARY AND AUXILIARY HIGH TEMPERATURE LIMIT SWITCHES.
- INDUCED DRAFT MOTOR SPEED SENSOR.
- FLAME ROLL OUT SWITCH (AUTOMATIC RESET).
- FLAME PROVING CONTROL.

7. UNIT SHALL HAVE TWO INDEPENDENT STAGES OF CAPACITY.

E. UNIT CONTROLS:

- UNIT SHALL BE COMPLETE WITH SELF CONTAINED LOW-VOLTAGE CONTROL CIRCUIT PROTECTED BY A RESETTABLE CIRCUIT BREAKER FUSE ON THE 24 VOLT TRANSFORMER SIDE.
- UNIT SHALL INCORPORATE A LOCK-OUT CIRCUIT WHICH PROVIDES RESET CAPABILITY AT THE SPACE THERMOSTAT OR BASE UNIT. SHOULD ANY OF THE FOLLOWING STANDARD SAFETY DEVICES TRIP AND SHUT OFF COMPRESSOR:
 - LOSS OF CHARGE/LOW-PRESSURE SWITCH.
 - HIGH-PRESSURE SWITCH.
 - FREEZE PROTECTION THERMOSTAT, EVAPORATOR COIL.

IF ANY OF THE ABOVE SAFETY DEVICES TRIP, A LED (LIGHT-EMITTING DIODE) INDICATOR SHALL ILLUMINATE.

3. UNIT SHALL INCORPORATE "AUTO RESET" COMPRESSOR OVER TEMPERATURE, OVER CURRENT PROTECTION.

4. UNIT SHALL OPERATE WITH PROGRAMMABLE THERMOSTAT DESIGNS AND HAVE A LOW VOLTAGE TERMINAL STRIP FOR EASY HOOK-UP.

F. ECONOMIZER CONTROL:

- UNITS SHALL BE FACTORY FURNISHED COMPLETE FOR FULL ENTHALPY ECONOMIZER OPERATION WITH BAROMETRIC RELIEF AND MINIMUM OUTSIDE AIR SET POINT.
- FURNISH EACH UNIT WITH A FACTORY INSTALLED DIFFERENTIAL ELECTRONIC ENTHALPY AUTOMATIC ECONOMIZER TO ACCOMPLISH THE FOLLOWING:
 - FURNISH UNIT WITH OUTDOOR AND RETURN AIR DAMPERS THAT ARE INTERLOCKED AND POSITIONED BY A FULLY-MODULATING, SPRING-RETURN DAMPER ACTUATOR. THE MAXIMUM LEAKAGE RATE FOR THE OUTDOOR AIR INTAKE DAMPER SHALL NOT EXCEED 2 PERCENT WHEN DAMPERS ARE FULLY CLOSED AND OPERATING AGAINST A PRESSURE DIFFERENTIAL OF .50 INCHES WATER GAUGE.
 - A UNIT MOUNTED POTENTIOMETER SHALL BE PROVIDED TO ADJUST THE OUTDOOR AIR TO MEET MINIMUM VENTILATION RATE AS SCHEDULED. MINIMUM OUTDOOR AIR FLOW RATE SHALL BE PROVIDED ANYTIME UNIT IS IN OCCUPIED CYCLE.
 - DURING ECONOMIZER OPERATION, A MIXED-AIR TEMPERATURE CONTROLLER SHALL MODULATE THE OUTDOOR AND RETURN AIR DAMPER ASSEMBLY TO PREVENT THE MIXED AIR TEMPERATURE FROM DROPPING BELOW 55 DEGREES F. CHANGE-OVER FROM COMPRESSOR TO ECONOMIZER OPERATION SHALL BE PROVIDED BY AN INTEGRAL ELECTRONIC ENTHALPY CONTROL THAT FEEDS INPUT INTO THE LOGIC MODULE. AN ADDITIONAL ELECTRONIC ENTHALPY SENSORS SHALL SUPPLY INPUT TO THE LOGIC MODULE WHICH MODULATES BOTH SETS OF DAMPERS FOR MAXIMUM ECONOMIZER SAVINGS. SIMULTANEOUS ECONOMIZER/COMPRESSOR OPERATION SHALL BE POSSIBLE FOR MAXIMUM ECONOMY.
 - THE OUTDOOR AIR INTAKE/RELIEF OPENING SHALL BE COVERED WITH A RAIN HOOD THAT MATCHES THE EXTERIOR OF THE UNIT. THE ECONOMIZER INTAKE OPENING SHALL ALSO BE COVERED WITH A RAIN HOOD THAT MATCHES THE EXTERIOR OF THE UNIT. WATER ELIMINATOR/FILTERS SHALL BE PROVIDED ON ALL INTAKES.
 - PROVIDE AND INSTALL A BAROMETRIC RELIEF AIR OPENING COVERED WITH A BIRD SCREEN AND HOOD THAT IS PAINTED TO MATCH THE EXTERIOR OF THE UNIT. THIS OPENING SHALL BE EQUIPPED WITH A BAROMETRIC RELIEF DAMPER.

G. CONSTRUCTION

- EACH UNIT ENCLOSURE SHALL BE CONSTRUCTED OF 18 GAUGE G90 GALVANIZED SHEET STEEL WITH ALL SURFACES FINISHED WITH A U.L. APPROVED COATING SYSTEM. EXTERIOR SURFACES SHALL BE COATED WITH A NON-CHALKING, POWDERED PAINT FINISH, CERTIFIED AT 750 HOURS SALT SPRAY TEST PER ASTM-B117 STANDARD.
- ALL PANELS SHALL BE REMOVABLE TYPE FOR EASY ACCESS TO ALL INTERNAL PARTS FOR MAINTENANCE, SERVICE, AND ADJUSTMENT.
- INDOOR BLOWER SECTION SHALL BE INSULATED WITH 1-INCH THICK INSULATION, COATED ON THE AIR SIDE. ALUMINUM FOIL FACED INSULATION SHALL BE USED IN THE FURNACE COMPARTMENT AND BE FASTENED WITH RIDGED FASTENERS TO PREVENT INSULATION FROM ENTERING THE AIR STREAM.
- FAN PERFORMANCE MEASURING PORTS SHALL BE PROVIDED ON THE OUTSIDE OF THE CABINET TO ALLOW ACCURATE AIR MEASUREMENTS OF EVAPORATOR FAN PERFORMANCE WITHOUT REMOVING PANELS OR CREATING AIR BY-PASS OF THE COILS.
- CONDENSATE PAN SHALL BE INTERNALLY DOUBLE SLOPED AND CONFORM TO ASHRAE 62-89 SELF-DRAINAGE STANDARDS. CONDENSATE PAN SHALL BE CONSTRUCTED OF 18 GAUGE GALVANIZED STEEL WITH INSULATION. CONDENSATE DRAIN CONNECTIONS SHALL BE PROVIDED ON BOTH SIDES OF UNIT.

H. FANS

- UNITS SHALL BE PROVIDED WITH BELT DRIVE BLOWERS WITH ADJUSTABLE SHEAVES, MOTORS SHALL BE BALL BEARING TYPE OF THE SIZE AND ELECTRICAL CHARACTERISTICS INDICATED ON THE PLANS. MOTORS SHALL HAVE CLASS B INSULATION AND SHALL BE PERMANENTLY LUBRICATED.
- FAN CURVES SHALL BE FURNISHED INDICATING SUPPLY AIR FAN PERFORMANCE AT DESIGN CONDITIONS. FAN MOTORS SHALL BE HIGH EFFICIENCY TYPE.
- CONDENSER PROPELLER TYPE FANS SHALL BE PROVIDED IN EACH UNIT. THE MOTORS SHALL HAVE CLASS B INSULATION SHEAVE BEARINGS AND BE PERMANENTLY LUBRICATED. CONDENSER FAN MOTORS SHALL BE TOTALLY ENCLOSED WITH PERMANENTLY LUBRICATED MOTORS INTERNALLY PROTECTED AGAINST OVERLOAD CONDITIONS AND STAGED INDEPENDENTLY.

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

I. FILTERS:

1. FILTER RACKS FOR 2-INCH FILTER SHALL BE PROVIDED. FILTERS SHALL BE 25 PERCENT EFFICIENT PLEATED MEDIA TYPE. FILTERS SHALL BE FARR, MEDIUM EFFICIENCY PLEATED TYPE 3030 WITH WELDED WIRE MEDIA SUPPORT GRID.

2. PROVIDE ONE ADDITIONAL SET OF FILTER MEDIA FOR EACH ROOFTOP UNIT TO BE DELIVERED TO THE OWNER'S REPRESENTATIVE UPON COMPLETION OF THE PROJECT.

J. ACCESSORIES:

- THE FOLLOWING ADDITIONAL ACCESSORIES/OPTIONS SHALL BE EITHER FACTORY INSTALLED OR PROVIDED FOR FIELD INSTALLATION.
 - A CUSTOM ROOF CURB, PROVIDED BY THE SAME MANUFACTURER, WHICH SHALL PROVIDE A WATER-TIGHT SEAL. CURBS SHALL BE APPROVED BY THE NATIONAL ROOFING CONTRACTOR ASSOCIATION.
 - A UNIT MOUNT THERMOSTAT TO DE-ENERGIZE THE COMPRESSOR WHEN THE SUCTION LINE TEMPERATURE DROPS BELOW 25 DEGREES F.
 - A 5 MINUTE TIMER TO PREVENT THE COMPRESSOR FROM SHORT-CYCLING.
 - A LOCKOUT CIRCUIT TO PREVENT THE COMPRESSOR FROM CYCLING ON ONE OF THE SAFETY CONTROLS.
 - AN OUTDOOR COIL GUARD.
 - GAS HEATING UNITS SHALL BE PROVIDED WITH GAS PIPE KITS.

K. EFFICIENCY:

- ALL ROOFTOP UNITS SHALL HAVE A MINIMUM SEER OF -10 FOR COOLING AND A MINIMUM AFUE OF 85 PERCENT FOR HEATING.

L. SOURCE QUALITY CONTROL:

- VERIFICATION OF PERFORMANCE: RATE CAPACITY ACCORDING TO ARI 210/240, "UNITARY AIR-CONDITIONING AND AIR SOURCE HEAT PUMP EQUIPMENT."
- VERIFICATION OF PERFORMANCE: RATE CAPACITY ACCORDING TO ARI 360, "COMMERCIAL AND INDUSTRIAL UNITARY AIR-CONDITIONING EQUIPMENT."
 - SOUND POWER LEVEL RATINGS: COMPLY WITH ARI 270, "STANDARD FOR SOUND RATING OF OUTDOOR UNITARY EQUIPMENT."
 - SOUND POWER LEVEL RATINGS: COMPLY WITH AMCA STANDARD 300 TO GENERATE SUPPLY AIR BORNE AND RETURN AIR BORNE SOUND POWER RATINGS.

M. ROOF CURB, PLENUM BASE, AND SERVICE PLATFORM

- AN INSULATED, PRE-FABRICATED ROOF CURB SHALL BE PROVIDED AND SHIPPED KNOCKED DOWN. THE ROOF CURB WILL BE MADE OF 16-GAUGE GALVANIZED STEEL WITH 4" FLANGES, MINIMUM 14" HIGH WITH A FACTORY INSTALLED 2" X 3" WOOD NAILER STRIP. CURBS SHALL BE FULLY INSULATED WITH 1 1/2" INCH THICK RIGID INSULATION WITH DUCT ADAPTERS.
- ELECTRICAL SHALL ENTER UNIT CONCEALED WITHIN ROOF CURB. ALL PIPING WITHIN THE UNIT ENCLOSURE SHALL BE INSULATED WITH INSULATION TYPE, THICKNESS, AND JACKETING AS SPECIFIED IN DIVISION 23 SECTION, HVAC INSULATION.
- UNIT SHALL BE PROVIDED WITH BASE DISCHARGE AND RETURN AIR OPENINGS. ALL OPENINGS THROUGH THE BASE PAN OF THE UNIT SHALL HAVE UPTURNED FLANGES OF AT LEAST 1/2 INCH IN HEIGHT AROUND THE OPENING. UNIT SHALL BE PROVIDED WITH INSULATED PLENUM BASE FOR SIDE DUCTWORK CONNECTIONS.
- SERVICE PLATFORM:
 - IF REQUIRED, FURNISH AND INSTALL SERVICE PLATFORM TO MATCH UNIT SIZE AND PLENUM CURB. SERVICE PLATFORM SHALL BE AS MANUFACTURED BY CURB TECHNOLOGIES OR APPROVED EQUAL. SERVICE PLATFORM SHALL BE SHIPPED FULLY WELDED FOR BOLTING ONTO THE CURB. MATERIAL SHALL BE STEEL, PRIMED AND PAINTED GRAY. HAND RAILS SHALL BE 1-1/4" SCHEDULE 40 GALVANIZED STEEL PIPE AND SHALL BE FULLY REMOVABLE. FURNISH WITH LADDERS AND SAFETY CHAINS.

N. ENERGY RECOVERY SECTION:

- UNIT SHALL CONTAIN A FACTORY MOUNTED AND TESTED ENERGY RECOVERY WHEEL(S). THE ENERGY RECOVERY WHEEL(S) SHALL BE MOUNTED IN A RIGID FRAME CONTAINING THE WHEEL DRIVE MOTOR, DRIVE BELT, WHEEL SEALS AND BEARINGS. FRAME SHALL SLIDE OUT FOR SERVICE AND REMOVAL FROM THE CABINET.
- THE ENERGY RECOVERY COMPONENT SHALL INCORPORATE A ROTARY WHEEL IN AN INSULATED CASSETTE FRAME COMPLETE WITH SEALS, DRIVE MOTOR AND DRIVE BELT.
- WHEELS SHALL BE WOUND CONTINUOUSLY WITH ONE FLAT AND ONE STRUCTURED LAYER IN AN IDEAL PARALLEL PLATE GEOMETRY PROVIDING LAMINAR FLOW AND MINIMUM PRESSURE DROP-TO-EFFICIENCY RATIOS. THE LAYERS SHALL BE EFFECTIVELY CAPTURED IN STAINLESS STEEL WHEEL FRAMES OR ALUMINUM AND STAINLESS STEEL SEGMENT FRAMES THAT PROVIDE A RIGID AND SELF-SUPPORTING MATRIX.
- WHEELS SHALL BE PROVIDED WITH REMOVABLE ENERGY TRANSFER MATRIX. WHEEL FRAME CONSTRUCTION SHALL BE A WELDED HUB, SPOKE AND RIM ASSEMBLY OF STAINLESS, PLATED AND/OR COATED STEEL AND SHALL BE SELF-SUPPORTING WITHOUT MATRIX SEGMENTS IN PLACE. SEGMENTS SHALL BE REMOVABLE WITHOUT THE USE OF TOOLS TO FACILITATE MAINTENANCE AND CLEANING. WHEEL BEARINGS SHALL BE SELECTED TO PROVIDE AN L-10 LIFE IN EXCESS OF 400,000 HOURS. RIM SHALL BE CONTINUOUS ROLLED STAINLESS STEEL AND THE WHEEL SHALL BE CONNECTED TO THE SHAFT BY MEANS OF TAPER LOCKS.
- ALL DIAMETER AND PERIMETER SEALS SHALL BE PROVIDED AS PART OF THE CASSETTE ASSEMBLY AND SHALL BE FACTORY SET. DRIVE BELTS OF STRETCH URETHANE SHALL BE PROVIDED FOR WHEEL RIM DRIVE WITHOUT THE NEED FOR EXTERNAL TENSIONERS OR ADJUSTMENT.

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

6. THE ENERGY RECOVERY CASSETTE SHALL BE AN UNDERWRITERS LABORATORIES RECOGNIZED COMPONENT FOR ELECTRICAL AND FIRE SAFETY. THE WHEEL DRIVE MOTOR SHALL BE AN UNDERWRITERS LABORATORY RECOGNIZED COMPONENT AND SHALL BE MOUNTED IN THE CASSETTE FRAME AND SUPPLIED WITH A SERVICE CONNECTOR OR JUNCTION BOX. THERMAL PERFORMANCE SHALL BE CERTIFIED BY THE MANUFACTURER IN ACCORDANCE WITH ASHRAE STANDARD 84, METHOD OF TESTING AIR-TO-AIR HEAT EXCHANGERS AND AHRI STANDARD 1060, RATING AIR-TO-AIR ENERGY RECOVERY VENTILATION EQUIPMENT. CASSETTES SHALL BE LISTED IN THE AHRI CERTIFIED PRODUCTS.

7. ENERGY RECOVERY WHEEL CASSETTE SHALL CARRY A 5 YEAR NON-PRORATED WARRANTY.

8. HINGED SERVICE ACCESS DOOR SHALL ALLOW ACCESS TO THE WHEEL(S).

9. TOTAL ENERGY RECOVERY WHEELS SHALL BE COATED WITH SILICA GEL DESICCANT PERMANENTLY BONDED BY A PROCESS WITHOUT THE USE OF BINDERS OR ADHESIVES, WHICH MAY DEGRADE DESICCANT PERFORMANCE. THE SUBSTRATE SHALL BE LIGHTWEIGHT POLYMER AND SHALL NOT DEGRADE NOR REQUIRE ADDITIONAL COATINGS FOR APPLICATION IN MARINE OR COASTAL ENVIRONMENTS. COATED SEGMENTS SHALL BE WASHABLE WITH DETERGENT OR ALKALINE COIL CLEANER AND WATER. DESICCANT SHALL NOT DISSOLVE NOR DELIQUESC IN THE PRESENCE OF WATER OR HIGH HUMIDITY.

10. UNIT SHALL INCLUDE ENERGY RECOVERY WHEEL ROTATION DETECTION SENSORS AND A SET OF NORMALLY OPEN AND NORMALLY CLOSED CONTACTS FOR FIELD INDICATION OF WHEEL ROTATION. INTERLOCK ENERGY RECOVERY WHEEL ROTATION DETECTOR SENSOR WITH ATC SYSTEM.

2.2 POOL DEHUMIDIFIER UNIT (PDU)

A. GENERAL

- THE DEHUMIDIFIER SHALL BE A SINGLE PACKAGE UNIT USING R 410A REFRIGERANT. UNIT SHALL INCLUDE 2 COMPRESSORS, EVAPORATORS (DEHUMIDIFYING COIL), CONDENSERS (AIR REHEAT COIL AND AC COOLING), SUPPLY AIR FLOWER, EXHAUST AIR BLOWERS, BLOWER MOTORS, HEAT RECOVERY ON EXHAUST & OUTDOOR AIR STREAMS AND CONTROLS IN ONE PACKAGED SYSTEM.
- UNIT SHALL HAVE A MICROPROCESSOR CONTROLLER WITH UNIT MOUNTED REFRIGERANT PRESSURE TRANSDUCERS ON EACH INDEPENDENT COMPRESSOR CIRCUIT. AIR PRESSURE SWITCHES ACROSS FILTERS AND COILS. TEMPERATURE SENSORS AND AN ETHERNET CONNECTION FOR FACTORY MONITORING AND CONTROL VIA THE INTERNET. THE UNIT SHALL BE CONNECTED TO THE INTERNET AND MONITORED 24/7 BY THE FACTORY WITH WEEKLY GRAPH REPORTS PROVIDED OF THE SPACE CONDITIONS. DEMONSTRATION OF THESE CAPABILITIES MUST BE CARRIED OUT AT THE ENGINEER'S OFFICE MUST BE PRIOR TO BID DAY.
- THE UNIT SHALL BE DOUBLE WALLED CONSTRUCTION AND DESIGNED FOR OUTDOOR INSTALLATION.
- THE SYSTEM SHALL BE CONFIGURED WITH A 100 % OUTDOOR AIR PURGE MODE. THIS MODE IS NORMALLY TRIGGERED BY AN OPERATOR WHEN SUPER-CHLORINATING THE POOL. IT CAN BE TRIGGERED AT THE OPERATOR PANEL (UNIT MOUNTED OR OPTIONAL REMOTE). IT HAS A TImED DURATION (8-15 MINUTES ADJUSTABLE) AFTER WHICH THE SYSTEM AUTOMATICALLY RESUMES NORMAL OPERATION.

B. PRINCIPLE OF OPERATION

- THE UNIT SHALL BE DESIGNED AND SIZED TO MAINTAIN THE SPECIFIED SPACE TEMPERATURE AND RELATIVE HUMIDITY RANGE. THE UNIT SHALL BE ABLE TO SIMULTANEOUSLY HEAT POOL WATER AND REJECT HEAT TO THE ROOM AIR, OR PROVIDE AIR CONDITIONING.
- DURING COMPRESSOR OPERATION THE UNIT SHALL PERFORM AS DESCRIBED BELOW:
 - THE HUMID AIR FROM THE NATATORIUM PASSES THROUGH THE DEHUMIDIFYING COIL AND IS COOLED BELOW ITS DEW POINT, THEREBY CONDENSING MOISTURE.
 - THE MOISTURE REMOVED AT THE EVAPORATOR COIL SHALL BE GREATER THAN OR EQUAL TO THE LATENT LOAD OF THE SPACE.
 - THE HEAT CAPTURED BY THIS PROCESS AND THE HEAT GENERATED BY THE COMPRESSOR POWER CONSUMPTION IS ABSORBED BY A MECHANICAL REFRIGERATION SYSTEM.
- THE COMPRESSOR HEAT SHALL BE DISTRIBUTED BASED ON THE DEMANDS IN THE SPACE OR POOL WATER.
 - DEHUMIDIFICATION (FULL REHEAT) MODE: THE SPACE IS CALLING FOR HEAT. 100% OF THE COMPRESSOR HOT GAS CONDENSES AT THE REHEAT COIL. THE SUPPLY AIR TEMPERATURE IS - 15 °F WARMER THAN THE RETURN AIR.
 - DURING AIR CONDITIONING MODE ANY HEAT NOT REQUIRED BY THE POOL WATER SHALL BE REJECTED AT THE OUTDOOR AIR COOLED CONDENSER.

- THE HUMID AIR FROM THE NATATORIUM PASSES THROUGH THE DEHUMIDIFYING COIL AND IS COOLED BELOW ITS DEW POINT, THEREBY CONDENSING MOISTURE.
- THE MOISTURE REMOVED AT THE EVAPORATOR COIL SHALL BE GREATER THAN OR EQUAL TO THE LATENT LOAD OF THE SPACE.
- THE HEAT CAPTURED BY THIS PROCESS AND THE HEAT GENERATED BY THE COMPRESSOR POWER CONSUMPTION IS ABSORBED BY A MECHANICAL REFRIGERATION SYSTEM.

C. CABINET

- THE UNIT FRAME SHALL BE CONSTRUCTED OF HEAVY GAUGE GALVANIZED STEEL WITH A FORMED GALVANIZED STRUCTURAL STEEL BASE. LIFTING LUGS SHALL BE PROVIDED ON THE BASE FRAME FOR RIGGING THE UNIT. ALL CABINET SHEET METAL SHALL BE GALVANIZED G90 STEEL WITH A MILL APPLIED ZINC PHOSPHATE PRIMER FOLLOWED BY AN EXTERIOR GRADE WHITE SILICONE MODIFIED POLYESTER TOP COAT.
- CABINET SHALL INCORPORATE 10, 12, 16 AND 20 GAUGE METALS ENGINEERED TO FORM A 2" DOUBLE WALLED CABINET WITH MAXIMUM STRENGTH AND RIGIDITY. PANELS SHALL BE FASTENED TO THE FRAME WITH STAINLESS STEEL HARDWARE. PANELS SHALL BE ISOLATED FROM THE STEEL FRAME WITH DIELECTRIC GASKETS TO PREVENT GALVANIC CORROSION. ALL SEAMS SHALL BE CAULKED WITH SILICONE INSIDE AND OUT TO PREVENT AIR AND WATER LEAKAGE.
- THE UNIT SHALL HAVE THE 2 COMPRESSORS, PLATE HEAT EXCHANGER, SOLENOID VALVES AND THE ELECTRICAL PANEL IN A SERVICE VESTIBULE OUT OF THE PROCESSED AIR STREAM. ALL COMPONENTS SHALL BE SERVICEABLE WHILE THE UNIT IS IN OPERATION WITHOUT DISTURBING THE AIRFLOW. VESTIBULE WILL BE COMPLETELY WEATHERPROOF.
- ACCESS DOORS SHALL BE SUPPORTED ON HINGES AND HAVE MULTIPLE COMPRESSION LATCHES TO PROVIDE QUICK ACCESS. DOORS SHALL BE PROVIDED FOR ENTRANCE TO ALL SECTIONS HOUSING COMPONENTS REQUIRING ROUTINE MAINTENANCE. ACCESS DOORS HAVE "HOLD BACK" LATCHES TO PREVENT DOOR CLOSURE DURING THE PERFORMANCE OF SERVICE PROCEDURES.
- ALL WALLS, ROOF, AND DOORS IN THE AIR-HANDLING COMPARTMENT SHALL BE DOUBLE WALL CONSTRUCTION ENCLOSED 2" THICK FIBERGLASS. INNER LINERS SHALL BE PAINTED 20 GAUGE GALVANIZED G90 STEEL WITH A MILL APPLIED ZINC PHOSPHATE PRIMER FOLLOWED BY AN EXTERIOR GRADE WHITE SILICONE MODIFIED POLYESTER TOP COAT. THE FLOOR OF THE AIR HANDLING SHALL BE PAINTED 20 GAUGE GALVANIZED G90 STEEL WITH A MILL APPLIED ZINC PHOSPHATE PRIMER FOLLOWED BY AN EXTERIOR GRADE WHITE SILICONE MODIFIED POLYESTER TOP COAT.

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

6. THE UNIT SHALL HAVE BUILT-IN AIR FILTER RACKS WITH SEPARATE ACCESS DOOR WITH COMPRESSION FASTENERS. THE FILTER RACK SHALL BE SUITABLE TO HANDLE 2" 30% EFFICIENCY DISPOSABLE FILTERS.

7. THE UNIT SHALL BE EQUIPPED WITH AN OPENING SUITABLE FOR ADMITTING OUTDOOR AIR TO COMPLY WITH ASHRAE VENTILATION STANDARD 62-2004. OUTDOOR AIR INTAKE ASSEMBLY SHALL HAVE A BUILT IN AIR FILTER RACK WITH SEPARATE ACCESS DOOR AND MANUAL AIR BALANCING DAMPER.

D. INSULATION

1. ALL EXTERIOR CABINET SECTIONS SHALL BE INSULATED WITH TWO (2) INCH THICK FIBERGLASS. THERMAL CONDUCTIVITY SHALL BE NOT MORE THAN 0.232 BTU/INHSQ FTF AT 75 F.

E. EVAPORATOR/DEHUMIDIFIER COILS

- SHALL BE MINIMUM 6 ROWS DEEP, 10 FPI FOR MAXIMUM MOISTURE REMOVAL CAPACITY. WITH 1/4 INCH OD SEAMLESS COPPER TUBING MECHANICALLY EXPANDED TO ASSURE HIGH HEAT TRANSFER.
- EACH COMPRESSOR CIRCUIT SHALL HAVE AN INDEPENDENT EVAPORATOR COIL AND INCREMENTAL DRAIN PAN TO ALLOW FOR TOTAL INDEPENDENT OPERATION.
- COILS SHALL BE FULLY DIPPED AND COATED WITH A POLYESTER ENAMEL CORROSION PROTECTION COATING THAT COMPLIES WITH ASTM B117/D1654 AND ASTM D2126 FOR CORROSION RESISTANCE AGAINST COMMON ACIDS, SALT AND GASES.
- COIL SHALL HAVE 18-GAUGE GALVANIZED CASING AND END PLATES.
- A MOTORIZED BYPASS AIR DAMPER SHALL BE INSTALLED FOR APPARATUS DEW POINT CONTROL.

F. CONDENSER (AIR REHEAT COIL)

- SHALL BE SIZED FOR VARIABLE HEAT TRANSFER INTO THE AIR WITH A CAPACITY OF 100% OF THE COMPRESSORS TOTAL REQUIRED HEAT OF REJECTION. SHALL BE MANUFACTURED WITH 3/8" OD SEAMLESS COPPER TUBING MECHANICALLY EXPANDED TO ASSURE HIGH HEAT TRANSFER WITH MAXIMUM TWELVE ALUMINUM FINNS PER INCH.
- COILS SHALL BE FULLY DIPPED AND COATED WITH A POLYESTER ENAMEL CORROSION PROTECTION COATING THAT COMPLIES WITH ASTM B117/D1654 AND ASTM D2126 FOR CORROSION RESISTANCE AGAINST COMMON ACIDS, SALT AND GASES.
- COIL SHALL HAVE 18-GAUGE GALVANIZED CASING AND END PLATES.

G. BLOWER, MOTOR AND DRIVE

- THE BLOWERS SHALL BE IMPELLER PLENUM FAN COMPLETE WITH BACKWARD CURVED, THREE-DIMENSIONAL, PROFILED BLADES MADE OF HIGH PERFORMANCE COMPOSITE MATERIAL. THE BLOWER SHALL BE COMPLETELY CORROSION RESISTANT AND BE MAINTENANCE FREE A DIRECT DRIVE VIA A DIRECT CURRENT (DC) ELECTRONIC COMMUTED (EC) MOTOR. THE EC-MOTOR SHALL HAVE ZERO SLIPPAGE DESIGN AND HAVE CONTINUOUSLY VARIABLE SPEED CONTROL WHEN CONNECTED TO THE UNITS CONTROLLER.
- THE EC MOTOR SHALL HAVE MAINTENANCE-FREE ELECTRONIC CIRCUITRY, A ROTOR WITH PERMANENT MAGNETS, AND AN INTEGRAL CONTROLLER TO PROVIDE THE WINDINGS WITH ELECTRICAL CURRENT SO THAT, THE MOTOR ROTATES CONTINUOUSLY AND QUIETLY.
- THE FAN ASSEMBLY SHALL BE SUITABLE FOR A MAXIMUM TEMPERATURE OF 60°C.
- THE FAN SHALL BE STATICALLY AND DYNAMICALLY BALANCED ON PRECISION ELECTRONIC BALANCERS.

H. COMPRESSORS

- THE UNIT SHALL HAVE 2 STAGES OF CONTROL VIA 2 INDEPENDENT COMPRESSOR CIRCUITS.
- TWO COMPRESSORS SHALL BE HEAVY DUTY SUCTION-COOLED, SCROLL, FORCED FEED LUBRICATION, SUCTION AND DISCHARGE SERVICE VALVES, SUCTION STRAINER, CRANKCASE HEATER, AND 3 PHASE SOLID STATE THERMAL MOTOR PROTECTION.
- THE COMPRESSORS SHALL BE MOUNTED ON SPRING ISOLATORS TO PREVENT TRANSMISSION OF ANY NOISE AND VIBRATION TO THE SPACE BELOW.
- COMPRESSORS SHALL HAVE A 3 YEAR WARRANTY EXTENSION FOR A TOTAL OF 5 YEARS COVERAGE.

I. REFRIGERATION CIRCUIT

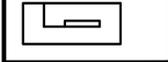
1. UNIT SHALL HAVE PRESSURE TRANSDUCERS MONITORING THE REFRIGERANT HIGH AND LOW PRESSURES. THE REFRIGERATION CIRCUIT SHALL ACCESSIBLE FOR DIAGNOSTICS, ADJUSTMENT AND SERVICING WITHOUT THE NEED OF SERVICE MANIFOLD GAUGES.

NO.	DATE	DESCRIPTION	REVISIONS	
			NO.	DATE

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NO. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
8719 Rebecke Drive
Suite 2-9
Baton, Maryland 21001
Phone: 410/882-8898
Fax: 410/882-8898



WO# 13072.B

PROJECT MANAGER: MXN

DESIGNER: SAS

DATE: 12/23/2015

MECHANICAL SPECIFICATIONS
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

M9.2

MECHANICAL SPECIFICATIONS

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

2.2 POOL DEHUMIDIFIER UNIT (PDU)

2. THE UNIT SHALL HAVE 2 REFRIGERANT CIRCUITS, THE REFRIGERANT CIRCUITS SHALL BE COMPLETELY PIPED, TESTED, DEHYDRATED AND FULLY CHARGED WITH OIL AND R410A REFRIGERANT, THE REFRIGERANT CIRCUIT COMPONENTS INCLUDE COMPRESSOR, CONDENSER, LIQUID LINE SERVICE AND CHARGING VALVE, REPLACEABLE CORE FILTER DRIER IN THE LIQUID LINE, FILTER IN THE SUCTION LINE, LIQUID LINE SIGHT GLASS, RELIEF VALVE, SOLENOID CONTROL VALVES, CHECK VALVES, LIQUID AND MOISTURE INDICATOR, THERMOSTATIC EXPANSION VALVES AND PUMP DOWN SOLENOID VALVES.
3. UNIT SHALL HAVE AN EXTERNALLY ADJUSTABLE BALANCED PORT DESIGN MECHANICAL THERMOSTATIC EXPANSION VALVE, THE VALVE SHALL HAVE A REMOVABLE POWERHEAD.
4. TAMPER PROOF, HERMETICALLY SEALED NON-ADJUSTABLE HIGH AND LOW PRESSURE CONTROLS AND REFRIGERATION SERVICE VALVES SHALL BE INSTALLED USING SCHRAEDER TYPE VALVES, REFRIGERATION SERVICE VALVES SHALL BE LOCATED OUTSIDE OF THE AIRSTREAM.
5. RECEIVER SHALL HAVE TWO REFRIGERANT LEVEL (MAXIMUM AND MINIMUM) INDICATING SIGHT GLASSES.
6. SUCTION LINE SHALL BE FULLY INSULATED WITH 1/2 INCH CLOSED CELL INSULATION.

K. CONTROL PANEL

1. THE MAIN CONTROL PANEL AND A DISCONNECT SWITCH SHALL BE MOUNTED IN THE WEATHERPROOF SERVICE VESTIBULE, UNIT SHALL BE COMPLETE WITH ALL SAFETY AND OPERATING CONTROLS FACTORY INSTALLED AND WIRED EXCEPT FOR REMOTE MOUNTED OPERATING PANEL, WHICH MUST BE FIELD INSTALLED BY THE CONTRACTOR.
2. SHALL HAVE POWER TERMINAL BLOCK FOR SINGLE POINT POWER SUPPLY WITH FACTORY MOUNTED BRANCH CIRCUIT FUSES FOR ALL CIRCUITS.
3. SHALL HAVE A VOLTAGE MONITOR TIED TO THE CONTROLLER.
4. SHALL HAVE COMPRESSOR AND FAN MOTOR STARTERS, THERMAL TRIP OVERLOADS AND REFRIGERATION OPERATING AND SAFETY CONTROLS.
5. SHALL HAVE DRY CONTACTS PROVIDED FOR ALARM, BLOWER INTERLOCK, HEATING, AUXILIARY POOL WATER HEATER, OUTDOOR AIR DAMPER, EXHAUST FAN AND SYSTEM ON.
6. SHALL HAVE A 24-VOLT CONTROL TRANSFORMER AND 24 VOLT FIELD WIRING CONTROL TERMINAL STRIP, TERMINALS NUMBERED FOR FIELD CONNECTION OF ALL CONTROLS IN ACCORDANCE WITH THE WIRING DIAGRAM. ALL WIRING SHALL BE NUMBERED AND/OR COLOR-CODED
7. ALL WIRING SHALL BE INSTALLED IN ACCORDANCE WITH UL OR CSA SAFETY ELECTRICAL CODE REGULATIONS, AND SHALL BE IN ACCORDANCE WITH NFPA. ALL COMPONENTS USED SHALL BE UL OR CSA LISTED.
8. SHALL HAVE AN AIRFLOW SWITCH AND DRY CONTACT FOR ALARM.
9. SHALL HAVE UNIT POWER AND CONTROL WIRING DIAGRAMS LAMINATED TO THE DOOR OF THE CONTROL PANEL.

L. MICROPROCESSOR CONTROL.

1. UNIT SHALL HAVE A MICROPROCESSOR CONTROLLER WITH UNIT MOUNTED REFRIGERANT PRESSURE TRANSDUCERS ON EACH INDEPENDENT COMPRESSOR CIRCUIT, AIR PRESSURE TRANSDUCERS ACROSS FILTERS AND COILS, TEMPERATURE SENSORS AND AN ETHERNET CONNECTION FOR FACTORY MONITORING AND CONTROL VIA THE INTERNET; THE UNIT SHALL BE CONNECTED TO THE INTERNET AND MONITORED 24/7 BY THE FACTORY WITH WEEKLY GRAPH REPORTS PROVIDED OF THE SPACE CONDITIONS, DEMONSTRATION OF THESE CAPABILITIES MUST BE CARRIED OUT AT THE ENGINEER'S OFFICE MUST BE PRIOR TO BID DAY.
2. UNIT SHALL BE PROVIDED WITH A FULLY SELF-DIAGNOSTIC MINIMUM 512K OF FLASH MEMORY, 512K OF BATTERY BACKED UP RAM, 9-BIT AND 22.1 MHZ MICROPROCESSOR CONTROLLER, ALL SET POINTS AND ADJUSTMENTS SHALL BE PREPROGRAMMED AT THE FACTORY DURING FULL QUALITY CONTROL AND TEST OPERATION, THE MICROPROCESSOR PROGRAM SHALL BE ABLE TO BE FIELD UPDATED VIA FLASH MEMORY, PROGRAM SHALL ALSO BE ABLE TO BE UPDATED VIA AN INTERNET CONNECTION.
3. THE CONTROLLER SHALL HAVE AS A MINIMUM: 11 ANALOG INPUTS, 4 ANALOG OUTPUTS, 24 DIGITAL INPUTS AND 16 DIGITAL OUTPUTS.
4. CONTROLLER SHALL HAVE FOUR (4) SERIAL INTERFACE PORTS INCLUDING ONE EACH OF RS232 AND RS485. THE CONTROLLER SHALL ALSO 10 BASE-T ETHERNET PORT WITH RJ-45 CONNECTOR COMPLETE WITH LINK AND ACTIVITY LEADS.
5. CONTROLLER SHALL HAVE A REAL TIME CLOCK TO TIME STAMP UNIT OPERATION LOG, TIME CLOCK SHALL HAVE PROGRAMMABLE 7-DAY OCCUPIED/UNOCCUPIED SCHEDULING CAPABILITIES.
6. CONTROL BOARD SHALL INCLUDE HARDWARE WATCHDOG SUPERVISOR TO ENSURE FAILSAFE OPERATION, THE CONTROL BOARD SHALL OPERATE AT -40°C TO +70°C.
7. KEYPAD AND DISPLAY PANEL SHALL HAVE A 122 BY 32 PIXEL BACKLIT GRAPHIC LIQUID CRYSTAL DISPLAY (LCD), THERE SHALL BE 7 SYSTEM STATUS LEADS, THE USER SHALL BE ABLE TO BROWSE THE SCREEN USING UP, DOWN, LEFT, RIGHT AND ENTER KEYS, THE PANEL SHALL HAVE 3 SOFT KEYS THAT CHANGE FUNCTIONS BASED ON WHERE THE USER IS IN THE SOFTWARE.
8. UNIT SHALL HAVE PRESSURE TRANSDUCERS MONITORING THE REFRIGERANT HIGH AND LOW PRESSURES, THE REFRIGERATION CIRCUIT SHALL ACCESSIBLE FOR DIAGNOSTICS, ADJUSTMENT AND SERVICING WITHOUT THE NEED OF SERVICE MANIFOLD GAUGES.
9. SHALL BE PROVIDED WITH A REMOTE OPERATOR PANEL THAT IS CONNECTED WITH AN RJ-114 WIRE (TELEPHONE) CABLE, THE REMOTE OPERATOR PANEL SHALL BE IDENTICAL TO UNIT MOUNTED PANEL AND ALLOW THE OPERATOR ALL THE SAME FEATURES.
10. UNIT SHALL HAVE A BACNET IP BMS INTERFACE, BACNET POINTS PROVIDED AS A SEPARATE DOCUMENT IN THE SUBMITTAL.
11. THE FOLLOWING STATUS LEADS SHALL BE ON THE CONTROLLER.

A. DEHUMIDIFICATION - INDICATES THAT THE SYSTEM IS DEHUMIDIFYING THE SPACE.

B. COOLING - INDICATES THAT THE AIR-CONDITIONING MODE IS IN OPERATION.

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

C. SPACE HEAT - INDICATES THAT THE SPACE HEATING IS OPERATING.

D. ALARM - INDICATES THERE HAS BEEN A FAILURE REQUIRING SERVICE.

12. THE FOLLOWING SETPOINTS SHALL BE ACCESSIBLE AND ADJUSTABLE FROM EITHER DISPLAY PANEL:

- A. SPACE TEMPERATURE
 - B. SPACE RELATIVE HUMIDITY
13. THE FOLLOWING SENSORS SHALL BE UNIT MOUNTED AND MONITORED AT EITHER OF THE UNIT'S DISPLAY PANELS:

- A. REFRIGERANT HIGH PRESSURE
- B. REFRIGERANT LOW PRESSURE
- C. RETURN AIR TEMPERATURE
- D. SUPPLY AIR TEMPERATURE
- E. RETURN AIR RELATIVE HUMIDITY
- F. OUTDOOR AIR TEMPERATURE
- G. EVAPORATOR LEAVING AIR TEMPERATURE

14. SYSTEM STATUS - SHALL INDICATE IN A TEXT MESSAGE TO THE DISPLAY WHAT SYSTEMS REQUIRE ATTENTION OR SERVICING, BUILT-IN MONITORING AND DIAGNOSTICS SHALL ALLOW THE USER TO VIEW THE FOLLOWING:

- A. VOLTAGE - PHASE IMBALANCE FAULT
- B. DIRTY AIR FILTER
- C. REFRIGERANT HIGH AND LOW PRESSURE
- D. FREEZESTAT
- E. HEAT RECOVERY PUMP FAULT
- F. SYSTEM OFF
- G. BLOWER OFF

M. AIR FILTERS

1. THE FILTER SECTION INCLUDES UL CLASS 2, 2" THICK, MERV 8 FILTERS.

N. DAMPERS

1. UNIT SHALL BE PROVIDED WITH A POWER OPEN AND SPRING RETURN OUTSIDE AIR AND EXHAUST AIR DAMPERS, DAMPERS ADJUST BETWEEN 0% TO 100% OPEN POSITION.
2. OUTDOOR AIR AND EXHAUST AIR DAMPERS SHALL BE OPPOSED BLADE, POWER OPEN AND SPRING RETURN, DAMPERS BLADES SHALL BE 3/4" INSULATED TYPE MADE FROM EXTRUDED ANODIZED ALUMINUM WITH NEOPRENE DOUBLE SEAL TIPS TO MINIMIZE LEAKAGE, DAMPER LEAKAGE SHALL BE LESS THAN 1% OF MAXIMUM FLOW AT 4-INCH W.C. DIFFERENTIAL, DAMPER BLADES SHALL BE MOUNTED ON STEEL RODS WHICH ROTATE ON NYLON BUSHINGS, ALL DAMPER HARDWARE SHALL BE CORROSION RESISTANT.
3. INTERNAL DAMPERS SHALL BE OPPOSED BLADE AND MADE FROM EXTRUDED ANODIZED ALUMINUM WITH NEOPRENE DOUBLE SEAL TIPS S TO MINIMIZE LEAKAGE, DAMPER BLADES SHALL BE MOUNTED ON STEEL RODS WHICH ROTATE ON NYLON BUSHINGS, ALL DAMPER HARDWARE SHALL BE CORROSION RESISTANT.

O. NATURAL GAS HEATING

1. THE UNIT SHALL HAVE A FACTORY MOUNTED NATURAL GAS HEATING SECTION COIL WITH FACTORY PIPED AND WIRED MODULATING CONTROL VALVE, HEATER SHALL BE SIZED TO MEET SCHEDULED HEATING CAPACITY.
2. SHALL BE MANUFACTURED WITH STAINLESS STEEL PRIMARY AND SECONDARY HEAT EXCHANGERS.

P. AIR-COOLED AIR CONDITIONING

1. UNIT SHALL BE EQUIPPED WITH AIR CONDITIONING MODE WHERE EXCESS COMPRESSOR HEAT IS REJECTED TO AN INTEGRAL OUTDOOR AIR-COOLED CONDENSER, THE OUTDOOR AIR-COOLED CONDENSER SHALL BE CAPABLE OF REJECTING 100% OF THE COMPRESSOR HEAT REJECTION WITH AN AIR ON TEMPERATURE AT SUMMER DESIGN CONDITIONS OF 100°F AS REQUIRED BY THE DESIGN ENGINEER.
2. ALL REFRIGERANT PIPING SHALL BE INSTALLED AND TESTED IN THE FACTORY PRIOR TO SHIPMENT OF THE COMPLETE UNIT.
3. THE AIR-COOLED CONDENSER COILS SHALL BE A MINIMUM OF FOUR ROWS DEEP AND HAVE COPPER TUBES EXPANDED INTO A MAXIMUM OF TEN ALUMINUM FINS PER INCH, COILS SHALL BE TESTED AT 425 PSIG AND MOUNTED VERTICALLY FOR COMPLETE SURFACE UTILIZATION, COILS SHALL BE COUNTER FLOW WITH A MINIMUM OF 10 DEGREES OF LIQUID SUB-COOLING AND HAVE ADEQUATE CAPACITY TO DISSIPATE THE TOTAL HEAT REJECTION OF THE SYSTEM AT DESIGN CONDITIONS, CONDENSERS SHALL HAVE GUARDS TO PROTECT THE COILS FROM VANDALISM AND WEATHER RELATED DAMAGE.
4. CONDENSER FANS SHALL BE COATED STEEL AND HAVE A STEEL HUB LOCKED ON A STAINLESS STEEL MOTOR SHAFT WITH A KEYWAY AND SQUARE HEAD SET SCREWS, FANS SHALL HAVE A RADIUS SPUN TYPE VENTUR FOR EFFICIENT PERFORMANCE, FANS SHALL HAVE VINYL COATED EXTERNAL GUARDS CAPABLE OF BEING REMOVED FOR SERVICE WITHOUT REMOVING THE FAN MOTOR.
5. FANS SHALL BE DIRECT DRIVEN BY NEMA CONSTRUCTED, THREE PHASE MOTORS OPERATING AT 1140 RPM, EACH MOTOR SHALL HAVE A SHAFT SLINGER TO PREVENT WATER SEEPAGE INTO THE MOTOR.
6. SYSTEM HEAD PRESSURE SHALL BE MAINTAINED BY INTERNAL PRESSURE CONTROL AND REGULATING VALVES.

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

7. REFRIGERATION CIRCUIT SHALL INCLUDE SOLENOID REFRIGERANT VALVES, RECEIVER WITH PRESSURE RELIEF VALVE SET AT 400 PSIG, PRESSURE CONTROL VALVE AND PRESSURE DIFFERENTIAL VALVE, AND TWO MANUAL SHUTOFF VALVES TO ISOLATE THE OUTDOOR CONDENSER, EACH REFRIGERANT CIRCUIT SHALL BE PROVIDED WITH A RECEIVER AND 2 REFRIGERANT LEVEL (MAX AND MIN) VIEWING SIGHT GLASSES TO FACILITATE SYSTEM CHARGE VERIFICATION.

Q. FACTORY PERFORMANCE TESTING

1. THE UNIT SHALL OPERATE IN ALL MODES AT THE FACTORY FOR A FULL PERFORMANCE AND QUALITY CONTROL INSPECTION, A COPY OF THE TEST REPORT SHALL BE AVAILABLE TO THE ENGINEER UPON REQUEST.
2. MICROPROCESSOR CONTROLS SHALL BE FACTORY ADJUSTED AND PRESET TO THE DESIGN CONDITIONS DURING TESTING.
3. WEB WITNESS TEST AVAILABLE, ALL UNITS ARE CONNECTED TO WEBSENTRY DURING TESTING AND AN INTERESTED PARTY COULD BE GIVEN ACCESS TO WEBSENTRY TO VIEW THE UNIT.

2.3 ELECTRICAL HEAT TRACING FOR PIPELINES

- A. GENERAL: FURNISH AND INSTALL A COMPLETE UL LISTED SYSTEM OF HEATERS, COMPONENTS, AND CONTROLS TO PREVENT PIPELINES FROM FREEZING.

B. PRODUCTS:

1. THE SELF-REGULATING HEATER SHALL CONSIST OF TWO (2) 16 AWG NICKEL-COATED COPPER BUS WIRES EMBEDDED IN PARALLEL IN A SELF-REGULATING POLYMER CORE THAT VARIES ITS POWER OUTPUT TO RESPOND TO TEMPERATURE ALL ALONG ITS LENGTH, ALLOWING THE HEATER TO BE CROSSED OVER ITSELF WITHOUT OVERHEATING, TO BE USED DIRECTLY ON PLASTIC PIPE, AND TO BE CUT TO LENGTH IN THE FIELD, THE HEATER SHALL BE COVERED BY A RADIATION CROSS-LINKED MODIFIED POLYOLEFIN DIELECTRIC JACKET.
2. IN ORDER TO PROVIDE ENERGY CONSERVATION AND TO PREVENT OVERHEATING, THE HEATER SHALL HAVE A SELF-REGULATING FACTOR OF AT LEAST 90 PERCENT, THE SELF-REGULATION FACTOR IS DEFINED AS THE PERCENTAGE REDUCTION, WITHOUT THERMOSTATIC CONTROL, OF THE HEATER OUTPUT GOING FROM 40 DEG F PIPE TEMPERATURE OPERATION TO 150 DEG F PIPE TEMPERATURE OPERATION.
3. THE HEATER SHALL OPERATE ON LINE VOLTAGES OF 208 VOLTS WITHOUT THE USE OF TRANSFORMERS.
4. THE REQUIRED HEATER OUTPUT RATING SHALL BE 5 WATTS PER FOOT AT 50 DEG F WITH MINIMUM AMBIENT TEMPERATURE BEING -10 DEG F.
5. THE HEATER SHALL BE XL-TRACE, AS MANUFACTURED BY RAYCHEM CORPORATION, OR AS APPROVED EQUAL.
6. POWER CONNECTION, END SEAL, SPLICE AND TEE KIT COMPONENTS SHALL BE APPLIED IN THE FIELD.
7. THE SYSTEM SHALL BE CONTROLLED BY A BULB-SENSING THERMOSTAT AMC-1B SET AT 40°F EITHER DIRECTLY, OR THROUGH AN APPROPRIATE CONTACTOR.

PART 3 EXECUTION

3.1 EXAMINATION

- A. VERIFY ALL DIMENSIONS BY FIELD MEASUREMENTS, VERIFY THAT ALL EQUIPMENT MAY BE INSTALLED IN ACCORDANCE WITH PERTINENT CODES AND REGULATIONS, THE ORIGINAL DESIGN, AND THE REFERENCED STANDARDS.
- B. EXAMINE ROUGH-IN REQUIREMENTS FOR ALL PIPING SYSTEMS TO VERIFY ACTUAL LOCATIONS OF PIPING CONNECTIONS PRIOR TO INSTALLATION.
- C. VERIFY THAT ELECTRICAL WORK INSTALLATION IS IN ACCORDANCE WITH MANUFACTURE'S SUBMITTAL AND INSTALLATION REQUIREMENTS OF DIVISION 26 SECTIONS, DO NOT PROCEED WITH EQUIPMENT START-UP UNTIL ELECTRICAL WORK IS ACCEPTABLE TO EQUIPMENT INSTALLER, COORDINATE SIZES OF ALL THERMAL OVERLOADS WITH DIVISION 26.
- D. DO NOT PROCEED UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 AIR HANDLING UNITS INSTALLATION REQUIREMENTS

- A. MOUNT UNIT ON FACTORY BUILT MOUNTING CURB PROVIDING WATERTIGHT ENCLOSURE TO PROTECT DUCTWORK AND UTILITY SERVICES.
- B. COORDINATE INSTALLATION OF CURBS AND EQUIPMENT SUPPORTS, SERVICE PLATFORM SHALL BOLT TO CURB PER MANUFACTURER'S REQUIREMENTS WITH STAINLESS STEEL HARDWARE.
- C. INSTALL UNITS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.
- D. INSTALL UNITS LEVEL AND PLUMB, MAINTAINING MANUFACTURER'S RECOMMENDED CLEARANCES.
- E. CURB SUPPORT: INSTALL CURB ON STRUCTURE, LEVEL, ACCORDING TO NRCA'S WRITTEN INSTALLATION INSTRUCTIONS, INSTALL AND SECURE UNITS ON CURBS.
- F. UNIT SUPPORT: INSTALL UNIT ON STRUCTURAL CURBS AND LEVEL, COORDINATE WALL PENETRATIONS AND FLASHING WITH WALL CONSTRUCTION.
- G. PROVIDE FACTORY START-UP AND TRAINING, SUBMIT START-UP REPORTS TO ENGINEER.

- H. EXAMINE AREAS TO RECEIVE UNITS FOR COMPLIANCE WITH REQUIREMENTS FOR INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF ENERGY RECOVERY UNITS, DO NOT PROCEED WITH INSTALLATION UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

I. INSTALL HEAT WHEELS SO SUPPLY AND EXHAUST FLOW IN OPPOSITE DIRECTIONS AND ROTATION IS FROM EXHAUST SIDE TO PURGE SECTION TO SUPPLY SIDE.

1. PROVIDE ACCESS DOORS IN BOTH SUPPLY AND EXHAUST DUCTS, BOTH UPSTREAM AND DOWNSTREAM, FOR ACCESS TO WHEEL SURFACES, DRIVE MOTOR, AND SEALS.
2. PROVIDE REMOVABLE PANELS OR ACCESS DOORS BETWEEN SUPPLY AND EXHAUST DUCTS ON BUILDING SIDE FOR BYPASS DURING STARTUP.

SECTION 15600 - HEATING, VENTILATING, AND AIR CONDITIONING - CONTINUED

- J. INSTALL NEW FILTERS AT COMPLETION OF EQUIPMENT INSTALLATION AND BEFORE TESTING, ADJUSTING, AND BALANCING.

- K. DUCTS AND FAN INSTALLATION REQUIREMENTS ARE SPECIFIED IN OTHER DIVISION 23 SECTIONS, DRAWINGS INDICATE THE GENERAL ARRANGEMENT OF PIPING, FITTINGS, AND SPECIALTIES.

L. GROUND EQUIPMENT

1. TIGHTEN ELECTRICAL CONNECTORS AND TERMINALS ACCORDING TO MANUFACTURER'S PUBLISHED TORQUE-TIGHTENING VALUES, WHERE MANUFACTURER'S TORQUE VALUES ARE NOT INDICATED, USE THOSE SPECIFIED IN UL 486A AND UL 486B.

- N. AFTER COMPLETING SYSTEM INSTALLATION, INCLUDING OUTLET FITTINGS AND DEVICES, INSPECT AND CLEAN EXPOSED FINISHES, REMOVE DIRT AND CONSTRUCTION DEBRIS AND REPAIR DAMAGED FINISHES.

- O. STARTUP SERVICES: ENGAGE A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE TO COMMISSION UNITS AS SPECIFIED BELOW.

1. ENERGIZE AND VERIFY CORRECT ROTATION OF HEAT WHEELS AND FANS.
2. ADJUST SEALS AND PURGE.
3. TEST AND ADJUST CONTROLS AND SAFETIES, REPLACE DAMAGED OR MALFUNCTIONING CONTROLS AND EQUIPMENT.
4. TEST REFRIGERANT CIRCUIT AND CONTROLS.
5. RECORD REFRIGERANT PRESSURES.
6. VERIFY SEQUENCE OF OPERATION.
7. RECORD FLUID TEMPERATURES AND FLOW RATES FOR HOT WATER COIL.
8. TEST ECONOMIZER OPERATION.
9. TEST DEHUMIDIFICATION SYSTEM AND HOT GAS RE-HEAT COIL OPERATION.

P. TRAINING

1. TRAIN OWNER'S MAINTENANCE PERSONNEL ON PROCEDURES AND SCHEDULES RELATED TO STARTUP AND SHUTDOWN, TROUBLESHOOTING, SERVICING, AND PREVENTATIVE MAINTENANCE.
2. REVIEW DATA IN THE OPERATION AND MAINTENANCE MANUALS, REFER TO DIVISION 01 SECTION, DEMONSTRATION AND TRAINING.
3. SCHEDULE TRAINING WITH OWNER, THROUGH ARCHITECT, WITH AT LEAST 7 DAYS ADVANCE NOTICE.

3.3 HEAT TRACE INSTALLATION REQUIREMENTS

- A. INSTALLATION:
 1. APPLY THE HEATER LINEARLY ON THE PIPE AFTER PIPING HAS BEEN SUCCESSFULLY PRESSURE TESTED, SECURE THE HEATER TO THE PIPING WITH CABLE TIES OR FIBERGLASS TAPE.
 2. INSTALL ELECTRIC HEATING CABLES ACCORDING TO IEEE 515.1.
 3. INSTALL INSULATION OVER PIPING WITH ELECTRIC CABLES PER MANUFACTURER'S RECOMMENDATIONS.
 4. APPLY "ELECTRIC TRACED" WARNING LABELS TO THE OUTSIDE OF THE THERMAL INSULATION.
- B. TESTS:
 1. AFTER INSTALLATION AND BEFORE AND AFTER INSTALLING THE THERMAL INSULATION, SUBJECT HEAT TO TESTING USING A 2500 VDC MEGGER, MINIMUM INSULATION RESISTANCE SHOULD BE 20 MEGOHMS REGARDLESS OF LENGTH.
 2. THE INSTALLER SHALL TEST FOR BOTH HEATING CABLE BUS WIRES TO VERIFY THE CONNECTION OF ANY SPLICES OR TEES.

SECTION 15700 - AIR DISTRIBUTION SYSTEM

PART 1 - RELATED DOCUMENTS

1.1 SUMMARY:

- A. ALL WORK UNDER THIS SECTION IS SUBJECT TO THE REQUIREMENTS OF SECTION 15100 "GENERAL MECHANICAL REQUIREMENTS".
- B. THE FABRICATION AND INSTALLATION OF ALL DUCTWORK, TOGETHER WITH RELATED EQUIPMENT, SHALL COMPLY WITH THE STANDARDS OF THE NATIONAL FIRE PROTECTION ASSOCIATION, AS SET FORTH IN NFPA STANDARD NO. 90A, AS WELL AS WITH THE APPLICABLE REQUIREMENTS OF THE SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, INC., AND THE LATEST EDITION OF THE ASHRAE GUIDE.
- C. ALL DUCT SIZES SHOWN ARE NET INSIDE CLEAR DIMENSIONS, WHERE INTERNAL DUCT LINING IS USED, INCREASE DUCT SIZES ACCORDINGLY TO PROVIDE THE INDICATED NET FREE AREA, UNLESS OTHERWISE INDICATED SIZE RUN-OUTS, DROPS, AND CONNECTIONS TO GRILLES, REGISTERS, DIFFUSERS, FANS, COILS, LOUVERS, FILTERS, AND OTHER EQUIPMENT TO THE FULL SIZE OF THE EQUIPMENT CONNECTION.
- D. MINOR CHANGES MAY BE MADE IN DUCT SIZES WHERE REQUIRED TO FIT THE AVAILABLE SPACE, PROVIDED THE INDICATED NET FREE AREA AND APPROXIMATE ASPECT RATIO ARE MAINTAINED.
- E. SMOOTHLY TRANSITION ALL DUCTWORK AND PREVENT EXCESSIVE OR UNNECESSARY TURBULENCE OR PRESSURE LOSS.

A. TEXTILE AIR DISPERSION SYSTEM:

1. HOOPS (HIS) SYSTEM: AIR DIFFUSERS SHALL BE CONSTRUCTED WITH INTERNAL RETENTION SYSTEM.
 - A. SYSTEM SHALL CONSIST OF AN INTERNAL 360 DEGREE HOOP SYSTEM, SPACED 5' ON CENTER.
 - B. SYSTEM SHALL BE INSTALLED WITH A ONE ROW SUSPENSION SYSTEM LOCATED 1.5' ABOVE TOP-DEAD-CENTER OF THE TEXTILE SYSTEM.

SECTION 15700 - AIR DISTRIBUTION SYSTEM - CONTINUED

PART 2 - PRODUCTS

2.1 GENERAL:

- A. UNLESS OTHERWISE INDICATED OR SPECIFIED, FABRICATE DUCTWORK OF GALVANIZED SHEET STEEL, STAINLESS STEEL, OR ALUMINUM CONFORMING TO COMMERCIAL DESIGNATION 3003 TEMPER H14 AND DUCT SHEET. DUCT GAUGES, JOINTING AND REINFORCEMENT SHALL CONFORM TO TABLES 4, 5, 6 AND 7, AS APPLICABLE, CHAPTER 1 OF THE LATEST ASHRAE GUIDE AND DATA BOOK. CONSTRUCTION DETAILS SHALL CONFORM TO APPLICABLE DUCT MANUALS AS PUBLISHED BY SHEET METAL AND AIR CONDITIONING CONTRACTORS' ASSOCIATION, INC. (SMACNA).
- B. ERECT SHEET METAL DUCTWORK IN A FIRST-CLASS, WORKMANLIKE MANNER SECURED IN PLACE RIGIDLY AND PERMANENTLY, PROVIDE SUITABLE HANGERS, SECURELY ATTACHED TO BUILDING CONSTRUCTION WITH BOLTS, CLIPS OR INSERTS. HANGERS SHALL BE STRUCTURAL SHAPES, FLAT BARS, OR FORMED STRAP HANGERS; USE OF WIRE WILL NOT BE PERMITTED, HANGERS SHALL NOT PASS THROUGH OR BE INSIDE DUCT, SUPPORT VERTICAL DUCTS PASSING THROUGH FLOORS BY ANGLES RIVETED TO DUCT AND RESTING EITHER ON FLOOR OR ON BRACKETS SECURED TO BUILDING CONSTRUCTION, ALL SPACE AROUND DUCT WHERE THEY PASS THROUGH ANY WALLS, FLOORS, CEILINGS, OR ROOFS SHALL BE SEALED TIGHT WITH INCOMBUSTIBLE, INERT MATERIAL, DO NOT ARRANGE DUCTS SO AS TO IMPAIR THE EFFECTIVENESS OF FIREPROOFING AROUND STRUCTURAL MEMBERS, PROVIDE SHEET METAL FLANGED COLLARS AROUND EXPOSED DUCTS PASSING THROUGH WALLS, FLOORS, OR CEILINGS IN FINISHED AREAS TO PROVIDE FINISHED APPEARANCE, SEAL ALL DUCT JOINTS AND SEAMS INCLUDING LOW PRESSURE SUPPLY AND RETURN, AND EXHAUST DUCTWORK WITH "HARDCAST" SEALING SYSTEM AS MANUFACTURED BY HARDCAST, INC., OR APPROVED EQUAL.

C. FLEXIBLE CONNECTIONS OF NEOPRENE OR OTHER NFPA APPROVED NONINFLAMMABLE FABRIC SHALL BE PROVIDED IN DUCT SYSTEM AT ALL FAN INLET AND OUTLET CONNECTIONS.

- D. PROVIDE 90-DEGREE ELBOWS OF RADIUS CONSTRUCTION WHEREVER SPACE PERMITS AND ELSEWHERE OF SQUARE CONSTRUCTION, CONSTRUCT 90-DEGREE SQUARE ELBOWS WITH DOUBLE RADIUS TURNING VANES, IF CENTERLINE RADIUS ON CURVED ELBOWS MUST BE LESS THAN 1-1/2 DUCT WIDTH, PROVIDE FULL LENGTH METAL TURNING VANES, PROVIDE 3/4" TRAILING EDGE ON TURNING VANES OF 90 DEGREE SQUARE ELBOWS WHEREVER ELBOW IS LESS THAN ONE DUCT PERIMETER UPSTREAM OF CHANGE IN DUCT SIZE OR DIRECTION.

E. PROVIDE DUCT COLLARS AND ANGLE IRON FRAMEWORK FOR MOUNTING OF AUTOMATIC DAMPERS.

F. BRANCH CONNECTIONS SHALL UTILIZE 45 DEGREE ENTRY OR CONICAL FITTINGS.

G. PROVIDE OFFSETS WITH 30 DEGREE MAXIMUM FULL RADIUS ELBOWS.

2.2 DUCT CONSTRUCTION:

A. ROUND AND RECTANGULAR DUCTWORK :

1. DETERMINE DUCT GAUGES BASED ON DUCT DIAMETER OR DUCT SIZE AND PRESSURES INDICATED IN PARAGRAPH 2.2A OF THIS SECTION.
2. ROUND DUCT SHALL BE SPIRAL SEAM TYPE.
3. ALL BRANCH DUCTS SHALL CONNECT TO THE MAIN DUCT WITH A 45-DEGREE CONICAL LATERAL OR LOW LOSS FITTINGS AS SHOWN ON THE DRAWINGS WHERE POSSIBLE, IF NOT POSSIBLE, A 90-DEGREE CONICAL CONNECTION SHALL BE USED.
4. ALL ELBOWS SHALL BE LONG RADIUS.
5. ALL SEAMS AND JOINTS OF FITTINGS SHALL BE WELDED BY GAS FUSION WITH ROD MATERIAL SAME AS DUCT MATERIAL.
6. CONNECTIONS TO EQUIPMENT SHALL BE FLEXIBLE MATERIAL, NEMA APPROVED, HAVING ADEQUATE REINFORCING TO BE COMPATIBLE WITH INTERNAL PRESSURE OF SYSTEM.
7. PAINT ALL CUT ENDS AND WELDED JOINTS WITH ALUMINUM PAINT.
8. DETERMINE DUCT GAUGES FOR THE LONGEST DUCT SIDE AND USE FOR ALL FOUR SIDES, JOINTS AND REINFORCING REQUIREMENTS APPLY TO THE LONGEST DUCT SIDE.
9. REINFORCE ALL DUCTS TO PREVENT BUCKLING, VIBRATION, OR NOISE AS RECOMMENDED IN THE REFERENCED CONSTRUCTION STANDARDS AND AS REQUIRED TO SUIT THE INSTALLED CONDITIONS.
10. DO NOT CROSSBREAK DUCT WHICH WILL RECEIVE RIGID INSULATION COVERING.
11. WHERE TAP SIZES OF DIVIDED-FLOW FITTINGS ARE NOT INDICATED, MAKE BRANCH AND MAIN CONNECTION SIZES PROPORTIONAL TO THEIR RESPECTIVE AIR FLOWS AND MAINTAIN UNIFORM TRANSVERSE VELOCITIES IN THE FITTING.
12. MAKE RADIUS ELBOWS AND RADIUS TEE CONNECTION WITH THROAT RADIUS EQUAL TO OR GREATER THAN THE WIDTH OF THE DUCT, USE VANED ELBOWS WHERE SHOWN AND WHERE RADIUS ELBOWS WILL NOT FIT THE SPACE, AND IN ALL SQUARE BENDS.
13. TURNING VANES SHALL BE 36-INCH MAXIMUM VANE LENGTH, WHERE LONGER VANES ARE REQUIRED, USE TWO OR MORE SETS OF VANES WITH INTERMEDIATE RUNNERS SECURELY FASTENED TOGETHER.
14. BOLT, SCREW, RIVET, OR SPOT WELD REINFORCING MEMBERS SECURELY TO THE DUCT ON NOT LESS THAN 6-INCH CENTERS.
15. WHERE DUCTS ARE OPEN-ENDED WITHOUT GRILLES, REGISTERS, OR OTHER MEANS OF STIFFENING, REINFORCE AND STIFFEN AND OPEN END WITH STANDING SEAMS OR AN ANGLE FRAME.
16. REMOVE ALL EXPOSED TRACES OF JOINT SEALERS, MANUFACTURER'S IDENTIFICATION AND OTHER MARKINGS.

B. ROUND DUCT SHALL BE SPIRAL CONDUIT AND FITTINGS AS MANUFACTURED BY UNITED MCGILL, SEMCO, EASTERN SHEET METAL, SPIRA-MATIC.

2.3 DUCTSOX (FABRIC DUCTWORK)

A. TEXTILE AIR DISPERSION SYSTEM:

1. HOOPS (HIS) SYSTEM: AIR DIFFUSERS SHALL BE CONSTRUCTED WITH INTERNAL RETENTION SYSTEM.
 - A. SYSTEM SHALL CONSIST OF AN INTERNAL 360 DEGREE HOOP SYSTEM, SPACED 5' ON CENTER.
 - B. SYSTEM SHALL BE INSTALLED WITH A ONE ROW SUSPENSION SYSTEM LOCATED 1.5' ABOVE TOP-DEAD-CENTER OF THE TEXTILE SYSTEM.

NO.	DATE	DESCRIPTION	REVISIONS	
			BY	DATE

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave.
Suite 102
Baltimore, MD 21206
Phone: 410/682-2900
Fax: 410/682-2419

8710 Brooke Drive
Suite 2-5
Arlund Heights
Baltimore, MD 21206
Phone: 410/682-6006
Fax: 410/682-6006



WO# 13072.B

PROJECT MANAGER: MXN

DESIGNER: SAS

DATE: 12/23/2015

MECHANICAL SPECIFICATIONS
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

M9.3

MECHANICAL SPECIFICATIONS

SECTION 15700 - AIR DISTRIBUTION SYSTEM - CONTINUED

SECTION 15850 - AUTOMATIC TEMPERATURE CONTROL - CONTINUED

SECTION 15850 - AUTOMATIC TEMPERATURE CONTROL - CONTINUED

- C. SYSTEM ATTACHMENT TO CABLE OR U-TRACK SHALL BE MADE USING GLIDERS SPACED 12 INCHES.
 - D. AVAILABLE FOR DIAMETERS FROM 8" - 60".
 - E. CABLE SUSPENSION HARDWARE TO INCLUDE CABLE, EYE BOLTS, THIMBLES, CABLE CLAMPS, AND TURNBUCKLE(S) AS REQUIRED.
2. TEXTILE (DURATEX)
- A. TEXTILE CONSTRUCTION: WOVEN POLYESTER WITH NON-PERMEABLE COATING, FIRE RETARDANT IN ACCORDANCE WITH UL 2518.
 - B. WEIGHT: 5.5 OZ./YD² PER ASTM D3776
 - C. AIR PERMEABILITY: 0 CFM/FT² PER ASTM D737, FRAZIER
 - D. WARRANTY: 10 YEARS
 - E. TEXTILE COLOR TO BE CHOSEN BY OWNER

- C. COORDINATE CONTROLS WITH CONTROLLED EQUIPMENT. UPON COMPLETION OF THE WORK, CALIBRATE AND ADJUST ALL CONTROLS FOR PROPER FUNCTION. ELECTRIC WIRING, INCLUDING INTERLOCK WIRING FOR EQUIPMENT SUCH AS AIR HANDLERS, FANS, ETC., SHALL BE FURNISHED AND INSTALLED UNDER THIS SECTION. ALL ELECTRICAL WORK SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF DIVISION 16. ALL CONTROL WIRING SHALL BE INSTALLED IN CONDUIT IN ACCORDANCE WITH DIVISION 16.
- 1.2 SUBMITTALS:
- A. SUBMIT COMPLETE SHOP DRAWINGS, INCLUDING COMPONENT CATALOG CUTS, FOR APPROVAL BEFORE STARTING ANY CONTROL WORK. SHOP DRAWINGS SHALL BE IN ACCORDANCE WITH SECTION 230500. SHOP DRAWINGS SHALL INDICATE ALL CONTROL EQUIPMENT, ARRANGEMENTS, LOCATIONS, FUNCTIONS, AND DESCRIPTION OF OPERATION.
- B. SUBMITTAL SHALL CONSIST OF:
1. DATA SHEETS OF ALL PRODUCTS.
 2. WIRING AND PIPING INTERCONNECTION DIAGRAMS INCLUDING PANEL AND DEVICE POWER AND SOURCES.
 3. EQUIPMENT LISTS OF ALL PROPOSED DEVICES AND EQUIPMENT.

3. TEMPERATURE SENSORS SHALL BE RESISTANCE TEMPERATURE DETECTOR (RTD) TYPE OF 1000 OHM BALCO, SPACE (60-90 DEGREES F); DUCT/WELL (-30-250 DEGREES F); AVERAGING DUCT (-30-225 DEGREES F) OR AS REQUIRED UNDER DIVISION 26.
 - A. SPACE TEMPERATURE SENSORS SHALL BE PROVIDED WITH A BLANK COMMERCIAL TYPE LOCKING SATIN CHROME COVERS.
 - B. DUCT TEMPERATURE SENSORS SHALL BE RIGID STEM OR AVERAGING TYPE AS SPECIFIED IN THE SEQUENCE OF OPERATION. WATER SENSORS SHALL BE PROVIDED WITH SEPARABLE COPPER, MONEL OR STAINLESS STEEL WELL. OUTSIDE AIR WALL MOUNTED SENSORS SHALL BE PROVIDED WITH A SUN SHIELD.
 - C. THE DEW POINT SENSOR SHALL EMPLOY A NON-REACTIVE ORGANIC BOBBIN MATERIAL TO GIVE PRECISE DEW POINT READINGS WITH ACCURACY OF NOT MORE THAN +/- 1.5 DEGREES F. THE DEW POINT SENSOR SHALL INCORPORATE AN INTEGRAL DRAFT SHIELD AS PART OF THE INSTRUMENT FOR AIR VELOCITIES IN EXCESS OF 50 FEET PER MINUTE. THE DEW POINT SENSOR SHALL OPERATE OVER A MINIMUM DEW POINT TEMPERATURE RANGE SUITABLE TO APPLICATION.
4. RELATIVE HUMIDITY SENSORS SHALL BE CAPACITANCE TYPE WITH 10 PERCENT TO 90 PERCENT RANGE. DUCT MOUNTED HUMIDITY SENSORS SHALL BE PROVIDED WITH A SAMPLING CHAMBER. WALL MOUNTED SENSORS SHALL BE PROVIDED WITH COVERS IDENTICAL TO TEMPERATURE SENSORS. SPACE 10 PERCENT - 90 PERCENT RH; DUCT 10 PERCENT - 90 PERCENT RH.
5. TEMPERATURE SENSORS AND HUMIDITY SENSORS SHALL BE VENTED FULLY RECESSED TYPE WITH HEAVY DUTY, STAINLESS STEEL LOCKABLE GUARD.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3. TEXTILE SYSTEM FABRICATION REQUIREMENTS:
- A. TEXTILE SYSTEM TO BE CONSTRUCTED IN MODULAR LENGTHS (ZIPPERED) WITH PROPER RADIAL SECURING CLIPS (INLETS, ENDCAPS, AND MID-SECTIONS) AND TOP ACCESS ZIPPERS FOR VERTICAL CABLE SAFETY ATTACHMENT.
 - B. INTEGRATED AIR DISPERSION SHALL BE SPECIFIED AND APPROVED BY MANUFACTURER.
 - C. AIR DISPERSION AND EXTENDED THROWS ARE ACCOMPLISHED BY ORIFICES. DISPERSION ORIFICE SIZING, UP TO 5 INCH DIAMETER (DESIGN DEPENDENT).
 - D. DIAMETER, QUANTITY, AND LOCATION OF ORIFICES TO BE SPECIFIED AND APPROVED BY MANUFACTURER.
 - E. INLET CONNECTION TO METAL DUCT VIA FABRIC DRAW BAND WITH ANCHOR PATCHES AS SUPPLIED BY MANUFACTURER. ANCHOR PATCHES TO BE SECURED TO METAL DUCT VIA ZIP SCREW FASTENER - SUPPLIED BY CONTRACTOR.
 - F. INLET CONNECTION INCLUDES ZIPPER FOR EASY REMOVAL / MAINTENANCE.
 - G. LENGTHS TO INCLUDE REQUIRED INTERMEDIATE ZIPPERS AS SPECIFIED BY MANUFACTURER.
 - H. SYSTEM TO INCLUDE ADJUSTABLE FLOW DEVICES TO BALANCE TURBULENCE, AIRFLOW AND DISTRIBUTION AS NEEDED. FLOW RESTRICTION DEVICE SHALL INCLUDE ABILITY TO ADJUST THE AIRFLOW RESISTANCE FROM 0.06 - 0.60 IN W.G. STATIC PRESSURE.
 - I. END CAP INCLUDES ZIPPER FOR EASY MAINTENANCE.
 - J. EACH SECTION OF THE TEXTILE SHALL INCLUDE IDENTIFICATION LABELS DOCUMENTING ORDER NUMBER, SECTION DIAMETER, SECTION LENGTH, PIECE NUMBER, CODE CERTIFICATIONS AND OTHER PERTINENT INFORMATION.
4. DESIGN PARAMETERS:
- A. TEXTILE AIR DIFFUSERS SHALL BE DESIGNED FROM 0.25" WATER GAGE MINIMUM TO 3.1" MAXIMUM, WITH 0.5" AS THE STANDARD.
 - B. TEXTILE AIR DIFFUSERS SHALL BE LIMITED TO DESIGN TEMPERATURES BETWEEN 0 DEGREES F AND 180 DEGREES F (-17.8 DEGREES C AND 82 DEGREES C).
 - C. SYSTEM OVERALL DESIGN; DIAMETER, LENGTH, AIRFLOW, OPERATING STATIC PRESSURE AND DISPERSION SHALL BE DESIGNED OR APPROVED BY THE MANUFACTURER.
 - D. DO NOT USE TEXTILE DIFFUSERS IN CONCEALED LOCATIONS.
 - E. USE TEXTILE AIR DISPERSION SYSTEMS ONLY FOR POSITIVE PRESSURE AIR DISTRIBUTION COMPONENTS OF THE MECHANICAL VENTILATION SYSTEM.

2.2 CONTROLLERS

3.1 GENERAL:

2.4 AIR TRANSFER OPENINGS:

- A. THERMOSTAT COVERS SHALL BE LOCKING TYPE, KEY TO OPEN WITH BLANK COVER. ALL ROOM THERMOSTATS SHALL BE MOUNTED 4'-0" INCHES ABOVE THE FURNISHED FLOOR TO TOP OF SWITCH BOX. PROVIDE INSULATING BASES WHERE THERMOSTATS ARE LOCATED ON EXTERIOR OR UNCONDITIONED WALLS. EACH THERMOSTAT SHALL HAVE ADJUSTABLE LIMIT STOPS AND ADJUSTABLE SENSITIVITY. PROVIDE VANDAL PROOF LOCKING COVERS.
 - B. LOW LIMIT THERMOSTATS: FREEZESTATS SHALL HAVE A MINIMUM 20 FOOT (AVERAGING SENSING ELEMENT) CAPILLARY TUBE SIZED TO THE BASIS OF ONE LINEAR FOOT OF CAPILLARY TUBE FOR EACH SQUARE FOOT OF COIL SURFACE. THERMOSTAT SENSITIVITY SHALL BE ADJUSTABLE. FREEZESTATS SHALL STOP SUPPLY AND RETURN FANS AND CLOSE THE OUTSIDE AIR DAMPER IF MIXED AIR TEMPERATURE DROPS BELOW 35 DEGREES F AND OPEN CONTROL VALVES. ADDITIONAL REQUIREMENTS ARE INDICATED IN SEQUENCE OF OPERATION.
 - C. RECEIVER-CONTROLLERS SHALL RECEIVE ONE, TWO OR THREE INPUTS AND SHALL BE EQUIPPED WITH SET POINT (INTERNAL OR EXTERNAL) PROPORTIONAL BAND AND AUTHORITY.
 - D. RELAYS AND SWITCHES SHALL BE PROVIDED AS NECESSARY TO ACCOMPLISH THE SEQUENCE OF CONTROL SPECIFIED HEREIN. RELAYS SHALL BE DIE CAST METAL SELECTED FOR THE REQUIRED APPLICATION.
- 2.3 CONTROL PANELS:
- A. FURNISH AND INSTALL LOCAL PANELS FOR INDICATING CONTROLLERS, SWITCHES, RELAYS, ETC. CONTROL PANELS SHALL BE FULLY ENCLOSED CABINETS, ALL STEEL CONSTRUCTION AND SHALL MEET THE REQUIREMENTS OF NEMA 1 ENCLOSURES. CABINET SHALL HAVE PIANO HINGED DOOR WITH A LOCKING LATCH. ALL CABINET LOCKS SHALL USE COMMON KEY. PROVIDE MEANS OF STORING CONTROL SYSTEM INSTRUCTIONS AND DRAWINGS INSIDE CABINET FOR FUTURE REFERENCE. PANEL SHALL BE WALL MOUNTED OR FREE STANDING AND LOCATED WHERE DIRECTED BY THE CONTRACT DRAWINGS OR ENGINEER. ALL GAUGES AND SWITCHES IN THE FACE OF PANELS SHALL BE IDENTIFIED WITH MICARTA NAMEPLATES WITH ETCHED WHITE FILLED LETTERS.

- A. THE AUTOMATIC TEMPERATURE CONTROL SYSTEM SHALL BE DESIGNED, INSTALLED, AND COMMISSIONED IN A TURNKEY FULLY IMPLEMENTED AND OPERATIONAL MANNER.
- 3.2 INSTALLATION:
- A. ALL WIRING SHALL BE PROPERLY SUPPORTED AND RUN IN A NEAT AND WORKMANLIKE MANNER. ALL WIRING EXPOSED AND IN EQUIPMENT ROOMS SHALL RUN PARALLEL TO OR AT RIGHT ANGLES TO THE BUILDING STRUCTURE. ALL WIRING WITHIN ENCLOSURES SHALL BE NEATLY BUNDLED AND ANCHORED TO PREVENT RESTRICTION TO DEVICES AND TERMINALS.
 - B. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ELECTRICAL INSTALLATION REQUIRED FOR A FULLY FUNCTIONAL CONTROL AND AUTOMATION SYSTEM AND NOT SHOWN ON THE ELECTRICAL PLANS OR REQUIRED BY THE ELECTRICAL SPECIFICATIONS. ALL WIRING SHALL BE IN ACCORDANCE TO ALL LOCAL AND NATIONAL CODES.

- A. FURNISH AND INSTALL METAL SLEEVES OR FRAMES, OF THE SAME MATERIAL AS THE DUCT OR AIR TERMINALS ATTACHED THERETO, IN ALL AIR TRANSFER OPENINGS THROUGH WALLS, PARTITIONS, FLOORS AND OTHER BUILDING CONSTRUCTION, EXTENDING COMPLETELY THROUGH THE OPENING. SECURELY FASTEN THE SLEEVES OR FRAMES IN PLACE AND PROVIDE FACE FLANGES ON BOTH SIDES. WHERE GRILLES OR REGISTERS ARE REQUIRED, ATTACH THEM TO THE SLEEVE OR FRAME, OR EXTEND DUCTWORK WHERE SHOWN ON THE DRAWINGS.

2.4 SPACE THERMOSTATS AIR HANDLING UNITS WITH GAS HEAT

3.2 INSTALLATION:

2.5 AIR VOLUME CONTROLS:

- A. THERMOSTAT COVERS SHALL BE LOCKING TYPE, KEY TO OPEN WITH BLANK COVER. ALL ROOM THERMOSTATS SHALL BE MOUNTED 4'-0" INCHES ABOVE THE FURNISHED FLOOR TO TOP OF SWITCH BOX. PROVIDE INSULATING BASES WHERE THERMOSTATS ARE LOCATED ON EXTERIOR OR UNCONDITIONED WALLS. EACH THERMOSTAT SHALL HAVE ADJUSTABLE LIMIT STOPS AND ADJUSTABLE SENSITIVITY. PROVIDE VANDAL PROOF LOCKING COVERS.
 - B. LOW LIMIT THERMOSTATS: FREEZESTATS SHALL HAVE A MINIMUM 20 FOOT (AVERAGING SENSING ELEMENT) CAPILLARY TUBE SIZED TO THE BASIS OF ONE LINEAR FOOT OF CAPILLARY TUBE FOR EACH SQUARE FOOT OF COIL SURFACE. THERMOSTAT SENSITIVITY SHALL BE ADJUSTABLE. FREEZESTATS SHALL STOP SUPPLY AND RETURN FANS AND CLOSE THE OUTSIDE AIR DAMPER IF MIXED AIR TEMPERATURE DROPS BELOW 35 DEGREES F AND OPEN CONTROL VALVES. ADDITIONAL REQUIREMENTS ARE INDICATED IN SEQUENCE OF OPERATION.
 - C. RECEIVER-CONTROLLERS SHALL RECEIVE ONE, TWO OR THREE INPUTS AND SHALL BE EQUIPPED WITH SET POINT (INTERNAL OR EXTERNAL) PROPORTIONAL BAND AND AUTHORITY.
 - D. RELAYS AND SWITCHES SHALL BE PROVIDED AS NECESSARY TO ACCOMPLISH THE SEQUENCE OF CONTROL SPECIFIED HEREIN. RELAYS SHALL BE DIE CAST METAL SELECTED FOR THE REQUIRED APPLICATION.
- 2.3 CONTROL PANELS:
- A. FURNISH AND INSTALL LOCAL PANELS FOR INDICATING CONTROLLERS, SWITCHES, RELAYS, ETC. CONTROL PANELS SHALL BE FULLY ENCLOSED CABINETS, ALL STEEL CONSTRUCTION AND SHALL MEET THE REQUIREMENTS OF NEMA 1 ENCLOSURES. CABINET SHALL HAVE PIANO HINGED DOOR WITH A LOCKING LATCH. ALL CABINET LOCKS SHALL USE COMMON KEY. PROVIDE MEANS OF STORING CONTROL SYSTEM INSTRUCTIONS AND DRAWINGS INSIDE CABINET FOR FUTURE REFERENCE. PANEL SHALL BE WALL MOUNTED OR FREE STANDING AND LOCATED WHERE DIRECTED BY THE CONTRACT DRAWINGS OR ENGINEER. ALL GAUGES AND SWITCHES IN THE FACE OF PANELS SHALL BE IDENTIFIED WITH MICARTA NAMEPLATES WITH ETCHED WHITE FILLED LETTERS.

- A. ALL LINE VOLTAGE WIRING, ALL WIRING EXPOSED, AND ALL WIRING IN EQUIPMENT ROOMS SHALL BE INSTALLED IN CONDUIT IN ACCORDANCE TO THE ELECTRICAL SPECIFICATIONS.
- 2. ALL ELECTRIC AND ELECTRONIC WIRING SHALL BE #18 AWG MINIMUM THHN AND SHIELDED IF REQUIRED.

- A. FURNISH AND INSTALL AIR VOLUME CONTROL DEVICES WHERE INDICATED AND WHERE REQUIRED TO ADJUST AND BALANCE AIR FLOW IN THE SYSTEMS.

- A. UNLESS OTHERWISE NOTED, SPACE THERMOSTATS LOCATED IN CONDITIONED SPACES SHALL HAVE BLANK LOCKING COVERS. ALL THERMOSTAT LOCATIONS SHALL BE SUBMITTED AS REQUIRED BY THE SEQUENCE OF OPERATION. SPACE THERMOSTATS FOR AIR HANDLING UNITS SHALL BE SPECIFICALLY DESIGNED FOR UNIT WITH GAS HEAT AND DX COOLING.

- C. INSTALL CONTROL UNITS AND OTHER HARDWARE IN POSITION ON PERMANENT WALLS WHERE NOT SUBJECT TO EXCESSIVE VIBRATION.
- D. INSTALL IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.

- B. MANUAL VOLUME DAMPERS IN DUCTWORK SHALL BE FACTORY-ASSEMBLED UNITS WITH RIGID FRAME, OPPOSED-BLADE ACTION, AND LOCKING QUADRANT OPERATOR. MARK THE EXTENDED DAMPER SHAFT AND ALIGN THE OPERATING HANDLE TO INDICATE THE BLADE POSITION. DAMPERS SHALL BE AS MANUFACTURED BY RUSKIN, AMERICAN WARMING AND VENTILATING, INC., ARROW, OR APPROVED EQUAL. RECTANGULAR DAMPERS SHALL BE TYPE MD35, WITH STEEL CHANNEL FRAME, 16 GAUGE STEEL BLADES, 9" MAXIMUM BLADE SPACING, LOW PRESSURE, NYLON BEARINGS, GALVANIZED FINISH WITH ALUMINUM PAINT TOUCHUP. ROUND MANUAL BALANCING DAMPERS SHALL BE TYPE MDR35 MANUFACTURED BY RUSKIN, ARROW, AMERICAN WARMING AND VENTILATING, INC. OR AS APPROVED EQUAL.

- C. EACH THERMOSTAT SHALL BE CAPABLE OF PROGRAMMABLE TEMPERATURE SETTING, OCCUPIED/UNOCCUPIED TIME SETTING, MORNING WARM-UP/COOL DOWN CAPABILITIES, AS WELL AS MANUAL OVERRIDE CAPABILITY. THERMOSTATS SHALL HAVE 24 HOUR MECHANICAL BATTERY BACK-UP WITH AUTOMATIC BATTERY RE-CHARGE WHEN POWER IS RESTORED.

- E. CHECK AND VERIFY LOCATION OF THERMOSTATS, HUMIDISTATS, AND OTHER EXPOSED CONTROL SENSORS WITH PLANS AND ROOM DETAILS BEFORE INSTALLATION. ALIGN WITH LIGHTING SWITCHES AND HUMIDISTAT.
- F. MOUNT FREEZE PROTECTION THERMOSTATS USING FLANGES AND ELEMENT HOLDERS.

- C. MOTOR-OPERATED DAMPERS SHALL BE AS HEREINAFTER SPECIFIED UNDER SECTION 15850 "AUTOMATIC TEMPERATURE CONTROLS".

- D. PROVIDE PROTECTIVE PLASTIC GUARDS FOR ALL SPACE THERMOSTATS. GUARDS SHALL BE LOCKED VANDAL-PROOF TYPE. GUARDS SHALL BE REVIEWED AND APPROVED BY THE OWNER.

- G. MOUNT OUTDOOR RESET THERMOSTATS AND OUTDOOR SENSORS INDOORS, WITH SENSING ELEMENTS OUTDOORS WITH SUN SHIELD.

- D. FURNISH AND INSTALL DUCT COLLARS AND ANGLE IRON FRAMES FOR THE INSTALLATION OF ATC DAMPERS.

2.5 MONITORING SYSTEM, SENSORS AND WIRING

- H. PROVIDE SEPARABLE SOCKETS FOR LIQUIDS AND FLANGES FOR AIR BULB ELEMENTS.

SECTION 15850 - AUTOMATIC TEMPERATURE CONTROL

- E. SPACE THERMOSTATS SHALL BE SIEBE MODEL TC, HONEYWELL, JOHNSON, CARRIER OR APPROVED EQUAL.

- I. MOUNT CONTROL PANELS ADJACENT TO ASSOCIATED EQUIPMENT ON VIBRATION FREE WALLS OR FREE STANDING ANGLE IRON SUPPORTS. ONE CABINET MAY ACCOMMODATE MORE THAN ONE SYSTEM IN SAME EQUIPMENT ROOM. PROVIDE ENGRAVED PLASTIC NAMEPLATES FOR INSTRUMENTS AND CONTROLS INSIDE CABINET AND ENGRAVED PLASTIC NAMEPLATES ON CABINET FACE.

PART 1 - RELATED DOCUMENTS

- J. CHECK AND VERIFY LOCATION OF SPACE TEMPERATURE SENSORS AND HUMIDITY SENSORS WITH PLANS AND ROOM DETAILS BEFORE INSTALLATION. ALIGN WITH LIGHTING SWITCHES AND HUMIDISTATS.

1.1 SUMMARY:

- A. SENSORS AND OTHER DEVICES FOR INPUT/OUTPUT SUMMARY SCHEDULE
1. PROVIDE ALL NECESSARY SENSORS, RELAYS, PANELS, CONDUITS AND WIRE FOR THE POINTS INDICATED IN THE INPUT/OUTPUT SUMMARY AS SHOWN ON THE CONTRACT DRAWINGS.
 2. ANALOG SENSING ELEMENTS FOR REMOTE INDICATION SHALL BE INDEPENDENT OF LOCAL SENSORS USED FOR LOCAL CONTROL LOOPS.

- A. ALL WORK DONE UNDER THIS SECTION IS SUBJECT TO THE REQUIREMENTS OF SECTION 15100, "GENERAL MECHANICAL REQUIREMENTS".

- B. THE AUTOMATIC TEMPERATURE CONTROL SYSTEM ATC SHALL BE ELECTRIC/ELECTRONIC. ALL WORK ASSOCIATED WITH THE AUTOMATIC TEMPERATURE CONTROL SYSTEM SHALL BE PERFORMED BY PERSONNEL REGULARLY EMPLOYED BY THE CONTROLS MANUFACTURER.

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE No. 35222, EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN AND CONSTRUCTION FEATURES DISCLOSED ARE PROPRIETARY TO GIPE ASSOCIATES, INC. AND SHALL NOT BE ALTERED OR REUSED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF GIPE ASSOCIATES, INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers

849 Fairmount Ave.
Suite 102
Baltimore, MD 21206
Phone: 410/682-2419
Fax: 410/682-2419

8719 Brooke Drive
Suite 2-5
Aurora, MD 21701
Phone: 410/822-6848
Fax: 410/822-6808



WO# 13072.B

PROJECT MANAGER: MXN

DESIGNER: SAS

DATE: 12/23/2015

MECHANICAL SPECIFICATIONS
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

M9.4

FOREST HILL ACTIVITY CENTER

2213 COMMERCE ROAD

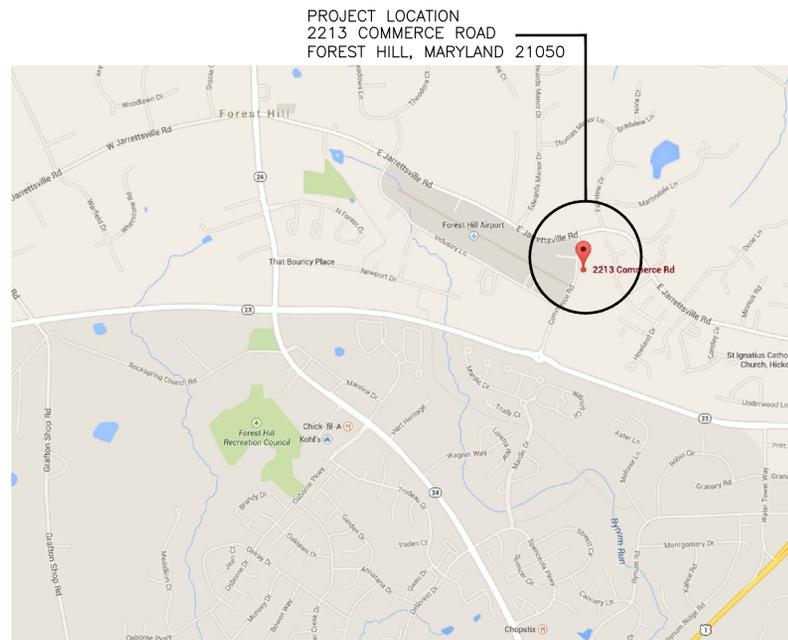
FOREST HILL, MARYLAND 21050

BID NO. 15-167 (COMPLETED)

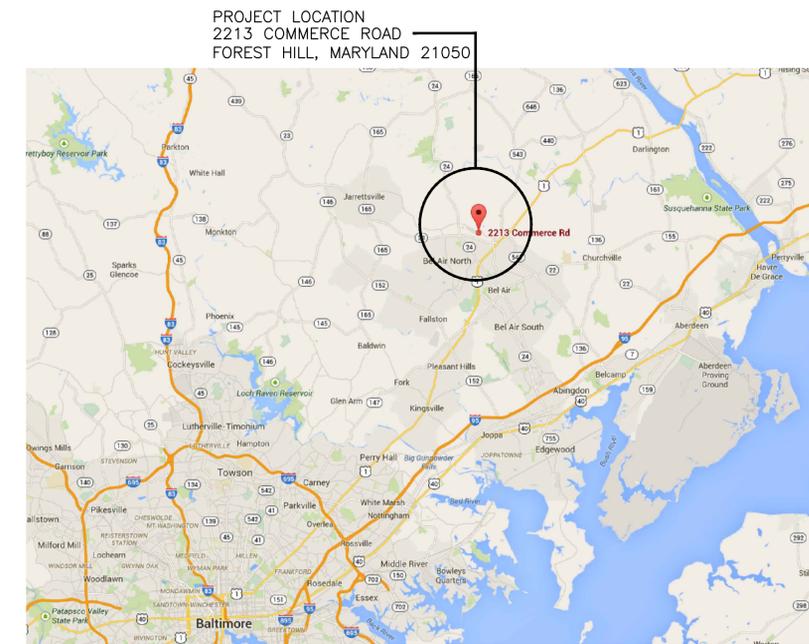
BID NO. 16-126



BID SET
DECEMBER 23, 2015



VICINITY MAP



LOCATION MAP

DRAWING LIST	
TO.1	TITLE SHEET
A1.1	ARCHITECTURAL PLANS
M0.1	MECHANICAL COVER SHEET
M1.1	POOL FLOOR PLAN - DEMOLITION
M1.2	ARENA FLOOR PLAN - DEMOLITION
M2.1	POOL FLOOR PLAN - EXISTING
M2.2	ARENA FLOOR PLAN - NEW WORK
M7.1	MECHANICAL DETAILS
M7.2	MECHANICAL DETAILS
M8.1	SEQUENCE OF OPERATION
M8.2	SEQUENCE OF OPERATION
M9.1	MECHANICAL SPECIFICATIONS
M9.2	MECHANICAL SPECIFICATIONS
M9.3	MECHANICAL SPECIFICATIONS
M9.4	MECHANICAL SPECIFICATIONS
E0.1	ELECTRICAL LEGEND AND GENERAL NOTES
E1.1	POOL AREA FIRST FLOOR PLAN - DEMOLITION
E1.2	ARENA AREA FIRST FLOOR PLAN - DEMOLITION
E2.1	POOL AREA FIRST FLOOR PLAN - EXISTING
E2.2	ARENA AREA FIRST FLOOR PLAN - NEW WORK
E3.1	RISER DIAGRAM & SCHEDULES
E4.1	DETAILS
E9.1	ELECTRICAL SPECIFICATIONS
E9.2	ELECTRICAL SPECIFICATIONS

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave Suite 102 Baltimore, MD 21286
Baltimore, Maryland (410)832-2420
Easton, Maryland (410)822-8688
W.O.# 13072.B

PROFESSIONAL CERTIFICATION

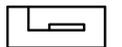
PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE DOCUMENTS
WERE PREPARED OR APPROVED BY ME,
AND THAT I AM A DULY LICENSED
PROFESSIONAL ENGINEER UNDER THE LAWS
OF THE STATE OF MARYLAND, LICENSE NO.
35222, EXPIRATION DATE: 01/05/2016.

NO.	DATE	DESCRIPTION

PROFESSIONAL CERTIFICATION:
I HEREBY CERTIFY THAT THESE
DOCUMENTS WERE PREPARED OR
APPROVED BY ME, AND THAT I
AM A DULY LICENSED
PROFESSIONAL ENGINEER UNDER
THE LAWS OF THE STATE OF
MARYLAND, LICENSE NO. 35222,
EXPIRATION DATE: 01/05/2016.

THIS DRAWING AND THE DESIGN
AND CONSTRUCTION FEATURES
DISCLOSED ARE PROPRIETARY TO
G.I.P.E. ASSOCIATES, INC. AND
SHALL NOT BE ALTERED OR
REUSED IN WHOLE OR IN PART
WITHOUT THE EXPRESS WRITTEN
PERMISSION OF G.I.P.E. ASSOCIATES,
INC. Copyright © 2015

Gipe Associates Inc.
Consulting Engineers
849 Fairmount Ave. Suite 102 Baltimore, MD 21286
8770 Brooke Drive Suite 2-5 Bel Air, MD 21054
Baltimore, MD 21286
Phone: (410)832-2420
Fax: (410)822-8688



W# 13072.B

PROJECT MANAGER MXN

DESIGNER SAS

DATE 12/23/2015

TITLE SHEET
FOREST HILL REC CENTER
FOREST HILL, MARYLAND

BID SET

DIRECTOR OF PUBLIC WORKS DATE

DIRECTOR OF PARKS & REC DATE

T0.1