# ABBREVIATIONS

| | |
|---|---|
| ø | PHASE |
| % EFF | PERCENT EFFICIENCY |
| °F | DEGREES FAHRENHEIT |
| ΔT | TEMPERATURE DIFFERENCE |
| A,AMP | AMPERES |
| AFF | ABOVE FINISHED FLOOR |
| AFG | ABOVE FINISHED GRADE |
| AHU | AIR HANDLING UNIT |
| AIC | AMPERE INTERRUPTING CAPACITY |
| APD | AIR PRESSURE DROP |
| ATC | AUTOMATIC TEMPERATURE CONTROL |
| AWG | AMERICAN WIRE GAUGE |
| BHP | BRAKE HORSEPOWER |
| BTU | BRITISH THERMAL UNIT |
| C,CND | CONDUIT |
| CAP | CAPACITY |
| CB | CIRCUIT BREAKER |
| CFM | CUBIC FEET PER MINUTE |
| CKT | CIRCUIT |
| DB | DRY BULB |
| DIA | DIAMETER |
| DIFF | DIFFUSER |
| DIST | DISTRIBUTION |
| DN | DOWN |
| DWG | DRAWING |
| EAT | ENTERING AIR TEMPERATURE |
| EF | EXHAUST FAN |
| ELECT. CHAR. | ELECTRICAL CHARACTERISTICS |
| EMS | ENERGY MANAGEMENT SYSTEM |
| EMT | ELECTRICAL METALLIC TUBING |
| ESP | EXTERNAL STATIC PRESSURE |
| ETR | EXISTING TO REMAIN |
| EWT | ENTERING WATER TEMPERATURE |
| EX,EXIST | EXISTING |
| EXH | EXHAUST |
| F | FUSE, FUSIBLE |
| FAAP | FIRE ALARM ANNUNCIATOR PANEL |
| FACP | FIRE ALARM CONTROL PANEL |
| FLA | FULL LOAD AMPERES |
| FPM | FEET PER MINUTE |
| FSS | FUSED SAFETY SWITCH |
| FT. H2O | FEET WATER GAUGE |
| FZ | FREEZE STAT |
| GFI | GROUND FAULT INTERRUPTING |
| G,GND | GROUND |
| GPM | GALLONS PER MINUTE |
| GSNK | GOOSENECK |
| GW | GROUND WIRE |
| HOA | HAND–OFF–AUTOMATIC |
| HP | HORSEPOWER |
| HT | HEIGHT |
| HZ | HERTZ |
| IN. H2O | INCHES WATER GAUGE |
| JB | JUNCTION BOX |
| KCMIL | THOUSAND CIRCULAR MILS |
| KVA | KILOVOLT–AMPERES |
| KW | KILOWATT |
| LAT | LEAVING AIR TEMPERATURE |
| LBS | POUNDS |
| LF | LINEAR FOOT |
| LRA | LOCKED ROTOR AMPERES |
| LV | LOW VOLTAGE |
| LWT | LEAVING WATER TEMPERATURE |
| MAX | MAXIMUM |
| MBH | BTU PER HOUR IN THOUSANDS |
| MCA | MINIMUM CIRCUIT AMPACITY |
| MCB | MAIN CIRCUIT BREAKER |
| MCP | MOTOR CIRCUIT PROTECTOR |
| MDP | MAIN DISTRIBUTION PANEL |
| MIN | MINIMUM |
| MLO | MAIN LUGS ONLY |
| MOP | MAXIMUM OVERCURRENT PROTECTION |
| MTD | MOUNTED |
| MH | MOUNTING HEIGHT |
| NC | NORMALLY CLOSED |
| NEC | NATIONAL ELECTRICAL CODE |
| NEMA | NATIONAL ELECTRICAL MANUFACTURER'S ASSOC. |
| NF | NON–FUSED |
| NFSS | NON–FUSED SAFETY SWITCH |
| NIC | NOT IN CONTRACT |
| NO | NORMALLY OPEN |
| No. | NUMBER |
| OAF | OUTSIDE AIR FAN |
| OAT | OUTSIDE AIR TEMPERATURE |
| OC | ON CENTER |
| P | POLE, POLES |
| PD | PRESSURE DROP |
| PNL | PANEL |
| PSI | POUNDS PER SQUARE INCH |
| PVC | POLYVINYL CHLORIDE |
| RAF | RETURN AIR FAN |
| REC,RECEPT | RECEPTACLE |
| REG | REGISTER |
| REQ'D | REQUIRED |
| RGS | RIGID GALVANIZED STEEL |
| RPM | REVOLUTIONS PER MINUTE |
| RX | REMOVE EXISTING |
| SAF | SUPPLY AIR FAN |
| SD | SMOKE DAMPER |
| SENS | SENSIBLE |
| SP | STATIC PRESSURE |
| SPC | STATIC PRESSURE CONTROLLER |
| SPLY | SUPPLY |
| SQ | SQUARE |
| SS | SAFETY SWITCH |
| STD | STANDARD |
| SWBD | SWITCHBOARD |
| SWT | SUPPLY WATER TEMPERATURE |
| TEMP | TEMPERATURE |
| TONS | TONS OF REFRIGERATION |
| TYP | TYPICAL |
| UON | UNLESS OTHERWISE NOTED |
| V | VOLT, VOLTS |
| VAV | VARIABLE AIR VOLUME |
| VEL | VELOCITY |
| VSD | VARIABLE SPEED DRIVE |
| W | WATTS/WIRE, WIRES |

## PROJECT

# BEL AIR LIBRARY CHILLER REPLACEMENT

100 E. PENNSYLVANIA AVE
BELAIR, MD 21014

## BID NO. 16-081

## HARFORD COUNTY GOVERNMENT
### DEPARTMENT OF PUBLIC WORKS
### CAPITAL PROJECTS
### 220 SOUTH MAIN STREET
### BEL AIR, MARYLAND


MECHANICAL/ELECTRICAL/PLUMBING

GIPE ASSOCIATES, INC.
DULANEY CENTER 1, SUITE 102
849 FAIRMOUNT AVENUE
BALTIMORE, MARYLAND 21286
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CS COVER SHEET

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M4 CHILLER REPLACEMENT PART PLANS & DETAILS – ADD ALTERNATE No.1 & No.2
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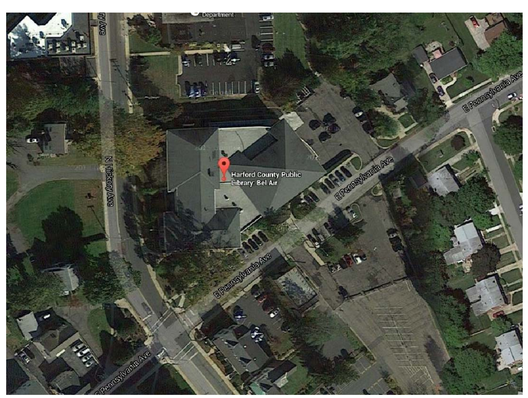
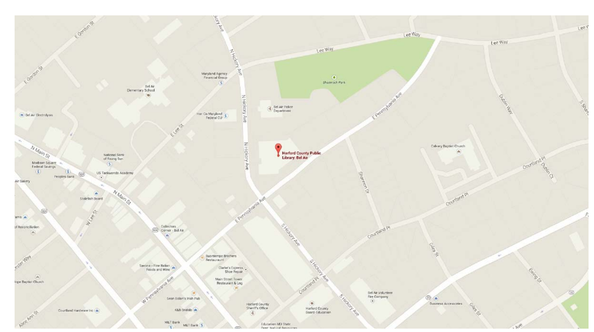
ELECTRICAL

E1 CHILLER REPLACEMENT PART PLANS – ELECTRICAL
E2 ELECTRICAL SPECIFICATIONS

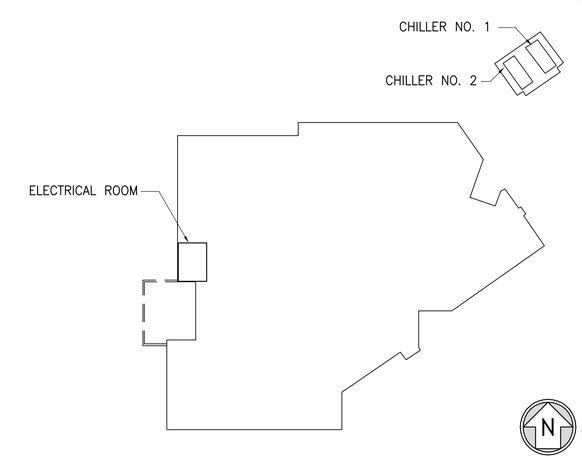

## LOCATION MAP NTS




## VICINITY MAP NTS



## CAMPUS MAP NTS




THIS PLAN AND SUBSEQUENT KEYPLANS SHOW THE GENERAL AREAS WHERE WORK IS TO TAKE PLACE UNDER A PARTICULAR PHASE AND IS TO BE USED FOR REFERENCE PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK THAT EXTENDS BEYOND THE PHASE BOUNDARY LINE. REFER TO MECHANICAL, AND ELECTRICAL DRAWINGS FOR THEIR INDIVIDUAL PHASING COORDINATION ITEMS AND THE PROJECT MANUAL FOR OVERLAPPING OF PHASING AND OTHER SPECIFIC REQUIREMENTS.

REVISIONS

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13072–D

PROJECT MANAGER MDM/DMD

DESIGNER MDM/JJS

COVER SHEET

BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

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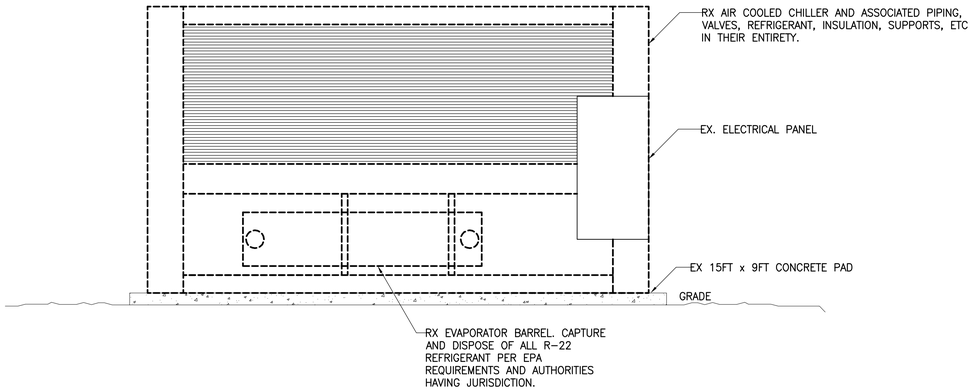
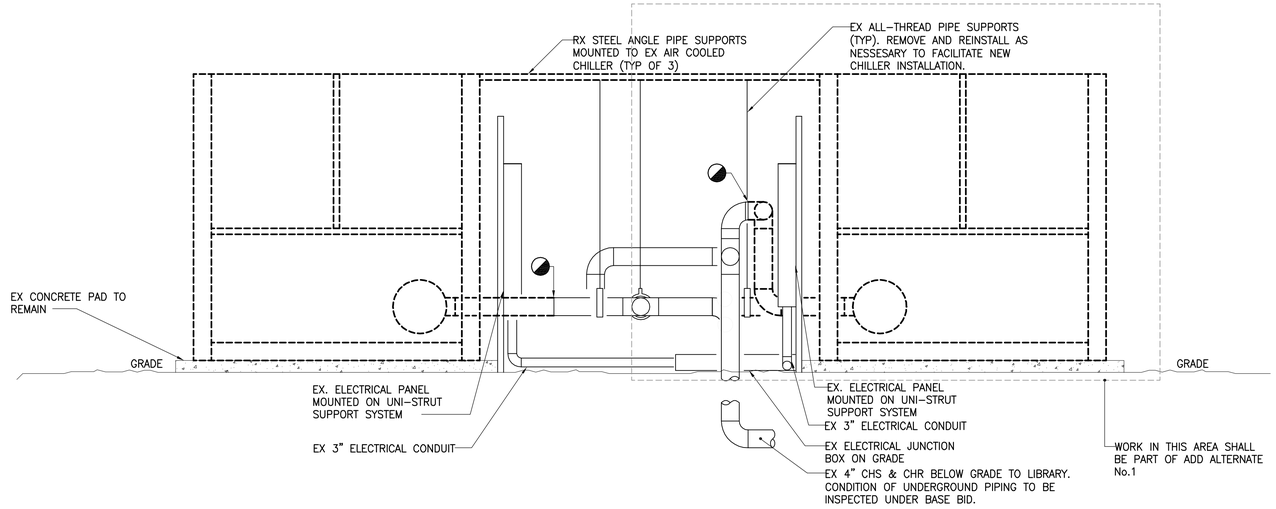


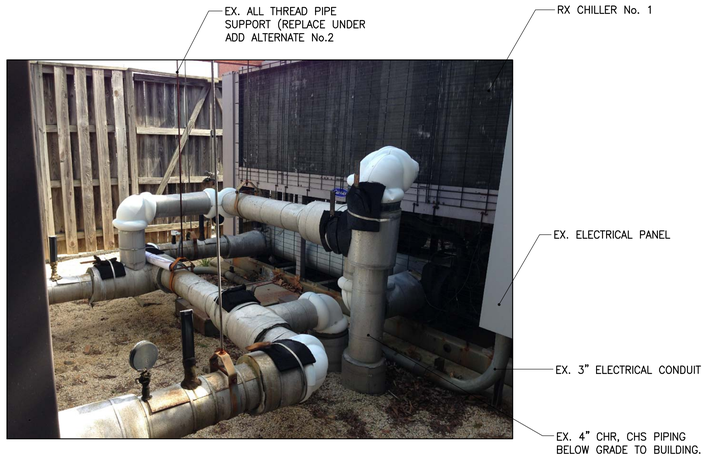

## EXISTING CHILLER DEMOLITION ELEVATION – SIDE VIEW

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




## EXISTING CHILLER DEMOLITION ELEVATION – END VIEW

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




## EXISTING CHILLER – DIGITAL ELEVATION A

SCALE: NONE

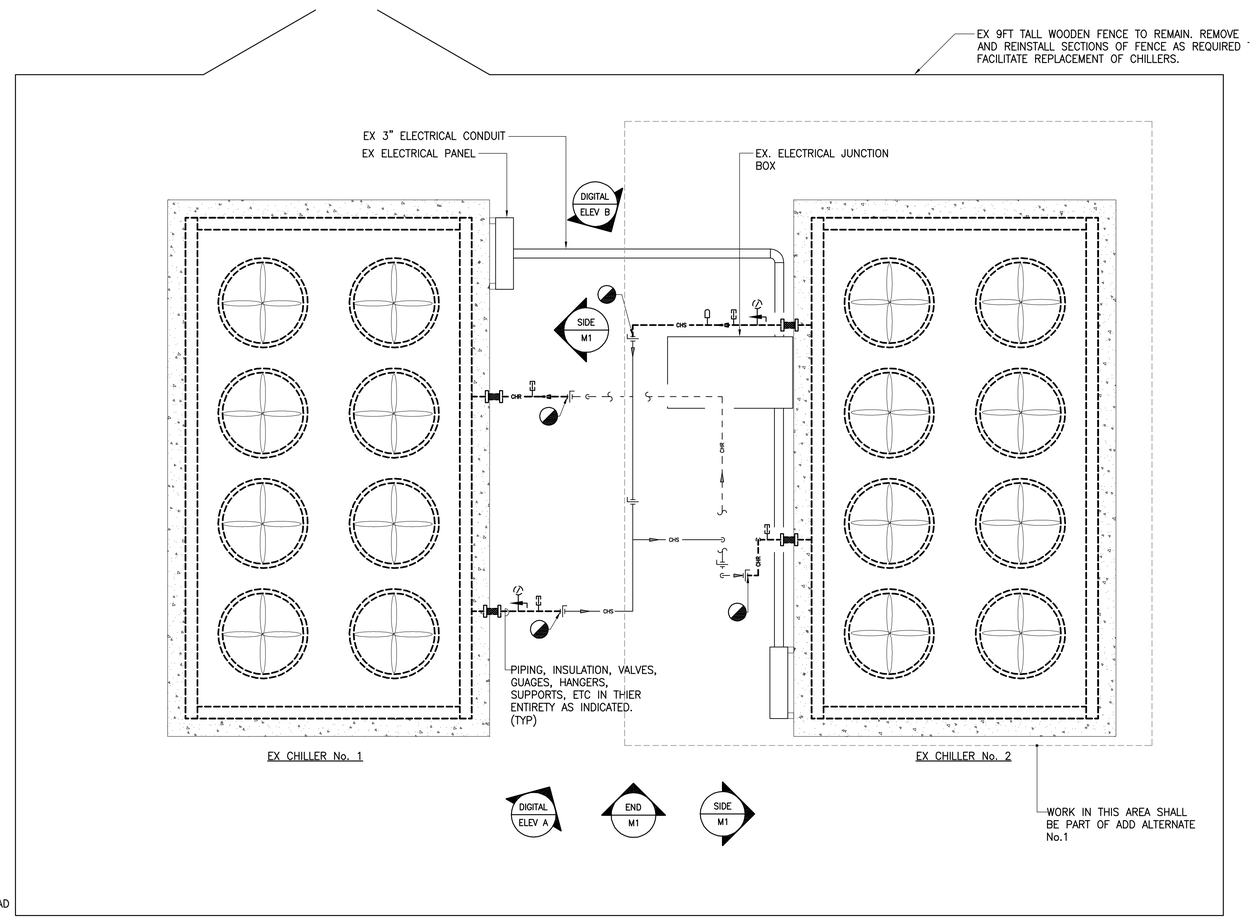
## EXISTING CHILLER – DIGITAL ELEVATION B

SCALE: NONE

## ADD ALTERNATES:

No. 1 – REPLACE CHILLER No. 2 IN ITS ENTIRETY AND RE-PIPE CHILLED WATER LINES TO EXISTING BUTTERFLY VALVES. EXTEND EXISTING CONCRETE PAD AS INDICATED.

No. 2 – REPLACE ALL EXTERIOR PIPING, VALVES, FITTINGS, INSULATION AND PIPE SUPPORTS IN ITS ENTIRETY.




## EXISTING CHILLER DEMOLITION PART PLAN

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

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

2 0 2 4

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Easton, Maryland

13072-D

PROJECT MANAGER MDM

DESIGNER MDM

CHILLER REPLACEMENT PART PLANS – DEMOLITION
BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

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M1

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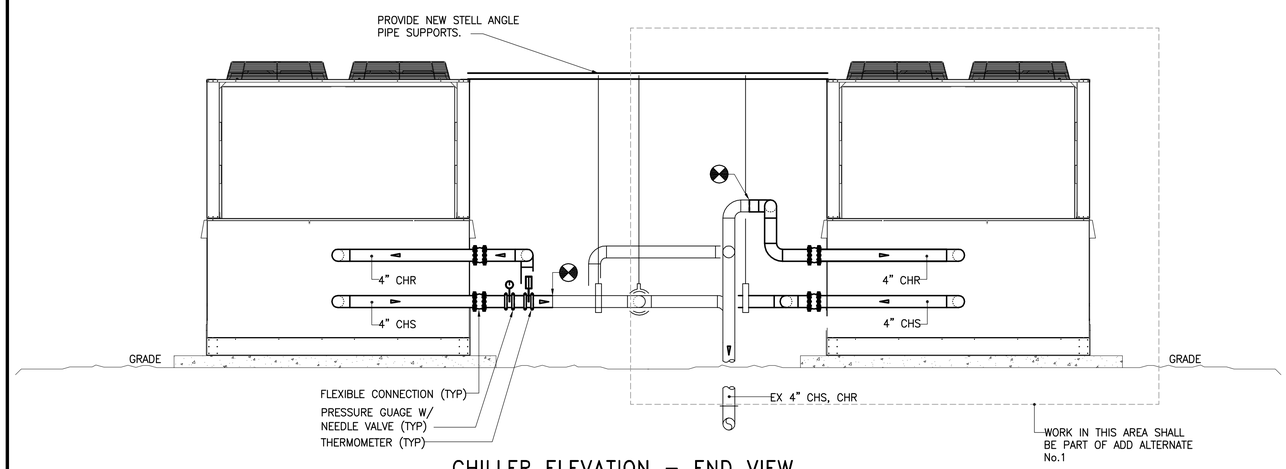
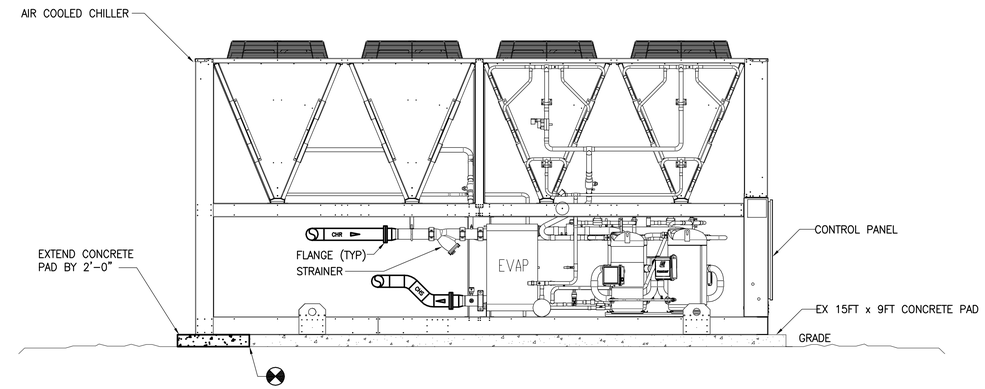


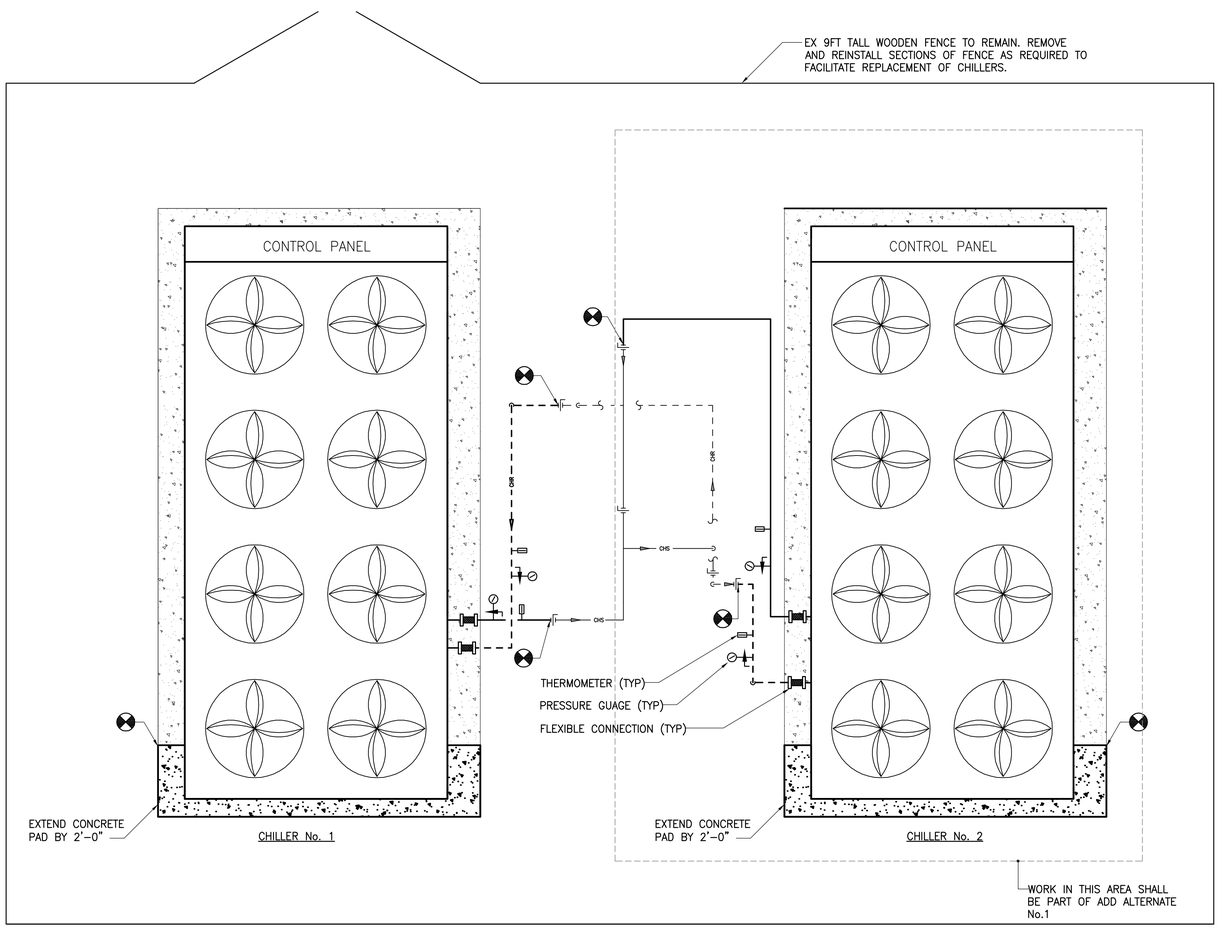

## CHILLER ELEVATION – END VIEW

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



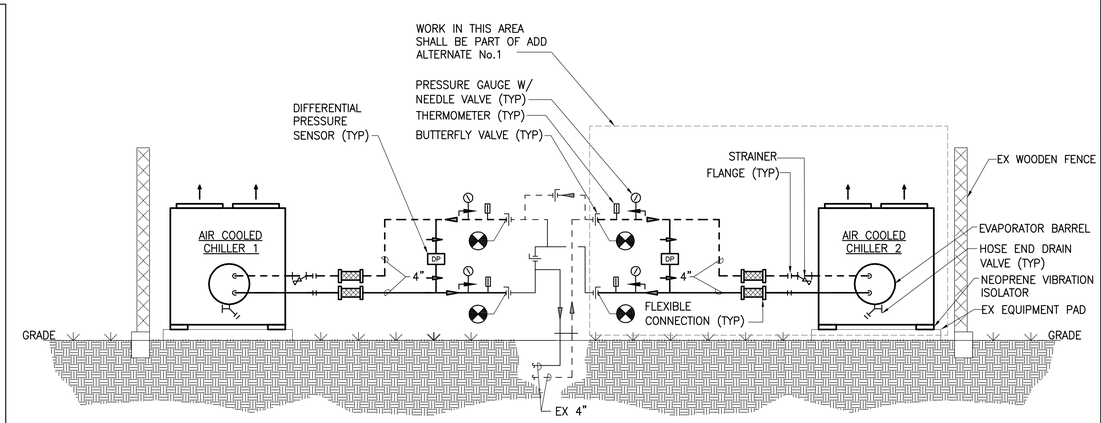

## CHILLER ELEVATION – SIDE VIEW

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




## CHILLER REPLACEMENT PART PLAN – NEW WORK

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




## CHILLER SYSTEM PIPING DETAIL

SCALE: NONE

NOTE: PROVIDE SELF REGULATING HEAT TRACE WITH THERMOSTAT (RAYCHEM XL TRACE) FOR ALL (EXISTING AND NEW) EXPOSED PIPING. PIPE FREEZE PROTECTION SYSTEM SHALL MAINTAIN A MINIMUM OF 40°F TEMPERATURE. ELECTRIC HEAT TRACE SHALL BE 120v – SIZED PER MANUFACTURERS RECOMMENDATIONS BASED ON 10°F OUTDOOR AIR TEMPERATURE.

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

2 0 2 4

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13072-D

PROJECT MANAGER MDM

DESIGNER MDM

CHILLER REPLACEMENT PART
PLANS & DETAILS
BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

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M2

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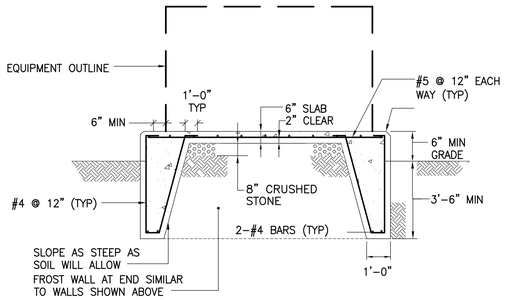


## TYPICAL CONCRETE EQUIPMENT PAD DETAIL

SCALE: NONE

## MECHANICAL EQUIPMENT NOTES:

### 1. AIR COOLED CHILLER

**GENERAL:**

AIR COOLED SCROLL TYPE WITH 4 COMPRESSORS
DIFFERENTIAL PRESSURE SENSOR FOR EVAPORATOR WATER INTERLOCKS
100 TON NOMINAL CAPACITY BASED ON R-410A
0.00010 FOULING FACTOR - EVAPORATOR
122.1 kW, 1.21 kW/TON
IPLV 15.5, 9.9 EER
MAX SOUND PRESSURE w/o ATTENUATION - 67dBA
MAX SOUND POWER w/o ATTENUATION - 95dBA

**EVAPORATOR:**

52.0°F EWT, 42.0°F LWT
100 TON CAPACITY @ FULL LOAD
300 GPM EVAPORATOR @
13.7 FT. MAX. WPD

**ELECTRICAL CHAR:**

SINGLE POINT POWER CONNECTION
277.1 MCA, 250 MAX FUSE SIZE
480v/3Ø/60Hz

**DIMENSIONS & WEIGHT:**

16'-0" LENGTH
7'-4" WIDTH
8'-3" HEIGHT
OPERATING WEIGHT: 5600 LBS

**MANUFACTURER:**

DAIKIN AGZ110E OR BY EQUAL OF TRANE, CARRIER, OR YORK/JCI.

## GENERAL NOTES

1. ALL ABOVEGROUND PIPING SHALL BE SCHEDULE 40 BLACK STEEL, GRADE B, TYPE E, ASTM A53 (ERW) WITH WELDED JOINTS.
2. STRAINERS SHALL BE "Y" TYPE, CONSTRUCTED OF CAST IRON, FLANGED ENDS, STAINLESS STEEL SCREENS WITH 1/8" PERFORATIONS AND BALL TYPE BLOWDOWN VALVE. STRAINER SHALL BE MUELLER No. 758 AND BLOWDOWN VALVE SHALL BE APPOLO 78-100/200 SERIES.
3. THERMOMETERS SHALL BE INDUSTRIAL TYPE, 9 INCH SCALE SIZE, BLUE ORGANIC FILLED, 0°F - 100°F RANGE WITH 1°F DIVISIONS, ANY ANGLE MOUNTING WITH BRASS THERMOMETER WELL, UNION HUB AND LAGGING EXTENSION. THERMOMETERS SHALL BE TRERICE INDUSTRIAL THERMOMETERS.
4. PRESSURE GAUGES SHALL BE BRONZE BOURDON TUBE TYPE, 4 1/2" DIAL, STEM MOUNTING, CAST ALUMINUM POINTER, 1% ACCURACY OVER MIDDLE HALF OF RANGE AND 1 1/25 ACCURACY OVER BALANCE. SELECT RANGE SO THAT NORMAL READINGS ARE AT THE APPROXIMATE MIDPOINT AND MAXIMUM SYSTEM PRESSURE DOES NOT EXCEED FULL SCALE. PROVIDE BALL TYPE GAUGE VALVE AND SNUBBER. SNUBBER SHALL BE MODEL 872 BY TRERICE AND PRESSURE GAUGE SHALL BE MODEL 600C BY TRERICE.
5. FLEXIBLE CONNECTIONS SHALL BE STRAIGHT TYPE, FABRICATED OF STAINLESS STEEL OR MONEL TUBE CONVERED WITH STAINLESS STEEL BRAID RESTRAINING AND PRESSURE COVER. FLEXIBLE CONNECTIONS SHALL BE 12 INCHES IN LENGTH WITH FLANGED ENDS AND BE TYPE BSS AS MANUFACTURED BY MASON INDUSTRIES.
6. FLANGES SHALL BE WROUGHT STEEL CLASS 150 WELDING NECK, ASTM STANDARD B16.5
7. INSULATION SHALL BE 2 INCH THICK FIBERGLASS WITH ALUMINUM WEATHER PROOF JACKETING SYSTEM (0.016" MINIMUM THICKNESS) WITH SMOOTH ALUMINUM ELBOWS BY CHILDERS. LONGITUDINAL JOINTS SHALL BE SEALED COMPLETELY.
8. ALL EXTERIOR PIPE HANGERS AND SUPPORTS SHALL BE CONSTRUCTED OF HOT DIPPED GALVANIZED STEEL. ALL FASTENERS (BOLTS, RODS, WASHERS, NUTS, ETC.) SHALL BE CONSTRUCTED OF STAINLESS STEEL.
9. INTERLOCK DIFFERENTIAL PRESSURE SWITCH WITH CHILLER CONTROL PANEL. INTERLOCK CHILLER START/STOP CONTROL WITH THE EXISTING BUILDING ATC SYSTEM AND PUMP START/STOP COMMAND. ALSO MONITOR WATER TEMPERATURE (AI), CHILLER FAILURE ALARMS, PUMP FAILURE ALARMS, & PROVIDE PUMP LEAD/LAG CONTROL. THE CHILLED WATER SYSTEM SHALL ENERGIZE WHENEVER THE OUTSIDE AIR TEMPERATURES ARE 60°F AND HIGHER WHEN THE BUILDING IS IN OCCUPIED MODE. THE CHILLER SHALL BE ALLOWED TO RUN WHEN PROOF OF WATER FLOW HAS BEEN ESTABLISHED. WHEN DE-ENERGIZED THE CHILLED WATER PUMP SHALL CONTINUE TO RUN FOR AN ADDITIONAL 5 MINUTES. INTERFACE THE CHILLER CONTROL PANEL WITH THE EXISTING COUNTY ENERGY MANAGEMENT SYSTEM.

## ADD ALTERNATES:

No. 1 - REPLACE CHILLER No. 2 IN ITS ENTIRETY AND RE-PIPE CHILLED WATER LINES TO EXISTING BUTTERFLY VALVES. EXTEND EXISTING CONCRETE PAD AS INDICATED.

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13072-D

PROJECT MANAGER MDM

DESIGNER MDM

CHILLER REPLACEMENT NOTES AND DETAILS
BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

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M3

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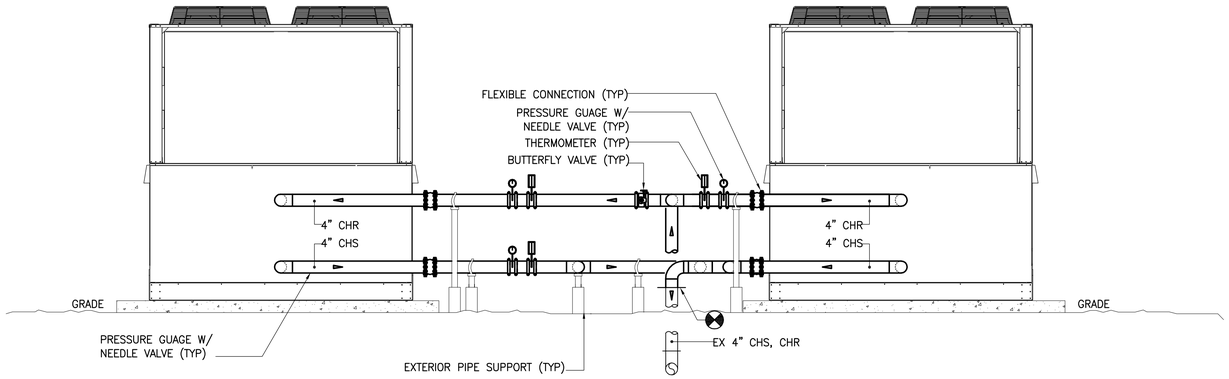
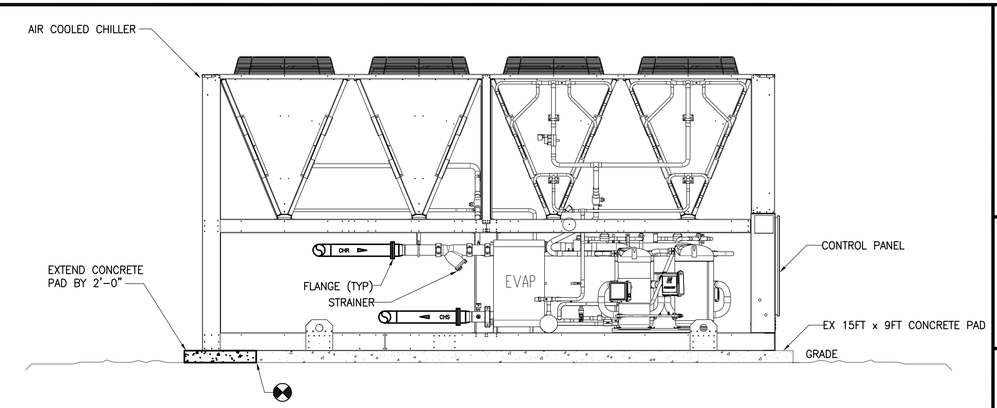



## CHILLER ELEVATION – END VIEW

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

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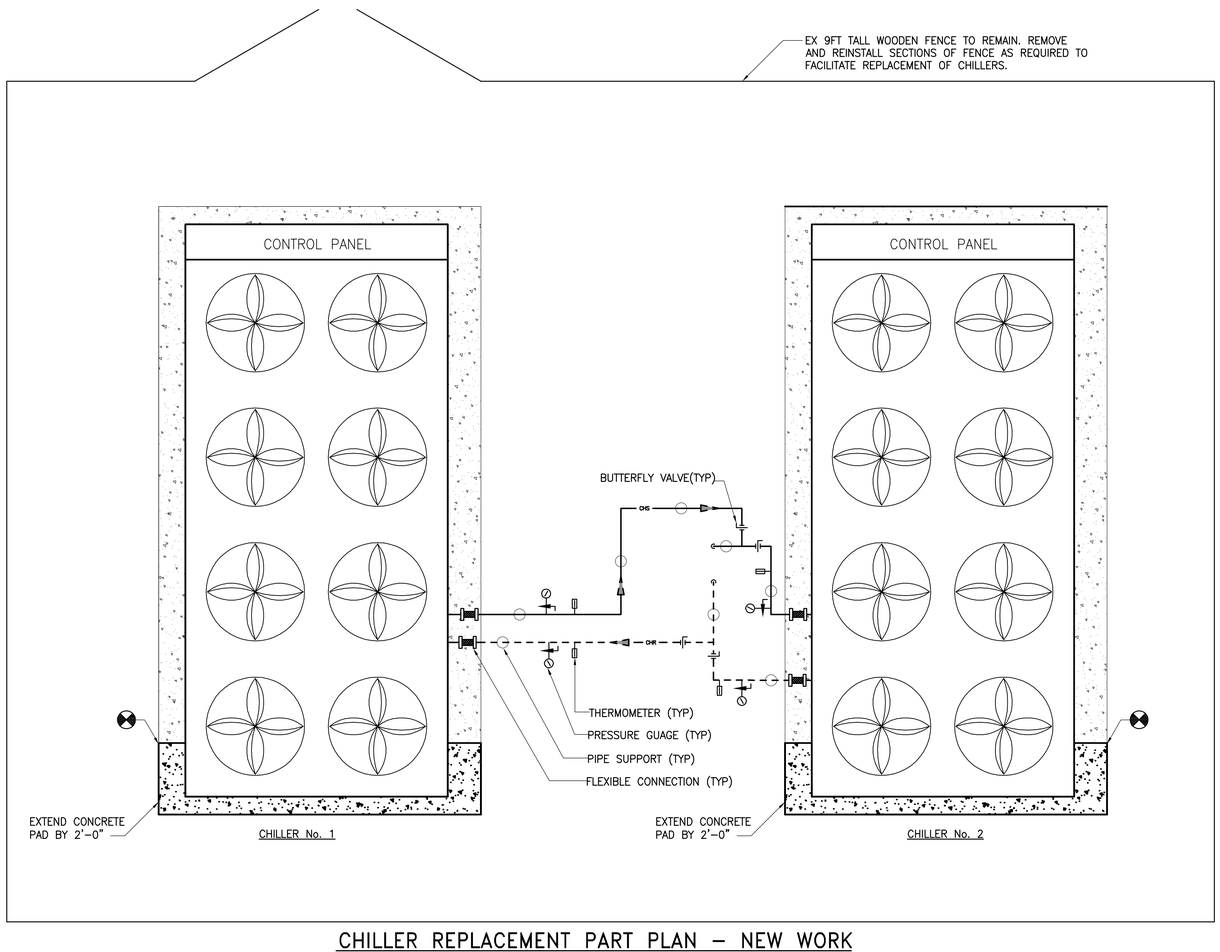
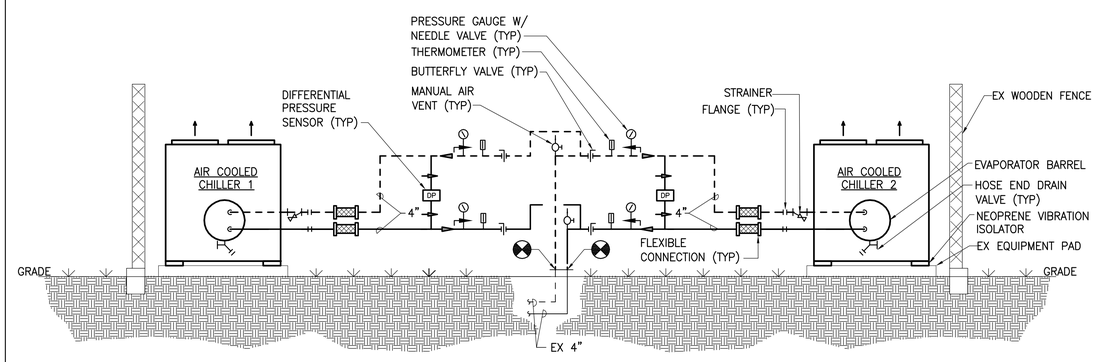



## CHILLER REPLACEMENT PART PLAN – NEW WORK

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




## CHILLER SYSTEM PIPING DETAIL

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PROJECT MANAGER MDM

DESIGNER MDM

CHILLER REPLACEMENT PART PLANS & DETAILS ADD ALTERNATE No.1 & No.2
BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

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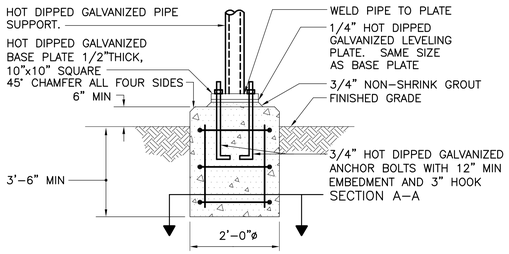
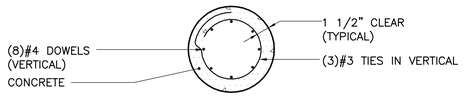
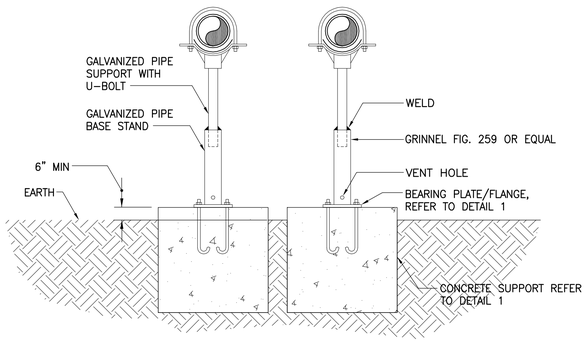



SECTION A-A

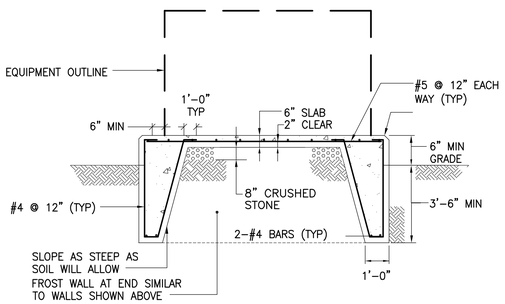
## EXTERIOR PIPE SUPPORT AND FOUNDATION DETAIL 1

SCALE: NONE




## TYPICAL PIPE SUPPORT DETAIL 2

SCALE: NONE




## TYPICAL CONCRETE EQUIPMENT PAD DETAIL

SCALE: NONE

## ADD ALTERNATES:

No. 1 – REPLACE CHILLER No. 2 IN ITS ENTIRETY AND RE-PIPE CHILLED WATER LINES TO EXISTING BUTTERFLY VALVES. EXTEND EXISTING CONCRETE PAD AS INDICATED.

No. 2 – REPLACE ALL EXTERIOR PIPING, VALVES, FITTINGS, INSULATION AND PIPE SUPPORTS IN ITS ENTIRETY.

## GENERAL NOTES

1. ALL ABOVEGROUND PIPING SHALL BE SCHEDULE 40 BLACK STEEL, GRADE B, TYPE E, ASTM A53 (ERW) WITH WELDED JOINTS.
2. BUTTERFLY VALVES SHALL BE HIGH PERFORMANCE TYPE, LUG STYLE WITH GEAR OPERATOR. VALVES SHALL BE DEZURICK HP, MILWAUKEE, BRAY, KEYSTONE OR JAMESBURY.
3. STRAINERS SHALL BE "Y" TYPE, CONSTRUCTED OF CAST IRON, FLANGED ENDS, STAINLESS STEEL SCREENS WITH 1/8" PERFORATIONS AND BALL TYPE BLOWDOWN VALVE. STRAINER SHALL BE MUELLER No. 758 AND BLOWDOWN VALVE SHALL BE APPOLO 78-100/200 SERIES.
4. THERMOMETERS SHALL BE INDUSTRIAL TYPE, 9 INCH SCALE SIZE, BLUE ORGANIC FILLED, 0°F – 100°F RANGE WITH 1°F DIVISIONS, ANY ANGLE MOUNTING WITH BRASS THERMOMETER WELL, UNION HUB AND LAGGING EXTENSION. THERMOMETERS SHALL BE TRERICE INDUSTRIAL THERMOMETERS.
5. PRESSURE GAUGES SHALL BE BRONZE BOURDON TUBE TYPE, 4 1/2" DIAL, STEM MOUNTING, CAST ALUMINUM POINTER, 1% ACCURACY OVER MIDDLE HALF OF RANGE AND 1 1/25 ACCURACY OVER BALANCE. SELECT RANGE SO THAT NORMAL READINGS ARE AT THE APPROXIMATE MIDPOINT AND MAXIMUM SYSTEM PRESSURE DOES NOT EXCEED FULL SCALE. PROVIDE BALL TYPE GAUGE VALVE AND SNUBBER. SNUBBER SHALL BE MODEL 872 BY TRERICE AND PRESSURE GAUGE SHALL BE MODEL 600C BY TRERICE.
6. FLEXIBLE CONNECTIONS SHALL BE STRAIGHT TYPE, FABRICATED OF STAINLESS STEEL OR MONEL TUBE CONVERED WITH STAINLESS STEEL BRAID RESTRAINING AND PRESSURE COVER. FLEXIBLE CONNECTIONS SHALL BE 12 INCHES IN LENGTH WITH FLANGED ENDS AND BE TYPE BSS AS MANUFACTURED BY MASON INDUSTRIES.
7. FLANGES SHALL BE WROUGHT STEEL CLASS 150 WELDING NECK, ASTM STANDARD B16.5
8. INSULATION SHALL BE 2 INCH THICK FIBERGLASS WITH ALUMINUM WEATHER PROOF JACKETING SYSTEM (0.016" MINIMUM THICKNESS) WITH SMOOTH ALUMINUM ELBOWS BY CHILDERS. LONGITUDINAL JOINTS SHALL BE SEALED COMPLETELY.
9. ALL EXTERIOR PIPE HANGERS AND SUPPORTS SHALL BE CONSTRUCTED OF HOT DIPPED GALVANIZED STEEL. ALL FASTENERS (BOLTS, RODS, WASHERS, NUTS, ETC.) SHALL BE CONSTRUCTED OF STAINLESS STEEL.
10. INTERLOCK DIFFERENTIAL PRESSURE SWITCH WITH CHILLER CONTROL PANEL. INTERLOCK CHILLER START/STOP CONTROL WITH THE EXISTING BUILDING ATC SYSTEM AND PUMP START/STOP COMMAND. ALSO MONITOR WATER TEMPERATURE (AI), CHILLER FAILURE ALARMS, PUMP FAILURE ALARMS, & PROVIDE PUMP LEAD/LAG CONTROL. THE CHILLED WATER SYSTEM SHALL ENERGIZE WHENEVER THE OUTSIDE AIR TEMPERATURES ARE 60°F AND HIGHER WHEN THE BUILDING IS IN OCCUPIED MODE. THE CHILLER SHALL BE ALLOWED TO RUN WHEN PROOF OF WATER FLOW HAS BEEN ESTABLISHED. WHEN DE-ENERGIZED THE CHILLED WATER PUMP SHALL CONTINUE TO RUN FOR AN ADDITIONAL 5 MINUTES. INTERFACE THE CHILLER CONTROL PANEL WITH THE EXISTING COUNTY ENERGY MANAGEMENT SYSTEM.

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

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13072-D

PROJECT MANAGER MDM

DESIGNER MDM

CHILLER REPLACEMENT NOTES & DETAILS ADD ALTERNATE No.1 & No.2
BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

| DATE | DESCRIPTION |
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M5

BID DOCUMENTS
6/19/2015

# CHILLER SPECIFICATIONS:

PART 1: GENERAL

1.1 SUMMARY

A. SECTION INCLUDES DESIGN, PERFORMANCE CRITERIA, REFRIGERANTS, CONTROLS, AND INSTALLATION REQUIREMENTS FOR AIR COOLED SCROLL COMPRESSOR CHILLERS.

1.2 REFERENCES

A. COMPLY WITH APPLICABLE STANDARDS/CODES OF ARI 550/590, ANSI/ASHRAE 15, ASHRAE 90.1 CURRENT VERSION REQUIREMENTS, OSHA, AND ASME SECTION VIIII.

1.3 SUBMITTALS

A. SUBMIT SHOP DRAWINGS AND PRODUCT DATA IN ACCORDANCE WITH THE SPECIFICATIONS.

B. SUBMITTALS SHALL INCLUDE THE FOLLOWING:

1. DIMENSIONED PLAN AND ELEVATION VIEW DRAWINGS, REQUIRED CLEARANCES, AND LOCATION OF ALL FIELD CONNECTIONS
2. SUMMARY OF ALL AUXILIARY UTILITY REQUIREMENTS SUCH AS ELECTRICITY, WATER, ETC. SUMMARY SHALL INDICATE QUALITY AND QUANTITY OF EACH REQUIRED UTILITY.
3. SINGLE LINE SCHEMATIC DRAWING OF THE FIELD POWER HOOKUP REQUIREMENTS, INDICATING ALL ITEMS THAT ARE FURNISHED.
4. SCHEMATIC DIAGRAM OF CONTROL SYSTEM INDICATING POINTS FOR FIELD INTERFACE/CONNECTION.
5. DIAGRAM SHALL FULLY DELINEATE FIELD AND FACTORY WIRING.
6. CERTIFICATION OF FACTORY–RUN TEST OF PACKAGED CHILLER UNIT SIGNED BY COMPANY OFFICER.
7. INSTALLATION AND OPERATING MANUALS.

1.4 QUALITY ASSURANCE

A. QUALIFICATIONS: EQUIPMENT MANUFACTURER MUST SPECIALIZE IN THE MANUFACTURE OF THE PRODUCTS SPECIFIED AND HAVE FIVE YEARS EXPERIENCE WITH THE TYPE OF EQUIPMENT.

B. REGULATORY REQUIREMENTS: COMPLY WITH THE CODES AND STANDARDS SPECIFIED.

C. CHILLER MANUFACTURER PLANT MUST BE ISO9002 REGISTERED.

1.5 DELIVERY AND HANDLING

A. CHILLERS SHALL BE DELIVERED TO THE JOB SITE COMPLETELY ASSEMBLED AND CHARGED WITH REFRIGERANT AND OIL BY THE MANUFACTURER.

B. COMPLY WITH THE MANUFACTURER'S INSTRUCTIONS FOR RIGGING AND HANDLING EQUIPMENT.

1.6 WARRANTY

A. THE REFRIGERATION EQUIPMENT MANUFACTURER'S WARRANTY SHALL BE FOR A PERIOD OF FIVE (5) YEARS FROM OWNER ACCEPTANCE. IT SHALL COVER REPLACEMENT PARTS (AND THE LABOR TO REPLACE THEM) AND LOSS OF REFRIGERANT.

PART 2: PRODUCTS

2.1 AIR COOLED CHILLER (SCROLL)

A. GENERAL: UNITS SHALL BE LEAK AND PRESSURE TESTED AT 390 PSIG HIGH SIDE, 250 PSIG LOW SIDE, THEN EVACUATED AND CHARGED. ALL AIR–COOLED CHILLERS SHALL BE FACTORY–TESTED PRIOR TO SHIPMENT. PROVIDE OPERATING CHARGE OF OIL AND REFRIGERANT AND ALL ASSOCIATED REFRIGERANT PIPING SUCH THAT THE SYSTEM SHALL BE FULLY CHARGED. REFRIGERANT SHALL BE R410A. UNIT PANELS, STRUCTURAL ELEMENTS AND CONTROL BOXES SHALL BE CONSTRUCTED OF GALVANIZED STEEL. UNIT PANELS AND CONTROL BOXES SHALL BE FINISHED WITH A BAKED–ON POWDER PAINT. ALL PAINT SHALL MEET THE REQUIREMENT FOR OUTDOOR EQUIPMENT OF THE US NAVY AND OTHER FEDERAL GOVERNMENT AGENCIES.

B. EVAPORATOR: THE EVAPORATOR SHALL BE DIRECT EXPANSION, BRAZED PLATE TO PLATE TYPE HEAT EXCHANGER CONSISTING OF PARALLEL STAINLESS STEEL PLATES. TWO INDEPENDENT REFRIGERANT CIRCUITS WITHIN THE EVAPORATOR SERVE THE UNIT'S DUAL REFRIGERANT CIRCUITS. FOR WATER REMOVAL, 3/8" (10MM) VENT AND DRAIN PLUGS ARE PROVIDED ON THE TOP AND BOTTOM OF THE SHELL. THE EVAPORATOR SHALL HAVE AN ELECTRIC RESISTANCE HEATER AND BE INSULATED WITH 3/4" (19MM) THICK VINYL NITRATE POLYMER SHEET INSULATION, PROTECTING AGAINST WATER FREEZE–UP AT AMBIENT AIR TEMPERATURES TO –20' F (–29' C). AN AMBIENT AIR THERMOSTAT CONTROLS THE HEATER CABLE. THE FITTED AND GLUED–IN–PLACE INSULATION SHALL HAVE A K FACTOR OF AT LEAST 0.28 AT 75' F (23' C). THE WATER SIDE WORKING PRESSURE SHALL BE 150 PSIG (1035 KPA). EACH EVAPORATOR SHALL BE DESIGNED, CONSTRUCTED, INSPECTED, AND STAMPED ACCORDING TO THE REQUIREMENTS OF THE ASME BOILER AND PRESSURE VESSEL CODE.

C. CONDENSER AND FANS: CONDENSER FANS SHALL BE PROPELLER TYPE ARRANGED FOR VERTICAL AIR DISCHARGE AND INDIVIDUALLY DRIVEN BY DIRECT–DRIVE FAN MOTORS. THE FANS SHALL BE EQUIPPED WITH A HEAVY–GAUGE VINYL–COATED FAN GUARD. FAN MOTORS SHALL BE TEAO TYPE WITH PERMANENTLY LUBRICATED BALL BEARINGS, INHERENT OVERLOAD PROTECTION, THREE–PHASE, DIRECT–DRIVE, 1140 RPM. EACH FAN SECTION SHALL BE PARTITIONED TO AVOID CROSS CIRCULATION. COIL SHALL BE ALL ALUMINUM ALLOY MICROCHANNEL DESIGN AND SHALL HAVE A SERIES OF FLAT TUBES CONTAINING MULTIPLE, PARALLEL FLOW MICROCHANNELS LAYERED BETWEEN THE REFRIGERANT MANIFOLDS. COILS SHALL CONSIST OF A TWO–PASS ARRANGEMENT. EACH CONDENSER COIL SHALL BE FACTORY LEAK TESTED WITH HIGH–PRESSURE AIR UNDER WATER. COILS SHALL WITHSTAND 1000+ HOUR ACIDIFIED SYNTHETIC SEA WATER FOG (SWAAT) TEST (ASTM G85–02) AT 120°F (49°C) WITH 0% FIN LOSS AND DEVELOP NO LEAKS.

D. COMPRESSOR AND LUBE OIL SYSTEM: THE COMPRESSORS SHALL BE SEALED HERMETIC, SCROLL TYPE WITH CRANKCASE OIL HEATER AND SUCTION STRAINER. COMPRESSOR SHALL HAVE A FORCED–FEED LUBRICATION SYSTEM WITH A REVERSIBLE OIL PUMP AND OIL CHARGE. THE COMPRESSOR MOTOR SHALL BE REFRIGERANT GAS COOLED, HIGH TORQUE, HERMETIC INDUCTION TYPE, TWO–POLE, WITH INHERENT THERMAL PROTECTION ON ALL THREE PHASES AND SHALL BE MOUNTED ON RIS VIBRATION ISOLATOR PADS.

E. REFRIGERATION CIRCUITS: THE REFRIGERANT CIRCUIT SHALL INCLUDE A REFRIGERANT FILTER–DRIER, SIGHT GLASS WITH MOISTURE INDICATOR, LIQUID LINE SOLENOID VALVE (NO EXCEPTIONS), THERMAL EXPANSION VALVE, AND INSULATED SUCTION LINE.

F. UNIT CONTROLS: ALL UNIT CONTROLS SHALL BE HOUSED IN AN OUTDOOR RATED WEATHERTIGHT ENCLOSURE WITH REMOVABLE PLATES TO ALLOW FOR CUSTOMER CONNECTION OF POWER WIRING AND REMOTE INTERLOCKS. ALL CONTROLS, INCLUDING SENSORS, SHALL BE FACTORY–MOUNTED AND TESTED PRIOR TO SHIPMENT. MICROCOMPUTER CONTROLS SHALL PROVIDE ALL CONTROL FUNCTIONS INCLUDING START–UP AND SHUT–DOWN, LEAVING CHILLED WATER TEMPERATURE, CONTROL, COMPRESSOR AND ELECTRONIC EXPANSION VALVE MODULATION, FAN SEQUENCING, ANTI–RECYCLE LOGIC, AUTOMATIC LEAD/LAG COMPRESSOR STARTING AND LOAD LIMITING. THE UNIT CONTROL MODULE, AN MICROPROCESSOR, SHALL AUTOMATICALLY TO TAKE ACTION AVOID UNIT SHUTDOWN DUE TO ABNORMAL OPERATING CONDITIONS ASSOCIATED WITH LOW REFRIGERANT PRESSURE, HIGH CONDENSING PRESSURE, AND MOTOR CURRENT OVERLOAD. SHOULD THE ABNORMAL OPERATING CONDITION CONTINUE UNTIL A PROTECTIVE LIMIT IS VIOLATED, THE UNIT WILL BE SHUT DOWN. SHUTDOWN ALARMS ARE NO EVAPORATOR WATER FLOW, SENSORS FAILURES, LOW EVAPORATOR PRESSURE, EVAPORATOR FREEZE PROTECTION, HIGH CONDENSER PRESSURE, OUTSIDE AMBIENT TEMPERATURE, MOTOR PROTECTION SYSTEM, PHASE VOLTAGE PROTECTION. LIMIT ALARMS ARE AS FOLLOWS: CONDENSER PRESSURE STAGE DOWN, UNLOADS UNIT AT HIGH DISCHARGE PRESSURES, LOW AMBIENT LOCKOUT, SHUTS OFF UNIT AT LOW AMBIENT TEMPERATURES, LOW EVAPORATOR PRESSURE HOLD, HOLDS STAGE #1 UNTIL PRESSURE RISES, LOW EVAPORATOR PRESSURE UNLOAD, SHUTS OFF ONE COMPRESSOR.
THE UNIT SHALL BE PROTECTED IN TWO WAYS: (1) BY ALARMS THAT SHUT THE UNIT DOWN AND REQUIRE MANUAL RESET TO RESTORE UNIT OPERATION AND (2) BY LIMIT ALARMS THAT REDUCE UNIT OPERATION IN RESPONSE TO SOME OUT–OF–LIMIT CONDITION. SHUT DOWN ALARMS SHALL ACTIVATE AN ALARM SIGNAL.
A DIGITAL DISPLAY SHALL INDICATE CHILLED WATER SETPOINT AND LEAVING CHILLED WATER TEMPERATURE AS STANDARD. CURRENT LIMIT SETPOINT, EVAPORATOR AND CONDENSER REFRIGERANT PRESSURES AND ELECTRICAL INFORMATION SHALL BE PROVIDED. BOTH STANDARD AND OPTIONAL DISPLAYS CAN BE VIEWED ON THE UNIT WITHOUT OPENING ANY CONTROL PANEL DOORS. STANDARD POWER CONNECTIONS SHALL INCLUDE MAIN THREE PHASE POWER TO THE COMPRESSORS, CONDENSER FANS, AND CONTROL POWER TRANSFORMER. PROVIDE A BACNET COMMUNICATION CARD FOR INTERFACING WITH THE EXISTING BUILDING ATC/EMS SYSTEM (BACNET MS/TP).

G. STARTERS: STARTERS ARE HOUSED IN A WEATHERTIGHT ENCLOSURE WITH REMOVABLE COVER PLATE TO ALLOW FOR CUSTOMER CONNECTION OF POWER WIRING. REDUCED VOLTAGE WYE DELTA CLOSED TRANSITION STARTERS SHALL BE PROVIDED.

H. CHILLED WATER RESET: THIS PROVIDES THE CONTROL LOGIC AND FACTORY INSTALLED SENSORS TO RESET LEAVING CHILLED WATER TEMPERATURE. THE SETPOINT CAN BE RESET BASED ON AMBIENT TEMPERATURE OR RETURN EVAPORATOR WATER TEMPERATURE.

I. FLOW CONTROL: THIS PROVIDES THE CONTROL LOGIC AND RELAYS TO TURN THE CHILLED WATER FLOW ON AND OFF AS THE CHILLER REQUIRES FOR OPERATION AND PROTECTION.

J. REMOTE INPUT: PERMITS REMOTE CHILLED LIQUID SETPOINT, REMOTE CURRENT LIMIT SETPOINT, OR BOTH BY ACCEPTING A 4–20 MA OR 2–10 VDC ANALOG SIGNAL.

K. REMOTE OUTPUT: PERMITS ALARM RELAY OUTPUTS, ICE MAKING OUTPUTS, OR BOTH.

L. COIL PROTECTION: LOUVERED PANELS PROTECT THE CONDENSER COILS ONLY.

M. NON–FUSED POWER DISCONNECT SWITCH: THE NON–FUSED MOLDED CASE DISCONNECT SWITCH (UL APPROVED) IS USED TO DISCONNECT THE CHILLER FROM MAIN POWER AND COMES PRE–WIRED FROM THE FACTORY WITH TERMINAL BLOCK POWER CONNECTIONS. THE EXTERNAL OPERATOR HANDLE IS LOCKABLE.

N. NEOPRENE ISOLATORS: ISOLATORS TO PROVIDE ISOLATION BETWEEN CHILLER AND STRUCTURE TO HELP ELIMINATE VIBRATION TRANSMISSION.

O. FLANGE KIT: PROVIDES A RAISED–FACE FLANGE KIT THAT CONVERTS THE GROOVED PIPE EVAPORATOR WATER CONNECTIONS TO FLANGE CONNECTORS.

P. PROVIDE FULL SIZED PROTECTIVE/ACOUSTICAL PANELS AND COMPRESSOR SOUND BLANKETS.

Q. PROVIDE LOUVERS FOR UPPER AND LOWER PORTIONS OF THE UNIT.

R. MANUFACTURER: AIR–COOLED CHILLERS WITH REMOTE EVAPORATOR SHALL BE MANUFACTURED BY MCQUAY/DAIKIN OR APPROVED EQUAL OF TRANE, CARRIER, OR YORK/JCI

PART 3: EXECUTION

3.1 INSTALLATION

A. INSTALL IN STRICT ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS, SHOP DRAWINGS, AND CONTRACT DOCUMENTS.

B. ADJUST AND LEVEL CHILLER IN ALIGNMENT ON SUPPORTS.

C. COORDINATE ELECTRICAL INSTALLATION WITH ELECTRICAL CONTRACTOR.

D. COORDINATE CONTROLS WITH CONTROL CONTRACTOR.

E. PROVIDE ALL APPURTENANCES REQUIRED TO PROVIDE A FULLY OPERATIONAL AND FUNCTIONAL CHILLER.

3.2 START–UP

A. INSTALL PROPER CHARGE OF REFRIGERANT AND OIL.

B. PROVIDE TESTING AND STARTING OF MACHINE, AND INSTRUCT THE OWNER IN ITS PROPER OPERATION AND MAINTENANCE.

# GENERAL NOTES:

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH ALL APPLICABLE CODES, ORDINANCES, REGULATIONS AND REQUIREMENTS OF ALL AGENCIES HAVING JURISDICTION OVER THE PROJECT.
2. THE CONTRACTOR IS CAUTIONED THAT THE WORK INCLUDES ALTERATIONS TO AN EXISTING FACILITY. THE CONTRACTORS SHALL VISIT THE SITE TO DETERMINE ACTUAL FIELD CONDITIONS, AND CHECK THE ACCURACY OF THE EXISTING CONDITIONS. FAILURE TO DO SO WILL NOT RELIEVE THEM OF THE RESPONSIBILITY FOR CARRYING OUT ANY AND ALL WORK SHOWN, NOTED OR SPECIFIED.
3. THE INTENT OF THESE DRAWINGS IS FOR THE CONTRACTOR TO PROVIDE ALL LABOR, MATERIAL, FINISHES, EQUIPMENT, INSTALLATION AND SERVICES NECESSARY FOR AND INCIDENTAL WITH THE WORK, TO PROVIDE THE OWNER WITH A COMPLETE PROJECT INCLUSIVE OF ALL SYSTEMS.
4. ACTUAL FIELD CONDITIONS MAY VARY FROM THOSE INDICATED. SHOULD ACTUAL CONDITIONS DIFFER MATERIALLY FROM THOSE ORDINARILY ENCOUNTERED AND GENERALLY RECOGNIZED AS INHERENT IN WORK OF THE CONTRACTOR PROVIDED FOR IN THE CONTRACT, THE CONTRACTOR SHALL PROMPTLY, BEFORE CONDITIONS ARE DISTURBED, NOTIFY THE ARCHITECT/ENGINEER. FAILURE TO DO SO MAY WAIVE THE CONTRACTOR'S RIGHT TO RECEIVE ADDITIONAL TIME OR CONSIDERATION DUE TO SUCH CONDITIONS.
5. PRIOR TO INITIATING ANY PORTION OF THE WORK, THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND COORDINATE ALL PORTIONS OF THE CONTRACT DOCUMENTS RELATING TO THAT PORTION OF THE WORK AND AFFECTING ADJOINING PORTIONS. IF DISCREPANCIES EXIST, THEY SHALL BE REPORTED TO THE CONSTRUCTION MANAGER/ENGINEER FOR CLARIFICATION AND/OR RESOLUTION BEFORE COMMENCING SUCH WORK.
6. BY SUBMITTING A BID PROPOSAL THE CONTRACTOR CERTIFIES THAT THEY HAVE VISITED THE SITE AND UNDERSTAND THE COMPLETE SCOPE OF WORK, WHICH IS INCLUDED IN THE PROPOSAL.
7. DEFINITIONS: "PROVIDE" MEANS "FURNISH AND INSTALL". "VERIFY" MEANS "VERIFY IN THE FIELD AND COORDINATE DIMENSIONS AND DISCREPANCIES".
8. THESE NOTES AND OTHER NOTES ON THE DRAWINGS ARE DIRECTIONS FOR THE CONTRACTOR'S PERFORMANCE, UNLESS NOTED OTHERWISE (U.N.O.). FOR EXAMPLE, THE VERB "INSTALL" MEANS "CONTRACTOR SHALL INSTALL", "RELOCATE" MEANS "CONTRACTOR SHALL RELOCATE", ETC.
9. UNLESS NOTED OTHERWISE. NUMBERED DIMENSIONS SHOWN ON DRAWINGS TAKE PRECEDENCE OVER SCALED DRAWINGS. DETAIL DRAWINGS TAKE PRECEDENCE OVER GENERAL DRAWINGS. IF CONFLICT EXISTS ON THE DRAWINGS, THEN THE MORE STRINGENT REQUIREMENT SHALL APPLY. FINAL INTERPRETATION SHALL BE MADE BY THE ENGINEER.
10. SAMPLES AND SHOP DRAWINGS MUST BE SUBMITTED BY THE CONTRACTOR TO THE CONSTRUCTION MANAGER/ENGINEER FOR REVIEW AND PROCESSING BEFORE THE PURCHASE OR FABRICATION OF ANY MATERIALS.
11. DIMENSIONS OF EXISTING OPENINGS SHALL BE VERIFIED PRIOR TO PREPARATION OF SHOP DRAWINGS. SHOP DRAWINGS SHALL INCLUDE A SCHEDULE OF ACTUAL OPENING DIMENSIONS AS VERIFIED IN FIELD.
12. DURING THE WORK, ANY CONDITION UNCOVERED THAT CAUSES CONFLICT WITH THE INTENDED DESIGN MUST BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER/ENGINEER.
13. CONTRACTOR SHALL STAGE WORK IN SUCH A WAY AS TO ENSURE SAFE EMERGENCY EGRESS AT ALL TIMES.
14. EXCEPT FOR PREFINISHED SURFACES, ALL ITEMS DISTURBED OR DAMAGED BY WORK SHALL BE REFINISHED TO MATCH SURROUNDING AREA OR FINISHED AS INDICATED.
15. REPAIRED AND NEW AREAS OF WALLS OR CEILINGS SHALL BE BLENDED AND FEATHERED INTO THE SURROUNDING AREA. THERE SHALL NOT BE ANY VISIBLE SEAMS OR CHANGE IN APPEARANCE BETWEEN THE REPAIRED OR NEW AREA AND THE SURROUNDING AREA WHEN VIEWED FROM A DISTANCE OF 3 FEET.
16. ALL NEW AND EXISTING HOLES AND PENETRATIONS IN WALLS AND CEILING SURFACES SHALL BE PATCHED AND FIRE STOPPED.
17. THE FLOOR SPACE WILL BE UNOCCUPIED AT THE TIME OF WORK & SHALL BE SECURED AT THE END OF EACH WORK DAY.
18. BEFORE COMMENCING ANY DEMOLITION, THE CONTRACTOR MUST COORDINATE DEMOLITION WITH PROPOSED WORK AND OTHER DISCIPLINES.
19. THE ENGINEER SHALL HAVE NO RESPONSIBILITY FOR THE DISCOVERY, PRESENCE, HANDLING, REMOVAL OR DISPOSAL OF, OR EXPOSURE OF PERSONS TO HAZARDOUS MATERIALS IN ANY FORM AT THE PROJECT SITE, INCLUDING BUT NOT LIMITED TO ASBESTOS, ASBESTOS PRODUCTS, POLYCHLORINATED BIPHENYL (PCB) OR OTHER TOXIC SUBSTANCES. CONTRACTOR TO CONTACT CONSTRUCTION MANAGER IF THESE ITEMS ARE APPARENT OR SUSPECTED.
20. ANY ALTERATION TO THE STRUCTURE (I.E., CORE DRILLING CONCRETE, ETC.) SHALL BE COORDINATED.
21. IF THERE ARE OPERATIONS WHICH INVOLVE EXCESSIVE NOISE (I.E., SAW CUTTING CONCRETE, ETC.) IT SHALL BE COORDINATED WITH THE SCHOOL TO BE PERFORMED DURING NON–SCHOOL HOURS.
22. GENERAL NOTES, THOSE FOUND ON THIS SHEET, APPLY TO ALL DRAWINGS RELATED TO THIS PROJECT.
23. CONSTRUCTION NOTES SPECIFICALLY REFER TO ITEMS NOTED WITH NUMBER OR LETTER DESIGNATIONS ON THE RESPECTIVE DRAWING WHERE THE DESIGNATIONS ARE SHOWN.
24. PROTECT ALL PAVED AND GRASS AREAS. ALL DISTURBED AREAS SHALL BE FULLY RESTORED TO LIKE NEW CONDITIONS.
25. UNDER BASE BID THE CONTRACTOR SHALL PROVIDE A TEST PIT TO VISUALLY INSPECT THE EXTERIOR CONDITION OF BOTH THE UNDERGROUND CHILLED WATER SUPPLY AND RETURN PIPING. ADDITIONALLY, THE INTERIOR CONDITION OF ONLY THE UNDERGROUND PIPING (IN THEIR ENTIRETY) SHALL BE INSPECTED VIA VIDEO TAPPING.
26. UNDER ALTERNATE No. 1 – REPLACE CHILLER No. 2 IN ITS ENTIRETY AND RE–PIPE CHILLED WATER LINES TO EXISTING BUTTERFLY VALVES. EXTEND EXISTING CONCRETE PAD AS INDICATED.
27. UNDER ALTERNATE No. 2 – REPLACE ALL EXISTING EXTERIOR PIPING, VALVES, FITTINGS, INSULATION AND PIPE SUPPORTS IN ITS ENTIRETY.

## LEGEND

| SYMBOL | ABBREV | DEFINITION |
|---|---|---|
| | | PIPE–TURN DOWN |
| | | PIPE TEE UP |
| | | END CAP |
| | | BALL VALVE |
| | | STRAINER W/HOSE END DRAIN VALVE & CAP |
| | EX | EXISTING |
| | RX | REMOVE EXISTING |
| | | CONNECT TO EXISTING |
| | | DEMOLITION ENDS HERE |
| CHR | CHR | CHILLED WATER RETURN |
| CHS | CHS | CHILLED WATER SUPPLY |

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PROJECT MANAGER MDM

DESIGNER MDM

MECHANICAL SPECIFICATIONS & GENERAL NOTES
BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

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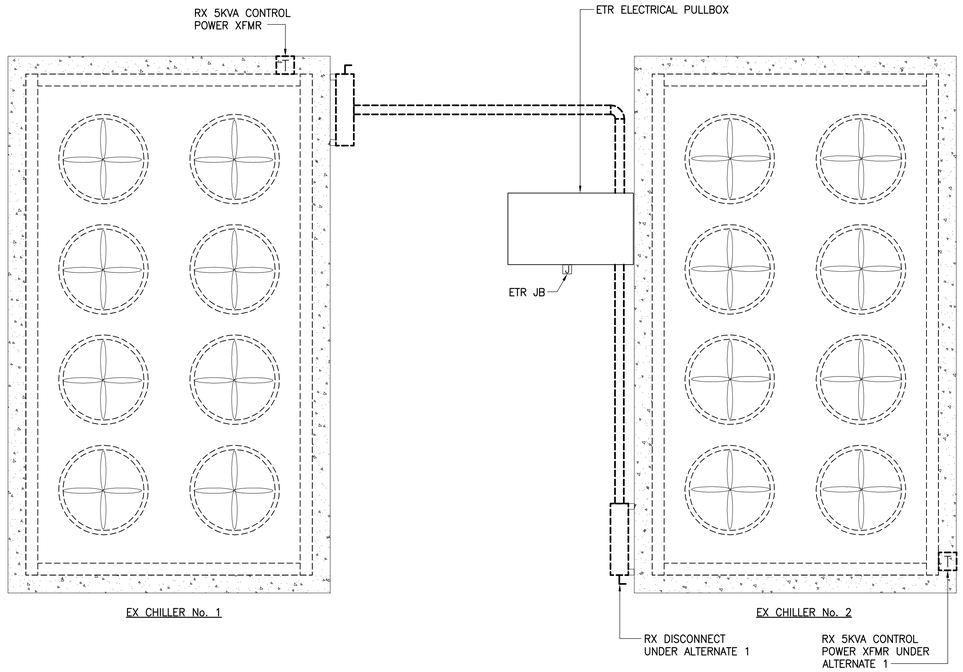
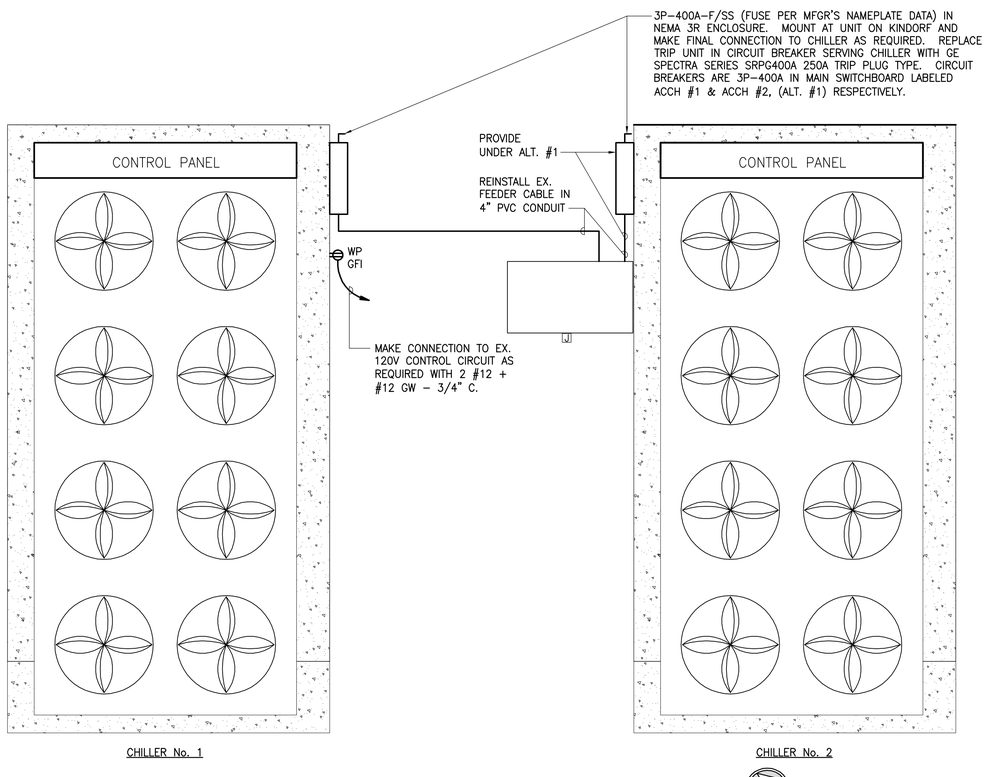
M6

BID DOCUMENTS
6/19/2015




## CHILLER PART PLAN – DEMOLITION – ELECTRICAL

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




## CHILLER PART PLAN – NEW WORK – ELECTRICAL

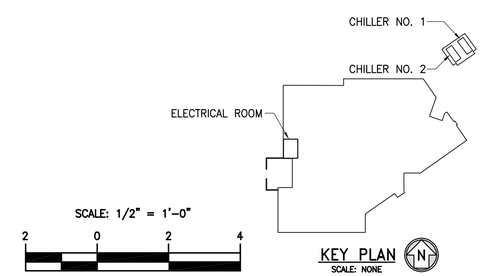
SCALE: 1/2" = 1'-0"

## GENERAL NOTES:

1. RX. ELECTRICAL WORK ASSOCIATED WITH CHILLER(S) BACK TO EX. PULLBOX & JUNCTION BOX. MAINTAIN FEEDERS FOR CONNECTION TO NEW FEEDER.
2. REFER TO DRAWING M1 FOR PHOTOS.

## ELECTRICAL LEGEND

| | |
|---|---|
| | FUSED SAFETY SWITCH – SIZE AS INDICATED ON DRAWINGS |
| WP GFI | DUPLEX RECEPTACLE; WP DESIGNATES WEATHERPROOF; GFI DESIGNATES GROUND FAULT INTERRUPTING |
| J | JUNCTION BOX |
| | HOMERUN TO PANELBOARD; NUMBER OF ARROWHEADS INDICATE NUMBER OF CIRCUITS; REFER TO PANEL SCHEDULES FOR MINIMUM WIRE AND CONDUIT SIZES |
| | CONDUIT OR WIRE CONCEALED IN CEILING SPACE, WALL OR SURFACE MOUNTED WHERE NO CEILING EXISTS |
| | ITEMS SHOWN SOLID/HEAVY ARE TO BE NEW |
| | ITEMS SHOWN DASHED/HEAVY ARE TO BE REMOVED |
| | ITEMS SHOWN SOLID/LIGHT ARE EXISTING TO REMAIN |
| XFMR. | TRANSFORMER |




KEY PLAN
SCALE: NONE

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SEAL

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13072-D

PROJECT MANAGER DMD

DESIGNER JJS

CHILLER REPLACEMENT
PART PLANS – ELECTRICAL
BEL AIR LIBRARY CHILLER REPLACEMENT
HARFORD COUNTY, MD

| DATE | DESCRIPTION |
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BID DOCUMENTS
6/19/2015

1. SECTION 16010 – BASIC ELECTRICAL REQUIREMENTS

A. THE WORK OF EACH OF THE ELECTRICAL SECTIONS INCLUDES FURNISHING AND INSTALLING THE MATERIAL, EQUIPMENT, AND SYSTEMS COMPLETE AS SPECIFIED AND/OR INDICATED ON THE DRAWINGS. THE ELECTRICAL INSTALLATIONS, WHEN FINISHED, SHALL BE COMPLETE AND COORDINATED, READY FOR SATISFACTORY SERVICE.

B. THE WORK UNDER THIS CONTRACT SHALL BE DONE IN STRICT ACCORDANCE WITH ALL APPLICABLE STATE, MUNICIPAL, AND OTHER LOCAL CODES, THE 2014 EDITION OF THE NATIONAL ELECTRICAL CODE, AND THE LATEST EDITION OF THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES (ADAAG

C. THE CONTRACTOR SHALL MAKE APPLICATION AND PAY FOR ALL PERMITS, LICENSES AND INSPECTIONS AS REQUIRED UNDER THE ABOVE CODES.

D. THE GENERAL ARRANGEMENT OF CONDUIT, WIRING AND EQUIPMENT SHALL BE AS IDENTIFIED ON THE CONTRACT DRAWINGS. THE CONTRACTOR SHALL CAREFULLY INVESTIGATE THE SITE, STRUCTURAL, AND FINISH CONDITIONS AFFECTING HIS WORK AND SHALL ARRANGE SUCH WORK ACCORDINGLY, PROVIDING SUCH FITTINGS AND ACCESSORIES AS MAY BE REQUIRED TO MEET SUCH CONDITIONS.

E. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, TOOLS, EQUIPMENT AND SERVICES NECESSARY FOR AND REASONABLY INCIDENTAL TO THE COMPLETE INSTALLATION OF THE ELECTRICAL WORK AND RELATED SYSTEMS AS INDICATED ON THE DRAWINGS OR AS NECESSARY TO PROVIDE A COMPLETE SYSTEM.

F. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY WIRING, LIGHTING AND CONSTRUCTION POWER FOR ALL TRADES AS REQUIRED TO COMPLETE THE PROJECT.

G. ALL MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND COMPLETED IN A FIRST–CLASS WORKMANLIKE MANNER. ALL MATERIALS SHALL BE NEW AND THE BEST OF THEIR RESPECTIVE KINDS. ALL EQUIPMENT AND SYSTEMS SHALL BE APPROVED BY UL OR SIMILAR NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL).

H. THE CONTRACTOR SHALL VISIT THE SITE AND OBSERVE THE CONDITIONS UNDER WHICH THE WORK SHALL BE COMPLETED. NO ALLOWANCE WILL BE MADE SUBSEQUENTLY IN THIS CONTRACT FOR ANY OMISSION, ERROR OR NEGLIGENCE ON THE CONTRACTOR'S PART.

I. PRIOR TO SUBMISSION OF SHOP DRAWING SUBMITTALS, AND NOT MORE THAN FOURTEEN (14) DAYS AFTER AWARD OF THE CONTRACT, THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL A LIST OF SUB–CONTRACTORS, MATERIALS AND EQUIPMENT MANUFACTURERS PROPOSED FOR THE PROJECT. THIS LIST SHALL INCLUDE THE PROPOSED MANUFACTURER OF ALL EQUIPMENT PROPOSED FOR THE PROJECT.

J. FOLLOWING APPROVAL OF THE LIST OF SUB–CONTRACTORS, MATERIALS AND EQUIPMENT MANUFACTURERS, THE CONTRACTOR SHALL SUBMIT DETAILED DIMENSIONED SHOP DRAWINGS, TOGETHER WITH WIRING DIAGRAMS, SPECIFICATIONS, OPERATING DATA, AND/OR CATALOG CUTS FOR ALL EQUIPMENT FURNISHED UNDER THIS DIVISION, SHOWN ON THE DRAWINGS OR SPECIFIED HEREIN.

1) COPIES OF THE PROJECT CADD DRAWINGS, ON CD–ROM, (IN AUTOCAD 2014 DWG FORMAT FOR A MICROSOFT WINDOWS XP OPERATING SYSTEM) WILL BE MADE AVAILABLE TO THE CONTRACTOR OR SUB–CONTRACTOR FOR USE IN PREPARING SHOP AND COORDINATION DRAWINGS, FOLLOWING RECEIPT OF A FULLY EXECUTED COPY OF A "COMPUTER AIDED DESIGN AND DRAFTING (CADD) FILE TRANSFER AGREEMENT" AS PROVIDED BY GIPE ASSOCIATES, INC.

K. A THOROUGH TEST SHALL BE MADE PRIOR TO ENERGIZING THE SYSTEM TO DEMONSTRATE THAT THE SYSTEM IS ENTIRELY FREE FROM GROUND FAULTS, SHORT CIRCUITS, AND OPEN CIRCUITS; THAT THE RESISTANCE TO GROUND ALL NON–GROUNDED CIRCUITS, BEFORE AND AFTER CONNECTION OF EQUIPMENT MEETS THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE AND IEEE STANDARDS/RECOMMEND–ATIONS.

L. IDENTIFY ALL MOTOR STARTERS, SWITCHES, CONTROLS AND OTHER EQUIPMENT. IDENTIFICATION PLATES SHALL BE LAMINATED PHENOLIC PLASTIC, BLACK WITH WHITE ENGRAVED LETTERS. LETTERING FOR CONTROL CENTERS, CONTROL PANELS, METERING AND INSTRUMENT PANELS SHALL BE 3/8" HIGH. LETTERING FOR ALL OTHER IDENTIFICATION PLATES SHALL BE 1/4' HIGH MINIMUM.

M. PROVIDE UPDATED DIRECTORIES FOR EACH PANELBOARD (EXISTING AND NEW) INDICATING THE TYPE LOAD (LIGHTING, RECEPTACLE, HEATER, ETC.) SERVED BY EACH CIRCUIT BREAKER, AS WELL AS THE ROOM IN WHICH THE LOAD IS LOCATED, USING ACTUAL ROOM DESIGNATIONS AND NUMBERS AS DESIGNATED BY FIELD INSTALLED ROOM SIGNAGE. VERIFY ALL EXISTING LOADS, AND PROVIDE SAME INFORMATION FOR EACH CIRCUIT, INCLUDING EXISTING LOADS, AS INDICATED HEREINBEFORE. PROVIDE ELECTRONIC COPIES OF EACH PANELBOARD DIRECTORY, ON EITHER COMPUTER DISKETTE OR CD–ROM, WITH THE OPERATION AND MAINTENANCE MANUALS.

N. THE MATERIAL AND WORKMANSHIP OF ALL PARTS OF THE ELECTRICAL INSTALLATION SPECIFIED HEREIN SHALL BE GUARANTEED UNCONDITIONALLY FOR A PERIOD OF ONE (1) YEAR FROM DATE OF ACCEPTANCE.

O. UPON COMPLETION OF THE ELECTRICAL INSTALLATION, THE CONTRACTOR SHALL DELIVER TO THE OWNER ONE (1) SET OF PRINTS OF ELECTRICAL CONTRACT DRAWINGS WHICH SHALL BE LEGIBLY MARKED IN RED PENCIL TO SHOW ALL ADDITIONS, CHANGES AND DEPARTURES OF THE INSTALLATION AS COMPARED WITH THE ORIGINAL DESIGN. THEY SHALL BE SUITABLE FOR USE IN PREPARATION OF RECORD DRAWINGS.

P. THE CONTRACTOR SHALL PREPARE THREE (3) COPIES OF A RECORD AND INFORMATION MANUAL. THE MANUAL SHALL BE BOUND IN A THREE–RING LOOSE–LEAF BINDER. PROVIDE THE FOLLOWING DATA IN THE BOOKLET:

1) CUTS OF ALL EQUIPMENT WITH TECHNICAL SPECIFICATIONS.
2) OPERATION AND MAINTENANCE PROCEDURES.
3) SERVICING INSTRUCTIONS.
4) COPIES OF PANELBOARDS DIRECTORIES.
5) COPIES OF WARRANTIES.
6) COPIES OF TEST REPORTS.

Q. THE ELECTRICAL CONTRACTOR SHALL COORDINATE HIS WORK WITH THAT OF ALL OTHER TRADES. THE ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ALL OTHER DRAWINGS AND SPECIFICATIONS SHALL BE CONSULTED AND COORDINATED WITH PRIOR TO ROUGH–IN. SWITCHES SHALL BE LOCATED ON THE LATCH SIDE OF THE DOOR OPENING AS INDICATED ON THE ARCHITECTURAL DRAWINGS. COORDINATE MOUNTING OF ALL DEVICES WITH CASEWORK, CHALK OR MARKER BOARDS, TACKBOARDS, TOILET ACCESSORIES, ETC.

R. PROVIDE DISCONNECT SWITCHES, OF PROPER VOLTAGE, CURRENT RATING AND QUANTITY OF POLES REQUIRED FOR THE APPLICATION WHERE INDICATED ON THE DRAWINGS, OR WHERE THE MOTOR OR EQUIPMENT IS NOT PROVIDED WITH A DISCONNECT SWITCH EITHER INTEGRAL TO THE EQUIPMENT OR AS A SEPARATE DEVICE. MAKE ALL FINAL CONNECTIONS TO ALL MECHANICAL, ARCHITECTURAL OR OTHER EQUIPMENT AS RECOMMENDED BY THE EQUIPMENT MANUFACTURER.

S. SEAL ALL CONDUIT PENETRATIONS THROUGH FIRE OR SMOKE RATED WALLS AND FLOORS TO MAINTAIN RATING INTEGRITY. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE AND SMOKE RATINGS OF WALLS, FLOORS, CEILINGS, ETC.

T. PROVIDE CONDULET SEALING FITTINGS WITH APPROVED SEALING COMPOUND ON ALL CONDUITS PASSING FROM INTERIOR TO EXTERIOR OF A BUILDING, OR BETWEEN AREAS OF WIDELY DIFFERING TEMPERATURES (SUCH AS A REFRIGERATED UNIT OR AIR HANDLING SYSTEM) WITHIN THE BUILDING. FITTINGS FOR REFRIGERATED UNITS OR AIR HANDLING SYSTEMS SHALL BE INSTALLED ON THE EXTERIOR OF THE UNIT, WITHIN 6' OF THE UNIT. ALL UNIT WALL/CEILING PENETRATIONS SHALL BE SEALED IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS WITH AN INSULATING SEALANT.

U. ELECTRICAL CONTRACTOR SHALL VERIFY ALL ELECTRICAL CHARACTERISTICS (VOLTAGE, PHASE, HORSEPOWER, FULL LOAD AMPERES, ETC.) OF MECHANICAL, ARCHITECTURAL, AND OTHER EQUIPMENT TO BE INSTALLED ON THIS PROJECT WITH MECHANICAL OR OTHER APPROPRIATE CONTRACTOR PRIOR TO ROUGH–IN. WHEREVER POSSIBLE, THE CONTRACTOR SHALL OBTAIN ROUGH–IN DRAWINGS FOR THE ACTUAL ITEM OF EQUIPMENT TO BE INSTALLED PRIOR TO ROUGH–IN. THIS SHALL APPLY TO ALL EQUIPMENT, WHETHER IT IS TO BE INSTALLED BY THE CONTRACTOR OR BY THE OWNER.

V. CONTRACTOR SHALL NOTE THAT BRANCH CIRCUIT WIRING IS NOT SHOWN; HOWEVER, CIRCUIT NUMBERS ARE SHOWN ADJACENT TO ALL OUTLETS/FIXTURES. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL BRANCH WIRING BASED ON THE CIRCUIT NUMBERS SHOWN TO COMPLETE THE WIRING SYSTEM.

W. ELECTRICAL DEMOLITION:

1. ANY EXISTING ELECTRICAL WORK SHOWN ON THESE DRAWINGS IS INDICATED FOR THE CONVENIENCE OF THE CONTRACTOR ONLY. THE OWNER, ARCHITECT AND ENGINEER IN NO WAY WARRANT OR GUARANTEE EITHER THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. FINAL LOCATIONS AND QUANTITIES SHALL BE FIELD VERIFIED BY THE CONTRACTOR TO HIS OWN SATISFACTION.

2. THE EXTENT OF ELECTRICAL DEMOLITION SHALL BE AS GENERALLY NOTED ON THE DRAWINGS.

3. EXISTING ELECTRICAL WORK IN THE AREAS SURROUNDING THE PROJECT AREA SHALL REMAIN IN SERVICE AT ALL TIMES. WHERE EXISTING CIRCUITS PASS THROUGH THE PROJECT AREA, THEY SHALL BE MAINTAINED IN SERVICE AT ALL TIMES. CONTRACTOR SHALL FIELD VERIFY WHICH CIRCUITS MUST REMAIN IN SERVICE.

4. WHEREVER EXISTING ELECTRICAL WORK IS TO BE REMOVED, THE FOLLOWING NOTES SHALL APPLY:

A) ALL EXISTING WIRING SHALL BE REMOVED BACK TO ITS SOURCE.

B) ALL EXISTING CONDUIT WHICH IS EXPOSED, OR WHICH BECOMES EXPOSED AT ANY TIME DURING CONSTRUCTION SHALL BE REMOVED IN ITS ENTIRETY. CONDUIT STUBS THROUGH THE FLOOR SHALL BE CUT OFF FLUSH WITH THE FLOOR SLAB, FILLED WITH CONCRETE, AND MADE READY TO ACCEPT NEW FLOOR FINISHES WHERE APPLICABLE.

C) CONDUIT WHICH REMAINS CONCEALED WITHIN WALLS OR SLABS SHALL BE ABANDONED IN PLACE AFTER REMOVAL OF ALL WIRING.

D) WHERE EXISTING CONDUIT STUBS THROUGH THE ROOF ARE NO LONGER REQUIRED, AND OCCUR IN AREAS WHERE THE EXISTING ROOF IS TO REMAIN, THE CONDUIT SHALL BE CUT OFF 6" ABOVE AND BELOW THE ROOF, FILLED WITH EXPANDABLE FOAM SEALANT (DOW CORNING SILICONE RTV OR APPROVED EQUAL). THE CONDUIT SHALL THEN BE CAPPED ABOVE THE ROOF AND MADE COMPLETELY WATERTIGHT.

E) WHEREVER EXISTING FLUSH MOUNTED BOXES WILL REMAIN EXPOSED, PROVIDE BLANK COVERPLATES ON THE EXISTING OUTLET BOXES.

F) ALL SURFACES WHICH ARE DISTURBED BY DEMOLITION UNDER THIS DIVISION SHALL BE PATCHED WITH MATERIALS TO MATCH THE SURROUNDING SURFACE. PATCHING SHALL BE DONE TO THE COMPLETE SATISFACTION OF THE ARCHITECT.

G) WHERE EXISTING CIRCUITS ARE REMOVED FROM PANELBOARDS WHICH ARE TO REMAIN, PROVIDE UPDATED TYPEWRITTEN PANELBOARD DIRECTORIES IN EACH AFFECTED PANELBOARD. DESIGNATE ALL UNUSED CIRCUITS AS "SPARE."

5. PRIOR TO REMOVAL OF ANY ELECTRICAL EQUIPMENT FROM THE PROJECT, THE CONTRACTOR SHALL DETERMINE WHETHER THE OWNER WISHES TO RETAIN THE MATERIAL. SHOULD THE OWNER DESIRE TO RETAIN AN ITEM, IT SHALL BE MOVED, BY THE CONTRACTOR, TO THE LOCATION ON THE SITE DIRECTED BY THE OWNER. ALL ELECTRICAL EQUIPMENT, WIRING, ETC. NOT DESIRED BY THE OWNER SHALL BE REMOVED FROM THE PROJECT SITE AND PROPERLY DISPOSED OF BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER.

X. OUTAGES OF ELECTRIC SERVICE:

1. OUTAGES OF ELECTRIC SERVICES TO EXISTING OCCUPIED AND/OR UNOCCUPIED AREAS OF THE BUILDINGS SHALL BE COORDINATED WITH AND SHALL BE SUBJECT TO THE APPROVAL OF THE OWNER. ANY AND ALL OUTAGES SHALL BE SCHEDULED IN WRITING WITH THE OWNER'S REPRESENTATIVE AND THE ARCHITECT AT LEAST SEVEN (7) DAYS IN ADVANCE OF THE PLANNED OUTAGE. SCHEDULED OUTAGES MAY BE CANCELED AT ANY TIME BY THE OWNER. THE CONTRACTOR SHALL NOT BE ALLOWED ANY EXTRA COMPENSATION FOR RESCHEDULING OUTAGES WHICH MAY BE CANCELED BY THE OWNER. SHOULD THE PLANNED OUTAGES BE REQUIRED AT OTHER THAN NORMAL WORKING HOURS (ON PREMIUM TIME), THE WORK SHALL BE PROVIDED TO THE OWNER AT NO ADDITIONAL COST IN CONTRACT PRICE.

Y. OVERTIME HOURS:

1. ANY WORK REQUIRED TO BE PERFORMED AT OTHER THAN NORMAL WORKING HOURS (NIGHTS, HOLIDAYS, WEEKENDS, ETC.) SHALL BE TAKEN INTO CONSIDERATION BY THE CONTRACTOR WHEN COMPUTING HIS BID. ADDITIONAL COMPENSATION SHALL NOT BE ALLOWED TO THE CONTRACTOR FOR ANY WORK PERFORMED AT OTHER THAN NORMAL WORKING HOURS.

2. SECTION 16050 – BASIC ELECTRICAL MATERIALS AND METHODS

A. INSTALL ALL WIRING IN CONDUIT EXCEPT AS OTHERWISE INDICATED. MINIMUM CONDUIT SIZE SHALL 3/4" MINIMUM. PROVIDE CONDUIT AS FOLLOWS:

1) PROVIDE HOT–DIP GALVANIZED, RIGID STEEL CONDUIT FOR WORK EXPOSED TO WEATHER AND FOR EMBEDDED WORK IN CONCRETE OR MASONRY.

2) PROVIDE GALVANIZED, (INSIDE AND OUT) ELECTRICAL METALLIC TUBING (EMT) FOR INTERIOR EXPOSED WORK, FOR CONCEALED WORK ABOVE SUSPENDED CEILINGS AND WITHIN INTERIOR PARTITIONS OR NON–MASONRY WALLS.

3) PROVIDE FLEXIBLE METAL CONDUIT (GREENFIELD) IN SHORT LENGTHS FOR THE CONNECTION OF RECESSED LIGHTING FIXTURES, MOTORS, AND ANY VIBRATING EQUIPMENT.

4) PROVIDE LIQUID TIGHT FLEXIBLE METAL CONDUIT (SEALTIGHT) WHEREVER MOISTURE MAY BE PRESENT, FOR ALL MOTORS IN MECHANICAL EQUIPMENT SPACES.

5) PROVIDE POLYVINYLCHLORIDE (PVC) SCHEDULE 40 CONDUIT FOR INSTALLATION UNDERGROUND OUTSIDE OF BUILDING (ON SITE). PVC CONDUIT SHALL BE MANUFACTURED IN ACCORDANCE WITH NEMA STANDARD TC–2. CONDUIT FOR DIRECT BURIAL SHALL BE TYPE DB, CONDUIT WITH CONCRETE ENCASEMENT SHALL BE TYPE EC. FITTINGS SHALL MEET THE REQUIREMENTS OF NEMA STANDARD TC–3.

B. RACEWAY AND BRANCH CIRCUIT CABLE INSTALLATIONS:

1) FOR RENOVATION PROJECTS, WHEREVER POSSIBLE INSTALL RACEWAYS AND METALLIC SHEATHED CABLES CONCEALED WITHIN NEW OR EXISTING HOLLOW/FISHABLE WALLS, OR ABOVE FINISHED CEILINGS. WHERE WORK CANNOT BE CONCEALED WITHIN WALL CONSTRUCTION OR ABOVE FINISHED CEILINGS, IT SHALL BE RUN EXPOSED (IN RACEWAY) ON EXISTING MASONRY OR NON–FISHABLE WALLS. WHERE EXPOSED RACEWAYS ARE INSTALLED, THE FOLLOWING SHALL APPLY PROVISIONS:

a) EXPOSED WIRING IN FINISHED AREAS SHALL BE RUN IN CONDUIT, AS SPECIFIED ABOVE. INSTALL EXPOSED RACEWAYS LEVEL AND PLUMB.
b) EXPOSED RACEWAYS SHALL RUN PARALLEL OR PERPENDICULAR TO CORNERS OF WALLS, CEILINGS, BULKHEADS OR BUILDING STRUCTURAL ELEMENTS.
c) WHEREVER POSSIBLE, RUN RACEWAYS TIGHT IN CORNERS OF WALLS, IN CORNER BETWEEN WALL AND CEILING, TIGHT AGAINST DOOR OR WINDOW FRAMES, OR TIGHT AGAINST BUILDING STRUCTURAL ELEMENTS.

2) WHERE NOTED ON THE DRAWINGS, INSTALL ALL PROPOSED ELECTRICAL WORK CONCEALED WITHIN EXISTING WALLS, ABOVE CEILINGS OR BELOW FLOORS. CUT OR CHANNEL THE EXISTING WALL OR FLOOR FINISHES, AND PROVIDE OPENINGS IN THE EXISTING CEILINGS AS MAY BE REQUIRED TO ALLOW THE FULLY CONCEALED INSTALLATION OF THE ELECTRICAL WORK. PATCH ALL SURFACES DISTURBED BY THIS WORK.

a) WHERE CUTTING OF EXISTING SURFACES IN REQUIRED, IT SHALL BE DONE IN A MANNER WHICH DOES NOT IMPACT THE STRUCTURAL INTEGRITY OF THE SURFACE TO BE MODIFIED. ALL CUTTING SHALL BE APPROVED BY THE ARCHITECT PRIOR TO PROCEEDING. WHERE DIRECTED BY THE ARCHITECT, OBTAIN ADDITIONAL APPROVAL FROM THE STRUCTURAL ENGINEER PRIOR TO MAKING ANY CUTS.

b) PROVIDE AND MAINTAIN ALL SUPPORTS, PROTECTION OR OTHER DEVICES REQUIRED BY THE ARCHITECT OR THE STRUCTURAL ENGINEER TO PROTECT THE STRUCTURE UNTIL REPAIRS HAVE BEEN COMPLETED AND APPROVAL OF THE INSTALLATION OBTAINED.

THE CONTRACTOR SHALL INCLUDE THE COST OF ALL REQUIRED CUTTING, PROTECTION AND PATCHING IN THEIR BID. NO SUBSEQUENT ALLOWANCES SHALL BE MADE FOR CUTTING AND PATCHING REQUIRED TO CONCEAL PROPOSED ELECTRICAL WORK AS NOTED HEREIN. PATCHING SHALL BE ACCOMPLISHED TO THE FULL AND COMPLETE SATISFACTION OF THE ARCHITECT AND THE ENGINEER.]

3) RACEWAYS MAY BE RUN EXPOSED ON UNFINISHED WALLS, WITHIN CEILING OR ROOF STRUCTURE OF SPACES WITHOUT FINISHED CEILING INSTALLATIONS, IN MECHANICAL OR ELECTRICAL EQUIPMENT SPACES, IN TUNNELS, AND ELSEWHERE AS INDICATED.

C. INSTALL CONDUITS PARALLEL AND PERPENDICULAR TO WALLS AND INTERIOR SURFACES. CLEAN AND PLUG AND PROVIDE A PULL LINE IN EACH CONDUIT TO BE LEFT EMPTY. USE MANUFACTURED ELBOWS AND SCREW JOINTED CONDUIT FITTINGS. USE CAPPED BUSHINGS OR "PUSH PENNY" PLUGS.

D. ALL OUTLET, SWITCH AND JUNCTION BOXES, SHALL BE GALVANIZED STAMPED STEEL BY STEEL CITY, RACO, APPLETON, OR APPROVED EQUAL. OUTLET BOXES IN CONCRETE CONSTRUCTION SHALL BE OCTAGONAL. NO "THRU–WALL" BOXES SHALL BE USED IN PARTITIONS. ALL BOXES SHALL BE FURNISHED WITH APPROPRIATE COVERS.

E. JUNCTION AND PULL BOXES SHALL BE FURNISHED AND INSTALLED AS INDICATED OR WHERE REQUIRED TO FACILITATE PULLING OF WIRES OR CABLES. BOXES FOR EXTERIOR WORK SHALL BE CAST ALUMINUM OR GALVANIZED CAST IRON TYPE WITH THREADED HUBS, UNLESS OTHERWISE DIRECTED. GASKETED COVER PLATES SHALL BE FURNISHED FOR OUTDOOR INSTALLATIONS.

F. BUILDING WIRE, UNLESS OTHERWISE INDICATED, SHALL BE COPPER, 600 VOLT, TYPE THWN/THHN INSULATION, #12 AWG MINIMUM, FOR INTERIOR AND EXTERIOR USE. THE WIRE SIZE INDICATED IN THE HOMERUN SHALL BE USED THROUGHOUT THE CIRCUIT.

G. MINIMUM WIRE SIZE SHALL BE NUMBER TWELVE (12) AWG. NO SPLICES SHALL BE MADE EXCEPT WITHIN OUTLET OR JUNCTION BOXES. WIRES NUMBER EIGHT (8) AWG AND LARGER SHALL BE STRANDED. WIRES AND CABLES SHALL BE AS MANUFACTURED BY PIRELLI, ROYAL, TRIANGLE OR EQUIVALENT.

H. THE COLOR CODING SYSTEM LISTED BELOW SHALL BE USED THROUGHOUT THE BUILDING:

SYSTEM

120/208V 277/480V%%U

| | | |
|---|---|---|
| PHASE A | BLACK | BROWN |
| PHASE B | RED | ORANGE |
| PHASE C | BLUE | YELLOW |
| NEUTRAL | WHITE | GRAY |
| GROUND | GREEN | GREEN |

I. ALL BRANCH CIRCUITS SHALL BE SUPPORTED INDEPENDENTLY OF THE CEILING GRID SYSTEM. PROVIDE SUPPORTS IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE.

J. PROVIDE DISCONNECT SWITCHES WHERE INDICATED AND AS REQUIRED. DISCONNECT SWITCHES SHALL BE OF SIZE, NUMBER OF POLES AND FUSED OR NON–FUSED, AS REQUIRED FOR JOB CONDITIONS AND THE NATIONAL ELECTRICAL CODE. ALL DISCONNECT SWITCHES SHALL BE HEAVY DUTY TYPE WITH INTERLOCKING COVER AND HANDLE, SQUARE D TYPE HD OR APPROVED EQUAL. PROVIDE NEMA 1 ENCLOSURE FOR INDOOR, DRY LOCATIONS OR NEMA 3R ENCLOSURES FOR EXTERIOR OR NORMALLY WET INTERIOR LOCATIONS, OR WHERE REQUIRED.

K. PROVIDE STARTERS AND CONTROL WIRING AS INDICATED ON THE DRAWINGS, OR SPECIFIED HEREIN. ALL TEMPERATURE CONTROL WIRING AND COMPONENTS SHALL BE UNDER DIVISION 15.

L. PRIOR TO PURCHASE AND INSTALLATION OF ANY MOTOR CONTROL EQUIPMENT (STARTERS, ETC.), THE CONTRACTOR SHALL VERIFY THE ACTUAL MOTOR ELECTRICAL CHARACTERISTICS. STARTER OVERLOADS SHALL BE SIZED IN ACCORDANCE WITH ACTUAL MOTOR NAMEPLATE RUNNING LOAD AMPERES.

M. WIRING DEVICES SHALL BE INDUSTRIAL SPECIFICATION GRADE, BY ARROW HART, GENERAL ELECTRIC, P & S, OR HUBBELL. DEVICE COLOR SHALL BE AS SELECTED BY THE ARCHITECT FROM THE MANUFACTURERS STANDARD COLORS. WIRING DEVICES SHALL BE EQUAL TO THE FOLLOWING ARROW HART CATALOG NUMBERS:

1) GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLES SHALL BE DUPLEX, RATED 125 VOLTS, [20 AMPERES, ARROW HART XGF20.] [ 15 AMPERES, ARROW HART XGF15.]

2) DEVICE PLATES: PROVIDE DEVICE PLATES ON EACH WIRING DEVICE OR GROUP OF DEVICES TO SUIT THE OUTLET CONFIGURATION. WALL PLATES SHALL BE TYPE 304 NON–MAGNETIC STAINLESS STEEL.

N. MOUNT WEATHERPROOF DEVICES IN CAST METAL BOXES WITH WEATHERPROOF COVERS WHICH ARE U.L. LISTED AS "SUITABLE FOR WET LOCATIONS WITH OUTLET IN USE." WEATHERPROOF COVERS WILL BE HIGH–IMPACT POLYCARBONATE CONSTRUCTION, AND WILL BE SUITABLE FOR INSTALLATION OF AN OWNER FURNISHED PADLOCK TO PREVENT TAMPERING OR UNAUTHORIZED USE OF THE OUTLET PROTECTED. IN USE TYPE WEATHERPROOF OUTLET COVERS WILL BE HUBBELL/RACO RAYNTITE II SERIES COVERS IN CONFIGURATION TO SUIT OUTLET ARRANGEMENT.

O. THE ENTIRE ELECTRICAL SYSTEM SHALL BE SOLIDLY GROUNDED INCLUDING DISCONNECT SWITCHES, WIRING TROUGHS AND PULL BOXES, RACEWAY SYSTEMS, OUTLET BOXES, MOTORS, TRANSFORMERS, ETC.

P. PROVIDE EQUIPMENT GROUNDING CONDUCTORS IN ALL BRANCH CIRCUITS AND FEEDERS SIZED IN ACCORDANCE WITH THE NEC.

Q. GROUND, PHASE AND NEUTRAL CONDUCTORS SHALL BE PIG–TAILED IN OUTLET BOXES OR MULTI–OUTLET ASSEMBLY FOR RECEPTACLES SO THAT GROUND AND ELECTRICAL SERVICE WILL NOT BE DISTURBED TO OTHER RECEPTACLES ON THE SAME MULTI–WIRE CIRCUIT IF RECEPTACLE IS REMOVED.

3. SECTION 16400 – SERVICE AND DISTRIBUTION:

A. FUSES:

1) FUSES FOR SERVICE ENTRANCE EQUIPMENT SHALL BE U.L. LISTED CLASS L, J, OR RK1.
2) FUSES FOR FEEDER CIRCUITS AND PANELBOARDS SHALL BE U.L CLASS RK1 FAST–ACTING TYPE.
3) FUSES FOR MOTOR OVERCURRENT, MOTOR CONTROLLER, AND TRANSFORMER PROTECTION SHALL BE DUAL–ELEMENT, U.L. CLASS RK1 TIME–DELAY TYPE.

REVISIONS

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DESIGNER JJS

ELECTRICAL SPECIFICATIONS

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