

HOUSTON COMMUNITY COLLEGE 2018 LOANSTAR ii PROJECT

SPRING BRANCH CAMPUS HVAC REPLACEMENT
1010 WEST SAM HOUSTON PKWY HOUSTON, TEXAS 77043



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HOUSTON COMMUNITY COLLEGE
HVAC SYSTEM REPLACEMENT AND
RENOVATION PROJECTS

HCC SPRING BRANCH CAMPUS
HVAC REPLACEMENT



DATE
MARCH 20, 2018

NO.	REV.	DATE
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APPROXIMATE SCALE:
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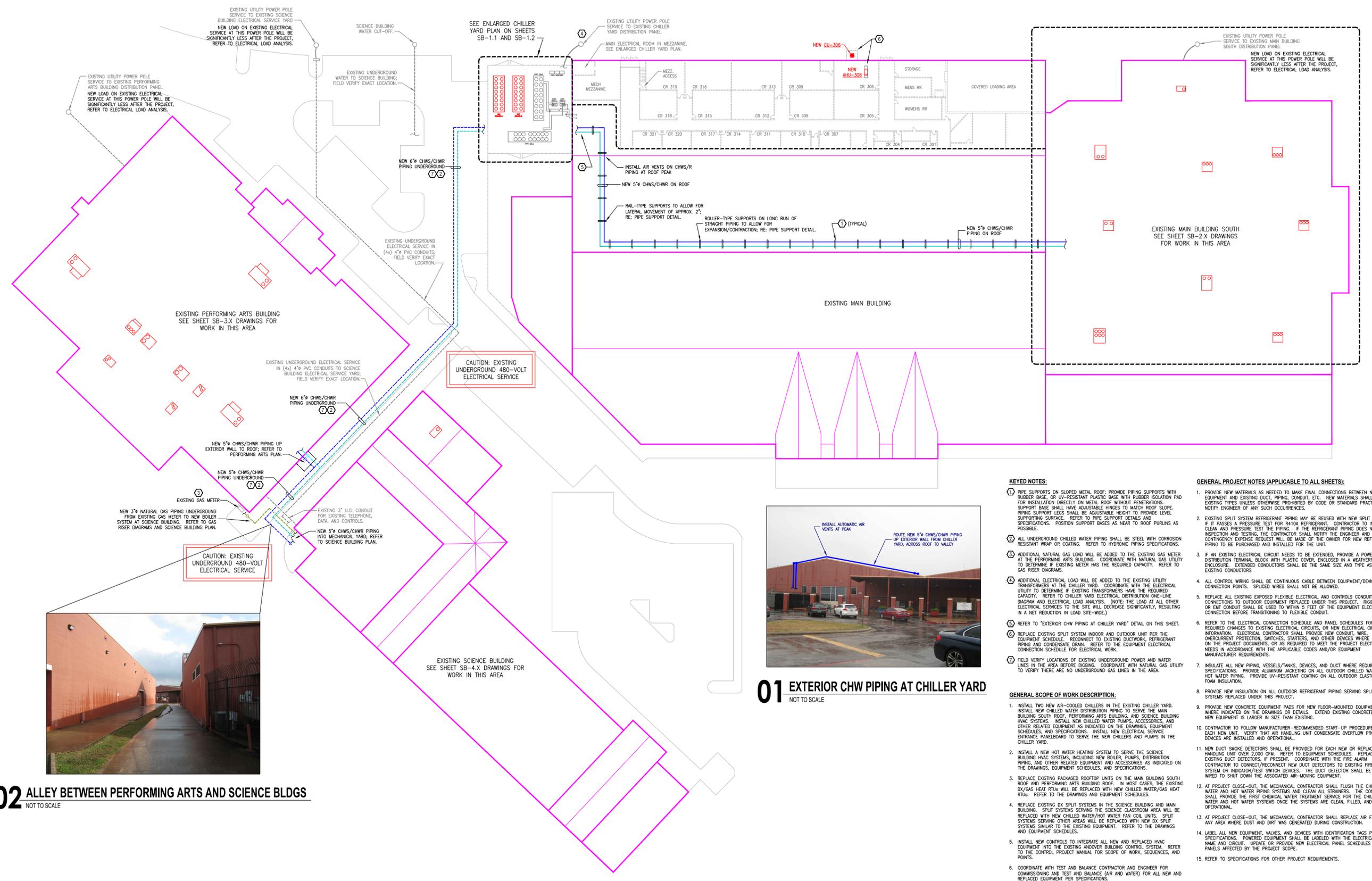
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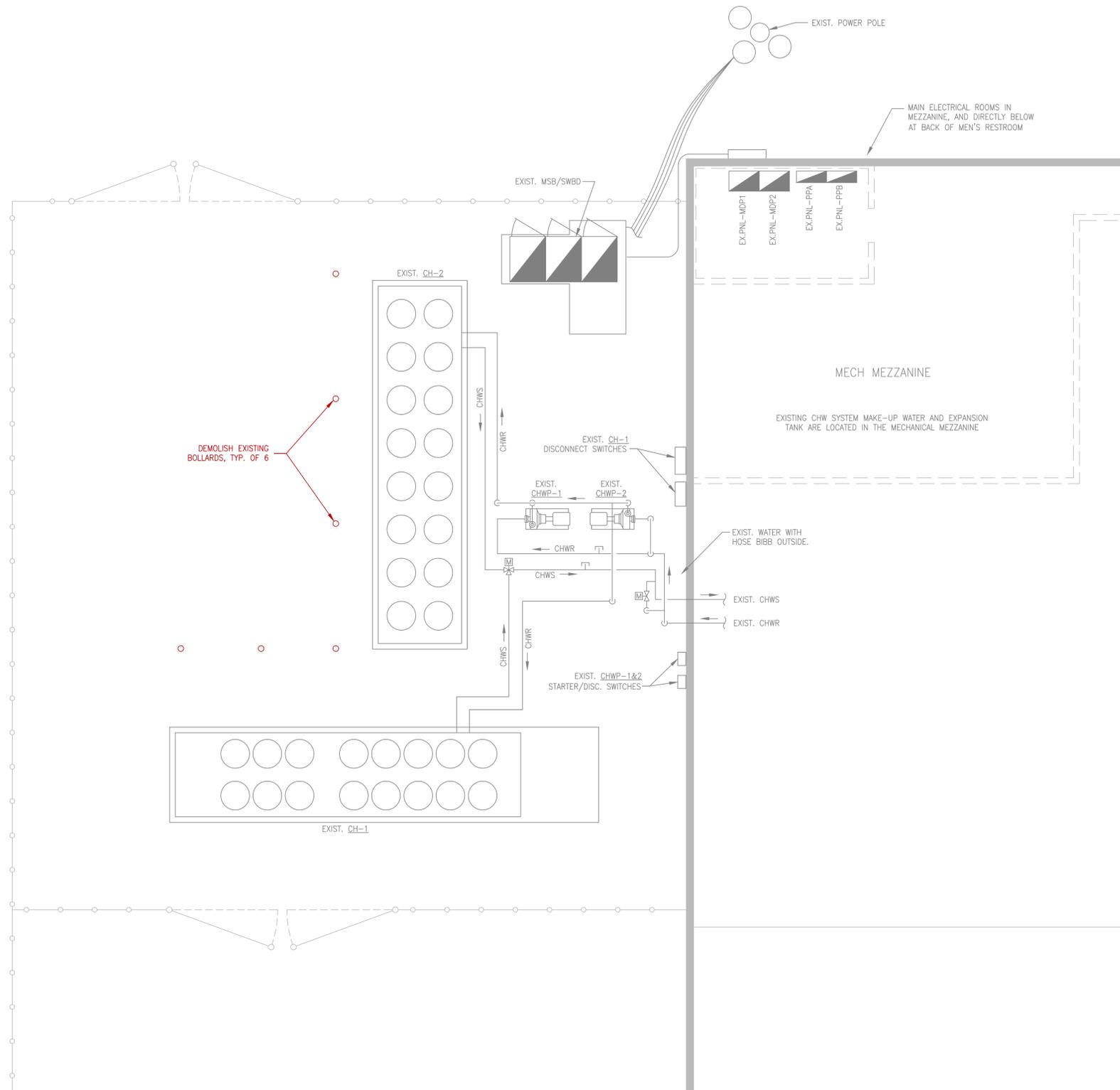
02 ALLEY BETWEEN PERFORMING ARTS AND SCIENCE BLDGS
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01 EXTERIOR CHW PIPING AT CHILLER YARD
 NOT TO SCALE

- KEYED NOTES:**
- PIPE SUPPORTS ON SLOPED METAL ROOF: PROVIDE PIPING SUPPORTS WITH RUBBER BASE, OR UV-RESISTANT PLASTIC BASE WITH RUBBER ISOLATION PAD FOR INSTALLATION DIRECTLY ON METAL ROOF WITHOUT PENETRATIONS. SUPPORT BASE SHALL HAVE ADJUSTABLE HINGES TO MATCH ROOF SLOPE. PIPING SUPPORT LEGS SHALL BE ADJUSTABLE HEIGHT TO PROVIDE LEVEL SUPPORTING SURFACE. REFER TO PIPE SUPPORT DETAILS AND SPECIFICATIONS. POSITION SUPPORT BASES AS NEAR TO ROOF PURLINS AS POSSIBLE.
 - ALL UNDERGROUND CHILLED WATER PIPING SHALL BE STEEL WITH CORROSION RESISTANT WRAP OR COATING. REFER TO HYDRONIC PIPING SPECIFICATIONS.
 - ADDITIONAL NATURAL GAS LOAD WILL BE ADDED TO THE EXISTING GAS METER AT THE PERFORMING ARTS BUILDING. COORDINATE WITH NATURAL GAS UTILITY TO DETERMINE IF EXISTING METER HAS THE REQUIRED CAPACITY. REFER TO GAS RISER DIAGRAMS.
 - ADDITIONAL ELECTRICAL LOAD WILL BE ADDED TO THE EXISTING UTILITY TRANSFORMERS AT THE CHILLER YARD. COORDINATE WITH THE ELECTRICAL UTILITY TO DETERMINE IF EXISTING TRANSFORMERS HAVE THE REQUIRED CAPACITY. REFER TO CHILLER YARD ELECTRICAL DISTRIBUTION ONE-LINE DIAGRAM AND ELECTRICAL LOAD ANALYSIS. (NOTE: THE LOAD AT ALL OTHER ELECTRICAL SERVICES TO THE SITE WILL DECREASE SIGNIFICANTLY, RESULTING IN A NET REDUCTION IN LOAD SITE-WIDE.)
 - REFER TO "EXTERIOR CHW PIPING AT CHILLER YARD" DETAIL ON THIS SHEET.
 - REPLACE EXISTING SPLIT SYSTEM INDOOR AND OUTDOOR UNIT PER THE EQUIPMENT SCHEDULE. RECONNECT TO EXISTING DUCTWORK, REFRIGERANT PIPING AND CONDENSATE DRAIN. REFER TO THE EQUIPMENT ELECTRICAL CONNECTION SCHEDULE FOR ELECTRICAL WORK.
 - FIELD VERIFY LOCATIONS OF EXISTING UNDERGROUND POWER AND WATER LINES IN THE AREA BEFORE DIGGING. COORDINATE WITH NATURAL GAS UTILITY TO VERIFY THERE ARE NO UNDERGROUND GAS LINES IN THE AREA.
- GENERAL SCOPE OF WORK DESCRIPTION:**
- INSTALL TWO NEW AIR-COOLED CHILLERS IN THE EXISTING CHILLER YARD. INSTALL NEW CHILLED WATER DISTRIBUTION PIPING TO SERVE THE MAIN BUILDING SOUTH ROOF, PERFORMING ARTS BUILDING, AND SCIENCE BUILDING HVAC SYSTEMS. INSTALL NEW CHILLED WATER PUMPS, ACCESSORIES, AND OTHER RELATED EQUIPMENT AS INDICATED ON THE DRAWINGS, EQUIPMENT SCHEDULES, AND SPECIFICATIONS. INSTALL NEW ELECTRICAL SERVICE ENTRANCE PANELBOARD TO SERVE THE NEW CHILLERS AND PUMPS IN THE CHILLER YARD.
 - INSTALL A NEW HOT WATER HEATING SYSTEM TO SERVE THE SCIENCE BUILDING HVAC SYSTEMS, INCLUDING NEW BOILER, PUMPS, DISTRIBUTION PIPING, AND OTHER RELATED EQUIPMENT AS INDICATED ON THE DRAWINGS, EQUIPMENT SCHEDULES, AND SPECIFICATIONS.
 - REPLACE EXISTING PACKAGED ROOFTOP UNITS ON THE MAIN BUILDING SOUTH ROOF AND PERFORMING ARTS BUILDING ROOF. IN MOST CASES, THE EXISTING DX/GAS HEAT RIGS WILL BE REPLACED WITH NEW CHILLED WATER/GAS HEAT RIGS. REFER TO THE DRAWINGS AND EQUIPMENT SCHEDULES.
 - REPLACE EXISTING DX SPLIT SYSTEMS IN THE SCIENCE BUILDING AND MAIN BUILDING. SPLIT SYSTEMS SERVING THE SCIENCE CLASSROOM AREA WILL BE REPLACED WITH NEW CHILLED WATER/HOT WATER FAN COIL UNITS. SPLIT SYSTEMS SERVING OTHER AREAS WILL BE REPLACED WITH NEW DX SPLIT SYSTEMS SIMILAR TO THE EXISTING EQUIPMENT. REFER TO THE DRAWINGS AND EQUIPMENT SCHEDULES.
 - INSTALL NEW CONTROLS TO INTEGRATE ALL NEW AND REPLACED HVAC EQUIPMENT INTO THE EXISTING AND/OR BUILDING CONTROL SYSTEM. REFER TO THE CONTROL PROJECT MANUAL FOR SCOPE OF WORK, SEQUENCES, AND POINTS.
 - COORDINATE WITH TEST AND BALANCE CONTRACTOR AND ENGINEER FOR COMMISSIONING AND TEST AND BALANCE (AIR AND WATER) FOR ALL NEW AND REPLACED EQUIPMENT PER SPECIFICATIONS.
 - REFER TO THE DRAWINGS, SPECIFICATIONS, AND OTHER PROJECT DOCUMENTS FOR OTHER WORK REQUIRED TO BE PERFORMED.
- GENERAL PROJECT NOTES (APPLICABLE TO ALL SHEETS):**
- PROVIDE NEW MATERIALS AS NEEDED TO MAKE FINAL CONNECTIONS BETWEEN NEW EQUIPMENT AND EXISTING DUCT, PIPING, CONDUIT, ETC. NEW MATERIALS SHALL MATCH EXISTING TYPES UNLESS OTHERWISE PROHIBITED BY CODE OR STANDARD PRACTICE; NOTIFY ENGINEER OF ANY SUCH OCCURRENCES.
 - EXISTING SPLIT SYSTEM REFRIGERANT PIPING MAY BE REUSED WITH NEW SPLIT SYSTEMS IF IT PASSES A PRESSURE TEST FOR R410A REFRIGERANT. CONTRACTOR TO INSPECT, CLEAN AND PRESSURE TEST THE PIPING. IF THE REFRIGERANT PIPING DOES NOT PASS INSPECTION AND TESTING, THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND A CONTINGENCY EXPENSE REQUEST WILL BE MADE OF THE OWNER FOR NEW REFRIGERANT PIPING TO BE PURCHASED AND INSTALLED FOR THE UNIT.
 - IF AN EXISTING ELECTRICAL CIRCUIT NEEDS TO BE EXTENDED, PROVIDE A POWER DISTRIBUTION TERMINAL BLOCK WITH PLASTIC COVER, ENCLOSED IN A WEATHERPROOF ENCLOSURE. EXTENDED CONDUCTORS SHALL BE THE SAME SIZE AND TYPE AS THE EXISTING CONDUCTORS.
 - ALL CONTROL WIRING SHALL BE CONTINUOUS CABLE BETWEEN EQUIPMENT/DEVICE CONNECTION POINTS. SPLICED WIRES SHALL NOT BE ALLOWED.
 - REPLACE ALL EXISTING EXPOSED FLEXIBLE ELECTRICAL AND CONTROLS CONDUIT AT CONNECTIONS TO OUTDOOR EQUIPMENT REPLACED UNDER THIS PROJECT. RIGID METAL OR EMT CONDUIT SHALL BE USED TO WITHIN 5 FEET OF THE EQUIPMENT ELECTRICAL CONNECTION BEFORE TRANSITIONING TO FLEXIBLE CONDUIT.
 - REFER TO THE ELECTRICAL CONNECTION SCHEDULE AND PANEL SCHEDULES FOR REQUIRED CHANGES TO EXISTING ELECTRICAL CIRCUITS, OR NEW ELECTRICAL CIRCUIT INFORMATION. ELECTRICAL CONTRACTOR SHALL PROVIDE NEW CONDUIT, WIRE, OVERCURRENT PROTECTION, SWITCHES, STARTERS, AND OTHER DEVICES WHERE INDICATED ON THE PROJECT DOCUMENTS, OR AS REQUIRED TO MEET THE PROJECT ELECTRICAL NEEDS IN ACCORDANCE WITH THE APPLICABLE CODES AND/OR EQUIPMENT MANUFACTURER REQUIREMENTS.
 - INSULATE ALL NEW PIPING, VESSELS/TANKS, DEVICES, AND DUCT WHERE REQUIRED, PER SPECIFICATIONS. PROVIDE ALUMINUM JACKETING ON ALL OUTDOOR CHILLED WATER AND HOT WATER PIPING. PROVIDE UV-RESISTANT COATING ON ALL OUTDOOR ELASTOMERIC FOAM INSULATION.
 - PROVIDE NEW INSULATION ON ALL OUTDOOR REFRIGERANT PIPING SERVING SPLIT SYSTEMS REPLACED UNDER THIS PROJECT.
 - PROVIDE NEW CONCRETE EQUIPMENT PADS FOR NEW FLOOR-MOUNTED EQUIPMENT WHERE INDICATED ON THE DRAWINGS OR DETAILS. EXTEND EXISTING CONCRETE PADS IF NEW EQUIPMENT IS LARGER IN SIZE THAN EXISTING.
 - CONTRACTOR TO FOLLOW MANUFACTURER-RECOMMENDED START-UP PROCEDURES FOR EACH NEW UNIT. VERIFY THAT AIR HANDLING UNIT CONDENSATE OVERFLOW PROTECTION DEVICES ARE INSTALLED AND OPERATIONAL.
 - NEW DUCT SMOKE DETECTORS SHALL BE PROVIDED FOR EACH NEW OR REPLACED AIR HANDLING UNIT OVER 2,000 CFM. REFER TO EQUIPMENT SCHEDULES. REPLACE EXISTING DUCT DETECTORS, IF PRESENT. COORDINATE WITH THE FIRE ALARM CONTRACTOR TO CONNECT/RECONNECT NEW DUCT DETECTORS TO EXISTING FIRE ALARM SYSTEM OR INDICATOR/TEST SWITCH DEVICES. THE DUCT DETECTOR SHALL BE DIRECTLY WIRED TO SHUT DOWN THE ASSOCIATED AIR-MOVING EQUIPMENT.
 - AT PROJECT CLOSE-OUT, THE MECHANICAL CONTRACTOR SHALL FLUSH THE CHILLED WATER AND HOT WATER PIPING SYSTEMS AND CLEAN ALL STRAINERS. THE CONTRACTOR SHALL PROVIDE THE FIRST CHEMICAL WATER TREATMENT SERVICE FOR THE CHILLED WATER AND HOT WATER SYSTEMS ONCE THE SYSTEMS ARE CLEAN, FILLED, AND OPERATIONAL.
 - AT PROJECT CLOSE-OUT, THE MECHANICAL CONTRACTOR SHALL REPLACE AIR FILTERS IN ANY AREA WHERE DUST AND DIRT WAS GENERATED DURING CONSTRUCTION.
 - LABEL ALL NEW EQUIPMENT, VALVES, AND DEVICES WITH IDENTIFICATION TAGS PER THE SPECIFICATIONS. POWERED EQUIPMENT SHALL BE LABELED WITH THE ELECTRICAL PANEL NAME AND CIRCUIT. UPDATE OR PROVIDE NEW ELECTRICAL PANEL SCHEDULES FOR PANELS AFFECTED BY THE PROJECT SCOPE.
 - REFER TO SPECIFICATIONS FOR OTHER PROJECT REQUIREMENTS.

A HCC SPRING BRANCH CAMPUS SITE PLAN
 SCALE: 1/32" = 1'-0" (APPROXIMATE)



A CHILLER YARD EXISTING / DEMOLITION PLAN

SCALE: 3/16" = 1'-0" (APPROXIMATE)



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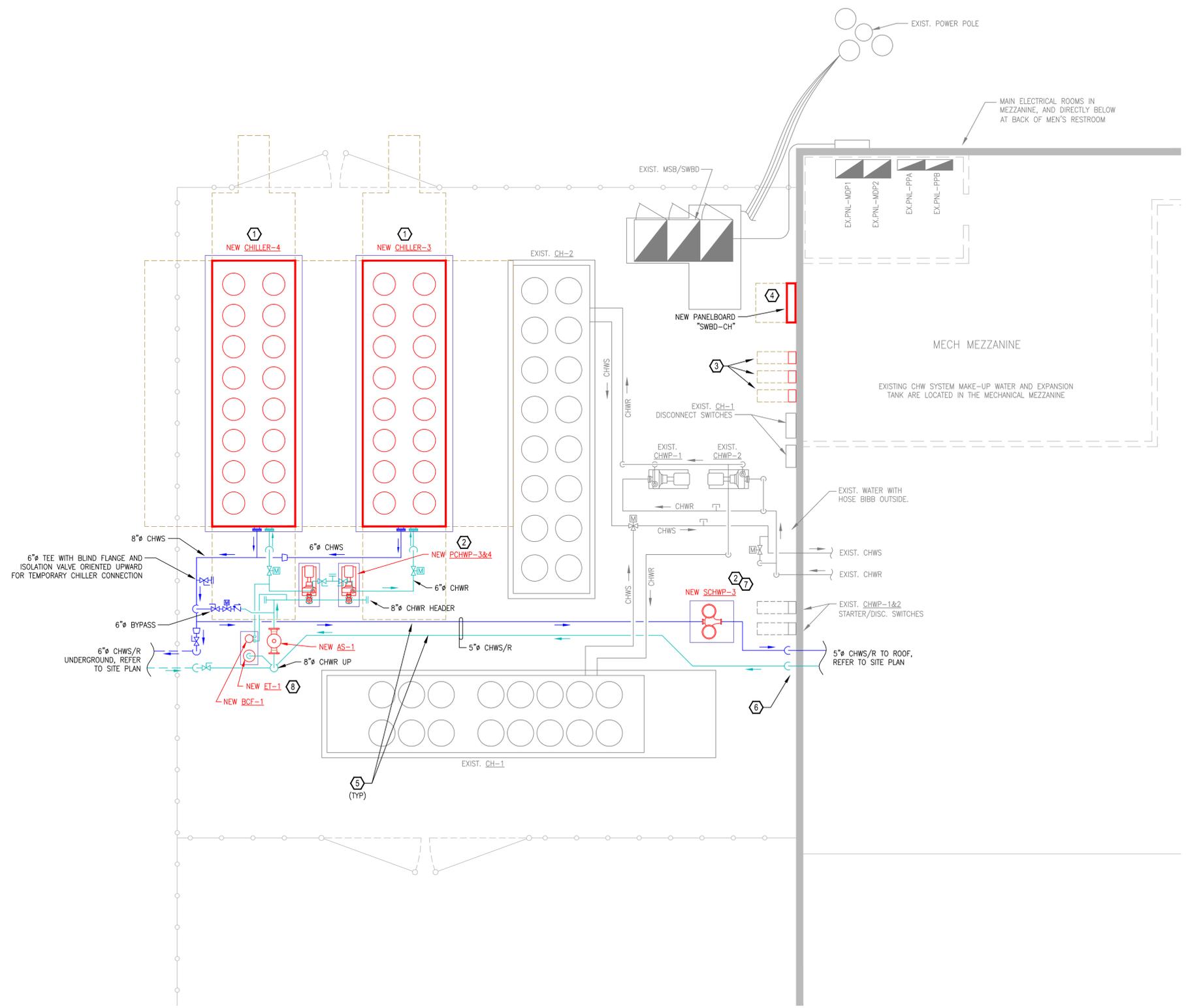
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GENERAL NOTES:

- THIS DRAWING IS ONLY INTENDED TO SHOW THE GENERAL PIPING AND EQUIPMENT LAYOUT. REFER TO PIPING SCHEMATIC DIAGRAMS AND DETAILS FOR ALL REQUIRED PIPE SIZES, CONNECTIONS, VALVES, APPURTENANCES, AND OTHER INFORMATION.

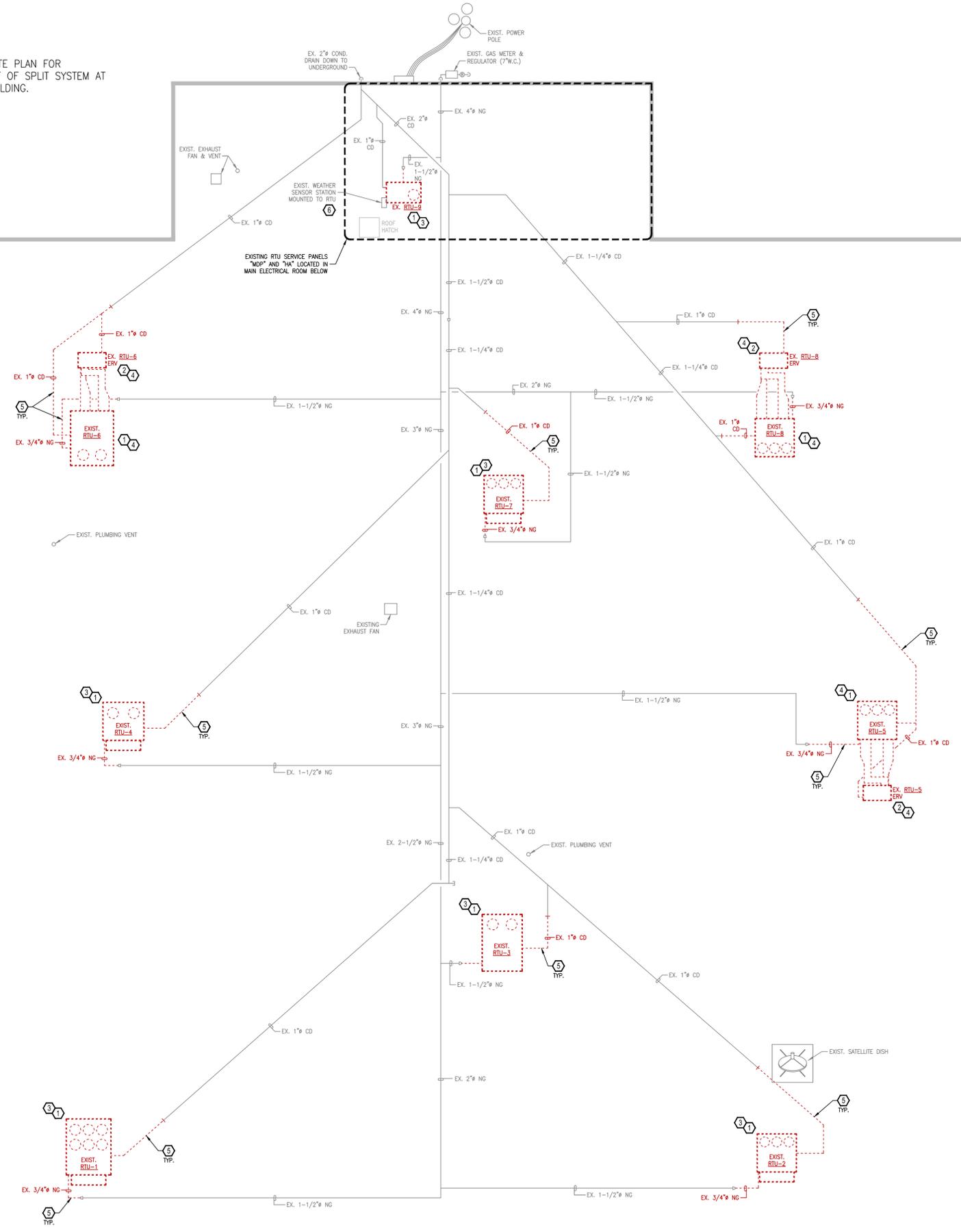
KEYED NOTES:

- INSTALL NEW AIR-COOLED CHILLERS PER THE EQUIPMENT SCHEDULE. PROVIDE NEW CONCRETE EQUIPMENT PAD. REFER TO DETAILS FOR INSTALLATION REQUIREMENTS AND PIPING CONNECTIONS. MAINTAIN MANUFACTURER-REQUIRED CLEARANCES WHERE POSSIBLE, ESPECIALLY FOR MAINTENANCE ACCESS. REFER TO THE EQUIPMENT ELECTRICAL CONNECTION SCHEDULE FOR ELECTRICAL WORK.
- INSTALL NEW PUMPS PER THE EQUIPMENT SCHEDULE. PROVIDE NEW CONCRETE EQUIPMENT PAD. REFER TO DETAILS FOR INSTALLATION REQUIREMENTS AND PIPING CONNECTIONS. REFER TO THE EQUIPMENT ELECTRICAL CONNECTION SCHEDULE FOR ELECTRICAL WORK.
- INSTALL NEW NEMA-3R OUTDOOR VFD WITH INTEGRAL DISCONNECT SWITCH FOR EACH NEW PUMP. PROVIDE AN OUTPUT TRANSFER SWITCH FROM THE VFD FOR TWIN REDUNDANT PUMP SCHWP-3. REFER TO PUMP SCHEDULE NOTES. INSTALL VFDs ON NORTH-FACING WALL FOR SHADING.
- PROVIDE NEW 480/277V, 3PH, 4W, 1200A, NEMA-3R ELECTRICAL PANELBOARD TO FEED NEW CHILLERS AND NEW PUMPS. COORDINATE WITH THE ELECTRICAL UTILITY TO PROVIDE NEW SERVICE FROM EXISTING POWER POLE AND PROVIDE NEW ELECTRIC METER. REFER TO THE ELECTRICAL ONE-LINE DIAGRAM ON SHEET SB-8.1 FOR NEW PANELBOARD SPECIFICATION AND CONNECTIONS.
- NEW CHILLED WATER SUPPLY AND RETURN PIPING INSULATED PER SPECIFICATIONS. PROVIDE FIELD-FABRICATED GALVANIZED STEEL SUPPORTS ANCHORED TO FOUNDATION WITH MIN. 1" TALL CONCRETE GROUTED BASE.
- NEW CHILLED WATER SUPPLY AND RETURN PIPING UP TO ROOF, REFER TO SITE PLAN. ANCHOR VERTICAL PIPE TO WALL.
- REFER TO VERTICAL IN-LINE PUMP DETAIL (NO SUCTION GUIDE). PROVIDE A MINIMUM OF 2 FEET OF STRAIGHT PIPE AFTER STRAINER AT PUMP INLET.
- INSTALL NEW 1-1/2" DOMESTIC WATER LINE WITH RPZ BACKFLOW PREVENTER FROM NEAREST EXISTING 1-1/2" OR LARGER DOMESTIC WATER SUPPLY FOR NEW CHILLED WATER MAKE-UP. REFER TO EXPANSION TANK DETAIL. INSULATE AND HEAT-TRACE OUTDOOR EXPOSED DOMESTIC WATER LINES. NOTE: THE EXISTING CHW SYSTEM MAKE-UP WATER CONNECTION IS LOCATED IN THE MECHANICAL MEZZANINE BESIDE THE CHILLER YARD.



A CHILLER YARD NEW WORK PLAN
 SCALE: 3/16" = 1'-0" (APPROXIMATE)

REFER TO SITE PLAN FOR REPLACEMENT OF SPLIT SYSTEM AT BACK OF BUILDING.



EXISTING PANEL MDP (277/480V):

CKT#	EQUIP.	CKT BREAKER
1,3,5	- RTU-1	70A / 3P
2,4,6	- PHASE MON.	20A / 3P
7,9,11	- RTU-8	70A / 3P
8,10,12	- RTU-2	70A / 3P
13,15,17	- RTU-5	70A / 3P
14,16,18	- RTU-3	70A / 3P
19,21,23	- RTU-9	20A / 3P
20,22,24	- RTU-6	70A / 3P
25,27,29	- RTU-7	70A / 3P
26,28,30	- RTU-4	70A / 3P
31,33,35	- SPARE?	175A / 3P
32,34,36	- PANEL HA	225A / 3P

EXISTING PANEL HA (277/480V):

CKT#	EQUIP.	CKT BREAKER
31,33,35	- RTU-6 ERV	15A / 3P
32,34,36	- RTU-5 ERV	20A / 3P
38,40,42	- RTU-8 ERV	15A / 3P

NOTES:
 • EXISTING CIRCUITS SHOWN FOR REFERENCE ONLY. REFER TO ELECTRICAL CONNECTION SCHEDULES FOR MORE INFORMATION.
 • NOT ALL CIRCUITS ON PANEL ARE SHOWN.

NOTES:
 • EXISTING CIRCUITS SHOWN FOR REFERENCE ONLY. REFER TO ELECTRICAL CONNECTION SCHEDULES FOR MORE INFORMATION.

KEYED NOTES:

- 1 DEMOLISH EXISTING PACKAGED ROOFTOP UNIT AND ELECTRICAL DISCONNECT SWITCH.
- 2 DEMOLISH EXISTING ENERGY RECOVERY VENTILATOR, DEMOLISH ASSOCIATED CONDENSATE PIPING AND ROOFTOP DUCTWORK TO CONNECTED RTU. DEMOLISH EXISTING ELECTRICAL CONDUCTORS BACK TO PANEL-HA IN THE MAIN MECHANICAL ROOM, AND LABEL CIRCUIT BREAKERS AS "SPARE".
- 3 EXISTING ROOF CURB TO REMAIN AND BE REUSED.
- 4 EXISTING ROOF CURB TO BE DEMOLISHED AND NEW CURB INSTALLED.
- 5 DEMOLISH EXISTING CONDENSATE AND NATURAL GAS PIPING AS INDICATED BY DASHED LINES TO ALLOW FOR REWORK TO NEW EQUIPMENT CONNECTIONS. REFER TO NEW EQUIPMENT ROOF PLAN.
- 6 DETACH SENSOR STATION FROM EXISTING RTU-9 AND MOUNT TO SIDE OF NEW RTU ADAPTOR CURB.

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HCC SPRING BRANCH CAMPUS
 SOUTH ROOF DEMOLITION PLAN

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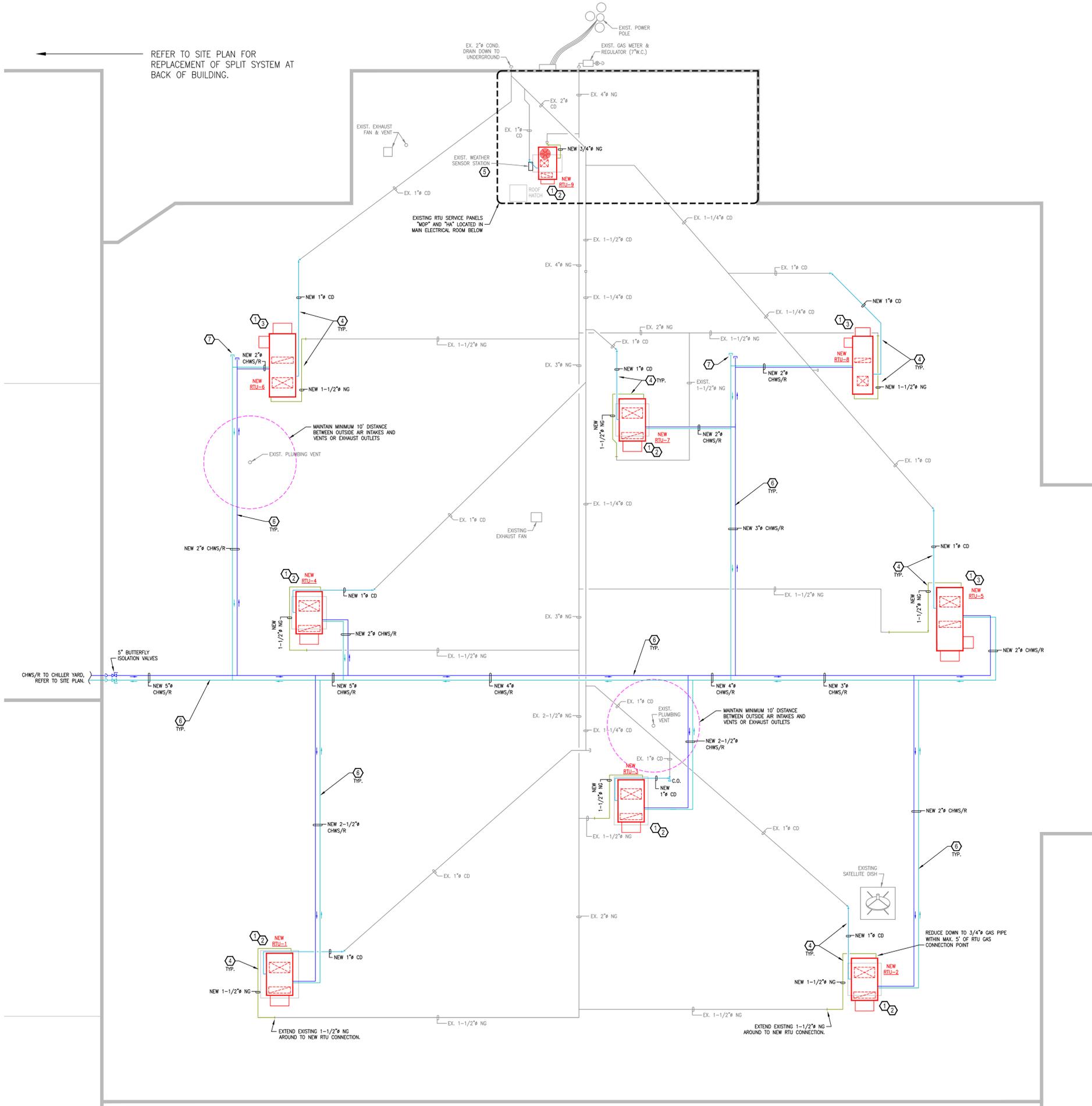
APPROXIMATE SCALE:
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SHEET INFO.

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A SOUTH ROOF DEMOLITION PLAN
 SCALE: 3/32" = 1'-0" (APPROXIMATE)

REFER TO SITE PLAN FOR REPLACEMENT OF SPLIT SYSTEM AT BACK OF BUILDING.



1. THIS DRAWING IS ONLY INTENDED TO SHOW THE GENERAL PIPING AND EQUIPMENT LAYOUT. REFER TO PIPING SCHEMATIC DIAGRAMS AND DETAILS FOR ALL REQUIRED PIPE SIZES, CONNECTIONS, VALVES, APPURTENANCES, AND OTHER INFORMATION.

KEYED NOTES:

1. INSTALL NEW PACKAGED ROOFTOP UNIT PER THE EQUIPMENT SCHEDULE. RECONNECT TO EXISTING DUCTWORK. REFER TO THE ELECTRICAL CONNECTION SCHEDULE FOR ELECTRICAL WORK.
2. PROVIDE ADAPTOR CURB TO SUPPORT NEW RTU ON EXISTING ROOF CURB.
3. INSTALL NEW ROOF CURB FROM EQUIPMENT MANUFACTURER. PROVIDE STEEL JOIST BRACING AND FULL SUPPORT UNDER ALL EDGES OF NEW CURB. PATCH UNUSED ROOF PENETRATIONS AND OPEN AREAS REMAINING FROM DEMOLISHED CURB. COORDINATE WITH WARRANTY-HOLDING ROOFING CONTRACTOR FOR ROOF WORK, INCLUDING NEW CURB INSTALLATION AND FLASHING REQUIREMENTS.
4. PROVIDE NEW CONDENSATE DRAIN PIPE (MATCH EXISTING MATERIAL) AND NEW NATURAL GAS PIPING AS INDICATED TO CONNECT EACH NEW ROOFTOP UNIT TO EXISTING PIPING. CONDENSATE DRAIN SIZE SHALL BE NO LESS THAN THE EQUIPMENT DRAIN CONNECTION SIZE. GAS PIPE SHALL BE THE SIZE INDICATED ON THE DRAWING UP TO WITHIN 5 FEET OF THE EQUIPMENT CONNECTION BEFORE TRANSITIONING DOWN TO THE EQUIPMENT CONNECTION SIZE. PROVIDE NEW PIPE SUPPORTS FOR ALL NEW PIPE.
5. RE-ATTACH EXISTING SENSOR STATION TO SIDE OF NEW RTU-9 ADAPTOR CURB.
6. NEW CHILLED WATER SUPPLY AND RETURN PIPING. REFER TO PIPE SUPPORT DETAIL FOR ROOFTOP PIPE SUPPORTS. REFER TO COIL CONNECTION DETAIL FOR PIPING AND VALVES AT EACH RTU.
7. PROVIDE BLIND FLANGE OR CAP.

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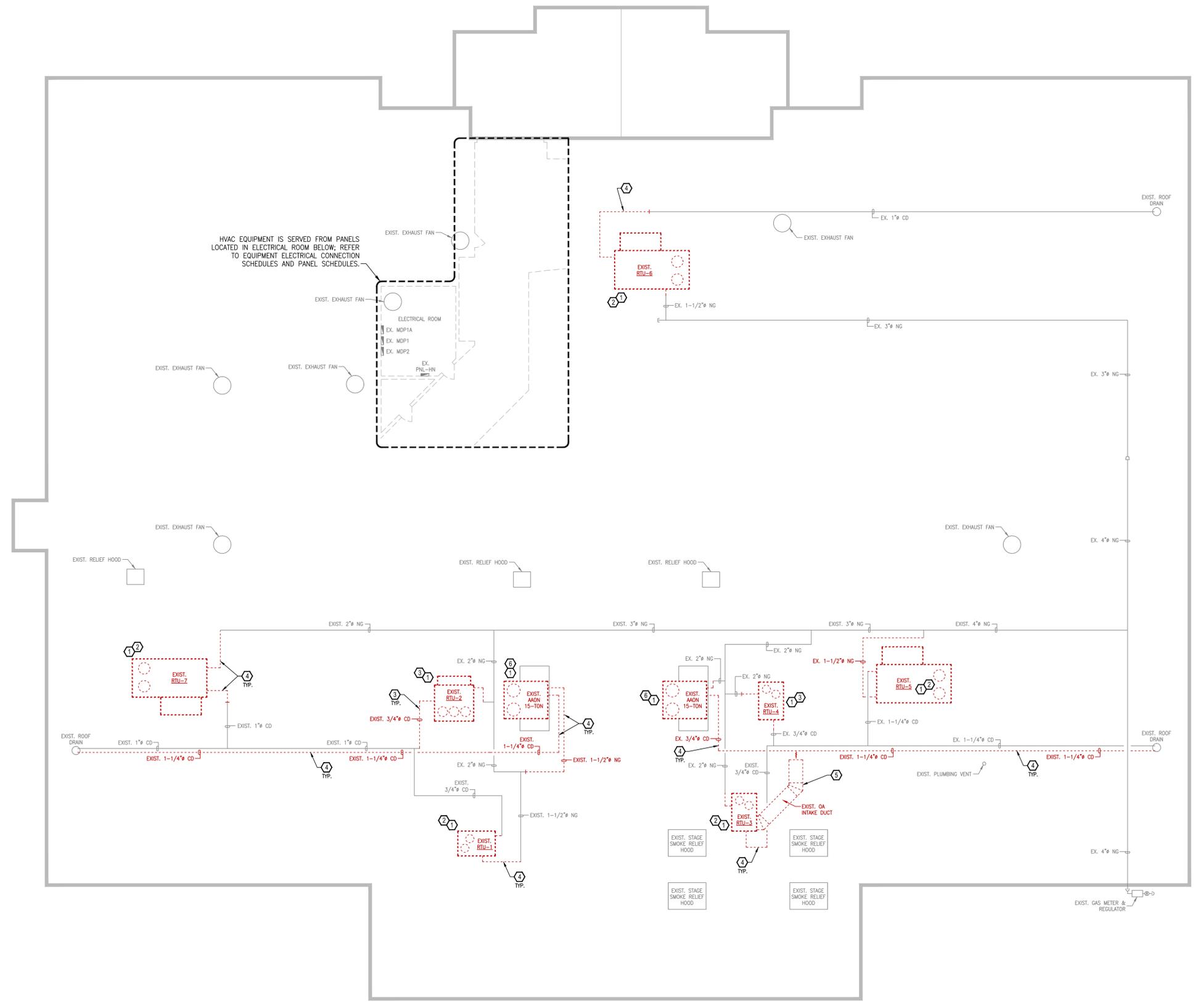
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HVAC EQUIPMENT IS SERVED FROM PANELS LOCATED IN ELECTRICAL ROOM BELOW; REFER TO EQUIPMENT ELECTRICAL CONNECTION SCHEDULES AND PANEL SCHEDULES.

GENERAL NOTES:

1. REFER TO SHEET SB-8.4 FOR EXISTING PERFORMING ARTS BUILDING ELECTRICAL PANEL INFORMATION.

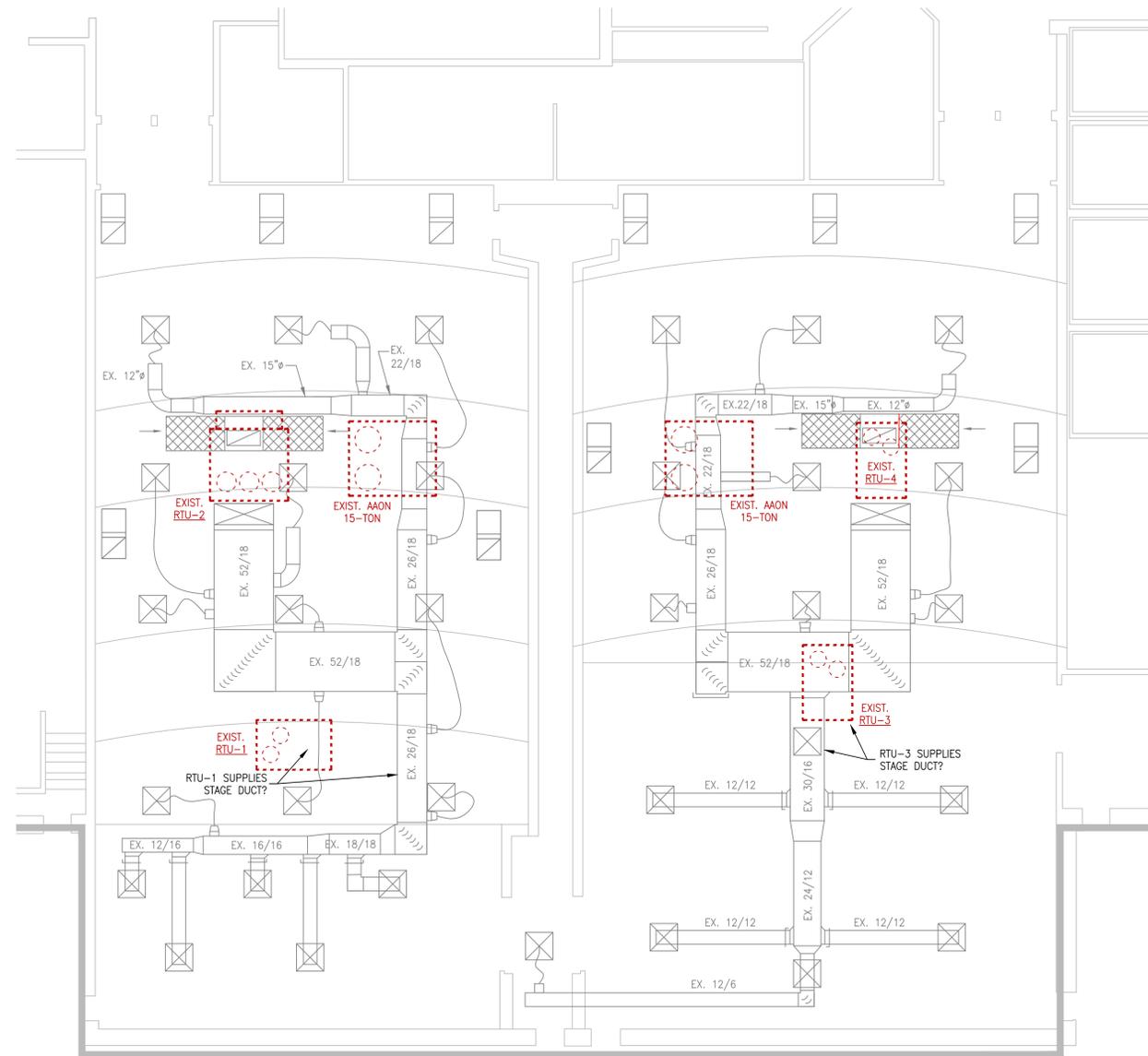
KEYED NOTES:

1. DEMOLISH EXISTING PACKAGED ROOFTOP UNIT AND ELECTRICAL DISCONNECT SWITCH. REFER TO THE ELECTRICAL CONNECTION SCHEDULE AND PANEL SCHEDULES FOR ELECTRICAL CIRCUIT INFORMATION.
2. EXISTING ROOF CURB TO REMAIN AND BE REUSED.
3. EXISTING ROOF CURB TO BE DEMOLISHED AND NEW CURB INSTALLED.
4. DEMOLISH EXISTING CONDENSATE AND NATURAL GAS PIPING AS INDICATED BY DASHED LINES TO ALLOW FOR REWORK TO NEW EQUIPMENT CONNECTIONS. REFER TO NEW EQUIPMENT ROOF PLAN.
5. DEMOLISH EXISTING ROOFTOP DUCTWORK.
6. DEMOLISH EXISTING PACKAGED ROOFTOP UNIT. DEMOLISH ASSOCIATED CONDENSATE PIPING. DEMOLISH NATURAL GAS PIPING BACK TO BRANCH TEE AND PROVIDE CAP. DEMOLISH EXISTING ELECTRICAL CONDUCTORS BACK TO THE ELECTRICAL PANEL, AND LABEL CIRCUIT BREAKERS AS "SPARE". CAP AND SEAL THE REMAINING SUPPLY AIR DUCT AIR-TIGHT AT THE ROOFTOP CONNECTION. EXISTING ROOF CURB TO REMAIN AND BE CAPPED; REFER TO "ABANDONED ROOF CURB CAP DETAIL" AND NEW EQUIPMENT ROOF PLAN.

A PERFORMING ARTS BUILDING DEMOLITION ROOF PLAN

SCALE: 3/32" = 1'-0" (APPROXIMATE)





EXISTING DUCTWORK IS SHOWN BASED ON BEST AVAILABLE RECORD DRAWINGS, FOR REFERENCE ONLY. THE RECORD DRAWING DUCTWORK DOES NOT MATCH UP WITH THE CURRENT RTU LOCATIONS ON THE ROOF.

THE EXISTING AAON UNITS ARE ASSUMED TO FUNCTION ONLY WHEN THE AUDITORIUM IS FULLY OCCUPIED AND ADDITIONAL VENTILATION AIR IS REQUIRED. THE EXISTING AAON UNITS WILL BE DEMOLISHED. NEW RTU-2 AND RTU-4 ARE DESIGNED TO SUPPLY THE FULL CONDITIONING AND VENTILATION DEMAND FOR THE AUDITORIUMS.

CONTRACTOR TO FIELD VERIFY EXISTING DUCT CONFIGURATION AND REMOVE/CAP THE SUPPLY DUCT FROM EACH EXISTING AAON UNIT. REFER TO NEW EQUIPMENT ROOF PLAN NOTES.

A PERFORMING ARTS BUILDING DEMOLITION AUDITORIUM PLAN **N**

SCALE: 1/8" = 1'-0" (APPROXIMATE)

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HCC SPRING BRANCH CAMPUS
 PERFORMING ARTS BUILDING
 EXISTING AUDITORIUM PLAN



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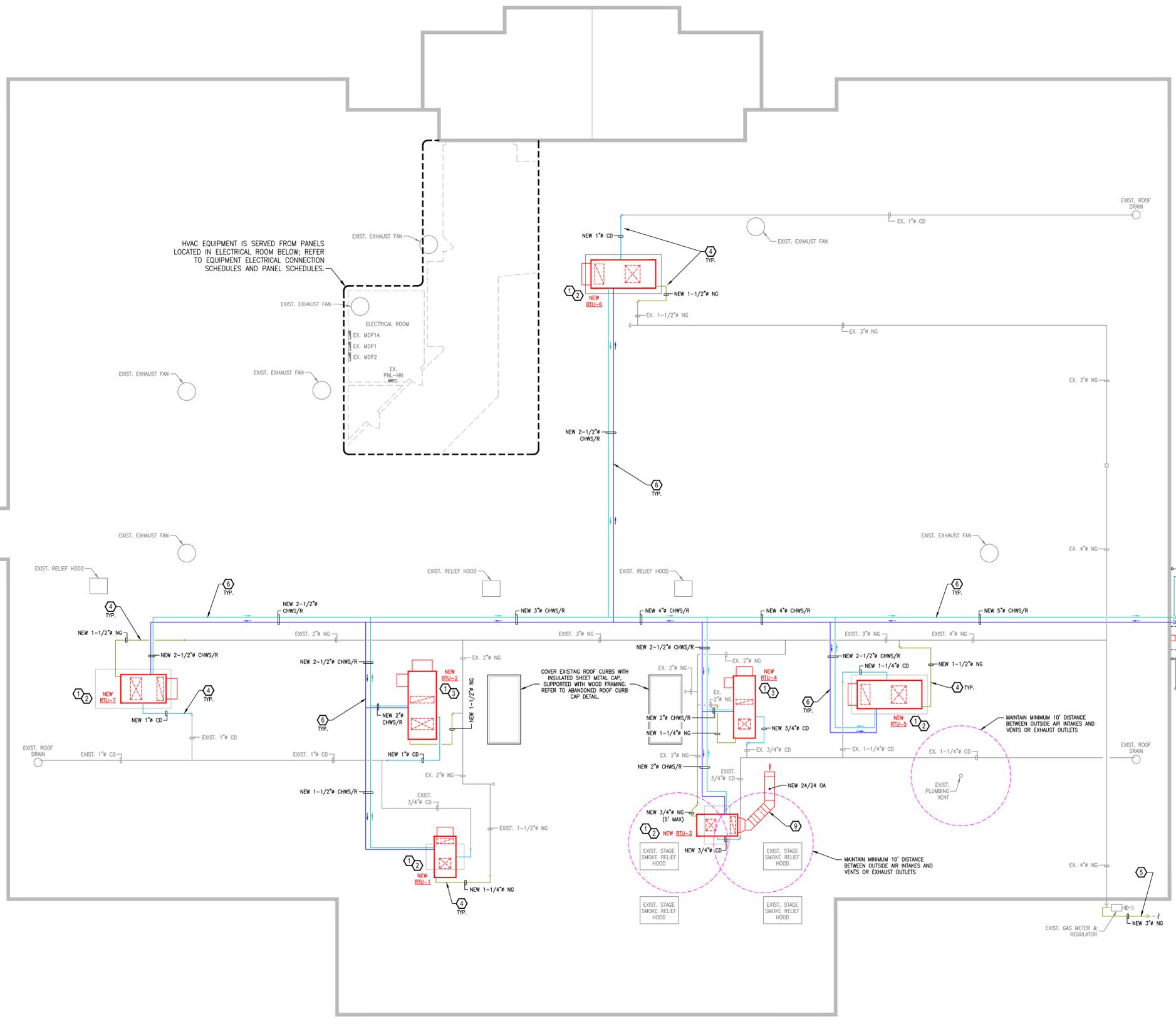
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GENERAL NOTES:

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- REFER TO SHEET SB-8.4 FOR EXISTING PERFORMING ARTS BUILDING ELECTRICAL PANEL INFORMATION.

KEYED NOTES:

- INSTALL NEW PACKAGED ROOFTOP UNIT PER THE EQUIPMENT SCHEDULE. RECONNECT TO EXISTING DUCTWORK. REFER TO THE ELECTRICAL CONNECTION SCHEDULE FOR ELECTRICAL WORK.
- PROVIDE ADAPTOR CURB TO SUPPORT NEW RTU ON EXISTING ROOF CURB.
- INSTALL NEW ROOF CURB FROM EQUIPMENT MANUFACTURER. PROVIDE STEEL JOIST BRACING AND FULL SUPPORT UNDER ALL EDGES OF NEW CURB. PATCH UNUSED ROOF PENETRATIONS AND OPEN AREAS REMAINING FROM DEMOLISHED CURB. COORDINATE WITH WARRANTY-HOLDING ROOFING CONTRACTOR FOR ROOF WORK, INCLUDING NEW CURB INSTALLATION AND FLASHING REQUIREMENTS.
- PROVIDE NEW CONDENSATE DRAIN PIPE (MATCH EXISTING MATERIAL) AND NEW NATURAL GAS PIPING AS INDICATED TO CONNECT EACH NEW ROOFTOP UNIT TO EXISTING PIPING. CONDENSATE DRAIN SIZE SHALL BE NO LESS THAN THE EQUIPMENT DRAIN CONNECTION SIZE. GAS PIPE SHALL BE THE SIZE INDICATED ON THE DRAWING UP TO WITHIN 5 FEET OF THE EQUIPMENT CONNECTION BEFORE TRANSITIONING DOWN TO THE EQUIPMENT CONNECTION SIZE. PROVIDE NEW PIPE SUPPORTS FOR ALL NEW PIPE.
- INSTALL NEW 3" NATURAL GAS PIPE UNDERGROUND TO SCIENCE BUILDING FROM EXISTING METER. REFER TO GAS RISER DIAGRAM, SITE PLAN, AND SCIENCE BUILDING FLOOR PLANS.
- NEW CHILLED WATER SUPPLY AND RETURN PIPING. REFER TO PIPE SUPPORT DETAIL FOR ROOFTOP PIPE SUPPORTS. REFER TO COIL CONNECTION DETAIL FOR PIPING AND VALVES AT EACH RTU.
- INSTALL NEW PUMP PER THE EQUIPMENT SCHEDULE. PROVIDE NEW CONCRETE EQUIPMENT PAD. REFER TO VERTICAL INLINE PUMP DETAIL (NO SUCTION GUIDE) FOR INSTALLATION REQUIREMENTS AND PIPING CONNECTIONS. PROVIDE A MINIMUM OF 2 FEET OF STRAIGHT PIPE AFTER STRAINER AT PUMP INLET. REFER TO THE EQUIPMENT ELECTRICAL CONNECTION SCHEDULE FOR ELECTRICAL WORK.
- PROVIDE NEW NEMA-3R OUTDOOR VFD WITH INTEGRAL DISCONNECT SWITCH AND OUTPUT TRANSFER SWITCH FOR TWIN REDUNDANT PUMP. REFER TO PUMP SCHEDULE NOTES. PROVIDE NEW ELECTRICAL CIRCUIT FROM INDOOR PANEL PER THE ELECTRICAL CONNECTION SCHEDULE.
- REPLACE EXISTING OA INTAKE DUCT WITH NEW 24"x24" DUCT; KEEP INLET 10' MINIMUM AWAY FROM SMOKE RELIEF HOODS.



A PERFORMING ARTS BUILDING NEW WORK ROOF PLAN **N**
 SCALE: 3/32" = 1'-0" (APPROXIMATE)



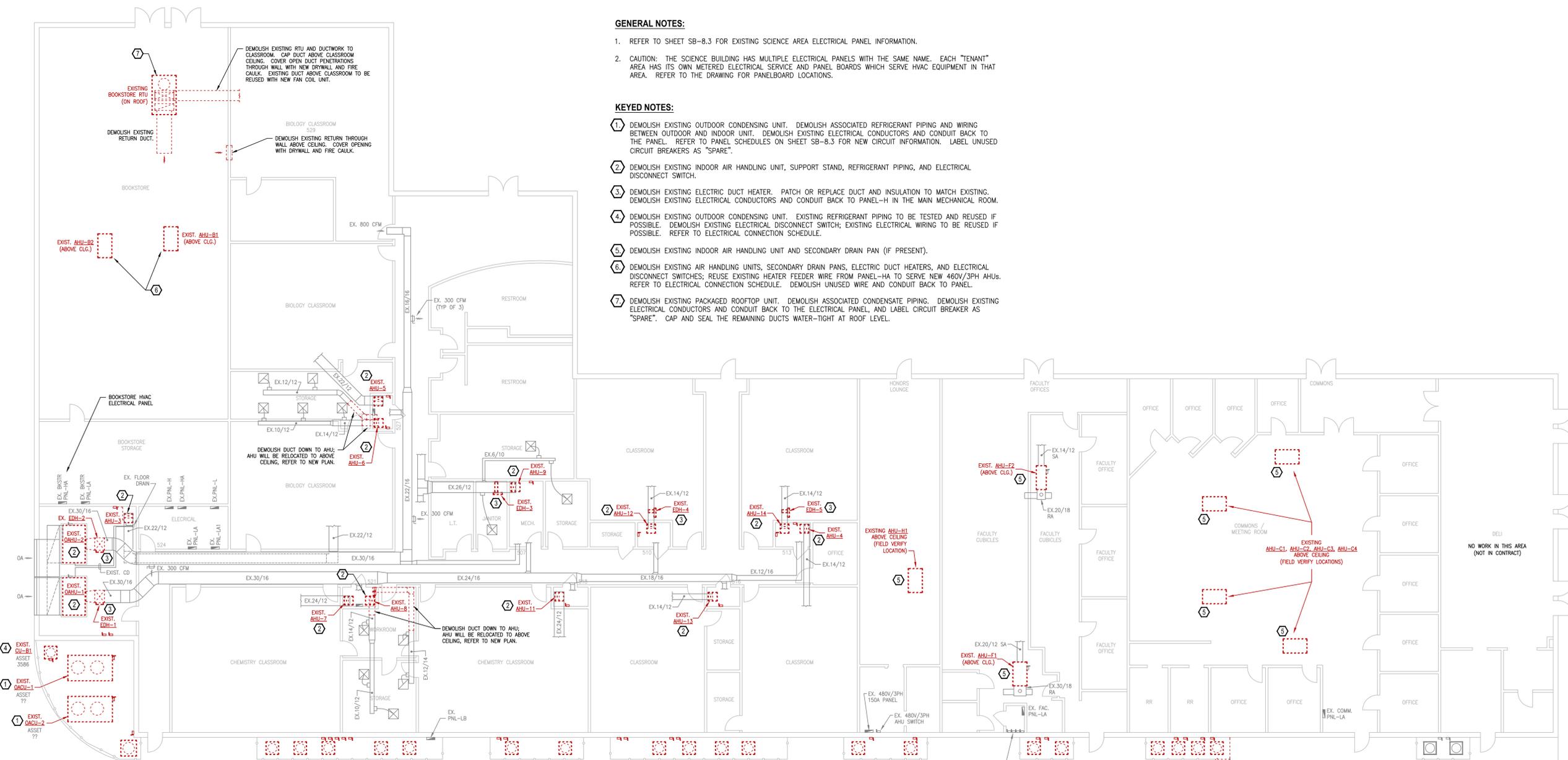
DATE
 MARCH 20, 2018

NO.	REV.	DATE
CD	BO/CC	3-2018

APPROXIMATE SCALE:
 SEE DRAWING

SHEET INFO.

SB
 4.1



- GENERAL NOTES:**
- REFER TO SHEET SB-8.3 FOR EXISTING SCIENCE AREA ELECTRICAL PANEL INFORMATION.
 - CAUTION: THE SCIENCE BUILDING HAS MULTIPLE ELECTRICAL PANELS WITH THE SAME NAME. EACH "TENANT" AREA HAS ITS OWN METERED ELECTRICAL SERVICE AND PANEL BOARDS WHICH SERVE HVAC EQUIPMENT IN THAT AREA. REFER TO THE DRAWING FOR PANELBOARD LOCATIONS.
- KEYED NOTES:**
- DEMOLISH EXISTING OUTDOOR CONDENSING UNIT. DEMOLISH ASSOCIATED REFRIGERANT PIPING AND WIRING BETWEEN OUTDOOR AND INDOOR UNIT. DEMOLISH EXISTING ELECTRICAL CONDUCTORS AND CONDUIT BACK TO THE PANEL. REFER TO PANEL SCHEDULES ON SHEET SB-8.3 FOR NEW CIRCUIT INFORMATION. LABEL UNUSED CIRCUIT BREAKERS AS "SPARE".
 - DEMOLISH EXISTING INDOOR AIR HANDLING UNIT, SUPPORT STAND, REFRIGERANT PIPING, AND ELECTRICAL DISCONNECT SWITCH.
 - DEMOLISH EXISTING ELECTRIC DUCT HEATER. PATCH OR REPLACE DUCT AND INSULATION TO MATCH EXISTING. DEMOLISH EXISTING ELECTRICAL CONDUCTORS AND CONDUIT BACK TO PANEL-H IN THE MAIN MECHANICAL ROOM.
 - DEMOLISH EXISTING OUTDOOR CONDENSING UNIT. EXISTING REFRIGERANT PIPING TO BE TESTED AND REUSED IF POSSIBLE. DEMOLISH EXISTING ELECTRICAL DISCONNECT SWITCH; EXISTING ELECTRICAL WIRING TO BE REUSED IF POSSIBLE. REFER TO ELECTRICAL CONNECTION SCHEDULE.
 - DEMOLISH EXISTING INDOOR AIR HANDLING UNIT AND SECONDARY DRAIN PAN (IF PRESENT).
 - DEMOLISH EXISTING AIR HANDLING UNITS, SECONDARY DRAIN PANS, ELECTRIC DUCT HEATERS, AND ELECTRICAL DISCONNECT SWITCHES; REUSE EXISTING HEATER FEEDER WIRE FROM PANEL-HA TO SERVE NEW 460V/3PH AHUs. REFER TO ELECTRICAL CONNECTION SCHEDULE. DEMOLISH UNUSED WIRE AND CONDUIT BACK TO PANEL.
 - DEMOLISH EXISTING PACKAGED ROOFTOP UNIT. DEMOLISH ASSOCIATED CONDENSATE PIPING. DEMOLISH EXISTING ELECTRICAL CONDUCTORS AND CONDUIT BACK TO THE ELECTRICAL PANEL, AND LABEL CIRCUIT BREAKER AS "SPARE". CAP AND SEAL THE REMAINING DUCTS WATER-TIGHT AT ROOF LEVEL.

EXIST. CU-11	EXIST. CU-3	EXIST. CU-5	EXIST. CU-6	EXIST. CU-7	EXIST. CU-8	EXIST. CU-11	EXIST. CU-9	EXIST. CU-12	EXIST. CU-13	EXIST. CU-14	EXIST. CU-4	EXIST. CU-X	EXIST. CU-11	EXIST. CU-F1	EXIST. CU-F2	EXIST. CU-C1	EXIST. CU-C2	EXIST. CU-C3	EXIST. CU-C4	
ASSET 3586	MISLABELED AS CU-3	ASSET 1161	ASSET 1160	ASSET 1159	ASSET 1158	ASSET 20470	ASSET 1164	ASSET 1163	ASSET 1168	ASSET 1167	ASSET 1166	ASSET 1165	ASSET ??	ASSET 1169	ASSET 20458	ASSET 20459	ASSET 20460	ASSET ??	ASSET ??	ASSET 1170

EXISTING PANEL LA - COMMONS AREA (120/208V):

DUCT	EQUIP.	CXL BREAKER
1.3.5	- AHU-1	50A / 3P
2.4.6	- AHU-2	40A / 3P
7.8.11	- AHU-4	40A / 3P
8.10.12	- AHU-3	40A / 3P
13.15.17	- CU-4	30A / 3P
14.16.18	- CU-2	30A / 3P
19.21.23	- CU-3	30A / 3P
20.22.24	- CU-1	30A / 3P

EXISTING SPLIT SYSTEMS SERVING MURPHY'S DELI ARE TO REMAIN (NOT IN CONTRACT)

EXISTING FENCED ENCLOSURE TO BE EXTENDED TO MAKE ROOM FOR LARGER NEW EQUIPMENT. REFER TO NEW FLOOR PLAN.

NOTES:
 • EXISTING CIRCUITS SHOWN FOR REFERENCE ONLY. REFER TO EQUIPMENT ELECTRICAL CONNECTION SCHEDULES FOR MORE INFORMATION.
 • NOT ALL CIRCUITS SHOWN.
 • ON-SITE POSTED PANEL SCHEDULE MAY NOT BE ACCURATE. FIELD VERIFY CIRCUITS.

SCIENCE BUILDING DEMOLITION FLOOR PLAN
 SCALE: 3/32" = 1'-0" (APPROXIMATE)

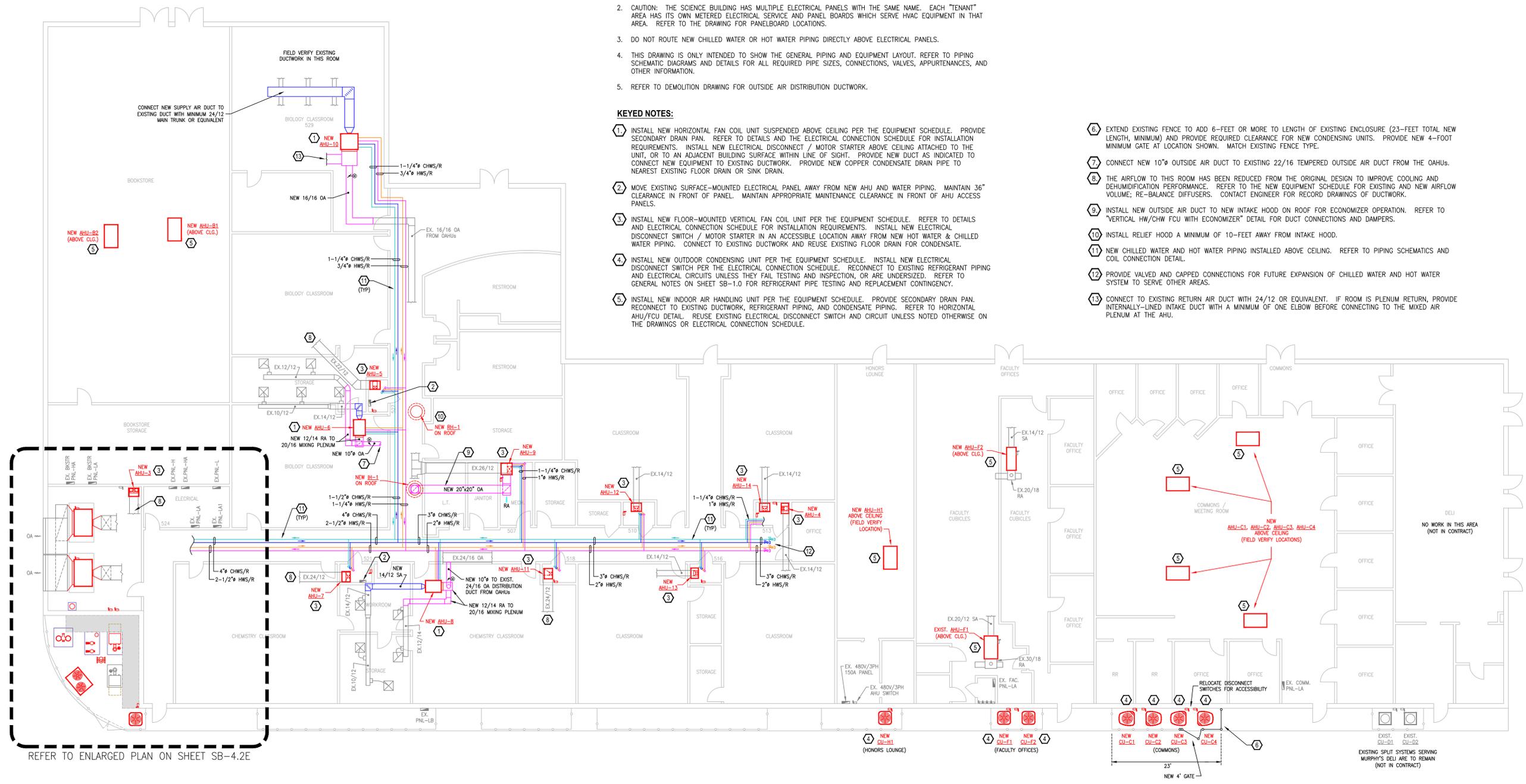
GENERAL NOTES:

- REFER TO SHEET SB-8.3 FOR SCIENCE AREA ELECTRICAL PANEL INFORMATION AND NEW CIRCUIT ASSIGNMENTS.
- CAUTION: THE SCIENCE BUILDING HAS MULTIPLE ELECTRICAL PANELS WITH THE SAME NAME. EACH "TENANT" AREA HAS ITS OWN METERED ELECTRICAL SERVICE AND PANEL BOARDS WHICH SERVE HVAC EQUIPMENT IN THAT AREA. REFER TO THE DRAWING FOR PANELBOARD LOCATIONS.
- DO NOT ROUTE NEW CHILLED WATER OR HOT WATER PIPING DIRECTLY ABOVE ELECTRICAL PANELS.
- THIS DRAWING IS ONLY INTENDED TO SHOW THE GENERAL PIPING AND EQUIPMENT LAYOUT. REFER TO PIPING SCHEMATIC DIAGRAMS AND DETAILS FOR ALL REQUIRED PIPE SIZES, CONNECTIONS, VALVES, APPURTENANCES, AND OTHER INFORMATION.
- REFER TO DEMOLITION DRAWING FOR OUTSIDE AIR DISTRIBUTION DUCTWORK.

KEYED NOTES:

- INSTALL NEW HORIZONTAL FAN COIL UNIT SUSPENDED ABOVE CEILING PER THE EQUIPMENT SCHEDULE. PROVIDE SECONDARY DRAIN PAN. REFER TO DETAILS AND THE ELECTRICAL CONNECTION SCHEDULE FOR INSTALLATION REQUIREMENTS. INSTALL NEW ELECTRICAL DISCONNECT / MOTOR STARTER ABOVE CEILING ATTACHED TO THE UNIT, OR TO AN ADJACENT BUILDING SURFACE WITHIN LINE OF SIGHT. PROVIDE NEW DUCT AS INDICATED TO CONNECT NEW EQUIPMENT TO EXISTING DUCTWORK. PROVIDE NEW COPPER CONDENSATE DRAIN PIPE TO NEAREST EXISTING FLOOR DRAIN OR SINK DRAIN.
- MOVE EXISTING SURFACE-MOUNTED ELECTRICAL PANEL AWAY FROM NEW AHU AND WATER PIPING. MAINTAIN 36" CLEARANCE IN FRONT OF PANEL. MAINTAIN APPROPRIATE MAINTENANCE CLEARANCE IN FRONT OF AHU ACCESS PANELS.
- INSTALL NEW FLOOR-MOUNTED VERTICAL FAN COIL UNIT PER THE EQUIPMENT SCHEDULE. REFER TO DETAILS AND ELECTRICAL CONNECTION SCHEDULE FOR INSTALLATION REQUIREMENTS. INSTALL NEW ELECTRICAL DISCONNECT SWITCH / MOTOR STARTER IN AN ACCESSIBLE LOCATION AWAY FROM NEW HOT WATER & CHILLED WATER PIPING. CONNECT TO EXISTING DUCTWORK AND REUSE EXISTING FLOOR DRAIN FOR CONDENSATE.
- INSTALL NEW OUTDOOR CONDENSING UNIT PER THE EQUIPMENT SCHEDULE. INSTALL NEW ELECTRICAL DISCONNECT SWITCH PER THE ELECTRICAL CONNECTION SCHEDULE. RECONNECT TO EXISTING REFRIGERANT PIPING AND ELECTRICAL CIRCUITS UNLESS THEY FAIL TESTING AND INSPECTION, OR ARE UNDERSIZED. REFER TO GENERAL NOTES ON SHEET SB-1.0 FOR REFRIGERANT PIPE TESTING AND REPLACEMENT CONTINGENCY.
- INSTALL NEW INDOOR AIR HANDLING UNIT PER THE EQUIPMENT SCHEDULE. PROVIDE SECONDARY DRAIN PAN. RECONNECT TO EXISTING DUCTWORK, REFRIGERANT PIPING, AND CONDENSATE PIPING. REFER TO HORIZONTAL AHU/FCU DETAIL. REUSE EXISTING ELECTRICAL DISCONNECT SWITCH AND CIRCUIT UNLESS NOTED OTHERWISE ON THE DRAWINGS OR ELECTRICAL CONNECTION SCHEDULE.

- EXTEND EXISTING FENCE TO ADD 6- FEET OR MORE TO LENGTH OF EXISTING ENCLOSURE (23- FEET TOTAL NEW LENGTH, MINIMUM) AND PROVIDE REQUIRED CLEARANCE FOR NEW CONDENSING UNITS. PROVIDE NEW 4- FOOT MINIMUM GATE AT LOCATION SHOWN. MATCH EXISTING FENCE TYPE.
- CONNECT NEW 10" OUTSIDE AIR DUCT TO EXISTING 22/16 TEMPERED OUTSIDE AIR DUCT FROM THE OAHUS.
- THE AIRFLOW TO THIS ROOM HAS BEEN REDUCED FROM THE ORIGINAL DESIGN TO IMPROVE COOLING AND DEHUMIDIFICATION PERFORMANCE. REFER TO THE NEW EQUIPMENT SCHEDULE FOR EXISTING AND NEW AIRFLOW VOLUME; RE-BALANCE DIFFUSERS. CONTACT ENGINEER FOR RECORD DRAWINGS OF DUCTWORK.
- INSTALL NEW OUTSIDE AIR DUCT TO NEW INTAKE HOOD ON ROOF FOR ECONOMIZER OPERATION. REFER TO "VERTICAL HW/CHW FCU WITH ECONOMIZER" DETAIL FOR DUCT CONNECTIONS AND DAMPERS.
- INSTALL RELIEF HOOD A MINIMUM OF 10- FEET AWAY FROM INTAKE HOOD.
- NEW CHILLED WATER AND HOT WATER PIPING INSTALLED ABOVE CEILING. REFER TO PIPING SCHEMATICS AND COIL CONNECTION DETAIL.
- PROVIDE VALVED AND CAPPED CONNECTIONS FOR FUTURE EXPANSION OF CHILLED WATER AND HOT WATER SYSTEM TO SERVE OTHER AREAS.
- CONNECT TO EXISTING RETURN AIR DUCT WITH 24/12 OR EQUIVALENT. IF ROOM IS PLENUM RETURN, PROVIDE INTERNALLY-LINED INTAKE DUCT WITH A MINIMUM OF ONE ELBOW BEFORE CONNECTING TO THE MIXED AIR PLENUM AT THE AHU.

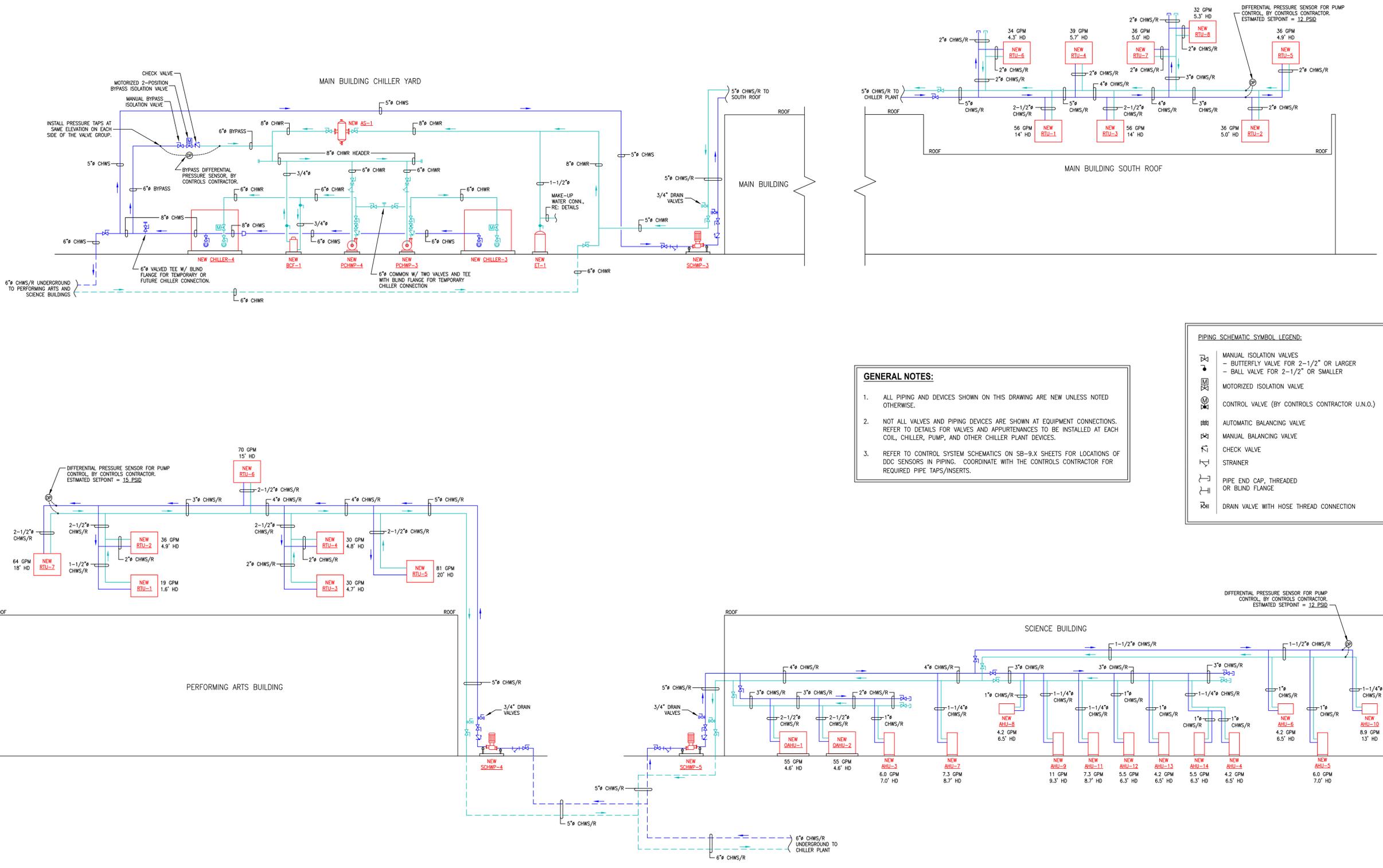


REFER TO ENLARGED PLAN ON SHEET SB-4.2E

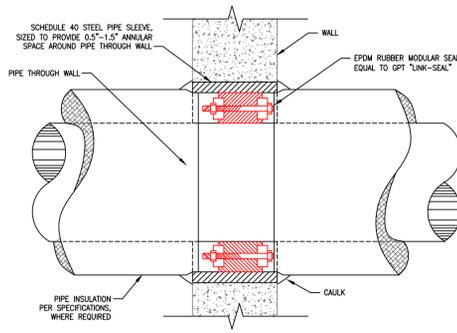
SCIENCE BUILDING NEW WORK FLOOR PLAN
 SCALE: 3/32" = 1'-0" (APPROXIMATE)



NO.	REV.	DATE
CD	BO/CC	3-2018

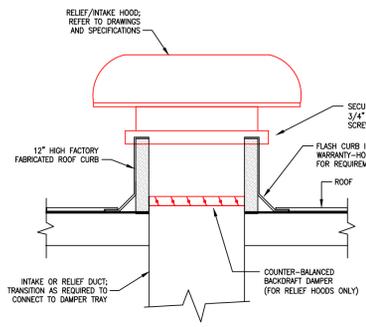


A NEW CHILLED WATER SYSTEM PIPING SCHEMATICS
 SCALE: NTS

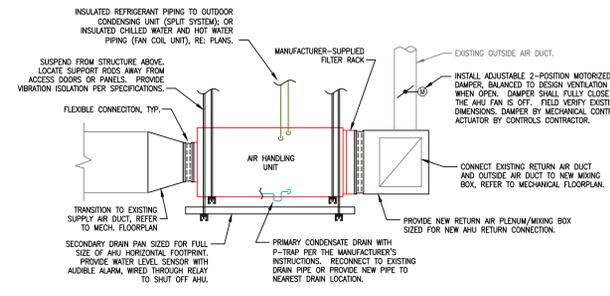


- NOTES:**
1. INSTALL LINK-SEAL PER MANUFACTURER'S INSTRUCTIONS. TIGHTEN BOLTS BY HAND TO THE TORQUE SPECIFIED BY MANUFACTURER.
 2. FOR INSULATED PIPING: INSULATE PIPE AFTER LINK-SEAL HAS BEEN INSTALLED AND INSPECTED. FILL VOIDS ON EACH SIDE OF LINK-SEAL WITH BAIT INSULATION. BOTH PIPE INSULATION UP TO EACH SIDE OF WALL PENETRATION AND CALK EDGES.
 3. FIRE-RATED WALLS MUST HAVE FIRE RETARDANT CAULKING.

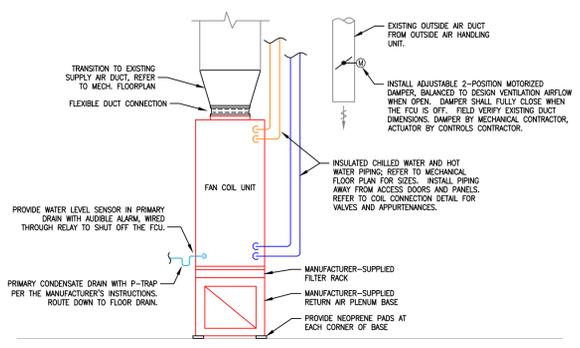
11 PIPE PENETRATION THROUGH EXTERIOR WALL DETAIL
Scale: NONE



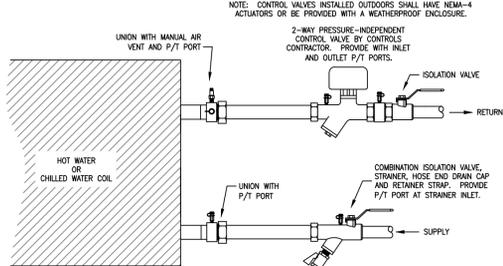
12 INTAKE/RELIEF HOOD DETAIL
Scale: NONE



13 HORIZONTAL AHU / FCU DETAIL
Scale: NONE

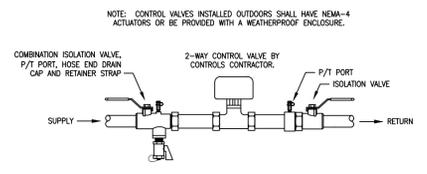


14 VERTICAL CHW/HW FAN COIL UNIT DETAIL
Scale: NONE



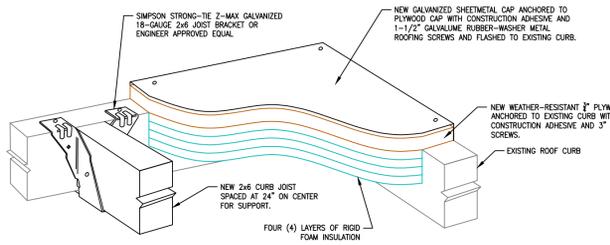
- NOTES:**
1. PROVIDE COIL CONNECTION PACKAGE BY BELIMO, BELL & GOSSETT, FLOW DESIGN, INC., NIBCO, OR ENGINEER APPROVED EQUAL.
 2. PROVIDE PRESSURE-INDEPENDENT 2-WAY CONTROL VALVE WHICH AUTOMATICALLY LIMITS THE MAXIMUM FLOW TO WITHIN +/- 5% OF THE DESIGN COIL GPM, INDEPENDENT OF SYSTEM PRESSURE. STANDARD CONTROL VALVES WITHOUT INTEGRAL PRESSURE REGULATORS WILL NOT BE ALLOWED.
 3. THE AUTOMATIC FLOW CONTROL, PRESSURE REGULATOR SHALL BE A FACTORY-SET AND FIELD-REPLACEABLE CONTROL, OR AN EXTERNALLY-ADJUSTABLE REGULATOR WITH GPM-CALIBRATED DIAL.
 4. CONTROL VALVES SHALL BE CHARACTERIZED BALL-TYPE OR GLOBE-TYPE.
 5. INSTALL DIELECTRIC UNIONS BETWEEN STEEL AND BRASS COMPONENTS.

15 COIL CONNECTION DETAIL - 2 WAY VALVE
Scale: NONE

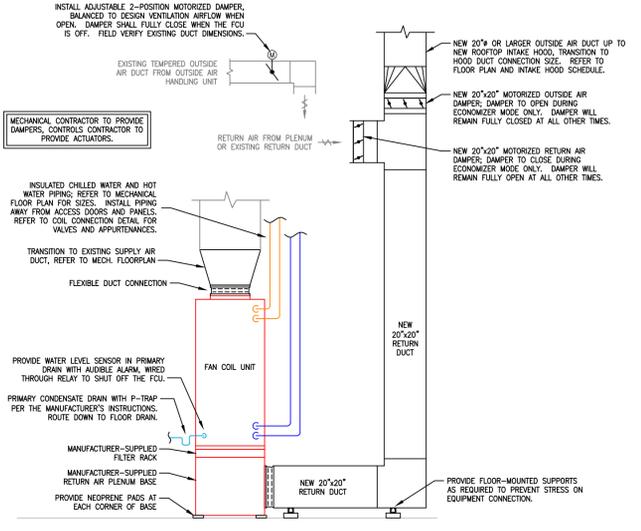


- NOTES:**
1. REFER TO CONTROLS MANUAL FOR BYPASS CONTROL.
 2. PROVIDE 2-WAY CONTROL VALVE. AUTOMATIC FLOW REGULATOR NOT REQUIRED FOR LOOP BYPASS CONTROL.
 3. CONTROL VALVES SHALL BE CHARACTERIZED BALL-TYPE OR GLOBE-TYPE.
 4. INSTALL DIELECTRIC UNIONS BETWEEN STEEL AND BRASS COMPONENTS.

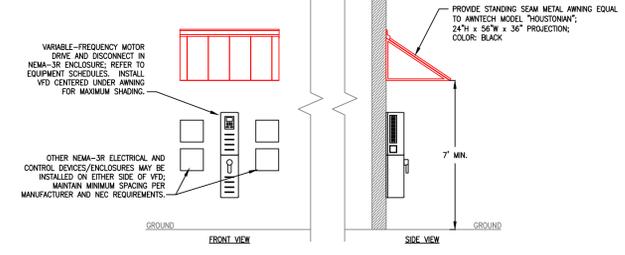
16 LOOP BYPASS DETAIL - 2 WAY VALVE
Scale: NONE



17 ABANDONED ROOF CURB CAP DETAIL
Scale: NONE

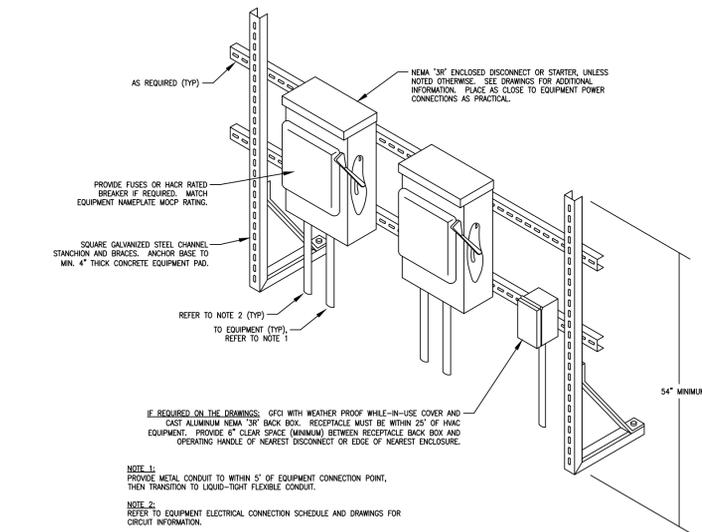


18 VERTICAL CHW/HW FCU WITH ECONOMIZER DETAIL
Scale: NONE



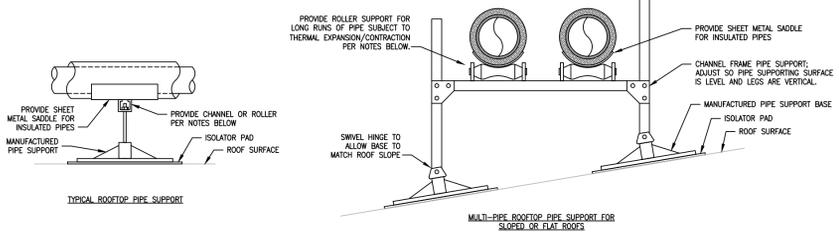
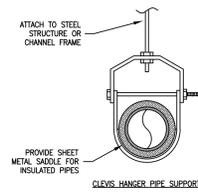
- NOTES:**
1. PROVIDE SUN SHADE AWNING TO PROTECT OUTDOOR VFD FROM DIRECT SUNLIGHT WHERE NOTED ON THE DRAWINGS. SUN SHADES ARE NOT REQUIRED FOR VFDs MOUNTED ON NORTH-FACING WALLS, OR WHERE AWNING IS PROVIDED BY BUILDING FEATURES OR OTHER NEARBY BUILDINGS THROUGHOUT THE YEAR.
 2. INSTALL AWNING ATTACHED TO BUILDING EXTERIOR WALL PER AWNING MANUFACTURER'S INSTRUCTIONS.
 3. INSTALL VFD ATTACHED TO BUILDING EXTERIOR WALL PER VFD MANUFACTURER'S INSTRUCTIONS.

19 OUTDOOR VFD SUN SHADE
Scale: NONE



- NOTE 1:** PROVIDE METAL CONDUIT TO WITHIN 5' OF EQUIPMENT CONNECTION POINT, THEN TRANSITION TO LIQUID-TIGHT FLEXIBLE CONDUIT.
- NOTE 2:** REFER TO EQUIPMENT ELECTRICAL CONNECTION SCHEDULE AND DRAWINGS FOR CIRCUIT INFORMATION.

20 EQUIPMENT ELECTRICAL DISCONNECT SUPPORT STAND
Scale: NONE



- PIPE SUPPORT NOTES:**
1. PROVIDE MANUFACTURED ROOFTOP PIPE SUPPORTS WITH RECYCLED RUBBER BASE OR UV-RESISTANT AND IMPACT-RESISTANT PLASTIC BASE WITH ISOLATION PAD. ISOLATION PAD SHALL BE RUBBER OR ROOFING MATERIAL TO MATCH EXISTING ROOF. COORDINATE WITH WARRANTY-HOLDING ROOFING CONTRACTOR FOR ANY SPECIAL REQUIREMENTS. SUPPORTS SHALL NOT REQUIRE ROOF PENETRATIONS.
 2. ROOFTOP PIPE SUPPORTS SHALL SUPPORT PIPE A MINIMUM OF 12" ABOVE THE ROOF SURFACE.
 3. PROVIDE FIELD-FABRICATED GALVANIZED STEEL PIPE SUPPORTS FOR OUTDOOR PIPING IN MECHANICAL YARDS. STEEL PIPE SUPPORTS SHALL BE ANCHORED TO A CONCRETE FOUNDATION. PROVIDE CONCRETE GROUTED BASE TO ELEVATE STEEL SUPPORT BASE PLATE A MINIMUM OF 1 INCH ABOVE SURROUNDING FOUNDATION SURFACE.
 4. PROVIDE ROLLER-TYPE PIPE SUPPORTS FOR GAS PIPING.
 5. PROVIDE ROLLER-TYPE PIPE SUPPORTS FOR LONG RUNS (GREATER THAN 100') OF HOT WATER OR CHILLED WATER PIPING TO ALLOW FOR THERMAL EXPANSION/CONTRACTION.
 6. PROVIDE CLEVIS HANGER OR CHANNEL FRAME PIPE SUPPORTS FOR SHORT RUNS OF HOT WATER OR CHILLED WATER PIPING.
 7. PROVIDE CLEVIS HANGER OR CHANNEL CLAMP-TYPE PIPE SUPPORTS FOR CONDENSATE DRAIN PIPE, REFRIGERANT PIPE, AND ELECTRICAL CONDUIT.
 8. REFER TO SPECIFICATIONS MANUAL FOR ADDITIONAL PIPE SUPPORT REQUIREMENTS.

21 PIPE SUPPORT DETAILS
Scale: NONE

DATE		
MARCH 20, 2018		
REVISIONS:		
NO.	REV.	DATE
CD	BO/CC	3-2018

APPROXIMATE SCALE:
SEE DRAWING

SPLIT SYSTEM SCHEDULE

AREA	TAG	EQUIPMENT DATA	NOMINAL SIZE	OUTDOOR UNIT MAKE & MODEL	OUTDOOR UNIT TYPE	INDOOR UNIT MAKE & MODEL	INDOOR UNIT TYPE	INDOOR UNIT ORIENTATION	SUPPLY CFM	OUTSIDE AIR CFM	EXT. SP (IN WG)	FAN MOTOR HP	COOLING CAPACITY (BTUH TOTAL)	COOLING STAGES	HEAT PUMP HEATING CAP. AT 47' (BTUH)	HEAT PUMP COP AT 47'	AHU HEAT SECTION CAPACITY	HEATING STAGES	SYSTEM EFFICIENCY RATING	AHRU REFERENCE	OUTDOOR UNIT ELECTRICAL		INDOOR UNIT ELECTRICAL	
																					VOLTS / PHASE	MCA / MOCOP (AMPS)	VOLTS / PHASE	MCA / MOCOP (AMPS)
MAIN BUILDING	AHU / CU-306	NEW	4 TON	LENNOX - TPA048H4	460V / 3PH HEAT PUMP	LENNOX - CBX27UH-048	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	1,600	450	0.2	1.0	48,000	1	47,500	3.6	10 KW (9.2 KW @ 460V)	1	12.7 EER 15.0 SEER	9032537	460V / 3PH	8.8 / 15	460V / 3PH	19 / 20
		EXISTING	4 TON	TRANE - 2TTA0048A4	CONDENSER	TRANE - TWE080A400EL	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	15 KW	--	--	--	--	460V / 3PH	10 / 15	460V / 3PH
BOOKSTORE	AHU / CU-B1	NEW	4 TON	LENNOX - TPA048H4	460V / 3PH HEAT PUMP	LENNOX - CBX27UH-048	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	1,600	160	0.2	1.0	48,000	1	47,500	3.6	10 KW (9.2 KW @ 460V)	1	12.7 EER 15.0 SEER	9032537	460V / 3PH	8.8 / 15	460V / 3PH	19 / 20
		EXISTING	4 TON	CARRIER - 24ABS348G600	CONDENSER	CARRIER - FA4ANF048	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	--	--	--	--	--	460V / 3PH	8.2 / 15	208V / 1PH
BOOKSTORE	AHU / CU-B2	NEW	7.5 TON	LENNOX - TPA090S4S	460V / 3PH HEAT PUMP	LENNOX - TAA090S4D	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	3,000	300	0.5	2.0	92,300	1	88,000	3.3	15 KW (13.5 KW @ 460V)	1	11.0 EER 12.0 IEER	3285556	460V / 3PH	19 / 30	460V / 3PH	27 / 30
		EXISTING	7.5 TON	GOODMAN - GSC100904AC	CONDENSER	CARRIER - 40RM-008	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	--	--	--	--	--	460V / 3PH	19.5 / 30	460V / 3PH
HONORS LOUNGE	AHU / CU-H1	NEW	5 TON	LENNOX - TPA060H4	460V / 3PH HEAT PUMP	LENNOX - CBX27UH-060	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	2,000	300	0.2	1.0	60,000	1	55,000	3.5	10 KW (9.2 KW @ 460V)	1	12.5 EER 15.0 SEER	9031120	460V / 3PH	11 / 15	460V / 3PH	19 / 20
		EXISTING	5 TON	YORK - HABA-W060SA	CONDENSER	--	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	--	--	--	--	--	460V / 3PH	10.8 / 15	460V / 3PH
FACULTY OFFICES	AHU / CU-F1	NEW	5 TON	LENNOX - TPA060H4	460V / 3PH HEAT PUMP	LENNOX - CBX27UH-060	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	2,100	300	0.2	1.0	60,000	1	55,000	3.5	10 KW (9.2 KW @ 460V)	1	12.5 EER 15.0 SEER	9031120	460V / 3PH	11 / 15	460V / 3PH	19 / 20
		EXISTING	5 TON	CARRIER - 24ABS360G600	CONDENSER	--	ELEC HEAT AHU	HORIZONTAL	2,100	--	--	--	58,000	--	N/A	N/A	--	--	--	--	--	460V / 3PH	9.7 / 15	460V / 3PH
FACULTY OFFICES	AHU / CU-F2	NEW	4 TON	LENNOX - TPA048H4	460V / 3PH HEAT PUMP	LENNOX - CBX27UH-048	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	1,650	160	0.2	1.0	48,000	1	47,500	3.6	10 KW (9.2 KW @ 460V)	1	12.7 EER 15.0 SEER	9032537	460V / 3PH	8.8 / 15	460V / 3PH	19 / 20
		EXISTING	4 TON	CARRIER - 24ABS348G600	CONDENSER	--	ELEC HEAT AHU	HORIZONTAL	1,650	--	--	--	--	--	N/A	N/A	7.5 KW	--	--	--	--	460V / 3PH	8.2 / 15	460V / 3PH
COMMONS	AHU / CU-C1	NEW	5 TON	LENNOX - SPB060H4	208V / 3PH HEAT PUMP	LENNOX - CBX27UH-060	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	2,000	200	0.2	1.0	58,000	2	56,500	3.6	10 KW (7.5 KW @ 208V)	1	12.0 EER 15.5 SEER	8231938	208V / 3PH	24.8 / 40	208V / 3PH	36 / 40
		EXISTING	5 TON	CARRIER - 24ABS360A520	CONDENSER	--	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	--	--	--	--	--	208V / 3PH	21.4 / 30	208V / 3PH
COMMONS	AHU / CU-C2	NEW	3 TON	LENNOX - SPB036H4	208V / 3PH HEAT PUMP	LENNOX - CBX27UH-036	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	1,200	120	0.2	1/2	36,200	2	34,400	3.2	8 KW (6.0 KW @ 208V)	1	12.5 EER 15.5 SEER	8231795	208V / 3PH	16.2 / 25	208V / 3PH	26 / 30
		EXISTING	3 TON	JCI - GCGD36S21S2C	CONDENSER	--	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	--	--	--	--	--	208V / 1PH	18.2 / 30	208V / 3PH
COMMONS	AHU / CU-C3	NEW	5 TON	LENNOX - SPB060H4	208V / 3PH HEAT PUMP	LENNOX - CBX27UH-060	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	2,000	200	0.2	1.0	58,000	2	56,500	3.6	10 KW (7.5 KW @ 208V)	1	12.0 EER 15.5 SEER	8231938	208V / 3PH	24.8 / 40	208V / 3PH	36 / 40
		EXISTING	5 TON	CARRIER - 38CKC060570	CONDENSER	--	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	--	--	--	--	--	208V / 3PH	21.4 / 30	208V / 3PH
COMMONS	AHU / CU-C4	NEW	5 TON	LENNOX - SPB060H4	208V / 3PH HEAT PUMP	LENNOX - CBX27UH-060	ELECTRIC HEAT AIR HANDLER	HORIZONTAL	2,000	200	0.2	1.0	58,000	2	56,500	3.6	10 KW (7.5 KW @ 208V)	1	12.0 EER 15.5 SEER	8231938	208V / 3PH	24.8 / 40	208V / 3PH	36 / 40
		EXISTING	5 TON	CARRIER - 38CKC060570	CONDENSER	--	ELEC HEAT AHU	HORIZONTAL	--	--	--	--	--	--	N/A	N/A	--	--	--	--	--	208V / 3PH	21.4 / 30	208V / 3PH

- SPLIT SYSTEM SCHEDULE NOTES:**
1. UNITS IDENTIFIED AS "EXISTING" ARE SHOWN FOR REFERENCE ONLY; DO NOT SUPPLY OR INSTALL UNITS IDENTIFIED AS "EXISTING".
 2. PROVIDE CONDENSATE DRAIN PAN OVERFLOW SAFETY SWITCH WITH AUDIBLE ALARM FOR EACH INDOOR UNIT.
 3. PROVIDE CONDENSER COIL HAIL GUARDS ON OUTDOOR UNITS.
 4. PROVIDE FILTER RACK AND DISPOSABLE PLEATED MERV 8 FILTERS FOR EACH UNIT.
 5. PROVIDE LOW AMBIENT KIT WITH FREEZESTAT AND LOW AMBIENT CUT-OFF FOR EACH HEAT PUMP.
 6. PROVIDE DUCT SMOKE DETECTOR FOR EACH AIR HANDLING UNIT WITH AIRFLOW 2,000 CFM OR GREATER, TO BE LOCATED ON THE SUPPLY AIR DUCT PER THE UNIFORM MECHANICAL CODE.



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HOUSTON COMMUNITY COLLEGE
 HVAC SYSTEM REPLACEMENT AND
 RENOVATION PROJECTS

HCC SPRING BRANCH CAMPUS
 NEW EQUIPMENT SCHEDULES



DATE
 MARCH 20, 2018

NO.	REV.	DATE
CD	BOCC	3-2018

APPROXIMATE SCALE:
 SEE DRAWING

SHEET INFO.

SB
 7.1

FAN COIL UNIT SCHEDULE - SCIENCE BUILDING

UNIT TAGS	TOTAL QUANTITY	EQUIPMENT DATA	NOMINAL SIZE	OUTDOOR UNIT MAKE & MODEL	OUTDOOR UNIT TYPE	MODEL & AIRFLOW INFORMATION							CHILLED WATER COIL							HOT WATER COIL							OUTDOOR UNIT ELECTRICAL		INDOOR UNIT ELECTRICAL							
						INDOOR UNIT MAKE & MODEL	INDOOR UNIT TYPE	INDOOR UNIT ORIENTATION	SUPPLY CFM	OUTSIDE AIR CFM	EXTERNAL SP (IN. WG)	FAN BHP	FAN RPM	MOTOR HP	TOTAL COOLING CAPACITY (BTUH)	SENS. COOLING CAPACITY (BTUH)	CHW COIL ROWS / FPI / CKT	EWI / LWT (°F)	EAT DB / WB (°F)	LAT DB / WB (°F)	CHW GPM	CHW PD (FT. WG)	AIR PD (IN. WG)	HEATING COIL POSITION	HEATING CAPACITY (BTUH)	HW COIL ROWS / FPI / CKT	EWI / LWT (°F)	ENTERING AIR TEMP. (°F)	LEAVING AIR TEMP. (°F)	HW GPM	HW PD (FT. WG)	AIR PD (IN. WG)	VOLTS / PHASE	MCA / MOCOP (AMPS)	VOLTS / PHASE	MCA / MOCOP (AMPS)
QAHU-1 QAHU-2	2	NEW	N/A	N/A	N/A	TITUS - TBH-40	BELT DRIVE BLOWER COIL UNIT	HORIZONTAL	3,500	3,500	1.0	1.80	933	2	275,600	152,700	6 / 12 / 27	44.0 / 56.0	97.0 / 78.0	54.8 / 54.1	54.9	4.59	0.58	PREHEAT	161,000	1 / 10 / 5	180 / 150	25.0	65.0	11.0	2.19	0.04	N/A	N/A	460V / 3PH	3.6 / 15
		EXISTING	30 TON	CARRIER - 38AKS034	DX S/S CONDENSER	ADDISON - HCA-361	DX / ELEC. HEAT AHU	HORIZONTAL	3,500	3,500	1.0	--	--	1.5	332,000	--	N/A	N/A	--	--	N/A	N/A	N/A	REHEAT	37.5 KW EDH	N/A	N/A	27.0	56.0	N/A	N/A	N/A	460V / 3PH	110 MOCOP	460V / 3PH	SEE PLANS
AHU-6 AHU-8	2	NEW	N/A	N/A	N/A	TITUS - TBH-8	BELT DRIVE BLOWER COIL UNIT	HORIZONTAL	850	250 (FROM QAHU)	0.3	0.32	1,199	1/3	25,600	19,600	6 / 10 / 3	44.0 / 56.0	75.0 / 63.0	53.3 / 52.3	4.2	6.46	0.38	REHEAT	25,700	1 / 10 / 2	180 / 150	65.0	93.3	1.8	0.46	0.04	N/A	N/A	208V / 1PH	3.9 / 15
		EXISTING	2 TON	CARRIER - 38CKC018340	DX S/S CONDENSER	CARRIER - FC4BNF024	DX / ELEC. HEAT AHU	VERTICAL	850	250	0.2	--	--	1/4	17,600	--	N/A	N/A	--	--	N/A	N/A	N/A	REHEAT	3 KW	N/A	N/A	--	--	N/A	N/A	208V / 1PH	14.3 / 20	208V / 1PH	30A CB	
AHU-4 AHU-13	2	NEW	N/A	N/A	N/A	TITUS - TBL-8	BELT DRIVE BLOWER COIL UNIT	VERTICAL	850	450 (FROM QAHU)	0.3	0.43	1,343	1/2	25,700	19,600	6 / 10 / 3	44.0 / 56.0	75.0 / 63.0	53.2 / 52.3	4.2	6.49	0.37	REHEAT	27,800	1 / 10 / 1	180 / 150	65.0	95.6	1.9	3.69	0.03	N/A	N/A	208V / 1PH	5 / 15
		EXISTING	2 TON	CARRIER - 38CKC024340	DX S/S CONDENSER	CARRIER - FC4BNF024	DX / ELEC. HEAT AHU	VERTICAL	850	450	0.2	--	--	1/4	22,600	--	N/A	N/A	--	--	N/A	N/A	N/A	REHEAT	5 KW	N/A	N/A	--	--	N/A	N/A	208V / 1PH	15.5 / 20	208V / 1PH	40A CB	
AHU-12 AHU-14	2	NEW	N/A	N/A	N/A	TITUS - TBL-12	BELT DRIVE BLOWER COIL UNIT	VERTICAL	1,100	450 (FROM QAHU)	0.3	0.44	1,166	1/2	33,500	25,500	6 / 10 / 4	44.0 / 56.0	75.0 / 63.0	53.1 / 52.2	5.5	6.30	0.35	REHEAT	35,200	1 / 10 / 2	180 / 150	65.0	95.0	2.4	1.08	0.03	N/A	N/A	208V / 1PH	5 / 15
		EXISTING	2.5 TON	CARRIER - 38CKC030340	DX S/S CONDENSER	CARRIER - FC4BNF030	DX / ELEC. HEAT AHU	VERTICAL	1,100	450	0.2	--	--	1/3	27,600	--	N/A	N/A	--	--	N/A	N/A	N/A	REHEAT	6 KW EDH	N/A	N/A	--	--	N/A	N/A	208V / 1PH	18.4 / 30	208V / 1PH	20A CB	
AHU-3 AHU-5	2	NEW	N/A	N/A	N/A	TITUS - TBL-12	BELT DRIVE BLOWER COIL UNIT	VERTICAL	1,200 (NOTE C1)	450 (FROM QAHU)	0.3	0.54	1,241	3/4	35,900	27,400	6 / 10 / 4	44.0 / 56.0	75.0 / 63.0	53.5 / 52.4	6.0	6.98	0.4	REHEAT	36,800	1 / 10 / 2	180 / 150	65.0	93.8	2.5	1.17	0.04	N/A	N/A	208V / 1PH	6.8 / 15
		EXISTING	3.5 TON	CARRIER - 38CKC042340	DX S/S CONDENSER	CARRIER - FC4BNF042	DX / ELEC. HEAT AHU	VERTICAL	1,500	450	0.2	--	--	1/2	40,000	--	N/A	N/A	--	--	N/A	N/A	N/A	REHEAT	5 KW	N/A	N/A	--	--	N/A	N/A	208V / 1PH	27.0 / 40	208V / 1PH	40A CB	
AHU-7 AHU-11	2	NEW	N/A	N/A	N/A	TITUS - TBL-12	BELT DRIVE BLOWER COIL UNIT	VERTICAL	1,400 (NOTE C1)	480 (FROM QAHU)	0.3	0.86	1,444	1	43,700	32,900	6 / 12 / 4	44.0 / 56.0	75.0 / 63.0	52.9 / 51.9	7.3	8.73	0.65	REHEAT	39,800	1 / 10 / 2	180 / 150	65.0	91.7	2.7	1.35	0.05	N/A	N/A	208V / 1PH	8.5 / 15
		EXISTING	3.5 TON	CARRIER - 38CKC042340	DX S/S CONDENSER	CARRIER - FC4BNF048	DX / ELEC. HEAT AHU	VERTICAL	1,700	480	0.2	--	--	3/4	41,000	--	N/A	N/A	--	--	N/A	N/A	N/A	REHEAT	5 KW	N/A	N/A	--	--	N/A	N/A	208V / 1PH	27.0 / 40	208V / 1PH	40A CB	
AHU-9	1	NEW	N/A	N/A	N/A	TITUS - TBL-20	BELT DRIVE BLOWER COIL UNIT	VERTICAL	2,000	1,050 (FROM QAHU)	0.5	0.85	1,131	1	62,700	47,000	6 / 10 / 6	44.0 / 56.0	75.0 / 63.0	52.8 / 51.9	10.5	9.34	0.39	REHEAT	61,400	1 / 10 / 4	180 / 150	65.0	93.8	4.2	0.74	0.04	N/A	N/A	208V / 1PH	8.5 / 15
		EXISTING	5 TON	CARRIER - 38CKC060370	DX S/S CONDENSER	CARRIER - FC4BNF060	DX / ELEC. HEAT AHU	VERTICAL	2,000	1,050	0.2	--	--	3/4	57,000	--	N/A	N/A	--	--	N/A</															

CHILLED WATER PACKAGED ROOFTOP UNIT SCHEDULE - MAIN BUILDING SOUTH ROOF

UNIT TAGS	MODEL INFORMATION							AIRFLOW							ENERGY RECOVERY							CHILLED WATER COIL							INDIRECT NATURAL GAS HEAT					ELECTRICAL AND WEIGHT										
	EQUIPMENT DATA	NOMINAL SIZE	MAKE	MODEL	TYPE	APPLICATION	CONTROL NOTES	SUPPLY AIR ORIENTATION	SUPPLY CFM	OUTSIDE AIR CFM	SUPPLY EXTERNAL SP (IN. WG)	SUPPLY MOTOR HP	EXHAUST AIR CFM	EXHAUST EXTERNAL SP (IN. WG)	EXHAUST MOTOR HP	ECONOMIZER?	ENERGY RECOVERY?	SUMMER OUTSIDE AIR DB / WB (°F)	SUMMER RETURN AIR CONDITIONS	ER WHEEL SUMMER SUPPLY LAT DB / WB (°F)	ER WHEEL SUMMER EFFECTIVENESS	WINTER OUTSIDE AIR DB (°F)	WINTER RETURN AIR CONDITIONS	ER WHEEL WINTER SUPPLY LAT DB / WB (°F)	ER WHEEL WINTER EFFECTIVENESS	TOTAL COOLING (MBH)	SENSIBLE COOLING (MBH)	CHW COIL ROWS / FPI / CKT	EWT / LWT (°F)	EAT DB / WB (°F)	LAT DB / WB (°F)	CHW GPM	CHW PD (FT. WG)	FACE VELOCITY (FPM)	AIR PD (IN. WG)	HEATING CAPACITY (MBH INPUT)	EFFICIENCY	HEATING STAGES	AIR TEMP. RISE (°F)	LAT (°F)	AIR PD (IN. WG)	VOLTS / PHASE	MCA / MOCP (AMPS)	WEIGHT (LBS)
RTU-1	NEW	N/A	GREENHECK	RV-45	CHW / GAS HEAT	SINGLE ZONE VARIABLE VOL.	1, 2, 3, 4	DOWNFLOW	8,750	875	1.0	10.0	N/A	N/A	N/A	YES	NO	97 / 78	75°F / 55%RH	N/A	N/A	25	68°F / 35%RH	N/A	N/A	336.0	234.6	6 / 10 / HALF	44.0 / 56.0	77.2 / 65.4	52.8 / 52.6	55.8	14.0	467	0.83	300.0	80%	4:1 MODULATING	25.4	89.1	0.90	460V / 3PH	16.2 / 25	2,637
	EXISTING	25 TON	CARRIER	48TMD028	DX / GAS HEAT			DOWNFLOW	8,750	875	1.0	10.0	N/A	N/A	N/A	NO	NO	--	--	N/A	N/A	--	--	N/A	N/A	278.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	275.0	--	2	--	--	--	--	460V / 3PH	64 / 80	2,270
RTU-2	NEW	N/A	GREENHECK	RV-45	CHW / GAS HEAT	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4	DOWNFLOW	6,300	630	1.0	5.0	N/A	N/A	N/A	YES	NO	97 / 78	75°F / 55%RH	N/A	N/A	25	68°F / 35%RH	N/A	N/A	219.1	159.0	4 / 12 / HALF	44.0 / 56.0	77.2 / 65.4	54.2 / 54.0	36.4	5.0	336	0.39	300.0	80%	4:1 MODULATING	35.3	99	0.47	460V / 3PH	9.8 / 15	2,524
	EXISTING	18 TON	CARRIER	48TMD020	DX / GAS HEAT			DOWNFLOW	6,300	630	1.0	5.0	N/A	N/A	N/A	NO	NO	--	--	N/A	N/A	--	--	N/A	N/A	202.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	275.0	--	2	--	--	--	--	460V / 3PH	48 / 60	1,850
RTU-3	NEW	N/A	GREENHECK	RV-45	CHW / GAS HEAT	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4	DOWNFLOW	8,750	875	1.25	10.0	N/A	N/A	N/A	YES	NO	97 / 78	75°F / 55%RH	N/A	N/A	25	68°F / 35%RH	N/A	N/A	336.0	234.6	6 / 10 / HALF	44.0 / 56.0	77.2 / 65.4	52.8 / 52.6	55.8	14.0	467	0.83	300.0	80%	4:1 MODULATING	25.4	89.1	0.90	460V / 3PH	16.2 / 25	2,637
	EXISTING	25 TON	TRANE	GAC3004E2L	DX / GAS HEAT			DOWNFLOW	8,750	875	1.25	10.0	N/A	N/A	N/A	NO	NO	--	--	N/A	N/A	--	--	N/A	N/A	300.0	--	N/A	N/A	N/A	N/A	N/A	N/A	240.0	--	--	--	--	--	--	460V / 3PH	55 / 70	2,058	
RTU-4	NEW	N/A	GREENHECK	RV-45	CHW / GAS HEAT	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4	DOWNFLOW	7,000	700	1.25	7.5	N/A	N/A	N/A	YES	NO	97 / 78	75°F / 55%RH	N/A	N/A	25	68°F / 35%RH	N/A	N/A	335.1	173.0	4 / 12 / HALF	44.0 / 56.0	77.2 / 65.4	54.7 / 54.4	39.1	5.7	373	0.45	300.0	80%	4:1 MODULATING	31.8	95.4	0.58	460V / 3PH	12.7 / 20	2,511
	EXISTING	20 TON	CARRIER	48TMD025	DX / GAS HEAT			DOWNFLOW	7,000	700	1.25	7.5	N/A	N/A	N/A	NO	NO	--	--	N/A	N/A	--	--	N/A	N/A	236.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	275.0	--	2	--	--	--	--	460V / 3PH	61 / 80	1,900
RTU-5	NEW	N/A	GREENHECK	RVE-65-32P-30L	CHW / GAS HEAT WITH ERV	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4	DOWNFLOW	6,300	3,000	1.25	5.0	3,000	0.5	5.0	YES	YES	97 / 78	75°F / 55%RH	78.9 / 65.4	80.9	25	68°F / 35%RH	60.4 / 47.7	81.9	217.3	156.4	4 / 12 / HALF	44.0 / 56.0	76.9 / 65.4	54.2 / 54.0	36.1	4.9	336	0.39	300.0	80%	4:1 MODULATING	35.3	99.7	0.47	460V / 3PH	17.6 / 25	3,569
	EXISTING	18 TON	CARRIER	48TMD020, 62AQ200	DX / GAS HEAT			DOWNFLOW	6,300	3,000	1.25	5.0	3,000	--	--	NO	YES	--	--	--	--	--	--	--	--	202.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	275.0	--	2	--	--	--	--	460V / 3PH	48 / 60	2,301
RTU-6	NEW	N/A	GREENHECK	RVE-65-32P-30L	CHW / GAS HEAT WITH ERV	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4	DOWNFLOW	6,300	2,000	1.0	5.0	2,000	0.5	5.0	YES	YES	97 / 78	75°F / 55%RH	78.0 / 64.7	84.5	25	68°F / 35%RH	62.1 / 48.7	85.8	204.1	151.0	4 / 12 / HALF	44.0 / 56.0	76.0 / 64.7	54.1 / 53.9	33.9	4.3	336	0.39	300.0	80%	4:1 MODULATING	35.3	101.4	0.47	460V / 3PH	17.6 / 25	3,569
	EXISTING	15 TON	TRANE	GAC1604E2L, 62AQ200	DX / GAS HEAT			DOWNFLOW	6,300	2,000	1.0	5.0	2,000	--	--	NO	YES	--	--	--	--	--	--	--	--	180.0	--	N/A	N/A	N/A	N/A	N/A	N/A	240.0	--	--	--	--	--	--	460V / 3PH	37 / 45	2,315	
RTU-7	NEW	N/A	GREENHECK	RV-45	CHW / GAS HEAT	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4	DOWNFLOW	6,300	630	1.0	5.0	N/A	N/A	N/A	YES	NO	97 / 78	75°F / 55%RH	N/A	N/A	25	68°F / 35%RH	N/A	N/A	219.1	159.0	4 / 12 / HALF	44.0 / 56.0	77.2 / 65.4	54.2 / 54.0	36.4	5.0	336	0.39	300.0	80%	4:1 MODULATING	35.3	99	0.47	460V / 3PH	9.8 / 15	2,524
	EXISTING	18 TON	CARRIER	48TMD020	DX / GAS HEAT			DOWNFLOW	6,300	630	1.0	5.0	N/A	N/A	N/A	NO	NO	--	--	N/A	N/A	--	--	N/A	N/A	202.0	--	N/A	N/A	N/A	N/A	N/A	N/A	275.0	--	2	--	--	--	--	460V / 3PH	48 / 60	1,850	
RTU-8	NEW	N/A	GREENHECK	RVE-40-36P-30L	CHW / GAS HEAT WITH ERV	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4	DOWNFLOW	5,500	2,000	1.0	7.5	2,000	0.5	7.5	YES	YES	97 / 78	75°F / 55%RH	80.0 / 65.3	76.5	25	68°F / 35%RH	58.1 / 46.4	77.1	189.5	137.2	6 / 10 / HALF	44.0 / 56.0	76.8 / 65.3	54.1 / 53.9	31.5	5.3	510	0.93	250.0	80%	4:1 MODULATING	33.7	98.1	0.72	460V / 3PH	22.7 / 30	2,504
	EXISTING	15 TON	CARRIER	48TMD016, 62AQ200	DX / GAS HEAT			DOWNFLOW	5,500	2,000	1.0	5.0	2,000	--	--	NO	YES	--	--	--	--	--	--	--	--	178.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	275.0	--	2	--	--	--	--	460V / 3PH	41 / 50	2,293

PACKAGED ROOFTOP UNIT SCHEDULE NOTES:

- UNITS IDENTIFIED AS "EXISTING" ARE SHOWN FOR REFERENCE ONLY; DO NOT SUPPLY OR INSTALL UNITS IDENTIFIED AS "EXISTING".
- PROVIDE CONDENSATE DRAIN PAN OVERFLOW SAFETY SWITCH FOR EACH UNIT.
- PROVIDE DISPOSABLE PLEATED MERV 8 FILTERS AND FILTER RACK.
- PROVIDE DUCT SMOKE DETECTOR FOR EACH AIR HANDLING UNIT WITH AIRFLOW 2,000 CFM OR GREATER, TO BE LOCATED ON THE SUPPLY AIR DUCT PER THE UNIFORM MECHANICAL CODE.
- PROVIDE OUTSIDE AIR ECONOMIZER OPTION PER IECC 2015 FOR EACH UNIT WHERE NOTED ON THE SCHEDULE.
 FOR SYSTEMS WITH ENERGY RECOVERY: PROVIDE ENERGY RECOVERY BYPASS AND VARIABLE SPEED EXHAUST FAN; EXHAUST FAN WILL OPERATE AT FULL SPEED (EQUAL TO DESIGN SUPPLY AIRFLOW) DURING ECONOMIZER OPERATION ONLY.
 FOR SYSTEMS WITHOUT ENERGY RECOVERY: PROVIDE BAROMETRIC RELIEF DAMPER.
- PROVIDE NEW 14" HIGH ROOF CURB FOR EACH UNIT EQUIPPED WITH ENERGY RECOVERY. FOR ALL OTHER UNITS, PROVIDE ADAPTOR CURB. REFER TO DRAWINGS.
- PROVIDE FACTORY-INSTALLED GFCI POWER RECEPTACLE ON EACH UNIT. GFCI RECEPTACLES WILL BE POWERED SEPARATELY FROM EXISTING 120V POWER SUPPLY CIRCUITS WHERE PRESENT.
- PROVIDE FACTORY MOUNTED AND WIRED DISCONNECT SWITCH ON EACH UNIT, FUSED PER THE NAMEPLATE MOCP. IF A FACTORY-MOUNTED FUSED DISCONNECT CANNOT BE PROVIDED, MECHANICAL CONTRACTOR TO PROVIDE SEPARATE NEMA-3R FUSIBLE DISCONNECT SWITCH.
- PROVIDE PHASE MONITOR AND PROTECTION ON EACH 3-PHASE UNIT.
- PROVIDE MODBUS/BACNET CONTROL INTERFACE TO ENABLE COMMUNICATION WITH EXISTING AND/OVER BUILDING CONTROL SYSTEM.
- CONTROLS CONTRACTOR TO PROVIDE FREEZE/STAT FOR EACH UNIT. REFER TO PROJECT CONTROL SEQUENCES FOR FREEZE PROTECTION OPERATION.
- PROVIDE VFD-CONTROLLED FAN MOTORS. FANS SHALL BE CAPABLE OF OPERATING AT REDUCED SPEED DURING PERIODS OF LOW COOLING LOAD AND VENTILATION-ONLY OPERATION PER IECC 2015.
- PROVIDE PREMIUM-EFFICIENCY MOTORS.

PACKAGED ROOFTOP UNIT CONTROL NOTES:

- SUPPLY FAN (AND EXHAUST FAN, IF EQUIPPED) VFD SPEED SETPOINT IS TO BE CONTROLLED BY THE BUILDING AUTOMATION SYSTEM.
- COOLING COIL VALVE IS TO BE CONTROLLED BY BUILDING AUTOMATION SYSTEM. CONTROL VALVE PROVIDED BY CONTROLS CONTRACTOR.
- ZONE OR SUPPLY AIR TEMPERATURE SETPOINTS WILL BE SET BY THE BUILDING AUTOMATION SYSTEM. ROOM TEMPERATURE SENSORS PROVIDED BY CONTROLS CONTRACTOR.
- RTU MANUFACTURER TO PROVIDE ECONOMIZER CONTROL SEQUENCE, BASED ON OUTSIDE AMBIENT TEMPERATURE AND DEWPOINT OR ENTHALPHY.
- RTU MANUFACTURER TO PROVIDE CO2 DEMAND-CONTROLLED VENTILATION CONTROL SEQUENCE. CO2 SENSOR PROVIDED BY CONTROLS CONTRACTOR.

CHILLED WATER PACKAGED ROOFTOP UNIT SCHEDULE - PERFORMING ARTS

UNIT TAGS	MODEL INFORMATION							AIRFLOW							ENERGY RECOVERY							CHILLED WATER COIL							INDIRECT NATURAL GAS HEAT					ELECTRICAL AND WEIGHT										
	EQUIPMENT DATA	NOMINAL SIZE	MAKE	MODEL	TYPE	APPLICATION	CONTROL NOTES	SUPPLY AIR ORIENTATION	SUPPLY CFM	OUTSIDE AIR CFM	SUPPLY EXTERNAL SP (IN. WG)	SUPPLY MOTOR HP	EXHAUST AIR CFM	EXHAUST EXTERNAL SP (IN. WG)	EXHAUST MOTOR HP	ECONOMIZER?	ENERGY RECOVERY?	SUMMER OUTSIDE AIR DB / WB (°F)	SUMMER RETURN AIR CONDITIONS	ER WHEEL SUMMER SUPPLY LAT DB / WB (°F)	ER WHEEL SUMMER EFFECTIVENESS	WINTER OUTSIDE AIR DB (°F)	WINTER RETURN AIR CONDITIONS	ER WHEEL WINTER SUPPLY LAT DB / WB (°F)	ER WHEEL WINTER EFFECTIVENESS	TOTAL COOLING (MBH)	SENSIBLE COOLING (MBH)	CHW COIL ROWS / FPI / CKT	EWT / LWT (°F)	EAT DB / WB (°F)	LAT DB / WB (°F)	CHW GPM	CHW PD (FT. WG)	FACE VELOCITY (FPM)	AIR PD (IN. WG)	HEATING CAPACITY (MBH INPUT)	EFFICIENCY	HEATING STAGES	AIR TEMP. RISE (°F)	LAT (°F)	AIR PD (IN. WG)	VOLTS / PHASE	MCA / MOCP (AMPS)	WEIGHT (LBS)
RTU-1	NEW	N/A	GREENHECK	RV-25	CHW / GAS HEAT	SINGLE ZONE VARIABLE VOL.	1, 2, 3, 4	DOWNFLOW	2,250	840	1.0	1.5	N/A	N/A	N/A	YES	NO	97 / 78	75°F / 55%RH	N/A	N/A	25	68°F / 35%RH	N/A	N/A	113.7	72.5	4 / 12 / HALF	44.0 / 56.0	83.2 / 69.7	54.0 / 53.9	19.9	1.6	208	0.21	150.0	80%	4:1 MODULATING	49.4	101.3	0.26	460V / 3PH	3.3 / 15	1,818
	EXISTING	8.5 TON	CARRIER	48HD009	DX / GAS HEAT			DOWNFLOW	2,250	--	--	--	N/A	N/A	N/A	--	NO	--	--	N/A	N/A	--	--	N/A	N/A	102.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	125.0	--	2	--	--	--	--	460V / 3PH	21.5 / 25	880
RTU-2	NEW	N/A	GREENHECK	RVE-65-32P-30L	CHW / GAS HEAT WITH ERV	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4, 5	DOWNFLOW	4,680	4,500	1.0	5.0	4,500	0.5	5.0	YES	YES	97 / 78	75°F / 55%RH	80.3 / 67.6	75.1	25	68°F / 35%RH	57.5 / 46.1	75.6	216.9	136.5	4 / 12 / HALF	44.0 / 56.0	80.1 / 67.9	53.0 / 52.9	38.0	4.9	250	0.27	300.0	80%	4:1 MODULATING	47.5	105.4	0.26	460V / 3PH	17.6 / 25	3,569
	EXISTING	15 TON	CARRIER	48HD017	DX / GAS HEAT			DOWNFLOW	4,680	--	--	--	N/A	N/A	N/A	--	NO	--	--	N/A	N/A	--	--	N/A	N/A	180.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	275.0	--	2	--	--	--	--	460V / 3PH	41 / 50	1,950
RTU-3	NEW	N/A	GREENHECK	RV-25	CHW / GAS HEAT	SINGLE ZONE VARIABLE VOL.	1, 2, 3, 4	DOWNFLOW	3,150	1,160	1.0	3.0	N/A	N/A	N/A	YES	NO	97 / 78	75°F / 55%RH	N/A	N/A	25	68°F / 35%RH	N/A	N/A	177.6	109.1	6 / 10 / HALF	44.0 / 56.0	83.1 / 69.6	51.6 / 51.6	29.5	4.7	292	0.44	200.0	80%	4:1 MODULATING	47.0	99.2	0.38	460V / 3PH	5.8 / 15	1,957
	EXISTING	10 TON	CARRIER	48HD012	DX / GAS HEAT			DOWNFLOW	3,150	--	--	--	N/A	N/A	N/A	--	NO	--	--	N/A	N/A	--	--	N/A	N/A	120.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	180.0	--	2	--	--	--	--	460V / 3PH	24.9 / 30	1,035
RTU-4	NEW	N/A	GREENHECK	RVE-40-41P-30H	CHW / GAS HEAT WITH ERV	SINGLE ZONE CONSTANT VOL.	1, 2, 3, 4, 5	DOWNFLOW	3,825	2,870	1.0	5.0	2,870	0.5	3.0	YES	YES	97 / 78	75°F / 55%RH	81.8 / 67.9	67.8	25	68°F / 35%RH	54.5 / 44.0	68.5	181.4	115.6	6 / 10 / HALF	44.0 / 56.0	80.1 / 67.9	52.7 / 52.5	30.1	4.8	354	0.57	200.0	80%	4:1 MODULATING	38.7	96.5	0.53	460V / 3PH	13.3 / 15	2,468
	EXISTING	10 TON	CARRIER	48HD012	DX / GAS HEAT			DOWNFLOW	3,825	--	--	--	N/A	N/A	N/A	--	NO	--	--	N/A	N/A	--	--	N/A	N/A	120.0	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	180.0	--	2	--	--	--	--	460V / 3PH		

DX PACKAGED ROOFTOP UNIT SCHEDULE

AREA	UNIT TAGS	EQUIPMENT DATA	NOMINAL SIZE	MAKE	MODEL	TYPE	SUPPLY AIR ORIENTATION	SUPPLY CFM	OUTSIDE AIR CFM	SUPPLY EXTERNAL SP (IN. WG)	SUPPLY MOTOR HP	ECONOMIZER?	POWER EXHAUST	DEHUMID. CONTROL	TOTAL COOLING (BTUH)	COOLING STAGES	HEATING CAPACITY	HEATING STAGES	SYSTEM EFFICIENCY RATING	AHRI REFERENCE	VOLTS / PHASE	MCA / MOCPP (AMPS)	WEIGHT (LBS)
MAIN BUILDING SOUTH ROOF	RTU-9	NEW	5 TON	LENNOX	LGH060H4E	DX COOLING / GAS HEAT	DOWNFLOW	1,800	180	1.0	1	YES	NO	NO	60,000	2	65 MBH IN	1	12.7 EER 17.0 SEER	3607851	480V / 3PH	15 / 20	846
		EXISTING	5 TON	CARRIER	48TJE006	DX / GAS HEAT	DOWNFLOW	2,000	60	--	--	NO	NO	--	--	N / A	115 MBH IN	--	--	--	480V / 3PH	14.8 / 20	--

PACKAGED ROOFTOP UNIT SCHEDULE NOTES:

- UNITS IDENTIFIED AS "EXISTING" ARE SHOWN FOR REFERENCE ONLY; DO NOT SUPPLY OR INSTALL UNITS IDENTIFIED AS "EXISTING".
- PROVIDE CONDENSATE DRAIN PAN OVERFLOW SAFETY SWITCH FOR EACH UNIT.
- PROVIDE CONDENSER COIL HAIL GUARDS ON EACH UNIT.
- PROVIDE DISPOSABLE PLEATED MERV 8 FILTERS AND FILTER RACK.
- PROVIDE MOTORIZED OUTSIDE AIR DAMPER FOR EACH UNIT.
- FOR UNITS SPECIFIED TO HAVE ECONOMIZER: PROVIDE OUTSIDE AIR ECONOMIZER WITH FAULT DETECTION PER IECC 2015 FOR EACH UNIT WHERE NOTED ON THE SCHEDULE. PROVIDE BAROMETRIC RELIEF DAMPER ON ECONOMIZER-EQUIPPED UNITS.
- FOR UNITS SPECIFIED TO HAVE POWER EXHAUST: PROVIDE POWERED EXHAUST FAN FOR ECONOMIZER RELIEF.
- FOR UNITS SPECIFIED TO HAVE DEHUMIDIFICATION CONTROL: PROVIDE FACTORY-INSTALLED HOT GAS REHEAT COIL FOR DEHUMIDIFICATION AND SPACE HUMIDITY SENSOR.
- PROVIDE DUCT SMOKE DETECTOR FOR EACH AIR HANDLING UNIT WITH AIRFLOW 2,000 CFM OR GREATER, TO BE LOCATED ON THE SUPPLY AIR DUCT PER THE UNIFORM MECHANICAL CODE.
- PROVIDE ADAPTOR CURB TO FIT OVER EXISTING ROOF CURB.
- PROVIDE FACTORY-INSTALLED GFCI POWER RECEPTACLE ON EACH UNIT. GFCI RECEPTACLES WILL BE POWERED SEPARATELY FROM EXISTING 120V POWER SUPPLY CIRCUITS WHERE PRESENT.
- PROVIDE PHASE MONITOR ON EACH 3-PHASE UNIT.
- PROVIDE DIRECT DRIVE ECM, PREMIUM-EFFICIENCY MOTORS WHEN AVAILABLE.

CHILLER SCHEDULE

EQUIPMENT DATA	CHILLER TAG	NOMINAL TONS	OUTDOOR AMBIENT TEMP (°F)	DESIGN GPM	MINIMUM ACCEPTABLE FLOW (GPM)	WATER PD (FT HD)	EWT (°F)	LWT (°F)	REFRIGERANT	MINIMUM CAPACITY	EFFICIENCY (KW/TON)	TOTAL UNIT POWER (KW)	ELECTRICAL DATA			APPROX. WEIGHT (LBS)	MANUFACTURER / MODEL
													VOLTS / PH / HZ	MCA	MOCPP		
NEW	CH-3	220	95	440	200	5.4	56.0	44.0	R134A	20%	0.972	230	460 / 3 / 60	402	500	15,900	ARCTICCOOL ACA200BT3510F
NEW	CH-4	220	95	440	200	5.4	56.0	44.0	R134A	20%	0.972	230	460 / 3 / 60	402	500	15,900	ARCTICCOOL ACA200BT3510F

CHILLER SCHEDULE NOTES:

- PROVIDE AIR COOLED CHILLER WITH OIL-FREE MAGNETIC BEARING CENTRIFUGAL COMPRESSORS.
- PROVIDE HEAVY-DUTY CONDENSER COIL HAIL GUARDS.
- PROVIDE FREEZE PROTECTION, SUCTION LINE INSULATION, LOW AMBIENT HEAD PRESSURE CONTROL.
- PROVIDE LOW SOUND FANS WITH VSD CONTROL.
- PROVIDE SINGLE-POINT POWER CONNECTION AND NON-FUSED DISCONNECT WITH LOCKABLE HANDLE.
- PROVIDE BACNET MS/TP COMMUNICATIONS INTERFACE.
- PROVIDE REFRIGERANT SERVICE ISOLATION VALVES.
- CHILLER SHALL HAVE BUILT-IN FLOW SWITCH AND SAFETIES FOR LOSS-OF-FLOW PROTECTION; OTHERWISE, THE MECHANICAL CONTRACTOR SHALL PROVIDE AND INSTALL AN EXTERNAL FLOW SWITCH PER MANUFACTURER INSTRUCTIONS.
- PROVIDE NEOPRENE VIBRATION ISOLATORS.

HOT WATER BOILER SCHEDULE

EQUIPMENT DATA	BOILER TAG	TYPE	FUEL	INPUT BTU/H	OUTPUT BTU/H	TURNDOWN	EFFICIENCY	EWT / LWT (°F)	MINIMUM EWT (°F)	DESIGN GPM / ΔP / ΔT	MIN. FLOW GPM / ΔP / ΔT	MAX. FLOW GPM / ΔP / ΔT	WATER CONNECTION	GAS CONNECTION	FLUE SIZE	ELECTRICAL DATA			MANUFACTURER / MODEL
																VOLTS / PH	MCA (AMPS)	MOCPP (AMPS)	
NEW	B-1	CONDENSING CATEGORY IV	NATURAL GAS	999,000	861,000	7:1	86.2% @ F.L. 88.4% @ P.L.	150 / 180	120	57 GPM 6" HD 30°F ΔT	44 GPM 3.7 HD 39°F ΔT	113 GPM 18.6" HD 15°F ΔT	2-1/2" Ø	1-1/4" Ø	8" Ø FLUE VENT 8" Ø COMB. AIR	120V / 1PH	12	15	RAYPAK MVB-H7-1003A

BOILER SCHEDULE NOTES:

- PROVIDE BACNET MS/TP INTERFACE FOR COMMUNICATION WITH EXISTING BUILDING AUTOMATION SYSTEM.
- PROVIDE FACTORY REPRESENTATIVE STARTUP FOR BOILER SYSTEM.
- BOILER PUMP WILL BE POWERED SEPARATELY FROM THE BOILER, BUT WILL BE ROUTED THROUGH THE PUMP CONTACTOR IN THE BOILER WIRING ENCLOSURE FOR CONTROL BY THE BOILER. REFER TO PUMP SCHEDULE AND ELECTRICAL CONNECTION SCHEDULE.
- EXHAUST VENT TO BE UL-LISTED STAINLESS STEEL.
- VENT CONNECTIONS WILL BE SELF-SUPPORTING AND NOT BE SUPPORTED BY THE CONNECTION TO THE BOILER.
- PROVIDE CONDENSATE NEUTRALIZATION KIT FOR EACH CONDENSING BOILER.
- PROVIDE COLD WATER START BYPASS VALVE AND CONTROLS.

PUMP SCHEDULE

TAG	SERVICE	SPEED CONTROL	DESIGN GPM		HEAD @ MAX FLOW (FT)	NPSHR (FT)	EFFICIENCY @ DESIGN	DESIGN RPM	DESIGN MAX VFD FREQ.	DESIGN BHP	MOTOR HP	IMPELLER DIA. (IN)	POWER V / PH / HZ	PUMP TYPE	SUCTION GUIDE	TRIPLE-DUTY VALVE	MANUFACTURER & MODEL
			MAX	MIN													
PCHWP-3	CHILLER PRIMARY PUMP	VARIABLE FREQUENCY DRIVE	440	220	25	9.7	81.1%	1629	55.2 HZ	3.43	5	6.47	460 / 3 / 60	HORIZ. BASE-MOUNTED END-SUCTION	YES	YES	ARMSTRONG 4030-5x4x8
PCHWP-4	CHILLER PRIMARY PUMP	VARIABLE FREQUENCY DRIVE	440	220	25	9.7	81.1%	1629	55.2 HZ	3.43	5	6.47	460 / 3 / 60	HORIZ. BASE-MOUNTED END-SUCTION	YES	YES	ARMSTRONG 4030-5x4x8
SCHWP-3	MAIN BLDG SOUTH ROOF	VARIABLE FREQUENCY DRIVE W/ OUTPUT TRANSFER SWITCH	330	0	75	11.5	70.5%	3168	53.7 HZ	8.87	15	5.83	460 / 3 / 60	VERTICAL INLINE TWIN SPLIT COUPLED	NO	NO	ARMSTRONG 4312-3x3x6
SCHWP-4	PERFORMING ARTS BUILDING	VARIABLE FREQUENCY DRIVE W/ OUTPUT TRANSFER SWITCH	330	0	80	11.5	70.9%	3238	54.9 HZ	9.40	15	5.83	460 / 3 / 60	VERTICAL INLINE TWIN SPLIT COUPLED	NO	NO	ARMSTRONG 4312-3x3x6
SCHWP-5	SCIENCE BUILDING	VARIABLE FREQUENCY DRIVE W/ OUTPUT TRANSFER SWITCH	200	0	60	6.2	68.3%	1568	53.2 HZ	4.44	7.5	8.98	460 / 3 / 60	VERTICAL INLINE TWIN SPLIT COUPLED	NO	NO	ARMSTRONG 4312-3x3x10
HWP-1	HOT WATER SYSTEM	CONSTANT SPEED	55	---	30	5.0	58.0%	1760	N / A	0.72	1.5	5.54	460 / 3 / 60	VERTICAL INLINE SPLIT COUPLED	YES	YES	ARMSTRONG 4300-2x2x6
HWP-2	HOT WATER SYSTEM	CONSTANT SPEED	55	---	30	5.0	58.0%	1760	N / A	0.72	1.5	5.54	460 / 3 / 60	VERTICAL INLINE SPLIT COUPLED	YES	YES	ARMSTRONG 4300-2x2x6
BP-1	BOILER B-1 PUMP	CONSTANT SPEED	57	---	12	4.9	61.9%	1170	N / A	0.28	1/2	5.69	120 / 1 / 60	VERTICAL INLINE CLOSE COUPLED	NO	NO	ARMSTRONG 4380-2x2x6

PUMP SCHEDULE NOTES:

- PUMPS SHALL HAVE BRONZE IMPELLER AND STAINLESS STEEL SHAFT SLEEVE
- ANSI CLASS 125 CONSTRUCTION
- MOTORS SHALL BE PREMIUM EFFICIENCY WHEN AVAILABLE AND INVERTER-DUTY COMPATIBLE WITH VFD OPERATION.
- PROVIDE BEARING PROTECTION SHAFT GROUNDING RINGS EQUAL TO "AEGIS SGR"
- PROVIDE TEFC MOTORS FOR OUTDOOR INSTALLATION
- FOR EACH PUMP NOTED TO HAVE A TRIPLE-DUTY VALVE: PROVIDE TRIPLE-DUTY CHECK, BALANCING, AND SHUT-OFF VALVE.
- FOR EACH PUMP NOTED TO HAVE A SUCTION GUIDE: PROVIDE SUCTION GUIDE WITH INTEGRAL STRAINER AND DRAIN.
- ELECTRICAL CONTRACTOR TO PROVIDE NEW NEMA-3R FUSED DISCONNECT AND MOTOR STARTER FOR EACH CONSTANT-SPEED PUMP.
- MECHANICAL CONTRACTOR TO PROVIDE NEW NEMA-3R VARIABLE-FREQUENCY DRIVE WITH INTEGRATED DISCONNECT SWITCH WITH LOCKABLE HANDLE FOR EACH VARIABLE-SPEED PUMP.
- FOR VERTICAL INLINE TWIN PUMPS (SCHWP-3, -4 & -5): TWIN PUMPS ARE PROVIDED FOR REDUNDANCY. FOR EACH TWIN PUMP, MECHANICAL CONTRACTOR TO PROVIDE A SINGLE NEMA-3R VARIABLE-FREQUENCY DRIVE WITH OUTPUT TRANSFER SWITCH CONTROLLED TO SAFELY TRANSFER POWER FROM ONE MOTOR TO THE OTHER (STOP THE VFD BEFORE TRANSFERRING POWER, THEN RESTART THE VFD ONCE THE TRANSFER IS COMPLETE). A CONTACTOR SHALL BE PROVIDED TO ALLOW THE BUILDING AUTOMATION SYSTEM TO SELECT WHICH MOTOR TO ENABLE.
- FOR BP-1: PROVIDE MOTOR WITH INTERNAL OVERLOAD PROTECTION, OR PROVIDE EXTERNAL OVERLOAD DEVICE. OVERLOAD PROTECTION WILL NOT BE PROVIDED IN STARTER.

ROOFTOP VENTILATION HOOD SCHEDULE

TAG	SERVICE	AIRFLOW (CFM)	SP (IN. W.G.)	VELOCITY (FPM)	CONNECTION	MODEL SIZE (IN.)	MANUFACTURER / MODEL
IH-1	OUTSIDE AIR INTAKE	2,000	0.040	398	DUCTED	30	GREENHECK GR51
RH-1	RELIEF AIR	4,000	0.123	795	NON-DUCTED	30	GREENHECK GR5R

ROOFTOP VENTILATION HOOD SCHEDULE NOTES:

- ALUMINUM, LOW-PROFILE, ROUND VENTILATION HOODS.
- PROVIDE INSECT SCREEN.
- PROVIDE 12" HIGH INSULATED ROOF CURB WITH SLOPE TO MATCH ROOF PITCH.
- PROVIDE GRAVITY RELIEF DAMPER FOR RELIEF HOODS.

AIR AND DIRT SEPARATOR SCHEDULE

TAG	SERVICE	PIPE SIZE (INCHES)	FLOW (GPM)	INLET VELOCITY (FT/S)	PRESSURE DROP (FT HD)	VOLUME (GAL)	WEIGHT (LBS)	MANUFACTURER / MODEL
AS-1	CHW SYSTEM	8	1,000	6.4	3.7	59	590	SPIROTHERM VHT800

AIR AND DIRT SEPARATOR SCHEDULE NOTES:

- ASME STAMPED PRESSURE VESSEL, MINIMUM 125 PSI WORKING PRESSURE, 250°F WORKING TEMPERATURE.
- COALESCING MEDIUM-TYPE AIR AND DIRT SEPARATOR.
- PROVIDE BLOW-DOWN VALVE, SKIM VALVE, AND AUTOMATIC AIR VENT.
- PROVIDE THREADED HOSE FITTING ON BLOW-DOWN VALVE.

HYDRAULIC SEPARATOR SCHEDULE

TAG	SERVICE	PIPE SIZE (INCHES)	FLOW (GPM)	INLET VELOCITY (FT/S)	PRESSURE DROP (FT HD)	CONNECTIONS	WEIGHT (LBS)	MANUFACTURER / MODEL
HS-1	HW SYSTEM	3	100	4.5	1.0	FLANGED	146	SPIROTHERM VDX300

HYDRAULIC SEPARATOR NOTES:

- ASME STAMPED PRESSURE VESSEL, MINIMUM 125 PSI WORKING PRESSURE, 250°F WORKING TEMPERATURE.
- PROVIDE HYDRAULIC SEPARATOR WITH COALESCING MEDIUM-TYPE AIR AND DIRT SEPARATOR.
- PROVIDE BLOW-DOWN VALVE, SKIM VALVE, AND AUTOMATIC AIR VENT.
- PROVIDE THREADED HOSE FITTING ON BLOW-DOWN VALVE.

EXPANSION TANK SCHEDULE

TAG	SERVICE	TOTAL EST. SYSTEM VOL. (GAL)	MIN TANK VOL. (GAL)	MIN ACCEPT. VOL. (GAL)	MAX PRESS. (PSI)	MIN PRESS. (PSI)	MAX TEMP (°F)	MIN TEMP (°F)	MANUFACTURER / MODEL
ET-1	CHW SYSTEM	4,540	35.0	19.0	60	20	90	40	ARMSTRONG AX-60V
ET-2	HW SYSTEM	240	12.5	7.5	60	15	190	40	ARMSTRONG AX-40V

EXPANSION TANK SCHEDULE NOTES:

- PROVIDE ASME PRE-CHARGED DIAPHRAGM EXPANSION TANK STAMPED FOR 125 PSI WORKING PRESSURE, WITH HEAVY DUTY BUTYL DIAPHRAGM.
- PROVIDE AIR CHARGING VALVE CONNECTION ON TANK FOR FIELD ADJUSTMENT OF AIR PRESSURE.
- SUPPLY WITH LIFTING RINGS AND BASE FOR INSTALLATION ON CONCRETE PAD.
- ACCEPTABLE MANUFACTURERS INCLUDE ARMSTRONG, AMTROL, BELL & GOSSETT, TACO.

BYPASS CHEMICAL FEEDER SCHEDULE

TAG	SERVICE	VOLUME (GAL)	INLET SIZE (INCHES)	OUTLET SIZE (INCHES)	DRAIN SIZE (INCHES)	MAX SYSTEM PRESS. (PSI)	MAX SYSTEM TEMP. (°F)	WEIGHT (LBS)	MANUFACTURER / MODEL
BCF-1	CHW SYSTEM	5	3/4"	3/4"	3/4"	125	100	37	J.L. WINGERT DB-5HD
BCF-2	HW SYSTEM	2	3/4"	3/4"	3/4"	125	200	23	J.L. WINGERT DB-2HD

BYPASS CHEMICAL FEEDER SCHEDULE NOTES:

- DOME-BOTTOM BYPASS FEEDER WITH ATTACHED SUPPORT LEGS FOR BOLT-DOWN INSTALLATION ON CONCRETE PAD.
- 3-1/2" DIA., 1/4" TURN CAST IRON TOP LID WITH O-RING SEAL.
- PROVIDE INLET, OUTLET, AND DRAIN VALVES.
- PROVIDE PRESSURE TEST PLUGS AND SIGHT GLASS/FLOW INDICATOR.

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HOUSTON COMMUNITY COLLEGE
HVAC SYSTEM REPLACEMENT AND
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HCC SPRING BRANCH CAMPUS
NEW EQUIPMENT SCHEDULES



DATE
MARCH 20, 2018

REVISIONS:			
NO.	REV.	DATE	
CD	BO/CC	3-20-18	

APPROXIMATE SCALE:
SEE DRAWING

SHEET INFO.

SB
7.3

ELECTRICAL CONNECTION SCHEDULE - MAIN BUILDING HVAC

UNIT TAGS	EQUIPMENT DATA	DESCRIPTION	SIZING BASIS	VOLTS / PHASE	NAMEPLATE MCA / MOCP (AMPS)	FEEDER CIRCUIT IDENTIFICATION	FEEDER CIRCUIT BREAKER / FUSE SIZE	FEEDER WIRE SIZE	CIRCUIT NOTES	DISCONNECT SWITCH	MOTOR STARTER
RTU-1	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	16.2 / 25	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	64 / 80	MDP-1,3,5	70A / 3P CB	---	---	---	---
RTU-2	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	9.8 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	48 / 60	MDP-8,10,12	70A / 3P CB	---	---	---	---
RTU-3	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	16.2 / 25	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	55 / 70	MDP-14,16,18	70A / 3P CB	---	---	---	---
RTU-4	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	12.7 / 20	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	61 / 80	MDP-26,28,30	70A / 3P CB	---	---	---	---
RTU-5	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	17.6 / 25	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #1	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	48 / 60	MDP-13,15,17	70A / 3P CB	---	---	---	---
RTU-6	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	17.6 / 25	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #1	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	37 / 45	MDP-20,22,24	70A / 3P CB	---	---	---	---
RTU-7	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	9.8 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	48 / 60	MDP-25,27,29	70A / 3P CB	---	---	---	---
RTU-8	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	22.7 / 30	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #1	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	41 / 50	MDP-7,9,11	70A / 3P CB	---	---	---	---
RTU-9	NEW	DX / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	15 / 20	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-3P, FUSED PER MOCP, 600V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	14.8 / 20	MDP-19,21,23	20A / 3P CB	---	---	---	---
CU-306	NEW	HEAT PUMP SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	480V / 3PH	8.8 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #2	NEW 30A-3P, FUSED PER MOCP, 600V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	480V / 3PH	10 / 15	PPB, TOP LEFT POS.	20A / 3P CB	---	---	---	---
AHU-306	NEW	HEAT PUMP SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	480V / 3PH	19 / 20	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #2	REUSE EXISTING, PROVIDE NEW FUSES PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	480V / 3PH	24 / 25	PPB-2,4,6	125A / 3P CB	---	---	---	---

GENERAL NOTES:
 A) ALL NEW WIRE, CIRCUIT BREAKERS, FUSES, DISCONNECT SWITCHES AND MOTOR STARTERS LISTED ON THIS SCHEDULE ARE TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE.
 B) BRANCH CIRCUIT WIRE DOWNSTREAM OF A FUSED DISCONNECT MAY BE SIZED PER NEC STANDARDS TO MATCH THE FUSE RATING, OR MINIMUM #12 AWG WIRE SIZE, WHICHEVER IS LARGER.
 C) CIRCUIT BREAKERS FOR ALL HEATING, AIR CONDITIONING, AND REFRIGERATION EQUIPMENT AND MOTOR LOADS SHALL BE INVERSE TIME UL-489 / HACR TYPE.
 D) WHEN FUSES ARE SPECIFIED OR REQUIRED FOR HVAC/MOTOR LOADS: PROVIDE CLASS-RK1 OR CLASS-J DUAL-ELEMENT TIME-DELAY FUSES FOR RATINGS 600A OR LOWER. PROVIDE CLASS-L TIME-DELAY FUSES FOR RATINGS GREATER THAN 600A. NEW CLASS-H FUSES SHALL ONLY BE PERMITTED FOR REPLACEMENT OF EXISTING CLASS-H FUSES IN EXISTING INSTALLATIONS WHERE THERE IS NO EVIDENCE OF OVERFUSING OR TAMPERING.

REFERENCED CIRCUIT NOTES:
 1) EXISTING RTU HAS A SEPARATE ENERGY RECOVERY VENTILATOR (ERV) FAN UNIT WHICH IS POWERED SEPARATELY FROM THE MAIN UNIT. REMOVE EXISTING CONDUCTORS FROM ERV BACK TO THE PANEL (PANEL-HA) AND LABEL THE CIRCUIT AS 'SPARE'.
 2) EXISTING CIRCUIT NUMBERING ON PANEL IS NOT IN STANDARD ORDER.

ELECTRICAL CONNECTION SCHEDULE - NEW CHILLER YARD EQUIPMENT

UNIT TAGS	EQUIPMENT DATA	DESCRIPTION	SIZING BASIS	VOLTS / PHASE	NAMEPLATE MCA / MOCP (AMPS)	MOTOR FULL LOAD AMPS	FEEDER CIRCUIT IDENTIFICATION	FEEDER CIRCUIT BREAKER / FUSE SIZE	FEEDER WIRE SIZE	DISCONNECT SWITCH	MOTOR STARTER
CHILLER-3	NEW	AIR-COOLED CHILLER	PER NAMEPLATE	480V / 3PH	402 / 500	---	NEWSWBD-CH	NEW 500A / 3P CB	2 SETS: (3x)250KCM, (1x)#2G, IN 2-1/2" C	NON-FUSED, PROVIDED BY MANUFACTURER	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
CHILLER-4	NEW	AIR-COOLED CHILLER	PER NAMEPLATE	480V / 3PH	402 / 500	---	NEWSWBD-CH	NEW 500A / 3P CB	2 SETS: (3x)250KCM, (1x)#2G, IN 2-1/2" C	NON-FUSED, PROVIDED BY MANUFACTURER	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
PCHWP-3	NEW	VARIABLE SPEED CHILLED WATER PUMP	5 HP MOTOR	480V / 3PH	---	7.6	NEWSWBD-CH	NEW 20A / 3P CB	NEW (3x)#12, (1x)#12G, IN 3/4" C	INTEGRAL WITH VFD, SEE MOTOR STARTER	NEW NEMA-3R VARIABLE FREQUENCY DRIVE, PROVIDED BY MECHANICAL CONTRACTOR
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
PCHWP-4	NEW	VARIABLE SPEED CHILLED WATER PUMP	5 HP MOTOR	480V / 3PH	---	7.6	NEWSWBD-CH	NEW 20A / 3P CB	NEW (3x)#12, (1x)#12G, IN 3/4" C	INTEGRAL WITH VFD, SEE MOTOR STARTER	NEW NEMA-3R VARIABLE FREQUENCY DRIVE, PROVIDED BY MECHANICAL CONTRACTOR
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
SCHWP-3	NEW	VARIABLE SPEED CHILLED WATER TWIN PUMP	15 HP MOTOR	480V / 3PH	---	21.0	NEWSWBD-CH	NEW 50A / 3P CB	NEW (3x)#6, (1x)#10G, IN 1" C	INTEGRAL WITH VFD, SEE MOTOR STARTER	NEW NEMA-3R VARIABLE FREQUENCY DRIVE WITH OUTPUT TRANSFER SWITCH, PROVIDED BY MECHANICAL CONTRACTOR
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---

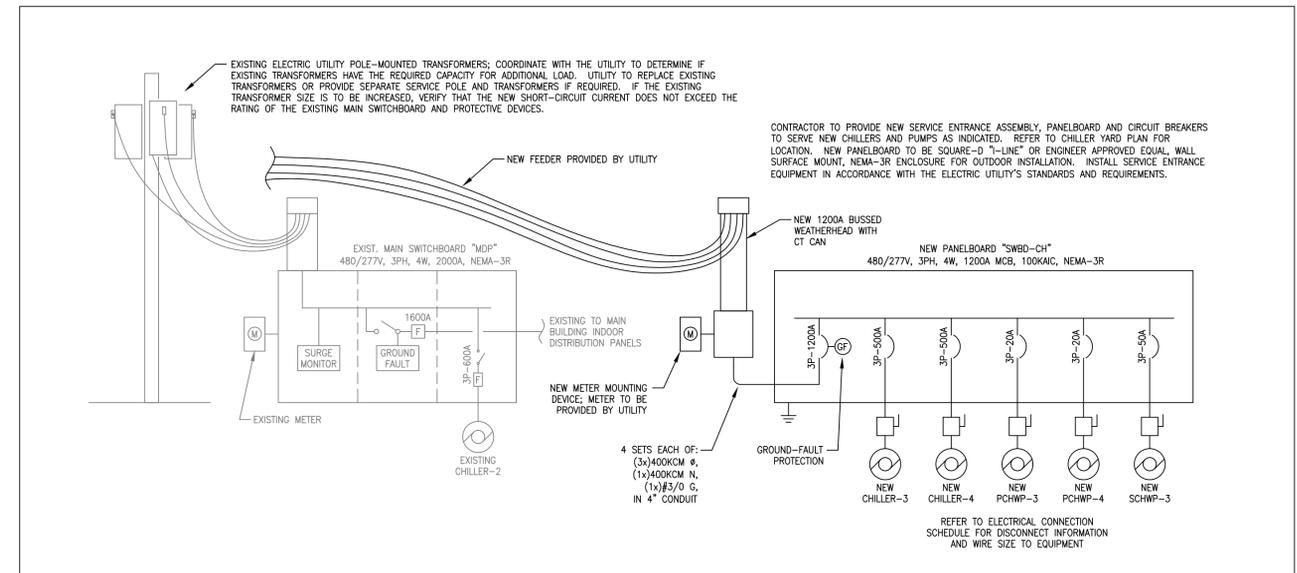
GENERAL NOTES:
 A) ALL WIRE, CIRCUIT BREAKERS, FUSES, DISCONNECT SWITCHES AND MOTOR STARTERS LISTED ON THIS SCHEDULE AS 'NEW' ARE TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE.
 B) BRANCH CIRCUIT WIRE DOWNSTREAM OF A FUSED DISCONNECT MAY BE SIZED PER NEC STANDARDS TO MATCH THE FUSE RATING, OR MINIMUM #12 AWG WIRE SIZE, WHICHEVER IS LARGER.
 C) CIRCUIT BREAKERS FOR ALL HEATING, AIR CONDITIONING, AND REFRIGERATION EQUIPMENT AND MOTOR LOADS SHALL BE INVERSE TIME UL-489 / HACR TYPE.
 D) WHEN FUSES ARE SPECIFIED OR REQUIRED FOR HVAC/MOTOR LOADS: PROVIDE CLASS-RK1 OR CLASS-J DUAL-ELEMENT TIME-DELAY FUSES FOR RATINGS 600A OR LOWER. PROVIDE CLASS-L TIME-DELAY FUSES FOR RATINGS GREATER THAN 600A. NEW CLASS-H FUSES SHALL ONLY BE PERMITTED FOR REPLACEMENT OF EXISTING CLASS-H FUSES IN EXISTING INSTALLATIONS WHERE THERE IS NO EVIDENCE OF OVERFUSING OR TAMPERING.

ELECTRICAL CONNECTION SCHEDULE - PERFORMING ARTS BUILDING HVAC

UNIT TAGS	EQUIPMENT DATA	DESCRIPTION	SIZING BASIS	VOLTS / PHASE	NAMEPLATE MCA / MOCP (AMPS)	FEEDER CIRCUIT IDENTIFICATION	FEEDER CIRCUIT BREAKER / FUSE SIZE	FEEDER WIRE SIZE	CIRCUIT NOTES	DISCONNECT SWITCH	MOTOR STARTER
RTU-1	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	3.3 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	21.5 / 25	MDP2-7,9,11	30A / 3P CB	---	---	---	---
RTU-2	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	17.6 / 25	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	41 / 50	MDP1-8,10,12	50A / 3P CB	---	---	---	---
RTU-3	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	5.8 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	24.9 / 30	MDP1-1,3,5	50A / 3P CB	---	---	---	---
RTU-4	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	13.3 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	24.9 / 30	MDP1-2,4,6	50A / 3P CB	---	---	---	---
RTU-5	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	28.7 / 40	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #1	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	87 / 90	UNKNOWN	UNKNOWN	---	---	---	---
RTU-6	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	22.4 / 30	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #1	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	69 / 70	UNKNOWN	UNKNOWN	---	---	---	---
RTU-7	NEW	CHW / GAS HEAT RTU	PER NAMEPLATE	480V / 3PH	16.2 / 25	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #1	DISCONNECT PROVIDED BY MANUFACTURER, FUSED PER MOCP	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX / GAS HEAT RTU	---	480V / 3PH	73 / 80	UNKNOWN	UNKNOWN	---	---	---	---
SCHWP-4	NEW	VARIABLE SPEED CHILLED WATER TWIN PUMP	15 HP MOTOR	480V / 3PH	21.0 FLA	MDP2-19,21,23	NEW 50A / 3P CB	NEW (3x)#6, (1x)#10G, IN 1" C	---	INTEGRAL WITH VFD, SEE MOTOR STARTER	NEW NEMA-3R VARIABLE FREQUENCY DRIVE WITH OUTPUT TRANSFER SWITCH, PROVIDED BY MECHANICAL CONTRACTOR
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---

GENERAL NOTES:
 A) ALL NEW WIRE, CIRCUIT BREAKERS, FUSES, DISCONNECT SWITCHES AND MOTOR STARTERS LISTED ON THIS SCHEDULE ARE TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE.
 B) BRANCH CIRCUIT WIRE DOWNSTREAM OF A FUSED DISCONNECT MAY BE SIZED PER NEC STANDARDS TO MATCH THE FUSE RATING, OR MINIMUM #12 AWG WIRE SIZE, WHICHEVER IS LARGER.
 C) CIRCUIT BREAKERS FOR ALL HEATING, AIR CONDITIONING, AND REFRIGERATION EQUIPMENT AND MOTOR LOADS SHALL BE INVERSE TIME UL-489 / HACR TYPE.
 D) WHEN FUSES ARE SPECIFIED OR REQUIRED FOR HVAC/MOTOR LOADS: PROVIDE CLASS-RK1 OR CLASS-J DUAL-ELEMENT TIME-DELAY FUSES FOR RATINGS 600A OR LOWER. PROVIDE CLASS-L TIME-DELAY FUSES FOR RATINGS GREATER THAN 600A. NEW CLASS-H FUSES SHALL ONLY BE PERMITTED FOR REPLACEMENT OF EXISTING CLASS-H FUSES IN EXISTING INSTALLATIONS WHERE THERE IS NO EVIDENCE OF OVERFUSING OR TAMPERING.

REFERENCED CIRCUIT NOTES:
 1) EXISTING ELECTRICAL PANELS ARE POORLY LABELED; FIELD VERIFY CIRCUITS AND PROVIDE NEW LABELS FOR RTU CIRCUIT IDENTIFICATION. NEW RTUS HAVE SIGNIFICANTLY LOWER ELECTRICAL REQUIREMENTS THAN EXISTING EQUIPMENT, SO EXISTING CIRCUITS SHOULD BE MORE THAN ADEQUATE IN CAPACITY.

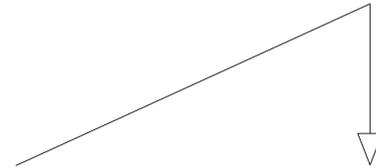


MAIN BUILDING CHILLER YARD - NEW SERVICE PANEL
 SCALE: NTS

ELECTRICAL CONNECTION SCHEDULE - SCIENCE BUILDING HVAC

UNIT TAGS	EQUIPMENT DATA	DESCRIPTION	SIZING BASIS	VOLTS / PHASE	NAMEPLATE MCA / MOCF (AMPS)	FEEDER CIRCUIT IDENTIFICATION	FEEDER CIRCUIT BREAKER / FUSE SIZE	FEEDER WIRE SIZE	CIRCUIT NOTES	DISCONNECT SWITCH	MOTOR STARTER
CU-B1 (BOOKSTORE)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	460V / 3PH	8.8 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-3P, FUSED PER MOCF, 600V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	460V / 3PH	8.2 / 15	BKSTR HA-7.8,11	20A / 3P CB	---	---	---	---
CU-B2 (BOOKSTORE)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	460V / 3PH	19 / 30	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-3P, FUSED PER MOCF, 600V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	460V / 3PH	19.5 / 30	BKSTR HA-1.3,5	30A / 3P CB	---	---	---	---
AHU-B1 (BOOKSTORE)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	460V / 3PH	19 / 20	CHANGE TO BKSTR HA-8,10,12	REUSE EXISTING 40A / 3P CB	REUSE EXIST. WIRE SERVING DEMOD DUCT HEATER	---	NEW 30A-3P, FUSED PER MOCF, 600V, NEMA-1	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 1PH	5.4 / 15	---	---	---	---	---	---
AHU-B2 (BOOKSTORE)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	460V / 3PH	27 / 30	CHANGE TO BKSTR HA-2,4,6	REUSE EXISTING 30A / 3P CB	REUSE EXIST. WIRE SERVING DEMOD DUCT HEATER	---	NEW 30A-3P, FUSED PER MOCF, 600V, NEMA-1	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	460V / 3PH	---	---	---	---	---	---	---
CU-H1 (HNRS. LOUNGE)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	460V / 3PH	11 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-3P, FUSED PER MOCF, 600V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	460V / 3PH	10.8 / 15	---	---	---	---	---	---
AHU-H1 (HNRS. LOUNGE)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	460V / 3PH	19 / 20	REUSE EXISTING	NEW 20A / 3P FUSES	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	460V / 3PH	---	---	---	---	---	---	---
CU-F1 (FAC. OFFICES)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	460V / 3PH	11 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	460V / 3PH	9.7 / 15	FUSED SWITCH	15A / 3P FUSES	---	---	---	---
CU-F2 (FAC. OFFICES)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	460V / 3PH	8.8 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	460V / 3PH	8.2 / 15	FUSED SWITCH	15A / 3P FUSES	---	---	---	---
AHU-F1 (FAC. OFFICES)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	460V / 3PH	19 / 20	REUSE EXISTING	NEW 20A / 3P FUSES	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	460V / 3PH	---	FUSED SWITCH	30A / 3P FUSES	---	---	---	---
AHU-F2 (FAC. OFFICES)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	460V / 3PH	19 / 20	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	460V / 3PH	---	FUSED SWITCH	20A / 3P FUSES	---	---	---	---
CU-C1 (COMMONS)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	208V / 3PH	24.8 / 40	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 60A-3P, FUSED PER MOCF, 240V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	208V / 3PH	21.4 / 30	COMMONS LA-20,22,24	30A / 3P CB	---	---	---	---
CU-C2 (COMMONS)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	208V / 3PH	16.2 / 25	REUSE EXISTING	REUSE EXISTING	NEW (3x)#10, (1x)#10G, IN 3/4"	SEE CKT NOTE #2	NEW 30A-3P, FUSED PER MOCF, 240V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	208V / 1PH	18.2 / 30	COMMONS LA-14, 16, 18	30A / 3P CB	---	---	---	---
CU-C3 (COMMONS)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	208V / 3PH	24.8 / 40	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 60A-3P, FUSED PER MOCF, 240V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	208V / 3PH	21.4 / 30	COMMONS LA-19,21,23	30A / 3P CB	---	---	---	---
CU-C4 (COMMONS)	NEW	DX SPLIT SYSTEM OUTDOOR UNIT	PER NAMEPLATE	208V / 3PH	24.8 / 40	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 60A-3P, FUSED PER MOCF, 240V, NEMA-3R	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM OUTDOOR UNIT	---	208V / 3PH	21.4 / 30	COMMONS LA-13, 15, 17	30A / 3P CB	---	---	---	---
AHU-C1 (COMMONS)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	208V / 3PH	36 / 40	REUSE EXISTING	NEW 40A / 3P CB	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 3PH	---	COMMONS LA-1,3,5	50A / 3P CB	---	---	---	---
AHU-C2 (COMMONS)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	208V / 3PH	26 / 30	REUSE EXISTING	NEW 30A / 3P CB	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 3PH	---	COMMONS LA-2,4,6	40A / 3P CB	---	---	---	---
AHU-C3 (COMMONS)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	208V / 3PH	36 / 40	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 3PH	---	COMMONS LA-8,10,12	40A / 3P CB	---	---	---	---
AHU-C4 (COMMONS)	NEW	DX SPLIT SYSTEM INDOOR UNIT	PER NAMEPLATE	208V / 3PH	36 / 40	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	REUSE EXISTING	MOTOR STARTER PROVIDED BY MANUFACTURER
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 3PH	---	COMMONS LA-7,9,11	40A / 3P CB	---	---	---	---

(CONTINUED)



UNIT TAGS	EQUIPMENT DATA	DESCRIPTION	SIZING BASIS	VOLTS / PHASE	NAMEPLATE MCA / MOCF (AMPS)	FEEDER CIRCUIT IDENTIFICATION	FEEDER CIRCUIT BREAKER / FUSE SIZE	FEEDER WIRE SIZE	CIRCUIT NOTES	DISCONNECT SWITCH	MOTOR STARTER
OAHU-1 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	460V / 3PH	5.1 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #3	INTEGRAL WITH VFD, SEE MOTOR STARTER	NEW NEMA-1 VARIABLE FREQUENCY DRIVE, PROVIDED BY MECHANICAL CONTRACTOR
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	460V / 3PH	---	SCIENCE HA-1.3,5	20A / 3P CB	---	---	---	---
OAHU-2 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	460V / 3PH	5.1 / 15	CHANGE TO SCIENCE HA-2,4,6	REPURPOSE EXISTING 20A / 3P CB	NEW (3x)#12, (1x)#12G, IN 3/4"	SEE CKT NOTE #3	INTEGRAL WITH VFD, SEE MOTOR STARTER	NEW NEMA-1 VARIABLE FREQUENCY DRIVE, PROVIDED BY MECHANICAL CONTRACTOR
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	460V / 3PH	---	SAME CKT AS OAHU-1	SEE OAHU-1	---	---	---	---
AHU-6 & AHU-8 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	208V / 1PH	5 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-2P, 15A FUSED, 240V, NEMA-1	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 1PH	---	SCI LA-9,11 & LA-17,19	30A / 2P CB EACH	---	---	---	---
AHU-4 & AHU-13 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	208V / 1PH	5 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	SEE CKT NOTE #1	INTEGRAL WITH VFD, SEE MOTOR STARTER	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 1PH	---	SCI LA-2,4 & LA-27,29	40A / 2P CB	---	---	---	---
AHU-12 & AHU-14 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	208V / 1PH	5 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-2P, 15A FUSED, 240V, NEMA-1	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 1PH	---	SCI LA-10,12 & LA-18,20	20A / 2P & 40A / 2P CB	---	---	---	---
AHU-3 & AHU-5 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	208V / 1PH	6.8 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-2P, 15A FUSED, 240V, NEMA-1	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 1PH	---	SCI LA-1,3 & LA-5,7	40A / 2P CB EACH	---	---	---	---
AHU-7 & AHU-11 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	208V / 1PH	8.5 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-2P, 15A FUSED, 240V, NEMA-1	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 1PH	---	SCI LA-13,15 & LA-6,8	40A / 2P CB EACH	---	---	---	---
AHU-9 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	208V / 1PH	8.5 / 15	REUSE EXISTING	REUSE EXISTING	REUSE EXISTING	---	NEW 30A-2P, 15A FUSED, 240V, NEMA-1	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	DX SPLIT SYSTEM INDOOR UNIT	---	208V / 1PH	---	SCIENCE LA-21,23	20A / 2P CB	---	---	---	---
AHU-10 (SCIENCE)	NEW	CHW / HW FAN COIL UNIT	PER NAMEPLATE	208V / 1PH	6.8 / 15	SCIENCE LA-14,16	USE EXISTING 20A / 2P SPARE CB	NEW (2x)#12, (1x)#12G, IN 3/4"	---	NEW 30A-2P, 15A FUSED, 240V, NEMA-1	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	DX ROOFTOP UNIT	---	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN	---	---	---
SCHWP-5	NEW	VARIABLE SPEED CHILLED WATER TWIN PUMP	7.5 HP MOTOR	460V / 3PH	11.0 FLA	SCIENCE H-25,27,29	NEW 30A / 3P CB	NEW (3x)#10, (1x)#10G, IN 3/4"	---	INTEGRAL WITH VFD, SEE MOTOR STARTER	NEW NEMA-3R VARIABLE FREQUENCY DRIVE WITH OUTPUT TRANSFER SWITCH, PROVIDED BY MECHANICAL CONTRACTOR
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
HWP-1	NEW	CONSTANT SPEED HOT WATER PUMP	1.5 HP MOTOR	460V / 3PH	3.0 FLA	SCIENCE H-13,15,17	NEW 20A / 3P CB	NEW (3x)#12, (1x)#12G, IN 3/4"	---	NEW 30A-3P, 6A FUSED, 600V, NEMA-3R	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
HWP-2	NEW	CONSTANT SPEED HOT WATER PUMP	1.5 HP MOTOR	460V / 3PH	3.0 FLA	SCIENCE H-19,21,23	NEW 20A / 3P CB	NEW (3x)#12, (1x)#12G, IN 3/4"	---	NEW 30A-3P, 6A FUSED, 600V, NEMA-3R	PROVIDE NEW COMBINATION MOTOR STARTER (NEMA SIZE 0) AND DISCONNECT
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
BP-1	NEW	CONSTANT SPEED BOILER PUMP	1/2 HP MOTOR	120V / 1PH	9.8 FLA	SCIENCE LB-17	NEW 20A / 1P CB	NEW (1x)#12, (1x)#12N, (1x)#12G, IN 3/4"	---	NEW 20A NEMA-3R MOTOR-RATED SWITCH	CONTROLLED THROUGH PUMP CONTACTOR ON BOILER; REFER TO BOILER WIRING DIAGRAM
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---
B-1	NEW	NATURAL GAS FIRED BOILER	PER NAMEPLATE	120V / 1PH	12 / 15	SCIENCE LB-19	NEW 15A / 1P CB	NEW (1x)#12, (1x)#12N, (1x)#12G, IN 3/4"	---	NEW 20A NEMA-3R MOTOR-RATED SWITCH	STARTER PROVIDED BY MANUFACTURER
	EXISTING	NO EXISTING EQUIPMENT	---	---	---	---	---	---	---	---	---

GENERAL NOTES:

- A) ALL NEW WIRE, CIRCUIT BREAKERS, FUSES, DISCONNECT SWITCHES AND MOTOR STARTERS LISTED ON THIS SCHEDULE ARE TO BE PROVIDED BY THE ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE.
- B) BRANCH CIRCUIT WIRE DOWNSTREAM OF A FUSED DISCONNECT MAY BE SIZED PER NEC STANDARDS TO MATCH THE FUSE RATING, OR MINIMUM #12 AWG WIRE SIZE, WHICHEVER IS LARGER.
- C) CIRCUIT BREAKERS FOR ALL HEATING, AIR CONDITIONING, AND REFRIGERATION EQUIPMENT AND MOTOR LOADS SHALL BE INVERSE TIME UL-489 / HACR TYPE.
- D) WHEN FUSES ARE SPECIFIED OR REQUIRED FOR HVAC/MOTOR LOADS: PROVIDE CLASS-RK1 OR CLASS-J DUAL-ELEMENT TIME-DELAY FUSES FOR RATINGS 600A OR LOWER. PROVIDE CLASS-L TIME-DELAY FUSES FOR RATINGS GREATER THAN 600A. NEW CLASS-H FUSES SHALL ONLY BE PERMITTED FOR REPLACEMENT OF EXISTING CLASS-H FUSES IN EXISTING INSTALLATIONS WHERE THERE IS NO EVIDENCE OF OVERFUSING OR TAMPERING.

REFERENCED CIRCUIT NOTES:

- 1) CIRCUIT LA-2,4 IS LABELED AS "AHU-10", BUT IS LIKELY SERVING "AHU-4". FIELD VERIFY AND UPDATE PANEL SCHEDULE.
- 2) EXISTING OUTDOOR UNIT IS A 1-PHASE UNIT INSTALLED ON A 3-PHASE CIRCUIT. NEW OUTDOOR UNIT WILL BE 3-PHASE. PROVIDE NEW CONDUCTORS IF EXISTING CANNOT BE REUSED.
- 3) EXISTING OAHU-1 AND OAHU-2 ARE FED FROM THE SAME 20A / 3P CIRCUIT BREAKER. REPURPOSE THE EXISTING 20A / 3P CIRCUIT SERVING DEMOLISHED AHU-14 ELECTRIC DUCT HEATER TO SERVE NEW OAHU-2. KEEP NEW OAHU-1 ON EXISTING CIRCUIT.

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HOUSTON COMMUNITY COLLEGE
HVAC SYSTEM REPLACEMENT AND
RENOVATION PROJECTS

HCC SPRING BRANCH CAMPUS
ELECTRICAL CONNECTION
SCHEDULES



DATE
MARCH 20, 2018

NO.	REV.	DATE
CD	BO/CC	3-2018

APPROXIMATE SCALE:
SEE DRAWING

SHEET INFO.

SB
8.2

EXISTING PANEL 'LB' (EXISTING EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 208/120V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: UNKNOWN					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1	40	2	CU-3	A	CU-9	60	2	2	
3				B				4	
5	40	2	CU-5	C	CU-11	40	2	6	
7				A				8	
9	40	2	CU-7	B	CU-12	25	2	10	
11				C				12	
13	20	2	CU-6	A	CU-4	20	2	14	
15				B				16	
17	20	2	CU-8	C	CU-13	20	2	18	
19				A				20	
21	20	2	UNKNOWN	B	CU-14	25	2	22	
23				C				24	
25	20	1	GFCI RECEPTACLES	A	UNKNOWN	20	1	26	
27	20	1	EF-8	B	UNKNOWN	20	1	28	
29			SPACE	C	SPACE			30	
31			SPACE	A	SPACE			32	
33			SPACE	B	SPACE			34	
35			SPACE	C	SPACE			36	
37			SPACE	A	SPACE			38	
39			SPACE	B	SPACE			40	
41			SPACE	C	SPACE			42	

BOLD RED TEXT = EQUIPMENT TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT ASSIGNMENT
BOLD RED TEXT = CIRCUIT BREAKER TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT BREAKER
TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'LB' (NEW EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 208/120V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: UNKNOWN					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1	40	2	SPARE	A	SPARE	60	2	2	
3				B				4	
5	40	2	SPARE	C	SPARE	40	2	6	
7				A				8	
9	40	2	SPARE	B	SPARE	25	2	10	
11				C				12	
13	20	2	SPARE	A	SPARE	20	2	14	
15				B				16	
17	20	1	NEW BP-1	C	SPARE	20	2	18	
19	15	1	NEW BOILER-1	A				20	
21				B				22	
23	20	2	UNKNOWN	C	SPARE	25	2	24	
25	20	1	GFCI RECEPTACLES	A	UNKNOWN	20	1	26	
27	20	1	EF-8	B	UNKNOWN	20	1	28	
29			SPACE	C	SPACE			30	
31			SPACE	A	SPACE			32	
33			SPACE	B	SPACE			34	
35			SPACE	C	SPACE			36	
37			SPACE	A	SPACE			38	
39			SPACE	B	SPACE			40	
41			SPACE	C	SPACE			42	

BOLD TEXT = NEW CIRCUIT ASSIGNMENT
BOLD TEXT = NEW CIRCUIT BREAKER
TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'HA' (EXISTING EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 480/277V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: 225A					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1				A				2	
3	20	3	OAHU-1 & OAHU-2	B	AHU-14 ELEC. DUCT HEAT	20	3	4	
5				C				6	
7				A				8	
9	20	3	EFS-1 THROUGH -4	B	EFS-5, 6, 7, 9	20	3	10	
11				C				12	
13	20	1	SPARE	A				14	
15	20	1	SPARE	B	AHU-12 ELEC. DUCT HEAT	20	3	16	
17	20	1	SPARE	C				18	
19	20	1	SPARE	A	ENCO	20	1	20	
21	20	1	SPARE	B	ENCO	20	1	22	
23	20	1	SPARE	C	ENCO	20	1	24	
25	20	1	SPARE	A	SPARE	20	1	26	
27	20	1	SPARE	B	SPARE	20	1	28	
29	20	1	SPARE	C	SPARE	20	1	30	
31	20	1	SPARE	A	SPARE	20	1	32	
33	20	1	SPARE	B	SPARE	20	1	34	
35	20	1	SPARE	C	SPARE	20	1	36	
37	20	1	SPARE	A	SPARE	20	1	38	
39	20	1	SPARE	B	SPARE	20	1	40	
41	20	1	SPARE	C	SPARE	20	1	42	

BOLD RED TEXT = EQUIPMENT TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT ASSIGNMENT
BOLD RED TEXT = CIRCUIT BREAKER TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT BREAKER
TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'HA' (NEW EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 480/277V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: 225A					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1				A				2	
3	20	3	NEW OAHU-1	B	NEW OAHU-2	20	3	4	
5				C				6	
7				A				8	
9	20	3	EFS-1 THROUGH -4	B	EFS-5, 6, 7, 9	20	3	10	
11				C				12	
13	20	1	SPARE	A				14	
15	20	1	SPARE	B	SPARE	20	3	16	
17	20	1	SPARE	C				18	
19	20	1	SPARE	A	ENCO	20	1	20	
21	20	1	SPARE	B	ENCO	20	1	22	
23	20	1	SPARE	C	ENCO	20	1	24	
25	20	1	SPARE	A	SPARE	20	1	26	
27	20	1	SPARE	B	SPARE	20	1	28	
29	20	1	SPARE	C	SPARE	20	1	30	
31	20	1	SPARE	A	SPARE	20	1	32	
33	20	1	SPARE	B	SPARE	20	1	34	
35	20	1	SPARE	C	SPARE	20	1	36	
37	20	1	SPARE	A	SPARE	20	1	38	
39	20	1	SPARE	B	SPARE	20	1	40	
41	20	1	SPARE	C	SPARE	20	1	42	

BOLD TEXT = NEW CIRCUIT ASSIGNMENT
BOLD TEXT = NEW CIRCUIT BREAKER
TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'H' (EXISTING EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 480/277V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: 600A					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1	20	1	LIGHTS	A	LIGHTS	20	1	2	
3	20	1	LIGHTS	B	LIGHTS	20	1	4	
5	20	1	LIGHTS	C	LIGHTS	20	1	6	
7	20	1	LIGHTS	A	LIGHTS	20	1	8	
9	20	1	LIGHTS	B	AHU-15	40	1	10	
11	20	1	LIGHTS	C	SPARE	20	1	12	
13				A				14	
15	20	3	AHU-9 ELEC. DUCT HEAT	B	WATER HEATER	30	3	16	
17				C				18	
19	60	3	AHU-2 ELEC. DUCT HEAT	A	TRANSFORMER T O PANEL LA	125	3	22	
21				B				24	
23				C				26	
25	60	3	AHU-1 ELEC. DUCT HEAT	A	CU-1	125	3	28	
27				B				30	
29				C				32	
31	125	3	TRANSFORMER TO PANEL L	A	CU-2	100	3	34	
33				B				36	
35				C				38	
37			SPACE	A	SPACE			40	
39			SPACE	B	SPACE			42	
41			SPACE	C	SPACE			44	

BOLD RED TEXT = EQUIPMENT TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT ASSIGNMENT
BOLD RED TEXT = CIRCUIT BREAKER TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT BREAKER
TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'H' (NEW EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 480/277V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: 600A					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1	20	1	LIGHTS	A	LIGHTS	20	1	2	
3	20	1	LIGHTS	B	LIGHTS	20	1	4	
5	20	1	LIGHTS	C	LIGHTS	20	1	6	
7	20	1	LIGHTS	A	LIGHTS	20	1	8	
9	20	1	LIGHTS	B	AHU-15	40	1	10	
11	20	1	LIGHTS	C	SPARE	20	1	12	
13				A				14	
15	20	3	NEW HWP-1	B	WATER HEATER	30	3	16	
17				C				18	
19	20	3	NEW HWP-2	A	TRANSFORMER TO PANEL LA	125	3	22	
21				B				24	
23	30	3	NEW SCHWP-5	C	SPARE	125	3	26	
25				A				28	
27	30	3	NEW SCHWP-5	B	SPARE	125	3	30	
29				C				32	
31	125	3	PANEL L	A	SPARE	100	3	34	
33				B				36	
35				C				38	
37			SPACE	A	SPACE			40	
39			SPACE	B	SPACE			42	
41			SPACE	C	SPACE			44	

BOLD TEXT = NEW CIRCUIT ASSIGNMENT
BOLD TEXT = NEW CIRCUIT BREAKER
TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'LA' (EXISTING EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 208/120V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: UNKNOWN					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1	40	2	AHU-3	A	AHU-10 (ACTUALLY AHU-47)	40	2	2	
3				B				4	
5	40	2	AHU-5	C	AHU-11	40	2	6	
7				A				8	
9	30	2	AHU-6	B	AHU-12	20	2	10	
11				C				12	
13	40	2	AHU-7	A	SPARE	20	2	14	
15				B				16	
17	30	2	AHU-8	C	AHU-14	40	2	18	
19				A				20	
21	20	2	AHU-9	B	SF-3	20	1	22	
23				C	SF-4	20	1	24	
25			SPACE	A	SF-1	20	1	26	
27				B	SF-2	20	1	28	
29	40	2	AHU-13	C	SF-5	20	1	30	
31				A	SF-6	20	1	32	
33	20	2	PANEL LB	B	SF-7	20	1	34	
35				C	SF-8	20	1	36	
37			SPACE	A	SPACE			38	
39			SPACE	B	SPACE			40	
41			SPACE	C	SPACE			42	

BOLD RED TEXT = EQUIPMENT TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT ASSIGNMENT
BOLD RED TEXT = CIRCUIT BREAKER TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT BREAKER
TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'LA' (NEW EQUIPMENT)									
PROJECT :		HCC Spring Branch		VOLTAGE : 208/120V, 3PH, 4W					
LOCATION :		Science Building		RATED AMPS: UNKNOWN					
NOTES :									
CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT	
1	40	2	NEW AHU-3	A					

EXISTING PANEL 'MDP1' (EXISTING EQUIPMENT)

PROJECT : HCC Spring Branch VOLTAGE : 480/277V, 3PH, 4W
 LOCATION : Performing Arts Bldg RATED AMPS: 600A
 NOTES :

CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT
1				A				2
3	50	3	RTU-3	B	RTU-4	50	3	4
5				C				6
7				A				8
9	90	3	JB ABOVE THEATER	B	RTU-2	50	3	10
11				C				12
13	20	1	LIGHTS	A	LIGHTS	20	1	14
15	20	1	LIGHTS	B	LIGHTS	20	1	16
17	20	1	LIGHTS	C	LIGHTS	20	1	18
19				A				20
21	50	3	VAV	B	UNKNOWN	150	3	22
23				C				24
25				A				26
27	30	3	WATER HEATER	B	VAV	100	3	28
29				C				30
31				A				32
33	40	3	VAV 5	B	UNKNOWN	100	3	34
35				C				36

BOLD RED TEXT = EQUIPMENT TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT ASSIGNMENT
BOLD RED TEXT = CIRCUIT BREAKER TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT BREAKER
 TEXT = NO CHANGE TO THIS CIRCUIT

NO CHANGE TO PANEL MDP-1 CONFIGURATION OR CIRCUIT ASSIGNMENTS; SHOWN FOR REFERENCE ONLY

EXISTING PANEL 'HN' (EXISTING EQUIPMENT)

PROJECT : HCC Spring Branch VOLTAGE : 480/277V, 3PH, 4W
 LOCATION : Performing Arts Bldg RATED AMPS: 250A
 NOTES :

CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT
1				A	LIGHTS	20	1	2
3	100	3	RTU	B	SPACE			4
5				C	SPACE			6
7	20	1	LIGHTS	A				8
9	20	1	LIGHTS	B	VAV-1	25	3	10
11			SPACE	C				12
13				A				14
15	15	3	VAV-8	B	VAV-2	15	3	16
17				C				18
19				A				20
21	25	3	VAV-6	B	VAV-3	15	3	22
23				C				24
25				A				26
27	20	3	VAV-7	B	VAV-4	20	3	28
29				C				30
31				A				32
33			SPACE	B	VAV-5	25	3	34
35				C				36
37				A				38
39			SPACE	B	SPACE			40
41				C				42

BOLD RED TEXT = EQUIPMENT TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT ASSIGNMENT
BOLD RED TEXT = CIRCUIT BREAKER TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT BREAKER
 TEXT = NO CHANGE TO THIS CIRCUIT

NO CHANGE TO PANEL-HN CONFIGURATION OR CIRCUIT ASSIGNMENTS; SHOWN FOR REFERENCE ONLY

EXISTING PANEL 'MDP2' (EXISTING EQUIPMENT)

PROJECT : HCC Spring Branch VOLTAGE : 480/277V, 3PH, 4W
 LOCATION : Performing Arts Bldg RATED AMPS: 600A
 NOTES :

CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT
1				A				2
3	225	3	PANEL HN	B	EXHAUST FAN	30	3	4
5				C				6
7				A				8
9	30	3	RTU-1	B	45KVA TRANSFORMER	70	3	10
11				C				12
13				A				14
15	40	3	ADDISON UNIT	B	1	40	3	16
17				C				18
19				A				20
21			SPACE	B	VAVs	30	3	22
23				C				24

BOLD RED TEXT = EQUIPMENT TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT ASSIGNMENT
BOLD RED TEXT = CIRCUIT BREAKER TO BE REMOVED FROM PANEL, SEE NEW PANEL SCHEDULE FOR NEW CIRCUIT BREAKER
 TEXT = NO CHANGE TO THIS CIRCUIT

EXISTING PANEL 'MDP2' (NEW EQUIPMENT)

PROJECT : HCC Spring Branch VOLTAGE : 480/277V, 3PH, 4W
 LOCATION : Performing Arts Bldg RATED AMPS: 600A
 NOTES :

CKT	AMPS	POLE	CIRCUIT DESCRIPTION	PH	CIRCUIT DESCRIPTION	AMPS	POLE	CKT
1				A				2
3	225	3	PANEL HN	B	EXHAUST FAN	30	3	4
5				C				6
7				A				8
9	30	3	RTU-1	B	45KVA TRANSFORMER	70	3	10
11				C				12
13				A				14
15	40	3	ADDISON UNIT	B	1	40	3	16
17				C				18
19				A				20
21	50	3	SCHWP-4	B	VAVs	30	3	22
23				C				24

BOLD TEXT = NEW CIRCUIT ASSIGNMENT
BOLD TEXT = NEW CIRCUIT BREAKER
 TEXT = NO CHANGE TO THIS CIRCUIT

PANEL MDP LOAD ANALYSIS:

- FULL-LOAD AMPS OF EXISTING RTU-1, RTU-2, RTU-3, AND RTU-4 ON PANEL MDP = 102.5 AMPS TOTAL
- FULL-LOAD AMPS OF NEW RTU-1, RTU-2, RTU-3, AND RTU-4 ON PANEL MDP = 40.0 AMPS TOTAL
- NEW PUMP SCHWP-4 WILL ADD 21.0 FULL-LOAD AMPS.
- TOTAL CHANGE IN PANEL MDP AMP LOAD: -102.5 + 40.0 + 21.0 = -41.5 AMPS (REDUCTION)

PERFORMING ARTS BUILDING EQUIPMENT PANEL SCHEDULES

SCALE: NTS

PERFORMING ARTS BUILDING PANEL SCHEDULE NOTES:

- EXISTING PANEL LAYOUT AND LABELING IS SHOWN IN THE ABOVE PANEL SCHEDULES FOR REFERENCE.
- CIRCUITS FOR SEVERAL OF THE EXISTING RTUs COULD NOT BE IDENTIFIED. THE ON-SITE POSTED PANEL SCHEDULES ARE NOT FULLY UP-TO-DATE AFTER THE PREVIOUS HVAC RENOVATION, AND RECORD DRAWINGS ARE NOT AVAILABLE. ELECTRICAL CONTRACTOR WILL NEED TO TRACE THE CIRCUITS SERVING EXISTING RTUs AND PROVIDE UPDATED PANEL SCHEDULES.
- ALL OF THE NEW RTUs ARE SIGNIFICANTLY SMALLER IN ELECTRICAL LOAD, SO EXISTING RTU CIRCUITS WILL HAVE CAPACITY FOR RE-USE WITH THE NEW EQUIPMENT WITHOUT SIGNIFICANT CIRCUITING CHANGES REQUIRED.
- REFER TO EQUIPMENT ELECTRICAL CONNECTION SCHEDULES FOR MORE INFORMATION.

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HOUSTON COMMUNITY COLLEGE
 HVAC SYSTEM REPLACEMENT AND
 RENOVATION PROJECTS

HCC SPRING BRANCH CAMPUS
 ELECTRICAL panel SCHEDULES



DATE
 MARCH 20, 2018

NO.	REV.	DATE
CD	BC/CC	3-2018

APPROXIMATE SCALE:
 SEE DRAWING

SHEET INFO.

SB
 8.4

Main Building South Section Utility Transformer

Equipment	Load Type	EXISTING EQUIPMENT					NEW EQUIPMENT					Project Scope		
		Volts	Phase	MCA	FLA	Load Mult.	VA	Volts	Phase	MCA	FLA		Load Mult.	VA
RTU-1	A/C	480	3	64	--	1.00	53,209	480	3	16.2	--	1.00	13,468	Replace existing equipment with new
RTU-2	A/C	480	3	48	--	1.00	39,906	480	3	9.8	--	1.00	8,148	Replace existing equipment with new
RTU-3	A/C	480	3	55	--	1.00	45,726	480	3	16.2	--	1.00	13,468	Replace existing equipment with new
RTU-4	A/C	480	3	61	--	1.00	50,714	480	3	12.7	--	1.00	10,559	Replace existing equipment with new
RTU-5	A/C	480	3	48	--	1.00	39,906	480	3	17.6	--	1.00	14,632	Replace existing equipment with new
RTU-6	A/C	480	3	37	--	1.00	30,761	480	3	17.6	--	1.00	14,632	Replace existing equipment with new
RTU-7	A/C	480	3	48	--	1.00	39,906	480	3	9.8	--	1.00	8,148	Replace existing equipment with new
RTU-8	A/C	480	3	41	--	1.00	34,087	480	3	22.7	--	1.00	18,872	Replace existing equipment with new
RTU-9	A/C	480	3	14.8	--	1.00	12,304	480	3	15	--	1.00	12,471	Replace existing equipment with new
RTU-5 Energy Rec. Unit	A/C	480	3	12	--	1.00	9,977	480	3	0	--	1.00	0	Demolish existing equipment and circuit
RTU-6 Energy Rec. Unit	A/C	480	3	16	--	1.00	13,302	480	3	0	--	1.00	0	Demolish existing equipment and circuit
RTU-8 Energy Rec. Unit	A/C	480	3	12	--	1.00	9,977	480	3	0	--	1.00	0	Demolish existing equipment and circuit

Note: Only the equipment affected by the project scope is shown.
 all other existing electrical loads connected to this service will remain the same as before.

Total VA: 379,776
Amps @ 480V: 456.8

Total VA: 114,398
Amps @ 480V: 137.6

Change in Load: **-265,378 VA (Reduction)**
 Change in Current: **-319 Amps @ 480V (Reduction)**

Main Building Chiller Yard Utility Transformer

Equipment	Load Type	EXISTING EQUIPMENT					NEW EQUIPMENT					Project Scope		
		Volts	Phase	MCA	FLA	Load Mult.	VA	Volts	Phase	MCA	FLA		Load Mult.	VA
CU-306	A/C	480	3	10	--	1.00	8,314	480	3	8.8	--	1.00	7,316	Replace existing equipment with new
AHU-306	A/C	480	3	24	--	1.00	19,953	480	3	19	--	1.00	15,796	Replace existing equipment with new
Chiller-3	A/C	480	3	0	--	1.00	0	480	3	402	--	1.00	334,217	New equipment
Chiller-4	A/C	480	3	0	--	1.00	0	480	3	402	--	1.00	334,217	New equipment
PCHWP-3	MOTOR	480	3	--	0	1.00	0	480	3	--	7.6	1.00	6,319	New equipment
PCHWP-4	MOTOR	480	3	--	0	1.00	0	480	3	--	7.6	1.00	6,319	New equipment
SCHWP-3	MOTOR 125%	480	3	--	0	1.25	0	480	3	--	21	1.25	21,824	New equipment

Note: Only the equipment affected by the project scope is shown.
 all other existing electrical loads connected to this service will remain the same as before.

Total VA: 28,267
Amps @ 480V: 34.0

Total VA: 726,006
Amps @ 480V: 873.3

Change in Load: **697,739 VA (Increase)**
 Change in Current: **839 Amps @ 480V (Increase)**

Performing Arts Center Utility Transformer

Equipment	Load Type	EXISTING EQUIPMENT					NEW EQUIPMENT					Project Scope		
		Volts	Phase	MCA	FLA	Load Mult.	VA	Volts	Phase	MCA	FLA		Load Mult.	VA
RTU-1	A/C	480	3	21.5	--	1.00	17,875	480	3	3.3	--	1.00	2,744	Replace existing equipment with new
RTU-2	A/C	480	3	41	--	1.00	34,087	480	3	17.6	--	1.00	14,632	Replace existing equipment with new
RTU-3	A/C	480	3	24.9	--	1.00	20,701	480	3	5.8	--	1.00	4,822	Replace existing equipment with new
RTU-4	A/C	480	3	24.9	--	1.00	20,701	480	3	13.3	--	1.00	11,057	Replace existing equipment with new
RTU-5	A/C	480	3	87	--	1.00	72,330	480	3	28.7	--	1.00	23,861	Replace existing equipment with new
RTU-6	A/C	480	3	69	--	1.00	57,366	480	3	22.4	--	1.00	18,623	Replace existing equipment with new
RTU-7	A/C	480	3	73	--	1.00	60,691	480	3	16.2	--	1.00	13,468	Replace existing equipment with new
RTU-8	A/C	480	3	36	--	1.00	29,930	480	3	0	--	1.00	0	Demolish existing equipment and circuit
RTU-9	A/C	480	3	36	--	1.00	29,930	480	3	0	--	1.00	0	Demolish existing equipment and circuit
SCHWP-4	MOTOR 125%	480	3	--	0	1.25	0	480	3	--	21	1.25	21,824	New equipment

Note: Only the equipment affected by the project scope is shown.
 all other existing electrical loads connected to this service will remain the same as before.

Total VA: 343,611
Amps @ 480V: 413.3

Total VA: 111,031
Amps @ 480V: 133.6

Change in Load: **-232,580 VA (Reduction)**
 Change in Current: **-280 Amps @ 480V (Reduction)**

Science Building Utility Transformer

Equipment	Load Type	EXISTING EQUIPMENT					NEW EQUIPMENT					Project Scope		
		Volts	Phase	MCA	FLA	Load Mult.	VA	Volts	Phase	MCA	FLA		Load Mult.	VA
Bookstore CU-B1	A/C	480	3	8.2	--	1.00	6,817	480	3	8.8	--	1.00	7,316	Replace existing equipment with new
Bookstore CU-B2	A/C	480	3	19.5	--	1.00	16,212	480	3	19	--	1.00	15,796	Replace existing equipment with new
Bookstore AHU-B1	A/C	208	1	32	--	1.00	6,656	208	1	37	--	1.00	7,696	Replace existing equipment with new
Bookstore AHU-B2	A/C	208	1	32	--	1.00	6,656	208	1	37	--	1.00	7,696	Replace existing equipment with new
Honors Lounge CU-H1	A/C	480	3	10.8	--	1.00	8,979	480	3	11	--	1.00	9,145	Replace existing equipment with new
Honors Lounge AHU-H1	A/C	480	3	24	--	1.00	19,953	480	3	19	--	1.00	15,796	Replace existing equipment with new
Fac. Offices CU-F1	A/C	480	3	9.7	--	1.00	8,064	480	3	11	--	1.00	9,145	Replace existing equipment with new
Fac. Offices CU-F2	A/C	480	3	8.2	--	1.00	6,817	480	3	8.8	--	1.00	7,316	Replace existing equipment with new
Fac. Offices AHU-F1	A/C	480	3	24	--	1.00	19,953	480	3	19	--	1.00	15,796	Replace existing equipment with new
Fac. Offices AHU-F2	A/C	480	3	16	--	1.00	13,302	480	3	19	--	1.00	15,796	Replace existing equipment with new
Commons CU-C1	A/C	208	3	21.4	--	1.00	7,710	208	3	24.8	--	1.00	8,935	Replace existing equipment with new
Commons CU-C2	A/C	208	3	18.2	--	1.00	3,786	208	3	16.2	--	1.00	5,836	Replace existing equipment with new
Commons CU-C3	A/C	208	3	21.4	--	1.00	7,710	208	3	24.8	--	1.00	8,935	Replace existing equipment with new
Commons CU-C4	A/C	208	3	21.4	--	1.00	7,710	208	3	24.8	--	1.00	8,935	Replace existing equipment with new
Commons AHU-C1	A/C	208	3	40	--	1.00	14,411	208	3	36	--	1.00	12,970	Replace existing equipment with new
Commons AHU-C2	A/C	208	3	32	--	1.00	11,529	208	3	26	--	1.00	9,367	Replace existing equipment with new
Commons AHU-C3	A/C	208	3	32	--	1.00	11,529	208	3	36	--	1.00	12,970	Replace existing equipment with new
Commons AHU-C4	A/C	208	3	32	--	1.00	11,529	208	3	36	--	1.00	12,970	Replace existing equipment with new
Science OAHU-1	A/C	480	3	8	--	1.00	6,651	480	3	5.1	--	1.00	4,240	Replace existing equipment with new
Science OAHU-2	A/C	480	3	8	--	1.00	6,651	480	3	5.1	--	1.00	4,240	Replace existing equipment with new
Science AHU-3	A/C	208	1	32	--	1.00	6,656	208	1	6.8	--	1.00	1,414	Replace existing equipment with new
Science AHU-4	A/C	208	1	32	--	1.00	6,656	208	1	5	--	1.00	1,040	Replace existing equipment with new
Science AHU-5	A/C	208	1	32	--	1.00	6,656	208	1	6.8	--	1.00	1,414	Replace existing equipment with new
Science AHU-6	A/C	208	1	24	--	1.00	4,992	208	1	5	--	1.00	1,040	Replace existing equipment with new
Science AHU-7	A/C	208	1	32	--	1.00	6,656	208	1	8.5	--	1.00	1,768	Replace existing equipment with new
Science AHU-8	A/C	208	1	24	--	1.00	4,992	208	1	5	--	1.00	1,040	Replace existing equipment with new
Science AHU-9	A/C	208	1	16	--	1.00	3,328	208	1	8.5	--	1.00	1,768	Replace existing equipment with new
Science AHU-10	A/C	208	1	0	--	1.00	0	208	1	6.8	--	1.00	1,414	New equipment
Science AHU-11	A/C	208	1	32	--	1.00	6,656	208	1	8.5	--	1.00	1,768	Replace existing equipment with new
Science AHU-12	A/C	208	1	16	--	1.00	3,328	208	1	5	--	1.00	1,040	Replace existing equipment with new
Science AHU-13	A/C	208	1	32	--	1.00	6,656	208	1	5	--	1.00	1,040	Replace existing equipment with new
Science AHU-14	A/C	208	1	16	--	1.00	3,328	208	1	5	--	1.00	1,040	Replace existing equipment with new
Science CU-1	A/C	480	3	84	--	1.00	69,836	480	3	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-2	A/C	480	3	84	--	1.00	69,836	480	3	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-3	A/C	208	1	27	--	1.00	5,616	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-4	A/C	208	1	15.5	--	1.00	3,224	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-5	A/C	208	1	27	--	1.00	5,616	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-6	A/C	208	1	14.3	--	1.00	2,974	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-7	A/C	208	1	27	--	1.00	5,616	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-8	A/C	208	1	14.3	--	1.00	2,974	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-9	A/C	208	1	37.4	--	1.00	7,779	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-11	A/C	208	1	27	--	1.00	5,616	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-12	A/C	208	1	18.4	--	1.00	3,827	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-13	A/C	208	1	15.5	--	1.00	3,224	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Science CU-14	A/C	208	1	18.4	--	1.00	3,827	208	1	0	--	1.00	0	Demolish existing equipment and circuit
Sci AHU-1 Elec. Duct Ht	HEAT	480	3	--	45.1	0.00	0	480	3	--	0	0.00	0	Demolish existing equipment and circuit
Sci AHU-2 Elec. Duct Ht	HEAT	480	3	--	12.0	0.00	0	480	3	--	0	0.00	0	Demolish existing equipment and circuit
Sci AHU-9 Elec. Duct Ht	HEAT	480	3	--	12.0	0.00	0	480	3	--	0	0.00	0	Demolish existing equipment and circuit
Sci AHU-12 Elec. Duct Ht	HEAT	480	3	--	7.2	0.00	0	480	3	--	0	0.00	0	Demolish existing equipment and circuit
Sci AHU-14 Elec. Duct Ht	HEAT	480	3	--	7.2	0.00	0	480	3	--	0	0.00	0	Demolish existing equipment and circuit
SCHWP-5	MOTOR 125%	480	3	--	0	1.25	0	480	3	--	11	1.25	11,432	New equipment
HWP-1	MOTOR	480	3	--	0	1.00	0	480	3	--	3	1.00	2,494	New equipment
HWP-2	MOTOR	480	3	--	0	1.00	0	480	3	--	3	1.00	2,494	New equipment
BP-1	MOTOR	208	1	--	0	1.00	0	208	1	--	5.4	1.00	1,123	New equipment
Boiler B-1 Control	EQUIP	120	1	0	--	1.00	0	120	1	12	--	1.00	1,440	New equipment

Note: Only the equipment affected by the project scope is shown.
 all other existing electrical loads connected to this service will remain the same as before.

Total VA: 454,703
Amps @ 480V: 546.9

Total VA: 250,418
Amps @ 480V: 301.2

Change in Load: **-204,285 VA (Reduction)**
 Change in Current: **-246 Amps @ 480V (Reduction)**

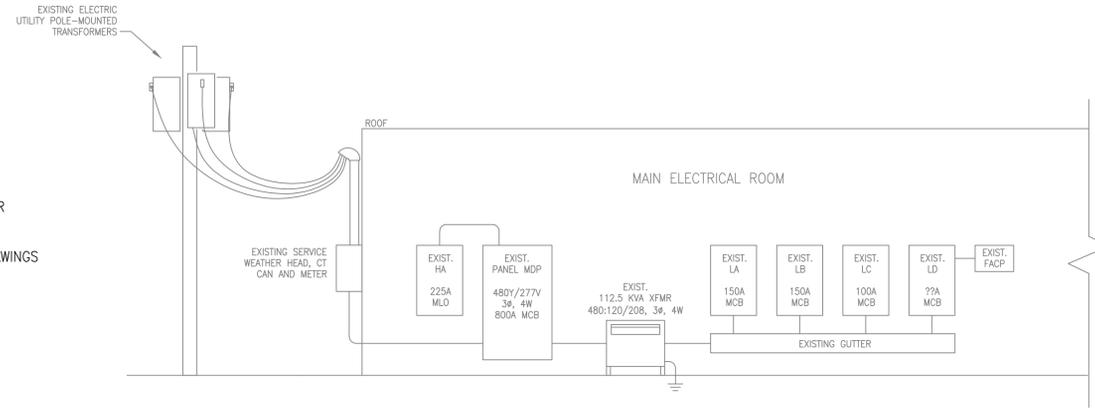
Project Impact on Total Site Electrical Load:

-4,503 Total VA (Reduction)
-5 Amps @ 480V (Reduction)

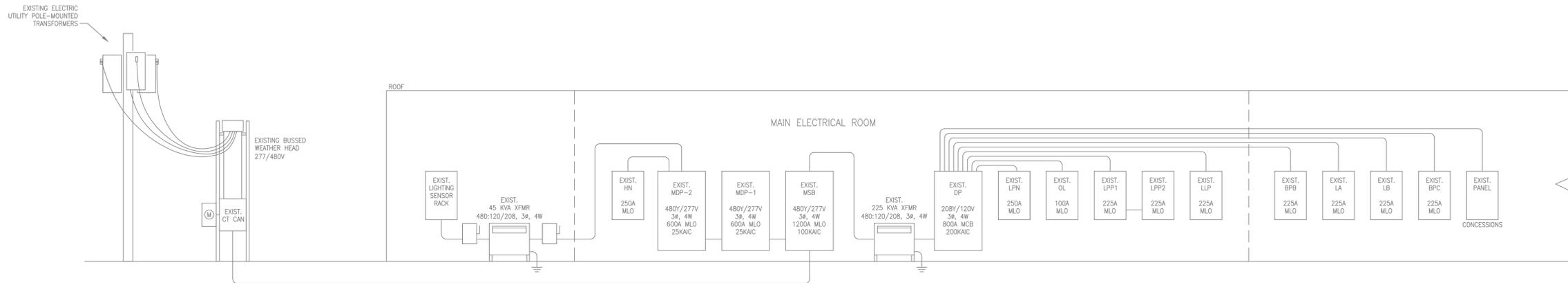
THIS ANALYSIS ONLY INCLUDES EQUIPMENT A

GENERAL NOTES:

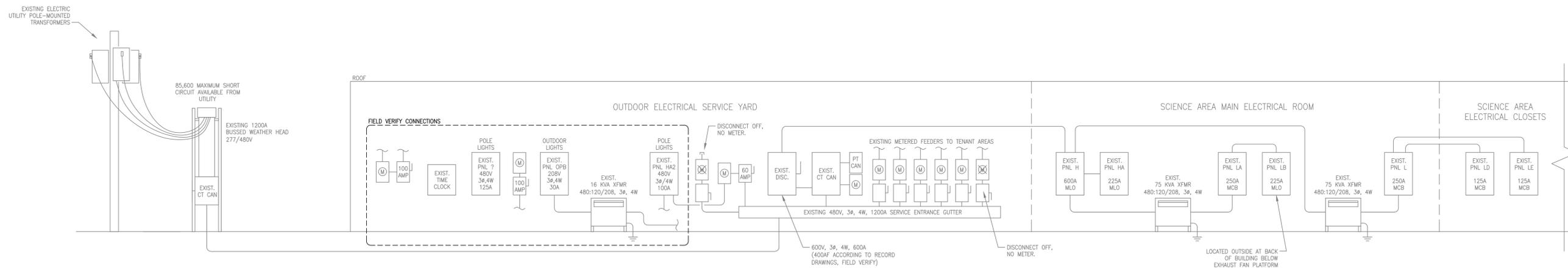
- EXISTING ELECTRICAL DISTRIBUTION DIAGRAMS ON THIS SHEET ARE SHOWN FOR REFERENCE ONLY. NO NEW WORK IS IMPLIED BY THESE DIAGRAMS.
- THESE DIAGRAMS WERE REPRODUCED FROM EXISTING RECORD DOCUMENT DRAWINGS AND BRIEF VISUAL OBSERVATIONS. FIELD VERIFY ACTUAL CONDITIONS BEFORE WORKING IN THESE AREAS.



A MAIN BUILDING SOUTH AREA ELECTRICAL DISTRIBUTION
SCALE: NTS



B PERFORMING ARTS BUILDING ELECTRICAL DISTRIBUTION
SCALE: NTS



C SCIENCE BUILDING ELECTRICAL DISTRIBUTION
SCALE: NTS

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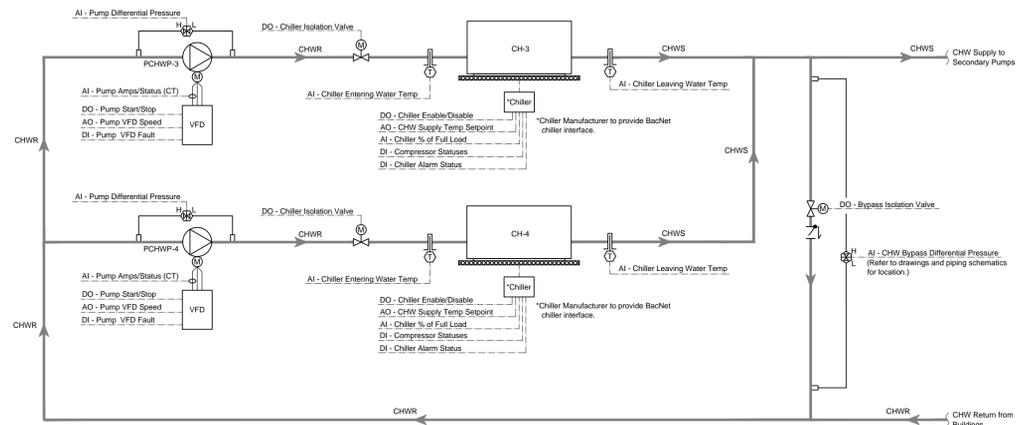
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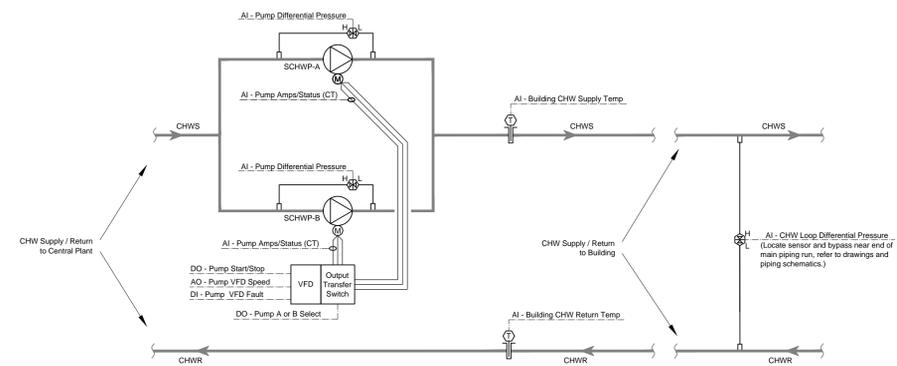
APPROXIMATE SCALE:
SEE DRAWING

SHEET INFO.

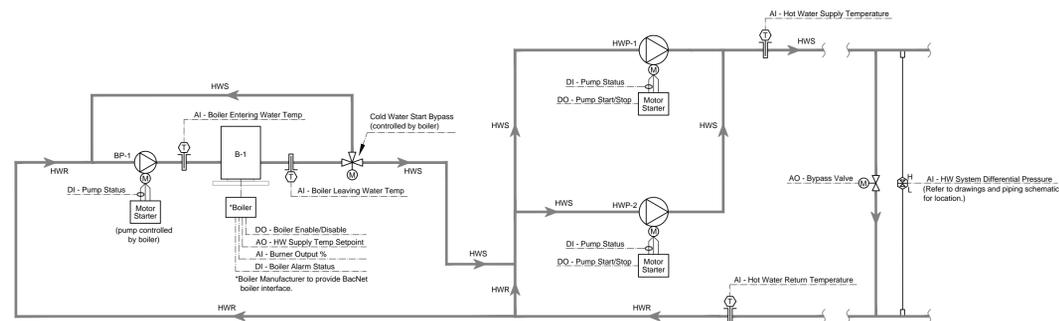
SB
8.6



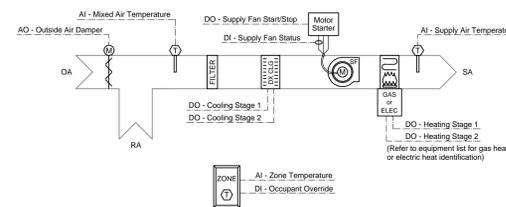
01 AIR-COOLED CHILLER SYSTEM
Scale: None



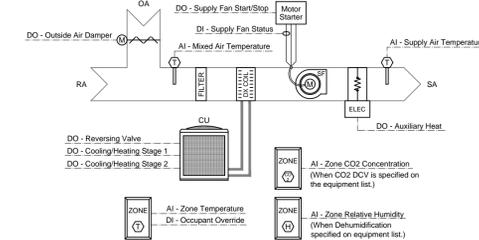
02 BUILDING CHW LOOP PUMPS
Scale: None



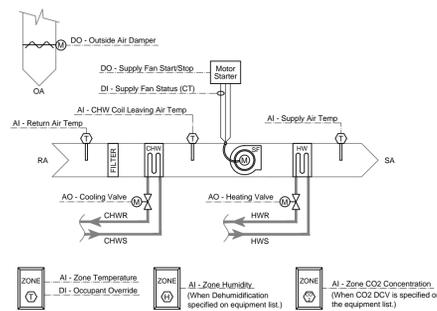
03 HOT WATER BOILER SYSTEM
Scale: None



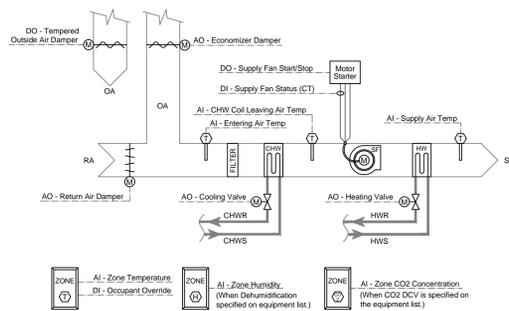
04 DX PACKAGED ROOFTOP
Scale: None



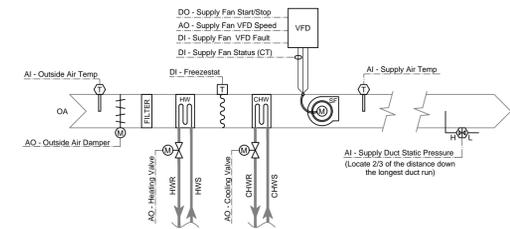
05 DX HEAT PUMP SPLIT SYSTEM
Scale: None



06 CV CHW/HW FAN COIL UNIT
Scale: None



07 CV CHW/HW FAN COIL UNIT w/ ECONOMIZER
Scale: None

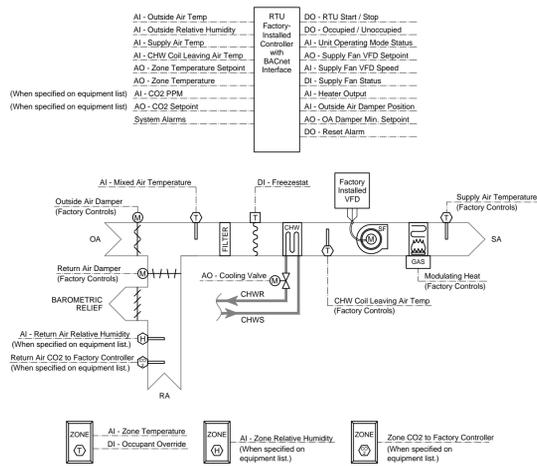


08 CV CHW/HW OUTSIDE AIR HANDLING UNIT
Scale: None

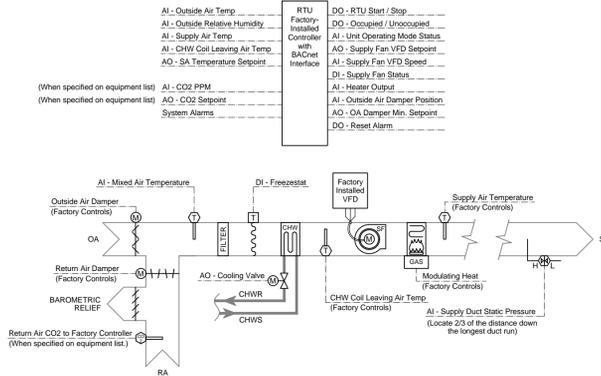
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APPROXIMATE SCALE:
SEE DRAWING

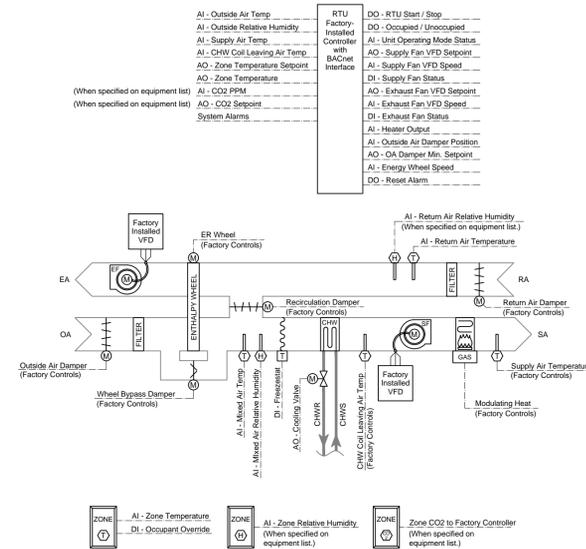
SHEET INFO.
SB
9.1



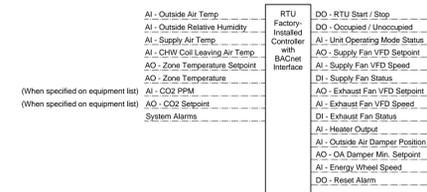
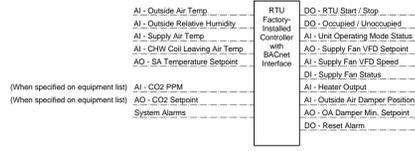
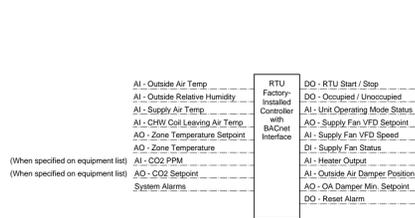
09 CHW/GAS HEAT PACKAGED SINGLE ZONE ROOFTOP UNIT
Scale: None



10 CHW/GAS HEAT PACKAGED MZ VAV ROOFTOP UNIT
Scale: None



11 CHW/GAS HEAT PACKAGED RTU W/ ENERGY RECOVERY
Scale: None



HOUSTON COMMUNITY COLLEGE
HVAC SYSTEM REPLACEMENT AND
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HCC SPRING BRANCH CAMPUS
CONTROL SCHEMATICS



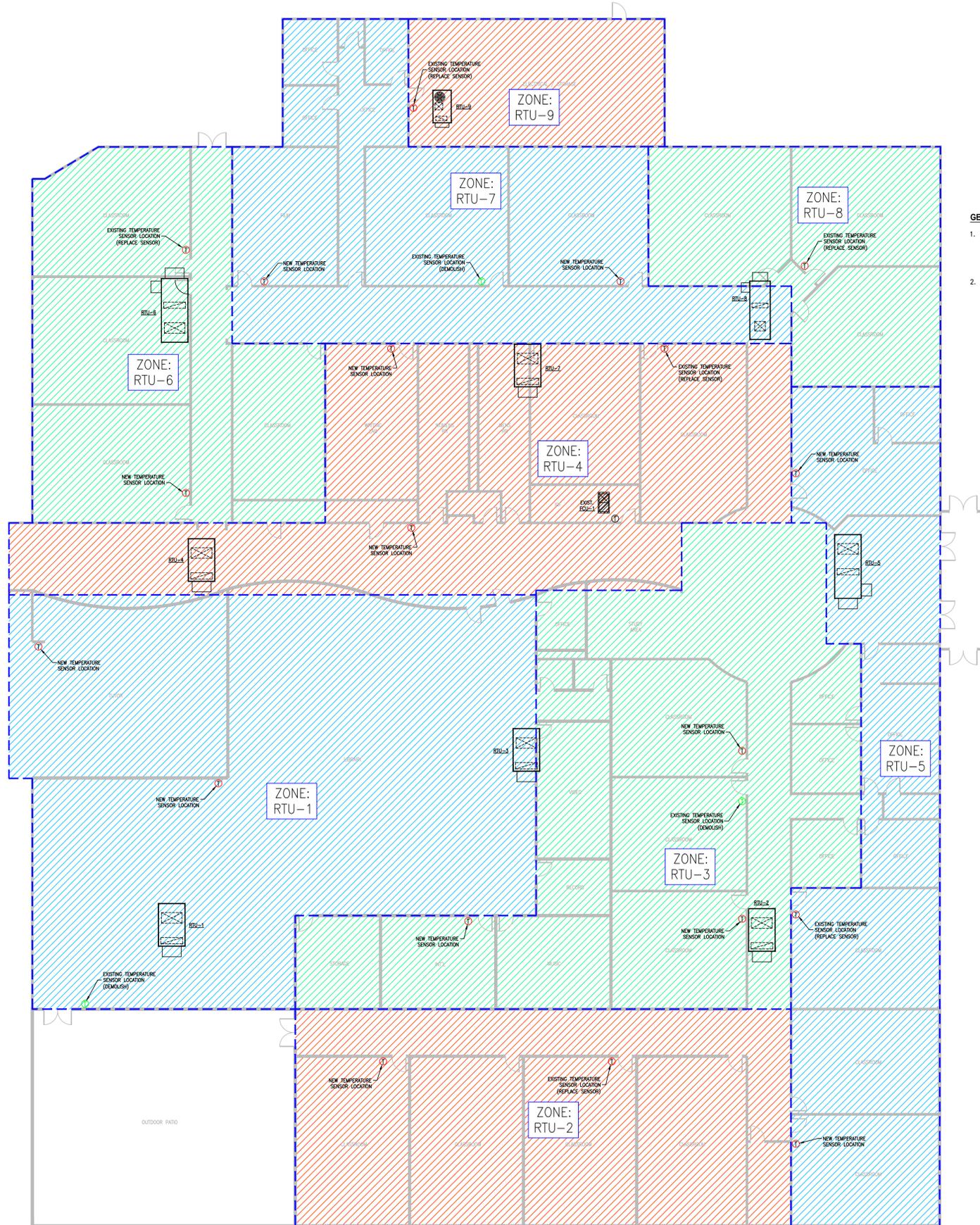
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MARCH 20, 2018

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CD	BC/CC	3-2018

APPROXIMATE SCALE:
SEE DRAWING

SHEET INFO.

SB
9.2



GENERAL NOTES:

1. SINGLE-ZONE ROOFTOP UNITS SERVE MULTIPLE ROOMS. RECORD DRAWINGS INDICATE THAT THERE IS ONLY ONE TEMPERATURE SENSOR PER ZONE. REMOVE, REPLACE / RELOCATE, OR ADD NEW TEMPERATURE SENSORS AS INDICATED ON THE DRAWING. FOR ZONES WITH MULTIPLE TEMPERATURE SENSORS, AVERAGE THE SENSOR TEMPERATURES FOR RTU CONTROL. PROVIDE A WEIGHTED AVERAGE ALGORITHM TO ALLOW ADJUSTMENT OF SENSOR PRIORITY.
2. TEMPERATURE SENSORS PER RTU:
 - 2.1. RTU-1: 2 SENSORS
 - 2.2. RTU-2: 2 SENSORS
 - 2.3. RTU-3: 3 SENSORS
 - 2.4. RTU-4: 3 SENSORS
 - 2.5. RTU-5: 3 SENSORS
 - 2.6. RTU-6: 2 SENSORS
 - 2.7. RTU-7: 2 SENSORS
 - 2.8. RTU-8: 1 SENSOR
 - 2.9. RTU-9: 1 SENSOR

MAIN BUILDING SOUTH AREA
TEMPERATURE SENSOR PLAN
 SCALE: NTS



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HOUSTON COMMUNITY COLLEGE

CONSTRUCTION PROJECT
DIVISION 1 SPECIFICATIONS

Construction Project Division 1 Specifications

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Section 010000 Miscellaneous Requirements

1. Summary

These Miscellaneous Requirements are issued as supplements to the Uniform General Conditions for Construction Contracts (UGCs) and any Special Conditions that form a part of the Contract for Construction between the Owner and the General Contractor (or Construction Manager, or Design-Build Contractor). The term “Contractor”, as used herein, is meant to refer to a General Contractor, or a Design-Build Contractor, or a Construction Manager. Should any provision of these Division 1 Specifications conflict with the Contract, the UGCs or the Special Conditions, the latter shall govern.

2. Removal of Debris (see Section 015240)

The Contractor shall remove and legally dispose of all demolition debris and all unused construction materials off-site. Unless specifically noted otherwise, all excess earth and rock excavation materials shall be removed and disposed of offsite. Such demolition debris, unused construction materials and excess excavated earth and rock shall be handled, transported and legally disposed of at the Contractor’s expense.

3. Drawings and Specifications (also see UGC Article 6)

- 3.1 The Drawings and Specifications are intended to describe and provide for a finished and complete piece of Work that meets the requirements of all the applicable governing laws, ordinances, rules, and regulations of the locality. It is mandatory that all work must meet these requirements.
 - 3.1.1 No extra compensation will be allowed for the Contractor’s rework due to its failure to conform to any such requirements unless the original installation was directed by written order issued by the A/E or the Owner.
 - 3.1.2 Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, shall be like effect as if shown or mentioned in both. If the Contractor believes that some information is missing then that information should be requested of the Owner or A/E in writing. Should the Drawings disagree among themselves, or with the Specifications, the better quality and/or greater quantity of work and/or materials shall be included with the Contractor’s project proposed pricing. In the case where the Specifications do not fully agree with the material schedules, the material schedules shall govern.
 - 3.1.3 The general character of the detail work is shown on Drawings, but minor modifications may be made by A/E in full size Drawings, shop drawings, or models. Contractor shall not attempt to execute any part of the Work requiring such drawings until he has received approved copies of same.
 - 3.1.4 Where the word “similar or typical” occurs on Drawings, they shall be understood in their general sense and not as meaning identical. All details shall be worked out in relation to their location and their connection to other parts of the Work. If the Contractor finds this to be beyond its capability, interpretations and directions should be requested of the A/E.

- 3.1.5 Small scale and large scale drawings are intended to be mutually compatible and explanatory. In case of variances, the following order of preferences is established to define the intent of the work.
- 3.1.6 Explanatory notes on Drawings;
 - 3.1.6.1 Recorded dimensions;
 - 3.1.6.2 Large scales details;
 - 3.1.6.3 Small scale details;
 - 3.1.6.4 Scaled measurements
- 3.2 The “Scope of Work” description placed in the front portion of each section of the Specifications is intended to designate the scope and locations of all items of Work included in that section, either generally or specifically. It is not, however, intended to limit the scope of the work where plans, schedules, or notes indicate a larger scope.

4. Interpretations of Documents (see UGC 3.2.2)

Whether bidding or building the Project, if there is any doubt as to the meaning of any part of the Construction Documents, the Contractor shall submit a written request to the Owner seeking an interpretation. If the question has to do with technical requirements, the Contractor should provide the A/E with a copy of the request as the Owner will typically ask the A/E for the technical interpretation. If such a request is made during bidding, it should be made at least ten days before bid opening. Interpretations shall then be issued by written response only and during bidding only by issuing an “Addendum” to the bid documents. When in doubt during construction, the Contractor should proceed only with a written interpretation by the Owner, or in its absence, proceed only after notifying the Owner in writing about the interpretation that is being used. Failure of the Contractor to request an interpretation shall not relieve the Contractor from responsibility to complete the Work to the Owner’s satisfaction. If the Contractor does not agree that an interpretation received is satisfactory and without cost or time implications, the Owner should be notified immediately in writing of that fact.

5. Materials and Work (see UGC 8.1)

- 5.1 Unless otherwise specified, all materials shall be new and free of asbestos, noxious or toxic fumes, urea-formaldehyde and lead (lead in potable water system) and both workmanship and materials shall be of the best quality. If requested by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of his materials and workmanship. Any work installed that does not meet the requirements of the Construction Documents shall be removed and replaced with conforming Work. **(UGC 3.3.5)**
- 5.2 The Contractor and subcontractors shall be responsible for the proper care and protection of all materials and equipment furnished both during and after installation. Such materials and equipment may be staged inside the construction fence, or areas designated by the Owner, but only consistent with a Staging Plan acceptable to the Owner. All materials affected by the weather shall be covered and protected to keep them free from damage while being transported to the site. When stored on site, they shall be placed in watertight storage shed/compartments or otherwise protected from the weather. Any material damaged by water or other causes shall be removed from the site and replaced with new material.

- 5.3 When necessary to avoid delay or to protect work or equipment, provide suitable watertight coverings over windows, doors, skylights, hatchways, and such other openings admitting rain, including the Owner's materials within the building area when working on a combined effort.
- 5.4 The Contractor and subcontractors shall protect and be responsible for their Work and any damage to their Work from the date of delivery or installation until Substantial Completion when the Owner will take possession and assume responsibility. They shall make good, without cost to the Owner, any damage or loss that may occur to their Work during this period.
- 5.5 When any room in one of Owner's buildings has been provided for use as a shop, storeroom, etc., the Contractor shall restore the room to equal, or better, condition by providing repairs, patching, cleaning, and painting at its sole expense.
- 5.6 During the execution of the Work the open ends of all piping, conduit and mechanical ducts and openings in equipment shall be sealed in such a way as to prevent the entrance of foreign matter. All heating, ventilating, plumbing and electrical equipment shall be covered and protected. All plumbing fixtures shall be protected and boarded over to prevent their usage by any person. All drains shall be covered until they are placed into service.
- 5.7 The Contractor shall provide all scaffolding and ladders necessary for performing the Work. All scaffolding shall be so constructed, anchored and braced to comply in all respects with OSHA guidelines to afford safety and protection to both workers and their Work, the inspectors and the Work of other contractors.
- 5.8 Except as otherwise specified, the Contractor shall furnish at its own cost and risk all tools, apparatus, hoists or cranes, derricks, etc. needed for the Work.
- 5.9 Temporary equipment shall be installed in such a manner that finished Work will not be damaged by smoke, falling mortar, concrete or other causes. The location and arrangement of temporary equipment shall be subject to the approval of the Owner.
- 5.10 All temporary shoring required for the installation of Work shall be provided by the Contractor who will take all responsibility.
- 5.11 The Contractor and its subcontractors shall provide on the premises, at locations approved by the Owner, suitable watertight storage sheds for the storage of tools and equipment. Such sheds shall be at least 6 inches off the ground on heavy joists. The Contractor shall maintain such sheds in good condition and remove them when directed by the Owner.
- 5.12 **Also see Sections 013100, 013523 and 015000 for related requirements.**

6. Intent of the Documents (see UGC 11.1.2)

- 6.1 It is the intention of the Construction Documents to describe and require the complete installation of the various systems and the Contractor is to furnish all items necessary to make the various systems complete, although each and every item required may not be specifically mentioned in the Construction Documents.
- 6.2 It is not the intent of the Construction Documents to limit materials, equipment or fixtures to the product of any particular manufacturer. Where definite materials, equipment or fixtures have been specified by name, manufacturer or catalog number, it has been done to set a quality standard, applicability, physical conformity and other characteristics. It is not the Owner's intent to discriminate against or prevent any dealer,

jobber or manufacturer from furnishing materials, equipment or fixtures that meet or exceed the characteristics of the specified items. However, substitutions of materials shall not be made without a specific written request by the Contractor having been approved by the Owner in writing. **(See paragraph 18 of this Section).**

- 6.3 Any discrepancies in the Specifications must be reported to the Owner for clarification, correction and interpretation from the A/E before the work is executed.

7. Existing Underground Utilities

If existing underground lines occur in the site where the work is to be accomplished, such lines will be located and staked by the Contractor for the benefit of the Owner and the Contractor prior to start of the work. Contractor shall maintain these markings throughout the duration of the construction project. Prior to any excavation, the Contractor shall review with the Owner the locations of all underground utilities and receive the Owner's written permission to proceed.

8. Pumping, Shoring, Etc.

- 8.1. Pumping: When necessary to avoid delay or to protect the Work or the premises, provide suitable pumping equipment and keep excavations, pits and other areas involved free of water that may leak, seep, or rain in. Do not allow water to flow into excavations. Do not allow water to flow off site in quantities or at rates that exceed the quantities or rates that existed prior to the start of construction
- 8.2. Shoring: The Contractor shall provide and be responsible for all temporary shoring required for execution and protection of the work. After all construction is secure and stable, and when authorized by the Structural Engineer or Civil Engineer, the Contractor shall remove all shoring.

9. Hazardous Materials

- 9.1 If during the course of his work, the Contractor observes the existence of asbestos, or asbestos bearing materials, the Contractor shall immediately terminate further operations and notify Owner of the condition. The Owner will, after consultations, determine a further course of action. **(UGC 7.5)**
- 9.2 Contractor shall furnish Manufacturer's Safety Data Sheets (MSDS) on all materials and products installed by the Contractor and subcontractors on this project to indicate no asbestos-containing materials have been installed.

10. Substantial Completion (see UGC 1.26 and 12.1.1)

"Substantial Completion" constitutes a stage of project completion that will allow Owner beneficial occupancy for the purpose of safely installing furnishings, maintaining normal security over them, and use of the facility for its intended purpose. Substantial Completion shall not be considered as Final Completion as there may be minor correction items outstanding and there are additional completion items required to achieve Final Completion. Upon acceptance that an entire Project, or a portion of a Project, as Substantially Complete the Owner will take possession from the Contractor and assume operations, maintenance and insurance liability responsibilities for that portion of the Project.

11. Coordination (see UGC 3.3.6.2)

The Contractor and subcontractors on the project shall coordinate their work with each other, advising on work schedules, equipment locations, etc. It shall be the responsibility of Contractor to assure this coordination and to schedule and supervise the work of all subcontractors performing work under this contract. Contractor shall be responsible for the proper fit of the various parts of the Work and for the coordination of operations of all trades, the subcontractors and the material suppliers engaged upon or in connection with the Work as well as those of his own employees. Contractor shall accommodate and coordinate with other independent contractors and Owner personnel on site during construction to allow them necessary access to perform their work.

12. Observation of Work (see UGC 8.5.1)

The Owner's representatives, as well as the A/E, shall have access to the work at all times wherever it is in preparation or progress. The Contractor shall provide proper and safe facilities for such access and for observation.

13. Cooperation with Building Officials

Contractor, Subcontractor and all related suppliers, vendors and employees will cooperate with applicable utility and government officials and inspectors at all times. If such official or inspector deems special inspections necessary, provide assistance and facilities that will expedite such inspection or observation.

14. Notification

The Contractor shall notify the Owner at least 48 hours in advance (Monday thru Friday) of concrete pours, roofing installation, start of each new section of classification of work, concealment of plumbing, heating, air conditioning, or electrical work.

15. Ongoing Operations/Construction Personnel

- 15.1 The facilities of the campus will only be available during the scheduled construction time-period as specified by the Owner, and if not specified, then from 8:00 a.m. until 6:00 p.m., Monday through Friday. Work during other times, including weekends, shall only be allowed with prior request and written authorization from the Owner. In addition, the Contractor shall accommodate and coordinate its construction work force and activities to allow the Owner's forces and Owner's separate contractors (i.e. telephone, data, IT, computer, and furniture installation) to enter the jobsite to perform their work.
- 15.2 This project is surrounded by continuously functioning campus facilities, including student housing, academic and research efforts. The Contractor shall make every effort to avoid disruptions to ongoing campus activities and to maintain a safe environment for students, faculty, and staff in the areas adjacent to the Project.
- 15.3 Adjacent facilities will continue to be used for their intended purpose while this Project is underway and the following requirements shall apply:
 - 15.3.1 Contractor, Subcontractors, Owner and A/E shall meet regularly to coordinate and schedule any construction activities affecting ongoing operations including, but not limited to: testing days, student/staff holidays, special events, etc.

- 15.3.2 The Owner may have other contractors, or its own employees, performing work on the campus and in the vicinity of the Contractor's Work. The Contractor shall not commit any act, or allow any act, that will interfere with the performance of work by these other work forces. The Contractor shall cooperate with all performing parties so that the Owner can realize the best possible outcome of all projects involved and requiring coordination.
 - 15.3.3 Student, faculty and general public safety is of utmost importance. Fire and life safety exiting from buildings must be maintained at all times and closely monitored. Review and receive approval for changes in existing conditions with the local fire marshal for each phase of construction. Provide temporary signage as required by the fire marshal and/or the Owner.
 - 15.3.4 Firearms, drugs, intoxicating beverages, X-rated materials, etc. are banned from the Owner's property.
 - 15.3.5 Smoking is not allowed inside any campus building or anywhere on the campus except in designated areas. Smoking will not be allowed in any enclosed area of the building(s) of this project. Enclosed, as used here, refers to erection of exterior walls and overhead structure for any portion of the project; it does not mean to limit the term to only "dried in" situations. Use of or possession of illegal drugs or alcohol on the project site or anywhere on campus is prohibited.
 - 15.3.6 Construction personnel are not to communicate or interact with students and faculty on site. Only the Project Superintendent, Project Manager and/or their appointed representatives may communicate with the faculty and administrative staff on an as needed basis.
- 15.4 Campus utilities must not be interrupted except when scheduled and approved in advance through Owner-designated campus channels. The Contractor or his personnel shall NOT open or close any valves of the central campus utility systems. Valve operation is to be done by University utilities personnel only. The Contractor shall not activate or deactivate any campus utility system or component of any system, without express written direction from the Owner.
- 15.5 Chemical cleaning of new utility additions shall be done by circulating a good non-phosphate cleaner through as much of the new system as possible. Prior to dumping the cleaning agent, the Contractor shall notify the local City/County industrial water treatment department to sample the effluent. If the City/County officials approve of dumping to drain, then the Contractor will dump into the sanitary sewer. The Contractor shall refill the new system with water and again have the City/County water treatment officials sample the effluent prior to dumping. If at any stage the City/County water treatment officials refuse to accept the effluent, then the Contractor must make special arrangements for legal disposal at its expense and provide the Owner with copies of the resulting shipping and disposal manifests.

16. Field Measurements (see 014518 – Field Engineering)

- 16.1 The Contractor will employ an experienced, competent staff to establish or survey the building lines, elevations, and field dimensions. Each subcontractor shall verify all existing grades, lines, levels and dimensions affected by their work.
- 16.2 Before ordering any materials or doing any work, each subcontractor shall verify all measurements and shall be responsible for their correctness. Any difference between the actual dimensions and conditions on the site and those indicated on the drawings shall be submitted to the Owner for instructions and consideration before proceeding with the work.

17. Substitutions (see UGC 8.3.5 and 8.3.6)

The Contractor may submit and Owner and A/E will consider substitutions that have not been submitted and approved prior to receipt of proposals. Contractor shall submit a written substitution request on an Owner approved form and the substitution shall be fully identified for product or method being replaced by substitution, including related specification section and drawing number(s) and fully documented to show compliance with the requirements of the Construction Documents. Include product data/drawings, description of methods, samples where applicable and Contractor's detailed comparison of significant qualities between the specified item and the proposed substitution. The Contractor shall include a statement of effect on construction time, coordination and other affected work, cost information or proposal and a written guarantee indicating the proposed substitution will result in overall work equal to or better than work originally indicated. Contractor shall allow sufficient time for review and approval of such proposed substitutions.

Section 012000 Project Meetings

1. Pre-Construction Conferences (see UGC 3.1.1)

- 1.1 Prior to commencing construction, the Contractor shall schedule a meeting to review all aspects of the Construction Project. The time of the Pre-Construction Conference and the attendees shall be determined through discussions between the Owner, Project Manager and Contractor prior to scheduling.
- 1.2 The following is a tentative agenda for the Pre-Construction Conference:
 - Critical work sequencing;
 - Designation of responsible personnel;
 - Procedures for processing submittals, substitutions, applications for payment, proposal requests, change letters and Contract Close-out procedures;
 - Parking and access to the site;
 - Office, storage areas and temporary facilities;
 - Utility information;
 - Testing procedures;
 - Procedures for maintaining record documents.
- 1.3 Minutes of the Pre-Construction Conference will be kept and distributed to all attendees and to all team members not present at the meeting. All final decisions recorded in the minutes shall become binding on the parties.

2. Pre-Installation Conferences

Conduct a Pre-installation Conference at the site before each construction activity that requires extensive coordination and for those activities where a preinstallation meeting is specifically required by the specification section.

3. Progress Meetings (see UGC 8.5 and 8.6)

- 3.1 The Contractor shall schedule progress meetings at regular intervals to discuss and monitor the construction project. The Contractor shall determine the meeting times and required attendees.
- 3.2 Minutes of the Progress Meeting shall be kept and distributed to all attendees and to all team members not present at the meeting.

4. Close-out Meetings

- 4.1 When the Contractor determines that a Project, including all punch list items, has been substantially completed and an acceptance date established, a formal project close-out meeting will be scheduled and attended by the parties designated by the Owner and A/E.
- 4.2 At the close-out meeting, upon documentation of exceptions and assignment of completion responsibilities, the close-out documents required by the Construction Documents will be released to the Owner.
- 4.3 Minutes of the Project Close-out meeting will be kept by the A/E and any exceptions identified will be recorded. Specific completion dates for the exceptions will be established and tracked by the Owner to ensure expeditious completion. Copies of the minutes will be distributed to all attendees.

Section 013100 Project Administration

1. Subcontracts (see UGC 3.3.6)

- 1.1 Contractor agrees to bind every subcontractor, and every subcontractor agrees to be bound by the terms and conditions of the Owner's contract.
- 1.2 The Contractor is required to submit a list of all first tier subcontractors to the Owner as subcontracts are executed.

2. Flow of Communications (see UGC 3.2, 3.3.1 and 3.3.6)

- 2.1 The Owner's Designated Representative (ODR) is the Owner's primary representative for the Project who will be designated to the Contractor in writing. The ODR is the only party authorized to issue written/or oral instructions directly to the Contractor that involve changes to the contract scope, cost or time of the Work. If any other party directs the Contractor to make changes to the Work that will involve scope, cost or time the Contractor should notify the ODR immediately in writing. (see UGC 1.17)
- 2.2 The Owner will also designate Project Manager. The ODSR will have the authority, delegated by the ODR, to make decisions on behalf of the Owner concerning coordination with the Owner of Work on the site including: traffic controls, site safety, scheduling of utility outages, and all matters within the contract that do not involve changes to the scope, cost and/or time for completion. The Project Manager, will coordinate and conduct quality inspections of the construction work as it is installed or performed, authorize payments (except first and final) and conduct final acceptance

inspections. The Project Manager will be the Contractor's primary point of contact on the site.

- 2.3 The Architect/Engineer (A/E) is responsible to the Owner for the technical aspects of the Design, including the review of Contractor Submittals and for interpretation of the technical requirements of the Construction Documents. The Owner's written instructions to the Contractor on these matters will generally be issued through the A/E.
 - 2.3.1 The A/E may issue clarifications and other information not affecting the contract scope, cost or time by means of an A/E's Supplemental Instructions (ASI), or similar clarification form, that will be sequentially numbered. Both the A/E and Contractor will maintain separate ASI registers. **(See UGC 3.2.2).**
 - 2.3.2 If Contractor believes such a clarification will create a change in the contract scope, cost or time for performance, a written notification of such must be provided to the ODR before performing the Work involved. The Contractor should proceed with such Work only after being directed to do so in writing by the ODR.
- 2.4 Any oral direction to the Contractor by the ODR, ODSR or the A/E should be confirmed in writing prior to the Contractor proceeding with the direction.
- 2.5 All Project correspondence shall include the Project Number and Name in the title or reference.
- 2.6 All correspondence originated by the Contractor should include simultaneous copies to the ODSR and the A/E. Such correspondence that involves changes, or proposed changes, to the scope, cost or time for the Work, or any dispute or potential dispute, should also include copies to the ODR.
- 2.7 All subcontractor correspondence to either the Owner or the A/E shall be routed through the Contractor.
- 2.8 All subcontractor Requests for Information (RFIs) shall be submitted by and under cover of the Contractor, who is to carefully review and ensure the completeness and appropriateness of the question prior to submission. The Contractor should sequentially number each RFI and submit them directly to the A/E, with copies to the ODSR. The Contractor and A/E will maintain separate RFI logs.
- 2.9 The preparation and handling of Pay Applications, Request for Information, Change Proposals, Submittals, etc. are to be processed as discussed in the Pre-Construction Conference meeting.

3. Project Changes (see UGC 9.1, 9.3.3.3, 9.6.2.2 and Article 11)

- 3.1 All changes to the Contract involving scope, cost, or time will be issued on either a written Contingency Expenditure Authorization (CEA) or the standard Houston Community College (HCC) Change Order form. The determination of whether changes in the Work are funded from the Owner's Construction Contingency or by Change Order is at the Owner's sole discretion. Such CEAs or Change Orders are valid only if signed by either the Chancellor of HCC or by the Executive Director for Construction Administration. A single CEA or Change Order may include several different change issues and they will not be required to be related to each other.
- 3.2 Prior to issuing a CEA or Change Order, the Owner must have received from the Contractor a Change Order Proposal that is complete in its description of the changes in scope and its detailed presentation of cost and time implications of the proposed change.

If the Owner and Contractor do not agree on the implications of a proposed change, they will meet and discuss and resolve their differences prior to proceeding with the changes to the Work.

- 3.2.1 The Contractor shall summarize all costs for each change at each level of subcontractor and supplier by preparing a "Cost Analysis", and shall provide each subcontractor's cost summary as backup. Additional support documentation from both the Contractor and its subcontractors is encouraged.
 - 3.2.2 Where the Contractor believes it is entitled to a time extension, it shall so state as part of its response to the Change Proposal, including a justification for such request. Time extensions will be granted only if a Change Order Proposal affects the activities on the Critical Path of the Owner approved Project Schedule (i.e., when the work impacts the "Contract Substantial Completion Date").
 - 3.2.3 If the Owner and Contractor cannot mutually agree upon a fair and reasonable cost and time settlement, the Owner may: 1) Reject the quotation and void the Change Order Proposal, 2) Issue instruction to the Contractor to proceed on a time and material basis for a price to be determined later not to exceed a fixed maximum dollar and time, or 3) Issue a Construction Change Directive.
 - 3.2.4 The Owner may issue Field Orders directly to the Contractor for minor changes to the contract, which can be negotiated in the field. Pricing backup shall be the same as a Change Order Proposal and is to be outlined as noted above. Once the Owner and the Contractor have signed the Field Order, the work is authorized and the Field Order will be included in the next CEA or Change Order.
- 3.3 Any funds remaining in the Owner's Construction Contingency at the completion of the Project belong to the Owner and shall be credited to the Owner by deductive Change Order.

4. Liquidated Damages (see UGC 9.11, 12.1.4 and 25.2)

If assessed, liquidated damages will be withheld from progress payments beginning with the first payment after the Contract substantial completion deadline and until all work of the contract is complete. The amount assessed shall be deducted from the contract price through a written Change Order.

5. Site Use Issues

- 5.1 The Contractor is responsible for the actions of its entire work force, including Subcontractor and Supplier employees, whenever they are on the campus. Harassment of any kind toward any person will not be tolerated. Offending workers will be removed from the project immediately and permanently. Harassment includes any action such as jeering, whistling, calling-out, staring, snickering, making rude or questionable comments, or similar behavior. Any offending worker or employee will be removed.
- 5.2 The Contractor shall provide and submit a program plan for worker orientation, identification and control of access to the site and for managing personnel records, including payroll records. All workers on the project shall participate in this program before beginning work of the project. This plan shall include, as a minimum:
 - 5.2.1 Employee identification badges with a photo of the employee, the employer and employees' name. Badges shall be provided for all employees and produced by a system on site. This identification shall be worn at all times while on the project

site. Lack of an ID badge shall be grounds for removal from the project until the badge is produced.

- 5.2.2 Identification badges for workers, busing of workers from remote parking lots, frequent written and verbal reminders to the work force of appropriate behavior and avoidance of campus facilities and publication of acceptable access and egress routes from the work site are all minimum requirements of the plan.

6. Shop Drawings and Submittals (see UGC 8.3)

- 6.1 Refer to the UGC for requirements not identified in this section.
- 6.2 The Contractor shall assign an identifying number to each submittal following a format to be established at the Pre-Construction Conference. The same number with a numerical or alphabetical suffix will be used to identify re-submittals.
- 6.3 The burden of timeliness to complete the submittal process is on the Contractor. The Contractor shall allow sufficient time within the construction schedule for the A/E and Owner to review and approve all submittals, including time for all re-submittals on any unaccepted/rejected submittal.
- 6.4 Any deviation from the Construction Documents shall be conspicuously noted on the submittal and the transmittal cover sheet. Failure to so note deviations will void any action taken on the submittal.
- 6.5 All manufacturers' data contained within the submittal shall have all inapplicable features crossed out or deleted in a manner that will clearly indicate exactly what is to be furnished.
- 6.6 Equipment of larger sizes than shown, even though of a specified manufacturer, will not be acceptable unless it can be demonstrated that ample space exists for proper installation, operations and maintenance.
- 6.7 The Owner will not be responsible for payment of any item that has not been submitted and approved through the established submittal process. **(UGC 10.5.1.4)**
- 6.8 The exact number of submittal copies required for distribution will be determined at the Pre-Construction Conference. The Contractor shall anticipate providing a minimum of four (4) copies of each submittal in addition to those needed by the Contractor and its subcontractors. Two (2) of the approved copies will be returned to the Contractor and one (1) shall be set aside for subsequent turn over to Owner at Project Closeout.

7. Substitution of Materials, Labor and Equipment (see UGC 8.3.5 and 010000 paragraph 17)

- 7.1 Refer to the UGC for requirements not identified in this section.
- 7.2 The specified products referenced in the Construction Documents establish minimum qualities for which substitutions shall at least equal to be considered acceptable. The burden of proof of equality rests with the Contractor. The Owner retains sole authority for acceptance of substitutions.
- 7.3 All substitutions shall be submitted with ninety (90) days of the Notice to Proceed for Construction and be clearly marked as such on the transmittal cover sheet for the submittal.
- 7.4 The Contractor shall allow a minimum of four (4) weeks for review of each substitution by the A/E and/or Owner in addition to the requirements identified in Section 7.3 above.

- 7.5 When requested by the A/E, the Contractor shall provide a sample of the proposed substitution item. In some cases, samples of both the specified item and the proposed item shall be required for comparison purposes.
- 7.6 Acceptance of materials and equipment will be based on the supplier/manufacturer's published data and will be tentative subject to submission of complete shop drawings and/or specifications indicating compliance with the Construction Documents. Acceptance of materials and/or equipment under this provision shall not be construed as authorizing any deviation from the Construction Documents, unless specifically directed in writing from the A/E.
- 7.7 Any and all additional costs or time resulting from the acceptance or rejection of any substitution shall be the sole responsibility of the Contractor. These include costs that are not presented at the time of the substitution request and those costs that become known after the approval of the substitution. This includes direct as well as indirect costs.
- 7.8 If a substitution is accepted, and the substitute proves defective, or otherwise unsatisfactory as determined by the Owner for the service intended within the warranty period, the substitute shall be replaced with the material or equipment specified in the Construction Documents, or as approved by the Owner, at no additional cost to the Owner.

8. Allowances

- 8.1 Allowances shall include:
 - Cost of materials to Contractor.
 - Delivery to project site; handling, storage and installation at project site.
 - Protection, security, including insurance.
- 8.2 At contract closeout, monies remaining in any allowance line item will be credited to the Owner by Change Order.

9. Alternates

- 9.1 Alternates will be exercised and added to the proposed contract sum at the option of the Owner.
- 9.2 For any or all additive alternates selected or otherwise approved for addition to the contract sum by the Owner, the Contractor shall coordinate all related work and modify the surrounding work as required to complete the work, including changes under each alternate, only if acceptance is designated in the contract.

10. Unit Prices (see UGC 11.2)

The Contractor shall provide unit prices for specific portions of the work identified by the Owner during the pre-bid process. Unit pricing shall include all costs of materials, including, but not limited to shipping, and their related labor cost, including, but not limited to all appropriate burdens and markups.

11. Applications for Payment (see UGC Article 10 and 12.3)

- 11.1 Such requests shall be presented on (AIA) style G702 & G703 Pay Application forms. The G702 & G703 forms which may be supplemented with columnar continuation sheets shall separately identify each update to the original contract or GMP amounts.

- 11.2 The Contractor's project accounting records shall be kept on the basis of generally accepted accounting principles in accordance with cost accounting standards issued by the Federal Office of Management and Budget Cost Accounting Standards Board and organized by each pay request period.
- 11.3 Prior to the submission of the initial Application for Payment the Contractor shall submit the following documents to the A/E, Project Manager and Owner for review:
 - 11.3.1 Contract Price of GMP Schedule of Values: A single document itemizing the breakdown of the Contract Price/GMP, including general conditions, contingencies and allowances shall be submitted using HCC standard Schedule of Values format. The Contractor shall submit a draft breakdown and such submittal shall be a condition precedent to the processing of the first pay application. The Contractor shall submit subsequent draft copies of the Schedule of Values no later than five (5) working days prior to formal submission of each monthly pay request.
 - 11.3.1.1 The breakdown shall follow the trade divisions of the specifications.
 - 11.3.1.2 No adjustment to the original detailed breakdown of the contract line item shall be made once accepted by the Owner and A/E, unless such adjustment is directed by the Owner in writing.
 - 11.3.1.3 Construction Manager at Risk or Design-Builders will be allowed to reallocate among General Conditions line items after consultation with, and written agreement from the Owner. In the event the contractual limits on General Condition's costs are exceeded, the overruns shall be subtracted from the Fee.
 - 11.3.2 The Contractor shall not use subcontractor invoices/pay applications in lieu of a single Schedule of Values from the Contractor.
 - 11.3.3 The breakdown shall anticipate future CEAs and Change Orders and make provisions for incorporating all changes into the breakdown listing. If issued, CEAs and Change Orders shall be identified separately and shall itemize the GMP, CEAs, Change Orders, Change Proposals and/or Field Orders, which are incorporated into each CEA or Change Order for payment on a line-item basis. Contracts with Guaranteed Maximum Price proposals shall repeat the process outlined in this section every time a subcontract is added to the monthly Schedule of Values for payment.
 - 11.3.4 Submission and approval of Construction Staging Plans, Parking Plans, Quality Control Plans and Trenching Plans are a prerequisite for starting Work at the site and for receiving the first monthly partial payment.
- 11.4 At a minimum, the Contractor shall provide attachments to each month's payment request as follows:
 - 11.4.1 One copy of the monthly Small Business Progress Assessment reports.
 - 11.4.2 One copy of the updated Submittal Schedule.
 - 11.4.3 One copy of all invoices required by the contract.
 - 11.4.4 One copy of the certified wage rate notification form for each member of the workforce not previously submitted.
 - 11.4.5 One copy of the updated RFI and ASI logs.

- 11.4.6 One copy of the updated Work Progress Schedule as specified herein.
- 11.5 All regular monthly applications for payment shall be submitted to the Owner, Project Manager and A/E for review and approval in draft form no less than five working days prior to the formal submission. The Contractor shall be prepared to review the draft copy at the project site, or at such other location as may be agreed to by the parties. Failure to comply with the requirements outlined in this section shall relieve the Owner from its obligation to make payments on any/all line items until the Contractor meets all requirements.
- 11.5.1 Payments cannot exceed the contract, work in-place, or subcontract amounts as noted on the Schedule of Values line items.
- 11.5.2 All as-built drawings shall be up to date and available for review by the A/E and Owner.
- 11.5.3 When requesting payment for materials stored off site, all such materials shall be specifically identified, including supporting documentation, photos and insurance. The Contractor should be available to escort the Owner to visit and personally verify the stored materials in a physically separated and secure area.
- 11.6 Request for payments in association with release of, or reduction in retainage, or completion of work have additional requirements outlined in the UGC.

12. Procurement of Subcontracts (Applies to Construction Manager at Risk and Design-Build Contracts Only)

- 12.1 The Construction Manager at Risk (CM) or Design/Build Contract (DB) shall provide a written Bid/Proposal Package Strategy (B/PPS) for procuring subcontracts including self-performance work (other than General Conditions), prior to the approval of the Guaranteed Maximum Price, but no later than twenty calendar days prior to the first advertisement for subcontractor proposals. The B/PPS shall be a written plan submitted to, and reviewed and approved by the Owner.
- 12.1.1 The plan shall identify bid packages that are most advantageous to the Project and align with the CM/DB's HCC SB Good Faith Effort by providing at least three qualified respondents for each package (including CM/DB). Each bid package shall include the UGC, Owner's Division 1 Specifications, Drawings and Specifications and any other HCC requirements included in the CM/DB Contract pertaining to the scope of work covered in the packages.
- 12.1.2 The B/PPS shall include the following for each bid package contemplated:
- Anticipated scope of work to be procured;
 - A current Work Progress Schedule;
 - Anticipated selection criteria and questions;
 - Self-perform work proposals to be submitted by the CM/DB;
 - Proposed advertising dates;
 - Proposed pre-proposal meeting(s) dates;
 - Proposed receipt, review and award dates;
 - Anticipated notice to proceed dates.
- 12.2 The CM/DB shall update the B/PPS monthly at a minimum, as conditions change, or as proposed dates are revised.

- 12.3 Per the Texas Government Code Sections 2267.255: “A Construction Manager at-Risk shall publicly advertise for bids or proposals and receive bids or proposals from trade contractors or subcontractors for the performance of all major elements of the work other than the minor work that may be included in the general conditions.” The CM may seek to perform portions of the work itself by submitting bids or proposals in the same manner as **and prior to** all other trade or subcontractors, and if the Owner determines that the CM’s bid or proposal provides the best value to the Owner.
- 12.4 The goal of the Project Team shall be to have all work procured through advertised competitive proposals, however, if a “minor procurement” condition arises during the process, the following procurement guidelines may be used by the CM/DB, with Owner approval, for procurement of work: Less than \$5,000.00 No requirements; Between \$5,000.01 to \$50,000.00 Obtain two solicitations Greater than \$50,000.00 Advertised competitive proposals as required by Texas Government Code Section 2267.255 If the CM does not receive at least two competitive proposals on procurements over \$50,000.00, or the Owner does not receive at least three competitive proposals on packages for which the CM seeks to self-perform, the Owner may require that the CM re-package the scope and reissue the proposal without additional cost to the Owner, or delay to the project “Substantial Completion” date. This solicitation requirement does not pertain to Change Orders to existing subcontracts.
- 12.5 Work shall be divided into reasonable lots; however, material and labor acquired through purchase order/vendor type contracts are subject to the entire project (i.e. Concrete material shall be procured as a unit price time an estimated total project quantity provided by the CM/DB to equal a total construction cost). Work shall not be incrementally divided for the purpose of circumventing the procurement guidelines of 12.4 above.
- 12.6 The CM/DB may establish selection criteria for each phase of work for review and approval by the Project Team. Criteria shall be qualifications based and consistent with the information needed by the CM/DB to make a proper evaluation and selection. The CM/DB shall establish a selection matrix including cost, criteria, weighting and ranking procedures for evaluation and work with the Project Team to tailor the selection criteria to be project and scope specific to ensure the questions are proper and relevant to the goals of the project.
- 12.6.1 The CM/DB shall establish clear criteria and questions so that those reading the Request for Proposals will understand how they will be evaluated.
- 12.6.2 If criteria are not included in the advertisement for proposals, the proposal shall be considered a lump sum bid, and the CM/DB shall award the work to the lowest qualified, responsive bidder.
- 12.6.3 After selection criteria have been established, the CM/DB shall publicly advertise the work in general circulations and trade associations as required by law. This advertisement shall included, at a minimum, the following:
- HCC Project Number and Project Name;
 - Institution/Campus name;
 - CM/DB name and address;
 - CM/DB contract name and phone number;
 - Location for viewing of plans and specifications;
 - Date, time and location of Pre-proposal meeting(s);
 - Date, time deadlines(s), and location for receiving proposals;

- Instruction to respondents for submitting proposals;
 - Selection criteria, questions and submittal requirements.
- 12.7 At the time and location identified in the advertisement, the CM/DB shall hold a Pre-proposal meeting(s) for all potential subcontractors with the Project Team and Owner present. The CM/DB shall review the following at a minimum:
- The general scope of the project and specific scope of work included in this package;
 - Instructions to respondents for submitting proposals;
 - Selection criteria and questions;
 - Small Business Program Requirements;
 - Project safety requirements;
 - Project schedule requirements;
 - Payment procedures and requirements, including retainage;
 - Commissioning and Close-out requirements.
- 12.8 If the CM/DB identifies any self-performance in the B/PPS (work to be performed by its own employees), the CM/DB shall submit a proposal to the Owner at least 24 hours before the advertised time and location in a manner so as not to compromise the competitive process.
- 12.9 The CM/DB shall accept all proposals at the advertised location until the advertised deadline. Upon receipt, the Owner shall be allowed to review the proposal and confirm the time and date received. Any proposals received after the deadline shall not be considered by the CM/DB, and shall be returned to the respondent unopened. Fax proposals shall not be accepted unless the ODR, prior to the initial advertisement for proposals, approves a detailed plan by the CM/DB for proper care and custody.
- 12.10 After compiling, reviewing and verifying the costs and scope associated with all proposals, the CM/DB shall provide a “bid tabulation” matrix and a proposed Schedule of Values for review by the project team.
- 12.10.1 The bid tabulation matrix shall compare all equivalent scope proposals to the CM/DB’s estimate.
 - 12.10.2 Each matrix shall indicate the CM/DB estimate(s) for each scope of work and identify the respective cost savings/over-runs.
 - 12.10.3 The CM/DB may use values/quantities from its own estimate to provide full scope comparisons between each respondent, however, these “plug” numbers shall be clearly identified in the matrix to the Project Team and be used only to compare various proposals.
 - 12.10.4 The proposed updated Schedule of Values shall summarize all executed and recommended “best value” subcontracts to provide a current status of the Guaranteed Maximum Price Proposal.
 - 12.10.5 Once the proposals are compiled into a bid tabulation matrix and the proposed Schedule of Values has been updated, the CM/DB shall request a meeting with the Project Team to review the proposals.
- 12.11 The CM/DB shall lead the proposal review meeting and identify any exclusions or conditions, identify any non-qualifying respondents and any other problems that may have occurred during the process.
- 12.11.1 The CM/DB shall confirm that the respondents are qualified, meet the established selection criteria, and identify the amount of the proposals.

- 12.11.2 The CM/DB shall identify the “best values” and the current status of the buyout savings to the project team. If the “best value” causes the CM/DB to exceed the Cost of Work line item, including contingencies in the GMP the CM/DB shall acknowledge that the overage will be deducted from the CM/DB’s Construction Phase Fee.
- 12.12 Once the “best value” respondent has been identified by the CM/DB, without exception by the Owner, the CM/DB shall finalize negotiations with the selected “best value” respondent. If the CM/DB is unsuccessful in its negotiations with the selected respondent, the CM/DB shall notify the ODR that it intends to begin negotiations with the second “best value” and report the cost implications to the Schedule of Values. Once negotiations are successfully completed the CM/DB shall notify the Owner in writing that it intends to write a subcontract to the selected “best value” respondent and identify the bid package number, value of the contract, along with any changes from the bid day value, changes in scope, report the current status of the GMP identifying the current savings/overages and provided a copy of the executed subcontract or purchase order prior to any request for payment by the CM/DB for applicable work.
- 12.13 The Owner reserves the right to object to the “best value” identified by the CM/DB and may conduct an evaluation of the selection process. If after evaluation the Owner disagrees with the CM/DB “best value” recommendation, the Owner may instruct the CM/DB to re-bid the scope of work or use the Owner’s “best value” selection. If the value of the Owner’s selection causes an increase in the Guaranteed Maximum Price, the increase will be the responsibility of the Owner.
- 12.14 The process identified in this section shall be repeated for each bid package until the project is entirely awarded to trade contractors or subcontractors, self-performed by the CM or self-performed by Owner and removed from the CM’s scope by deductive Change Order.

13. Contractor Daily Reports

The Contractor shall provide the Owner and Project Manager with a report detailing its daily activities on the Project in a format acceptable to the Owner. All tests performed by the Contractor are to be attached to these daily reports. All work reports required of subcontractors shall be attached to the Contractor’s daily report. As a minimum, the report shall include the following information as it relates to the day’s activities on site: subcontractors on site, equipment on site, areas of work, type of work performed, materials received, tests performed, any injuries or accidents, any oral instructions received from the Owner, Project Manager or A/E, any material damage, any change in supervisory personnel and anything that might impact the projects quality or schedule. These reports shall be submitted to the Owner and Project Manager on a daily basis. Not receiving these reports in a timely manner may be grounds for the Owner withholding payments until they are submitted.

14. As-Built Drawings and Record Drawings (see UGC 10.3 and 11.4)

- 14.1 One copy of all record documents shall be kept up to date and available at the Project Site. “As-Built” drawings, specifications, detail manuals, and submittals shall be continuously annotated by the Contractor to reflect actual record field conditions, addenda, issuance of all Change Orders and clarifications, and actual dimensional records

for underground and all other services. One copy of all approved submittals and material selections shall also be kept available.

- 14.2 Maintenance of current documentation by the Contractor is required in order to process pay applications. The Owner, Project Manager and A/E will review the status of such documentation monthly, at a minimum. Also refer to the Commissioning Procedures and Project Close-out Procedures for detailed instructions on As-Built drawings and specifications.

15. Utility Outages

- 15.1 The Contractor shall notify the Owner, in writing, of any planned utility outages ten business days in advance of the anticipated outage date. The notice shall identify the utility(s) to be shutdown, the anticipated duration of the outage and the subcontractor responsible for initiating and terminating the outage. The Owner has final authority to approve or disapprove of the requested outage date and time.
- 15.2 A standard form for processing a request for utility shutdown or any other disruption shall be provided by the Owner at the Pre-Construction Conference. The Contractor shall utilize this form, with attachments as necessary, in requesting an outage.

16. Coordination of Space (see UGC section 3.3 and 3.3.6.2 in particular)

- 16.1 The Contractor and subcontractors should coordinate the use of Project space and sequence of installation of mechanical, electrical, plumbing, HVAC and Communications work which is indicated diagrammatically on the drawings. The Contractor and subcontractors should follow routing shown for pipes, ducts, and conduits as closely as practicable, with due allowance for available physical space. The Contractor and subcontractors should utilize space efficiently to maximize accessibility for other and future installations, maintenance and repairs. Making adjustments due to field conditions is considered a part of the work.
- 16.2 Within finished areas all pipes, ducts and wiring should be concealed, unless otherwise directed in the plans and specifications. The Contractor and subcontractors should coordinate locations of fixtures and outlets with finish elements.
- 16.3 The Contractor and subcontractors should verify that mechanical and electrical controls, valves, cut-offs, cleanouts, switches and other items are located in such a manner as to make them readily accessible to the user.
- 16.4 In no case shall locations of equipment be established by scaling the drawings. In the event exact dimensions are not provided with the drawings either supplemental instructions should be obtained from the A/E, or approval of placement from the Owner, should be obtained prior to final placement.
- 16.5 All work should be arranged in a neat and orderly manner while maximizing clearances.
- 16.6 All operating system components which will be approved through the submittal process should be reviewed prior to submittal to confirm there is physically adequate space to accommodate the device.

17. Repair of Damage (see UGC 3.3.11.3)

The Contractor shall be responsible for any loss or damage caused by Contractor, his workers or his subcontractors, to the Work, materials stored on site, to tools and equipment, to adjacent property and to persons. The Contractor shall make good any loss,

damage or injury at Contractor's own expense and take particular care to protect adjacent buildings, utilities, landscape and lawn sprinkler systems.

18. Deliveries

- 18.1 The Owner will not accept delivery of products and materials bound for the Contractor. The Owner will not be responsible for material losses, or make arrangements to have someone present for acceptance of deliveries.
- 18.2 The name and address of Owner shall not be used for delivery of materials and equipment.
- 18.3 The Contractor should make arrangements for deliveries in accordance with construction schedules and in ample time to facilitate inspection prior to installation without causing delay to the project.

19. Protection of Utilities, Etc. (see UGC 3.3.11.3)

The Contractor and all subcontractors and vendors should take precaution to protect and leave intact the streets, site and work previously accomplished, including buildings, streets, utility poles, fire hydrants, utility lines, catch basins and storm drainage systems.

Section 013200 Project Planning and Scheduling
(see UGC Article 9)

1. Definitions:

- 1.1 Project Schedule (a.k.a. Work Progress Schedule) – the schedule developed, monitored Construction phases of the project.
- 1.2 Project Team – refers to the Owner, Architect/Engineer (A/E), Design Consultants, Users, Contractor and Subcontractors that are contracted and/or specifically assigned to the Project.
- 1.3 Work Day – refers to a day in which work is planned, excluding weekends and legally recognized state holidays.
- 1.4 Critical Path – is the sequence of activities that determines the longest duration for the project when the Total Float is equal to, or less than zero.
- 1.5 Total Float – the number of days an activity on the longest path can be delayed without delaying the Substantial Completion Date. Total float should not be shown as a single activity, but rather the relationship between the early and late finish dates or early and late start dates of each activity.

2. Purpose

- 2.1 Time is an essential part of this contract. Therefore, the timely and successful completion of the Work requires careful planning and scheduling of all activities inherent in the completion of the project.
- 2.2 The Contractor shall participate with the Owner and A/E in a project planning workshop promptly upon execution of the contract unless specified differently in the Construction Documents. The Schedule shall be coordinated with the Contract Price Breakdown, or Schedule of Values, and shall include all significant procurement actions (including long lead time delivery items and related approval activities), all work placement activities (including start and completion dates), identification of the timing of overhead inspections, system startup and commissioning activities, pre-final and final inspections, and punch list corrections as a minimum.

- 2.3 Acceptance of the Project Schedule; or any subsequent update thereof, by the Owner is for format and extent of detail of the Project Schedule only. Such “acceptance” does not indicate approval of the Contractor’s means or methods, or of any change to the contract terms including without limitation any required contract milestones.
- 2.4 The Project Schedule shall be developed with a certain amount of float time. This float, which shall be no less than ten percent of the total duration of the project, shall be presented in a format which facilitates reporting of progress and trends and can be used to identify risk and opportunities, project upcoming activities and forecast project milestones.
- 2.5 The Owner must be able to reasonably rely on the Contractor’s Project Schedule in order to make accurate commitments to the Project Team, campus administration and other parties as necessary.

3. Contractor Responsibilities

- 3.1 The Contractor is responsible for planning, managing, coordinating and scheduling all activities from a Notice to Proceed to Final Completion of the project within the time allotted by the contract.
- 3.2 The Contractor is responsible for keeping the Owner and Project Team fully informed of schedule status and upcoming activities throughout the project.
- 3.3 The Contractor’s Pre-Construction and Construction project management personnel shall actively participate in the planning and development of the Project Schedule and shall be prepared to review such development and progress with the Owner, A/E and any other members of the Project Team so the planned sequences and procedures are clearly understood by all parties.
- 3.4 The Contractor is to plan for appropriate activity durations to allow for thorough review, procurement, submittal, installation, inspection, testing and commissioning of all work in order to confirm compliance with the project plans and specifications.

4. Schedule Development Requirements

- 4.1 Appropriate logic relationships must be in place and complete, while the Project Schedule shall be free of any mandatory and/or late finish constraints, except for the Substantial Completion Date.
- 4.2 The estimated activity duration of an activity shall be expressed in workdays only.
- 4.3 During Pre-Construction Services, the Project Team will establish the maximum duration for every activity included in the schedule.
- 4.4 The Project Schedule should be coordinated with the Contractor’s Submittal Schedule and Schedule of Values.

5. Planning and Scheduling Workshop

- 5.1 Within fifteen calendar days after the Notice of Proceed is issued the Contractor will conduct a Planning and Scheduling Workshop with the Contractor’s Project Manager, Superintendent, the Owner, A/E, Project Manager, User Representative and any available subcontractors prior to submitting the initial Project Schedule to the Owner.
- 5.2 Two separate Planning and Scheduling Workshops should be held with the aforementioned parties prior to the Contractor submitting the baseline Preconstruction Project Schedule.
- 5.3 The baseline schedule shall be submitted within 10 workdays after the Planning and Scheduling Workshops are complete.

6. Construction Phase Baseline Schedule Submittal

- 6.1 The Baseline Project Schedule shall be submitted to the Owner with the required Total Float and a current data date (within five days of the date of submission). The Baseline Schedule will be updated within ten days of the date when each subcontractor is procured and brought on to the project.
- 6.2 Once the full scope of the Project has been approved (i.e. the last stage GMP Change Order has been executed), the Project Manager shall coordinate with the Owner to reset the Baseline Project Schedule.
- 6.3 The Owner reserves the right to withhold any and all payments related to the Project Schedule and/or General Conditions if a Baseline Project Schedule is not submitted, or is not acceptable to the Owner.
- 6.4 The Project Schedule shall be presented in a graphic time-scaled view including all activities, early start and finish dates, estimated durations and total float, sorted by early start.

7. Updating the Project Schedule

- 7.1 Once the Baseline Project Schedule has been accepted, the Project Manager shall update the Project Schedule on at least a monthly basis and submit the updated Project Schedule with the draft application for payment.
- 7.2 Project Schedule updates shall be based on actual work progress, current logic and remaining durations.
- 7.3 Total Float is intended to be used proportionally with the duration of the project; therefore, there should be no remaining Total Float at the actual Substantial Completion Date.

8. Excusable Delays and Time Extensions

- 8.1 Excusable delays shall be administered per the UGC.
- 8.2 If an excusable delay extends the Contract Substantial Completion Date, the ODR may extend the contract time by the number of excusable calendar days lost on the Project Schedule, or take other actions as appropriate under the terms of the contract.
 - 8.2.1 Any Change Order Proposal that the Contractor claims, or will claim, justifies an extension of contract time must contain the information necessary to justify the time extension.
 - 8.2.2 Change Order Proposals that do not affect the Critical Path for the Project and delay the Substantial Completion Date, or does not include a request for additional time prior to approval by the ODR, shall not be due a time extension.
- 8.3 Once the ODR accepts a time extension, and authorizes the Contractor to proceed with the contract change, the proposed revision shall be incorporated in the Project Schedule.

Section 013220 Photographic Documentation

1. Photographic Media

- 1.1 Digital Images: Provide images in uncompressed TIFF format produced with a minimum 4.0 mega pixels and image resolution of not less than 1024 by 768 pixels.
- 1.2 Videotape Format: Provide high-quality ½" VHS color videotape in full size cassettes, 90 minutes long.

2. Construction Photographs

- 2.1 Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the work. Photos with blurry or out-of-focus areas will not be accepted.
 - 2.2 Maintain key plan with each set of construction photos that identifies each photo location.
 - 2.3 Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 2.4 Date and Time: Include date and time filename for each image.
 - 2.5 Preconstruction Photos: Before commencement of work on the project take digital photos of the project site and surrounding properties, including existing items to remain during construction, for different vantage points.
 - 2.6 Take photos to show existing conditions adjacent to the project site.
- 3. Construction Videos - Preconstruction Videotapes:** Before starting construction on the project site prepare a video recording of the site and surrounding properties from different vantage points. Show existing conditions of the site and adjacent buildings. Show protection efforts by Contractor including, but not limited to, tree protection and storm water controls.

Section 013520 LEED Requirements (If LEED PROJECT)

1. Definitions - LEED – Leadership in Energy and Environmental Design.

2. Submittals

The Contractor shall provide preliminary submittals of its LEED Action Plan, indicating how the Owner’s requirements will be met, within thirty days after the Start date established by the Notice to Proceed. Submit additional LEED submittals required by other specification sections.

3. Quality Assurance

LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

Section 013523 Project Safety Requirements (see UGC Article 7)

1. Purpose

- 1.1 The Contractor shall bear overall responsibility for all aspects of safety at the project.
- 1.2 The Contractor shall, at all times, provide adequate resources, equipment, training and documentation to:
 - 1.2.1 Assure compliance with all applicable regulatory and contract requirements.
 - 1.2.2 Assure a safe work environment at the Project.
 - 1.2.3 Instill a culture for safe behavior in all supervisors and workers.
 - 1.2.4 Ensure a universal understanding that safety and health issues take precedence over all other considerations at the Project.
- 1.3 The Contractor and every subcontractor shall comply with the requirements of this section and all Federal, State, and local statutes, standards, and regulations. In any circumstance where this Section differs from, or is in conflict with any statutory requirement, the more stringent shall apply.

- 1.4 The Owner reserves the right to have any manager, supervisor or worker removed from the project for disregarding the Project's safety requirements.
- 1.5 The Owner reserves the right to deduct from the contract any safety related expenses that the Owner incurs as a result of the Contractor's, or any subcontractor's, failure to comply with the requirements of this section.
- 1.6 The Owner will deny requests for time extensions and/or monetary considerations whenever the Owner intercedes on behalf of safety compliance as a result of Contractor failure to act as required by the contract.

2. Contractor's Project Safety Coordinator (PSC)

- 2.1 The Contractor shall provide a Project Safety Coordinator, who shall be responsible for safety training, inspections, investigations, record keeping, reporting, incident response, and claims management, and shall serve as the technical advisor to the Contractor's Project staff for all safety issues.
- 2.2 If the contract value is less than \$3,000,000 the Contractor's project superintendent may perform these duties. If the contract value exceeds \$3,000,000 the Contractor shall furnish a construction safety specialist.

3. Subcontractors' Project Safety Representative (PSR)

Every subcontractor shall identify one employee to be its Project Safety Representative who will be on-site during all the subcontractor's activities and will participate in all training activities, audits, etc. related to the safety program.

- 3.1 The PSR shall attend all safety meetings while the company is actively performing work at the project and shall be responsible for reporting all incidents to the PSC.
- 3.2 The PSR shall transport or accompany any injured co-worker that requires medical attention at facilities outside the project.
- 3.3 The PSR shall be responsible for either conducting or making arrangements for all training, equipment and materials that workers need to perform their duties in the safest possible manner.

4. Project Safety Program

- 4.1 The Contractor shall develop a written, site specific, safety program. It shall be printed in English and an initial draft shall be submitted to the Owner for review and comment as a prerequisite to issuance of the Notice to Proceed with construction services'
- 4.2 The Contractor shall incorporate Owner comments into a final draft which shall be resubmitted to the Owner for concurrence.

5. Personal Protective Equipment (PPE)

- 5.1 PPE shall be required for all workers in construction areas. The followings items shall be furnished, inspected, and maintained by the employer. The Contractor shall maintain an adequate inventory to furnish these items for five Owner representatives who may visit the project from time to time:
 - 5.1.2 Hard Hats (safety helmets): shall be ANSI stamped (Z89.1-1997, Type I, Class E, G and C and be worn at all times while in the construction areas.
 - 5.1.3 Eye protection (safety glasses): shall be ANSI stamped Z87. If a worker wears prescription glasses (plastic lenses only) that are marked Z87, the employer shall furnish goggles or safety glasses that are designed to fit over another pair of glasses and be worn at all times while in the construction areas.
 - 5.1.4 Vests shall be at a minimum a Class II reflective traffic vests and be worn at all times while in the construction areas.

5.1.5 Hand protection, Hearing Protection, Respiratory Protection, Fall Arrest Equipment, Other PPE: shall all be furnished as required to comply with OSHA Standards.

6. Medical Equipment - The Contractor shall maintain at least one first aid kit on the project site at all times per ANSI Z308.1.

7. Certifications

Supervisors, Competent Persons, Equipment and Crane Operators, and Emergency Responders shall all be identified in lists submitted by employers to the PSC prior to commencement of work. In addition to lists, the employers shall include copies of all available training certificates or formal documentation to support the declared positions. For all operations that require a “competent person” (per OSHA definition), the PSC shall maintain a project file containing the transmittals from each employer naming each person declared to be competent for each operation. For operations requiring independent certification, a copy of the certificates shall be attached.

8. Project Safety Signs and Posters

- 8.1 The Contractor shall post safety regulation signs at every point of entry to the project in English and Spanish. The content of the sign should at a minimum indicate that visitors are required to check in at the project office, persons entering the construction area must be appropriately attired, no weapons, tobacco, alcohol, controlled substances and related paraphernalia may be brought onto the premises, a posted speed limit will be identified and copies of the MSDS sheets are available at the project office.
- 8.2 The Contractor shall post emergency contacts and notification, including phone numbers, notification of insurance carrier for Worker’s Compensation Coverage and any and all other required State and Federal postings.

9. Project Safety Training and Meetings

- 9.1 Within fifteen days of the issuance of the Notice to Proceed the Contractor shall hold the initial safety meeting and all Project Team members are strongly encouraged to participate.
- 9.2 The PSC shall present orientation training to every person who is to be allowed into the construction area without an escort. A translator shall be present when there are workers in attendance who do not speak English.
- 9.3 The PSC shall maintain a site safety orientation log signed by all persons receiving safety training.
- 9.4 Project safety meetings will be held on a weekly basis and will be chaired by the PSC and attended by all companies’ PSRs who are currently on site. The topics of discussion should focus on safety and loss control issues.
- 9.5 “Tool Box Talks” shall be conducted on a weekly basis by each PSR and will cover safety issues related to upcoming work, current site conditions and review of any recent incidents.
- 9.6 Special task training should occur when new equipment or non-routine activities are scheduled.

10. Safety Inspections

- 10.1 Daily – The PSC shall observe work operations in all areas of the project and note any violations in the daily progress reports.

- 10.2 Weekly – A comprehensive safety inspection shall be conducted by the PSC and each PSR for their respective work areas. A written record of the observations and recommended corrections should be made and placed in the project files.
 - 10.3 Quarterly – The PSC shall facilitate an inspection which shall include, but not be limited to the following: fall arrest equipment, fire extinguishers, rigging, ladders, hand tools, power tools, cords, welding leads, hoses, alarms, respirators, ground fault circuit interrupters, first aid stations, eye wash stations, and emergency rescue equipment.
 - 10.4 Semi-annually – The PSC shall facilitate an inspection of all hoists, cranes, mobile equipment, motorized lift platforms, stages, generators and compressors to assure proper operational condition.
 - 10.5 The PSC shall notify the Owner within one hour of the arrival at the project site by any representative of a regulatory agency and provide the Owner with a copy of any published findings or citations issued to any employer and shall ensure that statutory posting requirements are met.
- 11. Records and Reports** - The PSC shall prepare a written report for each incident that involves any injury that may not be resolved by first aid response and/or each incident that involves damage to property or equipment. The report should contain a list of factual details that created the incident, the responsive actions that occurred during and immediately following the incident and recommendations for modifications to prevent repetition of the incident. A copy of the report should be submitted to the Owner within 24 hours of the incident.
- 12. Construction Operations**
- 12.1 Cranes
 - 12.1.1 Tower cranes and related power supply equipment shall be surrounded by at least an eight foot high, 5/8” plywood enclosure with lock controlled entrance.
 - 12.1.2 Operators of cranes, derricks and/or hoisting equipment shall possess certification from a nationally accredited training organization.
 - 12.2 Demolition - Safe egress paths and barrier isolation of impacted areas shall be monitored and maintained to prevent entry by other trades and members of the public. This includes removal of materials and trash from elevated locations.
 - 12.3 Electrical Power
 - 12.3.1 Ground fault circuit interruption (GFCI) shall be the primary protection from exposure to electrical current for all workers on the project. Only exit lighting and medium-high (greater than 240) voltage service will not be GFCI protected.
 - 12.3.2 All strings of temporary lights shall be fully lamped and guarded regardless of height, and shall be continuously maintained. Adequate levels of illumination for the work operations must be maintained at all times.
 - 12.3.3 All receptacles and switches shall have trim plates installed before they are energized.
 - 12.3.4 All power distribution panels shall have full covers installed before primary power is brought into the panel.
 - 12.4 Excavations
 - 12.4.1 Prior to starting, each excavation shall be reviewed with the Owner to obtain any historical knowledge about existing utilities in the area. Where applicable, “utility locates” will be called for seventy two hours in advance of commencement of the

excavation. Potholing and/or hand excavation shall be required within two horizontal feet of located centerlines and in areas where knowledge is lacking.

12.4.2 When a trench excavations cannot be backfilled in the same day as it is created, a highly visible barricade shall be erected no less than six feet from all approachable edges. All portable means of access shall be removed at the end of each workday.

12.4.3 Earth ramps that are to be used for walking access shall not exceed twenty percent in grade slope. Steeper slopes shall be gated and used for equipment only.

12.5 Fall Protection and Prevention

12.5.1 Any walking/working surface shall be defined to have a fall exposure that has one or more sides, ends or edges without a guardrail system attached or a solid continuous wall of at least forty-two inches in height above the walking/working surface, and within twelve horizontal inches from the edge. The Contractor shall require engineered or conventional fall protection measures for each and every fall exposure that involves vertical distances equal to or greater than six feet. The recognized exemptions/exceptions are as follows:

- Portable step ladders
- Extension and straight ladders
- Erection and dismantling of scaffolding
- Limited exposure for engaging and disengaging a hook
- Vertical fall exposure protected by a warning line and six foot setback

12.5.2 Provide covers over holes which are secured and clearly marked as covers.

12.5.3 Job built ramps and bridges must be covered with non-skid materials.

12.5.4 Materials, scraps, waste and tools shall never be allowed to freefall from a height greater than twenty feet, unless it is contained within a chute or controlled by a hoist.

12.6 Fire Protection

12.6.1 The Contractor shall review fire prevention needs and procedures with the Owner and shall post appropriate information and warnings.

12.6.2 The Contractor shall maintain unobstructed access to fire extinguishers, temporary fire protection facilities, stairways and other access routes.

12.6.3 The Contractor shall provide supervision of welding operations, combustion type temporary heating units and similar sources of ignition.

12.6.4 All floors that have combustible materials present shall be accessible from ground level by a usable stair system. For structures greater than three stories in height shall have a fire sprinkler stand pipe installed and it shall be charged to within two stories (or thirty vertical feet) of all floors containing combustible materials. A Siamese connection shall be installed at every second level to provide access for fire hoses.

12.6.5 All fire extinguishers that are not task-specific shall be adequate in number and description to comply with OSHA declared limits for egress points, floor area and travel distances. They shall be situated in highly visible locations.

12.6.6 All fire extinguisher that are task specific shall be inspected and furnished in advance by the employer that will be conducting the work that requires such fire fighting provisions. Such extinguishers shall be located with twenty-five feet from the perimeter of the task operation.

- 12.7 Housekeeping - The Contractor shall ensure that all subcontractors effectively clean the project site continuously throughout each workday. Effective cleanup shall address all of the following housekeeping issues:
 - 12.7.1 All construction waste, trash, and debris shall be placed in designated receptacles. No glass bottles will be permitted on the project site.
 - 12.7.2 Stack all whole and scrap materials in locations that do not obstruct a clear pathway nor create a risk of toppling causing injury or damage to the work.
 - 12.7.3 Place all hoses, cords, cables and wires in locations that prevent them from being damaged by tires, sharp edges, or pinch points and from creating trip or hook hazards.
 - 12.7.4 Secure and effectively cover all materials on roofs and elevated levels to prevent displacement by wind.
 - 12.7.5 All materials and equipment shall be protected from the elements while staged on the project site.
 - 12.7.6 All signs, barricades, fire extinguishers, guardrails, gates, etc. are to be restored to their proper locations in sound condition after they have been moved for work purposes.
 - 12.7.7 Properly store and secure all flammable and combustible liquids and gases.
 - 12.7.8 Collect and place all cut-off or waste pieces of rolling stock into waste and scrape containers as they are created.
 - 12.7.9 Live rounds ejected from powder-actuated tools shall be immediately placed in designated containers and periodically returned to the tool dealer or law enforcement agency for proper disposal.
 - 12.7.10 All puncture and impalement exposures shall be covered or eliminated as soon as they are created.
- 12.8 Ladders
 - 12.8.1 Portable aluminum ladders are prohibited.
 - 12.8.2 Extension, straight and job built ladders shall be secured from movement at the top and bottom.
 - 12.8.3 Manufactured portable ladders shall display ANSI heavy duty rating (Class 1-A) and be inspected daily.
- 12.9 Medical Assistance and Screening
 - 12.9.1 The PSC shall maintain a First Aid Log for all treatment administered on the project.
 - 12.9.2 Drug and alcohol screening shall be mandatory for every supervisor and/or worker who sustains or contributes to the cause of any injury (beyond first aid) or property damage incident.
 - 12.9.3 Minimum requirements for chemical screening shall at least match the threshold limits for a NIDA 5-panel protocol and for alcohol screening shall at least match the Texas DOT vehicle operator's limit for blood alcohol content.
 - 12.9.4 Any supervisor or worker who tests positive shall be ejected and excluded from return to work at the project. Successful completion of an acceptable rehabilitation program may be considered by the Owner for restoring a person's ability to return to the project. The final decision rest solely with the Owner.
- 12.10 Petroleum Fuel Operated Equipment

- 12.10.1 Where possible, equipment operator cabs shall be locked during non-working hours. Only equipment operators and direct supervisors shall have access to keys.
- 12.10.2 Any combustion engine equipment with less than ninety-eight percent clean air exhaust shall not be operated in enclosed spaces unless the exhaust is piped to outside air, and fresh air is brought into the space to replace the amount being consumed. This includes generators/welders and compressors as well as mobile equipment.
- 12.10.3 For hose and termination fittings on air compressors, whip checks shall be used at all connection points. Emergency shut off valves shall be installed on every discharge fitting of all air compressors.
- 12.11 Public Protection - The public boundary perimeter shall be secured from public intrusion. Attractive nuisance items such as tower cranes, tall ladders, fire escapes, large excavations, etc. shall require additional and separate security measures.
- 12.12 Project Service Water
 - 12.12.1 Potable water: comply with city health requirements.
 - 12.12.2 Non-potable water: Water storage containers, hose bibs and faucet shall be posted in English and Spanish "Danger – Do Not Drink"
- 12.13 Welding and Burning
 - 12.13.1 Oxygen and fuel gas cylinders shall not be stored together, including on bottle carts. At the end of any workday bottles must be moved to OSHA prescribed storage arrangements.
 - 12.13.2 Anti-flashback arrestors shall be installed at the pressure regulator gauges of all Oxy-Acetylene cutting rigs.
 - 12.13.3 Welding operations shall not be allowed to present an opportunity for flash burn exposures to the eyes of any workers in the vicinity. All welding operations shall provide appropriate screening measures, erected in advance to contain the high energy light.

Section 0136001 Project Management Software

GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – General Requirements, which are hereby made a part of this Section.
- B. Refer to specification Section 01 33 00 – Submittals for additional information.

1.2 SUMMARY

- A. Project Management Communications: The Contractor shall use the Internet web based project management communications tool, e-Builder[®] ASP software and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
 - 1. Project management communications is available through e-Builder[®] as provided by "e-Builder[®]" in the form and manner required by HCC.

2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited
- B. Training: e-Builder® will provide a group training sessions scheduled by HCC, the cost of which is included in the initial users' fee. Users are required to attend the scheduled training sessions they are assigned to. Requests for specific scheduled classes will be on a first come first served basis for available spaces. Companies may also obtain group training from E-Builder at their own expense, please contact e-Builder® for availability and cost.
 - C. Support: e-Builder® will provide on-going support through on-line help files.
 - D. Project Archive: The archive shall be available to each team member at a nominal cost. The archive set will contain only documents that the firm has security access to during construction. All legal rights in any discovery process are retained. Archive material shall be ordered from e-Builder®.
 - E. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.
 - F. Purpose: The intent of using e-Builder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files
 - G. Authorized Users: Access to the web site will be by individuals who are licensed users.
 1. Individuals may use the User Application included in these specifications or may request the User Application.
 2. Submit completed user application forms with check made payable to "e-Builder, Inc."
 3. Authorized users will be contacted directly by the web site provider, e-Builder®, who will assign the temporary user password.
 4. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.
 - H. Administrative Users: Administrative users have access and control of user licenses and all posted items. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!** Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
 - I. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using e-Builder® to send messages. Communication functions are as follows:
 1. Document Integrity and Revisions:
 - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new

- document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
- b. The system shall make it easy to identify revised or superseded documents and their predecessors.
 - c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
2. Document Security:
 - a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties' communication except for Administrative Users. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!**
 3. Document Integration:
 - a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
 4. Reporting:
 - a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
 5. Notifications and Distribution:
 - a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
 6. Required Document Types:
 - a. RFI, Request for Information.
 - b. Submittals, including record numbering by drawing and specification section.
 - c. Transmittals, including record of documents and materials delivered in hard copy.
 - d. Meeting Minutes.
 - e. Application for Payments (Draft or Pencil).
 - f. Review Comments.
 - g. Daily Field Reports.
 - h. Construction Photographs.
 - i. Drawings.
 - j. Supplemental Sketches.
 - k. Schedules.
 - l. Specifications.
- J. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches

documents shall be submitted by transmission in electronic form to the e-Builder® web site by licensed users.

- a. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
- b. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
- c. The Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
- d. The following are some but not all of the paper documents which require original signature:
 - 1) Contract
 - 2) Change Orders
 - 3) Application & Certificates for Payment
 - 4) Construction Change Directives (CCD)
 - 5) Forms and reports in Division 0

K. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

1. Providing suitable computer systems for each licensed user at the users normal work location¹ with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
2. Each of the above referenced computer systems shall have the following minimum system² and software requirements:
 - a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
 - 1) PC system 500 MHz Intel Pentium III or equivalent AMD processor
 - 2) 128 MB Ram
 - 3) Display capable of SVGA (1024 x 768 pixels) 256 colors display
 - 4) 101 key Keyboard
 - 5) Mouse or other pointing device
 - b. Operating system and software shall be properly licensed.

¹ The normal work location is the place where the user is assigned for more than one-half of his time working on this project.

² The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the E-Builder® Documents area.

- 1) Internet Explorer or other browser (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
- 2) Adobe Acrobat Reader (current version is a free distribution for download).
- 3) Or, users intending to scan and upload to the documents area of e-Builder® should have Adobe Acrobat (current version must be purchased).
- 4) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 - PRODUCTS

2.1 LICENSE

- A. Houston Community College will issue license as needed.

PART 3 -

PART 4 - EXECUTION (Not Applicable.)

Section 014200 Reference Standards

1. **Governing Regulations/Authorities** - The Architect/Engineer (A/E) has contacted the appropriate authorities having jurisdiction for the listed regulations and codes to obtain information for preparation of the Construction Documents. The Contractor may contact the authorities having jurisdiction directly for information and decisions having bearing on the work. **Refer to the coversheet of the plans issued for construction to identify the appropriate authorities having jurisdiction.**
2. **Standards**
 - 2.1 Reference to standards, codes, Specifications, recommendations and regulations refer to the latest edition or printing prior to the date of issue of the Construction Documents.
 - 2.2 Applicable portions of standards listed that are not in conflict with the Construction Documents are hereby made a part of the Specifications
 - 2.3 Modifications or exceptions to Standards shall be considered as amendments and unmodified portions shall remain in full effect. In cases of discrepancies between standards, the more stringent requirements shall govern.
 - 2.4 Copies of Standards: Each entity engaged in construction of the Project is required to be familiar with industry standards applicable to its respective construction activity. Copies of applicable standards are not bound with the Construction Documents. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

3. Schedule of Standards

AA Aluminum Association
1525 Wilson Blvd. Suite 600
Arlington, VA 22209
703.358.2960
Fax 703.358.2961
www.aluminum.org

AABC Associated Air Balance Council
1518 K St. NW
Washington, DC 20005
202.737.0202
www.aabchq.com

AAMA American Architectural Manufacturers Assoc.
1827 Walden Office Square, Suite 550
Schaumburg, IL 60173-4268
847.303.5664
Fax 847.303.5774
www.aamanet.org

AAN American Association of Nurserymen
1250 Eye St., NW, Suite 500
Washington, DC 20005
202.789.2900

ANLA American Nursery and Landscape Association
1000 Vermont Ave., NW, Suite 300
Washington, DC 20005-4914
202.789.2900
www.anla.org

AASHTO American Association of State Highway and Transportation
Officials
444 North Capitol St., Suite 225
Washington, DC 20001
202.624.5800
www.transporation.org

ACI American Concrete Institute
38800 Country Club Dr.
Farmington Hills, MI 48331
248.848.3700
Fax 248.848.3701
www.aci-int.org

ACIL American Council on Independent Laboratories
1629 K St. NW
Washington, DC 20006
202.887.5872
www.acil.org

ACPA American Concrete Pipe Association
1303 West Walnut Hill Lane, Suite 305
Irving, TX 75038-3008

972.506.7216
Fax 972.506.7682
www.concrete-pipe.org

ADC Air Diffusion Council
1901 N. Roselle Rd., Suite 800
Schaumburg, IL 60195
847.706.6750
Fax 847.706.6751
www.flexibleduct.org

AF&PA American Forest & Paper Products
(Formerly National Forest Products Assoc. (NFPA))
1111 Nineteenth St., NW, Suite 800
Washington, DC 20036
800.878.8878
Fax 202.463.2700
www.afandpa.org

AI Asphalt Institute
2696 Research Park Dr.
Lexington, KY 40512-4052
606.288.4960
<http://www.washpaltinstitute.org>

AIA American Institute of Architects
1735 New York Ave. NW
Washington, DC 20006
202.626.7300
www.aia.org

AIHA American Industrial Hygiene Assoc.
P 2700 Prosperity Ave., Suite 250
Fairfax, VA 22031
703.849-888
www.aiha.org

AISC American Institute of Steel Construction
One East Wacker Dr., Suite 3100
Chicago, IL 60601-2001
312.670.2400
www.aisc.org

AISI American Iron and Steel Institute
1140 Connecticut Ave., NW, Suite 705

Washington, DC 20036
202.452.7100
www.steel.org

AITC American Institute of Timber Construction
7012 S. Revere Parkway, Suite 140
Centennial, CO 80112
303.792.9559
303.792.0669
www.aitc-glulam.org

ALI Associated Laboratories, Inc.
500 S. Vermont St.
Palatine, IL 60067
800.685.0026
www.associatedlabs.org

ALSC American Lumber Standards Committee
P.O. Box 210
Germantown, MD 20875
301.972.1700
www.alsc.org

AMCA Air Movement and Control Assoc.
30 W. University Dr.
Arlington Heights, IL 60004-1893
847.394.0150
www.amca.org

ANSI American National Standards Institute
1819 L St., NW, 6th Fl.
Washington, DC 20036
202.293.8020
Fax 202.293.9287
www.ansi.org

APA American Plywood Assoc.
7011 S. 19th
Tacoma, WA 98466
253.565.6600
Fax 253.565.7265
www.apawood.org

ARI Air Conditioning and Refrigeration Institute
4100 North Fairfax Dr., Suite 200

Arlington, VA 22203
703.524.8800
Fax 703.528.3816
www.ari.org

ARMA Asphalt Roofing Manufacturers Assoc.
Public Information Dept.
1156 15th St., NW, Suite 900
Washington, DC 20005
202.207.0917
Fax 202.223.9741

www.asphaltroofing.org
ASA Acoustical Society of America
2 Huntington Quadrangle, Suite 1N01
Melville, NY 11747-44502
516.576.2360
Fax 516.576.2377
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Date 3/02/09
www.asaa.aip.org

ASC Adhesive and Sealant Council
7979 Old Georgetown Rd. Suite 500
Bethesda, MA 20814
301.986.9700
Fax 301.986.9795
www.ascouncil.org

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning
Engineers
1791 Tullie Circle, NE
Atlanta, GA 30329
404.636.8400
Fax 404.321.5478
www.ashrae.org

ASME American Society of Mechanical Engineers
Three Park Ave.
New York, NY 10016-5990
800.843.2763
www.asme.org

ASPE American Society of Plumbing Engineers
8614 Catalpa Ave., Suite 1007
Chicago, IL 60656-1116
773.693.2773

Fax 773.695.9007

www.aspe.org

ASSE American Society of Sanitary Engineers

901 Canterbury, Suite A

Westlake, OH 44145

440.835.3040

Fax 440.835.3488

www.asse-plumbing.org

ASTM American Society for Testing and Materials

100 Barr Harbor Dr.

West Conshohocken, PA 19428-2959

610.832.9500

Fax 610.832.9555

AWCMA American Window Covering Manufacturers Assoc.

355 Lexington, AVE, 17th Fl.

New York, NY 10017

212.297.2122

Fax 212.370.9047

www.wcmanet.org

AWI Architectural Woodwork Institute

46179 Westlake Dr., Suite 120

Potomac Falls, VA 20165

571.323.3636

Fax 571.323.3630

www.awinet.org

AWPA American Wood-Preservers' Assoc.

P.O. Box 361784

Birmingham, AL 35236-1784

205.733.4077

www.awpa.com

AWPB American Wood Preservers Bureau

4 D. Washington, St

Newnan, GA 30263

404.254.9877

AWS American Welding Society

50 N.W. LeJeune Rd.

Miami, FL 33126

800.443.9353

Fax 305.443.9353

www.aws.org

BHMA Builder's Hardware Manufacturers Assoc.

355 Lexington Ave., 15th Fl.

New York, NY 10017

212.297.2122

Fax 212.370.9047

www.buildershardware.com

BIA The Brick Industry Association

1850 Centennial Park Dr., Suite 301

Reston, VA 20191

703.620.0010

Fax 703.620.3928

www.bia.org

BIFMA Business and Institutional Furniture Manufacturers Assoc.

2680 Horizon, Dr., SE, Suite A-1

Grand Rapids, MI 49546-7500

616.285.3963

Fax 616.285.3765

www.bifma.org

CFFA Chemical Fabrics & Film Assoc., Inc.

c/o Thomas Assoc., Inc

1300 Sumner Ave.

Cleveland, OH 44115-2851

216.241.7333

www.chemicalfabricsandfilm.com

CISCA Ceiling and Interior Systems Construction Assoc.

5700 Old Orchard Rd., 1st Fl.

Skokie, IL 60077

708.965.2776

www.cisca.org

CISPI Cast Iron Soil Pipe Institute

5959 Shallowford Rd., Suite 419

Chattanooga, TN 37421

615.892.0137

Fax 615.892.0817

www.cispi.org

CRI Carpet and Rug Institute

P.O. Box 2048
Dalton, GA 30722
706.278.8835
Fax 706.278.8835 www.carpet-rug.org

CRSI Concrete Reinforcing Steel Institute
933 North Plum Grove Rd.
Schaumburg, IL 60173-4758
847.517.1200
Fax 847.517.1206
www.crsi.org

CTIOA Ceramic Tile Institute of America
12064 Jefferson, Blvd.
Culver City, CA 90230-6219
310.574.7800
Fax 310.821.4655
www.ctioa.org

DHI Door and Hardware Institute
14150 Newbrook Dr., Suite 200
Page 40 of 69
Date 3/02/09
Chantilly, VA 20151
703.222.2010
Fax 703.222.2410
www.dhi.org

ETL ETL Testing Laboratories, Inc.
P.O. Box 2040
Route 11, Industrial Park
Cortland, NY 13045
607.753.6711
www.etl.com

ECDS Energy Conservation Design Standards for New State Buildings
State Energy Conservation Office
Texas Facilities Commission
P.O. Box 13047
Austin, TX 78711-3047

\\FGMA Flat Glass Marketing Assoc.
(The Flat Glass Marketing Assoc. included Glass Tempering Association, and members of the Laminators Safety Glass Association consolidated to form the Glass Assoc. of North America)

2495 SW Wanamaker Dr., Suite A
Topeka, KS 66614
785.271.0208
Fax 785.271.0166
www.glasswebsite.com

FM Factory Mutual Research Organization
500 River Ridge
P.O. Box 9102
Norwood, MA 02062
617.762.4300

GA Gypsum Association
810 First St., NE #510
Washington, DC 20002
202.289.5440
Fax 202.289.3707
www.gypsum.org

HMA Hardwood Manufacturers Assoc.
400 Penn Center Blvd., Suite 350
Pittsburg, PA 15235
412.829.0770
Fax 412.829.0844
www.hmamembers.org

HPMA Hardwood Plywood Manufacturers Assoc.
1825 Michael Farraday Dr.
Reston, VA 20190
703.435.2900
Fax 703.435.2537
www.hpva.org

IBC International Building Code
International Code Council
500 New Jersey Ave., NW 6th Fl.
Washington, DC 20001-2070

IBD Institute of Business Designers
341 Merchandise Mart
Chicago, IL 60654
312.647.1950

ICC International Code Council
500 New Jersey Ave., NW, 6th Floor
Washington, DC 20001

888.422.7233
Fax 202.783.2348
www.iccsafe.org

IECC International Energy Conservation Coder
www.iccsafe.com

IEEE Institute of Electrical and Electronic Engineers
3 Park Ave., 17th Fl.
New York, NY 10016-5997
212.419.7900
Fax 212.752.4929
www.ieee.org

IESNA Illuminating Engineering Society of North American
120 Wall Street, Fl. 17
New York, NY 10005
212.248.5000
Fax 212.248.5017
www.iesna.org

IFC International File Code
www.iccsafe.org

IGCC Insulating Glass Certification Council
c/o ETL Testing Laboratories, Inc.
P.O. Box 9
Henderson Harbor, NY 13651
315.646.2234
Fax 315.646.2297
www.igcc.org

ILI Indiana Limestone Institute of American
400 Stone City Bank Bldg.
Bedford, IN 47421
812.275.4426
Fax 812.279.8682
www.iliai.com

IPC International Plumbing Code
www.iccsafe.org

ISA Instrument Society of America
67 Alexander Dr.
Research Triangle Park, NC 27709
919.549.8411

Fax 919.549.8288
www.isa.org

LIA Lead Industries Assoc., Inc.
Sparta, New Jersey
www.leadinfo.com

LPI Lightning Protection Institute
25475 Magnolia Dr.
P.O. Box 99
Maryville MO 64468
800.488.6864
www.lightning.org

MBMA Metal Building Manufacturers Assoc.
1300 Sumner Ave.
Cleveland OH 44115-2851
216.241.7333
Fax 216.241.0105
www.mbma.com

MCAA Mechanical Contractors Assoc. of America
1385 Piccard Dr.
Rockville, MD 20850
301.869.5800
Fax 301.990.9690
www.mcaa.org

MFMA Maple Flooring Manufacturers Assoc.
60 Revere Dr., Suite 500
Northbrook, IL 60062
888.480.9138
Fax 847.480.9282
www.maplefloor.org

MIA Marble Institute of America
28901 Clemens Rd., Suite 100
Cleveland, OH 44145
440.250.9222
Fax 440.250.9223
www.marble-institute.com

ML/SFA Metal Lath/Steel Framing Assoc.
(A Division of the National Association of Architectural Metal
Manufacturers)
800 Roosevelt Rd., Bldg. C, Suite 312

Glen Ellyn, IL 60137
630.942.6591
Fax 630.7903095
www.naamm.org

NAAMM National Association of Architectural Metal Manufacturers
800 Roosevelt Rd., Bldg. C, Suite 312
Glen Ellyn, IL 60137
630.942.6591
Fax 630.7903095
www.naamm.org

NAIMA North American Insulation Manufacturers Assoc,
44 Canal Center Plaza, Suite 310
Alexandria, VA 22314
703.684.0084
Fax 703.684.0427
www.naima.org

NAPA National Asphalt Pavement Association
NAPA Building
5100 Forbes Blvd.
Lanham, MD 20706
888.468.6499
www.hotmix.org

NCMA National Concrete Masonry Assoc.
13750 Sunrise Valley Dr.
Herndon, VA 20171-4662
703.713.1900
Fax 703.713.1910
www.ncma.org

NEC National Electrical Code (NFPA)

NECA National Electrical Contractors Assoc.
3 Bethesda Metro Center, Suite 1100
Bethesda, MD 20814
301.657.3110
Fax 301.215.4500
www.necanet.org

NEII National Elevator Industry, Inc.
1677 County Route 64
P.O. Box 838
Salem, NY 127865-0838

518.854.3100
Fax 518.854.3257
www.neii.org

NEMA National Electrical Manufacturers Assoc.
1300 North 17th St., Suite 1752
Rosslyn, VA 22209
703.841.3200
Fax 703.841.5900
www.nema.org

NFPA National Fire Protection Assoc.
1 Batterymarch Park
Quincy, MA 02169-7471
617.770.3000
Fax 617.770.0700
www.nfpa.org

NHLA National Hardwood Lumber Assoc.
6830 Raleigh-LaGrange Rd.
Memphis, TN 38184-0518
901.377.1818
www.natlhardwood.org

NLGA National Lumber Grades Authority
#302 960 Quayside Dr.
New Westminister, BC V3M 6G2 Canada
604.524.2393
Fax 604.524.2893
www.nlga.org

NPA National Particleboard Assoc.
18928 Premiere Court
Gaithersburg, MD 20879-1569
301.670.0604
Fax 301.840.1252
www.pbmdf.org

NPCA National Paint and Coatings Assoc.
1500 Rhode Island Ave., NW
Washington, DC 20005
202.462.6272
Fax 202.462.8549
www.paint.org

NRCA National Roofing Contractors Assoc.
10255 W. Higgins Rd., Suite 600
Rosemont, IL 60018-5607
708.299.9070
Fax 847.299.1183

NTMA National Terrazzo and Mosaic Assoc.
201 North Maple, Suite 208
Purcellville, VA 20132
540.751.0930
Fax 540.751.0935

www.ntma.com

NWWDA National Wood Window and Door Assoc.
1400 E. Touhy Ave.
Des Plaines, IL 60018
800.223.2301
Fax 708.299.1286

PCA Portland Cement Assoc.
5420 Old Orchard Rd.
Skokie, IL 60077
847.966.6200
Fax 847.966.8389
www.cement.org

PCI Precast/Prestressed Concrete Institute
209 W. Jackson Blvd. #500
Chicago, IL 60606
312.786.0300
Fax 312.786.0353
www.pci.org

RFCI Resilient Floor Covering Institute
401 E. Jefferson St., Suite 102
Rockville, MD 20850
301.340.8580
Fax 301.340.7283
www.rfci.com

RMA Rubber Manufacturers Assoc.
1400 K St., NW, Suite 900
Washington DC 20005
202.682.4800
www.rma.org

SDI Steel Deck Institute

P.O. Box 25
Fox River Grove, IL 60021
847.458.4647
Fax 847.458.4648

SECO State Energy Conservation Office
LBJ State Office Bldg.
111 E. 17th St., Rm 1114
Austin, TX 78701
512.463.1931
Fax 512.475.2569

www.seco.cpa.stat.tx.us

SGCC Safety Glazing Certification Council

P.O. Box 730
Sackets Harbor, NY 13685
315.646.2234
Fax 315.646.2297

www.sgcc.org

SIGMA Sealed Insulating Glass Manufacturers Assoc.

401 N. Michigan
Chicago, IL 60611
312.644.8610

www.sigmaonline.org

SJI Steel Joist Institute

3127 Mr. Joe White Ave.
Myrtle Beach, SC 29577-6760
843.626.1995

Fax 843.626.5565

www.steeljoist.org

SMACNA Sheet Metal and Air Conditioning Contractors National Assoc.

4201 Lafayette Center Dr.
Chantilly, VA 20151-1209
703.803.2980

703.803.3732

www.smacna.org

SPIB Southern Pine Inspection Bureau

P.O. Box 10915
Pensacola, FL 32524-0915
850.434.2611

Fax 850.433.5594

www.spib.org

SPRI Single Ply Roofing Institute
77 Rumford Ave., Suite 3B
Waltham, MA 02453
781.647.7026
Fax 781.647.7222
www.spri.org

TCA Tile Council of America
100 Clemson Research Blvd.
Anderson, SC 29625
864.646.8453
Fax 864.646.2821
www.tileusa.com

TIMA Thermal Insulation Manufacturers Assoc.
29 Bank St.
Stanford, CT 06901
203.324.7533

(Standards now issued by NAIMA, www.naima.org)
UFAC Upholstered Furniture Action Council
Box 2436
High Point, NC 27261
919.885.5065
www.ufac.org

UL Underwriters Laboratories, Inc.
333 Pfingsten Rd.
Northbrook, IL 60062-2096
847.272.8800
Fax 847.272.8129
www.ul.com

WSFI Wood and Synthetic Flooring Institute
4415 W. Harrison St., Suite 242-C
Hillside, IL 60162
708.449.2933

WWPA Western Wood Products Assoc.
522 SW Fifth Ave., Suite 500
Portland, OR 97204-2122
503.224.3930
Fax 503.224.3934
www.wwpa.org

W.W.P.A. Woven Wire Products Assoc.

2515 N. Nordica Ave.
Chicago, IL 60635
312.637.1359
www.wovenwire.org

Government Agencies

CPSC Consumer Products Safety Commission

4330 E. West Highway
Bethesda, MD 20814
301.504.7923
Fax 301.504.0124

www.cpsc.gov

CS Commercial Standard

(U.S. Department of Commerce)

1401 Constitution Ave., NW
Washington, DC 20230

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Date 3/02/09

202.482.2000

www.commerce.gov

DOC U.S. Department of Commerce

1401 Constitution Ave., NW
Washington, DC 20230

202.482.2000

www.commerce.gov

EPA Environmental Protection Agency

1445 Ross Ave., Suite 1200
Dallas, TX 75202

214.665.6444

www.epa.gov

FS Federal Specifications (from GSA Specifications Unit WFSIS)

7th and D St., SW

Washington DC 20407

202.708.9205

www.apps.fss.gsa.gov/pub/fedspecs

GSA General Services Administration

1800 F. St., SW

Washington DC, 20405

202.708.9205

www.gsa.gov

GSC Texas Building and Procurement Commission

1711 San Jacinto
Austin, TX 78701
512.463.6363
www.tbpc.state.tx.us

NIST National Institute of Standards and Technology
100 Bureau Dr., Stop 1070
Gaithersbury, MD 20899-1077
301.975.6478
Fax 301.975.8295
www.nist.gov

OSHA Occupational Safety and Health Administration
Federal Office Building
1205 Texas Ave., Rm 806
Lubbock, TX 79401
806.472.7681
Fax 806.472.7686
www.osha.gov

PS Product Standard of NBS
(U.S. Department of Commerce)
Washington, DC 20230
202.482.2000
www.thenbs.com

USDA U.S. Department of Agriculture
1400 Independence Ave., SW
Washington, DC 20250
202.447.2791
www.usda.gov

Section 014300 Quality Assurance

1. General Requirements

- 1.1 The Contractor is responsible for controlling the quality of the Work of its forces and its subcontractors and all of the Work of the Project in general and as set forth in the Construction Documents. The Contractor shall provide qualified personnel, approved by the Owner, to perform daily supervision, reviews and inspections of subcontractor work to insure quality, accuracy, completeness and compliance.
- 1.2 The Owner will employ a testing laboratory and/or geotechnical engineering service to perform quality assurance test and to transmit copies of test reports to the Contractor. Sampling and testing that the Owner may require is specified in this section and in the various technical sections requiring quality assurance testing. The Contractor shall cooperate with the Owner's testing personnel, provide access to the work, to

- manufacturer's and fabricator's operations, furnish incidental labor and facilities and samples for test and inspection as specified.
- 1.2.1 Employment of the testing laboratory to perform quality assurance tests is for the benefit of Owner in confirming that performance and quality of the work is in conformance with the Construction Documents.
 - 1.2.2 Employment of the testing laboratory by Owner in no way relieves Contractor's obligation to perform the work in accordance with the Construction Documents and Owner's testing laboratory shall not be the same as Contractor's testing laboratory.
 - 1.2.3 The testing firm shall make all inspections and perform all tests in accordance with the rules and regulations of the building code, local authorities, the specifications of the ASTM and these Construction Documents.
 - 1.2.4 Any costs incurred by the Owner due to re-testing of materials or re-inspection of work due to non-compliance with the Construction Documents by the contractor shall be at the expense of the Contractor and shall be deducted from the next pay request accordingly.
- 1.3 Limits of testing laboratory authority: Laboratory is not authorized to:
- 1.3.1 Approve or reject any portion of the work.
 - 1.3.2 Perform any duties of the Contractor and subcontractors.
 - 1.3.3 Revoke, alter, relax, expand, or release any requirement of the Construction Documents or to approve or accept any portion of the Work, except where such approval is specifically called for in the specifications.
 - 1.3.4 Work will be checked as it progresses, but failure to detect any defective work or materials shall not, in any way, prevent later rejection when such defect(s) are discovered.
- 1.4 When requested by the Owner, the Contractor will demonstrate a material's compliance with the specifications in one of the following ways:
- Manufacturer's Certificate of Compliance
 - Mill Certificate
 - Testing Laboratory Certifications
 - Report of actual test results from Owner's designated laboratory, or a laboratory satisfactory to the Owner. Materials so tested shall be provided by the Contractor and selected by the Owner, or in the presence of the Owner, and the method of testing shall comply with the professional societies' standard specifications.
- 1.5 The Owner may require Special Inspections, Testing or Approval of certain materials or Work in addition to those clearly specified in the Construction Documents. Upon notification by the Owner of such requirements, the Contractor shall promptly arrange for such Special Inspections, Testing and Approval procedures. The costs associated with these efforts shall be borne by the Owner, except that if such materials or Work fail the initial Owner-paid inspections, tests and approvals, then subsequent tests required to prove the materials or Work suitable for inclusion in the Project Work shall be borne by the Contractor.
- 1.6 If the Contractor covers any of the Work that is required to be inspected, tested or approved by the Construction Documents, then that Work shall be uncovered, inspected, tested or approved and then recovered at the Contractor's sole expense.

- 1.7 The Contractor shall have the right to have tests performed on any material at any time for its own information and job control so long as the Owner is not charged for these tests or forced to rely on these tests when appraising quality of the materials. The tests specified in the Construction Documents for a specific material shall take precedence over any testing initiated by and paid for by the Contractor.
2. **Below Grade Inspections** - Before covering or backfilling of any improvement below grade, cover up inspections will be conducted to see that all items meet the plans and specifications. Only after all the deficiencies have been corrected will the Contractor be allowed to install any backfill.
3. **Concrete Inspections** - Before the placing of any cast-in-place concrete structure, an inspection will be conducted to see that all items meet the intent of the Construction Documents. Only after all deficiencies have been corrected will the Contractor be allowed to proceed.
4. **Wall Closure/Above-Ceiling Inspections** - Before the installation of any ceiling or the closing of walls chases, an inspection will be conducted to see that all items fully meet the contract document requirements before being covered. Only after all the deficiencies have been corrected will the Contractor be allowed to install the ceiling or close-up the wall. As a minimum, the following should be in place before an above-ceiling inspection is scheduled:
- All light fixtures installed and working;
 - All plumbing installed and insulation complete;
 - All rigid and flexible ducts installed;
 - All required valve identification tags installed;
 - All air devices installed and connected;
 - All control wiring and devices installed and connected;
 - The ceiling support structure installed.
5. **Substantial Completion Inspection (see UGC 12.1.1)**
When the Contractor feels that the work is complete and ready for the Owner's intended use, it will notify the A/E and Owner at least seven days prior to the date the Contractor is ready for a Substantial Completion Inspection. The A/E and appropriate members of the design team along with the Owner will perform a detailed inspection of the all work and furnish the Contractor with a list of incomplete or unsatisfactory items. When the Contractor has completed all the work related to these items the Pre-Final Inspection will be complete.
6. **Final Inspection & Acceptance (see UGC 12.1.2 & 12.3)**
Upon verification by the A/E and Owner that the deficiencies found during the Pre-Final Inspection have been corrected, and the work is ready for Final Inspection and Acceptance, the A/E and Owner will schedule a Final Inspection. When the work is found to be acceptable under the Construction Documents without exception and the contract is fully performed, then a Final Acceptance Notice will be issued by the A/E.
7. **One-year Warranty Inspection**
Within thirty-days prior to the expiration of the one year anniversary of the Substantial Completion date the Owner shall prepare a list of deficiencies related solely to the workmanship and material warranties provided by the Contractor through the Construction Documents. The Contractor shall make the necessary repairs and

replacements and notify the Owner that all work is complete and Owner shall review and approve the work and provide written acceptance.

8. Execution

8.1 Pier Drilling Operations

8.1.1 A representative of the soils testing laboratory shall make continuous inspections to determine that proper bearing stratum is obtained and utilized for bearing and that shafts are properly clean and dry before pouring concrete.

8.1.2 Soils testing laboratory shall furnish complete pier log showing the diameter, top and bottom elevations of each pier, casing required or not required, bell size, actual penetration into bearing stratum, elevation of top of bearing stratum, and volume of concrete used.

8.2 Reinforcing Steel Mechanical Splices

8.2.1 Visually inspect and report on the completed condition of each mechanical splice of reinforcing steel.

8.2.2 Each mechanical splice shall be visually inspected to ensure compliance with building code and the manufacturer's published criteria for acceptable completed splices.

8.2.3 Special emphasis shall be placed on inspection of the end preparation of each bar to be spliced.

8.2.4 Submit copies of manufacturer's published criteria for acceptable completed splices prior to observing mechanical splices.

8.2.5 Reports on each splice shall indicate location, size of bars and acceptability or rejection of splice. Reasoning for rejection shall be provided in the report.

8.3 Reinforcing Steel and Embedded Metal Assemblies - Inspect all concrete reinforcing steel for compliance with Construction Documents and approved shop drawings prior to placing concrete. All instances of noncompliance shall be immediately brought to the attention of the Contractor for correction and then, if not corrected, reported to the A/E.

Observe and report on the following:

- Number and size of bars;
- Bending and lengths of bars;
- Splicing;
- Clearance to forms including chair heights;
- Clearance between bars or spacing;
- Rust, form oil and other contaminants;
- Grade of steel;
- Securing, tying and chairing of bars;
- Excessive congestion of reinforcing steel;
- Installation of anchor bolts and placement of concrete around such bolts;
- Fabrication of embedded metal assemblies, including visual inspection of all welds;
- Visually inspect studs and deformed bar anchors on embedded assemblies for compliance with the Construction Documents.

8.4 Concrete Inspection & Testing

8.4.1 Receive, evaluate and certify all proposed concrete mix designs submitted by the Contractor which comply with the Construction Documents. Mix designs not complying shall be returned by the laboratory as unacceptable.

- 8.4.2 Secure composite samples of concrete at the jobsite and perform the appropriate tests as specified in the Construction Documents. Test results will be provided to the appropriate design team members, the Contractor and the Owner.
 - 8.4.3 Inspect the application of curing compounds and monitor all curing conditions to assure compliance with the Construction Documents.
- 8.5 Post-tensioning of Concrete
- 8.5.1 Verify certification of calibration of jacking equipment used in the post-tensioning operations.
 - 8.5.2 Observe and report on placement and anchorage of tendons immediately prior to placement of concrete.
 - 8.5.3 Provide a registered professional engineer experienced in posttension operations to observe and report on the placement, posttensioning and elongation measurement of each tendon.
 - 8.5.4 Observe and report on grouting of tendons noted to be bonded.
- 8.6 Masonry
- 8.6.1 Provide a qualified inspector to inspect all structural masonry work on a periodic basis.
 - 8.6.2 Inspect the following:
 - Preparation of masonry prisms for testing;
 - Placement of reinforcing;
 - Grout spaces;
 - Mortar mix operations;
 - Bedding of mortar for each type of unit and placing of units;
 - Grouting operations;
 - Condition of units before laying for excessive absorption.
 - 8.6.3 Provide a report of each inspection.
- 8.7 Structural Steel
- 8.7.1 Inspect all structural steel during and after erection for conformance with the Construction Documents and shop drawings. Any cases of insufficient bracing or guying, or other unsafe conditions shall be immediately called to the attention of the Contractor and reported to the A/E and Owner.
 - 8.7.2 Inspect the following:
 - Proper erection of all pieces;
 - Proper installation of all bolts;
 - Plumbness of structure and proper bracing;
 - Proper field painting;
 - Visual examination of all field welding;
 - Inspect all shop fabricated members, upon arrival at the jobsite;
 - Inspection of shop and field welding shall be in accordance with the AWS Structural Welding Code – Steel, latest edition;
 - Inspection of bolted construction shall be in accordance with AISC specifications for structural steel buildings;
 - Review all shop and field welder certifications;
 - Perform magnetic particle testing in accordance with ASTM E709 and at the discretion of the testing agency for all questionable welds;

- Ultrasonic test 100% of all complete penetration welds in accordance with AWS Structural Welding Code – Steel, latest edition, by ASNT Level II technicians;
 - Inspection of stud field welding shall be in accordance with AWS structural welding code latest edition.
- 8.8 Expansion Bolt Installations
 - 8.8.1 Inspect the drilling of holes and installation of expansion bolts for compliance with the Construction Documents and shop drawings.
 - 8.8.2 Verify the installation torque of the expansion bolts for compliance with the manufacturer’s installation instructions.
- 8.9 Metal Floor Deck - Field inspection shall consist of the following:
 - Check types, gauges and finishes for conformance with Construction Documents and shop drawings;
 - Exam for proper erection of all metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting and other coatings.
- 8.10 Metal Roof Deck - Field inspection shall consist of the following:
 - Check types, gauges and finishes for conformance with Construction Documents and shop drawings;
 - Exam for proper erection of all metal deck, fastenings, reinforcing of holes, deck reinforcing, miscellaneous deck supports, hanger tabs, shear studs, deck closures, painting and other coatings.

Section 014339 Site Mock-ups (see UGC 8.4)

1. General

- 1.1 The Contractor shall direct all the appropriate subcontractors in the construction of all site mock-ups for review by the Owner, Project Manager and Architect/Engineer (A/E) as required by the Construction Documents.
- 1.2 The mock-up(s) when approved by the A/E, Project Manager and Owner shall become the site reference for quality of the incorporated features of materials and workmanship.
- 1.3 The mock-up shall not be part of the work and shall remain in place until Substantial Completion, or otherwise directed by the Owner.

Section 014500 Quality Control (see 014000)

1. General Requirements

- 1.1 Quality control shall be the sole responsibility of the Contractor, unless specifically noted otherwise. The Contractor shall be responsible for all testing, coordination, start-up, operational checkout and commissioning of all items of work included in the project. All costs for these services shall be included in the Contractor’s cost of work and general conditions.
- 1.2 Specific quality control requirements for individual construction activities are specified in sections that govern those activities.
- 1.3 The Contractor employed testing agency shall comply with the requirements of ASTM C - 1021, 1077, 1093, E - 329, 543 and 548.

- 1.4 The Contractor shall develop design mixes for products to be used and have the appropriate test performed by the Contractor's employed testing agency at its own expense.

Section 014518 Field Engineering

- 1. Quality Assurance** - Surveyor Qualifications: Engage a land surveyor, registered in the State of Texas, to perform required land surveying services.
- 2. Examination** - Verify layout information shown on the construction documents, in relation to the property survey and existing benchmarks and building locations and finish floor elevations before proceeding to lay out the work. Protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 2.1 Do not change or relocate benchmarks or control points without prior written approval from the Owner.
 - 2.2 Establish and maintain a minimum of two permanent benchmarks on the site.
- 3. Performance**
 - 3.1 Work from lines and levels established by the Construction Documents. Calculate and measure required dimensions with indicated and recognized tolerances. Do not scale drawings to determine dimensions.
 - 3.2 Record deviations from required lines and levels and advise A/E immediately when deviations exceed indicated or recognized tolerances.
 - 3.3 Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines services, or other appurtenances located in or affect by construction.
 - 3.4 The as-built documents shall include a final Title I property survey.

Section 015000 Construction Facilities and Temporary Controls (see UGC 3.3.4, 8.1 & 13.1)

1. General Requirements

- 1.1 Contractor shall provide all construction facilities and temporary controls specified in this section and as necessary for the proper and expeditious prosecution of the work. The Contractor will be provided with a description of the Project Site and the Limits of Construction either by the Construction Documents, or by the Owner. At any time such a description has not been provided, the Contractor should request it of the Owner in writing.
- 1.2 The Contractor shall erect a wire mesh fence around the Project Site. The Contractor and all its personnel, assigns, material suppliers and subcontractors shall confine and limit their work to the Project Site and shall confine their construction activities to within the Limits of Construction. All areas beyond these defined areas are patrolled either by the Campus Police or by the Police Department of the City. All public and University laws, ordinances, rules and regulations shall be obeyed. No tools, construction vehicles or construction materials shall be permitted to be outside the Project Site. Loitering of construction-related personnel in areas outside the Project Site is strongly discouraged and it will be discontinued if it becomes persistent, or otherwise a nuisance to the ordinary and normal functioning of the campus. **(UGC 3.3.11)**

- 1.3 All campus roads, drives, fire lanes and sidewalks/pedestrian routes (other than those specifically given over to the Contractor for its use) must be kept open and clean at all times. The Contractor shall make advanced preparations for, and obtain security clearance for, all significant materials and equipment movements that will disrupt traffic and pedestrian flows. The Contractor shall provide all traffic controls, warning signs, barricades and flag persons needed to minimize disruptions during such approved movements. When such movements cause damage or leave debris, the Contractor shall immediately repair and clean up afterwards. **(UGC 3.3.11.3)**
- 1.4 Contractor shall pay all charges for all connections to and distribution from existing services and sources of supply.
- 1.5 Requirements of service and utility companies relating to the work shall be ascertained by Contractor, and the Contractor shall comply with all requirements, including those relating to continued protection and maintenance until completion of the work.
- 1.6 Materials and construction for construction facilities and temporary controls may be new or used, must be in adequate capacity, must not create unsafe conditions and shall not be unsightly.
- 1.7 Contractor shall relocate temporary services and facilities at its own expense, as required by progress of construction. **(See UGC 7.2.1)**
- 1.8 Contractor shall remove all temporary services and facilities when their use is no longer required or at completion of the project. **(See UGC 3.3.11)**
- 1.9 Contractor shall clean and repair damage caused by temporary services and facilities to new condition for new work and to a condition as good as or better than existing prior to start of work for existing construction projects. **(See UGC 3.3.11.3)**

2. Yard Repairs

Where compaction of the soil has occurred in turf or other plant material areas within the limits of construction, the areas shall be rejuvenated by deep cultivation of the compacted soil. After completion of construction, the Contractor shall scarify the construction site within the limits of construction to a minimum depth of eight inches, except within thirty feet of trees where it shall be a six inch depth. The Contractor will either place sod or hydro mulch on the rejuvenated areas, as may be mutually agreed to between the Owner and the Contractor, depending on the season and availability of irrigation.

3. Temporary Utilities and Services

- 3.1 The Contractor shall provide for all necessary and appropriate temporary utilities and services for execution and protection of the work.
- 3.2 Schedule of Costs and Fees for Utility Services are different on different campuses. The Contractor must review the Construction Documents carefully and communicate with the Owner to determine the status on each Project.
 - 3.2.1 **Temporary Water** – The Contractor shall provide and install temporary lines for all water required for the Work and will arrange with the Owner’s Utility Department for connection to the campus system and for services.
 - 3.2.2 **Temporary Electrical** – The Contractor shall arrange with the local Utility Company for temporary power and for metering. When using this temporary power, the Contractor shall be responsible for all related costs, including energy costs and fuel costs. If such power is available from the campus power systems, then the Contractor will make the same arrangements, but the Owner will pay for the power used unless the Contractor wastes energy and is not consuming it in a

reasonable and prudent manner. The Contractor shall not energize the permanent power on the Project it is constructing until the Owner specifically approves.

- 3.2.3 **Temporary Heating, Cooling and Ventilation** – If temporary heating/cooling/ventilation is required for the protection of the Work or the work forces, the Contractor shall provide, at its cost, Owner-approved apparatus.
- 3.2.4 **Temporary Lighting** – The Contractor shall provide adequate temporary lighting to facilitate quality workmanship and appropriate inspection of the Work. Temporary lighting provided by the Contractor also must be adequate for site security, inspections of excavations, night work if pursued and for personal and general safety of operations. Provide the following minimum standards:
 - 3.2.4.1 Provide and maintain lighting for construction operations to achieve a minimum lighting level of two watts per square foot.
 - 3.2.4.2 Provide and maintain one watt per square foot lighting for exterior staging and storage areas after dark for security purposes.
 - 3.2.4.3 Provide and maintain one-quarter watt per square foot lighting to interior work areas after dark for security purposes.
 - 3.2.4.4 Permanent building lighting may be utilized during construction.
- 3.2.5 **Temporary Services Provided by Owner** – When approved by the Owner, the Contractor may request that Project mechanical and electrical systems be put into service prior to Substantial Completion, even if only to facilitate Contractor operations. However, the Contractor shall NOT open or close any valve connecting to the campus systems without specific Owner approval. During operation of the equipment prior to Substantial Completion the Contractor shall keep the equipment in good operating condition, properly and legally flushed with chemical treatment systems, properly started and stopped, properly maintained, including regular replacement and/or cleaning of filters. Without exception the filters will be newly replaced just prior to turning the equipment over to the Owner for operation. The actual warranty periods will not start until the equipment is officially turned over to the Owner at Substantial Completion.
- 3.2.6 **Temporary Facilities/Equipment Removal** – Prior to turning the Project over to the Owner for operation and maintenance, the Contractor shall completely remove all temporary facilities and equipment from the Project Site and shall repair or replace any material, equipment, finished surfaces or landscaping that has been damaged by its activities on the site.

4. Construction Aids

- 4.1 **Material and Personnel Hoists:** The Contractor shall provide material and personnel hoist as required for normal use by all trades without charge. All necessary guards, signals and safety devices required for safe operation of these hoists shall be provided and properly maintained at all times.
- 4.2 **Stairs:** Provide temporary protective treads, handrails and wall coverings at stairways.

5. Barriers and Enclosures

- 5.1 Contractor shall construct temporary barricades, warning signs, hazard and warning lights, walks, passage-ways and similar temporary barriers and enclosures that are necessary to protect persons and property from hazards or damage due to construction operations, and required by the Owner, city, state or federal laws, ordinances or codes.

- 5.2 Contractor shall furnish and install construction fences and gates within the limits of construction, prior to beginning any other work on the project.
- 5.3 Contractor shall furnish and install movable fences as may be necessary and appropriate to facilitate execution of the work.
- 5.4 The Contractor shall be responsible for the protection of existing building surfaces (both interior and exterior), utilities, exterior structures, pavements, sidewalks, landscape, vegetation and irrigation systems. Any damage to existing areas will be repaired by the Contractor at its expense and to the satisfaction of the Owner. Such needed repairs that are not timely undertaken or completed by the Contractor may, at the Owner's sole discretion, be repaired by the Owner and the related expenses deducted from the Contract Amount by change order.
- 5.5 All existing trees, shrubs or endangered plants within the Project Site or near access ways to the Project Site, shall be protected by the Contractor as indicated on the Drawings and maintained in sound condition unless ordered by the Owner to remove them. Contractor shall furnish and install barricades, fences and guards as necessary to prevent damage to existing trees, shrubs or endangered plants indicated to remain after construction is completed. Contractor shall not remove, cut or trim any tree, shrub or endangered plant before first notifying the Owner and receiving prior approval for the action. The Contractor will be responsible for repair or replacement in kind of damaged vegetation including watering and maintenance until fully restored.
- 5.6 All fencing, gates, barricades and guards shall be maintained to be straight, level and having a neat and uniform appearance while in place. Upon removal all holes and damage caused by the placement and use of the fences shall be repaired to its original condition.
- 5.7 Contractor shall provide temporary roofing and weather tight insulated closures for openings in exterior surfaces as required to maintain specified working conditions and moisture content of all project materials.

6. Security

- 6.1 The Contractor shall provide security and facilities to protect the Work, materials and equipment from unauthorized entry, vandalism, or theft until Substantial Completion has been achieved. If deemed necessary the Contractor may, at its own expense, employ unarmed security personnel. The Contractor must first notify the Owner and provide particulars about the security firm and its personnel prior to its employment.
- 6.2 The Campus Police will not provide security for the Project Site or the areas that are given over to the Contractor's control.

7. Temporary Controls

- 7.1 Cleaning during construction: Contractor at all time shall keep the premises free from accumulation of waste materials and rubbish caused by operations for the work. Provide a collection can at each area used for eating. Pick up garbage daily. Keep project site free of garbage, trash, vermin and rodent infestation. Require each subcontractor to collect and deposit waste and rubbish caused by subcontractor operations at designated locations. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations. Protect installed equipment and seal installed ductwork and piping to prevent intrusion of dust. When the Work is within or adjacent to existing spaces that continue to be occupied, protect finishes, seal off occupied spaces and open ductwork and piping. The Contractor shall provide personnel for janitorial work

to clean up (both on the Project Site and in adjacent spaces) any dust or debris that results from its operations. (see UGC 3.3.8)

- 7.2 Noise control: In and around occupied areas, minimize use of noise producing equipment and sequence the Work to minimize its affect of occupants. Work with noise producing equipment adjacent to occupied spaces will be coordinated with the Owner. Curtail such use to accommodate specific meetings or activities when requested by the Owner.
- 7.3 Water control: Provide methods to control surface water to prevent damage to the project and adjoining properties. Control fill, grade and ditch to direct surface drainage away from excavations, pits, tunnels and other construction areas. Direct runoff to proper runoff paths.
- 7.4 Storm Water Pollution Prevention Plan (SWPPP): Contractor shall be responsible for securing the appropriate SWPPP permit and paying all related fees, penalties, fines, etc., related thereto, from Texas Commission on Environmental Quality (TCEQ). The Contractor shall implement the SWPPP plan and insure that all devices and structures are properly maintained through the course of the project. Upon completion of the project the Contractor shall provide TCEQ with a Notice of Termination within thirty days of final stabilization achievement. Refer to SWPPP for additional requirements and to ensure compliance with its requirements.
- 7.5 Pollution controls: Provide methods, means and facilities required to prevent contamination of soil, water, or atmosphere by discharge of noxious or hazardous substances from construction operations. The Contractor shall notify the Owner immediately of all pollutant spills. The Contractor shall be solely responsible for cleaning up and properly disposing of, in accordance with applicable laws and regulations, all spilled pollutants brought to the Site as a part of the Work including oil, paint, fuels, antifreeze, solvents, etc. The Contractor must keep accurate records of these clean up and disposal actions.
- 7.6 Protection of installed work: (see UGC 10.3.4.1)
 - 7.6.1 Protect installed work and provide special protection where specified in individual specification sections.
 - 7.6.2 Provide temporary and removable protection of installed products and control activity in the immediate area to prevent damage.
 - 7.6.3 Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
 - 7.6.4 Protect finished floors, stairs and other surfaces from dirt traffic, wear, damage, or movement of heavy objects.
 - 7.6.5 Prohibit traffic or storage upon waterproofed or roofed surfaces, or in the alternative obtain the manufacturer's recommendations for protection.
 - 7.6.6 Prohibit traffic from landscaped areas.

8. Parking: (see UGC 3.3.11.1)

- 8.1. Parking for workmen employed on the site shall be provided within the Limits of Construction or on such remote site as may be designated by the Owner from time to time. Any costs involved in Contractor parking shall be borne by the Contractor. The Contractor's forces shall not park on campus in areas outside the Project Site.
- 8.2. In some, but not all circumstances, Owner may provide remote parking spaces near the campus. In these cases the parking may be available for Contractor use at no cost, but permits issued by the campus police will be necessary to use this parking. In providing

remote parking the Owner will not take on any responsibility for the vehicles, or contents of the vehicles, when they are parked in the remote locations provided.

- 8.3. The contractor shall provide adequate reserved parking for the Owner's and the A/E's Project Team members who regularly visit the Project Site.
- 8.4. The Contractor shall be responsible for restoration of all pavement, curbs, signage, sidewalks, etc., damaged by the construction operations and/or the workmen.

9. Field Offices and Sheds

- 9.1. The office shall be weather tight, with lighting, electrical outlets, highspeed internet connection, telephone, heating, cooling and ventilation and equipped with sturdy furniture, a drawing table and plan racks.
- 9.2. Provide adequate space for projects meetings.

10. Temporary Toilets (see UGC 3.3.4)

- 10.1 Provide, maintain and pay for required temporary sanitary facilities and enclosures. Provide at time of project mobilization and do not remove until Substantial Completion. Locate these facilities away from public view as much as practical.
- 10.2 Clean and empty these facilities at least weekly unless it is needed more often to keep them sanitary. Post notices, remove deposited debris and take all steps necessary to keep the facilities clean and sanitary.
- 10.3 Do not use the Owner's toilet facilities, unless specifically approved by the Owner.

Section 015010 Project Signage

1. Installation of Temporary Project Signage

- 1.1 When permitted by the Owner, an exterior construction project sign shall be installed immediately after contract award. The sign will make specific reference to the Houston Community College Campus Location.
- 1.2 Prior to any construction or installation of the sign, submit to the Owner for approval a quarter scale drawing, complete with all graphics and lettering.
- 1.3 The Contractor shall ensure the exterior construction project signage is properly set-back from all street intersections and pedestrian walkways such that it does not conflict with or impede fields of view necessary to vehicular and pedestrian traffic circulation.
- 1.4 The Contractor may install one sign bearing the company name, logo, project address and point of contact.
- 1.5 The sign shall remain the property of the Contractor and shall be removed from the Project Site and legally disposed of at the completion of the Work.

- 2. Signage Dimensions and Materials** - The exterior construction project sign shall be constructed of a single four foot by eight foot sheet of three-quarter inch thick marine plywood placed on two four inch by four inch treated posts. The Architect/Engineer (A/E) shall provide the Contractor with the lettering, font background and rendering of the project, which will be installed by a professional sign company. All related costs shall be included in the General Conditions costs of Construction Manager at Risk and Design-Build contracts.

Section 015240 Construction Waste Management

1. Definitions

- 1.1 Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
 - 1.2 Disposal: Removal off-site of demolition and construction waste and deposited in landfill or incinerator acceptable to authorities having jurisdiction.
 - 1.3 Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
 - 1.4 Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
 - 1.5 Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the work.
- 2. Performance Goals** - The Contractor shall develop a waste management plan that will result in end of project rates for salvage/recycling as directed by the Owner during the Pre-construction conference.
- 3. Quality Assurance** - The Contractor shall continuously monitor the disposal, recycling, salvage and reuse of materials generated by the Project to confirm compliance with the waste management plan and provide a report to the project team at each progress meeting.
- 4. Waste Management Plan** - The Contractor shall develop a plan consisting of waste identification, waste reduction work plan and cost/revenue analysis. The plan should include separate sections for demolition and construction waste.
- 5. Salvaging Demolition Waste**
- 5.1 Salvage of items for sale or donation by the Contractor or subcontractors is not permitted.
 - 5.2 Salvaged items for Owner's use:
 - 5.2.1 Clean salvaged items;
 - 5.2.2 Pack or crate items and properly identify contents on the container;
 - 5.2.3 Store items in a secure area until delivery to Owner;
 - 5.2.4 Transport items to Owner's designated storage area.
- 6. Recycling Demolition and Construction Waste, General** - Separate recyclable waste by type at project site to maximum extent practical.
- 6.1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from the project site.
 - 6.2. Remove recyclable waste off Owner's property and transport to recycling receiver or processor within a reasonable time after an appropriate amount has been accumulated.

Section 017000 Contract Close-out

1. General (see UGC Article 12)

- 1.1 Project closeout is hereby defined to include requirements near the end of the contract time, in preparation for Substantial Completion acceptance, occupancy by Owner, release of retainage, final acceptance, final payment and similar actions evidencing completion of the work.
- 1.2 Time of closeout is directly related to completion and acceptance and may either be a single time period for the entire project, or a series of times for individual portions or phases of the project that have been certified as substantially complete at different times.
- 1.3 If the project is to be accepted in phases, whether by originally specified project scope or by subsequent agreement between the parties, then the project closeout requirements shall

pertain to each separately accepted portion or phase of the project. All required documentation for the portion of the project to be occupied early shall be furnished by the Contractor to the Owner on, or before, the date of early occupancy by the Owner. Such early occupancy of any portion of the Work will not waive the Contractor's obligations to complete the remaining Work within the Contract Time specified in the contract.

2. Record Documents (see UGC 6.2)

2.1 Record documents for project closeout shall include, but not necessarily limited to the following, which are required for substantial completion:

- As-built record drawings;
- As-built record specifications;
- Operating & maintenance manuals;
- Record approved submittals and samples;
- Certificate of no asbestos products incorporated in project;
- Completed punch lists.

3. Required Documents

3.1 Required documents for final payment to be released included final versions of all of the above and the following:

- Final release of claims and liens;
- Affidavit of payment of debts and claims;
- Consent(s) of surety;
- Certificate of Substantial Completion;
- City of Houston Certificate of Compliance (Occupancy) for Project;
- Final Change Order (if applicable);
- Final Application for Payment;
- Contractor's Letter for Confirmation of General Guarantee;
- Subcontractor and Material Suppliers' Release and Guarantee, notarized;
- Transmittal Listing Keys turn over to HCC Director of Operation and Maintenance;
- Completed SWPPP documents and Notice of Termination;
- Completed commissioning and closeout manuals.

4. Requirements for Substantial Completion (see UGC 12.1.1)

4.1 Prior to requesting Architect/Engineer (A/E) and Owner to schedule a Substantial Completion, or Pre-Final inspection, the Contractor shall complete the following and list known exceptions in the request:

- 4.1.1 Contractor's payment request should reflect a minimum of 95% completion for all applicable work.
- 4.1.2 Provide A/E, Project Manager and Owner with a complete copy of the Contractor's most current punch list.
- 4.1.3 Submit to the A/E for review a full set of as-built record drawings and specifications.
- 4.1.4 Submit to the A/E, Project Manager and Owner for review preliminary copies of the operating and maintenance manuals.
- 4.1.5 Submit release enabling Owner's full and unrestricted use of the work and access to service and utilities, including operating certificates and similar releases.

4.1.6 Contractor shall make provisions for final changeover of locks with the Owner's personnel.

4.1.7 Complete initial clean up requirements as described in the specifications.

4.2 The Contractor shall ensure that the work is ready for inspection and/or reinspection. If the work is found not to be as stated in the Contractor's punch list or the items have not been substantially corrected/completed; the inspection will be terminated.

5. Requirements for Final Acceptance (see UGC 12.1.2)

Prior to requesting Project Manager to schedule final inspection for the project, the Contractor shall complete the following:

5.1 Prepare draft payment request showing 100% completion for each line item on the schedule of values, including all appropriate releases and supporting documentation.

5.2 Submit a copy of the pre-final punch list which includes evidence that each item has been completed or otherwise resolved.

5.3 Submit final meter readings for utilities as of the time when the Owner took possession.

5.4 Transmit completed commissioning and close-out manuals to the Owner.

5.5 Complete final cleaning and touch-up.

5.6 Submit final payment request.

5.7 Submit evidence of final and continuing insurance coverage complying with applicable insurance requirements.

6. Operating and Maintenance Manuals (see UGC 6.2.3 & 6.2.4)

6.1 Contractor shall organize operating and maintenance manual information into suitable sets of manageable size, and bind into individual binders properly tabbed and indexed. Two complete copies of each bound operating and maintenance manual shall be provided to the Owner and one complete copy for the A/E.

6.2 The requirements of this section are separate, distinct and in addition to product submittal requirements that may be established by this and other sections of the specifications.

6.3. Material and equipment data required by this section is intended to include all data necessary for the proper installation, removal, normal operation, emergency operation, startup, shutdown, maintenance, cleaning, adjustment, calibration, lubrication, assembly, disassembly, repair, inspection, trouble shooting and service of the equipment or materials.

7. Record Product Submittals

During progress of the work, maintain approved copies of each product data submittal and shop drawings, and mark-up significant variations in the actual work in comparison with submitted information. A separate binder with one copy of all MSDS sheets for any and all products incorporated into the project shall be maintained during the course of the project, this binder shall be included in the record submittal documents.

8. Record Sample Submittals

Immediately prior to the date(s) of Substantial Completion, arrange for A/E, Project Manager and Owner to meet with Contractor at the project site to determine which (if any) of the submitted samples or mock-ups maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes.

9. Commissioning and Close-out Manual

The Contractor shall incorporate all commissioning and closeout documentation and/or verification not included in the operating and maintenance manuals, into a manual for transmittal to the Owner

Section 019100 General Commissioning Requirements

1. Scope of Work Included

- 1.1 It is of primary concern that all operable systems installed in the project perform in accordance with the Construction Documents and the specified Owner's operational needs. This is particularly critical for systems affecting life safety, building controls, plumbing, HVAC, lighting and power delivery systems. The process of assuring such performance is achieved is commonly referred to as "Commissioning".
- 1.2 This section establishes minimum general and administrative requirements pertaining to start-up and commissioning of equipment, devices, and building systems. Additional technical and operational requirements for particular systems and components are established in the various technical sections of the specifications. The Contractor is solely responsible for the Commissioning process.

2. Commissioning Plan

- 2.1 The Contractor shall prepare a detailed commissioning plan to identify the following:
 - 2.1.1 Project commissioning team members;
 - 2.1.2 Commissioning activities;
 - Pre-functional tests;
 - Start-up tests;
 - Functional tests;
 - System integration testing.
 - 2.1.3 The Contractor shall properly document the results of each phase of the commissioning plan and coordinate with the Architect/Engineer (A/E) and Owner to remedy any failures to achieve the specified performance levels.
- 2.2 The Contractor shall incorporate the commissioning plan into the project baseline schedule to reflect dates and durations of all commissioning activities.

3. Equipment Documentation Requirements

The Contractor shall develop a complete equipment matrix/list of all equipment, devices and systems which will be presented to the project commissioning team at the Pre-commissioning conference. The following information should be included on the matrix/list:

- Brief equipment identification text;
- Equipment or device i.d. number;
- Start-up inspection required;
- Associated building system;
- Governing specification section;
- Appropriate submittal reference number(s);
- Installation location (room number or column coordinates).

4. Test Equipment

- 4.1 The Contractor and subcontractors shall provide all specialized tools, test equipment and instruments required to execute start-up, checkout and functional performance testing of equipment under their contracts.
- 4.2 Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance within tolerances specified. A testing laboratory shall have calibrated the

test equipment within the previous twelve months. Calibration shall be NIST traceable and in accordance with the manufacturer's recommendations.

5. Pre-commissioning Meeting

- 5.1 The Contractor shall conduct the Pre-commissioning meeting and review all aspects of the commissioning plan. All documentation will be discussed and test procedures will be reviewed for approval by the Owner.
- 5.2 The Contractor shall establish target dates for each of the commissioning activities and these will be discussed at all future project progress meetings.

6. Pre-installation Meeting - The Contractor shall schedule a pre-installation meeting for the work of each major building system. This meeting shall be scheduled following approval of system submittals and prior to commencement of system installation work.

7. Contractor's Verification of Installation

The Contractor shall perform a review of all tests to confirm completion and compliance with the specified performance specifications. The Contractor shall verify:

- Each component device has been properly installed;
- All shop drawings and product data submittals have been approved;
- All valve charts, wiring diagrams, control schematics, electrical panel directories, etc. have been submitted, approved and properly installed;
- All tabulated data has been submitted for each system and/or device as required by the specifications;
- All test reports and/or certifications required have been submitted and accepted;
- Any and all deficiencies have been corrected and re-tested to conformance with the specifications.

8. Contractor's Operational Testing

- 8.1 The Contractor shall operate, or cause to be operated each system, device or equipment item, both intermittently and continuously, for the appropriate duration as set forth in the specifications and/or in accordance with the manufacturer's recommendations. These operations will be documented as a functional test.
- 8.2 Each component device and each building system shall be exercised to the full extent of its capability, from minimum to maximum, and under automatic control, where it is applicable, as well as checking manual operation.

9. Integrated System Demonstration

- 9.1 After successful completion and subsequent documentation of all system operations, the Contractor shall schedule a meeting with the project commissioning team to review the demonstration of all integrated systems within the facility.
- 9.2 The demonstration(s) shall included not only normal operating conditions over the entire operating range, but also failure modes such as major component failure and loss of power.

10. Owner Training

- 10.1 Training shall consist of classroom type sessions followed by on-site demonstrations of system operations.
- 10.2 The Contractor shall provide a minimum of eight hours of video recording of the training, with audio. The Owner will designate which portions of the training will be recorded. The video shall be produced in a professional manner.