BID NUMBER 10337

REQUEST FOR BID
SOUTHERN UNIVERSITY AND A&M COLLEGE-BATON ROUGE CAMPUS
BID DUE DATE & TIME: JUNE 3, 2025 @ 10:30 AM
CHILLER REPLACEMENT
US ARMY ROTC BUILDING
State Building ID # S02124, Site Code No. 2-17-038
State Project No. 09-671-22-01, WBS Project No. F-19002566

Engineer Firm: Parish Engineering
7600 Innovation Park Drive
Baton Rouge, LA 70820
Ph. 225-332-0222
Email: adeshotel@parisheng.com

ADVERTISEMENT DATES: 4/30/25, 5/7/25 & 5/14/25

MANDATORY PRE—BID CONFERENCE AND SITE VISIT: **MAY 16, 2025 @ 10:30 AM**
Physical Plant Department
Benjamin H. Kraft Building
515 James L. Hunt Street
Southern University SUBR Campus
Site Telephone No. 225-771-4741

DEADLINE TO SUBMIT INQUIRIES: **MAY 21, 2025 by 5:00 PM**
SUBMIT INQUIRIES TO: **Linda Antoine**
Email: linda_antoine@subr.edu

DEADLINE TO RESPOND TO INQUIRIES **MAY 26, 2025 by 5:00 PM**

Note: Responses to inquiries/Addenda are pasted on LaPAC (LA Procurement Website)
LA State Procurement website:
https://wwwcfprd.doa.louisiana.gov/OSP/LaPAC/Agency/outMain.cfm
It is the responsibility of the vendor to check LAPAC for addenda.

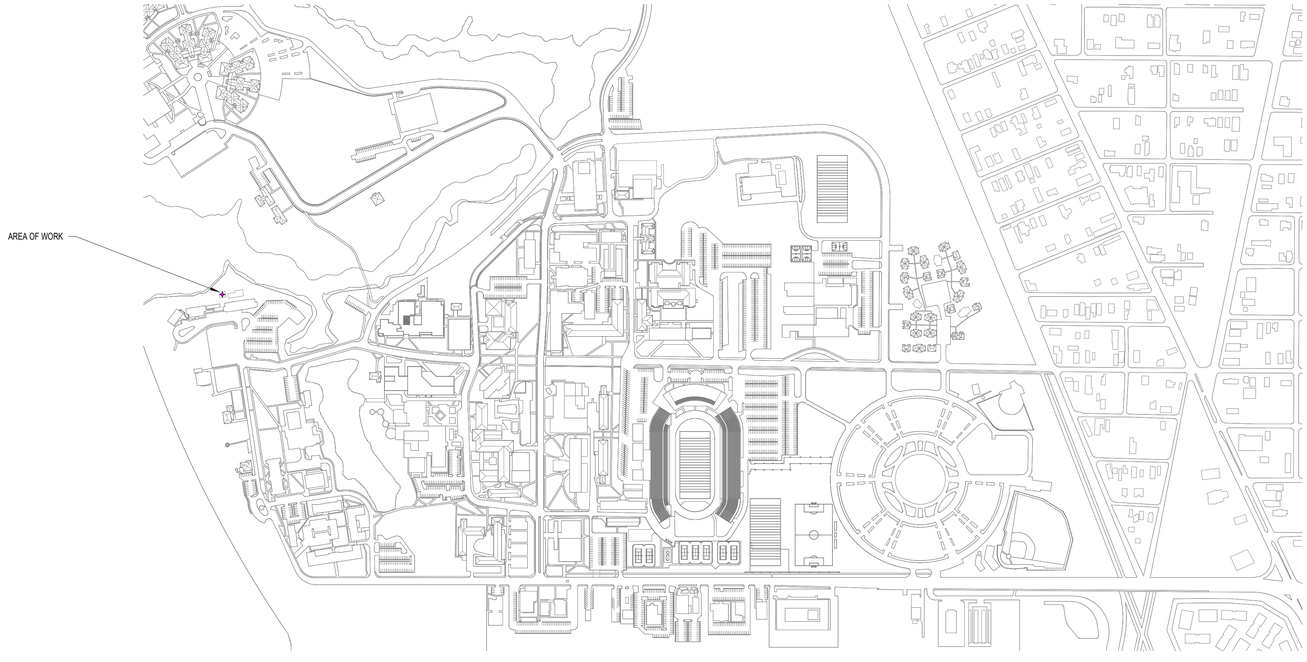
DEADLINE TO SUBMIT BID: JUNE 3, 2025 @ 10:30 AM
SUBMIT BID TO:
Linda Antoine, Director
Southern University Purchasing Department-
P. O. Box 9534 or James L. Prestage Drive
J. S. Clark Adm. Bldg. Annex, 1st Floor
Baton Rouge, LA 70813
Telephone No. 225-771-2804 or 771-4580

CHILLER REPLACEMENT
US ARMY ROTC
BATON ROUGE, LOUISIANA

PROJECT NO.: F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

SOUTHERN UNIVERSITY AND A&M COLLEGE
KENNETH DAWSON
SYSTEM DIRECTOR OF FACILITY PLANNING

CONSTRUCTION DOCUMENTS
FEBRUARY 7, 2025



1 VICINITY MAP
1" = 400'-0"

PARISH ENGINEERING
7600 Innovation Park Drive
Baton Rouge, LA 70820
225.332.0222
parisheng.com

SEAL

STATE OF LOUISIANA
GRANT T. McDONALD
LICENSED PROFESSIONAL ENGINEER
IN
CHANICAL ENGINEERING
02/07/25

PROJECT INFORMATION

CHILLER REPLACEMENT,
US ARMY ROTC
BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

REVISIONS

SHEET INFORMATION

DATE:	02/07/25
DRAWN BY:	GTM
CHECKED BY:	GTM
PROJECT #:	24-043

SHEET NAME

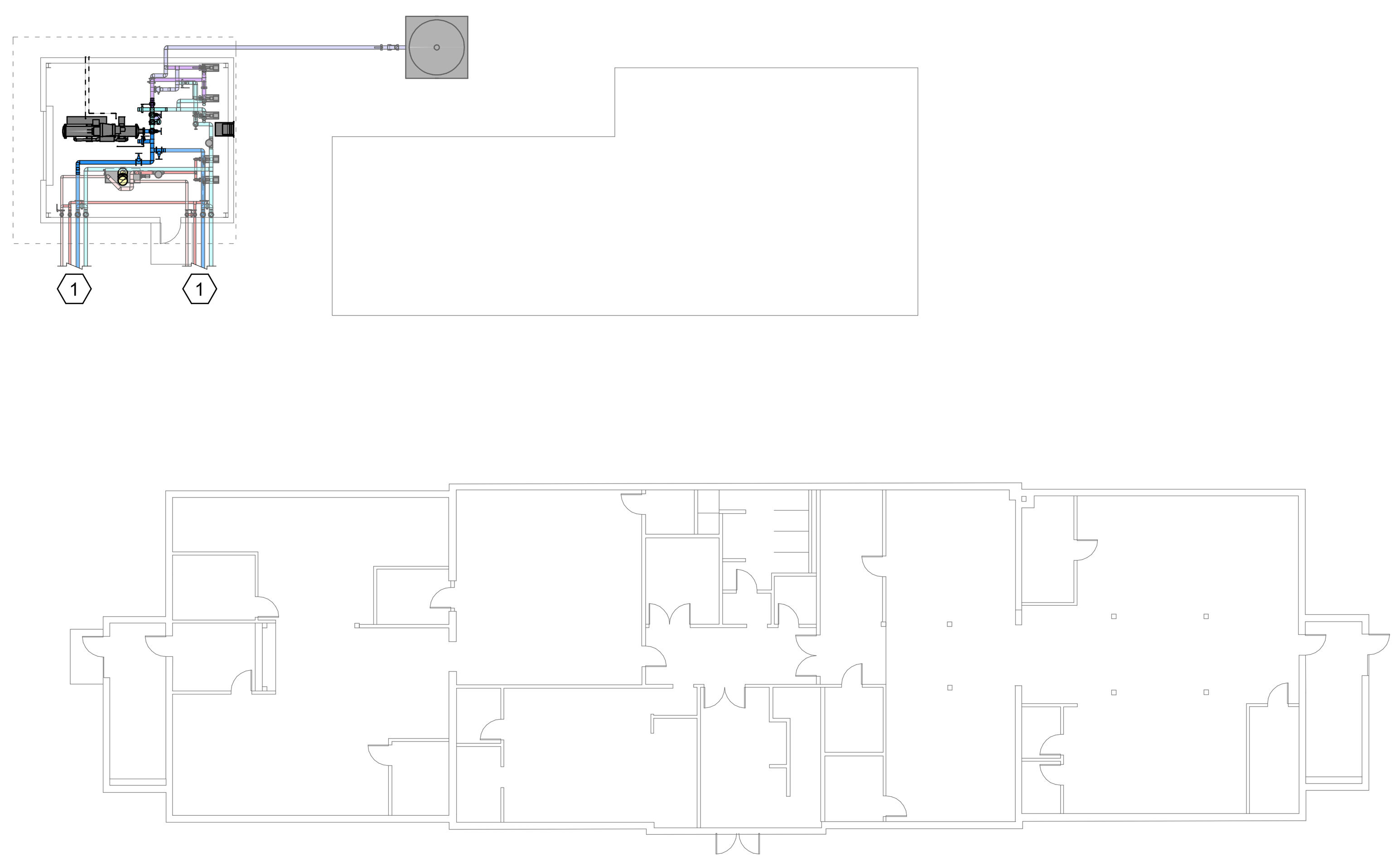
COVER

SHEET NUMBER

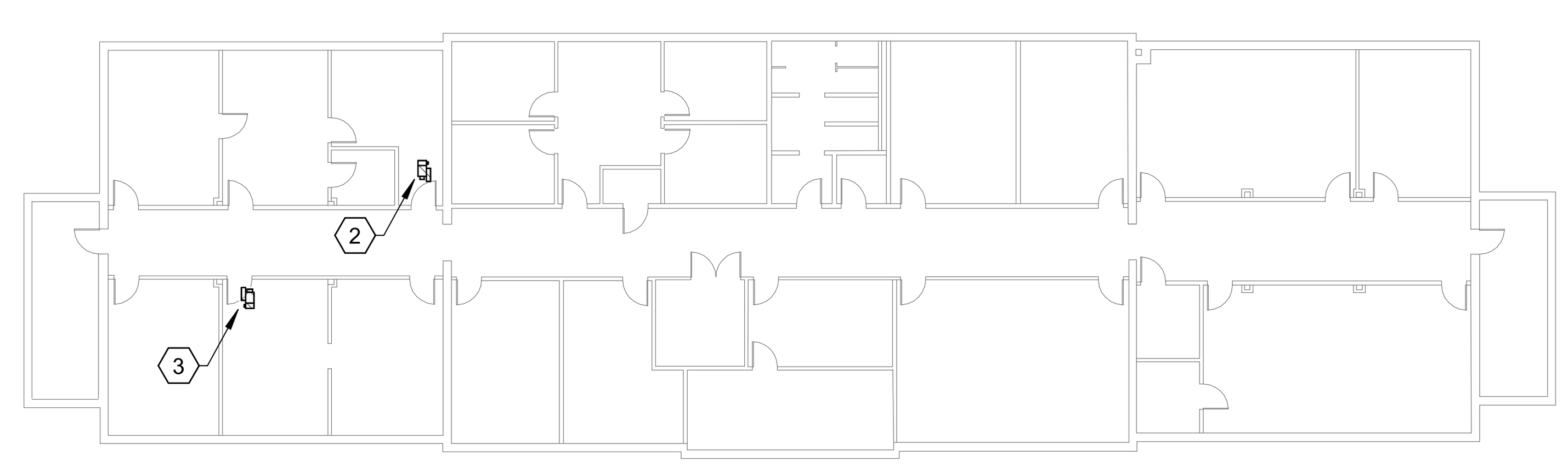
C0.0

MECHANICAL GENERAL NOTES

1. ALL WORK BY CONTRACTORS SHALL CONFORM TO ALL APPLICABLE FEDERAL, STATE AND LOCAL BUILDING CODES, INCLUDING THE CURRENT INTERNATIONAL ENERGY CONSERVATION CODE.
2. MATERIALS FURNISHED UNDER THE CONTRACT SHALL BE NEW & SHALL BEAR THE UL LABEL WHERE APPLICABLE, UNLESS NOTED OTHERWISE. ALL WORK SHALL BE GUARANTEED AGAINST DEFECTIVE MATERIALS & WORKMANSHIP FOR A PERIOD OF NOT LESS THAN ONE YEAR AFTER COMPLETION & ACCEPTANCE BY THE OWNER, LONGER IF STATED OTHERWISE ELSEWHERE IN THE SPECIFICATION.
3. CONTRACTOR SHALL INSTALL SYSTEMS WITHOUT INTERFERENCE & PROVIDE MANUFACTURER'S RECOMMENDED AIR & SERVICE CLEARANCES. CONTRACTOR SHALL COORDINATE WITH ALL TRADES & DISCIPLINES.
4. SEAL ALL FIRE WALL PENETRATIONS (DUCT, PIPE, ETC.) WITH UL-LISTED FIRE CAULK IN ACCORDANCE WITH NFPA 101.
5. MECHANICAL CONTRACTOR SHALL COORDINATE BETWEEN ELECTRICAL AND OTHER TRADES FOR PENETRATIONS AT WALLS, FLOORS AND ROOFS, EXACT EQUIPMENT LOCATIONS, AND REQUIRED EQUIPMENT SERVICE AND AIR FLOW CLEARANCE.
6. CONTRACTOR SHALL VISIT THE SITE FOR INSPECTION REGARDING ANY WORK REQUIRED TO COMPLETE THE SCOPE OF WORK FOR THE PROJECT PRIOR TO BID. THERE SHALL BE NO ADDITIONAL COST TO THE OWNER FOR BIDDERS AWARDED THE WORK FOR FAILURE TO EXAMINE SITE PRIOR TO BID.
7. CONTRACTOR SHALL REVIEW THE CONTRACT DOCUMENTS AND VISIT THE SITE AND COORDINATE DUCT, PIPE AND EQUIPMENT SIZES AND ROUTING. CONTRACTOR SHALL NOTIFY THE ARCHITECT AND ENGINEER WHERE DISCREPANCIES OCCUR BETWEEN CONTRACT DOCUMENTS AND EXISTING CONDITIONS.
8. CONTRACTOR SHALL REVIEW CEILING SPACE AND MECHANICAL ROOM SPACE AVAILABLE FOR DUCT, PIPING AND EQUIPMENT AND MAKE REQUIRED ALLOWANCES FOR THE SIZE AND ROUTING OF DUCT, PIPING AND EQUIPMENT.
9. COORDINATE EXACT LOCATION OF ALL SLAB, FLOOR, WALL AND ROOF PENETRATIONS WITH EXISTING STRUCTURAL BEAMS, JOIST AND COMPONENTS. DO NOT CUT OR MODIFY EXISTING STRUCTURAL COMPONENTS WITHOUT APPROVAL FROM STRUCTURAL ENGINEER.
10. CONTRACTOR SHALL VERIFY EQUIPMENT TO BE SUPPLIED TO PROJECT CAN BE INSTALLED IN SPACE PROVIDED AND ALL SERVICE AND AIRFLOW CLEARANCES MAINTAINED PRIOR TO ORDERING EQUIPMENT. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY MODIFICATIONS REQUIRED FOR EQUIPMENT THAT IS SUPPLIED THAT IS DIFFERENT THAN EQUIPMENT THAT IS BASIS OF DESIGN.
11. UNDER NO CIRCUMSTANCES SHALL EQUIPMENT AND RELATED SYSTEM COMPONENTS FOUND POSITIVE FOR MOLD, MILDEW, ASBESTOS, HARMFUL BACTERIA OR ANY OTHER CONTAMINATION BE PLACED INTO SERVICE.
12. COORDINATE ALL UNDERGROUND PIPING & WORK WITH EXISTING SYSTEMS, INCLUDING EXISTING UTILITIES, SEWER, GAS, DOMESTIC WATER, CHILLED/HEATING WATER, ELECTRIC DUCT BANKS AND POWER. NOT ALL EXISTING SYSTEMS SHOWN. COORDINATE ALL EXISTING SYSTEMS PRIOR TO BEGINNING WORK. MARKED UTILITIES AND EXISTING SYSTEMS DAMAGED BY THE CONTRACTOR SHALL BE REPLACED AND REPAIRED BACK TO ORIGINAL CONDITION BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE CONSTRUCTION CONTRACT.
13. MODEL NUMBERS SCHEDULED/SPECIFIED REPRESENT THE TYPE AND QUALITY OF EQUIPMENT REQUIRED TO MEET THE DESIGN REQUIREMENTS. CONTRACTOR SHALL REVIEW SUBMITTALS AND VERIFY EQUIPMENT SIZES, QUALITY AND PERFORMANCE REQUIREMENTS MEET SPECIFICATIONS PRIOR TO SUBMITTING FOR APPROVAL. EQUIPMENT THAT DIFFERS FROM BASIS OF DESIGN IS SUBJECT TO REJECTION. CONTRACTOR TO COORDINATE ALL DIFFERENCE IN EQUIPMENT WITH STRUCTURAL, ELECTRICAL AND PLUMBING CONTRACTORS.
14. ALL CONDENSATE LINES SHALL BE RIGID COPPER, INSULATED WITH CELLULAR FOAM UNLESS NOTED OTHERWISE OR SUBMITTED AND APPROVED BY MECHANICAL ENGINEER. SUPPORT WITH UNISTRUT PIPE EVERY 4' AND AT TURNS. PROVIDE NEOPRENE SLEEVES BETWEEN UNISTRUT AND COPPER CONDENSATE LINE.
15. DUCT SIZES SHOWN ARE SHEET METAL SIZES. ALLOWANCES HAVE BEEN INCLUDED FOR INTERNAL LINER WHERE APPLICABLE.
16. PROVIDE ELECTRICAL DISCONNECTS FOR MECHANICAL EQUIPMENT (VAV BOXES, FANS, VFD'S, ETC.) FACTORY INSTALLED BY EQUIPMENT MANUFACTURER UNLESS NOTED OTHERWISE. COORDINATE WITH ELECTRICAL CONTRACTOR.
17. DO NOT ROUTE PIPING CONTAINING WATER OVER ELECTRICAL EQUIPMENT.
18. PROVIDE PERMANENT LABELS FOR ALL SCHEDULED EQUIPMENT. LABELS SHALL BE MINIMUM 3/8" ENGRAVED BLACK LETTERS ON WHITE BACKGROUND, CONSTRUCTED OF MINIMUM 1" WIDE, LENGTH AS REQUIRED LAMINATED PLASTIC. SECURELY FASTENED TO EQUIPMENT WITH STAINLESS STEEL OR NONCORRODING HARDWARE. STICK ON LABELS NOT ACCEPTABLE.
19. EXHAUST OUTLETS SHALL BE LOCATED MINIMUM 10' FROM ANY AIR INTAKE OR OPERABLE BUILDING OPENING.
20. PRESSURE TEST ALL REUSED/REROUTED PIPING SYSTEMS. TESTING SHALL BE PERFORMED AT NORMAL SYSTEM OPERATING PRESSURE UNLESS INDICATED/SPECIFIED OTHERWISE. REPAIR AND RETEST AS REQUIRED UNTIL SYSTEMS ARE PROVEN TIGHT WITHOUT LEAKS.
21. ALL TESTS SHALL BE COMPLETED BEFORE ANY MECHANICAL EQUIPMENT OR PIPING INSULATION IS APPLIED.
22. LOCATE ALL TEMPERATURE PRESSURE AND FLOW MEASURING DEVICES IN ACCESSIBLE LOCATIONS WITH STRAIGHT SECTION OF PIPE OR DUCT UP AND DOWN STREAM AS RECOMMENDED BY THE MANUFACTURER.
23. REINFORCEMENT, DETAILING, AND PLACEMENT OF CONCRETE SHALL CONFORM TO ASTM 315 AND ACI 318. CONCRETE SHALL CONFORM TO ASTM C94. CONCRETE WORK SHALL CONFORM TO ACI318, PART ENTITLED "CONSTRUCTION REQUIREMENTS." COMPRESSIVE STRENGTH IN 28 DAYS SHALL BE 3,000 PSI. TOTAL AIR CONTENT OF EXTERIOR CONCRETE SHALL BE BETWEEN 5 AND 7 PERCENT BY VOLUME. SLUMP SHALL BE BETWEEN 3 AND 4 INCHES. CONCRETE SHALL BE CURED FOR 7 DAYS AFTER PLACEMENT.
24. COORDINATE ALL EQUIPMENT CONNECTION WITH MANUFACTURERS' CERTIFIED DRAWINGS. COORDINATE AND PROVIDE ALL DUCT AND PIPING TRANSITIONS REQUIRED FOR FINAL EQUIPMENT CONNECTIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DUCT AND PIPING DIMENSIONS BEFORE FABRICATION.
25. MINIMUM CONCRETE PAD THICKNESS SHALL BE 4 INCHES. PAD SHALL EXTEND BEYOND THE EQUIPMENT A MINIMUM OF 6 INCHES ON EACH SIDE UNLESS OTHERWISE DIRECTED IN THESE DOCUMENTS 15 LOCATIONS AND SIZES OF ALL FLOOR, WALL, AND ROOF OPENINGS SHALL BE COORDINATED WITH ALL OTHER TRADES INVOLVED. REFER TO TYPICAL DETAILS FOR DUCTWORK, PIPING, AND EQUIPMENT INSTALLATION.
26. INSTALL TRANSITION DUCT FROM INLET AND OUTLET OF EQUIPMENT TO DUCT SIZE SHOWN ON PLANS; CONSULT EQUIPMENT MANUFACTURER FOR INLET AND OUTLET SIZE.
27. PROVIDE ESCUTCHEONS AT ALL EXPOSED LOCATIONS WHERE PIPE PENETRATES WALL.
28. THE CONDENSATE DRAIN LINE SHALL NOT DECREASE IN SIZE FROM THE DRAIN PAN CONNECTION TO THE FLOOR DRAIN; ELEVATE UNIT TO ACCOMMODATE P-TRAP.
29. ALL EQUIPMENT AND DEVICES TO BE FURNISHED AND INSTALLED PER THE REQUIREMENTS OF CONTRACT DRAWINGS, SPECIFICATIONS, MANUFACTURERS RECOMMENDATIONS, AND ACCORDING TO CODE.
30. ALL MISCELLANEOUS ROOFTOP EQUIPMENT SUPPORTS SHALL BE ENDORSED BY BOTH THE RESPECTIVE EQUIPMENT MANUFACTURER AND ROOF SYSTEM MANUFACTURER.
31. ALL WALL APPLIED ITEMS SHALL BE INSTALLED PLUMB, LEVEL AND IN LOCATIONS DESIGNATED IN CONTRACT DOCUMENTS. ALL DEVICE COVERS AND TRIM SHALL FIT TIGHT TO WALL SURFACE ON ALL SIDES. WHERE SPECIFIC LOCATIONS FOR ITEMS NOT SHOWN OR CLEAR, CONTRACTOR SHALL OBTAIN CLARIFICATION AND DIRECTION FROM ARCHITECT AND MECHANICAL ENGINEER PRIOR TO INSTALLATION.
32. ALL EQUIPMENTS SUPPLIED TO THE PROJECT SHALL BE PER SPECIFICATIONS. OBTAINING APPROVED SUBMITTALS DOES NOT RELIEVE THE CONTRACTOR/SUPPLIER OF PROVIDING ALL FEATURES, OPTIONS AND ACCESSORIES INCLUDED WITHIN THE CONSTRUCTION DOCUMENTS.



1 MECHANICAL PLAN - OVERALL
1" = 20'-0"

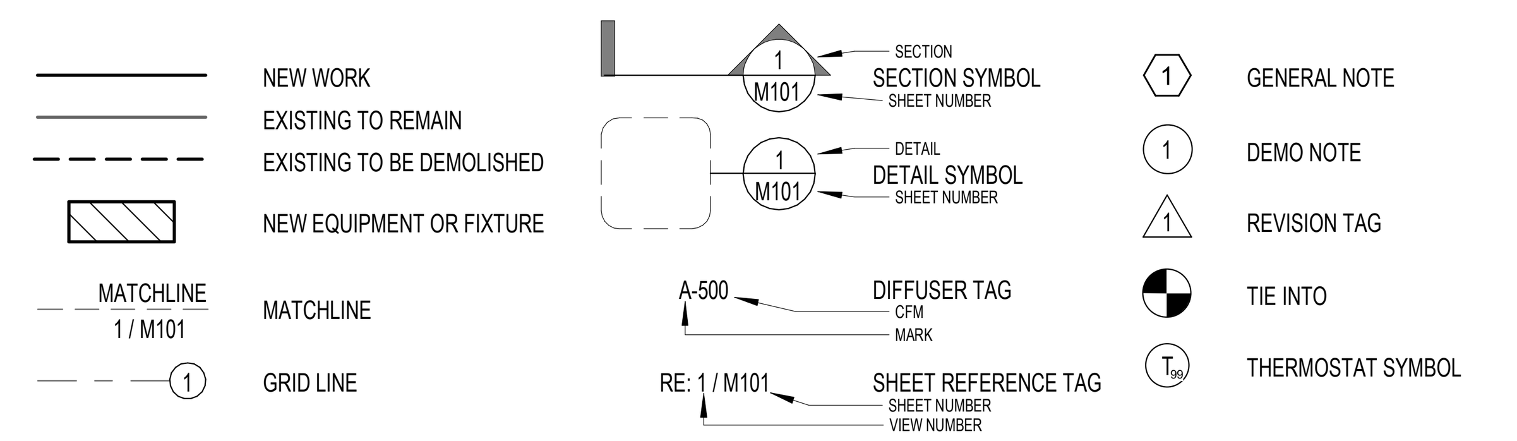


2 MECHANICAL RENOVATION PLAN - SECOND FLOOR
1" = 20'-0"

MECHANICAL SYMBOL LEGEND

(REFER TO DRAWINGS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS)

GENERAL



THERMAL DESIGN CONDITIONS

ROOM DESCRIPTION	INDOOR			OUTDOOR		
	SUMMER		WINTER	SUMMER		WINTER
	DB(°F)	RH(%)	DB(°F)	DB(°F)	WB(°F)	DB(°F)
CONDITIONED AREAS	75°	50%	70°	95°	80°	20°

DB(°F): DRY BULB
WB(°F): WET BULB
RH(%): RELATIVE HUMIDITY

INDEX - MECHANICAL SHEETS

MECHANICAL PLAN KEY NOTES

1. UNDERGROUND HYDRONIC PIPING CONTINUATION TO ROTC & NROTC BUILDINGS.
2. EXISTING 6" VAV BOX (PRICE MODEL SDV) WITH HEATING WATER REHEAT COIL. EXISTING HW COIL / VALVE ASSEMBLY LEAKING. CONTRACTOR SHALL INVESTIGATE IN FIELD & REPLACE EXISTING VALVE PACKAGE AND / OR HW COIL AS REQUIRED TO REPAIR EXISTING EQUIPMENT. FIELD VERIFY EXISTING CONDITIONS PRIOR TO BID. EXISTING VAV BOX SIZED FOR 600 CFM & 1.0 GPM. INTEGRATE INTO EXISTING CONTROLS SYSTEM WHERE VAV BOX REPLACEMENT REQUIRED.
3. EXISTING 8" VAV BOX (PRICE MODEL SDV) WITH HEATING WATER REHEAT COIL. EXISTING VAV BOX NOT OPERATING. CONTRACTOR SHALL INVESTIGATE & REPLACE EXISTING VAV BOX & VALVE PACKAGE AS REQUIRED TO REPAIR EXISTING EQUIPMENT. FIELD VERIFY EXISTING CONDITIONS. VAV BOX SIZED FOR 440 CFM & 1.7 GPM. INTEGRATE INTO EXISTING CONTROLS SYSTEM AS REQUIRED.

ABBREVIATION LEGEND

AC	AIR CONDITIONING
ACCU	AIR COOLED CONDENSING UNIT
AFF	ABOVE FINISHED FLOOR
AFS	AIR FLOW STATION
AHU	AIR HANDLING UNIT
AMB	AMBIENT
AS	AIR SEPARATOR
AV	AIR VENT
BAS	BUILDING AUTOMATION SYSTEM
BDD	BACKDRAFT DAMPER
BFP	BACKFLOW PREVENTER
BOD	BOTTOM OF DUCT
BTUH	BRITISH THERMAL UNIT PER HOUR
CC	COOLING COIL
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CHWCF	CHILLED WATER CHEMICAL FEED
CHP	CHILLED WATER PUMP
CHR	CHILLED WATER RETURN
CHS	CHILLED WATER SUPPLY
COMP	COMPRESSOR
CP	CIRCULATING PUMP
CU	CONDENSING UNIT
CT	COOLING TOWER
CV	CONTROL VALVE
CW	COLD WATER
CWCF	CONDENSER WATER CHEMICAL FEED
CWR	CONDENSER WATER RETURN
CWP	CONDENSER WATER PUMP
CWS	CONDENSER WATER SUPPLY
DB	DRY BULB TEMP (DEG F)
DDC	DIRECT DIGITAL CONTROL
DN	DOWN
DP	DIFFERENTIAL PRESSURE
DPS	DIFFERENTIAL PRESSURE SWITCH
DWG	DRAWING
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EF	EXHAUST FAN
EL	ELEVATION
ELEC	ELECTRICAL
ENT	ENTERING
ECU	ELECTRIC CONDENSING UNIT
ERU	ELECTRIC REFRIGERANT UNIT
ESP	EXTERNAL STATIC PRESSURE
ET	EXPANSION TANK
EUH	ELECTRIC UNIT HEATER
EVAP	EVAPORATOR
EX	EXHAUST
EXT	EXTERNAL
FA	FRESH AIR
FC/FCU	FAN COIL UNIT
FD	FIRE DAMPER
FT	FEET
FLA	FULL LOAD AMPS
FPM	FEET PER MINUTE
FV	FACE VELOCITY
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
GPH	GALLONS PER HOUR
GUH	GAS UNIT HEATER
HC	HEATING COIL
HP	HORSEPOWER
HR	HOUR
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
ID	INSIDE DIAMETER
IN	INCHES
KW	KILOWATTS
LVG	LEAVING
MA	MIXED AIR
MAX	MAXIMUM
MD	MOTORIZED DAMPER
MECH	MECHANICAL
NG	NATURAL GAS
MIN	MINIMUM
MVD	MANUAL VOLUME DAMPER
NC	NORMALLY CLOSED
NFPA	NATIONAL FIRE PROTECTION ASSOC.
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NOM	NOMINAL
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAF	OUTSIDE AIR FAN
OAU	OUTSIDE AIR UNITS
OS&Y	OUTSIDE STEM AND YOKE
OZ	OUNCES (PRESSURE)
PD	PRESSURE DROP
PTAC	PACKAGED TERMINAL AIR CONDITIONER
PSI	POUNDS PER SQUARE INCH
RA	RETURN AIR
REF	REFERENCE
RH	RELATIVE HUMIDITY
RHC	REHEAT COIL
RND	ROUND
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
SA	SUPPLY AIR
SD	SMOKE DAMPER
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SF	SUPPLY AIR FAN
SP	STATIC PRESSURE
SPEC	SPECIFICATIONS
TEMP	TEMPERATURE
TOD	TOP OF DUCT
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LISTED
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE
W /	WITH
W / O	WITHOUT
WB	WET BULB (DEG F)

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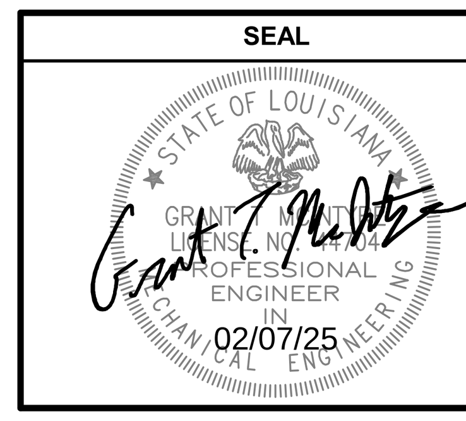
SEAL



PROJECT INFORMATION

CHILLER REPLACEMENT, US ARMY ROTC
BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

REVISIONS

SHEET INFORMATION

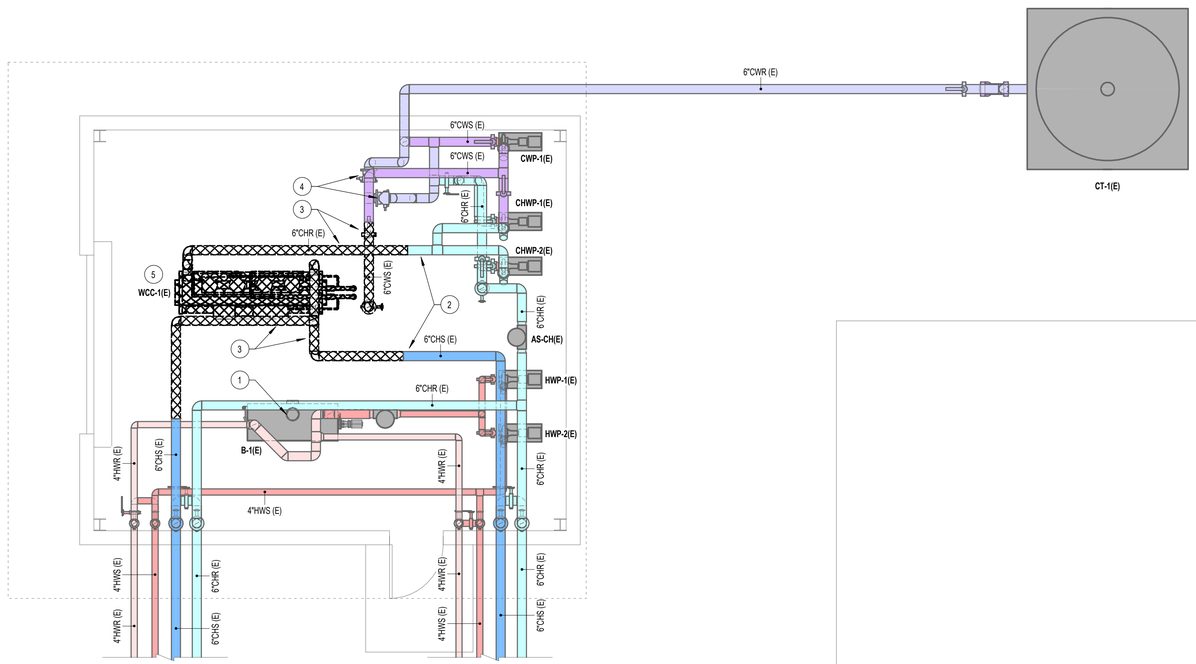
DATE:	02/07/25
DRAWN BY:	GTM
CHECKED BY:	GTM
PROJECT #:	24-043

SHEET NAME

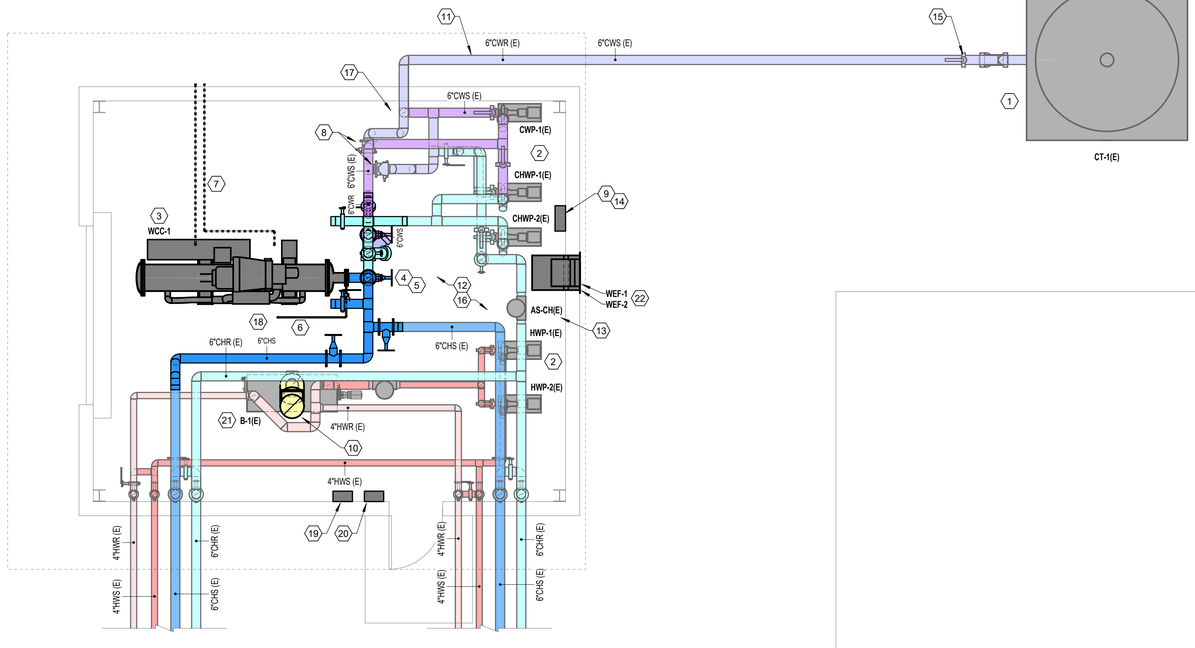
MECHANICAL COVER SHEET & OVERALL MECHANICAL PLANS

SHEET NUMBER

M0.0



1 MECHANICAL EQUIPMENT ROOM - DEMOLITION
1/4" = 1'-0"



2 MECHANICAL EQUIPMENT ROOM - RENOVATION
1/4" = 1'-0"

MECHANICAL KEY NOTES (DEMOLITION)

1. CONTRACTOR SHALL REMOVE & REPLACE EXISTING DAMAGED BOILER FLUE & OUTLET CAP. REFER TO RENOVATION DRAWINGS.
2. PROVIDE NEW TEMPORARY CHILLED WATER SUPPLY & RETURN TAPS FOR EXISTING TEMPORARY CHILLER OPERATION THIS LOCATION. ROUTE TEMPORARY CHILLED WATER LINES TO NEW TEMPORARY TAP LOCATIONS PRIOR TO COMMENCEMENT OF DEMOLITION.
3. REMOVE EXISTING PORTION OF HYDRONIC PIPING & CAP RESULTANT OPENING FOR CONNECTION TO NEW PIPING. REFER TO RENOVATION DRAWINGS.
4. EXISTING CONDENSER WATER CONTROL VALVES SHALL BE REPLACED WITH NEW DDC CONTROL VALVES.
5. EXISTING WATER COOLED CHILLER SHALL BE REMOVED. DISCONNECT ALL ASSOCIATED PIPING, ELECTRICAL, ETC AND REMOVE CHILLER. HAUL OFF SITE AS DEBRIS. REFER TO RENOVATION DRAWINGS AND NOTES FOR WORK ASSOCIATED WITH CHILLER CONNECTIONS.

MECHANICAL KEY NOTES (RENOVATION)

1. EXISTING 162.5 TON EVAPCO COOLING TOWER (MODEL # USS 19-58, SERIAL # M035316). PROVIDE FULL PREVENTATIVE MAINTENANCE & SERVICE ON COOLING TOWER, REPLACE FAN MOTOR SHEAVE - BUSHING SK SHAFT KIT & REPLACE FILL ON TOWER. HAUL OFF OLD FILL AS DEBRIS. FIELD VERIFY EXISTING CONDITIONS.
2. PROVIDE FULL PREVENTATIVE MAINTENANCE & SERVICE ON ALL FIVE (5) EXISTING HYDRONIC PUMPS (2 - CHILLED WATER, 1 CONDENSER WATER, 2 - HEATING WATER), REPLACE EXISTING PRESSURE GAUGES AT PUMPS THAT ARE NOT OPERATING. TYPICAL.
3. PROVIDE NEW WATER COOLED CHILLER & 6" HIGH HOUSEKEEPING PAD. ROUTE NEW CONDENSER & CHILLED WATER PIPING TO WCC & CONNECT. PROVIDE Y-STRAINER WITH MINIMUM 20 MESH ON INLET CHILLED & CONDENSER WATER PIPING TO WCC. PROVIDE FLEX CONNECTORS AT UNIT PIPING CONNECTION. PROVIDE PIPE HANGERS AND/OR GROUND PIPE SUPPORTS TO ENSURE NO WEIGHT CARRIED AT COIL CONNECTION.
4. PROVIDE NEW PRESSURE GAUGES & THERMOMETERS AT INLET & OUTLET CHILLED WATER PIPING MINIMUM 5 PIPE DIAMETERS AWAY FROM COIL CONNECTIONS. THERMOWELLS SHALL EXTEND MINIMUM 2" INTO PIPE.
5. PROVIDE NEW SHUT OFF VALVES ON ALL PIPING & BALANCING VALVES AT CHS & CWS OUTLET PIPING AT WCC AS CLOSE TO WCC AS FEASIBLE. PROVIDE AIR VENT ON PIPING IN ACCORDANCE TO MANUFACTURER'S RECOMMENDATIONS (TOP OF CHS).
6. ROUTE NEW DRAIN LINES WITH SHUT OFF VALVES FROM NEW WCC TO EXISTING FLOOR DRAIN & TURN DOWN WITH AIR GAP. FIELD VERIFY EXACT LOCATION OF FLOOR DRAIN.
7. ROUTE NEW RELIEF VENT PIPING FROM COMPRESSOR RELIEF PIPING CONNECTION TO EXTERIOR & TURN DOWN WITH ELBOW.
8. PROVIDE NEW CONTROL VALVES & ACTUATORS ON CONDENSER WATER PIPING. INTEGRATE INTO NEW DDC CONTROLLER FOR BYPASS CONDENSER WATER FLOW CONTROL.
9. REPLACE EXISTING CHILLER CONTROL PANEL & PROVIDE NEW DDC CONTROLLER FOR NEW BAS SYSTEM. INTEGRATE INTO WATER COOLED CHILLER, CHILLED & CONDENSER WATER PUMPS & COOLING TOWER. REFER TO SEQUENCE OF OPERATIONS FOR NEW CONTROL SYSTEM. NEW FRONT END CONTROLLER SHALL BE PROVIDED WITH GRAPHICAL USER INTERFACE & HAVE CAPABILITIES FOR INTEGRATION INTO SOUTHERN UNIVERSITY EXISTING IT SYSTEM. NEW USER INTERFACE SHALL BE INSTALLED IN ROTC MECHANICAL ROOM. COORDINATE EXACT LOCATION OF USER INTERFACE IN FIELD PRIOR TO ROUGH IN.
10. REMOVE EXISTING DAMAGED GAS FLUE & PROVIDE NEW 16" TYPE B-VENT GAS FLUE FROM BOILER. PROVIDE WITH NEW CAP & COLLAR ON ROOF & REUSE & RESEAL EXISTING ROOF FLASHING. EXISTING GAS FLUE INCLUDES TWO (2) 45° ELBOWS, ONE (1) TEE & CAP & APPROXIMATELY 12' OF PIPING. FIELD VERIFY EXISTING CONDITIONS.
11. REPAIR DAMAGED PORTION OF EXTERIOR ALUMINUM PIPING JACKET THIS AREA (APPROXIMATELY 6' LONG SECTION). FIELD VERIFY EXISTING CONDITIONS.
12. REPAIR ALL DAMAGED HYDRONIC PIPE INSULATION WITHIN MECHANICAL ROOM & PROVIDE NEW COLOR CODED PVC JACKET WITH PIPE LABELS & DIRECTIONAL FLOW ARROWS. CLEAN ALL RUST OFF EXISTING HYDRONIC PIPING THAT IS TO REMAIN & BE REUSED PRIOR TO REPAIRING INSULATION.
13. EXISTING AIR SEPARATOR, EXPANSION TANK, MAKEUP WATER ASSEMBLY & ASSOCIATED PIPING SHALL REMAIN & BE REUSED. PROVIDE PREVENTATIVE MAINTENANCE & SERVICE ON MAKE UP WATER ASSEMBLY.
14. EMS CONTROL PANEL. PROVIDE 120-1-60 ELECTRICAL SERVICE, DEDICATED 20 AMP & DATA DROP.
15. 6 COUPLINGS, 1 STRAINER & 2 VALVES WITH EXISTING FOAM INSULATION ON PIPING EXTERIOR OF BUILDING. PROVIDE 2 COATS OF UV RESISTANT COATING ON EXTERIOR PIPE ACCESSORY (VALVES, STRAINERS, COUPLINGS, ETC.) FOAM INSULATION. ARMAFLEX WB FINISH OR APPROVED EQUAL.
16. REPLACE ALL EXISTING TEMPERATURE & PRESSURE SENSORS ON PIPING. NEW BAS SYSTEM FOR CENTRAL PLANT SHALL HAVE ALL NEW CONTROL DEVICES & SENSORS. FIELD VERIFY EXISTING CONDITIONS.
17. CLEAN RUST OFF EXISTING INTERIOR CONDENSER WATER PIPING. PROVIDE PAINT (LIGHT GREEN SUPPLY, DARK GREEN RETURN), PIPE LABELS & DIRECTIONAL FLOW ARROWS.
18. CLEANOUT & JET ALL EXISTING FLOOR DRAINS WITHIN MECHANICAL ROOM. FIELD VERIFY EXISTING CONDITIONS.
19. REPLACE EXISTING REFRIGERANT LEAK MONITOR WITH NEW REFRIGERANT MONITOR & DISPLAY. NEW REFRIGERANT LEAK MONITOR SHALL READ DOWN TO 1 PPM. PROVIDED WITH NEW HORN & STROBE. EQUIPPED WITH FIVE INTERNAL RELAYS FOR FAULT, THREE LEVELS OF ALARMS, INTEGRATED BACnet FOR DDC TO CONTROL SYSTEM & NEW EXTERIOR PLASTIC SIGN ON DOOR WITH LABEL "DANGER, DO NOT ENTER IF LIGHTS ARE FLASHING". PROVIDE NEW SYSTEM WITH MANUAL EMERGENCY SHUT OFF CLEARLY IDENTIFIED (BREAK-GLASS TYPE SWITCH OR APPROVED TAMPER RESISTANT COVER) TO SHUT OFF REFRIGERANT COMPRESSORS, AUTOMATIC VALVES, ETC. REFRIGERANT MACHINERY SHALL AUTOMATICALLY SHUT OFF WHEN REFRIGERANT VAPOR CONCENTRATION EXCEEDS THE LOWER OF THE MONITORS UPPER DETECTION LIMIT OR 25% OF THE LEL. EMERGENCY MANUAL SHUT OFF ACTIVATION SHALL ENERGIZE WEF-2. NEW REFRIGERANT MONITOR SHALL BE MSA CHILLGARD 5000 OR PRIOR APPROVED EQUAL. COORDINATE WITH ELECTRICAL CONTRACTOR, TEMPERATURE CONTROLS CONTRACTOR & FAN MANUFACTURER FOR INTERCONNECTION & POWER REQUIREMENTS.
20. PROVIDE NEW CARBON MONOXIDE & HYDROCARBON GAS MONITOR LOCATED ADJACENT TO REFRIGERANT LEAK DETECTOR. PROVIDE NEW BOILER EMERGENCY SHUTDOWN SWITCH AT INTERIOR WALL ADJACENT TO DOOR WITH METAL LABEL NAMEPLATE WITH "EMERGENCY BOILER SHUTDOWN". ACTIVATION OF EMERGENCY BOILER SHUTDOWN SHALL SHUT OFF POWER & NATURAL GAS TO BOILER & ACTIVATE HORN & STROBE. CARBON MONOXIDE & HYDROCARBON DETECTOR SHALL ENERGIZE WEF-1, HORN & STROBE. PROVIDE SOLENOID VALVE ON NATURAL GAS PIPING WHERE REQUIRED FOR PROPER OPERATION OF EMERGENCY BOILER SHUTDOWN. COORDINATE WITH ELECTRICAL CONTRACTOR, TEMPERATURE CONTROLS CONTRACTOR & EXISTING CONDITIONS FOR INTERCONNECTION & POWER REQUIREMENTS.
21. EXISTING BOILER SHALL REMAIN & BE REUSED & INTEGRATED INTO NEW CONTROLS SYSTEM. CONTRACTOR SHALL FIELD VERIFY EXISTING ELECTRICAL & NATURAL GAS SERVICE & PROVIDE SOLENOID VALVE & ELECTRICAL DISCONNECTING MEANS INTERCONNECTED WITH NEW GAS MONITORY & EMERGENCY BOILER SHUTDOWN SWITCH. COORDINATE WITH ELECTRICAL CONTRACTOR & TEMPERATURE CONTROLS CONTRACTOR.
22. REPLACE TWO (2) EXISTING WALL EXHAUST FANS & OUTLET OPENINGS WITH NEW WEFs (WEF-1 INSTALLED IN EXISTING WEF LOCATION APPROXIMATELY 12" BELOW ROOF, WEF-2 INSTALLED IN EXISTING WEF LOCATION APPROXIMATELY 24" AFF). MODIFY EXISTING WALL OPENINGS & STRUCTURAL FRAMING AS REQUIRED FOR NEW WEFs INSTALLATION. FIELD VERIFY EXACT LOCATIONS OF STRUCTURE & EXISTING EQUIPMENT TO ENSURE NEW WEFs HAVE ADEQUATE SPACE & CLEARANCE FOR INSTALLATION PRIOR TO ORDERING EQUIPMENT. COORDINATE WITH ELECTRICAL CONTRACTOR & TEMPERATURE CONTROLS CONTRACTOR FOR POWER & CONTROLS REQUIREMENTS.

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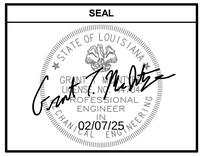


PROJECT INFORMATION

CHILLER REPLACEMENT, US ARMY ROTC BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

REVISIONS		

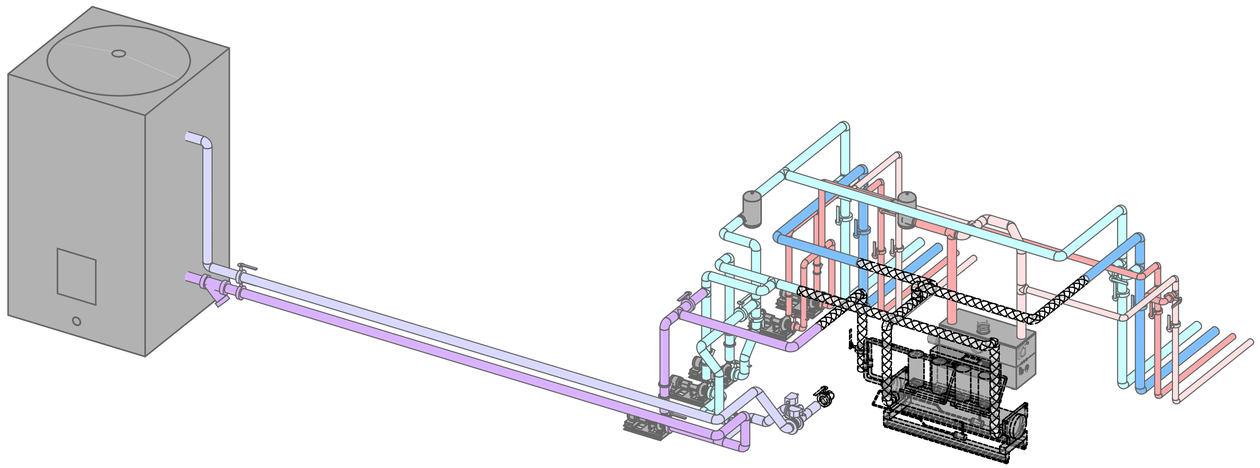
SHEET INFORMATION	
DATE:	02/07/25
DRAWN BY:	GTM
CHECKED BY:	GTM
PROJECT #:	24-043

SHEET NAME

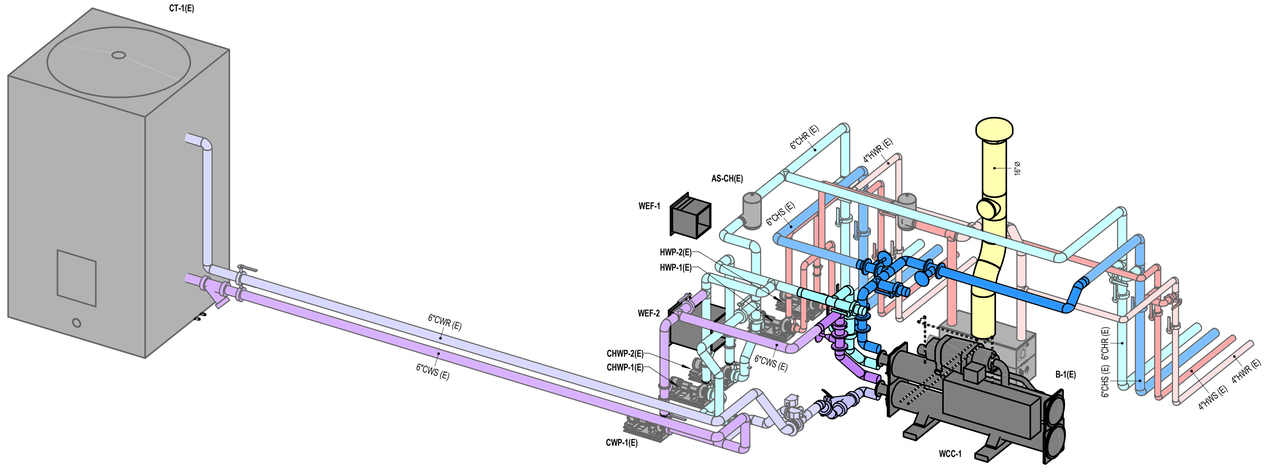
MECHANICAL PLAN

SHEET NUMBER

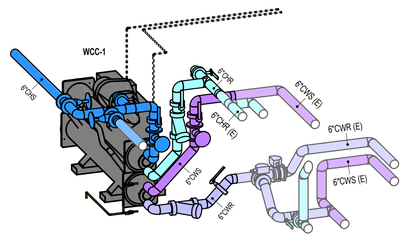
M1.0



1 MECHANICAL PLANT 3D RENDERING - DEMO



2 MECHANICAL PLANT 3D RENDERING - RENO



3 MECHANICAL PLANT 3D RENDERING - CHILLER CONNECTIONS - RENO

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SEAL

STATE OF LOUISIANA
GRANT T. McDONALD
LICENSED PROFESSIONAL ENGINEER
IN
CHANICAL ENGINEERING
02/07/25

PROJECT INFORMATION

CHILLER REPLACEMENT, US ARMY ROTC BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
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MECHANICAL 3D RENDERINGS

SHEET NUMBER

M1.1

SCHEDULE - CHILLERS - WATER COOLED

MARK	COOLING CAPACITY	AMBIENT TEMP	COMPRESSOR(S)				EVAPORATOR				CONDENSER				CHILLER ELECTRICAL SERVICE					CONTROL ELECTRICAL SERVICE			EFFICIENCY			UNIT SIZE MAXIMUMS				MANUFACTURER / MODEL
			COMPRESS OR TYPE	CAPACITY CONTROL STEPS	MINIMUM CAPACITY	QTY	FLOW RATE	EWT	LWT	WATER PD	FLOW RATE	EWT	LWT	WATER PDF	VOLTAGE	PHASE	FREQUEN CY	MCA	MOCP	VOLTAGE	PHASE	FREQUEN CY	FUSE	EER	IPLV	NPLV	LENGTH	WIDTH	HEIGHT	WEIGHT	
WCC-1	126.5 ton	95 °F	SCREW	8	10%	2	303.2 GPM	54 °F	44 °F	16.2 Feet	375.0 GPM	85 °F	95 °F	20.6 Feet	208 V	3	60 Hz	364.2 A	500 A	120 V	1	60 Hz	15 A	16.54 BTU/Wh	0.56 kW/Ton	0.5604 kW/Ton	11' - 3"	2' - 9"	5' - 5"	6600 lb	CARRIER MODEL 30HXC126, TRANE MODEL RTWD120 OR APPROVED EQUAL

NOTES:

1. R-513A CHARGE, STANDARD EVAPORATOR PASS, 2 INDEPENDENT REFRIGERANT CIRCUITS.
2. Y-DELTA STARTER.
3. ENERGY MANAGEMENT & BACnet COMMUNICATION OPTION.
4. PROVIDE NEW 6" HIGH CONCRETE HOUSEKEEPING PAD UNDER ENTIRE UNIT & 6" BEYOND.
5. PROVIDE WITH MIN LOAD CONTROL TO 10% CAPACITY.
6. PROVIDE WITH SUCTION SERVICE VALVES.
7. PROVIDE FACTORY INSTALLED 2" INSULATION ON COOLER HEAD & ALL COLD PARTS OF CHILLER. INSTALL IN MANNER TO ALLOW FOR SERVICE ACCESS AND REMOVAL OF HEAD.
8. COIL CONNECTIONS:
   - A. VICTAULIC NOZZLES FOR CONNECTION TO FIELD HYDRONIC PIPING.
   - B. PROVIDE PIPING IN MANNER TO NOT BE INSTALLED IN FRONT HEADS.
   - C. USE FLEX CONNECTIONS ON PIPING.
   - D. OFFSET PIPING TO PERMIT REMOVAL OF HEADS.
   - E. INSTALL PIPE HANGERS AND/OR PIPE GROUND SUPPORTS AS REQUIRED TO PLACE NO STRESS / WEIGHT ON WATER NOZZLE CONNECTION.
9. PROVIDE THE FOLLOWING FIELD INSTALLED OPTIONS & ACCESSORIES:
   - A. CHILLED WATER FLOW SWITCH & CONDENSER WATER SENSORS.
   - B. MINIMUM LOAD CONTROL.
   - C. NEOPRENE VIBRATION ISOLATORS.
   - D. TEMPERATURE RESET SENSOR.
   - E. EVAPORATOR HEAD INSULATION.
   - F. ACCESSORY INSULATION PACKAGE.
   - G. ENERGY MANAGEMENT MODULE, TEMPERATURE RESET & DEMAND LIMIT CONTROL.
   - H. PUMP INTERLOCK.
   - I. OCCUPANCY SCHEDULING.
   - J. EXTERNAL VIBRATION ISOLATION.
   - K. EXPANDED DISPLAY.
10. CHILLED WATER FLOW SWITCH FACTORY INSTALLED & WIRED AT INLET NOZZLE.
11. PROVIDE PRESSURE GAUGES & THERMOMETERS ON CHILLED & CONDENSER WATER PIPING AT WCC CONNECTION. THERMOWELLS SHALL EXTEND MINIMUM 2" INTO PIPE & GAUGES & THERMOMETERS INSTALLED 5 TO 10 PIPE DIAMETERS FROM UNIT COIL CONNECTIONS.
12. PROVIDE SCREEN STRAINER WITH MINIMUM 20 MESH ON CONDENSER & CHILLED WATER INLETS WITHIN 10' OF COIL CONNECTION. PROVIDE FIELD SUPPLIED AIR VENT , ISOLATION & BALANCING VALVES AT COIL CONNECTIONS AS SHOWN & RECOMMEND BY EQUIPMENT MANUFACTURER.
13. PROVIDE PRESSURE RELIEF REFRIGERANT VENT PIPING IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIOINS. PROVIDE MALE NPT TO COPPER OD BRAZE ADAPTER & 90° SHORT RADIUS ELBOW TO ADAPTER.
14. PROVIDE SEPARATE 120-1-60 ELECTRICAL CIRCUIT FOR CONTROL POWER. COORDINATE WITH ELECTRICAL CONTRACTOR.
15. PROVIDE FIELD CONTROL POWER CONNECTIONS FOR:
   - A. CHILLED WATER PUMP INTERLOCK.
   - B. REMOTE ON-OFF SWITCH (EMERGENCY SHUTDOWN).
   - C. REMOTE ALARM (AUDIBLE ALARM & HORN).
   - D. CONDENSER PUMP RELAY.
16. PROVIDE CHEMICAL TREATMENT FOR CHILLED & CONDENSER WATER SYSTEMS UPON COMPLETION OF RENOVATION WORK & PRIOR TO START UP.
17. PROVIDE FACTORY START UP & 5 YEAR UNIT, PARTS, LABOR & REFRIGERANT WARRANTY.

INTEGRATED PART LOAD VALUE (IPLV - AHRI)

COND. WATER SUPPLY TEMP (°F)	85	75	65	65
PERCENT OF FULL LOAD CAPACITY (%)	100	75	50	25
COOLING CAPACITY (TONS)	126.9	94.9	63.3	31.6
INPUT POWER (kW)	91.4	64.1	31.1	16.3
INPUT (kW/TON)	0.72	0.68	0.49	0.51
EER (BTU/Wh)	16.6	17.7	24.4	23.3

SCHEDULE - FANS

MARK	LOCATION	FAN					FAN MOTOR						WALL OPENING	BACK DRAFT DAMPER	WEIGHT	CONTROLS	MANUFACTURER / MODEL
		TYPE	AIRFLOW	MIN EXT ESP	MAX SONES	RPM	DRIVE	ENCLOSURE	POWER	VOLTS	PH	FREQ					
WEF-1	12" BELOW ROOF	SIDEWALL DIRECT DRIVE FAN	500 CFM	0.15 in-wg	5.3	1725	DIRECT	TENV	1/15 HP	120 V	1	60 Hz	16.25" x 16.25"	12" x 12"	60 lb	INTERCONNECT WITH ADJUSTABLE THERMOSTAT ON WALL & GAS MONITOR	GREENHECK MODEL SE1-10-440-VG, COOK MODEL 12XW26D153-FSC OR APPROVED EQUAL
WEF-2	24" A.F.F.	SIDEWALL DIRECT DRIVE FAN	1500 CFM	0.26 in-wg	7.6	1725	DIRECT	TENV	1/4 HP	120 V	1	60 Hz	21.25" x 21.25"	16" x 16"	100 lb	INTERCONNECT WITH CHILLER REFRIGERANT MONITOR	GREENHECK MODEL SE1-14-432-VG, COOK MODEL 14XW32D132-FSC OR APPROVED EQUAL

NOTES:

1. ACCEPTABLE MANUFACTURERS: GREENHECK, LOREN COOK, TWIN CITY.
2. STANDARD CONSTRUCTION FEATURES:
   - A. FAN PANELS OF GALVANIZED STEEL.
   - B. ALUMINUM BLADE PROPELLER.
   - C. DIE FORMED, GALVANIZED STEEL DRIVE FRAME ASSEMBLY.
   - D. CORROSION RESISTANT FASTENERS.
3. SELECTED OPTIONS & ACCESSORIES:
   - A. VARI-GREEN EC MOTOR.
   - B. DIAL FOR BALANCING
   - C. HAND/OFF/ AUTO SWITCH.
   - D. ULc/UL 705 LISTED
   - E. EXHAUST AIRFLOW DIRECTION.
   - F. WALL HOUSING, FLUSH EXTERIOR W/ OSHA GUARD FACTORY INSTALLED & COATED WITH PERMATECTOR.
   - G. MOTOR ACCESS FROM INTERIOR OF BUILDING.
   - H. NEMA-1 TOGGLE SWITCH.
   - I. FACTORY MOUNTED & WIRED JUNCTION BOX.
   - J. FACTORY INSTALLED ALUMINUM DAMPER GUARD.
   - K. FAN & ATTACHED ACCESSORIES COATED WITH PERMATECTOR.
   - L. GRAVITY OPERATED DAMPER.
   - M. 1 YEAR UNIT WARRANTY.
3. MOUNT NEW WEFs IN LOCATION OF EXISTING WEFs. MODIFY EXISTING WALL OPENING & STRUCTURAL FRAMING AS REQUIRED FOR NEW FAN SIZE & INSTALLATION. FIELD VERIFY EXACT LOCATION & CONDITIONS TO ENSURE NEW WEFs CAN BE INSTALLED IN CURRENT LOCATIONS PRIOR TO ORDERING EQUIPMENT.
4. WEF-1:
   - A. PROVIDE ADJUSTABLE THERMOSTAT ON WALL & INTERCONNECT INTO WEF-1.
   - B. WEF-1 SHALL ENERGIZE WHEN TEMPERATURE RISES ABOVE SETPOINT (INITIALLY SET TO 90°F).
5. WEF-2:
   - A. INTERCONNECT WITH NEW REFRIGERANT MONITOR. VERIFY REFRIGERANT MONITOR HAS CONTROL LINE OUTPUT FOR WEF PRIOR TO ORDERING EQUIPMENT.
   - B. WEF-2 SHALL ENERGIZE WHEN REFRIGERANT MONITOR DETECTS REFRIGERANT LEAK.

SCHEDULE - EXISTING HYDRONIC PUMPS

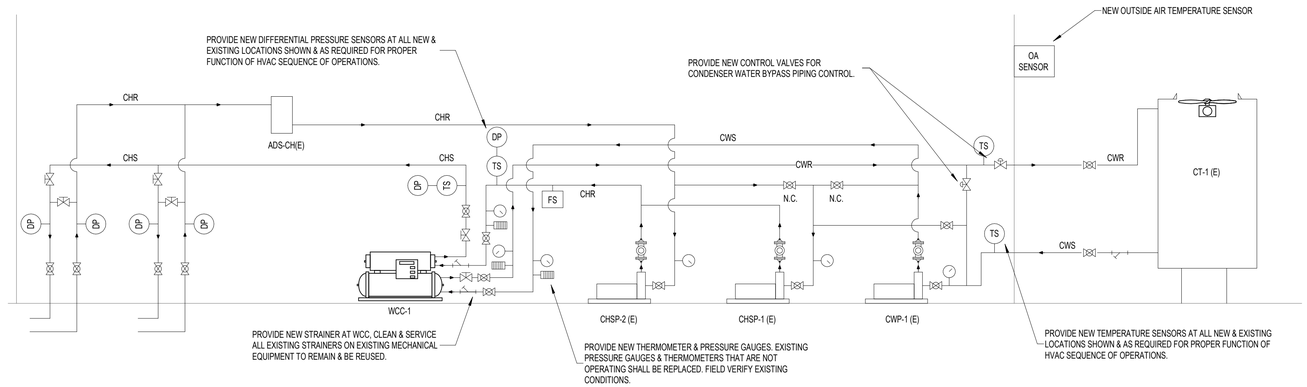
MARK	SERVICE	DESCRIPTION	FLOW	MOTOR	ELECTRIC SERVICE		
					VOLTS	PH	FREQ
CHWP-1(E)	CHILLED WATER	CONSTANT VOLUME PUMP WITH HOA SWITCH	312 GPM	5 hp	208 V	3	60 Hz
CHWP-2(E)	CHILLED WATER	CONSTANT VOLUME PUMP WITH HOA SWITCH	312 GPM	10 hp	208 V	3	60 Hz
CWP-1(E)	CONDENSER WATER	CONSTANT VOLUME PUMP WITH HOA SWITCH	390 GPM	10 hp	208 V	3	60 Hz
HWP-1(E)	HEATING WATER	CONSTANT VOLUME PUMP WITH HOA SWITCH	120 GPM	5 hp	208 V	3	60 Hz
HWP-2(E)	HEATING WATER	CONSTANT VOLUME PUMP WITH HOA SWITCH	120 GPM	5 hp	208 V	3	60 Hz

NOTES:

1. EXISTING PUMP DESIGN DATA PROVIDED FOR EASE & CLARIFICATION FOR TEST & BALANCE.
2. PROVIDE FULL PREVENTATIVE MAINTENANCE & SERVICE ON ALL HYDRONIC PUMPS.
3. REPLACE EXISTING PRESSURE GAUGES AT PUMPS THAT ARE NOT OPERATING.
4. VERIFY PROPER OPERATION OF ALL PIPING ACCESSORIES AT HYDRONIC PUMPS (ISOLATION VALVES, CHECK VALVES, ETC.). NOTIFY MECHANICAL ENGINEER ON ANY PIPING ACCESSORIES THAT ARE NOT OPERATING PROPERLY PRIOR TO COMMENCEMENT OF RENOVATION WORK.
5. PROVIDE NEW CURRENT SENSING RELAYS ON ALL HYDRONIC PUMPS FOR MONITORING, ALARM & AUTOMATIC CHANGEOVER.

SYMBOL LEGEND

CHS	CHILLED WATER SUPPLY
CHR	CHILLED WATER RETURN
CWS	CONDENSER WATER SUPPLY
CHR	CONDENSER WATER RETURN
(E)	EXISTING
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
	BUTTERFLY VALVE
	CHECK VALVE
	MOTORIZED VALVE
	Y STRAINER
TS	TEMPERATURE SENSOR
	THERMOSTAT WITH THERMOWELL
DP	DIFFERENTIAL PRESSURE SENSOR
	PRESSURE GAUGE
	TRIPLE DUTY VALVE
	BALANCING VALVE
FM	FLOW METER
	FLOW ARROW



1 PIPING & CONTROLS DIAGRAM - CHILLED & CONDENSER WATER

3/16" = 1'-0"

HVAC SEQUENCE OF OPERATIONS:

1. CENTRAL COOLING & CONDENSER WATER:
   - A. RUN CONDITIONS:
     - a. CHILLER SHALL BE IN STANDBY MODE & ENABLE UPON CALL FOR COOLING (TIME OF DAY SCHEDULE & OA SETPOINT).
     - b. CHILLER SHALL RUN ON INTERNAL CONTROLS & SAFETIES TO MAINTAIN CHILLED WATER SUPPLY TEMPERATURE SETPOINT.
     - c. CHILLER SHALL NOT ENABLE WHEN OA IS BELOW 50°F (ADJUSTABLE).
   - B. STOP CONDITIONS:
     - a. CHILLER SHALL SHUT DOWN & ENTER STANDBY MODE ONCE NO LONGER A CALL FOR COOLING (AHUs OFF AND/OR COOLING COIL VALVE POSITION, TIME SCHEDULE).
     - b. CHILLER SHALL SHUTDOWN AND GENERATE ALARM UPON REFRIGERANT LEAK STATUS.
     - c. CHILLER SHALL SHUT DOWN AND GENERATE ALARM UPON INTERNAL CONTROLS & SAFETIES.
     - d. CHILLER SHALL SHUT DOWN UPON AUTOMATIC ACTIVATION OF THE REFRIGERANT MONITOR OR MANUAL EMERGENCY ACTIVATION SWITCH.
   - C. CHILLER - PUMP INTERLOCK:
     - a. LEAD CHILLED WATER PUMP SHALL RUN FULL SPEED UPON CALL FOR COOLING. UPON PROOF OF FLOW IN CONDENSER & CHILLED WATER CIRCUIT, CHILLER SHALL BE STARTED & COOLING TOWER FAN ENABLED.
     - b. UPON CHILLER DISABLED, CHILLER SHALL STOP & PUMP SHALL STOP AFTER TIME DELAY.
   - D. CHILLER CONTROL:
     - a. CHILLER SHALL UTILIZE INTERNAL CONTROLS TO MAINTAIN ADJUSTABLE LEAVING WATER TEMPERATURE SETPOINT. SET POINT SHALL BE MANUALLY ADJUSTABLE BY OPERATOR.
     - b. TO PREVENT SHORT CYCLING, CHILLER SHALL RUN & BE OFF FOR MINIMUM ADJUSTABLE TIMES UNLESS SHUTDOWN FOR SAFETIES.
   - E. CHILLED WATER PUMPS:
     - a. CONTROLLER SHALL MEASURE DIFFERENTIAL PRESSURE OF EACH CHILLED WATER LOOP LEAVING MECHANICAL ROOM & MAINTAIN DIFFERENTIAL SETPOINT OF 12 PSI (ADJUSTABLE).
     - b. WHEN BOILER IS DISABLED, BOILER SHALL STOP & PUMP SHALL STOP AFTER TIME DELAY.
   - F. PUMP - LEAD - STANDBY OPERATION:
     - a. LEAD PUMP SHALL RUN FIRST. PUMPS SHALL BE EVALUATED FOR LEAD POSITION BASED ON RUNTIME OR DAILY, WEEKLY, MONTHLY SWAP OVER AS SELECTED BY OWNER.
     - b. ON FAILURE OF A PUMP, STANDBY PUMP SHALL RUN & PUMP FAILURE - ALARM SHALL TURN OFF.
   - G. COOILNG TOWER:
     - a. COOLING TOWER FAN SHALL NOT RUN UNLESS CHILLER IS ENABLED AND CONDENSER WATER PUMP IS ON.
     - b. CONTROLLER SHALL MONITOR COOLING TOWER CONDENSER WATER SUPPLY (BASIN) TEMPERATURE & CYCLE THE COOLING TOWER FAN TO MAINTAIN A CONDENSER WATER TEMPERATURE OF 80°F (ADJUSTABLE).
     - c. CODENSER WATER BYPASS VALVES SHALL MODULATE TO OPEN TO MAINTAIN SETPOINT WHEN CONDENSER WATER SUPPLY TEMPERATURE DROP BELOW 75°F (ADJUSTABLE).
2. REFRIGERANT LEAK MONITOR:
   - A. INTERCONNECT INTO BAS FOR MONITORING.
   - B. LEAK MONITOR SHALL HAVE MANUAL ACTIVATION SWITCH & AUTOMATIC ACTIVATION CONTROLS.
   - C. UPON MANUAL EMERGENCY SHUTDOWN SWITCH ACTIVATION OR AUTOMATIC ACTIVATION:
     - a. WEF-1 SHALL ENERGIZE UNTIL MANUAL SHUT DOWN.
     - b. BAS ALARM ACTIVATED.
     - c. HORN & STROBE ACTIVATED.
3. 3CARBON MONOXIDE & HYDROCARBON GAS MONITOR:
   - A. INTERCONNECT INTO BAS FOR MONITORING.
   - B. GAS MONITOR SHALL HAVE MANUAL ACTIVATION SWITCH & AUTOMATIC ACTIVATION CONTROLS.
   - C. UPON BOILER EMERGENCY SHUTDOWN SWITCH ACTIVATION:
     - a. BAS ALARM ACTIVATED.
     - b. HORN & STROBE ACTIVATED.
     - c. POWER & NATURAL GAS TO BOILER AUTOMATICALLY SHUT OFF.
   - D. UPON DETECTION OF CARBON MONOXIDE & HYDROCARBON GAS MONITOR:
     - a. BAS ALARM ACTIVATED.
     - b. HORN & STROBE ACTIVATED.
     - c. WEF-1 ENERGIZED.
4. WEF-1:
   - A. INTERCONNECT WITH ADJUSTABLE THERMOSTAT ON WALL & GAS MONITOR.
   - B. WEF-1 SHALL ENERGIZE WHEN TEMPERATURE RISES ABOVE 90°F (INITIAL SETPOINT).
   - C. WEF-1 SHALL ENERGIZE UPON CARBON MONOXIDE OR HYDROCARBON GAS DETECTION ABOVE LEL.
5. WEF-2:
   - A. INTERCONNECT WITH REFRIGERANT LEAK MONITOR & BAS.
   - B. WEF-2 SHALL ENERGIZE UPON AUTOMATIC OR MANUAL EMERGENCY ACTIVATION OF THE REFRIGERANT LEAK MONITOR SYSTEM.
6. CENTRAL HEATING WATER:
   - A. RUN CONDITIONS:
     - a. BOILER SHALL BE IN STANDBY MODE & ENABLE TO RUN UPON A CALL FOR HEATING, INDICATED BY TIME OF DAY SCHEDULE AND OUTSIDE AIR TEMPERATURE SETPOINT.
     - b. BOILER SHALL RUN SUBJECT TO ITS OWN INTERNAL CONTROLS & SAFETIES TO MAINTAIN A SUPPLY TEMPERATURE SETPOINT OF 180°F (ADJUSTABLE).
     - c. BOILER SHALL NOT BE ENABLED WHEN OUTSIDE AIR TEMPERATURE IS ABOVE 70°F (ADJUSTABLE).
   - B. STOP CONDITIONS:
     - a. BOILER SHALL SHUT DOWN AND ENTER STANDBY MODE WHEN NO CALL FOR HEATING, INDICATED BY TIME OF DAY SCHEDULE AND OUTSIDE AIR TEMPERATURE SETPOINT.
     - b. BOILER SHALL SHUT DOWN & GENERATE ALARM UPONE RECEIVING A REFRIGERANT LEAK DETECTION STATUS, CARBON MONOXIDE DETECTION OR HYDROCARBON DETECTION.
     - c. BOILER SHUT DOWN & GENERATE ALARM SUBJECT TO OWN INTERNAL CONTROLS & SAFETIES & MANUAL BOILER SHUTDOWN SWITCH.
   - C. BOILER - PUMP INTERLOCK:
     - a. LEAD HOT WATER PUMP SHALL RUN WHEN BOILER IS ENABLED. UPON PROOF OF FLOW OBTAINED BY CURRENT SENSING RELAY ON PUMP, BOILER SHALL BE ENABLED.
     - b. WHEN BOILER IS DISABLED, BOILER SHALL STOP & PUMP SHALL STOP AFTER TIME DELAY.
   - D. PUMP - LEAD - STANDBY OPERATION:
     - a. LEAD PUMP SHALL RUN FIRST. PUMPS SHALL BE EVALUATED FOR LEAD POSITION BASED ON RUNTIME OR DAILY, WEEKLY, MONTHLY SWAP OVER AS SELECTED BY OWNER.
     - b. ON FAILURE OF A PUMP, STANDBY PUMP SHALL RUN & PUMP FAILURE - ALARM SHALL TURN OFF.
   - E. BOILER:
     - a. BOILER SHALL UTLIZE INTERNAL CONTROLS TO MAINTAIN ADJUSTABLE LEAVING WATER TEMPERATURE SETPOINT. SETPOINT SHALL BE MANUALLY ADJUSTABLE BY OPERATOR.
     - b. TO PREVENT SHORT CYCLING, THE BOILER SHALL RUN FOR & BE OFF FOR MINIMUM ADJUSTABLE TIMES (BOTH USER DEFINED) UNLESS SHUTDOWN ON SAFETIES.
     - c. INTERCONNECT WITH CARBON MONOXIDE MONITOR, HYDROCARBON GAS MONITOR & MANUAL EMERGENCY SHUT OFF SWITCH.
     - d.

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SEAL

PROJECT INFORMATION

CHILLER REPLACEMENT, US ARMY ROTC BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.190025666; F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

REVISIONS

SHEET INFORMATION

DATE:	02/07/25
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PROJECT #:	24-043

SHEET NAME

MECHANICAL SCHEDULES & DETAILS

SHEET NUMBER

M2.0

ELECTRICAL SYMBOL LEGEND

(REFER TO DRAWINGS AND SPECIFICATIONS FOR FURTHER REQUIREMENTS)

GENERAL

1	KEYNOTE
A-1,3	CIRCUIT TAG; PANEL AND CIRCUIT DESIGNATION AS INDICATED; E.G. PANEL "A", CIRCUIT #1,3

WIRE, CONDUIT, AND RACEWAY

	ABOVE-SLAB CONDUIT & WIRE/CABLING
	BELOW-SLAB CONDUIT & WIRE/CABLING; 3/4" MINIMUM CONDUIT SIZE UON
	HOMERUN TO PANEL; TICK MARKS INDICATED NUMBER OF WIRES

DISTRIBUTION

	PANELBOARD, SWITCHBOARD, OR OTHER DISTRIBUTION EQUIPMENT AS NOTED; INSTALL WITH SUFFICIENT WORKING SPACE AND CLEARANCES TO MEET ALL REQUIREMENTS OF NEC SECTION 110.26.
GEN-ANNC	GENERATOR REMOTE ANNUNCIATOR PANEL; PROVIDE CONDUIT/CABLING TO GENERATOR AS REQUIRED PER THE MANUFACTURER'S SPECIFICATIONS.

EQUIPMENT CONNECTIONS

(PROVIDE CONDUIT AND WIRE PER THE PANEL SCHEDULE)

	FUSED SAFETY DISCONNECT SWITCH; LOCATE WITHIN SIGHT OF THE EQUIPMENT SERVED WITH 36" MINIMUM CLEAR WORKING SPACE IN FRONT OF THE SWITCH; DO NOT MOUNT DIRECTLY TO EQUIPMENT
J	JUNCTION BOX
M	JUNCTION BOX FOR MOTORIZED DAMPER
S^{M}	MOTOR RATED SWITCH WITH THERMAL OVERLOAD; LOCATE WITHIN SIGHT OF THE EQUIPMENT SERVED; DO NOT MOUNT DIRECTLY TO EQUIPMENT; WHEN LOCATED ABOVE CEILING, MOUNT TO STRUCTURAL MEMBER NEARBY.
	ELECTRICAL MOTOR, HORSEPOWER AS NOTED

LIGHTING

(PROVIDE CONDUIT AND WIRE PER THE PANEL SCHEDULE FOR POWER AND PER THE MANUFACTURER'S SPECIFICATIONS FOR CONTROLS)

Aa	LIGHT FIXTURE; UPPERCASE LETTER(S) INDICATE FIXTURE TYPE; LOWERCASE LETTER(S) INDICATE ASSOCIATED CONTROLS ID; SEE LIGHTING FIXTURE SCHEDULE FOR FIXTURE DESCRIPTIONS AND MOUNTING TYPES
X	EXIT LIGHT FIXTURE. ARROWS (IF USED) INDICATE DIRECTION. FILLED IN QUADRANT(S) INDICATE NUMBER AND ORIENTATION OF ILLUMINATED FACES. LETTER(S) INDICATE FIXTURE TYPE. SEE LIGHTING FIXTURE SCHEDULE FOR FIXTURE DESCRIPTION.
OS	CEILING MOUNTED OCCUPANCY SENSOR WITH 360° COVERAGE. LOCATE AND INSTALL PER THE MANUFACTURER'S RECOMMENDATIONS; TEST AND ADJUST SENSITIVITY AFTER INSTALLATION AND SET TIME DELAY AS REQUIRED BY THE OWNER
VS	CEILING MOUNTED OCCUPANCY SENSOR, AS ABOVE, CONFIGURED FOR VACANCY OPERATION
P	PHOTOELECTRIC CELL, EXTERIOR RATED; AIM AND SHIELD SENSOR FROM INTERIOR AND EXTERIOR ARTIFICIAL LIGHT SOURCES
S	SWITCH; SUBSCRIPT (WHEN USED): NONE - SINGLE POLE TOGGLE SWITCH 3 - THREE-WAY SWITCH D - LINEAR SLIDE DIMMER SWITCH 3D - THREE-WAY LINEAR SLIDE DIMMER SWITCH O - WALL MOUNTED OCCUPANCY SENSOR 3O - THREE-WAY SWITCH WITH OCCUPANCY SENSOR a,b,c etc. - SWITCH ID

ELECTRICAL GENERAL NOTES

1. ALL ELECTRICAL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE AS ADOPTED BY THE AHJ.
2. THE WORDS "PROVIDE" AND "PROVIDED" AS USED HEREIN SHALL BE UNDERSTOOD TO MEAN, "PROVIDE COMPLETE IN PLACE," THAT IS "FURNISH AND INSTALL". EQUIPMENT AND MATERIAL INDICATED TO BE PROVIDED SHALL BE NEW UNLESS OTHERWISE NOTED AND SHALL BE OF THE MOST SUITABLE GRADE FOR THE PURPOSE INTENDED.
3. ROUTE NEW CONDUIT AND WIRING CONCEALED IN WALLS AND CEILING WHERE POSSIBLE. COORDINATE INSTALLATION OF EXPOSED CONDUIT AND WIRING WITH THE ARCHITECT.
4. CONTRACTOR SHALL PROVIDE ELECTRICAL SERVICE TO NEW HVAC UNITS AS FURNISHED BY THE MECHANICAL CONTRACTOR. VERIFY THE EXACT ELECTRICAL REQUIREMENTS WITH THE REVIEWED HVAC SUBMITTALS PRIOR TO ORDERING ELECTRICAL EQUIPMENT.
5. BEFORE INSTALLATION, CONTRACTOR SHALL SUBMIT DETAILED DRAWINGS TO THE ENGINEER FOR REVIEW COVERING PROPOSED LOCATIONS, MOUNTING, AND ROUTING FOR ALL CONDUITS, SERVICES, FITTINGS, GROUND RODS, SUPPORTS, ETC.
6. CONTRACTOR IS RESPONSIBLE FOR OVER-CURRENT PROTECTIVE DEVICE SHORT CIRCUIT, COORDINATION, AND ARC-FLASH STUDIES.
7. MATERIALS AND MANUFACTURERS NOTED ON DRAWINGS ARE TO BE USED AS BASIS OF DESIGN TO ESTABLISH QUALITY AND PERFORMANCE STANDARDS AND SHALL BE PROVIDED AS SPECIFIED. SUBSTITUTIONS WILL BE CONSIDERED WHERE SUFFICIENT PRODUCT INFORMATION IS PROVIDED TO MAKE A PROPER EVALUATION. REVIEW OF A SUBSTITUTION IS AT THE SOLE DISCRETION OF THE PROFESSIONAL.
8. THE CONTRACTOR SHALL SUBMIT COPIES OF THE PRODUCT DATA, SHOP DRAWINGS, ETC. OF ALL MATERIALS NOTED ON THE DRAWINGS. ALL SUBMITTED PRODUCT DATA, SHOP DRAWINGS, ETC. SHALL BE MARKED WITH THE NAME OF THE PROJECT AND SHALL BEAR THE STAMP OF APPROVAL OF THE CONTRACTOR AS EVIDENCE THAT THE MATERIAL HAS BEEN CHECKED BY THE CONTRACTOR.
9. DRAWINGS SPECIFIC TO THIS TRADE DO NOT LIMIT THE RESPONSIBILITY OR WORK REQUIRED BY THE CONTRACT DOCUMENTS. REFER TO DRAWINGS AND SPECIFICATIONS OF OTHER TRADES FOR COMPLETE INFORMATION PRIOR TO BID.
10. WHERE CONFLICTS EXIST AMONG DRAWINGS, SPECIFICATIONS, AND EQUIPMENT SCHEDULES, THE MOST STRINGENT REQUIREMENT OR QUANTITY SHALL APPLY. NOTIFY THE ARCHITECT/ENGINEER OF ALL CONFLICTS FOR RESOLUTION OR INTERPRETATION.
11. NO EQUIPMENT SHALL BE ORDERED OR INSTALLED UNTIL THE PROJECT ENGINEER HAS RECEIVED A COPY STAMPED "NO EXCEPTIONS TAKEN." "NO EXCEPTIONS TAKEN" DOES NOT RELIEVE THE CONTRACTOR FROM CONFORMANCE WITH THE CONTRACT, EXTEND TO QUANTITIES OR DIMENSIONS, IMPLY THAT THE EQUIPMENT CAN BE INSTALLED OR OPERATE SATISFACTORILY, THAT THE EQUIPMENT CONTAINS ALL NECESSARY COMPONENTS, OR THAT IT WILL COORDINATE WITH OTHER REVIEWED ITEMS.
12. OMISSION FROM THIS SHEET OF ANY ITEM SHOWN ELSEWHERE IN THE PLANS DOES NOT RELIEVE THE CONTRACTOR FROM THE RESPONSIBILITY FOR ANY ASSOCIATED WORK.
13. COORDINATE INSTALLATION OF NEW ITEMS AND EQUIPMENT WITH THE OWNER'S REPRESENTATIVE AND THE WORK OF OTHER TRADES. THE CONTRACTOR SHALL INCUR ALL COSTS ASSOCIATED WITH THE RELOCATION OF EQUIPMENT CONFLICTING WITH NEW WORK BY OTHER TRADES THAT HAS NOT BEEN COORDINATED.
14. COORDINATE ALL ASPECTS OF NEW SERVICE WITH UTILITY COMPANY AND INCLUDE ALL COSTS IN BID.
15. WARNING TAPE SHALL BE INSTALLED 12 TO 18 INCHES BELOW GRADE OVER ALL CONDUITS.
16. PROVIDE 1/4" MINIMUM DIAMETER PULL ROPE. PULL ROPE SHALL NOT BE NYLON STRING.
17. FOR SERVICE ENTRANCE CONDUITS, UTILIZE LONG RADIUS (36") CONDUIT BENDS.
18. ALL CONDUIT RISERS FROM UNDERGROUND SHALL HAVE RIGID METAL ELLS AND RISERS.
19. PRIOR TO CONSTRUCTION, VERIFY THE LOCATION OF ALL EXISTING UNDERGROUND UTILITIES. AVOID DISTURBANCE OF EXISTING UTILITIES NOT INCLUDED IN THIS PROJECT.
20. SET SCREW CONDUIT FITTINGS SHALL NOT BE PERMITTED.

LIGHTING GENERAL NOTES

1. VERIFY THE EXACT LOCATION OF ALL LIGHTING SWITCHES WITH THE ARCHITECT PRIOR TO ROUGH-IN.
2. VERIFY THE EXACT LOCATION OF ALL LIGHTING FIXTURES WITH THE ARCHITECTURAL REFLECTED CEILING PLAN PRIOR TO ROUGH-IN.
3. VERIFY THE EXACT LOCATION OF CEILING MOUNTED OCCUPANCY SENSORS WITH THE MANUFACTURER'S SPECIFICATIONS PRIOR TO INSTALLATION FOR MAXIMUM PERFORMANCE.
4. EMERGENCY FIXTURES AND EXIT FIXTURES SHALL BE CONNECTED TO THE NEAREST LIGHTING CIRCUIT. BRANCH CIRCUIT WIRING TO EXIT FIXTURES AND TO BATTERY INVERTERS WITHIN FIXTURES WITH INTEGRAL BATTERY UNITS SHALL BE UNSWITCHED, CONNECTED AHEAD OF ANY CONTROL SWITCHING.
5. WALL MOUNT TYPE "Z" FIXTURES ABOVE DOOR AS SHOWN ON DRAWINGS. COORDINATE WITH THE ARCHITECT PRIOR TO ROUGH-IN.
6. MOUNT TYPE "EM" FIXTURES 8'-0" AFF UNLESS OTHERWISE NOTED.
7. VERIFY THE CEILING TYPES FOR ALL LIGHT FIXTURES TO BE FLUSH MOUNTED OR SUSPENDED AND ADJUST FIXTURE MOUNTING TYPES IN ACCORDANCE WITH THE CEILING TYPE, AS REQUIRED. CONTRACTOR SHALL PROVIDE ALL REQUIRED MOUNTING HARDWARE.
8. ALL VANITY FIXTURES SHALL BE MOUNTED WITH 0'-3" OF SPACE BETWEEN THE BOTTOM OF THE FIXTURE AND THE TOP OF THE MIRROR UNLESS OTHERWISE NOTED.
9. VERIFY THE EXACT MOUNTING LOCATION FOR ANY PHOTOELECTRIC CELLS WITH THE ARCHITECT PRIOR TO ROUGH-IN. ALL PHOTOELECTRIC CELLS MUST FACE NORTH.
10. CONTRACTOR SHALL CONFIRM COMPATIBILITY OF ALL LIGHTING CONTROL DEVICES/SWITCHES/DIMMERS WITH LIGHTING FIXTURES AND BALLASTS/DRIVERS PRIOR TO SUBMITTAL.
11. COORDINATE LOCATION OF LIGHT FIXTURES IN MECHANICAL ROOMS WITH DIVISION 15/23 PLANNED EQUIPMENT LOCATION AND DUCT INSTALLATION. WALL MOUNT LIGHTS OR PROVIDE PENDANT MOUNTING AS REQUIRED TO ILLUMINATE THE SPACE.
12. WHERE MULTIPLE OCCUPANCY SENSORS ARE SHOWN IN THE SAME AREA, MOTION DETECTION BY ONE SENSOR SHALL ILLUMINATE ALL LIGHTING IN THE RESPECTIVE AREA.

SPECIAL SYSTEMS GENERAL NOTES

1. VERIFY EXACT LOCATION, VOLTAGE, PHASE, AMPERAGE, ETC. OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ORDERING ELECTRICAL GEAR.
2. PROVIDE AN ADDITIONAL 10%, OR ONE (1), WHICHEVER IS GREATER, OF THE FOLLOWING DEVICES WHICH ARE INCLUDED IN THE PROJECT, AND INSTALL THEM AT THE DIRECTION OF THE ARCHITECT, ENGINEER, OR AHJ DURING THE COURSE OF THE PROJECT. PROVIDE ALL REQUIRED CONDUIT, INTERCONNECTIONS, CONDUCTORS, PROGRAMMING, ETC. AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER: INITIATING DEVICES (PULL STATIONS, SMOKE DETECTORS, THERMAL DETECTORS, ETC.), NOTIFICATION APPLIANCES (STROBES, HORN STROBES, SPEAKER STROBES, SPEAKERS, DUCT DETECTORS, ETC.), AND MONITORING MODULES.
3. VERIFY REQUIRED QUANTITY OF DUCT DETECTORS WITH DUCTWORK CONFIGURATION AS IT IS ACTUALLY INSTALLED. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.

DEMOLITION GENERAL NOTES

1. THE LOCATIONS OF EXISTING CIRCUITS AND EQUIPMENT ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING ELECTRICAL DEVICES, EQUIPMENT, AND WIRING BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE CAUSE BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL EXISTING PORTIONS OF THE ELECTRICAL SYSTEMS.
2. THE CONTRACTOR SHALL REMOVE SUCH EXISTING WORK AS CALLED FOR ON THE DRAWINGS OR AS REQUIRED TO CLEAR THE AREAS OF NEW CONSTRUCTION.
3. ALL EQUIPMENT REMOVED THAT IS NOT BEING REUSED SHALL REMAIN THE PROPERTY OF THE OWNER OR SHALL BE DISPOSED OF AS REQUIRED.
4. EXCEPT AS OTHERWISE NOTED, ALL EXISTING ELECTRICAL WORK WHICH WILL NOT BE RENDERED OBSOLETE AND WHICH MAY BE DISTURBED DUE TO ANY CHANGES REQUIRED UNDER THIS CONTRACT, SHALL BE RESTORED TO ITS ORIGINAL OPERATING CONDITION. OTHER ELECTRICAL WORK OR MATERIAL RENDERED OBSOLETE SHALL BE ABANDONED WHERE CONCEALED AND REMOVED WHERE EXPOSED. OLD, UNUSED WIRING AND DEVICES SHALL BE REMOVED FROM THE ABANDONED (CONCEALED) CONDUITS. OUTLETS SHALL BE PROVIDED WITH BLANK COVERS. ANY CONDUITS STUBBED OUT OF MASONRY SURFACE SHALL BE CUT INTO SURFACE AND PATCHED.
5. WHERE EXISTING ELECTRICAL WORK INTERFERES WITH NEW WORK AND WHERE SUCH INSTALLATIONS ARE TO REMAIN IN USE, THE INSTALLATIONS SHALL BE DISCONTINUED AND RELOCATED AND/OR RECONNECTED TO COORDINATE WITH THE WORK INDICATED ON THE CONTRACT DRAWINGS AS SPECIFIED.
6. WHERE EXISTING RACEWAYS THAT ARE NOT TO BE REUSED INTERFERE WITH NEW WORK, THESE RACEWAYS SHALL BE REMOVED BACK TO THE NEAREST JUNCTION BOX OR PULL BOX AND THE OPENINGS BLANKED.
7. CONTRACTOR SHALL MAINTAIN CONTINUITY OF BRANCH CIRCUITS SERVING MULTIPLE ITEMS OF WHICH ONE OR MORE ARE BEING DEMOLISHED. CONDUCTORS AND CONDUITS FOR THOSE ITEMS BEING DEMOLISHED SHALL BE REMOVED AS FAR AS PRACTICABLE.
8. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REMOVE ALL EXISTING ELECTRICAL EQUIPMENT AND DATA WIRING NOT REUSED OR NOT NECESSARY FOR THE COMPLETION OF THIS PROJECT.
9. IF ANY BRANCH CIRCUIT WIRING FEEDING EQUIPMENT TO REMAIN IN PLACE FOR REUSE IS DAMAGED DURING CONSTRUCTION, THE CONTRACTOR SHALL REPLACE THE NEW BRANCH CIRCUIT WIRING OF THE SAME SIZE AND TYPE AS THAT OF THE EXISTING AT NO COST TO THE OWNER.
10. EXISTING DEVICES ARE SHOWN IN GRAY. CONDUIT AND WIRING ARE NOT GENERALLY SHOWN AND SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. ADDITIONAL DEMOLITION WORK AND CLARIFICATION OF INDICATED WORK WILL BE GIVEN BY RFI.
11. COORDINATE THE REMOVAL AND REINSTALLATION (OR PROTECTION IN PLACE) OF EXISTING ELECTRICAL EQUIPMENT AND DEVICES WITH THE WORK OF OTHER TRADES TO REPLACE OR REFINISH EXISTING WALLS AND CEILINGS.
12. WHERE EXISTING CIRCUITS ARE BEING REMOVED IN EXISTING PANELS, PROVIDE A NEW, NEATLY TYPED DIRECTORY WHICH INDICATES WHERE "SPARE" BREAKERS ARE LOCATED. ANY EXISTING BREAKERS THAT ARE NOT FEEDING DEVICES SHALL REMAIN AND BE LABELED AS A "SPARE."
13. WHERE NEW LOADS ARE CONNECTED TO EXISTING PANELS, AND WHERE LOADS ARE REARRANGED IN EXISTING PANELS AS PART OF THIS PROJECT, UPDATE THE RESPECTIVE PANEL DIRECTORY SO AS TO PROVIDE A COMPLETE, ACCURATE, AND TYPEWRITTTEN PANEL SCHEDULE. THE NEW PANEL SCHEDULE SHALL INCORPORATE ALL EXISTING LOADS, INCLUDING LOADS "EXISTING TO REMAIN". PROVIDE ALL REQUIRED TESTING AND INVESTIGATIONS NECESSARY TO ACCOMPLISH THIS WORK.

INDEX - ELECTRICAL SHEETS

ABBREVIATIONS

A	AMPERE(S)	CATV	CABLE TELEVISION	EF	EXHAUST FAN	FOC	FIBER OPTIC CABLE	MCB	MAIN CIRCUIT BREAKER	NO	NORMALLY OPEN	SF	SUPPLY FAN	UGS	UNDERGROUND SECONDARY
AC	ABOVE COUNTER (6" ABOVE BACKSPLASH)	CB	CIRCUIT BREAKER	EGC	EQUIPMENT GROUNDING CONDUCTOR	G, GND	GROUND	MCM/KCMIL	1,000 CIRCULAR MILS	NU	WEATHERPROOF IN-USE COVER	S/N	SOLID NEUTRAL	UH	UNIT HEATER
AF	AMPERE(S) FUSED	CKT	CIRCUIT	EMER.	EMERGENCY	GEC	GROUNDING ELECTRODE CONDUCTOR	MECH.	MECHANICAL	OH	OVERHEAD	SPD	SURGE PROTECTIVE DEVICE	UL	UNDERWRITER'S LABORATORY, INC.
AFCI	ARC FAULT CIRCUIT INTERRUPTER	CLG	CLG	EMT	ELECTRICAL METALLIC TUBING	GFCI	GROUND FAULT CIRCUIT INTERRUPTER	MH	MANHOLE	OHE	OVERHEAD ELECTRICAL	STD	STANDARD	UON	UNLESS OTHERWISE NOTED
AFF	ABOVE FINISHED FLOOR	CORR	CORRIDOR	EQ	EQUAL	GRS	GALVANIZED RIGID STEEL	MLO	MAIN LUGS ONLY	OSP	OUTSIDE PLANT	TEL	TELEPHONE	V	VOLTS
AFG	ABOVE FINISHED GRADE	CT	CURRENT TRANSFORMER	EQUIP.	EQUIPMENT	HH	HANDHOLE	MOCP	MAXIMUM OVERCURRENT PROTECTION	UPP	UTILITY POWER POLE	TELECOM	TELECOMMUNICATIONS	VAC	VOLTS ALTERNATING CURRENT
AIC	AMP SYMMETRICAL INTERRUPTING CAPACITY RMS	CTRL	CONTROLLER	EWC	ELECTRIC WATER COOLER	HP	HORSEPOWER	MTD	MOUNTED	PB	PULL BOX	TGB	TELECOMMUNICATIONS GROUND BUS	VDC	VOLTS DIRECT CURRENT
AT	AMPERE(S) TRIP	D	TO BE DEMOLISHED	EWH	ELECTRIC WATER HEATER	KAIC	1,000 AMP SYMMETRICAL INTERRUPTING CAPACITY RMS	MTG	MOUNTING	PH	PHASE	TMGB	TELECOMMUNICATIONS MAIN GROUND BUS	VFD	VARIABLE FREQUENCY DRIVE
AWG	AMERICAN WIRE GAUGE	DISC.	DISCONNECT	EXIST.	EXISTING	KWH	1,000 WATT HOURS	NC	NORMALLY CLOSED	PNL	PANEL	TTB	TELECOM TERMINAL BOARD	WH	WATER HEATER
BG	BELOW GRADE	DIST.	DISTRIBUTION	FACP	FIRE ALARM CONTROL PANEL	KVA	1,000 VOLT AMPERES	NEC	NATIONAL ELECTRICAL CODE	PV	PHOTOVOLTAIC	TV	TELEVISION	WP	WEATHERPROOF
BLDG	BUILDING	DWG	DRAWING	FACPRA	FIRE ALARM CONTROL PANEL REMOTE ANNUNCIATOR	LAN	LOCAL AREA NETWORK	NEU	NEUTRAL	PVC	POLYVINYL CHLORIDE	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION	XFMR	TRANSFORMER
BKR	BREAKER	E	EXISTING TO REMAIN	FC	FOOTCANDLE	LC	LIGHTING CONTACTOR	NF	NON-FUSED	QTY	QUANTITY	TYP.	TYPICAL		
C	CONDUIT	EC	EMPTY CONDUIT	FCU	FAN COIL UNIT	LTG	LIGHTING	NIC	NOT IN CONTRACT	RCPT	RECEPTACLE	UG	UNDERGROUND		
CAT	CATEGORY	ECB	ENCLOSED CIRCUIT BREAKER	FLA	FULL LOAD AMPERE(S)	MCA	MINIMUM CIRCUIT AMPACITY	NL	NIGHT LIGHT	REQ'D	REQUIRED	UGP	UNDERGROUND PRIMARY		

ALL SYMBOLS, ABBREVIATIONS, AND NOTES ABOVE ARE TYPICAL AND ARE NOT NECESSARILY USED IN THESE CONSTRUCTION DOCUMENTS

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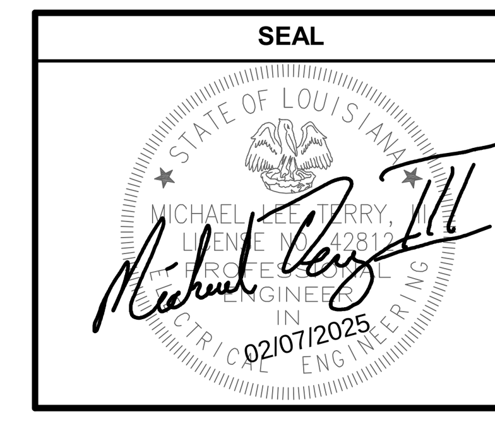
SEAL



PROJECT INFORMATION

CHILLER REPLACEMENT, US ARMY ROTC BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

REVISIONS

SHEET INFORMATION

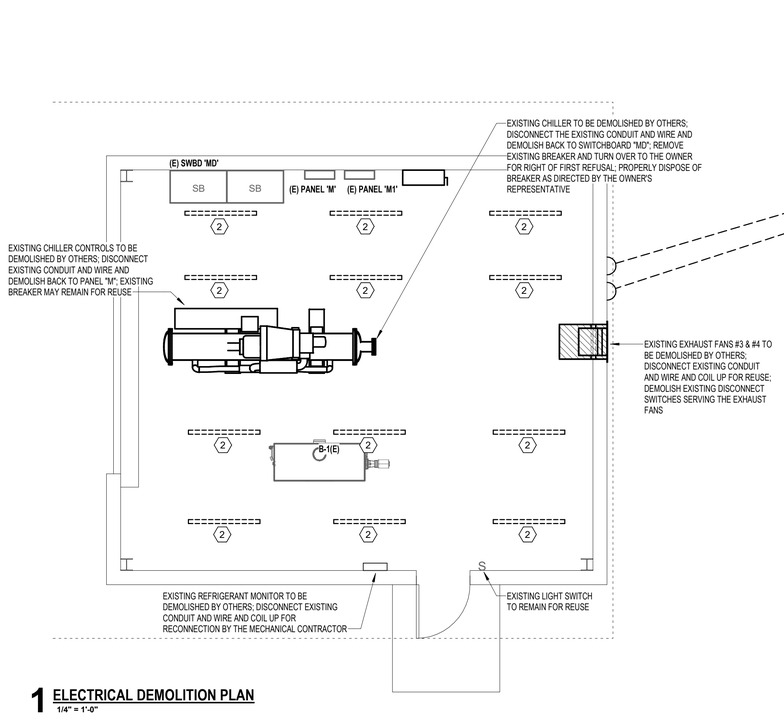
DATE:	02/07/25
DRAWN BY:	DTB
CHECKED BY:	SPG
PROJECT #:	24-043

SHEET NAME

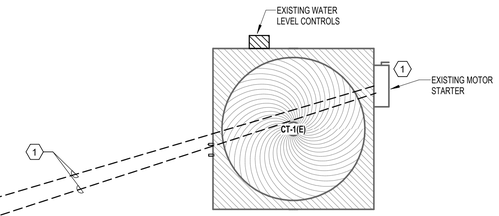
ELECTRICAL COVER SHEET

SHEET NUMBER

E0.0



1 ELECTRICAL DEMOLITION PLAN
1/4" = 1'-0"

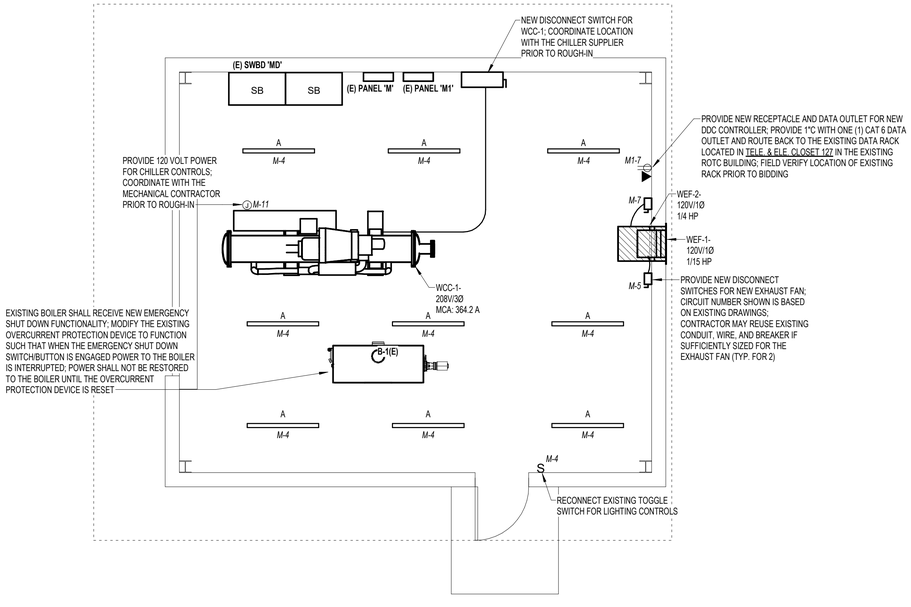


NOTE:

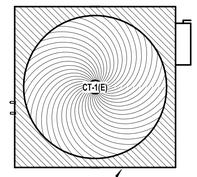
THE EXISTING COOLING TOWER FANS, HEATERS, ETC. WILL BE REPLACED WITH NEW LIKE AND KIND BY THE MECHANICAL CONTRACTOR. DISCONNECT THE EXISTING CONDUIT AND WIRE SERVING THE EXISTING COMPONENTS PRIOR TO DEMOLITION AND RECONNECT TO THE NEW COMPONENTS. COORDINATE REQUIREMENTS WITH THE MECHANICAL CONTRACTOR PRIOR TO BIDDING. VERIFY THE CONDITION OF THE EXISTING CONDUIT AND WIRE PRIOR TO BIDDING.

ELECTRICAL DEMOLTION PLAN KEYNOTES:

1. DISCONNECT EXISTING MOTOR STARTER. RETAIN WIRING AND CONDUIT FOR RECONNECTION TO NEW COOLING TOWER. EXISTING CONDUIT AND WIRE SHALL BE INSPECTED PRIOR TO REUSE. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.
2. DISCONNECT AND REMOVE ALL LIGHTING FIXTURES. RETAIN EXISTING CONDUIT AND WIRE FOR RECONNECTION TO NEW LIGHTING FIXTURES. EXISTING CONDUIT AND WIRE SHALL BE INSPECTED PRIOR TO REUSE.



2 ELECTRICAL PLAN
1/4" = 1'-0"



COORDINATE RECONNECTION OF EXISTING CIRCUITS TO THE NEW FANS, HEATERS, ETC. WITH THE MECHANICAL CONTRACTOR PRIOR TO COMMENCEMENT OF WORK

NOTE:

NEW LIGHT FIXTURES SHALL BE SUSPENDED BELOW PIPES WHERE POSSIBLE. LAYOUT MAY BE ADJUSTED TO AVOID CONFLICTS WITH PIPING. PROVIDE LAYOUT TO THE ENGINEER FOR REVIEW PRIOR TO INSTALLATION.

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SEAL

STATE OF LOUISIANA
MICHAEL PERRY
LICENSED PROFESSIONAL ENGINEER
02/07/2025
PROFESSIONAL ENGINEERING

PROJECT INFORMATION

CHILLER REPLACEMENT, US ARMY ROTC BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.19002566
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REVISIONS

SHEET INFORMATION

DATE:	02/07/25
DRAWN BY:	DTB
CHECKED BY:	SPG
PROJECT #:	24-043

SHEET NAME

ELECTRICAL PLANS

SHEET NUMBER

E1.0

Branch Panel: M1

Location:
Supply From:
Mounting: SURFACE
Enclosure: NEMA-1
Number of Sections:

Volts: 208Y/120
Phases: 3
Wires: 4

A.I.C. Rating: EXISTING
Mains Rating: 250 A
MLO Rating: 250 A

Panel Schedule Notes:
EXISTING LOADS SHOWN FOR REFERENCE ONLY AND HAVE NOT BEEN VERIFIED.

CKT	TRIP	POLES	WIRE	GND	CONDUIT	Circuit Description	A		B		C		Circuit Description	CONDUIT	GND	WIRE	POLES	TRIP	CKT
1							0.0 kVA	0.0 kVA											2
3	60 A	3	--	--	--	EXISTING STREET LTG.			0.0 kVA	0.0 kVA			EXISTING LOAD	--	--	--	3	50 A	4
5											0.0 kVA	0.0 kVA							6
7	20 A	1	2#12	#12	3/4"	DDC CONTROLLER	0.2 kVA	0.0 kVA											8
9	--	1	--	--	--	SPACE			--	0.0 kVA			EXISTING LOAD	--	--	--	3	100 A	10
11	--	1	--	--	--	SPACE					--	0.0 kVA							12
13	--	1	--	--	--	SPACE	--	--					SPACE	--	--	--	1	--	14
15	--	1	--	--	--	SPACE			--	--			SPACE	--	--	--	1	--	16
17	--	1	--	--	--	SPACE					--	--	SPACE	--	--	--	1	--	18
19	--	1	--	--	--	SPACE	--	--					SPACE	--	--	--	1	--	20
21	--	1	--	--	--	SPACE			--	--			SPACE	--	--	--	1	--	22
23	--	1	--	--	--	SPACE					--	--	SPACE	--	--	--	1	--	24
25	--	1	--	--	--	SPACE	--	--					SPACE	--	--	--	1	--	26
27	--	1	--	--	--	SPACE			--	--			SPACE	--	--	--	1	--	28
29	--	1	--	--	--	SPACE					--	--	SPACE	--	--	--	1	--	30
							180 VA		0 VA		0 VA								
							2 A		0 A		0 A								

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Receptacle	180 VA	100.00%	180 VA		
				Total Conn. Load:	180 VA
				Total Est. Demand:	180 VA
				Total Conn.:	0 A
				Total Est. Demand:	0 A

Load Summary Notes:

Switchboard: MD

Location:
Supply From:
Mounting:
Enclosure:

Volts: 208Y/120
Phases: 3
Wires: 4

A.I.C. Rating: EXISTING
Main Rating: 1600 A
MCB Rati... 1600 A

Notes:
EXISTING LOADS SHOWN FOR REFERENCE ONLY AND HAVE NOT BEEN VERIFIED.

CKT	Circuit Description	# of Poles	Frame Size	Trip Rating	Load	Remarks
1	EXISTING TROUGH	3	400 A	400 A	0 VA	
2	EXISTING PANEL "M"	3	200 A	200 A	0 VA	
3	WCC-1	3	600 A	500 A	104968 VA	TWO (2) 2-1/2"C, 4#250 MCM THWN & 1#2 GND EACH
4	EXISTING NAVY ROTC BUILDING	3	400 A	300 A	0 VA	
5	EXISTING PANEL "M1"	3	200 A	200 A	0 VA	
				Total Conn. Load:	104968 VA	
				Total Amps:	291 A	

Legend:

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	104968 VA	125.00%	131210 VA		
				Total Conn. Load:	104968 VA
				Total Est. Demand:	131210 VA
				Total Conn.:	291 A
				Total Est. Demand:	364.20 A

Notes:

SCHEDULE - LIGHTING FIXTURES

NOTES:

MARK	DESCRIPTION	LAMPS	VOLTS	LOAD	TEMP.	LUMENS	MOUNTING	BASIS OF DESIGN		ACCEPTABLE ALTERNATIVE		COUNT
								MANUFACTURER	CATALOG NO.	MANUFACTURER	CATALOG NO.	
A	4' SWITCHABLE LED VAPOR TIGHT STRIP LIGHT. MOUNT AT 9'-0" AFF. PROVIDE SUSPENSION HARDWARE AS REQUIRED.	LED	120	50 VA	40K	5000	SUSPENDED	LITHONIA LIGHTING	CSVT-L48-ALO3-MVOLT-SWW3-80CRI	ATLAS	ILW-S-4-8L-4-D-4K	9

Branch Panel: M

Location:
Supply From:
Mounting: SURFACE
Enclosure: NEMA-1
Number of Sections:

Volts: 208Y/120
Phases: 3
Wires: 4

A.I.C. Rating: EXISTING
Mains Rating: 200 A
MCB Rating: 200 A

Panel Schedule Notes:
EXISTING LOADS SHOWN FOR REFERENCE ONLY AND HAVE NOT BEEN VERIFIED.

CKT	TRIP	POLES	WIRE	GND	CONDUIT	Circuit Description	A		B		C		Circuit Description	CONDUIT	GND	WIRE	POLES	TRIP	CKT
1	20 A	1	--	--	--	EXISTING RECEPTACLES	0.0 kVA	0.0 kVA					EXISTING BOILER...	--	--	--	1	20 A	2
3	20 A	1	--	--	--	EXIST. W. SUPPLY			0.0 kVA	0.5 kVA			EXISTING LIGHTING	3/4"	#12	2#12	1	20 A	4
5	20 A	1	2#12	#12	3/4"	WEF-1					0.1 kVA	0.0 kVA							6
7	20 A	1	2#12	#12	3/4"	WEF-2	0.7 kVA	0.0 kVA					EXISTING LOAD	--	--	--	3	40 A	8
9	20 A	1	--	--	--	EXISTING HEATER			0.0 kVA	0.0 kVA									10
11	20 A	1	2#12	#12	3/4"	CHILLER CONTROLS					0.5 kVA	0.0 kVA	EXISTING LOAD	--	--	--	1	20 A	12
13	20 A	1	--	--	--	EXISTING LOAD	0.0 kVA	0.0 kVA					EXISTING LOAD	--	--	--	1	20 A	14
15	20 A	1	--	--	--	EXIST. HEAT TRACE			0.0 kVA	0.0 kVA			EXISTING LOAD	--	--	--	1	20 A	16
17											0.0 kVA	0.0 kVA							18
19	20 A	3	--	--	--	EXISTING LOAD	0.0 kVA	0.0 kVA					EXISTING "M-1"	--	--	--	3	30 A	20
21									0.0 kVA	0.0 kVA									22
23											0.0 kVA	0.0 kVA							24
25	30 A	3	--	--	--	EXISTING "M-5"	0.0 kVA	0.0 kVA					EXISTING "M-4"	--	--	--	3	30 A	26
27									0.0 kVA	0.0 kVA									28
29											0.0 kVA	0.0 kVA							30
31	30 A	3	--	--	--	EXISTING HEATER CONTROL PANEL	0.0 kVA	0.0 kVA					EXISTING COOLING TOWER FANS	--	--	--	3	40 A	32
33									0.0 kVA	0.0 kVA									34
35											0.0 kVA	0.0 kVA							36
37	50 A	3	--	--	--	EXISTING "M-3"	0.0 kVA	0.0 kVA					EXISTING "M-2"	--	--	--	3	50 A	38
39									0.0 kVA	0.0 kVA									40
41	--	1	--	--	--	SPACE					--	--	SPACE	--	--	--	1	--	42
							696 VA		450 VA		550 VA								
							6 A		4 A		5 A								

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Motor	746 VA	123.32%	920 VA		
Power	500 VA	100.00%	500 VA	**Total Conn. Load:**	1325 VA
Lighting	450 VA	125.00%	563 VA	**Total Est. Demand:**	1527 VA
				Total Conn.:	4 A
				Total Est. Demand:	4 A

Load Summary Notes:

PARISH ENGINEERING
7600 Innovation Park Drive
Baton Rouge, LA 70820
225.332.0222
parisheng.com

SEAL

PROJECT INFORMATION

CHILLER REPLACEMENT,
US ARMY ROTC
BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

REVISIONS

SHEET INFORMATION

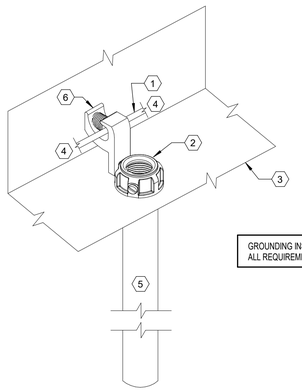
DATE:	02/07/25
DRAWN BY:	DTB
CHECKED BY:	SPG
PROJECT #:	24-043

SHEET NAME

ELECTRICAL SCHEDULES

SHEET NUMBER

E2.0

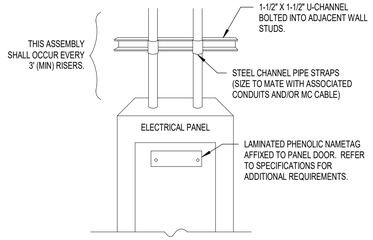


DETAIL KEYNOTES

1. SUPPLY SIDE EQUIPMENT BONDING JUMPER.
2. UL 467 LISTED GROUNDING BUSHING BY APPLETON, EATON, OR APPROVED EQUIVALENT.
3. ENCLOSURE.
4. TO ENCLOSURE GROUND BUS OR ADDITIONAL CONDUITS (AS REQUIRED).
5. INCOMING CONDUIT.
6. INTEGRAL BRACKET FOR ATTACHMENT OF BONDING JUMPER.

GROUNDING INSTALLATION SHALL MEET ALL REQUIREMENTS OF NEC 250.92.

1 DETAIL - CONDUIT GROUND BUSHING
N.T.S.



2 DETAIL - CONDUIT SUPPORT
N.T.S.

TYPICAL PANELBOARD PLAQUE

(INDICATE PANEL DESIGNATION)

__/__ VOLTS __ PHASE __ WIRE
__ AMPS MAIN __
FED FROM

(INDICATE FEEDER ORIGINATION I.D.)

(PANEL AND CIRCUIT NO.)

TYPICAL DISCONNECT PLAQUE

(INDICATE EQUIPMENT DESCRIPTION)

FUSED AT __ AMPERES
FED FROM

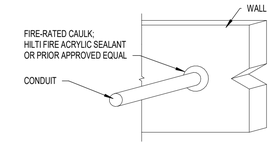
(INDICATE FEEDER ORIGINATION I.D.)

(PANEL AND CIRCUIT NO.)

SEE SPECIFICATIONS FOR MATERIALS, COLORS SIZE LETTERING, ETC.

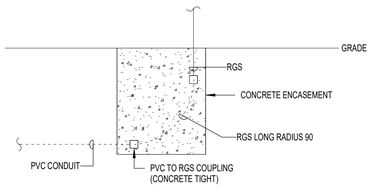
ATTACH PLAQUES USING INDUSTRIAL GRADE DOUBLE FACE ADHESIVE.

3 DETAIL - EQUIPMENT SIGNAGE
N.T.S.



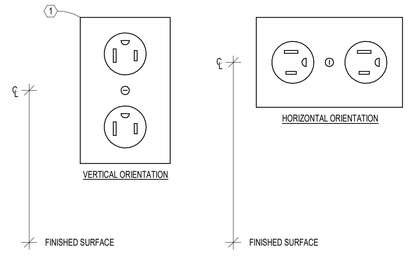
ALL PENETRATIONS THROUGH FIRE-RATED WALLS SHALL UTILIZE FIRE-RATED CAULK OR PRIOR APPROVED FIRE-STOPPING MATERIAL WITH BACKING MATERIAL.

4 DETAIL - FIRE-RATED WALL PENETRATION
N.T.S.



NOTE:
SUBMIT DIGITAL PHOTOGRAPHS OF INSTALLATION PRIOR TO POURING CONCRETE AND AFTER POURING CONCRETE.

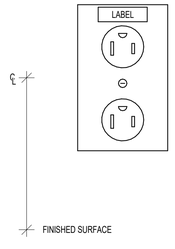
5 DETAIL - STUB-UP
N.T.S.



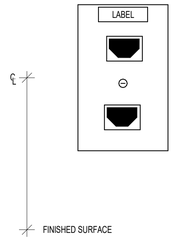
KEYNOTES

1. REFER TO SPECIFICATIONS FOR RECEPTACLE REQUIREMENTS.
2. UNLESS DENOTED OTHERWISE ON PLANS, MOUNTING HEIGHT IS FROM FINISHED SURFACE (FLOOR/GRADE/COUNTER TOP/ETC...) TO CENTERLINE OF DEVICE.

6 DETAIL - RECEPTACLE
N.T.S.



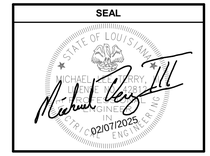
7 DETAIL - RECEPTACLE LABELING
N.T.S.



8 DETAIL - DATA LABELING
N.T.S.

PARISH ENGINEERING
7600 Innovation Park Drive
Baton Rouge, LA 70820
225.332.0222
parisheng.com

SEAL



PROJECT INFORMATION

CHILLER REPLACEMENT,
US ARMY ROTC
BATON ROUGE, LOUISIANA

SOUTHERN UNIVERSITY
BATON ROUGE, LOUISIANA
PROJECT NO.: F.19002566
STATE BUILDING I.D.: S02124
SITE CODE: 2-17-038

REVISIONS

SHEET INFORMATION

DATE:	02/07/25
DRAWN BY:	DTB
CHECKED BY:	SPG
PROJECT #:	24-043

SHEET NAME

ELECTRICAL DETAILS

SHEET NUMBER

E3.0

Construction Documents for
Chiller Replacement, US Army ROTC
Southern University, Baton Rouge LA
Project # F.19002566

SOUTHERN UNIVERSITY AND A&M COLLEGE
KENNETH DAWSON
SYSTEM DIRECTOR OF FACILITY PLANNING

PARISH ENGINEERING
7600 INNOVATION PARK DRIVE
BATON ROUGE, LA 70820
225.332.0222

February 7, 2025

TABLE OF CONTENTS

ADVERTISEMENT
REQUEST FOR BID
BID #10337
CHILLER REPLACEMENT
LEONCE GAITER HALL
STATE BUILDING # S02124
SITE CODE: 2-17-038
SOUTHERN UNIVERSITY AND A&M COLLEGE-BATON ROUGE
BID DUE DATE: JUNE 3, 2025 @ 10:30 AM

Sealed bids will be received by Southern University, Baton Rouge, Louisiana, in the Purchasing Office, 8100 James L. Prestage Drive, J. S. Clark Administration Building Annex, South Entrance, First Floor East. Bidders are solely responsible for ensuring timely delivery of their bids. The Southern University Purchasing Department is not responsible for any delays caused by bidders' chosen means of delivery. Failure to meet the bid deadline submittal date and time shall result in rejection of bid.

MAIL OR HAND-DELIVER BID TO PURCHASING DEPARTMENT NO LATER THAN 10:30 AM on JUNE 3, 2025

Electronic system to submit bid: *http://www.sus.edu/bidcertification*

Mandatory Pre-Bid Conference & Site Visit: May 16, 2025 @ 10:30 am
Site Visit Location: Physical Plant Department (Southern University Campus)
Benjamin H. Kraft Building, 515 James L. Hunt Street
Baton Rouge, La 70813
Site Visit Location Telephone Number: 225-771-4741

Participants shall be in attendance by 10:30 a.m. and sign-in on sheet provided by the Purchasing Department.

Bidders shall visit the site and be familiarized with the local conditions under which the work is to be performed. No additional compensation will be granted because of unusual difficulties, which may be encountered in the execution of any portion of the work.

Inquiries will be accepted until **May 21, 2025** by 5:00 p.m. Inquiries shall be submitted to Linda Antoine at linda_antoine@subr.edu

Responses to inquiries will be posted on LAPAC-LA State Procurement website by **May 26, 2025** by 5:00 PM.

Any person requiring special accommodations should notify the Purchasing Office of the type(s) of accommodation required not less than seven (7) days before the bid opening date.

All bids must be accompanied by bid security equal to **five (5%) percent of the sum of the base bid and all alternates, if applicable** and must be in the form of a certified/official check, cashier's check or bid bond, made payable to Southern University and A & M College. Surety represents that it is listed on the current U.S. Department of the Treasury Financial Management Service list of approved bonding companies and that

is listed thereon as approved for amount equal to or greater than the amount for which it obligates itself in this instrument. No bid bond indicating an obligation of less than five percent (5%) by any method is acceptable.

The successful bidder shall be required to furnish a **Performance and Payment Bond** written by a company licensed to do business in Louisiana, in an amount equal to 100% of the contract amount and who is currently on the U.S. Department of the Treasury Financial Management Service List.

Bidders shall include the following on envelope of choice: company's name, address, Louisiana contractor's license number, bid number, bid opening date and time.

Bids may be withdrawn by written, telegraphic fax notice or email and received at the address or email address designated in the Invitation to Bid prior to the time set for bid opening, as recorded by date stamp at the Purchasing Office. Bids received after closing time will be returned unopened. Evidence of authority to submit the bid shall be required in accordance with R.S. 38:2212(a)(1)(c) and/or R.S. 39:1594(c)(2)(d).

The Southern University System is a participant in the Louisiana for the Small Entrepreneurships Program (the Hudson Initiative) and the Louisiana Initiative for Veterans and Service-Connected Disabled Veterans-Owned Business Small Entrepreneurships. Bidders are encouraged to consider participation. A list of certified vendors and additional information can be obtained from website http://www.ledsmallbiz.com. Potential participants may also register at this website.

ALL BID SPECIFICATIONS CAN BE OBTAINED BY ACCESSING THE LA STATE PROCUREMENT WEBSITE
https://wwwcfprd.doa.louisiana.gov/osp/lapac/pubMain.cfm.
(Search by bid # 50016-10326)
We highly recommend registering with LA State Procurement/LAPAC

Any questions concerning bid documents, please contact Mary Jane Spruel, Assistant Director of Purchasing at (225) 771-2800 or email to maryjane_spruel@subr.edu

The University reserves the right to reject all bids and to waive any informalities incidental thereto. Bids will be accepted only from contractors who are licensed under Louisiana R.S. 39:2150-2173 for the classification of: 72130000 General Building Construction; 72000000 Building and Construction, and Maintenance Services; 72131600 Commercial or Industrial Construction, Chiller, Heating/Air Cooling-All Commercial.

SOUTHERN UNIVERSITY & A&M COLLEGE
AN EQUAL OPPORTUNITY EMPLOYER
Linda A. Antoine, Director of Purchasing

DATES ADVERTISED:
April 30, May 7, May 14, 2025

GENERAL TERMS & CONDITIONS
SOUTHERN UNIVERSITY AND A&M COLLEGE
BATON ROUGE CAMPUS
REQUEST FOR BID

PROJECT: ROOF REPLACEMENT

LOCATION: LEONCE GAITER HALL-STATE BUILDING # S02124

SITE CODE: 2-17-038

BATON ROUGE CAMPUS

BID DUE DATE: JUNE 3, 2025 @ 10:30 AM

BID # 10337

Bids submitted are subject to provisions of but not limited to La.R.S.38 Purchasing Rules and Regulations; Executive Orders; and the General Terms and Conditions, listed in this Invitation for Bid. Southern University reserves the right to award items separately, grouped or on an all or none basis and to reject any or all bids and waive any informalities.

BIDS MAY BE SENT BY MAIL OR HAND-DELIVERED TO:

Bids should be mailed to:
Southern University
Purchasing Department
Post Office Box 9534
Baton Rouge, Louisiana 70813

As an alternative, bids may be hand delivered to:
Southern University
Purchasing Department
1st Floor East-James L. Prestage Drive
J. S. Clark Administration Building
Baton Rouge, Louisiana 70813

MANDATORY PRE-BID CONFERENCE & SITE VISIT: MAY 16, 2025 @ 10:30 AM

INQUIRIES: Inquiries will be accepted through May 21 @ 5:00 PM

No negotiations, decisions, or actions will be executed by any bidder as a result or any oral discussion with any University employee or State Consultant. Only those transactions which are in writing, sent to **Linda A. Antoine, Director of Purchasing, will be considered as valid.**

INSTRUCTIONS TO BIDDERS

1. **Bid Forms**
   All written bids, unless otherwise provided for, must be submitted on, and in accordance with forms provided and properly signed in ink. Bids submitted in the following manner will not be accepted:
   Bid containing no signature indicating intent to be bound
   (1) Bid filled out in pencil
   (2) Bid not submitted on University standard forms
   Bids must be received at the address specified in the Invitation for Bid prior to bid opening time in order to be considered. .

2. **Envelope (if mailed)**
   Bidders are requested to submit bid package in a sealed envelope of your choice that is clearly marked identifying the ***company's name, complete address, bid number, time and date of bid opening, and license number, if applicable.***
   Bidder is responsible for means of delivery of bid.
   Louisiana Contractors License Number shall be placed on the outside of the envelope.

3. **Standards of Quality**
   Any product or service bid shall conform to all applicable federal, state and local laws, regulations and the specifications contained in the IFB. Unless otherwise specified in the IFB, any manufacturer's name, trade name, brand name, or catalog numbers used in the specifications is for the purpose of describing the quality level, performance and characteristics required. Bidder must specify the brand and model number of the product offered in his/her bid. Bids not specifying brand and model numbers will be considered as offering the exact product(s) specified in the IFB.

4. **Descriptive Information**
   Bidders proposing an equivalent brand or model should submit information with bid (such as illustrations, descriptive literature, technical data) sufficient for the University to evaluate quality, suitability and compliance with the specifications in the IFB. Failure to submit descriptive information may cause bid to be rejected. Any change made to a manufacturer's published specification submitted for a product should be verifiable by the manufacturer. If item(s) bid do not fully comply with specifications (including brand and/or product number), bidder must state in what respect the item(s) deviate. Failure to note exceptions on the bid form will not relieve the successful bidder(s)

This document will be included with the successful vendor's contract

from supplying the actual products requested.

5. **Prices**
Unless otherwise specified by the Purchasing Department, bid prices must be complete, including transportation, prepaid by bidder to destination. In the event of extension errors, the unit price shall prevail.

6. **Payment Terms**
Payment is to be made within thirty (30) days after receipt of properly executed invoice, or delivery and acceptance, whichever is later. Delinquent payment penalties are governed by **L.R.S. 39:1695**.

7. **Deliveries**
Bids may be rejected if the delivery or completion time indicated is longer than that specified.

8. **Vendor Invoices**
Invoices or AIA payment shall reference the Southern University purchase/release order number. AIA payment documents shall be certified and approved by the Architect or Engineer Firm and the agency. Pay applications will be paid by the State Office of Facility Planning.

9. **Tax Information/State of Louisiana**
Southern University is exempt from taxes. By accepting an award, resident and non-resident firms acknowledge their responsibility for the payment of all taxes duly accessed by the State of Louisiana and its political subdivisions for which they are liable, including but not limited to: franchise taxes, privilege taxes, sales taxes, use taxes, ad valorem taxes, etc. In accordance with Act Number 1029 of the 1991 Regular Session, effective September 1, 1991 state agencies will no longer be required to pay state sales tax.

10. **New Products**
Unless specifically called for, all products for purchases must be new (never previously used) and the current model and/or packaging. The manufacturer's standard warranty will apply unless otherwise specified.

11. **Contract Cancellation**
Southern University has the right to cancel any contract, in accordance with Purchasing Rules and Regulations, for cause, including but not limited to, the following: (1) failure to deliver within time specified in the contract; (2) failure of the product or service to meet specifications, conform to sample quality or to be delivered in good condition;(3) misrepresentations by the contractor;(4) fraud, collusion, conspiracy or other unlawful means of obtaining any contract with the state; (5) conflict of contract provisions with constitutional or statutory provision of state or federal law; (6) any other breach of contract.

12. **AWARD AND EXECUTION OF CONTRACT**:
The owner shall incur no obligation to the contractor until the contract between the owner and contractor is duly executed. If the contractor is notified of the acceptance of the bid contractor agrees to execute and deliver to owner, Performance and Payment Bond and Certificate of Insurance, a copy of which is attached to the Contract Documents, within ten (10) working days after notice from the Owner that the instrument is ready for signature.

13. **Fiscal Funding Clause (Renewal Contracts Only)**
In accordance with LA R.S.39:1615 (c) and (e), any contract entered into by the State of Louisiana and Southern University shall include the following Fiscal Funding Clause:
C. Termination due to unavailability of funds in succeeding years. When funds are not appropriated to support continuation of performance in a subsequent year of a multiyear contract, the contract for such subsequent year shall be terminated. When a contract is terminated under these conditions, no additional funds shall be paid to the contractor as a result of such action. **E.** With respect to all multiyear contracts, there shall be no provisions for a penalty to the state for the cancellation or early payment of the contract. The continuation of this contract is contingent upon the appropriation of funds to fulfill the requirements of the contract by the legislature. All proposers should be aware that our legislative process is such that it is often impossible to give prior notice of the non-appropriation of funds.

14. **Default of Contactor**
Failure to deliver within the time specified in the bid will constitute a default and may cause cancellation of the contract. Where the state had determined the contractor to be in default, the state reserves the right to purchase any or all products or services covered by the contract on the open market and to charge the contractor with cost in excess of the contract price. Until such assessed charges have been paid, no subsequent bid from the defaulting contractor will be considered.

15. **Applicable Law**

This document will be included with the successful vendor's contract

All contracts will be construed in accordance with and governed by the laws of State of Louisiana. Vendors shall be in compliance with applicable laws of the State of Louisiana and Federal Laws where applicable, to include licenses, fees and permits. Vendors are responsible for the cost of licenses, fees and permits.

16. **Certification of No Suspension or Debarment ($25,000 or more)**
By signing and submitting this bid, bidder certifies that its company, any subcontractors, or principals thereof, are not suspended or debarred under federal or state laws or regulations. A list of parties who have been suspended or debarred by federal agencies is maintained by the General Services Administration and can be viewed on the internet at www.sam.gov.
____Federal Funded X__Non-Federal Funded

17. **E-VERIFY** (verification of employees)
Contractor acknowledges and agrees to comply with the provisions of La R.S. 38:2212.10 and federal law pertaining to E-Verify in the performance of services under this contract.

18. **Prohibited Contractual Arrangements**
Per Louisiana R.S. 42:1113.a, no public servant, or member of such public servant's immediate family, or legal entity in which he is a controlling interest shall bid on or enter into any contract, subcontract, or other transaction that is under the supervision or jurisdiction of the agency of such public servant. See statute for complete law, exclusions and provisions.

19. **Discriminatory Boycotts of Israel**
This section applies to procurements with a value of $100,000 or more and for vendors with five (5) or more employees
Prohibition of Discriminatory Boycotts of Israel
In accordance with R.S. 39:1602.1, for any contract for $100,000 or more and for any contractor with five or more employees, the Contractor certifies that neither it nor its subcontractors are engaged in a boycott of Israel, and that the Contractor and any subcontractors shall, for the duration of this contract, refrain from a boycott of Israel. The State reserves the right to terminate this contract if the Contractor, or any Subcontractor, engages in a boycott of Israel during the term of this contract.

20. **Mutual Indemnification**
Each party hereto agrees to indemnify, defend and hold the other, its officers, directors, agents and employees harmless from and against any and all losses, liabilities and claims, including reasonable attorney's fees arising out of or resulting from the willful act, fault, omission, or negligence of the indemnifying party or of its employees, contractors, or agents in performing its obligations under this agreement, provided however, that neither party hereto shall be liable to the other for any consequential damages arising out of its willful act, fault, omission, or negligence.

21. **Fair Labor Standards Act**
Contractor shall be in compliance with the **Fair Labor Standards Act 29 USC 201-6;** Establishes minimum wage, overtime pay, equal pay, recordkeeping, and child labor standards for employees or in the production of goods for interstate commerce. **By signing and submitting this bid, bidder certifies that its company, any subcontractors, or principals thereof** is in accordance with said compliance. **United States Department of Labor website: www.dol.gov/esa**

22. **Davis-Bacon Act ($2,000 or more)**
Contractor shall be in compliance with the **Davis-Bacon Act, 40 USC 276A-7;** ensures that laborers and mechanics employed pursuant to federally funded construction contracts, subcontracts and construction under Federal grants, will be paid wages as determined by the U.S. Secretary of Labor. **By signing and submitting this bid, bidder certifies that its company, any subcontractors, or principals thereof** is in accordance with said compliance. **United States Department of Labor website: www.dol.gov/esa**

____Federal Funded _____Non-Federal Funded

23. **Small Business Entrepreneurship Programs**
The Southern University System is a participant in the Louisiana for the Small Entrepreneurships Program (the Hudson Initiative) and the Louisiana Initiative for Veterans and Service-Connected Disabled Veterans-Owned Business Small Entrepreneurships. Bidders are encouraged to consider participation. A list of certified vendors and additional information can be obtained from website http://www.ledsmallbiz.com. Potential participants may also register at this website. Businesses include minority and women.

24. **Public Works Projects (R.S. 38:2227)**
In accordance with the provisions of R.S. 38:2227; in awarding public works projects, any public entity is authorized to reject a proposal or bid, or not award the contract, to a business in which any individual with an ownership interest of ten percent (10%) or more, has been convicted, or has entered a plea of guilty or nolo contenere to any state felony or equivalent federal felony crime.

25. **Tobacco-Free Policy**

This document will be included with the successful vendor's contract

The use of tobacco products on any Southern University campus is prohibited by students, staff, faculty or visitors in all campus buildings, facilities, or property owned or leased by Southern University System and outside areas of the campus where non-smokers cannot avoid exposure to smoke; on campus grounds, facilities, or vehicles that are the property of the University; and at lectures, conferences, meetings, and social and cultural events held on school property or school grounds. The sale or free distribution of tobacco products, including merchandise on campus or at school events is prohibited.

26. Equal Opportunity Employer

Southern University and A&M College Systems of the State of Louisiana is an equal opportunity employer and looks to its contractors, sub-contractors, vendors, and suppliers to take affirmative action to effect this commitment in its operations. By submitting and signing this bid, the bidder certifies that he agrees to adhere to the mandates dictated by Title VI and VII of the Civil Rights Act of 1964, as amended; the Vietnam Era Veterans' Readjustment Assistance Act of 1974; Section 303 of the Rehabilitation Act of 1973; Section 202 of Executive Orderll24b,as amended; and the Americans with Disabilities Act of 1990. Bidder agrees that he will not discriminate in the rendering of services to and/or employment of individuals because of race, color, religion, sex, age, national origin, handicap, disability, veteran status, or any other non-merit factor. Bidder further agrees to keep informed of and comply with all Federal, State, and local laws, ordinances, and regulations which affect his employees or prospective employees. Any person who is a "Qualified Individual with a Disability" as defined by 42 USC 12131 of the American with Disabilities Act who has submitted a bid on this procurement and who desires to attend the bid opening, must notify this office in writing no later than seven (7) working days prior to the bid opening date of their need for special accommodations. If the requested accommodations cannot be reasonably provided, the individual will be so informed prior to the bid opening.

27. Code of Ethics

The contractor acknowledges that Chapter 15 of Title 42 of the Louisiana Revised Statutes (R.S. 42:1101 et. seq., Code of Governmental Ethics) applies to the Contracting Party in the performance of services called for in this contract. The contractor agrees to immediately notify the state if potential violations of the Code of Governmental Ethics arise at any time during the term of this contract.

28. Vendor Forms/SU Signature Authority

The terms and conditions of the SU solicitation and purchase order/contract shall solely govern the purchase agreement, and shall not be amended by any vendor contract, form, etc. The University's chief procurement officer, or designee, is delegated sole authority to execute any vendor contracts, forms, etc. Departments are prohibited from signing any vendor forms.

29. Prosecution of Work

The work is to be done when Southern University is in operation. The contractor shall, therefore, plan the repairs and installation in specifications so as not to interfere with normal operations of the facility and shall exert effort to expedite completion of the work once it has started. It is intended that the work shall be done during normal working hours, however, should work require overtime (Saturday, Sunday and/or night working hours), the cost must be borne by the contractor at no extra compensation from the Owner (Southern University).

30. On-Campus Attendance (COVID-19)

The Center for Disease and Control (CDC) recommends social distancing and wearing of masks to prevent the spread of the Coronavirus (COVID19).

31. Termination for Cause

The State may terminate this Contract for cause based upon the failure of the Contractor to comply with the terms and/or conditions of the Contract; provided that the State shall give the Contractor written notice specifying the Contractor's failure. If within thirty (30) days after receipt of such notice, the Contractor shall not have either corrected such failure or thereafter proceeded diligently to complete such correction, then the State may, at its option, place the Contractor in default and the Contract shall terminate on the date specified in such notice. The Contractor may exercise any rights available to it under Louisiana law to terminate for cause upon the failure of the Owner to comply with the terms and conditions of this contract; provided that the Contractor shall give the State written notice specifying the State's failure and a reasonable opportunity for the Owner to cure the defect.

32. Auditors

It is hereby agreed that the Legislative Auditor of the State of Louisiana and/or the Office of the Governor, Division of Administration auditors shall have the option of auditing all accounts of contractor which relate to this contract.

33. Awarded Products/Unauthorized Substitutions

Only those awarded brands and numbers stated in the SU contract are approved for delivery, acceptance, and payment purposes. Any substitutions require prior approval of the Purchasing Office. Unauthorized product substitutions are subject to rejection at time of delivery, post-return at vendor's expense, and non-payment.

34. Acceptance

Upon written notice by the Owner, a Notice by Owner of Acceptance of Work will be executed and forwarded to the Contractor for recording with the Clerk of Court in the parish in which the work has been performed and shall furnish a clear Lien Certificate from

the Clerk of Court (to the owner along with final invoice) forty-five (45) days after recordation of acceptance. Final payment will be made at this time.

35. Guarantee

It is the intention of the specifications to secure a first-class permanent material and construction and to this end, Contractor will be held responsible for and must correct defects discovered in the work within one (1) year from acceptance. Should any materials or methods be called for, of such nature to render this guarantee impossible, written notice to this effect should be given Owner (Southern University) before signing contract and/or beginning of work; failure to do this will be construed as agreement to the strictest terms of the guarantee.

36. Clean-Up

The Contractor will be directed during the progress of work to remove and properly dispose of the resultant and debris. Upon completion, Contractor shall remove all equipment, unused materials and debris and will leave the premises in a clean and first-class condition.

37. Examination of Site

Each bidder will visit the site of the proposed project and will fully acquaint himself with conditions relating to construction and labor so that he may fully understand the facilities, difficulties and restrictions attending the execution of work under this contract. No consideration or allowance will be granted the Contractor for failure to visit the site or for any alleged misunderstanding of the materials to be furnished or the work to be done.

38. *Anti-Kickback Clause*

The Contractor hereby agrees to adhere to the mandate dictated by The Copeland "Anti-Kickback" ACT which provides that each Contractor or Subgrantee shall be prohibited from inducing, by any means, any person employed in the completion of work, to give up any part of the compensation to which he is otherwise entitled.

39. Clean Air Act

The Contractor hereby agrees to adhere to the provisions which require compliance with all applicable standards, orders or requirements issued under Section 306 of the CLEAN AIR ACT which prohibits the use under non-exempt contracts, grants or loans of facilities included on the EPA list of Violating Facilities.

40. Clean Water Act

The Contractor hereby agrees to adhere to the provisions which require compliance with all applicable standards, orders or requirements issued under Section 508 of the Clean Water Act which prohibits the use under non-exempt federal contracts, grants or loans of facilities included on the EPA list of Violating Facilities.

41. Energy Policy and Conservation Act

The Contractor hereby recognizes the mandatory standards and policies relating to energy efficiency which are contained in the State energy conservation plan issued in compliance with the Energy Policy and Conservation Act (P.L. 94-163).

42. *Anti-Lobbying and Debarment Act*

The Contractor will be expected to comply with federal statutes in the Anti-Lobbying Act and The Debarment Act.

43. *Signature Authority*

A CORPORATE RESOLUTION OR WRITTEN EVIDENCE OF THE AUTHORITY OF THE PERSON SIGNING THE BID FOR THE PUBLIC WORK AS PRESCRIBED BY LOUISIANA REVISED STATUTE 38:2212 (B)(5)
A copy of the applicable signature authority document/Board Resolution or LA Secretary of State Registration must be submitted with bid.

44. ADITIONAL REQUIREMENTS

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE PLANS; THE PROJECT SPECIFICATIONS, AND HALL COMPLY WITH APPLICALBE LOCAL AND STATE BUILDING CODES AS WELL AS ANY AND ALL REGULATORY AGENCY REQUIREMENTS AND LAWS, INCLUDING BUT NOT LIMIOTED TO OSHA, ETC. GENERAL NOTES SHALL APPLY TO ALL DRAWINGS.
2. CONTRACTOR SHALL NOTIFY THE ENGINEER/ARCHITECT, IF APPLICABLE, OF ALL CONFLICTS OR DISCRENPENSIES PRESENTED IN THESE PLANS PRIOR TO THE START OF WORK.
3. ALL WORK WHETHER SHOWN OR IMPLIED, UNLESS SPECIFICALLY QUESTIONED SHALL BE CONSIDERED UNDERSTOOD IN ALL RESPECTS BY THE GENERAL CONTRATOR AND WHO WILL BE RESPOSIBLE FOR ANY MISINTERPRETATIONS AND CONSEQUENCES THEREOF.
4. ANY UTILITIES DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.
5. ENGINEER/ARCHITECT SHALL BE NOTIFIED IMMEDIATELY OF ALL IDENTIFIED EXISTING UTILITIES NOT INDENTIFIED IN THE PLANS.
6. OWNER SHALL PROVIDE WATER FOR CLEANING OPERATIONS FROM ANY FIRE HYDRANT AT NO COST TO THE CONSULTANT.

This document will be included with the successful vendor's contract

PUBLIC AWARENESS NOTICE – 192.616

Southern University Baton Rouge owns and operates a master meter natural gas distribution system on the school campus. The gas system consists of an underground network of pipelines. The purpose of the gas system is to provide a reliable and safe economical source of energy for heating purposes. The pipeline system has the capacity to reliably deliver natural gas.

The hazards of natural gas are: it is odorless, colorless, tasteless, lighter than air and can ignite and/or explode with tremendous force when mixed with the right amount of air.

Prevention measures taken include:

- Adding odorant to the gas to give it that distinctive smell, similar to rotten eggs, to warn us of its presence.
- Testing the odorant level each calendar quarter,
- Performing annual gas leakage surveys, and
- Conducting periodic pipeline patrols.

The following are signs that may indicate a gas leak:

- A hissing or roaring sound (caused by escaping gas)
- A patch of dead or discolored vegetation in an otherwise green setting along a pipeline route
- Blowing dirt, grass or leaves near a pipeline,
- Continuous bubbling in wet, flooded areas,
- A “gas small” similar to rotten eggs.

Anyone who may smell this odor or notice any unusual conditions on or near gas mains, vents, service lines, meter sets, or especially inside of a building should call the maintenance office immediately. If you smell a strong gas odor inside a building, notify workers/occupants in the building to leave. Do not operate any switches or use the phone. Go a safe distance away upwind of the gas smell and call the maintenance office. With any gas leak protect life first, then property, then notify the maintenance office.

State and federal laws require excavators to notify LA One-Call 2 days before digging. If any excavation is planned, you must notify LA One-Call which will notify the Southern University Baton Rouge Maintenance Department to locate the gas lines.

To obtain additional information or report a gas related issue call Southern University Baton Rouge Office of Facility Services. The maintenance office phone number is (225) 771-4741. The LA One-Call Center phone number is 811.

This document will be included with the successful vendor’s contract

INSTRUCTIONS TO BIDDERS

COMPLETION TIME:

The Bidder shall agree to fully complete the contract within (**270**) consecutive calendar days, subject to such extensions as may be granted under Paragraph 8.3, in the General Conditions and the Supplementary Conditions, and acknowledges that this construction time will start on or before the date specified in the written "Notice to Proceed" from the Owner.

LIQUIDATED DAMAGES:

The Bidder shall agree to pay as Liquidated Damages the amount of (**Five Hundred**) Dollars (**$500.00**) for each consecutive calendar day for which the work is not complete, beginning with the first day beyond the contract completion date stated on the "Notice to Proceed" or as amended by change order.

ARTICLE 1

DEFINITIONS

1.1 The Bid Documents include the following:

Advertisement for Bids
Instructions to Bidders
Bid Form
Bid Bond
General Conditions of the Contract for Construction,
AIA Document A201, 2017 Edition
Supplementary Conditions
Contract Between Owner and Contractor and Performance and Payment Bond
Affidavit
User Agency Documents (if applicable)
Change Order Form
Partial Occupancy Form
Recommendation of Acceptance
Asbestos Abatement (if applicable)
Other Documents (if applicable)
Specifications & Drawings
Addenda issued during the bid period and acknowledged in the Bid Form

1.2 All definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201 and the Supplementary Conditions are applicable to the Bid Documents.

1.3 Addenda are written and/or graphic instruments issued by the Architect prior to the opening of bids, which modify or interpret the Bid Documents by additions, deletions, clarifications, corrections and prior approvals.

1.4 A bid is a complete and properly signed proposal to do the work or designated portion thereof for the sums stipulated therein supported by data called for by the Bid Documents.

1.5 Base bid is the sum stated in the bid for which the Bidder offers to perform the work described as the base, to which work may be added, or deleted for sums stated in alternate bids.

1.6 An alternate bid (or alternate) is an amount stated in the bid to be added to the amount of the base bid if the corresponding change in project scope or materials or methods of construction described in the Bid Documents is accepted.

1.7 A Bidder is one who submits a bid for a prime Contract with the Owner for the work described in the Bid Documents.

1.8 A Sub-bidder is one who submits a bid to a Bidder for materials and/or labor for a portion of the work.

1.9 Where the word "Architect" is used in any of the documents, it shall refer to the Prime Designer of the project, regardless of discipline.

ARTICLE 2

PRE-BID CONFERENCE

2.1 A Pre-Bid Conference shall be held at least 10 days before the date for receipt for bids. The Architect shall coordinate the setting of the date, time and place for the Pre-Bid Conference with the User Agency and shall notify in writing the Owner and all who have received sets of the Bid Documents to

attend. The purpose of the Pre-Bid Conference is to familiarize Bidders with the requirements of the Project and the intent of the Bid Documents, and to receive comments and information from interested Bidders. If the Pre-Bid Conference is stated in the Advertisement for Bids to be a Mandatory Pre-Bid Conference, bids shall be accepted only from those bidders who attend the Pre-Bid Conference. Contractors who are not in attendance for the **entire** Pre-Bid Conference will be considered to have not attended.

2.2 Any revision of the Bid Documents made as a result of the Pre-Bid Conference shall not be valid unless included in an addendum.

ARTICLE 3

BIDDER'S REPRESENTATION

3.1 Each Bidder by making his bid represents that:

3.1.1 He has read and understands the Bid Documents and his bid is made in accordance therewith.

3.1.2 He has visited the site and has familiarized himself with the local conditions under which the work is to be performed.

3.1.3 His bid is based solely upon the materials, systems and equipment described in the Bid Documents as advertised and as modified by addenda.

3.1.4 His bid is not based on any verbal instructions contrary to the Bid Documents and addenda.

3.1.5 He is familiar with Code of Governmental Ethics requirement that prohibits public servants and/or their immediate family members from bidding on or entering into contracts; he is aware that the Designer and its principal owners are considered Public Servants under the Code of Governmental Ethics for the limited purposes and scope of the Design Contract with the State on this Project (see Ethics Board Advisory Opinion, No. 2009-378 and 2010-128); and neither he nor any principal of the Bidder with a controlling interest therein has an immediate family relationship with the Designer or any principal within the Designer's firm (see La. R.S. 42:1113). Any Bidder submitting a bid in violation of this clause shall be disqualified and any contract entered into in violation of this clause shall be null and void.

3.2 The Bidder must be fully qualified under any State or local licensing law for Contractors in effect at the time and at the location of the work before submitting his bid. In the State of Louisiana, Revised Statutes 37:2150, et seq. will be considered, if applicable.

The Contractor shall be responsible for determining that all of his Sub-bidders or prospective Subcontractors are duly licensed in accordance with law.

ARTICLE 4

BID DOCUMENTS

4.1 Copies

4.1.1 Bid Documents may be obtained from the Architect for a deposit as stated in the Advertisement for Bids. The deposit will be refunded as stated in the Advertisement for Bids. No deposits will be refunded on Bid Documents returned later than ten days after receipt of bids.

4.1.1.2 As an alternative method of distribution, the Designer may provide the Bid Documents in electronic format. They may be obtained without charge and without deposit as stated in the Advertisement for Bids.

4.1.1.2.1 If electronic distribution is available, printed copies will not be available from the Designer, but arrangements can be made to obtain them through most reprographic firms and/or plan rooms.

4.1.1.2.2 If electronic distribution is available, the reproduction cost on the first paper plan set acquired by bona fide prime bidders will be fully refunded by the Designer upon delivery of the documents to the Designer in good condition no later than ten days after receipt of bids.

4.1.1.2.3 If electronic distribution is available, all other plan holders are responsible for their own reproduction costs.

4.1.2 Complete sets of Bid Documents shall be used in preparing bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bid Documents.

4.1.3 The Owner or Architect in making copies of the Bid Documents available on the above terms, do so only for the purpose of obtaining bids on the work and do not confer a license or grant for any other use.

4.2 Interpretation or Correction of Bid Documents

4.2.1 Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bid Documents or of the site and local conditions.

4.2.2 Bidders requiring clarification or interpretation of the Bid Documents shall make a written request to the Architect, to reach him at least seven days prior to the date for receipt of bids.

4.2.3 Any interpretation, correction or change of the Bid Documents will be made by addendum. Interpretations, corrections or changes of the Bid Documents made in any other manner will not be binding and Bidders shall not rely upon such interpretations, corrections and changes.

4.3 Substitutions

4.3.1 The materials, products and equipment described in the Bid Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. No substitutions shall be allowed after bids are received.

4.3.2 No substitution will be considered unless written request for approval has been submitted by the Proposer and has been received by the Architect at least seven (7) working days prior to the opening of bids. (La. R.S. 38:2295(C)) Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including model numbers, drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or work that incorporation of the substitute would require shall be included. It shall be the responsibility of the proposer to include in his proposal all changes required of the Bid Documents if the proposed product is used. Prior approval, if given, is contingent upon supplier being responsible for any costs which may be necessary to modify the space or facilities needed to accommodate the materials and equipment approved.

4.3.3 If the Architect approves any proposed substitution, such approval shall be set forth in an addendum. Bidders shall not rely upon approvals made in any other manner.

4.4 Addenda

4.4.1 Addenda will be transmitted to all who are known by the Architect to have received a complete set of Bid Documents.

4.4.2 Copies of addenda will be made available for inspection wherever Bid Documents are on file for that purpose.

4.4.3 Except as described herein, addenda shall not be issued within a period of seventy-two (72) hours prior to the advertised time for the opening of bids, excluding Saturdays, Sundays, and any other legal holidays. If the necessity arises of issuing an addendum modifying plans and specifications within the seventy-two (72) hour period prior to the advertised time for the opening of bids, then the opening of bids shall be extended at least seven but no more than twenty-one (21) working days, without the requirement of re-advertising. Southern University shall be consulted prior to issuance of such an addendum and shall approve such issuance. The revised time and date for the opening of bids shall be stated in the addendum.

4.4.4 Each Bidder shall ascertain from the Architect prior to submitting his bid that he has received all addenda issued, and he shall acknowledge their receipt on the Bid Form.

4.4.5 The Owner shall have the right to extend the bid date by up to (30) thirty days without the requirement of re-advertising. Any such extension shall be made by addendum issued by the Architect.

ARTICLE 5

BID PROCEDURE

5.1 Form and Style of Bids

5.1.1 Bids shall be submitted on the Louisiana Uniform Public Work Bid Form provided by the Architect for this project.

5.1.2 The Bidder shall ensure that all applicable blanks on the bid form are completely and accurately filled in.

5.1.3 Bid sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written words shall govern.

5.1.4 Any interlineation, alteration or erasure must be initialed by the signer of the bid or his authorized representative.

5.1.5 Bidders are cautioned to complete all alternates should such be required in the Bid Form. Failure to submit alternate prices will render the bid non responsive and shall cause its rejection.

5.1.6 Bidders are cautioned to complete all unit prices should such be required in the Bid Form. Unit prices represent a price proposal to do a specified quantity and quality of work. Unit prices are incorporated into the base bid or alternates, as indicated on the Unit Price Form, but are not the sole components thereof.

5.1.7 Bidder shall make no additional stipulations on the Bid Form nor qualify his bid in any other manner.

5.1.8 Written evidence of the authority of the person signing the bid for the public work shall be submitted in accordance with La. R.S. 38:2212 (B)(5).

5.1.9 On any bid in excess of fifty thousand dollars ($50,000.00), the Contractor shall certify that he is licensed under La. R.S. 37: 2150-2173 and show his license number on the bid above his signature or his duly authorized representative.

5.2 Bid Security

5.2.1 No bid shall be considered or accepted unless the bid is accompanied by bid security in an amount of five percent (5.0%) of the base bid and all alternates.

The bid security shall be in the form of a certified check or cashier's check drawn on a bank insured by the Federal Deposit Insurance Corporation, or a Bid Bond written by a surety company licensed to do business in Louisiana and signed by the surety's agent or attorney-in-fact. The Bid Bond shall be written on the Bid Bond Form, and the surety for the bond must meet the qualifications stated thereon. The Bid Bond shall include the legal name of the bidder and shall be accompanied by appropriate power of attorney. The Bid Bond must be signed by both the bidder/principal and the surety in the space provided on the Bid Bond Form. Failure by the bidder/principal or the surety to sign the bid bond shall result in the rejection of the bid.

Bid security furnished by the Contractor shall guarantee that the Contractor will, if awarded the work according to the terms of his proposal, enter into the Contract and furnish Performance and Payment Bonds as required by these Bid Documents, within fifteen (15) days after written notice that the instrument is ready for his signature.

Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as penalty.

5.2.2 The Owner will have the right to retain the bid security of Bidders until either (a) the Contract has been executed and bonds have been furnished, or (b) the specified time has elapsed so that bids may be withdrawn, or (c) all bids have been rejected.

5.3 Submission of Bids

5.3.1 The Bid shall be sealed in an opaque envelope. The bid envelope shall be identified on the outside with the name of the project, and the name, address, and license number of the Bidder.
The envelope shall not contain multiple bid forms, and will be received until the time specified and at the place specified in the Advertisement for Bids. It shall be the specific responsibility of the Bidder to deliver his sealed bid to Southern University Purchasing Department at the appointed place and prior to the announced time for the opening of bids. Late delivery of a bid for any reason, including late delivery by United States Mail, or express delivery, shall disqualify the bid.

If the bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "Bid Enclosed" on the face thereof. Such bids shall be sent by Registered or Certified Mail, Return Receipt Requested, addressed to:

Southern University
Purchasing Department
P. 0. Box 9534
Baton Rouge, Louisiana, 70810.

Bids sent by express delivery shall be delivered to:

Southern University
Purchasing Department
8100 James L. Prestage Drive
J.S. Clark Administration Building Annex
South Entrance, First Floor East
Baton Rouge, Louisiana 70810

5.3.2 Bids shall be deposited at the designated location prior to the time on the date for receipt of bids indicated in the Advertisement for Bids, or any extension thereof made by addendum. Bids received after the time and date for receipt of bids will be returned unopened.

5.3.3 Bidder shall assume full responsibility for timely delivery at location designated for receipt of bids.

5.3.4 Oral, telephonic or telegraphic bids are invalid and shall not receive consideration. Owner shall not consider notations written on outside of bid envelope which have the effect of amending the bid. Written modifications enclosed in the bid envelope, and signed or initialed by the Contractor or his representative, shall be accepted.

5.4 Modification or Withdrawal of Bid

5.4.1 A bid may not be modified, withdrawn or canceled by the Bidder during the time stipulated in the Advertisement for Bids, for the period following the time and bid date designated for the receipt of bids, and Bidder so agrees in submitting his bid, except in accordance with R.S. 38:2214 which states, in part, "Bids containing patently obvious, unintentional, and substantial mechanical, clerical, or mathematical errors, or errors of unintentional omission of a substantial quantity of work, labor, material, or services made directly in the compilation of the bid, may be withdrawn by the contractor if clear and convincing sworn, written evidence of such errors is furnished to the public entity within forty-eight hours of the bid opening excluding Saturdays, Sundays, and legal holidays".

5.4.2 Prior to the time and date designated for receipt of bids, bids submitted early may be modified or withdrawn only by notice to the party receiving bids at the place and prior to the time designated for receipt of bids.

5.4.3 Withdrawn bids may be resubmitted up to the time designated for the receipt of bids provided that they are then fully in conformance with these Instructions to Bidders.

5.4.4 Bid Security shall be in an amount sufficient for the bid as modified or resubmitted.

5.5 Prohibition of Discriminatory Boycotts of Israel

By submitting a bid, the bidder certifies and agrees that the following information is correct:

In preparing its bid, the bidder has considered all proposals submitted from qualified, potential subcontractors and suppliers, and has not, in the solicitation, selection, or commercial treatment of any subcontractor or supplier, refused to transact or terminated business activities, or taken other actions intended to limit commercial relations, with a person or entity that is engaging in commercial transactions in Israel or Israel-controlled territories, with the specific intent to accomplish a boycott or divestment of Israel. The bidder has also not retaliated against any person or other entity for reporting such refusal, termination, or commercially limiting actions. The state reserves the right to reject any bid if this certification is subsequently determined to be false and to terminate any contract awarded based on such a false response.

ARTICLE 6

CONSIDERATION OF BIDS

6.1 Opening of Bids

6.1.1 The properly identified Bids received on time will be opened publicly and will be read aloud, and a tabulation abstract of the amounts of the base bids and alternates, if any, will be made available to Bidders.

6.2 Rejection of Bids

6.2.1 The Owner shall have the right to reject any or all bids and in particular to reject a bid not accompanied by any required bid security or data required by the Bid Documents or a bid in any way incomplete or irregular.

6.3 Acceptance of Bid

6.3.1 It is the intent of the Owner, if he accepts any alternates, to accept them in the order in which they are listed in the Bid Form. Determination of the Low Bidder shall be on the basis of the sum of the base bid and the alternates accepted. However, the Owner shall reserve the right to accept alternates in any order which does not affect determination of the Low Bidder.

ARTICLE 7

POST-BID INFORMATION

7.1 Submissions

7.1.1 At the Pre-Construction Conference, the Contractor shall submit the following information to the Architect.

7.1.1.1 A designation of the work to be performed by the Contractor with his own forces.

7.1.1.2 A breakdown of the Contract cost attributable to each item listed in the Schedule of Values Form (attached). No payments will be made to the Contractor until this is received.

7.1.1.3 The proprietary names and the suppliers of principal items or systems of material and equipment proposed for the work.

7.1.1.4 A list of names and business domiciles of all Subcontractors, manufacturers, suppliers or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the work. It is the preference of the Owner that, to the greatest extent possible or practical, the Contractor utilize Louisiana Subcontractors, manufacturers, suppliers and labor.

7.1.2 The General Contractor shall be responsible for actions or inactions of Subcontractors and/or material suppliers.

The General Contractor is totally responsible for any lost time or extra expense incurred due to a Subcontractor's or Material Supplier's failure to perform. Failure to perform includes, but is not limited to, a Subcontractor's financial failure, abandonment of the project, failure to make prompt delivery, or failure to do work up to standard. Under no circumstances shall the Owner mitigate the General Contractor's losses or reimburse the General Contractor for losses caused by these events.

7.1.3 The lowest responsive and responsible bidder shall submit to the Architect and the Owner within ten days after the bid opening a letter/letters from the manufacturer stating that the manufacturer will issue the roof system guarantee complying with the requirements based on the specified roof system and include the name of the applicator acceptable to the manufacturer at the highest level of certification for installing the specified roof system. This manufacturer shall be one that has received prior approval or is named in the specifications.

In accordance with La. R.S. 38:2227 [references La R.S. 38:2212(A)(3)(c)(ii), which has since been renumbered as La R.S. 38:2212(B)(3)], La. R.S. 38:2212.10 and La. R.S. 23:1726(B) the apparent low bidder on this project shall submit the completed Attestations Affidavit (Past Criminal Convictions of Bidders, Verification of Employees and Certification Regarding Unpaid Workers Compensation Insurance) form found within this bid package to Southern University Purchasing Department within 10 days <u>after</u> the opening of bids**.**

ARTICLE 8

PERFORMANCE AND PAYMENT BOND

8.1 Bond Required

8.1.1 The Contractor shall furnish and pay for a Performance and Payment Bond written by a company licensed to do business in Louisiana, which shall be signed by the surety's agent or attorney-in-fact, in an amount equal to 100% of the Contract amount. Surety must be listed currently on

the U. S. Department of Treasury Financial Management Service List (Treasury List) as approved for an amount equal to or greater than the contract amount, or must be an insurance company domiciled in Louisiana or owned by Louisiana residents. If surety is qualified other than by listing on the Treasury list, the contract amount may not exceed fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance and may not exceed the amount of $500,000. However, a Louisiana domiciled insurance company with at least an A- rating in the latest printing of the A. M. Best's Key Rating Guide shall not be subject to the $500,000 limitation, provided that the contract amount does not exceed ten percent of policyholders' surplus as shown in the latest A. M. Best's Key Rating Guide nor fifteen percent of policyholders' surplus as shown by surety's most recent financial statements filed with the Louisiana Department of Insurance. The Bond shall be signed by the surety's agent or attorney-in-fact. The Bond shall be in favor of Southern University.

8.2 Time of Delivery and Form of Bond

8.2.1 The Bidder shall deliver the required bond to the Owner simultaneous with the execution of the Contract.

8.2.2 Bond shall be in the form furnished by Southern University, entitled CONTRACT BETWEEN OWNER AND CONTRACTOR AND PERFORMANCE AND PAYMENT BOND, a copy of which is included in the Bid Documents.

8.2.3 The Bidder shall require the Attorney-in-Fact who executes the required bond on behalf of the surety to affix thereto a certified and current copy of his power of Attorney.

ARTICLE 9

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

9.1 Form to be Used

9.1.1 Form of the Contract to be used shall be furnished by Southern University Purchasing Department, an example of which is bound in the Bid Documents.

9.2 Award

9.2.1 After award of the Contract, the successful Bidder, if a corporation, shall furnish to the Owner the most current copy of a Disclosure of Ownership Affidavit on file with the Secretary of State.

9.2.2 In accordance with Louisiana Law, when the Contract is awarded, the successful Bidder shall, at the time of the signing of the Contract, execute the Non-Collusion Affidavit included in the Contract Documents

9.2.3 When this project is financed either partially or entirely with State Bonds, the award of this Contract is contingent upon the sale of bonds by the State Bond Commission. The State shall incur no obligation to the Contractor until the Contract Between Owner and Contractor is duly executed.

JOB SITE VISIT

NAME OF PROJECT: CHILLER REPLACEMENT – ARMY ROTC – LEONCE GAITER HALL
SOUTHERN UNIVERSITY AND A & M COLLEGE
BATON ROUGE, LOUISIANA
MANDATORY SITE VISIT DATE: MAY 16, 2025 @ 10:30 AM
Bid # 10337
LATE ARRIVALS CANNOT PARTICIPATE IN THE BID PROCESS

It is the responsibility of the bidder to inspect job site, verify any measurements and/or supplies needed prior to submitting a bid price on this project. Each bidder shall fully acquaint himself with conditions relating to construction and labor so that he may fully understand the facilities, difficulties and restrictions attending the execution of work under this contract. If vendor finds conditions that disagree with the physical layout as described in the bid, or any other features of the specifications that appear to be in error, same shall be noted on proposal. Failure to do so will be interpreted that bid is as specified. No consideration or allowance will be granted the Contractor for failure to visit the site or for any alleged misunderstanding of the materials to be furnished or the work to be done.

JOB SITE VISIT LOCATION:

Physical Plant Building/Benjamin H. Kraft Building
515 James L. Hunt Street
Southern University-Baton Rouge Campus 70813
Site Telephone No. 225-771-4741, 225-235-4969

The signed statement certifies the vendor's name listed below has visited the proposed site and is familiar with all conditions surrounding fulfillment of the specifications for this project.

*COMPANY*_____

*BY*_____

*DATE*_____

***Note**: Questions not answered at Site Visit or any additional questions shall be submitted in writing to the Director of Purchasing, Linda A. Antoine at linda_antoine@subr.edu.*

Note: Responses to inquiries/Addenda are pasted on LaPAC (LA Procurement Website)
LA State Procurement website:
https://wwwcfprd.doa.louisiana.gov/OSP/LaPAC/Agency/outMain.cfm
It is the responsibility of the vendor to check LAPAC for addenda.

JOB SITE VERIFIED BY DESIGNATED SOUTHERN UNIVERSITY EMPLOYEE:

_____
SIGNATURE

Return this sheet with bid for information purpose

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: Southern University and A&M College
Purchasing Department
P.O. Box 9534
Baton Rouge, Louisiana, 70810

BID FOR: Army ROTC Chiller Replacement
Southern University
Baton Rouge, Louisiana
Project No. F.1900566

The undersigned bidder hereby declares and represents that she/he: a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: **Parish Engineering, LLC** and dated: **February 7, 2025**.

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) _____ .

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____ Dollars ($ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

Alternate No. 1 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable Dollars ($ Not Applicable)

Alternate No. 2 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable Dollars ($ Not Applicable)

Alternate No. 3 *(Owner to provide description of alternate and state whether add or deduct)* for the lump sum of:

Not Applicable Dollars ($ Not Applicable)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

_____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH THE SUBMISSION OF THIS LOUISIANA UNIFORM PUBLIC WORK BID FORM:

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

**** A CORPORATE RESOLUTION OR WRITTEN EVIDENCE** of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5).

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA R.S. 38:2218(A) attached to and made a part of this bid.

BID BOND

Date: _____

KNOW ALL MEN BY THESE PRESENTS:

That_____of_____, as Principal, and_____, as Surety, are held and firmly bound unto _____(Obligee), in the full and just sum of five (5%) percent of the total amount of this proposal, including all alternates, lawful money of the United States, for payment of which sum, well and truly be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally firmly by these presents.

Surety represents that it is listed on the current U. S. Department of the Treasury Financial Management Service list of approved bonding companies as approved for an amount equal to or greater that the amount for which it obligates itself in this instrument or that it is a Louisiana domiciled insurance company with at least an A - rating in the latest printing of the A. M. Best's Key Rating Guide. If surety qualifies by virtue of its Best's listing, the Bond amount may not exceed ten percent of policyholders' surplus as shown in the latest A. M. Best's Key Rating Guide.

Surety further represents that it is licensed to do business in the State of Louisiana and that this Bond is signed by surety's agent or attorney-in-fact. This Bid Bond is accompanied by appropriate power of attorney.

THE CONDITION OF THIS OBLIGATION IS SUCH that, whereas said Principal is herewith submitting its proposal to the Obligee on a Contract for:

_____

NOW, THEREFORE, if the said Contract be awarded to the Principal and the Principal shall, within such time as may be specified, enter into the Contract in writing and give a good and sufficient bond to secure the performance of the terms and conditions of the Contract with surety acceptable to the Obligee, then this obligation shall be void; otherwise this obligation shall become due and payable.

_____	_____
PRINCIPAL (BIDDER)	SURETY
BY: _____	BY:_____
AUTHORIZED OFFICER-OWNER-PARTNER	AGENT OR ATTORNEY-IN-FACT(SEAL)

FOR INFORMATION ONLY

This document will be prepared by Southern University Purchasing Office in the form appropriate for the project.

STATE OF LOUISIANA
PARISH OF **«PARISH_OF_PROJECT»**

CONTRACT BETWEEN OWNER AND CONTRACTOR
AND PERFORMANCE AND PAYMENT BOND

This agreement entered into this _____ day of _____, 2025, by **«Contractor»** hereinafter called the "Contractor", whose business address is **«Contractor_Address», «Contractor_City», «Contractor_State» «Contractor_Zip»**, and the State of Louisiana Division of Administration, herein represented by the contracting officer executing this contract, hereinafter called the "Owner".

Witnesseth that the Contractor and the Owner, in consideration of premises and the mutual covenants; consideration and agreement herein contained, agree as follows:

Statement of Work: The contractor shall furnish all labor and materials and perform all of the work required to build, construct and complete in a thorough and workmanlike manner:

«Project_Reference_1»
«Project_Reference_2»
«Project_Reference_3»
«Project_City», Louisiana
Project No.: «ProjectNo», «Part_No»«WBS»;
«Supplement_Project_No», Part «Supplement_Part_No»
(«Supplement_WBS»)(Supplement)
State ID No.: «StateID» Site Code: «SiteCode»

in strict accordance with Contract Documents prepared by:

«Designer»
«Designer_Address»
«Designer_City», «Designer_State» «Designer_Zip»

It is recognized by the parties herein that said Contract Documents including by way of example and not of limitation, the Drawings and Specifications dated **«Drawings_and_Specs_Date»**, Addenda number(s) **«Addenda_No»**, the Instruction to Bidders, Bid Form, General Conditions, Supplementary Conditions, any Addenda thereto, impose duties and obligations upon the parties herein, and said parties thereby agree that they shall be bound by said duties and obligations. For these purposes, all of the provisions contained in the aforementioned Construction Documents are incorporated herein by reference with the same force and effect as though said Construction Documents were herein set out in full.

Time for Completion: The work shall be commenced on a date to be specified in a written order of the Owner and shall be completed within **«Time_Completion_Days» («Time_Completion_Days»)** consecutive calendar days from and after the said date.

Liquidated Damages: Contractor shall be assessed Liquidated Damages in the amount of **«Liquidated_Damages_Cost_Per_Day»** per day for each consecutive calendar day which work is not complete beginning with the first day beyond the completion time.

Compensation to be paid to the Contractor: The Owner will pay and the Contractor will accept in full consideration for the performance of the contract the sum of **«Contract_Amount_Words» and No/100 Dollars («Contract_Amount_Numeral»)** which sum represents the **«Base_Bid_Only_or_Plus_Alternates»**

Taxes: Contractor hereby agrees that the responsibility for payment of taxes from the funds thus received under this Contract and/or legislative appropriation shall be contractor's obligation and identified under Federal tax identification number _____.

Performance and Payment Bond: To these presents personally came and intervened _____, herein acting for _____, a corporation organized and existing under the laws of the State of _____, and duly authorized to transact business in the State of Louisiana, as surety, who declared that having taken cognizance of this contract and of the Construction Documents mentioned herein, he hereby in his capacity as its Attorney in Fact obligates his said company, as Surety for the said Contractor, unto the said Owner, up to the sum of **«Contract_Amount_Words» and No/100 Dollars («Contract_Amount_Numeral»)**. By issuance of this bond, the surety acknowledges they are in compliance with R.S. 38:2219.

The condition of this performance and payment bond shall be that should the Contractor herein not perform the contract in accordance with the terms and conditions hereof, or should said Contractor not fully indemnify and save harmless the Owner, from all cost and damages which he may suffer by said Contractor's non-performance or should said Contractor not pay all persons who have and fulfill obligations to perform labor and/or furnish materials in the prosecution of the work provided for herein, including by way of example workmen, laborers, mechanics, and furnishers of materials, machinery, equipment and fixtures, then said Surety agrees and is bound to so perform the contract and make said payment(s).

Provided, that any alterations which may be made in the terms of the contract or in the work to be done under it, or the giving by the Owner of any extensions of time for the performance of the contract, or any other forbearance on the part of either the Owner or the Contractor to the other shall not in any way release the Contractor or the Surety from their liability hereunder, notice to the Surety of any such alterations, extensions or other forbearance being hereby waived.

Contractor acknowledges and agrees to comply with the provisions of La. R.S. 38:2212.10 and federal law pertaining to E-Verify in the performance of services under this Contract.

It is hereby agreed that the Legislative Auditor of the State of Louisiana and/or the Office of the Governor, Division of Administration auditors shall have the option of auditing all accounts of contractor which relate to this contract.

The continuation of this contract is contingent upon the appropriation of funds to fulfill the requirements of the contract by the legislature. If the legislature fails to appropriate sufficient monies to provide for the continuation of the contract, or if such appropriation is reduced by the veto of the Governor or by any means provided in the appropriations act to prevent the total appropriation for the year from exceeding revenues for that year, or for any other lawful purpose, and the effect of such reduction is to provide insufficient monies for the continuation of the contract, the contract shall terminate on the date of the beginning of the first fiscal year for which funds are not appropriated.

The contractor agrees to abide by the requirements of the following as applicable: Title VI of the Civil Rights Act of 1964 and Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972, Federal Executive Order 11246 as amended, the Rehabilitation Act of 1973, as amended, the Vietnam Era Veteran's Readjustment Assistance Act of 1974, Title IX of the Education Amendments of 1972, the Age Discrimination Act of 1975, the Fair Housing Act of 1968 as amended, and contractor agrees to abide by the requirements of the Americans with Disabilities Act of 1990.

Contractor agrees not to discriminate in its employment practices, and will render services under this contract without regard to race, color, religion, sex, sexual orientation, national origin, veteran status, political affiliation, disability, or age in any matter relating to employment. Any act of discrimination committed by Contractor, or failure to comply with these statutory obligations when applicable shall be grounds for termination of this contract.

In accordance with R.S. 39:1602.1, effective May 22, 2018, for any contract for $100,000 or more and for any contractor with five or more employees, Contractor, or any Subcontractor, shall certify it is not engaging in a boycott of Israel, and shall, for the duration of this contract, refrain from a boycott of Israel. The State reserves the right to terminate this contract if the Contractor, or any Subcontractor, engages in a boycott of Israel during the term of the contract.

In accordance with La. R.S. 39:1602.2, the following applies to any competitive sealed bids, competitive sealed proposals, or contract(s) with a value of $100,000 or more involving a for-profit company with at least fifty full-time employees:

Unless otherwise exempted by law, by submitting a response to this solicitation or entering into this contract, the Bidder, Proposer or Contractor certifies the following:

1. The company does not have a practice, policy, guidance, or directive that discriminates against a firearm entity or firearm trade association based solely on the entity's or association's status as a firearm entity or firearm trade association;
2. The company will not discriminate against a firearm entity or firearm trade association during the term of the contract based solely on the entity's or association's status as a firearm entity or firearm trade association.

The State reserves the right to reject the response of the Bidder, Proposer or Contractor if this certification is subsequently determined to be false, and to terminate any contract awarded based on such a false response or if the certification is no longer true.

Contractor has a continuing obligation to disclose any suspensions or debarment by any government entity, including but not limited to General Services Administration (GSA). Failure to disclosed may constitute grounds for suspension and/or termination of the Contract and debarment from future Contracts.

Contractor, and each tier of Subcontractors, shall certify that it is not on the List of Parties Excluded from Federal Procurement or Nonprocurement Programs promulgated in accordance with E.O.s 12549 and 12689, "Debarment and Suspension," as set forth at 24 CFR part 24.

In Witness whereof, the parties hereto on the day and year first above written have executed this agreement in six (6) counterparts, each of which shall, without proof or accountancy for the other counterparts, be deemed an original thereof.

THUS DONE AND SIGNED at Baton Rouge, Louisiana, on the day, month, and year first written above.

WITNESSES:

SOUTHERN UNIVERSITY
BATON ROUGE CAMPUS

_____
Southern University Witness #1 Sign Here

BY: _____
DENNIS J. SHEILDS,
PRESIDENT-CHANCELLOR, SUS

_____
Southern University Witness #2 Sign Here

_____
Contractor Witness #1 Sign Here

BY: _____
«CONTRACTOR»

_____
Contractor Witness #2 Sign Here

SURETY:

_____
Surety Witness #1 Sign Here

BY: _____
ATTORNEY IN FACT

_____
Surety Witness #2 Sign Here

_____
ADDRESS

_____
TELEPHONE NUMBER

STATE OF LOUISIANA
PARISH OF **«PARISH_OF_CONTRACTOR»**

PROJECT NO.:«ProjectNo», «Part_No»«WBS»;
«Supplement_Project_No», Part
«Supplement_Part_No» («Supplement_WBS»)(Supplement)
NAME: «Project_Reference_1»
«Project_Reference_2»
«Project_Reference_3»
LOCATION: «Project_City»

NON-COLLUSION AFFIDAVIT

Before me, the undersigned authority, duly commissioned and qualified within and for the State and Parish aforesaid, personally came and appeared _____ representing **«Contractor»** who, being by me first duly sworn deposed and said that he has read this affidavit and does hereby agree under oath to comply with all provisions herein as follows:

PART I.

Section 2224 of Part II of Chapter 10 of Title 38 of the Louisiana Revised Statutes, as amended.

(1) That affiant employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project or in securing the public contract were in the regular course of their duties for affiant; and

(2) That no part of the Contract price received by affiant was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the Contract, other than the payment of their normal compensation to persons regularly employed by the affiant whose services in connection with the construction, alteration or demolition of the public building or project were in the regular course of their duties for affiant.

PART II.

Section 2190 of Part I of Chapter 10 of Title 38 of the Louisiana Revised Statutes, as amended.

That affiant, if an architect or engineer, or representative thereof, does not own a substantial financial interest, either directly or indirectly, in any corporation, firm, partnership, or other organization which supplies materials for the construction of a public work when the architect or engineer has performed architectural or engineering services, either directly or indirectly, in connection with the public work for which the materials are being supplied.

For the purposes of this Section, a "substantial financial interest" shall exclude any interest in stock being traded on the American Stock Exchange or the New York Stock Exchange.

That affiant, if subject to the provisions of this section, does hereby agree to be subject to the penalties involved for the violation of this section.

_____
AFFIANT

SWORN TO AND SUBSCRIBED BEFORE ME THIS _____ DAY OF _____, 2025.

_____
NOTARY

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Chiller Replacement, US Army ROTC
Baton Rouge, Louisiana
Project No.: F.19002566

THE OWNER:
(Name, legal status and address)

Southern University A & M College
Purchasing Department
PO Box 9534
Baton Rouge, LA 70810

THE ARCHITECT:
(Name, legal status and address)

Parish Engineering
7600 Innovation Park Drive
Baton Rouge, LA 70820

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set

forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately

suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not

have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will

similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the

Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor

change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot

be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to

the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,

the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions modify, change, delete from or add to the General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition. Where any Article of the General Conditions is modified or any Section, Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Section, Article, Paragraph, Subparagraph or Clause shall remain in effect.

Articles, Sections, Paragraphs, Subparagraphs or Clauses modified or deleted have the same numerical designation as those occurring in the General Conditions.

ARTICLE 1

GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1. The Contract Documents

In Section 1.1.1 delete the third sentence, and add the following sentence:
The Contract Documents shall include the Bid Documents as listed in the Instructions to Bidders and any modifications made thereto by addenda.

1.1.8 Initial Decision Maker

Delete all after the words, "shall not show partiality to the Owner or Contractor".

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE [REFER TO *La R.S. 38:2317*]

1.5.1 Delete the first sentence of the paragraph.

1.5.1 In the third sentence: delete the remainder after the word "publication".

1.7 DIGITAL DATA USE AND TRANSMISSION

In the first sentence after the words, "in digital form" delete ". The parties will use AIA Document E203 2013, Building Information Modeling and Digital Data Exhibit".

1.8 BUILDING INFORMATION MODELS USE AND RELIANCE

Delete Section 1.8.

ARTICLE 2

OWNER

2.2 EVIDENCE OF THE OWNER'S FINANCIAL ARRANGEMENTS

Delete Section 2.2.

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.3.1 In the first sentence, delete: all before "the Owner shall secure…"

Delete Section 2.3.2 and substitute the following:

2.3.2 The term Architect, when used in the Contract Documents, shall mean the prime Designer (Architect, Engineer, or Landscape Architect), or his authorized representative, lawfully licensed to practice architecture, engineering, or landscape architecture in the State of Louisiana, identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number.

2.3.3 Delete the words: "to whom the Contractor has no reasonable objection and".

ARTICLE 3

CONTRACTOR

3.4 LABOR AND MATERIALS

3.4.2 Delete Section 3.4.2.

Delete Section 3.4.3 and substitute with the following:

3.4.3 Contractor and its employees, officers, agents, representatives, and Subcontractors shall conduct themselves in an appropriate and professional manner, in accordance with the Owner's requirements, at all times while working on the Project. Any such individual who behaves in an inappropriate manner or who engages in the use of inappropriate language or conduct while on Owner's property, as determined by the Owner, shall be removed from the Project at the Owner's request. Such individual shall not be permitted to return without the written permission of the Owner. The Owner shall not be responsible or liable to Contractor or any Subcontractor for any additional costs, expenses, losses, claims or damages incurred by Contractor or its Subcontractor as a result of the removal of an individual from the Owner's property pursuant to this Section. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

3.5 WARRANTY

3.5.2 Replace reference to "Section 9.8.4" with "Section 9.8.6".

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS (La R.S. 40:1724[A])

3.7.1 Delete Section 3.7.1.

3.7.2 In Section 3.7.2, replace the word "public" with the word "State".

Delete Section 3.7.5 and substitute the following:

3.7.5 If, during the course of the Work, the Contractor discovers human remains, unmarked burial or archaeological sites, burial artifacts, or wetlands, which are not indicated in the Contract Documents, the Contractor shall follow all procedures mandated by State and Federal law, including but not limited to La R.S. 8:671 et seq., the Office of Coastal Protection and Restoration, and Sections 401 & 404 of the Federal Clean Water Act. Request for adjustment of the Contract Sum and Contract Time arising from the existence of such remains or features shall be submitted in writing to the Owner pursuant to the Contract Documents.

3.8 ALLOWANCES

Delete Sections 3.8.1, 3.8.2, and 3.8.3 in their entirety and add the following new Section 3.8.1:

3.8.1 Allowances shall not be made on any of the Work.

3.9 SUPERINTENDENT

3.9.1 Add the following to the end of the paragraph:
Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULES

3.10.1 Add the following: For projects with a contract sum greater than $1,000,000.00, the Contractor shall include with the schedule, for the Owner's and Architect's information, a network analysis to identify those tasks which are on the critical path, i.e., where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. A revised schedule shall be submitted with each Application and Certificate for Payment. No payment shall be made until this schedule is received.

3.10.3 In the first sentence, delete the word "general".

After the first sentence, add the following:
If the Work is not on schedule, as determined by the Architect, and the Contractor fails to take action to bring the Work on schedule, then the Contractor shall be deemed in default under this Contract and the progress of the Work shall be deemed unsatisfactory. Such default may be considered grounds for termination by the Owner for cause in accordance with Section 14.2.

Add the following Sections:

3.10.4 Add the following: Submittal by the contractor of a schedule or other documentation showing a completion date for his Work prior to the completion date stated in the contract shall not impose any obligation or responsibility on the Owner or Architect for the earlier completion date.

3.10.5 In the event the Owner employs a commissioning consultant, the Contractor shall cooperate fully in the commissioning process and shall require all subcontractors and

others under his control to cooperate. The purpose of such services shall be to ensure that all systems perform correctly and interactively according to the provisions of the Contract Documents.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following: This requirement is of the essence of the contract. The Architect shall determine the value of these documents and this amount shall not be approved for payment to the Contractor until all of the listed documents are delivered to the Architect in good order, completely marked with field changes and otherwise complete in all aspects.

ARTICLE 4

ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

4.2.1 In the first sentence, delete the phrase: "the date the Architect issues the final Certificate for Payment" and replace with the phrase "final payment is due, and with the Owner's concurrence, from time to time during the one year period for correction of Work described in Section 12.2."

4.2.2 In the first sentence, after the phrase: "become generally familiar with"; insert the following: "and to keep the Owner informed about".

In the first sentence, after the phrase "portion of the Work completed", insert the following: "to endeavor to guard the Owner against defects and deficiencies in the Work,"

4.2.4 In the first sentence, delete all after "The Owner and Contractor", and add the following "may communicate directly with each other, when deemed necessary by the Owner, and the Owner will notify the Architect of any decision."

4.2.10 Add the following sentence to the end of Section 4.2.10: There shall be no restriction on the Owner having a Representative.

4.2.11 Add the following sentence to the end of Section 4.2.11:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

4.2.14 Insert the following sentence between the second and third sentences of Section 4.2.14:

If no agreement is made concerning the time within which interpretation required of the Architect shall be furnished in compliance with this Section 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretation until 15 days after written request is made for them.

ARTICLE 5

SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Section 5.2.1, and substitute the following:

5.2.1 Unless otherwise required by the Contract Documents, the Contractor shall furnish at the Pre-Construction Conference, to the Owner and the Architect, in writing, the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. No Contractor payments shall be made until this information is received.

Delete Section 5.2.2, and substitute the following:

5.2.2 The Contractor shall be solely responsible for selection and performance of all subcontractors. The Contractor shall not be entitled to claims for additional time and/or an increase in the contract sum due to a problem with performance or nonperformance of a subcontractor.

Delete Sections 5.2.3 and 5.2.4 and substitute the following:

5.2.3 The Contractor shall notify the Architect and the Owner when a subcontractor is to be changed and substituted with another subcontractor.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

Delete Sections 5.4, 5.4.1, 5.4.2 and 5.4.3

ARTICLE 7

CHANGES IN THE WORK

7.1 GENERAL

Add the following Sections:

7.1.4 As part of the pre-construction conference submittals, the Contractor shall submit the following prior to the Contractor's initial request for payment:

7.1.4.1 Fixed job site overhead cost itemized with documentation to support daily rates.

7.1.4.2 Bond Premium Rate with supporting information from the General Contractor's carrier.

7.1.4.3 Labor Burden by trade for both Subcontractors and General Contractor. The Labor Burden shall be supported by the Worker's Compensation and Employer's Liability Insurance Policy Information Page. Provide for all trades.

7.1.4.4 Internal Rate Charges for all significant company owned equipment.

7.1.5 If the General Contractor fails to submit the aforementioned documentation as part of the pre-construction submittals, then pay applications shall not be processed until such time as the Owner receives this information.

7.2 CHANGE ORDERS

Delete Section 7.2.1, and substitute the following Sections:

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, the Architect, and the Contractor issued after execution of the Contract, authorizing a change in the Work and/or an adjustment in the Contract Sum and/or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time. Any reservation of rights, stipulation, or other modification made on the change order by the contractor shall have no effect.

7.2.2 "Cost of the Work" for the purpose of Change Orders shall be the eligible costs required to be incurred in performance of the Work and paid by the Contractor and Subcontractors which eligible costs shall be limited to:

7.2.2.1 Actual wages paid directly to labor personnel, with a labor burden markup exclusively limited to applicable payroll taxes, worker's compensation insurance, unemployment compensation, and social security taxes for those labor personnel performing the Work. Wages shall be the basic hourly labor rate paid an employee exclusive of fringe benefits or other employee costs. The labor burden percentage for the "Cost of the Work" is limited to categories listed herein. Employer-provided health insurance, fringe benefits, employee training (whether a requirement of employment or not), vacation pay, etc., are examples of ineligible labor burden costs which ***shall not*** be included, as these costs are already compensated by the Overhead and Profit markup.

Supervision shall not be included as a line item in the "Cost of the Work", except when the change results in a documented delay in the critical path, as described in Section 7.2.7.

7.2.2.2 Cost of all materials and supplies necessary and required to perform the Work, identifying each item and its individual cost, including taxes. Incidental consumables are not eligible costs and shall not be included.

7.2.2.3 Cost of each necessary piece of machinery and equipment required to perform the Work, identifying each item and its individual cost, including taxes. Incidental small tools of a specific trade (i.e., shovels, saws, hammers, air compressors, etc.,) and general use vehicles, such as pickup trucks even for

moving items around the site, fuel for these general use vehicles, travel, lodging, and/or meals are not eligible and shall not be included.

7.2.2.4 Eligible Insurance costs shall be limited to documented increases in "Builder's Risk" insurance premium / costs only. Commercial General Liability, Automobile Liability, and all other required insurances, where referenced in the Contract shall be considered part of normal overhead. These costs are already compensated by the Overhead and Profit markup.

7.2.2.5 Cost for the General Contractor Performance and Payment Bond premium, where the documented cost of the premiums have been increased due to the Change Order.

7.2.3 Overhead and Profit - The Contractor and Subcontractor shall be due home office fixed overhead and profits on the Cost of the Work, but shall not exceed a total of 16% of the direct cost of any portion of Work.

The credit to the Owner resulting from a change in the Work shall be the sum of those items above, including overhead and profit. Where a change results in both credits to the Owner and extras to the Contractor for related items, overhead and profit shall be computed for credits to the Owner and extras to the Contractor. The Owner shall receive full credit for the computed overhead and profit on credit change order items.

7.2.4 The cost to the Owner resulting from a change in the Work shall be the sum of: Cost of the Work (as defined at Section 7.2.2) and Overhead and Profit (as defined at Section 7.2.3), and shall be computed as follows:

7.2.4.1 When all of the Work is General Contractor Work; 8% markup on the Cost of the Work.

7.2.4.2 When the Work is all Subcontract Work; 8% markup on the Cost of the Work for Subcontractor's Overhead and Profit, plus 8% markup on the Cost of the Work, not including the Subcontractor's Overhead and Profit markup, for General Contractor's Overhead and Profit.

7.2.4.3 When the Work is a combination of General Contractor Work and Subcontract Work; that portion of the direct cost that is General Contract Work shall be computed per Section 7.2.4.1 and that portion of the direct cost that is Subcontract Work shall be computed per Section 7.2.4.2.

Premiums for the General Contractor's bond may be included, but after the markup is added to the Cost of the Work.
Premiums for the Subcontractor's Bond shall not be included.

7.2.4.4 Subcontract cost shall consist of the items in Section 7.2.2 above plus Overhead and Profit as defined in Section 7.2.3.

7.2.5 Before a Change Order is prepared, the Contractor shall prepare and deliver to the Architect the following information concerning the Cost of the Work, not subject to waiver, within a reasonable time after being notified to prepare said Change Order:

A detailed, itemized list of labor, material and equipment costs for the General Contractor's Work including quantities and unit costs for each item of labor, material and equipment.

An itemized list of labor, material and equipment costs for each Subcontractor's and/or Sub-Subcontractor's Work including quantities and unit costs for each item of labor, material and equipment.

7.2.6 After a Change Order has been approved, no future requests for extensions of time or additional cost shall be considered for that Change Order.

7.2.7 Extended fixed job-site costs are indirect costs that are necessary to support the work in the field. Examples of fixed job-site costs are field office rental, salaries of field office staff, field office utilities, and telephone.

Extended fixed job-site costs or equitable adjustment may be included in a Change Order due to a delay in the critical path, with the exception of weather related delays. In the event of a delay in the critical path, the Contractor shall submit all changes or adjustments to the Contract Time **within twenty-one (21) days** of the event giving rise to the delay. The Contractor shall submit documentation and justification for the adjustment by performing a critical path analysis of its most recent schedule in use prior to the change, which shows an extension in critical path activities.

The Contractor shall notify the Architect in writing that the Contractor is making a claim for extended fixed job-site overhead as required by Section 15.1.2. The Contractor shall provide proof that the Contractor is unable to mitigate financial damages through Alternate Work within this Contract or replacement work. "Replacement Work" is that work which the Contractor is obligated to perform under any construction contract separate from this Contract. Reasonable proof shall be required by the Architect that the delays affected the Completion Date.

7.2.8 "Cost of the Work" whether General Contractor cost or Subcontractor cost shall not apply to the following:

7.2.8.1 Salaries or other compensation of the Contractor's personnel at the Contractor's principal office and branch offices.

7.2.8.2 Any part of the Contractor's capital expenses, including interest on the Contractor's capital employed for the Work.

7.2.8.3 Overhead and general expenses of any kind or the cost of any item not specifically and expressly included above in Cost of the Work.

7.2.8.4 Cost of supervision refer to section 7.2.2.1, with exception as provided in Section 7.2.7.

7.2.9 When applicable as provided by the Contract, the cost to Owner for Change Orders shall be determined by quantities and unit prices. The quantity of any item shall be as

submitted by the Contractor and approved by the Architect. Unit prices shall cover cost of Material, Labor, Equipment, Overhead and Profit.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3 In the first sentence after "following methods" insert: ", but not to exceed a specified amount".

7.3.4 From .1 of the list, delete all after "Costs of labor, including" and substitute the following "social security, old age and employment insurance, applicable payroll taxes, and workers' compensation insurance;"

Delete the following from .4 of the list: "permit fees,"

Delete Section 7.3.9 and substitute the following:

7.3.9 Pending final determination of the total costs of a Construction Change Directive to the Owner, amounts not in dispute for such changes in the Work shall be included in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs.

ARTICLE 8

TIME

8.1 DEFINITIONS

Add the following:

8.1.5 The Contract Time shall not be changed by the submission of a schedule that shows an early completion date unless specifically authorized by change order.

8.2 PROGRESS AND COMPLETION

Add to Section 8.2.1 the following:

Completion of the Work must be within the Time for Completion stated in the Agreement, subject to such extensions as may be granted under Section 8.3. The Contractor agrees to commence Work not later than fourteen (14) days after the transmittal date of Written Notice to Proceed from the Owner and to substantially complete the project within the time stated in the Contract. The Owner will suffer financial loss if the project is not substantially complete in the time set forth in the Contract Documents. The Contractor and the Contractor's Surety shall be liable for and shall pay to the Owner the sum stated in the Contract Documents as fixed, agreed and liquidated damages for each consecutive calendar day (Saturdays, Sundays and holidays included) of delay until the Work is substantially complete. The Owner shall be entitled to the sum stated in the Contract Documents. Such Liquidated Damages shall be withheld by the Owner from the amounts due the Contractor for progress payments.

Delete Section 8.2.2.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 In the first sentence after the words "Owner pending" delete the words "mediation and binding dispute resolution" and add the word "litigation", and delete the last word "determine" and add the following: "recommend, subject to Owner's approval of Change Order. If the claim is not made within the limits of Article 15, all rights for future claims for that month are waived."

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

Delete Section 9.1.2.

Delete Section 9.2 and substitute the following:

9.2 SCHEDULE OF VALUES

At the Pre-Construction Conference, the Contractor shall submit to the Owner and the Architect a Schedule of Values prepared as follows:

9.2.1 The attached Schedule of Values Format shall be used. If applicable, the cost of Work for each section listed under each division, shall be given. The cost for each section shall include Labor, Materials, Overhead and Profit.

9.2.2 The Total of all items shall equal the Total Contract Sum. This schedule, when approved by the Architect, shall be used as a basis for the Contractor's Applications for Payment and it may be used for determining the cost of the Work in deductive change orders, when a specific item of Work listed on the Schedule of Values is to be removed. Once the Schedule of Values is submitted at the Pre-Construction Conference, the schedule shall not be modified without approval from the Owner and Architect.

9.3 APPLICATIONS FOR PAYMENT

Delete Sections 9.3.1, 9.3.1.1, and 9.3.1.2 and substitute the following:

9.3.1 Monthly, the Contractor shall submit to the Architect an – Application and Certification for Payment form, supported by any additional data substantiating the Contractor's right to payment as the Owner or the Architect may require. Application for Payment shall be submitted on or about the first of each month for the value of labor and materials incorporated into the Work and of materials, suitably stored, at the site as of the twenty-fifth day of the preceding month, less normal retainage as follows, per La R.S. 38:2248:

9.3.1.1 Projects with Contract price up to $500,000.00 – 10% of the Contract price.

9.3.1.2 Projects with Contract price of $500,000.00, or more – 5% of the Contract price.

9.3.1.3 No payment shall be made until the revised schedule required by Section 3.10.1 is received.

9.3.1.4 The normal retainage shall not be due the Contractor until after substantial completion and expiration of the forty-five day lien period and submission to the Architect of a clear lien certificate, consent of surety, and invoice for retainage.

Delete Section 9.3.2 and substitute the following:

9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. Payments for materials or equipment stored on the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, including applicable insurance.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Section 9.5.1.7: Delete the word "repeated".

Delete Section 9.5.4.

9.6 PROGRESS PAYMENTS

Delete Section 9.6.1 and substitute the following:

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment within twenty days except for projects funded fully or in part by a Federal reimbursement program. For such projects the Owner will make payment in a timely manner consistent with reimbursement.

9.6.2 Delete the phrase: "no later than seven days" from the first sentence.

After the end of the second sentence, add the following:

La R.S. 9:2784 (A) and (C) require a Contractor or Subcontractor to make payment due to each Subcontractor and supplier within fourteen (14) consecutive days of the receipt of payment from the Owner. If not paid, a penalty in the amount of ½ of 1% per day is due, up to a maximum of 15% from the expiration date until paid. The contractor or subcontractor, whichever is applicable, is solely responsible for payment of a penalty.

9.6.4 Delete the first two sentences of Section 9.6.4 and add the following to the end of the Section:

Pursuant to La. R.S. 38:2242 and La. R.S. 38:2242.2, when the Owner receives any claim of nonpayment arising out of the Contract, the Owner shall deduct 125% of such claim from the Contract Sum. The Contractor, or any interested party, may deposit security, in accordance with La. R.S. 38:2242.2, guaranteeing payment of the claim with the recorder of mortgages of the parish where the Work has been done. When the Owner receives

original proof of such guarantee from the recorder of mortgages, the claim deduction will be added back to the Contract Sum.

Delete Section **9.7 FAILURE OF PAYMENT**.

Delete Section 9.8 and substitute the following:

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The Architect shall determine if the project is substantially complete in accordance with this Section.

9.8.2 When the Contractor considers that the Work is Substantially Complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

9.8.3 Upon receipt of the Contractor's list, the Architect shall make an inspection to determine whether the Work is substantially complete. A prerequisite to the Work being considered as substantially complete is the Owner's receipt of the executed Roofing Contractor's and Roofing Manufacturer's guarantees, where roofing Work is part of the Contract. Prior to inspection by the Architect, the Contractor shall notify the Architect that the project is ready for inspection by the State Fire Marshal's office. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use, the Contractor shall, before the Work can be considered as Substantially Complete, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

9.8.4 When the Architect determines that the project is Substantially Complete, he shall prepare a punch list of exceptions and the dollar value related thereto. The monetary value assigned to this list will be the sum of the cost estimate for each particular item of Work the Architect develops based on the mobilization, labor, material and equipment costs of correcting the item and shall be retained from the monies owed the contractor, above and beyond the standard lien retainage. The cost of these items shall be prepared in the same format as the schedule of values. At the end of the forty-five day lien period payment shall be approved for all punch list items completed up to that time. After that payment, none of the remaining funds shall be due the contractor until all punch list items are completed and are accepted by the Architect. If the dollar value of the punch list exceeds the amount of funds, less the retainage amount, in the remaining balance of the Contract, then the Project shall not be considered as substantially complete. If funds remaining are less than that required to complete the Work, the Contractor shall pay the difference.

9.8.5 When the preparation of the punch list is complete the Architect shall prepare a Recommendation of Acceptance incorporating the punch list and submit it to the Owner.

Upon approval of the Recommendation of Acceptance, the Owner may issue a Notice of Acceptance of Building Contract which shall establish the Date of Substantial Completion. The Contractor shall record the Notice of Acceptance with the Clerk of Court in the Parish in which the Work has been performed. If the Notice of Acceptance has not been recorded seven (7) days after issuance, the Owner may record the Acceptance at the Contractor's expense. All additive change orders must be processed before issuance of the Recommendation of Acceptance. The Owner shall not be responsible for payment for any Work associated with change orders that is not incorporated into the contract at the time of the Recommendation of Acceptance.

9.8.6 Warranties required by the Contract Documents shall commence on the date of Acceptance of the Work unless otherwise agreed to in writing by the Owner and Contractor. Unless otherwise agreed to in writing by the Owner and Contractor, security, maintenance, heat, utilities, damage to the Work not covered by the punch list and insurance shall become the Owner's responsibility on the Date of Substantial Completion.

9.8.7 If all punch list items have not been completed by the end of the forty-five (45) day lien period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within forty-five (45) days after notification, the Surety has not completed the punch list, through no fault of the Architect or Owner, the Owner may, at his option, contract to have the balance of the Work completed and pay for such Work with the unpaid funds remaining in the Contract sum. Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future state contracts. If the surety fails to complete the punch list within the stipulated time period, the Owner may not accept bonds submitted, in the future, by the surety.

9.9 PARTIAL OCCUPANCY OR USE

Delete Section 9.9.1 and substitute the following:

9.9.1 Partial Occupancy is that stage in the progress of the Work when a designated portion of the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the designated portion of the Work for its intended use. The Owner may occupy or use any substantially completed portion of the Work so designated by separate agreement with the Contractor and authorized by public authorities having jurisdiction over the Work. Such occupancy or use may commence provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers the designated portion substantially complete the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Delete Section 9.10.4 and replace with the following:

9.10.4 The making of final payment shall not constitute a waiver of Claims by the Owner for the following:

9.10.4.1 Claims, security interests, or encumbrances arising out of the Contract and unsettled;

9.10.4.2 failure of the Work to comply with the requirements of the Contract Documents irrespective of when such failure is discovered;

9.10.4.3 terms of special warranties required by the Contract Documents; or

9.10.4.4 audits performed by the Owner, after final payment.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.2 In the first sentence, between the words: "bearing on" and "safety", add the words: "the health and,"

10.3 HAZARDOUS MATERIALS

10.3.1 In the second sentence after (PCB) add: "or lead".

10.3.2 After the first sentence, delete all remaining sentences.

Add at the end: "The Contract time shall be extended appropriately."

Delete Section 10.4 and substitute the following:

10.4 EMERGENCIES

In an emergency affecting the safety of persons or property, the Contractor shall notify the Owner and Architect immediately of the emergency, simultaneously acting at his discretion to prevent damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency Work shall be determined as provided in Article 15 and Article 7.

ARTICLE 11

INSURANCE AND BONDS

AIA A101 – 2017 Exhibit A is not a part of these documents. Delete all of Sections 11.1, 11.2, 11.3, 11.4, and 11.5, and substitute the following:

INSURANCE REQUIREMENTS FOR
NEW CONSTRUCTION, ADDITIONS AND RENOVATIONS

11.1 CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall purchase and maintain without interruption for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, its agents, representatives, employees or subcontractors. The duration of the contract shall be from the inception of the contract until the date of final payment.

11.2 MINIMUM SCOPE AND LIMITS OF INSURANCE

11.2.1 Worker's Compensation

Worker's Compensation insurance shall be in compliance with the Worker's Compensation law of the Contractor's headquarters. Employers Liability is included with a minimum limit of $1,000,000 per accident/per disease/per employee. If Work is to be performed over water and involves maritime exposure, applicable LHWCA, Jones Act or other maritime law coverage shall be included. A.M. Best's insurance company rating requirement may be waived for Worker's compensation coverage only.

11.2.2 Commercial General Liability

Commercial General Liability insurance, including Personal and Advertising Injury Liability and Products and Completed Operations Liability, shall have a minimum limit per occurrence based on the project value. The Insurance Services Office (ISO) Commercial General Liability occurrence coverage form CG 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. Claims-made form is unacceptable.

The aggregate loss limit must apply to each project. ISO form CG 25 03 (current form approved for use in Louisiana), or equivalent, shall also be submitted. The State project number, including part number, and project name shall be included on this endorsement.

COMBINED SINGLE LIMIT (CSL) PER OCCURRENCE

Type of Construction	**Projects up to $1,000,000**	**Projects over $1,000,000 up to $10,000,000**	**Projects over $10,000,000**
New Buildings:			
Each Occurrence Minimum Limit	$1,000,000	$2,000,000	$4,000,000
Per Project Aggregate	$2,000,000	$4,000,000	$8,000,000
Renovations:	**The building(s) value for the Project is $_____.**		
Each Occurrence Minimum Limit	$1,000,000**	$2,000,000**	$4,000,000**
Per Project Aggregate	2 times per	2 times per	2 times per

occur limit** occur limit** occur limit**

**While the minimum Combined Single Limit of $1,000,000 is required for any renovation, the limit is calculated by taking 10% of the building value and rounding it to the nearest $1,000,000 to get the insurance limit. Example: Renovation on a $33,000,000 building would have a calculated $3,000,000 combined single limit of coverage (33,000,000 times .10 = 3,300,000 and then rounding down to $3,000,000). If the calculated limit is less than the minimum limit listed in the above chart, then the amount needed is the minimum listed in the chart. Maximum per occurrence limit required is $10,000,000 regardless of building value. The per project aggregate limit is then calculated as twice the per occurrence limit.

11.2.3 Automobile Liability

Automobile Liability Insurance shall have a minimum combined single limit per occurrence of $1,000,000. ISO form number CA 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. This insurance shall include third-party bodily injury and property damage liability for owned, hired and non-owned automobiles.

11.2.4 Excess Umbrella

Excess Umbrella Insurance may be used to meet the minimum requirements for General Liability and Automobile Liability only.

11.2.5 Builder's Risk

11.2.5.1 Builder's Risk Insurance shall be in an amount equal to the amount of the construction contract including any amendments and shall be upon the entire Work included in the contract. The policy shall provide coverage equivalent to the ISO form number CP 10 20, Broad Form Causes of Loss (extended, if necessary, to include the perils of wind, earthquake, collapse, vandalism/malicious mischief, and theft, including theft of materials whether or not attached to any structure). The policy must include architects' and engineers' fees necessary to provide plans, specifications and supervision of Work for the repair and/or replacement of property damage caused by a covered peril, not to exceed 10% of the cost of the repair and/or replacement.

11.2.5.2 Flood coverage shall be provided by the Contractor on the first floor and below for all projects, except as otherwise noted. The builder's risk insurance policy, sub-limit for flood coverage shall not be less than ten percent (10%) of the total contract cost per occurrence. If flood is purchased as a separate policy, the limit shall be ten percent (10%) of the total contract cost per occurrence (with a max of $500,000 if NFIP). Coverage for roofing projects shall **not** require flood coverage.

11.2.5.3 A Specialty Contractor may provide an installation floater in lieu of a Builder's Risk policy, with the similar coverage as the Builder's Risk policy, upon the system to be installed in an amount equal to the amount of the contract including any amendments. Flood coverage is not required.

11.2.5.4 The policy must include coverage for the Owner, Contractor and any subcontractors as their interests may appear.

11.2.6 Pollution Liability *(required when asbestos or other hazardous material abatement is included in the contract)*

Pollution Liability insurance, including gradual release as well as sudden and accidental, shall have a minimum limit of not less than $1,000,000 per claim. A claims-made form will be acceptable. A policy period inception date of no later than the first day of anticipated Work under this contract and an expiration date of no earlier than 30 days after anticipated completion of all Work under the contract shall be provided. There shall be an extended reporting period of at least 24 months, with full reinstatement of limits, from the expiration date of the policy if the policy is not renewed. The policy shall not be cancelled for any reason, except non-payment of premium.

11.2.7 Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared to and accepted by the Owner. The Contractor shall be responsible for all deductibles and self-insured retentions.

11.3 OTHER INSURANCE PROVISIONS

11.3.1 The policies are to contain, or be endorsed to contain, the following provisions:

11.3.1.1 Worker's Compensation and Employers Liability Coverage

11.3.1.1.1 To the fullest allowed by law, the insurer shall agree to waive all rights of subrogation against the Owner, its officers, agents, employees and volunteers for losses arising from Work performed by the Contractor for the Owner.

11.3.1.2 Commercial General Liability Coverage

11.3.1.2.1 The Owner, its officers, agents, employees and volunteers are to be added as additional insureds as respects liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor, premises owned, occupied or used by the Contractor. ISO Form CG 20 10 (for ongoing work) AND CG 20 37 (for completed work) (current forms approved for use in Louisiana), or equivalent, are to be used.

11.3.1.2.2 The Contractor's insurance shall be primary as respects the Owner, its officers, agents, employees and volunteers for any and all losses that occur under the contract. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees or volunteers. Any insurance or self-insurance maintained by the Owner shall be excess and non-contributory of the Contractor's insurance.

11.3.1.3 Builder's Risk

The policy must include an endorsement providing the following:

In the event of a disagreement regarding a loss covered by this policy, which may also be covered by a State of Louisiana self-insurance or commercial property policy through the Office of Risk Management (ORM), Contractor and its insurer agree to follow the following procedure to establish coverage and/or the amount of loss:

Any party to a loss may make written demand for an appraisal of the matter in disagreement. Within 20 days of receipt of written demand, the Contractor's insurer and either ORM or its commercial insurance company shall each select a competent and impartial appraiser and notify the other of the appraiser selected. The two appraisers shall select a competent and impartial umpire. The appraisers shall then identify the policy or policies under which the loss is insured and, if necessary, state separately the value of the property and the amount of the loss that must be borne by each policy. If the two appraisers fail to agree, they shall submit their differences to the umpire. A written decision by any two shall determine the policy or policies and the amount of the loss. Each insurance company agrees that the decision of the appraisers and the umpire if involved shall be binding and final and that neither party will resort to litigation. Each of the two parties shall pay its chosen appraiser and bear the cost of the umpire equally.

11.3.1.4 All Coverages

11.3.1.4.1 All policies must be endorsed to require 30 days written notice of cancellation to the Agency. Ten-day written notice of cancellation is acceptable for non-payment of premium. Notifications shall comply with the standard cancellation provisions in the Contractor's policy. In addition, Contractor is required to notify Agency of policy cancellations or reductions in limits.

11.3.1.4.2 Neither the acceptance of the completed Work nor the payment thereof shall release the Contractor from the obligations of the insurance requirements or indemnification agreement.

11.3.1.4.3 The insurance companies issuing the policies shall have no recourse against the Owner for payment of premiums or for assessments under any form of the policies.

11.3.1.4.4 Any failure of the Contractor to comply with reporting provisions of the policy shall not affect coverage provided to the Owner, its officers, agents, employees and volunteers.

11.3.2 Acceptability of Insurers

All required insurance shall be provided by a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located. Insurance shall be placed with insurers with an A.M. Best's rating of **A-: VI or higher**. This rating requirement may be waived for Worker's compensation coverage only.

If at any time an insurer issuing any such policy does not meet the minimum A.M. Best rating, the Contractor shall obtain a policy with an insurer that meets the A.M. Best rating and shall submit another certificate of insurance within 30 days.

11.3.3 Verification of Coverage

Contractor shall furnish the Owner with Certificates of Insurance reflecting proof of required coverage. The Certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The Certificates are to be received and approved by the Owner before Work commences and upon any contract renewal or insurance policy renewal thereafter. The Certificate Holder must be listed as follows:

State of Louisiana
Name of Owner
Owner Address
City, State, Zip
Attn: Project # _____

The Owner reserves the right to request complete certified copies of all required insurance policies at any time.

Upon failure of the Contractor to furnish, deliver and maintain required insurance, this contract, at the election of the Agency, may be suspended, discontinued, or terminated. Failure of the Contractor to purchase and/or maintain any required insurance shall not relieve the Contractor from any liability or indemnification under the contract.

If the Contractor does not meet the insurance requirements at policy renewal, at the option of the Owner, payment to the Contractor may be withheld until the requirements have been met, OR the Owner may pay the renewal premium and withhold such payment from any monies due the Contractor, OR the contract may be suspended or terminated for cause.

11.3.4 Subcontractors

Contractor shall include all subcontractors as insureds under its policies OR shall be responsible for verifying and maintaining the certificates provided by each subcontractor. Subcontractors shall be subject to all of the requirements stated herein. The Owner reserves the right to request copies of subcontractor's certificates at any time.

If Contractor does not verify subcontractors' insurance as described above, Owner has the right to withhold payments to the Contractor until the requirements have been met.

11.3.5 Worker's Compensation Indemnity

In the event Contractor is not required to provide or elects not to provide Worker's compensation coverage, the parties hereby agree the Contractor, its Owners, agents and employees shall have no cause of action against, and shall not assert a claim against, the State of Louisiana, its departments, agencies, agents and employees as an employer, whether pursuant to the Louisiana Worker's Compensation Act or otherwise, under any circumstance. The parties also hereby agree that the State of Louisiana, its departments, agencies, agents and employees shall in no circumstance be, or considered as, the employer or statutory employer of Contractor, its Owners, agents and employees. The parties further agree that Contractor is a wholly independent Contractor and is exclusively responsible for its employees, Owners, and agents. Contractor hereby agrees to protect, defend, indemnify and hold the State of Louisiana, its departments, agencies, agents and employees harmless from any such assertion or claim that may arise from the performance of this contract.

11.3.6 Indemnification/Hold Harmless Agreement

Contractor agrees to protect, defend, indemnify, save, and hold harmless, the State of Louisiana, all State Departments, Agencies, Boards and Commissions, its officers, agents, servants, employees and volunteers, from and against any and all claims, damages, expenses and liability arising out of injury or death to any person or the damage, loss or destruction of any property which may occur, or in any way grow out of, any act or omission of Contractor, its agents, servants and employees, or any and all costs, expenses and/or attorney fees incurred by Contractor as a result of any claims, demands, suits or causes of action, except those claims, demands, suits or causes of action arising out of the negligence of the State of Louisiana, all State Departments, Agencies, Boards, Commissions, its officers, agents, servants, employees and volunteers.

Contractor agrees to investigate, handle, respond to, provide defense for and defend any such claims, demands, suits or causes of action at its sole expense and agrees to bear all other costs and expenses related thereto, even if the claims, demands, suits, or causes of action are groundless, false or fraudulent. The State of Louisiana may, but is not required to, consult with the Contractor in the defense of claims, but this shall not affect the Contractor's responsibility for the handling and expenses of all claims.

11.4 PERFORMANCE AND PAYMENT BOND

11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

11.4.3 Recordation of Contract and Bond [La R.S. 38:2241 thru 38:2241.1]

The Owner shall record within thirty (30) days the Contract Between Owner and Contractor and Performance and Payment Bond with the Clerk of Court in the Parish in which the Work is to be performed.

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

12.2.1 Before Substantial Completion

At the end of the paragraph, add the following sentences:
"If the Contractor fails to correct Work identified as defective within a thirty (30) day period, through no fault of the Designer, the Owner may hold the Contractor in default. If the Owner finds the Contractor in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the nonconforming Work, through no fault of the Architect or Owner, the Owner may contract to have nonconforming Work corrected and hold the Surety and Contractor responsible for the cost, including architectural fees and other indirect costs. If the Surety fails to correct the Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may elect not to accept bonds submitted in the future by the Surety. Finding the Contractor in default shall constitute a reason for disqualification of the Contractor from bidding on future state contracts.

12.2.2 After Substantial Completion

12.2.2.1 At the end of the paragraph delete the last sentence and add the following sentences:
"If the Contractor fails to correct nonconforming Work, or Work covered by warranties, within a thirty (30) day period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor is in default, the Surety shall be notified. If within thirty (30) days after notification, the Surety has not corrected the non-conforming or warranty Work, through no fault of the Architect or Owner, the Owner may contract to have the nonconforming or warranty Work corrected and hold the Surety responsible for the cost including architects fees and other indirect costs. Corrections by the Owner shall be in accordance with Section 2.4. If the Surety fails to correct the nonconforming or warranty Work within the stipulated time period and fails to meet its obligation to pay the costs, the Owner may not accept bonds submitted, in the future, by the Surety."

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Delete all after the word "located".

13.2 SUCCESSORS AND ASSIGNS

13.2.1 In the second sentence, delete "Except as … 13.2.2"

Delete Section 13.2.2.

13.3 RIGHTS AND REMEDIES

Add the following Section 13.3.3:

13.3.3 The Nineteenth Judicial Court in and for the Parish of East Baton Rouge, State of Louisiana shall have sole jurisdiction and venue in any action brought under this contract.

13.4 TESTS AND INSPECTIONS

In Section 13.4.1, delete the second sentence and substitute the following:

The Contractor shall make arrangements for such tests, inspections and approvals with the Testing Laboratory provided by the Owner, and the Owner shall bear all related costs of tests, inspections and approvals.

Delete the last two sentences of Section 13.4.1.

13.5 INTEREST

Delete Section 13.5.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

Delete Section 14.1.1.4.

In Section 14.1.3, after the word "profit," delete the words "on Work not executed" and substitute the following: "for Work completed prior to stoppage".

14.2 TERMINATION BY THE OWNER FOR CAUSE

Add the following Section:

14.2.1.5 failure to complete the punch list within the lien period as provided in 9.8.7.

14.2.3 Add the following sentence:

"Termination by the Owner shall not suspend assessment of liquidated damages against the Surety."

Add the following Section:

14.2.5 If an agreed sum of liquidated damages has been established, termination by the Owner under this Article shall not relieve the Contractor and/or Surety of his obligations under the liquidated damages provisions and the Contractor and/or Surety shall be liable to the Owner for per diem liquidated damages.

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

In Section 14.4.3, delete all after "incurred by reason of the termination," and add "along with reasonable profit on the Work not executed."

ARTICLE 15

CLAIMS AND DISPUTES

15.1 CLAIMS

Delete Section 15.1.2, **Time Limit on Claims,** (See La R.S. 38:2189, and 38:2189.1).

15.1.3.1 Add the following to the end of the paragraph:
"A Reservation of Rights and similar stipulations shall not be recognized under this contract as having any effect. A party must make a claim as defined herein within the time limits provided."

15.1.4.2 In the first sentence of the Section, delete "Initial Decision Maker's" and replace with "Architect's". In the second sentence of the Section, delete "the decision of the Initial Decision Maker" and replace with: "his/her decision".

Delete Section 15.1.6.2 and substitute the following:

15.1.6.2 If adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that weather conditions had an adverse effect on the scheduled construction. An increase in the contract time due to weather shall not be cause for an increase in the contract sum. At the end of each month, the Contractor shall make one Claim for any adverse weather days occurring within the month. The Claim must be accompanied by sufficient documentation evidencing the adverse days and the impact on construction. Failure to make such Claim within **twenty-one (21) days** from the last day of the month shall prohibit any future claims for adverse days for that month. No additional adverse weather days shall be granted after the original or extended contract completion date, except those adverse weather days associated with a National Weather Service named storm or federally declared weather related disaster directly affecting the project site.

Add the following Section:

15.1.6.3 The following are considered reasonably anticipated days of adverse weather on a monthly basis:

January	11 days	July	6 days
February	10 days	August	5 days

March	8 days	September	4 days
April	7 days	October	3 days
May	5 days	November	5 days
June	6 days	December	8 days

The Contractor shall ask for total adverse weather days. The Contractor's request shall be considered only for days over the allowable number of days stated above.

Note: Contract is on a calendar day basis.

15.2 INITIAL DECISION

15.2.1 In the second sentence, delete the word "will" and replace with: "shall always".

In the second sentence, delete the phrase: ", unless otherwise indicated in the Agreement."

In the third sentence, delete the word "mediation" and replace with: "litigation".

At the end of the third sentence, add: "arising prior to the date final payment is due".

Delete the fourth sentence.

15.2.5 In the middle of the first sentence, delete all after the phrase: "rejecting the Claim".

In the second sentence, delete the phrase: "and the Architect, if the Architect is not serving as the Initial Decision Maker,".

In the third sentence, delete all after: "binding on the parties" and add the following: "except that the Owner may reject the decision or suggest a compromise or both".

Delete Section 15.2.6.

Delete Section 15.2.6.1.

15.3 MEDIATION

Delete Section 15.3.

15.4 ARBITRATION

Delete Section 15.4.

SCHEDULE OF VALUES

The Contractor is to use the following format. The total Contract Cost is to be itemized in each Subsection listed (as applicable)

DIVISION 01 – GENERAL REQUIREMENTS	Quantity	Cost
01 00 00 General Requirements		
01 32 50 Record Drawings, Shop Drawings, Product Data, Samples and other submittals.		
	TOTAL	
DIVISION 02 – EXISTING CONDITIONS		
02 30 00 Subsurface Investigation		
02 41 00 Demolition		
	TOTAL	
DIVISION 03 – CONCRETE		
03 01 00 Maintenance of Concrete		
03 11 00 Concrete Forming		
03 15 00 Concrete Accessories		
03 20 00 Concrete Reinforcing		
03 30 00 Cast-in-place Concrete		
03 40 00 Precast Concrete		
03 50 00 Cast Decks & Underlayment	TOTAL	
DIVISION 04 – MASONRY		
04 01 00 Maintenance of Masonry		
04 05 13 Masonry Mortaring		
04 05 19 Masonry Anchorage & Reinforcing		
04 05 23 Masonry Accessories		
04 20 00 Unit Masonry	TOTAL	
DIVISION 05 – METALS		
05 05 23 Metal Fastenings		
05 10 00 Structural Metal Framing		
05 20 00 Metal Joists		
05 30 00 Metal Decking		
05 50 00 Metal Fabrications		
05 58 00 Formed Metal Fabrications	TOTAL	
DIVISION 06 – WOOD, PLASTICS, & COMPOSITES		
06 05 23 Fastening and Adhesives		
06 10 00 Rough Carpentry		
06 13 00 Heavy Timber		
06 17 00 Shop-fabricated Structural Wood		
06 20 00 Finish Carpentry	SUB-TOTAL	

DISISION 06 – WOOD, PLASTICS, &
COMPOSITES (CONTINUES)

06 40 00	Architectural Woodwork		
06 60 00	Plastic Fabrications		
06 80 00	Composite Fabrications		
		TOTAL	

DIVISION 07 – THERMAL AND MOISTURE
PROTECTION

07 10 00	Dampproofing and Waterproofing		
07 18 00	Traffic Coatings		
07 19 00	Water Repellents		
07 21 00	Thermal Insulation		
07 24 00	Exterior Insulation & Finish Systems		
07 25 00	Weather Barriers		
07 31 00	Shingles and Shakes		
07 32 00	Roof Tiles		
07 40 00	Roofing and Siding Panels		
07 50 00	Membrane Roofing		
07 60 00	Flashing and Sheet Metal		
07 61 00	Sheet Metal Roofing		
07 70 00	Roof & Wall Specialties and Accessories		
07 80 00	Fire and Smoke Protection		
07 90 00	Joint Protection		
07 95 00	Expansion Control		
		TOTAL	

DIVISION 08 – OPENINGS

08 11 00	Metal Doors and Frames		
08 14 00	Wood Doors		
08 15 00	Plastic Doors		
08 30 00	Specialty Doors and Frames		
08 41 00	Entrances and Storefronts		
08 44 00	Curtain Wall and Glazed Assemblies		
08 51 00	Metal Windows		
08 52 00	Wood Windows		
08 53 00	Plastic Windows		
08 56 00	Special Function Windows		
08 60 00	Roof Windows and Skylights		
08 70 00	Hardware		
08 80 00	Glazing		
08 90 00	Louvers and Vents		
		TOTAL	

DIVISION 09 – FINISHES

09 22 00	Supports for Plaster and Gypsum Board		
09 23 00	Gypsum Plastering		
09 24 00	Portland Cement Plastering		
09 29 00	Gypsum Board		
09 30 00	Tiling		
		SUB-TOTAL	

DIVISION 09 – FINISHES (CONTINUED)

09 50 00	Acoustical Ceilings		
09 54 00	Specialty Ceilings		
	Quantity		
09 61 00	Flooring Treatment		
09 62 00	Specialty Flooring		
09 63 00	Masonry Flooring		
09 64 00	Wood Flooring		
09 65 00	Resilient Flooring		
09 66 00	Terrazzo Flooring		
09 68 00	Carpeting		
09 69 00	Access Flooring		
09 97 00	Wall Finishes		
09 91 00	Painting		
09 97 00	Special Coatings		
		TOTAL	

DIVISION 10 – SPECIALTIES

10 11 00	Visual Display Surfaces		
10 14 00	Signage		
10 21 00	Compartments and Cubicles		
10 22 00	Partitions		
10 26 00	Wall and Door Protection		
10 28 00	Toilet, Bath, and Laundry Accessories		
10 44 00	Fire Protection Specialties		
10 51 00	Lockers		
10 56 00	Storage Assemblies		
10 82 00	Grilles and Screens	TOTAL	

DIVISION 11 – EQUIPMENT

11 15 00	Security, Detention, and Banking Equipment		
11 19 00	Detention Equipment		
11 23 00	Commercial Laundry and		
	Dry Cleaning Equipment		
11 26 00	Unit Kitchens		
11 27 00	Photographic Processing Equipment		
11 40 00	Foodservice Equipment		
11 51 00	Library Equipment		
11 52 00	Audio-Visual Equipment		
11 53 00	Laboratory Equipment		
11 61 00	Theater and Stage Equipment		
11 65 00	Athletic and Recreational Equipment		
11 70 00	Healthcare Equipment		
		TOTAL	

DIVISION 12 – FURNISHINGS

12 20 00	Window Treatments		
12 30 00	Casework		
12 40 00	Furnishings and Accessories		
12 50 00	Furniture		
		TOTAL	

DIVISION 13 –SPECIAL CONSTRUCTION

13 10 00	Special Facility Components		
13 34 00	Fabricated Engineered Structures		
13 49 00	Radiation Protection		
		TOTAL	

DIVISION 14 – CONVEYING EQUIPMENT

14 20 00	Elevators		
14 30 00	Escalators and Moving Walks		
14 40 00	Lifts		
14 80 00	Scaffolding		
		TOTAL	

DIVISION 21 – FIRE SUPPRESSION

21 10 00	Water-Based Fire-Suppression Systems Piping		
21 20 00	Fire-Extinguishing Systems		
21 30 00	Fire Pumps		
		TOTAL	

DIVISION 22 – PLUMBING

22 07 00	Plumbing Insulation		
22 11 00	Facility Water Distribution		
22 13 00	Facility Sanitary Sewerage		
22 14 00	Facility Storm Drainage		
22 30 00	Plumbing Equipment		
22 40 00	Plumbing Fixtures		
		TOTAL	

DIVISION 23 – HEATING, VENTILATING, & AIR-CONDITIONING

23 05 93	Testing, Adjusting, & Balancing for HVAC		
23 07 00	HVAC Insulation		
23 09 00	Instrumentation & Control for HVAC		
23 13 00	Facility Fuel-Storage Tanks		
23 20 00	HVAC Piping and Pumps		
23 30 00	HVAC Air Distribution		
23 40 00	HVAC Air Cleaning Devices		
23 50 00	Central Heating Equipment		
23 60 00	Central Cooling Equipment		
23 70 00	Central HVAC Equipment		
		TOTAL	

DIVISION 26 – ELECTRICAL

26 09 00	Instrumentation & Control for Electrical Systems		
26 10 00	Medium-Voltage Electrical Distribution		
26 20 00	Low-Voltage Electrical Transmission		
26 27 00	Low-Voltage Distribution Equipment		
26 30 00	Facility Electrical Power Generating & Storage Equipment		
26 40 00	Electrical and Cathodic Protection		
26 50 00	Lighting		
		TOTAL	

DIVIASION 27 – COMMUNICATIONS

27 10 00	Structured Cabling		
27 20 00	Data Communications		
27 30 00	Voice Communications		
27 40 00	Audio-Video Communications		
27 50 00	Distributed Communications & Monitoring Systems		
		TOTAL	

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 10 00	Electronic Access Control & Intrusion Detection		
28 20 00	Electronic Surveillance		
28 30 00	Electronic Detection and Alarm		
28 40 00	Electronic Monitoring and Control		
		TOTAL	

DIVISION 31 – EARTHWORK

31 10 00	Site Clearing		
31 20 00	Earth Moving		
31 31 00	Soil Treatment		
31 32 00	Soil Stabilization		
31 40 00	Shoring and Underpinning		
31 50 00	Excavation Support and Protection		
31 60 00	Special Foundations and Load-Bearing Elements		
		TOTAL	

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 10 00	Bases, Ballasts, and Paving		
32 30 00	Site Improvements		
32 90 00	Planting		
		TOTAL	

DIVISION 33 – UTILITIES

33 10 00	Water Utilities		
33 30 00	Sanitary Sewerage Utilities		
33 40 00	Storm Drainage Utilities		
33 50 00	Fuel Distribution Utilities		
33 60 00	Hydronic & Steam Energy Utilities		
33 70 00	Electrical Utilities		
33 80 00	Communications Utilities		
		TOTAL	

DIVISION 34 – TRANSPORTATION

34 00 00	Transportation		
		TOTAL	

DIVISION 35 – WATERWAY AND MARINE CONSTRUCTIONS

35 00 00	Waterway and Marine construction		
		TOTAL	

DIVISION 40-43 – PROCESS EQUIPMENT

DIVISION 44 – POLLUTION CONTROL EQUIPMENT

44 40 00	Water Treatment Equipment	_____	_____
44 41 00	Packaged Water Treatment Plants	_____	_____
44 50 00	Solid Waste Control	_____	_____
		TOTAL	_____

DIVISION 45 – INDUSTRY SPECIFIC MANUFACTURING EQUIPMENT

DIVISION 48 – ELECTRICAL POWER GENERATION

48 10 00	Electrical Power Generation Equipment	_____	_____
48 70 00	Electrical Power Generation Testing	_____	_____
		TOTAL	_____

CHANGE ORDER

PROJECT NAME: _____ CHANGE ORDER No. _____

PROJECT NUMBER: _____ WBS No. _____ CONTRACT DATE: _____

CONTRACTOR: _____ CFMS / SRM No(s). _____

SITE CODE: _____ STATE ID: _____ NOTICE TO PROCEED DATE: _____

You are directed to make the following change(s) in this contract. Attach SUMMARY, BREAKDOWN and/or UNIT PRICE BREAKDOWN forms as required and give a brief description of the change(s) below.

The Original Contract Sum			
Total Changes by Previous Change Order(s)			
Current Contract Sum			
Contract Sum will be (increased) (decreased) (unchanged) by this Change Order			
New Contract Sum			
The Original Contract Completion Date and Contract Time.	Date: _____	_____	DAYS
Total Time extended by Previous Change Order(s)		_____	DAYS
Contract Time will be (increased) (decreased) (unchanged) by this Change Order		_____	DAYS
New Contract Completion Date & Revised Contract Time	Date: _____	_____	DAYS
Added Building Area		_____	(Sq. Ft.)

NOTE ***: No additional increase in time or money will be considered for a Change Order item after it has been executed.***

RECOMMENDED	**ACCEPTED**	**APPROVED**
Designer's Name:	Contractor's Name:	Project Manager:
Address:	Address:	Southern University
Email Address:	Email Address:	
By:	By:	By:
Date:	Date:	Date:

Construction Contract Change Order
SUMMARY

Item No. _____

RFI No. (or COR, CPR, etc.) _____

Project No. _____ Date: _____

WBS No. _____

Project Name: _____

Contractor Name: _____

Description of Work: _____

General Contractor Direct Costs - Breakdown No. ____ _____
(See attached breakdown)

Total General Contractor Cost ____ % [ ]
(General Contract Direct Cost plus OH&P) (Max: 8%)

Subcontractor Cost Breakdowns
(See attached.)

Subcontractor Name	Breakdown No.	A Total Direct Cost	B OH&P (Max 8%)	C Total A+(A X B)
			%	
			%	
			%	
			%	
			%	
			%	
			%	
			%	

Subcontractor Direct Costs Total $ -
(Sum column A)

Subcontractor Direct Costs + Subcontractor OH&P
(Sum column C)

General Contractor OH&P on Subcontractor Direct Cost at ____ % _____
(Sum column A times General Contractor OH&P rate.) (Max: 8%)

Total Subcontractor Costs [ ]
(Subcontractor Direct Costs + OH&P + General Contractor OH&P)

Change Order Subtotal [ ]
(Sum of Total General Contractor Costs and Total Subcontractor Costs)

Performance and Payment Bond at ____ %
(Change Order Subtotal times Performance and Payment Bond rate)

Amount will be ☐ increased ☐ decreased ☐ unchanged by [ ]
(Sum of Change Order Subtotal and Performance and Payment Bond)

Days will be ☐ increased ☐ decreased ☐ unchanged by [ ]
(Attach supporting data such as meteorological reports)

Construction Contract Change Order

BREAKDOWN

Breakdown No. _____

Item No. _____

Project No. _____ RFI No. (or COR, CPR, etc.) _____

WBS No. _____ Date: _____

Project Name: _____

Contractor/Subcontractor Name: _____

Direct Cost of Work :

A. Labor	Check here if explained on the Comment Sheet ➘	Hourly Wage Rate	Hours	Total Cost
1	☐			
2	☐			
3	☐			
4	☐			
5	☐			
6	☐			
7	☐			
	Add Labor Burden @ _____ %			
	LABOR TOTAL			

B. Material		Unit Price	Unit	Units	Total Cost
1	☐				
2	☐				
3	☐				
4	☐				
5	☐				
6	☐				
7	☐				
(Copies of invoices may be required.)		Add Tax @ _____ %			
		MATERIAL TOTAL			

C. Equipment		Unit Rate	Unit	Units	Total Cost
1	☐				
2	☐				
3	☐				
4	☐				
5	☐				
6	☐				
7	☐				
(Copies of invoices may be required.)		Add Tax @ _____ %			
		EQUIPMENT TOTAL			

TOTAL DIRECT COST FOR THIS BREAKDOWN:
(Sum A, B & C)

Construction Contract Change Order

BREAKDOWN COMMENT SHEET

Breakdown No. _____
Item No. _____

Project No. _____ RFI No. (or COR, CPR, etc.) _____
WBS No. _____ Date: _____
Project Name: _____

Contractor/Subcontractor Name: _____

A. Labor

No. (From BREAKDOWN Sheet)

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

B. Material

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

C. Equipment

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Construction Contract Change Order
UNIT PRICE BREAKDOWN

Breakdown No. _____
Item No. _____
Project No. _____ RFI No. (or COR, CPR, etc.) _____
WBS No. _____ Date: _____
Project Name: _____

Contractor/Subcontractor Name: _____

Unit Price Tabulation

(Unit prices must be included in the bid or clearly defined in a standard, industry recognized pricing reference. The pricing reference shall be identified herein.)

Unit Price Description	Reference*	Unit Price	Units	Total

* Reference Legend: _____

Unit Price Total:
(Sum Total column)

Instructions for Change Order Back Up Forms

The General Conditions of the Contract for Construction, AIA Document A201, 2017 Edition, and the Supplementary Conditions provide for changes in the contract in the form of change orders. The costs of such changes must be carefully, clearly and accurately documented. This is a set of forms to be used to provide this documentation in a consistent format that is in accordance with the Contract Documents.

Change orders will typically contain one or more items of work. Each item of work will typically include work by the general contractor and/or one or more subcontractors. The documentation begins with a breakdown of the work of the contractor and each subcontractor. This is prepared using the form entitled "BREAKDOWN." One form for the General Contractor and one for each subcontractor. Each breakdown will be summarized on the form entitled "SUMMARY." Each item of work will, in turn, be summarized on the change order itself. This should be on the face of the change order.

The forms are available as a Microsoft Excel worksheet for ease of preparation, with formulas established for mark-ups and other basic mathematical operations.
These forms are to be used as provided. Any alteration to the forms may cause the change order to be rejected.

GENERAL:

(Refer to Article 7 of the Supplementary and General Conditions)

Forms - There are five forms to be used for all change orders: CHANGE ORDER form, SUMMARY, BREAKDOWN, BREAKDOWN COMMENT SHEET and UNIT PRICE BREAKDOWN. The CHANGE ORDER form is the highest level and is the official, signed document. A CHANGE ORDER form may include one or more items of work, each of which is backed up by a SUMMARY. Each SUMMARY will be backed up with one or more BREAKDOWNs. Any unusual rates, unit costs or quantities may be explained on the COMMENT SHEET. It's simple. The BREAKDOWN form must be used for the general contractor and any subcontractor, at any level, that is to get OH&P. Use as many as needed.

Unit Pricing - Labor, material and equipment breakdown is the standard method of pricing change orders. However, unit pricing may be considered in some circumstances if the unit prices are clearly established such as by unit prices that were included in the bid. These prices may also be derived from a construction industry standard reference such as R.S. Means. If unit prices were included in the bid they are acceptable for pricing change order work and, in fact, must be used for any work that is included in the change order for which they were established . The UNIT PRICE BREAKDOWN is provided for this purpose.

CHANGE ORDER:

Project identification information: Complete as required. The Site Code, State ID and CFMS / SRM No(s). (contract numbers) can be obtained from the Project Manager.

Description: This will include a list of each attached SUMMARY that makes up this change order and a brief statement of the work included in each.

New Contract Sum: Calculate the new contract amount using the original contract amount, previous change orders and the new change order. Select the appropriate word for increase, decrease or unchanged, and delete the terms that don't apply.

New Contract Completion Date and Revised Time: Calculate the new contract time using the original Contract Completion Date and Contract Time, previous changes in time and the change in time by this change order. Select the appropriate word for increase, decrease or unchanged and delete the terms that don't apply. Show days in the main column and the date in the blank indicated.

Added Building Area: Show any building area added by this change order. If none, enter "None."

RECOMMENDED: Show the Designer's name and address, sign on the line indicated as "By:" and date on the indicated line.

ACCEPTED: Show the Contractor's name and address, sign on the line indicated as "By:" and date on the indicated line.

APPROVED: For approval by owner.

SUMMARY:

(Refer to Article 7 of the Supplementary and General Conditions)

Item No.: Show the Item number as it will appear on the CHANGE ORDER Form. Note: This may be one of several items included in one CHANGE ORDER form.

RFI No.: Show the number of the request for information. This may be known by another name such as COR (Change Order Request,) CPR (Change Proposal Request,) etc.

Project No., WBS No., Date, Project Name. Complete as appropriate.

Contractor: Name of General Contractor.

Description of Work: Give a brief description of the work included in this **Item**.

General Contractor Direct Costs: Show the total General Contractor Cost from the BREAKDOWN and show the Breakdown No. in the space provided.

General Contractor Total Cost: Show the total General Contractor Cost plus the General Contractor's overhead and profit. The overhead and profit shall not exceed 8% of the Direct Cost.

Subcontractor Cost Breakdowns: List each subcontractor, Breakdown No. and Total Direct Cost (in column "A") from the attached BREAKDOWN sheets. Show the subcontractor's overhead and profit percentage in column "B" and show the calculated total of the direct cost plus the percentage of the direct cost in column "C." If the electronic version of the form is being used, column "C" will be automatically calculated. The overhead and profit shall not exceed 8% of the Total Direct Cost.

Subcontractor Direct Costs Total: Sum of column "A." This will be used to calculate the General Contractor's overhead and profit on the subcontractors' work. If the electronic version is being used, this will be an automatic calculation.

Subcontractor Direct Costs + Subcontractor OH&P: Sum of column "C." This represents the total amount that subcontractors will be paid. Automatic calculation.

General Contractor OH&P on Subcontractor Direct Cost at ___%. The contractors overhead and profit on the subcontractors' direct cost (without subcontractor OH&P.) Enter the percentage of the contractor's OH&P on the subcontractors' work (not to exceed 8%) and show the calculated total of the subcontractors' direct cost plus the percentage of the direct cost in the space. Automatic calculation.

Total Subcontractor Costs: Total of the last two spaces.

Change Order Subtotal: Total of change order except bond.

Performance and Payment Bond at ____%: Enter bond percentage (from amount provided by the contractor at the Pre-Construction Conference) and calculate the amount for the bond.

Amount will be (increased) (decreased) (unchanged) by: Add bond and calculate total change order amount. Indicate "increase," "decrease" or "unchanged", and **delete the terms that don't apply**.

Days will be (increased) (decreased) (unchanged) by: Show the number of days to be added or deleted from the contract, if any, due to changes in scope, adverse weather, unusual delays or other factors, **only** if it is proven the critical path is affected. Note that a change in scope does not necessarily indicate a change in time. Indicate "increased," "decreased" or "unchanged", and **delete the terms that don't apply**.

BREAKDOWN:

Item No. Show the Item number as it will appear on the CHANGE ORDER Form and the SUMMARY. Note: This may be one of several items included in one CHANGE ORDER form.

RFI No.: Show the number of the request for information. This may be known by another name such as COR (Change Order Request,) CPR (Change Proposal Request,) etc.

Project No., WBS No., Date, Project Name. Complete as appropriate.

Contractor: Name of General Contractor or Subcontractor.

Direct Cost of Work:

Check here if explained on the Comment Sheet: If rates, unit costs or quantities may appear unreasonable compared to standard costs or quantities the reasons may be explained on the attached comment sheet and the box checked to indicate that there is an explanation.

A. Labor: Include the "wages paid" hourly direct labor and/or foreman necessary to perform the required change. "Wages paid" is the amount actually paid the employee, not the fully burdened charge rate used in the bid, etc. Supervisory personnel in district or home office shall not be included. Do not include the project superintendent, except as permitted by Section 7.2 of Supplementary Conditions. Supervisory personnel on the job-site, but with broad supervisory responsibility shall not be included as Direct Labor, except as permitted by Section 7.2 of Supplementary Conditions. Typically there will be only one superintendent on the job and his/her time shall not be included, except as permitted by Section 7.2 of Supplementary Conditions. Typically all other employees are eligible for inclusion. List by job title each person employed on the work, his/her hourly rate, the number hours work and the extended Total Cost. Do not list crews unless the rates for them are readily available in standard cost estimating references such as R. S. Means. Add the labor burden that was provided at the Pre-Construction conference and in compliance with the Contract Documents, and total the amounts in LABOR TOTAL.

B. Material: Include the acquisition cost of all materials directly required to perform the required change. List each material used in the work, the price per unit, name of the unit, the number of units used and the extended Total Cost. Add the tax rate and tax and total the amounts in MATERIAL TOTAL.

C. Equipment: Include the rental cost of equipment items necessary to perform the change. For company-owned equipment items, include documentation of internal rental rates submitted at the pre-construction conference. Charges for small tools, and craft specific tools are not allowed. List each piece of equipment used in the work, the rate by units of time (hour, day, week, etc.,) number of units of time the piece was in service on the work and the extended total cost. Add the tax rate, calculate the tax and total the amounts in EQUIPMENT TOTAL.

TOTAL DIRECT COST FOR THIS BREAKDOWN: Total of A. Labor, B. Material and C. Equipment. This is the amount that will be carried forward to the SUMMARY Sheet. This amount does **NOT** include Overhead and Profit. This will be added on the SUMMARY Sheet.

COMMENTS SHEET:

The COMMENTS SHEET uses the same heading as the SUMMARY and BREAKDOWN.

The COMMENTS SHEET includes three sections, one each for A. Labor, B. Materials and C. Equipment. These correspond to the sections in the BREAKDOWN. Each comment should be entered in the section to which it corresponds on the BREAKDOWN and numbered to correspond to the appropriate line. Comments are to used only to explain unusual rates, costs or quantities.

UNIT PRICE BREAKDOWN:

The UNIT PRICE BREAKDOWN uses the same heading as the BREAKDOWN.

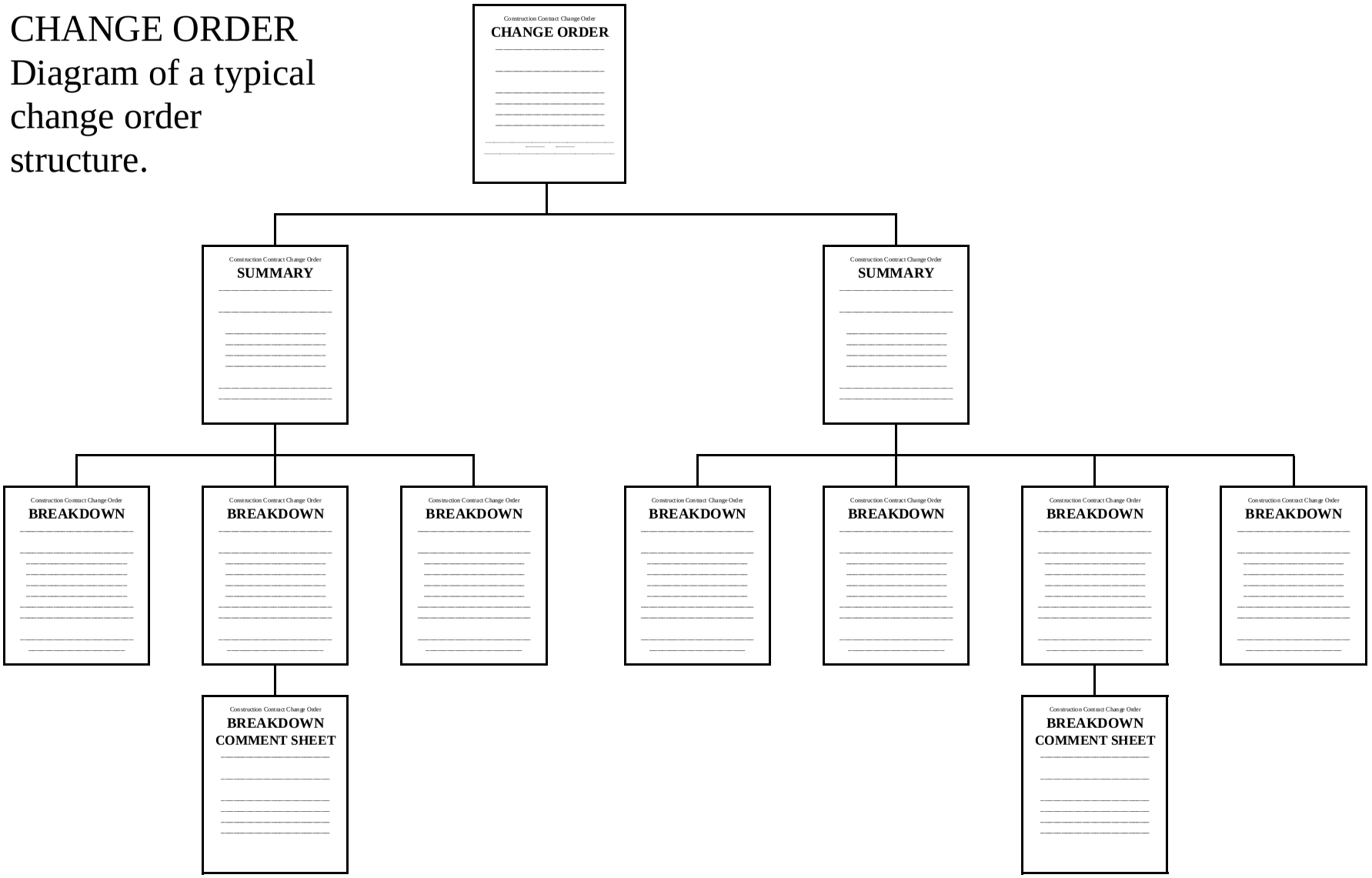
The UNIT PRICE BREAKDOWN is similar to the BREAKDOWN.

Unit Price Tabulation: Each unit price is listed along with its corresponding price and the number of units used in the work. The price and number of units are multiplied to provide the total cost of each unit price item. The pricing reference, such as the bid form for the project or a construction industry standard reference, must be cited for each unit price. This may be more fully described in "Reference Legend,"

Unit Price Total: Sum the unit prices to obtain the total cost for unit prices.

CHANGE ORDER

Diagram of a typical change order structure.



❖ **NOT FOR RECORDATION PURPOSES** ❖

RECOMMENDATION OF ACCEPTANCE

TO: SOUTHERN UNIVERSITY AND A&M COLLEGE
PURCHASING DEPARTMENT
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____
_____
_____
_____
Design Firm Name and Address

DATE: _____

PROJECT NAME: _____

PROJECT NUMBER: _____ WBS No. _____

SITE CODE: _____ STATE ID: _____ CFMS/SRM #: _____

CONTRACTOR: _____
_____

ORIGINAL CONTRACT AMOUNT: $ _____

FINAL CONTRACT AMOUNT: $ _____

FINAL BUILDING AREA (SQ. FEET):_____

I certify that, to the best of my knowledge and belief, this project is substantially complete in accordance with the Plans and Specifications to the point where it can be used for the purpose which was intended. It is recommended that it be accepted.

DATE OF ACCEPTANCE:_____

CONTRACT DATE OF COMPLETION:_____

NUMBER OF DAYS (OVERRUN) (UNDERRUN) (As of Acceptance Date)_____

LIQUIDATED DAMAGES PER DAY STIPULATED IN CONTRACT $_____

VALUE OF PUNCH LIST $_____*(Attach punch list)*

Was part of project occupied prior to Acceptance?

PORTION OCCUPIED: *(Attach Partial Occupancy Forms)*

ROOF GUAR-MANUF: _____ START DATE: _____ END DATE:

ROOFER: _____ START DATE: _____ END DATE:

Signed:_____
DESIGNER

FOR USE OF PROJECT MANAGER:

Signed:_____
PROJECT MANAGER

c: User Agency

❖ **NOT FOR RECORDATION PURPOSES** ❖

CERTIFICATE OF COMPLIANCE

with

Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines

TO: SOUTHERN UNIVERSITY AND A&M COLLEGE
PURCHASING DEPARTMENT
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

_____

_____

Design Firm Name and Address

PROJECT NAME: _____

_____

PROJECT No.: _____

WBS No.: _____

SITE CODE: _____ STATE ID: _____

DATE OF ACCEPTANCE: _____

I, _____ certify that, to the best of my knowledge and belief, this project has been constructed in compliance with the Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines as reviewed by the fire marshal.

_____ Date: _____

Designer Signature

CERTIFICATE OF COMPLIANCE

with

Louisiana Building Code for State Owned Buildings

TO: SOUTHERN UNIVERSITY AND A&M COLLEGE
PURCHASING DEPARTMENT
P.O. Box 94095
Baton Rouge, LA 70804-9095

FROM: _____

_____

_____

(Design Firm or Owner/User Name and Address)

PROJECT NAME: _____

_____

PROJECT No.: _____

WBS No.: _____

DATE OF ACCEPTANCE: _____

I, _____ certify that, to the best of my knowledge and belief, this project has been constructed in compliance with the construction documents determined to be satisfactory by Southern University.

_____ Date: _____

(*Signature of Designer or Owner/User)*

_____ _____

Name of Project **Project No.**

STATE OF _____

PARISH OF _____

ATTESTATIONS AFFIDAVIT

Before me, the undersigned notary public, duly commissioned and qualified in and for the parish and state aforesaid, personally came and appeared Affiant, who after being duly sworn, attested as follows:

LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:

(a) Public bribery (R.S. 14:118)
(b) Corrupt influencing (R.S. 14:120)
(c) Extortion (R.S. 14:66)
(d) Money laundering (R.S. 14:230)

B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:

(a) Theft (R.S. 14:67)
(b) Identity Theft (R.S. 14:67.16)
(c) Theft of a business record (R.S.14:67.20)
(d) False accounting (R.S. 14:70)
(e) Issuing worthless checks (R.S. 14:71)
(f) Bank fraud (R.S. 14:71.1)
(g) Forgery (R.S. 14:72)
(h) Contractors; misapplication of payments (R.S. 14:202)
(i) Malfeasance in office (R.S. 14:134)

LA. R.S. 38:2212.10 Verification of Employees

A. At the time of bidding, Appearer is registered and participates in a status verification system to verify that all new hires in the state of Louisiana are legal citizens of the United States or are legal aliens.

B. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.

C. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

Name of Project	Project No.

LA. R.S. 23:1726(B) Certification Regarding Unpaid Workers Compensation Insurance

A. R.S. 23:1726 prohibits any entity against whom an assessment under Part X of Chapter 11 of Title 23 of the Louisiana Revised Statutes of 1950 (Alternative Collection Procedures & Assessments) is in effect, and whose right to appeal that assessment is exhausted, from submitting a bid or proposal for or obtaining any contract pursuant to Chapter 10 of Title 38 of the Louisiana Revised Statutes of 1950 and Chapters 16 and 17 of Title 39 of the Louisiana Revised Statutes of 1950.

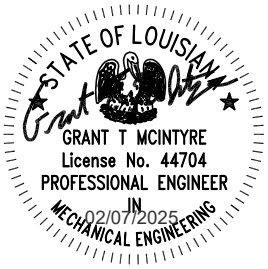
B. By signing this bid /proposal, Affiant certifies that no such assessment is in effect against the bidding / proposing entity.

NAME OF BIDDER	NAME OF AUTHORIZED SIGNATORY OF BIDDER
DATE	TITLE OF AUTHORIZED SIGNATORY OF BIDDER

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER/AFFIANT

Sworn to and subscribed before me by Affiant on the _____ day of _____ , 20___ .

Notary Public



DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:
   1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
   2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
   2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

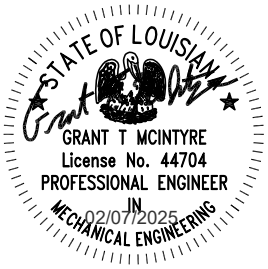
C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 EXECUTION (Not Applicable)

END OF SECTION



DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 05 19 - METERS AND GAGES FOR HVAC PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.
7. Sight flow indicators.
8. Flowmeters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Trerice, H. O. Co.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 6-inch nominal size.
4. Case Form: Back angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue[or red] organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum or brass and of length to suit installation.
a. Design for Air-Duct Installation: With ventilated shroud.
b. Design for Thermowell Installation: Bare stem.
9. Connector: 3/4 inch, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:
1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion in piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 DIAL-TYPE PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Ametek U.S. Gauge.
b. Ashcroft Inc.
c. Blue Ribbon Corp.
d. Ernst Flow Industries.
e. Flo Fab Inc.
f. Marsh Bellofram.
g. Miljoco Corporation.
h. Noshok.
i. Palmer Wahl Instrumentation Group.

j. REOTEMP Instrument Corporation.
k. Tel-Tru Manufacturing Company.
l. Trerice, H. O. Co.
m. WATTS.
n. Weiss Instruments, Inc.
o. Weksler Glass Thermometer Corp.
p. WIKA Instrument Corporation.
q. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Match pressure connection size in first subparagraph below with gage attachment size.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS ½ , ASME B1.20.1 pipe threads.

2.5 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Flow Design, Inc.
2. Miljoco Corporation.
3. Nexus Valve, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. WATTS.
8. Weiss Instruments, Inc.
9. Weksler Glass Thermometer Corp.

B. Description: Test-station fitting made for insertion in piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: [NPS 1/4] [or] [NPS 1/2], ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: [Chlorosulfonated polyethylene synthetic] [and EPDM self-sealing rubber.

2.6 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Flow Design, Inc.
2. Miljoco Corporation.
3. Nexus Valve, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. WATTS.
8. Weiss Instruments, Inc.

B. Furnish one test-plug kit(s) containing [one] [two] thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F.

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F.

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

F. Carrying Case: Metal or plastic, with formed instrument padding.

2.7 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. ARCHON Industries, Inc.
2. Dwyer Instruments, Inc.
3. Emerson Process Management; Rosemount Division.
4. Ernst Flow Industries.
5. John C. Ernst Co., Inc.
6. KOBOLD Instruments, Inc. - USA.
7. OPW Engineered Systems; OPW Fluid Transfer Group; a Dover company.
8. Pentair Valves & Controls; Penberthy Brand.

B. Description: Piping inline-installation device for visual verification of flow.

C. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

D. Minimum Pressure Rating: 150 psig.

E. Minimum Temperature Rating: 200 deg F.

F. End Connections for NPS 2 and Smaller: Threaded.

G. End Connections for NPS 2-1/2 and Larger: Flanged.

2.8 FLOWMETERS

A. Orifice Flowmeters:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. ABB.
   b. Bell & Gossett; a Xylem brand.
   c. Meriam Process Technologies.
   d. Preso Meters.
   e. S. A. Armstrong Limited.
2. Description: Flowmeter with sensor, hoses or tubing, fittings, valves, indicator, and conversion chart.
3. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
4. Sensor: Wafer-orifice-type, calibrated, flow-measuring element; for installation between pipe flanges.
   a. Design: Differential-pressure-type measurement for water.
   b. Construction: Cast-iron body, brass valves with integral check valves and caps, and calibrated nameplate.
   c. Minimum Pressure Rating: 300 psig.
   d. Minimum Temperature Rating: 250 deg F.
5. Permanent Indicators: Meter suitable for wall or bracket mounting, calibrated for connected sensor and having 6-inch-diameter, or equivalent, dial with fittings and copper tubing for connecting to sensor.
   a. Scale: Gallons per minute.
   b. Accuracy: Plus or minus 1 percent between 20 and 80 percent of scale range.
6. Display: Shows rate of flow, with register to indicate total volume in gallons.
7. Conversion Chart: Flow rate data compatible with sensor and indicator.
8. Operating Instructions: Include complete instructions with each flowmeter.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install valve and snubber in piping for each pressure gage for fluids (except steam).

I. Install test plugs in piping tees.

J. Install flow indicators in piping systems in accessible positions for easy viewing.

K. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

L. Install flowmeter elements in accessible positions in piping systems.

M. Install wafer-orifice flowmeter elements between pipe flanges.

N. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

O. Install permanent indicators on walls or brackets in accessible and readable positions.

P. Install connection fittings in accessible locations for attachment to portable indicators.

Q. Install thermometers in the following locations:
   1. Inlet and outlet of each hydronic zone.
   2. Inlet and outlet of each hydronic boiler.
   3. Two inlets and two outlets of each chiller.
   4. Inlet and outlet of each hydronic coil in air-handling units.
   5. Two inlets and two outlets of each hydronic heat exchanger.
   6. Inlet and outlet of each thermal-storage tank.
   7. Outside-, return-, supply-, and mixed-air ducts.

R. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
3. Suction and discharge of each pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow space for service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be the following:
1. Compact-style, liquid-in-glass type.

B. Thermometers at inlet and outlet of each hydronic boiler shall be the following:
1. Compact style, liquid-in-glass type.

C. Thermometers at inlets and outlets of each chiller shall be the following:
1. Compact-style, liquid-in-glass type.

D. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be the following:
1. Compact-style, liquid-in-glass type.

E. Thermometers at inlet and outlet of each thermal-storage tank shall be the following:
1. Compact-style, liquid-in-glass type.

F. Thermometers at outside-, return-, supply-, and mixed-air ducts shall be[one of] the following:
1. Compact style, liquid-in-glass type.

G. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 100 deg F

B. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F

C. Scale Range for Air Ducts: 0 to 150 deg F

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each pressure-reducing valve shall be the following:
   1. Liquid-filled, direct mounted, metal case.

B. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be following:
   1. Liquid-filled, direct mounted, metal case.

C. Pressure gages at suction and discharge of each pump shall be the following:
   1. Liquid-filled, direct mounted, metal case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 160 psi

B. Scale Range for Heating, Hot-Water Piping: 0 to 160 psi

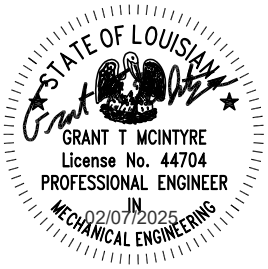
3.8 FLOWMETER SCHEDULE

A. Flowmeters for Chilled-Water Piping: Orifice type.

B. Flowmeters for Heating, Hot-Water Piping: Orifice type.

END OF SECTION

DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 05 23 - VALVES FOR HVAC PIPING



PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Butterfly Valves
2. Ball Valves
3. Check Valves
4. Globe Valves
5. Angle Valves
6. Gate Valves
7. Chainwheels
8. Control Valves

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1.3 DELIVERY, STORAGE AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle and globe valves closed to prevent rattling.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
4. ASME B16.18 for solder joint.

5. ASME B31.1 for power piping valves.
6. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Caution: Revise pressure ratings and insert temperature ratings in valve articles if valves with higher ratings are required. Valves larger than NPS 12 (DN 300) typically have a lower pressure rating than smaller valves. Verify pressure requirements for large valves.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:
1. Gear Actuator with Position Indicator: For valves NPS 8 and larger.
2. 10 Position Locking Handlever: For valves NPS 6 and smaller.
3. Chainwheel: Device for attachment to gear, stem, or other actuator of size and with chain for mounting height, according to "Valve Installation" Article.

H. Valves in Insulated Piping: With 2-inch stem extensions with extended necks.

I. Valve Bypass and Drain Connections: MSS SP-45

J. All valves shall have working pressure and manufacturer's name identified on valve body and have working pressure and temperature ratings equal to or greater than fluid service application.

2.2 BUTTERFLY VALVES

A. Iron, Single-Flange Butterfly Valves with Aluminum Bronze or Stainless-Steel Disc:
1. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum Bronze or Stainless steel.

2.3 BALL VALVES

A. Bronze Ball Valves, Two or Three-Piece with Full Port and Bronze or Brass Trim
1. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece or Three piece.

e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Ball Valves: 1-1/2"(DN40) through 6"(DN150) sizes, ASTM A-536, Grade 65-45-12, ductile iron body, chrome plated carbon steel ball and stem, TFE seats, with Fluoroelastomer seals. 800 psi (5515 kPa). Victaulic Series 726.

2.4 CHECK VALVES

A. Bronze Swing Check Valves with Nonmetallic Disc, Class 125:
1. Description:
a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE.

B. Iron Swing Check Valves with Nonmetallic-to-Metal Seats, Class 125:
1. Description:
a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Composition.
h. Seat Ring: Bronze.
i. Disc Holder: Bronze.
j. Disc: PTFE.
k. Gasket: Asbestos free.

C. Iron Swing Check Valves with Lever- and Spring-Closure Control, Class 125:
1. Description:
a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.
i. Closure Control: Factory-installed, exterior lever and spring.
j. IRON, CENTER-GUIDED CHECK VALVES

D. Iron, Compact-Wafer, Center-Guided Check Valves with Resilient Seat, Class 125:
   1. Description:
      a. Standard: MSS SP-125.
      b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
      c. NPS 14 to NPS 24, CWP Rating: 150 psig.
      d. Body Material: ASTM A 126, gray iron.
      e. Style: Compact wafer.
      f. Seat: EPDM or NBR.

E. 2"(DN50) through 3"(DN80) Sizes Spring Assisted: Black enamel coated ductile iron body, ASTM A-536, Grade 65-45-12, stainless steel non-slam tilting disc, stainless steel spring and brass shaft, nickel-plated seat surface, 365 psi (2517 kPa). Victaulic Series 716H.

F. 4”(DN100) through 12”(DN300) Sizes Spring Assisted: Black enamel coated ductile iron body, ASTM A-536, Grade 65-45-12, elastomer encapsulated ductile iron disc suitable for intended service, stainless steel spring and shaft, welded-in nickel seat, 300 psi (2065 kPa). Victaulic Series 716.

G. 2”(DN50) through 4”(DN100) Sizes Horizontal Swing: Horizontal installation, ductile iron body, ASTM A-536, Grade 65-45-12, and Type 316 stainless steel clapper. Synthetic rubber bumper & bonnet seals suitable for intended service, stainless steel wetted parts, 300 psi (2065 kPa). Victaulic Series 712.

H. 2”(DN50) through 4”(DN100) Swing Check Valve: Horizontal installation, original grooved or EndSealTM grooved ends, black enamel coated ductile iron body, ASTM A-536, Grade 65-45-12, with orange enamel coated access cap and closure coupling. ASTM A351 Grade CF8M stainless steel clapper, (302/304 stainless steel torsion spring in sizes 2-1/2” through 4”), Victaulic [Grade EHP: EPDM] or [Grade T: Nitrile] elastomer seat and closure gasket suitable for intended service, rated for service to 750 psi (5170 kPa). Victaulic Series 713.

2.5 GLOBE VALVES

A. Iron Globe Valves, Class 125:
   1. Description:
      a. Standard: MSS SP-85, Type I.
      b. CWP Rating: 200 psig.
      c. Body Material: ASTM A 126, gray iron with bolted bonnet.
      d. Ends: Flanged.
      e. Trim: Bronze.
      f. Packing and Gasket: Asbestos free.
      g. Operator: Handwheel or chainwheel.

2.6 GATE VALVES

A. Bronze Gate Valves, RS, Class 125:
   1. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Iron Gate Valves, OS&Y, Class 125:
1 Description:
a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

2.7 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.
3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, chain guides, chai, and attachment brackets for mounting chainwheels directly to hand wheels.
1. Sprocket Rim with Chain Guides: Ductile or cast iron of type and size required for valve.
2. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

2.8 BUTTERFLY CONTROL VALVE

A. At the Subcontractor's option, if a Victaulic grooved system is provided as specified herein, Victaulic 761 VIC-300 Masterseal butterfly valves 2 ½" through 12" suitable for bidirectional and dead-end service at full rated pressure. Body shall be grooved end black enamel coated ductile iron conforming to ASTM A536. Disc shall be electroless nickel plated ductile iron with blowout proof 416 stainless steel stem. Disc shall be offset from the stem centerline to allow full 360 degree circumferential seating. Seat shall be pressure responsive EPDM. Valve bearings shall be TFE lined fiberglass, and stem seals shall be of the same grade elastomer as the valve seat. Valve shall be complete with ISO flange for actuation mounting. if the contractor submits an acceptable detail for insulating the valve with his bid proposal for acceptance by the Owner and the Engineer. The use of flange adapters with lug or wafer style butterfly valves will not be allowed.

2.9 CONTROL VALVES

A. All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating and cooling loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.

B. Chilled water control valves shall be modulating plug, globe, ball, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer's recommendations for the given application. Valves serving air handling unit coils shall be shall be 2-way pattern, sized for a pressure drop equal to the actual coil pressure drop or; 3-way pattern mixing type sized for a pressure drop equal to 25% the actual coil pressure drop, but no less than 2 PSI, valve pattern as indicated on drawings. Mixing valves (3-way) serving secondary water circuits shall be sized for a pressure drop of no less than 5 PSI. control valves shall be Valves for terminal reheat coils shall be 2-way pattern, sized for a 2 PSIG pressure drop, but no more than a 5 PSI drop.

C. Modulating plug water valves of the single-seat type with equal percentage flow characteristics shall be used for all hot and chilled water applications, except those described hereinafter. The valve discs shall be composition type. Valve stems shall be stainless steel.

D. Butterfly valves shall be acceptable for modulating large flow applications greater than modulating plug valves, and for all two-position, open/close applications. In- line and/or three-way butterfly valves shall be heavy-duty pattern with a body rating comparable to the pipe rating, replaceable lining suitable for temperature of system, and a stainless-steel vane. Valves for modulating service shall be sized and travel limited to 50 degrees of full open. Valves for isolation service shall be the same as the pipe. Valves in the closed position shall be bubble-tight.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine mating flange faces for damage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for butterfly valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Check Valves:
1. Install check valves for proper direction and flow.
2. Swing Check Valves: Horizontal position with hinge pin level.
3. Center-Guided Check Valves: In horizontal or vertical position between flanges.

G. Install valve tags.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.

B. Select valves with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Tubing, NPS 2-1/2 and Larger: Flanged ends except where threaded valve-end option is indicated in valve schedules.

3.4 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.5 VALVE SCHEDULE

A. Gate and Check Valves
1. NPS 2 and Smaller:
a. Description:
1) 125 PSI SWP/200 PSI WOG
2) Standard: MSS SP-80
3) Bronze Body
4) Ends: Sweat Pattern or Threaded Ends (threaded for piping joined by brazing

b. Valves
1) Gate Valves – Rising Stem:
a) Nibco T/S-111
b) Milwaukee 184/149
c) Stockham B-100/108
2) Gate Valves – Non Rising Stem:
a) Niboc T/S-113
b) Milwaukee 105/115
c) Stockham B-100/108
3) Check Valves:
a) Nibco T/S-413
b) Milwaukee 509/1509
c) Stockham B-319/309

2. NPS 2-1/2 and Larger:
a. Description:
1) Class 125
2) Standard: MSS SP-70
3) Iron Body, Bronze Trimmed
4) Ends: Flanged faced and drilled
b. Valves
1) Gate Valves – OS&Y:
a) Nibco F-617
b) Milwaukee F2885
c) Stockham G-623
2) Gate Valves – Non Rising Stem:
a) Niboc F-619
b) Milwaukee F2882
c) Stockham G-612
3) Check Valves:
a) Nibco F-918
b) Milwaukee F2974
c) Stockham G-931

B. Ball Valves
1. NPS 1 and Smaller:
a. Description:
1) 200 psig WOG
2) Two piece construction.
3) Extended Stems for insulation.
4) Standard or Regular Port
b. Valves
1) Nibco T/S-585-70
2) Watts B-6080
3) Stockham S-216-BR-R Series
2. NPS 2 thru NPS 10:
a. Description:
1) 200 psi WOG
2) 3 piece construction
3) Bronze Body, Standard ASTM B62

4) Conventional or Full Port
5) Chrome plated brass or stainless steel ball
6) Replaceable Teflon or TFE seats and seals
7) Blow out proof stem
8) Vinyl covered steel lever, 4 inch minimum length

b. Valves:
1) Nibco 595-Y Series
2) Watts B-6800 Series
3) Grinnell 3810 Series

C Butterfly Valves:

1. NPS 12 and smaller

a. Description:
1) Standard: MSS SP-67
2) Bi-directional dead end service at rated pressure without use of downstream flange.
3) Ductile iron or cast iron body
4) EDPM Seats
5) Aluminum bronze or stainless steel disc
6) Stainless steel stem and lugged body drilled and tapped
7) 200 psi non shock cold water working pressure
8) Extended neck for insulation
9) 10 position locking type lever operate sizes 2-1/2 to 6 inch
10) Gear drive operator with position indicator sizes 8 inch and larger
11) Gate Valves suitable for chilled water sizes 2-1/2 and larger

b. Valves:
1) Nibco LD2000 Series
2) Watts BF-03-121 Series
3) Stockham LG-712/722 Series

3.6 VICTAULIC PRODUCTS

A. Where Victaulic Products are used:

1. Training:

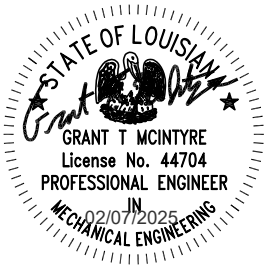
a. A Victaulic factory trained representative (direct employee) shall provide on-site product training for contractor's field personnel.

2. Application:

a. A Victaulic representative shall periodically visit the job site and review installation. Contractor shall remove and replace any improperly installed products.

b. Grooved end product manufacturer to be ISO-9001 certified.

END OF SECTION



DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 05 29 - HANGERS ANAD SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe and Tube Hangers:
   1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
   2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-plated steel or stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. B-line, an Eaton business.
      b. Flex-Strut Inc.
      c. G-Strut.
      d. Haydon Corporation.
      e. MIRO Industries.
      f. Thomas & Betts Corporation; A Member of the ABB Group.
      g. Unistrut; Part of Atkore International.
      h. Wesanco, Inc.
   2. Description: Shop- or field-fabricated, pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
   3. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
   4. Channels: Continuous slotted carbon-steel channel with inturned lips.
   5. Channel Width: Selected for applicable load criteria.
   6. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
   7. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
   8. Metallic Coating: Pregalvanized G90 or Hot-dip galvanized.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Buckaroos, Inc.
   2. Carpenter & Paterson, Inc.
   3. Clement Support Services.
   4. ERICO International Corporation.
   5. National Pipe Hanger Corporation.
   6. Pipe Shields Inc.
   7. Piping Technology & Products, Inc.

8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold & Hot Water Piping: ASTM C 552, Type II cellular glass with 100-psi minimum compressive strength and vapor barrier.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Hilti, Inc.
b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
c. MKT Fastening, LLC.
d. Simpson Strong-Tie Co., Inc.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. B-line, an Eaton business.
b. Empire Tool and Manufacturing Co., Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
e. MKT Fastening, LLC.
2. Indoor Applications: Zinc-coated or stainless-steel.
3. Outdoor Applications: Stainless steel.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MATERIALS

A. Aluminum: ASTM B 221.

B. Carbon Steel: ASTM A 1011/A 1011M.

C. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; galvanized.

D. Stainless Steel: ASTM A 240/A 240M.

E. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

F. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Nonstaining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
   1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
   2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut system.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:
   1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment support in first paragraph below requires calculating and detailing at each use.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.

b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
   4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
   5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
   6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
   7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.

10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

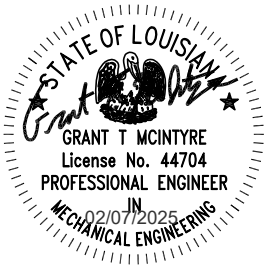
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

O. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION



DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. emedco.
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services, Inc.

j. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
3. Letter Color: Black, engraved
4. Background Color: White
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 1" wide.
7. Minimum Letter Size: 3/8 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fastener: Permanently fastened with non-corroding or stainless steel hardware. Stick on labels shall not be acceptable.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brady Corporation.
2. Brimar Industries, Inc.
3. Carlton Industries, LP.
4. Champion America.
5. Craftmark Pipe Markers.
6. emedco.
7. LEM Products Inc.
8. Marking Sevices Inc.
9. National Marker Company.
10. Seton Identification Products.
11. Stranco, Inc.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

D. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for

greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

F. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.
7. emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Sevices Inc.
11. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 VALVE TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
2. Brady Corporation.
3. Brimar Industries, Inc.
4. Carlton Industries, LP.
5. Champion America.
6. Craftmark Pipe Markers.

7. emedco.
8. Kolbi Pipe Marker Co.
9. LEM Products Inc.
10. Marking Sevices Inc.
11. Seton Identification Products.

B. Description: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
   1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Fasteners: Brass beaded chain.

C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
   1. Valve-tag schedule shall be included in operation and maintenance data.

2.5 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Brady Corporation.
   2. Brimar Industries, Inc.
   3. Carlton Industries, LP.
   4. Champion America.
   5. Craftmark Pipe Markers.
   6. emedco.
   7. Kolbi Pipe Marker Co.
   8. LEM Products Inc.
   9. Marking Sevices Inc.
   10. Seton Identification Products.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
   1. Size: 3 by 5-1/4 inches minimum
   2. Fasteners: Brass grommet and wire
   3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
   4. Color: Safety-yellow background with black lettering.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
   1. Near each valve and control device.
   2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
   3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
   4. At access doors, manholes, and similar access points that permit view of concealed piping.
   5. Near major equipment items and other points of origination and termination.
   6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.

B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes at location of pipe label.

C. Pipe Label Color Schedule:
   1. Chilled & Heating-Water and Refrigerant Piping: Black letters on a safety-green background

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

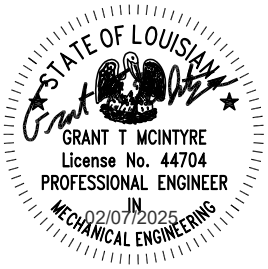
B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
   1. Valve-Tag Size and Shape: 1-1/2 inches, round
   2. Valve-Tag Colors: Safety Green

3. Letter Colors: Black

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION



DIVISION 23 - MECHANICAL
SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of hydronic systems.

B. Measurement of final operating condition of HVAC systems.

C. Commissioning activities.

1.2 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.3 SUBMITTALS

A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Mechanical Engineer.
   2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   3. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. False loading of systems to complete TAB work, if required.
      f. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies to Mechanical Engineer and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in I-P (inch-pound) units only.
   6. Include the following on the title page of each report:
   7. Name of Testing, Adjusting, and Balancing Agency.
   8. Address of Testing, Adjusting, and Balancing Agency.
   9. Telephone number of Testing, Adjusting, and Balancing Agency.
   10. Project name.
   11. Project location.
   12. Project Engineer.
   13. Project Contractor.
   14. Report date.

E. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Hydronic systems are flushed, filled, and vented.
   5. Pumps are rotating correctly.
   6. Proper strainer baskets are clean and in place.
   7. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

3.4 ADJUSTMENT TOLERANCES

A. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.6 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.7 DEMONSTRATION

A. In the presence of the Mechanical Engineer and Southern University Representative, verify that:
   1. Final settings of all valves have been permanently marked.
   2. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.
   3. Control valves are being commanded and operated from the BAS properly.
   4. Perform prerequisites prior to starting T&B activities.
   5. Fill out Prefunctional Checklists for:
      a. Water side systems.
   6. In the presence of the Mechanical Engineer and Southern University Representative, verify that:
      b. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
      c. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.8 SCOPE

A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Water Cooled Chillers.

3. Induced Draft Cooling Tower.

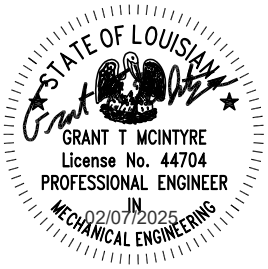
3.9 MINIMUM DATA TO BE REPORTED

A. Pumps:
1. Design flow rate, pressure drop, BHP.
2. Actual flow rate, pressure drop, BHP.
3. Discharge pressure.
4. Suction pressure.
5. Total operating head pressure.

B. Water Cooled Chillers:
1. Capacity.
2. Evaporator entering water temperature, design and actual.
3. Evaporator leaving water temperature, design and actual.
4. Evaporator pressure drop, design and actual.
5. Evaporator water flow rate, design and actual.
6. Condenser entering water temperature, design and actual.
7. Condenser pressure drop, design and actual.
8. Condenser water flow rate, design and actual.

C. Cooling Tower:
1. Tower identification/number.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Rated capacity.
6. Entering air WB temperature, specified and actual.
7. Ambient air DB temperature.
8. Condenser water entering temperature.
9. Condenser water leaving temperature.
10. Condenser water flow rate.
11. Fan RPM.

END OF SECTION



DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:
   1. Condensate drain piping, indoors and outdoors.
   2. Chilled-water piping, indoors and outdoors

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail attachment and covering of heat tracing inside insulation.
   3. Detail insulation application at pipe expansion joints for each type of insulation.
   4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   5. Detail removable insulation at piping specialties.
   6. Detail application of field-applied jackets.
   7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: A single set of plans or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Qualification Data: For qualified Installer.

C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Pittsburgh Corning Corporation.
   2. Block Insulation: ASTM C 552, Type I.
   3. Special-Shaped Insulation: ASTM C 552, Type III.
   4. Board Insulation: ASTM C 552, Type IV.
   5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
   6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
   7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Aeroflex USA, Inc.
      b. Airex Manufacturing.
      c. Armacell LLC.
      d. K-Flex USA.

H. Mineral-Fiber, Preformed Pipe Insulation:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. Knauf Insulation.
      c. Manson Insulation Inc.
      d. Owens Corning.
   2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Ramco Insulation, Inc.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Ramco Insulation, Inc.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Foster Brand; H. B. Fuller Construction Products.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Aeroflex USA, Inc.
      b. Armacell LLC.
      c. Foster Brand; H. B. Fuller Construction Products.
      d. K-Flex USA.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Foster Brand; H. B. Fuller Construction Products.
      d. Mon-Eco Industries, Inc.

E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Mon-Eco Industries, Inc.

F. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Dow Corning Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. P.I.C. Plastics, Inc.
    d. Speedline Corporation.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Childers Brand; H. B. Fuller Construction Products.
    b. Foster Brand; H. B. Fuller Construction Products.
    c. Knauf Insulation.
    d. Vimasco Corporation.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Mon-Eco Industries, Inc.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Foster Brand; H. B. Fuller Construction Products.
   2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
   3. Service Temperature Range: Minus 50 to plus 220 deg F.
   4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
   5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Foster Brand; H. B. Fuller Construction Products.
      c. Vimasco Corporation.
   2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
   3. Service Temperature Range: 0 to plus 180 deg F.
   4. Color: White.

2.6 SEALANTS

A. Cellular-Glass Joint Sealants:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Childers Brand; H. B. Fuller Construction Products.
      b. Eagle Bridges - Marathon Industries.
      c. Foster Brand; H. B. Fuller Construction Products.
      d. Mon-Eco Industries, Inc.
      e. Pittsburgh Corning Corporation.

B. Polystyrene Joint Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Permanently flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 100 to plus 300 deg F.
   4. Color: White or gray.

C. FSK and Metal Jacket Flashing Sealants:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Childers Brand; H. B. Fuller Construction Products.
b. Eagle Bridges - Marathon Industries.
c. Foster Brand; H. B. Fuller Construction Products.
d. Mon-Eco Industries, Inc.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

D. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Childers Brand; H. B. Fuller Construction Products.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Childers Brand; H. B. Fuller Construction Products.

B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Foster Brand; H. B. Fuller Construction Products.
b. Vimasco Corporation.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Alpha Associates, Inc.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: Impact and corrosion-resistant, complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Adhesive: As recommended by jacket material manufacturer.
2. Flame Spread 25 or less and smoke developed 50 or less when tested in accordance ASTM E84
3. Color: Color-code jackets based on system. Architect to have final approval of color coding. Any changes to be approved by both architect and mechanical engineer for color coding.
a. Chilled Water Supply: Dark blue
b. Chilled Water Return: Light blue
c. Heating Water Supply: Red
d. Heating Water Return: Yellow
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Metal Jacket:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. RPR Products, Inc.
2. Aluminum Jacket: Comply with ASTM C1729 and ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
    a. Factory cut and rolled to size
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
    d. Factory-Fabricated Fitting Covers:
        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.

8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: Refer to Underground Hydronic Piping Specification.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Avery Dennison Corporation, Specialty Tapes Division.
b. Compac Corporation.
c. Ideal Tape Co., Inc., an American Biltrite Company.
d. Knauf Insulation.
e. Venture Tape.
2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Compac Corporation.
b. Ideal Tape Co., Inc., an American Biltrite Company.
c. Venture Tape.
2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Avery Dennison Corporation, Specialty Tapes Division.
b. Compac Corporation.
c. Ideal Tape Co., Inc., an American Biltrite Company.
d. Knauf Insulation.
e. Venture Tape.
2. Width: 2 inches.
3. Thickness: 3.7 mils.

4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. ITW Insulation Systems; Illinois Tool Works, Inc.
b. RPR Products, Inc.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, [3/4 inch wide with wing seal or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, galvanized steel.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. C & F Wire.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor

insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a re-

movable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs.

B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
   1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.

3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work. Color-code jackets based on system. Architect to have final approval of color coding. Any changes to be approved by both architect and mechanical engineer for color coding.
a. Chilled Water Supply: Dark blue
b. Chilled Water Return: Light blue
c. Heating Water Supply: Red
d. Heating Water Return: Yellow

D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Cellular Foam: 1 inch thick
      b. All condensate drain lines shall be rigid copper. Support with Unistrut pipe every 4'-0" and at turns.

B. Chilled Water Piping, 40 Deg F and above:
   1. NPS 1 and Smaller: Insulation shall be one of the following:
      a. Cellular Glass: 1/2 inches thick.
      b. Mineral-Fiber, Preformed Pipe, Type I, 1/2 inch thick
      c. Insulation K-Value/Conductivity [BTU-in/(hr-sq ft-degree F)] : 0.21-0.27
   2. NPS 1-1/2 and Larger: Insulation shall be one of the following
      a. Cellular Glass: 1-1/2 inches thick
      b. Mineral-Fiber, Preformed Pipe, Type I, 1-1/2 inch thick
      c. Insulation K-Value/Conductivity [BTU-in/(hr-sq ft-degree F)] : 0.21-0.27

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Cellular Glass: 2 inches thick.
      b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
      c. Insulation K-Value/Conductivity [BTU-in/(hr-sq ft-degree F)] : 0.21-0.27

3.15 INDOOR, JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Concealed:
   1. PVC, Color-Coded by System: 20 mils thick.

C. Piping, Exposed:
   1. PVC, Color-Coded by System: 20 mils thick.

3.16 OUTDOOR, JACKET SCHEDULE

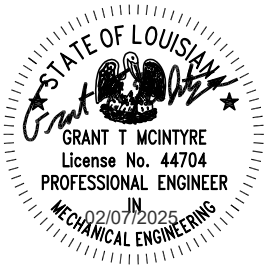
A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Piping, Concealed:
   1. Aluminum, Smooth: 16 mil thick

C. Piping, Exposed:

1. Aluminum, Smooth: 16 mil thick

END OF SECTION



DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 09 00 - BUILDING AND AUTOMATIC TEMPERATURE CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 QUALITY ASSURANCE

A. The DDC controls utilizing BACnet over IP shall be the following or prior approved equal system that interfaces with a future campus wide Energy Management/ Temperature Control System:
   1. Distech Controls
   2. Alerton by Synergy Building Solutions
   3. Prior approved system and manufacturer.

B. The Installer shall be authorized representative of the Control System Manufacturer and has been installing automation/temperature controls systems for a minimum of (5) years.

C. All products used shall be new, currently under manufacture and be standard off the shelf products. This installation shall not be a test site unless approved by the Engineer in writing. Spare parts shall be available for at least 5 years after completion of this contract. Single source responsibility of the controls contractor shall include installation, calibration, programming, and check-out of the stand-alone subsystems, as well as the complete operation of the integrated system.

D. Contractors Qualifications: Temperature controls contractor shall have a local office within 50 miles of the project for at least 5 years, staffed by trained personnel capable of providing instruction, routine maintenance and emergency service on systems. Provide proof of qualifications within 14 days of award of the contract to the BAS contractor.

E. Provide record of successful installation of similar size, performed by Contractor submitting the tender, showing successful experience with similar mechanical equipment, systems and Direct Digital Controls.

F. Provide proof of having access to local supplies of essential parts and provide 7 year guarantee of availability of compatible spare parts after manufacturer's declaration of obsolescence.

G. Provide proof of having in-house staff with expertise in pneumatic controls where applicable.

H. The Energy Management Control System (EMCS) shall be designed, installed, commissioned, and serviced by manufacturer authorized and trained personnel. System provider shall have a local in-place support facility site with technical staff, spare parts inventory, and necessary test and diagnostic equipment.

I. The Bidder shall be regularly engaged in the design, installation and maintenance of BAS systems and shall have demonstrated technical expertise and experience in the design, installation and maintenance of BAS systems similar in size and complexity to this project.

J. A single EMCS Contractor shall be used on the project. The EMCS Contractor shall furnish and install all controllers, sensors, etc. unless factory affixed to the Mechanical Equipment.

K. All Control Valves shall be provided by the Controls Contractor with control wiring by the EMCS Contractor and installation of the valve by Mechanical. Electrical Wiring (if applicable) shall be by properly licensed contractor.

L. Responsibility: The EMCS Contractor shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished. The EMCS Contractor shall work with the Mechanical Equipment Startup Technician to furnish integration configuration information such as Devices Instance, Mac Address, Baud Rate, etc.

M. All engineering and drawings required for developing the EMCS and the related project submittal and installation packages shall be produced by the manufacturer or the EMCS Integrator.

N. Component Testing: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Each and every controller, sensor, and all other DDC components shall be individually tested by the manufacturer prior to shipment.

O. Tools, Testing and Calibration Equipment: The EMCS supplier shall provide all tools, testing, and calibration equipment necessary to ensure reliability and accuracy of the system.

P. Conduct a Point to Point Testing of Graphics, Input/Outputs of Controllers and end devices in the presence of the Owner. Provide Commissioning Sheets for every point tested in the Final O&M Submittals.

Q. The systems control contractor shall be the authorized installing contractor for the manufacturer of the BACnet components.

R. Materials and equipment shall be manufacturer's latest standard design that complies with the specification requirements.

S. All BAS peer-to-peer network controllers, central system controllers and local user displays shall be UL Listed under Standard UL 916, category PAZX.

T. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.

U. Control system shall be engineered, programmed and supported completely by representative’s local office that must be within 30 miles of project site.

1.3 SCOPE OF WORK

A. Southern University is renovating the central plant for the ROTC building. The intent of this project is to provide a new BAS for the building's chilled water system, a new graphical user interface, and ability to interconnect to the campus network LAN so that the building may be remotely monitored, controlled and alarm via remotely and through the new hardware system provided at the band building.

B. Although such work is not specifically indicated, provide all supplementary or miscellaneous items, software, appurtenances, and devices necessary for a sound, secure, and complete system.

1.4 WORK INCLUDED

A. Furnish a totally native BACnet-based system. The system shall integrate with the Alerton Compass BAS workstation, located on the Southern University Baton Rouge Server. Coordinate with SUBR IT for IT connection to system. All building pumping systems that are fed from the central plant shall interface with central plant control system for complete energy optimization. See sequence of operations for details. The operator's workstation, all building controllers, application controllers, and all input/output devices shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135–2008, BACnet. In other words, all workstations and controllers, including unitary controllers, shall be native BACnet devices. No gateways shall be used for communication to controllers installed under this section.

B. Provide a system compliant with all aspects of the related specifications.

C. Provide necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including terminal device or unitary controllers and space temperature sensors.

D. Gateways may be used for communication to new and existing boilers, chillers, or large self-contained Air Handlers installed under other sections. However, the Gateways shall be provided by Alerton or developed specifically for equipment provided. Third-party and private labeled third-party gateways are not allowed.

E. All controllers and space temperature sensors, valves, or other groups of similar equipment and devices shall be provided by a sole manufacturer.

F. The existing Operator's workstation's hardware and software shall be utilized; no new software shall be installed on the existing client's machine to perform full system operation. All field level controllers shall be capable of being programmed from Ascent Compass software.

G. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

H. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

I. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

J. Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.

K. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.

L. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

M. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup, and commissioning.

N. Provide a comprehensive operator and technician training program as described herein.

O. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

P. Provide new sensors, dampers, valves, and install only new electronic actuators. No used components shall be used as any part or piece of installed system unless otherwise noted.

1.5 SYSTEM DESCRIPTION

A. A distributed logic control system complete with all software and hardware functions shall be provided and installed. System shall be completely based on ANSI/ASHRAE Standard 135-2008, BACnet. This system is to control all mechanical equipment, including all unitary equipment such as VAV boxes, heat pumps, fan-coils, AC units, etc. and all air handlers, boilers, chillers, and any other listed equipment using native BACnet-compliant components.

B. The entire control system shall be in complete compliance with the BACnet standard: ANSI/ASHRAE 135-2008 with a BTL listing. The system shall use BACnet protocols and LAN types throughout and exclusively. Non-BACnet-compliant or proprietary equipment or systems (including gateways) shall not be acceptable and are specifically prohibited.

C. The existing Operator's workstation hardware and software shall be utilized; no new software shall be installed on the existing client's machine to perform full system operation.

D. Building controllers shall include complete energy management software, including scheduling building control strategies and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator's terminal. Operator's terminal software is to be used for access to field-based energy man-

agement functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage.

E. When specified in the construction documents, room sensors shall be provided with digital readout that allow the user to view room temperature, view outside air temperature, adjust the room setpoint within preset limits and set desired override time. User shall also be able to start and stop unit from the digital sensor. Include all necessary wiring and firmware such that room sensor includes field service mode.

1.6 RELATED WORK

A. The following represents the general work scope of Contractors, which the controls contractor will be coordinating with.

B. Refer to Instructions to Bidders, Division 0 and Division 1, if included, for related contractual requirements.

C. Refer to Division 23, Heating, Ventilation and Air Conditions
   1. Installation of control valves by Mechanical Contractor
   2. Installation of Dampers or Air Flow Monitors or other Duct Related Devices shall be provided by the Sheet metal Contractor.
   3. Installation of sensor wells, pressure temperature sensors in piping, differential pressure sensors, flow meters, flow switches or other immersion type devices by Mechanical Contractor.
   4. Integrated Equipment:
      a. VFD provided by the Mechanical Contractor shall have a BACnet protocol for integration of any/all points requested by this division.
      b. Any EMCS provided shall be integrated in the existing Compass system by Alerton Technologies.

D. Refer to Division 26 Electrical
   1. All power wiring to control panel to be supplied by Division 26
   2. All power wiring to VAV, FCU or any other terminal unit to power the controls shall be provided by Division 26.
   3. All 120 VAC wiring to be provided by Division 26.
   4. All actuated valves with separate power source shall have a local disconnect switch mounted within 5 feet and line of site of the actuator.
   5. Smoke Detectors for Air Moving Devices, supply and return by HVAC equipment manufacturer.
   6. VFD provided by the Electrical Contractor shall have a native on-board BACnet protocol for integration of any/all points requested by this division. Notify Owner's Representative in writing immediately upon discovery of any VFD that does not meet this requirement.

E. Refer to Division 28 Electronic Safety and Security
   1. Fire Alarm System by Division 28.

1.7 CODES AND STANDARDS

A. It is the responsibility of the Controls contractor to be familiar with all codes, rules, ordinances, and regulations of the Authority Having Jurisdiction and their interpretations which are in effect at the site of the work.

B. The latest issue of applicable standards and recommended practices of the following agencies in effect shall form a part of the specification to the extent each agency's relative standards or recommended practices apply to the Systems and its components as specified herein.
1. Federal Communications Commission (FCC)
2. American National Standards Institute (ANSI)
3. American Society of Mechanical Engineers (ASME)
4. Electronic Industries Association (EIA)
5. Institute of Electrical and Electronics Engineers (IEEE)
6. National Electrical Manufacturers Association (NEMA)
7. National Fire Protection Association (NFPA)
8. Underwriters Laboratories (UL)
9. Occupational Safety and Health Administration (OSHA)
10. American Society of Heating, Refrigeration and Air Conditioning Engineers

C. This contractor shall be solely responsible for compliance with all health and safety regulations, performing the work in a safe and competent manner, and the use industry accepted installation procedures required for the work as outlined in these documents.

D. All systems equipment, components, accessories, and installation hardware shall be new and free from defects and shall be UL listed where applicable. All components shall be in current production and shall be a standard product of the system or device manufacturer.

1.8 ACTION SUBMITTALS

A. Product Data and Shop Drawings: Contractor shall provide shop drawings or other submittals on all hardware, software, and installation to be provided. No work may begin on any segment of this project until submittals have been reviewed and approved for conformity with the design intent. Six copies are required. All drawings shall be provided on magnetic/optical disk and as 11 X 17 inch drawings. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings should clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall include:
1. Direct Digital Control System Hardware:
   a. A complete bill of materials of equipment to be used shall be listed indicating quantity, manufacturer, model number, and other relevant technical data.
   b. Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:
      1) Direct Digital Controller (controller panels)

2) Transducers/Transmitters
3) Sensors (including accuracy data)
4) Actuators
5) Valves
6) Relays/Switches
7) Control Panels
8) Power Supply
9) Batteries
10) Operator Interface Equipment
11) Wiring

2. Software Submittal:
   a. Cross-referenced listing of software to be loaded on each operator workstation, server, gateway, and DDC controller.
   b. Description and technical data of all software provided, and cross-referenced to products in which software will be installed.
   c. Operating system software, operator interface and programming software, color graphic software, DDC controller software, maintenance management software, and third-party software.
   d. Include a flow diagram and an outline of each subroutine that indicates each program variable name and units of measure.
   e. Listing and description of each engineering equation used with reference source.
   f. Listing and description of each constant used in engineering equations and a reference source to prove origin of each constant.
   g. Description of operator interface to alphanumeric and graphic programming.
   h. Description of each network communication protocol.
   i. Description of system database, including all data included in database, database capacity and limitations to expand database.
   j. Description of each application program and device drivers to be generated, including specific information on data acquisition and control strategies showing their relationship to system timing, speed, processing burden and system throughout.
   k. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Wiring diagrams and layouts for each control panel. Show all termination numbers and schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware

C. Shop Drawings:
   1. General Requirements:
      a. Include cover drawing with Project name, location, Owner, Mechanical Engineer, Contractor and issue date with each Shop Drawings submission.
      b. Include a drawing index sheet listing each drawing number and title that matches information in each title block.
   2. Schematic drawings for each controlled HVAC system indicating the following:

a. I/O points labeled with point names shown. Indicate instrument range, normal operating set points, and alarm set points. Indicate fail position of each damper and valve, if included in Project.
b. I/O listed in table format showing point name, type of device, manufacturer, model number, and cross-reference to product data sheet number.
c. A graphic showing location of control I/O in proper relationship to HVAC system.
d. Wiring diagram with each I/O point having a unique identification and indicating labels for all wiring terminals.
e. Unique identification of each I/O that shall be consistently used between different drawings showing same point.
f. Elementary wiring diagrams of controls for HVAC equipment motor circuits including interlocks, switches, relays and interface to DDC controllers.
g. Narrative sequence of operation.
h. Graphic sequence of operation, showing all inputs and output logical blocks.

3. Control panel drawings indicating the following:
   a. Panel dimensions, materials, size, and location of field cable, raceways, and tubing connections.
   b. Interior subpanel layout, drawn to scale and showing all internal components, cabling and wiring raceways, nameplates and allocated spare space.
   c. Front, rear, and side elevations and nameplate legend.
   d. Unique drawing for each panel.
4. DDC system network riser diagram indicating the following:
   a. Each device connected to network with unique identification for each.
   b. Interconnection of each different network in DDC system.
   c. For each network, indicate communication protocol, speed and physical means of interconnecting network devices, such as copper cable type, or optical fiber cable type. Indicate raceway type and size for each.
   d. Each network port for connection of an operator workstation or other type of operator interface with unique identification for each.
5. DDC system electrical power riser diagram indicating the following:
   a. Each point of connection to field power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
   b. Each control power supply including, as applicable, transformers, power-line conditioners, transient voltage suppression and high filter noise units, DC power supplies, and UPS units with unique identification for each.
   c. Each product requiring power with requirements (volts/phase//hertz/amperes/connection type) listed for each.
   d. Power wiring type and size, race type, and size for each.
6. Monitoring and control signal diagrams indicating the following:
   a. Control signal cable and wiring between controllers and I/O.
   b. Point-to-point schematic wiring diagrams for each product.
   c. Control signal tubing to sensors, switches and transmitters.
   d. Process signal tubing to sensors, switches and transmitters.
7. Color graphics indicating the following:
   a. Itemized list of color graphic displays to be provided.

b. For each display screen to be provided, a true color copy showing layout of pictures, graphics and data displayed.
c. Intended operator access between related hierarchical display screens.

D. System Description:
1. Full description of DDC system architecture, network configuration, operator interfaces and peripherals, servers, controller types and applications, gateways, routers and other network devices, and power supplies.
2. Complete listing and description of each report, log and trend for format and timing and events which initiate generation.
3. System and product operation under each potential failure condition including, but not limited to, the following:
a. Loss of power.
b. Loss of network communication signal.
c. Loss of controller signals to inputs and outpoints.
d. Operator workstation failure.
e. Server failure.
f. Gateway failure.
g. Network failure
h. Controller failure.
i. Instrument failure.
j. Control damper and valve actuator failure.
4. Complete bibliography of documentation and media to be delivered to Owner.
5. Description of testing plans and procedures.
6. Description of Owner training.

1.9 CLOSEOUT SUBMITTALS

A. Project Record Documents: Upon completion of installation, submit three copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and shall include:
1. Project Record Drawings. These shall be as-built versions of the submittal shop drawings. One set of magnetic media including DXF drawing files also shall be provided
2. Testing and Commissioning Reports and Checklists.
3. Operation and Maintenance (O & M) Manual. This shall include as-built versions of the submittal product data. In addition to the information required for submittals, the O & M manual shall include:
a. Names, addresses, and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representatives of each
b. Operators Manual with procedures for operating the control systems, including logging on/off, alarm handling, producing point/object reports, trending data, overriding computer control, and changing setpoints and other variables
c. One set of Programming Manuals with a description of the programming language (including syntax), statement descriptions (including algorithms and calculations used), point/object database creation and modification, program creation and modification, and use of the editor

d. A listing and documentation of all custom software created using the programming language, including the setpoints, tuning parameters, and object database. One set of magnetic/optical media containing files of the software and database also shall be provided
e. Complete original issue documentation, installation, and maintenance information for all third-party hardware provided, including computer equipment and sensors
f. Complete original issue diskettes for all software provided, including operating systems, operator workstation software, and graphics software
g. Licenses, guarantee, and warranty documents for all equipment and systems.

4. HVAC Training Documents:
   a. Provide 8 hour training on DDC system and controls and provide file of video record of training session to the user.

1.10 WARRANTY

A. Labor and materials for the control system specified shall be warranted free from defects for a period of 12 months after final completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during normal business hours.

B. All work shall have a single warranty date, even when the Owner has received beneficial use due to an early system start-up. If the work specified is split into multiple contracts or a multi-phase contract, then each contract or phase shall have a separate warranty start date and period

C. Warranty shall be extended and shall cover all costs for parts, labor, associated travel, and expenses for a period of one year from the date of replacement of any items replaced under this warranty.

D. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours Monday through Friday, 48 hours on Saturday and Sunday.

E. Warranty support services shall be provide on-site by the BAS's INSTALLING (sub)contractor for the entire duration of all trouble shooting and all warranty repair services related to both installation and hardware/software issues for the full warranty period of all devices at no additional cost to Owner.

F. This warranty shall apply equally to both hardware and software

G At the end of the final start-up, testing, and commissioning phase, the Engineer shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of acceptance shall be the start of warranty.

1.11 DEFINITIONS

A. Analog Output: Proportional output signal (zero- to 10-V dc, 4 to 20 mA).

B. Binary Output: On/off output signal or contact closure.

C. DDC: Direct digital control.

D. Digital Output: Data output that must be interpreted digitally.

PART 2 PRODUCTS

2.1 MATERIALS

A. The equipment and software proposed by the supplier shall be currently in manufacture. No custom products shall be allowed unless required by the specification. All products shall be supported by the manufacturer for a minimum of (5) years and shall have been installed in similar installations applications for a minimum of (5) years.

B. All new building automation system products on this project shall be provided by a firm that is a registered ISO 9001:2008 manufacturer, for a minimum duration of 5 years, at time of bid.

C. The Building Automation System shall be furnished, engineered, installed, tested and calibrated by factory certified technicians qualified for this work. The contractor shall be Factory Authorized in good standing with the Manufacturer. Factory trained technicians shall provide instruction, routine maintenance, and emergency service within 24 hours upon receipt of request

1. Upon request, installer shall present records of successful completion of factory training courses including course outlines.
2. Upon request, the installer shall provide a letter from the manufacturer that they are a Factory Authorized installer in good standing with the Manufacturer

2.2 SYSTEM ACCURACY & STABILITY

A. Reporting Accuracy. The system shall report all values with an end-to-end accuracy as listed or better than those listed below:

Measured Variable	Reported Accuracy
Space Temperature	±1ºF
Ducted Air	±1ºF
Outside Air	±2ºF
Dewpoint	±3ºF
Delt-T	±0.25ºF
Relative Humidity	±5% RH
Airflow (air devices)	±10%
Airflow measuring Stations	±5%
Air Pressure (ducts)	±0.1” W.G.
Air Pressure (space)	±0.01” W.G.
Electrical	5% of reading (not including supplied meters)

Carbon Monoxide (CO)	±5%
Carbon Dioxide (CO2)	±50 ppm

2.3 ADVANCED WORKSTATION (AWS)

A. General structure of workstation interaction shall be a standard client/server relationship with web server embedded in the server for browser only access. Server shall be used to archive data and store system database. The Operator's Advanced Workstation in the District's Data Center maintained by Technology and Maintenance Departments shall be utilized without installation of any additional Integration / Management Software. The AWS shall support operation in a virtualized server environment. Thick and web clients shall access server for all archived data.

1. A single server license shall:
   a. Allow a minimum of 50 thick client seats/installations.
   b. Allow a minimum of 200 web client users.
   c. Not restrict system size based on point count (BACnet or Integration).

B. Data Displays

1. Data displays shall render all data associated with project as called out on drawings and/or object type list supplied. Graphic files shall be created using digital, full color photographs of system installation, AutoCAD or Visio drawing files of field installation drawings, and wiring diagrams from as-built drawings.
2. Data displays shall render data using iconic graphic representations of all mechanical equipment. System shall be capable of displaying graphic file, text, trendlog, and dynamic object data together on each display and shall include animation. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user.
3. Data display frame shall allow user to change all field-resident AWS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc., from any screen, no matter if that screen shows all text or a complete graphic display. This shall be done without any reference to object addresses or other numeric/mnemonic indications.
4. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual graphic items on the display screen as an overlay to the system graphic.
5. All displays and programming shall be generated and customized by the local use energy management and control system (EMCS) supplier and installer. Systems requiring factory development of graphics or programming of DDC logic are specifically prohibited.
6. AWS shall be supplied with a library of standard graphics, which may be used unaltered or modified by the operator. AWS shall include a library of equipment graphic components to assemble custom graphics. Systems that do not allow customization or creation of new graphic objects by the operator (or with third-party software) shall not be allowed.
7. A navigation tree for building, equipment and system diagnostic centric display organization shall be available from data display view. The tree navigation contents shall be customizable on a per-user and per-group basis.

8. Each display may be protected from viewing unless operator credentials have the appropriate access level. An access level may be assigned to each display and system object. The menu label shall not appear on the graphic if the operator does not have the appropriate security level.
9. Data displays shall have the ability to link to content outside of the EMCS system. Such content shall include, but is not limited to launching external files in their native applications (for example, a Microsoft Word document).
10. A single system software license can support a minimum of 200 user accounts and web access. Data displays shall support:
    a. Graphic items with custom geometry that offer both color gradient shading and variable opacity in scale to system variables, both analog and digital, and color range settings. For example, rooms on a floor plan graphic can be made to indicate the space temperature by varying the color of that room.
    b. Clear and custom geometry navigation buttons to provide intuitive navigation to system display or external URLs.
    c. Graphic files in JPG, PNG, and GIF file types.
    d. Viewing of up to 1,024 system data points (Analog, Binary, and/or Multistate) in a single screen.
    e. Customizable mouse-over tooltip information of graphic items or data points can be displayed. The tooltips can be turned on and off. The default setting is off.
    f. Right click capability to directly access system functionality, such as Schedule, Trendlogs, and Alarms associated with a display object selected.
    g. Automatic zooming to the screen size detected to maximize the size of the display to match screen display area available. The zoom capability can be enabled or disabled, default is enabled. The background color, if solid, will be used to flood fill the remaining screen background.
    h. Supports user configurable embedded Data Viewer for a persistent trend log data view to accompany system data and graphic information on a single display.

C. Password Protection
1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's assigned functions when user is logged on. This includes displays as outlined above.
2. AWS shall provide security for a minimum of 200 users. Each user shall have an individual User ID, User Name, and Password. Entries are alphanumeric characters only and are case sensitive (except for User ID). User ID, User Name, and Password shall be shall support a minimum of 40 characters. All user information and passwords shall be stored in an encrypted form.
3. Each user shall be allowed individual assignment of only those control functions, menu items, navigation tree, and user-specific system start display, as well as restricted access to discrete BACnet devices to which that user requires access.
4. All passwords, user names, and access assignments shall be adjustable via Server and Thick client. Password shall be adjustable via the web client.

5. Users shall also have a set access level, which defines access to displays and individual objects the user may control. System shall include 10 separate and distinct access levels for assignment to users.
6. The AWS and Thick Client shall include an Auto Logout feature that shall automatically logout user when there has been no keyboard or mouse activity for a set period of time. Time period shall be adjustable by system administrator. Auto Logout may be enabled and disabled by system administrator. Operator terminal shall display message on screen that user is logged out after Auto Logout occurs.
7. The system shall permit the assignment of an effective date range, as well as an effective time of day, that the User IDs are permitted to authenticate.

D. Operator Activity Log
1. An Operator Activity Log that tracks all operator changes and activities shall be included with AWS. System shall track what is changed in the system, who performed this change, date and time of system activity, and value of the change before and after operator activity. Operator shall be able to display all activity, sort the changes by user and also by operation. Operator shall be able to print the Operator Activity Log display.
2. Log shall be gathered and archived to a hard drive on AWS as needed. Operator shall be able to export data for display and sorting in a spreadsheet.
3. System shall have the option to require user comment recording in the Operator Activity Log upon any system point change.
4. Operator Activity log shall be accessible via the Web Client for viewing, sorting, filtering, and Printing.

E. Scheduling
1. AWS, Thick Client and Web Client shall show all information in easy-to-read daily format including calendar of this month and next. All schedules shall show actual ON/OFF times for day based on scheduling priority. Priority for scheduling shall be events, holidays and daily, with events being the highest.
2. Holiday and special event schedules shall display data in calendar format. Operator shall be able to schedule holidays and special events directly from these calendars.
3. Operator shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate access privileges.
4. AWS and Thick Client shall include a Schedule Wizard for set up of schedules. Wizard shall walk user through all steps necessary for schedule generation. Wizard shall have its own pull-down selection for startup or may be started by right-clicking on value displayed on graphic and then selecting Schedule.
5. Scheduling shall include optimum start based on outside air temperature, current heating/cooling setpoints, indoor temperature and history of previous starts. Each and every individual zone shall have optimum start time independently calculated based on all parameters listed. User shall input schedules to set time that occupied setpoint is to be attained. Optimum start feature shall calculate the startup time needed to match zone temperature to setpoint. User shall be able to set a limit for the maximum startup time allowed.
6. Schedule list shall show all schedules currently defined. This list shall include all standard, holiday and event schedules. In addition, user shall be able to select a list that shows all scheduled points and zones.

7. Display of all three schedules must show all ON times for standard, holiday and event schedules in different colors on a given day. In addition, OFF times for each must also be shown in additional colors. User shall be able to select from standard calendar what days are to be scheduled and same display shall show all points and zones affected. User shall be able to set time for one day and select all days of the week that shall be affected as a recurrence of that same schedule for that given day.
8. Any displayed data that is changeable by the operator may be selected using the right mouse button and the schedule shall then be selectable on the screen. Selection of the schedule using this method shall allow the viewing of the assigned schedule allow the point to be scheduled.
9. Schedule editor shall support drag-n-drop events and holidays onto the schedule calendar.
10. Schedule editor shall support drag-n-drop events default to a two-hour period, which can then be adjusted by the user.
11. Schedule editor shall support drag-n-drop holidays default for OFF all day and can be edited for multiple-day holidays.
12. Schedule editor shall support the view of affected zones when adding or editing timed events of a schedule.
13. The web client shall have the ability to search a list of all scheduled points and zones to access the schedule calendar.
14. Schedule time blocks shall present schedule detail via mouse-over information.

F. Alarm Indication and Handling
1. AWS shall provide visual, printed, and email means of alarm indication. Printout of alarms shall be sent to the assigned terminal and port. Alarm notification can be filtered based on the User ID's authorization level.
2. Web client shall display a persistent alarm state for the system regardless of the data view including points in alarm but not acknowledged, and points that have gone into alarm and returned to normal without being acknowledged.
3. Alarm History shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the AWS. Each entry shall include a description of the event-initiating object generating the alarm. Description shall be an alarm message of at least 256 characters in length. Entry shall include time and date of alarm occurrence, time and date of object state return to normal, time and date of alarm acknowledgment, and identification of operator acknowledging alarm.
4. Alarm messages shall be in user-definable text (English or other specified language) and shall be delivered either to the operator's terminal, client or through remote communication using email (Authenticated SMTP supported).
5. AWS, Thick Client, and Web Client shall allow for set up of alarms. UI shall walk user through all steps necessary for alarm generation. Alarm creation may be started by right-clicking on value displayed on graphic and then selecting Alarm setup.
6. Web client shall support color-coded indication of current alarms as follows:
    a. Red indicator shows number of active alarms that have not been acknowledged.
    b. Yellow indicator shows number of alarms that are still active but have been acknowledged.

c. Blue indicator shows number of alarms that have returned to normal but have not been acknowledged.
d. Color-coded indicators, when selected by the user, navigate to a pre-filtered view of alarm history.
e. Alarm history can be filtered by color-coded indicator states.

7. Alarm annunciation includes navigation link to a user-selected display or URL.
8. Any displayed data that is changeable by the operator may be selected using the right mouse button and the alarm shall then be selectable on the screen. Selection of the alarm using this method shall allow the viewing of the alarm history or allow the creation of a new alarm.

G. Trendlog Information

1. AWS shall periodically gather historically recorded data stored in the building controllers and store the information in the system database. Stored records shall be appended with new sample data, allowing records to be accumulated. Systems that write over stored records shall not be allowed unless limited file size is specified. System database shall be capable of storing up to 50 million records before needing to archive data. Samples may be viewed at the web client. All trendlog records shall be displayed in standard engineering units.
2. AWS shall be capable of trending on an interval determined by a polling rate, or change-of-value.
3. AWS, Thick client, or Web Client shall be able to add and edit trendlogs and the setup information. This includes the information to be logged as well as the interval at which it is to be logged. All operations shall be password protected. Viewing may be accessed directly from any and all graphics on which a trended object is displayed.
4. AWS and Thick Client shall include a Trendlog Wizard for setup of multiple trend logs simultaneously. Wizard shall walk user through all necessary steps. Wizard shall have its own pull-down selection for startup, or may be started by right-clicking on value displayed on graphic, and then selecting Trendlogs from the displayed menu.
5. AWS shall operate on one virtualized server while the Microsoft SQL runs on a separate virtualized server for the system database. Provide all licensing necessary Microsoft SQL.
6. Any displayed data that is changeable by the operator may be selected using the right mouse button and the trendlog shall then be selectable from a menu on the screen. Selection of the trendlog using this method shall allow the viewing of the trendlog data in the DataViewer.
7. DataViewer shall provide:
   a. Software that is capable of graphing the trend-logged object data shall be included.
   b. Access and ability to create, edit and view are restricted to users by user account credentials
   c. Specific and repeatable URL defines the trendlog(s) views for browser bookmarking and email compatibility.
   d. Call out of trendlog value at intersection of trend line and mouse-over vertical axis.
   e. Trendlog or Energy log and companion logs can be configured to display on one of two independent vertical scales embedded in the display.

f. Click zoom for control of data set viewed along either graph axis.
g. User-specifiable start and end dates as well as a fast scroll features that supports click zoom of macro scale view of the data for quickly finding data set based on visual signature.
h. User export of the viewed data set to MS Excel.
i. Web browser-based help.
j. Optional min/max ranges (Upper Control Limits, Lower Control Limits) for each value.

H. Energy Log Information
1. AWS shall be capable of periodically gathering energy log data stored in the field equipment and archive the information. Archive files shall be appended with new data, allowing data to be accumulated. Systems that write over archived data shall not be allowed unless limited file size is specified. Display all energy log information in standard engineering units.
2. All data shall be stored in database file format for direct use by third-party programs. Operation of system shall stay completely online during all graphing operations.
3. AWS operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. System shall support using flow and temperature sensors for BTU monitoring.
4. AWS shall display data in tabular format form for both consumption and peak values. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.
5. Web client shall display data in tabular format and graphical format. Data shall be shown in hourly, daily, weekly, monthly and yearly formats. In each format, the user shall be able to select a specific period of data to view.

I. Demand Limiting
1. AWS shall include demand limiting program that includes two types of load shedding. One type of load shedding shall shed/restore equipment in binary fashion based on energy usage when compared to shed and restore settings. The other type of shedding shall adjust operator-selected control setpoints in an analog fashion based on energy usage when compared to shed and restore settings. Shedding may be implemented independently on each and every zone or piece of equipment connected to system.
2. Binary shedding shall include minimum of five (5) priority levels of equipment shedding. All loads in a given priority level shall be shed before any loads in a higher priority level are shed. Load shedding within a given priority level shall include two methods. In one, the loads shall be shed/restored in a “first off-first on” mode, and in the other the loads are just shed/restored in a “first off-last on” (linear) fashion.
3. Analog shed program shall generate a ramp that is independently used by each individual zone or individual control algorithm to raise the appropriate cooling setting and lower appropriate heating setting to reduce energy usage.
4. AWS shall be able to display the status of each and every load shed program. Status of each load assigned to an individual shed program shall be displayed along with English description of each load.

J. Tenant Activity

1. AWS shall include program that monitors after-hours overrides by tenants, logs that data, and generates a bill based on usage and rate charged for each tenant space. Tenant Activity program shall be able to assign multiple zones, from a list of every zone connected to system, to a particular tenant. Every zone is monitored for after-hours override usage and that data logged in AWS. Operator may then generate a bill based on the usage for each tenant and the rate charged for any overtime use.
2. Configuration shall include entry of the following information for use in logging and billing:
    a. Tenant's contact name and address
    b. One or multiple tenant zones that make up a total tenant space, including a separate billing rate for each separate zone
    c. Minimum and maximum values an event duration and event limit
    d. Property management information
    e. Overall billing rate
    f. Seasonal adjustments or surcharge to billing rate
    g. Billing notification type including, but not limited to printer, file and email
    h. Billing form template
3. Logging shall include recording the following information for each and every tenant event:
    a. Zone description
    b. Time the event begins
    c. Total override time
    d. Limits shall be applied to override time
4. A tenant bill shall be generated for a specific period using all the entered configuration data and the logged data. User with appropriate security level shall be able to view and override billing information. User shall be able to select a billing period to view and be able to delete events from billing and edit a selected tenant activity event's override time.

K. Reports

1. AWS shall be capable of periodically producing reports of trendlogs, alarm history, tenant activities, device summary, energy logs, and override points. The frequency, content, and delivery are to be user adjustable.
2. All reports shall be capable of being delivered in multiple formats including text- and comma-separated value (CSV) files. The files can be printed, emailed, or saved to a folder, either on the server hard drive or on any network drive location.

L. Configuration/Setup

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, modem port and speed, etc. Items shall be modified using understandable terminology with simple mouse/cursor key movements.
2. The building management system (BMS) shall operate the user interface in any region and support varying languages and locale settings, without the addition of special software. Localization tools shall be commonly available open sourced or

purchased products, No BMS manufacturer specific software will be acceptable. The following localization capabilities shall be supported:

a. Locale settings related to date, time and number formats
b. Multiple left-to-right languages supported including Cyrillic languages
c. On the fly locale change using browser language settings (multiple language and locale setting change)
d. Default character encoding shall be UTF-8
e. Each localized BMS element can be localized independently and operate autonomously

M. Field Engineering Tools

1. AWS shall include field engineering tools for programming all controllers supplied. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from other types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.
2. User shall be able to select a graphical function block from menu and place on screen. Provide zoom in and zoom out capabilities. Function blocks shall be downloaded to controller without any reentry of data.
3. Programming tools shall include a real-time operation mode. Function blocks shall display real-time data and be animated to show status of data inputs and outputs when in real-time operation. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.
4. Field engineering tools shall also include a database manager of applications that include logic files for controllers and associated graphics. Operator shall be able to select unit type, input/output configuration and other items that define unit to be controlled. Supply minimum of 250 applications as part of workstation software.
5. Field engineering tool shall include Device Manager for detection of devices connected anywhere on the BACnet network by scanning the entire network. This function shall display device instance, network identification, model number, and description of connected devices. It shall record and display software file loaded into each controller. A copy of each file shall be stored on the computer's hard drive. If needed, this file shall be downloaded to the appropriate controller using the mouse.
6. AWS shall automatically notify the user when a device that is not in the database is added to the network.
7. AWS shall include backup/restore function that will back up entire system to selected medium and then restore system from that medium. The system shall be capable of creating a backup for the purpose of instantiating a new client PC.
8. The system shall provide a means to scan, detect, interrogate, and edit third-party BACnet devices and BACnet objects within those devices.

N. Workstation Hardware

1. Owner shall provide virtualized server and Owner shall assist in installing software on the server. EMCS Contractor Laptop Computer.

O. Software

1. At the conclusion of the project, contractor shall leave with owner a electronic copy that includes the complete software operation system and project graphics, set-points, system parameters, etc. This backup shall allow the owner to completely restore the system in the case of a computer malfunction.

P. Web Client

1. EMCS supplier shall provide an HTML5-based browser access to the AWS as part of standard installation. User must be able to access all displays of real-time data that are part of the AWS using a standard web browser. Web browser shall tie into the network through owner-supplied Ethernet network connection. The web client shall support a minimum of 200 users with a single license.
2. Browser shall be standard version of Microsoft Internet Explorer v10.0 or later, Firefox v19.0 or later, Chrome v24.0 or later, and Safari v7.1.1 or later. No special vendor-supplied software shall be needed on computers running browser. Data shall be displayed in real-time and update automatically without user interaction.
3. Web pages shall be automatically generated using HTML5 from the data display files that reside on the AWS. Any system that requires use of an HTML editor for generation of web pages shall not be considered.
4. Access through web client or thick client shall utilize the same hierarchical security scheme as the AWS. User shall be asked to log on once the client makes connection to the AWS. Once the user logs on, any and all changes that are made shall be tracked by the AWS. The user shall be able to change only those items he or she has authority to change. A user activity report shall show any and all activity of the users who have logged on to the system, regardless of whether those changes were made using a web client, thick client or through the AWS.
5. Shall provide User Session Management including the ability to view all connected user sessions to the web client, see how long they have been active/inactive for each unique session, and force log-out for any or all sessions.
6. Shall provide menu-style navigation access to primary features, i.e. alarm history, DataViewer, Search scheduled points and Zones, System Activity, User Session Management, and Top Display
7. Web client shall, at a minimum, support the following tablets:
    a. Android platform:
        1) Google Nexus
        2) Samsung Galaxy Note
    B. Apple platform
        1) Ipad
        2) Apple Ipad Mini

2.4 OPERATOR INTERFACE

A. Operator Interface. Utilize the existing PC-based workstation as shown on the system drawings. This workstation shall be able to access all information in the system. One common BACnet database shall reside within this system. Multiple BACnet databases are not acceptable.

B. Hardware. Each operator workstation and custom programming workstation shall consist of the following:

1. BACnet Services. The workstation shall use the Read (Initiate) and Write (Execute) Services as defined in clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135-95, to communicate with BACnet objects in the internet work.
2. BACnet Functional Groups. The Operator Workstation shall support the following BACnet functional groups: Clock, Event Initiation, Event Response, COV Event Response, Files, Reinitialize, Device Communication, Time Master and Router.
3. The Operator Workstation shall have the capability to create, delete and support the following BACnet Objects:
    a. ANALOG INPUT, ANALOG OUTPUT AND ANALOG VALUE
    b. BINARY INPUT, BINARY OUTPUT AND BINARY VALUE
    c. CALENDAR
    d. DEVICE
    e. EVENT ENROLMENT
    f. FILE
    g. NOTIFICATION CLASS
    h. PROGRAMS
    i. SCHEDULE
    j. TREND LOG
    k. ALARM LOG

C. System Software
1. Operating System. Furnish a concurrent multi tasking operating system. The operating system also shall support the use of other common software applications that operate under Microsoft Windows. Acceptable operating systems are Windows 2000, Windows XP and Windows NT only.
2. System Graphics. The operator workstation software shall be a graphical user interface (GUI). The system shall allow display of up to 10 dynamic and animated graphic screens at once for comparison and monitoring of system status. The system graphics shall be able to be modified while on-line.
3. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package. The graphics generation package also shall provide the capability of capturing or converting graphics from other programs such as Visio or AutoCad
4. Graphics Library. Furnish a complete library of standard HVAC equipment graphics. The library shall be furnished in a file format compatible with the graphics generation package program.
5. The time clocks in all controllers shall be automatically synchronized daily. An operator change to the time clock in any controller shall be automatically broadcast to all controllers on the network.

2.5 CONTROLLER SOFTWARE

A. Furnish the following applications software for building and energy management. All software applications shall reside and operate in the system controllers. Editing of applications shall occur at the operator workstation to insure standalone control.

B. System Security. Recorded user access shall be secured using individual security passwords and user names.

C. Scheduling. Provide schedules to each object or group of objects in the system.

D. Alarm Reporting. Alarms shall be routed to the appropriate workstations based on time and other conditions.

E. Remote Communication. The system shall have the ability to dial out in the event of an alarm using BACnet Point-To-Point at a minimum of 56K baud.

F. Maintenance Management. Provide maintenance messages based upon user-designated run-time, starts, and/or calendar date limits.

G. Sequencing. Provide application software to properly sequence the start and stop of chillers, boilers, and pumps to minimize energy usage in the facility.

H. PID Control. A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-windup shall be supplied. The controlled variable, setpoint, and PID gains shall be user-selectable.

I. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage.

J. Energy Calculations. Provide software to allow instantaneous power (e.g., kW) or flow rates (e.g., L/s [GPM]) to be accumulated and converted to energy usage data.

K. Anti-Short Cycling. All binary output objects shall be protected from short cycling.

L. On/Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and setpoint with adjustable differential.

M. Run-time Totalization. Provide software to totalize run-times for all binary input objects. A high run-time alarm shall be assigned, if required, by the operator.

2.6 BUILDING CONTROLLERS

A. General Requirements
   1. BACnet Conformance
      a. Building Controller shall be approved by the BTL as meeting the BACnet Building Controller requirements.
      b. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
   2. Building controller shall be of scalable design such that the number of trunks and protocols may be selected to fit the specific requirements of a given project.
   3. The controller shall be capable of panel-mounted on DIN rail and/or mounting screws.

4. The controller shall be capable of providing global control strategies for the system based on information from any objects in the system, regardless if the object is directly monitored by the building controller module or by another controller.
5. The controller shall be capable of running up to six (6) independent control strategies simultaneously. The modification of one control strategy does not interrupt the function or runtime others.
6. The software program implementing the DDC strategies shall be completely flexible and user-definable. All software tools necessary for programming shall be provided as part of project software. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site, using a wide area network (WAN) or downloaded through remote communications are not acceptable. Changing global strategies using firmware changes is also unacceptable.
7. Programming shall be object-oriented using control function blocks and support DDC functions. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be supplied and be resident on workstation. The same tool shall be used for all controllers.
8. The programming tool shall provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed using the operator's workstation or field computer.
9. Controller shall have 6,000 Analog Values and 6,000 Binary Values.
10. Controller IP configuration can be done via a direct USB connect with an operator's workstation or field computer.
11. Controller shall have at a minimum a Quad Core 996Ghz processor to ensure fast processing speeds.
12. Global control algorithms and automated control functions shall execute using a 64-bit processor.
13. Controller shall have a minimum of 1 GB of DDR3 SDRAM on a 533Mhz bus to ensure high speed data recording, large data storage capacity and reliability.
14. Controller shall support two (2) on-board EIA-485 ports capable of supporting various EIA-485 protocols including, but not limited to BACnet MS/TP and Modbus.
    a. Ports are capable of supporting various EIA-485 protocols including, but not limited to BACnet MS/TP and Modbus.
15. Controller shall support two (2) ports—each of gigabit speed—Ethernet (10/100/1000) ports.
    a. Ports are capable of supporting various Ethernet protocols including, but not limited to BACnet IP, FOX, and Modbus.
16. All ports shall be capable of having protocol(s) assigned to utilize the port's physical connection.
17. The controller shall have at a minimum four (4) onboard inputs, two (2) universal inputs and two (2) binary inputs.
18. Schedules
    a. Building controller modules shall provide normal seven-day scheduling, holiday scheduling and event scheduling.
    b. Each building controller shall support a minimum of 380 BACnet Schedule Objects and 380 BACnet Calendar Objects.
19. Logging Capabilities

a. Each building controller shall log as minimum 2,000 objects at 15-minute intervals. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
b. Logs may be viewed both on-site or off-site using WAN or remote communication.
c. Building controller shall periodically upload trended data to networked operator's workstation for longterm archiving if desired.
d. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

20. Alarm Generation
a. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
b. Each alarm may be dialed out as noted elsewhere.
c. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
d. Controller must be able to handle up to 2,000 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

21. Demand Limiting
a. Demand limiting of energy shall be a built-in, user-configurable function. Each controller module shall support shedding of up to 1,200 loads using a minimum of two types of shed programs.
b. Load shedding programs in building controller modules shall operate as defined in section 2.1.J of this specification.

22. Tenant Activity Logging
a. Tenant Activity logging shall be supported by a building controller module. Each independent module shall support a minimum of 380 zones.
b. Tenant Activity logging shall function as defined in section 2.1.K of this specification.

B. BACnet MS/TP
1. BACnet MS/TP LAN must be software-configurable from 9.6 to 115.4Kbps
a. Each BACnet MS/TP LAN shall support 64 BACnet devices at a minimum.
b. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. BACnet IP
1. The building controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the local area network (LAN).
2. Must support interoperability on WANs and campus area networks (CANs), and function as a BACnet Broadcast Management Device (BBMD).
3. Each controller shall support at a minimum 128 BBMD entries.
4. BBMD management architecture shall support 3,000 subnets at a minimum.
5. Shall support BACnet Network Address Translation.

6. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

D. Expansion Ports
   1. Controller shall support two (2) expansion ports.
      a. Combining the two on-board EIA-458 ports with fully loaded expansion ports, the controller shall support six (6) EIA-485 trunks simultaneously.
   2. Expansion cards that mate to the expansion ports shall include:
      a. Dual port EIA-485 card.
      b. LON network card.

E. Niagara Framework
   1. Controller shall utilize the Tridium Niagara Framework.
      a. Niagara Framework shall be version 3.8 or newer.
      b. All Niagara licensing shall be stored on a removable MicroSD card for fast in-field replacement of controller.
   2. The Niagara License for the controllers shall be an open license.
      a. The controller shall be programmable via Niagara Workplace programming tool.
      b. The controller shall be programmable via an Niagara embedded Workplace programming tool.

F. Power Supply
   1. Input for power shall accept between 17 and 30VAC, 47 and 63Hz.
   2. Optional rechargeable battery for shutdown of controller including storage of all data in flash memory.
   3. On-board capacitor will ensure continuous operation of real-time clocks for minimum of 14 days.

G. Controller shall be in compliance with the following:
   1. UL 916 for open energy management
   2. FCC Class B
   3. ROHS
   4. IEC 60703
   5. C-Tick Listed

H. Controller shall operate in the following environmental conditions:
   1. -4 to 149 °F (-20 to 65 °C) without optional battery, or 32 to 122 °F (0 to 50 °C) with optional battery.
   2. 0 to 95% relative humidity (RH), non-condensing.

I. Each site will have a Building Controller to support direct Ethernet or MS/TP to local workstation. The communications card shall be connected to the Building Controller by a bus connection. The Building Controller shall be connected to the BACnet network using the ISO 8802-3 (Ethernet) Data Link/ MS/TP Physical layer protocol. Building controllers that do not support direct connection to the BACnet network must provide as part of this project a BACnet gateway bridge to communicate to future BACnet systems.

J. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.
   1. Controllers used outdoors and inside rooftop equipment and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at 0°C to 40°C [32°F to 100°F] and 10 to 90% RH.
   2. Controllers used in conditioned space shall be mounted in dust proof enclosures, and shall be rated for operation at 0°C to 50°C [32°F to 120°F].

K. Building Controllers shall be fully peer-to-peer and support up to a minimum of 99 application specific controllers. Building controllers shall have a real time clock built into the controller.

L. Power loss and noise. Controller shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m [3 ft] and shall shut below 80 % nominal voltage.

M. Inputs/Outputs.
   1. Inputs. Controller input/output board shall support dry contact, 0-5 VDC and 0-10 VDC- voltage, 4-20 mA- current and thermistor-resistive signal types on an individual basis for connecting any status or sensing device. Analog resolution shall be 10-bit A to D.
   2. Outputs. Controller input/output board shall support plug-and-play I/O modules or built in HOA modules configured with manual-auto-off override switch, potentiometer and input channel for feedback status or and unrelated analog or digital input. Output supported shall be 0-10 VDC. All HOA's shall be supervised.
   3. Building Controller shall have the capability to create, delete and support the following BACnet Objects:
      a. ANALOG INPUT, ANALOG OUTPUT AND ANALOG VALUE
      b. BINARY INPUT, BINARY OUTPUT AND BINARY VALUE
      c. CALENDAR
      d. DEVICE
      e. EVENT ENROLMENT
      f. FILE
      g. LOOP (PID)
      h. NOTIFICATION CLASS
      i. PROGRAM
      j. SCHEDULE
      k. TREND LOG

2.7 APPLICATION SPECIFIC CONTROLLERS

A. General. Application Specific Controllers (ASCs) are microprocessor-based DDC controllers which through hardware or firmware design are able to control a wide variety of equipment. They are fully user-programmable, and are not restricted to any one type of equipment. Application Specific Controllers shall communicate with other BACnet objects on the internet work using the Read (Execute) Property service as defined in Clause 15.5 of ASHRAE Standard 135-95.
   1. Each ASC shall contain sufficient I/O capacity to control the target system, fully peer to peer, and shall continue to provide control functions without being connected to the network
   2. Both firmware and controller database shall be loadable over the network

3. One ASC shall be used for each piece of equipment. A single ASC supporting multiple units is unacceptable.

B. Communication
1. The controller shall reside on a BACnet network using the MS/TP Data Link/ Physical layer protocol.
2. Each controller shall have a BACnet Data Link/ Physical layer compatible connection for a laptop computer or a portable operator's tool. This connection shall be extended to a space temperature sensor port where shown and allow access to the entire network.
3. Each controller shall have a secondary sub-network for communicating sensors or I/O expansion modules

C. Environment. The hardware shall be suitable for the anticipated ambient conditions.
1. Controllers used outdoors in rooftop equipment and/or in wet ambient conditions shall be mounted within waterproof enclosures, and shall be rated for operation at 40°F to 150°F and/or suitably installed in a heated or fan cooled enclosure
2. Controllers used in conditioned space shall be mounted in dust proof enclosures, and shall be rated for operation at 32°F to 120°F.

D. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field-removable, modular terminal strips.

E. Memory. The Application Specific Controller shall use non-volatile memory and maintain all BIOS and programming information in the event of a power loss.

F. Immunity to power and noise. ASC shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m [3 ft].

G. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

H. Input/Output. ASC shall support as a minimum, directly connected, a combination of analog outputs and binary outputs and universal software selectable analog or digital inputs. ASC inputs shall support 0-5 VDC-voltage, 4-20mA-current, thermistor-resistance and dry contacts. ASC outputs shall support 0-10 VDC-voltage, digital triac rated at 0.5 amps at 24 VAC

2.8 CENTRAL PLANT AND AIR HANDLER APPLICATION CONTROLLERS

A. Provide one or more native BACnet application controllers for each air handler and provide native BACnet application controllers as needed for central plant control that adequately cover all objects listed in object list. All controllers shall interface to building controller through either MS/TP LAN using BACnet protocol, or Ethernet LAN using BACnet over Ethernet or BACnet TCP/IP. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable using graphical programming blocks. Programming tool

shall be resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

B. BACnet Conformance
   1. Application controllers shall be approved by the BTL as meeting the BACnet Advanced Application Controller requirements.
   2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.
   3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Multi-state Values, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 12-bit resolution that accept 3K and 10K thermistors, 0– 10VDC, Platinum 1000 ohm RTD, 0–5VDC, 4–20mA and dry contact signals. Any input on a controller may be either analog or digital with a minimum of three inputs that accept pulses. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs with 12-bit resolution shall support either 0–10VDC or 0–20mA. Binary outputs shall have LED indication of status. Software shall include scaling features for analog outputs. Application controller shall include 20VDC voltage supply for use as power supply to external sensors.
   1. All outputs must have onboard Hand-Off-Auto (HOA) switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.
   2. The position of each and every HOA switch shall be available system wide as a BACnet object property.

D. All program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller up to 20 times per second (minimum of 10 times per second) and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal.
   1. The following control blocks shall be supported:
      a. Natural Log
      b. Exponential
      c. Log base 10
      d. X to the power of Y
      e. Nth square root of X
      f. 5th Order Polynomial Equations
      g. Astronomical Clock (sunrise/sunset calculation)
      h. Time based schedules

E. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely using modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in operator's terminal section.

F. Application controller shall include support for intelligent room sensor (see Section 2.10.B.) Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode, based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

G. Schedules
   1. The controller shall support a minimum of 3 BACnet Schedule Objects and have a real time clock on board with battery backup to maintain time through a power loss.

H. Logging Capabilities
   1. Controller shall support a minimum of 50 trendlogs. Any object in the controller (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
   2. Controller shall periodically upload trended data to system server for long-term archiving if desired. Archived data stored in (MS Jet Database or SQL) database form and shall be available for use in third-party spreadsheet or database programs.

I. Alarm Generation

2.9 EXPANDABLE PLANT APPLICATION CONTROLLERS

A. General
   1. Expandable application controller shall be capable of providing control strategies for the system based on information from any or all connected inputs. The program that implements these strategies shall be completely flexible and user-definable. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site though simple download are not acceptable. Changing global strategies using firmware changes is also unacceptable. Program execution of controller shall be a minimum of once per second.
   2. Programming shall be object-oriented using control program blocks. Controller shall support a minimum of 500 Analog Values and 500 Binary Values. Each and every analog and binary value shall support standard BACnet priority arrays. Programming tool shall be provided with system and shall be the same tool that is used to program the building controller. All flowcharts shall be generated and automatically downloaded to controller. No re-entry of database information shall be necessary.
   3. Provide means to graphically view inputs and outputs on each program block in real-time as program is executing. This function may be performed using the operator's terminal or field computer.

4. Controller shall have adequate data storage to ensure high performance and data reliability. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1.5 years (cumulative). Battery shall be a field-replaceable (non-rechargeable) lithium type. Unused battery life shall be 10 years.
5. The onboard, battery-backed real-time clock must support schedule operations and trendlogs.
6. Global control algorithms and automated control functions should execute using 32-bit processor.
7. Controller shall include both onboard 10Base-T/100Base-TX Ethernet BACnet communication over UTP and shall include BACnet IP communication. In addition, controller shall include BACnet Point-to-Point (PTP) connection port.
8. The base unit of the controller shall host up to 8 expansion modules with various I/O combinations. These inputs and outputs shall include universal 12-bit inputs, binary triac outputs, and 8-bit switch-selectable analog outputs (0–10V or 0–20mA). Inputs shall support 3K and 10K thermistors, 0–5VDC, 0–10VDC, 4–20mA, dry contacts and pulse inputs directly.
9. All outputs must have onboard Hand-Off-Auto (HOA) switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.
10. The position of each and every HOA switch shall be available system wide as a BACnet object. Expandable central plant controller shall provide up to 176 discreet inputs/outputs per base unit.

B. BACnet Conformance
1. Central plant/AHU controller shall, as a minimum, support PTP, MS/TP and Ethernet BACnet LAN types. It shall communicate directly through these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Controllers shall be approved by the BTL as meeting the BACnet Advanced Application Controller requirements.
2. Please refer to Section 22.2, BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All necessary tools shall be supplied for working with proprietary information.
3. Standard BACnet object types supported shall include, as a minimum, Analog Input, Binary Input, Analog Output, Binary Output, Analog Value, Binary Value, Device, File, Group, Event Enrollment, Notification Class, Program, and Schedule object types. All necessary tools shall be supplied for working with proprietary information.
4. The Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on WANs and CANs, and function as a BBMD.
5. The Controller shall be capable of utilizing 10BASE-T1L protocol for 2-wire ethernet for LAN architecture.

C. Schedules
1. Each central plant/AHU controller shall support a minimum of 50 BACnet Schedule Objects.

D. Logging Capabilities
1. Each controller shall support a minimum of 200 trendlogs. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.
2. Controller shall periodically upload trended data to system server for long-term archiving if desired.
3. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

E. Alarm Generation
1. Alarms may be generated within the system for any object change of value or state (either real or calculated). This includes things such as analog object value changes, binary object state changes, and various controller communication failures.
2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site using remote communications.
3. Controller must be able to handle up to 200 alarm setups stored as BACnet event enrollment objects, with system destination and actions individually configurable.

2.10 AUXILIARY CONTROL DEVICES

A. Temperature sensors.
1. Temperature sensors shall be thermistors.
2. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 1.5 m [5 feet] in length.
3. Immersion sensors shall be provided with a separable brass well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
4. Space sensors for unitary equipment shall be equipped with the following:
   a. Programmable buttons for setpoint adjustment and override
   b. Setpoint display
   c. Communication port connected to entire network
5. Provide matched temperature sensors for differential temperature measurement.

B. Humidity sensors.
1. Duct and room sensors shall have a sensing range of 20% to 80%.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of -40°F to 170°F.
4. Humidity sensor's drift shall not exceed 3% of full scale per year.

C. Flow switches.
1. Flow-proving switches shall be either paddle or differential pressure type, as shown.

2. Paddle type switches (water service only) shall be UL Listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 enclosure unless otherwise specified.
3. Differential pressure type switches (air or water service) shall be UL Listed, SPDT snap acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application, or as specified.

D. Relays.
1. Control relays shall be UL Listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application
2. Time delay relays shall be UL Listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable +/-200% (minimum) from setpoint shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

E. Current transmitters
1. AC current transmitters shall be self-powered combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 0 – 5vdc two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, internal zero and span adjustment, and □1% full scale accuracy at 500 ohm maximum burden
2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
3. Unit shall be split-core type for clamp-on installation.

F. Current transformers
1. AC current transformers shall be UL/CSA recognized and completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for □1% accuracy at 5 A full scale output.
3. Transformers shall be split-core type for installation on new or existing wiring,

G. Voltage transmitters
1. AC voltage transmitters shall be self-powered single loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.
2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with □1% full-scale accuracy with 500 ohm maximum burden.
3. Transmitters shall be UL/CSA recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

H. Voltage transformers.
1. AC voltage transformers shall be UL/CSA recognized, 600 VAC rated, complete with built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4 to 55°C [40 to 130°F] and shall provide □0.5% accuracy at 24 VAC and a 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic material.

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

J. Pressure transducers
   1. Transducer shall have linear output signal. Zero and span shall be field adjustable.
   2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage

K. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclo¬sure, with scale range and differential suitable for intended application, or as shown.

L. Local control panels
   1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.

M. Actuated Dampers
   1. Actuated control dampers shall be a minimum of 13 gage channel shaped, galvanized steel, low leakage dampers with nylon or oiltite bearings as scheduled on the mechanical drawings or leakage rating at shutoff shall be less than 1/2 percent of flow rate at 1500 FPM face velocity, with 5 inches wg. differential across damper
   2. Smoke dampers shall be furnished and installed under Division 15 as part of the building fire alarm system. Division 16 shall connect power wiring and interlock wiring to fire alarm system and air handling unit starter circuit. Controls contractor shall provide monitoring interlock circuit to the automation system.

N. Actuated Valves
   1. Two or three way actuated control valves shall be as follows or as indicated on the mechanical drawings.

O. Control Valves
   1. General: Provide factory-fabricated two-way or three-way valves with two position or modulating control actuators of the type, body material, and pressure class required for each application. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements. Valve pressure class and rating shall be selected based on maximum pressure and temperature in the piping system in which it is installed.
   2. Performance: All valves shall conform to the following minimum standards and selection requirements.
      a. Valves shall be guaranteed to have a Class 5 shut off rating.
      b. Maximum pressure drop at design flow shall be 5 psi or as noted on the Drawings.
      c. Provide heavy-duty actuators, with proper close-off rating for each individual application.

d. The valve assembly shall be suitable for throttling control and for tight shut-off against pump shut-off head. All valves shall be certified by an authorized officer of the manufacturer to shut-off bubble tight against full system pump shut-off head.

e. All valves which are operated in sequence with damper motors, control switches, or other valves shall sequence properly without overlap. Provide oversized operators, or balanced trim if required for proper sequence control.

f. Valve schedules submitted for review shall clearly show shift in operator span for all valves operated in sequence and shut-off capability for all valves.

3. Valve Types: Control Valves ½" to 6": The BCAS contractor shall furnish all specified motorized control valves and actuators. BCAS contractor shall furnish all control wiring to actuators. The Division 23 Contractor shall install all valves. Equal Percentage control characteristic shall be provided for all water coil control valves. Linear valve characteristic is acceptable for 3-way valves 2½ inches and above.

4. Electric damper/valve actuators.

a. All actuator shall be U.L. and CSA rated and have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.

b. All rotary spring-return actuators shall be capable of both clockwise or counter-clockwise spring-return operation. Linear actuators shall spring-return to the retracted position. Spring-return actuators with more than 7 N·m [60 in-lb] torque capacity shall have a manual crank.

c. Proportional actuators shall accept a 0 to 10 VDC or 2 to 10vdc operating range.

d. All 24 VAC/VDC actuators shall operate on Class 2 wiring. Actuators operating on 120 VAC or 230 VAC shall not require more than 11 VA.

e. All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered.

2.11 ELECTRONIC CONTROL VALVES

A. Quality Assurance for electronic control valves

1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
2. NEMA 1 rated enclosures for inside mounting
3. NEMA 4 rated enclosures for outside mounting or exposure.

B. Execution Details

1. Each DDC analog output point shall have an actuator feedback signal, independent of control signal, wired and terminated in the control panel for true position information and troubleshooting. Or the actuator feedback signal may be wired to the DDC as an analog input for true actuator position status.
2. Terminal Unit valves shall be Analog (2-10vdc, 4-20ma).
3. Booster-heat valve actuation shall be Analog (2-10vdc, 4-20ma).
4. Primary valve control shall be Analog (2-10vdc, 4-20ma).
5. Valve Sizing for Water Coil

a. On/Off Control Valves shall be line size.

b. Modulating Control Valve Body Size may be reduced at most two pipe sizes from the line size or not less than 1/2 the pipe size. The BAS contractor shall size all water coil control valves for the application as follows:
   1) Booster-heat valves shall be sized not to exceed 4-9 PSI differential pressure. (Size valve for 50% valve authority). Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
   2) Primary valves shall be sized not to exceed 5-15 PSI differential pressure. (Size valve for 50% valve authority). Valve design pressure drop is equal to the sum of coil drop plus the balance valve drop.
   3) Butterfly valves shall be sized for modulating service at 60-70 degree rotation. Design velocity shall be 12 feet per second or less when used with standard EPDM seats.

c. Valve mounting arrangements shall comply with the following:
   1) Unions shall be provided on all ports of two-way and three-way valves.
   2) Install three-way equal percentage Characterized Control valves in a mixing configuration with the "A" port piped to the coil.
   3) Install 21/2 inch and above, Three-Way globe valves, as manufactured for mixing or diverting service to the coil.

C. Manufacturers:
   1. Belimo (USA), Inc.
   2. Honeywell, Inc.

2.12 CONTROL VALVES

A. Factory fabricated of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.

C. Characterized Control Valves (CCV): Use on terminal units, VAV boxes reheat, fan coil units, blower coil units and unitary heating/cooling.
   1. NPS 3" and Smaller: Nickel-plated forged brass body rated at no less than 400 PSI, stainless steel ball and stem, female, NPT union ends with a self-aligning, blowout proof, brass stem with a dual EPDM O-ring packing design. Fiberglas reinforced seats shall be used.
   2. NPS 3/4" and Smaller: Nickel-plated forged brass body rated at no less than 600 PSI, chrome plated brass ball and stem, female, NPT union ends with a self-aligning, blowout proof, brass stem with a dual EPDM O-ring packing design. Fiberglas reinforced seats shall be used.
   3. A TEFZEL, flow characterizing disc shall be installed in the inlet of two-way valves and in the control port of three-way valves.
   4. Sizing:
      a. Two-Position: Line size.

b. Two-Way Modulating: [3 PSIG] [5 PSIG] or twice the load pressure drop, whichever is more.
c. Three-Way Modulating: Twice the load pressure drop, but not more than [3 PSIG] [5 PSIG]

D. Combination of actuator and valve shall provide a minimum close-off pressure of 100 PSI.

E. The actuator shall be directly coupled to the valve at the factory. Valve assemblies requiring an extended stem design for actuator coupling are not acceptable.

F. Valves shall have a four-bolt mounting flange to provide a 4 position, field changeable, electronic actuator mounting arrangement

G. Hydronic system globe valves shall have the following characteristics: Use on Chilled Water & Hot Water Bypass valves or modulating applications (do not use on Primary Air Handlers)
1. NPS 2 and Smaller: ANSI Class 250 bronze body, stainless steel stem, brass plug, bronze seat, and a TFE packing.
2. NPS 2-1/2 and Larger: ANSI Class 125 or 250 cast iron body, stainless steel stem, bronze plug, bronze seat, and a TFE V-ring packing.
3. Sizing:
a. Two-Position: Line size.
b. Two-Way Modulating: 3 PSIG or twice the load pressure drop, whichever is more.
c. Three-Way Modulating: Twice the load pressure drop, but not more than 5 PSIG
d. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
e. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system head pressure for two-way valves and 100 percent of the total system differential pressure for three-way valves.
f. Two- and three-way globe valves shall be used only if characterized control valves do not fit the sizing criteria or application.

2.13 BUTTERFLY VALVES

A. Use on chilled/hot water plant isolation valves, cooling tower bypass valves (do not use on modulating applications other then cooling tower bypass control)
1. NPS 2 to 12: ANSI Class 125/150 and a body pressure rating of 200 PSI with a cast iron body, stainless steel disc, EPDM seat, and an extended neck. Disc-to-stem connection shall utilize an internal spleen. External mechanical methods to achieve this mechanical connection, such as pins or screws, are not acceptable.
2. NPS 14 and Larger: ANSI Class 125/150 and a body pressure rating of 150 PSI with a cast iron body, stainless steel disc, EPDM seat, and an extended neck. Disc-to-stem connection shall utilize a dual-pin method to prevent the disc from settling onto the liner, causing distortion. The shaft shall be supported at four locations by RPTFE bushings.
3. Sizing: Size for a maximum fluid velocity of 12 feet per second (fps).

a. Two-Position: Line size.
b. Modulating: [3 PSIG] [5 PSIG] or twice the load pressure drop, whichever is more. Size for the design flow with the disc in a 60-degree-open-position.
c. Flow Characteristics: Two-way valves shall be modified equal percentage; three-way valves shall be linear.
d. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum bubble-tight close-off rating of 150 percent of total system head pressure for two-way valves and 100 percent of the total system differential pressure for three-way valves.

2.14 ELECTRONIC ACTUATORS

A. Electronic Actuators: Directly couple and mount to a stem, shaft, or ISO-style mounting pad designed for minimum 60,000 full-stroke cycles at rated torque
1. Manufacturers:
a. Belimo (USA), Inc.
b. Honeywell, Inc.
2. Valves: Size for torque required for valve close off at 150 percent of total system (head) pressure for two-way valves; and 100 percent of pressure differential across the valve or 100 percent of total system (pump) head differential pressure for three-way valves.
3. Coupling: V-bolt and V-shaped, toothed cradle. Single point, bolt or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.
4. Mounting: Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required. Dual mounted actuators using additional anti-rotation strap mechanical linkages, or special factory wiring to function are not acceptable. Actuators in a tandem pair must be 'off the shelf' standard actuators.
5. Overload Protection: Electronic overload or digital rotation-sensing circuitry. End switches to deactivate the actuator at the end of rotation or magnetic clutches are not acceptable.
6. Fail-Safe Operation: Mechanical, spring-return mechanism. Actuators using internal chemical storage systems, capacitors, or other internal non-mechanical forms of fail-safe operation are unacceptable.
7. Power Requirements (Two-Position Spring Return): 24/120/230 V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Actuators shall be fully programmable. Control input, position feedback and running time shall be factory or field programmable by use of a handheld programming device or external computer software Diagnostic feedback shall provide indications of hunting or oscillation, mechanical overload and mechanical travel. Programming shall be through an EEPROM. Programming using actuator mounted switches are not acceptable.
10. Temperature Rating: Minus 22 to plus 122 deg F.
11. Noise Level: Non-spring return actuators shall conform to a maximum noise rating of 45dB(A). Spring return actuators shall not produce more than 62 dB(A).
12. The manufacturer shall warrant all components for a period of 5 years from the date of production, with the first two years unconditional.

2.15 ENCLOSURES

A. All controllers, power supplies and relays shall be mounted in enclosures.

B. Enclosures may be NEMA 1 when located in a clean, dry, indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment.

C. Enclosures shall have chrome plated hinges and hardware, powder coat painted white and labeled per the engineered drawings.

D. Provide laminated plastic nameplates for all enclosures in any mechanical room or electrical room. Include location and unit served on nameplate. Laminated plastic shall be 1/8" thick sized appropriately to make label easy to read.

E. All exterior panels shall have a NEMA 4X Stainless Steel Panel, no exceptions.
   1. Manufacturers:
      a. EMF Company
      b. Hoffman Company

2.16 REFRIGERANT LEAK DETECTOR

A. The refrigerant leak detector shall be a standalone device and shall provide a SPDT output to directly energize the refrigeration room exhaust ventilation fans. The detector shall include a sensor or sensors connected to a control panel. Two relay contacts at the control panel shall provide trouble and alarm indication to the Facility Management System. The alarm relay contact shall also directly energize the exhaust fans.

B. The refrigerant leak detector shall sense the type of refrigerant used in the specified chillers.

PART 3 EXECUTION

3.1 COORDINATION

A. Test and Balance
   1. The Contractor shall furnish all tools necessary to interface to the control system for test and balance purposes.
   2. The tools used during the test and balance process will be returned at the completion of the testing and balancing.

B. Life Safety
   1. Duct smoke detectors required for unit shutdown are supplied and installed under Division 26. The Division 26 Contractor shall interlock smoke detectors to unit starters for shutdown.
   2. Smoke dampers and actuators required for duct smoke isolation are provided under another Division 23 Section.
   3. Fire/smoke dampers and actuators required for fire rated walls are provided under another Division 23 Section. Control and power of these dampers shall be by Division 26.

C. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the Contractor as follows:

1. The Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this Section and those provided under other sections or divisions of this specification.

D. All work shall be performed at times acceptable to the Engineer/Construction Manager. Provide work schedule at the start of the job for the approval of the Engineer / Construction Manager. Schedule shall show when all staff and sub-contractors shall be on-site.

E. Organize all sub-contractors and ensure that they maintain the schedule.

F. Full cooperation shall be shown with other sub-contractors to facilitate installations and to avoid delays in carrying out the work.

G. Where, in the judgment of the Engineer/Construction Manager, the work could disrupt the normal operations in or around the building, contractor shall schedule work to eliminate or minimize interference.

H. Notify Engineer/Construction Manager of any changes to the schedule. Send any schedule changes and weekly progress reports via e-mail to Engineer/Construction Manager.

I. When connecting to the existing systems, advise the Engineer/Construction Manager and obtain permission to so. Perform work at a time acceptable to the Engineer/Construction Manager and Owner.

3.2 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.

B. Notify the owners' representative in writing of equipment that differs from the specified equipment or if conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved.

3.3 INSTALLATION (GENERAL)

A. Install in accordance with manufacturer's instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.4 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 3'-0" clear access space in front of units. Obtain approval on locations from owner's representative prior to installation.

B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections—sized to suit pipe diameter without restricting flow.

E. Room Temperature Sensor types, such as Stainless Steel Wall Plates with Push Button, VLDs, Microset II, Microset IV, or Micro-Touch Sensors shall be at the discretion of the owner, coordinate with the owner prior to installation.

F. Provide Stainless Steel Wall Plate Sensors with an integral over ride button shall be used in all high occupancy areas including gyms, dining rooms, hallways, etc.

G. On larger Automated Control Valves without an integral over-ride device, provide a 4x4 galvanized junction box rigidly connected directly to the valve actuator with a switch to disconnect power from the actuator allowing for ease of end user over-ride.

3.5 INTERLOCKING AND CONTROL WIRING

A. Furnish and install all wire, conduit, raceways and cable systems required for the complete operation of the Building Management and Control System as outlined in this section. All wiring shall be installed neatly and professionally with this section and in accordance with Division 26 and all National, state and local electrical codes.

B. Provide the completed graphics package prior to Testing and Commissioning the Controls. The EMCS Contractor shall perform a point to point check out and commissioning with the Owner or Owner's Controls Mechanic. The point to point shall begin with disconnecting and verifying every device point, graphic input and control function.

C. All wiring for the Building Management and Control System is specified in this section and includes, but is not limited to;
   1. Wiring of Control instruments
   2. Wiring of Control Panels
   3. Wiring of related power supplies, i.e. transformers.

D. Temperature control wiring shall be jacketed cables installed with or without conduit as specified below or single conductors installed in conduit. Control wiring shall have minimum 300V insulation for low voltage wiring and 600V insulation for line voltage wiring. Provide shielded low capacitance wire for all communications trunks.

E. Line and low voltage control wiring shall not be installed in the same raceway, magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the owner's representative prior to rough-in.

F. All line voltage control wiring, and low voltage control wiring in the mechanical, electrical, telephone and boiler rooms shall be installed in raceways or conduit. Sensor wiring to wall sensor to be installed in raceway to the top of the wall cavity with a 90 degree bend for stress relief. All other wiring to be installed neatly and inconspicuously per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum rated cable (without conduit), provided that the wiring run without conduit is properly supported from the building structure on maximum 5' centers and does not depend upon the ceiling grid or the ceiling support system for support. In other words, do not lay the plenum cable on top of the ceiling grid or tile system. Wires shall be tie wrapped on 5' centers and identified at each termination point. All control wiring, either in conduit or plenum cable shall be installed parallel or perpendicular to building lines. Flexible conduits shall be restricted to lengths no longer than six (6) feet with all transitions to flexible conduit made with a junction box.

G. All control wiring exposed to the weather shall be installed in rigid galvanized schedule 40 conduit. Above ground control wiring shall be installed in rigid galvanized conduit. Below ground wiring shall be installed in schedule 40 PVC conduit.

H. All jacketed cables shall be plenum rated in conduit or in plenum areas.

I. All wiring associated with the Building Management and Control System shall have a unique insulation color and specifically labeled by application. All other wiring shall comply with Division 26 insulation identifiers.
   1. Yellow Jacket with "device' printed every 12 inches on center – 18 AWG 2 Conductors, stranded bare copper.
   2. Yellow Jacket with "device" printed every 12 inches on center – 18 AWG 3 Conductors, stranded bare copper.
   3. Raspberry Jacket with "MSTP" printed every 12 inches on center – 22 AWG shielded 2 conductors, stranded bare copper.

J. Panel Wiring:
   1. All wiring in panel cans shall be run inside of plastic raceways (Panduit) with covers. (Plastic double sided sticky back's are NOT allowed)
   2. All wires terminated to a panel device shall have a Dura-Label Brand Label (Model # DL-4TTP) with computerized printout of the following:
      a. Description of Device Wire
      b. I/O Point Name
      c. Terminal landing identifier.
      d. Stick on, roll tape or any other type of identifier shall not be allowed.
      e. Label Size to be a minimum of 1/2" wide by 2" long.
      f. Do not shrink the label on the wire, leave loose for future service.
      g. Hand written labels, of any type or forbidden.
   3. Labels

a. All panel cans shall have a Phenolic Label on the exterior of the panel can to clearly identify the panel as outlined in the engineered drawings.
b. Label size minimum to be 2" x 3"
c. Printed labels are not allowed on panel exteriors.
d. Panel Labels to be riveted to the panel.
e. Labels for devices on the panel interior shall be computer generated,
f. Label each panel device.

3.6 WIRING

A. All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this specification. Where wiring is required to be installed in conduit, EMT shall be used. Conduit shall be minimum ½ inch galvanized EMT or as noted in Division 26.

B. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)

C. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it, and neatly tied at 6ft intervals. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.

D. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals

E. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the Contractor shall provide step-down transformers.

F. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.

3.7 COMMUNICATION WIRING

A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

B. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

C. All communication wiring shall be labeled to indicate origination and destination data.

D. Grounding of coaxial cable shall be in accordance with NEC regulations Article on Communications Circuits, Cable and Protector Grounding

3.8 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration
1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall

occur after the Contractor has completed the installation, started up the system, and performed its own tests

2. Demonstrate compliance with Sequences of Operation through all modes of operation
3. Demonstrate complete operation of Operator Interface
4. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance

1. All tests described in this specification shall have been performed to the satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting the requirements of Completion. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Engineer. Such tests shall then be performed as part of the warranty.
2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved

3.9 CLEANING

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

3.10 TRAINING

A. Provide a minimum of one onsite training classes, 8 hours in length, during the construction period for personnel designated by the owner. The contractor shall provide a course outline and sufficient training manuals for all training classes. Provide video record file of training to user.

B. Train the designated staff of Owner's Representative and Owner to enable them to:

1. Operator
    a. Proficiently operate the system
    b. Understand control system architecture and configuration
    c. Understand DDC system components
    d. Understand system operation, including DDC system control and optimizing routines (algorithms)
    e. Operate the workstation and peripherals
    f. Log on and off the system
    g. Access graphics, point/object reports, and logs
    h. Adjust and change system setpoints, time schedules, and holiday schedules
    i. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
    j. Understand system drawings, and Operation and Maintenance manual
    k. Understand the job layout and location of control components

l. Access data from DDC controllers and ASC
m. Operate portable operator's terminals

2. System Managers/Administrators
   a. Maintain software and prepare backups
   b. Interface with job-specific, third-party operator software
   c. Add new users and understand password security procedures

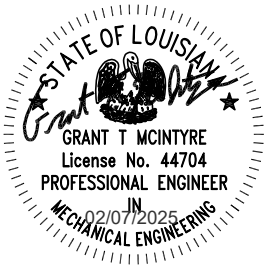
C. The instructor(s) shall be a factory-trained instructor(s).

3.11 SEQUENCE OF OPERATIONS

A. Refer to Sequence of Operations on drawings.

END OF SECTION

DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 21 13 - HYDRONIC PIPING



PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A Section includes pipe and fitting materials and joining methods for the following:
1. Copper tube and fittings.
2. Steel pipe and fittings.
3. Joining materials.
4. Transition fittings.
5. Dielectric fittings.
6. Bypass chemical feeder.
7. Grooved Coupling and Fittings

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following:
1. Pipe.
2. Fittings.
3. Joining materials.
4. Bypass chemical feeder.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: A single set of plans or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. Qualification Data: For Installer.

C. Welding certificates.

D. Field quality-control reports.

E. Preconstruction Test Reports:
1. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

B. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
1. Condenser Water Piping: 150 psig at 73 deg F.
2. Chilled-Water Piping: 150 psig at 73 deg F.
3. Makeup-Water Piping: 80 psig at 73 deg F.
4. Condensate-Drain Piping: 150 deg F.
5. Blowdown-Drain Piping: 180 deg F.
6. Air-Vent Piping: 200 deg F.
7. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.

B. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.

D. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.

E. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
   1. Material Group: 1.1.
   2. End Connections: Butt welding.
   3. Facings: Raised face.

G. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

F. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. A.Y. McDonald Mfg. Co.
      b. Capitol Manufacturing Company.
      c. Central Plastics Company.
      d. HART Industrial Unions, LLC.
      e. Jomar Valve.

f. Matco-Norca.
g. WATTS.
h. Wilkins.
i. Zurn Industries, LLC.

2. Description:
   a. Standard: ASSE 1079.
   b. Pressure Rating: 125 psig minimum at 180 deg F.
   c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Matco-Norca.
   d. WATTS.
   e. Wilkins.
   f. Zurn Industries, LLC.
2. Description:
   a. Standard: ASSE 1079.
   b. Factory-fabricated, bolted, companion-flange assembly.
   c. Pressure Rating: 125 psig minimum at 180 deg F.
   d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.
2. Description:
   a. Nonconducting materials for field assembly of companion flanges.
   b. Pressure Rating: 150 psig.
   c. Gasket: Neoprene or phenolic.
   d. Bolt Sleeves: Phenolic or polyethylene.
   e. Washers: Phenolic with steel backing washers.

E Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Elster Perfection Corporation.
   b. Grinnell Mechanical Products.
   c. Matco-Norca.
   d. Precision Plumbing Products.
   e. Victaulic Company.

2. Description:
    a. Standard: IAPMO PS 66.
    b. Electroplated steel nipple, complying with ASTM F 1545.
    c. Pressure Rating: 300 psig at 225 deg F.
    d. End Connections: Male threaded or grooved.
    e. Lining: Inert and noncorrosive, propylene.

2.6 BYPASS CHEMICAL FEEDER

A. Description: Welded steel construction; 125-psig working pressure; see drawings schedules for capacity; with fill funnel and inlet, outlet, and drain valves.
    1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

2.7 GROOVED COUPLINGS AND FITTINGS

A. If the capability of the HVAC Subcontractor is demonstrated to the Engineer, at the HVAC Subcontractor's option, and as approved by the authorities having jurisdiction, grooved couplings and fittings may be used for 150 and 300 psig working pressure in lieu of welded or screwed joints as specified herein.
    1. Piping sizes 2" through 12": Victaulic Style 107 series "Quick Vic". UL listed painted ductile iron couplings with cut groove or roll groove may be used.
    2. For Flanges: Flange adapters shall be equal to Victaulic Style 741 or Style 743 galvanized or painted, ductile iron, with electroplated steel hinge bushings.
    3. For Strainers: Victaulic or equal galvanized or painted ductile iron Style 732 strainers with groove suitable for the design working pressure may be used.
    4. Special Requirements: Victaulic or equal full flow fittings and couplings shall be made of ASTM A-395 Grade 65-45-15 ASTM A-536 Grade 65-45-12 ASTM A-536 Grade 65-45-12 ductile iron or ASTM A-53, Grade B steel with grooved ends.
    5. A cut or roll groove machine shall be used for all grooves in piping. The groove machine shall be the same manufacturer as the couplings and fittings.
    6. At the Subcontractor's option, factory built piping assemblies solutions where grooved piping is allowed, Victaulic manufactured catalog products may be used including Victaulic Series 380/381/382 Vibration Isolation Pumps, Series 385 Vibration Isolation AHU Drops, No. 26/No. 57 Vic-Headers.
    7. Flexible Couplings: In locations where vibration attenuation and stress relief are required. Victaulic Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three couplings, for each connector, shall be placed in close proximity to the vibration source.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS

A. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be the following:
    1. Schedule 40 steel pipe, forged-steel flanges and flange fittings, and welded and flanged joints.

B. Makeup-water piping installed aboveground shall be the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.

C. Makeup-Water Piping Installed Belowground and within Slabs: Type K, annealed-temper copper tubing, wrought-copper fittings, and soldered joints. Use the fewest possible joints.

D. Condensate-Drain Piping: Type L hard drawn copper tubing meeting ASTM b-88. Fittings shall be long radius type wrought copper solder meeting ASTM B-75. Slopes to be a minimum 1/8" per foot in direction of flow and joints to be 95%-5% tin-antimony solder.

E. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

F. Air-Vent Piping:
1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

G. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes. Hydronic piping to be installed in horizontal sections DEAD LEVEL. Run outs shall be graded in manners to prevent formation of air traps when mains expand and/or contract.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using [mechanically formed]tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

Q. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

R. Install shutoff valve immediately upstream of each dielectric fitting.

S. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

T. Install sleeves for piping penetrations of walls, ceilings, and floors.

U. Install sleeve seals for piping penetrations of concrete walls and slabs.

V. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.

B. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for seismic restraints.

C. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
   2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
   3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
   4. Spring hangers to support vertical runs.
   5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
   6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 7 feet.
   2. NPS 1: Maximum span, 7 feet.
   3. NPS 1-1/2: Maximum span, 9 feet.
   4. NPS 2: Maximum span, 10 feet.
   5. NPS 2-1/2: Maximum span, 11 feet.
   6. NPS 3 and Larger: Maximum span, 12 feet.

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
   1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
   4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
   7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

F. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

G. Fiberglass Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

H. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end.

D Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.

E Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 CHEMICAL TREATMENT

A. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling.

B. Install bypass chemical feeders in each hydronic system where indicated.

1. Install in upright position with top of funnel not more than 48 inches above the floor.
2. Install feeder in minimum NPS 3/4 bypass line, from main with full-size, full-port, ball valve in the main between bypass connections.
3. Install NPS 3/4 pipe from chemical feeder drain to nearest equipment drain and include a full-size, full-port, ball valve.

C. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

D. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

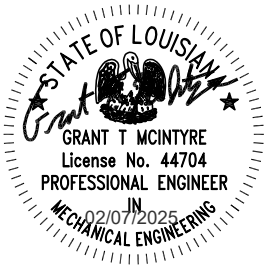
B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:
   1. Open manual valves fully.
   2. Inspect pumps for proper rotation.
   3. Set makeup pressure-reducing valves for required system pressure.
   4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
   5. Set temperature controls so all coils are calling for full flow.
   6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
   7. Verify lubrication of motors and bearings.

3.9 VICTAULIC PRODUCTS

A. Where Victaulic Products are used:
   1. Training: A Victaulic factory trained representative (direct employee) shall provide on-site product training for contractor's field personnel.
   2. Application:A Victaulic representative shall periodically visit the job site and review installation. Contractor shall remove and replace any improperly installed products.
   3. Grooved end product manufacturer to be ISO-9001 certified

END OF SECTION



DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING
SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Hydronic specialty valves.
   2. Air-control devices.
   3. Strainers.
   4. Connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product:
   1. Include construction details and material descriptions for hydronic piping specialties.
   2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
   3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For hydronic piping specialties to include in emergency, operation, and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.6 QUALITY ASSURANCE

A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

B. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 PRODUCTS

2.1 HYDRONIC SPECIALTY VALVES

A. Manual Flow Control Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. PRO Hydronic Specialties, L.L.C.
   b. Nexus Valve, Inc.
   c. NIBCO INC.
   d. TACO Comfort Solutions, Inc.
   e. Victaulic Company.
2. Design:
   a. 2" and under:
      1) Shall be brass body type.
      2) The assembly shall incorporate the ASHRAE recommended upstream pipe diameter clearances from the venturi orifice.
      3) Shall incorporate at least one union and tail piece.
      4) Shall include a ball type throttling valve with memory stop.
   b. 2-1/2" and up:
      1) Shall be carbon steel body type.
      2) Shall include a lug-style butterfly throttling valve with infinite position memory stop.
   c. Shall include a machined venturi integral to body forging or casting.
      1) Pressed-in venturis, orifice plates and calibrated ball valves will not be accepted.
   d. Each device shall have a 15° regain chamber for optimal pressure regain and minimal permanent pressure drop.
   e. Each device shall have two P/T ports for instrument readings.
   f. Each device shall have a memory stop to limit flow once set.
3. Construction:
   a. All devices shall have a venturi section and a throttling and/or isolation valve on the downstream side of the venturi.
   b. The ball valve for ½" through 2" sizes shall have a brass body, a blowout proof brass stem, Teflon seats, stem seals, and a plated steel handle.
   c. Butterfly type valves for 2½" and larger shall be a nodular cast iron lug type, with an EPDM rubber seat, stainless steel shaft, copper bearing, and an aluminum/bronze disc. Valve sizes >8" shall be gear operated.
4. Standard Operating Specifications:
   a. 2" and under:
      1) Shall be rated at 600 WOG/CWP at 250°F.
   b. 2-1/2" and up:
      1) Body shall be rated at 150 PSIG and include ANSI Class 150 flanges.
      2) Butterfly valve shall be rated at 150 PSIG and suitable for dead-end service.
      3) Memory stops shall be of infinite position design. Butterfly valves with 10 position stops only shall not be allowed.

c. The maximum pressure loss shall not exceed 6% of differential pressure.

B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. PRO Hydronic Specialties, L.L.C.
b. Nexus Valve, Inc.
c. NIBCO INC.
d. TACO Comfort Solutions, Inc.
e. Victaulic Company.
2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

C. Automatic Flow-Control Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. PRO Hydronic Specialties, L.L.C.
b. Nexus Valve, Inc.
c. NIBCO INC.
d. TACO Comfort Solutions, Inc.
e. Victaulic Company.
2. Design:
a. 2” and under:
1) Shall be a brass body type.
2) Shall have threaded or sweat connections
3) Minimum of one union and tailpiece incorporated into the design.
4) Shall be capable of measuring flow.
5) Shall include a full-port ball type isolation valve or a standard port valve if used as a setter valve.
b. 2-1/2” and up:
1) Shall be ductile iron wafer style.
2) Shall include mounting hardware (rods, nuts, etc).
c. The GPM for the automatic flow limiter valve shall be preset at the factory.
d. The flow tolerance shall be within ±5% of the specified GPM. Products that limit flow greater than 7% shall not be allowed.
e. The Automatic Flow Limiting Cartridge shall be permanently marked by a letter that corresponds to the specific GPM.

f. The AFL shall have a low start up pressure rating to operate. Start up pressure ratings of 5 psi and above shall not be allowed.
g. Each valve shall have two P/T ports "H' and "L" for identification of the High and Low Pressure port for flow verification.
h. The Automatic Flow Limiting Valve shall have the ability to measure flow while in the operation pressure range in ½" through 2" valves. Alternate Method: If unable to achieve flow measurement in a single, unitary device, a secondary flow measurement device must be used in conjunction with the automatic flow limiting valve provided.
i. Flow Orifices shall be larger than the strainer mesh during operation.
j. The automatic flow cartridge shall have a single large operational differential range rating (2-60+psid) and provide continual flow at differential pressures above design limits. Multiple spring ranges shall not be allowed.
k. Automatic Flow Limiting Valve shall be Pressure Independent. Pressure Independent Control Valves (PICVs) shall not be accepted

3. Construction:
   a. All automatic flow cartridge wear or flow surfaces shall be stainless steel. Brass or other soft materials shall not be allowed on wear or flow surfaces. Plastic or polymer flow cartridges shall not be allowed.
   b. For the ½" through 2" sizes, the automatic flow control cartridge shall be removable from the valve body without the use of special tools to provide maintenance inspection, cleaning, and/or exchange without breaking the main piping connections.
4. Standard Operating Specifications:
   a. The control range rating shall be 2 PSI to 60+ PSI.
   b. The minimum working pressure shall be 600 WOG/CWP.
   c. The operating temperature shall be 40˚F to 250˚F.
   d. The start-up head loss shall not exceed 7 feet of head pressure.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow within plus or minus 10 percent, regardless of system pressure fluctuations.

D. Diaphragm-Operated Safety Valves: ASME labeled.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. AMTROL, Inc.
   b. Apollo Flow Controls; Conbraco Industries, Inc.
   c. Armstrong Pumps, Inc.
   d. Bell & Gossett; a Xylem brand.
   e. Spence Engineering Company, Inc.
   f. WATTS.
2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.

8. Inlet Strainer: removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

E. Diaphragm-Operated, Pressure-Reducing Valves: ASME labeled.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. AMTROL, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Armstrong Pumps, Inc.
d. Bell & Gossett; a Xylem brand.
e. Spence Engineering Company, Inc.
f. WATTS.
2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Low inlet-pressure check valve.
8. Inlet Strainer: removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

2.2 AIR-CONTROL DEVICES

A. Manual Air Vents:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. AMTROL, Inc.
b. Apollo Flow Controls; Conbraco Industries, Inc.
c. Armstrong Pumps, Inc.
d. Bell & Gossett; a Xylem brand.
e. Hays Fluid Controls.
f. HCI; Hydronics Components Inc.
g. Nexus Valve, Inc.
h. NuTech Hydronic Specialty Products.
i. TACO Comfort Solutions, Inc.
2. Body: Bronze.
3. Internal Parts: Nonferrous.
4. Operator: Screwdriver or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

B. Automatic Air Vents:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. AMTROL, Inc.
      b. Armstrong Pumps, Inc.
      c. Bell & Gossett; a Xylem brand.
      d. Nexus Valve, Inc.
      e. NuTech Hydronic Specialty Products.
      f. Spirotherm, Inc.
      g. TACO Comfort Solutions, Inc.
   2. Body: Bronze or cast iron.
   3. Internal Parts: Nonferrous.
   4. Operator: Noncorrosive metal float.
   5. Inlet Connection: NPS 1/2.
   6. Discharge Connection: NPS 1/4.
   7. CWP Rating: 150 psig.
   8. Maximum Operating Temperature: 240 deg F.

C. Expansion Tanks:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. AMTROL, Inc.
      b. Armstrong Pumps, Inc.
      c. Bell & Gossett; a Xylem brand.
      d. Flo Fab Inc.
      e. TACO Comfort Solutions, Inc.
   2. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
   3. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.
   4. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
   5. Gage Glass: Full height with dual manual shutoff valves, 3/4-inch- diameter gage glass, and slotted-metal glass guard.

D. Bladder-Type ASME Expansion Tanks:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. AMTROL, Inc.
      b. Armstrong Pumps, Inc.

c. Bell & Gossett; a Xylem brand.
d. Flo Fab Inc.
e. TACO Comfort Solutions, Inc.

2. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
3. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
4. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

E. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

F. In-Line Air Separators:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. AMTROL, Inc.
b. Armstrong Products, Inc.
c. Bell & Gossett; a Xylem brand.
d. Spirotherm, Inc.
e. TACO Comfort Solutions, Inc.
2. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
3. Maximum Working Pressure: Up to 175 psig.
4. Maximum Operating Temperature: Up to 300 deg F.

2.3 STRAINERS

A. Y-Pattern Strainers:
1. Design:
a. 2” and under:
1) The strainer shall be single body, brass type wye-design.
2) Strainer shall include a full-port ball valve for isolation.
3) Strainer shall include an integral union nut and tail piece.
4) End connections can be either threaded or sweat.
b. 2-1/2” and up:
1) The strainer shall be single body, cast iron type wye-design.
2) Strainer shall include a lug-type butterfly valve for isolation.
3) Strainer shall be flanged on both ends.
c. All strainers shall incorporate at least (1) P/T port and (1) hose end drain valve for flushing of system.
d. All strainer screens will incorporate a minimum 8:1 ratio between strainer screen area and pipe diameter.
2. Construction:
a. The strainer shall have a 20 mesh stainless steel screen for maximum protection and minimum pressure loss.
b. Strainer screen shall be stainless steel.
3. Standard Operating Specifications:

a. 2” and under:
   1) Shall be rated at 600 WOG/CWP.
b. 2-1/2” and up:
   1) Body shall be rated at 150 PSIG and include ANSI Class 150 flanges.
   2) Butterfly valve shall be rated at 150 PSIG and suitable for dead-end service.

B. Victaulic Strainers:
1. Strainers shall be similar and approved equal to the following:
2. At the contractor’s option, Victaulic grooved and wye type strainers similar to the following will be acceptable.
3. 150 and 300 psig working pressure – 2" to 12", Victaulic Style 732 wye type, ductile iron body with perforated 304 stainless steel basket with 0.062" perforations in sizes 2" through 3", and 0.125" perforations for 4" through 12", grooved ends.

2.4 CONNECTORS

A. Stainless-Steel Bellow, Flexible Connectors:
1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

B. Spherical, Rubber, Flexible Connectors:
1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

PART 3 EXECUTION

3.1 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install manual balancing valves at each branch connection to return main where shown on drawings.

C. Install automatic flow control valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.2 HYDRONIC SPECIALTIES INSTALLATION

A. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

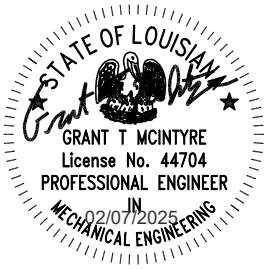
B. Install piping from boiler air outlet, air separator, to expansion tank with a 2 percent upward slope toward tank.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 and larger.

E. Install expansion tanks on the floor on 4” high concrete housekeeping pad, 6” past equipment footprint all around. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION

DIVISION 23 - MECHANICAL
SECTION 23 64 20 – SCREW WATER COOLED CHILLER



PART 1 GENERAL

1.1 SECTION INCLUDES

A. Water cooled screw chiller.

1.2 REFERENCE STANDARDS

A. AHRI 550/590 (I-P) - Performance Rating of Water-Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle; 2023.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2022, with Errata (2023).

C. ASHRAE Std 135 - A Data Communication Protocol for Building Automation and Control Networks; 2020, with Errata (2023).

D. Modbus (PS) - The Modbus Organization Communications Protocol.; Latest Update.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

F. NEMA MG 1 - Motors and Generators; 2021.

G. UL (DIR) - Online Certifications Directory; Current Edition.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate physical size, weight and location of major pieces of equipment to be installed. Notify Architect of any major deviations from the equipment originally specified prior to ordering equipment.

1.4 SUBMITTALS

A. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

B. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.

C. Manufacturer's Certificate: Certify that components furnished but not produced by manufacturer meet or exceed manufacturer's requirements.

D. Manufacturer's Performance Data: Indicate energy input versus cooling load output from 0 to 100 percent of full load at specified and minimum condenser water temperature for water-cooled chillers and at specified and minimum outdoor air temperature for air-cooled chillers.

E. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

F. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

G. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories; include trouble-shooting guide.

H. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.5 WARRANTY

A. Manufacturer’s Warranty: Provide minimum 5 year warranty including coverage for materials and labor..

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Daikin

B. Trane

C. Quantum Logic

D. Johnson Controls

2.2 PRODUCT SUBSTITUTIONS

A. The chilled water system has been designed based on specific capacities and characteristics of equipment specified on drawings.

B. When substitution of a different manufacturer or model number is desired, submit sufficient information to demonstrate to Architect that the substitute will have the same or better performance as that specified AND that the related equipment in the system will perform acceptably with the substitute.

C. If the related equipment must be modified to perform acceptably with the substitute, the entity proposing the substitution is responsible for all additional costs due to re-design and provision of different related equipment.

2.3 EQUIPMENT

A. General:

1. Factory assembled, single-piece, water-cooled or condenserless liquid chiller with dual (2) independent refrigerant circuits. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge (R-513a) (30HXA units shipped

with holding charge only), and special features required prior to field start-up. Unit must fit through a standard door.

B. Compressors:
   1. Semi-hermetic twin-screw compressors with internal muffler and check valve.
   2. Each compressor shall be equipped with a discharge shutoff valve.

C. Evaporator:
   1. Shall be tested and stamped in accordance with ASME Code for a refrigerant working-side pressure of 220 psig . Water-side pressure rating shall be 300 psig.
   2. Shall be mechanically cleanable shell-and-tube type with removable heads.
   3. Tubes shall be internally enhanced, seamless-copper type and shall be rolled into tube sheets. Tube wall thickness shall be 0.025 inches.
   4. Shall be equipped with Victaulic fluid connections.
   5. Shell shall be insulated with 3/4 in. (19 mm) closed-cell, polyvinyl chloride foam with a maximum K factor of 0.28. Heads may require field insulation.
   6. Shall have a evaporator drain and vent.
   7. Design shall incorporate 2 independent refrigerant circuits.
   8. Shall include isolation valves to allow isolation of the refrigerant charge in either the evaporator or the condenser.
   9. Shall be equipped with factory-installed thermal dispersion chilled fluid flow switch.

D. Condenser:
   1. Shall be tested and stamped in accordance with ASME code (U.S.A.) for a refrigerant working-side pressure of 220 psig (1408 kPa). Water-side pressure rating shall be 300 psig (2068 kPa). In Canada, maximum water-side pressure shall be 250 psig (1725 kPa), per the Canadian National Registry.
   2. Shall be mechanically cleanable shell-and-tube type with removable heads.
   3. Tubes shall be internally enhanced, seamless-copper type, and shall be rolled into tube sheets. Tube wall thickness shall be 0.025 in.
   4. Shall be equipped with Victaulic water connections.
   5. Design shall incorporate 2 independent refrigerant circuits.

E. Refrigeration Components:
   1. Refrigerant circuit components shall include oil separator, high and low side pressure relief devices, discharge and liquid line shutoff valves, filter drier, moisture-indicating sight glass, expansion valve, refrigerant economizer, and complete charge of compressor oil. The 30HXC units shall have a complete operating charge of refrigerant R-513a.

F. Controls, Safeties, and Diagnostics:
   1. Controls:
      a. Unit controls shall include the following minimum components:
         1) Microprocessor with non-volatile memory. Battery backup system shall not be accepted.
         2) Power and control circuit terminal blocks.
         3) ON/OFF control switch.
         4) Replaceable solid-state relay panels.

5) Thermistor installed to measure saturated condensing temperature, evaporator saturation temperature, compressor return gas temperature, and evaporator entering and leaving fluid temperatures.
6) Chilled fluid thermal dispersion flow switch.

b. Unit controls shall include the following functions as standard:
1) Automatic circuit lead/lag.
2) Capacity control based on leaving chilled fluid temperature and compensated by rate of change of return-fluid temperature with temperature set point accuracy to 0.1°F.
3) Limiting the chilled fluid temperature pull-down rate at start-up to an adjustable range of 0.2°F to 2°F per minute to prevent excessive demand spikes at start-up.
4) Seven-day time schedule.
5) Leaving chilled fluid temperature reset from return fluid, outdoor-air temperature, space temperature, or 4 to 20 mA input.
6) Demand limit control with 2-stage control (0 to 100% each) or through 4 to 20 mA input (0 to 100%).
7) Chilled and condenser water pump start/stop control.
8) Dual chiller control for series chiller applications without addition of hardware modules or additional thermistors.
9) Dual chiller control for parallel flow applications use one additional sensor.
10) Amperage readout per compressor with %MTA (must trip amps) per compressor.

c. NEMA 1 control panel shall include, as standard, a portable hand held display module with a minimum of 4 lines and 20 characters per line, of clear English, Spanish, - or French language. Display menus shall pro-vide clear language descriptions of all menu items, operating modes, configuration points and alarm diagnostics. Reference to factory codes shall not be accepted. An industrial grade coiled extension cord shall allow the display module to be moved around the chiller. Magnets shall hold the display module to any sheet metal panel to allow hands-free operation. Display module shall have NEMA 4x housing suitable for use in outdoor environments. Display shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions. The display module shall have raised surface buttons with positive tactile response.

d. The chiller controller shall include multiple connection ports for communicating with the local equipment network and the Carrier Comfort Network® (CCN) system, and the ability to access all chiller control functions from any point on the chiller.

e. The control system shall allow software upgrade without the need for new hardware modules.

2. Safeties:

Unit shall be equipped with thermistors and all necessary components in conjunction with the control system to provide the unit with the following protections:

a. Loss of refrigerant charge.

b. Reverse rotation.

c. Low chilled fluid temperature.

d. Low oil pressure (each compressor circuit).
e. Ground current fault.
f. Thermal overload.
g. High pressure.
h. Electrical overload.
i. Loss of phase.
j. Current imbalance.
k. Loss of flow.

3. Diagnostics:
   a. The display module shall be capable of indicating the safety lockout condition by displaying the information in clear language at the display. Information included for display shall be:
      1) Compressor lockout.
      2) Loss of charge.
      3) Low fluid flow.
      4) Low oil pressure.
      5) Evaporator freeze protection.
      6) High or low suction superheat.
      7) Thermistor malfunction.
      8) Entering and leaving-fluid temperature.
      9) Evaporator and condenser pressure.
      10) Electronic expansion valve positions.
      11) All set points.
      12) Time of day.
   b. Display module, in conjunction with the microprocessor, must also be capable of displaying the output results of a service test. Service test shall verify operation of every switch, thermistor, and compressor before chiller is started. User shall be able to force each output device.
   c. Diagnostics shall include the ability to review a list of the 20 most recent alarms with clear language descriptions of the alarm event. Display of alarm codes without the ability for clear language descriptions shall be prohibited.
   d. An alarm history buffer shall allow the user to store no fewer than 20 alarm events with clear language descriptions and time and date stamp event entry.

G. Operating Characteristics:
   1. Unit shall be capable of starting up with 95°Fentering fluid temperature to the evaporator.

H. Electrical Requirements:
   1. Unit primary electrical power supply shall enter the unit at a single location (some units have multiple power poles).
   2. Unit shall operate on 3-phase power at the voltage shown in the equipment schedule.
   3. Control voltage shall be 115-v (60 Hz), single-phase, separate power supply.
   4. Unit shall be shipped with factory control and power wiring installed.

I. Special Features:

1. Wye-Delta Starter:
   Unit shall have a factory-installed, Wye-Delta starter to minimize electrical inrush current.
2. Vibration Isolation:
   Chiller manufacturer shall furnish neoprene isolator pads for mounting equipment on a con-crete surface.
3. Control Power Transformer:
   Unit shall be supplied with a field-installed transformer that will supply control circuit power from the main unit power supply.
4. Temperature Reset Sensor:
   Unit shall reset leaving chilled fluid temperature based on outdoor ambient temperature or space temperature when this sensor is installed.
5. Minimum Load Control:
   Unit shall be equipped with factory (or field) installed, microprocessor-controlled, minimum load control that shall permit unit operation down to 10% of full capacity.
6. Suction Service Valves:
   Unit shall be supplied with factory-installed suction service valves to isolate compressor from evaporator and condenser.
7. Evaporator Head Insulation:
   Unit shall be supplied with field-installed evaporator insulation that shall cover the evaporator heads.
8. BACnet®[1] Communication Option:
   Shall provide factory-installed communication capability with a BACnet MS/TP network. Allows integration with i-Vu® Open control system or a BACnet building automation system.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Align chiller package on steel or concrete foundations.

C. Install units on vibration isolators.

D. Connect to electrical service.

E. Connect to chilled water piping.

F. Connect to condenser water piping.

G. Arrange piping for easy dismantling to permit tube cleaning and removal.

H. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front end interface.

3.2 MANUFACTURER'S FIELD SERVICES

A. Perform factory startup of the chiller by factory trained and authorized servicing technicians confirming equipment has been correctly installed prior to equipment becoming operational and covered under the manufacturer's warranty.

B. Supply initial charge of refrigerant and oil if not completely factory charged.

C. Demonstrate system operations and verify specified performance.

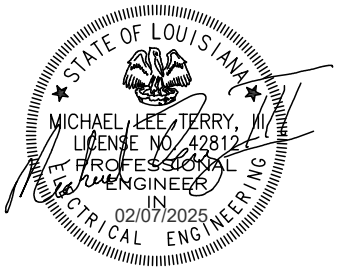
3.3 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of <equipment to Owner's designated representative.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
   3. Briefly describe function, operation, and maintenance of each component.

C. Training: Train Owner's personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of one day of training.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.
   5. Location: Owner's offsite classroom facilities may be used.
   6. Location: Provide local classroom facilities.
   7. Location: At manufacturer's training facility; include travel expenses for two members of Owner's staff.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 26 01 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE

A. The work to be performed under these specifications shall include the furnishing of all labor, materials, equipment and services required for a complete electrical system as specified herein and as shown by the Drawings. A state of Louisiana licensed Electrical Contractor shall perform the work specified herein. The work includes but is not limited to:

1. Demolishing the existing electrical conduit, wiring, and equipment associated with the existing cooling tower and chiller as shown on the Drawings.
2. Furnishing and installing disconnect switches for use within buildings and in exterior applications.
3. Furnishing and installing electrical conduit and wiring required for connection of mechanical equipment furnished under other sections of these specifications.
4. Furnishing and installing new light fixtures as shown on the Drawings.
5. Furnishing and installing rough-ins (outlet boxes and empty conduit) for future communications devices and wiring as shown on the drawings.
6. Installation of temporary construction power required by the General Contractor and Sub-Contractors during the construction period.

1.2 GENERAL CONDITIONS

A. The General Conditions and Supplementary General Conditions are a part of this section of these Specifications. The Contractor is cautioned to read and be thoroughly familiar with all provisions of the General Conditions. These conditions shall be complied with in every aspect. The word "shall" where used, is to be understood, as mandatory and the word "should" as advisory. "May" is used in the permissive sense.

1.3 GENERAL REQUIREMENTS

A. The Contractor is referred to all of the Drawings for building construction as well as the electrical Drawings.

B. The Contractor shall examine the site and shall verify to his own satisfaction the location of all utilities, and shall adequately inform himself as to their relation to his work before entering into a Contract and he shall base his bid on any conditions, which may be encountered during the progress of the work.

C. The Contractor shall furnish and install properly all materials, devices, equipment, supports, controls, appurtenances, etc., mentioned or required to make complete or satisfactory installations in working order whether shown or not. All electrical equipment shall be connected in accordance with manufacturer's instructions. All work shall be executed in a workmanlike manner and shall present a neat and mechanical appearance when completed.

1.4 MINIMUM STANDARDS

A. Applicable rules of the National Electrical Code apply as a minimum standard for this contract, but do not replace or reduce any specific requirement herein.

1.5 DRAWINGS

A. Plans and detail sketches are submitted to limit, explain, and define structural conditions, specified requirements, conduit sizes, and manner of erecting work. The Contractor is cautioned to field check and verify all existing conditions before bidding, as no extra compensation will be allowed for conditions found different than represented in the construction drawings and/or specifications. Written approval of the Architect shall be obtained prior to any alterations or additions to specified work.

B. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required, but specified sizes and requirements necessary for satisfactory operations shall remain unchanged.

C. The drawings and these specifications are complementary to each other and what is called for by one shall be binding as if called for by both.

D. General arrangement of work is indicated on plans. Due to the small scale of the drawings, offsets, fittings, and boxes required are not all indicated; provide fittings, boxes, etc., as needed in accordance with codes and accepted practices.

1.6 SUPERVISION

A. The Contractor shall personally or through an authorized and competent representative, constantly supervise the work from beginning to completion and final acceptance. So far as possible, he shall keep the same foreman and workmen throughout the project duration.

B. During its progress, the work shall be subject to inspection by representatives of the Engineer, at which times the Contractor shall furnish required information.

C. It is not the Engineer's duty to direct or guarantee the work of the Contractor, but to assist the Owner in obtaining a complete building in accordance with plans, specifications and addenda and to furnish engineering services in accordance with recognized practices.

1.7 PRIOR APPROVALS

A. The Contractor shall base his proposal on materials as specified herein. Any references to a specific manufacturer or trade name is made to establish a standard of quality and to define a type of product and in no way is intended to indicate a preference for a particular manufacturer. It is the intent of these specifications to allow all manufacturers of equipment, products, etc., judged equal to the specified product to bid on a competitive basis.

1.8 MEASUREMENTS

A. The Contractor shall verify all measurements and shall be responsible for the correctness of same, before ordering any materials or doing any work. No extra charge or compensation will be allowed for any differences between the actual measurements and those indicated on the drawings.

1.9 LAWS, PERMITS AND FEES

A. The entire electrical work shall comply with the rules and regulations of the City, Parish, and State, including the State Fire Marshal and State Board of Health, whether so shown on plans or not. The Contractor shall pay fees for permits, inspections, etc., and shall arrange with the inspecting authorities all required inspections.

1.10 SITE INSPECTION

A. The Contractor shall visit the site and familiarize himself with difficulties attendant to the successful execution of the work before bidding. Failure to visit the site shall not relieve the Contractor of the extent or conditions of the work required of him.

PART 2 PRODUCTS

2.1 MATERIAL AND EQUIPMENT

A. All materials, equipment, and accessories installed under this Contract, whether approved or not, shall be new and shall conform to all rules, codes, etc., as recommended or adopted by the National Association(s) governing the manufacture, rating and testing of such materials, equipment, and accessories.

2.2 SHOP DRAWINGS

A. The Contractor shall submit to the Architect complete descriptive and dimensional data on the following items for review and approval:
   1. Disconnect Switches
   2. Conduit, Conduit Fittings, and Conduit Ground Bushings
   3. Conductors
   4. Ground Rods
   5. Data Cables and Jacks
   6. Mechanical Equipment Electrical Information
   7. Light Fixtures

PART 3 METHODS OF INSTALLATIONS

3.1 CONTRACTOR COORDINATION

A. The Drawings are diagrammatic in nature. Cooperate with other trades so the interferences of facilities and equipment will be avoided.

3.2 OPENINGS, CUTTING AND PATCHING

A. Cut all openings as required for the electrical work. Patching will be done by the various crafts whose work is involved. Furnish and install all necessary sleeves, thimbles, hangers, inserts, etc., at such times and in such a manner as not to delay or interfere with the work of other Contractors. Caulk, flash or otherwise make weatherproof all penetrations through the roof and exterior walls.

B. Where conduit, cable or other items that are provided for under this contract penetrate fire rated walls or floors, the Contractor is to seal around the item to maintain the integrity of the rated system.

3.3 PAINTING

A. Painting shall be performed as described in the painting specifications. No painting will be required by the Contractor except for touch-up of factory finishes on equipment furnished under this contract.

3.4 APPLICABLE GENERAL CODES AND REGULATIONS

A. All electrical work and equipment, in whole or in part, shall conform to the applicable portions of the following specifications, codes and regulations in effect on that date of invitation for bids, and shall form a part of this specification.
   1. National Electrical Code, Latest Edition as accepted by the State Fire Marshal
   2. National Electrical Manufacturers Association Standards
   3. National Fire Protection Association Recommended Practices
   4. Local, City and State Codes and Ordinances
   5. National Board of Fire Underwriter's Recommended Practices
   6. Life Safety Code, 2015 Edition
   7. International Building Codes

B. Equipment that has been inspected and approved by the Underwriter's Laboratory shall bear its label or appear on its list of approved apparatus.

3.5 TESTS AND INSPECTIONS

A. The Contractor shall assist in making periodic inspections or tests required by the Owner’s Representative or Engineer. When requested, the Contractor shall provide the assistance of foremen and qualified craftsmen for reasonable duration of each test, etc.

3.6 SAFETY PRECAUTIONS DURING CONSTRUCTION

A. It shall be the Contractor's responsibility to furnish and install proper guards and instruction signs for prevention of accidents and to provide and maintain for the duration of construction any installations needed for safety of life and property.

3.7 HEATING AND AIR CONDITIONING SYSTEM

A. This Contractor shall be responsible for providing electrical service to all devices of the

heating and air conditioning system, and is referred to the mechanical plan for the exact location of the various devices.

3.8 EQUIPMENT NAMEPLATE

A. Each item of electrical equipment installed by the Contractor shall be provided with an engraved nameplate noting the equipment's function or designation. Nameplates shall be engraved laminated plastic with black letters on a white background. Letters shall be 1/4" high, all caps.

3.9 PANELBOARD SCHEDULES

A. The Contractor shall provide and affix typed panelboard schedules for each panelboard. Schedule will accurately list equipment served by each branch circuit, and not simply indicate “LIGHTING” or “RECEPTACLES”, etc. Schedules shall indicate rooms served and device or devices connected to the circuit.

B. Where new loads are connected to existing panels, and where loads are rearranged in existing panels as part of this project, the Contractor shall update the respective panel directory so as to provide a complete, accurate, and typewritten panel schedule. The new panel schedule shall incorporate all existing loads, including loads “existing to remain”. Provide all required testing and investigations necessary to accomplish this work.

3.10 COMPLETION

A. The Contractor shall leave all electrical equipment with proper connections, and in proper working order. He shall test the entire electrical system to show that it is properly installed. Contractor shall leave all panels and switches completely fused or complete with circuit breakers.

3.11 RECORD DRAWINGS

A. The Contractor shall furnish one (1) complete set of drawings on which any changes in the work shall be shown. These drawings must be turned over to the Architect prior to final acceptance of the work.

3.12 GUARANTEE

A. The Contractor shall guarantee to keep the entire electrical system as installed by him or his subcontractors in repair and in perfect working order for one (1) year from the date of the final Certification of Final Acceptance, and shall furnish free of cost to the Owner, all material and labor necessary to comply with the above guarantee; said guarantee shall be based upon defective material and workmanship. In any case where equipment has a factory warranty exceeding this one-year limit, the full extent of the warranty shall apply.

3.13 CLEANING

A. When all work has been finally tested, the Contractor shall clean all fixtures, equipment, conduits, ducts, and all exposed work. All cover plates and other finished products shall

be thoroughly cleaned.

3.14 INSTRUCTION MANUALS

A. The Contractor shall provide three (3) operating and maintenance instruction manuals on all systems and equipment installed in the electrical work.

3.15 CONTRACTOR SPECIAL NOTE

A. The Contractor is again cautioned to refer to all parts of these Specifications and all Drawings, not just electrical sections, and the individual cross references made to other standard specifications or details describing any electrical work, which may be required under these other sections. The Contractor is cautioned to note carefully any other sections which may reference electrical work in order for this Contractor to fully understand the wiring requirements and electrical work that is required. Any conflicts found between the electrical sections of these Specifications or Drawings shall be immediately directed to the General Contractor for clarification.

B. These Specifications and the electrical Drawings size equipment, wire, conduit, etc. based on the horsepower of motors and/or wattages of equipment as shown on the plans or specified herein. The Contractor shall install electrical raceways, conductors, fuses, safety switches, breakers, contactors, starters or any other electrical equipment with the capacities to suit the horsepower and/or wattages of the equipment actually furnished and installed. The Contractor shall not furnish or install any electrical raceways, conductors, safety switches, contactors or motor starters of sizes smaller than those shown on the Drawings or specified herein. The Contractor shall coordinate with the various sections of the Specifications and/or Drawings and with the various Sub-Contractors to provide the properly sized equipment without additional cost to the Owner.

C. The Contractor shall be required to install electrical services underground. Existing underground utilities should be disconnected. Refer to the electrical and mechanical drawings for demolition plans. However, some existing underground utilities may remain in service at the site. Contractor is cautioned to exercise extreme care when digging to not damage any existing utilities or equipment. Contractor shall be required to repair any utilities or equipment he may damage during construction.

END OF SECTION

DIVISION 26 - ELECTRICAL
SECTION 26 05 00 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. All material furnished shall be new and shall conform to all rules and codes as recommended or adopted by the National Association governing the manufacture, rating and testing of the material. All electrical equipment shall be UL listed for the intended use.

PART 2 PRODUCTS

2.1 RACEWAYS AND FITTINGS

A. Raceways permitted on this project shall be hot dipped galvanized rigid steel conduit; electrical metallic tubing (EMT); flexible metallic tubing; liquid-tight flexible metal conduit; and rigid polyvinyl chloride (PVC) conduit. All conduits shall be new and shall bear the inspection label of the Underwriter's Laboratories, Inc.

B. Metallic conduit shall be metalized, or hot-dipped galvanized. Non-metallic conduit shall be schedule 40 PVC.

C. Fittings for conduit shall be an approved type specially designed and manufactured for their purpose. EMT fittings shall be watertight, compression type. Rigid metal conduit fittings, bushings, and other components shall be galvanized. All fittings for rigid steel or aluminum conduit shall be threaded and coupled unless specifically approved otherwise by the Engineer.

D. Where conduit connects to an outlet box, it shall have an insulated throat type connector.

2.2 EXPOSED CONDUIT

A. Exposed conduit shall be firmly supported on galvanized hangers; on brackets, hangers, or pipe straps; or by beam clamps. Conduit installed exposed shall be neatly aligned and run at right angles to the building walls or walls of the rooms in which installed. All exposed conduit shall be located to avoid all conflicts with architectural or mechanical components.

2.3 FLEXIBLE CONDUIT

A. Liquid-tight flexible metal conduit shall have a spiral wound, flexible, galvanized steel core and a tough extruded synthetic moisture-tight outer covering. All flexible conduits shall be UL listed.

2.4 GALVANIZED CONDUIT

A. Galvanized conduit furnished in accordance with these specifications shall be of mild steel piping, galvanized inside and outside, and shall conform in all respects to the American Standard Association Rigid Steel Conduit Specification C80.1-1959 and Underwriter's

Laboratories Specifications.

B. The galvanized coat of zinc shall be of uniform thickness applied by the hot-dipped process to not only the inside surfaces of the conduit, but also to the threads of the conduit. It shall be further dipped in a chromic acid bath to chemically form a corrosive resistant protective coating of zinc chromate over hot-dipped galvanized surface. Each piece of conduit shall be straight, free from blisters and other debris, cut square and taper reamed, and furnished with coupling in 10-foot length threaded each end. The interior threaded surface of each coupling shall be galvanized to insure 100% galvanic protection on all surfaces. The hot galvanized zinc chromate on the inside and outside surfaces shall be sufficiently elastic to prevent cracking or flaking when sample of finished conduit is bent 90^{o} at a minimum temperature of 60^{o}F, the inner edge of the bend having a radius of six (6) times the inside diameter of the conduit.

2.6 RACEWAYS

A. Lay-in duct, JIC Wireway and troughs shall be NEMA 1 for indoor application and NEMA 3R for outdoor or applications exposed to weather or water. Raceways shall be sized as noted on Drawings and shall have hinged or screw covers with captive screws. Finish shall be gray enamel. All components shall be UL listed for steel enclosed wireway or auxiliary gutter.

2.7 OUTLET AND SWITCH BOXES

A. Outlet boxes in concealed conduit systems shall be flush mounted. Boxes shall be galvanized steel of sufficient size to accommodate devices shown and shall have raised covers where required to meet requirements of NEC Article 314.

B. All boxes shall be stamped, one-piece, galvanized steel, of proper size and shape for conduits entering them, and shall be UL listed and NEC approved for the intended use. Boxes shall be installed so that device and/or coverplates shall be tight and plumb with wall finish, have all unused openings closed with knock-out plugs, and be weatherproof for exterior locations.

C. Boxes for lighting fixtures shall be 4 inches octagon, not less than 1-1/2 inches deep, with fixtures stud fastened through from back box. Where boxes are installed in a concrete slab, boxes designed for this application shall be used.

D. Outlet boxes for switches in concealed work shall be standard switch boxes of required number of gangs. Outlet boxes for receptacles, telephone, and communication use in concealed work shall be 4-inch square, not less than 1-1/2 inches deep. Outlet boxes for switches and receptacles installed in exposed conduit system shall be cast type FS or FD, number of gangs as required. Outlet boxes for telephone and communication use in exposed systems to be cast, 4 inches square, not less than 1-1/2 inches deep.

E. Boxes shall not to be installed back-to-back in walls. Offset with connecting conduit as specified. Do not use long, extended boxes that would effectively couple light and sound between adjoining spaces.

2.8 WIRE (600 VOLT AND BELOW)

A. All conductors used in the work shall be of soft drawn annealed copper having a conductivity of not less than 98% of that of pure copper. Conductors shall be standard code gauge in size, insulated and shall have insulation rated for use at 600 volts.

B. Unless noted otherwise or specified, insulation shall be type THW, THWN, or THHN for sizes up to and including No. 2 AWG. Insulation for wire sizes larger than No. 2 AWG shall be type THW, XHHW, or THHN. Lighting fixture wire shall be heat resistant type TF (150^{o}C) with 300-volt insulation minimum. Wires shall be of the single conductor type. Sizes No.14 AWG and larger shall be stranded. No wire shall be single strand solid copper.

C. Throughout the system, all conductors shall be identified as to the phase and voltage of the system by color-coding in accordance with NEC 210.5. Color-coding shall be continuous the full length of the wire with surface printing at regular intervals on all conductors and for neutral conductors.

D. Color coding shall be as follows:

3phase, 208V System
Phase 1-Black
Phase 2-Red
Phase 3-Blue
Neutral-White
Ground-Green

2.9 WEATHERPROOF RECEPTACLES

A. Weatherproof receptacles shall be GFCI duplex receptacles as specified under WIRING DEVICES, mounted in a cast iron type FD conduit box and fitted with gasketed metal cover with spring. Weatherproof receptacles shall be flush mounted in exterior walls.

2.10 WIRING DEVICES

A. Wiring devices shall be as listed. The color of device shall match color of outlet cover plate. It shall be the responsibility of the Contractor to provide plugs, receptacles and fittings required for any equipment furnished or installed or connected under the contract. Color as selected by the Engineer.

	Leviton	P & S	Hubbell
Toggle Switches: 20A 120/277V			
Single pole	1221-I	20AC1-I	1221-I
Three-way	1223-I	20AC3-I	1223-I
Duplex Receptacle: 20A, 125V,			
NEMA 5-20R	5362-I	5362-I	5363-I
Ground Fault Circuit Interrupter:			
20A, 125V, Feed Through,			
NEMA 5-20R	6899-I	2091-S	GF-5362-I

B. Quad receptacles shall be 20-amp, 125 volt rated, NEMA 5-20R, with two (2) duplex receptacles or single four-plex device.

2.11 OUTLET COVER PLATES

A. Unless otherwise specified, all outlets shall be fitted with cover plates. Cover plates shall be standard size, uniform in design and finish for switches, receptacles and other outlets requiring cover plates. Plates shall be one piece of the required number of gangs. All cover plates shall be lexan unbreakable type. Engineer shall select coverplate color.

2.12 SPECIAL PURPOSE RECEPTACLE

A. Provide receptacles for special purpose devices as indicated on the plans. Refer to equipment specification for proper receptacle to be supplied. Provide stainless steel cover plate.

2.13 FIRESTOPPING PRODUCTS

A. The Contractor shall provide and install at all fire-rated wall through-penetrations, a non-hardening, conformable firestop system. The system shall consist of a water insoluble putty and suitable damming materials (where required). The non-hardening putty shall be a two-staged intumescent and capable of expanding up to 8 times its original volume. This putty shall contain no asbestos, no fiberglass, no solvents nor corrosive mineral salts of any kind. It shall remain soft during its installed life and shall be capable of being removed and reinstalled to facilitate the addition of cables or pipes. The putty shall exhibit aggressive adhesion to all common building materials and penetrants and shall allow reasonable movement of penetrants without being displaced. The firestop system shall be tested to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and classified for up to 3 hours.

PART 3 EXECUTION

3.1 WIRING - GENERAL

A. Unless otherwise specified, all wiring shall be installed in conduit. No wire shall be smaller than No. 12 unless noted otherwise. Wiring for low voltage control may be #14 AWG. Wire for each branch circuit shall be of single size and type from the branch circuit protective device the last outlet of the circuit. BX wiring shall not be allowed.

B. Feeders, motor circuit conductors and main service entrance conductors shall run their entire length without joints or splices. Wiring for branch circuits shall run the entire length without splices, with splices and joints made only at outlets or in accessible junction boxes only when absolutely necessary and approved by the Engineer. Joints and splices in branch circuit wiring shall be made with compression type solderless connectors.

C. Connectors of the non-metallic screw on type are not acceptable. Terminations or splices for conductors No. 6 AWG and larger shall utilize bolted connecting lugs. All splices and terminations shall be insulated in an approved manner by an integral or separate cover or by taping to provide insulating value equal to that of the conductors being joined.

D. Type THW or THWN conductors may be connected directly to recessed fixtures only when the fixtures are equipped with outlet boxes listed by Underwriter's Laboratories, Inc. for use with wire having insulation rated for maximum operating temperatures of 75°C (167°F); otherwise, for fixtures not rated for 75°C directly connection, use 125°C insulated conductors from the fixture to an outlet box placed at least one (1) foot, but not more than four (4) feet from the fixture.

E. Branch circuit home run numbers shown on the drawings shall be used as a guide for connection of circuit wiring to similarly number protective devices in branch circuit panelboards. Requests for changes in the plans shall be directed to the Engineer. No changes shall be made without approval from the Engineer.

F. Each circuit shall be furnished with its own neutral conductor. There shall be no sharing of neutral conductors.

G. In instances where a junction box, wireway, etc. contains three (3) or more branch circuits, the feeders shall be labeled within the junction box, wireway, etc. with circuit location, including panel name and breaker number. Labeling shall be neatly typed and affixed to each feeder. Labeling shall meet all applicable Code requirements.

H. No more than three (3) 20A/1P circuits may be installed in a single conduit. Circuits may not share grounds or neutrals. Conductors sharing raceways shall be derated per table 310.15(B)(3)(a) of the NEC.

3.2 ELECTRICAL SERVICE GROUNDING

A. Main electrical service equipment, conduit work, motors, panelboards and all other electrical equipment shall be effectively and permanently grounded. Grounding connections and conductor sizes shall be in accordance with requirements of the National Electrical Code, Article 250 and local or State ordinances.

B. Provide as part of the service grounding system an ufer ground in the building slab. The ufer ground shall be 20' long bare #4 copper wire and bonded to the main service ground lug with a grounding electrode cable of the size indicated on the drawings.

C. The building foundation steel and structural steel (if applicable) shall be connected to the service entrance ground lug with a grounding electrode cable of the size indicated on the drawings.

D. All ground lugs shall be properly torqued, as per the gear manufacturer's instructions and provide pictures of all ground connections to the Engineer for inspection before they are covered.

E. All grounding connections shall be mechanically made. Cadwell style connections are not permitted.

3.3 EQUIPMENT GROUNDING

A. All conduit entering panelboards shall be grounded to the panelboard by means of a

grounding type locknut installed on the inside of the panelboard. Where the continuity of the metallic conduit system is interrupted by a section of non-metallic conduit, as separate grounding conductor, sized in accordance with NEC table 250.122 shall be installed in the conduit with the insulated conductors. A separate grounding conductor, as described above or as called for on the plans, shall be run in the conduit with the circuit conductors for all circuits serving multi-outlet assemblies.

B. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The grounding screw on all grounding type receptacles shall be securely grounded to the outlet box using a No. 12 green insulated conductor attached to the outlet box with lug screw.

C. The grounding screw on all grounding type receptacles shall be security grounded to the outlet box using a No. 12 green insulated conductor attached to the outlet box with lug screw. Ground screws shall be green.

D. All switch legs shall include a green ground conductor connected to the circuit ground conductor and terminated in the switch outlet box.

3.4 CONDUIT - MATERIALS AND METHODS

A. Conduit shall be installed as per NEC and NEMA regulations and the manufacturer's recommendations. Conduit shall be as follows:

B. Rigid Steel Conduit shall be used for all conduits exposed to the weather, and underground conduit except where non-metallic conduit is specified or approved. Underground and under slab runs are to be watertight. All horizontal runs of underground conduit shall utilize rigid steel elbows on vertical risers. Conduits used for receptacles and run under the building slab shall be hot dipped galvanized rigid steel and shall be 3/4" minimum size.

C. All conduits routed underground shall not be placed in building slab. Conduits larger than 1" routed under building slab shall be routed below the vapor barrier. Minimum conduit size allowed to be routed underground shall be 3/4". Conduits routed under building slab may be PVC. All conduits rising vertically out of slab or out of ground shall be type RMC to 48” above finished floor.

D. Electrical Metallic Tubing or metal clad cabling (if permitted) shall be used for all other feeders, branch circuit and communications and control wiring where rigid steel or non-metallic conduit is not specified.

E. Non-metallic conduit, minimum schedule 40 PVC, shall be permitted to be installed underground. Non-metallic conduit shall not be used in any environmental air plenum. If PVC conduit is run, a full-sized grounding conductor shall be pulled with the circuit conductors. PVC conduit shall not be run exposed. Where PVC conduit is run underground, it shall be encased in concrete or run minimum 24" below grade, or at the depth below grade shown on the drawings.

F. Flexible metallic tubing and EMT shall only be permitted in spaces above finished ceilings

and within enclosed walls within the interior of buildings. Flexible metallic tubing shall only be permitted for the final four (4) feet of conduit runs to fixtures located above finished ceilings. No flexible metallic tubing or EMT will be permitted exposed. Also, EMT may not be installed in or below concrete slabs.

G. Flexible metal conduit or liquid-tight flexible metal conduit shall be used for the final connection of runs to motors. Flexible conduit shall be at least twelve (12) inches, but not more than 48 inches long. Where used, an external grounding conductor shall be run with conduit unless conductor is made as a part of the conduit.

H. Conduits installed underground and used for communications system wiring shall be reviewed with the communications contractor prior to installation. As an example, conduits below the vapor barrier may require moisture proof wiring to comply with the structured connectivity solution or conduits may need to be installed above the vapor barrier to maintain connectivity solution compliance. All conduit shall conform to the requirements of the data manufacturer's warranty and be accepted by the communications contractor.

I. Setscrew conduit fittings shall not be permitted.

3.5 CONDUIT - GENERAL

A. Fittings for rigid steel conduits shall be hot-dipped galvanized steel and shall be of a type especially designed and manufactured for their purpose. Fittings for EMT shall be die cast zinc type. Rigid conduit joints for single conduit runs shall be made with threaded fittings made tight with at least five threads fully engaged. Fittings for rigid non-metallic conduit shall be solvent welded.

B. Where enclosures (panels, wireways, etc.) contain live and exposed electrical parts, all conduits connecting to that enclosure shall be secured with threaded hubs. Utilize wet location rated hubs for outdoor installations.

C. Where conduits enter boxes or cabinets that do not have threaded hubs, they shall be secured in place with galvanized locknuts inside and outside the cabinet and shall have bushings inside. Conduits larger than 1-1/4 inch shall have galvanized locknuts and galvanized bushings.

D. All conduits shall be installed concealed or as indicated or scheduled on the drawings and shall be of sufficient size to accommodate the required number of insulated conductors including equipment grounding conductor where such grounding conductor is required or specified.

E. Conduit runs shall be straight; elbows and bends shall be uniform, symmetrical and free from dents or flattening. Exposed conduit shall be firmly supported on galvanized hangers; on brackets, hangers, or pipe straps; or by beam clamps. Conduit installed exposed shall be neatly aligned and run at right angles to the building walls or walls of the rooms in which they are installed. All exposed conduit shall be located to avoid all conflicts with architectural or mechanical components.

F. Pull boxes shall be installed as required to permit proper installation of conductors and

expansion fittings installed where conduit runs cross building expansion joints.

G. Conduit shall be run no closer than six (6) inches to covering of hot water or steam piping except where crossings are unavoidable. Conduit shall be kept at least one (1) inch from crossing steam and hot water piping.

H. Conduit shall be held securely in place by hangers and fasteners of appropriate design and dimensions for the particular application. Support shall be such that no strain will be transmitted to outlet box and pull box supports. Wire shall not be used, with or without spring steel fasteners, clips or clamps, for the support of any conduit. Conduit shall not be supported by or attached to duct work unless specifically allowed otherwise.

I. Hangers and other fasteners shall be supported on solid masonry with inserts or expansion sleeves and bolts, on wood with wood screws, hollow masonry with toggle bolts, on steel with machine screws or welded threaded studs. Fastenings shall be proof tested by the Contractor for secure mounting.

J. All conduits shall be cut square and reamed at the ends. The conduit system shall be complete and cleaned before any conductors are installed. Open ends of all conduits shall be capped until conductors are installed. A non-metallic fish wire shall be installed in all empty conduits. Empty conduit shall remain capped.

K. Contractor shall refer to National Electrical Code Appendix C, Conduit and Tubing Fill Tables for Conductors and Fixture Wire of the Same Size. Contractor shall refer to the appropriate table for the conduit and wire condition and shall install wiring in accordance with code requirements.

3.6 FLEXIBLE CONDUIT

A. Flexible metal conduit may be used for short final connections to equipment where permitted by governing codes. Flexible metal conduit shall be sized and supported in accordance with Article 350 of the NEC or more stringent local codes. A separate equipment-grounding conductor sized in accordance with NEC Table 250.122 shall be installed in flexible conduit unless exceptions are allowed by governing codes and if the fittings used are UL listed for the purpose.

B. Liquid-tight flexible metal conduit shall be used where flexible conduit is permitted and desired and conditions of installation, operation, or maintenance require protection from liquids, vapors, or solids and in other hazardous locations where specifically approved. Flexible conduit for all exterior motor connections shall be liquid tight. Liquid-tight flexible conduit shall be used with terminal fittings approved for the purpose.

3.7 FIRE-RATED WALL AND FLOOR THROUGH-PENETRATIONS

A. All fire-rated walls or floors penetrated by this Contractor shall be properly sealed with fire stopping materials. All floor through-penetrations shall be fire stopped with a light-weight mortar material. Wall through-penetrations shall be fire stopped with a non-hardening putty material. Contractor shall see that all penetrations are fire stopped and seals are inspected.

3.8 SUPPORTS AND FITTINGS

A. The Contractor shall furnish and install all supports for equipment under this contract. Supports shall be spaced at intervals of eight (8) feet maximum for rigid conduit and five (5) feet maximum for EMT and as necessary to obtain rigid support. Perforated strap supports will not be permitted.

B. All conduits shall be firmly secured with pipe clamps, conduit straps, or suspension hangers as appropriate. Fasten to steel with screws in tapped holes, to wood with wood screws, and to masonry with expansion anchors. Expansion anchors shall have a minimum pull out load of 1,200 pounds and an ultimate shear load of 1,950 pounds.

C. All conduit, fixtures, and accessories shall be rigidly supported to form a firm, well-braced installation.

D. Joints shall be made tight with standard galvanized or sheradized couplings; corners turned with fittings, elbows, or long radius bends.

E. Low voltage wiring installed above accessible ceilings shall be supported on J-hooks. J-hooks installed for communications system wiring shall not be used for other low voltage system wiring (fire alarm, security, EMS controls, etc.).

3.9 WEATHERPROOF EQUIPMENT

A. All disconnect switches, starters, and other electrical equipment located on the exterior of the building or exposed to the outside shall be enclosed in a rain-tight enclosure.

B. All lighting fixtures or other devices located on an exterior wall of the building shall be mounted on a flush-mounted, cast outlet box.

3.10 MOUNTING HEIGHTS

A. Unless otherwise noted on the drawings or required by the Engineer, the following mounting heights shall apply:

Receptacles	1'-6"
Panelboards	6'-0" to top
Data Outlets	1'-6" (48" for wall phone)
Safety Switches	5'-0" to top
Motor Control Equipment	5'-0" to top

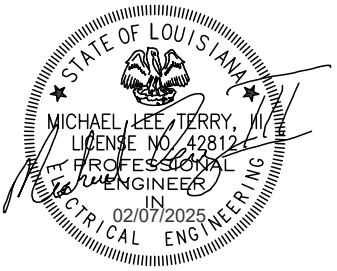
B. Upon permission of the Engineer, mounting heights may be adjusted to simplify cutting of masonry units or to facilitate furniture and cabinet arrangements. Dimensions above refer to the centerline of the device unless noted otherwise.

3.11 HOUSE KEEPING PADS

A. All floor and ground mounted electrical equipment - panels, switchboards, motor control centers, transformers, etc. shall be installed with a reinforced concrete housekeeping pad,

whether shown on the drawings or not. The pad shall extend 4” above either the finished floor or final grade (as applicable), have 45 degree chamfered edges, and be constructed of 3000psi concrete. The pad shall extend 3” beyond the edge of the respective electrical equipment.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 26 05 72 - OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Short-circuit study input data, including completed computer program input data sheets.
   2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Short-Circuit Study Specialist and Field Adjusting Agency.

B. Product Certificates: For short-circuit study software, certifying compliance with IEEE 399.

1.6 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. SKM Systems Analysis, Inc.
2. ETAP

B. Comply with IEEE 399 and IEEE 551.

C. Analytical features of fault-current-study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Comments and recommendations for system improvements, where needed.

E. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short-circuit ratings.
   2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
   3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
   4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
   5. Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.

G. Short-Circuit Study Output:
   1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. Equivalent impedance.
   2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. Calculated asymmetrical fault currents:

1) Based on fault-point X/R ratio.
2) Based on calculated symmetrical value multiplied by 1.6.
3) Based on calculated symmetrical value multiplied by 2.7.

3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
   a. Voltage.
   b. Calculated symmetrical fault-current magnitude and angle.
   c. Fault-point X/R ratio.
   d. No AC Decrement (NACD) ratio.
   e. Equivalent impedance.
   f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
   g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 EXECUTION

3.1 EXAMINATION

A. Obtain all data necessary for the conduct of the study.
   1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Engineer.
   2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
   3. For relocated equipment and that which is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.
   4. Obtain all arc flash information from the local utility in a timely manner. No extension of the contract time shall be permitted due to coordination with the local utility.

B. Gather and tabulate the following input data to support the short-circuit study. Comply with recommendations in IEEE 551 as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
   1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
   2. Obtain electrical power utility impedance at the service.
   3. Power sources and ties.
   4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
   5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.

6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
7. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
8. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
9. Motor horsepower and NEMA MG 1 code letter designation.
10. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

A. Perform study following the general study procedures contained in IEEE 399.

B. Calculate short-circuit currents according to IEEE 551.

C. Base study on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:
1. To normal system low-voltage load buses where fault current is 10 kA or less.
2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

H. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:
1. Electric utility's supply termination point.
2. Incoming switchgear.
3. Unit substation primary and secondary terminals.
4. Low-voltage switchgear.
5. Motor-control centers.
6. Control panels.
7. Standby generators and automatic transfer switches.
8. Branch circuit panelboards.
9. Disconnect switches.

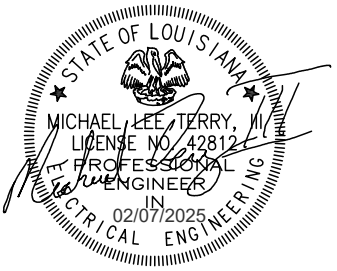
3.3 ADJUSTING

A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 26 05 73 - OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes computer-based, overcurrent protective device coordination studies to determine overcurrent protective devices and to determine overcurrent protective device settings for selective tripping.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Coordination-study input data, including completed computer program input data sheets.
   2. Study and equipment evaluation reports.
   3. Overcurrent protective device coordination study report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect

for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Coordination Study Specialist and Field Adjusting Agency.

B. Product Certificates: For overcurrent protective device coordination study software, certifying compliance with IEEE 399.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For the overcurrent protective devices to include in emergency, operation, and maintenance manuals.
   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
      a. The following parts from the Protective Device Coordination Study Report:
         1) One-line diagram.
         2) Protective device coordination study.
         3) Time-current coordination curves.
      b. Power system data.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Coordination Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Coordination Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
   1 Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. SKM Systems Analysis, Inc.
      b. ETAP

B. Comply with IEEE 242 and IEEE 399.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

D. Computer software program shall be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices and shall demonstrate selective coordination by computer-generated, time-current coordination plots.
   1. Optional Features:
      a. Arcing faults.
      b. Simultaneous faults.
      c. Explicit negative sequence.
      d. Mutual coupling in zero sequence.

2.2 PROTECTIVE DEVICE COORDINATION STUDY REPORT CONTENTS

A. Executive summary.

B. Study descriptions, purpose, basis and scope. Include case descriptions, definition of terms and guide for interpretation of the computer printout.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center, and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study:
   1. Report recommended settings of protective devices, ready to be applied in the field. Use manufacturer's data sheets for recording the recommended setting of overcurrent protective devices when available.
      a. Phase and Ground Relays:
         1) Device tag.

2) Relay current transformer ratio and tap, time dial, and instantaneous pickup value
3) Recommendations on improved relaying systems, if applicable.

b. Circuit Breakers:
1) Adjustable pickups and time delays (long time, short time, ground).
2) Adjustable time-current characteristic.
3) Adjustable instantaneous pickup.
4) Recommendations on improved trip systems, if applicable.

c. Fuses: Show current rating, voltage, and class.

G. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for the switching schemes and for emergency periods where the power source is local generation. Show the following information:

1. Device tag and title, one-line diagram with legend identifying the portion of the system covered.
2. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
3. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4. Plot the following listed characteristic curves, as applicable:
   a. Power utility's overcurrent protective device.
   b. Medium-voltage equipment overcurrent relays.
   c. Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
   d. Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
   e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
   f. Cables and conductors damage curves.
   g. Ground-fault protective devices.
   h. Motor-starting characteristics and motor damage points.
   i. Generator short-circuit decrement curve and generator damage point.
   j. The largest feeder circuit breaker in each motor-control center and panelboard.
5. Series rating on equipment allows the application of two series interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Both devices share in the interruption of the fault and selectivity is sacrificed at high fault levels. Maintain selectivity for tripping currents caused by overloads.
6. Provide adequate time margins between device characteristics such that selective operation is achieved.
7. Comments and recommendations for system improvements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated are indicated on Drawings.
   1. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

3.2 PROTECTIVE DEVICE COORDINATION STUDY

A. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

B. Comply with IEEE 399 for general study procedures.

C. The study shall be based on the device characteristics supplied by device manufacturer.

D. The extent of the electrical power system to be studied is indicated on Drawings.

E. Begin analysis at the service, extending down to the system overcurrent protective devices as follows:
   1. To normal system low-voltage load buses where fault current is 10 kA or less.
   2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

F. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

G. Transformer Primary Overcurrent Protective Devices:
   1. Device shall not operate in response to the following:
      a. Inrush current when first energized.
      b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
      c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.
   2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

H. Motor Protection:
   1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.
   2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

I. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

J. Generator Protection: Select protection according to manufacturer's written recommendations and to IEEE 242.

K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors, and asynchronous generators and shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
   1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

L. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:
   1. Electric utility's supply termination point.
   2. Switchgear.
   3. Unit substation primary and secondary terminals.
   4. Low-voltage switchgear.
   5. Motor-control centers.
   6. Standby generators and automatic transfer switches.
   7. Branch circuit panelboards.

M. Protective Device Evaluation:
   1. Evaluate equipment and protective devices and compare to short-circuit ratings.
   2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3.3 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform a load-flow and voltage-drop study to determine the steady-state loading profile of the system. Analyze power system performance two times as follows:
   1. Determine load-flow and voltage drop based on full-load currents obtained in "Power System Data" Article.
   2. Determine load-flow and voltage drop based on 80 percent of the design capacity of the load buses.
   3. Prepare the load-flow and voltage-drop analysis and report to show power system components that are overloaded, or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.4 MOTOR-STARTING STUDY

A. Perform a motor-starting study to analyze the transient effect of the system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze the effects of the motor starting on the power system stability.

B. Prepare the motor-starting study report, noting light flicker for limits proposed by IEEE 141 and voltage sags so as not to affect the operation of other utilization equipment on the system supplying the motor.

3.5 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the overcurrent protective device study.
   1. Verify completeness of data supplied in the one-line diagram on Drawings. Call discrepancies to the attention of Engineer.
   2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
   3. For existing equipment, whether or not relocated obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers. The qualifications of technicians and engineers shall be qualified as defined by NFPA 70E.

B. Gather and tabulate the following input data to support coordination study. The list below is a guide. Comply with recommendations in IEEE 551 for the amount of detail required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
   1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
   2. Electrical power utility impedance at the service.
   3. Power sources and ties.
   4. Short-circuit current at each system bus, three phase and line-to-ground.
   5. Full-load current of all loads.
   6. Voltage level at each bus.
   7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
   8. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
   9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
   10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
   11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
   12. Maximum demands from service meters.
   13. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
   14. Motor horsepower and NEMA MG 1 code letter designation.
   15. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
   16. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.
   17.. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram, showing the following:

a. Special load considerations, including starting inrush currents and frequent starting and stopping.
b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
d. Generator thermal-damage curve.
e. Ratings, types, and settings of utility company's overcurrent protective devices.
f. Special overcurrent protective device settings or types stipulated by utility company.
g. Time-current-characteristic curves of devices indicated to be coordinated.
h. Manufacturer, frame size, interrupting rating in amperes rms symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
j. Panelboards, switchboards, motor-control center ampacity, and SCCR in amperes rms symmetrical.
k. Identify series-rated interrupting devices for a condition where the available fault current is greater than the interrupting rating of the downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

3.6 FIELD ADJUSTING

A. Adjust relay and protective device settings according to the recommended settings provided by the coordination study. Field adjustments shall be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.

B. Make minor modifications to equipment as required to accomplish compliance with short-circuit and protective device coordination studies.

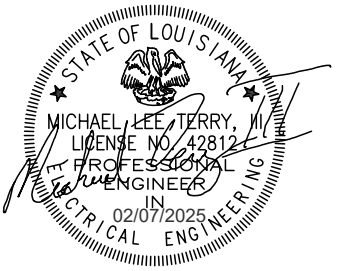
C. Testing and adjusting shall be by a full-time employee of the Field Adjusting Agency, who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters. Perform NETA tests and inspections for all adjustable overcurrent protective devices.

3.7 DEMONSTRATION

A. Engage the Coordination Study Specialist to train Owner's maintenance personnel in the following:

1. Acquaint personnel in the fundamentals of operating the power system in normal and emergency modes.
2. Hand-out and explain the objectives of the coordination study, study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpreting the time-current coordination curves.
3. Adjust, operate, and maintain overcurrent protective device settings.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 26 05 74 - OVERCURRENT PROTECTIVE DEVICE ARC-FLASH STUDY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes a computer-based, arc-flash study to determine the arc-flash hazard distance and the incident energy to which personnel could be exposed during work on or near electrical equipment.

1.3 DEFINITIONS

A. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

B. One-Line Diagram: A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

C. Protective Device: A device that senses when an abnormal current flow exists and then removes the affected portion from the system.

D. SCCR: Short-circuit current rating.

E. Service: The conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

1.4 ACTION SUBMITTALS

A. Product Data: For computer software program to be used for studies.

B. Other Action Submittals: Submit the following submittals after the approval of system protective devices submittals. Submittals shall be in digital form.
   1. Arc-flash study input data, including completed computer program input data sheets.
   2. Arc-flash study report; signed, dated, and sealed by a qualified professional engineer.
      a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Arc-Flash Study Specialist and Field Adjusting Agency.

B. Product Certificates: For arc-flash hazard analysis software, certifying compliance with IEEE 1584 and NFPA 70E.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance procedures according to requirements in NFPA 70E shall be provided in the equipment manuals.

B. Operation and Maintenance Procedures: In addition to items specified in Section 017823 "Operation and Maintenance Data," provide maintenance procedures for use by Owner's personnel that comply with requirements in NFPA 70E.

1.7 QUALITY ASSURANCE

A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

B. Arc-Flash Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
   1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.

C. Arc-Flash Study Specialist Qualifications: Professional engineer in charge of performing the study, analyzing the arc flash, and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.

D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1 COMPUTER SOFTWARE DEVELOPERS

A. Software Developers:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. SKM Systems Analysis, Inc.
      b. ETAP

B. Comply with IEEE 1584 and NFPA 70E.

C. Analytical features of device coordination study computer software program shall have the capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 399.

2.2 ARC-FLASH STUDY REPORT CONTENT

A. Executive summary.

B. Study descriptions, purpose, basis and scope.

C. One-line diagram, showing the following:
   1. Protective device designations and ampere ratings.
   2. Cable size and lengths.
   3. Transformer kilovolt ampere (kVA) and voltage ratings.
   4. Motor and generator designations and kVA ratings.
   5. Switchgear, switchboard, motor-control center and panelboard designations.

D. Study Input Data: As described in "Power System Data" Article.

E. Short-Circuit Study Output: As specified in "Short Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

F. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

G. Arc-Flash Study Output:
   1. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
      a. Voltage.
      b. Calculated symmetrical fault-current magnitude and angle.
      c. Fault-point X/R ratio.
      d. No AC Decrement (NACD) ratio.
      e. Equivalent impedance.
      f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
      g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis

H. Incident Energy and Flash Protection Boundary Calculations:
   1. Arcing fault magnitude with and without required Arc Energy Reduction methods.
   2. Protective device clearing time.
   3. Duration of arc.
   4. Arc-flash boundary.
   5. Working distance.
   6. Incident energy.

7. Hazard risk category.
8. Recommendations for arc-flash energy reduction.

I. Fault study input data, case descriptions, and fault-current calculations including a definition of terms and guide for interpretation of the computer printout.

2.3 ARC-FLASH WARNING LABELS

A. Comply with requirements in Section 260553 "Identification for Electrical Systems." Produce a 3.5-by-5-inch thermal transfer label of high-adhesion polyester for each work location included in the analysis.

B. The label shall have an orange header with the wording, "WARNING, ARC-FLASH HAZARD," and shall include the following information taken directly from the arc-flash hazard analysis:
1. Location designation.
2. Nominal voltage.
3. Flash protection boundary.
4. Hazard risk category.
5. Incident energy.
6. Working distance.
7. Engineering report number, revision number, and issue date.

C. Labels shall be machine printed, with no field-applied markings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine Project overcurrent protective device submittals. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.2 ARC-FLASH HAZARD ANALYSIS

A. Comply with NFPA 70E and its Annex D for hazard analysis study.

B. Preparatory Studies:
1. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 16402 "Overcurrent Protective Device Coordination Study."

C. Calculate maximum and minimum contributions of fault-current size.
1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.
2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

D. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

F. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

G. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:
   1. Fault contribution from induction motors should not be considered beyond three to five cycles.
   2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g., contributions from permanent magnet generators will typically decay from 10 per unit to three per unit after 10 cycles).

H. Arc-flash computation shall include both line and load side of a circuit breaker as follows:
   1. When the circuit breaker is in a separate enclosure.
   2. When the line terminals of the circuit breaker are separate from the work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.3 POWER SYSTEM DATA

A. Obtain all data necessary for the conduct of the arc-flash hazard analysis.
   1. Verify completeness of data supplied on the one-line diagram on Drawings and under "Preparatory Studies" Paragraph in "Arc-Flash Hazard Analysis" Article. Call discrepancies to the attention of Engineer.
   2. For new equipment, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
   3. For existing equipment, whether or not relocated, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers.

B. Electrical Survey Data: Gather and tabulate the following input data to support study. Comply with recommendations in IEEE 1584 and NFPA 70E as to the amount of detail that is required to be acquired in the field. Field data gathering shall be under the direct supervision and control of the engineer in charge of performing the study, and shall be by the engineer or its representative who holds NETA ETT Level III certification or NICET Electrical Power Testing Level III certification.
   1. Product Data for overcurrent protective devices specified in other Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams,

overcurrent protective device submittals, input and output data, and recommended device settings.

2. Obtain electrical power utility impedance at the service.
3. Power sources and ties.
4. Short-circuit current at each system bus, three phase and line-to-ground.
5. Full-load current of all loads.
6. Voltage level at each bus.
7. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in per cent, and phase shift.
8. For reactors, provide manufacturer and model designation, voltage rating and impedance.
9. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
10. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
11. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
12. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
13. Motor horsepower and NEMA MG 1 code letter designation.
14. Low-voltage cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).
15. Medium-voltage cable sizes, lengths, conductor material, and cable construction and metallic shield performance parameters.

3.4 LABELING

A. Apply one arc-flash label for 600-V ac, 480-V ac, and applicable 208-V ac panelboards and disconnects and for each of the following locations:
   1. Motor-control center.
   2. Low-voltage switchboard.
   3. Switchgear.
   4. Medium-voltage switch.
   5. Control panel.

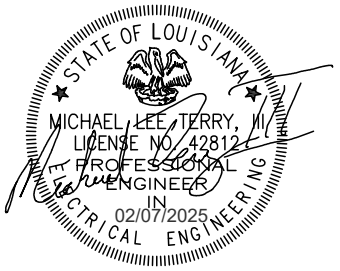
3.5 APPLICATION OF WARNING LABELS

A. Install the arc-fault warning labels under the direct supervision and control of the Arc-Flash Study Specialist.

3.6 DEMONSTRATION

A. Engage the Arc-Flash Study Specialist to train Owner's maintenance personnel in the potential arc-flash hazards associated with working on energized equipment and the significance of the arc-flash warning labels.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 26 20 00 - SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.1 SYSTEM VOLTAGE

A. The existing building service from the service entrance is rated 120/208V, 3 phase, 4 wire.

1.2 TERMINATIONS

A. All wiring shall be sized based on 75°C rated conductors. All connectors shall be rated for 75°C in accordance with N.E.C. Article 110-14 requirements.

PART 2 PRODUCTS

2.1 SAFETY SWITCHES

A. Furnish and install safety switches as shown on the Drawings. All switches shall be fused NEMA Heavy Duty Type HD and Underwriter's Laboratories listed. All switches shall have blades that are fully visible in the "OFF" position with the door open. Switches shall be dead-front construction with permanently attached arc suppressers. Lugs shall be UL listed for copper and aluminum conductor and front removable. All current carrying parts shall be plated to resist corrosion. Switches shall be quick-make, quick-break type. During operation of the switch, the movable contacts shall not be able to be restrained by the handle once the closing or the opening action of the contacts has been initiated. Switches shall have cover interlocks to prevent opening of the switch door while the switch is in the "ON" position or closing the switch with the door open. Switch shall have padlocking capabilities in the "OFF" position.

B. Safety switches shall be rated 600 volts for 480 volt service and rated 240 volts for 208 volt service. Switches shall be motor rated when used for motor loads. Switches shall be NEMA 1 enclosed for indoor applications and NEMA 3R for outdoor or wet area locations.

C. Switches used for service entrance shall be service entrance rated. Safety switches shall be furnished complete with fuses.

D. Safety switches shall be Square D Heavy Duty Class 3110 type, Eaton Heavy Duty type, or prior approved equal.

2.2 FUSES

A. All fuse holders shall be provided with dual-element, time-lag fuses as scheduled on the Drawings or as recommended by the equipment manufacturer. Fuses shall be rated 200,000 AIC. Fuses shall be Buss Fusetron, Economy Econ, or Gould Shawmut Tri-Onic for component protection and Buss Limitron, Economy Econolin, or Gould Shawmut Amp-Trap for circuit protection.

2.3 CIRCUIT BREAKER PANELBOARDS

A. Panelboards shall be sized as shown on the drawings and schedules, and shall be the bolted breaker panelboard type. Panelboards shall have copper bussing. Panelboards shall have door-in-door trim.

B. All branch breakers are to be quick-make, quick-break (over center toggle device) with trip indication and common trip on all multiple breakers. Trip indication shall be clearly shown by breaker handle taking a position between "ON" and "OFF" position. Breakers shall be ambient compensated to carry full NEC load in 120 degree F room temperature. Panelboards shall have distributed phase busing throughout. Any two adjacent single pole breakers shall be replaceable by a two pole breaker, and any three adjacent single pole breakers shall be replaceable by a three pole breaker.

C. Minimum interrupting capacity of breakers shall be as shown on panel schedules. No breakers shall be rated less than 10,000 RMS symmetrical amperes.

D. Branch breakers shall be numbered 1, 3, 5, etc. from top to bottom beginning at the top of the left hand column so that #1 shall be on phase A, #3 on phase B, and #5 on phase C.

E. All breakers shall be bolt on type. Panelboards for 120/208 volt or 120/240 volt service shall be Square D type NQ, Eaton Pow-R-Line series, or prior approved equal. Panelboards for 480/277 volt service shall be Square D type NEHB, Eaton Pow-R-Line series, or prior approved equal.

F. Replacement breakers to be installed in existing panels shall be fully compatible with the existing panel and shall be sized as shown on the Drawings. Breakers shall be bolt-on breaker type to match the existing breakers or plug-on breaker type if plug-on breakers are utilized in panel. If both bolt-on and plug-on breakers exist in the panel, bolt-on breakers shall be installed.

PART 3 EXECUTION

3.1 COORDINATION

A. Contractor shall coordinate all service and distribution work with other crafts on the project.

3.2 TEST AND BALANCING

A. At such times as the Architect directs, the Contractor shall conduct in the Architect's presence operating tests to demonstrate the electrical systems are installed and will operate properly and in accordance with the requirements of the specifications. The Contractor shall furnish instruments and personnel required for such tests. Any work that is found to be defective, or material that are found to vary from the requirements of the drawings or specifications shall be replaced by the Contractor without additional cost of the Owner.

3.3 EQUIPMENT FUSING

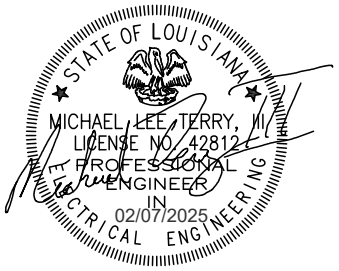
A. All equipment shall be furnished complete with fuses as described herein and/or as shown on the Drawings. Contractor shall furnish one set of spare fuses for each size fuse furnished on the project. Fuses shall be delivered to Owner prior to acceptance of project.

B. Fusing for protective equipment shall be of the type specifically designed for the intended application. Fuses for service entrance rated equipment shall be Class L. Fuses for branch circuit protection shall be Class RK5 unless specified otherwise. Provide protective fuses as specifically required by the equipment manufacturer.

3.5 INSTALLATION

A. Disconnecting means shall be provided for each motor and motor controller, and shall be located within site from the controller and motor locations in accordance with National Electrical Code Article 430.102 requirements.

END OF SECTION



DIVISION 26 - ELECTRICAL
SECTION 26 50 00 - LIGHTING

PART 1 GENERAL

1.1 LIGHTING SCHEDULE

A. The Contractor shall install lighting fixtures and accessories as shown on the drawings and/or described herein. The Contractor shall also install lamps for all fixtures.

PART 2 PRODUCTS

2.1 LED LIGHTING

A. Lighting fixtures with LED light sources shall meet the following fixture and light source requirements:
   1. LED Color Temperature – Cool White (CW), 4000K nom., CRI > 70
   2. Line Voltage – Universal Voltage 120-277 volts
   3. Governmental Standards – LM79 and LM80 Compliant
   4. Expected Lamp Life – LED Life Rating (L_{70} B_{10}) to be 60,000 hours to 100,000 hours; Defined as time of operation (in hours) to 30% lumen depreciation (i.e. 70% lumen maintenance), derived from Luminaire in-situ temperature measurement testing (i.e. LED chip package temperature (T_S) measurement obtained with the LED chip package operating in given luminaire and in a given stabilized ambient environment) under UL1598 environments and directly correlated to LED package manufacturers IESNA LM-80-08 data. Predicted (L_{70} B_{10}) Limits (@ 25°C luminaire ambient operating environment): Greater than 60,000 hours @ 350mA Drive Current
   5. Driver – Components must be fully encased in potting material for moisture resistance, and must comply with IEC and FCC standards
   6. Surge Protection – Surge protection must be provided including separate sure protection built into electronic driver
   7. Mechanical – Luminaire LED system components to be low copper aluminum, with high performance heat sink(s) designed specifically for LED luminaires. No active cooling features (Fans, etc.). Luminaire configuration must allow for modular upgradability and/or field repair of all electrical components (i.e. LED modules, Driver(s), etc.). Drivers and vertical light bars must be all mounted to a twist-lock tool-less assembly for ease of installation and trouble- shooting.

2.3 FIXTURES

A. Fixtures as described in the Fixture Schedule on the drawings shall be furnished by the Contractor and shall be properly installed.

PART 3 EXECUTION

3.1 INSTALLATION

A. Unless otherwise specified, lighting fixtures shall be permanently installed and connected to the wiring system.

B. The Contractor shall support each fixture, independently from the building structure. Ceiling framing members shall not be used to support fixtures except in specified areas where ceiling supports for this purpose have been specified elsewhere in these specifications. Each fixture shall have at least two fixture supports.

C. Flexible conduit used for fixture whips shall be at least twelve (12) inches, but not more than 48 inches long.

3.2 CEILING COMPATIBILITY

A. Catalog numbers shown on the drawings or descriptions of lighting fixtures contained herein may indicate fixture compatibility with certain types of ceiling construction. Contractor shall determine exact type of ceiling actually to be furnished in each area and shall obtain fixtures to suit, deviation from specified catalogue numbers or descriptions only where necessary and only to the extent necessary to insure fixture/ceiling compatibility.

3.3 LIGHT LEAKS

A. The Contractor shall, at the end of this project, adjust all recessed lighting fixtures so that there will be no light leaks between the fixture trim and the ceiling. Contractor shall also adjust recessed fluorescent fixtures to eliminate any light leaks between fixture trim and ceiling grid member.

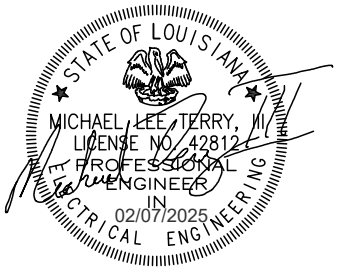
3.4 LAMPS

A. The Contractor shall install lamps in all fixtures and shall obtain replacement lamps should any not properly operate or become damaged during construction.

3.5 EXIT FIXTURES

A. Exit fixtures shall be installed according to Life Safety Code requirements, with face(s) plainly visible and directional arrows indicating the proper direction of egress.

END OF SECTION



DIVISION 27 - COMMUNICATIONS
SECTION 27 30 00 - VOICE/DATA COMMUNICATIONS

PART 1 GENERAL

1.1 SCOPE OF WORK FOR COMMUNICATIONS SYSTEM

A. The Contractor shall furnish labor, materials, and equipment required for the installation of a communication system infrastructure to provide the maximum performance for the system components and subsystems as shown on the Drawings.

1.2 STRUCTURED SYSTEM

A. The infrastructure requires a structured cabling system from general cable forming a channel solution. A channel solution is defined as: The end-to-end transmission path, using a single vendor solution, connecting any two pieces of application-specific equipment. Equipment cables and work area cables are included in the channel. Fiber jumpers and/or data patch cords of appropriate length will be provided for all data drops, switches, and patch panels.

B. The Certified Structured Connectivity Solutions should have as a minimum:
   1. Category 6 for Data and Category 6 for voice wire.
   2. A twenty-year written warranty on material and workmanship.
   3. Work shall be inspected and approved at least two times by the wiring manufacturer' representative - (at rough-in and at final inspection).
   4. All telephone and data wiring work is to be performed by a qualified telecommunications contractor regularly employed in this field. The contracting company performing the telecommunications and data work must have been continuously in the telecommunications business for at least the past five consecutive years.

1.3 QUALITY ASSURANCE

A. All work and equipment shall conform to the appropriate portions of the following specifications, codes and regulations:
   1. Building Industry Consulting Services International (BICSI)
   2. Telecommunications Distribution Methods Manual
   3. ANSI/TIA/EIA Standards:
      a. ANSI/TIA/EIA- 568-B.1- Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.
      b. ANSI/TIA/EIA -568-B.2 - Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components.
      c. ANSI/TIA/EIA - 568-B.3 - Optical Fiber Cabling Components Standards
      d. ANSI/TIA/EIA - 569A- Commercial Building Standard for Telecommunications Pathways and Spaces
      e. ANSI/TIA/EIA - 606 (A) - The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
      f. ANSI/TIA/EIA - 607 (A) - Commercial Building Grounding and Bonding Requirements for Telecommunications

g. ANSI/TIA/EIA - 526-7 -- Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.
h. ANSI/TIA/EIA-526-14A -- Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant.
i. ANSI/TIA/EIA-758(A) -- Customer-Owned Outside Plant Telecommunications Cabling Standard.

4. National Electric Safety Code (NESC)
5. National Fire Protection Agency (NFPA)
6. National Electrical Code (NEC)
7. Any Applicable State and Local Codes.

B. If conflict exists between applicable documents, then the more stringent requirement shall apply.

C. Maintenance Considerations - The cable and wire system shall be installed to maximize the safety, maintainability, and performance effectiveness of maintenance personnel and minimize the demands upon skills, training, and manpower. Splices/terminations shall be placed and supported with convenient accessibility so as to maximize the efficiency and ease with which it can be maintained. No cables shall be spliced unless as shown on plans or approved by Engineer.

1.5 SHOP DRAWINGS

A. Shop drawings shall be submitted for approval and shall include complete catalog and other information shown to describe the cables, wire, and equipment proposed.

PART 2 PRODUCTS

2.1 DATA STATION CABLES

A. Data station wiring shall be Category 6 (Cat 6) communications wire and cable. Station Cable shall be four-pair, unshielded, twisted pair, inside-station cable, and shall be constructed of solid 24 gauge annealed copper. Each conductor shall be insulated with a continuous layer of fluorinated ethylene propylene (FEP). The sheath shall be all weather, flame resistant, polyvinyl chloride. Station wire shall be constructed of 4 twisted pair sharing one sheath. Cable shall have Category 6 transmission characteristics as specified by ANSI/EIA/TIA-568-B2.1.

B. Cables routed in air plenum shall have a sheath and conductor insulation constructed of material so as to be classified as type CMP as defined by the NEC 800-3(b)(3).

C. Data cable shall be BLUE.

D. Data cabling shall be:
1. General Cable GENSPEED 6500 series, or approved equal

2.2 COMMUNICATIONS OUTLETS

A. Voice and data outlets shall be a modular data communication unit. Wall mounted outlets

shall be flush mounted in a double gang utility box and covered with a single gang data device plates. Complete outlet shall consist of utility box, communication assembly devices, cover plate, and jack inserts. All data outlet inserts shall be eight (8) position/eight (8) conductor, insulation displacement, open system to multi-vendor, EIA/TIA 568-B2.1, Category 6.

B. Outlet shall be furnished with 8-position, Category 6 compliant, RJ-45 modular, gig jacks. Each outlet shall consist of voice or data jack as shown on the Drawings.

C. Cover plates shall be brushed stainless steel, and shall be jumbo size.

D. Outlets shall consist of the following items:
   1. Double gang outlet box.
   2. Plastic cover plate; Electrical Ivory color.
   3. Voice and data jack inserts, category 6 compliant: Panduit CJ688TG or approved equal.

E. Each new jack shall be color-coded. Dual jack outlets shall have the top-most, or left-most, jack colored blue and the bottom-most, or right most, jack colored red. Quad jack outlets shall have the top-left-most jack colored blue, the top-right-most jack colored red, the bottom-left-most jack colored green, and the bottom-right-most jack colored EI. LABELING REQUIRED.

2.3 CROSS-CONNECT WIRE

A. Cross-connect wire, patch cables, and fiber jumpers shall be furnished and installed by Contractor. Cross-connect and patch cables must be factory certified Category 6 for voice and data wiring. The fiber jumper shall be a duplex, buffered, graded-index fiber, 50/125/900 micron, kevlar yarn over each fiber cladding, and a flame-retardant PVC jacket.

2.4 PATCH CORDS

A. Patch cords shall be provided for each data run indicated on plans. Furnish additional patch cords equal to five percent of the quantity shown. Provide cords of appropriate lengths. For wiring closets provide 5 foot patch cords, and for work station locations patch cords shall be half 10 foot and half 15 foot, appropriate for the wiring solution provided. Patch cords to be installed and dressed from wiring closet to switch. Patch cord color BLUE.

2.5 BUILDING PROTECTORS

A. Building protectors shall be 188 Type building cable entrance surge protection terminals that protect personnel and equipment from outside plant cable pairs terminating inside the buildings on the main distribution frames. The 188 Type Protector shall be a combination protector and terminating field with output through a 110 Type Connecting Block. The protectors shall be modular plug-in type, with 110-in/110-out connectivity and grounding lugs as manufactured by AT&T, NTI/Cook, or approved equal.

B. Protector modules shall be plug-in type surge protector modules compatible with modular building protector terminals. The modules shall be gas tube type for the station/BMDF end and gas tube type with sneak current protection for the PBX/MDF end. The modules shall have three (3) element protection, be rated for nominal 400V breakdown, and be color coded black for standard service, and shall be as manufactured by AT&T, NTI/Cook, or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Unless otherwise specified, all communications systems shall be permanently installed and connected to the wiring system. The systems must be installed according to manufacturer standards and recommendations.

B. The Contractor shall meet with the Engineer, wiring system subcontractor, wiring solution representative and the detention center's technology services representative to review wiring paths. This meeting shall also be used to coordinate the voice/data system installation with the Owner's ordering of electronic equipment required for the facility. This meeting shall also be used to prevent problems with the data wiring during installation.

C. Test results and as-built documents will be provided to the Owner's Technical Services office in both hard copy and electronic copy, furnished on a CD.

D. Wiring map/as built documents showing voice and data outlets, device numbers, room locations, and termination locations will be displayed in each wiring closet.

E. Wireless drop wiring shall be punched down on a separate punch down block at the end of the data punch down blocks. The wireless punch down block shall be a different color.

F. All fiber runs must be home run with no splices.

G. Voice and data wiring routed above accessible ceilings shall be supported on J-hooks, and shall be loose bundled using Velcro wraps.

H. Voice and data wire bundles shall not include power wiring or wiring for other low voltage systems (fire alarm, intercom, security, etc.).

I. Cabling installed in underground or under slab conduits shall be suitable for the environment installed and shall be compliant with the structured connectivity solution.

3.2 DATA SYSTEM GENERAL REQUIREMENTS

A. All cables, wires, and equipment shall be securely and neatly installed. Inside routing shall be installed parallel and perpendicular to existing structural lines and members.

B. Each station wire shall be plainly marked at its backboard end with the room number to which it is connected, and terminated on the termination blocks or patch panel.

C. Data cables shall be routed above ceilings, with cables neatly bundled. Cables must not be tie-wrapped. No more than 30 cables shall be bundled.

D. Contractor shall maintain recommended Category 5e/Category 6e bending radius, pulling tension, and cable support requirements. Cables ties may be finger tight, however, not so tight so they distort the outer jacket of the cable.

E. Cable suspended above an open ceiling shall not rest on ceiling tiles or lighting fixtures, and shall be supported from roof structure at 4' to 6' intervals.

F. Data system wiring shall be installed in accordance with NEC Article 800-5 and 6 requirements, and wiring solution requirements.

3.3 COMMUNICATIONS SYSTEM QUALIFICATIONS

A. The communications system installer shall be experienced in the design, fabrication and installation of communications premise distribution systems of similar size and scope to this project. Installation technicians shall be manufacturer certified.

B. The Communications Contractor must have installation and service facilities within a 100-mile radius of the project site. All qualifications, including the firm's facilities shall be available for inspection by any school board official.

3.4 CABLE/WIRE IDENTIFICATION

A. Each cable shall be clearly labeled and identified in accordance with the following:
   1. Each cable pair shall be plainly marked at the backboard end on terminal blocks with printed labels. Handwrite labels shall not be permitted.
   2. All outlets shall be permanently marked or labeled with printed type labels on the jack faceplate -- ID number, voice, data.
   3. All cables shall be legibly and permanently numbered at each end using wrap-around/stick-on label systems or approved equal.
   4. In rooms where more than one jack exists, the jacks shall be numbered sequentially using alpha-numeric numbers.
      Labeling in Room/Classroom shall contain:
      a. The room number of wiring closet that drop is terminated.
      b. The drop number. This number should be consecutive numbers by room, by wiring closet. Example: Room 203 with data drops 73 through 75, and voice 2 and 3 all terminated in wiring closet 117. The label in Room 203 would look like:
         R17 – D73-75 (data)
         R17 – V2 & 3 (voice)
   5. Labeling in wiring closet shall contain:
      a. The room number of the room the drop is in.
      b. The drop number. This number should be the numbers by room and by wiring closet. Example: Room 203 would have data drops 73 through 75 and voice 2 and 3 all terminated in wiring closet 17. The label in wiring closet 17 would look like:
         R203 – D73-75 (data)

R203 – V2 & 3 (voice)

c. Drop numbering shall start with 1 and continue through 999 by wiring closet.

d. Layout or wire on punch down block shall be by room number. Drop numbering shall start with 1 and continue through 999 by wiring closet.

6. All conduits, except those used for individual station jacks, shall be clearly and permanently marked or labeled at both ends, indicating the location of the other end of the conduit.

B. All cable and wiring identification shall be in compliance with ANSI/TIA/EIA 606 Structured Cabling Systems standards.

3.5 DOCUMENTATION AND TESTING

A. Upon completion of construction, the Contractor shall provide "as installed" drawings showing the exact placement of all outlets, cables, conduits and connecting hardware called for in this section. This shall be given in CD form and hard copy form to the owner.

B. Data wiring shall be tested upon completion of installation. Data cables shall contain no defective pairs nor near fails and shall be tested in accordance with Channel Solution standard per TIA/EIA 568-B.

C. The test procedures shall demonstrate, at a minimum:

1. Continuity of each conductor from end-to-end -- open test.
2. Shorted conductors with other conductors -- short test.
3. Proper polarity of paired conductors from end-to-end -- reverse test (for correct tip & ring and data terminations).
4. Proper termination of wire pairs from end-to-end -- cross test (for splits and other wrong terminations).
5. Proper ground and shield bonding (for shielded cables only) -- effective ground test (for zero potential difference bonding).
6. Grounded conductors (for all cables) -- ground fault test.
7. Detection of AC or DC power on any conductor -- power fault test.
8. All data cables shall be tested per EIA/TIA 568-B2.1 Level III requirements.

D. Prior to testing of any communications cable/wire and hardware, the Contractor shall notify the Architect and Engineer, in writing, at least two (2) weeks in advance of testing. Contractor shall furnish hard copy of all test reports to the Architect for approval prior to completion and final acceptance of project.

E. The data system shall be warranted and category 6 compliance certified from the data outlet to the patch panel, and shall be channel certified.

3.6 BONDING AND GROUNDING

A. Grounding and bonding of the communications system shall be in strict accordance with TIA 607, National Electrical Code, and NFPA requirements. Grounding and bonding shown on the drawings represent a minimum requirement.

B. All communications equipment racks that are installed or labeled or in anyway a part of this contract, shall be grounded, isolated from other grounds. The protective ground connection point shall NOT be made to electrical conduits, power distribution box grounds or neutral busses. The intent is to provide telecommunications equipment with a ground which will not be affected by any other electrical work. The ground shall be a #6 AWG solid copper conductor, green insulated ground wire which shall be grounded to the building ground or to contractor installed ground 3/4"/8', following NEC Codes.

3.7 WALK THROUGH, PUNCH LIST, DOCUMENTATION AND TESTING

A. Before completion of the job it is the responsibility of the Contractor to request a walk through inspection by Network Administrator. A Punch list will be created and agreed upon. Upon completion of punch list items it is the responsibility of the Contractor to request a Final Inspection.

B. Upon completion of installation, the contractor shall provide a copy of "as installed" drawings showing the number of cables terminated in each room, and the location of patch panel those cables are connected to.

C. Data wiring shall be tested upon completion of installation. A hard copy of the cable test results shall be provided with the "as installed" drawings upon completion of installation.

D. Testing shall be in accordance with the following standards:
ASTM D 4566-98 Standard Test Method for Electrical Performance Properties of Insulation and Jackets for Telecommunications Wire and Cable, 1998
ANSI/TIA/EIA-568-B.2 Commercial Building Telecommunication Cabling Standard, Part 2: Balance Twisted-Pair Cabling Components, 2000.

E. Data cables shall contain no defective pairs.

F. The test procedures shall demonstrate, at a minimum, that all data cables shall be tested per to the most recent proposed EIA/TIA CAT 6 standard

G. Each fiber optic cable shall be tested after installation by the contractor for optical power attenuation. Each LC cable termination may/shall have a maximum of 0.5dB loss, and a total loss of the cable shall be a maximum of 1.0 dB.

H. The Network Specialist will be given the "as installed" drawings, test results and approve final walk through before final payment will be made.

END OF SECTION