

SEQUENCE OF OPERATION:
SUPPLY FAN OPERATION SHALL BE CONTROLLED BY THE FMCS THROUGH A CONTACTOR.

SUPPLY FAN AND CONTROL VALVE OPERATION:
THE FMCS WILL MODULATE THE SUPPLY FAN, COOLING CONTROL VALVE, AND HEATING CONTROL VALVE TO MAINTAIN ROOM TEMPERATURE OF 72°F (ADJ.) WITH 5°F (ADJ.) DEAD BAND BASED ON A SIGNAL FROM A WALL MOUNTED TEMPERATURE SENSOR. SEE DRAWINGS FOR TEMPERATURE SENSOR REQUIREMENTS. SPACES WITH ADJUSTABLE THERMOSTATS WILL ALLOW A +/- 3°F (ADJ.) OFFSET FROM THE SETPOINT.

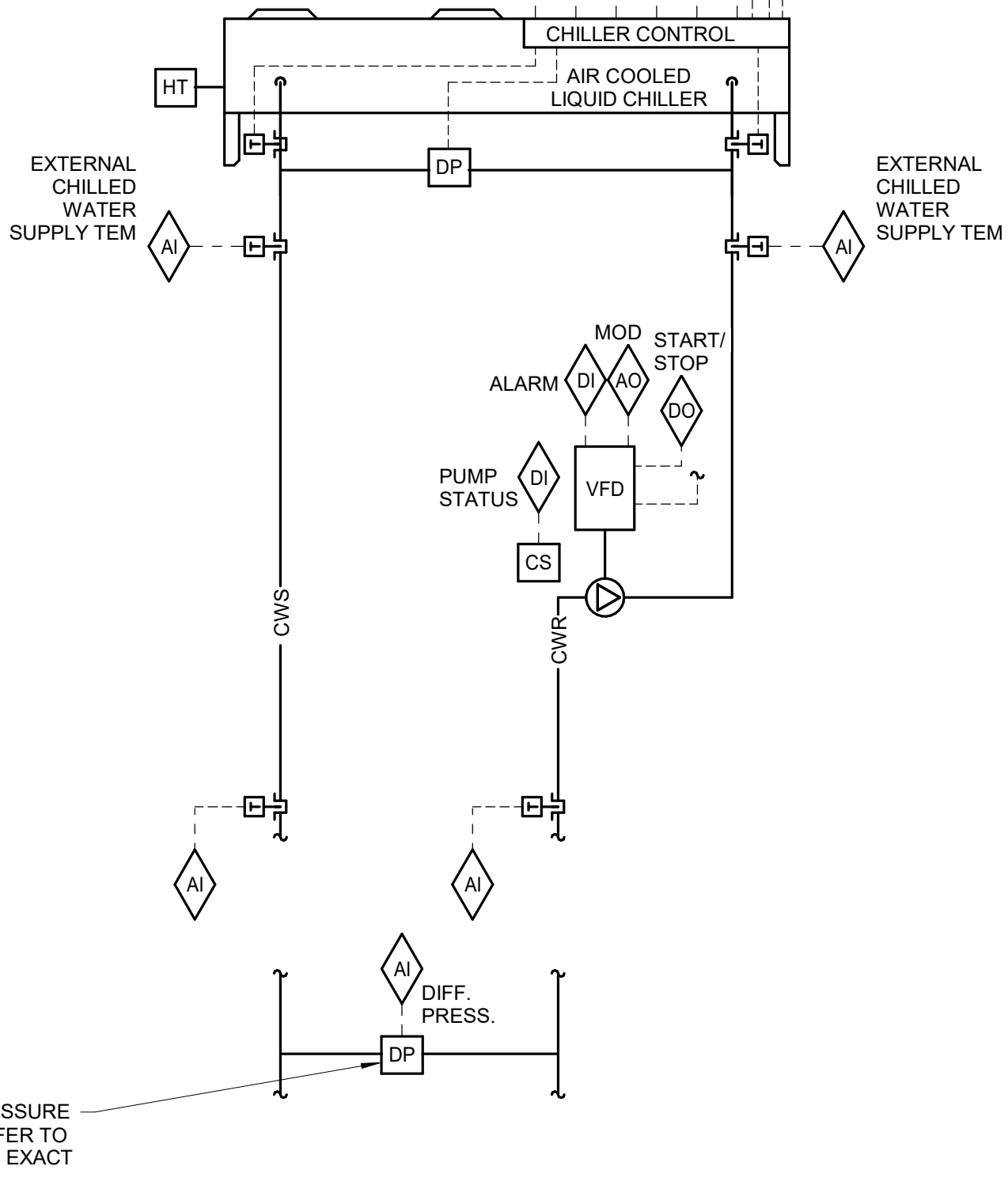
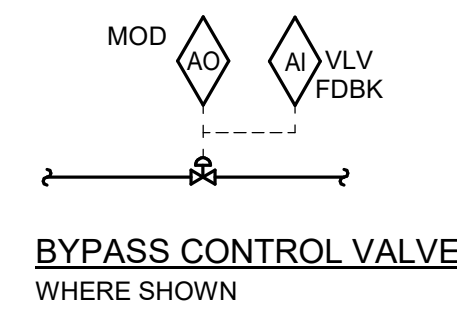
- AT A FULL COOLING, THE SUPPLY FAN IS AT MAXIMUM COOLING CFM SPEED AND THE COOLING CONTROL VALVE SHALL BE OPEN TO MAINTAIN 55°F (ADJ.) DISCHARGE AIR TEMPERATURE.
- AS THE ROOM AIR TEMPERATURE FALLS, THE SUPPLY FAN SHALL RAMP DOWN TO MAINTAIN ROOM TEMPERATURE SET POINT WHILE MAINTAINING A 55°F (ADJ.) DISCHARGE AIR TEMPERATURE SET POINT.
- ON A FURTHER FALL IN ROOM TEMPERATURE, THE SUPPLY FAN WILL REMAIN AT MINIMUM SPEED AND THE COOLING CONTROL VALVE SHALL MODULATE TO MAINTAIN ROOM AIR TEMPERATURE SET POINT. WHEN THE SUPPLY FAN IS AT MINIMUM SPEED THE AHU DISCHARGE AIR TEMPERATURE SHALL NOT CONTROL THE COOLING CONTROL VALVE.
- ON A FURTHER REDUCTION IN ROOM TEMPERATURE, THE HEATING CONTROL VALVE SHALL MODULATE OPEN TO MAINTAIN ROOM AIR TEMPERATURE SET POINT. THE DISCHARGE AIR TEMPERATURE SHALL NOT RISE ABOVE 95°F AS THE HEATING CONTROL VALVE OPENS. THE SUPPLY FAN SHALL REMAIN AT MINIMUM HEATING CFM.
- ONCE THE HEATING CONTROL VALVE IS MAINTAINING 95°F DISCHARGE AIR, THE SUPPLY FAN SPEED SHALL RAMP UP TO MAXIMUM HEATING SPEED TO MAINTAIN ROOM AIR TEMPERATURE SET POINT.

DEHUMIDIFICATION CONTROL:
RETURN AIR HUMIDITY SENSOR SHALL OVERRIDE HEATING COIL CONTROL VALVE INCREMENTALLY OPEN AT (5%) STEPS COMPARED TO NORMAL SPACE TEMPERATURE CONTROL. IF THE SPACE HUMIDITY SENSOR EXCEEDS 60% RH (ADJ.), IF SPACE HUMIDITY SENSOR IS BELOW 55% RH (ADJ.) DEHUMIDIFICATION SEQUENCE SHALL BE DISABLED.

BYPASS VALVE CONTROL (WHERE SHOWN):
THE MINIMUM FLOW BYPASS CONTROL VALVE SHALL MODULATE OPEN PROPORTIONATELY AS THE ASSOCIATED COIL CONTROL VALVE CLOSES.

ALARMS, INTERLOCKS & SAFETIES:
WHEN THE FIRE ALARM CONTROL PANEL INDICATES AN ALARM CONDITION, AHU SHALL SHUTDOWN.
A FLOAT SWITCH MOUNTED IN THE SECONDARY DRAIN PAN SHALL CLOSE THE CHILLED WATER VALVE AND PREVENT SUPPLY FAN OPERATION UPON DETECTION OF WATER AND SHALL INDICATE AN ALARM TO THE OPERATOR WORKSTATION.
FMCS SHALL INDICATE AN ALARM TO THE FMCS OPERATOR WORKSTATION IF THE FMCS COMMANDS ANY SUPPLY FAN TO OPERATE AND THE FAN CURRENT RELAY DETECTS INSUFFICIENT CURRENT FLOW.
WHENEVER AHU IS SHUTDOWN THE FOLLOWING SHALL OCCUR:
HEATING AND CHILLED WATER CONTROL VALVES SHALL CLOSE.
SUPPLY FAN SHALL BE DE-ENERGIZED.

- PUMP REQUIRED (DIGITAL)
- CHILLER STATUS (DIGITAL)
- GENERAL ALARM (DIGITAL)
- CHILLER START/STOP (DIGITAL)
- CHILLED WATER SET POINT/RESET [°F] (ANALOG)
- CHILLER DP [°W.C.] (ANALOG)
- CHILLED WATER SUPPLY TEMP [°F] (ANALOG)
- CHILLED WATER RETURN TEMP [°F] (ANALOG)
- HEAT TRACING (HT) START/STOP (DIGITAL)



CHILLER PLANT REPORT GENERATION:
FMCS SHALL MONITOR THE FOLLOWING POINTS ON 10 MINUTE (ADJ.) INTERVALS WITHIN A SINGLE TREND. THE TREND SHALL RUN FOR A 100-DAY (ADJ.) DURATION AT WHICH POINT THE NEWEST VALUES SHALL OVERWRITE THE OLDEST VALUES:

- DATE
- TIME
- GLOBAL OUTSIDE AIR TEMPERATURE [°F]
- GLOBAL OUTSIDE AIR DEWPOINT [°F]
- AVERAGE CHILLED WATER SUPPLY TEMPERATURE [°F]
- AVERAGE CHILLED WATER RETURN TEMPERATURE [°F]
- TOTAL CHILLED WATER FLOWRATE [GPM]
- TOTAL CHILLED WATER SYSTEM LOAD [TONS]
- CURRENT DRAW FROM CHILLER [AMPS]

THIS INFORMATION SHALL BE ACCESSIBLE TO VIEW IN EITHER TABULAR OR GRAPHICAL FORM ON THE FMCS OPERATOR WORKSTATION.

ONCE PER MONTH, THE FMCS SHALL RECORD THE LARGEST CHILLED WATER SYSTEM LOAD (IN TONS) WHICH OCCURRED DURING THAT MONTH. THE DATE, TIME, OUTSIDE AIR TEMPERATURE, OUTSIDE AIR DEWPOINT, CHILLED WATER SUPPLY & RETURN TEMPERATURE AND CHILLED WATER FLOWRATE THAT COINCIDED WITH THAT EVENT SHALL ALSO BE RECORDED. THIS INFORMATION SHALL BE STORED TO A MEMORY LOCATION ON THE FMCS OPERATOR WORKSTATION THAT IS MAINTAINED (NOT AUTOMATICALLY OVERWRITTEN).

CHILLER PLANT REPORT GENERATION

SEQUENCE OF OPERATION
THE CHILLER MANUFACTURER SHALL PROVIDE A FACTORY MOUNTED CHILLER CONTROL PANEL. ALL AVAILABLE DATA PROVIDED/MONITORED BY THE CHILLER CONTROL PANEL SHALL BE AVAILABLE TO AND MONITORED BY THE FMCS SYSTEM.

CHILLER OPERATION SHALL BE CONTROLLED BY THE CHILLER CONTROL PANEL AND SHALL BE ENABLED WHEN THE OUTSIDE AIR TEMPERATURE RISES ABOVE 50°F (ADJ.) FOR 15 MINUTES (ADJ.). WHEN OUTSIDE AIR TEMPERATURE DROPS BELOW 48°F (ADJ.) FOR 15 MINUTES (ADJ.) CHILLER OPERATION SHALL BE DISABLED. CHILLER SHALL NOT OPERATE UNTIL A CHILLED WATER VALVE IN THE SYSTEM HAS A CALL FOR COOLING AND BEGINS TO OPEN. ONCE VALVE STARTS TO OPEN THE FMCS SHALL ENERGIZE THE LEAD PUMP.

CHILLER STARTING:
WHEN THE FMCS INDEXES A CHILLER TO RUN THE FOLLOWING SHALL OCCUR:

- THE FMCS SHALL TURN ON THE CHILLED WATER PUMP.
- UPON PROOF OF FLOW IN THE EVAPORATOR BARREL THE CHILLER CONTROL PANEL SHALL INDEX CHILLER TO START.
- CHILLER SHALL START AFTER ALL INTERNAL SAFETIES ARE SATISFIED AND SHALL MAINTAIN CHILLED WATER SUPPLY TEMPERATURE OF 42°F (ADJ.) VIA INTERNAL CONTROLS.

CHILLER STOPPING:
WHEN THE FMCS INDEXES THE CHILLER TO STOP THE FOLLOWING SHALL OCCUR:

- THE CHILLER CONTROL PANEL SHALL INDEX CHILLER TO STOP.
- THE CHILLER CONTROL PANEL SHALL SEND A SIGNAL TO THE FMCS TO SHUTDOWN THE CHILLED WATER PUMP.

CHILLED WATER PUMP CONTROL:
THE FMCS SHALL MODULATE OUTPUT TO THE PUMP VFD AS REQUIRED TO MAINTAIN DP SETPOINT AT THE LOCATION OF THE DP TRANSMITTER. DP TRANSMITTER SIGNAL SHALL BE WIRED DIRECTLY TO THE CONTROLLER SERVING PUMP VFD (SIGNAL SHALL NOT BE TRANSMITTED ACROSS THE FMCS NETWORK). FMCS SHALL RESET THE DP SETPOINT UNTIL ONE MODULATING CONTROL VALVE IS 95% OPEN AS DETERMINED BY THE VALVE FEEDBACK. IN NO CASE SHALL DP SETPOINT EXCEED 10 PSID (ADJ.) OR DROP BELOW 2 PSID (ADJ.).

FREEZE PROTECTION:
WHEN THE OUTSIDE AIR TEMPERATURE DROPS BELOW 34°F (ADJ.) THE MINIMUM FLOW BYPASS CONTROL VALVES SHALL BE OPENED AND THE CHILLED WATER PUMP SHALL BE STARTED IF NOT ALREADY RUNNING. WHEN OUTSIDE AIR TEMPERATURE IS ABOVE 36°F (ADJ.) THE CHILLED WATER SYSTEM SHALL RETURN TO NORMAL OPERATION.

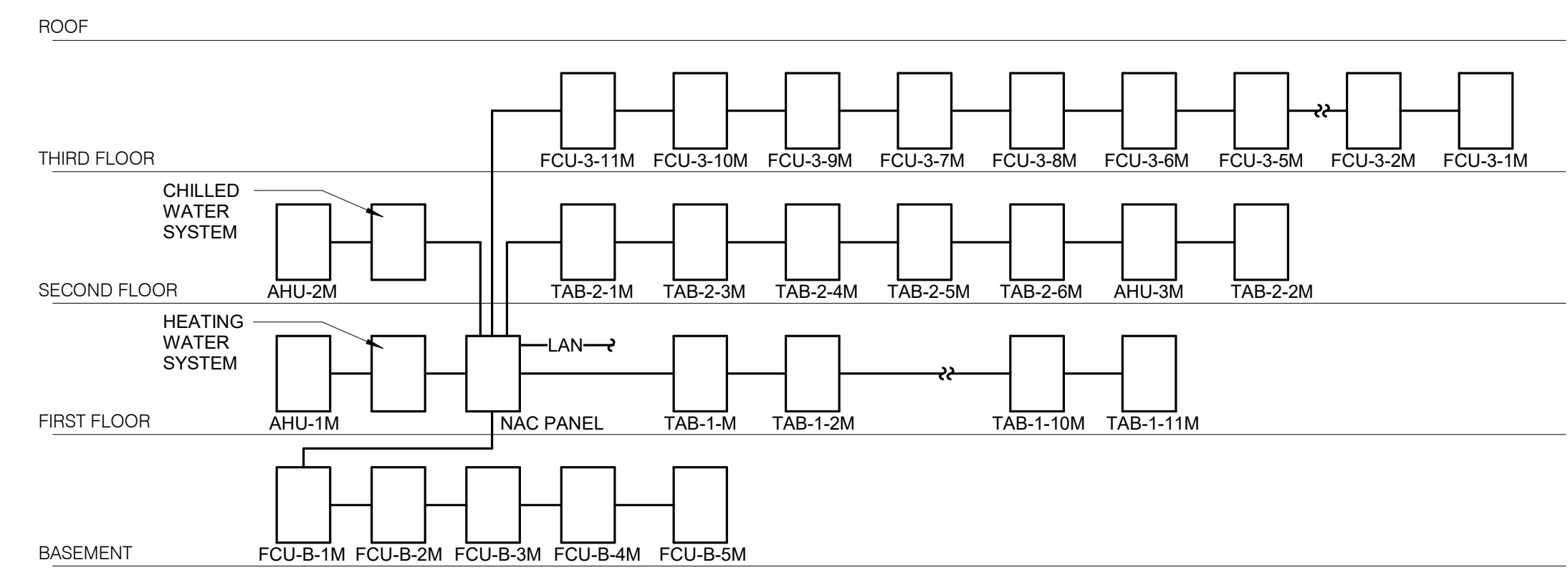
CHILLER SAFETIES:
CONTRACTOR SHALL COORDINATE ALL SAFETY AND INTERLOCK REQUIREMENTS WITH CHILLER MANUFACTURER. TCC SHALL PROVIDE THE INSTALLATION AND WIRING OF CHILLED WATER FLOW SWITCHES, AND OTHER COMPONENTS PROVIDED WITH CHILLER AS REQUIRED FOR PROPER OPERATION.

ALARMS, INTERLOCKS AND SAFETIES:
AN ALARM SHALL BE INDICATED AT THE FMCS WHEN THE FOLLOWING OCCUR:

- AN ALARM IS INDICATED AT THE CHILLER CONTROL PANEL.
- IF CHILLED WATER SUPPLY TEMPERATURE IS MORE THAN 5°F (ADJ.) ABOVE OR BELOW SETPOINT FOR MORE THAN 10 MINUTES (ADJ.).
- SHOULD THE FMCS COMMAND THE PUMP TO OPERATE AND THE PUMP FAILS TO DO SO AS DETERMINED BY THE VFD STATUS, AN ALARM SHALL BE INDICATED AT THE FMCS OPERATOR WORKSTATION AND THE FMCS SHALL START THE LAG PUMP.
- AN ALARM CONDITION OCCURS AT ANY VFD.
- IF SYSTEM DIFFERENTIAL PRESSURE IS NOT MAINTAINED FOR MORE THAN 15 MINUTES (ADJ.).
- AN ALARM IS INDICATED IF THE HEAT TRACE SYSTEM FAILS. THE LEAD CHILLED WATER PUMP SHALL RUN IF HEAT TRACE FAILS, FAULTS, OR GOES INTO ALARM.

1 FAN COIL UNIT CONTROL - FCU-A (HYDRONIC COOLING & HEATING)

NO SCALE



3 NETWORK ARCHITECTURE RISER DIAGRAM

NO SCALE

A/E FIRMS PRIME/ARCH: STRATA ARCHITECTURE 1703 OAK STREET, SUITE 100 KANSAS CITY, MO T: 816.474.0900	DESIGNED:	SUB SHEET NO. 01 ME8.0	TITLE OF SHEET MAURICE BATHHOUSE TEMPERATURE CONTROLS	DRAWING NO. 626 180065
	CADD:			PMIS/PKG NO. 318674
MEP/ENG: IMEG CORP. 1400 BALTIMORE STREET, SUITE 300 KANSAS CITY, MO T: 816.842.8437	TECH. REVIEW:	DATE: 10.27.2023	REHABILITATE BATHHOUSES HOT SPRINGS NATIONAL PARK	SHEET 159 OF 286
	DATE:			10.27.2023

