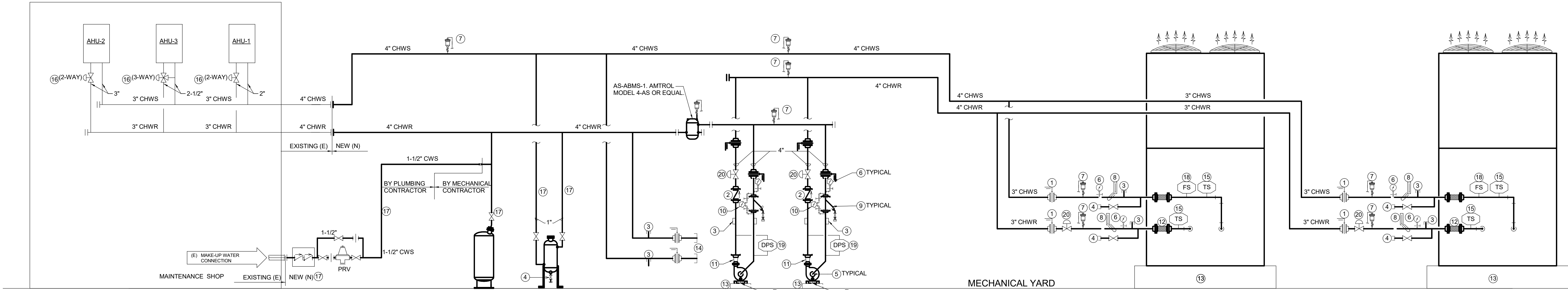


MECHANICAL KEYED NOTES:

- 1 STOP VALVE, REFER TO SPECIFICATIONS.
2 CHECK VALVE, REFER TO SPECIFICATIONS.
3 PRESSURE/TEMPERATURE TEST PLUG, REFER TO SPECIFICATIONS.
4 DRAIN VALVE WITH HOSE END ADAPTER.
5 SUCTION DIFFUSER, REFER TO SPECIFICATIONS.
6 PRESSURE GAUGE WITH GAUGE COCK, REFER TO SPECIFICATIONS.
7 AUTOMATIC AIR VENT, REFER TO SPECIFICATIONS.
8 THERMOMETER, REFER TO SPECIFICATIONS.
9 "Y" STRAINER, REFER TO SPECIFICATIONS.
10 DIFFERENTIAL PRESSURE GAUGE, REFER TO SPECIFICATIONS.
11 CONCENTRIC REDUCER, REFER TO SPECIFICATIONS.
12 FLEXIBLE CONNECTION, REFER TO SPECIFICATIONS.
13 EXISTING HOUSEKEEPING PAD.
14 4" CHWS/R PROVISION FOR EMERGENCY CONNECTION.
15 TEMPERATURE SENSOR, TIE-IN TO B.A.S. AND DISPLAY ON THE GRAPHICS.
16 CONTROL VALVE (E).
17 PROVIDE HEAT TRACE, REFER TO ELECTRICAL.
18 FACTORY APPLIED FLOW SWITCH
19 DIFFERENTIAL PRESSURE SENSOR
20 ELECTRONIC ISOLATION VALVES



CHILLED WATER PIPING SCHEMATICS (ALTERNATE 2)
SCALE: N.T.S.

CHILLER MANAGER SEQUENCE OF OPERATION

A. CHILLED WATER ACTIVATION

THE CHILLED WATER SYSTEM WILL BE ACTIVATED BY A REQUEST FOR COOLING FROM ANY AIR HANDLING UNITS OR COOLING EQUIPMENT SUPPLIED WITH CHILLED WATER.

B. CHILLER UNITS AND CHILLED WATER PUMPS ACTIVATION

WHEN THE CHILLED WATER SYSTEM IS ACTIVATED, THE CHILLER CONTROL PROGRAM WILL START THE LEAD CHILLED WATER PUMP BY SENDING A 24 VAC SIGNAL TO A RELAY MOUNTED IN THE PUMP MOTOR VFD, WHICH WILL COMPLETE THE AUTO SIDE OF THE CONTROL CIRCUIT AND START THE PUMP. A FLOW SWITCH WILL PROVE STATUS TO THE BUILDING AUTOMATION SYSTEM (B.A.S.) AND WILL ALARM AT THE CENTRAL SITE IF THE SWITCH IS NOT MADE WITHIN THE ADJUSTABLE TIME PERIOD. AFTER 15 SECONDS (ADJUSTABLE), THE B.A.S. WILL SEND 24 VAC SIGNAL TO A RELAY, WHICH WILL COMPLETE THE REMOTE START TERMINALS IN THE CHILLER CONTROL CIRCUIT AND ALLOW THE LEAD CHILLER (DEDICATED TO THE PUMP) TO RUN. A FLOW SWITCH WILL NOT ALLOW THE CHILLER TO START UNTIL FLOW HAS BEEN PROVEN. THE B.A.S. CONTROL MODULE WILL AUTOMATICALLY START THE LAG CHILLER AND AN ALARM WILL BE SENT TO THE CENTRAL SITE, 15 MINUTES (ADJUSTABLE) TIME DELAYS WILL BE ASSIGNED TO EACH CHILLER START/ STOP CIRCUIT TO PREVENT SHORT CYCLING.

C. TEMPERATURE CONTROL AND STAGING

THE CHILLER WILL BE SET TO MAINTAIN A CHILLED WATER SUPPLY TEMPERATURE AS SPECIFIED IN THE SCHEDULE DRAWING (ADJUSTABLE). THE CHILLER UNIT WILL OPERATE ON PART LOADS THROUGH MULTI-COMPRESSOR STAGING FEATURING ELECTRONIC EXPANSION VALVES FOR PRECISE REFRIGERANT CONTROL.

THE ASSOCIATED CHILLED WATER PUMP WILL RUN VARIABLE FLOW TO PROVIDE STABLE CHILLED WATER TEMPERATURE CONTROL AND HELPS LIMIT UNACCEPTABLE SHORT CYCLING OF CHILLER COMPRESSORS.

THE CHILLER UNIT CONTROLLER ENABLES VARIABLE WATER FLOW PROVIDING +/-2°F LEAVING WATER TEMPERATURE ACCURACY AND TOLERATES 30% PER MINUTE WATER FLOW VARIATION WITH FLOW EQUAL OR ABOVE THE MINIMUM UNIT REQUIREMENT.

IF THE LEAD CHILLER UNIT AND ASSOCIATED PUMP AT FULL LOAD DELIVERS CHILLED WATER AT 2°F AND ABOVE THE SETPOINT FOR 5 MINUTES (ADJUSTABLE), A RUN REQUEST WILL BE SENT TO THE LAG CHILLER AND ASSOCIATED PUMP. BOTH CHILLERS WILL OPERATE AT SHARED LOAD WHEN THE CHILLED WATER SUPPLY TEMPERATURE FALLS AT 2°F BELOW THE SETPOINT, THE LEAD UNITS WILL START DE-STAGING UNTIL THE LOAD IS HANDLED BY A SINGLE CHILLER WHICH THE LAG CHILLER WILL ASSUME FULL CONTROL.

THE B.A.S. WILL INITIATE AN ALARM TO THE CENTRAL SITE IF THE BUILDING CHILLED WATER SUPPLY TEMPERATURE IS 5°F (ADJUSTABLE) AND ABOVE THE SETPOINT. AN ALARM OUTPUT FROM THE CHILLER PANEL WILL BE MONITORED FOR DISPLAY AT THE CENTRAL SITE.

D. CHILLED WATER PUMP AND DIFFERENTIAL PRESSURE SENSOR (DPS)

WHEN THE EXISTING AHU MEETS THE DEMAND LOAD, THE UNIT WILL GRADUALLY LIMITS THE FLOW OF CHILLED WATER INTO THE COIL VIA THE 2-WAY AND 3-WAY CONTROL VALVES. THE PRESSURE IN THE PIPE WILL GRADUALLY INCREASE. WHEN THE PRESET HIGH LIMIT PRESSURE IN THE DPS IS REACHED, A SIGNAL WILL BE SENT TO CONTROL THE PUMP VIA THE VFD TO MODULATE DOWN THE OPERATION FOR LESS CHILLED WATER FLOW.

WHEN THE EXISTING AHU DEMANDS MORE LOAD, THE UNIT WILL GRADUALLY ALLOW MORE CHILLED WATER INTO THE COIL VIA THE 2-WAY AND 3-WAY CONTROL VALVES. THE PRESSURE IN THE PIPE WILL GRADUALLY DECREASE. WHEN THE PRESET LOW LIMIT PRESSURE IN THE DPS IS REACHED, A SIGNAL WILL BE SENT TO CONTROL THE PUMP VIA THE VFD TO MODULATE UP THE OPERATION FOR MORE CHILLED WATER FLOW.

E. LEAD / LAG ROTATION AND SEQUENCING (EQUAL RUN-TIME)

ON A DAILY BASIS, CHANGE THE CHILLER UNIT AND PUMP LEAD / LAG INDEXING. DAILY LEAD PUMP INDEXED TO RUN WITH THE LEAD CHILLER UNIT. DAILY LAG PUMP INDEXED TO RUN WITH THE LAG CHILLER.

UPON THE LAG PUMP STARTING, THE LEAD PUMP SHALL RAMP DOWN THAT BOTH PUMPS (LEAD/LAG) SHARE THE FLOW / LOAD AT 50% EACH TO PREVENT TOTAL FLOW SPIKES AND ALLOW BOTH PUMPS TO MODULATE IN PARALLEL.

THE BUILDING AUTOMATION SYSTEM (BAS) OR THE PROGRAMMABLE LOGIC CONTROLLER (PLC) SHALL ALTERNATE THE LEAD AND LAG DESIGNATIONS THAT TRIGGER THE ROTATION BASED ON CUMULATIVE RUN-HOURS (E.G. SWAPPING ROLES EVERY 500 HOURS) OR ON A WEEKLY SCHEDULE TO EQUALIZE WEAR AND TEAR ACROSS BOTH PUMPS.

F. CHILLED WATER SYSTEM SHUTDOWN SEQUENCE

AFTER ALL REQUEST FOR COOLING BEEN SATISFIED OR HALTED BY THE B.A.S., THE CHILLER WILL CYCLE TO ITS OFF STATUS. THE ASSOCIATED CHILLED WATER PUMP WILL CONTINUE TO RUN FOR 5 MINUTES (ADJUSTABLE) TO ENSURE ADEQUATE FLOW DURING SHUTDOWN.

G. EQUIPMENT OFF CONDITIONS

WHEN THE CHILLED WATER SYSTEM IS INACTIVE, THE CHILLER AND ASSOCIATED PUMP WILL BE DE-ENERGIZED.

H. FREEZE AVOIDANCE AND WINTER CONDITION

FREEZE AVOIDANCE TO BE PRESENT TO ENABLE OR DISABLE, THE CHILLER UNIT SHALL BE CONFIGURED WITH THE PUMP CONTROLLER. WHEN FREEZE AVOIDANCE IS ENABLED, THE CHILLED WATER PUMP SHALL ACTIVATE WHEN THE AMBIENT TEMPERATURE DROPS BELOW THE LEAVING WATER TEMPERATURE CUTOFF. THE PUMP STAYS ENERGIZED UNTIL THE MINIMUM EVAPORATOR TEMPERATURE RISES 13°F ABOVE THE LEAVING WATER CUTOFF. THE PUMP WILL CYCLE OFF FOR A PERIOD OF TIME, AFTER THE TIME EXPIRES, THE PUMP OUTPUT MAY COME BACK ENERGIZED AGAIN IF THE AMBIENT TEMPERATURE IS AGAIN BELOW THE WATER CUTOFF.

THE PUMP SHALL BE SET TO OPERATE VIA THE VFD PROVIDING MINIMUM FLOW WITH THE EXISTING 3-WAY VALVE LOCATED AT AHU-3 AT OPEN POSITION.

CONTROL SCHEMATIC LEGEND

AI	ANALOG INPUT
AO	ANALOG OUTPUT
DIBI	DIGITAL / BINARY INPUT
DOBO	DIGITAL / BINARY OUTPUT
AFMS	AIR FLOW MEASURING STATION
MCV	CONTROL VALVE MODULATING TYPE
VFD	VARIABLE FREQUENCY RIVE
CSR	CURRENT SENSING RELAY
FRZ	FREEZE/STAT
HSL	HIGH STATIC LIMIT
SPT	DIFFERENTIAL PRESSURE TRANSDUCER
FM	FLOW METER
FS	FLOW SWITCH
DAT	DISCHARGE AIR TEMPERATURE SENSOR
S	WALL SENSOR
T	THERMOSTAT
CO2	CARBON DIOXIDE
SP	SET POINT
S/A	SUPPLY AIR
R/A	RETURN AIR
O/A	OUTSIDE AIR
HC	HEATING COIL
CC	COOLING COIL
DX	DIRECT EXPANSION COOLING COIL
PICCV	PRESSURE INDEPENDENT CHARACTERIZED CONTROL VALVE
AFC	AIRFLOW CROSS
DPS	DIFFERENTIAL PRESSURE SWITCH

AIR COOLED CHILLER

TYPE	COUNT	NAME	DEVICE
AI	1	BUILDING CHW SUPPLY TEMPERATURE	10 KΩ IMMERSION SENSOR
AI	1	BUILDING CHW RETURN TEMPERATURE	10 KΩ IMMERSION SENSOR
AI	2	CHILLER CHW SUPPLY TEMPERATURE	10 KΩ IMMERSION SENSOR
AI	2	CHILLER CHW RETURN TEMPERATURE	10 KΩ IMMERSION SENSOR
AI	2	CHILLER AMPS	4-20 mA SENSOR
AI	1	OUTSIDE AIR TEMPERATURE (NORTH SIDE OF BLDG)	NORMALLY OPEN
DI	2	CHILLER PUMP STATUS	CURRENT SWITCH
DI	2	CHILLER ALARM	DRY CONTACT
DO	2	CHILLER START/STOP	24 VAC RELAY
DO	2	CHILLER PUMP START/STOP	24 VAC RELAY
DO	2	CHILLER ISOLATION VALVE	ELECTRONIC 2-WAY ISOLATION VALVE

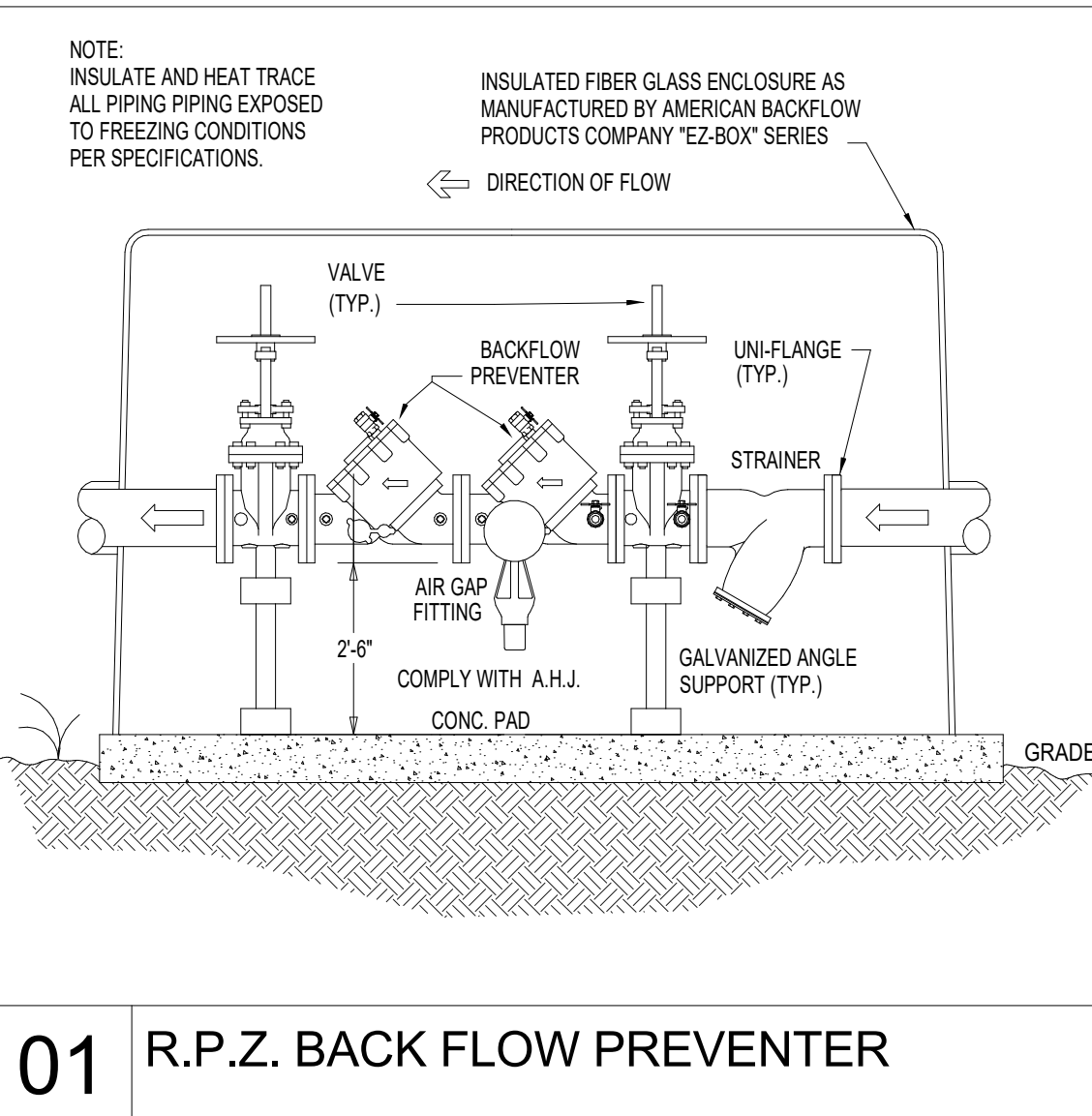
CHILLER BACnet INTEGRATION

FURNISH AND INSTALL BACnet INTEGRATION MEANS AND PROVIDE ONE BACnet INTEGRATION SCREEN IN THE BAS GRAPHICS THAT INCLUDES THE FOLLOWING INFORMATION AT A MINIMUM FOR MONITORING PURPOSES ONLY:

- LOCAL REMOTE MODE
- ACTIVE ALERT / ALARM WITH ALARM MODE (NOTE: INCLUDE CROSS-REFERENCE TABLE FOR ODE DECIPHERING)
- ACTIVE DEMAND LIMIT
- ENTERING / LEAVING TEMPERATURES
- RUNNING STATUS / MODE
- COMPRESSOR DISCHARGE PRESSURE
- COMPRESSOR WINDING TEMPERATURE
- OUTDOOR AIR TEMPERATURE
- SUCTION PRESSURE
- NUMBER OF COMPRESSOR RUNNING OR CIRCUITS
- CAPACITY
- OIL PRESSURE ON EACH CIRCUIT
- WATER SET-POINT
- WATER FLOW

HEAT TRACE BAS INTEGRATION

THE HEAT TRACING SHALL BE CONTROLLED VIA TEMP OUTSIDE AIR TEMPERATURE SENSORS PROVIDED BY HEAT TRACE MANUFACTURER. BAS TO MONITOR STATUS ONLY. CONTRACTOR IS RESPONSIBLE TO PROVIDE THIS INTEGRATION EITHER THROUGH A RELAY PROVIDED BY THE CONTROLS CONTRACTOR TO THE BAS OR VIA HEAT TRACE MANUFACTURER BACNET INTEGRATION.



01 R.P.Z. BACK FLOW PREVENTER

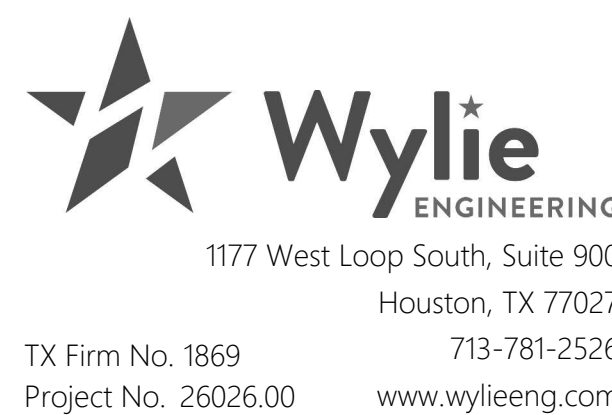
REVISIONS

No.	Date	Description
1	08/31/2026	ISSUE FOR BID
2	10/15/2026	ADDENDUM 01
2	10/19/2026	ADDENDUM 02



TOMBALL ISD - CHILLER
PACKAGE #2b

Ancillary Services Building
1110 Baker Dr
Tomball, TX 77375



MECHANICAL AND
PLUMBING PIPING
SCHEMATIC DIAGRAM
(ALTERNATE 2)
ADVIS -
MP5.02

Scale 1/8" = 1'-0"