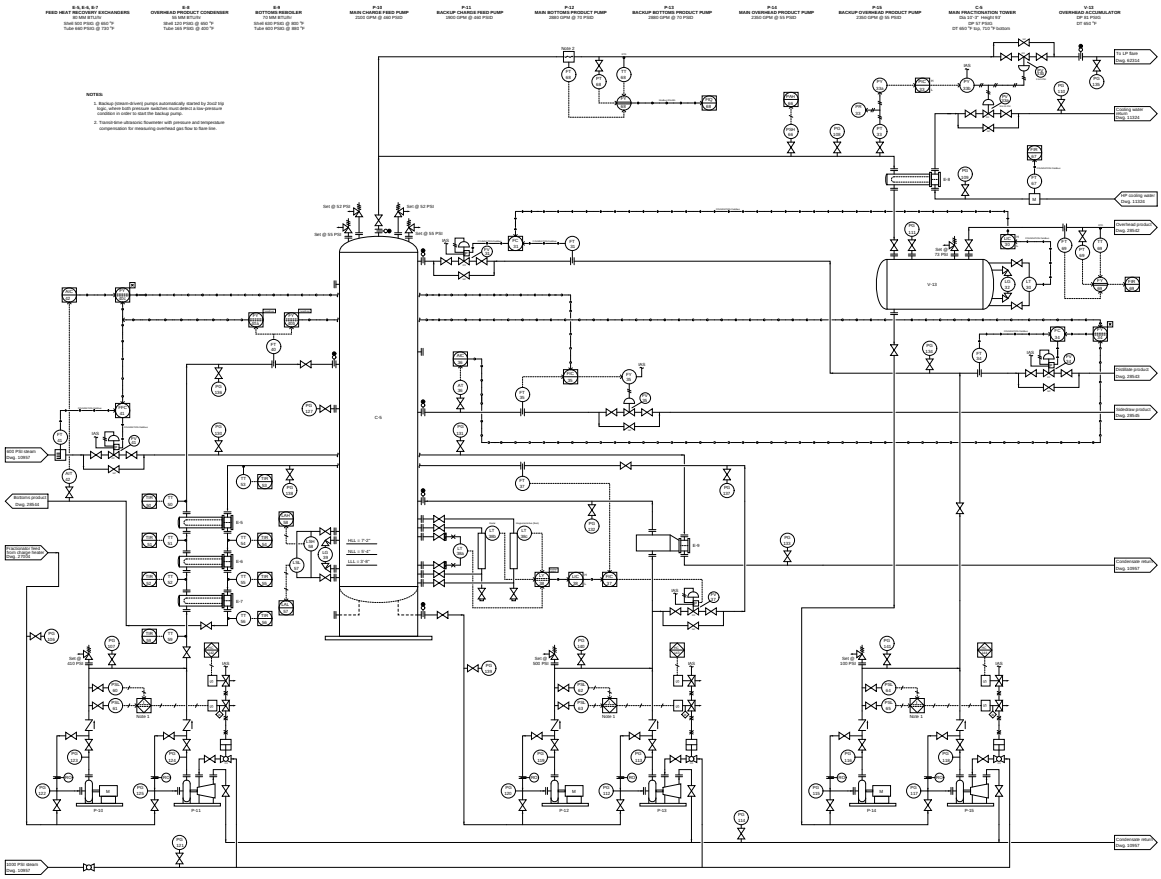
Realistic instrumentation diagrams

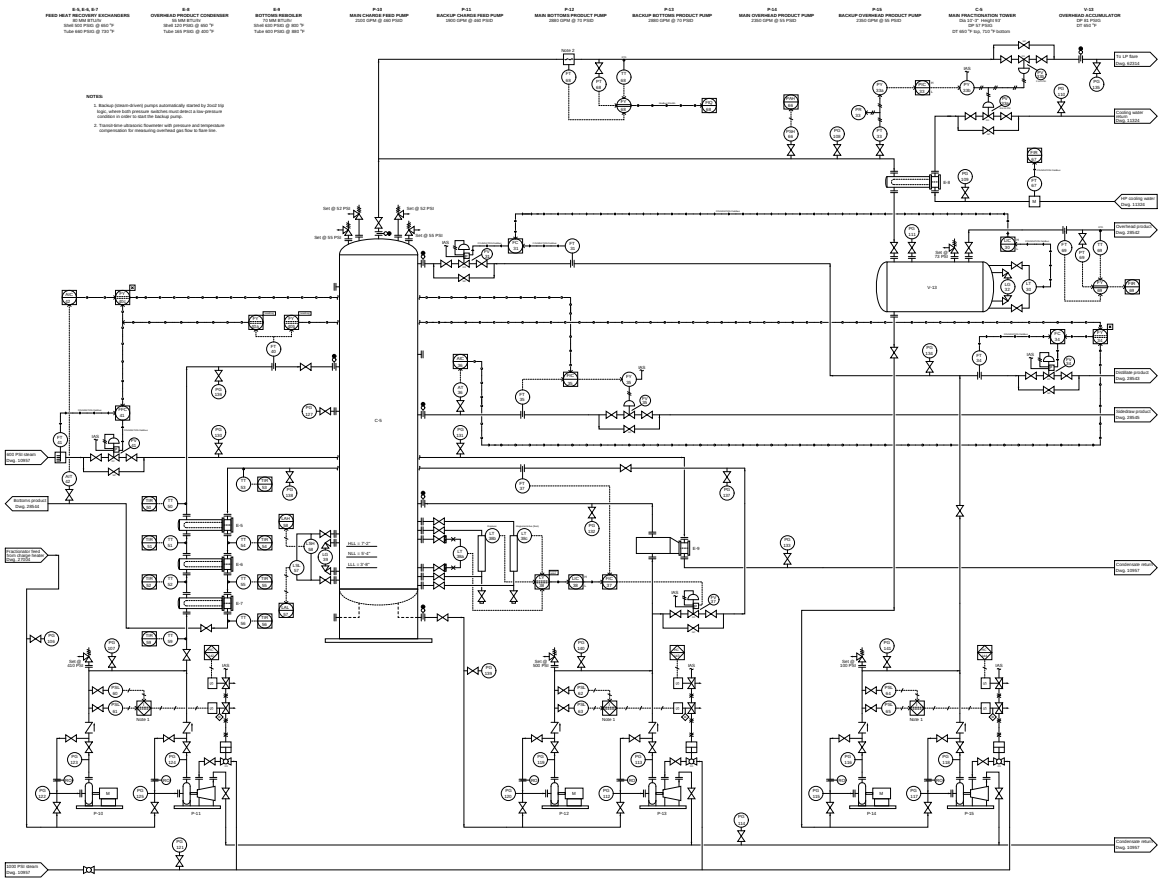
The purpose of this particular worksheet is to provide examples of realistic instrumentation diagrams (mostly P&IDs) useful as the foundation of specific worksheet questions. The graphic files included in this worksheet are used by many sequenced question files (`i0????.tex`) in the Socratic Instrumentation collection.

Question 1

A generic distillation process



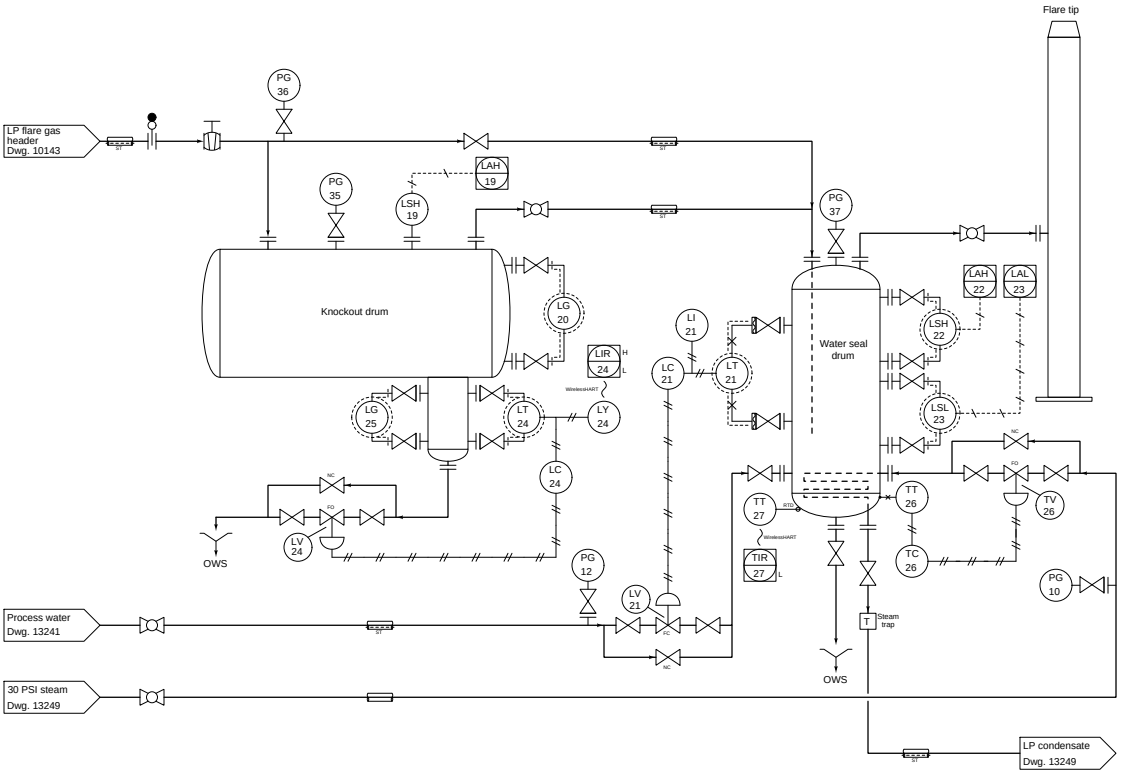
A generic distillation process (using displacer rather than radar LT-38b)



file i0001r

Question 2

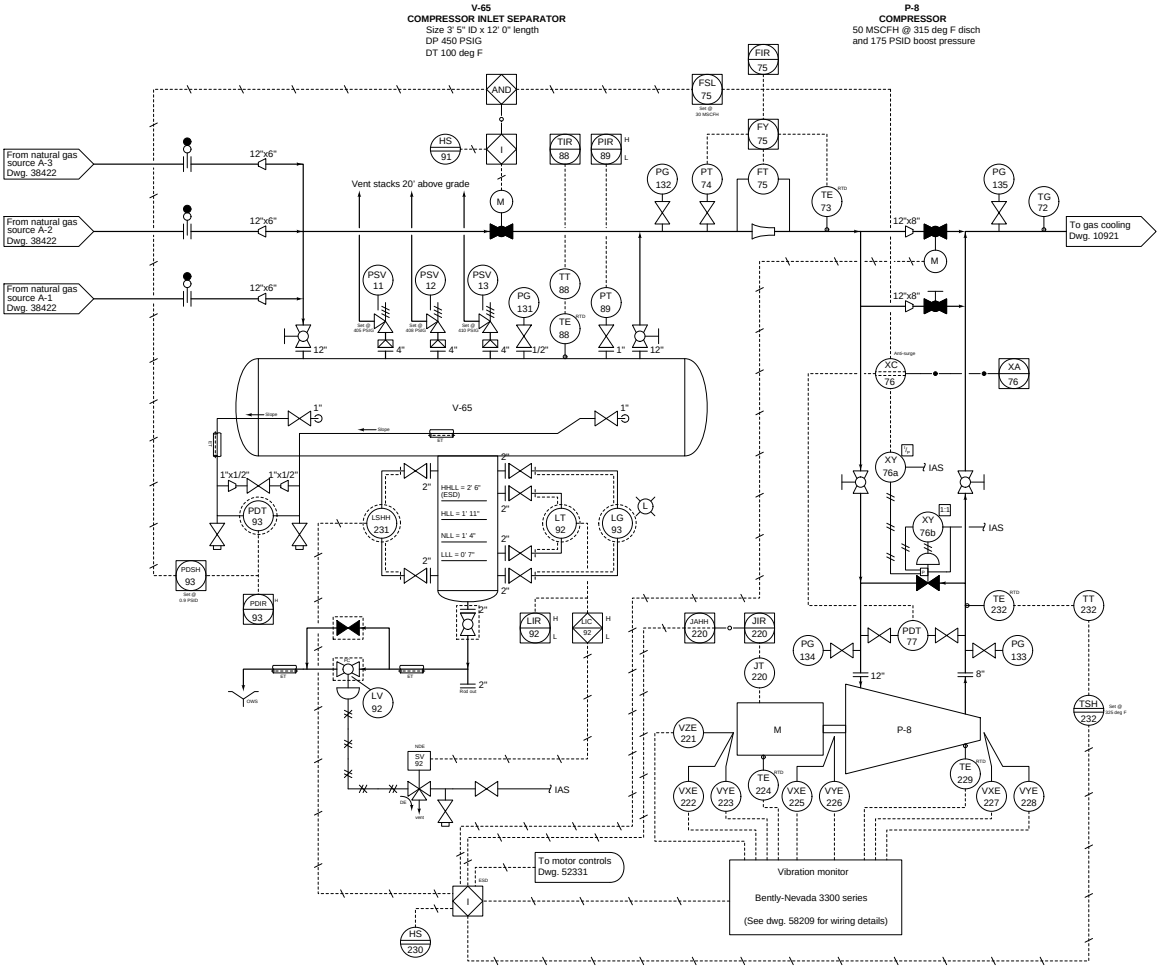
Flare knockout drum and water seal



file i0002r

Question 3

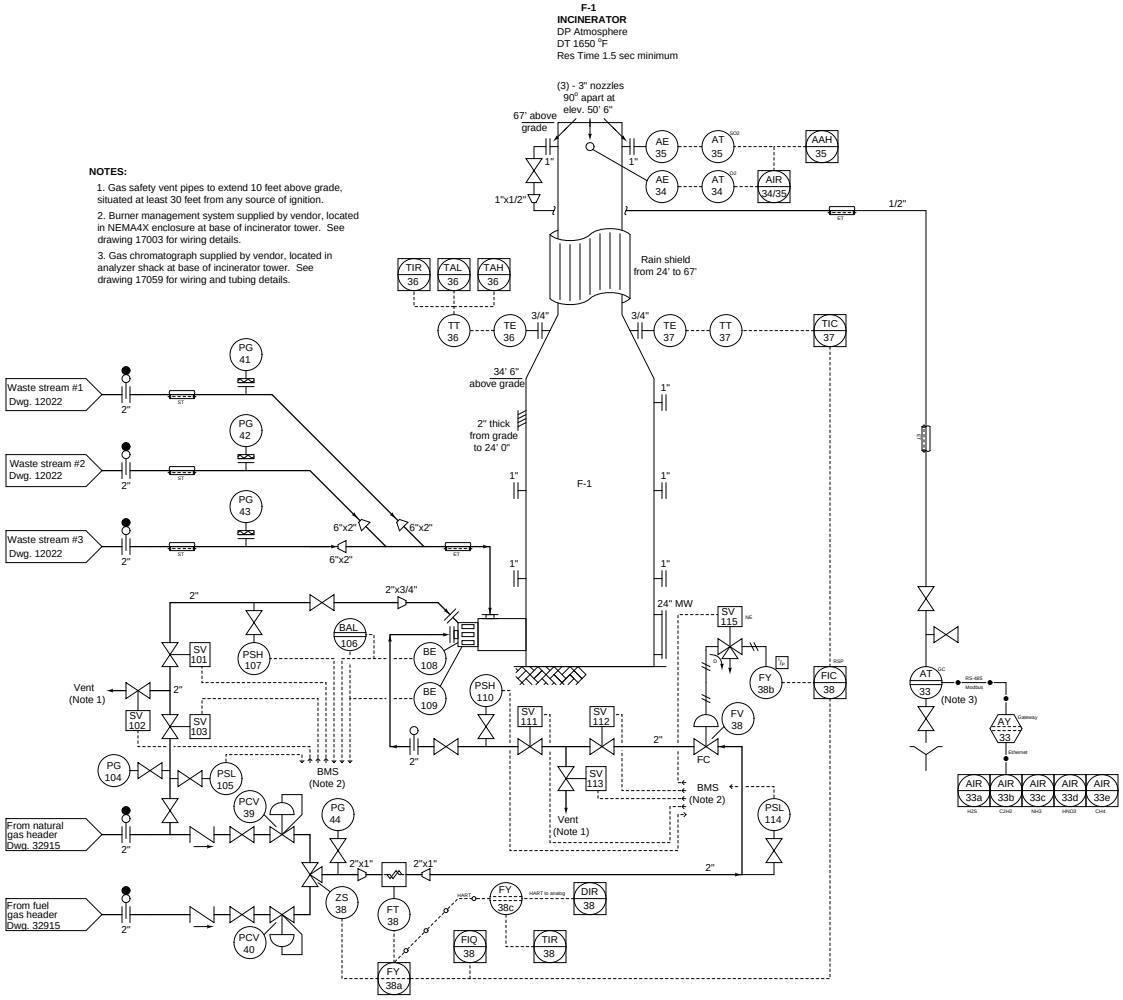
Gas compressor inlet separator



file i0003r

Question 4

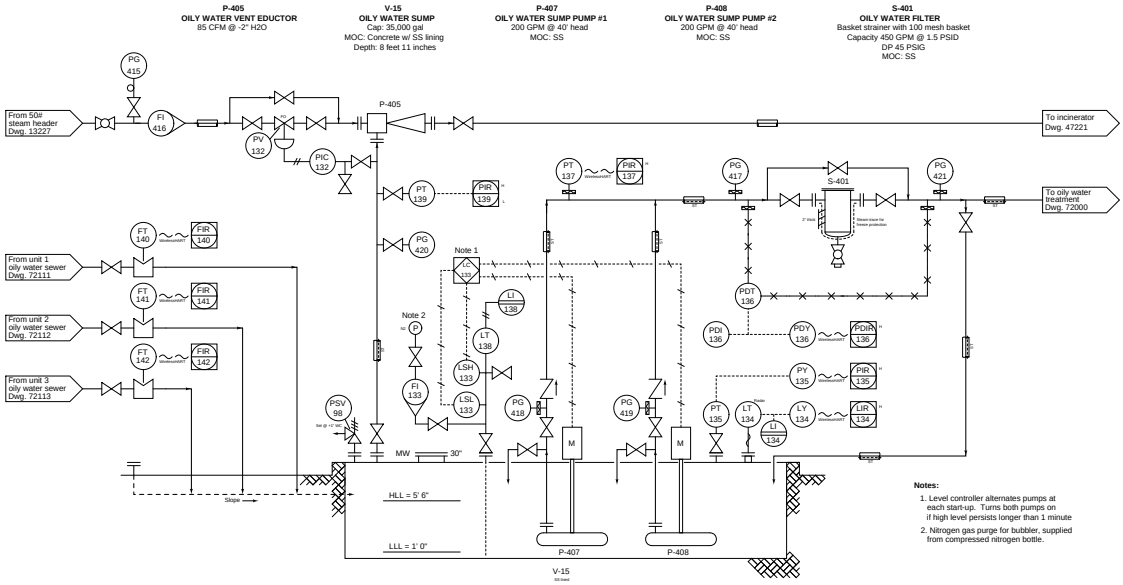
Toxic gas incinerator



file i0004r

Question 5

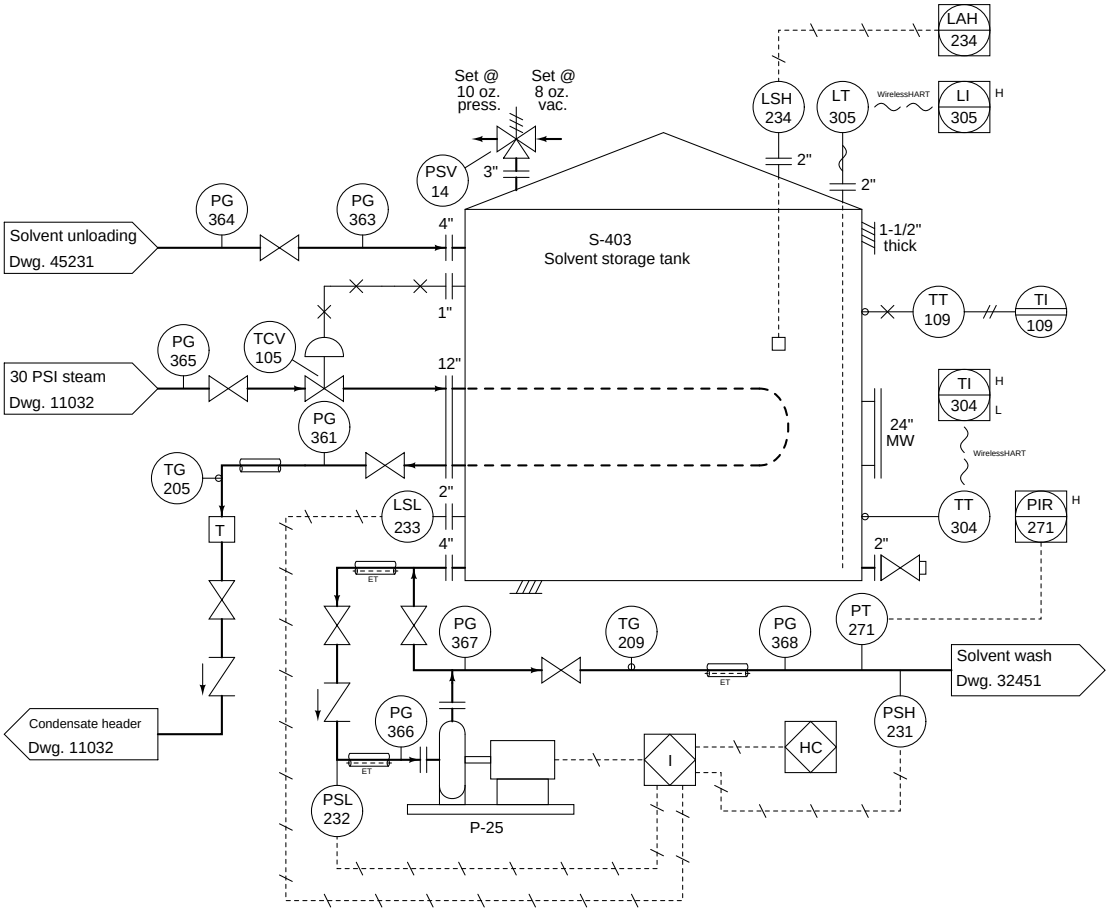
Oily water sump



file i0005r

Question 6

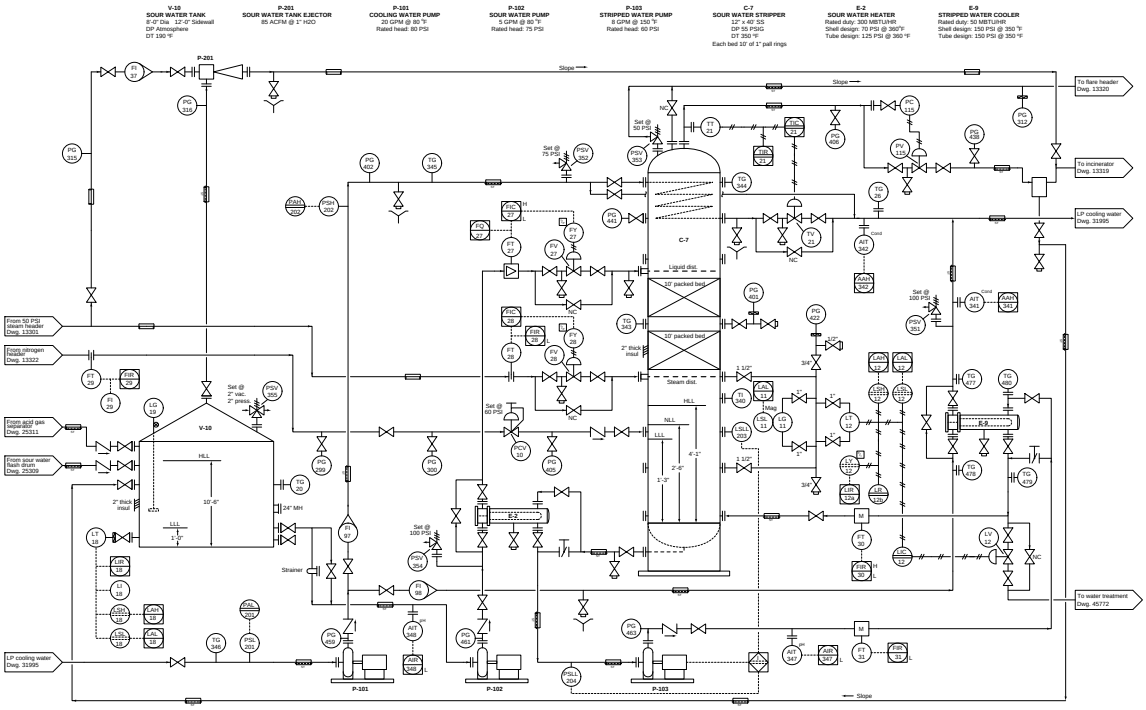
Solvent storage tank



file i0006r

Question 7

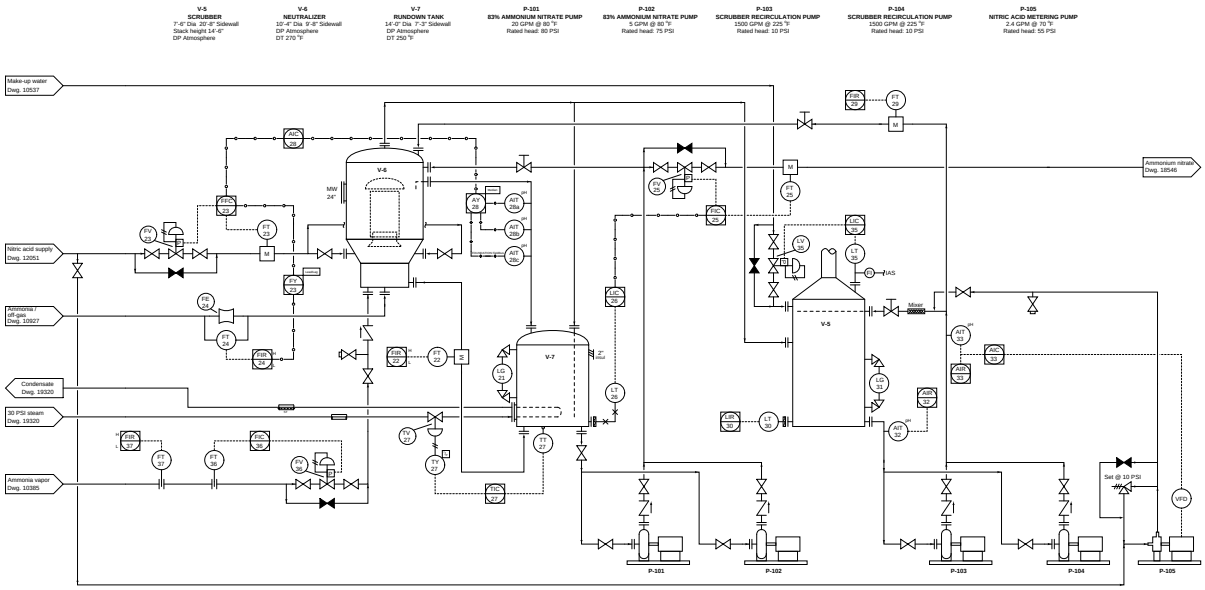
Sour water stripping process



file i0007r

Question 8

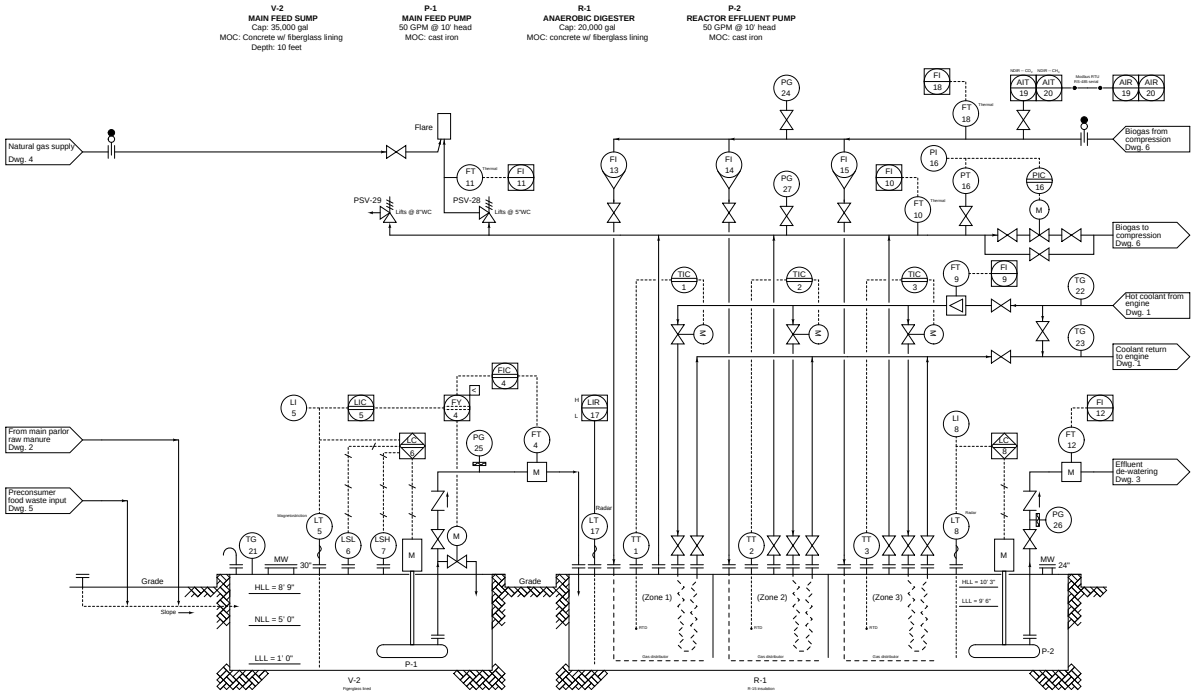
Ammonium nitrate fertilizer production unit



file i0008r

Question 9

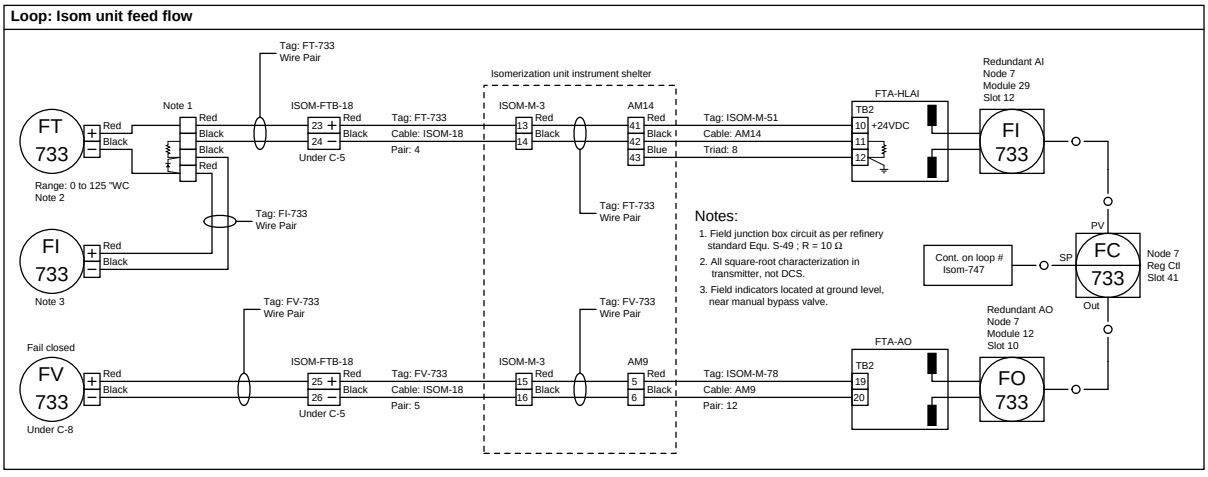
Anaerobic digester controls



file i0015r

Question 10

Isomerization feed flow control loop

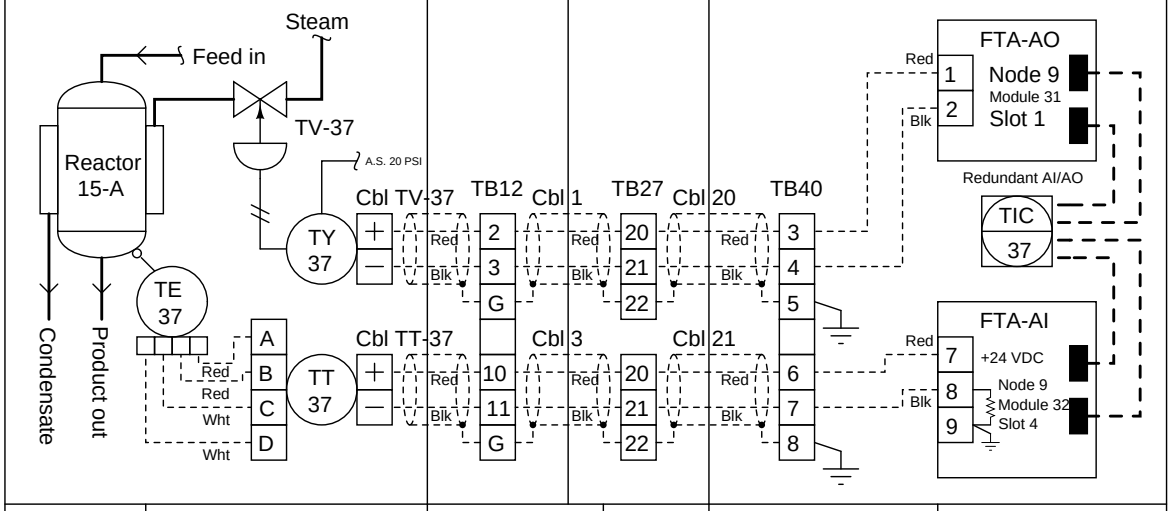


file i0009r

Question 11

Reactor temperature control

Loop Diagram: Reactor 15-A temperature control	**Revised by:** Tony Kuphaldt	**Date:** Nov 20, 2012



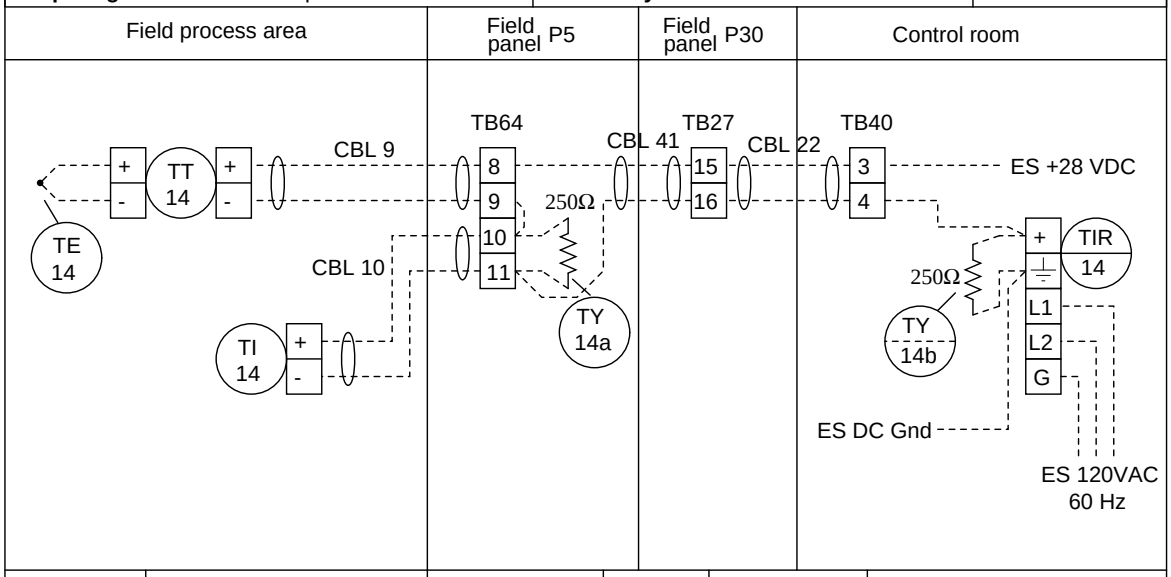
Tag number	Description	Manufacturer	Model	Calibration	Notes
TE-37	4-wire platinum RTD	Chromalox		100 Ω , α = 0.00392	
TT-37	Smart temp. transmitter	Rosemount	3244	100-250^{o} F , 4-20 mA	Direct action
TIC-37	DCS controller	Honeywell	PM		Reverse action
TY-37	I/P transducer	Fisher	546	4-20 mA , 3-15 PSI	Direct action
TV-37	Steam control valve	Fisher	Easy-E	3-15 PSI	Air-to-open

file i0010r

Question 12

Retort temperature monitoring

Loop Diagram: #3 retort temperature	**Revised by:** Lawrence T. Smith	**Date:** Jan 23, 1998



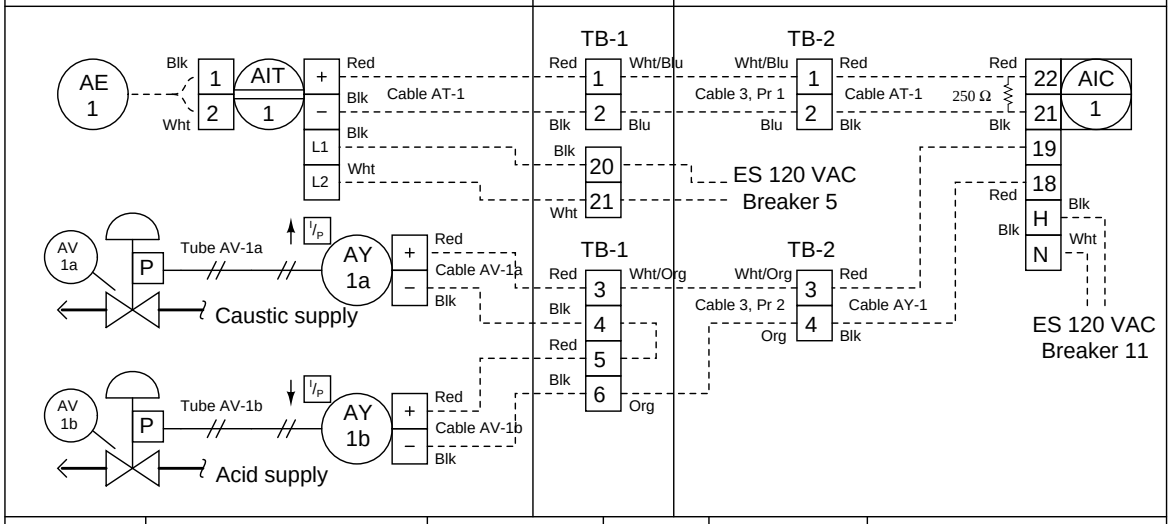
Tag number	Description	Manufacturer	Model	Calibration	Notes
TE-14	Type K thermocouple	Gordon			Ungrounded tip
TT-14	Temperature transmitter	Rosemount	444	500 - 1000° F 4-20 mA	Downscale burnout
TI-14	Local indicator			1 - 5 VDC 500 - 1000° F	
TY-14a,b	250 Ω resistor	n/a		+/- 0.1 %	
TIR-14	Paperless chart recorder	Eurotherm		1-5 VDC	

file i0011r

Question 13

pH neutralization system with split-ranged control valves

Loop Diagram: pH neutralization system	**Revised by:** P.H. Nernst	**Date:** April 1, 2007



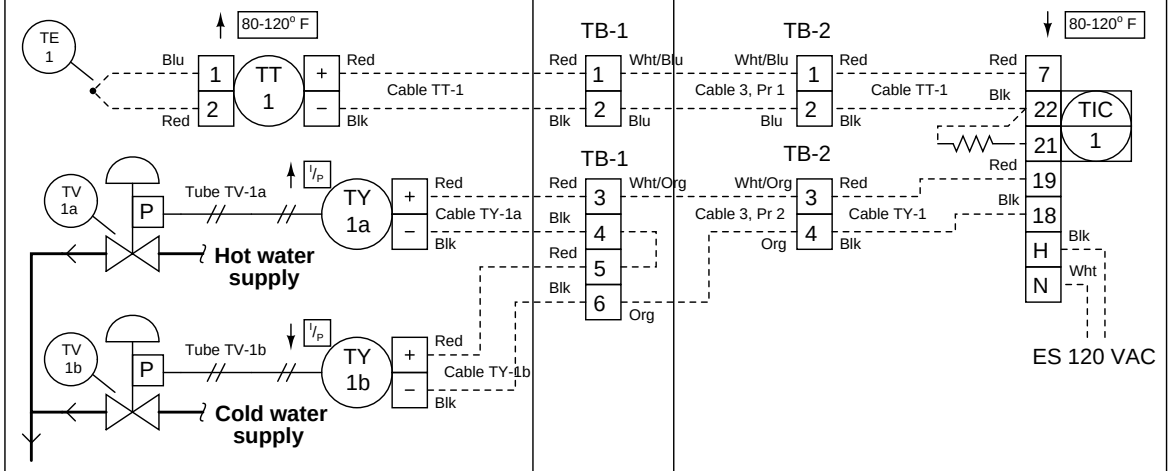
Tag number	Description	Manufacturer	Model	Calibration	Notes
AE-1	pH probe	Mettler-Toledo		n/a	
AIT-1	pH transmitter	ABB	5000	0-14 pH 4-20 mA	Direct-acting
AIC-1	Controller	Siemens	PAC 353	1-5 V 0-14 pH 0-100% 4-20 mA	Reverse-acting control
AY-1a	I/P transducer	Fisher	546	12-20 mA 3-15 PSI	Direct-acting, 176 Ω coil
AY-1b	I/P transducer	Fisher	546	12-4 mA 3-15 PSI	Reverse-acting, 176 Ω coil
AV-1a	Caustic control valve	Fisher	Easy-E	3-15 PSI	Air-to-open
AV-1b	Acid control valve	Fisher	Easy-E	3-15 PSI	Air-to-open

file i0012r

Question 14

Temperature control system with split-ranged control valves

Loop diagram: Bio-reactor temperature control	**Revised by:** Leroy Jenkins	**Date:** Oct 12, 2001

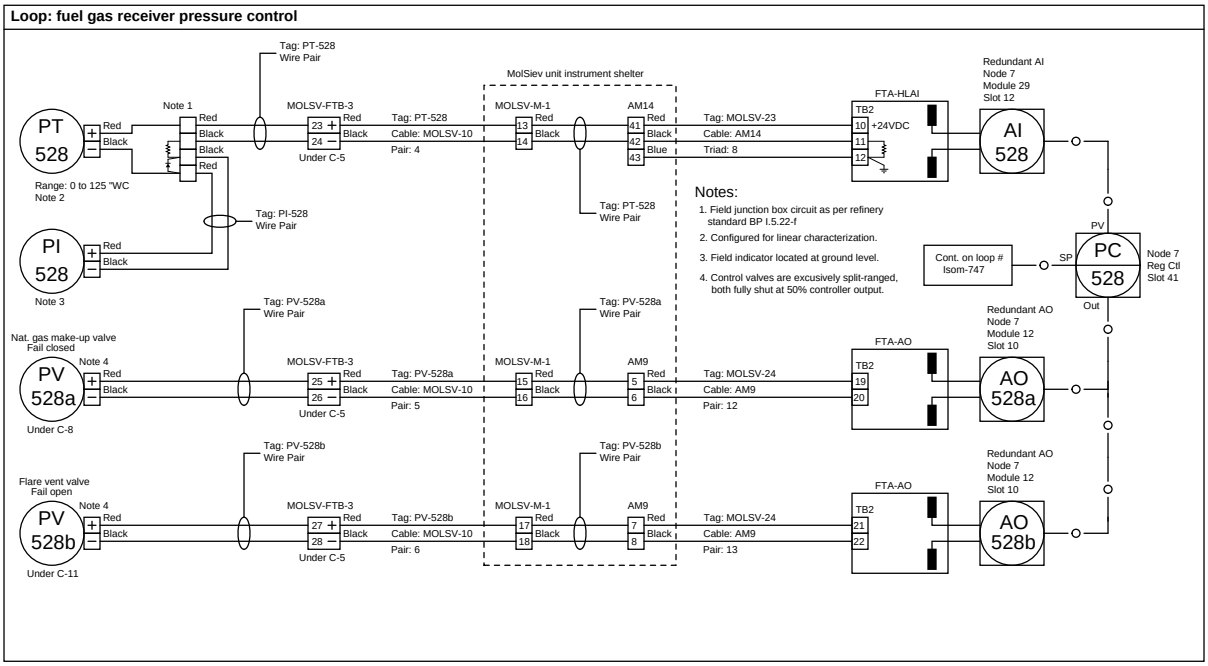


Tag number	Description	Manufacturer	Model	Calibration	Notes
TE-1	Thermocouple	Omega		Type T	Ungrounded tip
TT-1	Temperature transmitter	Rosemount	3144	80-120°F 4-20 mA	
TIC-1	Controller	Siemens	PAC 353	1-5 V 80-120°F	Reverse-acting control
TY-1a	I/P transducer	Fisher	546	4-20 mA 3-15 PSI	Direct-acting calibration
TY-1b	I/P transducer	Fisher	546	20-4 mA 3-15 PSI	Reverse-acting calibration
TV-1a	Control valve	Fisher	Easy-E	3-15 PSI	Air-to-open
TV-1b	Control valve	Fisher	Easy-E	3-15 PSI	Air-to-open

file i0013r

Question 15

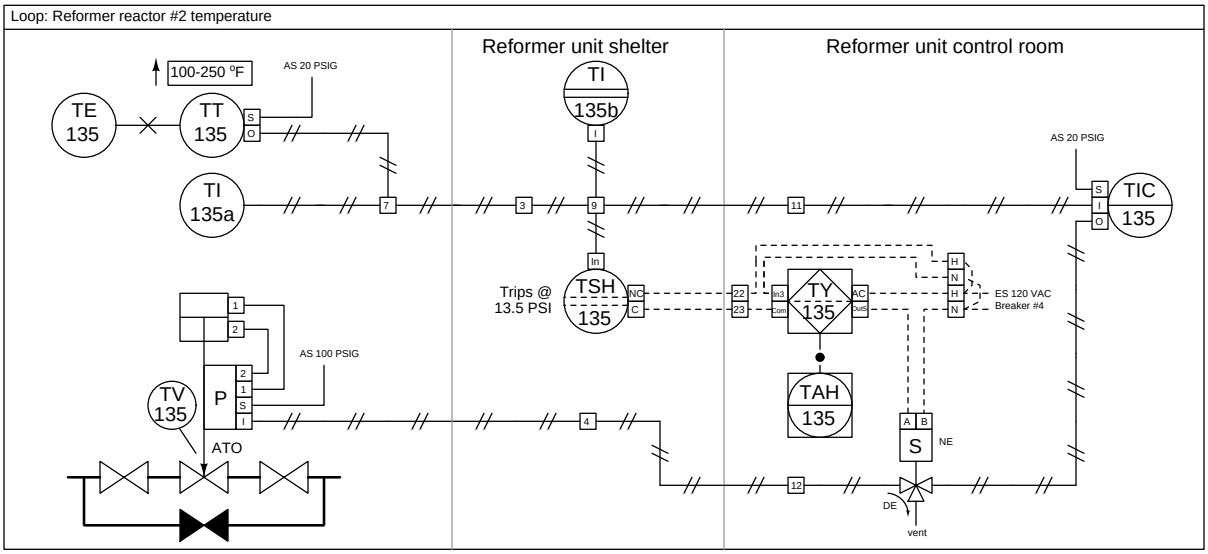
Fuel gas receiver pressure control loop



file i0014r

Question 16

Reactor temperature control loop



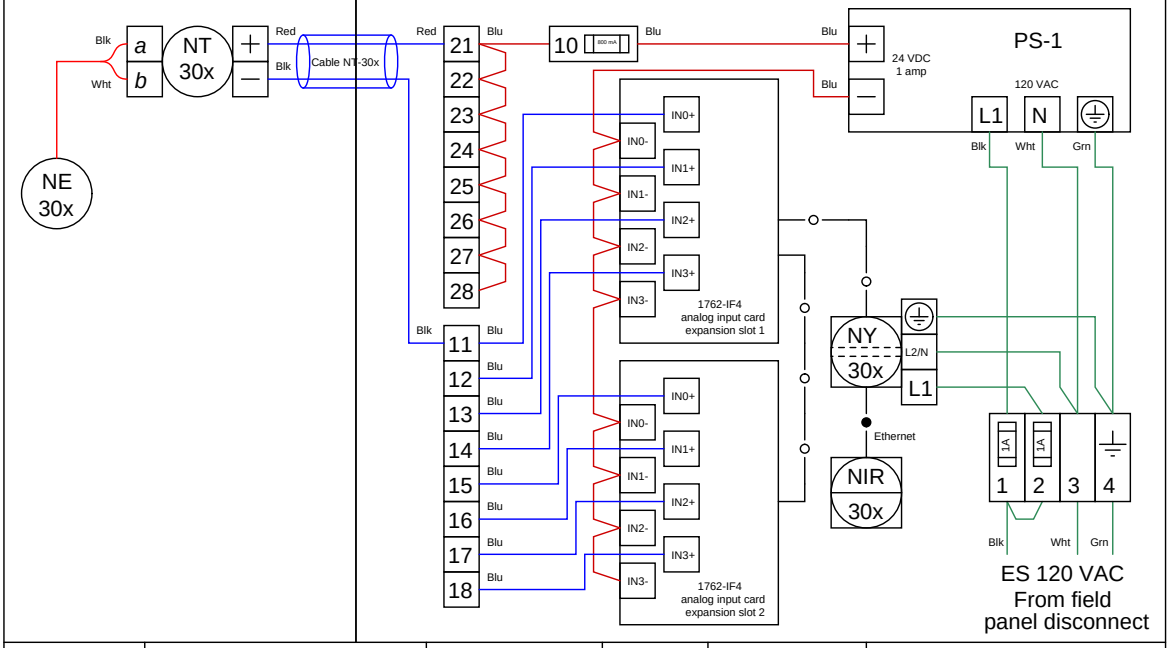
file i0016r

Question 17

Generic loop diagram for Perry Center salmon hatchery wet lab field panels

Loop Diagram: Salmon Hatchery wet room generic loop | **Date:** December 9, 2013

Process area | Field Panel FP-x



Tag number	Description	Manufacturer	Model	Calibration	Notes
NE-30x	Sensing element				
NT-30x	Transmitter	Rosemount		??? input 4-20 mA output	
NY-30x	PLC	Allen-Bradley	ML1100	1762-IF4 input 4-20 mA	IP = 169.254.10.x Mask = 255.255.0.0 Scaled register F8:x
NIR-30x	HMI touch-panel	AutomationDirect	C-More		

file i0017r

Answers

Answer 1

Answer 2

Answer 3

Answer 4

Answer 5

Answer 6

Answer 7

Answer 8

Answer 9

Answer 10

Answer 11

Answer 12

Answer 13

Answer 14

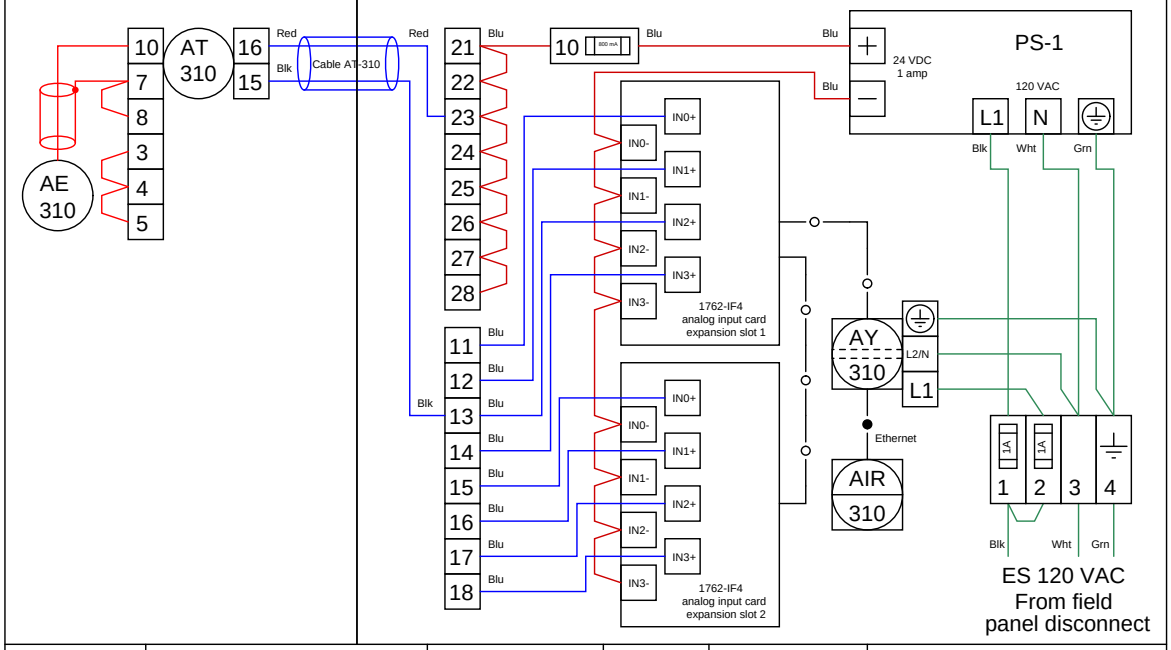
Answer 15

Answer 16

Answer 17

AT-310 loop diagram for Perry Center salmon hatchery wet lab pH measurement

Loop Diagram: AT-310 pH measurement of Bank C egg trough water | **Date:** December 9, 2013



Tag number	Description	Manufacturer	Model	Calibration	Notes
AE-310	Combination pH electrode				
AT-310	pH transmitter	Rosemount	3081	4-10 pH input 4-20 mA output	Temp compension set for manual = 45 deg F
AY-310	PLC	Allen-Bradley	ML1100	1762-IF4 input 4-20 mA	IP = 169.254.10.1 Mask = 255.255.0.0 Scaled register F8:2
AIR-310	HMI touch-panel	AutomationDirect	C-More		