ATTACHMENT 8

2017 Training Material on Diesel Generator Air Start Flow Path

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Course / Program:	EO Continuing	**Lesson ID:**	N-CL-EOC-1701
Title:	2017 Cycle 1 Training (DG-DO, ES-HD, FC, RW, VD, TREQs, Mods & LL)	**LMS Component**	N-CL-NLO-RQ01N
Author:	David Williams	**Revision / Date:**	00 / 01/05/2017
Prerequisites:	None	**Revision By:**	N/A
Responsible Site:	Clinton Power Station	**Est. Teach Time**	10hr

Approvals

Qualified Nuclear Engineer (If Applicable)	N/A	**Date:**	N/A
Training Supervision Review	Dave Williams /S/	**Date:**	01/06/2017
Program Owner Approval	Tim Windingland /S/	**Date:**	01/10/2017

SRRS 3D.126/3D.111 Retain approved lessons for life of plant OR life of insurance Policy +1 yr for RP lessons. May be retained in-department for two years, then forwarded to RM

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
233000.1.1 - STATE the purposes of the Fuel Pool Cooling & Cleanup System including applicable design bases.	20-22
233000.1.2 - Describe the major flow paths for the following modes of the FC system	23-29
.1 Normal Flow path	
.2 RX vessel pool draindown	
.3 RX vessel pool fill	
.4 FC assist	
.5 Alt Suppression pool cooling	31
233000.1.6 - Given a Fuel Pool Cooling& Cleanup System Annunciator, DESCRIBE:	32
b. Any automatic actions	
233000.1.7 - Given the Fuel Pool Cooling & Cleanup system, DESCRIBE the systems supporting and the nature of the support.	33-36
233000.1.15 - Given Fuel Pool Cooling & Cleanup System initial conditions, PREDICT how the system and/or plant parameters will respond to the manipulation of the following controls.	
.2 Fuel Pool Cooling & Cleanup system Filter/Demin controls for Hold, Filter, Backwash and Precoat	

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Objectives

Using the approved procedure, DISCUSS:

	Slide(s)
Task 331701.18 - Lower FC Surge Tank Level During System Operation	39
Task 331701.30 - Pump Casing Vent After Maintenance for the Fuel Pool Cooling and Cleanup System	39

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
264000.1.1 - STATE the purpose(s) of the DG/DO System including applicable design bases.	43-44
264000.1.2 - Describe the major flow paths for the following modes of the DG/DO system .1 Lube Oil Sys .2 Fuel Oil Sys .3 Air Start Sys	45-47, 52-66
264000.1.5 - Discuss the DG/DO system automatic functions/interlocks including purpose, signals, set points, sensing points, when bypassed, how/when they are. .6 Fuel Oil Storage Tank .7 Fuel Oil Day Tank .8 Fuel Oil Transfer Pump	48-51
264000.1.7 - Given the DG/DO system, DESCRIBE the systems supporting and the nature of the support. .1 DG Auto Starts	74-75

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
264000.1.11 - EVALUATE given key DG/DO System parameters, if needed DETERMINE a course of action to correct or mitigate the following abnormal condition(s): .1 High Crankcase Pressure .2 Overspeed .3 Overcrank .4 Low Oil Pressure .5 High Water Temperature .6 Reverse Power .7 Loss of Excitation .8 Overcurrent .9 Generator Ground Fault .10 Differential Current	76-77

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Objectives

Using the approved procedure, DISCUSS:

Task Description	Slide(s)
Task 350601.17 - Diesel Engine Lube Oil Addition or Removal	78
Task 350601.27 - Respond to DG 1A(1B)[1C] Auto Start	79
Task 350601.34D - Alternate Diesel Generator Start - Manual Override of Air Start Solenoids	80

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
233000.1.1 - STATE the purpose(s) of the DG ROOMS HVAC System including applicable design bases.	83-84
233000.1.2 - Describe the major flow paths for the following modes of the DG ROOMS HVAC system operation. .1 Normal Standby Mode .2 Diesel Generator Operating Mode .3 Purge Mode	85-87

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Objectives

Using the approved procedure, DISCUSS:

Task Description	Slide(s)
Task 340301.03 - Increased Cooling/PURGE Mode of the VD System	88-90
Task 340301.08 - Respond to a CO2 Initiation with respect to the VD System	91-92

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Objectives

Upon completion of this chapter, the student will be able to perform the following objectives at a minimum proficiency level of 80%, unless otherwise stated, on an oral or written exam:

Objective Description	Slide(s)
BC08Ir4_Controllers 4. State the purpose of a controller.	96
BC08Ir4_Controllers 5. Describe the theory of operation of the following types of controllers: a. Two position b. Proportional c. Proportional-plus-reset (PI) d. Proportional-plus-reset-plus-rate	97-101
BC08Ir4_Controllers 7. Describe the following characteristics of a flow control valve: a. Linear b. Quick opening c. Equal percentage	102
BC08Ir4_Controllers 9. State the function and describe the characteristics of valve positioners.	103-104
Treq 02422997-82 Discuss the operation of Bailey/NUS controllers at 1PA05J.	105

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Objectives

Upon completion of this chapter, the student will be able to perform the following objectives at a minimum proficiency level of 80%, unless otherwise stated, on an oral or written exam:

Objective Description	Slide(s)
239003.1.1 STATE the purpose(s) of the EXTRACTION STEAM, HEATER VENTS & DRAINS System including applicable design bases.	107
239003.1.2 DESCRIBE the major flowpaths for the following modes of the EXTRACTION STEAM, HEATER VENTS & DRAINS System operation.	108-113
.1 Extraction Steam System while operating in the normal mode	
.2 Extraction Steam System while operating in a specified abnormal mode	
.3 Feedwater Heating Drain System while operating in the normal mode	
.4 Feedwater Heating Drain System while operating in a specified abnormal mode	
239003.1.3 DESCRIBE the function, operation, interlocks, trips, physical location, and power supplies of the following EXTRACTION STEAM, HEATER VENTS & DRAINS System components.	114-119
.1 Feedwater Heaters	
.2 Flash Tanks	
.3 Drain Coolers	
.4 Extraction Steam Isolation Valves	
.5 Extraction Steam Check Valves	
.6 Heater and Drain Cooler Normal Drain Valves	
.7 Heater and Drain Cooler Emergency Drain Valves	

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Objectives

Upon completion of this chapter, the student will be able to perform the following objectives at a minimum proficiency level of 80%, unless otherwise stated, on an oral or written exam:

Objective Description	Slide(s)
239003.1.5 Discuss the EXTRACTION STEAM, HEATER VENTS & DRAINS system automatic functions/interlocks including purpose, signals, set points, sensing points, when bypassed, how/when they are.	120
239003.1.11 EVALUATE given key EXTRACTION STEAM, HEATER VENTS & DRAINS System parameters, if needed DETERMINE a course of action to correct or mitigate the following abnormal condition(s):	121-122
.1 Low heater level on system performance	
.2 Any heater reaching it's high level setpoint	
.3 High heater level on system performance	
.4 Any heater reaching it's high-high level setpoint	
.5 Heater string isolation valve closure	
.6 Loss of control power	
.7 Effect on other heaters when heaters are removed from service/ returned to service	
Task 310201.16 Respond to Feedwater Heater Abnormal Level	123-124
Task 310201.19 Preparing Feedwater Heater Level Control For Maintenance Or Trouble-Shooting Of A Normal Drain Valve Malfunction	125

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
268013.1.1- STATE the purposes of Spent Resin System	138
268016.1.4 - STATE the physical location and function of the following SOLID RADWASTE SLUDGE COLLECTION/DISPOSAL system controls, indicators, and/or sensors.	127-130
.9 Quantum Master Control Console	
.10 Tank Level Instrumentation	145
268009.1.10 - EXPLAIN the reasons for given RADWASATE DEMINERALIZERS System operating limits and precautions	
.1 Reason for maintaining Resin Outlet Valve gagged shut during normal operations.	
.2 Method of performing a Resin/Charcoal load.	
.3 Method of performing a Resin unload.	
.5 Loading charcoal prior to loading resin.	

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Objectives

Using the approved procedure, DISCUSS:

	Slide(s)
Task 390901.02 - Spent Resin Tank-level readings, 17 Resetting a Locked Up Quantum Master Controller	141-142
Task 390902.06 - Phase Separators Level Readings	131-137
Task 390903.02 - Waste Sludge Tanks level readings	137
Task 390904.03 - Concentrated Waste Tanks level readings	137
Task 390905.02 - FP/FD Sludge Tanks level readings	137
TREQ 02623308-33 - Liquid RW Discharge Surveillance	146
TREQ 02623308-21 - Resin Loading activities	143-144
TREQ 02623308-01 - WX Tank Level Mod	139-141

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Evaluation Methods and Passing Criteria

For objectives: Written Examination with Score ≥ 80%
For tasks: Satisfactory classroom participation, as decided by the instructor.

References

1. N-CL-OPS-233000, FC
2. N-CL-OPS-264000, DG-GO
3. N-CL-OPS-288006, VD
4. N-CL-OPS-239003, ES-HD
5. N-CL-OPS-268002, RW INTEGRATED LIQ COLLECTION AND PROCESSING
6. N-CL-OPS-268008, RW FILTERS
7. N-CL-OPS-268009, RW DEMINERALIZERS
8. N-CL-OPS-268010, RW EVAPORATORS
9. N-CL-OPS-268011, RW WASTE SAMPLE
10. N-CL-OPS-268012, RW EXCESS WATER
11. N-CL-OPS-268013, RW SPENT RESIN
12. N-CL-OPS-268014, RW CONCENTRATE WASTE
13. N-CL-OPS-268016, RW SOLID RW SLUDGE

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Evaluation Methods and Passing Criteria

For objectives: Written Examination with Score ≥ 80%
For tasks: Satisfactory classroom participation, as decided by the instructor.

References

14. CPS 3317.01, FUEL POOL COOLING AND CLEANUP (FC)
15. CPS 3317.02, FUEL POOL COOLING FILTER DEMINERALIZERS
16. CPS 5917, ALARM PANEL 5917 ANNUNCIATORS (0PL45J)
17. CPS 3506.01, DIESEL GENERATOR AND SUPPORT SYSTEMS
18. CPS 3403.01, DIESEL GENERATOR HVAC (VD)
19. CPS 3102.01, EXTRACTION STEAM-HTR VENT AND DRAINS
20. CPS 3906.01, OPERATING RW DEMINERLIZERS
21. CPS 3909.01, OPERATING SPENT RESIN SYSTEM
22. CPS 3909.02, OPERATING PHASE SEPARATORS
23. CPS 3909.03, OPERATING WASTE SLUDGE SYSTEM
24. CPS 3909.04, OPERATING CONCENTRATE WASTE SYSTEM
25. CPS 3909.05, OPERATING FUEL POOL FILTER DEMIN SLUDGE SYSTEM
26. CPS 9911.50, LIQUID RADIOACTIVE DISCHARGE SURVEILLANCE
27. CY-AA-110-5002, BEAD RESIN USE AND CONTROL
28. BC08Ir4_CONTROLLERS (GFES)

Commitments

Ensure the associated section is annotated in the right-hand column of the notes page

NONE

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Instructor Materials

1. System procedures (as needed)
2. System lesson plan (as needed)
3. Classroom with overhead projection abilities

Student Materials

1. Ipads with Sharefile access

Focus Areas

Crew / Dept Focus Areas

PIIM

HU Improvement Plan

Your Role in Training

Participation
Questions
Feedback
Training Observations
LASER Entries

Ground Rules

Return from breaks on time

Pagers and phones on silent mode

Practice good housekeeping

Phone calls, texting, and messages only on breaks, unless it is an emergency

Fuel Pool Cooling and Cleanup System

PURPOSE

Remove decay heat from the spent fuel assemblies
Maintain pool water level
Minimize fission product concentration in the water
Maintain pool clarity for fuel handling

Clean up the suppression pool
Provide alternate suppression pool cooling

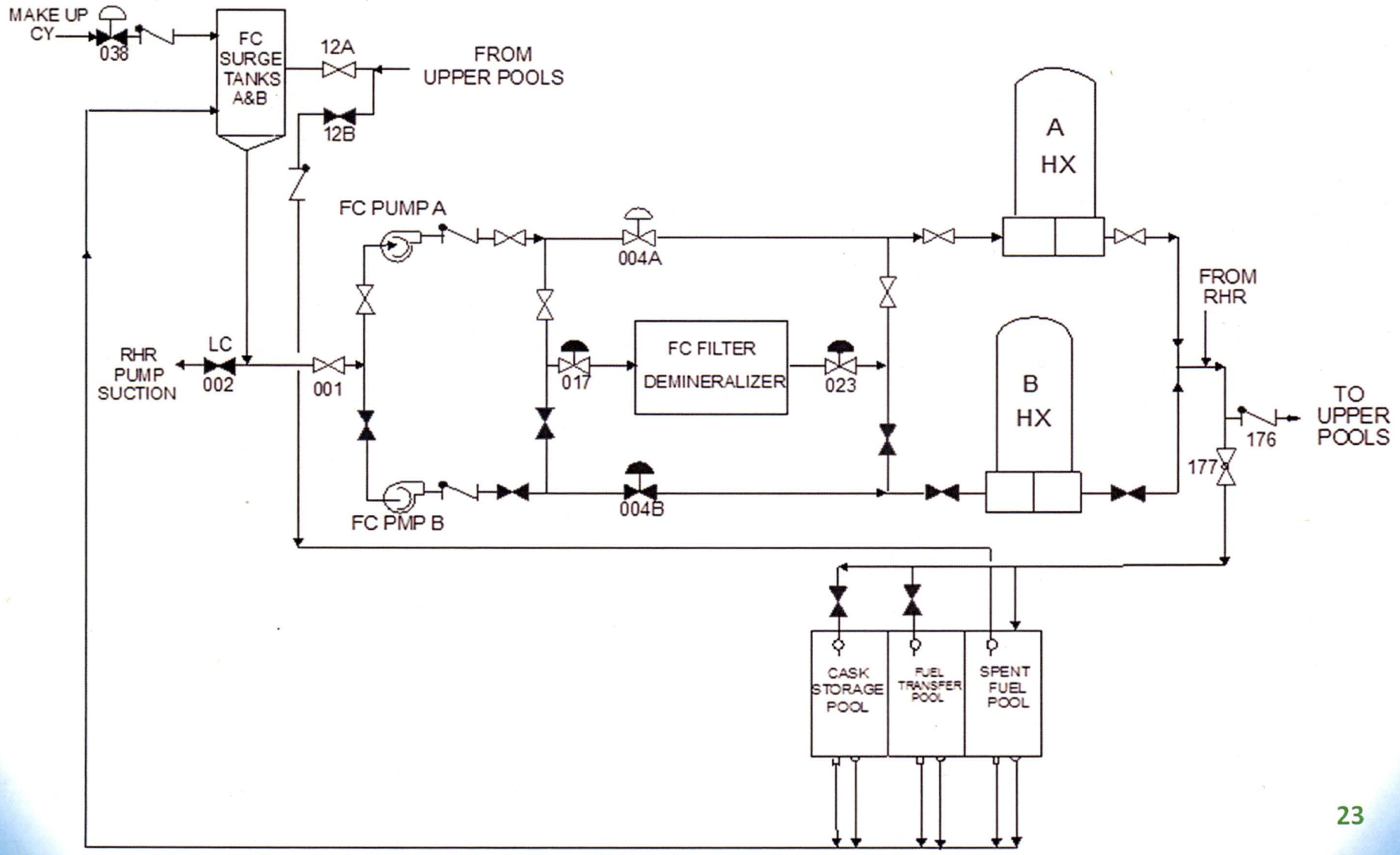
Design Bases

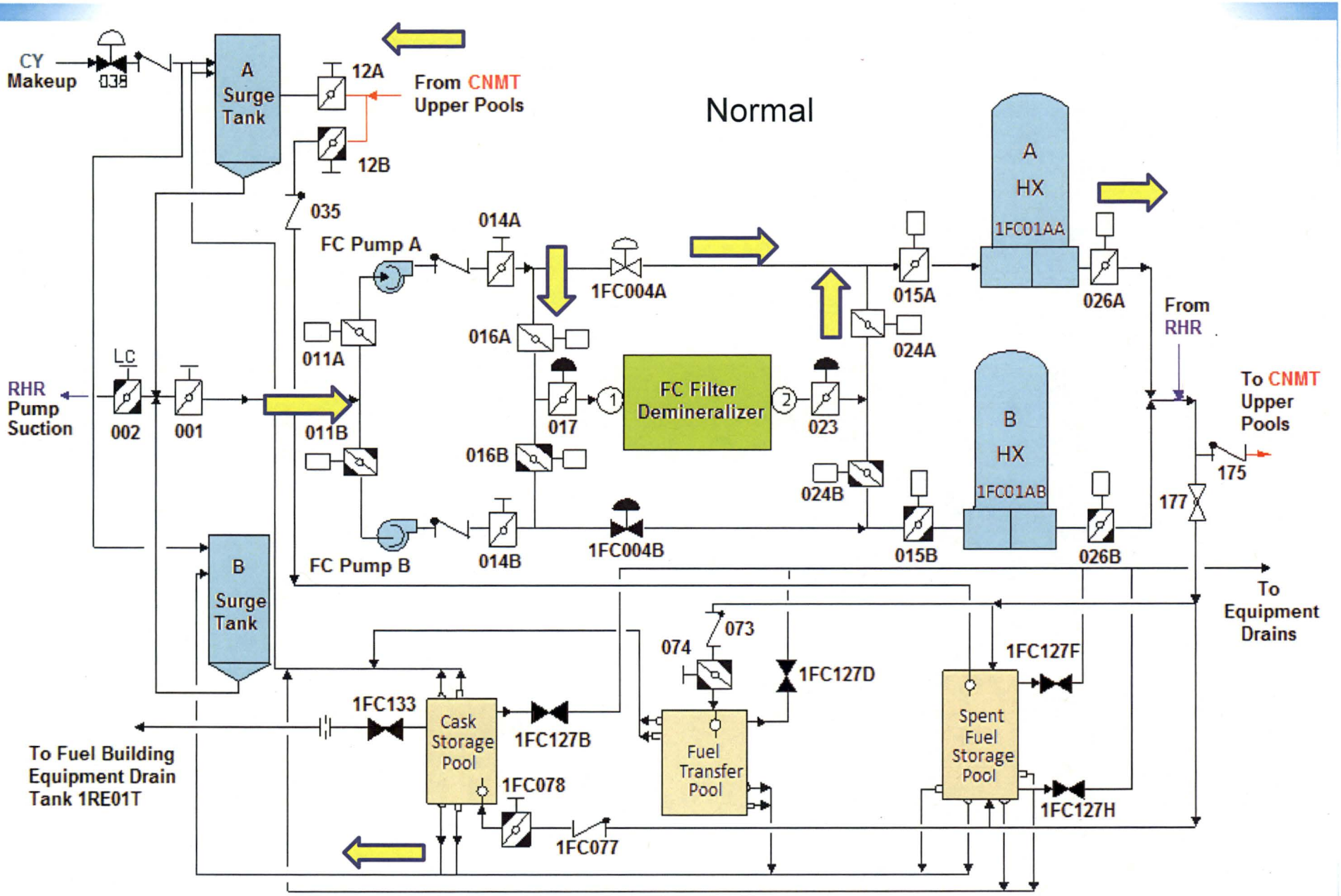
remove the decay heat

remove radioactive contaminants

- Minimize the radiation levels
- Minimize release of radioisotopes

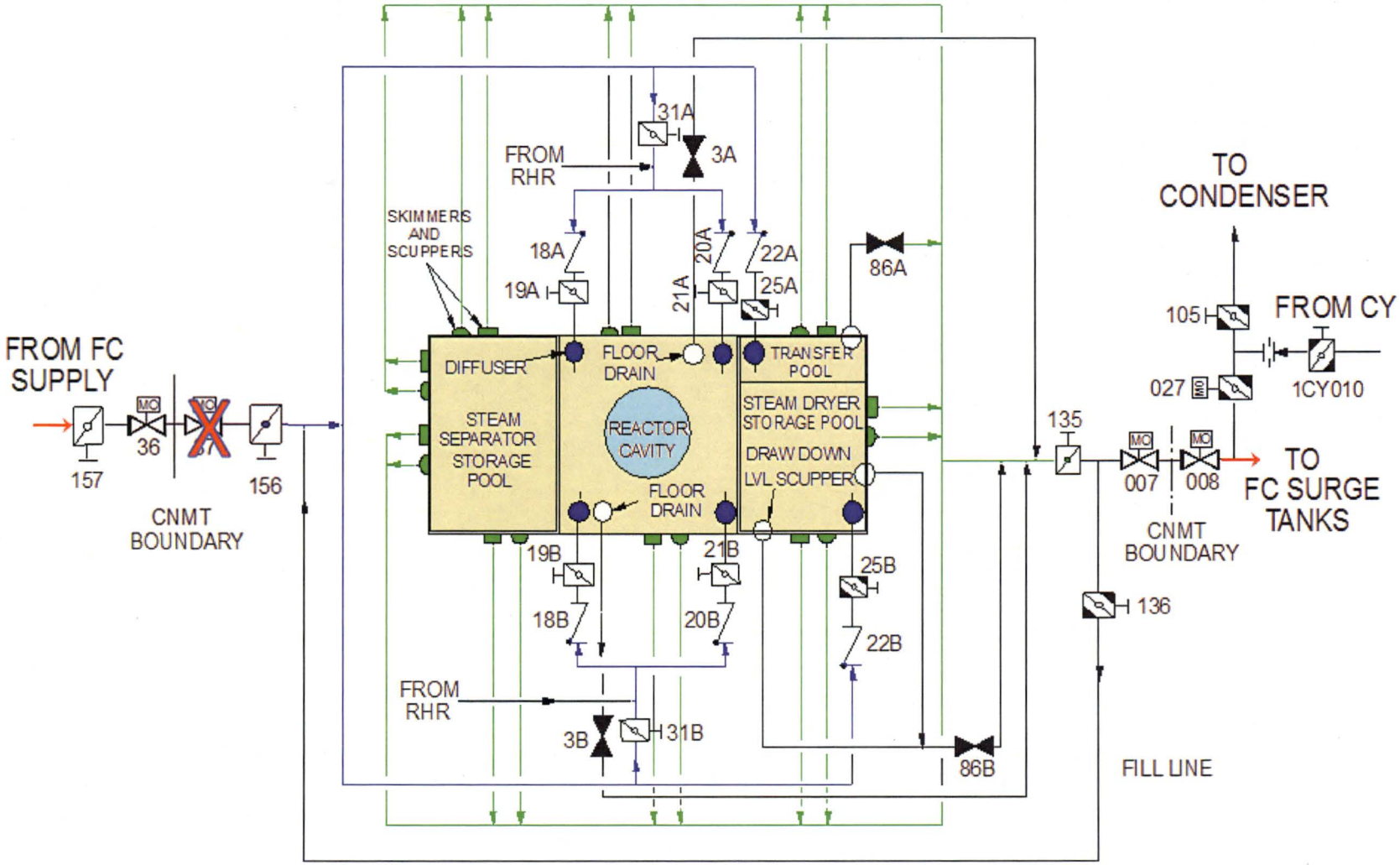
Flow Paths


MAKE UP
CY
038
FC
SURGE
TANKS
A&B
12A
12B
FROM
UPPER POOLS
FC PUMP A
004A
A
HX
FROM
RHR
RHR
PUMP
SUCTION
LC
002
001
017
FC FILTER
DEMINERALIZER
023
B
HX
TO
UPPER
POOLS
176
177
FC PMP B
004B
CASK
STORAGE
POOL
FUEL
TRANSFER
POOL
SPENT
FUEL
POOL



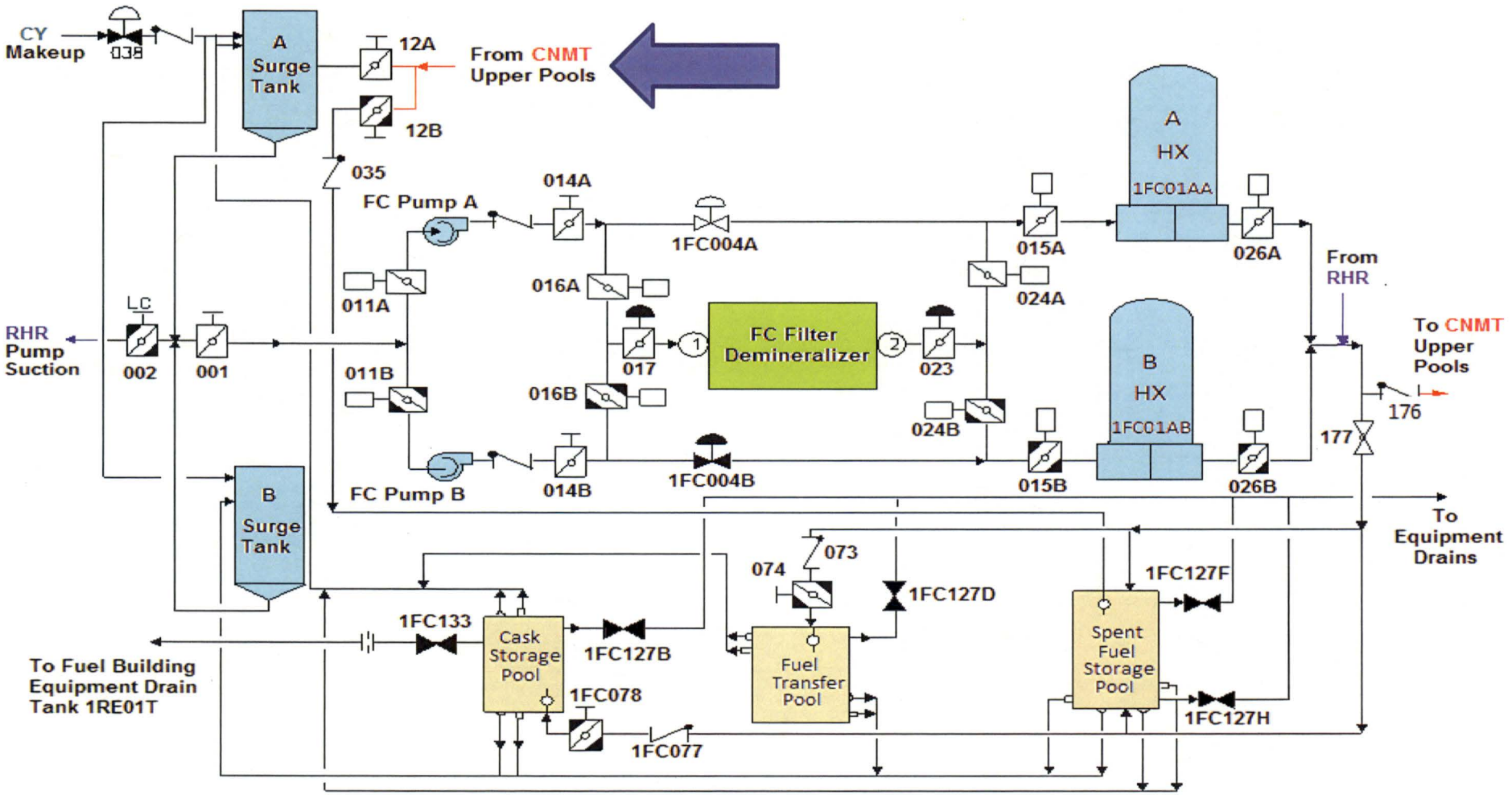
FUEL POOL COOLING AND CLEANUP SYSTEM FLOW DIAGRAM

RX vessel Pool Draindown



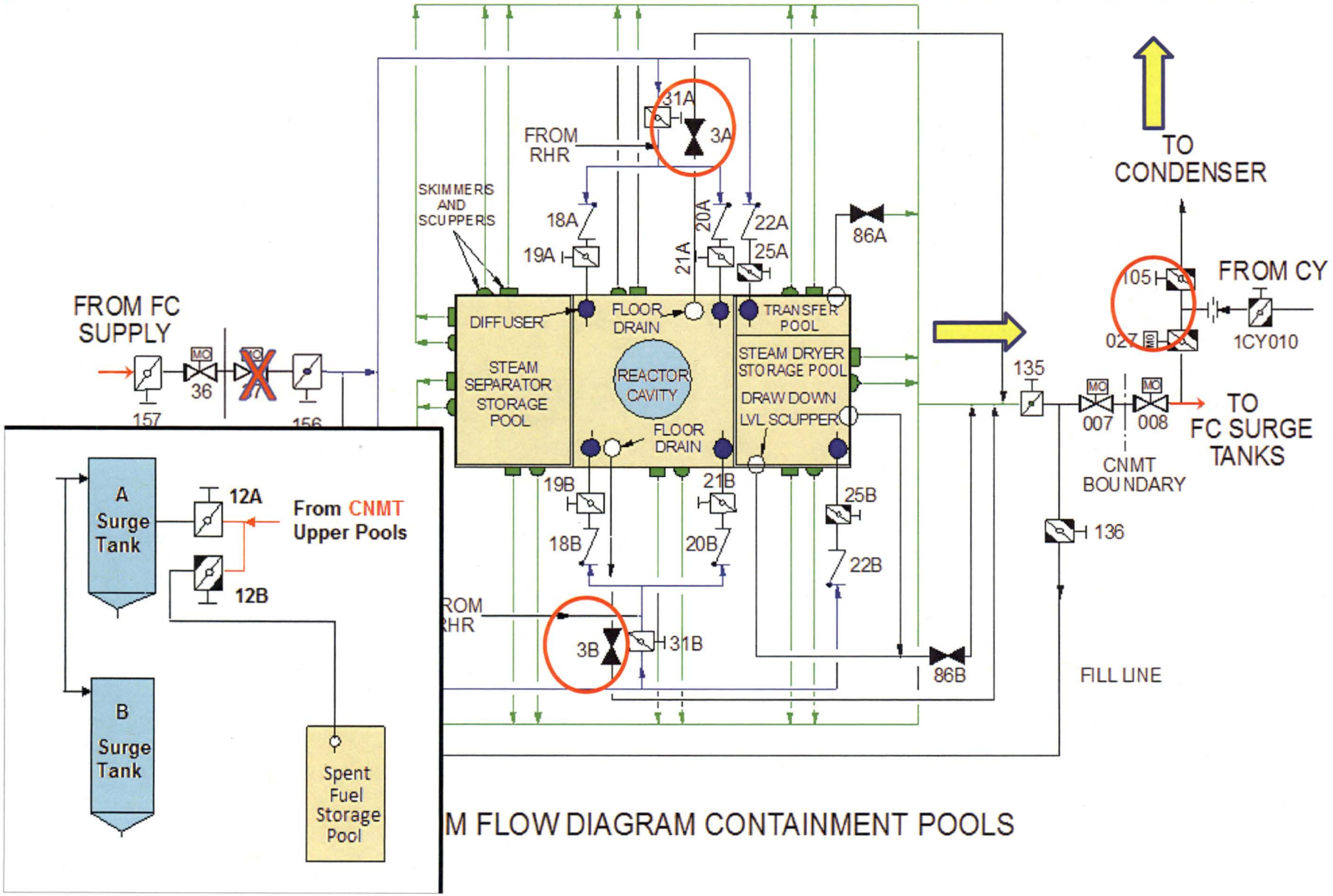
FC SYSTEM FLOW DIAGRAM CONTAINMENT POOLS

RX vessel Pool Draindown



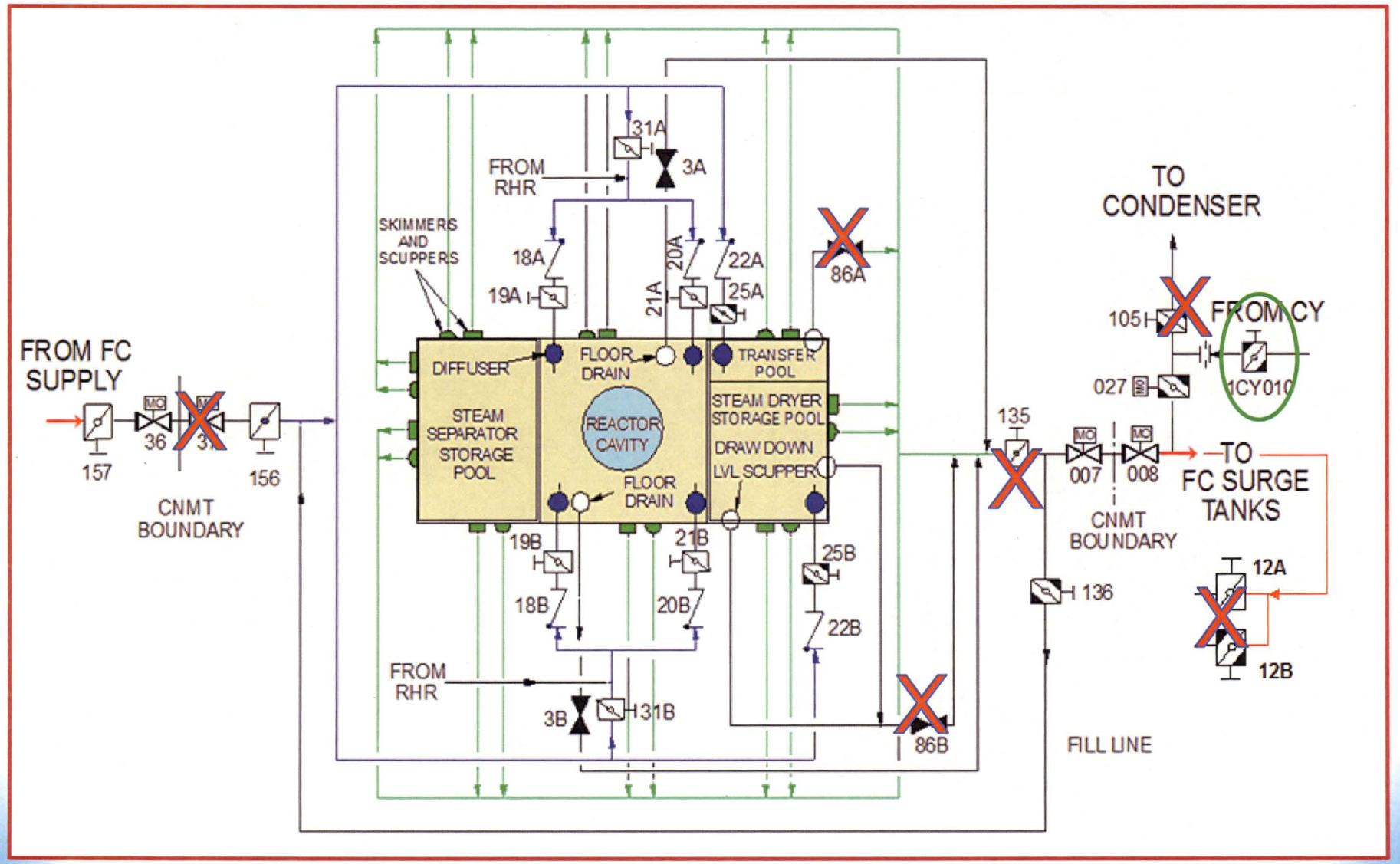
FUEL POOL COOLING AND CLEANUP SYSTEM FLOW DIAGRAM

RX vessel Pool Draindown

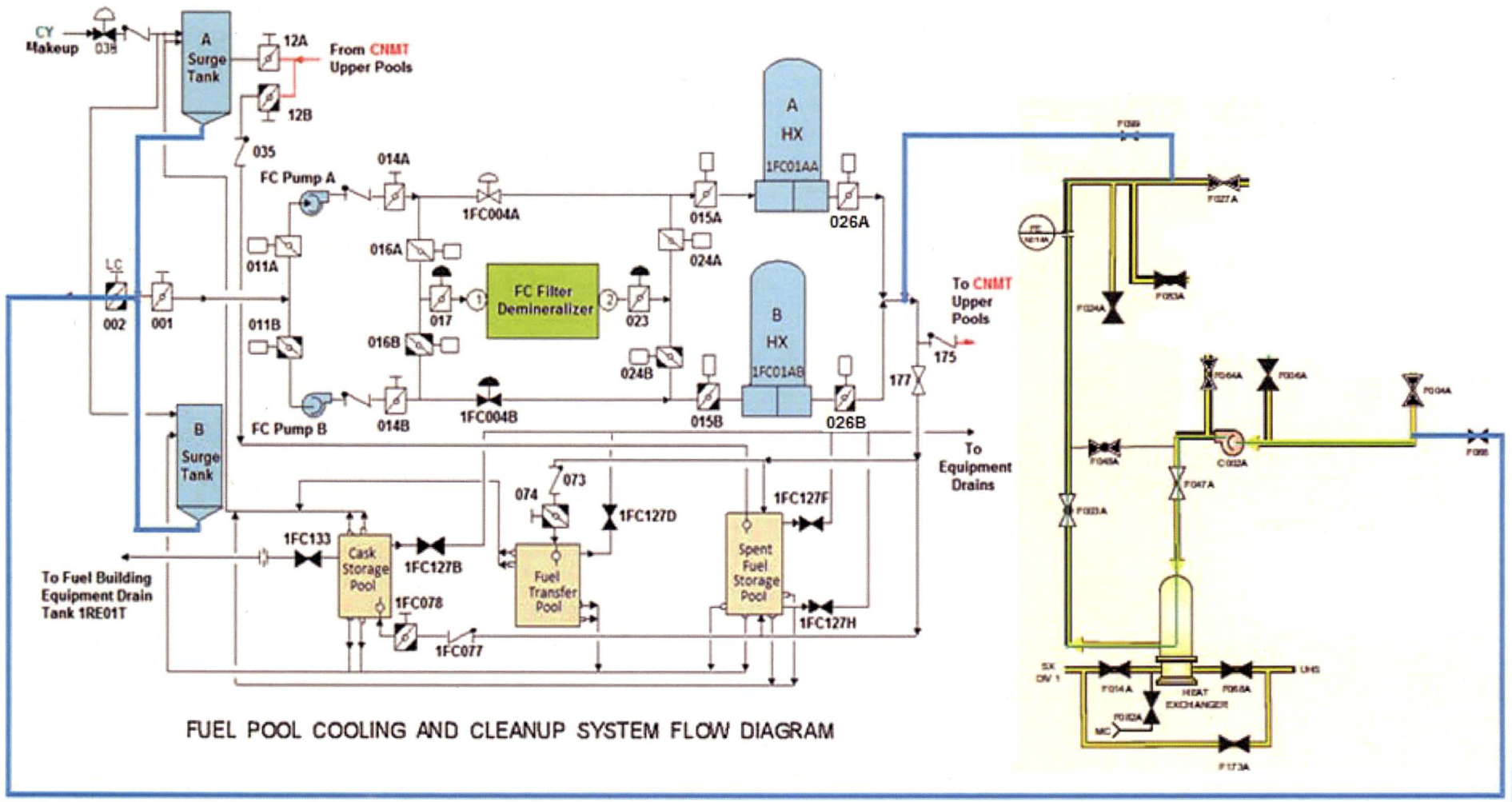


M FLOW DIAGRAM CONTAINMENT POOLS

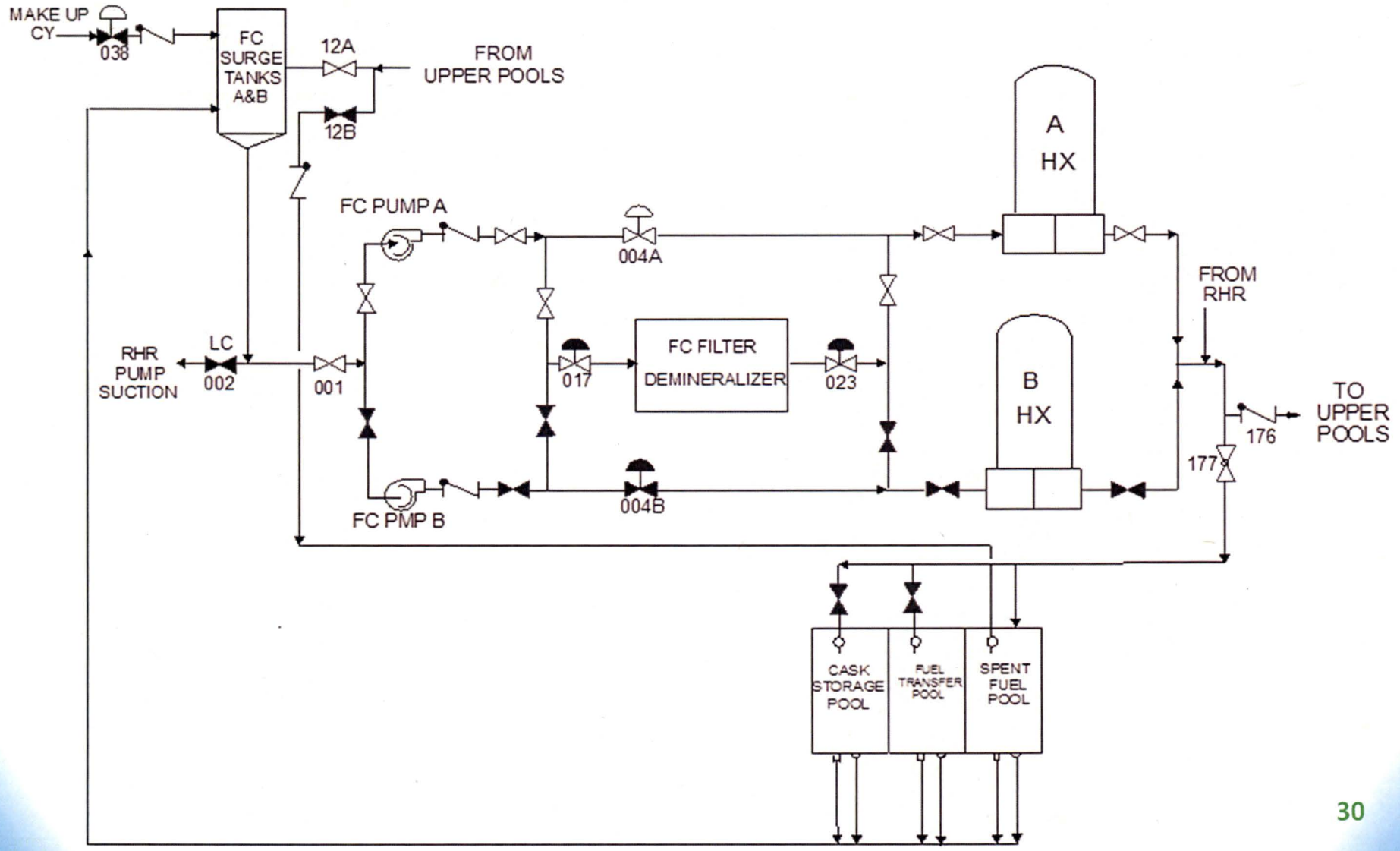
RX vessel Pool Fill

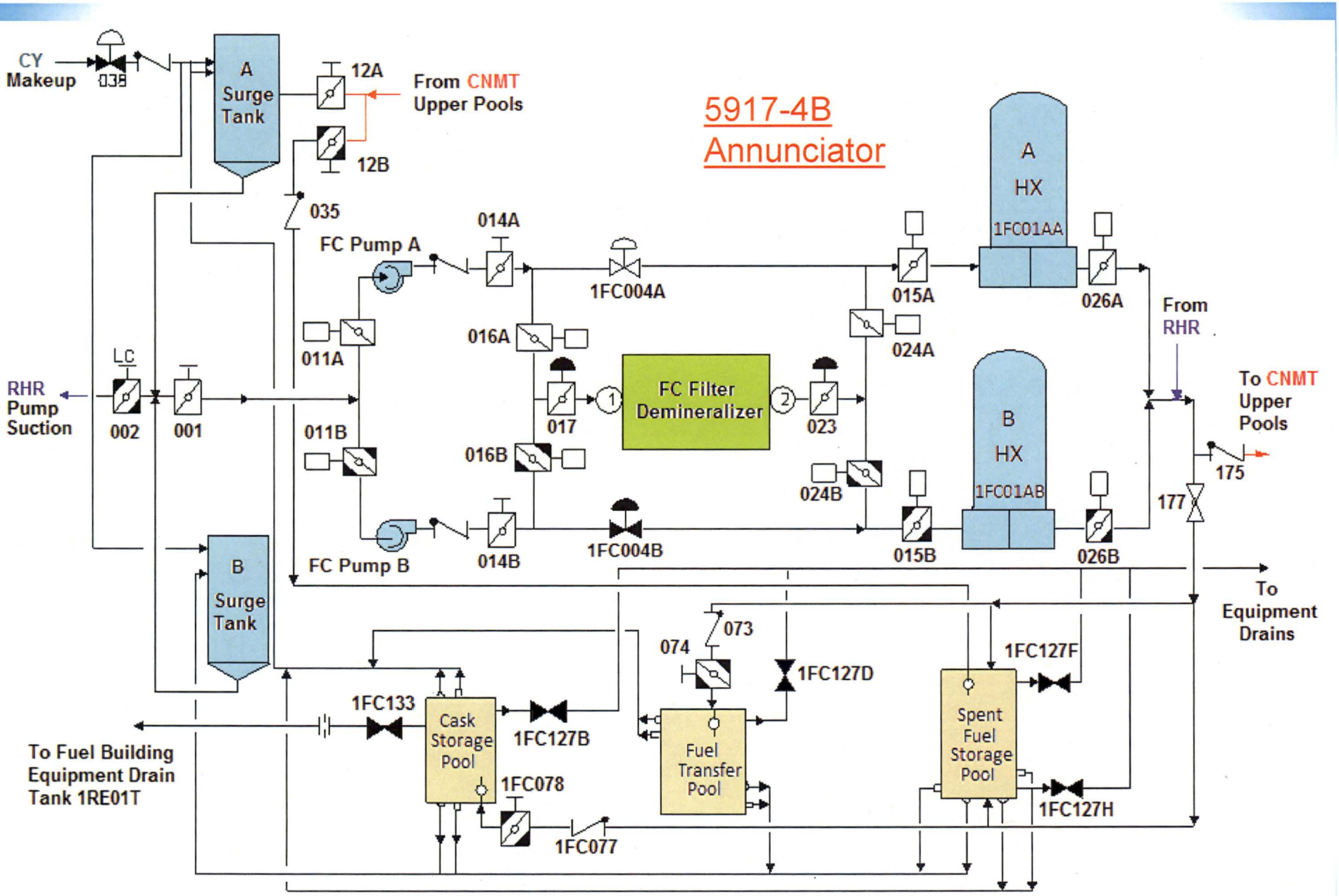


FC Assist


CY Makeup
035
A Surge Tank
12A
12B
From CNMT Upper Pools
035
FC Pump A
014A
1FC004A
A HX
1FC01AA
015A
026A
024A
011A
016A
LC
002
001
017
FC Filter Demineralizer
023
B HX
1FC01AB
011B
016B
024B
175
177
To CNMT Upper Pools
B Surge Tank
FC Pump B
014B
1FC004B
015B
026B
To Equipment Drains
073
074
1FC127D
1FC127F
1FC133
Cask Storage Pool
1FC127B
Fuel Transfer Pool
Spent Fuel Storage Pool
1FC078
1FC077
1FC127H
To Fuel Building Equipment Drain Tank 1RE01T
FUEL POOL COOLING AND CLEANUP SYSTEM FLOW DIAGRAM

Interim Summary





FUEL POOL COOLING AND CLEANUP SYSTEM FLOW DIAGRAM

Support Systems

Component Cooling Water System (CCW)Shutdown

Normal supply to FC HX and Pump Motor Coolers

Service Water System (SX)

Backup supply to FC HX and Pump Motor Coolers
Emergency Makeup to Spent Fuel Storage Pool

Cycled Condensate System

Makeup to FC Surge Tanks
Fill supply to Upper Containment Pools
F/D backwash and precoat

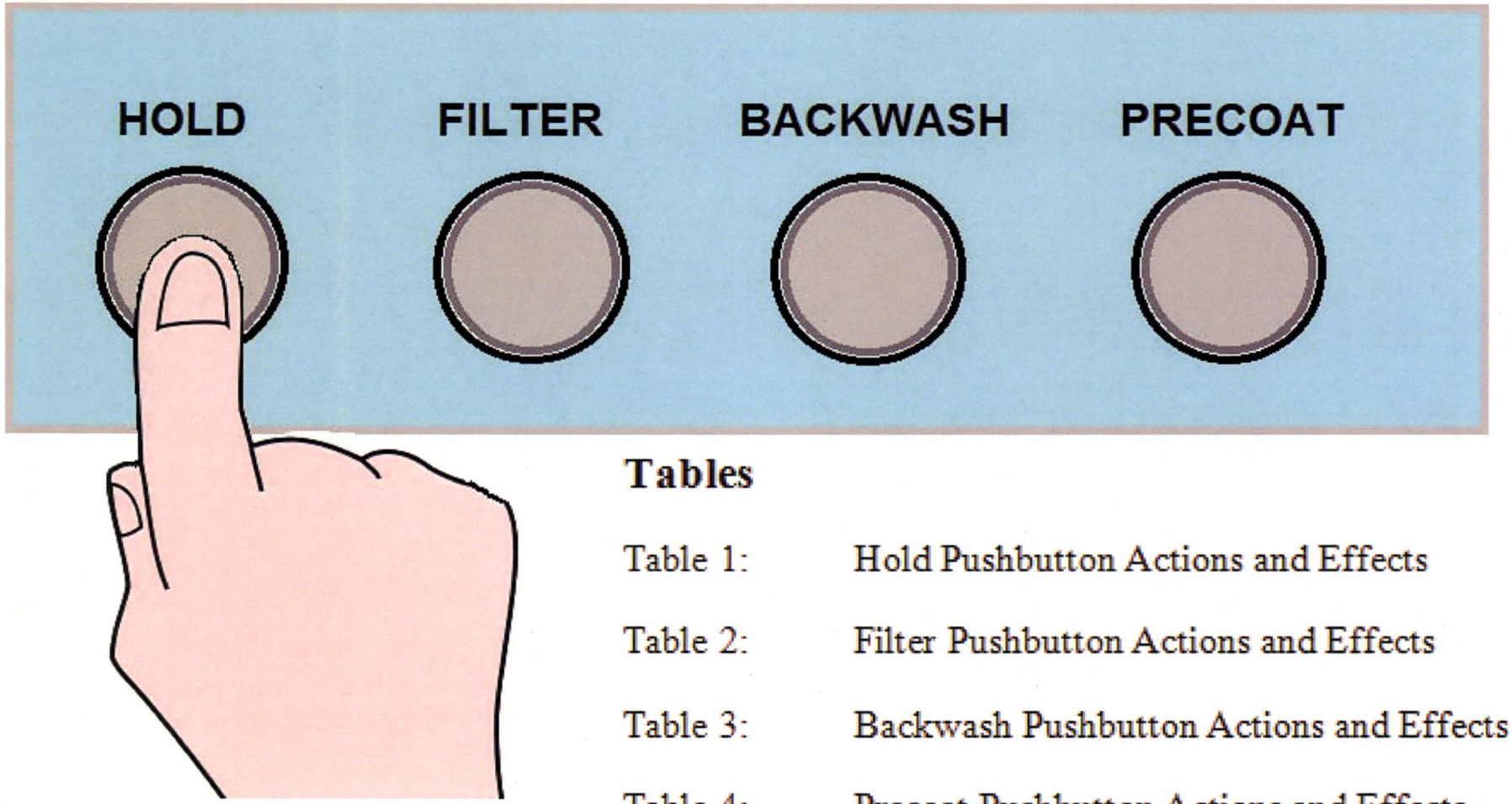
Containment and RPV Isolation Control (CRVICS) System

RPV Level 2 / High DW press isolation signals

Support Systems

-AC Electrical Distribution
-DC Electrical Distribution
-Leak Detection System
CT, DW, AB, and FB Floor and Equipment Drain System
-Residual Heat Removal System
-Main Condenser
-Solid Radwaste Processing
-Process Sampling
-Service/Instrument Air System
-Fuel Building Ventilation
-Containment Ventilation/Drywell Purge
-Radwaste Building Ventilation

FD Train
Manual Pushbuttons



Tables

Backwash Pushbutton Actions and Effects [.1.15.2]

Initiating Event	Action	System Effects
Press Backwash pushbutton (PB-3)	Backwash light comes on, PLC starts the process.	
	Backwash program sealed in.	
	058 closes	FD inlet isolated from FC & SF systems.
	068 opens	Water begins to drain for FD vessel dome.
	067 opens	Service Air admitted to vessel dome
	068 closes	Vessel dome is pressurized.
	062 closes, Hold Pump stops, 065 opens.	FD water & resin is forced out through main drain.
	067 closes	Service Air is shut off.
	065 closes	Vessel drainage stops.
	041, 063 & 066 open	CY enters to fill FD & flush through overflow line.
	069 opens	Air enters from bottom of vessel to create frothing action & dislodge resin from septa. (Air Scour)
	069, 063, 066, & 041 close	Vessel fill & scouring action stops.
	067 opens	Service Air pressurizes vessel dome.
	065 opens	FD vessel water and resin is forced out through main drain.
	067 closes	Service Air to dome is shut off.
	065 closes	Vessel drainage stops.
	PLC stops the process, Backwash light goes out, Shutdown light comes on.	

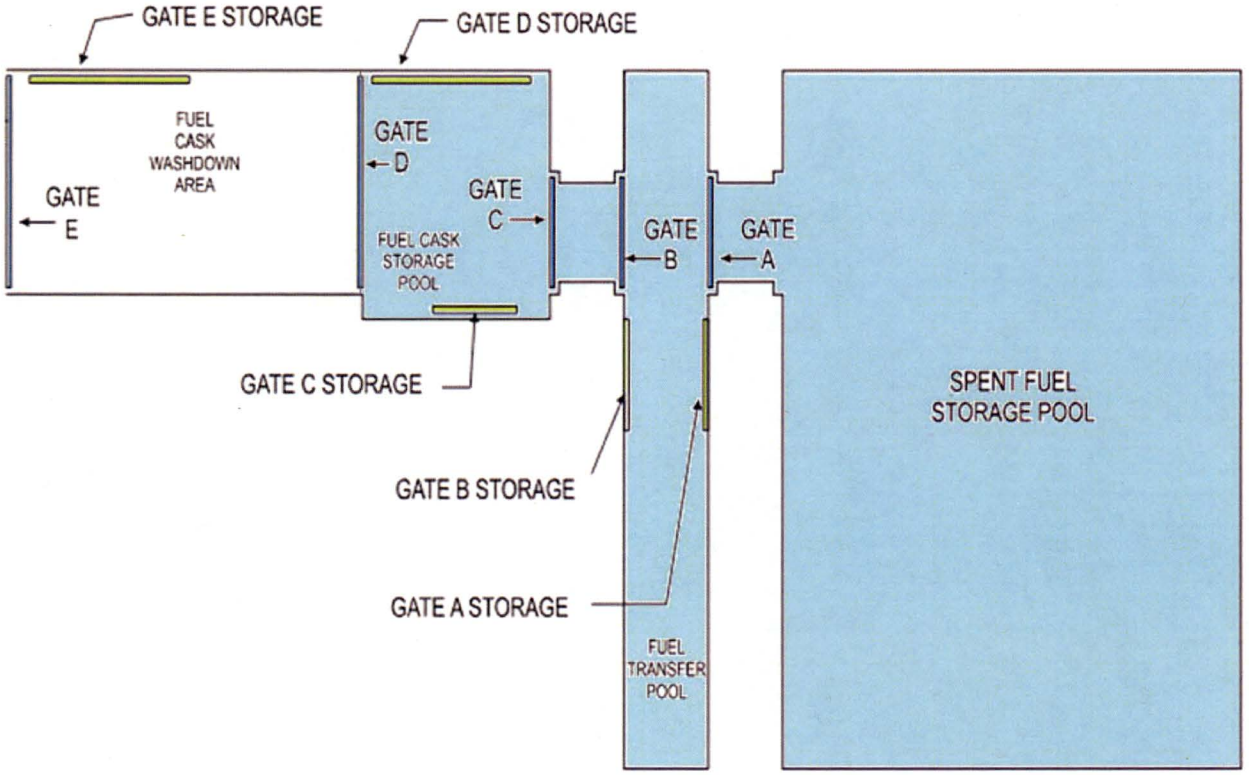
Precoat Pushbutton Actions and Effects **[.1.15.2]**

Initiating Event	Action	System Effects
Press Precoat pushbutton (PB-4)	PLC starts the process.	
	Shutdown light goes out, Backwash light comes on, and Precoat program is sealed in.	
	Backwash light goes out, Precoat light comes on, and Power Failure relay is reset (if necessary).	
	063, 066 and 041 open	FD Vessel fills with CY water.
PS-FC024 senses high pressure in overflow line	066 closes	Vessel overflow stops.
	066 opens	Vessel overflow resumes.
	041, 063, and 066 close	FD Vessel fill stops
	Precoat Pump starts	
	064 and 070 open	
	063 opens	Clean water from Precoat Tank is recirculated through FD Vessel at low flow rate.
	Resin Timer starts and is sealed-in	
	070 opens to high flow setting	Precoat recirculation flow rate increases
	053 opens	
	060 opens	Slurry from Resin Tank enters Precoat Pump suction through Resin Eductor.
	Resin Timer starts and Resin Coating light comes on	Resin slurry pumped to FD Vessel where resin coats the FD septa for 35 minutes.
	060 closes	Resin slurry flow is shut off to Precoat Pump suction stream.
	053 closes	
	Resin Coating light goes out and Resin Timer resets	
	070 closes to low flow setting	Precoat recirculation flow rate decreases
	062 opens and Hold Pump starts	Hold Pump supplies flow through FD Vessel
	063 closes	Precoat Pump supply to FD Vessel is shut off
	064 & 070 close	
	Backwash light comes on, Precoat light goes out, 058 opens, and Precoat Pump stops	FD inlet is lined up to FC or SF system
	Backwash light goes out	FD train is now in Hold mode and can be placed in service as needed.

TREQ 1648565-55

During shift in early September 2015 a leak was identified on the FC pool gate that separates the cask wash down pit from its adjacent pool. During initial investigation it was apparent that several operators were unaware of the capabilities or limitations of these pools and pits that are WEST of the 755' FB IFTS Fuel Transfer Pool. One knowledge deficiency in particular was that the fuel cask wash down area (pit) was not immediately recognized as NOT being a pool that would be capable of retaining fuel pool water if a seal failure were to occur. This information was either not covered or not retained by operators when the FC system review was performed. I do recall that there was some brief discussion about how the upcoming handling of casks may occur.

TREQ 1648565-55



CPS 3317.01

Task 331701.18 - Lower FC Surge Tank Level During System Operation

Task 331701.30 - Pump Casing Vent After Maintenance for the Fuel Pool Cooling and Cleanup System

CPS 3317.01

OPEX

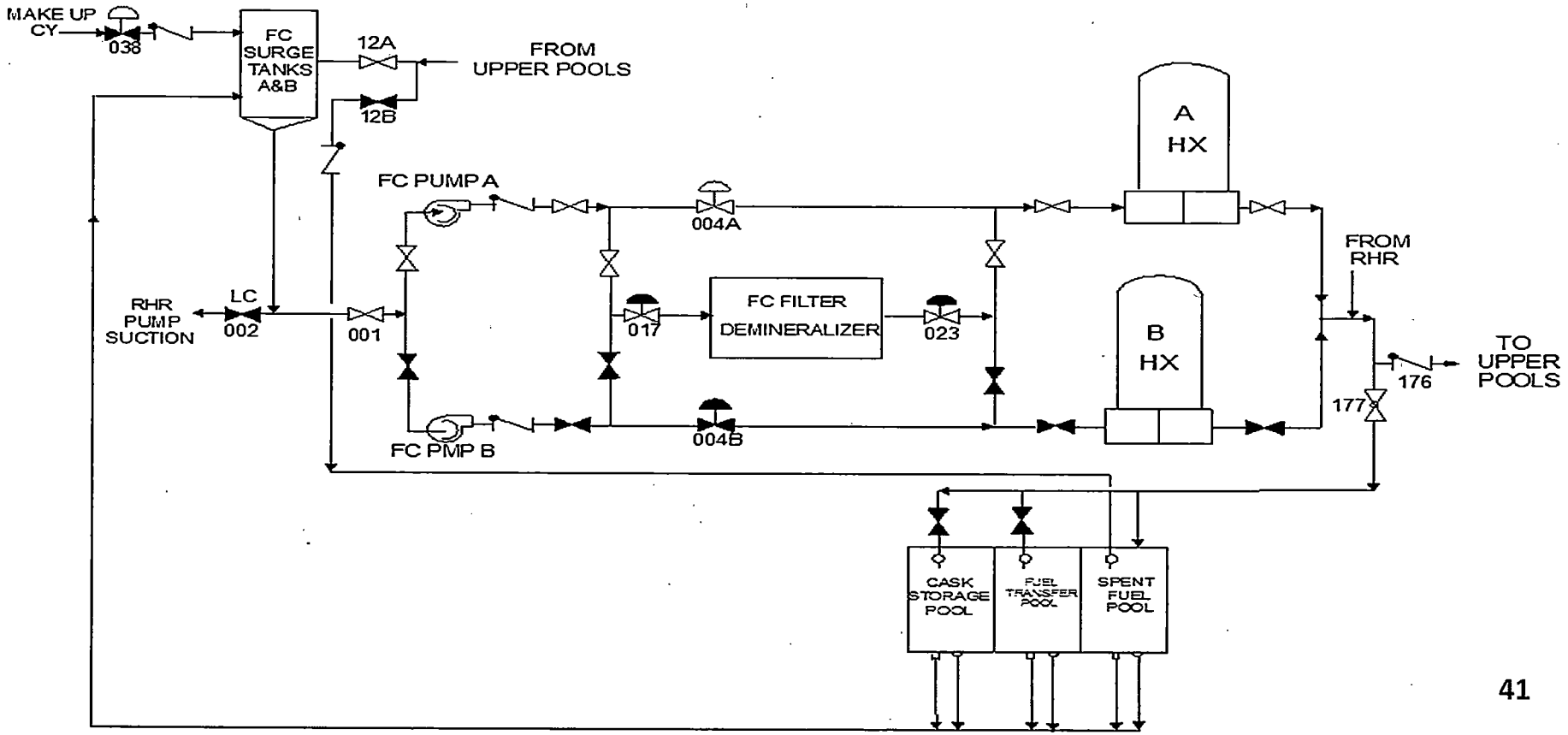
Lesson Plan:

Attachment A - Fuel Pool Siphoning Events

Attachment B - Reactor Cavity Overfilled during Floodup (Must-Know-OE)

Summary

The purpose of the Fuel Pool Cooling and Cleanup (FC) System is to remove decay heat from the spent fuel assemblies, maintain pool water level, minimize fission product concentration in the water, and maintain pool clarity for fuel handling.



Diesel Generator/Diesel Fuel Oil

Purpose

- To provide an *independent*, *Onsite* source of Emergency Power during Loss of Off-site power and LOCA to vital loads

Design Bases

- Redundant - only need 2 of 3
- Seismic
- Enough fuel oil stored for 7 days at maximum DG load
- Air starts- 5 consecutive starts without recharging air receivers
- Start and load in 12 seconds

Flow Paths

- Fuel Oil Transfer and Storage

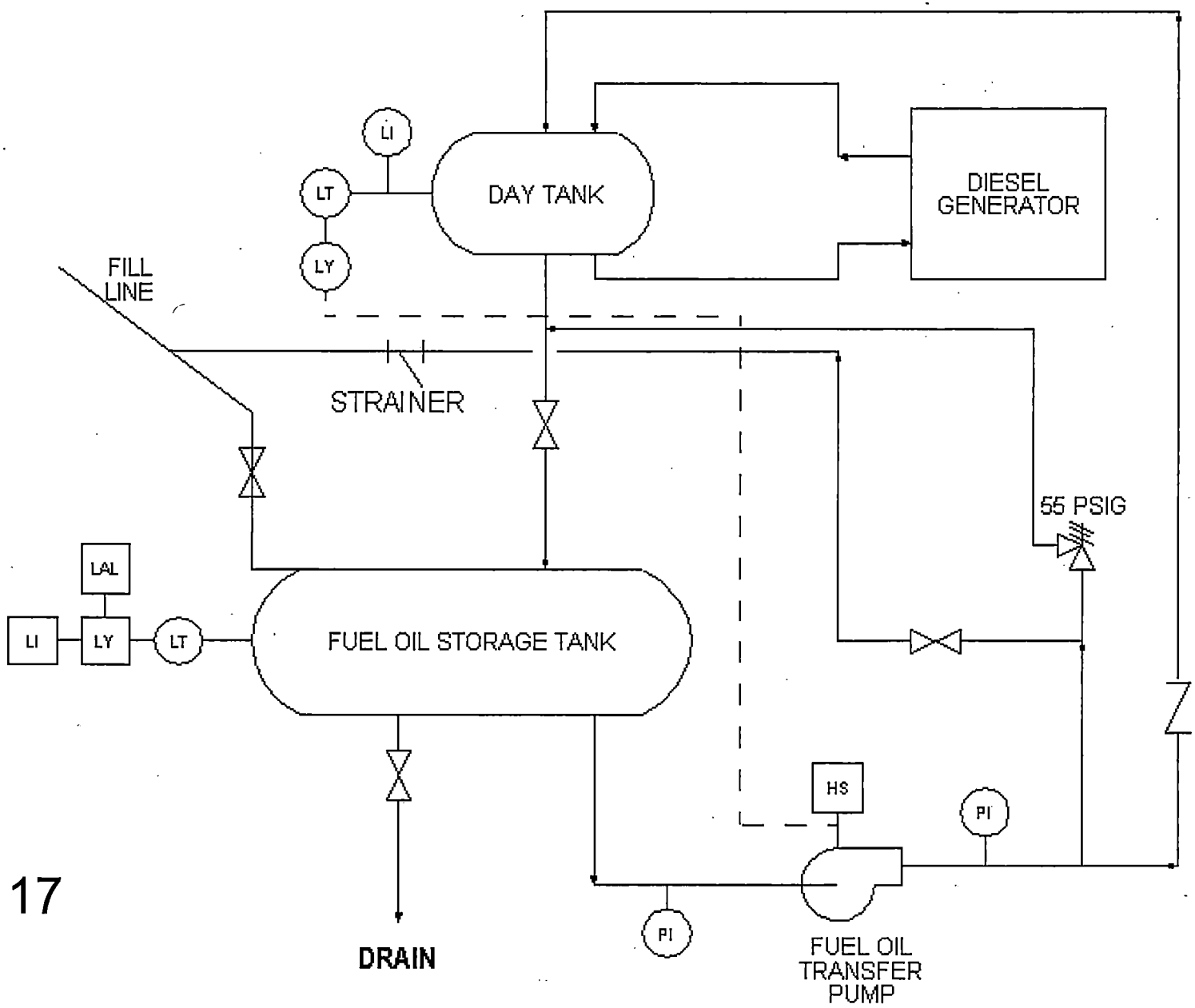


Fig 17

DIESEL GENERATOR FUEL OIL STORAGE & TRANSFER SYSTEM

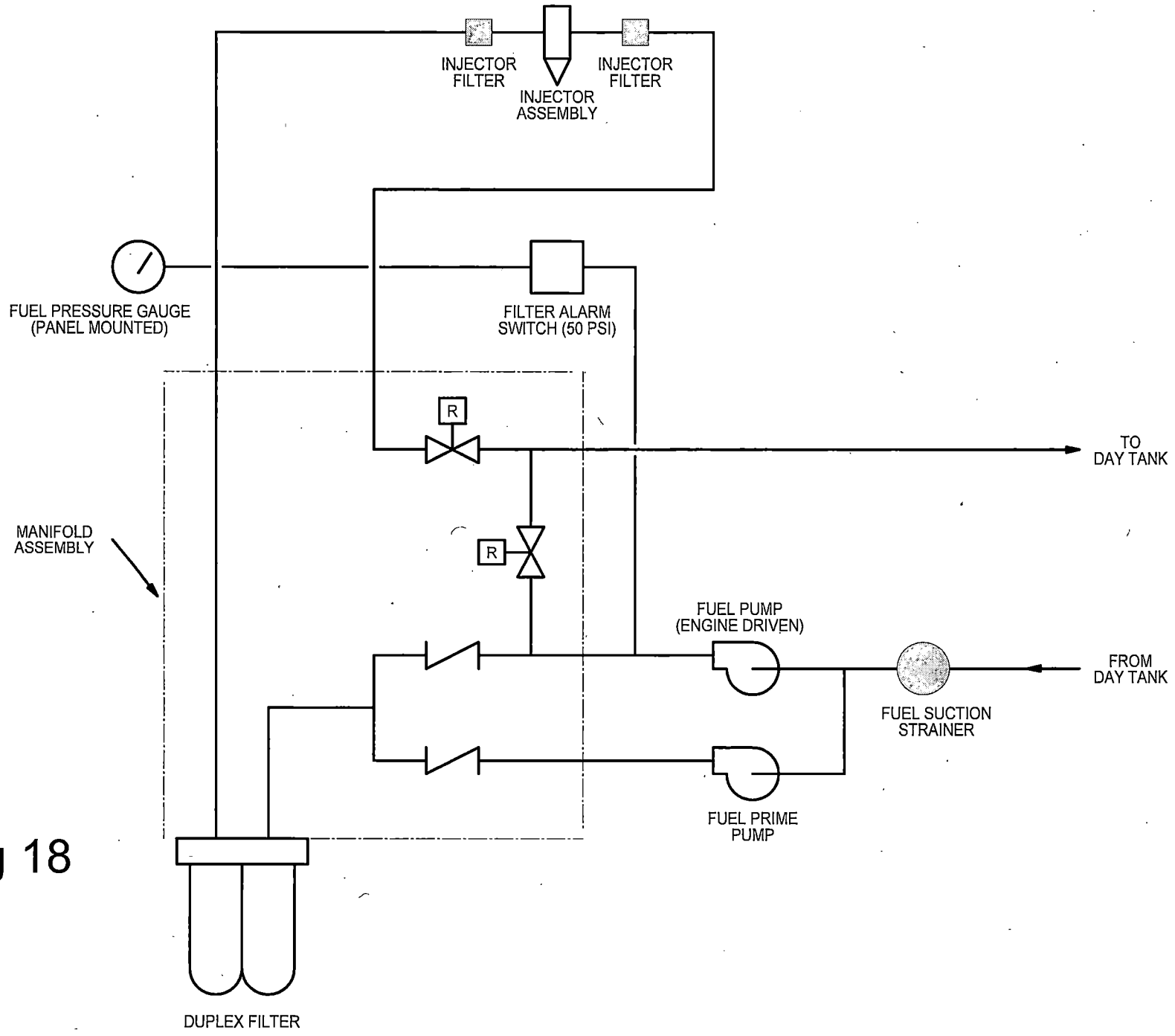

INJECTOR FILTER
INJECTOR ASSEMBLY
INJECTOR FILTER
FUEL PRESSURE GAUGE (PANEL MOUNTED)
FILTER ALARM SWITCH (50 PSI)
R
TO DAY TANK
MANIFOLD ASSEMBLY
R
FUEL PUMP (ENGINE DRIVEN)
FROM DAY TANK
FUEL SUCTION STRAINER
FUEL PRIME PUMP
DUPLEX FILTER

Fig 18

Fuel Oil Transfer Pumps

- Located DG Bldg 712'
- Takes suction on Fuel Oil Storage Tank and discharges to Day Tank
- Suction and Discharge pressure local indication
- Auto start when DG starts and shuts down when DG does

Fuel Oil Day Tank

- 737' DG Bldg
- 1 hour operation for max LOCA loads
- Overflows back to storage tank
- INOP DG for following levels
- Div 1 & Div 2 <54%
- Div 3 <35%
- Low level alarm - local

Fuel Oil Storage Tanks

- Stores and supplies of fuel oil to DG for 7 days during max LOCA conditions
- Div 1 51,000 gallons (LCO limit is 43, 810)
- Div 2 45,000 gallons (LCO limit is 38,572)
- Div 3 29,500 gallons (LCO Limit is 25,286)
- Level alarm local and indications in MCR

Fuel Oil Storage Tanks cont.

DC Priming Pump

- Auto start on DG Start
- Ensures sufficient fuel to injectors on DG Start
- Auto stop when DG gets to 850 RPM (DIV 1 & 2)
- DIV 3 runs continuously
- Local panel

Engine Driven Fuel Oil Pump

- Driven by the engine accessory gear train
- 4.5 gpm takes suction on day tank to injectors through filters
- Supply and return header pressure near fuel oil duplex filter (local)

Fuel Oil Filters

- Prevents clogging of injectors
- One in service, other standby
- Both can be in service with the selector lever in the mid-position

Starting Air

- Starts and accelerates the DG to achieve rated voltage, frequency and speed within 12 seconds of DG start signal

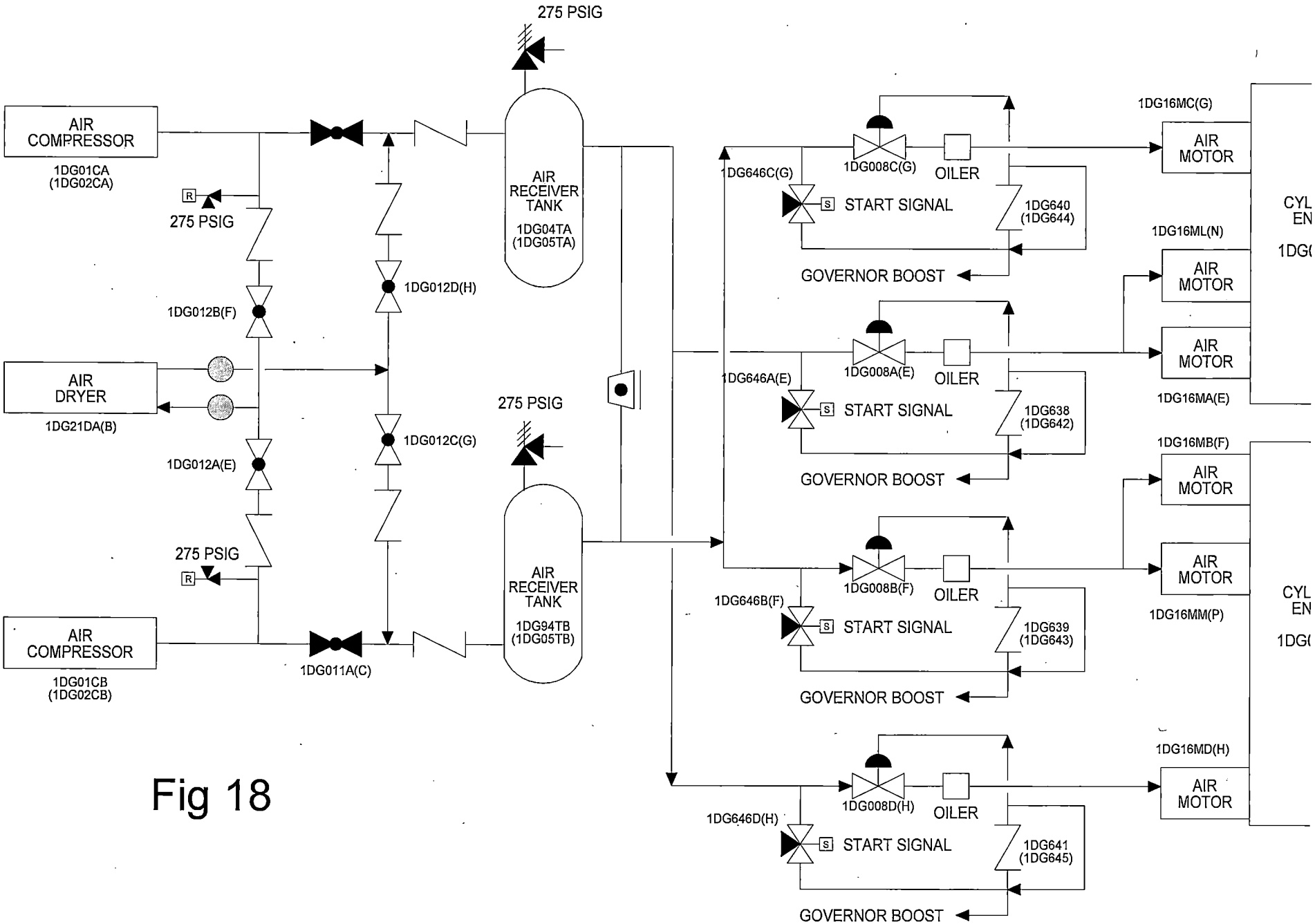

275 PSIG
AIR COMPRESSOR
1DG01CA (1DG02CA)
R
275 PSIG
1DG012B(F)
AIR DRYER
1DG21DA(B)
1DG012A(E)
275 PSIG
R
AIR COMPRESSOR
1DG01CB (1DG02CB)
1DG011A(C)
1DG012D(H)
AIR RECEIVER TANK
1DG04TA (1DG05TA)
1DG012C(G)
275 PSIG
AIR RECEIVER TANK
1DG94TB (1DG05TB)
1DG646C(G)
1DG008C(G)
OILER
S
START SIGNAL
1DG640 (1DG644)
GOVERNOR BOOST
1DG646A(E)
1DG008A(E)
OILER
S
START SIGNAL
1DG638 (1DG642)
GOVERNOR BOOST
1DG646B(F)
1DG008B(F)
OILER
S
START SIGNAL
1DG639 (1DG643)
GOVERNOR BOOST
1DG646D(H)
1DG008D(H)
OILER
S
START SIGNAL
1DG641 (1DG645)
GOVERNOR BOOST
1DG16MC(G)
AIR MOTOR
1DG16ML(N)
AIR MOTOR
AIR MOTOR
1DG16MA(E)
1DG16MB(F)
AIR MOTOR
AIR MOTOR
1DG16MM(P)
1DG16MD(H)
AIR MOTOR
CYL EN
1DG(
CYL EN
1DG(

Fig 18

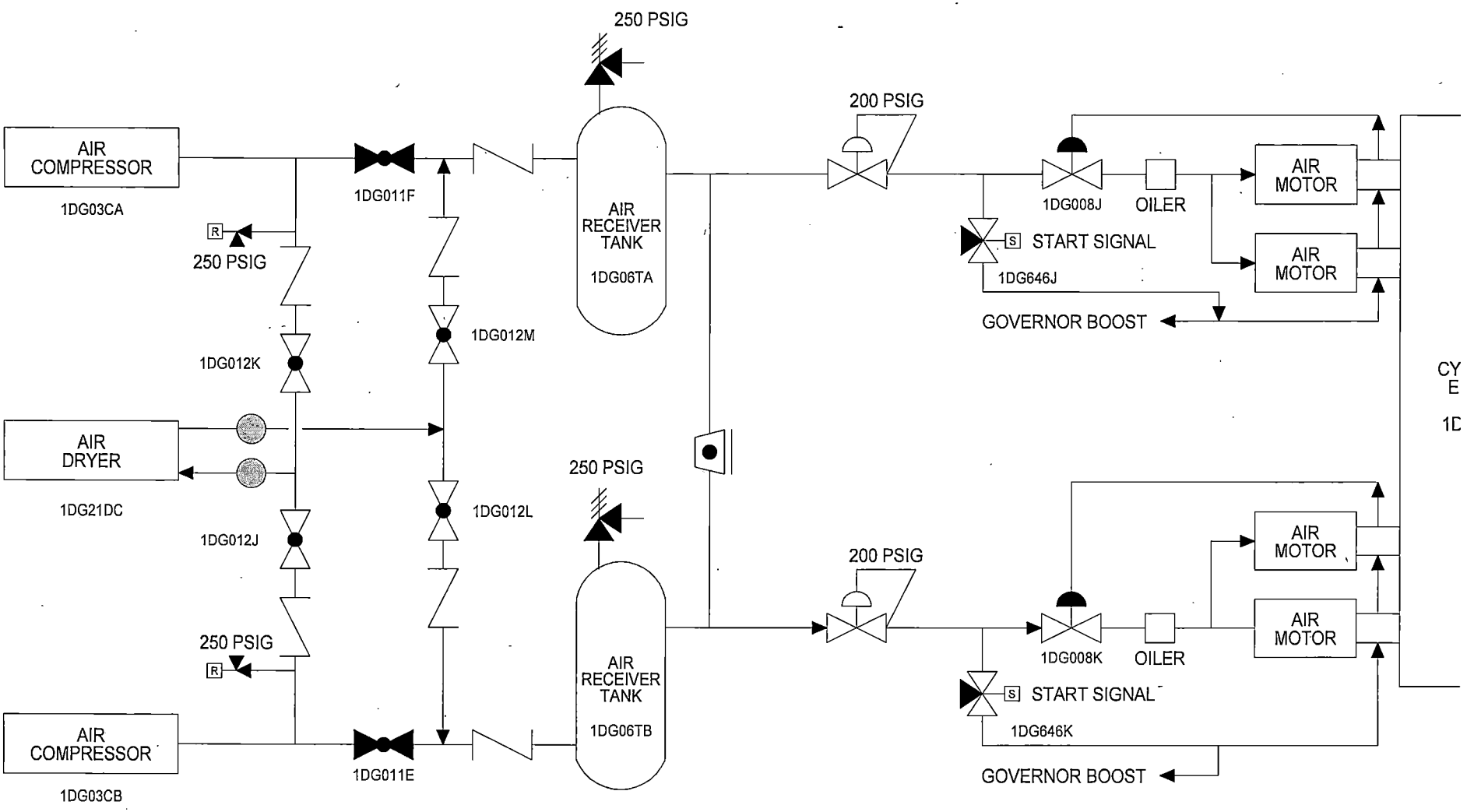
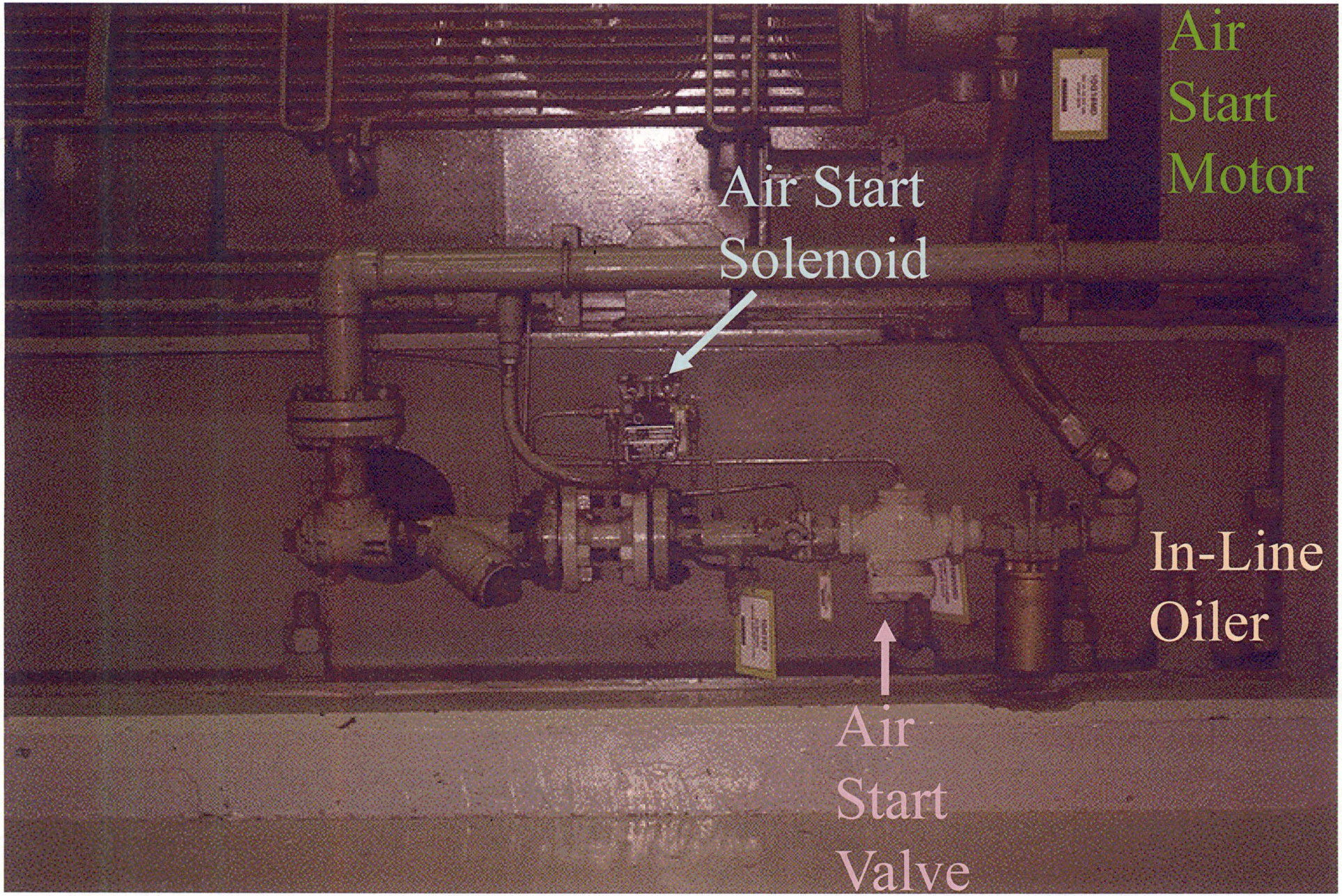
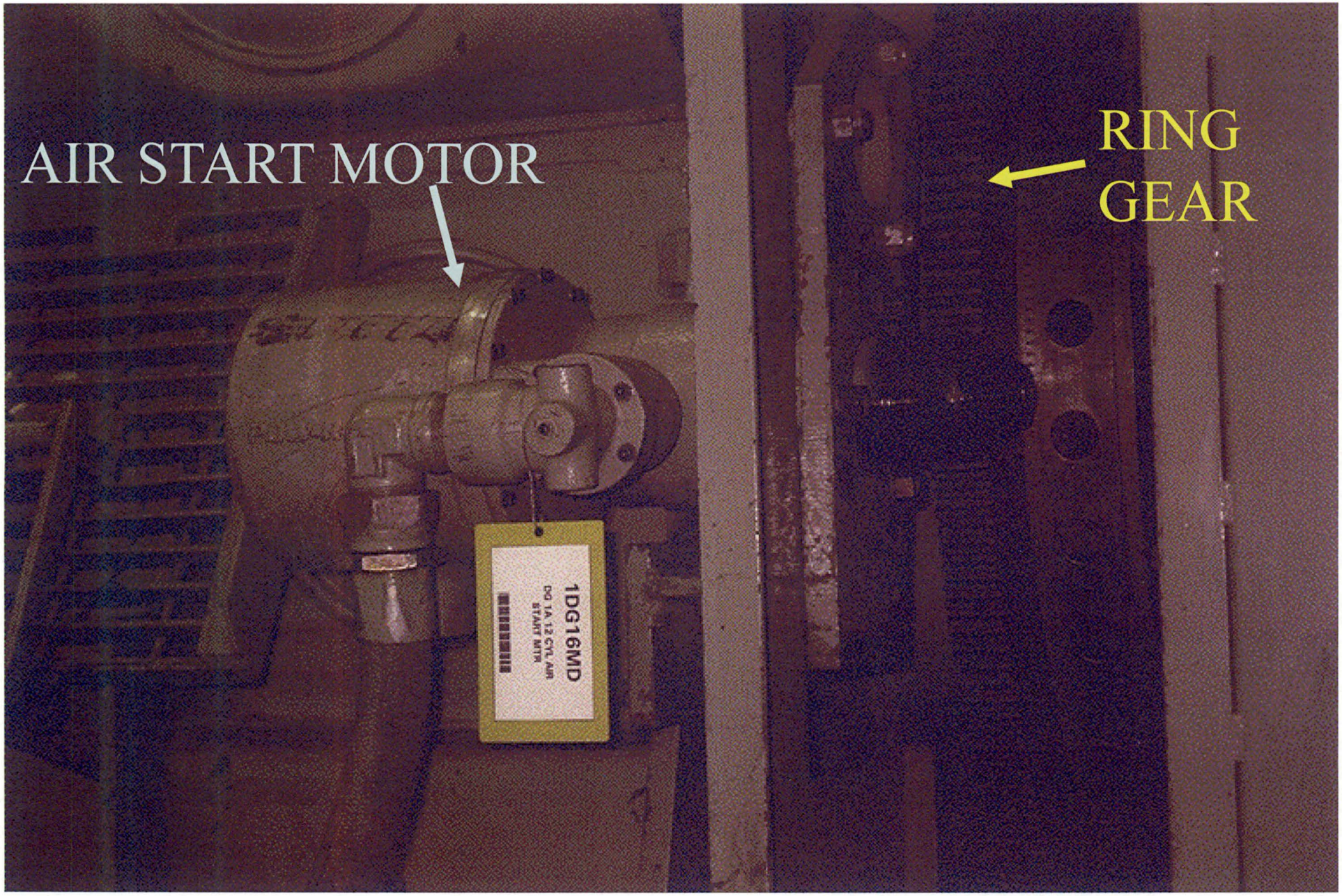

250 PSIG
AIR COMPRESSOR
1DG03CA
1DG011F
200 PSIG
AIR RECEIVER TANK
1DG06TA
1DG008J
OILER
AIR MOTOR
AIR MOTOR
START SIGNAL
1DG646J
GOVERNOR BOOST
250 PSIG
1DG012M
1DG012K
AIR DRYER
1DG21DC
1DG012J
1DG012L
250 PSIG
250 PSIG
AIR COMPRESSOR
1DG03CB
1DG011E
AIR RECEIVER TANK
1DG06TB
200 PSIG
1DG008K
OILER
AIR MOTOR
AIR MOTOR
START SIGNAL
1DG646K
GOVERNOR BOOST
CY
E
1D

Fig 19



DIV. I & II ENGINE AIR START MANIFOLD



DIV. I & II ENGINE AIR START MOTOR

Air Start Motors

- Div 1 & 2 have three air start motors per engine
- One of the motors on each engine is fed from the alternate air receiver
- 6 motors engage and crank engine only three are required
- Div 3 has 2 redundant pairs

Air Start Solenoids

- Provide the interface between the DG starting control logic and the engine air starting system
- Energized by 125 VDC
- Manual override for a loss of DC
- Air flow to air start motors through main air start valves from the receivers

In-Line Oilers

- Installed in the air lines upstream of the air start motors
- Release oil-air mist that lubricates the air start motors during engine cranking

Flow Path

- Lube Oil

Fig 20

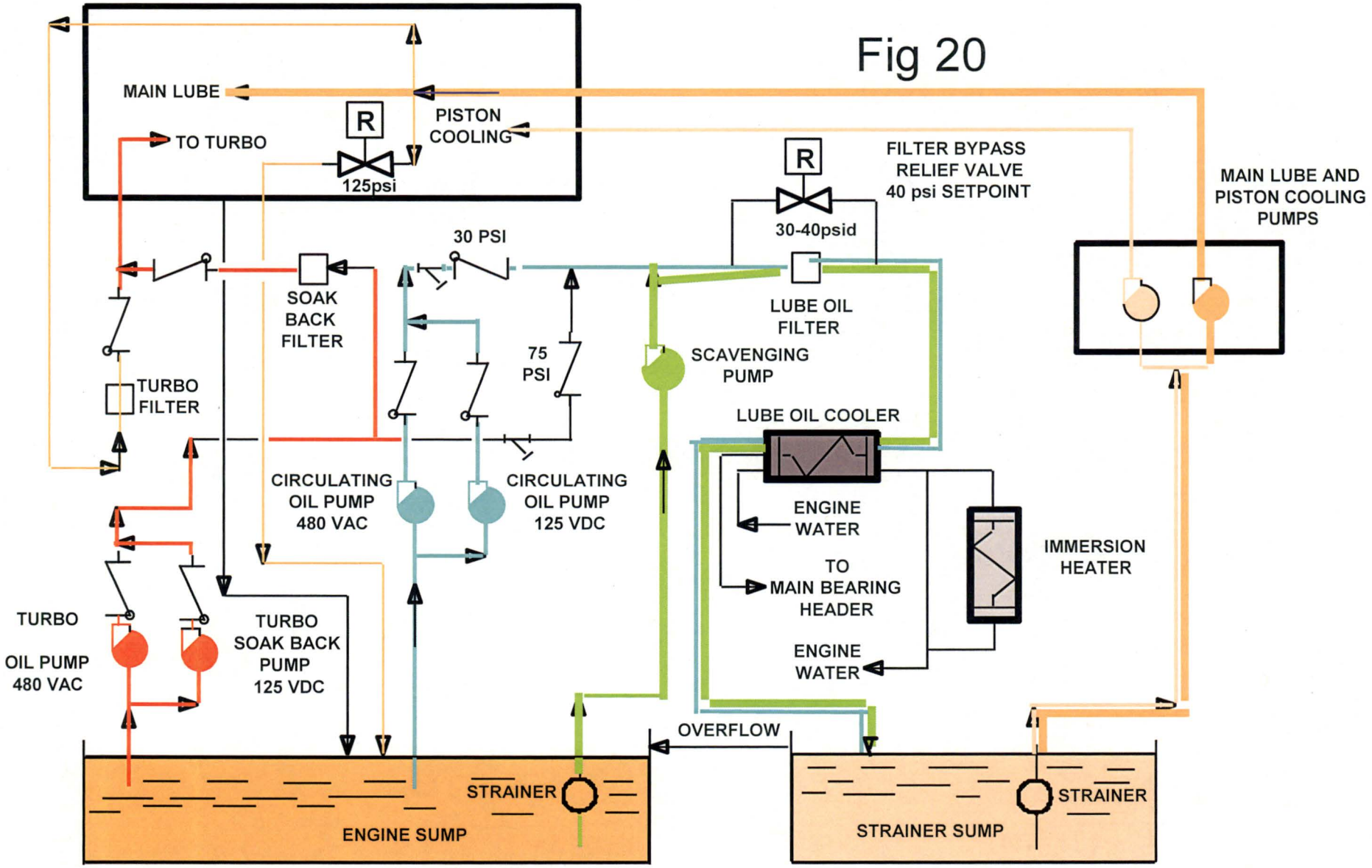
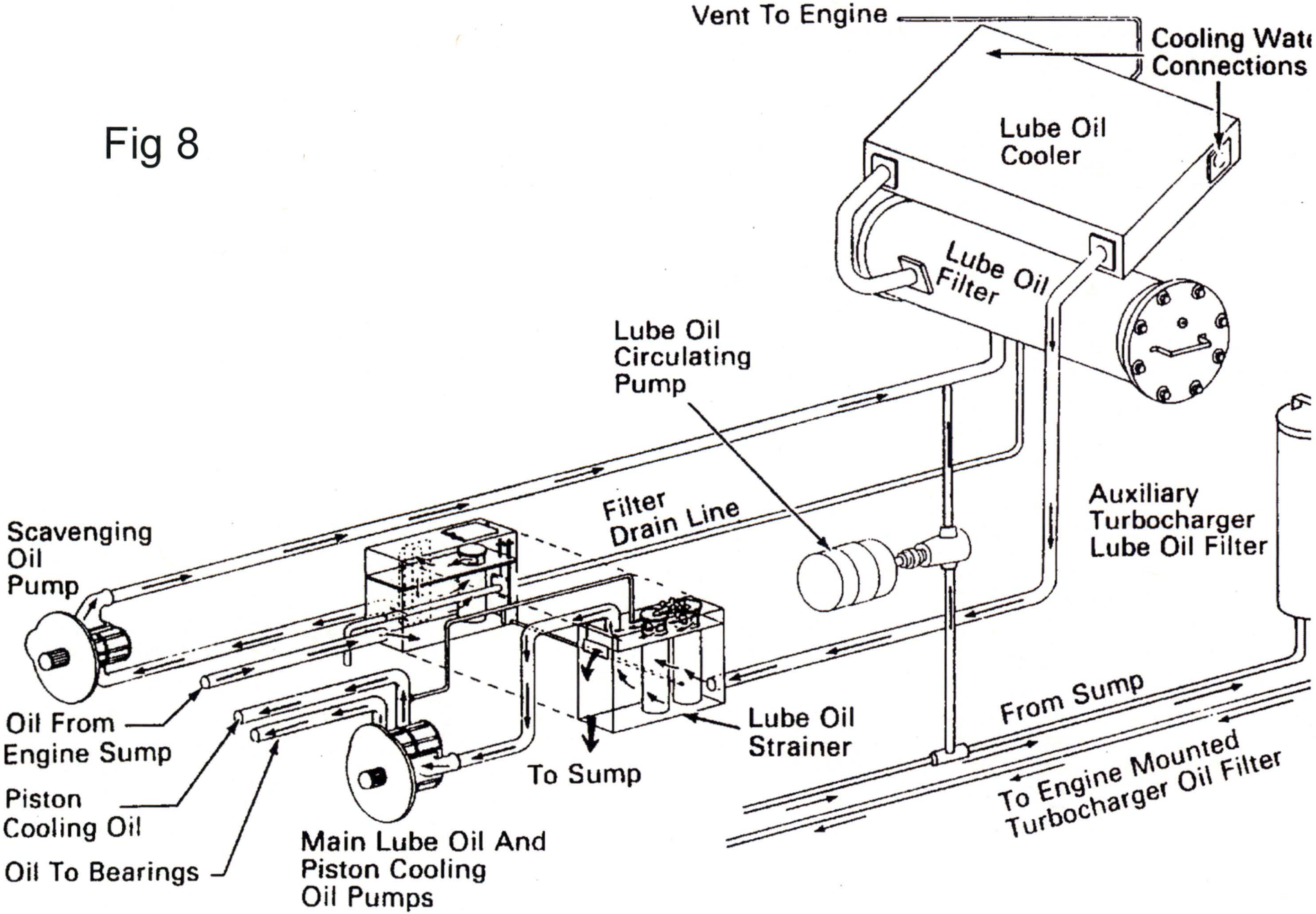

MAIN LUBE
TO TURBO
R
PISTON COOLING
125psi
R
FILTER BYPASS RELIEF VALVE 40 psi SETPOINT
30-40psid
MAIN LUBE AND PISTON COOLING PUMPS
30 PSI
SOAK BACK FILTER
LUBE OIL FILTER
TURBO FILTER
75 PSI
SCAVENGING PUMP
LUBE OIL COOLER
CIRCULATING OIL PUMP 480 VAC
CIRCULATING OIL PUMP 125 VDC
ENGINE WATER
TO MAIN BEARING HEADER
IMMERSION HEATER
ENGINE WATER
TURBO OIL PUMP 480 VAC
TURBO SOAK BACK PUMP 125 VDC
OVERFLOW
STRAINER
ENGINE SUMP
STRAINER
STRAINER SUMP

Fig 8


Vent To Engine
Cooling Wate
Connections
Lube Oil
Cooler
Lube Oil
Filter
Lube Oil
Circulating
Pump
Filter
Drain Line
Auxiliary
Turbocharger
Lube Oil Filter
Scavenging
Oil
Pump
Oil From
Engine Sump
Piston
Cooling Oil
Oil To Bearings
Main Lube Oil And
Piston Cooling
Oil Pumps
To Sump
Lube Oil
Strainer
From Sump
To Engine Mounted
Turbocharger Oil Filter

Lube Oil Pumps

- Main Lube Oil Pump: to engine moving parts 157gpm for 12 cylinder, 185 gpm for 16 cylinder
- Piston-cooling Pump: to piston carrier to cool underside of piston crown and ring belt
- 66 gpm for 12 Cylinder and 92 gpm for 16 Cylinder
- Header Temp gages on accessory of DG

Oil Pumps

- Scavenging Oil Pump: provides suction pressure for main and piston cooling pumps
- Goes through filters, cooler and strainer
- Local discharge pressure

Circulating Oil Pump

- AC driven keeps engine warm and ready to start
- DC backup pump
- On-Off Switch at local engine panel

Turbo "Soakback Oil Pump"

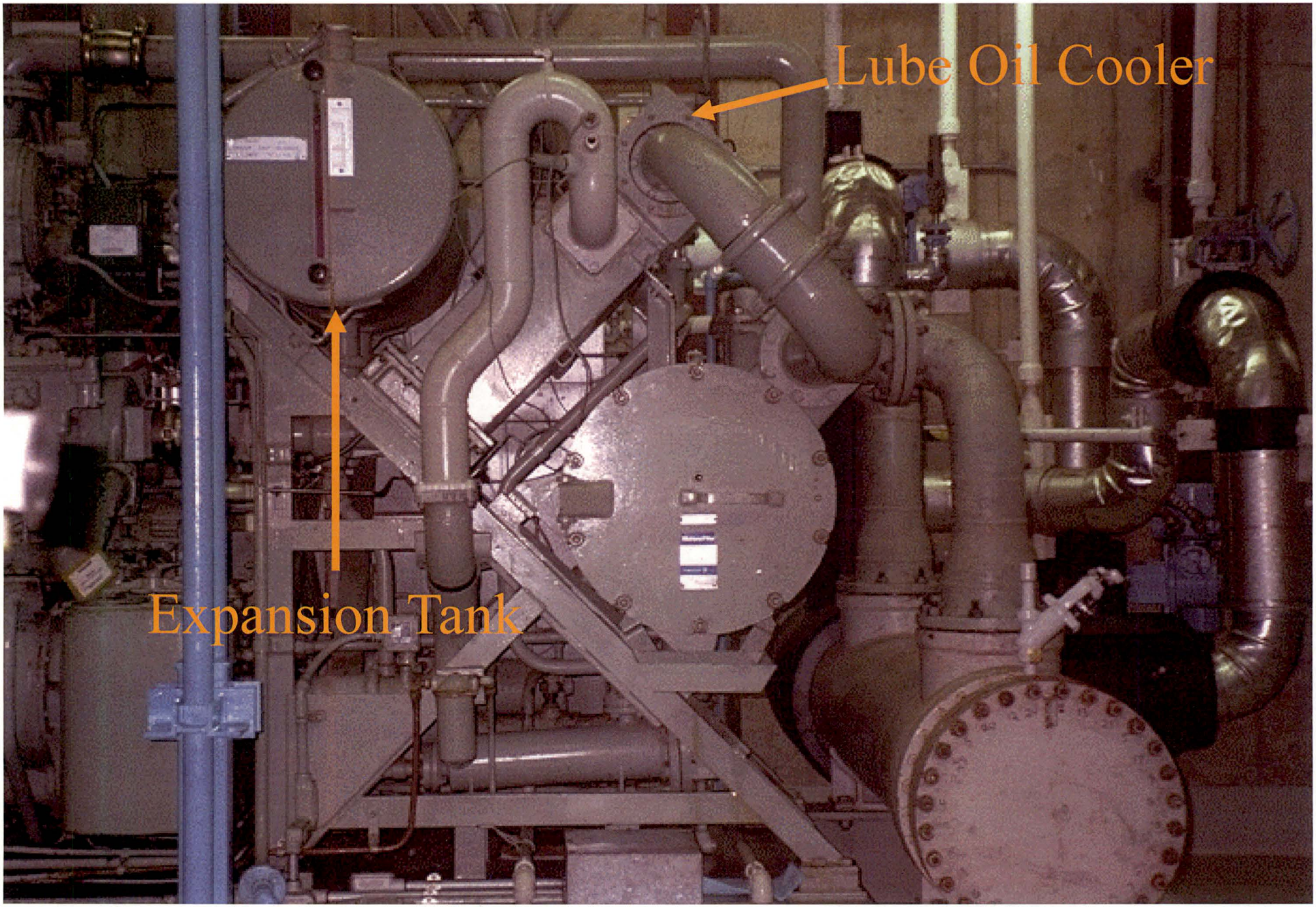
- Provides oil to turbocharger when DG shutdown
- AC and DC backup
- 3 gpm
- ON-OFF local controls

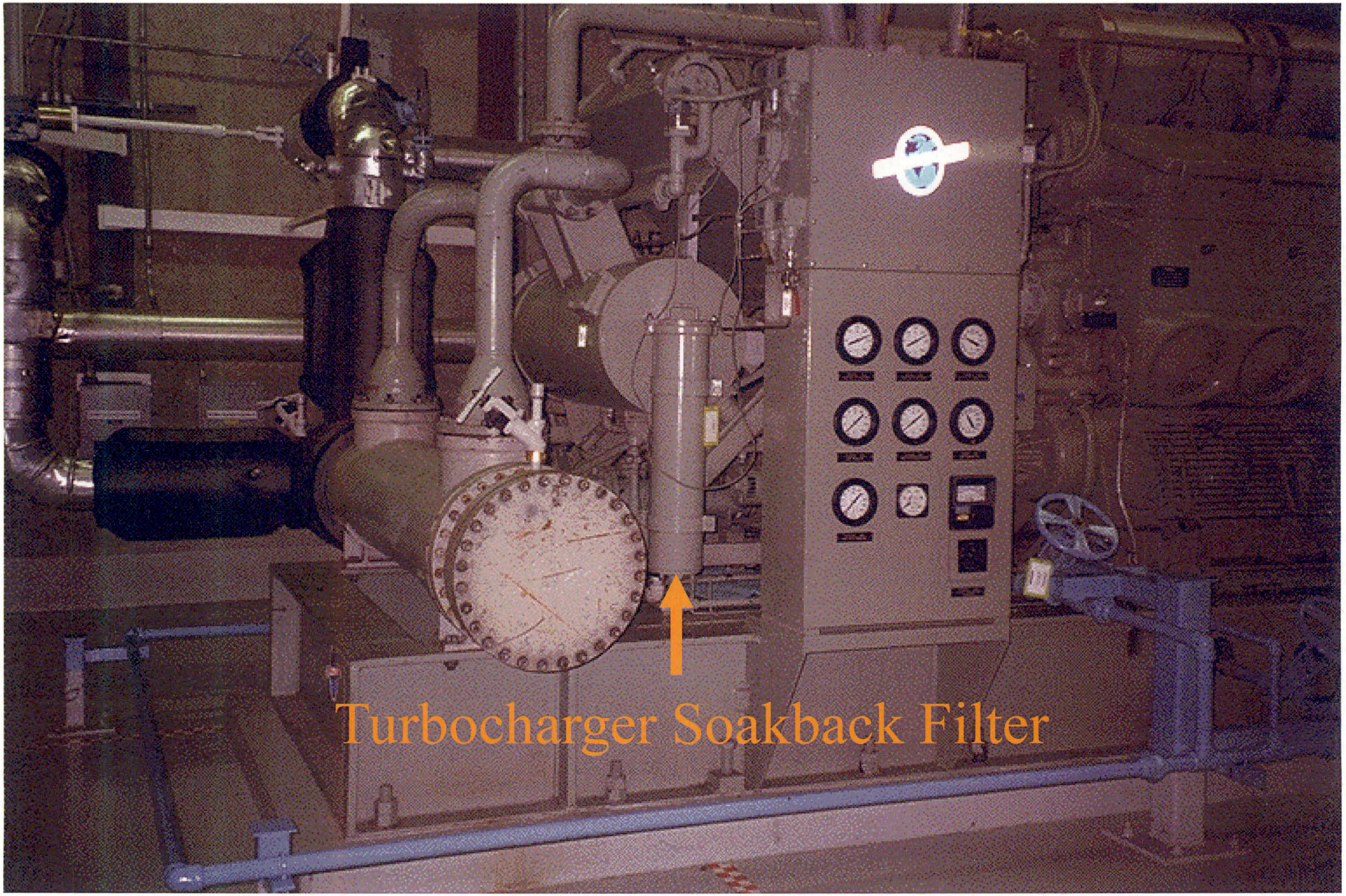
Lube Oil Strainers/Filters

- 3 strainer: one is scavenging oil and 2 main lube oil
- Lube Oil Filter: 7 element full flow type with sight glass on the side

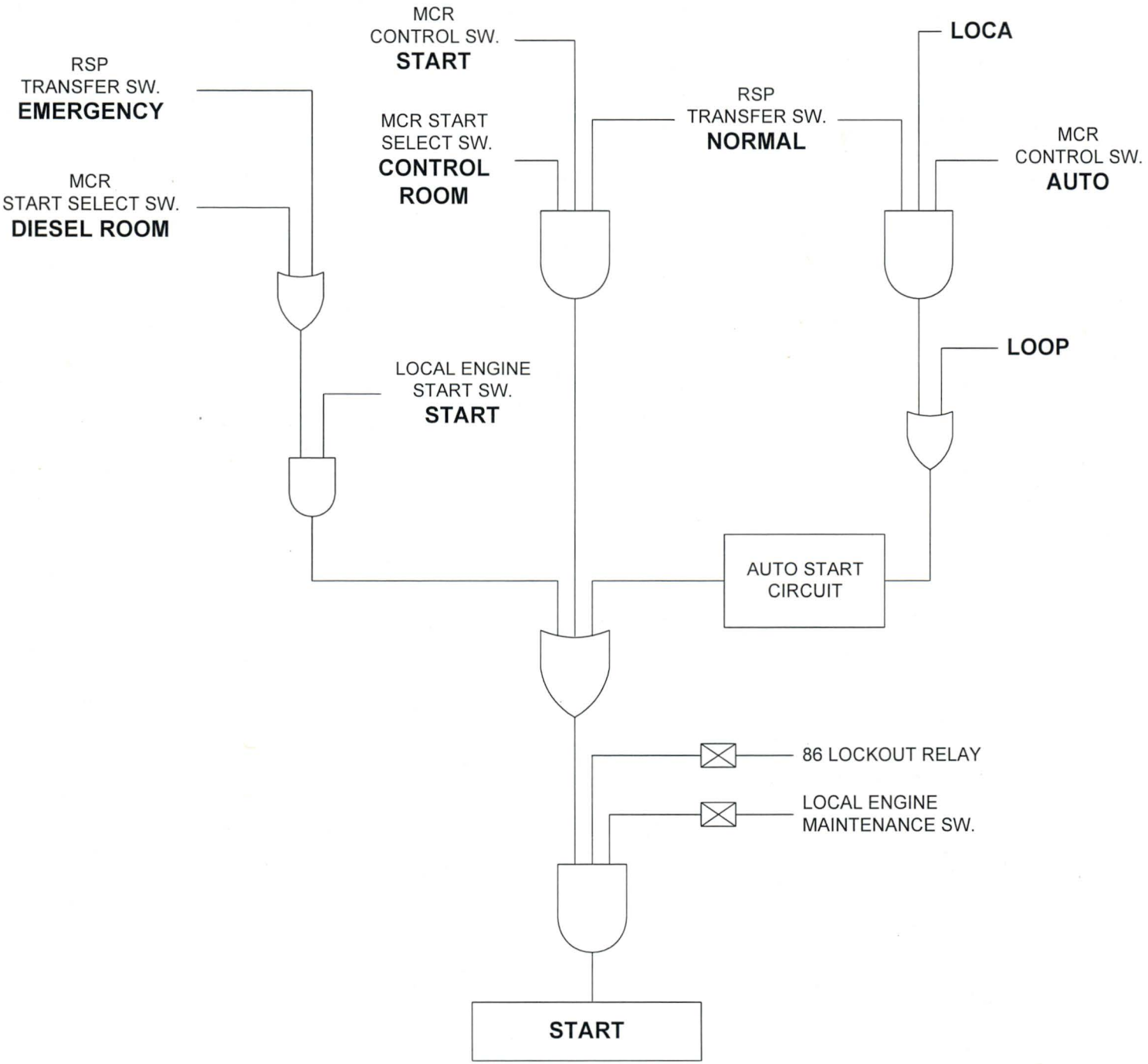
Lube Oil Cooler

- Cooled by jacket water and heated by jacket water
- Inlet and outlet temperatures monitored locally

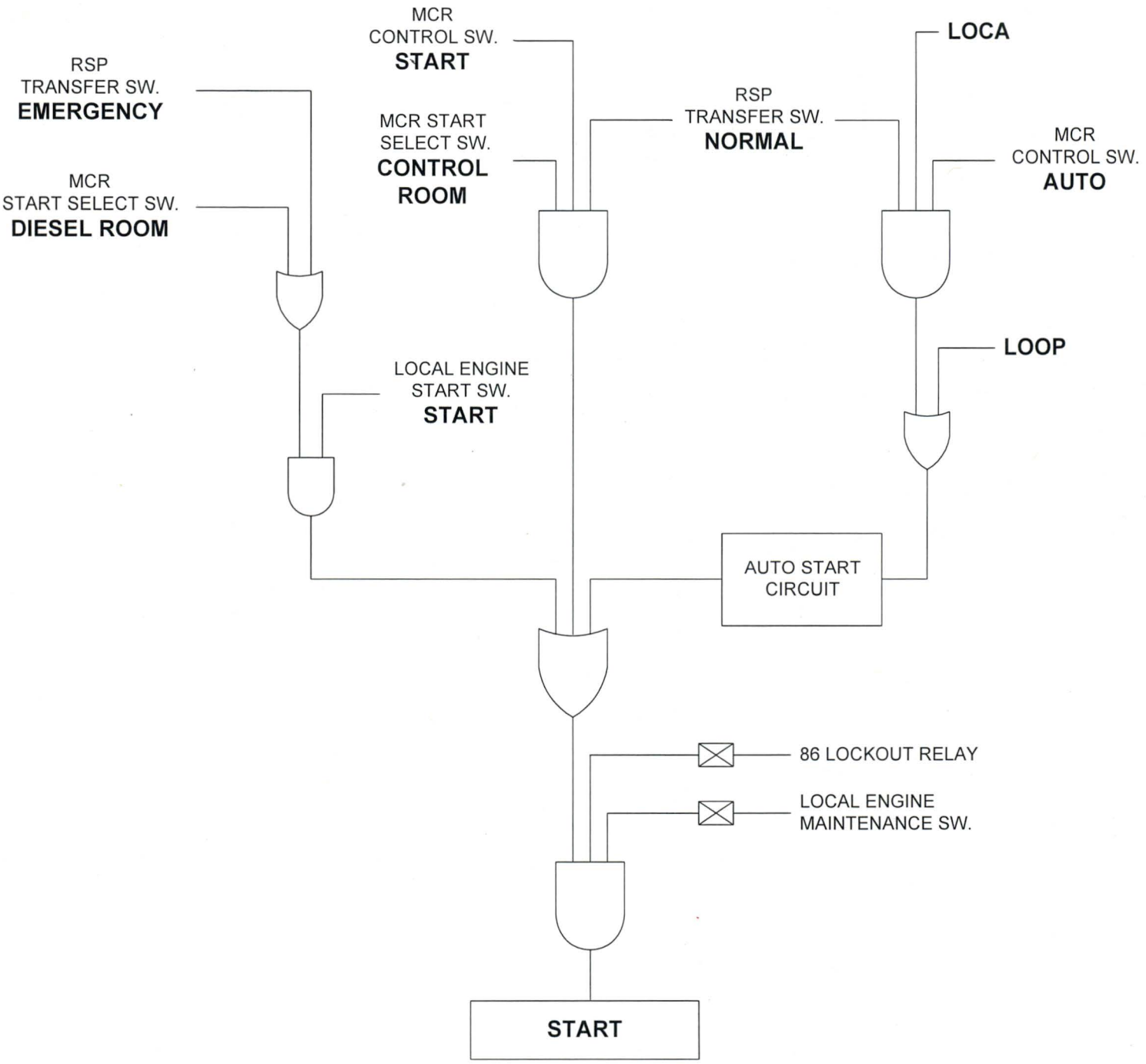

Lube Oil Cooler
Expansion Tank


Turbocharger Soakback Filter

Auto Starts


MCR
CONTROL SW.
START
RSP
TRANSFER SW.
EMERGENCY
MCR START
SELECT SW.
CONTROL
ROOM
RSP
TRANSFER SW.
NORMAL
LOCA
MCR
CONTROL SW.
AUTO
MCR
START SELECT SW.
DIESEL ROOM
LOCAL ENGINE
START SW.
START
LOOP
AUTO START
CIRCUIT
86 LOCKOUT RELAY
LOCAL ENGINE
MAINTENANCE SW.
START

Auto Starts cont.



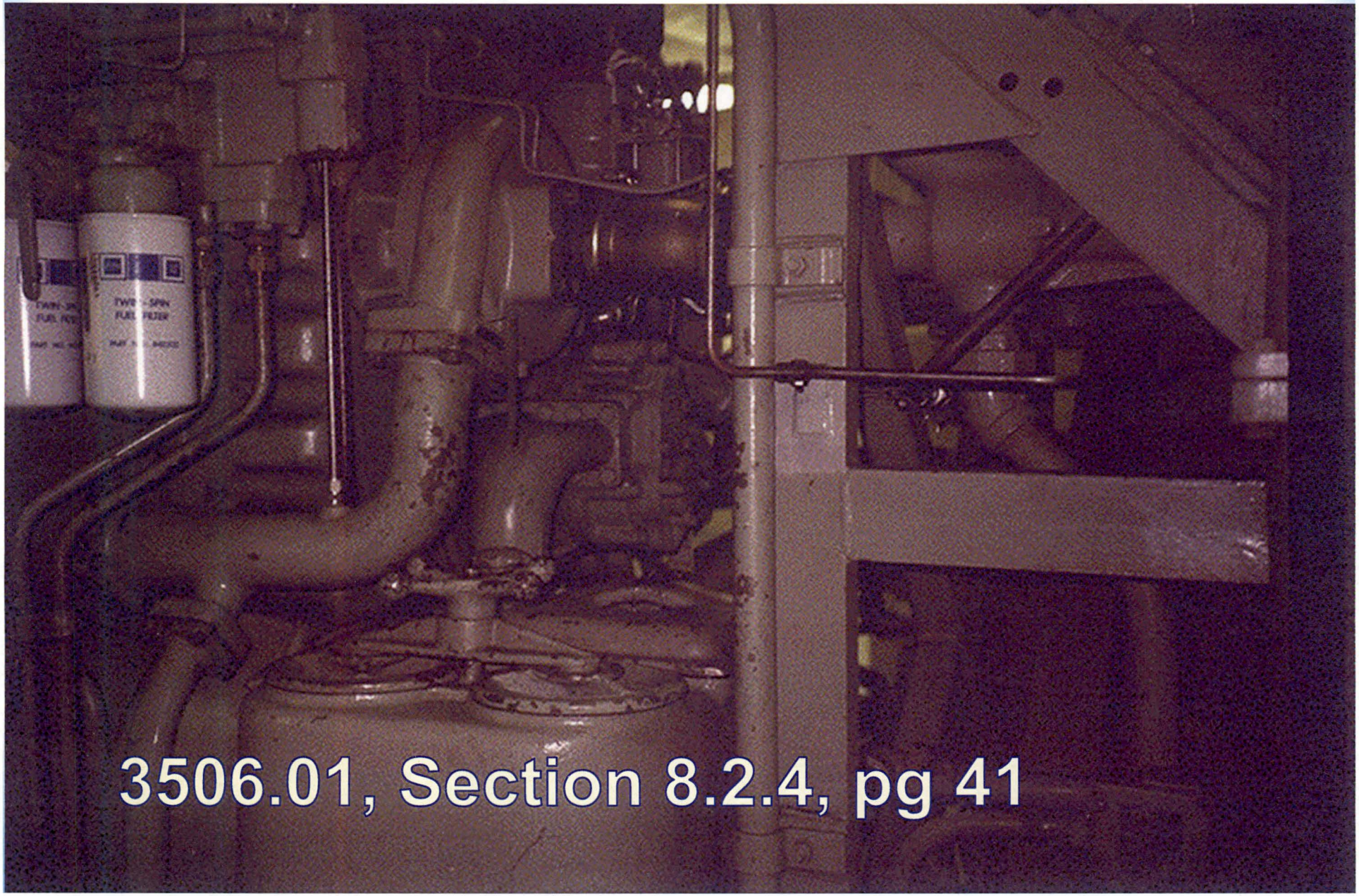
DG Trips

- **Engine Overspeed**
- **Engine Over crank (failure to start but will cause a lock out relay trip)**
- **Low Lube Oil Pressure**
- **High Water Jacket Temperature**
- **Reverse Power**
- Loss of excitation
- Overcurrent
- Generator Ground Fault
- Differential Overcurrent

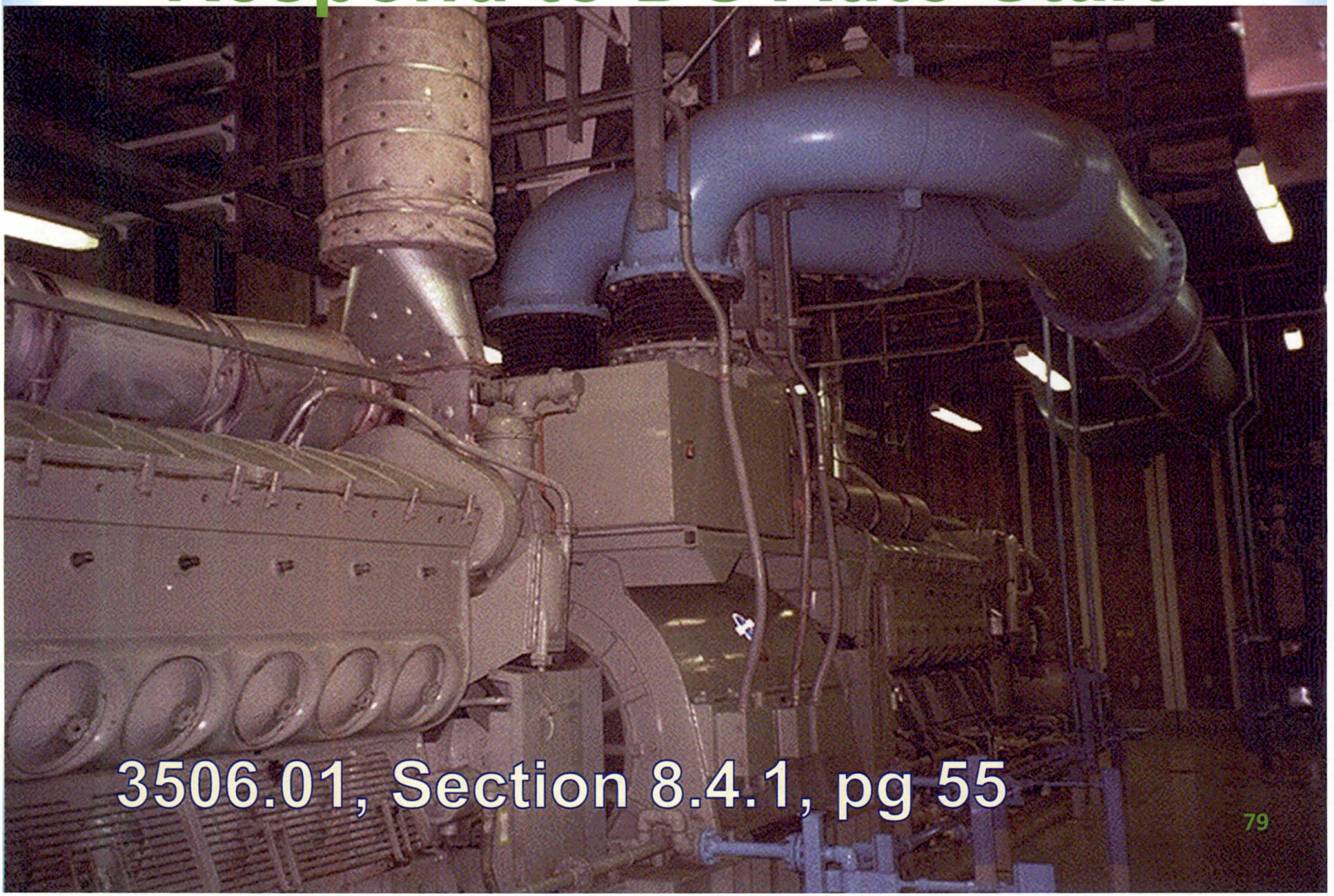
DG Trips cont.

- Engine Overspeed
- Engine Over crank (failure to start but will cause a lock out relay trip)
- Low Lube Oil Pressure
- High Water Jacket Temperature
- Reverse Power
- **Loss of excitation**
- **Overcurrent**
- **Generator Ground Fault**
- **Differential Overcurrent**

Add/Remove Lube Oil

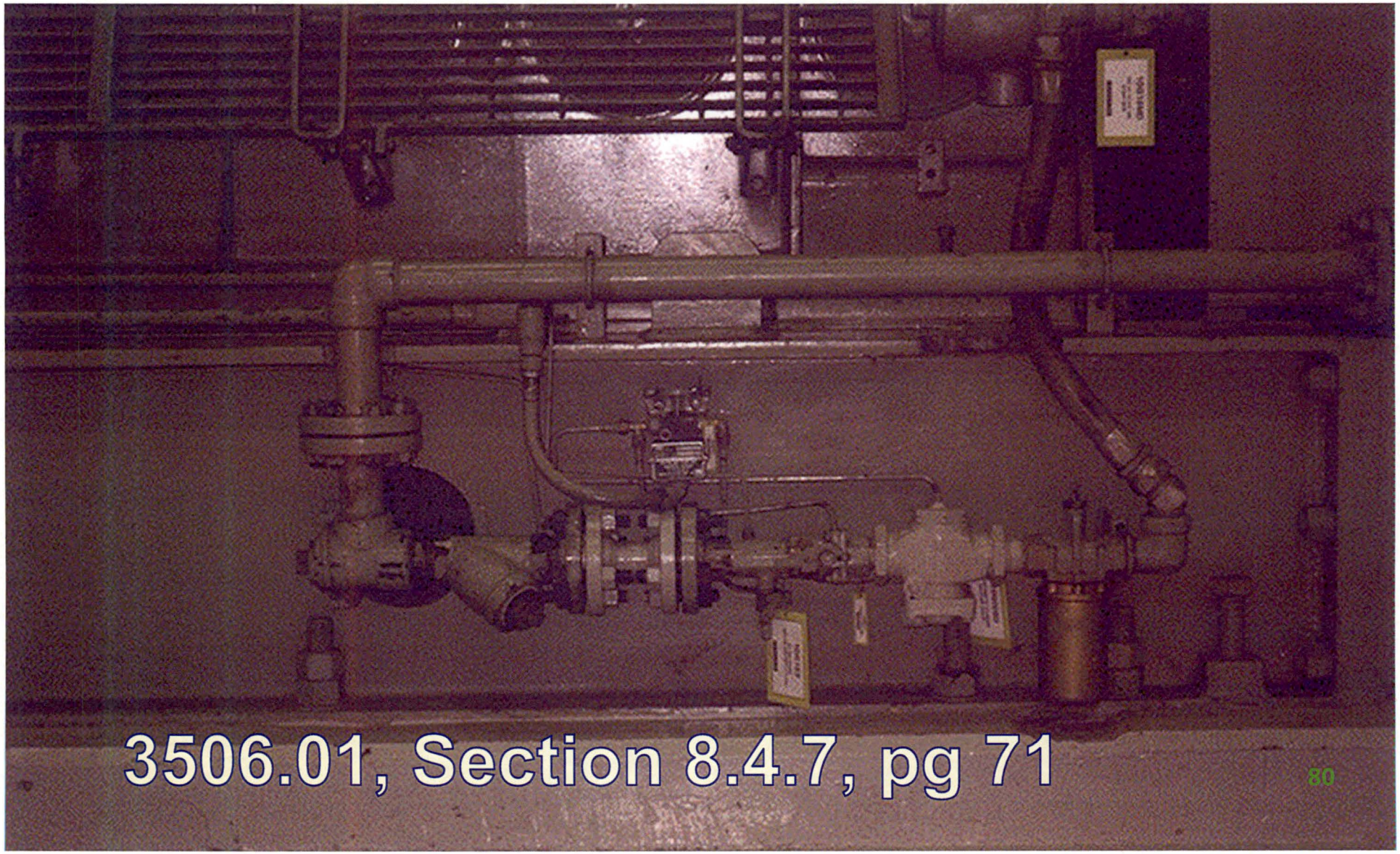


Respond to DG Auto Start



3506.01, Section 8.4.1, pg 55

Manual Override of Air Start Solenoids



Summary

- Trips
  - Engine Overspeed
  - Engine Over crank (failure to start but will cause a lock out relay trip)
  - Low Lube Oil Pressure
  - High Water Jacket Temperature
  - Reverse Power
  - Loss of excitation
  - Overcurrent
  - Generator Ground Fault (Div 1 & 2)
  - Differential Overcurrent
- Auto Starts
  - Division I & II
    - High Drywell Pressure (1.68 psig) and/or
    - Low RPV Water Level 1 (-145.5")
    - Bus Undervoltage
  - b. Division III
    - High Drywell Pressure (1.68 psig) and/or
    - Low RPV Water Level 2 (-45.5")
    - Bus Undervoltage

Diesel Generator Rooms
HVAC System

Purpose

- Ventilation for the three DG rooms, day tank rooms, and the FOST rooms (to prevent accumulation of diesel fumes).
- Normal alignment for VD:
  - Oil Room Exhaust Fans for all 3 DGs running (draw from the day tank and FOST rooms)
  - Makeup Fans running
  - Supply fans off

Design Bases

- Operate under normal and abnormal plant operating conditions
- Air intake and exhaust openings are located a sufficient distance apart to preclude reintroduction of exhaust air into the room
- Seismic
- Vital power
- Divisional separation
- Limit room to 130degF

Flow Paths

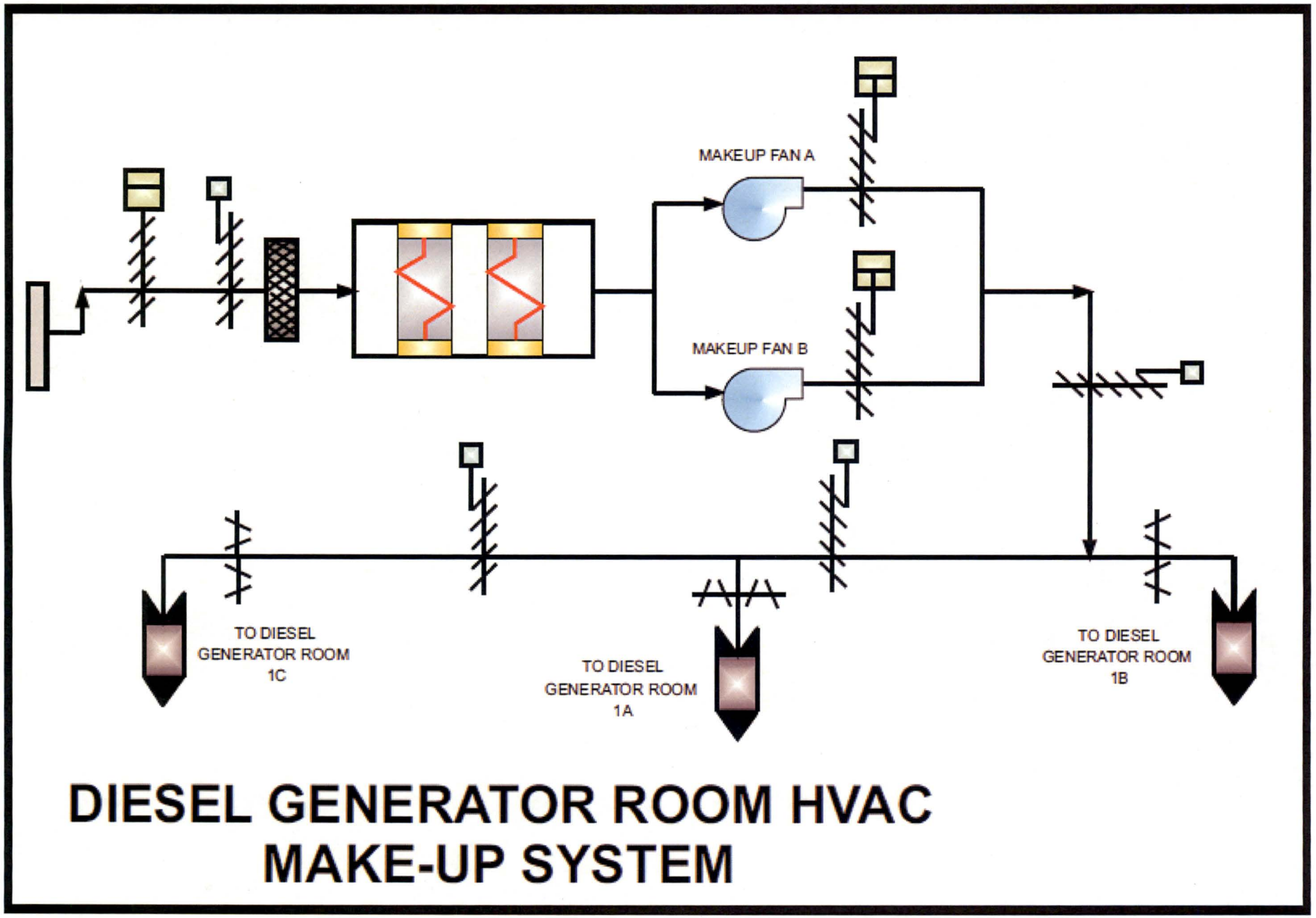
2.1 VD controls the temperature in the DG rooms due to equipment considerations. It also maintains sufficient air flow to the day tank and oil storage rooms to keep the rooms purged of potentially combustible fumes.

2.2 Normal system configuration is with:

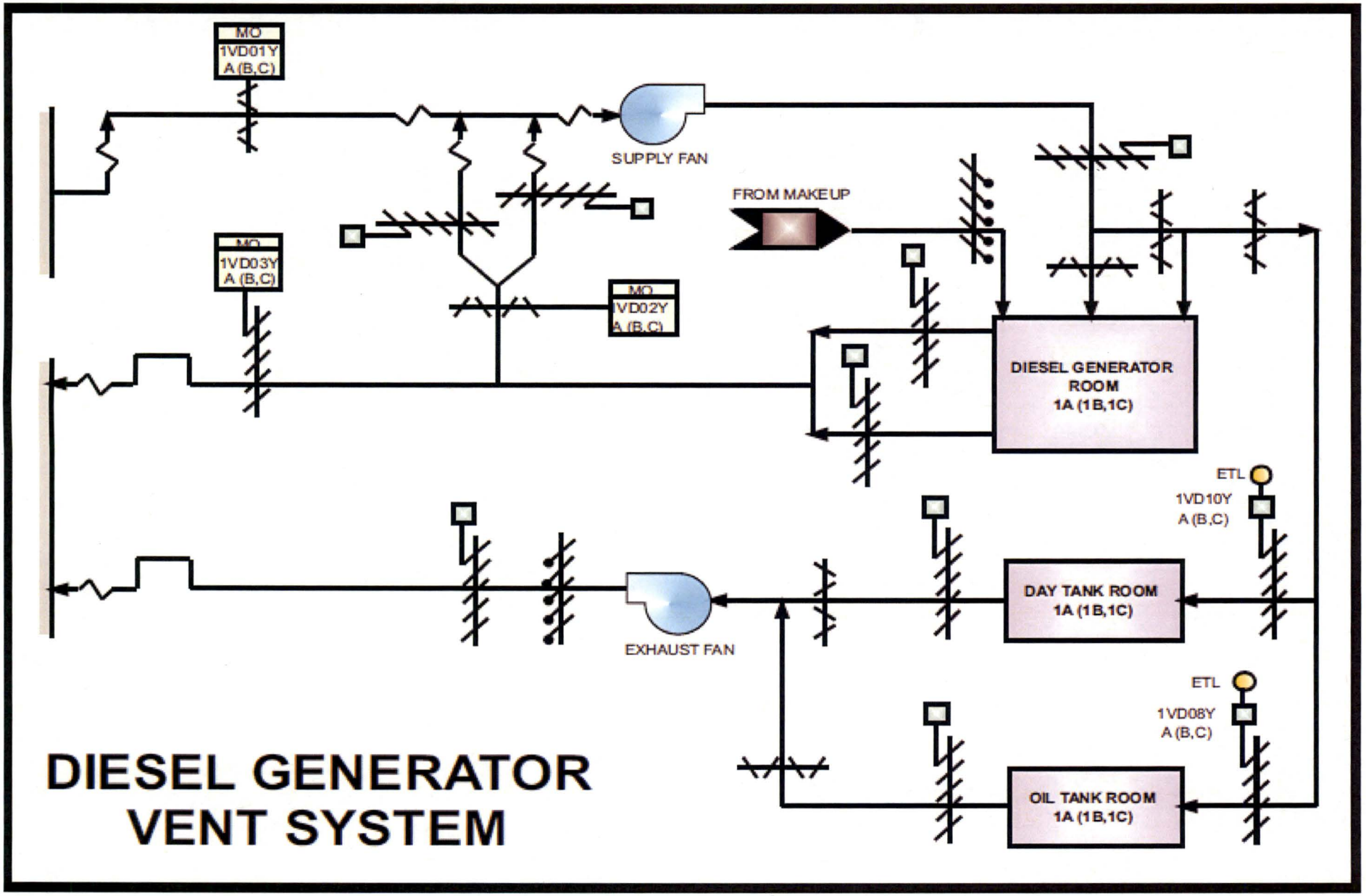
DG Rm 1A(B)[C] Vent Fans, 1VD01CA(B)[C] in STANDBY.

DG Vent Oil Room 1A(B)[C] Exh Fans, 1VD02CA(B)[C] running.
DG Make-Up Fans, 1VD03CA(B) running.

2.3 When any of the DGs start, the associated vent fan also starts in anticipation of the increased air flow and cooling requirements.



DIESEL GENERATOR ROOM HVAC MAKE-UP SYSTEM


MO
1VD01Y
A (B,C)
SUPPLY FAN
FROM MAKEUP
MO
1VD03Y
A (B,C)
MO
1VD02Y
A (B,C)
DIESEL GENERATOR
ROOM
1A (1B,1C)
ETL
1VD10Y
A (B,C)
DAY TANK ROOM
1A (1B,1C)
EXHAUST FAN
ETL
1VD08Y
A (B,C)
OIL TANK ROOM
1A (1B,1C)
DIESEL GENERATOR
VENT SYSTEM

Increasing Cooling /Purge Mode 3403.01, Section 8.3

NOTE

- *DG Rm 1A(B)[C] Vent Fan, 1VD01CA(B)[C] will trip at ~ 70°F room temperature when the DG is not running.*
- *Supply Air Damper 1VD01YA(B)(C) will not open on fan start if outside air temperature is < 70°F.*
- *When in PURGE mode, the supply air damper and recirc damper do not modulate to maintain > 70°F.*
- *The respective Diesel Generator Day Tank Room DP is impacted by running the VD Vent Fan for that division (especially Division 3). Alarms and auto start of the FO Transfer Pump have occurred upon VD Vent Fan start (IR 910035).*

Increasing Cooling /PURGE Mode

3403.01, Section 8.3 (Cont.)

WARNING

- *The starting of the DG Room Vent Fan can cause injury to any personnel located in the DG Vent Room.*
- *Observe proper safety precautions for entering a CO2 filled atmosphere.*

1. (MCR) Start DG Rm 1A(B)[C] Vent Fan, 1VD01CA(B)[C].

Increasing Cooling/PURGE Mode

3403.01, Section 8.3 (Cont.)

2. (Local)

   IF desired for temperature/PURGE control,

   THEN

   place Div 1(2)[3] Purge Switch to PURGE.
   Div 1[3] at entrance to Div 1[3] DG Room,
   Div 2 at CB 755' HVAC Mezzanine, Y-129.)

3. When increased cooling/PURGE mode is no longer desired,

   1) (Local) Place Div 1(2)[3] Purge Switch to NORMAL.

   2) (MCR) Stop DG Rm 1A(B)[C] Vent Fan, 1VD01CA(B)[C].

CO2 Initiation

3403.01, Section 8.8

NOTE

On a CO2 initiation signal, following divisional fans trip and dampers shut:

- DG Rm 1A(B)[C] Room Vent Fan, 1VD01CA(B)[C]
- DG Vent Oil Room 1A(B)[C] Exh Fan, 1VD02CA(B)[C]
- DG Make-Up Fan A(B), 1VD03CA(B)
- Makeup Fan Discharge Damper, 1VD25YA(B)
- Filter Isolation Damper, 1VD18Y
- Exhaust Damper, 1VD03YA(B)[C]
- Back Draft Damper, 1VD27YA(B)[C]
- Fire Dampers 1VD08YA(B)[C] & 1VD10YA(B)[C]

CAUTION

Observe proper safety precautions for entering a CO2 filled atmosphere.

CO_2 Initiation

3403.01, Section 8.8 (Cont.)

1. When the CO_2 Initiation signal clears:
   1) Purge DG Room A(B)[C] per section 8.3.
   2) Have Maintenance replace the fusible links, for the following Fire Dampers:
      1) 1VD08YA
      2) 1VD08YB
      3) 1VD08YC
      4) 1VD10YA
      5) 1VD10YB
      6) 1VD10YC
   4) Start VD per section 8.1.

OPEX

Beaver Valley Unit 1 2015-11-10 1:57 PM #320530

Failure of DG CO2 System to Actuate During Surveillance Testing

Abstract:
On 11/10/15 during the 18 month surveillance test of the Unit 1 number 1 Diesel Generator CO2 system, the valves for the CO2 system did not actuate when tested from a Manual discharge pushbutton. In the event of a fire CO2 fire suppression would reduce the potential for damage to safety-related equipment important to safe shutdown. The cause was a pilot valve mechanical plunger became stuck. Since a compensatory firewatch was established this event had minimal impact on station operations.

Summary

- Rooms ventilated?
  - ➢ The three DG rooms, day tank rooms, and the FOST rooms
- Normal alignment:
  - ❑ Oil Room Exhaust Fans for all 3 DGs running (draw from the day tank and FOST rooms)
  - ❑ Makeup Fans running
  - ❑ Supply fans off
- Review flowpaths:
  - ✓ Normal Standby Mode
  - ✓ Diesel Generator Operating Mode
  - ✓ Purge Mode

GFE Controllers

BC08Ir4_Controllers 4. State the purpose of a controller.

A controller is device that compares input signal with setpoint and generates output based on difference (error signal)

Five types of controllers:

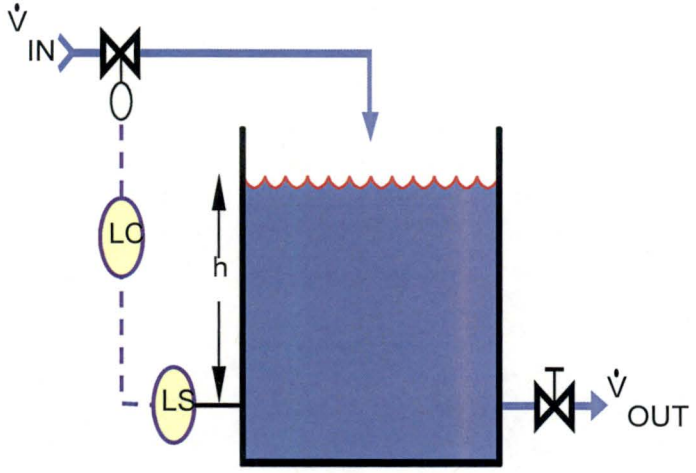
1. Two position controller
2. Proportional controller
3. Proportional plus derivative
4. Proportional-plus-reset controller
5. Proportional-plus-reset-plus-rate controller

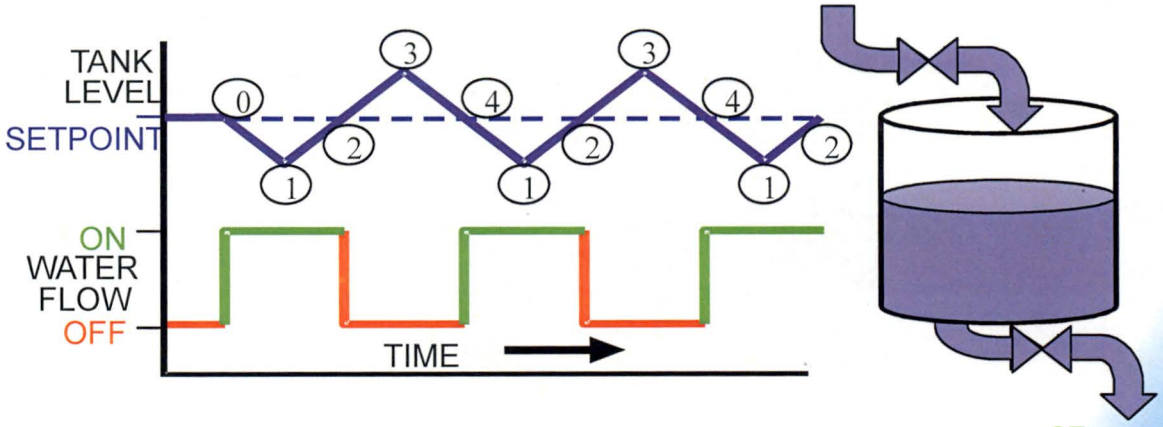
BC08Ir4_Controllers 5. Describe the theory of operation of the following types of controllers: Two position

Two-Position Controllers

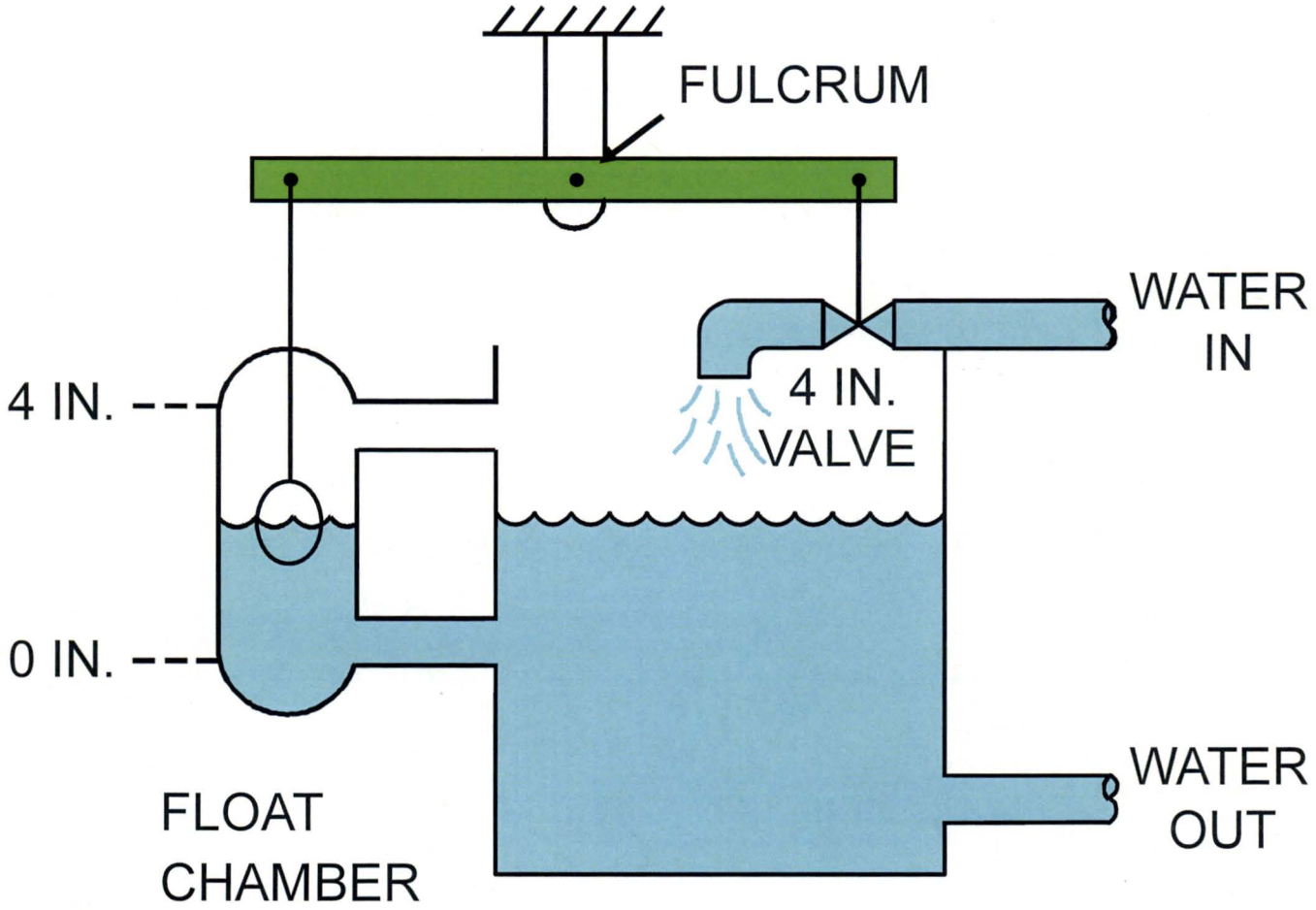
The device has two positions: on or off

The opening and closing of final control element results in cycling characteristic of measured variable





BC08Ir4_Controllers 5. Describe the theory of operation of the following types of controllers: Proportional controller



BC08Ir4_Controllers 5. Describe the theory of operation of the following types of controllers: Proportional plus derivative

The proportional plus derivative (PD) controller or rate controller results in a more rapid response and less offset than the pure proportional controller.

BC08Ir4_Controllers 5. Describe the theory of operation of the following types of controllers: Proportional-plus-reset controller

Offset Error:
The difference between setpoint and measured variable is called “error”
This error signal maintains control valve at specific position in response to change in demand of system

Proportional-plus-reset controllers automatically reset measured variable to setpoint, thus, offset error is eliminated

BC08Ir4_Controllers 5. Describe the theory of operation of the following types of controllers: Proportional-plus-reset-plus-rate controller

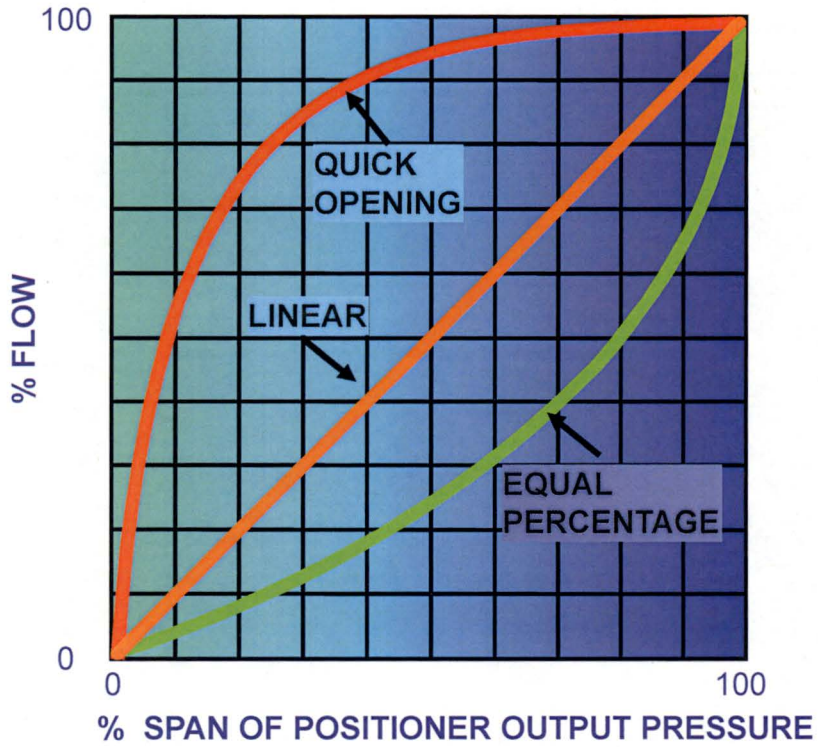
To overcome disadvantages of PI controller, “rate section” may be added

Valve Characteristics

The flow characteristic of control valve is relationship between flow rate through valve and percentage of valve travel

a. To compare and discuss flow characteristics of valve, it is helpful to plot curve as percentage of travel versus percentage of flow

b. The three most common flow characteristics are
   - Linear
   - Quick Opening
   - Equal Percentage



Valve Positioner

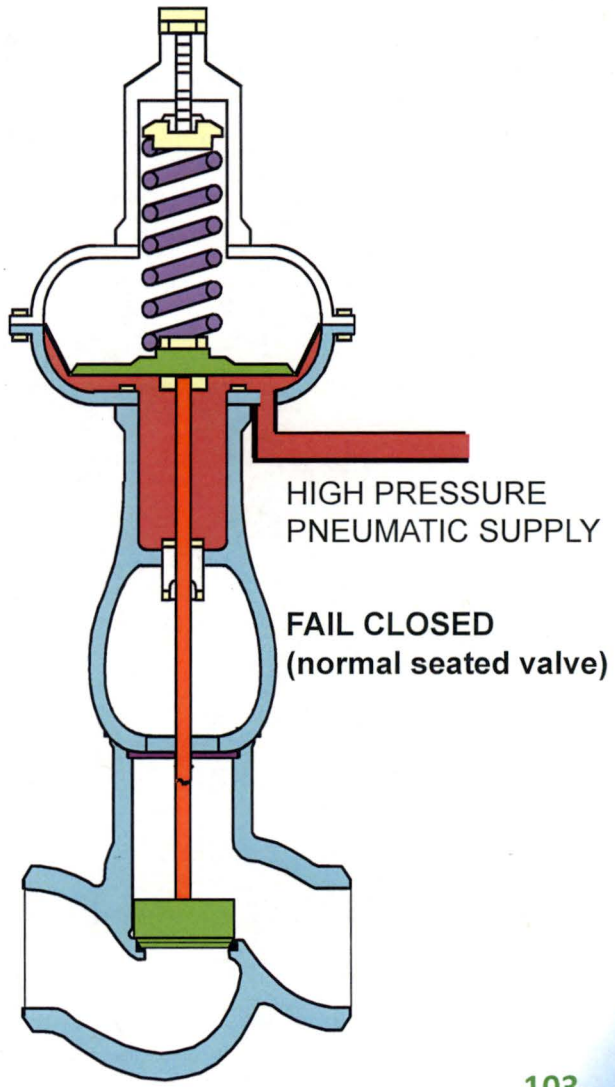
The primary function of valve positioner is to maintain control valve disk at position that is directly proportional to its controller output pressure

A valve positioner can be used to reverse signal to valve and to overcome frictional forces within valve on high-pressure drop applications.

Valve positioners are usually mounted on side of diaphragm actuators and on top of piston and rotary actuators

Because of large volume of pneumatics required to operate valve, valve positioner has independent, regulated, pneumatic supply.

Use of valve positioner should be considered for systems where it is necessary to provide control of process with minimum overshoot and fastest possible recovery following disturbance

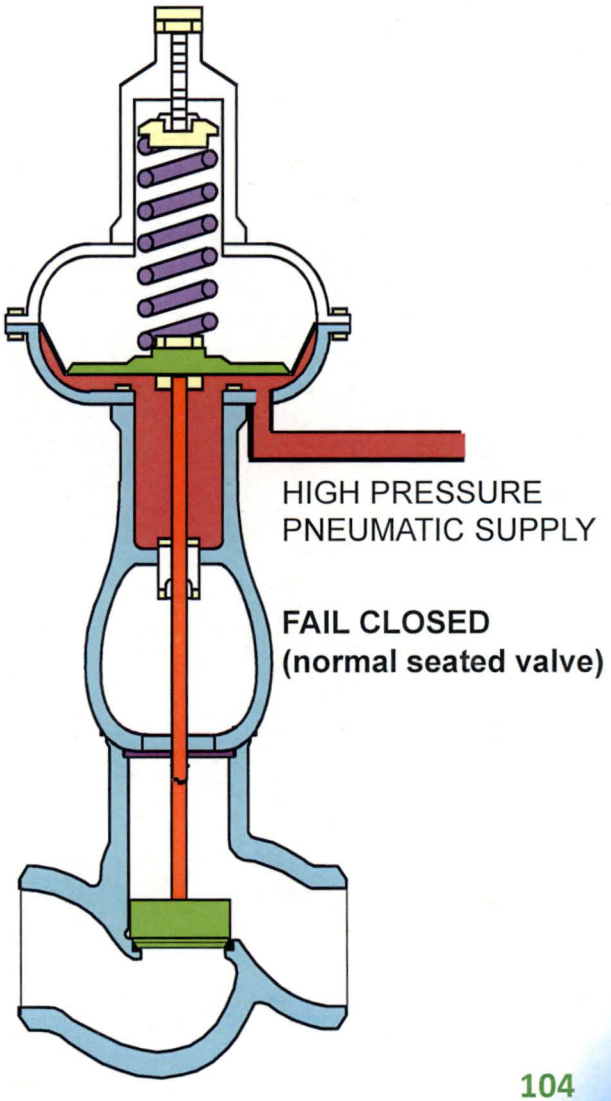


Valve Positioner cont.

In many cases, valve positioner improves performance of process control loop

Studies have shown that use of valve positioners is clearly beneficial in slow processes and clearly detrimental in fast processes

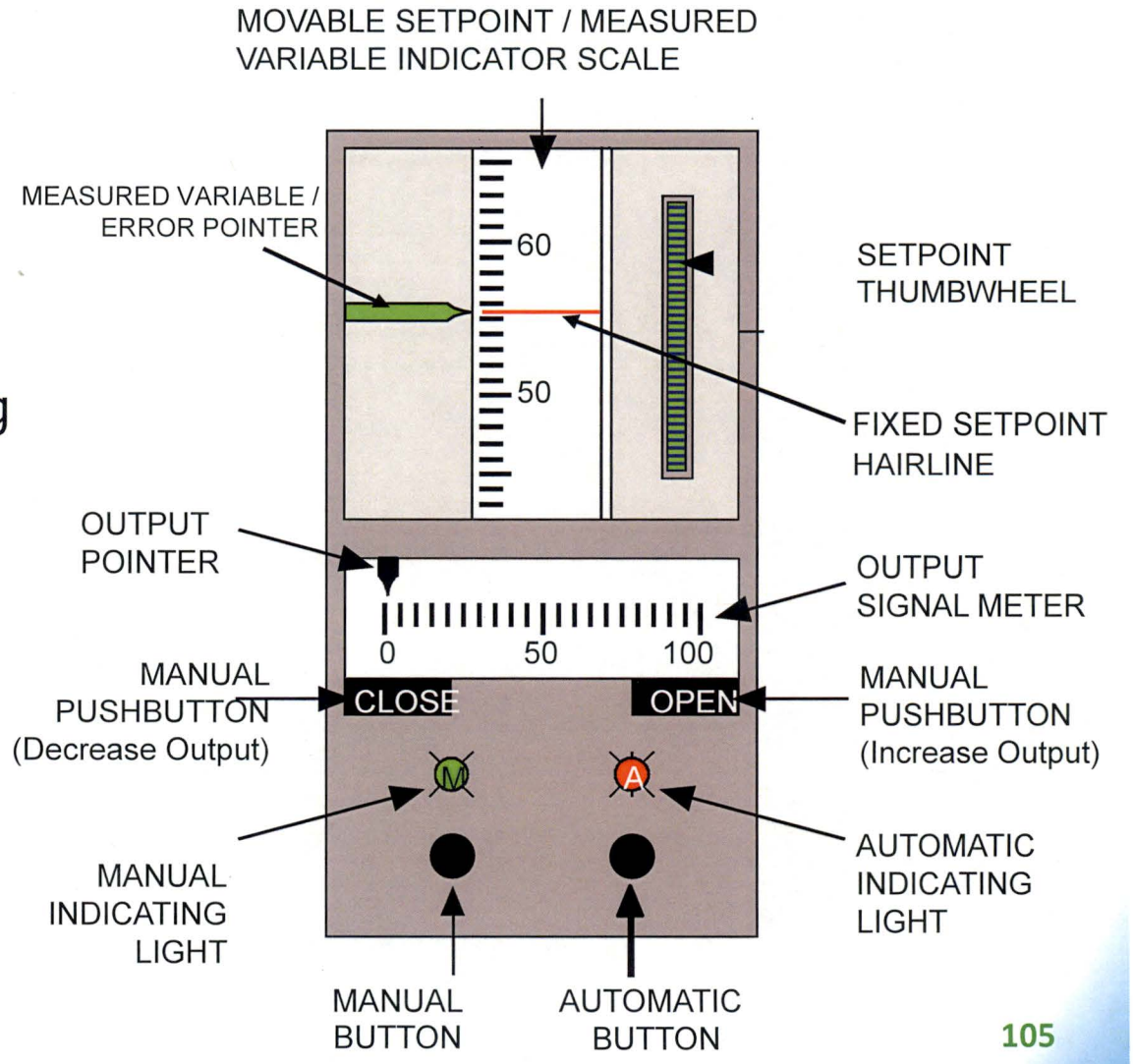
use of valve positioner should be considered for systems where it is necessary to provide control of process with minimum overshoot and fastest possible recovery following disturbance



1PA05J controller operations (02422997-82)

Request: Training be performed for EO-I and EO-C populations on 1PA05J controller operations.

Newer equipment operators do not have full understanding of how to operate Bailey/NUS controllers at the 1PA05J panel in a transient condition.



Extraction Steam, Heater Vents & Drains

Purpose of ES/HD

To improve overall plant thermodynamic efficiency

To route condensed Extraction Steam and non-condensable gases to the Main Condenser

Primary method to drain moisture from the Main Turbine

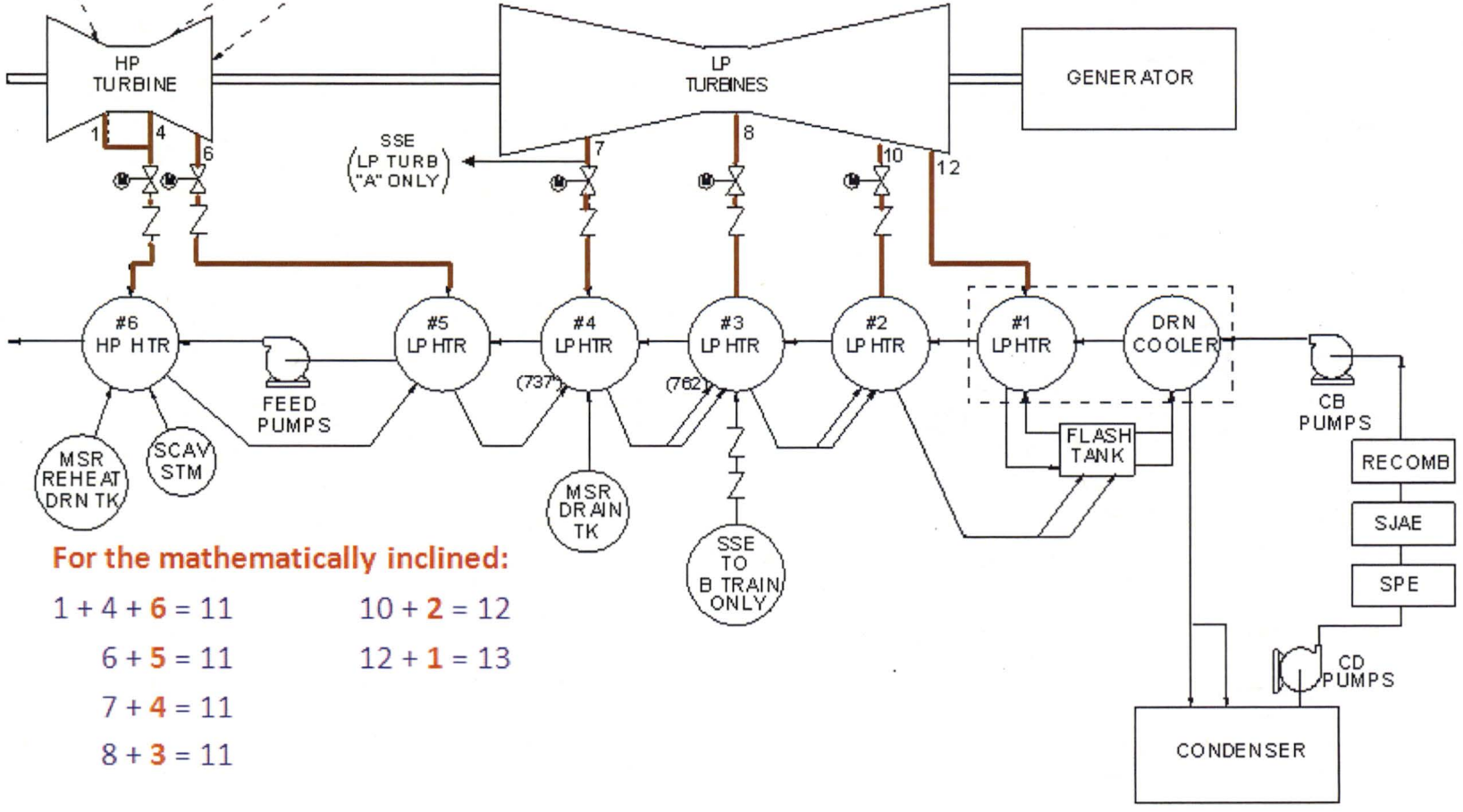
Design Bases

To raise condensate/feedwater temperature from approximately 100°F leaving the Main Condenser to approximately 430°F prior to entering the reactor vessel, in order to improve overall plant efficiency.

Flowpaths
Extraction Steam (fig. 1)

One class of **Forty Six** 7^{th} Graders **ate** **ten dozen** donuts

1 **4** **6** **7** **8** **10** **12** (TURBINE EXTRACTION STAGES)



For the mathematically inclined:

$1 + 4 + \mathbf{6} = 11$ $\quad$ $10 + \mathbf{2} = 12$

$6 + \mathbf{5} = 11$ $\quad$ $12 + \mathbf{1} = 13$

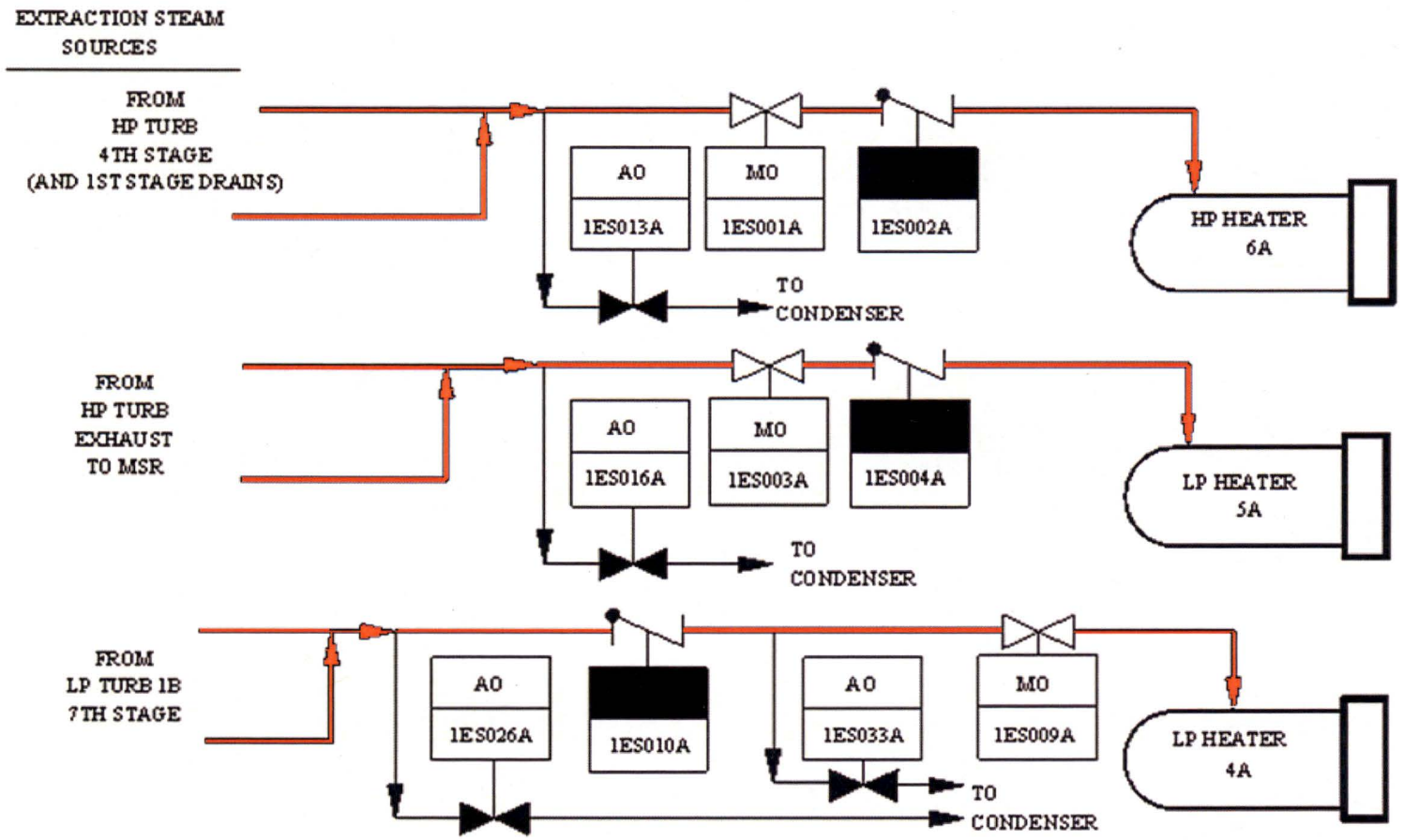
$7 + \mathbf{4} = 11$

$8 + \mathbf{3} = 11$

Flowpaths cont.

Extraction Steam Normal Operation

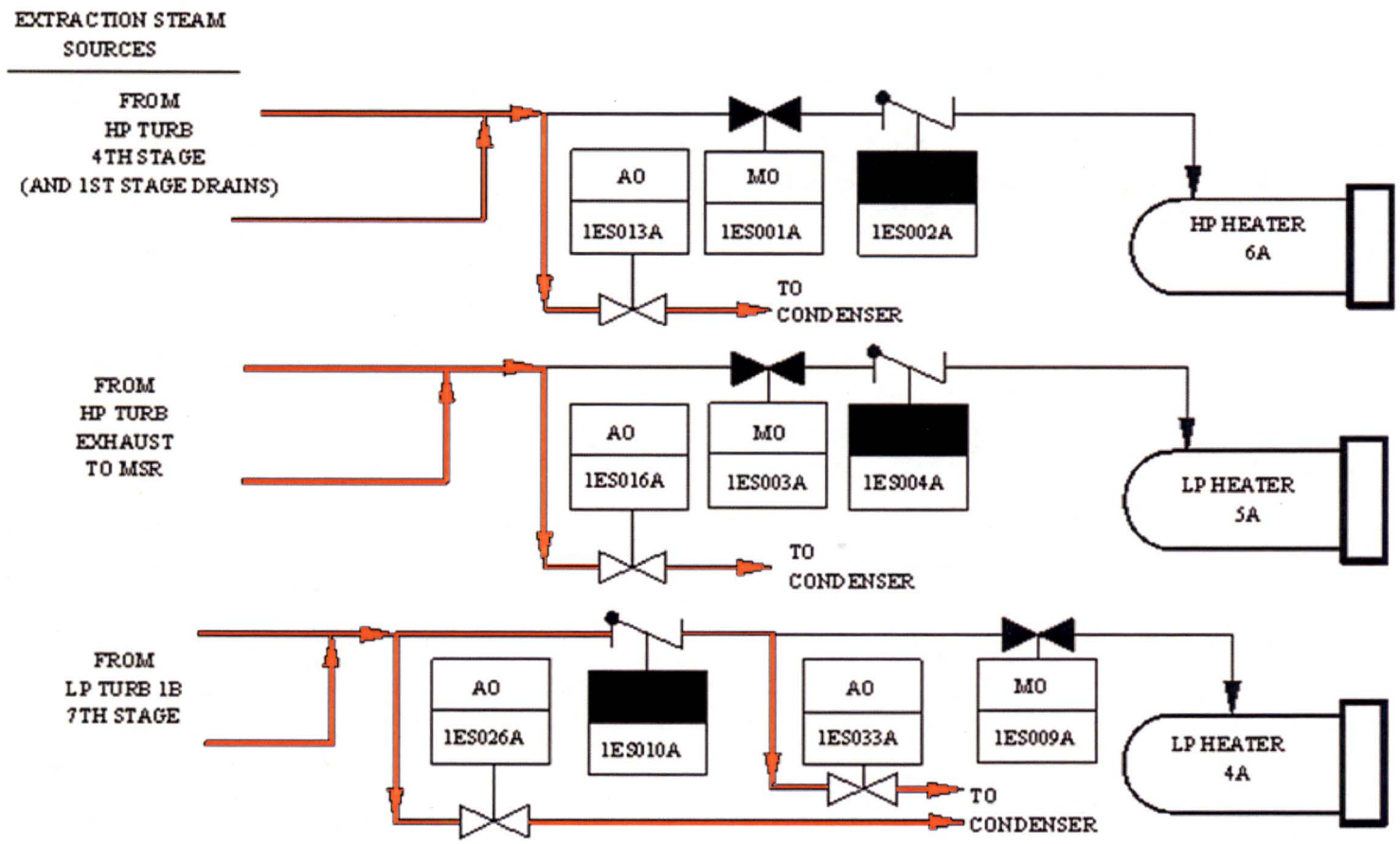
(One Heater String Shown) (fig. 2)



Flowpaths cont.

Extraction Steam Startup / Abnormal Operation

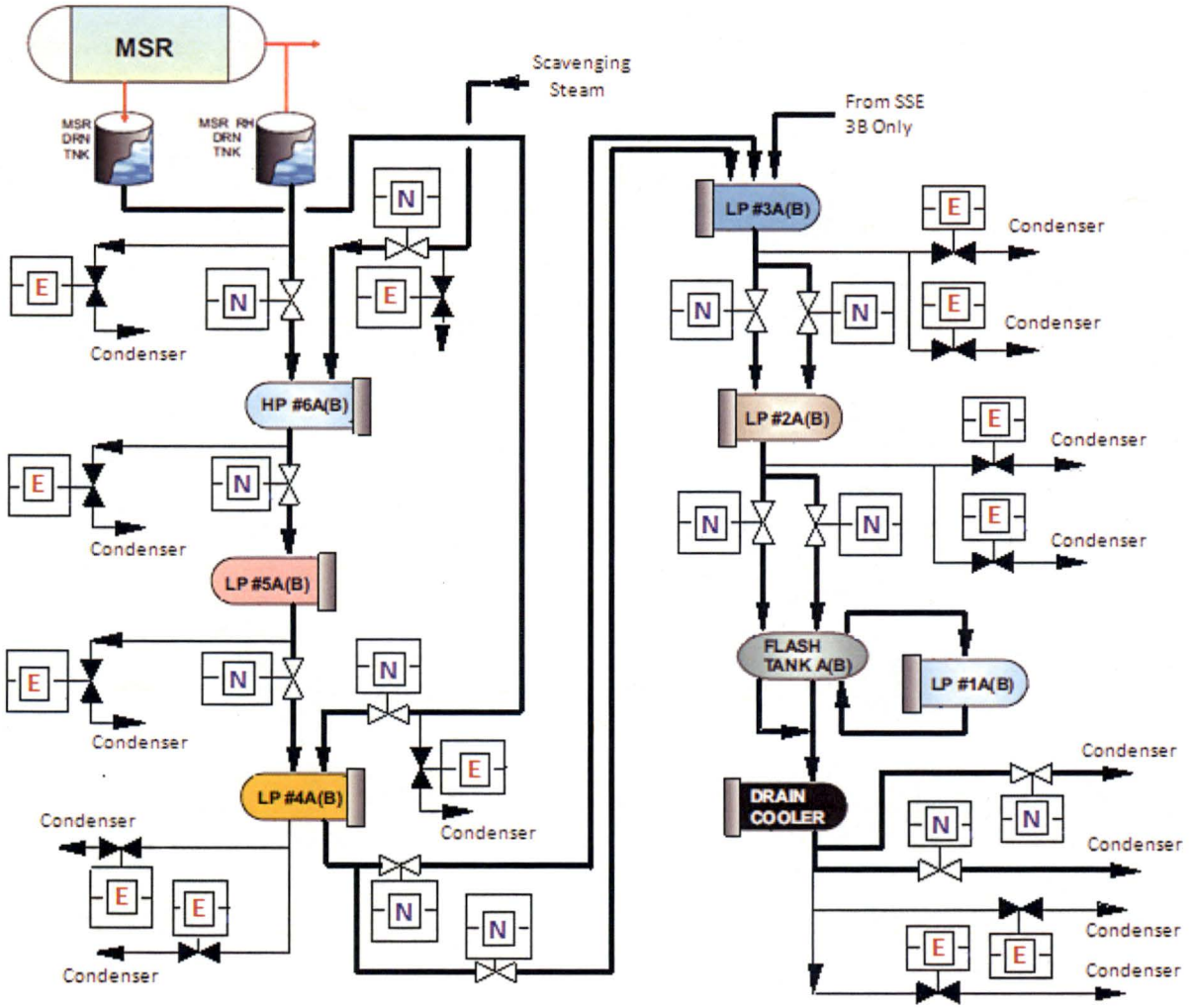
(One Heater String Shown) (fig. 3)



Flowpaths cont.

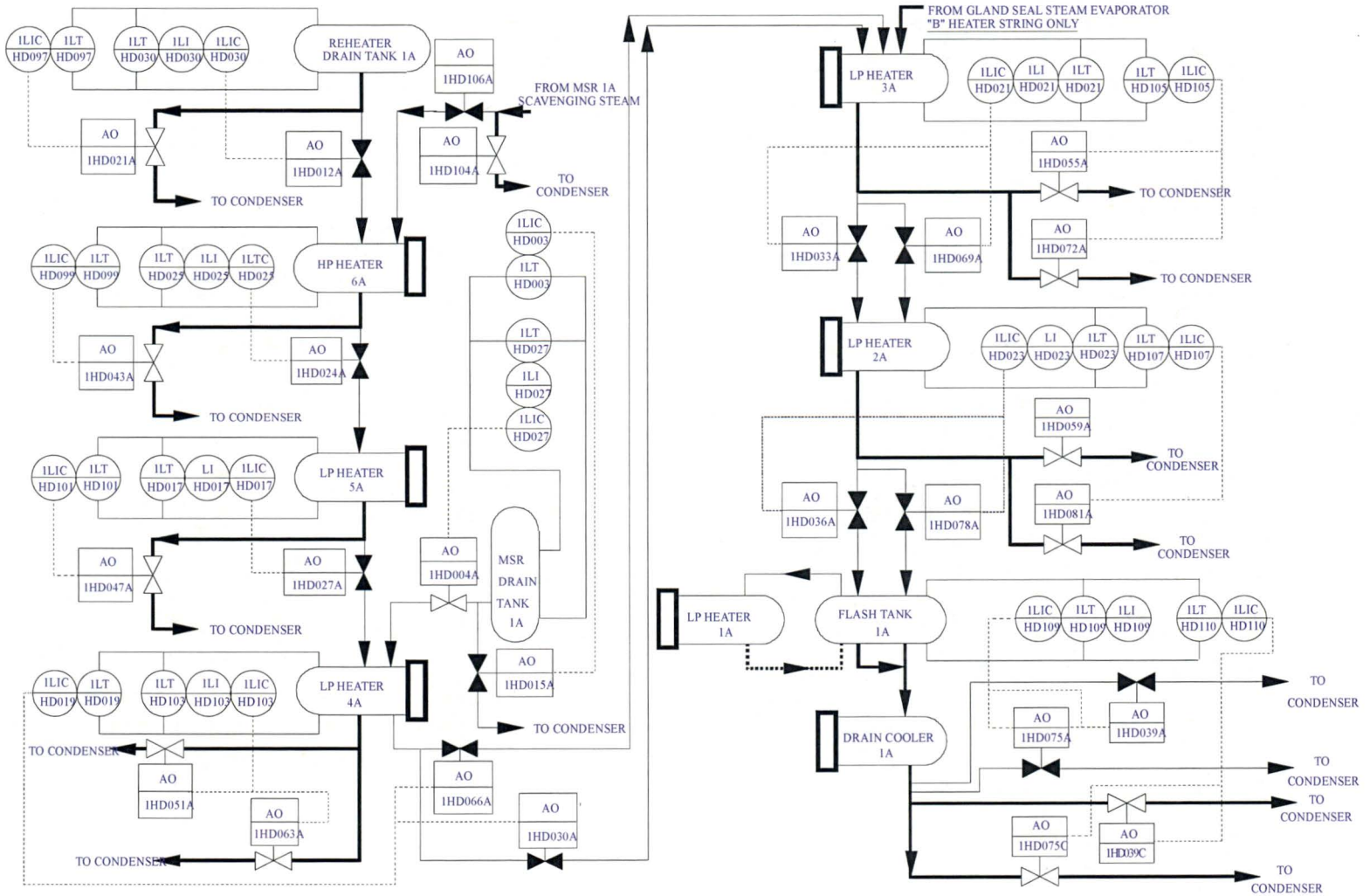
Heater Drains Normal Operation

(One Heater String Shown) (fig. 4)

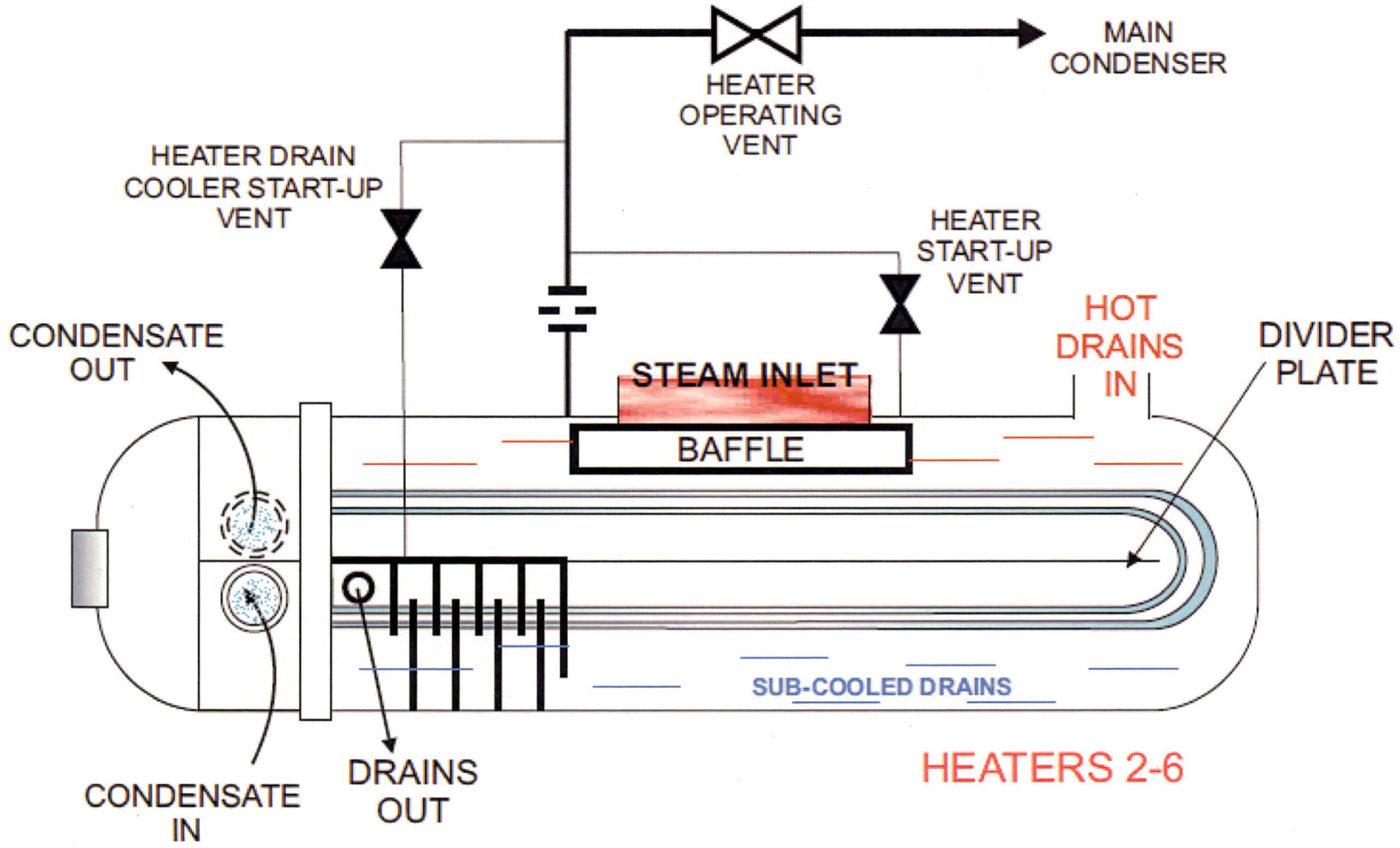


Flowpaths cont.

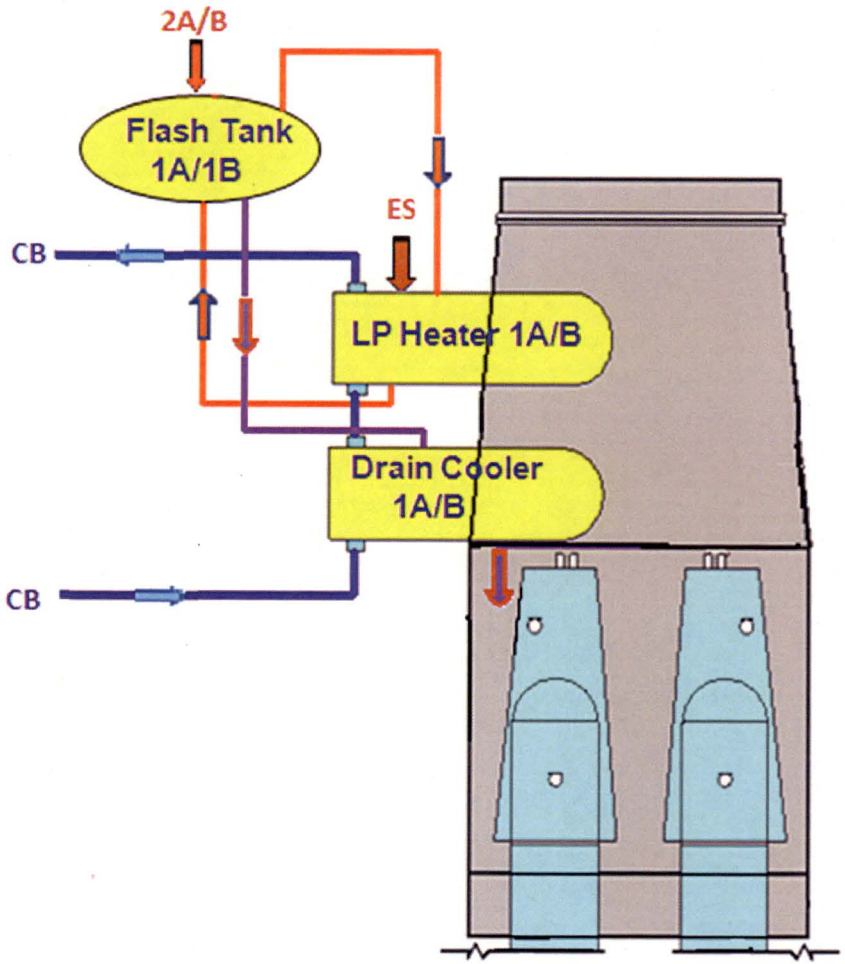
Emergency Drains (fig. 5)



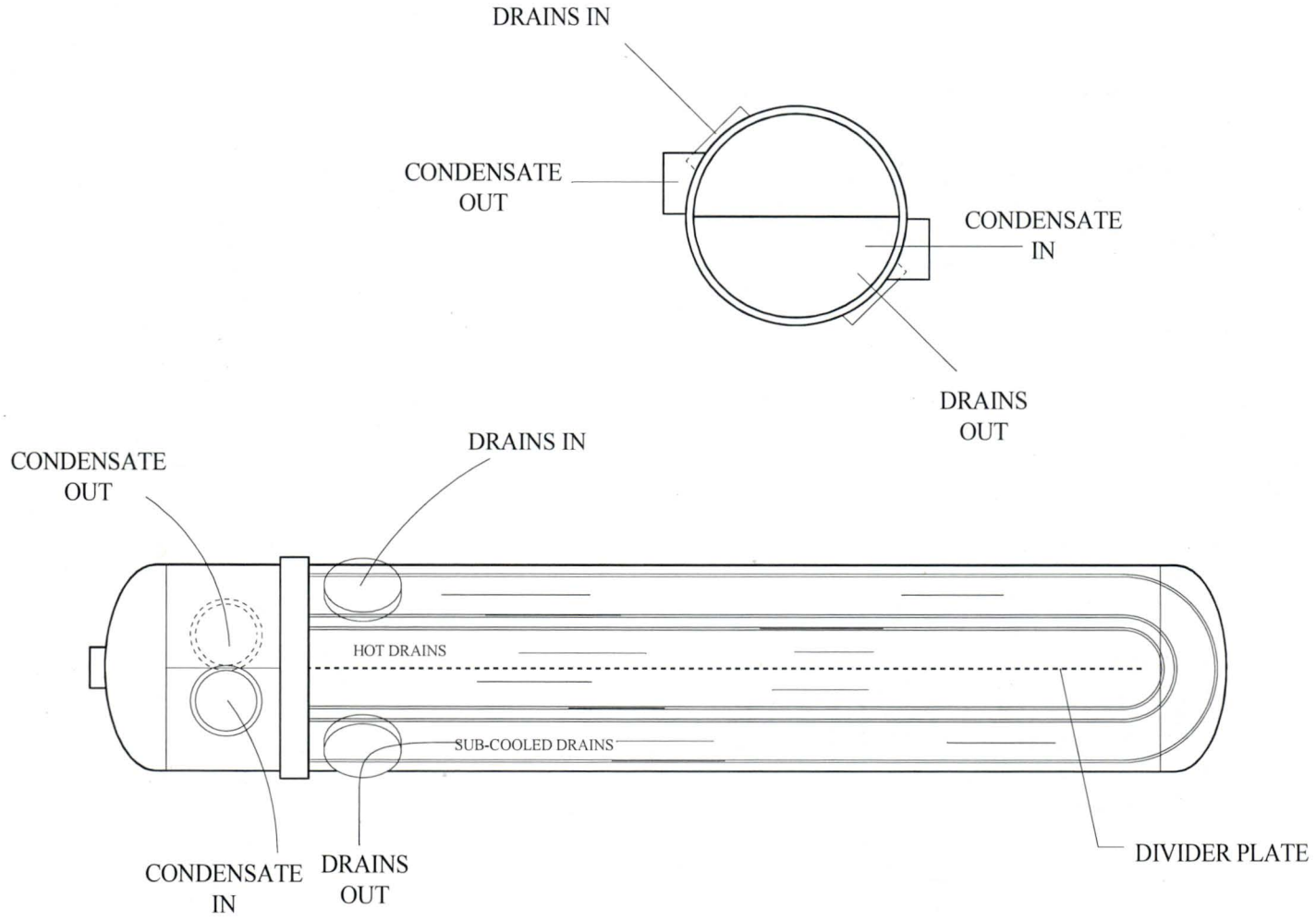
Components
Feedwater Heaters



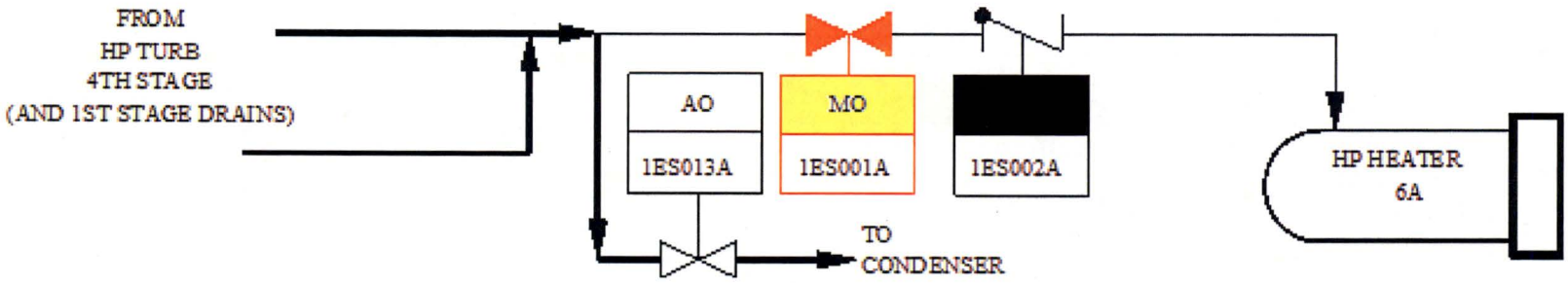
Components cont.
Flash Tanks



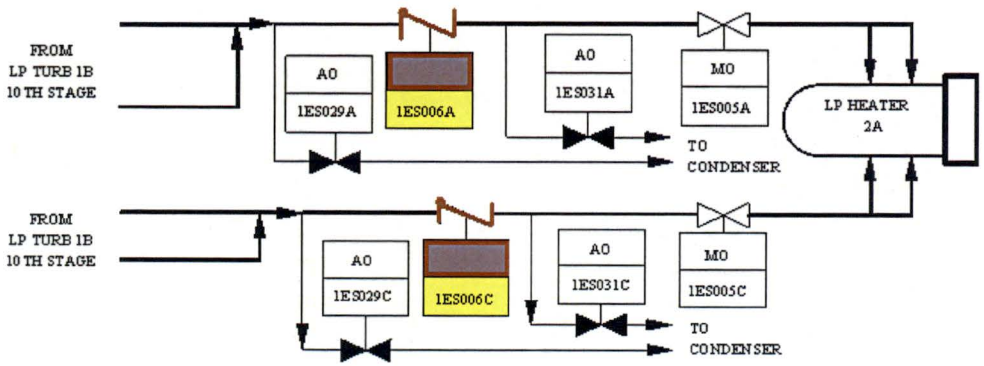
Components cont.
Drain Coolers

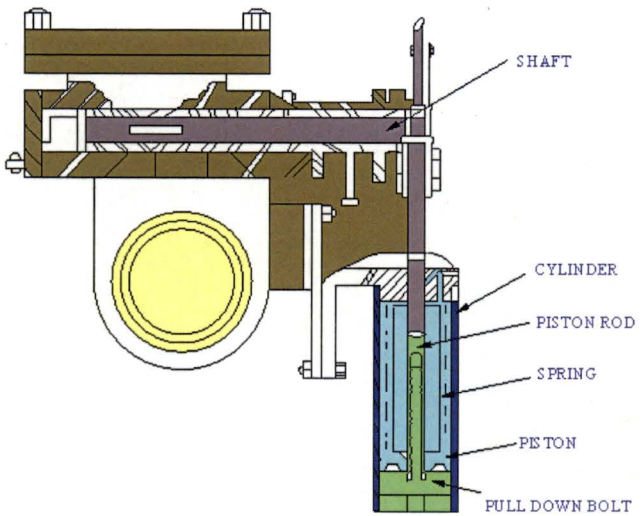


Components cont.
Extraction Steam Isolation Valves



Components cont.
Extraction Steam Check Valves





Components cont.
Heater and Drain Cooler Normal Drain Valves

Normal Drain Valves

Fail **CLOSED** on loss of air or power

Auto **CLOSE** on high level in downstream heater

Emergency Drain Valves

Fail **OPEN** on loss of air or power

Auto **OPEN** on high level in associated heater

Components cont.
Heater and Drain Cooler Emergency Drain Valves

Normal Drain Valves

Fail **CLOSED** on loss of air or power

Auto **CLOSE** on high level in downstream heater

Emergency Drain Valves

Fail **OPEN** on loss of air or power

Auto **OPEN** on high level in associated heater

Automatic Functions / Interlocks

- High Heater Level
- High-High Heater Level
- Main Turbine Trip

Evaluate Parameters

1. Low heater level on system performance
2. Any heater reaching it's high level setpoint
3. High heater level on system performance
4. Any heater reaching it's high-high level setpoint

Evaluate Parameters cont.

5. Heater string isolation valve closure
6. Loss of control power
7. Effect on other heaters when heaters are removed from service/ returned to service

310201.16 Respond to Feedwater Heater Abnormal Level

8.3.1 **Feedwater Heater Abnormal Level**

CAUTION «CM-7»

A Low level in the heater may cause level to be too near the bottom of the "snorkel" which will introduce a possible steam path into the drain cooler which would cause increased vibration and would lead to tube damage. See Appendix F: Feedwater Heater Distance To Snorkel.

Time spent with a low heater level must be minimized to reduce the potential for heater tube damage.

High feedwater heater levels cause extraction steam valves to the respective heater to close. If this occurs, refer to CPS 4005.01, Loss of Feedwater Heating while continuing in this procedure.

NOTE

See Appendix B, HEATER VALVE LIST for valve numbers associated with each heater vessel.

Emergency drain valve controller output is 100% for valve fully closed.

Normal drain valve controller output is 0% for valve fully closed.

1. **IF** Feedwater Heater Abnormal Level is result of a system malfunction or FW heaters are not operating properly, **THEN**

   1) Refer to CPS 4005.01, Loss Of Feedwater Heating for possible entry conditions.

   2) As necessary to help determine heater level high or low, use Appendix G, Feedwater Heater Level Diagnostics.

   3) Determine which drain control is malfunctioning, and if necessary, take manual control of the valve.

   4) If normal drain valve control is malfunctioning, it will be necessary to reduce the emergency drain setpoint in order to maintain relatively normal heater level.

      In this case, normal drains should be positioned in manual to maintain as little flow as practical through the emergency drains.

   5) If any heater controls are left in manual, the controls should be checked frequently due to the possibilities of controllers drifting in manual and due to changing demands that occur with small load changes.

310201.16 Respond to Feedwater Heater Abnormal Level cont.

2. **IF** Feedwater Heater Abnormal Level is result of a plant manipulation or transient (i.e., bypass valve operation, removal/ restoration of FW Htrs, etc.), *«CM-6»*

THEN

After stabilization of the feedwater heaters, verify proper operation of the feedwater heaters:

1) Normal level being maintained (P680/1PA05J).
2) Normal and Emergency Drain Controllers operating properly.
3) ES isolation valves positioned correctly.
4) FW heater bypass valves positioned correctly.
5) BOP-5 video services parameters indicate normal values.
6) Feedwater temperatures are normal.

NOTE

1CB003A(B) and 1CB005A(B) isolate (close) on Flashtank high level.

If condensate flow is attempted to be restored with Flashtank high level sensed, the heater isolation valves (1CB003A(B) & 5A(B)) will stroke open then immediately closed.

310201.19 Preparing Feedwater Heater Level Control For Maintenance Or Trouble-Shooting Of A Normal Drain Valve Malfunction

CAUTION

Section 8.2.3.1 shall be reviewed prior to proceeding due to changes in feedwater heating.

8.3.4 **Preparing Feedwater Heater Level Control For Maintenance Or Trouble-Shooting Of A Normal Drain Valve Malfunction**

1. At panel 1PA05J, verify level indicating controller for the emergency level control valve is in AUTO, and controlling at a reduced setpoint as described in 8.3.1.1.3.

2. Verify/place the normal drain controller in MANUAL.

3. Slowly close the normal drain valve using the closed push button on the level indicating controller while observing that the emergency level controller responds to maintain heater level.

4. **IF** Necessary due to the malfunction,

   THEN

   1) Isolate the malfunctioning drain valve. (refer to Appendix B Table 1 for list of normal drain isolation valves)

   2) Ensure the emergency level controller is maintaining heater level as desired on emergency level indicating controller.

5. **WHEN** Trouble-shooting/maintenance is complete,

   THEN Return normal drain regulator to service by performing the following as appropriate:

   1) Appropriate portion of CPS 3102.01V002, Heater Drains Valve Lineup completed (if needed).

   2) Appropriate portion of CPS 3102.01V004, Heater Drain Instrument Valve Lineup completed (if needed).

   3) Open the heater normal drain valve until the emergency drain automatically closes, and place the normal drain valve in automatic.

   4) Restore the heater emergency drain controller setpoint to its nominal value.

Radwaste

Reading Tank Levels

- All solid RW processing tanks contain a "plumb-bob" type level measuring.
- Operated from the Quantum Master Control cabinet
- One type of plumb-bob is used for decant water level and another type for sludge level.
- Each plumb-bob has a separate operating mechanism; therefore there are two separate mechanisms on top of each sludge tank.
- Concentrate Waste Tanks are the exception; there is only one mechanism to measure total level in these tanks. (Concentrated Waste Lesson Plan, LP85492)

Reading Tank Levels cont.

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Open LP and review Figures 11-17

Course/Program:	ILT/NLO/LORT	Module/LP ID:	N-CL-OPS-268016
Title:	© SOLID RADWASTE SLUDGE COLLECTION/DISPOSAL SYSTEMS	Course Code:	N-CL-OPS-268016
Author:	Russ Werman	Revision/Date:	01 / 08/02/12
Prerequisites:		Revision By:	M. Rodin
		Est. Teach Time:	3.0 hours

Qualified Nuclear Engineer Review (If applicable):	N/A	Date:	N/A
Training Supervision Review:	W. D. Kiser /S/	Date:	08/09/12
Program Owner Approval:	Rick Bair /S/	Date:	08/15/12

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Attachment A
RW Basement Flooding From Stuck Open Condensate Filter Demin Vent Valve

Course/Program:	ILT/NLO/LORT	Module/LP ID:	N-CL-OPS-268016
Title:	SOLID RADWASTE SLUDGE COLLECTION/DISPOSAL SYSTEMS	Course Code:	N-CL-OPS-268016
Author:	Russ Werman	Revision/Date:	01 / 08/02/12
Prerequisites:		Revision By:	M. Rodin
		Est. Teach Time:	3.0 hours

Qualified Nuclear Engineer Review (If applicable):	N/A	Date:	N/A
Training Supervision Review:	W. D. Kiser /S/	Date:	08/09/12
Program Owner Approval:	Rick Buir /S/	Date:	08/15/12

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Phase Separators – 3909.02

Discussion

The Phase Separators collect waste sludge from the Reactor Water Clean Up Filter Demineralizer Backwash Receiving Tank. After a sufficient volume of sludge has been accumulated, tank contents are decanted, recirculated and transferred to a Vendor for processing. Once tank contents have been transferred, the tank and associated components are flushed to remove sludge residue. Tank recirculation is normally performed manually. Flushing of the tank and associated components is also performed manually. Operation of the Phase Separator Sludge System to transfer sludge for processing will be a coordinated evolution between Operations and Vendor.

Phase Separator Lvl Reading

REFERENCE USE

8.6 **Level Readings using the Console Quantum Master Control**

CAUTION

If 0LIX-WX511, Console Quantum Master Control, is activated while the tank is in the recirculation mode or receiving waste, the plumb-bob level sensor unit could be damaged.

8.6.1 Verify no anticipated waste inputs for the duration of the level reading evolution.

8.6.2 Ensure tank is not in the Recirculation mode.

Phase Separator Lvl Reading (Cont.)

8.6.3 Perform the following at 0LIX-WX511, Console Quantum Master Control.

1. Depress the F button until display reads READ CHANNEL.

NOTE

It may take up to eight hours of settle time for the most accurate sludge level readings.

2. Select applicable channel number from Table 1.

Table 1

Channel No.	Description
13	1WX03T Liquid Level
14	1WX03T Sludge Level
8	2WX03T Liquid Level
9	2WX03T Sludge Level

Phase Separator Lvl Reading (Cont.)

NOTE

Level reading is a one-time reading, not a continuous input type. Plumb Bob is still retracting when a reading appears on the display; therefore, do not attempt to read any other channels until the display shows "Ready and Time". The conversion of level readings to indicate other than in feet can be performed.

3. Depress the E button.

4. To get the Console Quantum Master Control level readout to indicate other than in feet, perform the following:

    1. After performing a normal input sequence and while the readout is still indicating a level in feet, repeat the F/ CHANNEL No./ E sequence two to four more times as desired.

    2. A second sequence gives ALARM OF CHANNEL # (alarms are not actually hooked up so whether the readout says yes or no the answer is no).

    3. A third sequence gives MATERIAL % OF CHANNEL #.

Lvl Reading (Cont.)

NOTE

If the tank had been in recirculation and it is desired to take a sludge reading, it may take up to eight hours for the sludge to settle. Therefore any readings before eight hours could be inaccurate.

4. A fourth sequence gives MATERIAL HEIGHT OF CHANNEL # (feet-again).

5. A fifth sequence gives QUANTITY OF CHANNEL # (gallons/cu. ft.).

No. OF SEQUENCE	READOUT
1	Feet
2	Alarm
3	Material %
4	Feet
5	Gallons/ Cu. Ft.

8.21 Resetting a Locked Up Quantum Master Controller

NOTE

A schematic for the Quantum Master Controller is located in K-WX-F010-001 Bulletin 503.

There is only one fuse inside the Quantum Master Controller cabinet.

8.21.1 Obtain SMngt authorization to reset the locked up Quantum Master Controller.

8.21.2 Open the Quantum Master Controller cabinet on 0PL08J.

8.21.3 Using the proper electrical safety precautions per SA-AA-129, remove the unlabeled 5 amp fuse located inside the top center of the Quantum Master Controller cabinet.

8.21.4 Re-install the 5 amp fuse removed in the previous step, 8.21.3.

8.21.5 Close the door to the Quantum Master Controller.

Actions for quantum master controllers are the same for:

Task 390903.02 - Waste Sludge Tanks level readings

Task 390904.03 - Concentrated Waste Tanks level readings

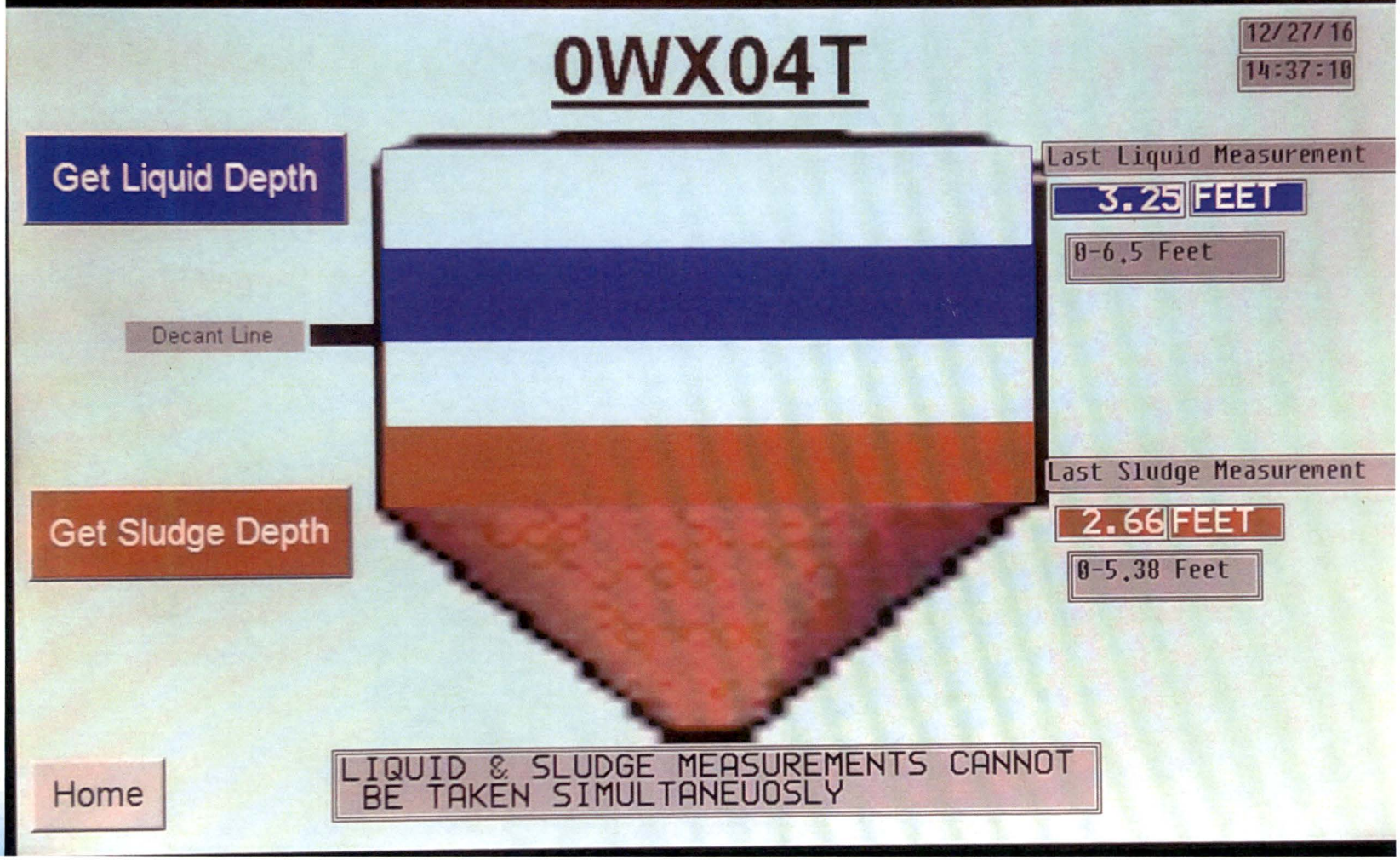
- Also secure the applicable tank agitator

Task 390905.02 - FP/FD Sludge Tanks level readings

Purpose of Spent Resin Sys

- To receive expended resin slurry from the Condensate Polishers, the Radwaste Demineralizers, and charcoal from the Radwaste Demineralizers.

WX Spent Resin Tank Level Indication Mod EC 399310



Staged in MLC

Spent Resin Tank-level readings

Task 390901.02 - Resetting a Locked Up ~~Quantum Master Controller~~ WX Level Control PLC

Section 8.18

CAUTION

To prevent possible damage to 0LIX-WX513, WX Level Control PLC, wait 10 seconds after removing power before applying power again.

8.18.1 Obtain Shift Management authorization to reset locked up 0LIX-WX513, WX Level Control PLC.

8.18.2 Open the back panel door on 0PL08J to obtain access to the back side of 0LIX-WX513, WX Level Control PLC.

8.18.3 Use the proper electrical safety precautions per SA-AA-129, Electrical Safety, for the following steps.

8.18.4 Locate the green 3-position power terminal block connector located on the back side of 0LIX-WX513, WX Level Control PLC, in the lower left hand corner on the controller.

Spent Resin Tank-level readings

Continued…

8.18.5 Remove the green 3-position power terminal block connector by pulling down on the connector until it is removed from the controller.

8.18.6 Wait a minimum of 10 seconds before proceeding.

8.18.7 Install the green 3-position power terminal block connector by pushing up on the connector until it is seated in the controller.

8.18.8 0LIX-WX513, WX Level Control PLC, will now go through a power on initialization sequence and then display the Home Screen.

Improper Loading of Resin

IR 02666117

- On 5/6/16 as identified in IR 2666117, resin was improperly loaded into WE demin "C" per 3906.01. 15 barrels of anion and 5 barrels of cation were loaded. The proper amount of resin is 13 barrels of anion and 5 barrels of cation (per section 7.1)

Improper Anion Underlay Resin Load (CP 'E')

IR 02673997 on 5/18/16

Required Load

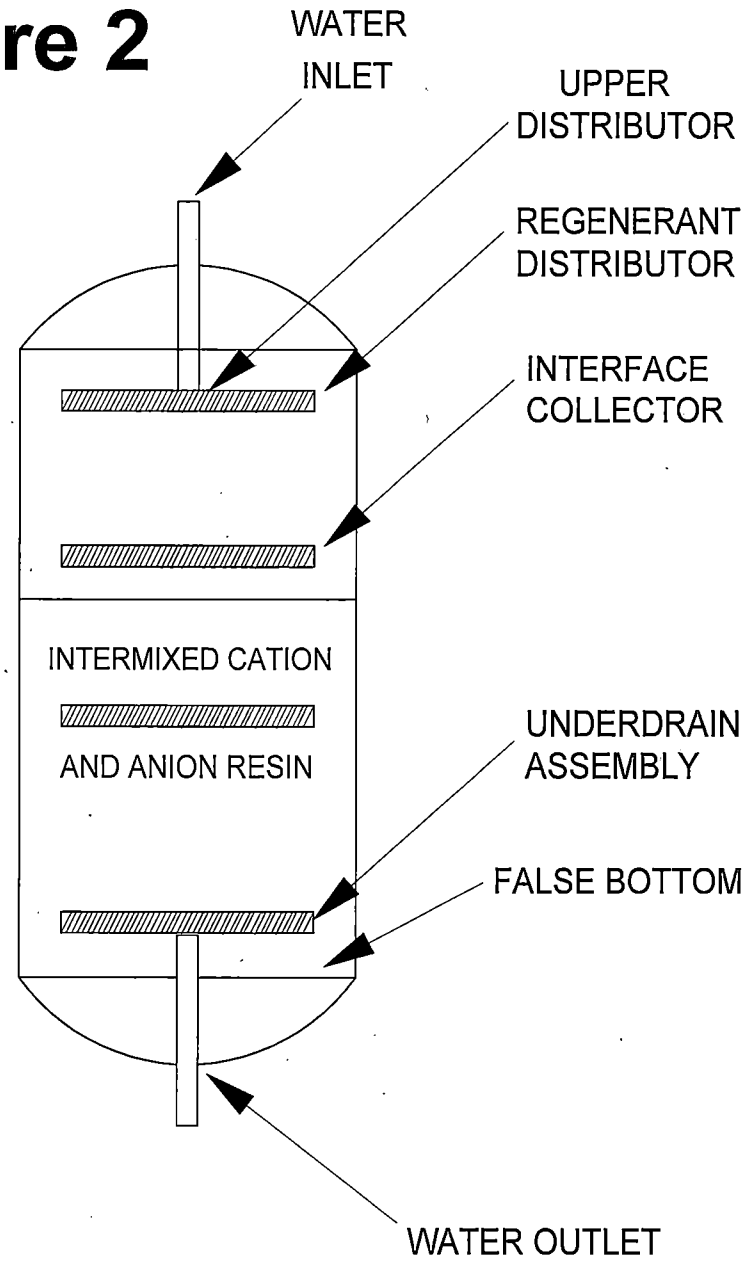
- Anion underlay -
  - 20 barrels A-284-LS (100cf).
- Mixed bed portion
  - 11 barrels cation C-471 (55cf) and 8 barrels anion A-284C

Loaded

- Anion underlay loaded
  - 4 barrels A-284C (20cf) and 16 barrels A-284-LS (80cf)
- Mixed bed portion loaded
  - 11 barrels cation C-471 (55cf)
  - 4 barrels anion A-284C
  - 4 barrels A-284-LS

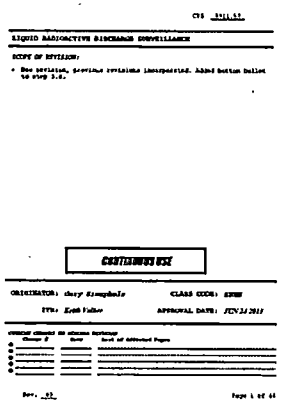
WASTE DEMINERALIZER

Figure 2



Liquid RW Discharge

- Large volumes of water will require processing and dispositioning to support station shutdown and decommissioning of station systems.
- During review of decommissioning activities for Clinton Power Station, it has been identified that returning 0RIXPR040, Liquid Radwaste Discharge monitor to service to support potential liquid discharges from the station may be warranted.
- 9911.50 – Liquid Radioactive Discharge Surveillance



Summary

- Tank Level Readings
- Importance of proper resin loads
- Liquid RW discharge

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
233000.1.1 - STATE the purposes of the Fuel Pool Cooling & Cleanup System including applicable design bases.	20-22
233000.1.2 - Describe the major flow paths for the following modes of the FC system .1 Normal Flow path .2 RX vessel pool draindown .3 RX vessel pool fill .4 FC assist .5 Alt Suppression pool cooling	23-29 31
233000.1.6 - Given a Fuel Pool Cooling& Cleanup System Annunciator, DESCRIBE: b. Any automatic actions	32
233000.1.7 - Given the Fuel Pool Cooling & Cleanup system, DESCRIBE the systems supporting and the nature of the support.	33-36
233000.1.15 - Given Fuel Pool Cooling & Cleanup System initial conditions, PREDICT how the system and/or plant parameters will respond to the manipulation of the following controls. .2 Fuel Pool Cooling & Cleanup system Filter/Demin controls for Hold, Filter, Backwash and Precoat	

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Objectives

Using the approved procedure, DISCUSS:

	Slide(s)
Task 331701.18 - Lower FC Surge Tank Level During System Operation	39
Task 331701.30 - Pump Casing Vent After Maintenance for the Fuel Pool Cooling and Cleanup System	39

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
264000.1.1 - STATE the purpose(s) of the DG/DO System including applicable design bases.	43-44
264000.1.2 - Describe the major flow paths for the following modes of the DG/DO system .1 Lube Oil Sys .2 Fuel Oil Sys .3 Air Start Sys	45-47, 52-66
264000.1.5 - Discuss the DG/DO system automatic functions/interlocks including purpose, signals, set points, sensing points, when bypassed, how/when they are. .6 Fuel Oil Storage Tank .7 Fuel Oil Day Tank .8 Fuel Oil Transfer Pump	48-51
264000.1.7 - Given the DG/DO system, DESCRIBE the systems supporting and the nature of the support. .1 DG Auto Starts	74-75

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
264000.1.11 - EVALUATE given key DG/DO System parameters, if needed DETERMINE a course of action to correct or mitigate the following abnormal condition(s): .1 High Crankcase Pressure .2 Overspeed .3 Overcrank .4 Low Oil Pressure .5 High Water Temperature .6 Reverse Power .7 Loss of Excitation .8 Overcurrent .9 Generator Ground Fault .10 Differential Current	76-77

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Objectives

Using the approved procedure, DISCUSS:

Task Description	Slide(s)
Task 350601.17 - Diesel Engine Lube Oil Addition or Removal	78
Task 350601.27 - Respond to DG 1A(1B)[1C] Auto Start	79
Task 350601.34D - Alternate Diesel Generator Start - Manual Override of Air Start Solenoids	80

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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
233000.1.1 - STATE the purpose(s) of the DG ROOMS HVAC System including applicable design bases.	83-84
233000.1.2 - Describe the major flow paths for the following modes of the DG ROOMS HVAC system operation. .1 Normal Standby Mode .2 Diesel Generator Operating Mode .3 Purge Mode	85-87

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Objectives

Using the approved procedure, DISCUSS:

Task Description	Slide(s)
Task 340301.03 - Increased Cooling/PURGE Mode of the VD System	88-90
Task 340301.08 - Respond to a CO2 Initiation with respect to the VD System	91-92

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Objectives

Upon completion of this chapter, the student will be able to perform the following objectives at a minimum proficiency level of 80%, unless otherwise stated, on an oral or written exam:

Objective Description	Slide(s)
BC08Ir4_Controllers 4. State the purpose of a controller.	96
BC08Ir4_Controllers 5. Describe the theory of operation of the following types of controllers: a. Two position b. Proportional c. Proportional-plus-reset (PI) d. Proportional-plus-reset-plus-rate	97-101
BC08Ir4_Controllers 7. Describe the following characteristics of a flow control valve: a. Linear b. Quick opening c. Equal percentage	102
BC08Ir4_Controllers 9. State the function and describe the characteristics of valve positioners.	103-104
Treq 02422997-82 Discuss the operation of Bailey/NUS controllers at 1PA05J.	105

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Objectives

Upon completion of this chapter, the student will be able to perform the following objectives at a minimum proficiency level of 80%, unless otherwise stated, on an oral or written exam:

Objective Description	Slide(s)
239003.1.1 STATE the purpose(s) of the EXTRACTION STEAM, HEATER VENTS & DRAINS System including applicable design bases.	107
239003.1.2 DESCRIBE the major flowpaths for the following modes of the EXTRACTION STEAM, HEATER VENTS & DRAINS System operation.	108-113
.1 Extraction Steam System while operating in the normal mode	
.2 Extraction Steam System while operating in a specified abnormal mode	
.3 Feedwater Heating Drain System while operating in the normal mode	
.4 Feedwater Heating Drain System while operating in a specified abnormal mode	
239003.1.3 DESCRIBE the function, operation, interlocks, trips, physical location, and power supplies of the following EXTRACTION STEAM, HEATER VENTS & DRAINS System components.	114-119
.1 Feedwater Heaters	
.2 Flash Tanks	
.3 Drain Coolers	
.4 Extraction Steam Isolation Valves	
.5 Extraction Steam Check Valves	
.6 Heater and Drain Cooler Normal Drain Valves	
.7 Heater and Drain Cooler Emergency Drain Valves	

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Objectives

Upon completion of this chapter, the student will be able to perform the following objectives at a minimum proficiency level of 80%, unless otherwise stated, on an oral or written exam:

Objective Description	Slide(s)
239003.1.5 Discuss the EXTRACTION STEAM, HEATER VENTS & DRAINS system automatic functions/interlocks including purpose, signals, set points, sensing points, when bypassed, how/when they are.	120
239003.1.11 EVALUATE given key EXTRACTION STEAM, HEATER VENTS & DRAINS System parameters, if needed DETERMINE a course of action to correct or mitigate the following abnormal condition(s):	121-122
.1 Low heater level on system performance	
.2 Any heater reaching it's high level setpoint	
.3 High heater level on system performance	
.4 Any heater reaching it's high-high level setpoint	
.5 Heater string isolation valve closure	
.6 Loss of control power	
.7 Effect on other heaters when heaters are removed from service/ returned to service	
Task 310201.16 Respond to Feedwater Heater Abnormal Level	123-124
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Objectives

Using normally available references, unless otherwise stated, and with 100% accuracy, in accordance with course reference materials and procedures, the trainee shall:

Objective Description	Slide(s)
268013.1.1- STATE the purposes of Spent Resin System	138
268016.1.4 - STATE the physical location and function of the following SOLID RADWASTE SLUDGE COLLECTION/DISPOSAL system controls, indicators, and/or sensors.	127-130
.9 Quantum Master Control Console	
.10 Tank Level Instrumentation	145
268009.1.10 - EXPLAIN the reasons for given RADWASATE DEMINERALIZERS System operating limits and precautions	
.1 Reason for maintaining Resin Outlet Valve gagged shut during normal operations.	
.2 Method of performing a Resin/Charcoal load.	
.3 Method of performing a Resin unload.	
.5 Loading charcoal prior to loading resin.	

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Objectives

Using the approved procedure, DISCUSS:

	Slide(s)
Task 390901.02 - Spent Resin Tank-level readings, 17 Resetting a Locked Up Quantum Master Controller	141-142
Task 390902.06 - Phase Separators Level Readings	131-137
Task 390903.02 - Waste Sludge Tanks level readings	137
Task 390904.03 - Concentrated Waste Tanks level readings	137
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TREQ 02623308-33 - Liquid RW Discharge Surveillance	146
TREQ 02623308-21 - Resin Loading activities	143-144
TREQ 02623308-01 - WX Tank Level Mod	139-141

Questions

Feedback

Feedback is essential for program health

LASER entries provide anecdotal measures of effectiveness

Training Observations are accessed from the Exelon Intranet