UNIT 2 ALARM RESPONSE MANUAL

IRI-AR-100

IRI POWER PLANT

This sample is a typical document.

The level of detail, format and content will vary to reflect the specific needs of each customer.

This document was developed for use in the IRI Plant Technician Training Program.
It is provided as a reference only and is not to be used for plant or system operation.

PREFACE

This Alarm Response Manual has been designed to assist you in meeting the requirements of Module 100 of the Plant Technician Training and Certification Program. It contains information about selected IRI Unit 2 Annunciator/Alarms. This includes annunciator alarm title, system, initiating device if available, automatic actions, Control Room observations, local observations, immediate operator action, and effect on the plant.

You should review each annunciator's response and familiarize yourself with its contents. You should also walk down the associated system and identify the components and switches/devices that initiate the annunciator alarm. Should you have additional questions about alarm response, ask your supervisor.

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UNIT 2 ALARM RESPONSE MANUAL

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I. PURPOSE

The purpose of the Alarm Response Manual is to address selected Annunciator Alarm Conditions. In doing so, this permits expeditious operator response to evaluate, curtail, and/or correct the alarm condition to prevent injury to personnel and unnecessary trips or equipment failure.

II. PRECAUTIONS, LIMITATIONS AND SETPOINTS

Care should be taken to maintain the protection of plant personnel at all times. Equipment should be protected to prevent damage to the equipment or catastrophic failure to the plant. The cause of the alarm condition should be rectified in a controlled yet expedient manner.

III. ALARM RESPONSE

Following is a listing of Alarm Response Cards for many systems/components that are considered critical for plant operation. We have purposely limited the Alarm Response Cards to maintain a usable index.

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ALARMS

<table>
<tr><td>ATTEMPERATOR
VALVE FAILURES</td><td>Alarm originates from Attemperator valve position switches. E.g. Upper Superheater attemperator south and north, Lower Superheater attemperators A&B south and A&C north, Reheat attemperator solenoid actuated block valve and associated control valve.</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Superheater Attemperator Spray Valve(s) does not close on Turbine Trip
• Superheater Attemperator Spray Valve(s) does not close on Fuel Trip
• Reheat Attemperator Spray block valve or control valve does not close on Turbine Trip, Fuel Trip or if boiler load is less than minimum.
• Faulty Position Switch
• Solenoid failure</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor for Attemperator(s) flow
• Monitor main and reheat steam temperatures</td><td>Local Observations
• Verify valves positioners are connected
• Verify valves are traveling
• Verify control air is available to solenoids</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Isolate the root block valve for the faulty attemperator (if turbine trip, fuel trip, or low load)</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If the faulty attemperator is not isolated may result in decreased steam temperature
• With decreased steam temperature, turbine rotor/shell growth may be effected
• With decreased steam temperature, condensing may occur on LP turbine blades resulting in blade erosion/damage</td></tr>
</table>

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<table>
<tr><td>AUX CONDENSER
BACK PRESSURE HIGH</td><td>High Alarm originates from 2PSH</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Back pressure High
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Auxiliary Condenser Pressure
• Circulating Water Flow and Differential pressure across Auxiliary Condenser
• Circulating Water Temperature inlet and outlet from Auxiliary Condenser
• Monitor TDBFP Turbine vibration</td><td>Local Observations
• Check Valve line-up e.g. vent to condenser, Circulating Water
• Check Aux. Condenser Hotwell Level
• Check Valve on Vacuum Breaker
• Check Condenser Expansion Point
• Check Operation of Vacuum Pump</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Increase Circulating Water Flow through Auxiliary Condenser
• If Hotwell High level, open level control valve bypass to reduce level to normal
• If High level, perform sample analysis or check sample panel analyzer to determine if Auxiliary condenser tube leak
• If Back Pressure gets to high, it may result in overheating of Feed Pump Turbine
• If problem is with vacuum pump swap to Main Turbine Vacuum Pump</td></tr>
<tr><td colspan="2">E. Effect on Plant
• If level is high and is not controlled, may result in severe damage to Feed Pump Turbine – e.g. water induction.
• If Level decreases too much, it may permit steam vapor to be drawn through the Hotwell make-up valves, resulting in a loss of vacuum and Unit trip</td></tr>
</table>

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<table>
<tr><td>AUX CONDENSER HOTWELL LEVEL HIGH OR LOW</td><td>High Alarm originates from 2LSH CD069
Low Alarm originates from 2LSH CD068</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Auxiliary Condenser High Level
• Auxiliary Condenser Low Level
• Faulty Level Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Auxiliary Condenser Pressure
• Circulating Water Flow through Auxiliary Condenser
• Monitor TDBFP Turbine vibration</td><td>Local Observations
• Verify Level high or low
• Check valve line-up</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level, open level control valve bypass to reduce level to normal
• If High level, perform sample analysis or check sample panel analyzer to determine if Auxiliary condenser tube leak
• If Low level, verify that level control valve and bypass are both closed</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If level is high and is not controlled, may result in severe damage to Feed Pump Turbine – e.g. water induction.
• If Level decreases too much, it may permit steam vapor to be drawn through the Hotwell make-up valves, resulting in a loss of vacuum and Unit trip</td></tr>
</table>

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<table>
<tr><td>BFP TURBINE
BEARING OIL PRESSURE LOW</td><td colspan="2">Signal originate from TDBFP Turbine Bearing Header Lube Oil Supply Pressure Switch</td></tr>
<tr><td colspan="3">A. <u>Possible Cause(s) of Alarm</u>
• Loss of lube oil supply pressure to turbine bearings
• Faulty Pressure Switch</td></tr>
<tr><td colspan="3">B. <u>Automatic Action(s)</u>
• Auxiliary Oil Pump will auto start
• Possible Auto-Start of the Emergency Bearing Oil Pump</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration
• Monitor Main Turbine Oil Pressure
• Possible BFP Turbine Auxiliary Oil Pump Trip or Auto Start annunciator
• Possible Auto-Start of the Emergency Bearing Oil Pump</td><td colspan="2">Local Observations
• Check Lube Oil system pump turbine bearing supply temperature and pressure
• Check Reservoir Level to determine if there is a loss of pump suction pressure
• Check for oil leaks</td></tr>
<tr><td colspan="3">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, decrease it
• If the problem is a low suction pressure due to Low level, add oil to the reservoir
• If the low supply pressure is cleared, return to single pump operation, shutting down the Auxiliary Oil Pump and placing its controls back in auto
• If the cause is failure of the Main Turbine shaft driven oil pump, shut down the Unit until repairs are made</td></tr>
<tr><td colspan="3">E. <u>Effect on Plant</u>
• May lead to High Bearing Vibration which leads to TDBFP Trip and Unit trip</td></tr>
</table>

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<table>
<tr><td>BFP TURBINE
ECCENTRICITY HIGH</td><td>Signal originates from TSI</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High eccentricity
• Faulty Eccentricity Sensor/ Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor eccentricity</td><td>Local Observations
• Walk around the turbine to determine audible rubbing</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• None. Continue turning gear operation until the high eccentricity clears.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• May impact startup activity if the condition is not corrected with turning gear operation.</td></tr>
</table>

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<table>
<tr><td>BFP TURBINE
HYDRAULIC OIL PRESSURE LOW</td><td>Signal originates from Hydraulic pressure supply to Servo valves pressure switch</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High Servo Oil Filter Differential Pressure
• Faulty Pressure Switch
• The Loss of Main Oil Pumps</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If hydraulic supply/control oil pressure decreases, the Auxiliary oil Pump auto-starts</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Control Oil Pressure</td><td>Local Observations
• Verify valve alignment to switch is correct
• Check control oil system pressure temperature and flow
• Check for leaks
• Check reservoir level is adequate</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Verify auto start of the Auxiliary oil Pump
• When the cause is identified and corrected alarm clears</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• May impact Unit load if the cause is not determined.
• If the condition worsens, the control oil pressure decreases which may lead to Boiler Feed Pump Turbine trip and the Unit trip.</td></tr>
</table>

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<table>
<tr><td>BFP TURBINE SERVO OIL FILTER DIFFERENTIAL PRESSURE HIGH</td><td>Signal originates from Hydraulic flow to Servo valve filter differential pressure switch</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High Servo Oil Filter Differential Pressure
• Faulty Differential Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• If hydraulic supply/control oil pressure is diminished, the Auxiliary oil Pump may auto-start</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Control Oil Pressure</td><td>Local Observations
• Verify differential pressure
• Verify valve alignment to switch is correct
• Check lube oil system pressure temperature and flow</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• When the cause is identified and corrected alarm clears</td></tr>
<tr><td colspan="2">E. Effect on Plant
• May impact Unit load if the cause is not determined.
• If the condition worsens, the control oil pressure decreases which may lead to Boiler Feed Pump Turbine trip and the Unit trip.</td></tr>
</table>

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<table>
<tr><td>BFP TURBINE
VIBRATION HIGH</td><td>Signal originates from TSI</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High eccentricity
• Faulty Vibration Sensor/ Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor vibration</td><td>Local Observations
• Walk around the turbine to determine audible rubbing
• Check lube oil system pressure temperature and flow</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If the condition is increasing, decrease load and Feedwater Flow until the alarm clears and the vibration increases to normal value.
• When the cause is identified and corrected, resume loading</td></tr>
<tr><td colspan="2">E. Effect on Plant
• May impact Unit load if the cause is not determined.
• If the condition worsens, the Boiler Feed Pump Turbine trips and the Unit trips.</td></tr>
</table>

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<table>
<tr><td>BOILER FEED PUMP SEAL WATER DRAIN TANK LEVEL HIGH OR LOW</td><td>High alarm originates from 2LSH CD081
Low alarm originates from 2LSL CD173</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High Boiler Feed Pump Seal Drain Tank level
• Low Boiler Feed Pump Seal Drain Tank level
• Faulty Level Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If level is high, Tank level control valve opens
• If level is low, Tank level control valve is closed</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm</td><td>Local Observations
• Verify level
• Check valve lineup</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If level is high, open level control valve bypass to clear the High level. Then close and monitor level control valve operation.
• If level is low, verify that the level control valve and bypass are both closed.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• No immediate impact if seal injection is not affected.</td></tr>
</table>

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<table>
<tr><td>BOILER FEED PUMP
SEAL WATER FILTER
DIFFERENTIAL PRESSURE HIGH</td><td>Signal originates from 2PDS CD055 or from 2PDS CD056</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High differential pressure across the filter
• Faulty Differential Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm</td><td>Local Observations
• Check filter differential pressure
• Check DP Switch valve lineup</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Turn handle on top of Cuno filter to clean filter.
• Operator can put old filters in service till Cuno Filters can be cleaned.
• Note the condition and input Maintenance Request into the work order system.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• No immediate impact if seal water flow is not affected.
• If flow is impacted, may lead to flashing across the seals and subsequent pump seal damage/wear</td></tr>
</table>

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<table>
<tr><td>BOILER FEED PUMP TURBINE EXHAUST BACKPRESSURE VERY HIGH</td><td>Signals originate from Auxiliary Condenser Pressure Switch(es)</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High Backpressure
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• This condition, if valid, may lead to a trip of the Boiler Feed Pump Turbine</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor TDBFP Turbine Bearing Vibration
• Monitor Auxiliary Condenser Pressure
• Monitor Circulating Water Flow through the Auxiliary Condenser</td><td>Local Observations
• Verify Auxiliary Condenser pressure
• Check valve line-up
• Check for possible air ingress
• Check circulating water differential pressure across auxiliary condenser
• Check Auxiliary Condenser level</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Increase circulating water flow through the Auxiliary Condenser
• It may be necessary to decrease load, decreasing TDBFP Turbine Load until the problem is corrected</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• This condition, if not corrected may lead to TDBFP Turbine Trip and resultant Unit trip</td></tr>
</table>

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<table>
<tr><td>CIRCULATING WATER PUMP BEARING OR SEAL WATER</td><td>Alarm Signal originates from 2PSL WS077</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Pressure Regulator Failure supplying Bearing/Seal Water. Normal Pressure is >25 psig
• Well Pump trip or supply valve closed
• Faulty Pressure Switch
• Line Break</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Verify Well Pump is in-service
• Monitor Circulating Water Pump and Service Water Pump bearing temperatures</td><td>Local Observations
• Verify System Pressure on Local Gauge
• Inspect valve line-up
• Inspect System Piping for leaks</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If pressure regulator has failed, open the bypass
• If Well Pump has tripped, attempt restart
• If Well Pump has tripped and will not restart, valve in the Emergency Supply from the Filtered Water System</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If Circulating Water Pump bearing temperatures increase, the pump should be shut down.
• If Circulating Water Pump shaft sealing is lost for an extended period of time, binding may occur</td></tr>
</table>

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<table>
<tr><td>CLOSED COOLING WATER HEADER PRESSURE LOW</td><td>Alarm Signal originates from 2PSL WC007</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Closed Cooling Water Pump Trip
• Inadequate suction pressure to Closed Cooling Water Pump(s)
• Faulty Pressure Switch
• Line Break</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Standby Pump will auto-start if control switch is properly aligned</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Verify Closed Cooling Water Pump(s) in-service
• Monitor Closed Cooling Water Header Pressure
• Verify auto-start of standby pump</td><td>Local Observations
• Verify System Pressure on Local Gauge
• Check Pump inlet filter differential pressure
• Inspect Closed Cooling Water Tank level
• Inspect valve line-up
• Inspect System Piping for leaks</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Start the Standby pump if it is available and did not auto-start
• If Cooling Water Pump inlet filter differential is high, isolate and clean it
• If Closed Cooling Water Tank Level is low, add Condensate make-up
• Throttle cooling water to out-of-service equipment coolers until the problem is rectified</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If bearing oil temperatures increase, high vibrations or equipment binding may result, leading to trip conditions
• Heater Drain Pump seal damage may occur
• Bus Duct temperatures may increase</td></tr>
</table>

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<table>
<tr><td>CLOSED COOLING WATER TANK LEVEL HIGH OR LOW</td><td>Low Alarm originates from 2PSL WC053
High Alarm originates from 2PSH WC015</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Tank Level Low
• Tank Level High
• Faulty Level Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Verify level
• Monitor Cooling Water flow
• Monitor Cooling Water temperature</td><td>Local Observations
• Verify Tank Level on local gauge
• Add Condensate make-up if required
• Inspect System Piping for leaks
• If level is high, verify make-up valve is closed
• If levels is high and make-up valve is closed, monitor operation of heat exchangers – checking for tube leaks</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Add Condensate make-up if level is low
• If level is high, determine the source of make-up and isolate it</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Low level may result in Cooling Water Pump trip and resultant plant equipment trip due to vibration and overheating</td></tr>
</table>

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<table>
<tr><td>COLD REHEAT LOW POINT DRAIN LEVEL HIGH</td><td>High Alarm - 2LSH CR009</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level detected in low point drain to Condenser</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Solenoid Drain Valve opens</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• None</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Possible turbine water induction if condition is not corrected</td></tr>
</table>

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<table>
<tr><td>COLD REHEAT LOW POINT DRAIN LEVEL VERY HIGH</td><td>High High Alarm originates from 2LSH CR010</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High High level detected in low point drain to condenser</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Redundant alarm indicating that level is increasing</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Operator should open drains on level point to drain line of solenoid drain valve is not working.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Possible turbine water induction if condition is not corrected</td></tr>
</table>

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<table>
<tr><td>CONDENSATE STORAGE TANK LEVEL HIGH OR LOW</td><td>High Alarm originates from 2LSH CD085
Low Alarm originates from 2LSH CD086</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Condensate Storage Tanks High Level
• Condensate Storage Tanks Low Level
• Faulty Level Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If level is HIGH, Demineralizer Train recalculating valve opens, if controls are properly aligned
• If Level is LOW, Demineralizer Train recalculating valve closes, if controls are properly aligned</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Condensate Storage Tank Level
• Monitor Hotwell Level
• Monitor Condenser Pressure</td><td>Local Observations
• Verify Condensate Storage Tank Level
• Check valve line-up
• Verify Water Treatment Demineralizer Equipment Control Switch line-up</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If level is high, shut down the Demineralizer make-up
• If level is low, Start up Demineralizer to add make-up
• If level continues to drop, it may be appropriate to line up the Condensate Storage Tank cross-tie from Unit 1 to restore level
• If level continues to drop, Hotwell level may decrease
• Unit may trip if tank level is not restored since air will be drawn through make-up piping into the Condenser</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If Hotwell level decreases too low, may lose suction supply to Condensate Pumps
• If Condensate Storage Tank Level decreases too much, it may permit air to be drawn through the Hotwell make-up valves, resulting in a loss of vacuum and Unit trip</td></tr>
</table>

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<table>
<tr><td>CONTROL AIR PRESSURE LOW</td><td>Alarm Signal originates from 2PSL IA001</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Control Air Compressor Trip
• Break in Control Air Piping
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If Standby Control Air Compressor Controls are properly aligned, a standby compressor will auto-start.</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Verify Control Air System Pressure
• Verify Control Air Compressor operating condition (ON/Tripped)</td><td>Local Observations
• Verify System Pressure on Local Gauge
• Inspect Control Air Compressor for possible cause of the low pressure
• Inspect System Piping for leaks
• Inspect Dryers for possible solenoid failure allowing continuous exhaust</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Attempt to start another Compressor
• Open Emergency Supply from Station Air System</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• As pressure continues to decrease, fail-safe valves will fail to their “safe” position
• If pressure is allowed to continue to decay, Unit will trip</td></tr>
</table>

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<table>
<tr><th colspan="2">DEAERATING HEATER
HIGH LEVEL ISOLATION</th></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High High shell level in DC Heater
• Faulty level switch
• Level control failure
• Emergency drain valve failure</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• On a High High level in the DC Heater, its extraction MOV and non-return valves close
• On a High High level in the DC Heater, its emergency drain valve opens to control level.</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Level Control Valve
• Monitor Emergency Drain Valve
• Monitor Turbine Vibration
• Monitor Turbine Different expansion</td><td>Local Observations
• Verify DC Heater level
• Inspect valve line-up
• If High level, verify emergency drain opens to control level
• If High level, inspect condensate level control valves/ and verify that valves are close</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level is caused from condensate level control valves/DC heater make-up failure, take manual control.
• Reduce condensate flow and restore level to normal.
• Return L.C.V. controls to automatic.
• After level returns to normal, open extraction MOV.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate
• Passable turbine water induction if conduction is not corrected.</td></tr>
</table>

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<table>
<tr><td>DEAERATING HEATER LEVEL HIGH OR LOW</td><td>High High Alarm – 2LSH HD057
High Alarm originates from 2LSH CD044
Low Alarm originates from 2LSH CD043</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level in DC Heater
• Low level in DC Heater
• Faulty level switch
• Level control failure</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• On a High High level in the DC Heater, its emergency drain valve opens to control level.
• On a High High level in the DC Heater, its extraction MOV and non-return valve close</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Level Control Valve
• Monitor Emergency Drain Valve</td><td>Local Observations
• Verify level
• Inspect valve line-up
• If High High level, verify DC Heater emergency drain valve opens and controls level
• If Low level, inspect condensate level control valves/are open
• If Low level, inspect condensate system recirculation valve</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Take manual control of Condensate Level Control Valves, control flow and restore level to normal.
• Return L.C.V. controls to normal after level is under control.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• If High High level may start flooding trays, reducing deaeration capability
• If Low level, decreases NPSH to Feedwater Pumps.
• If level is allowed to decrease further results in a Feed Pump Trip and Unit trip.</td></tr>
</table>

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FIRE WATER PRESSURE LOW	Low Pressure signal originates from 2PSL FP003 (downstream of Diesel Engine) or from 2PSL FP004 (Turbine Room Header)
A. Possible Cause(s) of Alarm • Pressure Low condition • Faulty Pressure Switch	
B. Automatic Action(s) • Diesel Engine (Fire Pump) Auto Start	
C. Control Room Observations • Annunciator Alarm • Engine Driven Fire Pump Running • Possible Transformer Fire, Early Warning or Water Flow Alarms • Possible Fire Protection System Alarm • Possible Station Fire Alarm, Early Warning or Water Flow Alarms • Possible Coal Handling Equipment Fire, or System Water Flow	**Local Observations** • Determine the location of fire water usage • Check valve configurations • Check Diesel Engine driven fire pump for proper operation
D. Immediate Operator Action • Verify Diesel Engine Fire Pump auto starts • Open cross-tie if necessary	
E. Effect on Plant • If pressure low condition does not clear, diminishes fire protection capability	

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<table>
<tr><td>FURNACE OR WINDBOX PRESSURE HIGH</td><td>Windbox high pressure alarm originates from 2PSH 062 or 2PSH 063

Furnace Pressure high alarm originates from 2PSH 078 or 2PSH 079</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Furnace Pressure High
• Windbox Pressure High
• Air Flow/Furnace Draft Control malfunction
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• If furnace pressure is high, induced draft fan flow will increase to return furnace pressure to setpoint (-0.5 inches w.c.)
• If windbox pressure is high and total air flow is also high, FD Fans will slightly decrease to maintain desired windbox to furnace differential pressure
• If a high furnace pressure is not corrected it may result in all fans being tripped and/or a Master Fuel Trip</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Furnace pressure
• Monitor Windbox pressure
• Monitor FD Fan/combustion air flow</td><td>Local Observations
• Verify damper positioners are connected
• Verify dampers are traveling</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If the furnace pressure is high, restore furnace pressure to normal by adjusting ID Fan vanes
• If the windbox pressure is high and air flow is also high, decrease FD Fan inlet vanes</td></tr>
<tr><td colspan="2">E. Effect on Plant
• This condition if not corrected may lead to all fan being tripped.
• This condition if not corrected may lead to a Master Fuel trip</td></tr>
</table>

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<table>
<tr><td>GRAVIMETRIC FEEDER
NO COAL ON BELT</td><td>Alarm originates from leveling bar from feeders 2-3 through 2-8, one of which shows no coal on belt with the feeder running</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Plugged Gravimetric Feeder feed chute on one of the feeders 2-3 through 2-8
• Empty Coal Silo for the associated feeder showing no coal on belt
• Feeder inlet isolation valve closed causing no coal flow to belt
• Faulty leveling bar detector switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• The feeder will trip, remaining feeders speeds will increase to make-up for the loss of the feeder with no coal on the belt
• Associated Feeder’s Pulverizer temperature control dampers will modulate accordingly to maintain Pulverizer outlet temperature</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor temperatures on Pulverizer that feeder tripped.
• Monitor other feeders to see if they take-up the load of the plugged feeder</td><td>Local Observations
• Verify which has no flow
• Check valve lineup</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Determine why there is no coal on the affected feeder
• Verify that remaining pulverizers/feeders are picking up the load
• Try to restart feeder that tripped.
• If the remaining feeders are heavily loaded, place an additional pulverizer/feeder in-service</td></tr>
<tr><td colspan="2">E. Effect on Plant
• No immediate impact if additional feeders are able to pick up the load
• If the other feeders are unable to pick up the load, it may be necessary to place an additional pulverizer/feeder in-service to maintain load.</td></tr>
</table>

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GRAVIMETRIC FEEDER PLUGGED	
A. Possible Cause(s) of Alarm • Plugged Gravimetric Feeder: one of 2-3 through 2-8	
B. Automatic Action(s) • Other in-service gravimetric feeders speeds will increase to make up for the loss of the one that is plugged • Temperature control on Pulverizer outlet of plugged feeder will close down on hot air damper and open up on tempering air damper to maintain desired pulverizer outlet temperature	
C. Control Room Observations • Annunciator Alarm • Monitor other feeders to see if they take-up the load of the plugged feeder	**Local Observations** • Verify which feeder is plugged • Check valve lineup
D. Immediate Operator Action • Shut down feeder till the feeder plug can be cleaned. • Verify that remaining pulverizers/feeders are picking up the load of the plugged feeder • If the remaining feeders are heavily loaded, place an additional pulverizer/feeder in-service • Attempt to manually clear the plugged feeder by jogging it from the local switch • If jogging the feeder does not work, sweep the plugged feeder's pulverizer and cool it down. • Issue a clearance order Lockout/tagout for the effected feeder, pulverizer and primary air dampers. • Clear the feeder plug	
E. Effect on Plant • No immediate impact if additional feeders are able to pick up the load • If the other feeders are unable to pick up the load, it may be necessary to place an additional pulverizer/feeder in-service to maintain load.	

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<table>
<tr><th colspan="2">HEATER LEVEL ISOLATION
RELAYS DC POWER FAILURE</th></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Loss of DC supply to Level Control on Heater 2-1A
• Loss of DC supply to Level Control on Heater 2-1B
• Loss of DC supply to Level Control on Heater 2-2
• Loss of DC supply to Level Control on Heater 2-3
• Loss of DC supply to Level Control on Heater 2-4
• Loss of DC supply to Level Control on DC Heater
• Loss of DC supply to Level Control on Heater 2-6
• Loss of DC supply to Level Control on Heater 2-7</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm</td><td>Local Observations
• Identify which heater(s) have lost their DC supply
• Manually control associated Heater shell level(s) until DC power is restored</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Restore DC Control Power to the associated Heater Level Control(s)
• If you can not restore Control Power, notify electricians</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Level Controls for associated heaters will not function until the DC Control Power is restored
• Extraction MOVs for associated heaters will not receive trip signal on High High heater level
• Possible Turbine Water Induction through extraction line if heater level is not controlled and if Extraction MOV is not Manually initiated to close on High High level</td></tr>
</table>

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<table>
<tr><td colspan="2">HP HEATER
HIGH LEVEL ISOLATION</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High High shell level in HP Heater 2-6 or 2-7
• Faulty level switch
• Level control failure
• Emergency drain valve failure</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• On a High High level in either HP Heater, the associated extraction MOV and non-return valves close
• On a High High level in an HP Heater, its emergency drain valve opens to control level
• On a High High level in an HP Heater, the next higher pressure heater normal drain closes and its emergency drain routes its flow to the Condenser</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Check Heater control panel
• Monitor that H.P. Heater when high level was isolated.
• Monitor unit load, which will be effected by isolationof H.P. Heaters.</td><td>Local Observations
• Verify Heater level
• Inspect valve line-up
• If High High level, verify emergency drain opens to control level
• Verify cascade drain from next heater is diverted to emergency drain
Verify Extraction MOV and non-return valve(s) close</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level is in Heater 2-6 or 2-7 and is caused from heater tube leak, operator should open H.P. Heater Feedwater bypass MOV and close H.P. Heater Feedwater inlet and outlet MOVs.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate</td></tr>
</table>

<table>
<tr><td>HP SERVICE WATER HEADER PRESSURE LOW</td><td>Alarm Signal originates from 2PSL FP009</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• LP Service Water Pump Header Pressure Low
• Fire Protection System in-service due to fire– water filled loops
• Fire Protection Header in-service for station cleaning
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• HP Service Water Pump auto-start if controls are properly aligned
• If header pressure continues to decrease Diesel Fire Pump will auto-start</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Monitor HP Service Water Header Pressure
• Monitor LP Service Water Header Pressure (suction supply to HP Service Water Pumps</td><td>Local Observations
• Verify System Pressure on Local Gauge
• Inspect valve line-up
• Inspect System Piping for leaks or breaks
• If HP Service Water Pump is in-service, check inlet filter differential pressure
• If Diesel fire pump auto-started check pump is running ok.</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If HP Service Water Pump(s) did not auto start, initiate a start after pump line-up is locally inspected
• If LP Service Water Pump(s) tripped of back-up pump, initiate a start
• Open LP Service Water cross-tie to Unit 1 if it is not already open
• If the cause is a deluge system trip, ensure fire is out and reset deluge valve(s)</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in Fire Protection System capability</td></tr>
</table>

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<table>
<tr><td>ID FAN 2-1
LUBE OIL PRESSURE LOW</td><td>Signal originate from ID Fan Lube Oil Bearing Header Supply Pressure Switch 2PSL OL008 located downstream of the cooler</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Loss of lube oil supply pressure
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Standby Lube Oil Pump will auto start
• The fan will be tripped on Low Lube Oil Pressure.</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Bearing Vibration</td><td>Local Observations
• Check Lube Oil system supply temperature and pressure
• Check Reservoir Level to determine if there is a loss of pump suction pressure
• Check for oil leaks
• Check for plugged supply Strainer</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If Lube Oil Supply temperature is high, decrease it
• If the problem is a low suction pressure due to Low level, add oil to the reservoir
• If the low supply pressure is cleared, return to single pump operation, shutting down the standby pump and placing its controls back in auto</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Fan will trip on a Low Lube Oil Pressure and Unit will run-back to 50% load.
• May lead to High ID Fan Bearing Vibration which leads to Fan Trip and Unit run-back to 50% load</td></tr>
</table>

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ID FAN 2-1 TRIP LOCKOUT RELAY OPERATED	
A. Possible Cause(s) of Alarm • Instantaneous Overcurrent • Time Overcurrent • High Vibration	
B. Automatic Action(s) • Unit Runback if load is greater than 50%	
C. Control Room Observations • Annunciator Alarm	**Local Observations** • Check associated Fan Breaker(s) • Walkdown associated Fan and Fan motor, checking for unusual noises/rubbing • Check for oil leaks • Check for abnormal lube oil supply temperature, pressure and flow
D. Immediate Operator Action • Determine the cause of the trip, • Correct the problem, • After being directed to do so, reset the lockout • Restart the fan	
E. Effect on Plant • Fan Trip and Unit run-back to 50% load	

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<table>
<tr><td>ID FAN 2-2
LUBE OIL PRESSURE LOW</td><td>Signal originate from ID Fan Lube Oil Bearing Header Supply Pressure Switch 2PSL OL007 located downstream of the cooler</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Loss of lube oil supply pressure
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Standby Lube Oil Pump will auto start
• The fan will be tripped on Low Lube Oil Pressure</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Bearing Vibration</td><td>Local Observations
• Check Lube Oil system supply temperature and pressure
• Check Reservoir Level to determine if there is a loss of pump suction pressure
• Check for oil leaks
• Check for plugged supply Strainer</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If Lube Oil Supply temperature is high, decrease it
• If the problem is a low suction pressure due to Low level, add oil to the reservoir
• If the low supply pressure is cleared, return to single pump operation, shutting down the standby pump and placing its controls back in auto</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Fan will trip on a Low Lube Oil Pressure and unit will run-back to 50% load.
• May lead to High ID Fan Bearing Vibration which leads to Fan Trip and Unit run-back to 50% load</td></tr>
</table>

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ID FAN 2-2 TRIP LOCKOUT RELAY OPERATED	
A. Possible Cause(s) of Alarm • Instantaneous Overcurrent • Time Overcurrent • High Vibration	
B. Automatic Action(s) • Unit Runback if load is greater than 50%	
C. Control Room Observations • Annunciator Alarm	**Local Observations** • Check associated Fan Breaker(s) • Walkdown associated Fan and Fan motor, checking for unusual noises/rubbing • Check for oil leaks • Check for abnormal lube oil supply temperature, pressure and flow
D. Immediate Operator Action • Determine the cause of the trip, • Correct the problem, • After being directed to do so, reset the lockout • Restart the fan	
E. Effect on Plant • Fan Trip and Unit run-back to 50% load	

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<table>
<tr><td>ID or FD FAN
VIBRATION HIGH</td><td>Signals originate from ID and FD Fan inboard and outboard fan and motor bearing vibration switches</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High Motor Bearing Vibration (inboard or outboard)
• High Fan Bearing Vibration (inboard or outboard
• Faulty Vibration Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• This condition, if valid, may lead to a trip of the associated fan pair</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration to determine the source of the alarm
• Monitor lube oil supply temperature and pressure
• Monitor bearing drain oil flow
• Monitor various system parameters to determine the location and potential cause of the high vibration</td><td>Local Observations
• Walk down the fans and motors
• Check for oil leaks
• Check Lube Oil system supply temperature and pressure
• Check fan and motor bearings Drain Oil flows
• Check Oil Coolers for proper operation</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, decrease it
• If coming up on load, it may be necessary to decrease this fan’s load slightly until the source of the vibration increase is determined and corrected</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• High Fan Bearing Vibration leads to Fan Trip, Fan Pair trip and Unit run-back to 50% load
• Operating with abnormal bearing vibration, leads to premature bearing wear and subsequent failure</td></tr>
</table>

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<table>
<tr><td>LOW PRESSURE HEATER 2-1A
LEVEL HIGH OR LOW</td><td>High High Alarm – 2LSH HD069
High Alarm originates from 2LSH HD070
Low Alarm originates from 2LSH HD071</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High shell level in Heater 2-1A
• Low shell level in Heater 2-1A
• Faulty level switch
• Shell level control failure
• Tube Leak</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• On a High level in Heater 2-1A, its emergency drain valve opens to control level.
• On a High High level, the normal cascade drain valve from LP Heater 2-2 closes, emergency drain valve to condenser opens, Condensate Bypass Opens, Condensate Inlet and Outlet Valves Close bypassing flow around heaters 2-1A and 2-1B
• On a Low level in Heater 2-1A, the normal drain valve closes</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• If High level, verify heater 2-1A emergency drain valve opens and controls level
• If High High level, verify heater 2-2 normal drain is closed and emergency drain is open
• If Low level, verify heater 2-1A normal drain, bypass and emergency drain are closed</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level, open heater 2-1A normal drain bypass until level is normal.
• If the cause is a heater tube leak, bypass condensate flow around LP Heaters 2-1A and 2-1B</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate</td></tr>
</table>

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<table>
<tr><td>LOW PRESSURE HEATER 2-1B
LEVEL HIGH OR LOW</td><td>High High Alarm – 2LSH HD073
High Alarm originates from 2LSH HD074
Low Alarm originates from 2LSH HD075</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High shell level in Heater 2-1B
• Low shell level in Heater 2-1B
• Faulty level switch
• Shell level control failure
• Tube Leak</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• On a High level in Heater 2-1B, its emergency drain valve opens to control level.
• On a High High level, the normal cascade drain valve from LP Heater 2-2 closes, emergency drain valve to condenser opens, Condensate Bypass Opens, Condensate Inlet and Outlet Valves Close bypassing flow around heaters 2-1A and 2-1B
• On a Low level in Heater 2-1B, the normal drain valve closes</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• If High level, verify heater 2-1B emergency drain valve opens and controls level
• If High High level, verify heater 2-2 normal drain is closed, emergency drain is open
• If Low level, verify heater 2-1B normal drain and emergency drain are closed</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level, open heater 2-1B normal drain bypass.
• If the cause is a heater tube leak, bypass condensate flow around LP Heaters 2-1A and 2-1B</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate</td></tr>
</table>

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<table>
<tr><td>LOW PRESSURE HEATER 2-2
LEVEL HIGH OR LOW</td><td>High High Alarm – 2LSH HD085
High Alarm originates from 2LSH HD084
Low Alarm originates from 2LSH HD086</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High shell level in Heater 2-2
• Low shell level in Heater 2-2
• Faulty level switch
• Shell level control failure
• Tube Leak</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• On a High level in Heater 2-2, its emergency drain valve opens to control level.
• On a High High level, the normal cascade drain valve from LP Heater 2-3 closes and the emergency drain valve to condenser opens
• On a High High level in Heater 2-2, its non-return valve and extraction MOV both close
• On a Low level in Heater 2-2, the normal drain valve closes</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• If High level, verify heater 2-2 emergency drain valve opens and controls level
• If High High level, verify heater 2-3 normal drain is closed and emergency drain is open
• If Low level, verify heater 2-2 normal drain and emergency drain are closed
• If Low level, verify that extraction steam supply is in-service to the heater</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level, open heater 2-2 emergency drain bypass, if emergency drain regulator is not open
• If cause is a heater tube leak, manually bypass condensate flow around LP Heaters 2-2, 2-3, and 2-4</td></tr>
</table>

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E. Effect on Plant

- Decrease in plant efficiency, increase in plant heat rate

<table>
<tr><td>LOW PRESSURE HEATER 2-3
LEVEL HIGH OR LOW</td><td>High Alarm – 2LSH HD027
High Alarm originates from 2LSH HD028
Low Alarm originates from 2LSH HD029</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High shell level in Heater 2-3
• Low shell level in Heater 2-3
• Faulty level switch
• Shell level control failure
• Tube Leak</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• On a High level in Heater 2-3, its emergency drain valve opens to control level.
• On a High High level, the normal cascade drain valve from LP Heater 2-4 closes and the emergency drain valve to condenser opens
• On a High High level in Heater 2-3, its non-return valve and extraction MOV both close
• On a Low level in Heater 2-3, the normal drain valve closes</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• If High level, verify heater 2-3 emergency drain valve opens
• If High High level, verify heater 2-3 normal drain is closed and emergency drain is open
• If Low level, verify heater 2-3 normal drain and emergency drain are closed
• If Low level, verify that extraction steam supply is in-service to the heater</td></tr>
</table>

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D. Immediate Operator Action

- If High level, open heater 2-3 emergency drain bypass, if emergency drain regulator is not open.
- If cause is a heater tube leak, manually bypass condensate flow around LP Heaters 2-2, 2-3, and 2-4

E. Effect on Plant

- Decrease in plant efficiency, increase in plant heat rate

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<table>
<tr><td>LOW PRESSURE HEATER 2-4
LEVEL HIGH OR LOW</td><td>High High Alarm – 2LSH HD034
High Alarm originates from 2LSH HD033
Low Alarm originates from 2LSH HD035</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High shell level in Heater 2-4
• Low shell level in Heater 2-4
• Faulty level switch
• Shell level control failure
• Tube Leak</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• On a High level in Heater 2-4, its emergency drain valve opens to control level.
• On a High High level in Heater 2-4, its extraction MOV and non-return valve close
• On a Low level in Heater 2-4, the normal drain valve closes</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• If High level, verify heater 2-4 emergency drain valve opens and controls level
• If Low level, verify heater 2-4 normal drain and emergency drain are closed
• If Low level, verify that extraction steam supply is in-service to the heater</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level, open heater 2-4 emergency drain bypass, if emergency drain regulator is not open.
• If cause is a heater tube leak, manually bypass condensate flow around LP Heaters 2-2, 2-3, and 2-4</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate</td></tr>
</table>

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<table>
<tr><td>LOW PRESSURE HEATER 2-6
LEVEL HIGH OR LOW</td><td>High High Alarm – 2LSH HD045
High Alarm originates from 2LSH HD046
Low Alarm originates from 2LSH HD047</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High shell level in Heater 2-6
• Low shell level in Heater 2-6
• Faulty level switch
• Shell level control failure
• Tube Leak</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• On a High level in Heater 2-6, its emergency drain valve opens to control level.
• On a High level in Heater 2-6, Heater 2-7 normal drain closes and emergency drain opens
• On a High level in Heater 2-6, its extraction MOV and non-return valve close</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• If Low Low level, HP Heater Drain Pump trips
• If level reaches High ,HP heater High level isolation occurs, shutting off extraction steam to heater, and normal drain from 2-7 heater.</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• If High level verify 2-6 Heater emergency drain regulator opens.
• If High High level, verify heater 2-7 normal drain closes and emergency drain opens to control level
• If Low level, verify heater 2-6 emergency drain is closed
• If Low level, verify that extraction steam supply is in-service to the heater</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level, verify that HP Heater Drain Pump is in-service
• If high level, open heater 2-6 emergency drain bypass, if drain regulator is not open
• If High level is caused from heater tube leak, isolate and bypass feedwater flow around HP Heaters 2-6 and 2-7</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u></td></tr>
</table>

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- Decrease in plant efficiency, increase in plant heat rate
- If level continues to decrease, the HP Heater Drain Pump will trip

<table>
<tr><td>LOW PRESSURE HEATER 2-6
LEVEL VERY LOW</td><td>Low Low Alarm – 2LSH HD049</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Low Low shell level in Heater 2-6
• Faulty level switch
• Shell level control failure</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• On a Low Low level, the HP Heater Drain Pump trips</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• HP Heater Drain Pump trips</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• Verify heater 2-6 emergency drain is closed
• Verify that extraction steam supply is in-service to the heater
• Verify that HP Heater Drain Pump trips</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Verify Extraction MOV is open
• Restart H.P. Heater Drain pump when heater level returns to normal</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate</td></tr>
</table>

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<table>
<tr><td>LOW PRESSURE HEATER 2-7
LEVEL HIGH OR LOW</td><td>High High Alarm – 2LSH HD039
High Alarm originates from 2LSH HD040
Low Alarm originates from 2LSH HD041</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High shell level in Heater 2-7
• Low shell level in Heater 2-7
• Faulty level switch
• Shell level control failure
• Tube Leak</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• On a High level in Heater 2-7, its emergency drain valve opens to control level.
• On a High level in Heater 2-7, its extraction MOV and non-return valve close</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• If level reaches High High, HP heater High level isolation occurs, closing the extraction MOV, opening the emergency drain</td><td>Local Observations
• Verify heater shell level
• Inspect valve line-up
• If High level, verify heater 2-7 emergency drain opens to control level
• If Low level, verify heater 2-7 emergency drain is closed
• If Low level, verify that extraction steam supply is in-service to the heater</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level is caused from heater tube leak, isolate and bypass feedwater flow around HP Heaters 2-6 and 2-7</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-2
EXTRACTION STEAM
LOW POINT DRAIN LEVEL HIGH</td><td>High Alarm originates from 2LSH ES076
High Alarm originates from 2LSH ES083
High Alarm originates from 2LSH ES085</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level detected in Extraction Drain Line - Heater side
• High level detected in Extraction Drain Line – 2-1B Turbine Side
• High level detected in Extraction Drain Line – 2-1A Turbine Side</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Associated solenoid actuated Extraction Line Drain Valve opens</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level is caused from heater tube leak, bypass condensate flow around heaters 2-2, 2-3, and 2-4
• If High level is caused from heater tube leak, ensure emergency drain valve is open
• If High level is caused from heater tube leak, ensure that Heater 2-3 emergency drain is open and normal drain is closed
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore condensate flow through heaters 2-2, 2-3, and 2-4
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-2

EXTRACTION STEAM LOW POINT DRAIN LEVEL VERYHIGH</td><td>High High Alarm originates from 2LSH ES075
High High Alarm originates from 2LSH ES084
High High Alarm originates from 2LSH ES086</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High High level detected in Extraction Drain Line - Heater side
• High High level detected in Extraction Drain Line – 2-1B Turbine Side
• High High level detected in Extraction Drain Line – 2-1A Turbine Side</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Redundant Alarm</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid operated drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level is caused from heater tube leak, bypass condensate flow around heaters 2-2, 2-3, and 2-4
• If High level is caused from heater tube leak, ensure that Heater 2-3 emergency drain is open and normal drain is closed
• If High level is caused from heater tube leak, ensure emergency drain valve is open
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore condensate flow through heaters 2-2, 2-3, and 2-4
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-3
EXTRACTION STEAM
LOW POINT DRAIN LEVEL HIGH</td><td>High Alarm originates from 2LSH ES078
High Alarm originates from 2LSH ES090
High Alarm originates from 2LSH ES087</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level detected in Extraction Drain Line - Heater side
• High level detected in Extraction Drain Line – 2-1B Turbine Side
• High level detected in Extraction Drain Line – 2-1A Turbine Side</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Associated solenoid actuated Extraction Line Drain Valve opens</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level is caused from heater tube leak, bypass condensate flow around heaters 2-2, 2-3, and 2-4
• If High level is caused from heater tube leak, ensure that Heater 2-4 emergency drain is open and normal drain is closed
• If High level is caused from heater tube leak, ensure emergency drain valve is open
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore condensate flow through heaters 2-2, 2-3, and 2-4
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate
• May lead to turbine water induction</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-3
EXTRACTION STEAM LOW POINT DRAIN LEVEL VERY HIGH</td><td>High High Alarm originates from 2LSH ES075
High High Alarm originates from 2LSH ES084
High High Alarm originates from 2LSH ES086</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High High level detected in Extraction Drain Line - Heater side
• High High level detected in Extraction Drain Line – 2-1B Turbine Side
• High High level detected in Extraction Drain Line – 2-1A Turbine Side</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Redundant Alarm</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid operated drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level is caused from heater tube leak, bypass condensate flow around heaters 2-2, 2-3, and 2-4
• If High level is caused from heater tube leak, ensure emergency drain valve is open
• If High level is caused from heater tube leak, ensure that Heater 2-4 emergency drain is open and normal drain is closed
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore condensate flow through heaters 2-2, 2-3, and 2-4
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-4
EXTRACTION STEAM
LOW POINT DRAIN LEVEL HIGH</td><td>High Alarm originates from 2LSH ES092</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level detected in Extraction Drain Line Turbine Side</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Associated solenoid actuated Extraction Line Drain Valve opens</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm</td><td>Local Observations
• Inspect drain valve line-up
• Verify solenoid drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level is caused from heater tube leak, bypass condensate flow around heaters 2-2, 2-3, and 2-4
• If High level is caused from heater tube leak, ensure emergency drain valve is open
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore condensate flow through heaters 2-2, 2-3, and 2-4
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-4
EXTRACTION STEAM LOW POINT DRAIN LEVEL VERY HIGH</td><td>High High Alarm originates from 2LSH ES091</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High High level detected in Extraction Drain Line – Turbine Side</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Redundant Alarm</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid operated drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level is caused from heater tube leak, bypass condensate flow around heaters 2-2, 2-3, and 2-4
• If High level is caused from heater tube leak, ensure emergency drain valve is open
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore condensate flow through heaters 2-2, 2-3, and 2-4
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-6
EXTRACTION STEAM
LOW POINT DRAIN LEVEL HIGH</td><td>High Alarm originates from 2LSH ES072</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level detected in Extraction Drain Line – Turbine Side</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Associated solenoid actuated Extraction Line Drain Valve opens</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level is caused from heater tube leak, bypass feedwater flow around heaters 2-6 and 2-7
• If High level is caused from heater tube leak, ensure that Heater 2-7 emergency drain is open and normal drain is closed
• If High level is caused from heater tube leak, ensure Heater 2-6 emergency drain valve is open
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore Feedwater flow through Heaters 2-6 and 2-7
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>LP HEATER 2-6
EXTRACTION STEAM LOW POINT DRAIN LEVEL VERY HIGH</td><td>High Alarm originates from 2LSH ES071</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High High level detected in Extraction Drain Line – Turbine Side</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Redundant Alarm</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid operated drain valve opens
• Verify Heater Level</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If High level is caused from heater tube leak, bypass feedwater flow around heaters 2-6 and 2-7
• If High level is caused from heater tube leak, ensure emergency drain valve is open
• If High level is caused from heater tube leak, ensure that Heater 2-7 emergency drain is open and normal drain is closed
• If High level is caused by improper valve line up, correct valve configuration
• After condition is corrected and level returns to normal, restore Feedwater flow through Heaters 2-6 and 2-7
• Open extraction MOVs and reset non-return valves</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td colspan="2">LP HEATER
HIGH LEVEL ISOLATION</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High High shell level in LP Heater 2-1A, 2-1B, 2-2, 2-3, or 2-4
• Faulty level switch
• Level control failure
• Emergency drain valve failure</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• On a High High level in any LP Heater, the associated extraction MOV and non-return valves close (if applicable)
• On a High High level in an LP Heater, its emergency drain valve opens to control level
• On a High High level in an LP Heater, the next higher pressure heater normal drain closes and the emergency drain routes its flow to the Condenser</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Eifferential Expansion
• Monitor Heater Isolation Panel</td><td>Local Observations
• Verify Heater level
• Inspect valve line-up
• If High High level, verify emergency drain opens to control level
• Verify cascade drain from next heater is diverted to emergency drain
• Verify Extraction MOV and non-return valve(s) close</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If High level is in Heater 2-1A or 2-1B and is caused from heater tube leak, ensure condensate bypass MOV opens and Condensate inlet and outlet MOVs close.
• If High level is in Heaters 2-2, 2-3, or 2-4 and is caused from heater tube leak, manually bypass condensate flow around the LP Heaters</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate</td></tr>
</table>

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<table>
<tr><td>LP SERVICE WATER
BEARING FLOW</td><td colspan="2">Alarm Signal originates from 2FSL WS132,
2FSL WS133, 2FSL WS134, 2FSL WS135, 2FSL WS136, or 2FSL WS137.</td></tr>
<tr><td colspan="3">A. Possible Cause(s) of Alarm
• Diminished bearing flow to LP Service Water Pump 2-1 upper or lower bearing
• Diminished bearing flow to LP Service Water Pump 2-2 upper or lower bearing
• Diminished bearing flow to LP Service Water Pump 2-3 upper or lower bearing
• Faulty pressure switch
• Faulty pressure regulator
• Well Pump trip</td></tr>
<tr><td colspan="3">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Monitor LP Service Water Pump bearing temperatures</td><td colspan="2">Local Observations
• Verify System supply pressure is adequate on local gauge
• Inspect valve line-up
• Inspect filters</td></tr>
<tr><td colspan="3">D. Immediate Operator Action
• If pressure regulator has failed, open the bypass
• If Well Pump has tripped, attempt restart
• If Well Pump has tripped and will not restart, valve in the Emergency Supply from the Filtered Water System
• If bearing supply filter is dirty, clean it</td></tr>
<tr><td colspan="3">E. Effect on Plant
• If an LP Service Water Pump bearing temperatures increase, the pump should shut down.</td></tr>
</table>

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<table>
<tr><td>LP SERVICE WATER HEADER PRESSURE LOW</td><td>Alarm Signal originates from 2 PSL WS014</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• LP Service Water Pump trip
• Dirty Service Water Strainer
• Faulty Pressure Switch
• Low suction pressure</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Monitor LP Service Water header pressure
• Monitor LP Service Water Pump status
• Monitor turbine lube oil temperatures
• Monitor Cooling Water temperatures</td><td>Local Observations
• Verify System Pressure on Local Gauge
• Inspect valve line-up
• Inspect System Piping for leaks
• Inspect Service Water Strainer differential
• Inspect standby LP Service Water Pumps for reverse rotation/check valve hanging up</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If standby LP Service Water Pump is available, initiate a start
• If condition does not improve with start of standby pump, open Service Water cross-tie/Unit 1</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Increase in Lube Oil temperature which may lead to increased vibration/trip
• Increase in Cooling Water temperature
• Decrease in Fire Protection header pressure</td></tr>
</table>

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<table>
<tr><td>LP SERVICE WATER PUMP STRAINER DIFFERENTIAL HIGH</td><td>Alarm Signal originates from 2PDS WS017</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High differential pressure across the Service Water Strainer
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Monitor high differential pressure across the Service Water Strainer</td><td>Local Observations
• Verify differential pressure on local gauge
• Verify strainer cleaning cycle in service
• Inspect strainer valve line-up</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Open Strainers blowdown valves to flush line.
• If Service Water Strainer cleaning cycle not running, initiate a start</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in LP Service Water pressure and flow</td></tr>
</table>

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<table>
<tr><td>MAIN CONDENSER HOTWELL LEVEL HIGH OR LOW</td><td>High Alarm originates from 2LSH CD041
Low Alarm originates from 2LSL CD039</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Level High
• Low Level
• Faulty Level Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Make-up level control valves should close on high alarm
• Make-up level control valves should open on low alarm</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Hotwell level
• Monitor Turbine vibration if level is high
• Monitor Condenser backpressure if level is high
• Monitor condensate pumps amps if panel is low, that pumps don’t start vibrating.</td><td>Local Observations
• Verify Level
• Check Valve line-up</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Hotwell High level, ensure make-up valves and associated bypasses are closed
• If High level, and make-up valves are closed, perform condensate sample analysis or check sample panel analyzer to determine presence of condenser tube leak
• If Low level, ensure overflow to Condensate Storage Tanks is closed and locked shut with its bypass closed
• If level is very low, open make-up by-pass valve.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If level is high and is not controlled, may result in severe damage to Main Turbine – e.g. water induction.
• If Level decreases too much, Condensate Hotwell pumps may trip resulting in Unit Trip.</td></tr>
</table>

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<table>
<tr><td>MAIN CONDENSER HOTWELL LEVEL VERY HIGH</td><td>High High Alarm originates from 2LSH CD041</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High High Level
• Faulty Level Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Make-up level control valves should close on high alarm</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Hotwell Level
• Monitor Main Turbine Vibration
• Monitor Condenser backpressure</td><td>Local Observations
• Verify Level
• Check Valve line-up</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If Hotwell High level, ensure make-up valves and associated bypasses are closed
• If High level, and make-up valves are closed, perform condensate sample analysis or check sample panel analyzer to determine presence of condenser tube leak</td></tr>
<tr><td colspan="2">E. Effect on Plant
• If level is high and is not controlled, may result in severe damage to Main Turbine – e.g. water induction.</td></tr>
</table>

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<table>
<tr><td>MDBFP LUBE OIL
PRESSURE LOW</td><td>Signal originate from MDBFP Lube Oil Supply Pressure Switches</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• MDBFP Lube Oil Pump trip
• Loss of lube oil supply pressure to pump
• Faulty pressure regulator
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Standby Lube Oil Pump auto start</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration
• Monitor Lube Oil Pressure and temperature.</td><td>Local Observations
• Check Lube Oil system pump, bearing supply temperature and pressure
• Check valve alignment
• Check Reservoir Level to determine if there is a loss of pump suction pressure
• Check for oil leaks</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, decrease it
• If the problem is a low suction pressure due to Low level, add oil to the reservoir
• If the low supply pressure is cleared, return to single pump operation, shutting down the standby pump and placing its controls back in auto</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• May lead to High Bearing Vibration, which leads to Trip.</td></tr>
</table>

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<table>
<tr><td>MDBFP LUBE OIL TEMPERATURE HIGH</td><td>Signal originate from MDBFP Lube Oil Supply Temperature Switches</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High oil temperature
• Faulty temperature switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Bearing Vibration
• Monitor Lube Oil temperature</td><td>Local Observations
• Check Lube Oil system pump, bearing supply temperature and pressure
• Monitor bearing drain oil temperatures
• Check valve alignment to and from cooler
• Increase cooler cooling water outlet flow</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If Lube Oil Supply temperature is high, decrease it</td></tr>
<tr><td colspan="2">E. Effect on Plant
• May lead to High Bearing Vibration, which leads to MDBFP Trip.</td></tr>
</table>

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<table>
<tr><td>MDBFP SUCTION STRAINER DIFFERENTIAL PRESSURE HIGH</td><td>Signal originates from 2PDS CD054</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High differential pressure across the suction strainer
• Faulty Differential Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Pump Suction and Discharge Pressure
• Monitor DC Heater Pressure
• Monitor Pump Discharge Flow</td><td>Local Observations
• Check DP Switch valve lineup</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• None. May lead to decreased feedwater flow if allowed to increase.
• Note the condition and input Maintenance Request into the work order system.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• No immediate impact if flow is not affected.</td></tr>
</table>

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<table>
<tr><td>PRIMARY AIR COILS DRAIN TANK LEVEL HIGH OR LOW</td><td>High Alarm - 2LSH HD063
Low Alarm – 2LSL HD062</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High level detected in Drain Tank
• Low level detected in Drain Tank
• Faulty level switch
• Drain Valve to Condenser not functioning properly</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If level is high and drains are aligned only to Condenser, drain valve should be open
• If level is low and drains are aligned only to Condenser, drain valve should be closed</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor condenser vacuum/backpressure</td><td>Local Observations
• Verify Level
• Inspect drain valve line-up
• Verify associated drain valves are functional</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If level is low and condenser vacuum is decaying, isolate drain to condenser…this condition is indicative of air ingress to the drain tank
• If level is high, open bypass around drain to condenser and close when high annunciator alarm clears</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If Low level with vacuum decaying, this could cause a Unit trip on loss of vacuum</td></tr>
</table>

<table>
<tr><td>PRIMARY AIR FAN 2-1
LUBE OIL PRESSURE LOW</td><td>Signals originate from PA Fan Lube Oil Bearing Header Supply Pressure Switches</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Loss of lube oil supply pressure
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Standby Lube Oil Pump will auto start</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration</td><td>Local Observations
• Check Lube Oil system supply temperature and pressure
• Check Reservoir Level to determine if there is a loss of pump suction pressure
• Check for oil leaks
• Check for plugged supply Strainer
• Check that there is no flow through the relief valve back to the reservoir</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, decrease it
• If the problem is a low suction pressure due to Low level, add oil to the reservoir
• If the low supply pressure is cleared, return to single pump operation, shutting down the standby pump and placing its controls back in auto</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• May lead to High PA Fan Bearing Vibration which leads to Fan Trip and possible Unit run-back to 50% load</td></tr>
</table>

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<table>
<tr><td>PRIMARY AIR FAN 2-1
VIBRATION HIGH</td><td>Signals originate from inboard and outboard fan and motor bearing vibration switches</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High Motor Bearing Vibration (inboard or outboard)
• High Fan Bearing Vibration (inboard or outboard
• Faulty Vibration Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Bearing Vibration to determine the source of the alarm
• Monitor lube oil supply temperature and pressure
• Monitor bearing drain oil flow
• Monitor various system parameters to determine the location and potential cause of the high vibration</td><td>Local Observations
• Walk down the fan and motor
• Check for oil leaks
• Check Lube Oil system supply temperature and pressure
• Check fan and motor bearing Drain Oil flows
• Check Air-Oil Cooler for proper operation</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If Lube Oil Supply temperature is high, decrease it
• If coming up on load, it may be necessary to decrease this fan’s load slightly until the source of the vibration increase is determined and corrected</td></tr>
<tr><td colspan="2">E. Effect on Plant
• High PA Fan Bearing Vibration leads to Fan Trip and possible Unit run-back to 50% load
• Operating with abnormal bearing vibration, leads to premature bearing wear and subsequent failure</td></tr>
</table>

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<table>
<tr><td>PRIMARY AIR FAN 2-2
LUBE OIL PRESSURE LOW</td><td>Signals originate from PA Fan Lube Oil Bearing Header Supply Pressure Switches</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Loss of lube oil supply pressure
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Standby Lube Oil Pump will auto start</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration</td><td>Local Observations
• Check Lube Oil system supply temperature and pressure
• Check Reservoir Level to determine if there is a loss of pump suction pressure
• Check for oil leaks
• Check for plugged supply Strainer
• Check that there is no flow through the relief valve back to the reservoir</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, decrease it
• If the problem is a low suction pressure due to Low level, add oil to the reservoir
• If the low supply pressure is cleared, return to single pump operation, shutting down the standby pump and placing its controls back in auto</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• May lead to High PA Fan Bearing Vibration which leads to Fan Trip and possible Unit run-back to 50% load</td></tr>
</table>

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<table>
<tr><td>PRIMARY AIR FAN 2-2
VIBRATION HIGH</td><td>Signals originate from associated Fan’s inboard and outboard fan and motor bearing vibration switches</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High Motor Bearing Vibration (inboard or outboard)
• High Fan Bearing Vibration (inboard or outboard
• Faulty Vibration Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration to determine the source of the alarm
• Monitor lube oil supply temperature and pressure
• Monitor bearing drain oil flow
• Monitor various system parameters to determine the location and potential cause of the high vibration</td><td>Local Observations
• Walk down the fan and motor
• Check for oil leaks
• Check Lube Oil system supply temperature and pressure
• Check fan and motor bearing Drain Oil flows
• Check Air-Oil Cooler for proper operation</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, decrease it
• If coming up on load, it may be necessary to decrease this fan’s load slightly until the source of the vibration increase is determined and corrected</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• High PA Fan Bearing Vibration leads to Fan Trip and possible Unit run-back to 50% load
• Operating with abnormal bearing vibration, leads to premature bearing wear and subsequent failure</td></tr>
</table>

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<table>
<tr><td>PRIMARY AIR HEATER
BACK-UP DRIVE TRIP</td><td></td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Primary Air Heater 2-1 Back-up Drive Motor Trip
• Primary Air Heater 2-2 Back-up Drive Motor Trip</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If Main Drive Motor has previously tripped and Back-up Drive Motor Trips, the Rotor Stops</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Determine which Back-up Drive Motor Tripped
• Monitor associated Air Heater gas and air inlet and outlet temperatures for any changes
• Monitor associated Air Heater Air and Gas side differential pressures
• Monitor Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td><td>Local Observations
• Inspect associated Main and Backup Drive Motors and Breakers
• Walkdown associated Air Heater
• Inspect Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Reset Main Drive and Backup Drive and attempt to Restart
• If Main Drive or Backup Drive restarts, and if Air Heater pluggage is suspect, blow soot until differential is reduced to normal. When sootblowing is complete, return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Lube System(s) is/are out of tolerance, restore conditions to normal. Return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If a drive restarts and if Air Heater Temperatures are rapidly climbing, attempt to blow soot to reduce temperature. If rotor stops, bottle up and deluge the air heater.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in primary air temperature and plant efficiency. It may be necessary to reduce unit load.</td></tr>
</table>

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<table>
<tr><th colspan="2">PRIMARY AIR HEATER MAIN DRIVE TRIP</th></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Primary Air Heater 2-1 Main Drive Motor Trip
• Primary Air Heater 2-2 Main Drive Motor Trip</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Associated Back-up Drive Motor Auto Start</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Determine which Main Drive Motor Tripped
• Verify associated Back-up Drive Motor Auto Start
• Monitor associated Air Heater gas and air inlet and outlet temperatures for any changes
• Monitor associated Air Heater Air and Gas side differential pressures
• Monitor Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td><td>Local Observations
• Inspect associated Main Drive Motor and Breaker
• Walkdown associated Air Heater
• Inspect Backup Drive Motor for proper operation
• Inspect Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If Air Heater pluggage is suspect, blow soot until differential is reduced to normal. When sootblowing is complete, reset Main Drive Breaker and Restart Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Lube System(s) is/are out of tolerance, restore conditions to normal, reset Main Drive Breaker and Restart Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Temperatures are rapidly climbing, attempt to blow soot to reduce temperature. If this does not work and Backup drive trips and rotor stops, bottle up and deluge the air heater.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• No immediate effect</td></tr>
</table>

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<table>
<tr><td colspan="2">PRIMARY AIR HEATER
ROTOR STOPPED</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Primary Air Heater 2-1 Main and Back-up Drive Motor Trip
• Primary Air Heater 2-2 Main and Back-up Drive Motor Trip</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Determine which Fan Main and Back-up Drive Motors Tripped
• Monitor associated Air Heater gas and air inlet and outlet temperatures for any changes
• Monitor associated Air Heater Air and Gas side differential pressures
• Monitor Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td><td>Local Observations
• Inspect associated Main and Backup Drive Motors and Breakers
• Walkdown associated Air Heater
• Inspect Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Reset Main Drive and Backup Drive and attempt to Restart
• If Main Drive or Backup Drive restarts, and if Air Heater pluggage is suspect, blow soot until differential is reduced to normal. When sootblowing is complete, return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Lube System(s) is/are out of tolerance, restore conditions to normal. Return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If a drive restarts and if Air Heater Temperatures are rapidly climbing, attempt to blow soot to reduce temperature. If rotor stops, bottle up and deluge the air heater.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in primary air temperature and plant efficiency. It may be necessary to reduce unit load.</td></tr>
</table>

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<table>
<tr><td>PULVERIZER COAL AIR TEMPERATURE HIGH</td><td>Alarm originates from Temperature Switches located at each pulverizer outlet</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Decrease in coal flow to pulverizer (feeder problem)
• Primary Air Temperature Control malfunction
• Faulty Temperature Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Tempering Air Damper position increases, hot air damper position decreases to decrease pulverizer outlet temperature to setpoint</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Pulverizer hot and tempering air damper positions
• Verify feeder coal flows</td><td>Local Observations
• Verify damper positioners are connected
• Verify dampers are traveling
• Verify cool flow to pulverizer</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Determine the cause of the high temperature
• Verify that the high temperature condition is correcting to return to normal
• Operator can increase coal flow to help cool pulverizer.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• No immediate impact if the condition is caused by temporary feeder coal flow deviation.
• If the problem is related to a faulty positioner, it may be necessary to remove the pulverizer from service – placing another one in service to make up for the feeder/pulverizer removed from service</td></tr>
</table>

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<table>
<tr><td>PULVERIZER COAL AIR TEMPERATURE LOW</td><td>Alarm originates from Temperature Switches located at each pulverizer outlet</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Wet Coal
• Primary Air Temperature Control malfunction
• Faulty Temperature Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Hot Air Damper position increases, tempering air damper position decreases to increase pulverizer outlet temperature to setpoint</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Pulverizer hot and tempering air damper positions
• Verify flame showing good flame.</td><td>Local Observations
• Verify damper positioners are connected
• Verify dampers are traveling
• Check top of silos for sources of water.</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Determine the cause of the low temperature
• Verify that the low temperature condition is correcting to return to normal</td></tr>
<tr><td colspan="2">E. Effect on Plant
• No immediate impact if the condition is caused by wet coal in only one silo.
• If a wet coal condition is present in all silos, this could lead to feeder and pulverizer load reductions.
• If the problem is wet coal, and the pulverizer outlet temperature(s) is/are not returning to normal, it may be necessary to start support ignition for affected pulverizers.
• May cause feeder to plug if coal is wet.</td></tr>
</table>

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<table>
<tr><th>PULVERIZER LUBE OIL PRESSURE HIGH</th><td>Alarm(s) originate from Pressure Switches located at each pulverizer Lube Oil Set</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Cold Lube Oil on system startup
• Cooler Malfunction
• Dirty Lube Oil Filters
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm</td><td>Local Observations
• Verify proper valve line-up
• Check Lube Oil Cooler
• Check Lube Oil Filters</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Determine the cause of the low temperature
• May wish to throttle back on the Pulverizer oil cooler outlet valve so that the oil temperature can increase, reducing the oil pressure
• Delay starting the pulverizer, allowing its oil system to recirculate until the oil temperature increases and the lube oil pressure returns to normal
• Swap lube oil filters if one in service is dirty</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• No immediate impact</td></tr>
</table>

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<table>
<tr><td>PULVERIZER SEAL AIR LOSS</td><td>Alarm originates from Pressure Switches monitoring each Pulverizer’s upper and lower seal air pressure</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Any pulverizer manually operated upper seal air damper closed
• Any pulverizer manually operated lower seal air damper closed
• Any pulverizer’s solenoid actuated lower seal air damper failed closed
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Increased Pulverizer Bowl Differential Pressure</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Pulverizer Bowl Differential Pressure
• Monitor pulverizer temperatures</td><td>Local Observations
• Verify manual seal air damper positions are open
• Verify solenoid actuated damper is open
• Check pyrites hopper – it may be filling up rapidly with the loss of seal air</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Determine the cause of the loss of seal air
• Restore Seal Air supply]
• Pull pulverizer pyrites on the affected pulverizer</td></tr>
<tr><td colspan="2">E. Effect on Plant
• No immediate impact if the condition is corrected
• Loss of seal air allows coal dust to enter into sealed areas. This could result in contamination of lubrication, etc. This results in excessive wear and increased heat. Increased heat can lead to pulverizer fire.</td></tr>
</table>

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<table>
<tr><td>SCREEN WASH HEADER PRESSURE LOW</td><td>Alarm Signal originates from 2PSL SW003</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Screen Wash Pump Trip
• LP Service Water Pump Trip
• LP Service Water High Filter Differential
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Auto-Start of the Standby Screen Wash Pump if control switch is properly aligned</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Monitor LP Service Water Header Pressure</td><td>Local Observations
• Verify System Pressure on Local Gauge
• Inspect valve line-up
• Inspect System Piping for leaks
• Verify that O/S Screen Wash Pump is not rotating backwards – indicating check valve hanging up</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Start the Standby Screen Wash Pump if it has not already auto-started
• Start the Standby LP Service Water Pump if the low pressure is due to LP Service Water Pump Trip</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• High Differential across the Traveling Screens
• Decrease in suction supply to Circulating Water Pumps</td></tr>
</table>

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<table>
<tr><td>SECONDARY AIR COILS DRAIN TANK LEVEL HIGH OR LOW</td><td>High Alarm - 2LSH HD098
Low Alarm – 2LSL HD097</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level detected in Drain Tank
• Low level detected in Drain Tank
• Faulty level switch
• Drain Valve to Condenser not functioning properly</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• If level is high and drains are aligned only to Condenser, drain valve should be open
• If level is low and drains are aligned only to Condenser, drain valve should be closed</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor condenser vacuum/backpressure</td><td>Local Observations
• Verify Level
• Inspect drain valve line-up
• Verify associated drain valves are functional</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If level is low and condenser vacuum is decaying/backpressure increasing, isolate drain to condenser this condition is indicative of air ingress to the drain tank and subsequent air ingress to condenser
• If level is high, open bypass around drain to condenser and close when annunciator alarm clears</td></tr>
<tr><td colspan="2">E. Effect on Plant
• If Low level with vacuum decaying, this could cause a Unit trip on loss of vacuum</td></tr>
</table>

<table>
<tr><td>SECONDARY AIR HEATER
BACK-UP DRIVE TRIP</td><td></td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Secondary Air Heater 2-1 Back-up Drive Motor Trip
• Secondary Air Heater 2-2 Back-up Drive Motor Trip</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If Main Drive Motor has previously tripped and Back-up Drive Motor Trips, the Rotor Stops</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Determine which Secondary Air Heater Back-up Drive Motor Tripped
• Monitor associated Air Heater gas and air inlet and outlet temperatures for any changes
• Monitor associated Air Heater Air and Gas side differential pressures
• Monitor Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td><td>Local Observations
• Inspect associated Main and Backup Drive Motors and Breakers
• Walkdown associated Air Heater
• Inspect Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Reset Main Drive and Backup Drive and attempt to Restart
• If Main Drive or Backup Drive restarts, and if Air Heater pluggage is suspect, blow soot until differential is reduced to normal. When sootblowing is complete, return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Lube System(s) is/are out of tolerance, restore conditions to normal. Return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If a drive restarts and if Air Heater Temperatures are rapidly climbing, attempt to blow soot to reduce temperature. If rotor stops, bottle up and deluge the air heater.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in secondary air temperature and plant efficiency. It may be necessary to reduce unit load.
• Will cause Unit Runback if Fan is tripped and load is greater than 50%</td></tr>
</table>

<table>
<tr><td>SECONDARY AIR HEATER
MAIN DRIVE TRIP</td><td></td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Secondary Air Heater 2-1 Main Drive Motor Trip
• Secondary Air Heater 2-2 Main Drive Motor Trip</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Associated Back-up Drive Motor Auto Start</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Determine which Secondary Air Heater Main Drive Motor Tripped
• Verify associated Back-up Drive Motor Auto Start
• Monitor associated Air Heater gas and air inlet and outlet temperatures for any changes
• Monitor associated Air Heater Air and Gas side differential pressures
• Monitor Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td><td>Local Observations
• Inspect associated Main Drive Motor and Breaker
• Walkdown associated Air Heater
• Inspect Backup Drive Motor for proper operation
• Inspect Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Air Heater pluggage is suspect, blow soot until differential is reduced to normal. When sootblowing is complete, reset Main Drive Breaker and Restart Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Lube System(s) is/are out of tolerance, restore conditions to normal, reset Main Drive Breaker and Restart Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Temperatures are rapidly climbing, attempt to blow soot to reduce temperature. If this does not work and Backup drive trips and rotor stops, bottle up and deluge the air heater.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• No immediate effect</td></tr>
</table>

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<table>
<tr><th colspan="2">SECONDARY AIR HEATER
ROTOR STOPPED</th></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• Secondary Air Heater 2-1 Main and Back-up Drive Motor Trip
• Secondary Air Heater 2-2 Main and Back-up Drive Motor Trip</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• None</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Determine which Secondary Air Heater's Main and Back-up Drive Motors Tripped
• Monitor associated Air Heater gas and air inlet and outlet temperatures for any changes
• Monitor associated Air Heater Air and Gas side differential pressures
• Monitor Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td><td>Local Observations
• Inspect associated Main and Backup Drive Motors and Breakers
• Walkdown associated Air Heater
• Inspect Air Heater Support Bearing and Guide Bearing oil pressures and temperatures</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• Reset Main Drive and Backup Drive and attempt to Restart
• If Main Drive or Backup Drive restarts and Rotor Stopped alarm clears, and if Air Heater pluggage is suspect, blow soot until differential is reduced to normal. When sootblowing is complete, return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If Air Heater Lube System(s) is/are out of tolerance, restore conditions to normal. Return to Main Drive. Shut down Back-up Drive after Main Drive Starts.
• If a drive restarts and if Air Heater Temperatures are rapidly climbing, attempt to blow soot to reduce temperature. If rotor stops, bottle up and deluge the air heater.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in secondary air temperature and plant efficiency, it may be necessary to reduce unit load.
• Will cause Unit Runback if Fan is tripped and load is greater than 50%</td></tr>
</table>

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<table>
<tr><td>STATION AIR PRESSURE LOW</td><td>Alarm Signal originates from 2PSL SA004</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Station Air Compressor Trip
• Break in Station Air Piping
• Faulty Pressure Switch
• Emergency supply to control air system open.</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If Standby Service Air Compressor Controls are properly aligned, the standby compressor will auto-start and load.</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Verify Service Air System Pressure
• Verify Service Air Compressor operating condition (ON/Tripped)
• Monitor control air system</td><td>Local Observations
• Verify System Pressure on Local Gauge
• Inspect Service Air Compressor for possible cause of the low pressure
• Inspect System Piping for leaks
• Inspect Dryers for possible solenoid failure allowing continuous exhaust
• Inspect emergency supply to control air system.</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Attempt to start another Compressor
• Open Emergency Supply/cross-connect from Unit 1 Station Air</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• If Unit is in startup with thermoprobes inserted, cooling air supply is diminished
• Coal Handling Vibratory Feeders may be impacted
• Dry Pipe Fire Protection System Valves may be effected
• Control air system may be effected.</td></tr>
</table>

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<table>
<tr><td>TDBFP & DC HEATER
EXTRACTION STEAM
LOW POINT DRAIN LEVEL HIGH</td><td>High Alarm - 2LSH ES054
High Alarm - 2LSH ES056
High Alarm – 2LSH ES074
High Alarm - 2LSH ES093</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High level detected in Drain Line “A” – Turbine Side Extraction Drain Line upstream of non-return valve
• High level detected in Drain Line “B” – located downstream of MO ES506
• High level detected in Drain Line “C” – located upstream of MO2 ES507 (DC Heater Extraction)
• High level detected in Drain Line “D” – Turbine Side Extraction Drain Line upstream of non-return valve</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Associated solenoid actuated Extraction Line Drain Valve(s) open</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If DC Heater Level is out of control high, take manual control of DC Heater Make-up
• If High level is caused from High level in the DC Heater, ensure that emergency drain to condenser is open
• When level is back to normal, put L.C.V. controls back in auto.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>TDBFP & DC HEATER
EXTRACTION STEAM LOW POINT DRAIN LEVEL VERY HIGH</td><td>High High Alarm originates from 2LSH ES055
High High Alarm originates from 2LSH ES057
High High Alarm originates from 2LSH ES073
High High Alarm originates from 2LSH ES094</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High High level detected in Drain Line “A” – Turbine Side Extraction Drain Line upstream of non-return valve
• High High level detected in Drain Line “B” – located downstream of MO ES506
• High High level detected in Drain Line “C” – located upstream of MO2 ES507 (DC Heater Extraction)
• High High level detected in Drain Line “D” – Turbine Side Extraction Drain Line upstream of non-return valve</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Redundant alarm indicating that level is increasing</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• If DC Heater Level is out of control high, take manual control of DC Heater Make-up and restore level to normal
• If High level is caused from High level in the DC Heater, ensure that emergency drain to condenser is open
• When level is back to normal, put L.C.V. controls back in auto.</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Decrease in plant efficiency, increase in plant heat rate
• Possible turbine water induction</td></tr>
</table>

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<table>
<tr><td>TDBFP BEARING OIL PRESSURE LOW</td><td>Signal originate from TDBFP Bearing Header Lube Oil Supply Pressure Switch</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• Loss of lube oil supply pressure to pump
• Faulty Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Auxiliary Oil Pump will auto start
• Possible Auto-Start of the Emergency Bearing Oil Pump</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration
• Monitor Turbine Oil Pressure
• Possible BFP Turbine Auxiliary Oil Pump Trip or Auto Start annunciator
• Possible Auto-Start of the Emergency Bearing Oil Pump</td><td>Local Observations
• Check Lube Oil system pump bearing supply temperature and pressure
• Check Reservoir Level to determine if there is a loss of pump suction pressure
• Check for oil leaks</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, decrease it
• If the problem is a low suction pressure due to Low level, add oil to the reservoir
• If the low supply pressure is cleared, return to single pump operation, shutting down the Auxiliary Oil Pump and placing its controls back in auto
• If the cause is failure of the Main Turbine shaft driven oil pump, shut down the Unit until repairs are made</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• May lead to High Bearing Vibration which leads to TDBFP Trip and Unit trip</td></tr>
</table>

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<table>
<tr><td>TDBFP
EXTRACTION STEAM
LOW POINT DRAIN LEVEL HIGH</td><td>High Alarm - 2LSH ES067</td></tr>
<tr><td colspan="2">A. Possible Cause(s) of Alarm
• High level detected in low point drain to Condenser</td></tr>
<tr><td colspan="2">B. Automatic Action(s)
• Solenoid Drain Valve opens</td></tr>
<tr><td>C. Control Room Observations
• Annunciator Alarm
• Monitor TDBFP Turbine Vibration
• Monitor Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens</td></tr>
<tr><td colspan="2">D. Immediate Operator Action
• None</td></tr>
<tr><td colspan="2">E. Effect on Plant
• Possible turbine water induction if condition is not corrected</td></tr>
</table>

<table>
<tr><td>TDBFP

EXTRACTION STEAM LOW POINT DRAIN LEVEL VERY HIGH</td><td>High High Alarm originates from 2LSH ES066</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High High level detected in low point drain to condenser</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• Redundant alarm indicating that level is increasing</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Turbine Vibration
• Monitor Turbine Differential Expansion</td><td>Local Observations
• Inspect drain valve line-up
• Verify associated solenoid drain valve opens</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• Open drain on level pot and verify high level.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• Possible TDBFP turbine water induction if condition is not corrected</td></tr>
</table>

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<table>
<tr><td>TDBFP SUCTION STRAINER DIFFERENTIAL PRESSURE HIGH</td><td>Signal originates from 2PDS CD053</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High differential pressure across the suction strainer
• Faulty Differential Pressure Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• None</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Pump Suction and Discharge Pressure
• Monitor DC Heater Pressure
• Monitor Pump Discharge Flow</td><td>Local Observations
• Check DP Switch valve lineup</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• None. May lead to decreased feedwater flow if allowed to increase.
• Note the condition and input Maintenance Request into the work order system.</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• No immediate impact if flow is not affected.</td></tr>
</table>

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<table>
<tr><td>VIBRATION MONITORING SYSTEM</td><td>Alarm originates from indicater vibration monitor panel</td></tr>
<tr><td colspan="2">A. <u>Possible Cause(s) of Alarm</u>
• High vibration on one of the ID, FD, PA fans motor driven boiler feed pump or motors, turbine driven boiler feed pump
• Faulty Proximity Probe/Vibration Switch</td></tr>
<tr><td colspan="2">B. <u>Automatic Action(s)</u>
• If high vibration on ID or FD fans will trip fan.</td></tr>
<tr><td>C. <u>Control Room Observations</u>
• Annunciator Alarm
• Monitor Bearing Vibration to determine the source of the alarm
• Monitor indicator panel to determine which piece of equipment is causing alarm.</td><td>Local Observations
• Walk down the equipment
• Check for oil leaks
• Check Bearing Drain Oil temperatures to see if there has been a change
• Check Lube Oil Supply temperature</td></tr>
<tr><td colspan="2">D. <u>Immediate Operator Action</u>
• If Lube Oil Supply temperature is high, increase cooling flow through heat exchanger’s
• If coming up on load, it may be necessary to hold that peace of equipment until the source of the vibration increase is determined and corrected</td></tr>
<tr><td colspan="2">E. <u>Effect on Plant</u>
• High Bearing Vibration leads to equipment trip
• Operating with abnormal turbine bearing vibration, leads to premature bearing wear and subsequent failure</td></tr>
</table>

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