

BOILER ONE SHUTDOWN

SAFE WORK PROCEDURE

POWER DEPARTMENT APPROVED SAFE WORK PROCEDURE

BOILER #1 SHUTDOWN PROCEDURE

1. CHECK LOAD SHEDDER TO INSURE THAT THERE ISN'T ANY TRIPS SET UP ON BOILER 1. IF THERE IS A TRIP(S) SET UP ON THE BOILER, DISABLE THEM ON THE LOADSHEDDER.
2. PUT BOILER MASTER ON MANUAL AND START KILLING BURNERS KEEPING THE BURNER GAS PRESSURE AT APPROX 4#'S PRESSURE. CUT GAS PRESSURE BACK TO 4#'S EACH TIME A BURNER IS KILLED.
- (CONTINUE TO KILL BURNERS LOWERING LOAD DOWN TO APPROX 70-75 M.
3. PUT COMBUSTION CONTROLS ON MANUAL, EXCEPT ID FANS AND ADJUST FAN OUTPUT TO APPROX. 10% MAINTAINING OR ABOVE 7%.
4. BLOCK IN STEAM TO HIGH PRESSURE HEATER.
5. OPEN SUPERHEATER VENT APPROX. 1 TURN.
6. OPEN SUPERHEATER DRAIN APPROX. 1 TURN.
7. CRACK TRICKLE FEED BLOCK VALVE AND CHECK THE OPERATION OF THE MOTOR OPERATED FEEDWATER BYPASS AND AUTOMATIC BLOWDOWN VALVE.
8. CHECK LOAD SHEDDER AND MAKE SURE NO TRIPS ARE SET UP AND THEN TRIP BOILER.
9. SHUT OFF CHEMICAL FEED PUMPS.
10. CLOSE FEEDWATER SHUTOFF VALVE AND WATCH DRUM LEVEL.
11. CLOSE LEAD LINE MOTOR OPERATED VALVE ONCE PRESSURE GETS TO 1000#.
12. CLOSE NON-RETURN.
- (ADJUST BLOWDOWN AND TRICKLE FEED BLOCK VALVES TO MAINTAIN DRUM LEVEL.
13. WHEN DRUM PRESSURE REACHES 100#'S, OPEN DRUM VENTS, MAINTAIN TRICKLE FEED UNTIL SUPERHEATER TUBE TEMPERATURE REACHES 300 DEGREES, THEN YOU CAN STOP TRICKLE FEED.
14. COOL BOILER DOWN ACCORDING TO BOILER SHUTDOWN CURVE.
15. WAIT UNTIL BOILER STOPS STEAMING BEFORE YOU DRAIN IT.

BOILER 2 STARTUP FROM COLD CONDITION

POWER DEPARTMENT APPROVED SAFE WORK PROCEDURES

BOILER 2 LIGHT-OFF OF IGNITOR OR BRNS. FROM COLD CONDITION

BOILER CLOSE-UP AND PREPARATION PROCEDURE

1. INSURE ALL PERSONNEL ARE OUT OF BOILER, YELL INTO EACH OPENING AND EXAMINE INTERIOR WITH FLASHLIGHT BEFORE CLOSING UP. ADVISE CRAFTSMEN SUPERVISOR OF THIS PROCEDURE AND THAT HE IS TO MAKE A HEAD COUNT OF HIS PEOPLE. POWER SUPERVISOR IS TO DO THE SAME FOR POWER DEPARTMENT PERSONNEL
2. ADVISE AN INSTRUMENT MAN TO MAKE SURE THAT ALL SWITCHES AND RELAYS RELATED TO THIS BOILER ARE ENABLED IN THE MODICON.
3. STARTING AT TOP OF BOILER, INSPECT EACH ACCESS DOOR INCLUDING HOT AND COLD OF ECONOMIZER SECTION, ACCESS TO SUPERHEATER SECTION, FENTHOUGH, ETC., FOR SCAFFOLDS, LADDERS, TOOLS. INSURE EVERYTHING IS REMOVED BEFORE BOILER ACCESS DOORS ARE CLOSED. INSURE ALL ACCESS DOORS ARE CLOSED AND TIGHTLY BOLTED
4. INSURE THAT ALL FID TAGS HAVE BEEN PROPERLY RELEASED, TREATED AND REIDED

SAFETY CONSIDERATIONS FOR BOILER START-UP

1. ABOVE PROCEDURES COMPLETED
2. ALWAYS CRIBBLE FEED BOILER WHEN BRINGING IT UP. OVERHEATING THE ECONOMIZER FROM LACK OF FLOW COULD CAUSE A RUPTURE
3. ALWAYS USE IGNITORS FOR LIGHTING BURNERS. NEVER TRY TO IGNITE FROM HOT BRICK WORK OR ADJACENT BURNERS.
4. OBSERVE FIRES CLOSELY DURING PRESSURE RAISING.
5. MAKE SURE ALL GAGS ARE REMOVED FROM SAFETY VALVES.
6. WEAR NOMEX SUIT WHEN LIGHTING GAS OR OIL BURNERS.
7. TRIP BOILER ANY TIME WATER LEVEL DROPS OUT OF SIGHT IN GAUGE GLASS

PRIOR TO LIGHT OFF:

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1. FILL BOILER TO TWO GREEN FORTS, OR -2 ON EYE-HYE. THIS ALLOWS FOR NATURAL SWELLING OF WATER ON HEATING AND WILL LESSEN BLOWING DOWN TO HOLD WATER LEVEL UPON CONTINUED HEATING (NOTE: FILL WITH MAKE-UP, NOT DEMIN BECAUSE MAKE-UP

WATER HAS A LOWER O₂ COUNT.

2. OPEN THE FOLLOWING VALVES:

- ___ A. EYE-HYE WATER COLUMN AND DRAIN BLOCK VALVES. (AT THE DRUM)
- ___ B. DRUM VENTS.
- ___ C. SUPERHEATER OUTLET VENT (1.5 TURNS OPEN.)
- ___ D. EAST AND WEST S. H. DRAIN VALVES ON DRAIN MANIFOLD
- ___ E. DRUM PRESSURE GAUGE.
- ___ F. CONTINUOUS BLOWDOWN VALVE (AT DRUM)
- ___ G. CHEMICAL FEED VALVES.
- ___ H. FLOW AND PRESSURE TRANSMITTERS.
- ___ I. ECONOMIZER INLET.
- ___ J. DRAIN ON BOILER SIDE OF MOV FOR BOILER STEAM LEAD LINE.
- ___ K. FLASH TANK BY-PASS.
- ___ L. DRUM LEVEL TRANSMITTERS.
- ___ M. ALL BOTTOM BLOWDOWN VALVES.
- ___ N. AUTO BLOWDOWN B. V. 'S

3. CLOSE THE FOLLOWING VALVES:

- ___ A EYE-HYE AND GAUGE GLASS DRAINS & WATER COLUMNS (AT DRAIN MANIFOLD)
- ___ B ECONOMIZER DRAIN (AT DRAIN MANIFOLD)
- ___ C FEEDWATER MOTOR OPERATED SHUTOFF VALVE.
- ___ D 2" MANUAL FEEDWATER BY-PASS VALVE
- ___ E. FEEDWATER MOTOR OPERATED BY-PASS VALVE.
- ___ F AUTO BLOWDOWN VALVE AND SHUT OFF.
- ___ G 4" FILL VALVE ON S. H. OUTLET HEADER.
- ___ H CONTINUOUS B/D GRADUATED VALVE
- ___ I FLASH TANK B. V. AND STEAM B. V. TO DEAERATORS

- 4 PLACE SUPERHEATER DAMPER IN 100% POSITION (ALL FLUE GAS THROUGH THE PRIMARY SUPERHEATER)
- 5 PLACE AIR PREHEATER BY-PASS DAMPERS IN OPEN POSITION
- 6 INSURE THAT ALL TURNER AIR REGISTERS ARE OPEN.
- 7 INSURE THAT OUTLET DAMPERS ON FD FANS ARE OPEN AND LOCKED IN POSITION
- 8 INSURE THAT FLEXIBLE CONNECTOR IS REMOVED FROM S. H. OUTLET HEADER FILL VALVE AND PLUG IS INSTALLED IN GRALOCK FITTING PRIOR TO LIGHTING OFF BOILER.
- 9. INSURE THAT INSTRUMENT AIR IS TURNED ON TO FAN VANE OPERATORS.
- 10. STROKE FAN VANES BEFORE STARTING.
- 11. CHECK OIL LEVEL IN BEARINGS ON INDUCED DRAFT AND FORCED DRAFT FANS AND START AN I. D. , THEN AN F. D. ONE AT A TIME

PURGE CYCLE AND TRIP CHECKS:

- 1 ESTABLISH NECESSARY AIR FLOW FOR PURGING (APPROX. 60%). READ ON AIR FLOW INDICATOR ON THE "B" FD FAN CONTROLLER
- 2 PUT IGNITER AND BURNER SWITCHES AT BURNER FRONT IN OFF POSITION.
- 3 THE FOLLOWING VALVES SHOULD BE CLOSED:

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GAS BURNER SO
IGNITOR SSO
GAS SSO
IGNITOR SO

4. DISABLE DRUM LEVEL TRIP SWITCH " LOW DRUM TRIP " LIGHTS SHOULD FLASH.
5. ESTABLISH AND MAINTAIN APPROX. 40# GAS PRESSURE ON GAS LINE.
6. "OPEN CV" LIGHT FLASHING.
7. OPEN GAS CONTROL VALVE AND MIN FLOW CONTROL VALVE.
8. "OPEN SSO" LIGHT FLASHING.
9. OPEN GAS SSO VALVE.
10. "GAS SSO OPEN" LIGHT ON
11. BURNER HEADER PRESSURE (25#) MUST BE ESTABLISHED WITHIN 30 SECONDS THEN GAS SSO VALVE CLOSSES AUTOMATICALLY
12. CLOSE GAS CONTROL VALVE.
13. "PURGE ON" LIGHT ON. HEADER PRESSURE PROVING; AIR PURGE ON. GAS HEADER PRESSURE MUST REMAIN ABOVE 10 PSIG FOR 5 MINUTES TO CONTINUE
14. AFTER A 5 MINUTE DELAY, "OPEN SSO" LIGHT FLASHING
15. OPEN GAS FAN VALVE
16. "GAS SSO OPEN" LIGHT ON
17. IF AIR FLOW FALLS BELOW 25% MINUTE
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SAFETY TRIP CHECKS (ROUTINE)

USE MODICON TRIP LIST.

SAFETY TRIP CHECKS (NON-ROUTINE)

USE MODICON TRIP LIST.

1. SHUT OFF FUEL FEED TO DRUM AND OPEN BLOWDOWN VALVES WHEN DRUM LEVEL DROPS TO -10%. GAS SSO VALVE SHOULD

BURNER LIGHT-OFF.

1. L.O. READY LIGHT ON
2. TURN IGNITER AND BURNER SWITCHES AT BURNER FRONT TO NEUTRAL POSITION
3. AIR FLOW SHOULD BE 25%. AIR REGISTERS ON BURNERS NO. 4 AND NO. 7 WILL BE OPEN. WHEN A BURNER IS LIT ON THE TOP ROW, THE NO. 7 REGISTER WILL NO LONGER BE REQUIRED TO BE OPEN. (THE SAME IS TRUE FOR #4 REGISTER ON THE BOTTOM ROW.)
4. ON BOILER BOARD, PUSH IGNITER BUTTON AND THE BUTTON FOR THE BURNER YOU WISH TO LIGHT. A FLASHING BURNER LIGHT INDICATES IGNITER FLAME. IF IGNITOR FAILS TO LIGHT, TWO MINUTE PURGE IS REQUIRED. AFTER TWO MINUTES, "L.O. READY" LIGHT IS ON AND IGNITOR IS READY TO BE TRIED AGAIN. ON THE FIRST IGNITOR ONLY, THE BOILER WILL TRIP AFTER UNSUCCESSFUL FLAME DETECTION ON THE SECOND TRY. THIS WILL REQUIRE RE-PURGING OF THE BOILER. AFTER A FLAME IS ESTABLISHED, IGNITORS MAY BE TRIED OVER AND OVER WITH ONLY A TWO MINUTE DELAY BETWEEN TRIES.

IF FLAME FAILS TO REMAIN ON AS LONG AS IGNITOR FLAME IS PROVEN. HOWEVER, IGNITERS WILL EXTINGUISH THEMSELVES AUTOMATICALLY AFTER 5 MINUTES. ONCE METHANE BURNER IS LIT, THE IGNITER TRIPS WITHIN 5 SECS. EXTENDED FIRING OF ANY IGNITER COULD CAUSE SERIOUS DAMAGE TO THE BURNER. THE INITIATION OF IGNITER LIGHTING WILL AUTOMATICALLY OPEN THE AIR FLOW AIR REGISTER. AIR REGISTER MUST PROVE OPEN FOR BURNER TO LIGHT. REGISTER IS OPEN WHEN HANDLES ARE CLOSEST TO 1/2 OPEN POSITION.

BOILER TRIP AND BURNER LIGHT-OFF

1. MIN FLOW VALVE TO 100% OPEN

1. AFTER IGNITER FLAME IS PROVEN, PUSH THE METHANE BUTTON. THE BURNER FOR THE BURNER YOU WISH TO LIGHT (WHICH ON THE TOP ROW) WILL LIGHT.
2. IF FLAME FAILS TO BE PROVEN WITHIN 4 SECONDS, MIN FLOW VALVE WILL CLOSE.
4. IF FLAME IS PROVEN, THE BURNER LIGHT WILL STOP FLASHING AND REMAIN ON. THE IGNITER WILL EXTINGUISH ITSELF.
5. AS ADDITIONAL BURNERS ARE LIT, ADJUST MIN FLOW CONTROLLER VALVE TO MAINTAIN 2-3 PSIG ON BURNER HEADER.

AFTER LIGHT OFF:

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1. FOLLOW THE CURRENTLY APPROVED PRESSURE RAISING CURVE BY THROTTLING THE SUPERHEATER VENT AND/OR ADJUSTING MINIMUM STEAM PRESSURE REGULATOR.
2. IN FEED PUMPS FREQUENTLY FOR PROPER COMBUSTION.
3. TRICKLE FEED BOILER WITH 1-1/2" BY-PASS AND CONTINUE UNTIL BOILER IS ON THE LINE TO PREVENT WATER FLASHING IN THE ECONOMIZER.
4. BLOW DOWN FRONT AND SIDE HEADERS EVERY 20 MINUTES FOR FIRST TWO HOURS OF FIRING AND EVERY 30 MINUTES THEREAFTER UNTIL BOILER IS ON THE LINE. (OPEN AS FAST AS

POSSIBLE AND CLOSE AS FAST AS POSSIBLE)

5. AS BOILER STARTS TO STEAM, SNUG UP ON HANDHOLE AND MAN-HOLE COVERS IF GASKETS HAVE BEEN REMOVED.

RAISING STEAM PRESSURE:

1. SET EDTA PUMP STROKE AT MANUAL PROJECTED BOILER LOAD AND START PUMP.
2. AT 25 PSIG, CLOSE DRUM VENTS AND THROTTLE SUPERHEATER VENTS
3. WHEN BOILER REACHES 500# AND AT 100# INTERVALS THEREAFTER CLOSE SUPERHEATER VENT FOR 15 SECONDS AND THEN OPEN WIDE FOR SURGING THE SUPERHEATER TUBES TO AID IN REMOVAL OF CONDENSATE.
4. BEGIN WARMING BOILER STEAM LEAD LINE FROM HEADER TO NON-RETURN, THROUGH LEAD LINE WARM UP BY-PASS AND LEAD LINE VENT. PUT ALL BOILER METERING, ON CRT, IN SERVICE.
5. ROTATE #1, #2, #3, #4, AND #5 BURNERS EVERY HALF HOUR TO CLEAR CONDENSATE IN SUPERHEATER TUBES BEING CAREFUL TO OBSERVE PROPER PROCEDURES AS DESCRIBED IN SAFE WORK PROCEDURE 1-1.
6. WHEN FLOW OF STEAM EMITTING FROM LEAD LINE APPEARS TO BE DRYING OUT, ADJUST VENT VALVE TO MINIMIZE FLOW ALLOWING LEAD LINE TO PRESSURE UP.
7. PUT POWER ON MOTOR-OPERATED VALVE ON BOILER LEAD LINE AND FEEDWATER LINE. OPEN LEAD LINE MOV AND STROKE FEEDWATER REGULATOR AT THIS TIME.
8. WHEN DRUM PRESSURE REACHES 1000 PSIG, HAVE LEAD LINE AND LEAD LINE BY-PASS OPEN AND OPEN NON-RETURN. INSURE ALL TUBES ARE CLEAR OF CONDENSATE. TUBE METAL TEMPERATURES SHOULD NOT EXCEED 875-950 DEGREES F.
9. FINE TUNE STEAM PRESSURE BY INCREASING GAS OR CUTTING BACK ON SUPERHEATER VENT. HOLD BOILER LOAD AT 50 TO 60M#/HR. FOR 15-30 MINUTES AS A PRECAUTION AGAINST CONDENSATE REMAINING IN SUPERHEATER TUBES THAT DO NOT HAVE THERMOCOUPLES.

BOILER ON THE LINE

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1. CLOSE DRAIN AND VENT VALVES. CLOSE SUPERHEATER DRAINS.
2. GO TO MAIN FEEDWATER REGULATOR AS SOON AS PRACTICAL. AND ENABLE DRUM LEVEL TRIP.
3. ADJUST SUPERHEATER DAMPER TO OBTAIN MAXIMUM OUTLET STEAM TEMPERATURE NOT TO EXCEED 950 DEGREES F.
4. CLOSE AIR PREHEATER BY-PASS DAMPERS WHEN OUTLET FLUE GAS TEMPERATURE FROM THE PREHEATER REACHES 212 DEGREES F.
5. AFTER ALL T.C.'S INDICATE THAT THE SUPERHEATER ELEMENTS ARE CLEAR OF CONDENSATE, INCREASE BOILER LOAD TO 100M#/HR AND RUN AT THIS LOAD FOR AT LEAST TWO(2) HOURS BEFORE INCREASING LOAD.
6. INSPECT BOILER THOROUGHLY FOR LEAKS, SIGNS OF UNEVEN EXPANSION, PROPER COMBUSTION, ETC.

7. AS SOON AS PRACTICAL, PUT COMBUSTION CONTROL ON AUTO.
8. INSURE THAT BLOCK VALVES IN FEEDWATER MOTOR-OPERATED BY-PASS LINE ARE OPEN AND ALSO THAT STAND-BY GAS REGULATOR IS READY FOR SERVICE.
9. OPEN C. B. D. GRADUATED VALVE 2-3 TURNS.
10. OPEN BLOCK VALVE TO FLASH TANK AND CLOSE BY-PASS.
11. CLOSE IGNITOR SSO VALVE AS SOON AS ALL BURNERS ARE LIT, OR AT LEAST ONE IGNITOR IS NO LONGER REQUIRED.

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