SEQUENCE OF CONTROL

A. BALANCE OF PLANT PLC - A PLC WITH LOCAL HUMAN INTERFACE AND TIED TO THE REDUNDANT ETHERNET SWITCH SHALL PROVIDE THE FOLLOWING FUNCTIONS. READOUT AT THE LOCAL COMPUTER WORKSTATION IS REQUIRED AND A TREND LOG SHOULD BE AVAILABLE WHERE REQUIRED.

1. OUTDOOR AIR TEMPERATURE: A TEMPERATURE SENSOR TO MEASURE OUTDOOR AIR AND RECORD OUTDOOR TEMPERATURE EVERY 15 MINUTES, 24/7. RECORD EACH MONTH.
2. DEGREE DAY CALCULATION: A PROGRAM SHALL BE AVAILABLE IN THE PROGRAM TO CALCULATE DEGREE DAY NUMBERS FOR EVERY HOUR, 24/7. TOTAL EACH MONTH AND RECORD.
3. ROOM TEMPERATURE: A SENSOR TO MEASURE OUTDOOR AIR AND RECORD INDOOR TEMPERATURE EVERY 15 MINUTES, 24/7. RECORD EACH MONTH.
4. CONDENSATE RETURN TEMPERATURE: A TEMPERATURE SENSOR IN THE CONDENSATE RETURN FROM STEAM TUNNELS SHALL BE LOCATED JUST PRIOR TO THE CONDENSATE PUMPS IN THE PUMP ROOM. RECORD CONDENSATE RETURN TEMPERATURE EVERY 15 MINUTES, 24/7. RECORD EACH MONTH.
5. HIGH PRESSURE STEAM SUPPLY PRESSURE: A PRESSURE SENSOR IN THE MAIN HPS PIPE PRIOR TO THE PRV'S SHALL MEASURE THE PRESSURE IN THE STEAM HEADER AND RECORD EVERY 15 MINUTES, 24/7. RECORD EVERY MONTH.
6. MEDIUM PRESSURE STEAM SUPPLY PRESSURE: A PRESSURE SENSOR IN THE MPS PIPE AFTER THE MPS PRV SHALL MEASURE THE PRESSURE IN THE MPS HEADER AND RECORD EVERY 15 MINUTES, 24/7. RECORD EVERY MONTH.
7. LOW PRESSURE STEAM SUPPLY PRESSURE: A PRESSURE SENSOR IN THE LPS PIPE AFTER THE LPS PRV SHALL MEASURE THE PRESSURE IN THE LPS HEADER AND RECORD EVERY 15 MINUTES, 24/7. RECORD EVERY MONTH.
8. FEEDWATER TEMPERATURE: A TEMPERATURE SENSOR IN THE FEEDWATER PIPE FROM THE DEAERATOR TO THE FEEDWATER PUMPS SHALL MEASURE THE TEMPERATURE AND RECORD EVERY 15 MINUTES, 24/7. RECORD EVERY MONTH.
9. MAKEUP WATER METER READOUT: A WATER METER LOCATED IN THE BOILER PLANT COLD WATER FEED SHALL MEASURE WATER USE IN GALLONS/MINUTE. RECORD EVERY HOUR, 24/7. TOTAL DAILY AND MONTHLY.
10. WATER SOFTENER WATER METER READOUT: A WATER METER LOCATED IN THE COLD WATER LINE TO THE WATER SOFTENER WILL MONITOR THE SOFT WATER MAKEUP TO THE BOILER PLANT IN GALLONS/MINUTE. RECORD EVERY HOUR 24/7. TOTAL DAILY AND MONTHLY. THIS WATER METER READING WILL BE USED TO ADJUST THE WATER SOFTENER.
11. BOILER ROOM GAS READOUT: A SEPARATE GAS METER LOCATED INSIDE THE BUILDING SHALL MEASURE GAS FLOW TO THE GAS BOILER IN CUBIC FEET/HOUR. RECORD EVERY HOUR, 24/7. TOTAL DAILY AND MONTHLY.
12. ELECTRIC METER READOUT: MONITOR ELECTRIC METER KW AND KWH. MONITOR PEAK KW USED EACH MONTH AND TOTAL KWH EACH MONTH.
13. HPS LAUNDRY METER READOUT: A TEMPERATURE/PRESSURE COMPENSATED STEAM METER SHALL MONITOR STEAM USE IN POUNDS/HR TO THE HPS TO THE TUNNEL (LAUNDRY.) THIS SHALL BE TOTALED DAILY AND MONTHLY AND RECORDED. ALSO RECORD PEAK POUNDS/HR.
14. MPS PLANT METER READOUT: A TEMPERATURE/PRESSURE COMPENSATED STEAM METER SHALL MONITOR STEAM USE IN POUNDS/HR TO THE MPS FOR PLANT HEATING. THIS SHALL BE TOTALED DAILY AND MONTHLY AND RECORDED. ALSO RECORD PEAK POUNDS/HR.
15. MPS HOSPITAL LOOP METER READOUT: A TEMPERATURE/PRESSURE COMPENSATED STEAM METER SHALL MONITOR STEAM USE IN POUNDS/HR TO THE MPS TO THE TUNNEL (ENTIRE SITE USE.) THIS SHALL BE TOTALED DAILY AND MONTHLY AND RECORDED. ALSO RECORD PEAK POUNDS/HR.
16. LPS DEAERATOR METER READOUT: A TEMPERATURE/PRESSURE COMPENSATED STEAM METER SHALL MONITOR STEAM USE IN POUNDS/HR TO THE LPS TO THE DEAERATOR. THIS SHALL BE TOTALED DAILY AND MONTHLY AND RECORDED. ALSO RECORD PEAK POUNDS/HR.
17. BOILER ROOM CARBON MONOXIDE AND COMBUSTIBLE GAS ALARM: AN CO & COMBUSTIBLE GAS LEVEL CONTROLLER SHALL MONITOR FOUR (4) CO AND COMBUSTIBLE GAS SENSORS. ONE IN THE CONTROL ROOM 102, ONE IN BOILER ROOM BEHIND COAL BOILERS, ONE IN BOILER ROOM BEHIND GAS BOILER AND ONE IN THE PUMP ROOM 11. THESE CO AND COMBUSTIBLE GAS SENSORS SHALL MONITOR FOR AN UNSAFE LEVEL OF CO AND COMBUSTIBLE GAS AND SOUND ALARM LOCALLY AND TO TELEPHONE ALARM SHOULD AN UNSAFE CONDITION EXIST.
18. BOILER FEED PUMPS 1, 2 & 3: CONTROLLED FROM THE BALANCE OF PLAN PLC. THE PUMPS TO BE STARTED FROM THIS PANEL BY ACTIVATING THE START/STOP SIGNAL. WHEN START IS ACTIVATED THE STATUS SHALL INDICATE THERE IS POWER TO THE VFD. THE VFD SPEED SHALL BE CONTROLLED TO PROVIDE 150 PSI TO THE COMBINED BOILER FEED PIPE. SHOULD ANY PUMP FAIL, AN ALARM SHALL SOUND AND THE NEXT PUMP IN LINE SHALL START. SHOULD ONE PUMP FAIL TO MAINTAIN 150 PSI IN THE COMBINED BOILER FED PIPE, THE SECOND PUMP SHOULD AUTOMATICALLY START AND EACH PUMP VFD CYCLED DOWN SO THAT THE COMBINED PUMPS MAINTAIN 150 PSI. PUMPS ARE SIZED FOR ONE PUMP FOR EACH COAL BOILER AND TWO PUMPS FOR GAS BOILER. ONE PUMP SHOULD ALWAYS BE A STAND-BY.
19. CONDENSATE TRANSFER PUMPS CTP - 1&2: THE CONDENSATE TRANSFER PUMPS PUMP CONDENSATE FROM THE CONDENSATE STORAGE TANK (SURGE TANK) TO THE DEAERATOR. THE PUMPS ARE CONTROLLED FROM THE BALANCE OF PLANT PLC. THE PUMPS ARE TO BE STARTED FROM THIS PANEL BY ACTIVATING THE START/STOP SIGNAL. WHEN START IS ACTIVATED THE STATUS SHALL INDICATE THERE IS POWER TO THE PUMP. ONE PUMP IS CAPABLE OF HANDLING THE ENTIRE PLANT, EITHER TWO COAL BOILERS OR ONE (1) GAS BOILER. THE SECOND PUMP IS A STANDBY. SHOULD A PUMP FAIL FOR ANY REASON AN ALARM SHOULD BE ACTIVATED AND THE SECOND PUMP SHALL START. THE CONDENSATE PUMP PUMPS AGAINST PRESSURE ON CV-4 VALVE ON THE DEAERATOR. ONCE THE PUMP IS ACTIVATED IT RUNS CONTINUOUSLY UNTIL STOP SIGNAL IS ACTIVATED.
20. ASH AUGER 1 & 2: CONTROLLED FROM THE BALANCE OF PLANT PLC. AUGER #1 AND #2 TO BE STARTED FROM THIS PANEL BY ACTIVATING THE START/STOP SIGNAL. WHEN START IS ACTIVATED, BOTH AUGERS ARE TO START AND RUN CONTINUOUSLY ANY TIME THE COAL BOILERS ARE IN USE. THE AUGERS SHALL REMAIN ON UNTIL STOP SIGNAL BY OPERATORS AFTER BOILERS ARE SHUT DOWN AND BAG HOUSES ARE EMPTY. WHEN STARTED, THE PLC SHALL INDICATE THAT EACH AUGER IS ON IN THE STATUS SIGNAL. SHOULD EITHER AUGER FAIL FOR ANY REASON, AN ALARM SIGNAL IS TO BE ACTIVATED.
21. BUCKET ELEVATOR: CONTROLLED FROM THE BALANCE OF PLANT PLC. BUCKET ELEVATOR TO BE STARTED FROM THIS PANEL BY ACTIVATING THE START/STOP SIGNAL. WHEN START IS ACTIVATED THE BUCKET ELEVATOR IS TO RUN CONTINUOUSLY ANY TIME THE COAL BOILERS ARE IN USE. THE AUGERS TO REMAIN ON UNTIL STOP SIGNAL BY OPERATOR AFTER BOILERS ARE SHUT DOWN AND BAG HOUSES ARE EMPTY. WHEN STARTED, THE PLC SHALL INDICATE THE ELEVATOR IS ON IN THE STATUS SIGNAL. SHOULD THE AUGER FAIL FOR ANY REASON, AN ALARM SIGNAL IS TO BE ACTIVATED.
22. EXISTING MUA UNIT: THE EXISTING MUA UNIT LOCATED ON ROOF ABOVE THE CONTROL ROOM AND THE EXISTING STEAM TO GLYCOL HEAT EXCHANGER SHALL BE CONTROLLED AS THEY ARE. THE CONTRACTOR WILL HAVE TO REESTABLISH, RECONNECT AND RECALIBRATE EXISTING CONTROLS TO MAKE THE SYSTEMS FUNCTIONAL. THE HEAT EXCHANGER IS RELOCATED IN THE NEW CONSTRUCTION. A NEW DISCHARGE AIR TEMPERATURE SENSOR IN THE MUA UNIT IS TO MEASURE THE TEMPERATURE AND PROVIDE AT THE PLC AND PROVIDE TEMPERATURE TO THE LOCAL COMPUTER. A NEW DISCHARGE AIR LOW TEMPERATURE ALARM SHALL ALARM AT 40°F AT THE PLC AND ALARM AT THE LOCAL COMPUTER. A NEW MOTOR SENSOR SHALL INDICATE STATUS OF MUA UNIT MOTOR AT THE PLC AND AT LOCAL COMPUTER.

B. CONDENSATE PUMPS CP-1&2: EACH CONDENSATE PUMP HAS DUPLEX PUMPS. THE CONDENSATE PUMPS ARE TO BE PROVIDED WITH THEIR OWN FACTORY PROVIDED PLC. WHEN CP-1 IS ACTIVATED THE PLC SHALL CONTROL TO START THE FIRST OF THE DUPLEX PUMPS IF ADEQUATE CONDENSATE IS IN THE TANK. ONE PUMP IS ADEQUATE FOR THE ENTIRE CONDENSATE OF THE PLANT BUT IF A HIGH LEVEL OF CONDENSATE IS SENSED IN THE CONDENSATE TANK, THE PLC WILL START THE SECOND PUMP. IF ONE PUMP WERE TO FAIL, THE PLC WILL START THE SECOND PUMP AND SEND AN ALARM SIGNAL TO THE LOCAL COMPUTER. SIGNALS AND CONTROL FROM THE PLC TO THE LOCAL COMPUTER ARE START/STOP, STATUS THAT PUMP IS ACTIVE OR NOT, AND ALARM THAT PUMP HAS FAILED. THESE ARE TYPICAL OF BOTH PUMPS ON EACH CONDENSATE PUMP. WHEN CP-2 IS ACTIVATED, THE SAME CONTROLS DESCRIBED FOR CP-1 SHALL BE PROVIDED. THE SWITCHOVER FROM CP-1 TO CP-2 IS MANUALLY DONE BY OPERATOR. IT IS ACCEPTABLE TO USE ONE PLC TO CONTROL BOTH CP-1 & CP-2 WITH SWITCHOVER OR PROVIDE SEPARATE PLC FOR EACH CP-1 AND CP-2.

C. SURGE TANK ST-1: THE SURGE TANK IS THE CONDENSATE STORAGE TANK FOR THE PLANT. THE SURGE TANK IS TO BE PROVIDED WITH ITS OWN FACTORY PROVIDED PLC. THE SURGE TANK SHOULD BE OPERATIONAL ANY TIME THE BOILER PLANT IS IN OPERATION. THIS PLC SHALL CONTROL CONDENSATE LEVEL IN THE TANK BY CONTROLLING THE SOFT WATER MAKEUP VALVE AND THE EMERGENCY MAKEUP COLD WATER VALVE. NORMAL MAKEUP IS DONE BY OPENING AND CLOSING THE SOFT WATER VALVE. SHOULD THE NORMAL MAKEUP NOT BE ADEQUATE, A LOW LEVEL ALARM SHOULD BE ACTIVATED AND SENT TO THE LOCAL COMPUTER. UPON A FURTHER FALL IN WATER LEVEL, THE EMERGENCY COLD WATER MAKEUP VALVE SHALL OPEN. IF THE CONDENSATE TANK OVERFILLS, A HIGH LEVEL ALARM SHALL BE ACTIVATED AND SENT TO THE LOCAL COMPUTER. IF THE TANK CONTINUES TO FILL, AN OVERFLOW PIPE DUMPS BACK TO THE CONDENSATE PUMPS CP-1&2.

D. DEAERATOR DA-1: THE DEAERATOR IS TO BE PROVIDED WITH ITS OWN FACTORY PROVIDED PLC. THE DEAERATOR SHOULD BE OPERATIONAL ANY TIME THE BOILER PLANT IS IN OPERATION. THIS PLC CONTROLS THE STEAM VALVE, CONDENSATE TRANSFER PUMP DISCHARGE VALVE, SOFT WATER MAKEUP VALVE AND OVERFLOW VALVE. THE STEAM CONTROL VALVE IS TO BE FACTORY PROVIDED BY THE DEAERATOR MANUFACTURER AND CONTROLLED BY THE PLC TO REGULATE THE TEMPERATURE IN THE DEAERATOR. THE CONDENSATE TRANSFER PUMP DISCHARGE VALVE IS THE NORMAL WATER LEVEL CONTROL FOR THE TANK AND IS TO MODULATE TO KEEP THE TANK AT THIS LEVEL. SHOULD THE TANK WATER LEVEL DROP TO THE LOW LEVEL A LOW LEVEL ALARM IS ACTIVATED AND A SIGNAL SENT TO THE LOCAL COMPUTER. SHOULD THE TANK WATER LEVEL CONTINUE TO DROP TO THE EMERGENCY MAKEUP LEVEL THE SOFT WATER MAKEUP VALVE IS TO OPEN. SHOULD THE TANK WATER LEVEL RISE TO A HIGH LEVEL, A HIGH LEVEL ALARM IS ACTIVATED AND A SIGNAL SENT TO THE LOCAL COMPUTER. SHOULD THE TANK WATER LEVEL CONTINUE TO RISE THE OVERFLOW CONTROL VALVE IS TO BE OPENED AND RETURNED TO THE CONDENSATE PUMPS IN THE PUMP ROOM.

E. COAL BOILER B-1 & B-2: EACH COAL BOILER TO BE FACTORY PROVIDED WITH ITS OWN PLC CONTROLLER WHICH CONTROLS THE ENTIRE BOILER AND ASSOCIATED SYSTEMS. THE COAL BOILER MANUFACTURER IS TO DETERMINE ALL THE FEATURES NECESSARY FOR THEIR BOILER BUT IN PRINCIPAL ALL OF THE FOLLOWING FEATURES NEED TO BE INCLUDED. THE BOILER PLC IS TO COMMUNICATE FIRING RATE, STEAM PRESSURE AND ALARMS BACK TO THE LOCAL COMPUTER STATION. THE FIRING RATE IS CONTROLLED BY STEAM PRESSURE BUT IS AN EXTENSIVE PROCESS CONTROLLING THE COAL AUGER, COAL HOPPER SLIDE VALVE, COAL FEED FAN ON BOILER, COAL FIRING GRATES AND RATE OF TRAVEL OF COAL GRATE, UNDER FIRE FAN, OVER FIRE FAN, STACK FAN, STACK FAN VFD SPEED CONTROL AND CO /SO2 STACK MONITOR ALL WORKING TOGETHER TO REGULATE THE COAL BOILER FIRING TO MAINTAIN 125 PSI STEAM PRESSURE. OTHER SYSTEMS REGULATED AND CONTROLLED BY THE BOILER PLC ARE THE BOILER SOOT BLOWER, BOILER ASH AUGER, SURFACE BLOW DOWN VALVE CONTROL, BOILER WATER LEVEL CONTROLLER WHICH REGULATES THE WATER LEVEL IN THE BOILER BY MODULATING THE FEED WATER PUMP DISCHARGE VALVE, BOILER FEEDWATER PRESSURE CONTROLLER FEEDING BACK TO THE FEEDWATER PUMP VFD, LOW WATER CUTOFF AND ALARM TO LOCAL COMPUTER AND LOW WATER CUTOFF SHUNT SWITCH WHICH SOUNDS ALARM LOCALLY AND BY REMOTE PHONE.
COAL BOILERS 1 & 2 ARE TO BE MANUALLY STARTED BY OPERATORS USING THE PLC CONTROLLER. ALL SAFETIES NECESSARY TO CONTROL THE BOILERS ARE TO BE PROVIDED BY THE BOILER MANUFACTURER AND INTEGRATED INTO THE PLC CONTROLLER PROVIDED BY THE BOILER MANUFACTURER. STATUS, PRESSURE AND ALARMS TO BE PICKED UP AT THE PLC AND BROUGHT BACK TO THE LOCAL COMPUTER AND AS REQUIRED TO REMOTE PHONE ALARM.

F. COAL FEED AUGER: CONTROLLED FROM THE BOILER 1 & 2 PLC CONTROLLER AND FED BACK TO THE BAS. EACH AUGER IS CAPABLE OF HANDLING BOTH BOILERS SO WHEN AUGER 1 IS OPERATIONAL, AUGER 2 IS A BACKUP. SHOULD AUGER 1 FAIL FOR ANY REASON IT SHALL ALARM AND AUTOMATICALLY START AUGER 2. WHEN AUGER 2 IS LEAD, THE SAME SHALL OCCUR. EACH PARALLEL AUGER SHALL BE PROVIDED WITH ITS OWN PLC CONTROLLER, WHICH SHALL COMMUNICATE WITH BOILER PLC CONTROLS TO MODULATE ON/OFF AND SPEED CONTROL AS REQUIRED BY BOILER PLC. AUGER CONTROLLER SHALL TREND TIME AND SPEED OF OPERATION 24/7 AND TOTAL DAILY AND MONTHLY. PLC SHALL CALCULATE VOLUME AND WEIGHT OF COAL CONVEYED, BASED ON STANDARD COAL PROPERTY DATA, AND COMMUNICATE THIS INFORMATION IN REAL TIME AT THE HUMAN MACHINE INTERFACE. AUGER SHALL ALSO MONITOR COAL LEVEL IN AUGER FEED HOPPER FOR MINIMUM AND MAXIMUM VOLUMES AND SHALL ALARM WHEN AUGER HOPPER REACHES LOW LEVEL TO INDICATE FAILURE OF FEED FROM COAL SILO.

G. GAS BOILER B-3: THE GAS BOILER TO BE FACTORY PROVIDED WITH ITS OWN PLC CONTROLLER WHICH CONTROLS THE ENTIRE BOILER PROCESS AND FEEDS STATUS, STEAM PRESSURE, LOW WATER ALARM, GAS PRESSURE ALARM BACK TO LOCAL COMPUTER AND LOW WATER SHUNT ALARM TO LOCAL COMPUTER AND TELEPHONE ALARM. THE GAS BOILER MANUFACTURER IS TO DETERMINE ALL THE FEATURES NECESSARY FOR THEIR BOILER BUT IN PRINCIPAL ALL OF THE FOLLOWING FEATURES NEED TO BE INCLUDED. THE FIRING RATE IS CONTROLLED BY STEAM PRESSURE BUT ALSO CONTROLLED IS THE FORCED DRAFT BURNER FAN VFD SPEED CONTROL, STACK TEMPERATURE, BLOW DOWN VALVE CONTROL, BOILER WATER LEVEL CONTROLLER WHICH REGULATES THE WATER LEVELS IN THE BOILER BY MODULATING THE FEED WATER PUMP DISCHARGE VALVE, BOILER FEEDWATER PRESSURE CONTROLLER CONTROLLING THE FEEDWATER PUMP VFD, GAS PRESSURE ALARM, LOW WATER CUTOFF AND ALARM TO LOCAL COMPUTER AND LOW WATER SHUNT SWITCH WHICH SHUTS EVERYTHING DOWN AND SOUNDS ALARM LOCALLY AND BY REMOTE PHONE.

GAS BOILER #3 IS TO BE KEPT HOT (190°) WHEN NOT IN USE BY A STEAM HEAT EXCHANGER PROVIDED WITH THE BOILER. THIS HEAT EXCHANGER AND STEAM CONTROL VALVE PROVIDED BY THE BOILER MANUFACTURER IS TO BE CONTROLLED BY THE BOILER PLC.
BOILER #3 IS TO BE MANUALLY STARTED BY OPERATORS AT THE PLC CONTROLLER. ALL SAFETIES NECESSARY TO CONTROL THE BOILERS ARE TO BE PROVIDED BY BOILER MANUFACTURER AND INTEGRATED INTO THE PLC CONTROLLER PROVIDED BY THE BOILER MANUFACTURER. STATUS, PRESSURE AND ALARMS TO BE PICKED UP AT THE PLC AND BROUGHT BACK TO THE LOCAL COMPUTER AND AS REQUIRED TO REMOTE PHONE ALARM.

H. BAG HOUSE BG-1,2: EACH BAG HOUSE IS TO BE PROVIDED WITH ITS OWN FACTORY PROVIDED PLC BUT IS ACCEPTABLE FOR ONE PLC FOR BOTH BAG HOUSES AS LONG AS ALL THE FUNCTIONS CAN BE PROVIDED BY ONE PLC AND BOTH BAG HOUSES CAN FUNCTION INDEPENDENTLY. THE BAG HOUSE BG-1 SHOULD BE ACTIVATED ANY TIME BOILER B-1 IS ACTIVATED. A DIFFERENTIAL PRESSURE SENSOR SHALL MEASURE THE DIFFERENTIAL PRESSURE ACROSS THE BAG HOUSE AND PROVIDE A TREND TO THE LOCAL COMPUTER. A TIMER LOCATED IN THE PLC SHALL ACTIVATE THE BAG HOUSE SOOT BLOWER MANIFOLD AS RECOMMENDED BY THE MANUFACTURER. SHOULD THE PRESSURE IN THE BAG HOUSE EXCEED THE RECOMMENDED OPERATING PRESSURE, THE FACTORY PROVIDED PLC SHALL ALARM AND SEND AN ALARM SIGNAL TO THE LOCAL COMPUTER. A FACTORY PROVIDED LEAK DETECTOR SHALL MONITOR THE BAGS IN THE BAG HOUSE AND INDICATE LOCAL ALARM AT THE PLC AND SEND ALARM SIGNAL TO THE LOCAL COMPUTER.

BAG HOUSE BG-2 IS THE SAME AS A BG-1, EXCEPT FOR BOILER B-2.

I. AIR COMPRESSOR AC-1&2: A FACTORY PROVIDED PLC SHALL CONTROL AIR COMPRESSORS AC-1 AND AC-2. EACH COMPRESSOR IS TO BE ACTIVATED ANY TIME BOILERS 1 OR 2 ARE ACTIVE OR AT ANY TIME THE PLANT OPERATOR CHOOSES TO ACTIVATE THE COMPRESSORS. EACH COMPRESSOR IS SIZED FOR FULL PLANT CAPACITY. WHEN THE PLC IS SWITCHED TO AC-1 AS LEAD THEN AC-1 RUNS TO MAINTAIN THE PRESSURE SETTING 130PSI AND THE STATUS THAT AC-1 IS TO RUN IS INDICATED AT THE LOCAL COMPUTER. SHOULD AC-1 FAIL FOR ANY REASON IT SHALL INDICATE AT THE LOCAL PLC AND SEND ALARM TO THE LOCAL COMPUTER. ALSO SHOULD AC-1 FAIL FOR ANY REASON, AC-2 IS TO BE STARTED AUTOMATICALLY BY THE LOCAL PLC AND AC-2 IS TO BE THE LEAD COMPRESSOR. IF AC-2 IS SELECTED AS THE LEAD COMPRESSOR IT IS TO OPERATE AS DESCRIBED FOR AC-1 ABOVE AND AC-1 IS THE BACKUP AS DESCRIBED ABOVE. PROVIDE AUTOMATIC DRAIN VALVE WITH AIR COMPRESSORS POWERED FROM AIR COMPRESSOR CONTROLLER.

J. AIR DRYER AD-1&2: EACH AIR DRYER, AD-1 AND AD-2, IS TO BE PROVIDED WITH ITS OWN FACTORY PROVIDED PLC BUT IT IS ACCEPTABLE FOR ONE PLC FOR BOTH AIR DRYERS AS LONG AS ALL THE FUNCTIONS CAN BE PROVIDED BY ONE PLC AND BOTH AIR DRYERS CAN FUNCTION INDEPENDENTLY. EACH AIR DRYER IS SIZED FOR FULL PLANT CAPACITY. ONE AIR DRYER IS TO RUN WHENEVER THE AIR COMPRESSORS ARE ACTIVATED. WHEN AIR DRYER AD-1 IS ACTIVATED IT IS TO RUN AS THE LEAD AIR DRYER AND THROUGH THE PLC CYCLE TO CONTROL ITS SETTING AND THE STATUS IS INDICATED AT THE LOCAL COMPUTER. SHOULD AIR DRYER AD-1 FAIL FOR ANY REASON IT SHALL INDICATE AT THE LOCAL PLC AND SEND ALARM TO THE LOCAL COMPUTER. ALSO SHOULD AIR DRYER AD-1 FAIL FOR ANY REASON THEN AD-2 IS TO BE STARTED AUTOMATICALLY BY THE LOCAL PLC AND AD-2 IS TO BE THE LEAD AIR DRYER. IF AD-2 IS SELECTED AS THE LEAD AIR DRYER, IT IS TO OPERATE AS DESCRIBED FOR AD-1 ABOVE AND AD-1 IS THE BACKUP AS DESCRIBED ABOVE. PROVIDE AUTOMATIC DRAIN VALVES ON EACH AIR DRYER AND 5 RECEIVER TANKS POWERED FROM AIR DRYER CONTROLLER.

K. STACK EMISSIONS: A STACK EMISSION MONITOR IS TO BE PROVIDED BY THE CONTROLS CONTRACTOR. THIS MONITOR IS TO BE PLACED IN THE EXISTING OUTSIDE MASONRY FLUE STACK. THE MONITOR IS TO READ CARBON MONOXIDE (CO) AND SULFUR DIOXIDE (SO2) IN THE FLUE STACK. THIS MONITOR DOES NOT CONTROL BUT IS USED TO HELP MEASURE THE EFFECTIVENESS OF THE PLANT AND RECORD THE READINGS AND COULD BE USED AS A CHECK FOR THE COAL BOILER CONTROLS. THIS MONITOR IS TO FEED ITS READINGS BACK TO THE LOCAL COMPUTER AND RECORD ON AN HOURLY BASIS.

L. ECONOMIZER E-1, 2 & 3: AN ECONOMIZER PLC IS TO CONTROL ECONOMIZER E-1, E2 AND E-3. THIS PLC IS TO BE PROVIDED BY THE CONTROLS CONTRACTOR AND CAN BE A SELF-CONTAINED PLC OR INTEGRATED INTO THE BALANCE OF PLANT PLC. IT IS IDENTIFIED HERE AS A SEPARATE PLC BECAUSE THE NUMBER OF POINTS REQUIRED. THE ECONOMIZER E-1 IS TO BE ACTIVATED WHENEVER BOILER B-1 IS ACTIVATED AND ECONOMIZER E-2 IS TO BE ACTIVATED WHENEVER BOILER B-2 IS ACTIVATED AND LIKEWISE FOR ECONOMIZER E-3 FOR BOILER B-3. THE PLC SHALL MONITOR AND CONTROL, BE ADJUSTABLE FOR SETTING ADJUSTMENT ONCE PLANT IS IN OPERATION AND SHALL COMMUNICATE BACK TO THE LOCAL COMPUTER. EACH ECONOMIZER SHALL HAVE THE FOLLOWING MEASUREMENTS AND CONTROLS: INLET FLUE GAS TEMPERATURE SHALL BE MEASURED. OUTLET FLUE GAS TEMPERATURE SHALL BE MEASURED. THESE MEASUREMENTS WILL BE USED BY PLANT OPERATORS TO MONITOR THE EFFECTIVENESS OF THE ECONOMIZER. THE FREEZE PROTECTION CONTROL VALVE LOCATED IN THE INLET FEEDWATER LINE SHALL BE CONTROLLED FROM THE OUTLET FLUE TEMPERATURE SENSOR. IF AND WHEN A BOILER IS SHUT DOWN, THE FLUE CAN BECOME COLD FROM OUTSIDE AIR DROPPING DOWN THE FLUE AND FREEZING THE ECONOMIZER COIL IS POSSIBLE. THUS WHEN THE OUTLET FLUE TEMPERATURE REACHES 35°F THE SMALL FEEDWATER FREEZE PROTECTION VALVE SHALL OPEN AND ALLOW A SMALL AMOUNT OF HOT FEEDWATER TO RUN THROUGH THE ECONOMIZER AND PREVENT FREEZING. ECONOMIZERS E-1 AND E-2 HAVE SOOT BLOWING CONTROLS AS FOLLOWS. ECONOMIZER E-3 DOES NOT HAVE SOOT BLOWING. ECONOMIZER E-1 & E-2 EACH HAVE A PNEUMATIC AIR VALVE IN THE SOOT BLOWER CONTROLLED FROM THE PLC CONTROLLER. THE PLC CONTROLLER WILL ACTIVATE A SOOT BLOWING CYCLE EVERY 8 HOURS BY FIRST OPERATING A PILOTED SOLENOID VALVE WHICH CONTROLS THE MAIN SOOT BLOWER VALVE. THERE IS A PRESSURE SWITCH IN THE FEED LINE TO THE SOOT BLOWER WHICH SENSES THE PRESSURE IN THE AIR LINE. WHEN THE PRESSURE DROPS TO 100 PSI, THE PLC WILL CLOSE THE PILOT SOLENOID VALVE WHICH IN TURN CLOSES THE MAIN SOOT BLOWING VALVES. ONCE THE PRESSURE BUILDS BACK UP TO 125 PSI, THE PLC SHALL EITHER ACTIVATE FURTHER SOOT BLOWING OR WAIT FOR THE NEXT SOOT BLOWING CYCLE.

M. BOILER BLOWOFF TANKS: A SELF-CONTAINED COLD WATER VALVE PROVIDED WITH THE BLOWOFF TANK IS TO CONTROL TO REGULATE DISCHARGE TO DRAIN TO 140°F ADJUSTABLE.

N. BLOWDOWN SEPARATOR: A SELF-CONTAINED COLD WATER VALVE PROVIDED WITH THE BLOWDOWN SEPARATOR IS TO CONTROL TO REGULATE DISCHARGE TO DRAIN TO 140°F ADJUSTABLE.

O. STEAM UNIT HEATERS: EACH UNIT HEATER SHALL HAVE A STEAM VALVE PROVIDED AND CONTROLLED BY THE CONTROL CONTRACTOR AND TO BE OPENED AND CLOSED. THE FAN IS TO BE CYCLED ON AND OFF FROM A FACTORY SPACE THERMOSTAT MOUNTED ON FACTORY MOUNTING BRACKET.

P. STEAM PRV'S: A SELF-CONTAINED PILOT OPERATED STEAM PRESSURE REDUCING VALVE REGULATES THE DOWNSTREAM STEAM PRESSURE TO THE SCHEDULED PRESSURE.

Q. FUEL OIL TANK MONITORING SYSTEM: A COMPLETE FUEL OIL MONITORING AND LEAK DETECTION SYSTEM SHALL BE PROVIDED AND INSTALLED AS SPECIFIED WITHIN THE FUEL OIL TANK.

R. TEMPORARY BOILERS: THE TEMPORARY BOILERS ARE TO COME WITH THEIR OWN CONTROL MADE OPERATIONAL BY THE CONTRACTOR. THIS INCLUDES BOILER, DEAERATOR, CONDENSATE AND FEEDWATER PUMPS, MAKE-UP WATER, FUEL OIL, GAS TRAIN, STEAM PRESSURE, ETC. TO MAKE A COMPLETE SYSTEM.

S. CHEMICAL FEED PUMPS: THE CHEMICAL FEED PUMPS ARE MANUALLY OPERATED BY OPERATORS.

CONSTRUCTION DOCUMENTATION SUBMISSION - BIDDING & CONTRUCTION

| Revisions: | Date |
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| | |

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