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PROJECT

ERF CONSTRUCTION WORKS FOR THE NORTH LONDON HEAT & POWER PROJECT

ORIGINATOR

EMPRESARIOS AGRUPADOS

DOCUMENT TITLE

MAIN STEAM, EXTRACTIONS, AUXILIARY STEAM & BY-PASS SYSTEM FUNCTIONAL DESCRIPTION

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DOCUMENT CHANGES LOG

Revision	Remarks	Paragraph
P01	Not applicable. First issue.	-

Please take into consideration the recommendations and notes from Hazop sessions.

Please consider the comments done by NLWA in the attached below and the proposed answer.

TABLE OF CONTENTS

1. PURPOSE

The purpose of this document is to describe the main functions, define the basic control of the system, its interfaces with other systems of the **Main Steam, Extractions, Auxiliary Steam & By-Pass System** for the Energy Recovery Facility (ERF) that North London Waste Authority (NLWA) will install at the Edmonton EcoPark Site.

2. REFERENCE DOCUMENTS

The following are the reference documents for the system:

1. Flow diagrams.
   - NPE7-EAI-41XX-XXX-PD-XA-000010 - Main Steam, Extractions, Auxiliary Steam & By-Pass System - P&ID.
   - NPE7-EAI-41XX-XXX-PD-XA-000017 - Chemical Dosing System - P&ID.
   - NPE7-EAI-41XX-XXX-PD-XA-000014 - Sampling System - P&ID.
   - NPE7-EAI-41XX-XXX-PD-XA-000002 - Main Steam, Extractions, Auxiliary Steam & By-pass System - P&ID.
   - NPE7-HZI-41AC2-ZZZ-PD-XA-0003 - Boiler Water Side Drum and Economiser - P&ID.
   - NPE7-HZI-41AC2-ZZZ-PD-XA-000007 - Boiler Blowdown - P&ID.
   - NPE7-HZI-41AE-ZZZ-PD-XA-000001 - Flue Gas Path SCR - P&ID
   - NPE7-HZI-41AC4-ZZZ-PD-XA-000002 - Primary Air Preheater - P&ID
   - NPE7-HZI-41AC4-ZZZ-PD-XA-000006 - Secondary Air Preheater - P&ID
   - NPE7-EAI-41AC-XXX-PD-XA-000005 - Boiler Drains System - P&ID
   - NPE7-HZI-41AC4-ZZZ-PD-XA-000001 - Primary Air System Feed - P&ID
   - NPE7-HZI-41AC4-ZZZ-PD-XA-000005 - P&ID Secondary Air System- P&ID
   - NPE7-HZI-41AC2-ZZZ-PD-XA-000005 - Boiler Water Side Superheater- P&ID
   - NPE7-EAI-41XX-XXX-PD-XA-000009 - District Heating- P&ID
   - NPE7-EAI-41XX-XXX-PD-XA-000015 - Steam Turbine Drains System- P&ID
   - PENDING - Seal Steam System- P&ID Add reference for this P&ID as well as the rest associated to turbine.

EAI

2. EA documentation
   - ~~NPE7-EAI-41XX-XXX-PC-XA-000005 - Component Identification System.~~
   - NPE7-EAI-41XX-XXX-MS-XA-000001 - Mechanical Design Criteria
   - NPE7-EAI-41XX-XXX-MS-XA-007501 - I&C Design Criteria
   - NPE7-EAI-41XX-XXX-MB-XA-000001 - Heat Balance - Flow Diagram & Design report
   - NPE7-EAI-41XX-XXX-FM-XA-000001 - Water Balance - Flow Diagram & Design report & Calc.
   - NPE7-EAI-41XX-XXX-SP-XA-000101 - Piping Class Technical Specification.
3. Equipment documentation
   - NP-RUK-41XX-XXX-SP-TA-090001_IChemE - Schedule 1: Description of the Works.

Please note that the document applicable for KKS is NPE7-ACC-41XX-ZZZ-ME-WA-000002 KKS Manual. Amend this reference in the applicable documents.

- NP-RUK-41XX-XXX-SP-TA-090028_IChemE - Schedule 22.1.7: General Technical Requirements.
- NP-RUK-41XX-XXX-SP-TA-090022_IChemE - Schedule 22.1.1 Technical Specifications for Incinerator Boiler.
- NLHP-00-EC-LT-HZI-0001 - Battery Limits List.
- NPE7-EAI-41XX-XXX-RG-XA-000001 - Mechanical Equipment List
- NPE7-EAI-41XX-XXX-CA-XA-0000003 – Main Steam, Extractions, Auxiliary Steam & By-Pass System Calculation Note
- NPE7-EAI-41XX-XXX-DS-XA-000019 - Deaerator & Feedwater Tanks - Datasheets.
- PENDING - Steam Turbine Documentation
- PENDING - ACC documentation

Update documentation references.

All reference documents are to be considered in their last revision.

3. GENERAL DESCRIPTION

3.1 FUNCTIONS

The Main Steam, Extractions, Auxiliary Steam & By-Pass System has been designed for the following functions:

- To supply steam from the boilers to the steam turbine.
- To supply medium pressure steam to the auxiliary steam / medium pressure header.
- To temper or condition the steam to meet the conditions of auxiliary steam header, ejectors, district heating and/or ACC.
- To supply low pressure steam to district heating heat exchanger for district heating and/or LP Preheater for heating the condensate system.
- To control the pressure of the high pressure, when needed, by means of the bypass valves.
- To collect and send the condensate generated in the different steam piping lines to the atmospheric drain tank, the intermittent blowdown tanks or the condenser expansion tank.
- To absorb steam turbine load rejections without causing boiler trips.
- To keep the operation of the plant when the turbine is out of operation.
- To supply steam for sparging, pegging and for heating the Main Steam, Extractions, Auxiliary Steam & By-Pass System by means of steam injection in the Deaerator & Feedwater Tank.

This sentence is not clear. How is the deaerator used for heating the Main Steam System?

- To supply steam from boilers steam drums to the Steam-Flue Gas heat exchangers.
- To supply steam to the steam ejectors to keep or reach the vacuum of the water steam cycle.
- To supply steam for LP side of the primary air preheaters, secondary air preheaters and sealing air preheaters to perform their operation, increase the performance of the plant and accomplish the emission levels of the boilers.
- To facilitate the operation of the plant and decrease start-up times.
- To supply seal steam to the turbine until the turbine would be capable to seal itself.

3.2 FUNCTIONAL DESCRIPTION

3.2.1 General

The Main Steam, Extractions, Auxiliary Steam & By-Pass System can be divided into the following subsystems:

- **High Pressure Steam Supply.** This subsystem is in charge to supply main steam to the steam turbine (for sealing and operation), main steam attemperation valve, district heating attemperation valves, ejectors attemperation valves and boilers bypass valves.

- **Medium Pressure Steam Supply.** This subsystem comprise the conditioned steam coming from IV Extraction, III Extraction, the tempered steam from main steam attemperation valve, the auxiliary steam header and its supply to the Deaerator & Feedwater Tank and boilers preheaters.

- **Low Pressure Steam Supply.** This subsystem comprise the extractions I and II, their supply to district heating heat exchangers and to LP preheater.

- **Saturated Steam Supply.** This subsystem referred to the supply from boilers drums to the Steam-Flue Gas Heat Exchangers.

- **HP Bypass Steam Supply.** This system comprise the Boiler 1 & 2 Bypass valves to the ACC.

- **Tempered & Conditioned Steam Supply.** This subsystem is in charge of temper and condition the steam for the different uses that it is required for the plant operation.

3.2.2 High Pressure Steam Supply

This subsystem is mainly made up of the live steam outlets from boilers and their header to the steam turbine, the interconnection header which connects both boilers header to supply auxiliary steam to the ejectors, turbine sealing and main steam attemperation valve and the connection with Boiler 1 & 2 bypass valves.

Main steam produced in the boilers come out from boilers superheaters to the steam turbine after meeting the conditions by two identical lines (one per boiler) and then distribute to the turbine, to auxiliary consumption or to the bypass as appropriate.

Each boiler outlet line have the following elements:

- Five (5) transmitters with control, two (2) redundant transmitters for pressure (B1/2LBA10CP001A/B) in charge of giving information for the operation of boilers' bypass valves (B1/2MAN10AA401) and the attemperation control valves (B1/2LAF31AA401) for the bypass valves to perform the enthalpy control; and three (3) redundant temperature transmitters

General comment. In P&IDs, not all the pots have abbreviated KKS. Please check.

(B1/2LBA10CT001A/B/C) to participate in the enthalpy control for the bypass operations and if turbine supplier required being able to trip the plant.

- One (1) pot (B1/2LBA10) to collect and drain the condensate that could be produced in the steam inlet of the system. The pot consists of:
    - A main line equipped with a temperature transmitter (B1/2LBA10CT001) for pot's motorized valve automatic control.
    - A secondary line connected to boiler 1/2 intermittent blowdown tank condensate header fitted with a motorized operated valve (B1/2LBA10AA302) and an isolation valve locked open.
    - A manual drain line with a screw connection at the end and double isolation valve.
- Boilers interconnection header connection to supply main steam for auxiliary consumptions.
- Boiler bypass inlet connection.
- A Hydrotest Port connection with a screw end connection and double isolation.
- Two (2) motorized operated valves, one (1) locally operated and the other one operated remotely (B1/2LBA10AA301) to allow the steam flow to the turbine inlet header or to isolate the boilers lines in case of being out of operation; and a drain connection with double isolation.

Both boilers inlet lines are connected to the main steam header that goes to the steam turbine. This header have the following elements:

- Two (2) test point, one (1) for pressure (B0LBA10CP801) and the other one (1) for temperature (B0LBA10CT801).

Update according to Doosan's instruments arrangement.

- Four (4) transmitters with control linked to the steam turbine control room to be defined by the steam turbine supplier. Two (2) redundant for pressure (B0LBA10CP001A/B) and the other two (2) for temperature (B0LBA10CT001A/B).
- Two (2) transmitters for information, one (1) for pressure (B0LBA10CP002) and the other one (1) for temperature (B0LBA10CT002).
- One (1) drain pot (B0LBA10) to collect and drain the condensate that could be produced in the turbine inlet steam header. The pot consists of:
    - A main line equipped with a temperature transmitter (B0LBA10CT003) for pot's motorized valve automatic control.

- A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA10AA302) and an isolation valve.
- A manual drain line with a screw connection at the end and double isolation.

- One (1) vent connection to warm up during start-up and to help, if needed, in case of steam rejection by the steam turbine. This vent line is fitted with the following elements:
  - One (1) isolation manual valve.
  - One (1) motor operated valve with limit switch (B0LBA10AA302)
  - One (1) silencer (B0LBA10BS001) before the discharge to the outside.

The interconnection line between boiler inlets are destined to supply auxiliary steam avoiding the use of the steam turbine. This allow the operation of the plant without turbine operation, making the system more solid and non-dependent. This main steam for auxiliary consumptions could be deliver as steam supply to medium pressure header by means of a main steam attemperation valve, as main steam for turbine sealing or after tempered to ejectors to maintain or generate the vacuum conditions of the plant.

The interconnection header between boilers consists of:

- Two (2) double motor operated isolation, each one with one (1) valve controlled remotely (B0LBA30AA301) and the other one (1) locally, with its corresponding drain connection double isolated. One (1) of each double isolation is located at connection inlet with the boiler inlet lines to allow the operation of the common consumers of this header with one or both boilers supply but at the same time allowing the isolation of each boiler in case of being out of operation.

- One (1) connection to the supply header for the Main Steam Attemperation valve (B0LBA30AA401) and for District Heating Attemperation valve (B0LBA31AA401) in order to be able to provide steam for district heating, Deaerator & Feedwater Tank (B0LAA10BB001) and Boiler 1 & 2 preheaters in case of the steam turbine would be out of operation or on standby.

- One (1) connection to the supply header for steam turbine sealing and steam ejectors in order not to require auxiliary boiler existence or steam turbine running to their operation.~~z~~

The turbine sealing line have the following elements:

- One (1) drain pot (B0LBW10) to collect and drain the condensate that could be produced in steam turbine sealing line. The pot consists of:

- A main line equipped with a temperature transmitter (B0LW10CT002) for pot's motorized valve automatic control.

- A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBW10AA301) and an isolation valve.

- A manual drain line with a screw connection at the end and double isolation.

- Two (2) test points, one (1) for pressure (B0LBW10CP801) and the other one (1) for temperature (B0LBW10CT801).

- Two (2) transmitters, one (1) for pressure (B0LBW10CP001) and the other one (1) for temperature (B0LBW10CT001). These instruments are dependent of steam turbine supplier for information and/or control.

3.2.3 Medium Pressure Steam Supply

Medium pressure steam supply subsystem comprise the auxiliary steam / MP steam header distribution and its sources of supply. It is in charge of supply to the Deaerator & Feedwater Tank and the Boiler 1 & 2 air preheaters (LP side of the Primary air Preheaters [B1/2HLC10AC001], Secondary Air Preheaters [B1/2HLC20AC001] and Sealing Air Preheaters [B1/2HMW10AC001]) at the conditions required.

The MP steam header could be feed from three (3) different sources:

- Main source of supply is the steam coming from the steam turbine's III extraction that is specifically design for this supply.

- Second source of supply is by means of the steam turbine's IV extraction. To use this source of supply, due to its conditions, the steam coming from the turbine shall be condition by the IV Extraction Conditioning Valve (B0LBD10AA401). This source in normal or standard operation shall not be used is only destined to be used in case that the III Extraction of the turbine cannot operate for anyway or if it cannot provide the steam conditions required for the consumers.

conditioned

- The third source of supply is by means of the Main Steam Attemperation valve. As it is commented before this way of supply is destined to be used when the steam turbine is out of operation or on standby thus it cannot export steam by its extractions.

The III extraction header flows to the MP steam / Auxiliary steam header that it is connected with the outlet lines of the IV Extraction Conditioning Valve and Main Steam Attemperation valve in such way that these auxiliary sources could substitute the III Extraction supply in case of being necessary. MP steam header is in charge of supply steam to the DA & FWT and to the boilers preheaters. For this last purpose it is connected to Air preheaters header that redirect the flow to the Boiler 1 & 2 in two

separated

(2) separates connections. Each of these boilers connections lead the steam to the primary, secondary and sealing air preheaters of each boiler.

The III Extraction header have the following elements:

- Two (2) test points, one (1) for pressure (B0LBD20CP801) and the other one (1) for temperature (B0LBD20CT801).
- Two (2) transmitters, one (1) for pressure (B0LBD20CP001) and the other one (1) for temperature (B0LBD20CT001). These instruments are dependent of steam turbine supplier for information and/or control.
- One (1) non return valve assisted pneumatically (B0LBD20AA301) and one (1) motor operated valve for isolation (B0LBD20AA302). Between both valves there is a drain connection with a screw end and a manual isolation valve.
- One (1) drain pot (B0LBD20) to collect and drain the condensate that could be produced in the III extraction header. The pot consists of:
    - A main line equipped with a temperature transmitter (B0LBD20CT002) for pot's motorized valve automatic control.
    - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBD20AA303).
    - A manual drain line with a screw connection at the end with isolation.

The auxiliary steam header have the following elements:

- Three (3) connections for the different sources, one (1) for the III extraction, one (1) for the IV extraction conditioning valve outlet and the last one (1) for the Main Steam attemperation valve outlet.
- One (1) connection for the safety relief to protect the header against overpressure, fitted with a pressure safety valve (B0LBG10AA501) with a silencer at atmosphere discharge (B0LBG10BS001). Indicate the KKS for the silencer in the P&ID.
- One (1) drain pot (B0LBG10) to collect and drain the condensate that could be produced in auxiliary steam header. The pot consists of:
    - A main line equipped with a temperature transmitter (B0LBG10CT004) for pot's motorized valve automatic control.
    - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBG10AA301) and a manual isolation valve.
    - A manual drain line with a screw connection at the end with double isolation.

- Four (4) transmitters, two (2) for pressure (B0LBG10CP001/2) and two (2) for temperature (B0LBG10CT001/2).

This test point is not shown in P&D.

- Two (2) test points, one (1) for pressure (B0LBG10CP801) and the other one (1) for temperature (B0LBG10CT801).

- One (1) connection for Deaerator & Feedwater Tank and one (1) connection for boilers 1 & 2 preheaters.

The supply line to deaerator is provided with:

- One (1) locked open isolation valve.

There is a control station instead of an isolation valve.

- One (1) drain pot (B0LBG20) to collect and drain the condensate that could be produced in deaerator steam supply line. The pot consists of:

  - A main line equipped with a temperature transmitter (B0LBG20CT001) for pot's motorized valve automatic control.

  - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBG20AA302).

  - A manual drain line with a screw connection at the end with isolation.

  - One (1) control station to adequate the conditions to meet the requirements in the Deaerator & Feedwater Tank.This control station consists of one (1) control valve (B0LBG20AA401) isolated upstream and downstream, a bypass line with a motor operated valve (B0LBG20AA301) and their corresponding vents and drain lines with isolation.

Check valve KKS in P&ID.

Describe the system downstream the branches to boilers preheaters.

The supply line to Boilers 1 & 2 preheaters have a locked open isolation valve and it is split in two (2) lines, one per each boiler. These line are in charge of the supply of the steam to the LP side of the primary air preheater, secondary air preheater and sealer air preheater of each boiler.

3.2.4 Low Pressure Steam Supply

This subsystem comprise the supply for the district heating and LP Preheater, whose function is to supply steam to heat up the district heating water and condensate, respectively.

The district heating supply comprise two (2) sources, the main one that comes from the Steam Turbine II Extraction and, in case of the turbine would be out of operation, the steam supply would be done by the District Heating Attemperation Valve.

Indicate valve KKS.

II Extraction line is connected to District heating system and to the District Heating attemperation valve outlet. The extraction has the following elements:

- Two (2) test points, one (1) for pressure (B0LBS10CP801) and the other one (1) for temperature (B0LBS10CT801).

- Two (2) transmitters, one (1) for pressure (B0LBS10CP001) and the other one (1) for temperature (B0LBS10CT001). These instruments are dependent of steam turbine supplier for information and/or control.

- One (1) non return valve assisted pneumatically (B0LBS10AA301) and one (1) motor operated valve for isolation (B0LBS10AA302). Between both valves there is a drain connection with a screw end and a manual isolation valve.

- One (1) drain pot (B0LBS10) to collect and drain the condensate that could be produced in the II extraction header. The pot consists of:

    - A main line equipped with two (2) level switch with control (B0LBS10CL001/2) for pot's motorized valve automatic control.

    - A secondary line connected to expansion drain tank condensate header fitted with a pneumatically operated valve (B0LBS10AA303).

    - A manual drain line with a screw connection at the end with isolation.

- Two (2) transmitters, one (1) for pressure (B0LBS10CP002) and other one (1) for temperature (B0LBS10CT002) for information.

- One (1) connection for the steam provided from the District Heating Attemperation Valve.

I Extraction line is connected to Condensate System by means of the LP Preheater. The extraction has the following elements:

- Two (2) test points, one (1) for pressure (B0LBS20CP801) and the other one (1) for temperature (B0LBS20CT801).

- Two (2) transmitters, one (1) for pressure (B0LBS20CP001) and the other one (1) for temperature (B0LBS20CT001). These instruments are dependent of steam turbine supplier for information and/or control.

- One (1) non return valve assisted pneumatically (B0LBS20AA301) and one (1) motor operated valve for isolation (B0LBS20AA302). Between both valves there is a drain connection with a screw end and a manual isolation valve.

- One (1) drain pot (B0LBS20) to collect and drain the condensate that could be produced in the II extraction header. The pot consists of:

    - A main line equipped with two (2) level switch with control (B0LBS20CL001/2) for pot's motorized valve automatic control.

- A secondary line connected to expansion drain tank condensate header fitted with a pneumatically operated valve (B0LBS20AA303).

- A manual drain line with a screw connection at the end with isolation.

3.2.5 Saturated Steam Supply

This subsystem comprises two (2) identical lines that interconnect the boiler drum of each boiler to the Steam-Flue Gas heat exchanger that are in charge to supply the required amount of steam that it is destined to perform the flue gas heating.

Update subsystem description according to P&ID.

Besides the control that it is under Boiler supplier scope the line have a drain pot (B1/2HAD50) to collect the condensates that could be produced in the steam lines due to its saturation condition. The drain pot consists of:

- A main line equipped with two (2) level switch with control (B1/2HAD50CL001A/B) for pot's motorized valve automatic control.

- A secondary line connected to Boiler ½ Intermittent Blowdown Tank condensate header fitted with a pneumatically operated valve (B1/2HAD50AA303) and an isolation valve.

- A manual drain line with a screw connection at the end with double isolation.

3.2.6 HP Bypass Steam Supply

This subsystem comprises two (2) identical bypass stations one per boiler that are in charge to adequate the steam to the conditions required for the ACC in case of being necessary to bypass the turbine.

This subsystem allows to operate the plant without the turbine operation, to start-up the plant and avoid tripping the plant in case of turbine failure.

Bypass valves perform based on enthalpic control.

The inlet line to bypass station is located at the boilers' steam inlet to the main steam system before the main steam header that goes to the turbine.

The inlet line is fitted with a drain pot (B1/2LBA20) to collect and drain the condensate that could be produced. The pot consists of:

- A main line equipped with a temperature transmitter (B1/2LBA20CT001) for pot's motorized valve automatic control.

- A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B1/2LBA20AA301) and an isolation valve.

- A manual drain line with a screw connection at the end with double isolation.

The boilers 1/2 bypass valves (B1/2MAN10AA401) have four (4) connections:

- Inlet connection from main steam
- Outlet connection to the ACC fitted with four (4) transmitters with control, two (2) redundant for pressure (B1/2MAN10CP001A/B) and two (2) redundant for temperature (B1/2MAN10CT001A/B) all of them for bypass valve control and its attemperation control valve.
- An internal drain pot (B1/2MAN10) to collect the condensate or water produced in the bypass valve. The drain pot consists of:
    - A main line equipped with a temperature transmitter (B1/2MAN10CT001) for pot's motorized valve automatic control.
    - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B1/2MAN10AA302) and an isolation valve.
    - A manual drain line with a screw connection at the end with double isolation.
- An attemperation connection. This line consist of:
    - One (1) isolating valve pneumatically actuated (B1/2LAF31AA301) with isolation locked open and drain connection double isolated.
    - One (1) filter (B1/2LAF31AT001) with its own drain double isolated and a pressure differential transmitter (B1/2LAF31CP001) with the purpose to protect the flowmeter downstream.
    - One (1) flowmeter (B1/2LAF31CF001) with two (2) redundant flow transmitters with control (B1/2LAFCF001A/B) used to perform the enthalpic control of the bypass valve.
    - One (1) pressure test point (B1LAF31CP801) and two (2) pressure transmitters (B1/2LAF31CP001/2) to monitor the condition upstream and downstream the control station.
    - A control station to adequate the required flow for the bypass valve that consists of:
        - A control valve (B1/2LAF31AA401) double isolated locked open at both sides with its corresponding drain and vents connection double isolated.

- A bypass line fitted with a globe valve and an isolation valve with a drain connection double isolated.

- One (1) non-return valve to avoid counterflow and two (2) isolation valves locked open with its corresponding drain connection double isolated.

3.2.7 Tempered & Conditioned Steam Supply

This subsystem is referred to the different attemperation and conditioning valves that adjust the conditions of the steam for the different purposes of the system. The main differences between these valves and the bypass valves are their function purposes and the way of control that in these cases are performed by temperature instead of enthalpic control.

The valves included in this subsystem are the following ones:

- **Main Steam Attemperation Valve (B0LBA30AA401).** Its function is to adequate the conditions of the main steam to supply the steam to the auxiliary header in case of the turbine have been out of operation or on standby. Its connections are as follow:

  - Inlet connection fitted with two (2) test points, one (1) for pressure (B0LBA30CP802) and the other one (1) for temperature (B0LBA30CP802) and; a drain pot (B0LBA30 #1) that could be generated in the line that consists of:

    - A main line equipped with a temperature transmitter (B0LBA30CT004) for pot's motorized valve automatic control.

    - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA30AA303) and an isolation valve.

    - A manual drain line with a screw connection at the end with double isolation.

  - An internal drain pot (B0LBA30 #2) to collect all the water and condensate generated in the valve in case of necessity. The drain pot consists of:

    - A main line equipped with a temperature transmitter (B0LBA30CT005) for pot's motorized valve automatic control.

    - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA30AA304) and an isolation valve.

- A manual drain line with a screw connection at the end with double isolation.

- An attemperation line to provide the required water to perform the attemperation of the steam. This line consists of:

  - One (1) isolating valve pneumatically actuated (B0LAF33AA301) with isolation locked open and drain connection double isolated.

  - Two (2) pressure transmitters (B0LAF33CP001/2) to monitor the condition upstream and downstream the control station.

  - A control station to adequate the required flow for the bypass valve that consists of:

    - A control valve (B0LAF33AA401) double isolated locked open at both sides with its corresponding drain and vents connection double isolated.

    - A bypass line fitted with a globe valve and an isolation valve with a drain connection double isolated.

  - One (1) non-return valve to avoid counterflow and two (2) isolation valves locked open with its corresponding drain connection double isolated.

- Outlet connection that lead the steam to the auxiliary steam header. This line have the following elements:

  - Two (2) test points, one (1) for pressure (B0LBG12CP801) and the other one (1) for temperature (B0LBG12CT801).

  - Four (4) transmitters with control in order to perform the temperature control and, also, adequate the pressure, if required. Two (2) redundant transmitters for pressure (B0LBG12CP001A/B) and the other two (2) redundant transmitters for temperature (B0LBG12CT001A/B).

- **IV Extraction Conditioning Valve (B0LBD10AA401).** Its function is to adequate the conditions of the IV extraction steam to supply the steam to the auxiliary header in case of the Steam Turbine III Extraction cannot provide steam at required conditions. Its connections are as follow:

  - The IV Extraction header have the following elements:

    - Two (2) test points, one (1) for pressure (B0LBD10CP801) and the other one (1) for temperature (B0LBD10CT801).

- Two (2) transmitters, one (1) for pressure (B0LBD10CP001) and the other one (1) for temperature (B0LBD10CT001). These instruments are dependent of steam turbine supplier for information and/or control.

- One (1) non return valve assisted pneumatically (B0LBD10AA301) and one (1) motor operated valve for isolation (B0LBD10AA302). Between both valves there is a drain connection with a screw end and a manual isolation valve.

- One (1) drain pot (B0LBD10 #1) to collect and drain the condensate that could be produced in the III extraction header. The pot consists of:

  - A main line equipped with a temperature transmitter (B0LBD10CT002) for pot's motorized valve automatic control.

  - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBD20AA303).

  - A manual drain line with a screw connection at the end with isolation.

- Inlet connection fitted with two (2) test points, one (1) for pressure (B0LBD10CP802) and the other one (1) for temperature (B0LBD10CP802); two (2) transmitters, one (1) for pressure (B0LBD10CP002) and the other one (1) for temperature (B0LBD10CT003) and; a drain pot (B0LBD10 #2) that could be generated in the line that consists of:

  - A main line equipped with a temperature transmitter (B0LBA30CT004) for pot's motorized valve automatic control.

  - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA30AA304) and an isolation valve.

  - A manual drain line with a screw connection at the end with double isolation.

- An internal drain pot (B0LBD10 #3) to collect all the water and condensate generated in the valve in case of necessity. The drain pot consists of:

  - A main line equipped with a temperature transmitter (B0LBD10CT005) for pot's motorized valve automatic control.

- A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBD10AA305) and an isolation valve.
- A manual drain line with a screw connection at the end with double isolation.

- An attemperation line to provide the required water to perform the attemperation of the steam. This line consists of:
  - One (1) isolating valve pneumatically actuated (B0LAF34AA301) with isolation locked open and drain connection double isolated.
  - Two (2) pressure transmitters (B0LAF34CP001/2) to monitor the condition upstream and downstream the control station.
  - A control station to adequate the required flow for the bypass valve that consists of:
    - A control valve (B0LAF34AA401) double isolated locked open at both sides with its corresponding drain and vents connection double isolated.
    - A bypass line fitted with a globe valve and an isolation valve with a drain connection double isolated.
  - One (1) non-return valve to avoid counterflow and two (2) isolation valves locked open with its corresponding drain connection double isolated.
- Outlet connection that lead the steam to the auxiliary steam header. This line have the following elements:
  - Two (2) test points, one (1) for pressure (B0LBG11CP801) and the other one (1) for temperature (B0LBG11CT801).
  - Four (4) transmitters with control in order to perform the temperature control and, also, adequate the pressure, if required. Two (2) redundant transmitters for pressure (B0LBG121P001A/B) and the other two (2) redundant transmitters for temperature (B0LBG11CT001A/B).

11

- **District Heating Attemperation Valve (B0LBA31AA401).** Its function is to adequate the conditions of the main steam to supply the steam to the District Heating System in case of the turbine have been out of operation or on standby. Its connections are as following:

- Inlet connection fitted with two (2) test points, one (1) for pressure (B0LBA31CP802) and the other one (1) for temperature (B0LBA31CP802); two (2) transmitters, one (1) for pressure (B0LBA31CP002) and the other one (1) for temperature (B0LBA31CT003) and; a drain pot (B0LBA31 #1) that could be generated in the line that consists of:
  - A main line equipped with a temperature transmitter (B0LBA31CT004) for pot's motorized valve automatic control.
  - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA31AA302) and an isolation valve.
  - A manual drain line with a screw connection at the end with double isolation.
- An internal drain pot (B0LBA31 #2) to collect all the water and condensate generated in the valve in case of necessity. The drain pot consists of:
  - A main line equipped with a temperature transmitter (B0LBA31CT005) for pot's motorized valve automatic control.
  - A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA30AA303) and an isolation valve.
  - A manual drain line with a screw connection at the end with double isolation.
- An attemperation line to provide the required water to perform the attemperation of the steam. This line consists of:
  - One (1) isolating valve pneumatically actuated (B0LAF32AA301) with isolation locked open and drain connection double isolated.
  - Two (2) pressure transmitters (B0LAF32CP001/2) to monitor the condition upstream and downstream the control station.
  - A control station to adequate the required flow for the bypass valve that consists of:
    - A control valve (B0LAF32AA401) double isolated locked open at both sides with its corresponding drain and vents connection double isolated.

- A bypass line fitted with a globe valve and an isolation valve with a drain connection double isolated.

▪ One (1) non-return valve to avoid counterflow and two (2) isolation valves locked open with its corresponding drain connection double isolated.

○ Outlet connection that lead the steam to the District heating header. This line have the following elements:

▪ Two (2) test points, one (1) for pressure (B0LBG40CP801) and the other one (1) for temperature (B0LBG40CT801).

▪ Four (4) transmitters with control in order to perform the temperature control and, also, adequate the pressure, if required. Two (2) redundant transmitters for pressure (B0LBG40CP001A/B) and the other two (2) redundant transmitters for temperature (B0LBG40CT001A/B).

Check KKS acc. to P&ID.

- **Ejectors Attemperation Valve (B0LBA40AA401).** Its function is to adequate the conditions of the main steam to supply the steam to the steam ejectors making the vacuum generation process independent of the turbine and assuring ejectors functioning without the necessity of an auxiliary boiler. Its connections are as follow:

○ Inlet connection fitted with two (2) test points, one (1) for pressure (B0LBA40CP801) and the other one (1) for temperature (B0LBA40CP801) and; a drain pot (B0LBA40 #1) that could be generated in the line that consists of:

CT

▪ A main line equipped with a temperature transmitter (B0LBA40CT001) for pot's motorized valve automatic control.

▪ A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA40AA301) and an isolation valve.

▪ A manual drain line with a screw connection at the end with double isolation.

○ An internal drain pot (B0LBA40 #1) to collect all the water and condensate generated in the valve in case of necessity. The drain pot consists of:

▪ A main line equipped with a temperature transmitter (B0LBA40CT002) for pot's motorized valve automatic control.

- A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA40AA302) and an isolation valve.
- A manual drain line with a screw connection at the end with double isolation.

- An attemperation line to provide the required water to perform the attemperation of the steam. This line consists of:
  - One (1) isolating valve pneumatically actuated (B0LAF35AA301) with isolation locked open and drain connection double isolated.
  - Two (2) pressure transmitters (B0LAF35CP001/2) to monitor the condition upstream and downstream the control station.
  - A control station to adequate the required flow for the bypass valve that consists of:
    - A control valve (B0LAF35AA401) double isolated locked open at both sides with its corresponding drain and vents connection double isolated.
    - A bypass line fitted with a globe valve and an isolation valve with a drain connection double isolated.
  - One (1) non-return valve to avoid counterflow and two (2) isolation valves locked open with its corresponding drain connection double isolated.

- Outlet connection that lead the steam to the steam ejectors inlet line. This line have the following elements:
  - Four (4) transmitters with control in order to perform the temperature control and, also, adequate the pressure, if required. Two (2) redundant transmitters for pressure (B0LBG50CP001A/B) and the other two (2) redundant transmitters for temperature (B0LBG50CT001A/B).
  - A drain pot (B0LBG50) at the inlet of the steam ejectors in order to protect them and collect and drain the condensate that could be produced. This drain pot consists of:
    - A main line equipped with a temperature transmitter (B0LBA50CT002) for pot's motorized valve automatic control.

- A secondary line connected to atmospheric drain tank condensate header fitted with a motorized operated valve (B0LBA50AA301) and an isolation valve.
- A manual drain line with a screw connection at the end with double isolation.

3.3 EMERGENCIES AND TRANSIENTS

Several events can alter the normal operation of the system, the most relevant ones are listed below:

3.3.1 Emergencies

Several events can alter the normal operation of the system; the most relevant ones are listed here below:

- High pressure at Boiler 1 steam inlet.
- High temperature at Boiler 1 steam inlet.
- Low pressure at Boiler 1 steam inlet.
- Low temperature at Boiler 1 steam inlet.
- High temperature at drain pot B1LBA10.
- Low temperature at drain pot B1LBA10.
- High pressure at Boiler 2 steam inlet.
- High temperature at Boiler 2 steam inlet.
- Low pressure at Boiler 2 steam inlet.
- Low temperature at Boiler 2 steam inlet.
- High temperature at drain pot B2LBA10.
- Low temperature at drain pot B2LBA10.
- High pressure at steam turbine inlet.
- High temperature at steam turbine inlet.
- Low pressure at steam turbine inlet.
- Low temperature at steam turbine inlet.

Should it be "steam outlet" instead of "steam inlet"?

Indicate the consequences associated to these emergencies and transients.

- High temperature at drain pot B0LBA10.
- Low temperature at drain pot B0LBA10.
- High pressure at steam turbine sealing line.
- High temperature at steam turbine sealing line.
- Low pressure at steam turbine sealing line.
- Low temperature at steam turbine sealing line.
- High temperature at drain pot B0LBW10.
- Low temperature at drain pot B0LBW10.
- High pressure at steam turbine IV Extraction.
- High temperature at steam turbine IV Extraction.
- Low pressure at steam turbine IV Extraction.
- Low temperature at steam turbine IV Extraction.
- High temperature at drain pot B0LBD10.
- Low temperature at drain pot B0LBD10.
- High pressure at steam turbine III Extraction.
- High temperature at steam turbine III Extraction.
- Low pressure at steam turbine III Extraction.
- Low temperature at steam turbine III Extraction.
- High temperature at drain pot B0LBD20.
- Low temperature at drain pot B0LBD20.
- High pressure at steam turbine II Extraction.
- High temperature at steam turbine II Extraction.
- Low pressure at steam turbine II Extraction.
- Low temperature at steam turbine II Extraction.
- High level at drain pot B0LBS10.

- Low level at drain pot B0LBS10.
- High pressure at steam turbine I Extraction.
- High temperature at steam turbine I Extraction.
- Low pressure at steam turbine I Extraction.
- Low temperature at steam turbine I Extraction.
- High level at drain pot B0LBS20.
- Low level at drain pot B0LBS20.
- High temperature at drain pot B0LBA30 #1.
- Low temperature at drain pot B0LBA30 #1.
- High temperature at drain pot B0LBA30 #2.
- Low temperature at drain pot B0LBA30 #2.
- High pressure at attemperation control station inlet of Main Steam Attemperation Valve.
- Low pressure at attemperation control station inlet of Main Steam Attemperation Valve.
- High pressure at outlet of Main Steam Attemperation Valve.
- High temperature at outlet of Main Steam Attemperation Valve.
- Low pressure at outlet of Main Steam Attemperation Valve.
- Low temperature at outlet of Main Steam Attemperation Valve.
- High pressure at inlet of IV Extraction Conditioning Valve.
- High temperature at inlet of IV Extraction Conditioning Valve.
- Low pressure at inlet of IV Extraction Conditioning Valve.
- Low temperature at inlet of IV Extraction Conditioning Valve.
- High temperature at drain pot B0LBD10 #1.
- Low temperature at drain pot B0LBD10 #1.
- High temperature at drain pot B0LBD10 #2.

- Low temperature at drain pot B0LBD10 #2.
- High pressure at attemperation control station inlet of IV Extraction Conditioning Valve.
- Low pressure at attemperation control station inlet of IV Extraction Conditioning Valve.
- High pressure at outlet of IV Extraction Conditioning Valve.
- High temperature at outlet of IV Extraction Conditioning Valve.
- Low pressure at outlet of IV Extraction Conditioning Valve.
- Low temperature at outlet of IV Extraction Conditioning Valve.
- High temperature at drain pot B0LBA31 #1.
- Low temperature at drain pot B0LBA31 #1.
- High temperature at drain pot B0LBA31 #2.
- Low temperature at drain pot B0LBA31 #2.
- High pressure at attemperation control station inlet of District heating Attemperation Valve.
- Low pressure at attemperation control station inlet of District heating Attemperation Valve.
- High pressure at outlet of District heating Attemperation Valve.
- High temperature at outlet of District heating Attemperation Valve.
- Low pressure at outlet of District heating Attemperation Valve.
- Low temperature at outlet of District heating Attemperation Valve.
- High temperature at drain pot B0LBG10 #1.
- Low temperature at drain pot B0LBG10 #1.
- High pressure at outlet of Medium Pressure header.
- High temperature at outlet of Medium Pressure header.
- Low pressure at outlet of Medium Pressure header.
- Low temperature at outlet of Medium Pressure header.

- High temperature at drain pot B0LBG20 #1.
- Low temperature at drain pot B0LBG20 #1.
- High temperature at drain pot B0LBG30 #1.
- Low temperature at drain pot B0LBG30 #1.
- High temperature at drain pot B1LBG31 #1.
- Low temperature at drain pot B1LBG31 #1.
- High temperature at drain pot B2LBG31 #1.
- Low temperature at drain pot B2LBG31 #1.
- High temperature at drain pot B1LBA20.
- Low temperature at drain pot B1LBA20.
- High temperature at drain pot B1MAN10.
- Low temperature at drain pot B1MAN10.
- High differential pressure at attemperation line of the Boiler 1 Bypass valve.
- High flow at attemperation line of the Boiler 1 Bypass valve.
- Low flow at attemperation line of the Boiler 1 Bypass valve.
- High pressure at attemperation line of the Boiler 1 Bypass valve.
- Low pressure at attemperation line of the Boiler 1 Bypass valve.
- High pressure at Boiler 1 Bypass valve outlet.
- High temperature at Boiler 1 Bypass valve outlet.
- Low pressure at Boiler 1 Bypass valve outlet.
- Low temperature at Boiler 1 Bypass valve outlet.
- High temperature at drain pot B2LBA20.
- Low temperature at drain pot B2LBA20.
- High temperature at drain pot B2MAN10.
- Low temperature at drain pot B2MAN10.

- High differential pressure at attemperation line of the Boiler 2 Bypass valve.
- High flow at attemperation line of the Boiler 2 Bypass valve.
- Low flow at attemperation line of the Boiler 2 Bypass valve.
- High pressure at attemperation line of the Boiler 2 Bypass valve.
- Low pressure at attemperation line of the Boiler 2 Bypass valve.
- High pressure at Boiler 2 Bypass valve outlet.
- High temperature at Boiler 2 Bypass valve outlet.
- Low pressure at Boiler 2 Bypass valve outlet.
- Low temperature at Boiler 2 Bypass valve outlet.
- High temperature at drain pot B0LBA40 #1.
- Low temperature at drain pot B0LBA40 #1.
- High temperature at drain pot B0LBA40 #2.
- Low temperature at drain pot B0LBA40 #2.
- High pressure at attemperation control station inlet of Ejectors Attemperation Valve.
- Low pressure at attemperation control station inlet of Ejectors Attemperation Valve.
- High pressure at outlet of Ejectors Attemperation Valve.
- High temperature at outlet of Ejectors Attemperation Valve.
- Low pressure at outlet of Ejectors Attemperation Valve.
- Low temperature at outlet of Ejectors Attemperation Valve.
- High level at drain pot BHAD50.
- Low level at drain pot B1HAD50.
- High level at drain pot B2HAD50.
- Low level at drain pot B2HAD50.

Add scenarios associated to steam to boilers preheaters and steam to steam/flue gas exchangers.

4. INTERFACES

The interfaces of the system with other systems or related equipment are described below. The interfaces are classified into those that are necessary for the system operation (support systems) and those that are supplied by the system and needed so that other systems con perform their function (dependent systems).

4.1 SUPPORT SYSTEMS

- Boiler 1 & 2. To supply steam to the system
- Low Voltage System. For the operation of the motor-operated valves ~~and Boiler Condensate Return Pumps.~~ These valves belong to feedwater.
- Feedwater system. To supply the required water to temper and condition the steam and to bear turbine rejection and trips by means of the Deaerator & Feedwater Tank.
- Compressed air system. Provides the required compressed air for the operation of the pneumatic valves.
- Chemical dosing system. It is in charge of inject chemicals to control the properties of the system. No chemical dosing is done in steam system. Sampling neither.
- Sampling system. It is the system responsible of checking the chemical conditions of the steam.
- Drain system. The drains of the system are sent to the drain system of the plant.
- Boiler 1 & 2 blowdown system. To receive the drains collection from drain pots.
- Steam turbine drains. To receive the drains collection from the drain pots.
- ACC. Receive the steam after turbine steam rejection or when it is out of operation.

4.2 DEPENDENT SYSTEMS

- Boilers 1 and 2. Receive the required steam at proper conditions to their air preheaters.
- Flue gas Treatment 1 & 2. Receive the required steam at proper conditions for the Steam- Flue gas heat exchangers

- Feedwater system. Receive the required steam at proper conditions for pegging, sparging, deaeration and heating in the Deaerator & Feedwater Tank.

- Primary air preheaters of Boilers 1 and 2. Receive the steam required to perform their operation.

- Secondary air preheaters of Boilers 1 and 2. Receive the steam required to perform their operation.

- Sealing air preheaters of Boilers 1 and 2. Receive the steam required to perform their operation.

- Steam-Flue Gas Heat Exchangers of Boilers 1 and 2. Receive the steam required to perform their operation.

- ACC vacuum system. Receive the required steam at proper conditions to perform their operation.

- Steam turbine. Receive the main steam and the sealing steam required to perform their operation.

- District heating system. Receive the required steam at proper conditions to perform their operation.

- Condensate system. Receive the required steam at proper conditions in the LP preheater for heating the condensate.

5. INSTRUMENT AND CONTROL

5.1 OPERATION DESCRIPTION

The Main Steam, Extractions, Auxiliary Steam & By-Pass System instrumentation is represented in the P&ID (NPE7-EAI-41XX-XXX-PD-XA-000010).

The system instrumentation is shown in P&ID No. NPE7-EAI-41XX-XXX-PD-XA-000002, "P&ID Main Steam, Extractions, Auxiliary Steam & Bypass System"

The system control diagram, document No. NPE7-EAI-41XX-XXX-PP-XA-007604, "Main Steam, Extractions Auxiliary Steam & By-Pass System - Control Logic Diagrams", details the control, protections and automatic devices of the system and includes a block diagram with hierarchical control structure level, so all the conditions to ensure that the system will start up automatically must be fulfilled.

The system can also be controlled from the lower hierarchical levels, actuating directly on the different drives. All drives are monitored and controlled from the operating displays (Human Machine Interfaces or HMI) of the operating stations of the Distributed Control System (DCS) installed in the Central Control Room (CCR).

In order to control and supervise the regulating stations, the system includes Automatic-Manual Operating stations (A/M stations), used by the operator to select the control mode (automatic or manual), modify the setpoints and actuate manually on the demand to the final control element.

In order to actuate upon the different parameters, the A/M station is equipped with auto-manual push buttons.

When a group or equipment item is in automatic mode, it is not possible to control it from the control faceplate located on the operating screen of each system, and it will only follow the automatic orders from a higher hierarchical level.

When a group or equipment item is in manual mode, the operator has the responsibility of the control. The group or equipment ignores any automatic order received from higher hierarchical levels and the control must be done, by the operator, from the control faceplate located on the operating screen of each system.

Whatever will be the control mode, the necessary startup permissives, protections and interlocks shall be programmed into the control system to prevent any type of actuation that could cause any damage to the system equipment or dependent systems. Any equipment, whose actuation depends on a measurement's value, will be immediately rejected to manual if that measurement turns to bad quality status. The plant operator will be warned by the corresponding alarm to solve the problem. In that way equipment improper actuations are prevented.

5.1.1 Normal Operation

During normal operation, the Drain Pot valves will be closed and in auto.

The isolation valves from the boilers will be opened and the Bypass valves will be closed.

The steam generated by the Boilers will be driven to the Steam turbine (ST).

For more detail, see section 4.2.1., Analogue Control and Regulation.

5.1.2 Start-Up

Check reference.

During the start-up, the Drain Pot valves will open to evacuate the condensate created during warm up of the lines.

As the pressure increases, the Bypass Control Valves drive the steam to the condenser, always according with the starting curves of the Boilers and Steam Turbine.

Once the Steam Turbine Floor Pressure setpoint is reached, the steam turbine will start to admit the generated steam and Bypass Control Valves will close.

5.1.3 Shutdown

Boilers steam generation and ST load will decrease gradually until the value is lower enough to open the ST generator circuit breaker.

At this point, the Bypass Control Valves will be in charge to regulate pressure in the lines, keeping the lines pressurized.

Indicate if there is any requirement to be considered in case of emergency shut-down or Plant black-out.

5.2 INSTRUMENTATION AND CONTROL

5.2.1 Main Steam

5.2.1.1 Analogue Control and Regulation

There is no analogue control and regulation in this sheet.

5.2.1.2 Logic Control and Protections

5.2.1.2.1 Boiler #1 Main Steam isolation MOV B1LBA10AA301

The task of this valve is to isolate the boiler #1 main steam header.

- Opening and closing conditions

The valve is operated manually. It will not be allowed to close if the steam turbine is operating

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

Homogenize font type.

5.2.1.2.2 Boiler #2 Main Steam isolation MOV B2LBA20AA301

The task of this valve is to isolate the boiler #2 main steam header.

- Opening and closing conditions

The valve is operated manually. It will not be allowed to close if the steam turbine is operating

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.1.2.3 Boiler #1 Main Steam to Auxiliary Steam Isolation MOV B0LBA30AA301

The task of this valve is to isolate the boiler #1 main steam to the auxiliary steam.

- Opening and closing conditions

The valve is operated manually.

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.1.2.4 Boiler #2 Main Steam to Auxiliary Steam Isolation MOV B0LBA30AA302

The task of this valve is to isolate the boiler #2 main steam to the auxiliary steam.

- Opening and closing conditions

The valve is operated manually.

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.1.3 B1LBA10 Pot Drain valve B1LBA10AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if B1LBA10 Pot Low Temp (B1LBA10CT001) is not detected.

Homogenize font type and size.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B1LBA10CP001A and B1LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure

is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B1LBA10CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

It is understood that this temperature is L1. Please indicate (general comment for all the drain pots).

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.1.4 B2LBA10 Pot Drain valve B2LBA10AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

B2LAB10

The valve has always open permissive.

The valve is permitted to close if B1LBA10 Pot Low Temp (B2LBA10CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B2LBA10CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.2 Main Steam & Extractions

5.2.2.1 Analogue Control and Regulation

There is no analogue control and regulation in this sheet.

5.2.2.2 Logic Control and Protections

5.2.2.2.1 B0LBA10 Pot Drain valve B0LBA10AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if B0LBA10 Pot Low Temp (B0LBA10CT003) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B0LBA10CP002 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B0LBA10CT003) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat

+ 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.2.2.2 Main Steam Vent MOV B0LBA10AA301

The task of this valve is to isolate the boiler #2 main steam to the auxiliary steam.

- Opening and closing conditions

Check the function of this valve, it seems to not be correct.

The valve is operated manually. Please, indicate when this valve is expected to be manually actuated.

- Forced open

The valve is not forced to open.

- Forced close

5.2.2.2.3 The valve is not forced to closeB0LBW10 Pot Drain valve B0LBW10AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if B0LBW10 Pot Low Temp (B0LBW10CT002) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B0LBW10CP001 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3

minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBW10CT002) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.2.2.4 B0LBD10 Pot Drain valve B0LBD10AA303

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if B0LBD10 Pot Low Temp (B0LBD10CT002) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the ST is in service and Main Steam Pressure, measured by the average between the pressure transmitter B0LBD10CP001 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBD10CT002) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.2.2.5 B0LBD20 Pot Drain valve B0LBD20AA303

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if B0LBD20 Pot Low Temp (B0LBD20CT002) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the ST is in service and Main Steam Pressure, measured by the average between the pressure transmitter B0LBD20CP001 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B0LBD20CT002) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.2.2.6 B0LBS10 Pot Drain valve B0LBS10AA303

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always opening and closing permissive.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the ST is in service and Main Steam Pressure, measured by the average between the pressure transmitter B0LBS10CP001 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position

  In normal operation the valve will open and close as the following indications:

  – High or high-high level (B0LBS10CL001 and B0LBS10CL002) is detected in the drain pot. This valve close if the above conditions are not complied with for more than a defined time (15 seconds).

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.2.2.7 B0LBS20 Pot Drain valve B0LBS20AA303

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always opening and closing permissive.

  The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the ST is in service and Main Steam Pressure, measured by the average between the pressure transmitter B0LBS20CP001 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position

In normal operation the valve will open and close as the following indications:

– High or high-high level (B0LBS20CL001 and B0LBS20CL002) is detected in the drain pot. This valve close if the above conditions are not complied with for more than a defined time (15 seconds).

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.3 MP Steam/Auxiliary Steam

5.2.3.1 Analogue Control and Regulation

5.2.3.1.1 Main Steam to Auxiliary Steam Attemperation CV B0LBA30AA401

The function of this valve is to regulate the pressure of the HP steam line to auxiliary steam.

The process variable is the Main Steam to auxiliary steam header pressure, measured by the average between pressure transmitters B0LBG12CP0001A and B0LBG12CP0001B.

The pressure measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a reverse PI algorithm. If the difference between the measured pressure and the setpoint is positive, the valve will close; the opposite applies if the difference is negative, opening the valve.

- Forced open

The valve is not forced to open.

- Forced close

The valve will be forced to close in the following cases:

- If the discharge steam temperature, measured by the average between temperature transmitters B0LBG12CT001A and B0LBG12CT001A is higher than a certain value. Check instrument KKS.

5.2.3.1.2 Main Steam to Auxiliary Steam Attemperation Water CV B0LAF33AA401

The primary function of this valve is to control the main steam to auxiliary steam header temperature.

The process variable is the Main Steam to Auxiliary Steam Attemperation CV discharge temperature, measured by the average between temperature transmitters B0LBG12CT0001A and B0LBG12CT0001B.

The temperature measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a direct PI algorithm. If the difference between the measured temperature and the setpoint ~~and the~~ is positive, the valve will open; the opposite applies if the difference is negative, closing the valve.

- Forced open

The valve is not forced to open.

- Forced closed:

The valve will be forced to close in the following cases:

- Main Steam to Auxiliary Steam Attemperation CV is closed

5.2.3.1.3 ST IV Extraction to Auxiliary Steam Conditioning CV B0LBD10AA401

The function of this valve is to regulate the pressure of ST extraction IV line to auxiliary steam.

The process variable is the ST IV extraction to auxiliary steam conditioning CV discharge pressure, measured by the average between pressure transmitters B0LBG11CP0001A and B0LBG11CP0001B.

The pressure measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a reverse PI algorithm. If the

difference between the measured pressure and the setpoint is positive, the valve will close; the opposite applies if the difference is negative, opening the valve.

- Forced open

The valve is not forced to open.

- Forced close

The valve will be forced to close in the following cases:

- If the discharge steam temperature, measured by the average between the temperature transmitters B0LBG11CT001A and B0LBG11CT001A is higher than a certain value. Check instrument KKS.

5.2.3.1.4 ST IV Extraction to Auxiliary Steam Conditioning water CV B0LAF34AA401

The primary function of this valve is to control the ST IV extraction to auxiliary steam Conditioning CV discharge temperature.

The process variable is the ST IV extraction Conditioning CV discharge temperature, measured by the average between temperature transmitters B0LBG11CT0001A and B0LBG11CT0001B.

The temperature measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a direct PI algorithm. If the difference between the measured temperature and the setpoint ~~and the~~ is positive, the valve will open; the opposite applies if the difference is negative, closing the valve.

- Forced open

The valve is not forced to open.

- Forced closed:

The valve will be forced to close in the following cases:

- ST IV Extraction to Auxiliary Steam Conditioning CV is closed

5.2.3.1.5 Main Steam to District Heating Header Attemperation CV B0LBA31AA401

The function of this valve is to regulate the pressure of the HP steam line to district heating.

The process variable is the Main Steam to district heating header pressure, measured by the average between pressure transmitters B0LBG40CP0001A and B0LBG40CP0001B.

The pressure measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a reverse PI algorithm. If the difference between the measured pressure and the setpoint is positive, the valve will close; the opposite applies if the difference is negative, opening the valve.

- Forced open

The valve is not forced to open.

- Forced close

The valve will be forced to close in the following cases:

- If the discharge steam temperature, measured by the average between temperature transmitters B0LBG40CT001A and B0LBG40CT001A is higher than a certain value. Check instrument KKS.

5.2.3.1.6 Main Steam to District Heating Header Attemperation Water CV B0LAF32AA401

The primary function of this valve is to control the main steam to district heating header temperature.

The process variable is the Main Steam to District Heating Attemperation CV discharge temperature, measured by the average between temperature transmitters B0LBG40CT0001A and B0LBG40CT0001B.

The temperature measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a direct PI algorithm. If the difference between the measured temperature and the setpoint and the is positive, the valve will open; the opposite applies if the difference is negative, closing the valve.

- Forced open

The valve is not forced to open.

- Forced closed:

The valve will be forced to close in the following cases:

- Main Steam to District Heating Header Attemperation CV is closed

5.2.3.1.7 Auxiliary Steam to Deaerator CV B0LBG20AA001

The function of this valve is to regulate the pressure of the auxiliary steam to the deaerator.

The process variable is the DA and FWT pressure, measured by the average between pressure transmitters TBD. Indicate transmitters associated.

The pressure measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a reverse PI algorithm. If the difference between the measured pressure and the setpoint is positive, the valve will close; the opposite applies if the difference is negative, opening the valve.

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2 Logic Control and Protections

5.2.3.2.1 B0LBA30 Pot #1 Drain valve B0LBA30AA303

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if B0LBA30 Pot #1 Low Temp (B0LBA30CT004) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B1LBA10CP001A and B1LBA10CP001B or B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBA30CT004) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.2 B0LBA30 Pot #2 Drain valve B0LBA30AA304

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if B0LBA30 Pot #2 Low Temp (B0LBA30CT005) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B1LBA10CP001A and B1LBA10CP001B or B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBA30CT005) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.3 B0LBA31 Pot #1 Drain valve B0LBA31AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if B0LBA31 Pot #1 Low Temp (B0LBA31CT004) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B1LBA10CP001A and B1LBA10CP001B or B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBA31CT004) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.4 B0LBA31 Pot #2 Drain valve B0LBA31AA303

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if B0LBA31 Pot #2 Low Temp (B0LBA31CT005) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the Boiler 1 or 2 are in service and Main Steam Pressure, measured by the average between the pressure transmitter B1LBA10CP001A and B1LBA10CP001B or B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B0LBA31CT005) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.5 B0LBD10 Pot #2 Drain valve B0LBA30AA304

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if B0LBD10 Pot #2 Low Temp (B0LBD10CT004) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the ST is in service and IV extraction steam Pressure, measured by the pressure transmitter B0LBD10CP002 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B0LBD10CT004) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.6 B0LBD10 Pot #3 Drain valve B0LBA30AA305

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

The valve is permitted to close if B0LBD10 Pot #3 Low Temp (B0LBD10CT005) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the ST is in service and IV extraction steam Pressure, measured by the pressure transmitter B0LBD10CP002 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBD10CT005) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.7 B0LBG10 Pot Drain valve B0LBG10AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if B0LBG10 Pot Low Temp (B0LBG10CT004) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the ST is in service and III extraction steam Pressure, measured by the pressure transmitter B0LBD20CP001 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once

Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBG10CT004) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.8 B0LBG20 Pot Drain valve B0LBG20AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if B0LBG20 Pot Low Temp (B0LBG20CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the auxiliary steam pressure, measured by the pressure transmitters B0LBG16CP001 and B0LBG16CP002 exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBG20CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.9 Auxiliary Steam Header to air preheaters Pot Drain valve B0LBG30AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if Pot Low Temp (B0LBG30CT001) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the Auxiliary Steam Header to air preheaters pressure, measured by the pressure transmitters B0LBG30CP001A and B0LBG30CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B0LBG30CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.10 Auxiliary Steam to Boiler 1 air preheaters Pot Drain valve B1LBG30AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if Pot Low Temp (B1LBG30CT001) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the Auxiliary Steam Header to air preheaters pressure, measured by the pressure transmitters B0LBG30CP001A and B0LBG30CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B1LBG30CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.11 Auxiliary Steam to Boiler 2 air preheaters Pot Drain valve B2LBG30AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

The valve is permitted to close if Pot Low Temp (B2LBG30CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Auxiliary Steam Header to air preheaters pressure, measured by the pressure transmitters B0LBG30CP001A and B0LBG30CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B2LBG30CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.3.2.12 Auxiliary Steam to Deaerator CV bypass MOV B0LBG20AA301

The task of this valve is to ensure auxiliary steam flow to deaerator in case of Auxiliary Steam to Deaerator CV is out of service.

- Opening and closing conditions

The valve is operated manually.

Indicate recommendation to manually open this valve. Is there any permissive to open the valve when the associated CV is out of service?

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.13 Main Steam to Auxiliary Steam Attemperation Water Isolation Valve B0LAF33AA301

The task of this valve is to isolate the water supply to the Main Steam to Auxiliary Steam Attemperation Water CV.

- Opening and closing conditions

The valve is operated manually. It is not allowed to close if the control valve downstream is operating.

- Forced open

The valve is not forced to open.

If this valve is opened manually, it is not clear the object of installing it.
Please clarify and indicate its normal position, it is understood to be normally open, or only opens when the associated CV opens?
Is the valve automatically closed when the associated CV is closed?
The same comment applies to the rest of isolation valves in water lines to attemperation valves.

- Forced close

The valve is not forced to close

5.2.3.2.14 Main Steam to District Heating Header Attemperation Water Isolation Valve B0LAF32AA301

The task of this valve is to isolate the water supply to the Main Steam to ~~Auxiliary Steam~~ Attemperation Water CV.

District Heating Header

- Opening and closing conditions

The valve is operated manually. It is not allowed to close if the control valve downstream is operating.

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.3.2.15 ST IV Extraction to Auxiliary Steam Conditioning Water Isolation Valve B0LAF34AA301

ST IV Extraction

The task of this valve is to isolate the water supply to the ~~Main Steam~~ to Auxiliary Steam Attemperation Water CV.

- Opening and closing conditions

The valve is operated manually. It is not allowed to close if the control valve downstream is operating.

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.4 Boiler 1 Bypass

5.2.4.1 Analogue Control and Regulation

5.2.4.1.1 Boiler 1 Main Steam Bypass CV B1MAN10AA401

The function of Boiler 1 Main Steam Bypass Control Valve is to regulate the pressure of the main steam line at a dynamic setpoint value.

The process variable is the Boiler 1 Main Steam Header Pressure, measured by the average between the pressure transmitter B1LBA10CP001A and B1LBA10CP001A.

The pressure measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a direct PI algorithm. If the difference between the measured pressure and the setpoint is positive, the valve will open; the opposite applies if the difference is negative, closing the valve.

The dynamic Set Point is elaborated as follows, depending on the different cases:

Check instrument KKS.

a) Boiler Start-up

During the early stages of the start-up, when the boiler is in service, with its isolation valve open, and the pressure in the main steam header measured pressure transmitters B1LBA10CP001A and B1LBA10CP001A is between a minimum pressure setpoint value and the ST floor pressure setpoint, a rate-controlled variable setpoint is used.

This rate-controlled variable setpoint will open the Main Steam Boiler 1 Bypass CV and will be limited by the pressure/temperature gradient of the boiler drum in order to protect it from thermal stress.

b) ST Start-up

Once the main steam header and the bypass piping are warmed-up and pressurized, and the ST floor pressure (Steam turbine admission condition) is reached, the rate-controlled variable setpoint is no longer required. It is established the Main Steam Boiler 1 Bypass pressure setpoint as the existing main steam line pressure plus a margin in order to start closing the bypass valve.

c) Normal Operation Mode

The Boiler 1 Bypass pressure setpoint is dynamic. During normal running operation it is continually above main steam pressure according to the Steam Turbine curve, keeping the Main Steam Boiler 1 Bypass CV closed.

d) Boiler Shutdown

The boiler load is reduced to decrease main steam generation while maintaining main steam temperature. When the shutdown control action is initiated, the Main Steam Boiler 1 Bypass pressure controller setpoint is immediately set to the boiler steam line pressure at the moment the steam turbine stops control. With the main steam bypass control maintaining the HP main steam pressure, the steam turbine control valves (MCVs) are ramped closed by means of the steam turbine speed/load control. As a result, all main steam is transferred to the Main Steam Boiler 1 Bypass system.

e) Shutdown of the ST

Define abbreviature.

As soon as the ST goes out of SPC control, the Main Steam Boiler 1 Bypass setpoint is locked at the existing pressure of the moment, and the Main Steam Boiler 1 Bypass setpoint will be ramped decreasing until ST floor pressure.

- Forces Open

The valve is not forced to open.

- Forced Close:

The valve shall be tripped closed by solenoid action and forced to close in the following cases:

- If the discharge steam temperature, measured by the average between the temperature transmitter B1MAN10CT001A and B1MAN10CT002B, is lower than a certain value.
- If the discharge steam temperature, measured by the average between the temperature transmitter B1MAN10CT001A and B1MAN10CT002B, is higher than a certain value.
- All Feedwater Pumps are stopped.

5.2.4.1.2 Main Steam Boiler 1 Bypass Attemperation CV B1LAF31AA401

The primary function of the controller is to control the discharge temperature to obtain the required attemperation water flow.

order

The Main Steam Boiler 1 Bypass Attemperation water control valve utilizes two controllers in to improve stability. First controller is the bypass discharge temperature, measured by the temperature transmitter B1MAN10CT001A and B1MAN10CT001B. The second controller is the maintaining a required enthalpy, using a cascade controller as described below.

Temperature Controller

The process variable to be used in the regulator is the bypass discharge temperature, measured by the average between temperature transmitters B1MAN10CT001A and B1MAN10CT001B.

That temperature measurement is compared with the established set point. Control shall be performed by a PI algorithm.

If PV> SP the valve will open, increasing the flow in the line. Otherwise, the valve tends to close.

The controller is the main one if the attemperation header water flow, measured by flow transmitters B1LAF31CF001A and B1LAF31CF001B is lower than a certain value. A soon as this flow is higher than this value, the valve will start controlling enthalpy with two controllers in cascade as follows.

Enthalpy (Cascade) controller

The setpoint is the desired discharge steam temperature. The output of the outer temperature loop controller is summed ("trimmed") with the calculated attemperation water demand and provides the reference to the inner flow-rate loop.

Outer Controller:

The process variable to be used in the regulator is the bypass discharge temperature, measured by the average between temperature transmitters B1MAN10CT001A and B1MAN10CT001B.

That temperature measurement is compared with the established set point. Control shall be performed by a PI algorithm.

If PV> SP the valve will open, increasing the flow in the line. Otherwise, the valve tends to close.

The output of the Outer Controller is scaled to water flow engineering units and summed with the required attemperation water to provide the setpoint to the Inner Controller

Inner Controller:

The process variable to be used in the regulator is the attemperation water flow, measured by the flow transmitters B1LAF31CF001A and B1LAF31CF001B.

That flow measurement is compared with a dynamic set point. Control shall be performed by a PI algorithm that shall order to close the valve if the difference (PV - SP) is positive, the opposite applies if the difference is negative.

The primary function of the Inner Controller is to provide feed-forward control to obtain the required attemperation water flow. This controller is independent of temperature feedback and therefore not susceptible to time lag associated with temperature measurement. This controller positions the attemperation Water Control (Spray) Valve. Water flow is the process variable and the trimmed calculated attemperation water flow demand summed with the output Outer Controller is the setpoint.

The required attemperation water flow is calculated performing an energy balance, as follows:

$$W_{ATT} = W_{STEAM} (h_{STEAM} - h_{TARGET}) / (h_{TARGET} - h_{ATT})$$

Where:

W_{ATT}: calculated attemperation water flow

W_{STEAM}: inlet steam flow rate

h_{ATT}: attemperation water enthalpy, derived from measured temperature

h_{STEAM}: inlet steam enthalpy, derived from measured inlet pressure and temperature

- h_{TARGET}: target steam enthalpy desired

In case of ST trip, the Main Steam Boiler 1 Bypass control valve will open and the HP spray water control valve will be in a minimum position adjusting the valve near to the required operating condition without controller action, so transients such as a steam turbine trip or a load rejection can be handled without reaching the bypass discharge header high temperature trip value

- Forced closed:

The valve shall be tripped closed by solenoid action and forced to close in the following cases:

- The discharge steam temperature, measured by the average between the temperature transmitter B1MAN10CT001A and B1MAN10CT001B, is lower than a certain value.
- Boiler 1 Bypass CV is closed

- Forced Opened:

- The discharge steam temperature, measured by the average between the temperature transmitter B1MAN10CT001A and B1MAN10CT001B, is higher than a certain value

5.2.4.2 Logic Control and Protections

5.2.4.2.1 Boiler 1 Bypass CV Attemperation Water Isolation Valve B1LAF31AA301

The task of this valve is to isolate the water supply to the Boiler 1 Bypass CV Attemperation Water CV.

- Opening and closing conditions

The valve is operated manually. It is not allowed to close if the control valve downstream is operating.

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.4.2.2 Boiler 1 Main Steam Pot Before Bypass CV Drain valve B1LBA20AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if Pot Low Temp (B1LBA20CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the boiler 1 main steam pressure, measured by the pressure transmitters B1LBA10CP001A and B1LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B1LBA20CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.4.2.3 Boiler 1 Main Steam Pot In Bypass CV Drain valve B1MAN10AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if Pot Low Temp (B1MAN10CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the boiler 1 main steam pressure, measured by the pressure transmitters B1LBA10CP001A and B1LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B1MAN10CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.5 Boiler 2 Bypass

5.2.5.1 Analogue Control and Regulation

5.2.5.1.1 Boiler 2 Main Steam Bypass CV B2MAN10AA401

The function of Boiler 2 Main Steam Bypass Control Valve is to regulate the pressure of the main steam line at a dynamic setpoint value.

The process variable is the Boiler 2 Main Steam Header Pressure, measured by the average between the pressure transmitter B2LBA10CP001A and B2LBA10CP001A.

The pressure measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a direct PI algorithm. If the difference between the measured pressure and the setpoint is positive, the valve will open; the opposite applies if the difference is negative, closing the valve.

The dynamic Set Point is elaborated as follows, depending on the different cases:

Check instrument KKS.

f) Boiler Start-up

During the early stages of the start-up, when the boiler is in service, with its isolation valve open, and the pressure in the main steam header measured pressure transmitters B2LBA10CP001A and B2LBA10CP001A is between a minimum pressure setpoint value and the ST floor pressure setpoint, a rate-controlled variable setpoint is used.

This rate-controlled variable setpoint will open the Main Steam Boiler 2 Bypass CV and will be limited by the pressure/temperature gradient of the boiler drum in order to protect it from thermal stress.

g) ST Start-up

Once the main steam header and the bypass piping are warmed-up and pressurized, and the ST floor pressure (Steam turbine admission condition) is reached, the rate-controlled variable setpoint is no longer required. It is established the Main Steam Boiler 2 Bypass pressure setpoint as the existing main steam line pressure plus a margin in order to start closing the bypass valve.

h) Normal Operation Mode

The Boiler 2 Bypass pressure setpoint is dynamic. During normal running operation it is continually above main steam pressure according to the Steam Turbine curve, keeping the Main Steam Boiler 2 Bypass CV closed.

i) Boiler Shutdown

The boiler load is reduced to decrease main steam generation while maintaining main steam temperature. When the shutdown control action is initiated, the Main Steam Boiler 2 Bypass pressure controller setpoint is immediately set to the boiler steam line pressure at the moment the steam turbine stops control. With the main steam bypass control maintaining the HP main steam pressure, the steam turbine control valves (MCVs) are ramped closed by means of the steam turbine speed/load control. As a result, all main steam is transferred to the Main Steam Boiler 2 Bypass system.

j) Shutdown of the ST

As soon as the ST goes out of SPC control, the Main Steam Boiler 2 Bypass setpoint is locked at the existing pressure of the moment, and the Main Steam Boiler 2 Bypass setpoint will be ramped decreasing until ST floor pressure.

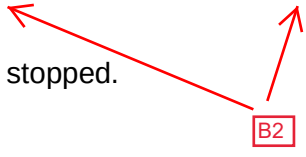
- Forces Open

The valve is not forced to open.

- Forced Close:

The valve shall be tripped closed by solenoid action and forced to close in the following cases:

- If the discharge steam temperature, measured by the average between the temperature transmitter B2MAN10CT001A and B2MAN10CT002B, is lower than a certain value.
- If the discharge steam temperature, measured by the average between the temperature transmitter B1MAN10CT001A and B1MAN10CT002B, is higher than a certain value.
- All Feedwater Pumps are stopped.



5.2.5.1.2 Main Steam Boiler 2 Bypass Attemperation CV B2LAF31AA401

The primary function of the controller is to control the discharge temperature to obtain the required attemperation water flow.

The Main Steam Boiler 2 Bypass Attemperation water control valve utilizes two controllers in to improve stability. First controller is the bypass discharge temperature, measured by the temperature transmitter B2MAN10CT001A and B2MAN10CT001B. The second controller is the maintaining a required enthalpy, using a cascade controller as described below.

Temperature Controller

The process variable to be used in the regulator is the bypass discharge temperature, measured by the average between temperature transmitters B2MAN10CT001A and B2MAN10CT001B.

That temperature measurement is compared with the established set point. Control shall be performed by a PI algorithm.

If PV> SP the valve will open, increasing the flow in the line. Otherwise, the valve tends to close.

The controller is the main one if the attemperation header water flow, measured by flow transmitters B2LAF31CF001A and B2LAF31CF001B is lower than a certain value. A soon as this flow is higher than this value, the valve will start controlling enthalpy with two controllers in cascade as follows.

Enthalpy (Cascade) controller

The setpoint is the desired discharge steam temperature. The output of the outer temperature loop controller is summed ("trimmed") with the calculated attemperation water demand and provides the reference to the inner flow-rate loop.

Outer Controller:

The process variable to be used in the regulator is the bypass discharge temperature, measured by the average between temperature transmitters B2MAN10CT001A and B2MAN10CT001B.

That temperature measurement is compared with the established set point. Control shall be performed by a PI algorithm.

If PV> SP the valve will open, increasing the flow in the line. Otherwise, the valve tends to close.

The output of the Outer Controller is scaled to water flow engineering units and summed with the required attemperation water to provide the setpoint to the Inner Controller

Inner Controller:

The process variable to be used in the regulator is the attemperation water flow, measured by the flow transmitters B2LAF31CF001A and B2LAF31CF001B.

That flow measurement is compared with a dynamic set point. Control shall be performed by a PI algorithm that shall order to close the valve if the difference (PV - SP) is positive, the opposite applies if the difference is negative.

The primary function of the Inner Controller is to provide feed-forward control to obtain the required attemperation water flow. This controller is independent of temperature feedback and therefore not susceptible to time lag associated with temperature measurement. This controller positions the attemperation Water Control (Spray) Valve. Water flow is the process variable and the trimmed calculated attemperation water flow demand summed with the output Outer Controller is the setpoint.

The required attemperation water flow is calculated performing an energy balance, as follows:

$$W_{ATT} = W_{STEAM} (h_{STEAM} - h_{TARGET}) / (h_{TARGET} - h_{ATT})$$

Where:

W_{ATT}: calculated attemperation water flow

W_{STEAM}: inlet steam flow rate

h_{ATT}: attemperation water enthalpy, derived from measured temperature

h_{STEAM}: inlet steam enthalpy, derived from measured inlet pressure and temperature

- h_{TARGET}: target steam enthalpy desired

In case of ST trip, the Main Steam Boiler 2 Bypass control valve will open and the HP spray water control valve will be in a minimum position adjusting the valve near to the required operating condition without controller action, so transients such as a steam turbine trip or a load rejection can be handled without reaching the bypass discharge header high temperature trip value

- Forced closed:

The valve shall be tripped closed by solenoid action and forced to close in the following cases:

- The discharge steam temperature, measured by the average between the temperature transmitter B2MAN10CT001A and B2MAN10CT001B, is lower than a certain value.
- Boiler 2 Bypass CV is closed

• Forced Opened:

- The discharge steam temperature, measured by the average between the temperature transmitter B2MAN10CT001A and B2MAN10CT001B, is higher than a certain value

5.2.5.2 Logic Control and Protections

5.2.5.2.1 Boiler 2 Bypass CV Attemperation Water Isolation Valve B2LAF31AA301

The task of this valve is to isolate the water supply to the Boiler 2 Bypass CV Attemperation Water CV.

• Opening and closing conditions

The valve is operated manually. It is not allowed to close if the control valve downstream is operating.

• Forced open

The valve is not forced to open.

• Forced close

The valve is not forced to close

5.2.5.2.2 Boiler 2 Main Steam Pot Before Bypass CV Drain valve B2LBA20AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

• Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if Pot Low Temp (B2LBA20CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the boiler 2 main steam pressure, measured by the pressure transmitters B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B2LBA20CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.5.2.3 Boiler 2 Main Steam Pot In Bypass CV Drain valve B2MAN10AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if Pot Low Temp (B2MAN10CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the boiler 1 main steam pressure, measured by the pressure transmitters B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B2MAN10CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.6 Ejectors Attemperation

5.2.6.1 Analogue Control and Regulation

5.2.6.1.1 Main Steam Ejectors Attemperation CV B0LBA50AA401

The function of this valve is to regulate the pressure of the main steam to the ejectors.

The process variable is the Main Steam Ejectors Attemperation CV discharge pressure, measured by the average between pressure transmitters B0LBG50CP0001A and B0LBG50CP0001B.

The pressure measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a reverse PI algorithm. If the difference between the measured pressure and the setpoint is positive, the valve will close; the opposite applies if the difference is negative, opening the valve.

- Forced open

The valve is not forced to open.

- Forced close

The valve will be forced to close in the following cases:

If the discharge steam temperature, measured by the average between the temperature transmitters B0LBG50CT001A and B0LBG50CT001A is higher than a certain value. Check instrument KKS.

5.2.6.1.2 Main Steam Ejectors Attemperation Water CV B0LAF35AA401

The primary function of this valve is to control the main steam to ejectors temperature.

The process variable is the Main Steam Ejectors Attemperation CV discharge temperature, measured by the average between temperature transmitters B0LBG50CT0001A and B0LBG50CT0001B.

The temperature measurement shall be compared to the setpoint, not adjustable by the operator. Control shall be performed by means of a direct PI algorithm. If the difference between the measured temperature and the setpoint and the is positive, the valve will open; the opposite applies if the difference is negative, closing the valve.

- Forced open

The valve is not forced to open.

- Forced closed:

The valve will be forced to close in the following cases:

Main Steam Ejectors Attemperation CV is closed.

5.2.6.2 Logic Control and Protections

5.2.6.2.1 Main Steam Ejectors Attemperation Water Isolation Valve B0LAF35AA301

The task of this valve is to isolate the water supply to the Main Steam Ejectors Attemperation Water.

- Opening and closing conditions

The valve is operated manually. It is not allowed to close if the control valve downstream is operating.

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close

5.2.6.2.2 Main Steam Pot Before Ejectors Attemperation CV Drain valve B0LBA40AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if Pot Low Temp (B0LBA40CT001) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the boiler 1 main steam pressure, measured by the pressure transmitters B1LBA10CP001A and B1LBA10CP001B or the boiler 2 main steam pressure, measured by the pressure transmitters B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B0LBA40CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

  The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.6.2.3 Main Steam Pot in the Ejectors Attemperation CV Drain valve B0LBA40AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

  The valve has always open permissive.

  The valve is permitted to close if Pot Low Temp (B0LBA40CT002) is not detected.

  The valve will open and close in AUTO during the start-up according to the following indications:

  – The Drain Pot Valve fully opens when the boiler 1 main steam pressure, measured by the pressure transmitters B1LBA10CP001A and B1LBA10CP001B or the boiler 2 main steam pressure, measured by the pressure transmitters B2LBA10CP001A and B2LBA10CP001B exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

  In normal operation the valve will open and close as the following indications:

  – The valve will open when the temperature measured (B0LBA40CT002) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.6.2.4 Main Steam Pot After Ejectors Attemperation CV Drain valve B0LBA50AA301

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always open permissive.

The valve is permitted to close if Pot Low Temp (B0LBA50CT001) is not detected.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when the Ejectors Attemperation CV discharge pressure measured by the pressure transmitters B0LBG50CP001A and B0LBG50CP001ABexceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position.

In normal operation the valve will open and close as the following indications:

– The valve will open when the temperature measured (B0LBA50CT001) in the drain pot is below the saturation temperature plus 28ºC (T<Tsat + 28ºC), and will close 15 seconds after the low temperature (L1) (low steam superheating) signal is lost

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.7 Steam/Flue Gas Heat Exchangers

Describe the operation of the CV to the exchangers or refer to HZI documentation where this logic is detailled, as applicable.

5.2.7.1 Logic Control and Protections

5.2.7.1.1 Boiler 1 Drum Steam to Flue Gas Heat Exchangers Pot Drain valve B1HAD50AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always opening and closing permissive.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when boiler 1 drum pressure, measured by the average between the pressure transmitter TBD exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position

Indicate KKS TBD.

In normal operation the valve will open and close as the following indications:

The valve will open if

– High or high-high level (B1HAD50CL001A and B1HAD50CL001B) is detected in the drain pot. This valve close if the above conditions are not complied with for more than a defined time (15 seconds).

- Forced open

The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.2.7.1.2 Boiler 2 Drum Steam to Flue Gas Heat Exchangers Pot Drain valve B2HAD50AA302

The task of this valve is to evacuate the condensate accumulated in the corresponding drain pot.

- Opening and closing conditions

The valve has always opening and closing permissive.

The valve will open and close in AUTO during the start-up according to the following indications:

– The Drain Pot Valve fully opens when boiler 2 drum pressure, measured by the average between the pressure transmitter TBD exceeds a minimum pressure (L). After the drain valve has been open a minimum defined time (3 minutes), and once Main Steam pressure is greater than a defined pressure (H), the valve closes to an intermediate position

Indicate KKS TBD.

In normal operation the valve will open and close as the following indications:

The valve will open if

– High or high-high level (B2HAD50CL001A and B2HAD50CL001B) is detected in the drain pot. This valve close if the above conditions are not complied with for more than a defined time (15 seconds).

- Forced open

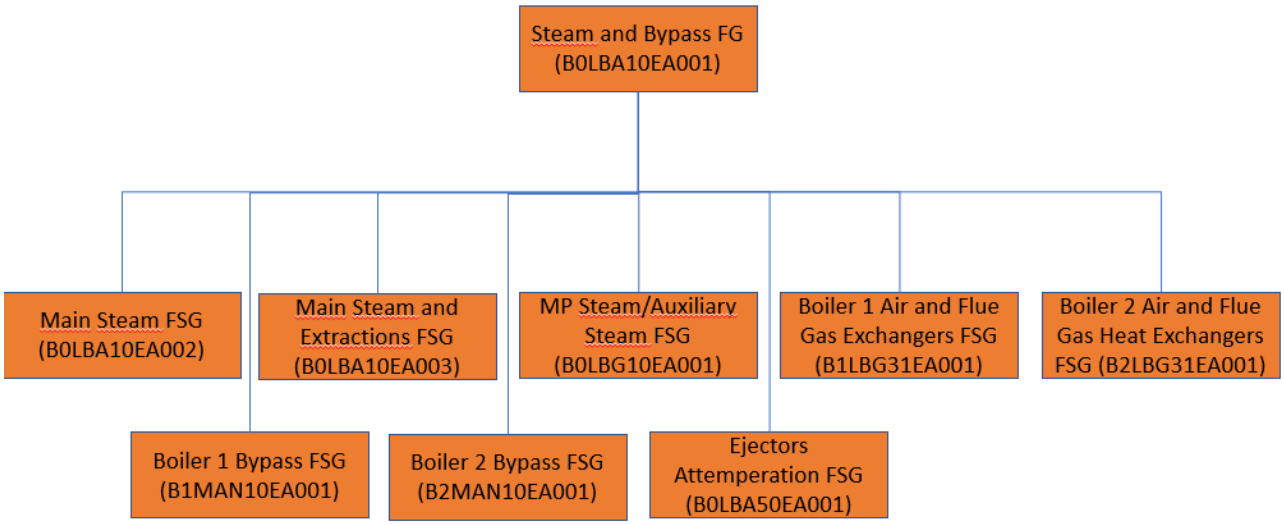
The valve is not forced to open.

- Forced close

The valve is not forced to close.

5.3 SYSTEM AUTOMATION

5.3.1 Steam and Bypass Functional Group (B0LBA10EA001)

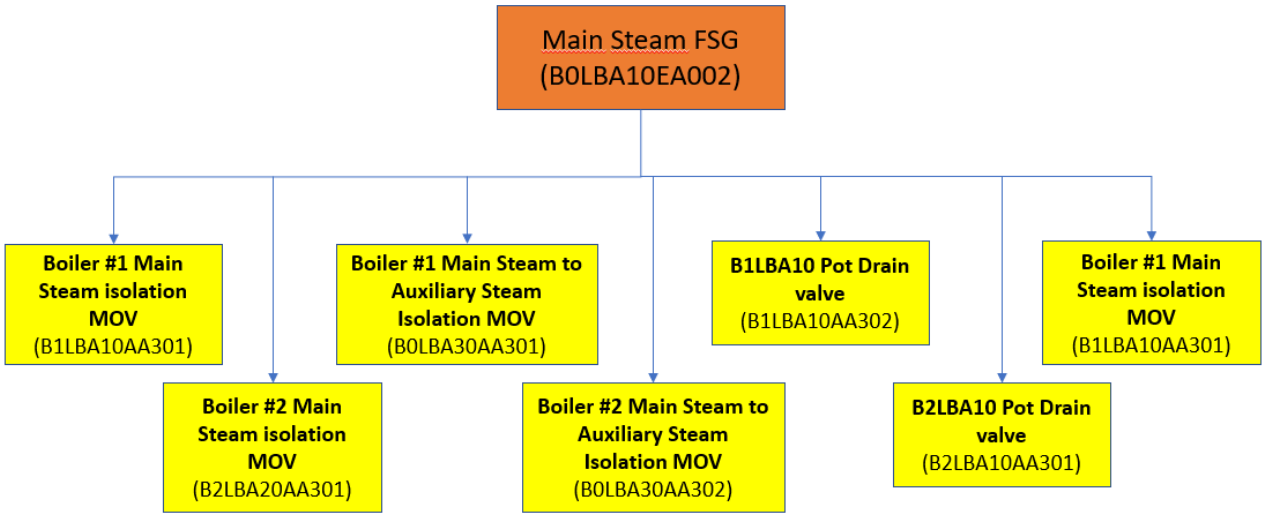


There will be a general Functional Group commanding all Functional Subgroups. When started, the main FG will send an ON command to all FSG

The main FG will have ON permissive when all FGS are available

The FG is always permitted to stop.

5.3.2 Main Steam FSG (B0LBA10EA002)



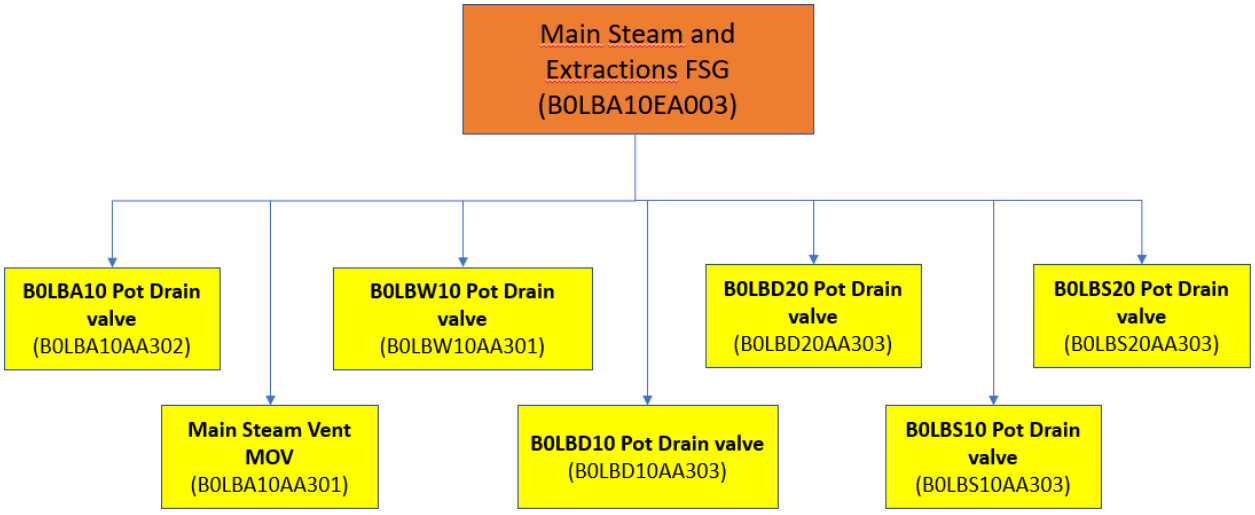
When the FSG is ON (both from the main FG or manually by the operator) the following actions are performed:

- Boiler #1 Main Steam isolation MOV B1LBA10AA301 is switched to AUTO
- Boiler #2 Main Steam isolation MOV B2LBA20AA301 is switched to AUTO
- Boiler #1 Main Steam to Auxiliary Steam Isolation MOV B0LBA30AA301 is switched to AUTO
- Boiler #2 Main Steam to Auxiliary Steam Isolation MOV B0LBA30AA302 is switched to AUTO
- B1LBA10 Pot Drain valve B1LBA10AA302 is switched to AUTO
- B2LBA10 Pot Drain valve B2LBA10AA301 is switched to AUTO
- Boiler #1 Main Steam isolation MOV B1LBA10AA301 is switched to AUTO

The FSG has ON permissive when all the previous devices are available

The FSG is always permitted to stop.

5.3.3 Main Steam and Extractions FSG (B0LBA10EA003)



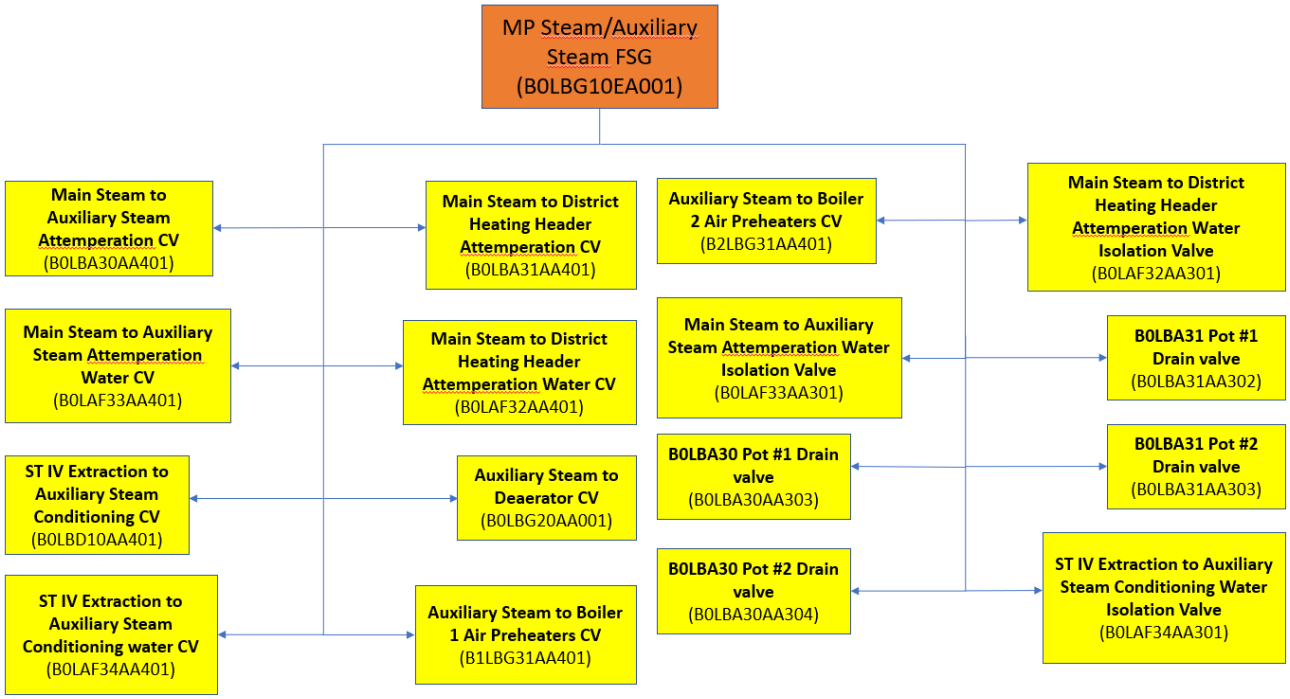
When the FSG is ON (both from the main FG or manually by the operator) the following actions are performed:

- B0LBA10 Pot Drain valve B0LBA10AA302 is switched to AUTO
- Main Steam Vent MOV B0LBA10AA301 is switched to AUTO
- B0LBW10 Pot Drain valve B0LBW10AA301 is switched to AUTO
- B0LBD10 Pot Drain valve B0LBD10AA303 is switched to AUTO
- B0LBD20 Pot Drain valve B0LBD20AA303 is switched to AUTO
- B0LBS10 Pot Drain valve B0LBS10AA303 is switched to AUTO
- B0LBS20 Pot Drain valve B0LBS20AA303 is switched to AUTO

The FSG has ON permissive when all the previous devices are available

The FSG is always permitted to stop.

5.3.4 MP Steam/Auxiliary Steam FSG (B0LBG10EA001)



When the FSG is ON (both from the main FG or manually by the operator) the following actions are performed:

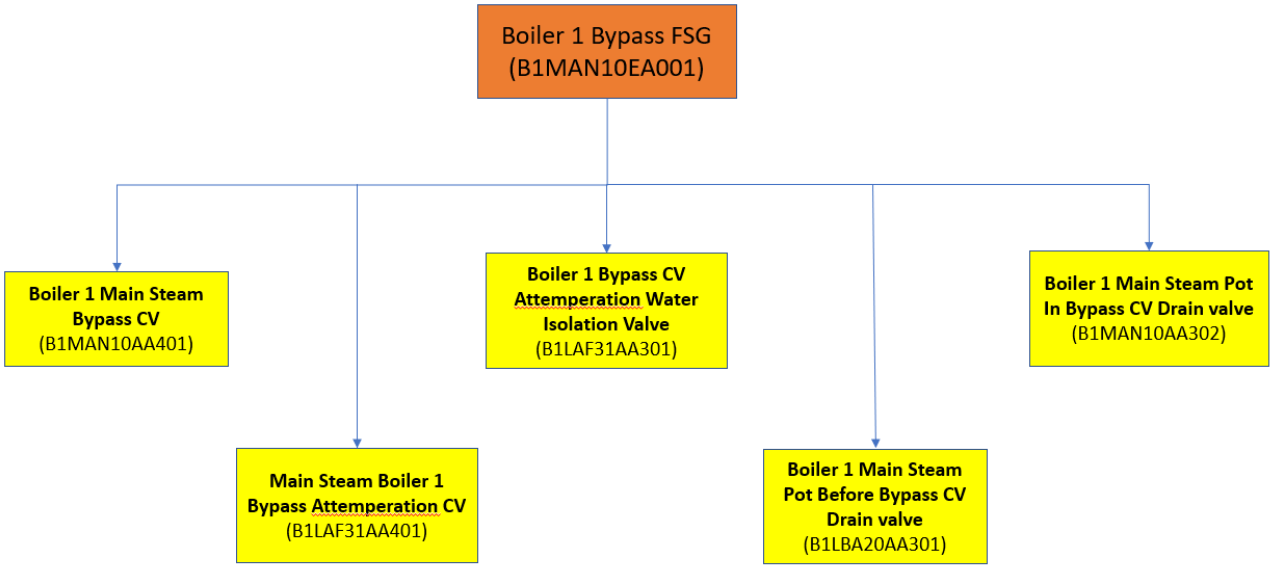
- Main Steam to Auxiliary Steam Attemperation CV B0LBA30AA401 is switched to AUTO
- Main Steam to Auxiliary Steam Attemperation Water CV B0LAF33AA401is switched to AUTO
- ST IV Extraction to Auxiliary Steam Conditioning CV B0LBD10AA401 is switched to AUTO
- ST IV Extraction to Auxiliary Steam Conditioning water CV B0LAF34AA401is switched to AUTO
- Main Steam to District Heating Header Attemperation CV B0LBA31AA401 is switched to AUTO
- Main Steam to District Heating Header Attemperation Water CV B0LAF32AA401 is switched to AUTO
- Auxiliary Steam to Deaerator CV B0LBG20AA001 is switched to AUTO
- Auxiliary Steam to Boiler 1 Air Preheaters CV B1LBG31AA401 is switched to AUTO

- Auxiliary Steam to Boiler 2 Air Preheaters CV B2LBG31AA401 is switched to AUTO
- Main Steam to Auxiliary Steam Attemperation Water Isolation Valve B0LAF33AA301 is switched to AUTO
- B0LBA30 Pot #1 Drain valve B0LBA30AA303 is switched to AUTO
- B0LBA30 Pot #2 Drain valve B0LBA30AA304 is switched to AUTO
- Main Steam to District Heating Header Attemperation Water Isolation Valve B0LAF32AA301 is switched to AUTO
- B0LBA31 Pot #1 Drain valve B0LBA31AA302 is switched to AUTO
- B0LBA31 Pot #2 Drain valve B0LBA31AA303 is switched to AUTO
- ST IV Extraction to Auxiliary Steam Conditioning Water Isolation Valve B0LAF34AA301 is switched to AUTO
- B0LBD10 Pot #2 Drain valve B0LBA30AA304 is switched to AUTO
- B0LBD10 Pot #3 Drain valve B0LBA30AA305 is switched to AUTO
- B0LBG10 Pot Drain valve B0LBG10AA301 is switched to AUTO
- Auxiliary Steam to Deaerator CV bypass MOV B0LBG20AA301 is switched to AUTO
- B0LBG20 Pot Drain valve B0LBG20AA302 is switched to AUTO
- Auxiliary Steam Header to air preheaters Pot Drain valve B0LBG30AA301 is switched to AUTO
- Auxiliary Steam to Boiler 1 Air Preheaters CV bypass MOV B1LBG30AA301 is switched to AUTO
- Auxiliary Steam to Boiler 1 air preheaters Pot Drain valve B1LBG30AA302 is switched to AUTO
- Auxiliary Steam to Boiler 2 Air Preheaters CV bypass MOV B2LBG30AA301 is switched to AUTO
- Auxiliary Steam to Boiler 2 air preheaters Pot Drain valve B2LBG30AA302is switched to AUTO

The FSG has ON permissive when all the previous devices are available

The FSG is always permitted to stop.

5.3.5 Boiler 1 Bypass FSG (B1MAN10EA001)



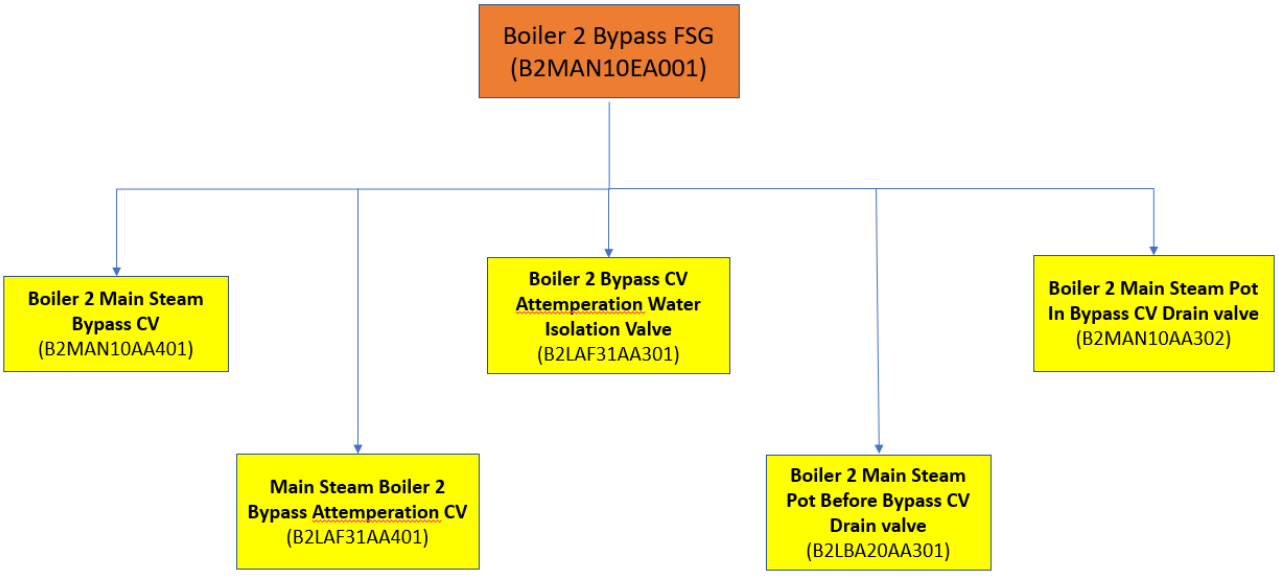
When the FSG is ON (both from the main FG or manually by the operator) the following actions are performed:

- Boiler 1 Main Steam Bypass CV B1MAN10AA401 is switched to AUTO
- Main Steam Boiler 1 Bypass Attemperation CV B1LAF31AA401 is switched to AUTO
- Boiler 1 Bypass CV Attemperation Water Isolation Valve B1LAF31AA301 is switched to AUTO
- Boiler 1 Main Steam Pot Before Bypass CV Drain valve B1LBA20AA301 is switched to AUTO
- Boiler 1 Main Steam Pot In Bypass CV Drain valve B1MAN10AA302 is switched to AUTO

The FSG has ON permissive when all the previous devices are available

The FSG is always permitted to stop

5.3.6 Boiler 2 Bypass FSG (B2MAN10EA001)



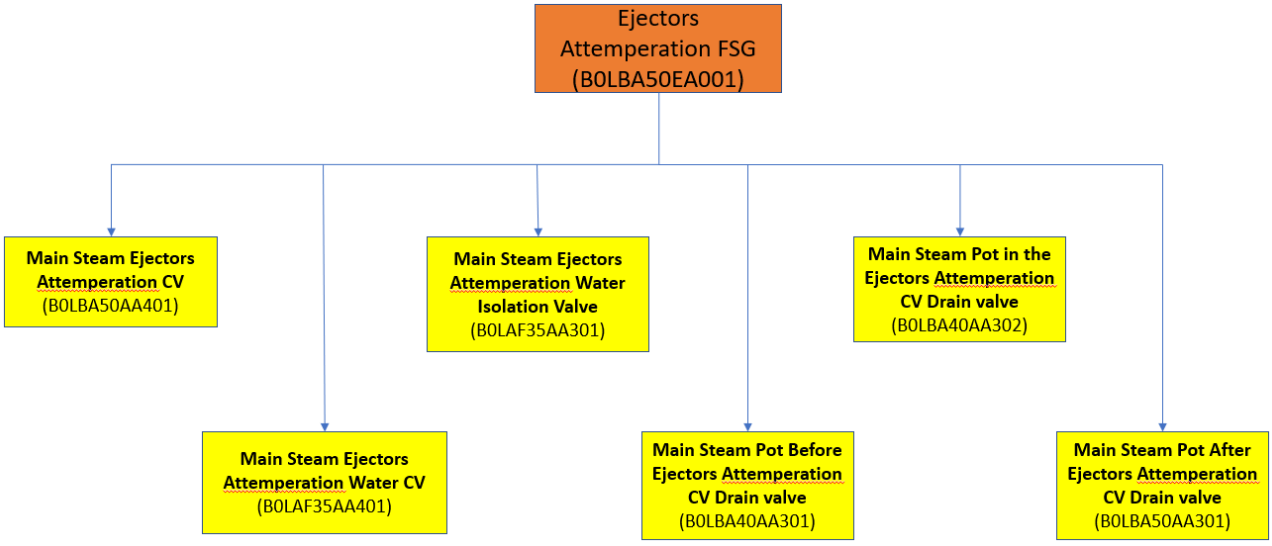
When the FSG is ON (both from the main FG or manually by the operator) the following actions are performed:

- Boiler 2 Main Steam Bypass CV B2MAN10AA401 is switched to AUTO
- Main Steam Boiler 2 Bypass Attemperation CV B2LAF31AA401 is switched to AUTO
- Boiler 2 Bypass CV Attemperation Water Isolation Valve B2LAF31AA301 is switched to AUTO
- Boiler 2 Main Steam Pot Before Bypass CV Drain valve B2LBA20AA301 is switched to AUTO
- Boiler 2 Main Steam Pot In Bypass CV Drain valve B2MAN10AA302 is switched to AUTO

The FSG has ON permissive when all the previous devices are available

The FSG is always permitted to stop

5.3.7 Ejectors Attemperation FSG (B0LBA50EA001)



When the FSG is ON (both from the main FG or manually by the operator) the following actions are performed:

- Main Steam Ejectors Attemperation CV B0LBA50AA401 is switched to AUTO
- Main Steam Ejectors Attemperation Water CV B0LAF35AA401 is switched to AUTO
- Main Steam Ejectors Attemperation Water Isolation Valve B0LAF35AA301 is switched to AUTO
- Main Steam Pot Before Ejectors Attemperation CV Drain valve B0LBA40AA301 is switched to AUTO
- Main Steam Pot in the Ejectors Attemperation CV Drain valve B0LBA40AA302 is switched to AUTO
- Main Steam Pot After Ejectors Attemperation CV Drain valve B0LBA50AA301 is switched to AUTO

The FSG has ON permissive when all the previous devices are available

The FSG is always permitted to stop

As general comment, it is considered necessary to define the alarms and trips associated to the different control loops.

General comment for all Functional Descriptions.
Add a Section dedicated to reference to the Set Point List and the Interlock and Alarm List.