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1	1	Cog. Eng. R. A. Wahlquist	<i>[Signature]</i>	9/29/94	R1-43						
1	1	Cog. Mgr. R.J. Nicklas	<i>[Signature]</i>	9/29/94	R4-43						
		QA									
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1	1	D.S. Haring	<i>[Signature]</i>	9/29/94	R1-43						

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242-A EVAPORATOR

207-A Retention Basins
System Design Description
(SDD)

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Prepared by,
Westinghouse Hanford Company
Waste Treatment Systems Engineering

For

U. S. Department of Energy

September 29, 1994

Written by *Roger A. Wahlquist* 9/29/94
R. A. Wahlquist Date
Reviewed by *Daniel S. Haring* 9/29/94
D. S. Haring Date
Reviewed by *M. A. White* 9/29/94
M. A. White Date
Manager/Waste Treatment *R. J. Nicklas* 9/29/94
R. J. Nicklas Date

MASTER

dk
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Reference Drawings:

- (1) H-2-69147 DRAWING INDEX 242-A BUILDING
- (2) H-2-69286 CIVIL KEY PLAN 242-A BUILDING AND 241-A TANK FARM
- (3) H-2-69292 CIVIL PLOT PLAN & DETAILS PUMP PIT & 207-A RETENTION BASINS
- (4) H-2-69293 STRUCTURAL PUMP PIT 207-A
- (5) H-2-69301/2 HEATING & VENTILATION - PUMP PIT 207-A
- (6) H-2-69332 FLOW DIAGRAM SC RETENTION BASINS & 207-A BUILDING
- (7) H-2-69440 ELECTRICAL - INSTRUMENTATION PLANS AND DETAILS
- (8) H-2-69454 PIPING ARRANGEMENT BUILDING 207-A PLAN AND SECTIONS
- (9) H-2-70113 RETENTION BASIN OVERFLOW ALARM & ADDITIONAL FLOW TOTALIZERS
- (10) H-2-72271 ENGINEERING FLOW DIAGRAM RELOCATION & MODIFICATIONS TO PC & SC RETENTION BASINS INSTRUMENTATION
- (11) H-2-72272 RELOCATION OF LIQUID LEVEL GAGES TO RETENTION BASINS
- (12) H-2-72282 LIQUID LEVEL GAUGE INTERLOCK
- (13) H-2-98970 DRAWING LIST AREA MAP (B-534 DRAWING LIST)
- (14) H-2-99085/3, ELECTRICAL ELEMENTARY DIAGRAM
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- (15) H-2-99949/1, MCS LOGIC DIAGRAM
2,23
- (16) H-2-100096/2 ELECTRICAL ONE LINE DIAGRAM

SUMMARY

242-A Evaporator General Description

The 242-A Evaporator is a waste treatment facility designed to reduce liquid waste volumes currently stored in the Hanford Area double shell Waste Storage Tanks. The evaporator uses evaporative concentration to achieve this volume reduction, returning the concentrated slurry to the double-shell tanks for storage. The process effluent is transferred to various retention/treatment facilities for eventual release to the environment. The process utilizes an evaporator vessel and various supporting systems for heating, evaporating, and condensing low-heat-generating liquid waste produced at the Hanford Site. The process reduces the total volume of the liquid waste requiring storage in a double shell tank, making it more manageable for current storage as well as for future treatment and disposal. The main components of the 242-A Evaporator are the Reboiler, Vapor-Liquid Separator, Recirculation Pump and Pump Loop, Slurry System, Condenser System, Steam Jet Vacuum System, Condensate Collection Tank, and Ion Exchange System. The 242-A Evaporator consists of four principal structures:

- 242-A Building, the main process building
- 242-AB Building, the adjacent control room building
- 242-A-81, the water service building
- 207-A Retention Basins and 207-A Building

The evaporator is connected to storage tanks, valve pits, Liquid Effluent Retention Facility and an evaporation pond through underground piping used for transferring feed and product slurry solution, process condensate, steam condensate, used raw water, and miscellaneous drainage.

Utilities and service supplied to the evaporator include electrical power, raw water, and steam.

The evaporator originally was designed and constructed in 1977 to Hanford Plant Standard Design Criteria (SDC) 4.1, Rev. 6, which established the design loads and acceptance criteria for all permanent facilities at the Hanford Site at the time. However, the standard was revised in September 1989 (SDC-4.1 Revision 11; DOE-RL 1989). The evaporator was designed to withstand a 0.25 g earthquake [safe shutdown earth quake (SSE)], a 100-mi/h high wind/tornado, and wind-generated missiles. This criteria actually exceeds the current SDC-4.1, Rev. 11 requirements for moderate hazard facilities.

207-A Steam Condensate Retention Basins General Description

The 207-A Steam Condensate Retention Basins (SCRB) are a sub-system of the 242-A Evaporator process. The SCRB's are used to collect steam condensate from the reboiler E-A-1 and other minor steam condensate streams collected in TK-C-103 within the Steam Condensate System (SCS) (P&ID Drawing H-2-98993 and WHC-SD-WM-SDD-013) and hold it for interim storage while samples of the basin are analyzed. The stored liquids in the Retention Basins are then pumped to 216-B-3 pond (B-pond) or 241-A-350 depending on the sample results from the basins. (NOTE: B-Pond and 241-A-350 are outside the scope of this document, therefore, will not be discussed in this document.)

The SCRB System originates at diversion valve HV-RC1-3 within the 242-A Evaporator main process building and extends through the 207-A Building, 207-A Retention Basins, and finally to the transfer line to B-pond and/or the 241-A-350 catch tank. Included in the SCRB system are the Steam Condensate Retention Basins, Sump, Sump Pump P-1, and Pump P-3. All components are located within the 200 East Area of the Hanford Site (Figures 1-1 and 1-2).

This System Design Description (SDD) is specifically written for the SCRB's which is one of 25 sub-systems listed in the 242-A Evaporator sub-systems list in Appendix A. The SCRB consists of the following primary elements:

- 207-A Building
- Six (three of which are still used for steam condensate) 70,000 gallon Retention Basins
- Sump Pump, P-1
- Pump, P-2
- Pump, P-3

The principal process components of this SDD are located in the 207-A Building (see Figure 1-3), and the 207-A Retention Basins. The 207-A building contains the valves, pumps, and instruments which control the transfer of liquids to and from the basins. The building itself is situated between the Steam Condensate Retention Basins and the abandoned Process Condensate Retention Basins, east of the 242-A Evaporator Building.

Of the six retention basins, only three, the SCRB #1, #2, and #3, are used for holding the steam condensate from the 242-A Evaporator process. The remaining three basins (Process Condensate Retention Basins #1, #2, and #3), Pump P-2, and their associated piping, valves, and instruments, were abandoned in place and are no longer in use. Thus, these abandoned parts of the 207-A system will not be discussed in this document.

This SDD is a supporting document for the 242-A Evaporator and includes the most recent Project B-534 upgrades. The B-534 upgrades to SCRB System include the following.

- Replacement and installation of new instruments and valves, as well as removal of redundant or obsolete systems
- Monitoring and Control System (MCS) installation with capabilities to monitor instruments and valves associated with the SCRB system.
- Addition of High Density Polyethylene (HDPE) liners in the SC basins

H9112019.2R
(242-A Rev 1C)

Fig. 1-1

Fig. 1-2

Fig 1-3

SCRB Operational Description

The SCRB, as depicted on P&ID Drawing H-2-69332, shows the 241-A-350 Catch Tank, Sump and Sump Pump P-1, Pump P-3, the abandoned in place equipment, the six 207-A Retention Basins, 207-A Building boundary, and the valves and instruments within this system. The abandoned in place equipment consists of Pump P-2, the three Process Condensate Retention Basins, and the valves and instruments involved in the Process Condensate portion of the 207-A Building.

1.0 PRIMARY FUNCTION

The primary function of the SCRB is to collect the steam condensate from the E-A-1 reboiler and other minor streams and hold it until it has been sampled and verified to be within release limits for B-pond. The mixed stream is collected in three Retention Basins, sampled, and pumped to B-pond for disposal if within release requirements or pumped to TK-241-AW-102 through 241-A-350 if not within B-pond release requirements.

2.0 SCRB OPERATING AND DESIGN REQUIREMENTS

2.1 General

The 242-A Evaporator operated from 1977 to 1989 and has since been upgraded and undergone complete operational testing. The SCRB System requirements outlined in this SDD reflect the results obtained and demonstrated during the operational testing of the facility after the B-534 project upgrade.

The specific operating requirements and ranges were obtained from Certified Vendor Information (CVI) and operational experience. These operating requirements and ranges were verified during the 242-A Evaporator tests and were determined to be consistent with the requirements specified in the Operating Specification Document (OSD), the Final Safety Analysis Report (FSAR), and the Component Based Recall System (CBRS), as applicable to the specific parameter being discussed.

The following "SCRB OPERATING AND DESIGN DESCRIPTION" is presented in a format that follows the flow of the liquid stream through the system, starting from the SCS and into the 207-A Building, continuing to the three 207-A Steam Condensate Retention Basins, returning to the 207-A Building, and out to B-pond or 241-A-350. To maintain a consistent and complete description of the system, a format was adopted to describe the components, and their associated monitoring instruments and controls as applicable in a succeeding order of the SCRB flow direction through the system, as depicted on P&ID Drawing H-2-69332. Due to the highly interconnected nature of the faceplates and devices, the main body of this document describes the function of each device.

2.1.1 Monitoring Control System (MCS)

The MCS was installed into the 242-A Evaporator system as part of project B-534 upgrades. The Texas Instruments D/3¹ computer system allows most of the 242-A Evaporator operations to be monitored and controlled from the main control room of the facility. This system allows for the display and control of functions previously located on the control room panel boards, as well as some of those which were located remotely. The MCS provides operating limits and alarm information for automatic control and shutdown of the Evaporator System in the event the operating limits are exceeded.

Specification WHC-SD-534-CSWD-005 Rev. 1, 242-A Control System Device Logic, Software Documentation, and Drawing H-2-98993 provide the documentation for the software for the 242-A Monitor Control System (MCS) interlock and control logic. The SCRB System is controlled by 25 faceplates shown on Faceplate Group Sheets 32 and 33 on the MCS monitor (see Appendix B). Each faceplate provides a readout of the instrument's monitoring parameters, such as valve positions, level readings, and pump status. The status of the faceplates are managed by MCS keyboard commands to open or close valves and provide instantaneous readings of liquid levels, and pump operations.

MCS faceplates show the limits of the operating requirements and set points for a specific valve, equipment and/or instrument; Drawing H-2-99949 Sheet 3 provides an illustration of a faceplate for a particular device; Appendix B contains copies of the SCRB System Faceplate Group Sheets as they are shown at the MCS monitor. Appendix C contains an index of the faceplates discussed in the body of this document and is presented as a quick reference guide.

Each faceplate directly involved with a particular aspect of the SCRB will be described in the appropriate section of this document.

2.2 207-A Retention Basins Major Elements

The P&ID Drawing H-2-69332 shows the major components of the 207-A Retention Basins. This P&ID Drawing also indicates the valves and instruments being monitored by the MCS.

The 207-A Steam Condensate Retention Basins are designed to hold steam condensate from the 242-A Evaporator Process in three (3) 70,000 gallon basins. The SC sent to these basins from the 242-A process is held in the basin for interim storage while samples are being taken/analyzed. The design of the SCRB system is such that while one basin is full and awaiting sample results and/or being pumped out, another basin can be filled with steam condensate from the 242-A process. During normal operation, one basin is usually being filled, one basin is full awaiting sample results or being pumped out, and the third basin is empty ready to accept steam condensate from the process when needed. Sampling of the steam condensate is usually

¹ D/3 is a trademark of Texas Instruments

accomplished by the RC-1 radiation monitor/diversion system located in the facility (see steam condensate SDD WHC-SD-WM-SDD-013). If samples of the steam condensate collected in a particular basin cannot be obtained from the RC-1 sampler, provisions are available to sample the steam condensate from the sample/fill port located in the basin cover, or from the basin strainer blowdown valves. Procedure TO-630-040 SAMPLE/FILL/DRAIN 242-A STEAM CONDENSATE contains the procedural steps to sample the basins from the sample/fill ports or the strainer blowdown valves. If the SC is determined to be within release limits of the 216-B-3 pond, the SC is pumped from the basin(s) to the 216-B-3 pond. If the SC is determined to NOT be within release limits of the 216-B-3 pond, the SC can be pumped from the basin(s) to a doubleshell tank for storage via the 241-A-350 catch tank.

2.2.1 Building 207-A

Steam Condensate gravity drains from the 242-A Building Steam Condensate System to the 207-A Building. The 207-A building measures 3.8 m (12 ft 6 in.) by 4.6 m (15 ft). The walls, constructed of 0.3 m (1 ft) thick reinforced concrete, are 4.6 m (15 ft) high and extend from 3 m (10 ft) below grade to 1.5 m (5 ft) above grade. The floor contains a 0.6 m (2 ft) by 0.6 m (2 ft) by 0.6 m (2 ft) deep sump. The ceiling/roof of the building is comprised of metal decking. Access is via an entry hatch. A ladder extends to a 2.4 m (8 ft) by 0.8 m (2 ft 9 in.) metal-grate work platform, which is suspended 2.3 m (7.5 ft) above the floor of the building.

The 207-A Building contains piping, valving, and pumps to:

- Route steam condensate to a specific basin.
- Pump steam condensate from the basins to the 216-B-3 Pond or to 241-A-350.

2.2.2 Motor Operated Ball Valves, SCRB Fill

These valves, MOV-SC-1A, MOV-SC-2A, and MOV-SC-3A, are designed to control SC flow into the three SC retention basins. The valves are 4 inch 150# or 125#, flanged, ball valves with 110 volt electric operators controlled by the MCS. The valves are a 2-position type with a steel body, chrome plated steel ball, teflon seals and integral position switches. The opening and closing of each valve allow flow into the basin corresponding to its number, or diverting the flow into a different basin. The project specification the MOV's described in this section were procured under is B-100-C2. These valves fall under the M-42 pipe code (or the M-5 pipe code which has been determined to be acceptable).

2.2.2.1 MCS Faceplates

- **ZS-SC-1FC, SC Basin-1 Fill Valve**

This 2-state faceplate displays the operating state of the MOV-SC-1A, Motor Operated Valve. This information is read from the position switch connected to MOV-SC-1A.

Faceplate Display:

CLOSED - Indicates MOV-SC-1A is closed, preventing flow of SC to retention basin #1.

OPEN - Indicates MOV-SC-1A is open, allowing SC to enter retention basin #1.

- **HV-SC-1A, SC Basin Fill Valve**

Similar to faceplate ZS-SC-1FC described above, this faceplate displays the operating state of MOV-SC-1A. This faceplate also gets its information on the valve position from ZS-SC-1FC.

Faceplate Display:

CF-CLOSD - Indicates MOV-SC-1A is closed, preventing flow of SC to retention basin #1.

OPEN - Indicates MOV-SC-1A is open, allowing SC to enter retention basin #1.

CLOSING - Indicates MOV-SC-1A has been sent a CLOSE signal but the limit switch has not been activated, thus the valve is not completely closed.

- **ZS-SC-2FC, SC Basin-2 Fill Valve**

This 2-state faceplate displays the operating state of the MOV-SC-2A, Motor Operated Valve. This information is read from the position switch connected to MOV-SC-2A.

Faceplate Display:

CLOSED - Indicates MOV-SC-2A is closed, preventing flow of SC to retention basin #2.

OPEN - Indicates MOV-SC-2A is open, allowing SC to enter retention basin #2.

■ **HV-SC-2A, SC Basin Fill Valve**

Similar to faceplate ZS-SC-2FC described above, this faceplate displays the operating state of MOV-SC-2A. This faceplate also gets its information on the valve position from ZS-SC-2FC.

Faceplate Display:

CF-CLOSD - Indicates MOV-SC-2A is closed, preventing flow of SC to retention basin #2.

OPEN - Indicates MOV-SC-2A is open, allowing SC to enter retention basin #2.

CLOSING - Indicates MOV-SC-2A has been sent a CLOSE signal but the limit switch has not been activated, thus the valve is not completely closed.

■ **ZS-SC-3FC, SC Basin-3 Fill Valve**

This 2-state faceplate displays the operating state of the MOV-SC-3A, Motor Operated Valve. This information is read from the position switch connected to MOV-SC-3A.

Faceplate Display:

CLOSED - Indicates MOV-SC-3A is closed, preventing flow of SC to retention basin #3.

OPEN - Indicates MOV-SC-3A is open, allowing SC to enter retention basin #3.

■ **HV-SC-3A, SC Basin Fill Valve**

Similar to faceplate ZS-SC-3FC described above, this faceplate displays the operating state of MOV-SC-3A. This faceplate also gets its information on the valve position from ZS-SC-3FC.

Faceplate Display:

CF-CLOSD - Indicates MOV-SC-3A is closed, preventing flow of SC retention basin #3.

OPEN - Indicates MOV-SC-3A is open, allowing SC to enter retention basin #3.

CLOSING - Indicates MOV-SC-3A has been sent a CLOSE signal but the limit switch has not been activated, thus the valve is not completely closed.

2.2.3 Manual Gate Valves, SCRB Fill

These valves, B2-2, B2-3 and B2-4 are designed to control SC flow into the three SC retention basins if one of the SCRB MOV valves fails. The valves are 4 inch, 150 #, flanged gate valves. The valves can be manipulated from outside the 207-A building. The opening and closing of each valve allows SC flow into the respective basin or diverts the SC flow into a different basin. The specification requirements for these valves is called out on drawings H-2-69454, H-2-69332 and specification B-100-C2. These valves fall under the M-42 pipe code (or to M-5 pipe code which has been determined to be acceptable).

2.2.4 207-A Steam Condensate Basins

The steam condensate basins are constructed of 10 cm (4 in.) thick reinforced concrete. For protection against leakage, the basins are coated with an elastomeric coating and lined with a high-density polyethylene liner. To keep foreign materials out of the basins that could cause loss of basin capacity and/or pumping problems, a High-Density Polyethylene (HDPE) cover was installed on each basin. The HDPE liner and cover were installed in 1991 as part of the B-534 project upgrade. The floor of each basin is 17 m (55 ft) long and 3.2 m (10.5 ft) wide. The walls slope at a 45 degree angle yielding surface dimensions of 24 m (79 ft) by 11 m (36 ft). At the high liquid elevation, the basins have a maximum depth of 1.8 m (6 ft). Samples of each basin can be taken using the sample/fill port installed in the cover of each basin. Procedural steps for taking samples from the sample/fill port in each basin cover is contained in procedure TO-630-040 SAMPLE/FILL/DRAIN 242-A STEAM CONDENSATE.

2.2.4.1 MCS Faceplates

■ LSL-SC-1, SC Basin-1 Level Low

Source: LE-SC-1-2, Level Element (As shown on H-2-70113)

This 2-state faceplate indicates whether the liquid level in retention basin #1 is low.

Faceplate Display:

NORMAL - Indicates the low level switch has not been activated.

LEVEL LO - Indicates the low level switch has been activated (WHITE alarm) and the liquid level in the basin is below 9".

■ LSH-SC-1, SC Basin-1 Level High

Source: LE-SC-1-1, Level Element (As shown on H-2-70113)

This 2-state faceplate indicates whether the liquid level of retention basin #1 is high.

Faceplate Display:

NORMAL - Indicates the high level switch has not been activated.

LEVEL HI - Indicates the high level switch has been activated (YELLOW alarm) and the liquid level in the basin exceeds 5'6".

■ LSL-SC-2, SC Basin-2 Level Low

Source: LE-SC-2-2, Level Element (As shown on H-2-70113)

This 2-state faceplate indicates whether the liquid level in retention basin #2 is low.

Faceplate Display:

NORMAL - Indicates the low level switch has not been activated.

LEVEL LO - Indicates the low level switch has been activated (WHITE alarm) and the liquid level in the basin is below 9".

■ LSH-SC-2, SC Basin-2 Level High

Source: LE-SC-2-1, Level Element (As shown on H-2-70113)

This 2-state faceplate indicates whether the liquid level of retention basin #2 is high.

Faceplate Display:

NORMAL - Indicates the high level switch has not been activated.

LEVEL HI - Indicates the high level switch has been activated (YELLOW alarm) and the liquid level in the basin is above 5'6".

■ **LSL-SC-3, SC Basin-3 Level Low**

Source: LE-SC-3-2, Level Element (As shown on H-2-70113)

This 2-state faceplate indicates whether the liquid level in retention basin #3 is low.

Faceplate Display:

NORMAL - Indicates the low level switch has not been activated.

LEVEL LO - Indicates the low level switch has been activated (WHITE alarm) and the liquid level in the basin is below 9".

■ **LSH-SC-3, SC Basin-3 Level High**

Source: LE-SC-3-1, Level Element (As shown on H-2-70113)

This 2-state faceplate indicates whether the liquid level of retention basin #3 is above 5'6".

Faceplate Display:

NORMAL - Indicates the high level switch has not been activated.

LEVEL HI - Indicates the high level switch has been activated (YELLOW alarm) and the liquid level in the basin is high.

■ **LSHH-SC-1, SC Basins Level HI-HI**

Source: LE-SC-1-3, LE-SC-2-3, LE-SC-3-3, level Element(s) (As shown on H-2-70113)

This faceplate monitors the levels of all three retention basins currently in operation. The 2-state display indicates whether the liquid level is above 6 ft. in any one of the retention basins.

Faceplate Display:

NORMAL - Indicates the liquid levels in the retention basins are not above 6 ft. deep.

HI HI - Indicates the liquid level(s) in the retention basin(s) are above 6 ft, a RED alarm is activated.

2.2.5 Strainer Isolation Valves

These valves, B1-12, B1-13 and B1-14, are used to isolate the strainers in the drain line from the SC basins. These valves are hand operated and are used when maintenance or cleaning of the drain line strainers is required. The valves are 3 inch, 150 #, flanged gate valves. The specification requirements for these valves is called out on drawings H-2-69454, H-2-69332 and specification B-100-C2. These valves fall under the M-42 pipe code (or the M-5 pipe code which has been determined to be acceptable).

2.2.6 Strainers

These strainers prevent foreign material from the basins from entering the P-3 pump. The strainers are 3 inch, 125 #, flanged face strainers with a 20 mesh monel screen. Though the 207-A Retention Basins are covered and lined to avoid exposure of the SC to the environment, the strainers are needed to assure no debris will get to the pumps and damage them. The strainers are essential to prevent any matter within the basins from clogging of the pipes or the pump, and possibly cause a malfunction. Each strainer has a blowdown valve associated with it (B1-9, B1-10, and B1-11). These blowdown valves are 1 1/4 inch manual ball valves. These blowdown valves are used when cleaning the strainers and are another point where samples of each basin can be taken. Procedural steps for taking samples from the strainer blowdown valves is contained in procedure TO-630-040 SAMPLE/FILL/DRAIN 242-A STEAM CONDENSATE. The specification requirements for these strainers and valves are called out on drawings H-2-69454, H-2-69332 and specification B-100-C2. These strainers/valves fall under the M-42 pipe code (or the M-5 pipe code which has been determined to be acceptable).

2.2.7 Motor Operated Ball Valves, SCRB Drain

These valves, MOV-SC-1B, MOV-SC-2B, and MOV-SC-3B, are designed to control SC flow from the three SC retention basins. The valves are 3 inch 150# or 125#, flanged, ball valves with 110 volt electric operators controlled by the MCS. The valves are a 2-position type with a steel body, chrome plated steel ball, teflon seals and integral position switches. The opening and closing of these valves allow flow into 207-A Building. The flow is then either pumped through Basin Pump, P-3, to B-pond, or 241-A-350. The project specification the MOV's described in this section were procured under is B-100-C2. These valves fall under the M-42 pipe code (or to the M-5 pipe code which has been determined to be acceptable).

2.2.7.1 MCS Faceplates

- ZS-SC-1DC, SC Basin-1 Drain Valve

This 2-state faceplate indicates the position of valve MOV-SC-1B. The information displayed on this faceplate is collected from the position switch connected to the valve.

Faceplate Display:

CLOSED - Indicates valve MOV-SC-1B is closed, preventing basin #1 from draining.

OPEN - Indicates valve MOV-SC-1B is open, allowing liquid from basin #1 to be drained.

■ **HV-SC-1B, SC Basin Drain Valve**

Similar to faceplate ZS-SC-1DC described above, this faceplate displays the operating state of MOV-SC-1B. This faceplate also gets its information on the valve position from ZS-SC-1DC.

Faceplate Display:

CF-CLOSED - Indicates valve MOV-SC-1B is closed, preventing basin #1 from draining.

OPEN - Indicates valve MOV-SC-1B is open, allowing liquid from basin #1 to be drained.

CLOSING - Indicates a CLOSE signal has been sent to MOV-SC-1B but the limit switch has not been activated, thus the valve is not completely closed.

■ **ZS-SC-2DC, SC Basin-2 Drain Valve**

This 2-state faceplate indicates the position of valve MOV-SC-2B. The information displayed on this faceplate is collected from the position switch connected to the valve.

Faceplate Display:

CLOSED - Indicates valve MOV-SC-2B is closed, preventing basin #2 from draining.

OPEN - Indicates valve MOV-SC-2B is open, allowing liquid from basin #2 to be drained.

■ **HV-SC-2B, SC Basin Drain Valve**

Similar to faceplate ZS-SC-2DC described above, this faceplate displays the operating state of MOV-SC-2B. This faceplate also gets its information on the valve position from ZS-SC-2DC.

Faceplate Display:

CF-CLOSED - Indicates valve MOV-SC-2B is closed, preventing basin #2 from draining.

OPEN - Indicates valve MOV-SC-2B is open, allowing liquid from basin #2 to be drained.

CLOSING - Indicates a CLOSE signal has been sent to MOV-SC-2B, but the limit switch has not been activated, thus the valve is not completely closed.

■ **ZS-SC-3DC, SC Basin Drain Valve**

This 2-state faceplate indicates the position of valve MOV-SC-3B. The information displayed on this faceplate is collected from the position switch connected to the valve.

Faceplate Display:

CLOSED - Indicates valve MOV-SC-3B is closed, preventing basin #3 from draining.

OPEN - Indicates valve MOV-SC-3B is open, allowing liquid from basin #3 to be drained.

■ **HV-SC-3B, SC Basin Drain Valve**

Similar to faceplate ZS-SC-3DC described above, this faceplate displays the operating state of MOV-SC-3B. This faceplate also gets its information on the valve position from ZS-SC-3DC.

Faceplate Display:

CF-CLOSED - Indicates valve MOV-SC-3B is closed, preventing basin #3 from draining.

OPEN - Indicates valve MOV-SC-3B is open, allowing liquid from basin #3 to be drained.

CLOSING - Indicates a CLOSE signal has been sent to MOV-SC-3B, but the limit switch has not been activated, thus the valve is not completely closed.

2.2.8 Manually Operated Valves, SCRB drain

These valves, B1-6, B1-7 and B1-8 are designed to control SC flow out of the three SC retention basins if one of the SCRB MOV valves fails. The valves can be manipulated from outside the 207-A building. The opening and closing of each valve allows/isolates flow out of their respective basin. The valves are 3 inch, 150 #, flanged gate valves. The specification requirements for these valves are called out on drawings H-2-69454, H-2-69332 and specification B-100-C2. These valves fall under the M-42 pipe code (or the M-5 pipe code which has been determined to be acceptable).

2.2.9 Sump and Sump Pump, P-1

The 2 ft. by 2 ft. by 2 ft. deep sump is located in the center of the 207-A Building. Within the sump is the Sump Pump, P-1. Sump pump P-1 is a 20 GPM centrifugal pump with a total dynamic head of 25ft and is rated for continuous service. The pump has a cast iron casing, stainless steel shaft and cast iron impeller. The pump has a 2 inch suction port with a 3 inch discharge port. The motor is a 1 horsepower, 460 volt three phase motor rated for 1725 rpm nominal. Pump P-1 is activated by the MCS when a high level of 18 inches is indicated in the sump. The pump is deactivated when the level in the sump is below the low level of 2 inches. The contents of the sump are pumped back into one of the steam condensate retention basins. The project specification sump pump P-1 was procured under is V-B534-CEM04G (CVI # 22069, sheets 1697 - 1714, CEM 4G).

2.2.9.1 MCS Faceplates

■ P-207A-S, 207-A Sump Pump Status

This faceplate indicates an alarm when the sump liquid level is above 18 inches and the sump pump does not activate.

Faceplate Display:

NORMAL - Indicates no alarm condition associated with the sump pump.

SA-RESET - Indicates a temporary status during the resetting of the sump alarm.

HI&P OFF - Indicates the sump level is above 18 inches and the sump pump is not operating. The high sump level signal is delayed for 10 seconds before the alarm is generated in order to allow time for the pump to come on.

SUMP ALM - Indicates the alarm status (YELLOW) for the high sump liquid level and failure of the sump pump.

■ LSH-P-1, 207-A Sump Level High

This 2-state faceplate indicates whether the liquid level in the 207-A Sump is above 18 inches.

Faceplate Display:

NORMAL - Indicates the liquid level in the sump is below the set alarm limit of 18 inches.

LEVEL HI - Indicates the liquid level in the sump exceeds the 18 inches (YELLOW alarm) and needs to be pumped.

- **YS-P1-1, 207-A Sump Pump Confirm**

This digital, 2-state faceplate indicates whether the sump pump is running or not.

Faceplate Display:

ON - Sump pump is running.
OFF - Sump pump is stopped.

- **II-SUMPP1, 207-A Sump Pump-P1 Current**

This faceplate displays the P-1 Sump Pump electrical current.

Faceplate range

0 to 5 amps

2.2.10 Basin Pump, P-3

Basin pump P-3 is used to pump steam condensate from the SC retention basins to B-Pond or 241-A-350. Basin pump P-3 is a 110 GPM horizontally flex coupled, frame mounted centrifugal pump with a total dynamic head of 50 ft, suction pressure of 15 psig and is rated for continuous service. The pumps casing, shaft and impeller are of 316 stainless steel construction. The pump has a 3 inch suction port with a 3 inch discharge port, both ports with 150 # flanged faces. The motor is a 3 horsepower, 460 volt three phase motor rated for 1750 rpm nominal. The project specification for basin pump P-3 is V-B534-CEM04H (CVI # 22069, sheets 1508 - 1518, CEM 4H).

2.2.10.1 MCS Faceplates

- **207-A-P3, Steam Condensate Basin Pump**

This faceplate displays the operating status of the P-3 pump motor.

Faceplate Display:

CF-OFF - Pump is stopped.

CF-ON - Pump is running, confirmed by the motor contact and current.

SD-RESET - Indicates a temporary status during the resetting of the SHUTDOWN status.

SHUTDOWN - Indicates the motor has stopped without a STOP command being issued.

STOPPING - Indicates the motor has been commanded to stop but the contact or motor current confirm is still present.

STARTING - Indicates the motor has been commanded to start but the contact and current confirm have not been received yet.

- **II-SC-P3, SC-Basin Pump P-3 Current**

This faceplate displays the electrical current in the P-3 Basin Pump.

Faceplate range

0 to 10 amps

2.2.11 Transfer piping to 241-A-350

If, after the sample results from the basin are received, the basin contents are not within the release limits of the 216-B-3 pond, the basin contents will be pumped to the 242-A-350 catch tank. To accomplish this, a temporary spool piece can be installed between valves B1-4 (4 inch, 150 #, flanged, hand operated gate valve) and B1-2 (4 inch, 150 #, flanged, hand operated gate valve). The basin contents can then be pumped to the 241-A-350 catch tank using pump P-3. Drawing H-2-69454 contains the piping specifications for both the temporary spool piece and the piping used to accomplish this type of transfer.

2.2.12 Interlocks

A software interlock is activated when a low level is received from one of the SC Retention Basins and pump P-3 is operating. When this occurs, a 60 second timer is started which, after timing out, will shutdown the P-3 pump.

Another software interlock exists on the 207-A sump pump P-1. The pump is automatically started when the sump level reaches greater than 18 inches and automatically shuts down when the sump level reaches 2 inches or less.

2.2.13 Electrical

Electrical utilities for the Level sensors and the MOV's are supplied from panel board "C" (see drawing H-2-99085) inside the 242-A evaporator. Electrical utilities for pumps P-1 and P-3 are supplied from MCC-1 (see drawing H-2-100096) inside the 242-A evaporator.

2.3 Quality Assurance and Safety

2.3.1 Operations and Maintenance Quality Assurance

The Quality Assurance approvals for all operating procedures for the SCRB system, and work performed on the SCRB system for maintenance and/or upgrades purposes will be specified by Engineering in accordance with WHC-CM-3-5, section 12.7 REV 0.

2.3.2 Safety

The SCRB shall accommodate normal conditions and operation without jeopardizing safety to personnel or plant. The design, operation, and maintenance of all equipment shall be in accordance with applicable safety standards and good plant operation practices. Application of the As Low As Reasonably Achievable (ALARA) Program shall be maintained at all times to assure compliance with DOE Order 5480.11.

The 242-A Evaporator Safety Analysis Report (FSAR) WHC-SD-WM-SAR-023 REV.1B, Chapter 9 identifies and evaluates hazards, analyzes selected scenarios, and determines risk acceptability. Specifically, the SCRB preliminary hazards assessment identifies one (1) potential accident and sequence, and categorized the safety level as depicted in Table 9-5 of the FSAR.

The postulated accident scenario and its corresponding safety level is listed below.

1. Building 207-A and Retention Basins

- Contaminated steam condensate from the Evaporator reaches the retention basins where the fluid is resuspended and dispersed to the environment. Safety Level III, Frequency - Extremely Unlikely.

Mitigating Feature: Engineered

- a. Interlock 25 in the evaporator to divert flow of excessively contaminated steam condensate from the 207-A basins back to tank TK-102-AW.
- b. RE-EA1-1, RE-RC1-1, and diversion system to alert operators to excessively contaminated steam condensate and divert flow of it to TK-102-AW.

Mitigating Feature: Administrative

- a. Shut down facility if not brought into conformance.

The 242-A Evaporator Safety Analysis Report (FSAR) WHC-SD-WM-SAR-023 identifies no OSR's on the SCRB system. The 242-A FSAR also does not identify any safety class 2 systems/components associated with the SCRB system.

2.4 Applicable Documents, Specifications and Standards

This SDD is a supporting document for the 242-A evaporator and reflects the latest system upgrades as describe in the following documents:

- 242-A Evaporator Safety Analysis Report (FSAR) WHC-SD-WM-SAR-023.
- 242-A Evaporator Dangerous Waste Permit Application, DOE/RL-90-42, Dated Published June 1991, DOE/RL-90-42 Revision 0, Volume 1 and 2.
- Construction Specification For 242-A Building Evaporator/Crystallizer Upgrade (Process Upgrades) KEH Specification V-B534-C1, Rev. 2, V-B534-C1-026.
- Operating Specifications for the 242-A Evaporator/Crystallizer OSD-T-151-00012.
- 242-A Safety Equipment List, WHC-SD-WM-SEL-028, Rev 0.

Summary of the work performed as a result of Project B-534 As-Built Specification V-B534C1-026 as applicable to the SCRB.

- Construction of a new control room.
- Relocate the process control system to the new control room (MCS).
- Addition of safety-related and non-safety-related interlocks on the process control system.
- Replace and install new instruments and valves.
- Install MCS console and MUX cabinets.
- Install HDPE liners in SCRB basins.

2.5 Original Construction Specification

The following specification has been added for reference purposes. Being the original construction specification, it is the controlling specification for the SCRB system not modified by project B-534 As Built Specification, V-B534C1-026.

- Construction Specification For 242-A Evaporator/Crystallizer Utilities B-100-C2, Rev. 0.

3.0 MAINTENANCE

3.1 Maintenance Approach

Maintenance of the 242-A Evaporator SCRB system is managed and controlled by the following administrative procedures:

- Component Based Recall System (CBRS) per WHC-CM-8-7

The CBRS system uses a computerized database to track, document and recall plant installed instruments and equipment requiring periodic maintenance/calibration.

- Preventative Maintenance (PMs) per WHC-CM-8-2

The PM program directs the inspection of components on a routine controlled frequency. Equipment requiring repair and/or restoration or does not perform its intended function will, as a result of the PM program, be serviced or replaced.

- Job Control System (JCS) per WHC-CM-8-8

The JCS system is used to provide information, guidance, and scheduling capabilities for needed maintenance activities. The types of work that may be performed by utilizing the JCS system include corrective maintenance, modification, preventative maintenance (predictive, Periodic, and Planned) and maintenance as a result of a periodic surveillance of equipment.

3.2.2 OSR Surveillance and Equipment Testing

Operational Safety Requirements (OSR) surveillance procedures incorporate the technical requirements for preventive maintenance, calibration, and testing of 242-A OSR equipment. These procedures include calibration and testing of associated instruments and interlocks. The OSR Surveillance procedures are performed within the appropriate time intervals using the OSR Surveillance Tracking/Notification System, a computer database listing all OSR equipment and appropriate information regarding previous OSR tests. No OSR's are associated with this system.

4.0 SCRB OPERATIONS

All of the 242-A Evaporator Sub-systems act as one system during normal startup and/or shutdown procedures, with each system involved in specific operating events. The role of the SCRB System in startup and/or shutdown is specified in the 242-A Evaporator startup and shutdown procedure. There are three (3) procedures which specify the events for the total Evaporator System, the Prestart Procedure TO-600-020, Startup Procedure TO-600-030, and the Shutdown Procedure TO-600-060. Procedures TO-630-040 is specifically written for the SCRB System for startup, basin sampling, filling and draining.

The startup and shutdown procedures for the 242-A Evaporator involve the readiness of the following evaporator buildings, rooms, systems, and components:

- 207-A and 242-A-81 Raw Water Buildings
- HVAC Room
- Condenser Room
- Building Readiness
- Seal Water Pumps
- RC-1, RC-2, and RC-3 Sampling Systems
- Configure Control Devices

4.1 Start-up

Startup of the SCRB System and the 242-A Evaporator is performed according to procedures TO-600-010, TO-600-020, TO-600-030, and TO-630-040.

As a minimum, the startup of the SCRB System shall meet the following sequence of events.

1. Sump Pump P-1, must be operational.
2. Basin Pump P-3, must be operational.
3. Strainers B1-9, B1-10, and B1-11 must be operational.
4. Equipment listed in the CBRS system must be calibrated.
5. All Motor Operated Valves (MOV-SC-1A, MOV-SC-2A, MOV-SC-3A, MOV-SC-1B, MOV-SC-2B, and MOV-SC-3B) must be operational to open and close on command.
6. RC1 system is operating, calibrated and functionally tested.

4.2 Shutdown

Shutdown and draining of the SCRB System and the 242-A Evaporator is performed according to procedures TO-600-060 and TO-630-040.

As a minimum, the shutdown of the SCRB System shall include the following:

1. Basin Pump P-3 must be shut off.

Appendix A
242-A Evaporator Subsystems

APPENDIX A
242-A EVAPORATOR SUB-SYSTEMS

SYSTEM	DRAWING	SDD	SAFETY CLASS
ELECTRICAL DISTRIBUTION	H-2-10096	WHC-SD-WM-SDD-008	*
STANDBY POWER	H-2-10096 H-2-79519	WHC-SD-WM-SDD-009	•
RAW WATER/USED RAW WATER	H-2-98991 H-2-98994	WHC-SD-WM-SDD-010	*
SANITARY WATER	H-2-69287 H-2-69300	WHC-SD-WM-SDD-011	*
STEAM	H-2-98992	WHC-SD-WM-SDD-012	*
STEAM CONDENSATE	H-2-98993	WHC-SD-WM-SDD-013	*
COMPRESSED AIR	H-2-99001	WHC-SD-WM-SDD-014	*
HVAC - BUILDING VENTILATION	H-2-69249 H-2-99421	WHC-SD-WM-SDD-015	•
FIRE PROTECTION	H-2-85087 H-2-79865	WHC-SD-WM-SDD-016	*
EVAPORATOR LOOP	H-2-98988	WHC-SD-WM-SDD-017	*
SLURRY	H-2-98989	WHC-SD-WM-SDD-018	*
PROCESS CONDENSATE	H-2-98990	WHC-SD-WM-SDD-019	*
DRAIN	H-2-98995	WHC-SD-WM-SDD-020	*
DECONTAMINATION	H-2-98996	WHC-SD-WM-SDD-021	*
ELUENT	H-2-98997	WHC-SD-WM-SDD-022	*
VESSEL VENT	H-2-98998	WHC-SD-WM-SDD-023	*
VACUUM CONDENSER	H-2-98999	WHC-SD-WM-SDD-024	*
ANTI-FOAM	H-2-99000	WHC-SD-WM-SDD-025	*
JET GANG VALVE	H-2-99002	WHC-SD-WM-SDD-026	*
207-A RETENTION BASINS	H-2-69332	WHC-SD-WM-SDD-027	*
MONITORING AND CONTROL	N/A	WHC-SD-WM-SDD-028	*
PERSONNEL PROTECTION DEVICES	H-2-69330	WHC-SD-WM-SDD-029	*
TRANSFER LINES	H-2-70398 H-2-70399	WHC-SD-WM-SDD-030	*
FILTERED RAW WATER SYSTEM	H-2-99003	WHC-SD-WM-SDD-031	*
BUILDING STRUCTURE	N/A	WHC-SD-WM-SDD-032	*

* The safety class of the systems/components can be found in WHC-SD-WM-SEL-028 REV 0.

Appendix B
Faceplate and Graphic Group Sheets

BASINS

022

RNK
SCBASIN

1. FREE LATE 2. GUSTREND 3. HIGHER END 4. 267-11-23

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207-A-P3	II-SC-P3	YS-SC-P3	YS-SCP3IL	HV-SC-1A	ZS-SC-1FC	HV-SC-1B	ZS-SC-1DC
MANUAL	V -0.002 10.00	DIGITAL INPUT	DIGITAL INPUT	MANUAL	DIGITAL INPUT	MANUAL	DIGITAL INPUT
CF-OFF CF-ON SD-RESET	AMPS	ON OFF	NORMAL INTERLOCK	CF-CLOSED OPEN	CLOSED OPEN	CF-CLOSED OPEN	CLOSED OPEN
SHUTDOWN INTERLOCK STOPPING STARTING	0.00			CLOSING		CLOSING	
STEAM CONDENSATE BASIN PUMP	SC BASIN PUMP P3 CURRENT	SC BASIN PUMP P3 CONFIRM	207A-P3 HARDWARE INTERLOCK STATUS	SC BASIN FILL VALVE	SC BASIN-1 FILL VALVE	SC BASIN DRAIN VALVE	SC BASIN-1 DRAIN VALVE
8 HV-SC-2A	9 ZS-SC-2FC	10 HV-SC-2B	11 ZS-SC-2DC	12 HV-SC-3A	13 ZS-SC-3FC	14 HV-SC-3B	15 ZS-SC-3DC
MANUAL	DIGITAL INPUT	MANUAL	DIGITAL INPUT	MANUAL	DIGITAL INPUT	MANUAL	DIGITAL INPUT
CF-CLOSED OPEN	CLOSED OPEN	CF-CLOSED OPEN	CLOSED OPEN	CF-CLOSED OPEN	CLOSED OPEN	CF-CLOSED OPEN	CLOSED OPEN
CLOSING		CLOSING		CLOSING		CLOSING	
SC BASIN FILL VALVE	SC BASIN-2 FILL VALVE	SC BASIN DRAIN VALVE	SC BASIN-2 DRAIN VALVE	SC BASIN FILL VALVE	SC BASIN-3 FILL VALVE	SC BASIN DRAIN VALVE	SC BASIN-3 DRAIN VALVE

COPY

32 SC BASINS

P1

0	1	2	3	4	5	6	7
LSH-P-1	LSH-SC-1	LSL-SC-1	LSH-SC-1	LSL-SC-2	LSH-SC-2	LSL-SC-3	LSH-SC-3
DIGITAL INPUT	DIGITAL INPUT	DIGITAL INPUT	DIGITAL INPUT	DIGITAL INPUT	DIGITAL INPUT	DIGITAL INPUT	DIGITAL INPUT
NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
LEVEL HI	HI HI	LEVEL LO	LEVEL HI	LEVEL LO	LEVEL HI	LEVEL LO	LEVEL HI
207-A SUMP LEVEL HIGH	SC BASIN LEVEL HI-HI	SC BASIN-1 LEVEL LOW	SC BASIN-1 LEVEL HIGH	SC BASIN-2 LEVEL LOW	SC BASIN-2 LEVEL HIGH	SC BASIN-3 LEVEL LOW	SC BASIN-3 LEVEL HIGH
8	9	10					
P-207A-S	II-SUMPP1	YS-P1-1					
MANUAL	V ——— 5.000	DIGITAL INPUT					
NORMAL	AMPS	ON					
SA-RESET		OFF					
HI&P OFF SUMP ALM	0.000						
207-A SUMP PUMP STATUS	207-A SUMP PUMP P1 CURRENT	207-A SUMP PUMP CONFIRM					

33 BASIN LEVEL-SUMP

P1

Appendix C
Faceplate and Instrument Listings

Appendix C

Faceplate Listing

ZS-SC-1FC	10
HV-SC-1A	10
ZS-SC-2FC	10
HV-SC-2A	11
ZS-SC-3FC	11
HV-SC-3A	11
LSL-SC-1	12
LSH-SC-1	13
LSL-SC-2	13
LSH-SC-2	13
LSL-SC-3	14
LSH-SC-3	14
LSHH-SC-1	14
ZS-SC-1DC	15
HV-SC-1B	16
ZS-SC-2DC	16
HV-SC-2B	16
ZS-SC-3DC	17
HV-SC-3B	17
P-207A-S	18
LSH-P-1	18
YS-P1-1	19
II-SUMPP1	19
207-A-P3	19
II-SC-P3	20

APPENDIX D

207-A Manual Valve List

APPENDIX D

207-A Manual Valve List

MANUAL VALVE:

- 1) B2-2 - The valve is a 4 inch, 150 #, flanged gate valve. Valve is used to isolate SC basin #1 from accepting steam condensate. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 2) B2-3 - The valve is a 4 inch, 150 #, flanged gate valve. Valve is used to isolate SC basin #2 from accepting steam condensate. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 3) B2-4 - The valve is a 4 inch, 150 #, flanged gate valve. Valve is used to isolate SC basin #3 from accepting steam condensate. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 4) B1-6 - The valve is a 3 inch, 150 #, flanged gate valve. Valve is used to keep SC basin #1 from draining steam condensate. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 5) B1-7 - The valve is a 3 inch, 150 #, flanged gate valve. Valve is used to keep SC basin #2 from draining steam condensate. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 6) B1-8 - The valve is a 3 inch, 150 #, flanged gate valve. Valve is used to keep SC basin #3 from draining steam condensate. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 7) B1-12 -The valve is a 3 inch, 150 #, flanged gate valve. Valve is used to isolate strainers on drain line from SC basin #1 for maintenance/cleaning. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 8) B1-13 -The valve is a 3 inch, 150 #, flanged gate valve. Valve is used to isolate strainers on drain line from SC basin #2 for maintenance/cleaning. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 9) B1-14 -The valve is a 3 inch, 150 #, flanged gate valve. Valve is used to isolate strainers on drain line from SC basin #3 for maintenance/cleaning. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 10) B1-5 - 1.5 inch, screwed ball valve. Valve is used to drain line between basins and Pump P-3 for maintenance purposes. The valve allows the line to drain into the 207-A building sump. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.

- 11) B2-1 - The valve is a 4 inch, 150 #, flanged gate valve. Valve is used to isolate pump P-3 from the transfer line to the 216-B-3 pond. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 12) B1-4 - The valve is a 4 inch, 150 #, flanged gate valve. Valve is used to route liquid through a temporary jumper to the 241-A-350 catch tank. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 13) B1-2 - The valve is a 4 inch, 150 #, flanged gate valve. Valve is used to route liquid through a temporary jumper to the 241-A-350 catch tank. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 14) B1-1A -The valve is a 4 inch, 150 #, flanged gate valve. Valve is used to isolate abandoned line jumper connection from the abandoned PC basins. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 15) B1-9 - The valve is a 1.25 inch manual ball valve. These blowdown valves are used when cleaning the strainers and are another point where samples of each basin can be taken. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 16) B1-10 -The valve is a 1.25 inch manual ball valve. These blowdown valves are used when cleaning the strainers and are another point where samples of each basin can be taken. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.
- 17) B1-11 -The valve is a 1.25 inch manual ball valve. These blowdown valves are used when cleaning the strainers and are another point where samples of each basin can be taken. M-42 (or M-5) pipe code. This valve is shown on drawing H-2-69332.