FAILURE MODE, EFFECTS, AND CRITICALITY ANALYSIS (FMECA) OF THE WEST VALLEY NUCLEAR SERVICES SUPERNATANT TREATMENT SYSTEM AND THE CEMENT SOLIDIFICATION SYSTEM

DECEMBER 1987

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1.0 SCOPE

The scope of this task was to provide a reliability analysis of two major systems in the Radwaste Treatment System at the West Valley Demonstration Project: the Supernatant Treatment System (STS) and the Cement Solidification System (CSS) (Figure 1). The purpose of this analysis was to provide assurance that these systems are designed for safe operation during the supernatant processing phase of the project. The analysis was not intended to predict overall availability of the systems. The study, completed by Westinghouse Hanford Company (WHC), evaluated the major components located in the steady state main process flow stream of the STS and CSS (through the drum filling operation only) as shown in Figures 2 and 3. Drum handling before and after filling was not to be included in the analysis. Major components include tanks, pumps, heat exchangers, main stream remotely operated valves, and special equipment such as drum filling equipment; the specific components addressed are identified in Appendix A. The analysis (Appendix B) did not address common cause failures and evaluated single failures only, i.e. failure of one component at a time. The analysis addressed the system design as specified in the documents listed in Appendix C and assumed the systems were constructed per those documents. Furthermore, the analysis assumed the operating procedures were current and correct, and the systems will be operated in accordance with these procedures.

2.0 OBJECTIVE

The objective of this analysis was to complete a systematic evaluation of postulated component failures, with the goal of providing confidence that the systems were designed for safe operation. The analytical method chosen for this task was a qualitative Failure Mode, Effects and Criticality Analysis (FMECA) which identifies the effects of postulated failures and provides judgement by the analyst regarding the severity and relative probability of occurrence of the postulated failure.

RADWASTE AND HIGH LEVEL WASTE TREATMENT SYSTEMS

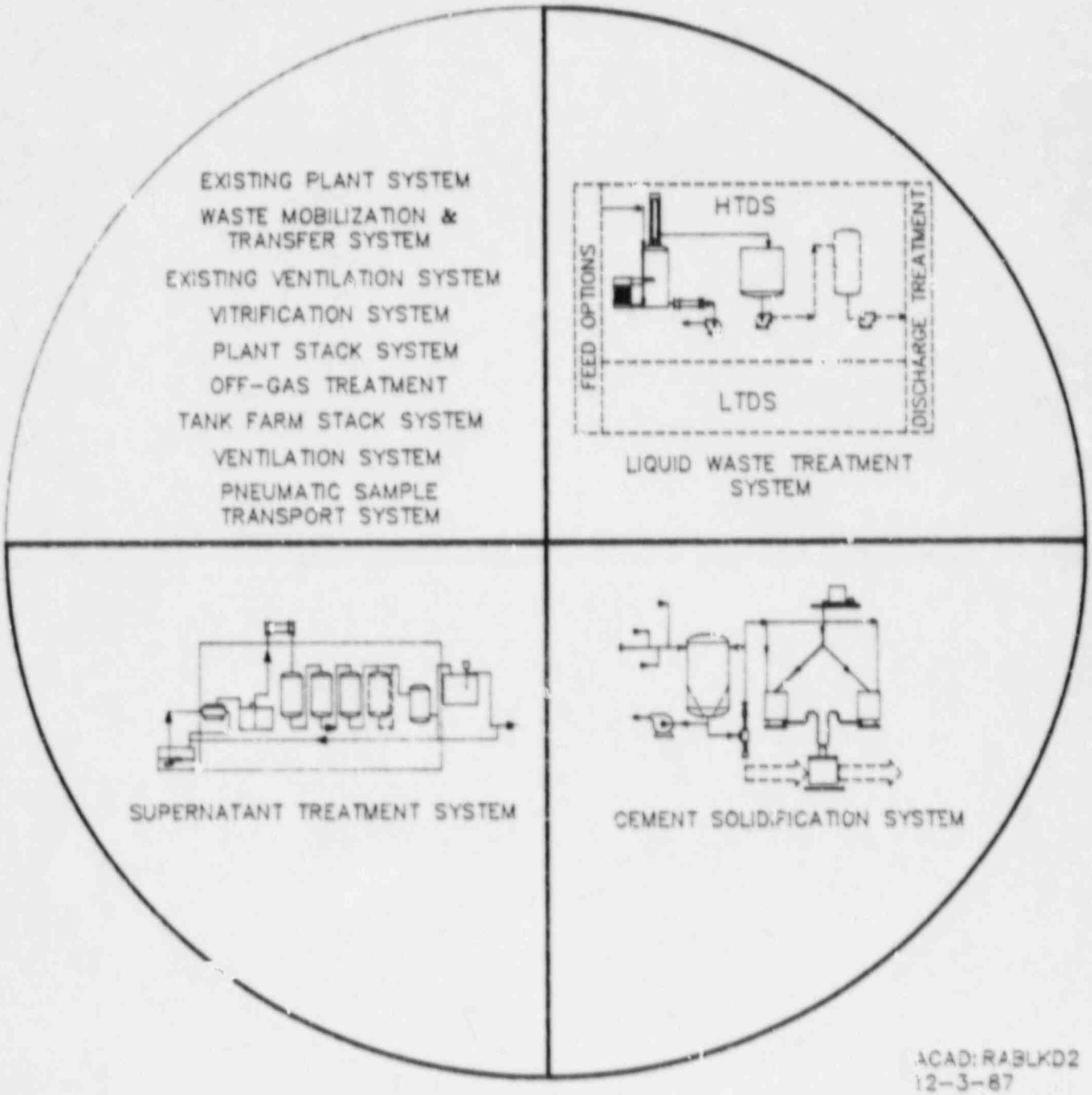

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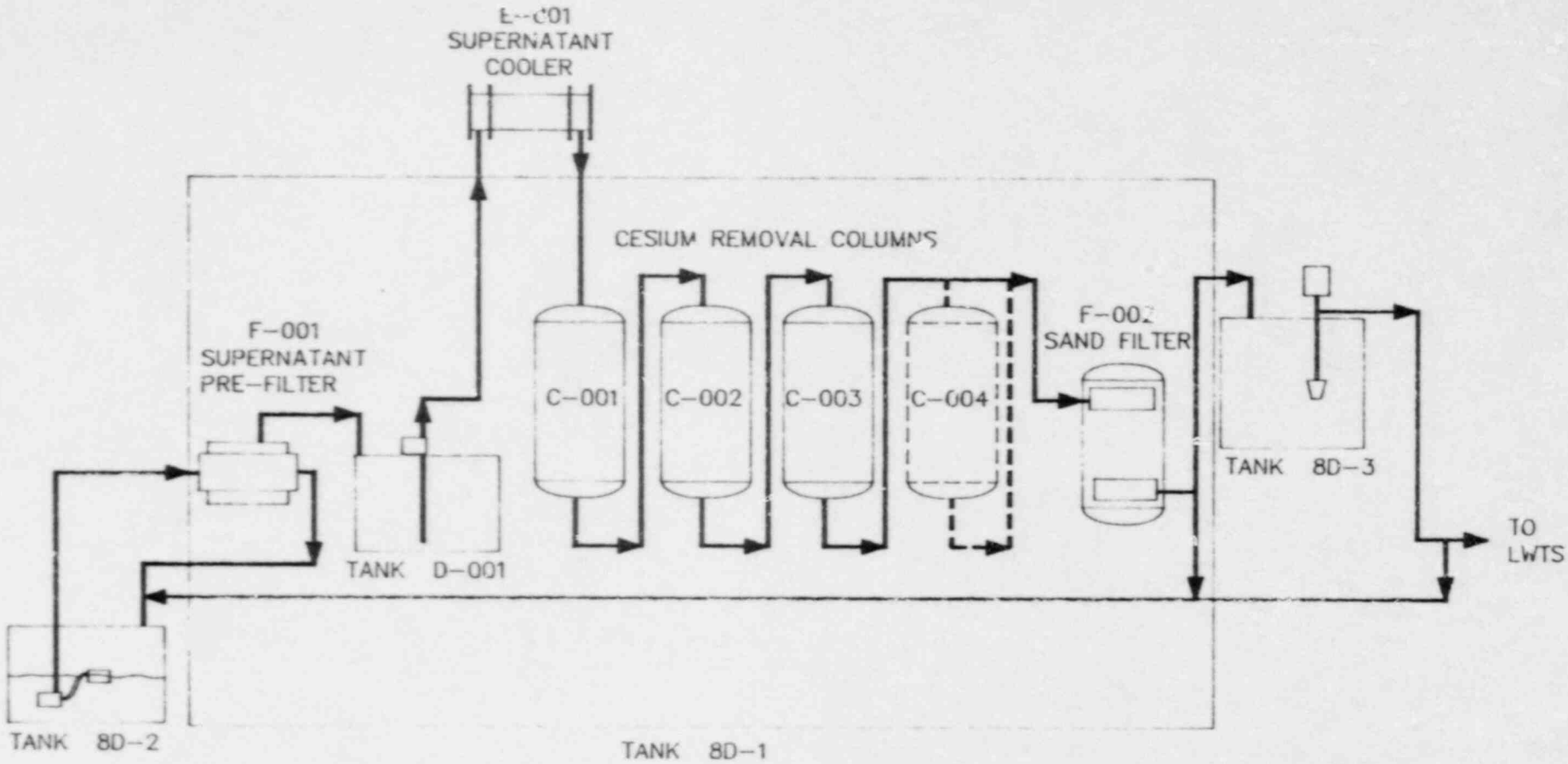
FIGURE 1



SUPERNATANT TREATMENT SYSTEM

FIGURE 2

ATTACHMENT 1
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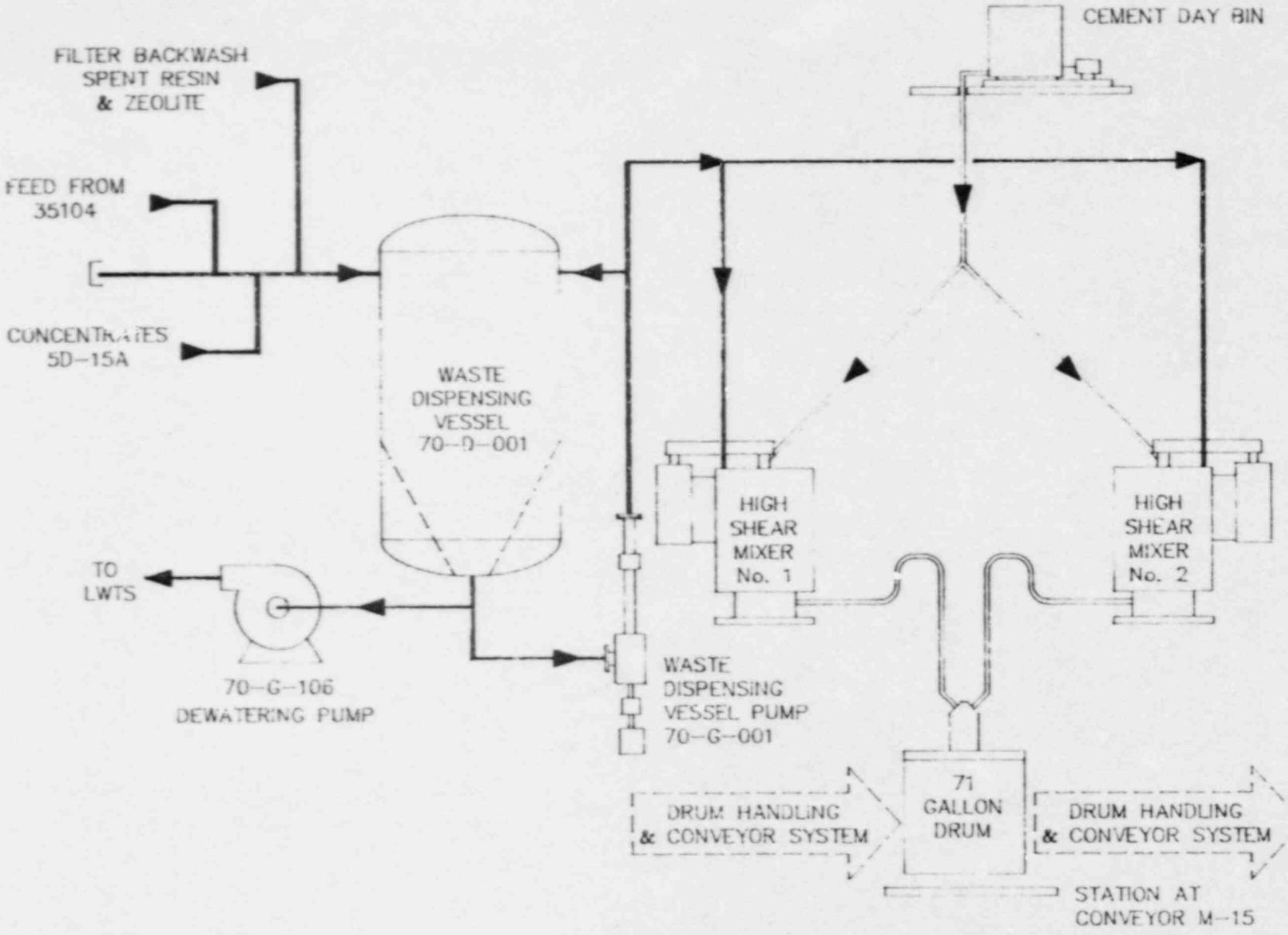

CEMENT SOLIDIFICATION SYSTEM

ACAD: CSS4
11-30-87

FIGURE 3

ATTACHMENT 1
Page 4

3.0 SUMMARY

Eighty-nine components were analyzed in the STS and 57 in the CSS. The number of failure modes postulated for the STS was 261 and 171 for the CSS.

Failures designated as "Class 1" (major severity combined with a high relative probability of occurrence) are of greatest concern. Failure definitions are shown in Table 1.

The number of failures that fall within the various categories of failure severity, including the number that fall within the various ranges of failure probability are shown in Table 2.

All postulated failures are identified in the worksheets of Appendix B; those judged to be of greater significance are summarized in Section 7.0. Also discussed in Section 7.0 are observations related to safety and reliability that were noted during the analysis, but were outside the specific work scope identified in Section 1.0. Recommendations for improvements in reliability and safety are included in Section 7.0 for information.

Although there are actions that should be taken to provide a safer and more reliable system, this independent analysis provides additional confidence that the STS and CSS are designed such that they can be operated safely.

		RELATIVE PROBABILITY OF FAILURE		
		LOW C	MODERATE B	HIGH A
SEVERITY OF FAILURE	MINOR III	CLASS 3		
	MEDIUM II			CLASS 2
	MAJOR I		CLASS 2	CLASS 1

SEVERITY

III MINOR: RESULTS IN NO UNPLANNED PERSONNEL EXPOSURE AND OPERATIONS MAY CONTINUE

II MEDIUM:
a) RESULTS IN AN UNPLANNED RELEASE OF CONTAMINATION TO A NORMALLY INACCESSIBLE AREA
b) RESULTS IN AN OPERATING OUTAGE OF LESS THAN 48 HOURS

I MAJOR:
a) RESULTS IN A RELEASE OF CONTAMINATION TO AN OPERATING AREA
b) RESULTS IN AN OPERATING OUTAGE OF GREATER THAN 48 HOURS

PROBABILITY

C. LOW: HIGHLY UNLIKELY TO OCCUR DURING 2 YEAR PLANT MISSION

B. MODERATE: OCCURRENCE IS POSSIBLE BUT NOT LIKELY DURING 2 YEAR PLANT MISSION

A. HIGH: LIKELY TO OCCUR DURING 2 YEAR PLANT MISSION

TABLE 1

DEFINITIONS OF FAILURE PROBABILITY, SEVERITY AND CLASSIFICATION

	NUMBER OF POSTULATED FAILURES		
FAILURE SEVERITY	STS	CSS	COMBINED
I (Major)	83	13	96
II (Medium)	57	103	160
III (Minor)	121	55	176
RELATIVE PROBABILITY			
A (High)	8	14	22
B (Moderate)	57	112	169
C (Low)	196	45	241
FAILURE CLASS			
1	3	4	7
2	31	10	41
3	227	157	384

TABLE 2

FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS

POSTULATED FAILURE SUMMARY

4.0 SYSTEM FUNCTION

4.1 Supernatant Treatment System (STS)

The function of the STS is to remove high level waste supernatant from the 8D-2 storage tank in the West Valley Radwaste Treatment System and extract Cesium-137 from the supernatant to a level that permits supernatant solidification and storage as low level waste. The STS utilizes a zeolite ion exchange process to separate cesium from the other constituents in the supernatant.

4.2 Cement Solidification System (CSS)

The primary function of the CSS, during supernatant processing, is to immobilize the processed supernatant coming from the Liquid Waste Treatment System (LWTS) and package it into drums for storage in the Drum Cell. Materials handling is accomplished remotely and includes handling of empty and filled drums, and loading the drums onto vehicles for local shipment to the Drum Cell. Drum handling and ancillary functions, such as cement storage, were not to be addressed in this reliability analysis.

5.0 SYSTEM AND PROCESS DESCRIPTION

5.1 Supernatant Treatment System (STS)

Figure 2 provides a block diagram showing the main process flow in the STS. The system uses an ion exchange process with a cesium-specific zeolite contained in four separate ion exchange columns to remove cesium from the supernatant. The zeolite columns are suspended in Tank 8D-1.

The system description can be followed on Figure 4 which includes all of the evaluated components up to the ion exchange columns. The supernatant is pumped from the high level storage tank (8D-2) and transferred via triple-contained piping to a pre-filter (F-001). This filtration prevents contamination of the zeolite by sludge particles suspended in the supernatant. The filtered supernatant is fed to an intermediate collection and feed tank (D-001) which provides about five hours of hold-up. Supernatant ready for ion exchange is then pumped through a cooler to ensure more effective cesium removal in the ion exchange columns. The supernatant is then directed to the first of three ion exchange columns arranged in series.

Figure 5 details the evaluated components and support systems for each ion exchange column. Processing is effected by down-flow through a six-foot zeolite bed in each column. Three successive columns are on line at all times; the fourth is off line undergoing rinse, backflush, sluice-out, zeolite replacement, or standby. Continuous on-stream radioactivity monitoring of the process supplements quantitative analytical sampling to detect column exhaustion and ensures that an appropriate process decontamination factor is achieved. Decontaminated supernatant exiting the third column in the series is passed through a sand filter (F-002) to remove zeolite fines which could contaminate the down stream process.

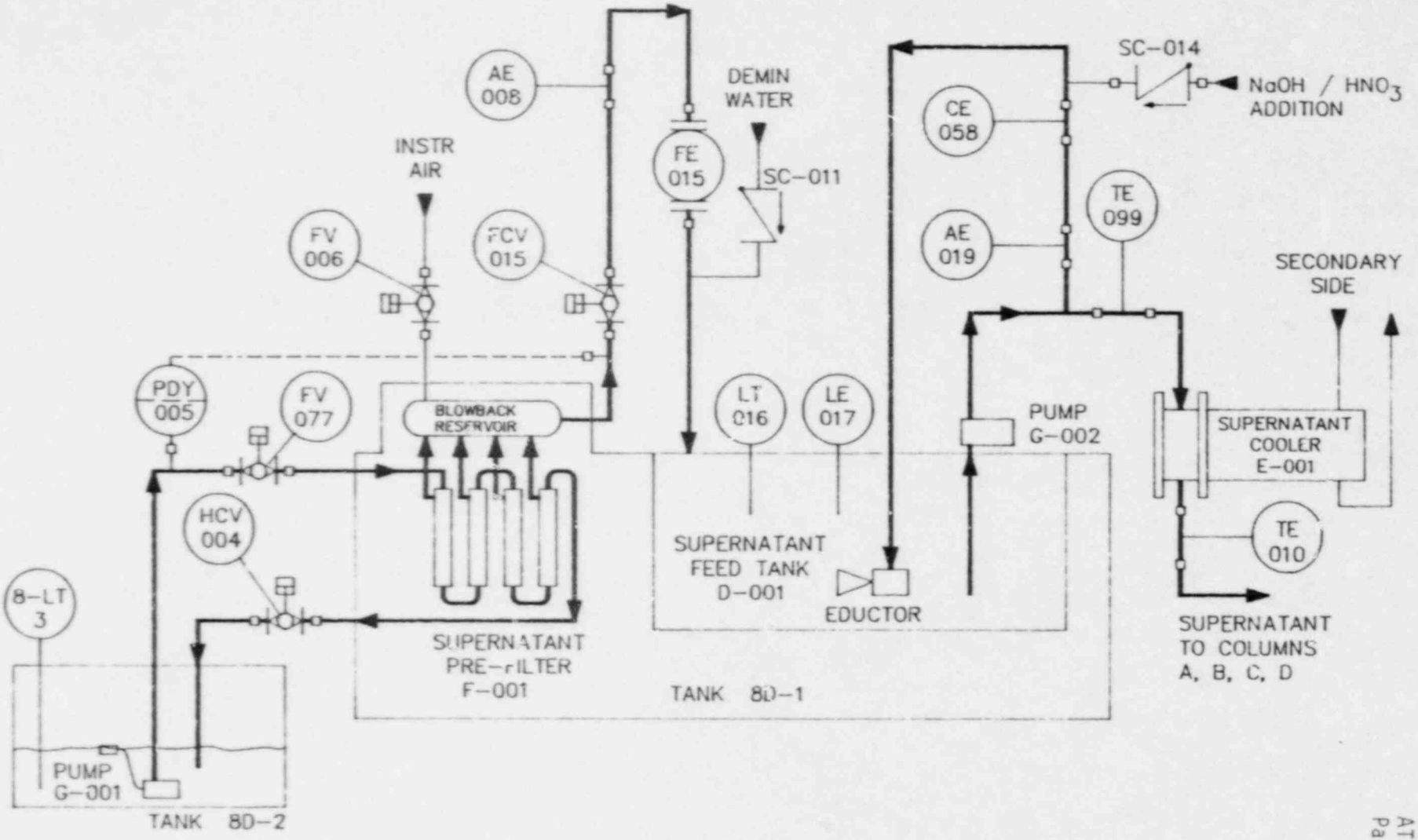

FIGURE 4

SUPERNATANT TREATMENT SYSTEM
FILTRATION AND COOLING SECTION
FLOW DIAGRAM

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12-4-87

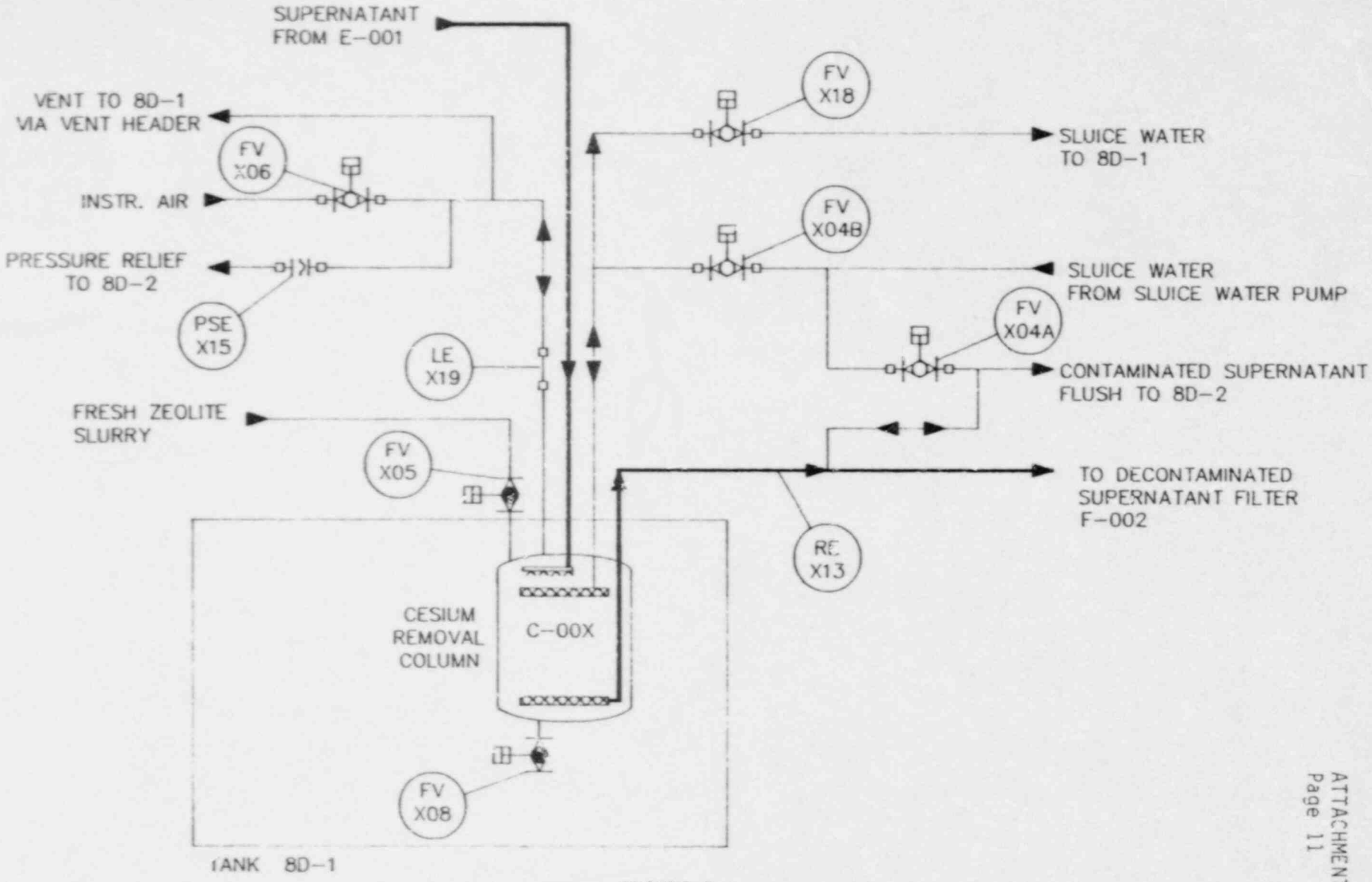

FIGURE 5

SUPERNATANT TREATMENT SYSTEM
ION EXCHANGE SECTION
(TYPICAL 4 PLACES)

ACAD: STS5
12-1-87

Figure 6 depicts the actual evaluated components downstream of the ion exchange column. Filtered and decontaminated supernatant flows to a 15,000 gallon underground storage tank (8D-3) which serves as an intermediate collection and sampling tank prior to transfer to the Liquid Waste Treatment System. From 8D-3, the process fluid is pumped to the LWTS Tank 35104. A recycle line is provided back to Tank 8D-2 to enable reprocessing if required.

Spent zeolite and sand filter media are removed when required and discharged to and stored at the bottom of Tank 8D-1 for subsequent delivery to the Vitrification System.

Fresh zeolite is fed to the columns in the form of a slurry. Dry zeolite (from drums) is transferred to a water filled batch tank and backwashed to remove fines. After fines are removed, fresh zeolite is charged into the ion exchange columns as a water slurry.

Other support services required for STS operation include instrument air for the filter blowback (F-001) and sluice water for the ion exchange columns and sand filter (F-002).

5.2 Cement Solidification System (CSS)

Figure 3 provides a block diagram showing the main process in the CSS. Supernatant concentrate is pumped from the LWTS to the Waste Dispensing Vessel (WDV) (70-D-001) in the CSS. The waste liquid is collected and stored here before mixing with cement. Figure 7 shows the process of feed delivery to the WDV. The Waste Dispensing Vessel Pump pumps the liquid waste slurry in batch quantities from the vessel into the High Shear Mixers. Recirculating the liquid back to the Waste Dispensing Vessel maintains homogeneity of the slurry. The slurry is fed into the upper portion of the High Shear Mixers where it mixes with Portland cement in accordance with a predetermined recipe.

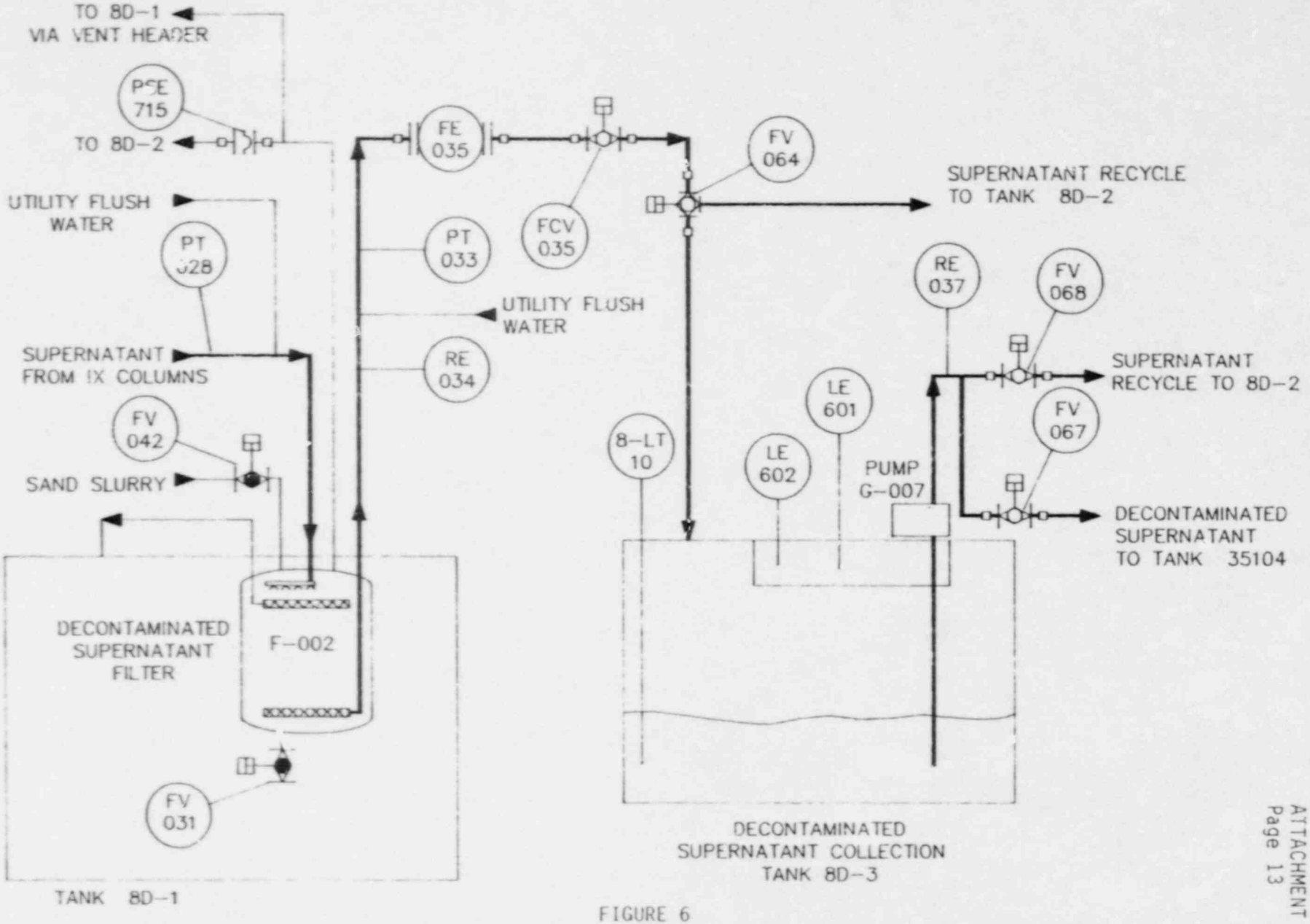

FIGURE 6

SUPERNATANT TREATMENT SYSTEM
FINAL FILTRATION & STORAGE
FLOW DIAGRAM

ACAD:STS4
12-3-87

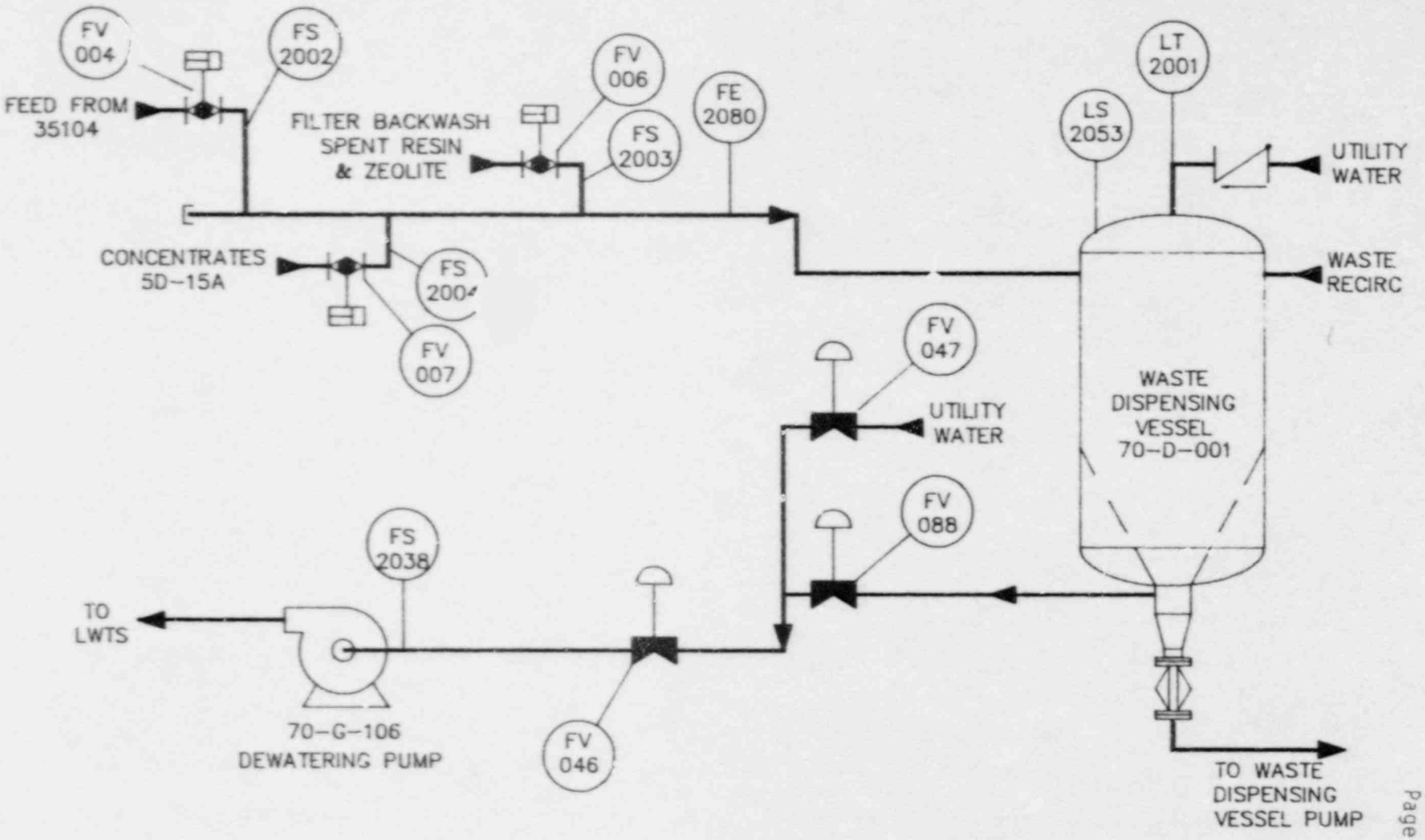

FIGURE 7

CSS SYSTEM 70

ACAD: CSS1
11-23-87

Figure 8 shows how the waste and cement is added to the mixers. The Cement Metering Subsystem consists of a cement day bin and feeder which dispenses metered amounts of dry cement into the High Shear Mixers via a diverter valve. The discharge rate is controlled based on the cement loss from the bin; as the cement feeds down into the mixer, the resulting decrease in weight is monitored by the control system.

The Cement Feed Diverter Valve alternately directs the cement into the two High Shear Mixers. The mixers provide the mechanical action to ensure adequate mixing of the waste slurry and cement. Additives can be introduced to adjust mixture setting time or the chemistry of the liquid wastes upstream of the mixers. Using the discharge head developed by a rotating blade in the mixer, the mixture batch (containing approximately 22 gallons of waste) is discharged through a special fill head and into a drum. Two mixer batches are placed into each drum. The fill head is designed to descend into the drum and seal the opening to prevent spillage of radioactive material. The fill head includes an internal vent that is normally vented to the process room. After each mixer completes its fill cycle, flush water is introduced into the mixer through spray nozzles which flush the top and side walls of the mixer to remove any residual material. This flush water becomes a part of the recipe for the next cycle and the process is repeated until the Waste Dispensing Vessel is emptied.

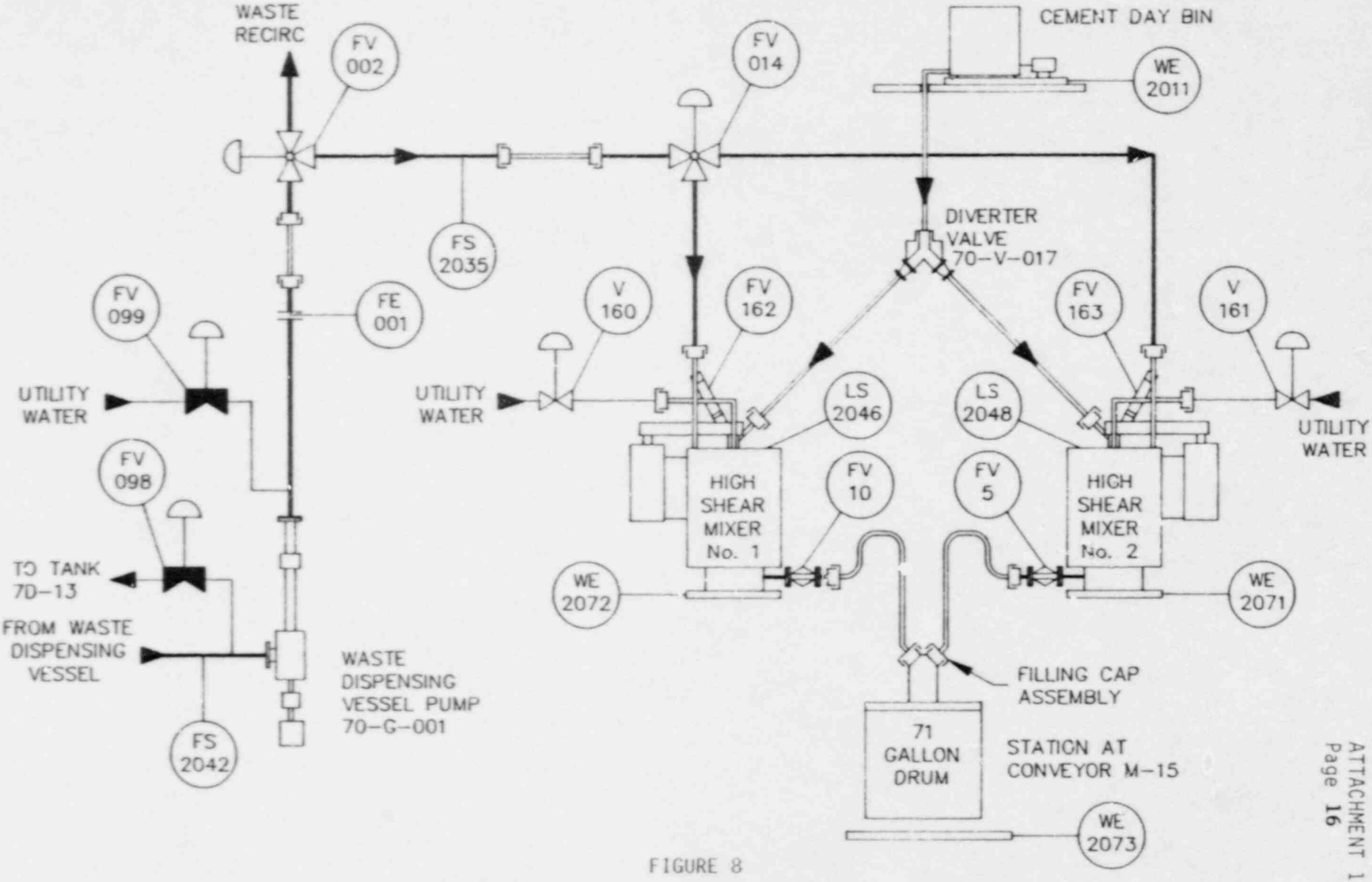

FIGURE 8

CSS CEMENT SOLIDIFICATION SYSTEM

ACAD: CSS2
11-23-87

6.0 APPROACH AND ASSUMPTIONS

6.1 Approach

The approach to this task was as follows:

1. The scope of work and objective were developed in conjunction with WVNS.

2. The team leaders selected for each system travelled to West Valley where they received technical briefings. The briefings included review of system drawings, discussions with the system cognizant engineers, and inspection of the mechanical equipment and control systems.

3. The documentation listed in Appendix C was used as the basis for the FMECA analyses.

4. In an effort to assure an accurate evaluation by Westinghouse Hanford Company (WHC) of the failure effects and to keep WVNS apprised of the results of the analysis, it was mutually agreed that WHC would transmit the FMECA worksheets on a daily basis for in-process review and comment by WVNS. It was also agreed that WVNS would return any comments to WHC within one day.

5. The definitions of failure probability, severity and classification, listed in Table 1, were developed jointly by WHC and WVNS prior to preparation of the FMECA worksheets.

6. The FMECA was conducted using the general guidelines of MIL-STD-1629A.

7. The results of the analysis were summarized in a draft report and transmitted to WVNS for review and comment prior to issuing the final report.

6.2 Basis for Analysis

The basis and assumptions applicable to the FMECA are as follows:

1. The documents listed in Appendix C were assumed to be current and correct for use in the analysis.

2. The support systems listed in Appendix A were treated as a "black box"; their discrete components were not examined individually.

3. Only steady state conditions were considered; startup and shutdown operating modes were not to be included in the scope of this task.

4. The components addressed are those containing or monitoring supernatant flow during normal processing from storage tank 8D-2 through encapsulation in the CSS. Those components which are in support systems and those which are included in ancillary systems used for bypass, return flow, sampling, etc. were not considered. The specific components addressed in this analysis are listed in Appendix A under four categories: Mechanical Equipment, Valves, Instruments, and Support Systems.

5. The analysis of the CSS assumed that system operation is in automatic mode with the Programmable Logic Controller (PLC) and Data Acquisition System (DAS) fully operational, operating correctly and providing proper alarms. It was also assumed that if manual recovery was necessary, the proper corrective action would be taken by operations personnel.

6. In the STS, three of the STS ion exchange columns were evaluated as though they were in normal serial process flow. The fourth column was evaluated under standby conditions and under the zeolite replacement mode. The zeolite replacement mode was assumed to occur immediately following 95% resin breakthrough. Resin replacement is comprised of five rather distinct steps that include: 1) air purge that forces supernatant fluid from the column back to Tank 8D-2, 2) fill and rinse of column zeolite with sluice water, 3) backwash of the column zeolite that fluffs the zeolite in the column to a 50% greater volume, 4) sluicing of the fluidized zeolite out the bottom of the column into Tank 8D-1, and 5) loading of fresh zeolite into the column.

7. In the STS, the prefilter (F-001) was evaluated in both normal process flow and in the blowback condition. The sand filter (F-002) was evaluated in steps similar to the ion exchange columns, as well as normal process flow.

7.0 FMECA FINDINGS AND OBSERVATIONS WITH RECOMMENDATIONS

The results of the analysis are shown in the FMECA worksheets in Appendix B. Worksheets number 50-1 through 50-65 address the STS. Worksheets number 70-1 through 70-41 address the CSS. Two hundred sixty-one postulated failures (failure modes) were analyzed for the STS and 171 postulated failures were analyzed for the CSS. A summary of the number of postulated failures that fall into the various categories of "failure severity", "relative probability", and "failure class" is shown in Table 2 (Section 3.0).

The majority of postulated failures are of minor severity and have a low probability of failure. Although the consequences of the majority of these failures may not be significant, they have the potential for decreasing system availability. Therefore, all postulated failures and their effects, which are identified in Appendix B, should be thoroughly reviewed in an attempt to reduce the possibility of these failures or mitigate their effect.

Section 7.1 discusses postulated failure modes which are considered to be significant enough to be discussed in further detail. Where appropriate, recommendations are provided.

In addition to the discussions of selected failure modes, a number of observations regarding safety and reliability of the STS and CSS are made that are significant but are not related to single failures of the components listed in Appendix A. These are discussed briefly in Section 7.2.

7.1 FMECA Findings of Greater Significance

7.1.1 STS

Section 7.1.1.1 is a discussion of the failure modes that resulted in Class 1 failures (major severity combined with a high relative probability of failure). Section 7.1.1.2 is a discussion of the more significant Class 2 failures. All failure modes are discussed in the worksheets contained in Appendix B. Sections 7.1.1.1 and 7.1.1.2 also contain recommended actions for providing a safer and more reliable system.

7.1.1.1 Class I Failures

The FMECA completed on the STS has identified three failure modes that could result in an extended operating outage requiring manned entry (personnel exposure) to repair the system. A detailed discussion of these failure modes is presented below with the 50-XXX number referring to the corresponding Appendix B worksheets.

50-023 Prefilter Back Flushing

The 1 micron sintered metal filter medium is highly susceptible to plugging. In addition, successful blowback sequence completion requires careful operator attention and interpretation of system conditions and the collective reliability of numerous components. The blowback and system stabilization cycle duration takes approximately 15 minutes to complete. Additional blowback cycles must be operator initiated if flow/pressure parameters are not within operating limits. These conditions add to the difficulty of maintaining the filters in an acceptable "unplugged" condition.

Recommendation: Test actual supernatant containing sediments in a small scale test model. Evaluate the use of larger media orifice size if possible. Consider purchase of spare filter elements and provide a verified replacement procedure prior to hot startup.

50-518 Ion Exchange Column Resin Dump Valve Failure

The reliability of the Zeolite column dump valves is critical to STS operation. The Tank 8D-1 environment, to which the valves are exposed, is considered severe. Since the valve is inaccessible for maintenance or repair, any malfunction has the potential for serious system impact.

Recommendation: Review the valve, valve operator and support hardware to assure maximum service life. Factors to consider are: 1) optimum operating air pressure, 2) lubricants in the air, 3) air moisture and foreign debris, 4) valve and valve operator materials, 5) most desirable failure position, 6) visual access to valve operation. Alternate methods of resin removal should also be investigated to the extent that procedures have been developed and verified.

50-892 Heat Exchanger Pressurization

Because the E-001 heat exchanger has no pressure relief on the shell side, there is a potential for overpressurization especially if the vessel were isolated with cool brine in the shell and allowed to warm.

Recommendation: Review the "as built" configuration to verify vessel and tube integrity under all probable operating conditions. If overstressing potential is found to exist, a pressure relief modification is recommended. Administrative

control over operating conditions may suffice if this modification cannot be made.

7.1.1.2 Other Failures

50-041 Heat Exchanger Tube Failure

Upon tube failure in E-001, particularly a small leak, brine fluid could be pumped into the supernatant stream without detection until the brine pump/pressurizer failed to maintain sufficient differential pressure (DP) across the tubes. At that point significant quantities of brine solution would have entered the supernatant. The loss of DP would alarm but no interlocks would be effected, i.e. the brine pump would continue to operate while G-002 would continue to pressurize the tube side.

Recommendation: Consider the addition of level alarm capability to the brine expansion tank. It would verify the intrusion of brine into the process or the loss of brine from the secondary side. Neither condition is directly detectable with instrumentation indicated on drawings. Evaluate the need to provide additional interlocks to shut down G-002 when this failure occurs.

50-490 Off-line Column Rupture Disc Failure

Loss of a column rupture disc during the refill mode will result in curtailment of resin replacement and the migration of resin to 8D-2. Conversations with WVNS personnel indicated that a rupture disc failure had occurred during cold tests.

Recommendation: These failures should be reviewed to assure that their causes are not related to system pressure transients, hydraulic shock or improper sizing. All disc failures should be fully evaluated.

50-570 Flow Control Valve Failure

FCV-035 is the prime control element in the resin column flow stream. Without alternate routings for decontaminated supernatant, failure of this control element would suspend processing.

Recommendation: Reassess the reliability of this control valve and establish a spare replacement assembly in the valve isle for use in event of valve failure.

50-330, 380, 470 On-line Column Rupture Disc Failure

Loss of the rupture disc for an on-line resin column will result in the process shut-down and the return of supernatant to tank 8D-2. Rupture disc reliability and the ability to identify rupture disc failures are important. Conversations with WVNS personnel indicate that there was a system disc failure during cold testing.

Recommendation: The cold test rupture disc failure should be reviewed to assure that the cause is not related to system pressure transients, hydraulic shock or improper sizing. Any disc failure during cold testing should be fully evaluated. The design should be reviewed to verify that all operating conditions have been considered (including warmup of ion exchange vessels C-001, 2, 3, and 4).

7.1.2 CSS

Figures 7 and 8 show the major CSS components addressed in the FMECA. The figures show all the equipment, valves, instruments and support systems evaluated. Section 7.1.2.1 is a discussion of the failure modes that resulted in Class 1 failures (major severity combined with a high relative probability of failure). Section 7.1.2.2 is a discussion of the failure modes that resulted in Class 2 failures. All failure modes are discussed in the

worksheets contained in Appendix B. Sections 7.1.2.1 and 7.1.2.2 also contain recommended actions for providing a safer and more reliable system.

7.1.2.1 Class I Failures

The FMECA completed on the CSS has identified four failure modes that could result in an extended operating outage requiring manned entry (personnel exposure) to repair the system. A detailed discussion of these failure modes is presented below with the 70-XXX number referring to the corresponding Appendix B worksheets.

70-053 WDV Discharge Line Plugging

Since the Waste Dispensing Vessel will be needed to process both liquid (concentrates 5D-15A) and solids (spent resin and zeolite), flushing of the main process lines using pressurized water is necessary to prevent plugging with solids. The section of piping between the WDV and the WDV pump has no pressurized flushing capability. Since this line has a high potential for plugging with solids, the capability to flush this line is mandatory.

> Recommendation: Add capability to flush this section of line from the WDV pump back to the WDV.

70-361, 70-371 Mixer Discharge Valves, FV-5 and FV-10 Failure

FV-5 and FV-10 operate on air pressure with pressure required to close the valve. At times, failed closed is appropriate and at other times failed open is appropriate. Based on the control system operation of the air supply solenoid valves, a solenoid valve failure prevents the depressurization of FV-5 and FV-10 causing the valves to fail closed. Valve failure in the closed position would prevent mixer discharge while valve failure in the open position could potentially cause a mixer to discharge without a drum in position.

Recommendation: The system should remain as designed, however, an emergency method to manually depressurize these valves should be provided to allow opening the valves. Appropriate controls should be established to insure correct use of the method established.

70-646 Failure of the HSCSS/DAS Control System

SOP-70-11 provides a means of operating the CSS with the Programmable Logic Controller (PLC) inoperative. Operation of the entire system can be performed in this manual mode. With the PLC inoperative, the 15 system alarms and the 8 DAS alarms are not functional. Therefore, manual operation of the system in this condition is not recommended. Operation of the system in manual with the PLC inoperative should only allow dumping a mixer after cement addition has been started to place the system in a safe shutdown condition. All other operations should be precluded.

Recommendation: With the HSCSS/DAS system providing all the control operations of the CSS, sufficient redundancy of the HSCSS/DAS control system should be provided to assure continued operation of the system. SOP-70-11 should be revised to allow only mixer dumping in manual mode without PLC being operational. Readily available spare components for PLC and DAS should be provided.

7.1.2.2 Other Failures

70-002 High Cement Feed

If too much cement is added, potential exists that a low water/cement ratio could cause cement setup in mixer.

Recommendation: Modify the HSCSS/DAS to limit the amount of time that the cement feeder may operate to ensure that excessive amounts of cement cannot be added.

70-027 Johnson Screen Plugging (WDV)

During handling of solids, the Johnson screen could plug, preventing further dewatering. Backflush of Johnson screens may then be required.

Recommendation: A procedure should be identified for backflushing of the screens.

70-079, 70-104 Mixer 1 and 2 Drainage

Detection of an accumulation of cement in the discharge line from mixers to drum, or within a mixer cannot be made.

Recommendation: Use the DAS to monitor changes in the tare weight of mixer and if this weight varies by more than 10-20%, flushing should be initiated and/or preparations made to replace the mixer.

70-362, 70-372 Mixer Discharge Valves FV-5 and FV-10 Failure

The open or partially open failure of the FV-5 and FV-10 pinch valves causes the CSS process to be unable to continue. The likelihood of a pinch valve failing due to clogging appears to have a high probability in the projected two-year operation of the CSS. The valves being located horizontally have the potential to allow cement to remain in the valves. The downtime to fix, flush, or replace the valve should not be extensive if the parts are readily available. However, if the failure occurs during a batch cycle, the waste may empty to the drum before the addition of cement. If the valve failed during mixing, this would result in a premature mixture dump of cement into the drum.

Recommendation: Adequate spare parts or spare valves should be available.

70-393, 70-394 Cement Diverter Valve

If the cement diverter valve is stuck partially open to one mixer or closed to both mixers, the program cannot continue. If waste/cement is in one mixer, then that mix cycle can be finished, but significant downtime may occur to fix or replace the cement diverter valve before the entire process can continue. This valve was projected to have a high failure probability because it has two cylinders, four limit switches, and interconnecting linkages associated with its operation.

Recommendation: Have available spares or spare valve to install as required.

70-541, 70-551 Mixer Overfill Level Switches

The high level switch in each mixer is projected to fail indicating an overflow condition if the probe should become severely crusted with mixer residue. This will cause some downtime and is likely to happen in the two-year operation of the system. Failure of the switches will shut off the WDV pump and prevent the pump from running until the switches are repaired.

Recommendation: Some method of frequent cleaning of the level probe should be devised.

7.2 General Observations

7.2.1 STS

Observation 1 - Overflow Capacity

Many of the new vessels utilized in STS have no liquid overflows. The only overflow route from these vessels is through the Waste Tank Farm Vent System (WTFVS).

Recommendation: The flow rates and related volumes of both planned and unplanned fluid intrusions (liquid, steam, air)

into a vessel should be compared with the ability of the vessel and the downstream WTFVS to safely handle them. With respect to the WTFVS, simultaneous intrusions and balance-of-plant demand should be considered when assessing handling capability.

Observation 2 - Control Valve Failures

There are a limited number of key control valves that regulate the process flow through the ion exchange columns to 8D-3 and the feed from 8D-2 through the prefilter to D-001.

Recommendation: Spare jumper assemblies that include a valve should be available in the valve aisle. The following valves are recommended as a minimum complement of valve isle spares: HCV-004, FCV-015, FCV-035, HCV-059, and FV-064.

Observation 3 - Rupture Disc Integrity Verification

Much of the pressure relief on STS vessels is achieved through the use of rupture discs which typically vent and gravity drain through a common header to 8D-2. Though all the discs are accessible from the valve aisle, there appears to be no off-line intentions to verify disc integrity while off-line. On-line methods of verification appear to be somewhat involved and possibly inconclusive.

Recommendation: Review the operating philosophy associated with rupture discs particularly assessing methods of verification which can quickly and assuredly identify failed discs.

Observation 4 - Verification Of Valve Position

The STS control system and operating procedures are closely tied to the validity of valve position indication through limit switches. Though the reliability of such indication is considered

adequate, critical operations should include validation of valve operation through other and/or redundant process indicators.

Recommendation: Review key Standard Operating Procedures (SOP) to assure that there is not sole dependence on valve limit switch indication or, where dependence does exist, the consequences are understood and determined to be acceptable.

Observation 5 - STS Tank Leak Indication

The existing tanks used as part of STS have leak pan and sump overflow indicators and alarms which readout in other facilities. Jet pumps associated with these sumps and pans are also operated from locations other than STS.

Recommendation: Consideration should be given to the operating benefit of placing these capabilities within STS. Where transfers originating within STS can potentially leak/overflow in other plant areas it may be prudent to have some indication, control or response capability located at STS. For G-007, in addition to the tank 8D-3 low level interlock, add a tank 35104 high level interlock to stop G-007.

Observation 6 - Stagnant Ion Exchange Column Flow

There are numerous failure scenarios which can lead to stagnant supernatant flow within resin columns, filters, etc. all of which require operator response. Recognition of the exact cause of loss of flow (or very low flow) will be difficult.

Recommendation: If it does not already exist, develop a rigorous troubleshooting procedure.

Observation 7 - Ion Exchange Column Failures

There are numerous scenarios which can lead to column failure, e.g., leaky vessels, valves, screens, etc. There is no way to

discover these failures other than through a loss of column efficiency or mass flow balance. The time required to deduce the r cause from these effects could be quite extensive.

Recommendation: If it does not already exist, develop a rigorous troubleshooting procedure.

Observation 8 - Vessel Overpressurization

Pressure relief/vent/overflow lines are smaller than the incoming feed lines. This is acceptable when all the vessels, columns, and piping are designed for the maximum pressure in the feed lines. Although a few are higher, 100 psi is the normal maximum. (A complete evaluation of this issue is beyond the scope of this study.)

Recommendation: If any system components are not designed for 100 psi pressure, a detailed "fault tree" type analysis of the tank vent system is recommended to demonstrate excessive pressurization is not possible.

Observation 9 - Ion Exchange Column Distributor Backflush

There are a number of operating errors, in addition to single component failures, which can transfer zeolite resin to the inside of the inlet distributors on the ion exchange columns. The small holes and fine screen openings of the inlet distributors may make it very difficult to back flush these screens. If the screens can not be cleaned, the ion exchange columns may have to be replaced. With several million curies of cesium in Tank 8D-1, column replacement would be very difficult and could extensively delay the operation.

Recommendation: A "cold" demonstration of the ability to back flush a distributor and screen should be done before "hot" operation.

Observation 10 - Sluice Water Screen

The screen on pump G-004 is a critical component. Failure of this screen to prevent particles of resin larger than 0.007 inches from entering pump G-004 could cause plugging of column screens. The water from tank 8D-1 is pumped via G-004 to tanks D-001 and D-004 and from there to the inside of the screens on the ion exchange columns.

Recommendation: The design of this screen should be reviewed to insure: mesh size at least as fine as the Johnson screens on the columns, high integrity construction was used and a provision for flushing is available.

Observation 11 - Tank Pressurization Consequences

The use of positive tank pressure in tank D-001 and D-004 to provide the required Net Positive Suction Head (NPSH) for pumps G-002 and G-003 (Engineering Change Notice 2024) was not evaluated as this was added during the FMECA review. Positive pressure tanks for radioactive solution storage and transfer have been involved in major contamination incidents. Great care should be exercised when using this approach. Of special concern is the instrumentation system for level and density. Back flow of solution in the transmitter lines will result in contamination in an operating area. Unless positive back flow prevention is provided in these lines they will operate as a single barrier to contamination release (WVNS-DC-013 sect. 5.1).

Recommendation: An analysis of the effects of positive tank pressure should be made before hot operation.

Observation 12 - Data Logging

The operating data for STS is only manually recorded. Evaluation of process upsets will be difficult because of the lack of

detailed and accurate records. Several low cost data logging systems are available which are directly compatible with an IBM-PC and spread sheet software.

Recommendation: The cost/benefit for an automatic data logging system should be investigated.

Observation 13 - Resin Routing Verification

The "Control Wiring Diagram Supernatant Treatment System [STS] Valve Box Interlocks" drawing, 9?3B-317-637A, shows inputs into the PLC from the zeolite hose. These inputs are not used in the program.

Recommendation: Ensure that the resin is directed to the right column with unused PLC inputs from the zeolite hose.

Observation 14 - G-002 Interlock

The low differential pressure alarm, PDAL-093, between the supernatant side and the brine side of the supernatant cooler (E-001) does not stop pump G-002. Operation of this pump with a low differential pressure could possibly contaminate the brine.

Recommendation: An interlock of pump G-002 with PDAL-093 should be provided.

Observation 15 - Supplemental Sequence Alarm

For those valve sequencers used to identify and alarm if an improper sequence is attempted, an alarm both at the control panel and in the valve operating gallery would minimize the time a valve is in the incorrect position.

Recommendation: A second alarm, in the valve operating gallery, should be provided.

Observation 16 - Program Valve Verification

In the program for the PLC used in the STS, Rung 351 needs to be changed. The counter's preset value should be 25 rather than 24. The reason for this change is the next rung in the ladder. When the counter is finished, Rung 352 returns it to 1. As written, the program will get out of sequence on the transition from step 23 to step 24. Counter 460 is used to point to the "as is" condition and counter 461 points to the "to be" position. On the transition from step 23 to 24, Rung 351 causes counter 460 to change to value 24 which also sets bit 460/15. Rung 352 then sets counter 460 to 1. The situation the next time through the ladder is that the "as is" step is 24, the counter 460 "as is" is 1 and counter 461's "to be" step is 2. A delay of longer than 20 seconds on the transition from step 24 to step 1 will cause the alarm.

Recommendation: The PLC, Rung 351 should be checked to insure the correct preset value has been used.

Observation 17 - PLC for Resin Replacement

Use of a PLC sequencer (see Observation 16) is a good one. A similar sequencer could be made for the column resin change out. Much of the basic work was done in trying to do this task automatically. If the automatic approach is dropped, use the PLC to monitor the operation and identify improper valve sequencing. Regarding the automatic sequencer, the program data table has a bad value. Word 01000 is given as "ffff"H (hexidecimal). In the sequencer 447, attempting to input word 01000 through output table word 702, results in step 1 opening valves SV-X04a, -X04b, -X05,-X06, -X08, and -X18. Word 01000 should be "000" to have these valves closed at the start. Additional time would be needed to further evaluate the operation of this sequencer.

Recommendation: A valve sequencer for resin change out should be investigated.

Observation 18 - Tank 8D-3 Interlocks

In accordance with the updated interlock table description, an interlock is needed between the high level alarm on tank 8D-3, LAH-023, and either the diverter valve FV-064 or pump G-002 to stop filling the tank when the high level alarm occurs.

Recommendation: An interlock of valve FV-064 and pump G-002 with LAH-023 should be provided.

7.2.2 CSS

Observation 1 - Limit Switch Failure Modes Related to Automatic Sequencing

o Fails to Close:

This failure mode is detected by no light being illuminated on the CSS graphics panel and can be caused by corrosion on the switch contacts. If a limit switch contact fails to close when expected during automatic sequencing, the program will detect the failure by annunciating "Program on Hold" and/or "Sequence not Verified". In all cases of the CSS control system examined during the FMECA, the failure to close is detected with a timer verifying arrival at the expected state after a command was issued. This failure mode is detected by the system and no system changes are necessary.

o Fails to Open:

This failure mode is noted by the limit switch contacts remaining closed when mechanically the contacts should be open. This could occur due to a temporary short to ground or due to aged contacts driving inductive loads. In the case of the CSS control system,

this problem would be interpreted by the program as having already completed a step when in fact the step was never completed. In this mode the actual device the limit switches are indicating is at some other position. If additional actions are required, the program will initiate them and system failure could result. The only way this failure mode is detected is when the device moves from the failed limit switch to the other limit switch. Both extreme limit switches would be contacting. No annunciator or alarm would sound indicating a failure until the next sequence was detected as not being complete.

This failure mode is extremely important in evaluating all automatic sequencing operations of the CSS, including FV-00?,FV-014, FV-160, FV-161, the Cement Diverter Valve, FV-5, FV-10, the lid handler/flipper and fill head assembly.

> Recommendation: An evaluation of the entire ladder diagram should be performed with this specific failure mode in mind. A possible solution to the program is to perform a status check during the PLC scan cycle of all limit switch positions to ensure that only one limit position is indicated for each device (valve, cylinder, etc.). If not, the program should annunciate the failure on the CSS alarm panel.

Observation 2 - Automatic versus manual operation of CSS

Review of the control system logic has shown that automatic operation of the CSS is an extremely safe operation. However, because of the number of control elements in the system, there exists high probability that frequent manual corrections are necessary to continue the process. Sufficient provisions for manual corrections have been provided. However, this also increases the potential for human errors during manual operations.

Recommendation: A reliability analysis of the CSS operation in manual mode should be performed to assure that appropriate hardwire interlocks are provided so that an operator error could not lead to an unsafe or unrecoverable operation.

8.0 REFERENCES

1. Letter, S.A. Spohr (WHC) to S. Marchetti (WVNS), "Request for Services - Proposal No. MA-069", dated November 5, 1987.

2. MIL-STD 1629A, November 24, 1980, Military Standard - Procedures for Performing a Failure Mode, Effects and Criticality Analysis, Including Notice 1 and Notice 2.

APPENDIX A

LIST OF COMPONENTS

FMECA COMPONENT LIST

Summary

TABLE 1 - STS TOTALS

MECHANICAL EQUIPMENT	14
VALVES	41
INSTRUMENTS	26
SUPPORT SYSTEMS	8
	89

TABLE 2 - CSS TOTALS

MECHNICAL EQUIPMENT	7
VALVES	19
INSTRUMENTS	16
SUPPORT SYSTEMS	15
	57

FMECA COMPONENT LIST

SUPERNATANT TREATMENT SYSTEM (STS)

MECHNICAL EQUIPMENT

8D-2	HIGH LEVEL WASTE STORAGE TANK
G-001	PUMP (IN 8D-2)
F-001	SUPERNATANT PRE-FILTER
D-001	SUPERNATANT FEED TANK
E-001	HEAT EXCHANGER
C-001	CESIUM ION EXCHANGE COLUMN "A"
C-002	CESIUM ION EXCHANGE COLUMN "B"
C-003	CESIUM ION EXCHANGE COLUMN "C"
C-004	CESIUM ION EXCHANGE COLUMN "D"
8D-1	SUPERNATANT TANK
8D-3	SUPERNATANT COLLECTION TANK
G-007	PUMP (IN 8D-3)
F-002	SAND FILTER
G-002	CENTRIFUGAL PUMP (IN D-001)

FMECA COMPONENT LIST

SUPERNATANT TREATMENT SYSTEM (STS)

(CONTINUED)

VALVES

FV-077	FV-204A	FV-405
HCV-004	FV-206	FV-408
FCV-015	PSE-215	FV-418
FV-006	FV-205	FV-404B
SC-011	FV-208	FV-404A
FV-118	FV-306	FV-042
FV-104B	FV-305	FV-031
FV-104A	FV-308	FCV-035
FV-105	FV-304A	PSE-715
FV-108	FV-304B	FV-064
FV-106	FV-318	FV-067
PSE-115	PSE-315	FV-068
FV-204B	FV-406	SC-014
FV-218	PSE-415	

FMECA COMPONENT LIST

SUPERNATANT TREATMENT SYSTEM (STS)

(CONTINUED)

INSTRUMENTS

AE-008 Turbidity
FE-015 Magmeter
TE-099
TE-010
FE-035
RE-037
RE-413
RE-313
RE-213
RE-113
RE-034
B-LT-10
PT-033
PT-028
LE-419
LE-319
LE-219
LE-119
AE-019 pH
CE-058
LE-017
LT-016
8-LT
LE-602
LE-601
PDY-005

FMECA COMPONENT LIST

SUPERNATANT TREATMENT SYSTEM (STS)

(CONTINUED)

SUPPORT SYSTEMS

Instrument Air - Prefilter Blowdown

Demin. H_2O to D-001 dilution

NaOH / HNO_3 Addition to D-001

Heat Exchanger (E-001) Secondary Side

Zeolite (Supply) for C-004

Instrument Air for C-004

Sluice H_2O for C-004

Sand Slurry (F-002)

FMECA COMPONENT LIST

CEMENT SOLIDIFICATION SYSTEM (CSS)

MECHANICAL EQUIPMENT

70-V-010-N	Cement Day Bin
70-D-001-N	Waste Dispensing Vessel
70-G-001-N	Waste Dispensing Vessel Pump
70-K-002-N	High Shear Mixer and Motor #1
70-K-004-N	High Shear Mixer and Motor #2
70-V-002-N	Filling Cap Assembly/Lid Handler
70-G-106-N	Dewatering Pump

VALVES

FV-004	FV-005
FV-006	FV-10
FV-007	CHECK VALVE-UW
FV-088	070-V-001 - CEMENT DIVERTER VALVE
FV-046	CHECK VALVE-UW
FV-047	CHECK VALVE-AIR
FV-098	CHECK VALVE-UW
FV-099	FV-160
FV-002	FV-161
FV-014	

FMECA COMPONENT LIST

CEMENT SOLIDIFICATION SYSTEM (CSS)

(CONTINUED)

INSTRUMENTS

WE-2071 (WT Mixer #2)

WE-2072 (WT Mixer #1)

WE-2073 (WT Drum)

LT-2001

WE-2011 (Cement WT)

FE-001 (Process Flow)

LS-2046 (Mixer Overflow)

LS-2048 (Mixer Overflow)

FS-2002 (Inlet Feed Flow)

FS-2004 (Inlet Feed Flow)

FS-2003 (Inlet Feed Flow)

FE-2080 (Main Inlet Flow)

FS-2042 (Recir Flow Indicator)

FS-2035 (Mixer Feed Flow Indicator)

FS-2038 (Dewatering Pump Flow)

LS-2053 (Level Switch WDV)

FMECA COMPONENT LIST

CEMENT SOLIDIFICATION SYSTEM (CSS)

(CONTINUED)

SUPPORT SYSTEMS

Feed from 35104

Resin and Zeolite Feed

Concentrate 5D-15A Feed

070-VE-053 (Vessel Vent)

070-UW-068 (H_2O to D-001)

070-UW-090 (H_2O to Mixer #2)

070-UW-094 (H_2O to Mixer #1)

Cement Silo

Hydraulic Fluid to Cylinders

070-UW-005 (H_2O to Return Line)

070-UW-067 (H_2O to Supply Header)

070-UW-011 (H_2O to Supply to Mixer)

070-DR-2-092

070-PL-014 (Return Line to LWTS)

HSCSS Control System

APPENDIX B

FAILURE MODE, EFFECTS AND CRITICALITY ANALYSIS WORKSHEETS

RELIABILITY ANALYSIS - SUPERNATANT PROCESSING - STEADY STATE

DATE 04-Dec-87 PAGE 50-1

ENGINEER [signature] DATE 12-4-87 REVIEWED BY [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-001	80-2 SUPERNATANT TANK	DURING HOT STARTUP PROCESS LIQUID LEVEL RISES AND LEAKS THROUGH A HOLE BELOW THE HIGH LEVEL ALARM	LEAK WOULD ACCUMULATE IN 80-2 PAN. PAN LEVEL WOULD INDICATE ON STS PANEL. LEAK CONDITION WOULD ALARM ELSEWHERE IN THE FACILITY BUT NOT IN STS.	THE SOURCE AND MAGNITUDE OF THE LEAK WOULD DETERMINE RESULTING IMPACT TO STS OPERATION. STS OPERATION WOULD MOST LIKELY BE SUSPENDED UNTIL THIS DETERMINATION WAS MADE.	II a, b	B	3
50-010	G-001 PUMP IN 802	PUMP FAILS TO STOP PUMPING	HIGH LEVEL ALARM LAH 016 WILL ALARM	ASSUMING PUMP G-001 FAILS TO STOP, SUPERNATANT WOULD CONTINUE TO FILL D-001 AND TRAVEL THROUGH THE VENT HEADER 026 TO 80-1. DEPENDING ON MANIFOLD CONFIG. SUPERNATANT COULD MIGRATE TO D-004 AS WELL.	IIb	B	3
50-011	G-001 PUMP IN 802	PUMP FAILS TO START PUMPING	FIO 015 WOULD INDICATE LOW/ NO FLOW, FCV-015 WOULD OPEN FULL AND FCV-024 WOULD CLOSE. PI-002 WOULD INDICATE LOW/ NO PRESSURE.	SINCE FCV-024 CLOSURE IS EFFECTED BY A RAMP FUNCTION, THERE'S SOME POTENTIAL TO ROUTE DEMIN WATER UPSTREAM THROUGH LINE 005 BUT THE AMOUNT WOULD BE OF LITTLE CONSEQUENCE.	III	A	3
50-012	G-001 PUMP IN 802	PUMP DISCHARGE IS TOO MUCH	NONE	NONE	III	C	3

ENGINEER [signature] DATE 12-4-87 REVIEWED BY [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-015	G-001 PUMP IN BD2	PUMP DISCHARGE IS LESS THAN ADEQUATE	LOW PRESSURE WOULD INDICATE ON PI-002. LOW FLOW WOULD INDICATE ON FIC-015. FAL-024 WOULD ALARM AT LOW DEMIN WATER FLOW.	LOW FLOW OR PUMP PRESSURE WOULD BE OF LITTLE CONSEQUENCE. PREFILTER SHOULD NOT BE AFFECTED.	IIb	A	2
50-020	F-001 SUPERNATANT PREFILTER	LEAKS THROUGH DURING NORMAL PROCESS FLOW	AI-008 WOULD BE EXPECTED TO SHOW AN INCREASE IN TURBIDITY AND AAH-008 WOULD ALARM. AN INCREASE IN PRESSURE DROP ACROSS THE IX COLUMN OUT OF E-001 WOULD ALSO BE EXPECTED.	IX COLUMN WOULD BE EXPECTED TO PREMATURELY FAIL THROUGH THE ACCUMULATION OF PARTICULATES WHICH LEAK THROUGH THE PREFILTER. DEPOSITION OF PASSED MATERIAL IS NOT EXPECTED TO ACCUMULATE IN E-001 OR RELATED PIPING.	IIb	C	3
50-021	F-001 SUPERNATANT PREFILTER	LEAKS (EXTERNAL) PRIOR TO FILTRATION DURING NORMAL PROCESS FLOW	LEAK IN EITHER FILTERED OR UNFILTERED STREAM WOULD RESULT IN LEVEL INCREASE IN BD-1. LEVEL CHANGE WOULD INDICATE ON STS CONTROL PANEL BUT NOT ALARM. DETECTION UNLIKELY FOR SMALL LEAKS.	A SUSTAINED LEAK WOULD LOWER PRODUCTION FEED VOLUME TO D-001 AND ACCUMULATE IN BD-1 AND REDUCE PRODUCTION EFFICIENCY. LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	IIb	C	3
50-022	F-001 SUPERNATANT PREFILTER	LEAKS (EXTERNAL) AFTER FILTRATION DURING NORMAL PROCESS FLOW	LEAK IN EITHER FILTERED OR UNFILTERED STREAM WOULD RESULT IN LEVEL INCREASE IN BD-1. LEVEL CHANGE WOULD INDICATE ON STS CONTROL PANEL BUT NOT ALARM. DETECTION UNLIKELY FOR SMALL LEAKS.	A SUSTAINED LEAK WOULD LOWER PRODUCTION FEED VOLUME TO D-001 AND ACCUMULATE IN BD-1. LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	IIb	A	2

ENGINEER [signature] DATE 12-4-87 REVIEWED [signature] 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-023	F-001 SUPERNATANT PREFILTER	CAN'T UNPLUG FILTER DURING BLOW BACK	PDI-005 WOULD SHOW NO CHANGE OR AN INCREASE IN DIFFERENTIAL PRESSURE. FIC-015 COULD ALSO SHOW A DECREASE IN FLOW. PDAH 005 WOULD ALARM IF F-001 PLUGS.	PRODUCT FLOW TO D-001 WOULD BE REDUCED AND POSSIBLY STOPPED IF F-001 PLUGGED. DISCHARGE PRESSURE OF PUMP G-001 WOULD INCREASE WITH AN INCREASE IN DISCHARGE TEMPERATURE.	IIb	A	1
50-024	F-001 SUPERNATANT PREFILTER	HIGH PRESSURE EXTERNAL LEAK DURING BLOW BACK	LEAK WOULD RESULT IN LEVEL INCREASE IS BD-1, DETECTION WOULD BE EXTREMELY DIFFICULT BECAUSE OF THE INTERMITTANT NATURE OF THE BLOWBACK SEQUENCE.	THE EFFICIENCY OF F-001 BLOWBACK COULD BE REDUCED REQUIRING MORE FREQUENT CYCLES AND LOWER FEED VOLUME TO D-001 LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	IIb	B	2
50-050	D-001 SUPERNATANT FEED TANK	THE TANK LEAKS DURING NORMAL PROCESS FLOW	DIFFICULT TO DETECT.... MASS/VOLUME BALANCES ARE NOT PERFORMED. LEVEL CHANGE IN BD-1 IS INDICATED ON STS PANEL BUT NO ALARM.	SIZE OF LEAK WOULD DETERMINE IMPACT ON PROCESS. WITH D-001 AS THE SOLE STS FEED TANK A MAJOR LEAK WOULD STOP PRODUCTION. LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	IIb	C	3
50-060	E-001 HEAT EXCHANGER	THE TUBES BECOME PLUGGED	TAHL-010 WOULD ALARM AS TE-010 WENT TO AMBIENT WITHOUT SUPERNATANT FLOW. FIC-035 WOULD INDICATE NO FLOW ON STS PANEL W/O ALARM. PDAL-093 WOULD ALARM DUE TO TO LOW DP ACROSS PRI/SEC OF E-001	PUMP G-002 WOULD RECYCLE TO D-001. WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP	IIb	C	3

ENGINEER J. P. Sorgi DATE 12-4-87 REVIEWED E. Biebesheimer DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-061	E-001 HEAT EXCHANGER	TUBES FAIL	PDAL-093 WOULD ALARM WHEN LEAK IS SUFFICIENT TO REDUCE DP ACROSS PRI/SEC of E-001. RAH-014 COULD ALARM HIGH IF SUPERNATANT FLOW REACHES RE-014.	CONTAMINATION COULD ENTER THE ENTIRE CHILLER SYSTEM. G-002 WOULD CONTINUE TO OPERATE DRIVING CONTAMINATION THROUGH THE FAILED TUBES.	I a, b	B	2
50-050	C-001, CESIUM REMOVAL COLUMN	COLUMN LEAKS IN THE PROCESS MODE	LI-022 INDICATES INCREASE IN SD-1 LIQUID LEVEL..... NO ALARM IN STS. PRESSURE DROP ON PI-214 COULD BE DETECTED DEPENDING ON SIZE OF LEAK.	DEPENDING ON THE MAGNITUDE/NATURE OF THE LEAK, SUPERNATANT OR RESIN COULD ACCUMULATE IN SD-1 LEAKAGE OF SUPERNATANT INTO SD-1 MAY REQUIRE REPROCESSING OF SD-1 LIQUID.	IIb	C	3
50-051	C-001, CESIUM REMOVAL COLUMN	LOWER SCREEN LEAKS THROUGH IN THE PROCESS MODE	PI-114 TO PI-214 PRESSURE DROP	RESIN WOULD BE DEPOSITED ON DOWNSTREAM COLUMN IF LEAK IS EXTENSIVE, COLUMN WOULD HAVE TO BE ABANDONED AND DOWNSTREAM COLUMN MAY BE PLUGGED.	IIb	C	3
50-052	C-001, CESIUM REMOVAL COLUMN	LOWER SCREEN PLUGS IN THE PROCESS MODE	PI WOULD INDICATE REDUCED SUPPLY PRESSURE TO DOWNSTREAM COLUMN. FIC-035 WOULD INDICATE LOW FLOW. TAH-112 MIGHT ALARM ON BED TEMP RISE. TAHL-010 MIGHT ALARM HI DUE TO STAGNANT SUPRN'T TEMP RISE. PI-020 WOULD INCREASE	WITH FLOW INTERRUPTION, ix COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP	IIb	A	2

ENGINEER _____ DATE _____ REVIEWED BY _____ DATE 12-16-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-053	C-001, CESIUM REMOVAL COLUMN	INLET DISTRIBUTOR PLUGS IN THE PROCESS MODE	PI WOULD INDICATE REDUCED SUPPLY PRESSURE TO DOWNSTREAM COLUMN. FIC-035 WOULD INDICATE LOW FLOW. TAHL-010 MIGHT ALARM HIGH DUE TO STAGNANT SUPERNATANT TEMP RISE.	WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP IF INLET DISTRIBUTOR CANNOT BE CLEARED, COLUMN MUST BE ABANDONED OR REPLACED	IIb	B	3
50-060	C-002, CESIUM REMOVAL COLUMN	COLUMN LEAKS IN THE PROCESS MODE	LI-022 INDICATES INCREASE IN BD-1 LIQUID LEVEL..... NO ALARM IN STS. PRESSURE DROP ON PI-314 COULD BE DETECTED DEPENDING ON SIZE OF LEAK.	DEPENDING ON THE MAGNITUDE/NATURE OF THE LEAK SUPERNATANT OR RESIN COULD ACCUMULATE IN BD-1 REQUIRING LATER TRANSFER TO BD-2 AND RECYCLE OF SUPERNATANT.	II a, b	C	3
50-061	C-002, CESIUM REMOVAL COLUMN	LOWER SCREEN LEAKS THROUGH IN THE PROCESS MODE	RAH-215 WOULD ALARM AS A RESULT OF EXPOSURE TO MIGRATING RESIN OR HIGH CURIE CONTENT SUPERNATANT. SAMPLE OF SUPERN'T LEAVING THE IX COLUMN COULD DETECT PRESENCE OF RESIN.	RESIN WOULD BE DEPOSITED ON DOWNSTREAM COLUMN AND POSSIBLY TO THE F-002 FILTER. IF LEAK IS EXTENSIVE COLUMN WOULD HAVE TO BE ABANDONED.	IIb	C	3
50-062	C-002, CESIUM REMOVAL COLUMN	LOWER SCREEN PLUGS IN THE PROCESS MODE	PI WOULD INDICATE REDUCED SUPPLY PRESSURE TO DOWNSTREAM COLUMN. FIC-035 WOULD INDICATE LOW FLOW TAH-212 MIGHT ALARM ON BED TEMP RISE. TAHL-010 MIGHT ALARM HI DUE TO STAGNANT SUPRN'T TEMP RISE.	WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP	IIb	A	2

ENGINEER _____ DATE _____ REVIEWED BY _____ DATE 12.10.87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-063	C-002, CESIUM REMOVAL COLUMN	INLET DISTRIBUTOR PLUGS IN THE PROCESS MODE	PI WOULD INDICATE REDUCED SUPPLY PRESSURE TO DOWNSTREAM COLUMN. FIC-035 WOULD INDICATE LOW FLOW. TAHL 010 MIGHT ALARM HIGH DUE TO STAGNANT SUPERNATANT TEMP RISE.	WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP IF INLET DISTRIBUTOR CANNOT BE CLEARED, COLUMN MUST BE ABANDONED OR REPLACED	IIb	B	3
50-070	C-003, CESIUM REMOVAL COLUMN	COLUMN LEAKS IN THE PROCESS MODE	LI-022 INDICATES INCREASE IN SD-1 LIQUID LEVEL..... NO ALARM IN SYS. PRESSURE DROP ON PI-314 COULD BE DETECTED DEPENDING ON SIZE OF LEAK.	DEPENDING ON THE MAGNITUDE/NATURE OF THE LEAK SUPERNATANT OR RESIN COULD ACCUMULATE IN SD-1 REQUIRING LATER TRANSFER TO SD-2 AND RECYCLE OF SUPERNATANT.	II a, b	C	3
50-071	C-003, CESIUM REMOVAL COLUMN	LOWER SCREEN LEAKS THROUGH IN THE PROCESS MODE	RAH-313 WOULD ALARM AS A RESULT OF EXPOSURE TO MIGRATING RESIN OR HIGH CURIE CONTENT SUPERNATANT. SAMPLE OF SUPERN'T LEAVING THE IX COLUMN COULD DETECT PRESENCE OF RESIN.	RESIN WOULD BE DEPOSITED ON DOWNSTREAM COLUMN AND POSSIBLY TO THE F-002 FILTER. IF LEAK IS EXTENSIVE COLUMN WOULD HAVE TO BE ABANDONED.	Ib	C	3
50-072	C-003, CESIUM REMOVAL COLUMN	LOWER SCREEN PLUGS IN THE PROCESS MODE	PI WOULD INDICATE REDUCED SUPPLY PRESSURE TO DOWNSTREAM COLUMN. FIC-035 WOULD INDICATE LOW FLOW. TAH-312 MIGHT ALARM ON BED TEMP RISE. TAHL-010 MIGHT ALARM HI DUE STAGNANT SUPERNATANT TEMP RISE.	WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP	IIb	A	2

ENGINEER [signature] DATE 12-4-87 REVIEWED [signature] 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-075	C-003, CESIUM REMOVAL COLUMN	INLET DISTRIBUTOR PLUGS IN THE PROCESS MODE	PI WOULD INDICATE REDUCED SUPPLY PRESSURE TO DOWNSTREAM COLUMN. FIC-035 WOULD INDICATE LOW FLOW. TAHL-010 MIGHT ALARM HIGH DUE TO STAGNANT SUPERNATANT TEMP RISE.	WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP IF INLET DISTRIBUTOR CANNOT BE CLEARED, COLUMN MUST BE ABANDONED OR REPLACED	IIb	B	3
50-080	C-004, CESIUM REMOVAL COLUMN	VESSEL LEAKS IN THE STANDBY MODE	NO DETECTION POSSIBLE SINCE VESSEL WOULD BE ISOLATED FROM ALL SYSTEMS. THERE WOULD BE NO ALARM IN STS EVEN WITH MAJOR LEAK	COLUMN FAILS WHEN PLACED IN SERVICE	III	C	3
50-081	C-004, CESIUM REMOVAL COLUMN	VESSEL LEAKS IN THE REPLENISH MODE	NO DETECTION POSSIBLE SINCE VESSEL WOULD BE ISOLATED FROM ALL SYSTEMS. THERE WOULD BE NO ALARM IN STS EVEN WITH MAJOR LEAK	COLUMN FAILS WHEN PLACED IN SERVICE	III	C	3
50-082	C-004, CESIUM REMOVAL COLUMN	UPPER SCREEN LEAK THROUGH IN THE REPLENISH MODE	RESIN WOULD MIGRATE WITH SLUICE WATER TO SD-1 BUT WOULD BE VERY DIFFICULT TO DETECT	NONE	III	C	3

ENGINEER [signature] DATE 12-9-87 REVIEWER [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS[6]
50-083	C-006, CESIUM REMOVAL COLUMN	UPPER SCREEN PLUGS "INSIDE" DURING THE REPLENISH MODE	FI-084 WOULD INDICATE NO FLOW. THE CONDITION WOULD NOT ALARM.	ALTERNATE METHOD OF RINSING COLUMN WOULD HAVE TO BE FOUND TO MAINTAIN USEFULNESS OF COLUMN. DEAD HEAD PUMP OPERATION COULD LEAD TO EARLY PUMP FAILURE.	IIb	C	3
50-084	C-006, CESIUM REMOVAL COLUMN	UPPER SCREEN PLUGS, OUTSIDE DURING THE REPLENISH MODE	ATTEMPTED BACKWASH WOULD DEAD HEAD G-003 AND INDICATE ON PI-434... NO ALARM. LI-044 WOULD INDICATE NO LEVEL CHANGE IN WATER FEED TANK D-004. FI-484 WOULD INDICATE NO FLOW.	ALTERNATE METHOD OF FLUFFING COLUMN WOULD HAVE TO BE FOUND TO MAINTAIN USEFULNESS OF COLUMN. DEAD HEAD PUMP OPERATION COULD LEAD TO EARLY PUMP FAILURE.	IIb	C	3
50-085	C-006, CESIUM REMOVAL COLUMN	LOWER SCREEN LEAKS THROUGH IN THE REPLENISH MODE	RESIN WOULD MIGRATE WITH FLUSH WATER TO BD-2 BUT WOULD BE VERY DIFFICULT	COLUMN FAILS WHEN PLACED IN SERVICE	III	C	3
50-086	C-006, CESIUM REMOVAL COLUMN	LOWER SCREEN PLUGS "INSIDE" DURING THE REPLENISH (BACKWASH) MODE	FI-086 WOULD INDICATE NO FLOW. CONDITION WOULD NOT ALARM.	INABILITY TO FLUFF THE COLUMN. ALTERNATE METHOD OF FLUFFING WOULD HAVE TO BE FOUND TO MAINTAIN USEFULNESS OF COLUMN. DEAD HEAD PUMP OPERATION COULD LEAD TO EARLY PUMP FAILURE IF NOT DETECTED EARLY.	IIb	C	3

ENGINEER [signature] DATE 12-4-87 REVIEWER [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-087	C-004, CESIUM REMOVAL COLUMN	1) LOWER SCREEN PLUGS "OUTSIDE" DURING THE REPLENISH (AIRPURGE) MODE	FI-026 INDICATES LOW FLOW	ALTERNATE METHOD OF PURGING COLUMN WOULD HAVE TO BE FOUND.	IIb	B	3
		2) LOWER SCREEN PLUGS "OUTSIDE" DURING THE REPLENISH (RINSE) MODE	LI-044 WOULD INDICATE NO LEVEL CHANGE IN WATER FEED TANK D-004. FI-084 WOULD INDICATE NO FLOW.	ALTERNATE METHOD OF FLUSHING COLUMN WOULD HAVE TO BE FOUND TO RINSE COLUMN. DEAD HEAD PUMP OPERATION COULD LEAD TO EARLY PUMP FAILURE.	IIb	B	3
50-088	C-004, CESIUM REMOVAL COLUMN	RESIN INLET LINE (INSIDE FV-405) PLUGS	LI-047 WOULD INDICATE NO CHANGE IN FEED TANK D-002 LEVEL. NO OTHER INDICATION WOULD OCCUR.	COLUMN RESIN COULD NOT BE REFILLED UNTIL PLUG WAS REMOVED.	III	B	3
50-090	80-1 SUPERNATANT TANK	AS THE LIQUID LEVEL RISES THE TANK LEAKS AT A SEAM NEAR THE BOTTOM	LEVEL INCREASE IN 80-1 LEAK PAN WOULD INDICATE ON STS PANEL BUT NOT ALARM. IT WOULD ALARM IN ANOTHER FACILITY.	PRODUCTION WOULD BE TERMINATED AND ALL DISCHARGES FROM STS TO 80-1 SUSPENDED.	Ib	B	2
50-100	80-3 COLLECTION TANK	TANK HAS A SEEP LEAK AT A SEAM AT THE BOTTOM	SMALL LEAK WOULD BE DIFFICULT TO DETECT IF ACCUMULATION IN PAN IS BELOW ALARM THRESHOLD. LEAK WOULD BE COLLECTED IN TK LEAK PAN AND ALARM IN MAIN CONTROL RM BUT NOT IN STS. LAL-025 WOULD ALARM WHEN TANK IS EMPTIED.	PRODUCTION WOULD BE SUSPENDED AND ALL FEEDS TO 80-3 TERMINATED. ALTERNATE COLLECTION TANK AND ROUTING TO 35104 WOULD HAVE TO BE FOUND TO CONTINUE PRODUCTION.	Iv	C	3

ENGINEER [signature] DATE 12-9-87 REVIEWER [signature] DATE 12-11-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-110	G-007 PUMP, DECONTAMINATED SUPERNATANT FROM BD-3	PUMP FAILS TO STOP PUMPING UPON COMMAND	LAL-023 WILL ALARM INDICATING LOW BD-3 TANK LEVEL. LAH 055 WOULD INDICATE AND ALARM ON HIGH LEVEL FOR RECEIVING TANK 35104. PI-069 WOULD INDICATE G-007 IS ON LINE.	CAPACITY OF BD3 IS CONSIDERABLY LARGER THAN 35104. OVERFLOW OF 35104 FLOWS TO GCR SUMP 2A-A-6. MATERIAL CAN BE PUMPED OR JETTED OUT OF 35104 IF OVERLOW IS DETECTED. SUMP WOULD OVERFLOW UNLESS JETTED IMMEDIATELY. PUMP G-007 COULD RUN DRY AND FAIL.	II a, b	B	3
50-111	G-007 PUMP, DECONTAMINATED SUPERNATANT FROM BD-3	PUMP FAILS TO START PUMPING	LI 055 (ON 35104) WOULD INDICATE THAT NO MATERIAL IS BEING TRANSFERRED FROM BD-3. LI-023 WOULD IND. NO MATERIAL IS BEING TRANS. NEITHER CONDITION WOULD ALARM. LAH-023 WOULD ALARM IF BD-3 OVERFLOWED. PI-069 WOULD SHOW NO PRES	FEED TO EVAPORATOR OR WASTE DISPENSING VESSEL WOULD BE SUSPENDED. BD 3 COULD OVERFLOW IF LEVEL ALARMS WERE IGNORED.	IIb	B	2
50-112	G-007 PUMP, DECONTAMINATED SUPERNATANT FROM BD-3	PUMP DISCHARGE IS LESS THAN ADEQUATE	PI-069, LI 023, LI-055	SUPERNATANT FLOW FROM BD-3 IS REDUCED	IIb	B	3
50-120	F-002, SAND FILTER	FILTER LEAKS DURING THE PROCESS MODE	PDI-028	DEPENDING ON TYE MAGNITUDE/NATURE OF THE LEAK, SUPERNATANT OR SACD COULD ACCUMULATE IN BD-1.	IIb	C	3

ENGINEER [signature] DATE 12-9-87 REVIEWER [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-121	F-072, SAND FILTER	THE LOWER SCREEN LEAKS THROUGH DURING THE PROCESS MODE	FIC-035 AND PDI-028	SAND IN PIPING REDUCES PROCESS LIQUID FLOW RATE AND POSSIBLY SAND AND ZEOLITE FINES IN DW-5	IIb	C	3
50-122	F-072, SAND FILTER	THE INLET DISTRIBUTOR PLUGS DURING THE PROCESS MODE	PDAJ-028, PDI-028 PI-033, FIC-035	PROCESS FLOW VIRTUALLY STOPS. IF BACKFLOW DOES NOT RESOLVE PLUGGING, THE FILTER MUST BE REMOVED FOR REPAIR. PRESSURE DROP ACROSS FILTER INCREASES.	IIb		3
50-123	F-002, SAND FILTER	THE LOWER SCREEN PLUGS DURING THE PROCESS MODE	PDAH-028, PDI-028, PI-028	PROCESS FLOW VIRTUALLY STOPS. IF BACKFLOW DOES NOT RESOLVE PLUGGING, THE FILTER MUST BE REMOVED FOR REPAIR. PRESSURE DROP ACROSS FILTER INCREASES.	IIb	C	3
55-130	G-002, CENTRIFUGAL PUMP IN D-601	PUMP FAILS TO STOP PUMPING UPON COMMAND	PI-020, FIC-035, LI-025, PI-033, LI-016, PI-028, PDF-028 COLUMN OR-SSUP-	D-001 LEVEL RECEDES ALLOWING POSSIBLE CAVITATION AND LOSS OF FLOW AND PUMP FAILURE AND POSSIBLE TANK DW-5 OVERFLOW	IIb	C	3

ENGINEER [signature] DATE 12-9-87 REVIEWED BY [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-131	G-002, CENTRIFUGAL PUMP IN D-001	PUMP FAILS TO START PUMPING	PI-020, FIC-035 LI-023, PI-033, LI-016, PI-028, LAHH-017, PDI-028, LAH-016 COLUMN PRESSURE	PROCESS SUSPENDED UNTIL PROBLEM RESOLVED	IIb	8	2
50-132	G-002, CENTRIFUGAL PUMP IN D-001	PUMP DISCHARGE IS LESS THAN ADEQUATE	FIC-035 PDI-028 REDUCED COLUMN PRESSURES	INABILITY TO MEET PROCESS REQUIREMENTS	IIb	8	3
50-200	FV-077 DURING NORMAL PROCESS FLOW	FAILS CLOSED	PANEL LIGHTS PDI-005 PDAH-005 PI-002 FIC-035 PI-094	PROCESS CANNOT CONTINUE NORMALLY.	IIb	8	2
50-201	FV-077	LEAKS TO ENVIRONMENT	LIQUID IN VALVE AISLE	NO SIGNIFICANT PROCESS EFFECT. VALVE REPLACEMENT MAY BE REQUIRED.	IIa	8	3

ENGINEER E Liebelsamen DATE 12-4-87 REVIEWED BY [signature] DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-210	HCV-004 DURING NORMAL PROCESS FLOW	FAILS OPEN	PI-094, HCV-004 LIMIT SWITCH PDI-005 PI-002	CONTINUED PROCESS FLOW IS LOST. WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP	IIb	B	2
50-211	HCV-004 DURING FILTER BLOW BACK	FAILS TO OPEN	LIMIT SWITCH PI-094 PI-002	REDUCED EFFICIENCY OF BLOWBACK	IIb	C	3
50-220	FCV-015	FAILS TO OPEN	PDI-005, FQI-015, LIMIT SWITCH FI-015 FAL-024	NORMAL PROCESS IS STOPPED AFTER F-001 BECOMES LOADED. WITH FLOW INTERRUPTION, 1x COLUMNS MAY WARM NECESSITATING COLUMN RESIN DUMP	IIb	B	2
50-221	FCV-015 DURING NORMAL PROCESS FLOW	CONTROLS FLOW ABOVE SETPOINT	FQI-015, LSHH-017, AND LAH-016, LAHH-016, LI-016 FI-015	D-001 MAY BECOME OVER-FILLED RESULTING IN G-001 SHUTDOWN. CONTROLS MAY NEED REPAIR.	IIb	B	3

ENGINEER E. Ebrahimian DATE 12-4-87 REVIEWED BY J. Maraj DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-222	FCV-015 DURING NORMAL PROCESS FLOW	CONTROLS FLOW BELOW SETPOINT	FQI-015 LI-016 FI-015	D-001 LIQUID LEVEL LOWERS DAMAGING G-002.	IIb	B	3
50-223	FCV-015 DURING FILTER BLOW BACK	FAILS TO CLOSE	FQI-015 FI-015 PANEL LIGHTS	NO SIGNIFICANT EFFECT.	III	B	3
50-230	FV-006	DURING NORMAL PROCESS FLOW VALVE LEAKS THROUGH	FIC-015 MAY BE ERRATIC	AIR IS ENTRAINED IN THE PROCESS FLUID	III	B	3
50-231	FV-006	DURING FILTER BLOW BACK VALVE FAILS OPEN	LIMIT SWITCH ON FV-006, PDI-005, PI-094	SUPERNATANT AND AIR MAY PRESSURIZE D-001, COMPROMISING INSTR. CALIBRATIONS. PRESSURIZING BD-2 IS POSSIBLE.	I a, b	C	3

ENGINEER E. Eibeshamian DATE 12-4-87 REVIEWED BY [signature] DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-232	FV-006	DURING FILTER BLOW BACK VALVE FAILS CLOSED	LIMIT SWITCH ON FV-006, PDI-005 PI-094 PI-095	UNABLE TO ACCOMPLISH BLOWBACK OF FILTER.	IIb	B	2
50-250	SC-011, CHECK VALVE DEMIN. WATER SUPPLY	VALVE FAILS OPEN	NONE	NONE	III	B	3
50-251	SC-011, CHECK VALVE DEMIN. WATER SUPPLY	VALVE FAILS CLOSED	FAL-024, HCV-024 POSITION, PI-073	DILUTION OF THE SUPERNATANT ENTERING D-001 IS NOT POSSIBLE. DILUTION MUST BE ACCOMPLISNED BY OTHER METHODS.	IIb	C	3
50-252	SC-011, CHECK VALVE DEMIN. WATER SUPPLY	VALVE PARTS LOOSEN	NONE	NO SIGNIFICANT EFFECT	III	C	3

ENGINEER E Biebesheimer DATE 12-4-87 REVIEWED BY J P Raymond DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-270	FV-118, SLUICE WATER TO BD-1	LEAKS THROUGH IN PROCESS MODE	LI-022 INDICATES INCREASE IN BD-1 LIQUID LEVEL. NO ALARM IN STS.	SUPERNATANT PROCESS FLUID WILL BE RETURNED TO BD-1 LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	IIb	C	3
50-280	FV-104B, SLUICE WATER SUPPLY TO TOP SCREEN	LEAKS THROUGH IN PROCESS MODE	NONE	SLIGHT PRODUCTION EFFICIENCY REDUCTION	III	C	3
50-290	FV-104A, SLUICE WATER SUPPLY TO BOTTOM SCREEN	LEAKS THROUGH IN PROCESS MODE	NONE	SLIGHT PRODUCTION EFFICIENCY REDUCTION	III	C	3
50-300	FV-105, ZEULITE SUPPLY	LEAKS THROUGH DURING PROCESS MODE	LI-022 INDICATES INCREASE IN BD-1 NO ALARM IN STS	SUPERNATANT AND RELIN COULD ACCUMULATE IN BD-1 LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	IIb	C	3

ENGINEER E. Liebsamen DATE 12-4-87 REVIEWED BY D. Mara, Jr. DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-301	FV-105, ZEOLITE SUPPLY	VALVE LEAKS EXTERNALLY DURING PROCESS MODE	RADIOACTIVITY IN VALVE BOX	VALVE BOX COLLECTS RADIOACTIVE LIQUID SUBSTANCE	IIa	C	3
50-310	FV-108, ZEOLITE DISCHARGE VALVE	VALVE LEAKS THRU DURING PROCESS MODE	LI-022 INDICATES INCREASE IN BD-1 NO ALARM IN STS.	SUPERNATANT AND RESIN COULD ACCUMULATE IN BD-1. LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	Ib	C	3
50-311	FV-108, ZEOLITE DISCHARGE VALVE	VALVE LEAKS EXTERNALLY DURING PROCESS MODE	LI-022 INDICATES INCREASE IN BD-1 NO ALARM IN STS.	SUPERNATANT AND RESIN COULD ACCUMULATE IN BD-1. LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	Ib	C	3
50-320	FV-106 INSTRUMENT AIR SUPPLY VALVE TO Ix-C-001	VALVE LEAKS THROUGH DURING PROCESS MODE	FIC-035 (INDICATIONS MAY BECOME ERRATIC) AND RE LE-X19 NO LEVEL INDICATION. PI-X14	LIQUID MAY BE DISPLACED IN ALL COLUMNS AND THE SAND FILTER, ULTIMATELY VENTING THROUGH BD-3 VENT SYSTEM. EFFECTIVENESS OF ZEOLITE MAY BE REDUCED TO AN UNACCEPTABLE LEVEL BECAUSE THE RESIDENCE TIME IS DECREASED, THEREBY SHORTENING THE EFFECTIVE LIFE OF THE ZEOLITE.	Ib	B	2

ENGINEER _____ DATE _____ REVIEWED BY _____ DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-330	PSE-115, COLUMN A VESSEL BURST DISC	RUPTURE ALLOWS PROCESS FLUID TO BE RECYCLED TO 80-2	FIC-035 AND OTHER PRESSURE INDICATORS WILL GIVE LEAKAGE INDICATION	SUPERNATANT PROCESS FLUID WILL BE RETURNED TO 80-2.	IIb	B	2
50-340	FV-204B, SLUICE WATER SUPPLY TO TOP SCREEN	LEAKS THROUGH IN PROCESS MODE	NONE	SLIGHT LOSS IN PRODUCTION EFFICIENCY	III	C	3
50-350	FV-218, SLUICE WATER TO 88-1	LEAKS THROUGH IN PROCESS MODE	LI-022 INDICATES INCREASE IN 80-1 LIQUID LEVEL. NO ALARM IN STS	SUPERNATANT PROCESS FLUID WILL BE RETURNED TO 80-1 LEAKAGE OF SUPERNATANT INTO 80-1 MAY REQUIRE REPROCESSING OF 80-1 LIQUID.	IIb	C	3
50-360	FV-204A, SLUICE WATER SUPPLY TO BOTTOM SCREEN	LEAKS THROUGH IN PROCESS MODE	NONE	SLIGHT PRODUCTION EFFICIENCY REDUCTION	III	C	3

ENGINEER _____ DATE _____ REVIEWED BY _____ DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-370	FV-206, INSTRUMENT AIR SUPPLY	VALVE LEAKS THROUGH DURING PROCESS MODE	FIC-035 (INDICATIONS MAY BECOME ERRATIC) AND RE	LIQUID MAY BE DISPLACED IN ALL COLUMNS AND THE SAND FILTER, ULTIMATELY VENTING THROUGH BD-3 VENT SYSTEM. EFFECTIVENESS OF ZEOLITE MAY BE REDUCED TO AN UNACCEPTABLE LEVEL BECAUSE THE RESIDENCE TIME IS DECREASED, THEREBY SHORTENING THE EFFECTIVE LIFE OF THE ZEOLITE.	IIb	B	2
50-380	PSE-215, TO IX C-302	BURST DISC RUPTURES DURING PROCESS MODE	FIC-035 AND OTHER PRESSURE INDICATORS WILL GIVE LEAKAGE INDICATION IF LEAKAGE IS LARGE	SUPERNATANT PROCESS FLUID WILL BE RETURNED TO BD-2.	IIb	B	2
50-390	FV-205, ZEOLITE SUPPLY	LEAKS THROUGH DURING PROCESS MODE	LI-022 INDICATES INCREASE IN BD-1 NO ALARM IN STS	SUPERNATANT AND RESIN COULD ACCUMULATE IN BD-1. LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	IIb	C	3
50-391	FV-205, ZEOLITE SUPPLY	VALVE LEAKS EXTERNALLY DURING PROCESS MODE	RADIOACTIVITY IN VALVE BOX	VALVE BOX COLLECTS RADIOACTIVE LIQUID SUBSTANCE	IIa	C	3

ENGINEER E. Liebelaimer DATE 12-4-87 REVIEWED BY [signature] DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-400	FV-208, ZEOLITE DUMP	VALVE LEAKS THROUGH IN PROCESS MODE	LI-022 INDICATES INCREASE IN 80-1. NO ALARM IN STS.	SUPERNATANT AND RESIN COULD ACCUMULATE IN 80-1 LEAKAGE OF SUPERNATANT INTO 80-1 MAY REQUIRE REPROCESSING OF 80-1 LIQUID.	Ib	C	3
50-401	FV-208, ZEOLITE DUMP	VALVE LEAKS EXTERNALLY DURING PROCESS MODE	LI-022 INDICATES INCREASE IN 80-1. NO ALARM IN STS.	SUPERNATANT AND RESIN COULD ACCUMULATE IN 80-1 LEAKAGE OF SUPERNATANT INTO 80-1 MAY REQUIRE REPROCESSING OF 80-1 LIQUID.	Ib	C	3
30-410	FV-306, INSTRUMENT AIR SUPPLY	VALVE LEAKS THROUGH DURING PROCESS MODE	FIC-035 (INDICATIONS MAY BECOME ERRATIC) AND RE	LIQUID MAY BE DISPLACED IN ALL COLUMNS AND THE SAND FILTER, ULTIMATELY VENTING THROUGH 80-3 VENT SYSTEM. EFFECTIVENESS OF ZEOLITE MAY BE REDUCED TO AN UNACCEPTABLE LEVEL BECAUSE THE RESIDENCE TIME IS DECREASED, THEREBY SHORTENING THE EFFECTIVE LIFE OF THE ZEOLITE.	Ib	B	2
50-420	FV-305, ZEOLITE SUPPLY	LEAKS THROUGH DURING PROCESS MODE	LI-022 INDICATES INCREASE IN 80-1 NO ALARM IN STS	SUPERNATANT AND RESIN COULD ACCUMULATE IN 80-1. LEAKAGE OF SUPERNATANT INTO 80-1 MAY REQUIRE REPROCESSING OF 80-1 LIQUID.	Ib	C	3

ENGINEER E. Fiebelkamer DATE 12-4-87 REVIEWED BY [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-421	FV-305, ZEOLITE SUPPLY	VALVE LEAKS EXTERNALLY DURING PROCESS MODE	RADIOACTIVITY IN VALVE BOX	VALVE BOX COLLECTS RADIOACTIVE LIQUID	IIa	C	3
50-430	FV-308, ZEOLITE DUMP	VALVE LEAKS THROUGH DURING PROCESS MODE	LI-022 INDICATES INCREASE IN 8D-1. NO ALARM IN STS.	SUPERNATANT AND RESIN COULD ACCUMULATE IN 8D-1 LEAKAGE OF SUPERNATANT INTO 8D-1 MAY REQUIRE REPROCESSING OF 8D-1 LIQUID.	Ib	C	3
50-431	FV-308, ZEOLITE DUMP	VALVE LEAKS EXTERNALLY DURING PROCESS MODE	LI-022 INDICATES INCREASE IN 8D-1. NO ALARM IN STS.	SUPERNATANT AND RESIN COULD ACCUMULATE IN 8D-1 LEAKAGE OF SUPERNATANT INTO 8D-1 MAY REQUIRE REPROCESSING OF 8D-1 LIQUID.	Ib	C	3
50-440	FV-304B, SLUICE WATER SUPPLY TO TOP SCREEN	LEAKS THROUGH IN PROCESS MODE	NONE	SLIGHT LOSS OF PRODUCTION EFFICIENCY	III	C	3

ENGINEER _____ DATE _____ REVIEWED BY _____ DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-450	FV-318, SLUICE WATER TO BD-1	LEAKS THROUGH IN PROCESS MODE	L1-022 INDICATES INCREASE IN BD-1 LIQUID LEVEL. NO ALARM IN STS	SUPERNATANT PROCESS FLUID WILL BE RETURNED TO BD-1 LEAKAGE OF SUPERNATANT INTO BD-1 MAY REQUIRE REPROCESSING OF BD-1 LIQUID.	Ib	C	3
50-460	FV-304A, SLUICE WATER SUPPLY TO BOTTOM SCREEN	LEAKS THROUGH IN PROCESS MODE	NONE	SLIGHT LOSS IN PRODUCTION EFFICIENCY	III	C	3
50-470	PSE 315, TO IX C-003	BURST DISC RUPTURES DURING PROCESS MODE	FIC-035 AND OTHER PRESSURE INDICATORS WILL GIVE LEAKAGE INDICATION IF LEAKAGE IS LARGE	SUPERNATANT PROCESS FLUID WILL BE RETURNED TO BD-2.	Ib	B	2
50-480	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE LEAKS THROUGH WHILE COLUMN D IS IN THE STANDBY MODE	PI-414 WILL READ THE SAME PRESSURE AS THE INSTRUMENT AIR SUPPLY PRESSURE	NO SIGNIFICANT EFFECT	III	C	3

ENGINEER E Bibelhauser DATE 12-4-87 REVIEWED BY D A Reay DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-481	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE FAILS TO OPEN DURING AIR PURGE CYCLE	LIMIT SWITCH, FI-026 AND PI-414	THE NORMAL ZEOLITE REFILL CYCLE CANNOT PROCEED.	IIb	B	3
50-482	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE FAILS TO CLOSE DURING AIR PURGE CYCLE	LIMIT SWITCH, FI-026	THE ZEOLITE REFILL CYCLE CANNOT PROCEED	Ib	C	3
50-483	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE LEAKS THROUGH DURING AIR PURGE CYCLE	NONE (SMALL LEAKAGE)	NONE	III	C	3
50-484	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE LEAKS THROUGH DURING RINSE CYCLE	NONE (SMALL LEAKAGE)	NONE	III	C	3

ENGINEER E. Liebelsamen DATE 12-4-87 REVIEWED BY [signature] DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-485	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE LEAKS THROUGH DURING BACKWASH	NONE (SMALL LEAKAGE)	NONE	III	C	3
50-486	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE LEAKS THROUGH DURING ZEOLITE SLUICING	NONE (SMALL LEAKAGE)	NONE	III	C	3
50-487	FV-406, INSTRUMENT AIR SUPPLY TO IX-C-004	VALVE LEAKS THROUGH DURING ZEOLITE LOADING	NONE (SMALL LEAKAGE)	NONE	III	C	3
50-490	PSE-415, COLUMN D VESSEL BURST DISC	PARTIAL RUPTURE ALLOWS COMMUNICATION BETWEEN COLUMN D AND VENTS FLUIDS TO 80-2 WHILE IN THE REFILL MODE	PI-414 WILL READ LOWER THAN NORMAL DURING THE AIR PURGE	PI-414 WILL GIVE A PREMATURE INDICATION THAT THE COLUMN LIQUID HAS BEEN DISPLACED. LIQUID DURING THE FLUSH MAY PARTIALLY SHORT CIRCUIT TO 80-2.	Ib	B	2

ENGINEER E Liebelsamen DATE 12-4-87 REVIEWED BY [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-500	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS THROUGH WITH COLUMN D IN STANDBY MODE	NONE	NO SIGNIFICANT EFFECT	III	C	3
50-501	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS EXTERNALLY WITH COLUMN D IN THE STANDBY MODE	NONE	NO SIGNIFICANT EFFECT	III	C	3
50-502	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS EXTERNALLY DURING AIR PURGE	NONE	NONE	III	C	3
50-504	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS THROUGH DURING RINSE MODE	NONE	NONE	III	C	3

ENGINEER E Eichelberger DATE 12-4-87 REVIEWED BY D M Parry DATE 12-9-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
SC 505	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS EXTERNALLY DURING RINSE MODE	RADIOACTIVITY IN VALVE BOX	VALVE BOX COLLECTS RADIOACTIVE LIQUID SUBSTANCE	IIa	C	3
50-506	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS THROUGH DURING BACKWASH MODE	NONE	NONE	III	C	3
50-507	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS EXTERNALLY DURING BACKWASH MODE	RADIOACTIVITY IN VALVE BOX	VALVE BOX COLLECTS RADIOACTIVE LIQUID SUBSTANCE	IIa	C	3
50-508	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS THROUGH DURING ZEOLITE SLUICING MODE	NONE	NONE	III	C	3

ENGINEER E. Liebelsamen DATE 12-4-87 REVIEWED BY D. Waag DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-509	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS EXTERNALLY DURING ZEOLITE SLUICING MODE	NONE	NONE	III	C	3
50-509A	FV-405, ZEOLITE SUPPLY VALVE	VALVE FAILS TO OPEN DURING ZEOLITE LOADING	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	COLUMN REFILL WITH RESIN WILL NOT BE POSSIBLE.	Ib	B	2
50-509B	FV-405, ZEOLITE SUPPLY VALVE	VALVE FAILS TO CLOSE DURING ZEOLITE LOADING	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	USE OF THE COLUMN MAY NOT BE ACCEPTABLE WITHOUT DOUBLE VALVE ISOLATION AT AN ENVIRONMENTAL INTERFACE.	Ib	C	3
50-509C	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS THROUGH DURING ZEOLITE LOADING ZEOLITE LOADING	NONE	NONE	III	C	3

ENGINEER E. Fiskaaen DATE 12-4-87 REVIEWED BY N. Narasimhan DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-5090	FV-405, ZEOLITE SUPPLY VALVE	VALVE LEAKS EXTERNALLY DURING ZEOLITE LOADING	NONE	LIQUID ACCUMULATES IN VALVE PIT.	III	C	3
50-510	FV-408, ZEOLITE DUMP	VALVE LEAKS THROUGH WITH COLUMN D IN THE STANDBY MODE	NONE	NONE	III	C	3
50-511	FV-408, ZEOLITE DUMP	VALVE LEAKS EXTERNALLY WHILE COLUMN D IS IN THE STANDBY MODE	NONE	NONE	III	C	3
50-512	FV-408, ZEOLITE DUMP	VALVE LEAKS THROUGH DURING AIR PURGE	NONE	SALTS MAY BE DEPOSITED IN SD-1. LEAKAGE OF SUPERNATANT INTO SD-1 MAY REQUIRE REPROCESSING OF SD-1 LIQUID.	III	C	3

ENGINEER [signature] DATE 12-4-87 REVIEWED BY [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-513	FV-408, ZEOLITE DUMP	VALVE LEAKS EXTERNALLY DURING AIR PURGE	NONE	SALTS MAY BE DEPOSITED IN 80-1. LEAKAGE OF SUPERNATANT INTO 80-1 MAY REQUIRE REPROCESSING OF 80-1 LIQUID.	III	C	3
50-514	FV-408, ZEOLITE DUMP	VALVE LEAKS THROUGH DURING RINSE CYCLE	NONE	SOME SALTS FROM THE SUPERNATANT WILL ENTER THE 80-1 TANK. EFFECTS ARE JUDGED TO BE MINOR. LEAKAGE OF SUPERNATANT INTO 80-1 MAY REQUIRE REPROCESSING OF 80-1 LIQUID.	III	C	3
50-515	FV-408, ZEOLITE DUMP	VALVE LEAKS EXTERNALLY DURING RINSE CYCLE	NONE	SOME SALTS FROM THE SUPERNATANT WILL ENTER THE 80-1 TANK. EFFECTS ARE JUDGED TO BE MINOR. LEAKAGE OF SUPERNATANT INTO 80-1 MAY REQUIRE REPROCESSING OF 80-1 LIQUID.	III	C	3
50-516	FV-408, ZEOLITE DUMP	VALVE LEAKS THROUGH DURING BACKWASH CYCLE	NONE	NONE	III	C	3

ENGINEER E Balakumar DATE 12-4-87 REVIEWED BY [illegible] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-517	FV-408, ZEOLITE DUMP	VALVE LEAKS EXTERNALLY DURING BACKWASH CYCLE	NONE	NONE	III	C	3
50-518	FV-408, ZEOLITE DUMP	VALVE FAILS TO OPEN DURING ZEOLITE SLUICING	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	EXPENDED RESIN CANNOT BE DUMPED	Ib	A	1
50-519	FV-408, ZEOLITE DUMP	VALVE FAILS TO CLOSE DURING ZEOLITE SLUICING	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	THE COLUMN CANNOT BE LOADED.	Ib	C	3
50-519A	FV-408, ZEOLITE DUMP	VALVE LEAKS THROUGH DURING ZEOLITE LOADING	NONE	THE COLUMN WOULD FAIL WHEN PLACED IN SERVICE.	III	C	3

ENGINEER E Siebelaniec DATE 12-4-87 REVIEWED BY R F Barazi DATE 12.4.87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-5190	FV-408, ZEOLITE DUMP	VALVE LEAKS EXTERNALLY DURING ZEOLITE LOADING	NONE	THE COLUMN WOULD FAIL WHEN PLACED IN SERVICE.	III	C	3
50-520	FV-418, SLUICE WATER TO 80-1, VALVE	VALVE LEAKS THROUGH WITH COLUMN D IN THE STANDBY MODE	NONE	NONE	III	C	3
50-521	FV-418, SLUICE WATER TO 80-1, VALVE	LEAKS THROUGH IN AIR PURGE MODE	NONE	NONE	III	C	3
50-522	FV-418, SLUICE WATER TO 80-1, VALVE	LEAKS THROUGH IN RINSE MODE	NONE	NONE	III	C	3

ENGINEER E. Liebelsamen DATE 12-4-87 REVIEWED BY D.F. Barraj DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-523	FV-418, SLUICE WATER TO 80-1, VALVE	FAILS TO OPEN IN BACKWASH MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	EXHAUSTED RESIN WITHIN THE COLUMN COULDN'T BE FLUFFED. IT IS POSSIBLE THAT THE RESIN COULD STILL BE SLUICED OUT OF THE COLUMN. ULTIMATELY THE VALVE WOULD HAVE TO BE REPLACED, RESULTING IN AN EXTENDED OUTAGE.	IIb	B	3
50-524	FV-418, SLUICE WATER TO 80-1, VALVE	FAILS TO CLOSE IN BACKWASH MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	RESIN COULD BE LOADED, BUT THE VALVE WOULD HAVE TO BE CHANGED OUT BEFORE THE COLUMN WAS PLACED ON LINE FOR USE. THE ANTICIPATED CHANGE OUT PROCESS RESULTS IN AN EXTENDED OUTAGE.	IIb	C	3
50-525	FV-418, SLUICE WATER TO 80-1, VALVE	LEAKS THROUGH IN BACKWASH MODE	NONE	NONE	III	C	3
50-526	FV-418, SLUICE WATER TO 80-1, VALVE	LEAKS THROUGH IN ZEOLITE SLUICING MODE	NONE	NONE	III	C	3

ENGINEER E Biebelheimer DATE 12-4-87 REVIEWED BY R Dorsey DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-527	FV-418, SLUICE WATER TO 80-1, VALVE	FAILS TO OPEN IN ZEOLITE LOADING MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	THE COLUMN WOULD NOT BE LOADED SATISFACTORILY.	IIb	B	3
50-528	FV-418, SLUICE WATER TO 80-1, VALVE	FAILS TO CLOSE IN ZEOLITE LOADING MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	RESIN COULD BE LOADED, BUT THE VALVE WOULD HAVE TO BE CHANGED OUT BEFORE THE COLUMN WAS PLACED ON LINE FOR USE. THE ANTICIPATED CHANGE OUT PROCESS RESULTS IN AN EXTENDED OUTAGE.	Ib	C	3
50-529	FV-418, SLUICE WATER TO 80-1, VALVE	LEAKS THROUGH DURING ZEOLITE LOADING MODE	NONE	NONE	III	C	3
50-530	FV-4048, SLUICE WATER TO TOP SCREEN	VALVE LEALS THROUGH WHILE COLUMN D IS IN STANDBY MODE	NONE	NONE	III	C	3

ENGINEER E Richardson DATE 12-4-87 REVIEWED BY [illegible] DATE 12.9.87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-531	FV-4048, SLUICE WATER TO TOP SCREEN	LEAKS THROUGH IN AIR PURGE MODE	NONE	NONE	III	C	3
50-532	FV-4048, SLUICE WATER TO TOP SCREEN	LEAKS THROUGH IN RINSE MODE	NONE	NONE	III	C	3
50-533	FV-4048, SLUICE WATER TO TOP SCREEN	FAILS TO OPEN IN RINSE MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	SUPERNATANT RINSE TO 8D-2 PRIOR TO DUMPING RESIN TO 8D-1 CAN OCCUR BUT LESS EFFECTIVE. SALTS IN SUPERNATANT CAN CONTAMINATE THE 8D-1 TANK.	Ib	B	2
50-534	FV-4048, SLUICE WATER TO TOP SCREEN	FAILS TO CLOSE IN RINSE MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION. PI-434 WILL INDICATE SLUICE SUPPLY PRESSURE.	DOESN'T PRECLUDE RINSE BUT CANNOT FLUFF OR RETURN TO SERVICE.	Ib	C	3

ENGINEER EJ Walter DATE 12/4/87 REVIEWED BY [illegible] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-535	FV-4048, SLUICE WATER TO TOP SCREEN	LEAKS THROUGH IN BACKWASH MODE	NONE	DOESN'T PRECLUDE BACKWASHING BUT MAY ALLOW RESIN TO ENTER PIPING	III	C	3
50-536	FV-4048, SLUICE WATER TO TOP SCREEN	LEAKS THROUGH IN ZEOLITE SLUICING MODE	NONE	NONE	III	C	3
50-537	FV-4048, SLUICE WATER TO TOP SCREEN	LEAKS THROUGH IN ZEOLITE LOADING MODE	NONE	NONE	III	C	3
50-540	FV-404A, SLUICE WATER TO LOWER SCREEN	VALVE LEAKS THROUGH WHILE COLUMN D IS IN THE STANDBY MODE	NONE	NONE	III	C	3

ENGINEER EJ Webber DATE 12/4/87 REVIEWED Elizabeth Lamoreaux 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-541	FV-404A, SLUICE WATER TO LOWER SCREEN	LEAKS THROUGH IN AIR PURGE MODE	NONE	SMALL AMOUNT OF WATER MAY BE ADDED TO BD-2.	III	C	3
50-542	FV-404A, SLUICE WATER TO LOWER SCREEN	LEAKS THROUGH IN RINSE MODE	NONE	SMALL AMOUNT OF WATER MAY BE ADDED TO BD-2.	III	C	3
50-543	FV-404A, SLUICE WATER TO LOWER SCREEN	VALVE FAILS TO OPEN IN BACKWASH MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	BACKWASHING CANNOT OCCUR.	Ib	B	2
50-544	FV-404A, SLUICE WATER TO LOWER SCREEN	VALVE FAIL TO CLOSE IN BACKWASH MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION. FI-084	CANNOT RETURN COLUMN TO SERVICE.	Ib	C	3

ENGINEER E.J. Webster DATE 12/4/87 REVIEW E. Liebelaar DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-545	FV-404A, SLUICE WATER TO LOWER SCREEN	VALVE LEAKS THROUGH IN BACKWASH MODE	NONE	NONE	11	C	3
50-546	FV-404A, SLUICE WATER TO LOWER SCREEN	VALVE FAILS TO OPEN IN THE ZEOLITE SLUICING MODE	POSITION INDICATOR LIGHTS AND AN ALARM WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	ZEOLITE WILL BE DIFFICULT TO REMOVE FROM TANK.	1b	B	2
50-547	FV-404A, SLUICE WATER TO LOWER SCREEN	VALVE FAILS TO CLOSE IN THE ZEOLITE SLUICING MODE	SAME AS ABOVE.	VALVE MUST BE FIXED BEFORE RETURNING TO SERVICE.	1b	C	3
50-548	FV-404A, SLUICE WATER TO LOWER SCREEN	VALVE LEAKS THROUGH IN THE ZEOLITE LOADING MODE	NONE	CONTAMINATION OF NEW ZEOLITE WITH 80-1 CESIUM.	11 a, b	C	3

ENGINEER E.E. Walton DATE 12/4/87 REVIEWER E. Liebelsamen DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-550	FV-042, F002 SAND SUPPLY VALVE	VALVE LEAKS THROUGH DURING NORMAL PROCESS	LI-022 INDICATES AN INCREASE IN BD-1. NO ALARM IN SIS.	SUPERNATANT COULD LEAK INTO BD-1.	IIb	C	3
50-551	FV-042, F002 SAND SUPPLY VALVE	VALVE LEAKS EXTERNALLY DURING NORMAL PROCESS	RADIOACTIVITY IN VALVE BOX	VALVE BOX COLLECTS RADIOACTIVE LIQUID SUBSTANCE	IIa	C	3
50-552	FV-042, F002 SAND SUPPLY VALVE	FAILS TO OPEN FOR F-002 SAND REFILL	POSITION INDICATOR LIGHTS WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	THOUGH NOT ANTICIPATED TO REQUIRE CHANGEOUT, THE FAILURE OF THIS VALVE WOULD PRECIPITATE AN EXTENDED OUTAGE. THE VALVE MUST BE CHANGED OR REPAIRED BEFORE THE FILTER COULD BE REFILLED WITH SAND.	IIb	B	2
50-553	FV-042, F002 SAND SUPPLY VALVE	VALVE FAILS TO CLOSE FOLLOWING F-002 SAND REFILL	POSITION INDICATOR LIGHTS WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	FAILURE TO CLOSE WOULD PRECLUDE USE OF THIS FILTER DURING PROCESS FLOW. NO PROVISION HAS BEEN MADE TO BYPASS THE FILTER SO VALVE FAILURE IN THIS MANNER WOULD INTERRUPT PROCESS FLOW.	IIb	C	3

ENGINEER R. Walker DATE 12/4/87 REVIEWER E. Siebelaman DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-554	FV-042, F002 SAND SUPPLY VALVE	VALVE LEAKS THROUGH DURING F-002 FILTER MEDIA REFILL	NONE	NONE	III	C	3
50-555	FV-042, F002 SAND SUPPLY VALVE	VALVE LEAKS EXTERNALLY DURING F-002 FILTER MEDIA REFILL	NONE	LIQUID COULD ACCUMULATE IN THE VALVE PIT.	III	C	3
50-560	FV-031, F-002 SAND DUMP VALVE	VALVE LEAKS THROUGH DURING NORMAL PROCESS	LI-022 INDICATES AN INCREASE IN BD-1. NO ALARM IN STS.	SUPERNATANT COULD LEAK INTO BD-1	Ib	C	3
50-561	FV-031, F-002 SAND DUMP VALVE	VALVE LEAKS EXTERNAL DURING NORMAL OPERATION	LI-022 INDICATES AN INCREASE IN BD-1. NO ALARM IN STS.	SUPERNATANT COULD LEAK INTO BD-1	Ib	C	3

...FILE ANALYSIS - SUPERNATANT PROCESSING - STEADY STATE

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ENGINEER E.J. Wallin DATE 12/4/87 REVIEW E. Liebelsamen DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-562	FV-031, F-002 SAND DUMP VA...	VALVE FAILS TO OPEN DURING SAND DUMP	POSITION INDICATOR LIGHTS WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	DUMPING OF SAND WOULD NOT BE ACCOMPLISHED. SINCE THERE IS NO WAY TO BYPASS THE FILTER, THE VALVE WOULD HAVE TO BE REPAIRED OR ANOTHER WAY OF EMPTYING THE FILTER WOULD HAVE TO BE DEVISED.	IIb	B	2
50-563	FV-031, F-002 SAND DUMP VALVE	VALVE FAILS TO CLOSE DURING SAND DUMP	POSITION INDICATOR LIGHTS WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION.	SINCE THERE IS NO WAY TO BYPASS THE FILTER, THE VALVE WOULD HAVE TO BE REPAIRED.	IIb	C	3
50-564	FV-031, F-002 SAND DUMP VALVE	VALVE LEAKS THROUGH DURING FILTER MEDIA REFILL	NONE	F-002 FAILS WHEN RETURNED TO SERVICE.	III	C	3
50-565	FV-031, F-002 SAND DUMP VALVE	VALVE LEAKS EXTERNAL DURING FILTER MEDIA REFILL	NONE	F-002 FAILS WHEN RETURNED TO SERVICE.	III	C	3

ENGINEER [signature] DATE 12-10-87 REVIEWED BY [signature] DATE 12.16.87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-570	FCV-035, PROCESS FLOW CONTROL VALVE DOWNSTREAM OF F-002	VALVE FAILS TO OPEN DURING NORMAL PROCESS	FIC-035 PROVIDES AN INDICATION OF NO FLOW AS WELL AS PDI-028. IN ADDITION, PRESSURE DIFFERENTIAL INDICATIONS FOR PUMP G-002 WOULD SHOW THE FAILURE OF THE VALVE TO OPEN. VALVE POSITION LAMPS ALSO INDICATE THE FAILURE.	PROCESS FLOW WOULD BE INTERRUPTED. THE Ix COLUMNS MAY JAM NECESSITATING COLUMN RESIN DUMP	Ic	B	2
50-571	FCV-035, PROCESS FLOW CONTROL VALVE DOWNSTREAM OF F-002	VALVE FAILS OPEN DURING NORMAL PROCESS	POSITION INDICATOR LIGHTS WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION. PDI-028 PROVIDES INFO TO INDICATE VALVE CONDITION. RAD DETECTORS MAY ALSO INDICATE THE RESULTS OF HIGH FLOW. FIC-035	THE FLOW THROUGH THE Ix COLUMNS AND F-002 WOULD BE EXCESSIVE. THIS COULD RESULT IN DF's LOWER THAN EXPECTED ALONG WITH SHORTER RESIN LIFE.	Ib	C	3
50-572	FCV-035, PROCESS FLOW CONTROL VALVE DOWNSTREAM OF F-002	VALVE CONTROLS FLOW HIGHER THAN SIGNAL DURING NORMAL PROCESS	POSITION LIGHTS WILL INDICATE THAT THE VALVE HAS NOT ASSUMED THE CORRECT POSITION. PDI-028 PROVIDES INFO TO INDICATE VALVE CONDITION. RAD DETECTORS MAY ALSO INDICATE THE RESULTS OF HIGH FLOW. FIC-035, LI-023	THE FLOW THROUGH THE Ix COLUMNS AND F-002 WOULD BE EXCESSIVE. THIS COULD RESULT IN DF'S MUCH LOWER THAT EXPECTED ALONG WITH SHORTER RESIN LIFE.	IIb	C	3
50-573	FCV-035, PROCESS FLOW CONTROL VALVE DOWNSTREAM OF F-002	VALVE CONTROLS FLOW LOWER THAN SIGNAL DURING NORMAL PROCESS	PDI-023 WILL INDICATE A LOWER DIFFERENTIAL PRESSURE THAN WOULD BE EXPECTED. LI-016 ON D-001 FEED TANK. LI-023	THE AMOUNT OF PRODUCT WILL BE REDUCED.	IIb	C	3

ENGINEER [signature] DATE 12/4/87 REVIEW [signature] DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-574	FCV-035, PROCESS FLOW CONTROL VALVE DOWNSTREAM OF F-002	VALVE FAILS TO CLOSE DURING THE F-002 FILTER MEDIA FLUIDIZING	VALVE POSITION INDICATION	FILTER MEDIA REFILL WOULD BE INHIBITED BECAUSE "OLD" SAND CAN'T BE REMOVED.	IIb	C	3
50-575	SV-035, PROCESS FLOW CONTROL VALVE DOWNSTREAM OF F-002	VALVE LEAKS THROUGH DURING THE F-002 FILTER MEDIA FLUIDIZING	NONE	MINIMAL IMPACT, BACKWASH WATER WOULD LEAK INTO BD-3	III	C	3
50-580	FSE-715, F-002, DECONTAMINATED SUPERNATANT FILTER	BURST DISC RUPTURES	FIC-035, PDI-028, AND OTHER PRESSURE INSTRUMENTATION	SUPERNATANT PROCESS FLUID WOULD BE RETURNED TO BD-2	IIb	C	3
50-590	FV-064, 3-WAY PROCESS BLOCK VALVE	VALVE FAILS TO MOVE TO "TRANSFER TO BD-3" POSITION IN THE PROCESS MODE	PANEL INDICATION REFLECTS VALVE ALIGNMENT. IN ADDITION, LEVEL OF BD-3 WOULD NOT INCREASE AS EXPECTED.	PRODUCT CANNOT BE MADE AVAILABLE TO LWTS. DECONTAMINATED PRODUCT BACK TO BD-2.	IIb	B	2

ENGINEER EJ. Wallace DATE 12/4/87 REVIEWER E. Liebaman DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-591	FV-064, 3-WAY PROCESS BLOCK VALVE	VALVE FAILS TO MOVE TO "TRANSFER TO 80-2" POSITION IN THE PROCESS MODE	PANEL INDICATION REFLECTS VALVE ALIGNMENT. TANK 80-3 LEVEL WOULD INCREASE.	PRODUCT WITH HIGH Cs-137 ACTIVITY MAY BE INTRODUCED TO 80-3, CONTAMINATING THE VESSEL. THE SUPERNATANT COULD BE DIVERTED FROM 80-3 TO 80-2 INSTEAD OF GOING TO 3-104.	IIb	C	3
50-592	FV-064, 3-WAY PROCESS BLOCK VALVE	VALVE LEAKS THROUGH IN PROCESS MODE	MAY BE DETECTED BY ERRATIC FILL OF 80-3	LEAKAGE OF PRODUCT TO 80-2. REDUCED PROCESS RATE.	IIb	C	3
50-606	FV-067, DECONTAMINATED SUPERNATANT BLOCK VALVE (G-007 DISCHARGE)	VALVE FAILS OPEN	VALVE POSITION INDICATION IS PROVIDED LAH-055 OR LI-055 INCREASE IN 35104 DURING SAMPLING	AN UNACCEPTABLE PRODUCT MAY BE DIRECTED TO TANK 35104 OR OVERFLOW OF 35104	IIb	C	3
50-601	FV-067, DECONTAMINATED SUPERNATANT BLOCK VALVE (G-007 DISCHARGE)	VALVE FAILS TO OPEN (OR RAH-057 FAILURE)	VALVE POSITION INDICATION IS PROVIDED. RAH-057 MAY INDICATE THAT THE DETECTOR HAS FAILED.	PRODUCT CANNOT BE DIRECTED TO TANK 35104	IIa	B	2

ENGINEER E.J. Litchfield DATE 12/4/87 REVIEWER E. Liebelsamen DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-602	FV-067, DECONTAMINATED SUPERNATANT BLOCK VALVE (G-007 DISCHARGE)	VALVE LEAKS THROUGH	LI-055, OR LAH-055	POTENTIAL OVERFLOW OF 35104 OR AN UNACCEPTABLE PRODUCT DELIVERED TO 35104	IIb	C	3
50-610	FV-068, SUPERNATANT RECYCLE BLOCK VALVE (G-007 DISCHARGE)	VALVE FAILS TO CLOSE	VALVE POSITION INDICATION IS PROVIDED, LI-055 DOES NOT INDICATE AN INCREASE	REDUCED PRODUCT EFFICIENCY	IIb	B	2
50-611	FV-068, SUPERNATANT RECYCLE BLOCK VALVE (G-007 DISCHARGE)	VALVE FAILS CLOSED	VALVE POSITION INDICATION IS PROVIDED. CANNOT TRANSFER TO BD-2 FROM BD-3.	OUT OF SPECIFICATION PRODUCT CONTAINED IN BD-3 CANNOT BE DIRECTED TO BD-2 FOR REPROCESSING.	IIb	C	3
50-612	FV-068, SUPERNATANT RECYCLE BLOCK VALVE (G-007 DISCHARGE)	VALVE LEAKS THROUGH	LOSS OF LEVEL IN BD-3 DURING SAMPLING	PRODUCTION RATE WILL DECREASE SLIGHTLY.	IIb	C	3

ENGINEER E Biebesheimer DATE 12-4-87 REVIEWED BY SJ Welter DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-630	SC-014, CHECK VALVE IN CAUSTIC SODA, NITRIC ACID OR WATER SUPPLY	VALVE FAILS CLOSED	YES, AE-019, CE-058, AND TANK D-001 SAMPLINGS WOULD INDICATE THAT THE INJECTED FLUID WAS NOT ENTERING THE SYSTEM.	ASSUMING THAT CHEMICAL ADDITION IS NECESSARY, AN OUTAGE WOULD BE NECESSARY TO REPLACE THE FAULTY VALVE JUMPER.	IIb	C	3
50-631	SC-014, CHECK VALVE IN CAUSTIC SODA, NITRIC ACID OR WATER SUPPLY	VALVE FAILS OPEN	NONE	NONE	III	C	3
50-632	SC-014, CHECK VALVE IN CAUSTIC SODA, NITRIC ACID OR WATER SUPPLY	VALVE LEAKS THROUGH	NONE	NONE	III	C	3
50-633	SC-014, CHECK VALVE IN CAUSTIC SODA, NITRIC ACID OR WATER SUPPLY	VALVE PARTS LOOSEN	NONE	SMALL PARTS BECOME LODGED WITHIN HV-059 OR EDUCTOR G-014 AND PRECLUDE THE MIXING OF D-001.	IIb	C	3

ENGINEER E Bibbiani DATE 12-4-87 REVIEWED BY EJ Wahl DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-710	TE-099 TEMPERATURE INDICATION (PROCESS UPSTREAM E-002)	TEMPERATURE INDICATES HIGHER THAN ACTUAL	NONE.	NONE.	III	C	3
50-711	TE-099 TEMPERATURE INDICATION (PROCESS UPSTREAM E-002)	TEMPERATURE INDICATES LOWER THAN ACTUAL	NONE.	NONE.	III	C	3
50-715	TE-010 TEMPERATURE INDICATION (PROCESS UPSTREAM E-002)	TEMPERATURE INDICATES HIGHER THAN ACTUAL	IX COLUMN THAT IS FIRST IN LINE HAS TEMPERATURE READINGS LOWER THAN EXPECTED FOR THE INDICATED TI-010 TEMPERATURE.	ACTUAL PRODUCT TEMPERATURE IS LOWER THAN SETPOINT TEMPERATURE OF THE IX COLUMNS.	III	C	3
50-716	TE-010 TEMPERATURE INDICATION (PROCESS UPSTREAM E-002)	TEMPERATURE INDICATES LOWER THAN ACTUAL	IX COLUMN THAT IS FIRST IN LINE HAS TEMPERATURE READINGS HIGHER THAN EXPECTED FOR THE INDICATED TI-010 TEMPERATURE.	ACTUAL PRODUCT TEMPERATURE IS HIGHER THAN SETPOINT TEMPERATURE FOR THE IX COLUMNS. REDUCED EFFICIENCY OF THE IX COLUMNS. POSSIBLE EARLIER INDICATION OF RESIN BREAKTHROUGH RESULTING IN RESIN CHANGEOUT BEFORE FULL LOADING WAS ACHIEVED.	II	C	3

ENGINEER E Siebenhaar DATE 12-4-87 REVIEWED BY EJ Wallace DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-730	RSH-413 HIGH ALARM SWITCH (COLUMN D DISCHARGE)	INDICATES HIGH ALARM WHEN LEVEL IS LOW	RAH-413 ALARMING; RI-413 AND RR-413 LESS THAN SETPOINT. SINCE THIS COLUMN IS IN STANDBY OR HAVING ITS RESIN REPLACED, RAH-413 DOES NOT CLEAR WHEN COLUMN IS RETURNED TO SERVICE	INCREASED SAMPLING RELIANCE TO IDENTIFY RESIN BREAKTHROUGH	III	C	3
50-735	RSH-313 HIGH ALARM SWITCH (COLUMN C DISCHARGE)	INDICATES HIGH ALARM WHEN LEVEL IS LOW	RI-313 AND RR-313 ARE LESS THAN THE SETPOINT. SAMPLES TAKEN AT THE IX COLUMN OUTLET ARE LOWER THAN THE RADIATION SETPOINT.	INCREASED MONITORING OF RI-313 FOR RESIN BREAKTHROUGH. INDICATION OF RESIN BREAKTHROUGH RESULTING IN RESIN CHANGEOUT BEFORE FULL LOADING WAS ACHIEVED.	III	C	3
50-736	RSH-313 HIGH ALARM SWITCH (COLUMN C DISCHARGE)	INDICATES NO ALARM WHEN LEVEL IS HIGH	RI-313 AND RR-313 ARE ABOVE THE ALARM SETPOINT. SAMPLES TAKEN AT THE IX COLUMN OUTLET ARE HIGHER THAN THE RADIATION SETPOINT.	FAILURE TO DETECT RESIN BREAKTHROUGH. POSSIBLE REDUCTION IN DOWNSTREAM MEDIA'S TIME BEFORE BREAKTHROUGH AND CHANGEOUT.	IIb	C	3
50-740	RSH-213 HIGH ALARM SWITCH (COLUMN B DISCHARGE)	INDICATES HIGH ALARM WHEN LEVEL IS LOW	RI-213 AND RR-213 ARE LESS THAN THE SETPOINT. SAMPLES TAKEN AT THE IX COLUMN OUTLET ARE LOWER THAN THE RADIATION SETPOINT.	INCREASED MONITORING OF RI-213 FOR RESIN BREAKTHROUGH. POSSIBLE EARLIER INDICATION OF RESIN BREAKTHROUGH RESULTING IN RESIN CHANGEOUT BEFORE FULL LOADING WAS ACHIEVED.	III	C	3

ENGINEER E Bibbahamer DATE 12/4/87 REVIEWED BY E J Wallace DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-741	RSH-213 HIGH ALARM SWITCH (COLUMN B DISCHARGE)	INDICATES NO ALARM WHEN LEVEL IS HIGH	RI-213 AND RR-213 ARE ABOVE THE ALARM SETPOINT. SAMPLES TAKEN AT THE IX COLUMN OUTLET ARE HIGHER THAN THE RADIATION SETPOINT.	FAILURE TO DETECT RESIN BREAKTHROUGH. POSSIBLE REDUCTION IN DOWNSTREAM MEDIA'S TIME BEFORE BREAKTHROUGH AND CHANGEOUT.	IIb	C	3
50-745	RSH-113 HIGH ALARM SWITCH (COLUMN A DISCHARGE)	INDICATES HIGH ALARM WHEN LEVEL IS LOW	R..3 AND RR-113 ARE LESS THAN THE SETPOINT. SAMPLES TAKEN AT THE IX COLUMN OUTLET ARE LOWER THAN THE RADIATION SETPOINT.	INCREASED MONITORING OF RI-113 FOR RESIN BREAKTHROUGH. POSSIBLE EARLIER INDICATION OF RESIN BREAKTHROUGH RESULTING IN RESIN CHANGEOUT BEFORE FULL LOADING WAS ACHIEVED.	III	C	3
50-746	RSH-113 HIGH ALARM SWITCH (COLUMN A DISCHARGE)	INDICATES NO ALARM WHEN LEV. . IS HIGH	RI-113 AND RR-113 ARE ABOVE THE ALARM SETPOINT. SAMPLES TAKEN AT THE IX COLUMN OUTLET ARE HIGHER THAN THE RADIATION SETPOINT.	FAILURE TO DETECT RESIN BREAKTHROUGH. POSSIBLE REDUCTION IN DOWNSTREAM MEDIA'S TIME BEFORE BREAKTHROUGH AND CHANGEOUT.	IIb	C	3
50-754	B-LT-10 HIGH ALARM SWITCH (80-3) (LAH-023)	INDICATES HIGH ALARM WHEN LEVEL IS LOW	LEVEL INDICATION LI-023 IS LESS THAN THE SETPOINT YET LAH-023 IS ALARMING.	NONE.	III	C	3

ENGINEER E Richardson DATE 12-4-87 REVIEWED BY [illegible] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-755	B-LT-10 HIGH ALARM SWITCH (80-3) (LAH-023)	INDICATES NO ALARM WHEN LEVEL IS HIGH	LEVEL INDICATION LI-023 IS HIGHER THAN THE SETPOINT YET LAH-023 IS NOT ALARMING.	POSSIBLE OVERFLOW OF TANK 80-3.	IIa	C	3
50-7	B-LT-10 LOW LEVEL ALARM SWITCH (80-3) (LAL-023)	INDICATES LOW ALARM WHEN LEVEL IS HIGH	LI-023 READING MORE THAN THE SETPOINT WITH LAL-023 ALARMING. PUMP G-007 STOPS.	PUMP G-007 CAN NOT BE STARTED WITHOUT THE ALARM BEING CLEARED. AFTER A PERIOD OF TIME, THE POTENTIAL FOR OVERFILLING TANK 80-3 EXISTS.	IIb	C	3
50-757	B-LT-10 LOW LEVEL ALARM SWITCH (80-3) (LAL-023)	INDICATES NO ALARM WHEN LEVEL IS LOW	LI-023 READING LESS THAN THE SETPOINT WITH LAL-023 NOT ALARMING. POSSIBLE CAVITATION OF G-007 RESULTING IN LOW READING ON PI-069.	POSSIBLE DAMAGE TO G-007.	IIb	C	3
50-758	B-LT-10 LEVEL INDICATION (80-3) (LI-023)	METER INDICATES HIGHER THAN ACTUAL LEVEL	LAL-023 NOT ALARMING AND LI-023 READING ABOVE THE SETPOINT WITH CAVITATION OF G-007 RESULTING IN LOW READING ON PI-069.	POSSIBLE DAMAGE TO G-007.	IIb	C	3

ENGINEER E Richardson DATE 12-4-87 REVIEWED BY R Welty DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	PROBABILITY	FAILURE CLASS
50-759	B-LT-10 LEVEL INDICATION (80-3) (LI-025)	METER INDICATES LOWER THAN ACTUAL LEVEL	NONE.	NONE.	III	C	3
50-760	PT-033 PRESSURE TRANSDUCER AT F-002 DISCHARGE	METER INDICATES ZERO PRESSURE NO MATTER WHAT THE ACTUAL LINE PRESSURE	PDAH-028 ALARMS AND PI-033 READS LOW.	LOSS OF THE ABILITY TO DETERMINE SAMP FILTER CLOGGING. BACKUP INDICATION FOR CLOGGING IS PROVIDED BY THE ABILITY OR INABILITY OF FCV-035 TO CONTROL THE FLOW AT ITS SETPOINT.	III	C	3
50-761	PT-033 PRESSURE TRANSDUCER AT F-002 DISCHARGE	METER INDICATES ZERO PRESSURE NO MATTER WHAT THE ACTUAL LINE PRESSURE	PI-033 WILL INDICATE HIGH. PDI-028 WILL INDICATE LOW.	INABILITY TO MEASURE F-002 FILTER DP AND THEREFORE THE LOSS OF THE ABILITY TO IDENTIFY FILTER PLUGGING. BACKUP INDICATION OF FILTER PLUGGING IS PROVIDED INDIRECTLY BY THE ABILITY OF FCV-035 TO MAINTAIN FLOW.	III	C	3
50-762	PT-033 PRESSURE TRANSDUCER AT F-002 DISCHARGE	METER INDICATES HIGHER THAN ACTUAL PRESSURE	PI-033 WILL INDICATE HIGHER THAN NORMAL PRESSURE FOR THE AMOUNT OF TIME THE FILTER HAS BEEN IN USE. THE FILTER DP, PDI-028, WILL INDICATE LOWER THAN EXPECTED FOR THE TIME THE FILTER HAS BEEN IN USE.	REDUCED ABILITY TO MEASURE F-002 FILTER DP AND THEREFORE THE ABILITY TO IDENTIFY FILTER PLUGGING. BACKUP INDICATION OF FILTER PLUGGING IS PROVIDED INDIRECTLY BY THE ABILITY OF FCV-035 TO MAINTAIN FLOW.	III	C	3

ENGINEER E Eichelsdoerfer DATE 12-4-87 REVIEWED BY [illegible] DATE 12/4/87

ITEM NO	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-763	PT-033 PRESSURE TRANSDUCER AT F-002 DISCHARGE	METER INDICATES LOWER THAN ACTUAL PRESSURE	PI-033 WILL INDICATE LOWER THAN NORMAL PRESSURE FOR THE AMOUNT OF TIME THE FILTER HAS BEEN IN USE. THE FILTER DP, PDI-028, WILL INDICATE HIGHER THAN EXPECTED FOR THE TIME THE FILTER HAS BEEN IN USE.	REDUCED ABILITY TO MEASURE F-002 FILTER DP. BACKUP INDICATION OF FILTER PLUGGING IS PROVIDED BY FCV-035.	III	C	3
50-764	PT-028 PRESSURE TRANSDUCER AT F-002 SUPPLY	METER INDICATES ZERO PRESSURE NO MATTER WHAT THE ACTUAL LINE PRESSURE.	ABNORMAL INDICATION OF FILTER DP ON PDI-028. LOW READING ON PI-028.	INABILITY TO MEASURE F-002 FILTER DP AND THEREFORE THE LOSS OF THE ABILITY TO IDENTIFY FILTER PLUGGING. BACKUP INDICATION OF FILTER PLUGGING IS PROVIDED INDIRECTLY BY THE ABILITY OF FCV-035 TO MAINTAIN FLOW.	III	C	3
50-765	PT-028 PRESSURE TRANSDUCER AT F-002 SUPPLY	METER INDICATES FULL PRESSURE NO MATTER WHAT THE ACTUAL LINE PRESSURE.	HIGH FILTER DP ALARM, PDAH-028. HIGH READING ON PI-028.	INABILITY TO MEASURE F-002 FILTER DP AND THEREFORE THE LOSS OF THE ABILITY TO IDENTIFY FILTER PLUGGING. BACKUP INDICATION OF FILTER PLUGGING IS PROVIDED INDIRECTLY BY THE ABILITY OF FCV-035 TO MAINTAIN FLOW.	III	C	3
50-766	PT-028 PRESSURE TRANSDUCER AT F-002 SUPPLY	METER INDICATES HIGHER THAN ACTUAL PRESSURE	PI-028 WILL INDICATE HIGHER THAN NORMAL PRESSURE FOR THE AMOUNT OF TIME THE FILTER HAS BEEN IN USE. THE [illegible] OF PDI-028 WILL INDICATE HIGHER THAN EXPECTED FOR THE TIME THE FILTER HAS BEEN IN USE.	F-002 FILTER DP IS IN ERROR. OTHER INSTRUMENTS AND FIC-035 ARE USED FOR CONTINUED OPERATION.	III	C	3

ENGINEER E Liebsch DATE 12-4-87 REVIEWED BY [illegible] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-767	PT-028 PRESSURE TRANSDUCER AT F-002 SUPPLY	METER INDICATES LOWER THAN ACTUAL PRESSURE	PI-028 WILL INDICATE LOWER THAN NORMAL PRESSURE FOR THE AMOUNT OF TIME THE FILTER HAS BEEN IN USE. THE FILTER DP, PDI-028, WILL INDICATE LOWER THAN EXPECTED FOR THE TIME THE FILTER HAS BEEN IN USE.	REDUCED ABILITY TO MEASURE F-002 FILTER DP AND THEREFORE THE ABILITY TO IDENTIFY FILTER PLUGGING. BACKUP INDICATION OF FILTER PLUGGING IS PROVIDED INDIRECTLY BY THE ABILITY OF FCV-035 TO MAINTAIN FLOW.	III	C	3
50-768	PT-028 HIGH ALARM SWITCH AT F-002 SUPPLY	INDICATES HIGH ALARM WHEN LEVEL IS LOW	PDAH-028 ALARMS. PDI-028 INDICATES LESS THAN THE SET POINT VALUE.	NONE	III	C	3
50-769	PT-028 HIGH ALARM SWITCH AT F-002 SUPPLY	INDICATES NO ALARM WHEN LEVEL IS HIGH	PDI-028 INDICATES HIGHER THAN THE SET POINT. FCV-035 UNABLE TO MAINTAIN THE PROPER FLOW RATE. HIGHER THAN NORMAL OUTLET PRESSURES ON THE IX COLUMNS.	FIC-035 AND OTHER PRESSURE INDICATORS WILL BE USED FOR CONTINUED OPERATION.	III	C	3
50-770	LE-619 HIGH LEVEL ALARM SWITCH ON COLUMN D	INDICATES HIGH ALARM WHEN LEVEL IS LOW	THE ALARM DOES NOT CLEAR DURING THE IX COLUMN RESIN DUMP CYCLE.	INABILITY TO VERIFY PROPER FILLING OF THE COLUMN WITH RESIN SLURRY. INABILITY TO IDENTIFY Ix DUMP VALVE FAILURE TO CLOSE.	IIb	C	3

ENGINEER E Liebeskamin DATE 12-4-87 REVIEWED BY E Hullatt DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-771	LE-419 HIGH LEVEL ALARM SWITCH ON COLUMN D	INDICATES NO ALARM WHEN LEVEL IS HIGH	THE ALARM DOES NOT OCCUR DURING THE IX COLUMN RESIN ADDITION CYCLE AS EXPECTED.	INABILITY TO VERIFY PROPER FILLING OF THE COLUMN WITH RESIN SLURRY. INABILITY TO IDENTIFY IX DUMP VALVE FAILURE TO CLOSE.	Ib	C	3
50-775	LE-319 HIGH ALARM SWITCH ON COLUMN C	INDICATES NO ALARM WHEN LEVEL IS HIGH	ALARM CLEARS DURING NORMAL OPERATION.	NONE. THE LEVEL INDICATION IS ONLY USED DURING THE COLUMN RESIN REPLACEMENT CYCLE.	III	C	3
50-780	LE-219 HIGH LEVEL ALARM SWITCH ON COLUMN B	INDICATES HIGH ALARM WHEN LEVEL IS LOW	ALARM CLEARS DURING NORMAL OPERATION.	NONE. THE LEVEL INDICATION IS ONLY USED DURING THE COLUMN RESIN REPLACEMENT CYCLE.	III	C	3
50-785	LE-119 HIGH ALARM SWITCH ON COLUMN A	INDICATES HIGH ALARM WHEN LEVEL IS LOW	ALARM CLEARS DURING NORMAL OPERATION.	NONE. THE LEVEL INDICATION IS ONLY USED DURING THE COLUMN RESIN REPLACEMENT CYCLE.	III	C	3

ENGINEER E Bibelhauser DATE 12-4-87 REVIEWED BY D Walker DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-790	AE-019 pH INDICATION AT G-002 DISCHARGE	METER INDICATES MINIMUM pH NO MATTER WHAT THE ACTUAL pH IS.	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS RELIED UPON FOR pH DETERMINATION	III	C	3
50-791	AE-019 pH INDICATION AT G-002 DISCHARGE	METER INDICATES MAXIMUM pH NO MATTER WHAT THE ACTUAL pH IS.	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS RELIED UPON FOR pH DETERMINATION	III	C	3
50-792	AE-019 pH INDICATION AT G-002 DISCHARGE	METER INDICATES HIGHER THAN ACTUAL pH	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS REQUIRED FOR pH DETERMINATION	III	C	3
50-793	AE-019 pH INDICATION AT G-002 DISCHARGE	METER INDICATES LOWER THAN ACTUAL pH	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS REQUIRED FOR pH DETERMINATION	III	C	3

ENGINEER E Richardson DATE 12-4-87 REVIEWED BY EJ Wahlen DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-795	CE-058 CONDUCTIVITY INDICATION AT G-002 DISCHARGE	METER INDICATES MINIMUM CONDUCTIVITY NO MATTER WHAT THE ACTUAL CONDUCTIVITY IS.	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS REQUIRED FOR CONDUCTIVITY DETERMINATION	III	C	3
50-796	CE-058 CONDUCTIVITY INDICATION AT G-002 DISCHARGE	METER INDICATES MAXIMUM CONDUCTIVITY NO MATTER WHAT THE ACTUAL CONDUCTIVITY IS.	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS REQUIRED FOR CONDUCTIVITY DETERMINATION	III	C	3
50-797	CE-058 CONDUCTIVITY INDICATION AT G-002 DISCHARGE	METER INDICATES HIGHER THAN ACTUAL CONDUCTIVITY	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS REQUIRED FOR CONDUCTIVITY DETERMINATION	III	C	3
50-798	CE-058 CONDUCTIVITY INDICATION AT G-002 DISCHARGE	METER INDICATES LOWER THAN ACTUAL CONDUCTIVITY	SUDDEN UNEXPLAINED CHANGE IN READING, OR MISMATCH BETWEEN READING AND PERIODIC SAMPLE RESULTS.	SAMPLING IS REQUIRED FOR CONDUCTIVITY DETERMINATION	III	C	3

ENGINEER E Liebsamen DATE 12-4-87 REVIEWED BY E J Wallace DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-800	LE-017 HIGH-HIGH ALARM SWITCH ON D-001	INDICATES HIGH ALARM WHEN LEVEL IS LOW	LAHH-017 INDICATES AN ALARM WHEN LI-016 IS WITHIN ITS NORMAL RANGE.	PUMP G-001 WILL STOP OPERATING AND NOT BE ABLE TO RESTART UNTIL THE LEVEL ALARM IS REPAIRED.	IIb	C	3
50-801	LE-017 HIGH-HIGH ALARM SWITCH ON D-001	INDICATES NO ALARM WHEN LEVEL IS HIGH	LAHH-016 INDICATES AN ALARM WHILE LAHH-017 DOES NOT.	PUMP G-001 WILL STOP DUE TO THE HIGH LEVEL ALARM ON LAHH-016. REPAIRS SHOULD BE MADE TO LAHH-017 PRIOR TO CONTINUED OPERATION SINCE IT PROVIDES THE BACKUP FOR LAHH-016 IN PREVENTING THE OVERFLOW OF D-001	IIb	C	3
50-802	LT-016 HIGH ALARM SWITCH ON D-001	INDICATES HIGH ALARM WHEN LEVEL IS LOW	ALARM OCCURS WHEN LI-016 IS BELOW THE ALARM SETPOINT.	NONE	III	B	3
50-803	LT-016 HIGH ALARM SWITCH ON D-001	INDICATES NO ALARM WHEN LEVEL IS HIGH	ALARM DOES NOT OCCUR WHEN LI-016 IS ABOVE THE ALARM SETPOINT.	NONE	III	B	3

ENGINEER E Biebelhaimer DATE 12-4-87 REVIEWED BY E Walter DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-804	LT-016 HIGH-HIGH ALARM SWITCH ON D-001	INDICATES HIGH-HIGH ALARM WHEN LEVEL IS LESS THAN HIGH-HIGH	LAHH-016 INDICATES AN ALARM WHEN LI-016 IS WITHIN ITS NORMAL RANGE AND LAHH-017 IS NOT ALARMING.	PUMP G-001 WILL S / OPERATING AND NOT BE ABLE TO RESTART UNTIL THE LEVEL ALARM IS REPAIRED.	IIb	8	3
50-805	LT-016 HIGH-HIGH ALARM SWITCH ON D-001	INDICATES NO ALARM WHEN LEVEL IS HIGH-HIGH	LAHH-016 DOES NOT OCCUR WHEN LAHH-017 DOES AND WHEN LI-016 IS INDICATING ABOVE THE SETPOINT FOR THE HIGH-HIGH ALARM.	PUMP G-001 WILL STOP DUE TO THE HIGH LEVEL ALARM ON LAHH-017. REPAIRS SHOULD BE MADE TO LAHH-016 PRIOR TO CONTINUED OPERATION SINCE IT PROVIDES THE BACKUP FOR LAHH-017 IN PREVENTING THE OVERFLOW OF D-001	IIb	8	3
50-806	LT-016 LEVEL INDICATION ON D-001	METER INDICATES MINIMUM LEVEL NO MATTER WHAT THE ACTUAL LEVEL IS.	PUMP G-001 IS RUNNING, FLOW INDICATIONS FI-015 AND FI-021 SHOW FLOW INTO THE TANK AND THE LEVEL IS NOT GOING UP. POSSIBLY, AN ALARM ON LAHH-017 WITH LI-016 READING LOW.	LOSS OF INDICATION OF TANK LEVEL FOR D-001. LOSS OF BACKUP INDICATION OF EXCESSIVELY HIGH LEVEL IN D-001 USED TO STOP PUMP G-001.	IIb	8	3
50-807	LT-016 LEVEL INDICATION ON D-001	METER INDICATES MAXIMUM LEVEL NO MATTER WHAT THE ACTUAL LEVEL IS.	LAHH-016 INDICATES AN ALARM WHEN LI-016 IS AT THE EXTREME HIGH END OF ITS RANGE AND LAHH-017 IS NOT ALARMING.	PUMP G-001 WILL STOP OPERATING AND NOT BE ABLE TO RESTART UNTIL THE LEVEL INDICATION AND ALARM IS REPAIRED.	IIb	8	3

ENGINEER E Bibelhauser DATE 12-4-87 REVIEWED BY E Bibelhauser DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-808	LT-016 LEVEL INDICATION ON D-001	METER INDICATES HIGHER THAN ACTUAL TANK LEVEL	A SUDDEN UNEXPLAINED SHIFT IN THE LEVEL INDICATION. NO ALARM ON LAHH-017 WHEN LI-016 IS INDICATING AN ALARM LEVEL.	NONE	III	B	3
50-809	LT-016 LEVEL INDICATION ON D-001	METER INDICATES LOWER THAN ACTUAL TANK LEVEL	A SUDDEN UNEXPLAINED SHIFT IN THE LEVEL INDICATION. AN ALARM ON LAHH-017 WHEN LI-016 IS INDICATING AN ALARM LEVEL.	NONE	III	B	3
50-810	B-LT (LI-011) LEVEL INDICATION ON SD-2	METER INDICATES MINIMUM LEVEL NO MATTER WHAT THE ACTUAL LEVEL IS.	A SUDDEN UNEXPLAINED LEVEL CHANGE; THE LEVEL DOES NOT INCREASE WITH ADDITIONS TO THE TANK.	UNABLE TO START PUMP G-001 BY PROCEDURE. NO INTERLOCK EXISTS BETWEEN THE PUMP AND THIS LEVEL INDICATION.	III	C	3
50-811	B-LT (LI-011) LEVEL INDICATION ON SD-2	METER INDICATES MAXIMUM LEVEL NO MATTER WHAT THE ACTUAL LEVEL IS.	A SUDDEN UNEXPLAINED LEVEL CHANGE; THE LEVEL INCREASES WITHOUT ADDITIONS TO THE TANK; THE LEVEL DOES NOT DECREASE WHEN THE PUMP IS RUNNING.	NONE	III	C	3

ENGINEER E Biebelhausen DATE 12-4-87 REVIEWED BY E Walther DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-812	B-LT (LI-011) LEVEL INDICATION ON 80-2	METER INDICATES HIGHER THAN ACTUAL TANK LEVEL	A SUDDEN UNEXPLAINED LEVEL CHANGE; THE LEVEL INCREASES WITHOUT ADDITIONS TO THE TANK; THE LEVEL DOES NOT DECREASE WHEN THE PUMP IS RUNNING.	NONE	III	C	3
50-813	B-LT (LI-011) LEVEL INDICATION On 80-2	METER INDICATES LOWER THAN ACTUAL TANK LEVEL	A SUDDEN UNEXPLAINED LEVEL CHANGE; THE LEVEL DECREASES WITHOUT PUMPING FROM THE TANK; THE LEVEL DOES NOT INCREASE WHEN ADDITIONS ARE MADE.	NONE	III	C	3
50-815	LE-602 HIGH LEVEL ALARM SWITCH IN G-007 PIT	INDICATES HIGH ALARM WHEN LEVEL IS LOW	NO WATER VISIBLE IN PUMP PIT	NONE	III	C	3
50-816	LE-602 HIGH LEVEL ALARM SWITCH IN G-007 PIT	INDICATES NO ALARM WHEN LEVEL IS HIGH	WATER VISIBLE IN PIPE	NONE	III	C	3

ENGINEER E Biebelhamer DATE 12-4-87 REVIEWED BY [illegible] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-820	LE-601 HIGH LEVEL ALARM SWITCH IN G-007 PIT	INDICATES HIGH ALARM WHEN LEVEL IS LOW	WATER NOT VISIBLE IN PUMP PIT	NONE	III	C	3
50-821	LE-601 HIGH LEVEL ALARM SWITCH IN G-007 PIT	INDICATES NO ALARM WHEN LEVEL IS HIGH	WATER VISIBLE IN PIPE	NONE	III	C	3
50-855	PDY-005 FILTER F-001 DIFFERENTIAL PRESSURE INDICATION	METER INDICATES MINIMUM PRESSURE NO MATTER WHAT ACTUAL PRESSURE IS	FCV-015 UNABLE TO PROVIDE THE PROPER FLOWRATE WHILE INDICATING FULLY OPEN; UNUSUALLY HIGH PRESSURE INDICATION ON PI-005 OR UNUSUALLY LOW INDICATION ON PI-002.	LOSS OF THE ABILITY TO IDENTIFY FILTER F-001 CLOGGING. BACKUP INDICATION IS PROVIDED BY THE INABILITY OF FCV-015 TO CONTROL THE FLOWRATE.	III	C	3
50-856	PDY-005 FILTER F-001 DIFFERENTIAL PRESSURE INDICATION	METER INDICATES MAXIMUM PRESSURE NO MATTER WHAT ACTUAL PRESSURE IS	PAH-005 ALARM; PI-002 OR PI-005 OR BOTH INDICATING ABNORMALLY. PI-002 READING SIGNIFICANTLY DIFFERENT THAN PI-004; FCV-015 ABLE TO HOLD FLOWRATE SETPOINT WITHOUT BEING FULLY OPEN	LOSS OF THE ABILITY TO IDENTIFY FILTER F-001 CLOGGING. BACKUP INDICATION IS PROVIDED BY THE INABILITY OF FCV-015 TO CONTROL THE FLOWRATE.	III	C	3

ENGINEER E. Liebelaner DATE 12-4-87 REVIEWED BY [illegible] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-857	PDY-005 FILTER F-001 DIFFERENTIAL PRESSURE INDICATION	METER INDICATES LESS THAN ACTUAL PRESSURE	P1-002 OR P1-005 OR BOTH INDICATING ABNORMALLY; P1-002 READING SIGNIFICANTLY DIFFERENT THAN P1-096.	LOSS OF ABILITY TO MONITOR F-001 CLOGGING AND BLOWBACK IS NOT FREQUENT ENOUGH. FCV-015 AND OTHER INSTRUMENTS ARE REQUIRED FOR CLOGGING DETERMINATION.	III	C	3
50-858	PDY-005 FILTER F-001 DIFFERENTIAL PRESSURE INDICATION	METER INDICATES MORE THAN ACTUAL PRESSURE	P1-002 OR P1-005 OR BOTH INDICATING ABNORMALLY; P1-002 READING SIGNIFICANTLY DIFFERENT THAN P1-096.	POSSIBLE LOSS OF THE ABILITY OF FCV-015 TO CONTROL THE FLOWRATE AT ITS SETPOINT. BLOWBACK MORE FREQUENT THAN NEEDED.	III	C	3
50-859	PDY-005 HIGH LEVEL ALARM SWITCH	INDICATES HIGH ALARM WHEN PRESSURE IS LOW	ALARM PDAH-005 HAS OCCURRED WHILE PDI-005 INDICATES LESS THAN THE EXPECTED SETPOINT.	NONE. ADDITIONAL MONITORING OF THE INDICATED FILTER DP, PDI-005, WILL BE NECESSARY TO INSURE PROPER TIMING OF THE FILTER BLOWBACK SEQUENCES.	III	C	3
50-860	PDY-005 HIGH LEVEL ALARM SWITCH	INDICATES NO ALARM WHEN PRESSURE IS HIGH	ALARM PDAH-005 HAS NOT OCCURRED WHILE PDI-005 INDICATES MORE THAN THE EXPECTED SETPOINT.	NONE. ADDITIONAL MONITORING OF THE INDICATED FILTER DP, PDI-005, WILL BE NECESSARY TO INSURE PROPER TIMING OF THE FILTER BLOWBACK SEQUENCES.	III	C	3

ENGIN E Biebelhausen DATE 12-4-87 REVIEWED BY S J Wolfe DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-875	PRE-FILTER BLOWDOWN INSTRUMENT A, AS A BLACK BOX	INSTRUMENT AIR IS AVAILABLE AT TOO LOW A PRESSURE	PDI-005 WILL INDICATE THE DIFFERENTIAL PRESSURE ACROSS THE FILTER FOLLOWING BLOWBACK ATTEMPTS. IN ADDITION, PI-902 WILL PROVIDE AN INDICATION OF SUPPLY AIR PRESSURE. PSL-095 AT AIR BREAK TANK	LOW AIR PRESSURE MAY NOT SUCCESSFULLY CLEAR THE FILTER AND PRECLUDE REQUIRED FLOWS THROUGH THE FILTER TO CLEAR THE FILTER.	IIb	C	3
50-876	PRE-FILTER BLOWDOWN INSTRUMENT AIR, AS A BLACK BOX	INSTRUMENT AIR IS AVAILABLE AT TOO HIGH A PRESSURE	PI-902 INDICATES PREESSURE IN THE INSTRUMENT AIR LINE TO THE FILTER	NONE	III	C	3
50-877	PRE-FILTER BLOWDOWN INSTRUMENT AIR, AS A BLACK BOX	INSUFFICIENT INSTRUMENT AIR VOLUME IS AVAILABLE	YES, PDI-005 WILL INDICATE THE DIFFERENTIAL PRESSURE ACROSS THE FILTER FOLLOWING BLOWBACK ATTEMPTS. PSL-095, AIR BREAK TANK	LOW AIR FLOW MAY NOT SUCCESSFULLY CLEAR THE FILTER AND PRECLUDE REQUIRED FLOWS THROUGH THE FILTER TO CLEAR THE FILTER. SUPERNATANT FLOW COULD BE BYPASSED AROUND THE FILTER. WHEN THE AIR FLOW PROBLEM WAS RESOLVED SUPERNATANT WOULD AGAIN BE FILTERED.	IIb	C	3
50-280	TANK D-001 DEMINERALIZED DILUTION WATER, AS A BLACK BOX	AN INSUFFICIENT VOLUME OF DEMINERALIZED WATER IS AVAILABLE	YES, FE-024 WOULD INDICATE THE LOW DEMIN. WATER FLOW. CE-058 PROVIDES AN INDICATION OF THE SUPERNATANT CONDUCTIVITY THAT WOULD RISE WITH INADEQUATE DEMIN. WATER FLOW.	NONE	III	C	3

ENGINEER E Biebelsamen DATE 12-4-87 REVIEWED BY [illegible] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-881	TANK D-001 DeMINERALIZED DILUTION WATER, AS A BLACK BOX	DEMINERALIZED WATER IS AVAILABLE AT TOO HIGH A PRESSURE	IF THE WATER ORIGINATES FROM G-015 THE PRESSURE WOULD BE INDICATED ON A LOCAL PI-073.	NONE	III	C	3
50-882	TANK D-001 DEMINERALIZED DILUTION WATER, AS A BLACK BOX	WATER AVAILABLE IS NOT DEMINERALIZED WATER, I.E., IT CONTAINS NUMEROUS IONIC SPECIES	MAY BE DETECTED THROUGH SAMPLING OF D-001 OR ON CE-058.	NONE	III	C	3
50-885	TANK D-001 CHEMICAL ADDITION	CHEMICALS ARE NOT AVAILABLE FOR ADDITION WHEN NEEDED	AE-0079 WOULD INDICATE PH AS WELL AS S-001 CHEMICAL ANALYSIS AND THE D-001 SAMPLING PROGRAM.	IF HYDROXIDE WERE NOT AVAILABLE TO MAINTAIN A RELATIVELY HIGH PH CE-137 REMOVAL EFFICIENCY MAY BE REDUCED.	IIb	C	3
50-886	TANK D-001 CHEMICAL ADDITION	CHEMICALS ARE ADDED BUT NOT NEEDED	AE-0079 WOULD INDICATE PH AS WELL AS S-001 CHEMICAL ANALYSIS AND THE D-001 SAMPLING PROGRAM.	IF THE PH WERE LOWERED, BUT WERE NOT NECESSARY, CE-137 REMOVAL EFFICIENCY MAY BE REDUCED.	III	C	3

ENGINEER E Beiselamen DATE 12-4-87 REVIEWED BY P Walter DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-890	Hx (E-001) SECONDARY SIDE	TOO MUCH COOLING IS AVAILABLE	PERHAPS DETECTED ON TAHL-010.	NONE	III	C	3
50-891	Hx (E-001) SECONDALY SIDE	TOO LITTLE COOLING IS AVAILABLE	YES, ON TAHL-010	REDUCED CE-137 REMOVAL EFFICIENCIES AND GREATER THAN EXPECTED RESIN USAGE.	IIb	C	3
50-892	Hx (E-001) SECONDARY SIDE	VALVES H-096 AND H-097 ARE CLOSED RESULTING IN ISOLATION OF THE SECONDARY SIDE OF THE Hx WHICH IS FILLED WITH COOL BRINE.	YES, TAHL-010 ANNUNCIATES HIGH TEMPERATURES AT THE Hx.	AT A MINIMUM, Ix EFFICIENCIES WILL BE REDUCED REQUIRING MORE FREQUENT RESIN CHANGOUT. IF THE BREECH WERE TO OCCUR, THE PROCESS WOULD BE INTERRUPTED AND THE Hx WOULD REQUIRE REPLACEMENT.	IIb	A	1
50-910	ZEOLITE SUPPLY FOR Ix-D, AS A BLACK BOX	ADEQUATE ZEOLITE VOLUMES ARE NOT AVAILABLE	YES, ZEOLITE BATCH TANK LEVEL DETECTION.	EMPTIED COLUMN READY FOR ZEOLITE FILL CANNOT BE REPLENISHED. MAY RESULT IN AN OPERATING OUTAGE TO FILL COLUMN.	IIb	C	3

ENGINEER E Liebelsamen DATE 12-4-87 REVIEWED BY E J Wahlen DATE 12-4-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
50-911	ZEOLITE SUPPLY FOR Ix-D, AS A BLACK BOX	TOO MUCH ZEOLITE IS INSTALLED INTO THE Ix	YES, FILL LINE WOULD PLUG AND LI-047 ON D-002 WOULD INDICATE NO LEVEL DECREASE WHEN THE FILL LINE PLUGGED.	COLUMN FILL LINE WOULD PLUG. RESIN IN THE COLUMN COULDN'T BE REFILLED UNTIL THE PLUG WAS REMOVED.	III	B	3
50-930	INSTRUMENT AIR SUPPLY FOR Ix-D, AS A BLACK BOX	SUFFICIENT AIR SUPPLY IS NOT AVAILABLE	YES, FI-026 WOULD INDICATE LOW FLOW	SUPERNATANT WOULD NOT BE PURGED TO SD-2. IT COULD BE RINSED TO SD-2 WITH A HIGHER RINSE VOLUME GOING TO SD-2. THIS HAS A DRAWBACK IN THE SD-2 TANK INVENTORY WOULD INCREASE.	III	C	3
50-950	SLUICE WATER SUPPLY FOR Ix-D, AS A BLACK BOX	SUFFICIENT SLUICE WATER IS NOT AVAILABLE TO BACKFLUSH OR SLUICE C-004	FI-084 WOULD PROVIDE A LOW FLOW INDICATION. THERE IS NO ALARM.	SUPERNATANT COULD NOT BE RINSED FROM THE RESIN TO SD-2, HAVING LOW IMPACT. RESIN COULD NOT BE FLUFFED DURING BACKWASH, RESULTING POSSIBLY IN KEEPING RESIN FROM BEING WASHED FROM THE COLUMN.	IIb	B	3
50-955	SAND SLURRY FOR FILTER F-002, AS A BLACK BOX	SUFFICIENT SAND SLURRY IS NOT AVAILABLE	YES, SAND BATCH TANK (D-002) LEVEL DETECTION.	EMPTIED FILTER F-002 READY FOR SAND SLURRY FILL CANNOT BE REPLENISHED. MAY RESULT IN AN OPERATING OUTAGE TO FILL FILTER.	IIb	C	3

ENGINEER Dawjit Tankal DATE 12/10/87 REVIEWED BY [illegible] DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-001	CEMENT DAY BIN 70-V-010-W	WILL NOT FEED CEMENT	o ACRISON PANEL ALARM o DAS ALARM o CEMENT FEEDER TROUBLE ALARM	o PROGRAM INTERRUPTED o HIGH WATER/CEMENT RATIO o UNQUALIFIED MIX REQUIRING MANUAL CORRECTION BY ADDING CEMENT AFTER FIXING BIN TO FEED CEMENT AGAIN	IIb	B	3
70-002	CEMENT DAY BIN 70-V-010-W	FEEDS TOO MUCH CEMENT	o ACRISON PANEL ALARM o DAS ALARM o CEMENT FEEDER TROUBLE ALARM	o LOW WATER/CEMENT RATIO o CEMENT SET-UP IN MIXER	IIb	B	2
70-003	CEMENT DAY BIN 70-V-010-W	FEEDS LESS THAN REQUIRED AMOUNT OF CEMENT	o ACRISON PANEL ALARM o DAS ALARM o CEMEXT FEEDER TROUBLE ALARM	HIGH WATER/CEMENT RATIO UNQUALIFIED MIX IS POSSIBLE MANUAL CORRECTION OF CEMENT ADDITION IS POSSIBLE	III	B	3
70-026	WASTE DISPENSING VESSEL 70-D-001-W	VESSEL LEAKS	o CELL SUMP ALARMS - LE-2092 o WDV LEVEL INDICATOR DROPS - LI-2001	SUMP PUMP DISCHARGES TO LWTS. SEVERITY OF LEAK MUST BE DETERMINED FOR POSSIBLE MANNED ENTRY TO CELL	IIb	C	3

ENGINEER Daryl Lambert DATE 12/4/87 REVIEWED BY Kirk D. Harris DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-027	WASTE DISPENSING VESSEL 70-D-001-N	WDV JOHNSON SCREEN PLUGS	o NO FLOW ON FS-2038 DURING DEWATERING ATTEMPT o WDV LEVEL WILL NOT DECREASE	UNABLE TO DEWATER WDV AND UNABLE TO PROCESS RESINS DUE TO HIGH WATER CONTENT. CAN USE UTILITY WATER LINE 070-UW-005 WITH FV-947 AND 088 OPEN, FV-046 CLOSED TO FLUSH SCREEN	IIb	B	2
70-028	WASTE DISPENSING VESSEL 70-D-001-N	WDV JOHNSON SCREEN BREAKS THROUGH	NO DETECTION	PUMP RESIN AND/OR ZEOLITE TO 7013 TANK	IIb	C	3
70-029	WASTE DISPENSING VESSEL 70-D-001-N	AIR SPARGE PLUGS	NO FLOW INDICATION ON CONTROL PANEL	NO MIXING OF SOLIDS IN WDV PRIOR TO PUMP CIRCULATION.	III	C	3
70-051	WASTE DISPENSING VESSEL PUMP 70-G-001-N	PUMP WILL NOT RUN	o HSCSS ALARM PANEL - FS-2042 o NO FLOW INDICATION - FE-001	UNABLE TO ADD WASTE TO MIXER UNABLE TO RECIRCULATE WASTE IN WDV	IIb	B	3

ENGINEER [signature] DATE 12/10/87 REVIEWED BY [signature] DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-052	WASTE DISPENSING VESSEL PUMP 70-G-001-N	PUMP WILL NOT STOP	ATTEMPTING TO DE-ENERGIZE: - FLOW INDICATION ON FE-001	NO EFFECT ON PROCESS AS PUMP IS IN RECIRC UNTIL WASTE IS REQUIRED	III	B	3
			- "PUMP ON" LIGHT ON HSCSS PANEL	PUMP COULD RUN DRY IF DV IS EMPTY (FAIL PUMP)	IIb	B	3
70-053	WASTE DISPENSING VESSEL PUMP 70-G-001-N	PUMP WILL NOT DEVELOP FLOW	HSCSS PANEL ALARM - FLUID PRESENT SIGNAL FROM FS-2042	o AUTO PROGRAM WILL NOT RUN	III	B	3
				NO SUPPLY DUE TO PLUGGED LINE WITH NO WAY TO FLUSH LINE.	Ib	A	1
70-054	WASTE DISPENSING VESSEL PUMP 70-G-001-N	PUMP HOUSING FAILS	o LOW/NO FLOW ON FE-001 o CELL SUMP ALARM.	WASTE DISPENSING VESSEL'S CONTENTS DRAIN TO CELL SUMP.	II a, b	B	3
70-076	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	MOTOR WILL NOT TURN ON	o NO RPM INDICATION HSCSS PANEL o MIXER MOTOR BELT BREAK, ALARM DUE TO LOW RPM	o UNABLE TO START OR CONTINUE PROGRAM o WATER AND WASTE IN MIXER	IIb	B	3

ENGINEER [signature] DATE 12/10/87 REVIEWED BY [signature] DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-077	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	MOTOR WILL NOT TURN OFF	CONTINUED RPM INDICATION	o MUST MANUALLY TRIP BREAKER WHICH INTERRUPTS PROGRAM o SHUTDOWN OCCURS AFTER CEMENT DISCHARGE WITH EFFECT OF NOT CONTINUING TO PROCESS WASTE	IIb	B	3
70-078	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	MIXER OVERFLOWS	HIGH LEVEL ALARM ON HSCSS PANEL - LS-2048 TIME OUT ALARM ON V-2	MIXER OVERFLOWS CONTAMINATING CELL	IIa	d	3
70-079	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	MIXER WILL NOT EMPTY/DRAIN DUE TO CEMENT BUILD UP IN DISCHARGE LINE.	o NO WT LOSS ON MIXER (WE-2071 AND/OR WE-2072) o NO WT INCREASE ON DRUM (WE-2073) o DAS ALARM WHEN WGT. EXCEEDS 100# ABOVE TARE WGT.	CEMENT WILL SET UP IN MIXER INITIATE EMERGENCY PROCEDURE	Ib	B	2
70-080	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	BELT DRIVE FAILS	o NO RPM INDICATION o BELT BREAK ALARM	o PROGRAM INTERRUPT o INITIATE EMERGENCY PROCEDURE - MIXER EMPTY - STOP PROCESS - MIXER FULL - DUMP MIXER	IIb	B	3

ENGINEER Kim A. Morris DATE 12/4/87 REVIEWED BY Darryl Tapke DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-082	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	[illegible] BEARING FAILURE	HIGH MOTOR CURRENT ALARM	o PROGRAM INTERRUPT	IIb	C	3
				o INITIATE EMERGENCY PROCEDURE - MIXER EMPTY - STOP PROCESS - MIXER FULL - MIXER WILL DUMP AUTOMATICALLY			
				o REPLACE MIXER			
70-083	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	RAM VALVE HYDRAULIC CYLINDER WILL NOT GO TO "HOME"	o SEQ. NOT VERIFIED AND PROGRAM ON HOLD ALARMS. (HYDRAULICS FAIL)	o PROGRAM INTERRUPTED. HYDRAULIC CYLINDER STOPS IN POSITION WHEN HYDRAULIC FAILURE OCCURS.	IIb	B	3
70-084	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	TACHOMETER FAILS	o TACHOMETER NEEDLE INDICATOR READS ZERO ON CONTROL PANEL. o BELT BREAK ALARM o MOTOR CURRENT STILL REGISTERING o MIXER MOTOR REGISTERS FAST OR SLOW ON CONTROL PANEL.	PROGRAM AND PROCESS INTERRUPTS MUST DUMP MIXER	IIb	C	3
70-085	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-N	RAM VALVE HYDRAULIC CYLINDER WILL NOT GO TO "FULLY RETRACT" POSITION	SEQ. NOT VERIFIED AND PROGRAM ON HOLD ALARMS. (HYDRAULICS FAIL)	PROGRAM INTERRUPTED. HYDRAULIC CYLINDER STOPS IN POSITION WHEN HYDRAULIC FAILURE OCCURS.	IIb	B	3

ENGINEER Daryl Lambert DATE 12/9/87 REVIEWED BY Kim D. Morris DATE 12/9/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-086	HIGH SHEAR MIXER AND MOTOR #1 70-K-004-M	DISCAR DETACHES FROM MIXER SHAFT.	o MOTOR CURRENT GOES DOWN	REPLACE MIXER	IIb	C	3
70-087	HIGH SHEAR MIXER AND MOTOR #1 70-K-007-M	RAM VALVE HYDRAULIC CYLINDER WILL NOT GO TO "EXTEND" POSITION	SEQ. NOT VERIFIED AND PROGRAM ON HOLD ALARMS. (HYDRAULICS FAIL)	PROGRAM INTERRUPTED. HYDRAULIC CYLINDER STOPS IN POSITION WHEN HYDRAULIC FAILURE OCCURS.	IIb	B	3
70-101	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-M	MOTOR WILL NOT TURN ON	o NO RPM INDICATION HSCSS PANEL o MIXER MOTOR BELT BREAK, ALARM DUE TO LOW RPM	UNABLE TO START OR CONTINUE PROGRAM WATER AND WASTE IN MIXER	IIb	B	3
70-102	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-M	MOTOR WILL NOT TURN OFF	CONTINUED RPM INDICATION	o MUST MANUALLY TRIP BREAKER WHICH INTERRUPTS PROGRAM o SHUTDOWN OCCURS AFTER CEMENT DISCHARGE WITH EFFECT OF NOT CONTINUING TO PROCESS WASTE	IIb	B	3

ENGINEER [signature] DATE 12/10/87 REVIEWED BY [signature] DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(_)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-103	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-N	MIXER OVERFLOWS	HIGH LEVEL ALARM ON HSCSS PANEL - LS-2046	MIXER OVERFLOWS CONTAMINATING CELL	IIa	B	3
70-104	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-N	MIXER WILL NOT DRAIN/EMPTY DUE TO CEMENT BUILD UP IN DISCHARGE LINE.	o NO INCREASE ON M-15 WEIGHT (WE-2073) o NO DECREASE ON MIXER WEIGHT (WE-2071, WE-2072) o DAS ALARM WHEN WGT. EXCEEDS 100# ABOVE TARE WGT.	o CEMENT WILL SET UP IN MIXER o INITIATE EMERGENCY PROCEDURE	IIb	B	2
70-105	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-N	BELT DRIVE FAILS	o NO RPM INDICATION o BELT BREAK ALARM	o PROGRAM INTERRUPT o INITIATE ALARM PROCEDURE - MIXER EMPTY - STOP PROCESS - MIXER FULL - DUMP MIXER	IIb	B	3
70-107	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-N	DISCAR BEARING FAILURE	SAME AS 70-082	SAME AS 70-082	IIb	C	3

ENGINEER Kim A. Nelson DATE 12/1/87 REVIEWED BY Danny Lambert DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-108	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-M	RAM VALVE HYDRAULIC CYLINDER WILL NOT GO TO "HOME" POSITION	SAME AS 70-083	SAME AS 70-083	IIb	B	3
70-109	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-I	TACHOMETER FAILS	SAME AS 70-084	SAME AS 70-084	IIb	C	3
70-110	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-M	RAM VALVE HYDRAULIC CYLINDER WILL NOT GO TO "FULLY RETRACTED" POSITION	SAME AS 70-085	SAME AS 70-085	IIb	B	3
70-111	HIGH SHEAR MIXER AND MOTOR #2 70-K-002-M	DISK/AR DETACHES FROM MIXER SHAFT.	o MOTOR CURRENT GOES DOWN. o BELT BREAK ALARM.	REPLACE MIXER	Ib	C	3

ENGINEER Darryl Lambert DATE 12/4/87 REVIEWED by: King P. Harris DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-126	FILL HEAD ASSEMBLY 70-V-002-W	ASSEMBLY WILL NOT RAISE	NO INDICATION OF FILL HEAD RAISED OBTAINED ON PANEL	INTERRUPTS PROGRAM UNABLE TO REMOVE FILLED DRUM	IIb	B	3
70-127	FILL HEAD ASSEMBLY 70-V-002-W	ASSEMBLY WILL NOT LOWER	NO LOWERED INDICATION ON HSCSS PANEL	UNABLE TO CONTINUE PROGRAM AND FILL DRUMS	IIb	B	3
70-128	FILL HEAD ASSEMBLY 70-V-002-W	WILL NOT FLIP LID	NO INDICATION ON HSCSS PANEL FOR LID FLIPPED	PROGRAM ON HOLD. CAN CONTINUE BY USING SAME TOP LID AND NOT SWITCH LIDS. BUILDUP OF CEMENT ON FACING LID.	III	B	3
70-129	FILL HEAD ASSEMBLY 70-V-002-W	LOSS OF VACUUM AFTER PICKING UP LID	LOSS OF VACUUM ALARM HSCSS PANEL	DROPS LID - FOLLOW SOP 70-18-9	III	A	3
		WILL NOT PICK UP LID	LOSS OF VACUUM ALARM HSCSS PANEL	UNABLE TO CONTINUE PROGRAM AND PROCESS DRUMS	III	A	3

ENGINEER Darryl Lambert DATE 12/4/87 REVIEWED BY Kim A. Morris DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-150	FILL HEAD ASSEMBLY 70-V-002-W	PLUGS WITH CEMENT	SLOW DRAINING OF MIXER	UNABLE TO CONTINUE PROGRAM IF MIXER FILLED, ENTRY REQUIRED TO UNPLUG FOR MIXER EMPTYING ENTRY REQUIRED TO REPAIR MAY REQUIRE REMOVAL OF MIXER SKID	IIb	B	3
70-151	FILL HEAD ASSEMBLY 70-V-002-W	WILL NOT ROTATE LIDS AWAY FROM FILL NOZZLE	CYLINDER LIMIT SWITCHES NOT ACTUATED	PROCESS INTERRUPT, CANNOT FILL DRUMS	IIb	B	3
70-152	FILL HEAD ASSEMBLY 70-V-002-W	WILL NOT ROTATE LIDS UNDER FILL NOZZLE	CYLINDER LIMIT SWITCHES NOT ACTUATED	PROCESS INTERRUPT. UNABLE TO INSTALL LID ON FILLED DRUM OR REMOVE LID OF NEXT DRUM. COULD DRIP CEMENT ONTO DRUM FILL STATION AND CONTAMINATE BOTTOM OF NEXT DRUM IF DRUM REMOVED.	III	B	3
70-153	FILL HEAD ASSEMBLY 70-V-002-W	WILL NOT GO TO "FLIP" HEIGHT	ACTUATOR LIMIT SWITCH	CANNOT FLIP LIDS, BUT CAN CONTINUE BY USING SAME TOP LID AND NOT SWITCH LIDS -- BUILDUP OF CEMENT ON UP FACING LID	III	B	3

ENGINEER _____ DATE 12-10-87 REVIEWED BY _____ DATE 12/10/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-134	FILL HEAD ASSEMBLY 70-V-002-K	WILL NOT GO TO "DAB" HEIGHT	ACTUATOR LIMIT SWITCH	[illegible] PROGRAM.	III	B	3
70-135	FILL HEAD ASSEMBLY 70-V-002-K	WILL NOT GO TO "SWING" HEIGHT	ACTUATOR LIMIT SWITCH	FROM FLIP HEIGHT: CAN'T P. LIDS ON DRUM OR PLACE LID UNDER FILL ASSY.	IIb	B	3
				FROM PICK HEIGHT: CANNOT REMOVE LID, LOWER FILL ASSY. AND PROCESS DRUMS	IIb	B	3
				FROM DAB HEIGHT: CANNOT LOWER FILL ASSY. AND PROCESS DRUMS	IIb	B	3
70-136	FILL HEAD ASSEMBLY 70-V-002-K	WILL NOT GO TO "PICK" HEIGHT	ACTUATOR LIMIT SWITCH	INTERRUPT PROGRAM. CANNOT PICKUP OR REPLACE LID ON DRUM	IIb	B	3
70-137	FILL HEAD ASSEMBLY 70-V-002-K	WILL NOT LEAVE "FLIP" HEIGHT	ACTUATOR LIMIT SWITCH	INTERRUPT PROGRAM. CANNOT SWING LID [illegible]ER FILL ASSEMBLY.	IIb	B	3

ENGINEER Darryl Lambert DATE 12/4/87 REVIEWED BY Kim L. Morris DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-138	FILL HEAD ASSEMBLY 70-V-002-W	WILL NOT LEAVE "DAB" HEIGHT	ACTUATOR LIMIT SWITCH	INTERRUPTS PROGRAM. CANNOT LOWER FILL ASSEMBLY AND PROCESS DRUMS	IIb	B	3
70-139	FILL HEAD ASSEMBLY 70-V-002-W	WILL NOT LEAVE "SWING" HEIGHT	ACTUATOR LIMIT SWITCH	INTERRUPTS PROGRAM. CANNOT PICK UP LID AND PROCESS DRUM	IIb	B	3
70-140	FILL HEAD ASSEMBLY 70-V-002-W	WILL NOT LEAVE "PICK" HEIGHT	ACTUATOR LIMIT SWITCH	INTERRUPTS PROGRAM. CANNOT REMOVE LID AND PROCESS DRUM	IIb	B	3
70-151	DEWATERING PUMP 70-G-106-W	PUMP WILL NOT RUN	o NO LEVEL DECREASE IN WASTE DISPENSING VESSEL o NO FLOW ON FS-2038	WILL NOT BE ABLE TO DEWATER RESINS AND CAN'T PROCESS RESINS DUE TO HIGH WATER CONTENT	IIb	B	3

ENGINEER [signature] DATE 12/10/87 REVIEWED BY [signature] DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-152	DEWATERING PUMP 70-G-106-N	PUMP WILL NOT TURN OFF	o LOW LEVEL ALARM ON WASTE DISPENSING VESSEL o NO FLOW ON FS-2058 AFTER LOW LEVEL ALARM	DAMAGE TO PUMP COULD OCCUR. NO EFFECT ON PROCESS	III	B	3
70-153	DEWATERING PUMP 70-G-106-N	WILL NOT DEVELOP HEAD OR FLOW.	o SAME AS 70-151 o REDUCED FLOW WILL NOT BE DETECTED	WILL NOT BE ABLE TO DEWATER RESINS AND THEREFORE UNABLE TO PROCESS RESINS DUE TO HIGH WATER CONTENT	IIb	B	3
70-176	FV-160	VALVE WILL NOT OPEN - CLOSED WHEN SHOULD BE OPEN	o HSCSS ALARM (SEQUENCE NOT VERIFIED AND PROGRAM ON HOLD)	o NO FLUSH WATER ADDED TO MIXER - PROGRAM INTERRUPT o POTENTIAL CEMENT BUILDUP	IIb	B	3
70-177	FV-160	VALVE WILL NOT CLOSE - OPEN WHEN SHOULD BE CLOSED	o HSCSS ALARM (SEQUENCE NOT VERIFIED AND PROGRAM ON HOLD)	o EXCESSIVE WATER ADDED TO MIXER - PROGRAM INTERRUPT o INITIATE EMERGENCY PROCEDURE WATER MUST BE MANUALLY TURNED OFF	IIb	B	3

ENGINEER _____ DATE 12-10-87 REVIEWED BY _____ DATE 12/10/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-178	FV-160	FAIL AT INTERMEDIATE POSITION	o HSCSS ALARM (SEQUENCE NOT VERIFIED AND PROGRAM ON HOLD)	o EXCESSIVE WATER ADDED TO MIXER - PROGRAM INTERRUPT o INITIATE EMERGENCY PROCEDURE WATER MUST BE MANUALLY TURNED OFF	IIb	B	3
70-186	FV-161	VALVE WILL NOT OPEN - CLOSED WHEN SHOULD BE OPEN	o HSCSS ALARM (SEQUENCE NOT VERIFIED AND PROGRAM ON HOLD)	o NO FLUSH WATER ADDED TO MIXER - PROGRAM INTERRUPT o POTENTIAL CEMENT BUILDUP	IIb	B	3
70-187	FV-161	VALVE WILL NOT CLOSE - OPEN WHEN SHOULD BE CLOSED	o HSCSS ALARM (SEQUENCE NOT VERIFIED AND PROGRAM ON HOLD)	SEE 70-178	IIb	B	3
70-188	FV-161	FAILS AT INTERMEDIATE POSITION	o HSCSS ALARM (SEQUEN . NOT VERIFIED AND PROGRAM . HOLD)	SEE 70-178 AND 187	IIb	B	3

ENGINEER Kim A McMinn DATE 12/4/87 REVIEWED BY Jerry Peterson DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-251	FLOW VALVE FV-004 TRANSFER FROM 35104 TO WDV	VALVE WILL NOT OPEN	o LEVEL DOES NOT DECREASE IN TANK 35104 (SENSED ON LWIS) o LIMIT SWITCH SHOULD INDICATE CLOSED o LEVEL DOES NOT INCREASE IN WASTE DISPENSING VESSEL o NO FLOW ON FI-2002	NO FEED TRANSFER AND CANNOT PROCESS WASTE	IIb	B	3
70-252	FLOW VALVE FV-004	VALVE WILL NOT CLOSE	o LIMIT SWITCH SHOULD INDICATE OPEN OR NOT CLOSED o FLOW ON FI-2002	o COULD GET CROSS FEED FROM ZEOLITE/BACKWASH OR 50-15 IF ANOTHER TRANSFER IS ATTEMPTED o NO EFFECT IF TRANSFERS ARE STOPPED	III	B	3
70-253	FLOW VALVE FV-004	FAILS AT INTERMEDIATE POSITION	WHEN TRANSFER STOPS SOME LIQUID WILL FLOW DRAIN TO 35104 NO CHANGE IN EITHER LIMIT SWITCHES WHEN VALVE IS CYCLED	COULD GET CROSS FEED FROM ZEOLITE/BACKWASH OR 50-15 IF ANOTHER TRANSFER IS ATTEMPTED NO EFFECT IF TRANSFERS ARE STOPPED	III	B	3
70-261	FLOW VALVE FV-006 TRANSFER RESIN ZEOLITE OR FILTER BACKWASH	VALVE WILL NOT OPEN	o LIMIT SWITCH SHOULD INDICATE CLOSED. NO DROP IN ZEOLITE OR BACKWASH TANK LEVEL o NO FLOW ON FI-2003 o LEVEL DOES NOT INCREASE IN WASTE DISPENSING VESSEL	NO FEED TRANSFER AND CANNOT PROCESS WASTE	IIb	B	3

ENGINEER Kim Allers DATE 12/4/87 REVIEWED BY Darryl Sanders DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-262	FLOW VALVE FV-006	VALVE WILL NOT CLOSE	o LIMIT SWITCH INDICATES OPEN OR NOT CLOSED o FLOW ON FI-2003	COULD GET CROSS FEED 35104 OR 50-15 IF ANOTHER TRANSFER IS ATTEMPTED NO EFFECT IF TRANSFERS ARE STOPPED	III	B	3
70-263	FLOW VALVE FV-006	FAILS AT INTERMEDIATE POSITION	SEE 70-253	SEE 70-253	III	B	3
70-271	FLOW VALVE FV-007	VALVE WILL NOT OPEN	o SEE 70-251 AND 70-261 o NO FLOW ON FI-2004	SEE 70-251 AND 70-261	IIb	B	3
70-272	FLOW VALVE FV-007	VALVE WILL NOT CLOSE	o SEE 70-252 AND 70-262 o FLOW ON FI-2004	SEE 70-252 AND 70-262	III	B	3

ENGINEER Kim A. Morris DATE 12/4/87 REVIEWED BY Dave Lauderdale DATE 12/9/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-275	FLOW VALVE FV-007	FAILS AT INTERMEDIATE POSITION	SEE 70-253 AND 70-265	SEE 70-253 AND 70-263	III	B	3
70-281	FLOW VALVE FV-058	VALVE WILL NOT OPEN	o VALVE LIMIT SWITCH INDICATES CLOSED o NO FLOW INDICATED ON FI-2058 WHICH SHUTS PUMP OFF	o NOT ABLE TO DEWATER o NOT ABLE TO FLUSH SCREEN IN WDV	IIb	B	3
70-282	FLOW VALVE FV-058	VALVE WILL NOT CLOSE	o FLOW INDICATED ON *I-2058 IF FV-046 IS OPEN o WDV LEVEL WILL DROP SLIGHTLY AND UNACCOUNTABLY (LT-2001) o VALVE LIMIT SWITCH INDICATES POSITION	WASTE DRAINS IN LINE DOWNSTREAM OF FV-058 AND MORE IS DRAINED FROM WDV THAN WAS PLANNED	III	B	3
70-285	FLOW VALVE FV-058	FAILS AT INTERMEDIATE POSITION	o LIMIT SWITCH DOESN'T INDICATE OPEN OR CLOSED o NO DETECTION WITH FS-2058 - WDV LEVEL WILL DROP SLIGHTLY AND UNACCOUNTABLY	WASTE DRAINS IN LINE DOWNSTREAM OF FV-058 AND MORE IS DRAINED FROM WDV THAN WAS PLANNED	III	B	3

ENGINEER Kim O'Malley DATE 12/4/87 REVIEWED BY Gary Goodwin DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-291	FLOW VALVE FV-046	VALVE FAILS TO OPEN	o LIMIT SWITCH ON VALVE INDICATES CLOSED o NO FLOW INDICATED ON FI-2058 WHICH SHUTS PUMP OFF o WDV LEVEL DOESN'T D/CREASE	NOT ABLE TO DEWATER	IIb	B	3
70-292	FLOW VALVE FV-046	VALVE FAILS TO CLOSE	o LIMIT SWITCH ON VALVE INDICATES OPEN o FLOW INDICATED ON FI-058 IF PUMP IS RUNNING o WDV LEVEL WILL DROP SLIGHTLY	WASTE DRAINS IN LINE DOWNSTREAM OF FV-046 AND MORE IS DRAINED FROM WDV THAN WAS PLANNED	IIb	B	3
70-295	FLOW VALVE FV-046	VALVE FAILS AT INTERMEDIATE POSITION	SAME AS 70-292	SAME AS 70-292	IIb	B	3
70-301	FLOW VALVE FV-047 (DIAPHRAGM VALVE)	CLOSED WHEN SHOULD BE OPEN	o NO FLOW TO FI-2056 OR NO LEVEL INCREASE IN WDV. o LIMIT SWITCH INDICATES CLOSED.	DEWATERING PUMP CAN'T BE FLUSHED OR JOHNSON SCREEN CAN'T BE BACK FLUSHED.	IIb	B	3

ENGINEER [signature] DATE 12/4/87 REVIEWED BY [signature] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-302	FLOW VALVE FV-047 (DIAPHRAGM VALVE)	OPEN WHEN SHOULD BE CLOSED.	1) o NO DETECTION IF FV-046 AND 052 CLOSED. o IF IN NO FLOW SITUATION TO DEWATERING PUMP THEN PUMP WON'T TURN ON & NO DETECTION 2) WDV LEVEL INCR. IF 088 OPEN 3) LIMIT SWITCH INDICATES OPEN	1) NO EFFECT 2 & 3) WASTE IN WDV IS LESS CONCENTRATED, CAUSING RECIPE INACCURACY	III	B	5
70-303	FLOW VALVE FV-047 (DIAPHRAGM VALVE)	STOPS IN INTERMEDIATE POSITION.	1) o NO DETECTION IF FV-046 AND 088 CLOSED. o IF IN NO FLOW SITUATION TO DEWATERING PUMP THEN PUMP WON'T TURN ON & NO DETECTION 2) WDV LEVEL INCR. IF 088 OPEN 3) LIMIT SWITCH INDICATES FAILURE	1) NO EFFECT 2 & 3) WASTE IN WDV IS LESS CONCENTRATED CAUSING RECIPE INACCURACY	III	B	5
70-321	FV-098 (DIAPHRAGM VALVE)	OPEN WHEN SHOULD BE CLOSED	o LIMIT SWITCH ON VALVE INDICATES OPEN. o FS-2040 INDICATES FLOW o WDV LEVEL WILL BEGIN TO DROP. o F10-001 WILL RECORD LOW FLOW & WDV PUMP ALARM.	PROGRAM INTERRUPTED - FOLLOW SOP 70-10-4.	IIb	B	5
70-322	FV-098 (DIAPHRAGM VALVE)	CLOSED WHEN SHOULD BE OPEN	o FS-2040 INDICATES NO FLOW o WDV LEVEL ISN'T DECREASING. o LIMIT SWITCH ON, VALVE INDICATES OPEN.	WILL NOT BE ABLE TO FLUSH WDV.	IIb	B	5

ENGINEER [signature] DATE 12/4/87 REVIEWED BY [signature] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-523	FV-098 (DIAPHRAGM VALVE)	HALF OPEN	o FS-2040 INDICATES FLOW. o WDV LEVEL IS DECREASING IF MINIMUM FLOW. o F10-001 WILL RECORD LOW FLOW - WDV PUMP LOW FLOW ALARM.	o PROGRAM INTERRUPTED - FOLLOW SOP 70-18-4. o IF LOW FLOW ALARM, PROGRAM WILL SHUT DOWN	IIb	B	3
70-531	FV-099 (DIAPHRAGM VALVE)	OPEN WHEN SHOULD BE CLOSED	o WHEN PUMP NOT RUNNING, VALVE LIMIT SWITCHES AND WDV LEVEL INCREASE IF WATER ON. o WHEN PUMP RUNNING, F10-001 INDICATES HIGHER FLOW. o RECIRC. CYCLE; WDV LEVEL INCREASES.	o WHEN PUMP NOT RUNNING, UTILITY WATER WILL EQUALIZE IN PROCESS LINE. o THE WASTE MIXTURE WILL BE LESS CONCENTRATED DUE TO THE ADDITION OF THE UTILITY WATER.	III	B	3
70-532	FV-099 (DIAPHRAGM VALVE)	CLOSED WHEN SHOULD BE OPEN	o LIMIT SWITCH INDICATES CLOSED. o WDV LEVEL DOESN'T INCREASE	WON'T GET WATER TO FLUSH THE PROCESS LINES. NOT USED IN THE MAIN PROCESS.	III	B	3
70-533	FV-099 (DIAPHRAGM VALVE)	HALF OPEN	o WHEN PUMP NOT RUNNING, VALVE LIMIT SWITCHES AND WDV LEVEL INCREASE IF WATER ON. o WHEN PUMP RUNNING, F10-001 INDICATES HIGHER FLOW. o RECIRC. CYCLE; WDV LEVEL INCREASES.	o WHEN PUMP NOT RUNNING, UTILITY WATER WILL EQUALIZE IN PROCESS LINE. o THE WASTE MIXTURE WILL BE LESS CONCENTRATED.	III	B	3

ENGINEER [signature] DATE 12/4/87 REVIEWED BY [signature] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-341	FLOW VALVE FV-002	VALVE WILL NOT CYCLE FROM "RECIR" TO "FILL MIXER"	TIME OUT SIGNAL ON LIMIT SWITCH PROGRAM ON HOLD AND SEQ. NOT VERIFIED ALARMS.	KEEPS RECYCLING WASTE FOR THE TIME DETERMINED BY TT-0248, RUNG 295, THEN SHUTS DOWN PUMP ON SIGNAL	IIb	B	3
70-342	FLOW VALVE FV-002	VALVE WILL NOT CYCLE FROM "FILL MIXER" TO "RECIR"	TIME OUT SIGNAL ON LIMIT SWITCH PROGRAM ON HOLD AND SEQ. NOT VERIFIED ALARMS.	SHUTS DOWN PUMP ON SIGNAL (AFTER TIME DETERMINED BY TT-0258, RUNG 212)	IIb	B	3
70-343	FLOW VALVE FV-002	STOPS IN INTERMEDIATE POSITION	o TIME OUT SIGNAL ON LIMIT SWITCH FOR EITHER OPEN OR CLOSED FAILURE - NO INBETWEEN o FI-2055 (AC). FLOW (PARTIAL) o NO FLOW ON FIQ-001 (BLOCKED) o LOW FLOW AT FIQ 001 (IF PARTIAL FLOW IN RECIRC.)	o SHUTS DOWN PUMP ON SIGNAL o FLOW WILL EITHER BE BLOCKED OR BE PARTIAL TO ONE SIDE OR THE OTHER BUT NOT TO BOTH.	IIb	B	3
70-344	FLOW VALVE FV-002	ROD FROM ACTUATOR TO BALL VALVE BREAKS	o LIMIT SWITCH INDICATES VALVE HAS CYCLED - NO DETECTION o DAS ALARM - WT INCORRECT IN MIXER o WHEN ATTEMPTING BATCH PROCESSING o WHEN ATTEMPTING RECIRCULATION	o NOT ABLE TO CYCLE FROM RECIRC. OR NOT ABLE TO CYCLE FROM FILL o PROGRAM INTERRUPTED. FOLLOW SOP 70-18-17 SECT. 6.4 OR SECT. 6.5	IIb	C	3

ENGINEER [signature] DATE 12/4/87 REVIEWED BY [signature] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-351	FV-014	VALVE WILL NOT CYCLE TO MIXER 2	TIME OUT SIGNAL ON LIMIT SWITCH - PROGRAM ON HOLD & SEQUENCE NOT VERIFIED ALARMS.	PROGRAM INTERRUPTED. PROCESS WILL NOT BE CONTINUED AUTOMATICALLY UNTIL VALVE CAN CYCLE.	IIb	B	3
70-352	FV-014	VALVE WILL NOT CYCLE TO MIXER 1	TIME OUT SIGNAL ON LIMIT SWITCH - PROGRAM ON HOLD & SEQUENCE NOT VERIFIED ALARMS.	PROGRAM INTERRUPTED. PROCESS WILL NOT BE CONTINUED AUTOMATICALLY UNTIL VALVE CAN CYCLE.	IIb	B	3
70-354	FV-014	STOPS IN INTERMEDIATE POSITION.	TIME OUT SIGNAL ON LIM. SWITCH - PROG. ON HOLD & SEQ. NOT VERIFIED ALARMS. o NO FLOW IN FI-2035 (IF BLOCKED) o NO INCR. IN WT. IN MIXER	FLOW WILL EITHER BE BLOCKED OR LEAK TO ONE SIDE OR THE OTHER, NOT TO BOTH. PROGRAM INTERRUPTED. PROCESS WILL NOT CONT AUTOMATICALLY UNTIL VALVE CAN CYCLE.	IIb	B	3
70-355	FV-014	ROD FROM ACTUATOR TO BALL VALVE BREAKS	LIMIT SWITCH INDICATES VALVE HAS CYCLED - NO DETECTION THERE. WRONG MIXER GETS WASTE. SEQ. NOT VERIFIED, BAS & PROG. ON HOLD ALARMS.	VALVE WON'T CYCLE. WRONG MIXER GETS WASTE. PROGRAM INTERRUPTED. FOLLOW SOP 70-18-11,35,17 FOR RECOVERY.	IIb	C	3

ENGINEER [signature] DATE 11/11/87 REVISED BY [signature] DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-561	70-FV-005 (PINCH VALVE)	CLOSED WHEN SHOULD BE OPEN. (AIR SOLENOID VALVE CAUSES VALVE TO FAIL CLOSED)	o SEQ. NOT VERIFIED & PROG. ON HOLD ALARMS. o NO WT. CHANGE IN MIXER. o VALVE LIMIT SWITCHES SHOW VALVE POSITION.	PROGRAM INTERRUPTED AND ACTION TAKEN PER SOP 70-18-17, SECT. 6.11 OR 6.9. CANNOT EMPTY MIXER AUTOMATICALLY. CEMENT SETUP MAY OCCUR.	IIb	A	1
70-562	70-FV-005 (PINCH VALVE)	OPEN OR PARTIALLY OPEN WHEN SHOULD BE CLOSED.	o VALVE LIM. SWITCHES SHOW VALVE POSITION o SEQ. NOT VERIFIED AND PROGRAM ON HOLD ALARMS. o DAS ALARM POSSIBLE.	o PROGRAM INTERRUPTED. CANNOT MAINTAIN FLUSH WATER, WASTE OR CEMENT TO MIXER. o UNMIXED OR NOT THOROUGHLY MIXED WASTE TO DRUM.	IIb	A	2
70-571	70-FV-10 (PINCH VALVE)	CLOSED WHEN SHOULD BE OPEN. (AIR SOLENOID VALVE CAUSES VALVE TO FAIL CLOSED.)	o "SEQUENCE NOT VERIFIED" ALARM o WT DOESN'T CHANGE IN MIXER o VALVE LIM. SWITCHES SHOW VALVE POSITION.	PROGRAM INTERRUPTED AND ACTION TAKEN PER SOP 70-18-17 SECT. 6.11 OR SECT. 6.9 CANNOT EMPTY MIXER AUTOMATICALLY CEMENT SETUP MAY OCCUR.	IIb	A	1
70-572	70-FV-10 (PINCH VALVE)	OPEN OR PARTIALLY OPEN WHEN SHOULD BE CLOSED.	o VALVE LIM. SWITCHES SHOW VALVE POSITION o SEQ. NOT VERIFIED AND PROGRAM ON HOLD ALARMS. o DAS ALARM POSSIBLE.	o PROGRAM INTERRUPTED. CANNOT MAINTAIN FLUSH WATER, WASTE OR CEMENT TO MIXER. o UNMIXED OR NOT THOROUGHLY MIXED WASTE TO DRUM.	IIb	A	2

ENGINEER Kim D'Agnolo DATE 12/4/87 REVIEWED BY Darryl Kubel DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-581	CHECK VALVE - UTILITY WATER - 1 (TO WASTE DISPENSING VESSEL INLET PROCESS LINE, 70-PL-150)	FAILS TO OPEN WHEN ACTIVATED, UTIL. WATER	o F10-2080 RECORDS NO FLOW o LEVEL TRANSMITTER 2001 RECORDS NO LEVEL INCREASE IN WDV	NOT ABLE TO FLUSH WDV FOR WASTE CHANGE	IIIb	B	3
70-591	CEMENT DIVERTER VALVE 070-V-017	WILL NOT CYCLE FROM MIXER 1 TO MIXER 2	o LIM. SWITCH OPERATIONAL AND INDICATES MIXER 1 STILL CLOSED. SEQ. NOT VERIFIED AND PROGRAM ON HOLD ALARMS.	o PROGRAM INTERRUPTED. FOLLOW SOP 70-10-11 OR -15 FOR RECOVERY. CONTINUED OPERATION POSSIBLE.	III	A	3
70-592	CEMENT DIVERTER VALVE 070-V-017	WILL NOT CYCLE FROM MIXER 2 TO MIXER 1	SAME AS 70-591	SAME AS 70-591	III	A	3
70-595	CEMENT DIVERTER VALVE 070-V-017	VALVE FAILS AT INTERMEDIATE POSITION, PARTIALLY OPEN TO ONE MIXER AND CLOSED TO OTHER MIXER	o LIMIT SWITCH OPERATIONAL AND INDICATES VALVE FAILED. PROGRAM ON HOLD AND SEQ. NOT VERIFIED ALARMS.	o PROGRAM INTERRUPTED. FOLLOW SOP 70-10-11 & -15 FOR RECOVERY. o DOWNTIME WILL RESULT TO FIX VALVE	IIIb	A	2

ENGINEER [signature] DATE 12/4/87 REVIEWED BY [signature] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-594	CEMENT DIVERTER VALVE 070-V-017	VALVE FAILS WITH VALVE CLOSED TO BOTH MIXERS	o LIMIT SWITCH OPERATIONAL AND INDICATES VALVE FAILED. PROGRAM ON HOLD AND SEQ. NOT VERIFIED ALARMS.	o PROGRAM INTERRUPTED. FOLLOW SOP 70-18-11 AND 15 FOR RECOVERY. o DOWNTIME WILL RESULT TO FIX VALVE	IIIb	A	2
70-611	CHECK VALVE - UTILITY WATER - 2 (TO DEWATERING PUMP, 070-G-166) SEAL WATER	FAILS TO OPEN	NO DETECTION	PUMP WILL FAIL WITHOUT SEAL WATER. UNABLE TO DEWATER WITHOUT PUMP.	IIIb	C	3
70-621	CHECK VALVE - AIR (TO WASTE DISPENSING VALVE MIXER)	FAILS TO OPEN	FI 250 DETECTS NO FLOW	o NO EFFECT IN RECIRC. CYCLE - RECIRCULATION SHOULD KEEP MIXTURE HOMOGENEOUS o IN FILL CYCLE, MIXTURE MAY SETTLE AND BECOME NON HOMOGENEOUS	III	C	3
70-622	CHECK VALVE - AIR (TO WASTE DISPENSING VALVE MIXER)	FAILS TO CLOSE	FI 250 DETECTS FLOW	NO EFFECT	III	C	3

ENGINEER [illegible] DATE 12/11/87 REVIEWED BY [illegible] DATE 12-18-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-151	CHECK VALVE - UTILITY WATER - 3 (TO WASTE DISPENSING VESSEL 070-C-001 FOR TRANSMITTER)	FAILS TO OPEN	LEVEL IN WDV DECREASE	PLUGGING / ERRONEOUS READINGS OF LEVEL TRANSMITTER CONTINUES	III	C	3
70-432	CHECK VALVE - UTILITY WATER - 3 (TO WASTE DISPENSING VESSEL 070-D-001 FOR TRANSMITTER)	FAILS TO CLOSE	NO DETECTION	NO PRESSURE TO BACKWASH INTO UTILITY WATER SYSTEM UNLESS TRIPLE FAILURE: 1) WDV OVERFILLS AND VENT IS PLUGGED 2) HIGH LEVEL ALARM DOESN'T SOUND 3) CHECK VALVE FAILS TO CLOSE	III	C	3
70-481	WE-2071 (WT. OF MIXER #1)	READING HIGHER THAN ACTUAL WT. (OUT OF CALIB.)	o DAS ALARM ON HSCSS PANEL WEIGHT DOESN'T MATCH RECIPE	o PROGRAM INTERRUPTED AND ACTION TAKEN PER SOP 70-10-17, SECT. 6.5 EX). IF ACTUAL WEIGHT IS CORRECT WITH READING >110% THE MIXER WILL BE UNNECESSARILY DUMPED. IF ACTUAL WT IS CORRECT, WITH READING < 110% MANUAL CORR. OF CEMENT MADE.	IIb	C	3
			o DAS ALARM WHEN WASTE IN MIXER	o PROGRAM INT. AND ACT. PER SOP 70-10-17, SECT. 6.11	IIb	C	3
70-492	WE-2071	READING LOWER THAN ACTUAL (OUT OF CALIB.)	o DAS ALARM ON HSCSS PANEL WEIGHT DOESN'T MATCH RECIPE	o PROGRAM INTERRUPTED AND ACTION TAKEN PER SOP 70-10-17, SECT. 6.5 OR 6.4. IF ACTUAL WEIGHT IS CORRECT AND READING TOO LOW, MORE WASTE AND/OR CEMENT WILL BE ADDED. IF ACTUAL WEIGHT HIGH AND READING OK WILL GET DAS ALARM WHEN MIXER DUMPED	IIb	C	3
			o DAS ALARM WHEN WASTE IN MIXER	o PROGRAM INT. AND ACT. PER SOP 70-10-17, SECT 6.11	IIb	C	3

ENGINEER _____ DATE 12-10-87 REVIEWED BY _____ DATE 12/10/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-483	WE-2071	NO READING	o DAS USES ACRISON TO DETERMINE AMOUNT OF CEMENT (WE2011) AND DAS ALARM	PROGRAM INTERRUPTED AND ACTION PER SOP 70-18-17 SECT. 6.6, 6.7, 6.11	IIb	C	3
70-491	WE-2072 (WT. OF MIXER #2)	READING HIGHER THAN ACTUAL WT. (OUT OF CALIB.)	SAME AS 70-481	SAME AS 70-481	IIb	C	3
70-492	WE-2072	READING LOWER THAN ACTUAL WT. (OUT OF CALIB.)	SAME AS 70-482	SAME AS 70-482	IIb	C	3
70-493	WE-2072	NO READING	SAME AS 70-483	PROGRAM INTERRUPTED AND ACTION PER SOP 70-18-17, SECT. 6.6, 6.7, 6.11	IIb	C	3

ENGINEER Kim P. Morris DATE 12/4/87 REVIEWED BY Daryl Laubach DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-501	WE-2073 (WI-2073) (WT. OF DRUM)	READING HIGHER THAN ACTUAL (OUT OF CALIB.)	DAS - WILL SHOW DRUM > 100% FULL DAS WILL ALARM	PROGRAM INTERRUPTED AND ACTION TAKEN PER SOP 70-18-17, SECT. 6.11	IIb	C	3
70-502	WE-2073 (WI-2073)	READING LOWER THAN ACTUAL (OUT OF CALIB.)	DAS - WILL SHOW DRUM TO BE NOT FULL ENOUGH DAS WILL ALARM	PROGRAM INTERRUPTED AND ACTION TAKEN PER SOP 70-18-17, SECT. 6.11	IIb	C	3
70-503	WE-2073 (WI-2073)	NO READING	DAS ALARM, DRUM WEIGHT NOT SUM OF DISCHARGE WEIGHTS	PROCESS CONTINUES AS PER SOP 70-18-17, SECT. 6.11	III	-	3
70-511	LT-2401	READS HIGHER THAN ACTUAL	PREMATURE HIGH LEVEL ALARM WHEN FILLING	PROCESS IS STOPPED AS PER SOP 70-18-1	IIb	C	3

ENGINEER Kim L. Morris DATE 12/4/87 REVIEWED BY Darryl Tunstall DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-512	LT-2001	READS LOWER THAN ACTUAL	LS-2053 CLOSES APPROPRIATE FLOW VALVES (FV-004, 006, OR 007)	NO EFFECT - PROCESS CONTINUES AS USUAL	III	C	3
70-521	WE-2011 (CEMENT WEIGHT DETECTOR)	READING HIGHER THAN ACTUAL	DAS SYSTEM ALARM BECAUSE CAN'T MATCH WEIGHT IN MIXER. (LOW WATER/CEMENT RATIO WITH RECIPE.)	STOP AUTOMATIC PROCESS. PROCESS CONTINUES AS PER SOP 70-18-17, SECTION 6.7	IIb	C	
70-522	WE-2011	READING LOWER THAN ACTUAL	DAS SYSTEM ALARM BECAUSE CAN'T MATCH WEIGHT IN MIXER (HIGH WATER/CEMENT RATIO WITH RECIPE.)	STOP AUTOMATIC AND PROCEED AS PER SOP 70-18-17, SECTION 6.5	IIb	C	3
70-523	WE-2011	NO READING	DAS ALARM (HIGH WATER/CEMENT RATIO)	STOP AUTOMATIC PROCESS AND PROCEED AS PER SOP 70-18-17, SECTION 6.6	IIb	C	3

ENGINEER Kim D. Williams DATE 12/4/87 REVIEWED BY Dave Lambert DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-531	FE-001	INDICATES FLOW WHEN THERE IS NO FLOW	o IN RECIRC. CYCLE, PUMP INDICATES OFF.	NO EFFECT	III	C	3
70-532	FE-001	INDICATES NO FLOW WHEN THERE IS FLOW	"SEQUENCE NOT VERIFIED" ALARMS AND MOTOR OF PUMP INDICATES ON	V-002 WILL NOT OPEN TO MIXERS AND PROGRAM IS INTERRUPTED	IIb	C	3
70-533	FE-001	FLOW READING HIGHER THAN ACTUAL	o IN RECIRC. CYCLE, NO INDICATION o IF IN FILL CYCLE, DAS ALARMS AND "SEQUENCE NOT VERIFIED" ALARM SOUNDS BECAUSE MIXER WEIGHT DOESN'T CORRELATE WITH RECIPE	o RECIRC. CYCLE: NO EFFECT o FILL CYCLE: PROGRAM INTERRUPTED AND WASTE IN MIXER IS MORE OR LESS THAN REQUIRED. IF LESS, WASTE MUST BE ADDED MANUALLY AND PROCESS CONTINUES. IF MORE WASTE, PROCESS CONTINUES WITH DRUM AS "SUSPECT."	IIb	B	3
70-534	FE-001	FLOW READING LOWER THAN ACTUAL	o IN RECIRC. CYCLE "SEQUENCE NOT VERIFIED" ALARMS o IN MIXER FILL CYCLE, WEIGHT WILL NOT CORRELATE (WE-2071 OR WE-2072) AND "SEQUENCE NOT VERIFIED" ALARM AND DAS ALARM WILL SOUND	o RECIRC. CYCLE: PUMP STOPS AND PROG. INTERRUPTED o FILL CYCLE: 1) MORE WASTE IN MIXER, PROCESS CAN CONTINUE WITH DRUM AS "SUSPECT" OR MAY MANUALLY ADD CEMENT OR DISCHARGE TO FLUSH DRUM 2) IF FLOW IS ACTUALLY 80 GPM AND THE READING IS LESS, THE SYSTEM WILL NOT ALLOW V-002 TO CYCLE TO FILL CYCLE FROM RECIRC	IIb	B	3

ENGINEER Kim D. Morris DATE 12/4/87 REVIEWED BY Gary Lambert DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-541	LS-2046 (LEVEL SWITCH [PROBE] ON MIXER #2) ONLY A HIGH LEVEL PROBE	TOO HIGH WHEN UNDERFILLED	HIGH LEVEL ALARM	o PROGRAM INTERRUPTION AND PUMP SHUTDOWN RECOVERY AS PER SOP 70-18-6 o DOWNTIME WILL RESULT TO CLEAN PROBE	IIb	A	2
70-542	LS-2046	NO HIGH LEVEL READING WHEN FILLED	NO DETECTION	LOSS OF REDUNDANCY, HSCSS CONTROL SYSTEM WILL PREVENT OVERFILL	IIb	B	3
70-551	LS-2048 (LEVEL SWITCH [PROBE] ON MIXER #1) ONLY A HIGH LEVEL PROBE	TOO HIGH WHEN UNDERFILLED	SAME AS 70-541	SAME AS 70-541	IIb	A	2
70-552	LS-2048	NO HIGH LEVEL READING WHEN FILLED	NO DETECTION	LOSS OF REDUNDANCY, HSCSS CONTROL SYSTEM WILL PREVENT OVERFILL	IIb	B	3

ENGINEER Kim A. Williams DATE 12/4/87 REVIEWED BY Daryl Lambert DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-556	FS-2038	SHOWS FLOW WHEN THERE IS NO FLOW	PUMP OFF LIGHT FV-046, 047, 088 CLOSED. HAS TO SHOW NO FLOW	NO EFFECT - REPAIR FS.	III	8	3
			PUMP ON FV-046, 088 OPEN WDV LEVEL DOESN'T CHANGE	PUMP COULD FAIL	IIb	8	3
70-557	FS-2038	SHOWS NO FLOW WHEN THERE IS FLOW	FV-046, 088 OPEN. LIQUID IN WDV.	ON NO FLOW INDICATION, DEWATERING PUMP TURNS OFF. THEREFORE UNABLE TO DEWATER AND CAN'T PROCESS RESINS.	IIb	8	3
70-561	FEED FROM 35104 (SUPPORT SYSTEM)	NO FEED WHEN FEED DESIRED	o FS-2002 INDICATES NO FLOW o NO LEVEL INCREASE IN WDV	NO EFFECT INITIALLY. LOW LEVEL ALARM MAY ACTIVATE IN WDV IF NO FLOW TO VESSEL IS COMBINED WITH BATCH PROCESSING INSTEAD OF RECIRC.	III	8	3
70-562	FEED FROM 35104 (AS A SUPPORT SYSTEM)	FEED WHEN FEED NOT DESIRED	NOT DETECTED ON CSS SYSTEM DETECTION IN LWTS	NO INITIAL EFFECT - MAY CAUSE FAILURE OF FV-004 BECAUSE OF PRESSURE BUILD-UP UPSTREAM.	III	8	3

ENGINEER Kim S. Swenson DATE 12/4/87 REVIEWED BY Darryl Lambert DATE 12/9/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-566	RESIN AND ZEOLITE FEED (AS A SUPPORT SYSTEM)	NO FEED WHEN FEED DESIRED	o FS-2003 INDICATES NO FLOW o NO LEVEL INCREASE IN WDV	SEE 70-561	III	B	3
70-567	ESIN AND ZEOLITE FEED (AS A SUPPORT SYSTEM)	FEED WHEN FEED NOT REQUESTED/DESIRED	NOT DETECTED IN CSS SYSTEM DETECTION IN LWTS	NO INITIAL EFFECT. MAY CAUSE FAILURE OF FV-006 BECAUSE OF PRESSURE BUILD-UP UPSTREAM	III	B	3
70-571	CONCENTRATE FROM 50-15A-FEED (AS A SUPPORT SYSTEM)	NO FEED WHEN FEED DESIRED	o NO FLOW INDICATION ON FS-2004 o NO LEVEL INCREASE ON WASTE DISP. VESSEL.	SEE 70-561	III	B	3
70-572	CONCENTRATE FROM 50-15A-FEED (AS A SUPPORT SYSTEM)	FEED WHEN FEED NOT REQUESTED	NO DETECTION ON RSCSS CONTROL PANEL - DETECTION IN LWTS	NO INITIAL EFFECT - MAY CAUSE FAILURE (LEAKAGE) OF FV-006 BECAUSE OF PRESSURE BUILD-UP UPSTREAM OF VALVE	III	B	3

ENGINEER _____ DATE 12-10-87 REVIEWED BY _____ DATE 12/10/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-576	VESSEL VENT 070-VE-053 (AS A SUPPORT SYSTEM)	VESSEL VENT OFF	"CELL LOSS OF NEGATIVE PRESSURE" ALARM SOUNDS	NO EFFECT ON PROCESS	III	C	3
70-581	FLUSH H20 TO 70-D-101 (AS A SUPPORT SYSTEM)	NO WATER TO LINE 070-UW-068 WHEN WATER NEEDED	FV-061 IS CLOSED (AS INDICATED ON HSCSS GRAPHICS PANEL)	UNABLE TO FLUSH WASTE DISPENSING VESSEL USING SPRAY. CAN USE UW FROM 070-UW-067 AND 070-UW-011 TO FILL WDV WITH FLUSHWATER	IIb	B	3
70-582	FLUSH H20 TO 70-D-001 (AS A SUPPORT SYSTEM)	WATER TO LINE 070-UW-068 WHEN WATER NOT REQUIRED	FV-061 IS OPEN (as indicated on HSCSS GRAPHICS PANEL)	SLURRY NOT AS CONCENTRATED AS DESIRED.	IIb	B	3
70-596	FLUSH H20 TO MIXER #2 (AS A SUPPORT SYSTEM)	NO WATER TO LINE 070-UW-090 WHEN WATER NEEDED	o FV-160 IS CLOSED AS INDICATED ON GRAPHICS PANEL o NO CHANGE IN WEIGHT	CEMENT RESIDUE MAY ACCUMULATE AND HARDEN IN THE MIXER.	IIb	B	3

ENGINEER Darryl Lambert DATE 12/4/87 REVIEWED BY [illegible] DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-597	FLUSH H2O TO MIXER #2 (AS A SUPPORT SYSTEM)	WATER TO LINE 070-UW-090 WHEN WATER NOT REQUIRED	o FV-160 IS OPEN AS INDICATED ON GRAPHICS PANEL o WEIGHT INCREASE - "SEQUENCE NOT VERIFIED" ALARM AND DAS ALARM	PROGRAM INTERRUPTS (MIXTURE MAY NOT BE IN CORRECT RATIO IN THE MIXER) AS PER SOP 70-18-17, SECT. 6.6	IIb	B	3
70-601	FLUSH WATER TO MIXER #1 (AS A SUPPORT SYSTEM)	NO WATER TO LINE 070-UW-091 WHEN WATER REQUIRED	SEE 70-596	SEE 70-596	IIb	B	3
70-602	FLUSH WATER TO MIXER #1 (AS A SUPPORT SYSTEM)	WATER TO LINE 070-UW-094 WHEN NO WATER REQUIRED	SEE 70-597	SEE 70-597	IIb	B	3
70-606	CEMENT TO CEMENT DAY BIN (AS A SUPPORT SYSTEM)	NO CEMENT TO DAY BIN	"CEMENT FEEDER TROUBLE" ALARM SOUNDS	PROGRAM INTERRUPTED	IIb	C	3

ENGINEER Kim L. Morris DATE 12/4/87 REVIEWED BY Dan Haberl DATE 12/4/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-611	HYDRAULIC FLUID TO CYLINDER SYSTEMS (AS A SUPPORT SYSTEM)	NO FLUID PRESSURE	o RAM VALVE DOESN'T REGISTER CHANGE ON GRAPHICS PANEL. (NOT DETECTED SPECIFICALLY) o LID HANDLER UP/DOWN DOESN'T REGISTER CHANGE ON GRAPHICS PANEL o FILL HEAD UP/DOWN DOESN'T REGISTER	PROGRAM INTERRUPTED	IIb	B	3
70-656	FLUSH WATER TO DEWATER RETURN LINE 070-UW-005 (AS A SUPPORT SYSTEM)	INSUFFICIENT FLUSH WATER AVAILABLE	o NO DETECTION POSSIBLE IF FLUSHING 070-PL-008 o NO WDV LEVEL INCREASE IF BACK-FLUSHING	o RESIDUALS MAY RESIDE IN THE LINE CAUSING PLUGGAGE o CAN'T BACKWASH JOHNSON SCREEN IN WDV	III	C	3
70-621	FLUSH WATER TO SUPPLY HEADER 070-UW-067 (AS A SUPPORT SYSTEM)	INSUFFICIENT FLUSH WATER AVAILABLE	o FE 1080 INDICATES LOW FLOW o FE 62 INDICATES CLOSED ON THE PANEL o NO LEVEL INCREASE IN WDV	WASTE NOT FLUSHED FROM LINE. EVENTUALLY, DIFFEREAT WASTES MAY MIX	III	C	3
70-631	FLUSH WATER TO RECIR LINE 070-UW-011 (AS A SUPPORT SYSTEM)	INSUFFICIENT FLUSH WATER AVAILABLE	FI-001 REGISTERS INSUFFICIENT FLOW	WASTE NOT FLUSHED FROM LINE. EVENTUALLY, DIFFERENT WASTES MAY MIX	III	C	3

ENGINEER [signature] DATE 12/15/87 REVIEWED BY [signature] DATE 12-18-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-636	FLUSH WATER DRAIN RETURN TO D-13 TANK 070-DR-2-092 (AS A SUPPORT SYSTEM)	LINE PLUGGED NOT ALLOWING DRAINAGE	o NO FLOW INDICATED FROM FS-2042 OR FS-2040 o FV-098 INDICATES CLOSED	WASTE NOT rLUSHED FROM LINE	III	C	3
70-641	RETURN LINE TO LWTS FROM DEWATERING PUMP 070-PL-014 (AS A SUPPORT SYSTEM)	LINE PLUGGED PREVENTING PUMPING OF FLUID	FS-2038 INDICATES NO FLOW	PUMP SHUTS OFF. FLUSHING PROCESS CAN'T CONTINUE.	IIb	C	3
70-646	HSCSS CONTROL SYSTEM & DATA ACQUISITION SYSTEM (AS A SUPPORT SYSTEM)	PLC NOT OPERATIONAL	HSCSS PANEL "SEQUENCER FAILURE" ALARM "DAS SYSTEM FAILURE" ALARM	PROGRAM INTERRUPTION - OPERATION IN MANUAL MODE NOT RECOMMENDED EXCEPT TO STABILIZE SYSTEM. SOP 70-11 SHOULD BE REVISED TO PREVENT CONTINUED OPERATIONS.	Ib	A	1
70-651	FS-2002	SWITCH SHOWS NO FLOW WHEN THERE IS FLOW	o FE 2080 IS REGISTERING FLOW o FV-004 INDICATES OPEN o LI-2001 INCREASES	IF WDV REACHES HIGH LEVEL VALUE, FV 4 WILL BE CLOSED	III	B	3

ENGINEER Kim A. Gasmann DATE 12/4/87 REVIEWED BY Darryl Sasaki DATE 12/9/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-652	FS-2002	SWITCH SHOWS FLOW WHEN THERE IS NO FLOW	o FE 2080 NOT REGISTERING FLOW o FV-004 INDICATES CLOSED	NO EFFECT INITIALLY. LOW LEVEL ALARM MAY SOUND IN WDV IF INADEQUATE FLOW IS COMBINED W/ BATCH PROCESSING INSTEAD of RECIRCULATION	III	B	3
70-656	FS-2004	SWITCH SHOWS NO FLOW WHEN THERE IS FLOW	o FE 2080 IS REGISTERING FLOW o FV-007 INDICATES OPEN o WDV LEVEL INCREASES	IF WDV REACHES HIGH LEVEL VALUE, FV 7 WILL BE CLOSED	III	B	3
70-657	FS-2004	SWITCH SHOWS FLOW WHEN THERE IS NO FLOW	o FE 2080 NOT REGISTERING FLOW o FV-007 INDICATES CLOSED	NO EFFECT INITIALLY. LOW LEVEL ALARM MAY SOUND IN WDV IF INADEQUATE FLOW IS COMBINED W/ BATCH PROCESSING INSTEAD OF RECIRCULATION		B	3
70-661	FS-2003	SWITCH SHOWS NO FLOW WHEN THERE IS FLOW	o FE 2080 IS REGISTERING FLOW o FV-006 INDICATES OPEN o WDV LEVEL (LI-2001) INCREASES	IF WDV REACHES HIGH LEVEL VALUE, FV 6 WILL BE CLOSED	III	B	3

ENGINEER Kim L. Harris DATE 12/4/87 REVIEWED BY Dan J. Lenkeit DATE 12/9/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-662	FS-2003	SWITCH SHOWS FLOW WHEN THERE IS NO FLOW	o FE 2080 NOT REGISTERING FLOW o FV-006 INDICATES CLOSED	NO EFFECT INITIALLY. LOW LEVEL ALARM MAY SOUND IN WDV IF INADEQUATE FLOW IS COMBINED W/ BATCH PROCESSING INSTEAD OF RECIRCULATION	III	B	3
70-666	FE-2080	ELEMENT SHOWS FLOW WHEN THERE IS NO FLOW	FS-2002, -2003, -2004 INDICATE NO FLOW ON PANEL	EVENTUALLY LOW ALARM WILL SOUND IF PROCESS IS NOT MANUALLY STOPPED AND PROCESS WILL AUTOMATICALLY STOP	IIb	B	3
70-667	FE-2080	ELEMENT SHOWS NO FLOW WHEN THERE IS FLOW	FS-2002, -2003, -2004 INDICATE FLOW ON PANEL	EVENTUALLY HIGH ALARM WILL SOUND IF PROCESS IS NO MANUALLY STOPPED AND PROCESS WILL AUTOMATICALLY STOP	IIb	B	3
70-668	FE-2080	FLOW READING HIGHER THAN ACTUAL	LOW LEVEL ALARM MAY SOUND OTHERWISE, NO DETECTION	NO EFFECT INITIALLY. LOW LEVEL ALARM MAY SOUND IN WASTE DISPENSING VESSEL IF INADEQUATE FLOW TO VESSEL IS COMBINED W/ BATCH PROCESSING INSTEAD OF RECIRCULATION	III	B	3

ENGINEER _____ DATE 12/10/87 REVIEWED BY _____ DATE 12/10/87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-669	FE-2080	FLOW READING LOWER THAN ACTUAL	HIGH LEVEL ALARM MAY SOUND OTHERWISE NO DETECTION	APPROPRIATE FLOW VALVE WILL CLOSE (FV-006, 007, 004) BEFORE TIMED SEQUENCE IS COMPLETE IF HIGH LEVEL ALARM SOUNDS	IIb	B	3
70-671	FS-2042	SWITCH SHOWS NO FLOW WHEN THERE IS FLOW	WITH PUMP RUNNING AT TIME OF FAILURE FE-001 INDICATES FLOW, AND "SEQUENCE NOT VERIFIED" ALARM SOUNDS	PROCESS STOPS BECAUSE PUMP SHUTS OFF. V-002 VALVE CANNOT OPEN.	IIb	C	3
70-672	FS-2042	SWITCH SHOWS FLUID PRESENT WHEN THERE IS NO FLOW	FG-001 NOT REGISTERING SUFFICIENT FLOW	V-002 VALVE CANNOT OPEN	IIb	C	3
70-676	FS-2035	SWITCH SHOWS NO FLUID WHEN THERE IS FLOW	"FS-2035 LOW FLOW" ALARM	NO EFFECT	III	B	3

ENGINEER [illegible] DATE 11-6-87 REVIEWED BY [illegible] DATE 12-10-87

ITEM NO.	COMPONENT IDENTIFICATION	FAILURE MODE	FAILURE DETECTION METHOD(S)	FAILURE EFFECT	SEVERITY CATEGORY	RELATIVE PROBABILITY	FAILURE CLASS
70-677	FS-2035	SWITCH SHOWS FLUID WHEN THERE IS NO FLOW	NO DETECTION	NO EFFECT	III	B	3
70-681	LS-2053 ONLY HIGH LEVEL PROBE	TOO HIGH WHEN UNDERFILLED	o WDV LEVEL HIGH ALARM DOESN'T CORRELATE WITH LT-2001 READING o PROGRAM ON HOLD	LT-2001 WILL INDICATE CORRECT LEVEL WILL SHUT OFF FV-004, 006, OR 007. PROGRAM INTERRUPTED	III	C	3
70-682	LS-2053	NO HIGH LEVEL READING WHEN OVERFILLED	WDV LEVEL HIGH ALARM	LOSS OF REDUNDANCY, LT-2001 WILL STOP OVERFILL	IIb	C	3

END RUN

APPENDIX C

LIST OF DOCUMENTS

STS

QUA	DOCUMENT #	DOCUMENT TITLE	REV	DATE
	C-10526	Configuration Document - Mycro 352 Single Loop Digital Controller	0	05/87
	SIP-87-18	STS Decontaminated Supernatant Filter (50-F-002)	0	06/87
	SIP-87-23	STS Utilities and Drains Checkout	0	03/87
	SIP-87-24	STS Valve Aisle Operability	0	07/87
	SIP-87-27	Testing and Checkout of the Cesium Removal Columns A, B, C, and D	0	06/87
	SIP-87-28	Testing and Checkout of the Supernatant Feed Tank (50-3-001) and Pump (50-6-002)	0	07/87
	SIP-87-30	Testing and Checkout of the STS (50-V-001) and Supernatant Cooler (50-E-001)	0	06/87
	SIP-87-37	Integrated Checkout of the STS	0	09/87
	SIP-87-43	Permanent Ventilation System Checkout and Startup	0	02/87
11	SIP-87-61	STS Analog Instrument Testing	0	0.057
	SIP-87-62	STS Valve Checkout	0	05/87
	SIP-87-69	Integrated Testing of STS/LWTS/CSS/RTS	0	10/87
	TOP-50-12	Removal of Supernatant from Tank 8D-2 and Pump 50-G-001 Operation	0	10/86
	TOP-50-13	STS Prefilter Operation	0	11/86
	TOP-50-14	Supernatant Feed Operation	0	11/86
	TOP-50-15	Supernatant Cooler (50-E-001) and Supernatant Chiller (50-V-001) Operation	0	11/86
	TOP-50-16	STS Ion Exchange Operation	0	11/86
	TOP-50-17	STS Ion Exchange Column Switchout Operation	0	11/86
	TOP-50-18	STS Ion Exchange Zeolite Discharge	0	12/86
	TOP-50-19	STS Zeolite Batch Tank Loading and Fines Removal	0	12/86

STS

QUA	DOCUMENT #	DOCUMENT TITLE	REV	DATE
	TOP-50-20	STS Ion Exchange Column Loading	0	01/87
	TOP-50-21	Returning Fresh Vessel to STS Process Operation	0	12/86
	TOP-50-22	STS Final Filtration	0	08/87
	TOP-50-23	Decontaminated Supernatant Collection and Transfer	0	09/87
	TOP-50-29	STS Sampling and Pneumatic Sample Transfer	0	09/87
	TOP-50-33	STS Radiation Monitors	0	10/87
	WVDP-SAR	Safety Analysis for the STS	1	07/86
	WVNS-DC-013	STS Design Criteria	2	10/87
	Unknown	Material Control Report PR 19-FVV-14554 Ion Exchange Columns	0	unkn
	Video Tape-EN306C	Motive Devices	0	unkn
	Video Tape-EN346C	What Ifs - STS Failure Analysis	0	unkn

CSS

QUA	DOCUMENT #	DOCUMENT TITLE	REV	DATE
	SIP-87-53	Data Acquisition System Checkout	0	08/87
	SIP-87-65 *	HSCSS Control Panel and Data Acquisition System Checkout	0	08/87
	SOP-70-1	Waste Stream Recipe Sheet	2	10/87
	SOP-70-3	Automatic Solidification Operation	2	06/87
	SOP-70-4	CSS Manual Solidification with the Process Logic Controller Operational	2	08/87
	SOP-70-5	Gravimetric Feeder Operation	1	05/87
	SOP-70-6	Bulk Cement Transfer to Day Bin	2	05/87
	SOP-70-9	Automatic Drum Operations for the CSS	2	07/87
	SOP-70-11	CSS Manual Operation with Process Logic Controller Non-operational	2	07/87
	SOP-70-12	CSS Mixer System Flush Operation	2	07/87
	SOP-70-17	Manual Drum Operations for CSS	2	08/87
	SOP-70-18	Alarm Procedures for CSS	2	08/87
	SOP-70-19	CSS Emergency Procedure - Emergency Shut-Down	1	06/87
	SOP-70-31	CSS Drum Conveyor Alarm Responses	2	09/87
	SOP-70-39	Draining and Flushing the Waste Dispensing Vessel	0	08/87
	WTSD-TME-081 WTSD-TME-081 I WTSD-TME-081 II WTSD-TME-081 III	Westinghouse Hi-Shear CSS Operating and Maintenance Manual Mechanical Components Vendor Literature Instrumentation & Controls Vendor Lit.	0	03/85
	WVDP-SAR	Safety Analysis for CSS	1	10/86
	Video Tape-EN400C	System Overview (LP 4 Hour Mode)		
	Video Tape-EN406C	HS CSS System (Tape 1 of 2)	0	Unkn
	Video Tape-EN406C	HS CSS System (Tape 2 of 2)	0	Unkn
	* Includes CSS10097			

LWTS

QUA	DOCUMENT #	DOCUMENT TITLE	REV	DATE
	SIP-86-18	LWTS Valve Checkout	0	01/87
	SIP-87-01	Testing and Checkout of Tank 35104 (Evaporator Feed Tank) and Feed Pump P-01	0	03/87
	SIP-87-2	Testing and Checkout of Evaporation System Rboiler, Vapor-Body Separator, and Condenser	1	05/87
	SIP-87-2-1	Testing and Checkout of Feed Routes to Evaporator During Cold Testing	0	03/87
	SIP-87-3	Testing and Checkout of Distillate Surge Tank D-005 (Run Side), Pump P-15 and the Distillate Zeolite Ion Exchanger (D-003)	0	03/87
	SIP-87-4	Testing and Checkout Evaporator Concentrate Cooler (E-005) and Concentrate Pump (P-16)	0	04/87
	SIP-87-5	Testing and Checkout of Concentrates Storage Tanks (5D-15A1/A2) and Pumps (P05/06)	0	04/87
	SIP-87-6	Testing and Checkout of Liquid Waste Cell Tanks 78-2, 13D-8, Tanks 5D-15B, 71-D-009, 7D-13 and High TDS Storage Tank Pump 71-P-04	0	04/87
	SIP-87-11	Testing and Checkout for Dewatering and Transfer of Wet Solids from Tanks 71-D-006, 71-D-007, and 71-D-008 to CSS Waste Dispensing Vessel	0	04/87
	SIP-87-19	Checkout of Pump and Valve Interlocks and Sequencing - LWTS Software	0	07/87
	SIP-87-39	LWTS Digital Functional Testing Field and Rack Mounted Switches	0	01/87
	SIP-87-40	LWTS Analog Instrument Testing	0	01/87
	SIP-87-49	Evaporator Overall Integrated Testing with Simulated Supernatant	0	06/87
4	SIP-87-61	STS Analog Instrument Testing	0	05/87
	TOP-71-1	Tank 35104 Evaporator Feed	0	07/86
	TOP-71-2	Process Evaporator (31017) Distillate Zeolite Ion Exchange Column (71-D-003) and Distillate Surge Tank (71-D-005)	0	08/86

LWTS

QUA	DOCUMENT #	DOCUMENT TITLE	REV	DATE
	TOP-71-3	Resin/Zeolite Hopper (71-D-004) and Loading of Resin Zeolite into Exchange Columns	0	12/86
	TOP-71-4	LWTS Filter System	0	07/86
	TOP-71-5	LWTS Organic (71-D-001) and Zeolite Ion Exchangers (71-D-002)	0	08/86
	TOP-71-7	Unloading Spent Resin/Zeolite from Ion Exchange Columns	0	09/86
	TOP-71-8	Dewatering and Transfer of Wet Solids from Filter Backwash Storage Tank (71-D-008) or Spent Resin Tank (71-D-006) or Spent Zeolite Tank (71-D-007)		
	TOP-71-10	Transfer of LWTS Evaporator Concetrates to the CSS	0	09/86
	TOP-71-14	LWTS Alarm Response Procedure	0	06/87
	TOP-71-15	LWTS Process Monitoring Procedure	0	06/87
	WVDP-SAR	Safety Analysis Report - LWTS		
7	WVNS-EQ-248	Control Concepts for the LWTS	2	06/87
6	WVNS-EQ-249	Equipment Specification LWTS Control Interlocks	4	08/87
3	WVNS-EQ-250	Fundamental Process Narrative for LWTS	0	01/87
	WVNS-TR-71-004	Test Results Report - Checkout of Pump and Valve Interlocks and Sequencing LWTS Software SIP-87-19	0	10/87

	QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
Retrotech		010-26-01	0	1	Conveyor Schematics
Retrotech		010-26-01	0	2	Conveyor Schematics
Retrotech		010-26-01	0	3	Conveyor Schematics
Retrotech		010-26-01	0	4	Conveyor Schematics
Retrotech		010-26-01	0	5	Conveyor Schematics
Retrotech		010-26-01	0	6	Conveyor Schematics
Retrotech		010-26-01	0	7	Conveyor Schematics
Retrotech		010-26-01	0	8	Conveyor Schematics
Retrotech		010-26-01	0	9	Conveyor Schematics
Retrotech		010-26-01	1	10	Conveyor Schematics
Retrotech		010-26-01	0	11	Conveyor Schematics
Retrotech		010-26-01	1	12	Conveyor Schematics
Retrotech		010-26-01	0	13	Conveyor Schematics
Retrotech		010-26-01	0	14	Conveyor Schematics
Retrotech		010-26-01	0	15	Conveyor Schematics
Retrotech		010-26-01	0	16	Conveyor Schematics
Retrotech		010-26-01	0	17	Conveyor Schematics
Retrotech		010-26-01	1	18	Conveyor Schematics
Retrotech		010-26-01	0	19	Conveyor Schematics
Retrotech		010-26-01	0	20	Conveyor Schematics
Retrotech		010-26-01	0	21	Conveyor Schematics
Retrotech		010-26-01	0	22	Conveyor Schematics
Retrotech		010-26-01	0	23	Conveyor Schematics
Retrotech		010-26-01	0	24	Conveyor Schematics
		172-E2-001	2	1	Elementary Wiring Diagram Legend
		172-E2-002	5	1	Empty Drum Room
		172-E2-003	6	1	Empty Drum to Process Room
		172-E2-004	6	1	Crimper, Truck, Hydraulic and Barcode
		172-E2-005	6	1	Vacuum Transfer and Alarms
		172-E2-008	4	1	Wiring Diagram
	3	172-P1-00	0	1	P&ID STS Legend
Bechtel		15R-A-74	9	1	P&ID Controlled Ventilation System Below Grade to El 131'
Bechtel		15R-A-75	9	1	P&ID Controlled Ventilation System Above El 131'
Bechtel		15R-M-1	1	1	Key Plan Process Bldg
Bechtel		68-D-2	1	1	Vessel Off-Gas Condensate Catch Tank 60-3
Bechtel		8R-A-1	15	1	Flow, P&ID Waste Tank Farm Spent Fuel Proc. Plant
Smoot Co.	3	7046-1	0	1	Flow Diagram
Smoot Co.	3	7046-9	0	1	Flow Diagram
Smoot Co.		7046-11	0	1	Electrical Schematic Main Panel
Smoot Co.		7046-11	0	2	Conveyor Schematics
Smoot Co.		7046-12	0	1	Electrical Schematic Main Panel
		900C 539	1	1	CSS Field Wiring Bldg 01/14
		900C 539	4	2	CSS Field Wiring Bldg 01/14
		900C 539	5	3	CSS Field Wiring Bldg 01/14
		900C 539	3	4	CSS Field Wiring Bldg 01/14
		900C 539	5	5	CSS Field Wiring Bldg 01/14
		900C 539	4	6	CSS Field Wiring Bldg 01/14
		900C 539	4	7	CSS Field Wiring Bldg 01/14
		900C 539	4	8	CSS Field Wiring Bldg 01/14
		900C 539	3	9	CSS Field Wiring Bldg 01/14

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
	900C 539	3	10	CSS Field Wiring Bldg 01/14
	900C 539	3	12	CSS Field Wiring Bldg 01/14
	900C 539	0	13	CSS Field Wiring Bldg 01/14
	900C 539	1	14	CSS Field Wiring Bldg 01/14
	900C 539	0	15	CSS Field Wiring Bldg 01/14
	900C 539	1	16	CSS Field Wiring Bldg 01/14
	900C 539	2	17	CSS Field Wiring Bldg 01/14
	900C 539	1	18	CSS Field Wiring Bldg 01/14
	900C 539	0	19	CSS Field Wiring Bldg 01/14
	900C 539	1	20	CSS Field Wiring Bldg 01/14
	900C 539	0	21	CSS Field Wiring Bldg 01/14
	900C 1114	0	1	CSS Pyrotronics Fire Cont. PNL Schem. Diag. for 01/14 Bldg
2	900C 1116	10	1	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	6	2	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	8	3	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	8	4	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	9	5	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	8	6	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	10	7	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	7	8	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	7	9	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	7	10	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	6	11	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	3	12	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	0	13	HSCSS Control Cabinet Elementary Diagram
2	900C 1116	0	14	HSCSS Control Cabinet Elementary Diagram
	900C 1122	3	1	HSCSS Control Cabinet Thumb Wheel and Proc. Wiring Diagram
	900C 1325	1	1	CSS Bldg 01/14 High Shear Mixer-Top Plate
2	9000 108	2	1	Radwaste Treatment System-Conceptual Process Flow Diagram
5	9000 397	7	1	CSS System 070 P&ID
5	9000 397	6	2	CSS Bldg 01-14, P&ID
5	9000 397	5	3	CSS Bldg 01-14, P&ID
5	9000 397	4	4	CSS Bldg 01-14, P&ID
5	9000 397	7	5	CSS Bldg 01-14, P&ID
3	9000 436	0	1	Symbols, Notes, and Legends
3	9000 436	0	2	Symbols, Notes, and Legends
3	9000 436	0	3	Symbols, Notes, and Legends
3	9000 436	0	4	Symbols, Notes, and Legends
	9000 807	1	1	Low Level Waste Evaporator Assembly
	9000 807	2	2	Low Level Waste Evaporator Reboiler Section Details
	9000 807	2	3	Low Level Waste Evaporator Separator Section Details
	9000 807	0	4	Low Level Waste Evaporator Support Details
	9000 807	2	5	Low Level Waste Evaporator Condenser Section Details
2	9000 1204	8	1	P&ID LWTS Recycle Water System
2	9000 1204	3	2	P&ID LWTS Recycle Water System
	9000 1236	3	1	CSS Bldg 01/14 High Shear Mixers #1 and #2 Assy
	9000 1236	3	2	CSS Bldg 01/14 High Shear Mixers #1 and #2 Assy
	9000 1291	2	1	CSS Bldg 01/14 High Shear Mixers Frame Weldment
	9000 1292	1	1	CSS Bldg 01/14 High Shear Mixers #1 and #2 Details
	9000 1293	2	1	CSS Bldg 01/14 High Shear Mixers #1 and #2 Details

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
	9000 1324	3	1	CSS Bldg 01/14 High Shear Mixers Ram Valve Parts
	9000 1396	3	1	CSS Fill Head Nozzle Weldment
	9000 1413	4	1	HSCSS Panel Layout
	9000 1436	4	1	RTS Drum Cell Loadout Conveyor Plan
3	9000 1481	3	1	CSS-070-V-050 M37 Hydraulic P&ID
3	9000 1482	3	1	CSS-070-V-050 M37 Hydraulic P&ID
	9000 1666	0	1	P&ID STS Permanent Ventilation System
3	9000 1697	2	1	CSS-070-V-050 Pneumatic Solenoid Pack P&ID
	9000 1728	0	1	CSS-Bldg 01/14 Schematic Diagram Load Out Crane (4 ton)
	9000 1728	0	2	CSS-Bldg 01/14 Schematic Diagram Load Out Crane (4 ton)
	9000 1832	1	1	CSS Fill Head Lid Turner Assy
	9000 1833	0	1	CSS Fill Head Paddle Assy
	9000 1834	0	1	CSS Fill Head Lid Turner Details
	9000 1835	1	1	CSS Fill Head Mod. Assy
	9000 1836	0	1	CSS Fill Head Mod. Frame Weldment
	9000 1917	0	1	Gen Arr CSS Decant System Equipment
	9000 1917	0	2	Gen Arr CSS Decant System Equipment
	9000 1966	1	1	CSS Drum Loadout Drum Overpack Details
	900E 1483	3	1	HSCSS Graphics Panel
	900E 1827	1	1	RTS CSS 01/14 Bldg Plan View El 98'
	900E 318	2	1	Gen Arr CTS Pit Area Equipment Plan
2	900E 2005	0	1	Gen Arr RTS Drum Cell
3	900J 1363	8	1	External Interface Control Diagram
2	9018 301 701 B	1	1	CWD LWTS Evaporator Feed Pump 71-P-01
2	9018 301 702 B	1	1	CWD LWTS Valve 71-H-001
2	9018 301 703 B	1	1	CWD LWTS Valve 71-H-003
2	9018 301 704 B	1	1	CWD LWTS Valve 71-H-006
2	9018 301 705 A	1	1	CWD LWTS Valve 71-H-014
2	9018 301 706 A	1	1	CWD LWTS Valve 71-H-021
2	9018 301 707 A	1	1	CWD LWTS Valve 71-H-022
2	9018 301 708 A	1	1	CWD LWTS Heat Tracing Alarms
2	9018 301 710	0	1	CWD LWTS Heat Tracing Control and Alarms
2	9018 301 715	4	1	CWD LWTS Control Panel I/O Rack 120V AC Dist.
2	9018 301 717	4	1	CWD LWTS Instrumentation 15V DC Dist.
2	9018 301 718 B	1	1	CWD LWTS 24V DC Dist. to Recorders
2	9018 301 719 A	0	1	CWD LWTS Data Liner Message Display
2	9018 301 719	5	1	CWD LWTS 24V DC Dist. to Annunciator
2	9018 301 720	2	1	CWD LWTS Processor 24V DC Dist. for Valves and Pumps
2	9018 301 721 A	4	1	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 722 B	4	2	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 723 A	4	3	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 724 A	3	4	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 725 A	4	5	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 726 B	4	6	CWD LWTS Valve Contro witches Processor 24V DC Inputs
2	9018 301 727 A	4	7	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 728 A	3	8	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 729	5	9	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 730	4	10	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 731 A	4	11	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 732 A	3	12	CWD LWTS Valve Control Switches Processor 24V DC Inputs

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
2	9018 301 733	6	13	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 734 A	3	14	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 735 A	3	15	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 736 A	3	16	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 737 A	3	17	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 738 A	3	18	CWD LWTS Valve Control Switches Processor 24V DC Inputs
2	9018 301 741 B	2	1	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 742 B	2	2	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 743 B	2	3	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 744 B	2	4	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 745 B	2	5	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 746 B	2	6	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 747 B	2	7	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 748	3	8	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 749	2	9	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 750	2	10	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 751 B	2	11	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 752	3	12	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 753 B	2	13	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 754 B	2	14	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 755 B	2	15	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 756 B	3	16	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 757 B	2	17	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 758 B	3	18	CWD LWTS Valve Position and Processor 24V DC Outputs
2	9018 301 760	2	1	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 761	2	2	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 762	2	3	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 763	2	4	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 764	2	5	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 765	3	6	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 766	3	7	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 767	3	8	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 768	2	9	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 769	2	10	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 770	6	11	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 770 A	3	12	CWD LWTS Solenoid Valves Processor Outputs
2	9018 301 771	2	1	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 772	2	2	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 773	3	3	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 774	3	4	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 775	2	5	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 776	3	6	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 777	3	7	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 778	2	8	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 779	3	9	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 780	2	10	CWD LWTS Valve Limit Switches Processor Inputs
3	9018 301 781	2	11	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 783	3	13	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 784	3	14	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 785	2	15	CWD LWTS Valve Limit Switches Processor Inputs

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
2	9018 301 786	2	16	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 787	2	17	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 788	2	18	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 789	2	19	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 790	4	20	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 791	4	1	CWD LWTS Pump Control Switches Processor 24V DC Inputs
2	9018 301 792 B	3	1	CWD LWTS Pump Control Switches Processor 24V DC Inputs
2	9018 301 792 A	5	1	CWD LWTS Pump Control Switches Processor 24V DC Inputs
2	9018 301 792	5	2	CWD LWTS Pump Control Switches Processor 24V DC Inputs
2	9018 301 796	3	1	CWD LWTS Pump Status Ind. Lights Processor 24V DC Outputs
2	9018 301 797 B	3	1	LWTS Valve Position Ind. Processor 24V DC Outputs
2	9018 301 797 A	2	1	LWTS Valve Position Ind. Processor 24V DC Outputs
2	9018 301 797	6	2	CWD LWTS Pump Status Ind. Lights Processor 24V DC Outputs
2	9018 301 801 B	1	1	CWD LWTS Pump 71-P-01
2	9018 301 802 B	1	1	CWD LWTS Pump 71-P-15
2	9018 301 803 B	2	1	CWD LWTS Pump 71-P-16
2	9018 301 805 B	1	1	CWD LWTS Pump 71-P-02
2	9018 301 806 B	1	1	CWD LWTS Pump 71-P-03
2	9018 301 807 B	1	1	CWD LWTS Pump 71-P-011
2	9018 301 808 B	2	1	CWD LWTS Pump 71-P-04
2	9018 301 809 B	1	1	CWD LWTS Pump 71-P-05
2	9018 301 810 B	1	1	CWD LWTS Pump 71-P-06
2	9018 301 811	2	1	CWD LWTS Pump 71-P-17
2	9018 301 812 B	2	1	CWD LWTS Pump 71-P-07
2	9018 301 813 B	2	1	CWD LWTS Pump 71-P-08
2	9018 301 814	2	1	CWD LWTS Pump 71-P-18
2	9018 301 819 A	2	1	CWD LWTS Pump 71-P-12 and -13 Acid Metering Pumps
2	9018 301 820 A	2	1	CWD LWTS Caustic Addition Tanks 140-7 and 140-8 Agitators
2	9018 301 821	4	1	CWD LWTS Pump Starter Process 120V AC Inputs/Outputs
2	9018 301 822	4	2	CWD LWTS Pump Starter Process 120V AC Inputs/Outputs
2	9018 301 823	6	3	CWD LWTS Pump Starter Process 120V AC Inputs/Outputs
2	9018 301 824	3	18	CWD LWTS Valve Limit Switches Processor Inputs
2	9018 301 826	6	1	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 827	3	2	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 828	3	3	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 829	7	4	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 830	5	5	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 831 B	3	6A	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 831	4	6	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 832	3	7	CWD LWTS Instrumentation Processor 4-20 MA Inputs
2	9018 301 838	3	1	CWD LWTS Controllers I/O to Processor
2	9018 301 839 A	1	1	CWD LWTS I/P Converter Signal Inputs from PLC
2	9018 301 839	2	1	CWD LWTS I/P Converter Signal Inputs from PLC
2	9018 301 840 A	1	1	CWD LWTS Processor T/C Inputs
2	9018 301 840	2	1	CWD LWTS Processor T/C Inputs
2	9018 301 842	4	1	CWD LWTS Process 4-20 MA Outputs to Recorders
2	9018 301 843	4	2	CWD LWTS Process 4-20 MA Outputs to Recorders
2	9018 301 852 B	5	1	CWD LWTS Process 4-20 MA Outputs to Indicators
2	9018 301 853 B	3	2	CWD LWTS Process 4-20 MA Outputs to Indicators
2	9018 301 854 B	4	3	CWD LWTS Process 4-20 MA Outputs to Indicators

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
2	9018 301 855	4	4	CWD LWTS Process 4-20 MA Outputs to Indicators
2	9018 301 877	3	1	CWD LWTS Annunciators Wiring Connection
2	9018 301 878	3	2	CWD LWTS Annunciators Wiring Connection
2	9018 301 879	4	3	CWD LWTS Annunciators Wiring Connection
2	9018 301 880	4	4	CWD LWTS Annunciators Wiring Connection
2	9018 301 881	6	5	CWD LWTS Annunciators Wiring Connection
2	9018 301 886 A	2	1	CWD LWTS Solenoid Valve and Rad Alarm Processor Outputs
2	9018 301 886	2	1	CWD LWTS Solenoid Valve and Rad Alarm Processor Outputs
2	9018 301 891	4	1	CWD LWTS Flow Sws and Va Limit Switches Processor Inputs
2	9018 301 891 A	3	1	CWD LWTS Flow Sws and Va Limit Switches Processor Inputs
2	9018 301 892	5	2	CWD LWTS Flow Sws and Va Limit Switches Processor Inputs
2	9018 301 893	3	3	CWD LWTS Flow Sws and Va Limit Switches Processor Inputs
2	9018 301 894	4	4	CWD LWTS Flow Sws and Va Limit Switches Processor Inputs
2	9018 301 896	1	1	CWD LWTS Processor and I/O Interconnections
2	9018 301 897	3	2	CWD LWTS Processor and I/O Interconnections
2	9018 301 897 A	1	3	CWD LWTS Processor and I/O Interconnections
2	9018 301 898	3	4	CWD LWTS Processor and I/O Interconnections
2	9018 301 898 A	2	5	CWD LWTS Processor and I/O Interconnections
2	9018 301 899	0	1	CWD LWTS IR-017
2	9018 301 900	0	1	CWD LWTS Processor 4-20 MA Input
	901C 061	4	1	LWTS Piping Contruction Isometric XC-3 Lines
5	901D 020	1	1	Process Flow Diagram LWTS
	901D 020	0	2	Process Flow Diagram LWTS
	901D 020	0	3	Process Flow Diagram LWTS
	901D 020	0	4	Process Flow Diagram LWTS
4	901D 021	0	1	P&ID-LWTS-35104
1	901D 021	1	2	P&ID LWTS 7D-13
3	901D 021	0	2	P&ID-LWTS-7D-13
5	901D 021	0	3	P&ID LWTS 7D-2
5	901D 021	0	4	P&ID-LWTS-7D-8
5	901D 021	0	5	P&ID-LWTS-40-10
5	901D 021	0	6	P&ID-LWTS-30-2
5	901D 021	0	7	P&ID-LWTS-130-8 and 71514
3	901D 022	7	1	P&ID-LWTS
4	901D 023	7	1	P&ID-LWTS
3	901D 023	7	2	P&ID-LWTS
3	901D 023	1	3	P&ID-LWTS
4	901D 024	6	1	P&ID-LWTS
4	901D 026	7	1	P&ID-LWTS
	901D 033	0	1	Gen Arr 01/14 Bldg Plan - El 98'
	901D 034	0	1	Gen Arr 01/14 Bldg Plan - El 116.5'
	901D 035	0	1	Gen Arr 01/14 Bldg Plan - El 130'and Sections
	901D 036	0	1	Gen Arr 01/14 Bldg Plan - El 144'and Sections
	901D 037	0	1	Gen Arr 01/14 Bldg Sections
	901D 038	0	1	Gen Arr 01/14 Bldg Sections
	901D 041	2	1	Gen Arr LWTS Plan El 100'
	901D 042	0	1	Gen Arr LWTS Plan El 114.5'
	901D 043	1	1	Gen Arr LWTS Plan El 131'
	901D 044	0	1	Gen Arr LWTS Plan El 144'
	901D 045	0	1	Gen Arr LWTS Plan El 160'

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
	901D 046	1	1	Gen Arr LWTS Section
	901D 047	0	1	Gen Arr LWTS Section
5	901D 049	5	1	P&ID LWTS Utility Water System Interface
6	901D 050	4	1	P&ID LWTS Steam and Condensate Interface
4	901D 051	3	1	P&ID LWTS Instrument and Utility Air System
5	901D 059	6	1	P&ID LWTS
3	901D 1204	8	1	P&ID-LWTS Recycle Water System
3	901D 1204	3	2	P&ID-LWTS Recycle Water System
3	901D 1340	1	1	P&ID-LWTS Backflushable Filter
	902D 030	1	1	Gen Arr CTS Enclosure Plan El 100'
	902D 031	1	1	Gen Arr CTS Enclosure Plan El 110'
	902D 032	1	1	Gen Arr CTS Enclosure Plan El 124'
	902D 033	1	1	Gen Arr CTS Enclosure Plan Section Plan
	902D 034	1	1	Gen Arr CTS Enclosure Plan El 100'
	902D 041	1	1	Gen Arr CTS Enclosure Plan Sections
	9038 317 201	4	1	CWD STS HVAC Alarms
	9038 317 204	3	1	CWD STS HVAC Air Supply Unit 56-V01
	9038 317 205 C	1	1	CWD STS HVAC Alarms and Indications
	9038 317 206 B	2	1	CWD STS HVAC Air Supply Unit 56-V02 Condensers & HVAC Alarms
	9038 317 206 A	0	1	CWD STS HVAC Heater Unit
	9038 317 207 B	1	1	Instr. Install. Detail STS HVAC Control Panel Layout
	9038 317 208 S	2	1	CWD STS HVAC Diff. Press. Ind. Sws-120V DC Dist.
	9038 317 501 B	1	1	CWD STS Distribution Panel
	9038 317 502 A	2	1	CWD STS Programmable Controller
	9038 317 503 A	2	1	CWD STS Annunciator
	9038 317 511 A	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-104A,1048,105,106
	9038 317 512 B	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-108,118,005
	9038 317 513 A	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-204A,2048,205,206
	9038 317 514 B	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-208,218,077,042
	9038 317 515 A	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-304A,3048,305,306
	9038 317 516 A	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-308,318.031,064
	9038 317 517 A	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-404A,4048,405,406
	9038 317 518 A	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-408,418,067,066
	9038 317 519 A	2	1	CWD STS PLC I/O Cabinet and Hand Sws 50-HS-032,038,045
	9038 317 520 A	2	1	CWD STS Pump G-015
	9038 317 521 A	2	1	CWD STS Pump G-005
	9038 317 522 A	2	1	CWD STS Pump G-007
	9038 317 523 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 524 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 525 B	2	1	CWD STS PLC I/O Cabinet
	9038 317 526 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 531 A	2	1	CWD STS Valves 50-FV-104A and 1048
	9038 317 532 A	2	1	CWD STS Valves 50-FV-105 and 106
	9038 317 533 A	2	1	CWD STS Valves 50-FV-108 and 118
	9038 317 534 B	2	1	CWD STS Valves 50-FV-006 and HCV-004
	9038 317 535 A	2	1	CWD STS Valves 50-FV-204A and 2048
	9038 317 536 A	2	1	CWD STS Valves 50-FV-205 and 206
	9038 317 537 A	2	1	CWD STS Valves 50-FV-208 and 218
	9038 317 538 A	2	1	CWD STS Valves 50-FV-077 and 007
	9038 317 539 A	2	1	CWD STS Valves 50-FV-078 and 015

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
	9038 317 540 A	2	1	CWD STS Valves 50-FV-101 and 103
	9038 317 541 A	2	1	CWD STS Valves 50-FV-102A and 102B
	9038 317 542 A	2	1	CWD STS Valves 50-FV-201 and 203
	9038 317 543 A	2	1	CWD STS Valves 50-FV-202A and 202B
	9038 317 544 A	2	1	CWD STS Valves 50-FV-107 and 207
	9038 317 545 A	2	1	CWD STS Valves 50-FV-304A and 304B
	9038 317 546 A	2	1	CWD STS Valves 50-FV-305 and 306
	9038 317 547 A	2	1	CWD STS Valves 50-FV-308 and 318
	9038 317 548 A	2	1	CWD STS Valves 50-FV-031 and 064
	9038 317 549 A	2	1	CWD STS Valves 50-FV-404A and 404B
	9038 317 550 A	2	1	CWD STS Valves 50-FV-405 and 406
	9038 317 551 A	2	1	CWD STS Valves 50-FV-408 and 418
	9038 317 552 A	2	1	CWD STS Valves 50-FV-067 and 068
	9038 317 553 A	2	1	CWD STS Valves 50-FV-301 and 303
	9038 317 554 A	2	1	CWD STS Valves 50-FV-302A and 302B
	9038 317 555 B	2	1	CWD STS Valves 50-FV-401 and 403
	9038 317 556 A	2	1	CWD STS Valves 50-FV-402A and 402B
	9038 317 557 A	2	1	CWD STS Valves 50-FV-307 and 407
	9038 317 558 A	2	1	CWD STS Valves 50-FV-029 and 030
	9038 317 559 A	2	1	CWD STS Valves 50-FV-042 and 092
	9038 317 560 A	2	1	CWD STS Valves 50-FCV-035 and 024
	9038 317 561 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 562 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 563 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 564 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 565 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 566 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 567 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 568 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 569 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 570 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 571 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 572 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 573 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 574 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 575 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 576 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 577 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 578 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 579 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 580 A	3	1	CWD STS PLC I/O Cabinet
	9038 317 581 B	2	1	CWD STS PLC I/O Cabinet and Solenoid Valves
	9038 317 582 A	2	1	CWD STS PLC I/O Cabinet and Solenoid Valves
	9038 317 583 A	2	1	CWD STS PLC I/O Cabinet and Solenoid Valves
	9038 317 584 B	3	1	CWD STS PLC I/O Cabinet and Solenoid Valves
	9038 317 585 B	2	1	CWD STS PLC I/O Cabinet
	9038 317 586 B	3	1	CWD STS PLC I/O Cabinet
	9038 317 587 B	2	1	CWD STS PLC I/O Cabinet
	9038 317 588 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 589 B	2	1	CWD STS PLC I/O Cabinet

QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
	9038 317 590 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 591 B	2	1	CWD STS Valves 50-FV-120 and 121
	9038 317 592 B	2	1	CWD STS Valves 50-FV-220 and 221
	9038 317 593 B	2	1	CWD STS Valves 50-FV-320 and 321
	9038 317 594 B	2	1	CWD STS Valves 50-FV-420 and 421
	9038 317 595 A	2	1	CWD STS Valves 50-FV-80
	9038 317 596 A	2	1	CWD STS Valves 50-FV-079 and 081
	9038 317 597 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 598 B	2	1	CWD STS Valves 50-FV-059
	9038 317 599 B	1	1	CWD STS PLC I/O Cabinet
	9038 317 600 A	2	1	CWD STS Valves 50-FV-520 and 521
	9038 317 601 A	1	1	CWD STS Instrumentation
	9038 317 602 A	1	2	CWD STS Instrumentation
	9038 317 603 B	2	3	CWD STS Instrumentation
	9038 317 605 B	2	4	CWD STS Instrumentation
	9038 317 606 B	3	5	CWD STS Instrumentation
	9038 317 607 B	2	6	CWD STS Instrumentation
	9038 317 608 B	2	7	CWD STS Instrumentation
	9038 317 609 B	2	8	CWD STS Instrumentation
	9038 317 610 B	2	9	CWD STS Instrumentation
	9038 317 611 B	2	10	CWD STS Instrumentation
	9038 317 612 A	1	11	CWD STS Instrumentation
	9038 317 613 A	2	12	CWD STS Instrumentation
	9038 317 614 B	1	13	CWD STS Instrumentation
	9038 317 616 B	2	14	CWD STS Instrumentation
	9038 317 617 A	4	15	CWD STS Instrumentation
	9038 317 618 A	4	16	CWD STS Instrumentation
	9038 317 619 A	4	17	CWD STS Instrumentation
	9038 317 620 B	1	18	CWD STS Instrumentation
	9038 317 621 B	2	19	CWD STS Instrumentation
	9038 317 622 B	4	20	CWD STS Instrumentation
	9038 317 623 B	4	21	CWD STS Instrumentation
	9038 317 624 A	4	22	CWD STS Instrumentation
	9038 317 625	4	1	CWD STS Radiation Monitors
	9038 317 626	4	1	CWD STS Radiation Monitors
	9038 317 627	4	1	CWD STS Radiation Monitors
	9038 317 628 A	2	26	CWD STS Instrumentation
	9038 317 632 A	3	1	CWD STS PLC I/O Cabinet
	9038 317 633 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 634 A	2	1	CWD STS PLC I/O Cabinet
	9038 317 635 A	3	1	CWD STS Valves 50-SV-120,121,220,221,320,321,420,421
	9038 317 636 A	3	1	CWD STS Valves 50-SV-520,521
	9038 317 637 A	2	1	CWD STS Valve Box Interlocks
	9038 317 640 A	1	1	CWD STS Bl ; Sump Pump WW-G-001
	9038 317 641	1	1	CWD STS PL. I/O Cabinet
	9038 317 642	1	1	CWD STS Pump G-001
	9038 317 643	1	1	CWD STS Pump G-004
	9038 317 644	1	1	CWD STS PLC I/O Cabinet
	9038 317 645	1	1	CWD STS PLC I/O Cabinet
	9038 317 646	1	1	CWD STS Fresh Water Tank D-003 Level Control Wiring

	QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
		9038 317 647	0	1	CWD STS Leak Detectors
		9038 317 648	1	1	CWD STS Moisture Detector Panel
		9038 317 649	1	1	CWD STS Moisture Detector Panel
		9038 317 650	3	1	CWD STS Stack Monitors
		9038 317 651	2	1	CWD STS Stack Monitors and Perm. Vent System
		9038 317 652	0	1	CWD STS Fines Collection
		9038 317 653	1	1	CWD STS Zeolite Makeup Fan and Shutters
		9038 317 654	1	1	CWD STS 3rd Sample Leg Perm. Vent System
		9038 317 655	0	1	CWD STS Control Panel Cage #4
		9038 317 656	0	1	CWD STS Zeolite Loading System (Vacu-Max)
		9038 317 657	0	1	CWD STS Pumps G002 and G003 Interconnection
		9038 317 658	0	1	CWD STS
	3	9030 013	1	1	P&ID STS Utility Water Systems
	2	9030 014	4	1	P&ID STS Utility and Instrument Air
	3	9030 014	1	2	P&ID STS Utility and Instrument Air
		9030 015	0	1	Process Diagram STS
	2	9030 016	4	1	P&ID STS Filtration and Cooling Section
	2	9030 017	3	1	P&ID STS Ion Exchange Section
		9030 018	3	1	P&ID STS Ion Exchange Section
	2	9030 018	3	2	P&ID STS Ion Exchange Section
		9030 019	3	1	P&ID STS Final Filtration and Storage
	2	9030 020	3	1	P&ID STS Zeolite Fill and Sluice Section
	2	9030 021	3	1	P&ID STS Venting/Chiller Section
		9030 055	2	1	Gen Arr STS BD1 Tank Plan 88.5'
		9030 056	2	1	Gen Arr STS BD1 Tank Section
		9030 057	4	1	Gen Arr STS Bldg and BD-3 & 4 Tanks Plan El 92'
		9030 058	4	1	Gen Arr STS Bldg Plan El 107'
		9030 059	4	1	Gen Arr STS Bldg Plan and Sections
		9030 109	3	1	P&ID STS Final Filtration and Storage
		9030 418	2	1	STS Bldg HVAC Floor Plan El 92'
		9050 030	C	1	Gen Arr Vitrification Facility Plan El 100'
		9050 031	C	1	Gen Arr Vitrification Facility EDT, CPC El 100'
		9050 032	C	1	Gen Arr Vitrification Facility El 110'
		9050 033	C	1	Gen Arr Vitrification Facility EDR CPC El 117'
		9050 034	C	1	Gen Arr Vitrification Facility Plan El 124' and Above
		9050 035	C	1	Gen Arr Vitrification Facility EDR CPC Plan El 131'
		9050 036	C	1	Gen Arr Vitrification Facility Sections
		9050 037	C	1	Gen Arr Vitrification Facility Sections
		9050 041	C	1	Gen Arr Cold Chemical Bldg Plan El 98'5 and 100'
		9050 042	C	1	Gen Arr Cold Chemical Bldg Plan El 115' and Above
		9050 043	C	1	Gen Arr Cold Chemical Bldg Sections
Aurora Sys		CS-85-6471-60	0	1	Electrical Schematic Truck Panel
Moore Prod		C-10526	0	6	FIC-015 Flow Controller TIC-010
Moore Prod		C-10526	0	0	FIC-015 Flow Controller
Moore Prod		C-10526	0	9	FIC-015 Flow Controller LIC-054
Moore Prod		C-10526	0	7	FIC-015 Flow Controller HIC-[illegible]
Moore Prod		C-10526	0	5	FIC-015 Flow Controller FIC-0[illegible]
Moore Prod		C-10526	0	8	FIC-015 Flow Controller HIC-027
Colcrete		D 1670-M	2	1	Gen Arr High Shear Mixer MK. IV
JD Cousins		E 4746	1	1	Concentrates Cooler

	QU	DRAWING NUMBER	REV	SHT	DRAWING TITLE
Bechtel		GR-A-1	15	1	P&ID Process Off-Gas and Vent. System Spent Fuel Proc Plant
		HOHL 01	0	1	Module #1 Truck Unload Conv, #60
		H-3- 53751	0	1	Crane Maintenance Room Vitrification Facility Cell 5A
		Kranco B1	0	1	Bridge Assembly 1-Ton Automated Radwaste Crane
		Kranco B15	0	1	Runway Rails and Conductor System 375' Runway
		Kranco T1	0	1	Trolley Assembly 1-Ton Automated Radwaste Crane
		SKCEH111386	0	1	RTS-CSS 01/14 Bldg Lower Plan
		SKCEH111386	0	2	RTS-CSS C1/14 Bldg Lower Plan
		SKCEH111386	0	3	RTS-CSS 01/14 Bldg Upper Plan
		SKCEH111386	0	4	RTS-CSS 01/14 Bldg Elevation
		SKCEH111386	0	5	RTS-CSS 01/14 Bldg Elevation
		SKCEH111386	0	6	RTS-CSS 01/14 Bldg Elevation
		SKCEH111386	0	7	RTS-CSS 01/14 Bldg Elevation
		SKCEH111386	0	8	RTS-CSS 01/14 Bldg Section El. Looking South
		SK-DJL-016	0	1	STS Controller Config. Diagram HIC-004
		SK-DJL-016	0	2	STS Controller Config. Diagram HIC-056
		SK-DJL-016	0	3	STS Controller Config. Diagram FFIC-024