RADWASTE DISPOSAL-REACTOR COOLANT LIQUID LEAKAGE RECOVERY SYSTEM

(REACTOR COOLANT DRAIN TANK MODIFICATION)

DRAFT SYSTEM DESIGN DESCRIPTION AND SCOPE OF DESIGN

WORK ORDER 2555

JERSEY CENTRAL POWER AND LIGHT CO.

THREE MILE ISLAND NUCLEAR STATION

UNIT NO.2

BURNS AND ROE, INC.
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PARAMUS, N.J.

Prepared By: R.L.Schlosser
Date: May 9, 1975

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LEAKAGE RECOVERY SYSTEM

DRAFT SYSTEM DESIGN DESCRIPTION AND

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INTRODUCTION

Recent operating experience on TMI Unit 1 has indicated that one or more of the pressurizer relief valves may be expected to leak through the valve seat and that some leakage may be expected through the packing in valves within the Reactor Coolant Pressure Boundary (RCPB). Operating experience at Oconee has shown that the Bingham Reactor Coolant Pumps can be expected to have excessive seal leakage under certain conditions. In order to accomodate these sources of leakage (and meet FSAR and Regulatory requirements for the collection and measurement of reactor coolant pressure boundary leakage) with minimum impact on the plant design, the Reactor Coolant Drain Tank will be utilized, in conjunction with an external cooling loop as a leakage recovery system.

In addition to the changes required to detect, collect and cool leakages from the RCPB and the reactor coolant pumps, the design includes changes required to provide a closed cooling water system for heat removal, transfer of collected leakage to the miscellaneous waste system and return of processed leakage to the reactor coolant system.

CRITERIA

Process

The criteria for design of the process portion of the leakage recovery system are summarized below:

1. The leakage recovery systems shall be designed to accomodate 3 gpm total seal leakage from the Reactor Coolant pumps. (Basis - one pump operating with unstaged seals, Ref. 1).

2. The leakage recovery system shall be designed to accomodate leakage from power-operated valve stem leakoffs, reactor coolant pump casing leakoffs, and reactor vessel closure flange leakoff at a cumulative rate of 5279 lb/hr. (Basis - 15 gpm at

580°F, saturated liquid (mass flowrate), half of the limit permitted by Technical Specification 3.1.6.7, Ref. 1,2).

3. The leakage recovery system shall be designed to accommodate leakage through the valve seats of the pressurizer safety and electromatic relief valves at a cumulative rate of 5279 lb/hr. (Basis - 15 gpm at 580°F saturated liquid (mass flowrate), half of the limit permitted by Technical Specification 3.1.6.7, Ref. 1,2).

4. The leakage recovery system shall maintain sufficient capacity to accommodate 3500 lb. of pressurizer blowdown at any time. (Basis - simultaneous operation of pressurizer safety and electromatic relief valves and subsequent valve reseating, Ref. 3).

5. The leakage recovery system shall be designed to limit the backpressure at the reactor coolant pump seal leakage alarm tanks to 0.1 psig by means of a direct vent to the reactor building atmosphere. (Basis - to prevent flow of seal leakage through the pump bushing, Ref.4).

6. The leakage recovery system shall provide an alternate path for leakage from the reactor coolant pump seals. This path will direct pump seal lakage to the reactor building sump in the event that the reactor coolant drain tank overpressure is high. (Basis - to provide a continuous path for drainage of reactor coolant pump seal leakage subsequent to pressurizer blowdown, Ref. 4).

7. The leakage recovery system shall provide sufficient cooling capability to cool the various leakage sources and pressurizer blowdown. The heat sources will be:

   a. R.C.Pump Seal Leakage - 185°F (Ref. 1).

   b. Power operated valve stem leakage - at R.C. "hot leg" saturated water conditions (Ref. 1).

   c. Pressurizer safety and electromatic relief valve seat leakage - at pressurizer saturated steam conditions (Ref. 1).

   d. Pressurizer blowdown - at an enthalpy of 1140 Btu/lb (Ref. 4).

8. Instrumentation and controls used in the leakage recovery system which are required in order to perform daily leakage

rate tests shall have sufficient sensitivity to detect leakage at a rate of 1 gpm. The test period should, if possible, be of approximately one hour duration. (Basis - System should be capable of identifying leakage at a rate equivalent to the unidentified leakage rate limit (Ref. 2) within a test period of one hour (Ref. 5)).

9. Instrumentation and controls shall be located, insofar as practical, such that instrument calibrations may be performed during normal plant operation. The common leakoff temperature readout panel shall be located outside the reactor building in an accessible area. All controls necessary for leakage rate testing and the transfer of leakage to the Reactor Coolant Bleed Holdup Tanks should be located in the control room. (Basis - Control Room Operators to have control of all operations involving the transfer of "reactor coolant" and leakage rate testing (Ref. 1)).

10. The leakage recovery system shall be designed, fabricated, inspected and certified in accordance with the requirements for Mechanical Integrity Group D (pipe system classification C).

11. The leakage recovery system shall be designed in accordance with seismic Category II.

12. The reactor building electrical penetration utilized for temperature element signal transmission and the temperature readout selector shall include a minimum of 10% spare cables and terminals to allow for additions by the plant operating personnel.

Cooling Water

The criteria for design of the cooling water portion of the leakage recovery system are summarized below:

1. The cooling water portion of the leakage recovery system shall be an added closed cooling water loop interconnected with the decay heat closed cooling water system. The decay heat service coolers shall be used as the path for heat rejection to the nuclear services river water system, and the decay heat closed cooling surge tanks shall provide the

required surge capacity. (Basis - the leakage closed cooling loop will be used during normal plant operation only, when the existing decay heat closed cooling water system is not in operation. All other closed cooling water systems do not have sufficient capacity to accommodate the design heat load of the leakage recovery system).

2. The leakage closed cooling system shall be designed to remove heat at a rate consistent with the leakage recovery system process criterion 7.

3. The leakage closed cooling system shall consist of pumps, valves, reactor building penetrations and piping necessary for the transfer of heat from the leakage recovery system to the Nuclear Services River Water System and associated controls and instrumentation. (Basis - to provide a closed cooling water system without major changes to the existing engineered safety feature system).

4. The leakage closed cooling system shall be designed in accordance with the following Mechanical Integrity classifications:

   a. Reactor Building penetrations and isolation valves - Group B (pipe system classification N-2)

   b. Balance of system - Group D (pipe system classification C) (Basis - Leakage closed cooling is not an essential function (Ref. 6)).

5. The leakage closed cooling water system shall be designed to the requirements of Seismic Category II with the exception of the piping and valves associated with the reactor building penetration and the piping and valves up to the second isolation valve which interconnect with the decay heat closed cooling water system. The penetrations and interconnecting piping with the decay heat closed cooling water system shall be designed to the requirements of seismic Category I. (Basis - containment isolation and the operation of the decay heat closed cooling water system are required for the mitigation of consequences of accidents (Ref.2)).

Transfer Interconnections

1. Interconnections shall be provided to satisfy the following requirements:

   a. Provide venting from (to) the leakage recovery system to (from) the reactor coolant bleed holdup tanks to minimize the backpressure and nitrogen consumption of the leakage recovery system during leakage recovery (pumpout).

   b. Provide an interconnection to allow transfer of recovered leakage to the miscellaneous waste holdup tanks and a local sample connection in the reactor coolant drain header. (Basis - to allow for disposal of leakage in the event of chemical contamination of the leakage. (Basis - Met Ed request (Ref. 1)).

   c. Provide an interconnection for the transfer of processed leakage from the evaporator condensate test tanks to the reactor coolant bleed holdup tanks for subsequent return to the reactor coolant system. (Basis to meet the recoverability requirement of Tech. Spec. 3.1.6.7 (Ref.2)).

2. The interconnections required by the criteria above shall be designed to the same Mechanical Integrity and seismic classification as those of the systems which they interconnect with suitable valving to provide changes of classification if required. The reactor building penetration piping and associated containment isolation valves required for venting shall be designed in accordance with the requirements of Mechanical Integrity Group B (pipe system classification N-2) and Seismic Category I.

DESCRIPTION

Process

1. Flow

   The leakage recovery system provides a means of collection of leakage from the reactor coolant pump seals, from pressurizer safety and electromatic relief valve seats and from leakoff connections for valve stem leakage from power operated valves within the reactor coolant pressure boundary

(Figure 1). To quench leakage from valve stem leakoffs, the leakoff connections are discharged to the 14" quench (relief valve discharge) header. The relatively low backpressure restriction (0.1 psig at the seal leakage alarm tanks) which is imposed on the reactor coolant pump seal leakage system is met by use of the elevation difference between the alarm tanks (El. 325 ft) and the reactor coolant drain tank (top of tank El. 293 ft) which provides sufficient head to allow discharge into the pressurized drain tank and the use of venting to the reactor building. An alternate path is provided for discharge of pump seal leakage to the reactor building sump to allow continuous seal leakage flow when the drain tank pressure is too high for pump seal leakage collection.

The reactor coolant drain tank, which serves as the collection point for the leakage sources enumerated above, provides a means of quenching the high energy leakage and a holding point for the leakage prior to cooling and manually controlled transfer to the reactor coolant bleed holdup tanks. The quenched leakage is drawn from the drain tank by the leakage transfer pumps and passed through the tubeside of the leakage coolers. The cooled water is then returned to the drain tank.

Transfer of the leakage from the leakage recovery system to the reactor coolant bleed holdup tanks is accomplished by use of a line at the discharge of the coolers which allows bleedoff of a flow to the reactor coolant drain header.

In order to minimize the backpressure in the drain tank, a vent is provided with a path to the reactor coolant bleed holdup tanks. By interconnecting the vent spaces of the drain tank and the bleed holdup tanks, the consumption of nitrogen will be minimized by using the bleed holdup tanks as a gas surge volume. In order to limit direct steam venting to the bleed holdup tanks, the vent interconnection is divided at the drain tank into two separate lines. One of the lines, used for return of cover gas to the drain tank during leakage pumpout, is provided with a check valve to prevent flow to the bleed holdup tanks. The other line, used for removal of cover gas from the drain tank during tank filling is provided with a restricting orifice (an excess flow check valve or self-regulated gate valve may be required if analysis dictates) to limit steam flow to the bleed holdup tanks during blowdown periods.

2. Instrumentation and Control

Seal leakage measuring devices are added to the discharges of each of the reactor coolant pump seal leakage alarm tanks to provide a continuous indication of the pump seal leakage rates. The seal leakage measuring devices transmit flow rate indications by means of an on-off electrical pulse rate.

Each valve steam leakoff and vessel leakoff line is provided with two temperature elements. The elements are located to provide an indication of the source of leakage - a leaking valve stem will be identified by a higher temperature reading from the element nearer the valve than the reading from the further element. Twelve temperature elements on the pressurizer safety and electromatic relief valve inlet and discharge piping will be utilized to indicate valve seat leakage in the manner described above. In addition the temperature elements on the inlet piping will provide information on the performance of the loop seals.

All temperature element signals are brought out of the reactor building to the temperature monitoring panel located in the control or auxiliary building. This panel provides selector switches to allow use of a single meter for monitoring of the temperature elements individually.

In order to monitor the flow of recovered leakage from the drain tank to the reactor coolant bleed holdup tanks, a flow meter and recorder are provided on the leakage transfer line between the leakage cooler discharge and the reactor coolant bleed holdup tanks. The recorder is activated during the test periods to provide an accurate record of the quantity of leakage removed from the leakage recovery system.

Level, pressure and temperature in the drain tank are continuously indicated and appropriate high and low setpoint alarms provide annunciation of abnormal conditions. In addition, temperature indication is provided at the discharge of the leakage coolers to provide the operational status of the coolers and indicate the temperature of recovered leakage when it is transferred to the bleed holdup tanks. Sufficient temperature and pressure indications and/or test points are provided to allow monitoring of pump and cooler performance.

In order to control pumpout of the recovered leakage to the bleed holdup tanks, the valve in the transfer line is provided with a position regulating handswitch. The vent penetration of the reactor building is provided with isolation valves provided with "ES" signals to assure containment under abnormal reactor building conditions.

Insofar as is possible, all remote instrumentation and controls required to monitor and control the recovery of leakage and transfer of recoverd leakage will be located in the control room. Other remote instrumentation and any of the transfer instrumentation which cannot be located in the control room will be located on the auxiliary building WDL Panel 301B. Local instrumentation, such as the level gage for the reactor coolant drain tank will be located so that instrument calibrations can be performed while the plant is in normal operation.

Cooling Water

1. Flow

The leakage closed cooling system, a subsystem of the decay heat closed cooling water system is used to transfer heat from the leakage recovery system to the nuclear services river water system for ultimate rejection to the atmosphere via the mechanical draft cooling tower and the Susquehanna River via the cooling tower discharge. The leakage closed cooling system is comprised of piping, pumps and valves required to utilize the decay heat service coolers for heat rejection and remove heat from the leakage coolers (Figure 2).

The leakage closed cooling pumps take their suction from the discharge of the decay heat services coolers and pump the cooling water into the reactor building to the leakage coolers. Heat is transferred from the leakage recovery system to the closed cooling system at this point. The closed cooling water discharge from the leakage coolers is then directed out of the reactor building and returned to the inlet of the decay heat service coolers. Heat is rejected in the service coolers and the cooling water is returned to the leakage closed cooling pump suction.

The system is designed to utilize the cooling capacity of one decay heat service cooler and the surge capacity of one decay heat closed cooling water surge tank and be fully isolated from the redundant decay heat closed cooling water loop. In order to allow emergency operation of the decay heat closed cooling water loop, suitable valving is provided to isolate the leakage closed cooling system from the decay heat closed cooling loop utilized for leakage cooling during normal operation.

Since the decay heat removal and decay heat closed cooling water systems are not utilized during normal reactor operation and the leakage closed cooling system is required only during normal reactor operation, the performance of the leakage cooling function does not affect and is not affected by the performance of the decay heat removal function.

2. Instrumentation and Control

The system is designed to operate continuously at a balanced condition based on operation of one or two pumps and one or two leakage coolers. Flow elements and indicators, the only instrumentation utilized, are located at the discharge of the leakage coolers. These are used to initially balance operation of the pumps and subsequently to set the flow through each of the leakage coolers for each system operating mode.

Valves which serve to isolate containment and valves which serve to isolate the leakage closed cooling system from the decay heat closed cooling water system are provided with motor operators and are closed automatically upon receipt of an "ES" signal. Since the leakage closed cooling system utilizes portions of one decay heat closed cooling loop only, the valving which isolates the leakage closed cooling system from the unused, dant decay heat closed cooling loop will be administrativ. controlled (maintained in the closed position).

Transfer Interconnections

1. Flow

In order to allow transfer of recovered leakage to the miscellaneous waste system, an interconnection is provided from the reactor coolant drain header to the inlet line for the miscellaneous waste holdup tank. The leakage transfer pumps provide pumping capability for this transfer operation.

The transfer of processed leakage to the reactor coolant and makeup systems is achieved by use of an interconnection from the discharge of the evaporative condensate pumps to the inlets of each of the reactor coolant bleed holdup tanks. This allows the transfer of processed water of known quality to the bleed holdup tanks for subsequent return to the reactor coolant system. Pumping power for this transfer operation is provided by the evaporative condensate pumps.

2. Instrumentation and Control

Specific instrumentation and controls for the transfer operations have not been determined at this time. At a minimum, there may be no instrumentation and controls directly associated with the added transfer interconnections (manual local control). At a maximum, the required instrumentation and controls for the transfer interconnections may be sufficient to monitor and control transfer operations from the control room (manual remote control).

SCOPE OF DESIGN

1. Process

The scope of the engineering and physical design for the process system includes all analyses, equipment procurement (and modifications) and preparation of design drawings and documents required to integrate the leakage recovery system with the existing plant design.

Analyses are required to determine the impact of the leakage recovery system on existing plant systems due to changes and additions to component functions. These BOP impact analyses include evaluation of performance of the reactor coolant drain tank and the waste gas system. Also, instrumentation and controls for the drain tank must be evaluated for the changed conditions. Additional analyses are required to evaluate impact on the radwaste disposal-reactor coolant liquid system and the affects of the recovered leakage on water chemistry.

Analyses are required to size and specify equipment, piping and valve requirements. These analyses include a system cooling versus flowrate optimization for sizing the leakage coolers and the capacities of the leakage transfer pumps. System operation calculation to determine system, design pressures and required discharge head, drive motor size and power requirements for the pumps; drive motor size, operational requirements, design pressure valve characteristics and power requirements for the valving in the system; design pressures for piping and leakage coolers; and instrumentation accuracy, range and sensitivity requirements. The use of a reactor building penetration requires stress analysis to determine specific design requirements. Radiation source terms and shielding analyses are required to determine the extent of changes in radiation zoning, plant activity releases and shield wall requirements for the added piping, pumps and heat exchangers. If shielding is required, the structural design of the shield walls must be analyzed. Equipment foundations must also be designed and analyzed. Electrical power supply systems must be analyzed to determine wiring requirements for added cables and changes to existing transmission systems.

New equipment which must be procured are as follows:

4 Seal leakage measuring devices

2 leakage transfer pumps and drive motors

2 leakage coolers

Isolation, instrument root, process control and relief valves and associated equipment.

Motor control centers and instrumentation.

Pipe spools

- Thermocouples

Equipment which may require modification or replacement are as follows:

Reactor Coolant Drain Tank, WDL-T-3 (modifications)

Instrumentation and relief valves associated with WDL-T-3 (replacement)

Reactor Coolant drain header (modifications)

Reactor Building penetration R-553 or R-565 (modification)

Reactor Coolant Pump Seal Leakage Alarm Tanks (modifications)

Pressurizer Relief Valve discharge piping (modifications)

Reactor Coolant Bleed Holdup Tank inlet and relief valve piping and nozzles (modification and/or replacement)

The design drawings requisite for addition of the leakage recovery system include revisions to existing flow diagrams, piping drawings, general arrangements, composite drawings, structural drawings, penetration schedules, electrical elementaries, I&C schematics, cable/conduit drawings, piping isometrics and radiation zone maps. In addition to the revisions required for existing drawings, a new flow diagram is required and some new drawings in several of the above mentioned list of drawing types may be required.

Specific design documents within the scope of design include a System Design Description (which provides the specific details of design summarized in this report). The System Design Description will serve as the basic design document, providing sufficiently detailed design criteria and specific process and auxiliary component requirements to achieve the system design. Further, the System Design Description will form the basis for revisions to existing System Descriptions and appropriate portions of the FSAR, as well as a new System Description detailing the Leakage Recovery System. Additional documentation required includes operating procedures, pull slips. Revisions of the valve and instrument lists will also be required.

2. Cooling Water

The leakage closed cooling modification will require analyses, procurement, design and documentation as outlined below.

Analyses include system analysis for design pressure, pump discharge head, drive motor and power supply requirements, capacity requirements are taken from the optimization of leakage coolers described under process analysis; stress analysis for reactor building penetrations and interconnections with the decay heat closed cooling water system and system analysis for the nuclear services river water system.

Equipment procurement includes:

2 leakage closed cooling pumps and drive motors

Isolation, instrument root, process control and relief valves and associated equipment

MCC's and instrumentation

Pipe Spools

Equipment which require modification are as follows:

Piping at the inlet and outlet of the decay heat service coolers.

Reactor building penetrations R-548 and R-539

Design drawings required are all based upon the changes to be shown on the decay heat closed cooling water flow diagram (Dwg. 2035) and include new and revised piping, electrical and structural drawings required to implement the process system and component additions and resulting changes.

Design documentation includes the cooling water portion of the System Design Description and consequent changes in System Descriptions, Operating Procedures and FSAR Sections. Pull slip changes and additions are also included as design documentation.

Tranfer Interconnections

The scope of design for the transfer interconnections includes analysis to determine sizing and valving requirements, procurement of valves and pipe spools, changes to existing piping, revision of flow diagrams and piping drawings, and revision of System Descriptions and FSAR Sections. Major equipment modification within the radwaste system is not within the scope of this effort.

REFERENCES

1. Conference Notes No. 998, dated November 25, 1974.

2. TMINS - Unit 2 FSAR, Sections 3.2.1, 5.2.7, Technical Specifications 3.1.6.

3. B&W letter, L.R.Pletke to R.J.Dobbs (B&R), Subject: Pressurizer Relief, dated March 20, 1975.

4. B&W letter, L.R.Pletke to R.J.Dobbs (B&R), Subject: R.C.Pump Seal Leakage, dated January 3, 1975.

5. TMINS Unit 1 Surveillance Procedure 1303-1.1 Rev. 3, dated August 1, 1974.

6. B&R Engineering and Design Procedure Number 2, Revision 4, "Engineering Design Procedure for Mechanical Integrity Classification of Pressurized Water Reactor Systems," issued October 4, 1971.

Route to file Res 145 — Include: Kinder, Floyd, Dubiel, GPM Last

Ref 5 — NP Miller

Burns and Roe, Inc.

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NELSON
HAWKINS

125

Subject: W.O. 2555-02
Jersey Central Power and Light Co.
Three Mile Island Nuclear Station Unit No. 2
Reactor Coolant Drain Tank Modification

Ref: 1. B&R letter S/N 2356-GP, dated 3/14/75
2. B&R letter S/N 2390-GP, dated 3/31/75
3. B&R Conference Notes No. 1035, dated 4/3/75

Serial No. 2550-GP
June 4, 1975

Mr. R. W. Heward, Jr.
GPU Service Corporation
260 Cherry Hill Road
Parsippany, NJ 07054

Dear Mr. Heward:

Burns and Roe's recommended redesign of the Reactor Coolant Drain Tank and associated cost estimates were transmitted by references 1 and 2. As detailed in reference 3, certain design changes have been eliminated from consideration and a new summary of the design changes was deemed necessary.

The detailed description of the agreed upon system design is included as a report, Attachment 1 to this letter.

The estimated capital expenditure and the engineering and design costs (excluding installation) are described in this letter.

POOR ORIGINAL

A. Capital Expenditure

The capital outlay for procurement of valves, piping and equipment is estimated to be $175,000. This is a preliminary estimate which includes the procurement of the following major equipment items:

4 - Seal Leakage Measuring Devices
2 - 50% Capacity Leakage Coolers
2 - 50% Capacity Leakage Transfer Pumps

Dupe of

7911090566

5U125

2 - 50% Capacity Leakage Closed Cooling Water Pumps

B. Engineering and Design Costs

The engineering and design costs associated with incorporation of the leakage recovery system in the TMI Unit 2 design are estimated to be $256,000. This estimate includes all engineering and design necessary for equipment procurement, shielding, piping design, system analyses, system design documentation, electrical system changes, and instrumentation and control of the proposed system.

In order to provide necessary information for the basic equipment and piping to allow expeditious procurement of equipment subject to extended fabrication schedules, we are proceding with engineering and design of the leakage recovery system. We trust you will find the above estimates and the attached summary design description sufficient for your evaluation of the leakage recovery system. If you require supplemental information to complete your evaluation of the proposed system design, please feel free to contact us.

Very truly yours,

R. J. Dobbs
Project Manager

RJD/RLS/evt

cc: J.A.Smith, GPU
GPU Resident Office
E.Wallace, GPU
J.G.Herbein, Met Ed Site
G.P.Miller, Met Ed Site
N.Williams, Met Ed Site
(all w/attachment)

Attachment 1 - Draft System Design Description and Scope of Design
Attachment 2 - Schedule and Manhours

BY RS DATE 4-9-75 SUBJECT FLOW DIAGRAM (DWG 2632) SHEET NO. ___ OF ___
CHKD. BY ___ DATE ___ RADWASTE DISPOSAL JOB NO. 2555-02
REACTOR COOLANT LIQUID - LEAKAGE RECOVERY

NOTES

1. ANALYSIS REQUIRED FOR REQUIREMENTS

2. SPECIFIC USE OF WDL-T-3 NOZZLES REQUIRES ANALYSIS

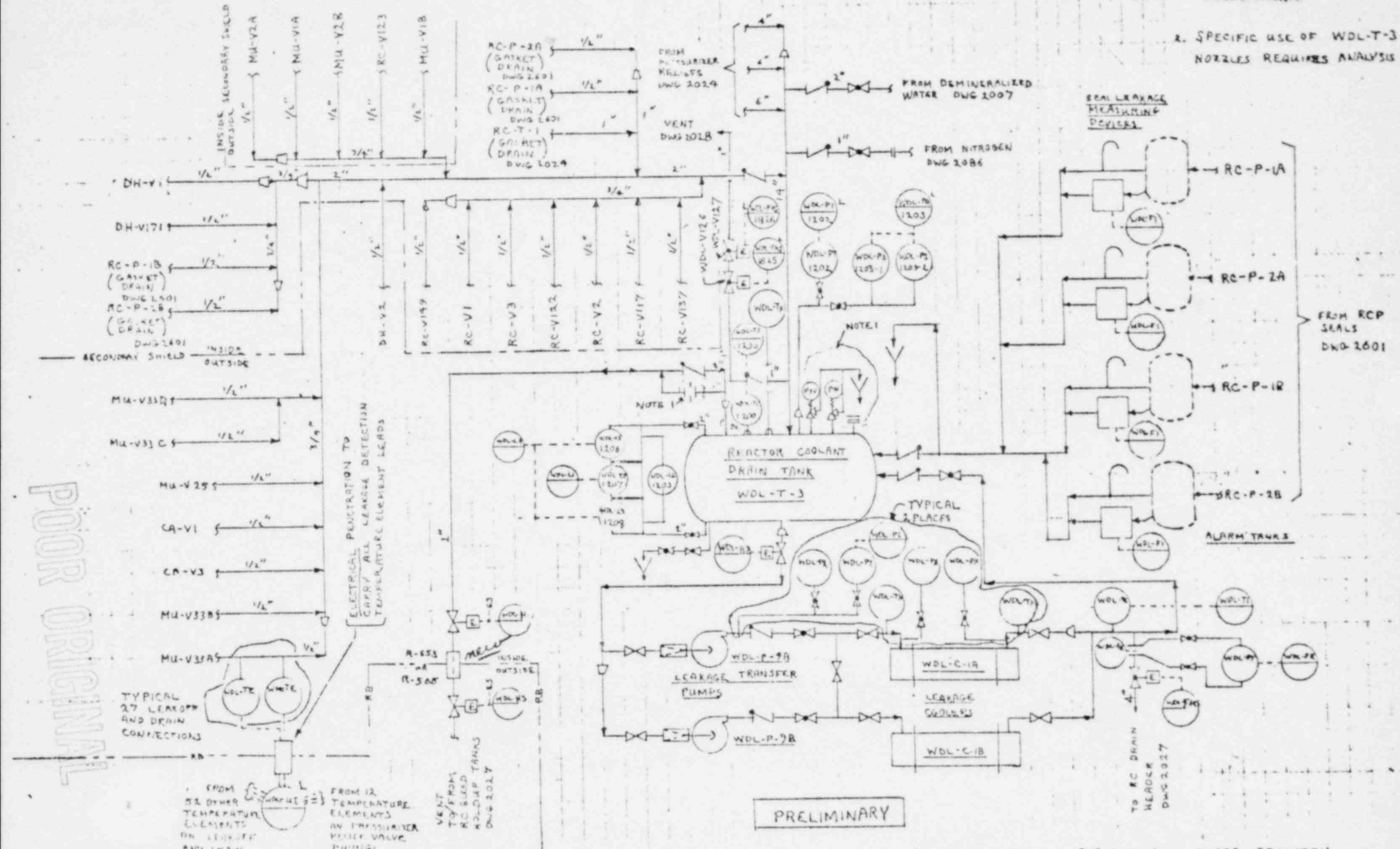


FIGURE 1. DWG. 2632 FLOW DIAGRAM RADWASTE DISPOSAL - R.C. LIQUID - LEAKAGE RECOVERY

BY P3 DATE 3-12-75 SUBJECT (LEAKAGE RECOVERY) FLOW DIAG. REV. DECAY HEAT CLOSED COOLING WATER SHEET NO. ... OF ... JOB NO. 3555-122...
CHKD. BY ... DATE ...

DWG 2035

NEW GENERAL NOTE ON DWG. 2035

2. CONTAINMENT ISOLATION VALVE TEST NIPPLES HAVE THREADS

NOTES:

1. 8 VALVES REQUIRED FOR LEAKAGE COOLER VENTS & DRAINS

VENT	(WDL-C-1A)	DC-V
		DC-V
	(WDL-C-1B)	DC-V
		DC-V
DRAIN	(WDL-C-1A)	DC-V
		DC-V
	(WDL-C-1B)	DC-V
		DC-V

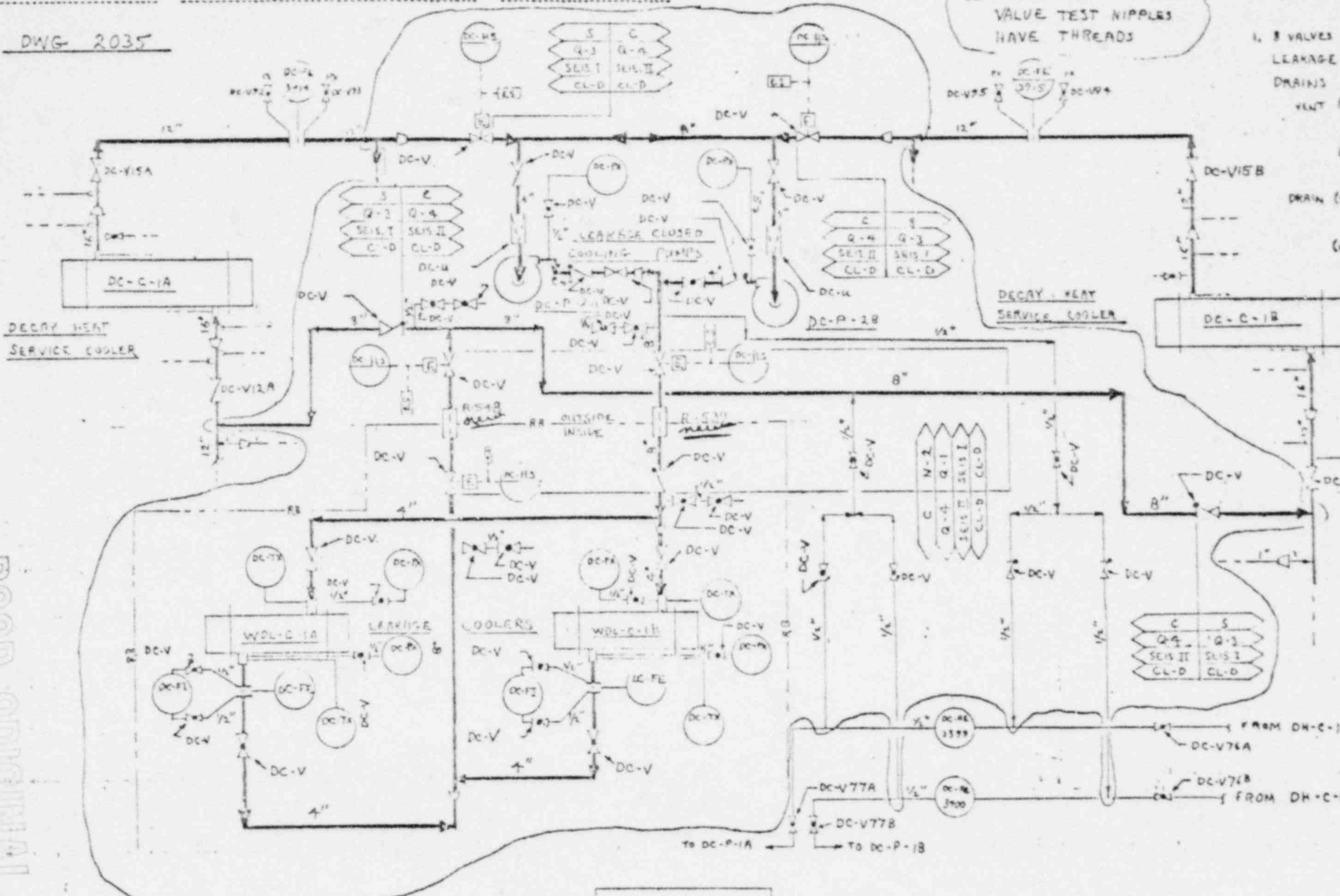
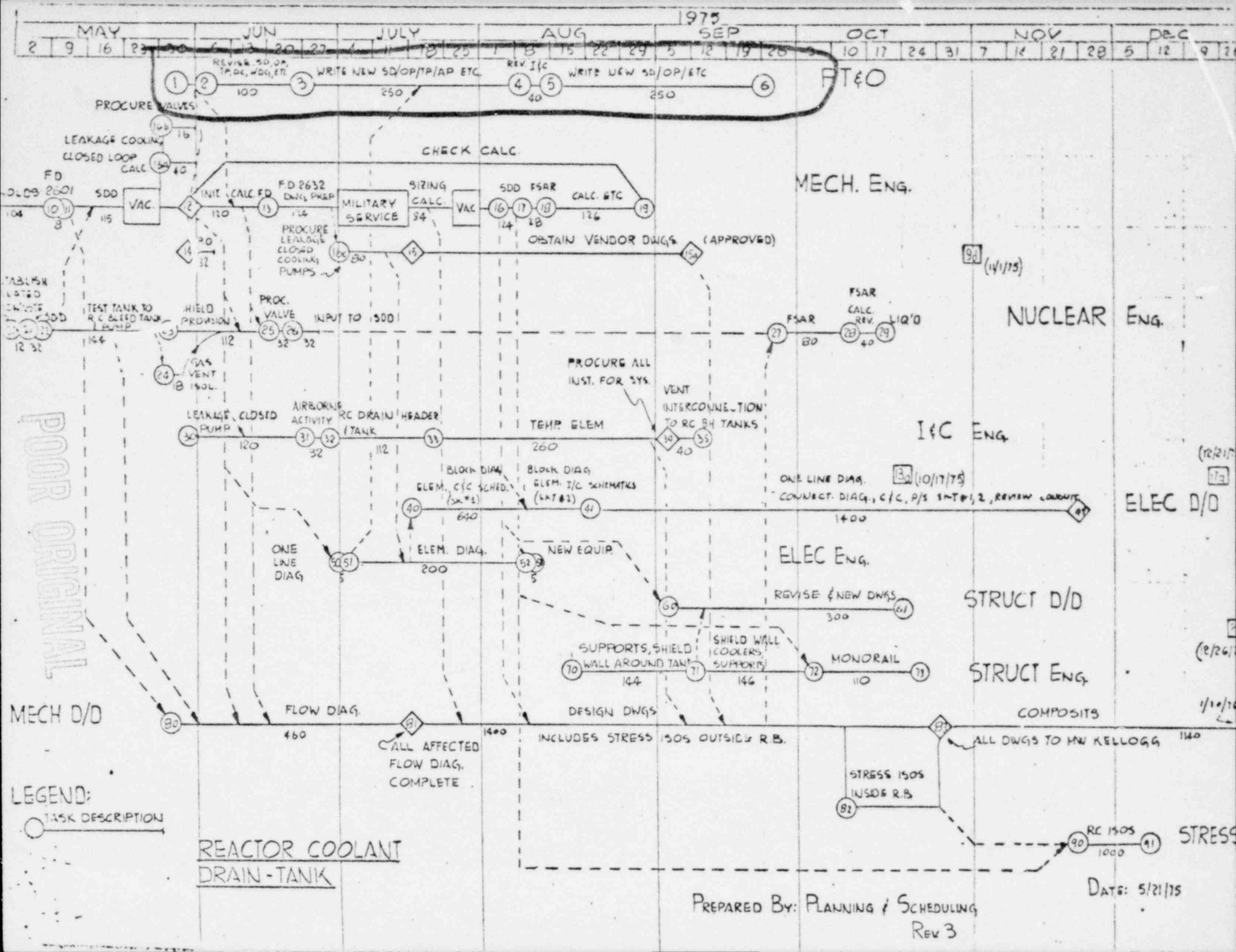


FIGURE 2. REVISIONS - DWG. 2035 FLOW DIAGRAM DECAY HEAT CLOSED COOLING WATER



REACTOR COOLANT DRAIN-TANK

DATE: 5/21/75

PREPARED BY: PLANNING & SCHEDULING

REV 3

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: PT&O

Milestone Numbers	Description of Effort	Est. M.H.
2	Revise SD's, OP's, TP's, etc. for 4 systems DC, WDG, WDL-RC, WDL-Misc.	100
4	Review new elec. elementaries, I&C etc.	40
3, 5	Write new SD/OP/TP/AP/SP/MP etc. for RC Leakage	500 ?

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Mechanical

Milestone Number	Description of Effort	Estimated Manhours
-	"Holds", prep. of PCN/letters	104
10	Release Eng. & Design of RC Pump Seals	8
11	Prepare System Design Description	100
12	Drawing Prep. & initial sizing calcs.	120
13	Drawing Prep. & sizing calcs.	124
14	P. O. & Weight Estimates for Heat Exchangers	32
15	Obtain approved vendor dwg. no later than 9/5/75	
16	Revise SDD for as-bought equipmt., etc.	24
16a	Leakage Cooling Closed Loop Calc.	40
16b	Procure Valves	16
16c	Procure leakage closed cooling & transfer pumps	80
17	Revise FSAR Sections	28
18	Calculations, etc.	100

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Nuclear

Milestone Numbers	Description of Effort	Estimated Manhours
20	Establish Construction related radwaste system	12
22	Dwg. 2027, 2045 - Eval. & Design Transfer Provision from RCDT to Misc. Radwaste	40
22	Dwg. 2027 - Eval. & Design Transfer provision from Evap. Cond. Test Tank to R. C. Bleed Tank	32
22	Evaluate Introduction Oxygenated RC Pump Leakage to RC Bleed Tank vs. B&W Chemistry Limits	40
22	Dwg. 2027 - revamp connections to RC Bleed Tank	32
23	Gen. Arrange Dwgs. - Calc. Shielding Provisions	80
24	Dwg. 2027 & 2028 - Evaluate need for gas vent isolation & design if needed	18
25	Spec. Procure new valves	32
26	Input to Sys. Design Description	32
27	FSAR Eval. WDG Sys. Releases & RB Build-up and Purge	80
28	FSAR - Calc. Revised Liquid.	40

5/21/75

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: I&C

MILESTONE NUMBER	Description of Effort	Estimated Manhours
30	Provide leakage closed cooling pumps, valving and piping interconnections in Decay Heat Closed Cooling System	120
31	Evaluate Reactor Building airborne activity and equipment shielding requirements.	32
32	Leakage Transfer interconnection with PC drain header & RC Bleed Holdup tank inlet line capacity to accommodate leakage.	112
33	Evaluate instrumentation & provide suitable instrument sensitivies & control schemes	260 ?
34	Vent interconnection to RC Bleed Holdup tanks from RC Drain Tank	40
	Total	564

5/21/75

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Elec. D/D

Milestone Number	Description of Effort	Est. M.H.
	Sketch #1	
40	Draft elementaries & I/C Schematics	60
40	Block Diagrams & Cable-Conduit Scheds.	300
41	Update one-line diagrams & connection diagrams	80
41	Revise conduit L/O Dwgs. - C&C Schedule Physical, P/S	630
	Sketch #2	
40	Draft elementaries & I/C Schematics	80
40	Block Diagrams & C&C Schedule	200
41	Update one line diagrams & connection diagrams	150
41	Revise conduit L/O Dwgs. & C&C Schedule (Physical), P/S	540
	Total	2040

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Elec. Eng.

Milestone Numbers	Description of Effort	Est. M.H.
51	Prepare Elementary Diagrams as Follows: New elementary diagram for 6 motor operated valves, 7 air-operated valves and 4 pump motors. Modify, elementary diagrams for 3 motor-operated valves & 2 pumps, add alarms	200
50	Revise One-line diagrams	5
52	Issue purchase requisitions for new equipment (starters, relays, etc.)	5

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Structural D/D

Milestone Numbers	Description of Effort	Est. M.H.
60	Revise & Possible Prep. of New Drawings	300

5/21/75

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Civil/Struct.

Milestone Numbers	Description of Effort	Est. M.H.
70	Supports and Seismic for Reactor Coolant Drain Tank	48
70	R.B. Liner Modification of 3 Penetrations	16
70	Shield Wall Around Tank	48
	Service Platforms for Tank	32
71	Supports for Two R.C. Leakage Coolers	144
	Top and Bottom, and R.C. Drain Pumps	100
	Shield Walls for Coolers and Pump Zone	46
72	Monorail for Bundle Transfer Revision of Spec. 58	110

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Mechanical D/D

Milestone Numbers	Description of Effort	Est. M.H.
80	Flow Diagram 2632, 2035, 2045, 2601, 2027, 2181, 2024	460
81	Design Drawings Inside Reactor Bldg.	600
82	Stress Isos - Inside R. Bldg.	200
82	Design Dwgs. Outside R. Bldg. (Incl. Stress Isos)	600
	and	
83	Composites, Radiation Dwgs., Piping Arrangements - Revs., VA & Specialty Lists	1140

REACTOR COOLANT DRAIN TANK

ACTIVITIES DESCRIPTION

Discipline: Stress

Milestone Numbers	Description of Effort	Est. M.H.
90	Estimated 10 isometrics for piping analysis	1000