10 CFR 50.55a

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102-06665-JJC/RKR/CJS
February 22, 2013

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station**
Units 1, 2, and 3
Docket Nos. STN 50-528, 529, and 530
Response to Request for Additional Information (RAI) - Request for Relief from the American Society of Mechanical Engineers (ASME) Code, Section XI, Reactor Vessel Head Flange Seal Leak Detection Piping - Relief Request 49

Pursuant to 10 CFR 50.55a(a)(3)(ii) Arizona Public Service Company (APS) requested the Nuclear Regulatory Commission (NRC) approve Relief Request 49, by letter number 102-06637, dated December 19, 2012 [Agencywide Documents Access & Management System (ADAMS) Accession No. ML12361A256], for the Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3.

Specifically, APS requested relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI requirements regarding pressure testing the reactor vessel head flange seal leak detection piping. The basis for the request was that compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

In e-mail dated January 30, 2013, the NRC staff indicated that the APS submittal had been reviewed and that additional information was needed to complete the review. The NRC requested that the information be provided by February 22, 2013. The Enclosure to this letter contains the requested information.

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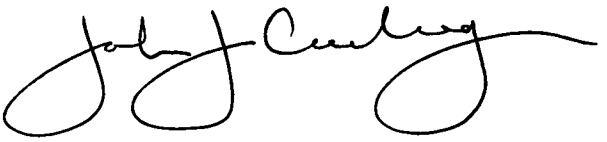
There are no commitments being made in this letter. Should you need further information regarding this relief request, please contact Robert K. Roehler, Licensing Section Leader, at (623) 393-5241.

Sincerely,



JJC/RKR/CJS/hsc

Enclosure: APS Response to NRC Request for Additional Information (RAI) - Relief Request 49, Request for Relief from the American Society of Mechanical Engineers (ASME) Code, Section XI, Reactor Vessel Head Flange Seal Leak Detection Piping

cc: E. E. Collins Jr. NRC Region IV Regional Administrator
L. K. Gibson NRC NRR Project Manager for PVNGS
M. A. Brown NRC Senior Resident Inspector for PVNGS

ENCLOSURE

APS Response to NRC Request for Additional Information (RAI) - Relief Request 49

Request for Relief from the American Society of Mechanical Engineers (ASME) Code, Section XI, Reactor Vessel Head Flange Seal Leak Detection Piping

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APS requested relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI requirements regarding pressure testing the reactor vessel head flange seal leak detection piping. The basis for the request was that compliance with the specified requirements of the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Specifically, APS proposed an alternative to the system leakage test of reactor pressure vessel (RPV) flange leak-off line that is required by the Code, Section XI, Table IWC-2500-1, Examination Category C-H, at the Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3. Instead of pressurizing the subject lines to the system leakage test pressure required by IWC-5221, APS proposed to pressurize the line using the static pressure head of the refueling water prior to performing a VT-2 visual examination.

In e-mail dated January 30, 2013, the NRC staff indicated that the APS submittal had been reviewed and that additional information was needed to complete the review. The NRC requested that the information be provided by February 22, 2013. This enclosure contains the requested information.

NRC RAI Number 1

What are the scheduled end dates for the PVNGS, Unit 1, 2, and 3 third 10-year inservice inspection interval?

APS Response

The PVNGS Units 1, 2 and 3 third 10-year inservice inspection interval end dates are as follows:

Unit 1, July 17, 2018
Unit 2, March 17, 2017
Unit 3, January 10, 2018

NRC RAI Number 2

The proposed alternative is being submitted pursuant to Title 10 of the *Code of Federal Regulations*, Part 50 (10 CFR 50), paragraph 55a(g)(5)(ii), revised inservice inspection program for a facility conflicts with the technical specification for the facility, but cites the provisions of 10 CFR 50.55a(a)(3)(ii), hardship without a compensating increase in the level of quality and safety. Please confirm that the relief request is being submitted pursuant to 10 CFR 50.55a(a)(3)(ii).

APS Response

The cover letter that transmitted relief request 49 incorrectly cited paragraph 55a(g)(5)(ii). The relief request, which was provided as an enclosure to the transmittal letter, correctly cited 10 CFR 50.55a(a)(3)(ii) as the basis for the relief request. APS confirms that the relief request is being submitted pursuant to 10 CFR 50.55a(a)(3)(ii).

NRC RAI Number 3

Provide a brief description of the operation of the RPV flange seal leak detection system, i.e., how the pressure in the leak-off line is measured and monitored, how the operators are alerted to a leakage condition and how they respond.

a. If O-ring leakage trips the leak-off alarm and rapid depressurization of the leak-off line subsequently occurs, does the control room annunciator continue to show an indication?
b. Are there other control room indications of O-ring leakage?

APS Response

Leakage of reactor coolant between the mating surfaces of the reactor vessel and reactor head flanges is contained by two self-energizing metal O-rings. The outer O-ring seal remains passive unless a problem develops with the inner O-ring seal. A 0.75 inch connection for the reactor vessel seal leak-off line is located between the double O-ring seals penetrating the reactor vessel flange. The reactor vessel seal leak detection system provides leak-off line pressure monitoring and alarm indications to the control room operator. The leak-off line is routed to the reactor drain tank through a solenoid valve that is normally closed. A pressure transmitter senses the leak-off line pressure and provides output to a control room pressure instrument and a high pressure alarm.

If the inner O-ring seal leaks, the area between the O-ring seals and the leak-off line will pressurize to reactor coolant system (RCS) pressure (normally 2250 psia) and remain at that pressure. When the leak-off line pressure reaches 1500 psig or greater, the control room receives a high pressure alarm. Procedures then direct operators to check leak-off line pressure on the control board instrument and vent off pressure in the line by opening the solenoid valve to the reactor drain tank from the control room, followed by re-closure of the solenoid valve. The purpose of venting pressure from the line is to determine if the alarm was caused by heat-up of trapped water in the piping or due to

inner O-ring seal leakage. Operators will also perform an RCS leakrate determination to verify that leakage is within limitations.

3.a Response

Yes, if rapid depressurization occurs for any reason, the alarm will reset at 1455 psig and the annunciator window will flash, requiring operator acknowledgment. Also, the pressure instrument in the control room will indicate the changes in leak-off line pressure. This instrument is viewed by control room operators during routine control board monitoring and log taking activities.

3.b Response

Yes, there is an instrument installed in the control room which provides reactor vessel seal leak-off line pressure indication. Leakage from the inner O-ring seal will result in increased pressure indication on this instrument. Outer O-ring failure or leak-off piping leakage coincident with inner O-ring seal leakage would be considered RCS leakage. The alarm response procedure (40AL-9RK4A, *Panel B04A Alarm Responses*) directs that the leak be identified in accordance with procedure 40AO-9ZZ02, *Excessive RCS Leakrate;* and procedure 40ST-9RC02, *ERFDADS (Preferred) Calculation of RCS Water Inventory,* as directed by the shift manager or control room supervisor. These procedures can be used to identify the source and quantify the magnitude of leakage by a corresponding increase in Containment sump levels, radiation monitoring and/or Containment humidity indications and/or RCS leakrate determination.

NRC RAI Number 4

Provide a piping and instrumentation diagram (P&ID) and a piping isometric drawing showing the RPV flange seal leak detection piping.

APS Response

The requested piping and instrumentation diagram (P&ID) and the piping isometric drawing showing the RPV flange seal leak detection piping is provided as Attachment 1 of this Enclosure.

NRC RAI Number 5

What is the material of construction of the leak-off line?

APS Response

The material of construction of the leak-off line is schedule 160 seamless, stainless steel (ASME SA-376 or SA-312 Grade 304).

NRC RAI Number 6

Describe PVNGS experience with degradation (corrosion, stress corrosion cracking, fatigue, etc.) of the RPV flange seal leak detection piping.

APS Response

Palo Verde has not experienced degradation of the reactor vessel leak-off line due to corrosion, stress corrosion cracking or fatigue. The leak-off line is flushed during refueling outages to prevent the buildup of contaminants in the stagnant piping.

NRC RAI Number 7

Potential O-ring leakage during service is detected with a pressure element in the leak-off line. The proposed alternative would utilize the static fluid head of the refueling water to pressurize the leak-off line prior to a VT-2 examination.

a. What is the fluid head pressure that exists in the line when the refueling cavity has been filled to its normal refueling water level?
b. What is the trip pressure for the O-ring leakage alarm indication in the control room?

APS Response

7.a Response

The fluid head pressure that exists in the line when the refueling cavity has been filled to its normal refueling water level is approximately 20 psig.

7.b Response

The pressure trip set-point for the O-ring leakage alarm indication in the control room is 1500 psig.

NRC RAI Number 8

Discuss whether a system leakage test of the RPV flange seal leak detection piping could be performed at a pressure higher than that of the refueling water fluid head prior to removing the head at the beginning of the refueling outage. Describe any hardship associated with this sequence.

APS Response

Although APS is not aware of any facility that performs such a high pressure leakage test for the RPV flange seal leak detection piping, procedural methods could likely be developed as described below. Special test equipment would have to be configured to support such a high pressure test method.

Introduction

The APS response will first describe the alternative test options, then describe the related hardships associated with the envisioned alternative test methods, and finally describe how the relief request test method would be effective in detecting potential piping leakage.

The purpose of this inservice inspection is a visual examination to detect leakage. The ASME Code requirements are that a pressure test (with insulated piping) be held for 4 hours minimum before the visual examination is started as described further in the response to NRC RAI 9. This is to allow for any leakage to become visible through the insulation.

If there were O-ring seal and leak-off line leakage during an operating cycle, the leakage would already have been identified, as described in the response to NRC RAI 3. Such leakage would be addressed during the course of a mid-cycle or refueling outage as part of the corrective action process.

As outlined in the relief request, with the RCS depressurized, any pressurization of the annulus between the inner and outer O-ring seals creates pressure forces in a direction opposite to the design function of the inner O-ring seal; which could result in degradation or damage. Thus, this test option is not considered feasible.

A limitation for an alternative higher pressure test (of pressurizing the leak-off line at the beginning of the refueling outage, while the reactor head is still installed) would be that RCS pressure always be higher than the O-ring annulus test pressure.

Alternative Higher Pressure Test Options

It could be possible to connect a portable pump skid at the location of the seal leak-off line pressure instrument to pressurize the leak-off line from the reactor vessel to the Code boundary isolation valve. This alternative higher pressure test could be performed at either of 2 operating plateaus: Normal operating pressure and temperature in Mode 3 or at approximately 350 psia in Mode 5.

Immediately after reactor shutdown for a refueling outage, the RCS is stabilized in Mode 3, followed closely by RCS cooldown. To perform a leak-off line alternative test at or near full RCS pressure would require holding the plant at normal operating pressure and temperature for a minimum of 4 extra hours, beyond the normal refueling outage sequence, while a portable skid is installed and operated. At this time, the entire containment would be a Locked High Radiation Area (LHRA) as radiation protection personnel would not have sufficient time to survey and de-post the walkways and various areas.

Once a cooldown starts, the RCS enters Mode 5 approximately 6 hours later. The RCS is stabilized at approximately 350 psia to keep the reactor coolant pumps (RCPs) running for peroxide injection / crud removal (to minimize personnel dose during the refueling

outage as a whole) and to cool down the RCS metal mass. This 350 psia plateau is maintained for about 12 hours. The portable skid could be installed and operated at this lower pressure plateau. However, during the peroxide injection / crud removal process, which also occurs at this pressure level, the radiation levels in the RCP / Steam Generator (SG) bays increase such that radiation protection personnel prohibit entry into the bays. This would prevent a visual inspection of a large portion of the piping, which is routed through bay 2. As a result, performance of a leak-off line alternative test at this lower RCS pressure would require postponing peroxide injection / crud removal process for a minimum of 4 extra hours while a portable skid is installed and operated.

Alternative Higher Pressure Test Method Hardships

In summary, the performance of an alternative higher pressure test would impose the following hardships:

- The pump testing skid pressure and water quality must be adequately controlled, such that the reactor vessel O-ring seals are not over-pressurized or compromised; there is additional risk of O-ring seal damage and potential RCS leakage resulting from the alternative test method, as compared to the proposed relief request test method
- If an operational transient were to occur during testing such that the RCS pressure were to decrease below the O-ring annulus test pressure, inner O-ring seal loading would reverse resulting in a condition that has not been fully analyzed
- Performance of the test may require opening manual containment isolation valves to provide a water source for the portable pump skid; which would require positive control by stationing operations personnel, both inside and outside containment, dedicated for the duration of the test (i.e., Mode 3 pressure test option)
- Operations would have to hold the RCS at an elevated pressure and temperature for a longer period (i.e., Mode 3 pressure test option) or postpone peroxide injection / crud removal process (i.e., Mode 5 pressure test option), either of which would impact critical path time at the start of the outage
- Additional personnel dose would be accrued to transport, install, test and remove the testing skid in a LHRA, which requires continuous radiation protection personnel coverage (i.e., Mode 3 pressure test option)

Relief Request Test Method

Code Case N-805, *Alternative to Class 1 Extended Boundary End of Interval or Class 2 System Leakage Testing of Reactor Vessel Head Flange O-ring Leak Detection System*, was issued to the 2010 Edition of the ASME Section XI Code and is listed in Supplement 6 for Code Cases. While Code Case N-805 has not yet been endorsed by the NRC in Regulatory Guide 1.147, *Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1,* the APS relief request is consistent with the Code Case methods and is, therefore, an appropriate test approach.

For PVNGS, the testing methodology proposed would be performed when the refueling pool is filled. During a refueling outage, the refueling pool is normally kept filled for a

period of more than a week for shielding of the upper guide structure (UGS) assembly. The leak-off line visual examination, as proposed in the APS relief request, would be performed at some time after the refueling pool has been flooded for an extended period. For example, in the most recent Unit 2 outage (Fall 2012), the pool was filled for about 11.5 days.

As the visual examination is looking for through-wall flaws, the proposed test is considered a reasonable and sufficient method, even for small leak rates that result from the proposed low test pressure, since the piping is exposed to the pressure for a number of days.

Summary

The test methodology of the relief request is an appropriate test for detecting through-wall leakage. Performance of the alternative higher pressure test at the beginning of the outage, prior to removing the head, is not justified based upon the additional operational risk and hardships. For the reason stated above, the alternative higher pressure test would constitute a hardship without a compensating increase in the level of quality and safety.

NRC RAI Number 9

In order for a fluid leak in a pressurized line to be observed with a VT-2 examination, sufficient time must have elapsed between the time that the line was pressurized and the time that the examination is performed. Specify the minimum time between the time that the line is pressurized and the time that the VT-2 examination is performed for both uninsulated lines and insulated lines (as appropriate). Provide a technical justification based on the pressure in the leak-off line during the leakage test for the hold time.

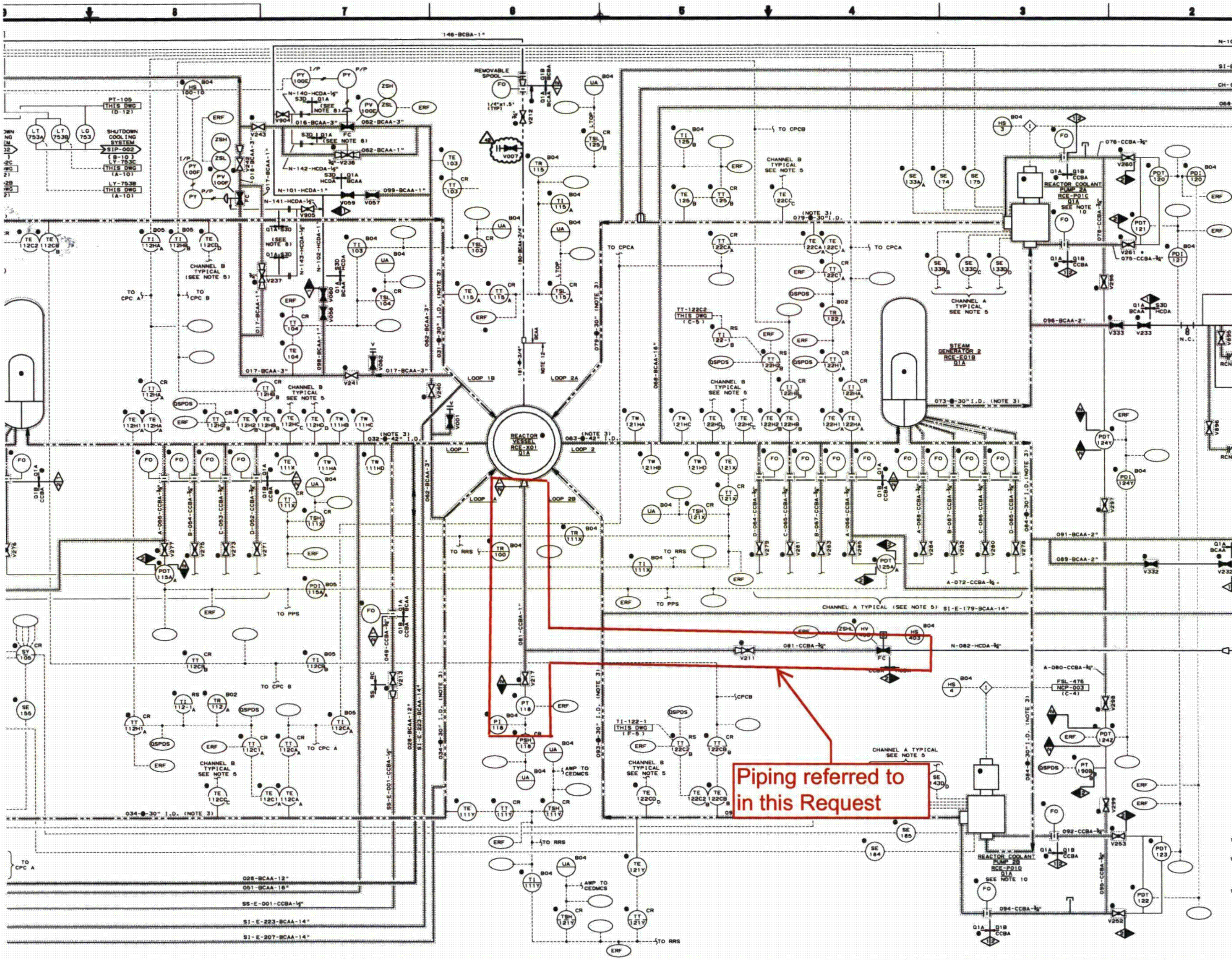
APS Response

The ASME Code, Section [IWA-5213(a)(3)] requires a 4-hour hold time for insulated components. The reactor vessel leak-off line at PVNGS is insulated. The PVNGS pressure test program adheres to the Code requirements for insulated components and performs the inspections after the minimum hold time of four hours has been established. The leak-off line leak test visual examination would be performed when the reactor cavity has been flooded for an extended period, as described in the response to NRC RAI 8.

Attachment 1

RAI Question 4

Piping and Instrumentation Diagram (P&ID) and Piping Isometric Drawing RPV Flange Seal Leak Detection Piping



NOTES:

1. ALL GLOBE VALVES SHOWN ON THIS DRAWING HAVE FLOW UNDER THE SEAT.

2. THE SAFETY TRAIN DESIGNATOR E IS TO PRECEDE ALL LINE NUMBERS SHOWN ON THIS DRAWING UNLESS OTHERWISE INDICATED.

3. CE SUPPLIED PIPING DESIGNED FOR 2500 PSIA AND 650°, AND PER CODE REQUIREMENTS OF ASME SECTION III, CLASS 1.

4. THIS P & ID IS REDRAWN FROM THE CE SUPPLIED P & ID, PVNGS DRAWING E-14273-310-110, REVISION NO. 02.

(NOTES CONT. BELOW)

5. ONLY ONE INSTRUMENT CHANNEL IS SHOWN FOR INFORMATION. FOR DETAILS ON OTHER CHANNELS REFER TO INSTRUMENT LOOP DIAGRAMS FOR APPLICABLE INSTRUMENTS.

6. INTERNALS OF CHECK VALVES V064, V065, V066 & CH-V487 ARE REMOVED (REF. DCP 1SM-CH-113).

7. DELETED

8. PIPING CLASS BREAK BOUNDARY IS AT LEAKOFF NIPPLE.

9. THE REFUELING WATER LEVEL MONITORING SYSTEM REFERENCE LEG SENSING LINE CONNECTIONS TO THE FLANGE AT VALVE RCE-V058 AND TO THE CONDENSATE POT TUBING FITTING ASSOCIATED WITH VALVE RCC-V204 ARE APPLICABLE ONLY DURING THE COLD SHUTDOWN AND REFUELING MODES OF OPERATION (MODES 5 & 6). CONNECTIONS SHALL BE MADE WHILE IN MODES 5 OR 6 WHENEVER THE REFUELING WATER LEVEL MONITORING SYSTEM IS REQUIRED BY OPERATIONS. DRAWINGS 13-J-03D-137 AND 13-J-03D-138 SPECIFY THE ACCEPTABLE IN-SERVICE AND OUT-OF-SERVICE SENSING LINE CONFIGURATIONS OF THE REFUELING WATER LEVEL MONITORING SYSTEM.

10. REFUELING RCP BOWL COVERS MAY BE INSTALLED DURING MODES 5 AND 6 TO SUPPORT REFUELING OPERATIONS.

11. UNLESS NOTED OTHERWISE, ISI BOUNDARY ENDS AT THE FIRST ROOT VALVE FOR VENTS, DRAINS, INSTRUMENTATION AND PSV'S WHICH VENT TO THE RDT. FOR CLASS 1 VENTS AND DRAINS ISI BOUNDARY INCLUDES END BLIND FLANGES.

12. SCHEDULE 80, MATERIAL ASTM-SB-167-N06690 PIPING SUPPLIED BY DOOSAN HEAVY INDUSTRIES & CONSTRUCTION AND DESIGNED PER CODE REQUIREMENTS OF ASME SECTION III, CLASS 1.

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NO.	DATE	REVISIONS	DR	CH'K	ENG	IY	X-DISCIP.	MISC.	NAE
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REV. ___ BY ___ SEE MICROFILM FOR PREVIOUS R.P.E. APPROVALS

PALO VERDE NUCLEAR GENERATING STATION

P & I DIAGRAM
REACTOR COOLANT SYSTEM

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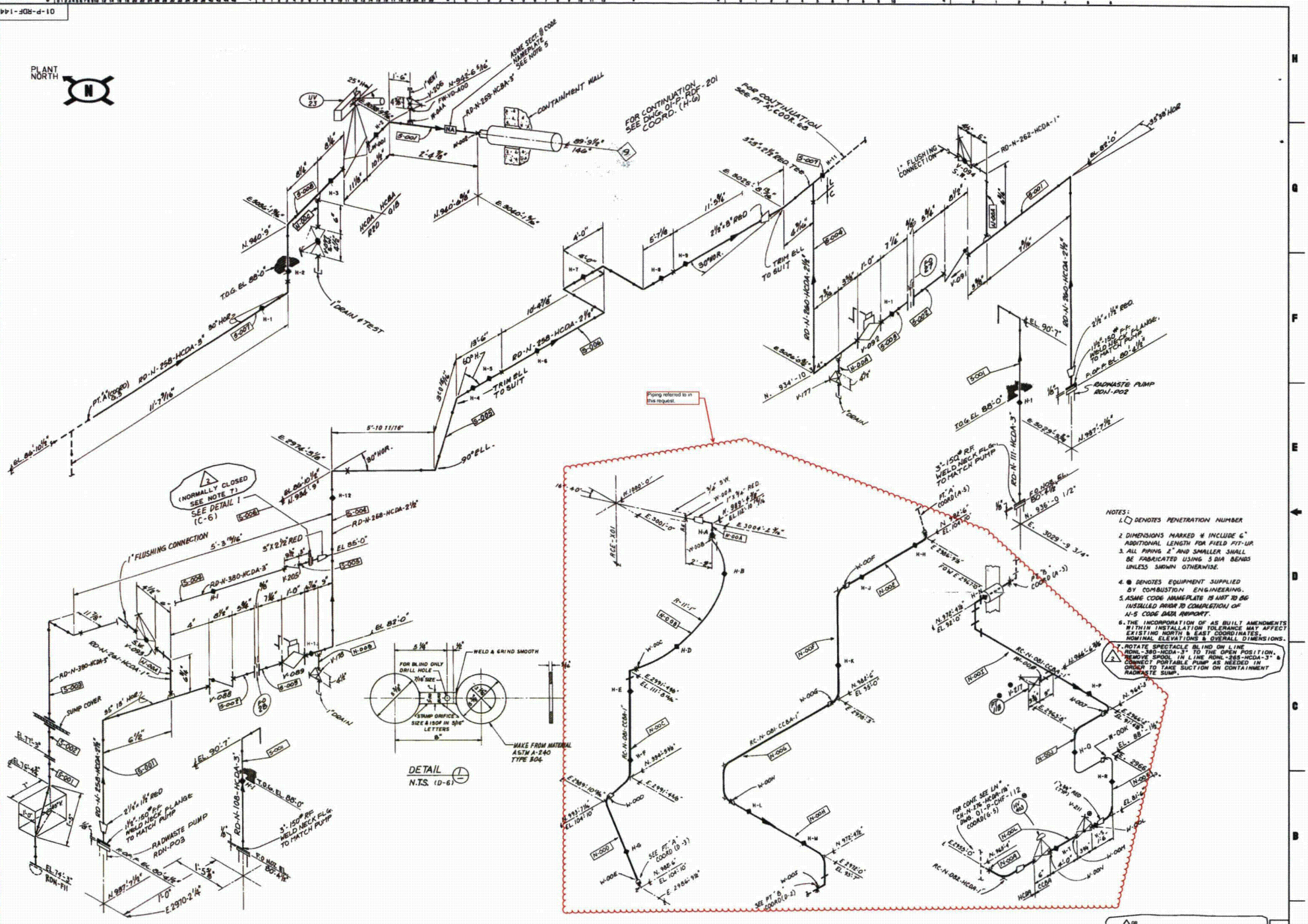

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2		INCORP. EDC 2003-00885. GR AS NOTED.							

DWG. NO. | REFERENCE

PALO VERDE NUCLEAR GENERATING STATION

CONTAINMENT BLDG ISOMETRIC
RADWASTE SYSTEM
RADWASTE SUMP DRAIN

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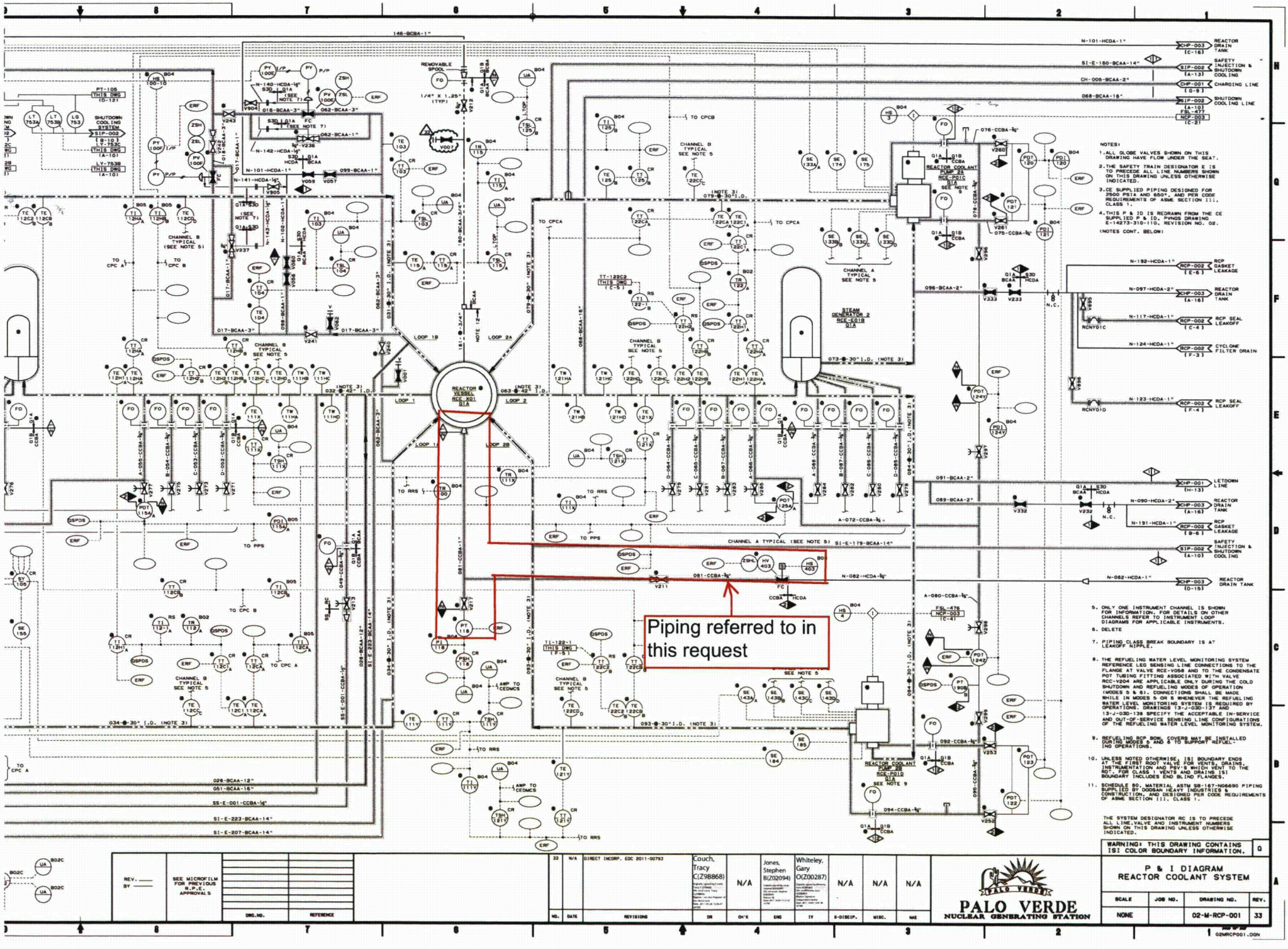

PALO VERDE NUCLEAR GENERATING STATION

P & I DIAGRAM
REACTOR COOLANT SYSTEM

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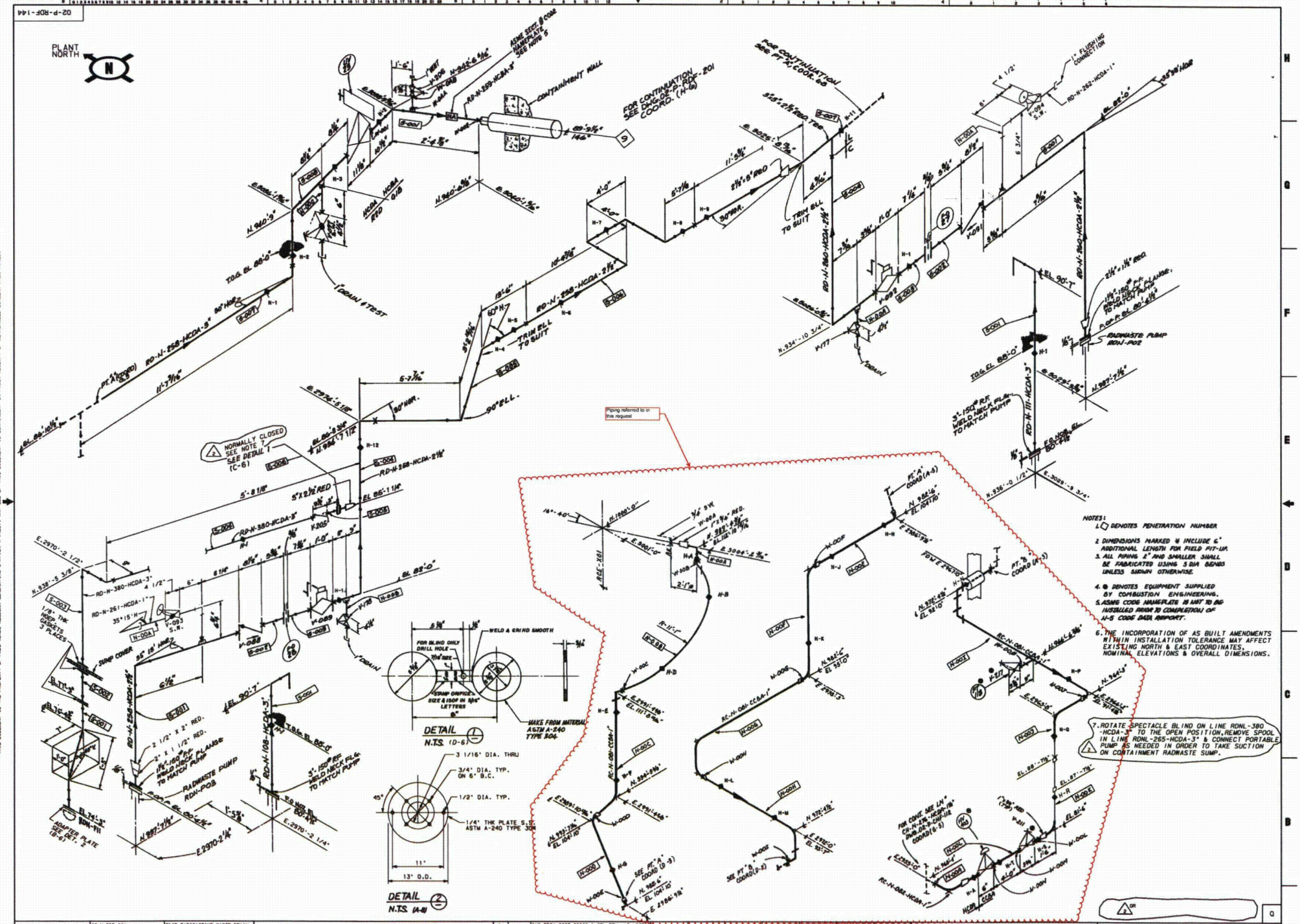
NO.	DATE	REVISIONS	DR	CH'K	ENG	I/V	X-DISCIP.	MISC.	NAE
33	N/A	DIRECT INCORP. EDC 2011-00753	Couch, Tracy C(Z98868)	N/A	Jones, Stephen B(Z02094)	Whiteley, Gary O(Z00287)	N/A	N/A	N/A

SEE MICROFILM FOR PREVIOUS R.P.E. APPROVALS

DWG.NO. REFERENCE

02MRCP001.DGN



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2		INC. EDC* 2003-00866 & GEN. REV. AS NOTED							

PALO VERDE NUCLEAR GENERATING STATION

CONTAINMENT BLDG ISOMETRIC
RADWASTE SYSTEM
RADWASTE SUMP DRAIN

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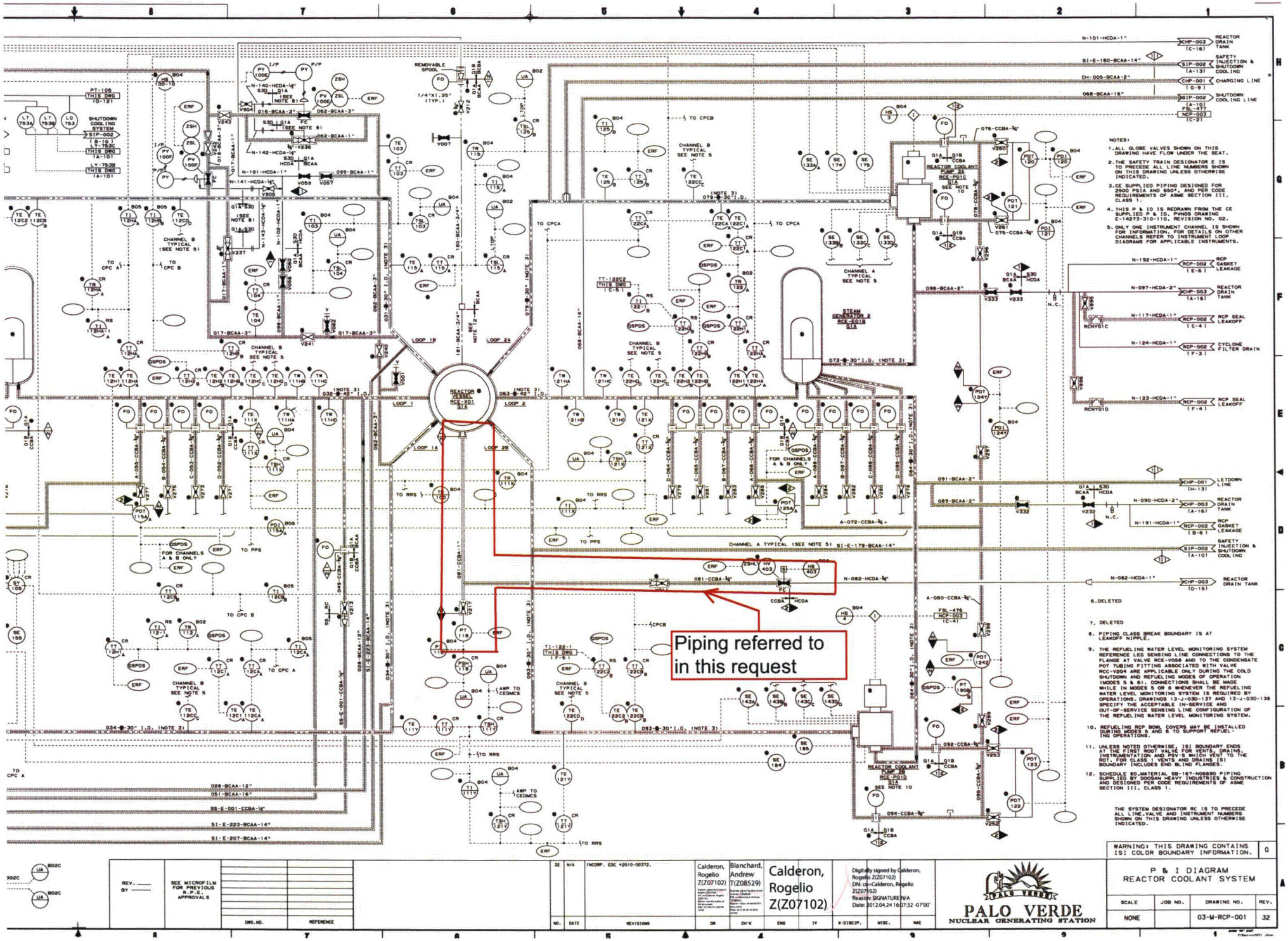

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3. CE SUPPLIED PIPING DESIGNED FOR 2500 PSIA AND 650°, AND PER CODE REQUIREMENTS OF ASME SECTION III. CLASS 1.
4. THIS P & ID IS REDRAWN FROM THE CE SUPPLIED P & ID, PVNGS DRAWING E-14273-310-110, REVISION NO. 02.
5. ONLY ONE INSTRUMENT CHANNEL IS SHOWN FOR INFORMATION. FOR DETAILS ON OTHER CHANNELS REFER TO INSTRUMENT LOOP DIAGRAMS FOR APPLICABLE INSTRUMENTS.

6. DELETED
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REV. — BY —

SEE MICROFILM FOR PREVIOUS P.E. APPROVALS

DWG. NO.	REFERENCE

NO.	DATE	REVISIONS	DR	CH'K	ENG	IV	X-DISCIP.	MISC.	NAE
32	N/A	INCORP. EDC #2010-00372.	Calderon, Rogelio Z(Z07102)	Blanchard, Andrew T(Z08529)	Calderon, Rogelio Z(Z07102)				

Digitally signed by Calderon, Rogelio Z(Z07102)
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PALO VERDE
NUCLEAR GENERATING STATION

P & I DIAGRAM
REACTOR COOLANT SYSTEM

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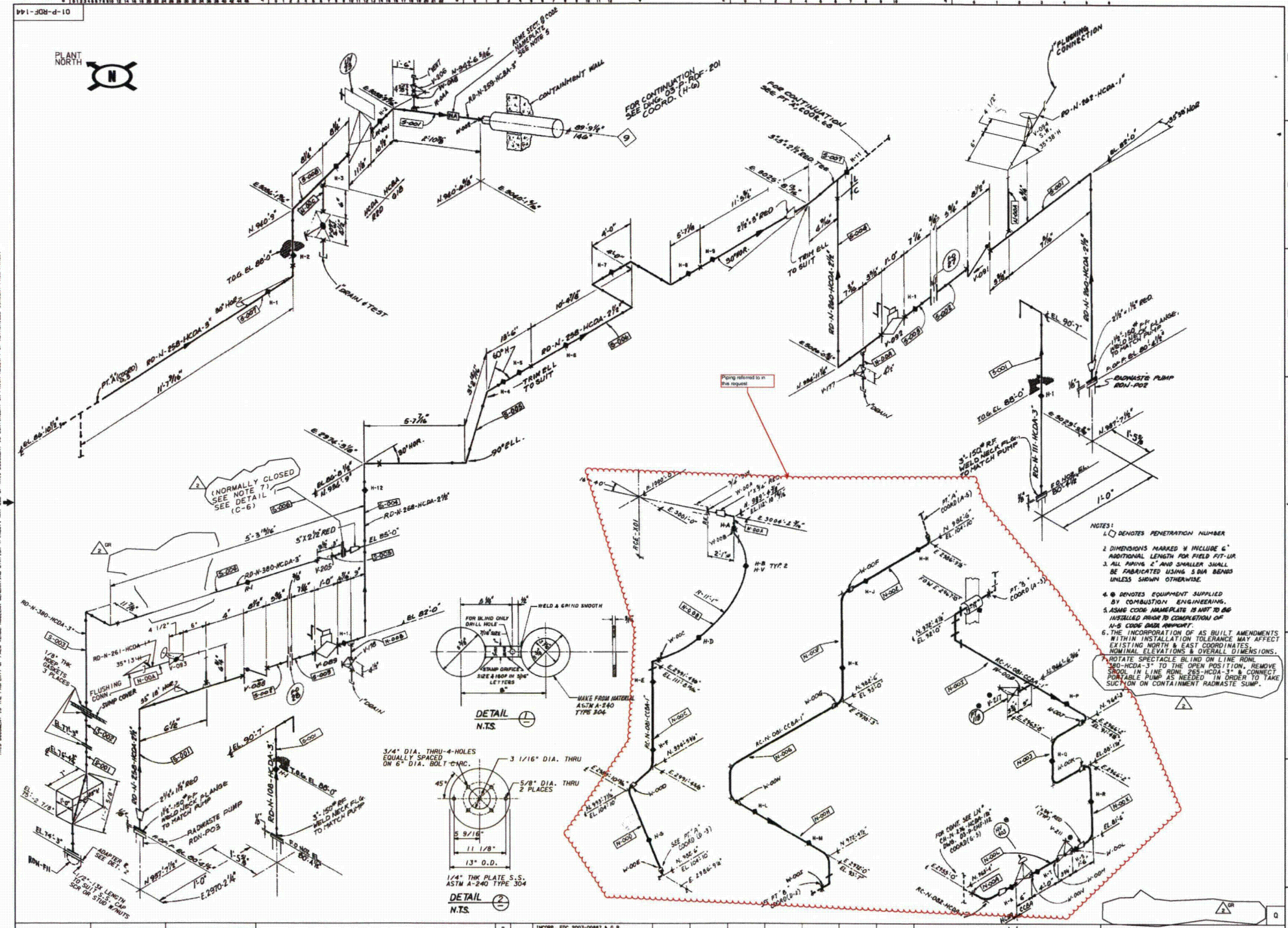

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NO.	DATE	REVISIONS	DR	CH'K	ENG	IV	X-DISCIP.	MISC.	MAE
2		INCORP. EDC 2003-00887 & G.R. TO REMOVE DCN NOTE							

PALO VERDE NUCLEAR GENERATING STATION

CONTAINMENT BLDG ISOMETRIC
RADWASTE SYSTEM
RADWASTE SUMP DRAIN

SCALE	JOB NO.	DRAWING NO.	REV.
NONE		03-P-RDF-144	2

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