North Atlantic

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The Northeast Utilities System

November 6, 1998
Docket No. 50-443
NYN-98122
AR#98015457

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Seabrook Station
NRC Generic Letter 96-06
Response to Request For Additional Information (TAC No. M96864)

Generic Letter (GL) 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated September 30, 1996, included a request for licensees to evaluate cooling water systems that serve containment air coolers to assure that they are not vulnerable to waterhammer and two-phase flow conditions. North Atlantic Energy Service Corporation (North Atlantic) provided its assessment of the waterhammer and two-phase flow issues for Seabrook Station in a letter dated January 28, 1997.

The NRC staff, in an August 12, 1998 letter, requested additional information related to our submittal. In a teleconference on October 30, 1998 between Mr. James M. Peschel of North Atlantic and Mr. John T. Harrison of your staff, the submittal date for the requested information was extended to November 6, 1998. Accordingly, the North Atlantic response to this request is attached.

Should you have any additional questions, please contact Mr. Terry L. Harpster, Director - Licensing Services, at (603) 773-7765.

Very truly yours,

NORTH ATLANTIC ENERGY SERVICE CORP.

Ted C. Feigenbaum
Executive Vice President and
Chief Nuclear Officer

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cc: H. J. Miller, NRC Regional Administrator
J. T. Harrison, NRC Project Manager, Project Directorate 1-3
R. K. Lorson, NRC Senior Resident Inspector

STATE OF NEW HAMPSHIRE

Rockingham, ss. November 6, 1998

Then personally appeared before me, Bruce L. Drawbridge, Director of Services, North Atlantic Energy Service Corporation that he is duly authorized to execute and file the foregoing information in the name and on the behalf of North Atlantic Energy Service Corporation and that the statements therein are true to the best of his knowledge and belief.

Marilyn R. Sullivan

Marilyn R. Sullivan, Notary Public
My Commission Expires: March 19, 2002

NYN-98122

NRC GENERIC LETTER 96-06
RESPONSE TO
REQUEST FOR ADDITIONAL INFORMATION (TAC NO. M96864)

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Waldo, B.	e-mail
Letter Distribution	e-mail
File 0001	01-48
File 0030	01-48
RMD	02-06

ENCLOSURE 1 TO NYN-98122

NORTH ATLANTIC ENERGY SERVICE CORPORATION
NRC GENERIC LETTER 96-06
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (TAC NO. M96864)

1. The licensee's response indicated that the Primary Component Cooling Water (PCCW) system will be isolated and the containment air coolers will not be used following a Phase B isolation. Describe measures that exist, including guidance provided in emergency operating procedures, to assure that plant operators will not use the containment air coolers as an option following Phase B isolation.

   Response: The Containment Structure Cooling Unit fans (the containment air coolers) themselves are not placed in service during phase B containment isolation conditions and are not required to mitigate the consequences of an accident, achieve safe shutdown and to protect the health and safety of the public. However, the Emergency Operating Procedures (EOPs) have provisions to realign the PCCW serving the Containment Structure Cooling Unit fans under certain reactor coolant system and main steam system conditions as part of the recovery phase of the accident response. Procedural steps are performed to allow for operation of the instrument air system (a non-safety related system) within the containment building and for operation of the reactor coolant pumps (non-safety related components). In addition, the EOPs provide guidance to use the Containment Structure Cooling Unit fans once containment pressure is less than 4 psig, a pressure well below the phase B pressure of 18 psig or greater in the containment building. In these two cases (i.e., realignment for instrument air system and reactor coolant pump operation, and Containment Structure Cooling Unit operation once containment pressure is reduced) the actions specified above are taken during the recovery phase of the accident and are not required to mitigate the consequences of the accident or to achieve safe shutdown.

   Based on an engineering evaluation of the possible scenarios as listed in response to question 3 and the description of the worst case scenarios in response to question 6, below, there is a possibility of vapor void development during cooldown of the isolated portion of the PCCW system due to contraction of the isolated mass of water. Based on this, revisions will be made to the EOPs, per the technical issues process of the EOP maintenance program. The proposed revisions apply to the following procedures:

   - E-1, "Loss of Reactor or Secondary Coolant"
   - ES-1.1, "SI Termination"
   - ES-1.2, "Post LOCA Cooldown and Depressurization"
   - E-3, "Steam Generator Tube Rupture"
   - ECA 1.1, "Loss of Emergency Coolant Recirculation"
   - ECA 2.1, "Uncontrolled Depressurization of All Steam Generators"
   - ECA 3.1, "SGTR with Loss of Reactor Coolant - Subcooled Recovery Desired"
   - FR-H.1, "Response to Loss of Secondary Heat Sink"
   - FR-P.1, "Response to Imminent Pressurized Thermal Shock Conditions"
   - FR-I.1, "Response to High Pressurizer Level"

Procedures ES-1.1, ES-1.2, E-3, ECA-1.1, ECA 2.1, ECA 3.1, FR-H.1, FR-P.1, and FR-I.1 currently contain steps to ensure proper alignment for and functioning of instrument air supplies. These steps require the opening of the PCCW containment isolation valves, if closed. There is no sequence of operation of the PCCW valves specified. In order to preclude the possibility of two-phase flow (see response to question 6 for more details), these procedures will be revised to open the supply valves prior to opening the return valves.

A Standing Operating Order has been reviewed by the SORC and issued to direct the operators to take the actions stated above while the EOP changes are being processed.

Procedures E-1, ES-1.1, E-3, ECA 2.1, ECA 3.1, and FR-H.1 each contained steps that check if containment spray should be stopped and if so, to open the containment isolation valves to supply component cooling water to the Containment Structure Cooling Units and to start the associated fans. This is a non-safety related operation to enable further cooling of the containment building. Moreover, the use of the cooling units is not required and does not provide a significant benefit. In order to preclude the possibility of vapor void development due the contraction of water that has cooled down (see response to question 6 for more details), these procedures were revised to delete the actions to open the containment isolation valves and start the fans.

2. The licensee's response indicated that for accident scenarios where Phase B isolation does not occur (containment pressure less than 18 psig), the PCCW head tank provides sufficient overpressure to prevent the occurrence of waterhammer and two-phase flow conditions. Discuss specific system operating parameters and other operating restrictions that must be maintained to assure that the waterhammer and two-phase flow analyses remain valid (e.g., head tank level, pressures, temperatures), and explain why it would not be appropriate to establish Technical Specification requirements to acknowledge the importance of these parameters and operating restrictions. Also, describe and justify reliance on any non-safety related instrumentation and controls in this regard.

   Response: The governing specific system operating parameter on which the evaluation is based is the minimum level in the PCCW head tanks. The tanks are vented to the atmosphere, such that pressure is not a controlled parameter. The temperature of the component cooling water from the head tank to the cooling units is assumed to be at 126 °F. During the time of concern of the postulated transients, the temperature of the PCCW would be close to the normal temperature of 85° F. During subsequent emergency core cooling recirculation in the event of a LOCA, the PCCW temperature may peak to 126° F. This value was conservatively used to determine resulting pressures. Furthermore, the calculated pressure is not sensitive to temperature, such that its control in this regard is not pertinent. Therefore, only head tank level is a true controlling / restricting parameter.

The minimum level in the head tanks used in the evaluation is based on the LO-LO level alarm setpoint. It considered instrument uncertainty towards the low side. This level calculated to an elevation of 68' $5^{1}/_{8}$". The top PCCW connection to the Containment Structure Cooling Units is at elevation 9' 2 1/2". This equates to a head of 59' 2 5/8", or 25.2 psig.

Each of the two PCCW trains has its own head tank. Each of the two head tanks has two sets (each set containing 3 detectors) of redundant level instrumentation and controls that are safety related and 1E (ref: UFSAR Section 7.6.8). A two out of three logic is used for each level instrument set. Therefore, there is no reliance on non-safety related instrumentation and controls in this regard.

Technical Specification 3.7.3 requires that at least two independent primary component cooling water loops be operable. In addition, as indicated on Technical Specification Table 3.3-12, each PCCW System Head Tank has a Rate of Change Monitor to alert the operator of a 100 gallon decrease in level in one hour.

A hard wired alarm alerts the operator of PCCW Head Tank Level LO and directs the operator to procedure OS1212.01, PCCW System Malfunction. If level continues to decrease, a LO-LO PCCW Head Tank Level alarm will be received, at which point the containment isolation valves will close and the containment cooling fans will trip due to low PCCW flow. Again, the engineering evaluation is based on this LO-LO level setpoint including its uncertainty (as opposed to LO level or normal operating level) for the determination of static head provided by the head tanks.

An immediate operational concern associated with a LO-LO signal is the loss of PCCW cooling to the reactor coolant pumps. This warrants a manual reactor trip within 10 minutes as directed in OS1212.01. PCCW supply to containment building loads therefore provides important operational needs and consequently, tank level is an important operational parameter during normal operation.

Based on the above, existing technical specifications, indications, alarms, and procedures provide appropriate requirements and operational information. Therefore, no additional technical specifications are necessary.

3. Implementing measures to assure that waterhammer and two-phase flow conditions will not occur, such as prohibiting post-accident operation of the affected system and maintaining specific PCCW head tank conditions, is an acceptable approach for addressing the waterhammer and two-phase flow concerns. However, all scenarios must be considered to assure that the vulnerability to waterhammer and two-phase flow has been eliminated. Confirm that all scenarios have been considered, such that the measures that have been established are adequate to prevent the occurrence of waterhammer and two-phase flow.

Response: An engineering evaluation was prepared to address NRC Generic Letter 96-06 concerns regarding two-phase flow and waterhammer susceptibility due to void formation. This engineering evaluation has since been revised to amplify the evaluation, based on the request for additional information. The following scenarios are encompassing of the concern and have been evaluated:

- Large Break LOCA with Offsite Power Available
- Large Break LOCA with Loss of Offsite Power (LOOP)
- Small Break LOCA with Offsite Power Available
- Small Break LOCA with LOOP
- Large Break Main Steam Line Break (MSLB) with Offsite Power Available
- Large Break MSLB with LOOP
- Small Break MSLB with Offsite Power Available
- Small Break MSLB with LOOP

The conclusion of this evaluation is that, prior to operator actions during recovery phases, the Containment Structure Cooling Units cooling loops are not susceptible to either waterhammer or two-phase flow conditions during postulated accident conditions. There is a possibility of vapor void development during cooldown of the isolated system due to contraction of the isolated mass of water. As discussed in response to question 1, the emergency operating procedures have been and will be revised to address the potential two-phase flow conditions during recovery from accident conditions. A description of the worst case scenarios that were identified, based upon an evaluation of the spectrum of events listed above, is provided in response to question 6, below.

4. Describe and justify all assumptions and input parameters that were credited in the waterhammer and two-phase flow analyses. Also, explain and justify all uses of "engineering judgment."

Response: Instrument uncertainties were assumed to occur in the conservative direction, as follows:

- The containment isolation of the PCCW loop nominally occurs at 18 psig. Per UFSAR section 7.3.1.2 , the instrument uncertainty is 2.5 % of the span of 0 to 60 psig (or 1.5 psig). The direction of uncertainty is based on the time frame that results in the higher containment building temperature. For the LOCA cases, it is more conservative to assume that the uncertainty results in isolation at a lower pressure. For the MSLB cases, it is more conservative to assume that the isolation occurs at the higher pressure. The pressure at which isolation occurs was then 19.5 psig or 16.5 psig, depending on the event being evaluated.

- The head tank LO-LO level alarm and control is nominally at 18" of tank level (at plant elevation 68' 5 1/8"). The instrument uncertainty is 6.7 % of span, such that the lowest actual level is 14.5" . Conservatively, this lowest level was used to determine the static head provided in the cooling loop.

Other assumptions were as follows:

- As discussed in response to question 1, during the time of concern of the postulated transients, the temperature of the PCCW would be close to the normal temperature of 85° F. During subsequent emergency core cooling recirculation in the event of a LOCA, the PCCW temperature may peak to 126°F. This 126°F value was conservatively used to determine resulting pressures.

- The stroke times for the containment isolation valves range between 3 and 14 seconds. The containment building response for maximum temperature in this range were used. The time to the PCCW loop isolation conservatively used the maximum stroke time of 14 seconds.

- The reset pressure of thermal relief valve is assumed to be at the minimum allowed of 5% below the set pressure. The lowest relief valve set pressure within the PCCW system is 100 psig. A value of 95 psig was therefore used.

- The partial pressure of air in the containment building is dependent upon temperature. This pressure, when subtracted from the containment building pressure, provides the partial pressure of the steam. For the large break MSLB cases, although it is estimated that the temperature would probably be in the vicinity of 300°F, a containment building temperature of 200°F was conservatively used for the purpose of the partial pressure of air.

Engineering judgment was used, as follows:

- During a MSLB, there is a short time interval where superheated conditions exist within the containment building. Based on extrapolation of information developed during Northeast Utilities evaluation of two-phase flow and water hammer potential within the containment cooling system at the Haddam Neck plant, engineering judgment was used to determine the highest temperature to which the cooling coil water will be heated during this time frame prior to isolation upon a phase B containment isolation signal. Specifically, it is judged that the predominant Containment Structure Cooling Unit heat transfer mechanism is condensation heat transfer, which occurs at T_{sat} (i.e., most of the finned tubes are wet and this is where most of the heat transfer occurs). The heat transfer due to the single phase (dry) heat transfer is relatively negligible as compared with the condensing heat transfer for the air/water mixture. Based on the Haddam Neck work, a thermally clean Containment Structure Cooling Unit's outlet temperature is best approximated by the bulk saturation temperature (i. e., slightly below the temperature associated with a wet tube surface in the air/steam mixture). Based on this consideration, it is judged that it is unlikely that the cooling coil temperature will increase significantly above T_{sat} during this time period of the units remaining unisolated (up to 29 seconds).

- An engineering judgment was made that an existing calculation for response of containment building steel to an MSLB is applicable to heat transfer to the PCCW system. The thinnest steel member case is used for an analogy to the cooling coils units and the thickest steel member is bounding for the remainder of the PCCW system.

  The thinnest steel member has a thickness of 0.228 inches. The thermal conductivity of the steel is 26.0 Btu/hr-ft-°F. The thickness of the copper tubes in the cooling coils is 0.049 inches, and the thermal conductivity of the copper is much higher, at about 220 Btu /hr-ft-°F. Therefore, there will be much more heat transfer into the copper portion than to the steel members. However, even if the copper wall is ignored, there is the "thickness" of the water into which the heat is conducted. The thermal conductivity of the water of about 0.4 Btu/hr-ft-°F is much lower than for the steel and the thickness of the water is the inside diameter of the 5/8 (O.D. tubes), or 0.527 inches. This is more than twice the thickness of the steel member analyzed.

  The cooling coils would experience some additional heat transfer (convective) via the forced circulation of the steam /air mixture by the coast down of the fans. However, engineering judgment is that the temperature of the water would still be in the range of the results provided in the heat transfer calculation performed for the thinnest steel member, especially considering that the fans have coasted down and that the conduction calculation analogy is very conservative.

  Other than the tubes of the cooling coils, the PCCW system contains substantially large steel piping, ranging from 4" to 12", with some smaller piping entering the individual loads. The results of the calculation for thermal response inside the containment building of the thickest steel member considered (W30×211 beam), being that this steel is thinner than the smallest piping cross-section, are conservatively applied to the response of temperature in this PCCW piping.

- During realignment of the PCCW system for non-safety related actions, there could be a hot slug of water from the cooling coils of the Containment Structure Cooling Units that enters into a section of the system that may be slightly less than saturation pressure. Downstream of the coils, there is a rise in elevation and additional pressure drops through valves and a flow element that result in a lower pressure. This pressure is 30 psig for loop A and 29 psig for loop B. Further downstream, the pressure then actually increases to 40 psig as the piping elevation decreases (see Figures 1 and 2 for system elevations). However, applying engineering judgment, the small volume (7.2 ft per unit) would mix with the colder surrounding large volumes contained in the 6, 8, and 10 inch piping system in which it enters and also pass through this low pressure portion quickly, such that a significant vapor void would not be expected to occur.

5. Confirm that the waterhammer and two-phase flow analyses included a complete failure modes and effects analysis (FMEA) for all components (including electrical and pneumatic failures) that could impact performance of the cooling water system and confirm that the FMEA is documented and available for review, or explain why a complete and fully documented FMEA was not performed.

   Response: The pressure and temperature effects of LOCAs and MSLBs in the containment building are based on design basis single failures. The UFSAR contains a failure modes and effects analysis for the PCCW System in Table 9.2-9. The conclusion of this FMEA is that the equipment is redundant, such that degradation in one loop is acceptable due to the second completely redundant loop. Each loop provides 100 percent of the required heat removal after an accident.

   Details of the head tank level instrumentation and controls are not provided in Table 9.2-9 but are discussed in section 7.6.8 of the UFSAR. It is stated that the LO-LO level in the head tank is indicative of a possible break in the NNS portion of the PCCW loop. This results in isolation of the loads inside the containment building. There are two sets of level instrumentation for each of the two tanks. Each set contains three level detectors. The tank isolation signal is generated using a two-out-of-three logic. The sensors, activation logic components, and the solenoid valves are classified as Class 1E equipment.

   If a relief valve in the PCCW system did not reseat after lifting due to thermal expansion of the isolated system, the piping would drain, such that upon realignment, the head tanks level would drop. This event is bounded by the "possible break in the NNS portion" of the system discussed in section 7.6.8 of the UFSAR. Upon drop in tank level, there would be an automatic isolation of the non-essential cooling loads.

   The activated components upon either a phase B containment isolation signal or a head tank LO-LO level signal include two containment isolation valves on the supply line and two on the return line. Therefore, any postulated single active failure would still result in an isolated loop as assumed in this engineering evaluation.

   A FMEA associated with a two-phase condition within the system is an evaluation of a potentially common mode failure. North Atlantic's engineering evaluation provides a FMEA in this regard in that the system responses to design basis accident scenarios are evaluated. This engineering evaluation is documented and available for review.

6. Provide a detailed description of the "worst case" scenarios that were identified for the situations where Phase B isolation does, and does not, occur, taking into consideration the complete range of event possibilities, system configurations, and parameters (e.g., temperatures, pressures, flow rates, load combinations, potential component failures).

Discuss the minimum margin to boiling that will exist, taking into consideration instrumentation and analytical uncertainties.

Response: Based on the evaluation of each of scenarios listed in response to question 3, the "worst case" scenarios are a large break LOCA with LOOP and a large break MSLB with LOOP. The LOCA results in a relatively long duration at relatively steady high temperatures within the containment building. The MSLB results in a short duration but higher peak temperature within the containment building. The temperature and pressure responses within the containment building during the range of transients were obtained from Figure 3.11-1 sheet 1, Table 6.2-8, Table 6.2-13 and Table 6.2-14 of the UFSAR. Assumptions, input parameters, instrument uncertainties, and the use of engineering judgment are as discussed in response to question 4, above.

It is noted that, for the scenarios that were identified for the situations where Phase B containment isolation does not occur, the system response and consequences are bounded by the two large break scenarios mentioned above. The "worst case" for when the phase B containment isolation setpoint is not reached is the small break LOCA with LOOP case. In this case, the maximum possible temperature of the water in the cooling coils of the Containment Structure Cooling Units would not exceed 250°F. This corresponds to a saturation pressure of 15.1 psig. As discussed in response to question 2, the minimum static pressure provided by the head tanks is 25.2 psig.

A detailed description of the two "worst case" scenarios (i.e., a large break LOCA with LOOP and a large break MSLB with LOOP) follows.

Large Break LOCA with LOOP

During a large break LOCA with a loss of offsite power, the PCCW pumps would stop running, and the Containment Structure Cooling Unit fans would consequently trip on low PCCW flow. The fans would coast down after the trip and continue to remove heat from the containment atmosphere with no cooling water flow. Therefore, significant heatup of the cooling water would immediately commence. Rising pressure inside the containment would result in the phase B containment isolation signal being reached. The containment isolation valves would close, thus isolating the safety-related portion of the PCCW system from the non-safety related portion serving the Containment Structure Cooling Units. The Phase B containment isolation signal would be reached in about 4 seconds. The containment isolation valves would close in the 7 to 18-second range following initiation of the event. Upon complete isolation, the containment building reaches a maximum temperature of about 255 °F. This corresponds to a saturation pressure of about 32.5 psia, or 17.8 psig.

Even conservatively assuming there were 100 % of the theoretical maximum transfer of heat energy to the cooling water just prior to complete isolation, the temperature of the water in the cooling coils would not exceed 255 °F. The minimum pressure provided by the head tank is 25.2 psig. This exceeds the maximum possible saturation conditions (17.8 psig) within the system. Therefore, there are no waterhammer or two phase flow conditions created at this point.

Once the component cooling water to the containment building loads is isolated, the heated stagnant cooling water will not have any effect on the operating portions of the PCCW, as relief valves are present to prevent overpressurization. Upon heatup of these non-safety related isolated sections, the pressure would rise and be maintained at the lowest reset pressure of the relief valves plus containment building pressure. Based on minimum reset pressure of the lowest thermal relief valve and containment backpressure, the pressure within the PCCW system would be 144.6 psig, or about 159 psia. This corresponds to a saturation temperature of 360 °F.

The maximum temperature within the containment building during a large break LOCA is 273° F. This is the maximum temperature that the component cooling water could reach. The saturation pressure at this temperature is about 44 psia, or 29.3 psig. The PCCW system minimum saturation temperature of 360 ° F is well above the maximum system temperature of 273 °F. Therefore, there are no waterhammer or two phase flow conditions created at this point.

During the short term following a large break LOCA condition, there are no steps specified by the emergency procedures to restore flow to the isolated portion of the cooling system. There is currently guidance in this regard (in the long term) once the pressure inside the containment building is less than 4 psig. This involves alignment for the non-safety related recovery steps involving the operation of containment structure cooling units. Such realignment does not occur until the containment building has cooled down from its peak temperature of 273 °F. If this occurs, there will have been contraction of the isolated mass of water. This will have caused depressurization and consequential boiling in the hottest portion of the system.

In this large break LOCA case, there is a sustained period of high temperature within the containment building, thus allowing the temperature in the cooling system to rise to very close to the containment building peak temperature and approach uniformity throughout the system. The cooling coils will initially be hotter, but prior to cooldown of the building, the remainder of the system will also approach this temperature. This would be followed by a large reduction of temperature, hours to a day later. This cooldown provides the potential for voids to form at the high points of the system, via the contraction of the isolated mass. Once the pressure in the containment is reduced to less than 4 psig, the operators are directed to stop containment building spray, to reopen the containment isolation valves in the component cooling water loop, and to start the Containment Structure Cooling Units. The use of the cooling units is not required and does not provide a significant benefit. Therefore, the steps that align for and start the Containment Structure Cooling Units in the EOPs have been eliminated.

Large Break MSLB with LOOP

During a large break MSLB with a loss of offsite power, the PCCW pumps would stop running, and the Containment Structure Cooling Unit fans would consequently trip on low PCCW flow. The fans would coast down after the trip and continue to remove heat from the containment atmosphere with no cooling water flow. Therefore, significant heatup of the cooling water would immediately commence. Rising pressure inside the containment would result in a phase B containment isolation signal being reached. The containment isolation valves would close, thus isolating the safety-related portion of the PCCW system from the portion serving the non-safety related portion including the Containment Structure Cooling Units.

The Phase B containment isolation signal would be reached in about 15 seconds. The stroke time for the valves is 3 to 14 seconds. The containment building temperature during this 18 to 29 second range for complete isolation reaches a maximum of about 325 °F at about 25 psig, or 40 psia. This is a superheated steam and air mixture. The partial pressure of the air at this temperature is about 20 psi. Therefore, the partial pressure of the saturated steam at this point is 20 psia, which is approximately 228°F.

With off-site power unavailable, the PCCW flow will stop until the PCCW pumps are loaded onto the emergency diesel through the sequencer. This loading does not occur until 32 seconds following initiation of the event, which is after the 29 second time span in question. Therefore, the cooling flow is interrupted up to the point of isolation of the system by the Phase B containment isolation signal. The cooling coil temperature will not increase significantly above T_{sat} (228°F) during this short time period of the units remaining unisolated and without cooling water flow. The minimum pressure provided by the head tank is 25.2 psig (or 39.9 psia) which corresponds to a boiling point of 267°F. This exceeds the maximum possible saturation conditions within the system. Therefore, there are no waterhammer or two phase flow conditions created at this point.

Once the component cooling water to the containment building loads is isolated, the heated stagnant cooling water will not have any effect on the operating portions of the PCCW, as relief valves are present to prevent overpressurization upon heatup of these non-safety related isolated sections. Furthermore, as the water in the isolated loop heats up, the pressure in the system would rise and be maintained at the lowest reset pressure of the relief valves plus containment building pressure. Based on minimum reset pressure of the lowest thermal relief valve and containment backpressure, the pressure within the PCCW system would be 126 psig, or about 140 psia. This corresponds to a saturation temperature of 353 °F. As delineated in the following few paragraphs, this is well above the maximum system temperature. Therefore, there are no waterhammer or two phase flow conditions created at this point.

There is a range of large break MSLB events that were analyzed, as described in the UFSAR. The peak pressure case is 36.1 psig, or 50.8 psia, with a peak temperature of

349 °F. The peak temperature case is 364 °F with a peak pressure of 33.6 psig, or 48.3 psia. For this superheated condition, until the heat transfer surfaces become dry, the predominant heat transfer mechanism is condensation heat transfer, limiting the cooling water temperature rise to not significantly higher than the saturation temperature at the peak pressure. The partial pressure of the air is conservatively estimated to be about 17.5 psia. The partial pressure of steam, in the peak pressure case is therefore 33.3 psia. This corresponds to a saturation temperature of about 257 °F.

However, the peak temperature for these two cases occurs at time beyond the point during which condensation heat transfer is predominant. It occurs at 82 seconds after the initiation of the event in the peak temperature case and 112 seconds after for the peak pressure case. Furthermore, the duration of the superheated condition continues to exist for about 50 seconds beyond this. The duration of the superheated condition is about 120 seconds, or 2 minutes. Therefore, the temperature of the cooling coil fluid may be significantly higher than 257 °F.

The results of a heat transfer calculation for steel members within the containment building reveal that, following the worst case MSLB break, the thin steel member would reach a peak temperature of 314 °F about 100 seconds after the peak containment building temperature is reached (or about 200 seconds after the initiation of the event). The heat transfer by conduction to the water within the Containment Structure Cooling Unit tubes would be less than this case for a thin steel member.

It is noted the cooling coils would experience some additional heat transfer (convective) via the forced circulation of the steam /air mixture by the coast down of the fans. However, the temperature of the water would still be in the range of 314 °F, especially considering that the fans have coasted down and that the conduction calculation analogy is very conservative. Therefore, the temperature in the cooling coils would be well below the saturation temperature of the system of 353 °F as described above.

Subsequent operator action may include realignment of component cooling water to containment heat loads, unisolating the stagnant system. This involves alignment of heat loads to allow for non-safety related recovery steps involving the operation of the inside containment instrument air system, the operation of reactor coolant pumps, and operation of containment structure cooling units. Such realignment is contingent on reactor coolant pressure being above 260 psig and the steam generator supplying the faulted main steam line being completely blown down.

Per section 6.2.1.1 (pg. 6.2-18) of the UFSAR, following a MSLB, the peak containment building pressure occurs either at the time the spray water enters the containment building or at the steam generator dryout time. The peak containment building temperature always occurs at the spray time. The steam generator dryout time for large break MSLBs occurs after the peak temperature, in the range of 173 to 281 seconds after initiation of the event. The containment building will have cooled down to below the super heated region by this time. The cooling coils of the containment structure cooling units is expected to be near the peak temperature at this time. This is in the 3 minute time frame following the initiation of the event. The water temperature would decrease about 40°F at the 16 minute point. It is estimated that the procedural step where realignment occurs would be reached in ten to twenty minutes. Therefore, the cooling coil water temperature would be dropping at the time of the operator action, and by extrapolation would be in the range of 250 to 290°F.

Except for the tubes of the cooling coils, the remainder of the system contains substantially large piping, ranging from 4" to 12", with some smaller piping entering the individual loads. Conservatively applying the results of the calculation for thermal response of thickest steel member within the containment building, the results for a large break MSLB are that the temperature peaks for this piping would be about 250 °F. In fact, it is fairly level at the peak temperature from about 3 minutes to 16 minutes after the accident, with a drop in temperature from the peak of about 3 °F. Extrapolating this data, it is therefore reasonable to expect that the temperature would not drop by more than 10 °F, even with operator action 30 minutes after the accident.

When this cooldown of the system occurs, there will have been contraction of the isolated mass of water. This will have caused depressurization and subsequent boiling in the hottest portion of the system (the cooling coils of the containment structure cooling units).

Because the loop is isolated as opposed to unisolated, the impact of such boiling is much different than the Diablo Canyon case cited in Generic Letter 96-06. This is due to the very small decrease in volume by cooldown contraction. As mentioned above, the cooling coils may cool down about 60 degrees, and the remainder of the piping about 10 degrees. The volume of water in the tubes is 7.2 ft^3. This compares to a total containment loop volume of 445 ft^3. Therefore, the average system temperature change would still be about 10 degrees. The contraction of water for the 10 °F reduction in temperature from 250 to 240 °F for the bulk of the containment building portion of the cooling water is about 0.47 percent. This would be the maximum volume that the steam bubbles from the boiling would occupy. This is much less than the volume that could be occupied by a steam bubble if allowed to grow based on a change in density from liquid to steam. The pressure in the system would therefore be maintained at the saturation point of the hottest portion of the system. The total volume of the resulting bubbles would be very small (0.47 percent of the volume).

Bubbles created by this boiling would rise and mix with the subcooled water and consequently be dissipated prior to an equilibrium throughout the system being reached. In this manner, bubbles would not have opportunity to collect at high points and form a vapor void and create the possibility of water hammer. Equilibrium temperature conditions are not expected prior to operator action to unisolate the system.

Another potential concern is that, at the time of realignment of cooling water flow for instrument air and operation of RCPs, the water in the cooling coils for the Containment Structure Cooling Units, following a MSLB, may be close to the saturation temperature of operating pressure at the return line to the PCCW pumps. As discussed above, the saturation temperature at the coolers, based on the static pressure provided by the head tanks is 267 °F. As also discussed above, the cooling coil water would be 250 to 290 °F at the time the system is realigned. Hence, the temperature could be higher than the saturation pressure.

Although the pressure will be higher, even without flow through the containment loads (the case when return lines are opened first), than that provided by the head tanks alone, it may still not be high enough in the event that the temperature in the coolers were at higher end of the 250 to 290 °F range. Therefore, if the cooling water return line were opened prior to the supply lines, the pressure of the heretofore isolated portion of the cooling system could drop such as to allow a small amount of boiling to occur. Unlike the stagnant condition described above, the bubbles could grow somewhat because of the pressure drop in a now-open system without upstream pressure from a PCCW pump. This creates the possibility of a two-phase flow mixture, albeit containing a relatively small amount of steam. Upon reinitiation of flow, there would be a small risk of water hammer. As evaluated below, however, high enough containment loop pressures would result if the supply lines were opened first.

With an operating system, the typical pressure at the coolers is obtained from existing flow distribution calculations. The pressure at the inlet of the coolers ranges from 92 to 100 psig and the outlet of the cooling coils is 60 psig, or 74.7 psia. The saturation pressure at 290°F is 57.55 psia. Therefore, there is not a two phase condition created within the cooling coils.

However, downstream of the coils, there is a rise in elevation and additional pressure drops through valves and a flow element that result in a lower pressure. This pressure is approximately 30 psig for loop A and 29 psig for loop B. Further downstream, the pressure then actually increases to 40 psig as the piping elevation decreases (see Figures 1 and 2 for system elevations). The saturation temperature at the lowest pressure (29 psig, or 43.7 psia) is about 273°F. Although this is below the 290°F maximum expected coil water temperature, the small volume (7.2 ft^3 per unit) would mix with the colder surrounding large volumes contained in the 6, 8, and 10 inch piping system in which it enters and also pass through this low pressure portion quickly, such that a significant vapor void would not be expected to occur.

Based on the above, the steps for realignment of cooling water for instrument air and reactor coolant pump operation will be revised to specify the cooling water supply containment isolation valves are opened prior to opening the return containment isolation valves.

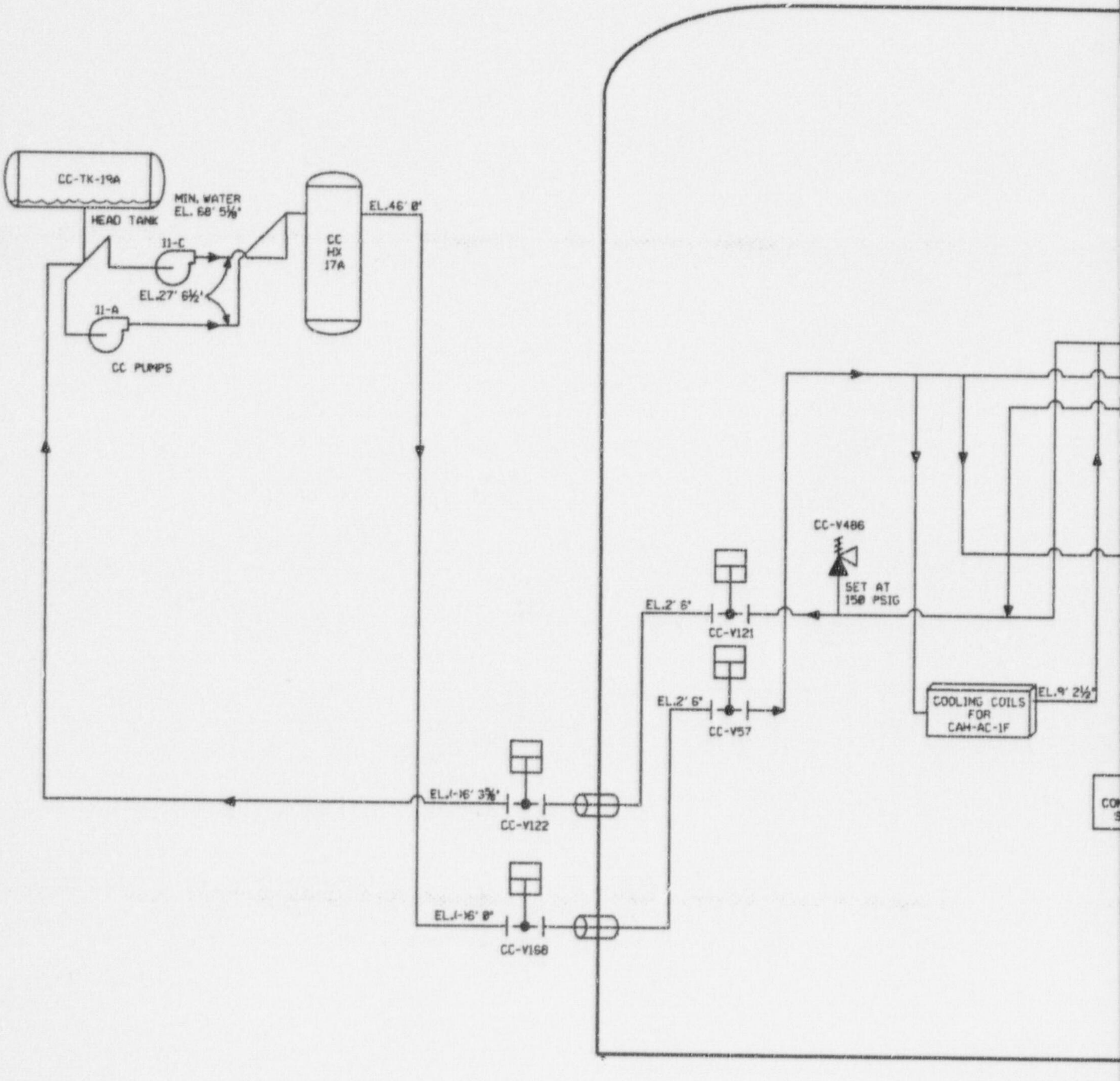
7. Provide a simplified diagram of the affected system showing major components, active components, relative elevations, lengths of piping runs, and the location of any orifices and flow restrictions.

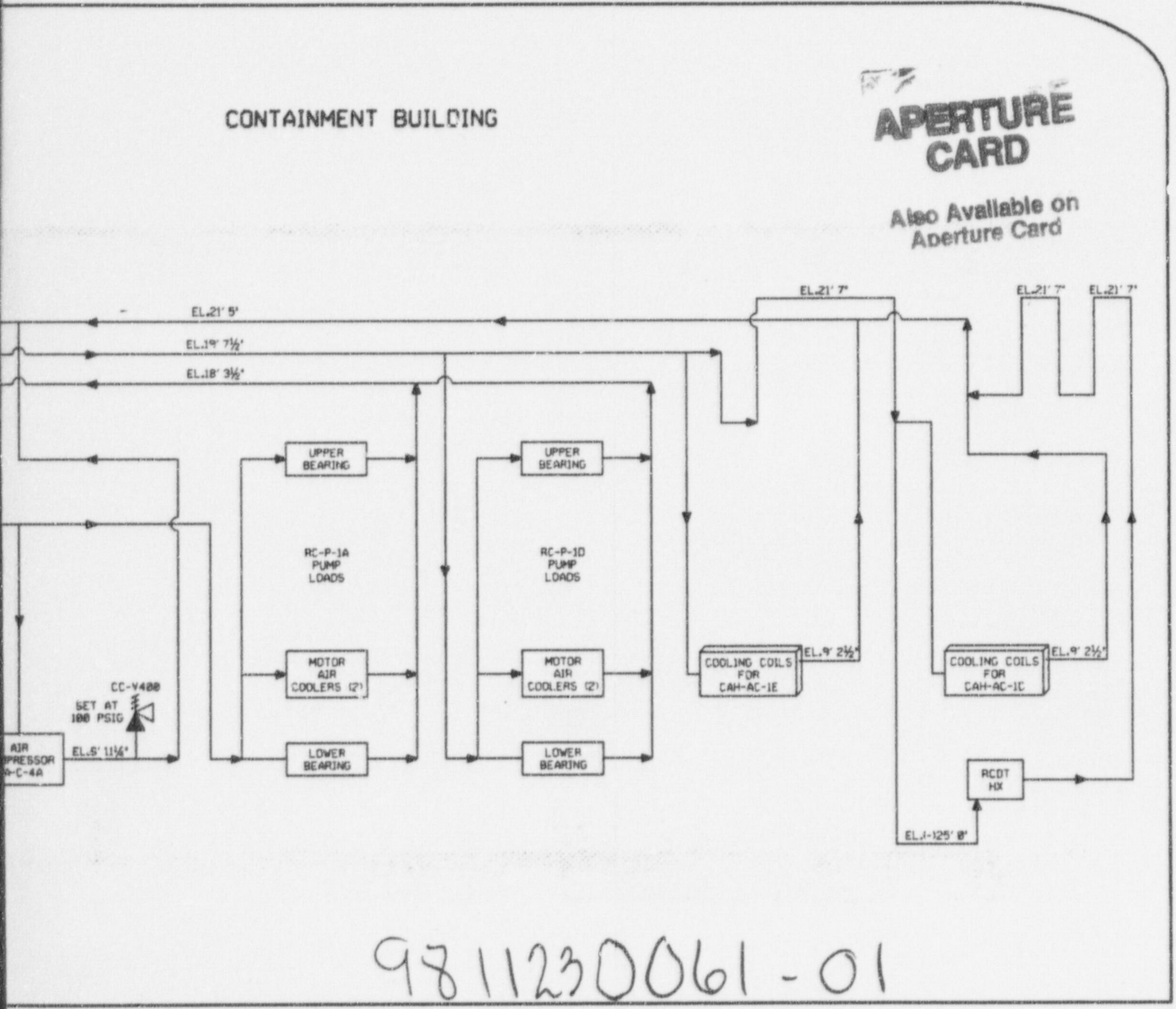
Response: Figures 1 and 2, attached, provide simplified diagrams for each of the two trains (loops A and B) of the PCCW system. Active components and relative elevations are shown. Although lengths of piping runs and orifices and flow restrictions are not shown, these components were used in the existing flow distribution calculations for the PCCW system. The resulting data from these calculations were used in North Atlantic's engineering evaluation. The pertinent P&IDs that show orifices and flow restrictions for the diagrammed portion of the system are provided in Figures 9.2-4 (sheets 1,3,4) and 9.2-6 (sheets 1,3,4,5) of the UFSAR (copies enclosed). The piping isometric drawings that were used to develop the figures also depict lengths of piping runs. These drawings are available for review at North Atlantic, if desired.

8. Describe in detail any plant modifications or procedure changes that have been made or are planned to be made to resolve the waterhammer and two-phase flow issues.

Response: Changes have been and will be made to Emergency Operating Procedures for non-safety related recovery actions. Details are provided in response to question 1. A Standing Operating Order has been reviewed by the Station Operation Review Committee and issued to direct the operators to take the actions as described in the answer to question 1, while the EOP changes are being processed. No plant modifications are needed to resolve the waterhammer and two-phase flow issues.

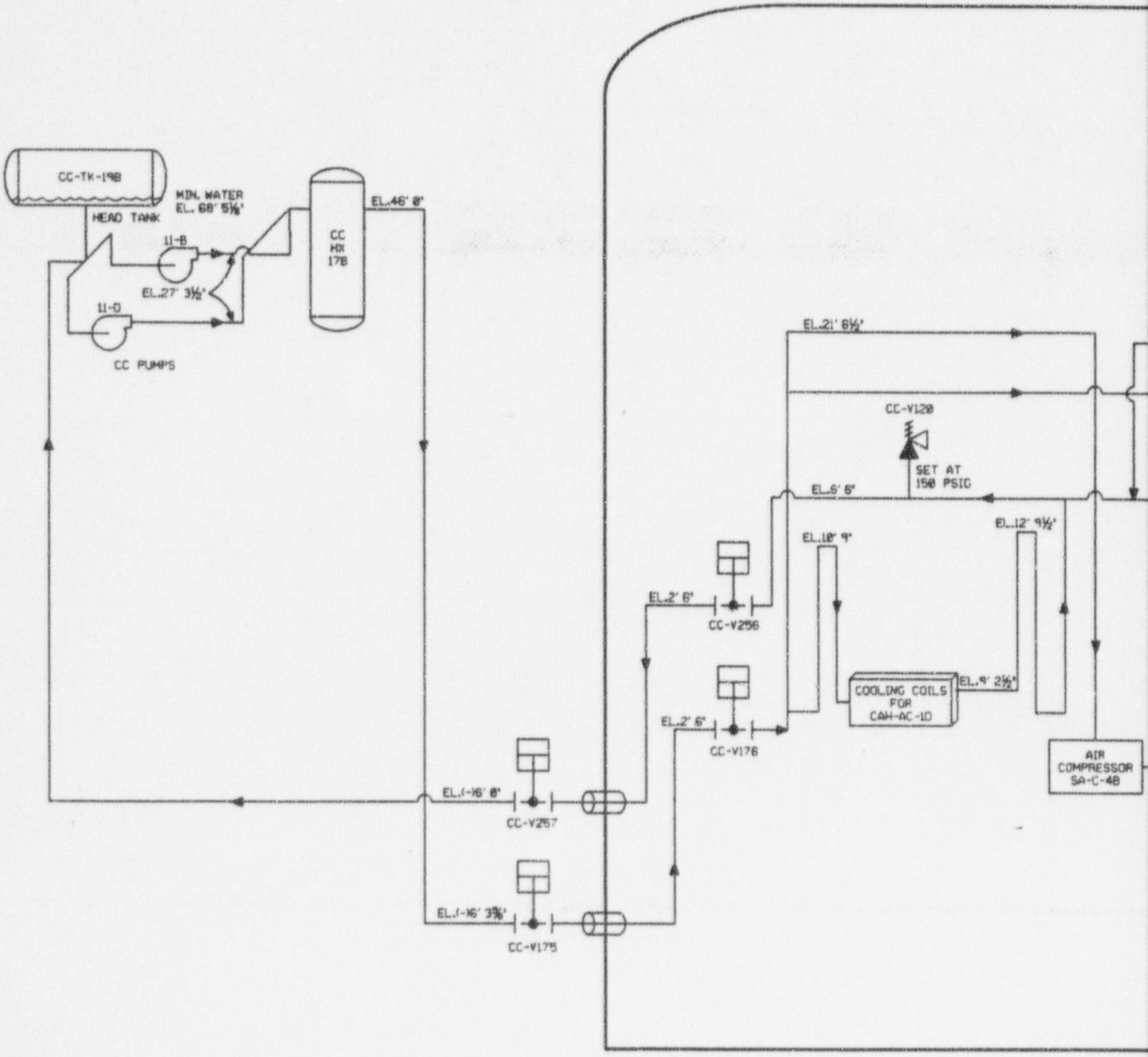
ENCLOSURE 2 TO NYN-98122

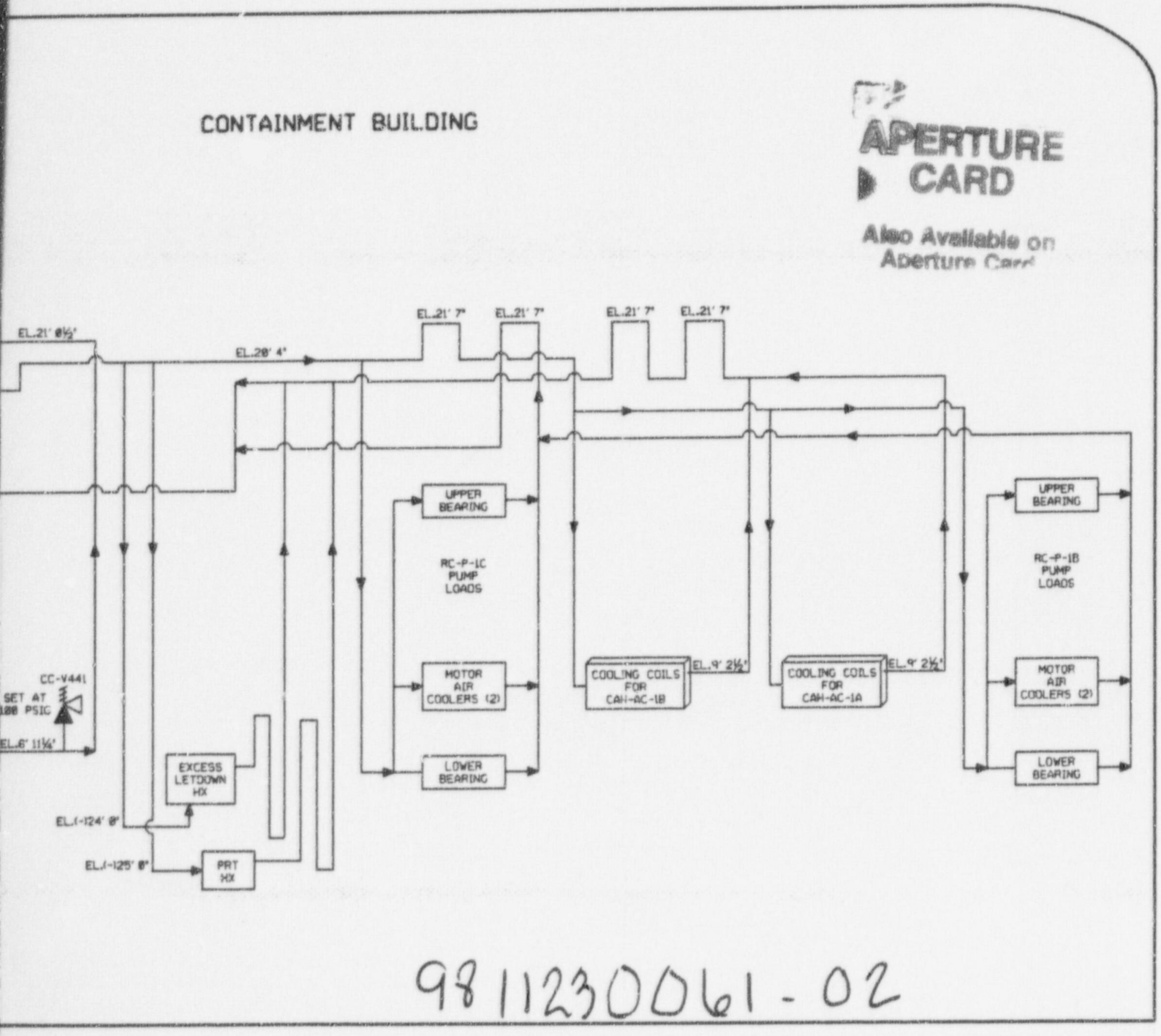

CC-TK-19A
HEAD TANK
MIN. WATER
EL. 68' 5⅛"
11-C
11-A
EL.27' 6½"
CC PUMPS
CC
HX
17A
EL.46' 0"
CC-V486
SET AT
150 PSIG
EL.2' 6"
CC-V121
EL.2' 6"
CC-V57
COOLING COILS
FOR
CAH-AC-1F
EL.9' 2½"
EL.(-16' 3⅝"
CC-V122
EL.(-16' 0"
CC-V168
CON
S



9811230061-01

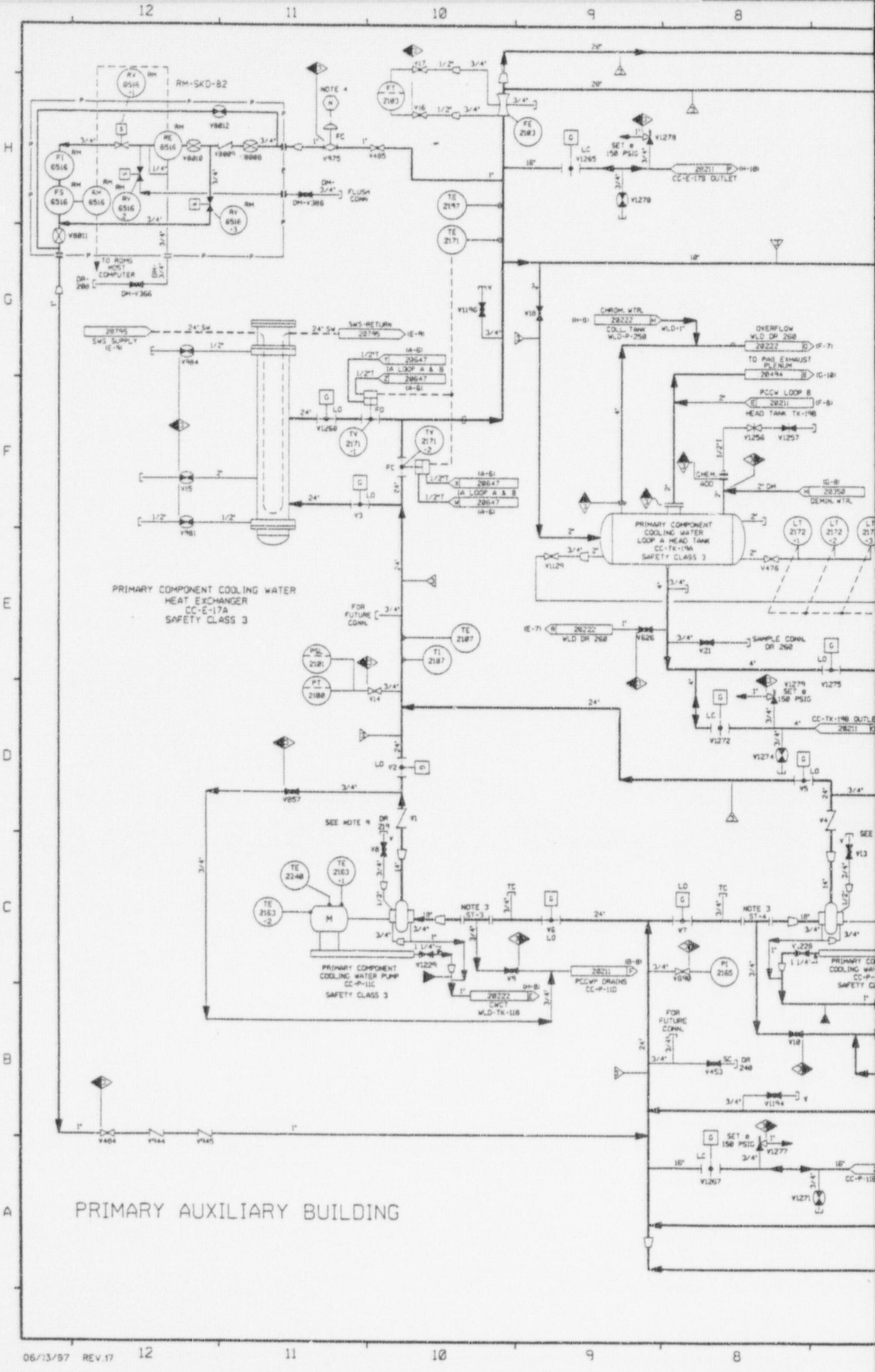
Figure 1 PCCW (CC) Loop A


CC-TK-19B
HEAD TANK
MIN. WATER
EL. 68' 5⅛'
11-B
11-D
EL.27' 3½'
CC PUMPS
CC
HX
17B
EL.46' 0'
EL.21' 6½'
CC-V120
SET AT
150 PSIG
EL.8' 6"
EL.10' 9'
EL.12' 9½'
EL.2' 6'
CC-V256
EL.2' 6'
CC-V176
COOLING COILS
FOR
CAH-AC-1D
EL.9' 2½'
AIR
COMPRESSOR
SA-C-4B
EL.(-16' 0"
CC-V257
EL.(-16' 3⅝'
CC-V175



9811230061-02

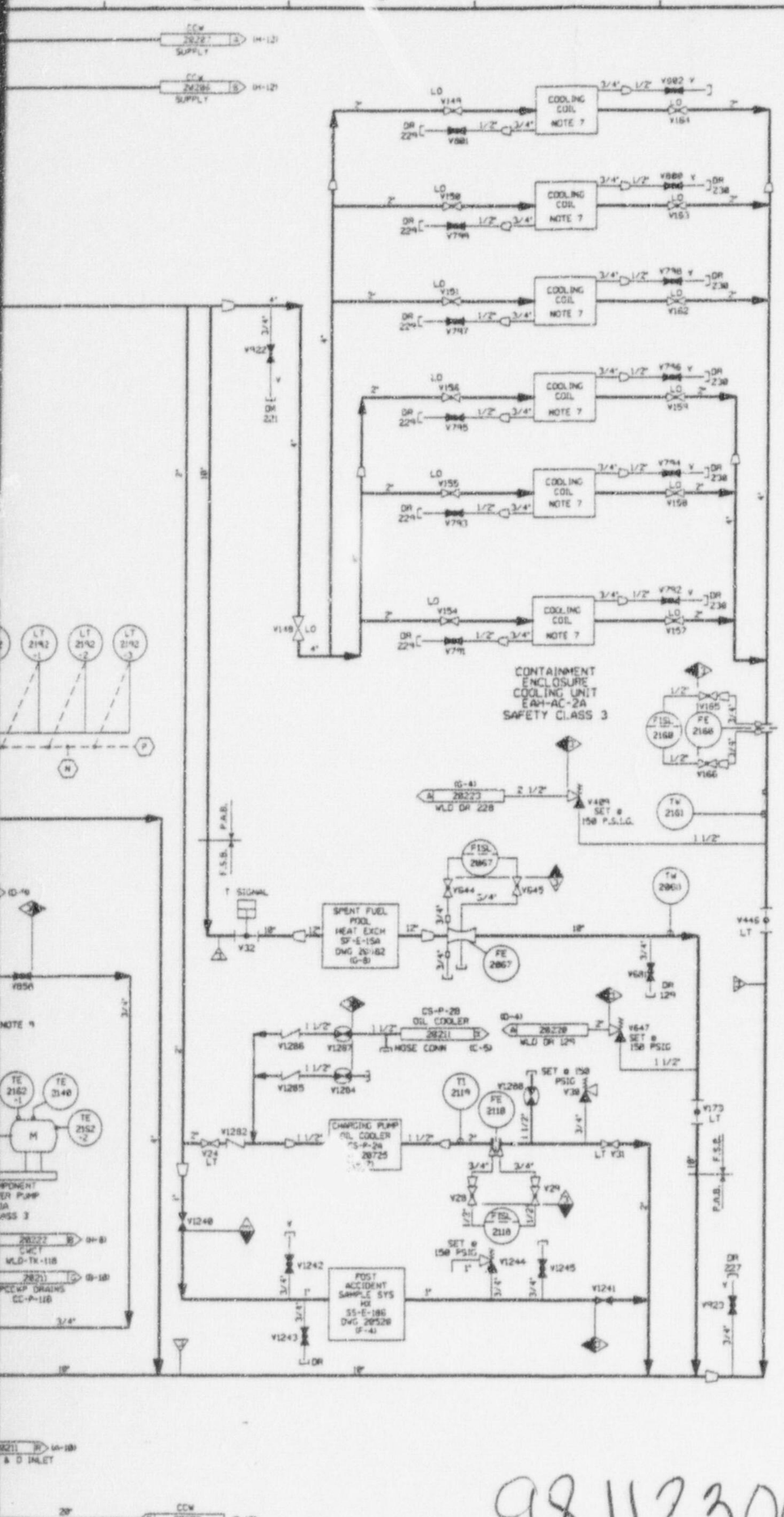
Figure 2 PCCW (CC) Loop B

12
11
10
9
8
H
G
F
E
D
C
B
A
RM-SKD-82
RV 6516 -1
RE 6516
FI 6516
FS 6516
RH 6516
RV 6516 -2
RV 6516 -3
V8012
V8011
V8010
V8009
V8008
TO RDMS HOST COMPUTER
DM-V366
DM-V386
FLUSH CONN
NOTE 4
FC
V975
V485
PT 2103
FE 2103
V17
V16
LC V1265
SET @ 150 PSIG
V1278
V1270
20211 CC-E-17B OUTLET
(H-10)
TE 2197
TE 2171
V1196
V18
CHROM. WTR. 20222 COLL. TANK WLD-P-250
WLD-1"
OVERFLOW WLD DR 260 20222
(F-7)
TO PAB EXHAUST PLENUM 20494
(G-10)
PCCW LOOP B 20211 HEAD TANK TK-19B
(F-8)
V1256
V1257
CHEM. ADD
20350 DEMIN. WTR.
(G-8)
PRIMARY COMPONENT COOLING WATER LOOP A HEAD TANK CC-TK-19A SAFETY CLASS 3
LT 2172 -1
LT 2172 -2
V1129
V476
20795 SWS SUPPLY (E-9)
SWS-RETURN 20795 (E-9)
24" SW
V984
V15
V981
20647 IA LOOP A & B
(A-6)
V1258
TV 2171 -1
TV 2171 -2
FO
V3
PRIMARY COMPONENT COOLING WATER HEAT EXCHANGER CC-E-17A SAFETY CLASS 3
FOR FUTURE CONN
TE 2107
TI 2107
PSL 2101
PT 2100
V14
(E-7) 20222 WLD DR 260
V626
V21
SAMPLE CONN DR 260
V1275
V1279 SET @ 150 PSIG
LC V1272
CC-TK-19B OUTLET 20211
V1274
V5
V2
LO
V857
SEE NOTE 9
DR 219
V8
V1
V4
V13
TE 2240
TE 2163 -1
TE 2163 -2
M
PRIMARY COMPONENT COOLING WATER PUMP CC-P-11C SAFETY CLASS 3
NOTE 3 ST-3
NOTE 3 ST-4
TC
V6 LO
V7
V1229
V9
20211 PCCWP DRAINS CC-P-11D
(B-8)
20222 CWCT WLD-TK-118
(H-8)
V690
PI 2165
V1228
PRIMARY COMPONENT COOLING WATER
V10
FOR FUTURE CONN
SC DR 240
V453
V1194
V484
V944
V945
SET @ 150 PSIG
V1277
LC V1267
V1271
PRIMARY AUXILIARY BUILDING
06/13/97 REV.17

REV. 05

FOR P&ID REFERENCE DRAWINGS, SYMBOLS AND ABBREVIATIONS
REFER TO DRAWINGS P&ID - LEGEND 1 AND P&ID - LEGEND 2

3



NOTES:

1. WORK THIS DRAWING WITH DRAWINGS B20204 AND B20206 THROUGH B20215.
2. ALL LINES, EQUIPMENT, COMPONENTS AND INSTRUMENTS HAVE SYSTEM PREFIX "1-CC", UNLESS NOTED OTHERWISE.
3. PERMANENT SPOOL PIECE INSTALLATION SHOWN. TEMPORARY STRAINER IS USED IN PLACE OF SPOOL PIECE DURING INITIAL FLUSHING OPERATION. STRAINER TO BE REMOVED BEFORE PLANT START-UP.
4. (N) CLOSE ON HEAD TANK TK-19A LOW LEVEL SIGNAL. SIGNAL TO V426 & V427 ON DWG CC-20206, AND V975 ON THIS DWG. (H-11)

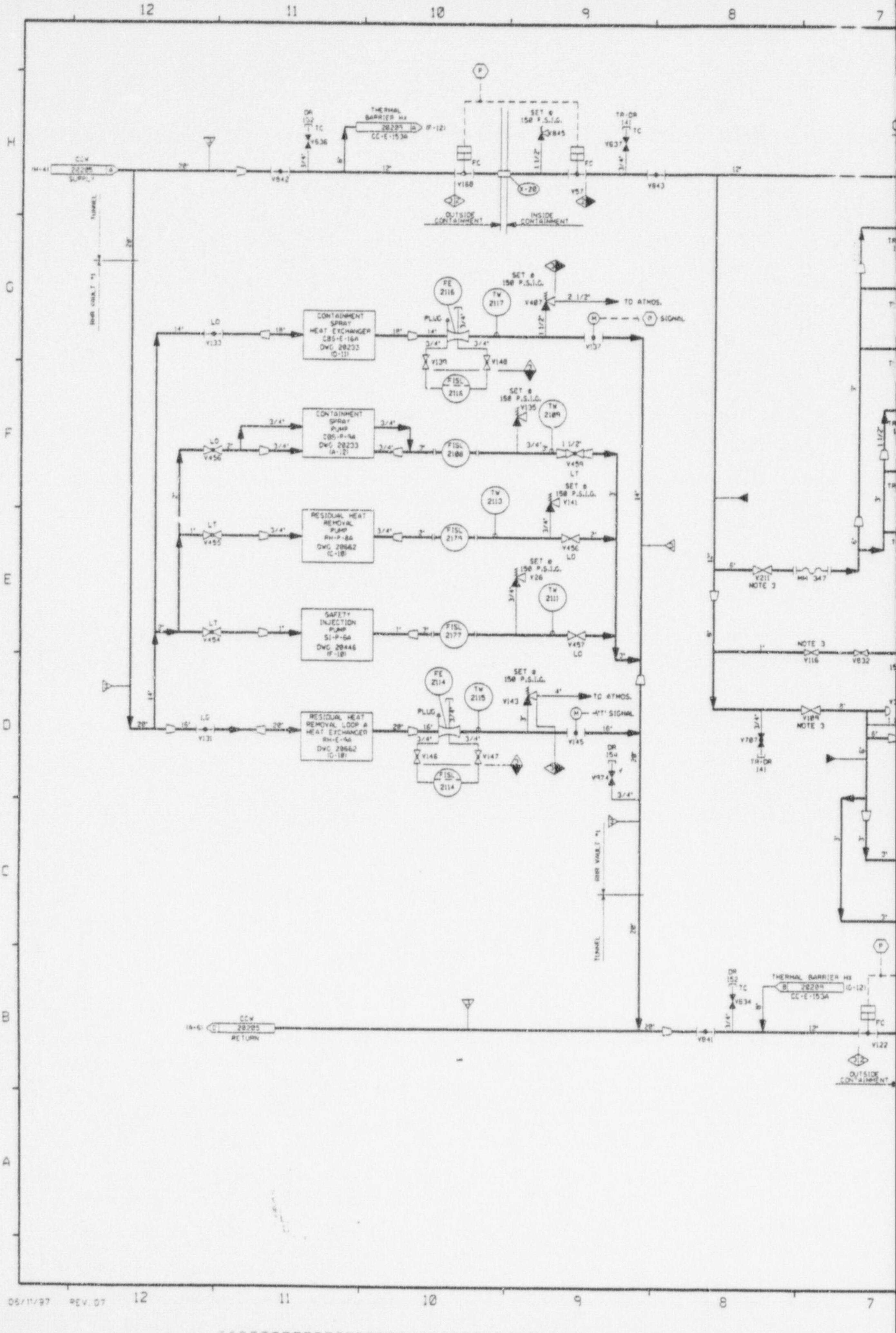
   (P) SIGNAL TO V122, V168, V121 & V57 ON DWG. CC-20207
5. VENT & DRAIN CODE BREAKS ARE AT THE DOWNSTREAM END OF THE OUTER ISOLATION VALVE PER 1-NHY-005111 UNLESS OTHERWISE NOTED.
6. △ - INDICATES REVISION LEVEL.
7. CONTAINMENT ENCLOSURE AIR HANDLING FOR AC-2A SEE DWG 1-HAH-20495 (D-6).
8. CONNECTION TO BE USED FOR FLUSHING SEE DWG DM-20350 (F-9) & NOTE 7.
9. QUICK DISCONNECTS MAY BE INSTALLED UPSTREAM OF PIPE CAPS AS DEEMED NECESSARY BY STATION STAFF TO FACILITATE VENT AND DRAIN OPERATIONS.

9811230061-03

SEABROOK STATION UPDATED
FINAL SAFETY ANALYSIS REPORT

PRIMARY COMPONENT COOLING
LOOP A
DETAIL

CC-20205 | FIGURE 9.2-4 | SH 1

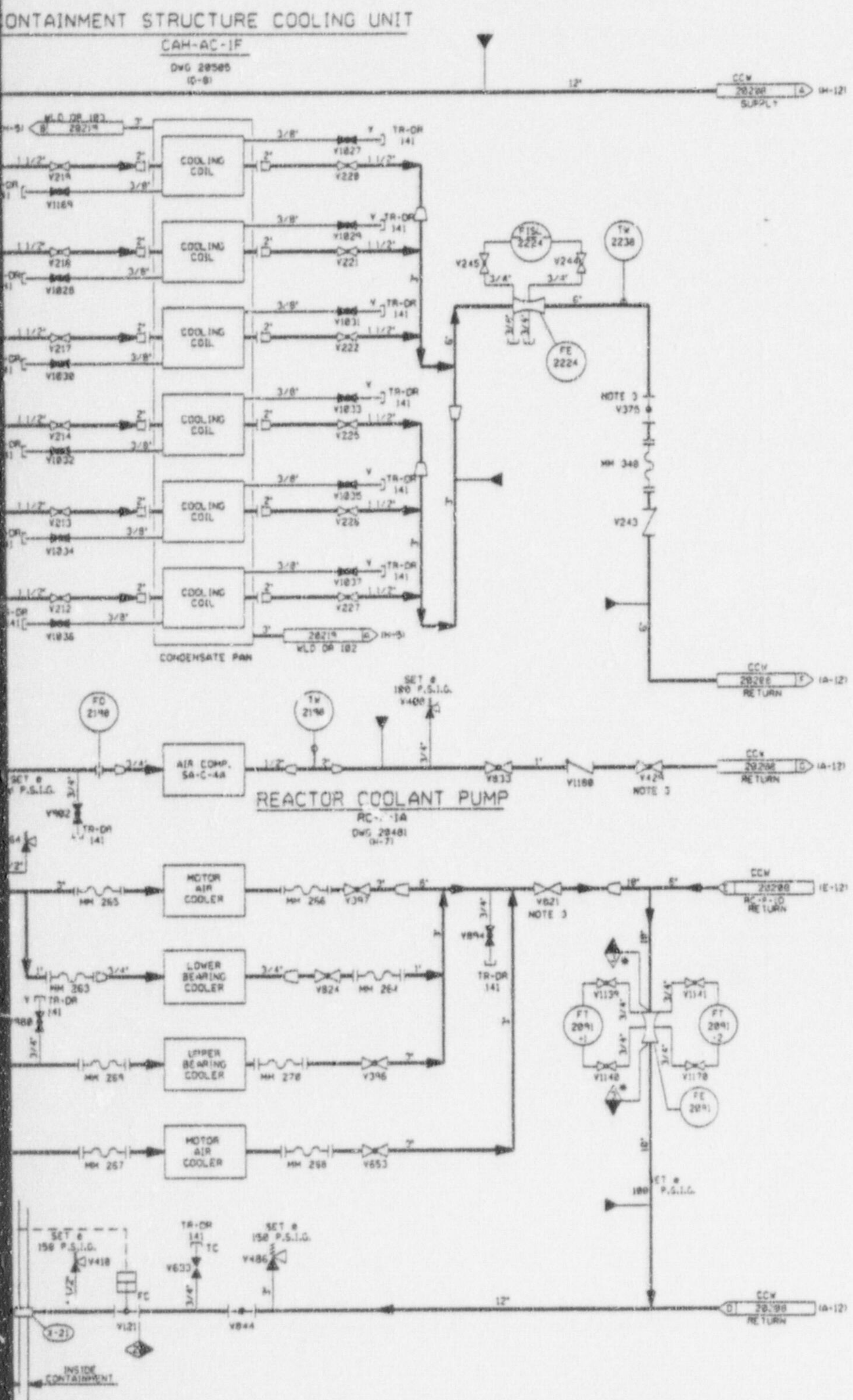


05/11/97 REV. 07

REV 05

FOR P&ID REFERENCE DRAWINGS, SYMBOLS AND ABBREVIATIONS
REFER TO DRAWINGS P&ID - LEGEND 1 AND P&ID - LEGEND 2

4



NOTES:

1. WORK THIS DRAWING WITH DRAWINGS 20204, 20205, 20206, & 20208 THROUGH 20215.
2. ALL LINES, EQUIPMENT, COMPONENTS AND INSTRUMENTS HAVE SYSTEM PREFIX CC UNLESS NOTED OTHERWISE.
3. EQUIPMENT ISOLATION VALVE INSIDE CONTAINMENT ARE OPERABLE FROM THE CONTAINMENT ANNULUS.
4. VENT, DRAIN & TEST CONNECTIONS CODE BREAKS ARE AT THE DOWNSTREAM END OF THE OUTER ISOLATION VALVE PER 1-NH-[illegible]20511 UNLESS OTHERWISE NOTED.
5. △ INDICATES REVISION LEVEL
6. INSTRUMENT REFERENCES

   (F) CLOSE ON "P" SIGNAL OR HEAD TANK 19A LOW LOW LEVEL SIGNAL DWG. 20205

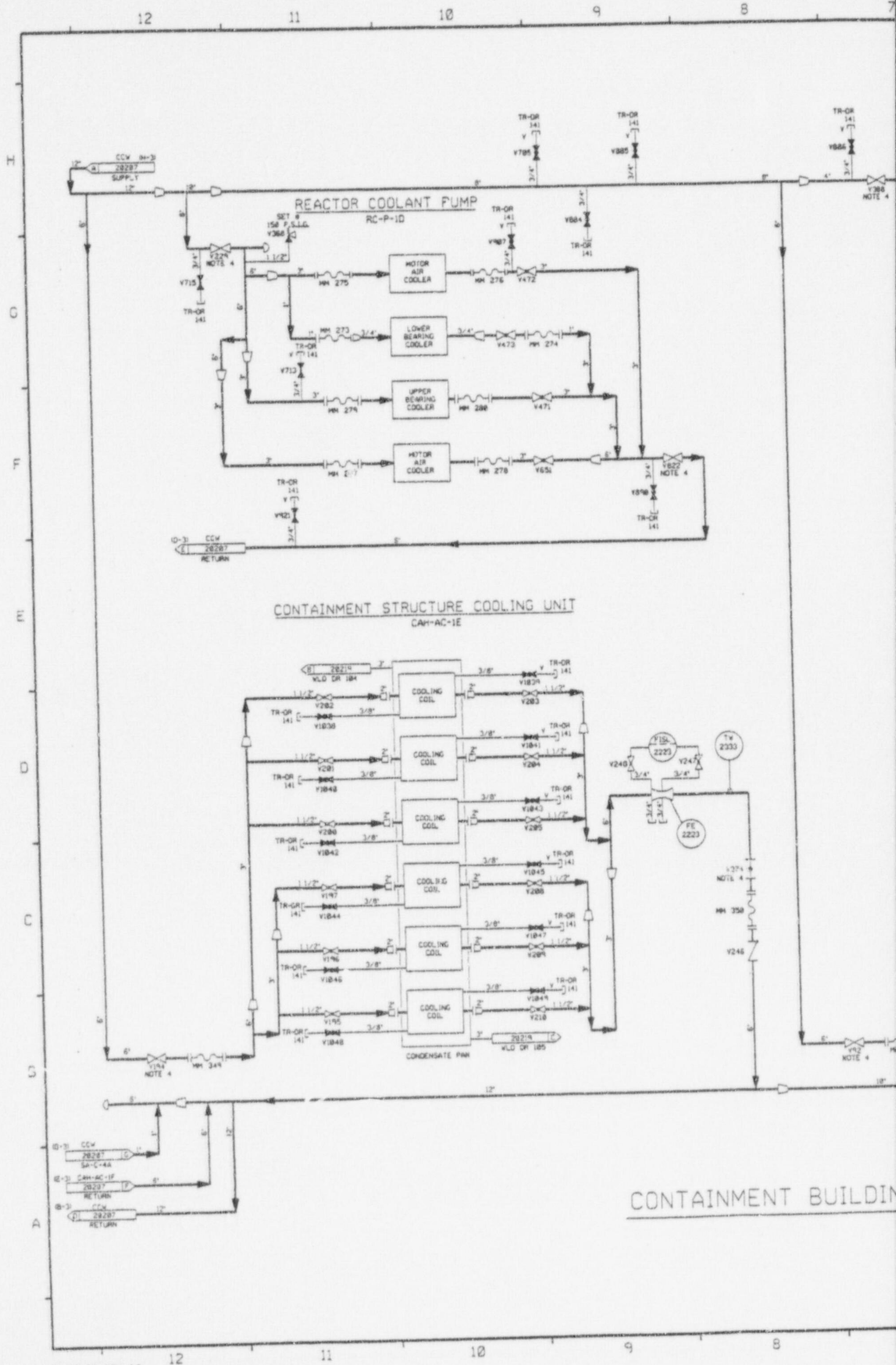
9811230061-04

SEABROOK STATION UPDATED
FINAL SAFETY ANALYSIS REPORT

PRIMARY COMPONENT COOLING
LOOP A
DETAIL

CC-20207

FIGURE 9.2-4 SH 3

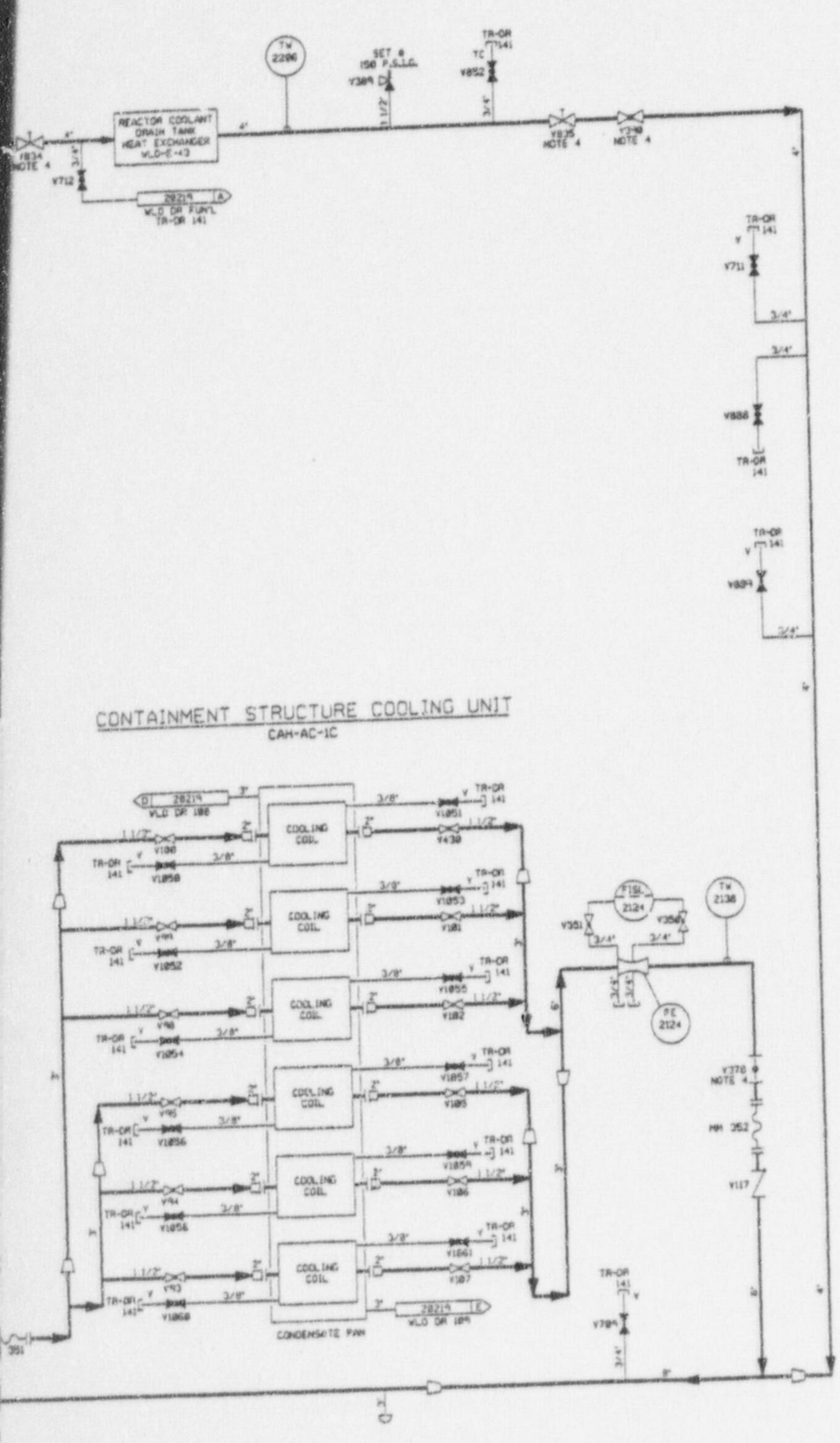


04/13/92 REV. 03

REV. 02

FOR P&ID REFERENCE DRAWINGS, SYMBOLS AND ABBREVIATIONS
REFER TO DRAWINGS P&ID - LEGEND 1 AND P&ID - LEGEND 2

5



APERTURE CARD

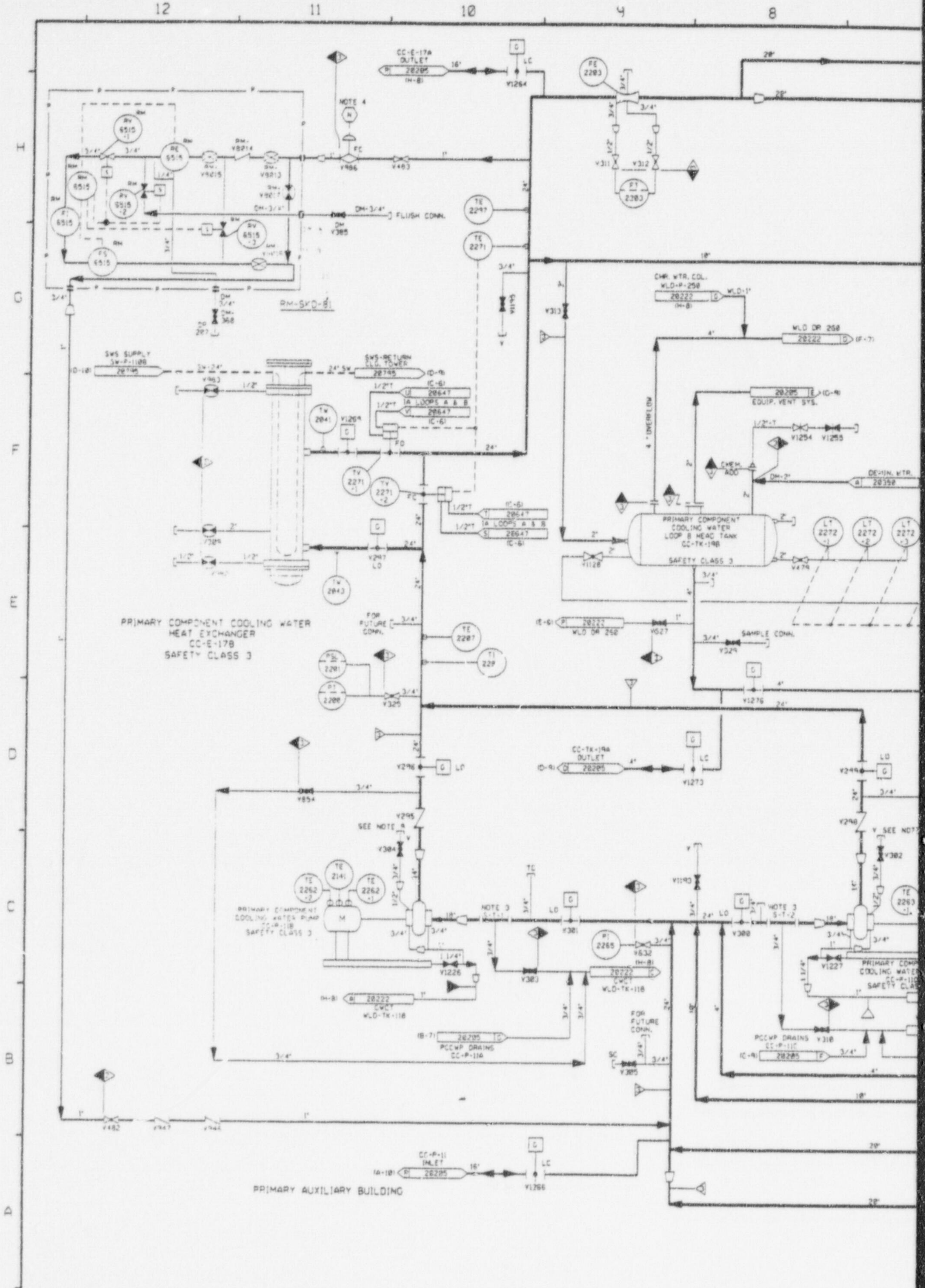
Also Available on Aperture Card

NOTES:

1. WORK THIS DRAWING WITH DRAWINGS 20204, 20205, 20206, 20207, & 20209, THROUGH 20215.
2. ALL LINES, EQUIPMENT, COMPONENTS & INSTRUMENTS HAVE SYSTEM PREFIX 1-CC UNLESS NOTED OTHERWISE.
3. ALL LINES, EQUIPMENT, COMPONENTS AND INSTRUMENTS ARE SAFETY SAFETY CLASS N, UNLESS NOTED OTHERWISE.
4. EQUIPMENT ISOLATION VALVES LOCATED INSIDE CONTAINMENT ARE OPERABLE FROM THE CONTAINMENT ANNULUS.
5. VENT & DRAIN CODE BREAKS ARE AT THE DOWNSTREAM END OF THE OUTER ISOLATION VALVES PER DESIGN STANDARD M-001 UNLESS OTHERWISE NOTED.
6. △ INDICATES REVISION LEVEL.

9811230061-05

SEABROOK STATION UPDATED FINAL SAFETY ANALYSIS REPORT	PRIMARY COMPONENT COOLING LOOP A DETAIL	
	CC-20208	FIGURE 9.2-4 SH 4

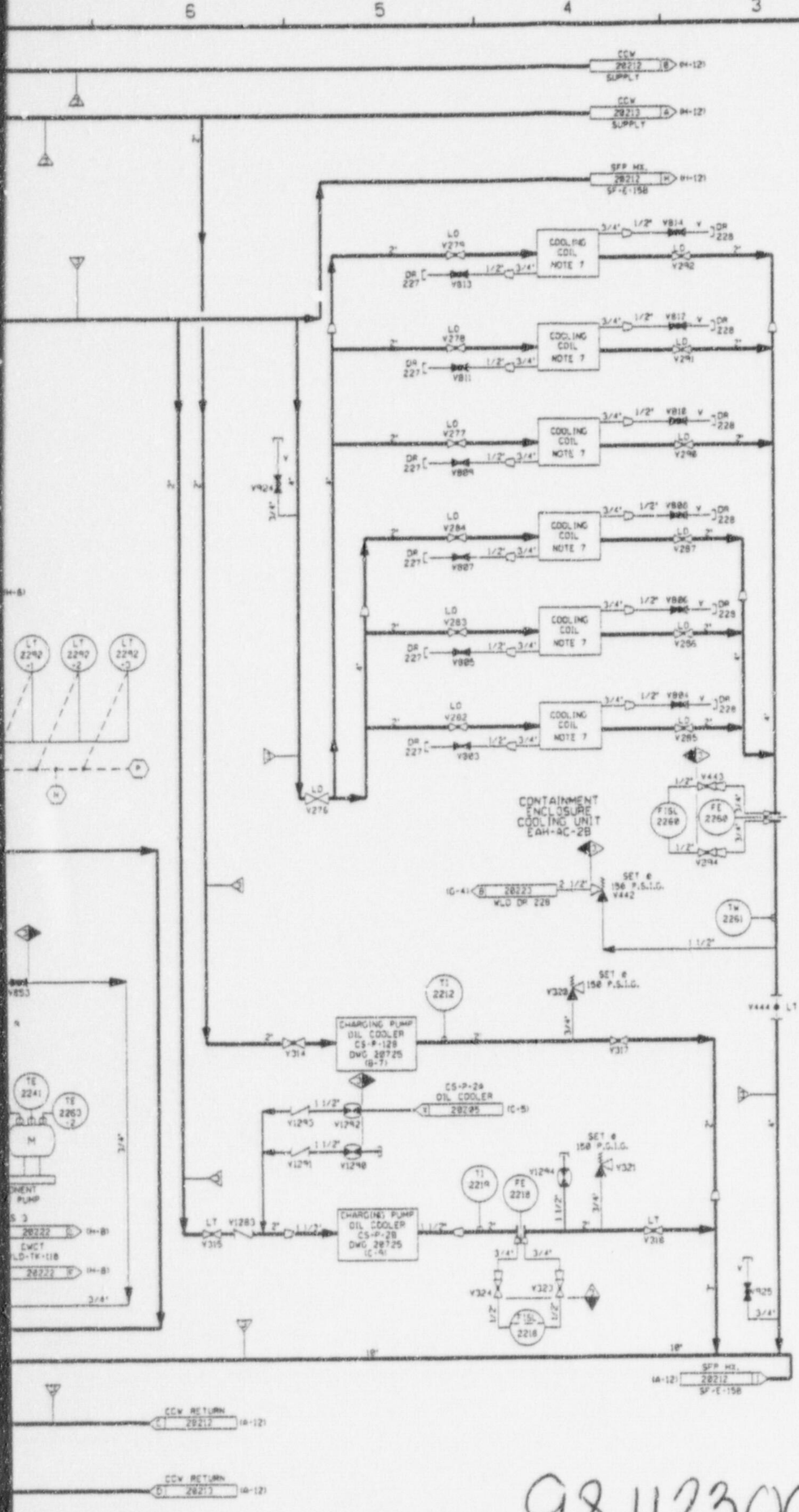


05/28/97 REV.11

REV. 05

FOR P&ID REFERENCE DRAWINGS, SYMBOLS AND ABBREVIATIONS REFER TO DRAWINGS P&ID - LEGEND 1 AND P&ID - LEGEND 2

6



NOTES:

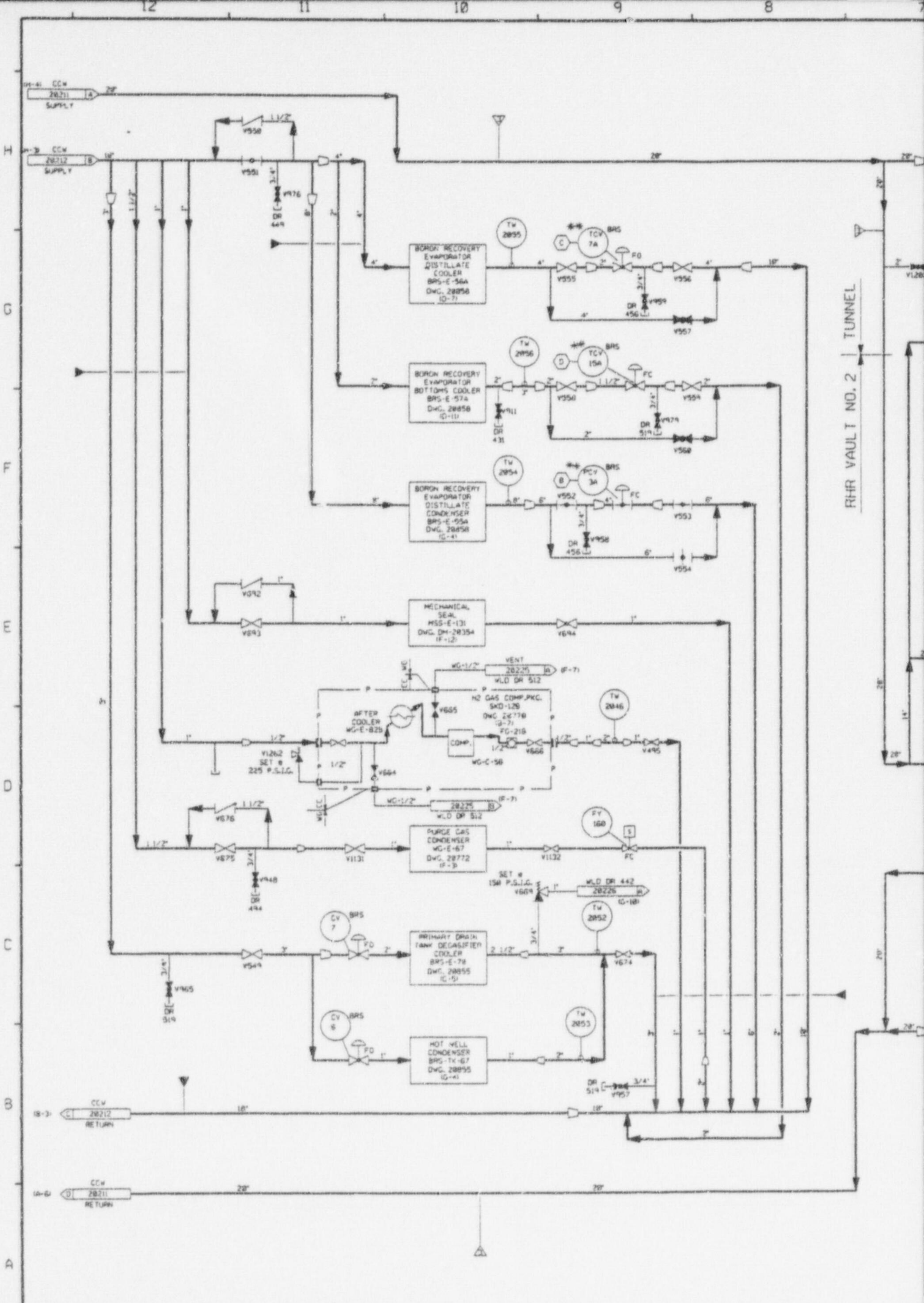
1. WORK THIS DRAWING WITH DRAWINGS 20204 THROUGH 20215.
2. ALL LINES, EQUIPMENT, COMPONENTS AND INSTRUMENTS HAVE SYSTEM PREFIX "1-CC" UNLESS NOTED OTHERWISE.
3. PERMANENT SPOOL PIECE INSTALLATION SHOWN. TEMPORARY STRAINER IS USED IN PLACE OF SPOOL PIECE DURING INITIAL FLUSHING OPERATION. STRAINER TO BE REMOVED BEFORE PLANT START-UP.
4. (N) CLOSE ON HEAD TANK TK-19B LOW LEVEL SIGNAL. SIGNAL TO CC-V447 AND CC-V448 ON DWG CC-20212, AND CC-V486 ON THIS DWG (H-3).
   (P) SIGNAL TO CC-V175, CC-V176, CC-V256 & CC-V257 ON DWG. CC-20213
5. VENT & DRAIN CODE BREAKS ARE AT THE DOWNSTREAM END OF THE OUTER ISOLATION VALVE PER 1-NHY-805111 UNLESS OTHERWISE NOTED.
6. △ - INDICATES REVISION LEVEL.
7. CONTAINMENT ENCLOSURE AIR HANDLING FOR AC-2B SEE DWG 1-MAH-20495 (E-6).
8. CONNECTION TO BE USED FOR FLUSHING SEE DWG DM-20350 (E-11) & NOTE 6.
9. QUICK DISCONNECTS MAY BE INSTALLED UPSTREAM OF PIPE CAPS AS DEEMED NECESSARY BY STATION STAFF TO FACILITATE VENT AND DRAIN OPERATIONS.

9811230061-06

SEABROOK STATION UPDATED
FINAL SAFETY ANALYSIS REPORT

PRIMARY COMPONENT COOLING
LOOP "B"
DETAIL

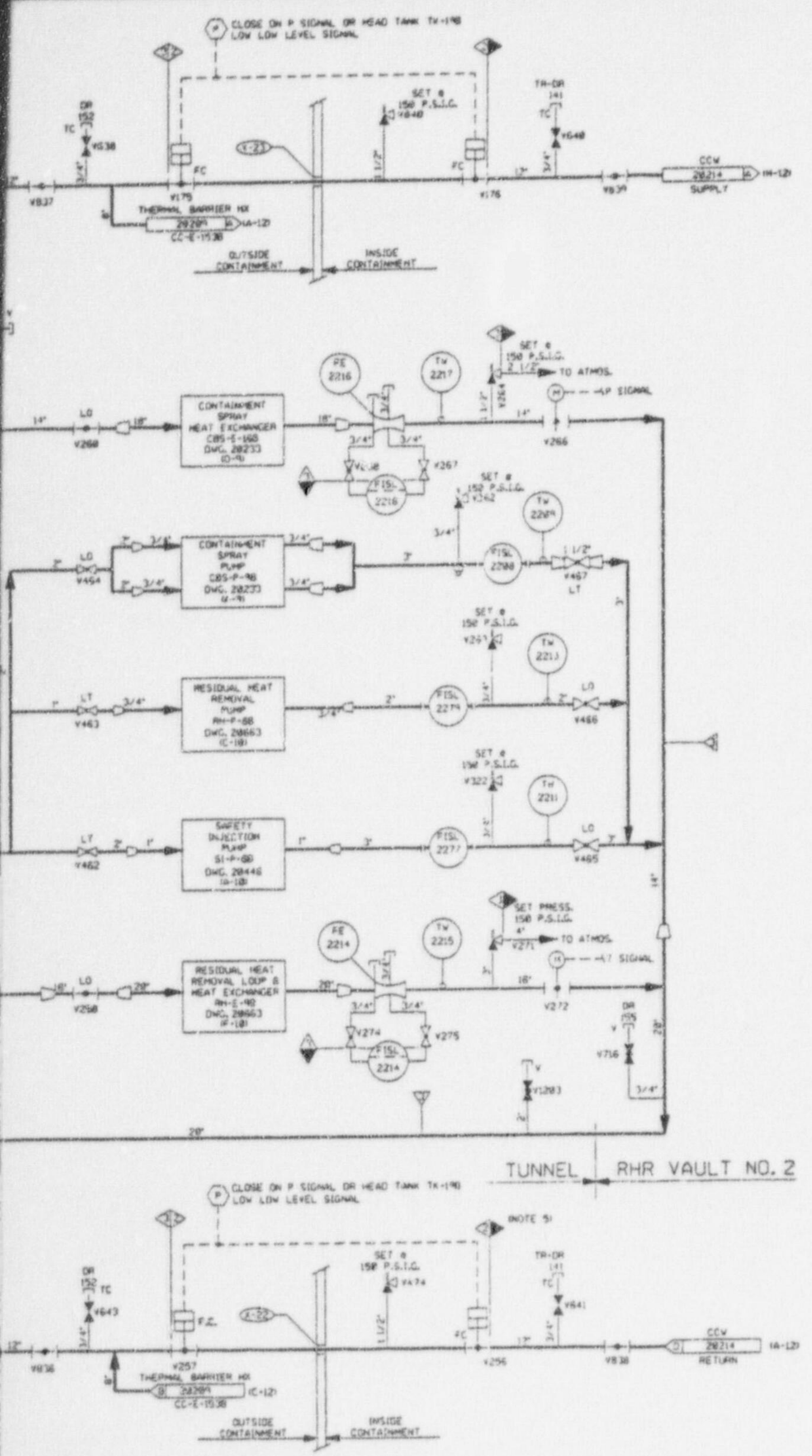
CC-20211 FIGURE 9.2-6 SH 1



09/28/95 REV. 08

REV. 04

FOR P&ID REFERENCE DRAWINGS, SYMBOLS AND ABBREVIATIONS
REFER TO DRAWINGS P&ID - LEGEND 1 AND P&ID - LEGEND 2



7

NOTES:

1. WORK THIS DRAWING WITH DRAWINGS 20204 THRU 20215.
2. ALL LINES, EQUIPMENT, COMPONENTS AND INSTRUMENTS HAVE SYSTEM PREFIX 1-CC UNLESS NOTED OTHERWISE.
3. INSTRUMENT REFERENCES
   - Ⓑ FROM BRS-PT-3A DWG. 20858
   - Ⓒ FROM BRS-TE-7A DWG. 20858
   - Ⓓ FROM BRS-TE-15A DWG. 20858
4. VENT & DRAIN CODE BREAKS ARE AT THE DOWNSTREAM END OF THE OUTER ISOLATION VALVE PER 1-NHY-805111 UNLESS OTHERWISE NOTED.

APERTURE CARD

Also Available on Aperture Card

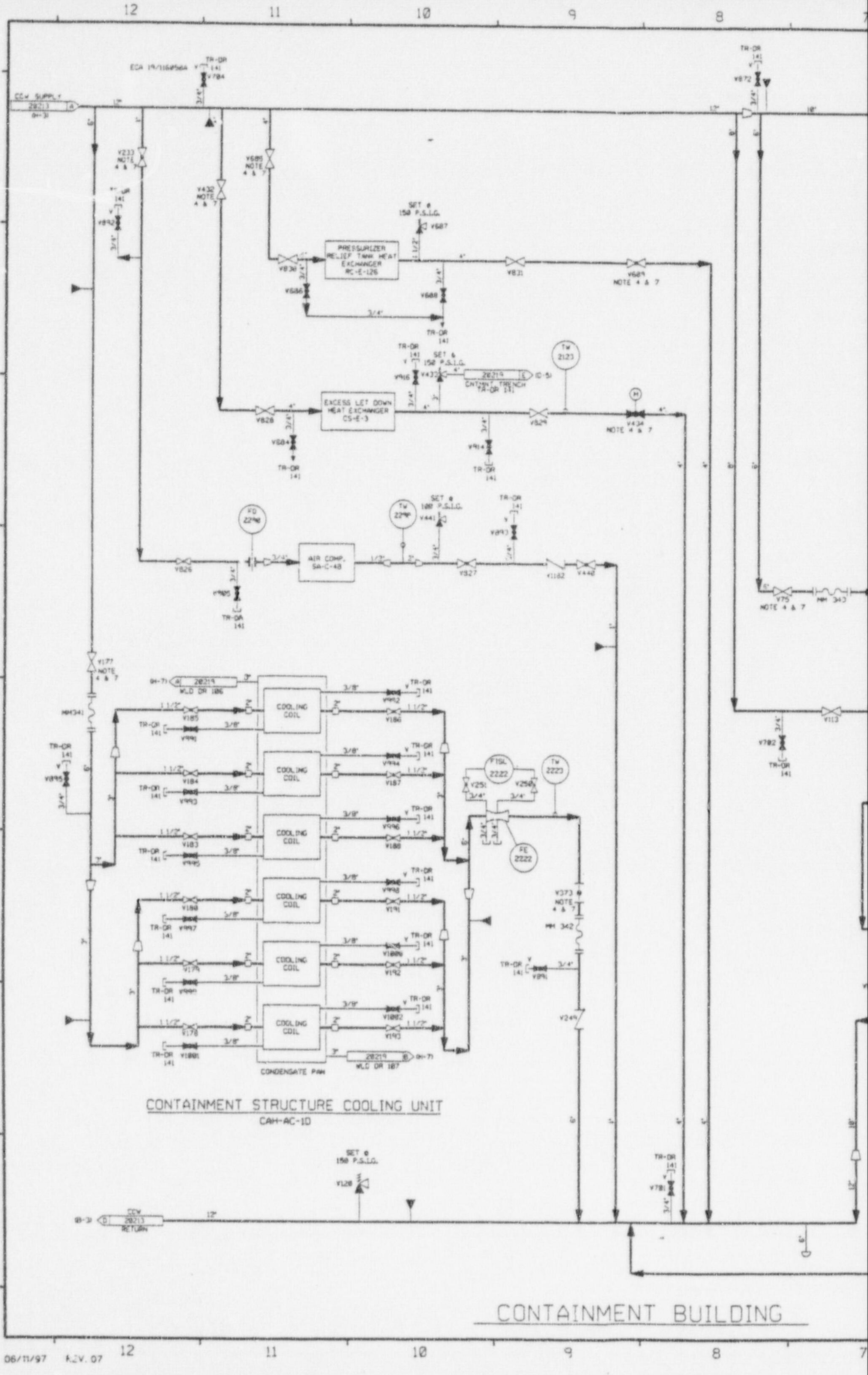
9811230061-07

SEABROOK STATION UPDATED
FINAL SAFETY ANALYSIS REPORT

PRIMARY COMPONENT COOLING
LOOP B
DETAIL

CC-20213

FIGURE 9.2-6 SH 3

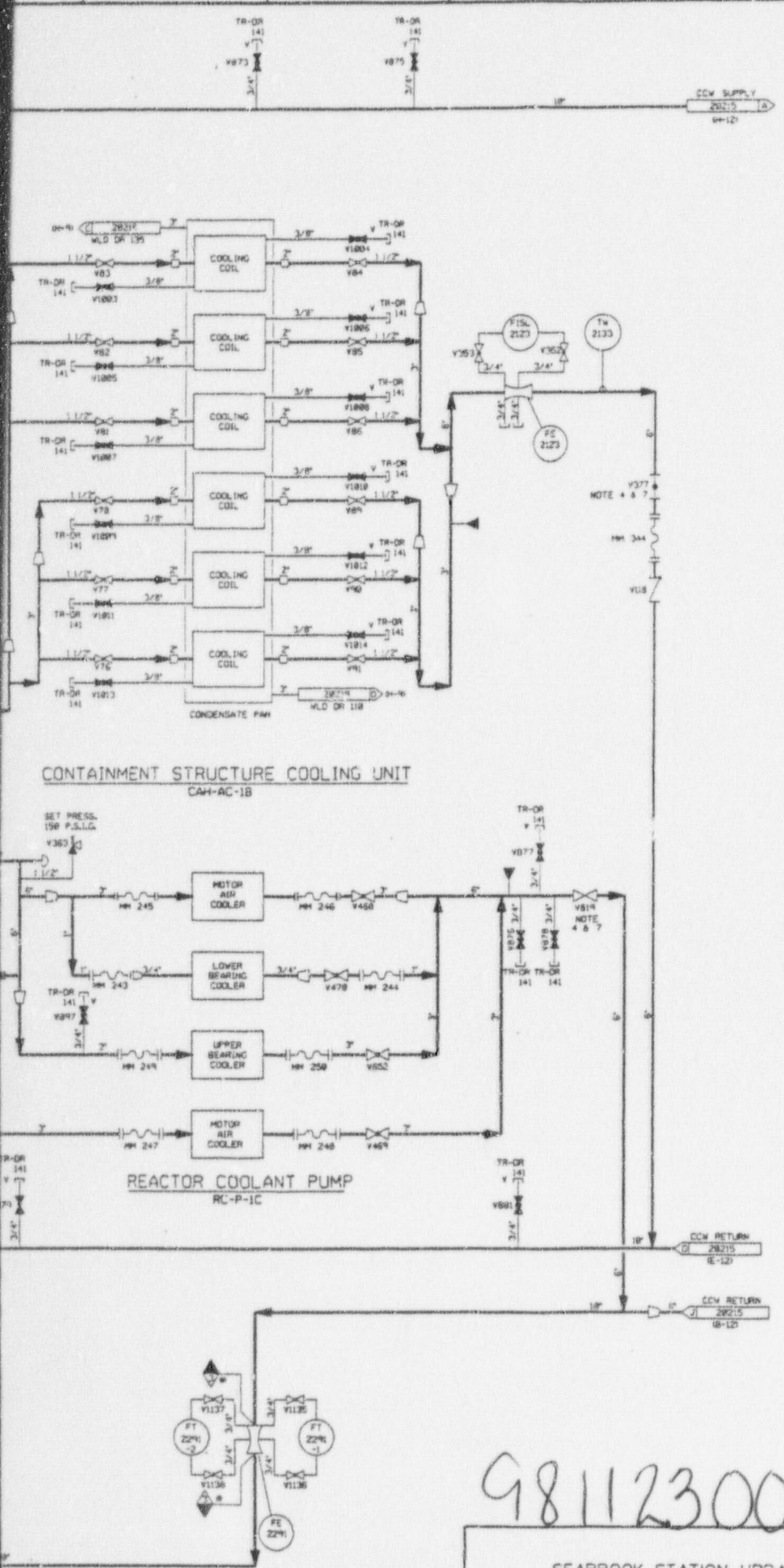


06/11/97 REV. 07

REV. 05

FOR P&ID REFERENCE DRAWINGS, SYMBOLS AND ABBREVIATIONS
REFER TO DRAWINGS P&ID - LEGEND 1 AND P&ID - LEGEND 2

8

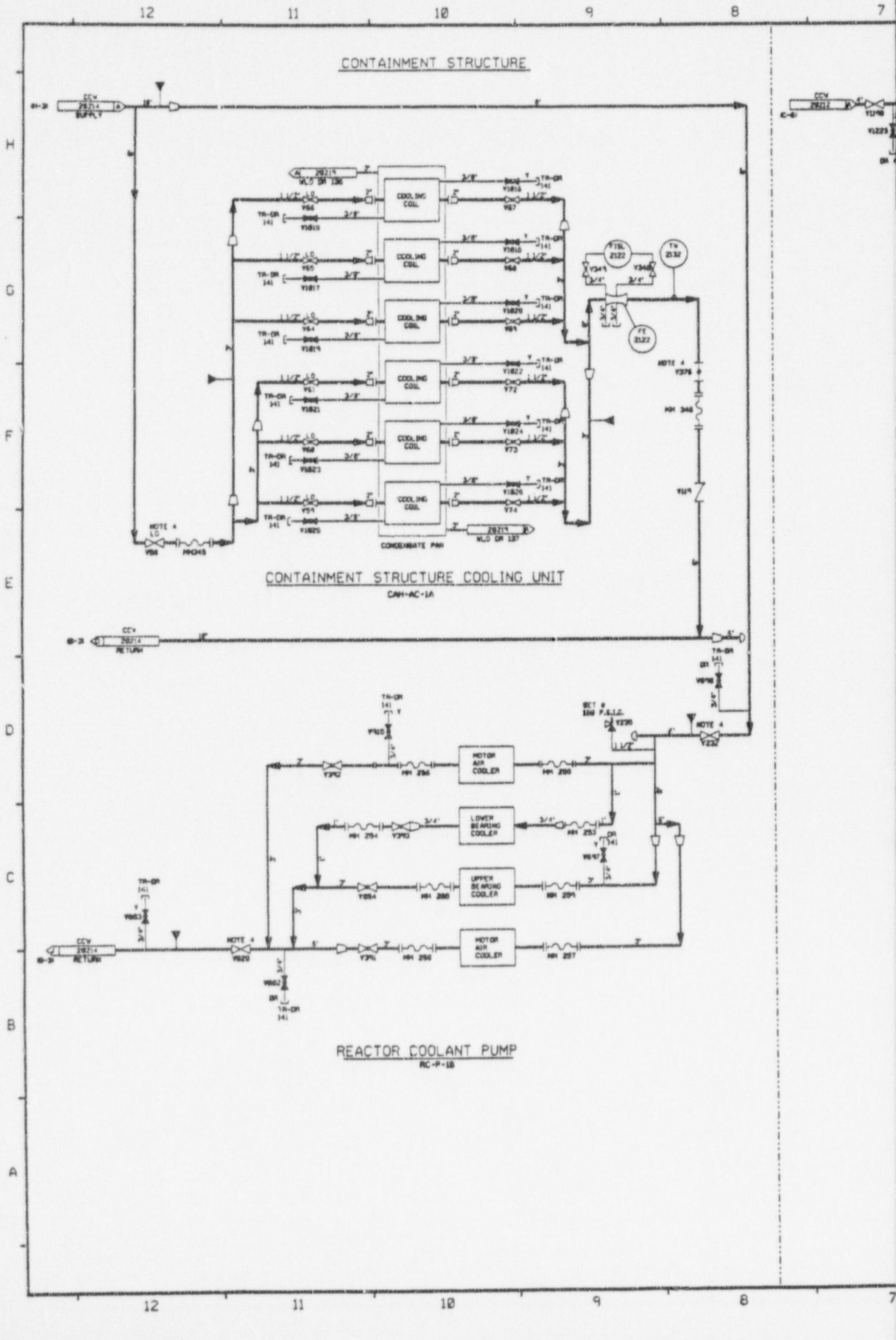


NOTES:

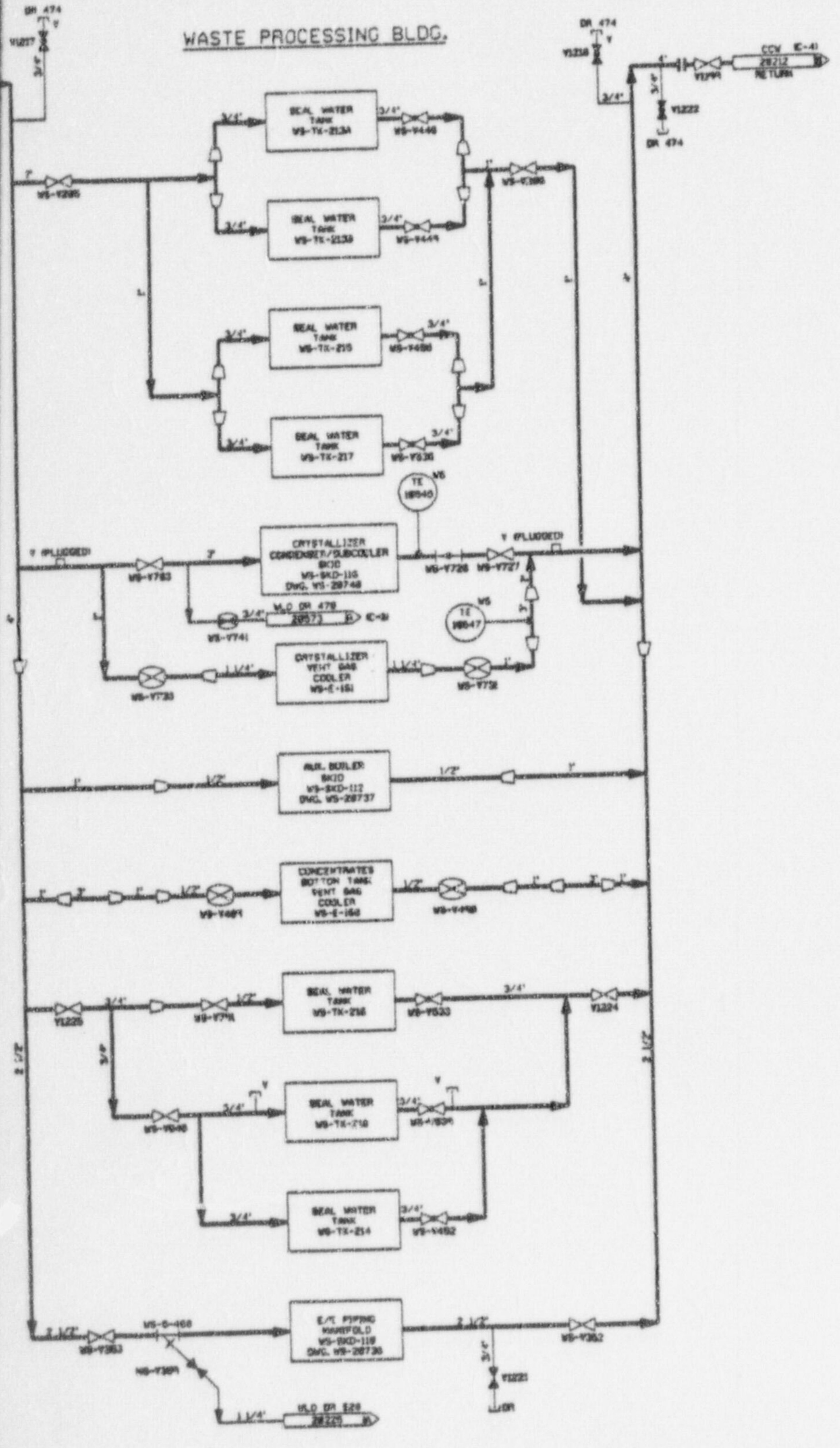
1. WORK THIS DRAWING WITH DRAWINGS 20204 THRU 20215.
2. ALL LINES, EQUIPMENT, COMPONENTS, AND INSTRUMENTS HAVE SYSTEM PREFIX 1-CC UNLESS NOTED OTHERWISE.
3. ALL LINES, EQUIPMENT, COMPONENTS, AND INSTRUMENTS ARE SAFETY CLASS N UNLESS NOTED OTHERWISE.
4. EQUIPMENT ISOLATION VALVES INSIDE CONTAINMENT ARE OPERABLE FROM THE CONTAINMENT ANNULUS.
5. VENT & DRAIN CODE BREAKS ARE AT THE DOWNSTREAM END OF THE OUTER ISOLATION VALVE PER DESIGN STANDARD M-001 UNLESS OTHERWISE NOTED.
6. △ INDICATES REVISION LEVEL.
7. PORTION OF SYSTEM HAS BEEN DOWNGRADED, HOWEVER PIPING SPECIFICATION HAS BEEN MAINTAINED TO SAFETY CLASS NOMENCLATURE. SOME COMPONENTS WITHIN THE NEW BOUNDARY HAVE BEEN PROCURED TO SAFETY CLASS 3 REQUIREMENTS, BUT USED IN N.N.S. SERVICE.

9811230061-08

SEABROOK STATION UPDATED FINAL SAFETY ANALYSIS REPORT	PRIMARY COMPONENT COOLING LOOP B DETAIL
	CC-20214 | FIGURE 9.2-6 | SH 4


12
11
10
9
8
7
H
G
F
E
D
C
B
A
CONTAINMENT STRUCTURE
CCW
28214
SUPPLY
A
18"
8"
6"
28219
WLD DR 136
COOLING COIL
COOLING COIL
COOLING COIL
COOLING COIL
COOLING COIL
COOLING COIL
1 1/2"
LO
V66
V65
V64
V51
V50
V59
3/8"
2"
TR-DR
141
V1815
V1817
V1819
V1821
V1823
V1825
V1816
V1818
V1820
V1822
V1824
V1826
V67
V68
V69
V72
V73
V74
FISL
2122
FE
2122
TW
2132
V349
V348
3/4"
NOTE 4
V376
MH 348
V119
NOTE 4
LO
V56
MH345
28219
WLD DR 137
CONDENSATE PAN
CONTAINMENT STRUCTURE COOLING UNIT
CAH-AC-1A
CCW
28214
RETURN
CCW
28212
4"
V1749
V1223
DR
TR-DR
141
DR
V616
3/4"
SET @
100 P.S.I.G.
V230
1 1/2"
NOTE 4
V232
MOTOR AIR COOLER
LOWER BEARING COOLER
UPPER BEARING COOLER
MOTOR AIR COOLER
V342
V343
V684
V34
MH 286
MH 288
MH 294
MH 253
MH 289
MH 290
MH 287
V610
V657
V603
V829
V602
CCW
28214
RETURN
REACTOR COOLANT PUMP
RC-P-1B

FOR P&ID REFERENCE DRAWINGS, SYMBOLS AND ABBREVIATIONS REFER TO DRAWINGS P&ID - LEGEND 1 AND P&ID - LEGEND 2



9

NOTES:
1. WORK THIS DRAWING WITH DRAWINGS 820204 THRU 820214.
2. ALL LINES, EQUIPMENT, COMPONENTS, AND INSTRUMENTS HAVE SYSTEM PREFIX 1-CC, UNLESS NOTED OTHERWISE.
3. ALL LINES, EQUIPMENT, COMPONENTS AND INSTRUMENTS ARE SAFETY CLASS N UNLESS NOTED OTHERWISE.
4. EQUIPMENT ISOLATION VALVES INSIDE CONTAINMENT ARE OPERABLE FROM THE CONTAINMENT ANNULUS.
5. DELETED

9811230061-09

SEABROOK STATION UPDATED FINAL SAFETY ANALYSIS REPORT	PRIMARY COMPONENT COOLING LOOP B DETAIL	
	CC-20215	FIGURE 9.2-6 SH 5

ENCLOSURE 3 TO NYN-98122

NRC Commitments Contained in NYN-98122

AR#98015457	**Description of Commitment**
Item 2	Seabrook Station Procedures ES-1.1, ES-1.2, E-3, ECA-1.1, ECA 2.1, ECA 3.1, FR-H.1, FR-P.1, and FR-I.1 will be revised to specify the preferred sequence to re-open PCCW containment isolation valves following Phase B containment isolation during the post accident recovery stage.