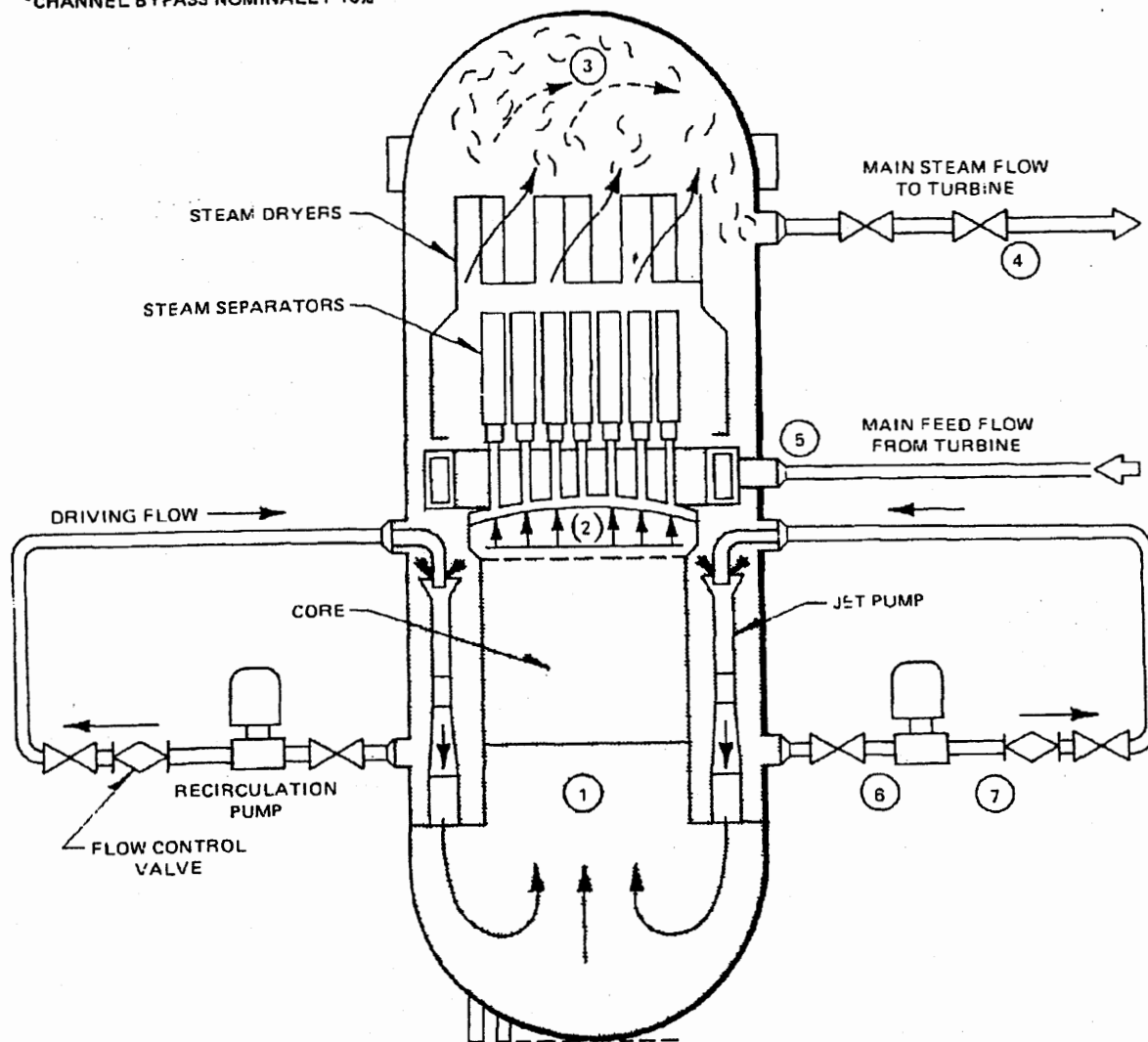


|   | PRESSURE<br>(psia) | FLOW<br>(lb/hr)     | TEMPERATURE<br>(°F) | ENTHALPY<br>(Btu/lb) |
|---|--------------------|---------------------|---------------------|----------------------|
| 1. CORE INLET                             | 1075               | $104.0 \times 10^6$ | 533                 | 527.4                |
| 2. CORE OUTLET                            | 1050               | $104.0 \times 10^6$ | 550                 | 651.4                |
| 3. SEPARATOR OUTLET (STEAM DOME)          | 1040               | $16.3 \times 10^6$  | 549                 | 1190.8               |
| 4. STEAM LINE (2ND ISOLATION VALVE)       | 981                | $16.3 \times 10^6$  | 542                 | 1190.8               |
| 5. FEEDWATER INLET (INCLUDES RETURN FLOW) | 1065               | $16.4 \times 10^6$  | 426                 | 403.7                |
| 6. RECIRC PUMP SUCTION                    | 1040               | $32.1 \times 10^6$  | 533                 | 527.2                |
| 7. RECIRC PUMP DISCHARGE                  | 1296               | $32.1 \times 10^6$  | 533.8               | 528.4                |

\*CHANNEL BYPASS NOMINALLY 10%



(Rev. 12 1/03)

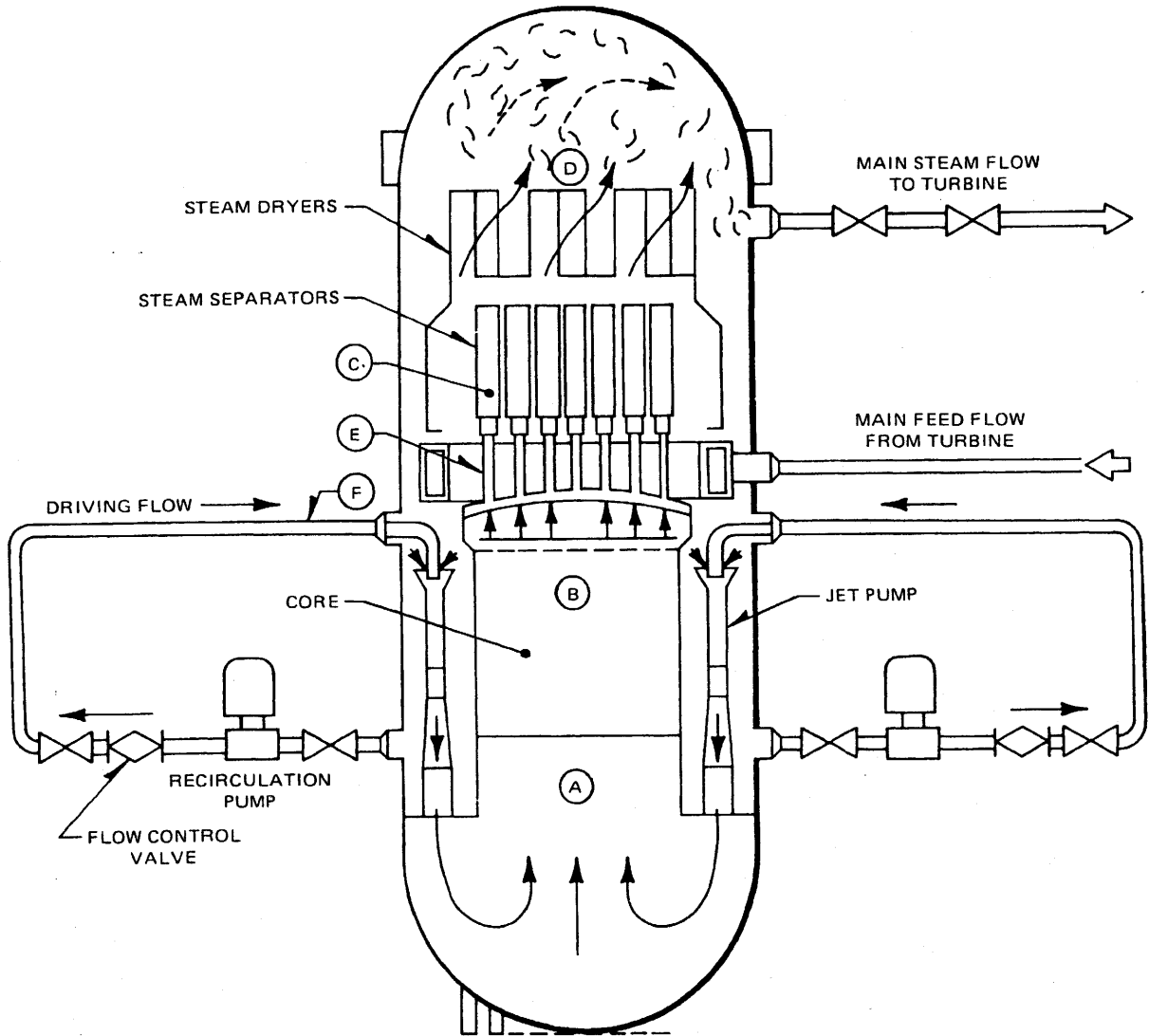


**PERRY NUCLEAR POWER PLANT**

Rated Operating Conditions of  
the Boiling Water Reactor

Figure 5.1-1

|                                     | VOLUME OF FLUID (ft <sup>3</sup> ) |
|-------------------------------------|------------------------------------|
| A LOWER PLENUM                      | 3990                               |
| B CORE                              | 2020                               |
| C UPPER PLENUM AND SEPARATORS       | 2440                               |
| D DOME (ABOVE NORMAL WATER LEVEL)   | 5700                               |
| E DOWNCOMER REGION                  | 4060                               |
| F RECIRCULATION LOOPS AND JET PUMPS | 960                                |



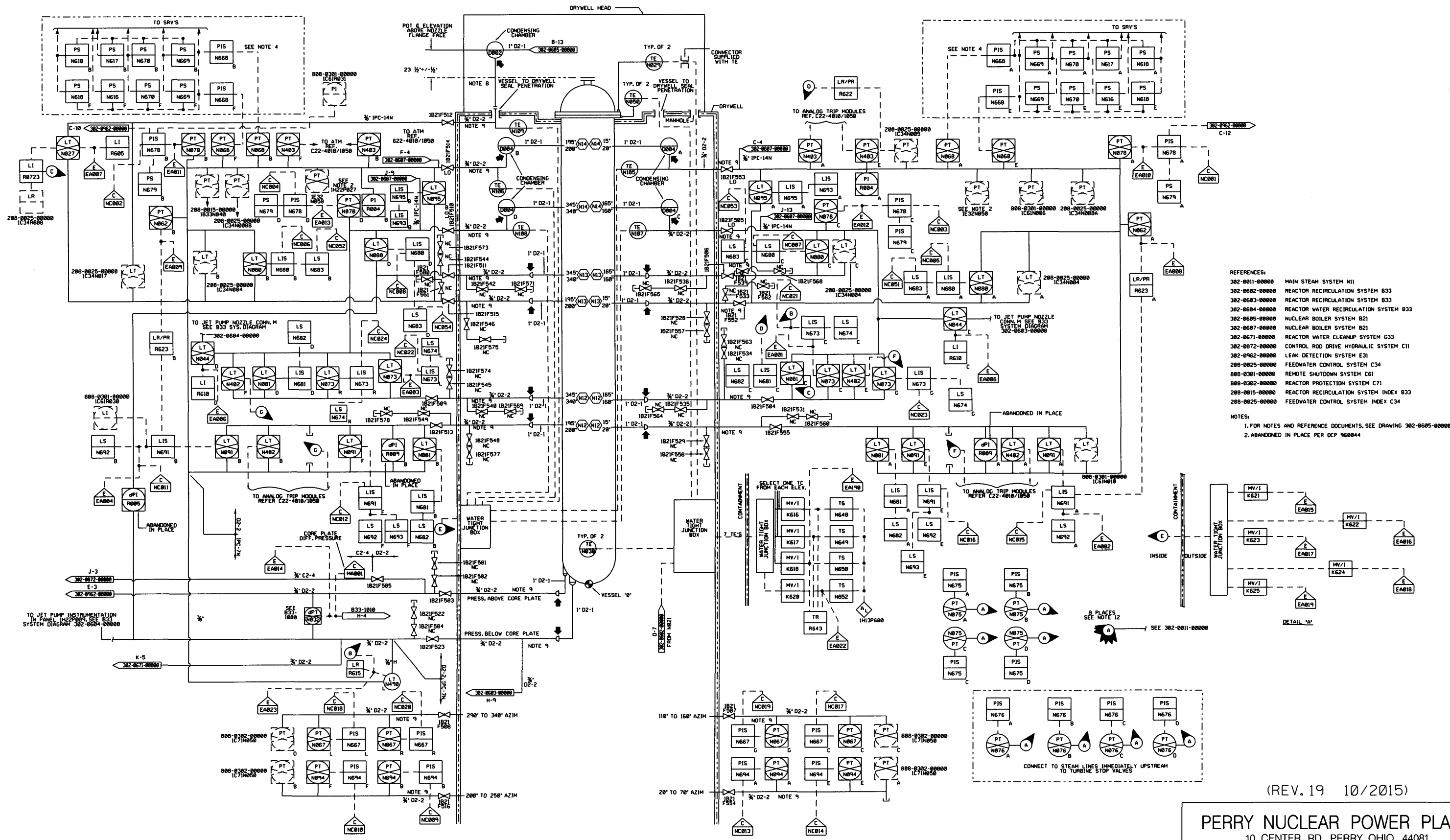
(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Coolant Volumes of the Boiling  
Water Reactor

Figure 5.1-2





- REFERENCES:
- 302-0011-00000 MAIN STEAM SYSTEM N11
  - 302-0602-00000 REACTOR RECIRCULATION SYSTEM B33
  - 302-0603-00000 REACTOR RECIRCULATION SYSTEM B33
  - 302-0604-00000 REACTOR WATER RECIRCULATION SYSTEM B33
  - 302-0605-00000 NUCLEAR BOILER SYSTEM B21
  - 302-0607-00000 NUCLEAR BOILER SYSTEM B21
  - 302-0671-00000 REACTOR WATER CLEANUP SYSTEM G33
  - 302-0672-00000 CONTROL ROD DRIVE HYDRAULIC SYSTEM C11
  - 302-0962-00000 LEAK DETECTION SYSTEM E31
  - 200-0025-00000 FEEDWATER CONTROL SYSTEM C34
  - 000-0301-00000 REMOTE SHUTDOWN SYSTEM C61
  - 000-0302-00000 REACTOR PROTECTION SYSTEM C71
  - 200-0015-00000 REACTOR RECIRCULATION SYSTEM INDEX B33
  - 200-0025-00000 FEEDWATER CONTROL SYSTEM INDEX C34
- NOTES:
1. FOR NOTES AND REFERENCE DOCUMENTS, SEE DRAWING 302-0605-00000
  2. ABANDONED IN PLACE PER DCP 960044

(REV. 19 10/2015)

**PERRY NUCLEAR POWER PLANT**  
 10 CENTER RD., PERRY, OHIO 44081

NUCLEAR  
 BOILER SYSTEM  
 FIGURE 5.1-3 (SHEET 2 OF 4)  
 (DWG. D-302-0606-00000)

FOR RELAY LOGIC ONLY

TABLE I: PRESSURE INSTRUMENT CONTACT UTILIZATION

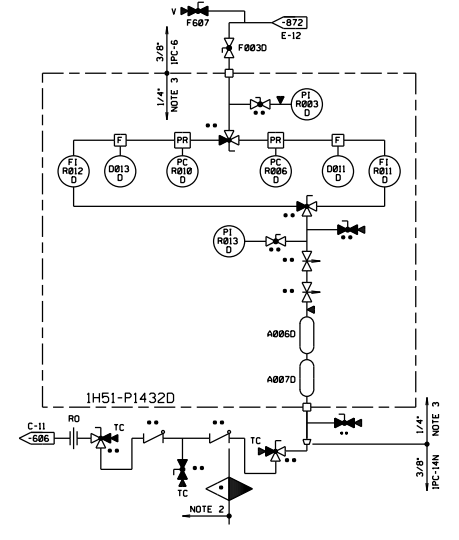
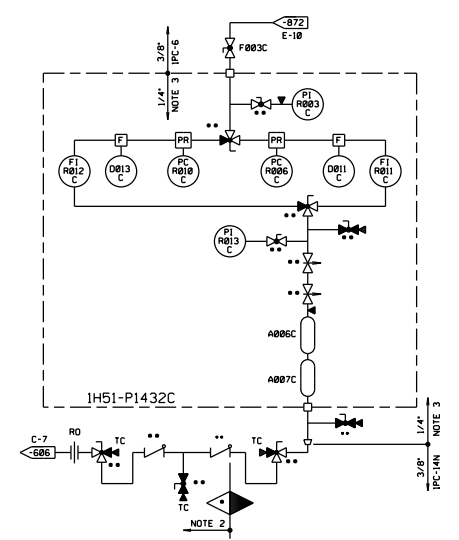
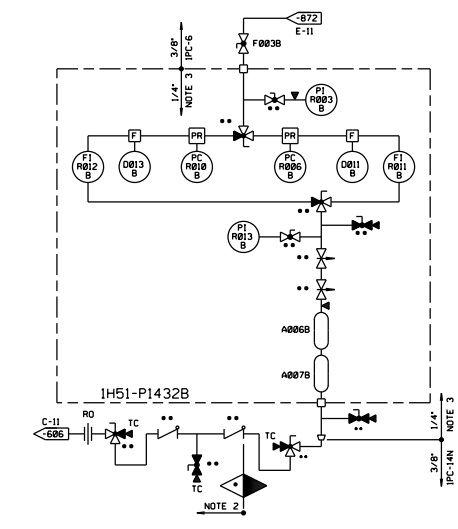
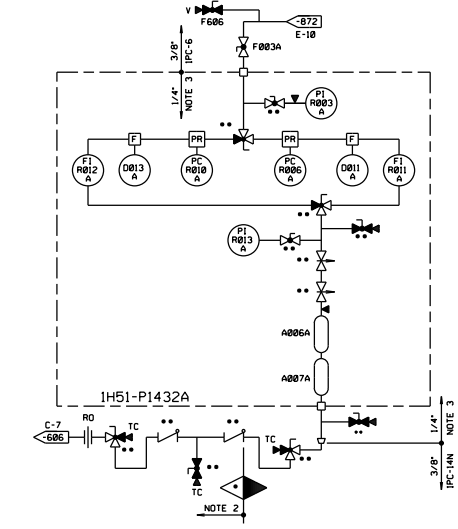
| TRANSMITTER | MECH DIV LOC | ELEC DIV    | TRIP UNIT | SYSTEM                       |
|-------------|--------------|-------------|-----------|------------------------------|
| PT N078A    | 1            | 1           | PIS N678A | RPS (A)                      |
|             |              |             | PS N679A  | NS <sup>4</sup> (A/RHR ISOL) |
| PT N078B    | 2            | 2           | PIS N678B | RPS (B)                      |
|             |              |             | PS N679B  | NS <sup>4</sup> (B/RHR ISOL) |
| PT N078C    | 3            | 3           | PIS N678C | RPS (C)                      |
|             |              |             | PS N679C  | NS <sup>4</sup> (C/RHR ISOL) |
| PT N078D    | 4            | 4           | PIS N678D | RPS (D)                      |
|             |              |             | PS N679D  | NS <sup>4</sup> (D/RHR ISOL) |
| PT N403A    | 1            | 1           | ATM       | RRCS (*)                     |
| PT N403E    | 1            | 1           | ATM       | RRCS (*)                     |
| PT N403B    | 2            | 2           | ATM       | RRCS (*)                     |
| PT N403F    | 2            | 2           | ATM       | RRCS (*)                     |
| PT N067C    | 3            | 3           | PIS N667C | HPCS                         |
| PT N067G    | 3            | 3           | PIS N667G | HPCS                         |
| PT N067L    | 4            | 3           | PIS N667L | HPCS                         |
| PT N067R    | 4            | 3           | PIS N667R | HPCS                         |
| PT N094A    | 1            | 1           | PIS N694A | RHR (A)/ LPCS/ RCIC          |
| PT N094E    | 1            | 1           | PIS N694E | RHR (A)/ LPCS                |
| PT N094B    | 2            | 2           | PIS N694B | RHR (B)/ RHR (C)/ RCIC       |
| PT N094F    | 2            | 2           | PIS N694F | RHR (B)/ RHR (C)             |
| PT N068A    | 1            | LOW LOW SET | PIS N668A | PRESS RELIEF                 |
|             |              |             | PS N669A  | PRESS RELIEF                 |
|             |              |             | PS N670A  | PRESS RELIEF                 |
|             |              |             | PS N617A  | RE-OPEN / RE-CLOSE (MID)     |
| PT N068B    | 2            | LOW LOW SET | PS N618A  | RE-OPEN / RE-CLOSE (HIGH)    |
|             |              |             | PIS N668B | PRESS RELIEF                 |
|             |              |             | PS N669B  | PRESS RELIEF                 |
|             |              |             | PS N670B  | PRESS RELIEF                 |
| PT N076A    | 1            | LOW LOW SET | PS N617B  | RE-OPEN / RE-CLOSE (MID)     |
|             |              |             | PS N618B  | RE-OPEN / RE-CLOSE (HIGH)    |
|             |              |             | PIS N676A | NS <sup>4</sup>              |
|             |              |             | PIS N676B | NS <sup>4</sup>              |
| PT N076C    | 3            | 3           | PIS N676C | NS <sup>4</sup>              |
| PT N076D    | 4            | 4           | PIS N676D | NS <sup>4</sup>              |
| PT N075A    | 1            | 1           | PIS N675A | NS <sup>4</sup>              |
| PT N075B    | 2            | 2           | PIS N675B | NS <sup>4</sup>              |
| PT N075C    | 3            | 3           | PIS N675C | NS <sup>4</sup>              |
| PT N075D    | 4            | 4           | PIS N675D | NS <sup>4</sup>              |
| dPT N032    | -            | -           | -         | CORE PLATE dP                |
| PT N062A    | 1            | 1           | -         | POST ACCIDENT MON.           |
| PT N062B    | 2            | 2           | -         | POST ACCIDENT MON.           |
| PT N068E    | 1            | LOW LOW SET | PIS N668E | PRESS RELIEF                 |
|             |              |             | PS N669E  | PRESS RELIEF                 |
|             |              |             | PS N670E  | PRESS RELIEF                 |
|             |              |             | PS N616E  | RE-OPEN/ RE-CLOSE (LOW)      |
| PT N068F    | 2            | LOW LOW SET | PS N616E  | RE-OPEN/ RE-CLOSE (HIGH)     |
|             |              |             | PIS N668F | PRESS RELIEF                 |
|             |              |             | PS N669F  | PRESS RELIEF                 |
|             |              |             | PS N670F  | PRESS RELIEF                 |
| PT N068G    | 2            | LOW LOW SET | PS N616F  | RE-OPEN/ RE-CLOSE (LOW)      |
|             |              |             | PS N616F  | RE-OPEN/ RE-CLOSE (HIGH)     |

\* REFERENCE C22-4010/ 1050  
 NS<sup>4</sup> - NUCLEAR STEAM SUPPLY SHUTOFF  
 CONTAINMENT ISOLATION FUNCTION

TABLE II: WATER LEVEL INSTRUMENT CONTACT UTILIZATION

| TRANSMITTER | MECH DIV LOC | ELEC DIV | TRANS E/S MPL NUMBER | TRIP UNIT | SYSTEM                     | LEVEL TRIP POINT |
|-------------|--------------|----------|----------------------|-----------|----------------------------|------------------|
| LT N027     | 2            | -        | B21-K615             | -         | SHUTDOWN LEVEL *           | -                |
| LT N044C    | 3            | 1        | -                    | LI R610C  | FUEL ZONE *                | -                |
| LT N044D    | 4            | 2        | -                    | LI R610D  | FUEL ZONE *                | -                |
| LT N490     | 4            | 3        | -                    | LR R615   | FUEL ZONE                  | -                |
| LT N091A    | 1            | 1        | E21-PS2              | LIS N691A | ADS (A)/ RHR (A)/ LPCS     | 1                |
| LT N091B    | 2            | 2        | E12-PS2              | LS N692A  | RCIC                       | 2                |
|             |              |          |                      | LIS N691B | ADS (B)/ RHR (B)/ RHR (C)  | 1                |
| LT N091E    | 1            | 1        | E21-PS2              | LS N692B  | RCIC                       | 2                |
|             |              |          |                      | LIS N691E | ADS (A)/ RHR (A)/ LPCS     | 1                |
| LT N091F    | 2            | 2        | E12-PS2              | LS N692E  | RCIC                       | 2                |
|             |              |          |                      | LS N693E  | RCIC                       | 8                |
|             |              |          |                      | LIS N691F | ADS (B)/ RHR (B)/ RHR (C)  | 1                |
| LT N073C    | 3            | 3        | E22-PS2              | LS N692F  | RCIC                       | 2                |
|             |              |          |                      | LS N693F  | RCIC                       | 8                |
|             |              |          |                      | LIS N673C | HPCS ****                  | 2                |
| LT N073G    | 3            | 3        | E22-PS2              | LS N674C  | HPCS                       | 8                |
|             |              |          |                      | LIS N673D | HPCS                       | 2                |
| LT N073L    | 4            | 3        | E22-PS2              | LS N674D  | HPCS                       | 8                |
|             |              |          |                      | LIS N673L | HPCS                       | 2                |
| LT N073R    | 4            | 3        | E22-PS2              | LS N674L  | HPCS                       | 8                |
|             |              |          |                      | LIS N673R | HPCS                       | 2                |
| LT N482A    | 1            | 1        | -                    | ATM       | RRCS **                    | 2                |
| LT N482E    | 3            | 1        | -                    | ATM       | RRCS **                    | 2                |
| LT N482B    | 2            | 2        | -                    | ATM       | RRCS **                    | 2                |
| LT N482F    | 4            | 2        | -                    | ATM       | RRCS **                    | 2                |
| LT N095A    | 1            | 1        | E21-PS2              | LIS N695A | ADS (A)                    | 3                |
| LT N095B    | 2            | 2        | E12-PS2              | LS N693A  | RCIC                       | 8                |
|             |              |          |                      | LIS N695B | ADS (B)                    | 3                |
| LT N081A    | 1            | 1        | C71-K613A            | LS N693B  | RCIC                       | 8                |
|             |              |          |                      | LIS N681A | NS <sup>4</sup> (MSIV) *** | 1                |
| LT N081B    | 2            | 2        | C71-K613B            | LS N682A  | NS <sup>4</sup>            | 2                |
|             |              |          |                      | LIS N681B | NS <sup>4</sup> (MSIV) *** | 1                |
| LT N081C    | 3            | 3        | C71-K613C            | LS N682B  | NS <sup>4</sup>            | 2                |
|             |              |          |                      | LIS N681C | NS <sup>4</sup> (MSIV) *** | 1                |
| LT N081D    | 4            | 4        | C71-K613D            | LS N682C  | NS <sup>4</sup>            | 2                |
|             |              |          |                      | LIS N681D | NS <sup>4</sup> (MSIV) *** | 1                |
| LT N080A    | 1            | 1        | C71-K613A            | LS N682D  | NS <sup>4</sup>            | 2                |
|             |              |          |                      | LIS N680A | RPS (A) (RHR ISOLATION)    | 3                |
| LT N080B    | 2            | 2        | C71-K613B            | LS N683A  | RPS (A)                    | 8                |
|             |              |          |                      | LIS N680B | RPS (B) (RHR ISOLATION)    | 3                |
| LT N080C    | 3            | 3        | C71-K613C            | LS N683B  | RPS (B)                    | 8                |
|             |              |          |                      | LIS N680C | RPS (C) (RHR ISOLATION)    | 3                |
| LT N080D    | 4            | 4        | C71-K613D            | LS N683C  | RPS (C)                    | 8                |
|             |              |          |                      | LIS N680D | RPS (D) (RHR ISOLATION)    | 3                |
| LT N080E    | 2            | 2        | C71-K613E            | LS N683D  | RPS (D)                    | 8                |
|             |              |          |                      | LIS N680E | RPS (E) (RHR ISOLATION)    | 3                |

\* REFERENCE B21-1050  
 \*\* REFERENCE C22-4010/ 1050  
 ATM - ANALOG TRIP MODULE  
 \*\*\* ADDITIONAL FUNCTIONS  
 - CLOSE DRYWELL FAN COOLER'S COOLING WATER ISOLATION VALVES  
 - ISOLATE THE MSIV'S AIR SUPPLY  
 \*\*\*\* ALSO FEEDS 2-PEN RECORDER R615



- NOTES:
- FOR NOTES AND REFERENCES, SEE DRAWING D-302-605.
  - \* SAFETY RELATED NON-CODE SEISMIC CATEGORY I.
  - 1/4" O.D. x .049 WALL SEISMIC STEEL TUBING ASTM A213 TP-304.
  - \*\* THESE VALVES ARE TAGGED PER THE APPROPRIATE 003 SERIES DRAWING.
  - THE FOLLOWING REACTOR VESSEL LEVEL PURGE CONTROL PANELS SHALL BE ISOLATED FROM THE PARENT LOCAL CONTROL PANELS PRIOR TO CLOSING THE ASSOCIATED PENETRATION ISOLATION VALVES:

| PURGE CONTROL PANEL | LOCAL CONTROL PANEL | ISOLATION VALVE |
|---------------------|---------------------|-----------------|
| H51-P1432A          | H22-P004A           | B21-F553        |
| H51-P1432B          | H22-P027            | B21-F514        |
| H51-P1432C          | H22-P005            | B21-F505        |
| H51-P1432D          | H22-P026            | B21-F510        |

(REV. 21 10/2019)

**PERRY NUCLEAR POWER PLANT**  
 10 CENTER RD., PERRY, OHIO 44081  
  
**NUCLEAR BOILER SYSTEM**  
  
 FIGURE 5.1-3 (SHEET 3 OF 4)  
 (DWG. D-302-0607-00000)

TABLE I - SUFFIX LETTER ASSIGNMENT FOR SAFETY RELIEF VALVES & ASSOCIATED EQUIPMENT

| SAFETY/RELIEF VALVE        | FC41A | FC41B | FC41C | FC41D | FC41E | FC41F | FC41G | FC41H | FC41I | FC41J | FC41K | FC41L | FC41M | FC41N | FC41O | FC41P | FC41Q | FC41R | FC41S | FC41T | FC41U | FC41V |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| FLEXIBLE HOSE              | D030  | S     | C     | L     | J     | E     | A     | Q     | E     | D     | N     | K     | F     | R     | H     | T     | B     | M     | G     | U     | P     | V     |
| TEMP ELEMENT               | NO04  | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |
| ACCUMULATOR                | A004  | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |
| AD5 A003                   | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |       |
| AD09 SEE NOTE 3            |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| CHECK VALVE                | FO36  |       |       | C     | D     |       |       | G     | H     | J     | K     |       | M     | N     |       | R     | S     |       | U     | U     |       |       |
| AD5 FO39                   | A     | B     |       |       | E     | F     |       |       |       |       |       | L     |       |       | P     |       |       | T     |       | U     | V     |       |
| VACUUM BREAKER             | FO37  | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |
| FO78                       | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |       |
| SRV DISCHARGE PRESS SWITCH | N40   | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |
| ERS COMP INPUT             | ECO42 | ECO43 | ECO44 | ECO45 | ECO46 | ECO47 | ECO48 | ECO49 | ECO50 | ECO51 | ECO52 | ECO53 | ECO54 | ECO55 | ECO56 | ECO57 | ECO58 | ECO59 | ECO60 |       |       |       |
| AD5 MO3 FO31               | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |       |
| AD3 MO4 FO32               | A     | B     | C     | D     | E     | F     | G     | H     | J     | K     | L     | M     | N     | P     | R     | S     | T     | U     | U     | V     |       |       |
| AD04 FO31                  |       |       | C     | D     |       |       | G     | H     | J     | K     |       | M     | N     |       | R     | S     |       | U     | U     |       |       |       |
| AD09 FO31                  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| * R COMPUTER INPUT         | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   | B21   |
| NC025                      | NC026 | NC027 | NC028 | NC029 | NC030 | NC031 | NC032 | NC033 | NC034 | NC035 | NC036 | NC037 | NC038 | NC039 | NC040 | NC041 | NC042 | NC043 |       |       |       |       |
| SPRING SET PRESS           | PSIG  | 1165  | 1165  | 1165  | 1165  | 1165  | 1165  | 1165  | 1180  | 1180  | 1180  | 1180  | 1180  | 1180  | 1180  | 1190  | 1190  | 1190  | 1190  | 1190  | 1190  | 1190  |
| RELIEF SET PRESSURE        | PSIG  | 1123  | 1123  | 1123  | 1123  | 1123  | 1123  | 1123  | 1113  | 1123  | 1113  | 1113  | 1113  | 1113  | 1113  | 1113  | 1113  | 1103  | 1103  | 1113  |       |       |
| PRESSURE INDIC SWITCH      | N668  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                            | N669  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                            | N670  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                            | N616  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                            | N617  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|                            | N618  |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| LOW SET RECLOSE PRESS      | PSIG  |       |       |       |       |       |       |       |       |       |       |       |       |       | 946   | 946   | 946   | 936   | 936   | 936   | 946   |       |
| LOW SET REOPEN PRESS       | PSIG  |       |       |       |       |       |       |       |       |       |       |       |       |       | 113   | 113   | 113   | 1073  | 1033  | 1033  | 1113  |       |

\* R COMPUTER INPUTS FOR VALVE POSITION (REF 4)  
 † CONTROL PROVIDED IN REMOTE SHUTDOWN SYSTEM (REF 3)

TABLE CONTINUED BELOW (K-14-K-7)

TABLE II ELEVATION CORRELATION CHART

| REFERENCE  | COLD VESSEL INCHES ABOVE VESSEL ZERO | DESCRIPTION OF TRIPS  | INSTRUMENT(S) PROVIDING TRIP | REACTOR VESSEL LEVEL IDENTITY SEE REF 2 | CONTROL ROOM WATER LEVEL INDICATION AND TRIP LEVELS SEE NOTE 2 |            |                          |                            |             |         |
|--|--------------------------------------|---|------------------------------|---|--|------------|--------------------------|----------------------------|-------------|---------|
|  |                                      |   |                              |   | SAFEGUARDS   |            |                          | FEEDWATER                  |             |         |
|  |                                      |   |                              |   | FUEL ZONE  | WIDE RANGE | NARROW RANGE             | UPSET                      | SHUTDOWN    |         |
|  |                                      |   |                              |   | LI R610 C/D  | LR R605    | LR/PR R625A/B LR/PR R622 | C34 LR R608 C34 LI R606A/B | C34 LR R608 | LI R605 |
|  |                                      |   |                              |   |  |            |                          |                            | 3500"       | 5700"   |
| TOP OF HEAD FLANGE                                 | 896.0"                               |   |                              |   |  |            |                          |                            |             |         |
| STEAM LINE NOZZLE                                  | 844.5"                               |   |                              |   |  |            |                          |                            |             |         |
| INSTRUMENT LINE NOZZLE                             | 806.0"                               |   |                              |   |  |            |                          |                            |             |         |
|  |                                      | TRIP RCIC TURBINE & HPCS INJECTION VALVE CLOSURE SIGNAL. CLOSE MAIN TURBINE STOP VALVES. TRIP FEED PUMPS AND CONDENSATE BOOSTER PUMPS. SCRAM.   | TABLE II REF 7 REF 1         | 8                                       |  | 230"       | 230"                     | 230"                       | 230"        |         |
|  |                                      | HIGH LEVEL ALARM  | REF 1                        | 7                                       |  |            |                          |                            | 205"        |         |
|  |                                      | NORMAL WATER LEVEL  | REF 1                        | 5                                       |  |            |                          |                            | 204"        |         |
|  |                                      | LOW LEVEL ALARM   | REF 1                        | 4                                       |  |            |                          |                            | 197"        |         |
|  |                                      | RUN RECIRC FLOWBACK R SCRAM & CONTRIBUTE TO AUTO DEPRESSURIZATION TRIP REOP PUMPS TO THE CRASH CLOSE RHR SHUTDOWN ISOL VALVES.  | TABLE II REF 7 REF 1         | 3                                       |  |            |                          | 172"                       | 172"        |         |
| BOY FOM OF DRYER SHRT. + 15"                       | 529.5"                               |   |                              |   |  |            |                          |                            |             |         |
| INSTRUMENT LINE NOZZLE                             | 518.0"                               | INITIATE RCIC & HPCS CLOSE PRIMARY SYSTEMS ISOL VALVES EXCEPT IN RHR SHUTDOWN ISOL VALVES. INITIATE RHR AND LPCS. CONTRIBUTE TO AUTO DEPRESSURIZATION. START DIV 1 & DIV 2 STAND-BY DIESEL. PROMOTE SIGNAL TO RRC'S. H M. CLOSE MSIV'S DRYWELL FAN COOLERS COOLING WATER ISOL VALVES AND MSIV AIR SUPPLY ISOL VALVES. | TABLE II REF 7               | 2                                       |  |            |                          | 123"                       |             |         |
| INSTRUMENT LINE NOZZLE                             | 364.0"                               |   |                              |   |  | 50.0"      | 50.0"                    |                            |             |         |
|  |                                      |   |                              |   |  |            |                          | 165"                       |             |         |
| TOP OF ACTIVE FUEL AND WATER LEVEL INSTRUMENT ZERO | 363.5"                               |   |                              |   |  | 0          | 0                        | 0                          | 0           | 0       |
|  |                                      |   |                              |   |  | -150.0"    | -150.0"                  |                            |             |         |
| JET PUMP DIFFUSER TAP                              | 12.8"                                |   |                              |   |  |            |                          |                            |             |         |
| JET PUMP INSTRUMENT NOZZLE                         | 136.5"                               |   |                              |   |  |            |                          |                            |             |         |

R FUNCTION IS IN FEEDWATER CONTROL SYS (REF 1) FOR LOSS OF ONE FEED PUMP  
 M FUNCTION IS DEFINED IN REF. 6

TABLE I (CONTINUED)

| SAFETY/RELIEF VALVE               | FC41A | FC41B | FC41C | FC41D | FC41E | FC41F | FC41G | FC41H | FC41I | FC41J | FC41K | FC41L | FC41M | FC41N | FC41O | FC41P | FC41Q | FC41R | FC41S | FC41T | FC41U | FC41V |
|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| ERS SRV INT (VULC. FROM COMPUTER) | ECO21 | ECO22 | ECO23 | ECO24 | ECO25 | ECO26 | ECO27 | ECO28 | ECO29 | ECO30 | ECO31 | ECO32 | ECO33 | ECO34 | ECO35 | ECO36 | ECO37 | ECO38 | ECO39 | ECO40 | ECO41 | ECO42 |

NOTES:

- MPL NUMBERS AND COMPUTER INPUT NUMBERS ARE PREFIXED BY B21 UNLESS OTHERWISE NOTED.
- WATER LEVEL INSTRUMENTS FOR VARIOUS RANGES ARE CALIBRATED AS STATED BELOW. ALL WATER LEVEL SWITCH SET POINTS ARE NOMINAL. I.E., THE ANALYSES ARE PERFORMED WITH THE SWITCH TRIP UNCERTAINTY INCLUDED. THE CONTAINMENT BUILDING TEMPERATURE ASSUMED TO BE 90°F.
  - A. FUEL ZONE: THE INSTRUMENTS ARE CALIBRATED FOR SATURATED WATER AND STEAM CONDITIONS @ PSIG IN THE VESSEL AND THE DRYWELL WITH NO JET PUMP FLOW.
  - B. WIDE RANGE: THE INSTRUMENTS ARE CALIBRATED FOR 1025 PSIG IN THE VESSEL, NORMAL OPER. TEMP. IN THE DRYWELL AND 20 BTU/LB SUBCOOLING BELOW THE MIDDLE WATER LEVEL NOZZLE AND SATURATED WATER AND STEAM CONDITIONS ABOVE THE MIDDLE WATER LEVEL NOZZLE WITH NO JET PUMP FLOW.
  - C. NARROW RANGE: (SAFEGUARDS AND FEEDWATER): THE INSTRUMENTS ARE CALIBRATED FOR SATURATED WATER AND STEAM CONDITIONS AT 1025 PSIG IN THE VESSEL AND NORMAL OPERATING TEMPERATURE IN THE DRYWELL.
  - D. UPSET RANGE: THE INSTRUMENT IS CALIBRATED FOR SATURATED WATER AND STEAM CONDITIONS AT 1025 PSIG IN THE VESSEL AND NORMAL OPERATING TEMP. IN THE DRYWELL.
  - E. SHUTDOWN: THE INSTRUMENT IS CALIBRATED FOR 120°F WATER AT 0 PSIG IN VESSEL AND 90°F IN THE DRYWELL.
- THE ACCUMULATOR A005 DESIGN PRESSURE SHALL BE COMPATIBLE WITH THE A05 PNEUMATIC SUPPLY ACCUMULATOR.

SYSTEM SELECTION OPTIONS ARE INDICATED BY MULTIPLE MPL ITEM NO.

REFERENCES:-

- |                  |  |
|------------------|--|
| MPL ITEM NO.     | REFERENCE DOCUMENTS                        |
| 1. D-808-001     | FEEDWATER CONTROL SYSTEM IED               |
| 2. B21-4820      | NUCLEAR BOILER SYSTEM DESIGN SPECIFICATION |
| 3. D-808-301     | REMOTE SHUTDOWN SYSTEM IED                 |
| 4. C81-4830      | PERFORMANCE MONITORING SYSTEM              |
| 5. C84-4830      | DCS I/O LIST                               |
| 6. C12-4810/1050 | RBCS                                       |
| 7. D-302-607     | NUCLEAR BOILER SYSTEM                      |

LEGEND:-

△ 'ERS' SIGNAL LIST FUNCTION

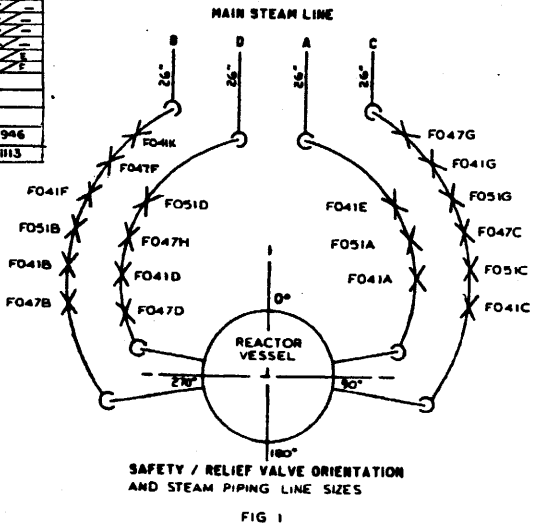
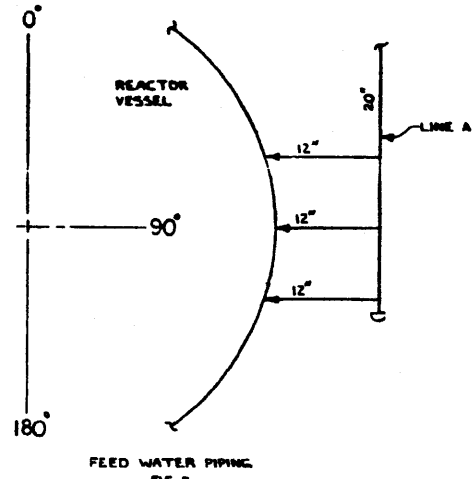


FIG 1 SAFETY / RELIEF VALVE ORIENTATION AND STEAM PIPING LINE SIZES



FEED WATER PIPING FIG.2

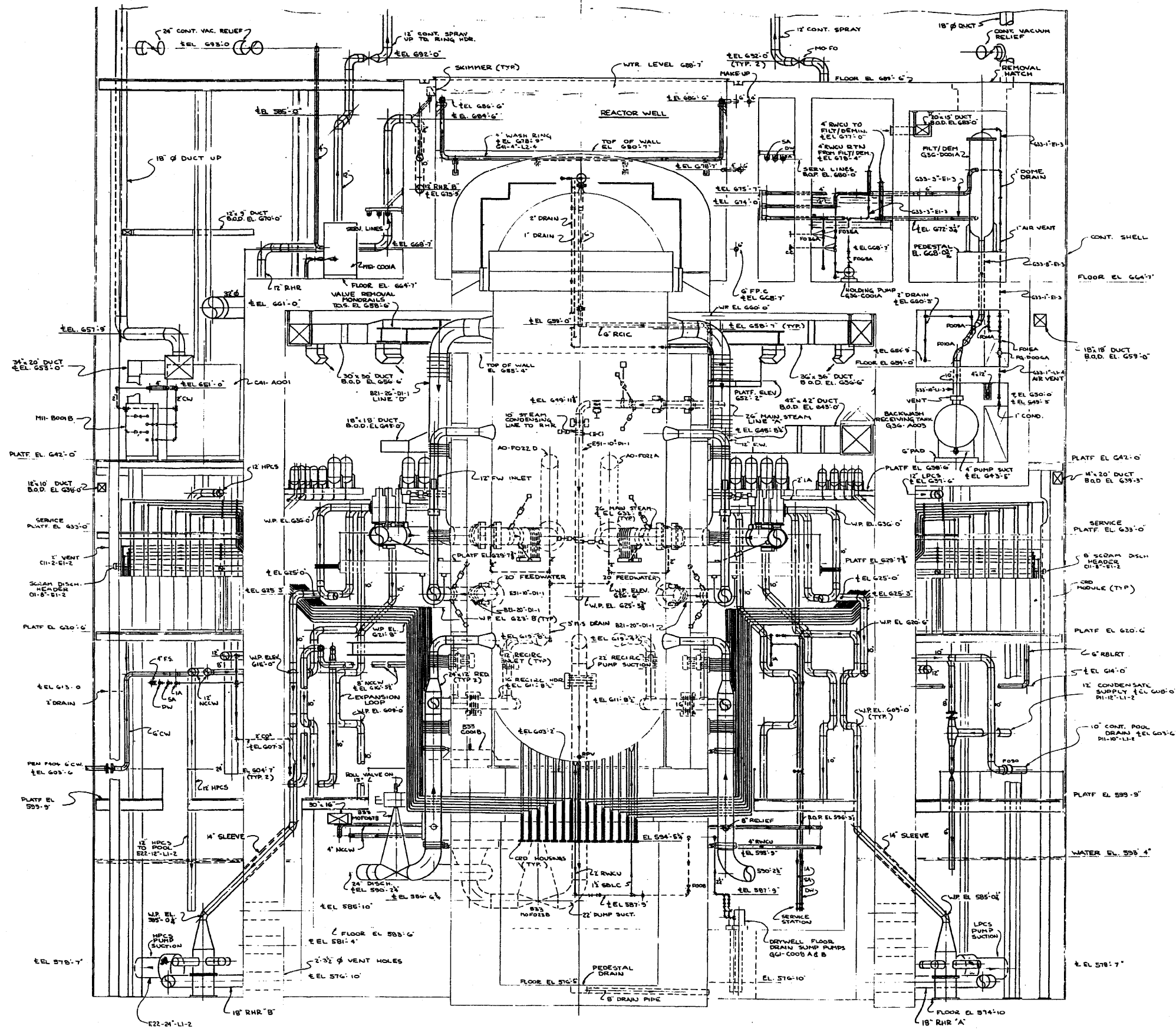
(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

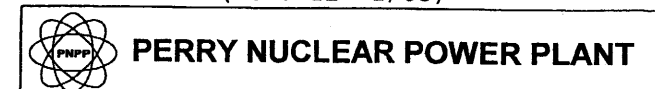
Nuclear Boiler System

Figure 5.1-3 (Sheet 4 of 4)

(Dwg. D-302-608)



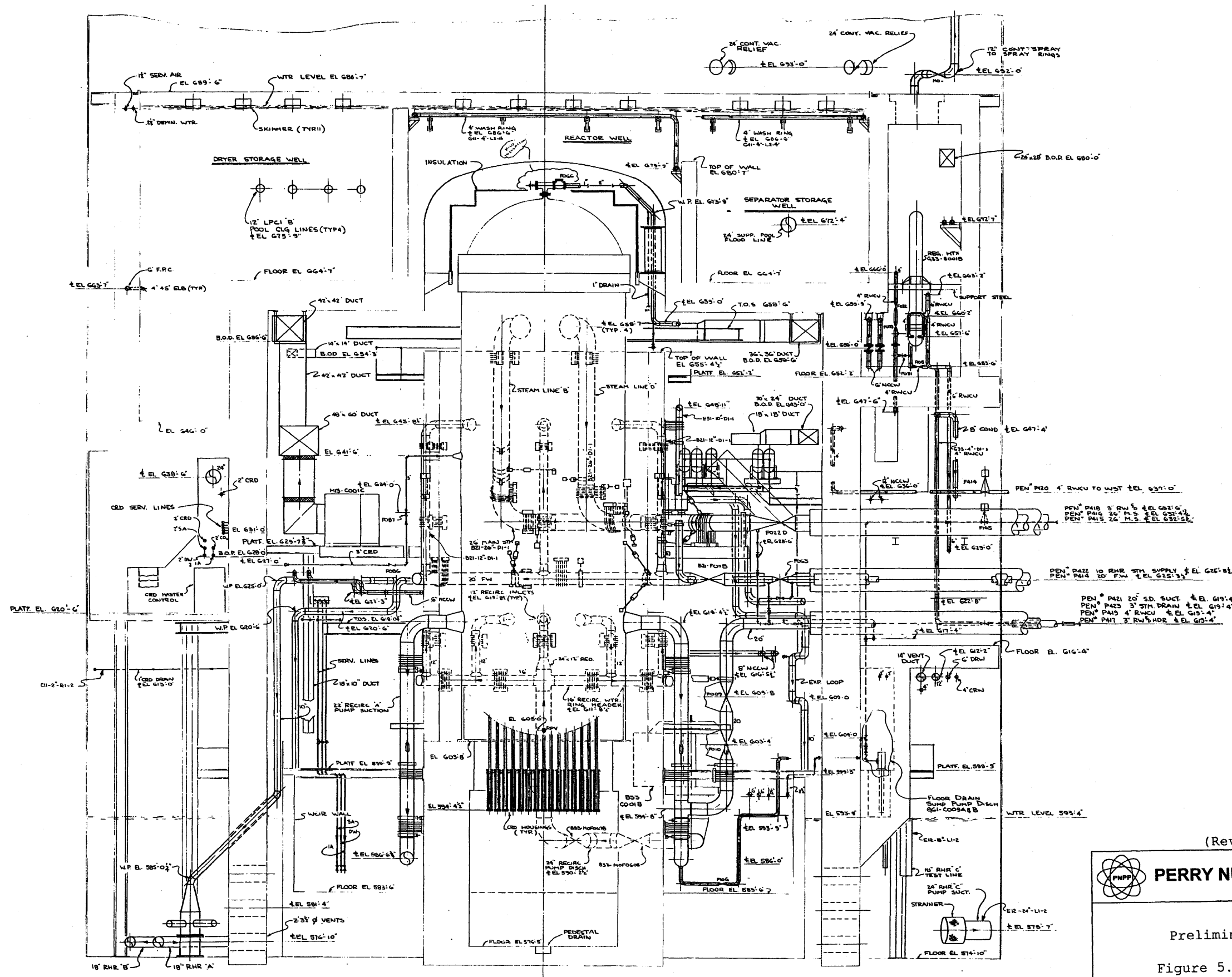
(Rev. 12 1/03)



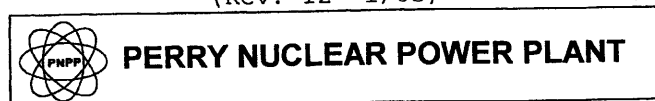
**PERRY NUCLEAR POWER PLANT**

Preliminary Piping Study

Figure 5.1-4 (Sheet 1 of 2)



(Rev. 12 1/03)

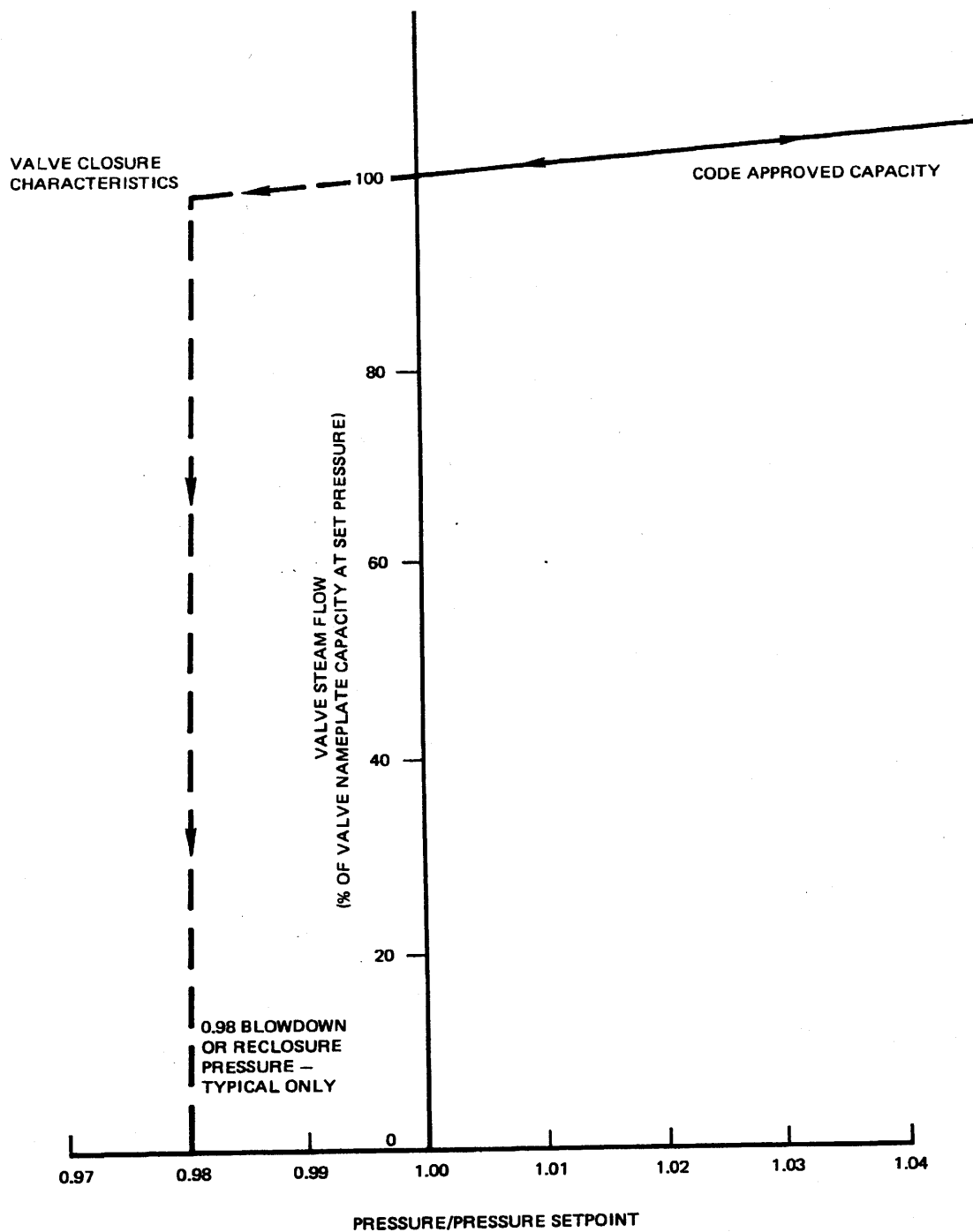


**PERRY NUCLEAR POWER PLANT**

Preliminary Piping Study

Figure 5.1-4 (Sheet 2 of 2)





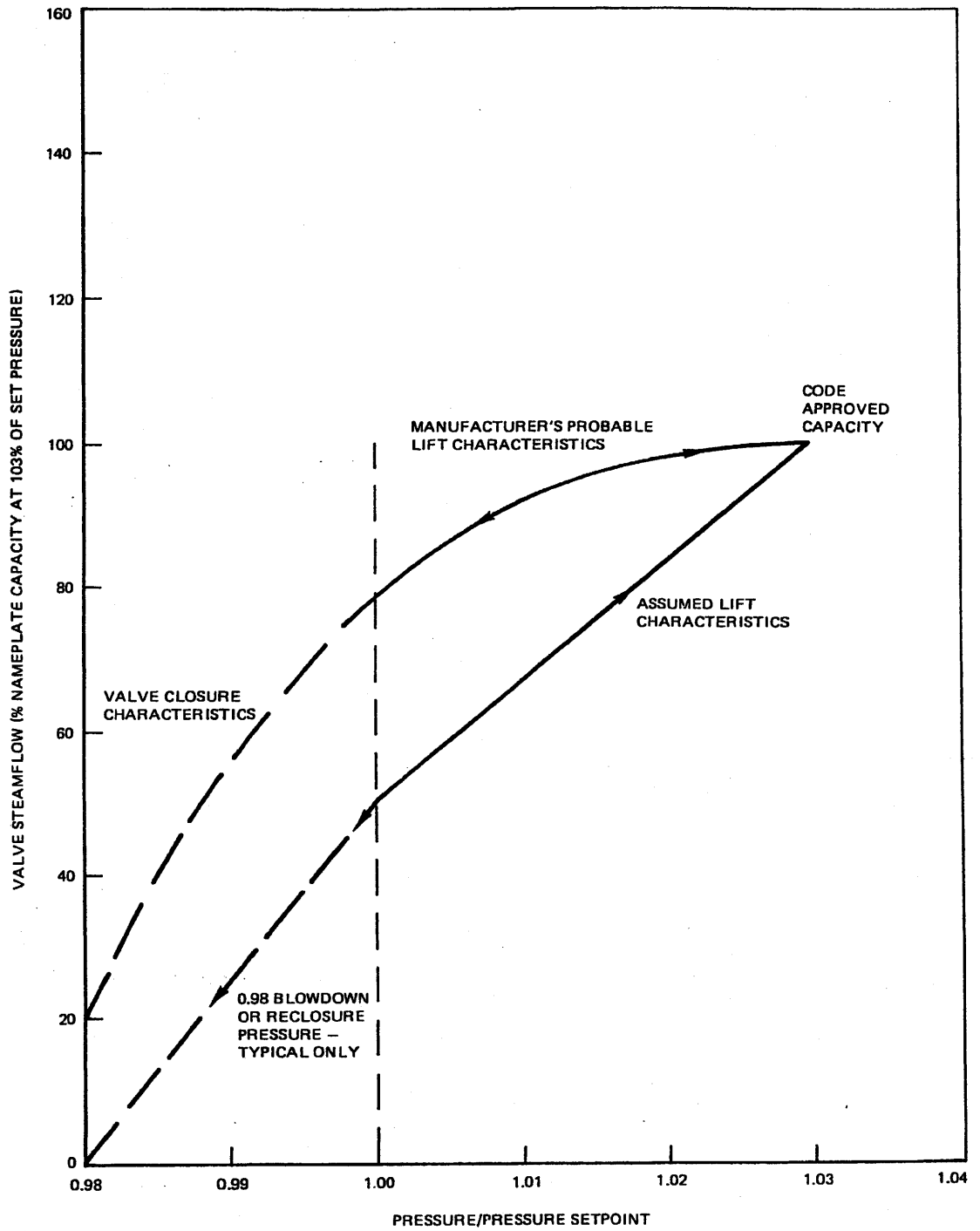
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Typical Dual Safety/Relief Valve  
Capacity Characteristics Power -  
Actuated Relief Mode

Figure 5.2-1



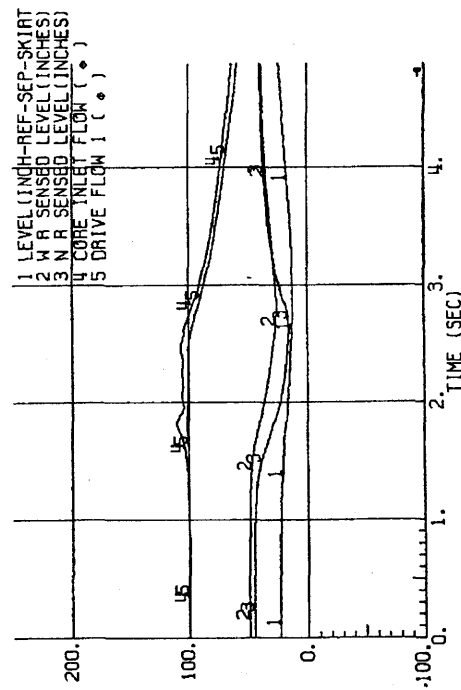
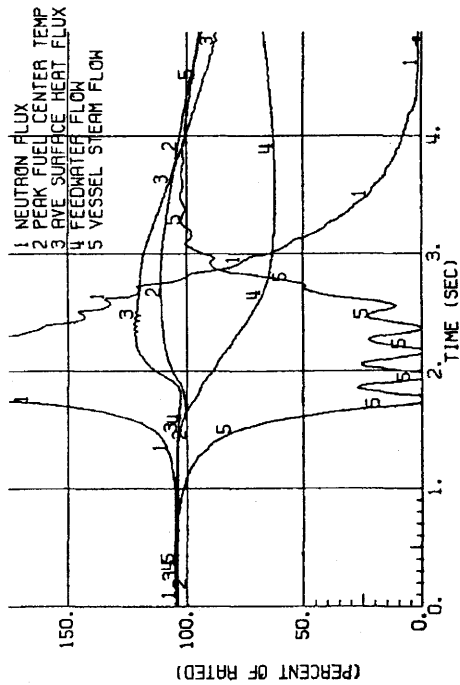
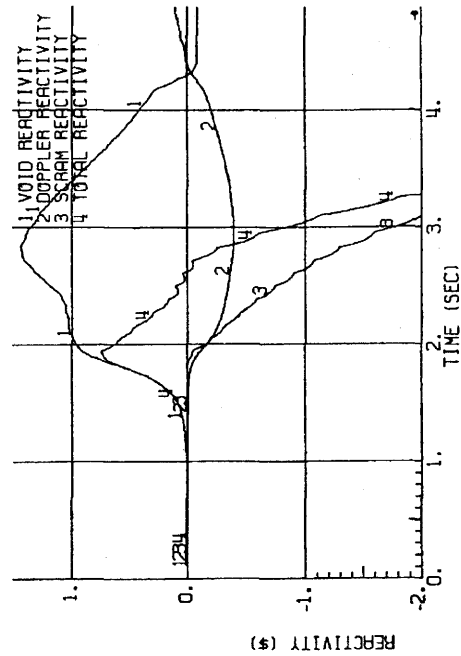
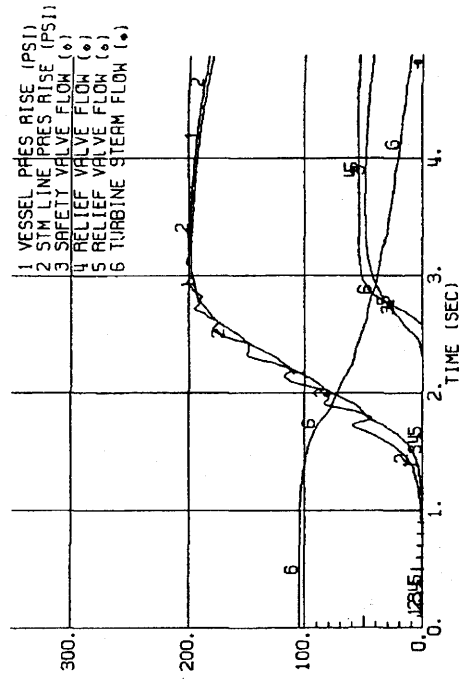
(Rev. 12 1/03)




**PERRY NUCLEAR POWER PLANT**

Typical Dual Safety/Relief Valve  
Capacity Characteristics - Spring  
Action Safety Mode

Figure 5.2-2

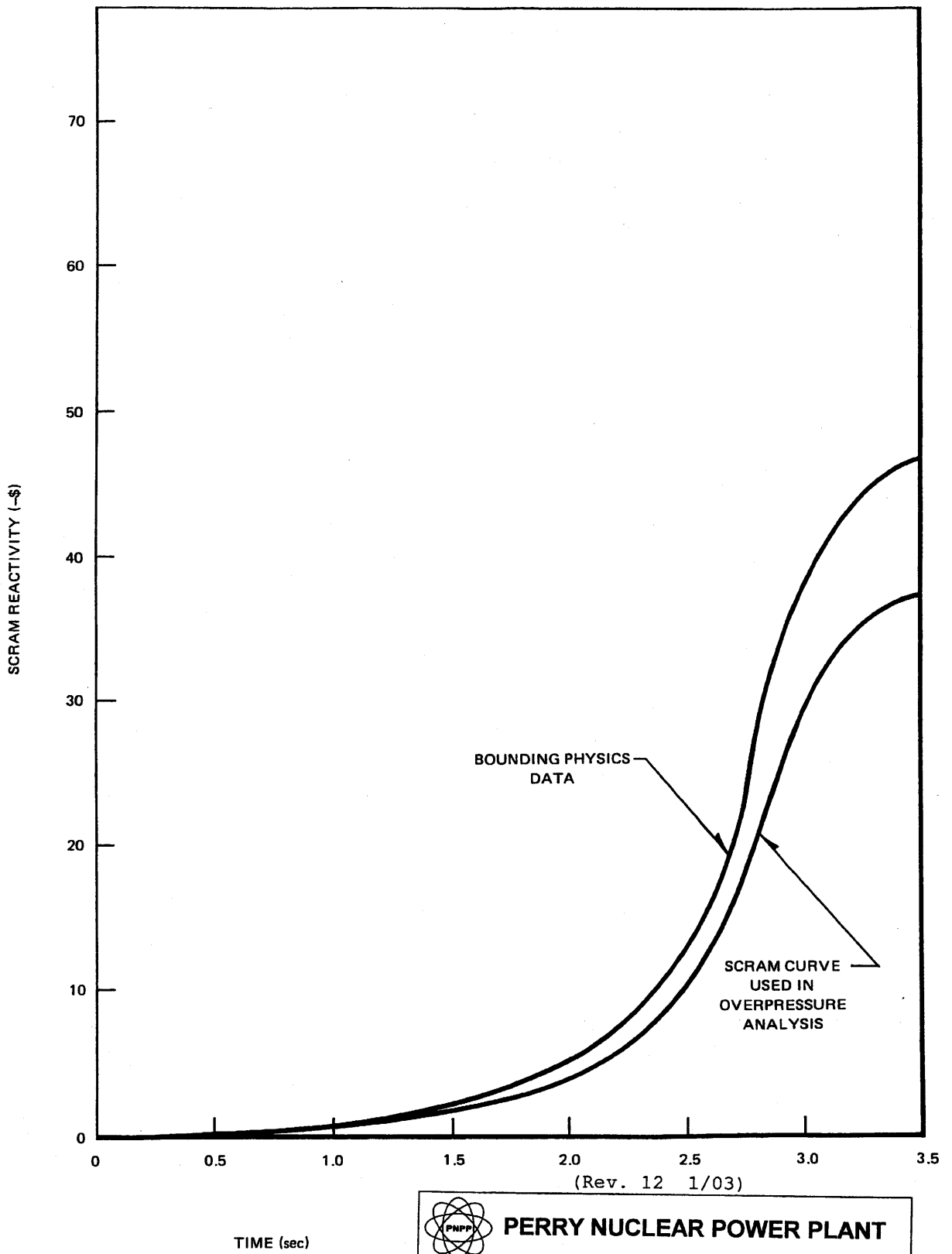


(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

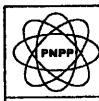
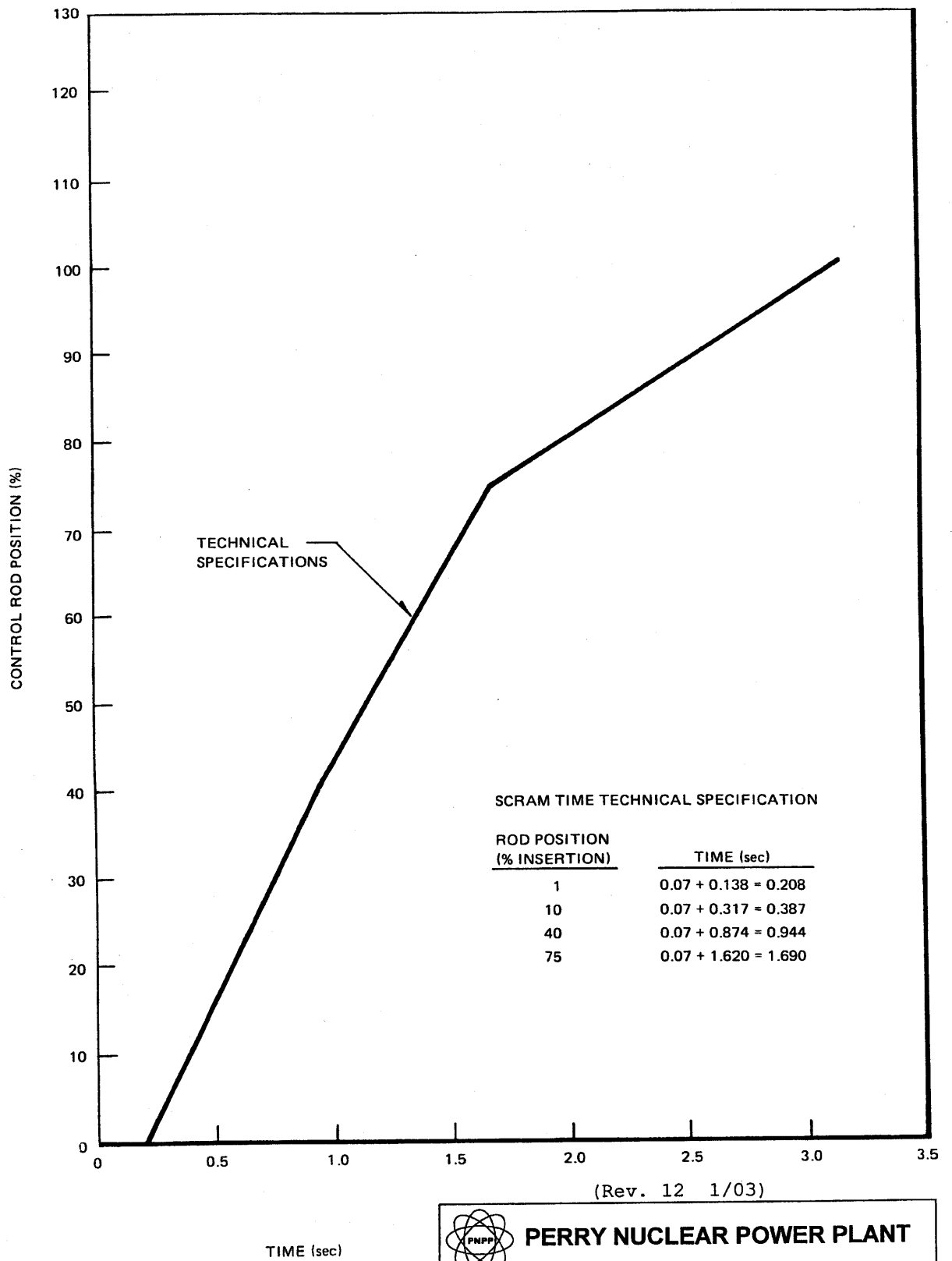
Initial Cycle MSIV Closure  
 with Flux Scram and Installed  
 Safety/Relief Valve  
 Capacity (Overpressurization  
 Protection Analysis)  
 Figure 5.2-3



**PERRY NUCLEAR POWER PLANT**

Scram Reactivity vs  
Time Characteristics

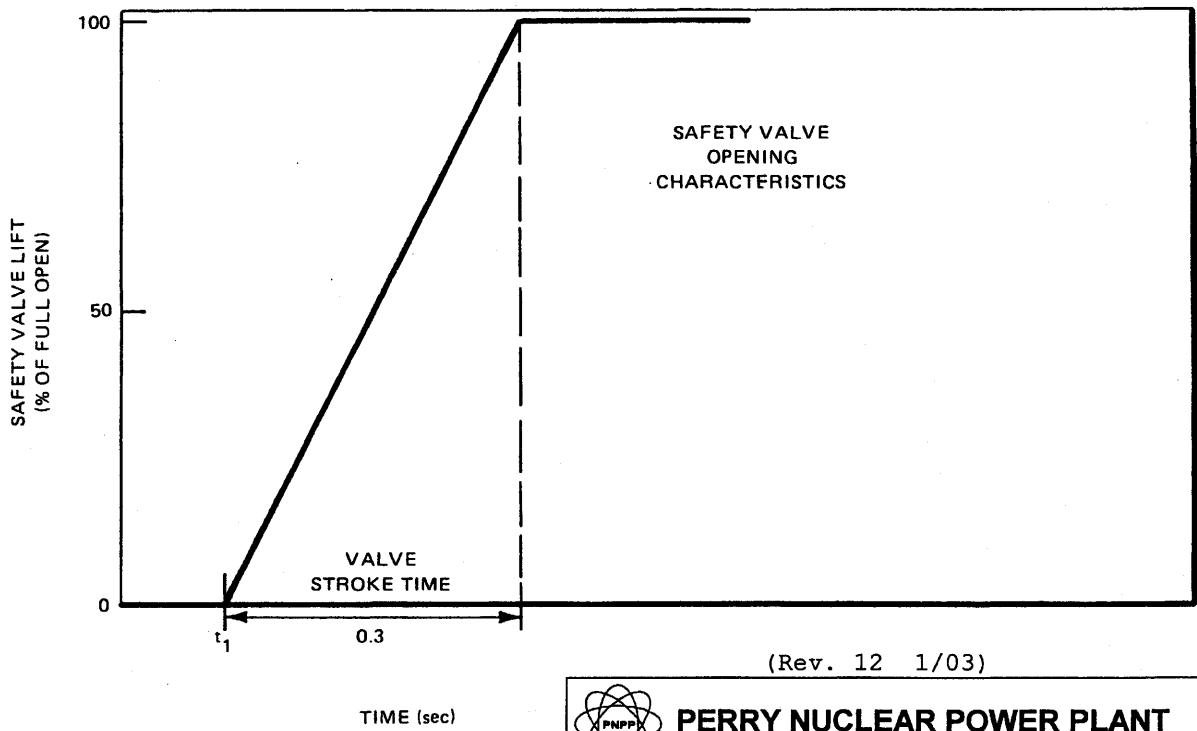
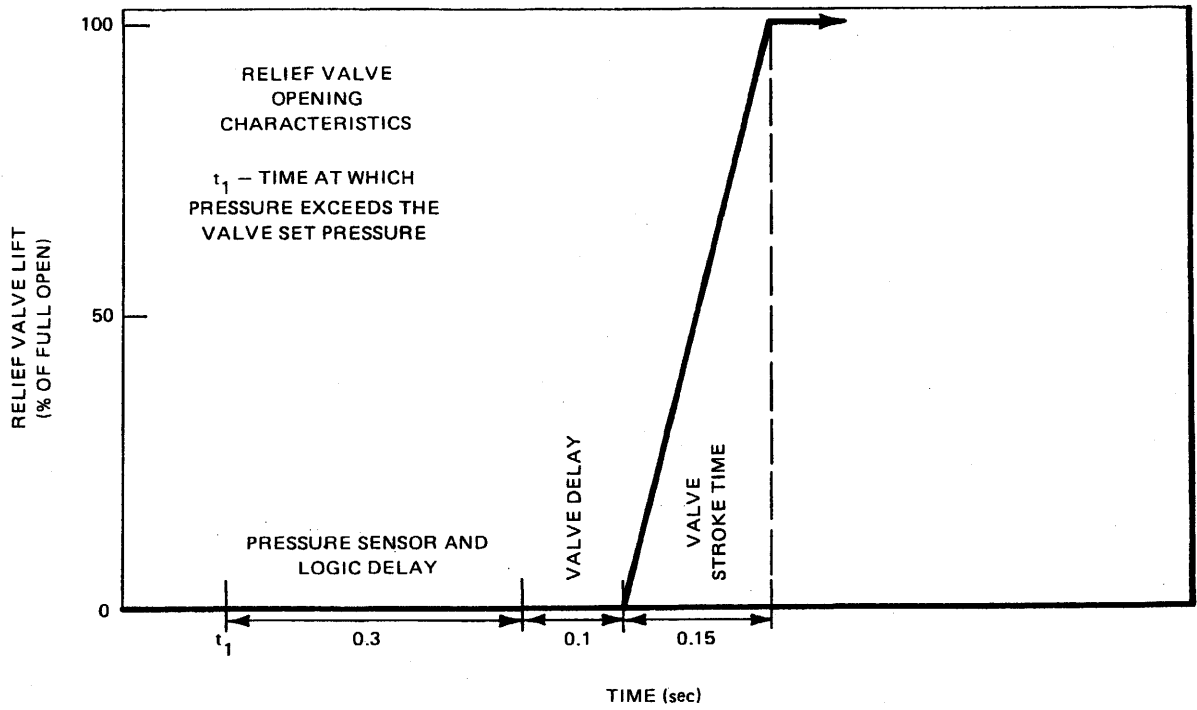
Figure 5.2-4



**PERRY NUCLEAR POWER PLANT**

Control Rod Drive vs  
Time Characteristics

Figure 5.2-5



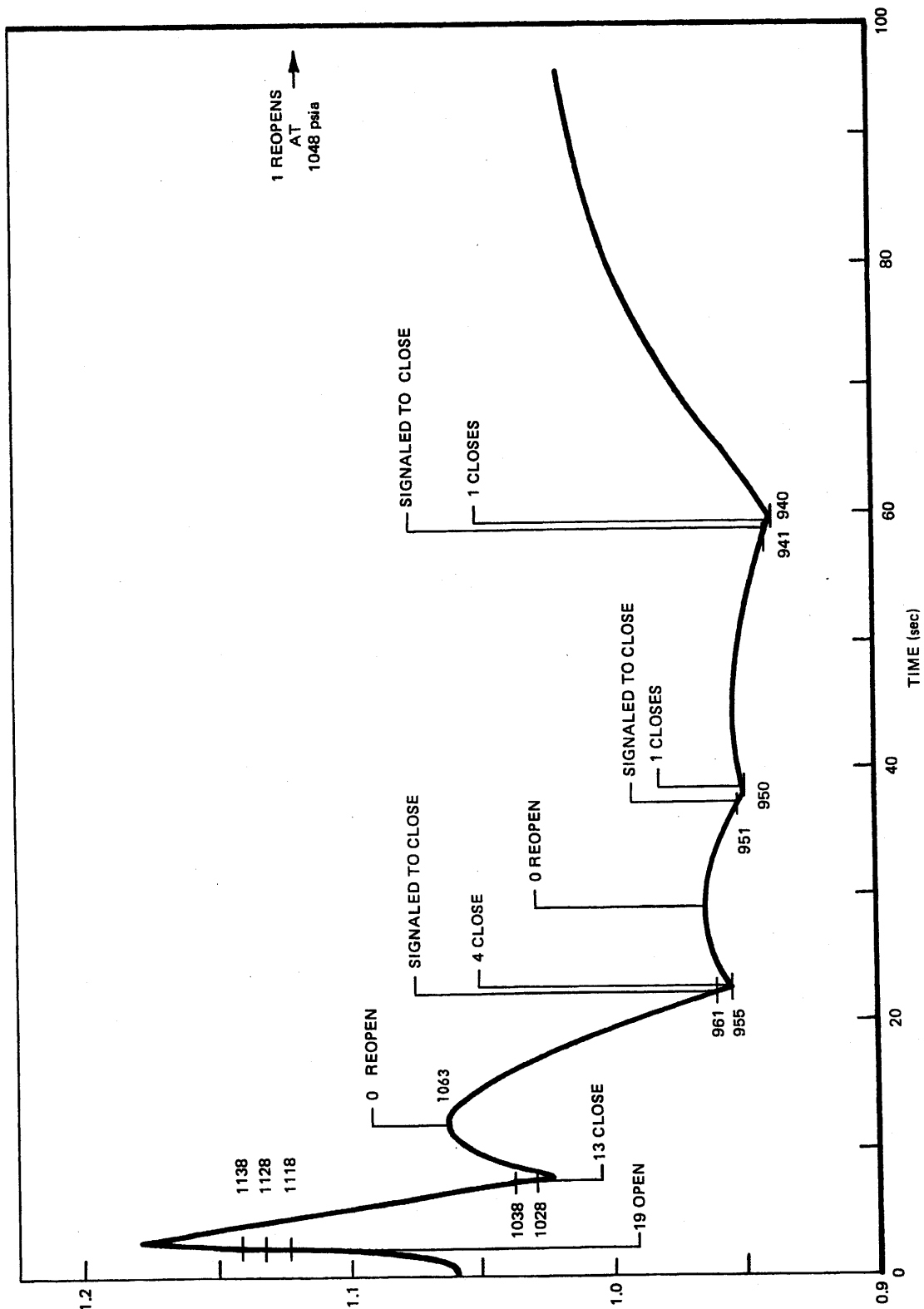
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Power Actuated & Safety Action  
Valve Lift Characteristics

Figure 5.2-6a



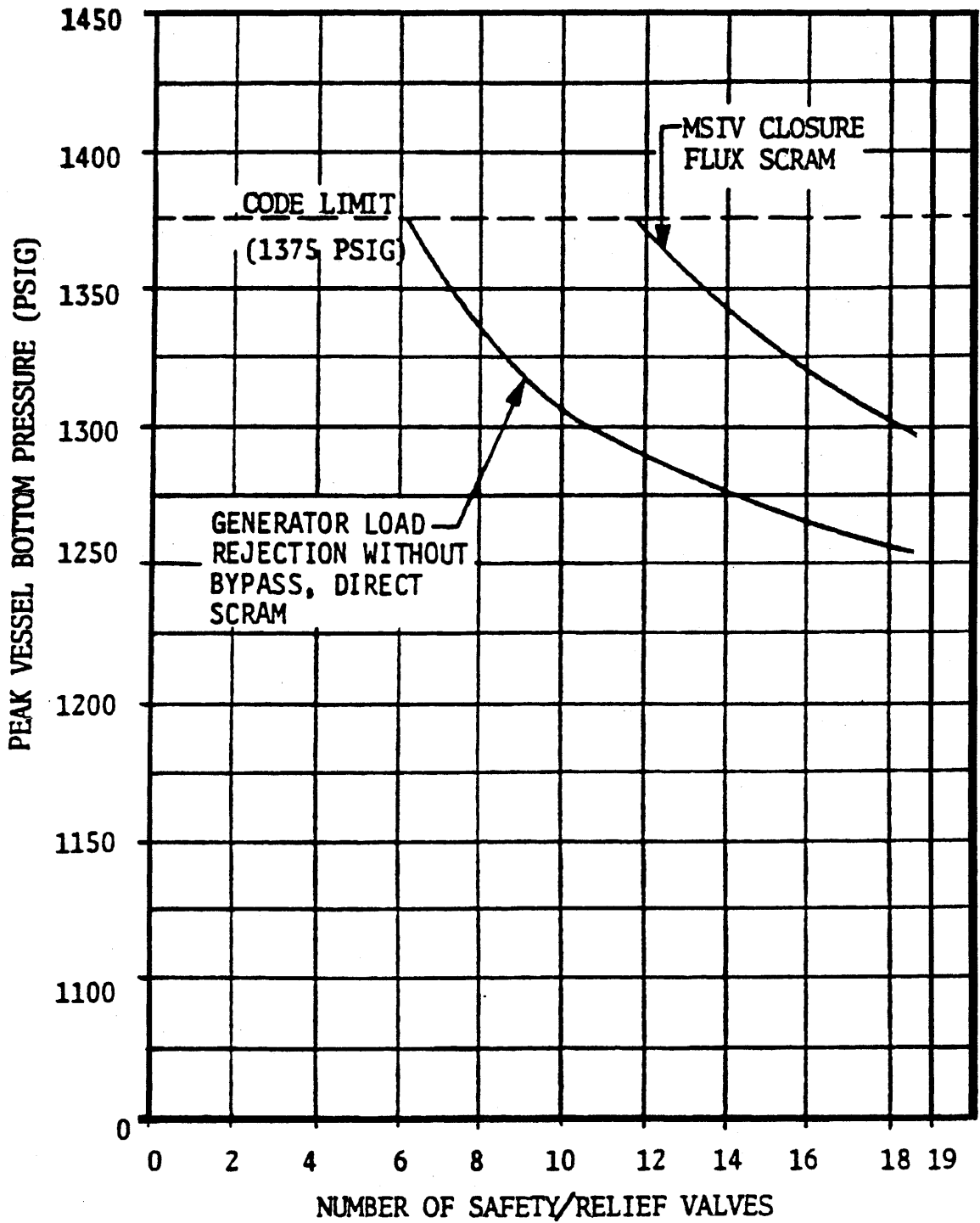
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Reactor Vessel Pressure Following  
Transient Isolation Event

Figure 5.2-6b



(Rev. 12 1/03)

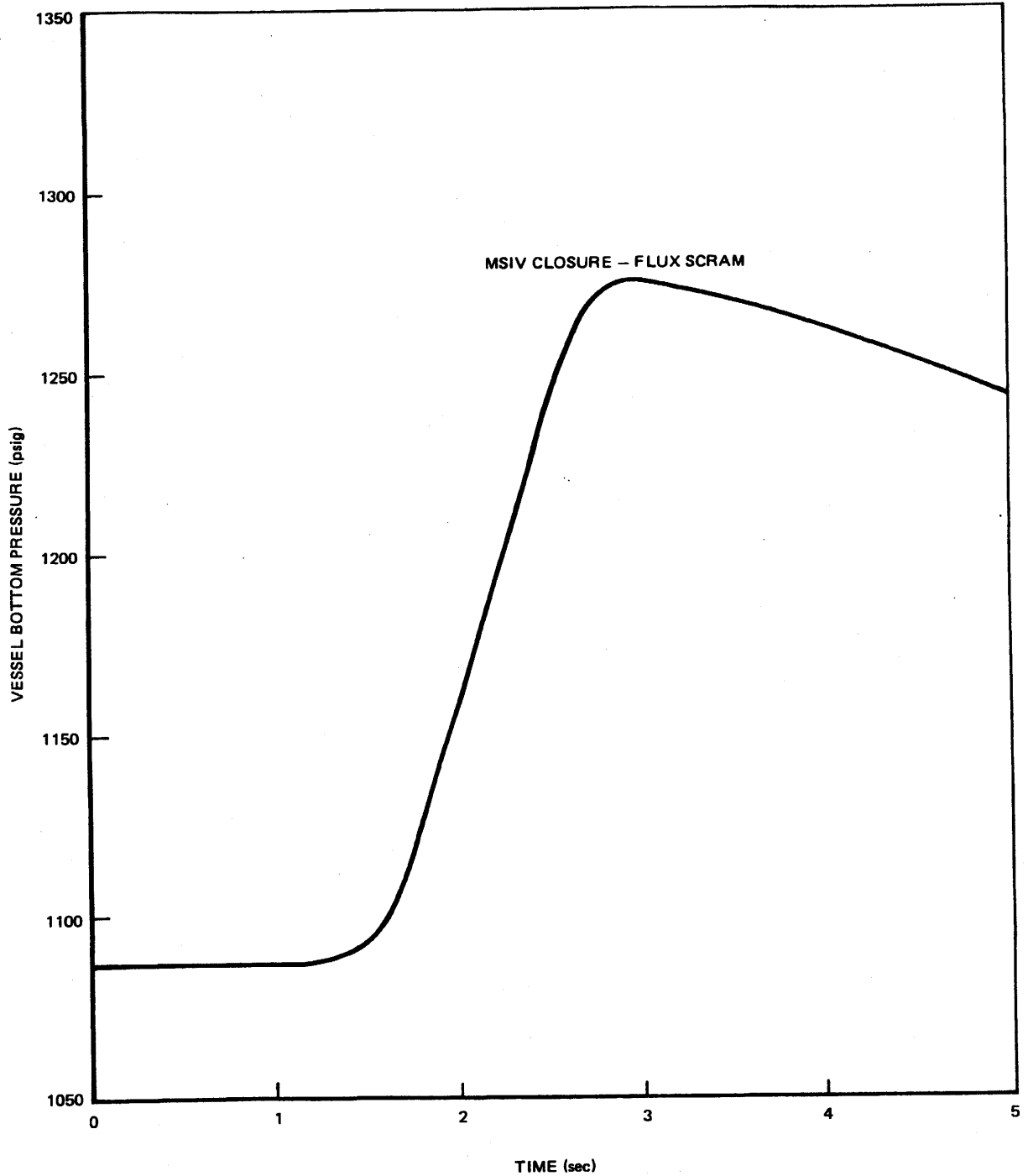


**PERRY NUCLEAR POWER PLANT**

Peak Vessel Pressure  
Versus Safety/Relief Capacity

Figure 5.2-7





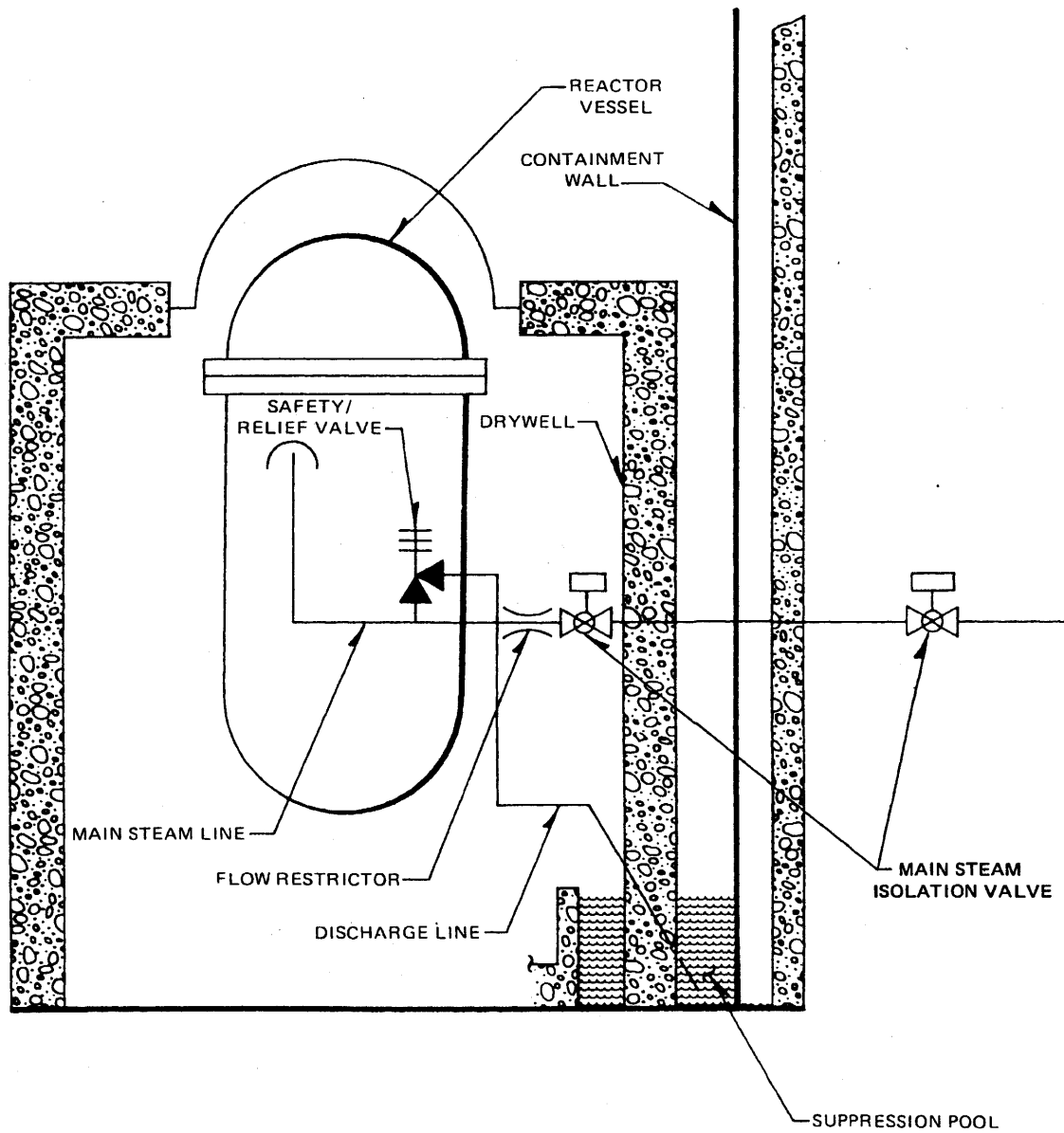
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Initial Cycle  
Time Response for Pressurization

Figure 5.2-8



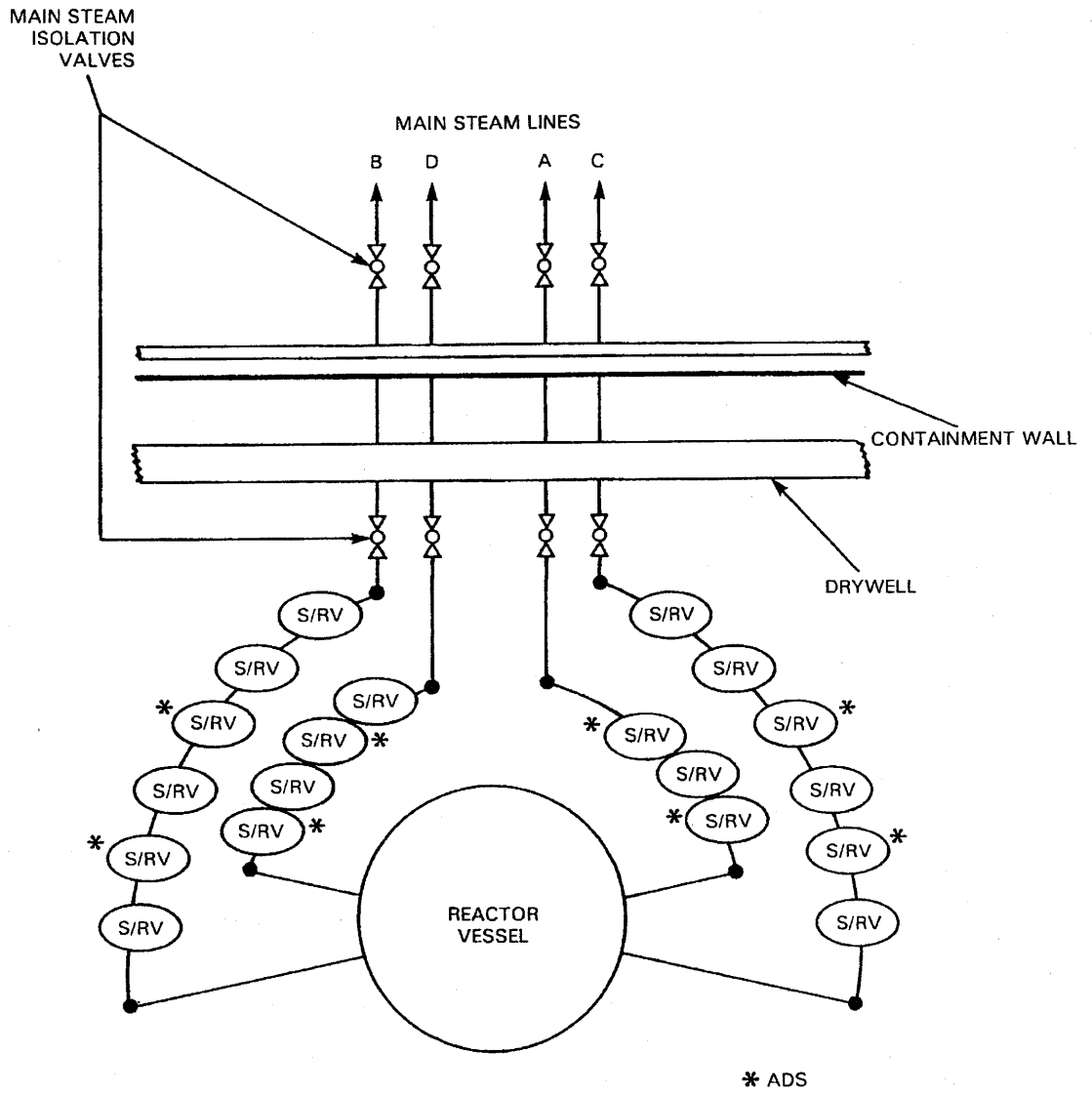
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Safety/Relief Valve Schematic  
Elevation

Figure 5.2-9



SCHMATIC PLAN

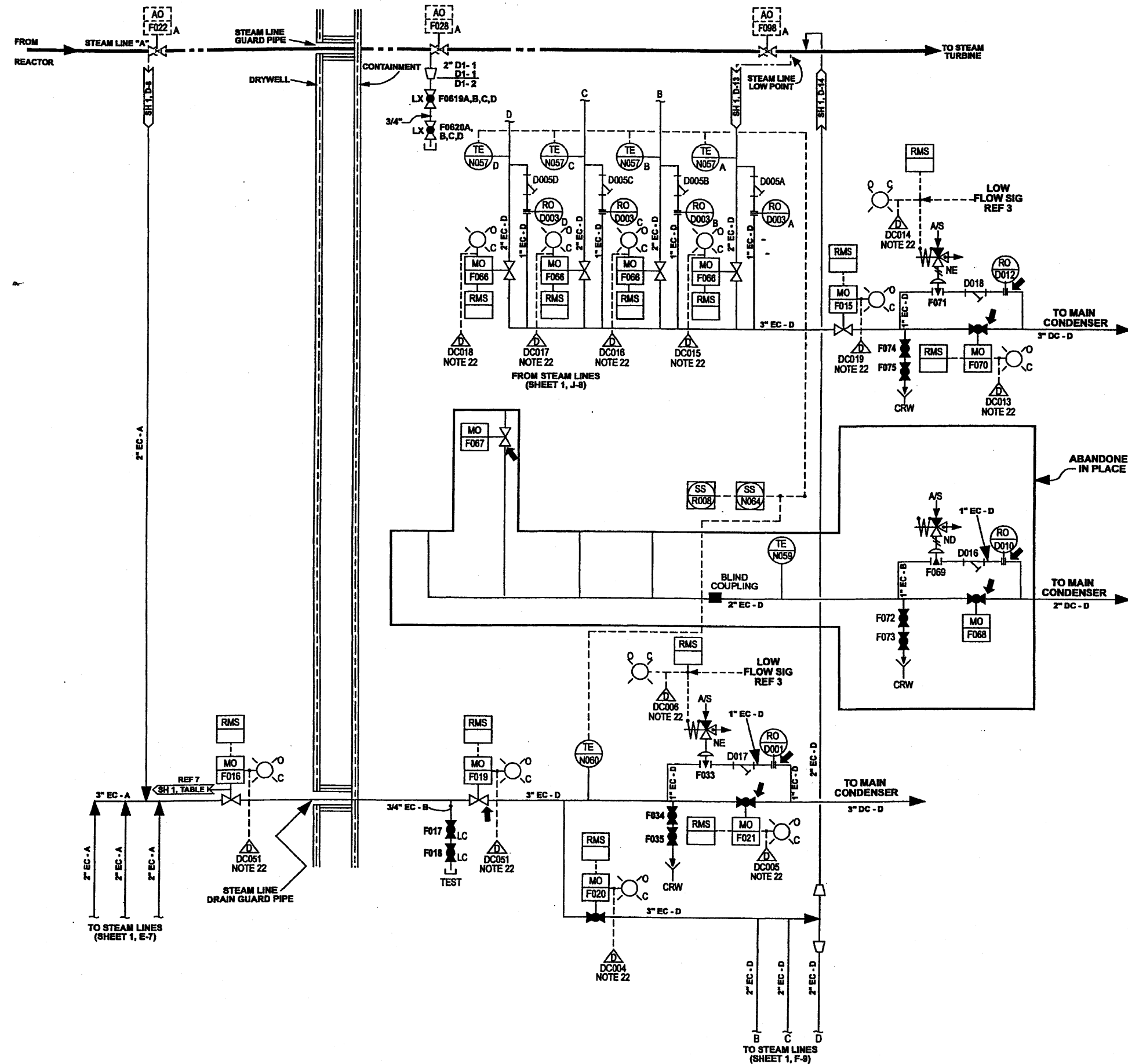
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**


Safety/Relief Valve and  
Steamline Schematic

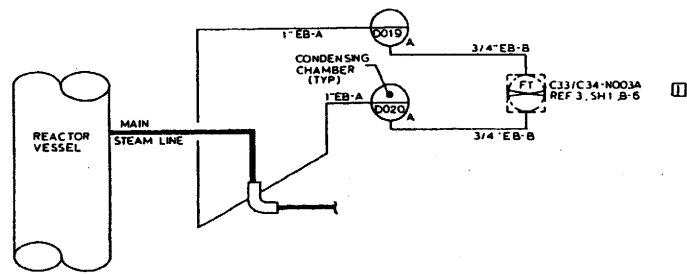
Figure 5.2-10



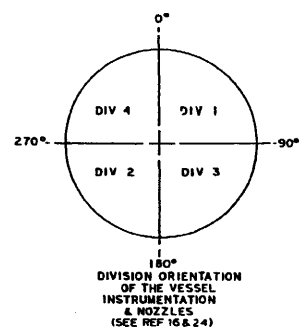
- Notes: (Continued)
25. Applies to solid state plants only.
  26. If no other check valve between the reactor and the feedwater pumps is designed to close prior to appreciable flow reversal, F032 should be interlocked to dump air pressure automatically in the event all feedwater pumps trip.
  27. S/RV body vent lines (if required by S/R valve interface control drawing, Ref. 30) shall be stainless steel for approximately the last 15 feet. The outlet of the vent line shall be submerged approximately 10 feet. The balance of the piping shall be 2" schedule 40 carbon steel.
  28. Configuration applies to relay plants only. For solid state, R623 receives signals from PIS N678 and LIS N681.

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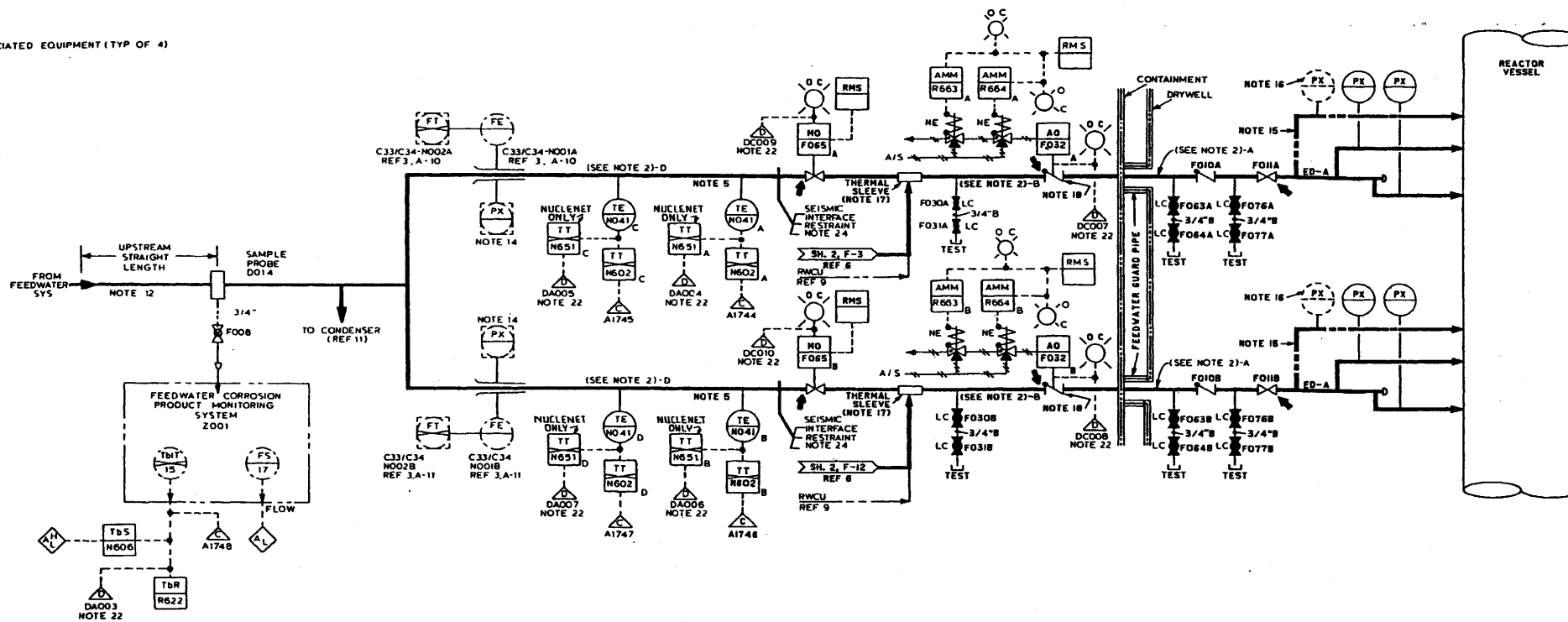
|   |                                  |
|---|----------------------------------|
|  | <b>PERRY NUCLEAR POWER PLANT</b> |
|   | Nuclear Boiler System            |
|   | Figure 5.2-11 (Sheet 1 of 2)     |



DETAIL  
ELBOW TAP & ASSOCIATED EQUIPMENT (TYP OF 4)



180°  
DIVISION ORIENTATION  
OF THE VESSEL  
INSTRUMENTATION  
& NOZZLES  
(SEE REF 10 & 24)

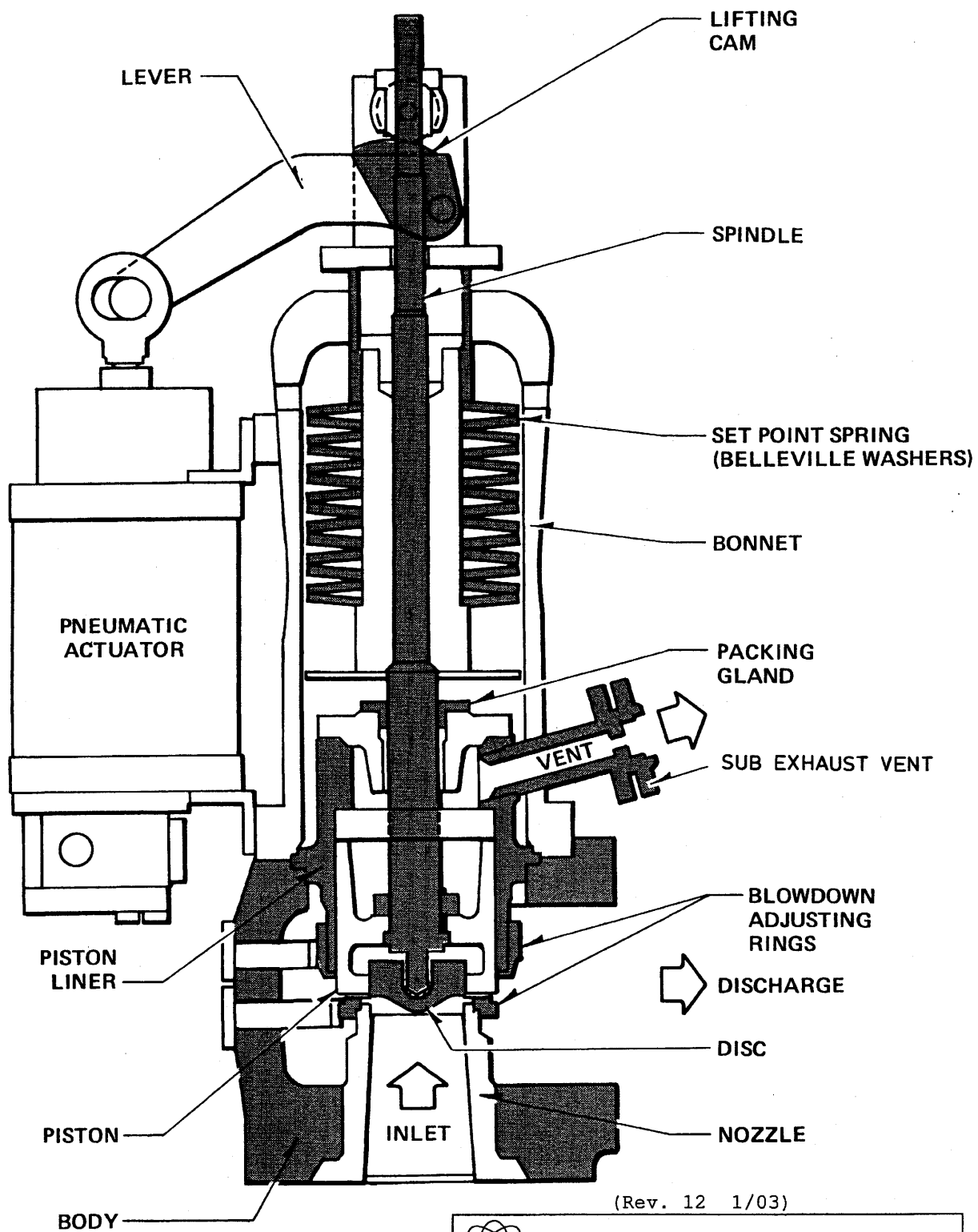


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**PERRY NUCLEAR POWER PLANT**

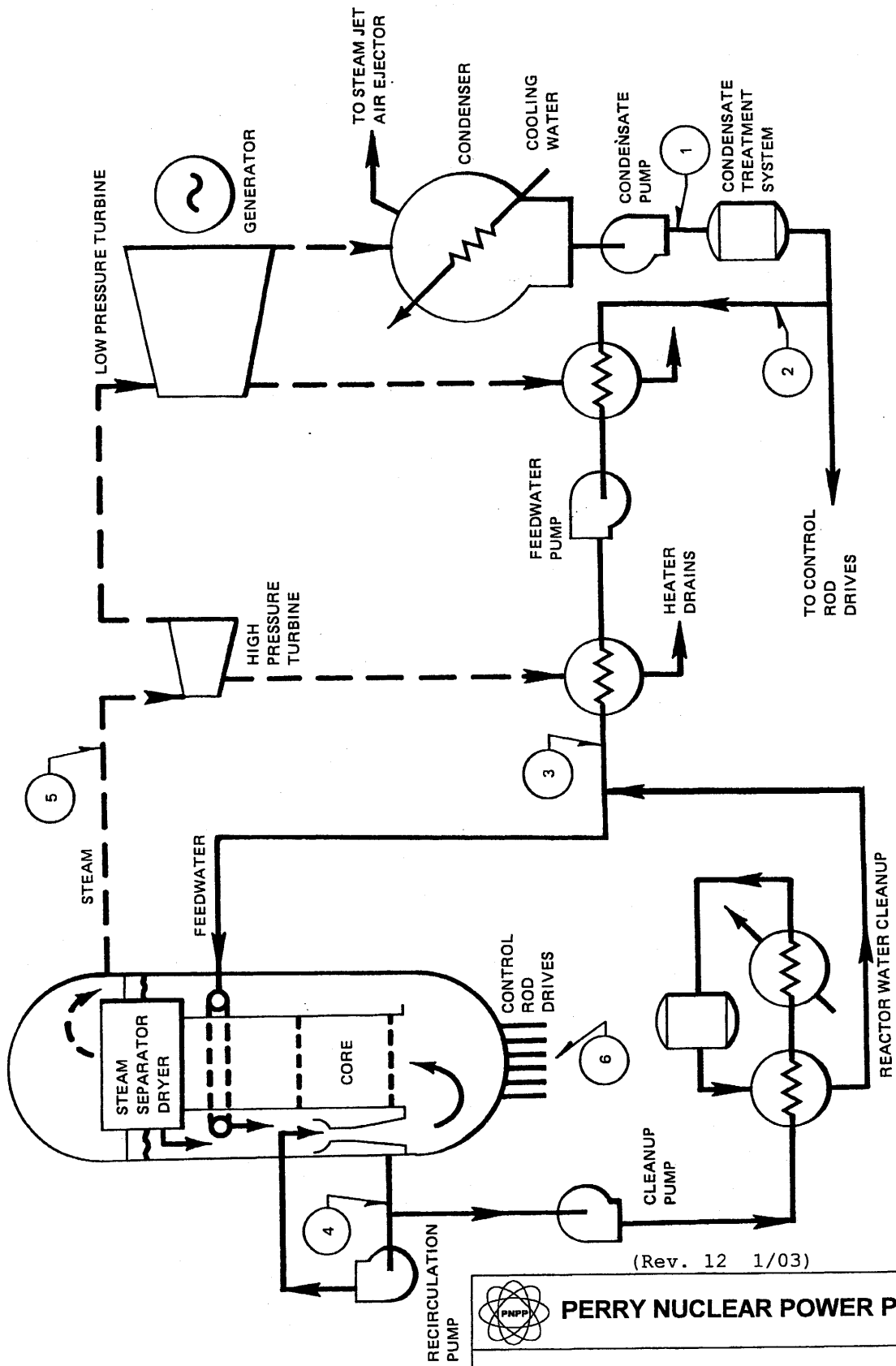
Nuclear Boiler System  
Figure 5.2-11 (Sheet 2 of 2)




**PERRY NUCLEAR POWER PLANT**

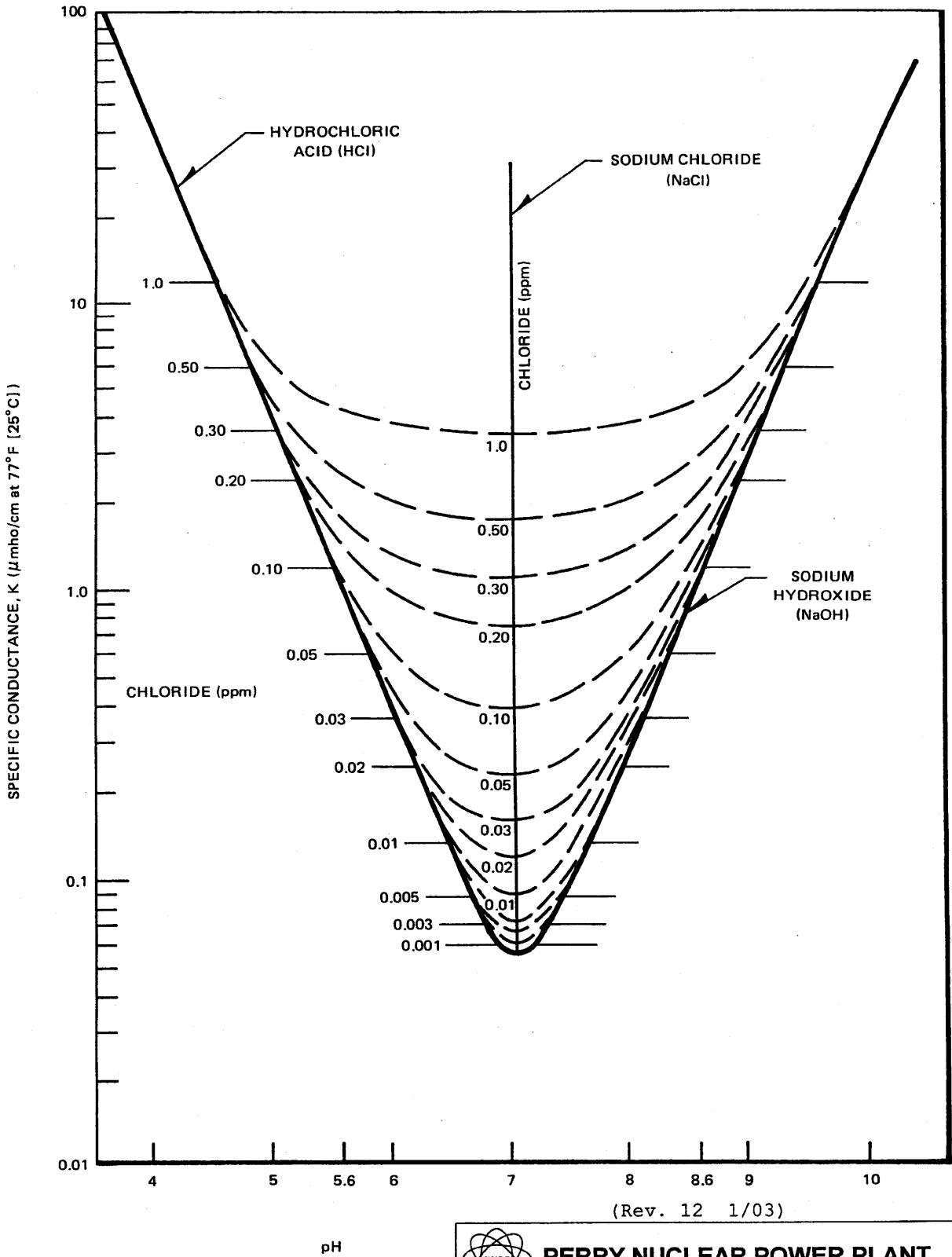
Schematic of Safety Valve with  
Auxiliary Activating Device

Figure 5.2-12




(Rev. 12 1/03)

|  |                                  |
|--|----------------------------------|
|  | <b>PERRY NUCLEAR POWER PLANT</b> |
| Typical BWR Flow Diagram<br>Figure 5.2-13  |                                  |



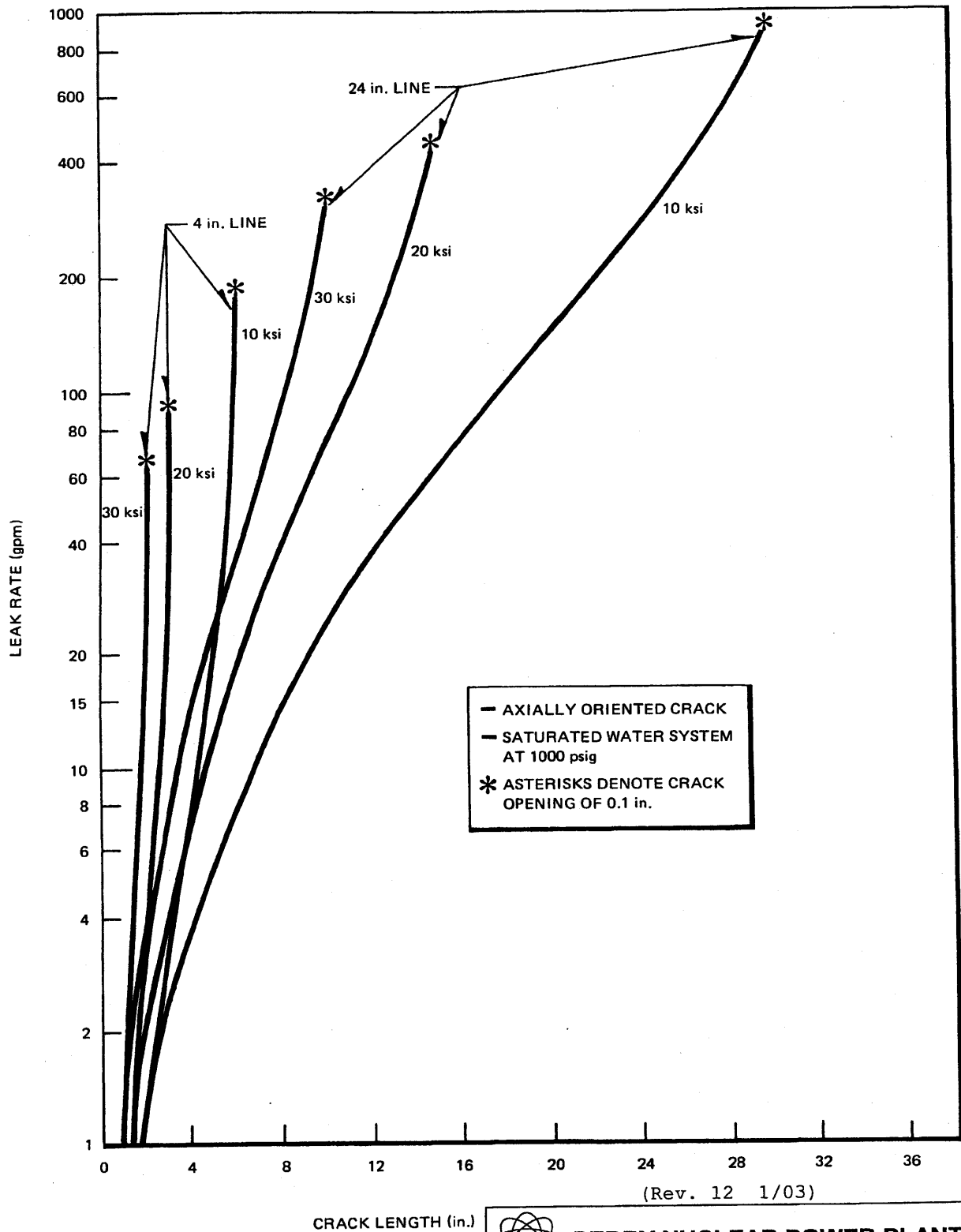
(Rev. 12 1/03)


**PERRY NUCLEAR POWER PLANT**

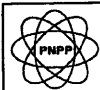
Conductivity pH and Chloride  
 Concentration of Aqueous Solution @  
 77°F (25°C)

Figure 5.2-14





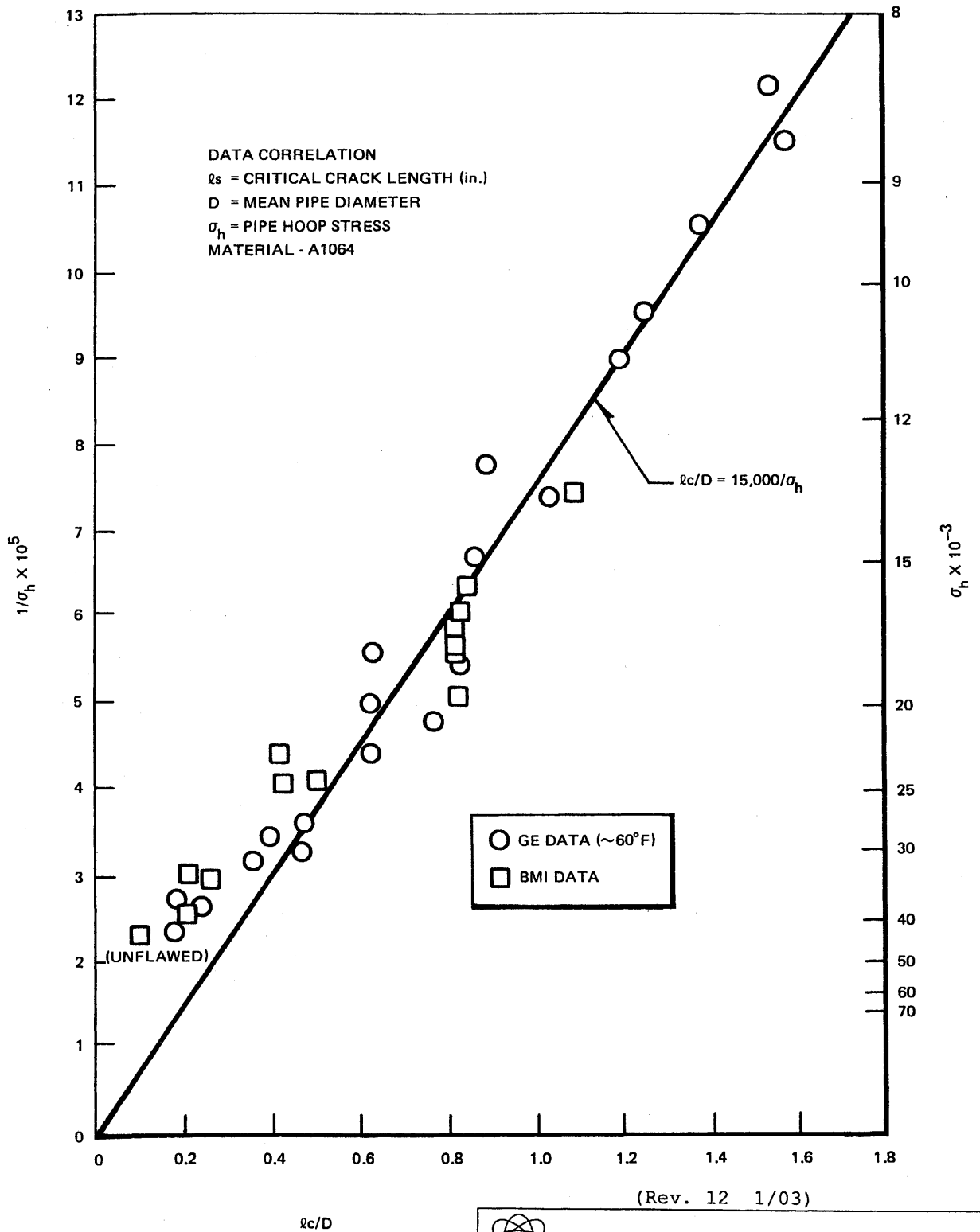
— AXIALLY ORIENTED CRACK  
 — SATURATED WATER SYSTEM AT 1000 psig  
 \* ASTERISKS DENOTE CRACK OPENING OF 0.1 in.




**PERRY NUCLEAR POWER PLANT**

Calculated Leak Rate vs Crack Length as a Function of Applied Hoop Stress

Figure 5.2-15 ...

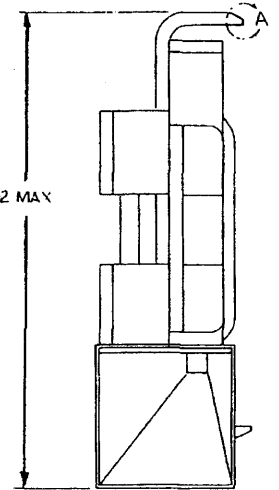
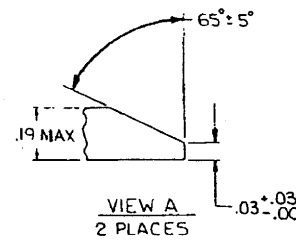
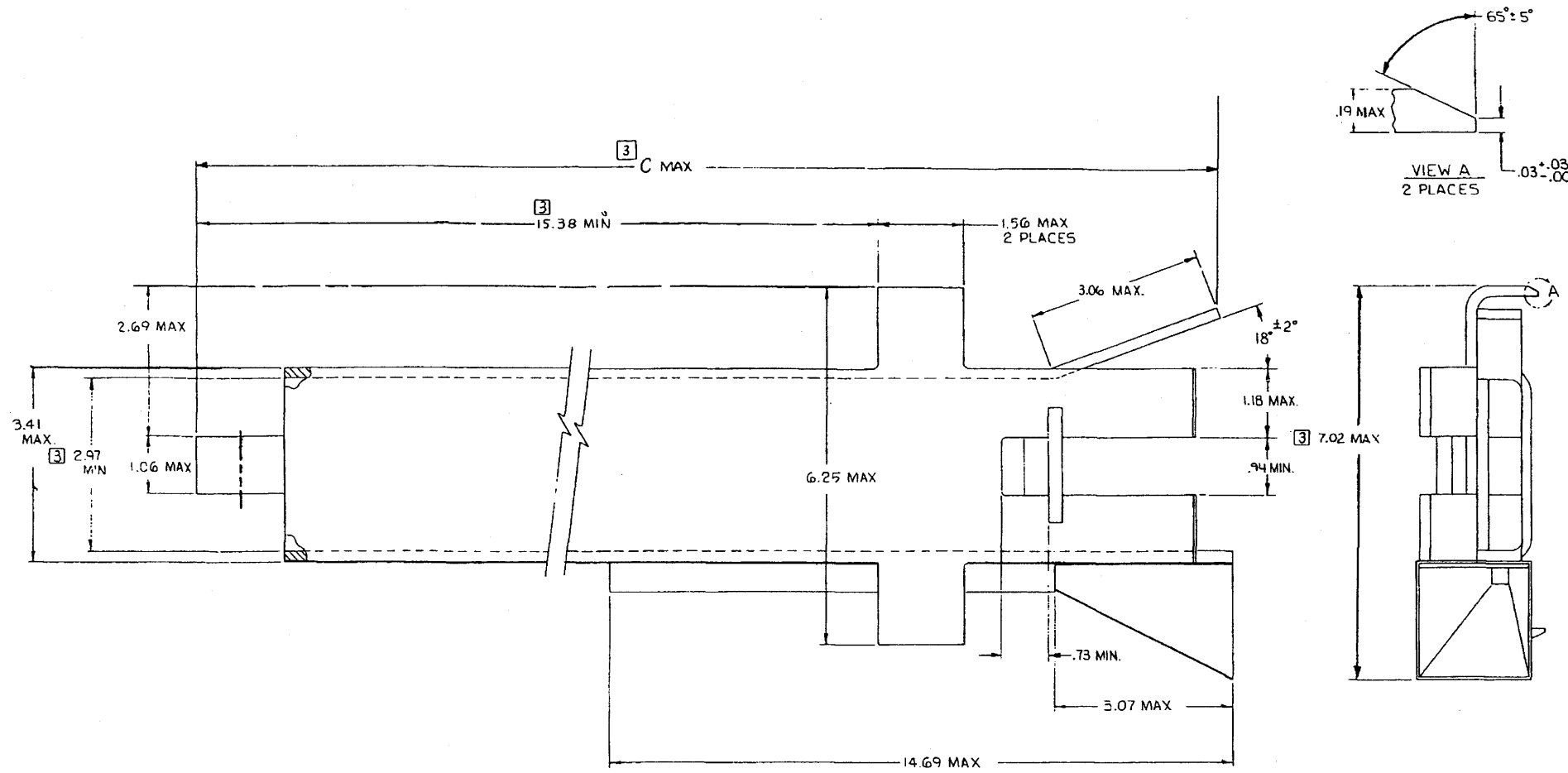



**PERRY NUCLEAR POWER PLANT**

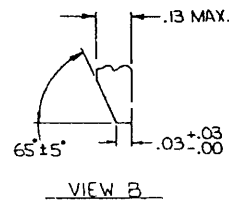
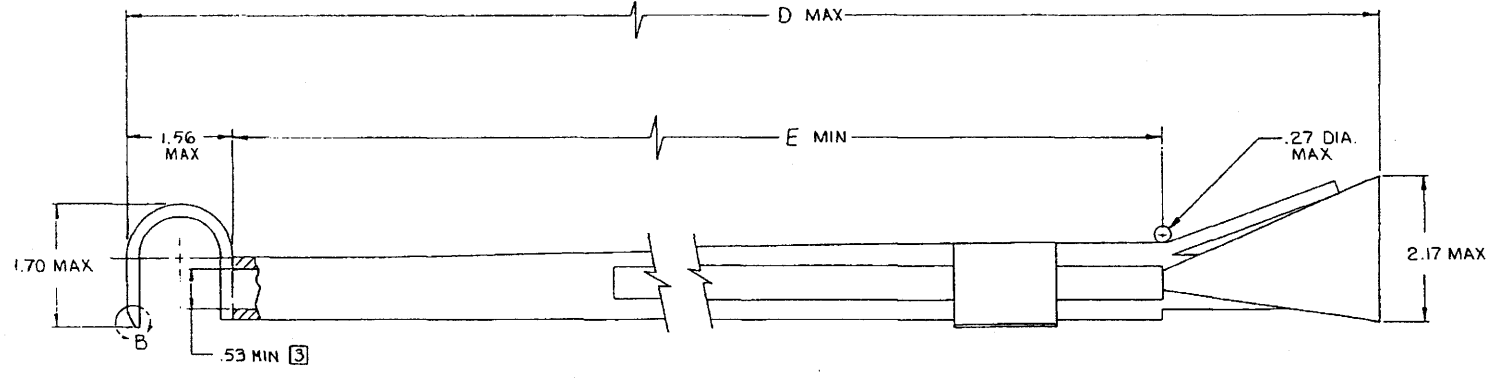
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Axial Throughwall Crack Length  
 Data Correlation

Figure 5.2-16

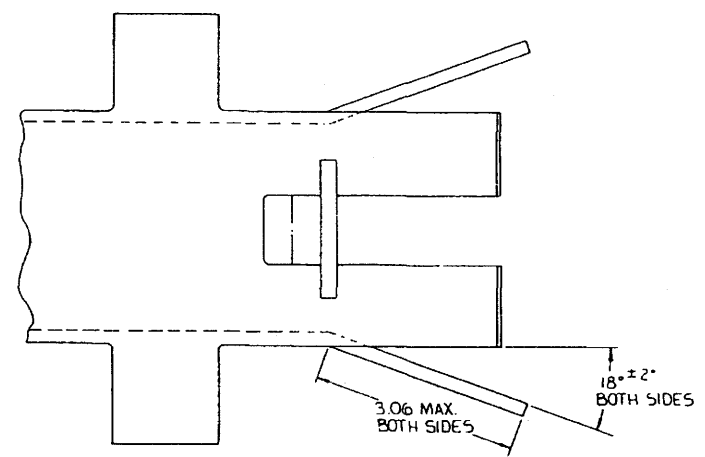


- NOTES:
- 1. MATL: AUSTENITIC STN STL UNLESS OTHERWISE INDICATED.
  - 2. ALL DIMENSIONS ARE IN INCHES EXCEPT AS NOTED ON DRAWING
  - 3. ABBREVIATIONS PER ANSI Y1.1



1 3 APPROX. WT = 6 LBS

| PT. NO | C     | D     | E     |
|--------|-------|-------|-------|
| 1      | 21.54 | 21.61 | 16.92 |
| 2      | 21.54 | N A   | 16.92 |
| 3      | 23.79 | 22.30 | 19.17 |
| 4      | 23.79 | N A   | 19.17 |



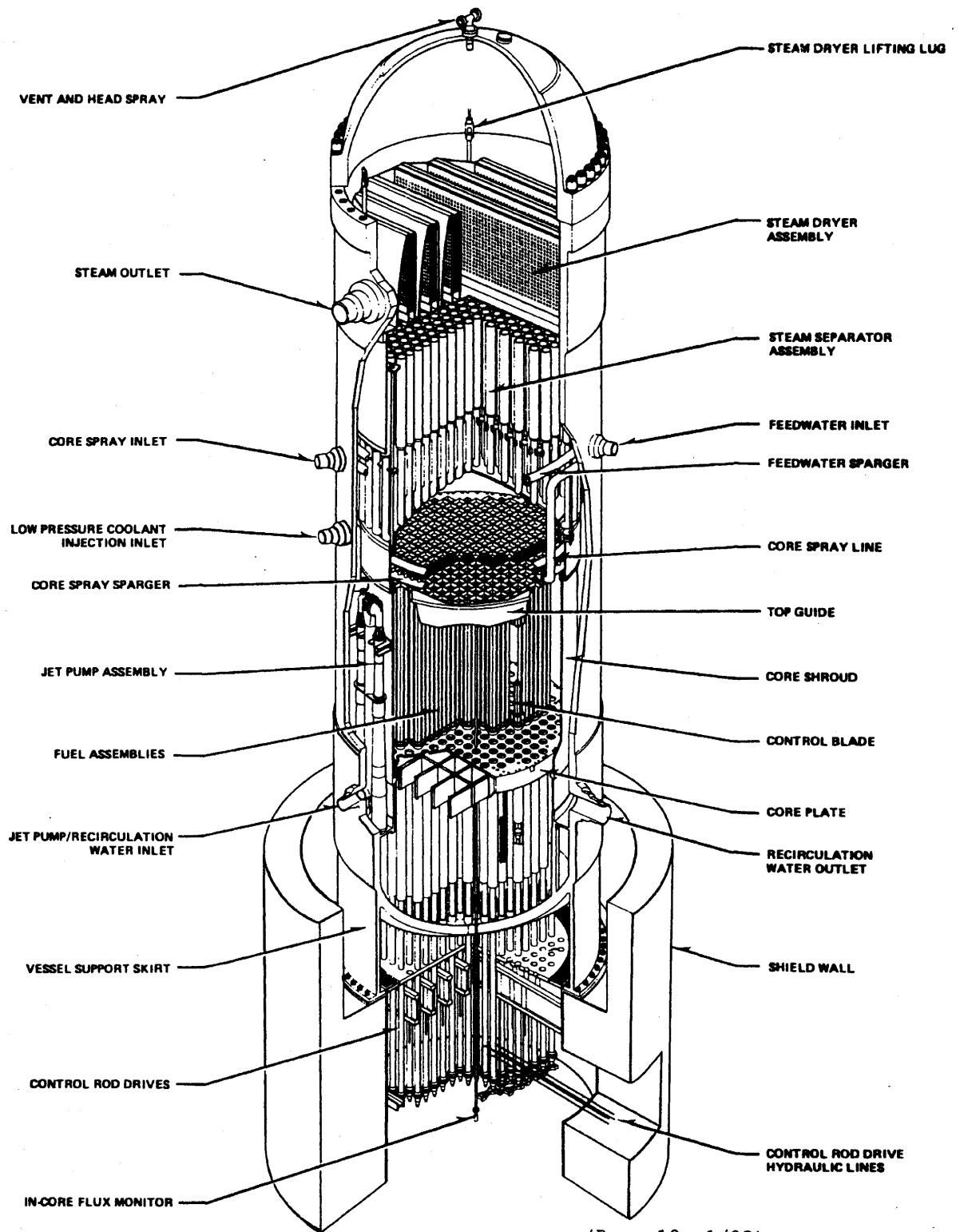
- 2 OMIT FUNNEL AS SHOWN, OTHERWISE SAME AS PART 1 APPROX. WT = 5 LBS
- 4 OMIT FUNNEL AS SHOWN, OTHERWISE SAME AS PART 3 APPROX. WT = 5 LBS.

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Surveillance Bracket

Figure 5.3-1



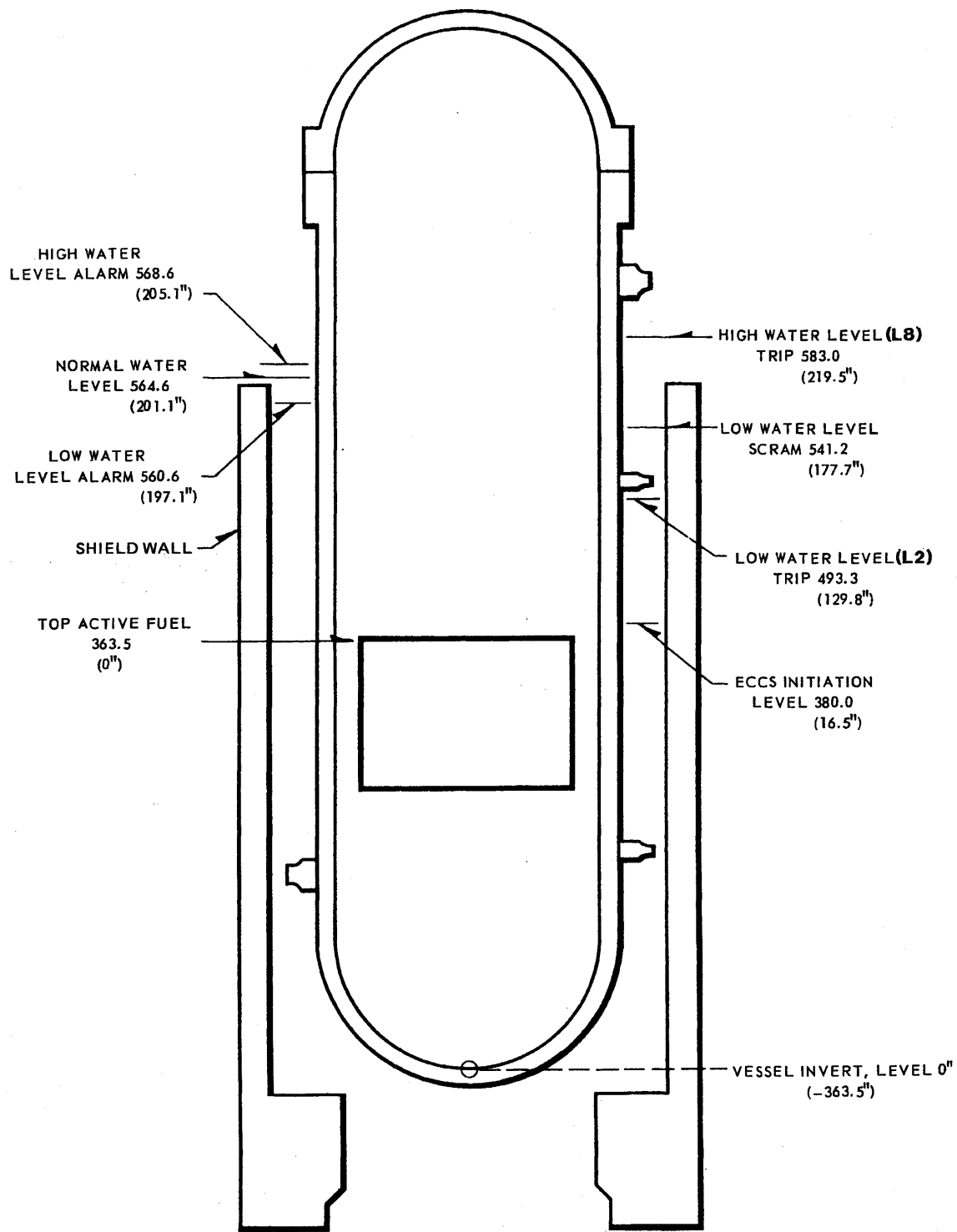
(Rev. 12 1/03)



## PERRY NUCLEAR POWER PLANT

Reactor Vessel Cutaway Diagram

Figure 5.3-6



(Rev. 12 1/03)

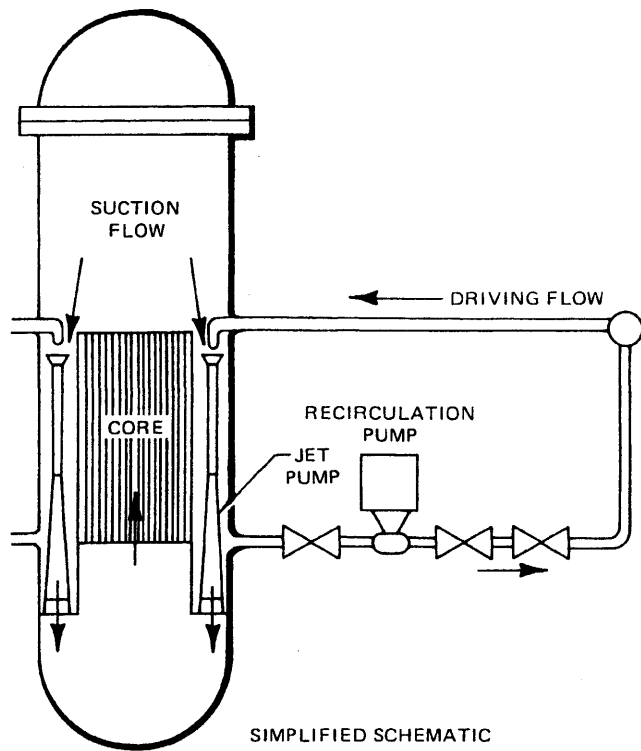
LEGEND:  
 WATER LEVEL ABOVE VESSEL INVERT  
 (WATER LEVEL ABOVE TOP OF ACTIVE FUEL)



**PERRY NUCLEAR POWER PLANT**

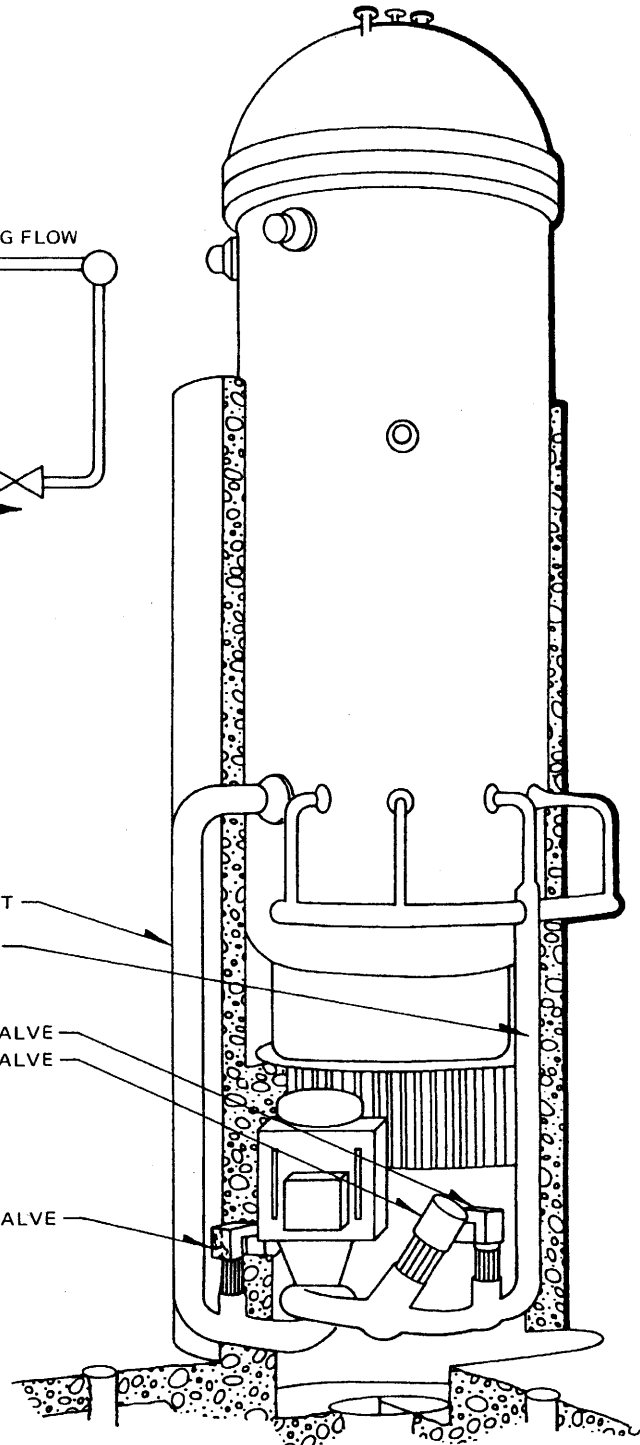
Reactor Vessel Nominal Water  
 Level Trip and Alarm Elevations

Figure 5.3-7




SIMPLIFIED SCHEMATIC

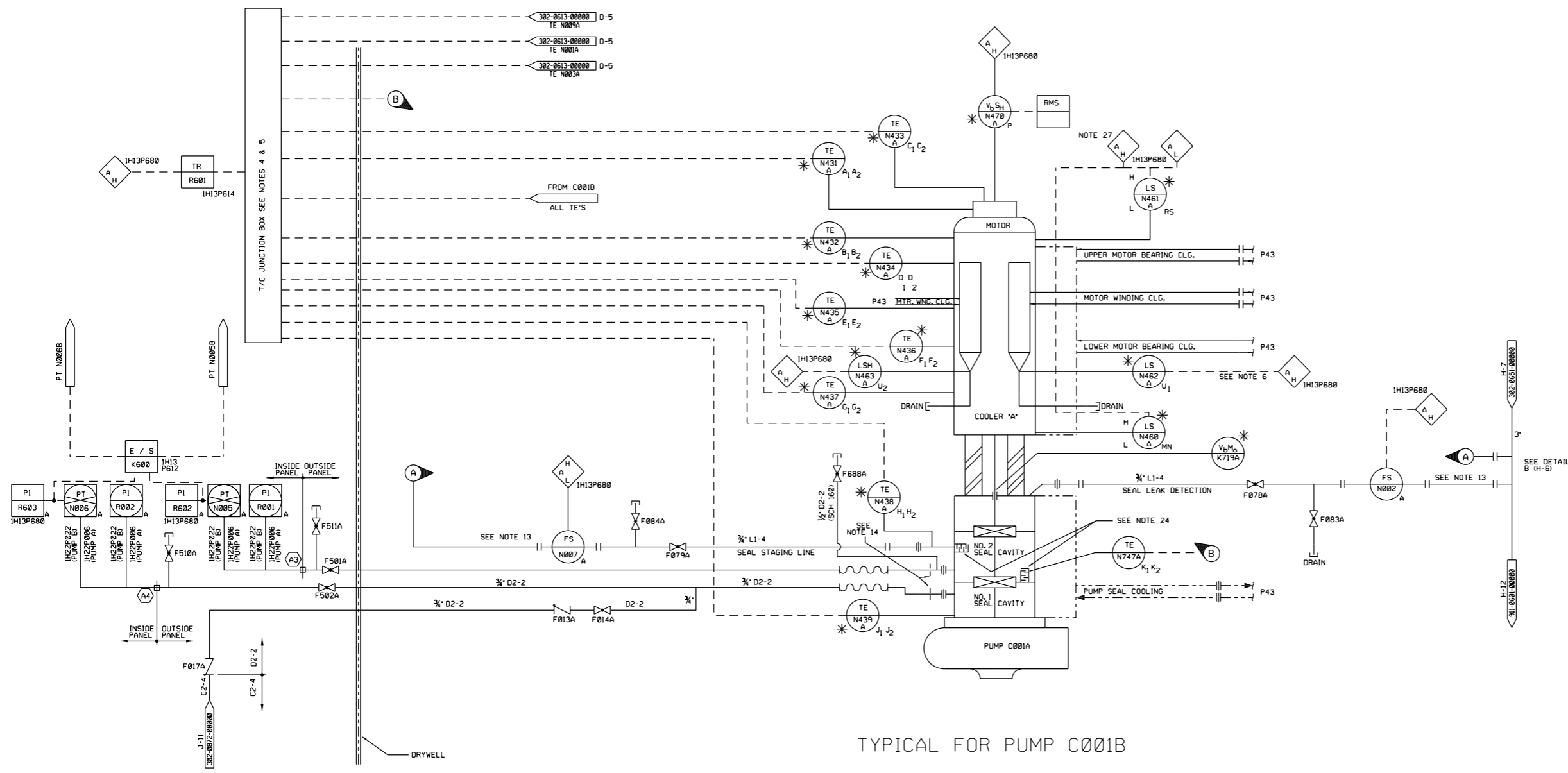
- RECIRCULATION OUTLET
- RECIRCULATION INLET
- DISCHARGE SHUTOFF VALVE
- FLOW CONTROL VALVE
- SUCTION SHUTOFF VALVE



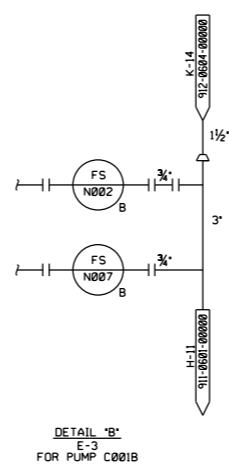
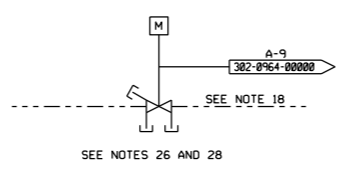
PICTORIAL VIEW  
(Rev. 12 1/03)

|   |                                  |
|---|----------------------------------|
|  | <b>PERRY NUCLEAR POWER PLANT</b> |
| Recirculation System Elevation<br>and Isometric                                     |                                  |
| Figure 5.4-1  |                                  |

- NOTES:
- DELETED
  - FOR LOCATION AND IDENTIFICATION OF INSTRUMENTS, SEE INSTRUMENT DATA SHEET LISTED IN MPL.
  - CLOSED COOLING WATER SYSTEM TO AND FROM THE RECIRCULATION PUMP SHALL BE CAPABLE OF CONTINUOUS OPERATION INCLUDING PERIODS OF DRYWELL ISOLATION.
  - WHERE THERMOCOUPLES ARE DESIGNATED A<sup>1</sup> A<sup>2</sup> ETC. A<sup>2</sup> IS A SPARE ELEMENT.
  - LIST OF PUMP AND MOTOR AUXILIARY INSTRUMENTATION (SUPPLIED W/ C001B):
    - TE/B<sup>1</sup>B<sup>2</sup> - THRUST BEARING LOWER FACE
    - TE/C<sup>1</sup>C<sup>2</sup> - UPPER GUIDE BEARING
    - TE/D<sup>1</sup>D<sup>2</sup> - MOTOR WINDING A
    - TE/E<sup>1</sup>E<sup>2</sup> - MOTOR WINDING B
    - TE/F<sup>1</sup>F<sup>2</sup> - MOTOR WINDING C
    - TE/G<sup>1</sup>G<sup>2</sup> - LOWER GUIDE BEARING
    - TE/H<sup>1</sup>H<sup>2</sup> - NO. 2 SEAL CAVITY
    - TE/J<sup>1</sup>J<sup>2</sup> - NO. 1 SEAL CAVITY
    - TE/N009 - MOTOR WINDING COOLING WATER DISCHARGE (MPL\* B33N009A&B)
    - TE/N001 - MOTOR BEARING OIL COOLING WATER DISCHARGE (MPL\* B33N001A&B)
    - TE/N003 - PUMP SEAL COOLING WATER DISCHARGE (MPL\* B33N003A&B)
    - LS<sup>M</sup>/MN - MOTOR LOWER BEARING OIL HIGH/LOW LEVEL SWITCH
    - TE/K<sup>1</sup>K<sup>2</sup> - SEAL INTERSTAGE PRESSURE BREAKDOWN OUTLET
    - V<sup>S</sup><sup>M</sup>/P - MOTOR VIBRATION SWITCH
    - LS<sup>H</sup>/RS - MOTOR UPPER BEARING OIL HIGH/LOW LEVEL SWITCH
    - LS<sup>H</sup>/U<sup>1</sup> - MOTOR COOLING COILS DRAIN HIGH LEVEL SWITCH
    - FS<sup>L</sup>/N008 - MOTOR WINDING LOW FLOW SWITCH
    - LS<sup>M</sup>/U<sup>2</sup> - MOTOR COOLING COILS DRAIN HIGH LEVEL SWITCH
    - FS/N004 - PUMP SEAL COOLING WATER LOW FLOW SWITCH
    - FS<sup>M</sup>/N007 - PUMP SEAL STAGING LINE HIGH AND LOW FLOW SWITCH
    - FS<sup>M</sup>/N002 - PUMP SEAL LEAKAGE HIGH FLOW SWITCH
    - V<sup>S</sup>/P - SHAFT VIBRATION MONITOR
- ALL THERMOCOUPLES ARE TO BE WIRED OUT THROUGH DRYWELL TO T/C JUNCTION BOX.
- A LEVEL SWITCH IS SUPPLIED WITH EACH COOLER TO DETECT COOLING WATER LEAKAGE OR CONDENSATE BUILDUP IN THE COOLER HOUSING.
  - DELETED
  - ALL MOTOR OPERATED AND AIR OPERATED PILOT SOLENOID VALVES ARE AC, UNLESS NOTED OTHERWISE.
  - FOR NUMBER OF RISERS, JET PUMP INSTRUMENTATION, AND NUMBER AND SIZE OF BOTTOM HEAD DRAIN LINES, SEE REACTOR RECIRCULATION SYSTEM P&ID DATA.
  - THE DESIGN PRESSURE AND TEMPERATURE RATINGS FOR THE RECIRCULATION PIPING AND EQUIPMENT ARE SHOWN IN THE SYSTEM DESIGN SPEC. (B33-4010)
  - CLOSED COOLING WATER TO THE MOTOR BEARING IS TO SERVE BOTH THE UPPER BEARING AND THE LOWER MOTOR BEARING. THE RETURN FLOWS ARE JOINED UPSTREAM OF THE TEMPERATURE ELEMENT.
  - THE SAMPLE PIPING TO THE SECOND ISOLATION VALVE SHALL BE 3/4 INCH DOUBLE EXTRA STRONG WITH NOMINAL INSIDE DIAMETER OF 0.434 INCHES TO MAXIMIZE TURBULENT FLOW FROM THE SECOND ISOLATION VALVE TO THE SAMPLE STATION 3/8 INCH O.D. X 0.065 INCH WALL SEAMLESS STAINLESS STEEL TUBING SHALL BE USED. SEE A62-4240
  - PIPING DESIGNER SHALL ADD UNION ENDS TO THE PIPING BEFORE AND AFTER THE SWITCH TO PROVIDE MEANS OF CALIBRATING THE FLOW SWITCH AND ALSO FLUSHING THE LINE.
  - A 3000LB RESTRICTING ORIFICE COUPLING WITH A BORE DIAMETER OF 1/4 INCH SHALL BE SOCKET WELDED INTO THE DRYWELL SIDE OF THE LINE TO LIMIT MASS RELEASE OUTSIDE THE DRYWELL FOLLOWING A LINE BREAK. (RESTRICTING TEE AT F688A AND B VENT BRANCH.)
  - ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY THE SYSTEM B33, UNLESS OTHERWISE SPECIFIED.
  - THIS SYSTEM PAID DRAWING SHEETS 302-0601-00000 AND 302-0602-00000 WERE PHOTOGRAPHIC COPIES OF G.E. DWG 7626268 SHEETS 1 AND 2 WHICH WERE SUBSEQUENTLY REPLACED BY G.E. DWG 7693699 PAID DRAWINGS 302-0603-00000 AND 302-0604-00000 ARE REPRODUCED FROM G.E. DWG 7693699, SPECIFIC REVISION BENEATH TITLE BLOCK.
  - THIS INSTRUMENT IS SHOWN FOR COMPLETENESS OF PANEL CONNECTIONS ONLY. FOR INSTRUMENT FUNCTION AND CONNECTION TO SYSTEM, SEE APPROPRIATE SYSTEM DIAGRAM.
  - F060 FLOW CONTROL VALVE ONLY HAS TWO SEAL LEAK-OFF DRAINS WHICH SHALL BE CONNECTED TOGETHER EXTERNALLY.
  - DELETED
  - THE SAMPLE PROBE SHALL BE LOCATED ON A VERTICAL SECTION OF THE RETURN LEG.
  - DECONTAMINATION CONNECTIONS TO BE READILY ACCESSIBLE FOR CONVENIENT AND RAPID CONNECTION OF TEMPORARY PIPING.
  - NON-SAFETY ACTUATION LINES FOR B33-0003A AND B HPU'S TO B33-0004A AND B. ACTUATORS SHALL BE SEISMICALLY SUPPORTED THRU THE DRYWELL PENETRATION INCLUDING PIPING ADJACENT TO THE DRYWELL IMMEDIATELY INBOARD AND OUTBOARD OF THE PENETRATION.
  - DELETED
  - INTERSTAGE AND CONTROLLED BLEEDOFF PRESSURE BREAKDOWN LABYRINTHS (1/8 INCH TUBE HELICES IN THE SEAL CARTRIDGE).
  - DELETED
  - FOR VALVES 1B33-F0023A/B, 1B33-F0060A/B AND 1B33-F0067A/B APPENDAGE CAPS/PLUGS DO NOT ENTIRELY CONFORM TO LINE SPECIFICATION D2-1 AND D2-2. SEE PIPING ISOMETRIC DWG. 304-0601-00103 FOR DETAILS.
  - HIGH ALARM FOR LEVEL SWITCHES N460 AND N461 ONLY APPLICABLE TO PUMP C001B. ALARM REMOVED FOR PUMP C001A.
  - DRAIN VALVES REMOVED AND LINE PLUGGED OR CAPPED AT VALVE FOR 1B33-F0023A/B, 1B33-F0060A/B AND 1B33-F0067A/B. DRAIN VALVES REMOVED AND LINE PLUGGED OR CAPPED AT VALVE 1B33-F0023A/B, 1B33-F0060A/B AND 1B33-F0067A/B.
  - DELETED



TYPICAL FOR PUMP C001B

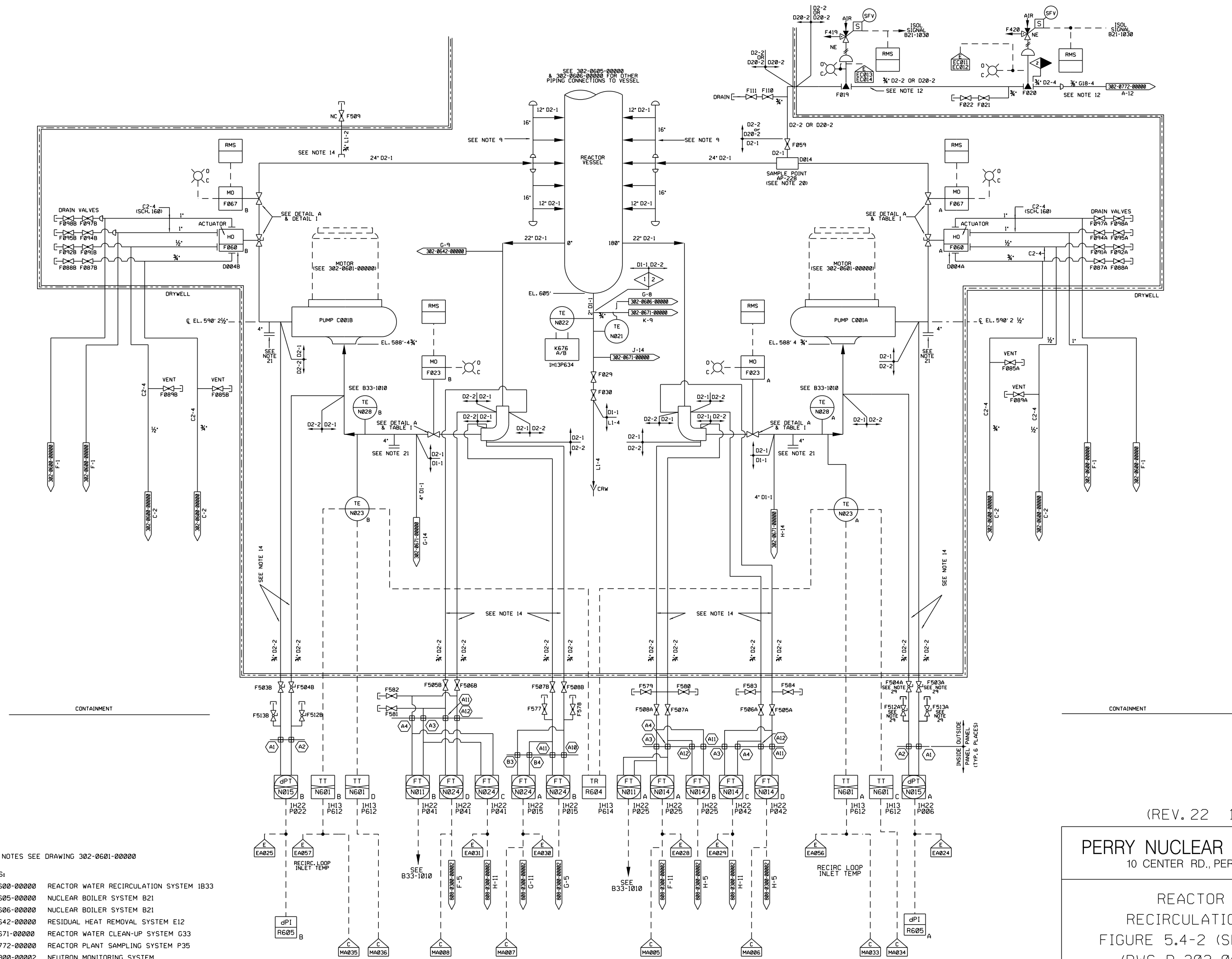


- REFERENCES:
- 302-0605-00000 NUCLEAR BOILER SYSTEM B21
  - 302-0606-00000 NUCLEAR BOILER SYSTEM B21
  - B21-1030 NUCLEAR BOILER SYSTEM FCO
  - 302-0642-00000 RESIDUAL HEAT REMOVAL SYSTEM E12
  - 302-0772-00000 REACTOR PLANT SAMPLING SYSTEM P35
  - 808-0300-00000 NEUTRON MONITORING SYSTEM IED
  - 302-0671-00000 REACTOR WATER CLEAN-UP SYSTEM G33
  - 302-0964-00000 LEAK DETECTION SYSTEM E31
  - 302-0872-00000 CONTROL ROD DRIVE HYDRAULIC SYSTEM C11
  - A62-4240 WATER SAMPLING REQUIREMENT
  - B33-1030 REACTOR RECIRCULATION SYSTEM ELEMENTARY DIAGRAM
  - A42-1010 PIPING AND INSTRUMENT SYMBOLS
  - B33-1010 REACTOR RECIRCULATION SYSTEM IED AND P&ID DATA
  - B33-1020 REACTOR RECIRCULATION SYSTEM FCO
  - B33-4010 REACTOR RECIRCULATION SYSTEM DESIGN SPECIFICATION
  - 302-0613-00000 NUCLEAR COOLING SYSTEM P43
  - 911-0601-00000 REACTOR BLDG DRAINS P68
  - 912-0604-00000 CONTAINMENT VESSEL AND DRYWELL PURGE M14
  - 302-0651-00000 FUEL POOL COOLING AND CLEAN-UP SYSTEM G41
  - 302-0431-00000 POST ACCIDENT SAMPLING SYSTEM P87
  - 302-0602-00000 REACTOR WATER RECIRCULATION SYSTEM

(REV. 22 10/2021)

PERRY NUCLEAR POWER PLANT  
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REACTOR WATER  
RECIRCULATION SYSTEM  
FIGURE 5.4-2 (SHEET 1 OF 4)  
(DWG. D-302-0601-00000)



(REV. 22 10/2021)

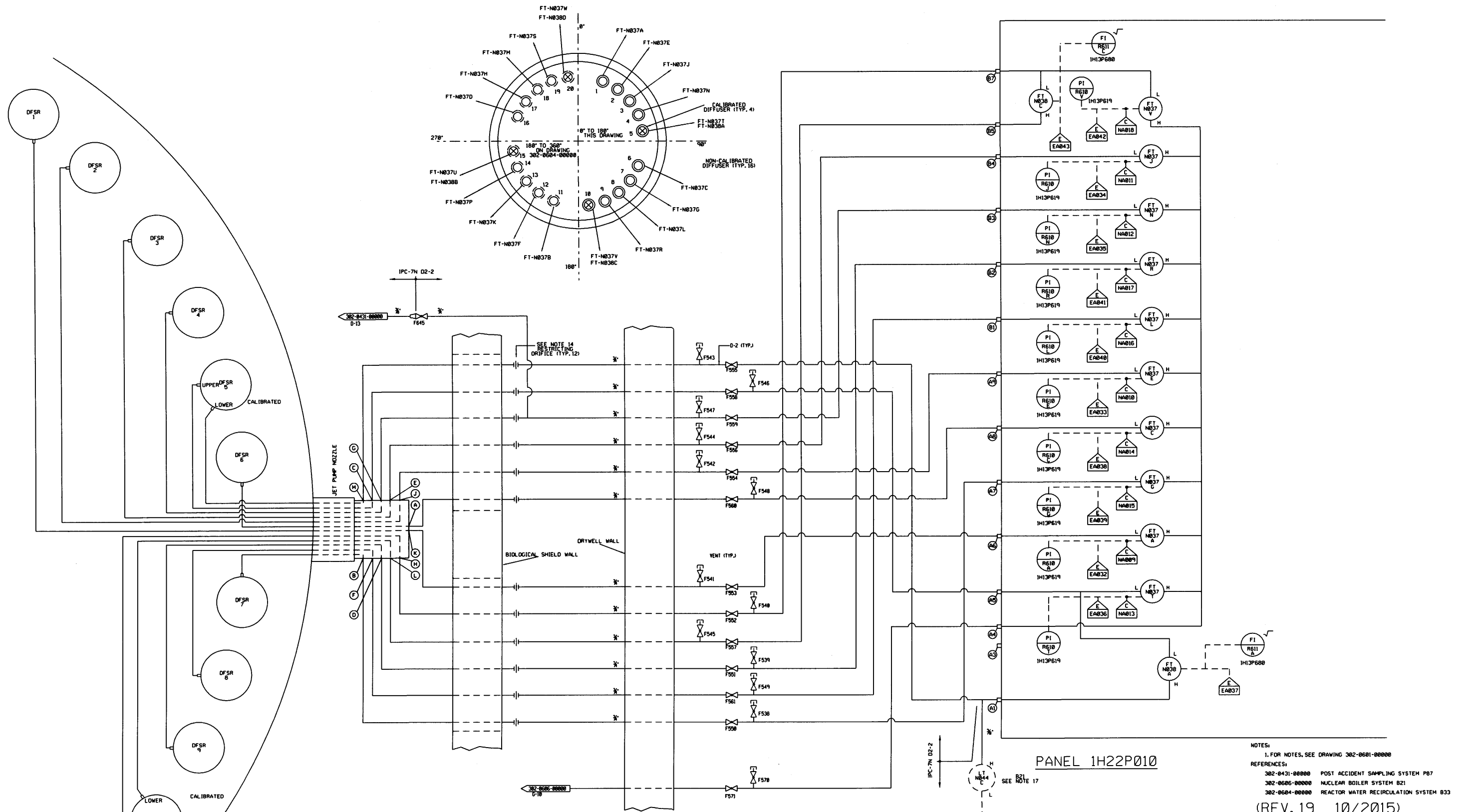
**PERRY NUCLEAR POWER PLANT**  
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**REACTOR WATER  
 RECIRCULATION SYSTEM**  
 FIGURE 5.4-2 (SHEET 2 OF 4)  
 (DWG. D-302-0602-00000)

- NOTES:  
 1. FOR NOTES SEE DRAWING 302-0601-00000
- REFERENCES:
- |                |   |
|----------------|---|
| 302-0600-00000 | REACTOR WATER RECIRCULATION SYSTEM 1B33 |
| 302-0605-00000 | NUCLEAR BOILER SYSTEM B21               |
| 302-0606-00000 | NUCLEAR BOILER SYSTEM B21               |
| 302-0642-00000 | RESIDUAL HEAT REMOVAL SYSTEM E12        |
| 302-0671-00000 | REACTOR WATER CLEAN-UP SYSTEM G33       |
| 302-0772-00000 | REACTOR PLANT SAMPLING SYSTEM P35       |
| 808-0300-00002 | NEUTRON MONITORING SYSTEM               |

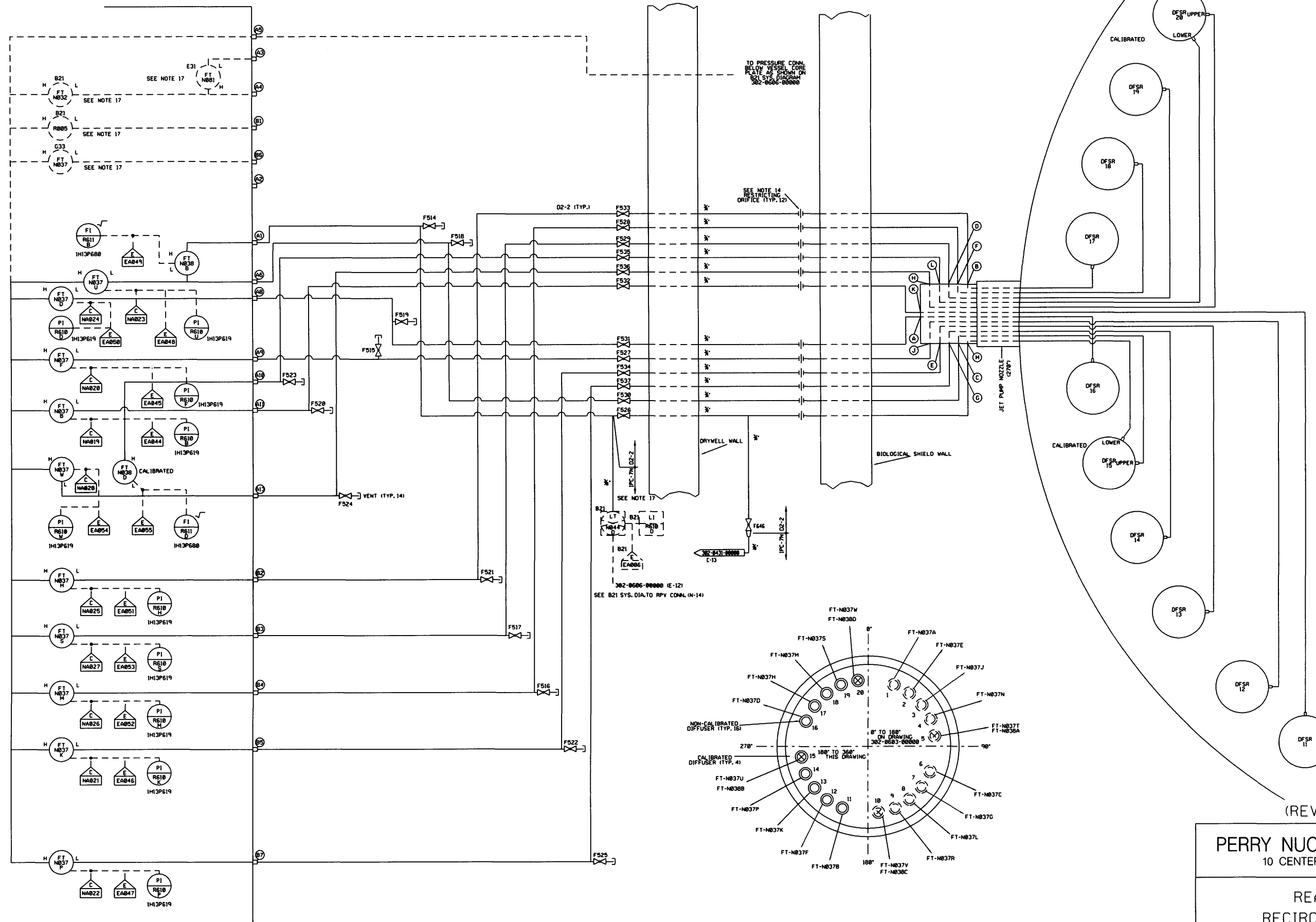




NOTES:  
 1. FOR NOTES, SEE DRAWING 302-0601-00000  
 REFERENCES:  
 302-0431-00000 POST ACCIDENT SAMPLING SYSTEM P07  
 302-0606-00000 NUCLEAR BOILER SYSTEM B21  
 302-0604-00000 REACTOR WATER RECIRCULATION SYSTEM B33  
 (REV. 19 10/2015)

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REACTOR WATER  
 RECIRCULATION SYSTEM  
 FIGURE 5.4-2 (SHEET 3 OF 4)  
 (DWG. D-302-0603-00000)



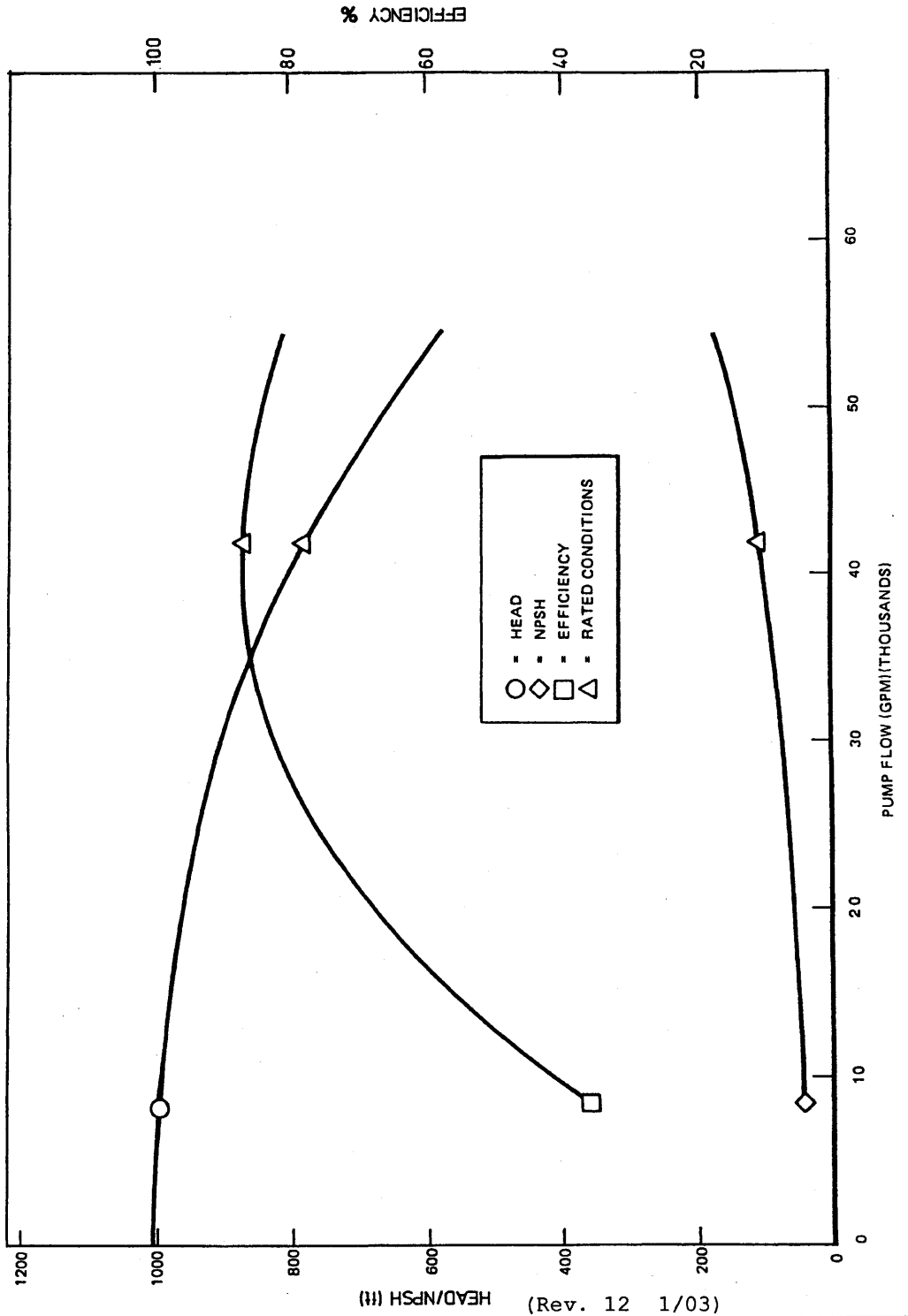
NOTES:  
 1. FOR NOTES, SEE DRAWING 302-0600-0000  
 REFERENCES:  
 302-0431-00000 POST ACCIDENT SAMPLING SYSTEM P87  
 302-0603-00000 REACTOR WATER RECIRCULATION SYSTEM B33  
 302-0606-00000 NUCLEAR BOILER SYSTEM B21

(REV. 19 10/2015)

**PERRY NUCLEAR POWER PLANT**  
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REACTOR WATER  
 RECIRCULATION SYSTEM  
 FIGURE 5.4-2 (SHEET 4 OF 4)  
 (DWG. D-302-0604-00000)

PANEL 1H22P009



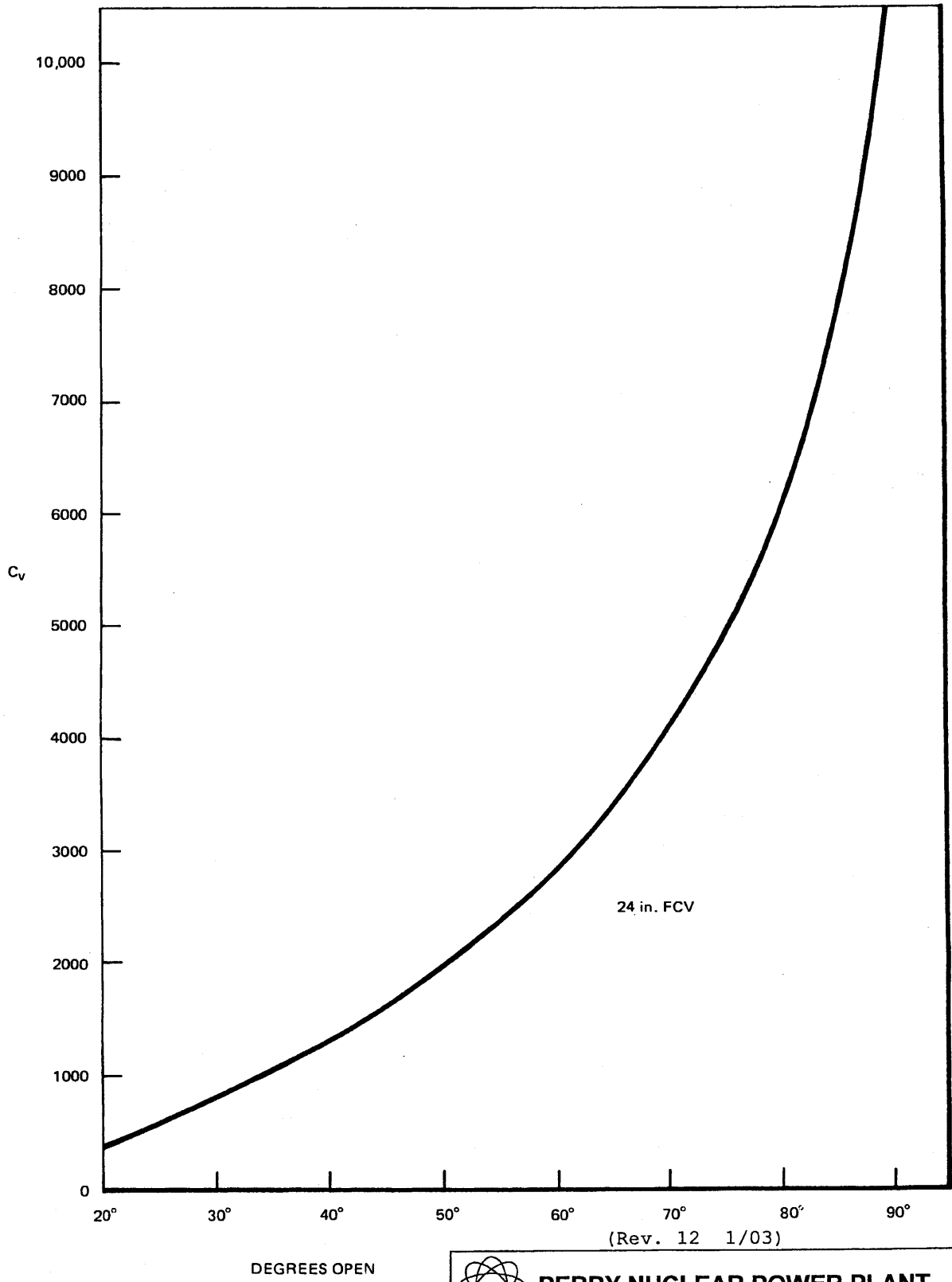
(H) HSBN/VAH (Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Typical Recirculation Pump Head,  
NPSH, and Efficiency Curves

Figure 5.4-3



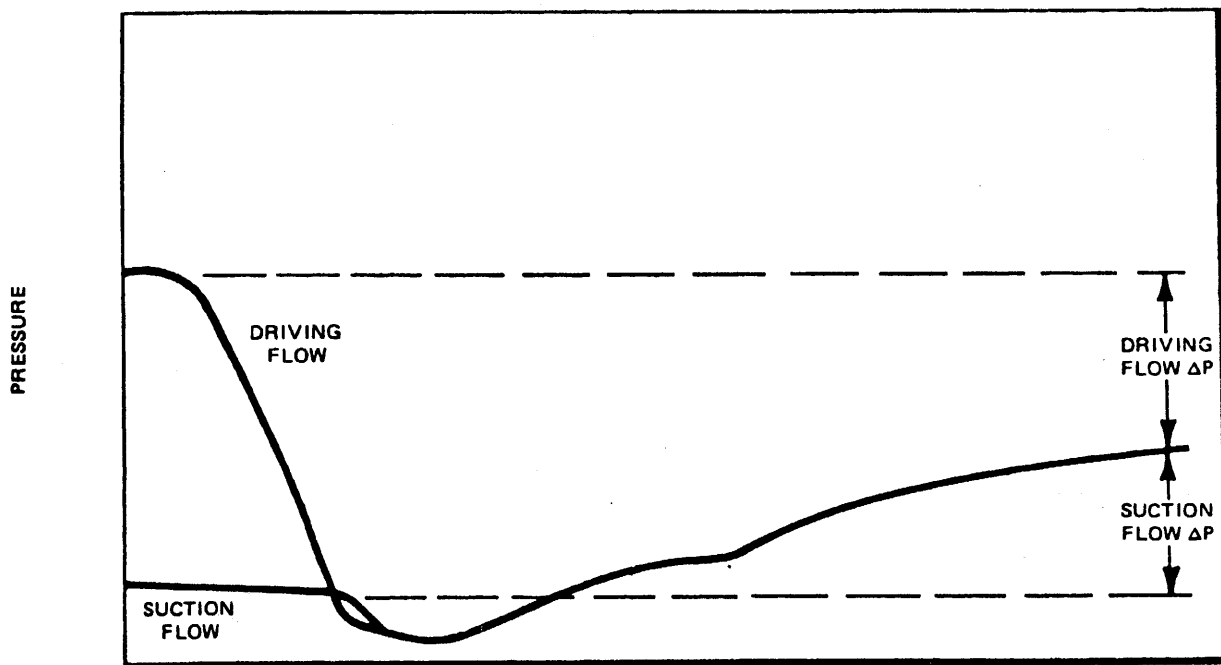
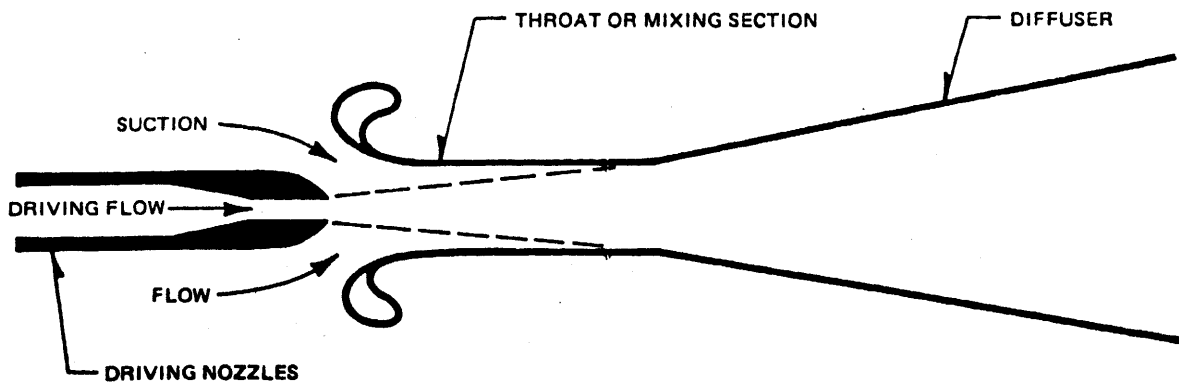
DEGREES OPEN



**PERRY NUCLEAR POWER PLANT**

Typical Flow Control  
Valve Characteristic

Figure 5.4-4



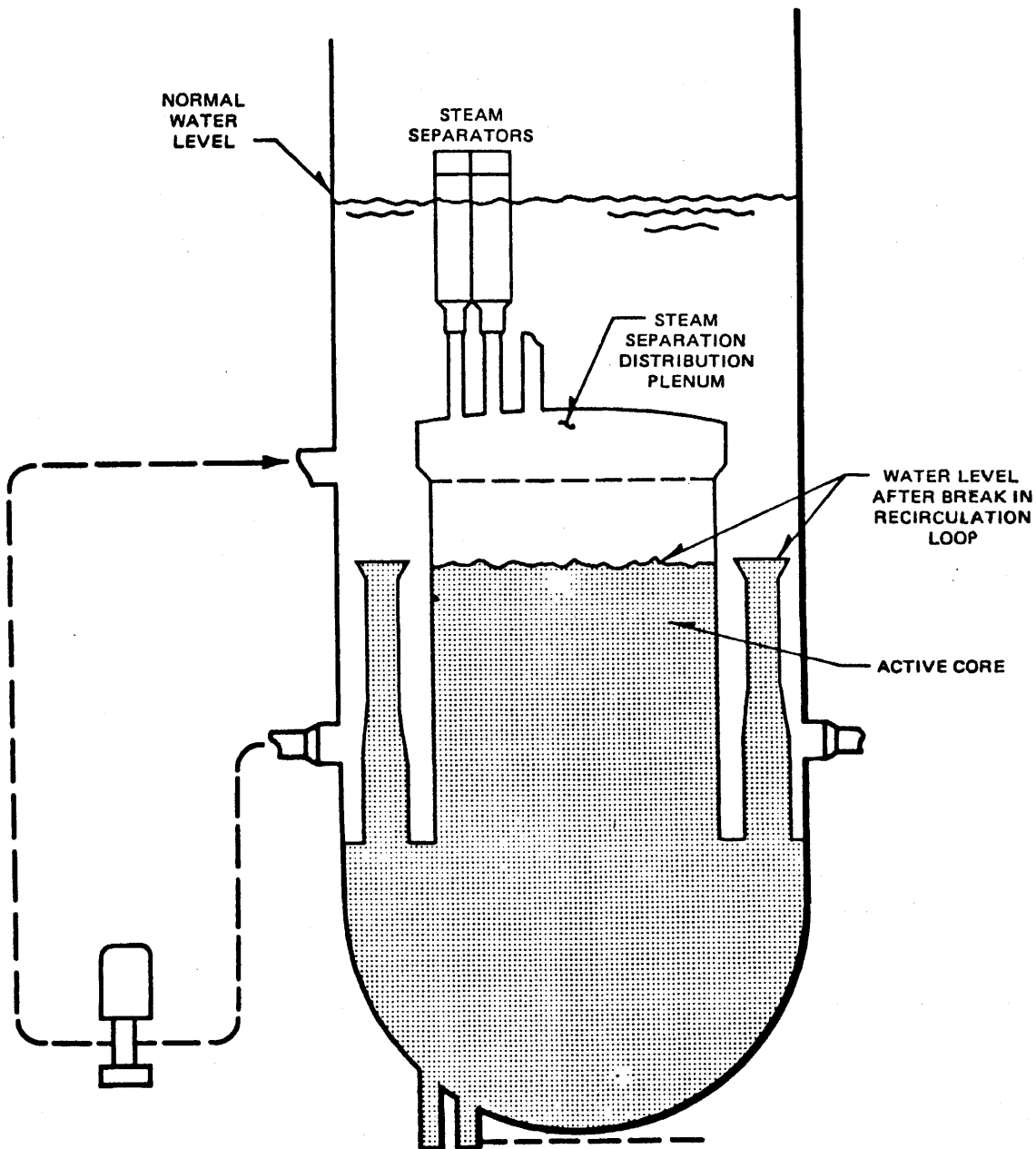
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Operating Principle of Jet Pump

Figure 5.4-5



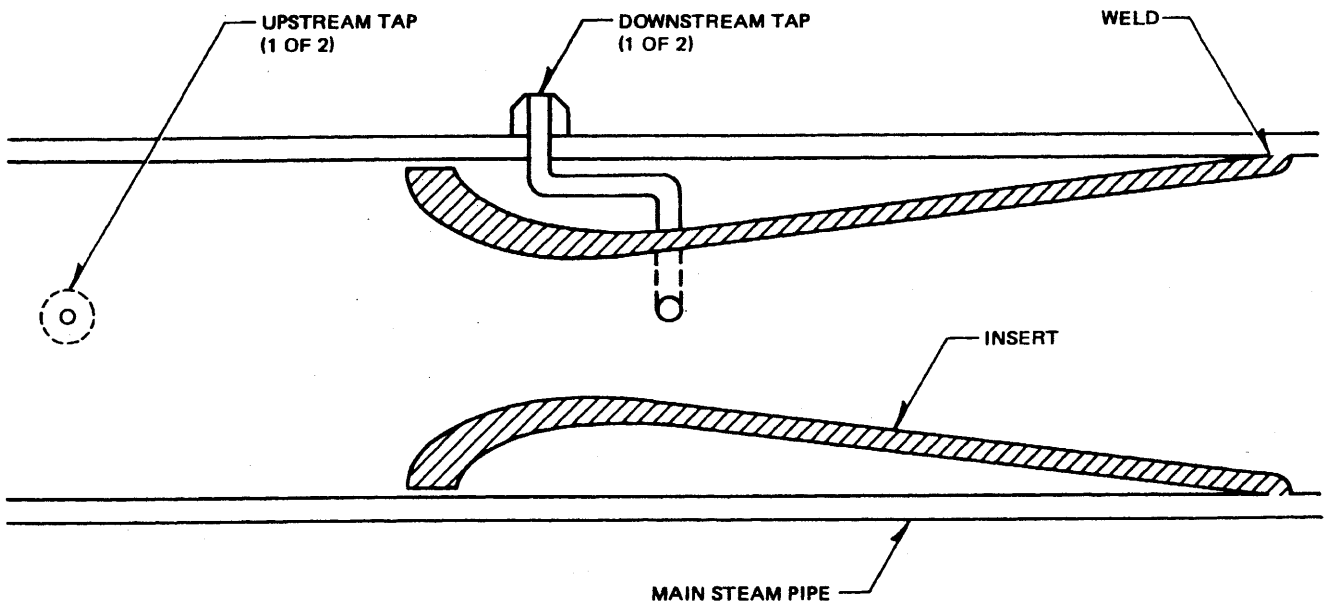
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Core Flooding Capability of  
Recirculation System

Figure 5.4-6



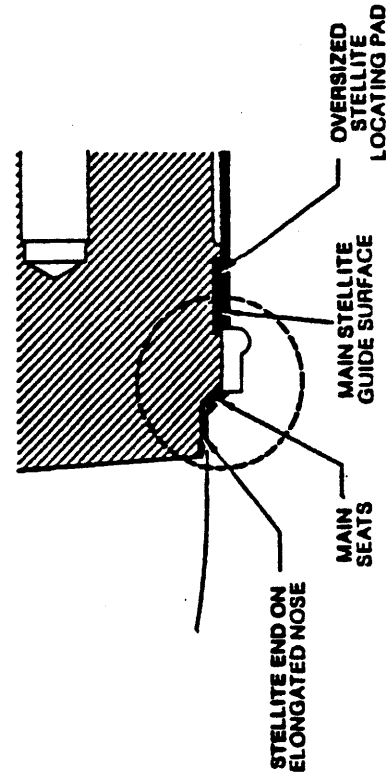
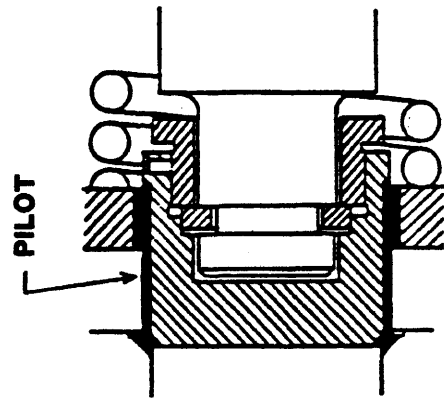
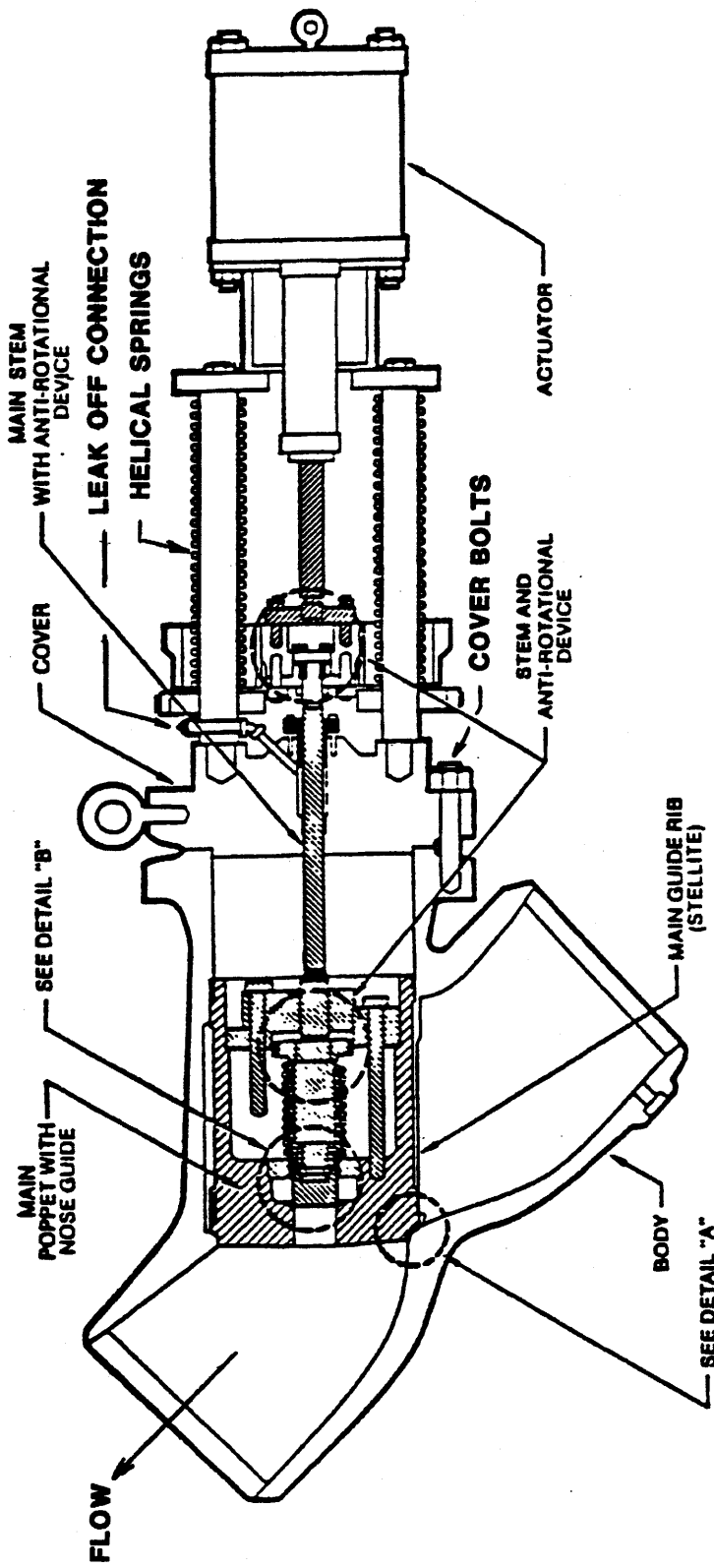
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**


Main Steamline Flow Restrictor

Figure 5.4-7



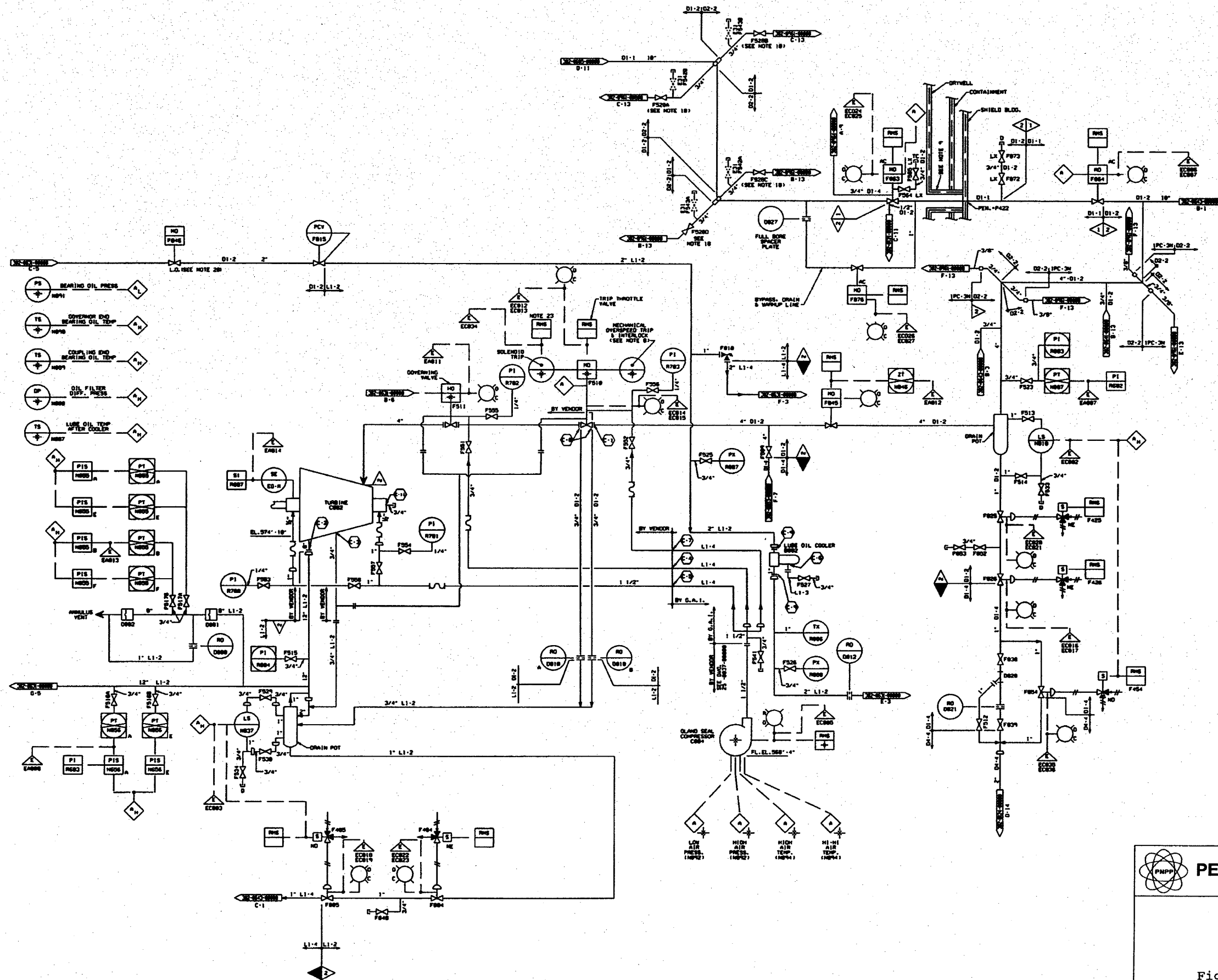
NOTE: THIS FIGURE APPLIES TO 1B21F022 & 1B21F028.

(Rev. 12 1/03)

|   |                                  |
|---|----------------------------------|
|  | <b>PERRY NUCLEAR POWER PLANT</b> |
| Main Steam Isolation Valve  |                                  |
| Figure 5.4-8  |                                  |








NOTES:  
 1. FOR NOTES AND REFERENCES, SEE DRAWING 302-0631-00000.

NUCLEAR SAFETY RELATED

(Rev. 16 10/09)

|   |   |
|---|---|
|  | <b>PERRY NUCLEAR POWER PLANT</b>                |
|   | Reactor Core Isolation<br>Cooling System        |
|   | Figure 5.4-9 (Sheet 2 of 2)<br>(Dwg. D-302-632) |

MODE A SUCTION FROM CONDENSATE STORAGE, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT HIGH PRESSURE.

| LOCATION ( )             | 1      | 2      | 3      | 4      | 5      | 6   | 7   | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18  | 19  | 20  |
|--------------------------|--------|--------|--------|--------|--------|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|-----|
| FLOW (SEE NOTE 2)        | 700    | 716    | 700    | ---    | ---    | --- | 0   | ---    | 34.88  | 34.88  | 34.88  | 16     | 16     | 16     | 75     | 16     | ---    | --- | --- | 0   |
| PRESSURE (PSIA)          | 14.7   | ⊕      | ⊕      | 1133   | 16     | --- | --- | 1118   | ⊕      | ⊕      | 18.8   | ⊕      | ⊕      | ⊕      | 25     | ⊕      | ⊕      | --- | --- | --- |
| TEMPERATURE (°F)         | 100    | 100    | 100    | 100    | 140    | --- | --- | 565    | SAT    | SAT    | 228    | 100    | 100    | 100    | 333    | 100    | 100    | --- | --- | --- |
| MAX/MIN TEMPERATURE (°F) | 100/40 | 100/40 | 100/40 | 100/40 | 170/40 | --- | --- | 565/70 | 565/70 | 250/70 | 250/70 | 100/40 | 100/40 | 100/40 | 375/40 | 100/40 | 100/40 | --- | --- | --- |

MODE B SUCTION FROM CONDENSATE STORAGE, REACTOR AT LOW PRESSURE, SUPPRESSION POOL AT HIGH PRESSURE.

| LOCATION ( )             | 1      | 2      | 3      | 4      | 5      | 6   | 7   | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18  | 19  | 20  |
|--------------------------|--------|--------|--------|--------|--------|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|-----|
| FLOW (SEE NOTE 2)        | 700    | 716    | 700    | ---    | ---    | --- | 0   | ---    | 11.00  | 11.00  | 11.00  | 16     | 16     | 16     | 75     | 16     | ---    | --- | --- | 0   |
| PRESSURE (PSIA)          | 14.7   | ⊕      | ⊕      | 180    | 16     | --- | --- | 165    | ⊕      | ⊕      | 18.8   | ⊕      | ⊕      | ⊕      | 25     | ⊕      | ⊕      | --- | --- | --- |
| TEMPERATURE (°F)         | 100    | 100    | 100    | 100    | 140    | --- | --- | 366    | SAT    | SAT    | 228    | 100    | 100    | 100    | 333    | 100    | 100    | --- | --- | --- |
| MAX/MIN TEMPERATURE (°F) | 100/40 | 100/40 | 100/40 | 100/40 | 170/40 | --- | --- | 366/70 | 366/70 | 250/70 | 250/70 | 100/40 | 100/40 | 100/40 | 375/40 | 100/40 | 100/40 | --- | --- | --- |

MODE C SUCTION FROM SUPPRESSION POOL, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT LOW PRESSURE.

| LOCATION ( )             | 1   | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18  | 19  | 20  |
|--------------------------|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|-----|
| FLOW (SEE NOTE 2)        | 700 | 716    | 700    | ---    | ---    | ---    | 700    | ---    | 33.84  | 33.84  | 33.84  | 16     | 16     | 16     | 75     | 16     | ---    | --- | --- | 0   |
| PRESSURE (PSIA)          | --- | ⊕      | ⊕      | 1133   | 14.7   | 18.5   | 18.0   | 1118   | ⊕      | ⊕      | 18.8   | ⊕      | ⊕      | ⊕      | 25     | ⊕      | ⊕      | --- | --- | --- |
| TEMPERATURE (°F)         | --- | 140    | 140    | 140    | 140    | 140    | 140    | 565    | SAT    | SAT    | 228    | 140    | 140    | 140    | 333    | 140    | 140    | --- | --- | --- |
| MAX/MIN TEMPERATURE (°F) | --- | 170/40 | 170/40 | 170/40 | 170/40 | 170/40 | 170/40 | 565/70 | 565/70 | 250/70 | 250/70 | 170/40 | 170/40 | 170/40 | 375/40 | 170/40 | 170/40 | --- | --- | --- |

MODE D SUCTION FROM SUPPRESSION POOL, REACTOR AT LOW PRESSURE, SUPPRESSION POOL AT LOW PRESSURE.

| LOCATION ( )             | 1   | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18  | 19  | 20  |
|--------------------------|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|-----|
| FLOW (SEE NOTE 2)        | 700 | 716    | 700    | ---    | ---    | ---    | 700    | ---    | 10.40  | 10.40  | 10.40  | 16     | 16     | 16     | 75     | 16     | ---    | --- | --- | 0   |
| PRESSURE (PSIA)          | --- | ⊕      | ⊕      | 180    | 14.7   | 18.5   | 18.0   | 1118   | ⊕      | ⊕      | 18.8   | ⊕      | ⊕      | ⊕      | 25     | ⊕      | ⊕      | --- | --- | --- |
| TEMPERATURE (°F)         | --- | 140    | 140    | 140    | 140    | 140    | 140    | 366    | SAT    | SAT    | 228    | 140    | 140    | 140    | 333    | 140    | 140    | --- | --- | --- |
| MAX/MIN TEMPERATURE (°F) | --- | 170/40 | 170/40 | 170/40 | 170/40 | 170/40 | 170/40 | 366/70 | 366/70 | 250/70 | 250/70 | 170/40 | 170/40 | 170/40 | 375/40 | 170/40 | 170/40 | --- | --- | --- |

MODE F TEST MODE: SUCTION FROM CONDENSATE STORAGE, REACTOR AT HIGH PRESSURE, SUPPRESSION POOL AT LOW PRESSURE. (SEE NOTE 14)

| LOCATION ( )             | 1      | 2      | 3      | 4   | 5      | 6   | 7   | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18  | 19  | 20  |
|--------------------------|--------|--------|--------|-----|--------|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|-----|
| FLOW (SEE NOTE 2)        | 700    | 716    | 700    | --- | ---    | --- | 700 | ---    | 27.80  | 27.80  | 27.80  | 16     | 16     | 16     | 75     | 16     | ---    | --- | --- | 700 |
| PRESSURE (PSIA)          | 14.7   | ⊕      | ⊕      | --- | 14.7   | --- | --- | 1000   | ⊕      | ⊕      | 18.8   | ⊕      | ⊕      | ⊕      | 25     | ⊕      | ⊕      | --- | --- | --- |
| TEMPERATURE (°F)         | 100    | 100    | 100    | --- | 100    | --- | --- | 545    | SAT    | SAT    | 228    | 100    | 100    | 100    | 333    | 100    | 100    | --- | --- | --- |
| MAX/MIN TEMPERATURE (°F) | 100/40 | 100/40 | 100/40 | --- | 170/40 | --- | --- | 545/70 | 545/70 | 250/70 | 250/70 | 100/40 | 100/40 | 100/40 | 375/40 | 100/40 | 100/40 | --- | --- | --- |

SEE NOTE 10

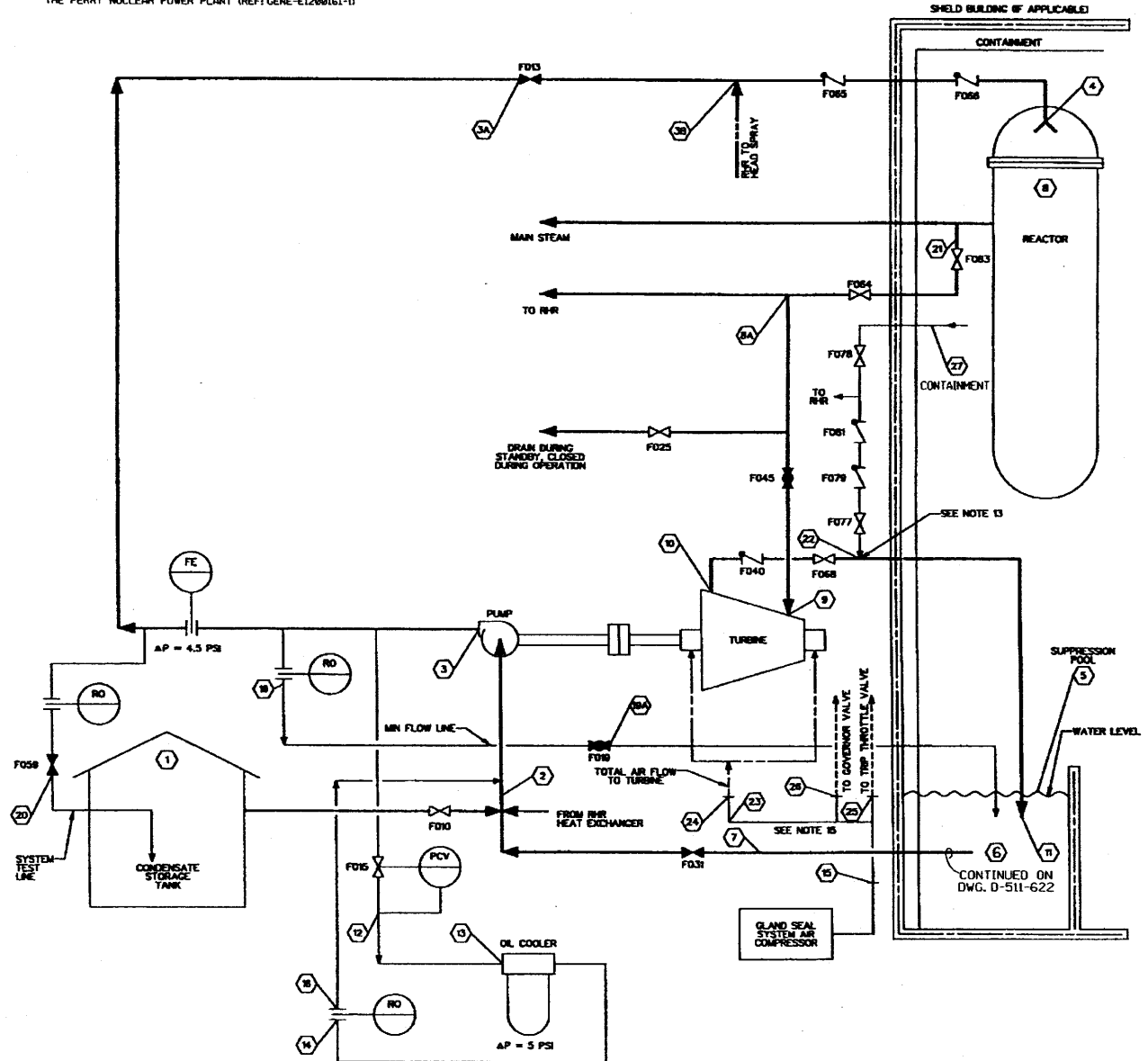
| POSITION ( )                      | 1-2 | 3-3A | 3A-4 | 7-2 | 8-8A | 8A-9 | 10-11 | 3-12 | 12-13 | 13-14 | 15     | 18-18A | 18A-8 | 3-20 | 20-1 | 18-2 |
|-----------------------------------|-----|------|------|-----|------|------|-------|------|-------|-------|--------|--------|-------|------|------|------|
| PEAK PRESSURE, PSIG               | N/A | 1677 | 1677 | N/A | 1337 | 1337 | 150   | 1677 | N/A   | N/A   | N/A    | 1677   | N/A   | 1677 | N/A  | N/A  |
| RECOMMENDED DESIGN PRESSURE, PSIG | 75  | 1525 | 1525 | 75  | 1250 | 1250 | 150   | 1525 | 150   | 150   | 150    | 1525   | 75    | 1525 | 75   | 75   |
| DESIGN TEMPERATURE (°F)           | 140 | 140  | 575  | 140 | 575  | 575  | 287   | 140  | 140   | 140   | 375    | 140    | 140   | 140  | 140  | 140  |
| ESTIMATED LINE SIZE, IN           | 6"  | 6"   | 6"   | 6"  | 10"  | 10"  | 2"    | 2"   | 2"    | 2"    | 1 1/2" | 2"     | 2"    | 4"   | 4"   | 2"   |

- PEAK PRESSURE - IS THE MAXIMUM PRESSURE ANTICIPATED DURING A TRANSIENT PERIOD WITH ALL OF THE CONTRIBUTING ELEMENTS AT A MAXIMUM. IT WOULD BE EXPECTED TO OCCUR LESS THAN 1% OF SYSTEM OPERATING TIME.
- THE PRESSURE AT THIS POSITION DEPENDS ON PIPING ARRANGEMENT, AND MAY BE VARIED WITHIN THE FOLLOWING LIMITS.
- |  |   |
|--|---|
| ② MINIMUM NPSH AT PUMP SUCTION = 22 FEET @ PUMP SPEED 4680 RPM   | ⑭ PRESSURE IS 5 PSI LESS THAN POSITION ⑬              |
| ③ MAXIMUM PUMP TOTAL DYNAMIC HEAD (TDH) 3835 FEET @ PUMP SPEED 4680 RPM FOR MODES A & C 810 FEET FOR MODES B & D | ⑮ SUFFICIENT PRESSURE TO RETURN TO SUPPRESSION POOL   |
| ④ MAXIMUM PRESSURE DROP BETWEEN POSITION (SEE NOTE 3)  | ⑯ AND ⑰ = 15 PSI                                      |
| ⑤ MAXIMUM PRESSURE ALLOWED = 25 PSIA   | ⑰ SUFFICIENT PRESSURE TO RETURN TO CONDENSATE STORAGE |
| ⑫ ⑬ MAXIMUM PRESSURE ALLOWED = 125 PSIA ±1%  | ⑱ MAXIMUM PRESSURE REQUIRED = 85 PSIA                 |

- MAXIMUM LINEAR LINE LENGTH BETWEEN POSITION 22 & 27 EQUALS 80 FT. THE INTERNAL CROSS SECTIONAL AREA OF THE VACUUM BREAKER PIPING THAT IS SHARED BY RCC AND RHR SHALL BE EQUAL TO OR GREATER THAN THE COMBINED INTERNAL CROSS SECTIONAL AREAS OF THE INDIVIDUAL RCC AND RHR VACUUM BREAKER LINES.
- STEAM FLOWS FOR TEST MODE AT POSITIONS 9, 10 & 11 ARE BASED UPON A PUMP TDH OF 2531 FEET.
- REFER TO RCC TURBINE VENDORS DRAWING FOR LINE LENGTHS CONNECTING POINTS 6, 23, 24, 25 AND 26.
- DURING RCC SYSTEM OPERATION A FLOW OF 1/4 GPM OCCURS THROUGH THE TURBINE EXHAUST LINE DRAIN POT SYSTEM AT 25 PSIA AND 240 °F.
- AIR FLOW FROM GLAND SYSTEM PREVENTS STEAM LEAKAGE OF 250 LB/HR FROM TURBINE.
- DELETED
- THIS REQUIREMENT IS NO LONGER APPLICABLE. THE STRAINER INSTALLED BY OCP 168842 HAS BEEN DESIGNED TO ENSURE ADEQUATE PUMP NPSH UNDER MAXIMUM POSTULATED LOADING RESULTING FROM LOCA-GENERATED AND PRE-LOCA DEBRIS MATERIALS AND FOR MAXIMUM EXPECTED SUPPRESSION POOL TEMPERATURE.
- THE RHR STEAM CONDENSING MODE IS NO LONGER USED AT THE PERRY NUCLEAR POWER PLANT (REF: GENE-E1200161-1)
- PUMP MINIMUM FLOW REQUIREMENT MAY OCCUR DURING ANY OPERATING MODE. FLOW REQUIREMENT IS 80 GPM MINIMUM WITH TURBINE/PUMP AT MAXIMUM SPEED BE MADE AT.
- DELETED
- DURING SYSTEM STANDBY, EQUIPMENT IS NOT OPERATING. INTERMITTENT FLOW OCCURS THROUGH THE STEAM SUPPLY LINE DRAIN TRAP SYSTEM AT 1000 PSIA AND 560 °F.
- HEAD SPRAY NOZZLE PRESSURE DROP IS 15 PSI.
- DESIGN PRESSURE AND TEMPERATURES GIVEN ARE FOR INFORMATION ONLY AND ARE THE BASIS FOR DESIGN OF SUPPLIED EQUIPMENT. ESTIMATED LINE SIZES ARE FOR INFORMATION ONLY. ACTUAL LINE SIZES AS DETERMINED BY PIPING DESIGNER, SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENTS.
- FLOW VALUES SHOWN IN MODES C & D ARE BASED UPON SUCTION PIPING DESIGN PERMITTING THE MINIMUM REQUIRED NPSH TO CONTINUE TO BE PROVIDED TO THE RCC PUMP WHEN THE SUPPRESSION POOL SUCTION STRAINER IS 50 PERCENT PLUGGED. (SEE NOTE 19)

- NOTES:
- ATMOSPHERIC PRESSURE OF 14.7 PSIA WAS USED IN CALCULATIONS.
  - WATER FLOWS ARE SHOWN IN GPM, STEAM FLOWS IN 1000 LB/HR, AND AIR FLOW IN SCFH (0.7 PSIA AND 60 °F).
  - THE UNCOVERED FLOW NOZZLE PRESSURE DROP OF 4.5 PSI IS A FIXED LOSS BETWEEN POSITIONS ③ AND ④.
  - THE LUBE OIL COOLER PRESSURE DROP OF 3.0 PSI IS A FIXED LOSS BETWEEN POSITIONS ⑫ AND ⑬.
  - THE CONTROLLING MODES FOR LINE SIZING AND ARRANGEMENT ARE:
 

|                                 |               |
|---------------------------------|---------------|
| SUCTION FROM CONDENSATE STORAGE | MODE A, B & D |
| SUCTION FROM SUPPRESSION POOL   | MODE A, B & D |
| PUMP DISCHARGE                  | MODE A, B & C |
| STEAM SUPPLY                    | MODE A & C    |
| TURBINE EXHAUST                 | MODE A        |
| TEST LINE COOLING SYSTEM        | MODE A        |
  - SYSTEM OPERATION IS POSSIBLE WITH INTERMEDIATE PRESSURES IN THE REACTOR VESSEL AND THE SUPPRESSION POOL. HOWEVER, THESE CONDITIONS DO NOT CONTROL PIPE OR VALVE SIZING OR SPECIFICATION AND NO DATA IS SHOWN.



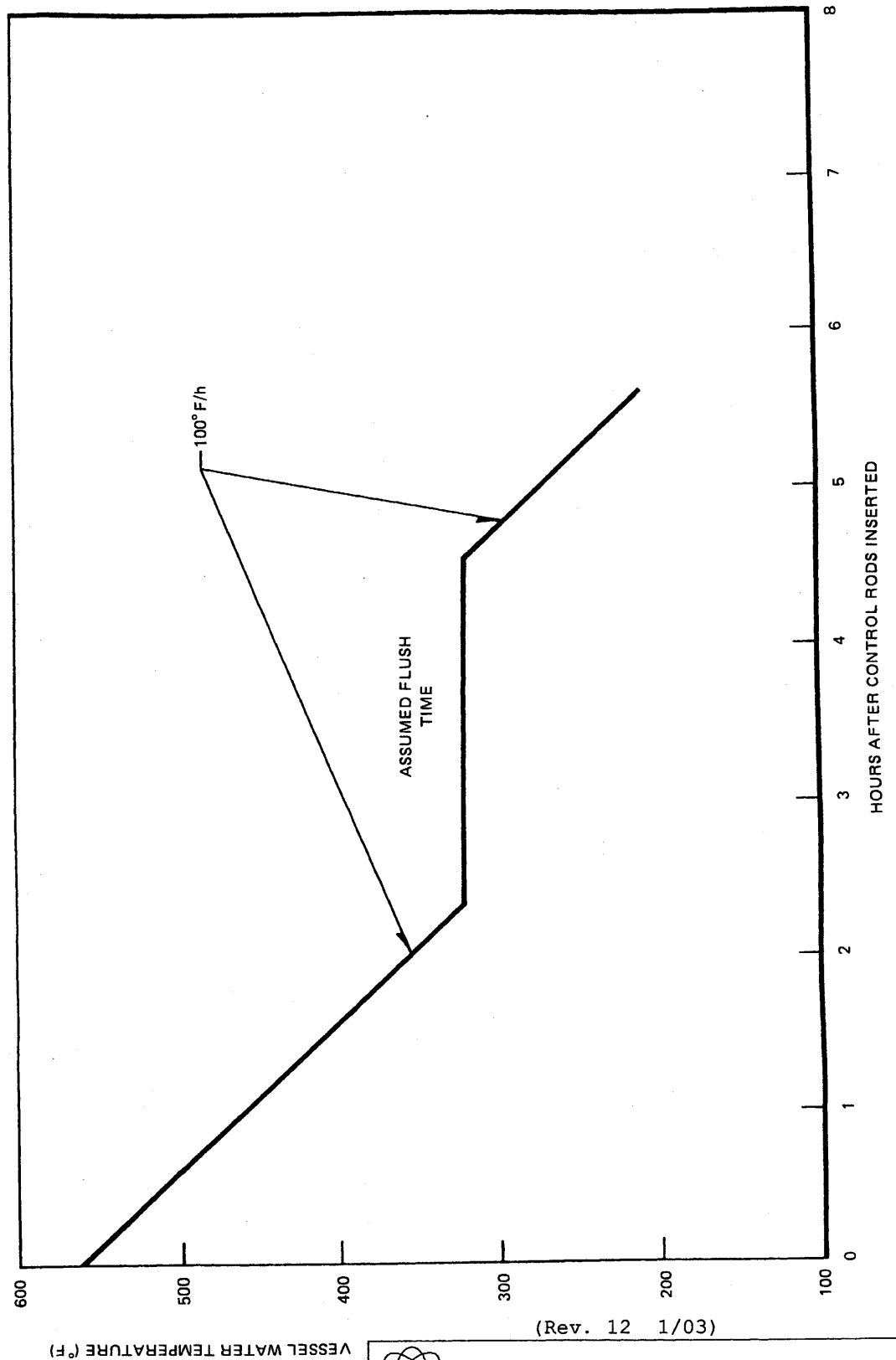
MPL. \*E51-1020  
 REFERENCE G. E. DRAWING \*762E421CA REV. 1

(Rev. 13 12/03)

**PERRY NUCLEAR POWER PLANT**

Reactor Core Isolation  
Cooling System

Figure 5.4-10



(Rev. 12 1/03)

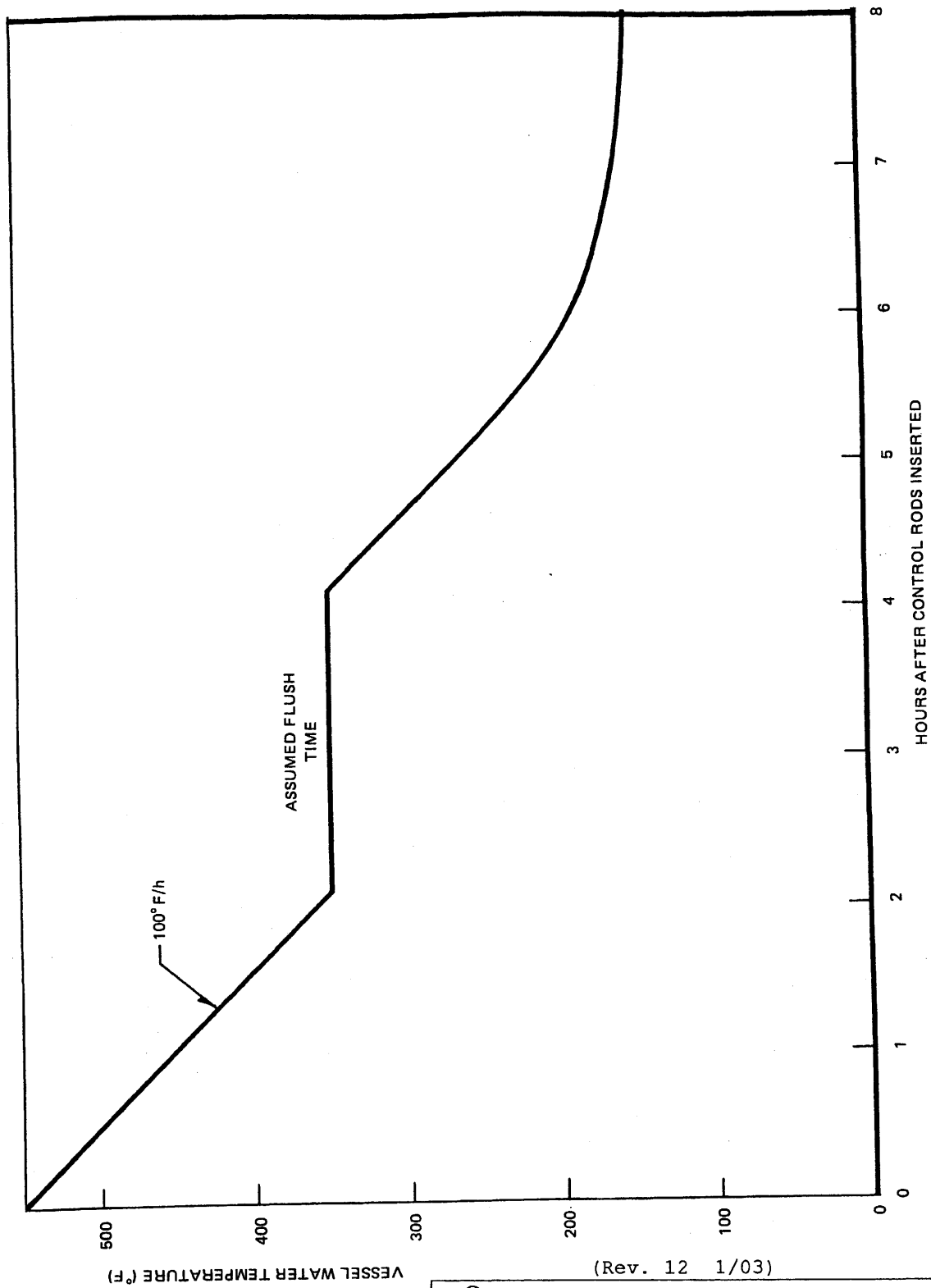
VESSEL WATER TEMPERATURE (°F)



**PERRY NUCLEAR POWER PLANT**

Vessel Coolant Temperature vs  
Time (Two Heat Exchangers Available)

Figure 5.4-11



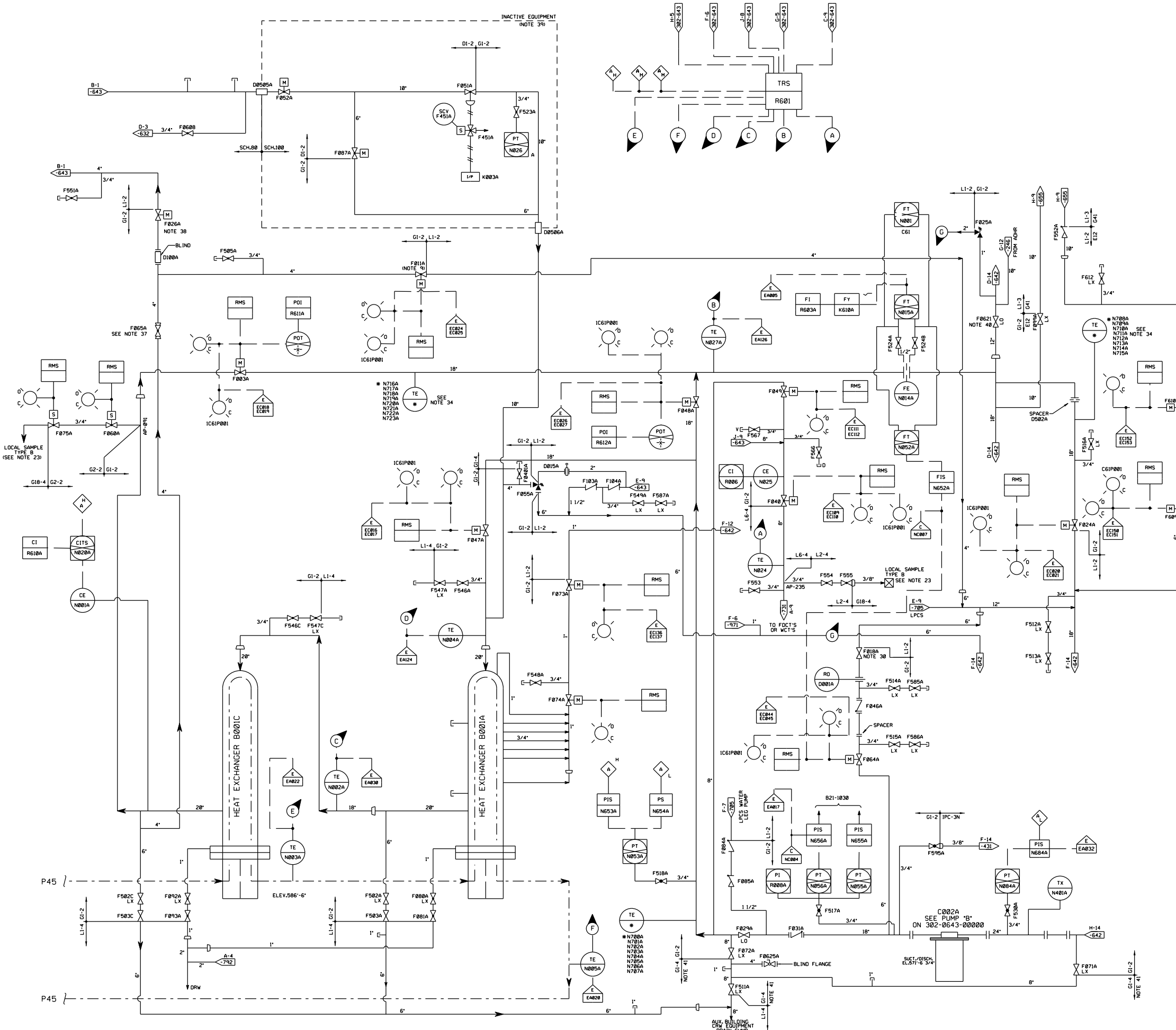
(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Vessel Coolant Temperature vs  
Time (One Heat Exchanger Available)

Figure 5.4-12



- NOTES:
1. DELETED.
  2. DELETED.
  3. DELETED.
  4. DELETED.
  5. DELETED.
  6. ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY SYSTEM E12, UNLESS OTHERWISE NOTED.
  7. ALL MOTOR OPERATED VALVES ARE AC OPERATED, UNLESS OTHERWISE NOTED.
  8. DELETED.
  9. VALVE SHOULD BE INSTALLED WITH PACKING GLANDS ON UPSTREAM SIDE OF DISK. ALTERNATIVELY, THE PACKING GLANDS CAN BE ON THE DOWNSTREAM SIDE OF THE DISK PROVIDED THE PACKING IS TESTED FOR LEAKAGE.
  10. DELETED.
  11. DELETED.
  12. PROVISION FOR CONTAINMENT ISOLATION SHALL BE IN ACCORDANCE WITH CURRENT LICENSING REQUIREMENTS.
  13. GUARD PIPE REQUIRED BETWEEN DRYWELL WALL AND CONTAINMENT.
  14. DELETED.
  15. DELETED.
  16. DELETED.
  17. DELETED.
  18. DELETED.
  19. DELETED.
  20. DELETED.
  21. DELETED.
  22. DELETED.
  23. FOR DESCRIPTION OF SAMPLE TYPES, SEE DWG. D-302-771.
  24. HIGH CONTAINMENT PRESSURE SIGNAL IN CONJUNCTION WITH A LOCA SIGNAL (AND 18 MINUTE TIME DELAY) OPENS (MO) F082A & B AND (MO) F037A & B.
  25. DELETED.
  26. ALL REMOTE MANUAL SWITCHES, ALARMS, AND INDICATING LIGHTS ARE LOCATED ON H13-P801, UNLESS OTHERWISE NOTED.
  27. DELETED.
  28. LOCKED OPEN TO PREVENT OVERPRESSURIZATION VIA LEAKAGE ACROSS F0715.
  29. RING SPACERS D086A AND B TO BE PLACED DURING PLANT OPERATION. SINGLE BLINDS D086A AND B TO BE TEMPORARILY INSERTED DURING PERIODIC SYSTEM TESTING. SINGLE BLINDS TO BE STORED IN BETWEEN TESTS.
  30. VALVES F081A, B AND C TO BE THROTTLED TO ACHIEVE REQUIRED MINIMUM FLOW OF 1500 GPM (NOMINAL) BASED ON APPROPRIATE CERTIFIED PUMP CURVE FOR EACH LOOP, AND LOCKED IN THAT POSITION. THE DESIGN MINIMUM PERMITTED PUMP FLOW IS 1250 GPM.
  31. DELETED.
  32. STRAINER T21E0001 IS SAFETY RELATED NON-ASME.
  33. DELETED.
  34. EIGHT (8) STRAP-ON RTDS UTILIZED FOR RHR HEAT EXCHANGER PERFORMANCE TESTING (H-13); TYPICAL 6 PLACES.
  35. CHECK VALVE INTERNALS REMOVED FROM IE12F046B (VALVE FUNCTIONS AS STRAIGHT PIPE).
  36. D086A & B TO USE SPACER WHEN USE OF RHR UPPER POOL RETURN PATH IS NEEDED DURING REFUEL OPERATION. D086A AND B MAY USE SPACER OR BLANK AT OTHER TIMES. SEE ECP 18-0092 FOR ADDITIONAL INFORMATION.
  37. THE DIAPHRAGM ACTUATOR, BONNET, YOKE, VALVE STEM AND PLOD HAVE BEEN REMOVED FROM VALVES F082A & F082B AND REPLACED WITH A BLIND BONNET. VALVE FUNCTIONS AS STRAIGHT PIPE.)
  38. VALVES F026A/B HAVE BEEN DETERMINED AT THE MCC COMPARTMENT. THEY ARE REQUIRED TO MAINTAIN THE SYSTEM STRUCTURAL AND SEISMIC INTEGRITY OF THE PIPING SYSTEM AND TO MAINTAIN A PRESSURE BOUNDARY.
  39. THE PIPING AND COMPONENTS BETWEEN BLINDS D085A/B AND D086A/B ARE INACTIVE AND ARE REQUIRED ONLY FOR THE SEISMIC AND STRUCTURAL INTEGRITY OF THE PIPING SYSTEM.
  40. VALVE DISK MODIFIED TO ADDRESS OVER PRESSURE PROTECTION.
  41. RHR A/B PUMP BYPASS LINES, INCLUDING VALVES IE12F0511A/B, ARE SEISMICALLY QUALIFIED. REFER TO ECP 13-0519. VALVE IE12F0511A IS ALSO SEISMICALLY QUALIFIED.
  42. HYDROLASE CONNECTION.

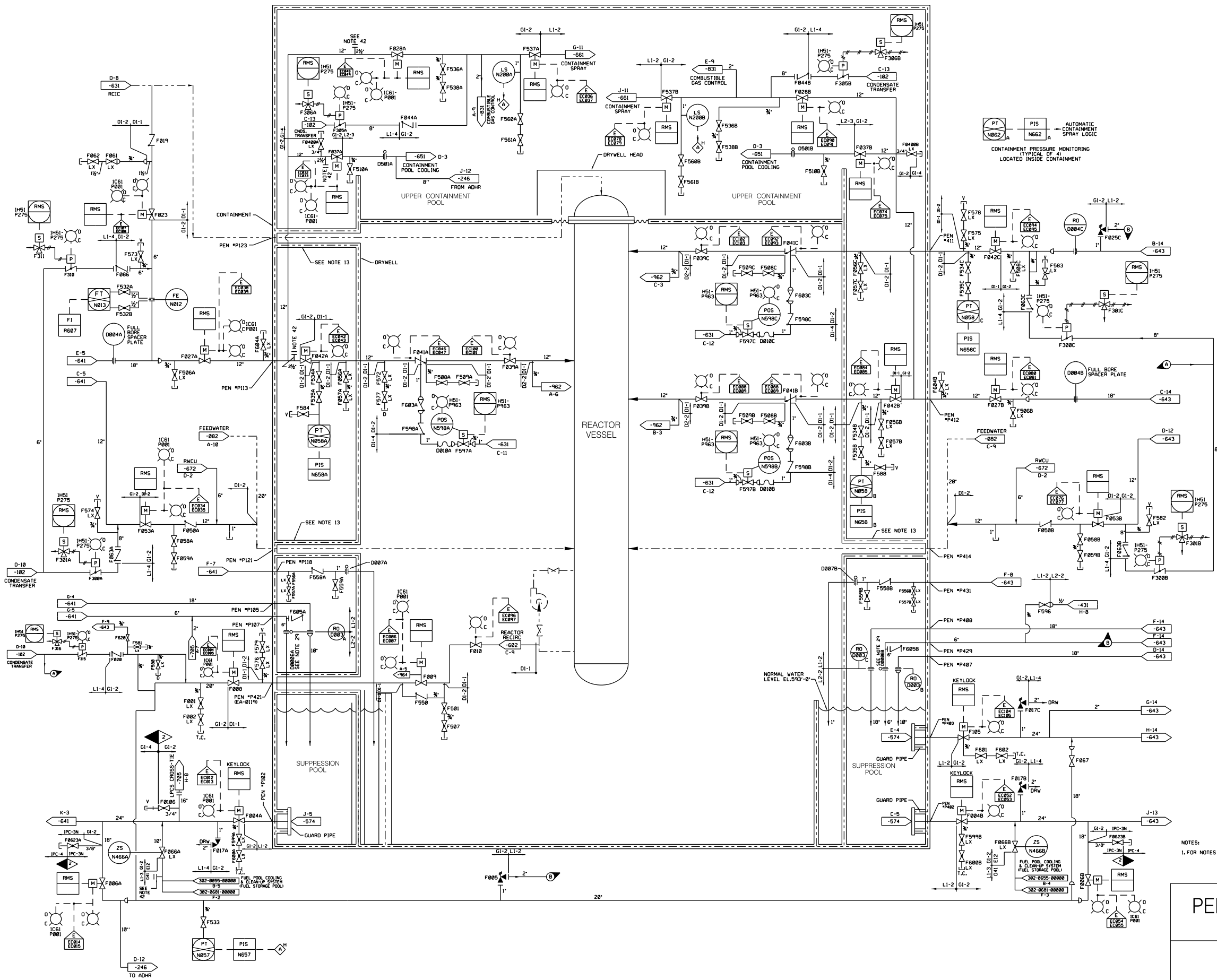
- REFERENCES:
- 442-1810 PIPING AND INSTRUMENT SYMBOLS
  - 462-4030 PRESSURE INTEGRITY OF NUCLEAR COMPONENTS
  - 462-4070 PROCESS INSTRUMENTATION
  - 462-4140 CLEANING OF PIPING AND EQUIPMENT
  - 462-4230 EMERGENCY EQUIPMENT COOLING WATER SPECIFICATION
  - B21-1030 NUCLEAR BOILER SYSTEM FCD
  - C91-4030 PROCESS COMPUTER SYSTEM INPUT/OUTPUT LIST
  - D17-1010 PROCESS RADIATION MONITORING SYSTEM
  - E12-1020 RHR PROCESS DIAGRAM
  - 302-0001-00000 P&ID SYMBOLOLOGY
  - 302-0002-00000 P&ID SYMBOLOLOGY
  - 302-0002-00000 FEEDWATER SYSTEM, N27
  - 302-0102-00000 CONDENSATE TRANSFER SYSTEM, P11
  - 302-0431-00000 POST ACCIDENT SAMPLING SYSTEM, P87
  - 302-0574-00000 ECC SYSTEM SUCTION STRAINER, T21
  - 302-0601-00000 REACTOR RECIRCULATING SYSTEM, B33
  - 302-0631-00000 RCIC SYSTEM, E51
  - 302-0632-00000 RCIC SYSTEM, E51
  - 302-0642-00000 RESIDUAL HEAT REMOVAL SYSTEM, E12
  - 302-0643-00000 RESIDUAL HEAT REMOVAL SYSTEM, E12
  - 302-0651-00000 FUEL POOL COOLING AND CLEAN-UP SYSTEM, G41
  - 302-0655-00000 FUEL POOL COOLING AND CLEAN-UP SYSTEM, G41
  - 302-0661-00000 CONTAINMENT SPRAY SYSTEM, E15
  - 302-0671-00000 REACTOR WATER CLEAN-UP SYSTEM, G33
  - 302-0701-00000 HIGH PRESSURE CORE SPRAY SYSTEM, E22
  - 302-0705-00000 LOW PRESSURE CORE SPRAY SYSTEM, E21
  - 302-0731-00000 LIQUID RADWASTE SYSTEM, G50
  - 302-0771-00000 NUCLEAR SAMPLING SYSTEM, P34
  - 302-0792-00000 EMERGENCY SERVICE WATER SYSTEM, P45
  - 302-0831-00000 COMBUSTIBLE GAS CONTROL SYSTEM, M51
  - 302-0962-00000 LEAK DETECTION SYSTEM, E31
  - 302-0964-00000 LEAK DETECTION SYSTEM, E31
  - 302-0971-00000 FEEDWATER LEAKAGE CONTROL SYSTEM, N27
  - 320-0641-00000 DESIGN SPEC. RESIDUAL HEAT REMOVAL SYSTEM, E12
  - 320-0642-00000 DESIGN SPEC. RESIDUAL HEAT REMOVAL SYSTEM, E12
  - 320-0643-00000 DESIGN SPEC. RESIDUAL HEAT REMOVAL SYSTEM, E12
  - 800-0301-00000 REMOTE SHUTDOWN SYSTEM, C61

(REV. 21 10/2019)

**PERRY NUCLEAR POWER PLANT**  
10 CENTER RD., PERRY, OHIO 44081

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RESIDUAL HEAT  
REMOVAL SYSTEM  
FIGURE 5.4-13 (SHEET 1 OF 3)  
(DWG. D-302-0641-00000)

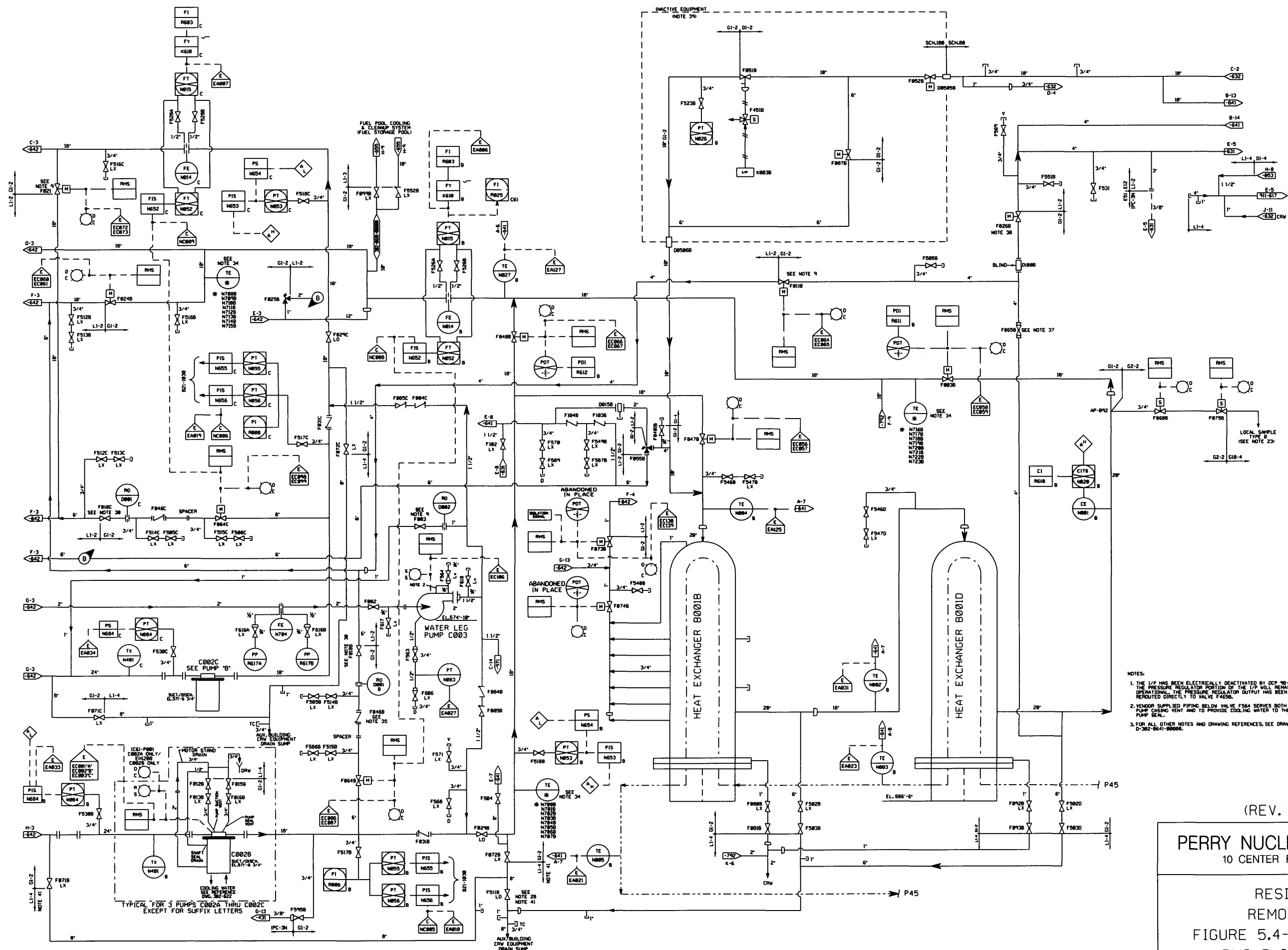


NOTES:  
 1. FOR NOTES AND DRAWING REFERENCES SEE DRAWING 302-0641-00000.

(REV. 22 10/2021)

**PERRY NUCLEAR POWER PLANT**  
 10 CENTER RD., PERRY, OHIO 44081

RESIDUAL HEAT REMOVAL  
 SYSTEM  
 FIGURE 5.4-13 (2 OF 3)  
 (DWG. D-302-0642-00000)



- NOTES:
1. THE I/P HAS BEEN ELECTRICALLY DEACTIVATED BY DCP 98-0824. THE PRESSURE REGULATOR PORTION OF THE I/P WILL REMAIN OPERATIONAL. THE PRESSURE REGULATOR OUTPUT HAS BEEN REROUTED DIRECTLY TO VALVE F4508.
  2. VENDOR SUPPLIED PIPING BELOW VALVE F564 SERVES BOTH AS A PUMP CASING VENT AND TO PROVIDE COOLING WATER TO THE PUMP SEAL.
  3. FOR ALL OTHER NOTES AND DRAWING REFERENCES, SEE DRAWING D-302-0641-00000.

(REV. 19 10/2015)

**PERRY NUCLEAR POWER PLANT**  
10 CENTER RD., PERRY, OHIO 44081

**RESIDUAL HEAT  
REMOVAL SYSTEM**  
FIGURE 5.4-13 (SHEET 3 OF 3)  
(DWG. D-302-0643-00000)



MODE A-1 (SEE NOTES 3 & 13)

|                         |      |      |    |   |   |   |                  |                  |   |    |    |      |      |
|-------------------------|------|------|----|---|---|---|------------------|------------------|---|----|----|------|------|
| POSITION                | 1    | 2    | 3  | 4 | 5 | 6 | 7 <sub>A,B</sub> | 8 <sub>A,B</sub> | 9 | 10 | 46 | 11   | 29   |
| FLOW GPM                | —    | 7100 | —  | — | — | — | —                | —                | — | —  | —  | 7100 | —    |
| PRESSURE PSIA           | 29.7 | 14.7 | —  | — | — | — | —                | —                | — | —  | —  | 53.7 | 38.7 |
| TEMPERATURE °F          | —    | 170  | 40 | — | — | — | —                | —                | — | —  | —  | 170  | 40   |
| MAX. PRESSURE DROP FEET | —    | —    | —  | — | — | — | —                | —                | — | —  | —  | —    | —    |

HEAT REMOVAL CAPABILITY PER HX LOOP 158.4 x 10<sup>6</sup> BTU/HR (1 HX OPERATING)

MODE A-2 SEE NOTE 13

|                         |      |      |    |   |   |   |                  |                  |   |    |    |      |    |
|-------------------------|------|------|----|---|---|---|------------------|------------------|---|----|----|------|----|
| POSITION                | 1    | 2    | 3  | 4 | 5 | 6 | 7 <sub>A,B</sub> | 8 <sub>A,B</sub> | 9 | 10 | 46 | 11   | 29 |
| FLOW GPM                | —    | 8520 | —  | — | — | — | —                | —                | — | —  | —  | 8520 | —  |
| PRESSURE PSIA           | 14.7 | —    | —  | — | — | — | —                | —                | — | —  | —  | 14.7 | —  |
| TEMPERATURE °F          | —    | 180  | 90 | — | — | — | —                | —                | — | —  | —  | 180  | 90 |
| MAX. PRESSURE DROP FEET | —    | —    | —  | — | — | — | —                | —                | — | —  | —  | —    | —  |

HEAT REMOVAL CAPABILITY PER HX LOOP 153 x 10<sup>6</sup> BTU/HR (1 HX OPERATING)

MODE B-1 SEE NOTE 20

|                         |      |                |                |                |                |                |                 |                 |                |                 |                 |                 |                 |                 |                 |      |                 |                 |
|-------------------------|------|----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|-----------------|-----------------|
| POSITION                | 1    | 2 <sub>B</sub> | 3 <sub>B</sub> | 4 <sub>B</sub> | 5 <sub>B</sub> | 6 <sub>B</sub> | 18 <sub>B</sub> | 19 <sub>B</sub> | 9 <sub>B</sub> | 10 <sub>B</sub> | 11 <sub>B</sub> | 53 <sub>B</sub> | 44 <sub>B</sub> | 43 <sub>B</sub> | 24 <sub>B</sub> | 1    | 60 <sub>B</sub> | 61 <sub>B</sub> |
| FLOW GPM                | —    | 7100           | —              | —              | —              | —              | —               | —               | —              | —               | —               | —               | —               | —               | 7100            | —    | —               | —               |
| PRESSURE PSIA           | 29.7 | 14.7           | —              | —              | —              | —              | —               | —               | —              | —               | —               | —               | —               | —               | —               | 29.7 | —               | —               |
| TEMPERATURE °F          | —    | 185            | —              | —              | —              | —              | —               | 185             | 139.4          | —               | —               | —               | —               | —               | —               | —    | —               | —               |
| MAX. PRESSURE DROP FEET | —    | —              | —              | —              | —              | —              | —               | —               | —              | —               | —               | —               | —               | —               | —               | —    | —               | —               |

HEAT REMOVAL CAPABILITY PER HX LOOP 158.4 x 10<sup>6</sup> BTU/HR (1 HX OPERATING)

MODE B-2 (SEE NOTE 20)

|                         |      |      |                |                |                |                |                 |                 |                |                 |                 |                 |                 |                 |      |                 |                 |
|-------------------------|------|------|----------------|----------------|----------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|-----------------|-----------------|
| POSITION                | 1    | 2    | 3 <sub>B</sub> | 4 <sub>B</sub> | 5 <sub>B</sub> | 6 <sub>B</sub> | 18 <sub>B</sub> | 19 <sub>B</sub> | 9 <sub>B</sub> | 10 <sub>B</sub> | 16 <sub>B</sub> | 67 <sub>B</sub> | 68 <sub>B</sub> | 69 <sub>B</sub> | 1    | 60 <sub>B</sub> | 61 <sub>B</sub> |
| FLOW GPM                | —    | 5250 | —              | —              | —              | —              | —               | —               | —              | —               | —               | —               | —               | —               | 5250 | —               | —               |
| PRESSURE PSIA           | 29.7 | 14.7 | —              | —              | —              | —              | —               | —               | —              | —               | —               | —               | —               | —               | 29.7 | —               | —               |
| TEMPERATURE °F          | —    | 200  | —              | —              | —              | —              | —               | 200             | 139.7          | —               | —               | —               | —               | —               | —    | —               | —               |
| MAX. PRESSURE DROP FEET | —    | —    | —              | —              | —              | —              | —               | —               | —              | —               | —               | —               | —               | —               | —    | —               | —               |

HEAT REMOVAL CAPABILITY PER HX LOOP 153 x 10<sup>6</sup> BTU/HR (1 HX OPERATING)

NOTES:

1. PIPING BETWEEN POINTS WITH EMPTY DATA BLANKS (SEE ALSO TABLE 3) SHALL BE SIZED BY CUSTOMER OR AS BASED ON SPECIFIED OPERATING CONDITIONS. EMPTY DATA BLANKS CAN BE FILLED IN BASED ON ACTUAL ARRANGEMENT OR EQUIVALENT HYDRAULIC DATA SUBMITTED TO INRSB FOR REVIEW.
2. PIPING BETWEEN POINTS WITH EMPTY DATA BLANKS (SEE ALSO TABLE 3) SHALL BE SIZED BY CUSTOMER OR AS BASED ON SPECIFIED OPERATING CONDITIONS. EMPTY DATA BLANKS CAN BE FILLED IN BASED ON ACTUAL ARRANGEMENT OR EQUIVALENT HYDRAULIC DATA SUBMITTED TO INRSB FOR REVIEW.
3. --- INDICATES THE DATA IS NOT SIGNIFICANT.
4. SHOWN AS TYPICAL FOR ONE LOOP. IF LOOPS ON SIDE 1 AND SIDE 11 ARE NOT SYMMETRICALLY ARRANGED, VALUES FOR BOTH SIDES SHALL BE SUBMITTED.
5. ΔH VALUES FOR EQUIPMENT WITHIN GE SCOPE ARE AS NOTED.
6. ELEVATIONS ARE NOT INCLUDED IN ΔP VALUES GIVEN. ELEVATIONS SHALL BE INCLUDED WHEN DETERMINING FINAL VALUES FOR THE EMPTY DATA BLANKS.
7. [X] INDICATES MAXIMUM (X) AND MINIMUM (Y) VALUES FOR THE MODE SPECIFIED.
8. DASHED LINES INDICATE FLOW DOES NOT PASS THRU THESE POINTS. SOLID LINES INDICATE FLOW DOES PASS THRU THESE POINTS.
9. THE NPSH AVAILABLE IN MODE A-2 AT A REFERENCE LOCATION 3 FEET ABOVE THE PUMP MOUNTING FLANGE MUST EQUAL OR EXCEED 6.2 FEET, ASSUMING SATURATION TEMPERATURE OF 222°F. THE NPSH AVAILABLE IN MODES B-1 & B-2 AT A REFERENCE LOCATION 3 FEET ABOVE THE PUMP MOUNTING FLANGE MUST EQUAL OR EXCEED 4 FEET ASSUMING SATURATION TEMPERATURES OF 212°F AND 200°F, RESPECTIVELY. THE NPSH AVAILABLE AT THE PUMP SUCTION NOZZLE MUST EQUAL OR EXCEED THIS VALUE PLUS THE DIFFERENCE IN ELEVATION BETWEEN THE REFERENCE LOCATION AND THE CENTER-LINE OF THE PUMP SUCTION NOZZLE.
10. PIPING SYSTEM DESIGN PRESSURE AND TEMPERATURE AND THE ESTIMATED LINE SIZES ARE FOR INFORMATION ONLY. ACTUAL DESIGN PRESSURE AND TEMPERATURE AND LINE SIZES AS DETERMINED BY PIPING DESIGNER SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENTS. REFER TO HARDWARE DINGS FOR NOZZLE SIZES ON GE SUPPLIED EQUIPMENT.
11. FUEL POOL CONNECTIONS MUST PROVIDE ADEQUATE NPSH TO AVOID PUMP CAVITATION AND AT THE SAME TIME PROVIDE FOR GREATER THAN MINIMUM PUMP FLOW.
12. TABLE 1 INDICATES VALVE POSITION DURING VARIOUS MODES OF OPERATION.
13. [Symbol] - [Symbol]
14. TYPICAL VALUES FOR MAX. SUPPRESSION POOL TEMP SHOWN. FINAL TEMPERATURE DEPENDS ON INITIAL POOL WATER TEMPERATURE & POOL WATER VOLUME.
15. WATER FLOWS ARE IN GPM.
16. MAXIMUM SOH 700 FEET.
17. SERVICE WATER CROSS-TIE SHALL BE SIZED TO FLOW 300 GPM AND ENOUGH HEAD TO FLOOD THE CONTAINMENT.
18. THE HEIGHT OF WATER IN THE SHUTDOWN COOLING SUBSYSTEM PIPING, INCLUDING THE HEAT EXCHANGERS AND PUMPS SHALL NOT EXCEED 278,000 LBS AT 75°F TO PREVENT DILUTION OF STANDBY LIQUID CONTROL NEUTRON ABSORBER BELOW MINIMUM REQUIREMENTS.
19. SEE REFERENCE 3 FOR SUPPLEMENTAL FLOWS ENTERING DOWNSTREAM OF E12-F05C DURING NORMAL PLANT OPERATIONS.
20. FLOW SHOWN IS A MAXIMUM. ACTUAL FLOW WILL BE INDICATED LATER FOR EACH PROJECT.
21. MAXIMUM SHELL SIDE FLOW RATE IS 7800 GPM.
22. FLOW SHOWN AT POSITION 71 DOES NOT INCLUDE FLOW FROM FUEL POOL COOLING AND CLEANUP SYSTEMS.
23. SEE SYSTEM DATA SHEET FOR SUGGESTED VALVE SIZING.
24. SUCTION TEMPERATURE AND PRESSURE ARE FOR LOOPS A&B ONLY. LOOP C CONDITIONS ARE 0 PSIG VESSEL PRESSURE 125 F.
25. THE HX INLET PRESSURE SHALL BE GREATER THAN 60 PSIA TO MINIMIZE THE POSSIBILITY OF FLOW INDUCE VIBRATION.
26. FOR LOOPS A AND B, MODE G MAY BE ELIMINATED FROM DESIGN CONSIDERATION DURING SHUTDOWN COOLING IF HOP - F04A IS ELECTRICALLY DISABLED. WHEN SHUTDOWN COOLING IS INITIATED IN THE A+B LOOP, ONLY ONE VALVE SHOULD BE DISABLED AT ANY GIVEN TIME. CUSTOMER ESTABLISHED DESIGN ALTERNATE TO GE STANDARD.
27. REFER TO DSP-E12-1-4549-00, TABLE L, MODE J, NOTE 5 FOR OPERATING PARAMETERS IN THE SHUTDOWN COOLING HEADER LEAN-OFF LINE PIPING DURING NORMAL OPERATION.
28. THE R/R STEAM CONDENSING MODE IS NO LONGER USED AT THE PERRY NUCLEAR POWER PLANT (REF: GEN-EL20061-1).
29. THE ORAPHAN ACTUATOR BONNET, YOKE, VALVE STEM AND PLUG HAVE BEEN REMOVED FROM VALVES F05A & F05B AND REPLACED WITH A BLIND BONNET. (VALVE FUNCTIONS AS STRAIGHT PIPE)
30. FOR CORRESPONDING ESN OPERATING DATA REFER TO P&ID 300-4743-00000. ESN OPERATING DATA CORRESPONDING TO R/R MODES B-2 AND D-2 ARE NOT PROVIDED SINCE THESE MODES ARE NOT LISTED FOR ESN. HOWEVER, ESN INLET POSITION, FLOW RATES AND TEMPERATURES ARE THE SAME FOR MODES B-1 AND B-2 AND MODES D-1 AND D-2.

LEGEND:

- ΔH - HEAD LOSS
- ΔP - PRESSURE LOSS
- RX PRESS - REACTOR VESSEL PRESSURE
- SOH - SHUTOFF HEAD
- TDH - TOTAL DYNAMIC HEAD

REFERENCE DOCUMENTS

- |  |          |
|--|----------|
| 1. RECIC SYSTEM PROCESS DIAGRAM          | E51-1020 |
| 2. RECIC SYSTEM DESIGN SPEC DATA         | 833-4010 |
| 3. LOW PRESSURE CORE SPRAY SYSTEM PD     | E21-1020 |
| 4. NUCLEAR BOILER SYSTEM PROCESS DIAGRAM | B21-1020 |
| 5. REACTOR WATER CLEANUP SYSTEM PD       | G33-1030 |

SUPPORTING DOCUMENTS

- |                                |          |
|--------------------------------|----------|
| 1. PIPING & INSTRUMENT SYMBOLS | AAZ-1010 |
|--------------------------------|----------|

MODES:

- A-1 LOW PRESSURE COOLANT INJECTION (LPCI) RECIRCULATION LINE BREAK IN EITHER SIDE AND THREE PUMPS OPERATING, ONE STRAINER 50% PLUGGED.
- A-2 LOW PRESSURE COOLANT INJECTION (LPCI) RECIRCULATION LINE BREAK IN EITHER SIDE AND THREE PUMPS OPERATING, ONE STRAINER 50% PLUGGED, VESSEL PRESSURE=0 PSIG.
- B-1 POST ACCIDENT SUPPRESSION POOL COOLING WITH ONE PUMP OPERATION AND STRAINER 50% PLUGGED, PEAK SUPPRESSION POOL TEMPERATURE
- B-2 POST ACCIDENT CONTAINMENT SPRAY WITH HEAT REJECTION WITH ONE PUMP OPERATION AND STRAINER 50% PLUGGED.
- D-1 INITIATION OF SHUTDOWN COOLING AFTER BLOWDOWN TO MAIN CONDENSER AT 4 HOURS.
- D-2 CONTINUATION OF SHUTDOWN COOLING AT 20 HOURS.
- E-1 CONTINUATION OF SHUTDOWN COOLING AT 20 HOURS AND FUNCTIONAL PUMP TEST AFTER SHUTDOWN.
- E-2 CONTINUATION OF SHUTDOWN COOLING WITH RETURN TO UPPER CONTAINMENT POOL AT GREATER THAN 20 HOURS AND FUNCTIONAL PUMP TEST AFTER SHUTDOWN.
- F RWR SYSTEM TEST DURING PLANT OPERATION.
- G MINIMUM FLOW BYPASS MODE: 2 SUCTION SOURCES.
- S SYSTEM ON STANDBY DUTY.

(Rev. 13 12/03)



PERRY NUCLEAR POWER PLANT

Residual Heat Removal System

Figure 5.4-14 (Sheet 1 of 3)

MODE D-1 RX PRESSURE 110 PSIG SEE NOTE 20

|                        |       |       |      |                 |                 |                  |                  |                  |                  |                  |                  |         |                  |                  |
|------------------------|-------|-------|------|-----------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|---------|------------------|------------------|
| POSITION               | 29    | 25    | 26   | 5 <sub>AB</sub> | 6 <sub>AB</sub> | 18 <sub>AB</sub> | 19 <sub>AB</sub> | 16 <sub>AB</sub> | 50 <sub>AB</sub> | 27 <sub>AB</sub> | 28 <sub>AB</sub> | 29      | 60 <sub>AB</sub> | 61 <sub>AB</sub> |
| FLOW GPM               | 14200 | 14200 | 7100 | 7100            | 7100            | 7100             | 7100             | 7100             | 7100             | 7100             | 7100             | 7100    | 7100             | 7100             |
| PRESSURE PSIA          | 125   |       |      |                 |                 |                  |                  |                  |                  |                  |                  | 125     |                  |                  |
| TEMPERATURE °F         | 344   |       |      | 344             | 304.1           |                  |                  |                  |                  |                  |                  | 304.1   |                  |                  |
| MAX PRESSURE DROP FEET |       |       |      | TDH=275         |                 |                  |                  |                  |                  |                  |                  | TDH=275 |                  |                  |

HEAT REMOVAL CAPABILITY PER HX LOOP 135.1 X 10<sup>6</sup> BTU/HR (2 HRS OPERATING)

MODE D-2 RX PRESSURE 0 PSIG SEE NOTE 20

|                        |       |       |      |                 |                 |                  |                  |                  |                  |                  |                  |    |                  |                  |
|------------------------|-------|-------|------|-----------------|-----------------|------------------|------------------|------------------|------------------|------------------|------------------|----|------------------|------------------|
| POSITION               | 29    | 25    | 26   | 5 <sub>AB</sub> | 6 <sub>AB</sub> | 18 <sub>AB</sub> | 19 <sub>AB</sub> | 16 <sub>AB</sub> | 50 <sub>AB</sub> | 27 <sub>AB</sub> | 28 <sub>AB</sub> | 29 | 60 <sub>AB</sub> | 61 <sub>AB</sub> |
| FLOW GPM               | 14200 | 14200 | 7100 |                 |                 |                  |                  |                  |                  | 7100             |                  |    |                  |                  |
| PRESSURE PSIA          | 14.7  |       |      |                 |                 |                  |                  |                  |                  | 14.7             |                  |    |                  |                  |
| TEMPERATURE °F         | 125   |       |      |                 |                 |                  |                  |                  |                  | 102              |                  |    |                  |                  |
| MAX PRESSURE DROP FEET |       |       |      | TDH=275         |                 |                  |                  |                  |                  | 102              |                  |    |                  |                  |

HEAT REMOVAL CAPABILITY PER HX LOOP 100.5 X 10<sup>6</sup> BTU/HR (2 HRS OPERATING)

MODE E-1 RX PRESSURE 0 PSIG SEE NOTE 20

|                        |       |       |      |                 |                 |      |   |   |                 |                  |                  |                 |   |    |                  |                  |                  |                  |                  |    |    |                  |                  |  |
|------------------------|-------|-------|------|-----------------|-----------------|------|---|---|-----------------|------------------|------------------|-----------------|---|----|------------------|------------------|------------------|------------------|------------------|----|----|------------------|------------------|--|
| POSITION               | 29    | 25    | 26   | 5 <sub>AB</sub> | 6 <sub>AB</sub> | 4    | 5 | 6 | 7 <sub>AB</sub> | 18 <sub>AB</sub> | 19 <sub>AB</sub> | 6 <sub>AB</sub> | 9 | 10 | 16 <sub>AB</sub> | 50 <sub>AB</sub> | 27 <sub>AB</sub> | 28 <sub>AB</sub> | 67 <sub>AB</sub> | 11 | 29 | 60 <sub>AB</sub> | 61 <sub>AB</sub> |  |
| FLOW GPM               | 14200 | 14200 | 7100 | 7100            | 7100            | 7100 |   |   |                 |                  |                  |                 |   |    |                  | 7100             | 7100             | 7100             | 7100             |    |    |                  |                  |  |
| PRESSURE PSIA          | 14.7  |       |      |                 |                 |      |   |   |                 |                  |                  |                 |   |    |                  |                  |                  |                  |                  |    |    |                  | 14.7             |  |
| TEMPERATURE °F         | 109.1 |       |      |                 |                 |      |   |   | 109.1           | 90.5             |                  |                 |   |    |                  |                  |                  |                  |                  |    |    | 90.5             |                  |  |
| MAX PRESSURE DROP FEET |       |       |      |                 |                 |      |   |   | TDH=275         | ΔH=35            |                  |                 |   |    |                  |                  |                  |                  |                  |    |    | 90.5             |                  |  |

HEAT REMOVAL CAPABILITY PER HX LOOP 48.9 X 10<sup>6</sup> BTU/HR (2 HRS OPERATING)

MODE E-2 RX PRESSURE 0 PSIG SEE NOTE 20 & 21

|                        |       |       |      |                 |                 |      |   |   |                 |                  |                  |                 |   |    |    |                  |                  |       |    |                  |                  |       |       |  |
|------------------------|-------|-------|------|-----------------|-----------------|------|---|---|-----------------|------------------|------------------|-----------------|---|----|----|------------------|------------------|-------|----|------------------|------------------|-------|-------|--|
| POSITION               | 29    | 25    | 26   | 5 <sub>AB</sub> | 6 <sub>AB</sub> | 4    | 5 | 6 | 7 <sub>AB</sub> | 18 <sub>AB</sub> | 19 <sub>AB</sub> | 6 <sub>AB</sub> | 9 | 10 | 11 | 67 <sub>AB</sub> | 70 <sub>AB</sub> | 71    | 29 | 60 <sub>AB</sub> | 61 <sub>AB</sub> |       |       |  |
| FLOW GPM               | 14200 | 14200 | 7100 | 7100            | 7100            | 7100 |   |   |                 |                  |                  |                 |   |    |    |                  | 7100             | 14200 |    |                  |                  |       |       |  |
| PRESSURE PSIA          | 14.7  |       |      |                 |                 |      |   |   |                 |                  |                  |                 |   |    |    |                  |                  |       |    |                  |                  |       | 14.7  |  |
| TEMPERATURE °F         | 510.1 |       |      |                 |                 |      |   |   | 510.1           | 590.5            |                  |                 |   |    |    |                  |                  |       |    |                  |                  |       | 590.5 |  |
| MAX PRESSURE DROP FEET |       |       |      |                 |                 |      |   |   | TDH=275         | ΔH=35            |                  |                 |   |    |    |                  |                  |       |    |                  |                  | 590.5 |       |  |

HEAT REMOVAL CAPABILITY PER HX LOOP 48.9 X 10<sup>6</sup> BTU/HR (2 HRS OPERATING)

MODE F SEE NOTE 3

|                        |      |   |   |   |   |   |   |   |   |    |    |                  |                  |      |   |
|------------------------|------|---|---|---|---|---|---|---|---|----|----|------------------|------------------|------|---|
| POSITION               | 1    | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 49 | 13 <sub>AB</sub> | 53 <sub>AB</sub> | 24   | 1 |
| FLOW GPM               | 7100 |   |   |   |   |   |   |   |   |    |    |                  |                  | 7100 |   |
| PRESSURE PSIA          | 14.7 |   |   |   |   |   |   |   |   |    |    |                  |                  | 14.7 |   |
| TEMPERATURE °F         | 120  |   |   |   |   |   |   |   |   |    |    |                  |                  | 40   |   |
| MAX PRESSURE DROP FEET |      |   |   |   |   |   |   |   |   |    |    |                  |                  | 40   |   |

MODE G RX PRESSURE 110 PSIG SEE NOTE 23 AND NOTE 25

|                        |      |    |    |    |   |   |   |     |    |    |   |   |   |   |   |   |   |     |    |    |   |  |  |
|------------------------|------|----|----|----|---|---|---|-----|----|----|---|---|---|---|---|---|---|-----|----|----|---|--|--|
| POSITION               | 29   | 25 | 26 | 35 | 4 | 5 | 6 | 6.1 | 43 | 24 | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 6.1 | 43 | 24 | 1 |  |  |
| FLOW GPM               | 1250 |    |    |    |   |   |   |     |    |    |   |   |   |   |   |   |   |     |    |    |   |  |  |
| PRESSURE PSIA          | 125  |    |    |    |   |   |   |     |    |    |   |   |   |   |   |   |   |     |    |    |   |  |  |
| TEMPERATURE °F         | 344  |    |    |    |   |   |   |     |    |    |   |   |   |   |   |   |   |     |    |    |   |  |  |
| MAX PRESSURE DROP FEET |      |    |    |    |   |   |   |     |    |    |   |   |   |   |   |   |   |     |    |    |   |  |  |

MODE S

|                        |      |    |   |   |   |   |                  |                  |   |    |    |                  |    |    |    |    |    |     |     |                  |                  |                  |                  |                  |                  |                  |     |     |  |
|------------------------|------|----|---|---|---|---|------------------|------------------|---|----|----|------------------|----|----|----|----|----|-----|-----|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----|-----|--|
| POSITION               | 1    | 2  | 3 | 4 | 5 | 6 | 18 <sub>AB</sub> | 19 <sub>AB</sub> | 9 | 10 | 46 | 50 <sub>AB</sub> | 51 | 53 | 54 | 56 | 56 | 34  | 35  | 36 <sub>AB</sub> | 37 <sub>AB</sub> | 17 <sub>AB</sub> | 20 <sub>AB</sub> | 38 <sub>AB</sub> | 39 <sub>AB</sub> | 40 <sub>AB</sub> | 41  | 42  |  |
| FLOW GPM               | N/A  |    |   |   |   |   |                  |                  |   |    |    | N/A              |    |    |    |    |    | N/A |     |                  |                  |                  | N/A              |                  |                  |                  |     |     |  |
| PRESSURE PSIA          | 14.7 |    |   |   |   |   |                  |                  |   |    |    |                  |    |    |    |    |    |     |     |                  |                  |                  |                  |                  |                  |                  |     |     |  |
| TEMPERATURE °F         | 90   | 40 |   |   |   |   |                  |                  |   |    | 90 | 40               |    |    |    |    |    | AMB | AMB | AMB              | AMB              | 90               | 40               | 90               | 40               | AMB              | AMB | AMB |  |
| MAX PRESSURE DROP FEET |      |    |   |   |   |   | TDH=0            |                  |   |    |    |                  |    |    |    |    |    |     |     |                  |                  |                  |                  |                  |                  |                  |     |     |  |

DESIGN PRESSURE AND TEMPERATURE TABLE SEE NOTE 9

|                         |     |     |   |   |   |   |   |   |    |    |     |    |     |     |     |    |   |     |     |   |   |     |    |    |    |    |     |    |     |     |     |    |    |    |     |    |    |     |     |     |     |     |     |     |     |    |    |
|-------------------------|-----|-----|---|---|---|---|---|---|----|----|-----|----|-----|-----|-----|----|---|-----|-----|---|---|-----|----|----|----|----|-----|----|-----|-----|-----|----|----|----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|
| POSITION                | 3.1 | 3.2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 16 | 46  | 11 | 7   | 7.1 | 18  | 19 | 8 | 3.1 | 3.2 | 5 | 6 | 9   | 10 | 16 | 46 | 11 | 25  | 54 | 28  | 44B | 54B | 16 | 56 | 27 | 28  | 67 | 70 | 71  | 14  | 30  | 31  | 51  | 66  | 57  | 70  | 68 | 69 |
| DESIGN PRESSURE IN PSIG | 100 | 230 |   |   |   |   |   |   |    |    | 500 |    | 500 | 500 | 100 |    |   |     |     |   |   | 500 |    |    |    |    | 500 |    | 200 |     |     |    |    |    | 500 |    |    | 500 | 125 |     | 300 |     | 500 |     | 200 |    |    |
| DESIGN TEMP IN °F       | 212 | 354 |   |   |   |   |   |   |    |    | 350 |    | 350 | 400 | 212 |    |   |     |     |   |   | 212 |    |    |    |    | 212 |    | 400 |     |     |    |    |    | 400 |    |    | 300 |     | 300 |     | 300 |     | 212 |     |    |    |
| ESTIMATED LINE SIZE     |     | 24" |   |   |   |   |   |   |    |    | 18" |    | 18" | 24" |     |    |   |     |     |   |   | 18" |    |    |    |    | 18" |    | 20" |     |     |    |    |    | 18" |    |    | 12" |     |     | 8"  |     |     | 12" |     |    |    |

DESIGN PRESSURE AND TEMPERATURE TABLE SEE NOTE 9

|                         |      |    |    |    |    |    |    |    |      |    |    |     |      |     |    |    |    |     |      |     |     |      |                 |     |     |     |     |     |     |     |  |     |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|------|----|----|----|----|----|----|----|------|----|----|-----|------|-----|----|----|----|-----|------|-----|-----|------|-----------------|-----|-----|-----|-----|-----|-----|-----|--|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|
| POSITION                | 35   | 36 | 37 | 17 | 18 | 19 | 20 | 38 | 40.1 | 41 | 42 | 40  | 40.2 | 44  | 13 | 53 | 24 | 56  | 56.1 | 4C  | 49  | 40.1 | 24 <sub>C</sub> | 6   | 6.1 | 43  | 6   | 6.1 | 43  |     |  |     |  |  |  |  |  |  |  |  |  |  |  |  |  |
| DESIGN PRESSURE IN PSIG | 1250 |    |    |    |    |    |    |    |      |    |    | 500 |      | 125 |    |    |    | 500 | 125  | 200 | 100 | 500  | 125             | 500 |     | 125 | 500 |     | 125 | 500 |  | 125 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| DESIGN TEMP IN °F       | 575  |    |    |    |    |    |    |    |      |    |    | 350 |      | 140 |    |    |    | 350 | 212  | 350 | 212 | 350  | 212             | 350 |     | 212 | 350 |     | 212 | 350 |  | 212 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ESTIMATED LINE SIZE     |      |    |    |    |    |    |    |    |      |    |    | 4"  |      | 18" |    |    |    | 18" |      |     |     |      |                 |     |     |     |     |     |     |     |  |     |  |  |  |  |  |  |  |  |  |  |  |  |  |

TABLE 2 LIMITING LINE LOSSES NUMBERS REFER TO POSITIONS

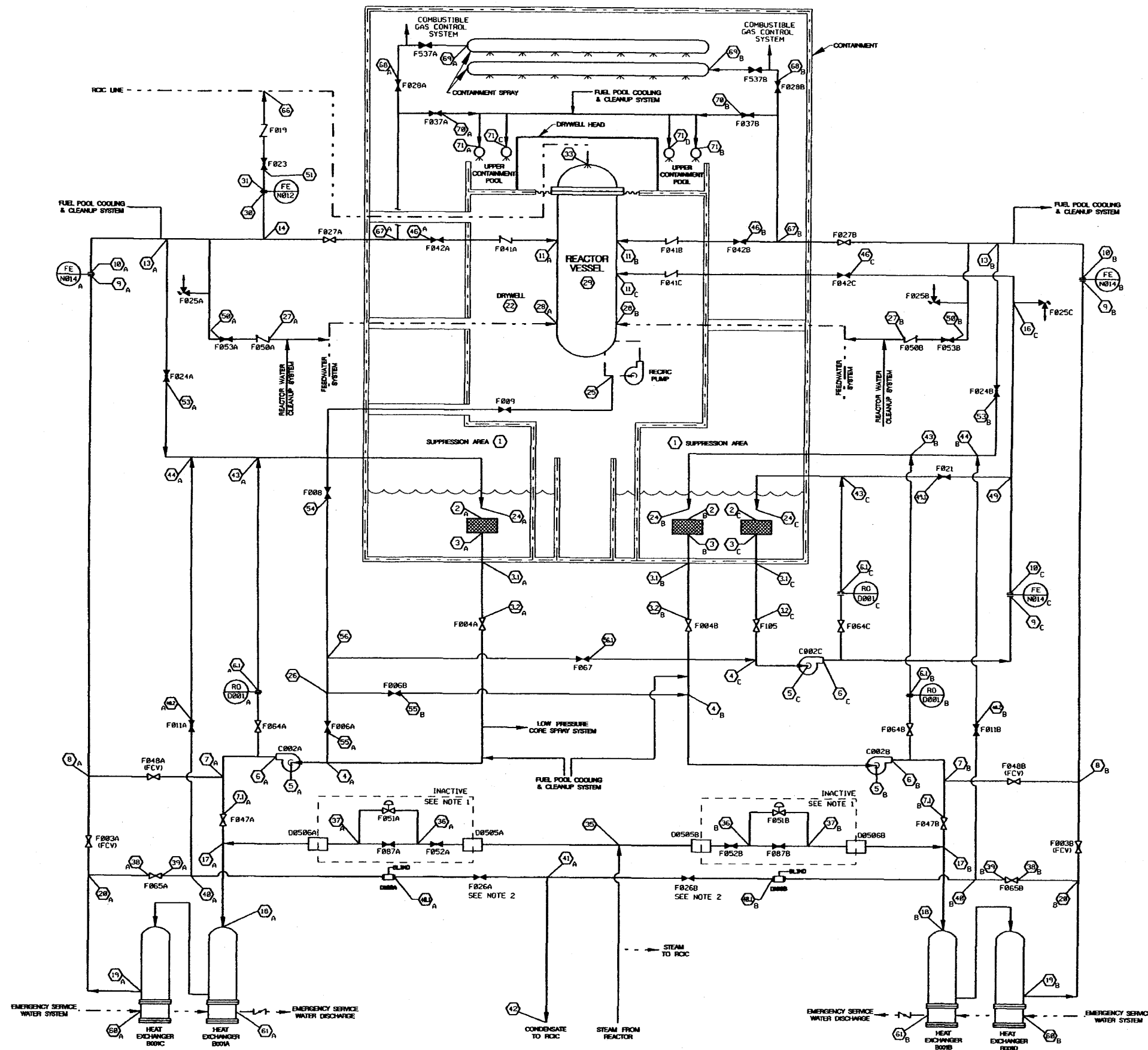
|                |  |
|----------------|--|
| MODE A-1       | 6-7-8-9-10-11 PUMP DISCHARGE LINE TO RPV FLOODING PENETRATION                        |
| MODE A-2       | 1-2-5 SUCTION LINE SUPPRESSION POOL TO PUMP  |
| MODE B-1       | 1-2-5 SUCTION LINE SUPPRESSION POOL TO PUMP 17-18-19-20HX PIPING-60-61 SERVICE WATER |
| MODE B-2       | 67-68-69-1 CONTAINMENT SPRAY FROM LPCI LINE  |
| MODE D-1 & D-2 | 14-51-66 VESSEL HEAD SPRAY LINE<br>29-25-4 SHUTDOWN SUCTION LINE RPV TO PUMP         |
| MODE E-1       | 16-27 SHUTDOWN RETURN LINE LPCI BRANCH TO FEEDWATER SYS. 56-4C C PUMP TEST           |
| MODE E-2       | 67-70-71 SHUTDOWN RETURN LINE TO UPPER CONTAINMENT POOL                              |
| MODE F         | 13-43-24 & 49-49.1-24 TEST LINES TO SUPPRESSION POOL                                 |
| MODE G         | 6-43 PUMP MINIMUM FLOW BYPASS LINE   |

NOTE: SYSTEM DATA PROVIDED IN THE ABOVE TABLE REFLECTS NORMAL DESIGN VALUES FOR SYSTEM MODES A-1, A-2, B-1, AND F, AND DOES NOT ACCOUNT FOR THE FOLLOWING:

- LPCI FLOW PATH IS SPLIT BETWEEN 1022F80A/B AND 1022F84A/B
- 1022F82A/B THROTTLING IN SP COOLING AND TESTING FLOWPATHS

TABLE 3 VALVE POSITION CHART SEE NOTE 11.26.20

|      |       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
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| MODE | VALVE | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 67 |
|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|



NOTES:

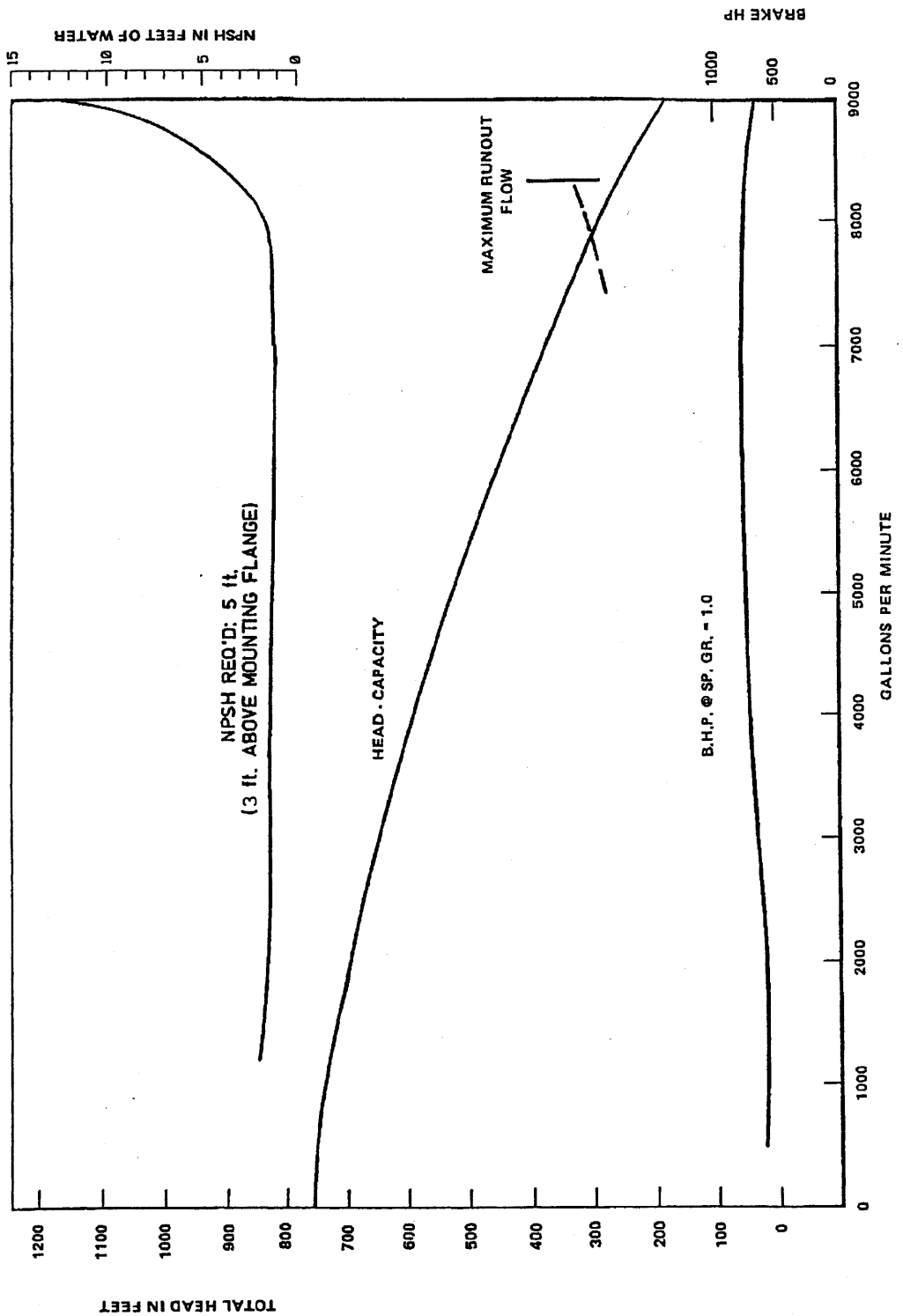
1. THE PIPING & COMPONENTS BETWEEN BLINDS D0505A/B & D0506A/B ARE INACTIVE & ARE REQUIRED ONLY FOR THE SEISMIC & STRUCTURAL INTEGRITY OF THE PIPING SYSTEM.
2. VALVES F082A/B HAVE BEEN DETERMINATED AT THE MCC COMPARTMENT. THEY ARE REQUIRED TO MAINTAIN THE SEISMIC & STRUCTURAL INTEGRITY OF THE PIPING SYSTEM & TO MAINTAIN A PRESSURE BOUNDARY.

(Rev. 13 12/03)

**PERRY NUCLEAR POWER PLANT**

Residual Heat Removal System

Figure 5.4-14 (Sheet 3 of 3)




NPSH REQ'D: 5 ft.  
(3 ft. ABOVE MOUNTING FLANGE)

HEAD - CAPACITY

MAXIMUM RUNOUT FLOW

B.H.P. @ SP. GR. = 1.0

(Rev. 12 1/03)

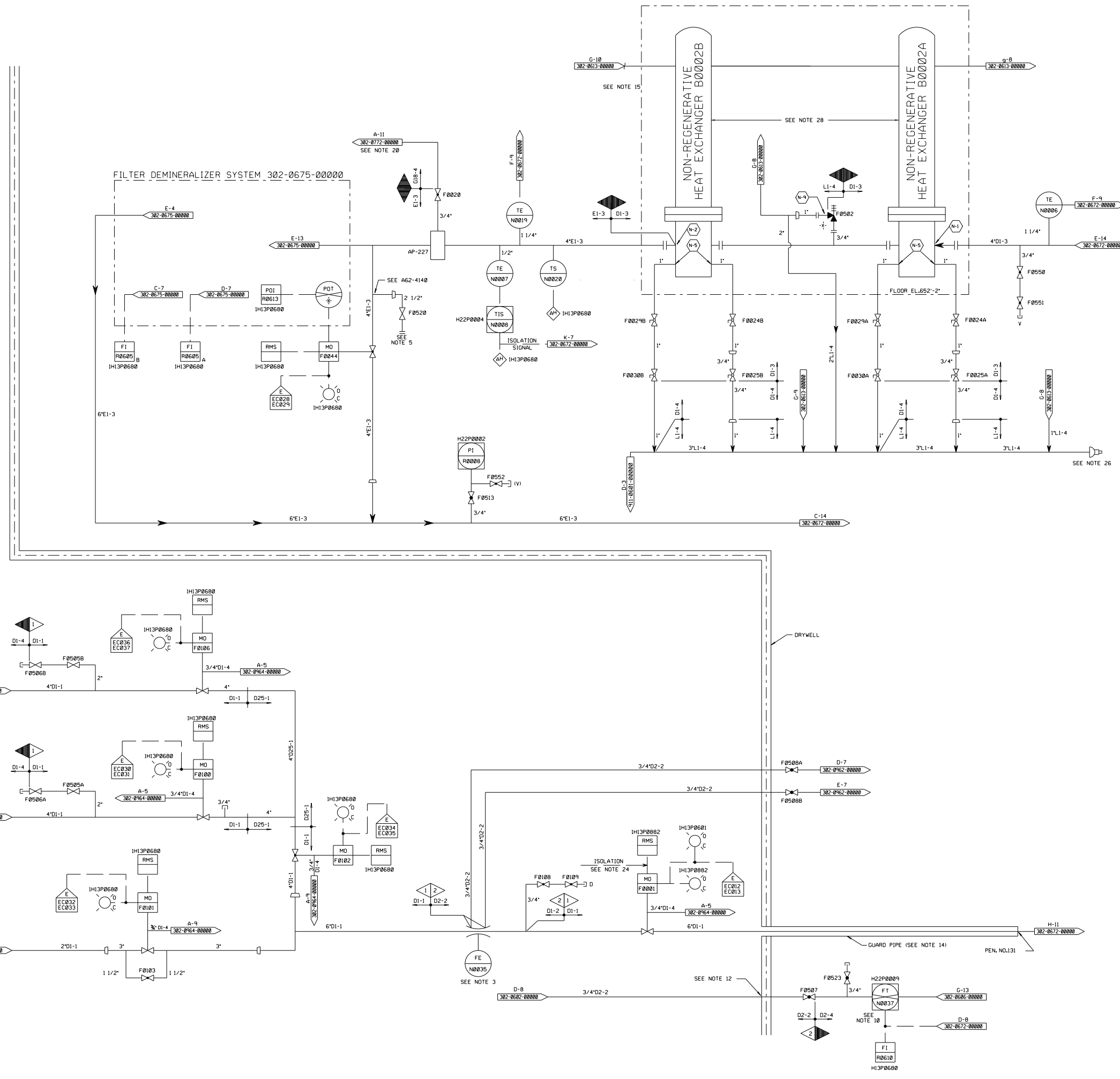


**PERRY NUCLEAR POWER PLANT**

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RHR Pump Characteristic Curve

Figure 5.4-15



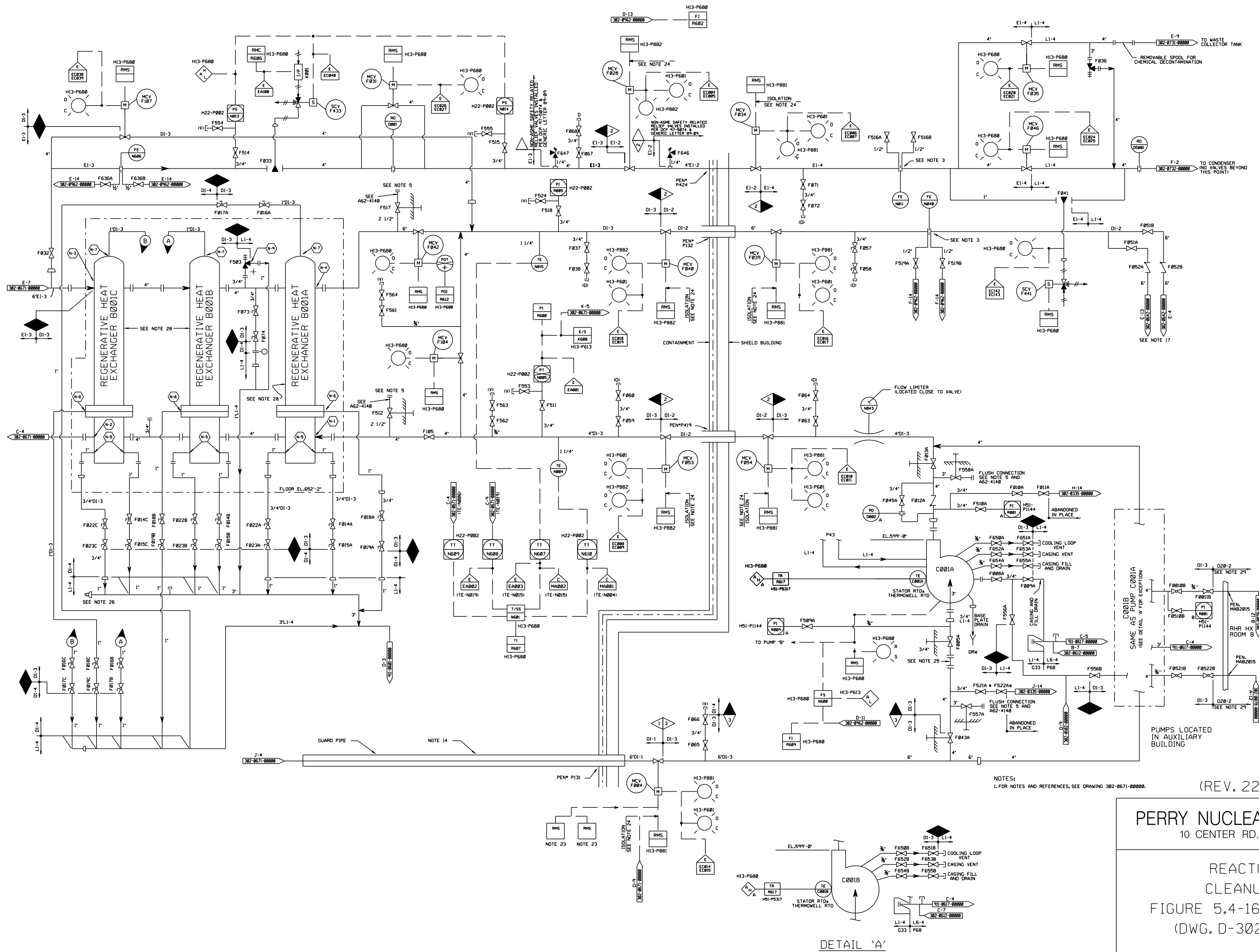
- NOTES:
- EXCEPT AT POINT OF CONNECTION WITH BURS SUPPLIED EQUIPMENT OR PIPING, THE PIPING DESIGNER SHALL SIZE PIPES IN CONFORMANCE WITH THE SYSTEM DESIGN SPECIFICATIONS AND PROCESS DIAGRAM.
  - DELETED.
  - MOUNT FLOW ELEMENT AS CLOSE TO ISOLATION VALVE AS PRACTICAL. LOCATION TO BE IN ACCORDANCE WITH ASME PTC 19.5.
  - ALL SMALL AUXILIARY PIPING CONTAINING PRIMARY FLUID SHALL BE SAME PIPE CLASS AS MAIN PIPING, EXCEPT IF MAIN PIPING IS CLASS 1 AND AUXILIARY PIPING IS 3/4" OR LESS, THEN CLASS 2 PIPING MAY BE USED. SEE A62-4030.
  - CHEMICAL CLEANING AND DECONTAMINATION CONNECTIONS SHALL BE PROVIDED TO GIVE OPTIMUM DECONTAMINATION. CONNECTIONS SHALL BE ARRANGED TO PROVIDE DECONTAMINATION OF THE FOLLOWING EQUIPMENT SEPARATELY FROM EACH OTHER.
    - PUMPS.
    - HEAT EXCHANGERS - THE TUBE SIDE OF BOTH EXCHANGERS MAY BE CLEANED SEPARATELY FROM THE SHELL SIDE OF THE REGENERATIVE HEAT EXCHANGER OR TOGETHER.
    - FILTER DEMINERALIZERS.
    - PRESSURE TAP CONNECTIONS TO BE PROVIDED AT HEAT EXCHANGER INLET AND OUTLET FOR DETERMINING ΔP ACROSS HEAT EXCHANGER DURING START-UP.
  - INSTRUMENT LINE VALVING MUST COMPLY WITH INSTRUMENT PIPING SPECIFICATION. SEE A62-4070.
  - ALL EQUIPMENT AND INSTRUMENTS ARE PREFIXED BY THE SYSTEM NUMBER G33, UNLESS OTHERWISE NOTED.
  - TEMPORARY STRAINER SCREENS SHALL BE PROVIDED ON THE SUCTION SIDE OF ALL PUMPS IN ACCORDANCE WITH A62-4140.
  - ALL LOCATION AND IDENTIFICATION OF INSTRUMENTS, SEE INSTRUMENT DATA SHEET.
  - LOCATE TAPS FOR N0037 SUCH THAT:
    - FULL RANGE IS NOT EXCEEDED PER INSTRUMENT DATA SHEET.
    - ELEVATION SHOULD BE WITHIN 30 INCHES BELOW VESSEL Ø.
  - ALL MOTOR OPERATED VALVES ARE AC OPERATED, UNLESS OTHERWISE SPECIFIED.
  - PROVISION FOR INSTRUMENT LINE ISOLATION BY CUSTOMER, THIS SHALL INCLUDE A 1/4" ORIFICE INSIDE THE DRYWELL. LINE SPECIFICATION CHANGE SHALL COMPLY WITH A62-4030.
  - VENTS AND DRAINS SHALL BE PROVIDED AT ALL HIGH AND LOW POINTS OF THE SYSTEM PIPING. DOUBLE VALVING IS REQUIRED.
  - GUARD PIPES TO BE QUALITY GR-B.
  - TO AVOID EXCESSIVE HEAT EXCHANGE TUBE VIBRATION, A FLOW METERING DEVICE SHALL BE PROVIDED SO THAT THE COOLING WATER FLOW VALUES SHALL NOT EXCEED THE VALUES SHOWN ON THE PROCESS DATA G33-1030 BY MORE THAN 5%.
  - DRAIN CONNECTION FROM HIGH PRESSURE SOURCE SHALL BE DESIGNED TO ASME SECTION III CODE, PARAGRAPH N0361.4.
  - DESIGN PRESSURE AND TEMPERATURE TO BE ESTABLISHED BY PIPING DESIGNER BASED ON FEED PUMP SHUTOFF PRESSURE AND SYSTEM ARRANGEMENT.
  - THIS DRAWING WAS ADAPTED FROM GE DWG. NUMBER 945E614 SHEET 1, REVISION Ø.
  - ITEMS MARKED 'X' ARE FURNISHED WITH ASSOCIATE EQUIPMENT.
  - CONDUCTIVITY INSTRUMENTS WITH G33 MPL NUMBERS ARE SHOWN ON THE REACTOR PLANT SAMPLING SYSTEM (P35) DIAGRAM (302-0772-00000).
  - FOR CONTROL ROOM, LOCAL OR REMOTE PANEL AND RACK ID NUMBERS FOR INSTRUMENTS, SEE THE INSTRUMENT INDEX.
  - PORTIONS OF THE SYSTEM DESIGNATED WITH SAFETY CLASS 3 PIPE LINE SPECIFICATION (E.G. D1-3, E1-3) IN NON-SAFETY CLASS AREAS HAS IDENTIFIED BY FLAG SYMBOL. WILL BE DESIGNED IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS:
    - PIPING AND COMPONENTS ARE NON-SAFETY CLASS AND NON-SEISMIC CATEGORY 1.
    - PIPING AND COMPONENTS ARE DESIGNED, FABRICATED, INSPECTED, TESTED, AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF ASME B AND PV CODE, SECTION III, SUBSECTION N0, N1, AND N2.
    - PIPING SHALL BE INSTALLED BY SPECIFICATION 44.
    - DELETED.
  - PROVIDES CONTROL ROOM ISOLATION AND REMOTE SHUTDOWN CONTROL OF G33F0004 FOR APPENDIX R REMOTE SHUTDOWN METHOD A, SWITCHES LOCATED ON MOTOR CONTROL CENTER EF107.
  - FOR ISOLATION SIGNALS, SEE NS4 ELEMENTARY DIAGRAM 200-0013-00000.
  - TEMPORARY STRAINERS D0016A AND B, USED FOR START UP ONLY, ARE REMOVED FOR PLANT OPERATION.
  - THE 1" THREADED PLUGS ARE USED TO HELP DECONTAMINATE THE 3" HEADERS PRIOR TO PERFORMING WORK IN THE APPLICABLE AREAS. THEY ARE SIZED TO ALLOW HIGH PRESSURE FLUSHING OF THESE LINES.
  - OPERATION OF DOUBLE ISOLATION DRAIN VALVES (G33F0505A/B & G33F0506A/B) SHALL BE PERFORMED SO AS TO ASSURE THAT NO WATER IS TRAPPED IN THE PIPING BETWEEN THE DOUBLE ISOLATION VALVES.
  - RWCU REGENERATIVE / NON-REGENERATIVE HEAT EXCHANGERS AND THE ASSOCIATED INTERCONNECTING PIPING ARE VENDOR SUPPLIED, REF. GEK-90388.
  - PIPING, FITTING & COMPONENTS ARE DESIGNED, FABRICATED, INSPECTED & INSTALLED TO ASME B & PV CODE SECTION III, SUBSECTION N0. PIPING LINE DESIGNATED NON-SEISMIC, NON-SAFETY CLASS BUT ANALYZED FOR 2 OVER 1 REQUIREMENTS.

- REFERENCES:
- 302-0102-00000 CONDENSATE TRANSFER AND STORAGE SYSTEM, P11
  - 302-0335-00000 ZINC INJECTION PASSIVATION SYSTEM, P05
  - 302-0602-00000 REACTOR RECIRCULATION SYSTEM, B33
  - 302-0606-00000 NUCLEAR BOILER SYSTEM, B21
  - 302-0642-00000 RESIDUAL HEAT REMOVAL SYSTEM, E12
  - 302-0672-00000 REACTOR WATER CLEANUP SYSTEM, G33
  - 302-0675-00000 FILTER DEMINERALIZER SYSTEM, G36
  - 302-0731-00000 LIQUID RADWASTE SYSTEM, G50
  - 302-0732-00000 LIQUID RADWASTE SYSTEM, G50
  - 302-0772-00000 REACTOR PLANT SAMPLING SYSTEM, P35
  - 302-0962-00000 LEAK DETECTION SYSTEM, E31
  - 302-0964-00000 LEAK DETECTION SYSTEM, E31
  - 911-0601-00000 REACTOR BLDG. DRAINS SYSTEM, P68
  - 911-0617-00000 AUXILIARY BLDG. DRAINS SYSTEM, P68
  - A62-4030 PRESSURE INTEGRITY OF NUCLEAR COMPONENTS
  - A62-4070 PROCESS INSTRUMENTATION
  - A62-4140 CLEANING OF PIPING AND EQUIPMENT
  - A62-4240 WATER SAMPLING REQUIREMENTS
  - G33-1020 REACTOR WATER CLEANUP SYSTEM FCD
  - G33-1030 REACTOR WATER CLEANUP SYSTEM P.D.

(REV. 20 10/2017)

**PERRY NUCLEAR POWER PLANT**  
 10 CENTER RD., PERRY, OHIO 44081

**REACTOR WATER CLEANUP SYSTEM**  
 FIGURE 5.4-16 (SHEET 1 OF 2)  
 (DWG. D-302-0671-00000)



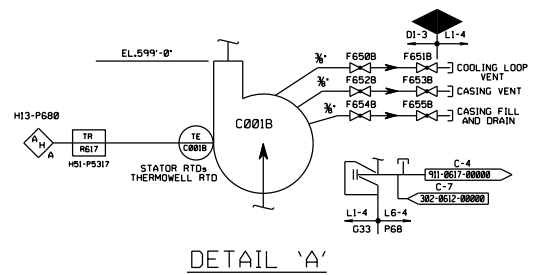
NOTES:  
1. FOR NOTES AND REFERENCES, SEE DRAWING 302-0671-00000.

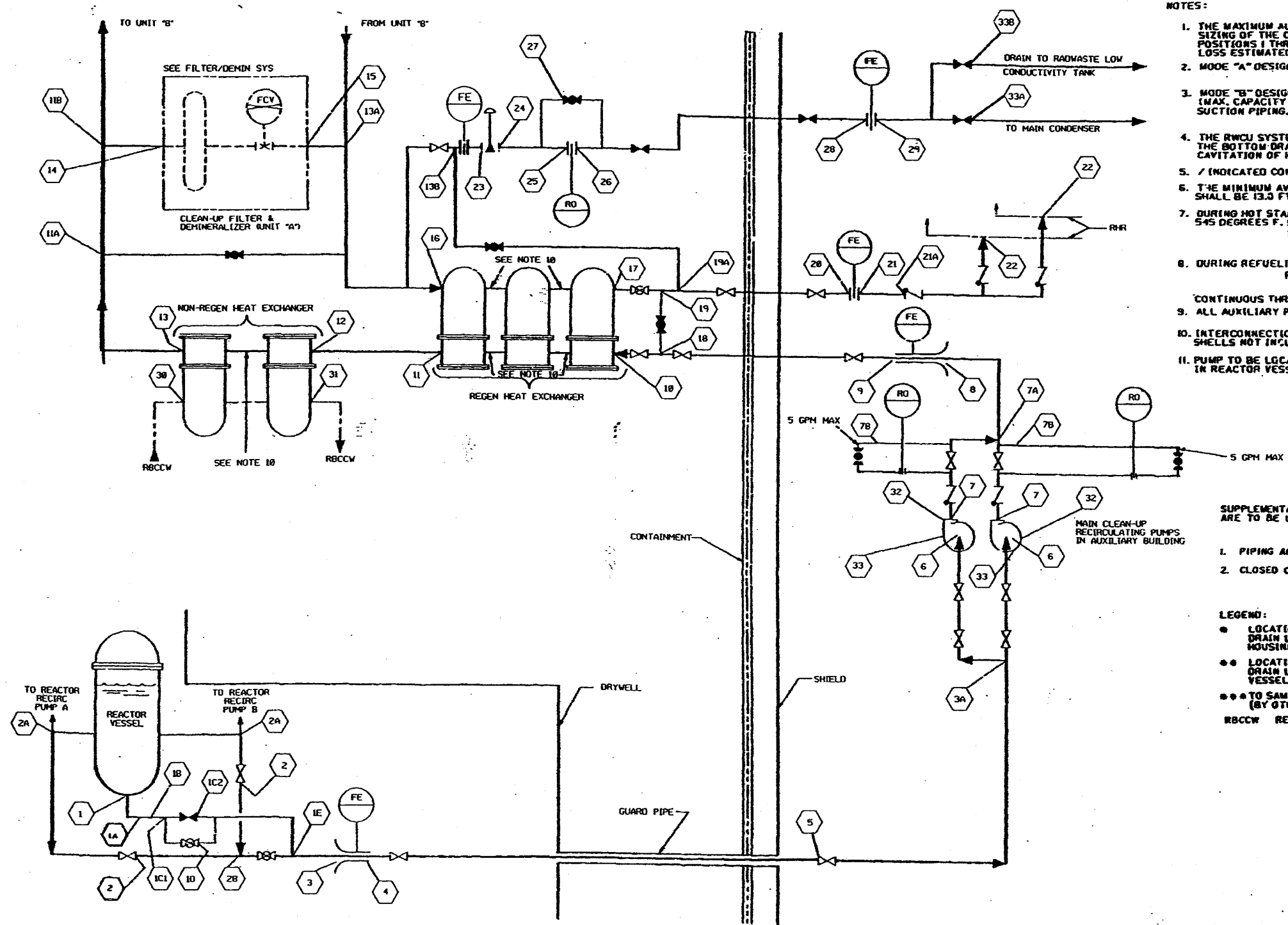
(REV. 22 10/2021)

**PERRY NUCLEAR POWER PLANT**  
 10 CENTER RD., PERRY, OHIO 44081

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**REACTOR WATER  
 CLEANUP SYSTEM**  
 FIGURE 5.4-16 (SHEET 2 OF 2)  
 (DWG. D-302-0672-00000)





NOTES:

1. THE MAXIMUM ALLOWABLE PIPE FRICTION DROP FOR THE SIZING OF THE CLEANUP RECIRCULATION PUMPS SUCTION PIPING FROM POSITIONS 1 THROUGH 4 SHALL BE CONTROLLED BY MODE "B". SUCTION LOSS ESTIMATED AT 12 PSI.
  2. MODE "A" DESIGN BASIS FOR HEAT EXCHANGERS.
  3. MODE "B" DESIGN BASIS FOR MAIN CLEANUP PUMP (MAX. CAPACITY AND MIN. NPSH) AND SIZING OF MAIN PUMPS SUCTION PIPING.
  4. THE RWCU SYSTEM SHALL NOT OPERATE IN MODE "B" UNLESS THE BOTTOM DRAIN TEMPERATURE IS SUBCOOLED TO PREVENT CAVITATION OF HEAT EXCHANGER BY-PASS VALVE.
  5. / INDICATED CONDITIONS FOR 0 FLOW RATE.
  6. THE MINIMUM AVAILABLE NPSH OF THE CLEANUP RECIRC. PUMP SHALL BE 13.5 FT. BASED ON CONDITION SHOWN IN MODE "B".
  7. DURING HOT STANDBY, WITH ONE CLEANUP PUMP IN OPERATION AT 545 DEGREES F. BLOWDOWN RATE IS APPROX. P1 - 107.0 GPM.
  8. DURING REFUELING WITH THE R.S.S. AT 15 PSIA FLOW RATE IS: P1 - 311 GPM.
- CONTINUOUS THROUGHOUT THE SYSTEM.
9. ALL AUXILIARY PIPING IS DESIGNED AT 150 DEGREES F.
  10. INTERCONNECTION PIPE FRICTION LOSS BETWEEN HEAT EXCHANGER SHELLS NOT INCLUDED. THIS IS ESTIMATED AT 5 PSI TOTAL.
  11. PUMP TO BE LOCATED AT 50 FT. (MIN.) BELOW WATER LEVEL 2 IN REACTOR VESSEL.

SUPPLEMENTAL DOCUMENTS UNDER THE FOLLOWING IDENTITIES ARE TO BE USED IN CONJUNCTION WITH THIS DRAWING:

- |                                  |                              |
|----------------------------------|------------------------------|
| 1. PIPING AND INSTRUMENT SYMBOLS | REFERENCE DESIGNATOR A42-010 |
| 2. CLOSED COOLING WATER          | A62-4250                     |

LEGEND:

- LOCATION 1A IS THE POINT WHERE THE BOTTOM DRAIN LINE CONNECTION EXITS FROM THE C.R.D. HOUSING AREA.
  - LOCATION 1B IS THE POINT WHERE THE BOTTOM DRAIN LINE CONNECTION EXITS FROM THE REACTOR VESSEL PEDESTAL.
  - TO SAME CONDITIONS AS THE FEEDWATER PIPING (BY OTHERS).
- RCCW REACTOR BUILDING CLOSED COOLING WATER.

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**PERRY NUCLEAR POWER PLANT**

Reactor Water Cleanup System

Figure 5.4-17 (Sheet 1 of 2)

MODE A NORMAL OPERATION (SEE NOTE 2, SH II)

| LOCATION                                       | 1   | 2   | 3   | 4   | 5   | 6      | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18 | 19 | 20 | 21  | 22  | 23  | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |  |  |
|--|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| FLOW GPM                                       | E3  | 172 | 408 | 408 | 408 | 204    | 204 | 408 | 408 | 408 | 324 | 324 | 317 | 156 | 156 | 311 | 369 |    |    |    | 369 | 369 | 185 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| TEMP °F  | 533 | 533 | 533 | 533 | 533 | 533    | 534 | 534 | 534 | 534 | 233 | 233 | 120 | 80  | 120 | 120 | 437 |    |    |    | 437 | 437 | 437 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| MAX PRESSURE DROP                              | PI  |     | 1.5 |     |     | 185 TD | 2.5 |     |     | 10  | 10  |     |     | 64  | 10  |     |     |    |    |    | 4   |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| ALLOWABLE PIPE FRICTION DROPS (NOTE 1 SHT. II) |     |     |     |     |     |        |     |     |     |     |     |     |     |     |     |     |     |    |    |    |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
| PSID   | 40  |     |     |     |     |        |     |     |     |     |     |     |     |     |     |     |     |    |    |    |     |     |     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |

MODE B HGT SHUTDOWN OPERATION (WITH LOSS OF RPV RECIRC PUMPS) (R.S.S. 360 PSIA)

| LOCATION                                       | 1       | 2   | 3   | 4   | 5   | 6   | 7      | 8   | 9   | 10  | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20  | 21  | 22  | 23  | 24  | 25 | 26 | 27 | 28 | 29 | 30 | 31 |  |  |  |  |  |  |  |  |  |
|--|---------|-----|-----|-----|-----|-----|--------|-----|-----|-----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|--|--|--|--|--|--|--|--|--|
| FLOW GPM                                       | PI      | 138 | 114 | 368 | 368 | 368 | 185    | 185 | 368 | 368 |    |    |    |    |    |    |    |    |    | 368 | 368 | 368 | 368 | 185 |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |
| TEMP °F  | PI      | 430 | 435 | 435 | 433 | 433 | 433    | 434 | 434 | 434 |    |    |    |    |    |    |    |    |    | 434 | 434 | 434 | 434 | 434 |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |
| MAX PRESSURE DROP                              | PI      |     |     | 1.5 |     |     | 177 TD | 2.5 |     |     |    |    |    |    |    |    |    |    |    | 146 | 4   |     |     |     |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |
| ALLOWABLE PIPE FRICTION DROPS (NOTE 1 SHT. II) |         |     |     |     |     |     |        |     |     |     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |
| PSID   | DELTA P |     |     |     |     |     |        |     |     |     |    |    |    |    |    |    |    |    |    |     |     |     |     |     |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |

DESIGN PRESSURE & TEMPERATURE GIVEN BELOW IS FOR INFORMATION ONLY AND IS THE BASIS FOR PIPING DESIGN. ESTIMATED LINE SIZES ARE FOR INFORMATION ONLY. ACTUAL LINE SIZES AS DETERMINED BY THE PIPING DESIGNER SHALL MEET THE PROCESS DATA HYDRAULIC REQUIREMENTS.

| LOCATION                 | RAET | 1A   | 1A-1B | 1B-1C1 | 1C1-1D | 1C1-1C2 | 1C2-1E | 2A-2B | 2B-2A | 2A-6 | 7-7A | 7A-10 | 7B   | 11-12 | 12-11B | 11A-12B | 11B-13A | 13A-1E | 131-19A | 13B-33A | 18-19 | 29-33B | 17-21A | 21A-22 |
|--------------------------|------|------|-------|--------|--------|---------|--------|-------|-------|------|------|-------|------|-------|--------|---------|---------|--------|---------|---------|-------|--------|--------|--------|
| DESIGN PRESS (PSIG)      | PI   | 1275 | 1275  | 1275   | 1275   | 1275    | 1275   | 1250  | 1250  | 1250 | 1410 | 1410  | 1410 | 1410  | 1410   | 1410    | 1410    | 1410   | 1410    | 1410    | 1410  | 1410   | 1410   | 1410   |
| DESIGN TEMP (°F)         | PI   | 575  | 575   | 575    | 575    | 575     | 575    | 575   | 575   | 575  | 575  | 575   | 575  | 575   | 575    | 575     | 575     | 575    | 575     | 575     | 575   | 575    | 575    | 575    |
| ESTIMATED LINE SIZE (IN) | PI   | 2.0  | 3.0   | 2.0    | 1.5    | 3.0     | 3.0    | 4.0   | 6.0   | 4.0  | 4.0  | 4.0   | 3/4" | 4.0   | 4.0    | 4.0     | 4.0     | 4.0    | 4.0     | 4.0     | 4.0   | 4.0    | 4.0    | 6.0    |

(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

Reactor Water Cleanup System

Figure 5.4-17 (Sheet 2 of 2)



FD AREA = 97 FT<sup>2</sup>

| TYPE REQUIREMENT | STATION SERVICES |             |                |              |         |         |             |                      |           |                 | PROCESS PIPING SIZING      |                          |                    |                     |                    |                            |                 |              |                       |                   |                    |             |                    |               |         |
|------------------|------------------|-------------|----------------|--------------|---------|---------|-------------|----------------------|-----------|-----------------|----------------------------|--------------------------|--------------------|---------------------|--------------------|----------------------------|-----------------|--------------|-----------------------|-------------------|--------------------|-------------|--------------------|---------------|---------|
|                  | CONDENSATE       |             |                |              |         |         | SERVICE AIR | EXHAUST AIR HANDLING |           | REACTOR WATER   | REACTOR WATER & F/D SOLIDS | CNDS & SOLKA FLOC SLURRY | CNDS               | CNDS & RESIN SLURRY | CONC. RESIN SLURRY | REACTOR WATER & F/D SOLIDS | CNDS            | CNDS         | REACTOR WATER OR CNDS | CNDS & F/D SOLIDS | CNDS               | WATER SPRAY | WATER & F/D SOLIDS | RAD AIR       |         |
| COMMODITY        | ①                | ②           | ③              | ④            | ⑤       | ⑥       | ⑥A          | ⑦                    | ⑧         | ⑧A              | ⑨                          | ⑩                        | ⑪                  | ⑫                   | ⑬                  | ⑭                          | ⑮               | ⑯            | ⑰                     | ⑱                 | ⑲                  | ⑳           | ㉑                  | ㉒             | ㉓       |
| PROCESS STEP     | NORMAL OPER      | NORMAL OPER | PRECOAT SLURRY | RESIN SLURRY | RINSE   | FILL    | FINAL FILL  | AIR PRESS            | FILL VENT | FINAL FILL VENT | DOPE DRAIN                 | FIRST AIR BUMP           | SOLKA FLOC PRECOAT | PRECOAT RETURN      | RESIN PRECOAT      | RESIN PUMP                 | SECOND AIR BUMP | HOLD PRECOAT | PRECOAT RETURN        | HOLD              | MAIN DRAIN (BKWSH) | HOLD RETURN | WATER SPRAY        | WATER SPARGER | VENT    |
| PRESSURE PSIG    | 80               | 80          | 80             | 80           | 80      | 80      | 80          | 80                   | 3         | 3               | 80                         | 0-80                     | 40                 | 40                  | 40                 | —                          | 0-80            | 40           | 40                    | 60 TO 80          | 0-80               | 40          | 80                 | 35            | ATMOSP  |
| TEMP OF          | 80               | 80          | 80             | 80           | 80      | 80      | 80          | 60                   | 60        | 60              | 120                        | 120                      | 80                 | 80                  | 80                 | 80                         | 80              | 80           | 80                    | 80 TO 120         | 0-80               | 40          | 80                 | 120           | 60      |
| FLOW RATE        | 40 GPM           | 25 GPM      | 280 GPM        | 280 GPM      | 280 GPM | 280 GPM | 50 SCFM     | 37 SCFM              | 37 SCFM   | 60 GPM          | 5000 GPM PEAK              | 95 GPM                   | 95 GPM             | 150 GPM             | 1 GPM              | 5000 GPM PEAK              | 100 GPM         | 150 GPM      | 50 GPM                | 280 GPM           | 100 GPM            | 100 GPM     | 140 GPM            | 102 SCFM MAX. |         |
| FLOW TIME, MIN.  | —                | —           | 1.5            | 1            | 0.5     | 1.5     | 2           | 3                    | 1.5       | 2               | 3                          | 0.5                      | 10                 | 10                  | 30                 | 30                         | 0.5             | 5            | 30                    | —                 | 0.5                | 5           | 3                  | 5             | —       |
| TOTAL FLOW       | —                | —           | 60 GAL         | 30 GAL       | 150 GAL | 375 GAL | 550 GAL     | 150 SCF              | 50 SCF    | 73 SCF          | 175 GAL                    | 375 GAL                  | —                  | —                   | —                  | 30 GAL                     | 375 GAL         | —            | —                     | —                 | 150 GAL            | —           | 300 GAL            | —             | 600 SCF |
| TOTAL LBS SOLIDS | —                | —           | 20             | 20           | —       | —       | —           | —                    | —         | —               | —                          | 20                       | 20                 | —                   | —                  | 20                         | 20              | RESIDUAL     | —                     | —                 | RESIDUAL           | —           | —                  | —             | —       |

\* - SEE NOTE 2

FD AREA = 130 FT<sup>2</sup>

| TYPE REQUIREMENT | STATION SERVICES |             |                |              |         |         |             |                      |           |                 | PROCESS PIPING SIZING      |                          |                    |                     |                    |                            |                 |              |                       |                   |                    |             |                    |               |         |
|------------------|------------------|-------------|----------------|--------------|---------|---------|-------------|----------------------|-----------|-----------------|----------------------------|--------------------------|--------------------|---------------------|--------------------|----------------------------|-----------------|--------------|-----------------------|-------------------|--------------------|-------------|--------------------|---------------|---------|
|                  | CONDENSATE       |             |                |              |         |         | SERVICE AIR | EXHAUST AIR HANDLING |           | REACTOR WATER   | REACTOR WATER & F/D SOLIDS | CNDS & SOLKA FLOC SLURRY | CNDS               | CNDS & RESIN SLURRY | CONC. RESIN SLURRY | REACTOR WATER & F/D SOLIDS | CNDS            | CNDS         | REACTOR WATER OR CNDS | CNDS & F/D SOLIDS | CNDS               | WATER SPRAY | WATER & F/D SOLIDS | RAD AIR       |         |
| COMMODITY        | ①                | ②           | ③              | ④            | ⑤       | ⑥       | ⑥A          | ⑦                    | ⑧         | ⑧A              | ⑨                          | ⑩                        | ⑪                  | ⑫                   | ⑬                  | ⑭                          | ⑮               | ⑯            | ⑰                     | ⑱                 | ⑲                  | ⑳           | ㉑                  | ㉒             | ㉓       |
| PROCESS STEP     | NORMAL OPER      | NORMAL OPER | PRECOAT SLURRY | RESIN SLURRY | RINSE   | FILL    | FINAL FILL  | AIR PRESS            | FILL VENT | FINAL FILL VENT | DOPE DRAIN                 | FIRST AIR BUMP           | SOLKA FLOC PRECOAT | PRECOAT RETURN      | RESIN PRECOAT      | RESIN PUMP                 | SECOND AIR BUMP | HOLD PRECOAT | PRECOAT RETURN        | HOLD              | MAIN DRAIN (BKWSH) | HOLD RETURN | WATER SPRAY        | WATER SPARGER | VENT    |
| PRESSURE PSIG    | 80               | 80          | 80             | 80           | 80      | 80      | 80          | 80                   | 3         | 3               | 80                         | 0-80                     | 40                 | 40                  | 40                 | —                          | 0-80            | 40           | 40                    | 60 TO 80          | 0-80               | 40          | 80                 | 35            | ATMOSP  |
| TEMP OF          | 80               | 80          | 80             | 80           | 80      | 80      | 80          | 60                   | 60        | 60              | 120                        | 120                      | 80                 | 80                  | 80                 | 80                         | 80              | 80           | 80                    | 80 TO 120         | 0-80               | 40          | 80                 | 120           | 60      |
| FLOW RATE        | 40 GPM           | 25 GPM      | 400 GPM        | 400 GPM      | 400 GPM | 400 GPM | 50 SCFM     | 52 SCFM              | 52 SCFM   | 60 GPM          | 5000 GPM PEAK              | 130 GPM                  | 130 GPM            | 200 GPM             | 1.5 GPM            | 5000 GPM PEAK              | 130 GPM         | 100 GPM      | 65 GPM                | 400 GPM           | 130 GPM            | 100 GPM     | 140 GPM            | 102 SCFM MAX. |         |
| FLOW TIME, MIN.  | —                | —           | 2.5            | 2            | 0.5     | 1       | 1.4         | 3                    | 1         | 1.4             | —                          | 0.5                      | 10                 | 10                  | 30                 | 30                         | 0.5             | 5            | 30                    | —                 | 0.5                | 5           | 3                  | 5             | —       |
| TOTAL FLOW       | —                | —           | 95 GAL         | 45 GAL       | 200 GAL | 375 GAL | 550 GAL     | 150 SCF              | 50 SCF    | 73 SCF          | 175 GAL                    | 375 GAL                  | —                  | —                   | —                  | 45 GAL                     | 375 GAL         | —            | —                     | —                 | 200 GAL            | —           | 300 GAL            | —             | 600 SCF |
| TOTAL LBS SOLIDS | —                | —           | 26             | 26           | —       | —       | —           | —                    | —         | —               | —                          | 60                       | 26                 | —                   | —                  | 26                         | 26              | RESIDUAL     | —                     | —                 | RESIDUAL           | —           | —                  | —             | —       |

FILTER DEMINERALIZER BACKWASH & PRECOATING SEQUENCE - SEE NOTE 3

- FUNCTIONS:
- SERVICE: ① ②
  - ISOLATE & HOLD: ⑧
  - DEPRESSURIZE: ⑨
  - DOPE DRAIN: ⑨ ⑦
  - AIR PRESSURIZE: ⑦
  - FIRST AIR BUMP & DRAIN: ⑩ ⑦
  - FILL & VENT: ⑥ ⑤

- AIR PRESSURIZE: ⑦
- SECOND AIR BUMP & DRAIN: ⑮ ⑦
- RINSE & DRAIN: ⑤ ⑮
- FINAL FILL & VENT: ⑥A ⑧A
- SOLKA FLOC PRECOAT: ⑪ ⑫
- RESIN PRECOAT: ⑬ ⑭ ⑰

- HOLD PRECOAT: ⑮ ⑳
- HOLD UNTIL RETURN TO SERVICE: ⑮
- SERVICE: ① ②

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

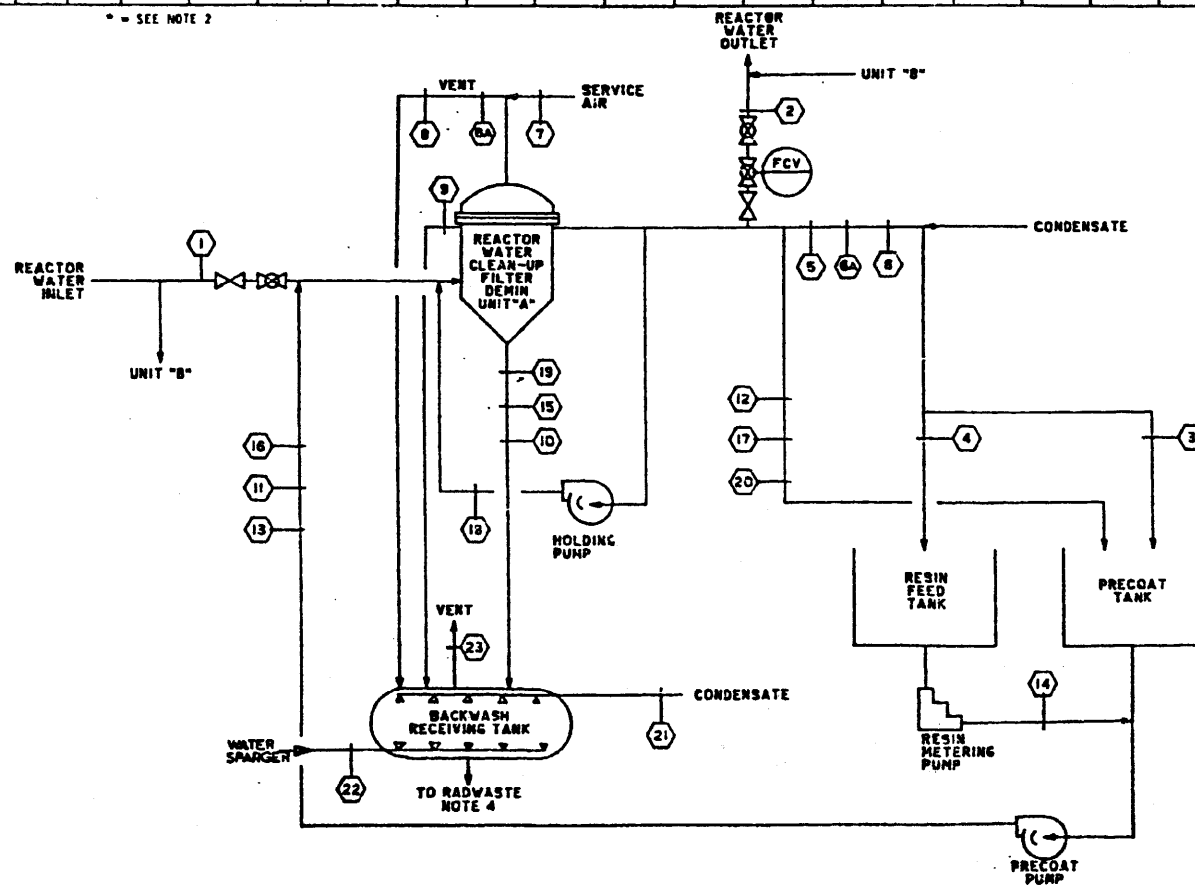
Filter/Demineralizer System,  
Reactor Water Cleanup System

Figure 5.4-18 (Sheet 1 of 2)

TABLE III

| TYPE REQUIREMENT  | STATION SERVICES |              |                |              |         |         |             |                 |           |                 |               | PROCESS PIPING SIZING      |                          |                |                     |                   |                            |              |                |                       |                   |             |             |                    |              |
|-------------------|------------------|--------------|----------------|--------------|---------|---------|-------------|-----------------|-----------|-----------------|---------------|----------------------------|--------------------------|----------------|---------------------|-------------------|----------------------------|--------------|----------------|-----------------------|-------------------|-------------|-------------|--------------------|--------------|
|                   | CONDENSATE       |              |                |              |         |         | SERVICE AIR | RADIOACTIVE AIR |           |                 | REACTOR WATER | REACTOR WATER & F/D SOLIDS | COND & SOLKA FLOC SLURRY | COND           | COND & RESIN SLURRY | COND RESIN SLURRY | REACTOR WATER & F/D SOLIDS | COND         | COND           | REACTOR WATER OR COND | COND & F/D SOLIDS | COND        | WATER SPRAY | WATER & F/D SOLIDS | RAD AIR      |
| POSITION          | ①                | ②            | ③              | ④            | ⑤       | ⑥       | ⑦           | ⑧               | ⑨         | ⑩               | ⑪             | ⑫                          | ⑬                        | ⑭              | ⑮                   | ⑯                 | ⑰                          | ⑱            | ⑲              | ⑳                     | ㉑                 | ㉒           | ㉓           |                    |              |
| PROCESS STEP      | NORMAL ORDER     | NORMAL ORDER | PRECOAT SLURRY | RESIN SLURRY | RINSE   | FILL    | FINAL FILL  | AIR PRESS       | FILL VENT | FINAL FILL VENT | DOSE DRYTR    | FIRST AIR BUMP             | SOLKA FLOC PRECOAT       | PRECOAT RETURN | RESIN PRECOAT       | RESIN PUMP        | SECOND AIR BUMP            | HOLD PRECOAT | PRECOAT RETURN | HOLD                  | MAIN DRAIN (BWSH) | HOLD RETURN | WATER SPRAY | WATER SPARGER      | VENT         |
| PRESSURE PSIG     | —                | —            | 80             | 80           | 80      | 80      | 80          | 80              | 3         | 3               | 80            | 0-80                       | 40                       | 40             | 40                  | —                 | 0-80                       | 40           | 40             | 60 TO 120             | 0-80              | 40          | 80          | 35                 | ATMOSP       |
| TEMP F            | —                | —            | 80             | 80           | 80      | 80      | 80          | 60              | 60        | 60              | 120           | 120                        | 80                       | 80             | 80                  | 80                | 80                         | 80           | 80             | 80                    | 80                | 80          | 80          | 120                | 60           |
| FLOW RATE         | —                | —            | 40 GPM         | 25 GPM       | 560 GPM | 560 GPM | 560 GPM     | 50 SCFM         | 73 SCFM   | 73 SCFM         | 60 GPM        | 5000 GPM PEAK              | 170 GPM                  | 170 GPM        | 250 GPM             | 2 GPM             | 5000 GPM PEAK              | 175 GPM      | 250 GPM        | 85 GPM                | 560 GPM           | 175 GPM     | 100 GPM     | 140 GPM            | 102 SCFM MAX |
| FLOW TIME, MIN.   | —                | —            | 4.3            | 2.5          | 0.5     | 0.7     | 1.0         | 3               | 0.7       | 1.0             | 3             | 0.5                        | 10                       | 10             | 30                  | 30                | 0.5                        | 5            | 30             | —                     | 0.5               | 5           | 3           | 5                  | 10           |
| TOTAL FLOW        | —                | —            | 150 GAL        | 60 GAL       | 260 GAL | 375 GAL | 550 GAL     | 150 SCF         | 50 SCF    | 73 SCF          | 175 GAL       | 375 GAL                    | —                        | —              | —                   | 60 GAL            | 375 GAL                    | —            | —              | —                     | 260 GAL           | —           | 300 GAL     | —                  | 600 SCF      |
| TOTAL LBS. SOLIDS | —                | —            | 34             | 34           | —       | —       | —           | —               | —         | —               | —             | 74                         | 34                       | —              | 34                  | 34                | RESIDUAL                   | —            | —              | —                     | RESIDUAL          | —           | —           | —                  | —            |

\* - SEE NOTE 2



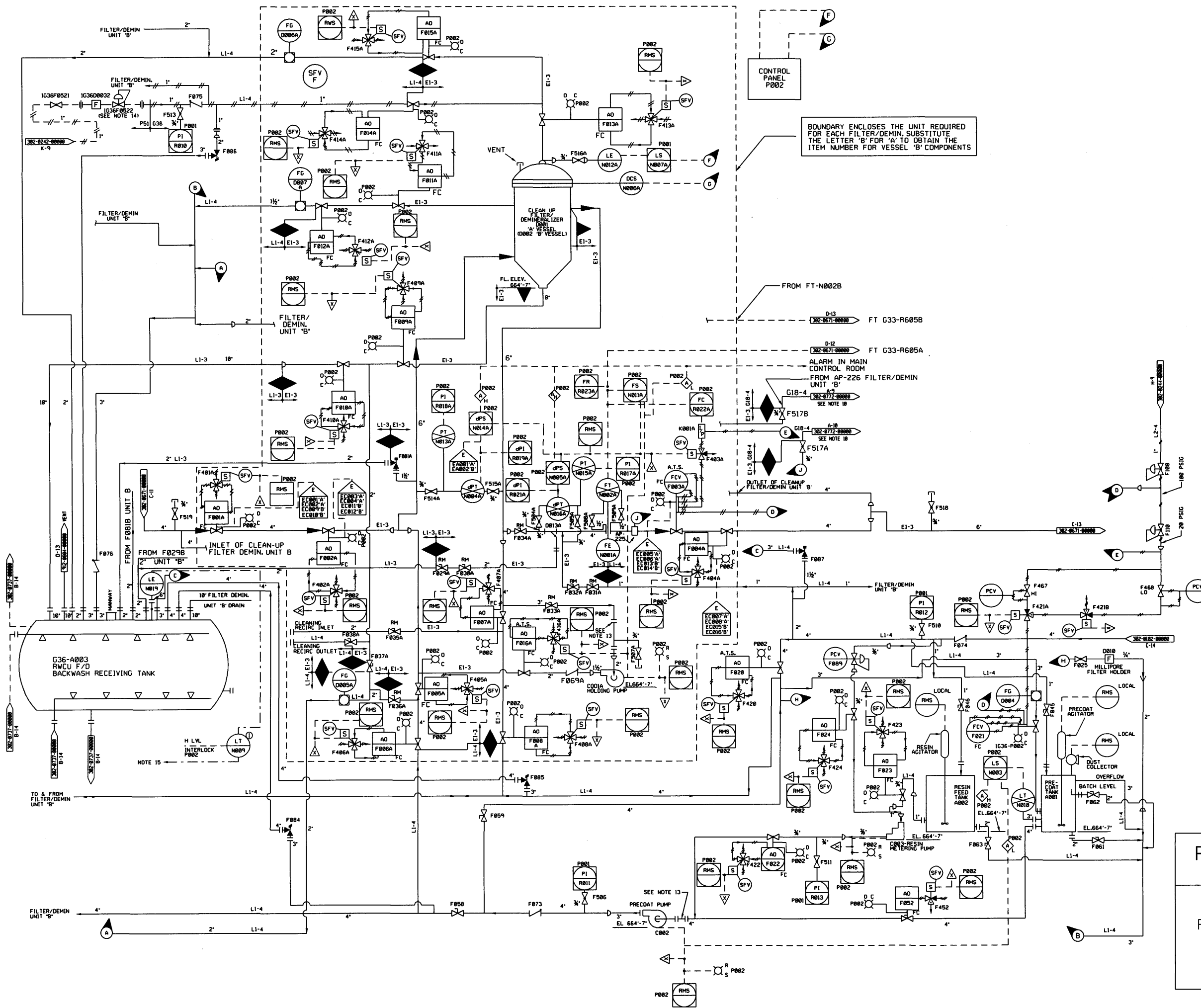
- NOTES:**
1. FOR THESE VALUES & REMAINDER OF SYSTEM VALUES, SEE REACTOR WATER CLEAN-UP SYSTEM PROCESS DATA.
  2. DRY WEIGHT VALUES FOR RESIN, AS SHIPPED RESINS CONTAIN 50% MOISTURE (APPROXIMATE).
  3. NORMAL BACKWASH - PRECOAT FREQUENCY IS EACH VESSEL EVERY 8-14 DAYS.
  4. BACK WASH RECEIVING TANK IS PUMPED DOWN EVERY 6-28 DAYS, DEPENDING UPON CYCLE TIME TO RADWASTE.

(Rev. 12 1/03)

**PERRY NUCLEAR POWER PLANT**

Filter/Demineralizer System,  
Reactor Water Cleanup System

Figure 5.4-18 (Sheet 2 of 2)



BOUNDARY ENCLOSES THE UNIT REQUIRED FOR EACH FILTER/DEMIN. SUBSTITUTE THE LETTER 'B' FOR 'A' TO OBTAIN THE ITEM NUMBER FOR VESSEL 'B' COMPONENTS

- NOTES:
- ALL PIPING AND FITTINGS SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH A62-4838.
  - AIR OPERATED VALVES ARE SHOWN IN FILTERING PROCESS STATUS AND ARE FAIL CLOSE ON LOSS OF AIR PRESSURE TO VALVE OPERATOR OR LOSS OF ELECTRICAL POWER TO VALVE.
  - ALL REMOTE INSTRUMENTS AND CONTROLS WITHIN THE BOUNDARY SHALL BE ARRANGED ON INSTRUMENT PANEL P001 AND CONTROL PANEL P002 IN GROUPS FOR EACH FILTER/DEMINERALIZER UNIT.
  - ALL INDICATING LIGHTS SHALL BE MOUNTED ON CONTROL PANEL P002.
  - SYMBOLS AND ABBREVIATIONS:
    - A.T.S. : ADJUSTABLE TRAVEL STOP
    - ▽ : AUTOMATICALLY SEQUENCED CONTROL WITH REMOTE MANUAL CONTROL IN THE SHUTDOWN MODE.
    - R : RANING
    - LE : LEVEL ELEMENT
    - S : STOP
    - DCS : DOME CLOSURE INTERLOCK SWITCH
    - SFV : FOUR-WAY SOLENOID VALVES
  - INSTALL ALL AIR OPERATED VALVES WITH THE FLOW OVER THE SEAT, UNLESS OTHERWISE NOTED. INSTALL VALVES F001, F002, F003, F005, F007, F014, F020 AND F023 WITH FLOW UNDER THE SEAT.
  - ALL MPL NUMBERS ARE PREFIXED BY G36, UNLESS OTHERWISE NOTED.
  - FLUSHING CONNECTIONS SHALL BE PROVIDED IN ACCORDANCE WITH A62-4148. TEMPORARY STRAINER SCREENS SHALL BE PROVIDED ON SUCTION SIDE OF ALL PUMPS IN ACCORDANCE WITH A62-4148.
  - THIS SYSTEM DIAGRAM IS A PHOTOGRAPHIC REPRODUCTION OF G.E. DRAWING 762E409, RENUMBERED 79E709 SPECIFICATION REVISION IS SHOWN BENEATH GAI TITLE BLOCK.
  - CONDUCTIVITY INSTRUMENTS WITH 0-35 ASSET NUMBERS ARE SHOWN ON THE REACTOR PLANT SAMPLING SYSTEM (P-35) DIAGRAM.
  - FOR CONTROL ROOM LOCAL OR REMOTE PANEL AND RACK ID NUMBERS FOR INSTRUMENTS, SEE THE INSTRUMENT INDEX.
  - PORTIONS OF THE SYSTEM DESIGNATED WITH SAFETY CLASS 3 PIPE LINE SPECIFICATION (E.G. DI-3, EI-3) IN NON-SAFETY CLASS DESIGNATED AREAS (AS IDENTIFIED BY FLAG SYMBOL) WILL BE DESIGNED IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS:
    - A. PIPING AND COMPONENTS ARE NON-SAFETY CLASS AND NON-SEISMIC CATEGORY.
    - B. PIPING AND COMPONENTS ARE DESIGNED, FABRICATED, INSPECTED, TESTED, AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF ASME B AND PV CODE, SECTION III, SUBSECTIONS NA AND NP.
    - C. PIPING SHALL BE INSTALLED BY SPECIFICATION 44.
  - TEMPORARY STRAINERS D030, D031A, AND D031B USED FOR START-UP ONLY, ARE REMOVED FOR PLANT OPERATION.
  - FILTER D0032 AND REGULATOR F0522 ARE NON-STANDARD LI-4 PIPING MATERIALS.
  - INPUT TO THE LIQUID RADWASTE DISTRIBUTED CONTROL SYSTEM.

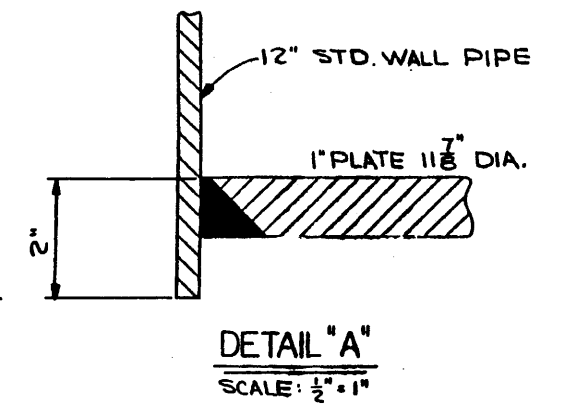
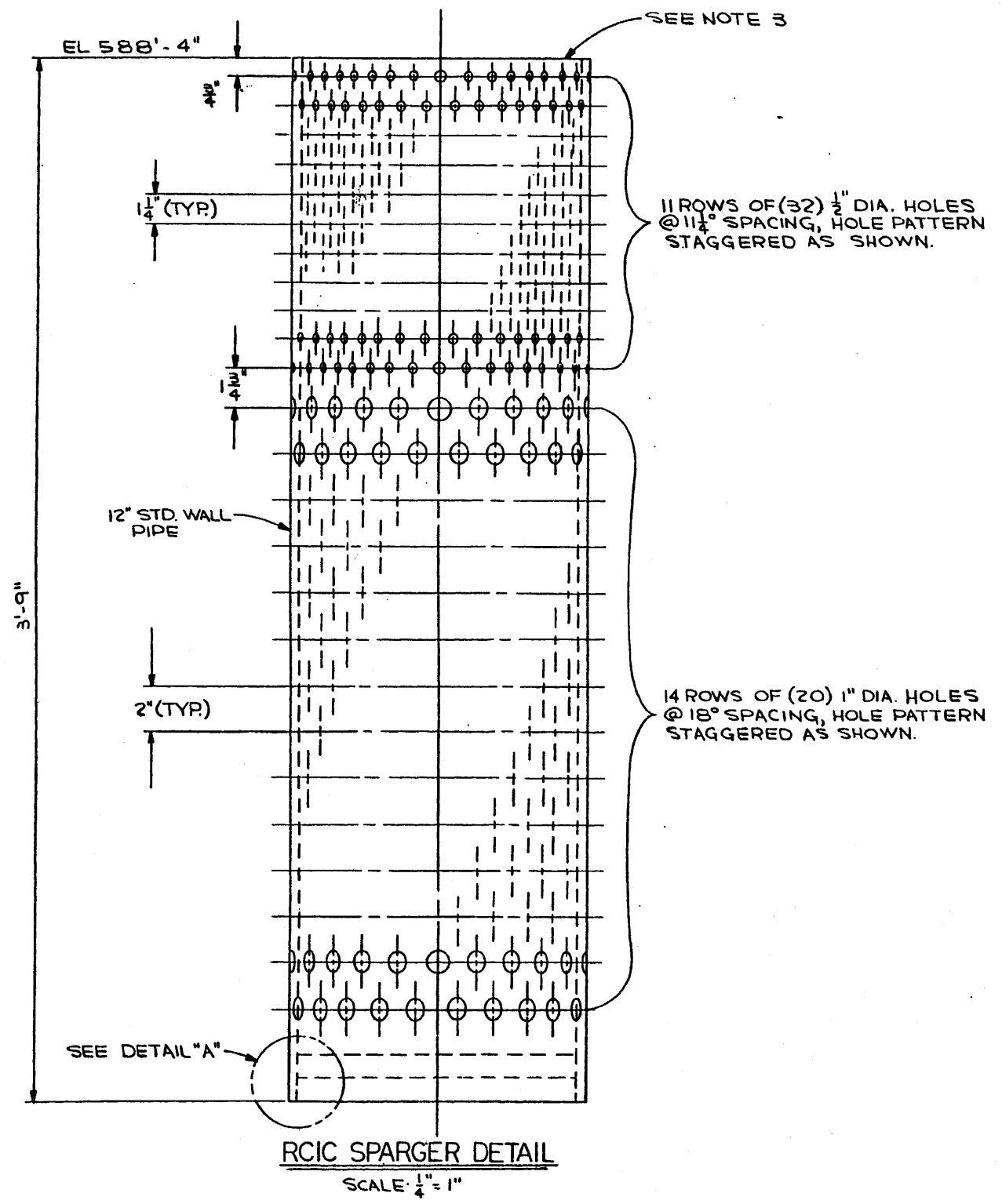
REFERENCES:

|                |  |
|----------------|--|
| 302-0182-00000 | CONDENSATE TRANSFER SYSTEM P11                   |
| 302-0241-00000 | SERVICE AND INSTRUMENT AIR SYSTEM P51, P52       |
| 302-0671-00000 | REACTOR WATER CLEANUP SYSTEM G33                 |
| 302-0737-00000 | LIQUID RADWASTE SYSTEM G50                       |
| 302-0772-00000 | REACTOR PLANT SAMPLING SYSTEM P35                |
| A62-4838       | PRESSURE INTEGRITY OF NUCLEAR COMPONENTS         |
| A62-4148       | CLEANING OF PIPING AND EQUIPMENT                 |
| A62-4248       | WATER SAMPLING REQUIREMENTS                      |
| 302-0244-00000 | PARALLEL INSTRUMENT AIR SYSTEM, P52              |
| 302-0242-00000 | SERVICE AIR DISTRIBUTION SYSTEM, P51             |
| 912-0604-00000 | CONTAINMENT VESSEL AND DRYWELL PURGE SYSTEM, M14 |

(REV. 19 10/2015)

**PERRY NUCLEAR POWER PLANT**  
10 CENTER RD., PERRY, OHIO 44081

**FILTER/DEMINERALIZER SYSTEM,  
REACTOR WATER CLEANUP SYSTEM**  
FIGURE 5.4-19  
(DWG. D-302-0675-00000)




- NOTES: -
1. A. PIPING IS SAFETY CLASS 2.
  - B. PIPING IS SEISMIC CATEGORY 1.
  2. FOR PIPE MATERIAL, SEE BAI SPECIFICATION SP 527-4540-00 LINE CLASS L2-2.
  3. FOR WELD END DETAIL, SEE BAI DRAWING D-301-001.

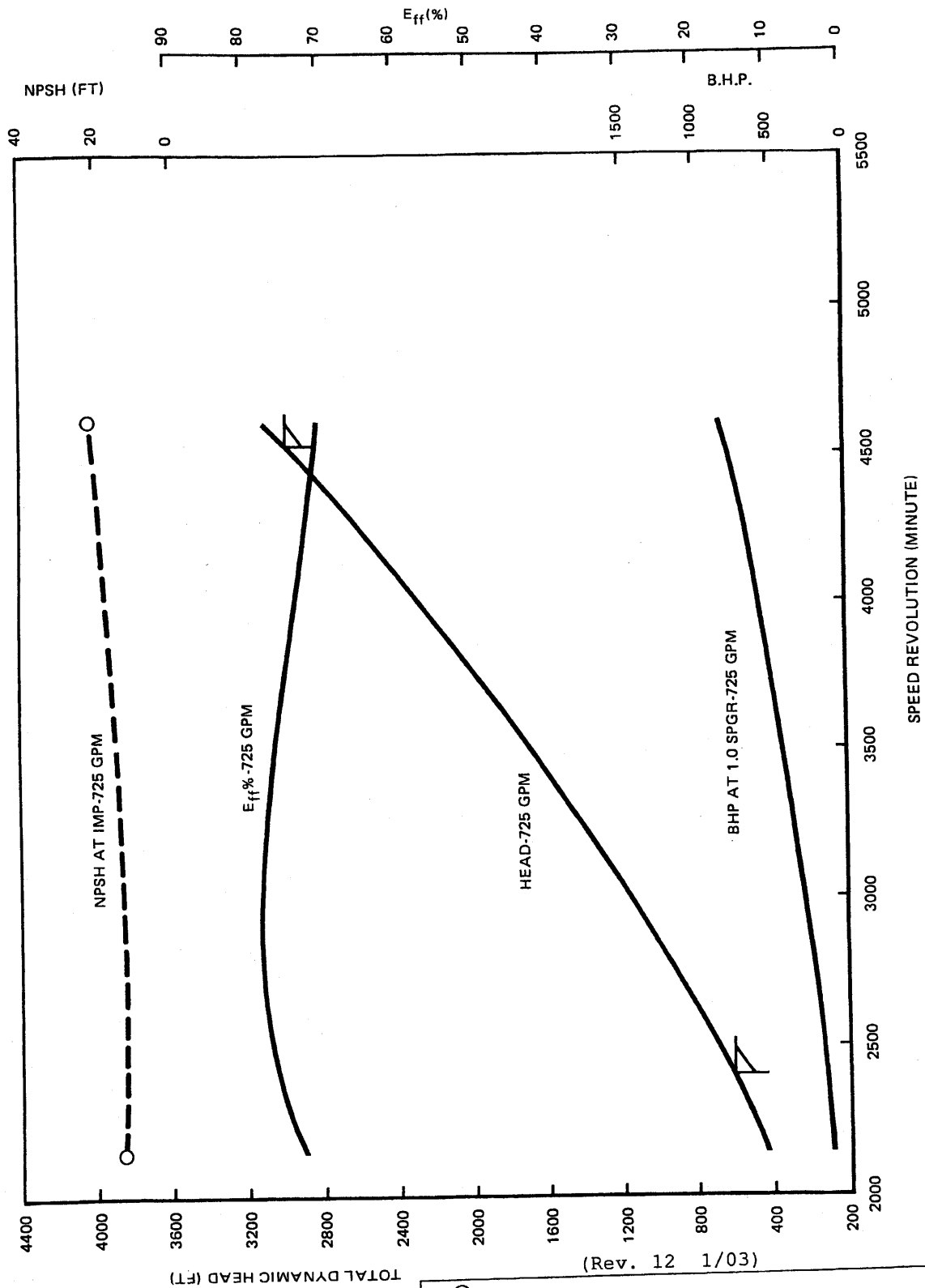
REFERENCES: -

D-304-634 RCIC REACTOR BUILDING

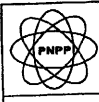
**NUCLEAR SAFETY RELATED**

(Rev. 12 1/03)

|   |                                  |
|---|----------------------------------|
|  | <b>PERRY NUCLEAR POWER PLANT</b> |
| RCIC Turbine Exhaust<br>Sparger Detail  |                                  |
| Figure 5.4-20<br>(Dwg. B-301-726)   |                                  |



(Rev. 12 1/03)



**PERRY NUCLEAR POWER PLANT**

RCIC Pump Performance Curves

Figure 5.4-21