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SUBJECT: Forwards response to Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Power Plants." Codes & stds used in design & fabrication of piping associated w/pipe wall thinning program listed.

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SEP 11 1987

Mr. William T. Russell
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

SUSQUEHANNA STEAM ELECTRIC STATION
RESPONSE TO BULLETIN 87-01
PLA-2909 FILE R41-2/R41-1A

Docket Nos. 50-387
and 50-388

Dear Mr. Russell:

The attached report is PP&L's complete response to Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Power Plants". We trust you will find our response satisfactory. If you have any questions, please contact Mr. R. M. Harris at (215) 770-7918.

Very truly yours,

H. W. Keiser
Vice President-Nuclear Operations

Affidavit
Attachments

cc: NRC Document Control Desk (original)
NRC Region I
Mr. L. R. Plisco - NRC Resident Inspector
Mr. M. C. Thadani - NRC Project Manager



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**AFFIDAVIT**

**COMMONWEALTH OF PENNSYLVANIA)**
**: SS**
**COUNTY OF LEHIGH )**

I, HAROLD W. KEISER, being duly sworn according to law, state that I am Vice President, Nuclear Operations of Pennsylvania Power & Light Company and that the facts set forth on the attached response to IE Bulletin 87-01 are true and correct to the best of my knowledge, information and belief.

Harold W. Keiser
Vice President, Nuclear Operations

Sworn to and subscribed before me this 11th day of September, 1987.

Notary Public

MARTHA C. BARTO, NOTARY PUBLIC
ALLENTOWN, LEHIGH COUNTY
MY COMMISSION EXPIRES JAN. 15, 1990
Member, Pennsylvania Association of Notaries

rmh/msc200368i

## RESPONSE TO BULLETIN 87-01

In response to the specific actions requested by Bulletin 87-01, the following information is provided.

**Action 1**

Identify the codes or standards to which the piping was designed and fabricated.

**Response**

The following codes and standards were used in the design and fabrication of piping associated with the Susquehanna Steam Electric Station Pipe Wall Thinning Program:

a. ANSI B31.1.0 (Design)
b. Bechtel Specification M-199 (Fabrication)

Refer to Table I for a more detailed breakdown of pipe sizes, materials and applicable codes.

**Action 2**

Describe the scope and extent of your programs for ensuring that pipe wall thicknesses are not reduced below the minimum allowable thickness. Include in the description the criteria that you have established for:

a. selecting points at which to make thickness measurements
b. determining how frequently to make thickness measurements
c. selecting the methods used to make thickness measurements
d. making replacement/repair decisions

**Response**

The scope and extent of the program to detect pipe wall thinning encompasses both Susquehanna units. Inspection of Unit #1 piping was done during both the 1st refueling and inspection outage in March of 1985 and the 2nd refueling and inspection outage in February of 1986. A Unit #2 piping inspection was done during the first refueling and inspection outage in September 1986.

Shortly after the startup of Unit #1, PP&L reviewed the two phase moisture erosion problems being reported by the nuclear industry. A technical report, NPE 83-01, was issued in November 3, 1983 that recommended 21 two phase and flashing piping locations be inspected. One conditional piping location was also identified. PP&L implemented the recommendations of the report plus 2 additional conditional inspections in time for the Unit #1 first refueling outage. An additional forty-one (41) piping inspection locations have been identified as erosion problems as reported by the nuclear industry. An engineering general specification covering two phase and flashing piping locations currently defines the program.

The piping locations presently covered by the inspection program at SSES encompasses 65 locations which fall into one of the following six categories:

2.1 Extraction Piping (two phase E/C)
2.2 Feedwater Heater Drains Piping (Flashing E/C)
2.3 Extraction Drains Piping to Condenser
2.4 Feedwater Heater Vents to Condenser
2.5 Feedpump Turbine Drain Piping
2.6 Feedwater Piping (Single Phase E/C)

Items 2.3 through 2.6 above represent additions to the initial program. For the Unit #1 3rd refueling and inspection outage in September 1987, 33 locations of the 65 identified locations in the program are scheduled to be inspected. This includes 22 feedwater locations that were added as a result of the Surry Unit 2 pipe failure. For the Unit #2 2nd refueling and inspection outage in March of 1988, 33 locations including the 22 feedwater locations are scheduled to be inspected.

a. Monitoring of industry experience has been the primary criteria used to select inspection points. Additional considerations include temperature, piping geometry, and fluid bulk velocities (see Table II). Monitoring of industry experience has been continuous since the program was initiated. This includes the following sources:

   1. INPO SER's and SOER's
   2. Nuclear Notepad Entries
   3. EPRI Seminars and Reports
   4. Massachusetts Institute of Technology Work
   5. EEI Reports
   6. EDF (France) Reports
   7. Toledo Edison Erosion/Corrosion Seminar
   8. CGEB (British) Papers
   9. ASME Papers
   10. NRC IE Bulletins and Information Notices
   11. Results of SSES Piping Inspections (see Table III)
   12. Surry Incident Reports and Related Seminars

b. Determination of frequency to take measurements is based upon evaluation of the erosion rate found after both a base line wall thickness inspection and follow-up wall thickness inspection between 12 and 24 months later (ie, one fuel cycle).

c. Wall thickness measurements are made with ultrasonic measurements. Where automated UT readings are suspected to be false, the wall thickness is rechecked by hand (see Table III). At six locations, in the cross-around pipe where manways exist, a visual inspection is used to inspect for erosion/corrosion. Results are compared in the field to minimum allowable wall thickness which is the greater of:

- o Two-thirds of nominal wall thickness
- o ASME code minimum wall thickness (pressure)
- o Piping loads (pressure plus dead weight plus thermal)

In most cases the two-thirds (2/3) of nominal is more conservative than either the ASME code or piping loads.

When erosion/corrosion has reduced wall thickness by more than 50% of the difference between nominal and minimum as determined above, further engineering evaluation is required.

d. No replacement/repair decision criteria have been established because no significant wall thinning relative to minimum allowable wall thickness has been detected. When significant erosion is detected, an evaluation on a case-by-case basis will be made that may include both temporary and permanent repair methods. Included in this evaluation will be consideration of material availability, material changes, piping stresses and geometry changes.

Changes of this nature would be similar to those made during the design of the Susquehanna Plant when PP&L requested our A/E, Bechtel, to use more erosion resistant piping materials because of known industry problems. Consequently we have copper bearing carbon steel piping in the cross-around pipe and some turbine extraction piping. Feedwater heater drains and moisture separator cascading drains have 2-1/4 Cr alloy piping downstream of the level control valves. Carbon steel piping material is used at most other balance of plant locations.

Action 3

For liquid-phase systems, state specifically whether the following factors have been considered in establishing your criteria for selecting points at which to monitor piping thickness (Item 2a):

a. piping material (e.g., chromium content)
b. piping configuration (e.g., fittings less than 10 pipe diameters apart)
c. pH of water in the system (e.g., pH less than 10)
d. system temperature (e.g., between 190 and 500°F)
e. fluid bulk velocity (e.g., greater than 10 ft/s)
f. oxygen content in the system (e.g., oxygen content less than 50 ppb)

Response

For liquid-phase systems the following factors have been considered (see Table II):

a. Piping material was not a significant consideration. All seven piping materials in the program see liquid flow. This includes piping with chromium, copper and molybdenum content. Refer to Table I for specific percentages of each material. We have insufficient data to eliminate these materials at this time.

b. Piping geometry was considered. Several piping configurations with close coupled fittings are included within the program. Specifically this includes two adjacent elbows (90-90 and 45-90) and elbows adjacent to branching tees in the feedwater system.

c. For BWR systems, the pH of the water does not vary significantly and has been taken as 7. This is representative of the locations currently in our program.

d. Temperature was considered. System temperatures for the 24 single-phase, 5 flashing and 36 two-phase inspection locations within our program range from 100°F to 540°F. Most locations have temperatures greater than 190°F. The few locations with temperatures less than 190°F have been included for reasons other than temperature considerations.

e. Fluid bulk velocities along with piping geometry (high local velocities) and temperature are the three major parameters that have been used to select specific inspection locations. The 100% power operating mode as shown in FSAR Figure 10.1-1 provides the bulk velocity design basis. However, other off-normal, startup or shutdown modes, where the bulk velocity is greater than 100% power operation, have also been used.

f. Oxygen content was not a controlling parameter for defining program scope. Table II indicates systems determined to contain less than 50 ppb $O_2$. All others were assumed to be low $O_2$ for program scoping. Those systems where oxygen content will be or could be a controlling variable are under further detailed evaluation.

Action 4

Chronologically list and summarize the results of all inspections that have been performed, which were specifically conducted for the purpose of identifying pipe wall thinning, whether or not pipe wall thinning was discovered, and any other inspections where pipe wall thinning was discovered even though that was not the purpose of that inspection.

a. Briefly describe the inspection program and indicate whether it was specifically intended to measure wall thickness or whether wall thickness measurements were an incidental determination.

b. Describe what piping was examined and how (e.g., describe the inspection instrument(s), test method, reference thickness, locations examined, means for locating measurement point(s) in subsequent inspections).

c. Report thickness measurement results and note those that were identified as unacceptable and why.

d. Describe actions already taken or planned for piping that has been found to have a nonconforming wall thickness. If you have performed a failure analysis, include the results of that analysis. Indicate whether the actions involve repair or replacement, including any change of materials.

Response

Three inspections have been done to date specifically for pipe thinning. Two of the inspections were done on Unit #1 during the first and second refueling and inspection outages while the third inspection was done on Unit #2 during the first refueling and inspection outage. Refer to Table III for a summary of all locations that have been inspected so far. The inspection includes location, size, component type, nominal thickness and minimum thickness measured.

a. The program was established specifically to detect pipe wall thinning. Thus far thirty-seven (37) locations covering categories 2.1, 2.2, 2.3 and 2.4 described above are included in the program and have been covered by inspections. Another six (6) feedpump drain locations and twenty-two (22) feedwater/condensate locations were added to the program after the last inspection was done. These new locations are scheduled to be inspected during the next refueling outage for both units.

b. Extraction piping, feedwater heater drain piping, extraction drain piping and feedwater heater vents have been inspected thus far. SwRI's 'SUTARS' ultrasonic system with 0.2 inch grid spacing and Sonic 'FTS Mark I' was used for both Unit #1 inspections while SwRI's 'TDAS' ultrasonic system with 1.0 inch grid spacing was used for the one Unit #2 inspection. An inspection area (ie, grid) is specified for each component as well as a minimum wall thickness relative to nominal wall thickness. Specific details for each of these items is covered in an engineering technical specification. A low stress stamp is used at the 0.0 grid point of each inspection location as a reference.

c. Table III summarizes the minimum thickness readings for each location for each of the three inspections done so far. No location inspected so far has had readings either approaching or below the minimum allowed wall thickness. All were acceptable.

d. No modification actions have been taken or are planned because all measured pipe wall thickness are above minimums.

Action 5

Describe any plans either for revising the present or for developing new or additional programs for monitoring pipe wall thickness.

Response

At this time, our program incorporates monitoring locations for single- phase, flashing and two-phase flow for all types of BOP piping operating above 190°F as shown on FSAR Figure 10.1-1 and for several locations with temperatures below 190°F. All locations were selected based upon industry experience. As a result of the Surry incident the following additional items are under review:

a. Use of a predictive erosion method. Currently the following predictive methods are being reviewed:

   o EPRI Report NP-3944 (two phase)

   o KWU erosion/corrosion model as presented at EPRI seminar (single and two phase)

   o EPRI 'CHEC' computer program (single phase only)

b. Review of other water systems outside the BOP cycle.

c. Review of water chemistry (PH, oxygen) for the non BOP systems.

d. Upgrading of the inspection program engineering general specification to include the 41 additional single phase and two phase inspection locations and other industry recommendations.

e. Review of ASME Section III Class 1 and Section III Class 2 feedwater piping inside of primary containment.

In the future, if significant erosion/corrosion is found at other BOP locations, these will be added to the program.

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Table I

## SUSQUEHANNA STEAM ELECTRIC STATION

## EROSION/CORROSION PROGRAM PIPING MATERIALS

| CATEGORY | NOMINAL SIZE | CLASS | MATERIAL SPEC. | APPLICABLE CODE (2) |
|---|---|---|---|---|
| Carbon Steel | 16, 18 | DBD | A-106 GR 'B' | ANSI B31.1.0 |
| | 2,3,4,6,8,12,14,16,20 | GBD | | ANSI B31.1.0 |
| | 2,3,4,12,14,16,18,24 | HBD | | ANSI B31.1.0 |
| | 30 | DBD | A-155 GR KC-70 CL 1 | ANSI B31.1.0 |
| | 26 | HBD | A-155 GR KC-70 CL 2 | ANSI B31.1.0 |
| Copper Bearing | 1½, 2, 4, 6, 14 | GFD | SA-333 GR 9 (Yoloy .75-1.25 CU) | ANSI B31.1.0 |
| | 10 | HFD | | ANSI B31.1.0 |
| | 16, 18 | GFD | A-155 GR KC-55 CL 1 (.30-.60 CU) | ANSI B31.1.0 |
| | 16 | HFD | | ANSI B31.1.0 |
| | 42, 48 | XFX | A-155 GR KC-55 CL 2 | Non Code (Turbine Vendor) |
| Alloy | 6,10,12,16 | GAD | A-333 GR P-11 (MO .44-.65) (CR 1.0-1.5) | ANSI B31.1.0 |
| | 12, 14, 18 | HAD | | ANSI B31.1.0 |

Note: 1. The second letter of the pipe class determines the material.
2. The third letter of the pipe class determines the applicables codes.

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TABLE II

| SUSQUEHANNA SYSTEMS | P&ID | PIPE(1) MATL (M-199) | REASON FOR ELIMINATION: NOT WATER/ STEAM | NOT CARBON STEEL | LOW TEMP | HIGH $O_2$ | REQUIRES FURTHER Study (2) |
|---|---|---|---|---|---|---|---|
| S1 - Switchyard | | | x | | | | |
| S2 - 125V DC | | | x | | | | |
| S3 - 13.8 KV System | | | x | | | | |
| S4 - 4160V System | | | x | | | | |
| S5 - 480V Load Centers | | | x | | | | |
| S6 - 480V Motor Control Center MCC | | | x | | | | |
| S7 - Lighting & Misc Distribution 120V | | | x | | | | |
| S8 - Domestic Water | M-117 | B,D | | | x | x(4) | |
| S9 - Intake Structure | | | x | | | | |
| S10 - Screens & Screenwash System | | | x | | | | |
| S11 - Service Water | M-109/10 | R | | | x | x(5) | |
| S12 - Bldgs. & Facilities | | | x | | | | |
| S13 - Fire Protection | M-122 | | | | x | x(5) | |
| S14 - Reactor Bldg. Cooling Water | M-113 | B | | | x | (6) | |
| S15 - Turbine Bldg. Cooling Water | M-114 | B | | | x | (6) | |
| S16 - Residual Heat Removal Service Water RHRSW | M-112 | R | | | x | x(5) | |
| S17 - Instrument AC | | | x | | | | |
| S18 - Instrument Air | | | x | | | | |
| S19 - Service Air | | | x | | | | |
| S20 - Bldg. Drains Nonradioactive | M-160 | B,M,N,T | | | x | x(5) | |
| S21 - Water Pretreatment | M-117 | B | | | x | x(5) | |
| S22 - Makeup Demineralizer | M-118 | C | | x | x | x(5) | |
| S23 - Fuel Oil | | | x | | | | |
| S24 - Diesel Generators | | | x | | | | |
| S25 - Primary Containment Instrument Gas | | | x | | | | |
| S26 - Motor Operated Doors | | | x | | | | |
| S27 - Station Auxiliary Boiler | M-121 | B,C | | | | | Yes |
| S28 - Misc Areas HVAC (Chillers) | M-189 | B,C,D | | | x | (6) | |
| S29 - Service & Administration Bldg. HVAC (Chillers) | | | | | x | (6) | |
| S30 - Control Structure HVAC (Chillers) | M-186 | B,R | | | x | (6) | |
| S31 - Computer | | | x | | | | |
| S32 - Security Systems | | | x | | | | |
| S33 - Turbine Bldg. HVAC (Chillers) | M-188 | B,R | | | x | (6) | |
| S34 - Reactor Bldg. HVAC (Chillers) | M-187 | B | | | x | (6) | |
| S35 - Fuel Pool Cooling | M-153/154 | B,C | | | x | x(5) | |
| S36 - Fuel Pools | | | | x | | x(5) | |
| S37 - Demineralizer Water Transfer | M-108 | C | | (7) | x | x | |
| S38 - Low Pressure Air | | | x | | | | |
| S39 - Condensate Demineralizer | M-116 | B,C | | | x | | |
| S40 - Lube Oil Transfer & Purification | M-119 | | x | | | | |
| S41 - Cooling Towers | | | | x | x | x(5) | |
| S42 - Circulating Water | M-115 | - | | (8) | x | x(5) | |
| S43 - Condenser & Air Removal | | - | | | x | x(9) | |
| * S44 - Condensate | M-105 | B,C | | | x | | PLI-49129 |
| * S45 - Feedwater | M-106/41 | B,L | | | | | PLI-49129 |
| * S46 - Extraction Steam | M-102 | A,B,F | | | | (10) | PLI-48540 |
| * S47 - Feedwater Heaters FWH | M-103/104 | A,B | | | | | Yes (3) |
| * S48 - Feedwater Pump Turbine | M-127 | B,F | | | | | PLI-48540 |
| S49 - Residual Heat Removal RHR | M-151 | B | | | | x | |
| S50 - Reactor Core Isolation Cooling RCIC | M-149/50 | B | | | | x(11) | |
| S51 - Core Spray | M-152 | B | | | x | | |
| S52 - High Pressure Coolant Injection HPCI | M-155/56 | B | | | | x(11) | |
| S53 - Standby Liquid Control SLC | M-148 | C | | x | | x(5) | |
| S54 - Emergency Service Water ESW | M-111 | R | | | x | x(5) | |
| S55 - Control Rod Drive Hydraulics CRDH | M-146/47 | C | | x | x | | |
| S56 - Control Rod Control | | | x | | | | |
| S57 - Uninterruptable AC | | | x | | | | |
| S58 - Reactor Protection | | | x | | | | |
| S59 - Containment & Suppression | M-141 | - | | | x | x(11) | |
| S60 - Primary Containment Atmosphere Circulation | | | x | | | | |
| S61 - Reactor Water Cleanup RWCU | M-144/45 | B,C | | | | (12) | Yes |
| S62 - Reactor Vessel & Auxiliaries | M-141 | - | | x | | (12) | |
| S63 - Bypass Indication | | | x | | | | |

TABLE II

| SUSQUEHANNA SYSTEMS | P&ID | PIPE(1) MATL (M-199) | REASON FOR ELIMINATION: NOT WATER/ STEAM | NOT CARBON STEEL | LOW TEMP | HIGH $O_2$ | REQUIRES FURTHER Study (2) |
|---|---|---|---|---|---|---|---|
| S64 - Reactor Recirculation | M-143 | | | x | | (12) | |
| S65 - Radwaste Bldg. Air Supply | | | x | | | | |
| S66 - Transient Monitoring TM | | | x | | | | |
| S67 - Vibration & Loose Parts Monitoring System VLPMS | | | | | | | |
| S68 - Radwaste Solids Handling | | | x | | | | |
| S69 - Radwaste Liquid LRW | M-161-64 | B | | | x | x(5) | |
| S70 - Standby Gas Treatment SGT | | | x | | | | |
| S71 - Gaseous Radwaste Recombiner Closed Cooling Water GRRCCW | M-131 | | | | x | (6) | |
| S72 - Gaseous Radwaste | | | (13) | | | x(5) | |
| S73 - Containment Atmosphere Control & Recombiner | | | x | | | | |
| S74 - Nitrogen & Hydrogen Systems | | | x | | | | |
| S75 - 24V DC | | | x | | | | |
| S76 - Sampling | | | | x(14) | X(14) | | |
| S77 - Modular Control Room | | | x | | | | |
| S78 - Nuclear Instrumentation | | | x | | | | |
| S79 - Process & Area Radition Monitoring | | | x | | | | |
| S80 - Reactor Non-Nuclear Instrumentation | | | x | | | | |
| S81 - Fuel Handling | | | x | | | | |
| S82 - Bypass Steam | M-101 | B | | | | | PLI-48540 |
| S83 - Main Steam | M-101/39/41 | B | | | | | PLI-48540 |
| * S84 - Moisture Separators Reheaters | M-101/02 | A,B | | | | | Yes (3) |
| S85 - Cathodic & Freeze Protection | | | x | | | | |
| S86 - Low Level Radwaste LLRW Holding Facility | | | x | | | | |
| S87 - Main & Unit Auxiliaries Transformers | | | x | | | | |
| S88 - 250V DC | | | x | | | | |
| S90 - Safety Parameters Display System SPDS | | | x | | | | |
| S91 - Plant Annunciators | | | x | | | | |
| S92 - Turbine Steam Seals & Drains | M-107 | B | | | | | Yes (3) |
| S93 - Main Turbine | M-101 | - | | | | | No |
| S95 - Hydrogen Seal Oil System | | | x | | | | |
| S97 - Stator Cooling | M-192 | - | | | x | (6) | |
| S98 - Main Generator & Excitation System | | | x | | | | |
| S99 - Misc. | | | x | | | | |
| S100- "E" Diesel Gen. | | | | | x | x(15) | |

* The inspection points currently in our program are portions of these six systems.

NOTES:
1. 2nd letter of pipe class - B, F, G, L or R is carbon steel.
2. Results of study given in "PLI" letter shown.
3. Two phase study completed - needs re-review for single phase.
4. Currently well water approximately 8000 ppb. Lower after well water tie in but greater than 50 ppb.
5. Air saturated or air saturated when flowing (10,000 ppb)
6. Closed inhibited loop
7. Valves are carbon steel - piping and other fitting are austenetic stainless steel
8. Crossaround piping is carbon steel scheduled to be coated, sections are concrete
9. Mixture of steam radiolysis gasses and air
10. Steam from the reactor contains 20,000 ppb $O_2$. Condensate could be as low as 10 ppb
11. Water from suppression pool 1200-10000 ppb. Steam moisture content is zero
12. Reactor water greater than 200 ppb during operation. May be less than 50 ppb during startup or shutdown
13. Contains condensate from coolers, condensers, etc.
14. Most piping stainless steel, low temperature down stream of coolers, very low flow
15. Semi-closed loop cooling water systems exposed to air in stand pipe. Have seen 5-20 ppb $O_2$.

TABLE III

| ID (4) No. | Type | Size | Location | Nominal Wall | U.T. RESULTS SSES #1 1-RIO | SSES #1 2-RIO (5) | SSES #2 1-RIO |
|---|---|---|---|---|---|---|---|
| X-1 | Tee | 14-HAD | Drain 3A to 2A | .375 | OK | .385 | .520 |
| X-2 | Tee | 18-GFD | Extr. to FWH 5B, C | .375 | OK | .319/OK | .382 |
| X-3 | Tee | 18-GFD | Extr. to FWH 5B, C | .375 | OK | .300/OK | .416 |
| X-4 | Elbow | 18-GFD | Extr. to FWH 5B, C | .375 | OK | .300/OK | .380 |
| X-5 | Elbow | 18-GFD | Extr. to FWH 5B, C | .375 | OK | .302/OK | .375 |
| X-6 | Elbow | 18-GFD | Extr. to FWH 5B, C | .375 | OK | .312/OK | .396 |
| X-7 | Elbow | 18-GFD | Extr. to FWH 5B, C | .375 | OK | .320/OK | .410 |
| X-8 | Pipe | 14-GFD | Extr. to FWH 5B, C | .375 | .360 | .267/.360 | .350 |
| X-9 | Elbow | 14-GFD | Extr. to FWH 5B, C | .375 | .360 | .194/.360 | .358 |
| X-10 | Elbow | 16-GFD | Extr. to FWH 5B | .375 | OK | .300/OK | .432 |
| X-11 | Elbow | 16-GFD | Extr. to FWH 5B | .375 | OK | .302/OK | .390 |
| X-12 | Tee | 10-GAD | MSEP. Drain to 4A | .365 | OK | .403 | .400 |
| X-13 | Elbow | 26-HBD | Extr. to FWH 3C | .375 | .348 | .257/.340 | .342 |
| X-14 | Elbow | 16-HFD | Extr. to FWH 4C | .375 | OK | .345/OK | .401 |
| X-15 | Tee | 24-HBD | Extr. to FWH 2A | .375 | OK | .332/OK | (2) |
| X-16 | Tee | 16-GAD | Drain 4A to 3A | .375 | (2) | (2) | (2) |
| X-17 | Elbow | 42 | Crossaround | .625 | OK | OK(3) | OK(3) |
| X-18 | Elbow | 42 | Crossaround | .625 | OK | OK(3) | -- |
| X-19 | Elbow | 42 | Crossaround | .625 | OK | -- | -- |
| X-20 | Elbow | 42 | Crossaround | .625 | OK | -- | OK(3) |
| X-21 | Elbow | 42 | Crossaround | .625 | OK | -- | -- |
| X-22 | Elbow | 42 | Crossaround | .625 | OK | -- | -- |
| X-23 | Tee | 12-GAD | Drain 5A to 4A | .375 | (2) | (2) | (2) |
| X-24 | Tee | 18-HBD | Drain 2A to 1A | .375 | (2) | (2) | (2) |
| X-25 | Elbow | 4-GBD | Extr. 5C Drain (20C) | .237 | (1) | .200/.214 | .203 |
| X-26 | Elbow | 2-GBD | Extr. 5A Drain (46A) | .344 | (1) | .460 | .500 |
| X-27 | Elbow | 2-HBD | Extr. 4B Drain (05B) | .218 | (1) | (2) | (2) |
| X-28 | Elbow | 2-HBD | Extr. 4C Drain (18C) | .218 | (1) | (2) | (2) |
| X-29 | Elbow | 2-HBD | Extr. 3A Drain (04A) | .218 | (1) | (2) | (2) |
| X-30 | Elbow | 2-HBD | Extr. 3B Drain (09B) | .218 | (1) | (2) | (2) |
| X-31 | Elbow | 3-GBD | FWH 5B Vent | .300 | (1) | .270 | .306 |
| X-32 | Elbow | 3-GBD | FWH 4A Vent | .300 | (1) | (2) | (2) |
| X-33 | Elbow | 4-HBD | FWH 3C Vent | .237 | (1) | (2) | (2) |
| X-34 | Elbow | 3-HBD | FWH 2A Vent | .216 | (1) | (2) | (2) |
| X-35 | Elbow | 2-GFD | Xaround Drain (51A2) | .344 | (1) | .42 | .450 |
| X-36 | Elbow | 6-GBD | F.W. S-U (FO-10659C) | .280 | (1) | .249/OK | .301 |
| X-37 | Elbow | 16-GBD | Long Path (FO-10570B | .656 | (1) | .471/OK | .588 |

NOTES:
(1) Inspection requirements issued after first outage
(2) Conditional Inspection - not necessary to inspect unless other inspection points indicate inspection is warranted.
(3) Visual Inspection Only (Per Spec M-1414)
(4) Unit #2 locations use a "20XX" prefix
(5) Automated UT/Hand Recheck - Numerous false UT readings were recorded requiring hand rechecks.

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