

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-412/87-18

Docket No. 50-412

License No. CPPR-105

Licensee: Duquesne Light Company
Nuclear Construction Division
P. O. Box 328
Shippingport, PA 15077

Facility Name: Beaver Valley Power Station, Unit 2

Dates: March 1 - April 12, 1987

Inspectors: J. E. Beall, Senior Resident Inspector
L. J. Prividy, Resident Inspector
A. A. Asars, Resident Inspector
W. M. Trokoski, Senior Resident Inspector, BVPS Unit 1
D. F. Limroth, Project Engineer, DRP

Approved by: J. E. Tripp
E. E. Tripp, Chief, Reactor Projects Section 3A

4/29/87
Date

Inspection Summary: Inspection No. 50-412/87-18 on March 1 - April 12, 1987.

Areas Inspected: Routine inspections by the resident inspectors (394 hours) of licensee actions on previous findings, site activities, preoperational test program implementation, TMI Action Plan Requirements, containment sump screen installation, safety related pump structural installation, control room wall removal preparation, test results review, HVAC controls, and cable tray installation.

Results: During the inspection period, the licensee announced a three week scheduling delay due to the decision to replace the ball-type MSIVs with valves of a different design. Two violations were identified, one due to an inadequate HVAC controls design (detail 11) and another due to a cable tray hold-down clamps installation deficiency (detail 12). One item concerning apparent corrosion of containment sump screen bolts (detail 7) was determined to be unresolved.

DETAILS

1. Persons Contacted

During the report period, interviews and discussions were conducted with members of the licensee's management and staff as necessary to support inspection activities.

2. Project Status Summary

Construction activities are currently estimated to be in excess of 99% complete. All 476 subsystems have been turned over for flushing and proof-testing, and 28 of 69 systems have been turned over to the operating staff. For software, all 87 preoperational (PO) tests and 28 of 36 initial startup tests (IST) have been approved. The remainder are in various phases of development.

Approximate dates for the major project milestones, as currently estimated by the licensee are as follows:

-- Implementation of Security Plan	April 13, 1987
-- Loss of Power Test (Site Blackout Portion)	April 30, 1987
-- Fuel Load	May 21, 1987
-- Initial Startup	June 6, 1987
-- Commercial Operation	September 21, 1987

On March 16, 1987, the licensee made the decision to replace the MSIVs. This decision produced a three week delay in fuel load and subsequent milestone dates.

3. Inspection Program Status Summary

Preoperational Test Program Inspection completion status is approximately as follows:

<u>AREA</u>	<u>% INSPECTION COMPLETE</u>	
	<u>END OF THIS PERIOD</u>	<u>END OF LAST PERIOD</u>
Overall Program	80	45
Procedure Reviews:		
Mandatory	100	70
Primal	100	100
Test Witness:		
Mandatory	70	50
Primal	100	100
Results Review:		
Mandatory	50	15
Primal	50	5

This inspection status is consistent with the applicant's test program progress. At the end of this inspection period, there were approximately 50 open NRC inspection items as listed below:

<u>NO. OF OPEN INSPECTION ITEMS</u>		
<u>TYPE OF ITEM</u>	<u>END OF THIS PERIOD</u>	<u>END OF LAST PERIOD</u>
Bulletins	3	5
Violations	5	6
Deviations	0	0
Construction Deficiency Reports	15	16
Unresolved	<u>27</u>	<u>29</u>
TOTAL	50	56

Of these items, only about four pertain to equipment or issues that require resolution before fuel load can commence.

4. Licensee Actions on Previous Inspection Findings

(Closed) IE Bulletin (85-BU-02): Undervoltage Trip Attachments of Westinghouse DB-50 Type Reactor Trip Breakers. This Bulletin contains required actions for those plants that utilize this model RTB. BVPS 2 has installed Westinghouse DS-416 RTBs; however, the preoperational testing of the RTB features and preventive maintenance procedures were evaluated to determine compliance with the criteria detailed by the bulletin. NRC Inspection Reports 412/87-02 (detail 8) and 412/86-31 (details 10B and 11) contain discussions of these inspections. Based on these reviews, this item is closed.

(Closed) IE Bulletin (80-BU-24): Prevention of damage due to water leakage inside containment. The only "open" water system inside containment is the service water system (SWS) which is isolated outside containment by normally closed valves; this portion of the system serves only as backup for chilled water to the cooling coils in the containment air recirculation system. The unidentified leakage monitoring program has been assessed as meeting the requirements of Regulatory Guide 1.45, 1973, Reactor Coolant Pressure Boundary Leakage Detection Systems, and provides a redundant means of detecting and alerting control room operators to an accumulation of water in containment as well as to determine flow from the containment sumps, including the incore detector sump. This item is closed.

(Closed) IE Bulletin (80-BU-18): Adequate minimum flow through centrifugal charging pump following secondary side high energy line rupture. The charging system has been modified from that described in the subject Bulletin and now includes alternate minimum recirculation flow paths during a safety injection. These valves, 2CHS-MOV380A & B, open on receipt of a Safety Injection Signal

(SIS) and remain open until receipt of a recirculation signal. The operation of these valves was successfully tested under preoperational test PO-2.07.01, Section VII A, Steps 148 through 156. This item is closed.

(Closed) IE Bulletin (86-BU-02): Static O-Ring differential pressure switches. In response to this Bulletin, the licensee conducted a review of procurement documents and specifications and determined that none of the subject switch models have been purchased for Unit 2. This item is closed.

(Closed) IE Bulletin (84-BU-03): Refueling Cavity Water Seal. This Bulletin required each licensee to evaluate the potential for and consequences of a refueling cavity water seal failure and to provide a summary report of these actions. The licensee responded to this requirement by letter dated November 28, 1984, and committed to develop abnormal refueling procedures by July 1985. The inspector reviewed the licensee's response and the abnormal procedures which have been developed and issued. No deficiencies were noted; this item is closed.

(Open) IE Bulletin (85-BU-03): Motor-operated valve common mode failures during plant transients due to improper switch settings. By letter of August 15, 1986, the licensee identified the valves to which this Bulletin applies and also the torque, torque bypass and limit switch settings for these valves. The licensee committed to testing valve operators with MOVATs equipment, in which each valve will be stroke tested, operator parameters measured, documented (as found) and compared to previously calculated values or setpoints. Torque switch settings will be adjusted to the calculated thrust values based on design differential pressure and the final (as-left) settings will be documented. Proper valve operation under system flow and pressure conditions will be performed to the extent practicable during preoperational and hot functional testing. This item remains open pending review of action in conjunction with the licensee's commitment.

(Closed) IE Bulletin (80-BU-10): Containment of non-radioactive system and resulting potential for unmonitored, uncontrolled release to environment. This Bulletin levied no action on this construction permit; however, the licensee has evaluated the issue and a recommendation to sample feedwater has been implemented. Other systems which have the potential for contamination have the capability for sampling; however, sanitary waste is not routinely monitored for radioactivity. This item is closed.

(Closed) Construction Deficiency Report (87-00-04): Missing Bolts in the Diesel Generator Building HVAC Fan Supports. This item was previously identified as a violation (87-02-02) and will be followed for proper resolution and closure under that item number. Therefore, this item can be closed.

(Closed) Unresolved Item (84-16-04): Repair of Main Steam Isolation Valves (MSIVs). During this inspection period, the licensee removed the ball-type MSIVs identified in this item. This item is no longer applicable and is therefore closed.

(Closed) Construction Deficiency Report (85-00-02): Latch roller bearer failure in MSIV actuator. This item is also being administratively closed due to removal and replacement of the ball-type MSIVs.

(Closed) Construction Deficiency Report (85-00-04): Cable tray hold-down clamps. This item was reviewed in Inspection Report 50-412/85-24 and left open pending inspection of installed hardware. NRC inspection identified a violation in installation (detail 12). Further review of this item will be tracked as part of violation followup; this item is closed.

(Closed) Construction Deficiency Report (87-00-03): Failure of actuator latching mechanism on MSIVs. This item is also being administratively closed due to removal and replacement of the ball-type MSIVs.

(Closed) IFI (84-14-04): Followup on bases for certification of HVAC fans. In a prior inspection, the seismic and environmental qualification reports for fans 2HVD*FN271A and B and 2HVZ*FN216A and B were reviewed and found acceptable by the inspector as determined by the review of the certification data furnished by the equipment suppliers. Due to the construction status at that time, the inspector was not able to confirm that certain as-built information was consistent with the qualification reports. Based on direct observations and reviews of inspection records as compared to the information in the qualification reports, the inspector determined that the actual materials and construction techniques used for these fans were acceptable with one exception which is being followed as a Violation (87-02-02). Since other aspects of this item are acceptable and the one problem is being followed separately, this item can be closed.

(Closed) IFI (86-06-01): Perform a sample review to verify that the minimum heat transfer coefficient in the preoperational tests corresponds to the applicable design documents. The inspector reviewed the tests intended to confirm the heat removal capacity of the Recirculation Spray System (RSS): PO-2.13.01, "Recirculation Spray Pumps and Control Test" and PO-2.30.01, "Service Water System Test." The heat transfer coefficients demonstrated by the tests (i.e., the acceptance criteria) were verified to be more conservative than the design and safety analysis assumptions. That is, the tests showed that the RSS heat exchangers removed more heat than the minimum required by the safety analysis. This item is closed.

5. Site Activities

Throughout the inspection period, the inspectors toured the licensee facilities. General work activities were observed including construction, surveillance, testing and maintenance. The inspectors also monitored the licensee's housekeeping, security and preliminary radiation control activities.

On March 16, 1987, the licensee announced the decision to replace the MSIVs which were ball-type valves with valves of a different design (globe). This decision followed by about a week a similar move by the only other United States utility employing these valves in this application. MSIV replacement

was expected to delay fuel load by about three weeks. Licensee contingency planning for possible MSIV replacement had begun in Fall, 1986, and had included the acquisition of critical components for the candidate replacement valves. Inspectors witnessed portions of the valve removal effort, but focused primarily on licensee activities in preparation for the new MSIVs which differ in mass, dimensions and orientation from the ball-type valves they replace. The licensee currently expects the new valves to arrive onsite during the first three weeks of May.

The licensee's efforts to implement security ("lock down") were monitored by resident and security specialist inspectors. The implementation of site-wide security is not only a necessary prerequisite to Unit 2 fuel load, but also is required for control room wall removal and the subsequent restart of Unit 1. Details of NRC reviews are presented in Inspection Report 50-412/87-30.

6. TMI Action Plan Requirements (NUREG 0737)

Licensee commitments in response to TMI Action Plan requirements have been reviewed by the staff and are documented in the BVPS Unit 2 Safety Evaluation Report (SER) and its supplements. Several of the TMI items are still under review and items may require further attention if significant changes become necessary. During this inspection period, the inspectors verified the licensee's compliance with the following items:

a. Item I.C.5, Feedback of Operating Experience

Each licensee is required to prepare procedures to assure that operating information pertinent to plant safety originating from both within and outside the utility organization is continually supplied to operators and other personnel and is incorporated into the training program as appropriate. BVPS 2 will utilize one Operating Manual Chapter and two Station Administrative Procedures to fulfill this requirement in the same manner as BVPS 1. OM Chapter 48, Conduct of Operations, provides for this feedback of operating experience in the Operations group. Specifically, Section 2, Procedure C, Adherence and Familiarization to Operating Procedures, describes this as a responsibility of the Nuclear Operations Supervisor, or his designee. He must initiate and maintain the required reading material and ensure that the process of relaying information is expedited, and schedule an audit of this process approximately every four months. Depending upon the issue and its urgency, the communication of information is through either the Shift Supervisor discussions during the pre-shift briefing, addition to the required reading list, or incorporation into the Training Program.

SAP 16, Technical Advisory Group, charges this group with the responsibility to review, evaluate for applicability to BVPS and distribute materials originating from INPO, NRC, and equipment vendors. Reviews of technical information by site personnel not in Operations or the TAG are governed by SAP 24, Correspondence Control. This SAP contains a detailed discussion of the responsibility of each reviewer to provide

prompt notification to personnel, notify the Procedures Group if changes are necessary, update technical manuals, and notify the Training Group if changes to the program are required. Based on the review of these procedures and inspector observations of licensee practices in this area at Unit 1, this item is closed.

b. Item I.C.6, Guidance on Procedures for Verifying Correct Performance of Operating Activities

The licensee must provide an effective system of verifying the correct performance of operating activities as a means of reducing human errors and improving the quality of normal operations. The licensee intends to operate BVPS 2 with the same administrative guidelines as are currently in use at Unit 1. All maintenance work to be performed on plant equipment is controlled by the Maintenance Work Request (MWR). Before activities related to the MWR begin, the Shift Supervisor's signature is required, signifying the control room staff's knowledge and approval of work commencement. All manipulations of plant equipment are performed by an operator under the guidance of Equipment Clearance Permit Procedures. The operator performing the clearance must also update the control room valve operating number diagrams (VONDS) to provide accurate presentation of plant configuration. After maintenance work is complete, system realignment is performed by an operator with double verification by another operator for safety related systems. The VONDS are again updated. Any necessary post-maintenance testing will require Shift Supervisor concurrence and operations support. The conduct of surveillance and post-modification testing are controlled in a similar fashion. By these methods, the licensee ensures that procedures are performed correctly and that human errors are minimized. Based on this review and inspector observations of Unit 1 operations, this item is closed.

c. Item II.K.3, Final Recommendations of B&O Task Force

This item is divided into several subsections; Item II.K.3.1, Installation and Testing of Automatic PORV Isolation Systems, was reviewed during this inspection period. This item requires the licensee to provide a system which will isolate a PORV to protect against a small-break LOCA if the PORV should stick open. BVPS 2 SER states that an evaluation was performed by Westinghouse to show that the probability of a PORV sticking open is sufficiently low to justify the omission of this system. NRC has reviewed and accepted this evaluation; this item is closed.

d. Item III.D.1.1, Integrity of Systems Outside of Containment Likely to Contain Radioactive Material

Licensees are required to implement a leak reduction program for systems outside containment which would or could contain highly radioactive fluids during a transient or accident. For those systems meeting this description, procedures have been developed to perform system integral leak rate tests and to verify that system leakage is being maintained

as low as practical. The systems to be tested each refueling outage include Safety Injection, Containment Depressurization, and Post-DBA Hydrogen Control. Any leakage points identified will be repaired in accordance with the SAP 3D, the MWR. Additionally, the Onsite Safety Review Committee will review all leak rate test results to verify minimum leakage from these systems. On a daily basis, operators on routine tours are responsible for identifying and reporting any leakage which requires repair. The repairs will also be conducted through MWRs. Based on this review of leak testing procedures and administrative procedures for operations and maintenance, this item is closed.

e. Item II.K.1, IE Bulletins

This item is divided into several subsections, the following were reviewed during this inspection period:

(1) II.K.1.5, Safety Related Valve Position

Licensees are required to maintain positive control over safety related valve positions and all activities related to testing and maintenance of safety related valves to ensure proper ESF system alignment. OM Chapter 48, Conduct of Operations, contains instructions for personnel regarding verification of valve positions. For example, Chapter 48 discusses performance of shift turnovers and control board walkdowns, maintenance of control room Valve Operating Number Diagrams for an accurate representation of plant system status, and performance of equipment clearances. Based on this review and inspector observations of activities at Unit 1 in this area, this item is closed.

(2) II.K.1.10, Operability Status

This item requires that licensees have procedures for removal from service and restoration of safety related equipment. OM Chapter 48, Section 10, Figure 48-36, Emergency Safeguards Equipment Clearance Checklist is the licensee's method for controlling clearances for safety related equipment. This checklist contains provisions for verification that TS requirements are not violated when removing safety related equipment from service for either maintenance or testing. It also provides for double verification by operators of system alignment to ensure operability. Based on this review and inspector observations of the use of ESF checklists at Unit 1, this item is closed.

(3) II.K.1.17, Trip Per Low Level Bistable

Licensees are required to trip the pressurizer low level bistable which would result in a reactor trip on pressurizer low pressure rather than a low pressure coincident with low level. BVPS 2 has

a reactor trip on pressurizer low pressure, two of three coincidence logic, when reactor power is greater than 10% (P-7). The inspector verified that TS accurately represents this. This item is closed.

7. Containment Sump Screen Corrosion

During a routine inspection of the Reactor Building, the inspector noted certain components in the Recirculation Spray System (RSS) sump showed evidence of corrosion. The RSS is designed to provide the long term cooling function following a hypothetical accident. The RSS sump is the source of water and contains screens designed to prevent the intake of debris which could degrade flow or damage the RSS pumps.

The 1/4-inch diameter threaded studs which secure the RSS screen assemblies showed evidence of oxidation corrosion. The applicable construction drawings permit the use of the A36 carbon steel material that was found to be rusting although the matching nuts were required to be stainless steel. Other studs in the containment sump area were also required to be stainless steel. Failure of the RSS sump screen studs and subsequent loss of the screens could impact RSS operability under design conditions. Some areas of the vertical galvanized steel grating at the RSS sump screen perimeter also showed evidence of corrosion. This item is unresolved (87-18-01) pending further review including investigation and resolution of these deficiencies by the licensee.

8. Structural Installation Review of Selected Safety Related Pumps

The inspector reviewed the Turbine Driven Auxiliary Feed Pump (TAFP) instrument manual, including the pump drawing and material list, and compared these drawings to the as-built configuration. Attention was focused on the anchor bolts used for the TAFP and its supporting equipment. The inspector noted one discrepancy with the mounting of the lube oil cooler which appeared to be a documentation problem. The vendor drawing and the associated material list called for the lube oil cooler to be mounted to the pump base with four 3/4-inch bolts and nuts. However, the as-built configuration of the lube oil cooler uses four 3/4-inch bolts threaded into a tapped support member. No nuts are used.

The inspector informed licensee personnel of this discrepancy. The licensee verified that the TAFP seismic analysis indicates negligible forces in the lube oil cooler supports and mounting bolts and committed to revise the applicable documents to accurately reflect the as-built configuration.

The inspector also reviewed the Quench Spray System (QSS) Chemical Injection Pump (2QSS*P24B) and compared the seismic analysis report to the as-built installation, including anchor bolt location, material and size. The pump and motor are individually bolted to a common baseplate which is bolted to structural steel framing in the Safeguards Building. A discrepancy was identified in the bolting configurations assumed in the seismic analysis versus the as-built installation concerning the four anchor bolts which mount the pump/motor common baseplate to the structural steel framing. The inspector

determined that the seismic report assumed four 7/8-inch, A307 bolts were used. However, the as-built installation consists of four 3/4-inch, A36 threaded studs which are welded to the structural steel.

Further review revealed that the mounting changes (from the original calculation assumptions) had been performed via approved procedures and were appropriately reflected in the applicable construction drawings. The inspector noted that while there might not be a hardware problem due to the addition of the baseplate welds, the current seismic analysis calculation should be updated to reflect the mounting changes. In response to the inspector's concerns, the licensee committed to correct the calculation and that preliminary results showed shear and tension stresses well below allowable values under design seismic loads.

No violations were identified.

9. Control Room Wall Removal

The inspector monitored the various ongoing activities associated with the removal of the wall between the Unit 1 and Unit 2 control rooms. The schedule for project completion was moved back several weeks, primarily as a result of the operational availability of the Physical Security System. The security system was projected to be operational by April 13, 1987.

One problem which was addressed during the inspection period was the difficulty in achieving the design flow of 1000 cfm through all the filters for the Control Room Emergency Pressurization System using either fan HVC*FN241A or B. The apparent cause of this problem was undersized fresh air intake dampers, HVC*MOD204A and B. These dampers are actually 6-inch butterfly valves selected for use as dampers which will be resized to 8-inch. The inspector determined that the root cause was incorrect design information (pressure drop projected at maximum flow). Design personnel had used a pressure drop based on an incompressible fluid flow equation for this air system which caused some dampers to be undersized. Subsequent followup inspection indicated that this error was an isolated case. Other applications where butterfly valves were being used as dampers were evaluated and it was determined that either the flow had been tested and verified adequate or the discrepancy in pressure drop calculations was not significant to the damper service. The inspector had no further concerns with this problem.

On March 21, 1987, the licensee performed an initial pressurization of the Control Room as part of a Phase I test procedure. No major problems were encountered and the test results were satisfactory. Overall leakage was measured as 316 cfm at a pressure of 0.25" H₂O which compares favorably with the acceptance criteria of 1000 cfm at a pressure of 0.125" H₂O.

No violations were identified.

10. Test Results Review

10 CFR 50, Appendix B, XI, Test Control, requires test results to be documented and evaluated to assure that test requirements have been satisfied. Additionally, Reg Guide 1.68, Initial Test Programs For Water Nuclear Power Plants, require that records be kept of test results, their acceptability, and the action taken to correct any deficiencies. The intent is to ensure that test results adequately demonstrate to the extent practical the capability of structured systems and components to meet performance requirements to satisfy design criteria. Deficiencies relating to design and construction found during conduct of these tests, system modifications, and corrective actions required to correct these deficiencies, are required to be incorporated into the test report records. It is the purpose of these records to ensure that all identified deficiencies have been adequately reviewed, corrected and retested as appropriate to assure that any previous test results are not invalidated.

The inspector reviewed SUM Chapter 8, Systems Training Section, to assure that the station's administrative controls adequately addressed the above requirements. SUM Chapter 8 contained requirements for the preparation, review and approval of both test result reports (TRRs) and test completion reports (TCRs). A pre-JTG review group serves as an initial screen prior to formal submittal for review and approval. A TRR is not submitted until all test deficiencies are resolved or suitably addressed and documented. Test deficiencies are handled either by a station work request (SWR), a request for information (RI). If an SWR is used, the cognizant test engineer is responsible for review of proposed post-maintenance testing. Any deficiency not resolved at the time the TRR is approved, must be entered on the station's open item list, charged to the particular test. The TRR may be issued prior to satisfactory completion of the test but a requirement form would be initiated for each open deficiency, and tracked in the retest log book. Any deficiencies discovered other than during testing, will be corrected via the SWR mechanism.

Test completion reports are used to summarize the status of particular tests at the time the package is transmitted to permanent station storage files. A unique feature of TCRs is that they also track QA surveillance deficiency reports (SDRs) issued against that particular test. Any SDRs opened at the time of transmittal are identified in these reports.

The inspector reviewed TRR for PO 2.01A.01, Reactor Trip Switch Gear and Control Rod Drive Motor, approved March 4, 1987. All test deficiencies identified for both Issue 0 and 1 were satisfactorily addressed. The inspector did note that Test Deficiency No. 5 concerning the A reactor trip breaker failure to close from the control room switch, had been corrected by troubleshooting through SWR 11543. This troubleshooting found dirty and loose contacts that were momentarily opening tripping the breaker upon closure. The contacts were cleaned and tension was increased on the spring. It retested several times satisfactorily during the remainder of the test. Though the test deficiency was closed out, the SWR remains open pending order and arrival of a new

switch. The inspector determined that the station's TRR System appeared to adequately track and ensure resolution of needed corrective actions identified during testing.

No violations were identified.

11. HVAC Controls Redesign Deficiency

On January 16, 1987, the licensee reported (per 10 CFR 50.55(e)) that the control circuit logic for certain HVAC fans would cause the fans to restart following a loss of offsite power and subsequent transfer to emergency power in a manner not in accordance with HVAC system design requirements. The licensee's February 13, 1987 report described the proposed corrective actions and, in early March, the inspector began a followup inspection of the installed, redesigned logic circuits. While gathering the materials and construction drawings requested by the inspector, licensee personnel identified that the design change for the power supply circuitry for the Control Room Emergency Pressurization System fans was not correct.

In the original design, the Containment Isolation Phase B (CIB) timers were powered from the emergency buses via certain motor control centers (MCC-2-E09 and MCC-2-E10). A loss of offsite power subsequent to a CIB initiation would rezero the timers upon restoration of power to the MCCs from the EDGs. The proposed design change was to place the CIB timers on an uninterruptible power source (battery) to prevent timer rezeroing.

The redesigned, installed and accepted circuits did not power the CIB timers from an uninterruptible power source. The new circuits contained the same design deficiency as reported in CDR 87-00-02 in that the emergency buses were still the CIB timer power supplies except now different MCCs (MCC-2-E05 and MCC-2-E06) were utilized. The licensee had conducted an independent verification of the design change but the error was not identified. Failure to properly control this design change is a Violation (87-18-02). This item needs to be satisfactorily resolved before initial criticality.

Of further concern is that this deficiency apparently would not have been identified during the licensee's current testing program. The response to this violation should also address the licensee's post-modification or redesign confirmatory testing program.

12. Cable Tray Hold-Down Clamps Installation Deficiency

On June 14 1985, the licensee reported (per 10 CFR 50.55(e)), that approximately 700 cable tray hold-down clamps might not be adequate during a seismic event due to loads in excess of the original design bases. The licensee's July 15, 1985 report described the proposed corrective actions which included clamp modifications and changes to the applicable engineering drawings. Inspection Report 50-412/85-24 documented NRC review of this item but left it open pending actual replacement of the clamps and physical inspection of the installed hardware.

While conducting a walkdown inspection of the installed and accepted modified clamps, the inspector identified apparent deficiencies in clamp installation in curved portions of the cable trays. The modified clamp (MT style) consists of a square plate with a matching hole to accept a half-inch bolt and washer. The design assumptions involved the clamp being installed such that one square edge would be affixed parallel to the tray side rail for maximum hold-down force. The modified design was tested and qualified for the increased loads in that configuration. The inspector identified several examples in curved cable tray sections where the clamps were not installed parallel to the tray side rail. Further review indicated that the applicable construction drawings, the governing installation specification (2BVS-931), and QC inspection criteria did not adequately address the required clamp orientation. This is a Violation (87-18-03). This item needs to be satisfactorily resolved before initial criticality.

The root cause of these deficiencies was the apparent failure by Engineering to assure that the assumptions of the reanalysis and the subsequent requirements of the redesign were translated into adequate construction and inspection instructions. This violation has apparent similarities to Violation 87-18-02 (discussed in detail 11) and Violation 86-31-04 (Rigid Sway Strut Interference); both also involved redesign and rework performed in response to identified deficiencies which did not accomplish the stated purpose. In the former item, an incorrect redesign was installed but would apparently never have been tested. In the latter item, reworked hardware which did not meet the original requirement was accepted due, in part, to inadequate acceptance criteria presented to QC by Engineering.

Additional inspection of other geometrically similar cable tray sections showed that the orientation of the standard hold-down clamps varied considerably. In some instances, the installed clamps did not bear fully on the tray side rail. These potential deficiencies were identified to the licensee; the resolution of these items will be reviewed in a later inspection.

13. Exit Interview

Meetings were held with senior facility management periodically during the course of this inspection to discuss the inspection scope and findings. A summary of inspection findings was further discussed with the licensee at the conclusion of the report period.