U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Report No. 50-412/84-07

Docket No. 050-412

License No. CPPR-105 Priority -- Category B

Licensee: Duquesne Light Company
Robinson Plaza Building No. 2
Suite No. 210, PA Route 60
Pittsburgh, Pennsylvania

Facility Name: Beaver Valley Power Station, Unit 2

Inspection At: Shippingport, Pennsylvania

Inspection Conducted: June 1 - July 23, 1984

Inspectors:

G. A. Walton, Senior Resident Inspector — Aug. 1, 1984 date

W. M. Troskoski, Senior Resident Inspector — Aug. 1, 1984 date

D. M. Johnson, Resident Inspector — Aug. 1, 1984 date

Approved by: J. E. Tripp — 8/8/84 date
J. E. Tripp, Chief, Reactor Projects Section No. 3A, Reactor Projects Branch No. 3, Division of Project and Resident Programs, Region I

Inspection Summary: Routine, unannounced inspection by three resident inspectors of activities pertaining to previously identified unresolved items, allegation on surface coatings, 50.55(e) items, deviation, cable separation, activities of constructability review team, vendor supplied materials, record review, qualification of post weld heat treatment, and daily site tours. The inspection involved 127 hours by three resident inspectors.
Results: The allegation was unsubstantiated and considered closed. The system turnover of the service water system resulted in a high number of items being turned over before construction was completed. This is a concern to the NRC. In addition, the walk down inspections were performed by DLC Construction and the contractor without an approved procedure. Several vendor problems are included as unresolved items. All other items were found acceptable.

DETAILS

1. Persons Attending Exit Interview

Duquesne Light Company

L. Arch, Construction Liaison
R. Coupland, Director, Quality Control
C. Ewing, Manager, Quality Assurance
H. Good, Senior Q.C. Weld Specialist
E. Horvath, Construction Liaison
C. Kirschner, Senior Q.A. Engineer
R. Swiderski, Startup Manager
R. Wallaver, Compliance Engineer
J. Waslousky, Senior Q.A. Engineer

Stone and Webster Engineering

C. Bishop, Construction Manager
A. McIntyre, Superintendent, Engineering
R. Wittschen, Licensing Engineer

2. Construction Site Walk-Through Inspections

Daily tours of the construction site were made to observe work activities in progress, completed work and plant status of the construction site. The presence of Quality Control inspectors and quality records were observed. The areas observed were found acceptable and no violations were identified.

3. Licensee Action on Previous Findings

(Closed) Unresolved Item 84-03-03, Storage of Transfer Tube Bellows in the Fuel Transfer Canal.

This unresolved item identified that the installed fuel transfer tube contained excessive dirt, sand and other abrasives in addition to electrical cords, air lines and grinding shields located on the thin gauge convoluted sections of the stainless steel bellows. The ends were not sealed and it was apparent that personnel were using the opening as an access from the containment building to the fuel building. The inspector questioned the licensee regarding a need to protect the transfer bellows, remove the foreign material and surface rust and inspect for damage. The inspector also questioned the need to provide inplace storage requirements for the fuel transfer bellows.

The licensee has taken the following corrective actions on this matter.

All debris and dirt was removed from the fuel transfer canal. Engineering took corrective action on Nonconformance and Disposition Report Number 20,002 to resolve the rust condition on the stainless steel bellows. Ultrasonic thickness measurements were made of the convoluted bellows to assure wear, possible damage or surface sanding had not reduced the minimum wall thickness to less than that required.

Specification 2 BVS-981 (2 BVS-65) was issued and requires installation of temporary caps on both ends of the tube and quarterly inspection to assure caps are in place. The inspector reviewed all documentation associated with this item and visually observed the present storage condition of the transfer bellows. All items were found acceptable and this item is closed.

(Closed) Unresolved Item, 84-05-01, Inplace Storage of Motor Operated Valves

This unresolved item identified that in the primary intake structure,motor operated valves were stored in a high humidity condition without heat source to prevent moisture from entering the motors. The motor operated valves were located in the pump cubicle room where water leakage was present from Unit 1 operations. The licensee committed to perform a review and provide protection, if necessary, to the motors.

The licensee has taken corrective actions on these motor operated valves by connecting power to the heater located in each motor. The power source is provided with an indicator light to demonstrate that it is energized.

The inspector visually observed the motor operated valves and found them energized and warm to the touch. The inspector found the storage conditions acceptable and this item is closed.

(Closed) 50.55(e), 84-00-01, Clamp Anchor Assemblies with Undersized Welds

This item identified that clamp anchor assemblies were fabricated at Pittsburgh Bridge and Iron (PBI) with undersized welds. They bypassed vendor inspection because the licensee assumed they would be fabricated by Schneider Power at their local facility and receive normal Q.C. inspection. Instead, Schneider Power contracted PBI to fabricate the clamps. DLC vendor Q.C. Department was not advised of this change and therefore, no DLC inspections were performed. When inspected onsite by DLC Site Quality Control, it was discovered that virtually all of the 1100 clamp anchor assemblies contained undersized welds. A majority of the welds were found to contain less than 50 percent of the specified size. An investigation, by the licensee, of this incident found the following programmatic problems.

- The QC inspector at PBI apparently became involved in the production process and the assemblies were not adequately verified by Quality Control.

- Because the work was subcontracted by the mechanical contractor to another vendor, the significance of their return to the contractor's local fabrication facility was missed and adequate receiving inspection procedures were not invoked.

- The DLC Vendor Surveillance Group did not perform inspections at PBI because proper notification and authority was not given to DLC by the contractor.

The licensee has taken the following corrective actions.

- All 1100 clamp anchors were scrapped.

- New clamp anchor designs have been issued for fabrication. The new designed clamp anchors will be fabricated by a different vendor. The purchase order will be placed by Stone & Webster to ensure normal purchase controls.

- The DLC vendor program will be applied, including shipping release authority and formal verification by DLC - SQC Receiving Department.

- The new assemblies will be used to replace all 1100 clamp assemblies, including 515 installed assemblies.

The inspector reviewed the documentation associated with this item and reviewed the licensee's corrective actions. All items were found acceptable and this item is closed.

As permitted by the NRC Enforcement Policy, no violation will be issued for this problem in the licensee's quality assurance program based on the licensee's identification of the problem and the timely corrective action that resulted.

(Open) Deviation 83-05-02, Telecon Approval of Design Documents

This "Deviation" was written because Stone & Webster Engineering was approving base design documents such as specifications, E&DCRs and N&Ds from Boston office by telephone discussions with the field office. The inspector found numerous design documents signed by individuals who did not perform the review, but who signed for the designated reviewer. The word "TELECON" was written above the reviewer's name and no further documentation of the telephone transmittal was made.

The licensee has taken the following corrective actions on this deviation.

- Specification 2 BVM-204 was revised on June 21, 1984, and requires that all specifications and revisions must be transmitted to the offsite reviewer for his dated signature.

- All "Finalized Specifications" i.e., those which will not be revised, which were approved based on "Telecon" approval will be signed and dated by the reviewer.

- E&DCRs and N&Ds will be incorporated into the specification within three months. "Telecon" approval of E&DCRs and N&Ds is acceptable because it will be incorporated into a design specification which will receive proper approval.

- "Dormant Specifications" i.e., those still active but not planned for revision, will be signed and dated by the reviewer within three months from June 21, 1984.

The inspector audited the actions being taken on this item and found the program acceptable.

This item is one part of a three part deviation and will remain open pending resolution of the other two items.

4. System Turnover to Duquesne Light Startup Group

Discussions concerning the BVPS Unit 2 turnover program were conducted with cognizant licensee personnel on June 14, 1984. Topics included the test program, organization and administration. Currently, the licensee is in the midst of reorganizing their startup and test organizations along lines different than as described in the FSAR. Another planned deviation from the current FSAR description is the point at which the Operations Quality Assurance Program (OQA) becomes effective. Rather than activate OQA on a system by system basis during turnover for preoperational testing, the licensee now intends to initiate it 90 days prior to hot functional testing. Both changes are to be reflected in the next FSAR revision.

To date, only portions of the service water system have been turned over from the constructor to the plant for operation in order to provide an initial shakedown of various control systems used to meet the requirements of Regulatory Guide 1.68, Initial Test Program for Water Cooled Nuclear Power Plants. This was accomplished with the development of a 600 open items list. During the discussions, the inspector raised a concern that the subsystems were being accepted from the constructor prematurely. Regulatory Guide 1.68 requires that the construction or installation of structures, systems and components should be essentially completed to the degree that outstanding construction items could not be expected to affect the validity of the test results. It further requires that construction related inspections and tests should be completed prior to beginning preoperational tests. The licensee currently has not developed explicit administrative controls to assure that the above requirements are met prior to system or subsystem turnover. The development of such administrative controls that document the system walk-down/turnover and contain acceptance criteria appropriate for the particular system being turned over, is an Unresolved Item (84-07-01).

5. (Allegation) Incorrect Coating Applications on Concrete

On August 25, 1983, a Region I Investigator and the Senior Resident Inspector interviewed a boilermaker who had previously testified at the Hatch hearings on union bookbuying and unqualified welders. An attorney was present at this interview as a representative for the boilermaker. During the interview, the attorney made statements to the NRC representatives regarding the practices used at Beaver Valley, Unit 2, when applying coatings to the concrete. According to the attorney, he represented 11 or 12 painters in a different case who have filed a suit against Painters Union, Local 6, for unfair work practices. He advised that on several occasions, several of the painters which he represents, alleged that the coating being applied to concrete at Beaver Valley Unit 2 was being applied incorrectly. Specifically, when three coats are required, they are all the same color and the painters are applying the coats in the wrong sequence; i.e., second coat is being applied first, first coat last, etc. The attorney provided a name of a painter who could supply additional information on this matter.

The NRC opened an inquiry into this matter and performed interviews and onsite inspections to assess the merits of the attorney's remarks. On October 5, 1983, telephone contact was made with the individual who the attorney advised us would supply the necessary details. This person is identified as Interviewee #1.

October 5, 1983, Contact with Interviewee #1

On the above date, Region I personnel contacted Interviewee #1 by telephone. He had no first hand knowledge of paint being applied in the wrong sequence or anything else done wrong except for the following allegation. In about the December 1981 - January 1982 time period, he stated that he had done sand blasting without being qualified (certified). When this was noticed by a QC inspector, he was qualified and his previous work was checked. He indicated that he was experienced as a sand blaster and knew how to do the work, thus, this was only a procedural technicality. In response to NRC questioning, he indicated that (Interviewee #2) could provide further details of additional painting discrepancies.

October 5, 1983 Contact with Interviewee #2

On the above date, Region I personnel contacted Interviewee #2 by telephone. He alleged that the following incident(s) occurred in the Spring of 1982 (March-April). Concrete walls were supposed to receive three coatings of Nutech paint in the following order: No. 11S first coating, No. 11 second coating, and No. 1201 third coating. While working on the bottom level (of containment) patching spots about 2 by 3 inches in size on the walls behind pipes, he did not have any 11S paint and was told to go ahead and use No. 11 paint for the first coating. He stated that QC inspectors were not aware that this was being done. He also alleged that after he and other qualified painters were laid off, unexperienced people were brought in off the street to paint without going thru a qualification program (he did not appear to have first hand knowledge about replacement painter qualifications). He indicated that Interviewee #3, a former painter foreman could supply more first hand knowledge of BV-2 painting discrepancies.

November 2, 1983 Contact with Interviewee #3

After repeated attempts to reach Interviewee #3, he was contacted by Region I on the above date. Notes of that conversation are as follows:

- He worked at Beaver Valley Unit 2 as a painter, and for the last 4-5 months as a foreman, from October 1981 to June 17, 1983.

- He alleged that it was common knowledge that paint coatings were applied in the wrong order.

- He alleged that about 80% of the foremen did not receive the Field Construction Procedures (FCP) - they were told things, but no one knew the facts. When people went to work there, they were expected to keep their mouths shut and not question anything if they wanted to stay on the payroll. If workers "brought anything up, they went down the tube (were fired)."

- His biggest concern was surface preparation. What you did today was not always acceptable tomorrow. He alleged that QC inspectors didn't always care if surfaces were properly prepared before painting; as a consequence, paint was sometimes applied over rough, dirty and/or rusty surfaces. Some of this paint was said to subsequently have peeled off, requiring repair.

- He alleged that QC inspectors frequently did not measure coating thicknesses. Instead, they asked the painters for thickness values and recorded the numbers they were given. As a consequence, he stated that the QC records were filled with repetitious values (either 7, 9, or 11 mils). He alleged that there was only one metal MFT gage (necessary for measuring the 1201 coating thickness) available. As a consequence, it was often not available or used in determining the 1201 coating thickness.

- He alleged that there were multiple cases where places that had been repaired and repainted following drilling for Hilti bolts had not received one of the necessary paint coatings. They were said to be behind cable trays where they could not be seen without climbing; it was alleged that QC inspectors did not climb to verify such work.

The information received from each interview was analyzed and the following conclusions were reached:

- Interviewee #1 - This individual, which the attorney had advised NRC to contact, could not supply any specific information about incorrect coating applications. His only adverse statement regarded his formal qualification for sand blasting. He further advised this was a procedure technicality and not a quality concern.

  An inspection was made in this area and documented in NRC Inspection Report Number 50-412/83-13 dated November 10, 1983. The qualifications of this specific individual, as well as others, were reviewed and no discrepancies were noted.

- Interviewee #2 - This individual alleged that there were only a few spots, approximately 2 x 3 inches in size where the primer coat 11 was applied before primer coat 11S. He could not give any specific location, such as azimuth location or elevation. He also stated that he could not show the NRC the exact location, since many things had probably changed since he worked there.

  The inspector performed visual inspections of the bottom elevations of the containment building looking for abnormalities in the painting applications. Particular attention was noted in inaccessible areas for peeling of paint. No discrepancies were noted.

  Stone and Webster Engineering was asked to give an evaluation of these type situations, i.e., application of the primer coat 11 before the 11S was applied. They advised that this method is acceptable and referenced test data which qualifies the application of NUTECH 11 being applied directly to concrete substrate. A report, titled "Qualification of Imperial's Nutech Series Concrete Surfacer Coatings in a Simulated Environment, Technical Report Number 326-79-G" was presented as justification. This report describes samples Number 3531 and 3532 which contain concrete as the substrate, one coat of Nutech 11 with a dry film thickness (DFT) of 1-15 mils followed by a second coat of Nutech 1201 with a 3-11 mils DFT. The report describes the pretest requirements on the samples before analysis.

  The tests were designed to simulate a main steam line break accident (MSLB) with radiation exposure of 1000 M rad to the samples. To simulate the MSLB, the samples were exposed to an environment of 385 degrees fahrenheit at 66 psig for 10 minutes, and then to a chemical spray and saturated steam environment marked by decreasing temperature and pressure for a total test duration of 16 days. After this, the samples were evaluated for coating performance in accordance with ASTM Standards D659, D714 and D772. The summary of the test results states "The Nutec Series specimens were one of few that passed the simulated LOCA environment within the acceptable parameters of ANSI N5.12 and 101.2."

The inspector reviewed all pertinent details of this report and determined the test samples were representative of the conditions described by Interviewee #2.

A second report, titled "Radiation Tolerance and DBA Nutech 1201 on Steel and Concrete Substrates" was presented which shows the qualification of Nutech 1201 applied directly to steel without a primer or applied directly to concrete without a surfacer. These test specimens were irradiated to as high as 1×10^9 rads, then subjected to design basis accident testing with maximum temperature and pressures of 340 degrees fahrenheit at 70 psi. The samples were also prepared with varying degrees of surface preparation including masonry stone, wire brushed surface and compressed air cleaned. This report states "The tested specimens meet the acceptance criteria for DBA testing as outlined in ANSI - N101.2."

- Interviewee #3 - This person made several general statements about incorrect coating applications, insufficient surface preparations, Q.C. inspectors not measuring the paint thickness, and inadequate coating of repaired area or areas that were inaccessible. No further specifics were provided. To perform a comprehensive review of these alleged discrepancies, the licensee was asked to perform evaluations and justify acceptance of the coatings on concrete in light of the allegations made by Interviewee #3. The NRC specifically asked to be advised of their proposed program. The licensee was asked to consider interviews with craft workers and Q.C. inspectors and take actual test samples which would demonstrate coating adhesion and dry film thickness.

  Attachment A gives the details of the licensee program.

The licensee was given the concerns which are identified as Items a, b, c, d, and e of Attachment A. The resident inspector reviewed the licensee's program and concurred with their planned actions. The program consisted of interviews with nine Quality Control Inspectors who inspect coating applications and twenty-one craft personnel who apply coatings. The questions and responses are described in Attachment A. From these interviews and with the input from the NRC on other interviews, the licensee established a destructive test program to assess the actual quality of the coating at different locations within the containment building. The program consisted of the following:

- Check the adhesion of the coating system to the concrete substrate with the use of a Elcometer Adhesion Tester.

- Take chip samples and measure the film thickness of each coat.

The licensee and the resident inspector jointly selected the areas to be evaluated. The samples were selected in different locations throughout the containment building, including inaccessible areas, on both concrete and steel substrates.

A total of 187 areas were examined for adhesion and 187 adjacent areas were examined for film thickness. The sample location and results are shown in Attachment B. The acceptance standard is defined in American National Standard N5.12-74 as; "Adhesion of the prime coat to the substrate, intercoat adhesion, or cohesion of any coat of the coating system shall be determined by the use of the Elcometer Adhesion Tester." Five steel or five concrete test specimens as applicable shall be used. The coating adhesion on four of these specimens shall exhibit a pull of at least 200 Lbs.

As shown on Attachment B, all samples which pulled loose in the coating were above 200 Lbs. Several of the samples pulled loose at values less than 200 Lbs., but when analyzed, it was found that the glue which connected the coating to the dolly failed. Retests were performed on these areas. Some values less than 200 Lbs. were obtained because the concrete failed.

Twenty-nine tests of the 187 areas pulled with the Elcometer Adhesion Tester were witnessed by the Resident Inspector. The licensee has evaluated this data and concluded that all areas investigated meet the required acceptance standards. The inspector reviewed the data and found the licensee's evaluation acceptable. One hundred and eighty-seven chip samples were taken of the coating in areas adjacent to the pull test to evaluate coating thicknesses.

Evaluation of each chip sample was made on a microscope at either 100 or 200 magnification. Readings were obtained using a graduated scale on the microscope. The acceptance standards was based on the engineering requirements stated in specification 2 BVS-950A. The limits are specified as 3 mils minimum to 12 mils maximum for the topcoat, NUTECH 1201. The primer coat requirements are stated as; "Only as much material as is necessary to cover all of the voids and smooth out surface roughness and depressions shall be applied. The thickness as applied shall not exceed 35 mils of Nutech 11S, (suggested targets 10-20 mils) and 20 mils for Nutech 11, (suggested targets 6-15 mils). These readings are given as wet film thickness (WFT) for the Nutech 11S and 11. When reading the actual thicknesses of the coatings, no distinction was found between the 11S and 11 because they are the same color and comparable texture. Therefore, the total primer thicknesses were read. For determining the acceptable thickness of the primer coating, the acceptance standards allowables were combined; i.e., 10-20 mils and 6-15 mils were combined to 16-35 mils as the target acceptance standards given as WFT. When converted to dry film thicknesses, the target acceptance standards are 12.85 to 27.9 mils, and the min/max acceptance numbers are 0-55 mils WFT, (0-46.2 mils DFT). The results obtained, shown as DFT, are given on Attachment B. The licensee has analyzed this data and concluded that except for two locations of the 1201 topcoat, acceptable results were found. The two minor deviations are being investigated by the licensee. The resident inspector witnessed the thickness analysis performed on ten chip samples. In addition, the inspector reviewed the complete data and found the licensee's analysis acceptable.

Summary: This allegation was unsubstantiated.

The numerous interviews conducted by the NRC and those performed by the licensee failed to produce any specific locations which could be investigated. The information which was received was general in nature and therefore, no particular spot, area or location could be pinpointed. Based on the lack of specifics, it was decided to ask the licensee to perform specific investigations into general areas. This included random interviews of Quality Control Inspectors, and craft personnel. Destructive tests were then performed, again in general areas, to ascertain the actual condition of the as-coated conditions.

The interviews did not reveal that any coatings were misapplied. The destructive test demonstrated that the coatings are functionally sound and will withstand its intended service. The report presented by Engineering shows the coatings are acceptable even if they somehow did get misapplied. The areas destructively investigated will be repaired by the contractor in accordance with instructions given on Nonconformance and Disposition Report Number 4624. This item is considered closed.

6. Vendor Supplied Material

A. On May 11, 1984, a Part 21 report was submitted by Rockbestos Company, advising that possible insulation damage had occurred on certain electrical cables. A supplement to the Part 21 report was submitted May 22, 1984, and identified that five specific reels of electrical cable were supplied to Beaver Valley, Unit 2. As described in the vendor's report to the licensee, dated May 25, 1984, the insulation damage was in the form of small nicks or cuts in the insulation caused during the process of reworking the outer jackets to remove spot imperfections. The operator had allowed a cutting blade to come in contact with the insulation. The vendor supplied the reel mark numbers and the footage location on the cable where damage possibly occurred for each reel.

The inspector reviewed the licensee's actions taken on these five reels. The licensee has taken the following actions:

Reel Mark - NKA-24-816A-206

Three cables were pulled using cable from this reel. A total of 2,958 feet was used. Approximately 148 feet remain on the reel. The reel is now on Quality Control hold status. The three cables already pulled are all non-safety related with no safety significance.

Reel Mark - NKA-25-816A-266

Two cables were pulled using cable from this reel. A total of 965 feet was used. The reel is now empty. The two cables pulled are non-safety related with no safety significance.

Reel Marks - NKA-23-816A-326, NKA-25-816A-337 and NKA-25-816A-306

No cable has been used from these three reels. The Quality Control Department has placed hold tags on all three reels.

The licensee has not decided a disposition on the above subject cables. This item will remain unresolved pending disposition by the licensee on this item (84-07-02).

B. A Region IV vendor inspection, conducted on October 11 - 14, and November 14 - 18, 1983, of Cardinal Industrial Products Corporation identified numerous concerns regarding compliance with the ASME Code for fastener material.

The inspector questioned the licensee regarding receipt of material from this vendor. They advised that material for Purchase Order 2BV-59135 was on site, in a "Hold" status awaiting document review. Also, material for Purchase Order 2BV-59039 has been placed on "Hold" from shipment. The licensee has advised that the above orders are the only two to this vendor. They are on hold pending disposition. This item is an unresolved item pending disposition of these items by the licensee (84-07-03).

C. A Region IV inspection conducted January 16 - 20, 1984, of Lone Star Screw Company identified a discrepancy of bolting material. The discrepancy regarded the requirements of tempering and stress relief of these bolts when fabricated to certain editions and addendums of the ASME Code. On April 13, 1984, Lone Star Screw Company advised Stone and Webster Engineering of this discrepancy and stated that it is their position that the subject material is acceptable if an earlier Edition (i.e., 1974) of ASME Code could be used. The licensee presently has this material on hold pending further evaluation. This item is unresolved pending disposition by the licensee (84-07-04).

D. A report was received by NRC from a nuclear facility which identified that 36 Westinghouse DS-416 Breakers had failed or defective tack welds. These welds join a sheet metal secondary disconnect support bracket to the seismic positioner. The major concern was that failure of enough of these tack welds could result in lack of engagement or disengagement of the secondary disconnect contacts from the corresponding control contacts. Loss of control power to the affected breaker could result. Westinghouse performed evaluations of these conditions and by letter to the NRC dated June 14, 1984, advised that testing of "worst case" conditions demonstrated that the as-welded condition of the brackets would sustain at least six times the maximum service load. Based on this analysis, the inspector has no further questions on this matter at this time.

7. Constructability Review Team

Based on statements written in the Systematic Assessment of Licensee Performance (SALP) report and on problems noted by SQC when performing back fit inspections, Stone and Webster Engineering established a constructability review team with the objective of reviewing pipe support drawings to determine if unclear and confusing information existed on them. The team consisted of representatives from Schneider Power Construction and Engineering, Stone and Webster Construction and Engineering, and Duquesne Light Company Site Quality Control. The review teams objective was to collectively review 100 percent of all drawings issued during the month of June, 1984, of pipe supports for both small and large bore piping, and duct and instrumentation supports.

Where clarity was warranted, the team marked up a copy of the drawing and Engineering revised it as necessary. The review team looked at approximately 225 drawings. The majority of all drawings required changes to meet the objective of the team. Most changes were made for clarity purposes. In addition, Stone & Webster Engineering made a decision to redraw all drawings which contained details for pipe rack supports. This compromised ninety-seven pipe rack supports. This decision was made because of the confusion which resulted when constructing the rack supports from the drawings.

The inspector met with S&W Engineers and the review team leader to ascertain the review team's accomplishments. Also, the inspector reviewed several drawings which the review team had audited. In addition, the inspector reviewed several of the redrawn pipe rack supports.

The inspector found that a comprehensive, thorough review was made and even very minor clarifying items were being changed. The revised drawings appeared to be constructable and should eliminate confusion when constructing and inspecting the supports. In addition, the inspector was advised the review team would continue further reviews and all drawings would require this review before they could be released for issue.

The inspector was also given a letter, dated June 27, 1984, which gives direction for starting a second review team to review conduit design drawings presently undergoing issuance. The letter states the review team should be formed and working by July 2, 1984.

The inspector found all areas reviewed acceptable. The review team concept gives input to engineering from the construction and inspection forces and should help eliminate any confusion and/or errors experienced before.

The acceptability of supports installed using drawings prior to the above reviews will continue to be reviewed by the inspector as part of followup to the SALP and to existing open item 412/83-15-01.

8. Backfit Inspection Program - Color Separation of Raceway and Cable

The inspector reviewed the licensee's program for reinspection of raceways and cable in free air which were inspected by Quality Control prior to May 15, 1984, for the electrical color separation criteria. The intent of the reinspection is to identify areas where the required spatial separation (RG 1.75 requirements) are not presently being met. Also, the reinspection is to identify that where minimum spatial separation is not met, reduced spatial separation requirements are met. The reduced separation distances are needed for modification purposes, such as addition of tray covers, cable wraps, barriers, etc. The licensee has established teams of QC inspectors to perform these reinspections. The requirements are identified in Inspection Procedure IP-10.2.2 issued May 21, 1984.

The inspector accompanied a two person team on May 29, 1984, and witnessed the licensee's inspections of cabe tray numbers 2TC1350 and 2TC1360, located in the cable tunnel, elevation 736'6".

Both inspections found the cable spacings below the minimum required spatial separation. One of the two inspections found the cable was also closer than the allowable reduced allowable spatial separation. The inspector found the inspectors were adequately trained in the inspection requirements, and were performing inspections in accordance with the inspection procedure.

The inspector performed a review of the Inspection Procedure IP-10.2.2 and other pertinent aspects of the separation problem. After this review, the inspector discussed the following concerns with Stone and Webster Engineering.

- The inspection requirements failed to provide minimum separation clearance for inspection cable, conduit or raceways of the same color to assure that items of the same color did not interfere with tray covers, etc. As written, the procedure required inspection of other color trays, HVAC, concrete, piping, and fire protection, but failed to recognize cable and trays of the same color. On July 26, 1984, Engineering issued E&DCR Number 2PS-3481C which states "Although color separation is not required between non-color coded, purple and white, orange and red, and the same colored raceway, the design and installation of all raceways should not prohibit installation of tray covers." Constructability clearances are then specified. Quality Control then modified their inspection procedure to include this requirement. The inspector questioned Engineering regarding how it would be assured that after this reinspection was performed, other construction disciplines would not install other items within these minimum separation distances.

  On June 27, 1984, S&W Engineering issued E&DCRs Number 2PS-3481B, 2PS-3560, 2PS-3561, 2PS-3562 and 2PS-3563. Each E&DCR covers a different discipline, such as HVAC installation, fire protection, and piping. Each requirement specifies a minimum clearance requirement from electrical cable tray and cable.

  With the changes implemented, as stated above, the inspector found the reinspection program acceptable.

9. Data Review of Electrical Penetration Weld Repairs

The inspector selected three completed welds which form a pressure boundary juncture in the containment building boundaries. The welds are part of electrical penetrations and had been repaired. The repairs resulted from ultrasonic inspections of these welds. The welds are identified as Number 9, 71 and 105.

The inspector reviewed the associated documentation with these repairs to ascertain the following:

- Defects were removed and cavities were inspected to assure defect removal.

- Qualified welders and welding procedures were used.

- Interpass temperatures were controlled.

- Weld wire was certified and issue controls were implemented.

- Reinspections were performed.

- Required activities were documented.

The inspector found the record review acceptable. The inspector also witnessed the final ultrasonic inspection performed on weld number 9. The tests were performed in accordance with the requirements specified in specification number UT-16 Revision dated September 28, 1983.

All items reviewed by the inspector were found acceptable and no violations were identified.

10. Procedure Qualification of Post Weld Heat Treatment of Piping Welds

The licensee established a procedure qualification for post weld heat treatment (PWHT) of piping welds in accordance with the requirements stated in ASME B&PV Code Section III. The procedure is planned to be used on-site for PWHT of main steam pipe welds.

The procedure qualification established the acceptance criteria for thermo-couple placement, heat band control, thermal gradients, inside temperature controls, insulation requirements and minimum and maximum temperature controls. Based on this qualification, it has been determined that the outside temperatures must be taken to 1150 degrees fahrenheit minimum in order for the inside temperatures to reach the minimum PWHT temperature range of 1100 degrees fahrenheit.

The inspector witnessed the qualification test and found the necessary parameters are being controlled in the procedure. The inspector found this item acceptable.

11. Exit Meeting

The inspectors met with licensee and contractor representatives (denoted in paragraph 1) at the conclusion of the inspection on July 23, 1984. The inspector summarized the scope and findings of the inspection as described in this report.

During this inspection, no written material was given to the licensee by the inspectors.

April 6, 1984

ATTACHMENT A

LICENSEE INQUIRY--COATINGS APPLICATION AND VERIFICATION PRACTICES

Initiation of Inquiry

A meeting was called by Nuclear Regulatory Commission (NRC) representatives Messrs. L. Tripp and G. Walton at the office of the Vice-President, Nuclear Construction Division (NCD) at the Beaver Valley (BV) #2 project offices, Robinson Plaza. Messrs. E. J. Woolever, Vice-President and R. Coupland, Director, Quality Control (QC), BV #2 represented the Duquesne Light Company (DLC).

The NRC representatives outlined their concerns that had been initiated by statements attributed to Painting craftsmen who had been employed on the BV #2 project in the past. On completion of the discussion the Director, QC was instructed to perform an investigation and report his conclusions described herein.

Basis Used for Inquiry

The concerns related to coating application applied within the reactor containment on concrete surfaces and alleged the following--

a. The NUTEC Coating System that consists of three (3) separate coatings (11S, 11 and 1201) had been applied in the wrong order to the effect 11 had been applied prior to 11S.

b. 11S had been omitted, thus, the finished system would consist of 11 and 1201 only.

c. QC inspectors did not, themselves, take wet film thickness (WFT) readings but utilized figures given to them by craftsmen to complete their official documentation.

d. QC inspectors did not verify the coating system on minor repairs.

e. QC inspectors did not verify coating system if considered by them to be inaccessible.

Approach to Inquiry

With reference to items a and b it was considered essential to establish that in the event that the coatings had been applied in the wrong order whether or not we had a significant safety problem. Therefore, Stone & Webster Engineering Corporation (SWEC) and our Consultant, KTA Associates, were required to present a position to establish whether the previously described misapplication of the coating system would present a significant safety problem if it was substantiated or could not be disproved.

With reference to c, d and e, it was considered that the only method of establishing the facts was to perform a series of interviews in private with the appropriate QC inspectors and a sample of experienced craftsmen who had spent some time on the project.

Misapplication of the NUTEC Coating System (Items a and b)

On February 20, 1984 a meeting was held with representatives of SWEC where the previously described misapplication was discussed (DLC-SQCL-Gen. Admin.-#0555A reference). The engineering position was presented as follows--

a. We had satisfactory test results when the system was applied correctly, i.e., 11S/11/1201.

b. We had satisfactory test results where the system had been applied with 11S/1201 only.

c. We had satisfactory test results when the system had been applied with 11/1201 only.

Further, it was submitted that the test results of the application in the correct order, 11S/11/1201, and for the incomplete systems, 11/1201 and 11S/1201, was sufficient evidence to demonstrate that the reported existing condition of the coatings in the Reactor were acceptable, particularly when the areas involved were related to small patches.

This engineering position was substantiated by SWEC memorandum Site 2BVM-3286, dated February 24, 1984 confirming their position as follows--

> "NUTEC coating materials have been successfully LOCA/DBA qualified in numerous sequential combinations including 11S/11/1201, 11S/1201 and 11/1201. Each individual component satisfies the applicable material requirements contained in 2BVS-950."

"Out of sequence application or failure to use both surfacers in small areas, although not recommended, does not present a technical problem when the above is considered."

Following the meeting of February 20, the position taken by SWEC was presented to our Consultant, KTA Associates, who advised that subject to acceptable test data, they considered this to be an acceptable position.

Further confirmation of the engineering position has been received by the issuance of engineering instructions via Engineering and Design Coordination Reports (E&DCR) 2PS-3334 and 3334A to be incorporated in Specification 2BVS-950A. This instruction allows the re-application of the coating system around repaired pilot holes, full diameter drilled-in anchor holes and minor paint spalling around an installed anchor to be recoated using the NUTEC 1201 topcoat only.

Thus, based on the acceptable review of test data by the NRC, it is considered that we have no significant safety problem as related to the allegation. In view of this, it is recommended that a sample program is not required to establish whether the misapplication condition exists.

Although the evidence received from engineering presents no technical problem, the incident described, if substantiated, would indicate a lack of discipline and control relative to supervision and craftsman employed in the coating activities. Discussions were held with SWEC Construction Management personnel on this matter, resulting in a letter being transmitted to the coating contractor re-emphasizing construction responsibilities regardless of whether the activity was subject to QC inspection or not. (2BVSW-22317L dated 3/26/84 reference.)

Quality Control Inspector Activities (Items c, d and e)

All QC inspectors certified for the inspection of the NUTEC Painting System in the reactor containment were interviewed in private. Prior to the interview, they were advised that their names would be included in this report, but remarks would not be directly attributed to an individual.

For information, the DLC-SQC organization is made up of personnel from many companies and linked together under a common training and certification program with common inspection plans and reports.

For the coating QC inspection activities, the personnel are obtained from KTA Associates; that company being well-known in the coating field, supplying both personnel and consultant functions to the BV #2 project. The personnel interviewed were as follows--

Names withheld for confidential reasons

Nine (9) inspectors interviewed

QC Preliminary Interview Questions

The thrust of these questions was to establish a confidence level with the QC inspector. The questions included the following--

a. Why was the WFT of a greater importance when painting concrete than painting metal surfaces?

b. What was the requirement for inspection frequency with WFT gages?

c. Why was a white plastic WFT gage used for 11S and 11 and a metal permanent type WFT gage used for 1201?

d. The WFT requirements for 11S, 11 and 1201.

e. How was the WFT for 1201 established when the requirements are given as Dry Film Thickness (DFT)?

The above questions were answered satisfactorily.

QC Primary Interview Questions

The thrust of these questions was to establish the facts relative to the allegations described on Page 1, Items c, d and e. The questions and subsequent discussion were expanded dependent upon the initial response given.

a. How do you take your WFT reading when for reasons such as a loaded stage, restricted corner area or limited scaffolding makes it impossible for you to reach the area of concern?

b. Have you asked the painters for their readings during the intervals between the formal specification reading requirements?

c. Do you witness repairs and patches on small holes?

d. Have you any quality concerns overall, reference the coatings in the reactor containment.

e. Have you ever used the painters readings, verbally given to you, to include in your QC documentation?

Supplementary Question

This question is not directly related to the subject, but in view of the opportunity, all QC inspectors were asked.

Have you in the course of your duties ever felt threatened, coerced or in any way been given the impression that you should accept some condition that in your view was unacceptable and thus gave you cause for concern?

Quality Control Primary Interview Responses

a. Three (3) of the nine (9) QC inspectors advised that they had never been in a position where they could not, themselves, insert the gage and take the reading.

The remaining six (6) QC inspectors gave consistent answers of how they achieve the required readings when the conditions, as described, occurred. They all stated that they handed their gage to the craftsmen with a request for him to insert the gage, in their view, and then they took the reading from that gage. Several of the QC inspectors added that for them to interrupt the process under the conditions described could be adverse to quality as it would interrupt the continual process. In their view, their approach was sensible and did not interrupt such things as pot life and squeegee process.

b. All QC inspectors stated that they continually asked the craftsmen for their readings for comparison purposes with their specified required readings. They considered it standard practice and would investigate measurements if an adverse trend of readings was received from the craftsmen.

c. Not all QC inspectors were involved with the repair process, but those who were advised that they performed their inspection on such repairs. They would not guarantee that they had inspected all of them; it being dependent upon them being informed by the appropriate Craft supervisor or observing that such repairs were occurring.

d. No QC inspector had concerns of the finished quality of the coating in the reactor containment, however, four (4) QC inspectors considered that the craftsmen should be more knowledgeable of their requirements; advising that work had been offered to them but did not meet the requirements and, in consequence, had to be rectified. One (1) QC inspector advised of an occasional language problem with reference to communication with some of the craftsmen indicating, however, that the problems were always resolved.

e. All QC inspectors stated that they did record such readings given to them by the craftsmen by various informal methods. However, in response to a direct question they all advised that they were prepared to testify to the effect that they had never used a craftsman's reading as a record on formal QC documentation.

Quality Control Supplementary Question Response

All QC inspectors advised that they have had remarks made to them by craftsmen in the course of their duties but considered them of no account. All advised that they never felt threatened in any way to accept unacceptable conditions. They also indicated that they felt confident in the support that they would receive from their supervisor or QC Management in the event that such an incident occurred.

No conclusions were drawn at this time, it was considered necessary to interview the craftsmen prior to any summation.

Craftsmens' Interviews

The allegation was believed to have been made by craftsmen who had apparently left the project some time ago. It was decided to interview a selection of craftsmen from those who had been on the site for two years or longer and were qualified to apply coatings to the concrete in the reactor containment. A list of craftsmen who fell into this category was supplied by SWEC Construction Management and consisted of 45 craftsmen. From these, 21 were interviewed from both the first and second shift current at the time of the interview.

During the preparation for the interview, SWEC Construction Management, Contractor's Management and the Union Steward requested to be present during the interview. It was agreed to have those representatives present except for questions (e), (f) and (g) and Supplementary question (a) shown on page nine (9). Similar to the interviews with the QC inspector, the craftsmen were advised that their names would be included in this report but remarks would not be directly attributable to a specific individual. They were advised that the emphasis was on the quality of the coating within the reactor building and not related to any individual's performance. They were also requested not to repeat the questions, to their colleagues on the basis that an individual's own opinion was wanted without prejudice from others. It appeared that this request was honored.

For information, craftsmen for the coating activities at the BV #2 project are supplied by the Stuart Painting Company.

The craft personnel interviewed were as follows--

Names withheld for confidential reasons

Twenty-one (21) craft personnel interviewed

The approximate experience quotient of the craftsmen is given as follows--

Total 340 years, average per man 16 years, of which 93 years, average per man 4½ years had been spent on nuclear coatings.

Craftsmens' Preliminary Interview Questions

a. Are you qualified to use the NUTEC System (11S, 11 and 1201) for painting concrete?

b. Have you painted the concrete using this system?

c. Have you used the wet film thickness gage?

Craftmens' Preliminary Interview Response

All craftsmen interviewed were qualified per question (a) however one, although qualified, had not used the system in the reactor building. As he gave negative responses to questions (f) and (g) shown on the following page, he was excluded from the remainder of the questioning. The remaining craftsmen gave affirmative answers to questions (b) and (c) shown above.

Craftsmens' Primary Interview Questions

a. Has a QC inspector asked you for your WFT gage readings?

b. Have you ever inserted a WFT gage for the QC inspector to read?

c. Have you given your readings to the QC inspector and observed him recording same on his QC documentation?

d. Have you ever performed an activity that required QC inspection and the inspection was not performed?

e. Are there any areas that you could recommend that we re-inspect paint thickness?*

f. Are there any areas that you consider have not been adequately painted or inspected?*

g. Any other quality concerns, for example, the NUTEC system being applied out of sequence or similar problems.*

Craftsmens' Supplementary Question

a. Are you aware of the DLC quality concerns "hot line" program where you can advise of quality concerns in a confidential manner?*

Craftsmens' Supplementary Question Response

The question was asked of 16 craftsmen, none of whom had knowledge of the program. This matter was brought to the attention of the DLC, QA Manager who has taken action to correct the condition on a site wide basis.

*Questions asked in private.

Craftsmens' Primary Interview Responses

a. All craftsmen interviewed (20) stated they were asked and gave their WFT readings to QC inspectors during activities.

   These answers confirms the QC inspectors answers to the effect this was considered standard practice.

b. Of the 20 craftsmen questioned eight (8) advised they could not recall or had not inserted WFT gages for the QC inspector to read. The remaining 12 gave affirmative answers.

   These answers confirms the QC inspectors answers to this question, some QC inspectors had requested the assistance, others had not.

c. Of the 20 craftsmen questioned five (5) stated they had not seen their WFT readings being recorded by the QC inspector. The remaining 15 stated they had seen the QC inspector recording their WFT readings, of this 15, 12 advised they had noticed the readings being written in field notebooks. The remaining three (3) did not know where the readings had been recorded.

   The use of field notebooks or other other informal devices confirms the QC inspectors' response on the subject. In no instance did a craftsmen state that he had seen readings being recorded by the QC inspector in anything but a field notebook, which is not a QC official documentation record.

d. Of the 20 craftsmen interviewed, 16 advised that the inspection was always performed, three (3) advised that it was after a delay and one (1) was not sure.

   Additional comments were made in response to the question. One (1) craftsman advising that on an occasion he had bypassed inspection and had to rectify all his work emphasizing that disciplinary action is taken against craftsmen who bypass QC inspection. Other comments indicated work was always double-checked by QC and similar observation. It should be further noted that two (2) of the craftsmen interviewed, who stated that their activities had always been checked by QC, were engaged in the repair of small holes, etc.

e. Fifteen (15) of the craftsmen questioned gave a definitive "no" to the question with reference to areas that would recommend to be re-inspected. The other craftsmen advised of problems that were corrected; one problem relating to thinner that failed the dolly test, the other being of more generic matter that was corrected.

One (1) other craftsman advised of the difficulties of obtaining the correct application in the very small clearances between pipe and hanger and also on the threaded portion of bolts. The first problem has been recognized, and the full system does not have to be applied. The second problem is known by management, and it appears to be a difficulty factor problem rather than a quality problem.

One (1) other craftsman considered there were problems in the application of the NUTEC System in the very early days, during approximately the first two or three months. This matter will be discussed in the conclusion.

One (1) other craftsman advised that on elevation 718 it had been extremely difficult to correctly apply the system behind certain restrictions, and this will be discussed in the conclusion.

f. All craftsmen interviewed considered that all areas had been adequately painted and inspected with the exception of those comments made to question (e).

g. This question is far ranging relating to any quality concerns, and 21 craftsmen were interviewed. Fifteen (15) of the craftsmen had no quality concerns and could not recall the NUTEC System being misapplied. The remaining six (6) craftsmen had concerns but none of them indicated that they had any knowledge of the NUTEC System being misapplied. They did, however, have the following concerns--

Two (2) considered that more training was necessary for the craftsmen, one emphasizing the need for more training for foremen.

One (1) advised of the difficulty of maintaining the coating thickness on the floors that had slight undulation characteristics. It was considered that this was more of a difficulty factor than an actual quality problem.

One (1) considered there was a minor matter related to surveyors mark.

Two (2) expressed concern with reference to concrete preparation prior to applying the coating. One gave a general comment that in some instances the surfaces appeared smooth. The other being far more technically inclined, advised that our method of preparation requires the use of 80-grit sanding followed by wire brush and he required to know whether any testing of the system had used the same preparation. This matter will be discussed in the conclusion.

Conclusion

Misapplication of NUTEC System (a and b).

Subject to formal review of the supporting test data it is recommended that no further action is taken.

Quality control inspectors use readings given to them by craftsmen (c).

From the interview, it is clear that an observer could believe that readings were being used by QC for their official documentation if the observation was limited to conversation between inspectors and craftsmen in the field. However, it is considered that a satisfactory explanation has been given for this communication of craftsmens' readings to QC inspectors and no further action is recommended.

Quality control inspectors verifying coating systems on minor repairs (d).

It is considered that this has been substantiated and it further considered to be impractical to require every minor repair to be subject to 100% verification by the QC forces. Evidence that QC has been involved in the requirements for minor repairs is available but again this would not demonstrate 100% verification.

Quality control inspectors verifying coating systems, if considered inaccessible (e).

The consistent answers to how QC inspectors overcame the difficulties of taking WFT readings in inaccessible areas is found to be convincing. In addition, although not recorded in detail in the report the craftsmen interviewed constantly emphasized, sometimes in a complaining manner, how they were controlled by QC. At no time during the interview with craftsmen was the impression given that QC inspectors would not inspect the work as required, and this finding is considered unsubstantiated. It is known that QC does not inspect all paint surfaces and, in consequence, certain areas were not inspected, but this is not considered to be related to inaccessibility.

General

From the craft interview the following appears to be worthy of further investigation--

a. The quality of the NUTEC System applied during the first few months of its application on the site. It is recommended that when the areas are established with Construction Management samples are taken for both--

   1. Adhesive quality
   2. Coating thickness requirements

b. A review of the concrete painted surfaces of elevation 718 should be performed and from that review those areas considered inaccessible or difficult should be sample inspected, similarly as discussed in (a).

c. The engineers should be requested to re-review the test data and compare it with the specified concrete surface preparation requirements and make a report on their evaluation of these documents.

d. Approximately 50% of the inspectors interviewed and 10% of the craftsmen interviewed emphasized the need for more training of crafts and foremen. Construction Management should be instructed to review their training methods, by interview if necessary, to establish whether any further training of craft and foremen in coating requirements is needed.

R. Coupland, Director, QC, BV2

ATTACHMENT B

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PROTECTIVE COATINGS (PAINT) CONSULTANTS: Testing • Instruments • Inspection • Analytical Laboratory

July 27, 1984

Mr. Reginald Coupland
Duquesne Light Company
Beaver Valley Station
Site QC
c/o Stone & Webster Engrg. Corp.
P. O. Box 186
Shippingport, PA 15077

SUBJECT: Evaluation of Coatings Previously Applied to Concrete and Steel Surfaces Within Primary Containment--Beaver Valley Power Station--Unit II--Shippingport, PA

Dear Mr. Coupland:

In accordance with Duquesne Light Company's recent request, KTA-Tator, Inc. conducted an evaluation of the coatings previously applied to various concrete and steel surfaces within the primary containment of Beaver Valley Power Station Unit II. Field testing began June 4, 1984 and was completed June 18, 1984. The testing involved adhesion testing and dry film thickness measurements of the concrete coatings applied to the exterior crane wall, crane wall columns, interior/exterior core wall, and the underside of the instrumentation room slab. Testing of steel coatings was restricted to the liner plates at 710' EL.

The exterior crane wall was the first area to be tested. Originally, a sample frequency of three adhesion tests per every 100 square feet was used. However, on June 7, 1984, KTA, Mr. Walton--Nuclear Regulatory Commission (NRC) Site Representative, and Mr. Morgan--Duquesne Light Company (DLC) Representative agreed that the frequency was too great and should be reduced to one adhesion test every 300 square feet.

Sample frequency for all other surfaces was provided by Mr. Walton and was as follows:

Crane Wall Columns -- two adhesion test dollies per every other column
Core Wall -- six dollies on the interior, and six on the exterior
Underside of Instrumentation Room Slab -- six dollies
Steel Liner Plate -- one dolly approximately every 20° AZ.

CONCRETE

The coating system applied to all concrete surfaces is manufactured by Imperial Professional Coatings, New Orleans, Louisiana. The system consists of Nutec 11S and 11 surfacers finish coated with Reactic 1201.

Coating chips were forcibly removed from each sample area for thickness determinations at the KTA laboratory using an Olympus Inverted Stage Metallurgical Microscope with graduated eyepiece. Difficulty was encountered distinguishing the difference between the 11S and 11 surfacers because they are both sand-filled materials of the same color. Therefore, total surfacer thickness was recorded.

The specification (2BVS-950-A) requires that only enough surfacer to fill voids, cover depressions, and provide a relatively uniform surface for topcoating is necessary. In addition, total surfacer thickness shall be limited to 55.0 mils. The topcoat is to be applied to achieve a dry film thickness from 3.0 mils to 12.0 mils.

The jobsite specification does not address adhesion testing of concrete; therefore, the minimum 200 psi value referenced in ANSI N5.12 was implemented by Mr. Walton. Additionally, all parties agreed that values less than 200 psi would be acceptable if a concrete failure occurred. Any values less than 200 psi exhibiting a glue or coating failure would be retested.

Exterior Crane Wall

A total of eighty-nine initial adhesion tests were performed on the exterior crane wall. Seventy-six resulted in a range of 91 psi to 1,000 psi averaging 476 psi. Only two dollies exhibited values less than 200 psi; one at 91 psi and one at 196 psi. Both were considered acceptable due to concrete failures. Dollies revealing glue/coating failures with values less than 200 psi were retested (three dollies per sample area) and retests ranged 307 psi to 823 psi.

Coating thickness of the surfacers ranged 7.6 mils to 49.7 mils, averaging 27.3 mils. The finish coat thicknesses ranged 2.2 mils to 13.8 mils, averaging 6.5 mils. 1201 thicknesses less than the specified minimum (3.0 mils) and greater than the specified maximum (12.0 mils) were limited to only two sample areas.

Crane Wall Columns

Twenty-three initial adhesion tests were conducted on seven of the fourteen columns. Seventeen of these tests were considered acceptable, achieving a range of 182 psi to 866 psi, averaging 421 psi. The one value of 182 psi was acceptable as it was a concrete failure. Two of the twenty-three required retesting, and the retests were 468 psi and 540 psi.

The surfacer thickness ranged 6.1 mils to 38.2 mils, averaging 23.0 mils. The finish coat ranged 3.0 mils to 11.4 mils, averaging 7.0 mils.

Interior Core Wall

Six adhesion tests were performed, all of which were acceptable, revealing a range of 362 psi to 764 psi, averaging 596 psi. Therefore, no retesting was required.

Surfacer thickness was found to range 30.6 mils to 42.0 mils, with an average of 35.7 mils. Finish coat ranged 5.3 mils to 11.4 mils, averaging 7.3 mils.

Exterior Core Wall

All six of the adhesion tests performed were acceptable, exhibiting a range of 362 psi to 764 psi, averaging 596 psi.

Surfacer thickness ranged 10.7 mils to 26.8 mils, averaging 17.0 mils. The finish coat thickness range was 5.3 mils to 9.9 mils, with an average of 7.1 mils.

Underside of Instrumentation Room Slab

A total of thirteen initial adhesion tests were conducted, with twelve achieving a range of 182 psi to 764 psi, averaging 667 psi. Two tests registered 102 psi. One was acceptable as it exhibited a concrete failure; the other was a glue failure. When retested, the average obtained was 498 psi.

Thickness of the surfacer ranged 5.3 mils to 19.1 mils, averaging 12.2 mils. Finish coat thickness ranged 3.8 mils to 8.4 mils, averaging 6.3 mils.

STEEL

The coating system applied to steel substrates is manufactured by Carboline Company, St. Louis, Missouri. The system consists of Carbo Zinc 11 and 191HB. All of the surfaces were primed with the Carbo Zinc 11, but only one sample area was finish coated with 191HB at the time of testing.

Dry film thickness measurements were determined using a Mark II Tooke Gage provided by Duquesne Light Company Site Quality Control (DLC-SQC). Thickness determinations were made within each of the eighteen sample areas of the liner plate at 710' EL every 20^{o} AZ.

The specification requires the Carbo Zinc 11 and 191HB to be applied to a dry film thickness of 2.0 mils to 5.0 mils and 4.0 mils to 6.0 mils, respectively.

Elcometer adhesion testing was also conducted within each sample area in accordance with the specification requirements. The specification requires a minimum of 200 psi, and if any value exhibits less than 200 psi, retesting is required. The sample area retested must indicate an average of 250 psi to be considered acceptable.

Liner Plate

Eighteen initial adhesion tests were performed, and fifteen were found to acceptable with a range of 272 psi to 1,000 psi. Three were less than 200 psi, and when retested were found acceptable with averages of 286 psi, 286 psi, and 346 psi.

The Carbo Zinc 11 primer thickness ranged 2.0 mils to 5.0 mils, averaging 2.9 mils. One sample area was finished coated with 191HB and revealed a dry film thickness of 4.5 mils.

CONCLUSION

The concrete finish coat (Reactic 1201) was found to be outside the specified range in two cases. However, the minimum and maximum thicknesses were violated by only 0.8 mils and 1.8 mils, respectively. The surfacers never exceeded the specified maximum thickness of 55.0 mils. Furthermore, the adhesion tests revealed satisfactory results, in every case exhibiting concrete failures and/or coating adhesion values exceeding 200 psi.

The coating thicknesses measured on the steel surfaces in every case were within the specified range. In addition, fifteen of the eighteen initial adhesion tests exceeded the minimum 200 psi required by the specification. The remaining three were retested and the retest averages ranged 286 psi to 346 psi, in compliance with the specification.

Based upon these findings, it is recommended that the coatings be considered acceptable.

If you have any questions or comments, please do not hesitate to contact this office.

Very truly yours,

KTA-TATOR, INC.

Joseph F. Padavich

JFP:pc

Attachments

COATING EVALUATION PROCEDURE
BEAVER VALLEY POWER STATION -- UNIT II

1.0 Scope

This procedure includes instructions for the evaluation of coatings previously applied to various concrete formed surfaces (A) and sections of the steel liner plate (B) within the primary containment of Beaver Valley Power Station (BVPS) Unit II--Shippingport, Pennsylvania.

2.0 General

2.1 The coating system for concrete surfaces covered by this procedure is manufactured by Imperial Professional Coatings of New Orleans, Louisiana. The coating system consists of Nutec 11S/11 surfacers, and Reactic 1201 epoxy finish coat.

2.2 The coating system for steel surfaces is manufactured by Carboline Company, St. Louis, Missouri. The coating system consists of Carbo Zinc 11 primer and 191HB epoxy finish coat.

2.3 The tests within this procedure include Elcometer adhesion testing of concrete formed surfaces and the steel liner plate as directed by the United States Nuclear Regulatory Commission (USNRC) Site Representative and Duquesne Light Company (DLC). Film thickness measurements of concrete surfaces will be determined by obtaining samples (chips) from each sample area and measured at the KTA laboratory using an Olympus Inverted Stage Metallurgical Microscope and graduated eyepiece. Film thickness measurements of the steel liner shall be determined by the Tooke Gage.

2.4 Instruments to be used at the site will be provided by Duquesne Light Company/Site Quality Control (DLC/SQC).

2.5 Sample frequency and test locations shall be as instructed by the Site Resident NRC Official and DLC.

2.6 The results of all testing shall be recorded on the attached report forms (KTA-C and KTA-S) and subsequently turned over the DLC.

A. CONCRETE

3.0 Tensile Adhesion Testing

3.1 Determine the tensile adhesion strength of the coating at each test location using an Elcometer Adhesion Tester. Adhere and pull the dollies in accordance with Section 10.0 of this procedure for the use of the Elcometer Adhesion Tester.

3.2 Record the instrument reading, true ps. from the calibration curve, and a brief description of the type of failure. Record the percentage of each type of failure caused by the dolly and the specific coat of the system which is involved. Descriptions of the types of failure follow:

3.2.1 Adhesion--This is a failure where a clean break occurs between coats. An adhesion failure occurs if the Reactic 1201 breaks cleanly from the Nutec 11, the 11 breaks cleanly from the 11S, or the 11S breaks cleanly from the concrete surface. It is possible that a portion of the dolly will show this type of adhesion failure when the remainder may show a failure in the concrete or a cohesive failure and so forth.

3.2.2 Cohesion--This type of failure occurs when a specific coat is pulled apart within itself. In this case some of the coating will remain on the dolly while the rest is left on the surface. Cohesion type failure can occur within the surfacers, or within the Reactic 1201. Again, it is possible that a percentage of the dolly face will exhibit a cohesion type failure while the remainder will show a concrete failure or adhesion failure and so forth.

3.3.3 Concrete Failure--A failure of the concrete substrate can occur in two different forms. In one case, a very thin smooth film of concrete or a thin speckled pattern of the concrete will remain on the dolly. This type of failure is generally due to the disbonding of a layer of laitance and should be reported as "concrete-surface layer" failure. The second type of failure involves a large portion of the concrete attached to the dolly as much as 1/8" or more in thickness. Report this as a "concrete failure".

3.2.4 Epoxy Adhesive--Record this when the epoxy adhesive used to adhere the dollies fails.

4.0 Acceptance Criteria

4.1 Categorize the quality of the coating system in each test area according to the results of the adhesion tests. The categories and additional testing required under each are described below.

4.2 Acceptable

The system within the test area is considered acceptable if the test results are equivalent to:

Elcometer Adhesion Tester - 200 psig or greater, or dolly surface reveals a concrete failure (regardless of psi obtained).

If this is achieved, no further testing within the area is necessary.

4.3 Retest

The system within the test area is considered uncertain if:

Elcometer Adhesion Tester - less than 200 psig, and dolly surface does not reveal a concrete failure.

If this occurs, additional testing within the area is necessary. Attach three additional dollies. If the average adhesive strength is less than 250 psi, the system is considered unacceptable.

Note: Individual values less than 200 psi are only acceptable if the surface of the dolly reveals a concrete failure.

If directed by DLC, return to unacceptable areas and run additional tests to determine the boundaries of the poor coating.

5.0 Thickness

5.1 Remove a chip from each location, break in half to provide a "smooth" cross-section, and place between stage clips on top of microscope with the edge to be measured facing downward.

5.2 Turn power source switch to "ON". This will light the source lamp and pilot lamp.

5.3 Adjust brightness by turning the voltage control handle.

5.4 Remove the two eyepieces and replace with the two labeled W20XHE-14mm. One will have the reticle graduated in divisions.

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5.5 Select one of the objectives (M-5, M-10, or M-40) and focus the instrument (Section 5.9) by first lowering the stage all the way down by operating the coarse adjustment handle.

5.6 Look through the eyepiece and slowly raise the stage by using the coarse adjustment handle (rough adjustment of the focus has been obtained with the coarse adjustment marking lines on the right side have been matched).

5.7 Rotate the nosepiece to put a desired objective in place and make an accurate adjustment of focus by turning the fine adjustment handle.

5.8 After all adjustments have been performed, measure each individual coat for thickness and record on the attached report form (KTA-C).

5.9 Use the following table to determine film thickness:

Eyepiece	Objective	Power	1 Division =
20X	5X (M-5)	100	.7648 mils
20X	10X (M-10)	200	.3889 mils
20X	40X (M-40)	800	.096774 mils

5.10 To meet specification requirements, the coating system must comply with the following thickness ranges:

Nutec 11S/11 - 13-55 mils
Reactic 1201 - 3-12 mils

B. STEEL

6.0 Tensile Adhesion Testing

6.1 Determine the tensile adhesion strength of the coating at each test location using an Elcometer Adhesion Tester. Adhere and pull the dollies in accordance with Section 10.0 of this procedure for the use of the Elcometer Adhesion Tester. Adhere one dolly every 20° AZ at 710' EL as directed by the NRC.

6.2 Record the instrument reading, true psi from the calibration curve, and a brief description of the type of failure. Record the percentage of each type of failure caused by the dolly and the specific coat of the system which is involved. Descriptions of the types of failure follow:

6.2.1 Adhesion--This is a failure where a clean break occurs between coats. An adhesion failure occurs if the 191HB breaks cleanly from the Carbo Zinc 11 or the Carbo Zinc 11 breaks cleanly from the substrate. It is possible that a portion of the dolly will show this type of adhesion failure when the remainder may show a cohesive failure.

6.2.2 Cohesion--This type of failure occurs when a specific coat is pulled apart within itself. In this case some of the coating will remain on the dolly while the rest is left on the surface. Cohesion type failure can occur within the 191HB or within the Carbo Zinc 11. Again, it is possible that a percentage of the dolly face will exhibit a cohesion type failure while the remainder will show an adhesion failure.

6.2.3 Epoxy Adhesive--Record this when the epoxy adhesive used to adhere the dollies fails.

7.0 Acceptance Criteria

7.1 Categorize the quality of the coating system in each test area according to the results of the adhesion tests, and record all results. Determine compliance with 2BVS-950-A as outlined in 7.2 and 7.3. The categories and additional testing required under each are described below.

7.2 Acceptable

The system within the test area is considered acceptable if the test results are equivalent to:

Elcometer Adhesion Tester - 200 psi or greater.

If this is achieved, no further testing within the area is necessary.

7.3 Retest

The system within the test area is considered uncertain if:

Elcometer Adhesion Tester - less than 200 psig.

If less than 200 psig is achieved, additional testing within the area is necessary. Attach three additional dollies. If the average adhesive strength is less than 250 psi, the system is considered unacceptable.

If directed by DLC, return to unacceptable areas and run additional tests to determine the boundaries of the poor coating.

8.0 Thickness Measurements

8.1 Measure the coating thickness within each sample area using a Mark II Tooke Gage in accordance with Section 9.0.

C. INSTRUMENT USE

9.0 Use of the Mark II Tooke Gage

9.1 The optical dry film thickness gage utilizes a 50X illuminated microscope in conjunction with a microscopic incision made through the coating. This provides for the direct observation of a cross-section of the coating to determine thickness.

9.2 Make a reference benchmark on the coating surface with the marker supplied in the instrument or a pencil.

9.3 Make an incision with one of the cutting tips through the coating in the location of the benchmark down to the substrate. Pull toward you when making a cut and always let the studs lead the cutting tip. The tip with the least angle is 10X and is suitable for thicknesses up to 3 mils. The tip with the greatest angle is 1X and is used for coatings from 20-50 mils. The tip in between is 2X and is used for coating thicknesses from 3-20 mils. It is important to remember which tip is used.

9.4 View the incision through the microscope. Coating will be visible on both sides of the substrate. One side will appear to have a smoother edge at the benchmark than the other. Evaluate only the smoother side of the coating.

9.5 Line up the reticle of the microscope across the incision and count the number of divisions of the coating from the substrate/primer interface outward to the benchmark. Each division is equivalent to 1 mil if the 1X tip is used; 1/2 mil if the 2X tip is used; and 1/10 mil if the 10X tip is used.

9.6 The thickness reading is the approximate average of readings obtained across the length of the scribe.

9.7 The thickness of individual coats in a multi-coat system can be determined by the same method.

10.0 Use of the Elcometer Adhesion Tester

10.1 The adhesion tester is used to evaluate the tensile adhesion strength of applied coatings.

10.2 Roughen the base of the test dolly by blast cleaning or sanding.

10.3 Clean the surface to be tested.

10.4 Thoroughly mix the epoxy adhesive and apply a thin film to the dolly.

10.5 Firmly press the dolly to the surface and twist 1/2 turn to assure total contact.

10.6 Tape the dolly if necessary to hold it in place.

10.7 After the epoxy adhesive has dried, score around the perimeter of the dolly through the coating down to the substrate. Use a knife, 1" hole saw, or special dolly cutter for this purpose.

10.8 Turn the handwheel of the instrument counterclockwise to lower the instrument claw.

10.9 Slide the claw under the lip of the dolly and straighten the legs of the instrument so that they are in total contact with and perpendicular to the surface.

10.10 Slide the pin on the scale of the instrument barrel to zero (0).

10.11 Slowly and uniformly turn the handwheel of the instrument clockwise to apply increasing tensile force to the dolly.

10.12 After the dolly disbonds from the surface, read the pressure from the instrument scale. The pressure is represented by the number corresponding with the bottom of the pin. Use the calibration chart to translate this number to true psig.

D. DOCUMENTATION

11.0 Preparation of the Inspection Report Form

11.1 Scope

This section covers the requirements for completion of the form (KTA-C) used to record the results of the concrete coating adhesion and thickness tests.

11.2 Report KTA-C (Concrete)

11.2.1 ADHESION TESTER--Record instrument serial number(s).

11.2.2 PAGE ____ OF ____--Record page number and total number of pages.

11.2.3 NO.--Record number/letter designation of dolly.

11.2.4 LOCATION--Record the specific location of the tests.

11.2.5 THICKNESS--Record the thickness of the 11S/11 and 1201.

11.2.6 ELCOMETER ADHESION TEST--Record the instrument reading, true psi from the calibration curve, and type/percentage of failure.

11.2.7 COMMENTS--Record any comments deemed necessary.

11.2.8 NOTES--Record any additional information (if required).

11.2.9 Sign and date the form.

12.0 Preparation of Inspection Report Form

12.1 This section covers the requirement for completion of the form (KTA-S) used to record results of steel liner coating adhesion and thickness tests.

12.2 Report KTA-S (Steel)

12.2.1 TOOKE GAGE--Record instrument serial number.

12.2.2 ADH. TEST.--Record instrument serial number.

12.2.3 NO.--Record number/letter dolly number.

12.2.4 LOCATION--Record specific location of the tests.

12.2.5 THICKNESS--Record the thickness of the CZ11/191HB with the appropriate columns.

12.2.6 ELCOMETER ADHESION TESTER RESULTS--Record the instrument reading, true psi from the calibration curve, and type/percentage of failure.

12.2.7 COMMENTS--Record any additional comments.

12.2.8 PAGE ____ OF ____--Record page number and total number of pages.

12.2.9 Sign and date the report.

Instrument DLC/SQC SN

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

FORM KTA-C

Adhesion Tester 106/1 - B13-2525 used for Dolly #1
106/2 - B13-1168=*
106/2 - B13-1167=**

Coating System Imperial Nutec 11S, 11, and Reactic 1201

Date July 16

No.	Location		Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Com
1	Exterior Crane Wall	741' EL 283° AZ	30.6	7.6	4.0	376	40%	SL 35%	S 10%		15%		
2**	Same	745' EL 288° AZ	7.6	3.8	2.0	196	10%	50%	S 40%				
3*	Same	743' EL 294° AZ	26.8	6.1	6.0	560		100%					
4*	Same	758' EL 285° AZ	38.2	4.6	4.0	362	85%				15%		
5	Same	758' EL 287° AZ	45.9	7.6	Pulled Concrete			SL 80%	S 20%				Broke ing S
6*	Same	761' EL 294° AZ	40.5	3.8	2.0	182	90%				10%		Retes Requi
6A*	Same	Same			6.0	560	25%	SL 15%		50%	10%		
6B*	Same	Same			7.0	662	20%	SL 20%		5%	55%		
6C*	Same	Same			6.0	560	75%	SL 10%		15%			
7*	Same	764' EL 280° AZ	34.4	3.1	4.0	362		90%	S 10%				
8*	Same	764' EL 286° AZ	35.9	6.1	9.0	904		100%					
9*	Same	764' EL 294° AZ	26.8	3.8	9.0	904		100%					
10*	Same	756' EL 297° AZ	15.3	5.4	7.0	662		100%					
11*	Same	757' EL 313° AZ	19.0	7.6	8.0	764		SL 95%		5%			
12*	Same	756' EL 319° AZ	15.3	9.1	4.0	362	5%	SL 95%					
13*	Same	757' EL 321° AZ	19.9	8.4	4.0	362	30%				70%		
14*	Same	757' EL 327° AZ	16.8	6.1	4.0	362		SL 90%	S 10%				
15*	Same	756' EL 334° AZ	20.6	6.1	9.4	1000	5%	90%			5%		
16*	Same	755' EL 309° AZ	19.1	4.6	8.0	764	40%	SL 60%					
17*	Same	752' EL 312° AZ	42.1	3.8	4.0	362		SL 10%		90%			

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacers

SIGNATURE Joseph F. Podsiadlo

Instrument DLC/SQC SN

Adhesion Tester
B13-1168=*
B13-1167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

Coating System Imperial Nutec 11S, 11, and Reactic 1201

FORM KTA-C

Page 2 of

Date JULY 1

NO.	Location	Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Com
18*	Exterior Crane Wall (Con't) 752'EL 319°AZ	34.4	3.8	6.0	560		SL 70%		30%			
19*	Same 749'EL 321°AZ	20.6	6.1	4.0	362	60%	SL 30%		10%			
20*	Same 753'EL 329°AZ	30.5	7.6	5.0	461	20%			50%	30%		
21*	Same 752'EL 334°AZ	30.6	9.1	5.0	461		SL 100%					
22*	Same 742'EL 180°AZ	26.8	5.3	5.0	461		100%					
23*	Same 745'EL 184°AZ	30.5	4.6	8.0	765		85%	S 15%				
24*	Same 742'EL 189°AZ	34.4	6.1	3.0	272	90%			5%	5%		
25*	Same 744'EL 192°AZ	38.2	6.8	8.0	764	100%						
26*	Same 740'EL 200°AZ	22.9	6.8	7.0	662	30%	SL 70%					
27*	Same 741'EL 204°AZ	32.1	7.6	4.0	362	85%			10%	5%		
28*	Same 741'EL 209°AZ	42	7.6	4.0	362	95%				5%		
29*	Does Not Exist											
30*	Same 742'EL 218°AZ	19.8	6.1	4.0	362	25%	60%	S 10%		5%		
31*	Same 740'EL 220°AZ	15.2	5.3	4.0	362	95%				5%		
32*	Same 745'EL 222°AZ	22.9	7.6	3.0	272	95%				5%		
33*	Same 742'EL 160°AZ	22.9	7.6	7.0	662	100%						
34*	Same 743'EL 161°AZ	26.8	6.9	2.0	182	100%						Retes Requi
34A	Dolly broke off while removing tape. Dolly pulled concrete.			—	—		60%		40%			
34B*	Same as Above			4.0	362		85%	S 15%				
34C*	Same as Above			6.0	560	20%	SL 10%	S 50%	20%			

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacers

SIGNATURE Joseph F. Podrasnik

Instrument DLC/SQC SN

Adhesion Tester
B13-1168=*
B13-1167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

Coating System Imperial Nutec 11S, 11, and Reactic 1201

FORM KTA-C

Date JULY

NO.	Location		Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test: Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Co
35*	Exterior Crane Wall (Con't)	740' EL 165° AZ	21.4	6.1	2.0	182	95%				5%		Rete Requ
35A*	Same	Same			4.0	362		SL 50%		50%			
35B*	Same	Same			3.0	272	30%	SL 50%		20%			
35C*	Same	Same			4.0	362		100%					
36*	Same	743' EL 171° AZ	32.1	5.3	3.0	272	100%						
37*	Same	742' EL 174° AZ	26.8	11.5	6.0	560	20%	55%		25%			
38*	Same	743' EL 177° AZ	27.5	5.3	4.0	362	100%						
39*	Same	750' EL 160° AZ	42.0	3.8	3.0	272		75%		25%			
40*	Same	750' EL 165° AZ	49.7	4.6	6.0	560	75%	S 20%			5%		
41*	Same	749' EL 173° AZ	13.8	9.1	6.0	560	25%	50%	S 25%				
42*	Same	754' EL 175° AZ	19.1	8.4	5.0	461	85%			15%			
43*	Same	754' EL 178° AZ	23.0	6.9	4.0	362	65%	SL 10%	S 5%	20%			
44*	Same	754' EL 183° AZ	29.1	7.6	6.0	560		50%		50%			
45*	Same	752' EL 187° AZ	34.4	8.4	6.0	560		100%					
46*	Same	751' EL 191° AZ	36.0	11.4	3.0	272		SL 75%	S 5%				
47*	Same	757' EL 171° AZ	30.6	11.4	4.0	362		S 85%		15%			
48*	Same	757' EL 179° AZ	19.1	9.1	4.0	362		100%					
49*	Same	757' EL 191° AZ	38.2	9.1	5.0	461	100%						
50*	Same	757' EL 196° AZ	23.0	7.6	4.0	362	100%						
51*	Same	757' EL 201° AZ	36.0	9.1	6.0	560	100%						

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacer

SIGNATURE Joseph F. Pachuck

Instrument DLC/SQC SN

Adhesion Tester
B13-1168=*
B13-1167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

FORM KTA-C

Coating System Imperial Nutec 11S, 11, and Reactic 1201

Date July 12

No.	Location		Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Co
52*	Exterior Crane Wall (Con't)	757'EL 210°AZ	13.8	11.4	6.0	560	95%				5%		
53*	Same	757'EL 217°AZ	45.9	7.6	4.0	362	50%			10%	40%		
54*	Same	757'EL 223°AZ	36.0	13.8	5.0	461		70%		20%	10%		
55*	Same	758'EL 165°AZ	42.0	6.1	2.0	182	85%				15%		Rete Requ
55A*	Same	Same			6.0	560		100%					
55B*	Same	Same			8.0	764	80%				20%		
55C*	Same	Same			5.0	461	5%	SL 90%		5%			
57*	Same	734'EL 357°AZ	19.1	7.6	4.0	362	20%	SL 40%		40%			
58*	Same	737'EL 345°AZ	23.0	3.8	4.0	362	85%	SL 15%					
59*	Same	730'EL 329°AZ	19.1	5.3	2.0	182		90%		10%			Rete Requ
59A*	Same	Same			3.0	272	20%	SL 80%					
59B*	Same	Same			6.0	560		SL 100%					
59C*	Same	Same			4.0	362	40%	SL 30%	S 15%		15%		
60*	Same	734'EL 323°AZ	30.6	6.1	4.0	362	70%	SL 30%					
61*	Same	737'EL 310°AZ	30.6	3.8	4.0	362	100%						
62*	Same	730'EL 301°AZ	20.6	6.1	2.0	182	100%						Rete Requ
62A*	Same	Same			6.0	560		100%					
62B*	Same	Same			3.0	272		100%					
62C*	Same	Same			4.0	362		100%					
63*	Same	732'EL 290°AZ	42.0	5.3	1.0	—	100%						Rete Requ

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacer
56 Does Not Exist

SIGNATURE Joseph T. Padavich

Instrument DLC/SOC SN

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

FORM KTA-C

Adhesion Tester
B13-1168=*
B13-1167=**

Coating System Imperial Nutec 11S, 11, and Reactic 1201

Date JULY

No.	Location	Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test: Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Co
63A*	Exterior Crane Wall (Con't) 732' EL 290° AZ			9.0	904	60%	SL 20%			20%		
63B*	Same Same			6.0	506	60%			35%	5%		
63C*	Same Same			3.0	272	80%			10%	10%		
64*	Same 735' EL 285° AZ	45.9	3.8	5.0	461	100%						
65*	Same 730' EL 282° AZ	9.1	11.4	4.0	362	85%	S 15%					
66*	Same 734' EL 12° AZ	34.4	4.6	8.0	764	90%			10%			
67*	Same 730' EL 20° AZ	26.8	7.6	6.0	560	80%				20%		
68*	Same 731' EL 30° AZ	23.0	9.1	4.0	362	100%						
69*	Same 730' EL 38° AZ	20.6	4.6	2.0	182	95%				5%		Ret Req
69A*	Same Same			3.0	272	95%				5%		
69B*	Same Same			9.0	904		90%	S 10%				
69C*	Same Same			6.0	560		100%					
70*	Same 730' EL 50° AZ	34.4	3.8	4.0	362	95%				5%		
71*	Same 734' EL 60° AZ	34.4	6.1	4.0	362	95%				5%		
72*	Same 730' EL 68° AZ	19.1	7.6	5.0	461	55%	SL 25%		10%	10%		
73*	Same 735' EL 80° AZ	19.1	6.1	6.0	560		95%			5%		
74*	Same 730' EL 90° AZ	31.0	4.6	3.0	272	90%				10%		
75*	Same 730' EL 97° AZ	23.0	11.4	4.0	362	100%						
76*	Same 731' EL 108° AZ	26.8	6.1	3.0	272	95%			5%			
77*	Same 738' EL 120° AZ	26.8	7.6	6.0	560	15%	60%			25%		

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacers

SIGNATURE Joseph F. Padarick

Instrument DLC/SQC SN

Adhesion Tester
B13-1168=*
B13--167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

Coating System Imperial Nutec 11S, 11, and Reactic 1201

FORM KTA-C

Page 6 of

Date JUNE 1

No.	Location	Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test: Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Co
78*	Exterior Crane Wall (Con't) 729'EL 130°AZ	29.0	2.2	5.0	461	100%						
79*	Same 731'EL 138°AZ	30.6	5.3	7.0	662	95%				5%		
81*	Same 730'EL 162°AZ	24.4	7.6	5.0	461		90%	S 10%				
82*	Same 732'EL 173°AZ	30.6	7.6	7.0	662	65%	SL 15%		5%	15%		
83*	Same 738'EL 180°AZ	19.9	6.1	8.0	764		100%					
84*	Same 728'EL 188°AZ	24.4	5.3	4.0	362		100%					
85*	Same 731'EL 199°AZ	28.2	8.4	8.0	764		100%					
86*	Same 764'EL	26.8	7.6	8.0	764		100%					
	Crane Wall Columns											
87A*	Exterior Face Column #4 - 697'EL	24.4	3.8	3.0	272	85%			10%	5%		
87B*	Same as Above - 696'EL	24.4	3.8	3.0	272	10%	80%		10%			
88A*	Interior Face Column #4 - 697'EL	20.6	11.4	2.0	182	90%			5%	5%		Ret Req
88B*	Same as Above - 696'EL	20.6	11.4	1.0	—	75%	SL 10%		15%			Ret Req
** 88Aa	Interior Face Column #4 - 697'EL Retest			5.0	469		100%					
** 88Ba	Same as Above			9.0	866	65%	SL 25%			10%		
** 88Ca	Same as Above			3.0	286		100%					
** 88Ab	Same as Above			4.0	376		100%					
** 88Bb	Same as Above			4.0	376		100%					
** 88Cb	Same as Above			7.0	651		75%		25%			

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacers
80 Does Not Exist

SIGNATURE Joseph T. Padavich

Instrument DLC/SQC SN

Adhesion Tester B13-1168=*
B13-1167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

Coating System Imperial Nutec 11S, 11, and Reactic 1201

FORM KTA-C

Page 7 of
Date [illegible]

No.	Location	Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test: Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Comm
90*	Columns Con't. Interior Face #6 - 697'EL	15.2	7.6	4.0	362	85%	SL 10%	S 5%				
121*	Same as Above Exterior Face 705'EL	15.2	3.0	8.0	764	50%	SL 40%		10%			
92*	Column #8 Interior Face - 697'EL	16.8	5.3	5.0	461	70%	30%					
117*	Same as Above Exterior Face - 705'EL	19.1	9.1	3.0	272	85%			15%			
113*	Column #10 Interior Face - 705'EL	28.2	9.1	2.0	182	60%	SL 15%		20%	5%		Pull Concr
93*	Same as Above Exterior Face - 697'EL	34.4	6.1	3.0	272	60%		S 25%	15%			
110*	Column #12 Interior Face - 706'EL	24.4	4.6	4.0	362	80%			20%			
95*	Same as Above Exterior Face - 696'EL	38.2	5.3	8.0	764	40%	SL 60%					
98*	Column #14 Interior Face - 697'EL	6.1	9.1	4.0	362	50%	SL 50%					
105*	Same as Above Exterior Face - 707'EL	30.6	6.1	7.0	662	65%			20%	15%		
100*	Column #2 Interior Face - 698'EL	19.1	9.1	7.0	662	90%				10%		
101*	Same as Above Exterior Face - 706'EL	28.2	9.1	3.0	272		80%		20%			
129**	Interior Core Wall 699'EL 300°AZ	34.4	7.6	7.0	651		SL 15%		10%	75%		
130**	Interior Core Wall 699'EL 240°AZ	34.4	5.3	5.0	469	40%	30%		15%	10%		
131**	Interior Core Wall 699'EL 180°AZ	42.0	6.1	9.0	866		SL 25%	S 65%	10%			
132**	Interior Core Wall 699'EL 120°AZ	30.6	6.1	4.0	376	90%				10%		
133**	Interior Core Wall 699'EL 85°AZ	38.2	11.4	5.0	469		85%		15%			
134**	Interior Core Wall 699'EL 50°AZ	34.4	7.6	4.0	376		80%		20%			
126**	Column #4 Interior Face - 705'EL	22.9	9.1	4.0	376	25%	50%		20%	5%		

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacers.
89, 91, 94, 96, 97, 99, 102, 103, 104, 116, 118, 119.

SIGNATURE Joseph F. Padanick

Instrument DLC/SQC SN

Adhesion Tester
B13-1168=*
B13-1167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

Coating System Imperial Nutec 11S, 11, and Reactic 1201

FORM KTA-

Date 1/31

No.	Location	Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test: Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	
135*	Exterior Core Wall 709'EL 0°AZ	11.4	5.3	8.0	764	20%	70%		10%			
136*	Same 698'EL 300°AZ	26.8	7.6	8.0	764		85%		15%			
137*	Same 698'EL 240°AZ	19.1	8.4	4.0	362	50%	SL 15%		10%	25%		
138*	Same 698'EL 180°AZ	10.7	9.9	8.0	764	50%	SL 10%		5%	35%		
139*	Same 695'EL 125°AZ	22.9	6.1	4.0	362	15%			70%	15%		
140*	Same 695'EL 60°AZ	11.4	5.3	6.0	560	70%	SL 15%		5%	10%		
141*	Underside of Inst. Room Slab 705'EL 26°-341°AZ	9.1	3.8	2.0	182	---	85%		15%			P C
142*	Same	15.2	7.6	5.0	461	30%	50%		20%			
143*	Same	15.2	6.1	3.0	272		100%					
144*	Same	5.3	7.6	3.0	272	85%	SL 10%		5%			
145*	Same	13.0	5.3	2.0	182	100%						R R
145A**	Same			8.0	740	100%						
145B**	Same			5.0	469	85%			10%	5%		
145C**	Same			3.0	286	100%						
146*	Same	11.4	7.6	6.0	560		100%					
147*	Same	7.6	7.6	3.0	272	85%	SL 5%		5%	5%		
148*	Same	13.0	4.6	6.0	560	100%						
149*	Same	9.7	7.6	7.0	662	65%	SL 25%		10%			
150*	Same	11.4	3.8	5.0	461	5%	80%		15%			
152*	Same	12.2	8.4	3.0	272	10%	75%		10%	5%		

NOTES: SL = Surface Layer
151 - Extra dolly applied to underside of slab — not needed — knocked off

SIGNATURE Joseph F. Podanick

Instrument DLC/SQC SN

Adhesion Tester
B13-1168=*
B13-1167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

Coating System Imperial Nutec 11S, 11, and Reactic 1201

FORM KTA-C

Page 9 of
Date JULY

No.	Location	Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Co
154*	Inst. Room Slab Ceiling (Con't)	16.8	5.3	4.0	362		90%		10%			
155*	Same	19.1	7.6	8.0	764		100%					
159*	Interior of Crane Wall 772'EL 90°AZ	19.1	5.3	Broke Off		100%						Rete Requ
59A*	Same Same			7.0	662		100%					
159B*	Same Same			9.0	904		90%		10%			
159C*	Same Same			9.0	904		100%					
160*	Same 772'EL 210°AZ	19.1	3.8	1.0	—	15%	75%		10%			Pul Con
161*	Same 772'EL 330°AZ	19.1	6.1	2.0	182	95%		5%				Rete Requ
161A*	Same Same			2.0	182	40%	SL 10%	S 30%	%	15%		Pul Con
161B*	Same Same			4.0	362		80%	S 15%	5%			
161C*	Same Same			7.0	662	5%		S 85%		10%		
162*	Same 722'EL 0°AZ	45.9	5.3	1.0	182	50%		50%				Rete Requ
162A*	Same Same			8.0	764		60%	40%				
** 162B	Same Same			3.0	286		SL 15%	35%	50%			
** 162C	Same Same			5.0	469		90%	10%				
163*	Same 723'EL 120°AZ	22.9	3.8	Redo		100%						Bro
** 163	Same Same			3.0	286	15%	60%		25%			
164	Same 723'EL 240°AZ	9.7	7.6	2.0	182	90%			10%			Rete Requ
** 164A	Same Same			5.0	469		SL 95%	S 5%				
** 164B	Same Same			5.0	469	25%	75%					

NOTES: SL = Surface Layer
S = Break Occurred Between Coats of Surfacer
153, 156, 157, 158 were extras applied to underside of

SIGNATURE Joseph F. Padavick

Instrument DLC/SQC SN

Adhesion Tester
B13-1168=*
B13-1167=**

CONCRETE COATING EVALUATION
BEAVER VALLEY POWER STATION UNIT II

FORM KTA-C

Coating System Imperial Nutec 11S, 11, and Reactic 1201

Page 10 o

Date July

.	Location	Thickness 11S & 11	Thickness 1201	Elcometer Adhesion Test Instr. Reading	PSI	Glue	Conc.	11S/11 Adh.	11S/11 Coh.	1201 Coh.	1201 Adh.	Co
** 164C	Exterior of Crane Wall 723' 240°..2			3.0	286	40%	60%					

NOTES: _____

SIGNATURE Joseph F. Padanek

Instrument DLC/SQC SN:

Tooke Gage

Adh. Test. 106/2 - B13-1168=*
106/2 - B13-1167=**

STEEL COATING EVALUATION

BEAVER VALLEY POWER STATION
UNIT II

Coating System Carbo Zinc 11 and 191HB

FORM KTA-S

Date(s) July 17, 1984

No.	Location		Thickness		Elcometer Adh. Tester Results					Comments
			CZ-11	191HB	Instr. Reading	PSI	Glue	Zinc	191HB	
170**	Steel Plate Liner 710'EL	220°AZ	2.0 mils	N/A	3.0	286	25%	75%*	N/A	*Cohesive
171**	Same	240°AZ	2.5 mils	N/A	3.0	286	40%	60%	N/A	*Cohesive
172**	Same	200°AZ	5.0 mils	4.5 mils	9.7	1000	N/A	100%*	N/A	*Cohesive
173**	Same	180°AZ	3.0 mils	N/A	4.0	376	20%	80%*	N/A	*Cohesive
174**	Same	160°AZ	2.0 mils	N/A	4.0	376	25%	75%*	N/A	*Cohesive
175**	Same	140°AZ	2.5 mils	N/A	6.0	562	5%	95%*	N/A	*Cohesive
176**	Same	120°AZ	2.5 mils	N/A	4.0	376	40%	60%*	N/A	*Cohesive
177**	Same	100°AZ	4.0 mils	N/A	2.0	196	50%	50%*	N/A	*Cohesive
177A**	Same	100°AZ	N/A	N/A	3.0	286	5%	95%*	N/A	Retest * Cohesive
177B**	Same	100°AZ	N/A	N/A	3.0	286	40%	60%*	N/A	Retest * Cohesive
177C**	Same	100°AZ	N/A	N/A	3.0	286	40%	60%*	N/A	Retest * Cohesive
178**	Same	80°AZ	2.5 mils	N/A	3.0	286	40%	60%	N/A	*Cohesive
179**	Same	60°AZ	2.0 mils	N/A	3.0	286	75%	25%*	N/A	*Cohesive
180**	Same	40°AZ	2.5 mils	N/A	2.0	196	25%	75%*	N/A	*Cohesive
180A**	Same	40°AZ	N/A	N/A	4.0	376	5%	95%*	N/A	Retest * Cohesive

SIGNATURE Joseph F. Podawiltz

Instrument DLC/SQC SN:

Tooke Gage

Adh. Test. 106/2 - B13-1168=*
106/2 - B13-1167=**

STEEL COATING EVALUATION

BEAVER VALLEY POWER STATION
UNIT II

Coating System Carbo Zinc 11 and 191HB

FORM KTA-S

Date(s) July 12, 19

No.	Location	Thickness		Elcometer Adh. Tester Results					Comments
		CZ-11	191HB	Instr. Reading	PSI	Glue	Zinc	191HB	
180B**	Steel Plate Liner 710'EL (Con't) 40°AZ	N/A	N/A	3.0	286	N/A	100%*	N/A	180 Retest Achieve an Average of
180C**	Same 40°AZ	N/A	N/A	2.0	196	N/A	100%*	N/A	286 psi *Cohesive
181**	Same 20°AZ	3.0 mils	N/A	3.0	286	15%	85%*	N/A	*Cohesive
182**	Same N ℄	3.0 mils	N/A	5.0	469	40%	60%*	N/A	*Cohesive
183**	Same 340°AZ	3.0 mils	N/A	3.0	286	30%	70%*	N/A	*Cohesive
184*	Same 320°AZ	3.0 mils	N/A	3.0	272	20%	80%*	N/A	*Cohesive
185*	Same 300°AZ	5.0 mils	N/A	3.0	272	50%	50%*	N/A	*Cohesive
186**	Same 280°AZ	3.0 mils	N/A	2.0	196	3%	97%*	N/A	*Cohesive
186A**	Same 280°AZ	N/A	N/A	4.0	376	5%	95%*	N/A	Retest * Cohesive
186B**	Same 280°AZ	N/A	N/A	4.0	376	3%	97%*	N/A	Retest
186C**	Same 280°AZ	N/A	N/A	3.0	286	2%	98%*	N/A	Retest
187**	Same 260°AZ	2.5 mils	2.5 mils	3.0	286	N/A	100%*	N/A	*Cohesive

SIGNATURE Joseph F. Padovich