U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-254/84-06((DRS); 50-265/84-05(DRS)

Docket Nos. 50-254; 50-265 License Nos. DPR-29; DPR-30

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: Quad-Cities Station, Units 1 and 2

Inspection At: Quad-Cities Site, Cordova, IL

Inspection Conducted: April 18, May 3-4, 16-17, 24, June 6-7 and 29, 1984

Inspectors: D H Danielson for K. D. Ward — 7/12/84 Date

D H Danielson for D. E. Jones — 7/12/84 Date

Approved By: D H Danielson
D. H. Danielson, Chief
Materials and Processes Section — 7/12/84 Date

Inspection Summary

Inspection on April 18, May 3-4, 16-17, 24, June 6-7 and 29, 1984 (Report No. 50-254/84-06(DRS); 50-265/84-05(DRS))

Areas Inspected: Review of inservice inspection (ISI) activities; inspection and repair of stainless steel piping in the Unit 1 drywell; torus modification; IE Bulletins; jet pump instrument penetration activities. This inspection involved a total of 69 inspector-hours by two NRC inspectors including 11 inspector-hours during off-shifts.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

*G. Spedl, Technical Staff Supervisor
*C. Smith, QC Supervisor
*J. Wethington, QA Engineer
*H. Do, ISI Coordinator
N. Kalivianakis, Station Superintendent
L. Petri, Construction Superintendent
R. Bax, Assistant Superintendent of Maintenance
E. Potter, Chief, Level III, NDE Examiner
J. Ford, QC Inspector
D. Huizenga, QC Inspector
W. Witt, Level III, NDE

NUTECH Engineers, Inc.

D. Pitcairn, Engineer Director

Lambert, MacGill & Thomas, Inc. (LMT)

D. Harvey, NDE Level III

Universal Testing Laboratories, Inc. (UTL)

A. Cella, Technical Director

Morrison Construction Company (MCCo)

W. Flesch, QC Supervisor

Hartford Steam Boiler Inspection and Insurance Company

F. Roose, ANII

The inspector also contacted and interviewed other licensee and contractor employees.

*Denotes those present at the final exit interview June 29, 1984.

2. Licensee Action on IE Bulletins

(Closed) IE Bulletin 82-03 and Revision 1 (254/82-03-BB; 254/82-03-1B; 265/82-03-BB; 265/82-03-1B): Stress corrosion cracking in thick wall, large diameter, stainless steel, recirculation system piping at BWR plants. The inspector reviewed the final response for Unit 1 dated December 1, 1982, and the final response for Unit 2 dated January 27, 1984. The inspector followed the activities and considers the bulletin closed. (Ref. NRC report 254/82-19; 265/82-22)

(Closed) IE Bulletin 83-02 (265/83-02-BB): Stress corrosion cracking large diameter stainless steel recirculation system piping. The inspector reviewed the final response dated January 27, 1984, followed the activities and considers the bulletin closed. (Ref. NRC report No. 265/83-23)

(Open) IE Bulletin 83-02 (254/83-02-BB): Stress corrosion cracking large diameter stainless steel recirculation system piping. See Paragraph 3 below.

3. <u>Followup on LER 84-005</u>

A plan for inspection and repair of stainless steel piping in the Unit 1 drywell during the refueling outage started March 6, 1984.

The NDE contracts that performed ultrasonics (UT) were Lambert, MacGill and Thomas (LMT) and Universal Testing Laboratories (UTL) - Kraft Werke Union (KWU). The Level II and III ultrasonic examination (UT) personnel performing evaluations of crack indications were qualified at the EPRI NDE Center by successfully performing the practical (IE Bulletin 83-02) examination. Level I and II UT personnel performing scanning duties were trained by the contractor on site. Results of the contractor examinations were reviewed by CECo and the inspector and found to be acceptable. CECo personnel were qualified by the practical (IE Bulletin 83-02) examination at the NDE Center, Charlotte, North Carolina.

A class was held to instruct the Level I UT examiners scheduled to work on the Unit I stainless piping examinations in the techniques of scanning and measurement required to accurately locate IGSCC indications. (This class was observed by the NRC inspector when this Bulletin was being worked for Unit 2.) The eight hour class included lecture and performance practice sessions. The performance practice session was examining samples as directed by a Level II examiner. The Level I, in voice communication with the Level II observing the tester, scanned the part and made the measurements necessary for the Level II examiner to evaluate its condition. Two Nine Mile Point pipe segments containing IGSCC were scanned in the performance training. Each sample was scanned by a Level III prior to the training and areas containing recordable indications noted. Each team was required to scan the samples as defined in procedure NDT-C-2, Rev. 13. The Level I and II jointly prepared the examination report. The sessions and the data reports were reviewed to assure that the Level I's would perform scanning and measuring operations as required by the procedure.

Supplemental equipment and techniques were used to some extent to assist in the final resolution of indications. These include the EPRI developed ALN 4000 processing system for characterization of indications and the KWU creeping wave technique for discrimination of indications.

The decon of the reactor water cleanup system, recirculation suction and discharge of the pump ring head, cross ties and risers to the thermal sleeves was performed by London Nuclear Personnel who have performed the same decontamination at Vermont Yankee, Nine Mile Point, Brunswick 2 and other sites.

CAN-DECON (TRADEMARK) is a dilute, regenerative, chemical decontamination process for cleaning the interior surfaces of pipes and components of nuclear reactor systems. A small amount of a solid proprietary reagent, typically 0.1 percent by weight, is added directly to the water in the system to be decontaminated. The chemicals dissolve and are circulated through the system, attacking the oxide deposits and releasing contamination from the surfaces. Once the contaminants are in the liquid, they are removed from the system by purification. Dissolved metals, such as iron, nickel, and cobalt are removed by cation exchange resin. In addition to removing the dissolved metals, the cation resin performs another important function: conversion of the spent contaminated solution into a clean re-useable form. This is regeneration. The regenerated solution is recirculated to the system, to be used over and over again as long as contaminants are still being removed. The decontamination is terminated by valving out the cation resin and valving in a mixed-bed column. The anion part of the resin removes the chemical reagents themselves and the cation part removes any remaining dissolved metals. At the end of the process, only demineralized water remains in the system; therefore, it can be immediately returned to normal operation. The inspector reviewed flow diagrams of the equipment, the purchase order and work request.

NUTECH Engineers, Inc. (NUTECH) performed Induction-Heating-Stress-Improvement (IHSI) for the licensee on a total of 88 welds. Of the 88 IHSI-treated welds, 17 were UT inspected prior to IHSI. Ultrasonic examinations were performed on a sampling of weld joints in the recirculation system prior to the IHSI treatment. UT inspection was performed on each weld after IHSI. There was a significant difference in some of the UT results before and after IHSI. Some welds that did not leak before IHSI leaked after IHSI. (Ref. Table I attached)

IHSI is defined as the practice of heating the outer surface of a pipe by induction techniques, while simultaneously water cooling the inner surface. The objective of this process is to relieve the inner surface of tensile residual stress in the vicinity of the weld and heat affected zone. It is applicable to joints which have been in BWR service, as well as joints which have not been in service.

For flaws that were treated by IHSI, a crack growth analysis was performed assuming twice the measured flaw depth and a post-IHSI residual stress pattern.

NUTECH performed flaw evaluations on one defective weld #02BS59 for the licensee to determine whether overlay repair was needed or not. The evaluations were based on the methodology provided in the new ASME Code Section XI, IWB-3600. The new IWB-3600 provides flaw acceptance criteria for the austenitic stainless steel piping based on a limit load approach which was approved by the ASME Main Committee in May 1983 and was published in Winter 1983 Addenda. The results of NUTECH's flaw evaluations, including crack growth calculations, indicated that the defective weld did not require weld overlay repair because the calculated flaw sizes of the weld at the end of an 18-month period did not exceed the staff's criteria of two-thirds of the new Code allowable limits. In NUTECH's calculations, the cracks in each weld were essentially arrested by the surrounding compressive residual stresses induced by the IHSI treatment.

NUTECH performed weld overlay design for the licensee. Sixteen defective welds were weld overlay repaired. The overlay thickness was designed to meet the new IWB-3600 limits based on an assumed crack depth which is two times the reported maximum crack depth. The length of the overlay was selected to reinforce the weld structure and minimize the end effects.

The licensee calculated the shrinkage stresses based on the conservatively assumed axial shrinkages resulting from weld overlay.

The repairs met the requirements of the ASME Code, Section XI, 1980 Edition with Addenda through Winter 1980. In addition, guidance was taken from the current Edition of Section XI including the recently approved Subarticle IWB-3640.

As allowed by ASME Section XI, repairs were performed in accordance with the original Code of Construction and Design Specification referenced in Section 3, except as modified in Section 5, Repair Requirements.

The companies performing the welding were GE, GAPCo, and Schneider Power Corp.

The welding filler metal used was Type E308L-16 for repairs and type ER308L for weld overlays.

The design of the weld overlay was to the original design margins using the Net Section Collapse methodology of Section XI, Subarticle IWB-3640.

Physical dimensions of the weld overlay were based on the flaw sizing and were shown on design drawings for each of the individual weld joint configurations.

All welding was performed in accordance with welding procedure specifications written and qualified in accordance with ASME Section IX. The inspector observed some of this welding.

All welders were qualified in accordance with ASME Section IX, the latest addition of the Code.

The repair was exempt from postweld heat treatment.

The preparation, application, and examination of the weld overlay were described in the Station Traveler and procedures for the work.

Each overlay was examined by the liquid penetrant (PT) method in accordance with the latest revision of CECo Procedure NDT-D. PT was extended to include base metal within one inch of each end of the overlay.

An ultrasonic examination was performed in accordance with Commonwealth Edison Procedures to establish the soundness of the weld overlay and its fusion to the base metal.

Ultrasonic examinations were performed in accordance with the latest revision of Commonwealth Edison Procedures written for ultrasonic examination of weld overlays.

A hydro will be performed in the areas that were repaired/overlaid.

Code symbol stamping of the repairs was not required by ASME Section XI.

Metallurgical sampling removed the crack indications from a 28" recirculation outlet weld and the two locations were repaired with half couplings.

All repair work was performed in accordance with CECo's Quality Assurance Program. Design was in accordance with the NUTECH Quality Assurance Program.

O'Donnell & Associates invented and carried out the conceptual development of Pipelock OPL-1 for safeguarding butt welds subjected to IGSCC in BWR piping systems. CECo wished to determine the feasibility of potential future use of Pipelocks on weld #02MS3.

O'Donnell & Associates states that the Pipelock is a positive mechanical lock capable of retaining the pipe ends on both sides of the butt welds even when the cracks penetrate through the entire wall of the pipe around the entire circumference. This resolves the safety issue by providing defense-in-depth. In addition to providing positive mechanical protection against pipe breaks, pretightening of the Pipelock bolts produces axial and circumferential compressive stresses in the pipe wall at the weldment, thus retarding or eliminating crack growth during subsequent operation, and controlling leaks.

The Pipelock consists of mating wedge-shaped inner locking rings and intermediate wedge rings. The inner locking rings clamp the pipe by wedge action and are held in place on the pipes on either side of the welded joint by shear rings even in the absence of friction. Locking rings are also designed to protect pipe against excessive radial compression. The shear rings are positioned in circular grooves that are machined on the corresponding inside and outside surfaces of the rings and pipes, respectively. The rings are held firmly from both sides by the intermediate wedge rings that are tightened together by nuts and bolts.

Sperical washers or nuts with spherical bottom surfaces are used to provide the proper bearing surfaces and to ensure that the Pipelock bolts are not subjected to bending. To avoid any possibility of the nuts becoming loose, they are provided with locking devices. Contact between the inner and intermediate rings occurs on a conical surface. All of these wedge-shaped rings and the shear rings are split so that they may be assembled around the pipes. The necessary radial constraint is provided by the outer closure rings which also secure the Pipelock assembly in place. Closure of the outer rings is provided by threaded keys.

With a fully cracked weldment, the axial motion of the pipes moving apart locks the entrapped wedges preventing the ends from separating.

The following are the functions of the pipelock:

- Pipelocks provide positive mechanical protection against separation of the pipe-ends in the case of crack extension through the entire cross-section of the welded joint.

- Pipelocks can be applied for the joints between straight pipes or for the joints between the pipes and pipe fittings.

- Pipelocks are designed for installation on the existing piping systems; their rings are split to enable assembly.

- Pipelocks are assembled without welding.

- Pipelocks can be disassembled to enable inspection of the welds.

- Pipelocks can be installed on pipes with or without weld overlay.

- Prestraining of Pipelocks during assembly generates residual compressive stresses at weld location, therefore reducing or eliminating growth of stress corrosion cracks.

In the next outage the results of the pipelock will be evaluated on weld #02MS3 to determine if it is feasible to use the pipelock again.

The following records were reviewed by the inspector including radiographs of the original welds:

- Certified material test reports (CMTRs) for the filler material.

- Welding procedure specifications and qualification records including General Welding Procedure.

- Records of welder and welding operator qualifications.

- Nondestructive examination procedures and personnel qualifications.

- Nondestructive examination reports.

- Section XI repair program.

- Certified design report for repair.

- Weld overlay data sheets.

- Code data report form.

- Welding Operator Log Sheet.

- Station Work Request.

- Maintenance Modification Approved Sheet.

- Station Traveler.
- Calibration records for certified measuring instruments.
- Final documentation checklist.

In summary, during the current outage, a total of 128 austenitic stainless steel welds were ultrasonically examined. In addition, 88 welds were treated with IHSI. The UT results based on combined LMT and UTL examinations indicated that 16 welds showed linear crack indications and all of these welds were weld overlay repaired. Metallurgical sampling removed the crack indications from one weld and the two locations were repaired with half couplings. One weld was evaluated by NUTECH and determined to use as is.

LMT was contracted by the licensee to perform the ultrasonic examinations during the inspection using commercial instrumentation and techniques that have been used at other plant sites. Examinations were performed at relatively high ultrasonic sensitivity to permit the discrimination of IGSCC from inherent geometric conditions. The welds were examined with 0° longitudinal wave and 45° shear wave techniques. To evaluate the nature of ultrasonic indications in certain welds, supplemental 60° shear wave examinations were performed. Flaw dimensions were reported in a conservative manner by determining the overall length and maximum depth of the suspected IGSCC and attributing the maximum reported depth to the entire measured length. The licensee made repair decisions based on the LMT results for axially-oriented IGSCC, i.e., flaws transverse to the weld centerline. However, the licensee believed that the characterization on some welds of the circumferentially-oriented IGSCC was overly conservative and contracted with UTL to repeat the examination of 9 welds in regions of the maximum reported depth using a different ultrasonic technique. The UTL procedure used a 30° shear wave and its associated 70° longitudinal wave component. The 30° shear wave undergoes a mode conversion at the inner surface of the pipe that propagates as a longitudinal wave at a shallow angle along the inside surface of the pipe. Experienced NDE personnel identify cracks by the intersection and reinforcement of the two longitudinal waves and other parameters. The UTL procedure was developed based on a concern about interpreting flaws from geometric or metallurgical conditions, i.e., innocuous reflectors from the weld root or fusion line, when using conventional 45° shear wave techniques at the high ultrasonic sensitivities required for the detection of IGSCC. The ultrasonic transducers used by UTL are commercially available. Although the UTL procedure was designed to be less influenced by innocuous geometric and metallurgical conditions than the combined 45° and 60° shear wave examination, the UTL procedure might be less sensitive for detecting shallow IGSCC adjacent to the weld root if the ID contour near the weld root is irregular, the weld crown is wide, or a component permits only one-side access.

CECo used UTL for supplemental examinations to make a decision concerning known ultrasonic reflectors reported by LMT. The licensee used the LMT results to make a decision concerning axial IGSCC. The technical problems with interpreting deep axial flaws is less difficult because reflections from the weld root and metallurgical conditions are less of an influencing factor. However, all axial IGSCC that may exist in welds might not be detected for reasons such as scanning limitations from the outside contour of the weld or the axial flaw is too short or shallow for discrimination.

Review of Procedures

The inspector reviewed the following procedures:

- CECo, Ultrasonic Inspection of Pipe Welds, NDT-C-2, Revision 13.
- UTL, Ultrasonic Inspection of Stainless Pipe for Intergranulate Stress Corrosion Cracking Procedure #UTL-AUT-01, Revision 1.
- UTL, Training and Qualifications of NDE Personnel #UTL-QA-00, Revision 8.
- UTL, Sizing Procedure of Intergranular Stress Corrosion Cracking, UTS-1, Rev. 0.
- NUTECH, Induction Heating Stress Improvement, XCE-11-203, Rev. 0.
- LN, Project Operating Procedures, 09-005.

Observation of Personnel, Material and Equipment Certifications, Data Reports and Audits

The inspector observed the work and had discussions with personnel during review of the IGSCC activities. These observations included calibration, performance of the ultrasonic examinations, and the documentation.

The inspector reviewed documents relative to the following items:

- Ultrasonic instruments, calibration blocks, transducers and UT couplant certifications.
- NDE personnel certifications in accordance with SNT-TC-1A.
- Data reports including strip charts of scans.
- Audits and surveillances.

CECo will submit the final response in the near future, and Region III will evaluate their response at that time.

No items of noncompliance or deviations were identified.

4. Inservice Inspection

   a. General

   CECo and LMT performed the ISI in accordance with ASME Section XI, 1974 Edition, Summer 1975 Addenda.

b. Program and Procedures

The inspector reviewed the following procedures:

- CECo Magnetic Particle Examination, NDT-B-1, Rev. 2.
- CECo, Ultrasonic Inspection of Pipe Welds, NDT-C-2, Revision 13.
- CECo, Ultrasonic Inspection of the Inner Radius of the Nozzle to Vessel Junction, NDT-C-10, Revision 8.
- CECo, Ultrasonic Inspection of Pressure Retaining Bolting Two Inches or Greater in Diameter, NDT-C-14, Revision 7.
- CECo, Ultrasonic Examination of Reactor Vessel Welds to NRC Regulatory Guide 1.150 for Boiling Water Reactors, NDT-C-30-80, Revision 0.
- CECo Beam Spread and Refracted Angle Determination of NRC Regulatory Guide 1.150 for BWRs, NDE-C-31-80, Rev. 0.
- CECo, Ultrasonic Examination of Weld Buildup, NDT-C-33, Rev. 0.
- CECo, Liquid Penetrant Examination, NDT-D-2, Revision 5.
- CECo, Visual Examination, Welds, Pressure Retaining Bolting and Component Internals, VT-1-1, Revision 0.
- CECo, Visual Examination, System Hydrostatic and Leak Tests, VT-2-1, Revision 0.
- CECo, Visual Examination, Component Supports, VT-3-1, Revision 0.

c. Observation of Personnel, Material and Equipment Certifications, Data Reports and Audits

The inspector observed the work and had discussions with personnel during review of the ISI activities. These observations included calibration, performance of the ultrasonic examinations, and the documentation.

The inspector reviewed documents relative to the following items:

- Ultrasonic instruments, calibration blocks, transducers and UT couplant certifications.
- NDE personnel certifications in accordance with SNT-TC-1A.
- Data reports including strip charts of scans.
- Audits and surveillances.

No items of noncompliance or deviations were identified.

5. Torus Modification

a. General

References:

- Region III Report Nos. 50-254/79-19; 50-265/79-16 Modification.
- Region III Report Nos. 50-254/79-29; 50-265/79-26.
- Region III Report Nos. 50-254/80-03; 50-265/80-05 Modification.
- Region III Report No. 50-254/80-15; 50-265/80-18.
- Region III Report No. 50-254/80-23; 50-265/80-25.
- Region III Report No. 50-254/82-19; 50-265/82-22.
- Region III Report No. 50-254/83-24; 50-265/83-23.

Unit 1 modification was completed this outage.

The inspector reviewed the following documents:

- MCCO, Quality Assurance Manual, Controlled Copy No. 517.
- MCCO, Procedure, Qualification and Certification of Quality Control Personnel, PQC-3, Rev. 4.
- MCCO, Qualification of Welders, QSPC-4, Rev. 1.
- MCCO, Torus Coating, QSPC-38, Rev. 6.

b. Personnel, Material, and Equipment Certifications Review of Audits and Data Reports

The inspector reviewed the following:

- Magnetic particle materials and equipment.
- NDE personnel certifications in accordance with SNT-TC-1A, 1975 Edition.
- Welder certifications in accordance with ASME Section IX, 1980 Edition, Summer 1983 Addenda.
- CECo QA Surveillances.
- MCCo QA Audits.
- Welding and data reports.

No items of noncompliance or deviations were identified.

6. Jet Pump Instrument Penetration Material Certification and Ultrasonic Examinations, Unit I

CECo requested from GE material information concerning Quad Cities jet pump instrument penetrations and associated vessel safe ends June 19, 1984.

GE stated that the safe ends for the jet pump instrumentation nozzle replacements were purchased on PO 205-A-991 and were shipped on 5/13/70. The vendor was Coulter Steel (Forging Supplier). Neither General Electric nor Coulter has the Material Certifications on file. Coulter disposed of all records after a ten year retention period.

The jet pump instrumentation penetration seals drawing #730E499 SN 11/12 were manufactured by Lamco Industries per GE PO #1563. Copies of material certifications and heat treat records provided by Lamco were reviewed by CECo and the NRC inspector and found to be acceptable. The materials were forgings.

The ten welds of the jet pump instrumentation penetrations, A and B loops, were UT'd by LMT and found to be acceptable. They were nozzles to safe end welds, safe end to reducer welds, reducer to reducer welds, reducer to pipe welds, and pipe to end cap welds.

No items of noncompliance or deviations were identified.

7. Exit Interview

The inspector met with site representatives (denoted in Persons Contacted paragraph) at the conclusion of the inspection. The inspection summarized the scope and findings of the inspection noted in this report.

DRAFT

TABLE I

WELD	SYSTEM	PIPE DIAMETER	CONFIGURATION	IHSI	UT'd	FLAW CHARACTERIZATION	FLAW DISPOSITION
02C-S4	RISER	12"	PIPE TO ELBOW (P-EL)	YES	AFTER 1HSI	44% X 4" CIRC - PIPE 3 AXIALS 1" MAX - PIPE	OVERLAY 0.195" x 4.0"
02D-S4	RISER	12"	P-EL	NO	BEFORE 1HSI	2 AXIALS 7/8" MAX - PIPE	OVERLAY 0.125" x 3.5"
02E-S4	RISER	12"	P-EL	YES	BEFORE & AFTER 1HSI	65% x 0.8" CIRC - PIPE 8 AXIALS 1.5" MAX - PIPE LEAK STARTED AFTER 1HSI	OVERLAY 0.195" x 4.0"
02F-S4	RISER	12"	P-EL	NO	BEFORE 1HSI	3 AXIALS 0.8" MAX - PIPE	OVERLAY 0.125" x 2.76"

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WELD	SYSTEM	PIPE DIAMETER	CONFIGURATION	IHSI	UT'd	FLAW CHARACTERIZATION	FLAW DISPOSITION
02G-S3	RISER	12"	ELBOW TO PIPE (EL-P)	YES	AFTER 1HSI	50% x 3/4" CIRC - PIPE 7 AXIALS 1 1/8" MAX - PIPE 1 AXIAL 7/8" MAX - ELBOW LEAK STARTED AFTER 1HSI	OVERLAY 0.195" x 4.0"
02G-S4	RISER	12"	P-EL	NO	BEFORE 1HSI	18% x 1" CIRC - ELBOW 1 AXIAL 1/8" CON'TD - ELBOW	OVERLAY 0.195" x 4.0"
02H-S3	RISER	12"	EL-P	YES	BEFORE & AFTER 1HSI	21% x 3" CIRC - PIPE 3 AXIALS 3/4" MAX - PIPE; LEAK STARTED AFTER 1HSI	OVERLAY 0.195" x 4.0"
02H-S4	RISER	12"	P-EL	YES	BEFORE & AFTER 1HSI	4 AXIALS 3/4" MAX - BOTH LEAK STARTED AFTER 1HSI	OVERLAY 0.125" x CROWN (C) + 2.0"

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WELD	SYSTEM	PIPE DIAMETER	CONFIGURATION	IHSI	UT'd	FLAW CHARACTERIZATION	FLAW DISPOSITION
02J-F6	RISER	12"	SWEEP-O-LET TO PIPE	NO	BEFORE 1HSI	4 AXIALS MIN 1 ¼" MAX - PIPE - LEAK STARTED AFTER 1HSI	OVERLAY 0.125 x C + 2.5"
02J-S3	RISER	12"	EL-P	YES	AFTER 1HSI	12% x 0.6" CIRC - PIPE 1 AXIAL ½" CON'TD - PIPE LEAK STARTED AFTER 1HSI	OVERLAY 0.195" x 4.0"
02J-S4	RISER	12"	P-EL	YES	AFTER 1HSI	6 CIRCS - 55% MAX x 13.25" TOTAL - PIPE LEAK STARTED AFTER 1HSI	OVERLAY 0.195" x 4.0"
02K-S3	RISER	12"	EL-P	YES	AFTER 1HSI	4 CIRCS - 25% MAX x 10.6" TOTAL - PIPE 5 AXIALS 5/8" MAX - PIPE LEAK STARTED AFTER 1HSI	OVERLAY 0.195" x 4.0"

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WELD	SYSTEM	PIPE DIAMETER	CONFIGURATION	IHSI	UT'd	FLAW CHARACTERIZATION	FLAW DISPOSITION
02K-S4	RISER	12"	P-EL	YES	AFTER 1HSI	2 AXIALS ¼" MAX - PIPE LEAK STARTED AFTER 1HSI	OVERLAY 0.125" x 3.2"
02M-S3	RISER	12"	EL-P	YES	AFTER 1HSI	3 AXIALS 1" MAX - PIPE	OVERLAY 0.125" x 3.81"
02B-S10	RINGLEADER	22"	PIPE TO CAP	YES	AFTER 1HSI	10% x 2" CIRC - CAP 3 AXIALS ½" MAX - CAP	OVERLAY 0.125" x 3.55"
02B-S7	RINGLEADER	22"	CROSS TO PIPE	YES	AFTER 1HSI	AXIAL FLAW IN HAZ-PIPE LEAK STARTED AFTER 1HSI	OVERLAY 0.125" x C + 0.75"
02BS-S12	OUTLETS	28"	EL-P	YES	AFTER 1HSI	2 AXIALS & CIRC.	REPAIRED WITH HALF COUPLINGS
02BS-S9	OUTLETS	28"	EL-P	YES	AFTER 1HSI	2 CIRC. 18% MAX. x 2" TOTAL - PIPE	LEAVE AS IS