STEAM GENERATOR TUBE INTEGRITY SAFETY ANALYSIS REPORT

FOR

TUBE SUPPORT PLATE INTERSECTIONS

PORTLAND GENERAL ELECTRIC COMPANY

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EXECUTIVE SUMMARY

This report contains a significant amount of detailed technical discussion. Therefore, for convenience, Portland General Electric Company (PGE) has provided in this executive summary, a brief discussion of critical points and conclusions that have been addressed in more detail in the body of the report. The organization of this Executive Summary is consistent with the structure of the full report. For a detailed discussion of the factors that support the PGE position, the full report should be reviewed.

INTRODUCTION AND PURPOSE

The purpose of this report is to demonstrate, based upon months of extensive examination, testing, and analysis, that reasonable assurance exists that the steam generator tubes left in service meet the applicable tube integrity requirements.

During the 1991 Refueling Outage at the Trojan Nuclear Plant (TNP), PGE conducted inservice inspection (ISI) of steam generator tubes using bobbin coil and motorized rotating pancake coil (MRPC) probes. Destructive examinations also were performed on eight tubes that previously had been removed from service.

Evaluations of MRPC probe results indicate that axially oriented intergranular stress corrosion cracking (IGSCC) microflaws were present on the outer diameter of tubes at the tube support plate (TSP) intersections. An inspection of the affected steam generator tube intersections with the TSPs was completed using the MRPC probe. Destructive examinations of some TSP intersections showed some intergranular attack (IGA). Tubes with defects were repaired by plugging or sleeving.

Outside diameter stress corrosion cracking/intergranular attack (ODSCC/IGA) microflaws meeting stringent repair criteria were left in service because they do not significantly affect tube structural integrity. This report provides the technical basis for concluding that the tubes remaining in service for Operating Cycle 14 meet applicable tube integrity requirements.

PGE has also prepared this report to address several reporting requirements in Trojan Technical Specifications (TTS) and in Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.83, "Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes", Revision 1, dated July 1975.

BACKGROUND

PGE conducted the first inservice inspection of the TNP steam generator tubes in 1975. In 1989, the first year that an MRPC probe was used to confirm bobbin coil probe possible indications (PIs), 199 tubes were identified as having ODSCC/IGA at TSP intersections. In 1990, 137 tubes were identified as having ODSCC/IGA at TSP intersections. These tubes were removed from service by plugging. Based in part on the number of ODSCC/IGA flaws discovered in 1989 and 1990, an extensive eddy current testing (ECT) program was planned for the 1991 Refueling Outage.

RESULTS OF INSPECTION

American Society of Mechanical Engineers (ASME) Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components" (1983 Edition through Summer 1983 Addenda), requires examination of steam generator tubes. This requirement is satisfied by using eddy current techniques described in ASME Section V, "Nondestructive Examination" (1983 Edition through Summer 1983 Addenda). Notwithstanding successful use of the bobbin coil probe in eddy current tests for identifying significant tube flaws, the MRPC probe has been shown to be more reliable at characterizing ODSCC/IGA. As such, MRPC probes are used at TNP to confirm PIs identified by a bobbin coil probe.

In addition to ECT of steam generator tubes in place, several tubes which (according to ECT readings) had flaws were pulled to determine burst strength and flaw characteristics. As a result of these tests, it was determined that bobbin coil probe data from all four steam generators should be re-examined to identify PIs with similar degradation. These and other analyses led to the conclusion that additional repairs were warranted. Also, additional conservatism was added to tube repair thresholds in that tubes which had ODSCC/IGA microflaws identified by bobbin coil probe PIs, with a voltage amplitude greater than or equal to 1.0 V (normalized to a 5 V standard on 20 percent through-wall hole per the ASME Code), and confirmed by MRPC probe results also were repaired.

EVALUATION OF PULLED TUBES

Eight steam generator tubes with TSP intersections were removed from Trojan Steam Generators C and D. With two exceptions, removed TSP intersections were burst/leak tested. In sum, it was determined that for tubes that have been in service: (1) various forms of intergranular corrosion morphology were observed - from IGA to IGSCC; (2) burst strengths are usually close to that of a nondegraded tube; (3) the number of axial flaws around the circumference of a tube varies considerably from one TSP intersection to another; (4) the variation in the number of flaws suggests that the chemical conditions for ODSCC/IGA may be localized in a relatively small circumferential arc of a TSP crevice, or may extend uniformly around the tube; (5) usually, the length of the intergranular burst flaw is less than the thickness of the TSP; and (6) burst tests demonstrate that notwithstanding tube ODSCC/IGA flaws, NRC RG 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes", dated August 1976, will still be satisfied since the burst pressure is greater than the maximum differential pressure for a steam line break (2,260 psi), and greater than three times differential pressure for normal operating conditions (4,275 psi).

ACCEPTABILITY OF TUBES REMAINING IN SERVICE

The inspection criteria that has been used during the 1991 Refueling Outage has the following critical elements: (1) 100 percent bobbin coil inspection of hot leg tubes from the hot leg tubesheet to the cold leg side seventh TSP intersection; (2) 100 percent MRPC inspection of hot leg TSP intersections up through the fifth TSP intersection and of bobbin coil probe PIs; and (3) MRPC inspection of a sample of hot leg sixth and seventh TSP intersections and of the hot leg sixth and seventh TSP intersections that had bobbin coil voltage readings of greater than 1.0 V (normalized to a 5 V standard).

The tube repair basis for the 1991 Refueling Outage had three phases. Revision 0 inspection criteria resulted in the repair of tubes that had bobbin coil probe PIs, which were confirmed by MRPC probe to have ODSCC/IGA. Revision 2 (finalization of Revision 1) inspection criteria resulted in the repair of tubes that had MRPC probe indications found during the 100 percent MRPC probe inspection of the first through the fifth TSP intersections, and a sampling of the sixth and seventh TSP intersections. Revision 3 inspection criteria resulted in the repair of tubes that have a bobbin coil probe signal amplitude greater than or equal to 1.0 V (normalized to a 5 V standard), and have been confirmed by MRPC probe to have ODSCC/IGA microflaws.

The tube repair bases were developed such that tubes at TNP that remained in service with ODSCC/IGA microflaws satisfy the tube integrity requirements of NRC RG 1.121. This approach considered other factors such as future degradation of the tube, ECT measurement uncertainty, and anticipated end of Operating Cycle (EOC) bobbin coil probe voltage. Furthermore, the projected increase in reactor coolant outlet temperature of 2.2°F, as a result of plugging the analyzed limit of 20 percent of the steam generator tubes, has been conservatively accounted for by increasing the estimated EOC bobbin coil probe voltages by 15 percent in assessing tube integrity. NRC RG 1.121 requires in relevant part that: (1) tubes maintain a factor of safety of three against failure (burst) under normal operating pressure differential conditions; (2) tubes maintain adequate margin against failure under postulated combined accident condition loadings and under loadings required to initiate propagation of the largest longitudinal flaw resulting in tube rupture; and (3) the leak rate determined for the largest permissible longitudinal flaw should be less than the leak rate limit specified in TTS. Items 1 and 2 are satisfied without consideration of the constraint of the TSP.

In sum, evaluations of burst test data conclude that because NRC RG 1.121 has been satisfied, adequate structural integrity and margin against tube burst remains. Similarly, it has been concluded based on this margin, there is a 3.4×10^{-5} probability that a tube rupture will occur in a TNP steam generator as the result of an ODSCC/IGA microflaw. In other words, tube rupture is an unlikely event due to this type of degradation.

FAILURE ANALYSIS ASSOCIATES, INC. (FaAA) OVERVIEW

FaAA was retained at the request of PGE to provide an independent overview function of the PGE steam generator tube repair actions that have been undertaken during this refueling outage. The FaAA overview included the review of plans and products generated by engineering staff, PGE consultants, and service vendors. FaAA has concluded that: (1) PGE inspection and analysis procedures comply with appropriate regulatory and industry requirements; (2) recently evolved data analysis procedures appear to be technically sound and applicable to the subject problem; (3) the statistical analysis of ECT results for hundreds of axial indications for the past two operating cycles provides a basis to establish degradation growth rates based on voltage used in tube integrity assurance analyses; (4) tube integrity will be maintained per Westinghouse analyses and TNP's conservative basis of repair; and (5) FaAA concurs with the Operating Cycle 14 plan to (a) continue operation with high purity water, (b) implement planned improvements in water chemistry analytical instrumentation; (c) provide for scientific study of crevice chemistry and the use of crevice chemistry computer models through short-term controlled species injections, while maintaining water chemistry control within current Electric Power Research Institute (EPRI) guidelines; and (d) make changes as required to improve tube-to-TSP intersection crevice chemistry consistent with EPRI guidelines.

OPERATIONAL ENHANCEMENTS FOR FUEL CYCLE 14

Several operational enhancements will be implemented prior to, or during Operating Cycle 14. These enhancements are intended to either minimize the likelihood of a tube rupture, or better enable operations staff to promptly detect a rupture, should it occur. The enhancements include:

(1) Installation of nitrogen-16 (N-16) monitors on main steam lines. These monitors will provide early detection of primary-to-secondary leaks at a sensitivity of approximately 1 gpd.

(2) Tube degradation has occurred at TNP even though very low levels of impurities in secondary side water have been achieved in striving to

comply with increasingly stringent recommended impurity standards. The degradation appears to have resulted from the concentration of caustic agents in crevices between tubes and TSPs. The concentration of impurities stems from the restriction of flow in the tube-to-TSP intersection crevices, which is a condition inherent in TNP steam generator design. As a result, PGE will monitor and control molar ratios of important cations and anions in the secondary side bulk water and monitor the hideout-return. In regard to overall water chemistry, PGE plans to change the water chemistry to achieve a near-neutral tube-to-TSP intersection crevice chemistry condition.

(3) The present TTS primary-to-secondary leakage limit of 500 gpd per steam generator and total of 1 gpm will be reduced substantially to 130 gpd per steam generator and total of 400 gpd in a TTS change that will be submitted to the NRC in the near future. In addition, PGE plans to implement an additional administrative control that will reduce the allowed primary-to-secondary leak rate for Operating Cycle 14 to 80 gpd.

(4) Training for operators has been augmented to ensure operator ability to detect and correctly respond to a potential steam generator tube rupture or tube leakage. The training utilized the Plant simulator to test operator skills regarding specific accidents (and precursors) that could occur at TNP, and relevant tube rupture events that have occurred at several other facilities.

CONCLUSION

PGE has demonstrated that the condition of TNP steam generators prior to restart will satisfy TTS and NRC RG 1.121 requirements in that: (1) tubes will not be left in service which contain structurally significant flaws that have an average depth exceeding about 40 percent through-wall, and (2) tubes left in service with ODSCC/IGA microflaws at the TSP intersections will not become unserviceable prior to the next refueling outage.

Accordingly, PGE has determined that TNP steam generators will be acceptable for restart.

STEAM GENERATOR TUBE INTEGRITY SAFETY ANALYSIS REPORT

FOR

TUBE SUPPORT PLATE INTERSECTIONS

I. INTRODUCTION AND PURPOSE

The purpose of this report is to demonstrate, based on months of extensive examination, testing, and analysis, that reasonable assurance exists that the steam generator tubes to be left in service for Operating Cycle 14 meet applicable tube integrity requirements to protect public health and safety.

During the 1991 Refueling Outage of the Trojan Nuclear Plant (TNP), Portland General Electric Company (PGE) conducted inservice inspection (ISI) of the steam generator tubes in accordance with Trojan Technical Specification (TTS). The ISI was accomplished by eddy current testing (ECT), using a bobbin coil probe to identify possible indications (PIs) which were then evaluated using a motorized rotating pancake coil (MRPC) probe. In addition, destructive examinations were performed on tubes removed from the steam generators.

The inspections and examinations of the TNP steam generator tubes identified the presence of some intergranular attack (IGA) and axially oriented intergranular stress corrosion cracking (IGSCC) on the outer diameter of the tubes where they intersect with the tube support plates (TSPs). The particular IGSCC identified is referred to at TNP as outer diameter stress corrosion cracking (ODSCC). Inspections of the affected TSP intersections were completed using the MRPC probe. The inspections and examinations were revised and expanded during the course of the outage.

Evaluations of MRPC probe results also identified the presence of ODSCC/IGA microflaws (those flaws which may extend to a maximum depth greater than 40 percent through-wall, but which do not involve significant tube degradation) at the TSP intersections. Burst pressure tests of tube intersections removed from the steam generators demonstrated that tubes with ODSCC/IGA microflaws retain their structural integrity. An evaluation was completed to demonstrate that steam generator tubes with the identified ODSCC/IGA microflaws meet the criteria of Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes", dated August 1976.

PGE plans to request NRC approval of a clarification to the TTS for steam generator tube integrity to distinguish acceptance criteria for ODSCC/IGA from acceptance criteria for other tube degradation phenomena. This report provides the technical basis for that TTS change.

In addition to providing information to the NRC staff regarding steam generator inspection activities, this report satisfies several routine and non-routine reporting requirements contained in TTS and in NRC RG 1.83, "Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes", Revision 1, dated July 1975. TTS 4.4.5.5, "Steam Generators, Reports", Item a, requires that as a routine matter, "following each inservice inspection of steam generator tubes, the number of tubes plugged or sleeved in each steam generator shall be reported to the Commission within 15 days." This information has been provided in Section III of this report to the degree known at this time. A supplemental report on tube plugging and/or sleeving will be submitted subsequent to this report, as necessary, to reflect additional information.

A non-routine reporting requirement that relates to steam generator tube inspections is found in TTS 4.4.5.5c. This specification requires that, "results of steam generator tube inspections which fall into Category C-3 shall be reviewed for reportability pursuant to Specification 6.6.1." TTS 6.6.1, "Reportable Event Action", requires PGE to report events as required by Title 10 of the Code of Federal Regulations, Part 50.73 (10 CFR 50.73), "Licensee Event Report System", and to have all reportable events reviewed by the Trojan Plant Review Board. Consistent with this requirement, on September 11, 1991, PGE submitted Licensee Event Report (LER) 91-27, "Steam Generator Inspections Result in C-3 Classification", which addressed the C-3 classification of the steam generator tube inspections. The LER noted that details regarding final steam generator-related corrective actions will be provided by PGE in a supplement to the LER. This report contains further information concerning the steam generator-related corrective actions and will be referenced in the supplement to the LER.

Another nonroutine report is addressed in the basis to TTS 4.4.5. Basis 3/4.4.5 notes that if a steam generator inspection is categorized as C-3, steam generator inspection results must be promptly reported to the NRC pursuant to TTS 6.9.1, "Reporting Requirements, Routine Reports", prior to the resumption of TNP operation. This basis notes also that such cases will be considered by the NRC Staff on a case-by-case basis, and may result in a requirement for analysis, laboratory examination, tests, additional eddy current inspection, and revision of TTS, if necessary. These potential results have occurred, and are addressed in this report, with the exception of a TTS change. A TTS change will be provided to the NRC as a separate submittal.

Finally, PGE has committed to NRC guidelines provided in NRC RG 1.83. Section C.7.d of NRC RG 1.83 notes that if steam generator inspections result in the equivalent of a C-3 classification, or if more than three steam generator tubes inspected exceed the plugging limit, the situation should be immediately reported by the licensee to the NRC in accordance with the facility license for resolution and approval of proposed remedial actions. This document responds to the requirement to provide information to the NRC pursuant to NRC RG 1.83, Section C.7.d, and should be utilized by the staff during its consideration of PGE positions on this matter. PGE requests staff review of this report and appropriate action, as necessary, prior to the scheduled date for TNP restart.

II. BACKGROUND

PGE conducted the first inservice inspection of the TNP steam generator tubes in 1975, before TNP began commercial operation. In the 1979 to 1981 time period, the TNP steam generator tubes exhibited degradation identified as primary water stress corrosion cracking (PWSCC) occurring on the inside surface of the small radius, highly-stressed curved-to-straight transition of the Row 1 U-bends. In 1981, Row 1 tubes in each steam generator, which were not previously plugged, were plugged as a conservative preventive measure because of the ongoing leakage associated with this type of degradation. Since then, additional instances of inside diameter PWSCC have been observed at the WEXTEX transitions and in the Row 2 U-bends. This type of degradation has been analyzed and previously reported by PGE to the NRC, and will not be further discussed in this report.

In the mid-1980s, OD pitting was identified in several steam generator tubes. Pulled tubes examined in 1986 were found to have acidic-induced pitting. This pitting and other modes of degradation were addressed by a number of changes which were made to the secondary system and secondary water to improve steam generator chemistry.

In 1989, PGE identified axially-oriented IGSCC in several steam generator tubes. This degradation was located on the OD of the tubes at their intersections with the TSPs and was called "ODSCC". In 1989, the first year that the MRPC probe was used to confirm bobbin coil probe PIs, 199 tubes were identified as having ODSCC/IGA in the TSP intersections. In 1990, 137 tubes were identified as having ODSCC/IGA in the TSP intersections. These tubes were removed from service by plugging.

Based in part on the number of ODSCC/IGA flaws discovered in 1989 and 1990, an extensive ECT program was planned for the 1991 Refueling Outage. Furthermore, it was planned to pull tubes having representative flaws from the steam generators for destructive examination.

III. RESULTS OF INSPECTION

A. Eddy Current Testing Inspection Methodology

American Society of Mechanical Engineers (ASME) Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components", 1983 Edition through Summer 1983 Addenda, requires examination of steam generator tubes. This requirement is satisfied by using eddy current techniques described in ASME Section V, "Nondestructive Examination", 1983 Edition through Summer 1983 Addenda.

The following is a description of the types of probes and coil arrangements used for ECT at TNP during the 1991 Refueling Outage:

1. Bobbin coil probe can be manufactured in absolute or differential coil arrangements. PGE uses the external reference, differential coil arrangement for initial examination.

   a. Differential signal arrangements use two coils opposed to one another. When a different condition is presented to one of the coils, an output signal is generated. Short discontinuities such as cracks, pits, or other localized discontinuities with abrupt boundaries can be detected if their size is larger than the fields generated by the differential coils.

   b. Absolute signals measure the absolute value of the eddy current conductivity and therefore do not rely on differences between adjacent closely spaced coils.

2. MRPC probe refers to the motorized rotating pancake coil probe assembly. Initially, PGE used an MRPC probe containing a single coil. Following the initial 1991 Refueling Outage MRPC probe evaluation, PGE changed to a probe containing three coils, rather than a single coil, for examinations. The first coil is axially sensitive, the second is circumferentially sensitive, and the third one is isotropic (pancake), which is sensitive to flaws in both the axial and circumferential planes.

Industry use of the bobbin coil probe to perform nondestructive examination (NDE) inspections of steam generators has been accepted by the NRC for many years. This type of probe has proven to be very successful in detecting significant tube flaws. Use of an MRPC probe to supplement or verify bobbin coil probe PIs is an enhancement of presently accepted steam generator inspection methods, and has only recently been used by industry. In NRC Information Notice (IN) 91-67, "Problems With the Reliable Detection of Intergranular Attack (IGA) of Steam Generator Tubing", dated October 21, 1991, which focused on TNP, the NRC staff acknowledged that, "The threshold at which IGA can be detected reliably with MRPC and bobbin probes is not well understood." Notwithstanding NRC staff concerns regarding this matter, the NRC staff has not required, as a generic matter, that licensees use more sensitive probes (such as the MRPC). PGE, however, has implemented conservative criteria that take advantage of the capabilities of the bobbin coil and MRPC probes.

The MRPC probe has been shown to be effective in distinguishing ODSCC/IGA in confirming PIs identified by the bobbin coil probe. Since it provides an absolute response, the MRPC probe provides flaw orientation display, and is capable of detecting slight changes in material conductivity such as the type caused by SCC. Accordingly, at TNP, this method has become the principle method of characterizing ODSCC/IGA as single axial indication (SAI) or multiple axial indication (MAI). SAI refers to a single axial flaw which may be composed of several axial flaws which have grown together. MAI refers to a population of axial flaws that do not appear predominantly as a single flaw. This method was also used to identify an indication referred to as a "3:1 indication". Axial indications reported as 3:1 indications are low level MRPC probe signals that have amplitudes at or near the system noise level such that they cannot be unambiguously interpreted.

In addition to ECT of steam generator tubes in situ, a number of tubes with a range of ECT indications were pulled from the steam generators for further examination. Metallurgical examinations, including burst testing, were performed by Asea Brown Boveri/Combustion Engineering (ABB/CE). The remaining strength of flawed tubes was determined by burst testing. The in situ ECT results were correlated by measuring flaw depths. Flaw mechanisms were confirmed by metallographic examination. Description of the tubes removed for these inspections and the results of these inspections are discussed in Section IV of this report.

B. Eddy Current Testing Inspection Results

This section discusses the ECT results of the inspections of the TNP steam generator tubes during the 1991 Refueling Outage from the beginning of the outage on April 15, 1991, through November 1991. The planned steam generator tube inspection program was expanded and revised during the course of the 1991 Refueling Outage. Figures III-1A and III-1B display the repair sequence and logic used throughout the 1991 inspection and repair program.

The 1991 Refueling Outage original steam generator inspection scope included:

1. 100 percent bobbin coil probe examination from the hot leg tubesheet to the cold leg seventh TSP in all four steam generators.

2. Cold leg bobbin coil probe examination of 20 percent of the tubes in Steam Generator A.

3. MRPC probe examination of PIs resulting from the bobbin coil probe examinations using the single-coil MRPC probe.

4. 100 percent MRPC probe examination of the hot leg tubesheet region using the single-coil MRPC probe.

5. 100 percent MRPC probe examination of Row 2 U-bends using the single-coil MRPC probe.

ECT of the original steam generator inspection scope was accomplished in accordance with the Allen Nuclear Associates (ANA) Procedure, ANA-ET-29, "Interpreters Guidelines", and associated TNP-specific "Supplemental Analysis Guidelines", Revision 0. Procedure ANA-ET-29, Revisions 0 through 3 of the associated guidelines, and amended bobbin coil probe analysis guidelines are provided as Appendix 4.

The inspection resulted in 296 tubes requiring repair as a result of ODSCC/IGA at the TSP intersections. The inspection results for these 296 tubes are provided in Appendix 1. This appendix provides the following information for each tube repaired for ODSCC/IGA at the TSP intersections: TSP location, bobbin coil probe voltage[1],

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[1]Voltage amplitudes given in Appendix 1 are normalized to a 5 V standard on the 20 percent through-wall hole per the ASME Code in accordance with PGE practice. These voltages must be multiplied by a factor of 0.8 when comparing to data used by Westinghouse in Appendix 3 and by Failure Analysis Associates, Incorporated (FaAA) in Appendix 5, since Westinghouse normalizes to a 4 V standard. Throughout this report, TNP voltage values are represented by V_T and Westinghouse voltage values are represented in parentheses by (V_W). The conversion between TNP voltage values and Westinghouse voltage values is discussed in Section V.A.3.

bobbin coil probe phase angle, bobbin coil probe call, MRPC probe voltage, MRPC probe phase angle, MRPC probe call on type of flaw, and type of repair performed. An additional 38 tubes were identified as requiring repair for other defects, including one with a defective inner diameter sleeve installed in 1990. The Revision 0 (1991 Refueling Outage original inspection scope) repair efforts were completed on May 17.

A pulled tube from Steam Generator D, Row 12, Column 8 (D R12C8) was sent to ABB/CE for analysis under a joint agreement between PGE and the Electric Power Research Institute (EPRI). On July 18, 1991, initial results were received from ABB/CE regarding the analysis of D R12C8. The analysis showed IGA and ODSCC at the first, second, and third TSP intersections, extending a maximum of 92 percent, 48 percent, and 55 percent through-wall, respectively. The ECT of the second and third TSP intersections, prior to the tube pull, did not identify this degradation as requiring repair based on Revision 0 criteria.

Based on the analysis of D R12C8, discussed in greater detail in Section IV, it was determined that the bobbin coil probe data from the four steam generators should be re-examined to identify PIs of the type of degradation that was observed in D R12C8. The concern was that flaws of this type were not anticipated in the initial bobbin coil probe data screening.

In August, ANA issued "Amended Guidelines for Reevaluation of Spring 1991 Bobbin Data" (see Appendix 4) to provide more conservative criteria for reporting bobbin coil probe PIs. Additionally, Revision 1 of ANA's "Supplemental Analysis Guidelines" was issued to provide direction for use of the 3-coil

MRPC probe. Revision 1 was superseded shortly thereafter by Revision 2, which incorporated minor clarifications.

The "Amended Guidelines for Reevaluation of Spring 1991 Bobbin Data" and Revision 2 of "Supplemental Analysis Guidelines" were used in conjunction with Procedure ANA-ET-29 to re-examine the bobbin coil probe data obtained when using Revision 0 ECT criteria. An additional population of bobbin coil probe PIs for the type of degradation seen in the pulled tube sample was identified using the new criteria. The additional bobbin coil probe PIs were examined with the three-coil MRPC probe per Revision 2 of the "Supplemental Analysis Guidelines".

While this effort was ongoing, inspections (using the three-coil MRPC probe) of intersections without bobbin coil probe PIs were also being performed. Of 200 such intersections inspected, eight were identified as requiring repair. Based on these results, MRPC probe examinations were conducted on 100 percent of the TSP intersections from the first through the fifth TSPs, and a statistical sampling program was conducted at the sixth and the seventh TSPs. As a result of this conservative multi-method approach, 1,824 tubes were identified for repair as a result of ODSCC/IGA at the TSP intersections based on Revision 2 criteria. The results of these tube inspections are provided in Appendix 1. The Revision 2 (August 1991 inspection scope) repair efforts were completed on October 24, 1991. One thousand one hundred ninety-three (1,193) tubes were plugged, and 631 tubes were sleeved.

As a result of the number of tubes identified for repair, additional tubes were pulled for analysis from Steam Generator C prior to completion of the Revision 2 repairs. It was anticipated that this analysis would: (1) confirm that correct decisions had been made regarding which tubes required repair, and (2) provide additional burst test data to support a supplemental tube plugging acceptance basis and a structural integrity analysis, which would justify steam generator operability pursuant to TTS.

Two tubes (C R29C70 and C R30C64) were pulled from Steam Generator C and sent to ABB/CE for destructive analysis. Each tube sample included three TSP intersections (first through third TSPs). The MRPC inspections at the TSP intersections included the following range of results:

1. One TSP intersection with SAI, called for repair.

2. Two TSP intersections with MAI, called for repair.

3. Three TSP intersections with 3:1 indications, not called for repair.

Metallographic analytical results for the first tube, C R29C70, at the first TSP intersection, which was characterized as having an SAI requiring repair, showed ODSCC with a maximum of 56 percent through-wall depth. The second TSP intersection, which was characterized as having MAI requiring repair, showed ODSCC with a maximum of 76 percent depth. The third TSP intersection, which was characterized as having a 3:1 indication not requiring repair, showed ODSCC microflaws with a maximum of 71 percent depth.

Metallographic analytical results for the second tube, C R30C64, at the first TSP intersection, which was characterized as having a 3:1 indication not requiring repair, showed ODSCC microflaws with a maximum depth of 55 percent. The second TSP intersection, which was characterized as having MAI requiring repair, showed ODSCC with a maximum depth of 64 percent. The third TSP intersection, which was characterized as having a 3:1 indication not requiring repair, showed ODSCC microflaws with a maximum depth of 50 percent. None of the TSP intersections had extensive IGA such as was found at the TSP intersections of D R12C8.

The IGA reported for C R29C70 and C R30C64 involved the very outside surface of the tubes, was confined within the TSP region, and was about one to five grain boundaries deep. The degradation was characterized as microscopic ODSCC flaws with ligaments between them.

Based on the analysis of C R29C70 and C R30C64, discussed in greater detail in Section IV, it was determined that previous MRPC probe ECT data and MRPC probe raw data should be re-examined to identify tubes with early stages of ODSCC degradation. The concern was that 3:1 indications not called for repair could have significant ODSCC/IGA microflaw depths greater than or equal to 40 percent through-wall.

In October, ANA issued Revision 3 of "Supplemental Analysis Guidelines", more conservative criteria for determining ODSCC microflaws as requiring repair. Revision 3 (November 1991 inspection scope) criteria was used to evaluate TSP intersections for the hot leg side of all four steam generators up through the fifth TSPs for sampling at the sixth and seventh TSPs, and for intersections at the sixth and seventh TSPs with a bobbin coil probe voltage amplitude greater than or equal to 1.0 V_T (0.8 V_W). As a result of this approach, approximately 500 tubes have been identified thus far for repair due to ODSCC/IGA microflaws at the TSP intersections. The Revision 3 repair efforts are in progress.

Affected tubes are being plugged or sleeved. Additionally, five more tubes were pulled and sent to ABB/CE for destructive analysis. The analysis of these tubes is discussed in Section IV.

In summary, tubes have been repaired which had degradation identified for repair by MRPC probe based on Revision 2 of "Supplemental Analysis Guidelines". Then, to provide additional conservatism, tubes which had ODSCC/IGA microflaws identified by bobbin coil probe PIs with a voltage amplitude greater than or equal to 1.0 V_T (0.8 V_W) and confirmed by MRPC probe based on Revision 3 of "Supplemental Analysis Guidelines" are also being repaired. A summary of the steam generator tube repairs thus far for each steam generator are given in Table III-1, "Preliminary Status of Steam Generator Tube Repairs for the Trojan Nuclear Plant 1991 Refueling Outage".

IV. EVALUATION OF PULLED TUBES

A. General Description of Degradation

Various forms of intergranular corrosion were observed on the TSP intersections of tube samples pulled from TNP steam generators. Intergranular corrosion morphology can vary from IGA to IGSCC to combinations of the two.

IGA is defined as a three-dimensional localized corrosion degradation of grain boundaries. The radial dimension of IGA is relatively constant when viewed from different axial and circumferential coordinates. IGA can occur in isolated patches, referred to as "patchy IGA", or as general networks, referred to as "general IGA", which may encompass a larger area up to the entire tube surface within the concentrating crevice. The growth of IGA is dependent on the local chemical environment as it exists in the crevice and is relatively independent of the stress in the tube material.

IGSCC is defined as a two-dimensional corrosion degradation of grain boundaries that is strongly stress dependent. IGSCC is typically observed in the axial-radial plane in steam generator tubing, but can occur in the circumferential-radial plane or in combinations of the two planes. IGSCC can occur as a single, two-dimensional crack, or it can occur with branches extending from the main plane. Both of the IGSCC variations can occur simultaneously with general or patchy IGA. The IGA component can occur simply as an IGA base with IGSCC protruding through the IGA base or the IGSCC plane may have a semi-three-dimensional characteristic. Based on laboratory corrosion tests, it is believed that IGSCC protrusions with significant IGA aspects grow at rates similar to that of IGSCC, as opposed to the slower rates usually associated with IGA alone. When IGSCC and IGA are both present, examination shows that the IGSCC grows more rapidly.

The density of flaws can vary from one single macroflaw (usually composed of microflaws which have grown together) to hundreds of very short microflaws that have partially linked together to form an array of microflaws. Note that in cases where a very high density of axial flaws (MAI) are present, and where these flaws also have significant IGA components, the outer surface of the tube (flaw origin surface) may have patches with three-dimensional IGA. Axial overload of the tube (such as occurs during tube pulling) may preferentially open up circumferential features on the outer surface of the tube within the three-dimensional network of IGA.

These features are sometimes referred to as circumferential flaws, even though the axial IGSCC in the same TSP intersection is deeper and is the dominant contributor to tube strength degradation.

B. Discussion of Destructive Examination

Eight steam generator tubes with TSP intersections were removed from TNP Steam Generators C and D during the 1991 Refueling Outage. The tube samples were analyzed by ABB/CE. The results of the analysis are provided in Report CE-NPSD-706, "Trojan Steam Generator Tubing Destructive Examination Interim Report", (Appendix 2). Appendix 2, Table 1-1, "Trojan Tubes Removed for Destructive Examination in 1991", lists the specific tubes which were analyzed. With two exceptions, removed TSP intersections were burst/leak tested. The results of these tests are shown in Appendix 2, Table 3-1, "Burst Test Summary".

With the exception of D R12C8, which will be discussed later, burst tested TSP intersections were sectioned to provide a burst face surface (axial or longitudinal) scanning electron microscope sample, longitudinal metallographic sample near the burst face surface, and mid-support plate transverse metallographic sample. The axial burst face surface was photographed at a magnification of either 30 or 40 times actual, and measured to determine certain quantities of metallurgical interest. These measurements are summarized in Appendix 2, Table 4-1, "Montage Measurements". Sections from a typical montage are presented in Appendix 2.

The analyses of longitudinal and transverse metallographic samples from all eight tubes have not yet been completed. Results of these evaluations, which are not expected to alter the conclusion of this report, will be provided to PGE by ABB/CE. For typical conditions found, the examples taken from the first three tubes are shown in Appendix 2.

Tube D R12C8

Actions taken for the first pulled tube, D R12C8, were an exception to the examination process described above. In this instance, the first TSP intersection was subjected to a leak test, but was not subsequently burst tested. Because it appeared that the tube section had been damaged in pulling, it was felt that a full burst test would not be the best use of the material. Instead, the degraded TSP intersection of the tube was separated by pulling axially on a tensile machine, allowing examination of the nature of the degradation in the resulting circumferential fracture surface. Scanning electron microscope and metallographic examination found IGA and ODSCC. The maximum depth of general IGA was 43 percent through-wall. Intergranular penetration of 92 percent also was observed. The average flaw depth over this TSP intersection was 38 percent.

The second TSP intersection was examined by metallography without burst or tensile fracturing. The maximum depth of intergranular penetration was found to be 48 percent, with the maximum depth of general IGA at approximately 27 percent.

The third TSP intersection was subjected to a burst test, the results of which are shown in Appendix 2, Table 3-1. Both general and patchy IGA of up to 33 percent through-wall depth and discrete ODSCC were observed in different areas of this TSP intersection.

TSP intersections from subsequent tubes (except for C R12C70, TSP Intersection 2) were burst tested and examined as described earlier. These TSP intersections sometimes exhibited small patches of IGA in addition to ODSCC. The ODSCC degradation was the limiting flaw with respect to the burst pressure and the structural strength of the tube section.

Observations made on the test results obtained to date are as follows:

1. Burst strengths are usually close to that of a nondegraded tube. Furthermore, where comparisons (D R12C8, TSP Intersection 3 and C R29C70, TSP Intersection 1; C R30C64, TSP Intersection 1 and TSP Intersection 2) could be made among ODSCC flaws of comparable depths, the burst strengths appear to be unaffected by associated IGA of up to 33 percent.

2. The number of axial flaws around the circumference of the tube varies considerably from one TSP intersection to another. This does not appear to be an important factor in determining the burst pressure. Burst pressure is directly associated with the depth, length, and relative orientation of the ODSCC flaws which exist at the burst location. This lack of sensitivity to the number of axial flaws suggests that the deepest and longest flaw determines the strength of that tube.

3. The variation in the number of flaws also suggests that the chemical conditions for degradation may be localized in a relatively small circumferential arc of a tube-to-TSP intersection crevice, or may extend uniformly around the tube. The number of axial indications apparently have little effect on the burst strength, as noted above.

4. The nature of the degradation seen at the first and second TSP intersections of D R12C8 suggested that the mode of degradation was general and patchy IGA narrowing to intergranular penetrations as the stress level increased in the thinning wall. This type of degradation also was observed in certain

regions of the third TSP intersection. However, the third TSP also contained discrete ODSCC, with no associated IGA.

This finding is consistent with an alternative hypothesis that the initial penetration was by ODSCC, which is normally a more rapidly propagating mode of attack. When the tube was removed from service, the tensile hoop stress was eliminated and the chemical concentrating mechanism was greatly diminished. This could place the region in a chemical potential environment where IGA could propagate and broaden the existing ODSCC to the point where it appeared to be IGA penetrations. Significant general IGA has not been observed in tubes in continuous service at TNP, but patchy IGA has been observed.

5. Usually, the length of the intergranular burst flaw is less than the thickness of the TSP. In some instances, however, this length exceeds the thickness of the TSP. This should be clearly differentiated from the total burst lengths which do exceed the TSP thickness. This latter burst length includes a substantial amount of ductile tearing when the tube was burst.

   The reported measurements of the intergranular burst flaw length are (because of specimen geometry, axial strain from pulling, and other factors) conservative upper bound measurements of the actual length. However, even if these could be and were corrected, some intergranular burst flaws extended slightly beyond the nominal thickness of a TSP.

6. Burst tests demonstrated that notwithstanding tube flaws, NRC RG 1.121 is satisfied since burst test pressures have exceeded the maximum differential pressure for a steam line break (ΔP_{SLB}) of 2,260 psi and three times differential pressure for normal operating conditions ($3\Delta P_{NO}$) of 4,275 psi at TNP.

C. Environmental Conditions Affecting Degradation

In order to postulate the behavior of flaws in the future (i.e., propagation or development of new flaws), conditions that could affect these processes need to be understood. ODSCC/IGA of Alloy 600 steam generator tubes is a phenomenon that has only recently been found at TNP in the low-flow region of the tube-to-TSP intersection crevices. Results of laboratory studies and the examination of tubes suggest that ODSCC/IGA is due to caustic-induced attack at the grain boundaries.
EPRI Report NP-5368, "Mechanisms for Formation and Disruption of Surface Oxides", dated August 1987, provides support for the hypothesis that caustic-induced flaws are usually characterized by a low level or absence of chromium in the first oxide layer along the fracture surface of the flaw. This is based on the preferential dissolution of chromium relative to nickel in an alkaline environment. Thus, the surface oxide of a nickel-chromium alloy will show relative nickel enrichment under alkaline attack. Preliminary Auger analysis[1] shows that the initial oxide layer in a flaw in Tube C R29C70 is relatively chromium depleted along the length of the flaw with the presence of potassium and boron in the corrosion film. This arrangement suggests that the flaws at the TSP intersections were produced under caustic conditions. Auger analysis at flaw locations in other TSP intersections also suggests an alkaline-to-neutral environment. However, Auger work is still underway, and studies are continuing to resolve the cause of the flaws. These results will be taken into consideration in determining what, if any, changes to the secondary water chemistry

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[1]Auger analysis is an atomic-level surface examination.

are required. PGE will inform the NRC of significant water chemistry changes should they occur, and the effect of those changes, if any, on the conclusions of this report.

The chemical environment in the tube-to-TSP intersection crevice is different than the bulk water chemistry as a result of the concentrating mechanism in the crevice region. The concentrating mechanism is the restriction of flow in the tube-to-TSP intersection gap and the transfer of heat from the steam generator tube. The flow is restricted where the tube comes into contact with the TSP and when the tube-to-TSP intersection gap is reduced by the oxidation of the carbon steel TSP material and accumulation of deposits.

Thus, the local chemical environment is determined by the concentrating mechanisms inherent in the design and by the bulk water chemistry in the steam generator. EPRI guidelines on bulk water chemistry, which have been followed at TNP, specify low limits on sodium, chloride, and other impurities. These limits are so low that consideration of the ratios of sodium and similar species to chloride were previously thought unimportant. However, it is now recognized that these ratios can be important in determining the chemical environment in the tube-to-TSP intersection crevices. For purposes of this report, consideration of the bulk water chemistry will focus on the sodium-to-chloride ratio in the steam generator blowdown. The sodium and chloride species and the molar ratio were selected for the analysis because:

1. Sodium is normally associated with the development of these flaws under alkaline conditions.

2. Chloride is the dominant acidic species in solution.

3. Sodium and chloride are dominant species in prompt hideout-return (which suggests that these species are associated with one another in the crevice region).

4. MULTEQ (EPRI crevice chemistry computer code) results generally predict that because of high solubility and low volatility, sodium and chloride are generally the dominant species in the concentrated crevice chemistry solution.

5. A high sodium-to-chloride ratio (greater than 1) indicates the development of alkaline crevice chemistry conditions.

Sodium-to-chloride molar ratios are graphically presented for Operating Cycles 7 through 13 in Appendix 6. Operating Cycle 7 covers the period from September 1984 through May 1985. During this interval, the sodium-to-chloride ratio averaged 0.63, indicating that acidic conditions probably existed in the crevice region.

During Operating Cycle 8 (July 1985 through April 1986), repeated episodes of low level primary-to-secondary leakage were noted. The sodium-to-chloride ratio for unexplainable reasons increased to an average value of 1.58, in the alkaline range. In January 1986, a temporary demineralizer was installed on the steam generator blowdown and may have caused a slight increase in the sodium-to-chloride ratio from January to March 1986.

Three tubes were removed from Steam Generator C during the 1986 Refueling Outage. The destructive examination of these tubes, as referenced in EPRI Report NP-6362-SD, "Examination of Pits in Trojan Nuclear Plant Steam Generator Tubes", dated May 1989, revealed numerous pits. Chemical analyses of the corrosion products and surface oxides gave results consistent with the acid crevice chemistry environment predicted by the sodium-to-chloride molar ratio prior to Operating Cycle 8.

One of the tubes, C R25C58, extended through the first TSP intersection. Archive samples of the TSP intersection were re-examined in October 1991. IGA and/or ODSCC was not identified in this sample, which suggests that IGA and/or ODSCC probably initiated after June 1986.

Hideout-return is a phenomenon in which chemical species typically located in crevices come out of and return (redissolve) into the bulk steam generator water. Hideout-return studies were conducted in April 1986 at the completion of Operating Cycle 8. The details are referenced in EPRI Report NP-6455, "Field Studies on Intergranular Attack", dated August 1989. The sodium-to-chloride weight ratios in the prompt hideout-return ranged from 1.5 to 3.0, with considerable variation between steam generators. Crevice hideout-return tests referenced in EPRI Report NP-4678, "Crevice Hideout Return Testing", dated July 1986, indicate that prompt hideout-return sodium-to-chloride weight ratios of 1.5 to 3.0 are not unusual.

Plant conditions during Operating Cycle 9 (June 1986 through April 1987) returned to a more typical historic pattern with a sodium-to-chloride molar ratio averaging 0.77 in the steam generator blowdown. A new titanium condenser was installed during the 1987 Refueling Outage to reduce the likelihood of introducing contaminants from condenser in-leakage.

Westinghouse Report, "Trojan - Review of Secondary System Chemistry 1987/1988", transmitted to PGE by Letter POR-89-648, dated December 15, 1989, reviews secondary chemistry conditions at TNP during 1987 and 1988, and specifically focuses on hideout-return results obtained in April 1987 and April 1988. This analysis indicated an excess of sodium species with respect to anionic species in an approximate range of 3 to 45 ppb over the first 23 hours of the hideout-return period.

Water chemistry conditions during Operating Cycle 10 (August 1987 through April 1988) were largely influenced by changes in Plant configuration and operation. Steam generator pH was increased from approximately 8.5 to approximately 9.2 in December 1987, and, in February 1988, the condensate polishers were removed from service in preparation for conversion to a high-pH morpholine secondary chemistry program. Over the remaining part of the operating cycle, the sodium-to-chloride ratio increased quite dramatically, largely as a result of a reduction in bulk water chloride content associated with the removal of the polishers.

From Operating Cycle 1 through a significant portion of Operating Cycle 10, the secondary water chemistry appears to have been controlled by operation of the condensate polishers. These polishers are capable of removing approximately 80 percent of the influent sodium and up to 50 percent of the chloride, as referenced in EPRI Report NP-3037, "Condensate Polishing at Surry Nuclear Power Station", dated June 1983. Thus, the polishers tend to bias the polisher effluent stream toward a chloride-rich condition. In a separate study dated March 15, 1989, a nationally recognized expert, Dr. Sallie Fisher, performed tests of different resin ratios of powdered resin. Tests with cation-to-anion resin ratios ranging from 1.0 to 3.3 produced a combined effluent having an approximate sodium-to-chloride molar ratio of 0.77. From Operating Cycles 2 through 7, and also during Operating Cycle 9, average sodium-to-chloride molar ratios in the steam generators were less than 0.72. This suggests that the characteristics of the powdex resin established the sodium-to-chloride ratio in the bulk water during this interval.

Westinghouse Report POR-89-648, which was referenced earlier, also provides additional information on prompt hideout-return in December 1987 and again at the end of Operating Cycle 10 (EOC-10). The December 1987 hideout-return appears to be acidic, based on negative values of excess sodium. The corresponding hideout at the end of Operating Cycle 10, again expressed as excess sodium, varied from 1.9 ppb to 17.1 ppb, suggesting neutral to slightly alkaline conditions in the crevice region.

A new steam generator blowdown system was installed during the 1988 Refueling Outage, significantly increasing blowdown capacity. This system incorporated deep bed demineralizers to treat the blowdown, and had the effect of reducing the concentration of sodium and chloride. Associated with this reduction in concentration levels was an increase in the sodium-to-chloride ratio during Operating Cycle 11 (July 1988 through April 1989) to an average value of 3.14. Morpholine injection was started in September 1988 after the polishers were taken out of service. Occasional condenser in-leakage required periodic use of the condensate polishers to control impurities in the steam generator blowdown.

Westinghouse analyzed the hideout-return data from April 1989 based on a sodium plus potassium-to-chloride equivalency concentration ratio in the prompt hideout-return. Westinghouse believes that at hot standby, the ratios of nonprecipitating cations-to-anions provides a good indication of the relative alkalinity of crevice solutions during power operation. Based on the Westinghouse analysis, the alkaline equivalency ratio varied from 7 to 9 across the four generators. A value of one for this ratio indicates a neutral crevice solution. The above equivalency ratios indicate significant accumulation of alkaline species in crevices in the steam generator during power operation. A considerable number of tubes were plugged during the 1989 Refueling Outage due to ODSCC/IGA at the TSP intersections. These tubes were the first tubes taken out of service because of ODSCC/IGA.

During Operating Cycle 12 operation (August 1989 through March 1990), sodium-to-chloride molar ratios increased to an average value of 6.21 while the average concentration of sodium and chloride in the bulk water decreased to 2.6 and 1.25 ppb, respectively. (Note: The above numbers were computed on a daily basis and averaged over the length of the cycle.)

Adams and Hobart, under contract to PGE, conducted an extensive sampling program in October 1989, to assess secondary water chemistry conditions at TNP. Their report, "Process Analysis at the Trojan Nuclear Power Plant", dated June 1990, recommended the use of an aggressive boric acid program with crevice flushing and on-line boric acid addition and continuing use of morpholine-boric acid all volatile treatment (AVT) chemistry, which were accepted and implemented by TNP.

Adams and Hobart also reported sodium and chloride concentrations from which PGE calculated a molar ratio of approximately 3.8 in the steam generators, corroborating TNP analytical chemistry results. The importance of this specific parameter (sodium-to-chloride ratio in the bulk water) as an indication of caustic crevice chemistry conditions in the steam generator was not addressed by Adams and Hobart and was not generally recognized by the industry as significant.

In March 1990, hideout-return results were again obtained and analyzed by Westinghouse. Based on sodium plus potassium-to-chloride equivalency concentration ratios, hideout-return ratios varied from 9.1 to 22.1. These ratios indicate a significant accumulation of caustic species in the crevice region during Operating Cycle 12 operation. Eddy current inspection activity during the 1990 Refueling Outage identified a significant number of additional tubes with ODSCC/IGA at the TSP intersections that required plugging.

Operating Cycle 13 operation (July 1990 through March 1991) commenced with a relatively high sodium-to-chloride molar ratio in the steam generators, followed by periods when the instrumentation was unresponsive. During these periods, the average individual values of sodium and chloride decreased below the effective detection limit of the TNP analytical chemistry equipment. Consequently, the analytical parameters for these species during Operating Cycle 13 do not appear to be useful indicators of the bulk water chemistry. Hideout-return results exhibited very low contaminant concentrations compared to previous hideout-return episodes. Although the ratios of sodium-to-chloride were still high at hot standby, the concentrations were low with the maximum reported sodium concentration of 7 to 12 ppb and maximum chloride of 2 ppb. The presence of caustic conditions in the crevices is consistent with the development of ODSCC/IGA in the tube-to-TSP intersection regions.

In summary, ODSCC/IGA has occurred even though hyperpure water chemistry has been achieved at TNP. Prior to Operating Cycle 8, the secondary water chemistry was such that acidic conditions probably existed in crevices and/or other regions where concentrating mechanisms operate. Since 1983, several actions were implemented to reduce the concentration of impurities and to meet increasingly stringent guidelines on water chemistry. These actions included the purchase of low chloride anion resin to reduce chloride concentration; removal of copper alloy feedwater components to reduce copper deposition in the steam generators; installation of a condenser with titanium tubes to reduce the likelihood of in-leakage; and installation of a higher capacity steam generator blowdown system with deep bed demineralizers to improve the removal of contaminants. In spite of these improvements, since 1988 (Operating Cycle 10), the secondary bulk water sodium-to-chloride molar ratio has been significantly greater than one, such that the crevices are in an alkaline (caustic) range. Recent studies of chemical hideout-return phenomena based on sodium plus potassium-to-chloride equivalency ratios greater than one indicate caustic conditions have existed in the crevices. In the chemical environment of the tube-to-TSP intersection crevices, Alloy 600 may experience ODSCC/IGA.

V. ACCEPTABILITY OF TUBES REMAINING IN SERVICE

A. Projected End of Operating Cycle Condition

1. Tubes Left in Service

a. The following summarizes the inspection and tube repair basis used for the TNP 1991 Refueling Outage steam generator tube inspection for potential flaws at the TSP intersections:

1) Inspection:

(a) 100 percent bobbin coil probe inspection of hot leg tubes from the hot leg side tubesheet through the cold leg side seventh TSP intersection.

(b) 100 percent MRPC inspection of hot leg TSP intersections up through the fifth TSP and of bobbin coil probe PIs.

(c) MRPC probe inspection of a sample of hot leg sixth and seventh TSP intersections and of hot leg sixth and seventh TSP hot leg intersections with bobbin coil probe voltage greater than 1.0 V_T (0.8 V_W).

2) Tube Repair Basis:

The objective of the tube repair methodology is to satisfy the structural integrity requirements of TTS 4.4.5.4, "Steam Generators, Acceptance Criteria". This is accomplished by the following:

(a) Repairing all bobbin coil probe PIs if confirmed as MAI or SAI by MRPC probe inspection having amplitudes above the noise level.

(b) Repairing all tubes with MRPC probe indications having amplitudes above the noise level than can be most likely associated with tube degradation. These repairs were made for any associated bobbin coil probe voltage and also for MRPC probe indications not identified by bobbin coil probe inspection. This repair practice is consistent with recent industry practice and EPRI guidelines for satisfying technical specification requirements for tube plugging. The nearly 100 percent MRPC probe inspection is more extensive than industry practice.

(c) Repairing all tubes having MRPC probe 3:1 indications with associated bobbin coil probe indications of 1.0 V_T (0.8 V_W) or greater. This represents a conservative repair guideline for the 3:1 indications.

2. Allowance For Degradation

Degradation of the OD of some TNP steam generator tubes at the TSP intersections has been observed due to the formation, growth in depth, length, and gradual linking together of ODSCC/IGA microflaws to form SAI and/or MAI.

Extensive burst testing (21 TSP intersections from 8 pulled tubes) has shown that the degradation of tube integrity is related to both the overall depth and length, and the details of the ligament array which bridges across the microflaw array forming the indication (SAI, MAI). The degradation and its growth is characterized from the eddy current inspection results in the TSP intersection regions of the Trojan steam generators. Specifically, bobbin coil probe voltage is used to estimate the effective degradation due to ODSCC/IGA.

Subsequent to the discovery of ODSCC/IGA, further analysis of the eddy current data from the last three Trojan inspections (1989, 1990, and 1991) was performed for the purpose of determining the growth rates of flaw depths and voltage amplitude. Westinghouse Report WCAP 13129, "Trojan Nuclear Plant Steam Generator Tube Repair Criteria for Indications at Tube Support Plates", dated December 1991 (Appendix 3) Table 5.3, "Voltage and Growth in Indicated Depth Analysis of 1991 Possible Indications", provides the results of the inservice inspection analysis.

One thousand three hundred twenty-nine (1,329) PIs with OD phase angle responses were noted in 1991. The average bobbin voltage amplitude for these indications is 0.89 V_T (0.71 V_W). These 1,329 indications were traced back to the 1990 inspection. It appears from the 1990 bobbin coil probe data that there was evidence of 806 indications in 1990. The average amplitude at that time was 0.68 V_T (0.54 V_W). Five hundred sixty-one (561) of the 806 signals could be traced back to 1989. The average amplitude at that time was 0.60 V_T (0.48 V_W). Comparisons made in Appendix 3, Table 5.5, "Trojan

Bobbin Coil Voltage Growth Rates for Indications with OD Phase Angles in Consecutive Inspections", and in Appendix 5, Table 1, "Growth of Bobbin Voltage Per Cycle", and Table 2, "Growth of Bobbin Voltage Per Cycle", show that the voltage growth rates per cycle are relatively independent of the specific population of OD PIs analyzed. Although there is substantial variance in apparent voltage growth, Appendix 5, Table 2 shows MRPC-confirmed OD PIs indicate similar average voltage growth rates and similar differences between the generators.

Appendix 5, Table 1 summarizes the bobbin coil probe voltage growth observed in each of the four steam generators as well as the average of all four generators in Operating Cycles 12 (1989-1990), 13 (1990-1991) and the total of 1989-1991. The average voltage growth for the 806 indications present in the steam generators at beginning of Operating Cycle 13 (BOC-13) in 1990 and at EOC-13 in 1991 was 0.24 V_T (0.188 V_W). The average voltage growth rate was lower in 1989-1990 [(0.10 V_T (0.078 V_W)] than in 1989-1991 [(0.17 V_T (0.134 V_W)). The average voltage growth rate was largest for Steam Generator D [0.28 V_T (0.225 V_W) per cycle for 1989-1991].

As is discussed in Section IV.C, the larger voltage growth experienced during Operating Cycle 13, compared to during Operating Cycle 12, is consistent with a continuing increase in tube-to-TSP intersection crevice alkalinity. The plan for Operating Cycle 14 to address obtaining a near-neutral crevice chemistry, while maintaining high water purity, makes Operating Cycle 13 voltage growth rates conservative for use in projecting EOC-14 voltages.

Detailed statistical analysis of the voltage growth was performed to partition the variance due to the true voltage growth from that due to measurement uncertainty (error). The method-of-moments was used to solve for shape of several different forms used to represent the statistical distributions of the true voltage growth and the measurement uncertainty (error). Appendix 5, Figure 1, "Histogram of Observed and Modeled Voltage Growths", shows the observed and modeled distribution increments using the gamma distribution for true voltage growth and two different forms for the measurement uncertainty distribution. Referring to Appendix 5, Figure 2, "Cumulative Probability Distribution of Observed and Modeled Voltage Growths", the fit of either distribution was excellent and enables accurate modeling of the observed voltage growth distribution and the true voltage growth. Referring to Appendix 3, Table 5.6, "Comparison of Measured Data and Statistical Model", or Appendix 5, Figure 1, it is shown that most indications will grow at a rate near the true voltage growth average of 0.24 V_T (0.188 V_W) per operating cycle, but that some small percentage of indications show higher voltage growth. Appendix 5, Table 4, "Critical Values from the Estimate of the Distribution of True Voltage Growth", and Figure 3, "Estimated Probability Density Function of True Voltage Growth", provide more detailed characteristics of the voltage growth distribution.

Plugging of the steam generator tubes to the analyzed limit of 20 percent results in a projected increase in reactor outlet coolant temperature from 616.8°F to 619°F. The increase in temperature will increase the rate of degradation and the associated rate of increase in bobbin coil probe voltage. The increase in the average growth rate of ODSCC is 10.3 percent for a 2.2°F increase in reactor outlet coolant temperature. The increase in the average growth rate for IGA is 4.9 percent. To be conservative, PGE has assumed the following:

a. The temperature at the location of degradation is conservatively assumed to increase 2.2°F without crediting a decrease in steam generator water temperature.

b. The increase in growth rate as a result of the 2.2 °F increase in reactor outlet coolant temperature is 15 percent.

c. The 15 percent increase is conservatively applied in the total voltage including the BOC condition, NDE uncertainty, and growth rate.

3. ECT Measurement Uncertainty

As part of the rate of degradation characterization, a statistical analysis was performed to determine the proportion of the observed voltage signal variability attributable to the true rate of degradation and that attributable to measurement uncertainty. Discussion of this analysis is provided in Appendix 5, Section 3.3, "Statistical Analyses of True Voltage and Depth Growth". Fifty-one percent of the total variance in the observed voltage growth is due to true voltage growth rate, and 49 percent of the total variance in the observed voltage growth rate is due to measurement uncertainty. For example, the NDE calibration standard can be used to set the level for the 400 kHz signal or for the level for the mixed (100/400 kHz) signal. Therefore, a comparison of absolute values and changes in voltage amplitude by different organizations must consider also, the specific procedure used to calibrate the ECT system. Besides the 0.8 adjustment for the difference in the TNP and Westinghouse ECT system voltage settings, cross calibration using the same standard showed that TNP voltage measurements should be reduced an additional 15 percent for comparison to Westinghouse data as follows:

$$V_W = 0.8\ V_T \times (1 - 0.15).$$

However, considering the assumption regarding the increase in flaw average growth rate due to the increase in reactor outlet coolant temperature described in Section V.A.2, TNP voltage measurements are increased an additional 15 percent when using the leak rate and burst correlations developed by Westinghouse. Therefore, the conversion from TNP voltage values to Westinghouse voltage values remains 0.8 as follows:

$$V_W = 0.8\ V_T \times (1 - 0.15) \times (1 + 0.15)$$
$$\approx 0.8\ V_T$$

Wear on the probe will also affect voltage measurement due to the impact on centering in the tube and wobble of the probe. Finally, some difference in reading may result between different analysts as a result of interpretation of the procedures to specific ECT signals.

Adjacent structures and artifacts can also result in ECT signals which are not related to flaws or degradation. Carbon steel TSPs result in ECT signals from a single frequency probe which effectively masked signals from degradation of steam generator tubes in the region of the TSP. The masking of signals from the axial flaws has been largely eliminated by the use of multi-frequency mixes to eliminate the TSP signal. An artifact which can affect the ECT signal is copper deposits. PGE uses an MRPC probe which is more sensitive to shorter flaws and can distinguish flaws from surface artifacts.

Finally, the ECT signal is sensitive to the volume of material removed and to resultant conductivity change (connection paths). Therefore, short microflaws can penetrate to a much greater depth than other flaws before the ECT signal becomes greater than the noise level. Furthermore, the presence of ligaments between adjacent microflaws can also significantly reduce the ECT signal. Therefore, ECT using the bobbin coil probe cannot reliably characterize the maximum depth of short microflaws characteristic of ODSCC/IGA. However, based on structural (burst) tests reported elsewhere in this report, the ECT voltage amplitude provides a measure of the structural integrity degradation. The above uncertainties are conservatively treated in assuring tube integrity.

4. Projected EOC-14 Bobbin Voltage

To establish tube integrity for Operating Cycle 14, the largest bobbin coil probe voltage at the EOC-14 is estimated based on the largest bobbin coil probe voltage amplitude left in service plus an estimate of the voltage uncertainty and the increase in voltage during the cycle.

The maximum projected EOC-14 bobbin voltage amplitude is estimated as follows:

$$V^{EOC}_{Max} = V^{BOC}_{Max} + \Delta V_{NDE} + \Delta V_{G}$$

Where:

V^{EOC}_{Max} = Maximum projected amplitude EOC-14

V^{BOC}_{Max} = Maximum voltage amplitude left in service BOC-14

= 1.0 V_T (0.80 V_W)

ΔV_{NDE} = Uncertainty in measurement of voltage amplitude attributable to calibration[1], probe wear, and analyst.

$= \sqrt{\Delta V^2_{NDE\text{-analyst}} + \Delta V^2_{NDE\text{-probe}}}$

= 1.0 V_T (0.80 V_W) $\sqrt{(0.15)^2 + (0.20)^2}$

= 0.25 V_T (0.20 V_W)

ΔV_G = Increase in voltage amplitude

= 0.24 V_T (0.19 V_W)

The average growth rate is used along with the variations as margin and uncertainty in the other terms.

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[1]Cross calibration shows a 15 percent constant factor between Trojan voltage values and Westinghouse voltage values; therefore, $\Delta V_{NDE\text{-calibration}} = 0$.

Based on the previous development, the projected end of cycle voltage amplitude is:

$$V^{EOC-14} = 1.0\ V_T\ (0.8\ V_W) + 0.25\ V_T\ (0.20\ V_W) + 0.24\ V_T\ (0.19\ V_W)$$
$$= 1.49\ V_T\ (1.19\ V_W)\ \text{(at average voltage growth)}$$

Furthermore, calculations of EOC-14 voltage at 95 percent, 99 percent and 99.9 percent cumulative probabilities on voltage growth show projected EOC-14 voltages of 2.21 V_T (1.77 V_W), 2.74 V_T (2.19 V_W), and 3.46 V_T (2.77 V_W), respectively.

In summary, the projected EOC-14 voltage of 1.49 V_T (1.19 V_W) is significantly less than the voltage amplitude of 8.0 V_T (6.4 V_W) for tube burst at $3\Delta P_{NO}$ and the voltage amplitude of 36.0 V_T (29.0 V_W) for tube burst at SLB conditions, evaluated at the lower 95 percent confidence limit.

B. Tube Integrity

1. Criteria

Steam generator tubes with through-wall flaws should maintain "leakage integrity" and are acceptable for continued operation if the extent of the flaws meets the following NRC RG 1.121 criteria:

a. Tubes are demonstrated to maintain a factor of safety of greater than 3.0 against failure (burst) under normal operating pressure differential.

b. Tubes are demonstrated to maintain adequate margin against tube failure under postulated combined accident condition loadings and the loadings required to initiate propagation of the largest longitudinal flaw resulting in tube rupture.

c. The leakage rate determined for the largest permissible flaw should be less than the leakage rate limit specified by the plant technical specification.

2. Approach

Two independent evaluations of the potential for burst were performed by Westinghouse and documented in Appendix 3. The evaluations include: (1) assessment utilizing correlations between bobbin coil voltage and burst pressure to demonstrate margins against burst without considering the constraint of the TSP and (2) analyses to demonstrate that the TSP does not displace even during the SLB accident condition. The conclusion of these tube integrity evaluations is that the tube burst criteria defined by NRC RG 1.121 have been met for Trojan for Operating Cycle 14 operation, without considering the constraint of the TSP. The criteria are satisfied by a wide margin considering that the TSPs are not displaced during operation and the TSPs are unlikely to be displaced during accident conditions.

The approach applied to demonstrate Trojan tube integrity utilizing the bobbin coil voltage amplitude to burst pressure correlation was accomplished by the following evaluation steps:

a) Demonstrate the applicability of voltage/burst correlation to Trojan tube degradation at TSPs.

b) Establish the upper bound voltage amplitude left in service.

c) Define voltage amplitude growth rates from Trojan operating experience.

d) Define NDE uncertainty for voltage amplitude.

e) Conservatively estimate the bobbin voltage amplitude at EOC-14 from Steps b through d.

f) Compare EOC-14 projected voltage amplitude from Step e with values for burst at $3\Delta P_{NO}$ from Step a.

g) Estimate the probability of tube burst at SLB conditions for the bounding voltage amplitude left in service.

h) Estimate the potential SLB leakage at EOC-14 for indications left in service utilizing a correlation for leakage with bobbin voltage.

NRC RG 1.121 describes a method acceptable to the NRC staff for establishing the required integrity margin beyond which a defective tube shall be removed from service. For degraded steam generator tubes, plugging criteria have been developed by licensees on a case-by-case basis, using analyses and tests to establish the maximum tube flaw that can be tolerated while still maintaining tube integrity. The degree of allowable degradation may differ depending on the type of flaw. Because of the nature of ODSCC/IGA (i.e., microscopic), short but deep microflaws may be present and undetected, yet the tube will remain serviceable. Serviceability has been verified by using the projected EOC-14 bobbin coil probe voltage in a bobbin coil probe voltage to burst strength correlation based on pressure burst tests of tube samples pulled from TNP steam generators.

3. Tube Integrity Based on Bobbin Voltage to Burst Correlation (Free Span Model)

The burst pressure test results and bobbin coil voltages on tubing from TNP with ODSCC/IGA flaws were combined with other industry data to develop a voltage/burst strength correlation and the associated 95 percent lower prediction. The trend of TNP data fits well with the other industry data demonstrating an excellent correlation between bobbin voltage and burst pressure. The correlation was adjusted to account for temperature effects and the lower tolerance limit for material properties. The correlation is shown in Appendix 3, Figure 8-2, "Burst Pressure Versus Bobbin Voltage (7/8 x 0.050 Inch Tubing)", to be applicable to TNP for tubes with ODSCC/IGA.

Only two of the sample TSP intersections from TNP include significant IGA (maximum of percent depth). Therefore, the voltage/burst strength correlation was confirmed for uniform IGA by burst test of laboratory specimens with uniform IGA of 9 percent, 36 percent, 52 percent, and 58 percent depth. The test results were at or near the mean fit to Appendix 3, Figure 8-2 data. Therefore, the correlation is a reasonable basis from which to assess tube integrity at Trojan for ODSCC/IGA.

The maximum projected EOC-14 bobbin coil probe voltage is projected to be 4.9 V_T (3.9 V_W) with a probability of approximately 1×10^{-4}. The conservative projection exceeds the 4.5 V_T (3.6 V_W) indication found in 1991. The probability for one tube at 1.9 V_T (1.5 V_W) at BOC-14 to burst at SLB conditions is approximately 5×10^{-8}. A total of approximately 680 3:1 indications are being left in service with an assumed bobbin coil probe voltage of 1.9 V_T (1.5 V_W), to estimate the net probability of burst at SLB conditions of 3.4 x 10^{-5}. The assumed level of 1.9 V_T (1.5 V_W) is greater than the inspection criteria of 1.0 V_T (0.8 V_W) with an allowance for uncertainty and voltage, including the effect of a 2.2°F increase in reactor outlet coolant temperature, due to plugging of steam generator tubes to the analyzed limit of 20 percent as discussed in Section V.A.3.

Based on the projected EOC-14 bobbin coil probe voltage of 1.5 V_T (1.2 V_W), the burst strength of the degraded tube without the constraint of the TSP is conservatively estimated as approximately 6,000 psi. This is over a factor of four greater than the normal operating differential pressure, which represents a margin of 40 percent between the $3\Delta P_{NO}$ criterion and the burst strength. For the SLB accident, the 6,000 psi burst strength is over a factor of two greater, which provides a margin of over 100 percent. Thus, even ignoring the constraint of the TSP during normal operating conditions, PGE has been conservative in repairing tubes, and the tubes remaining in service provide a wide margin of safety beyond the criteria described in RG 1.21.

3. <u>Tube Integrity Based on Tube Support Plate Constraint</u>:

The tube integrity was established above based on a correlation of bobbin voltage to burst pressure, assuming that the OD indications at the TSP intersections could be in the free span elevations (TSP displaced remote from the degradation). With a nominal gap up to 0.039 inch (1.0 mm) between the TSP and the tube, the reinforcement provided by the support plate will preclude burst as long as it remains over the degradation. The reinforcement effect of the support plate was confirmed by burst testing of simulated degraded samples in TSP "collars" discussed in Appendix 3.

The most credible mechanism for displacement of the TSPs is the SLB accident condition. The following analysis demonstrates that assuming the TSP is displaced is conservative because the TSPs are constrained from moving relative to the tubes even under the most limiting accident condition of SLB.

This approach to tube integrity involves a comparison of the number of tube-to-TSP intersections required to support the computed SLB integrated pressure "applied plate loadings" to the number of tube-to-TSP intersections which will offer "supporting load" capability based on field ECT results. Thermo-hydraulic modeling of the Trojan steam generators computed maximum plate forces representing the maximum dynamic loads over time. These loads are compared to tests results employing specimens exposed in autoclaves that are used to establish the conservative (smallest) static "pull forces" which cause "breakaway" and relative motion between the tube and TSP specimens. The test-measured "pull forces" are much lower than the pull forces on in situ tubes, demonstrating conservatism relative to the expected actual load carrying capability of the in situ steam generator tube support plates.

Trojan ECT data were reviewed to assess the presence of TSP corrosion and magnetite or tube denting with deformation at the TSP intersections. The results of the TSP corrosion evaluation show that, with the exception of the first and second TSPs of Steam Generator B, more than 50 percent of the TSP intersections show TSP corrosion. Corroded tube-to-TSP intersections from laboratory tests were found to be capable of carrying, as a minimum, the lower bound load of 80 pounds. The analysis results show that the percentage of TSP intersections that are corroded based on ECT results meets or exceeds the percentage of corroded intersections required to provide the condition of no expected tube-to-TSP relative motion during a postulated SLB.

In the unlikely event that a postulated SLB should actually occur, it is unlikely that significant relative motion would occur between the tubes and the TSPs in the TNP steam generators. Therefore, the TSP constraint present at the indications would prevent tube burst for axial indications within the TSPs during an SLB as well as during normal operating conditions.

NRC RG 1.121 requires that steam generator tubes provide adequate margin against tube failure under postulated combined accident condition loadings. Conceptually, combined loading conditions could result in yielding at a TSP with subsequent deformation of tubes. If significant tube deformation should occur, primary flow area could be reduced, and postulated flaws in tubes could propagate through-wall with the potential for in-leakage under loss of coolant accident (LOCA) conditions or increased primary-to-secondary leakage. Analyses performed by Westinghouse and documented in Section 9 of Appendix 3 conclude that for the combined LOCA and Safe Shutdown Earthquake (SSE) condition, the maximum deformation will not exceed 0.025 inch, and tubes will not have increased leakage as a consequence of the deformation. For the combined loading condition of SLB and SSE, the analysis demonstrates that burst capability of a full thickness tube with a through-wall flaw is not affected by the SSE bending stress in combination with pressure stress of an SLB.

C. Consideration of Leak Before Break

The TTS limit of 500-gpd leakage per steam generator makes it likely that steam generator tube integrity would be maintained in the event of a main steam line rupture or under LOCA conditions. To provide additional margin that an ODSCC/IGA flaw (or other flaw form) will be detected, should it propagate at a much greater rate than expected, a TTS change will be submitted which will limit primary-to-secondary leakage to 130 gpd. A single tube leaking at this rate will still maintain adequate integrity to satisfy NRC RG 1.121.

NRC RG 1.121 acceptance criteria for establishing operating leakage limits are based on leak before break (LBB) requirements such that Plant shutdown is initiated if the leakage associated with the longest permissible flaw is exceeded. The longest permissible flaw is that of a length that provides a factor of safety of three against bursting at the normal operating pressure differential.

A single tube leaking at the rate of 130 gpd will exhibit a flaw length which can be calculated assuming a tight SCC axial flaw. Westinghouse developed a leakage model for single axial flaws that has been validated with leak rate test results from pulled tube and laboratory specimens. The burst pressure for this flaw length can also be calculated to determine whether or not a tube leaking at this rate will have a burst pressure greater than $3\Delta P_{NO}$.

As discussed in Appendix 3, Section 10, "Tube Repair Criteria for OD Indications at TSPs", 130 gpd corresponds to a through-wall axial flaw of 0.4 inch. A flaw of this length has a burst pressure greater than $3\Delta P_{NO}$. Thus, the 130-gpd limit provides for Plant shutdown prior to reaching critical flaw lengths, even if the TSPs were displaced under normal operating conditions.

D. Conclusion Regarding Tube Integrity

The potential for tube burst was evaluated at $3\Delta P_{NO}$ and at ΔP_{SLB} considering the projected maximum EOC bobbin voltage amplitudes, ECT uncertainty, and increase in reactor outlet coolant temperatures. The $3\Delta P_{NO}$ is based on the expected secondary pressure for 20 percent plugging. Both evaluations showed there is adequate margin against tube burst even with the conservative assumption that the TSP is displaced away from the region of degradation (free span model) under normal operating and accident conditions. The probability for burst and SLB leakage at EOC-14, based on correlations of bobbin coil voltage to burst pressure and bobbin coil voltage to leak rate was evaluated. Additional structural integrity is provided by the constraint of the TSP under normal operating conditions. In addition, for accident conditions the analysis that concludes that in the unlikely event that a postulated SLB actually occurred, the TSP would not be displaced. Since the TSP prevents tube burst for axial indications within the TSP intersections, burst is precluded under normal operating and accident conditions. Therefore, the structural integrity of the steam generator tubes remaining in service at TNP has been confirmed for Operating Cycle 14 based on satisfying the criteria of NRC RG 1.121 with very conservative assumptions.

The 130-gpd leakage limit provides further protection against tube rupture. In addition, the 130-gpd limit provides the capability for detecting a flaw that might grow at much greater than expected rates, and thus, provides additional protection against exceeding SLB leakage limits. In summary, the results of consideration of tube integrity and leakage support a return to power and full cycle operation for Operating Cycle 14.

E. Summary of Safety Evaluation Regarding Steam Generator Status

PGE has performed an evaluation assessing whether an unreviewed safety question (USQ) as defined by 10 CFR 50.59, "Changes, Tests and Experiments", exists. This report provides much of the information that was utilized in the safety evaluation conclusions, and that information is not restated in this section. However, PGE has addressed in this section, in summary form, key factors that contributed to its conclusion that the current status of TNP steam generators does not involve a USQ.

The criteria for determining if an USQ exists as provided in 10 CFR 50.59(a)(2) are as follows:

> A proposed change, test, or experiment shall be deemed to involve a USQ (i) if the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or (ii) if a possibility for an accident or malfunction of a different type than evaluated previously in the safety analysis report may be created; or (iii) if the margin of safety as defined in the basis for any Technical Specification is reduced.

PGE has utilized the guidance of the Nuclear Safety Analysis Center (NSAC)-125, "Guidelines For 10 CFR 50.59 Safety Evaluations", dated June 1989 in performing this safety evaluation.

Turning to the specific 10 CFR 50.59 criteria, PGE has concluded that the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the TNP safety analysis report will not be increased as a result of Plant operation during Operating Cycle 14 with marginally detectable indications in the steam generator tubes at the TSPs. This conclusion is based on the technical positions taken herein, and the fact that TNP will continue to maintain adequate margin for tube failure. Burst testing of pulled tube TSP intersections has shown for NDE calls, which resulted in inconclusive depth measurements, that the burst strengths exceeded $3\Delta P_{NO}$. The analyzed FSAR conditions for tube rupture bound the consequences of potential indications left in service based on the eddy current program performed during the current outage. The results of the analysis performed confirm that tube integrity is maintained, and therefore, the probability of a steam generator tube rupture (SGTR) event is not increased. As previously noted, basing tube integrity on burst strength is appropriate for microscopic flaws. Volumetric flaws will continue to be assessed on a percent through-wall basis.

Accidents affected by primary-to-secondary leakage were reviewed, and the SLB is the most limiting in considering the potential for off-site doses. The results of the analysis performed concludes that the expected distribution of indications at the TSP intersections are such that primary-to-secondary leakage would result in site boundary doses within a small fraction of the 10 CFR 100 guideline during a postulated SLB event.

In regard to the second criteria for a USQ, PGE has concluded that the possibility for an accident or malfunction of equipment of a different type than previously evaluated in the TNP safety analysis report will not be created as a result of the present Plant condition. PGE reaches this conclusion based on information contained throughout this report. In particular, the TNP FSAR already postulates a steam generator tube rupture (see FSAR Section 15.6.3) Based on the Trojan repair guideline for Cycle 14, which is more conservative than repair criteria supported by Appendix 3, a tube rupture remains the type of accident that could occur.

The completed analysis also concludes that significant tube deformation, which would affect primary coolant flow, does not occur during the combined accident loading conditions of a LOCA and an SSE. Tube burst integrity is maintained during a combined SLB and SSE.

In addition, LBB criteria established for Operating Cycle 14 operation precludes unstable flaw growth leading to tube burst in the unlikely event of a limiting accident. LBB provides protection against a coupled SLB and SGTR event, which is outside the design basis of the Plant.

Finally, PGE has evaluated the third 10 CFR 50.59 criteria, and has determined that the margin of safety as defined in the basis of TTS has not been reduced as a result of the current Plant condition. Adequate safety margin has been proven to exist for the EOC-14 estimated tube degradation conditions, in that NRC RG 1.121 requirements will continue to be satisfied. In addition, operational enhancements that have or will be implemented should increase the margin of safety regarding a tube rupture accident. These enhanced capabilities include: (1) installation of N-16 monitors, which will detect increasing primary-to-secondary leakage more promptly than off-gas monitoring previously used; (2) additional operator training on SGTR events has been conducted; (3) the allowed primary-to-secondary leak rate has been reduced significantly by administrative procedure from 500 gpd to 130 gpd; and finally, (4) PGE has applied a more conservative limit than is used by most of the industry regarding the detection and repair of microscopic flaws. These actions, collectively considered, provide adequate assurance that the margin of safety as discussed in TNP Technical Specifications has not been reduced.

VI. FaAA OVERVIEW

FaAA was retained at the request of the PGE Corporate Office to provide an independent overview of PGE steam generator-related activities undertaken toward restart of TNP for Operating Cycle 14. The FaAA overview included review of plans and products by PGE engineering staff, PGE consultants and service vendors. Specific technical areas of FaAA overview were concerned with reviewing: (1) NDE practice for conformance to applicable standards; (2) the validation of NDE results; (3) methodology for determination of degradation growth rates; (4) the use of eddy current inspections to assure the integrity of tubes during Operating Cycle 14; and (5) evaluation of proposed water chemistry for Operating Cycle 14 in terms of the current state of knowledge pertaining to initiation and growth of the tube degradation being experienced at Trojan.

Performance of FaAA's overview proceeded along multiple lines. On-site staff attended PGE-TNP planning meetings and interacted directly with PGE and on-site contractor staff. FaAA staff attended meetings between NRC and PGE at TNP and an Advisory Committee on Reactor Safeguards (ACRS) meeting dealing with alternate plugging criteria (APC) held in Washington, DC. Documentation and procedures of the NDE service vendor were reviewed by FaAA Level III eddy current specialists and compared with applicable standards. FaAA level III specialists also attended portions of the database review conducted at Zetec facilities. Documentation developed by Westinghouse and PGE in support of reactor startup was reviewed and commented upon. Where applicable, FaAA obtained raw data and conducted an independent analysis, specifically in the area of developing flaw growth rates from the NDE database. Meetings were held with PGE staff, PGE consultants, and EPRI concerning corrosion mechanisms and recommendations for Operating Cycle 14 water chemistry. Identification and review of pertinent technical literature was conducted to support FaAA evaluations.

Overview findings of FaAA are as follows:

1. NDE Practice

The inspection and analysis procedures appear to be in close conformance with both regulatory and guidance documents. Conformance to ASME Code, NRC RG 1.83 and EPRI Examination Guidelines was evident.

2. Validation of NDE Results

The recently-evolved data analysis procedures appear to be technically sound and applicable to the problem at hand. The technology utilized appears to be at state-of-the-art limits. This is particularly manifest in the use of the new three-coil MRPC probe combined with computerized band pass filtering. As a result, detectability and characterization should be substantially improved over that attainable with the standard pancake coil and conventional filtering.

Extensive effort was apparent on the part of the ISI vendor in the areas of personnel certification and training. Analysts were certified in accordance with American Society for Nondestructive Testing (ASNT) Recommended Practice No. SNT-TC-1A, "Personnel Qualification and Certification of Nondestructive Testing", dated August 1984. Moreover, each was administered a site-specific practical examination. Examination results were reviewed by FaAA Staff.

3. Determination of the Rate of Degradation

The statistical analysis of ECT results for hundreds of axial indications for the past two operating cycles (three inspections) provides an adequate basis to establish degradation growth rates based on voltage for use in tube integrity assurance analyses.

4. Tube Integrity Assurance

FaAA has reviewed the PGE approach to tube integrity assurance regarding degradation at the TSPs. We conclude that:

a) PGE has performed NDE of the TSP intersections which exceeds normal industry practice, which is at the current state-of-the-art, and which is detecting degradation at earlier stages of development than industry practice.

b) PGE has pulled, tested, and examined metallurgically TSP intersections with a range of NDE indications, has well characterized the actual degradation, and has measured the maximum effect on tube burst by not including the constraint actually provided by the TSP.

c) PGE has implemented for Operating Cycle 14 much more extensive and improved NDE coupled with a more conservative repair basis to identify and remove from service tubes with less developed (severe) degradation at the TSPs.

d) PGE consultant, Westinghouse, has determined the allowable degradation based on bobbin voltage using extensive TNP-specific testing as well as generic data. The effects of NDE uncertainties on the BOC degradation left in service and the rate of degradation growth and its uncertainty have been included to establish the allowable BOC voltage. This BOC allowable is well in excess of the repair basis which PGE has established.

5. Evaluation of Water Chemistry For Operating Cycle 14

FaAA concurs with the Operating Cycle 14 plan of (1) operating under continued high purity conditions in conformance with EPRI guidelines, (2) implementing improvements in Plant water chemistry analytical instrumentation to provide real time on line quantification of water chemistry parameters, (3) providing data for scientific study of crevice chemistry and the use of crevice chemistry computer models through short-term controlled species injections, and (4) adjusting water chemistry to achieve a near-neutral crevice chemistry.

The Operating Cycle 14 water chemistry (like the Operating Cycle 13 chemistry) will include maintaining hyperpurity conditions (per EPRI guidelines), boric acid soaks and injections, and AVT control. PGE is exploring options which may offer opportunity to slow the current tube degradation in the TSP intersections. The Operating Cycle 14 plan for water chemistry should maintain or decrease current rates of tube degradation.

VII. OPERATIONAL ENHANCEMENTS FOR FUEL CYCLE 14

A. <u>Installation and Use of Nitrogen-16 Monitors</u>

Nitrogen-16 (N-16) monitors are being installed on the main steam lines at Trojan to provide early detection of primary-to-secondary leaks (much better than the manual sampling techniques previously used at TNP). The leakage detection limit with these monitors is equivalent to approximately 1 gpd from each steam generator. This provides a significant margin for operator action prior to reaching primary-to-secondary leakage limits.

N-16 is produced by the interaction of neutrons with oxygen in the primary coolant. The amount of N-16 in the primary coolant is directly proportional to reactor power level. N-16 is a radioisotope characterized by a short half-life (7.35 seconds) and the emission during decay of two high-energy gammas (6.13 MeV and 7.12 MeV). N-16 monitors provide a threshold detection limit of about 1 gpd based on a gamma radiation count rate of 0.25 counts per minute over background (background radiation count rate is expected to be 0.2 counts per minute).

The N-16 detectors are located in proximity to one another downstream of the main steam isolation valves. This is the preferred location because the N-16 detectors are well shielded from the steam generator blowdown lines. Also, with this configuration, several monitors should respond at the same time to a leakage event, providing a more reliable confirmation of leakage. Steam generator tube leakage that may occur when the main steam isolation valves are closed (i.e., when reactor power is less than 20 percent) will still be detected by the existing Process Radiation Monitors (PRM-16 Geiger-Muller detectors) which are located just outside Containment upstream of the main steam isolation valves.

N-16 monitors have been successfully used at Zion, North Anna, Farley, Millstone 2, Braidwood, and Indian Point 2. The operational results have demonstrated that low-level leakage rates tracked by the N-16 monitors after calibration have closely agreed with the leakage rates determined from chemistry measurements obtained from the steam generator blowdown or air ejector vent.

However, the N-16 monitors are preferred because they provide continuous on-line monitoring capability. Consideration of N-16 monitors is recommended in NRC IN 91-43, "Recent Incidents Involving Rapid Increases in Primary-to-Secondary Leak Rate", dated July 5, 1991. Westinghouse has also recently recommended N-16 monitors in Westinghouse Report, "Fatigue Cracking of Steam Generator Tubes with AVB [anti-vibration bar] Support", transmitted to PGE by letter POR-91-596, dated October 3, 1991.

B. Planned Steam Generator Chemistry Program

Tube degradation has occurred at TNP even though very low levels of impurities in secondary water have been achieved in striving to comply with increasingly lower recommended impurity standards. The degradation appears to have resulted from the concentration of caustic agents in crevices between tubes and TSPs. The concentration of impurities stems from the restriction of flow in the tube-to-TSP intersection crevices, which is a condition inherent in TNP steam generator design. As a result, the proposed Cycle 14 secondary chemistry control program has been designed to modify the caustic conditions in steam generator tube crevices. The best method known of predicting the conditions in the crevice is to monitor the molar ratios of important cations and anions in the secondary side bulk water and the hideout return.

During Operating Cycle 14, TNP plans to implement improved water chemistry to achieve near-neutral tube-to-TSP intersection crevice chemistry conditions. The changes will be consistent with EPRI secondary water chemistry guidelines.

The on-line ion chromatograph is currently capable of analyzing and detecting contaminants of interest (sodium, potassium, chloride, and sulfate) in the 500-ppt range. Lower limits of detection will be established during Operating Cycle 14.

After reaching 100 percent power and stable chemistry conditions, a hideout test to determine the rate of hideout of particular chemical species in the Trojan steam generators will be performed by injecting very small quantities of chemicals into the secondary system. Using the results of the hideout test, a new EPRI computer program, CREV-SIM, will be used with EPRI's MULTEQ computer program to evaluate the ionic balance of cations and anions in the steam generator tube-to-TSP intersection crevices.

After careful review of the information from the hideout test, the CREV-SIM results, and the results from the destructive examination of pulled tube samples, a revised chemical control program will be implemented as required. This program may include low level chemical injection to achieve neutral or slightly acidic crevices. An alternative approach is to consider use of the condensate polishers during Operating Cycle 14 to produce more acidic crevice chemistry conditions. Whatever approach is taken, this program will be conducted in accordance with Technical Specification 6.8.4.c, "Secondary Water Chemistry".

Cation-to-anion ratios will be monitored and trended by the Trojan Chemistry Department. A method to control this molar ratio will be evaluated following completion of hideout testing, pulled tube analysis, and initial CREV-SIM and MULTEQ analysis.

A hideout-return study will be completed within the first four months of full power operation to evaluate the results of CREV-SIM predictions. The chemical control program will be further evaluated during Operating Cycle 14.

The NRC Office of Nuclear Reactor Regulation, Division of Engineering Technology requested that PGE provide additional information regarding steam generator TSP intergranular corrosion. Responses to the request are as follows:

NRC Request 1:

Provide a description of the Trojan plans to control crevice IGA/SCC, including hideout/hideout-return studies and cation-to-anion molar ratio control parameters, and action responses when the cation-to-anion molar ratio is outside the control range, and required instrumentation including detectability level.

PGE Response:

The requested information is provided throughout the preceding paragraphs of Section VII.B of this report.

NRC Request 2:

Provide a statement concerning the use of phosphate in the steam generator secondary water chemistry control program.

PGE Response

Phosphate injection into the steam generators is not currently part of the Operating Cycle 14 secondary water chemistry control program. If the plan to not inject phosphates changes, PGE will discuss the issue with the NRC.

C. Administrative Limits for Primary-to-Secondary Leakage

As part of PGE's response to NRC Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes", dated February 5, 1988, PGE implemented an enhanced primary-to-secondary leak rate monitoring program. (See PGE response dated March 11, 1988.) Initially, the enhanced monitoring program was intended to ensure that Plant power level would be reduced to 50 percent power or less when the leakage rate reached a level at which a tube rupture was predicted to occur.

PGE's enhanced monitoring program provides for progressively increased surveillance as the detected leakage rate increases. The program requires that the primary-to-secondary leak rate be monitored and calculated weekly so long as the leak rate remains less than 10 gpd. If the increased leakage is 10 gpd or greater, then the enhanced monitoring requirements are invoked, requiring the calculation of the leakage rate every 8 hours. If the leakage rate further increases to 50 gpd or greater and is increasing at a rate of 50 gpd, then recommendations are made to the Plant Manager to either reduce power or shut down the Plant.

PGE continued to improve on leak rate detection criteria and limits as the need for tighter limits became evident. Accordingly, PGE will submit a change to reduce the current 500-gpd primary-to-secondary leakage limit per steam generator to 130 gpd. In addition, PGE plans to reduce this limit further to 80 gpd per steam generator with administrative controls.

Recently, PGE has upgraded Plant procedures to require prompt operator action to complete shutdown within 45 minutes of detecting or observing a rapid leakage increase. Procedures exist to carry out the leakage detection program actions which include a rapid response and Plant shutdown upon an indication of a sudden or rapidly increasing leak.

D. Augmented Training for Operators

To improve operator ability to detect and correctly respond to potential SGTR or steam generator tube leakage, PGE has increased operator training.

The following steam generator-related training was conducted from August 1990 to December 1991.

1. Simulator

   Each licensed operator acts in various roles as part of a team in simulator exercises. These exercises are part of each retraining cycle that approximates 20 percent of the operator's duties (one week out of five). Actual time in the simulator responding to various scenarios is over 60 hours per year per operator. The typical scenario varies, but usually includes normal, off-normal, and emergency situations, and lasts from one to four hours. The scenarios range from the relatively straight forward to complex multiple casualties. The following exercises were conducted in the current retraining cycle that relate to steam generator tube problems:

   a. Steam Generator Tube Leak

   b. Tube Leak/Plant Shutdown

   c. Faulted and Ruptured Steam Generator

2. Classroom

   Classroom lectures are also part of the retraining cycle and are conducted on about 120 hours per year per individual. Lectures last from one to five hours and are conducted on the following topics that relate to the steam generator tube problems:

a. Response to Steam Generator Tube Rupture

Portions of this lesson cover the steam generator-related emergency contingency actions. These actions include responses to an SGTR with a concurrent LOCA or loss of pressure control.

b. Lessons Learned from Ginna and North Anna SGTRs

The students reviewed the lessons learned from Ginna and North Anna SGTRs and considered action taken to prevent or mitigate the consequences of similar events at Trojan.

c. Ready for Startup Training

This training includes reviews of the following: the Mihama steam generator tube leak event and Trojan Chemistry Manual procedure changes to account for this experience; the capability of the planned installation of N-16 detectors to monitor steam generator tube leakage in real time; and integrated Plant effects of increased tube plugging of the steam generators during the next operating cycle.

d. Steam Generator Tube Leak Procedure

This training covered changes to the steam generator tube leak procedure, due to the Mihama event. It also provided management feedback on steam generator tube rupture procedure use issues.

e. NRC IN 91-43

This training covered NRC IN 91-43 on recent events involving rapid increases in primary-to-secondary leak rate.

E. Procedure for Shutdown When Leakage is Detected

In response to the Japanese plant, Mihama, steam generator tube rupture event, a revision was made to the steam generator tube leak procedure to improve operator response to indications of a steam generator tube leak. This upgrade was completed in July 1991 and included the following changes:

1. Upgraded to be consistent with the emergency instruction for an SGTR.

2. Upgraded to require prompt action to initiate Plant shutdown based on the first confirmed indications of an increasing steam generator tube leak as indicated by radiation monitors (located on the condenser off gas line, the steam generator blowdown lines, the main steam lines, and the steam generator blowdown condensate return line to the condenser) decreasing Reactor Coolant System pressure or pressurizer level increasing steam generator level or Chemical and Volume Control System flow mismatch.

3. The procedure also requires (1) Plant shutdown to be completed within 45 minutes of identification of an increasing steam generator tube leak. (2) Manual safety injection and entry into emergency operating procedures if pressurizer level cannot be maintained with one centrifugal charging pump. This results in a more rapid and conservative transition into the emergency operating procedures than previously required.

After completion of on-line testing on the new N-16 main steam line radiation monitors, the steam generator tube leak procedure will be revised to include the additional diagnostic abilities of these instruments.

VIII. CONCLUSIONS

Based on months of extensive examination, testing, and analysis, that have been performed as described below, it is concluded that there is reasonable assurance that the condition of TNP steam generators will satisfy TTS prior to restart in that: (1) tubes will not be left in service which contain flaws that exceed the 40 percent through-wall criterion as determined by traditional ECT techniques accepted by the ASME Code, and (2) tubes left in service even with ODSCC/IGA microflaws will not become unserviceable prior to the next refueling outage.

This conclusion is based on the following:

1. 100 percent bobbin coil probe inspection of hot leg tubes from the hot leg side tubesheet through the cold leg side seventh TSP intersection.

2. MRPC probe inspection of TSP intersections with PIs identified by the bobbin coil probe.

3. 100 percent MRPC probe inspection of hot leg TSP intersections up through the fifth TSP.

4. MRPC probe inspection of a sample of hot leg sixth and seventh TSP intersections and of hot leg sixth and seventh TSP intersections with bobbin coil probe voltage greater than 1.0 V_T (0.8 V_W).

5. Repair by plugging or sleeving tubes with bobbin coil probe PIs confirmed by MRPC testing (Revision 0 and Revision 2 inspection criteria without regard to bobbin voltage).

6. Repair by plugging or sleeving tubes with MRPC-confirmed ODSCC/IGA microflaws at the TSP intersections having bobbin coil probe voltages greater than or equal to 1.0 V_T (0.8 V_W).

7. Confirmation by destructive testing that the burst strength for tubes with ODSCC/IGA microflaws remaining in service substantially exceeds the recommendations of NRC RG 1.121. Using NRC RG 1.121, an allowable criterion of 4.3 V_T (3.5 V_W) was developed. A more conservative TNP repair basis of 1.0 V_T (0.8 V_W) discussed in Item 6 above was adopted to ensure tube integrity throughout Operating Cycle 14 operations.

8. In addition, significant surveillance and operational enhancements have been or will be implemented during Operating Cycle 14. These actions include:

   A. A significant reduction in the TTS-allowable primary-to-secondary leak rate from 500 gpd to 130 gpd per steam generator and from 1 gpm to 400 gpd total.

   B. Installation of N-16 monitors, which are designed to promptly detect primary-to-secondary leakage.

   C. Revision of a procedure has been implemented to require rapid Plant shutdown in the event of any rapidly increasing steam generator tube leakage.

   D. Enhanced operator training has been conducted on steam generator tube break events.

Based primarily on the above factors, it is determined that TNP steam generators are operable. PGE, therefore, requests NRC review of this report and appropriate actions as necessary.

REFERENCES

1. Adams and Hobart Report, "Process Analysis at the Trojan Nuclear Power Plant", dated June 1990.

2. ABB/CE Report No. CE-NPSD-702, "Structural Aspects of Trojan Steam Generator Tubing Determined by Destructive Examination".

3. ASNT Recommended Practice No. SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing", dated August 1984.

4. ASME Section V, "Nondestructive Examination", 1983 Edition through Summer 1983 Addenda.

5. ASME Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components", 1983 Edition through Summer 1983 Addenda.

6. 10 CFR 50.59, "Changes, Tests and Experiments".

7. 10 CFR 50.73, "Licensee Event Report System".

8. EPRI Report NP-3037, "Condensate Polishing at Surry Nuclear Power Station", dated June 1983.

9. EPRI Report NP-4678, "Crevice Hideout Return Testing", dated July 1986.

10. EPRI Report NP-5368, "Mechanisms for Formation and Disruption of Surface Oxides", dated August 1987.

11. EPRI Report NP-6362-SD, "Examination of Pits in Trojan Nuclear Plant Steam Generator Tubes", dated May 1989.

12. EPRI Report NP-6455, "Field Studies on Intergranular Attack", dated August 1989.

13. NRC Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes", dated February 5, 1988.

14. NRC IN 91-43, "Recent Incidents Involving Rapid Increases in Primary-to-Secondary Leak Rate", dated July 5, 1991.

15. NRC IN 91-67, "Problems With the Reliable Detection of Intergranular Attack (IGA) of Steam Generator Tubing", dated October 21, 1991.

16. NRC RG 1.83, "Inservice Inspection of Pressurized Water Reactor Steam Generator Tubes", Revision 1, dated July 1975.

REFERENCES (Continued)

17. NRC RG 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes", dated August 1976.

18. NUMARC NSAC-125, "Guidelines For 10 CFR 50.59 Safety Evaluations", dated June 1989.

19. NWT Corporation Report, "Blowdown Molar Ratio Variations at the Trojan Nuclear Power Plant", dated October 28, 1991.

20. PGE LER 91-27, "Steam Generator Inspections Result in C-3 Classification", dated September 11, 1991.

21. Trojan Nuclear Plant Final Safety Analysis Report (Docket 50-344).

22. Trojan Nuclear Plant Technical Specifications (Appendix A to Facility Operating License NPF-1, Docket 50-344).

23. Westinghouse Report, "Trojan - Review of Secondary System Chemistry 1987/1988", transmitted to PGE by Letter POR-89-648, dated December 15, 1989.

24. Westinghouse Report, "Fatigue Cracking of Steam Generator Tubes With AVB [anti-vibration bar] Support", transmitted to PGE by Letter POR-91-596, dated October 3, 1991.

25. Westinghouse Report WCAP-13082. "Trojan Tube Integrity Assessment for Cycle 14 Operation", dated November 1991.

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

ABB	Asea Brown Boveri
ACRS	Advisory Committee on Reactor Safeguards
ANA	Allen Nuclear Associates
APC	Alternate Plugging Criteria
ASME	American Society of Mechanical Engineers
ASNT	American Society for Nondestructive Testing
AVT	All Volatile Treatment
BOC	Beginning of Operating Cycle
C	Column
CE	Combustion Engineering
CFR	Code of Federal Regulations
°F	Degrees Fahrenheit
ΔP	Differential Pressure
ECT	Eddy Current Testing
EOC	End of Operating Cycle
EPRI	Electric Power Research Institute
FaAA	Failure Analysis Associates, Incorporated
FSAR	Final Safety Analysis Report
gpd	Gallons Per Day
gpm	Gallons Per Minute
Hz	Hertz
IGA	Intergranular Attack
IGSCC	Intergranular Stress Corrosion Cracking
IN	Information Notice
ISI	Inservice Inspection
LBB	Leak Before Break
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
MAI	Multiple Axial Indication
MeV	Million Electron Volts
mm	Millimeter
MRPC	Motorized Rotating Pancake Coil
N	Nitrogen
NDE	Nondestructive Examination
NO	Normal Operating
NRC	Nuclear Regulatory Commission
NSAC	Nuclear Safety Analysis Center
OD	Outer Diameter
ODSCC	Outer Diameter Stress Corrosion Cracking
P	Pressure
PGE	Portland General Electric Company
PI	Possible Indication
ppb	Parts Per Billion
ppt	Parts Per Trillion

ACRONYMS, ABBREVIATIONS, AND SYMBOLS

PRM	Process Radiation Monitor
psi	Pounds Per Square Inch
PWR	Pressurized Water Reactor
PWSCC	Primary Water Stress Corrosion Cracking
R	Row
RG	Regulatory Guide
SAI	Single Axial Indication
SCC	Stress Corrosion Cracking
SGTR	Steam Generator Tube Rupture
SLB	Steam Line Break
SSE	Safe Shutdown Earthquake
TNP	Trojan Nuclear Plant
TSP	Tube Support Plate
TTS	Trojan Technical Specification(s)
USQ	Unreviewed Safety Question
V	Volt(s)
V_T	Volt(s) - Trojan (Normalized to 5 V standard)
V_W	Volt(s) - Westinghouse ($V_W = 0.8\ V_T$)

TABLE III-1

PRELIMINARY STATUS OF STEAM GENERATOR TUBE REPAIRS
FOR THE TROJAN NUCLEAR PLANT 1991 REFUELING OUTAGE

	Steam Generator			
	A	B	C	D
No. of Tubes Inspected in 1991	3161	3169	3021	3004
No. of Tubes Plugged in 1991	290	490	385	362
No. of Tubes Plugged Total	455	644	645	645
No. of Tubes Sleeved in 1991	0	0	295	336
No. of Tubes Sleeved Total	0	0	296*	336

*One of the two tubes which were sleeved in Steam Generator C during the 1990 Refueling Outage was plugged during the 1991 Refueling Outage due to a defective sleeve.

FIGURE III-1A
STEAM GENERATOR TUBE REPAIR SEQUENCE

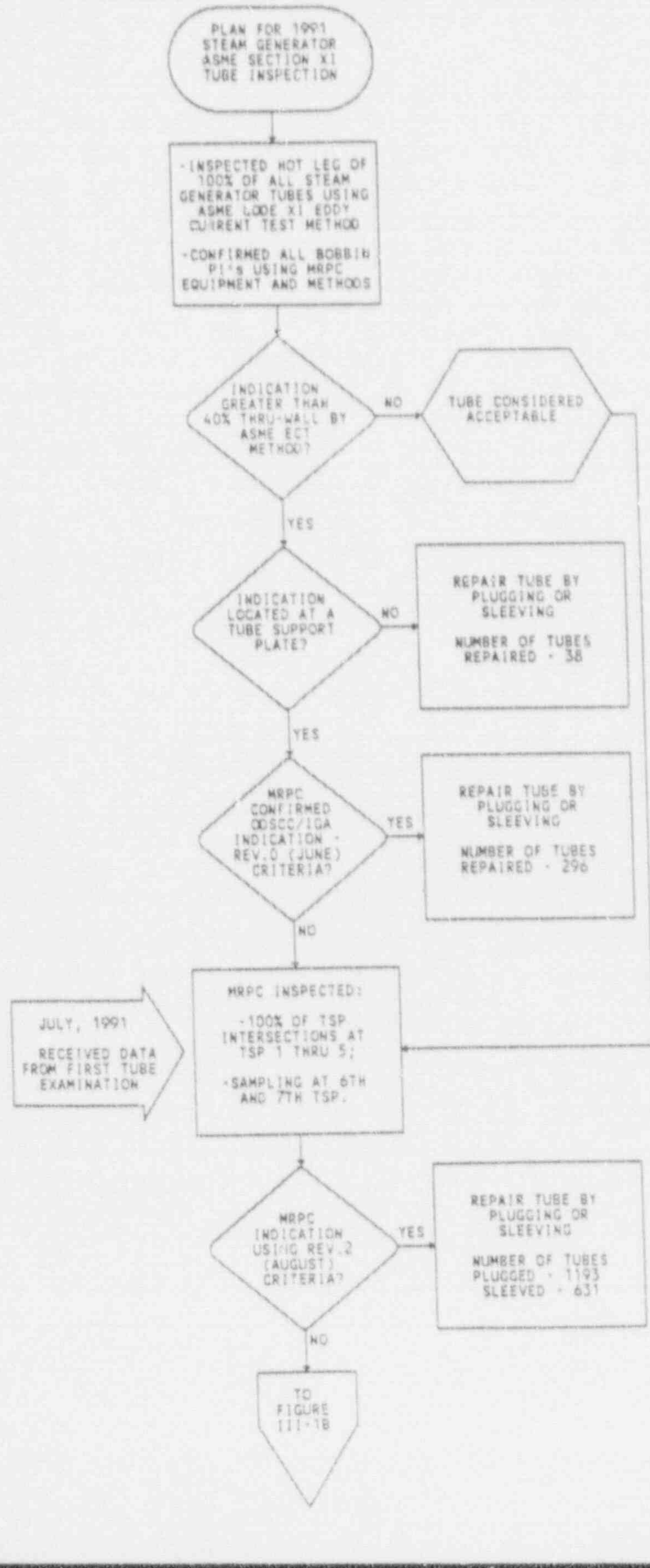
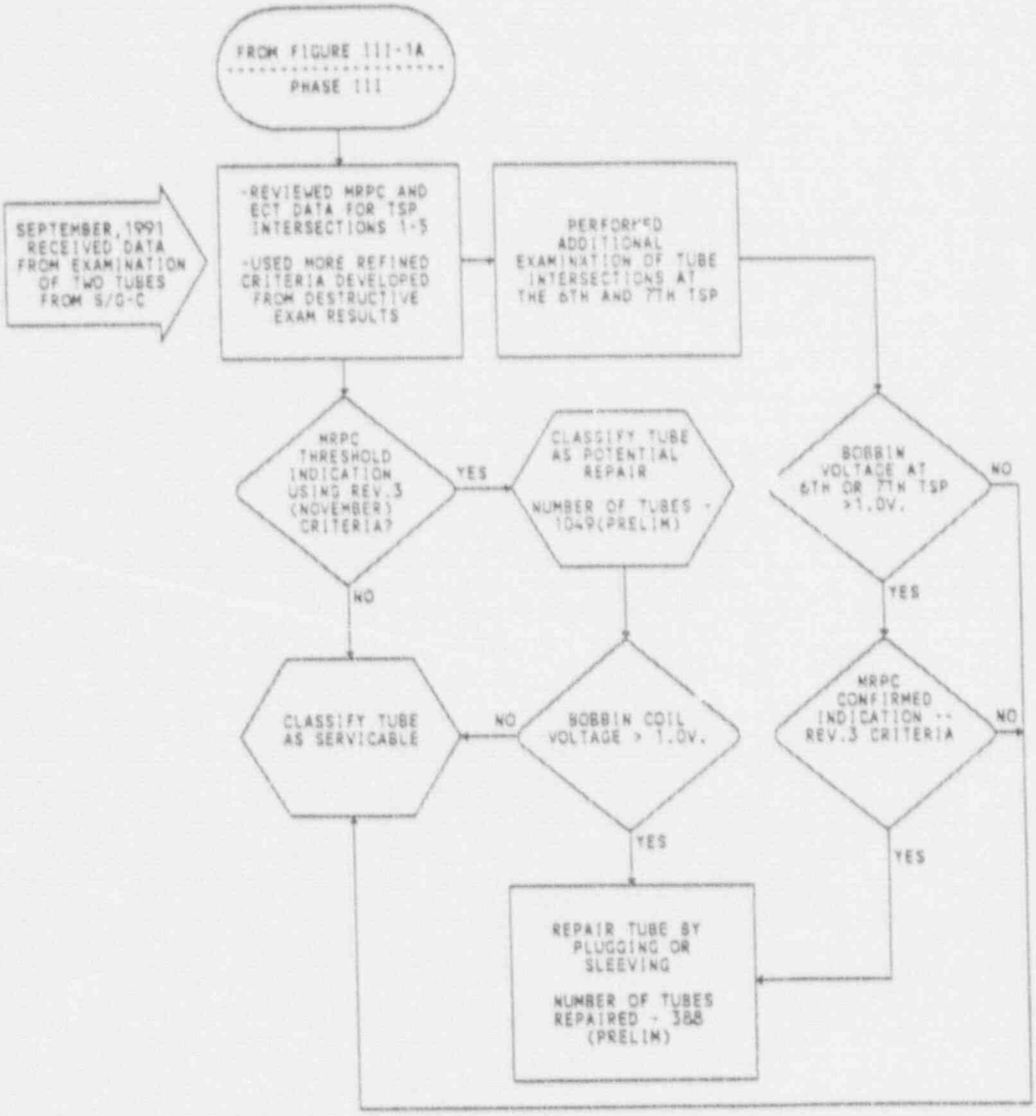


FIGURE III-1B
STEAM GENERATOR TUBE REPAIR SEQUENCE



APPENDIX 1

TUBE INSPECTION AND REPAIR RESULTS FOR REPAIRED TUBES IN 1991 REFUELING OUTAGE

(Preliminary)

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
1	A	28	12	01H	1.39	48	PI	0.46	119	MAI	PLUG
2	A	35	20	02H	1.28	31	PI	1.35	7	MAI	PLUG
3	A	6	34	01H	1.09	19	PI	0.91	19	MAI	PLUG
4	A	37	41	02H	1.73	32	PI	1.35	40	SAI	PLUG
5	A	23	48	02H	1.62	49	PI	1.02	156	SAI	PLUG
6	A	24	53	01H	1.40	57	PI	0.62	39	MAI	PLUG
7	A	27	56	01H	1.88	38	PI	0.71	87	MAI	PLUG
8	A	24	56	01H	2.18	40	PI	0.39	130	SAI	PLUG
9	A	21	59	02H	2.93	22	PI	0.43	152	MAI	PLUG
10	A	24	59	02H	1.16	99	PI	0.58	82	SAI	PLUG
11	A	14	60	01H	1.69	20	PI	0.66	146	SAI	PLUG
12	A	25	60	01H	1.86	57	PI	0.55	119	MAI	PLUG
13	A	44	60	02H	2.81	20	PI	0.31	83	SAI	PLUG
14	A	3	67	01H	1.11	27	PI	0.55	15	SAI	PLUG
15	A	27	68	01H	1.54	87	PI	1.08	96	MAI	PLUG
16	A	8	70	01H	1.93	52	PI	1.03	126	MAI	PLUG
17	A	5	71	01H	0.58	66	PI	0.66	83	SAI	PLUG
18	A	9	72	01H	0.84	102	PI	0.48	70	MAI	PLUG
19	A	15	72	02H	0.47	93	PI	0.26	100	SAI	PLUG
20	A	20	73	01H	2.46	24	PI	0.46	23	MAI	PLUG
21	A	26	73	02H	1.02	96	PI	0.99	59	MAI	PLUG
22	A	14	74	01H	1.81	37	PI	0.92	36	SAI	PLUG
23	A	25	74	02H	2.21	26	PI	0.92	28	MAI	PLUG
24	A	4	75	01H	0.54	54	PI	0.56	46	SAI	PLUG
25	A	15	75	02H	1.19	59	PI	0.61	20	MAI	PLUG
26	A	19	75	01H	3.18	25	PI	0.66	63	SAI	PLUG
27	A	20	77	02H	1.00	96	PI	0.37	46	MAI	PLUG
28	A	6	78	01H	2.24	17	PI	0.67	103	MAI	PLUG
29	A	15	79	01H	0.96	96	PI	1.47	98	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
30	A	18	79	03H	1.05	27	PI	0.49	119	SAI	PLUG
31	A	29	79	01H	1.05	57	PI	1.22	63	SAI	PLUG
32	A	22	80	02H	1.56	30	PI	0.71	67	MAI	PLUG
33	A	6	81	01H	2.09	50	PI	0.79	27	MAI	PLUG
34	A	21	82	01H	1.05	39	PI	0.36	90	MAI	PLUG
35	A	23	82	01H	1.55	40	PI	0.40	57	MAI	PLUG
36	A	29	82	02H	1.47	23	PI	1.09	49	SAI	PLUG
37	A	3	83	01H	1.28	34	PI	0.53	53	MAI	PLUG
38	A	11	83	01H	1.24	32	PI	0.48	70	SAI	PLUG
39	A	7	84	01H	1.18	41	PI	0.41	91	SAI	PLUG
40	A	15	84	01H	1.59	39	PI	0.59	72	[illegible]	PLUG
41	A	21	84	01H	1.03	73	PI	0.63	56	[illegible]	PLUG
42	A	5	85	01H	3.24	21	PI	0.71	40	SAI	PLUG
43	A	10	86	01H	0.92	21	PI	0.52	131	SAI	PLUG
44	A	18	86	01H	1.30	7	PI	0.29	48	MAI	PLUG
45	A	24	86	02H	2.57	24	PI	0.46	62	MAI	PLUG
46	A	12	87	01H	2.07	33	PI	0.52	82	MAI	PLUG
47	A	18	87	01H	1.17	12	PI	0.59	117	SAI	PLUG
48	A	25	87	01H	1.53	157	PI	0.70	35	SAI	PLUG
49	A	7	88	01H	1.14	30	PI	0.90	33	SAI	PLU[illegible]
50	A	12	89	01H	1.79	31	PI	0.53	86	MAI	PLUG
51	A	8	90	01H	1.47	100	PI	0.66	77	SAI	PLUG
52	A	12	90	01H	1.64	38	PI	0.69	134	MAI	PLUG
53	A	15	92	01H	0.61	54	PI	0.32	77	SAI	PLUG
1	B	4	3	02H	1.58	37	PI	1.15	73	SAI	PLUG
2	B	14	5	01H	1.03	38	PI	0.56	99	SAI	PLUG
3	B	15	5	03H	1.05	55	PI	1.36	55	SAI	PLUG
4	B	9	7	02H	1.35	36	PI	1.37	153	MAI	*PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
5	B	25	10	01H	1.48	35	PI	0.97	35	MAI	PLUG
6	B	12	12	01H	3.26	17	PI	1.26	133	SAI	PLUG
7	B	13	12	01H	1.26	40	PI	0.37	39	SAI	PLUG
8	B	25	15	01H	0.67	101	PI	0.70	76	SAI	PLUG
9	B	27	16	02H	1.43	33	PI	0.29	95	SAI	PLUG
	B	27	16	01H	0.84	41	PI	0.32	45	SAI	
10	B	28	16	02H	1.60	34	PI	0.58	104	MAI	PLUG
	B	28	16	01H	1.95	34	PI	1.33	37	SAI	
11	B	11	17	01H	0.60	109	PI	1.42	16	SAI	PLUG
12	B	14	18	02H	1.45	28	PI	1.66	18	MAI	PLUG
	B	14	18	01H	1.14	105	PI	2.13	52	MAI	
13	B	30	20	02H	0.75	63	PI	0.04	172	SAI	PLUG
14	B	31	21	02H	0.63	49	PI	0.27	93	SAI	PLUG
15	B	30	22	02H	1.30	42	PI	0.75	58	SAI	PLUG
16	B	11	23	01H	1.38	61	PI	0.84	52	MAI	PLUG
17	B	35	27	02H	2.53	34	PI	0.54	42	MAI	PLUG
18	B	12	28	02H	0.94	73	PI	0.76	44	MAI	PLUG
19	B	12	29	02H	1.45	25	PI	0.38	124	SAI	PLUG
20	B	38	29	02H	1.75	25	PI	0.52	104	SAI	PLUG
21	B	40	29	02H	2.29	47	PI	0.64	142	SAI	PLUG
22	B	43	30	01H	2.01	38	PI	0.39	38	MAI	PLUG
23	B	39	31	02H	2.24	21	PI	0.44	104	SAI	PLUG
24	B	41	31	01H	1.59	55	PI	0.81	101	SAI	PLUG
25	B	24	32	01H	2.44	39	PI	0.62	86	SAI	PLUG
26	B	39	32	02H	1.96	28	PI	0.47	79	MAI	PLUG
27	B	27	34	02H	1.28	28	PI	0.43	40	SAI	PLUG
28	B	40	34	02H	2.10	18	PI	0.59	43	SAI	PLUG
29	B	37	36	02H	0.82	75	PI	0.63	109	SAI	PLUG
30	B	40	36	02H	2.47	68	PI	1.52	27	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
31	B	42	36	02H	1.23	24	PI	1.02	4	SAI	PLUG
32	B	43	36	02H	2.74	15	PI	0.43	78	SAI	PLUG
33	B	42	39	02H	1.07	49	PI	0.57	137	SAI	PLUG
34	B	44	39	02H	0.97	43	PI	1.08	109	MAI	PLUG
35	B	2	41	02H	0.93	67	PI	0.37	58	MAI	PLUG
36	B	12	41	03H	0.97	107	PI	1.09	112	SAI	PLUG
37	B	44	42	02H	0.74	83	PI	0.86	47	MAI	PLUG
38	B	36	45	02H	1.36	34	PI	0.49	90	MAI	PLUG
39	B	44	45	02H	1.93	34	PI	0.56	71	MAI	PLUG
40	B	41	46	02H	2.27	58	PI	0.66	48	MAI	PLUG
41	B	17	47	04H	2.32	30	PI	0.84	156	MAI	PLUG
42	B	33	47	02H	0.91	92	PI	0.47	25	MAI	PLUG
43	B	37	47	02H	2.99	50	PI	0.99	129	SAI	PLUG
44	B	30	49	02H	1.40	45	PI	0.54	75	SAI	PLUG
45	B	46	51	03H	1.16	25	PI	0.84	93	MAI	PLUG
46	B	43	54	02H	1.58	62	PI	0.69	87	MAI	PLUG
47	B	37	57	02H	0.98	45	PI	1.39	138	MAI	PLUG
48	B	29	60	02H	1.20	64	PI	0.59	60	MAI	PLUG
49	B	44	61	02H	0.87	87	PI	1.84	137	SAI	PLUG
50	B	17	64	03H	0.72	77	PI	0.62	105	MAI	PLUG
51	B	35	68	03H	0.59	101	PI	0.94	100	SAI	PLUG
52	B	30	81	01H	1.73	32	PI	0.60	65	MAI	PLUG
53	B	31	82	01H	0.97	128	PI	0.95	96	MAI	PLUG
54	B	22	87	01H	1.29	36	PI	1.46	105	SAI	PLUG
55	B	9	88	01H	2.09	27	PI	0.76	112	MAI	PLUG
56	B	8	90	01H	1.75	39	PI	2.39	165	MAI	PLUG
1	C	14	14	02H	1.03	65	PI	2.48	29	SAI	PLUG
2	C	14	17	02H	1.10	49	PI	0.96	15	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
3	C	29	19	02H	2.15	35	PI	1.54	45	SAI	PLUG
4	C	14	24	02H	1.97	30	PI	1.70	164	MAI	PLUG
5	C	10	25	02H	2.27	29	PI	1.42	176	MAI	PLUG
6	C	18	26	02H	1.12	71	PI	1.43	162	MAI	PLUG
7	C	23	27	02H	2.45	50	PI	1.76	170	MAI	PLUG
8	C	27	27	02H	1.24	38	PI	0.95	34	MAI	PLUG
9	C	5	28	03H	0.84	42	PI	0.66	77	MAI	PLUG
	C	5	28	02H	0.98	30	PI	0.74	99	MAI	
10	C	15	30	02H	3.59	157	PI	1.88	161	SAI	PLUG
11	C	19	37	01H	0.52	56	[illegible]	0.78	43	MAI	PLUG
12	C	5	38	02H	2.25	30	PI	1.53	15	MAI	PLUG
13	C	6	38	03H	1.55	38	PI	0.79	120	MAI	PLUG
	C	6	38	02H	1.27	40	PI	0.67	107	MAI	
	C	6	38	01H	0.82	43	PI	1.77	140	MAI	
14	C	19	38	02H	0.98	61	PI	1.37	140	SAI	PLUG
15	C	28	39	03H	1.68	57	PI	0.73	60	MAI	PLUG
16	C	29	39	02H	1.83	23	PI	0.90	93	MAI	PLUG
17	C	22	40	01H	2.62	38	PI	0.83	96	MAI	PLUG
18	C	5	41	02H	1.28	45	PI	0.46	74	MAI	PLUG
19	C	30	41	02H	2.06	35	PI	0.71	78	MAI	PLUG
20	C	32	42	02H	1.89	29	PI	0.80	143	MAI	PLUG
21	C	33	43	02H	0.97	68	PI	0.59	53	MAI	PLUG
22	C	44	43	02H	1.21	67	PI	0.56	75	SAI	PLUG
23	C	45	43	02H	2.93	24	PI	0.84	90	SAI	PLUG
24	C	12	44	01H	2.87	32	PI	0.98	57	MAI	PLUG
25	C	33	44	01H	1.35	26	PI	0.95	147	SAI	PLUG
26	C	18	45	01H	0.65	47	PI	0.45	53	SAI	PLUG
27	C	4	46	03H	0.97	21	PI	0.25	26	SAI	PLUG
28	C	42	46	02H	2.00	30	PI	0.54	25	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
29	C	45	46	02H	1.33	58	PI	0.43	37	SAI	PLUG
30	C	16	47	02H	1.44	41	PI	0.32	112	MAI	PLUG
31	C	30	47	01H	2.17	49	PI	0.60	79	SAI	PLUG
32	C	34	47	02H	0.91	55	PI	0.92	54	MAI	PLUG
33	C	32	48	02H	1.90	27	PI	0.57	77	MAI	PLUG
34	C	33	48	03H	0.76	40	PI	0.53	99	MAI	PLUG
	C	33	48	02H	1.25	74	PI	0.73	92	MAI	
	C	33	48	01H	2.05	69	PI	0.54	134	MAI	
35	C	12	49	02H	1.59	28	PI	1.67	151	SAI	PLUG
36	C	30	49	01H	2.05	28	PI	0.67	38	SAI	PLUG
37	C	45	49	02H	2.38	34	PI	0.80	85	MAI	PLUG
38	C	13	50	01H	1.55	28	PI	0.38	28	SAI	PLUG
39	C	33	50	02H	0.68	171	PI	1.00	120	MAI	PLUG
40	C	35	50	02H	1.20	7	PI	0.36	56	SAI	PLUG
41	C	9	54	03H	1.00	51	PI	0.82	104	MAI	PLUG
42	C	34	54	02H	0.87	60	PI	0.67	72	MAI	PLUG
43	C	36	54	01H	0.89	29	PI	0.69	67	SAI	PLUG
44	C	33	58	01H	0.51	53	PI	1.03	153	MAI	PLUG
45	C	44	58	02H	1.94	24	PI	1.22	150	SAI	PLUG
46	C	33	62	02H	1.99	14	PI	0.36	31	MAI	PLUG
47	C	40	62	02H	1.69	33	PI	0.63	131	SAI	PLUG
48	C	14	63	03H	0.53	64	PI	0.61	83	SAI	PLUG
49	C	30	63	05H	1.58	19	PI	0.75	35	SAI	PLUG
	C	30	63	04H	1.24	30	PI	0.53	78	SAI	
	C	30	63	02H	2.08	37	PI	0.42	116	MAI	
50	C	35	63	02H	1.88	25	PI	0.44	53	SAI	PLUG
51	C	15	65	01H	1.21	18	PI	0.75	25	SAI	PLUG
52	C	23	67	01H	0.84	0	PI	1.74	139	SAI	PLUG
53	C	32	67	03H	1.07	20	PI	0.43	209	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
54	C	15	68	03H	1.37	38	PI	1.32	104	SAI	PLUG
55	C	23	68	01H	0.94	42	PI	0.51	47	MAI	PLUG
56	C	32	68	02H	1.40	39	PI	2.16	161	MAI	PLUG
57	C	8	69	03H	1.39	36	PI	0.33	130	SAI	PLUG
	C	8	69	01H	1.35	40	PI	1.01	66	MAI	
58	C	14	69	01H	1.58	26	PI	0.64	30	SAI	PLUG
59	C	28	59	02H	1.31	65	PI	2.29	142	MAI	PLUG
60	C	30	69	01H	1.59	36	PI	0.97	333	MAI	PLUG
61	C	34	69	02H	2.05	20	PI	0.63	146	SAI	PLUG
62	C	35	69	32H	1.94	41	PI	0.62	57	SAI	PLUG
63	C	38	69	02H	1.95	32	PI	0.42	105	SAI	PLUG
64	C	11	70	02H	1.31	52	PI	1.02	109-	MAI	PLUG
65	C	12	70	01H	1.45	21	PI	0.77	290	MAI	PLUG
66	C	14	71	02H	1.25	77	PI	0.87	135	MAI	PLUG
67	C	11	72	02H	1.00	68	PI	0.33	111	SAI	PLUG
68	C	20	72	01H	1.35	40	PI	0.92	34	SAI	PLUG
69	C	29	72	02H	2.26	37	PI	1.19	177	SAI	PLUG
70	C	32	72	02H	1.21	43	PI	0.41	55	SAI	PLUG
71	C	27	73	02H	1.18	40	PI	0.93	45	SAI	PLUG
72	C	29	73	01H	1.63	47	PI	0.86	68	MAI	PLUG
73	C	20	74	01H	1.42	25	PI	1.01	47	SAI	PLUG
74	C	27	74	02H	1.58	30	PI	0.87	161	MAI	PLUG
75	C	12	75	02H	1.94	51	PI	1.80	132	SAI	PLUG
76	C	19	75	02H	2.24	24	PI	0.61	166	SAI	PLUG
77	C	27	75	01H	1.22	30	PI	0.47	57	MAI	PLUG
78	C	25	78	01H	2.20	30	PI	0.49	104	MAI	PLUG
79	C	26	78	01H	1.41	42	PI	0.46	35	SAI	PLUG
80	C	28	78	01H	1.58	24	PI	0.38	110	SAI	PLUG
81	C	14	84	03H	0.80	40	PI	0.35	113	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
82	C	15	84	03H	1.15	50	PI	0.40	83	SAI	PLUG
83	C	13	85	02H	0.95	50	PI	0.67	111	SAI	PLUG
84	C	27	85	01H	1.44	35	PI	0.42	118	SAI	PLUG
85	C	15	86	03H	2.62	25	PI	0.54	36	SAI	PLUG
86	C	21	86	03H	1.32	53	PI	0.66	126	MAI	PLUG
87	C	21	88	01H	1.77	35	PI	0.38	127	MAI	PLUG
88	C	18	89	01H	1.09	22	P	0.34	142	SAI	PLUG
89	C	3	91	01H	1.30	34	P	0.47	139	MAI	PLUG
90	C	4	94	02H	2.45	34	PI	0.39	94	MAI	PLUG
1	D	10	3	01H	4.64	27	PI	3.05	113	MAI	PLUG
	D	10	3	02H	2.01	38	PI	1.45	140	MAI	
2	D	10	4	01H	2.21	27	PI	1.55	117	SAI	PLUG
3	D	6	6	01H	1.66	34	PI	1.23	27	SAI	PLUG
4	D	12	6	01H	2.52	31	PI	0.83	153	MAI	PLUG
5	D	8	7	01H	1.30	46	PI	0.58	74	SAI	PLUG
6	D	20	7	01H	1.42	33	PI	1.18	148	MAI	PLUG
7	D	16	8	01H	2.09	52	PI	2.44	45	SAI	PLUG
8	D	6	10	01H	3.79	53	PI	3.27	64	SAI	PLUG
9	D	26	10	01H	1.81	38	PI	1.27	97	SAI	PLUG
	D	26	10	02H	1.08	82	PI	0.78	98	SAI	
10	D	25	11	03H	1.06	47	PI	0.84	110	SAI	PLUG
11	D	5	12	01H	0.71	97	PI	0.95	100	MAI	PLUG
12	D	11	13	01H	0.83	55	PI	0.46	95	MAI	PLUG
13	D	21	13	02H	1.62	60	PI	1.30	106	MAI	PLUG
14	D	22	13	01H	2.95	27	PI	1.80	40	MAI	PLUG
15	D	12	14	02H	1.21	28	PI	0.79	129	SAI	PLUG
16	D	7	16	01H	2.30	30	PI	1.07	119	MAI	PLUG
17	D	19	16	02H	2.63	31	PI	0.98	95	MAI	*PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
18	D	6	17	01H	1.63	54	PI	0.95	126	MAI	PLUG
19	D	7	17	01H	2.33	29	PI	1.15	135	SAI	PLUG
20	D	15	18	01H	2.58	39	PI	1.57	110	SAI	PLUG
21	D	16	18	01H	1.03	71	PI	0.69	105	MAI	PLUG
22	D	33	18	01H	1.51	29	PI	0.61	51	MAI	PLUG
23	D	8	19	01H	1.91	39	PI	0.64	133	MAI	PLUG
24	D	16	19	01H	1.90	46	PI	0.79	164	SAI	PLUG
25	D	13	20	01H	1.36	29	PI	1.10	156	MAI	PLUG
26	D	16	20	01H	2.05	24	PI	1.12	143	SAI	PLUG
27	D	17	20	01H	2.82	32	PI	0.99	76	MAI	PLUG
28	D	16	21	01H	2.32	40	PI	1.39	24	MAI	PLUG
29	D	9	22	01H	1.39	53	PI	0.69	87	SAI	PLUG
30	D	21	22	02H	3.32	22	PI	0.79	101	SAI	PLUG
31	D	28	22	02H	1.54	29	PI	0.94	149	SAI	PLUG
32	D	15	23	01H	1.01	42	PI	1.19	24	SAI	PLUG
33	D	26	23	02H	1.09	64	PI	0.62	125	MAI	PLUG
34	D	27	23	02H	1.37	43	PI	0.73	42	MAI	PLUG
35	D	29	24	02H	1.52	42	PI	0.54	76	MAI	PLUG
36	D	21	25	02H	1.83	81	PI	1.62	244	MAI	PLUG
37	D	33	25	02H	2.30	24	PI	1.47	163	MAI	PLUG
38	D	16	26	01H	0.84	87	PI	1.78	6	MAI	PLUG
39	D	17	26	01H	1.85	26	PI	0.95	311	MAI	PLUG
40	D	23	26	02H	1.16	66	PI	0.91	165	SAI	PLUG
41	D	13	28	01H	2.05	82	PI	0.83	108	MAI	PLUG
42	D	19	28	01H	1.63	84	PI	0.89	85	MAI	PLUG
43	D	23	28	03H	3.09	42	PI	0.96	47	MAI	PLUG
44	D	16	29	01H	3.10	48	PI	1.03	139	MAI	PLUG
45	D	25	29	01H	1.29	56	PI	0.81	111	MAI	PLUG
46	D	40	29	02H	1.71	42	PI	0.60	37	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
47	D	5	30	01H	1.27	47	PI	0.63	112	MAI	PLUG
48	D	25	30	01H	1.94	40	PI	1.11	145	SAI	PLUG
49	D	28	30	02H	1.04	77	PI	1.36	5	SAI	PLUG
50	D	40	30	02H	1.9?	43	PI	0.68	111	MAI	PLUG
51	D	2	31	01H	1.36	31	PI	1.09	121	MAI	PLUG
52	D	18	31	01H	3.42	19	PI	2.29	83	MAI	PLUG
53	D	31	31	02H	1.62	58	PI	0.56	67	MAI	PLUG
54	D	6	32	01H	2.44	40	PI	0.70	211	MAI	PLUG
55	D	18	32	01H	3.50	28	PI	0.96	140	MAI	PLUG
56	D	30	33	01H	1.08	79	PI	1.24	119	MAI	PLUG
57	D	4	34	02H	0.83	63	PI	1.30	161	MAI	PLUG
58	D	23	34	02H	2.16	49	PI	1.37	75	SAI	PLUG
59	D	13	35	01H	0.54	88	PI	0.75	104	MAI	PLUG
60	D	12	36	01H	1.17	40	PI	0.98	138	MAI	PLUG
61	D	20	37	01H	1.45	33	PI	0.80	153	MAI	PLUG
62	D	12	38	01H	1.70	43	PI	1.04	68	SAI	PLUG
63	D	17	38	01H	1.55	69	PI	3.05	120	SAI	PLUG
64	D	10	39	01H	1.65	21	PI	0.67	67	SAI	PLUG
65	D	15	40	01H	0.90	50	PI	0.54	88	SAI	PLUG
66	D	20	41	01H	1.60	116	PI	0.55	55	MAI	PLUG
67	D	16	42	01H	2.59	26	PI	0.39	66	MAI	PLUG
68	D	19	42	01H	2.97	27	PI	0.90	69	MAI	PLUG
69	D	22	42	02H	4.16	33	PI	1.18	60	SAI	PLUG
70	D	16	44	02H	1.82	96	PI	0.96	133	SAI	PLUG
71	D	5	45	01H	1.29	31	PI	1.83	150	SAI	PLUG
72	D	13	45	01H	2.61	47	PI	1.54	62	MAI	PLUG
73	D	17	47	01H	0.54	47	PI	0.38	95	MAI	PLUG
74	D	25	49	02H	1.06	40	PI	0.61	81	SAI	PLUG
75	D	8	50	01H	1.66	52	PI	0.51	68	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
76	D	9	51	01H	1.38	47	PI	0.69	117	SAI	PLUG
77	D	11	51	01H	2.40	25	PI	1.01	70	MAI	PLUG
78	D	8	52	02H	0.81	55	PI	0.78	63	MAI	PLUG
79	D	9	52	01H	0.90	57	PI	0.30	74	MAI	PLUG
80	D	9	58	01H	2.00	63	PI	1.12	113	MAI	PLUG
81	D	20	58	01H	1.61	16	PI	0.50	123	SAI	PLUG
82	D	14	59	01H	1.12	45	PI	1.01	124	MAI	PLUG
83	D	35	64	02H	3.72	28	PI	0.60	126	SAI	PLUG
84	D	16	66	03H	2.38	30	PI	1.03	142	MAI	PLUG
85	D	36	67	02H	2.63	26	PI	0.25	79	MAI	PLUG
86	D	9	69	01H	1.03	46	PI	0.64	63	SAI	PLUG
87	D	25	69	02H	1.52	24	PI	0.45	152	MAI	PLUG
88	D	29	69	03H	1.28	36	PI	0.77	119	SAI	PLUG
89	D	37	69	02H	1.51	31	PI	0.52	62	MAI	PLUG
90	D	20	72	02H	0.84	69	PI	0.72	91	MAI	PLUG
91	D	14	74	01H	3.46	23	PI	0.38	71	MAI	PLUG
92	D	16	74	01H	0.96	50	PI	0.57	53	MAI	PLUG
93	D	25	77	02H	2.01	31	PI	0.61	129	MAI	PLUG
94	D	17	80	02H	1.60	46	PI	0.79	140	SAI	PLUG
95	D	9	81	01H	0.78	63	PI	1.78	183	SAI	PLUG
96	D	20	83	03H	1.00	37	PI	0.72	132	SAI	PLUG
97	D	9	88	02H	0.84	57	PI	0.50	117	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
1	A	21	9	03H	0.85	33	NONE	0.3	118	SAI	PLUG
2	A	33	16	01H	1.41	81	PI	0.23	84	SAI	PLUG
3	A	31	17	05H	0.86	27	NONE	0.64	135	SAI	PLUG
4	A	15	18	03H	1.08	11	PI	0.30	37	SAI	PLUG
5	A	29	18	02H	1.01	27	PI	0.51	135	MAI	PLUG
6	A	30	18	01H	0.51	64	NONE	0.46	78	SAI	PLUG
7	A	26	19	02H	0.73	22	NONE	0.28	91	SAI	PLUG
8	A	11	20	03H	0.42	111	NONE	0.9	36	SAI	PLUG
9	A	36	20	02H	0.60	96	PI	0.26	95	MAI	PLUG
10	A	36	22	01H	1.23	21	NONE	0.21	101	MAI	PLUG
11	A	39	22	02H	0.85	28	NONE	0.46	32	MAI	PLUG
12	A	33	23	02H	0.49	31	NONE	0.45	120	SAI	PLUG
13	A	38	23	01H	0.5	147	NONE	0.67	147	SAI	PLUG
14	A	21	24	03H	0.44	45	NONE	0.56	36	SAI	PLUG
	A	21	24	02H	0.25	137	NONE	0.34	115	SAI	
15	A	11	25	01H	0.39	51	NONE	0.38	60	SAI	PLUG
16	A	5	28	03H	0.73	19	NONE	0.12	90	SAI	PLUG
17	A	10	28	04H	0.69	147	NONE	0.39	44	SAI	PLUG
	A	10	28	02H	0.49	34	NONE	0.15	104	SAI	
18	A	22	28	04H	0.13	97	NONE	0.26	81	SAI	PLUG
19	A	27	28	02H	0.59	12	NONE	0.21	38	SAI	PLUG
20	A	7	29	01H	0.64	125	NONE	0.39	116	SAI	PLUG
21	A	28	29	03H	0.61	33	NONE	0.6	69	MAI	PLUG
22	A	26	30	03H	0.54	21	NONE	0.27	104	SAI	PLUG
	A	26	30	02H	0.18	80	NONE	0.25	129	SAI	
23	A	19	31	01H	0.46	43	NONE	0.3	67	MAI	PLUG
24	A	41	31	02H	1.04	15	PI	0.30	151	MAI	PLUG
25	A	41	32	02H	0.5	33	NONE	0.45	136	SAI	PLUG
26	A	21	33	03H	0.78	38	NONE	0.3	125	MAI	PLUG
27	A	41	33	01H	0.93	32	NONE	0.38	119	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
28	A	8	34	01H	0.72	49	NONE	0.43	138	SAI	PLUG
29	A	11	36	03H	0.32	39	NONE	0.37	103	MAI	PLUG
30	A	23	36	01H	0.46	35	PI	0.64	18	SAI	PLUG
31	A	5	37	01H	0.93	20	NONE	0.35	123	SAI	PLUG
32	A	6	37	01H	0.69	41	NONE	0.35	29	MAI	PLUG
33	A	20	37	02H	0.33	28	NONE	0.32	130	SAI	PLUG
34	A	44	37	02H	1.15	174	NONE	0.21	123	MAI	PLUG
35	A	45	37	03H	0.89	10	NONE	0.2	101	SAI	PLUG
36	A	3	38	03H	0.68	24	NONE	0.47	153	SAI	PLUG
37	A	4	39	03H	0.28	149	NONE	0.34	92	SAI	PLUG
38	A	14	39	03H	0.86	25	NONE	0.75	127	SAI	PLUG
	A	14	39	02H	0.5	15	NONE	0.46	64	SAI	
39	A	35	40	02H	1.02	62	PI	0.33	34	MAI	PLUG
40	A	37	40	02H	1.19	7	NONE	0.29	130	SAI	PLUG
41	A	42	40	02H	0.61	17	NONE	0.5	142	SAI	PLUG
42	A	3	41	02H	0.95	124	NONE	0.3	133	SAI	PLUG
43	A	11	41	01H	0.92	21	NONE	0.57	150	SAI	PLUG
44	A	12	41	01H	0.37	9	NONE	0.39	161	SAI	PLUG
45	A	14	41	01H	0.46	68	NONE	0.21	55	SAI	PLUG
46	A	24	41	01H	0.45	17	NONE	0.3	142	SAI	PLUG
47	A	42	41	02H	1.07	19	NONE	0.49	135	SAI	PLUG
48	A	4	42	02H	0.68	145	NONE	0.23	113	SAI	PLUG
49	A	9	42	02H	0.74	9	NONE	0.25	126	MAI	PLUG
50	A	11	42	02H	0.18	90	NONE	0.61	149	SAI	PLUG
	A	11	42	01H	0.65	10	NONE	0.41	141	SAI	
51	A	14	42	03H	0.38	46	NONE	0.25	101	SAI	PLUG
52	A	19	42	01H	0.51	26	NONE	0.3	119	SAI	PLUG
53	A	20	42	01H	0.44	98	PI	0.47	131	SAI	PLUG
54	A	21	42	01H	1.51	20	NONE	0.29	125	SAI	PLUG
55	A	30	42	02H	0.72	1	NONE	0.35	71	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
56	A	33	42	02H	0.43	0	NONE	0.18	109	MAI	PLUG
57	A	45	42	02H	1.08	11	NONE	0.55	134	SAI	PLUG
58	A	46	42	01H	6.33	175	PI	0.47	119	SAI	PLUG
59	A	6	43	01H	0.44	41	NONE	0.2	75	SAI	PLUG
60	A	20	43	01H	0.35	23	NONE	0.54	133	SAI	PLUG
61	A	26	43	05H	0.72	33	PI	0.19	119	SAI	PLUG
62	A	10	44	03H	0.66	15	NONE	0.33	142	SAI	PLUG
63	A	28	44	01H	0.66	49	NONE	0.27	47	SAI	PLUG
64	A	32	44	02H	0.57	61	NONE	0.14	120	SAI	PLUG
65	A	3	45	03H	0.92	10	NONE	0.51	159	SAI	PLUG
66	A	17	45	01H	0.57	55	NONE	0.35	67	MAI	PLUG
67	A	23	45	03H	0.37	344	NONE	0.83	141	MAI	PLUG
68	A	26	45	03H	0.37	58	PI	0.41	74	SAI	PLUG
	A	26	45	01H	0.69	52	PI	0.38	122	MAI	
69	A	42	45	01H	12.01	176	PI	0.79	150	MAI	PLUG
70	A	46	45	04H	0.57	77	PI	0.15	88	SAI	PLUG
71	A	4	46	01H	0.93	8	NONE	0.62	150	SAI	PLUG
72	A	16	46	01H	0.6	154	NONE	0.75	138	SAI	PLUG
73	A	19	46	04H	0.64	155	NONE	0.66	89	SAI	PLUG
	A	19	46	01H	0.24	103	PI	0.62	125	MAI	
74	A	20	46	04H	0.37	150	NONE	0.27	72	SAI	PLUG
	A	20	46	02H	0.34	38	NONE	0.54	132	SAI	
75	A	13	47	01H	0.45	66	NONE	0.57	94	SAI	PLUG
76	A	16	47	01H	0.58	358	NONE	0.57	129	SAI	PLUG
77	A	17	47	03H	0.27	124	NONE	0.38	53	SAI	PLUG
78	A	20	47	02H	0.56	4	NONE	0.23	78	SAI	PLUG
79	A	32	47	02H	1.28	41	PI	0.42	135	SAI	PLUG
80	A	33	48	01H	0.55	39	PI	0.71	125	SAI	PLUG
81	A	17	50	02H	0.89	19	PI	0.49	146	SAI	PLUG
82	A	25	50	01H	0.92	10	NONE	0.36	96	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
83	A	30	50	01H	1.35	17	NONE	0.3	40	MAI	PLUG
64	A	21	52	03H	0.41	69	NONE	0.38	93	SAI	PLUG
	A	21	52	02H	0.43	138	NONE	0.28	53	SAI	
85	A	22	52	01H	1.37	18	NONE	0.39	116	MAI	PLUG
86	A	27	52	01H	0.79	44	NONE	0.38	81	SAI	PLUG
87	A	12	54	01H	0.32	67	NONE	0.44	120	SAI	PLUG
88	A	14	54	02H	0.8	7	NONE	0.34	118	SAI	PLUG
89	A	16	54	02H	2.10	26	PI	0.57	127	MAI	PLUG
90	A	20	54	01H	1.49	1	NONE	0.59	118	SAI	PLUG
91	A	21	54	02H	[illegible].98	150	NONE	0.34	96	MAI	PLUG
92	A	24	54	01H	0.91	53	PI	0.32	115	MAI	PLUG
93	A	11	55	01H	2.13	173	NONE	0.34	59	SAI	PLUG
94	A	16	55	03H	0.86	27	NONE	0.37	124	SAI	PLUG
95	A	25	55	01H	0.71	31	NONE	0.57	138	MAI	PLUG
96	A	27	55	01H	0.74	16	NONE	0.3	127	SAI	PLUG
97	A	33	55	04H	1.16	20	NONE	0.86	106	SAI	PLUG
	A	33	55	01H	0.71	24	NONE	0.64	142	SAI	
98	A	34	55	01H	0.19	61	NONE	0.36	104	MAI	PLUG
99	A	14	56	03H	0.66	25	PI	0.38	147	SAI	PLUG
100	A	17	56	04H	0.76	22	NONE	0.58	152	SAI	PLUG
101	A	20	56	01H	0.99	142	NONE	0.48	114	SAI	PLUG
102	A	17	57	02H	0.98	25	NONE	0.17	116	MAI	PLUG
103	A	6	58	01H	0.9	104	NONE	0.63	138	MAI	PLUG
104	A	10	58	01H	0.53	50	NONE	0.4	94	MAI	PLUG
105	A	19	58	02H	0.49	111	NONE	0.59	151	MAI	PLUG
106	A	7	59	03H	0.76	43	PI	0.21	11[illegible]	MAI	PLUG
107	A	10	59	03H	0.2	90	NONE	0.21	135	SAI	PLUG
108	A	14	59	01H	1.27	30	NONE	0.34	155	MAI	PLUG
109	A	17	59	03H	0.25	132	NONE	0.32	147	SAI	PLUG
110	A	20	59	01H	1.74	3	PI	0.48	47	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
111	A	42	59	01H	0.75	91	PI	0.93	76	SAI	PLUG
112	A	43	59	01H	0.45	49	PI	1.40	168	SAI	PLUG
113	A	15	60	02H	0.82	118	NONE	0.56	65	MAI	PLUG
	A	15	60	01H	0.44	135	NONE	0.53	59	MAI	
114	A	16	60	02H	0.82	13	NONE	0.27	70	SAI	PLUG
115	A	21	61	01H	0.58	49	PI	0.68	128	SAI	PLUG
116	A	25	61	01H	0.58	70	NONE	0.44	94	MAI	PLUG
117	A	10	62	02H	0.52	41	NONE	0.32	79	SAI	PLUG
118	A	16	62	02H	2.57	20	NONE	0.54	115	MAI	PLUG
119	A	25	62	02H	1.53	26	NONE	0.27	144	MAI	PLUG
120	A	27	62	01H	1.41	16	NONE	0.17	26	SAI	PLUG
121	A	16	63	02H	1.95	16	NONE	0.63	115	MAI	PLUG
122	A	18	63	03H	2.61	15	NONE	0.38	30	SAI	PLUG
	A	18	63	02H	1.87	26	NONE	0.63	66	SAI	
	A	18	63	01H	1.82	29	PI	0.21	82	MAI	PLUG
123	A	25	63	02H	0.7	22	NONE	0.27	135	SAI	PLUG
124	A	25	63	01H	1.86	9	NONE	0.26	100	MAI	
	A	35	63	01H	0.39	138	NONE	0.16	109	SAI	PLUG
125	A	39	63	01H	0.41	21	NONE	0.19	128	SAI	PLUG
126	A	3	64	01H	0.31	28	NONE	0.65	160	SAI	PLUG
127	A	8	64	01H	2.55	30	PI	0.54	133	SAI	PLUG
128	A	33	64	02H	0.92	32	NONE	0.21	138	SAI	PLUG
129	A	3	65	01H	0.67	34	NONE	0.37	164	SAI	PLUG
130	A	6	65	01H	0.79	25	PI	0.41	150	SAI	PLUG
131	A	21	65	03H	0.32	34	NONE	0.31	146	SAI	PLUG
132	A	21	65	01H	0.32	73	PI	0.25	34	MAI	
	A	26	65	01H	0.57	15	NONE	0.46	23	MAI	PLUG
133	A	33	65	01H	1.05	150	NONE	0.25	143	SAI	PLUG
134	A	11	66	01H	1.6	33	NONE	0.31	124	SAI	PLUG
135	A	15	66	01H	0.78	24	NONE	0.83	151	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
137	A	17	66	04H	1.42	7	NONE	0.27	67	SAI	PLUG
138	A	23	66	03H	0.58	167	NONE	0.52	36	SAI	PLUG
139	A	25	66	01H	0.77	59	NONE	0.59	33	SAI	PLUG
140	A	26	66	03H	0.22	135	NONE	0.36	47	SAI	PLUG
141	A	8	67	03H	0.42	15	NONE	0.35	139	MAI	PLUG
142	A	9	67	01H	0.72	27	PI	0.37	146	MAI	PLUG
143	A	17	67	02H	0.44	163	NONE	0.39	111	SAI	PLUG
	A	17	67	01H	2.08	73	PI	0.41	127	MAI	
144	A	23	67	01H	0.90	48	PI	0.48	131	SAI	PLUG
145	A	41	67	01H	0.92	143	NONE	0.32	128	MAI	PLUG
146	A	20	68	01H	1.39	28	PI	0.66	131	SAI	PLUG
147	A	24	68	01H	0.94	21	PI	0.25	104	MAI	PLUG
148	A	25	68	01H	1.03	56	NONE	0.55	129	SAI	PLUG
149	A	4	69	01H	1.2	15	NONE	0.66	88	SAI	PLUG
150	A	29	69	01H	1.05	150	NONE	0.19	108	SAI	PLUG
151	A	39	69	02H	3.25	192	NONE	1.29	132	MAI	PLUG
152	A	21	70	02H	0.89	158	NONE	0.33	67	SAI	PLUG
	A	21	70	01H	0.42	96	NONE	0.22	57	SAI	
153	A	4	71	03H	0.27	18	NONE	0.14	97	SAI	PLUG
154	A	21	71	03H	0.7	16	NONE	0.43	158	SAI	PLUG
	A	21	71	01H	0.3	62	NONE	0.28	81	MAI	
155	A	24	71	03H	0.9	71	NONE	0.57	153	SAI	PLUG
156	A	33	71	01H	1.92	19	PI	0.25	122	MAI	PLUG
157	A	37	71	01H	0.49	180	NONE	0.37	144	SAI	PLUG
	A	5	72	02H	0.70	120	PI	0.20	95	SAI	
	A	5	72	01H	1.37	46	PI	0.25	122	MAI	
158	A	10	72	01H	0.81	23	NONE	0.28	117	SAI	PLUG
159	A	13	72	01H	2.95	172	PI	0.19	51	MAI	PLUG
160	A	17	72	01H	0.54	42	NONE	0.36	88	SAI	PLUG
161	A	19	72	02H	0.09	71	NONE	0.31	147	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
162	A	22	72	01H	0.77	20	PI	0.30	47	MAI	PLUG
163	A	24	72	02H	0.61	21	PI	0.32	131	SAI	PLUG
164	A	33	72	01H	0.89	94	NONE	0.25	137	MAI	PLUG
165	A	6	73	01H	0.97	45	PI	0.45	128	MAI	PLUG
166	A	9	74	04H	1.65	23	NONE	1.09	149	SAI	PLUG
167	A	11	74	03H	0.29	93	NONE	0.35	124	SAI	PLUG
	A	11	74	01H	1	164	NONE	0.48	141	SAI	
168	A	19	74	01H	0.31	101	NONE	0.67	125	SAI	PLUG
169	A	22	74	03H	0.54	45	NONE	0.34	76	SAI	PLUG
	A	22	74	01H	2.37	23	NONE	0.49	129	MAI	
170	A	24	74	02H	1.01	136	PI	0.39	88	MAI	PLUG
171	A	26	75	01H	0.95	78	NONE	0.86	159	MAI	PLUG
172	A	17	76	01H	0.65	62	PI	0.29	63	MAI	PLUG
173	A	20	76	02H	0.94	23	NONE	0.18	139	MAI	PLUG
174	A	30	76	02H	0.55	27	NONE	0.55	142	SAI	PLUG
	A	30	76	01H	3.27	9	NONE	0.57	157	SAI	
175	A	16	77	02H	1.00	38	PI	0.47	47	MAI	PLUG
176	A	23	77	02H	1.16	20	NONE	0.41	68	SAI	PLUG
177	A	24	77	03H	2.35	10	NONE	0.29	135	SAI	PLUG
178	A	25	77	01H	0.38	31	PI	0.24	95	SAI	PLUG
179	A	35	77	03H	0.22	45	PI	0.22	98	SAI	PLUG
180	A	4	78	01H	0.52	63	PI	0.43	117	MAI	PLUG
181	A	10	78	01H	0.5	103	NONE	0.6	84	SAI	PLUG
182	A	11	78	01H	0.29	36	NONE	0.4	94	MAI	PLUG
183	A	30	78	03H	0.24	40	NONE	0.18	58	SAI	PLUG
	A	30	78	02H	0.57	95	NONE	0.36	123	MAI	
184	A	4	79	01H	1.49	28	PI	0.37	102	MAI	PLUG
185	A	10	79	01H	0.48	65	NONE	0.74	91	MAI	PLUG
186	A	19	79	01H	1.62	8	NONE	0.35	126	SAI	PLUG
187	A	28	79	02H	1.10	20	PI	0.48	55	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
188	A	13	80	01H	0.64	168	NONE	0.39	113	SAI	PLUG
189	A	21	80	01H	0.71	56	PI	0.45	36	MAI	PLUG
190	A	23	80	01H	1.45	20	NONE	0.57	70	SAI	PLUG
191	A	26	80	02H	2.18	11	NONE	0.78	32	MAI	PLUG
	A	26	80	01H	1.23	94	PI	0.25	99	MAI	
192	A	10	81	01H	2.77	17	NONE	0.19	78	SAI	PLUG
193	A	13	81	01H	0.65	46	NONE	0.22	30	MAI	PLUG
194	A	14	81	01H	1.32	30	PI	0.26	131	MAI	PLUG
195	A	18	81	02H	0.73	85	PI	0.38	140	MAI	PLUG
	A	18	81	01H	0.88	156	NONE	0.52	86	MAI	
196	A	20	81	01H	1.46	19	PI	0.26	81	MAI	PLUG
197	A	30	81	02H	0.51	112	PI	0.40	145	SAI	PLUG
198	A	3	82	02H	0.34	21	NONE	0.3	130	MAI	PLUG
	A	3	82	01H	0.84	28	NONE	0.74	79	SAI	
199	A	7	82	01H	1.62	20	NONE	0.59	112	MAI	PLUG
200	A	11	82	01H	1.65	15	NONE	0.85	43	MAI	PLUG
201	A	13	82	01H	0.38	24	NONE	0.35	146	MAI	PLUG
202	A	16	82	04H	0.8	22	NONE	0.17	85	MAI	PLUG
	A	16	82	03H	0.79	39	NONE	0.43	151	MAI	
203	A	20	82	01H	0.64	52	PI	0.20	50	MAI	PLUG
204	A	4	83	03H	1.39	0	PI	0.62	49	MAI	PLUG
	A	4	83	01H	1.39	22	PI	0.79	73	MAI	
205	A	15	83	03H	0.71	15	NONE	0.4	59	MAI	PLUG
206	A	18	83	02H	1.71	17	NONE	0.42	72	SAI	PLUG
207	A	24	83	03H	0.52	37	NONE	0.81	136	SAI	PLUG
	A	24	83	01H	2.74	11	PI	0.54	128	SAI	
208	A	29	83	03H	0.22	50	NONE	0.29	98	MAI	PLUG
	A	29	83	02H	0.41	136	NONE	0.38	40	SAI	
209	A	4	84	01H	0.79	9	NONE	0.42	133	SAI	PLUG
210	A	8	84	02H	0.8	6	NONE	0.42	145	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	A	8	84	01H	1.35	20	PI	0.88	130	MAI	
211	A	13	84	01H	1.78	24	PI	0.57	127	SAI	PLUG
212	A	14	85	01H	0.72	144	NONE	0.25	135	MAI	PLUG
213	A	15	85	01H	0.25	116	NONE	0.17	145	SAI	PLUG
	A	15	85	01H	0.93	35	PI	0.31	112	MAI	
214	A	20	85	02H	0.91	16	NONE	0.37	21	SAI	PLUG
215	A	23	85	02H	0.98	16	NONE	0.24	127	SAI	PLUG
216	A	4	86	03H	0.69	10	NONE	1.7	8	SAI	PLUG
	A	4	86	01H	0.82	17	NONE	0.57	149	SAI	
217	A	5	86	02H	0.45	30	NONE	0.75	10	MAI	PLUG
218	A	15	86	02H	0.16	21	NONE	0.3	168	SAI	PLUG
	A	15	86	01H	0.3	95	NONE	0.34	148	MAI	
219	A	16	86	01H	0.85	26	NONE	0.45	100	SAI	PLUG
220	A	20	86	02H	0.38	127	NONE	0.46	145	SAI	PLUG
221	A	21	86	01H	0.46	143	NONE	0.21	92	MAI	PLUG
222	A	25	86	01H	0.88	46	NONE	0.45	5	MAI	PLUG
223	A	11	87	03H	0.67	11	NONE	0.42	60	SAI	PLUG
	A	11	87	02H	0.4	34	NONE	0.45	138	SAI	
224	A	15	88	01H	0.7	31	NONE	0.82	87	MAI	PLUG
225	A	8	89	01H	0.56	74	PI	0.32	100	SAI	PLUG
226	A	9	89	05H	0.39	10	NONE	0.39	144	SAI	PLUG
227	A	4	93	01H	0.9	138	NONE	0.55	10	MAI	PLUG
228	A	5	93	04H	1.04	20	PI	0.19	118	SAI	PLUG
	A	5	93	01H	1.10	41	PI	0.19	106	SAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
1	B	2	2	03H	1.13	23	NONE	0.32	35	SAI	PLUG
2	B	6	2	01H	1.99	8	NONE	0.86	154	MAI	PLUG
3	B	9	2	02H	3.64	13	NONE	0.39	120	MAI	PLUG
4	B	10	2	02H	2.66	16	NONE	0.45	81	MAI	PLUG
	B	10	2	01H	1.49	32	NONE	0.29	85	SAI	
	B	10	2	01H	1.07	52	PI	0.59	104	MAI	PLUG
5	B	11	2	01H	1.07	52	PI	0.59	104	MAI	PLUG
6	B	12	2	02H	2.67	16	NONE	0.38	119	MAI	PLUG
	B	12	2	01H	2.88	28	PI	0.34	64	MAI	
7	B	11	3	04H	0.97	40	PI	0.45	138	SAI	PLUG
	B	11	3	03H	1.38	25	PI	0.30	66	SAI	
	B	11	3	02H	1.43	25	NONE	0.36	50	SAI	
8	B	12	3	02H	2.60	16	NONE	0.39	96	MAI	PLUG
	B	12	3	01H	3.65	36	PI	0.31	124	MAI	
	B	12	3	05H	0.84	29	NONE	0.31	115	SAI	PLUG
9	B	14	3	04H	0.68	41	PI	2.53	2	SAI	PLUG
10	B	15	3	03H	0.61	21	NONE	0.26	97	SAI	
	B	15	3	03H	1.07	149	NONE	1.25	97	SAI	PLUG
11	B	6	4	02H	0.59	41	PI	0.34	73	SAI	
	B	6	4	01H	1.08	163	NONE	0.59	127	SAI	
	B	6	4	02H	1.01	12	NONE	0.99	151	SAI	PLUG
12	B	7	4	01H	1.41	147	NONE	1.49	149	MAI	PLUG
13	B	9	4	01H	0.40	71	NONE	0.18	127	SAI	PLUG
14	B	12	4	05H	0.92	17	NONE	0.64	9	SAI	PLUG
15	B	15	4	02H	1.36	39	NONE	0.48	122	SAI	
	B	15	4	01H	0.75	33	NONE	0.37	103	SAI	
	B	15	4	02H	2.20	21	NONE	0.79	10	SAI	PLUG
16	B	16	4	02H	0.50	47	NONE	0.26	283	MAI	PLUG
17	B	10	5	02H	2.62	16	PI	0.44	124	MAI	PLUG
18	B	11	5	04H	0.68	13	NONE	0.21	92	SAI	PLUG
19	B	12	5	01H	0.74	48	NONE	0.23	123	SAI	PLUG
20	B	18	5								

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
21	B	19	5	03H	0.77	41	NONE	0.26	35	SAI	PLUG
22	B	2	6	03H	1.35	26	NONE	0.51	43	SAI	PLUG
23	B	3	6	04H	1.23	8	NONE	1.27	100	MAI	PLUG
	B	3	6	03H	1.04	156	NONE	0.73	39	MAI	
24	B	5	6	03H	1.33	28	NONE	0.59	68	MAI	PLUG
25	B	13	6	03H	0.93	29	NONE	0.45	42	SAI	PLUG
26	B	15	6	04H	0.49	33	NONE	0.65	20	SAI	PLUG
27	B	16	6	03H	0.86	18	NONE	1.34	136	SAI	PLUG
	B	15	6	01H	1.67	23	NONE	0.74	91	MAI	
28	B	6	7	02H	1.82	3	NONE	0.88	64	MAI	PLUG
	B	6	7	01H	0.85	90	NONE	0.65	102	MAI	
29	B	8	7	03H	0.61	92	NONE	0.65	102	SAI	PLUG
30	B	14	7	01H	0.82	49	NONE	0.18	15	SAI	PLUG
31	B	19	7	01H	1.73	26	NONE	0.25	52	SAI	PLUG
32	B	4	8	03H	1.71	25	PI	0.53	130	MAI	PLUG
33	B	8	8	03H	1.06	28	NONE	0.52	121	SAI	PLUG
34	B	15	8	03H	0.49	60	NONE	0.35	115	MAI	PLUG
35	B	17	8	03H	0.55	50	PI	0.47	57	SAI	PLUG
36	B	19	8	03H	0.87	24	PI	0.67	16	SAI	PLUG
37	B	6	9	02H	1.03	6	NONE	0.38	124	SAI	PLUG
38	B	8	9	03H	0.34	38	NONE	0.60	25	MAI	PLUG
39	B	10	9	01H	0.40	45	NONE	0.35	54	SAI	PLUG
40	B	20	9	03H	0.91	34	PI	0.53	121	MAI	PLUG
41	B	26	9	01H	1.20	32	NONE	0.39	94	MAI	PLUG
42	B	4	10	03H	1.28	17	PI	0.54	79	MAI	PLUG
	B	4	10	02H	0.39	17	NONE	0.76	163	MAI	
	B	4	10	01H	1.44	6	NONE	0.55	128	SAI	
43	B	8	10	03H	1.03	28	PI	0.87	145	MAI	PLUG
	B	8	10	02H	0.49	46	PI	0.47	110	SAI	
	B	8	10	01H	0.55	25	NONE	0.52	136	MAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
44	B	13	10	02H	0.52	57	NONE	0.75	116	SAI	PLUG
45	B	14	10	02H	0.86	16	NONE	0.58	65	MAI	PLUG
46	B	16	10	02H	0.64	20	NONE	0.21	102	SAI	PLUG
	B	16	10	01H	2.24	21	PI	0.23	92	MAI	
47	B	19	10	04H	0.44	47	NONE	0.72	128	SAI	PLUG
48	B	22	10	02H	0.98	28	NONE	0.36	109	SAI	PLUG
49	B	26	10	01H	0.63	51	NONE	0.21	84	MAI	PLUG
50	B	3	11	04H	0.40	43	NONE	0.25	0	MAI	PLUG
	B	3	11	01H	1.13	32	NONE	0.32	118	MAI	
51	B	4	11	01H	0.25	70	NONE	0.49	123	SAI	PLUG
52	B	8	11	02H	1.57	30	PI	0.45	143	MAI	PLUG
	B	8	11	01H	0.99	35	PI	0.43	42	SAI	
53	B	9	11	01H	1.12	33	PI	0.26	102.	MAI	PLUG
54	B	10	11	04H	0.68	26	PI	0.38	131	MAI	PLUG
	B	10	11	01H	0.93	68	PI	0.46	116	MAI	
55	B	17	11	01H	0.69	88	PI	0.36	77	SAI	PLUG
56	B	20	11	01H	0.81	31	NONE	0.45	126	SAI	PLUG
57	B	28	11	01H	2.29	19	PI	0.32	97	MAI	PLUG
58	B	2	12	02H	2.00	14	NONE	0.80	17	SAI	PLUG
	B	2	12	01H	0.86	30	PI	0.74	66	MAI	
59	B	5	12	03H	0.82	3	NONE	0.64	126	MAI	PLUG
	B	5	12	01H	1.91	6	PI	0.46	80	MAI	
60	B	7	12	02H	0.94	47	PI	0.46	99	MAI	PLUG
61	B	8	12	01H	0.90	31	PI	0.66	133	MAI	PLUG
62	B	9	12	01H	1.81	12	NONE	0.41	58	SAI	PLUG
63	B	11	12	04H	0.51	152	NONE	0.29	97	SAI	PLUG
64	B	14	12	03H	0.86	14	NONE	0.49	127	SAI	PLUG
	B	14	12	01H	1.31	41	PI	0.73	140	SAI	
65	B	21	12	02H	0.81	22	NONE	0.36	78	SAI	PLUG
66	B	22	12	01H	0.58	24	NONE	0.44	147	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
67	B	28	12	02H	2.17	21	PI	0.28	49	SAI	PLUG
68	B	3	13	03H	0.26	86	NONE	1.30	97	MAI	PLUG
	B	3	13	02H	1.63	17	PI	1.66	158	SAI	
	B	3	13	01H	1.91	39	PI	1.35	123	MAI	
69	B	4	13	01H	1.36	6	NONE	0.78	246	MAI	PLUG
70	B	5	13	01H	1.08	17	NONE	1.18	143	SAI	PLUG
71	B	8	13	01H	0.71	17	NONE	0.53	66	SAI	PLUG
72	B	9	13	01H	0.99	32	PI	1.13	123	MAI	PLUG
73	B	10	13	02H	1.29	22	PI	0.82	147	SAI	PLUG
74	B	12	13	01H	1.32	26	PI	0.89	114	MAI	PLUG
75	B	14	13	01H	0.55	97	PI	3.55	22	MAI	PLUG
76	B	17	13	04H	1.10	14	NONE	0.75	96	MAI	PLUG
77	B	27	13	03H	1.47	20	NONE	1.68	13	MAI	PLUG
78	B	28	13	02H	0.97	16	NONE	0.83	92	SAI	PLUG
79	B	3	14	01H	2.32	23	PI	0.94	165	MAI	PLUG
80	B	11	14	01H	0.34	124	PI	0.53	51	SAI	PLUG
81	B	14	14	03H	1.04	15	PI	0.42	92	SAI	PLUG
82	B	20	14	01H	0.41	45	NONE	0.32	148	SAI	PLUG
83	B	24	14	04H	1.40	17	NONE	0.37	62	MAI	PLUG
	B	24	14	02H	0.67	81	NONE	0.47	80	MAI	
84	B	25	14	02H	1.94	30	PI	0.29	136	MAI	PLUG
85	B	26	14	01H	0.95	48	PI	0.57	99	MAI	PLUG
86	B	29	14	01H	2.02	26	PI	0.42	27	MAI	PLUG
87	B	3	15	01H	0.80	21	NONE	0.76	88	SAI	PLUG
88	B	11	15	01H	0.66	35	PI	0.56	93	MAI	PLUG
89	B	19	15	01H	1.48	24	PI	0.66	158	MAI	PLUG
90	B	20	15	02H	0.63	38	PI	0.29	92	SAI	PLUG
91	B	28	15	03H	0.94	29	NONE	0.27	95	SAI	PLUG
92	B	2	16	02H	1.24	25	PI	0.63	137	SAI	PLUG
93	B	6	16	01H	0.97	109	PI	0.55	28	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
94	B	10	16	01H	1.21	23	PI	0.34	150	MAI	PLUG
95	B	14	16	01H	0.61	39	NONE	0.59	134	SAI	PLUG
96	B	16	16	03H	1.51	17	PI	0.43	101	SAI	PLUG
97	B	21	16	04H	0.70	31	NONE	0.31	85	SAI	PLUG
	B	21	16	02H	1.65	32	PI	0.60	149	MAI	
98	B	24	16	05H	1.15	27	PI	0.37	156	MAI	PLUG
	B	24	16	04H	0.88	39	PI	0.45	26	MAI	
	B	24	16	03H	0.75	48	PI	0.35	88	MAI	
	B	24	16	02H	0.64	144	NONE	0.36	88	MAI	
	B	32	16	02H	1.36	32	NONE	0.33	99	MAI	PLUG
99	B	32	16	02H	1.06	350	NONE	0.56	132	SAI	PLUG
100	B	4	17	02H	0.77	54	NONE	0.92	92	SAI	PLUG
101	B	26	17	02H	0.46	143	PI	0.52	138	MAI	PLUG
102	B	29	17	01H	0.67	27	NONE	0.27	101	SAI	PLUG
103	B	4	18	01H	0.39	40	NONE	0.33	99	SAI	PLUG
104	B	19	18	03H	0.98	143	NONE	0.54	127	MAI	PLUG
105	B	23	18	01H	0.83	355	NONE	0.22	128	SAI	PLUG
106	B	29	18	03H	0.96	82	NONE	0.79	81	MAI	
	B	29	18	01H	0.52	113	PI	0.68	140	MAI	PLUG
107	B	5	19	02H	0.88	49	NONE	1.04	32	MAI	
	B	5	19	01H	0.83	187	NONE	0.25	47	SAI	PLUG
108	B	7	19	03H	1.73	14	NONE	0.27	106	MAI	
	B	7	19	02H	0.35	23	NONE	0.64	156	SAI	
	B	7	19	01H	0.19	63	NONE	0.41	139	MAI	PLUG
109	B	11	19	05H	2.48	26	PI	0.61	167	MAI	
	B	11	19	02H	0.48	141	NONE	1.36	165	SAI	PLUG
110	B	15	19	03H	0.46	31	PI	0.55	12	MAI	
	B	15	19	02H	0.78	42	NONE	0.53	85	SAI	PLUG
111	B	21	19	03H	0.57	53	PI	0.54	122	SAI	PLUG
112	B	25	19	05H	0.61	54	NONE	0.38	122	SAI	PLUG
113	B	30	19	03H							

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
114	B	35	19	03H	0.66	14	NONE	0.42	43	SAI	PLUG
115	B	36	19	02H	0.75	25	PI	0.23	119	SAI	PLUG
116	B	37	19	02H	2.20	28	PI	0.30	35	MAI	PLUG
117	B	3	20	02H	0.45	175	NONE	0.40	150	SAI	PLUG
118	B	9	20	02H	0.90	19	NONE	0.28	93	SAI	PLUG
	B	9	20	01H	0.99	16	NONE	0.63	158	SAI	
119	B	10	20	01H	0.32	142	NONE	0.50	39	SAI	PLUG
120	B	11	20	02H	0.70	30	PI	0.40	85	MAI	PLUG
121	B	12	20	02H	1.37	15	NONE	0.39	129	SAI	PLUG
122	B	13	20	02H	0.48	22	PI	0.30	46	SAI	PLUG
123	B	18	20	01H	1.77	26	NONE	0.28	137	MAI	PLUG
124	B	19	20	02H	1.90	26	PI	0.44	32	MAI	PLUG
125	B	23	20	02H	1.87	27	PI	0.36	61	MAI	PLUG
126	B	24	20	02H	0.40	96	NONE	0.41	39	MAI	PLUG
127	B	25	20	05H	0.46	90	PI	0.48	121	MAI	PLUG
128	B	27	20	04H	1.32	19	NONE	0.37	12	MAI	PLUG
129	B	29	20	05H	0.34	56	NONE	0.29	65	SAI	PLUG
	B	29	20	04H	0.53	32	NONE	0.31	137	MAI	
	B	29	20	01H	0.38	100	NONE	0.45	32	SAI	
130	B	31	20	01H	0.36	180	NONE	0.25	120	SAI	PLUG
131	B	33	20	04H	1.55	15	PI	0.32	120	SAI	PLUG
132	B	34	20	03H	0.62	24	PI	0.49	153	MAI	PLUG
	B	34	20	02H	1.18	45	PI	0.36	99	MAI	
	B	34	20	01H	1.34	19	NONE	0.46	132	SAI	
133	B	35	20	01H	1.88	15	NONE	0.19	36	MAI	PLUG
134	B	37	20	02H	0.99	29	NONE	0.27	68	MAI	PLUG
135	B	2	21	01H	1.69	10	NONE	0.56	19	SAI	PLUG
136	B	3	21	03H	0.84	20	NONE	0.33	82	SAI	PLUG
137	B	14	21	01H	1.57	13	NONE	0.36	115	MAI	PLUG
138	B	15	21	01H	0.47	40	NONE	0.46	140	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
139	B	16	21	05H	0.36	61	NONE	0.41	78	SAI	PLUG
140	B	33	21	02H	1.77	22	NONE	0.32	142	MAI	PLUG
141	B	4	22	03H	1.88	1	NONE	0.23	147	SAI	PLUG
142	B	8	22	03H	0.41	112	PI	0.20	137	SAI	PLUG
143	B	9	22	03H	1.90	8	NONE	0.32	71	MAI	PLUG
144	B	11	22	03H	0.26	93	NONE	0.24	135	SAI	PLUG
145	B	12	22	01H	0.27	71	NONE	0.20	55	MAI	PLUG
146	B	14	22	01H	1.98	28	NONE	0.76	64	MAI	PLUG
147	B	15	22	05H	0.42	80	NONE	0.29	107	MAI	PLUG
	B	15	22	04H	0.46	68	NONE	0.31	111	MAI	
148	B	19	22	04H	0.51	99	NONE	0.23	128	MAI	PLUG
149	B	20	22	05H	0.40	27	NONE	0.24	95	SAI	PLUG
150	B	32	22	02H	0.52	184	NONE	0.32	90	SAI	PLUG
151	B	37	22	02H	0.58	73	PI	0.33	110	MAI	PLUG
	B	37	22	01H	0.42	72	NONE	0.25	0	MAI	
152	B	2	23	03H	1.68	4	NONE	0.28	91	MAI	PLUG
153	B	3	23	02H	0.13	23	NONE	0.17	94	SAI	PLUG
154	B	4	23	01H	2.34	358	NONE	0.20	103	MAI	PLUG
155	B	5	23	01H	1.33	10	NONE	0.28	96	SAI	PLUG
156	B	15	23	01H	0.79	24	PI	0.43	131	MAI	PLUG
157	B	19	23	01H	1.54	6	NONE	0.86	164	MAI	PLUG
158	B	23	23	02H	0.40	34	PI	0.60	106	SAI	PLUG
159	B	24	23	01H	0.26	167	NONE	1.04	159	SAI	PLUG
160	B	25	23	02H	0.88	22	PI	0.44	143	MAI	PLUG
	B	25	23	01H	0.28	49	NONE	0.37	132	SAI	
161	B	29	23	05H	0.21	74	PI	0.27	115	MAI	PLUG
162	B	34	23	01H	1.11	31	PI	0.29	126	SAI	PLUG
163	B	35	23	01H	2.21	37	PI	0.71	105	MAI	PLUG
164	B	36	23	01H	0.82	11	NONE	0.35	148	MAI	PLUG
165	B	38	23	02H	2.02	163	NONE	0.68	97	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	B	38	23	01H	1.02	41	NONE	0.40	93	MAI	
166	B	2	24	01H	1.82	150	PI	0.42	115	MAI	PLUG
167	B	3	24	01H	1.54	167	NONE	0.29	113	MAI	PLUG
168	B	6	24	05H	0.74	28	NONE	0.30	119	SAI	PLUG
	B	6	24	01H	0.49	34	NONE	0.53	105	SAI	
169	B	11	24	04H	0.38	85	PI	0.30	150	MAI	PLUG
	B	11	24	03H	0.16	174	NONE	0.36	51	MAI	
	B	11	24	02H	0.51	28	NONE	0.53	87	MAI	
	B	11	24	01H	1.12	4	NONE	0.49	109	MAI	
170	B	35	24	01H	1.91	12	NONE	1.10	142	SAI	PLUG
171	B	36	24	02H	0.20	56	PI	0.40	152	SAI	PLUG
172	B	37	24	01H	1.84	93	PI	0.96	142	MAI	PLUG
173	B	12	25	02H	0.29	116	NONE	0.45	130	MAI	PLUG
	B	12	25	01H	0.44	345	NONE	0.31	77	SAI	
174	B	15	25	02H	1.75	17	NONE	0.50	126	SAI	PLUG
	B	15	25	01H	0.36	20	PI	0.69	135	MAI	
175	B	17	25	02H	0.31	15	NONE	0.33	110	MAI	PLUG
	B	17	25	01H	1.06	15	NONE	0.46	71	SAI	
176	B	2?	25	02H	0.70	14	PI	0.29	91	SAI	PLUG
177	B	37	25	02H	1.25	24	PI	0.19	90	SAI	PLUG
178	B	15	26	02H	0.40	53	PI	1.57	164	SAI	PLUG
	B	15	26	01H	1.21	19	NONE	0.67	13	SAI	
179	B	19	26	05H	0.31	54	PI	0.53	98	MAI	PLUG
180	B	24	26	02H	1.87	12	NONE	0.35	72	SAI	PLUG
181	B	34	26	05H	1.70	11	NONE	0.41	94	SAI	PLUG
182	B	38	26	02H	3.16	32	PI	0.51	114	MAI	PLUG
183	B	9	27	05H	0.54	22	NONE	0.40	146	SAI	PLUG
184	B	20	27	03H	0.38	74	NONE	0.53	111	SAI	PLUG
185	B	26	27	04H	0.46	33	NONE	0.36	99	SAI	PLUG
186	B	36	27	05H	1.01	27	PI	0.41	93	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
187	B	39	27	05H	[illegible]	16	PI	0.70	154	SAI	PLUG
	B	39	27	02H	0.54	64	PI	0.51	102	MAI	
188	B	40	27	[illegible]	0.84	40	PI	0.65	121	MAI	PLUG
189	B	11	28	[illegible]	0.30	11	NONE	0.78	95	SAI	PLUG
190	B	16	28	[illegible]	0.87	31	PI	1.44	127	SAI	PLUG
191	B	26	28	[illegible]	0.85	13	NONE	0.61	106	MAI	PLUG
	B	26	28	02H	0.13	6	NONE	0.50	75	SAI	
192	B	31	28	05H	0.43	155	NONE	0.29	72	SAI	PLUG
193	B	36	28	04H	0.39	32	PI	0.33	131	MAI	PLUG
194	B	39	28	02H	0.49	32	PI	0.75	93	MAI	PLUG
195	B	40	28	05H	[illegible]	13	PI	0.73	78	MAI	PLUG
196	B	21	29	01H	0.84	159	NONE	0.95	138	SAI	PLUG
197	B	36	29	01H	0.31	48	NONE	0.50	138	SAI	PLUG
198	B	5	30	03H	2.18	10	NONE	0.58	125	SAI	PLUG
199	B	7	30	01H	0.44	28	NONE	0.44	93	SAI	PLUG
200	B	10	30	01H	0.55	168	NONE	0.58	37	SAI	PLUG
201	B	11	30	03H	0.31	12	NONE	0.51	113	SAI	PLUG
202	B	13	30	03H	0.55	163	NONE	0.38	90	MAI	PLUG
203	B	21	30	01H	0.74	172	NONE	0.33	90	MAI	PLUG
204	B	30	31	02H	1.29	9	NONE	0.31	115	SAI	PLUG
205	B	33	31	02H	1.66	11	NONE	0.41	117	MAI	PLUG
206	B	36	31	02H	0.89	21	PI	0.53	141	SAI	PLUG
207	B	38	31	02H	1.51	16	NONE	0.31	108	SAI	PLUG
208	B	4	32	03H	1.26	1	NONE	0.57	144	SAI	PLUG
	B	4	32	02H	1.48	1	NONE	1.01	183	SAI	
209	B	11	32	03H	0.52	40	NONE	0.35	141	MAI	PLUG
	B	11	32	02H	0.57	22	NONE	0.25	87	MAI	
210	B	25	32	04H	0.57	17	NONE	0.44	135	SAI	PLUG
211	B	10	33	01H	0.82	56	PI	1.54	80	SAI	PLUG
212	B	40	33	03H	2.90	44	PI	0.45	119	MAI	PLUG

REVISION 2: SU[illegible] PROGRAM (AUGUST 1991)

	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
213	B	39	34	02H	0.49	51	NONE	1.17	163	SAI	PLUG
214	B	42	34	02H	1[illegible]	57	PI	0.26	98	MAI	PLUG
215	B	4	35	03H	1.57	171	NONE	0.42	78	SAI	PLUG
216	B	18	35	01H	0.64	39	NONE	0.70	168	MAI	PLUG
217	B	32	35	02H	1.42	19	NONE	0.32	31	SAI	PLUG
218	B	41	35	03H	0.41	117	PI	0.56	144	SAI	PLUG
	B	41	35	02H	1.98	16	PI	0.68	131	SAI	
219	B	2	36	03H	0.53	23	NONE	0.61	147	SAI	PLUG
	B	2	36	02H	1.01	25	NONE	0.23	98	SAI	
220	B	8	36	02H	0.45	46	PI	0.35	76	SAI	PLUG
221	B	16	36	01H	0.44	69	PI	0.73	96	SAI	PLUG
222	B	27	36	02H	0.69	34	PI	0.42	129	MAI	PLUG
223	B	30	36	04H	0.26	3	NONE	0.25	59	MAI	PLUG
224	B	41	36	03H	0.68	37	PI	0.36	156	MAI	PLUG
	B	41	36	02H	2.09	37	PI	0.61	150	MAI	
	B	41	36	01H	0.85	15	NONE	0.48	170	SAI	
225	B	44	36	01H	1.04	59	PI	0.52	128	MAI	PLUG
226	B	12	37	03H	0.58	158	NONE	0.36	157	MAI	PLUG
	B	12	37	02H	1.11	50	PI	0.51	168	SAI	
227	B	13	37	02H	0.43	133	NONE	0.47	139	SAI	PLUG
228	B	15	37	03H	0.55	8	NONE	0.43	5	SAI	PLUG
	B	15	37	01H	0.63	93	PI	0.57	145	MAI	
229	B	21	38	01H	0.86	26	NONE	0.40	145	MAI	PLUG
230	B	22	38	05H	0.76	74	NONE	0.13	116	MAI	PLUG
	B	22	38	04H	0.48	3	NONE	0.21	154	SAI	
	B	22	38	01H	0.78	36	PI	0.19	29	MAI	
231	B	36	38	02H	0.78	56	PI	0.37	39	SAI	PLUG
	B	36	38	01H	0.74	12	NONE	0.51	132	MAI	
232	B	40	38	03H	1.84	28	PI	0.44	141	SAI	PLUG
	B	40	38	02H	0.61	57	PI	0.34	77	MAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	B	40	38	01H	0.62	5	NONE	0.67	149	SAI	
233	B	41	38	02H	2.93	21	PI	0.60	138	MAI	PLUG
234	B	42	38	02H	1.19	39	PI	0.39	84	MAI	PLUG
235	B	43	38	01H	0.84	31	NONE	0.66	138	MAI	PLUG
236	B	5	39	02H	0.25	146	NONE	0.32	135	SAI	PLUG
	B	5	39	01H	2.36	3	NONE	0.44	123	SAI	
237	B	8	39	05H	0.91	11	NONE	0.27	48	MAI	PLUG
	B	8	39	04H	1.56	34	PI	0.25	124	MAI	
	B	8	39	03H	2.41	39	PI	0.53	116	MAI	
	B	8	39	01H	1.08	151	NONE	0.73	34	MAI	
238	B	11	39	02H	0.42	45	NONE	0.29	78	SAI	PLUG
239	B	12	39	03H	0.80	31	PI	0.30	75	MAI	PLUG
240	B	15	39	01H	0.74	5	NONE	0.91	159	SAI	PLUG
241	B	26	39	01H	0.59	25	NONE	0.71	16	MAI	PLUG
242	B	29	39	02H	0.86	19	NONE	0.58	45	SAI	PLUG
243	B	30	39	01H	0.77	36	NONE	0.29	137	SAI	PLUG
244	B	32	39	05H	0.22	328	NONE	0.25	59	SAI	PLUG
	B	32	39	02H	0.49	35	NONE	0.42	139	SAI	
245	B	38	39	05H	0.44	47	NONE	0.48	77	SAI	PLUG
246	B	39	39	02H	0.58	52	NONE	0.28	128	SAI	PLUG
247	B	40	39	02H	0.52	135	NONE	0.78	146	SAI	PLUG
248	B	11	40	02H	0.90	37	PI	0.76	16	MAI	PLUG
249	B	30	40	03H	0.14	66	NONE	0.42	141	SAI	PLUG
250	B	31	40	01H	1.21	14	NONE	0.94	145	SAI	PLUG
251	B	32	40	05H	0.52	45	NONE	0.39	125	SAI	PLUG
	B	32	40	02H	1.97	26	PI	0.57	85	MAI	
252	B	33	40	05H	0.68	14	NONE	0.44	139	SAI	PLUG
	B	33	40	04H	0.30	46	NONE	0.61	103	SAI	
	B	33	40	03H	0.51	13	NONE	0.56	57	SAI	
	B	33	40	01H	0.60	24	NONE	0.79	145	SAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
253	B	36	40	04H	0.82	21	NONE	0.59	138	MAI	PLUG
254	B	37	40	05H	0.55	16	NONE	0.74	151	SAI	PLUG
	B	37	[illegible]	04H	0.87	21	NONE	0.48	55	SAI	
255	B	38	40	02H	0.76	150	NONE	0.71	132	SAI	PLUG
256	B	43	40	02H	2.15	39	PI	0.55	119	MAI	PLUG
257	B	45	40	03H	0.55	59	NONE	0.52	130	SAI	PLUG
258	B	5	41	03H	1.26	173	NONE	0.27	39	SAI	PLUG
259	B	11	41	02H	0.84	36	PI	0.48	91	MAI	PLUG
260	B	18	41	01H	0.47	23	NONE	0.28	88	SAI	PLUG
261	B	29	41	02H	0.82	23	NONE	0.60	121	SAI	PLUG
262	B	32	41	02H	0.87	34	NONE	0.54	145	SAI	PLUG
263	B	33	41	04H	0.91	18	NONE	0.60	104	MAI	PLUG
264	B	45	41	02H	0.44	69	PI	0.54	99	MAI	PLUG
265	B	46	41	03H	1.82	30	PI	0.36	109	SAI	PLUG
	B	46	41	01H	1.55	34	NONE	0.54	87	SAI	
266	B	5	42	05H	0.72	15	NONE	0.36	72	SAI	PLUG
267	B	7	42	01H	0.41	7	NONE	0.42	141	SAI	PLUG
268	B	8	42	04H	1.06	2	NONE	0.31	77	SAI	PLUG
269	B	15	42	01H	0.26	173	NONE	0.31	145	SAI	PLUG
270	B	19	42	01H	0.87	14	NONE	0.87	162	SAI	PLUG
271	B	32	42	02H	0.79	34	NONE	[illegible]	119	SAI	PLUG
272	B	34	42	02H	1.13	34	NONE	0.49	105	SAI	PLUG
273	B	40	42	02H	2.12	42	NONE	0.43	42	SAI	PLUG
274	B	42	42	02H	1.20	15	NONE	0.27	111	MAI	PLUG
275	B	45	42	02H	0.67	45	NONE	0.27	112	MAI	PLUG
276	B	4	43	02H	0.67	1	NONE	0.26	78	SAI	PLUG
277	B	14	43	05H	1.96	142	PI	0.30	79	MAI	PLUG
	B	14	43	04H	0.46	91	NONE	0.56	167	SAI	
	B	14	43	03H	0.46	25	NONE	0.29	48	MAI	
278	B	28	43	03H	0.38	72	NONE	0.26	109	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
279	B	31	43	01H	0.63	37	NONE	0.46	14	MAI	PLUG
280	B	33	43	01H	1.63	31	NONE	0.35	48	SAI	PLUG
281	B	35	43	02H	0.95	18	NONE	0.45	36	SAI	PLUG
282	B	37	43	02H	0.30	103	NONE	0.36	46	MAI	PLUG
283	B	41	43	01H	1.20	19	NONE	0.64	17	SAI	PLUG
284	B	42	43	02H	1.44	15	NONE	0.41	84	MAI	PLUG
285	B	44	43	02H	1.63	22	NONE	0.40	138	MAI	PLUG
286	B	3	44	02H	0.48	42	NONE	0.32	118	SAI	PLUG
	B	3	44	01H	1.00	29	NONE	0.37	145	MAI	
287	B	4	44	04H	0.63	29	NONE	0.21	81	SAI	PLUG
288	B	5	44	02H	1.95	11	NONE	0.31	37	SAI	PLUG
289	B	21	44	03H	2.78	181	NONE	0.52	61	SAI	PLUG
	B	21	44	02H	2.65	21	NONE	0.33	87	MAI	
290	B	34	44	02H	1.25	171	NONE	0.30	58	SAI	PLUG
291	B	43	44	03H	0.53	42	NONE	0.74	155	SAI	PLUG
292	B	6	45	01H	1.54	166	NONE	0.59	122	SAI	PLUG
293	B	6	45	02H	0.72	35	PI	0.63	128	SAI	PLUG
294	B	18	46	01H	1.95	3	NONE	0.57	129	SAI	PLUG
295	B	2	47	01H	0.78	138	NONE	0.84	64	SAI	PLUG
296	B	34	47	03H	0.24	126	NONE	0.73	86	MAI	PLUG
297	B	35	47	05H	0.29	92	NONE	0.72	121	SAI	PLUG
	B	35	47	02H	1.80	26	PI	0.98	134	MAI	
298	B	39	47	02H	1.93	32	PI	0.45	72	MAI	PLUG
299	B	3	48	02H	2.15	5	NONE	0.39	74	SAI	PLUG
300	B	10	48	03H	0.61	20	NONE	0.39	141	SAI	PLUG
301	B	33	48	04H	0.69	349	NONE	0.44	95	SAI	PLUG
302	B	39	48	02H	1.65	24	PI	0.71	143	SAI	PLUG
303	B	42	48	02H	0.85	51	PI	0.43	111	MAI	PLUG
304	B	46	48	03H	0.38	15	NONE	0.35	111	MAI	PLUG
305	B	10	49	03H	0.47	30	NONE	1.01	155	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
306	B	13	49	02H	1.04	22	NONE	0.63	35	SAI	PLUG
307	B	42	49	02H	1.39	32	PI	0.95	131	MAI	PLUG
308	B	46	49	05H	0.93	3	NONE	0.53	114	SAI	PLUG
309	B	3	50	01H	0.24	53	NONE	0.50	98	SAI	PLUG
310	B	23	50	03H	0.84	27	NONE	0.44	80	MAI	PLUG
311	B	32	50	02H	0.81	42	NONE	0.94	156	SAI	PLUG
312	B	11	51	04H	1.30	16	NONE	0.69	143	SAI	PLUG
313	B	16	51	02H	1.26	48	PI	0.48	118	MAI	PLUG
	B	16	51	01H	0.57	101	NONE	0.91	121	SAI	
314	B	20	51	01H	1.38	23	NONE	0.50	111	MAI	PLUG
315	B	24	51	02H	1.32	12	NONE	0.44	126	SAI	PLUG
316	B	37	51	02H	1.33	36	NONE	0.70	144	MAI	PLUG
317	B	38	51	02H	0.87	34	NONE	0.50	167	MAI	PLUG
318	B	8	52	04H	0.50	56	NONE	0.60	51	MAI	PLUG
319	B	22	52	03H	0.56	20	NONE	0.40	122	SAI	PLUG
320	B	25	52	02H	0.30	39	NONE	1.13	136	SAI	PLUG
321	B	39	52	05H	0.18	347	NONE	0.46	62	SAI	PLUG
322	B	43	52	02H	1.20	26	NONE	0.97	78	MAI	PLUG
323	B	2	53	01H	0.54	30	NONE	0.62	106	SAI	PLUG
324	B	13	53	02H	0.61	22	NONE	0.30	82	SAI	PLUG
325	B	17	53	01H	1.10	18	NONE	0.48	136	MAI	PLUG
326	B	28	53	02H	1.63	12	NONE	1.66	165	MAI	PLUG
327	B	37	53	02H	0.58	29	NONE	0.58	135	SAI	PLUG
328	B	5	54	01H	0.20	142	NONE	0.5[illegible]	53	SAI	PLUG
329	B	38	54	02H	1.81	9	NONE	0.48	115	MAI	PLUG
330	B	40	54	03H	0.56	48	NONE	0.38	102	MAI	PLUG
331	B	37	55	04H	0.70	31	NONE	0.69	99	MAI	PLUG
332	B	2	56	02H	0.99	345	PI	1.36	28	MAI	PLUG
	B	2	56	01H	0.60	107	NONE	0.61	107	SAI	
333	B	7	56	01H	0.39	66	NONE	0.84	102	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
334	B	12	56	03H	0.63	27	NONE	0.76	34	SAI	PLUG
335	B	2	57	02H	5.72	183	PI	1.96	149	SAI	PLUG
336	B	8	57	03H	0.31	37	NONE	0.63	133	SAI	PLUG
337	B	9	57	02H	1.45	14	NONE	0.72	143	SAI	PLUG
338	B	10	57	01H	0.51	168	NONE	0.98	142	SAI	PLUG
339	B	30	57	02H	0.48	107	NONE	0.74	53	MAI	PLUG
340	B	45	57	02H	1.44	18	NONE	0.61	62	SAI	PLUG
341	B	24	58	02H	0.77	35	NONE	0.95	84	MAI	PLUG
342	B	41	58	04H	0.75	54	PI	0.45	129	SAI	PLUG
343	B	17	60	01H	0.77	25	NONE	0.60	126	MAI	PLUG
344	B	41	60	02H	1.94	9	NONE	0.52	118	SAI	PLUG
345	B	21	61	03H	0.75	135	NONE	0.65	100	MAI	PLUG
346	B	39	61	02H	1.63	25	NONE	0.43	145	SAI	PLUG
347	B	3	62	02H	2.17	13	NONE	0.38	90	MAI	PLUG
	B	3	62	01H	1.29	25	PI	0.45	113	MAI	
348	B	11	62	01H	0.71	14	NONE	0.44	34	SAI	PLUG
349	B	14	63	01H	0.69	171	NONE	0.46	125	MAI	PLUG
350	B	31	63	02H	0.39	38	NONE	0.54	115	SAI	PLUG
351	B	39	63	02H	0.51	30	NONE	0.31	131	SAI	PLUG
352	B	42	63	02H	1.26	26	NONE	0.36	133	SAI	PLUG
	B	42	63	01H	[illegible]	35	NONE	0.37	61	SAI	
353	B	6	64	01H	[illegible]	49	NONE	0.28	91	MAI	PLUG
354	B	36	64	02H	2.81	20	NONE	0.56	136	MAI	PLUG
355	B	41	64	02H	1.07	38	NONE	0.31	110	SAI	PLUG
356	B	42	64	02H	1.88	42	NONE	0.69	62	MAI	PLUG
357	B	2	65	01H	0.59	63	NONE	0.47	126	SAI	PLUG
358	B	10	66	02H	0.89	22	NONE	0.53	129	MAI	PLUG
359	B	37	67	03H	1.22	19	NONE	0.41	159	SAI	PLUG
360	B	29	68	02H	0.35	80	PI	0.60	59	SAI	PLUG
361	B	4	69	01H	1.12	22	NONE	0.57	149	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
362	B	20	69	02H	0.52	30	NONE	0.35	154	SAI	PLUG
363	B	28	69	02H	1.04	356	NONE	0.88	19	SAI	PLUG
364	B	3	70	02H	0.91	15	NONE	1.15	154	MAI	PLUG
	B	3	70	01H	0.76	22	PI	2.17	163	MAI	
365	B	8	70	02H	1.12	27	NONE	0.81	163	MAI	PLUG
	B	8	70	01H	0.50	46	NONE	0.58	48	SAI	
366	B	17	70	01H	1.84	26	PI	1.46	345	MAI	PLUG
367	B	22	70	03H	1.86	66	PI	0.55	137	MAI	PLUG
368	B	26	70	02H	1.66	12	NONE	0.64	161	SAI	PLUG
369	B	38	70	01H	0.93	32	PI	0.16	102	SAI	PLUG
370	B	10	71	02H	0.60	71	NONE	0.54	69	MAI	PLUG
371	B	19	71	02H	0.20	351	NONE	0.38	55	SAI	PLUG
372	B	34	71	02H	0.66	80	PI	1.23	159	MAI	PLUG
373	B	8	72	01H	0.58	54	NONE	0.44	105	MAI	PLUG
374	B	29	72	02H	0.44	82	NONE	0.49	141	MAI	PLUG
375	B	38	72	01H	1.55	79	PI	0.31	114	PID	PLUG
376	B	34	73	01H	0.64	54	NONE	1.02	35	MAI	PLUG
377	B	5	74	02H	0.60	16	NONE	0.42	97	SAI	PLUG
378	B	22	74	02H	0.10	98	NONE	0.56	109	SAI	PLUG
379	B	37	74	01H	0.95	60	NONE	0.62	123	SAI	PLUG
380	B	3	76	01H	0.26	151	NONE	0.39	33	MAI	PLUG
381	B	7	76	01H	0.85	68	NONE	0.84	41	SAI	PLUG
382	B	5	77	01H	0.86	30	NONE	0.30	98	SAI	PLUG
383	B	4	78	01H	0.75	14	NONE	1.07	34	MAI	PLUG
384	B	11	78	01H	1.75	25	PI	0.90	35	MAI	PLUG
385	B	33	78	01H	7.40	178	PI	1.27	131	MAI	PLUG
386	B	9	79	02H	0.45	83	NONE	0.51	83	MAI	PLUG
	B	9	79	01H	0.68	32	PI	0.84	131	SAI	
387	B	13	79	02H	0.45	341	NONE	0.57	140	SAI	PLUG
388	B	22	79	02H	0.86	86	PI	0.94	147	MAI	PLUG

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	S/G	ROW	COLUMN	TSF	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
389	B	30	79	02H	1.75	30	PI	0.35	127	MAI	PLUG
390	B	26	80	02H	1.18	22	PI	0.30	81	SAI	PLUG
391	B	31	80	01H	1.60	23	PI	0.47	118	MAI	PLUG
392	B	14	81	02H	0.63	37	PI	0.41	97	MAI	PLUG
393	B	21	81	04H	1.13	21	PI	0.47	157	PID	PLUG
394	B	31	81	02H	1.46	30	NONE	0.58	85	MAI	PLUG
395	B	10	83	01H	0.26	42	NONE	0.59	146	SAI	PLUG
396	B	28	83	02H	1.06	69	NONE	0.55	62	SAI	PLUG
397	B	29	84	02H	1.09	22	NONE	0.42	155	SAI	PLUG
398	B	15	85	03H	0.90	22	NONE	0.58	147	SAI	PLUG
399	B	17	85	03H	0.99	20	PI	0.63	130	MAI	PLUG
400	B	20	85	02H	0.54	132	NONE	0.88	139	SAI	PLUG
401	B	5	86	03H	0.63	31	NONE	0.59	134	SAI	PLUG
402	B	21	86	01H	1.04	43	NONE	0.82	72	MAI	PLUG
403	B	9	87	02H	0.36	79	NONE	0.47	98	SAI	PLUG
	B	9	87	01H	1.09	9	NONE	0.75	157	SAI	
404	B	10	87	01H	1.27	7	NONE	0.46	145	SAI	PLUG
405	B	13	87	02H	1.47	18	NONE	0.62	37	SAI	PLUG
406	B	15	87	02H	1.14	26	PI	0.81	134	SAI	PLUG
407	B	21	87	02H	0.87	137	NONE	1.55	122	MAI	PLUG
408	B	5	88	02H	0.82	36	NONE	0.37	76	SAI	PLUG
409	B	9	89	01H	1.14	39	NONE	0.44	137	MAI	PLUG
410	B	10	89	02H	0.49	40	PI	0.31	57	SAI	PLUG
411	B	14	89	01H	0.82	35	PI	0.34	126	MAI	PLUG
412	B	19	89	01H	3.16	23	PI	0.27	131	MAI	PLUG
413	B	6	90	02H	0.70	162	PI	0.46	90	MAI	PLUG
414	B	10	90	01H	1.96	9	NONE	0.31	78	SAI	PLUG
415	B	12	90	02H	1.56	27	NONE	0.32	91	SAI	PLUG
	B	12	90	01H	1.95	19	NONE	0.20	101	MAI	
416	B	14	90	02H	1.54	21	PI	0.19	106	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
417	B	15	90	02H	2.88	21	PI	0.19	95	MAI	PLUG
	B	15	90	01H	1.66	28	NONE	0.38	93	MAI	
418	B	19	90	01H	2.03	22	NONE	0.28	89	SAI	PLUG
419	B	8	91	01H	0.62	132	NONE	1.09	104	SAI	PLUG
420	B	9	91	02H	0.51	4	NONE	0.54	128	SAI	PLUG
	B	9	91	01H	1.16	14	NONE	0.80	129	SAI	
421	B	14	91	03H	0.92	358	NONE	0.49	111	SAI	PLUG
422	B	7	92	02H	2.75	26	NONE	1.66	94	SAI	PLUG
423	B	10	92	02H	3.07	14	PI	0.89	131	SAI	PLUG
424	B	11	92	02H	0.56	27	NONE	0.54	106	SAI	PLUG
425	B	13	92	01H	0.44	51	NONE	0.94	59	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
1	C	6	4	01H	0.26	30	NONE	0.62	180	SAI	PLUG
2	C	10	4	05H	0.38	23	NONE	0.48	134	SAI	SLEEVE
3	C	12	4	03H	0.56	29	NONE	0.56	141	SAI	SLEEVE
4	C	14	4	05H	0.47	[illegible]	NONE	0.23	59	SAI	SLEEVE
5	C	16	4	05H	0.53	33	NONE	0.34	154	MAI	SLEEVE
6	C	3	5	04H	0.60	8	NONE	0.78	166	SAI	SLEEVE
7	C	10	5	02H	0.97	24	NONE	0.23	86	SAI	PLUG
8	C	12	5	05H	0.50	12	NONE	0.50	146	MAI	PLUG
	C	12	5	03H	0.23	203	NONE	0.29	85	MAI	
9	C	19	5	02H	0.65	23	NONE	0.46	37	SAI	SLEEVE
10	C	6	6	02H	0.71	18	NONE	0.31	128	SAI	PLUG
11	C	11	6	02H	0.57	4	NONE	0.30	47	SAI	SLEEVE
12	C	12	6	01H	0.61	151	NONE	0.38	146	SAI	PLUG
13	C	18	6	02H	0.16	146	NONE	0.32	28	MAI	SLEEVE
14	C	21	6	02H	1.00	7	NONE	1.07	153	SAI	PLUG
15	C	12	7	02H	0.65	10	NONE	0.32	127	SAI	SLEEVE
16	C	17	7	02H	0.90	4	NONE	0.61	155	SAI	SLEEVE
17	C	19	8	02H	0.85	158	NONE	0.61	158	SAI	PLUG
18	C	22	8	02H	1.80	7	NONE	1.42	10	SAI	SLEEVE
19	C	9	9	05H	0.28	9	NONE	1.46	156	MAI	SLEEVE
20	C	12	9	03H	0.30	165	NONE	0.99	40	SAI	SLEEVE
21	C	13	9	02H	0.65	56	NONE	1.76	16	SAI	SLEEVE
22	C	23	9	01H	1.41	15	NONE	0.41	38	SAI	SLEEVE
23	C	11	10	02H	N/A	N/A	NONE	0.31	243	SAI	SLEEVE
24	C	12	10	02H	N/A	N/A	NONE	0.17	67	SAI	SLEEVE
25	C	16	10	05H	0.41	33	NONE	0.21	132	SAI	SLEEVE
26	C	18	10	02H	0.95	13	NONE	0.35	127	SAI	SLEEVE
27	C	19	10	03H	0.39	37	NONE	0.50	27	SAI	PLUG
	C	19	10	02H	0.71	167	NONE	0.56	25	SAI	
28	C	20	10	03H	0.67	79	PI	0.38	79	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
29	C	4	11	01H	0.83	4[illegible]	NONE	0.58	118	MAI	SLEEVE
30	C	28	11	02H	0.15	53	NONE	0.35	118	SAI	SLEEVE
31	C	8	14	04H	0.45	24	NONE	0.46	145	SAI	SLEEVE
32	C	12	15	02H	0.73	56	PI	0.65	97	MAI	SLEEVE
33	C	30	15	02H	1.21	2	NONE	0.21	78	SAI	SLEEVE
34	C	12	16	02H	1.37	17	NONE	0.15	93	SAI	SLEEVE
35	C	18	16	04H	0.45	3	NONE	0.21	45	SAI	SLEEVE
36	C	19	16	02H	1.53	42	PI	0.56	63	SAI	SLEEVE
37	C	33	16	05H	0.91	0	NONE	0.29	163	MAI	SLEEVE
38	C	20	17	02H	1.12	28	NONE	0.52	117	SAI	SLEEVE
39	C	34	17	01H	0.32	19	NONE	0.77	68	MAI	PLUG
40	C	21	18	02H	1.09	34	NONE	0.49	81	SAI	SLEEVE
41	C	28	18	02H	2.88	22	PI	0.30	71	MAI	SLEEVE
42	C	30	18	02H	0.92	18	NONE	0.93	150	SAI	SLEEVE
43	C	31	18	01H	0.86	45	NONE	1.29	115	SAI	PLUG
44	C	7	19	02H	1.08	44	PI	0.76	81	SAI	SLEEVE
45	C	11	19	02H	0.83	4	NONE	0.33	77	SAI	SLEEVE
46	C	27	19	02H	0.40	148	NONE	0.19	101	MAI	SLEEVE
47	C	15	21	02H	0.38	184	NONE	0.45	137	SAI	PLUG
48	C	.7	21	02H	0.27	18	NONE	0.49	107	MAI	SLEEVE
49	C	19	21	03H	0.51	4	NONE	0.52	85	MAI	PLUG
	C	19	21	02H	0.86	24	NONE	0.42	94	SAI	
50	C	20	21	03H	0.25	28	PI	0.22	88	SAI	PLUG
	C	20	21	02H	0.81	14	NONE	0.43	78	SAI	
51	C	32	21	02H	0.17	109	PI	0.41	119	SAI	SLEEVE
52	C	34	21	02H	1.07	45	PI	0.67	86	MAI	PLUG
	C	34	21	01H	1.05	46	PI	0.46	128	MAI	
53	C	38	21	02H	1.30	27	PI	0.48	107	SAI	SLEEVE
54	C	17	22	02H	0.69	15	NONE	0.37	138	SAI	SLEEVE
55	C	22	22	02H	0.64	35	NONE	0.37	117	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
56	C	30	22	02H	1.67	54	PI	0.54	118	MAI	SLEEVE
57	C	2	23	03H	0.71	26	NONE	0.28	113	SAI	PLUG
	C	2	23	02H	0.61	47	NONE	0.58	160	MAI	
58	C	11	23	02H	0.40	357	NONE	0.28	102	SAI	PLUG
59	C	12	23	02H	0.41	56	NONE	0.36	142	MAI	SLEEVE
60	C	13	23	02H	0.62	91	PI	0.35	131	MAI	SLEEVE
61	C	14	23	02H	0.80	180	NONE	0.29	125	MAI	SLEEVE
62	C	17	23	04H	1.27	17	PI	0.22	102	MAI	PLUG
	C	17	23	03H	0.84	31	NONE	0.63	137	MAI	
	C	17	23	02H	1.19	19	PI	0.22	91	MAI	
63	C	21	23	03H	1.14	14	NONE	0.51	116	SAI	PLUG
	C	21	23	02H	0.57	115	NONE	0.54	67	SAI	
	C	21	23	01H	0.30	115	NONE	0.31	112	SAI	
64	C	23	23	05H	0.47	154	NONE	0.41	106	SAI	SLEEVE
65	C	26	23	02H	0.48	46	PI	0.40	128	MAI	SLEEVE
66	C	39	23	01H	0.96	21	PI	0.31	101	SAI	SLEEVE
67	C	2	24	02H	0.93	25	NONE	0.22	83	SAI	SLEEVE
68	C	4	24	04H	0.75	352	NONE	0.33	28	SAI	SLEEVE
69	C	5	24	02H	0.30	42	NONE	0.68	27	SAI	PLUG
	C	5	24	01H	0.28	121	NONE	0.17	67	SAI	
70	C	9	24	02H	0.37	67	NONE	0.34	149	SAI	SLEEVE
71	C	15	24	02H	0.63	46	NONE	0.34	151	SAI	SLEEVE
72	C	27	24	02H	2.51	19	PI	0.52	133	MAI	SLEEVE
73	C	29	24	03H	1.56	12	NONE	0.40	34	SAI	SLEEVE
74	C	32	24	01H	1.24	47	PI	0.42	79	MAI	PLUG
75	C	39	24	03H	1.27	28	NONE	0.29	74	MAI	PLUG
	C	39	24	02H	1.81	64	PI	0.67	139	MAI	
	C	39	24	01H	0.54	45	NONE	0.33	32	MAI	
76	C	8	25	02H	0.19	57	NONE	0.22	136	SAI	SLEEVE
77	C	14	25	03H	0.56	41	NONE	0.38	129	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
78	C	20	25	03H	1.18	23	NONE	0.25	63	MAI	SLEEVE
79	C	26	25	02H	0.89	15	NONE	0.14	64	SAI	SLEEVE
80	C	33	25	03H	0.83	170	NONE	0.48	152	MAI	PLUG
	C	33	25	02H	0.39	94	NONE	0.28	108	SAI	
81	C	34	25	03H	0.95	49	NONE	0.16	97	MAI	PLUG
82	C	35	25	02H	0.52	64	NONE	0.35	16	SAI	SLEEVE
83	C	5	26	02H	0.47	16	PI	0.12	113	SAI	SLEEVE
84	C	6	26	02H	0.53	34	NONE	0.16	91	MAI	SLEEVE
85	C	9	26	02H	0.19	116	NONE	0.11	136	SAI	SLEEVE
86	C	14	26	02H	0.45	80	NONE	0.19	40	SAI	SLEEVE
87	C	29	26	02H	0.67	29	NONE	0.13	147	MAI	SLEEVE
88	C	41	26	01H	0.94	26	NONE	0.31	135	MAI	SLEEVE
89	C	9	27	04H	0.84	33	NONE	0.27	143	SAI	PLUG
	C	9	27	02H	1.07	36	PI	0.21	137	SAI	
90	C	10	27	03H	0.98	16	NONE	0.20	83	MAI	SLEEVE
91	C	12	27	02H	0.76	6	NONE	0.12	49	SAI	PLUG
	C	12	27	01H	0.84	15	NONE	0.24	75	SAI	
92	C	15	27	02H	0.65	15	NONE	0.24	109	MAI	SLEEVE
93	C	18	27	02H	1.54	19	PI	0.27	105	MAI	SLEEVE
94	C	19	27	04H	0.96	3	NONE	0.17	103	SAI	PLUG
	C	19	27	03H	0.24	61	NONE	0.40	136	MAI	
	C	19	27	02H	0.07	78	NONE	0.27	58	MAI	
95	C	38	27	02H	0.67	111	PI	0.46	131	MAI	SLEEVE
96	C	39	27	01H	0.73	15	NONE	0.13	121	MAI	SLEEVE
97	C	12	28	03H	0.16	90	NONE	0.41	164	SAI	SLEEVE
98	C	18	28	02H	0.40	37	PI	0.42	72	MAI	SLEEVE
99	C	28	28	02H	1.61	22	PI	0.68	147	SAI	SLEEVE
100	C	42	28	01H	0.34	170	NONE	0.32	45	SAI	SLEEVE
101	C	7	29	01H	0.67	48	NONE	0.51	15	MAI	PLUG
102	C	10	29	01H	0.67	43	NONE	0.51	86	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
103	C	18	29	03H	0.21	33	NONE	0.22	90	MAI	SLEEVE
104	C	23	29	02H	0.89	37	NONE	0.17	117	MAI	PLUG
	C	23	29	01H	0.86	32	NONE	0.31	37	SAI	
105	C	30	29	02H	0.49	178	NONE	1.17	166	SAI	PLUG
106	C	34	29	02H	0.59	17	NONE	0.49	147	SAI	SLEEVE
107	C	36	29	02H	1.35	30	NONE	0.22	122	MAI	PLUG
	C	36	29	01H	0.25	79	NONE	0.24	66	SAI	
108	C	3	30	03H	0.18	5	NONE	0.20	119	SAI	SLEEVE
109	C	5	30	02H	0.55	170	NONE	0.25	110	MAI	PLUG
	C	5	30	01H	0.40	33	NONE	0.27	92	MAI	
110	C	7	30	01H	0.91	32	PI	0.65	93	SAI	SLEEVE
111	C	17	30	03H	0.59	9	NONE	0.23	106	SAI	SLEEVE
112	C	18	30	02H	0.98	10	NONE	0.52	151	SAI	SLEEVE
113	C	21	30	03H	0.39	26	NONE	0.32	58	SAI	SLEEVE
114	C	27	30	04H	0.36	15	NONE	0.32	156	MAI	PLUG
	C	27	30	02H	0.58	69	NONE	0.21	97	MAI	
115	C	28	30	02H	0.72	34	NONE	0.28	112	SAI	SLEEVE
116	C	43	30	01H	2.45	12	NONE	0.31	101	SAI	SLEEVE
117	C	16	31	03H	0.85	13	NONE	0.72	13	SAI	PLUG
	C	16	31	01H	0.41	59	NONE	0.87	157	MAI	
118	C	17	31	02H	1.12	23	NONE	0.65	138	SAI	SLEEVE
119	C	22	31	03H	0.90	11	NONE	0.22	106	SAI	SLEEVE
120	C	31	31	01H	0.46	348	NONE	0.17	95	MAI	SLEEVE
121	C	32	31	03H	1.11	10	NONE	0.14	119	MAI	SLEEVE
122	C	36	31	02H	0.38	30	NONE	0.22	139	SAI	SLEEVE
123	C	37	31	02H	1.09	13	NONE	0.23	116	MAI	SLEEVE
124	C	3	32	03H	0.46	33	NONE	0.52	122	SAI	PLUG
	C	3	32	01H	0.36	49	NONE	0.72	104	SAI	
125	C	7	32	01H	0.94	45	PI	0.49	62	MAI	SLEEVE
126	C	9	32	03H	0.17	32	NONE	0.49	62	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
127	C	19	32	03H	0.68	136	NONE	0.25	122	SAI	PLUG
	C	19	32	01H	0.84	31	NONE	0.45	34	SAI	
128	C	27	32	02H	0.72	36	PI	0.37	136	MAI	SLEEVE
129	C	6	33	04H	1.25	8	NONE	0.24	120	MAI	PLUG
	C	6	33	01H	0.67	9	NONE	0.37	169	SAI	
130	C	10	33	01H	0.49	33	NONE	0.44	135	SAI	SLEEVE
131	C	22	33	03H	1.14	12	NONE	0.45	135	SAI	SLEEVE
132	C	23	33	02H	0.62	49	NONE	0.36	119	MAI	SLEEVE
133	C	32	33	02H	0.44	103	NONE	0.51	84	MAI	SLEEVE
134	C	36	33	04H	0.16	341	NONE	1.22	140	MAI	SLEEVE
135	C	8	34	01H	0.48	26	NONE	0.24	144	SAI	SLEEVE
136	C	18	34	02H	1.11	35	PI	0.84	130	SAI	PLUG
	C	18	34	01H	1.27	31	PI	0.41	48	MAI	
137	C	24	34	04H	N/A	N/A	NONE	0.46	30	SAI	SLEEVE
138	C	25	34	02H	0.75	23	NONE	0.17	64	SAI	SLEEVE
139	C	26	34	03H	1.41	359	NONE	0.94	72	SAI	SLEEVE
140	C	5	35	03H	0.54	50	PI	0.62	104	MAI	PLUG
	C	5	35	02H	0.50	21	NONE	0.46	146	SAI	
141	C	9	35	02H	0.36	65	NONE	0.39	101	SAI	SLEEVE
142	C	18	35	03H	0.53	14	NONE	0.50	110	SAI	SLEEVE
143	C	2	36	02H	0.57	40	NONE	0.15	95	SAI	SLEEVE
144	C	5	36	02H	0.41	32	NONE	0.62	59	MAI	SLEEVE
145	C	11	36	05H	0.37	36	NONE	0.44	93	MAI	PLUG
	C	11	36	02H	0.39	167	NONE	0.47	114	SAI	
146	C	16	36	02H	0.48	59	PI	0.38	60	MAI	SLEEVE
147	C	19	36	04H	N/A	N/A	NONE	0.17	45	SAI	SLEEVE
148	C	20	36	03H	0.83	12	NONE	0.38	60	MAI	PLUG
	C	20	36	02H	0.99	62	PI	0.61	117	SAI	
149	C	22	36	02H	1.02	167	NONE	0.61	117	SAI	PLUG
150	C	35	36	03H	0.95	31	PI	0.48	134	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
151	C	36	36	02H	0.49	4	NONE	0.61	134	SAI	SLEEVE
152	C	7	37	02H	63.40	4	PI	0.50	149	MAI	SLEEVE
153	C	9	37	02H	1.21	10	NONE	0.60	66	SAI	PLUG
	C	9	37	01H	0.29	70	PI	0.39	88	SAI	
154	C	12	37	02H	0.52	60	PI	0.47	114	MAI	SLEEVE
155	C	23	37	01H	0.29	70	PI	0.54	128	MAI	PLUG
156	C	24	37	02H	1.26	40	PI	0.62	140	MAI	SLEEVE
157	C	45	37	01H	0.23	17	NONE	0.54	128	MAI	PLUG
158	C	3	38	02H	0.63	22	NONE	0.69	30	MAI	SLEEVE
159	C	7	38	02H	0.94	43	PI	0.22	136	MAI	PLUG
160	C	8	38	02H	0.46	116	NONE	0.22	136	MAI	SLEEVE
161	C	9	38	02H	0.30	39	NONE	0.61	163	SAI	PLUG
	C	9	38	01H	1.23	23	PI	1.11	8	MAI	
162	C	15	38	02H	0.43	51	PI	0.51	100	MAI	SLEEVE
163	C	18	38	01H	1.14	8	PI	0.31	56	SAI	SLEEVE
164	C	20	38	02H	0.74	5	NONE	0.40	76	SAI	SLEEVE
165	C	21	38	01H	1.69	14	NONE	0.48	24	SAI	SLEEVE
166	C	22	38	01H	1.12	21	NONE	0.51	21	MAI	SLEEVE
167	C	30	38	02H	0.59	35	PI	0.93	158	MAI	PLUG
168	C	33	38	01H	1.97	18	PI	0.40	62	MAI	PLUG
169	C	34	38	03H	1.85	21	PI	0.67	144	MAI	SLEEVE
170	C	37	38	02H	0.61	24	NONE	0.53	145	SAI	PLUG
	C	37	38	01H	1.65	13	NONE	0.25	50	SAI	
171	C	38	38	02H	2.36	26	PI	1.23	94	MAI	SLEEVE
172	C	2	39	02H	0.47	3	NONE	1.02	158	SAI	PLUG
173	C	9	39	02H	0.99	25	PI	1.90	9	MAI	PLUG
	C	9	39	01H	1.00	0	NONE	1.34	161	SAI	
174	C	10	39	03H	0.44	165	NONE	0.58	112	SAI	PLUG
	C	10	39	02H	0.24	35	NONE	0.95	144	SAI	
175	C	14	39	02H	0.67	156	NONE	0.84	56	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	C	14	39	01H	0.53	138	NONE	0.84	56	SAI	
176	C	15	39	01H	1.16	17	PI	1.20	22	MAI	SLEEVE
177	C	18	39	02H	0.33	151	NONE	1.32	147	SAI	PLUG
	C	18	39	01H	0.57	38	PI	1.40	144	MAI	
178	C	19	39	01H	0.59	27	NONE	0.75	101	SAI	SLEEVE
179	C	22	39	01H	0.70	353	NONE	1.19	166	MAI	PLUG
180	C	36	39	05H	0.43	7	NONE	1.35	50	MAI	PLUG
	C	36	39	04H	0.57	14	NONE	1.07	142	SAI	
	C	36	39	03H	0.93	101	PI	1.11	22	MAI	
	C	36	39	02H	0.73	347	NONE	1.59	151	MAI	
181	C	37	39	03H	1.48	30	PI	2.76	15	SAI	SLEEVE
182	C	40	39	03H	0.92	158	NONE	0.67	73	SAI	SLEEVE
183	C	3	40	03H	0.28	45	NONE	0.48	129	SAI	PLUG
	C	3	40	01H	0.42	48	PI	1.13	99	SAI	
184	C	6	40	02H	0.29	285	NONE	0.47	134	SAI	PLUG
185	C	10	40	03H	0.88	2	NONE	0.47	139	SAI	SLEEVE
186	C	15	40	02H	0.45	116	NONE	0.97	108	MAI	SLEEVE
187	C	23	40	03H	0.58	69	PI	0.89	127	SAI	PLUG
	C	23	40	02H	1.54	1	NONE	0.78	162	SAI	
	C	23	40	01H	1.19	16	NONE	1.57	150	SAI	
188	C	25	40	01H	0.69	28	PI	0.98	153	MAI	PLUG
189	C	34	40	01H	0.63	169	NONE	0.46	141	SAI	PLUG
190	C	36	40	02H	0.53	152	NONE	0.65	115	SAI	PLUG
191	C	37	40	05H	1.68	15	PI	0.23	111	SAI	PLUG
	C	37	40	02H	1.18	30	PI	0.46	149	MAI	
192	C	42	40	02H	0.77	59	PI	0.62	128	MAI	PLUG
	C	42	40	01H	0.55	20	NONE	1.87	19	MAI	
193	C	44	40	03H	0.95	22	NONE	0.91	14	MAI	PLUG
	C	44	40	02H	0.66	39	NONE	0.88	143	SAI	
194	C	6	41	05H	0.15	341	NONE	0.54	130	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
195	C	9	41	02H	2.25	19	PI	0.29	115	MAI	PLUG
196	C	10	41	02H	1.07	15	PI	0.92	134	SAI	PLUG
197	C	12	41	04H	0.48	164	NONE	0.64	42	SAI	SLEEVE
198	C	15	41	02H	0.31	79	PI	1.86	14	MAI	SLEEVE
199	C	16	41	02H	1.24	17	PI	0.47	105	SAI	SLEEVE
200	C	17	41	01H	0.45	47	NONE	1.04	88	MAI	PLUG
201	C	20	41	02H	0.37	94	NONE	0.71	132	MAI	SLEEVE
202	C	24	41	01H	0.54	48	NONE	0.64	128	SAI	PLUG
203	C	26	41	01H	1.66	31	PI	0.57	96	MAI	PLUG
204	C	28	41	02H	1.69	30	PI	0.45	146	MAI	PLUG
	C	28	41	01H	1.78	17	PI	0.41	148	MAI	
205	C	32	41	02H	0.62	26	PI	0.42	72	MAI	SLEEVE
206	C	37	41	03H	0.82	23	NONE	0.88	83	SAI	SLEEVE
207	C	38	41	02H	0.75	180	NONE	0.36	130	SAI	SLEEVE
208	C	42	41	02H	0.41	45	PI	0.61	30	MAI	SLEEVE
209	C	7	42	02H	0.27	71	NONE	0.40	105	SAI	PLUG
	C	7	42	01H	0.21	74	NONE	0.42	107	SAI	
210	C	12	42	02H	0.24	20	NONE	0.54	50	SAI	PLUG
211	C	13	42	02H	2.40	28	PI	0.28	154	MAI	SLEEVE
212	C	36	42	03H	0.54	53	NONE	0.37	92	MAI	SLEEVE
213	C	37	42	03H	0.61	58	NONE	0.40	78	SAI	PLUG
214	C	38	42	02H	1.93	50	PI	0.28	29	MAI	PLUG
215	C	45	42	02H	1.48	21	NONE	1.07	34	MAI	SLEEVE
216	C	2	43	02H	0.46	39	NONE	1.11	171	MAI	PLUG
217	C	4	43	03H	0.74	26	NONE	0.62	158	SAI	PLUG
218	C	5	43	04H	0.59	10	NONE	0.76	14	SAI	PLUG
	C	5	43	03H	0.56	352	NONE	0.36	78	MAI	
	C	5	43	02H	0.58	22	NONE	1.08	159	MAI	
219	C	7	43	02H	0.73	40	NONE	0.65	114	SAI	PLUG
220	C	14	43	02H	1.48	14	PI	0.69	141	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
221	C	18	43	04H	0.90	19	NONE	0.45	138	SAI	PLUG
	C	18	43	02H	1.70	38	PI	0.29	106	MAI	
	C	18	43	01H	0.20	51	NONE	1.00	85	MAI	
222	C	19	43	02H	1.42	24	PI	0.38	62	SAI	SLEEVE
223	C	29	43	02H	1.75	15	PI	0.68	150	MAI	SLEEVE
224	C	31	43	01H	0.28	51	PI	0.39	74	MAI	SLEEVE
225	C	34	43	01H	1.13	17	NONE	0.54	66	SAI	SLEEVE
226	C	45	43	01H	1.80	12	PI	0.23	103	MAI	SLEEVE
227	C	4	44	03H	0.44	56	NONE	2.48	10	SAI	PLUG
228	C	8	44	02H	0.81	7	NONE	0.77	35	SAI	PLUG
229	C	9	44	02H	0.50	27	PI	0.98	161	SAI	PLUG
230	C	11	44	01H	0.21	8	NONE	0.82	149	SAI	PLUG
231	C	14	44	01H	0.81	38	PI	0.46	94	MAI	PLUG
232	C	16	44	02H	0.26	32	NONE	0.97	153	SAI	PLUG
233	C	18	44	02H	0.40	141	NONE	0.46	74	SAI	SLEEVE
234	C	40	44	02H	1.42	17	PI	0.50	23	SAI	SLEEVE
235	C	42	44	02H	1.10	21	PI	0.29	86	SAI	PLUG
236	C	43	44	03H	1.49	23	PI	0.44	110	MAI	PLUG
	C	43	44	02H	0.25	108	NONE	0.56	82	SAI	
237	C	7	45	03H	0.71	40	NONE	0.64	141	MAI	PLUG
	C	7	45	02H	0.50	30	NONE	0.28	93	SAI	
	C	7	45	01H	0.31	37	NONE	0.52	91	MAI	
238	C	21	45	03H	0.68	112	NONE	0.44	78	SAI	SLEEVE
239	C	23	45	01H	0.56	28	PI	0.48	60	MAI	SLEEVE
240	C	25	45	02H	0.34	17	NONE	0.60	149	MAI	PLUG
	C	25	45	01H	0.51	20	NONE	0.90	4	SAI	
241	C	28	45	01H	0.91	34	PI	0.67	35	SAI	PLUG
242	C	38	45	02H	0.45	34	NONE	0.55	25	MAI	SLEEVE
243	C	43	45	02H	0.51	100	NONE	0.32	96	SAI	SLEEVE
244	C	44	45	02H	1.41	14	PI	1.29	177	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
245	C	46	45	01H	0.56	55	NONE	0.64	124	SAI	PLUG
246	C	9	46	02H	0.82	28	PI	0.94	143	SAI	PLUG
247	C	16	46	03H	0.59	38	NONE	0.61	143	SAI	PLUG
	C	16	46	02H	0.42	73	NONE	0.55	50	SAI	
248	C	17	46	01H	0.24	47	NONE	1.05	22	SAI	PLUG
249	C	27	46	02H	0.88	33	PI	0.36	96	MAI	SLEEVE
250	C	29	46	02H	0.48	3	NONE	0.50	137	SAI	PLUG
251	C	34	46	01H	0.63	23	NONE	0.59	163	SAI	PLUG
252	C	38	46	02H	0.34	45	NONE	0.50	149	MAI	SLEEVE
253	C	43	46	02H	0.63	53	PI	0.78	6	SAI	SLEEVE
254	C	46	46	02H	0.42	87	NONE	0.67	14	SAI	SLEEVE
255	C	7	47	02H	0.70	63	NONE	1.62	90	SAI	PLUG
256	C	16	47	02H	1.11	21	PI	0.67	116	SAI	SLEEVE
257	C	21	47	02H	0.78	45	NONE	0.98	91	SAI	SLEEVE
258	C	24	47	01H	1.16	48	PI	0.22	152	MAI	PLUG
259	C	32	47	02H	0.78	33	PI	0.18	79	MAI	SLEEVE
260	C	33	47	02H	0.68	46	PI	0.34	79	MAI	PLUG
	C	33	47	01H	0.82	36	NONE	0.83	90	SAI	
	C	33	47	03H	0.36	38	NONE	0.35	135	MAI	SLEEVE
261	C	37	47	03H	0.36	38	NONE	0.35	135	MAI	SLEEVE
262	C	39	47	04H	1.07	15	NONE	0.49	126	SAI	SLEEVE
263	C	41	47	05H	1.13	9	NONE	0.25	94	SAI	SLEEVE
264	C	42	47	02H	0.36	65	NONE	0.71	41	SAI	SLEEVE
265	C	43	47	02H	0.50	53	PI	0.76	68	SAI	SLEEVE
266	C	46	47	01H	0.94	47	PI	0.35	52	SAI	PLUG
267	C	13	48	03H	0.28	36	NONE	0.75	97	SAI	PLUG
	C	13	48	02H	0.64	52	PI	0.80	82	MAI	
268	C	19	48	02H	0.57	169	NONE	0.51	86	SAI	SLEEVE
269	C	29	48	02H	0.98	24	NONE	0.26	146	MAI	SLEEVE
270	C	41	48	03H	0.58	29	NONE	1.03	132	SAI	PLUG
	C	41	48	02H	0.38	143	NONE	0.39	125	SAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
271	C	43	48	03H	0.93	32	NONE	0.60	91	MAI	PLUG
	C	43	48	02H	1.08	23	PI	0.62	130	MAI	
272	C	4	49	02H	1.62	26	PI	0.42	119	SAI	PLUG
273	C	9	49	03H	0.93	16	NONE	0.80	38	SAI	PLUG
274	C	18	49	01H	0.46	8	NONE	1.04	31	SAI	PLUG
275	C	27	49	01H	1.40	18	NONE	1.47	24	MAI	PLUG
276	C	29	49	03H	0.83	24	PI	0.89	8	SAI	PLUG
	C	29	49	02H	0.85	48	PI	0.49	90	MAI	
277	C	34	49	02H	1.60	8	PI	0.47	42	MAI	SLEEVE
278	C	37	49	03H	0.53	27	NONE	0.95	37	SAI	SLEEVE
279	C	42	49	02H	0.43	60	PI	1.69	16	SAI	PLUG
	C	42	49	01H	0.95	50	PI	1.27	149	MAI	
280	C	8	50	01H	0.77	11	NONE	0.47	50	SAI	PLUG
281	C	17	50	01H	0.79	19	PI	0.48	101	SAI	PLUG
282	C	19	50	01H	0.46	151	NONE	0.69	56	SAI	SLEEVE
283	C	23	50	04H	0.26	8	NONE	0.27	97	MAI	PLUG
	C	23	50	02H	0.61	29	NONE	0.73	54	SAI	
	C	23	50	01H	2.17	23	PI	0.53	65	MAI	
284	C	26	50	01H	0.44	43	NONE	0.63	171	MAI	PLUG
285	C	27	50	01H	2.81	15	NONE	0.68	110	MAI	PLUG
286	C	29	50	01H	1.63	26	PI	0.59	141	MAI	PLUG
287	C	42	50	01H	0.47	81	NONE	0.72	69	MAI	SLEEVE
288	C	43	50	05H	0.78	153	NONE	[illegible]	164	SAI	SLEEVE
289	C	44	50	01H	0.98	21	NONE	0.64	155	SAI	PLUG
290	C	45	50	01H	1.39	43	PI	0.32	98	MAI	SLEEVE
291	C	2	51	01H	0.39	9	NONE	0.44	147	SAI	PLUG
292	C	4	51	02H	0.55	15	NONE	2.69	14	SAI	PLUG
	C	4	51	01H	0.42	34	NONE	0.53	126	SAI	
293	C	5	51	02H	0.33	139	NONE	1.26	20	MAI	PLUG
		5	51	01H	0.65	17	NONE	1.03	24	MAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
294	C	8	51	01H	0.59	16	NONE	0.32	42	MAI	PLUG
295	C	14	51	01H	0.87	10	NONE	0.29	56	SAI	PLUG
296	C	16	51	02H	0.78	18	NONE	0.41	87	SAI	PLUG
	C	16	51	01H	0.66	38	PI	0.25	83	MAI	
	C	17	51	02H	0.87	27	PI	0.36	106	MAI	PLUG
297	C	17	51	01H	0.91	10	NONE	0.27	54	SAI	
	C	21	51	03H	0.69	53	NONE	0.41	131	MAI	SLEEVE
298	C	33	51	03H	0.89	12	NONE	0.81	20	SAI	PLUG
299	C	33	51	01H	0.85	36	NONE	0.84	139	SAI	
	C	34	51	03H	0.15	158	NONE	0.58	156	MAI	SLEEVE
300	C	43	51	[illegible]	0.30	142	NONE	0.31	86	MAI	PLUG
301	C	44	51	02H	2.08	17	PI	0.41	100	MAI	PLUG
302	C	44	51	01H	0.56	127	NONE	0.48	84	SAI	
	C	45	51	01H	0.64	53	NONE	0.46	135	MAI	PLUG
303	C	46	51	02H	0.58	108	PI	0.38	104	MAI	PLUG
304	C	46	51	01H	0.88	152	NONE	0.35	146	SAI	
	C	7	52	04H	0.45	46	NONE	0.48	18	SAI	PLUG
305	C	7	52	02H	0.49	48	PI	0.33	75	SAI	
	C	8	52	01H	0.43	15	NONE	0.37	56	SAI	PLUG
306	C	9	52	01H	0.30	45	PI	1.05	146	SAI	PLUG
307	C	11	52	02H	0.44	101	NONE	0.32	52	SAI	PLUG
308	C	17	52	01H	0.76	48	NONE	0.65	38	MAI	PLUG
309	C	22	52	02H	0.21	176	NONE	0.54	99	MAI	PLUG
310	C	22	52	01H	1.65	31	NONE	0.67	136	MAI	
	C	33	52	03H	0.18	28	NONE	0.50	101	SAI	PLUG
311	C	33	52	02H	0.69	26	NONE	1.42	11	MAI	
	C	35	52	02H	0.49	56	NONE	0.51	116	SAI	SLEEVE
312	C	37	52	05H	0.67	4	NONE	0.28	115	SAI	SLEEVE
313	C	42	52	03H	0.54	139	NONE	0.37	94	SAI	PLUG
314	C	42	52	02H	0.54	45	NONE	1.04	68	MAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
315	C	43	52	01H	1.28	29	PI	0.93	159	SAI	PLUG
316	C	44	52	01H	0.44	42	NONE	0.32	58	MAI	PLUG
317	C	2	53	02H	1.14	16	NONE	0.86	15	MAI	PLUG
	C	2	53	01H	0.78	22	NONE	0.26	102	SAI	
318	C	6	53	03H	0.96	41	PI	0.86	25	MAI	PLUG
319	C	9	53	04H	0.41	101	PI	0.33	126	MAI	PLUG
	C	9	53	03H	0.75	27	PI	0.37	75	MAI	
320	C	10	53	03H	0.60	26	NONE	0.64	166	SAI	SLEEVE
321	C	11	53	02H	0.36	23	NONE	0.54	57	MAI	SLEEVE
322	C	13	53	02H	0.23	78	NONE	0.47	85	MAI	SLEEVE
323	C	14	53	04H	0.39	32	PI	0.31	86	MAI	PLUG
	C	14	53	02H	0.28	9	NONE	0.46	114	SAI	
324	C	15	53	01H	0.14	165	NONE	0.63	35	MAI	SLEEVE
325	C	17	53	02H	0.18	78	NONE	0.42	80	MAI	SLEEVE
326	C	18	53	02H	0.50	76	NONE	0.47	31	SAI	SLEEVE
327	C	19	53	02H	0.47	22	NONE	0.58	23	MAI	PLUG
	C	19	53	01H	0.41	61	PI	0.58	23	MAI	
328	C	20	53	01H	0.83	28	PI	0.53	154	MAI	PLUG
329	C	21	53	02H	0.13	153	NONE	0.31	41	MAI	PLUG
	C	21	53	01H	0.29	92	PI	0.66	90	SAI	
330	C	23	53	02H	0.39	25	NONE	0.49	130	SAI	SLEEVE
331	C	25	53	01H	0.43	145	NONE	0.21	122	MAI	PLUG
332	C	29	53	02H	1.60	13	NONE	0.36	54	MAI	PLUG
	C	29	53	01H	0.91	17	NONE	0.33	140	SAI	
333	C	35	53	01H	0.73	19	NONE	0.38	116	SAI	SLEEVE
334	C	36	53	02H	0.44	60	NONE	0.27	110	SAI	SLEEVE
335	C	37	53	02H	0.50	39	PI	0.45	62	SAI	SLEEVE
336	C	41	53	03H	1.41	14	NONE	0.53	22	MAI	SLEEVE
337	C	44	53	03H	0.54	138	NONE	0.35	24	MAI	PLUG
	C	44	53	02H	0.90	134	NONE	0.44	118	SAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
338	C	2	54	02H	0.74	23	NONE	0.30	152	SAI	SLEEVE
339	C	4	54	02H	0.19	0	NONE	0.31	129	SAI	SLEEVE
340	C	5	54	02H	0.81	21	PI	0.63	107	MAI	SLEEVE
341	C	10	54	02H	0.52	32	NONE	0.17	81	MAI	PLUG
342	C	12	54	04H	N/A	N/A	NONE	0.20	149	PID	SLEEVE
343	C	13	54	02H	0.67	17	NONE	0.29	108	SAI	PLUG
344	C	16	54	01H	0.43	22	NONE	0.28	94	SAI	PLUG
345	C	18	54	01H	1.07	49	PI	0.55	148	MAI	PLUG
346	C	19	54	02H	0.64	14	PI	0.34	137	MAI	SLEEVE
347	C	26	54	01H	0.58	58	NONE	0.67	67	MAI	PLUG
348	C	28	54	03H	0.40	25	NONE	0.55	141	SAI	PLUG
	C	28	54	01H	0.45	11	PI	0.44	111	SAI	
349	C	31	54	02H	0.48	22	PI	0.53	124	MAI	SLEEVE
350	C	32	54	02H	0.32	21	PI	0.27	149	MAI	SLEEVE
351	C	38	54	01H	0.57	101	NONE	0.89	116	MAI	PLUG
352	C	42	54	01H	1.33	14	NONE	0.28	105	MAI	PLUG
353	C	4	55	04H	0.76	17	NONE	0.28	130	MAI	PLUG
	C	4	55	02H	0.87	33	NONE	0.46	128	MAI	
354	C	7	55	04H	0.51	25	PI	0.16	91	MAI	PLUG
	C	7	55	03H	0.33	33	NONE	0.15	113	MAI	
	C	7	55	02H	0.64	11	NONE	0.28	127	MAI	
355	C	12	55	01H	0.26	149	NONE	0.15	79	SAI	PLUG
356	C	16	55	02H	0.80	169	NONE	0.53	126	MAI	PLUG
	C	16	55	01H	0.41	94	NONE	0.45	98	MAI	
357	C	17	55	02H	0.46	5	NONE	0.18	145	SAI	SLEEVE
358	C	19	55	02H	0.46	22	NONE	0.15	27	SAI	PLUG
359	C	20	55	02H	0.16	131	NONE	0.24	112	MAI	SLEEVE
360	C	33	55	02H	1.07	18	NONE	0.28	136	SAI	SLEEVE
361	C	34	55	01H	0.46	14	PI	0.40	101	SAI	PLUG
362	C	35	55	05H	0.28	9	NONE	0.30	38	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
363	C	37	55	03H	0.28	94	NONE	0.36	109	SAI	PLUG
364	C	42	55	02H	0.73	39	PI	0.60	95	MAI	SLEEVE
365	C	5	56	03H	0.28	14	NONE	0.09	84	SAI	PLUG
366	C	17	56	05H	0.69	31	NONE	0.45	27	SAI	SLEEVE
367	C	29	56	01H	1.15	30	PI	0.34	116	MAI	PLUG
368	C	34	56	03H	0.41	19	NONE	0.41	24	MAI	SLEEVE
369	C	6	57	04H	0.58	36	PI	0.28	42	SAI	PLUG
	C	6	57	03H	0.49	9	NONE	1.23	168	MAI	
370	C	11	57	03H	0.74	24	PI	0.40	155	SAI	SLEEVE
371	C	13	57	01H	0.38	28	NONE	0.28	71	MAI	PLUG
372	C	15	57	01H	0.57	15	PI	0.35	174	MAI	PLUG
373	C	17	57	03H	0.56	98	NONE	0.28	147	MAI	PLUG
	C	17	57	01H	0.58	176	NONE	0.44	73	SAI	
374	C	36	57	02H	0.78	37	PI	0.34	121	MAI	SLEEVE
375	C	37	57	02H	0.78	18	NONE	0.64	45	SAI	SLEEVE
376	C	2	58	02H	1.00	31	NONE	0.34	122	SAI	SLEEVE
377	C	3	58	04H	0.57	25	PI	0.28	133	SAI	PLUG
	C	3	58	03H	0.27	145	NONE	0.55	157	SAI	
	C	3	58	02H	0.99	41	PI	0.39	137	MAI	
378	C	8	58	04H	0.58	14	NONE	0.47	9	SAI	PLUG
	C	8	58	03H	0.72	25	PI	0.37	120	MAI	
	C	8	58	02H	0.88	167	NONE	1.02	117	SAI	
379	C	10	58	05H	0.33	109	NONE	0.44	41	SAI	PLUG
	C	10	58	03H	0.51	34	NONE	0.47	39	SAI	
	C	10	58	02H	0.74	31	NONE	0.52	109	MAI	
380	C	11	58	02H	0.35	136	NONE	0.62	132	SAI	SLEEVE
381	C	15	58	01H	0.49	24	NONE	0.52	112	SAI	PLUG
382	C	21	58	03H	0.63	67	NONE	0.28	61	SAI	SLEEVE
383	C	27	58	01H	0.78	34	NONE	0.53	[illegible]	MAI	PLUG
384	C	41	58	01H	0.56	38	PI	0.42	43	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
385	C	3	59	01H	0.41	14	NONE	0.29	123	SAI	PLUG
386	C	5	59	03H	1.04	25	NONE	0.51	29	SAI	SLEEVE
387	C	14	59	01H	0.40	21	NONE	1.01	111	SAI	PLUG
388	C	22	59	01H	0.21	79	NONE	0.53	63	SAI	PLUG
389	C	41	59	03H	0.35	67	PI	0.46	100	SAI	SLEEVE
390	C	42	59	01H	0.35	44	PI	0.65	112	SAI	PLUG
391	C	44	59	04H	1.85	19	PI	0.22	97	MAI	PLUG
	C	44	59	02H	2.59	20	PI	0.38	128	MAI	
392	C	3	60	04H	1.08	30	NONE	2.37	138	SAI	SLEEVE
393	C	11	60	01H	0.34	23	NONE	1.33	68	SAI	PLUG
394	C	17	60	01H	1.11	187	PI	1.93	75	SAI	PLUG
395	C	19	60	01H	0.82	31	PI	0.85	96	MAI	PLUG
396	C	22	60	01H	0.24	10	NONE	1.24	[illegible]	SAI	PLUG
397	C	24	60	02H	0.20	22	NONE	0.34	118	SAI	SLEEVE
398	C	25	60	01H	0.20	142	NONE	0.46	147	SAI	PLUG
399	C	26	60	02H	0.57	32	PI	0.24	90	MAI	SLEEVE
400	C	28	60	02H	0.72	83	PI	0.61	98	MAI	SLEEVE
401	C	33	60	03H	0.24	79	NONE	0.52	37	MAI	SLEEVE
402	C	44	60	01H	2.34	28	PI	3.46	40	SAI	PLUG
403	C	7	61	01H	0.30	37	PI	0.81	90	SAI	PLUG
404	C	10	61	01H	0.30	6	NONE	0.60	52	SAI	PLUG
405	C	15	61	01H	1.10	22	PI	0.44	168	MAI	PLUG
406	C	23	61	03H	0.06	41	NONE	0.49	90	SAI	SLEEVE
407	C	28	61	01H	0.36	29	NONE	0.58	84	SAI	PLUG
408	C	33	61	03H	0.64	37	PI	0.30	132	SAI	SLEEVE
409	C	36	61	03H	0.76	15	NONE	0.36	125	MAI	SLEEVE
410	C	38	61	02H	0.22	14	NONE	0.35	84	SAI	SLEEVE
411	C	4	62	04H	0.46	46	PI	0.65	30	SAI	PLUG
	C	4	62	02H	0.38	87	PI	0.40	90	MAI	
412	C	5	62	01H	0.72	21	NONE	0.52	45	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
413	C	8	62	01H	0.64	31	PI	0.18	74	MAI	PLUG
414	C	16	62	02H	0.38	16	NONE	1.13	24	MAI	SLEEVE
415	C	17	62	01H	0.64	48	PI	0.88	63	SAI	PLUG
416	C	24	62	03H	1.43	7	NONE	0.68	113	MAI	PLUG
	C	24	62	02H	2.76	24	PI	0.20	68	MAI	
417	C	31	62	03H	0.47	78	NONE	0.58	59	MAI	PLUG
	C	31	62	02H	0.84	28	NONE	0.50	115	MAI	
418	C	35	62	02H	N/A	N/A	NONE	0.36	112	PID	PLUG
419	C	38	62	03H	1.41	24	NONE	0.71	29	SAI	SLEEVE
420	C	4	63	01H	1.07	13	PI	0.43	[illegible]	MAI	PLUG
421	C	20	63	01H	0.77	33	PI	0.86	135	SAI	PLUG
422	C	25	63	04H	0.89	25	NONE	0.44	82	MAI	PLUG
	C	25	63	02H	0.91	90	PI	1.19	40	SAI	
	C	25	63	01H	2.30	31	PI	0.78	40	MAI	
423	C	38	63	02H	2.27	24	PI	0.21	91	MAI	SLEEVE
424	C	4	64	05H	0.86	35	PI	0.16	112	MAI	PLUG
	C	4	64	02H	1.21	20	PI	0.15	86	MAI	
425	C	6	64	02H	0.38	45	NONE	0.82	56	SAI	SLEEVE
426	C	8	64	01H	1.12	37	PI	0.42	18	MAI	PLUG
427	C	9	64	03H	0.80	52	PI	0.68	114	MAI	PLUG
	C	9	64	02H	0.24	124	NONE	0.52	64	SAI	
428	C	12	64	02H	1.16	39	PI	0.47	103	SAI	PLUG
429	C	14	64	01H	1.39	16	NONE	0.45	85	MAI	PLUG
430	C	15	64	01H	1.45	19	PI	0.34	59	SAI	PLUG
431	C	17	64	02H	1.71	15	NONE	0.36	115	MAI	SLEEVE
432	C	18	64	02H	0.33	64	NONE	0.90	15	MAI	PLUG
	C	18	64	01H	0.46	30	NONE	0.31	20	SAI	
433	C	26	64	02H	0.97	144	NONE	0.64	66	MAI	SLEEVE
434	C	28	64	05H	1.50	32	PI	0.38	128	MAI	SLEEVE
435	C	29	64	03H	0.38	68	NONE	0.57	37	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	C	29	64	02H	0.57	139	NONE	0.97	117	MAI	
436	C	30	64	02H	1.25	41	PI	0.49	142	SAI	PLUG
437	C	31	64	02H	1.63	14	NONE	0.33	100	MAI	SLEEVE
438	C	33	64	04H	0.21	143	NONE	0.26	86	SAI	SLEEVE
439	C	36	64	02H	0.51	109	NONE	0.25	106	SAI	SLEEVE
440	C	4	65	02H	0.2[illegible]	41	NONE	0.54	168	SAI	SLEEVE
441	C	8	65	01H	[illegible]	35	NONE	0.25	120	SAI	PLUG
442	C	14	65	03H	0.39	45	NONE	0.72	131	SAI	SLEEVE
443	C	19	65	02H	0.06	2[illegible]	NONE	0.46	135	SAI	SLEEVE
444	C	22	65	02H	0.36	61	NONE	0.99	141	SAI	SLEEVE
445	C	30	65	02H	1.51	39	PI	0.37	146	SAI	SLEEVE
446	C	33	65	02H	0.36	73	NONE	0.42	152	MAI	SLEEVE
447	C	34	65	03H	0.67	124	NONE	0.67	136	SAI	SLEEVE
448	C	9	66	02H	0.67	27	NONE	0.43	116	SAI	PLUG
449	C	16	66	02H	1.08	38	PI	0.31	138	MAI	SLEEVE
450	C	19	66	02H	0.58	63	PI	0.72	12[illegible]	SAI	SLEEVE
451	C	24	66	05H	0.34	19	NONE	0.64	159	SAI	PLUG
	C	24	66	03H	0.6[illegible]	3	NONE	0.19	74	SAI	
	C	24	66	02H	0.46	71	NONE	0.38	114	MAI	
452	C	26	66	04H	[illegible]A	N/A	NONE	0.25	105	SAI	SLEEVE
453	C	29	66	02H	0.28	158	NONE	0.56	86	SAI	SLEEVE
454	C	35	66	02[illegible]	0.91	35	PI	0.31	84	MAI	SLEEVE
455	C	4	67	01H	0.84	66	PI	0.46	132	MAI	PLUG
456	C	11	67	03H	0.64	25	NONE	0.83	167	SAI	SLEEVE
457	C	14	67	02H	0.22	109	NONE	0.49	141	SAI	SLEEVE
458	C	17	67	02H	1.45	1	NONE	0.35	114	SAI	SLEEVE
459	C	20	67	01H	0.28	21	NONE	0.56	148	SAI	PLUG
460	C	22	67	02H	0.72	38	NONE	0.47	77	SAI	SLEEVE
461	C	28	67	02H	1.02	45	NONE	0.6[illegible]	96	MAI	SLEEVE
462	C	37	67	03H	1.01	38	NONE	0.82	103	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
463	C	41	67	02H	0.76	53	NONE	0.87	148	MAI	SLEEVE
464	C	2	68	01H	0.48	26	NONE	0.48	40	SAI	PLUG
465	C	5	68	05H	0.81	18	NONE	0.78	151	SAI	PLUG
	C	5	68	04H	0.66	19	NONE	0.65	138	SAI	
	C	5	68	02H	0.53	48	PI	0.80	152	MAI	
	C	5	68	01H	0.40	41	NONE	0.73	124	MAI	
466	C	7	68	02H	1.22	19	NONE	0.44	149	MAI	SLEEVE
467	C	10	68	03H	0.79	17	NONE	0.55	142	SAI	SLEEVE
468	C	11	68	05H	0.31	25	NONE	0.43	148	SAI	SLEEVE
469	C	12	60	02H	0.99	28	PI	0.40	135	SAI	PLUG
470	C	22	68	01H	1.22	30	PI	0.46	146	MAI	PLUG
471	C	27	68	02H	0.75	22	NONE	0.22	37	SAI	SLEEVE
472	C	29	68	02H	0.50	25	NONE	0.39	119	MAI	SLEEVE
473	C	31	68	01H	2.40	25	PI	0.58	148	MAI	PLUG
474	C	35	68	02H	1.52	37	PI	0.80	124	MAI	PLUG
	C	35	68	01H	2.30	20	NONE	1.08	153	MAI	
475	C	39	68	02H	0.52	12	NONE	0.51	136	MAI	SLEEVE
476	C	10	69	01H	1.13	18	PI	0.48	127	MAI	PLUG
477	C	15	69	02H	1.12	37	PI	0.51	109	MAI	PLUG
	C	15	69	01H	0.61	38	PI	1.09	14	MAI	
478	C	17	69	01H	0.58	25	NONE	0.29	124	SAI	PLUG
479	C	21	69	01H	0.61	21	NONE	0.25	151	SAI	PLUG
480	C	24	69	02H	1.01	38	NONE	0.77	100	SAI	PLUG
	C	24	69	01H	1.33	28	PI	0.35	135	MAI	
481	C	27	69	02H	0.44	136	NONE	0.92	157	SAI	SLEEVE
482	C	29	69	01H	0.44	72	PI	0.55	156	MAI	PLUG
483	C	31	69	01H	[illegible]	6	NONE	0.57	152	MAI	PLUG
484	C	36	69	01H	1.18	24	PI	0.58	146	SAI	PLUG
485	C	37	69	02H	2.15	64	PI	0.29	141	MAI	SLEEVE
486	C	40	69	01H	1.18	35	NONE	0.57	15	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
487	C	3	70	01H	1.09	24	NONE	0.55	131	SAI	PLUG
488	C	6	70	01H	0.60	26	PI	0.35	159	MAI	PLUG
489	C	8	70	03H	0.89	26	PI	0.51	142	SAI	PLUG
	C	8	70	02H	0.58	30	PI	0.62	142	SAI	
	C	8	70	01H	0.88	36	PI	0.74	139	MAI	
490	C	13	70	01H	0.18	48	NONE	0.77	142	SAI	PLUG
491	C	15	70	02H	0.64	31	NONE	0.50	118	SAI	SLEEVE
492	C	16	70	02H	0.91	23	NONE	1.43	154	MAI	SLEEVE
493	C	17	70	03H	0.75	12	NONE	0.59	144	SAI	PLUG
494	C	18	70	02H	0.62	32	PI	0.60	135	MAI	PLUG
495	C	20	70	02H	0.45	110	NONE	0.61	130	SAI	SLEEVE
496	C	21	70	03H	0.11	74	NONE	0.53	122	SAI	SLEEVE
497	C	22	70	01H	0.46	26	PI	0.36	5	MAI	PLUG
498	C	29	70	02H	0.67	28	PI	0.51	118	SAI	PLUG
	C	29	70	01H	0.84	16	NONE	0.94	153	SAI	
499	C	35	70	01H	1.43	27	PI	0.30	104	MAI	PLUG
500	C	38	70	01H	1.70	71	PI	0.83	155	MAI	PLUG
501	C	5	71	02H	0.42	90	NONE	1.46	140	SAI	PLUG
	C	5	71	01H	0.63	48	PI	0.35	32	MAI	
502	C	19	71	02H	0.96	171	NONE	2.42	83	SAI	PLUG
503	C	31	71	01H	0.49	59	PI	0.95	114	SAI	PLUG
504	C	10	72	02H	1.84	19	PI	0.17	40	MAI	SLEEVE
505	C	16	72	02H	0.96	39	PI	0.77	107	SAI	SLEEVE
506	C	27	72	02H	0.77	48	PI	0.28	114	MAI	SLEEVE
507	C	28	72	02H	0.54	71	NONE	0.82	110	SAI	SLEEVE
508	C	30	72	01H	0.61	49	NONE	0.78	83	SAI	PLUG
509	C	33	72	02H	2.19	41	PI	0.21	123	MAI	SLEEVE
510	C	3	73	02H	0.68	59	NONE	1.47	111	SAI	SLEEVE
511	C	16	73	02H	1.59	22	PI	0.24	41	MAI	SLEEVE
512	C	19	73	02H	0.21	138	NONE	0.93	139	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	C	19	73	01H	0.57	53	PI	0.32	134	MAI	
513	C	22	73	03H	0.49	65	NONE	1.60	115	MAI	SLEEVE
514	C	28	73	01H	0.70	37	PI	1.41	142	SAI	PLUG
515	C	5	74	02H	0.98	38	PI	0.44	152	MAI	PLUG
	C	5	74	01H	0.12	146	NONE	0.40	140	MAI	
516	C	21	74	02H	1.38	35	PI	0.77	62	SAI	SLEEVE
517	C	25	74	02H	0.73	33	PI	0.34	41	MAI	PLUG
	C	25	74	01H	0.58	45	PI	0.17	130	SAI	
518	C	33	75	03H	0.57	62	PI	0.52	139	SAI	SLEEVE
519	C	15	76	01H	0.74	32	NONE	0.37	88	SAI	PLUG
520	C	23	76	02H	0.64	30	NONE	0.51	64	SAI	SLEEVE
521	C	20	77	03H	0.64	44	PI	0.34	136	SAI	SLEEVE
522	C	22	77	03H	0.49	28	NONE	0.58	131	SAI	PLUG
	C	22	77	02H	0.55	164	NONE	0.54	62	MAI	
523	C	24	77	01H	0.22	28	NONE	0.52	60	SAI	PLUG
524	C	28	77	02H	0.43	67	NONE	0.59	69	SAI	SLEEVE
525	C	32	77	03H	1.71	19	PI	0.24	132	SAI	SLEEVE
526	C	29	78	02H	1.15	27	PI	0.31	143	MAI	SLEEVE
527	C	11	79	02H	0.47	342	NONE	0.64	45	SAI	SLEEVE
528	C	23	79	02H	0.74	23	NONE	0.49	79	SAI	SLEEVE
529	C	28	79	02H	0.65	32	PI	0.25	122	MAI	SLEEVE
530	C	2	80	03H	0.79	13	NONE	0.69	121	SAI	SLEEVE
531	C	19	80	03H	1.36	15	NONE	0.66	122	SAI	SLEEVE
532	C	20	80	02H	1.09	[illegible]	NONE	1.47	14	SAI	SLEEVE
533	C	26	80	01H	1.66	23	PI	0.27	124	SAI	PLUG
534	C	8	82	01H	0.44	79	NONE	0.78	41	SAI	PLUG
535	C	19	82	01H	0.73	33	PI	0.35	136	MAI	PLUG
536	C	27	83	01H	1.51	26	PI	0.29	147	MAI	PLUG
537	C	26	84	01H	0.35	47	PI	0.26	137	SAI	PLUG
538	C	28	84	01H	0.18	48	NONE	0.83	119	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
539	C	3	85	02H	1.32	23	NONE	0.75	112	SAI	SLEEVE
540	C	10	85	02H	0.89	11	NONE	0.86	108	SAI	SLEEVE
541	C	12	85	02H	0.47	343	NONE	0.62	101	SAI	SLEEVE
542	C	14	85	03H	0.43	35	NONE	0.35	114	SAI	PLUG
	C	14	85	02H	3.63	114	NONE	0.73	115	MAI	
543	C	15	85	02H	0.69	70	PI	1.42	35	SAI	SLEEVE
544	C	28	85	01H	0.96	46	PI	0.93	164	SAI	PLUG
545	C	10	86	02H	0.44	25	NONE	1.31	73	SAI	PLUG
	C	10	86	01H	0.38	149	NONE	0.88	59	SAI	
546	C	22	86	01H	0.42	77	NONE	0.80	117	SAI	PLUG
547	C	5	87	01H	0.28	61	PI	0.58	84	MAI	PLUG
548	C	7	87	01H	0.32	349	NONE	0.30	108	SAI	PLUG
549	C	20	87	03H	0.47	34	NONE	0.53	122	SAI	SLEEVE
550	C	23	87	01H	0.69	50	PI	0.40	104	SAI	PLUG
551	C	4	88	02H	0.23	355	NONE	0.39	133	SAI	PLUG
	C	4	88	01H	0.64	6	NONE	0.44	152	SAI	
552	C	8	88	01H	0.66	9	NONE	0.34	114	SAI	PLUG
553	C	11	88	02H	0.58	25	NONE	0.63	142	SAI	SLEEVE
554	C	13	88	02H	0.41	19	NONE	0.30	67	MAI	SLEEVE
555	C	14	88	02H	1.13	21	NONE	0.32	95	MAI	SLEEVE
556	C	20	88	01H	0.95	19	PI	0.26	110	MAI	PLUG
557	C	23	88	02H	1.23	38	PI	0.47	116	MAI	PLUG
558	C	3	89	05H	0.95	3	NONE	0.40	138	SAI	SLEEVE
559	C	6	89	03H	1.84	32	PI	0.26	124	MAI	SLEEVE
560	C	7	89	02H	0.55	50	NONE	0.45	62	SAI	SLEEVE
561	C	9	89	04H	N/A	N/A	NONE	0.18	75	SAI	SLEEVE
562	C	11	89	03H	0.41	29	NONE	0.35	85	SAI	PLUG
	C	11	89	02H	0.84	21	NONE	0.37	108	SAI	
563	C	13	89	04H	1.73	18	NONE	0.26	56	SAI	SLEEVE
564	C	14	89	02H	0.54	25	NONE	0.59	62	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	C	14	89	01H	0.55	153	NONE	0.39	49	MAI	
565	C	15	89	01H	0.83	18	NONE	0.35	80	MAI	PLUG
566	C	19	89	02H	0.30	51	NONE	0.25	104	SAI	PLUG
	C	19	89	01H	0.85	55	PI	0.49	100	SAI	
567	C	7	90	01H	1.14	21	PI	0.17	130	SAI	PLUG
568	C	14	90	03H	0.59	33	NONE	[illegible].30	123	SAI	SLEEVE
569	C	17	90	02H	0.72	29	PI	[illegible].41	[illegible]	SAI	PLUG
	C	17	90	01H	0.45	78	PI	[illegible].50	[illegible]34	[illegible]AI	
570	C	18	90	04H	0.65	55	PI	0.64	11[illegible]	SAI	PLUG
	C	18	90	02H	0.48	73	PI	0.[illegible]7	[illegible]5	SAI	
571	C	11	91	05H	N/A	N/A	NONE	0.30	122	MAI	SLEEVE
572	C	5	92	01H	1.65	15	PI	0.66	120	MAI	PLUG
573	C	6	93	01H	0.32	33	PI	0.46	[illegible]6	MAI	PLUG
574	C	10	93	03H	0.81	14	NONE	0.36	124	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
1	D	4	1	04H	1.85	24	NONE	0.87	140	SAI	PLUG
	D	4	1	02H	1.94	18	NONE	0.53	124	SAI	
2	D	7	1	01H	0.62	115	NONE	0.86	79	SAI	SLEEVE
3	D	8	2	04H	1.03	26	NONE	0.35	98	MAI	PLUG
	D	8	2	01H	2.73	24	PI	0.53	139	MAI	
4	D	9	2	04H	1.14	34	PI	0.60	115	SAI	SLEEVE
5	D	10	2	05H	2.28	20	PI	0.59	136	SAI	PLUG
	D	10	2	04H	1.57	14	PI	0.63	133	SAI	
	D	10	2	03H	1.54	28	PI	0.52	104	MAI	
	D	10	2	02H	1.37	14	PI	0.42	43	SAI	
6	D	12	2	03H	0.82	47	PI	0.28	116	MAI	PLUG
7	D	5	3	01H	0.20	85	NONE	0.71	156	SAI	PLUG
8	D	8	3	03H	0.60	28	NONE	0.63	129	MAI	PLUG
	D	8	3	02H	0.21	26	NONE	0.47	120	SAI	
	D	8	3	01H	0.29	84	NONE	1.13	95	SAI	
9	D	9	3	03H	0.96	22	NONE	0.27	77	MAI	PLUG
10	D	15	3	01H	0.80	18	PI	0.48	95	SAI	SLEEVE
11	D	3	4	02H	0.60	32	NONE	0.81	157	SAI	PLUG
12	D	5	4	04H	0.86	160	NONE	0.83	281	MAI	SLEEVE
13	D	8	4	02H	2.76	24	PI	0.41	53	MAI	SLEEVE
14	D	11	4	04H	1.45	30	PI	0.40	149	MAI	PLUG
	D	11	4	03H	0.28	37	NONE	0.56	120	MAI	
	D	11	4	01H	1.00	37	PI	1.34	119	SAI	
15	D	12	4	04H	1.88	20	PI	0.51	5	MAI	PLUG
	D	12	4	03H	1.35	24	PI	0.54	112	MAI	
	D	12	4	01H	0.60	172	NONE	0.55	155	MAI	
16	D	13	4	04H	2.50	18	PI	0.29	99	MAI	SLEEVE
17	D	14	4	01H	1.71	22	PI	0.61	28	MAI	PLUG
18	D	15	4	01H	2.86	25	PI	0.39	118	MAI	SLEEVE
19	D	16	4	01H	2.09	22	PI	0.25	64	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
20	D	5	5	01H	0.81	31	NONE	0.49	104	MAI	PLUG
21	D	6	5	04H	0.61	47	NONE	0.67	142	MAI	PLUG
	D	6	5	03H	1.02	29	NONE	0.65	148	MAI	
	D	6	5	02H	0.55	84	NONE	1.25	118	SAI	
	D	6	5	01H	1.18	43	PI	1.76	111	MAI	
22	D	16	5	01H	1.02	39	PI	0.88	118	MAI	SLEEVE
23	D	18	5	03H	N/A	N/A	NONE	0.41	137	MAI	SLEEVE
24	D	4	6	04H	0.46	12	NONE	0.38	94	SAI	SLEEVE
25	D	10	6	04H	0.20	21	NONE	0.24	65	SAI	PLUG
	D	10	6	01H	2.49	32	PI	0.55	142	MAI	
26	D	11	6	03H	0.27	19	NONE	0.28	143	MAI	PLUG
27	D	18	6	01H	1.22	32	PI	0.54	144	MAI	SLEEVE
28	D	21	6	01H	1.45	14	PI	0.68	148	MAI	SLEEVE
29	D	5	7	04H	0.93	17	NONE	0.44	82	SAI	PLUG
	D	5	7	01H	1.53	25	NONE	0.18	46	MAI	
30	D	6	7	01H	0.64	41	NONE	0.20	48	SAI	PLUG
31	D	7	7	01H	1.26	45	NONE	0.20	260	MAI	PLUG
32	D	9	7	01H	0.95	16	NONE	0.20	111	MAI	SLEEVE
33	D	11	7	01H	0.98	28	NONE	0.30	55	MAI	PLUG
34	D	12	7	01H	1.53	32	PI	0.59	147	MAI	SLEEVE
35	D	14	7	01H	0.29	126	NONE	0.20	113	SAI	SLEEVE
36	D	4	8	04H	0.61	5	NONE	0.33	63	SAI	SLEEVE
37	D	5	8	04H	0.59	12	NONE	0.35	115	SAI	PLUG
	D	5	8	03H	0.30	3	NONE	0.82	24	MAI	
38	D	6	8	04H	0.87	8	NONE	0.46	143	SAI	PLUG
	D	6	8	03H	0.58	184	NONE	0.36	113	SAI	
39	D	8	8	04H	1.00	42	NONE	0.45	139	MAI	SLEEVE
40	D	11	8	01H	0.39	30	NONE	[illegible]	80	MAI	PLUG
41	D	13	8	03H	0.10	71	NONE	0.52	79	SAI	SLEEVE
42	D	20	8	01H	0.85	26	PI	0.16	144	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
43	D	22	8	04H	0.21	7	NONE	0.35	104	SAI	PLUG
	D	22	8	02H	0.43	21	NONE	0.35	134	SAI	
	D	22	8	01H	1.21	23	PI	0.44	144	SAI	
44	D	6	9	01H	0.68	29	NONE	0.47	115	SAI	SLEEVE
45	D	7	9	05H	0.46	68	NONE	0.23	121	MAI	PLUG
	D	7	9	03H	0.33	182	NONE	0.30	41	SAI	
46	D	8	9	01H	1.48	23	NONE	0.46	66	MAI	SLEEVE
47	D	12	9	01H	0.57	32	NONE	0.32	137	MAI	PLUG
48	D	15	9	02H	1.25	34	PI	0.40	102	MAI	SLEEVE
49	D	16	9	02H	0.49	42	NONE	0.30	72	SAI	SLEEVE
50	D	17	9	01H	N/A	N/A	NONE	0.44	143	MAI	SLEEVE
51	D	22	9	01H	0.19	96	NONE	0.32	73	SAI	PLUG
52	D	3	10	04H	0.58	20	NONE	0.16	103	SAI	SLEEVE
53	D	4	10	01H	0.93	20	NONE	0.32	87	SAI	PLUG
54	D	5	10	01H	0.61	57	PI	0.27	135	SAI	PLUG
55	D	10	10	01H	0.88	11	NONE	0.47	147	SAI	SLEEVE
56	D	11	10	02H	0.61	17	NONE	0.18	108	MAI	PLUG
	D	11	10	01H	0.73	17	NONE	0.25	119	MAI	
57	D	13	10	01H	1.84	20	PI	0.75	157	MAI	SLEEVE
58	D	16	10	02H	0.06	75	NONE	0.46	143	SAI	SLEEVE
59	D	20	10	02H	0.38	87	NONE	0.45	148	SAI	SLEEVE
60	D	21	10	02H	1.04	55	PI	0.14	102	MAI	SLEEVE
61	D	6	11	03H	0.30	146	NONE	0.59	82	MAI	PLUG
	D	6	11	02H	1.05	56	NONE	0.68	116	SAI	
	D	6	11	01H	1.48	71	PI	0.79	81	MAI	
62	D	7	11	05H	0.57	73	NONE	0.39	109	MAI	PLUG
	D	7	11	04H	1.42	28	PI	0.87	154	MAI	
	D	7	11	01H	1.11	41	NONE	0.71	123	SAI	
63	D	8	11	01H	1.57	12	NONE	0.68	32	MAI	PLUG
64	D	13	11	04H	0.39	31	NONE	1.04	139	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	D	13	11	03H	0.72	69	NONE	0.39	96	SAI	
65	D	21	11	01H	0.45	36	PI	0.51	71	SAI	SLEEVE
66	D	8	12	01H	0.88	112	NONE	1.33	78	MAI	SLEEVE
67	D	19	12	01H	0.97	26	NONE	0.32	86	SAI	SLEEVE
68	D	4	13	01H	0.41	107	PI	0.37	49	SAI	SLEEVE
69	D	6	13	02H	0.68	71	NONE	0.40	127	MAI	PLUG
	D	6	13	01H	1.84	29	PI	0.25	55	MAI	
70	D	7	13	03H	0.63	15	NONE	0.25	128	SAI	SLEEVE
71	D	8	13	01H	0.78	80	NONE	0.54	66	MAI	SLEEVE
72	D	24	13	02H	0.56	41	NONE	0.49	103	SAI	PLUG
	D	24	13	01H	0.47	115	NONE	0.75	75	MAI	
73	D	27	13	02H	0.56	128	NONE	1.03	162	SAI	SLEEVE
74	D	28	13	03H	1.12	39	PI	0.30	103	MAI	SLEEVE
75	D	6	14	01H	1.43	32	NONE	0.62	169	MAI	SLEEVE
76	D	9	14	01H	1.12	22	NONE	0.32	101	MAI	PLUG
77	D	10	14	01H	0.70	11	NONE	0.30	120	MAI	PLUG
78	D	23	14	04H	1.05	15	NONE	0.30	50	SAI	PLUG
	D	23	14	03H	0.33	351	NONE	0.43	90	SAI	
79	D	24	14	02H	0.99	33	PI	0.48	59	SAI	SLEEVE
80	D	26	14	02H	1.40	26	PI	0.55	44	MAI	PLUG
	D	26	14	01H	1.16	29	PI	0.32	42	MAI	
81	D	27	14	01H	0.25	97	NONE	0.43	42	SAI	SLEEVE
82	D	4	15	02H	0.25	28	NONE	0.33	93	SAI	PLUG
	D	4	15	01H	0.66	23	NONE	0.58	80	MAI	
83	D	5	15	01H	1.21	29	NONE	0.65	70	SAI	SLEEVE
84	D	6	15	05H	0.76	40	NONE	0.34	105	SAI	PLUG
	D	6	15	01H	1.10	35	NONE	0.54	90	MAI	
85	D	8	15	04H	0.92	14	NONE	0.19	97	SAI	SLEEVE
86	D	10	15	02H	0.78	47	NONE	0.45	72	MAI	PLUG
	D	10	15	01H	1.38	29	NONE	0.33	86	MAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
87	D	13	15	02H	1.24	37	PI	0.22	93	SAI	PLUG
	D	13	15	01H	0.41	73	PI	0.52	65	MAI	
88	D	15	15	01H	1.14	140	NONE	0.29	70	MAI	SLEEVE
89	D	17	15	02H	0.83	40	PI	0.25	99	SAI	PLUG
	D	17	15	01H	0.76	42	PI	0.28	59	MAI	
90	D	22	15	01H	0.92	42	PI	0.56	114	SAI	PLUG
91	D	25	15	03H	0.52	116	NONE	1.32	140	SAI	SLEEVE
92	D	29	15	01H	1.20	24	PI	0.35	118	MAI	SLEEVE
93	D	3	16	02H	0.31	78	NONE	0.45	121	SAI	SLEEVE
94	D	4	16	03H	0.43	5	NONE	0.27	115	SAI	SLEEVE
95	D	11	16	01H	0.86	19	NONE	0.28	85	SAI	SLEEVE
96	D	12	16	04H	0.47	6	NONE	0.22	105	SAI	PLUG
	D	12	16	01H	1.94	15	NONE	0.24	107	SAI	
97	D	20	16	01H	1.04	16	NONE	0.33	85	SAI	SLEEVE
98	D	23	16	01H	0.38	74	NONE	0.29	116	SAI	SLEEVE
99	D	26	16	02H	0.35	148	NONE	0.29	127	SAI	SLEEVE
100	D	28	16	01H	2.19	19	NONE	0.64	111	MAI	SLEEVE
101	D	3	17	01H	0.71	23	NONE	0.81	117	MAI	PLUG
102	D	10	17	01H	1.13	33	PI	0.55	115	MAI	PLUG
103	D	11	17	01H	1.09	35	NONE	0.68	102	MAI	SLEEVE
104	D	13	17	03H	0.97	23	NONE	0.64	127	SAI	PLUG
	D	13	17	01H	0.61	88	PI	0.62	117	MAI	
105	D	14	17	01H	1.32	23	NONE	0.42	118	SAI	SLEEVE
106	D	15	17	02H	0.80	51	NONE	0.42	108	MAI	SLEEVE
107	D	17	17	01H	1.04	52	PI	0.59	123	MAI	PLUG
108	D	20	17	03H	0.60	117	NONE	0.78	149	SAI	SLEEVE
109	D	22	17	01H	0.82	34	NONE	0.58	49	MAI	SLEEVE
110	D	26	17	03H	0.52	129	NONE	0.58	86	SAI	PLUG
	D	26	17	02H	0.82	148	NONE	0.45	51	SAI	
	D	26	17	01H	1.64	20	NONE	0.45	64	SAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
111	D	27	17	05H	0.87	22	NONE	0.22	59	SAI	SLEEVE
112	D	30	17	04H	0.75	43	NONE	0.20	66	SAI	PLUG
	D	30	17	01H	1.18	38	NONE	0.52	132	MAI	
113	D	3	18	01H	0.93	31	NONE	0.62	132	MAI	SLEEVE
114	D	5	18	01H	0.47	100	NONE	0.40	114	SAI	PLUG
115	D	6	18	01H	0.44	12	NONE	0.46	144	SAI	SLEEVE
116	D	7	18	04H	0.79	54	NONE	0.42	120	SAI	PLUG
	D	7	18	01H	0.88	61	NONE	0.46	115	MAI	
117	D	22	18	01H	0.45	105	PI	0.61	96	MAI	SLEEVE
118	D	23	18	02H	0.85	18	NONE	0.20	81	SAI	SLEEVE
119	D	36	18	05H	1.81	27	PI	0.34	65	MAI	SLEEVE
120	D	4	19	01H	0.78	27	NONE	0.96	127	SAI	PLUG
121	D	7	19	04H	1.28	11	NONE	0.56	138	SAI	SLEEVE
122	D	10	19	01H	2.78	33	PI	1.17	108	MAI	SLEEVE
123	D	12	19	02H	0.75	36	NONE	0.56	137	SAI	PLUG
	D	12	19	01H	1.27	34	PI	0.52	73	MAI	
124	D	21	19	01H	0.25	4	NONE	1.90	92	SAI	PLUG
125	D	25	19	02H	0.22	118	NONE	0.64	89	SAI	SLEEVE
126	D	26	19	02H	0.78	78	PI	0.56	74	MAI	SLEEVE
127	D	31	19	02H	2.68	26	PI	0.41	101	MAI	SLEEVE
128	D	3	20	01H	0.93	17	NONE	0.56	44	MAI	SLEEVE
129	D	5	20	01H	1.52	38	NONE	0.93	29	MAI	SLEEVE
130	D	8	20	01H	2.82	25	PI	1.32	32	MAI	PLUG
131	D	9	20	01H	0.52	74	PI	0.74	81	MAI	SLEEVE
132	D	11	20	01H	0.80	83	NONE	1.44	96	MAI	PLUG
133	D	12	20	01H	1.67	25	PI	1.13	110	MAI	SLEEVE
134	D	30	20	03H	0.09	126	NONE	0.57	150	MAI	PLUG
	D	30	20	02H	0.88	41	PI	0.86	41	MAI	
135	D	7	21	02H	0.65	33	NONE	0.42	135	MAI	PLUG
	D	7	21	01H	1.81	29	PI	0.75	87	MAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
136	D	8	21	01H	1.35	39	NONE	0.85	91	MAI	SLEEVE
137	D	10	21	02H	1.66	23	PI	0.21	65	SAI	PLUG
	D	10	21	01H	1.20	18	PI	0.38	140	MAI	
138	D	11	21	01H	1.14	44	PI	0.41	116	MAI	SLEEVE
139	D	13	21	02H	1.15	41	NONE	0.21	124	SAI	PLUG
	D	13	21	01H	2.06	31	PI	0.20	84	MAI	
140	D	15	21	02H	0.45	51	NONE	0.34	104	SAI	PLUG
	D	15	21	01H	1.45	44	PI	0.27	143	MAI	
141	D	18	21	02H	0.21	19	NONE	0.24	71	MAI	SLEEVE
142	D	24	21	02H	0.75	81	NONE	0.31	73	MAI	PLUG
	D	24	21	01H	0.95	159	NONE	0.48	72	MAI	
143	D	28	21	04H	1.11	22	NONE	0.49	74	SAI	PLUG
	D	28	21	03H	0.74	347	NONE	0.29	75	SAI	
144	D	29	21	02H	1.81	27	PI	0.29	135	MAI	SLEEVE
145	D	31	21	02H	2.09	28	NONE	0.37	135	SAI	SLEEVE
146	D	33	21	03H	0.81	37	NONE	0.34	134	SAI	SLEEVE
147	D	34	21	03H	0.58	148	NONE	0.18	139	SAI	SLEEVE
148	D	3	22	01H	1.29	17	NONE	0.38	45	MAI	SLEEVE
149	D	6	22	03H	0.79	19	NONE	0.35	61	SAI	PLUG
	D	6	22	01H	1.02	43	PI	0.66	118	MAI	
150	D	8	22	04H	1.88	25	PI	0.30	76	MAI	PLUG
	D	8	22	01H	0.76	62	NONE	0.43	49	MAI	
151	D	14	22	01H	0.77	40	PI	0.07	139	MAI	PLUG
152	D	22	22	02H	0.74	23	NONE	0.54	124	SAI	SLEEVE
153	D	27	22	02H	0.45	55	PI	0.58	134	MAI	PLUG
	D	27	22	01H	0.37	71	PI	0.55	148	MAI	
154	D	4	23	03H	0.24	19	NONE	0.26	145	SAI	PLUG
	D	4	23	01H	0.43	8	NONE	0.20	131	MAI	
155	D	8	23	01H	1.63	124	NONE	0.27	59	SAI	SLEEVE
156	D	10	23	04H	0.66	32	PI	0.36	92	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	D	10	23	03H	0.60	28	NONE	0.43	136	SAI	
	D	10	23	02H	0.77	3	NONE	0.24	124	SAI	
	D	10	23	01H	0.61	20	PI	0.34	101	MAI	
157	D	14	23	03H	0.71	21	NONE	0.36	107	SAI	PLUG
	D	14	23	01H	0.34	354	NONE	0.38	86	SAI	
158	D	16	23	01H	0.55	52	PI	0.55	124	MAI	SLEEVE
159	D	20	23	01H	0.72	144	PI	0.74	28	MAI	SLEEVE
160	D	21	23	01H	2.63	8	NONE	0.28	128	MAI	PLUG
161	D	22	23	01H	0.87	74	NONE	0.60	128	MAI	SLEEVE
162	D	30	23	01H	0.78	26	NONE	0.54	115	SAI	SLEEVE
163	D	31	23	02H	0.50	66	PI	0.44	48	SAI	PLUG
	D	31	23	01H	0.84	130	NONE	0.39	85	SAI	
164	D	34	23	01H	1.65	30	NONE	0.69	84-	MAI	PLUG
165	D	36	23	01H	1.00	8	NONE	0.45	133	SAI	PLUG
166	D	3	24	04H	0.19	212	NONE	0.53	89	MAI	PLUG
	D	3	24	03H	0.64	52	NONE	0.61	113	MAI	
	D	3	24	01H	1.96	21	NONE	0.77	29	MAI	
167	D	5	24	01H	1.18	6	NONE	0.64	128	SAI	SLEEVE
168	D	6	24	04H	1.12	345	NONE	0.70	152	SAI	PLUG
	D	6	24	02H	0.41	94	NONE	0.48	9	MAI	
169	D	16	24	02H	1.00	35	NONE	0.44	108	MAI	PLUG
	D	16	24	01H	1.12	26	PI	0.51	90	MAI	
170	D	21	24	02H	1.36	24	PI	0.36	114	SAI	PLUG
	D	21	24	01H	0.54	73	PI	0.40	79	MAI	
171	D	24	24	01H	1.40	17	PI	0.64	178	MAI	PLUG
172	D	27	24	02H	0.74	40	NONE	0.38	93	MAI	SLEEVE
173	D	28	24	02H	1.06	15	NONE	0.45	40	SAI	SLEEVE
174	D	30	24	01H	2.40	13	NONE	0.49	62	MAI	PLUG
175	D	32	24	02H	1.25	7	NONE	0.43	95	MAI	SLEEVE
176	D	4	25	01H	0.74	15	NONE	0.30	131	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
177	D	5	25	01H	1.45	25	PI	0.28	118	MAI	SLEEVE
178	D	7	25	01H	0.80	26	PI	0.47	143	MAI	SLEEVE
179	D	10	25	01H	0.25	21	NONE	0.28	55	SAI	PLUG
180	D	11	25	02H	0.35	10	NONE	0.50	143	SAI	SLEEVE
181	D	14	25	02H	0.35	0	NONE	0.56	148	SAI	PLUG
	D	14	25	01H	0.57	86	PI	0.87	133	MAI	
182	D	15	25	04H	0.52	35	NONE	0.65	101	SAI	PLUG
	D	15	25	02H	0.65	45	PI	0.60	71	MAI	
183	D	16	25	02H	0.26	14	NONE	1.28	121	SAI	PLUG
	D	16	25	01H	0.27	93	PI	1.03	145	MAI	
184	D	17	25	04H	0.18	15	NONE	0.38	108	SAI	SLEEVE
185	D	19	25	03H	0.09	90	NONE	0.33	97	SAI	PLUG
	D	19	25	01H	0.13	82	NONE	0.28	105	MAI	
186	D	20	25	05H	0.16	73	NONE	0.62	144	SAI	PLUG
	D	20	25	02H	0.58	141	NONE	0.90	98	MAI	
	D	20	25	01H	1.01	46	NONE	0.61	118	MAI	
187	D	23	25	02H	1.78	72	PI	0.98	138	MAI	PLUG
188	D	24	25	05H	1.45	1	NONE	0.57	97	SAI	PLUG
	D	24	25	02H	4.21	16	NONE	1.09	67	MAI	
189	D	25	25	02H	0.28	51	NONE	0.46	110	MAI	PLUG
	D	25	25	01H	0.51	23	NONE	0.39	126	MAI	
190	D	27	25	02H	1.23	25	NONE	0.37	131	MAI	SLEEVE
191	D	37	25	02H	0.75	26	PI	0.35	144	MAI	SLEEVE
192	D	4	26	02H	0.35	13	NONE	0.26	137	SAI	PLUG
	D	4	26	01H	0.67	21	NONE	0.51	134	MAI	
193	D	7	26	01H	2.77	23	PI	0.40	111	MAI	SLEEVE
194	D	9	26	01H	0.84	23	PI	0.80	49	MAI	SLEEVE
195	D	10	26	01H	0.38	33	NONE	0.56	15	SAI	SLEEVE
196	D	12	26	01H	1.07	51	PI	0.32	114	MAI	SLEEVE
197	D	14	26	03H	1.11	24	NONE	0.40	99	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	D	14	26	02H	0.58	34	PI	0.61	107	MAI	
198	D	18	26	03H	0.33	157	PI	0.16	76	SAI	SLEEVE
199	D	19	26	04H	0.81	5	NONE	0.36	58	SAI	PLUG
	D	19	26	02H	0.59	66	NONE	0.90	156	SAI	
	D	19	26	01H	1.29	17	NONE	0.33	127	SAI	
200	D	20	26	01H	1.69	24	NONE	0.20	67	SAI	SLEEVE
201	D	21	26	02H	1.59	49	NONE	0.37	155	MAI	SLEEVE
202	D	25	26	05H	0.19	55	NONE	0.37	71	MAI	PLUG
	D	25	26	02H	0.39	121	NONE	0.73	60	MAI	
	D	25	26	01H	0.97	19	PI	0.32	127	MAI	
203	D	26	26	02H	0.33	95	NONE	0.44	111	MAI	SLEEVE
204	D	27	26	02H	0.73	94	NONE	1.23	66	MAI	SLEEVE
205	D	28	26	01H	0.72	23	NONE	0.52	124	SAI	SLEEVE
206	D	29	26	02H	0.50	69	NONE	0.52	109	SAI	SLEEVE
207	D	35	26	04H	0.33	48	NONE	0.27	121	SAI	SLEEVE
208	D	38	26	01H	1.23	32	NONE	0.52	86	MAI	SLEEVE
209	D	2	27	02H	0.91	45	NONE	0.75	13	SAI	PLUG
	D	2	27	01H	1.31	25	PI	0.52	86	MAI	
210	D	5	27	01H	0.71	54	PI	0.43	66	MAI	SLEEVE
211	D	8	27	01H	1.48	20	PI	0.99	171	MAI	SLEEVE
212	D	14	27	03H	0.30	67	NONE	0.28	136	SAI	PLUG
	D	14	27	02H	0.94	159	NONE	0.59	163	MAI	
213	D	15	27	02H	0.11	90	NONE	0.43	87	SAI	PLUG
	D	15	27	01H	0.53	48	PI	0.39	107	SAI	
214	D	18	27	02H	0.49	26	NONE	0.26	146	MAI	PLUG
	D	18	27	01H	1.11	57	NONE	0.64	122	SAI	
215	D	19	27	04H	1.14	26	NONE	0.24	132	SAI	PLUG
	D	19	27	01H	0.80	46	PI	0.31	79	SAI	
216	D	22	27	02H	0.77	28	NONE	0.32	122	SAI	PLUG
	D	22	27	01H	0.23	132	NONE	0.17	109	SAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
217	D	25	27	04H	0.80	24	NONE	0.45	156	SAI	PLUG
218	D	26	27	02H	0.81	12	NONE	0.28	83	SAI	SLEEVE
219	D	27	27	03H	1.01	37	NONE	0.21	133	SAI	SLEEVE
220	D	34	27	02H	0.82	63	PI	0.65	72	MAI	PLUG
	D	34	27	01H	0.41	57	NONE	0.74	110	MAI	
221	D	39	27	02H	1.25	22	NONE	0.17	69	SAI	SLEEVE
222	D	40	27	01H	0.04	153	NONE	0.22	110	SAI	PLUG
223	D	2	28	01H	2.18	27	PI	0.37	116	MAI	SLEEVE
224	D	4	28	01H	0.79	23	NONE	0.37	136	MAI	SLEEVE
225	D	6	28	01H	1.56	17	PI	0.22	115	MAI	PLUG
226	D	8	28	01H	1.21	45	PI	0.25	142	MAI	SLEEVE
227	D	11	28	01H	2.39	23	NONE	0.23	75	SAI	SLEEVE
228	D	12	28	01H	0.47	24	NONE	0.21	30	MAI	SLEEVE
229	D	14	28	04H	1.04	140	NONE	0.40	20	MAI	PLUG
	D	14	28	02H	0.96	36	NONE	0.20	113	MAI	
	D	14	28	01H	1.78	31	NONE	0.24	149	SAI	
230	D	15	28	02H	0.56	51	NONE	0.15	67	MAI	SLEEVE
231	D	24	28	01H	0.55	32	NONE	0.21	127	MAI	PLUG
232	D	33	28	01H	1.20	48	NONE	1.00	157	MAI	SLEEVE
233	D	38	28	01H	1.74	9	NONE	0.35	110	SAI	SLEEVE
234	D	11	29	01H	1.35	26	PI	0.47	55	MAI	SLEEVE
235	D	15	29	01H	0.44	19	NONE	0.27	148	SAI	SLEEVE
236	D	18	29	02H	0.42	348	NONE	0.27	110	SAI	SLEEVE
237	D	20	29	02H	1.94	93	PI	0.35	120	MAI	PLUG
	D	20	29	01H	1.08	45	PI	0.41	149	SAI	
238	D	22	29	03H	0.51	3	NONE	0.23	20	SAI	PLUG
	D	22	29	01H	1.56	19	NONE	0.29	104	MAI	
239	D	23	29	02H	0.84	24	NONE	0.48	139	MAI	PLUG
	D	23	29	01H	0.90	40	PI	0.29	104	MAI	
240	D	24	29	04H	0.80	147	NONE	0.82	122	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	D	24	29	02H	0.84	40	NONE	0.37	37	MAI	
	D	24	29	01H	1.23	9	NONE	0.50	63	SAI	
241	D	26	29	02H	1.19	8	NONE	0.33	108	SAI	SLEEVE
242	D	30	29	02H	1.16	43	PI	0.32	92	MAI	SLEEVE
243	D	32	29	01H	1.18	12	NONE	0.98	157	SAI	SLEEVE
244	D	36	29	06H	0.76	125	NONE	0.50	107	MAI	PLUG
245	D	10	30	01H	0.37	69	NONE	0.68	180	MAI	SLEEVE
246	D	13	30	02H	0.32	81	NONE	0.52	121	SAI	SLEEVE
247	D	14	30	03H	0.73	19	NONE	0.39	119	SAI	SLEEVE
248	D	20	30	01H	1.65	40	PI	0.45	99	MAI	SLEEVE
249	D	22	30	01H	0.61	27	PI	0.30	137	SAI	PLUG
250	D	23	30	02H	0.94	21	PI	0.26	145	SAI	SLEEVE
251	D	31	30	01H	1.15	24	NONE	0.13	[illegible]	SAI	PLUG
252	D	34	30	04H	0.45	163	NONE	0.23	155	SAI	PLUG
	D	34	30	02H	1.31	50	PI	0.26	141	MAI	
	D	34	30	01H	0.88	22	NONE	0.76	140	SAI	
253	D	39	30	01H	0.68	52	NONE	0.74	165	MAI	PLUG
254	D	41	30	01H	1.27	151	NONE	0.48	148	MAI	PLUG
255	D	3	31	01H	0.53	4	NONE	0.60	136	SAI	PLUG
256	D	8	31	01H	[illegible]	101	NONE	0.51	[illegible]	MAI	SLEEVE
257	D	10	31	05H	0.90	75	NONE	0.47	121	SAI	SLEEVE
258	D	11	31	04H	0.93	106	NONE	0.31	81	MAI	PLUG
	D	11	31	01H	0.99	39	NONE	0.34	98	SAI	
259	D	14	31	04H	0.34	3	NONE	0.96	97	SAI	PLUG
	D	14	31	01H	0.88	65	NONE	0.38	124	SAI	
260	D	15	31	03H	0.41	39	NONE	0.37	139	SAI	PLUG
	D	15	31	02H	0.42	12	NONE	0.23	116	MAI	
	D	15	31	01H	0.47	106	NONE	0.37	107	MAI	
261	D	16	31	02H	0.38	64	PI	0.33	123	MAI	SLEEVE
262	D	21	31	04H	0.26	140	NONE	0.52	75	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
263	D	25	31	03H	0.81	23	NONE	0.69	114	MAI	PLUG
	D	25	31	02H	0.73	66	NONE	0.41	106	MAI	
264	D	26	31	01H	1.81	11	NONE	0.40	138	MAI	SLEEVE
265	D	28	31	02H	0.27	123	NONE	0.17	69	MAI	SLEEVE
266	D	36	31	02H	0.99	20	PI	0.20	109	MAI	SLEEVE
267	D	38	31	02H	2.69	162	NONE	0.20	118	MAI	SLEEVE
268	D	4	32	02H	0.48	2	NONE	0.18	123	SAI	SLEEVE
269	D	7	32	01H	1.60	94	PI	0.39	133	MAI	SLEEVE
270	D	11	32	02H	0.93	141	NONE	2.15	163	SAI	PLUG
	D	11	32	01H	0.33	137	NONE	0.16	106	MAI	
271	D	13	32	01H	1.24	62	NONE	0.27	99	MAI	SLEEVE
272	D	14	32	01H	0.62	21	NONE	0.28	154	SAI	SLEEVE
273	D	15	32	01H	1.13	17	NONE	1.15	64	SAI	SLEEVE
274	D	23	32	02H	0.48	20	NONE	0.32	61	SAI	SLEEVE
275	D	24	32	04H	0.61	148	NONE	0.27	135	SAI	PLUG
	D	24	32	02H	0.77	104	NONE	0.24	103	SAI	
276	D	26	32	04H	0.39	148	NONE	0.26	139	SAI	PLUG
	D	26	32	02H	1.08	36	PI	0.55	103	MAI	
277	D	27	32	04H	0.95	162	NONE	0.26	87	SAI	PLUG
	D	27	32	02H	0.68	80	NONE	0.39	146	MAI	
278	D	31	32	02H	0.68	37	NONE	0.30	86	SAI	PLUG
	D	31	32	01H	0.48	182	NONE	0.40	145	SAI	
279	D	33	32	02H	1.48	14	NONE	0.20	88	SAI	SLEEVE
280	D	4	33	02H	1.10	26	NONE	0.23	133	MAI	SLEEVE
281	D	9	33	01H	2.52	19	PI	0.23	106	MAI	SLEEVE
282	D	11	33	02H	0.85	18	NONE	0.22	77	SAI	PLUG
	D	11	33	01H	0.74	7	NONE	0.17	100	SAI	
283	D	14	33	02H	0.74	52	NONE	0.30	113	MAI	PLUG
	D	14	33	01H	0.36	101	NONE	0.22	110	SAI	
284	D	15	33	03H	1.08	20	NONE	0.28	59	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	D	15	33	02H	0.37	75	NONE	0.11	98	MAI	
	D	15	33	01H	1.62	20	PI	0.68	108	MAI	
285	D	20	33	01H	3.07	14	NONE	0.28	80	MAI	SLEEVE
286	D	21	33	03H	0.51	2	NONE	0.16	65	SAI	PLUG
	D	21	33	02H	1.14	50	PI	0.46	124	MAI	
	D	21	33	01H	0.97	47	PI	0.42	46	MAI	
287	D	24	33	05H	0.46	148	NONE	0.19	42	MAI	PLUG
	D	24	33	02H	0.77	30	NONE	0.74	135	MAI	
288	D	25	33	02H	1.40	20	NONE	0.18	137	MAI	PLUG
289	D	31	33	04H	0.68	7	NONE	0.13	88	MAI	PLUG
	D	31	33	03H	0.99	29	NONE	0.35	130	MAI	
	D	31	33	02H	0.89	39	NONE	0.15	70	MAI	
	D	31	33	01H	0.59	99	NONE	0.29	120	MAI	
290	D	33	33	04H	1.16	14	NONE	0.13	76	SAI	PLUG
	D	33	33	02H	0.92	25	NONE	0.16	50	MAI	
	D	33	33	01H	0.89	50	NONE	0.41	161	SAI	
291	D	34	33	02H	2.48	19	PI	0.16	136	MAI	SLEEVE
292	D	40	33	05H	2.04	26	PI	0.19	140	SAI	PLUG
	D	40	33	02H	0.65	27	PI	0.73	135	MAI	
293	D	7	34	01H	0.44	0	NONE	0.60	60	SAI	SLEEVE
294	D	19	34	01H	1.07	24	NONE	0.58	118	SAI	PLUG
295	D	25	34	04H	0.96	15	NONE	0.58	112	SAI	PLUG
	D	25	34	01H	0.89	108	NONE	0.79	128	MAI	
296	D	29	34	02H	1.12	38	PI	0.20	96	MAI	PLUG
	D	29	34	01H	0.63	17	PI	0.91	129	MAI	
297	D	39	34	02H	1.23	55	PI	0.27	145	MAI	SLEEVE
298	D	3	35	03H	0.72	8	NONE	0.60	71	SAI	PLUG
	D	3	35	02H	0.63	22	NONE	1.07	158	SAI	
299	D	4	35	01H	0.58	26	PI	0.46	107	MAI	SLEEVE
300	D	8	35	02H	0.46	358	NONE	0.21	124	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
301	D	20	35	02H	9.94	27	PI	0.23	112	MAI	PLUG
	D	20	35	01H	0.55	16	PI	0.51	25	SAI	
302	D	21	35	01H	3.78	16	NONE	0.77	147	MAI	SLEEVE
303	D	24	35	05H	3.06	3	NONE	1.15	148	SAI	SLEEVE
304	D	26	35	02H	0.68	345	NONE	0.63	71	SAI	SLEEVE
305	D	29	35	01H	1.03	150	NONE	0.64	74	SAI	SLEEVE
306	D	34	35	02H	1.08	23	NONE	0.47	88	SAI	SLEEVE
307	D	36	35	02H	1.13	18	NONE	0.74	137	SAI	SLEEVE
308	D	37	35	04H	1.23	6	NONE	0.26	137	SAI	PLUG
	D	37	35	02H	0.91	28	PI	0.31	100	SAI	
309	D	7	36	04H	1.08	46	PI	0.31	56	MAI	PLUG
	D	7	36	01H	0.63	102	PI	0.73	78	MAI	
310	D	10	36	03H	0.87	11	NONE	0.57	107	MAI	PLUG
	D	10	36	01H	0.86	13	NONE	1.20	100	MAI	
311	D	17	36	01H	0.40	51	PI	0.59	125	SAI	PLUG
312	D	24	36	01H	0.61	75	NONE	0.46	111	MAI	SLEEVE
313	D	8	37	01H	1.09	30	PI	0.53	43	MAI	SLEEVE
314	D	10	37	01H	2.19	18	NONE	0.78	94	SAI	SLEEVE
315	D	16	37	03H	1.13	355	NONE	0.58	95	SAI	PLUG
	D	16	37	01H	0.34	18	NONE	0.55	49	SAI	
316	D	24	37	02H	0.62	136	NONE	0.41	109	SAI	SLEEVE
317	D	25	37	02H	1.31	32	PI	0.49	97	MAI	SLEEVE
318	D	28	37	06H	0.16	101	NONE	0.51	95	SAI	PLUG
319	D	33	37	01H	1.35	22	NONE	0.52	54	MAI	PLUG
320	D	41	37	02H	1.10	17	NONE	0.23	91	SAI	SLEEVE
321	D	42	37	02H	1.97	27	PI	0.20	88	MAI	SLEEVE
322	D	8	38	01H	1.69	33	PI	0.54	114	MAI	SLEEVE
323	D	20	38	01H	10.67	181	PI	0.29	40	SAI	SLEEVE
324	D	21	38	01H	0.87	31	PI	0.56	69	MAI	PLUG
325	D	22	38	01H	0.87	24	PI	0.41	133	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
326	D	23	38	01H	0.29	10	NONE	0.82	107	SAI	SLEEVE
327	D	27	38	04H	0.27	7	NONE	0.36	50	SAI	PLUG
	D	27	38	01H	1.26	16	NONE	0.74	153	SAI	
328	D	32	38	04H	0.53	20	NONE	0.46	136	SAI	SLEEVE
329	D	2	39	01H	0.32	90	NONE	1.18	9	SAI	SLEEVE
330	D	7	39	03H	0.29	324	NONE	0.41	57	SAI	SLEEVE
331	D	11	39	04H	1.38	20	NONE	0.42	100	SAI	SLEEVE
332	D	12	39	01H	0.38	54	NONE	0.39	142	SAI	PLUG
333	D	15	39	02H	1.89	21	NONE	0.70	152	MAI	PLUG
	D	15	39	01H	0.53	93	NONE	0.46	122	MAI	
334	D	17	39	01H	0.74	36	NONE	0.43	142	SAI	SLEEVE
335	D	18	39	02H	1.23	152	NONE	0.64	96	SAI	PLUG
	D	18	39	01H	2.65	22	PI	0.91	83	MAI	
336	D	22	39	04H	0.31	170	NONE	0.58	111	SAI	PLUG
	D	22	39	01H	2.42	36	NONE	0.55	111	MAI	
337	D	14	40	04H	0.44	110	NONE	0.35	122	SAI	PLUG
338	D	16	40	02H	0.62	11	NONE	0.87	125	SAI	PLUG
	D	16	40	01H	0.82	70	PI	0.62	82	SAI	
339	D	18	40	01H	0.95	43	PI	0.56	73	MAI	SLEEVE
340	D	19	40	01H	1.25	47	PI	0.38	102	MAI	SLEEVE
341	D	20	40	01H	1.25	10	PI	0.21	107	MAI	SLEEVE
342	D	22	40	02H	1.89	8	NONE	0.31	99	SAI	PLUG
	D	22	40	01H	1.17	2	NONE	0.38	102	MAI	
343	D	24	40	02H	2.10	15	NONE	0.36	102	SAI	SLEEVE
344	D	26	40	05H	0.82	39	NONE	0.21	127	SAI	PLUG
	D	26	40	01H	1.89	15	NONE	0.46	143	MAI	
345	D	33	40	05H	0.79	161	NONE	0.42	147	SAI	PLUG
	D	33	40	02H	0.47	141	NONE	0.43	55	SAI	
346	D	42	40	03H	1.85	15	PI	0.41	24	MAI	SLEEVE
347	D	7	41	01H	* 21	118	PI	1.06	100	MAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
348	D	16	41	01H	1.44	36	PI	0.26	119	MAI	SLEEVE
349	D	31	41	02H	1.42	25	PI	0.21	95	MAI	SLEEVE
350	D	4	42	03H	0.45	20	NONE	0.52	63	SAI	PLUG
	D	4	42	01H	0.44	24	NONE	0.83	94	SAI	
351	D	5	42	05H	0.44	125	NONE	0.43	125	SAI	SLEEVE
352	D	7	42	04H	0.18	16	NONE	0.36	130	SAI	PLUG
353	D	10	42	03H	0.53	146	NONE	0.37	96	SAI	SLEEVE
354	D	18	42	03H	0.16	60	NONE	0.46	139	SAI	SLEEVE
355	D	21	42	01H	0.61	38	NONE	0.67	100	MAI	PLUG
356	D	23	42	01H	1.80	20	PI	0.45	124	MAI	PLUG
357	D	30	42	04H	1.89	15	NONE	0.55	72	MAI	SLEEVE
358	D	35	42	02H	3.24	1	NONE	0.58	141	SAI	SLEEVE
359	D	38	42	02H	1.17	35	PI	0.49	91	SAI	SLEEVE
360	D	43	42	02H	0.85	11	NONE	0.71	63	SAI	SLEEVE
361	D	5	43	01H	0.46	357	NONE	0.49	125	SAI	PLUG
362	D	6	43	01H	0.44	2	NONE	1.11	78	SAI	PLUG
363	D	9	43	01H	0.99	169	NONE	0.35	112	MAI	PLUG
364	D	12	43	02H	1.21	27	NONE	0.53	120	MAI	PLUG
	D	12	43	01H	1.08	23	NONE	0.14	72	MAI	
365	D	19	43	01H	1.45	24	PI	0.28	91	SAI	SLEEVE
366	D	21	43	01H	0.63	14	NONE	0.29	41	MAI	SLEEVE
367	D	22	43	01H	2.04	21	NONE	0.29	96	M[illegible]	PLUG
368	D	23	43	05H	0.72	15	NONE	0.36	62	SAI	PLUG
	D	23	43	04H	0.77	52	NONE	0.64	99	SAI	
	D	23	43	01H	1.48	45	NONE	0.55	139	MAI	
369	D	35	43	03H	0.36	118	NONE	0.33	102	MAI	PLUG
	D	35	43	02H	0.28	19	NONE	0.42	85	SAI	
370	D	7	44	02H	1.04	51	NONE	2.28	160	SAI	PLUG
	D	7	44	01H	1.42	126	NONE	1.44	66	SAI	
371	D	9	44	02H	0.73	37	NONE	0.48	108	SAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
372	D	10	44	02H	0.65	30	NONE	0.98	35	SAI	PLUG
	D	10	44	01H	0.27	120	NONE	1.20	132	MAI	
373	D	12	44	01H	1.86	25	PI	0.38	132	MAI	PLUG
374	D	20	44	02H	0.39	66	NONE	0.47	131	SAI	PLUG
	D	20	44	01H	1.52	52	PI	0.75	116	MAI	
375	D	25	44	03H	1.27	3	NONE	0.34	104	SAI	PLUG
	D	25	44	02H	1.29	356	NONE	0.60	129	SAI	
376	D	26	44	04H	0.44	106	NONE	0.44	90	MAI	SLEEVE
377	D	34	44	03H	0.88	4	NONE	0.34	83	SAI	PLUG
	D	34	44	02H	0.73	18	NONE	0.26	53	SAI	
378	D	2	45	01H	0.47	32	NONE	2.04	178	SAI	PLUG
379	D	7	45	04H	0.50	38	PI	0.82	22	MAI	PLUG
	D	7	45	01H	0.81	34	PI	0.44	94	MAI	
380	D	10	45	02H	0.72	25	NONE	2.62	168	SAI	PLUG
381	D	17	45	01H	0.63	1	NONE	0.55	66	SAI	SLEEVE
382	D	19	45	05H	1.35	71	PI	0.65	92	MAI	PLUG
	D	19	45	03H	0.55	120	NONE	1.01	22	MAI	
	D	19	45	02H	0.47	123	PI	0.78	111	MAI	
	D	19	45	01H	0.76	63	NONE	1.31	159	MAI	
383	D	20	45	03H	0.55	346	NONE	0.71	131	SAI	PLUG
	D	20	45	02H	0.30	80	NONE	0.68	47	SAI	
384	D	21	45	04H	2.30	43	PI	0.92	42	MAI	PLUG
	D	21	45	01H	1.01	34	PI	0.34	23	SAI	
385	D	40	45	02H	0.62	143	PI	1.00	83	SAI	SLEEVE
386	D	3	46	02H	0.29	164	NONE	0.51	151	SAI	PLUG
	D	3	46	01H	0.57	32	NONE	1.48	155	SAI	
387	D	4	46	01H	0.34	17	NONE	0.75	26	SAI	PLUG
388	D	5	46	01H	0.78	36	PI	0.59	146	MAI	PLUG
389	D	8	46	01H	1.36	29	PI	0.65	116	MAI	PLUG
390	D	10	46	01H	1.08	27	PI	0.57	80	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
391	D	15	46	02H	0.14	159	NONE	0.97	71	SAI	SLEEVE
392	D	22	46	04H	0.54	25	NONE	0.57	78	SAI	SLEEVE
393	D	29	46	02H	0.52	43	PI	0.26	106	SAI	PLUG
394	D	7	47	01H	1.25	41	PI	0.25	94	SAI	PLUG
395	D	15	47	01H	1.40	18	NONE	0.25	116	MAI	SLEEVE
396	D	5	48	02H	0.23	63	NONE	1.12	43	SAI	PLUG
	D	5	48	01H	0.58	46	NONE	0.96	91	SAI	
397	D	6	48	04H	0.25	4	NONE	0.48	129	SAI	PLUG
	D	6	48	02H	0.52	163	NONE	0.29	97	SAI	
398	D	21	48	01H	0.34	27	PI	0.57	129	SAI	SLEEVE
399	D	22	48	01H	0.29	45	NONE	0.53	140	SAI	SLEEVE
400	D	34	48	03H	0.51	28	NONE	0.47	103	SAI	PLUG
	D	34	48	02H	0.67	22	NONE	0.31	91	MAI	
401	D	4	49	01H	1.20	26	NONE	0.48	124	MAI	PLUG
402	D	5	43	01H	2.72	31	PI	0.88	108	MAI	PLUG
403	D	11	49	02H	0.29	60	NONE	0.92	150	SAI	PLUG
404	D	12	49	02H	0.46	40	NONE	0.56	159	MAI	PLUG
	D	12	49	01H	0.50	35	PI	0.53	172	SAI	
405	D	16	49	01H	1.14	36	PI	0.69	100	SAI	SLEEVE
406	D	17	49	02H	0.24	82	NONE	0.42	27	SAI	PLUG
407	D	22	49	02H	0.98	28	NONE	0.93	3	SAI	SLEEVE
408	D	24	49	04H	0.20	71	NONE	0.34	107	SAI	SLEEVE
409	D	30	49	02H	0.49	69	NONE	0.92	113	SAI	SLEEVE
410	D	5	50	01H	0.96	169	NONE	0.24	88	MAI	PLUG
411	D	7	50	01H	0.63	49	PI	0.40	130	SAI	PLUG
412	D	9	50	01H	2.01	20	PI	0.20	51	SAI	PLUG
413	D	10	50	01H	0.74	37	PI	0.26	93	MAI	PLUG
414	D	12	50	01H	1.30	41	PI	0.54	137	MAI	PLUG
415	D	14	50	01H	0.62	31	NONE	0.64	139	SAI	SLEEVE
416	D	32	50	02H	0.86	53	NONE	0.29	78	SAI	SLEEVE

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
417	D	40	50	02H	2.26	20	PI	0.44	108	MAI	SLEEVE
418	D	5	51	02H	1.62	22	NONE	0.28	80	SAI	PLUG
419	D	12	51	01H	0.16	18	NONE	0.30	30	SAI	PLUG
420	D	14	51	02H	0.47	20	NONE	0.22	57	MAI	PLUG
	D	14	51	01H	0.87	29	PI	0.79	43	MAI	
421	D	15	51	01H	0.16	84	NONE	0.44	122	MAI	SLEEVE
422	D	19	51	02H	0.57	33	PI	0.32	86	SAI	PLUG
	D	19	51	01H	0.32	40	NONE	0.28	123	SAI	
423	D	20	51	02H	0.13	29	NONE	0.24	143	SAI	SLEEVE
424	D	22	51	02H	0.19	344	NONE	0.31	103	SAI	SLEEVE
425	D	24	51	04H	0.05	108	NONE	0.40	143	SAI	SLEEVE
426	D	3	52	01H	0.87	15	PI	0.53	154	SAI	PLUG
427	D	4	52	02H	1.00	27	NONE	0.75	104	SAI	PLUG
428	D	5	52	01H	1.62	33	NONE	0.47	113	SAI	PLUG
429	D	13	52	01H	0.16	36	NONE	0.87	162	SAI	SLEEVE
430	D	16	52	02H	0.32	23	NONE	1.30	98	SAI	PLUG
	D	16	52	01H	0.41	118	NONE	0.33	85	SAI	
431	D	30	52	02H	0.68	43	PI	0.47	90	MAI	SLEEVE
432	D	31	52	02H	0.43	46	PI	0.42	78	SAI	SLEEVE
433	D	11	53	01H	0.57	24	NONE	0.26	115	SAI	PLUG
434	D	27	53	02H	0.79	32	NONE	0.27	81	SAI	SLEEVE
435	D	37	53	01H	1.41	127	NONE	0.23	56	MAI	PLUG
436	D	4	54	01H	0.45	7	NONE	0.47	104	MAI	PLUG
437	D	18	54	01H	0.17	45	NONE	0.27	112	MAI	SLEEVE
438	D	25	54	02H	0.40	41	NONE	0.30	60	SAI	SLEEVE
439	D	30	54	03H	0.60	17	NONE	0.27	142	MAI	SLEEVE
440	D	33	54	02H	0.35	160	NONE	0.88	129	SAI	SLEEVE
441	D	38	54	02H	0.22	85	NONE	0.44	136	SAI	SLEEVE
442	D	42	54	02H	0.90	45	NONE	0.36	123	MAI	SLEEVE
443	D	44	54	02H	0.73	65	NONE	0.42	104	SAI	SLEEVE

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	S/C	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
444	D	5	55	01H	0.24	28	NONE	1.15	131	SAI	PLUG
445	D	8	55	02H	0.34	31	NONE	0.46	134	MAI	PLUG
	D	8	55	01H	1.36	22	NONE	0.92	27	MAI	
446	D	11	55	03H	0.58	46	NONE	0.39	105	MAI	PLUG
	D	11	55	02H	0.65	60	NONE	0.38	123	MAI	
447	D	17	55	02H	0.33	49	NONE	0.39	37	SAI	SLEEVE
448	D	18	55	01H	0.53	14	NONE	0.54	145	MAI	SLEEVE
449	D	33	55	02H	0.93	9	NONE	0.68	109	SAI	PLUG
450	D	45	55	05H	0.32	11	NONE	0.35	130	SAI	SLEEVE
451	D	12	56	01H	0.78	38	NONE	0.22	119	SAI	SLEEVE
452	D	32	56	02H	0.24	163	NONE	0.31	129	SAI	SLEEVE
453	D	34	56	02H	0.93	28	NONE	0.47	63	MAI	SLEEVE
454	D	41	56	04H	0.76	169	NONE	1.03	54	SAI	SLEEVE
455	D	45	56	01H	0.07	0	NONE	0.88	147	SAI	SLEEVE
456	D	4	57	01H	0.85	26	NONE	0.83	139	SAI	SLEEVE
457	D	8	57	01H	0.32	18	PI	0.33	95	SAI	SLEEVE
458	D	20	57	02H	0.22	77	NONE	0.26	66	SAI	PLUG
459	D	42	57	02H	1.07	22	PI	0.40	90	MAI	SLEEVE
460	D	24	58	05H	0.43	148	NONE	0.49	135	MAI	SLEEVE
461	D	25	58	02H	0.86	37	NONE	0.44	101	MAI	SLEEVE
462	D	35	58	02H	1.04	29	PI	0.28	85	SAI	PLUG
463	D	15	59	01H	0.66	18	NONE	0.24	97	SAI	PLUG
464	D	18	59	02H	0.42	51	NONE	0.27	75	SAI	SLEEVE
465	D	20	59	01H	0.15	45	NONE	0.17	67	SAI	SLEEVE
466	D	22	59	01H	0.56	351	NONE	0.49	152	SAI	PLUG
467	D	23	59	04H	0.24	120	NONE	0.34	117	SAI	PLUG
468	D	31	59	03H	0.32	45	NONE	0.36	106	SAI	SLEEVE
469	D	32	59	02H	0.27	78	NONE	0.84	118	SAI	SLEEVE
470	D	33	59	05H	0.09	180	NONE	0.65	147	SAI	PLUG
	D	33	59	02H	1.55	29	PI	0.30	74	MAI	

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
471	D	37	59	03H	0.04	116	NONE	0.31	144	SAI	PLUG
	D	37	59	02H	0.28	29	NONE	0.39	140	MAI	
472	D	8	60	01H	0.46	19	NONE	0.43	108	MAI	SLEEVE
473	D	14	60	01H	0.58	25	NONE	0.73	137	SAI	SLEEVE
474	D	15	60	01H	0.55	43	PI	0.67	132	SAI	SLEEVE
475	D	24	60	02H	0.91	34	NONE	0.66	133	MAI	PLUG
	D	24	60	01H	0.14	82	NONE	0.11	120	SAI	
476	D	30	60	03H	0.19	206	NONE	0.85	110	SAI	SLEEVE
477	D	34	60	05H	1.10	15	NONE	1.32	78	SAI	SLEEVE
478	D	9	61	02H	0.73	46	NONE	0.92	104	MAI	PLUG
479	D	12	61	01H	0.64	30	NONE	0.64	83	MAI	SLEEVE
480	D	18	61	02H	0.59	40	NONE	0.19	107	SAI	SLEEVE
481	D	29	61	04H	0.88	41	NONE	0.56	61	SAI	PLUG
482	D	10	62	01H	0.57	19	NONE	0.56	126	SAI	SLEEVE
483	D	22	62	03H	0.36	25	NONE	0.45	106	SAI	SLEEVE
484	D	25	62	04H	0.30	156	NONE	0.52	70	MAI	SLEEVE
485	D	32	62	02H	0.44	99	NONE	0.81	73	MAI	SLEEVE
486	D	3	63	01H	2.07	20	PI	0.25	110	MAI	SLEEVE
487	D	22	63	02H	0.07	90	NONE	0.44	117	SAI	SLEEVE
488	D	36	63	02H	1.31	26	PI	0.95	81	SAI	SLEEVE
489	D	4	64	01H	0.44	30	PI	1.09	163	SAI	SLEEVE
490	D	5	64	01H	1.02	20	PI	0.38	35	MAI	SLEEVE
491	D	9	64	04H	0.38	131	NONE	0.50	115	MAI	PLUG
	D	9	64	01H	0.77	54	NONE	0.85	111	MAI	
492	D	11	64	01H	0.70	40	PI	0.46	144	MAI	PLUG
493	D	13	64	01H	0.89	5[illegible]	PI	0.74	143	MAI	SLEEVE
494	D	3	65	01H	1.53	19	PI	0.64	164	MAI	PLUG
495	D	5	65	01H	2.54	51	NONE	2.62	70	SAI	SLEEVE
496	D	7	65	01H	0.84	17	NONE	0.49	81	MAI	SLEEVE
497	D	8	65	02H	1.74	21	PI	0.76	113	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	D	8	65	01H	1.13	30	PI	0.68	140	MAI	
498	D	12	65	01H	1.00	44	PI	0.34	125	MAI	SLEEVE
499	D	18	65	01H	1.10	30	PI	0.50	109	MAI	SLEEVE
500	D	20	65	02H	0.53	46	NONE	0.62	144	MAI	SLEEVE
501	D	35	65	04H	1.62	45	NONE	0.50	121	SAI	SLEEVE
502	D	6	66	01H	0.83	41	NONE	0.40	97	MAI	SLEEVE
503	D	7	66	01H	0.73	40	NONE	0.81	77	SAI	SLEEVE
504	D	11	66	01H	0.98	13	NONE	0.38	310	MAI	SLEEVE
505	D	15	66	01H	0.26	82	PI	0.30	84	MAI	SLEEVE
506	D	17	66	02H	0.63	37	NONE	0.39	119	SAI	PLUG
	D	17	66	01H	1.10	27	PI	0.39	103	MAI	
507	D	18	66	02H	1.00	33	PI	0.42	96	MAI	SLEEVE
508	D	21	66	02H	0.84	25	NONE	0.26	122	MAI	SLEEVE
509	D	23	66	05H	0.31	6	NONE	0.27	113	SAI	SLEEVE
510	D	27	66	02H	0.97	52	PI	0.24	105	MAI	SLEEVE
511	D	34	66	04H	0.23	206	NONE	0.43	123	MAI	PLUG
	D	34	66	02H	0.66	43	PI	0.78	104	SAI	
512	D	7	67	02H	0.44	45	NONE	0.48	101	MAI	PLUG
	D	7	67	01H	0.62	86	PI	0.40	123	MAI	
513	D	8	67	01H	0.78	27	NONE	0.48	75	SAI	SLEEVE
514	D	9	67	04H	0.37	45	NONE	1.46	48	SAI	SLEEVE
515	D	12	67	01H	0.59	49	PI	0.71	119	MAI	PLUG
516	D	17	67	04H	0.43	53	NONE	0.50	108	SAI	PLUG
	D	17	67	03H	0.85	34	NONE	0.40	95	SAI	
	D	17	67	02H	0.78	43	NONE	0.88	105	SAI	
517	D	19	67	03H	0.44	108	NONE	1.06	113	SAI	SLEEVE
518	D	5	68	02H	0.59	12	NONE	0.39	68	MAI	PLUG
	D	5	68	01H	1.28	21	NONE	0.64	86	SAI	
519	D	8	68	03H	0.48	30	NONE	0.87	169	SAI	SLEEVE
520	D	11	68	03H	0.45	6	NONE	0.42	46	MAI	PLUG

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	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
	D	11	68	01H	0.91	24	NONE	0.76	58	MAI	
521	D	14	68	03H	0.71	18	NONE	0.26	86	MAI	SLEEVE
522	D	16	68	04H	0.70	32	NONE	0.96	152	SAI	PLUG
	D	16	68	01H	0.70	150	NONE	0.79	135	MAI	
523	D	19	68	02H	0.67	24	NONE	0.42	124	SAI	SLEEVE
524	D	22	68	03H	0.84	36	NONE	0.30	130	SAI	PLUG
525	D	30	68	02H	0.82	52	PI	0.84	80	MAI	SLEEVE
526	D	32	68	02H	0.89	27	NONE	0.38	59	MAI	SLEEVE
527	D	33	68	02H	0.31	15	NONE	0.24	65	SAI	SLEEVE
528	D	34	68	03H	0.67	24	NONE	0.31	136	SAI	PLUG
	D	34	68	02H	1.65	13	NONE	0.91	150	SAI	
529	D	36	68	02H	0.78	29	NONE	0.22	111	MAI	SLEEVE
530	D	4	69	01H	0.91	37	PI	0.81	86	SAI	SLEEVE
531	D	6	69	03H	0.41	4	NONE	0.60	70	SAI	SLEEVE
532	D	8	69	01H	1.11	20	PI	0.31	40	MAI	PLUG
533	D	13	69	01H	0.82	[illegible]	NONE	0.29	60	SAI	SLEEVE
534	D	16	69	03H	1.14	15	NONE	0.21	100	SAI	PLUG
	D	16	69	02H	0.51	24	NONE	0.27	147	MAI	
535	D	22	69	02H	0.97	20	NONE	0.24	85	MAI	SLEEVE
536	D	28	69	02H	0.30	33	NONE	0.42	103	MAI	SLEEVE
537	D	5	70	02H	0.7[illegible]	93	NONE	0.63	90	SAI	SLEEVE
538	D	12	70	03H	[illegible].53	126	NONE	0.35	127	SAI	SLEEVE
539	D	16	70	01H	1.09	37	PI	0.73	100	MAI	SLEEVE
540	D	25	70	02H	1.45	30	NONE	0.[illegible]8	138	SAI	PLUG
541	D	33	71	02H	0.37	59	NONE	0.51	67	SAI	SLEEVE
542	D	2	72	02H	1.63	11	NONE	3.87	162	SAI	SLEEVE
543	D	7	72	02H	0.79	29	NONE	0.39	106	MAI	SLEEVE
544	D	9	72	01H	0.56	62	PI	0.52	64	SAI	SLEEVE
545	D	17	72	02H	0.80	73	PI	0.42	113	MAI	PLUG
	D	17	72	01H	0.76	12	NONE	0.25	100	SAI	

APPENDIX 1

REVISION 2: SUMMER REPAIR PROGRAM (AUGUST 1991)

	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
546	D	23	72	02H	0.85	46	PI	0.48	108	MAI	SLEEVE
547	D	24	72	02H	0.45	32	PI	0.80	86	SAI	PLUG
548	D	30	72	02H	1.71	27	PI	0.28	87	MAI	SLEEVE
549	D	6	73	01H	1.34	36	PI	0.44	127	MAI	SLEEVE
550	D	8	73	01H	2.14	27	NONE	0.37	133	MAI	SLEEVE
551	D	13	73	03H	1.06	37	NONE	0.32	78	SAI	PLUG
	D	13	73	02H	0.19	79	NONE	0.20	133	SAI	
	D	13	73	01H	0.42	62	PI	0.16	76	SAI	
552	D	14	73	01H	1.08	41	PI	0.44	113	MAI	PLUG
553	D	15	73	01H	0.72	23	NONE	0.33	106	SAI	SLEEVE
554	D	18	73	04H	0.52	29	NONE	0.19	97	SAI	SLEEVE
555	D	20	73	01H	0.49	50	PI	0.28	83	SAI	PLUG
556	D	24	73	02H	0.52	24	PI	0.30	90	MAI	PLUG
	D	24	73	01H	0.29	49	NONE	0.26	125	MAI	
557	D	36	73	02H	1.96	22	NONE	0.33	148	SAI	SLEEVE
558	D	15	74	01H	0.59	39	PI	0.79	113	MAI	SLEEVE
559	D	21	75	02H	0.76	36	NONE	0.52	115	SAI	SLEEVE
560	D	32	75	02H	0.40	68	PI	0.42	117	SAI	SLEEVE
561	D	7	76	01H	0.75	17	PI	0.21	81	SAI	SLEEVE
562	D	3	77	02H	0.68	11	NONE	0.40	53	SAI	SLEEVE
563	D	5	77	01H	0.59	9	NONE	0.35	134	SAI	SLEEVE
564	D	6	77	03H	0.49	70	NONE	0.43	49	SAI	SLEEVE
565	D	16	77	04H	0.46	43	NONE	0.39	83	MAI	SLEEVE
566	D	18	77	03H	0.14	97	NONE	0.35	82	SAI	SLEEVE
567	D	3	78	03H	1.06	9	NONE	0.46	131	SAI	PLUG
	D	3	78	02H	0.56	21	NONE	0.36	87	SAI	
568	D	19	78	02H	0.46	46	NONE	0.48	107	SAI	SLEEVE
569	D	8	79	01H	0.84	39	NONE	0.44	94	MAI	SLEEVE
570	D	11	81	02H	0.19	113	NONE	0.79	149	SAI	SLEEVE
571	D	6	82	01H	0.54	48	PI	0.42	128	MAI	SLEEVE

APPENDIX 1

REVISION 2: SUMMER REPAIR PROGRAM (AUGUST 1991)

	S/G	ROW	COLUMN	TSP	B.C. VOLTAGE	B.C. PHASE	B.C. CALL	MRPC VOLTAGE	MRPC PHASE	MRPC CALL	TYPE REPAIR
572	D	8	82	02H	0.69	14	NONE	0.56	142	SAI	SLEEVE
573	D	8	83	02H	0.80	353	NONE	0.49	147	SAI	PLUG
	D	8	83	01H	0.31	52	NONE	0.30	112	SAI	
574	D	11	83	02H	0.54	31	PI	0.46	47	SAI	PLUG
	D	11	83	01H	0.84	28	NONE	0.54	58	SAI	
575	D	16	83	04H	0.40	180	NONE	0.55	125	SAI	SLEEVE
576	D	4	84	04H	0.78	150	NONE	0.43	53	SAI	SLEEVE
577	D	6	84	02H	0.74	86	NONE	0.46	82	SAI	SLEEVE
578	D	9	84	02H	0.65	47	NONE	0.59	102	SAI	SLEEVE
579	D	15	84	02H	0.79	358	NONE	0.25	135	SAI	PLUG
	D	15	84	01H	0.55	38	NONE	0.66	65	SAI	
580	D	18	84	02H	0.66	36	NONE	0.42	90	SAI	SLEEVE
581	D	19	84	02H	0.79	20	NONE	0.77	121	SAI	PLUG
582	D	8	85	02H	2.39	3	NONE	0.35	121	SAI	SLEEVE
583	D	25	85	01H	1.22	24	PI	0.29	127	SAI	SLEEVE
584	D	7	86	02H	0.91	21	NONE	0.24	102	SAI	SLEEVE
585	D	9	86	02H	0.90	18	NONE	0.22	93	SAI	SLEEVE
586	D	12	86	02H	0.32	14	NONE	0.27	93	SAI	SLEEVE
587	D	5	87	02H	0.66	71	PI	0.36	95	SAI	SLEEVE
588	D	11	87	02H	0.90	53	NONE	0.39	145	SAI	SLEEVE
589	D	17	87	02H	0.62	53	PI	0.21	93	SAI	SLEEVE
590	D	5	88	02H	0.68	45	NONE	0.69	49	MAI	SLEEVE
591	D	10	88	02H	0.38	10	NONE	0.92	109	SAI	SLEEVE
592	D	16	88	02H	1.07	23	NONE	0.46	99	SAI	SLEEVE
593	D	3	89	02H	0.72	46	PI	0.53	114	MAI	SLEEVE
594	D	16	89	02H	0.71	38	PI	1.16	157	SAI	SLEEVE
595	D	8	90	01H	0.37	70	NONE	0.74	138	SAI	SLEEVE
596	D	9	90	02H	0.16	116	NONE	0.26	126	SAI	PLUG
597	D	11	90	03H	1.04	39	PI	0.38	129	MAI	PLUG

TROJAN STEAM GENERATOR TUBING

DESTRUCTIVE EXAMINATION

INTERIM REPORT

CE-NPSD-706

T. P. MAGEE
J. F. HALL
R. S. MAURER

ABB COMBUSTION ENGINEERING NUCLEAR POWER
COMBUSTION ENGINEERING
1000 PROSPECT HILL ROAD
WINDSOR, CONNECTICUT 06095-0500

JFH-18

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QUALITY ASSURANCE NOTICE

This report includes information from two programs, one funded jointly by the Electric Power Research Institute (EPRI) and Portland General Electric (PGE), and the second funded solely by PGE. The EPRI/PGE program includes the examination of sections taken from tubes 'C'R12C66, 'C'R14C14 and 'D'R12C8 and is being performed to standard engineering practices, not necessarily following Combustion Engineering's QAM-100, Revision 3. The PGE program includes the examination of sections taken from tubes 'C'R29C70, 'C'R30C64, 'D'R16C74, 'D'R20C66, 'D'R8C66, 'C'R8C69, 'C'R12C70, and it is being performed to meet QAM-100, Rev. 3 standards. Information presented in this report, or conclusions derived from the EPRI/PGE program will be enclosed in square cornered brackets ([]) to indicate that it is presented for information only. The information in the brackets may have to be read, however, to obtain a clear understanding of text outside the brackets. This is an interim report, not the final report.

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Section 1

INTRODUCTION

This interim report presents limited results from the post-test examination of the tube support plate (TSP) regions of eight steam generator tubes removed from the Trojan nuclear plant during Spring and Fall, 1991. One tube removed during the Spring was examined under an EPRI funded project (RPS413-02). Two other tubes were also examined under the EPRI program, but they did not contain TSP regions and are not included in this report. Seven additional tubes removed in the Fall were examined as a Portland General Electric project. The objective of this report is to document in a single interim report the initial results.

The Trojan nuclear plant is a Westinghouse four loop NSSS situated on the Columbia River in Oregon. Condenser coolant is from acidified cooling tower water. Each of the four Model 51 steam generators contain 3388 NiCrFe (Alloy 600) heat transfer tubes with an OD of 7/8 inch and a nominal wall thickness of 0.050 inch. The Alloy 600 is typical of the material that received a low temperature final anneal and that was used for steam generator tubes in many plants that commenced operation at approximately the same time as Trojan. This material has been susceptible to primary water stress corrosion cracking (PWSCC) and Trojan experienced this form of tube degradation, beginning about 1979, in the small radius U-bends. Ultimately all row 1 U-bends were preventively removed from service. In the mid 1980's Trojan experienced pitting of a small number of tubes and in 1986 removed three tubes to confirm the presence of pitting. Results of that examination were presented in EPRI report NP-6362-SD.

After the 1986 tube pull, the plant made a number of improvements to the secondary cycle to enhance water quality. After these were completed, the plant detected in 1988 apparent degradation of tube OD surfaces at tube support locations. The degradation was judged to be axial cracks. The number of these indications increased significantly at the 1989 and 1990 outages resulting in a decision to remove tubes in 1991 to quantify and characterize the degradation. Table 1-1 summarizes the tubes removed in 1991.

Tubes were removed in May 1991, but because of pulling difficulties only one tube with TSP locations was removed. That tube had been plugged in 1989 because of indications at the TSP. Based on examination results of these tubes, two additional tubes were removed in the Fall for examination. These two tubes were active prior to the 1991 outage and had been plugged just before being removed. These two tubes were selected to provide a range of ECT indications for analysis. Based on ECT and the burst test results of these two tubes, the NRC requested that additional tubes be removed for destructive examination. The last five tubes in Table 1-1 were either recently plugged or plugged during a previous outage.

The examinations included a variety of tasks:

- [visual examination]
- [dimensional characterization]
- [double and single wall radiography]
- burst testing
- scanning electron microscope examinations
- light optical microscopy evaluations
- deposit analysis
- tensile testing
- [microhardness testing]
- [sensitization assessment]
- [chemical analysis]
- crack surface chemical analysis by Auger and XPS

Tube support locations, WEXTEX expansion transition regions [and free span locations] were evaluated but not every location received the full complement of tests and evaluations.

The burst testing of the latter five tubes is complete as is the limited SEM work to characterize the defect dimensions. Some limited metallography is also complete. This interim report updates the prior interim report. More detailed final reports will be issued at a later date.

Table 1-1

TROJAN TUBES REMOVED FOR DESTRUCTIVE EXAMINATION IN 1991

Tube	Plugged	Month Removed	Number of TSPs Removed
['C'R12C66	1990	May	0]
['C'R14C14	No	May	0]
['D'R12C8	1989	May	3]
'C'R29C70	1991	Sept.-Oct	3
'C'R30C64	1991	Sept.-Oct	3
'D'R16C74	1991	November	3
'D'R20C66	1990	November	3
'D'R8C66	1989	November	3
'C'R8C69	1991	November	3
'C'R12C70	1991	November	3

Section 2

EDDY CURRENT TESTS

Tube support plate intersections were examined by bobbin coil and motorized rotating pancake coil (MRPC) eddy current test techniques before and after they were removed from the steam generators. The results, provided by PGE, are summarized in Table 2-1.

Table 2-1

EDDY CURRENT RESULT SUMMARY

Tube	TSP	Pre-Pull 400/100 diff.mix Bobbin Coil Voltage	Pre-Pull Bobbin Coil Signal	Pre-Pull Bobbin Coil Phase Angle	Pre-Pull 300KHz Axial Coil MRPC Voltage	Orig. Repair MRPC Signal Call	(Rev.2) Pre-Pull MRPC Signal Call	(Rev.3) Pre-Pull MRPC Signal Call	Post-Pull 400/100 diff.mix Bobbin Coil Voltage	Post-Pull Bobbin Coil Signal	Post-Pull Bobbin Coil Phase Angle	Post-Pull 300KHz Axial Coil MRPC Voltage	Post-Pull MRPC Signal Call
[12/8	- 1	5.17	82%	64	4.35	MAI	MAI	MAI	12.51	69%	78	7.26	MAI]
[	- 2	1.72	55%	96	0.50	NDD	MAI	MAI	3.29	67%	80	1.16	SAI]
[	- 3	1.14	55%	96	0.52	NDD	MAI	MAI	7.76	13%	127	5.87	SAI]
29/70	- 1	0.31	62%	81	0.16	SAI	SAI	MAI	1.74	3%	139	1.45	SAI
	- 2	0.37	64%	85	0.34	MAI	MAI	SAI	6.07	0%	171	0.79	MAI
	- 3	0.34	0%	357	0.25	NDD	3:1	SAI	7.00	0%	187	0.49	SAI
30/64	- 1	0.62	43%	105	0.15	NDD	3:1	SAI	3.35	92%	41	1.30	MAI
	- 2	1.13	93%	55	0.57	MAI	MAI	MAI	9.68	0%	158	2.74	MAI
	- 3	1.12	0%	139	0.59	NDD	3:1	MAI	4.86	0%	147	1.37	MAI
16/74	- 1	1.12	85%	57	0.66	MAI	MAI	MAI	7.16	64%	87	0.98	MAI
	- 2	0.87	12%	4	N/A	NDD	NDD	NDD	0.60	49%	100	0.31	MAI
	- 3	0.99	35%	14	N/A	NDD	NDD	NDD	4.53	42%	14	0.49	SAI
20/66	- 1	2.58	66%	78	1.10	MAI	MAI	MAI	7.98	28%	114	0.97	MAI
	- 2	2.25	64%	80	1.51	SAI	MAI	MAI	8.65	1%	156	1.10	MAI
	- 3	0.99	97%	44	0.80	NDD	MAI	MAI	2.81	35%	109	0.76	MAI
8/66	- 1	3.12	67%	77	2.16	MAI	MAI	MAI	8.00	40%	110	1.60	MAI
	- 2	1.66	73%	29	0.56	NDD	MAI	MAI	2.11	43%	134	0.79	MAI
	- 3	0.5	48%	19	0.18	NDD	SAI	SAI	0.69	63%	86	N/A	NDD

Table 2-1 (continued)

EDDY CURRENT RESULT SUMMARY

Tube	TSP	Pre-Pull 400/100 diff.mix Bobbin Coil Voltage	Pre-Pull Bobbin Coil Signal	Pre-Pull Bobbin Coil Phase Angle	Pre-Pull 300KHz Axial Coil MRPC Voltage	Orig. Repair MRPC Signal Call	(Rev.2) Pre-Pull MRPC Signal Call	(Rev.3) Pre-Pull MRPC Signal Call	Post-Pull 400/100 diff.mix Bobbin Coil Voltage	Post-Pull Bobbin Coil Signal	Post-Pull Bobbin Coil Phase Angle	Post-Pull 300KHz Axial Coil MRPC Voltage	Post-Pull MRPC Signal Call
8/69	- 1	1.08	94%	45	0.96	MAI	MAI	MAI	4.38	56%	98	1.91	MAI
	- 2	0.89	99%	36	0.30	NDD	MAI	MAI	1.01	52%	119	0.28	MAI
	- 3	1.13	94%	45	0.25	SAI	MAI	MAI	1.55	84%	63	0.33	MAI
12/70	- 1	1.34	97%	35	0.40	MAI	MAI	MAI	4.82	72%	83	0.63	MAI
	- 2	0.73	94%	32	0.27	NDD	SAI	SAI	1.66	90%	56	0.53	MAI
	- 3	0.59	87%	52	0.20	NDD	SAI	SAI	1.04	61%	98	0.47	MAI

Notes: SAI - Single axial indication
MAI - Multiple axial indication
3:1 - Does not meet 3:1 signal to noise criteria
NDD - No detectable defects
N/A - Not available
Revision 0 to the MRPC data analysis guidelines April 4, 1991
Revision 1 to the MRPC data analysis guidelines August 1991 (Revised for clarification only)
Revision 2 to the MRPC data analysis guidelines August 1991
Revision 3 to the MRPC data analysis guidelines October 1991

Section 3

BURST TESTING

PROCEDURES

A major objective of the combined tube examination programs was to determine the burst strengths of tube support plate locations (TSP) with known, suspected or potentially unknown levels of tube degradation. Accordingly, burst tests were performed on twenty-two (22) tube sections, each of which contained a tube support location, prior to the initiation of any destructive examinations. The burst test specimens were approximately 10 inches in length with the TSP locations near the centers of the test sections. The burst test specimens included:

[(a) TSP #1 and #3 from 'D'R12C8]
(b) TSP #1, #2 and #3 from 'C'R29C70, 'C'R30C64, 'D'R16C74, 'D'R20C66, 'D'R8C66 and 'C'R8C69
(c) TSP #1 and #3 from SG 'C'R12C70

Tests were conducted without benefit of a simulated carbon steel TSP over the tube section. A prior study indicated that the presence of such a device could prevent failure of the tube at the TSP location even when significant degradation was present. Furthermore, PGE indicated that analysis suggested that during some postulated accident scenarios, the tubesheet could be displaced upward with the result that the original TSP location could momentarily be located outside the TSP boundaries (i.e., the TSP would not provide support that could prevent a burst).

The ends of the burst specimens were sealed with mechanical fittings, the upper one of which was welded to 1/8 inch high pressure tubing to permit pressurization of the test specimens. Prior experiences with burst testing of removed tubes indicated a significant probability of leakage from the fittings because of gouges, scratches or ovalization of the tubes resulting from the pulling operation. This problem was addressed by silver soldering the end fittings onto the tube sections. This technique proved effective.

The pressurizing equipment included:

(a) a hand pump to pump deionized water to pressurize the specimens

(b) a calibrated pressure gauge

(c) a pressure transducer connected to a strip chart recorder

(d) 1/8 inch high pressure tubing

(e) a 3000 psi accumulator with valve

The burst test procedures were in accordance with C-E Specification 00000-MCC-094, Revision 3, "Procedure for Testing Steam Generator Tubes for Leak Before Bursting." Prior to test outside diameters and wall thicknesses were characterized at 90^{0} increments around the circumference of each specimen. The specimens were not decontaminated prior to test. The basic plan for pressurizing the samples was as follows:

(a) pressurize to 1375 psi internal pressure, hold for five minutes and collect and measure leakage, if any

(b) increase pressure slowly to 3000 psi, hold for five minutes and collect and measure leakage, if any

(c) reduce pressure to 1375 psi, hold for five minutes and collect and measure leakage, if any

(d) increase pressure to 4450 psi, hold for five minutes, collect and measure leakage, if any

(e) decrease pressure to 1375 psi, hold for five minutes, collect and measure leakage, if any

(f) increase pressure at about 2000 psi/minute until failure occurs.

The tests were conducted without an internal bladder initially to determine at what pressure leakage from development of a throughwall defect initiated. Provisions were made to use an internal bladder if leakage developed for any tubes prior to burst. After test, the burst surface and the remainder of the TSP location were examined via scanning electron microscopy and light optical microscopy to characterize defect depth and type.

RESULTS

Table 3-1 summarizes the burst test results for each specimen. [The burst test specimen from tube R12C8 developed a leak that exceeded the makeup capacity of the pump at approximately 3300 psi. Although a bladder could have been inserted and the test resumed, this was not done. Double and single wall radiography, post-tube pull ECT and visual observation all disclosed the presence of a circumferential indication that covered over 270^{0} of the circumference. Further, the tube was not dented at this location nor was there any obvious source of excessive axial stresses other than tube pull forces that could have initiated such a defect. A review of the tube pulling process indicated the possibility that a load of 7000 lbs was applied to remove the tube. With no throughwall degradation, such a load would produce stresses near the yield strength of the material, and for relatively uniform wall loss of 50%, the applied tube pull stress would be at the ultimate strength of the material. With these considerations, the conclusion was that the tube section had been severely damaged during the removal process and that further testing would not provide technically defensible burst test data. No further testing was done.]

The other twenty-one specimens failed by an axial (slot) rupture at pressures of 5900 psi to 10,600 psi. By comparison, a non-defective burst specimen would fail at 10,000-11,500 psi. None of these specimens developed throughwall leaks at any of the hold points. Two of the specimens developed leaks during the ascent to burst pressure ('D'R8C66 - #1 and 'C'R8C69 - #1). The specimens were depressurized, bladders made of Tygon tubing inserted, then repressurized to burst.

After the test, the specimens were photographed to document the post-test condition and visually examined to determine if any of the intergranular cracks extended beyond the support plate boundaries. Figure 3-1 shows photographs of a typical specimen subsequent to burst. Visible are some of the additional cracks that opened up as a result of the deformation. Most of these indications were axial, although link-up of cracks may have resulted in some minor circumferential cracking.

Table 3-1

BURST TEST SUMMARY

Tube	TSP	Burst(psi)	Burst Angular Position*	Total Burst Length** (inch)	Secondary Crack Description
['D'R12C8	1	>3300 (leak)	20°	0	Five axial and circ. Near Leak
	3	10400	80°	1.1	Numerous, mostly axial, 315° extent]
'C'R29C70	1	10400	0°	1.3	Eight short axial
	2	9000	0°	1.0	Nine short axial
	3	10400	180°	1.3	Four small branched axial
'C'R30C64	1	10500	340°	1.3	Several axial near top TSP
	2	8800	340°	1.0	Several axial, in three "patches"
	3	10200	0°	1.3	Numerous axial, 270° extent, minor circ.
'D'R16C74	1	8600	315°	1.1	Axial, 180° extent
	2	9500	330°	1.1	Axial, 90° extent
	3	10400	270°	1.5	Axial, 90° extent
'D'R20C66	1	8150	20°	1.1	Axial, almost 360° extent
	2	8750	180°	1.1	Axial, almost 360° extent
	3	9300	180°	1.1	Axial, almost 360° extent
'D'R8C66	1	7500 (leak) 7500 (burst)	90°	1.5	Axial, almost 360° extent
	2	8750	210°	1.3	Axial, almost 360° extent, minor circ.
	3	10600	280°	1.5	None
'C'R8C69	1	5500 (leak) 5900 (burst)	10°	1.3	None
	2	7700	270°	1.0	Axial, almost 360° extent
	3	9700	180°	1.3	Numerous axial, 360° extent
'C'R12C70	1	7100	280°	0.9	Two small axial patches, minor circ.
	3	9500	260°	1.3	Axial, almost 360° extent

* Notch made during tube pull is 0°. Direction is clockwise looking down (towards bottom of the steam generator).

** Includes ductile tearing beyond the in-service degradation.

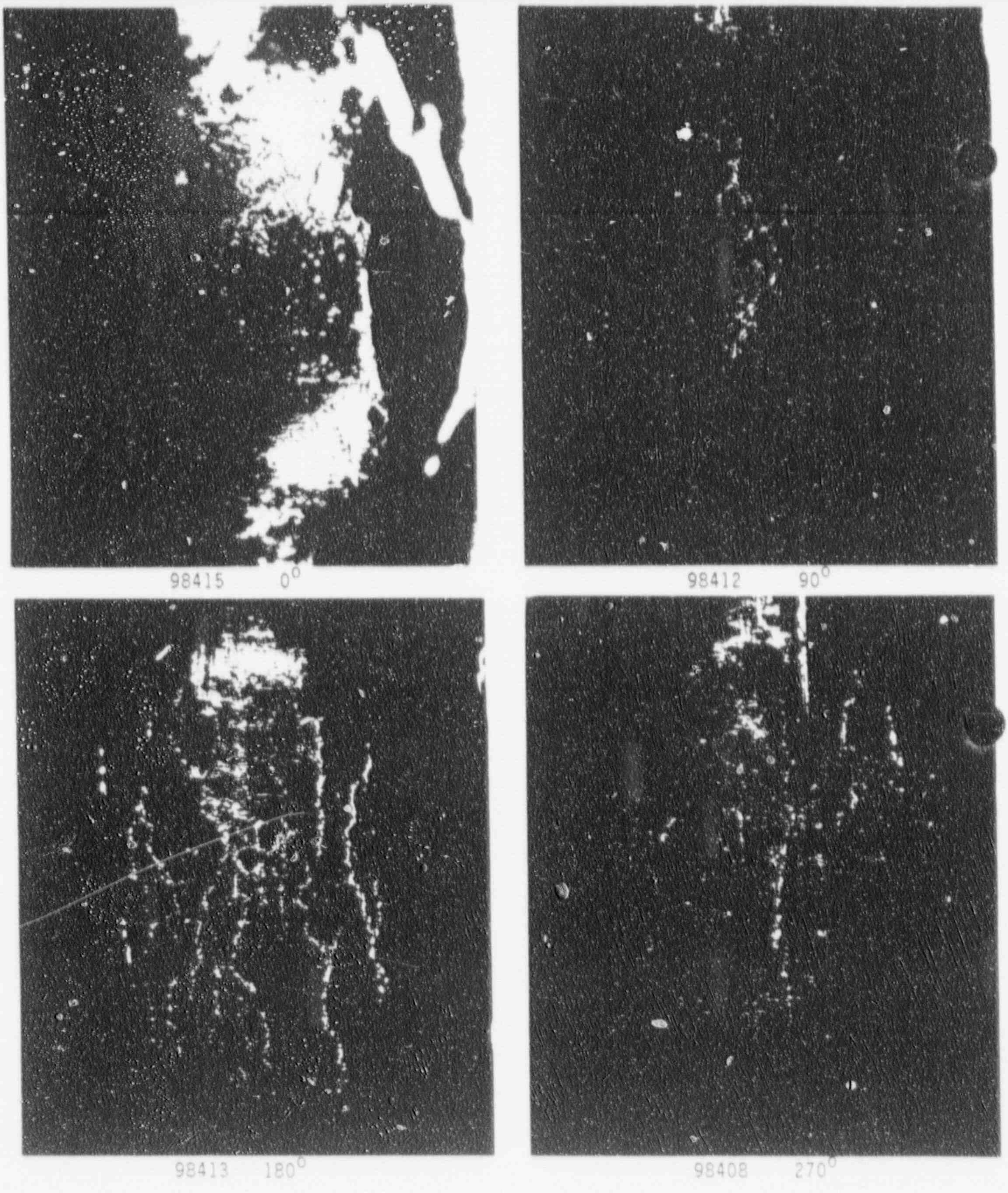


Figure 3-1. Tube 'C'R30C64 TSP #2 After Burst (5X).

Section 4

FRACTOGRAPHY

SAMPLE SELECTION

Upon completion of each burst te: and its documentation, a section was removed from each burst test specimen for analysis by scanning electron microscope (SEM). [The second tube support plate (TSP) section of tube 'D'R12C8 was not analyzed by fractography since it was not burst.] Similarly, the second TSP of tube 'C'R12C70 was not examined for the same reason. With the exception of the first TSP of 'D'R12C8, all fractography was performed on one of the two axial burst crack faces. [The section of tubing containing the first TSP of 'D'R12C8 was first pulled apart in the axial direction, producing a circumferential fracture around the weakest portion of the tube in the circumferential direction. The lower crack face was selected for examination by fractography, since it contained less of the TSP intersection, leaving more material for other examinations. This sample was cut off about 1/8 inch below the bottom of the TSP. The crack surface was very jagged and ranged from as much as 1/4 inch above the bottom of the TSP to less than 1/16 inch above the bottom of the TSP. Similar attempts were made to axially pull apart the section of tubing containing the third TSP of 'D'R12C8 after burst, but after a couple of attempts it was decided to cut out and analyze the axial burst crack face.] The remaining samples for SEM factography (total of 21) were cut using a Dremmel Moto Tool Wheel #409 to provide a sample convenient for use with SEM. All SEM samples were about 1/4 inch wide and extended the entire burst length. Generally, the least curved (or least distorted) of the two burst faces was chosen for SEM analysis. The left burst face was taken from 'C'R29C70 TSP #1, 'C'R30C64 TSP #1 and #2. The other four samples were taken from the right burst face. [One of the upper half axial cracks of 'D'R12C8 TSP #1 was opened up and examined as well.]

PROCEDURE

After samples had been cut from the tubes, they were blown with a jet of dry oil-free air to remove loose particulates from the crack surface to minimize charging during the SEM examination. An ETEC Autoscan Scanning Electron Microscope was used in this analysis. Operation of this instrument followed the manufacturer's instructions. ASTM has not published procedures for fractography examinations. However surfaces examined by SEM, in accordance with accepted scientific principles, can be compared with pictures presented in various fractography textbooks, such as "Metals Handbook, Volume 9, Fractography and Atlas of Fractographs," 8th Edition, John A. Fellows, American Society for Metals, c 1974. Selected areas were examined in detail to determine crack morphology, followed by documentation of the entire sample in a photomontage. A photomontage consists of a series of photographs all taken at a magnification of either 30X or 40X using Polaroid 52 film. This was accomplished by careful placement of the sample in a four point screw adjusted holder and adjustment of the sample's location in the SEM vacuum chamber. Prior to photographing the surface, the operator checked that the entire surface could be viewed without having to manually reposition the sample in the holder. After photos were taken, they were pasted together on poster board for evaluation.

RESULTS

[The SEM examination began with an investigation of the outer surface of 'D'R12C8 TSP #1. Figure 4-1 shows some of the secondary cracks below the crack face opened by tensile fracture. The cracks are orientated mostly in the circumferential direction, an artifact of the tensile fracture operation. Closer inspection of one of the secondary cracks clearly shows that attack was intergranular as seen by the clean separation of grains and well defined grain facets. The surface of the tube shows numerous circumferentially oriented machining marks, which do not seem to have contributed to the tube degradation.

The crack surface was then investigated. Figure 4-2 shows, in cross-section, the depth of the cracking in the area near where leakage occurred during the burst test (the large pit in the center of the 20X view is thought to be the leak path). The crack surface is very jagged, is intergranular and shows evidence of numerous branches.]

Figure 4-3 shows a similar examination of the 'C'R30C64 TSP #1 axial burst crack. In this case the predominantly axial (with some circumferential) cracks on the OD surface opened up from the bulging of the tube section during the burst test. Again, the crack surface is jagged, is intergranular and shows evidence of branching.

Figure 4-4 shows the surface of the 'C'R29C70 TSP #3 axial burst crack. These photos show several ligaments between microcracks.

The photomontages of each crack face were useful in determining the maximum depth of penetration in each TSP location. Table 4-1 presents a summary of the measurements made off of the montages.

The samples from the three TSPs of 'C'R29C70 and 'C'R30C64 were sent to Westinghouse for further analysis of the microcracks and ligaments.

Table 4-1

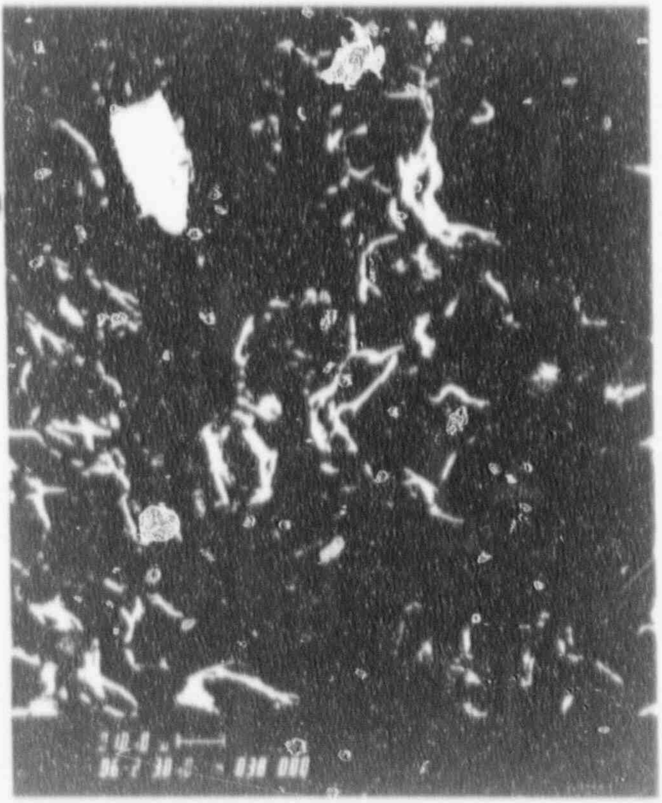
MONTAGE MEASUREMENTS

Tube	TSP	Max. Depth %	Average Depth %	Intergranular Burst Crack Length, in.*
['D'R12C8	1	92	38	Extent = 340°]
['D'R12C8	3	55	N/A	.75]
'C'R29C70	1	56	44	.29
	2	76	51	.62
	3	71	35	.45
'C'R30C64	1	55	40	.53
	2	64	53	.51
	3	50	34	.45
'D'R16C74	1	70	58	.56
	2	62	38	.30
	3	51	33	.25
'D'R20C66	1	80	45	.60
	2	58	47	.68
	3	58	44	.60
'D'R8C66	1	98	58	.83**
	2	75	44	.85**
	3	53	32	.50
'C'R8C69	1	98	72	.92***
	2	83	57	1.00
	3	81	51	.49
'C'R12C70	1	98	68	.92**
	3	63	43	.85

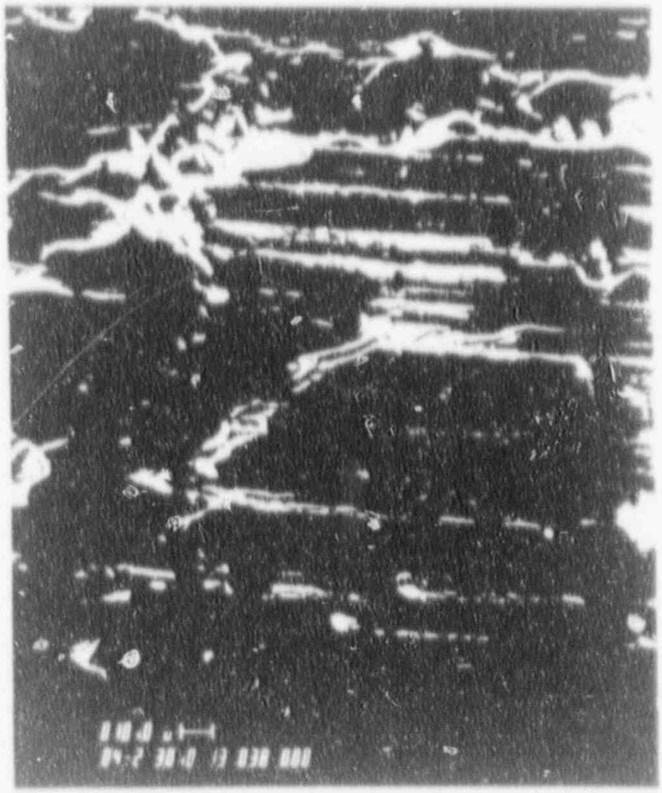
* - Direct measurements show the lengths to be conservative due to burst deformation.
** - Direct measurement shows pre-burst length does not exceed 0.75 inch.
*** - Section not available for direct measurement.
N/A - Not available as of 12/4/91.

96670 10X

96671 150X

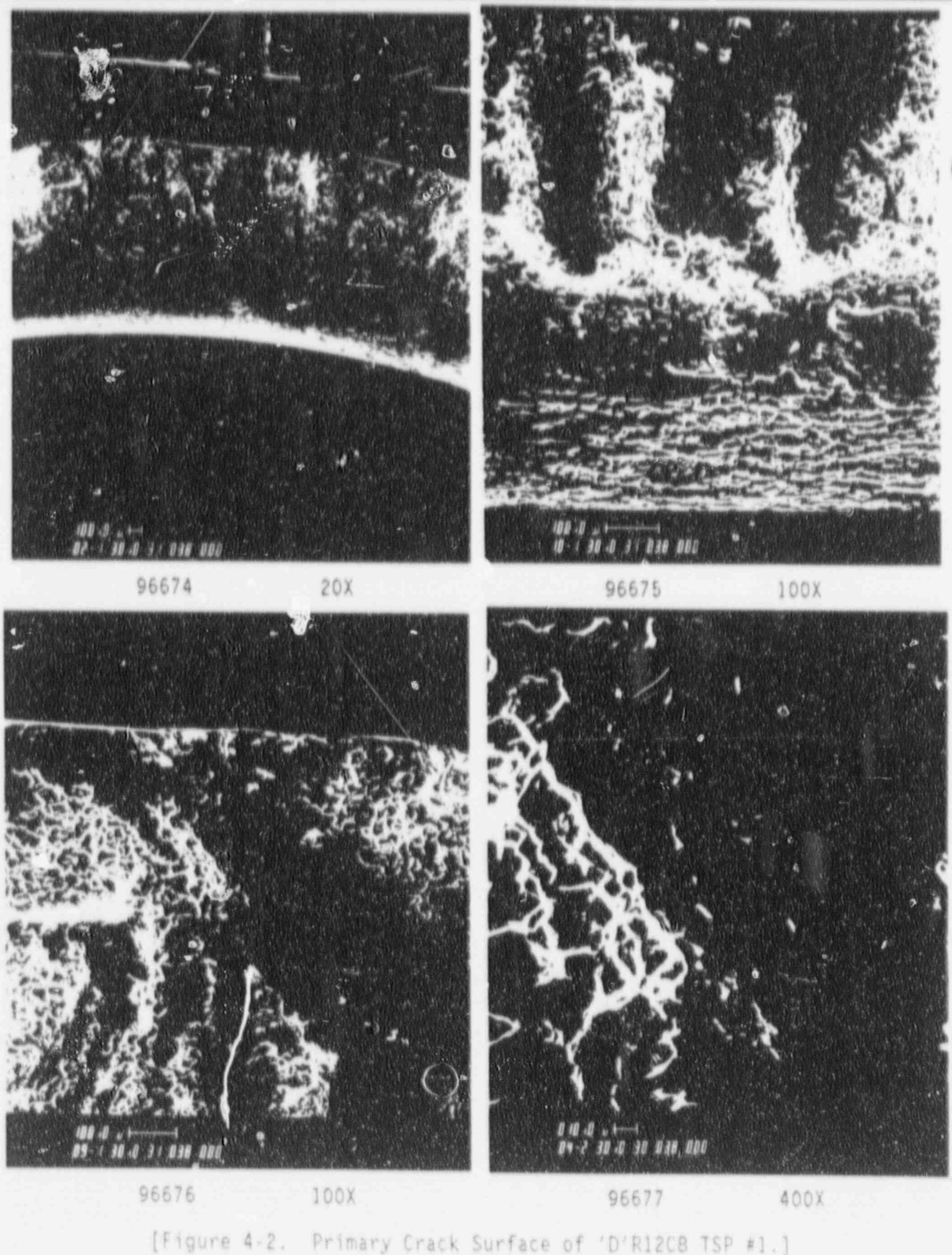


96672 580X



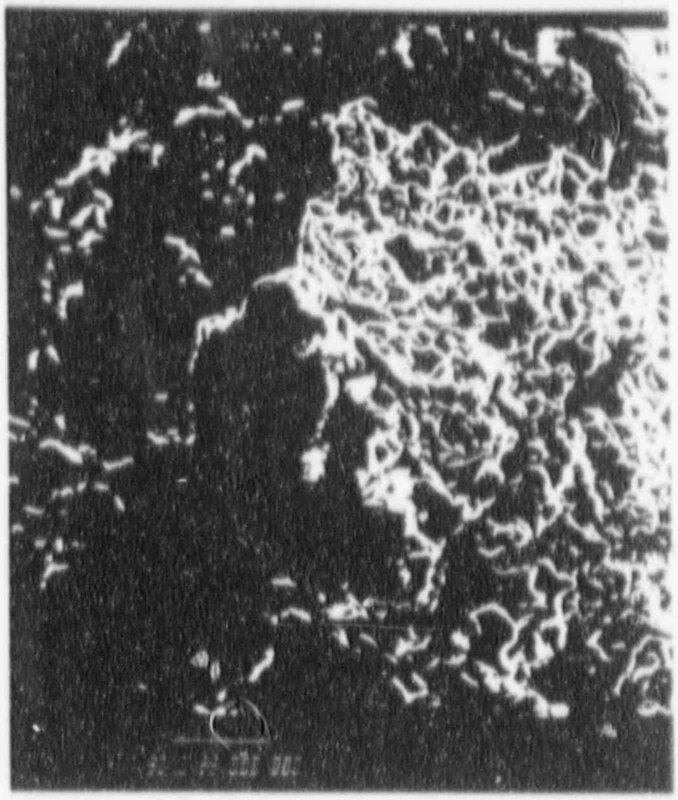
96673 410X

[Figure 4.1. OD Surface of D'R12C8 TSP #1.]

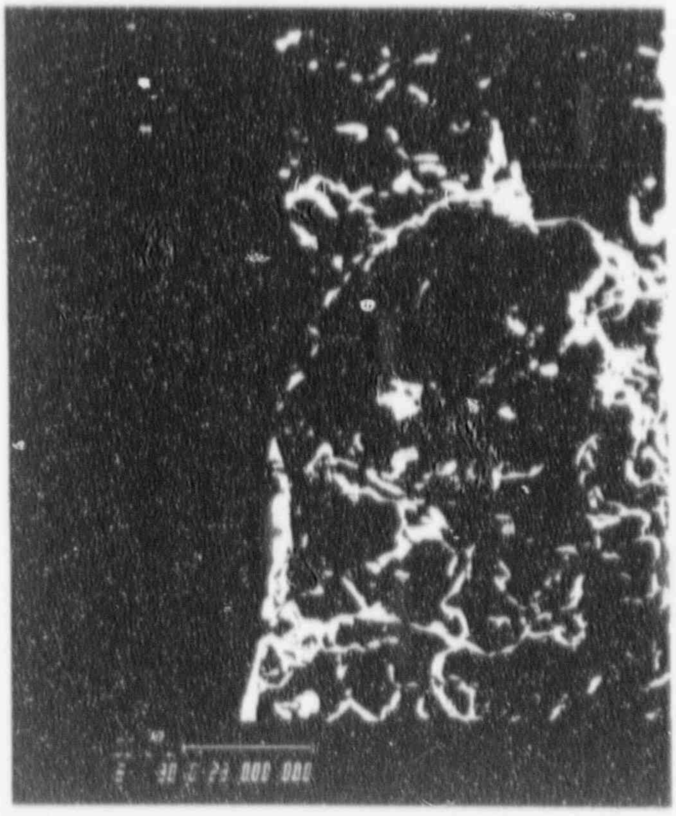


[Figure 4-2. Primary Crack Surface of 'D'R12C8 TSP #1.]

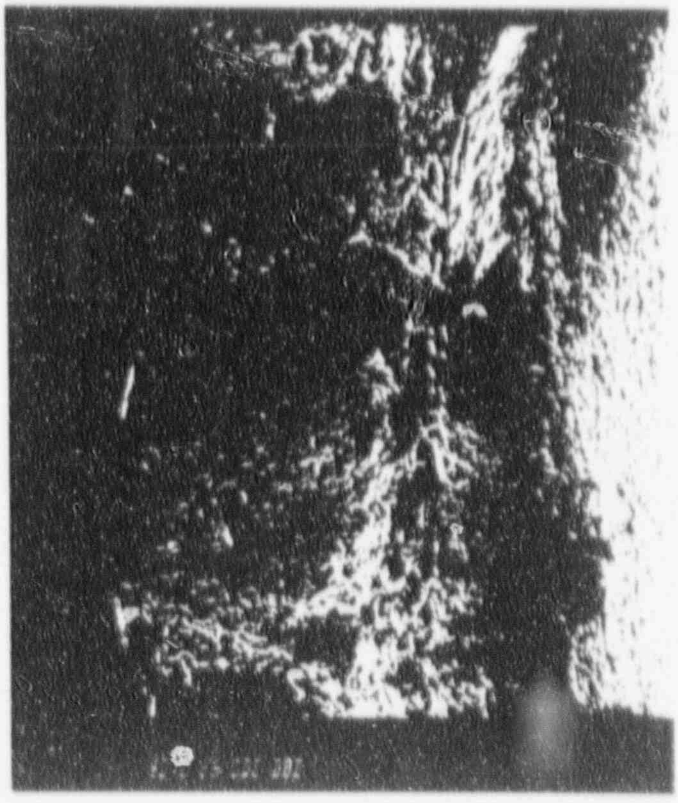
98372 20X



98373 130X

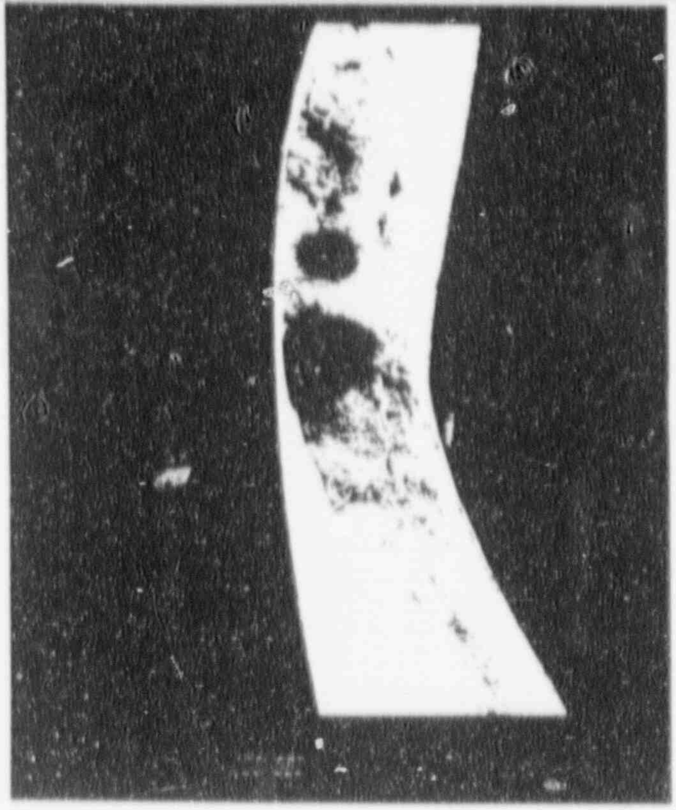


98375 180X

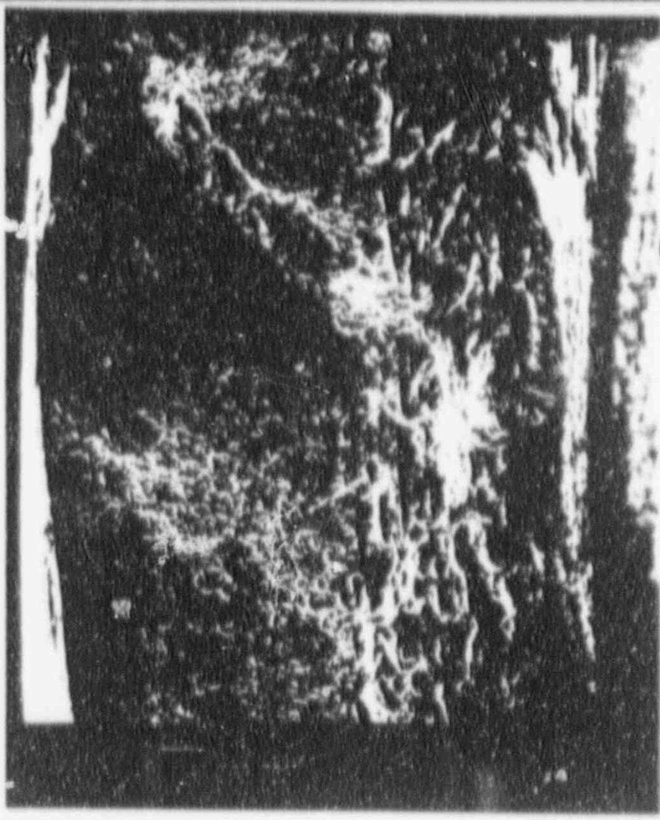


98376 50X

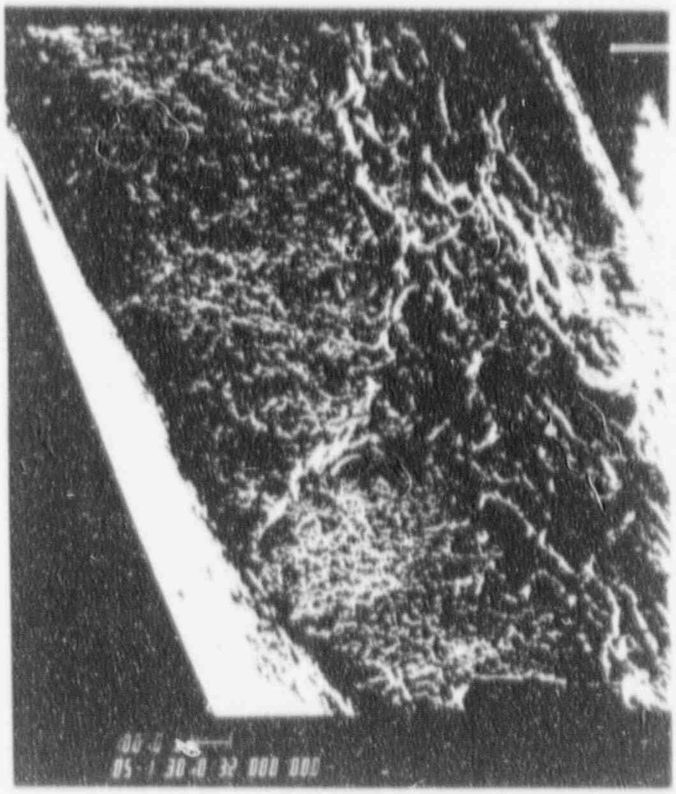
Figure 4-3. Burst Crack of 'C'R30C64 TSP #1.



98377 11X



98379 50X



98380 50X

Figure 4-4. Burst Crack of 'C'R29C70 TSP #3.

Section 5

METALLOGRAPHY

Metallographic examinations were performed on all the TSPs removed in 1991 [as well as on the first TSP of tube 'C'R25C58 which was removed and examined in 1986]. Metallography included studies of the degradation that occurred at the mid-plane of the TSP [and sequential elevation investigations of transverse and longitudinal mounts]. Information from the last 5 tubes of Table 1-1 is not available at the time this report was written and is not included. Preliminary investigations show it to be similar to the information presented in this section.

SAMPLE SELECTION

Transverse samples for examination of mid-support degredation were cut about 1/8 inch wide. From the mid-plane of the TSP they were cut 1/8 inch in the direction of greatst degradation. In the cases of ['D'R12C8 TSP #2], 'C'R29C70 TSP #1, 'C'R30C64 TSP #1 and #2 this meant that the direction of view was up. In the cases of ['D'R12C8 TSP #3,] 'C'R29C70 TSP #2 and #3, and 'C'R30C64 TSP #3, the direction viewed is down. ['D'R12C8 TSP #1 was not analyzed at the mid-plane by metallography since a montage of SEM photomicrographs had already been obtained, thus giving a good idea of the extent of tube degradation at that support]. Samples taken from the TSPs of 'C'R29C70 and 'C'R30C64 were in one piece but did not include the 1/4 inch wide section used in fractography. [Samples from the second and third TSPs of 'D'R12C8 represent the complete circumference, but those mounts were assembled from several pieces.]

Longitudinal sections have been taken from each of the TSPs of tubes 'C'R29C70 and 'C'R30C64, but have not yet been photographed. [Longitudinal and transverse sets of samples have been taken from the second and third TSPs of 'D'R12C8. Two sets were taken from the first TSP of 'D'R12C8. These sets were used in a sequential evaluation investigation.]

[A longitudinal mount of the first TSP of 'C'R25C58, representing a half cylinder extending from above the top of the TSP to below the bottom of the TSP, was recovered from storage. It was broken out of its old mounting material, which had shrank away from the edge of the sample, cut in half transversely and made into a longitudinal and a transverse mount. The longitudinal mount was investigated at one level while the transverse mount was investigated at four levels, .050 inches apart.]

PROCEDURES

All mounts were prepared following ASTM procedures. Mounting compounds were prepared according to the manufacturer's instructions. In most cases, glyceregia was used as the etchant. Glyceregia brings out cracks in the polished surface.

Photomontages of the [second and third TSPs of 'D'R12C8 and the] TSPs of 'C'R30C64 were made from the mid-TSP transverse mounts. Montages were not made of 'C'R29C70 TSPs because inspection showed that little degradation had occurred. The photomontages were done at either 45X or 50X, using Polaroid 52 film. After each photo was taken, it was pasted to poster board.

Depth of penetration measurements around the circumference of the mid-TSP mounts were made using a 10X filar eyepiece, which had been compared with calibrated dial calipers.

RESULTS

Depth of penetration measurements for all TSPs are shown in Figures 5-1 to 5-9. [In Figure 5-1 the data is taken from the SEM montage of the circumferential crack of 'D'R12C8 TSP #1. It is presented here for comparison. In this case the measurements were made every 10°.] In Figures 5-2 to 5-9, the depth of penetration represents the deepest penetration within each 10° increment. [Figure 5-3 shows that a small 10° section was not available at the mid-support plate plane. This is because the mid-support plate plane was reassembled from three samples used in other tests and cutting had resulted in loss of sample. Figure 5-3 also demonstrates that the deepest portion of the burst crack does not necessarily occur at the mid-support level.] The penetrations in tubes 'C'R29C70 and 'C'R30C64 were judged to be primarily intergranular stress corrosion cracks (IGSCC). [However, the penetrations in 'D'R12C8 were considered to be a mixture of mostly general IGA and fingers of IGA with a small amount of IGSCC. The penetrations in the second and third TSPs of 'D'R12C8 were characterized in greater detail, as is shown in Figures 5-10 and 5-11. In these figures, a finger was arbitrarily considered to be IGA that was one to five grains wide. Zero grains wide was considered a crack and general IGA was greater than five grains wide. Only penetrations greater than 15% throughwall were characterized in detail. 50 penetrations were identified in the 2nd TSP and 85 in the 3rd. All penetrations were associated with one form of IGA or the other and penetrations less than 15% throughwall were observed to be mostly general IGA. Only one significant IGSCC crack (>20% TW) was identified.] Table 5-1 summarizes the number of cracks or penetrations counted at the mid-support plane. Figures 5-12 through 5-17 present examples of the cracking found on 'C'R29C70 and 'C'R30C64.

[Sets of longitudinal and transverse sections were examined at sequential levels approximately .025" apart. Table 5-2 summarizes the levels that were investigated. Figure 5-18 presents an example of how degradation changes from level to level. Both long and short axial penetrations are evident. Figures 5-19 through 5-21 present examples of IGA and IGSCC at the three support plates of 'D'R12C8.]

[Longitudinal and transverse mounts of the first TSP of 'C'R25C58 were also inspected. The transverse mount was inspected at four elevations, spaced .050 inches apart, without etching the second and third levels. In no case were any penetrations observed. Figure 5-22 presents views of 'C'R25C58 TSP #1.]

Table 5-1

NUMBER OF CRACKS AT MID-TSP

Tube	TSP	Number of Cracks
['D'R12C8	1	Estimated at 400]
['D'R12C8	2	50]
['D'R12C8	3	85]
'C'R29C70	1	2-3
'C'R29C70	2	5
'C'R29C70	3	4
'C'R30C64	1	29
'C'R30C64	2	About 85
'C'R30C64	3	About 30

[Table 5-2]

SEQUENTIAL GRINDS INVESTIGATED FOR 'D'R12CB

		Depth (mils)							
TSP #	Direction	0	25	50	75	100	125	150	175
1	Transverse-Sample A	X	X	X	X	X	X	X	X
1	Longitudinal-Sample A	X	X	X	X	X			
1	Transverse-Sample B	X	X	X	X	X	X	X	X
1	Longitudinal-Sample B	X	X	X	X	X	X		
2	Transverse	X	X	X	X	X			
2	Longitudinal	X	X	X	X	X			
3	Transverse	X	X	X	X	X	X	X	X
3	Longitudinal	X	X	X	X				

Figure 5-1. 'D'R12C8 TSP #1 Degradation

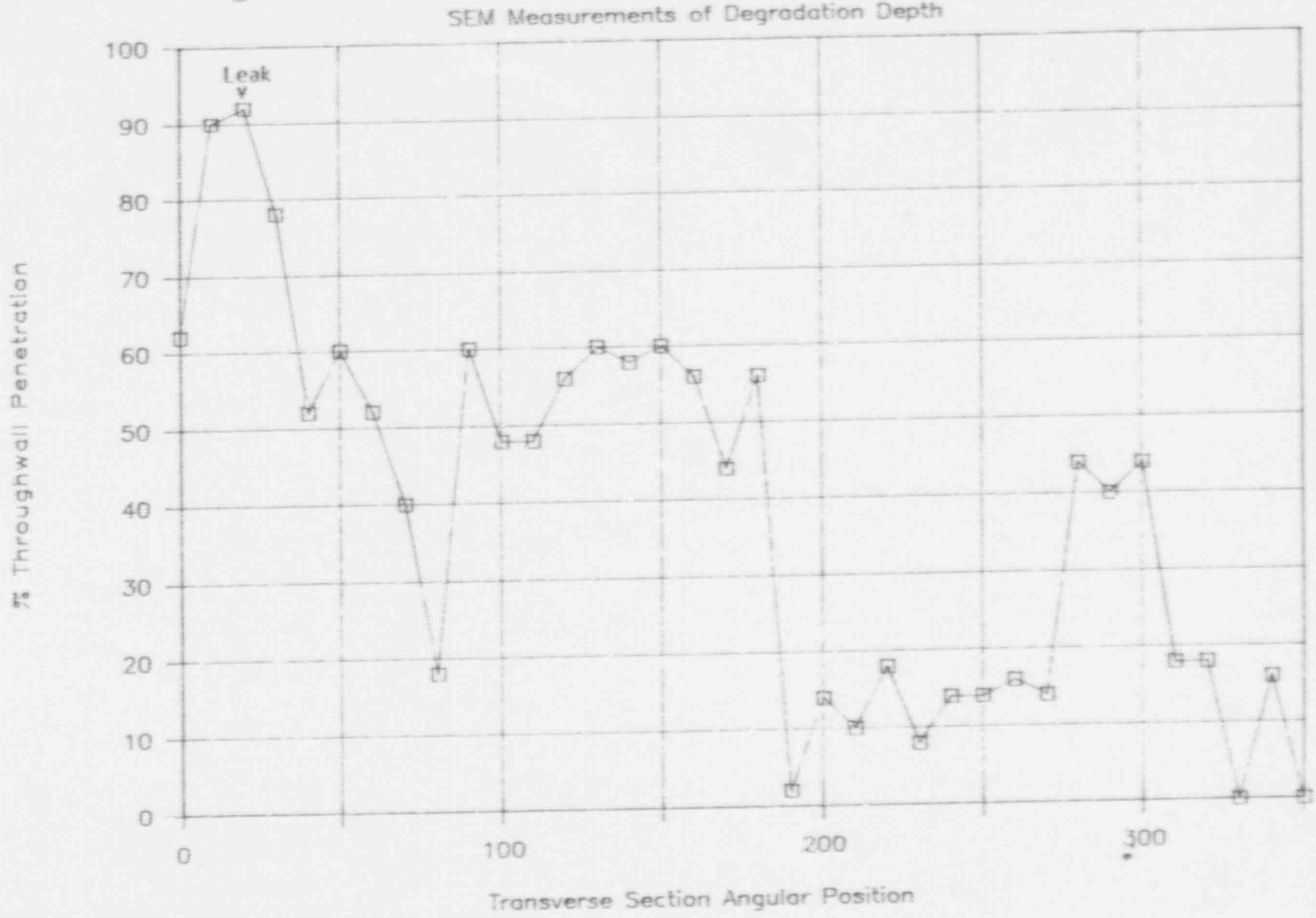


Figure 5-2. 'D'R12C8 TSP#2 Degradation

Optical Measurements of IGSCC/IGA Depth

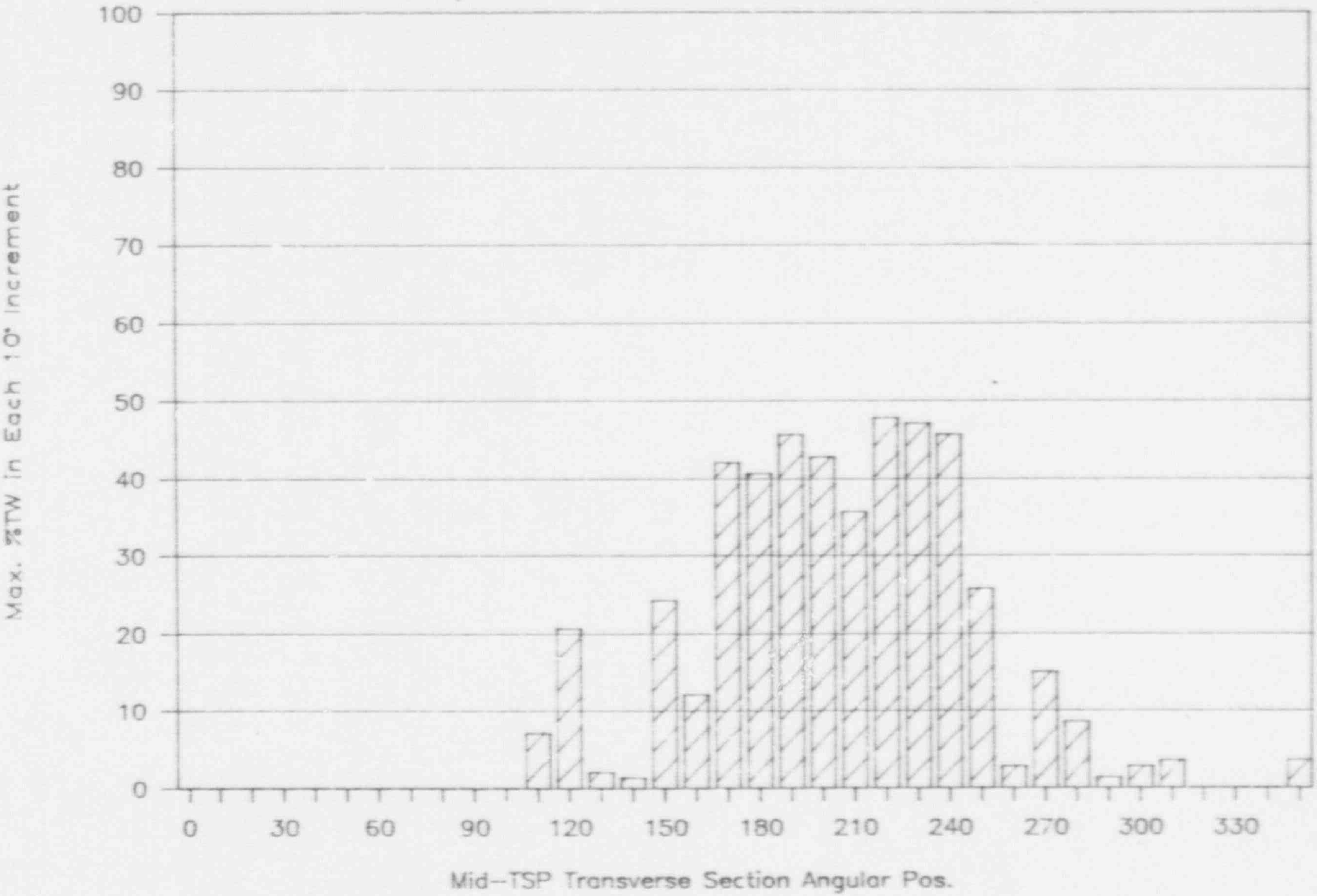


Figure 5-3. 'D'R12C8 TSP#3 Degradation

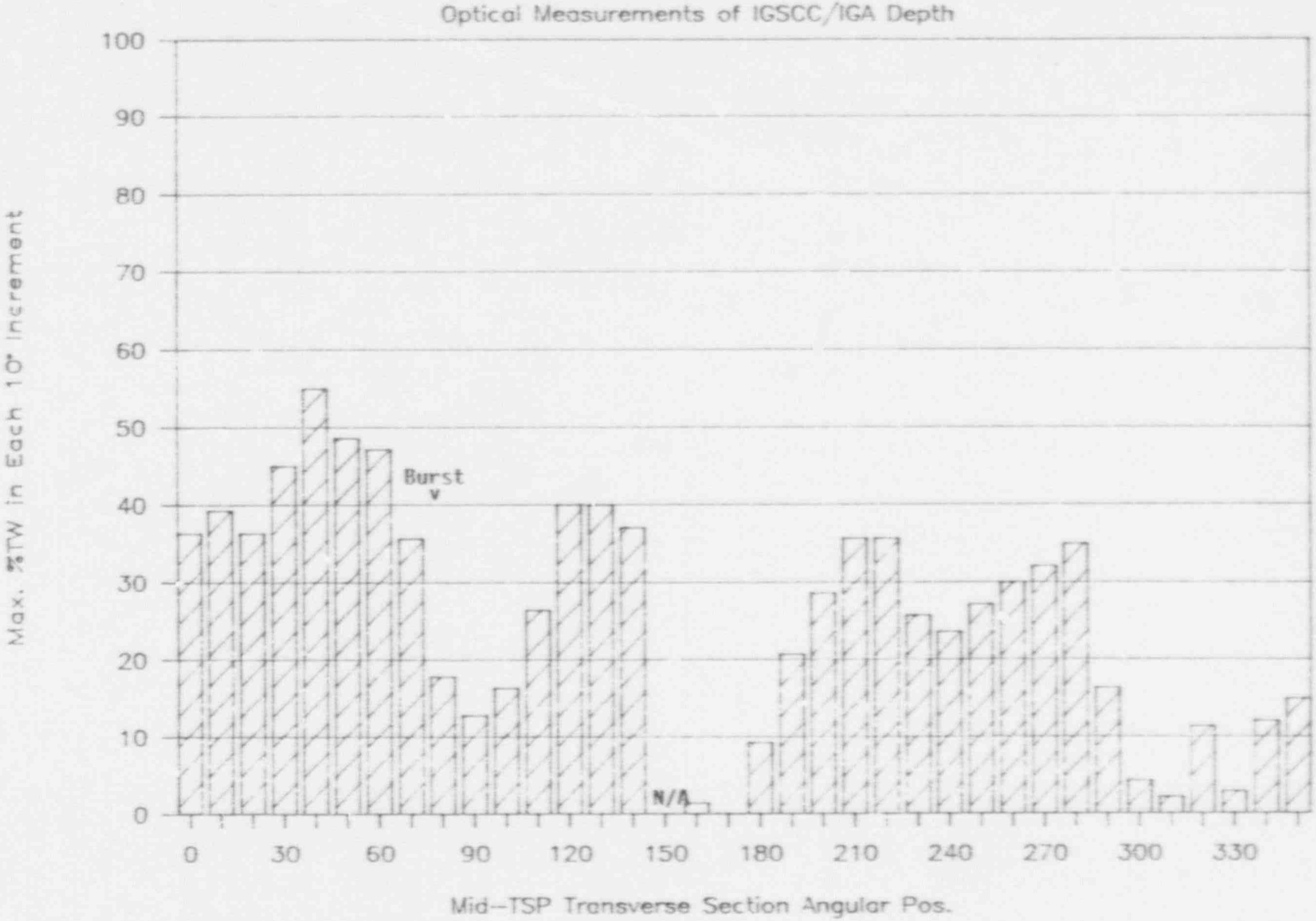


Figure 5-4. 'C'R29C70 TSP#1 Degradation

Optical Measurements of IGSCC/IGA Depth

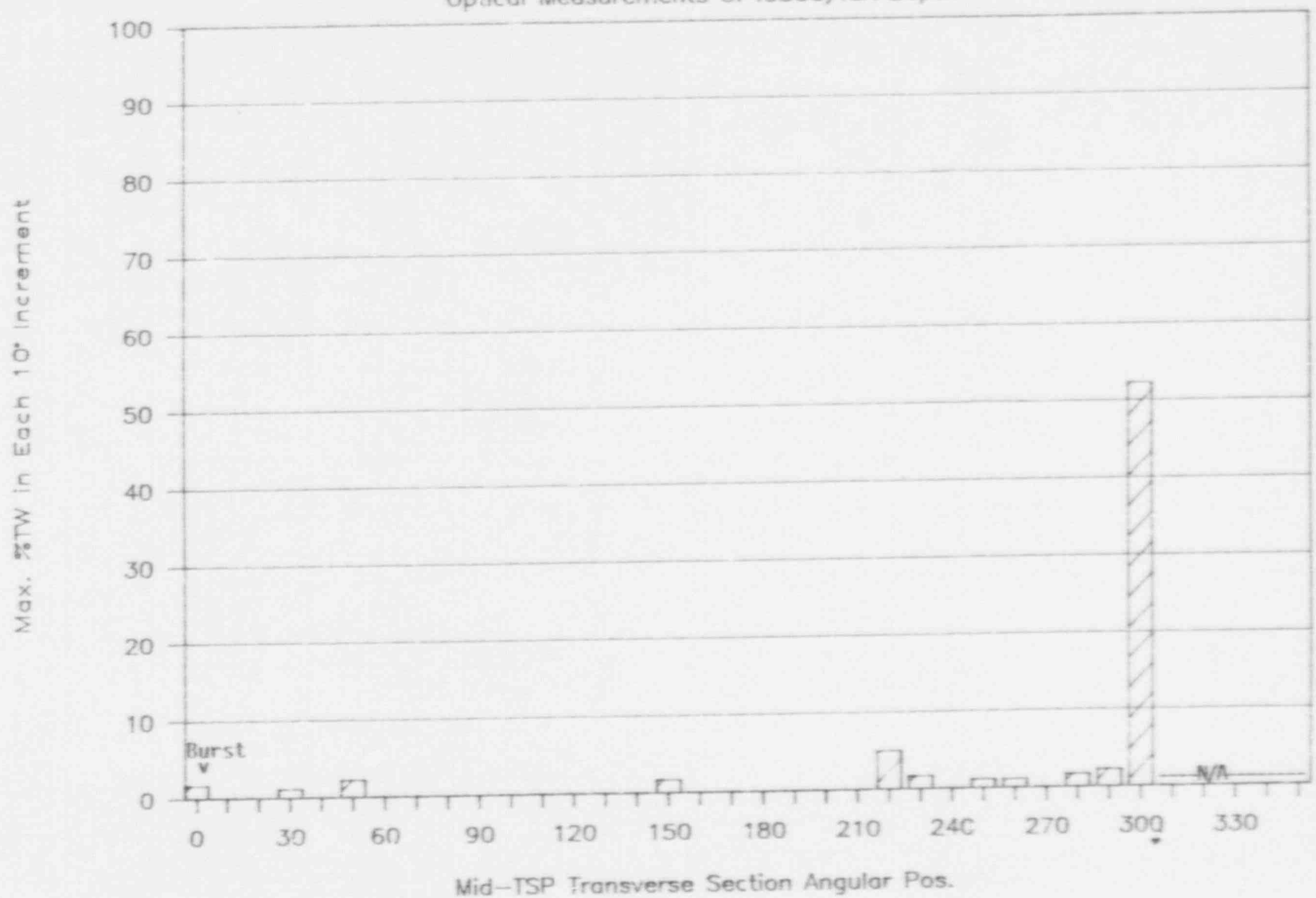


Figure 5-5. 'C'R29C70 TSP#2 Degradation

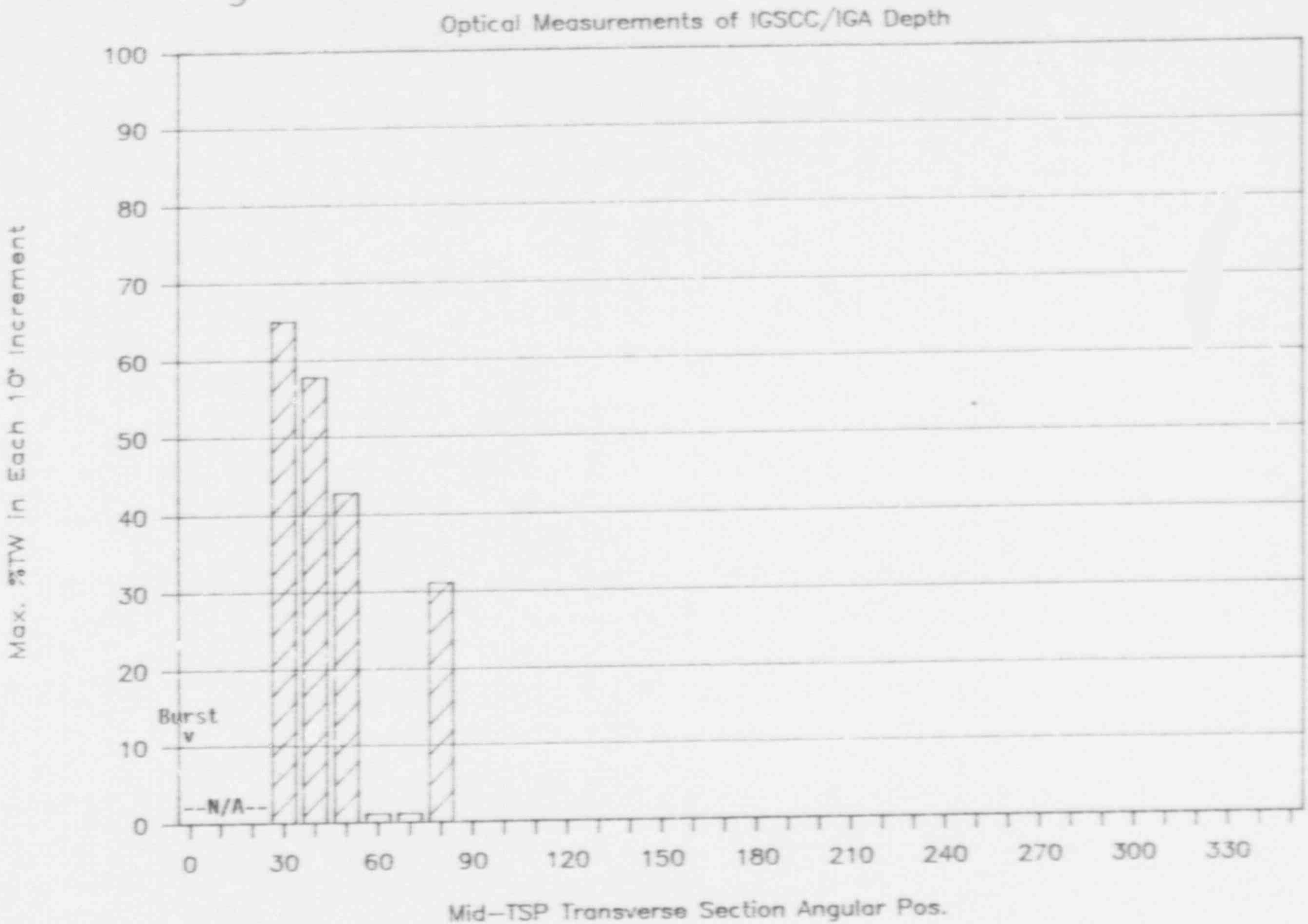


Figure 5-6. 'C'R29C70 TSP#3 Degradation

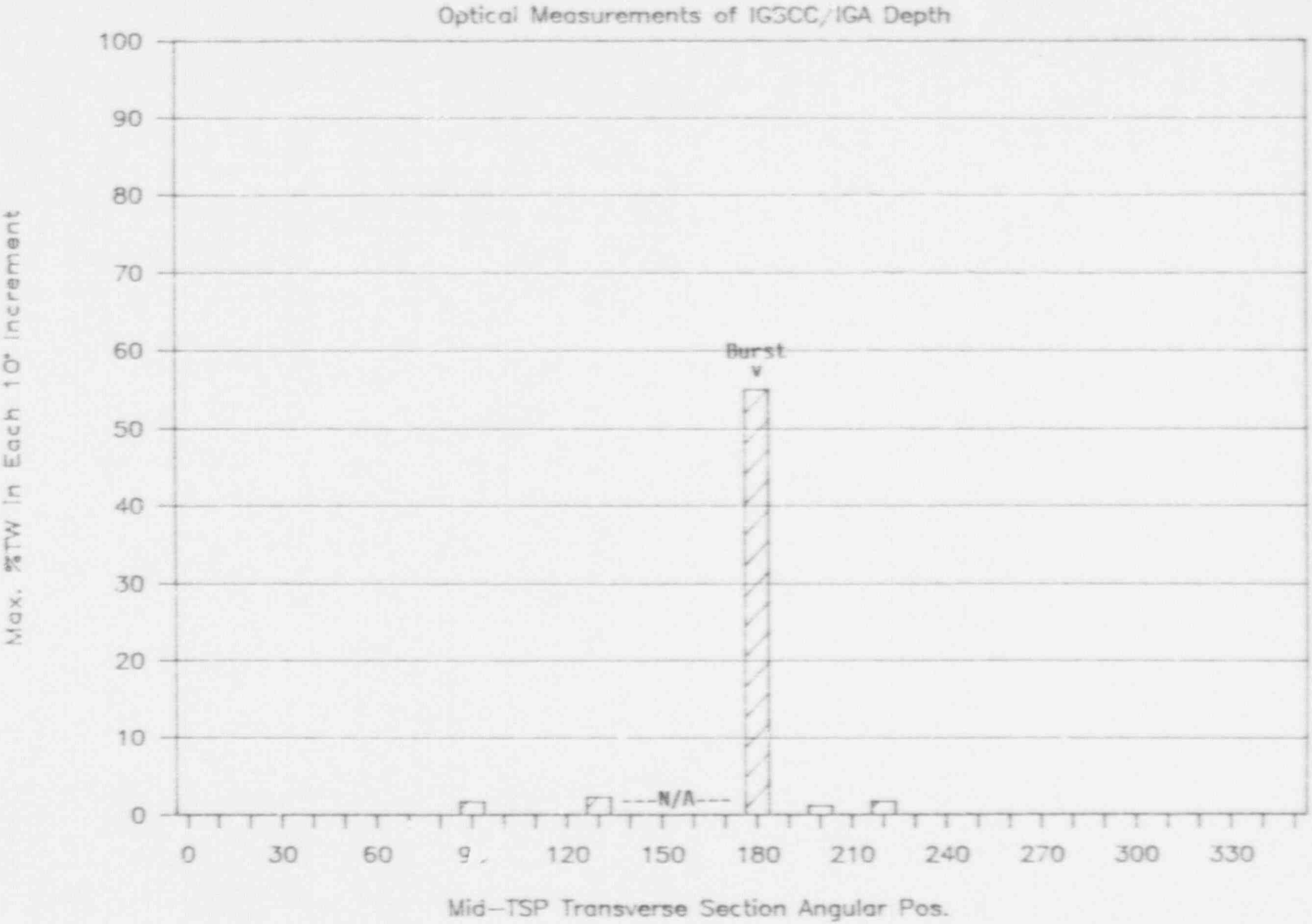


Figure 5-7. 'C'R30C64 TSP#1 Degradation

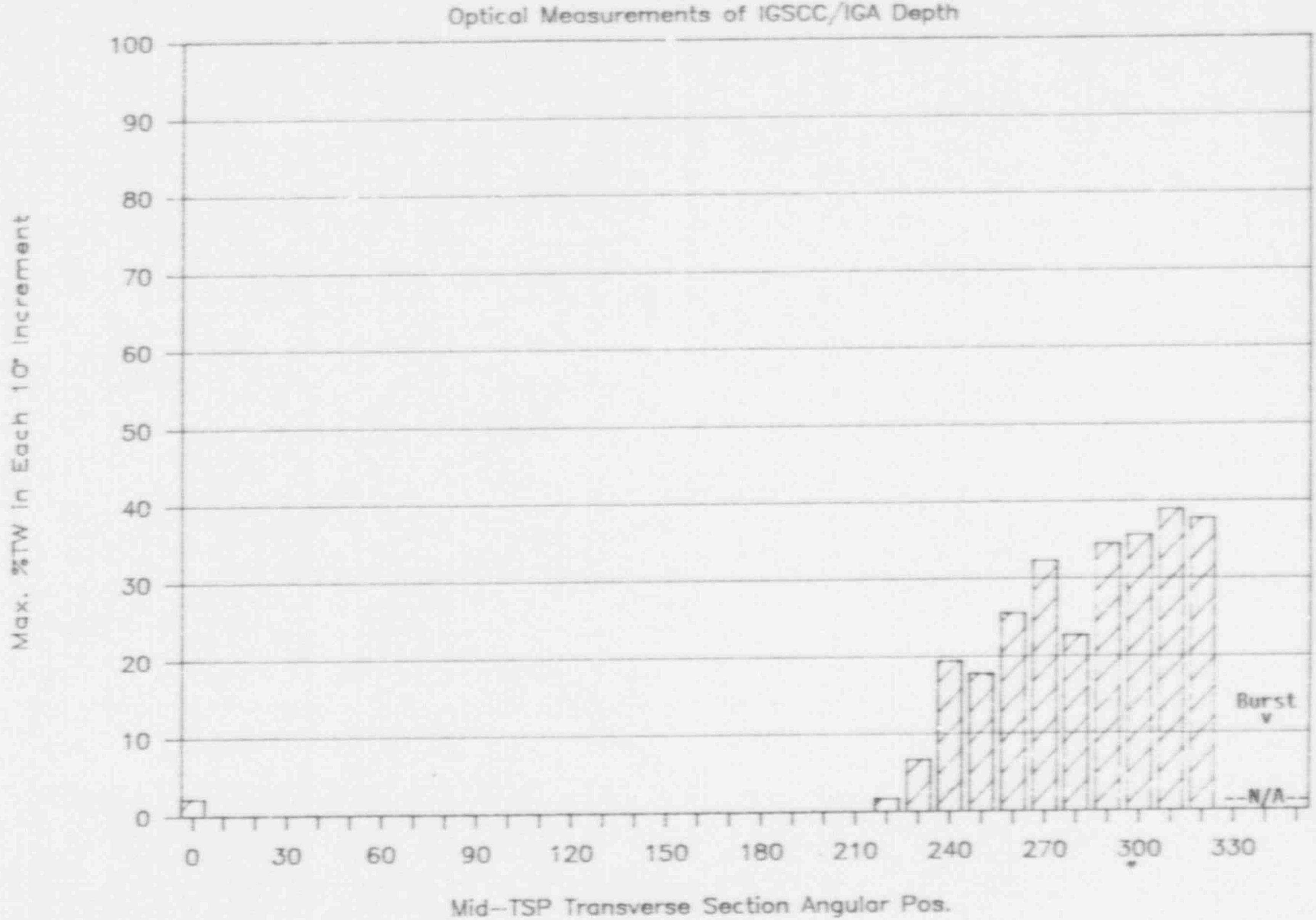


Figure 5-8. 'C'R30C64 TSP#2 Degradation

Optical Measurements of IGSCC/IGA Depth

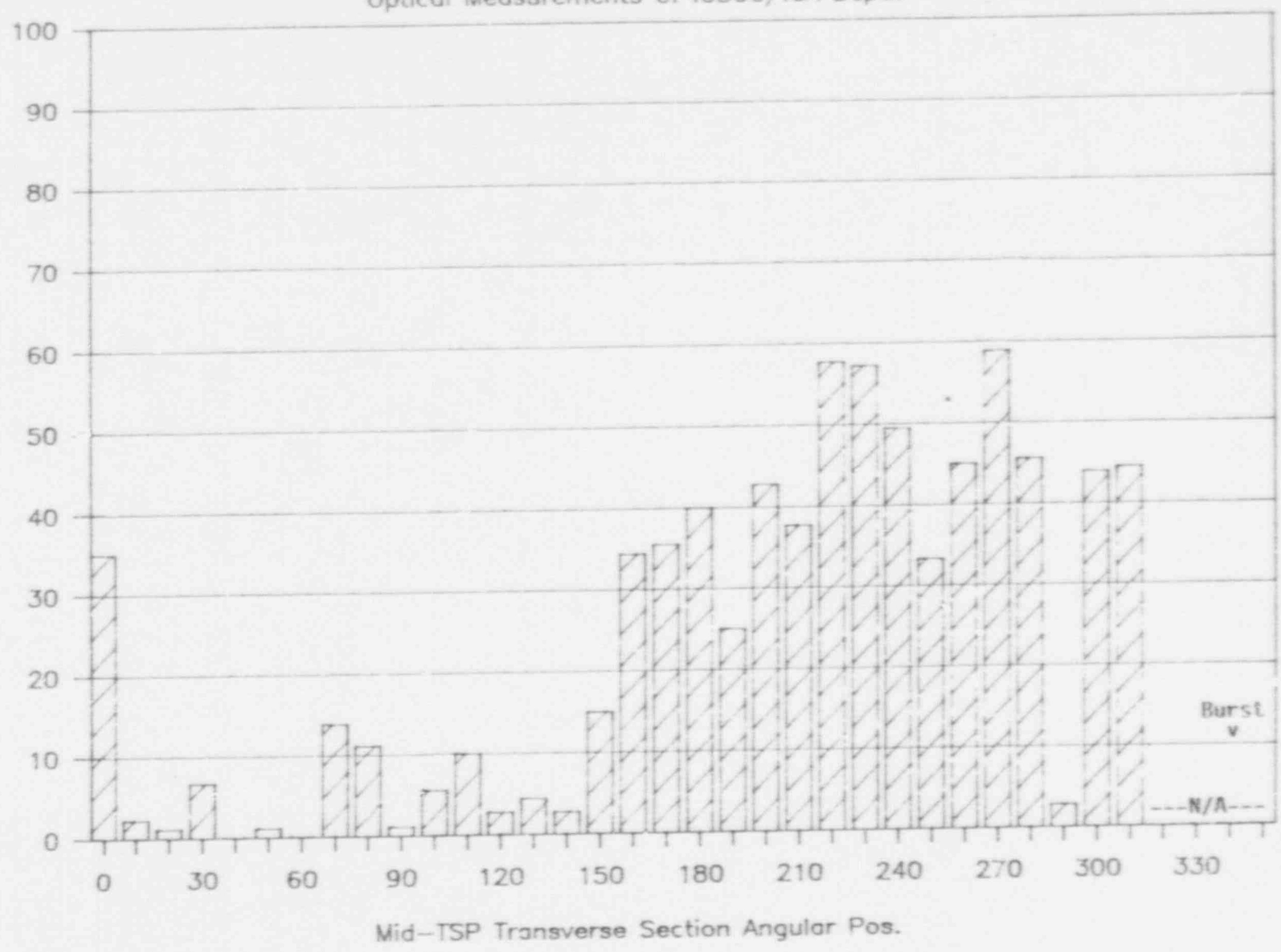


Figure 5-9. 'C'R30C64 TSP#3 Degradation

Optical Measurements of IGSCC/IGA Depth

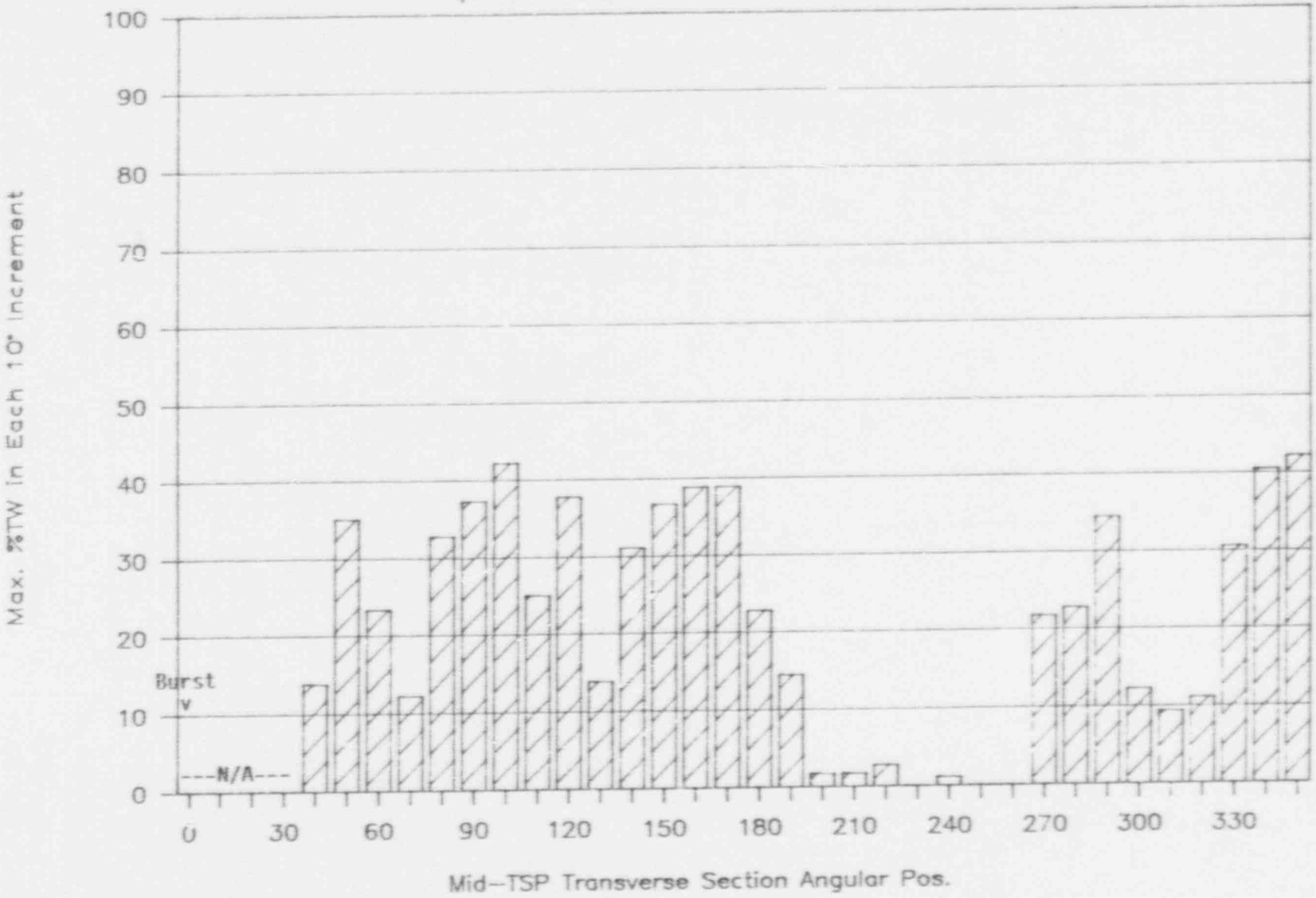


Fig 5-10. Penetration Characterization

Tube 'D'R12C8 TSP #2

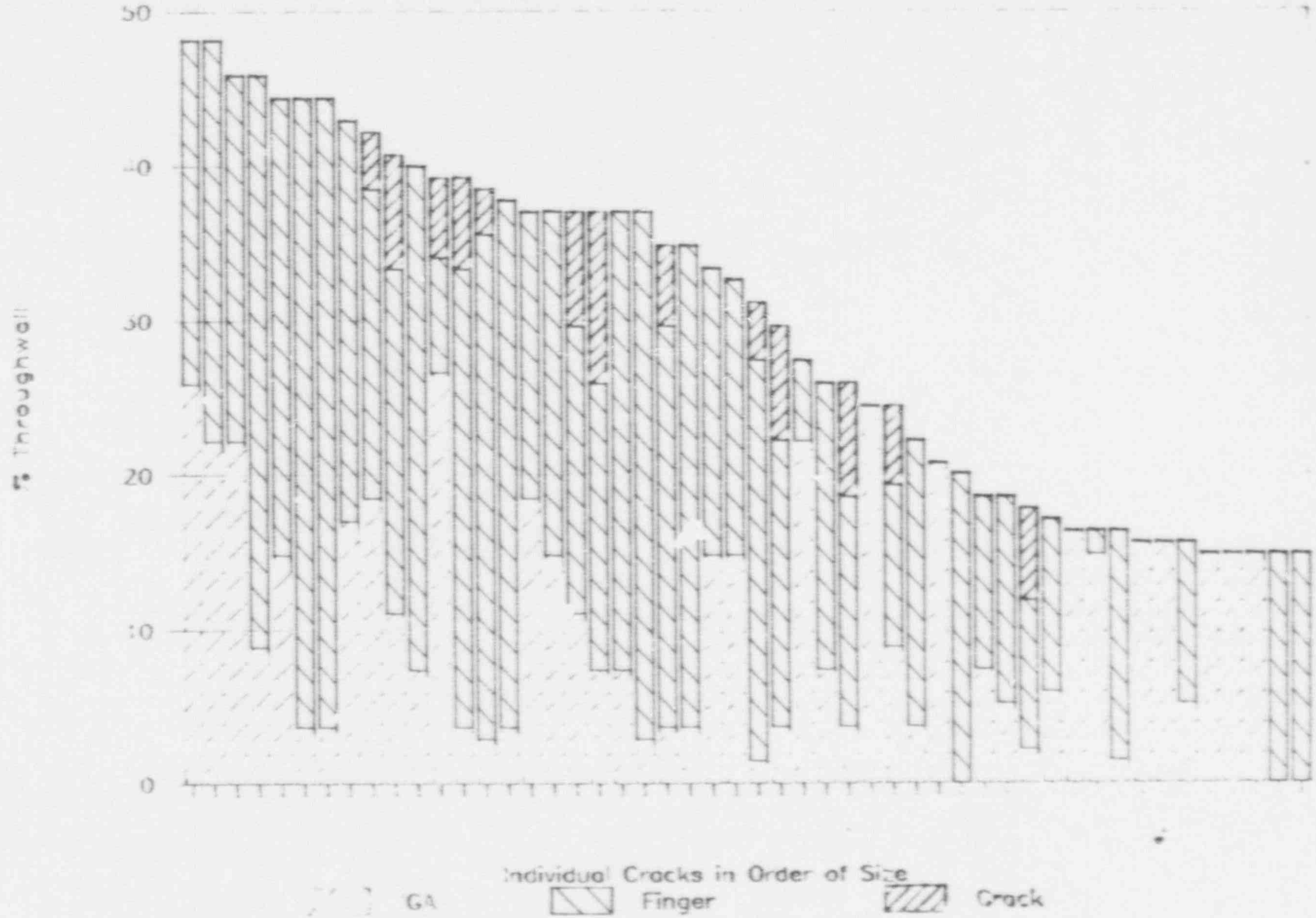
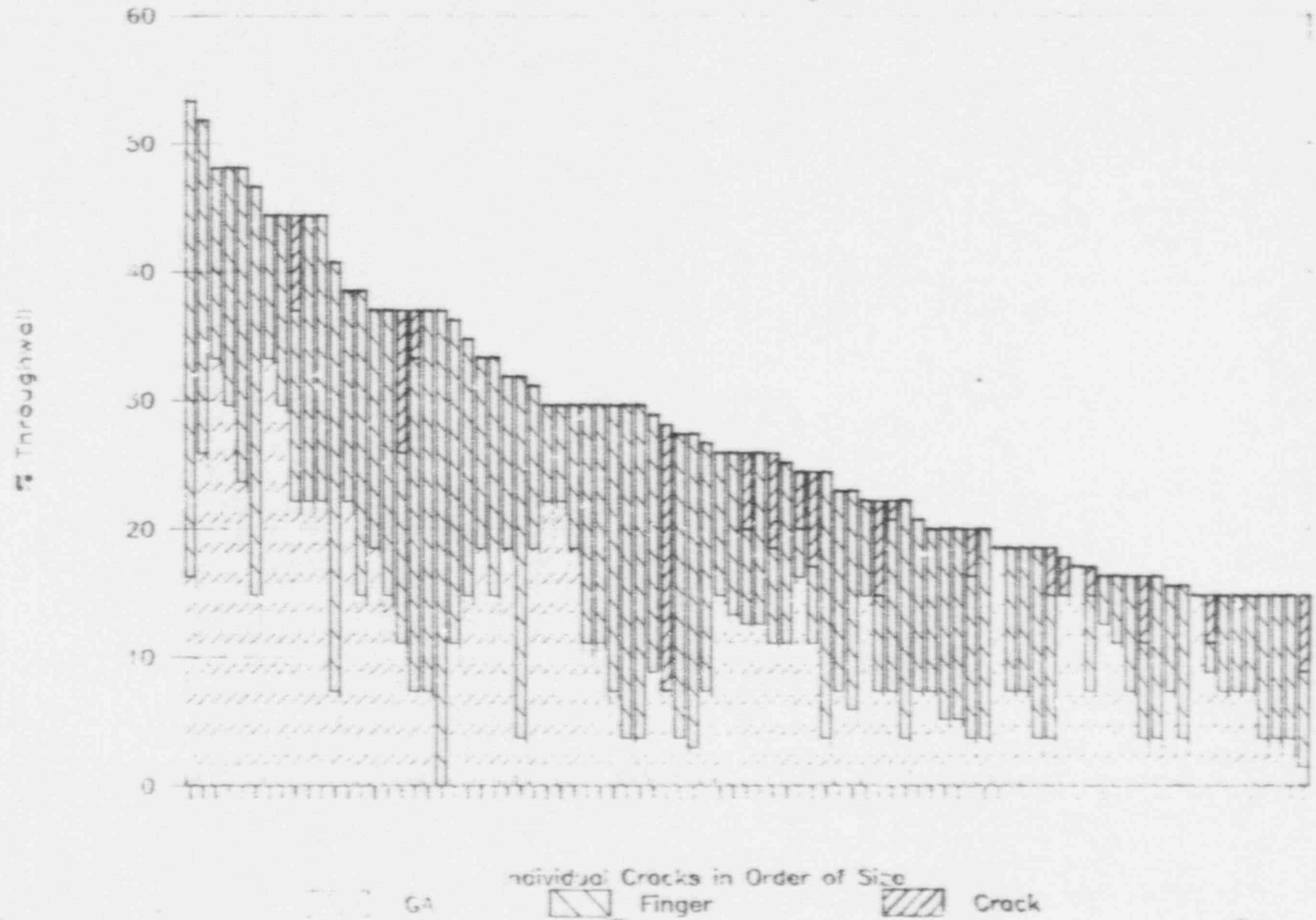


Fig 5-11. Penetration Characterization

Tube 'D'R12C8 TSP #3



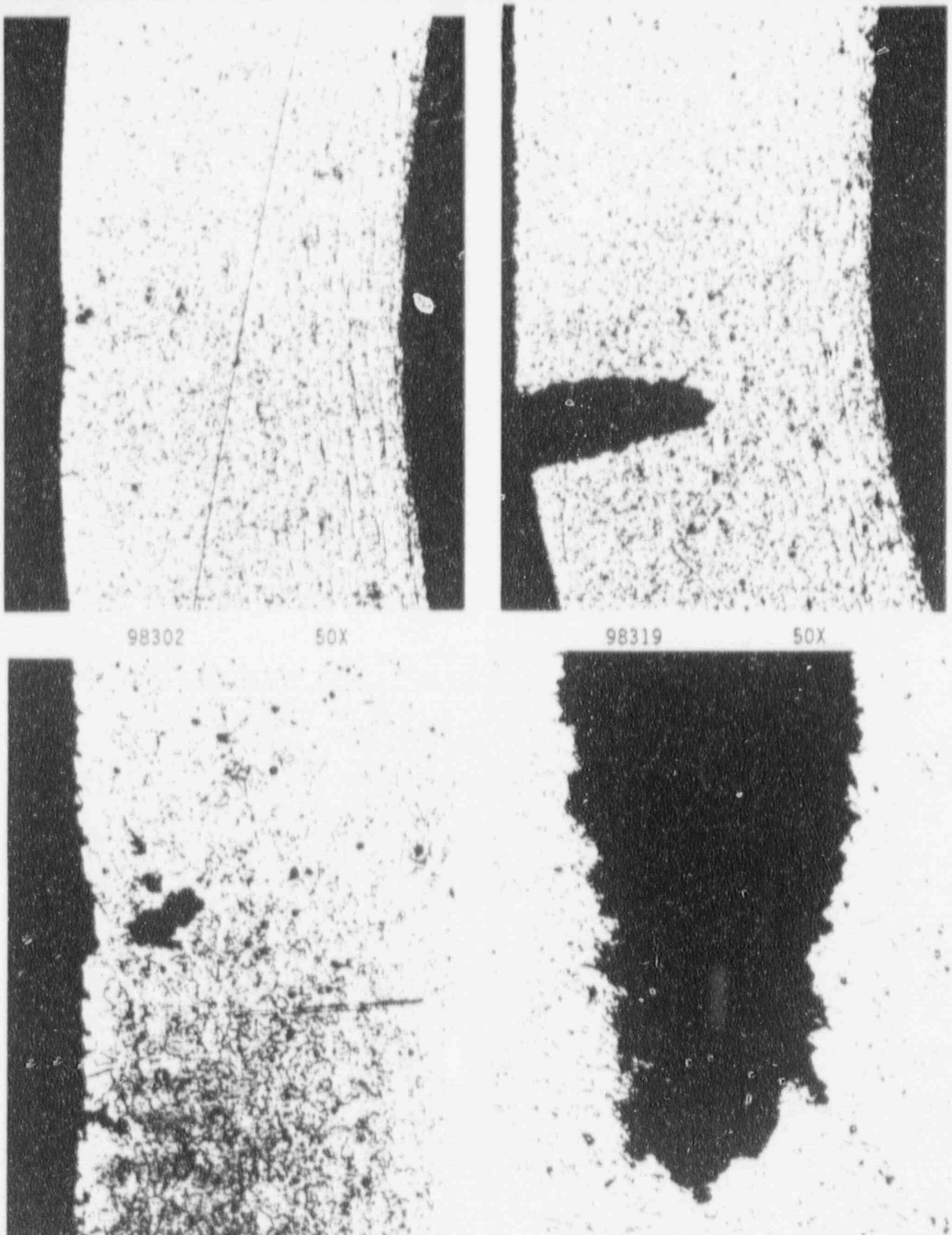


Figure 5-12. Transverse View of 'C'R29C70 TSP #1 Cracking.

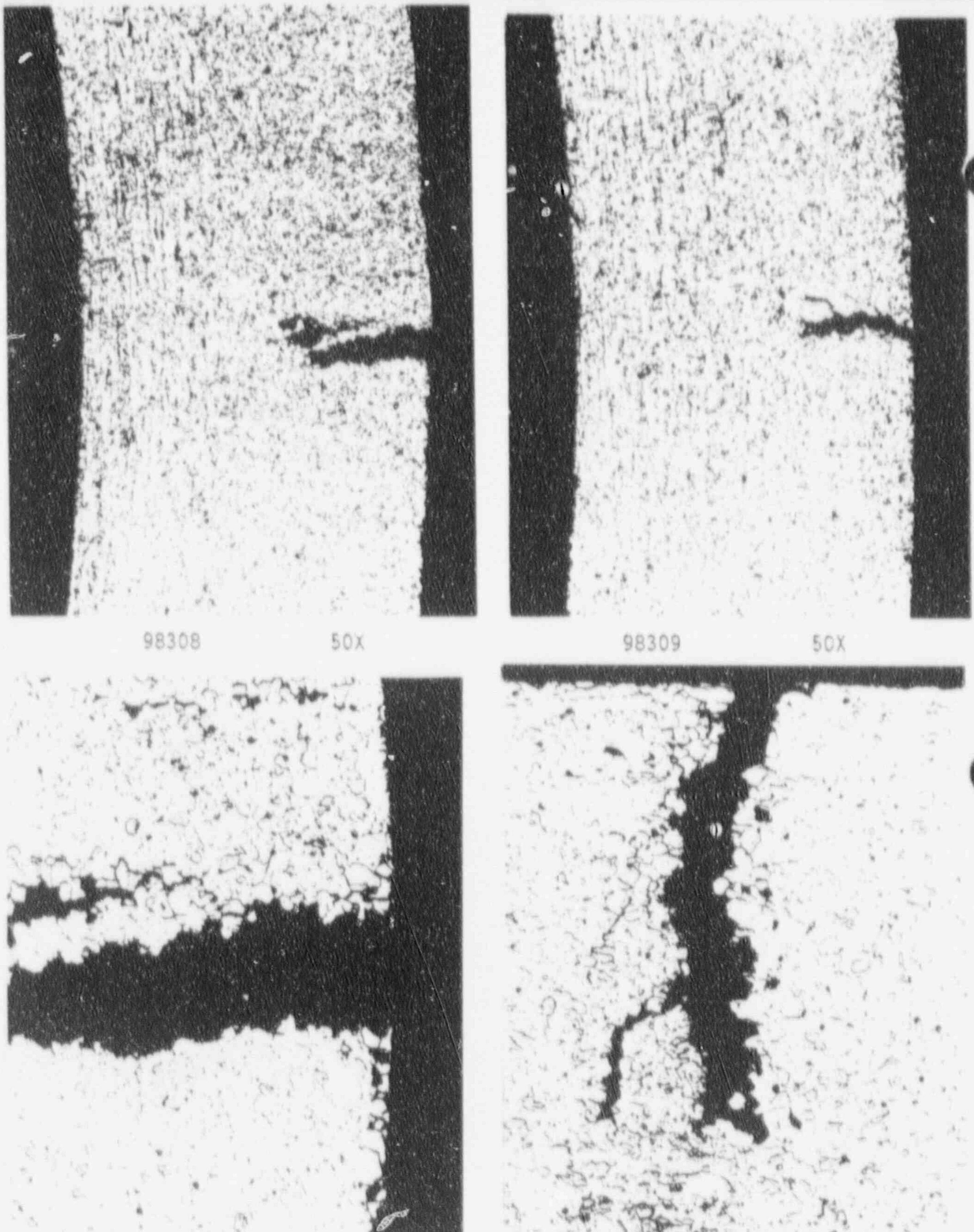


Figure 5-13. Transverse View of 'C'R29C70 TSP #2 Cracking.

98322 50X

98320 200X

98315 200X

98316 200X

Figure 5-14. Transverse View of 'C'R29C70 TSP #3 Cracking.

98404 200X

98405 200X

98406 200X

98407 200X

Figure 5-15. Transverse View of 'C'R30C64 TSP #1 Cracking.

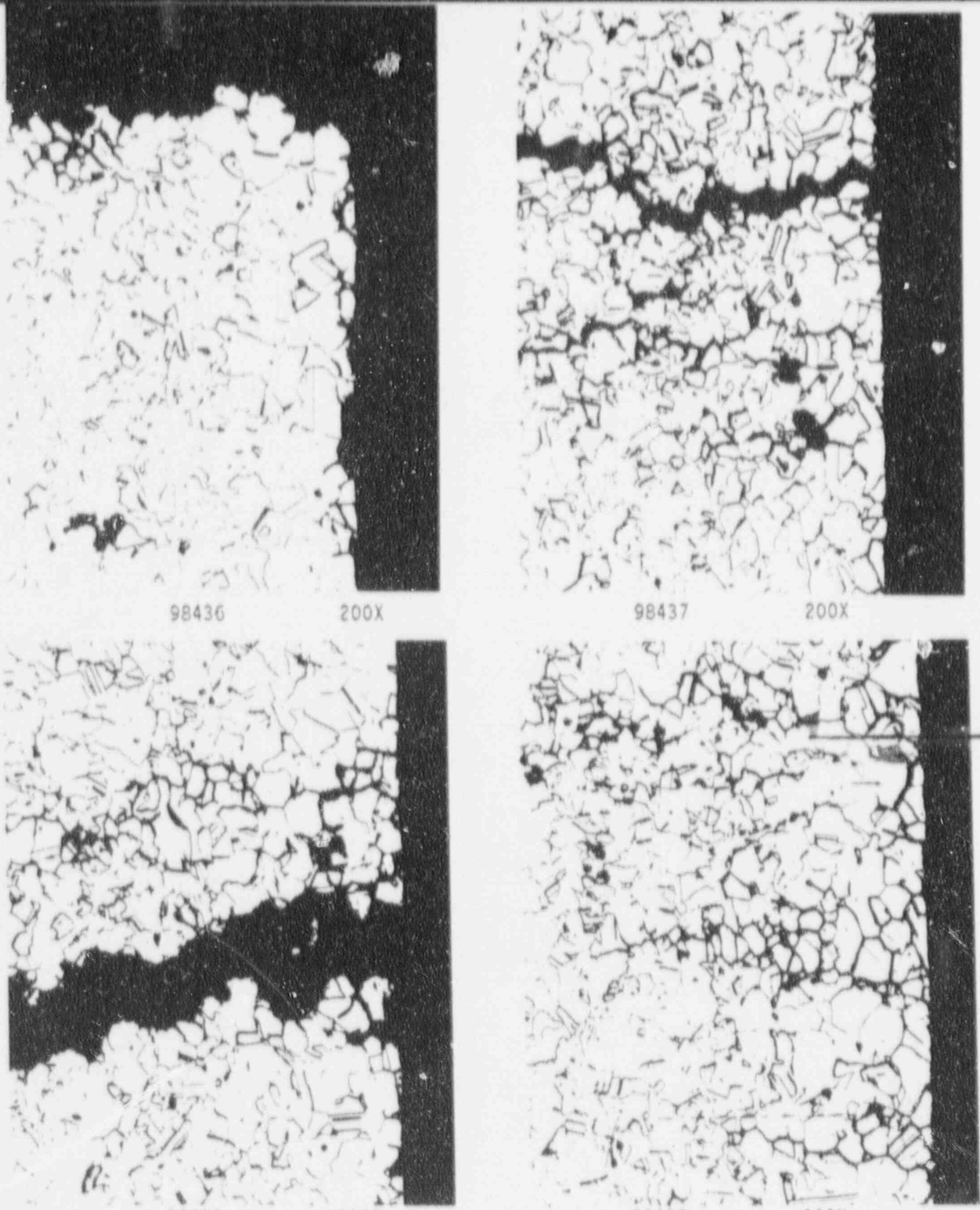
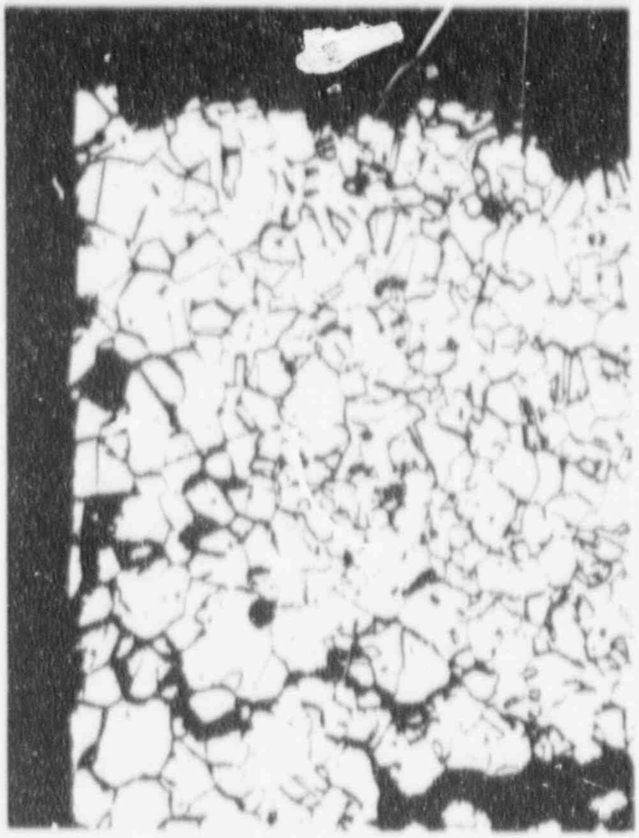
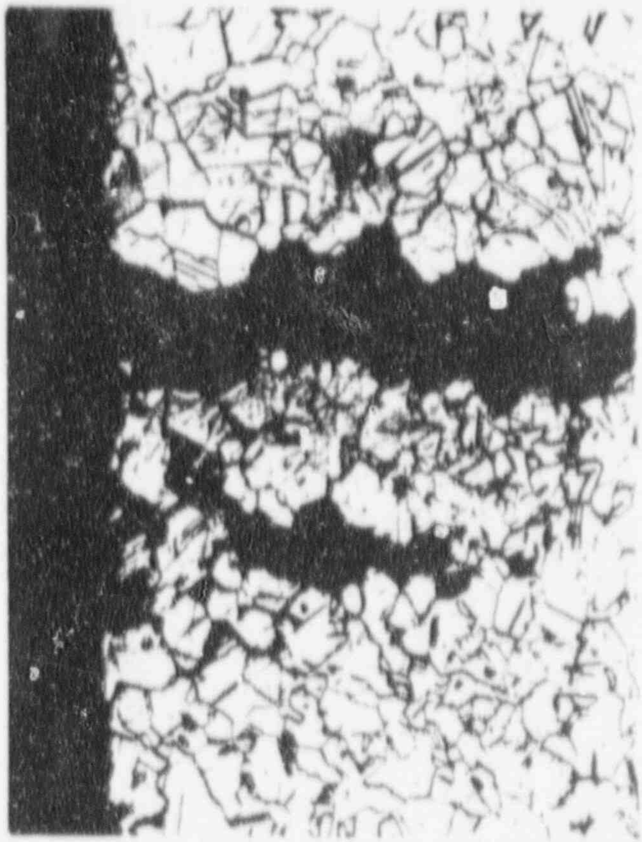


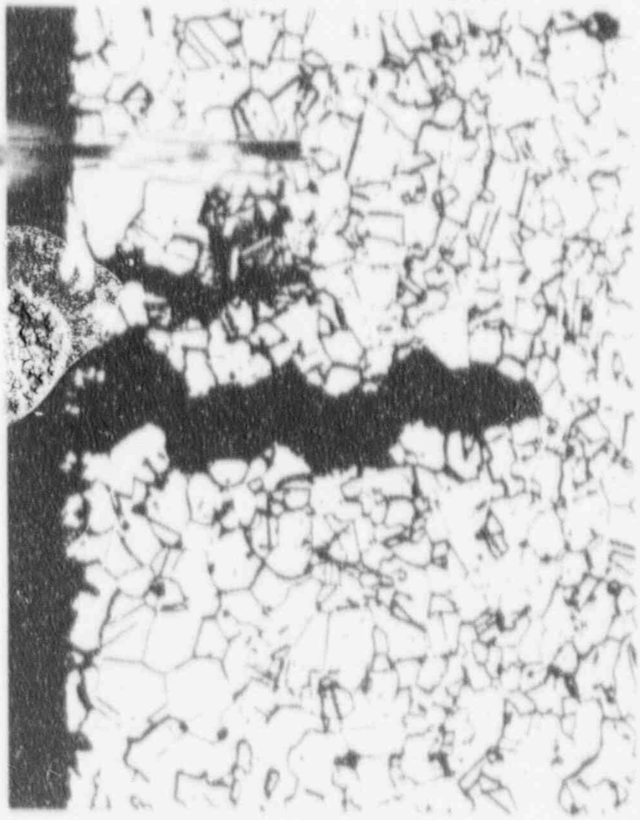
Figure 5-16. Transverse View of 'C'R30C64 TSP #2 Cracking.



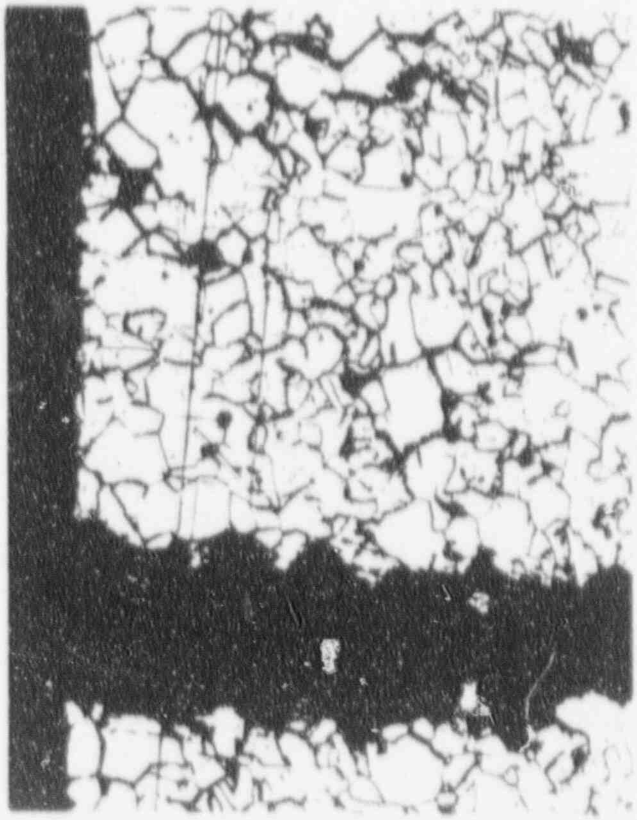
98432 200X



98433 200X

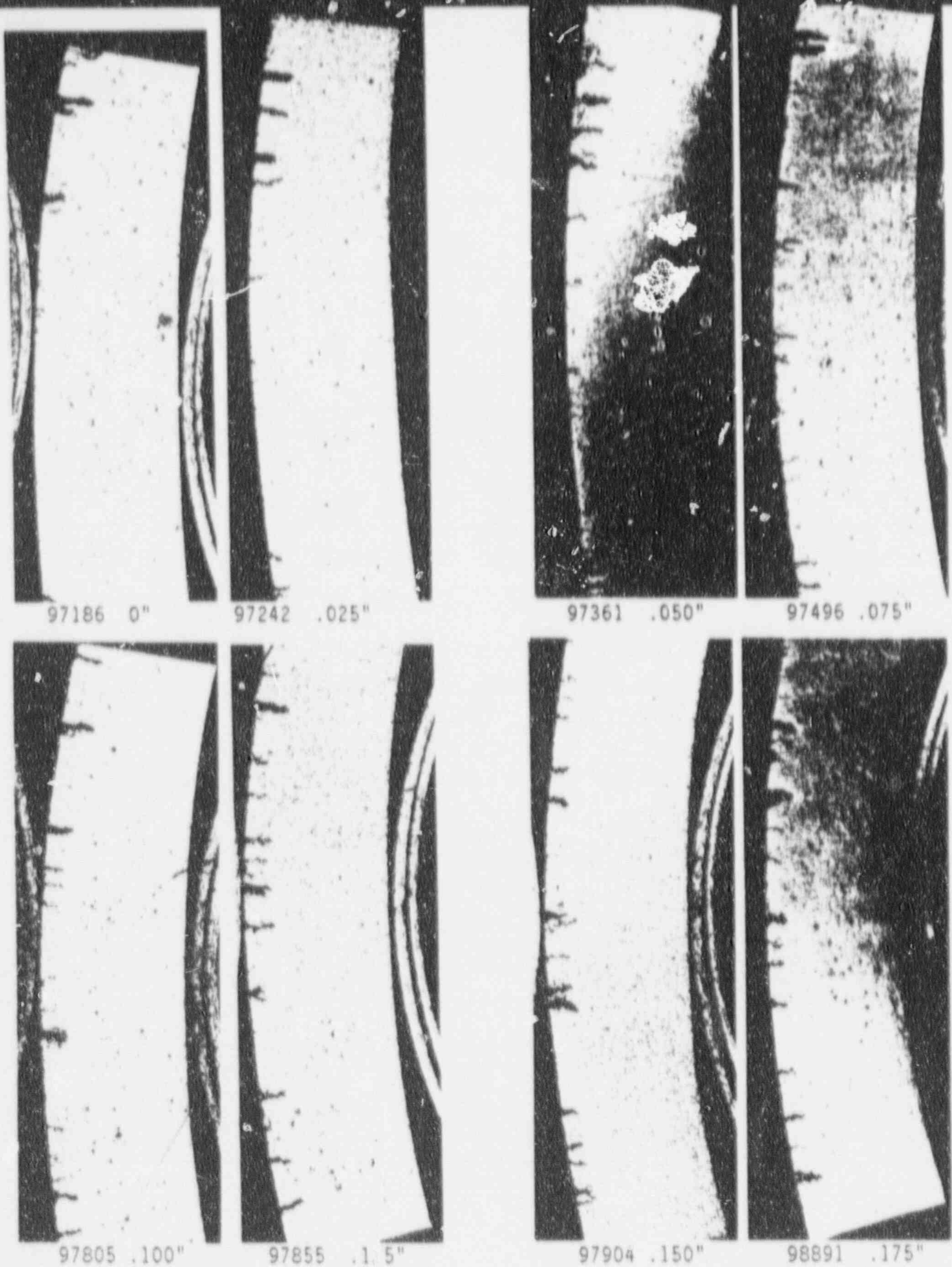


98434 200X

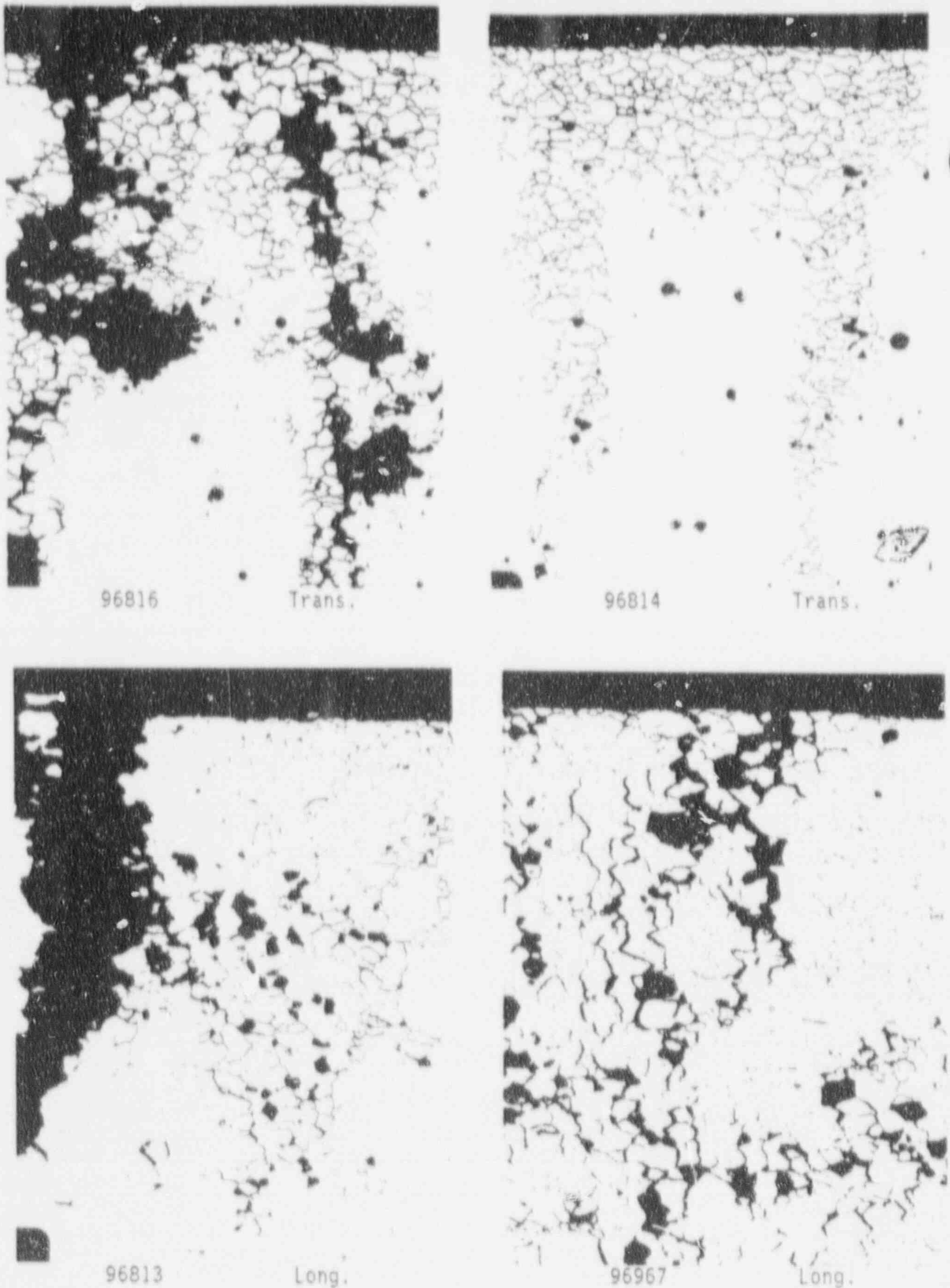


98435 200X

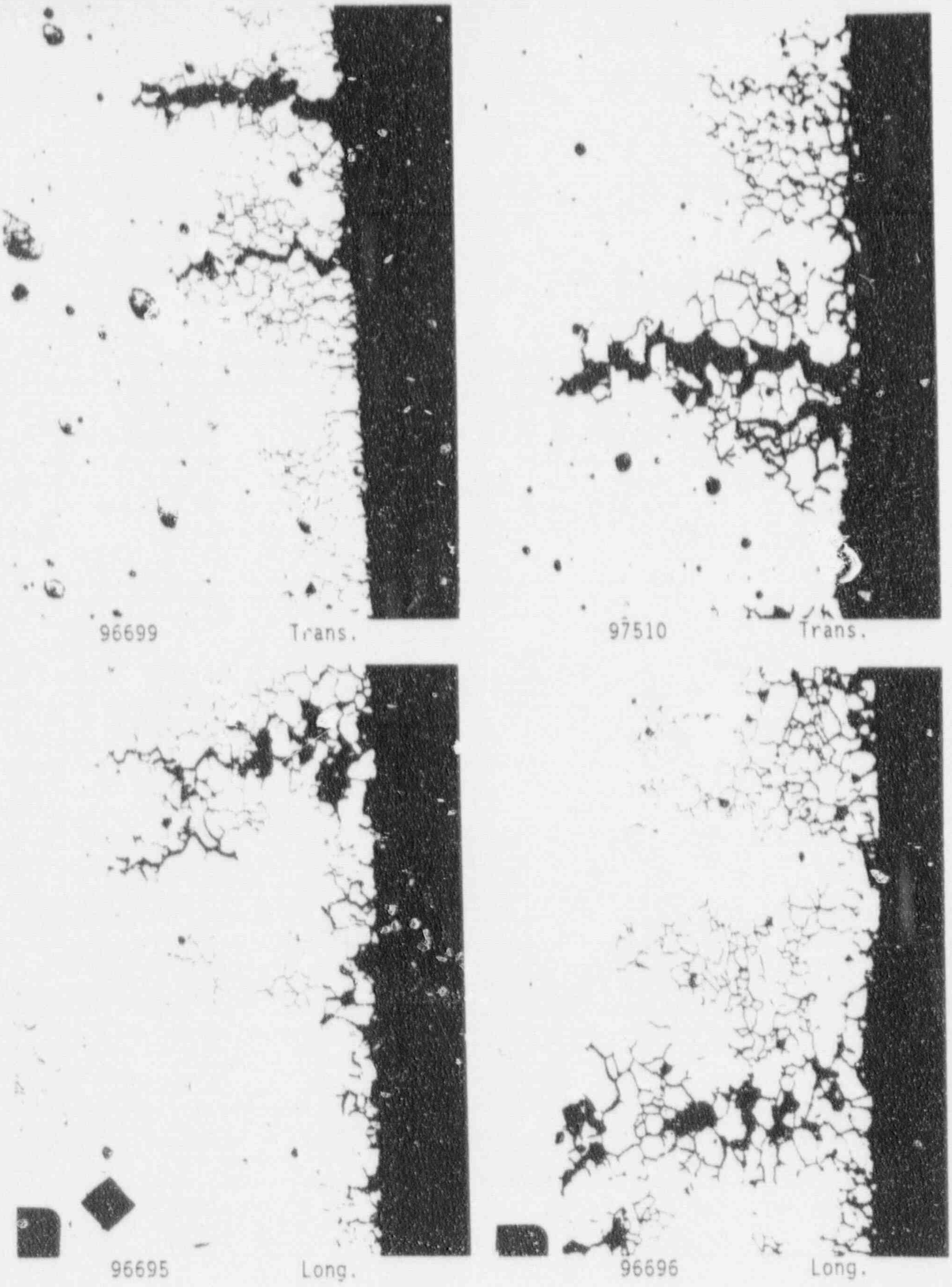
Figure 5-17. Transverse View of 'C'R30C64 TSP #3 Cracking.



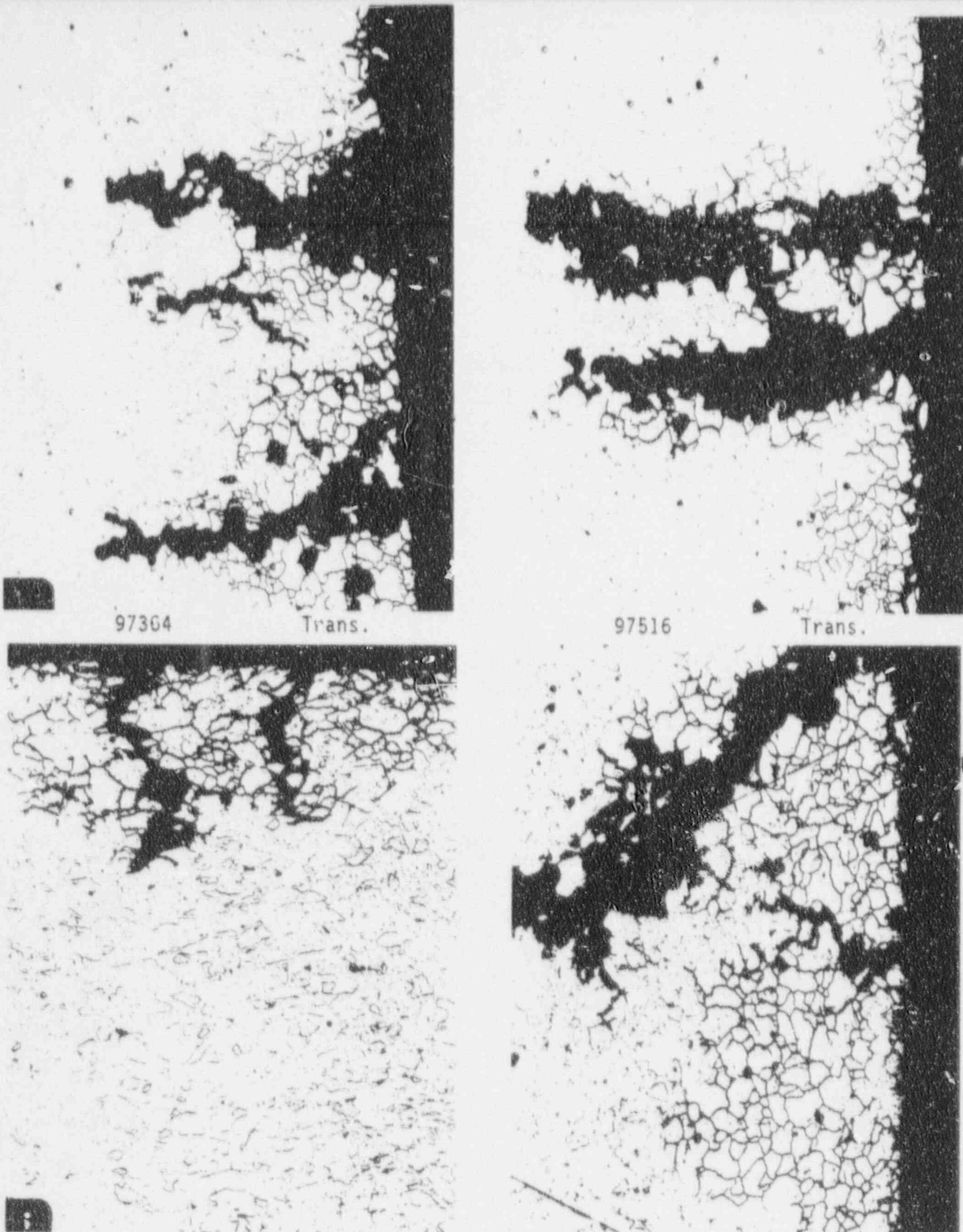
[Figure 5-18. Transverse View of 'D'R12C8 TSP #3 Seq. Grinds (20X)]



[Figure 5-19. View of 'D'R12C8 TSP #1 Penetrations (200X).]



[Figure 5-20. View of 'D'R12C8 TSP #2 Penetrations (200X).]



[Figure 5-21. View of 'D'R12C8 TSP #3 Penetrations (200X).]

97713 Transverse

97717 Longitudinal

[Figure 5-22. View of 'C'R25C58 TSP #1 (200X).]

Appendix 3

Westinghouse Electric Corporation
Energy Systems

Box 355
Pittsburgh Pennsylvania 15230-0355

December 13, 1991
ET-NRC-91-3648

Document Control Desk
US Nuclear Regulatory Commission
Washington, DC 20555

Attention: Mr. James E. Richardson
Director, Division of Engineering Technology

Subject: "Trojan Nuclear Plant Steam Generator Tube Repair Criteria for Indications at Tube Support Plates"

Dear Mr. Richardson:

Enclosed is WCAP-13129 entitled "Trojan Nuclear Plant Steam Cenerator Tube Repair Criteria for Indications at the Tube Support Plates" (Proprietary).

The enclosed document contains information which is proprietary to Westinghouse Electric Corporation. Accordingly, we request that this information be withheld from public disclosure.

We will comply with the requirements of 10CFR2.790 to provide proprietary and non-proprietary versions of the above material together with an affidavit as soon as the proprietary and non-proprietary versions have been prepared. We will submit the total required number of copies of the proprietary and non-proprietary versions of the information and the required affidavit at that time.

In the meantime, we have provided sufficient copies for your information and use. Ms. M. P. Siemien, Esq., of the NRC Office of the General Counsel, has advised Westinghouse that she concurs with this procedure.

We expect to be able to fully comply with the requirements for the proprietary and non-proprietary versions of the information and an accompanying affidavit within four weeks.

Very truly yours,

Ronald P DiLeaga for

S. R. Tritch, Manager
Engineering Technology

JMB/cld
Enclosure

C0134:JMB/121191

bcc: S. R. Tritch (ECE 4-02) 1L, 1A
G. Desaedeleer (Brussels) 1L, 1A
J. Cobian (Madrid) 1L, 1A
J. M. Moore (Expo 335) 1L, 1A
M. D. Beaumont (Rockville) 1L, 1A
H. Spinner (ECE 4-15) 1L, 1A (Ltrs. w/Affidavits only)

C0134:JMB/121191