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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Braidwood Station, Unit 1
Facility Operating License No. NPF 72
NRC Docket No. STN 50-456

Subject: Braidwood Station, Unit 1 Thirteenth Refueling Outage Steam Generator Inservice Inspection Summary Report

In accordance with Technical Specification 5.6.9, "Steam Generator (SG) Tube Inspection Report," Exelon Generation Company, LLC is reporting the results of the SG inspections, which were completed during the Braidwood Station, Unit 1 thirteenth refueling outage (A1R13). The attached report is also being submitted in accordance with the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, 1989 Edition, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," Article IWA-6000, "Records and Reports," and Article IV-7000, "Report of Examination," of Mandatory Appendix IV, "Eddy Current Examination of Non-Ferromagnetic Steam Generator Heat Exchanger Tubing."

If there are any questions regarding this submittal, please contact Mr. David Gullott, Regulatory Assurance Manager, at (815) 417-2800.

Respectfully,

Thomas Coutu
Site Vice President
Braidwood Station

Attachment: Exelon Braidwood Station Unit 1 Thirteenth Refueling Outage Steam Generator Inservice Inspection Summary Report

Exelon Nuclear
BRAIDWOOD STATION UNIT 1
35100 South Rte. 53, Suite 84
Braceville, IL 60407

COMMERCIAL OPERATION: July 29, 1988

STEAM GENERATOR EDDY CURRENT INSPECTION REPORT

THIRTEENTH REFUELING OUTAGE (A1R13)

October 2007

Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Document Completion Date: January 11, 2008

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1.0 INTRODUCTION

Braidwood Station Unit 1 operates with four Babcock & Wilcox Replacement Steam Generators (SGs) in the four loop pressurized water reactor system. The SGs each contain 6633 thermally treated Inconel-690 U-tubes that have a nominal diameter of 0.6875 inches and a nominal thickness of 0.040 inches. The tubes are supported by stainless steel lattice grid structures and fan bars. The tubes are hydraulically expanded into the full depth of the tubesheet. Main Feedwater enters the SGs above the tube bundle through a feedring and J-tubes. The SG configuration is shown in Figures A.1 and A.2. The replacement SGs were installed at the end of Cycle 7, in Fall 1998.

In compliance with Braidwood Station Technical Specification (TS) 3.4.19, Steam Generator (SG) Tube Integrity," TS 5.5.9, "Steam Generator (SG) Program," and American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section XI 1989 Edition, IWB 2500-1, Examination Category B-Q, Item B16.20, SG eddy current examinations were performed during the Braidwood Station Unit 1 thirteenth refueling outage (A1R13). The inspections were performed consistent with the Electric Power Research Institute (EPRI) "PWR Steam Generator Examination Guidelines," Revision 6, and Nuclear Energy Institute NEI 97-06, "Steam Generator Program Guidelines," Revision 2. The inspections were conducted from October 4, 2007 through October 13, 2007 by the Westinghouse Electric Company (Westinghouse). The following inspections were performed during this outage (TS 5.6.9.a).

- 100% full length bobbin coil eddy current in all four SGs
- 100% hot leg dents and dings $\geq$ 2.0 volts +Point™
- Diagnostic +Point™ eddy current based on bobbin coil eddy current results
- 100% Visual Inspection of Previously Installed Tube Plugs
- 100% Visual Inspection of Newly Installed Tube Plugs

2.0 SUMMARY

The requirements of Revision 6 of the EPRI PWR Steam Generator Examination Guidelines (i.e., EPRI Guidelines) along with Interim Guidance as provided by EPRI, were implemented during this inspection. A degradation assessment was performed prior to the inspection to ensure the proper EPRI Guidelines Appendix H, "Performance Demonstration for Eddy Current Examination," qualified inspection techniques were used to detect any existing and potential modes of degradation. Each technique was evaluated to ensure that the detection and sizing capabilities are applicable to the Braidwood Station Unit 1 site-specific condition in accordance with the EPRI Guidelines. All data analysts were qualified to Appendix G, "Qualification of Nondestructive Examination Personnel for Analysis of NDE Data," of the EPRI Guidelines (i.e., Qualified Data Analyst (QDA)). All data analyst and acquisition personnel satisfactorily completed site-specific training and testing prior to beginning examinations. An independent QDA process control review was employed to randomly sample the data to ensure that the analysis resolution process was properly performed and that the field calls were properly reported. An analysis feedback process was implemented that required the data analysts to review their missed calls and overcalls on a daily basis.

The modes of tube degradation found during A1R13 were fan bar wear, lattice grid wear and foreign object wear. Pursuant to EPRI Guideline Section 3.5, "Inspection Results Categories," the results of the inspection were classified as inspection category C-1 for all four SGs.

As a result of the eddy current inspection of the SGs, a total of 21 tubes were removed from service by mechanical tube plugging. The 21 tubes were removed from service due to either having wear associated with secondary side foreign objects or were required to be removed from service in order to bound high flow locations where secondary side foreign objects could not be retrieved.

There were no tubes containing wear greater than the TS plugging limit of $\geq$ 40% in any of the four SGs.

There were no scanning limitations during the eddy current examinations. Table 2.1, "Equivalent Tube Plugging Level," provides the total tube plugging history and equivalent plugging levels to-date for the Braidwood Station, Unit 1 SGs. Table 2.2 "Tubes Plugged During A1R13," provides the total number of tubes during the current outage by degradation mode.

Table 2.1
Equivalent Tube Plugging Level (TS 5.6.9.f and 5.6.9.h)

	SG A	SG B	SG C	SG D	Total
Tubes Plugged at Factory	1	2	0	0	3
Tubes Plugged in A1R08	1	0	0	0	1
Tubes Plugged in A1R10	8	10	3	0	21
Tubes Plugged in A1R11	0	2	2	1	5
Tubes Plugged in A1R12	11	17	0	0	28
Tubes Plugged in A1R13	6	8	7	0	21
Total Tubes Plugged	27	39	12	1	79
Total Tubes Plugged (%)	0.41%	0.59%	0.18%	0.02%	0.30%

Note: Steam Generator Inspections Were Not Performed During A1R09.

Table 2.2
Tubes Plugged During A1R13 (TS 5.6.9.b and TS 5.6.9.e)

Mode of Degradation	SG A	SG B	SG C	SG D	Total
Fan Bar Wear	0	0	0	0	0
Lattice Grid Wear	0	0	0	0	0
Foreign Object Wear	1	0	0	0	1
Preventively Plugged	5	8	7	0	20
Total Tubes Plugged in A1R13	6	8	7	0	21

3.0 CERTIFICATIONS

3.1 Procedures/Examinations/Equipment

3.1.1 The examination and evaluation procedures used during the SG eddy current inspection were approved by personnel qualified to Level III in accordance with the 1984 Edition of SNT-TC-1A, "Personnel Qualification and Certification in Nondestructive Testing." Exelon Generation Company, LLC (i.e., Exelon) Procedure ER-AP-335-039, "Multifrequency Eddy Current Data Acquisition of Steam Generator Tubing," Revision 4 and Exelon Procedure ER-AP-335-040, "Evaluation of Eddy Current Data for Steam Generator Tubing," Revision 3, were used for data acquisition and analysis.

3.1.2 The examinations, equipment and personnel were in compliance with the requirements of Exelon and Westinghouse Quality Assurance Programs for Inservice Inspection; Braidwood Station TS 5.5.9; 1989 Edition of ASME Boiler and Pressure Vessel Code Sections XI, "Rules for Inservice Inspection of Nuclear power Plant Components," and Section V, "Nondestructive Examination"; EPRI PWR SG Examination Guidelines, Revision 6; and NEI 97-06, "Steam Generator Program Guidelines," Revision 2.

3.1.3 Certification packages for examiners, data analysts, and equipment are available at Braidwood Station. Tables A.1 and A.2 of Attachment A list all personnel who performed, supervised, or evaluated the data during this SG inservice inspection.

3.1.4 CoreStar International Corporation OMNI-200™ Remote Data Acquisition Units (RDAUs) with Westinghouse ANSER computer software was used to acquire the eddy current data. Analysis was performed with Westinghouse ANSER 8.4.3 Rev 275 computer software. Secondary analysis was performed with CoreStar EddyVision™32, Release 6.3 computer software.

3.1.5 The bobbin coil examinations of the SGs were performed with Westinghouse 0.560 inch diameter probes. For low row U-Bend tubing, a 0.540 inch diameter probe was utilized to achieve the complete full tube examination in tubes where there was difficulty using the 0.560 inch diameter probe.

3.1.6 The rotating coil examinations were performed with Zetec 0.560 inch diameter three coil +Point™ probes for straight section tubing. The coils within this probes were a 0.115 inch diameter pancake coil, a shielded 0.080 inch diameter pancake coil and a standard +Point™ coil. For diagnostic evaluation of indications within the U-Bend tubing, a 0.520 inch diameter probe was used with a single standard +Point™ coil.

3.2 Personnel

3.2.1 The personnel who performed the SG eddy current inspections were qualified to Level I and Level II certification in accordance with the 1984 Edition of SNT-TC-1A. The Level I personnel performed the inspections under the direct supervision of Level II or Level III personnel. A list of the certified eddy current personnel who performed data acquisition for the examination is contained in Table A.1 of Attachment A.

3.2.2 The personnel who performed the SG eddy current data analysis were qualified to a minimum of Level II, with special analysis training (i.e., Level IIA) in accordance with the 1984 Edition of SNT-TC-1A and Article IV-2000 of ASME Section XI, 1989 Edition. A list of the certified eddy current personnel who performed data analysis for the examination is contained in Table A.2 of Attachment A.

3.2.3 All eddy current data analysts were qualified in accordance with EPRI Appendix G for Qualified Data Analysts (QDAs). In addition, all data analysts were trained and tested in accordance with a site specific performance demonstration program in both the bobbin coil and +Point™ inspection data analysis. Resolution analysts were also trained and tested specifically for the performance of data resolution. All analysts were required to achieve a minimum score of 80% probability of detection with a 90% confidence level on the practical examination, and a minimum score of 80% on the written examination prior to analyzing data.

3.2.4 All SG eddy current data acquisition personnel were trained and tested in accordance with a site specific performance demonstration program. The data acquisition operators were required to achieve a written test score of 80% or greater prior to acquiring data.

3.2.5 The SG eddy current analysis was subject to two independent analyses. Primary and secondary analysis was performed by an automated data screening analysis system as described in the EPRI Guidelines, Revision 6. The analysis systems were operated in the manual interactive mode. Each system successfully passed the EPRI Automated Analysis Performance Demonstration Database (AAPDD). Each system also was required to successfully pass the site specific performance demonstration practical examination prior to analyzing field data. Discrepancies between the two parties required Level III concurrence between both parties for final resolution.

3.2.6 Two independent SG eddy current Level III QDAs were employed to serve as a process control reviewers, in accordance with EPRI Guidelines, to randomly sample the data to ensure the resolution process was properly performed and that the field calls were properly reported. The Independent Level III QDAs also provided data acquisition oversight to ensure that the data collection process was in compliance with appropriate procedures, that all essential variables were set in accordance with the applicable Examination Technique Specification

Sheet (ETSS) and to provide a data quality check of acquired data. The Independent Level III QDAs reported directly to the Exelon Level III inspector.

3.2.7 Personnel qualified as data analysts performed real time data quality verifications.

4.0 EXAMINATION TECHNIQUES AND EXAMINATION SCOPE

All SG eddy current examination techniques used were qualified in accordance with Appendix H of the EPRI Guidelines. Each examination technique was evaluated to be applicable to the tubing and conditions of the Braidwood Station Unit 1 SGs.

4.1 Examination Techniques (TS 5.6.9.c)

4.1.1 The bobbin coil examinations were performed with a 0.560 inch diameter probe as described in Section 3.1.5 of this report. For low row U-Bend regions where there was difficulty using the 0.560 inch diameter probe, a 0.540 inch diameter probe was utilized to achieve the full tube inspection. Nominal probe inspection speed was 40 inches per second for tubes in row 10 and higher and 24 inches per second for low row tubes. Sufficient sampling rates were used to maintain a minimum digitizing rate of 30 samples per inch. The bobbin probes were operated in both the differential and absolute modes at frequencies of 650 kHz, 320 kHz, 160 kHz, and 35 kHz. The following suppression mixes were used to enhance the inspection: 650/160 kHz differential mix, 320/160 kHz absolute mix, 650/320 kHz differential mix and a 650/320/160 kHz differential mix.

4.1.2 Inspections of non-quantifiable bobbin coil indications and hot leg dents/dings greater than or to 2.0 volts as detected by the bobbin coil examination, were performed utilizing +Point™ probes as described in Section 3.1.6. Maximum axial probe inspection speed was 0.6 inches per second for straight tubing, 0.35 inches per second for U-bend region of the tubing and 0.15 inches per second at dents and dings. Sample rates and rotation speeds were used to maintain a minimum digitizing rate of 30 samples per inch (i.e., 25 samples per inch for the axial direction and 30 samples per inch for the circumferential direction). The rotating probes for straight section tubing and dents/ding inspections were operated in the absolute test mode at frequencies of 300 kHz, 200 kHz, 100 kHz and 20 kHz. The rotating probes for U-bend section inspections were operated in the absolute test mode at frequencies of 400 kHz, 300 kHz, 100 kHz and 20 kHz. In addition to the four base frequencies, three process channels were used to display axial indications in the positive trace.

4.1.3 The eddy current calibration standards used for the bobbin coil and +Point™ inspections met the requirements of the EPRI Guidelines, Revision 6, and Sections V and XI of the ASME Code, 1989 Edition.

4.1.4 The SG eddy current examination techniques used during this inspection were equivalent to the EPRI Guidelines Appendix H techniques listed in Table 4.1. Each ETSS was evaluated and determined to be applicable to site conditions.

Table 4.1
EPRI Appendix H Techniques

EPRI Technique ETSS	Probe	Description
96004.3 Rev. 11	Bobbin	Fan Bar/Lattice Grid/Foreign Object Wear and Free Span Flaws
96910.1 Rev. 10	+Point™	Foreign Object Wear/Free Span Flaws (Wear Like Flaws)
21998.1 Rev. 4	+Point™	Foreign Object Wear (Volumetric Like Flaws)
96703.1 Rev. 17	+Point™	Dents/Dings – Primary Water Stress Corrosion Cracking (Axial PWSCC)
21409.1 Rev. 5	+Point™	Outer Diameter Stress Corrosion Cracking (Axial ODSCC)
21410.1 Rev. 6	+Point™	Outer Diameter Stress Corrosion Cracking (Circumferential ODSCC)
20511.1 Rev. 8	+Point™	Inside Diameter Stress Corrosion Cracking (Axial PWSCC)
20510.1 Rev. 7	+Point™	Inside Diameter Stress Corrosion Cracking (Circumferential PWSCC)
96010.1 Rev. 7	Bobbin	Manufacturing Burnish Marks
22401.1 Rev. 4	+Point™	Dents/Dings – Outer Diameter Stress Corrosion Cracking (Axial ODSCC)
96008.1 Rev. 14	Bobbin	Tube Support Plate / Sludge Pile – Outer Diameter Stress Corrosion Cracking (Axial ODSCC)

PWSCC – Primary Water Stress Corrosion Cracking
ODSCC – Outside Diameter Stress Corrosion Cracking

4.2 Steam Generator Inspection Scope (TS 5.6.9.a)

4.2.1 100% of the tubes in all SGs were inspected full-length with a bobbin probe as described in Section 4.1.1.

4.2.2 Diagnostic examinations were performed on all non-quantifiable indications, locations of foreign object wear, and hot leg dents/dings greater than or equal to 2.0 volts that were detected by the bobbin coil examination. Diagnostic examinations were also conducted in the vicinity of potential foreign objects to determine the extent of tubes potentially affected by the objects. These special examinations were performed with the three coil +Point™ probe described in Section 4.1.2 above. See Section 5.1 and Attachment B.3 for further detail.

4.2.3 See Attachment B for tubesheet maps detailing the inspection scope for each SG.

4.3 Recording of Examination Data

Results of the SG eddy current data analysis were recorded on optical disks. The data was then loaded into a Westinghouse Eddy Current Data Management System, "STMax" version, 1.20.02. The system was used to track the completion of the examinations and was used to generate the final SG eddy current report summaries.

4.4 Witness and Verification of Examination

SG eddy current inspections were witnessed and/or verified by the Authorized Nuclear Inservice Inspectors, Mr. L. Malabanan of the Hartford Steam Boiler Inspection and Insurance Company of Hartford Connecticut, Chicago Branch, 2443 Warrenville Road, Suite 500, Lisle, Illinois 60532-9871.

5.0 EXAMINATION RESULTS

5.1 Eddy Current Inspection (TS 5.6.9.b and TS 5.6.9.d)

Full-length bobbin coil examination of all inservice tubes was performed in all SGs. Only two hot leg region dents / dings greater than or equal to 2.0 volts in the hot leg region were identified. These dents / dings were inspected with +Point™ and showed no degradation.

5.1.1 Fan Bar Wear – A total of 34 indications of tube wear at the Fan Bar intersections were identified during A1R13. The largest indication of Fan Bar wear was 16% Through Wall (TW) as measured by the eddy current technique. The EPRI Appendix H bobbin coil technique 96004.3 Revision 11 was utilized in this inspection for depth sizing of all Fan Bar wear. Refer to Attachment B.5 for detailed locations and sizing for all Fan Bar wear.

5.1.2 Lattice Grid Wear – A total of six indications of tube wear at the Lattice Grid intersections were identified during A1R13. The largest indication of Lattice Grid wear was 10% TW as measured by the eddy current technique. The EPRI Appendix H bobbin coil technique 96004.3 Revision 11 was utilized in this inspection for depth sizing of all Lattice Grid wear. Refer to Attachment B.6 for detailed locations and sizing for all Lattice Grid wear.

5.1.3 Foreign Object Wear – A total of five indications of secondary side foreign object wear were identified during A1R13. The EPRI Appendix H +Point™ technique 21988.1 Revision 4 was utilized in this inspection for depth sizing of all foreign object wear.

Of the five indications, four were associated with relatively small amounts of tube wear (15% TW, 15% TW, 14% TW and 22%TW) as measured by the eddy current technique. These tubes were identified during the previous SG inspection (A1R12) and were allowed to remain in service since they were below the TS plugging criteria of greater than or equal to 40% TW, coupled with secondary side visual inspection confirming that the objects that caused the tube wear were no longer present. Re-inspection of these indications during A1R13 confirmed that the associated wear had not changed since first identified during A1R12. Therefore these indications were allowed to remain in service.

One tube had secondary side foreign object wear that was newly identified during A1R13. In the 1A SG, Tube Row 112 Column 59 had an 11% TW wear, as measured by the eddy current technique, at the top of the cold leg tubesheet + 0.26 inches. The wear was associated with a piece of metallic gasket material approximately 1.7 inches long. The object could not be successfully retrieved. The tube with the 11% TW indication, along with five tubes surrounding the gasket material were preventatively stabilized and plugged.

In the 1C SG, seven tubes were preventatively plugged and stabilized in the hot leg top of tubesheet region due to visual inspection identifying a piece of metallic gasket material approximately 2.5 inches in length. Since this object was in a high flow area and could not be successfully retrieved, the tubes surrounding the object were preventively stabilized and plugged even though they showed no signs of degradation based on eddy current or visual inspection.

In the 1B SG, eight tubes were preventatively plugged and stabilized in the hot leg top of tubesheet region due to visual inspection identifying a piece of weld slag approximately 2.0 inches in length. Since this object was in a high flow area and could not be successfully retrieved, the tubes surrounding the object were preventively stabilized and plugged even though they showed no signs of degradation based on eddy current or visual inspection.

Refer to Attachment B.4 for detailed locations and sizing for all Foreign Object wear indications.

5.1.4 Attachment B contains tube lists with axial elevations of all imperfections that contain measurable through wall depth that were found during the A1R13 eddy current inspection.

5.2 Other Inspection Results

5.2.1 Visual Inspection of Installed Tube Plugs – All previously installed tube plugs were visually inspected for signs of degradation and leakage. In addition, all plugs installed during this outage were also visually inspected and the installation parameters were reviewed for acceptable installation. No anomalies were found.

6.0 RESULTS OF CONDITION MONITORING (TS 5.6.9.g)

A condition monitoring assessment was performed for each inservice degradation mechanism found during the A1R13 inspection. The condition monitoring assessment was performed in accordance with TS 5.5.9.a and NEI 97-06 using the EPRI Steam Generator Integrity Assessment Guidelines, Revision 2. For each identified degradation mechanism, the as-found condition was compared to the appropriate performance criteria for tube structural integrity, accident induced leakage and operational leakage as defined in TS 5.5.9.b. For each damage mechanism a tube structural limit was determined to ensure that SG tube integrity would be maintained over the full range of normal operating conditions and design basis accidents. This includes retaining a safety factor of 3.0 against burst under normal steady state full power operation primary to secondary pressure differential and a safety factor of 1.4 against burst under the limiting design basis accident pressure differential. Since only volumetric wear was identified during A1R13, satisfying the structural limit ensures that the SG tube integrity performance criteria for structural integrity, accident induced leakage and operational leakage will be maintained. The structural limits provided below are conservative in that they assume uniform 360 degree wall thinning for the length of the tube.

The as-found condition of each degradation mechanism found during A1R13 was shown to meet the appropriate limiting structural integrity performance parameter with a probability of 0.95 at 50% confidence, including consideration of relevant uncertainties.

No tube pulls or in-situ pressure testing was performed during A1R13.

Sections 6.1 through 6.3 provide a summary of the condition monitoring assessment for each degradation mechanism.

6.1 Fan Bar Wear

The largest Fan Bar wear indication found during the A1R13 inspection was 16% TW as measured by the EPRI Appendix H qualified technique 96004.3, Revision 11. Considering technique and analyst uncertainties, the largest AVB wear indication found is corrected to 24.3% TW with a 0.95 probability at 50% confidence. This is well below the conservative Fan Bar wear structural limit of 60% TW.

6.2 Lattice Grid Wear

The largest Lattice Grid wear indication found during the A1R13 inspection was 10% TW as measured by the EPRI Appendix H qualified technique 96004.3, Revision 11. Considering technique and analyst uncertainties, the largest AVB wear indication found is corrected to 18.5% TW with a 0.95 probability at 50% confidence. This is well below the conservative Lattice Grid wear structural limit of 60% TW.

6.3 Foreign Object Wear

The largest Foreign Object wear indication found during the A1R13 inspection was 22% TW as measured by the EPRI Appendix H qualified technique 21998.1, Revision 4. Considering technique and analyst uncertainties, the largest Foreign Object wear indication found is corrected to 39.8% TW with a 0.95 probability at 50% confidence. This is well below the conservative Foreign Object wear structural limit of 60% TW.

7.0 REPAIR SUMMARY (TS 5.6.9.i)

Repairs were conducted in accordance with ASME Section XI, 1989 Edition. All repairs were performed using Inconel-690 mechanical tube plugs. All repairs were performed in accordance with Westinghouse approved procedures. Table 7.0 summarizes the repairs performed during A1R13. No tube sleeving was performed.

Table 7.0
Summary of A1R13 Tube Plugging

REPAIRS PERFORMED	SG 1A	SG 1B	SG 1C	SG 1D	TOTAL
Tubes Plugged	6	8	7	0	21
Tubes Stabilized	6	8	7	0	21

8.0 DOCUMENTATION

All original data is stored on optical disks that have been provided to Exelon and are maintained at Braidwood Station. The final data sheets and pertinent tube sheet plots are contained in the Westinghouse Outage Report for Braidwood Unit 1, Thirteenth Refueling Outage, and are also maintained at Braidwood Station.

NOTE: The ASME Section XI NIS-1 Form. "Owner's Report for Inservice Inspections," for steam generator inspections performed during the Braidwood Unit 1 Thirteenth Refueling Outage is contained in a separate transmittal: the "Braidwood Station, Unit 1 Inservice Inspection Summary Report."

9.0 FIGURES/TABLES/ATTACHMENTS

Attachment A Contents

Table A.1 Data Acquisition Personnel Certification List

Table A.2 Data Analysis Personnel Certification List

Figure A.1 Babcock & Wilcox Replacement Steam Generator Braidwood Unit 1 Configuration

Figure A.2 Babcock & Wilcox Replacement Steam Generator Braidwood Unit 1 Tubesheet Configuration

Attachment B Contents

Attachment B.1 As-tested Bobbin Inspection Maps

Attachment B.2 As-tested +Point™ Special Interest Inspection Maps

Attachment B.3 Tubes Damaged by Secondary Side Foreign Objects

Attachment B.4 Tubes Containing Fan Bar Wear

Attachment B.5 Tubes Containing Lattice Grid Wear

Attachment B.6 Tubes Repaired During A1R13

Attachment A

Personnel Certifications

TABLE A.1
A1R13
Data Acquisition Personnel Certifications

No.	Name	Company	Level	QDA (Y/N)
1	Estel, J.	Westinghouse	II	No
2	Kukic, F.	Westinghouse	II	No
3	Mantic, S.	Hudson	I	No
4	Parris, J.	Westinghouse	II	No
5	Pessek, S.	Young	IIA	Yes
6	Pyle, S.	Intech	II	No
7	Schachte, D.	Westinghouse	II	No
8	Scott, A.	Westinghouse	II	No
9	Smith, D.	Westinghouse	II	No
10	Thompson, K.	Westinghouse	II	No
11	Vernon, D.	Westinghouse	II	No

TABLE A.2
A1R13
Data Analysis Personnel Certifications

No.	Name	Company	Level	QDA (Y/N)
1	Belville, C.	Wiltec	IIA	Yes
2	*Brown, M.	NDE Technology	III	Yes
3	Causby, G.	NDE Technology	III	Yes
4	Chevalier, W.	Young	IIA	Yes
5	Childers, J.	Wiltec	III	Yes
6	Circosta, S.	Young	III	Yes
7	Dlabik, A.	Master-Lee	III	Yes
8	Dzapo, M.	HRID	IIA	Yes
9	Gootz, T.	Westinghouse	III	Yes
10	Hill, J.	Infineddy	III	Yes
11	Kirk, M.	Consumers	III	Yes
12	Lewis, C.	NDE Technology	IIA	Yes
13	Lewis, D.	NDE Technology	III	Yes
14	Lynn, V.	Master-Lee	III	Yes
15	Martin, A.	Wiltec	IIA	Yes
16	Mast, M.	NDE Technology	III	Yes
17	Mauller, K.	Wiltec	III	Yes
18	Moon, D.	Wiltec	III	Yes
19	Nadinic, B.	HRID	III	Yes
20	Pocratsky, R.	Westinghouse	III	Yes
21	Popovich, R.	Westinghouse	III	Yes
22	Prentice, R.	Anatec	III	Yes
23	Rengel, A.	HRID	IIA	Yes
24	Rush, S.	Infineddy	III	Yes
25	Schaefer, S.	Anatec	III	Yes
26	*Siegel, R.	NDE Technology	III	Yes
27	Skirpan, J.	NDE Technology	IIA	Yes
28	Stock, W.	Westinghouse	III	Yes
29	Thompson, K.	NDE Technology	IIA	Yes
30	Yaklich, D.	Westinghouse	III	Yes
31	Zerovnik, J.	HRID	IIA	Yes
32	Zevchak, J.	NDE Technology	IIA	Yes
33	Zunac, D.	HRID	IIA	Yes

* Independent Qualified Data Analyst

FIGURE A.1
Babcock & Wilcox Replacement Steam Generator
Braidwood Unit 1 Configuration

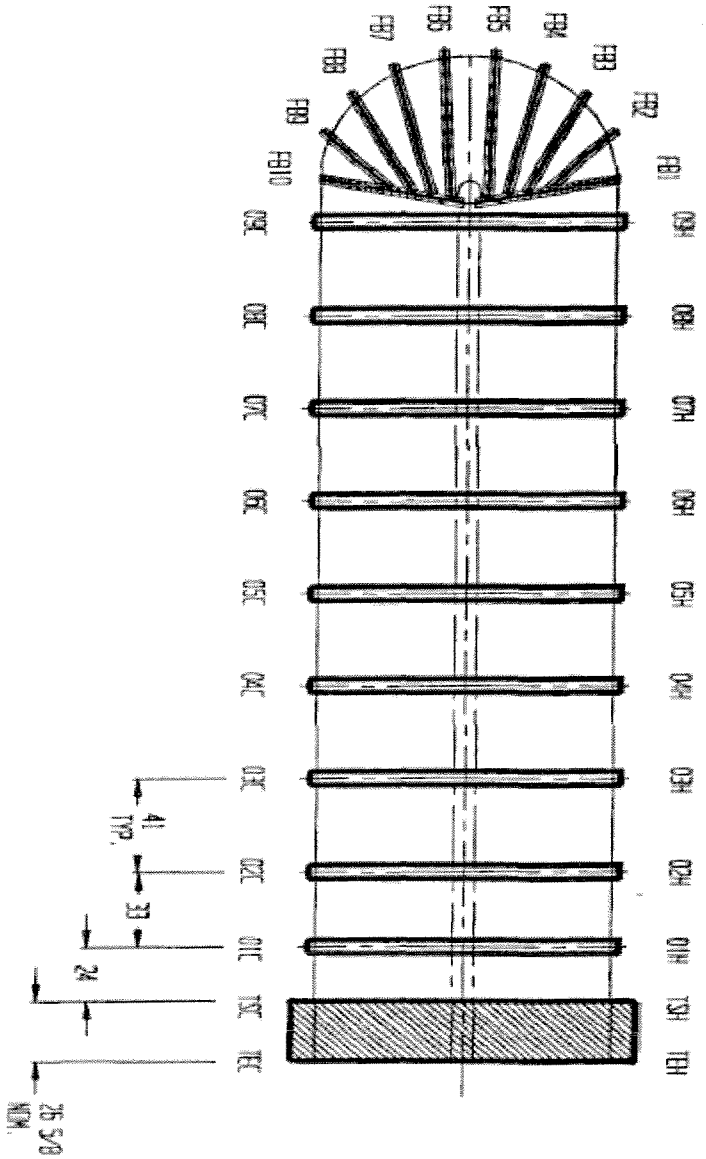
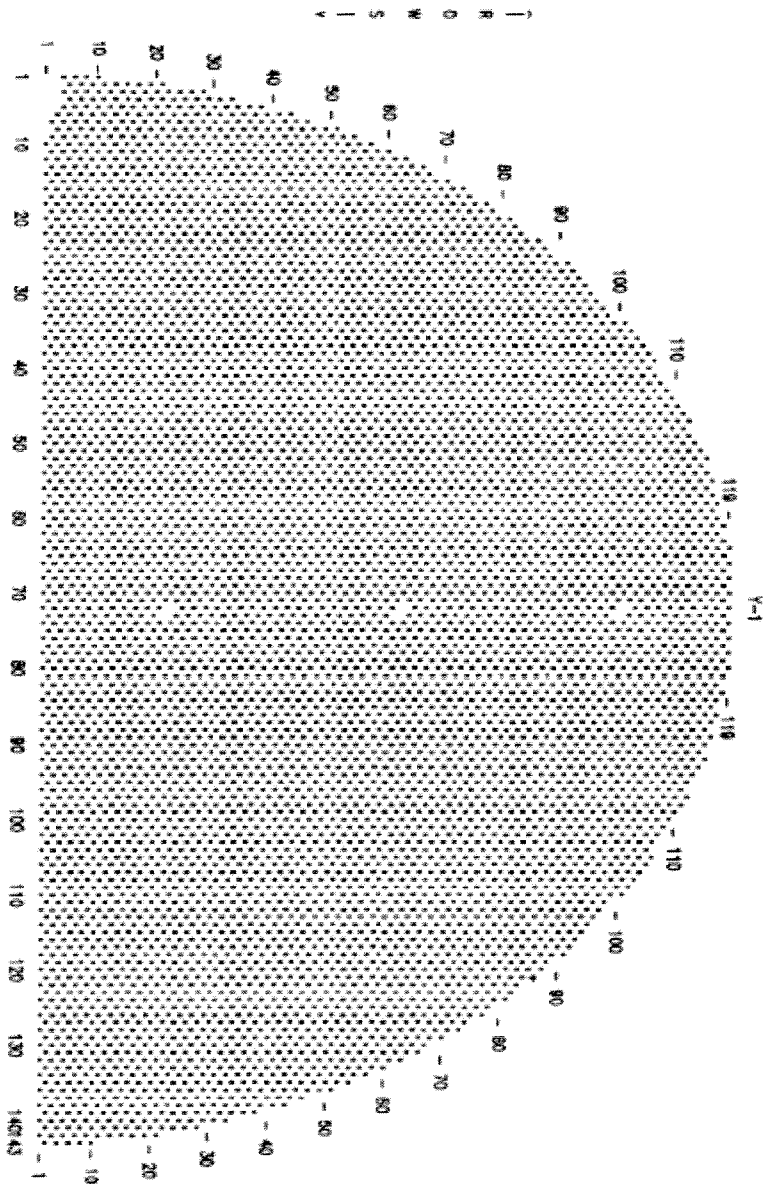


FIGURE A.2
Babcock & Wilcox Replacement Steam Generator
Braidwood Unit 1 Tubesheet Configuration



Attachment B

Inspection Scope / Results
A1R13

Attachment B.1

As-tested Bobbin Inspection Maps
A1R13

SG - A Bobbin as Tested from the Hot Leg

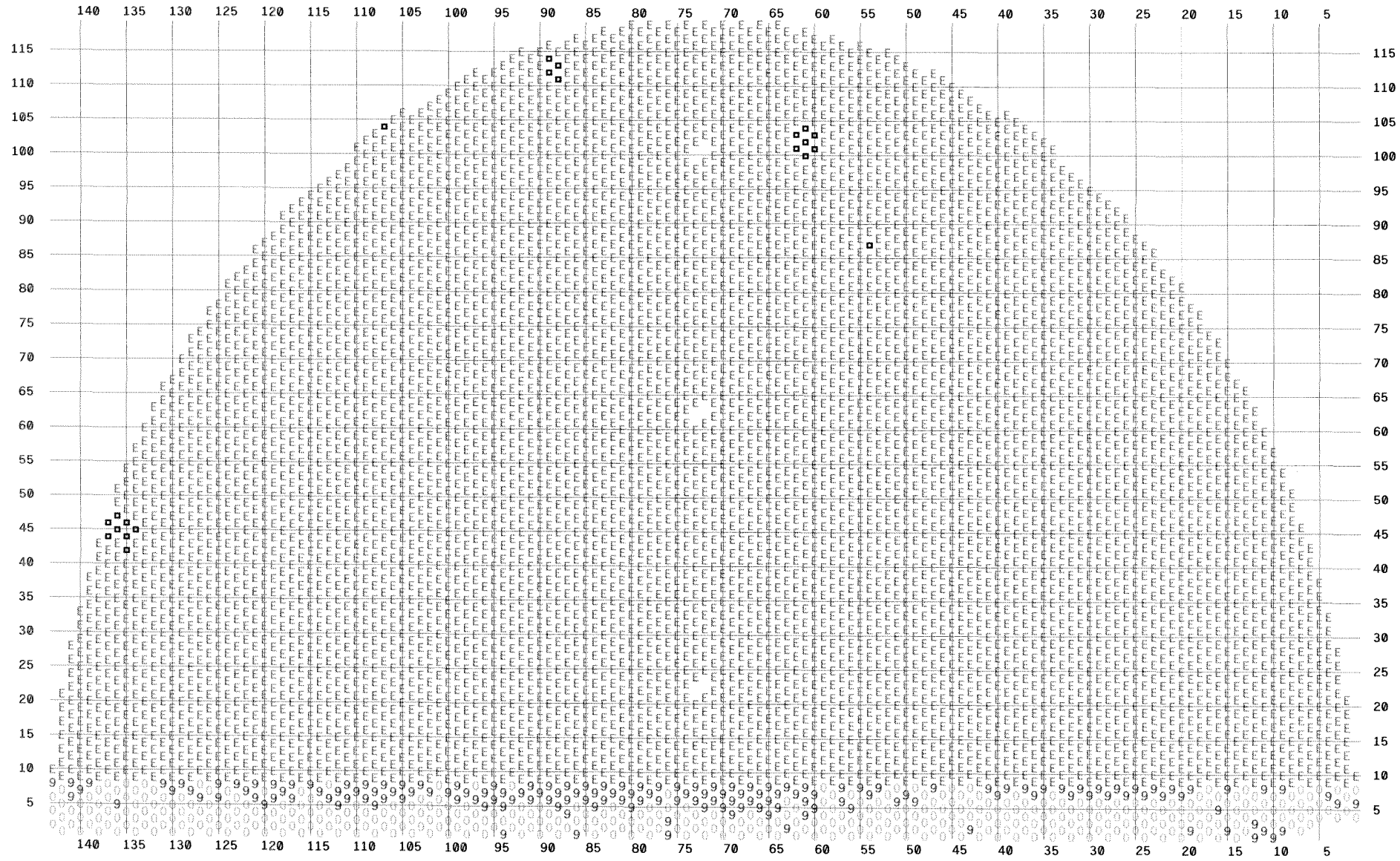
Braidwood A1R13 CCE 7720

E 6049 Tested from TEC through TEH

0 397 Tested from F10 through TEH

9 166 Tested from 09C through TEH

21 Plugged Tube



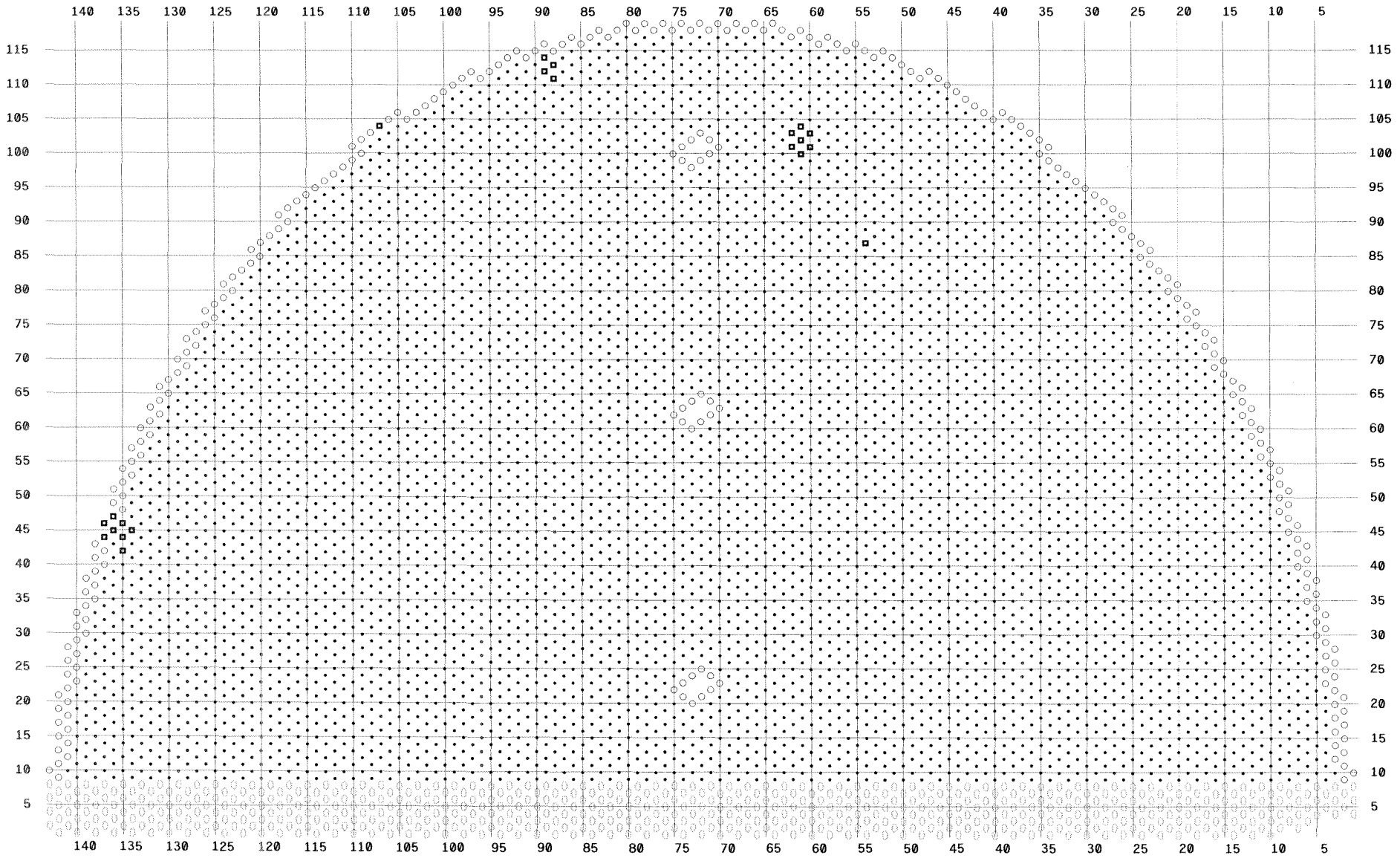
Westinghouse Electric Company LLC - ST Max 10/14/2007 09:41:59

SG - A Bobbin as Tested from the Cold Leg

Braidwood A1R13 CCE 7720

0 563 Tested from F10 through TEC

21 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 09:43:54

SG - B Bobbin as Tested from the Hot Leg

Braidwood A1R13 CCE 7720

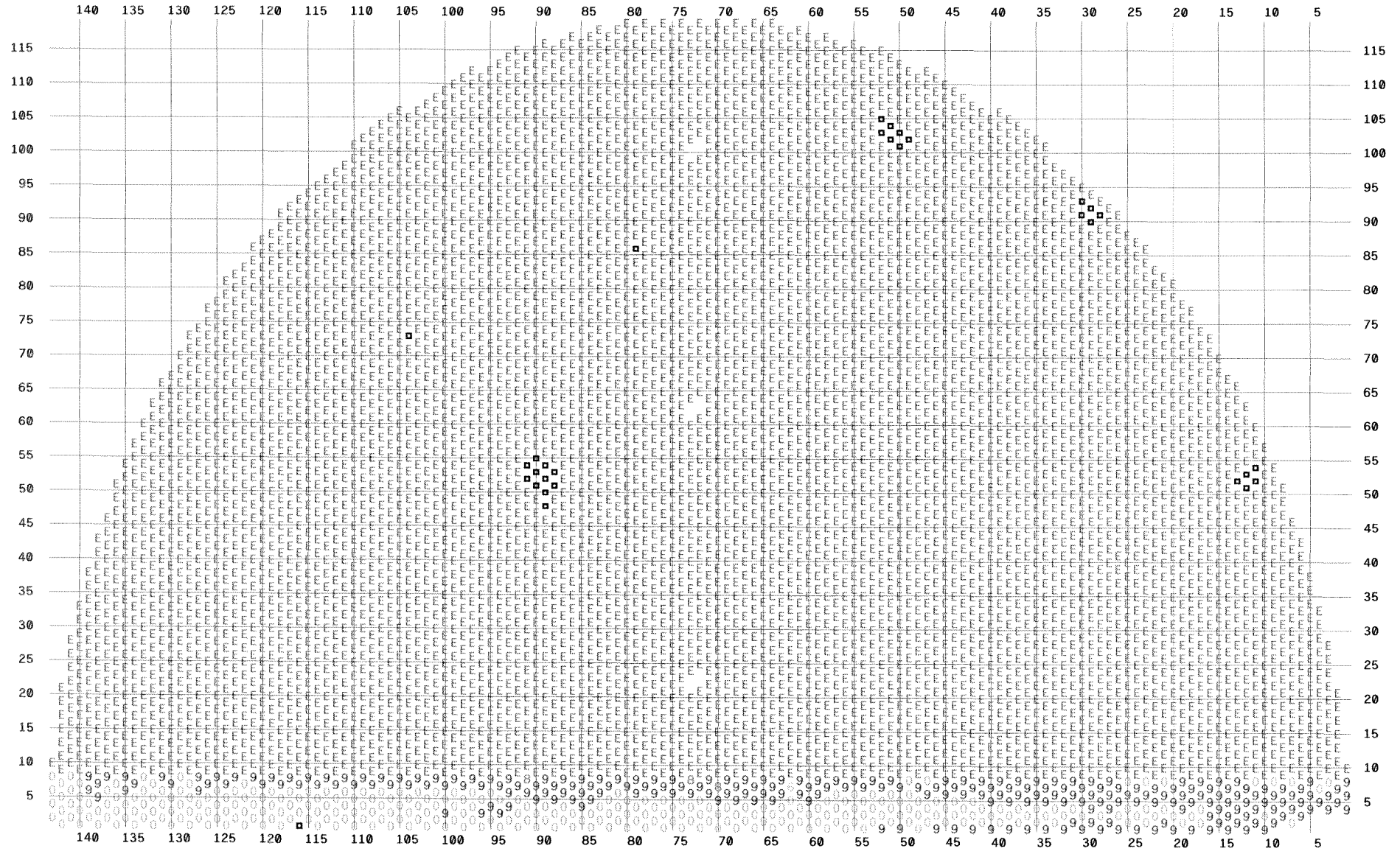
E 6040 Tested from TEC through TEH ▫ 31 Plugged Tube

O 314 Tested from F10 through TEH

9 244 Tested from 09C through TEH

8 3 Tested from 08C through TEH

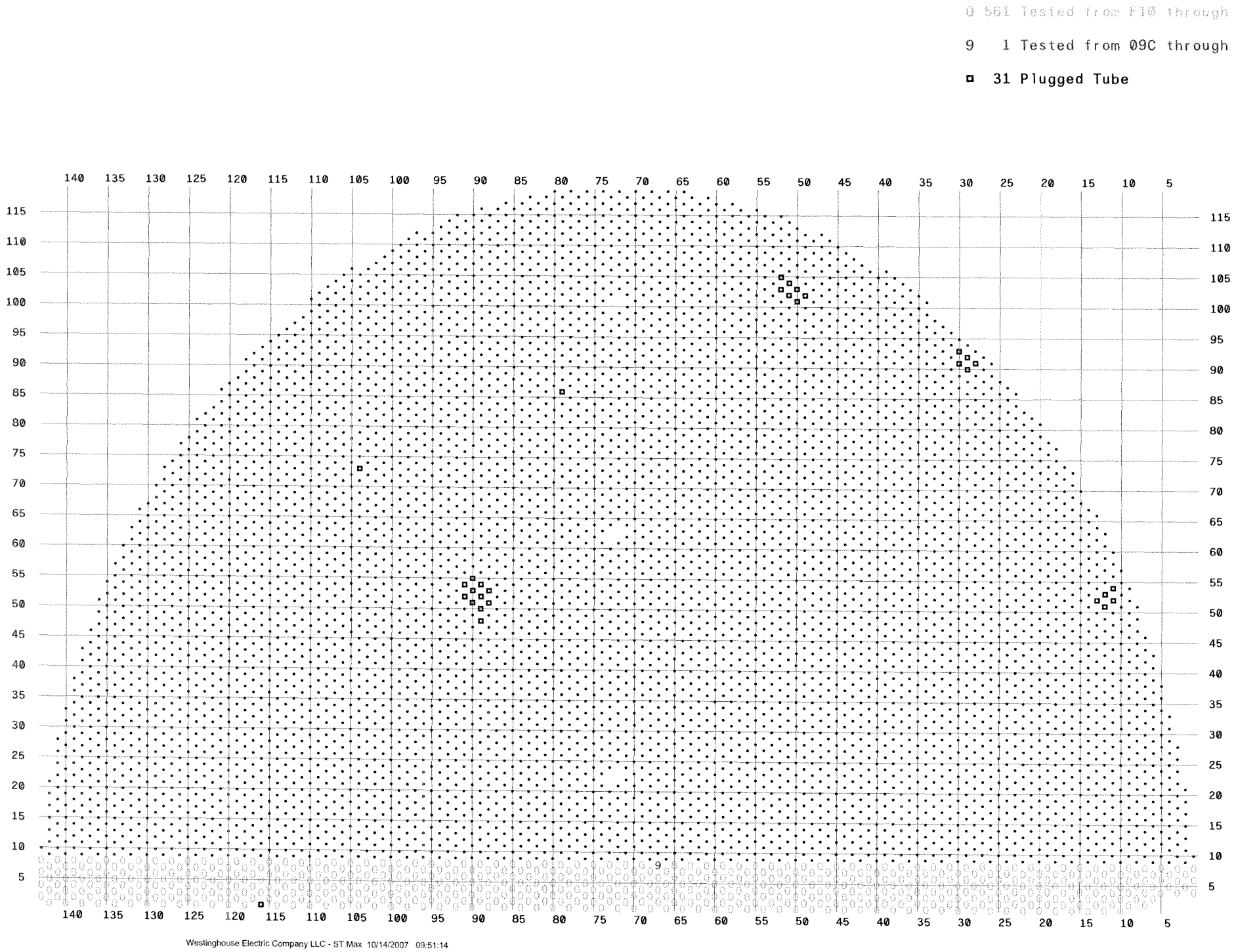
6 1 Tested from 06C through TEH



Westinghouse Electric Company LLC - ST Max 10/14/2007 09:48:37

SG - B Bobbin as Tested from the Cold Leg

Braidwood A1R13 CCE 7720



SG - C Bobbin as Tested from the Hot Leg

Braidwood A1R13 CCE 7720

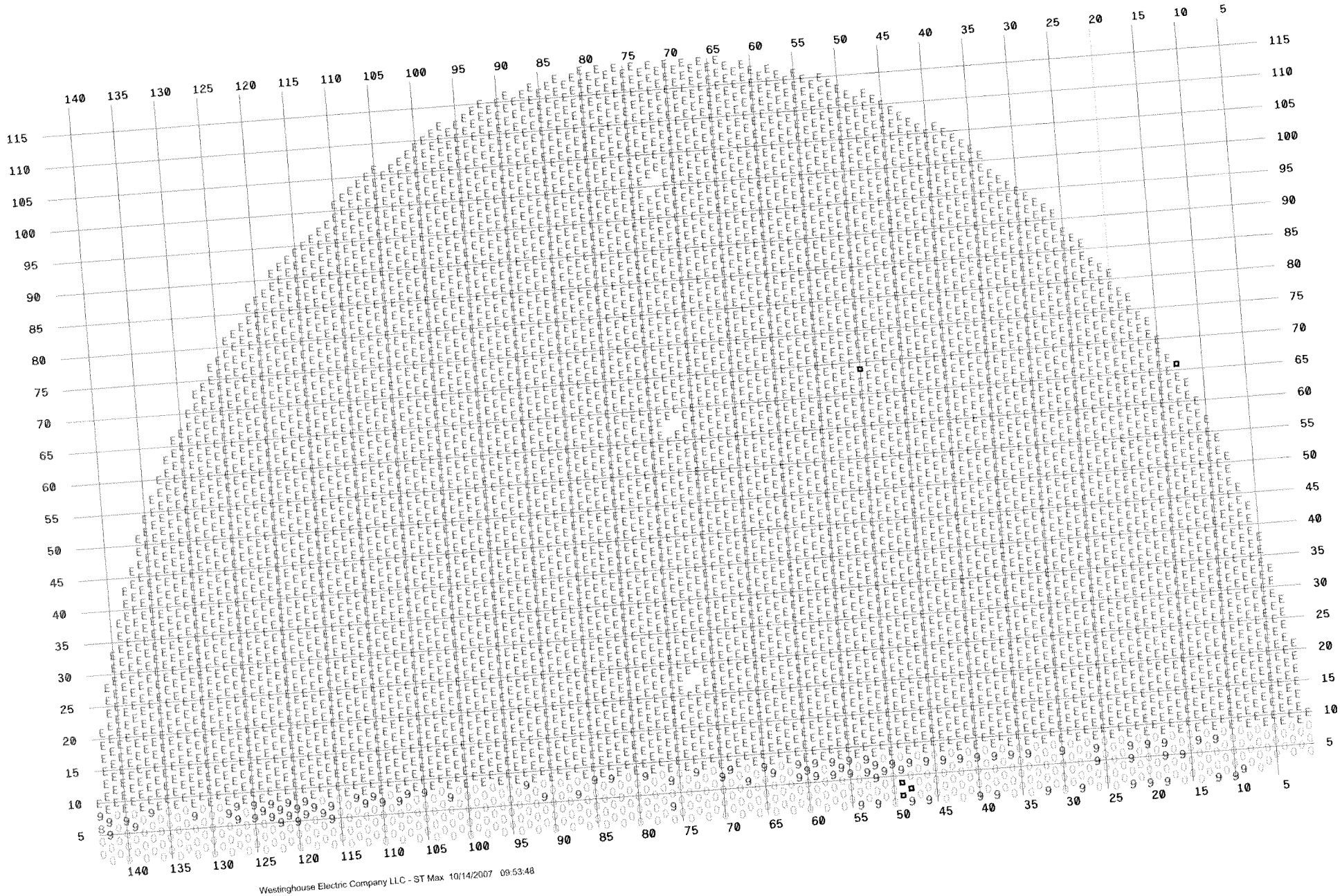
E 6068 Tested from TEC through TEH

0 460 Tested from F10 through TEH

9 99 Tested from 09C through TEH

8 1 Tested from 08C through TEH

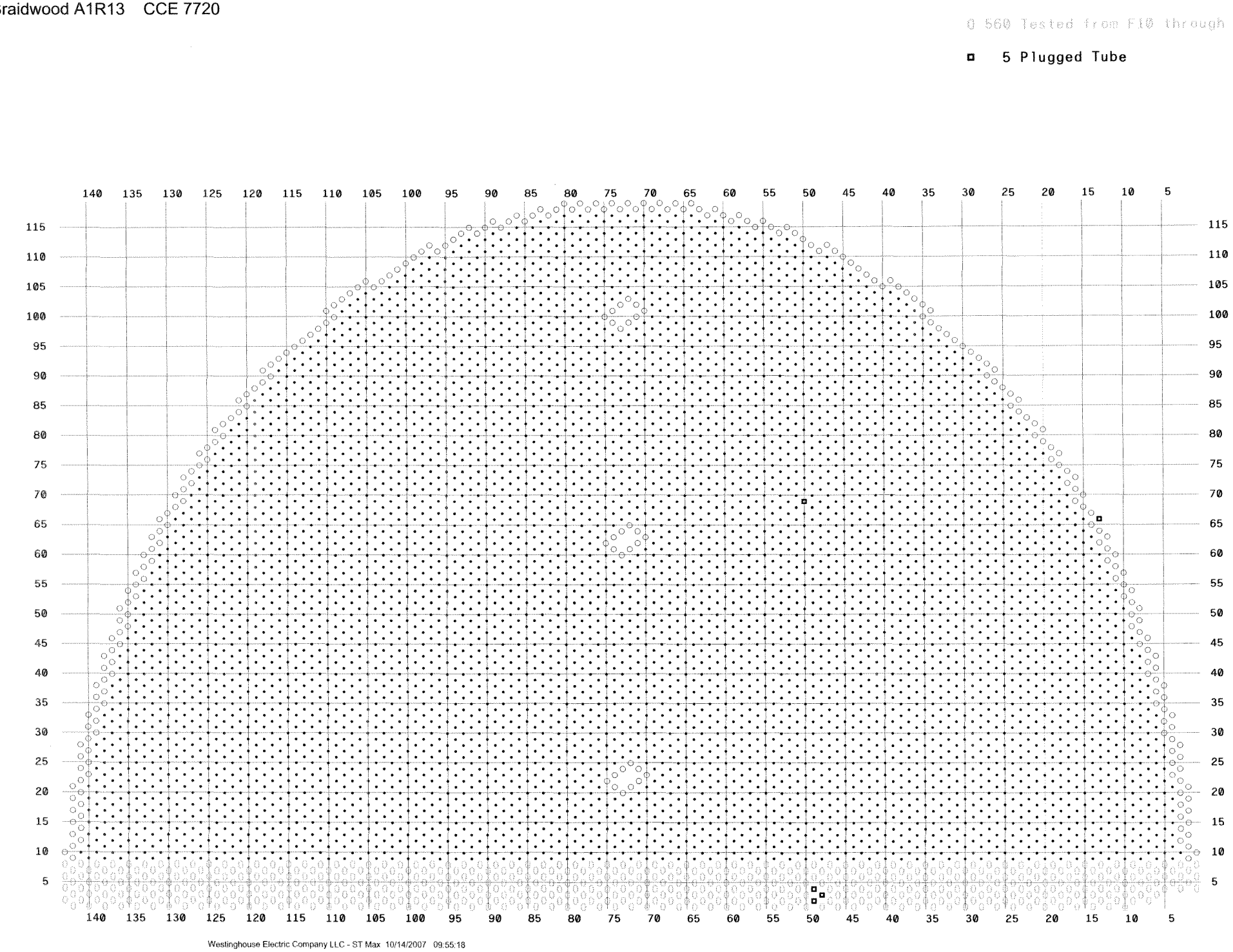
5 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 09:53:48

SG - C Bobbin as Tested from the Cold Leg

Braidwood A1R13 CCE 7720



SG - D Bobbin as Tested from the Hot Leg

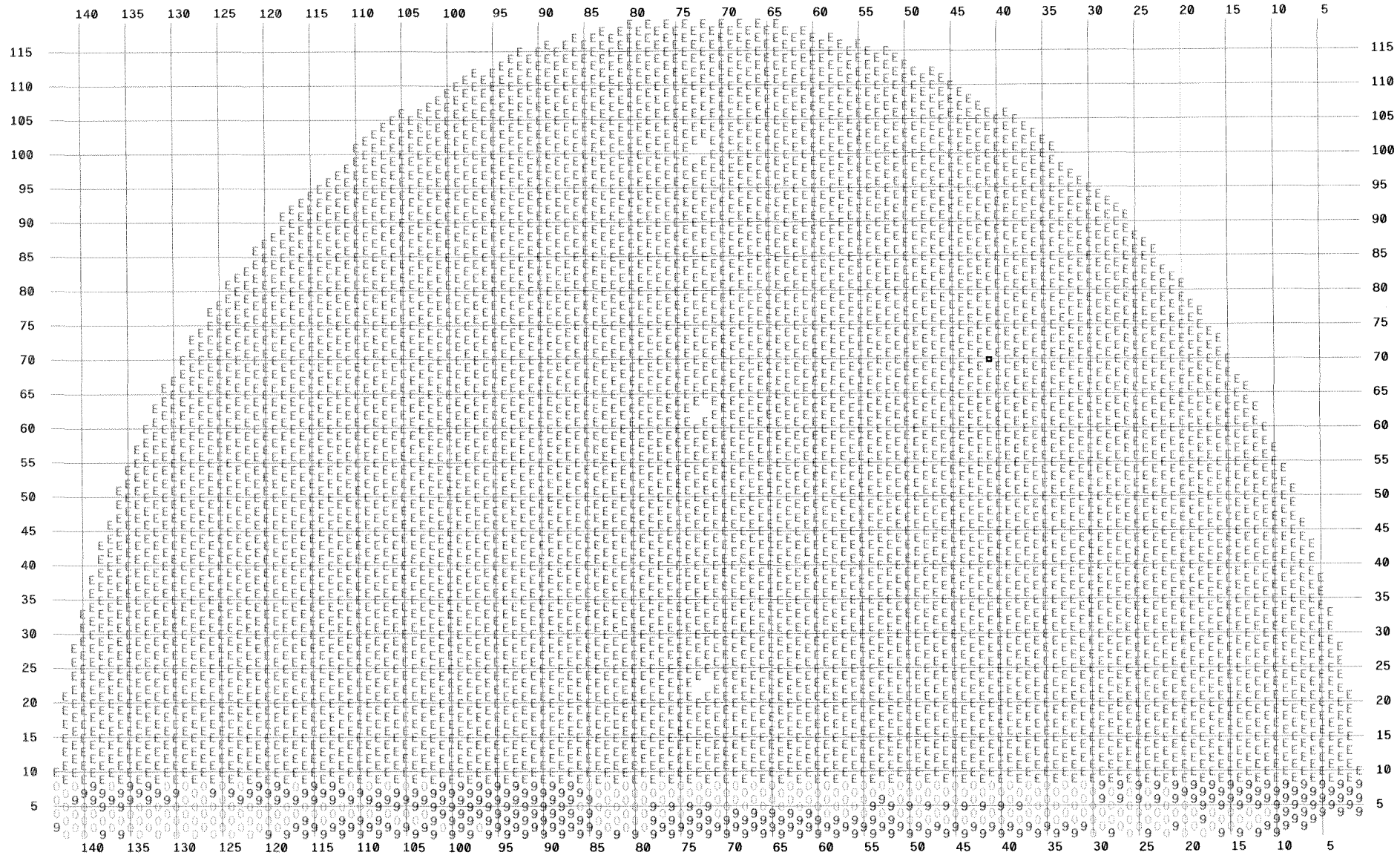
Braidwood A1R13 CCE 7720

E 6069 Tested from TEC through TEH

0 271 Tested from F10 through TEH

9 292 Tested from 09C through TEH

1 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 09:59:56

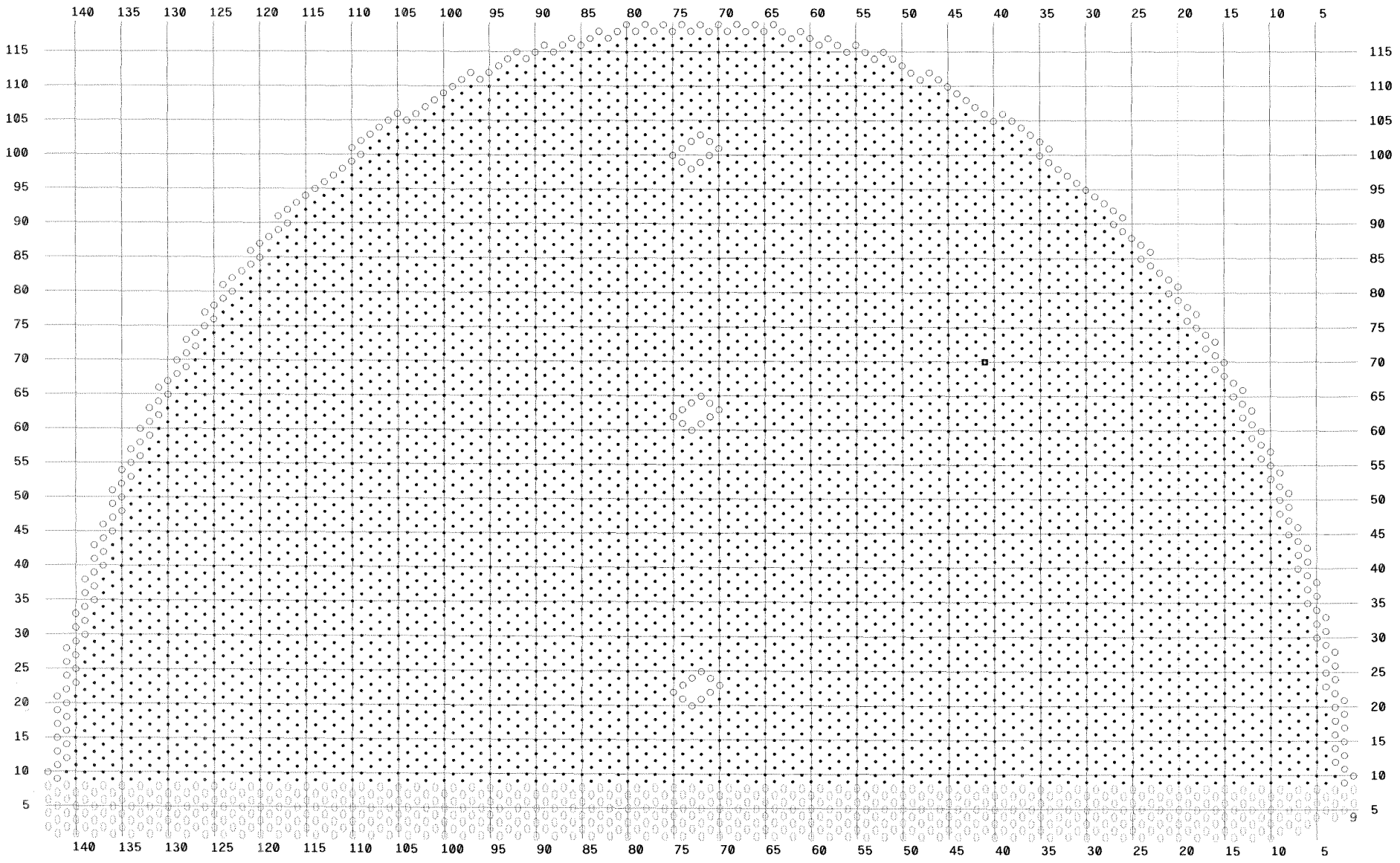
SG - D Bobbin as Tested from the Cold Leg

Braidwood A1R13 CCE 7720

0 562 Tested from F10 through TEC

9 1 Tested from 09C through TEC

1 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 10:01:38

Attachment B.2

As-tested +Point™ Special Interest Inspection Maps
A1R13

SG - A Hot Leg +PT Special Interest Tests

Braidwood A1R13 CCE 7720

1 5 Tested at TSH -2/+4" for FOSAR Findings - CCE-A-001

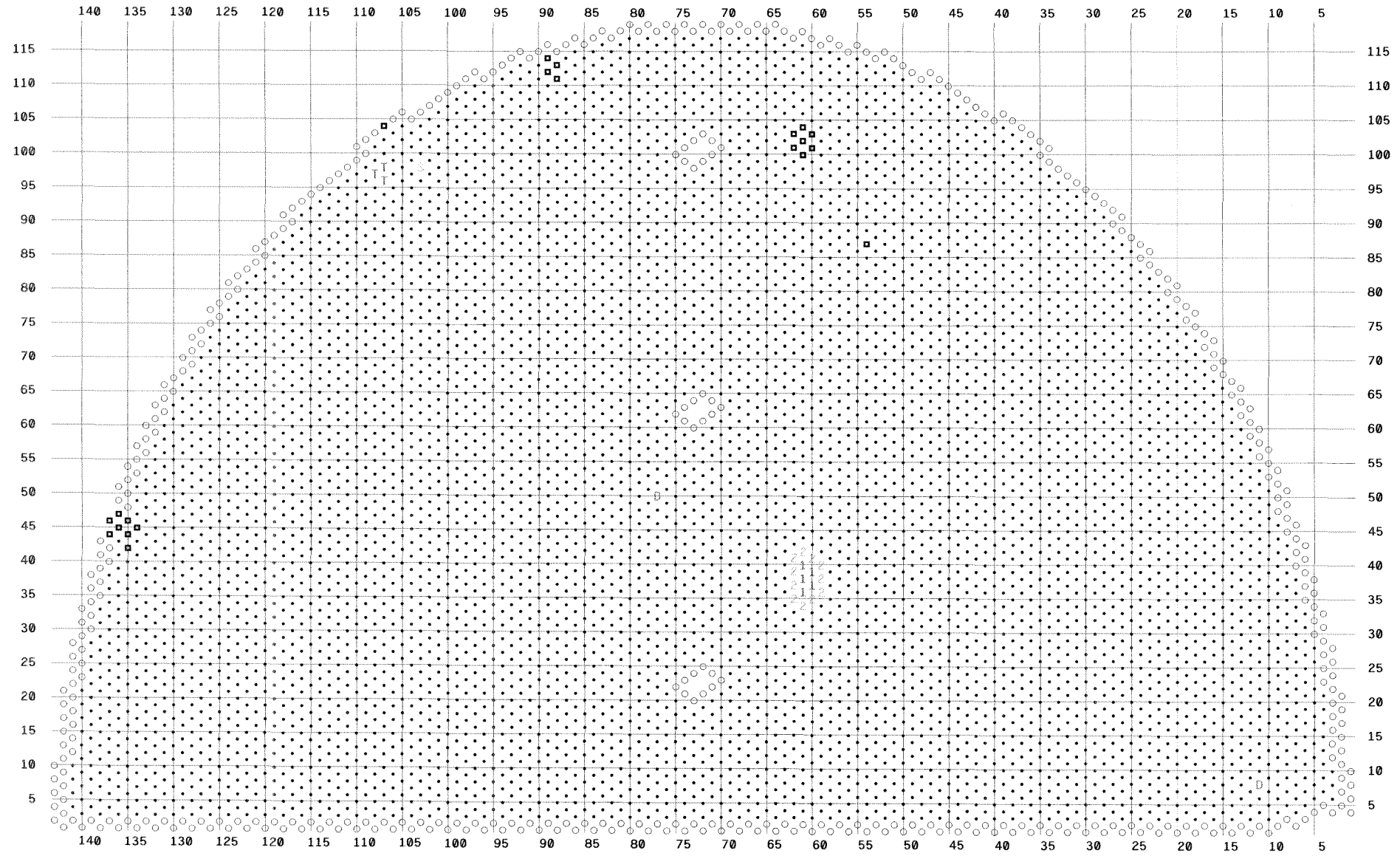
2 11 Tested at TSH -2/+4" for FOSAR Findings - CCE-A-002

D 2 Tested for DNT / DNG >= 2 Volts in Hot Leg

S 1 Tested for DSI

T 3 Tested for Foreign Object Wear from Prior Inspection - DA Table 5.3-2

▫ 21 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 11:10:49

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
8	11			NDD						F10	TEC	.560	ZBALL	8	C
8	11	2.45	179	DNG		P1	TSH	10.17		09C	TEH	.540	SBALL	105	H
8	11			NDF		2	TSH	10.17		TSH	01H	.560	ZPSNM	135	H
36	59			NDD						TEC	TEH	.560	SBALL	59	H
36	59			NDD						TSH	TSH	.560	ZPSNM	137	H
38	59			NDD						TEC	TEH	.560	SBALL	59	H
38	59			NDD						TSH	TSH	.560	ZPSNM	137	H
40	59			NDD						TEC	TEH	.560	SBALL	59	H
40	59			NDD						TSH	TSH	.560	ZPSNM	137	H
35	60			NDD						TEC	TEH	.560	SBALL	57	H
35	60			NDD						TSH	TSH	.560	ZPSNM	137	H
37	60			NDD						TEC	TEH	.560	SBALL	57	H
37	60			NDD						TSH	TSH	.560	ZPSNM	133	H
39	60			NDD						TEC	TEH	.560	SBALL	57	H
39	60			NDD						TSH	TSH	.560	ZPSNM	133	H
41	60			NDD						TEC	TEH	.560	ZBALL	71	H
41	60			NDD						TSH	TSH	.560	ZPSNM	137	H
34	61			NDD						TEC	TEH	.560	SBALL	57	H
34	61			NDD						TSH	TSH	.560	ZPSNM	137	H
36	61			NDD						TEC	TEH	.560	SBALL	57	H
36	61			NDD						TSH	TSH	.560	ZPSNM	133	H
38	61			NDD						TEC	TEH	.560	SBALL	57	H
38	61			NDD						TSH	TSH	.560	ZPSNM	133	H
40	61			NDD						TEC	TEH	.560	SBALL	57	H
40	61			NDD						TSH	TSH	.560	ZPSNM	133	H
42	61			NDD						TEC	TEH	.560	SBALL	73	H
42	61			NDD						TSH	TSH	.560	ZPSNM	137	H
35	62			NDD						TEC	TEH	.560	SBALL	59	H
35	62			NDD						TSH	TSH	.560	ZPSNM	137	H
37	62			NDD						TEC	TEH	.560	SBALL	59	H
37	62			NDD						TSH	TSH	.560	ZPSNM	137	H
39	62			NDD						TEC	TEH	.560	SBALL	59	H
39	62			NDD						TSH	TSH	.560	ZPSNM	137	H
41	62			NDD						TEC	TEH	.560	SBALL	59	H
41	62			NDD						TSH	TSH	.560	ZPSNM	137	H
50	77	2.47	176	DNT		P1	05H	.82		TEC	TEH	.560	SBALL	49	H
50	77			NDF		2	05H	.82		05H	05H	.560	ZPSNM	135	H
98	103	.23	142	DSS		P1	09H	1.77		TEC	TEH	.560	ZBALL	19	H
98	103			NDF			09H	1.77		09H	09H	.560	ZPSNM	133	H
96	107			NDD						TEC	TEH	.560	ZBALL	19	H
96	107	.13	107	VOL		P4	TSH	.15		TSH	TSH	.560	ZPSNM	133	H
96	107	.15	281	PCT	15	2	TSH	.15		TSH	TSH	.560	ZPSNM	133	H
98	107			NDD						TEC	TEH	.560	ZBALL	19	H
98	107	.13	85	VOL		P4	TSH	.10		TSH	TSH	.560	ZPSNM	133	H
98	107	.15	80	PCT	15	2	TSH	.10		TSH	TSH	.560	ZPSNM	133	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
97	108			NDD						TEC	TEH	.560	ZBALL	17	H
97	108	.12	95	VOL		P4	TSH	.16		TSH	TSH	.560	ZPSNM	133	H
97	108	.13	269	PCT	14	2	TSH	.16		TSH	TSH	.560	ZPSNM	133	H

| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

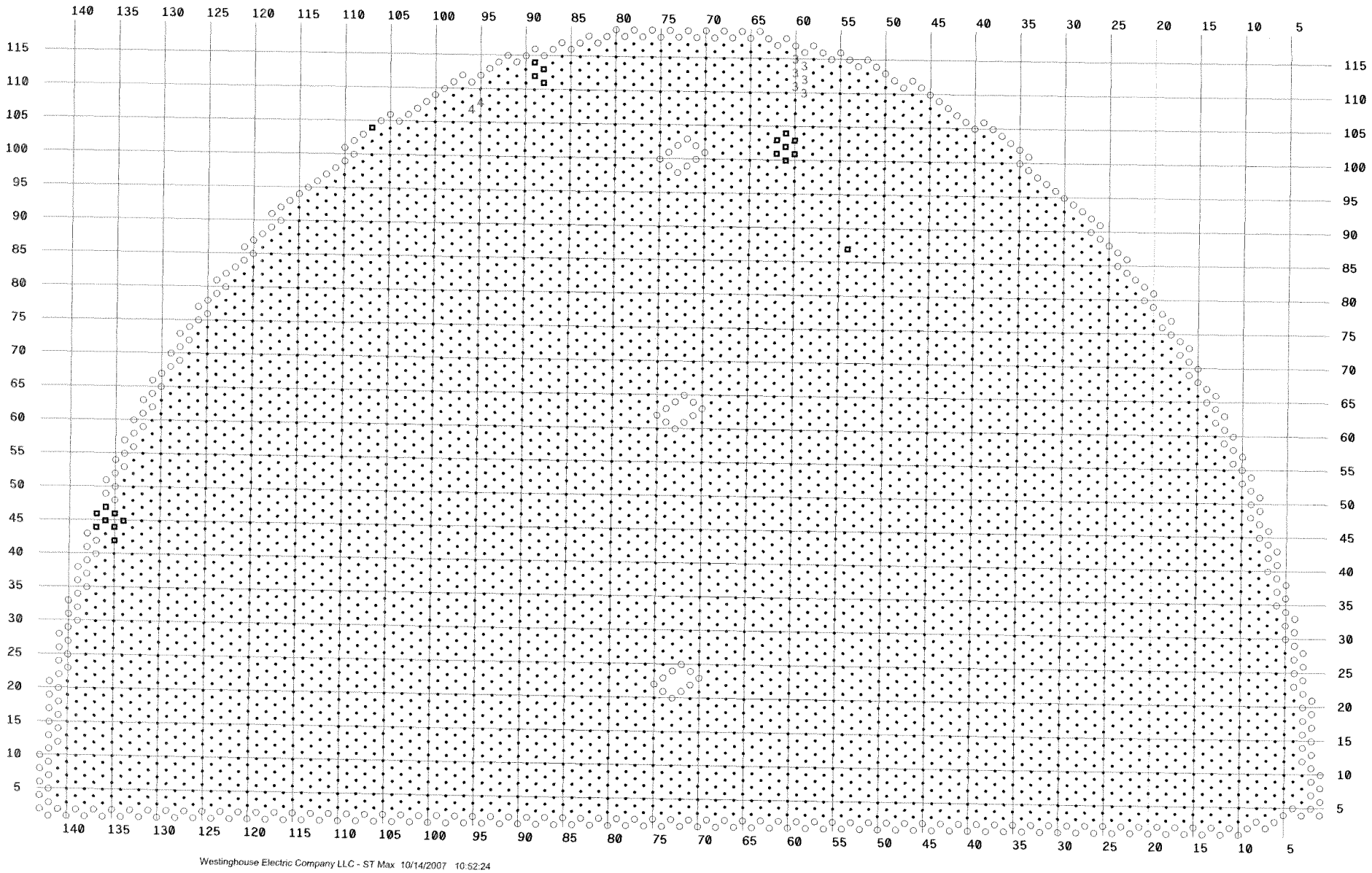
SG - A Cold Leg +PT Special Interest Tests

Braidwood A1R13 CCE 7720

3 6 Tested at TSC -2/+4" for FOSAR Findings - CCE-A-003

4 2 Tested at TSC -2/+4" for FOSAR Findings - CCE-A-004

▫ 21 Plugged Tube



ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
110	59			NDD						TSC	TSC	.560	ZPSNM	18	C
110	59			NDD						TEC	TEH	.560	ZBALL	71	H
112	59	.10	86	PCT	11	2	TSC	.26		TSC	TSC	.560	ZPSNM	18	C
112	59	.11	78	SVI	0	P4	TSC	.26		TSC	TSC	.560	ZPSNM	18	C
112	59			NDD						TEC	TEH	.560	ZBALL	71	H
114	59			NDD						TSC	TSC	.560	ZPSNM	18	C
114	59			NDD						TEC	TEH	.560	ZBALL	71	H
111	60			NDD						TSC	TSC	.560	ZPSNM	18	C
111	60			NDD						TEC	TEH	.560	ZBALL	69	H
113	60			NDD						TSC	TSC	.560	ZPSNM	18	C
113	60			NDD						TEC	TEH	.560	ZBALL	69	H
115	60			NDD						TSC	TSC	.560	ZPSNM	18	C
115	60			NDD						TEC	TEH	.560	ZBALL	69	H
108	95			NDD						TSC	TSC	.560	ZPSNM	18	C
108	95			NDD						TEC	TEH	.560	SBALL	31	H
107	96			NDD						TSC	TSC	.560	ZPSNM	18	C
107	96			NDD						TEC	TEH	.560	SBALL	31	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

SG - B Hot Leg +PT Special Interest Tests

Braidwood A1R13 CCE 7720

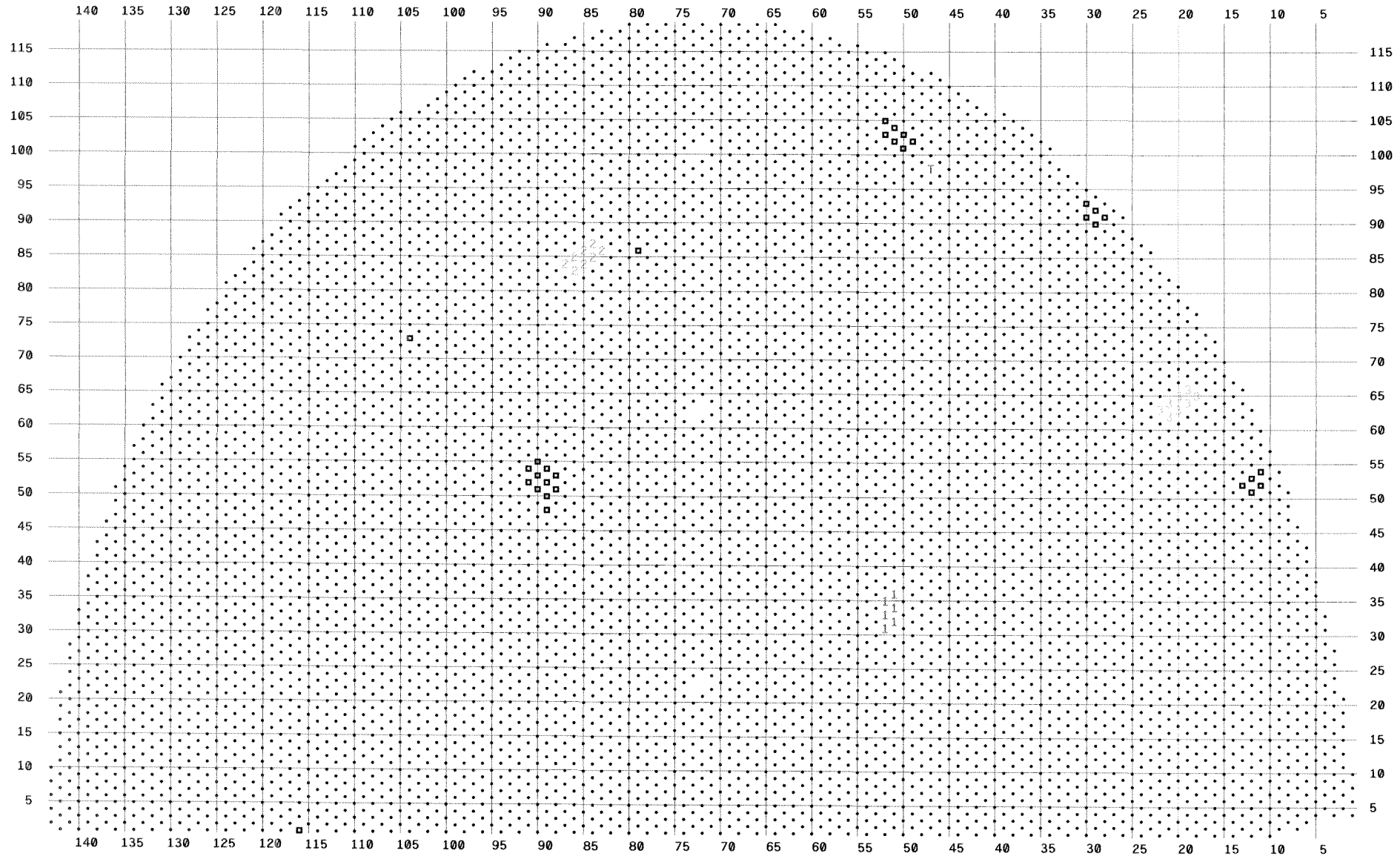
1 6 Tested at TSH -2/+4" for FOSAR Findings - CCE-B-001

2 8 Tested at TSH -2/+4" for FOSAR Findings - CCE-B-002

3 8 Tested at TSH -2/+4" for FOSAR Findings - CCE-B-003

T 1 Tested for Foreign Object Wear from Prior Inspection - DA Table 5.3-2

▫ 31 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 11:16:24

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
65	18			NDD						TEC	TEH	.560	ZBALL	11	H
65	18			NDD						TSH	TSH	.560	ZPSNM	127	H
64	19			NDD						TEC	TEH	.560	ZBALL	11	H
64	19			NDD						TSH	TSH	.560	ZPSNM	127	H
66	19			NDD						TEC	TEH	.560	ZBALL	11	H
66	19			NDD						TSH	TSH	.560	ZPSNM	127	H
63	20			NDD						TEC	TEH	.560	ZBALL	11	H
63	20			NDD						TSH	TSH	.560	ZPSNM	127	H
65	20			NDD						TEC	TEH	.560	ZBALL	11	H
65	20	.54	84	PLP		11	TSH	.04		TSH	TSH	.560	ZPSNM	127	H
62	21			NDD						TEC	TEH	.560	ZBALL	9	H
62	21			NDD						TSH	TSH	.560	ZPSNM	127	H
64	21			NDD						TEC	TEH	.560	ZBALL	9	H
64	21	.35	81	PLP		11	TSH	.03		TSH	TSH	.560	ZPSNM	127	H
63	22			NDD						TEC	TEH	.560	ZBALL	9	H
63	22			NDD						TSH	TSH	.560	ZPSNM	127	H
98	47			NDD						TEC	TEH	.560	ZBALL	19	H
98	47	.25	78	PCT	22	P1	TSH	-.01		TSH	TSH	.560	ZPSNM	127	H
98	47	.10	94	VOL	0	P4	TSH	.01		TSH	TSH	.560	ZPSNM	127	H
32	51			NDD						TEC	TEH	.560	ZBALL	35	H
32	51			NDD						TSH	TSH	.560	ZPSNM	127	H
34	51			NDD						TEC	TEH	.560	ZBALL	35	H
34	51			NDD						TSH	TSH	.560	ZPSNM	127	H
36	51			NDD						TEC	TEH	.560	ZBALL	35	H
36	51			NDD						TSH	TSH	.560	ZPSNM	127	H
31	52			NDD						TEC	TEH	.560	ZBALL	35	H
31	52			NDD						TSH	TSH	.560	ZPSNM	127	H
33	52			NDD						TEC	TEH	.560	ZBALL	35	H
33	52			NDD						TSH	TSH	.560	ZPSNM	127	H
35	52			NDD						TEC	TEH	.560	ZBALL	35	H
35	52			NDD						TSH	TSH	.560	ZPSNM	127	H
86	83			NDD						TEC	TEH	.560	ZBALL	57	H
86	83			NDD						TSH	TSH	.560	ZPSNM	127	H
85	84			NDD						TEC	TEH	.560	ZBALL	61	H
85	84			NDD						TSH	TSH	.560	ZPSNM	127	H
87	84			NDD						TEC	TEH	.560	ZBALL	61	H
87	84			NDD						TSH	TSH	.560	ZPSNM	127	H
84	85			NDD						TEC	TEH	.560	ZBALL	61	H
84	85			NDD						TSH	TSH	.560	ZPSNM	127	H
86	85			NDD						TEC	TEH	.560	ZBALL	61	H
86	85			NDD						TSH	TSH	.560	ZPSNM	127	H
83	86			NDD						TEC	TEH	.560	ZBALL	63	H
83	86			NDD						TSH	TSH	.560	ZPSNM	127	H
85	86			NDD						TEC	TEH	.560	ZBALL	63	H

| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
85	86			NDD						TSH	TSH	.560	ZPSNM	127	H
84	87			NDD						TEC	TEH	.560	ZBALL	59	H
84	87			NDD						TSH	TSH	.560	ZPSNM	127	H

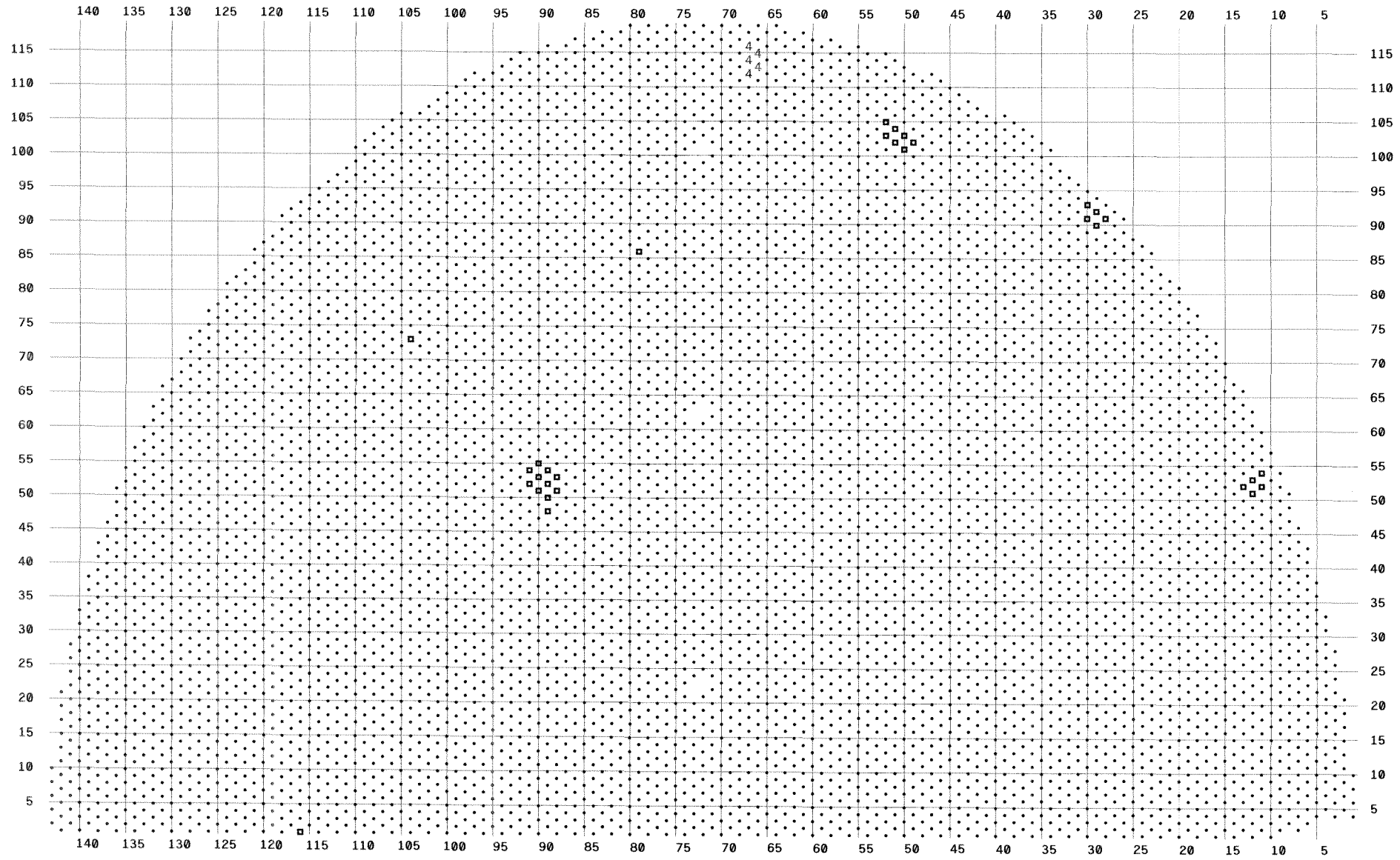
| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

SG - B Cold Leg +PT Special Interest Tests

Braidwood A1R13 CCE 7720

4 5 Tested at TSC -2/+4" for FOSAR Findings - CCE-B-004

31 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 10:57:29

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
113	66			NDD						TSC	TSC	.560	ZPSNM	10	C
113	66			NDD						TEC	TEH	.560	ZBALL	45	H
115	66			NDD						TSC	TSC	.560	ZPSNM	10	C
115	66			NDD						TEC	TEH	.560	ZBALL	45	H
112	67			NDD						TSC	TSC	.560	ZPSNM	10	C
112	67			NDD						TEC	TEH	.560	ZBALL	47	H
114	67			NDD						TSC	TSC	.560	ZPSNM	10	C
114	67			NDD						TEC	TEH	.560	ZBALL	47	H
116	67			NDD						TSC	TSC	.560	ZPSNM	10	C
116	67	.60	71	MBM		6	07C	12.37		TEC	TEH	.560	ZBALL	47	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

Tubes: 5 Records: 10

SG - C Hot Leg +PT Special Interest Tests

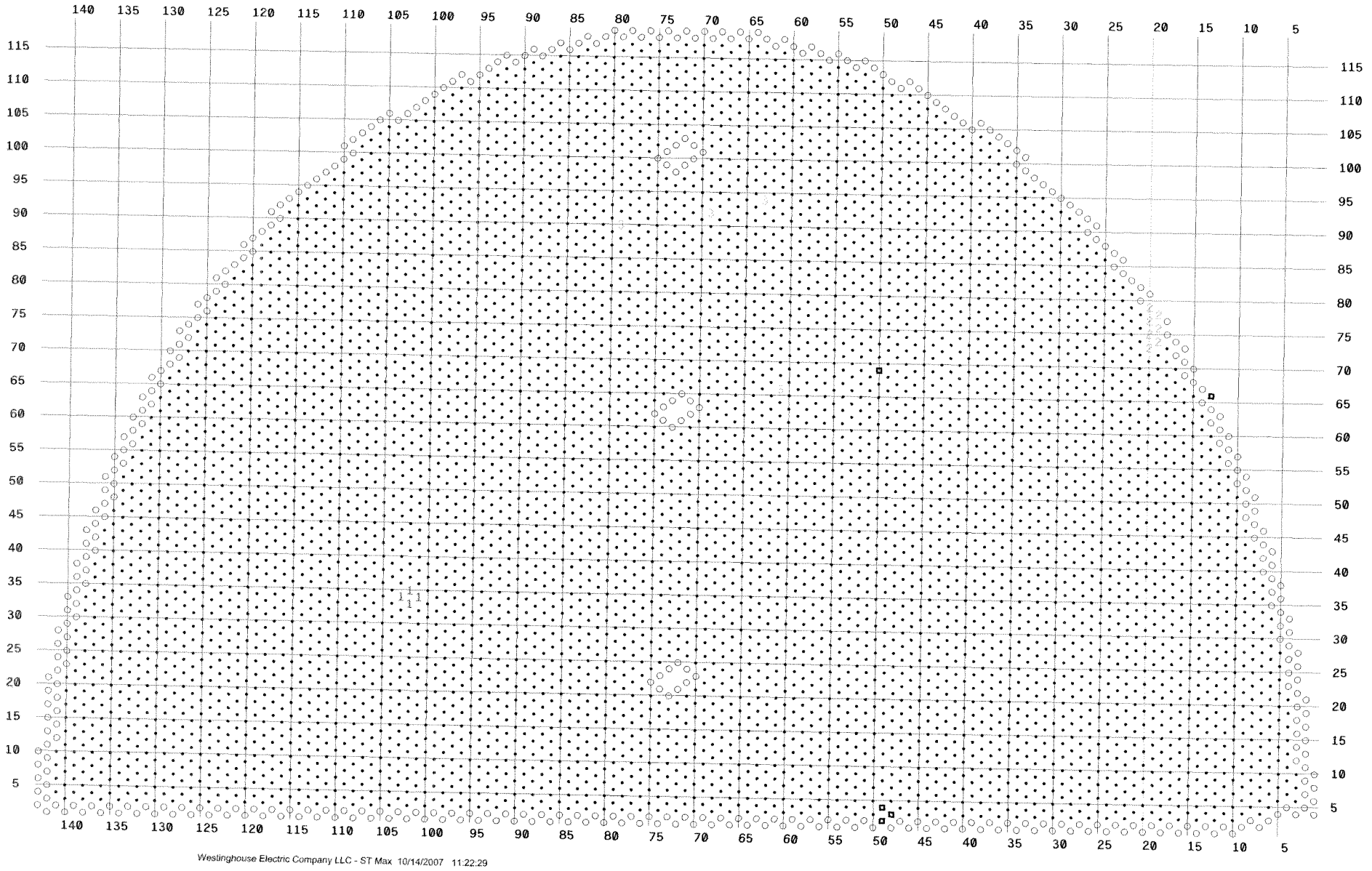
Braidwood A1R13 CCE 7720

1 4 Tested at TSH -2/+4" for FOSAR Findings - CCE-C-001

2 7 Tested at TSH -2/+4" for FOSAR Findings - CCE-C-002

3 4 Tested at Fan Bar +/-4" for 20% Sample of New Fan Bar Wear - CCE-C-003

▫ 5 Plugged Tube



ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
74	19			NDD						TEC	TEH	.560	ZBALL	17	H
74	19			NDD						TSH	TSH	.560	ZPSNM	119	H
76	19			NDD						TEC	TEH	.560	ZBALL	17	H
76	19			NDD						TSH	TSH	.560	ZPSNM	119	H
78	19			NDD						TEC	TEH	.560	ZBALL	17	H
78	19			NDD						TSH	TSH	.560	ZPSNM	119	H
73	20			NDD						TEC	TEH	.560	ZBALL	17	H
73	20			NDD						TSH	TSH	.560	ZPSNM	119	H
75	20			NDD						TEC	TEH	.560	ZBALL	17	H
75	20			NDD						TSH	TSH	.560	ZPSNM	119	H
77	20			NDD						TEC	TEH	.560	ZBALL	17	H
77	20			NDD						TSH	TSH	.560	ZPSNM	119	H
79	20			NDD						TEC	TEH	.560	ZBALL	17	H
79	20			NDD						TSH	TSH	.560	ZPSNM	119	H
66	61	.38	0	PCT	10	P2	F07	1.90		TEC	TEH	.560	ZBALL	61	H
66	61	.47	90	VOL		P4	F07	1.84		F07	F07	.520	ZPUNM	121	H
94	63	.38	0	PCT	10	P2	F05	-1.70		TEC	TEH	.560	ZBALL	55	H
94	63	.20	73	VOL		P4	F05	-1.65		F05	F05	.520	ZPUNM	121	H
92	69	.49	0	PCT	11	P2	F05	-.99		TEC	TEH	.560	ZBALL	47	H
92	69	.38	85	VOL		P4	F05	-.83		F05	F05	.520	ZPUNM	121	H
90	79	.73	0	PCT	14	P2	F06	1.36		TEC	TEH	.560	ZBALL	37	H
90	79	.70	82	VOL		P4	F06	1.21		F06	F06	.520	ZPUNM	121	H
34	101			NDD						TEC	TEH	.560	ZBALL	13	H
34	101			NDD						TSH	TSH	.560	ZPSNM	119	H
33	102			NDD						TEC	TEH	.560	ZBALL	13	H
33	102			NDD						TSH	TSH	.560	ZPSNM	119	H
35	102			NDD						TEC	TEH	.560	ZBALL	13	H
35	102			NDD						TSH	TSH	.560	ZPSNM	119	H
34	103			NDD						TEC	TEH	.560	ZBALL	13	H
34	103			NDD						TSH	TSH	.560	ZPSNM	119	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

Tubes: 15 Records: 30

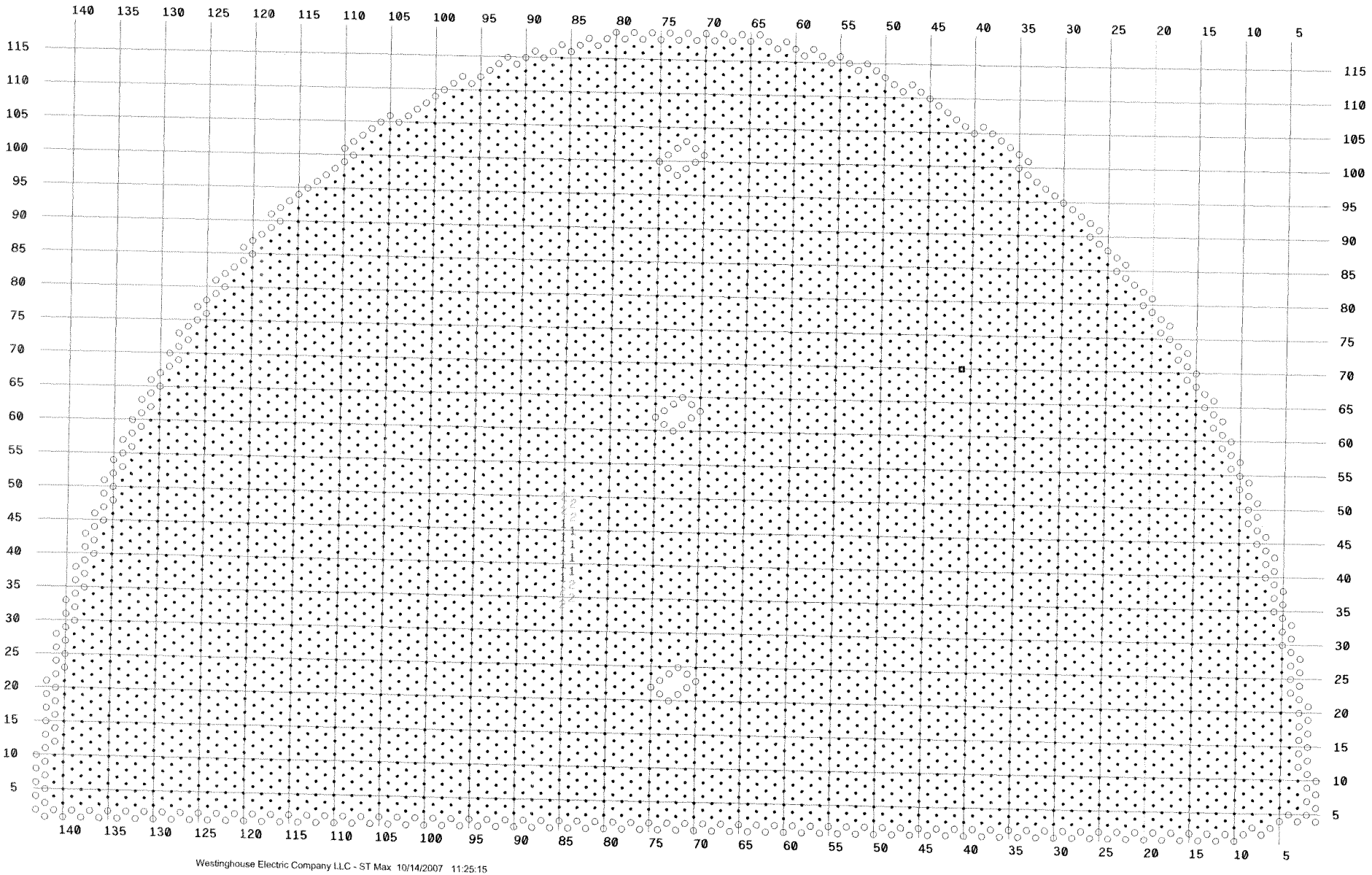
SG - D Hot Leg +PT Special Interest Tests

Braidwood A1R13 CCE 7720

1 9 Tested at TSH -2/+4" for FOSAR Findings - CCE-D-001

2 8 Tested at TSH -2/+4" for FOSAR Findings - CCE-D-002

▫ 1 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 11:25:15

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
35	84			NDD						TEC	TEH	.560	SBALL	63	H
35	84			NDD						TSH	TSH	.560	ZPSNM	127	H
37	84			NDD						TEC	TEH	.560	SBALL	63	H
37	84			NDD						TSH	TSH	.560	ZPSNM	127	H
39	84			NDD						TEC	TEH	.560	SBALL	63	H
39	84			NDD						TSH	TSH	.560	ZPSNM	127	H
41	84			NDD						TEC	TEH	.560	SBALL	63	H
41	84			NDD						TSH	TSH	.560	ZPSNM	127	H
43	84			NDD						TEC	TEH	.560	SBALL	63	H
43	84			NDD						TSH	TSH	.560	ZPSNM	127	H
45	84			NDD						TEC	TEH	.560	SBALL	63	H
45	84			NDD						TSH	TSH	.560	ZPSNM	127	H
47	84			NDD						TEC	TEH	.560	SBALL	63	H
47	84			NDD						TSH	TSH	.560	ZPSNM	127	H
49	84			NDD						TEC	TEH	.560	SBALL	63	H
49	84			NDD						TSH	TSH	.560	ZPSNM	127	H
34	85			NDD						TEC	TEH	.560	ZBALL	69	H
34	85			NDD						TSH	TSH	.560	ZPSNM	127	H
36	85			NDD						TEC	TEH	.560	ZBALL	69	H
36	85			NDD						TSH	TSH	.560	ZPSNM	127	H
38	85			NDD						TEC	TEH	.560	ZBALL	69	H
38	85			NDD						TSH	TSH	.560	ZPSNM	127	H
40	85			NDD						TEC	TEH	.560	ZBALL	69	H
40	85			NDD						TSH	TSH	.560	ZPSNM	127	H
42	85			NDD						TEC	TEH	.560	ZBALL	65	H
42	85			NDD						TEC	TEH	.560	SBALL	67	H
42	85			NDD						TSH	TSH	.560	ZPSNM	127	H
44	85			NDD						TEC	TEH	.560	SBALL	67	H
44	85			NDD						TSH	TSH	.560	ZPSNM	127	H
46	85			NDD						TEC	TEH	.560	SBALL	67	H
46	85			NDD						TSH	TSH	.560	ZPSNM	127	H
48	85			NDD						TEC	TEH	.560	SBALL	67	H
48	85			NDD						TSH	TSH	.560	ZPSNM	127	H
50	85			NDD						TEC	TEH	.560	ZBALL	65	H
50	85			RBD						TEC	TEH	.560	SBALL	67	H
50	85			NDD						TSH	TSH	.560	ZPSNM	127	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

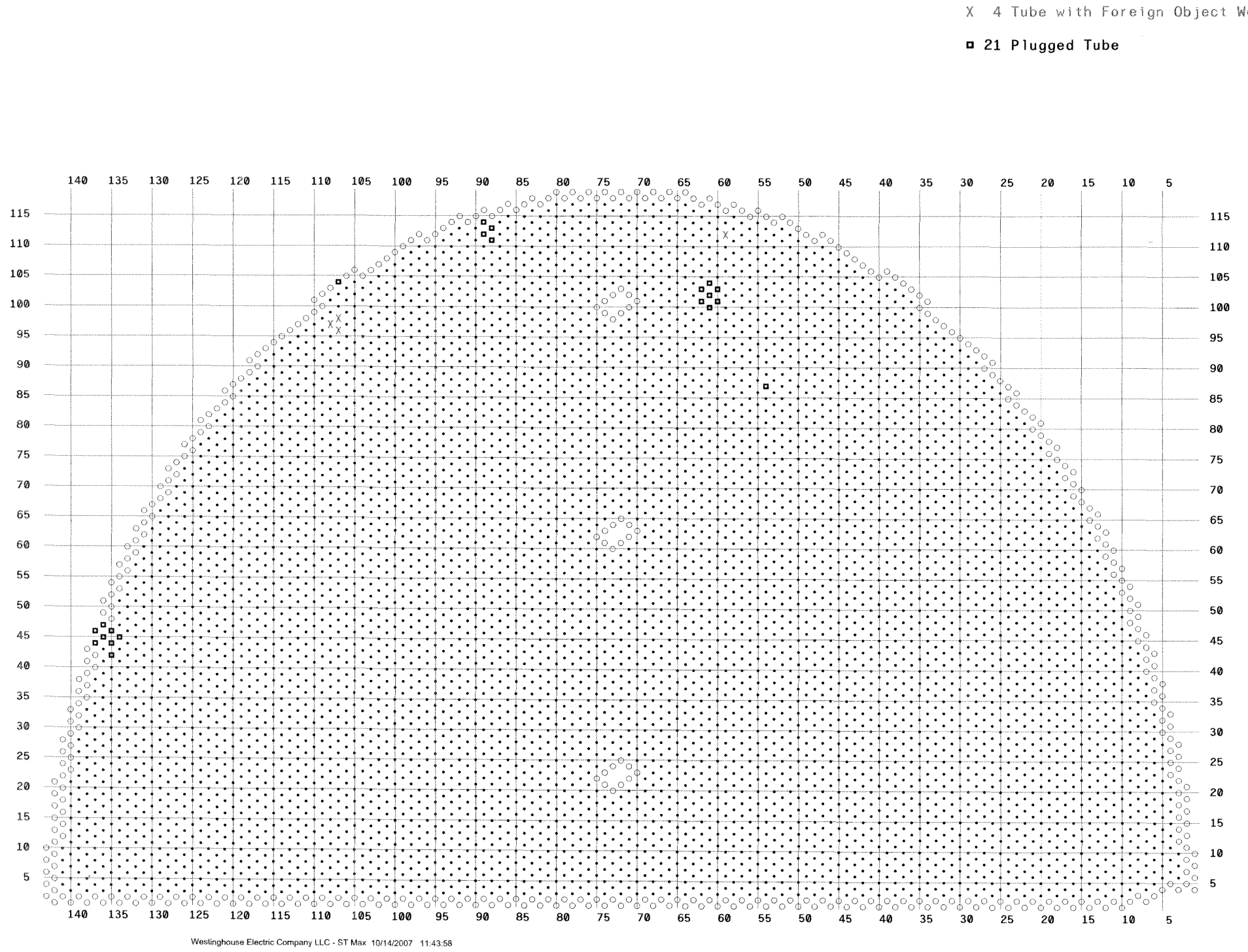
Tubes: 17 Records: 36

Attachment B.3

Tubes Damaged by Secondary Side Foreign Objects
A1R13

SG - A Tubes with Foreign Object Wear

Braidwood A1R13 CCE 7720



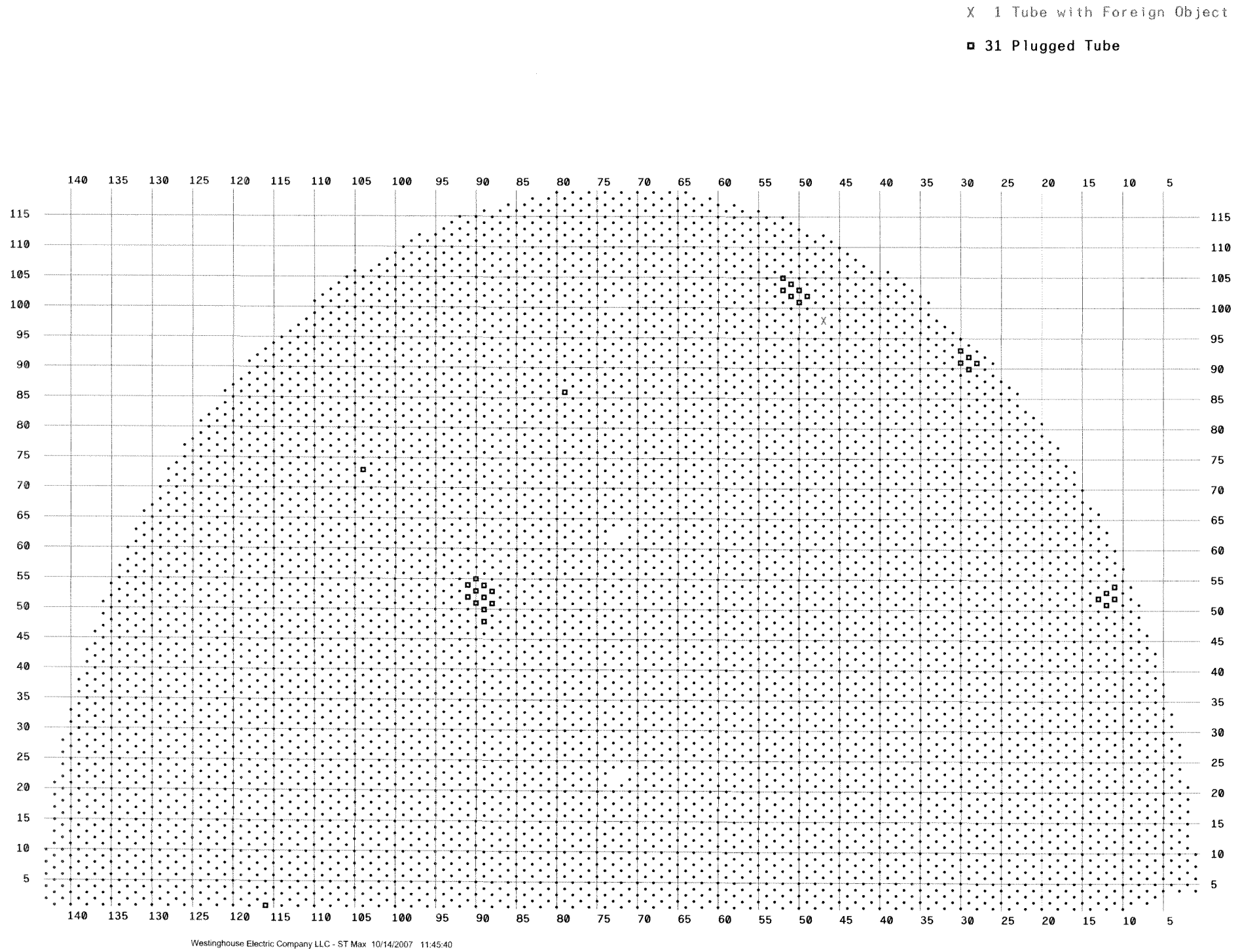
INSPDATE	ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
	112	59	.10	86	PCT	11	2	TSC	.26		TSC	TSC	.560	ZPSNM	18	C
	112	59	.11	78	SVI	0	P4	TSC	.26		TSC	TSC	.560	ZPSNM	18	C
	112	59			NDD						TEC	TEH	.560	ZBALL	71	H
2006/04/01	112	59			NDD						TEH	TEC	.560	ZBALL	50	C
	96	107			NDD						TEC	TEH	.560	ZBALL	19	H
	96	107	.13	107	VOL		P4	TSH	.15		TSH	TSH	.560	ZPSNM	133	H
	96	107	.15	281	PCT	15	2	TSH	.15		TSH	TSH	.560	ZPSNM	133	H
2006/04/01	96	107			NDD						TEH	TEC	.560	ZBALL	24	C
2006/04/01	96	107	.16	280	PCT	17	2	TSH	.11		TSH	TSH	.560	ZPSNM	85	H
2006/04/01	96	107	.16	280	VOL		2	TSH	.12		TSH	TSH	.560	ZPSNM	85	H
	98	107			NDD						TEC	TEH	.560	ZBALL	19	H
	98	107	.13	85	VOL		P4	TSH	.10		TSH	TSH	.560	ZPSNM	133	H
	98	107	.15	80	PCT	15	2	TSH	.10		TSH	TSH	.560	ZPSNM	133	H
2006/04/01	98	107			NDD						TEH	TEC	.560	ZBALL	24	C
2006/04/01	98	107	.15	82	PCT	16	2	TSH	.10		TSH	TSH	.560	ZPSNM	85	H
2006/04/01	98	107	.15	82	VOL		2	TSH	.10		TSH	TSH	.560	ZPSNM	85	H
	97	108			NDD						TEC	TEH	.560	ZBALL	17	H
	97	108	.12	95	VOL		P4	TSH	.16		TSH	TSH	.560	ZPSNM	133	H
	97	108	.13	269	PCT	14	2	TSH	.16		TSH	TSH	.560	ZPSNM	133	H
2006/04/01	97	108			NDD						TEH	TEC	.560	ZBALL	24	C
2006/04/01	97	108	.14	272	VOL		2	TSH	.16		TSH	TSH	.560	ZPSNM	85	H
2006/04/01	97	108	.14	272	PCT	16	2	TSH	.16		TSH	TSH	.560	ZPSNM	85	H

| INSPDATE | ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

Tubes: 4 Records: 22

SG - B Tubes with Foreign Object Wear

Braidwood A1R13 CCE 7720



INSPDATE	ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
	98	47			NDD						TEC	TEH	.560	ZBALL	19	H
	98	47	.25	78	PCT	22	P1	TSH	-.01		TSH	TSH	.560	ZPSNM	127	H
	98	47	.10	94	VOL	0	P4	TSH	.01		TSH	TSH	.560	ZPSNM	127	H
2006/04/01	98	47	.28	72	VOL		P1	TSH	-.05		TSH	TSH	.560	ZPSNM	5	H
2006/04/01	98	47	.29	75	VOL		P1	TSH	-.03		TSH	TSH	.560	ZPSNM	13	H
2006/04/01	98	47	.29	75	PCT	23	P1	TSH	-.01		TSH	TSH	.560	ZPSNM	13	H
2006/04/01	98	47			NDD						TEH	TEC	.560	SBALL	20	C

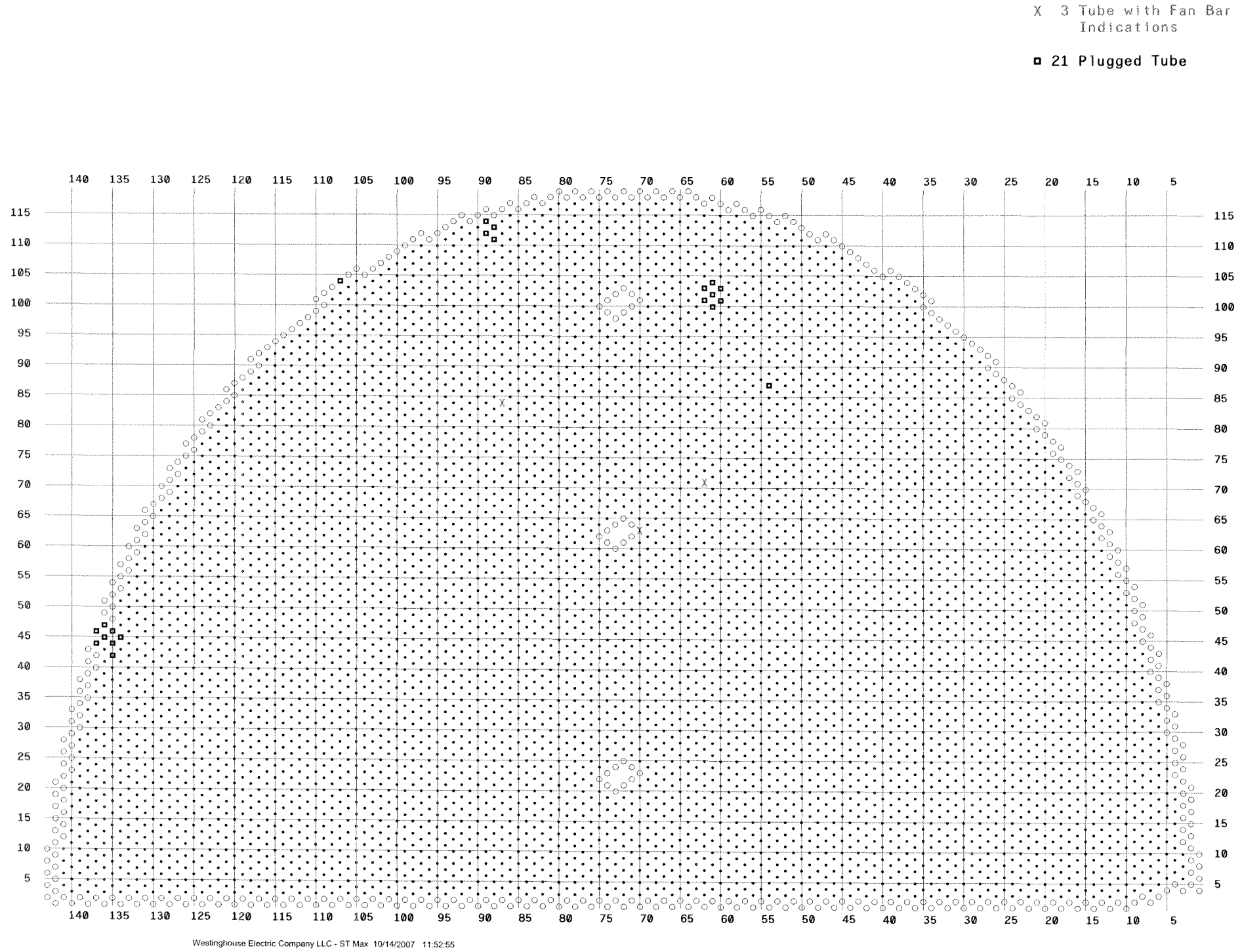
| INSPDATE | ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

Attachment B.4

Tubes Containing Fan Bar Wear
A1R13

SG - A Tubes with Fan Bar Wear Indications

Braidwood A1R13 CCE 7720



SG - A Fan Bar Wear Indications

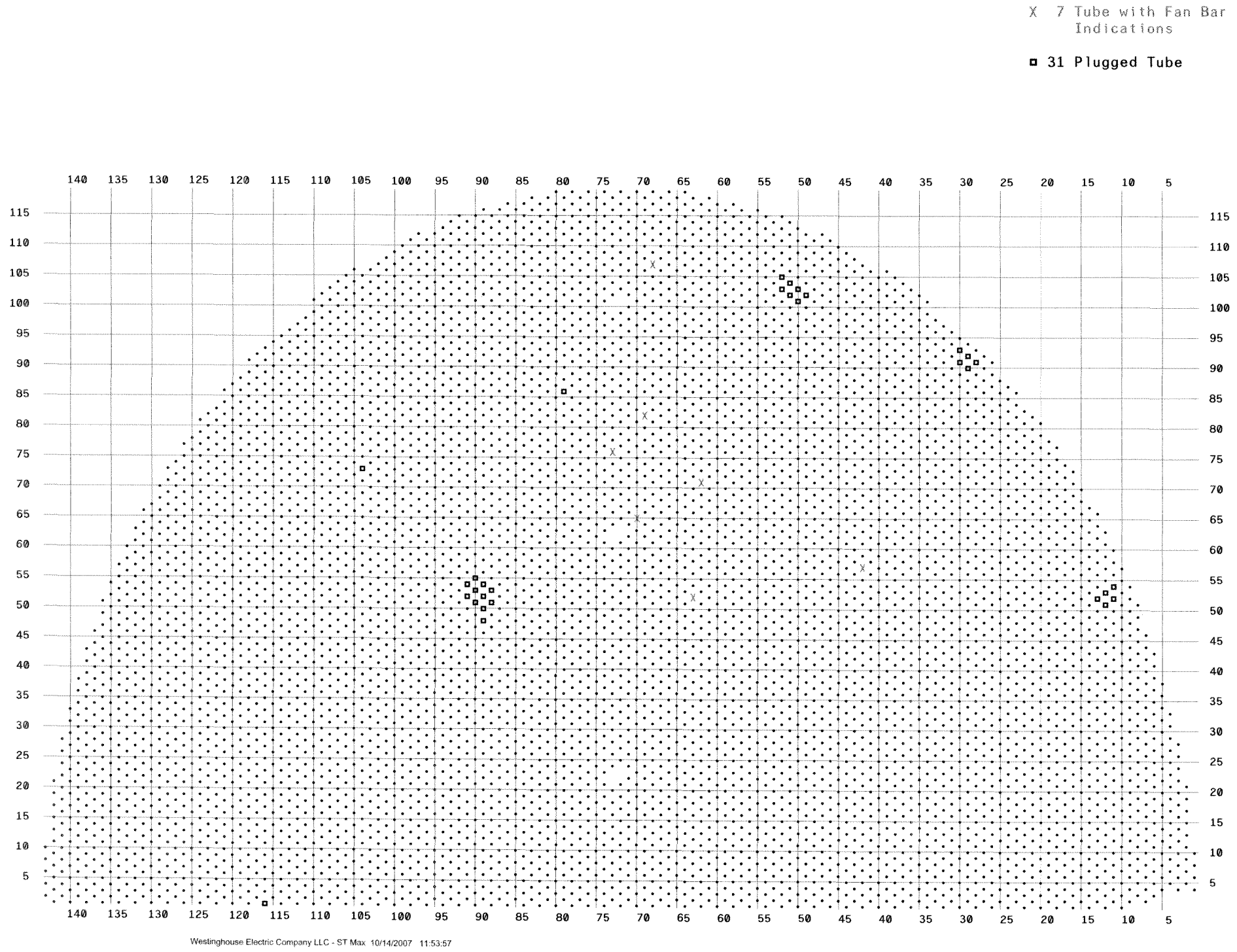
Braidwood 1 A1R13 CCE 20071001 01/14/2008 09:55:40

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
71	62	.17	0	PCT	4	P2	F04	-1.81		TEC	TEH	.560	SBALL	73	H
63	70	.11	0	PCT	4	P2	F05	.54		TEC	TEH	.560	SBALL	47	H
84	87	.23	0	PCT	5	P2	F05	-1.04		TEC	TEH	.560	ZBALL	35	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

Tubes: 3 Records: 3

SG - B Tubes with Fan Bar Wear Indications

Braidwood A1R13 CCE 7720



SG - B Fan Bar Wear Indications

Braidwood 1 A1R13 CCE 20071001 01/14/2008 09:55:39

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
57	42	.19	0	PCT	4	P2	F05	-1.53		TEC	TEH	.560	ZBALL	29	H
71	62	.21	0	PCT	5	P2	F04	1.05		TEC	TEH	.560	ZBALL	45	H
52	63	.11	0	PCT	5	P2	F05	.97		TEC	TEH	.560	ZBALL	39	H
107	68	.17	0	PCT	6	P2	F05	1.69		TEC	TEH	.560	ZBALL	47	H
82	69	.25	0	PCT	6	P2	F06	-1.19		TEC	TEH	.560	ZBALL	45	H
65	70	.23	0	PCT	4	P2	F06	-.98		TEC	TEH	.560	ZBALL	53	H
76	73	.18	0	PCT	4	P2	F05	-1.22		TEC	TEH	.560	ZBALL	53	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

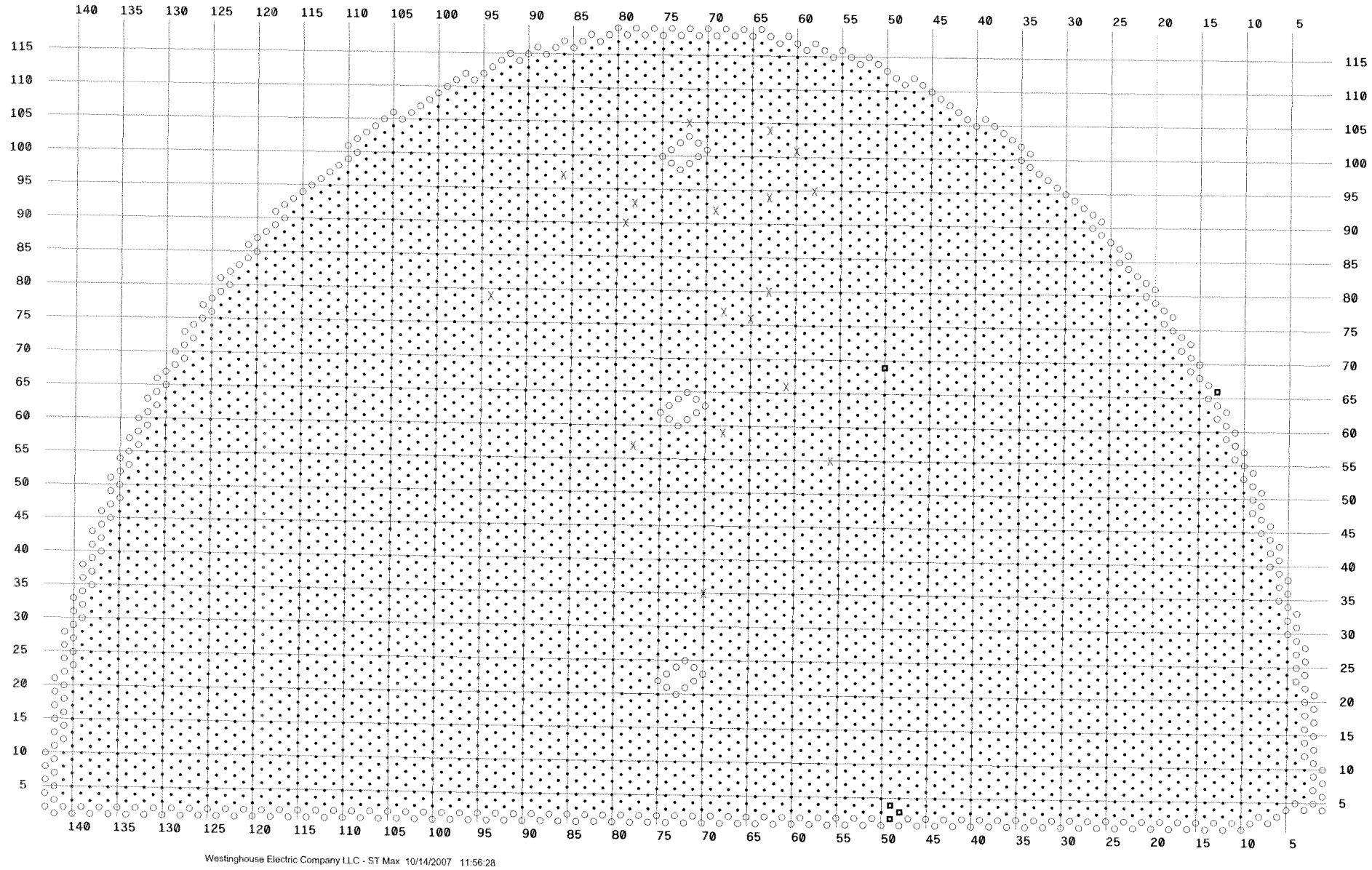
Tubes: 7 Records: 7

SG - C Tubes with Fan Bar Wear Indications

Braidwood A1R13 CCE 7720

X 18 Tube with Fan Bar Wear Indications

5 Plugged Tube



SG - C Fan Bar Wear Indications

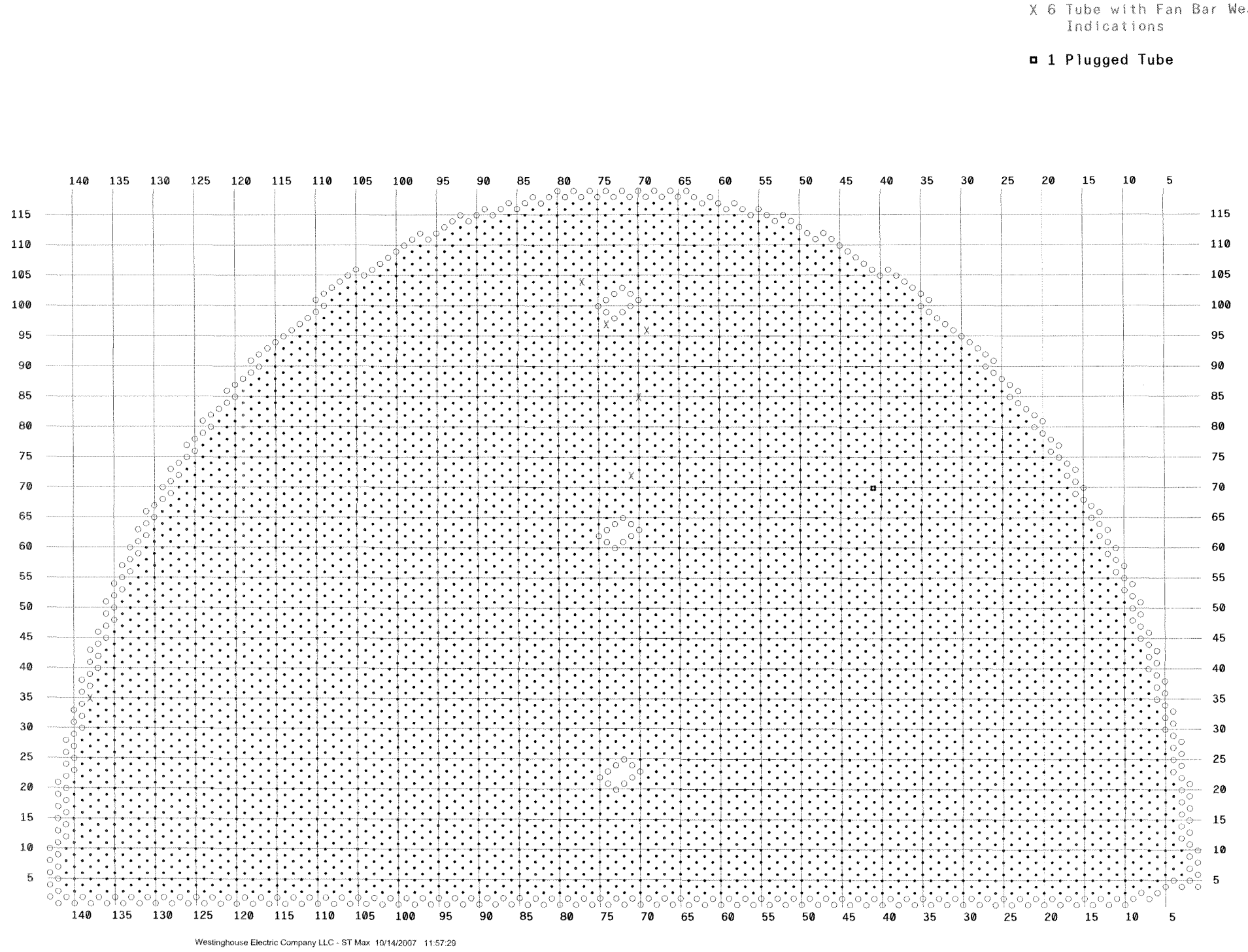
Braidwood 1 A1R13 CCE 20071001 01/14/2008 09:55:39

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
55	56	.21	0	PCT	6	P2	F05	1.29		TEC	TEH	.560	ZBALL	61	H
95	58	.27	0	PCT	8	P2	F05	-.87		TEC	TEH	.560	ZBALL	57	H
101	60	.22	0	PCT	6	P2	F05	1.40		TEC	TEH	.560	ZBALL	55	H
66	61	.38	0	PCT	10	P2	F07	1.90		TEC	TEH	.560	ZBALL	61	H
80	63	.25	0	PCT	6	P2	F06	-1.31		TEC	TEH	.560	ZBALL	59	H
94	63	.38	0	PCT	10	P2	F05	-1.70		TEC	TEH	.560	ZBALL	55	H
104	63	.27	0	PCT	7	P2	F05	1.09		TEC	TEH	.560	ZBALL	55	H
76	65	.12	0	PCT	4	P2	F05	.81		TEC	TEH	.560	ZBALL	57	H
59	68	.14	0	PCT	4	P2	F05	.92		TEC	TEH	.560	ZBALL	45	H
77	68	.56	0	PCT	13	P2	F05	-1.03		TEC	TEH	.560	ZBALL	45	H
92	69	.49	0	PCT	11	P2	F05	-.99		TEC	TEH	.560	ZBALL	47	H
35	70	.20	0	PCT	5	P2	F05	1.11		TEC	TEH	.560	ZBALL	47	H
105	72	.21	0	PCT	5	P2	F03	-.39		TEC	TEH	.560	ZBALL	53	H
57	78	.33	0	PCT	9	P2	F06	.94		TEC	TEH	.560	ZBALL	39	H
93	78	.24	0	PCT	7	P2	F05	-.71		TEC	TEH	.560	ZBALL	39	H
90	79	.73	0	PCT	14	P2	F06	1.36		TEC	TEH	.560	ZBALL	37	H
97	86	.25	0	PCT	5	P2	F05	1.11		TEC	TEH	.560	ZBALL	35	H
79	94	.42	0	PCT	9	P2	F06	-.99		TEC	TEH	.560	ZBALL	31	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

Tubes: 18 Records: 18

SG - D Tubes with Fan Bar Wear Indications

Braidwood A1R13 CCE 7720



ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
96	69	.51	0	PCT	8	P2	F08	.67		TEC	TEH	.560	SBALL	55	H
85	70	.92	0	PCT	16	P2	F06	-1.29		TEC	TEH	.560	ZBALL	57	H
72	71	.40	0	PCT	8	P2	F06	.92		TEC	TEH	.560	ZBALL	57	H
97	74	.44	0	PCT	9	P2	F08	-.59		TEC	TEH	.560	ZBALL	57	H
104	77	.37		PCT	7	P2	F06	-1.45		TEC	TEH	.560	SBALL	59	H
35	138	.33	0	PCT	5	P2	F05	1.21		TEC	TEH	.560	ZBALL	85	H

| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

Tubes: 6 Records: 6

Attachment B.5

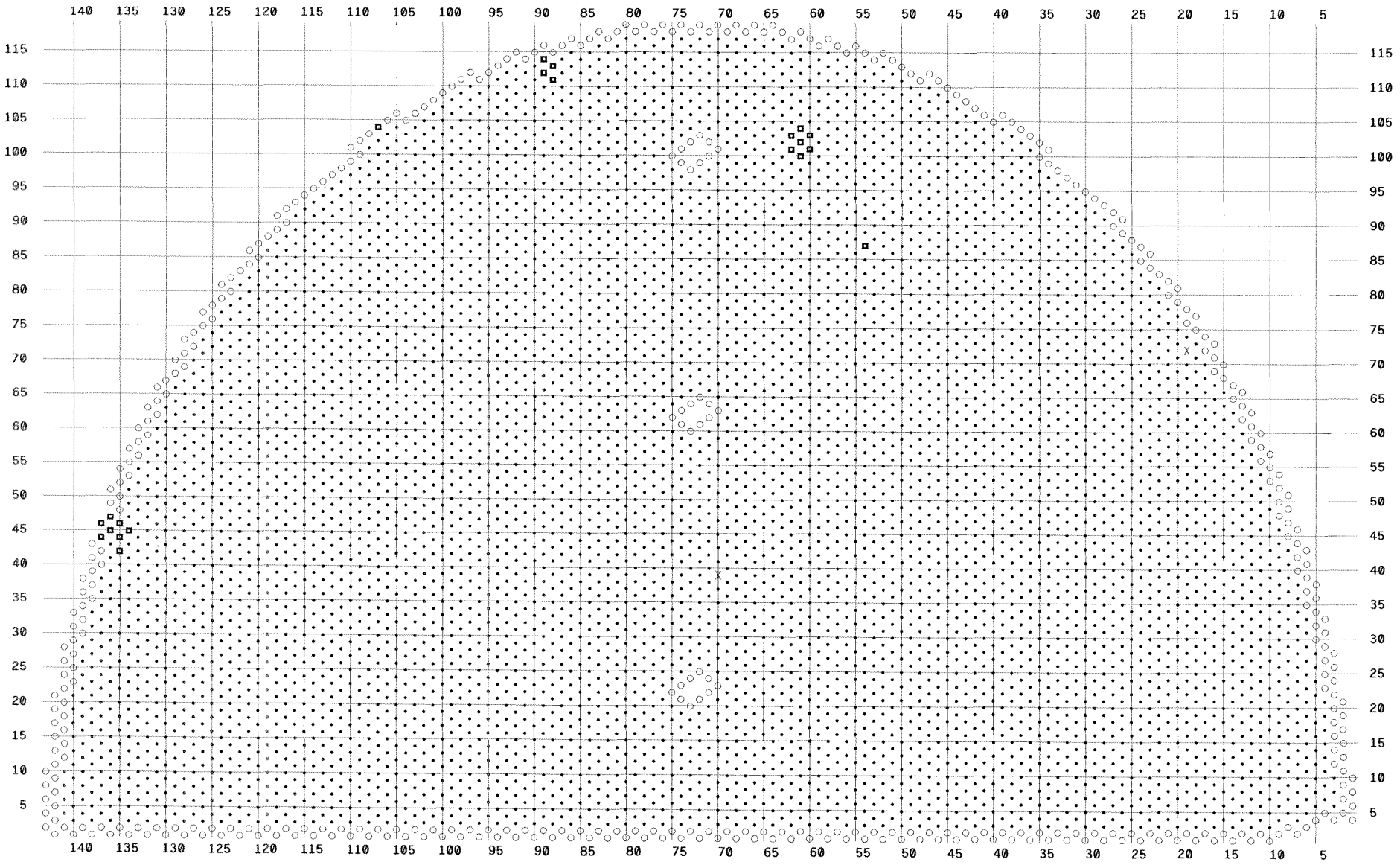
Tubes Containing Lattice Grid Wear
A1R13

SG - A Tubes with Lattice Grid Wear Indications

Braidwood A1R13 CCE 7720

X 2 Tube with Lattice Grid Wear Indications

▫ 21 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 12:45:36

SG - A Lattice Grid Wear Indications

Braidwood 1 A1R13 CCE 20071001 01/14/2008 09:52:12

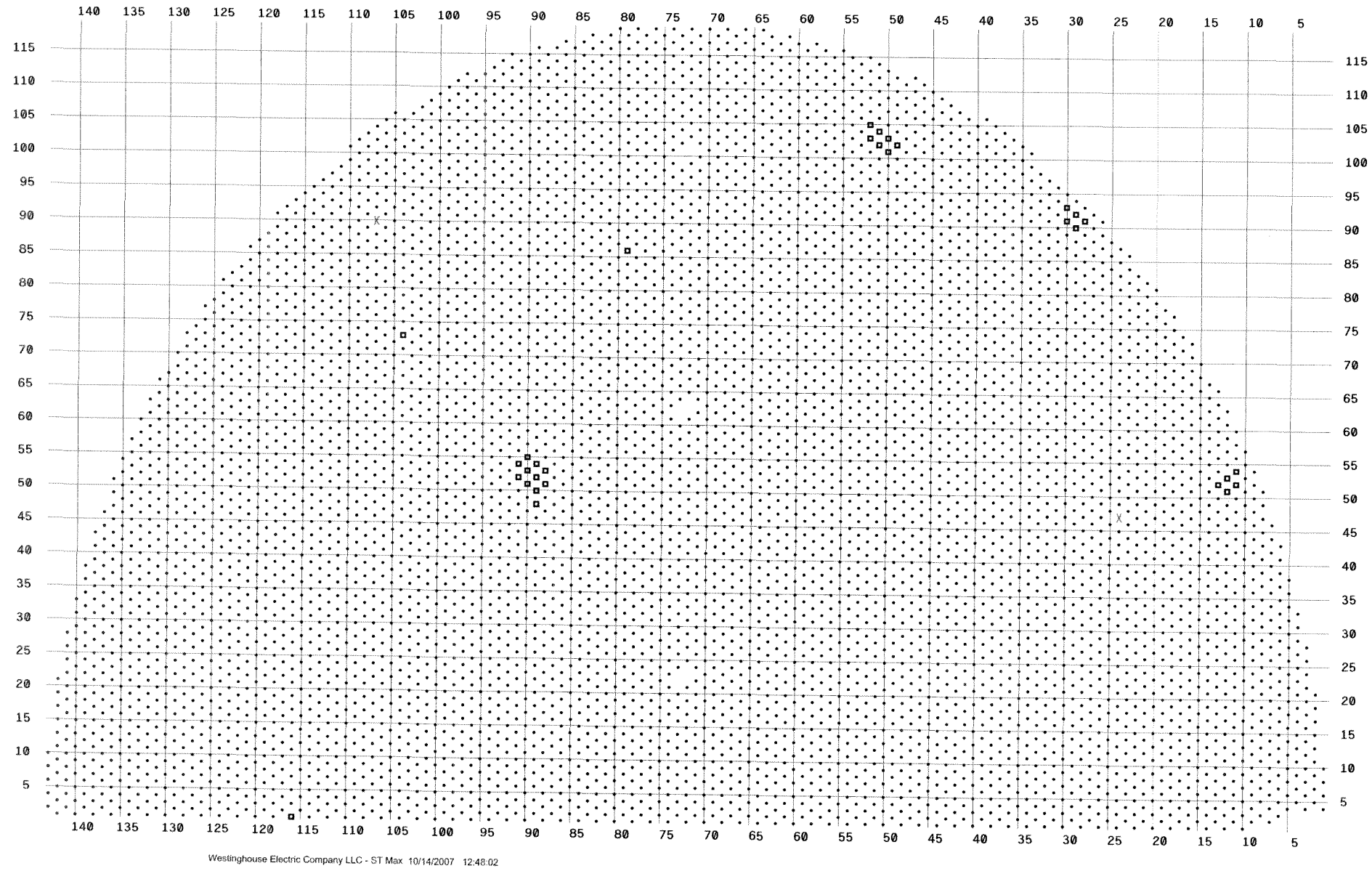
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
72	19	.17	0	PCT	4	P2	05H	.48		TEC	TEH	.560	ZBALL	97	H
39	70	.36	0	PCT	10	P2	01H	-1.85		TEC	TEH	.560	SBALL	47	H

| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

Tubes: 2 Records: 2

SG - B Tubes with Lattice Grid Wear Indications

Braidwood A1R13 CCE 7720



SG - B Lattice Grid Wear Indications

Braidwood 1 A1R13 CCE 20071001 01/14/2008 09:52:11

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
47	24	.11	0	PCT	3	P2	08H	-1.53		TEC	TEH	.560	ZBALL	27	H
90	107	.59	0	PCT	10	P2	07H	.57		TEC	TEH	.560	ZBALL	79	H

| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

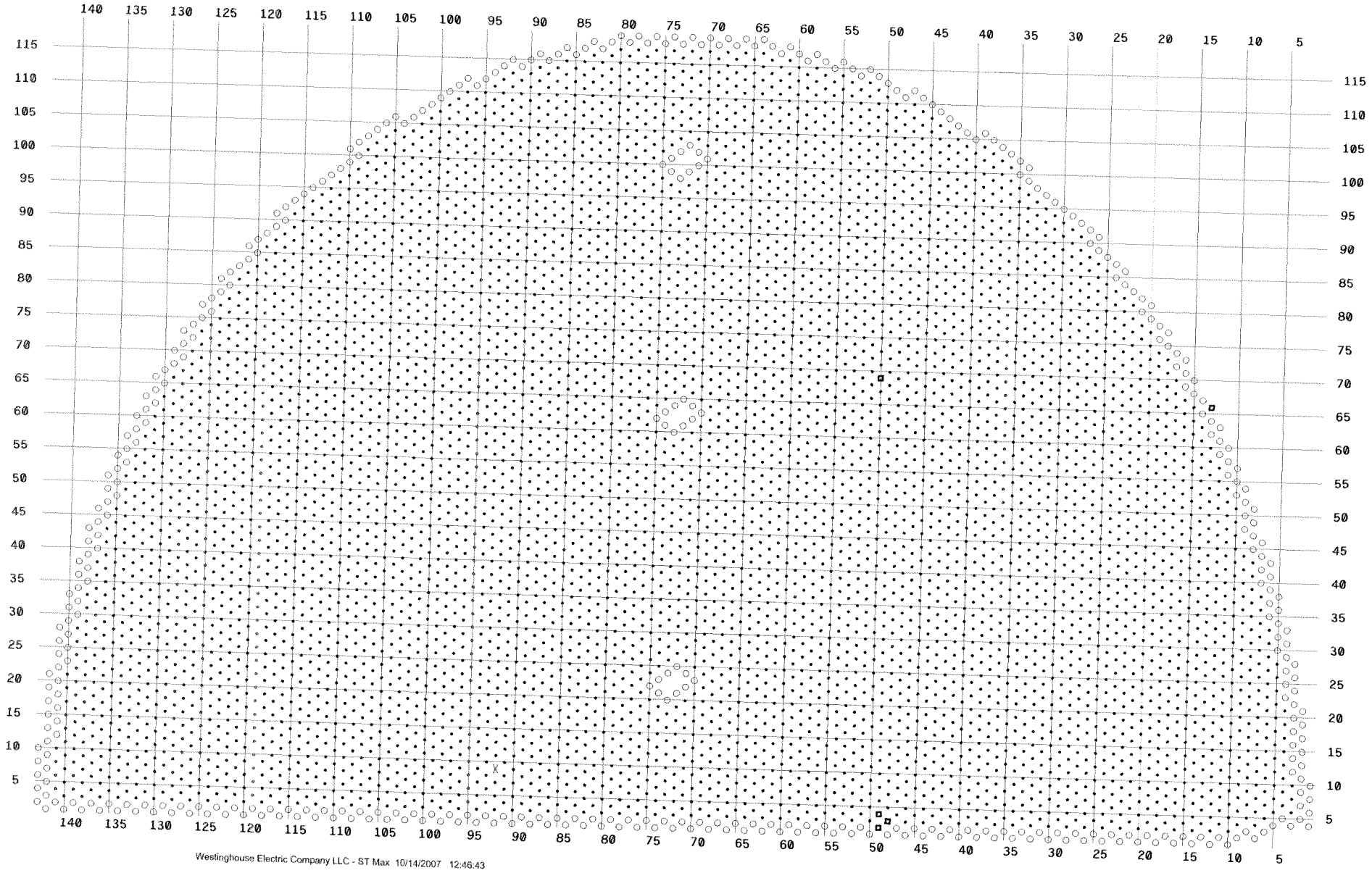
Tubes: 2 Records: 2

SG - C Tubes with Lattice Grid Wear Indications

Braidwood A1R13 CCE 7720

X 1 Tube with Lattice Grid Wear Indications

5 Plugged Tube



SG - C Lattice Grid Wear Indications

Braidwood 1 A1R13 CCE 20071001 01/14/2008 09:52:11

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
9	92	.11	0	PCT	3	P2	05C	-1.59		TEC	TEH	.560	ZBALL	29	H

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

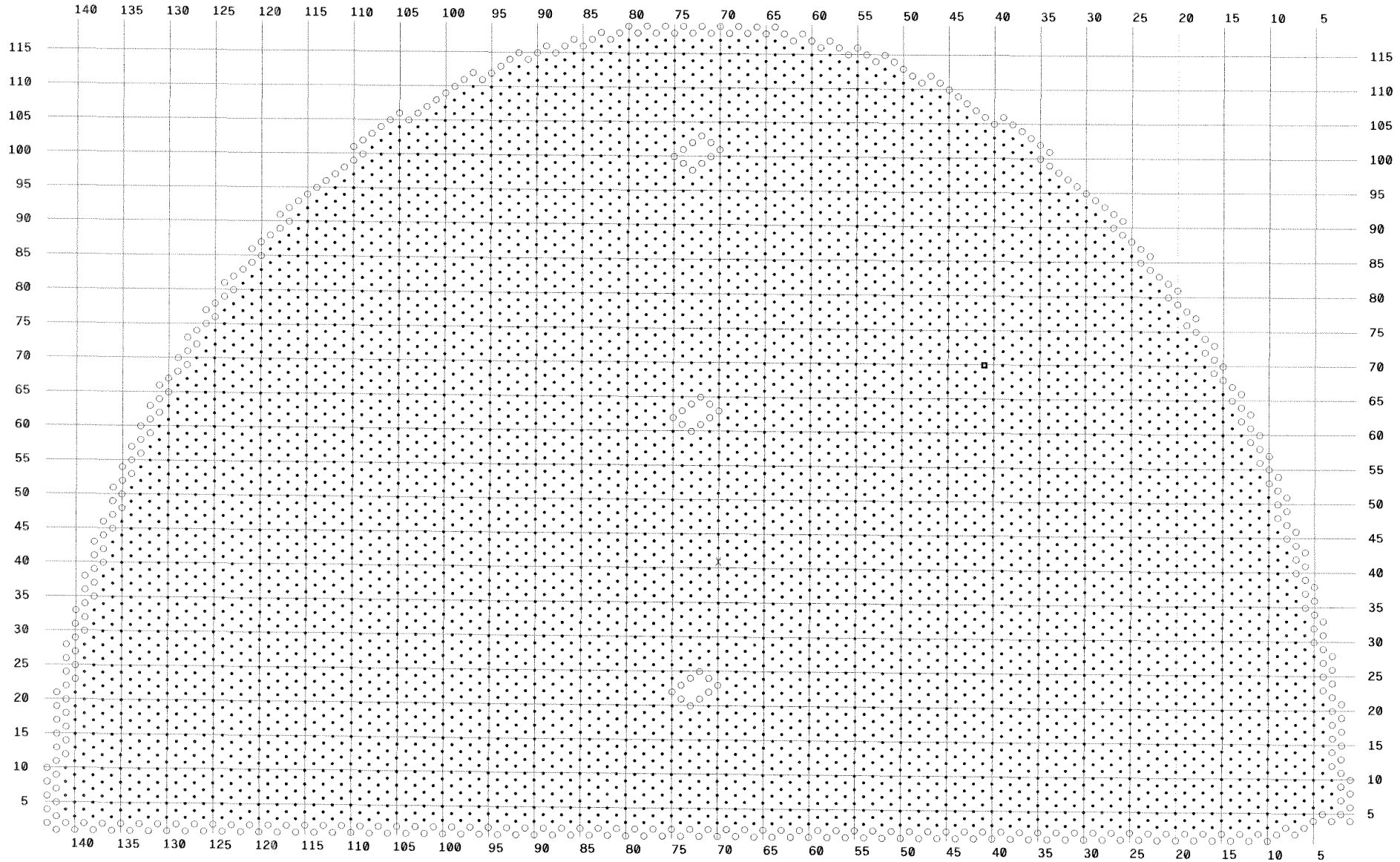
Tubes: 1 Records: 1

SG - D Tubes with Lattice Grid Wear Indications

Braidwood A1R13 CCE 7720

X 1 Tube with Lattice Grid Wear Indications

1 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 12:43:51

SG - D Lattice Grid Wear Indications

Braidwood 1 A1R13 CCE 20071001 10/14/2007 12:37:23

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM
41	70	.36	0	PCT	8	P2	08H	-1.51		TEC	TEH	.560	ZBALL	57	H	
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L	COM

Tubes: 1 Records: 1

Attachment B.6

Tubes Repaired During A1R13

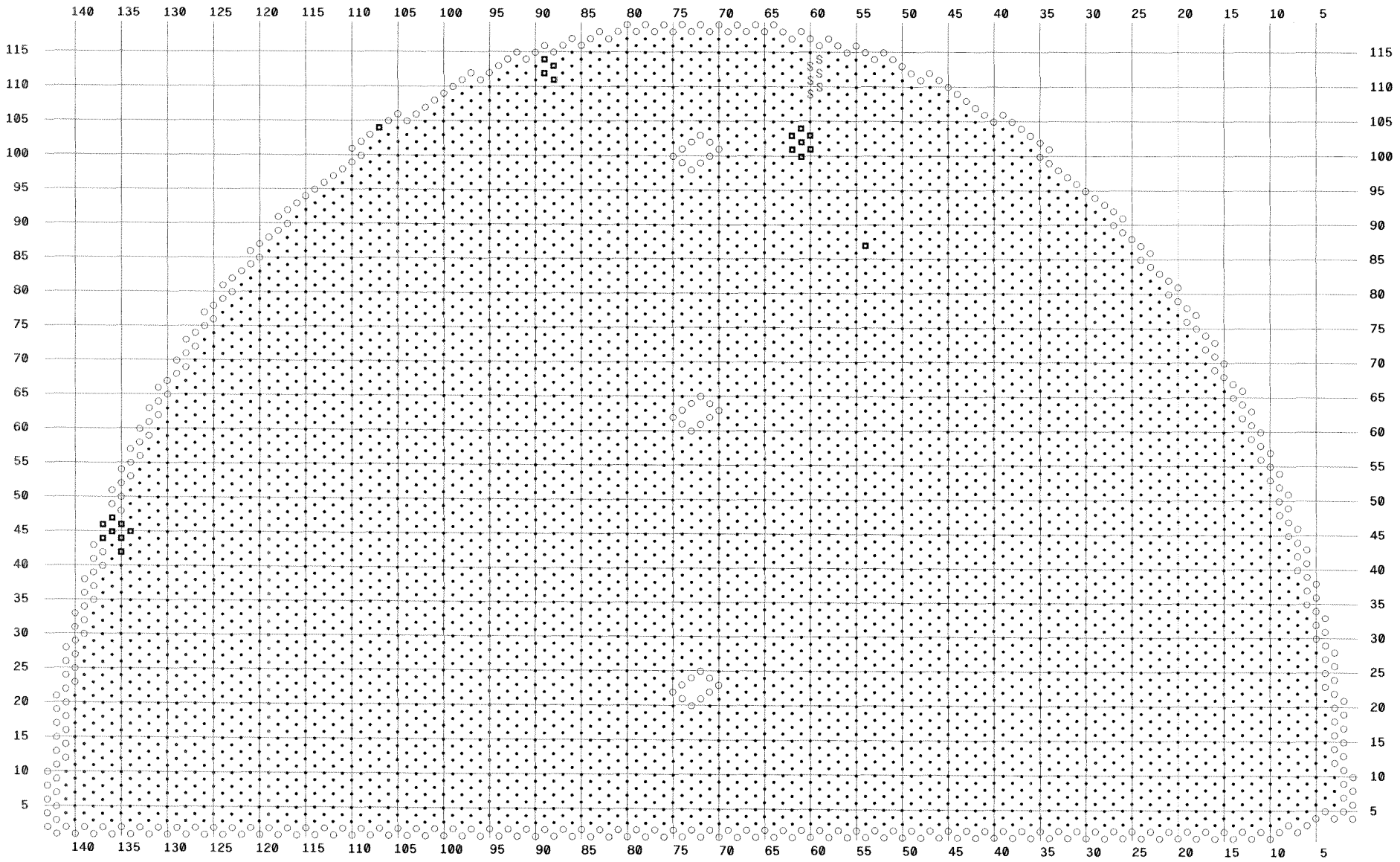
SG - A Tubes Plugged During A1R13

Plugs are Short Mechanical Type

Braidwood A1R13 CCE 7720

S 6 Tube Plugged in the Hot Leg and Stabilized (82") and Plugged in the Cold Leg

21 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 17:07:53

Braidwood 1 A1R13 CCE 20071001 01/14/2008 10:10:29

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
110	59			NDD						TSC	TSC	.560	ZPSNM	18	C
110	59			NDD						TEC	TEH	.560	ZBALL	71	H
112	59	.11	78	SVI	0	P4	TSC	.26		TSC	TSC	.560	ZPSNM	18	C
112	59	.10	86	PCT	11	2	TSC	.26		TSC	TSC	.560	ZPSNM	18	C
112	59			NDD						TEC	TEH	.560	ZBALL	71	H
114	59			NDD						TSC	TSC	.560	ZPSNM	18	C
114	59			NDD						TEC	TEH	.560	ZBALL	71	H
109	60			NDD						TEC	TEH	.560	ZBALL	69	H
111	60			NDD						TSC	TSC	.560	ZPSNM	18	C
111	60			NDD						TEC	TEH	.560	ZBALL	69	H
113	60			NDD						TSC	TSC	.560	ZPSNM	18	C
113	60			NDD						TEC	TEH	.560	ZBALL	69	H
ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L

Tubes: 6 Records: 12

SG - B Tubes Plugged During A1R13

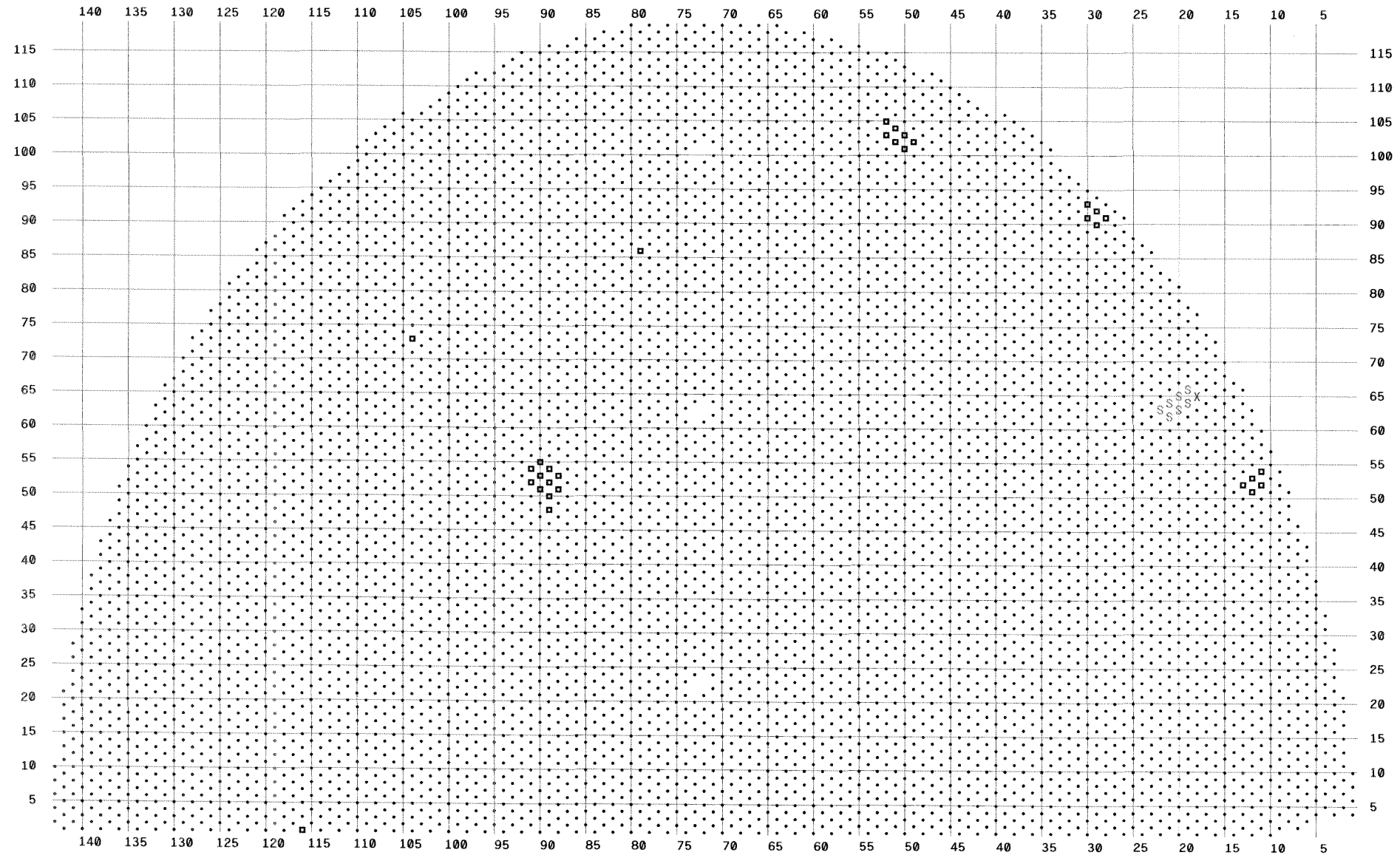
Plugs are Short Mechanical Type

Braidwood A1R13 CCE 7720

S 7 Tube Stabilized (82") and Plugged in the Hot Leg and Plugged in the Cold Leg

X 1 Tube Stabilized (254") and Plugged in the Hot Leg and Plugged in the Cold Leg

▫ 31 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 17:11:59

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
65	18			NDD						TEC	TEH	.560	ZBALL	11	H
65	18			NDD						TSH	TSH	.560	ZPSNM	127	H
64	19			NDD						TEC	TEH	.560	ZBALL	11	H
64	19			NDD						TSH	TSH	.560	ZPSNM	127	H
66	19			NDD						TEC	TEH	.560	ZBALL	11	H
66	19			NDD						TSH	TSH	.560	ZPSNM	127	H
63	20			NDD						TEC	TEH	.560	ZBALL	11	H
63	20			NDD						TSH	TSH	.560	ZPSNM	127	H
65	20			NDD						TEC	TEH	.560	ZBALL	11	H
65	20	.54	84	PLP		11	TSH	.04		TSH	TSH	.560	ZPSNM	127	H
62	21			NDD						TEC	TEH	.560	ZBALL	9	H
62	21			NDD						TSH	TSH	.560	ZPSNM	127	H
64	21			NDD						TEC	TEH	.560	ZBALL	9	H
64	21	.35	81	PLP		11	TSH	.03		TSH	TSH	.560	ZPSNM	127	H
63	22			NDD						TEC	TEH	.560	ZBALL	9	H
63	22			NDD						TSH	TSH	.560	ZPSNM	127	H

| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

Tubes: 8 Records: 16

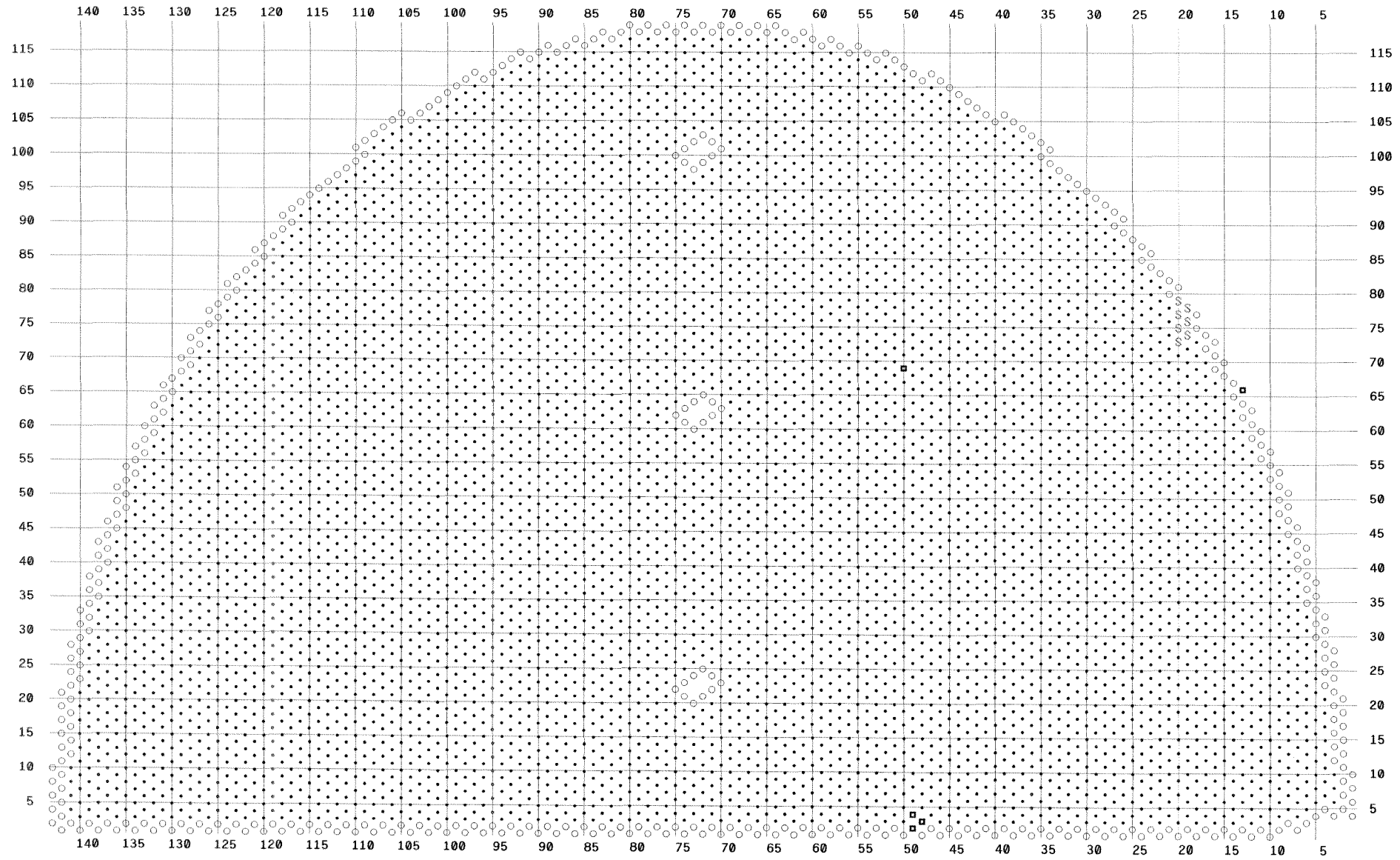
SG - C Tubes Plugged During A1R13

Plugs are Short Mechanical Type

Braidwood A1R13 CCE 7720

S 7 Tube Stabilized (82") and
Plugged in the Hot Leg and
Plugged in the Cold Leg

5 Plugged Tube



Westinghouse Electric Company LLC - ST Max 10/14/2007 17:13:46

Braidwood 1 A1R13 CCE 20071001 01/14/2008 10:11:57

ROW	COL	VOLTS	DEG	IND	PER	CHN	LOCN	INCH1	INCH2	BEGT	ENDT	PDIA	PTYPE	CAL	L
74	19			NDD						TEC	TEH	.560	ZBALL	17	H
74	19			NDD						TSH	TSH	.560	ZPSNM	119	H
76	19			NDD						TEC	TEH	.560	ZBALL	17	H
76	19			NDD						TSH	TSH	.560	ZPSNM	119	H
78	19			NDD						TEC	TEH	.560	ZBALL	17	H
78	19			NDD						TSH	TSH	.560	ZPSNM	119	H
73	20			NDD						TEC	TEH	.560	ZBALL	17	H
73	20			NDD						TSH	TSH	.560	ZPSNM	119	H
75	20			NDD						TEC	TEH	.560	ZBALL	17	H
75	20			NDD						TSH	TSH	.560	ZPSNM	119	H
77	20			NDD						TEC	TEH	.560	ZBALL	17	H
77	20			NDD						TSH	TSH	.560	ZPSNM	119	H
79	20			NDD						TEC	TEH	.560	ZBALL	17	H
79	20			NDD						TSH	TSH	.560	ZPSNM	119	H

| ROW | COL | VOLTS | DEG | IND | PER | CHN | LOCN | INCH1 | INCH2 | BEGT | ENDT | PDIA | PTYPE | CAL | L |

Tubes: 7 Records: 14