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Richard J. St. Onge
Director, Nuclear Regulatory Affairs and
Emergency Planning

February 7, 2013 10 CFR 50.4

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: **Docket No. 50-361**
Response to Request for Additional Information (RAI 25)
Regarding Confirmatory Action Letter Response
(TAC No. ME 9727)
San Onofre Nuclear Generating Station, Unit 2

References:
1. Letter from Mr. Elmo E. Collins (USNRC) to Mr. Peter T. Dietrich (SCE), dated March 27, 2012, Confirmatory Action Letter 4-12-001, San Onofre Nuclear Generating Station, Units 2 and 3, Commitments to Address Steam Generator Tube Degradation

2. Letter from Mr. Peter T. Dietrich (SCE) to Mr. Elmo E. Collins (USNRC), dated October 3, 2012, Confirmatory Action Letter – Actions to Address Steam Generator Tube Degradation, San Onofre Nuclear Generating Station, Unit 2

3. Letter from Mr. James R. Hall (USNRC) to Mr. Peter T. Dietrich (SCE), dated December 26, 2012, Request for Additional Information Regarding Response to Confirmatory Action Letter, San Onofre Nuclear Generating Station, Unit 2

Dear Sir or Madam,

On March 27, 2012, the Nuclear Regulatory Commission (NRC) issued a Confirmatory Action Letter (CAL) (Reference 1) to Southern California Edison (SCE) describing actions that the NRC and SCE agreed would be completed to address issues identified in the steam generator tubes of San Onofre Nuclear Generating Station (SONGS) Units 2 and 3. In a letter to the NRC dated October 3, 2012 (Reference 2), SCE reported completion of the Unit 2 CAL actions and included a Return to Service Report (RTSR) that provided details of their completion.

By letter dated December 26, 2012 (Reference 3), the NRC issued Requests for Additional Information (RAIs) regarding the CAL response. Enclosure 2 of this letter provides the response to RAI 25.

Enclosure 2 of this submittal contains proprietary information. SCE requests that this proprietary enclosure be withheld from public disclosure in accordance with 10 CFR 2.390(a)(4). Enclosure 1 provides a notarized affidavit from AREVA NP Inc., which sets forth the basis on

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NRR

which the information in Enclosure 2 may be withheld from public disclosure by the NRC and addresses with specificity the considerations listed by paragraph (b)(4) of 10 CFR 2.390. Enclosure 3 provides the non-proprietary version of Enclosure 2.

There are no new regulatory commitments contained in this letter. If you have any questions or require additional information, please call me at (949) 368-6240.

Sincerely,

Enclosures:

1. Notarized Affidavits
2. Response to RAI 25 (Proprietary)
3. Response to RAI 25 (Non-proprietary)

cc: E. E. Collins, Regional Administrator, NRC Region IV
J. R. Hall, NRC Project Manager, SONGS Units 2 and 3
G. G. Warnick, NRC Senior Resident Inspector, SONGS Units 2 and 3
R. E. Lantz, Branch Chief, Division of Reactor Projects, NRC Region IV

ENCLOSURE 1

Notarized Affidavit

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is Gayle F. Elliott. I am Manager, Product Licensing, for AREVA NP Inc. (AREVA NP) and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by AREVA NP to determine whether certain AREVA NP information is proprietary. I am familiar with the policies established by AREVA NP to ensure the proper application of these criteria.

3. I am familiar with the AREVA NP information contained in Engineering Information Record 51-9197672-000 entitled, "SONGS Unit 2 Probability of FEI Operational Assessment RAI Responses," dated January 2013 and referred to herein as "Document." Information contained in this Document has been classified by AREVA NP as proprietary in accordance with the policies established by AREVA NP for the control and protection of proprietary and confidential information. The proprietary information is identified by its enclosure within pairs of brackets ("[ ]").

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by AREVA NP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in

accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information":

6. The following criteria are customarily applied by AREVA NP to determine whether information should be classified as proprietary:

(a) The information reveals details of AREVA NP's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA NP.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA NP in product optimization or marketability.

(e) The information is vital to a competitive advantage held by AREVA NP, would be helpful to competitors to AREVA NP, and would likely cause substantial harm to the competitive position of AREVA NP.

(f) The document contains identification information, the disclosure of which could reasonably be expected to constitute an unwarranted invasion of personal privacy.

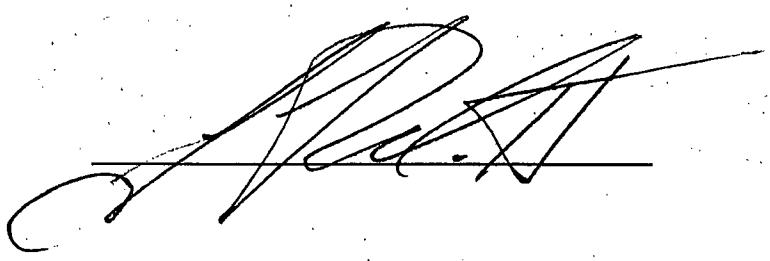
The information in the Document is considered proprietary for the reasons set forth in paragraphs 6(f).

7. In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in this Document have been made available,

on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA NP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.



SUBSCRIBED before me this 1st
day of February 2013.

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/14
Reg. # 7079129

SHERRY L. MCFADEN
Notary Public
Commonwealth of Virginia
7079129
My Commission Expires Oct 31, 2014

ENCLOSURE 3

SOUTHERN CALIFORNIA EDISON

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

REGARDING RESPONSE TO CONFIRMATORY ACTION LETTER

DOCKET NO. 50-361

TAC NO. ME 9727

Response to RAI 25

(NON-PROPRIETARY)

RAI 25

Reference 3, page 59 of 129 -There is a statement in the last paragraph that reads, "Patterns of dents and associated high contact forces are in good agreement with the final quarter model calculations." Provide or show this comparison.

RESPONSE

Note: RAI Reference 3 is the "SONGS U2C17 Steam Generator Operational Assessment for Tube-to-Tube Wear," AREVA Document No. 51-9187230-000, Revision 0, October 2012.

The evidence supporting the statement in RAI Reference 3 that "Patterns of dents and associated high contact forces are in good agreement with final quarter model calculations" is provided below.

Classic dents/dings at Anti Vibration Bar (AVB) to tube intersections were observed in both Pre-Service Inspection (PSI) and In-Service Inspection (ISI) surveys of the steam generators at SONGS. The ding data from the PSI inspections was used by MHI to guide and benchmark finite element analysis (FEA) calculations of contact forces. Laboratory experiments provided plots of ding voltage versus load for an AVB in contact with a tube. Ding voltage was obtained under load and then again after a load was applied and released. Under a load of [ ] a ding voltage of 0.5 volts is observed. This value increases to about 2.2 volts for a load of [ ].

Figures 1 and 2 (corresponding to Figure 6-19 and 6-20 in RAI Reference 3) show tubesheet maps of dings equal to or greater than 0.5 volts at the PSI inspections of SG 2E-089 and SG 3E-089 respectively. These dings are associated with contact forces of [ ] and higher. There are more dings in SG 2E-089 compared to SG 3E-089 by a factor of about 13. Figures 1 and 2 show that dings occur primarily in rows. These rows correspond to the noses of AVB pairs. See Figure 3 which is the same as Figure 3-1 of RAI Reference 3. There are sporadic dings in high rows near the periphery. The row pattern is much more distinct in SG 2E-089 simply because there are many more dings in SG 2E-089.

Figures 4 and 5 plot tube sheet maps of calculated contact forces equal to or greater than [ ] in the cold condition corresponding to the PSI results. A comparison of Figures 1 and 2 with Figures 4 and 5 shows that observed ding locations compare very well with FEA calculations of where dings should be observed.

Since ding voltage is correlated with contact force it is instructive to plot ding voltage versus row number and compare these plots with plots of calculated contact force versus row number. Figures 6 and 7 show plots of ding voltage versus row number and Figures 8 and 9 show plots of calculated contact force versus row number. Ding voltages are equal to or greater than 0.5 volts and therefore calculated forces are equal to or greater than [ ]. The comparison between Figure 6 and Figure 8 for SG 2E-089 is excellent. Not only do the peak locations coincide but the relative numbers of points at various peak locations are in agreement. Furthermore the peak heights are in agreement. Consider the largest peak near row 30, the maximum ding voltage is about 2.2 volts which agrees with a maximum contact force of about [ ].

Since there are relatively few dings in SG 3E-089 a few spurious dings near row 42 in Figure 7 distorts the peak comparison to some degree. However the calculated contact forces in Figure 9 match the observation of numerous dings near row 30 and agree with SG 2E-089

calculations in terms of the region near row 30 being a dominant region of high contact forces. Perhaps more importantly ding voltages near row 30 lead to an expectation of a relatively small spread of contact forces compared to SG 2E-089. This expectation is met. Near row 30 the maximum calculated contact force is about [ ] which agrees with a maximum observed ding voltage of about 0.8 volts.

Figures 10 and 11 provide a comparison of histograms of numbers of dings and numbers of calculated high contact force locations. Row numbers are binned with a bin width of 6 rows. The percentage of total data points is plotted versus mid bin row number. Figure 10 shows an excellent match of relative number of dings and calculated high contact forces versus row number for SG 2E-089. Figure 11 shows a good match for SG 3E-089 but is influenced to some degree by the relatively low number of dings and the presence of some spurious dings.

The statement that "Patterns of dents and associated high contact forces are in good agreement with final quarter model calculations," is well supported.

While classic dents/dings observed in the PSI inspections was used by MHI to guide and benchmark FEA calculations of contact forces a further check of the reasonableness of the FEA results is provided by the non-classical contact signals described in RAI Reference 3. Three dimensional plots of these contact signals are provided in Figures 6-22 through 6-25 of RAI Reference 3. Most of these contact signals are low amplitude signals extending down to a threshold of 0.25 volts. This has the advantage of reflecting lower contact forces than the larger amplitude classic dent/ding signals. Hence contact forces throughout the bundle are reflected. The patterns of contact signals are consistent with expected regions of higher stiffness in the bundle such as AVB noses and support structures in the periphery.

The substantial difference between contact forces in Units 2 and 3 is demonstrated by the relatively high amplitude classic dent/ding signals. This substantial difference is also reflected by the more numerous, lower amplitude contact signals. Table 1 lists the numbers of contact signals at ISI inspections.

Table 1
Contact Signal Threshold 0.25 Volts

Steam Generator	Number of Contact Signals
Unit 2, SG 88	5602
Unit 2, SG 89	6316
Unit 3, SG 88	2284
Unit 3, SG 89	1814

Contact force calculations are appropriately reliable to demonstrate maintenance of adequate margins relative to the onset in plane fluid-elastic instability at 70% power. The key point is the capture of the essential features of the patterns and magnitudes of contact forces and gaps such that the observed instability behavior of Units 2 and 3 can be benchmarked and extended to provide a reliable evaluation of the margins present at 70% power. This has been accomplished.

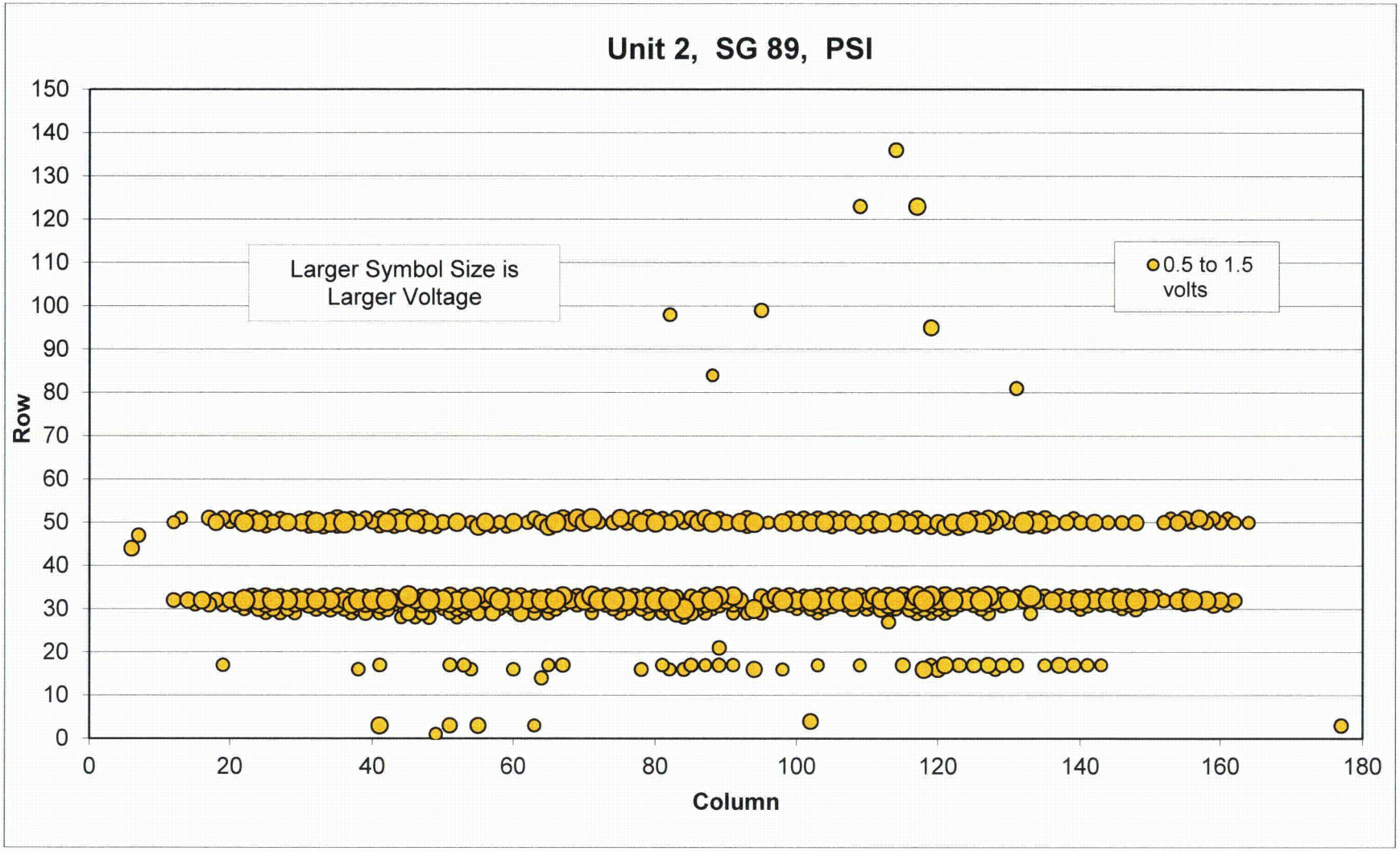


Figure 1. Tubesheet Map of Dings => 0.5 volts, SG 2E-089, PSI Inspection

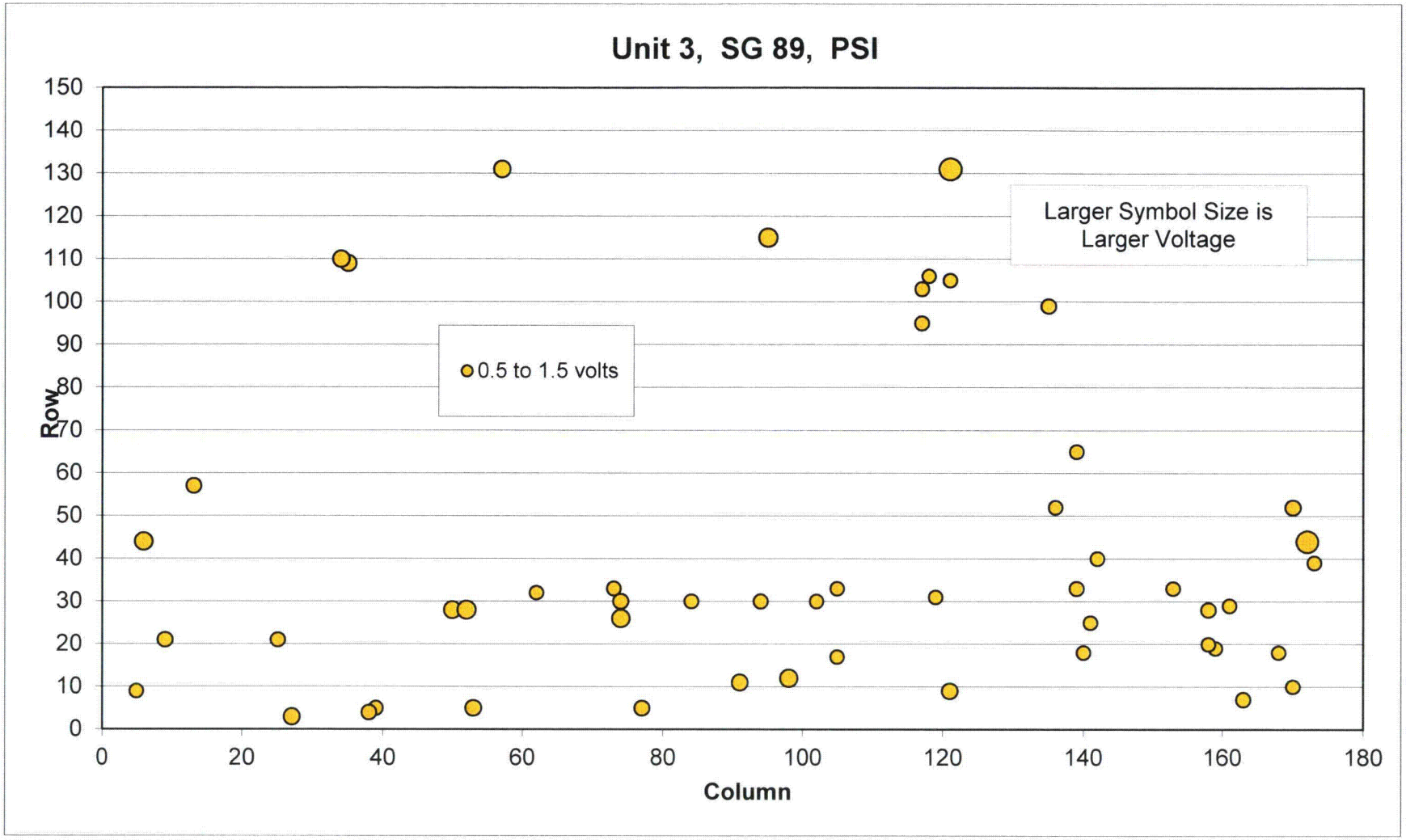


Figure 2. Tubesheet Map of Dings => 0.5 volts, SG 3E-089, PSI Inspection

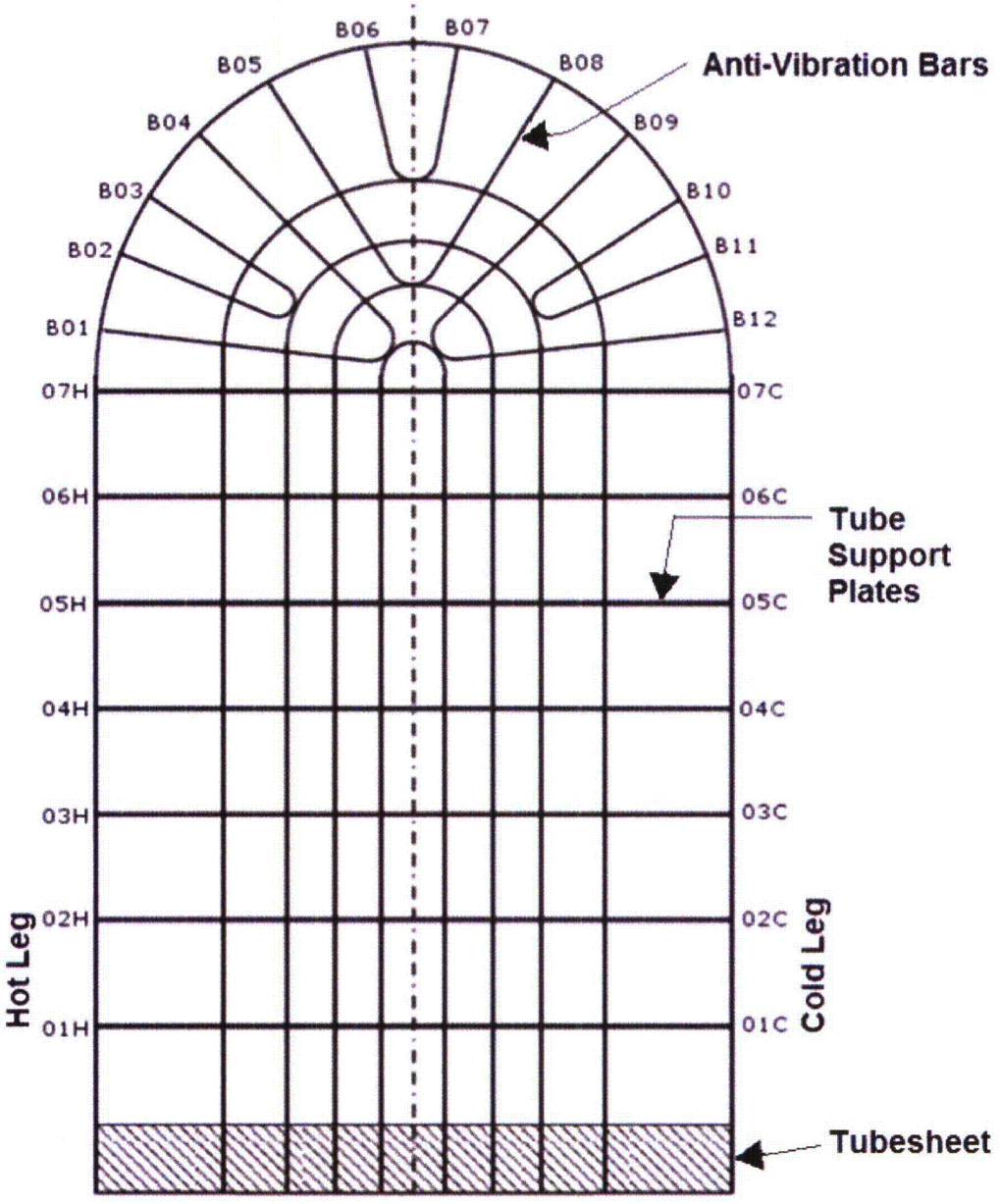


Figure 3. Arrangement of Tube Supports

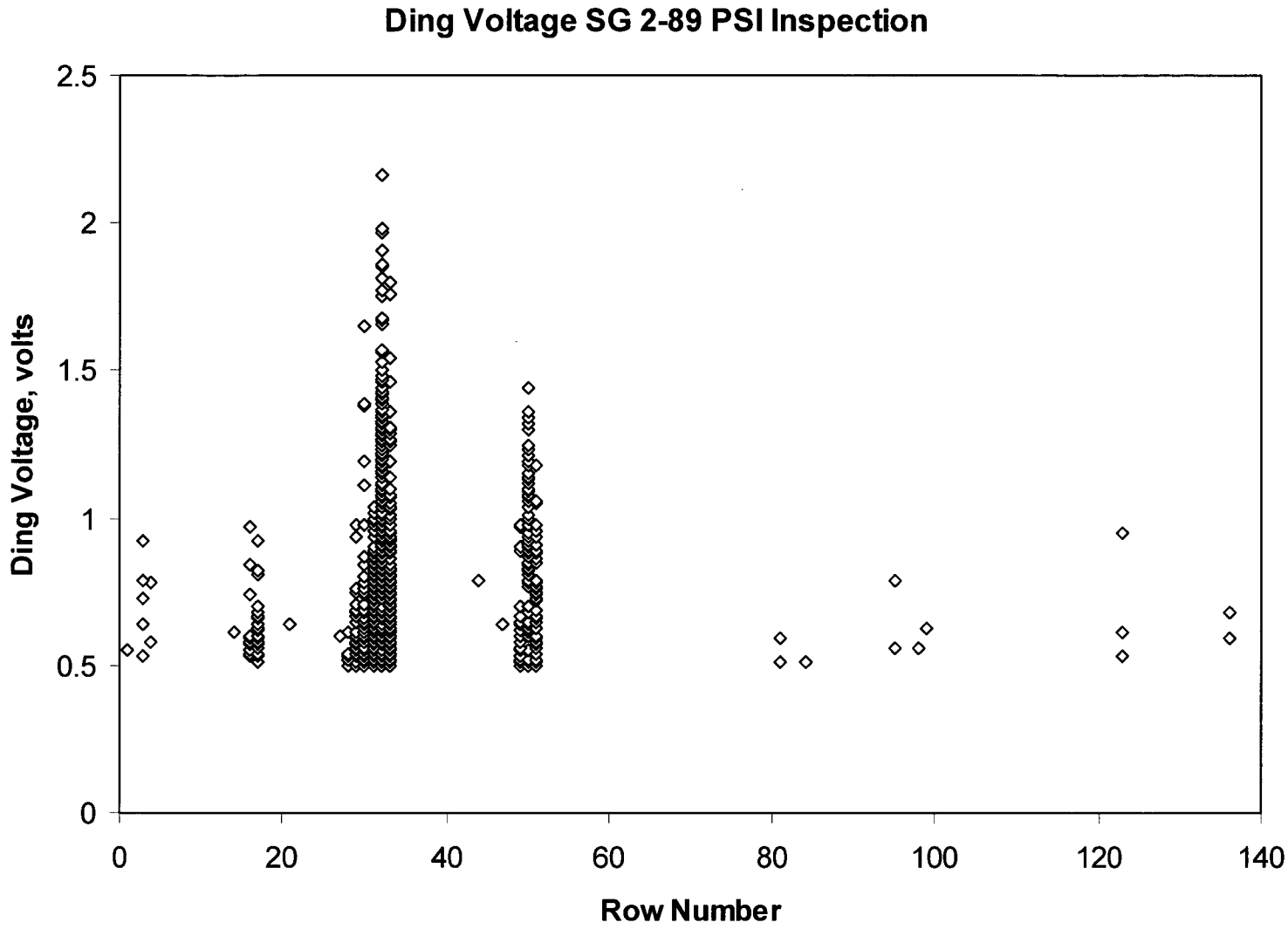


Figure 6. Ding Voltage => 0.5 volts versus Row Number, SG 2E-089, PSI Inspection

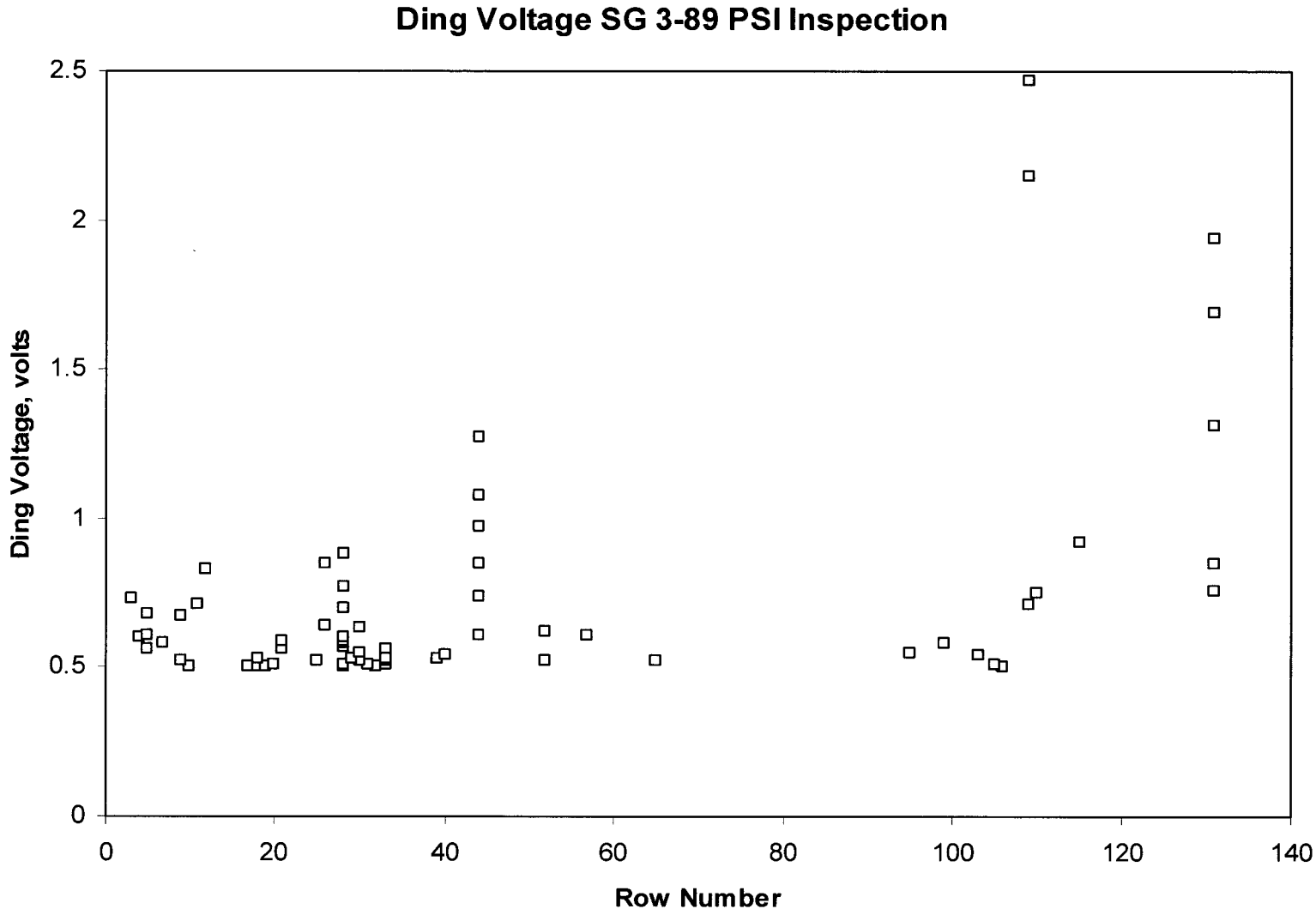


Figure 7. Ding Voltage => 0.5 volts versus Row Number, SG 3E-089, PSI Inspection