Attachment 1

Limerick Generating Station, Unit 1
Preservice Inspection Relief Request
ASME B&PV Code, Section XI

Submittal Program

1. Introduction

1.1 The following provides a summary of our program for submitting relief requests for those Unit 1 Reactor Pressure Vessel (RPV) and piping components that could not be fully examined to the requirements of the ASME Boiler and Pressure Vessel Code, Section XI, Rules for Inservice Inspection of Nuclear Power Plant Components.

2. Scope

2.1 Requests for relief for limited preservice examinations of the RPV pressure retaining and support components are applicable to the requirements of the 1980 Edition of Section XI, as modified by the Addenda through the Winter 1980.

2.2 Requests for relief for limited preservice examinations of the pressure retaining and support components of piping, vessels, pumps, and valves are applicable to the requirements of the 1974 Edition of Section XI, as modified by the Addenda through the Summer 1975, Appendix III of the Winter 1975 Addenda and paragraph IWA-2232 of the Summer 1976 Addenda.

2.3 The requirements of Subsections IWP and IWV, pump and valve operability testing, are not included in the scope of this document.

3. References

3.1 Final Safety Analysis Report, Limerick Generating Station, Units 1 & 2

3.2 Safety Evaluation Report, related to the operation of Limerick Generating Station, Units 1 & 2, August 1983

3.3 ASME Boiler & Pressure Vessel Code, Section XI

3.3.1 1980 Edition as modified by the Addenda through the Winter 1980.

3.3.2 1974 Edition as modified by the Addenda through the Summer 1975, Appendix III of the Winter 1975 Addenda and paragraph IWA-2232 of the Summer 1976 Addenda.

4.2 Limited piping component examinations are documented in Relief Requests 6 through 24, the Component Summary Table and the Safety Impact Summary.

4.2.1 Relief Requests 6 through 24 include:

4.2.1.1 Summary of the Code requirements for the preservice examination of a particular group of piping components. Generally, there is one Relief Request per Code Item No. of Tables IWB-2600 and IWC-2600. (More than one Relief Request is possible if there is a difference in the particular Code requirement from which relief is requested.)

4.2.1.2 The particular Code requirement from which relief is requested.

4.2.1.3 Identification of the number of piping components included in each Relief Request.

4.2.1.4 Technical justification for granting relief.

4.2.2 Component Summary Table includes:

4.2.2.1 The identity of each pipe component for which relief is requested. Components are listed on the Component Summary Table in the same order that they are listed in NES document 80A1558 (Reference 3.5). The Table includes:

- Component identification number.
- Isometric drawing number.
- Code Item No. & Category.
- Description of the physical configuration.
- Incomplete Examination Analysis Report Number.
- Description of the obstruction limiting the examination.
- Identification of the examinations that were limited and to what extent.
- Safety Impact Category Number.
- Relief Request Number.

4.2.3 Safety Impact Summary includes:

4.2.3.1 A brief description of the Plant requirements based on a postulated complete failure of each piping component that was not completely examined.

3.4 General Electric (GE) Document LIM-PIP-1, Preservice Inspection Program Plan for the Reactor Pressure Vessel, Limerick Unit No. 1

3.4.1 GE Dwg. 160-83B-18, Sheets 1-4, Weld Identification (RPV)

3.5 Nuclear Energy Services (NES) Document 80A1558, Limerick Generating Station, Unit 1, Preservice Inspection Program Plan for Nuclear Piping Systems

4. Description

4.1 Limited RPV examinations are documented in Relief Requests 1 through 5 and Attachment #7 (TAB #8) of General Electric's "USNRC Regulatory Guide 1.150 Report, Limerick Unit #1".

4.1.1 Relief Requests 1 through 5 include:

4.1.1.1 A summary of the Code requirements for the preservice examination of a particular group of RPV components. Generally there is one Relief Request per Code Item No. of Table IWB-2500-1.

4.1.1.2 The particular Code requirement from which relief is requested.

4.1.1.3 Identification of the RPV component(s) included in each Relief Request.

4.1.2 Attachment #7 (TAB #8), "Report of Examined Volume" includes:

4.1.2.1 A list of the RPV welds that were examined including a description of the limited examinations and the obstruction causing the limitation.

4.1.2.2 A description of the examination technique used for each weld (manual vs. remote automatic) and the coverage provided by each technique.

4.1.2.3 Calculations of the areas examined and not examined.

4.1.2.4 A graphic representation of the areas in 4.1.2.2 and 4.1.2.3 above.

5. Submittal

5.1 Submittal of the request for relief is provided for resolution of SER confirmatory Item #12 as detailed in our response to NRC RAI 250.5. The submittal is attached as follows:

5.1.1 Attachment 2: Final Relief Requests with supporting Technical Justification.

5.1.2 Attachment 3: General Electric's "USNRC Regulatory Guide 1.150 Report, Limerick Unit #1".

5.1.3 Attachment 4: Component Summary Table.

5.1.4 Attachment 5: Safety Impact Summary.

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Attachment 2

Limerick Generating Station, Unit 1
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ASME B&PV Code, Section XI

1. Class 1 Pressure Retaining Welds in Reactor Vessel
Code Item No. B1.11, Category B-A

Code Requirement:

The Reactor Vessel circumferential shell welds shall be volumetrically examined per Table IWB-2500-1, Category B-A, Item No. B1.11. The examinations shall cover 100% of the circumferential shell welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall be as shown on Figure IWB-2500-1 and shall include 100% of the weld length.

Relief Request:

Relief is requested from examining 100% of the required length of four welds identified as AA, AC, AD, and AE. A description of the examination coverage, percent complete, and the obstruction(s) for each weld is included under Tab #8 of the General Electric "USNRC Regulatory Guide 1.150 Report, Limerick Unit #1", presented as Attachment 3 of this report.

2. Class 1 Pressure Retaining Welds in Reactor Vessel
Code Item No. B1.12, Category B-A

Code Requirement:

The Reactor Vessel longitudinal shell welds shall be volumetrically examined per Table IWB-2500-1, Category B-A, Item No. B1.12. The examinations shall cover 100% of the longitudinal shell welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall be as shown on Figure IWB-2500-2 and shall include 100% of the weld length.

Relief Request:

Relief is requested from examining 100% of the required length of four welds identified as BA, BB, BC, and BN. A description of the examination coverage, percent complete, and the obstruction(s) for each weld is included under Tab #8 of the General Electric "USNRC Regulatory Guide 1.150 Report, Limerick Unit #1", presented as Attachment 3 of this report.

3. Class 1 Pressure Retaining Welds in Reactor Vessels
Code Item No. B1.22, Category B-A

Code Requirement:

The Reactor Vessel bottom head meridional welds shall be volumetrically examined per Table IWB-2500-1, Category B-A, Item No. B1.22. The examinations shall include 100% of the welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall be as shown on Figure IWB-2500-3 and shall include 100% of the accessible weld length.

Relief Request:

Relief is requested from examining 100% of the required length of six bottom head meridional welds identified as DA, DB, DC, DD, DE, and DF. A description of the examination coverage, percent complete and the obstruction(s) for each weld is included under Tab #8 of the General Electric "USNRC Limerick Unit #1", presented as Attachment 3 of this report.

4. Class 1 Pressure Retaining Welds in Reactor Vessel
Code Item No. B1.30, Category B-A

Code Requirement:

The Reactor Vessel shell-to-flange weld shall be volumetrically examined per Table IWB-2500-1, Category B-A, Item No. B1.30. The examination shall be performed completely, once, as a preservice examination requirement. The examination volume shall be as shown on Figure IWB-2500-4 and shall include 100% of the weld length.

Relief Request:

Relief is requested from examining 100% of the required length of the shell-to-flange weld identified as AF. A description of the examination coverage, percent complete, and the obstruction(s) is included under Tab #8 of the General Electric "USNRC Regulatory Guide 1.150 Report, Limerick Unit #1", presented as Attachment 3 of this report.

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5. Class 1 Full Penetration Welds of Nozzles in Vessels-Inspection Program B Code Item No. B3.90, Category B-D

Code Requirement:

Those Reactor Vessel nozzle-to-vessel welds shall be volumetrically examined per Table IWB-2500-1, Category B-D, Item No. B3.90. The examinations shall cover 100% of the welds and shall be performed completely, once, as a preservice examination requirement. The examination volume(s) shall be as shown in the applicable Figures IWB-2500-7 (a) through (d) including the adjacent areas of nozzle and vessel base metal.

Relief Request:

Relief is requested from examining 100% of the required volume of feedwater inlet nozzle N4D nozzle-to-vessel weld. A description of the examination coverage, percent complete, and the obstruction(s) for each nozzle-to-vessel weld is included under Tab #8 of the General Electric "USNRC Regulatory Guide 1.150 Report, Limerick Unit #1, presented as Attachment 3 of this report.

6. Class 1 Pressure Retaining Welds in Piping
Code Item No. B4.5, Category B-J

Code Requirement:

Those pipe longitudinal and circumferential pressure retaining welds included in Code Category B-J of Table IWB-2500 shall be volumetrically examined per Item No. B4.5 of Table IWB-2600. The examinations shall cover 100% of the pressure retaining welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include the weld plus the base metal on each accessible side of the weld for a distance of 1/2 T or 1 inch, whichever is smaller.

Relief Request:

Relief is requested from examining 100% of the required volume for reasons noted in the Component Summary Table. Examinations were performed perpendicular and parallel to the weld axis in accordance with subarticles III-4420 and III-4430, respectively. The percent complete of each examination is also noted in the Table. There are 57 welds included in this relief request.

Justification for Granting Relief:

The integrity of the piping pressure boundary has been verified by construction code testing requirements. Shop welds were radiographed and liquid penetrant tested in accordance with that edition of ASME Section III in effect at the time of procurement. Field weld examinations, which include radiography, liquid penetrant, and hydrostatic pressure tests, were performed in accordance with the 1974 Edition of Section III, as modified by the Winter 1974 Addenda.

The ASME Section XI preservice ultrasonic examinations were augmented by complete liquid penetrant tests which were performed in accordance with the 1977 Edition of Section XI as modified by the Addenda through the Summer 1978.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

7. Class 1 Pressure Retaining Welds in Piping
Code Item No. B4.6, Category B-J

Code Requirement:

Those pipe branch connection welds exceeding six inches in diameter included in Code Category B-J of Table IWB-2500 shall be volumetrically examined per Item No. B4.6 of Table IWB-2600. The examinations shall cover 100% of the pressure retaining welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include the weld plus the base metal for one wall thickness beyond the edge of the weld on the main run, and at least two inches of base metal from the edge of the weld on the branch run.

Relief Request:

Relief is requested from examining 100% of the required volume for reasons noted in the Component Summary Table. There are 0 welds included in this relief request.

Justification:

None listed. Code coverage has since been achieved.

8. Class 1 Support Members for Pumps
Code Item No. B5.4, Category B-K-1

Code Requirement:

Those pump integrally-welded external support attachment welds included in Code Category B-K-1 of Table IWB-2500 shall be volumetrically examined per Item No. B5.4 of Table IWB-2600. The examinations shall ›ver 25% of the supports with attachment welds and shall be performed completely, once as a preservice examination requirement. The examination volume shall include the attachment weld to the pressure retaining boundary plus the base metal beneath the weld and along the attachment for a distance of 2 support thicknesses.

Relief Request:

Relief is requested from performing the volumetric examination, obstructed by the material properties of the pump pressure boundary. There are 3 integrally welded support attachments per reactor recirculation pump for a total of 6 supports included in this relief request.

Justification for Granting Relief:

The structural integrity of the support attachments and welds to the pressure boundary castings has been verified by construction code testing requirements. The reactor recirculation pumps were fabricated and tested in accordance with the 1968 Draft ASME Code for Pumps and Valves for Nuclear Power, as modified by the March 1970 Addenda. Pump pressure boundary castings were radiographed. Surface examinations were performed on all internal and external surfaces and were repeated for final machined surfaces. All bolting was visually examined. A hydrostatic pressure test was performed at 1.3 times the design pressure.

The pump pressure boundary castings, material specification ASME SA-351 GR. CF8M, have precluded ultrasonic testing from providing a meaningful Section XI volumetric examination. It is intended that liquid penetrant surface examinations serve as an acceptable alternative.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

9. Class 1 Pump Casings
Code Item No. B5.7, Category B-L-2

Code Requirement:

Those pump internal pressure boundary surfaces included in Code Category B-L-2 of Table IWB-2500 shall be visually examined per Item No. B5.7 of Table IWB-2600. The examinations shall cover one pump in each group of pumps performing similar functions in a system and shall be performed completely, once, as a preservice examination requirement.

Relief Request:

Relief is requested from performing the required visual examination. There are 2 pumps comprising 1 group included in this relief request.

Justification for Granting Relief:

The integrity of the reactor recirculation pump pressure boundary castings has been verified by construction code testing requirements. These pumps were fabricated and tested in accordance with the 1968 Draft ASME Code for Pumps and Valves for Nuclear Power, as modified by the March 1970 Addenda. Pressure boundary castings were radiographed. Surface examinations were performed on all internal and external surfaces and were repeated for final machined surfaces. All bolting was visually examined. A hydrostatic pressure test was performed at 1.3 times the design pressure.

It is intended that the visual examination of the pump internals, performed by the manufacturer, serve as an acceptable alternative to the Section XI preservice requirement. In addition, field inspections prior to installation as well as successful full flow tests of both pumps has provided reasonable assurance that wear from mechanical misalignment is not a factor.

10. Class 1 Valve Bodies
Code Item No. B6.7, Category B-M-2

Code Requirement:

Those valve internal pressure boundary surfaces included in Code Category B-M-2 of Table IWB-2500 shall be visually examined per Item No. B6.7 of Table IWB-2600. The examinations shall cover one valve in each group of valves of the same constructional design and manufacturer that performs similar functions in a system and shall be performed completely, once, as a preservice examination requirement.

Relief Request:

Relief is requested from performing the required visual examinations. These valves are identified in Part 2 of the Component Summary Table. There are 69 valves comprising 17 groups included in this relief request.

Justification for Granting Relief:

The integrity of each valve's pressure boundary has been verified by construction code testing requirements. This code category includes both cast and forged valves that were fabricated and tested in accordance with that edition of ASME Section III in effect at the time of procurement. Note that some valves were fabricated and tested in accordance with the 1968 Draft ASME Code for Pumps and Valves for Nuclear Power and Addenda. Generally, all cast valves and components were radiographed. Surface examinations were performed on the internal, external, and component surfaces of both cast and forged valves and were repeated for final machined surfaces. All bolting was visually examined. Hydrostatic pressure tests in excess of 1.5 times the design pressure were performed.

It is intended that the visual examination of the valve internals, performed by the manufacturer, serve as an acceptable alternative to the Section XI preservice requirement. In addition, field inspections prior to installation as well as successful pre-operational tests have provided reasonable assurance that wear from mechanical misalignment is not a factor.

11. Class 2 Pressure Retaining Nozzle Welds in Vessels
Code Item No. C1.2, Category C-B

Code Requirement:

Those nozzle to vessel attachment welds included in Code Category C-B of Table IWC-2520 shall be volumetrically examined per Item No. C1.2 of Table IWC-2600. The examinations shall cover 100% of the welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include 100% of the nozzle to vessel weld.

Relief Request:

Relief is requested from examining 100% of the required volume for reasons noted in the Component Summary Table. There are 4 welds included in this relief request.

Justification for Granting Relief:

The integrity of the heat exchanger pressure boundary has been verified by construction code testing requirements. Examinations were performed in accordance with the applicable material specifications and the 1968 Editions of ASME Section III, Class C and Section VIII, Division 1, for the shell and tube sides, respectively. Shell plates received ultrasonic and magnetic particle examinations. The entire shell, including nozzle-to-vessel and support attachment welds was radiographed. Magnetic particle examinations were repeated for final machined surfaces and welds. All bolting and machined surfaces were visually examined. A hydrostatic pressure test was performed at 1.5 times the design pressure.

The ASME Section XI preservice ultrasonic inspections of nozzle-to-vessel welds N-3 and N-4 have been augmented by complete liquid penetrant tests, which were performed in accordance with the 1977 Edition of Section XI as modified by the Addenda through the Summer 1978.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

12. Class 2 Integrally Welded Support Attachments to Vessels
Code Item No. C1.3, Category C-C

Code Requirement:

Those vessel integrally welded external support attachment welds included in Code Category C-C of Table IWC-2520 shall be surface examined per Item No. C1.3 of Table IWC-2600. The examinations shall cover 100% of the welds and shall be performed completely, once, as a preservice examination requirement. The examination surface shall include 100% of the attachment weld.

Relief Request:

Relief is requested from examining 100% of the required surface due to attachment design. There are 15 attachment welds in 2 heat exchangers included in this relief request.

Justification for Granting Relief:

The integrity of the heat exchanger pressure boundary has been verified by construction code testing requirements. Examinations were performed in accordance with the applicable material specifications and the 1968 Editions of ASME Section III, Class C and Section VIII, Division 1, for the shell and tube sides, respectively. Shell plates received ultrasonic and magnetic particle examinations. The entire shell, including nozzle-to-vessel and support attachment welds was radiographed. Magnetic particle examinations were repeated for final machined surfaces and welds. All bolting and machined surfaces were visually examined. A hydrostatic pressure test was performed at 1.5 times the design pressure.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

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13. Class 2 Pressure Retaining Welds in Piping
Code Item No. C2.1, Categories C-F and C-G

Code Requirement:

Those pipe circumferential butt welds included in Code Categories C-F and C-G of Table IWC-2520 shall be volumetrically examined per Item No. C2.1 of Table IWC-2600. The examinations shall cover 100% of the C-F welds and 50% of the C-G welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include the weld plus the base metal on each accessible side of the weld for a distance of 1/2 T or 1 inch, whichever is smaller.

Relief Request:

Relief is requested from examining 100% of the required volume of the C-F welds for reasons noted in the Component Summary Table. Examinations were performed perpendicular and parallel to the weld axis in accordance with subarticles III-4420 and III-4430, respectively. The percent complete of each examination is also noted in the Table. There are 49 welds included in this relief request.

Justification for Granting Relief:

The integrity of the piping pressure boundary has been verified by construction code testing requirements. Shop welds were radiographed in accordance with that edition of ASME Section III in effect at the time of procurement. Field weld examinations, which include radiography and hydrostatic pressure tests, were performed in accordance with the 1974 Edition of Section III, as modified by the Winter 1974 Addenda.

The ASME Section XI preservice ultrasonic examinations were augmented by complete liquid penetrant tests (exception: RH 190 & RH 194), which were performed in accordance with the 1977 Edition of Section XI as modified by the Addenda through the Summer 1978.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

14. Class 2 Pressure Retaining Welds in Piping
Code Item No. C2.2, Categories C-F and C-G

Code Requirement:

Those longitudinal weld joints in pipe fittings included in Code Categories C-F and C-G of Table IWC-2520 shall be volumetrically examined per Item No. C2.2 of Table IWC-2600. The examinations shall include 100% of the C-F welds and 10% of the C-G welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include the weld plus the base metal on each accessible side of the weld for a distance of 1/2 T or 1 inch, whichever is smaller.

Relief Request:

Relief is requested from examining 100% of the required volume of the C-F welds for reasons noted in the Component Summary Table. Examinations were performed perpendicular and parallel to the weld axis in accordance with subarticles III-4420 and III-4430, respectively. The percent complete of each examination is also noted in the Table. There are 5 welds included in this relief request.

Justification for Granting Relief:

The integrity of the piping pressure boundary has been verified by construction code testing requirements. Shop welds were radiographed in accordance with that edition of ASME Section III in effect at the time of procurement. Field weld examinations, which include radiography and hydrostatic pressure tests, were performed in accordance with the 1974 Edition of Section III, as modified by the Winter 1974 Addenda.

The ASME Section XI preservice ultrasonic examinations were augmented by complete liquid penetrant tests, which were performed in accordance with the 1977 Edition of Section XI as modified by the Addenda through the Summer 1978.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

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15. Class 2 Pressure Retaining Welds in Piping
Code Item Nos. C2.1 and C2.2, Categories C-F and C-G

Code Requirement:

Those pipe circumferential butt welds and those longitudinal weld joints in pipe fittings included in Code Categories C-F and C-G of Table IWC-2520 shall be volumetrically examined per Item Nos. C2.1 and C2.2 of Table IWC-2600. The examinations shall include 100% of the C-F welds and 50% of the C-G welds and shall be performed completely, once, as a preservice examination requirement. Appendix III is not applicable because Radiography was used as the volumetric examination technique. The required volume then includes the weld plus the base metal for a distance of one-wall thickness beyond the edge of the weld per Table IWC-2520.

Relief Request:

Relief is requested from the area requirement of Table IWC-2520. Using Radiography as the examination technique, the examination volume shall include the weld plus the base metal for a distance of 1/4 inch beyond the edge of the weld. There are 40 circumferential and 80 longitudinal welds associated with 20 Main Steam elbows included in this relief request.

Justification for Granting Relief:

The integrity of the piping pressure boundary has been verified by construction code testing requirements. Shop welds were radiographed in accordance with that edition of ASME Section III in effect at the time of procurement. Field weld examinations, which include radiography and hydrostatic pressure tests, were performed in accordance with the 1974 Edition of Section III, as modified by the Winter 1974 Addenda.

Laminar indications throughout the base metal of the 20 main steam elbows have precluded ultrasonic testing from providing a meaningful Section XI volumetric examination. Radiographs for the welds in question were checked and additional radiography was performed to achieve coverage in excess of the requirements of the 1980 Edition of Section XI, as modified by the Addenda through the Winter 1981, Figure IWC-2500-7. It is intended that flaw evaluations during subsequent inservice inspections be performed in accordance with Section XI, IWA-3370. The preservice volumetric examinations have been augmented by complete liquid penetrant tests, which were performed in accordance with the 1977 Edition of Section XI, as modified by the Addenda through the Summer 1978.

16. Class 2 Support Members for Piping
Code Item No. C2.5, Category C-E-1

Code Requirement:

Those pipe integrally-welded attachment welds included in Code Category C-E-1 of Table IWC-2520 shall be surface examined per Item No. C2.5 of Table IWC-2600. The examinations shall include 100% of the supports with attachment welds and shall be performed completely, once, as a preservice examination requirement. The examination surface shall include the attachment weld to the pressure retaining boundary plus the base metal beneath the weld and along the attachment for a distance of 2 support thicknesses.

Relief Request:

Relief is requested from the area requirement of Table IWC-2520. For preservice inspection the examination surface shall include the attachment weld to the pressure retaining boundary plus the base metal beneath the weld and along the attachment for 1/2 inch on all sides. There are 139 supports included in this relief request.

Justification for Granting Relief:

The structural integrity of the support attachments, welds, and piping pressure boundary has been verified by construction code testing requirements. The attachment welds and base metal were surface examined, after the hydrostatic pressure tests, in accordance with the 1974 Edition of ASME Section III, as modified by the Winter 1974 Addenda.

Interpretation of the 1974 Edition of ASME Section XI, as modified by the Addenda through the Summer 1975, category C-E-1 requirements, leads to an examination area that includes large sections of pipe. In light of the provided interpretation, later editions of Section XI were considered to clarify the intent of category C-E-1 requirements. Therefore, the integral attachment welds included in category C-E-1 have been magnetic particle tested utilizing the coverage specified in the 1980 Edition of Section XI as modified by the Addenda through the Winter 1981, Figure IWC-2500-5.

17. Class 2 Pressure Retaining Welds in Pumps
Code Item No. C3.1, Categories C-F and C-G

Code Requirement:

Those pump casing weld joints included in Code Categories C-F and C-G of Table IWC-2520 shall be volumetrically examined per Item No. C3.1 of Table IWC-2600. The examinations shall cover 100% of the C-F welds and 50% of the C-G welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include 100% of the weld plus the base metal for one wall thickness beyond the edge of the weld.

Relief Request:

Relief is requested from examining 100% of the required volume of the C-F welds for reasons noted in the Component Summary Table. There are 40 welds included in this relief request.

Justification for Granting Relief:

The integrity of the RHR and Core Spray pump pressure boundaries has been verified by construction code testing requirements. Examinations were performed in accordance with the applicable material specification and that edition of ASME Section III in effect at the time of procurement. The pump casings were radiographed and liquid penetrant tested. Surface examinations were repeated for final machined surfaces. Pump shell plates received ultrasonic and magnetic particle tests. All bolting was visually examined. Hydrostatic pressure tests were performed at 1.3 times the design pressure.

The ASME Section XI preservice ultrasonic examination of the shell welds was augmented by complete liquid penetrant tests, which were performed in accordance with the 1977 Edition of Section XI, as modified by the Addenda through the Summer 1978.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

18. Class 2 Support Components for Pumps
Code Item No. C3.4, Category C-E-2

Code Requirement:

Those pump support components included in Code Category C-E-2 of Table IWC-2520 shall be visually examined per Item No. C3.4 of Table IWC-2600. The examinations shall cover 100% of the support components and shall be performed completely, once, as a preservice examination requirement. The area subject to examinations shall include the support components that extend from the pump attachment to and including the attachment to the supporting structure. Support settings shall be verified.

Relief Request:

Relief is requested from visually examining that portion of the pump anchor bolting encased in concrete. All bolting is 1 1/4 inch nominal diameter. This relief request includes:

10 bolts on each of 4 RHR Pumps
10 bolts on each of 4 Core Spray Pumps
8 Bolts on the HPCI Pump

Justification for Granting Relief:

The structural integrity of the RHR, Core Spray, and HPCI pump anchor bolting has been verified by construction code testing requirements. Examinations were performed in accordance with the material specification and that edition of ASME Section III in effect at the time of procurement. Visual examinations were performed on the threads, shanks, and heads (where applicable). Surface examinations were performed on either the finished bolting or the material stock just prior to threading.

An ASME Section XI visual examination was performed on the accessible portions of the anchor bolting. All final torque settings were checked. In addition, field inspections prior to installation as well as successful pre-operational tests have provided reasonable assurance of proper installation. The inaccessible portion of the anchor bolting will be exempted from inservice inspection per later editions of Section XI, IWC-1230.

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19. Class 1 Pressure Retaining Welds in Piping
Code Item No. B4.5, Category B-J

Code Requirement:

Those pipe longitudinal and circumferential pressure retaining welds included in Code Category B-J of Table IWB-2500 shall be volumetrically examined per Item B4.5 of Table IWB-2600. Indications shall be evaluated using the acceptance standards specified in the 1974 Edition of Section III, subsubarticle NB-5330 per subarticle IWA-3100(b).

Relief Request:

Relief is requested from performing the evaluation of 7 longitudinal welds, identified as RRA-027LD Max./Min., RRA-028LU Max./Min., RRA-037LD Max., RRA-038LU Max., RHB-005LD Max., and 1 circumferential weld identified as FWB-028, using the acceptance standards specified in NB-5330. These welds are included in the Component Summary Table.

Justification for Granting Relief:

All indications, which produced a response greater than 20% of reference level during the preservice ultrasonic examinations, were investigated to the extent that the NDE technician was able to evaluate the extent, shape, identity, and location in terms of the requirements of the 1974 Edition of ASME Section III, as modified by the Addenda through the Summer 1975, subsubarticle NB-5330. The indications included in this relief request have been identified as either interpass lack of fusion or non-metallic inclusion and although they do not exceed the limits specified in NB-5330, they are considered rejectable because of their identity.

These specific indications produced a response greater than 20% of reference level. They were sized using a 1/2 amplitude endpoint technique.

Supplemental flaw evaluations were performed using the acceptance standards specified in the 1980 Edition of ASME Section XI as modified by the Addenda through the Winter 1981. Flaw characterization was performed in accordance with Article IWA-3000.

Limerick Generating Station, Unit 1
Preservice Inspection Relief Request
ASME B&PV Code, Section XI

The indications included in this relief request have been characterized as either subsurface or multiple planar flaws, the majority of which are laminar in orientation. Aspect ratios were developed for all flaws. The flaws were then evaluated using the acceptance standards specified in Article IWB-3000 and found acceptable. Note that IWB-3000 was used to evaluate indications in both Class 1 and Class 2 components.

The indications included in this relief request will receive successive inspections in accordance with subsubarticle IWB-2420.

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20. Class 2 Pressure Retaining Welds in Piping
Code Item No. C2.1, Categories C-F and C-C

Code Requirement:

Those pipe circumferential butt welds included in Code Categories C-F and C-G of Table IWC-2520 shall be volumetrically examined per Item No. C2.1 of Table IWC-2600. Indications shall be evaluated to the acceptance standards specified in the 1974 Edition of Section III, subsubarticle NC-5330 per subarticle (WA-3100(b).

Relief Request:

Relief is requested from performing the evaluation of 4 welds, identified as RHB-194, HP-117, RDA-019, and RDB-011, using the acceptance standards specified in NC-5330. These welds are included in the Component Summary Table.

Justification for Granting Relief:

All indications, which procured a response greater than 20% of reference level during the preservice ultrasonic examinations, were investigated to the extent that the NDE technician was able to evaluate the extent, shape, identity, and location in terms of the requirements of the 1974 Edition of ASME Section III, as modified by the Addenda through the Summer 1975, subsubarticle NC-5330. The indications included in this relief request have been identified as either interpass lack of fusion or non-metallic inclusion and although they do not exceed the limits specified in NC-5330, they are considered rejectable because of their identity.

These specific indications produced a response greater than 20% of reference level. They were sized using a 1/2 amplitude endpoint technique.

Supplemental flaw evaluations were performed using the acceptance standards specified in the 1980 Edition of ASME Section XI as modified by the Addenda through the Winter 1981. Flaw characterization was performed in accordance with Article IWA-3000.

Limerick Generating Station, Unit 1
Preservice Inspection Relief Request
ASME B&PV Code, Section XI

The Indications included in this relief request have been characterized as either subsurface or multiple planar flaws, the majority of which are laminar in orientation. Aspect ratios were developed for all flaws. The flaws were then evaluated using the acceptance standards specified in Article IWB-3000 and found acceptable. Note that IWB-3000 was used to evaluate indications in both Class 1 and Class 2 components.

The indications included in this relief request will receive successive inspections in accordance with subsubarticle IWB-2420.

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Limerick Generating Station, Unit 1
Preservice Inspection Relief Request
ASME B&PV Code, Section XI

21. Class 2 Pressure Retaining Welds in Pressure Vessel
Code Item No. C1.1, Category C-A

Code Requirement:

Those shell and head circumferential welds included in Code Category C-A of Table IWC-2520 shall be volumetrically examined per Item No. C1.1 of Table IWC-2600. The examinations shall cover at least 20% of each circumferential weld, uniformly distributed among three areas around the vessel circumference, and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include the weld plus the base metal for one plate thickness beyond the edge of the weld joint.

Relief Request:

Relief is requested from examining 100% of each vessel shell and circumferential weld for reasons noted in the Component Summary Table. There are 2 welds in the "A" and 3 welds in the "B" heat exchangers included in this relief request.

Justification for Granting Relief:

The integrity of the heat exchanger pressure boundary has been verified by construction code testing requirements. Examinations were performed in accordance with the applicable material specifications and the 1968 Editions of ASME Section III, Class C and Section VIII, Division 1, for the shell and tube sides, respectively. Shell plates received ultrasonic and magnetic particle examinations. The entire shell, including nozzle-to-vessel and support attachment welds was radiographed. Magnetic particle examinations were repeated for final machined surfaces and welds. All bolting and machined surfaces were visually examined. A hydrostatic pressure test was performed at 1.5 times the design pressure.

As noted in the Component Summary Table, the ultrasonic examination coverage, achieved during the preservice inspection, exceeds ASME Section XI (74/S75) requirements.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

Limerick Generating Station, Unit 1
Preservice Inspection Relief Request
ASME B&PV Code, Section XI

22. Class 2 Pressure Retaining Welds in Piping
Code Item No. C2.3, Categories C-F and C-G

Code Requirement:

Those pipe-to-pipe branch connections included in Code Categories C-F and C-G of Table IWC-2520 shall be volumetrically examined per Item No. C2.3 of Table IWC-2600. The examinations shall cover 100% of the C-F welds and 50% of the C-G welds and shall be performed completely, once, as a preservice examination requirement. The examination volume shall include the weld plus the base metal on each accessible side of the weld for a distance of 1/2 T or 1 inch, whichever is smaller.

Relief Request:

Relief is requested from examining 100% of the required volume of the C-F welds for reasons noted in the Component Summary Table. Examinations were performed perpendicular and parallel to the weld axis in accordance with subarticles III-4420 and III-4430, respectively. The percent complete of each examination is also noted in the Table. There is 1 weld included in this relief request.

Justification for Granting Relief:

The integrity of the piping pressure boundary has been verified by construction code testing requirements. Shop welds were radiographed in accordance with that edition of ASME Section III in effect at the time of procurement. Field weld examinations, which include radiography and hydrostatic pressure tests, were performed in accordance with the 1974 Edition of Section III, as modified by the Winter 1974 Addenda.

The ASME Section XI preservice ultrasonic examinations were augmented by complete liquid penetrant tests which were performed in accordance with the 1977 Edition of Section XI as modified by the Addenda through the Summer 1978.

The minimal safety impact of incomplete Section XI preservice examinations described above is explained in the Safety Impact Summary which postulates that a defect has propagated through-wall, undetected. Sufficient system redundancy, leak detection capability, and alternative systems have been included in the plant design to assure plant safety.

23. Class 2 Pressure Retaining Bolting Exceeding 1-inch in Diameter
Code Item No. C3.2, Category C-D

Code Requirement:

Those pump bolting components included in Code Category C-D of Table IWC-2520 shall be visually and either surface or volumetrically examined per Item No. C3.2 of Table IWC-2600. Bolting may be examined either in place under tension, when the connection is disassembled, or when the bolting is removed. Examinations shall cover 10% of the bolting components, threads in the base material and flange ligaments between threaded stud holes for each bolted joint, but not less than two bolts or studs per joint and shall cover 100% of the bolting per inspection interval. The examinations shall include bolts, studs, nuts, bushings, washers, and threads in the base material and flange ligaments between threaded stud holes. Bushings, threads, and ligaments in base material and flanges are required to be examined only when the connection is disassembled.

Relief Request:

Relief is requested from performing the visual examination of 38, nominal diameter 1 3/4-inch, HPCI Pump impeller casing bolts.

Justification for Granting Relief:

The integrity of the pump pressure retaining bolting has been verified by construction code testing requirements. Examinations were performed in accordance with the material specification and that edition of ASME Section III in effect at the time of procurement. Visual examinations were performed on the threads, shanks, and heads (where applicable). Surface examinations were performed on either the finished bolting or the material stock just prior to threading.

Complete ASME Section XI ultrasonic tests were performed on each stud with the cap nut removed. The cap nuts received magnetic partical surface examinations. As noted, all bolting included in this relief request is less than 2 inches in diameter.

24. Class 2 Pressure Retaining Bolting Exceeding 1-inch in Diameter
Code Item No. C4.2, Category C-D

Code Requirement:

Those valve bolting components included in Code Category C-D of Table IWC-2520 shall be visually and either surface or volumetrically examined per Item No. C4.2 of Table IWC-2600. Bolting may be examined either in place under tension, when the connection is disassembled, or when the bolting is removed. Examinations shall cover 10% of the bolting components, threads in the base material and flange ligaments between threaded stud holes for each bolted joint, but not less than two bolts or studs per joint and shall cover 100% of the bolting per inspection interval. The examinations shall include bolts, studs, nuts, bushings, washers, and threads in the base material and flange ligaments between threaded stud holes. Bushings, threads, and ligaments in base material and flanges are required to be examined only when the connection is disassembled.

Relief Request:

Relief is requested from performing 100% of the required surface examination when the bolted joint is assembled. The number of bolts per joint (set) is noted in the Component Summary Table. There are 9 bolting sets included in this relief request.

Justification for Granting Relief:

The integrity of the valve pressure retaining bolting has been verified by construction code testing requirements. Examinations were performed in accordance with the material specification and that edition of ASME Section III in effect at the time of procurement. Visual examinations were performed on the threads, shanks, and heads (where applicable). Surface examinations were performed on either the finished bolting or the material stock just prior to threading.

Complete ASME Section XI visual examinations were performed with the bolting either in place under load or disassembled. When a bolted connection was disassembled, studs received both ultrasonic and liquid penetrant tests while the nuts received a liquid penetrant examination. When a bolted connection was examined in place, studs received an ultrasonic examination while the nuts were either liquid penetrant or magnetic particle tested. All bolting included in this relief request is less than 2 inches in diameter.

Attachment 3

"USNRC Regulatory Guide 1.150 Report, Limerick Unit 1"

Prepared by General Electric
for
Philadelphia Electric Company
in Support of the Response to
SER Confirmatory Issue #12

DLS/pd07058404

USNRC REGULATORY GUIDE 1.150 REPORT

OF

EXAMINATION RESULTS

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Prepared by: W. F. Miller 6/28/84

A. F. Pfeffer 6/28/84

Reviewed by: Scott J Kepler 6/28/84

Level III

Approved by: Wade F. Miller 6/28/84

USNRC REGULATORY GUIDE 1.150
REPORT OF EXAMINATION RESULTS

REFERENCE: Philadelphia Electric Company
Limerick Nuclear Generating Station
Contract No. 8031-M-246B
Unit #1 - Preservice Ultrasonic Examination

USNRC Regulatory Guide 1.150, Revision 1, Alternate Method requires that ultrasonic examinations performed on reactor pressure vessels be performed and documented in a manner that will allow meaningful comparison of data gathered during successive examinations. This report documents the steps taken by General Electric to assure that the data gathered during the Limerick Unit #1 Preservice Ultrasonic Examination meets the intent of Reg. Guide 1.150.

The Limerick Unit #1 Ultrasonic Examination was performed as a composite examination; that is, part of the examination was performed utilizing remote automatic examination equipment, and part was performed using manual examination equipment. This report addresses each section of Reg. Guide 1.150 as it affects both types of examination equipment. Data gathered supporting the conclusions presented in this report is included. Attachments that include this data are referenced frequently throughout the report.

The results of the examination appear in tabular form with evaluations. The examination data from which the tables were assembled appear in various sections of the Final Report. The tabulation of examination results appears as Attachment #1.

Ultrasonic Examination Procedure LIM-UT-1, Revision 1 (see Attachment #9) covered the Reg. Guide 1.150 compliance activities performed by General Electric during the Limerick Unit #1 Preservice Examination. This report contains all documentation required by LIM-UT-1. The examination was performed in accordance with the requirements of ASME Section XI 1980 Edition, Winter 1980 Addenda and the Limerick Safety Analysis Report supplemented by LIM-UT-1.

Inspection System Performance Checks

The Pre-Exam Performance Checks specified in Paragraph 1.1 of the Reg. Guide Alternate Method were not performed for the Limerick Unit #1 Preservice Examination. These checks are identical to the Field Performance Checks required by Paragraph 1.2 of the Alternate Method and were performed at the job site. General Electric's Quality Assurance requirements do not allow performance checks performed up to six months in advance of an examination to constitute Quality Assurance records for the project; therefore, these checks, if performed, could not become a part of the records package.

The Field Performance Checks specified in Paragraph 1.2 of the Reg. Guide Alternate Method were performed for both automatic and manual examination equipment. The methods used to perform these checks varied to accommodate differences in examination systems. The required checks were performed as follows:

AUTOMATED EQUIPMENT

RF Wave Form and frequency amplitude information for transducers used during the automatic ultrasonic examinations is a photographic record. The frequency amplitude information can be calculated from the oscilloscope photographs. The reflector used to generate the analyzed signal was the 1/2t side-drilled hole in RPV Calibration Standard #1. Photographs are provided for both an unfiltered return signal and a filtered return signal to allow comparison. The signal was obtained by mounting the transducer in the package (shoe) in the position it was to be used (i.e., 0°, 45°, 60°) and manually manipulating the package to obtain a peak signal amplitude. The signal was then fed through the oscilloscope, which was calibrated per the screen writing, and the photograph was taken. Frequency amplitude photographs for the search units used during the automatic ultrasonic examinations appear in Attachment #2. This attachment contains both the photographs obtained before the examination began and those obtained after completion of the automatic examinations. It also contains the original manufacturer's transducer analysis data for reference purposes.

MANUAL EQUIPMENT

RF Wave Form and frequency amplitude information for transducers used during the manual examinations is a computer-generated data sheet with a supplementary oscilloscope photograph. Frequency amplitude information apppears as a printout on the data sheet. The photograph displays a digitized RF wave form and gating information. The reflectors used to generate the analyzed signal were the ID notch in Safe End Calibration Standard #1 for angle beam data and the first back reflection from the same Standard for straight beam data. The data for each transducer or transducer/wedge combination was obtained by manually manipulating the search unit to obtain a peak signal amplitude from the reflector. This signal was processed through an Adaptronics ALN-4060 microprocessor to obtain the analysis printout. An oscilloscope photograph showing the digitized RF wave form and gating was taken and attached to the data sheet to complete the documentation for each search unit. Data sheets for the search units used during the manual ultrasonic examinations appear in Attachment #2. This attachment contains both the data sheets generated before the examination began and those generated after completion of the manual examinations. It also contains the original manufacturer's transducer analysis data for reference purposes.

Screen Height Linearity Data and Amplitude Control Linearity Data for both automatic and manual examination systems was recorded daily as a minimum. General Electric examination procedures governing these ultrasonic examinations require these checks to appear on the calibration data sheets. The calibration data sheets are not an attachement to this report; they are, however, readily available in the Final Report.

Angle Beam Profile Characterization was performed for each automatic examination package and each manual examination transducer/wedge combination used during the ultrasonic examination of RPV welds. The data for automatic examination packages was gathered using an automated calibration scanning mechanism. The data for manual examination search units was gathered using manual techniques. The beam profile data does not appear as an attachment to this report; it is, however, readily available in the final report.

Calibration

Calibrations for the Automatic Examination System were performed in accordance with either Procedure LIM-UT-8 for Vessel Assembly Welds or Procedure LIM-UT-9 for Nozzle to Vessel Welds. Each calibration of the examination system was performed using a mechanized calibration scanner that operates in a manner that duplicates the essential variables of the mechanized examination scanner.

The scanning speed set by the operator for the examination scanner was, per procedure, limited to the scanning speed set for the calibration scanner.

The direction(s) of scanning during calibrations trace (forward) and retrace (backward) are verified during the system calibration. If, for example, a valid calibration is obtained for both trace and retrace modes, examination data may be gathered in both the forward and backward directions. If a valid calibration for only one direction was made, then examination data was only gathered in the direction of the valid calibration.

All calibrations for the mechanized portion of this Preservice Examination were performed in a dynamic mode. No static vs. dynamic correction is necessary.

Calibrations for the Manual Examination System(s) were performed in accordance with Procedure LIM-UT-5 for Nozzle to Vessel and for Vessel Assembly Welds, and Procedure LIM-UT-2 for 0° Examination from the RPV Flange Sealing Surface. These manual examination procedures use static calibration methods. The signals were maximized during both calibration and examination. Calibrations were verified at scanning speed.

Calibration Confirmations for both automatic and manual examination systems were performed in accordance with the applicable examination procedure. In all cases, the procedural requirements equal or exceed those specified in ASME Section V, Article 4, T-433.

There was no use of electronic simulators or off-site system calibrations during the Limerick Unit #1 Preservice Examination.

Calibration Blocks for the Limerick Unit #1 Preservice Examination were furnished by the Owner. These blocks were fabricated in accordance with ASME Section XI, Appendix 1, 1974 Edition, Winter 1975 Addenda requirements. No alternative calibration blocks or new conventional blocks were used during this examination.

The top surface of Limerick RPV Calibration Standards #1 contains numerous deep pits randomly scattered over the surface. Mechanical removal of the pitting would have caused the calibration standard thickness to be reduced below Code-acceptable thickness for portions of the RPV. Polyester resin body filler was used to fill the pits, which allowed calibration on the pitted surface. Attachment #3 details the testing performed by General Electric supporting such use. The "filled" calibration standard was used for automatic calibrations only.

The ID surface notches on both Calibration Standards #1 and #2 exhibit return signal amplitudes that are lower than expected by the ASME Code. The notch amplitude from Calibration Standard #1 was apparently further reduced due to a crud build-up. No cause for the low amplitude from Standard #2 could be determined. Attachment #4 details the work performed to investigate the notch amplitudes.

Examination

Examination Scope and Extent are specified in the Limerick Unit #1 Preservice Inspection Plan LIM-PIP-1. Minor interferences occurred during the examination due to RPV design considerations. The interferences are addressed in Attachment #7.

The examination was performed in accordance with written procedures. The procedures contain requirements for electronic gating and transducer scanning overlap. The procedural requirements are in accordance with Reg. Guide 1.150 requirements.

Internal Surface Examination Capabilities for both automatic and manual examination systems were demonstrated by detection of the ASME 2% ID notch during calibration. No alternate reflectors were utilized for this examination. The referenced 1" of the RPV wall measured perpendicularly to the clad/base metal interface was examined (see Recording and Sizing section for details).

Scanning Weld-Metal Interface. The ultrasonic examination procedures developed by General Electric for preservice inspection of the Limerick Unit #1 RPV utilize the ASME Section V, Article 4 specified beaming angles of 0°, 45°, and 60°. These search unit angles are not based on weld preparation geometry. The ability of these beaming angles to detect an unfavorably-oriented planar flaw was demonstrated (see Recording and Sizing section for details).

Recording and Sizing

The Capability of the Ultrasonic Examination Procedures utilized during the Limerick Unit #1 Preservice Examination to detect, record, and size the flaws delineated by Section XI was demonstrated and documented as follows:

Automatic Examination Procedures LIM-UT-8 and LIM-UT-9 were demonstrated on site by performing a successful calibration utilizing the calibration scanner, remote data system (Blue Box), and Calibration Standard #1. The ability to detect ASME Code flaws was determined in San Jose, California and at a BWR site using a specially fabricated test standard. The results of this testing are documented in Attachment #5. The referenced ASME Code flaws were detected and recorded.

Manual Examination Procedure LIM-UT-5 was demonstrated on site by performing successful calibrations for a variety of thicknesses utilizing manual examination equipment and the Calibration Standard applicable to the thickness being examined. The ability to detect ASME Code flaws was determined on site using a specially fabricated test standard. The results of this testing are documented in attachment #6. The referenced ASME Code flaws were detected and recorded.

Geometric Indications were evaluated by a certified Level III individual. Evaluations were performed using vessel design drawings, finger dampening, and other commonly-used techniques. Geometric indications detected during the examination are listed in the detailed summary of the examination (Attachment #1).

Indications With Changing Metal Paths were recorded at 20% DAC. Indication sizing and evaluations were determined by the location of the indication. Evaluations of these indications were performed in accordance with Paragraph 6.2 of Reg. Guide 1.150, Revision 1, Alternate Method. In all cases, the most conservative size for an indication was used. Attachment #1 details the indications found and these evaluations.

Indications Without Changing Metal Paths were recorded at 20% DAC. Indication sizing and evaluations were determined by the location of the indication. Evaluations of these indications were performed in accordance with Paragraph 6.3 of Reg. Guide 1.150, Revision 1, Alternate Method. Attachment #1 details the indications found and these evaluations.

Reporting of Results

All original records generated during the Limerick Unit #1 Preservice Examination have been transmitted to PECo for retention. In addition, copies of these records, in the form of a report, have been transmitted to PECo for use during subsequent Inservice Inspection activities.

No indications were detected that require reporting as abnormal degradation of the reactor pressure boundary in accordance with Reg. Guide 1.16.

The Estimate of the Sizing Tolerances for both automatic and manual examination equipment is as follows:

Automatic Examination Equipment Error Band for inner 1/4 t. See Attachment #5 for details.	= 45° $\pm$ 5.3% t 60° $\mp$ 2.1% t
Manual Examination Equipment Error Band See Attachment #6 for details.	= $\pm$ 2.56%t

The Description of the Technique used to qualify the effectiveness of Automatic Examination Procedures LIM-UT-8 and LIM-UT-9 is presented in Attachment #5. The technique used to qualify the effectiveness of Manual Examination Procedure LIM-UT-5 is presented in Attachment #6.

Estimate of Unexamined Volumes for both automatic and manual examinations are as follows:

1) Unexamined volume due to near field effects.

Automatic Examination	.500 beneath the transducer package
Manual Examination	.500 beneath the wedge

2) Unexamined volume due to clad to base metal interface.

Automatic Examination	None
Manual Examination	None

3) Volume shadowed by laminar defects.

Automatic Examination	None determinable
Manual Examination	None determinable

4) Volumes unexamined due to vessel configuration.

Some unexamined volume exists for both the automatic and manual examinations. Attachment #7 details these unexamined volumes and their effect on the examination.

5) Unexamined volumes near the surface opposite the search unit.

Automatic Examination	None determinable
Manual Examination	None determinable

6) Volumes affected by electronic gating.

Automatic Examination	None determinable
Manual Examination	No electronic gating was used

Sketches of Automatic Examination Equipment for use by reviewers is included as Attachment #8. No sketches of manual examination equipment are included since the equipment consisted of standard catalogue items needing no such sketches to allow review.

No alternate volumetric examinations were used during the Preservice Examination of Limerick Unit #1 Reactor Pressure Vessel Assembly Welds.

USNRC REGULATORY GUIDE 1.150 REPORT

ATTACHMENT #1

The following pages contain tables detailing the welds examined in accordance with USNRC Regulatory Guide 1.150 and the results of these examinations.

The Tables list the indications found, the scanning direction, the evaluation, and any remarks. The scanning direction is indicated by either T scan for indications parallel to the weld seam or P scan for indications transverse to the weld seam.

The initials NRI in the tables indicates that no indications requiring evaluation in accordance with Regulatory Guide 1.150 were detected.

All examination data used in preparation of the summary tables is contained in the final examination report.

Summary Table of Reg Guide 1.150
Indications for Limerick Unit #1
Preservice Ultrasonic Examination

Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
SHELL CIRCUMFERENTIAL	AA 45°	NRI	21 10 T SCAN 11 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	AA 60°	1 P SCAN	15 13 T SCAN 2 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	AA 0°BM	NRI	NRI	N/A	NRI	30 LAMINAR	∠ 18 IN^2	INDICATION #50=31.57 IN^2 MANUAL EXAM SHOWS SEVERAL SMALL SPOTS
	AA 0°WM	NRI	NRI	N/A	NRI	1 LAMINAR	∠18 IN^2	
SHELL CIRCUMFERENTIAL	AB 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	AB 60°	NRI	1 T SCAN	SPOT INDICATION	NRI	NRI	N/A	
	AB 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	AB 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL CIRCUMFERENTIAL	AC 45°	NRI	3 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	AC 60°	NRI	1 P SCAN	SPOT INDICATION	NRI	NRI	N/A	
	AC 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	AC 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

Summary Table of Reg Guide 1.150
Indications for Limerick Unit #1
Preservice Ultrasonic Examination

Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
SHELL CIRCUMFERENTIAL	AD 45°	NRI	1 T SCAN	SPOT INDICATION	NRI	NRI	N/A	
	AD 60°	NRI	12 T SCAN 13 1 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	AD 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	AD 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL CIRCUMFERENTIAL	AE 45°	1 T SCAN	1 T SCAN	SPOT INDICATION	NRI	NRI	N/A	
	AE 60°	NRI	1 T SCAN	SPOT INDICATION	NRI	NRI	N/A	
	AE 0°BM	NRI	NRI	N/A	NRI	3 LAMINAR	$\angle$18 IN^2	
	AE 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL TO FLANGE	AF 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	AF 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	AF 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	AF 0°WM	NRI	NRI	N/A	NRI	Geometric	Acceptable	INTERMITTANT GEOMETRIC FROM RPV-FLANGE TRANSITION

Summary Table of Reg Guide 1.150
Indications for Limerick Unit #1
Preservice Ultrasonic Examination

Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
SHELL LONGITUDINAL	BA 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BA 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BA 0°BM	NRI	NRI	N/A	NRI	1 LAMINAR	∠18 IN^2	
	BA 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL LONGITUDINAL	BB 45°	NRI	2 T SCAN 15 13 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	BB 60°	1 P SCAN	4 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	BB 0°BM	NRI	NRI	N/A	NRI	11 LAMINAR	∠18 IN^2	
	BB 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL LONGITUDINAL	BC 45°	NRI	2 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	BC 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BC 0°BM	NRI	NRI	N/A	NRI	9 LAMINAR	∠18 IN^2	
	BC 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

Summary Table of Reg Guide 1.150
Indications for Limerick Unit #1
Preservice Ultrasonic Examination

Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
SHELL LONGITUDINAL	BD 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BD 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BD 0°BM	NRI	NRI	N/A	NRI	3 LAMINAR	<18 IN^2	
	BD 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL LONGITUDINAL	BE 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BE 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BE 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	BE 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL LONGITUDINAL	BF 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BF 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BF 0°BM	NRI	NRI	N/A	NRI	3 LAMINAR	<18 IN^2	
	BF 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
SHELL LONGITUDINAL	BG 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BG 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BG 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	BG 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL LONGITUDINAL	BH 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BH 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BH 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	BH 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL LONGITUDINAL	BJ 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BJ 60°	NRI	1 P SCAN	SPOT INDICATION	NRI	NRI	N/A	
	BJ 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	BJ 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
SHELL LONGITUDINAL	BK 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BK 60°	1 P SCAN	3 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	BK 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	BK 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
SHELL LONGITUDINAL	BM 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BM 60°	NRI	1 P SCAN	SPOT INDICATION	NRI	NRI	N/A	
	BM 0°BM	NRI	NRI	N/A	NRI	6 LAMINAR	$< 18 IN^2$	
	BM 0°WM	NRI	NRI	N/A	NRI	1 LAMINAR	$< 18 IN^2$	
SHELL LONGITUDINAL	BN 45°	NRI	1 P SCAN	SPOT INDICATION	NRI	NRI	N/A	
	BN 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BN 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	BN 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
SHELL LONGITUDINAL	BP 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	BP 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	BP 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	BP 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
BOTTOM HEAD CIRCUMFERENTIAL	AJ 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	AJ 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	AJ 0°BM	NRI	NRI	N/A	NRI	2 LAMINAR	$<$18IN^2	
	AJ 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
BOTTOM HEAD MERIDIONAL	DA 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DA 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DA 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DA 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
BOTTOM HEAD MERIDIONAL	DB 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DB 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DB 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DB 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
BOTTOM HEAD MERIDIONAL	DC 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DC 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DC 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DC 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
BOTTOM HEAD MERIDIONAL	DD 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DD 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DD 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DD 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
BOTTOM HEAD MERIDIONAL	DE 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DE 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DE 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DE 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
BOTTOM HEAD MERIDIONAL	DF 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DF 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DF 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DF 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
BOTTOM HEAD MERIDIONAL	DG 45°	NRI	NRI	N/A	GEOMETRIC	NRI	ACCEPTABLE	GEOMETRIC CAUSED BY STUB TUBE INSTALLATION GROOVE
	DG 60°	NRI	NRI	N/A	GEOMETRIC	NRI	ACCEPTABLE	SEE 45°
	DG 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DG 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
CLOSURE HEAD CIRCUMFERENTIAL	AH 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	AH 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	AH 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	AH 0°WM	NRI	NRI	N/A	NRI	1 LAMINAR	< 18 IN^2	
CLOSURE HEAD MERIDIONAL	DH 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DH 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DH 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DH 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
CLOSURE HEAD MERIDIONAL	DJ 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DJ 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DJ 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DJ 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
CLOSURE HEAD MERIDIONAL	DK 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DK 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DK 0°BM	NRI	NRI	N/A	NRI	1 LAMINAR	< 18 IN^2	
	DK 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
CLOSURE HEAD MERIDIONAL	DM 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DM 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DM 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DM 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
CLOSURE HEAD MERIDIONAL	DN 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DN 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DN 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DN 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
CLOSURE HEAD MERIDIONAL	DP 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	DP 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	DP 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	DP 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
CLOSURE HEAD TO FLANGE	AG 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	AG 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	AG 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	AG 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N1A 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N1A 60°	NRI	12 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N1A 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N1A 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N1B 45°	1 T SCAN	3 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N1B 60°	1 T SCAN	23 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N1B 0°BM	NRI	NRI	N/A	NRI	6 LAMINAR	< 18 IN^2	INDICATION #17=26.58IN^2 MANUAL EXAMINATION DETECTED SEVERAL SPOTS
	N1B 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N2A 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2A 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2A 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N2A 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N2B 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2B 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2B 0°BM	NRI	NRI	N/A	NRI	2 LAMINAR	< 18 IN^2	
	N2B 0°WM	NRI	NRI	N/A	1 PLANAR	NRI	SPOT INDICATION	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N2C 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2C 60°	NRI	1 T SCAN	SPOT INDICATION	NRI	NRI	N/A	
	N2C 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N2C 0°WM	NRI	NRi	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N2D 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2D 60°	NRI	1 T SCAN	SPOT INDICATION	NRI	NRI	N/A	
	N2D 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N2D 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N2E 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2E 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2E 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N2E 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N2F 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2F 60°	NRI	1 T SCAN	SPOT INDICATION	NRI	NRI	N/A	
	N2F 0°BM	NRI	NRI	N/A	NRI	16 LAMINAR	< 18 IN^2	INDICATION #121=72.71 IN^2 MANUAL EXAMINATION SHOWS 3 SMALL LAMINARS
	N2F 0°WM	NRI	NRI	N/A	NRI	4 LAMINAR	< 18 IN^2	
NOZZLE TO VESSEL	N2G 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2G 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2G 0°BM	NRI	NRI	N/A	NRI	8 LAMINAR	< 18 IN^2	
	N2G 0°WM	NRI	NRI	N/A	2 PLANAR	4 LAMINAR	4 < 18 IN^2 2 ACCEPTABLE	2 PLANAR INDICATIONS MANUALLY EVALUATED & FOUND ACCEPTABLE
NOZZLE TO VESSEL	N2H 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2H 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2H 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N2H 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N2J 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2J 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2J 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N2J 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N2K 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2K 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N2K 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N2K 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N3A 45°	1 T SCAN	3 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N3A 60°	NRI	2 1 T SCAN 1 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N3A 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N3A 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N3B 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N3B 60°	NRI	4 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N3B 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N3B 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N3C 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N3C 60°	NRI	2 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N3C 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N3C 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N3D 45°	3 T SCAN	5 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N3D 60°	1 T SCAN	1 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N3D 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N3D 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N4A 45°	NRI	2 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4A 60°	NRI	2 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4A 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N4A 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N4B 45°	4 T SCAN	2 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4B 60°	NRI	1 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4B 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N4B 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N4C 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N4C 60°	NRI	6 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4C 0°BM	NRI	NRI	N/A	NRI	1 LAMINAR	$< 18\ IN^2$	
	N4C 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N4D 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N4D 60°	1 T SCAN	1 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4D 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N4D 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N4E 45°	NRI	2 T SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4E 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N4E 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N4E 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N4F 45°	4 T SCAN	7 6 T SCAN 1 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4F 60°	1 T SCAN	6 5 T SCAN 1 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N4F 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N4F 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N5A 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N5A 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N5A 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N5A 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N5B 45°	NRI	2 P SCAN	SPOT INDICATIONS	NRI	NRI	N/A	
	N5B 60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N5B 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N5B 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO CLOSURE HEAD	N6A 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N6A 60°	NRI	NRI	N/A	1 GEOMETRIC	NRI	REFLECTION FROM INSIDE RADIUS OF NOZZLE	FINGER DAMPENED AND PLOTTED
	N6A 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N6A 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

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Indications for Limerick Unit #1
Preservice Ultrasonic Examination

Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO CLOSURE HEAD	N6B 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N6B 60°	NRI	NRI	N/A	1 GEOMETRIC	NRI	REFLECTION FROM INSIDE RADIUS OF NOZZLE	FINGER DAMPENED AND PLOTTED
	N6B 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N6B 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO CLOSURE HEAD	N7 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N7 60°	NRI	NRI	N/A	1 GEOMETRIC	NRI	REFLECTION FROM INSIDE RADIUS OF NOZZLE	FINGER DAMPENED AND PLOTTED
	N7 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N7 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N8A 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N8A 60°	NRI	NRI	N/A	1 GEOMETRIC	NRI	REFLECTION FROM INSIDE RADIUS OF NOZZLE	PLOTTED
	N8A 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N8A 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

Summary Table of Reg Guide 1.150
Indications for Limerick Unit #1
Preservice Ultrasonic Examination

Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N8B 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N8B 60°	NRI	NRI	N/A	1 GEOMETRIC	NRI	REFLECTION FROM INSIDE RADIUS OF NOZZLE	PLOTTED
	N8B 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N8B 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N9 45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N9 60°	NRI	NRI	N/A	1 GEOMETRIC	NRI	REFLECTION FROM INSIDE RADIUS OF NOZZLE	PLOTTED
	N9 0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N9 0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N17A45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N17A60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N17A0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N17A0°WM	NRI	NRI	N/A	NRI	NRI	N/A	

Summary Table of Reg Guide 1.150
Indications for Limerick Unit #1
Preservice Ultrasonic Examination

Weld Type	Weld ID	Inner 25% of the RPV Wall Thickness			Outer 75% of the RPV Wall Thickness 1" and Greater Minimum Dimension			REMARKS
		Traveling	Nontraveling	Evaluation	Traveling	Nontraveling	Evaluation	
NOZZLE TO VESSEL	N17B45°	1 P SCAN	NRI	SPOT INDICATION	NRI	NRI	N/A	
	N17B60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N17B0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N17B0°WM	NRI	NRI	N/A	NRI	NRI	N/A	
NOZZLE TO VESSEL	N17C45°	NRI	NRI	N/A	NRI	NRI	N/A	
	N17C60°	NRI	NRI	N/A	NRI	NRI	N/A	
	N17C0°BM	NRI	NRI	N/A	NRI	NRI	N/A	
	N17C0°WM	NRI	NRI	N/A	NRI	1 LAMINAR	< 18 IN^2	
NOZZLE TO VESSEL	N17D$_{45°}$	NRI	NRI	N/A	NRI	NRI	N/A	
	N17D$_{60°}$	NRI	NRI	N/A	NRI	NRI	N/A	
	N17D$_{0°BM}$	NRI	NRI	N/A	NRI	NRI	N/A	
	N17D$_{0°WM}$	NRI	NRI	N/A	NRI	NRI	N/A	

USNRC REGULATORY GUIDE 1.150 REPORT

ATTACHMENT 2

This attachment contains the Regulatory Guide 1.150 required RF Waveform Date for both automatic and manual examination search units.

The following pages contain the USNRC Regulatory Guide 1.150 required RF Waveform Records for the automatic examination search units used during the Limerick Unit #1 Preservice Examination.

The search units for which data is presented are listed below.

The same 0° longitudinal wave transducer was used for all automatic examinations.

The original manufacturer's transducer certifications are included for reference purposes.

Dates Used	Transducer SN	Shoe SN	Position in Shoe
10/17/83 - 10/21/83	K 23988	*30	45°
10/17/83 - 10/21/83	K 23978	*30	60°

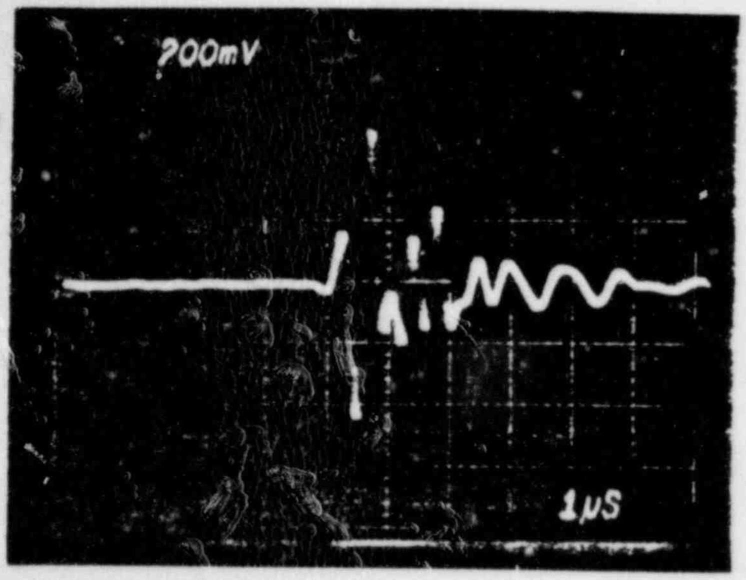
* On 10/21/83, Shoe #30 cracked during a package rebuilding procedure. The crack happened prior to calibration and was caused by overtightening a screw. No data was gathered with the cracked shoe. Due to the crack, no RF waveform data could be gathered at the completion of the examination.

Dates Used	Transducer SN	Shoe SN	Position in Shoe
10/21/83 - 11/15/83	*C 16828	4	45°
11/15/83 - 12/29/83	K 23978	4	45°
10/21/83 - 12/29/83	C 16829	4	6C°

* On 11/15/83, this transducer was damaged during package assembly. The damage happened prior to calibration. The coaxial cable connector was broken away from the transducer housing, severing the electrodes. Due to this damage, no RF waveform data could be gathered at the completion of the examination.

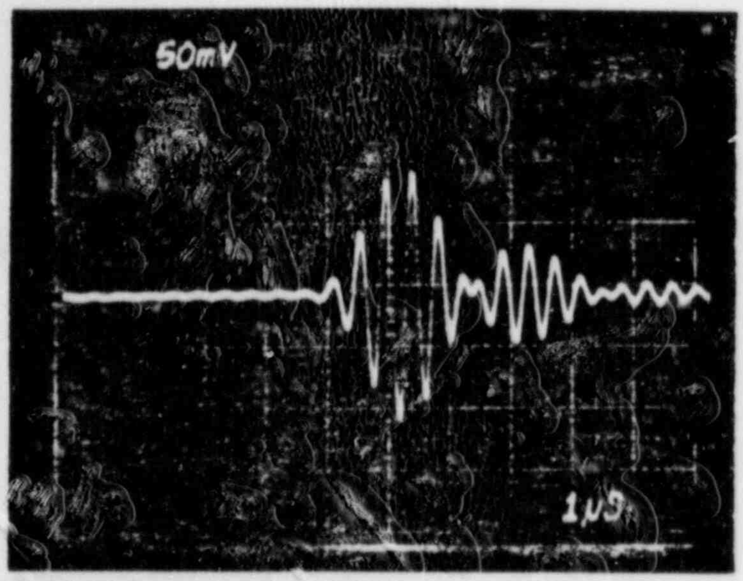
Dates Used	Transducer SN	Shoe SN	Position in Shoe
11/22/83 - 12/29/83	K 23977	2	45°
11/22/83 - 12/29/83	A 10124	2	60°
10/17/83 - 12/39/83	M 19083	N/A	0°BM, 0°WM

Regulatory Guide 1.150 contains no guidance for compliance with RF waveform requirements when equipment becomes inoperable. In the cases above, data gathered with the referenced equipment is considered to be valid. The last day of use for each item included a valid calibration, and a valid calibration check when the day's examinations were completed. The damage, prior to the next day's initial calibration, has no effect on data gathered previously.



Site Limerick Date 10/2/83 Examiner [signature] Level II
Transducer # K23988 Angle 45°
Scope # 400005 Filter (Before/After Before
Cal Block #1 ½T Hole

SHOE # 30



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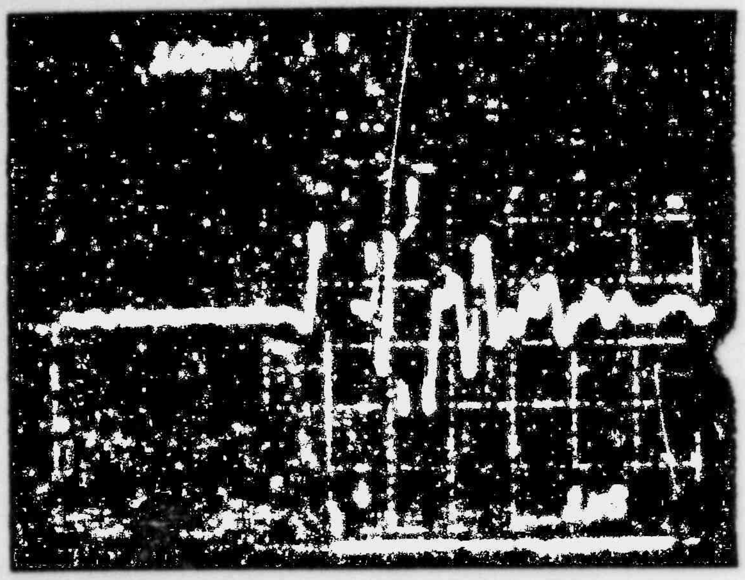
Transducer # K23988 Angle 45°
Scope # 400005 Filter (Before/After After
Cal Block #1 ½T Hole



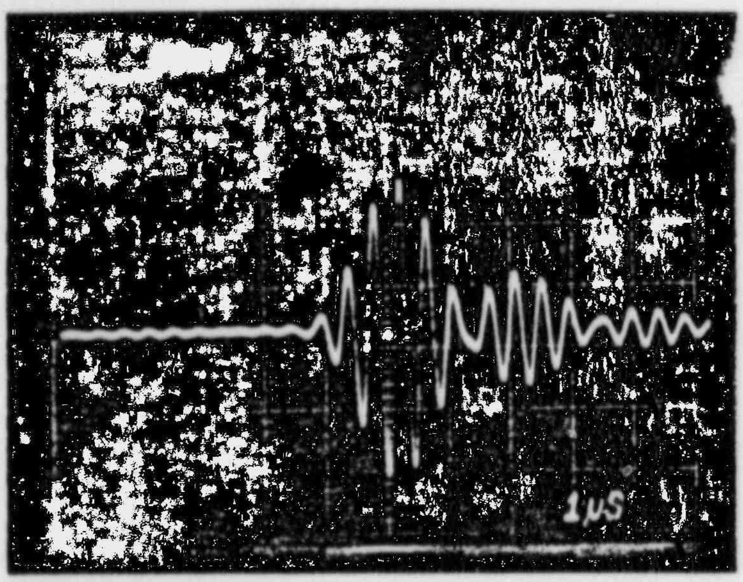
Site LIMERICK Date 10/7/83 Examiner Level II

Transducer # K23998 Angle 60

Scope # 400005 Filter (Before/After BEFORE

CALBLOCK #1 1/2 HOLE

SHOE #30



Site LIMERICK Date 10/9/83 Examiner Level II

Transducer # K23998 Angle 60

Scope # 400005 Filter (Before/After AFTER

CALBLOCK #1 1/2 HOLE

Transducer Description

Series GAMMA

Frequency 2.25 MHz

Element dimensions 1.0 in.

Style - Connector type

MSWS - MD

Focal Type: [X] Nonfocused
[ ] Spherical
[ ] Cylindrical

~~Water Path~~ 1" PLEX

Serial Number K23988

Relative sensitivity rating

31 db

Inspector QP

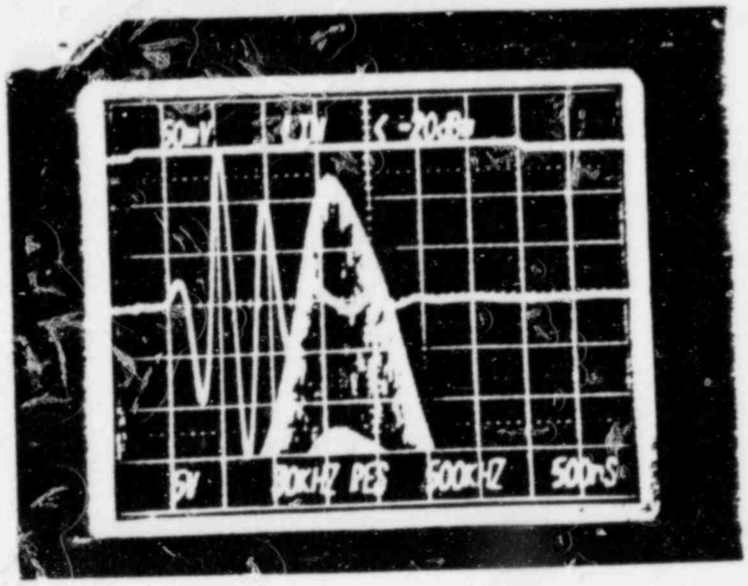
Date 10.24.90

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick steel plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using a KB-AEROTECH Ultrasonic Transducer Analyzer, Model UTA-3, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time wave form, UTA-3 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-3 receiver, the amplitude of the real time wave form is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 50 millivolts per division, the amount of attenuation used provides a relative sensitivity rating for all transducers certified by KB-AEROTECH.

Real Time Waveform — Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker — Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum — Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

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Transducer Technology Center
P.O. Box 350
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Series GAMMA

Frequency 2.25

Element dimensions 1.0

Style - Connector type

Special SWS - MD

Focal type: ☐ Nonfocused
☐ Spherical
☐ Cylindrical

Water Path 1" Plex

Serial Number K23978

Relative sensitivity rating

32 db

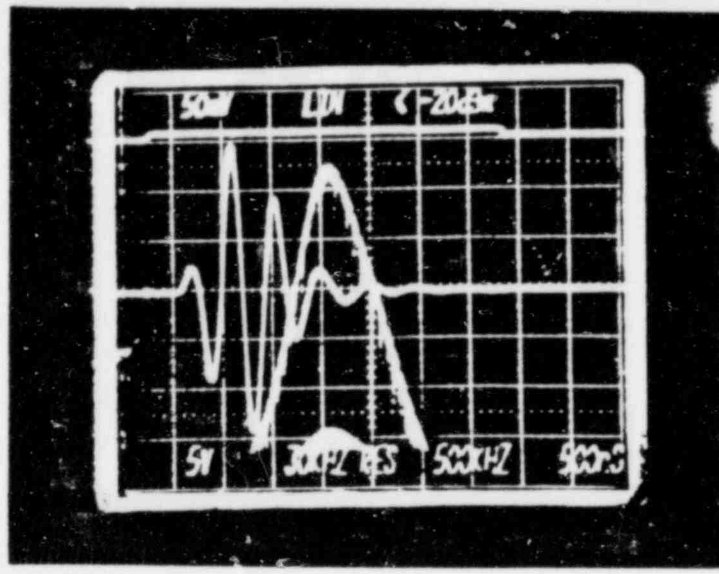
Inspector WN

Date 10/25/79

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick aluminum plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

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Frequency Spectrum — Trace III

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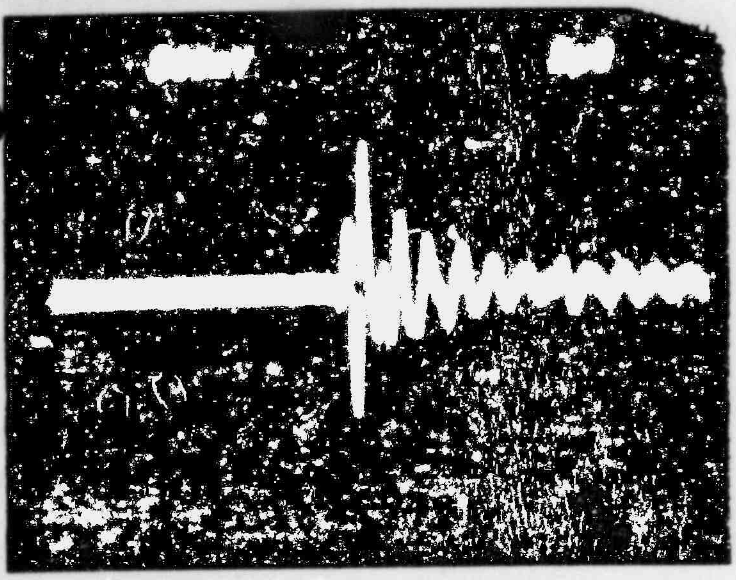
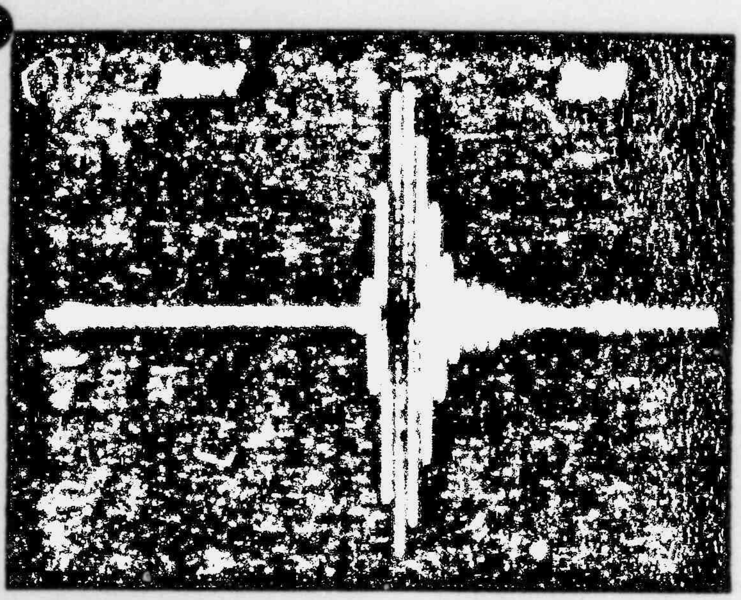
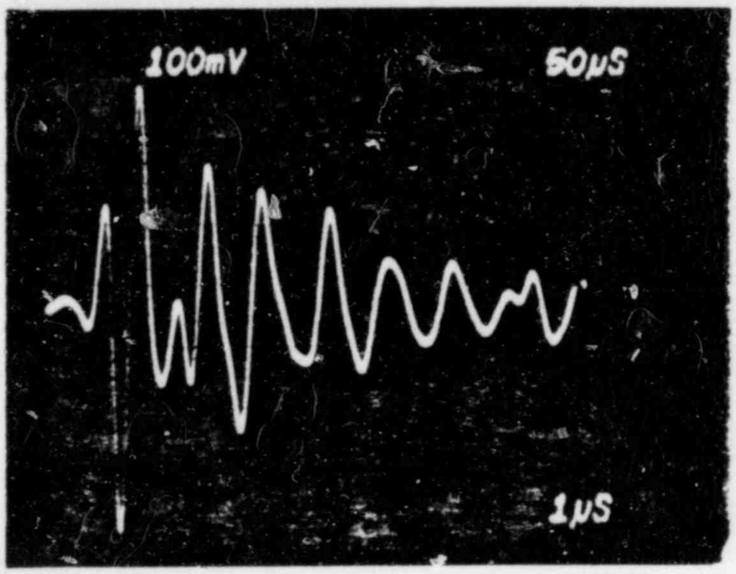


Site Limerick Date 10/21/83 Examiner PMP Level II
Transducer # C16828 Angle 45
Scope # 400005 Filter (Before/[redacted]r
Cal Block #1 ½T
SHOE # ~~30~~ 4 wcm 10/21/83

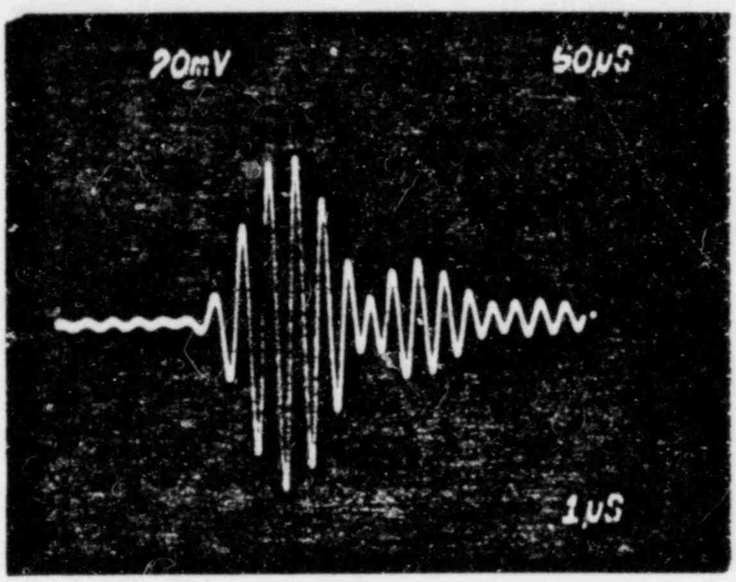


Site Limerick Date 10/21/83 Examiner PMP Level II
Transducer # C16828 Angle 45
Scope # 400005 Filter ([redacted]/After
Cal Block #1 ½T



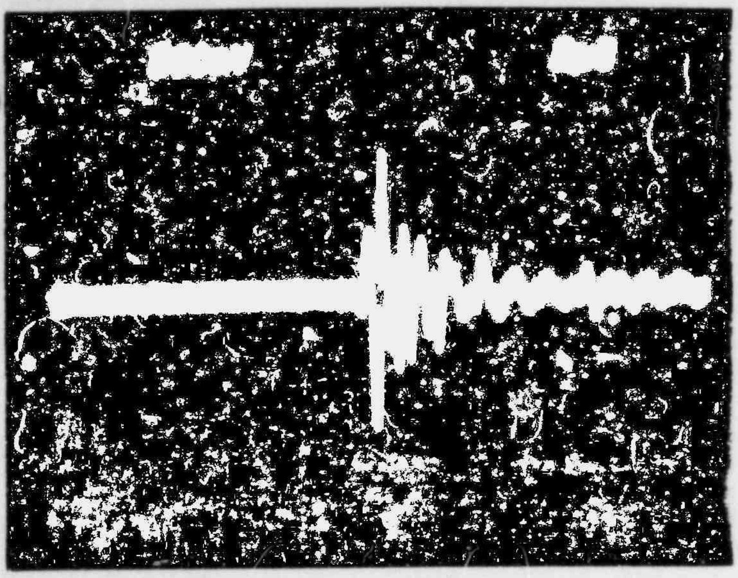
Site Limerick Date 11/15/83 Examiner DKV Level II
Transducer # K23978 Angle 45°
Scope # 400005 Filter (Before/~~After~~

Block #1 1/2t



SHOE #4

Site Limerick Date 11/15/83 Examiner DKV Level II
Transducer # K23978 Angle 45
Scope # 400005 Filter (~~Before~~/After



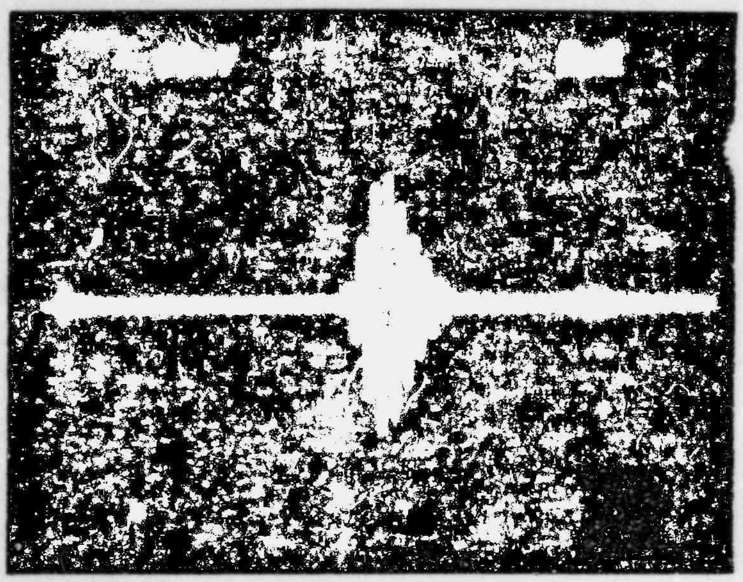
Site Limerick Date 10/21/83 Examiner PMP Level II

Transducer # C16829 Angle 60

Scope # 400005 Filter (Before/~~After~~

Cal. Block #1 1/2T

SHOE # ~~3~~ 4 WCM 10/21/83

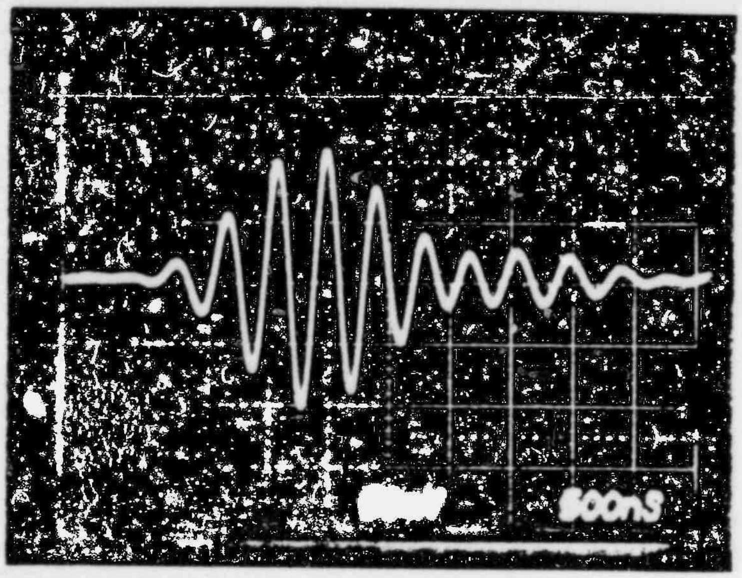


Site Limerick Date 10/21/83 Examiner PMP Level II

Transducer # C16829 Angle 60

Scope # 400005 Filter (~~Before~~/~~After~~ After

Cal Block #1 1/2T

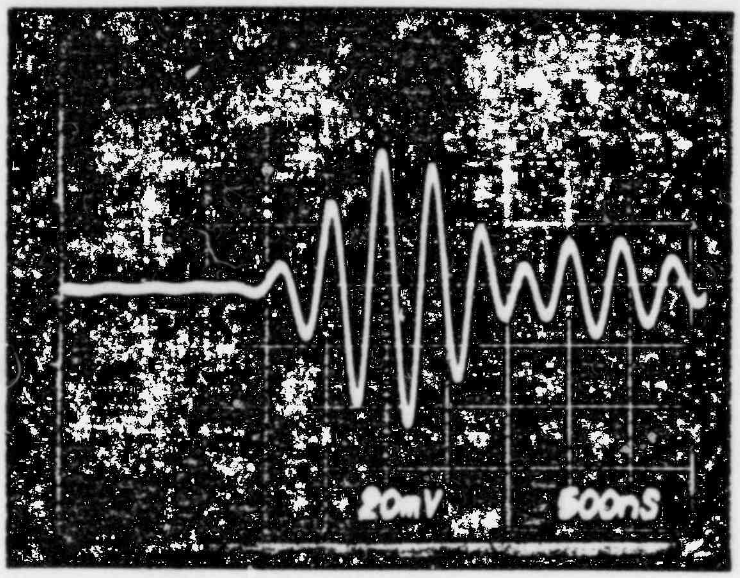


Site Limerick I Date 12/30 Examiner SCM Level III

Transducer # C16829 Angle 60° T

Scope # 400005 Filter (Before/After AFTER

BLOCK #1 ½t SHOE #4



Site Limerick I Date 12/30 Examiner SCM Level III

Transducer # K23978 Angle 45° T

Scope # 400005 Filter (Before/After AFTER

Transducer Description

Series GAMMA

Frequency 2.25 MHZ

Element dimensions 1.0

Style - Connector type

C5W5 - N.D. [illegible]

Focal type: ☒ Nonfocused
☐ Spherical
☐ Cylindrical

Water Path N/A

Serial Number C16828

Relative sensitivity rating

38 db

Inspector D.C.Y.

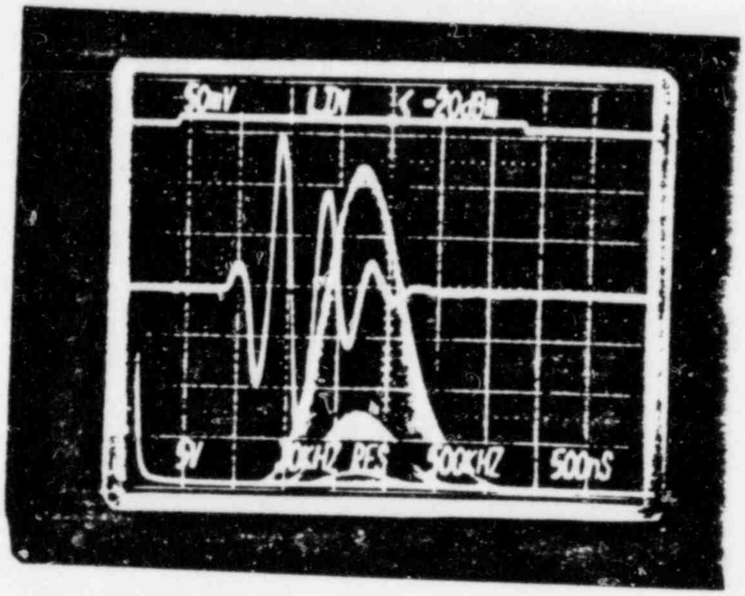
Date 3-16-78

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick aluminum plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

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Frequency Spectrum — Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

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Transducer Technology Center
P. O. Box 350
Lewistown, Pa. 17044

Transducer Description

A B

Series GAMMA

Frequency 2.25

Element dimensions 1.0

Style - Connector type

Special SWS - MD

Focal type: ☐ Nonfocused
☐ Spherical
☐ Cylindrical

Water Path 1"Plex

Serial Number K23978

Relative sensitivity rating

32 db

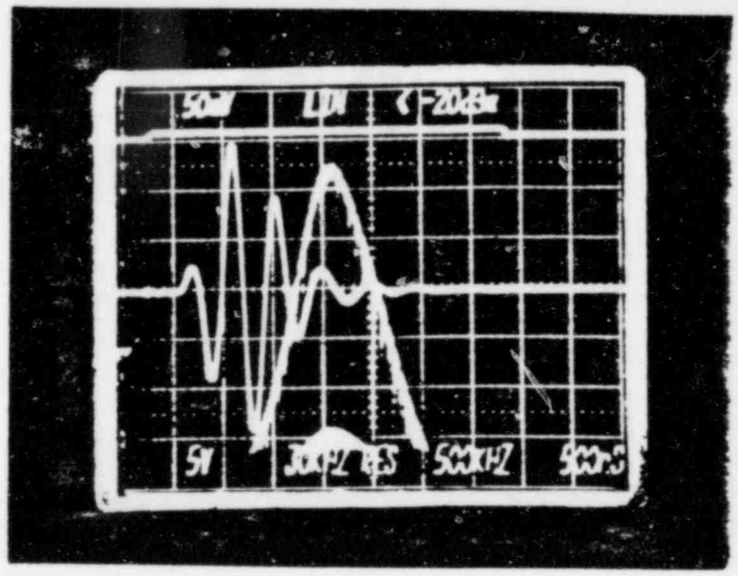
Inspector WN

Date 10/25/79

TRACE I

TRACE II

TRACE III



C D E F

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KB-AEROTECH
Transducer Technology Center
P. O. Box 350
Lewistown, Pa. 17044

Transducer Description

Series GAMMA

Frequency 2.25 MHZ

Element dimensions 1.0

Style - Connector type

CBWS - ? ?

Focal type: ☒ Nonfocused
☐ Spherical
☐ Cylindrical

Water Path N/A

Serial Number C16829

Relative sensitivity rating

38 db

Inspector D.C.Y.

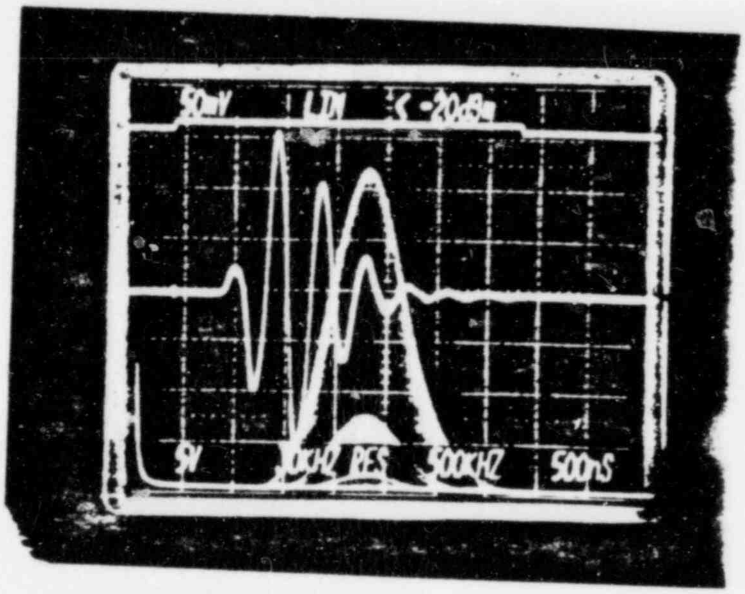
Date 3-16-78

A B

TRACE I

TRACE II

TRACE III



C D E F

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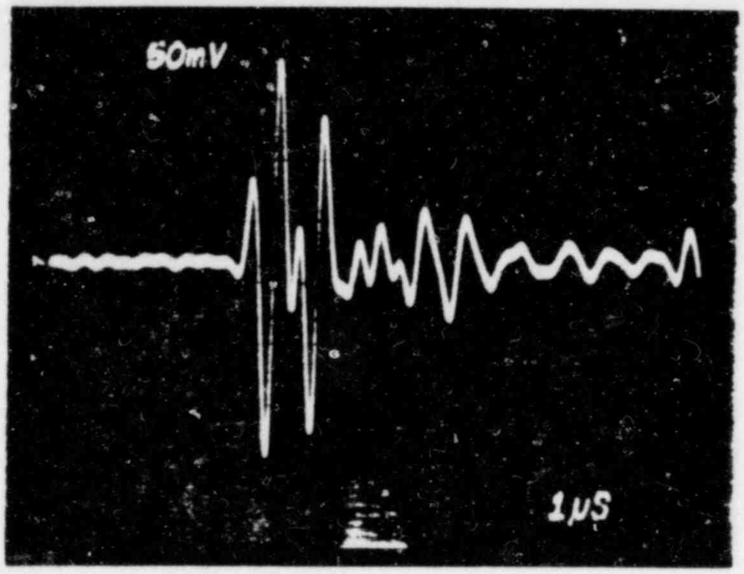
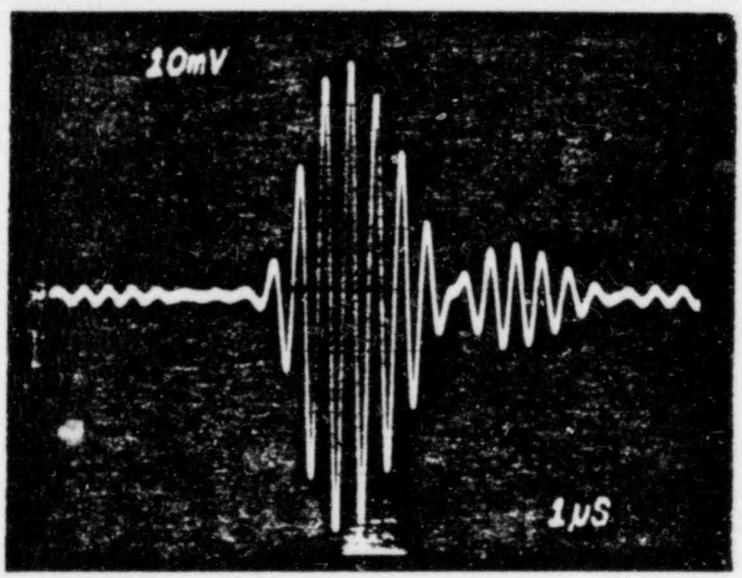
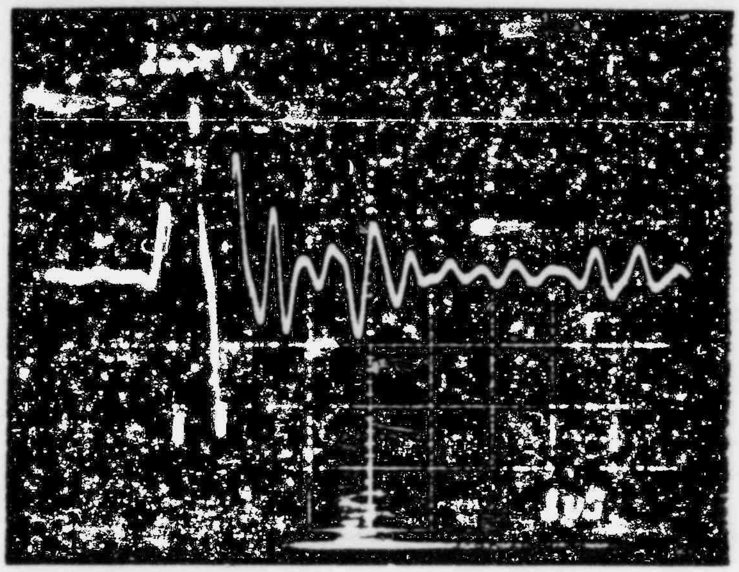
P. O. Box 350
Lewistown, Pa. 17044



Site LIMERICK I Date 11/22 Examiner DKV Level II
Transducer # K23977 Angle 45°
Scope # 7603 Filter (Before/~~After~~
BLOCK #1 ½t
SHOE #2



Site LIMERICK I Date 11/22 Examiner DKV Level II
Transducer # K23977 Angle 45°
Scope # 7603 Filter (~~Before~~/After

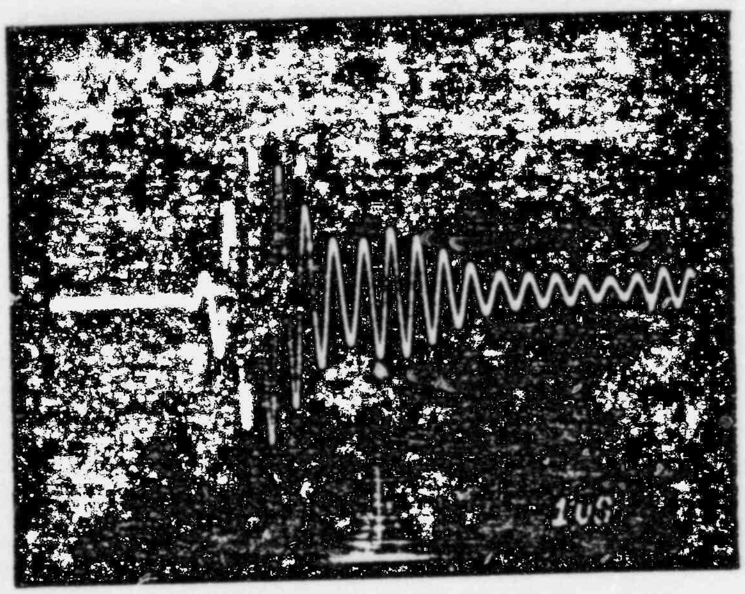


Site LIMERICK I Date 11/22 Examiner DKV Level II

Transducer # A10124 Angle 60°

Scope # 7603 Filter (Before/~~After~~

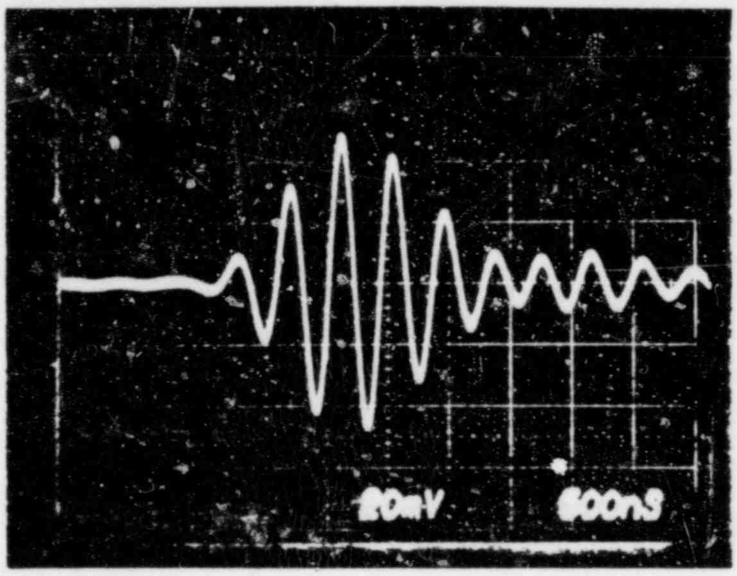
BLOCK # 1 ½ t
SHOE # 2



Site LIMERICK I Date 11/22 Examiner DKV Level II

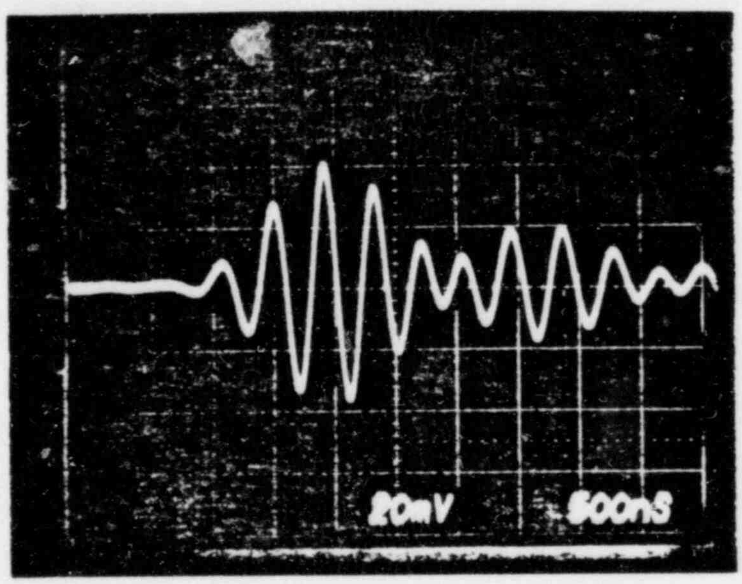
Transducer # A10124 Angle 60°

Scope # 7603 Filter (~~Before~~/After



Site Limerick I Date 12/30 Examiner SCM Level III
Transducer # K23977 Angle 45° P
Scope # 400005 Filter (Before/After AFTER

Block #1 ½ t
SHOE #2



Site Limerick I Date 12/30 Examiner SCM Level III
Transducer # A10124 Angle 60° P
Scope # 400005 Filter (Before/After AFTER

Transducer Description

Series GAMMA

Frequency 2.25 MHZ

Element dimensions 1.0

Style - Connector type

SPecial SWS - MD

Focal type: [x] Nonfocused
[ ] Spherical
[ ] Cylindrical

Water Path 1" Plex

Serial Number K23977

Relative sensitivity rating

32 db

Inspector IVN

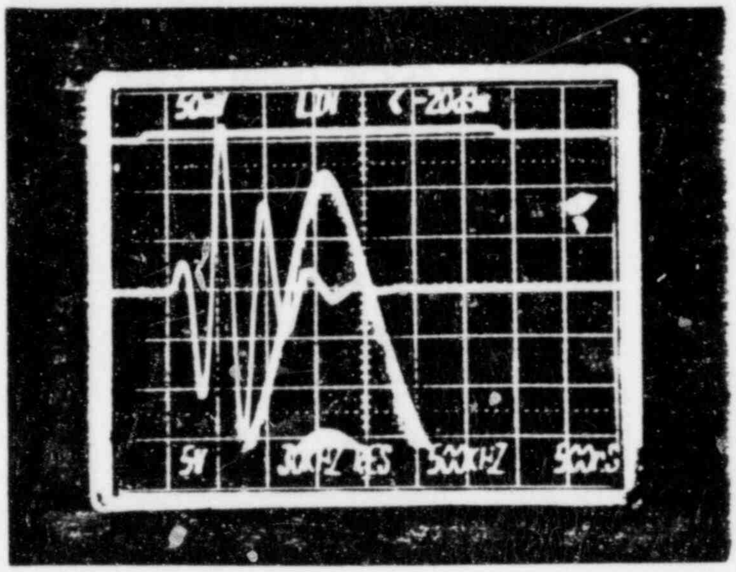
Date 10/25/79

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick aluminum plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using a KB-AEROTECH Ultrasonic Transducer Analyzer, Model UTA-3, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time wave form, UTA-3 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-3 receiver, the amplitude of the real time wave form is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 50 millivolts per division, the amount of attenuation used provides a relative sensitivity rating for all transducers certified by KB-AEROTECH.

Real Time Waveform — Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker — Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum — Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

KB-AEROTECH
Transducer Technology Center
P. O. Box 350
Lewistown, Pa. 17044

Transducer Description

Series GAMMA SP

Frequency 2.25 MHz

Element dimensions 1.0 in.

Style - Connector type

SWS - MD

Focal Type: ☒ Nonfocused
☐ Spherical
☐ Cylindrical

~~Water Path~~ 1" flex

Serial Number A10124

Relative sensitivity rating

- 31 db

Inspector RZ

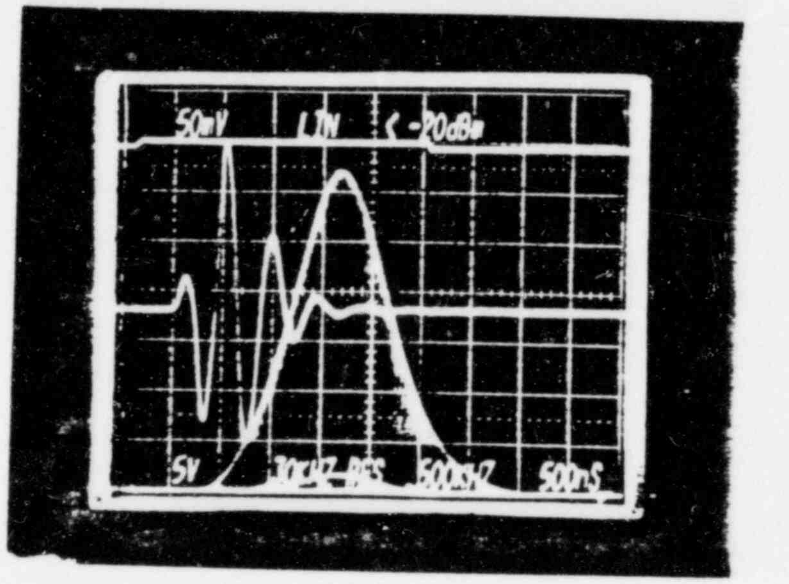
Date 4/1/81

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick steel plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using a KB-AEROTECH Ultrasonic Transducer Analyzer, Model UTA-3, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time wave form, UTA-3 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-3 receiver, the amplitude of the real time wave form is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 50 millivolts per division, the amount of attenuation used provides a relative sensitivity rating for all transducers certified by KB-AEROTECH.

Real Time Waveform — Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker — Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum — Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

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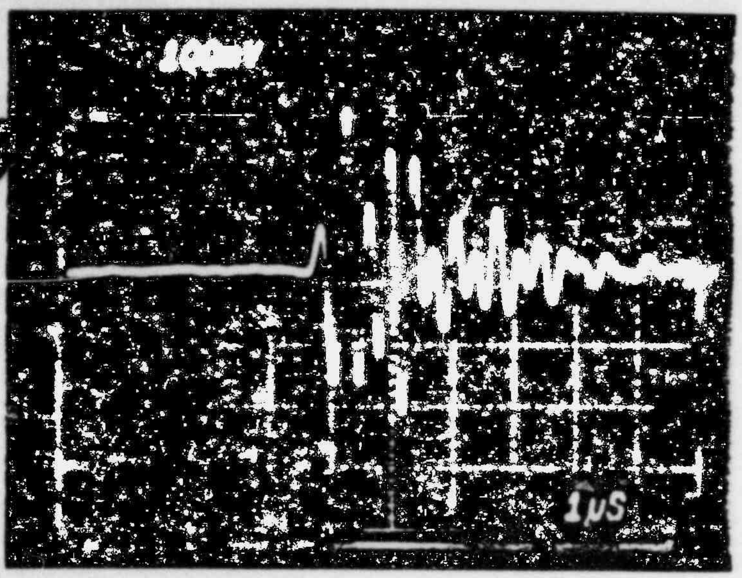
Lewistown, PA 17044

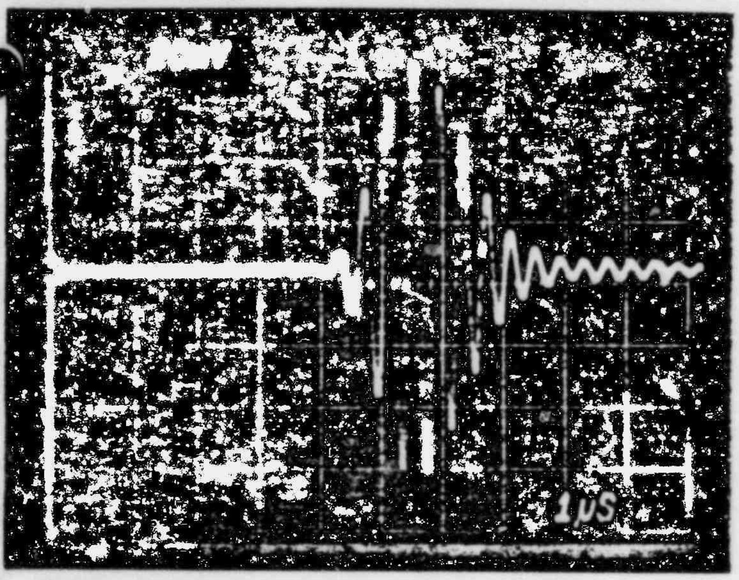


Site LIMERICK Date 10/9/83 Examiner PM Patterson Level II

Transducer # H19083 Angle 0

Scope # 400005 Filter (Before/After BEFORE

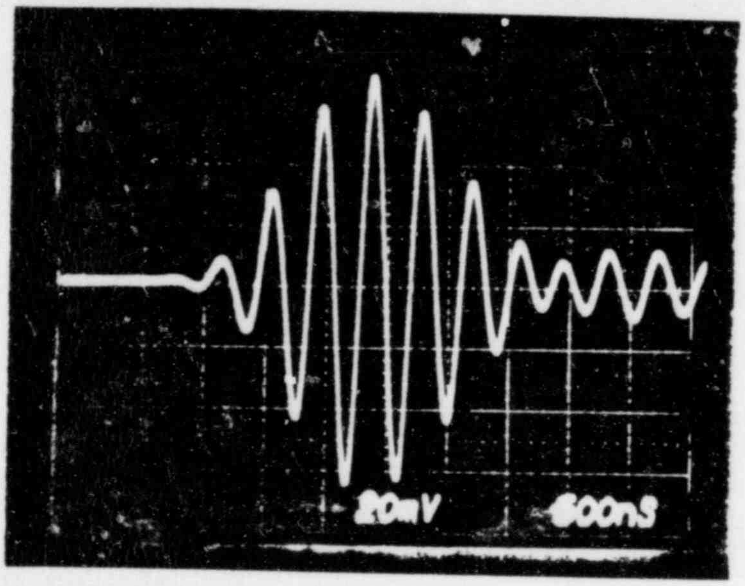
BLOCK # 1 ½ t



Site LIMERICK Date 10/7/83 Examiner PM Patterson Level II

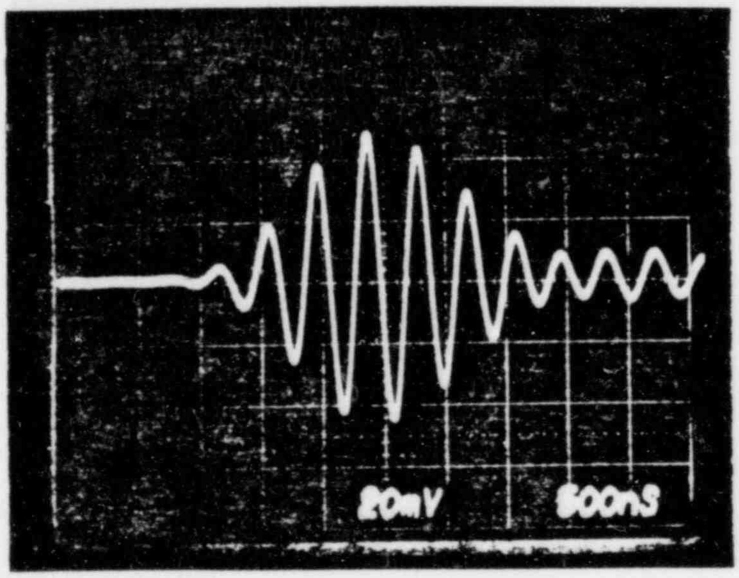
Transducer # ~~400006~~ H19083 Angle 0

Scope # 400005 Filter (Before/After AFTER



Site Limerick I Date 12/30 Examiner SCM Level III
Transducer # M19083 Angle L-wave Weld
Scope # 400005 Filter (Before/After AFTER

Block #1 1/2 t



Site Limerick I Date 12/30 Examiner SCM Level III
Transducer # M19083 Angle L-wave Base
Scope # 400005 Filter (Before/After AFTER

Transducer Description

Series SP. GAMMA

Frequency 2.25 MHz

Element dimensions 1.0 in.

Style - Connector type

PFCS - MD

Focal Type: ■ Nonfocused
☐ Spherical
☐ Cylindrical

~~Water Path~~ 1"PLEX

Serial Number M19083

Relative sensitivity rating

33 db

Inspector [illegible]

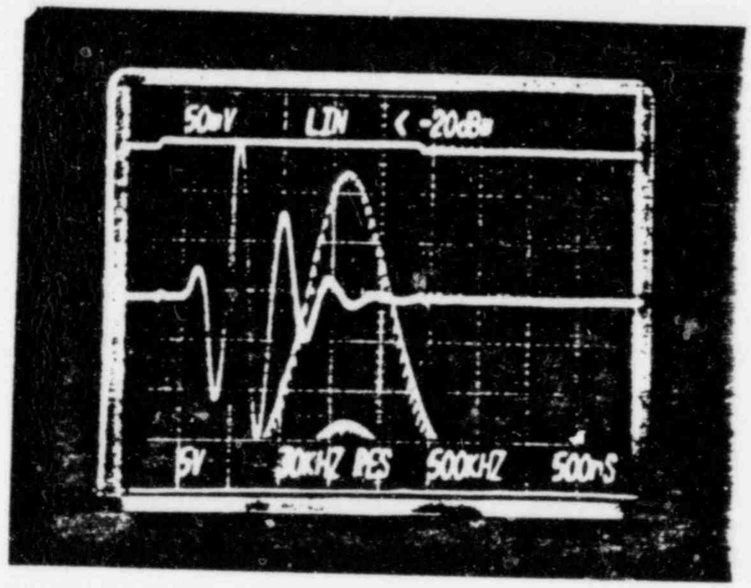
Date 12.22.80

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick steel plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using a KB-AEROTECH Ultrasonic Transducer Analyzer, Model UTA-3, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time wave form, UTA-3 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-3 receiver, the amplitude of the real time wave form is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 50 millivolts per division, the amount of attenuation used provides a relative sensitivity rating for all transducers certified by KB-AEROTECH.

Real Time Waveform — Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker — Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum — Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

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The following pages contain the USNRC Regulatory Guide 1.150 required RF Waveform Records for the manual examination search units used during the Limerick Unit #1 Preservice Examination.

Coaxial cable/search unit combinations were not performed. The high cable breakage rate during manual examinations precludes this type of combination having anymeaning. General Electric determined through testing with an Adaptronics ALN 4060 that there is no measurable affect on frequency/amplitude data gathered using 6' - 12' cables. All cables used for manual examinations fell in the 6' - 12' range.

The search units for which data is presented are listed below.

Dates Used	Transducer SN	Wedge SN	Beaming Angle
11/16/83 - 03/26/84	J08325	SSI-10	45°
		SSI-4	60°
10/25/83 - 03/26/84	J08326	SSI-9	45°
		SSI-1	60°
		SSI-2	60°
03/01/84 - 03/27/84	J08327	SSI-2	60°
10/24/83 - 03/27/84	J08328	SSI-3	45°
		SSI-2	60°
11/16/83 - 03/27/84	D17921	N/A	0°
12/02/83 - 03/26/84	K 11749	N/A	0°
12/02/83 - 03/26/84	30956	N/A	0°

TRANSDUCER EVALUATION 11/16/83

SN: Ø8325	ATTEN:53.Ø	PWDTH: 2ØØ
DAMPG: Ø	FILTR: Ø	SAMPL:2Ø.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 89%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	65.85
PULSE WIDTH (CYCLES)	=	3.2Ø
ENVELOPE MODALITY	=	Ø.83

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.19
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.56
UPPER HALF POWER PT	=	2.34
BAND WIDTH (%)	=	4Ø.ØØ
BAND WIDTH CTR FREQ	=	1.95
HI/LO POWER RATIO	=	Ø.59
SPECTRAL MODALITY	=	Ø.Ø4

SITE LIMERICK UNIT #1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 174 Length 12' S/N C-3

ANGLE BEAM WEDGE INFORMATION

S/N SSI 10 Type 45° LUCITE

CALIBRATION STANDARD DESCRIPTION

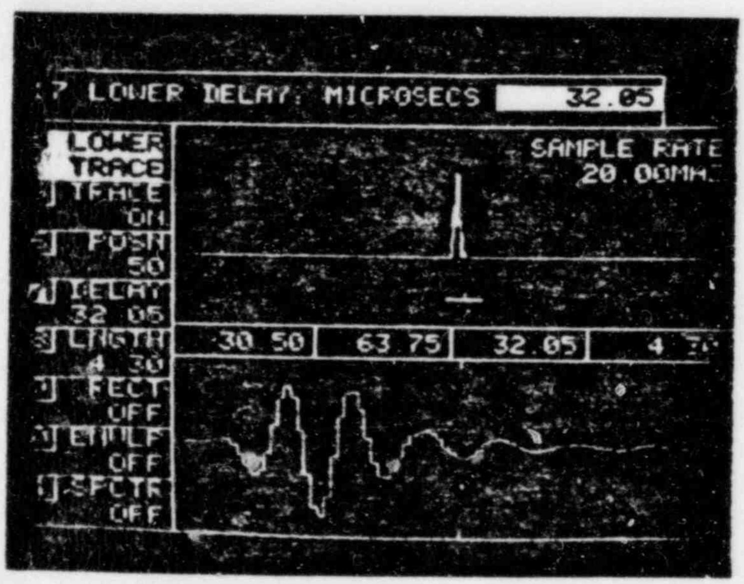
SA 508 CL III

ID N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION I D NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 11/16/83

SN: Ø8325	ATTEN:35.Ø	PWDTH: 2ØØ
DAMPG: Ø	FILTR: Ø	SAMPL:2Ø.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 93%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	13.47
PULSE WIDTH (CYCLES)	=	4.59
ENVELOPE MODALITY	=	1.63

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.3Ø
PEAK FREQUENCY	=	2.Ø3
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.5Ø
BAND WIDTH (%)	=	37.Ø4
BAND WIDTH CTR FREQ	=	2.11
HI/LO POWER RATIO	=	1.17
SPECTRAL MODALITY	=	Ø.ØØ

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG-174 Length 12' S/N C-3

ANGLE BEAM WEDGE INFORMATION

S/N SSI - 4 Type 60° LUCITE

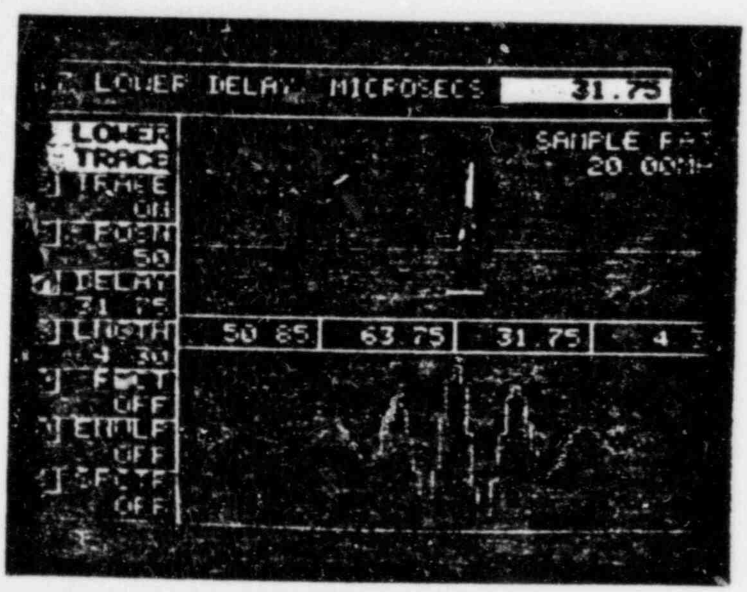
CALIBRATION STANDARD DESCRIPTION

SA 508 CL III
ID N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



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TRANSDUCER EVALUATION 03/26/84

SN: Ø8325 ATTEN:48.Ø PWDTH: 2ØØ
DAMPG: Ø FILTR: Ø SAMPL:2Ø.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 99%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	85.57
PULSE WIDTH (CYCLES)	=	3.97
ENVELOPE MODALITY	=	Ø.91

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.16
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.56
UPPER HALF POWER PT	=	2.34
BAND WIDTH (%)	=	4Ø.ØØ
BAND WIDTH CTR FREQ	=	1.95
[illegible] RATIO	=	1.Ø6
SPECTRAL MODALITY	=	Ø.ØØ

SITE LIMERICK UNIT #1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 58 Length 12' S/N C-5

ANGLE BEAM WEDGE INFORMATION

S/N SSI 10 Type 45° LUCITE

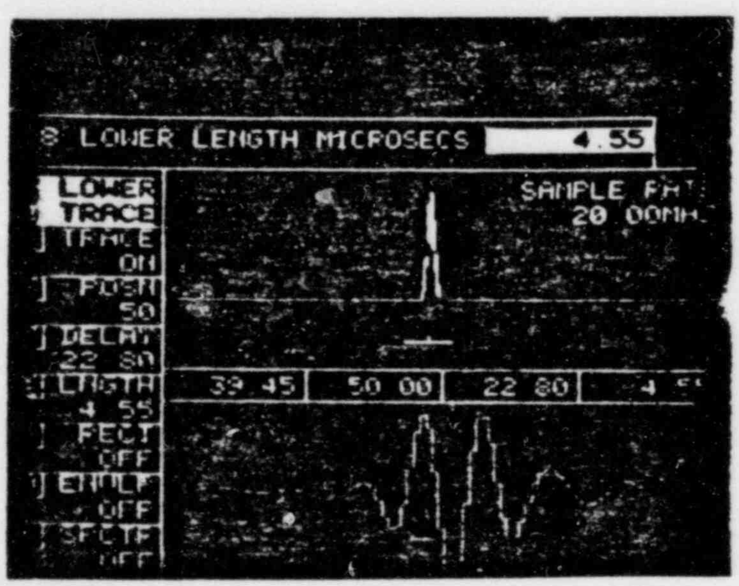
CALIBRATION STANDARD DESCRIPTION

ID SA508 CL III N2 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/26/84

SN: 03325 ATTEN:35.0 PWDTH: 200
DAMPG: 0 FILTR: 0 SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 92%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	8.46
PULSE WIDTH (CYCLES)	=	5.61
ENVELOPE [illegible]	=	1.29

FREQ DOMAIN EVALUATION

[illegible]	=	2.26
PEAK FREQUENCY	=	2.19
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.50
[illegible]	=	37.04
[illegible] FREQ	=	2.11
[illegible] RATIO	=	0.97
SPECTRAL [illegible]	=	0.00

SITE LIMERICK UNIT # 1

Evaluation Performed By: [illegible signature]

CO-AXIAL CABLE INFORMATION

Type RG58 Length 12' S/N C-5

ANGLE BEAM WEDGE INFORMATION

S/N SSI 4 Type 60° LUCITE

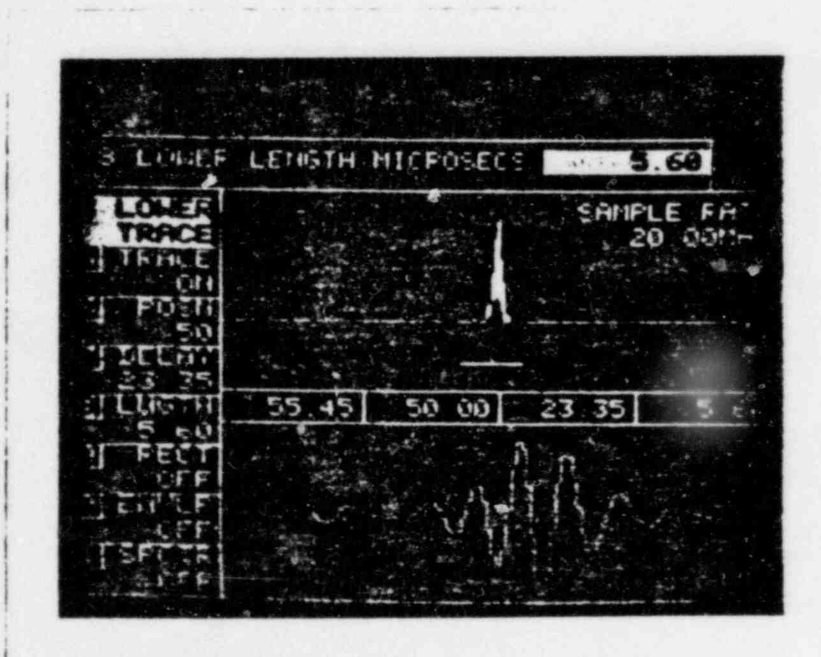
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



Transducer Description

Series GAMMA

Frequency 2.25 MHz Size .5x1.0"

Serial No. J08325

☒ Contact ☐ Immersion Water Path 1" flex. ☒ Nonfocused ☐ Spherical ☐ Cylindrical

Style SWS Connector BNC

Relative Sensitivity 39 DB

Energy Setting 2 Impedance 50 Ω

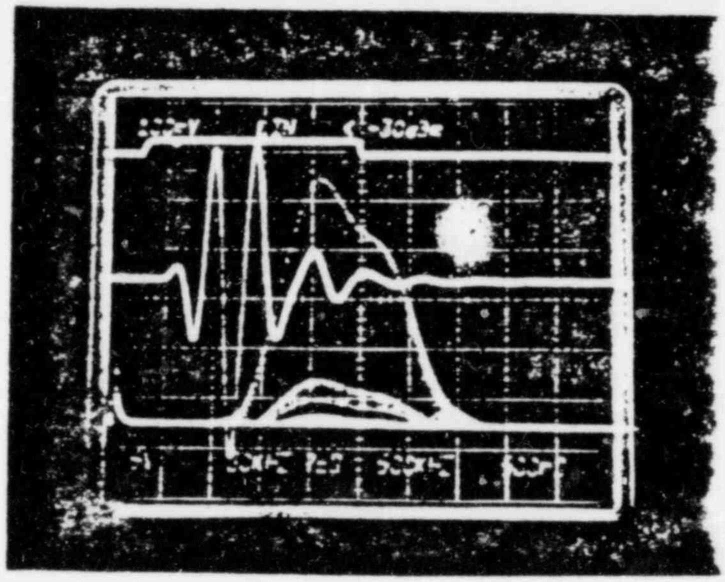
Inspector MK Date 9-20-83

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time waveform shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact (wearplate) transducers are tested on a 1.0" flat steel (4340) plate while epoxy-faced shear wave transducers are tested on a flat polymer block. Delay fingertip removable (Style DFR) transducers are tested off of the tip of the delay line. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using an AEROTECH Ultrasonic Transducer Analyzer, Model UTA-4, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time waveform, UTA-4 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-4 receiver, the amplitude of the real time waveform is adjusted to a six centimeter amplitude (+ 1 db) on the CRT. With the vertical calibration of trace II fixed at 100 millivolts per division, the amount of attenutation used provides a relative sensitivity rating for all transducers certified by Krautkramer Branson.

Real Time Waveform - Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker - Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum - Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

KRAUTKRAMER BRANSON
P. O. Box 350

TRANSDUCER EVALUATION 11/16/83

SN: Ø8326 ATTEN:35.Ø PWDTH: 2ØØ
DAMPG: Ø FILTR: Ø SAMPL:2Ø.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 88%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	14.89
PULSE WIDTH (CYCLES)	=	4.54
ENVELOPE MODALITY	=	1.67

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.36
PEAK FREQUENCY	=	2.19
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.5Ø
BAND WIDTH (%)	=	37.Ø4
BAND WIDTH CTR FREQ	=	2.11
HI/LO POWER RATIO	=	Ø.62
SPECTRAL MODALITY	=	Ø.ØØ

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 174 Length 12' S/N C-4

ANGLE BEAM WEDGE INFORMATION

S/N SSI - 1 Type 60° LUCITE

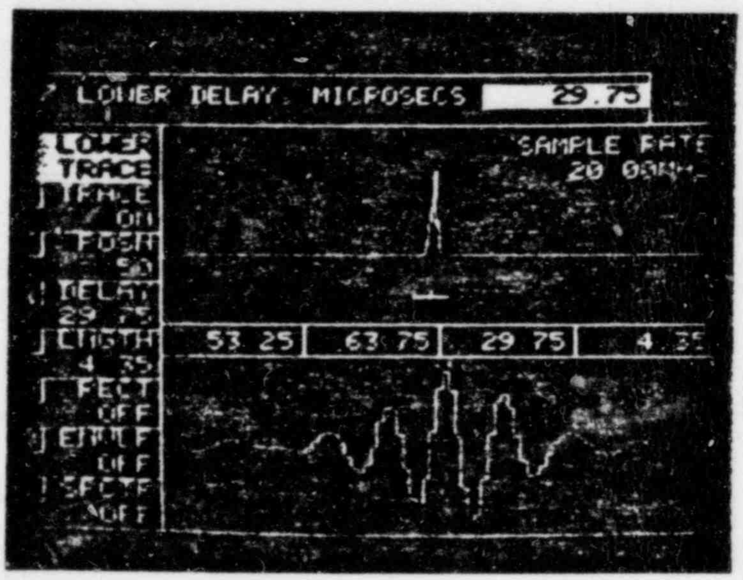
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 SAFE END Thickness 2.12

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 10/25/83

SN: Ø8326 ATTEN: 48.Ø FWDTH: 200
DAMPG: Ø FILTR: Ø SAMPL: 20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 99%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	59.76
PULSE WIDTH (CYCLES)	=	4.Ø2
ENVELOPE MODALITY	=	Ø.75

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.2Ø
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.56
UPPER HALF POWER PT	=	2.5Ø
BAND WIDTH (%)	=	46.15
BAND WIDTH CTR FREQ	=	2.Ø3
HI/LO POWER RATIO	=	Ø.63
SPECTRAL MODALITY	=	Ø.22

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Muller

CO-AXIAL CABLE INFORMATION

Type RG-174 Length 12' S/N C2

ANGLE BEAM WEDGE INFORMATION

S/N SS1-2 Type 60° LUCITE

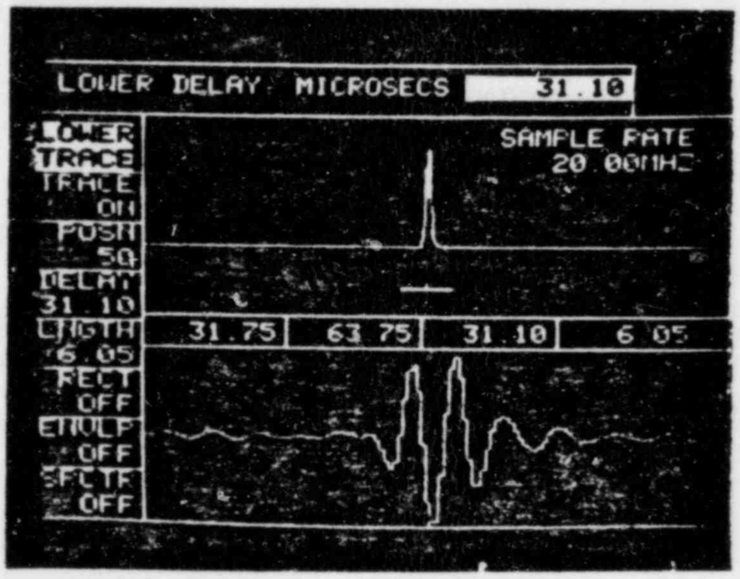
CALIBRATION STANDARD DESCRIPTION

SA 508 CL III
ID N1 SAFE END Thickness 2.12"

REFLECTOR USED
FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 11/16/83

SN: Ø8326 ATTEN:48.Ø PWDTH: 2ØØ
DAMPG: Ø FILTR: Ø SAMPL:2Ø.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 96%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	63.45
PULSE WIDTH (CYCLES)	=	4.Ø7
ENVELOPE MODALITY	=	Ø.83

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.17
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.56
UPPER HALF POWER PT	=	2.34
BAND WIDTH (%)	=	4Ø.ØØ
BAND WIDTH CTR FREQ	=	1.95
HI/LO POWER RATIO	=	1.12
SPECTRAL MODALITY	=	Ø.ØØ

SITE LIMERICK UNIT #1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG-174 Length 12' S/N C-4

ANGLE BEAM WEDGE INFORMATION

S/N SSI - 9 Type 45° LUCITE

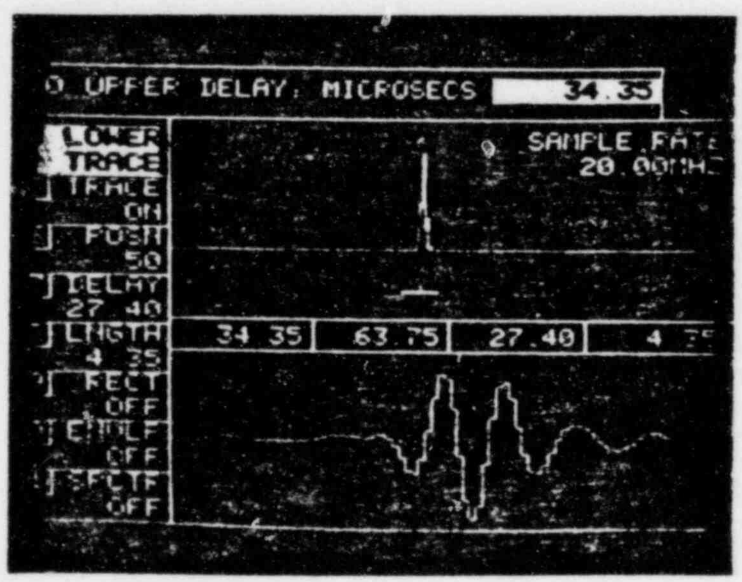
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/26/84

SN: 08326 ATTEN:27.5 PWITH: 200
DAMPG: 0 FILTR: 0 SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 96%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	11.01
PULSE WIDTH (CYCLES)	=	5.66
ENVELOPE MODALITY	=	1.33

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.36
PEAK FREQUENCY	=	2.19
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.50
BAND WIDTH (%)	=	37.04
BAND WIDTH CTR FREQ	=	2.11
HI/LO POWER RATIO	=	0.60
SPECTRAL MODALITY	=	0.00

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG-58 Length 12' S/N C5

ANGLE BEAM WEDGE INFORMATION

S/N SSI-1 Type 60° LUCITE

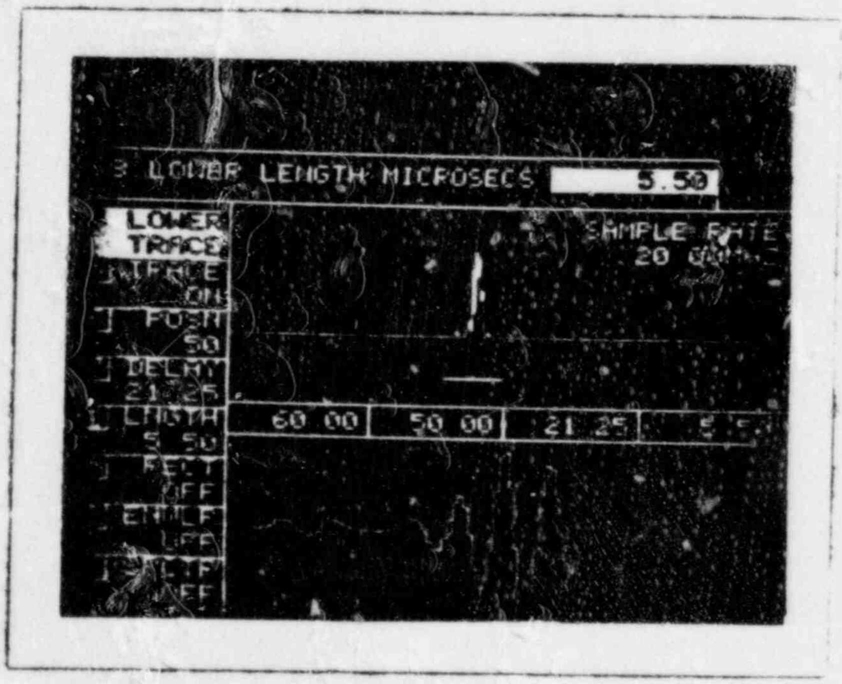
CALIBRATION STANDARD DESCRIPTION

SA 508 CL III
ID N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/26/84

SN: Ø8326	ATTEN:29.Ø	PWDTH: 200
DAMPG: Ø	FILTR: Ø	SAMPL:20.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 83%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	= 9.66
PULSE WIDTH (CYCLES)	= 3.70
ENVELOPE MODALITY	= 1.75

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	= 2.16
PEAK FREQUENCY	= 1.88
LOWER HALF POWER PT	= 1.56
UPPER HALF POWER PT	= 2.34
BAND WIDTH (%)	= 40.ØØ
BAND WIDTH CTR FREQ	= 1.95
HI/LO POWER RATIO	= 1.28
SPECTRAL MODALITY	= Ø.ØØ

SITE LIMERICK UNIT #1

Evaluation Performed By: [illegible]

CO-AXIAL CABLE INFORMATION

Type RG 58 Length 12' S/N C5

ANGLE BEAM WEDGE INFORMATION

S/N SSI - 2 Type 60° LUCITE

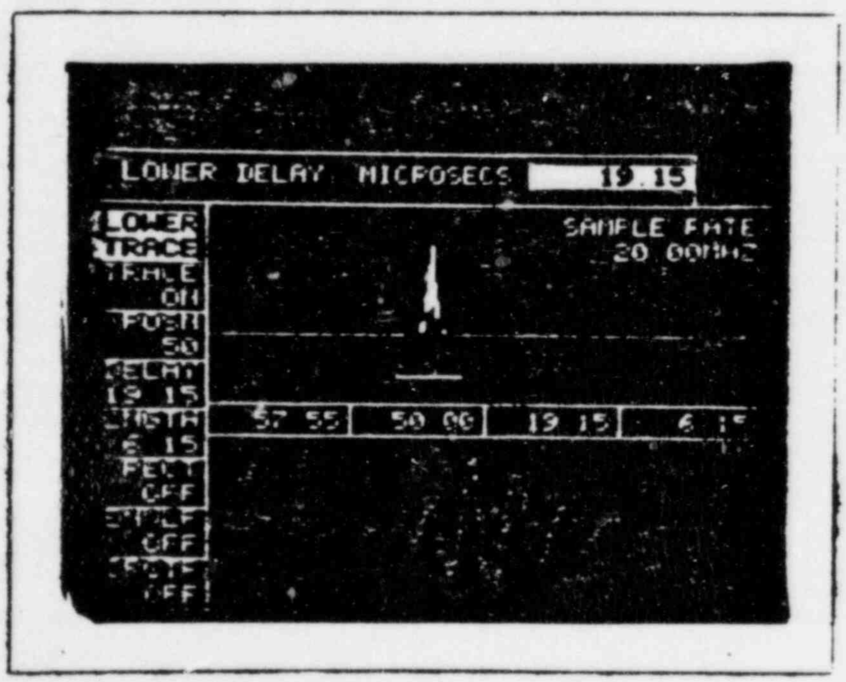
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/26/84

SN: 08326 ATTEN:46.5 PWDTH: 200
DAMPG: 0 FILTR: 0 SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 78%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	35.43
PULSE WIDTH (CYCLES)	=	4.07
ENVELOPE MODALITY	=	1.25

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.12
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.56
UPPER HALF POWER PT	=	2.34
BAND WIDTH (%)	=	40.00
BAND WIDTH CTR FREQ	=	1.95
HI/LO POWER RATIO	=	0.87
SPECTRAL MODALITY	=	0.16

SITE LIMERICK UNIT #1

Evaluation Performed By Hadie F. Miller

CO-AXIAL CABLE INFORMATION

Type RG58 Length 12' S/N C5

ANGLE BEAM WEDGE INFORMATION

S/N SSI-9 Type 45° LUCITE

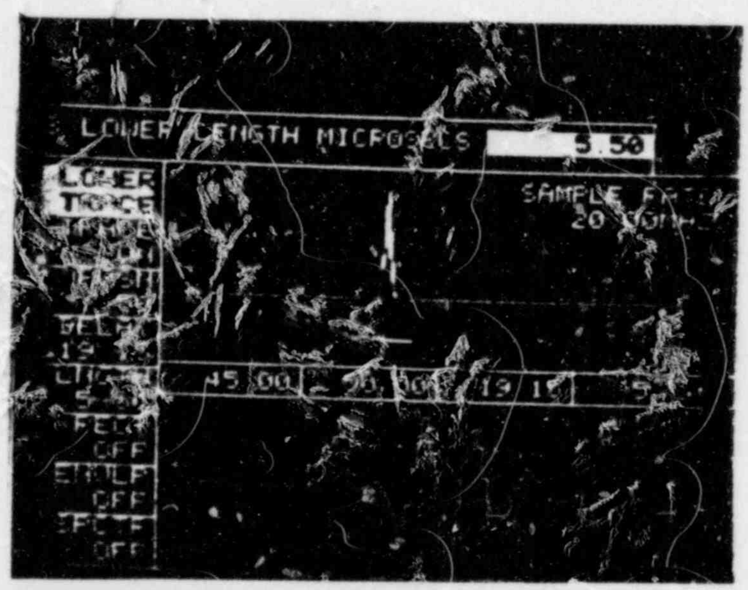
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION I D NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



Transducer Description

Series GAMMA

Frequency 2.25 MHz Size .5x1.0"

Serial No. J08326

[x] Contact [ ] Immersion [x] Nonfocused
Water Path [ ] Spherical
1" Plat. [ ] Cylindrical

Style SWS Connector BNC

Relative Sensitivity 39 DB

Energy Setting 2 Impedance 50Ω

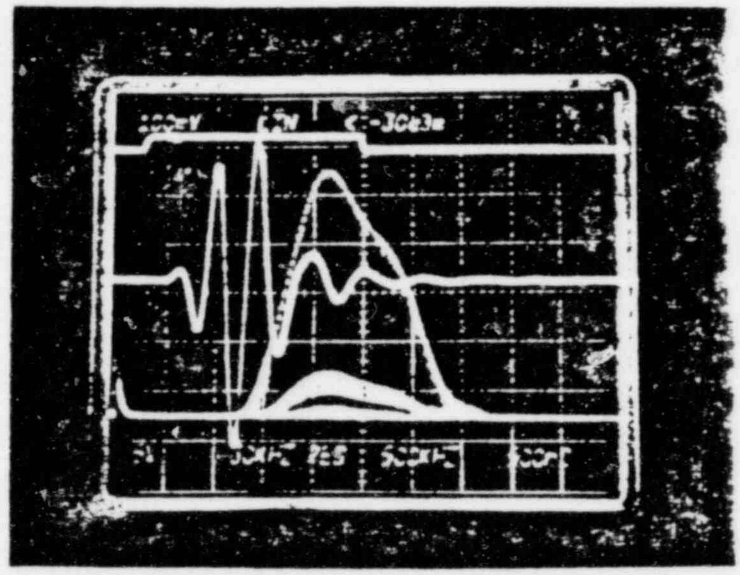
Inspector MK Date 9-20-83

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time waveform shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact (wearplate) transducers are tested on a 1.0" flat steel (4340) plate while epoxy-faced shear wave transducers are tested on a flat polymer block. Delay fingertip removable (Style DFR) transducers are tested off of the tip of the delay line. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using an AEROTECH Ultrasonic Transducer Analyzer, Model UTA-4, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time waveform, UTA-4 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-4 receiver, the amplitude of the real time waveform is adjusted to a six centimeter amplitude (+ 1 db) on the CRT. With the vertical calibration of trace II fixed at 100 millivolts per division, the amount of attenutation used provides a relative sensitivity rating for all transducers certified by Krautkramer Branson.

Real Time Waveform - Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker - Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum - Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

KRAUTKRAMER BRANSON
P. O. Box 350

TRANSDUCER EVALUATION 03/01/84

SN: 08327 ATTEN: 31.0 PWDTH: 200
DAMPG: 0 FILTR: 0 SAMPL: 20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 70%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	12.40
PULSE WIDTH (CYCLES)	=	3.60
ENVELOPE MODALITY	=	1.10

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.28
PEAK FREQUENCY	=	2.19
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.50
BAND WIDTH (%)	=	37.04
BAND WIDTH CTR FREQ	=	2.11
HI/LO POWER RATIO	=	1.22
SPECTRAL MODALITY	=	0.00

SITE LIMERICK UNIT #1

Evaluation Performed By: Wade F Miller

CO-AXIAL CABLE INFORMATION

Type RG 58 Length 12' S/N C-5

ANGLE BEAM WEDGE INFORMATION

S/N SSI-2 Type 60° LUCITE

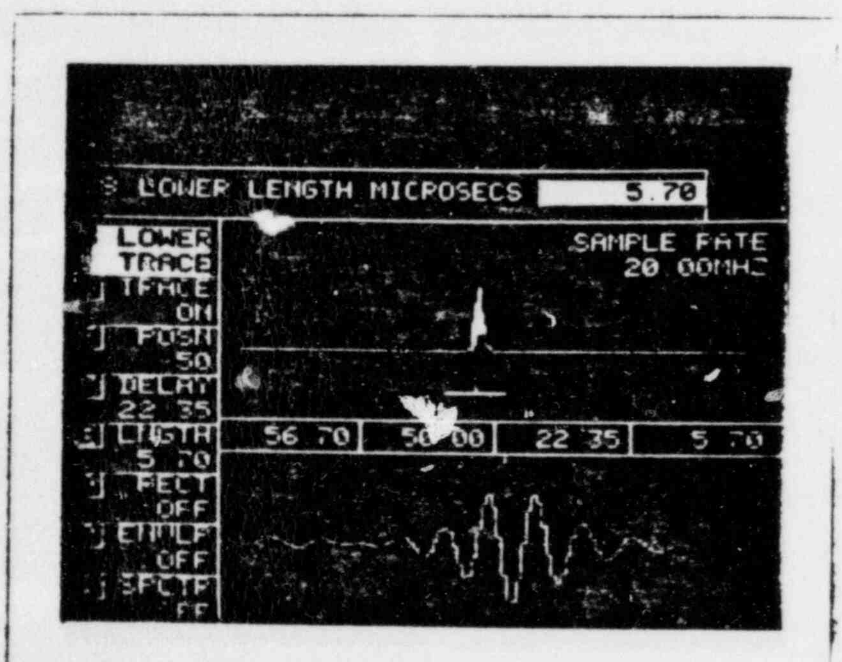
CALIBRATION STANDARD DESCRIPTION

ID SA508 CL III N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/28/84

SN: 08327 ATTEN:29.0 PWDTH: 200
DAMPG: 0 FILTR: 0 SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 80%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	15.35
PULSE WIDTH (CYCLES)	=	5.73
ENVELOPE MODALITY	=	2.00

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.32
PEAK FREQUENCY	=	2.19
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.50
BAND WIDTH (%)	=	37.04
BAND WIDTH/CTR FREQ	=	2.11
MIXED POWER RATIO	=	1.27
SPECTRAL MODALITY	=	0.00

SITE Limerick Unit # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 58 Length 12' S/N C-2

ANGLE BEAM WEDGE INFORMATION

S/N SSI 2 Type 60° Lucite

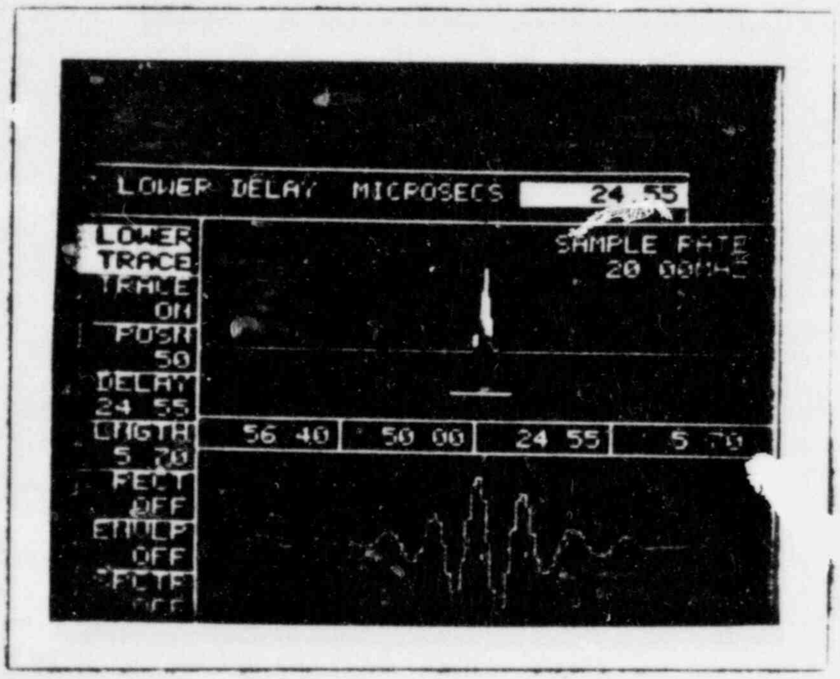
CALIBRATION STANDARD DESCRIPTION

SA 508 CL III
ID N1 Safe End Thickness 2.12"

REFLECTOR USED
FOR EVALUATION ID Notch

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



Transducer Description

Series GAMMA

Frequency 2.25 MHz Size .5x1.0"

Serial No. J08327

☒ Contact ☐ Immersion ☒ Nonfocused
Water Path ☐ Spherical
1" Plex. ☐ Cylindrical

Style SWS Connector BNC

Relative Sensitivity 38 DB

Energy Setting 2 Impedance 50 Ω

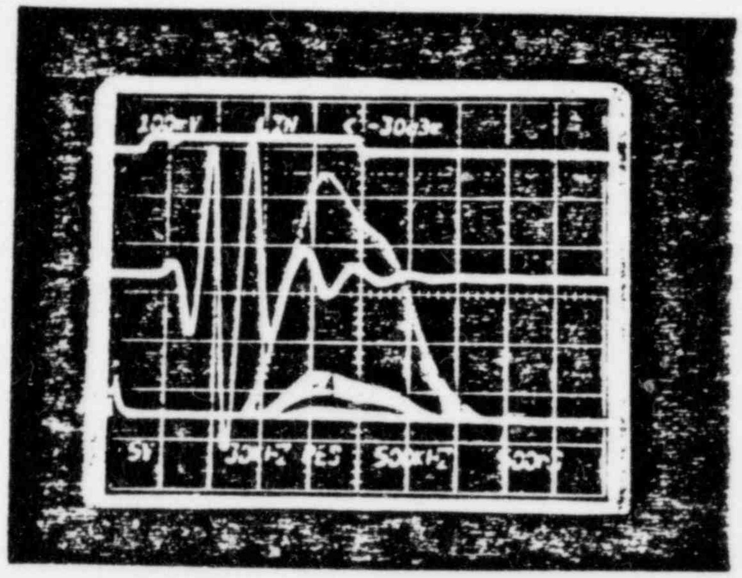
Inspector MK Date 9-20-85

A B

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time waveform shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact (wearplate) transducers are tested on a 1.0" flat steel (4340) plate while epoxy-faced shear wave transducers are tested on a flat polymer block. Delay fingertip removable (Style DFR) transducers are tested off of the tip of the delay line. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using an AEROTECH Ultrasonic Transducer Analyzer, Model UTA-4, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time waveform, UTA-4 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-4 receiver, the amplitude of the real time waveform is adjusted to a six centimeter amplitude (+ 1 db) on the CRT. With the vertical calibration of trace II fixed at 100 millivolts per division, the amount of attenutation used provides a relative sensitivity rating for all transducers certified by Krautkramer Branson.

Real Time Waveform - Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker - Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum - Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

KRAUTKRAMER BRANSON
P. O. Box 350
Lewistown, PA 17044

TRANSDUCER EVALUATION 10/24/83

SN: Ø8328	ATTEN:48.Ø	PWDTH: 200
DAMPG: Ø	FILTR: Ø	SAMPL:20.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 84%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	29.89
PULSE WIDTH (CYCLES)	=	3.10
ENVELOPE MODALITY	=	1.ØØ

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.Ø8
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.41
UPPER HALF POWER PT	=	2.34
BAND WIDTH (%)	=	5Ø.ØØ
BAND WIDTH CTR FREQ	=	1.88
HI/LO POWER RATIO	=	Ø.72
SPECTRAL MODALITY	=	Ø.ØØ

SITE LIMERICK UNIT #1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 174 Length 12' S/N C-1

ANGLE BEAM WEDGE INFORMATION

S/N SSI-3 Type 45° LUCITE

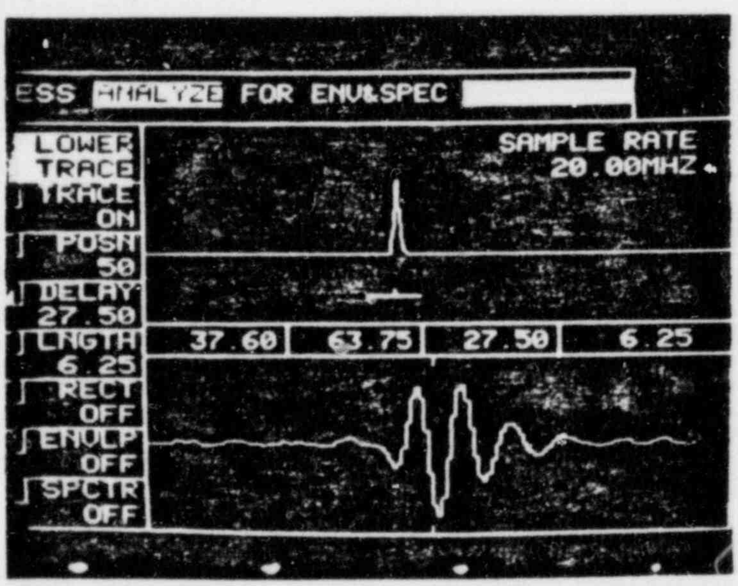
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



SITE LIMERICK UNIT #1

Evaluation Performed By: E.D. [illegible]

CO-AXIAL CABLE INFORMATION

Type RG-174 Length 12' S/N C-1

ANGLE BEAM WEDGE INFORMATION

S/N SSI-2 Type 60° LUCITE 1/2" x 1"

CALIBRATION STANDARD DESCRIPTION

ID SA-508 CL III N1-SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116

```
TRANSDUCER EVALUATION  11/03/83

SN: 06328       ATTEN:24.0    PWDTH:   200
DAMPG: 0        FILTR:    0   SAMPL:20.00

  RELATIVE SENSITIVITY
    PEAK AMPLITUDE = 90%

  TIME DOMAIN EVALUATION
    SIGNAL/NOISE RATIO     = 22.49
    PULSE WIDTH (CYCLES)   =  3.57
    ENVELOPE MODALITY      =  1.89

  FREQ DOMAIN EVALUATION
    CENTER FREQUENCY       =  2.05
    PEAK FREQUENCY         =  1.88
    LOWER HALF POWER PT    =  1.56
    UPPER HALF POWER PT    =  2.19
    BAND WIDTH (%)         = 33.33
    BAND WIDTH CTR FREQ    =  1.88
    HI/LO POWER RATIO      =  0.70
    SPECTRAL MODALITY      =  0.00
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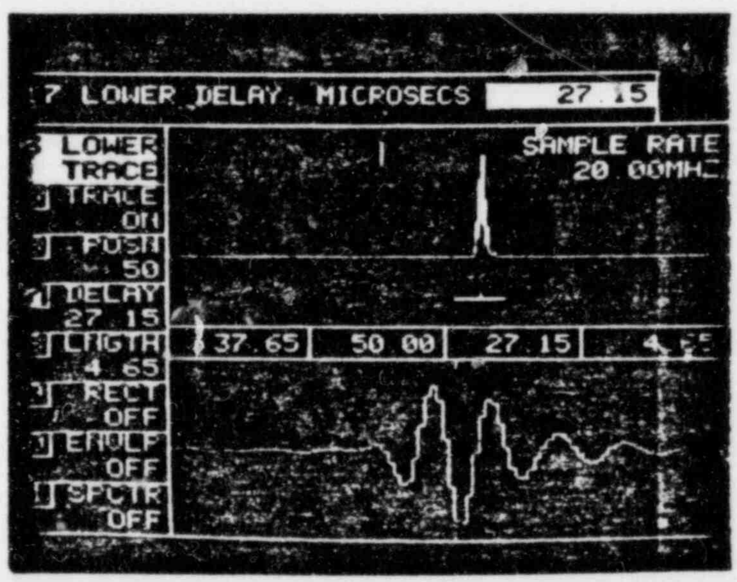


TRANSDUCER EVALUATION 03/28/84

SN: Ø8328 ATTEN:48.Ø PWDTH: 2ØØ
DAMPG: Ø FILTR: Ø SAMPL:2Ø.ØØ

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 99%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	85.33
PULSE WIDTH (CYCLES)	=	4.ØØ
ENVELOPE MODALITY	=	Ø.7Ø

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.11
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.56
UPPER HALF POWER PT	=	2.19
BAND WIDTH (%)	=	33.33
BAND WIDTH CTR FREQ	=	1.88
HI/LO POWER RATIO	=	Ø.79
SPECTRAL MODALITY	=	Ø.ØØ

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG58 Length 12' S/N C-2

ANGLE BEAM WEDGE INFORMATION

S/N SSI 3 Type 45° LUCITE

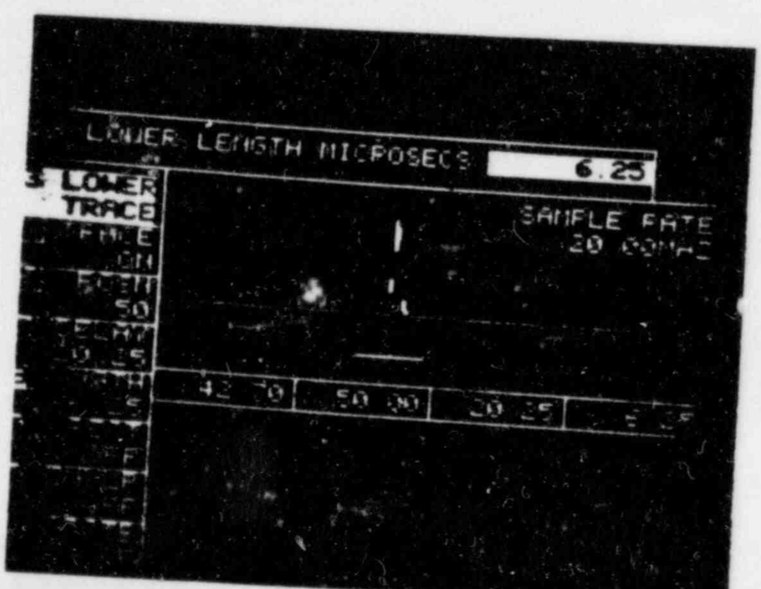
CALIBRATION STANDARD DESCRIPTION

ID SA508 CL III N2 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCE[illegible]ATION 03/28/84

SN: 0[illegible]	[illegible]FN:26.5	PWDTH: 200
DAMPG: [illegible]	[illegible] 0	SAMPL:20.00

RE[illegible]
[illegible] 81%

TI[illegible]ION

[illegible]IO	= 15.[illegible]
[illegible]	= 3.[illegible]
[illegible]Y	= [illegible]

FR[illegible]TION

[illegible]	= 2.[illegible]
[illegible]	= 1.88
[illegible]PT	= 1.56
[illegible]PT	= 2.19
[illegible]	= 33.3[illegible]
[illegible]RED	= 1.88
[illegible]D	= 1.59
[illegible]Y	= 0.[illegible]

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 58 Length 12' S/N C-2

ANGLE BEAM WEDGE INFORMATION

S/N SSI 2 Type 60° LUCITE

CALIBRATION STANDARD DESCRIPTION

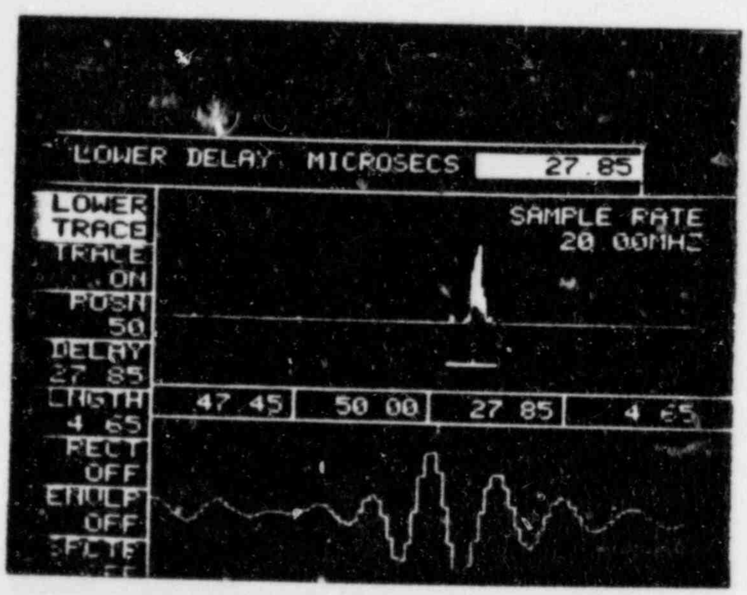
SA 508 CL III

ID N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION ID NOTCH

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



Transducer Description

Series GAMMA

Frequency 2.25 MHz Size .5X1.0"

Serial No. J08328

[X] Contact [ ] Immersion [X] Nonfocused
Water Path [ ] Spherical
1"Plex. [ ] Cylindrical

Style SWS Connector BNC

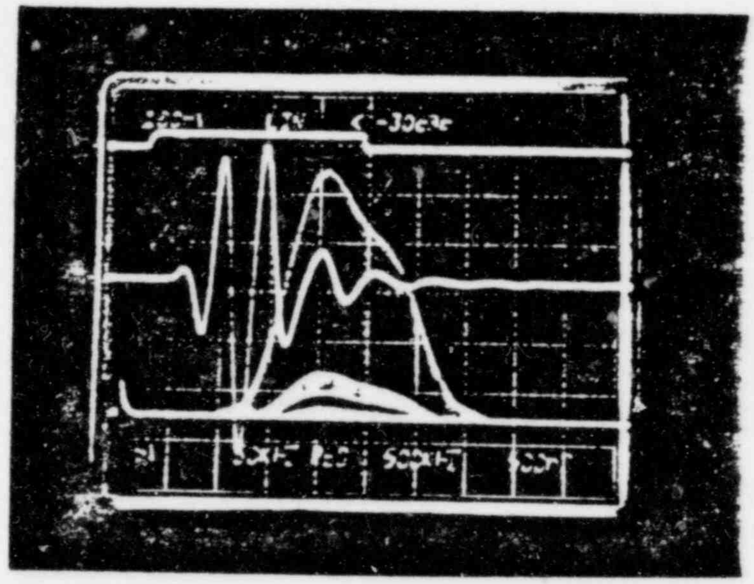
Relative Sensitivity 39 DB

Energy Setting 2 Impedance 50Ω

Inspector MK Date 9-20-83

A B

TRACE I



TRACE II

TRACE III

C D E F

Testing Procedure

The real time waveform shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact (wearplate) transducers are tested on a 1.0" flat steel (4340) plate while epoxy-faced shear wave transducers are tested on a flat polymer block. Delay fingertip removable (Style DFR) transducers are tested off of the tip of the delay line. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using an AEROTECH Ultrasonic Transducer Analyzer, Model UTA-4, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time waveform, UTA-4 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-4 receiver, the amplitude of the real time waveform is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 100 millivolts per division, the amount of attenutation used provides a relative sensitivity rating for all transducers certified by Krautkramer Branson.

Real Time Waveform - Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker - Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum - Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

TRANSDUCER EVALUATION 11/16/83

SN: 17921	ATTEN:47.0	PWDTH: 200
DAMPG: 0	FILTR: 0	SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 88%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	192.00
PULSE WIDTH (CYCLES)	=	4.66
ENVELOPE MODALITY	=	1.75

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.24
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.56
UPPER HALF POWER PT	=	2.50
BAND WIDTH (%)	=	46.15
BAND WIDTH CTR FREQ	=	2.03
HI/LO POWER RATIO	=	0.69
SPECTRAL MODALITY	=	0.16

SITE Limerick Unit # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG-174 Length 12' S/N C-4

ANGLE BEAM WEDGE INFORMATION

S/N N/A Type N/A

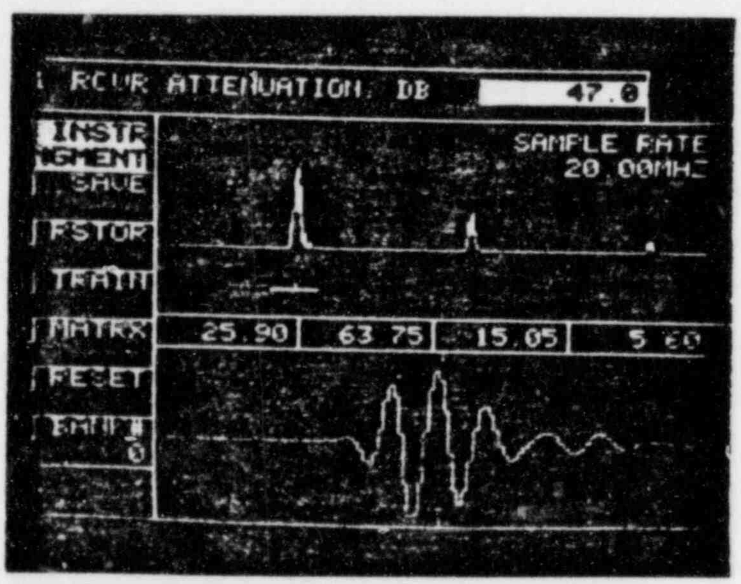
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 Safe End Thickness 2.12"

REFLECTOR USED FOR EVALUATION 1'st Back Reflection

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/28/84

SN: 17921	ATTEN:47.0	PWDTH: 200
DAMPG: 0	FILTR: 0	SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 80%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	62.72
PULSE WIDTH (CYCLES)	=	4.56
ENVELOPE MODALITY	=	1.38

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.23
PEAK FREQUENCY	=	1.88
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.50
BAND WIDTH (%)	=	37.04
BAND WIDTH CTR FREQ	=	2.11
HI/LO POWER RATIO	=	0.68
SPECTRAL MODALITY	=	0.02

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG58 Length 12' S/N C-2

ANGLE BEAM WEDGE INFORMATION

S/N N/A Type N/A

CALIBRATION STANDARD DESCRIPTION

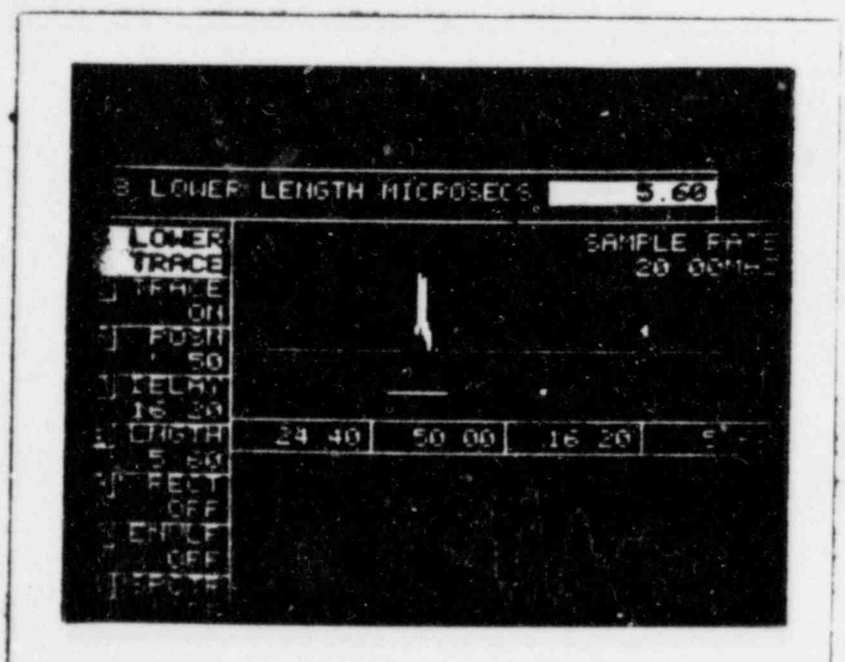
SA 508 CL III

ID N1 SAFE END Thickness 2.12"

REFLECTOR USED
FOR EVALUATION First Back Reflection

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



Transducer Description

Series GAMMA

Frequency 2.25 MHz

Element dimensions 1.0 in.

Style - Connector type

CR - BNC

Focal type: ☑ Nonfocused
☐ Spherical
☐ Cylindrical

Water Path N/A

Serial Number D17921

Relative sensitivity rating

53 db

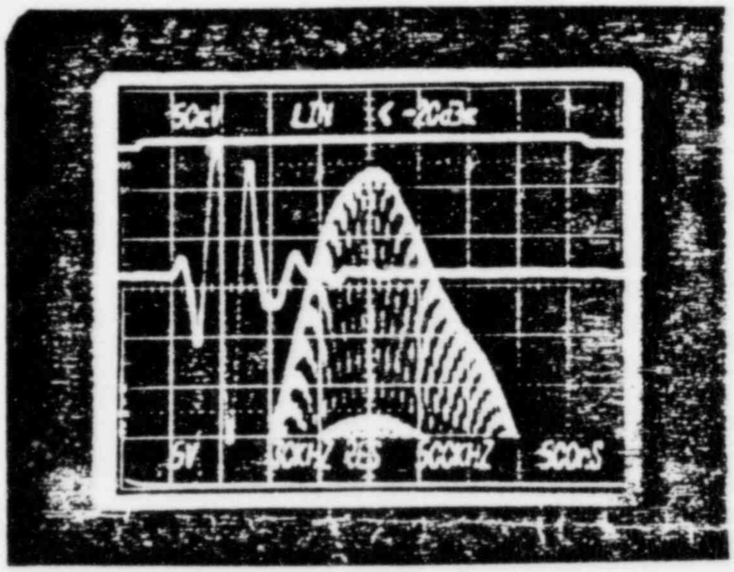
Inspector RP

Date 6/13/79

TRACE I

TRACE II

TRACE III



C D E F

Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick aluminum plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using a KB-AEROTECH Ultrasonic Transducer Analyzer, Model UTA-3, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time wave form, UTA-3 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-3 receiver, the amplitude of the real time wave form is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 50 millivolts per division, the amount of attenuation used provides a relative sensitivity rating for all transducers certified by KB-AEROTECH.

Real Time Waveform — Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker — Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum — Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

KB-AEROTECH
Transducer Technology Center
P. O. Box 350

TRANSDUCER EVALUATION 12/02/83

SN: 11749	ATTEN:44.0	PWDTH: 200
DAMPG: 0	FILTR: 0	SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 90%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	309.33
PULSE WIDTH (CYCLES)	=	3.76
ENVELOPE MODALITY	=	1.00

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.29
PEAK FREQUENCY	=	2.19
LOWER HALF POWER PT	=	1.72
UPPER HALF POWER PT	=	2.50
BAND WIDTH (%)	=	37.04
BAND WIDTH CTR FREQ	=	2.11
HI/LO POWER RATIO	=	1.17
SPECTRAL MODALITY	=	0.00

SITE LIMERICK UNIT #1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 174 Length 12' S/N C4

ANGLE BEAM WEDGE INFORMATION

S/N N/A Type N/A

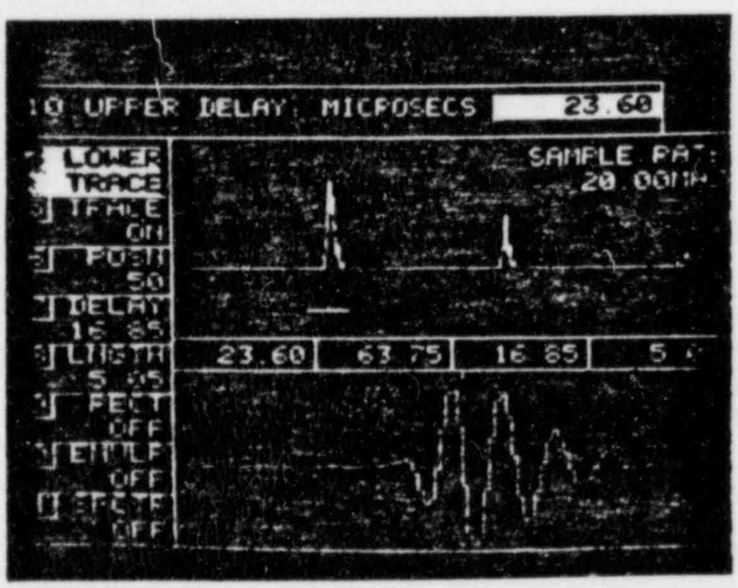
CALIBRATION STANDARD DESCRIPTION

ID SA508 CL III N2 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION FIRST BACK REFLECTION

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/26/84

```
SN: 11749        ATTEN:43.5    PWDTH:   200
DAMPG: 0         FILTR:    0   SAMPL:20.00

  RELATIVE SENSITIVITY
    PEAK AMPLITUDE = 66%

  TIME DOMAIN EVALUATION
    SIGNAL/NOISE RATIO       =145.78
    PULSE WIDTH (CYCLES)  =   3.78
    ENVELOPE MODALITY     =   1.00

  FREQ DOMAIN EVALUATION
    CENTER FREQUENCY      =   2.29
    PEAK FREQUENCY        =   2.19
    LOWER HALF POWER PT   =   1.72
    UPPER HALF POWER PT   =   2.50
    BAND WIDTH (%)        =  37.04
    BAND WIDTH CTR FREQ   =   2.11
    HI/LO POWER RATIO     =   1.17
    SPECTRAL MODALITY     =   0.00
```

SITE Limerick Unit #1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG58 Length 12' S/N C-5

ANGLE BEAM WEDGE INFORMATION

S/N N/A Type N/A

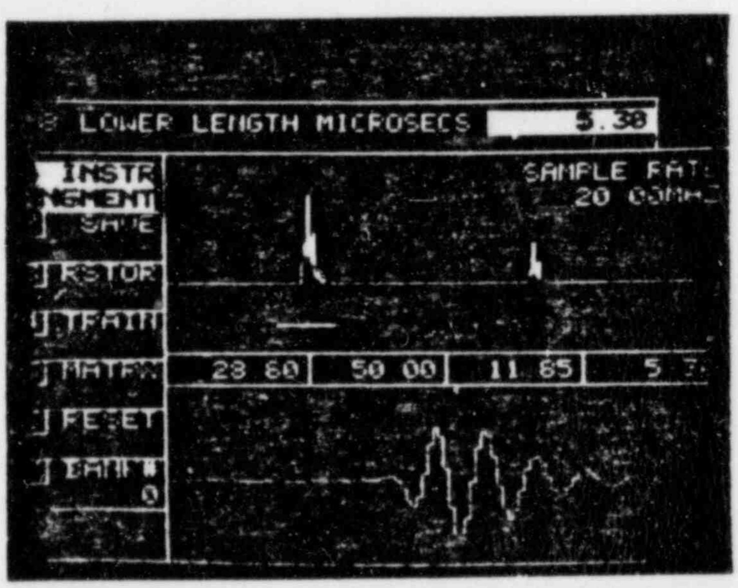
CALIBRATION STANDARD DESCRIPTION

ID SA508 CL III N1 Safe End Thickness 2.12"

REFLECTOR USED FOR EVALUATION First Back Reflection

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



Transducer Description

Series GAMMA

Frequency 2.25 MHZ

Element dimensions 1.0"

Style - Connector type

CR - BNC

Focal type: ☑ Nonfocused
☐ Spherical
☐ Cylindrical

Water Path N/A

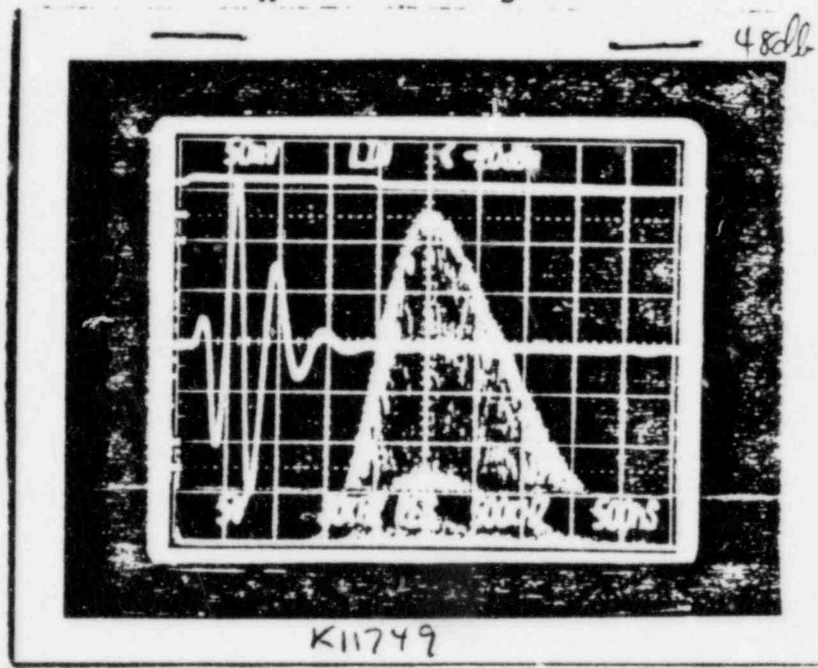
Serial Number K11749

Relative sensitivity rating

48 db

Inspector

Date 11/11/77



Testing Procedure

The real time wave form shown in the photo above is the first return echo from a reflector selected with respect to transducer type. All contact transducers are tested on a one-inch thick aluminum plate, except for epoxy-faced shear wave transducers which are tested on a one-inch thick polymer block. Nonfocused immersion transducers are tested in water over a flat steel plate using a water path as specified above. Focused immersion transducers are tested the same as nonfocused transducers except that the water path used is equal to the actual focal length.

Using a KB-Aerotech Ultrasonic Transducer Analyzer Model UTA-3, and a Tektronix 7L12 frequency spectrum analyzer in a 7704A Mainframe, the real time wave form, UTA-3 gate signal, and the frequency spectrum of the gated signal are simultaneously displayed and photographed. Using the linear attenuator in the UTA-3 receiver, the amplitude of the real time wave from is adjusted to a six centimeter amplitude (± 1 db) on the CRT. With the vertical calibration of trace II fixed at 50 millivolts per division, the amount of attenuation used provides a relative sensitivity rating for all transducers certified by KB-Aerotech.

Real Time Waveform — Trace II

Screen writing figures A and F provide the vertical and horizontal screen calibration respectively for trace II.

Gate Marker — Trace I

Screen writing figure C provides the vertical amplitude of the gate marker and is an inconsequential figure. The horizontal calibration for trace I is the same as that for trace II. The portion of trace II that falls within the gate time period is the signal fed to the frequency spectrum analyzer.

Frequency Spectrum — Trace III

Screen writing figure E provides the horizontal calibration for trace III. Figures B and D show the spectrum analyzer's attenuator and resolution settings respectively.

TRANSDUCER EVALUATION 12/02/83

SN: 30956	ATTEN:58.0	PWDTH: 200
DAMPG: 0	FILTR: 0	SAMPL:20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 91%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	412.00
PULSE WIDTH (CYCLES)	=	2.08
ENVELOPE MODALITY	=	1.36

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.38
PEAK FREQUENCY	=	1.72
LOWER HALF POWER PT	=	1.41
UPPER HALF POWER PT	=	2.34
BAND WIDTH (%)	=	50.00
BAND WIDTH CTR FREQ	=	1.88
HI/LO POWER RATIO	=	0.10
SPECTRAL MODALITY	=	0.00

SITE LIMERICK UNIT # 1

Evaluation Performed By: Wade F. Miller

CO-AXIAL CABLE INFORMATION

Type RG 174 Length 12' S/N C4

ANGLE BEAM WEDGE INFORMATION

S/N N/A Type N/A

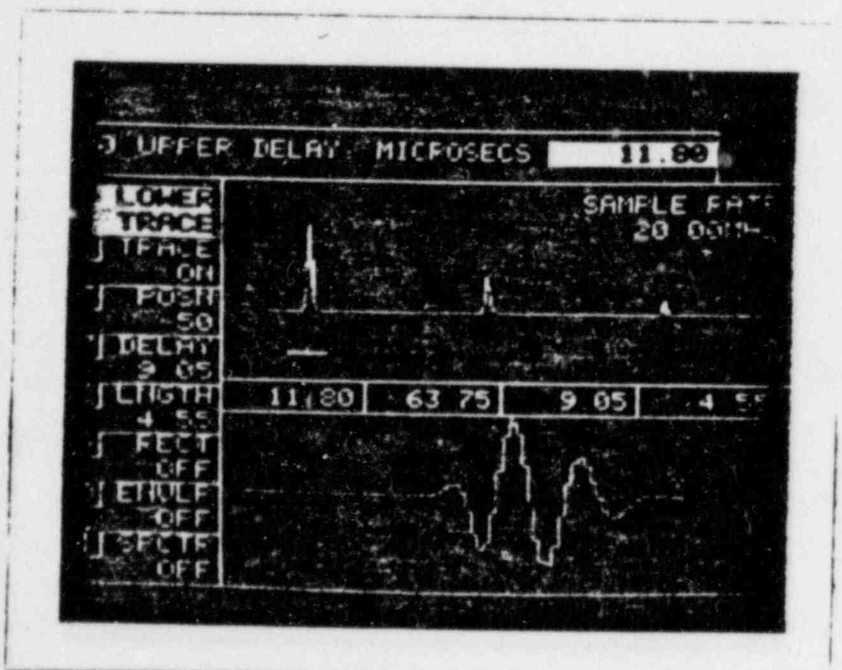
CALIBRATION STANDARD DESCRIPTION

ID SA 508 CL III N1 SAFE END Thickness 2.12"

REFLECTOR USED FOR EVALUATION FIRST BACK REFLECTION

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



TRANSDUCER EVALUATION 03/26/84

SN: 30956 ATTEN: 57.0 PWDTH: 200
DAMPG: 0 FILTR: 0 SAMPL: 20.00

RELATIVE SENSITIVITY
PEAK AMPLITUDE = 96%

TIME DOMAIN EVALUATION

SIGNAL/NOISE RATIO	=	53.65
PULSE WIDTH (CYCLES)	=	4.06
ENVELOPE MODALITY	=	1.75

FREQ DOMAIN EVALUATION

CENTER FREQUENCY	=	2.04
PEAK FREQUENCY	=	1.72
LOWER HALF POWER PT	=	1.41
UPPER HALF POWER PT	=	2.34
BAND WIDTH (%)	=	50.00
BAND WIDTH CTR FREQ	=	1.88
HI/LO POWER RATIO	=	0.63
SPECTRAL MODALITY	=	0.00

SITE LIMERICK UNIT #1

Evaluation Performed By: [signature]

CO-AXIAL CABLE INFORMATION

Type RG 58 Length 12' S/N C-5

ANGLE BEAM WEDGE INFORMATION

S/N N/A Type N/A

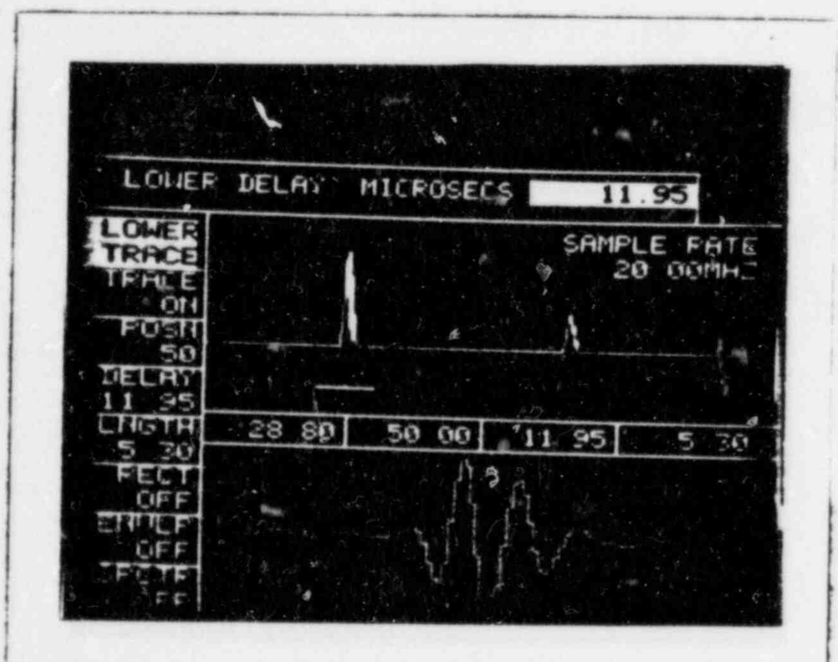
CALIBRATION STANDARD DESCRIPTION

ID N1 SAFE END SA 508 CL III Thickness 2.12"

REFLECTOR USED FOR EVALUATION FIRST BACK REFLECTION

ANALYSIS SYSTEM INFORMATION

Type Adaptronics ALN 4060 S/N 116



PANAMETRICS 221 CRESCENT STREET, WALTHAM, MASSACHUSETTS 02154 / 617 899-2719 TELEX: 923408

CONTACT TRANSDUCER ANALYSIS

Part No. A104S . Serial No. 30956 . Frequency 2.25 MHz.

Size: 1.0 " diameter; — " by — ". Cable: RG-174/u length 6 ft.

Echo from back surface of: 1.0 " thick fused silica.
" thick lucite.
" thick polystyrene.
"

TEST INSTRUMENTATION

Panametrics 5052PR Pulser Receiver

Panametrics 5052G Stepless Gate UA #2

Tektronix 7704A Oscilloscope System

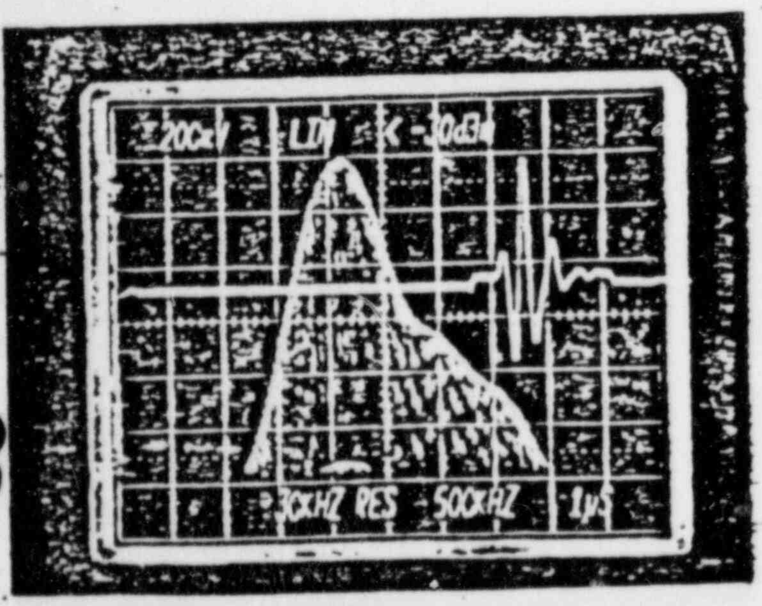
with 7A26 Dual Trace Amplifier

7B53A Dual Time Base

7L12 Spectrum Analyzer

Center frequency is determined by multiplying the horizontal scan width (4) by the number of divisions to the spectrum peak.

1 2 6



5 4 3

Waveform

Pulser Receiver Settings:

Energy Setting 1 .

Receiver Attenuation 58 dB.

Receiver Damping 125 ohms.

Oscilloscope Settings:

1-Vertical Sensitivity/div.

2-Horizontal Sweep Rate/div.

3-Scale Format.

Spectrum Analysis

Oscilloscope Settings:

4-Horizontal Scan Width/div.

5-Resolution.

6-Input Attenuation.

Technician K Arnold

Date 10/4/79

Summary Report: Effect of Polyster Resin Body Filler material when used to surface condition a calibration standard. Revision 1 Dated April 9, 1984

Reference: Philadelphia Electric Company
Limerick Nuclear Generating Station
Contract No. 8031-M-246B
Unit #1 RPV Preservice Ultrasonic Examination

This report is presented to document the effect of Polyester Resin Body Filler (hereafter referred to as "Bondo", its generic name) when used to surface condition a calibration standard to be used with the GE Remote Automatic Inspection Device. It also documents the results of testing performed by GE to determine these effects.

Bondo was used by GE to fill in scale pitting on the surface of Limerick RPV calibration standard #1 to provide a surface that is similar to the Limerick Unit #1 RPV. The welds and adjacent plate were ground to a relatively smooth surface, while the calibration standard received no such conditioning. Such a mismatch in surface conditions can cause a disparity between calibration gain and examination gain if it is not corrected. Several methods of achieving a representative surface finish were evaluated; namely grinding, welding, and Bondo. Bondo was chosen based on laboratory data, past satisfactory performance, and reversability. The fact that Bondo can be completely removed, proved to be the deciding factor.

GE was asked to perform some field verification tests to show that the effect of the Bondo was properly evaluated and documented. The following tests were performed and the results are as listed below.

1.150 Qualification Standard / Angle Beam Shear Wave(Test #1)

Test #1 was performed in the following manner:

1) Data was gathered from the 1.150 qualification standard which has scale pitting roughly euivalent to RPV standard #1 using the calibration and sizing holes.
2) Bondo was applied to the standard and finished to leave about .012" of Bondo (maximum thickness) in the pitted calibration surface. About 25% of the surface area contained Bondo for this test.
3) Calibration was performed through the Bondo and the amplitude response from the sizing holes was recorded.
4) The Bondo data was compared to the data taken without Bondo.

This test yielded the following results (average of four data sets):

	Response From 5/32 Diameter Holes. Calibration Performed Without Bondo over Calibration Area.	Response From 5/32 Diameter Holes Calibration Performed With Bondo over Calibration Area.
1/4t	50% DAC	53.75% DAC
1/2t	50% DAC	54.75% DAC
3/4t	50% DAC	57.75% DAC

The 1/4t data Exhibits A .63 dB Amplitude increase when calibrating through Bondo
The 1/2t data Exhibits A .79 dB Amplitude increase when calibrating through Bondo
The 3/4t data Exhibits A 1.25 dB Amplitude increase when calibrating through Bondo

This yields an average .9 dB gain increase caused by Bondo. It should be noted that the data from the qualification standard is angle beam (45° & 60°) data only. Configuration of the qualification standard precluded use of longitudinal wave transducers to gather data from the holes.

Test Block / Automatic Longitudinal Wave Search Unit (Test #2)

Test #2 was performed in the following manner:

1) A 6 inch square x 2 inch thick block was obtained.

2) A back reflection was obtained in 4 directions through the 6" sections of the block. No amplitude difference was noted between faces.

3) A layer of Bondo was applied to a single face of the block and surface finished to leave .035 thickness of Bondo

4) An epoxy faced longitudinal wave transducer from the automatic inspection package was coupled to the faces of the block containing no Bondo and an 80% FSH back reflection was obtained.

5) Without changing gain, the transducer was coupled directly to the Bondo on the block. This yielded no back reflection amplitude difference.

6) The transducer was then coupled to the block face opposite the Bondo and a back reflection was obtained this also yielded no change in back reflection amplitude.

7) A patch of Bondo was then sanded to a thickness of .003 (translucent) and steps 4 through 6 were repeated with the same results.

Test #2 concluded that no effect from Bondo can be detected when using the epoxy faced longitudinal wave transducer from the automatic inspection package.

Test Block / Manual Longitudinal Wave Transducer (Test #3)

Test #3 was performed in the following manner:

Manual contact longitudinal wave transducers were evaluated by reperforming test #2 steps 2 through 7 with three different types of contact transducers. These transducers had ceramic and metallic type wear faces. The results of the manual longitudinal wave contact transducer testing yielded an average of 22dB difference when coupled to the Bondo and a 0dB difference when coupled to the side of the block opposite the Bondo. This 22dB difference appears to be due to an acoustic impedance mismatch between the Bondo and the wear face materials used in the contact transducers. This difference is constant with varying thicknesses of Bondo which supports the impedance mismatch conclusion. This difference precludes use of manual contact longitudinal wave transducers with ceramic or metallic wear faces on a surface that has been conditioned with Bondo. Epoxy faced transducers with bladder type wear faces were not evaluated in this test, however, the test data shows that this type of transducer will be acceptable for use on calibration standards conditioned with Bondo.

Gain Reduction for Shear Waves through a Uniform Layer of Bondo (Test #4)

Bondo when used to fill pitting in a calibration standard gives a contact surface that is partly metallic and partly polyester filled pits. This does not allow calculation of the effect on shear waves in the Bondo layer. To determine this effect, Test #4 was performed on the 6" square block and Bondo layers used in Tests #2 and #3.

Test #4 was performed in the following manner:

1) A 45° manual shear wave search unit was coupled to a face of the block not containing Bondo and a reflection was obtained from the side drilled hole.

2) The amplitude of the SDH reflection was set at 90% FSH.

3) Without changing gain, the search unit was coupled to the Bondo layers and a peak signal amplitude was obtained from the side drilled holes.

4) Items 2 and 3 were repeated using a 60° search unit.

The results of this test were as follows:

45° & 60° No Bondo	.003" Bondo layer	.035" Bondo layer
90% FSH	80% FSH	21% FSH
dB difference 0dB	1.02dB	11.48dB

This yields an average of .334dB of difference per mil of Bondo thickness. The 60° data yielded equivalent results.

It should be noted that testing on this uniform layer of Bondo was intended to provide data to determine a gross effect. In actual use, the surface pitting beneath the transducer package seldom exceeds 10% of the area available for calibrating the package.

Test #4 was not performed using an automatic examination package since the essential dimensions of manual search units are considered to be equivalent.

There was no attempt to determine whether the dB difference is due to attenuation, acoustic impedance mismatch, or a combination of both. Since Bondo is a polyester resin material, this difference is most likely due to a combination of both, however to quantify the effect due to either, can not be performed with field equipment.

Conclusions

Based on the data presented here, Bondo (polyester Resin Body Filler) is suitable for use as a surface conditioning material for pitted calibration standards when the standard is to be used with the GE automated inspection device. The Bondo should not comprise more than 25% of the contact surface beneath the search unit.

Bondo, when properly applied, acts as an extension of the search unit wedge allowing the ultrasound to reach the bottom of the pits. The acoustic properties of Bondo are approximately equivalent to Lucite wedge material

Bondo applied to a pitted calibration standard increases the gain needed to achieve a calibration. This causes examinations performed on a surface that has not been conditioned to be "Hot" (conservative) in that responses from the reflector are higher than normal.

Bondo affects manual contact longitudinal wave transducers (ceramic and metallic wear faces) in an adverse manner. Acoustic impedance mismatch between the transducer wear face and the Bondo precludes use of standard manual longitudinal wave search units in conjunction with a Bondo conditioned calibration standard.

Increasing the area of the Bondo on the contact surface beneath the search unit increases the dB difference and decreases the thickness of Bondo that is technically acceptable. The use of Bondo to fill pits in calibration standards should not be attempted if:

1) The pitting results in more than 25% of the contact surface beneath the search unit, in the area(s) through which the calibration is performed, being Bondo.

2) The pitting is severe enough that spots of Bondo more than .016 thick will exist in the area(s) through which the calibration is performed.

3) Changes are made in the composition of wedge or wear face materials for the GE automatic inspection system.

There is no intent by the General Electric Company to limit either the area or the thickness of Bondo that may be applied to a calibration standard on surfaces outside the zones used for calibration.

Prepared By: Wade F. Miller

Wade F. Miller
GE A&ESO ESD
Level III

SUMMARY REPORT: Effect of ID notch amplitude on Limerick #1 Nozzle to vessel weld data.

REFERENCE: PHILADELPHIA ELECTRIC COMPANY
Limerick Nuclear Generating Station
Contract No. 8031-M-246B
Unit #1, RPV Preservice Ultrasonic Examination

This report is presented to document the effect of ID notch amplitudes obtained prior to 11-12-83 from Limerick RPV calibration standard #1. This calibration standard yields notch amplitudes that are much lower than what is considered "normal" by both the ASME code and prior vessel inspection experience. The nozzle to vessel welds affected by the low notch amplitude are listed in Table 1.

ASME Section V, Article 4, Paragraph T 441.8.1 requires recording of all surface reflectors that exhibit a response equal to or greater than the response obtained from the 2% surface notch during calibration. Appendix B-50 of Article 4 states that the notch amplitude with a 45° beaming angle may be 200% of DAC and 50% DAC with a 60° beaming angle. Calibration standard #1 yielded amplitudes ranging from 16-22% DAC with the 45° angle and from 28-33% with the 60° angle.

The recording level set for the Limerick Preservice Examination was 20% DAC in accordance with Reg. Guide 1.150 requirements, with the intent to manually compare surface indications with the calibration notch amplitudes.

It was discovered during data reduction that the difference between the recording level of 20% DAC and the notch calibration amplitude with the 45° beaming angle (channel 2) was causing a gap in the data. No data was being recorded below 20% DAC, so no comparison of ID surface reflectors with amplitudes less than 20% DAC could be performed. The site was notified on November 12, 1983, that the low notch amplitude was causing a potential violation of ASME code requirements. At this time, work was stopped pending resolution of the notch amplitude condition.

An investigation into the reason for the low notch amplitude from calibration standard #1 was begun immediately. The NEBO operator, DA&ESO Level III, a level II technician and the DA&ESO project manager performed the following:

1. The calibration scanner was dismatled and the calibration standard was turned on edge.
2. A high gain examination(0°) was performed from both the clad and unclad sides of the standard. No evidence of laminations or unbonded cladding was detected.
3. A manual UT instrument was calibrated on the side drilled holes and the notch response was checked. The manual response was determined to be equivalent to the automatic response i.e. 16-24% DAC.
4. Gain was increased incrementally and examinations were performed in an attempt to identify any small reflectors in the beam path to the notch. No such reflectors were detected.

5. The notch was examined to determine if the dimensions were correct. During the notch measurements a quantity of unidentified material was dislodged from the notch. A 6" scale was then used to remove a small additional amount of "crud."
6. The block was turned over and the calibration scanner was reassembled. A recalibration was performed and the notch amplitude increased to 30-40% DAC when corrected by TCG.
7. Several more notch amplitudes were obtained and all fell within the 30-40% DAC range. At this time, the stop work was lifted.

The steps above (1-7) provided no reason for the low notch amplitude except the foreign material removed during the notch measurements. It is the opinion of the General Electric Company that this material was responsible for the reduced notch amplitude. This conclusion is supported by:

1. A literature search reveals that damping of a return signal by foreign material is both possible and probable. *See Krautkramer 1969, USAF Handbook 333 1974 and ASM Handbook #11 for details.
2. After removal of the foreign material, the amplitude increased significantly.
3. The increased notch amplitude was consistent for the remainder of the examinations.
4. A review of manual examination data and calibrations performed during 1976 (the calibration standard was presumably new) showed the amplitude from the notch to be similar to that obtained in 1983 after cleaning.

It is the opinion of the General Electric Company that the data gap for ID surface reflectors does not represent a violation of the intent of either ASME V or Reg. Guide 1.150. this is supported by:

1. After cleaning the notch amplitide consistently exceeded the 20% DAC recording level.
2. Any ID surface reflectors detected prior to 11-12-83 were manually compared to the recorded (low) notch amplitudes. This is a conservative approach.

Based on the presentation above, the General Electric Company concludes that no examinations performed prior to 11-12-83 need to be reperformed.

Prepared By Wade F. Miller
2-14-84

Wade F. Miller
GE DA&ESO
Level III

Attachment 4

SUPPLEMENT NO. 1 TO SUMMARY REPORT

"EFFECT OF ID NOTCH AMPLITUDE ON LMERICK #1 NOZZLE TO VESSEL WELD DATA" - DATED FEBRUARY 14, 1984

During the investigation of ID notch amplitude effects documented in the original report, work was also performed on RPV calibration standard #2, which also exhibited lower than expected amplitudes from the notch. The examinations performed were:

1. A high gain, 0° examination for clad bond.
2. A high gain, 0° examination for small laminar indications.
3. A side drilled hole 45° and 60° calibration and interrogation of the ID notch.
4. High gain angle beam examinations (45°, 60°) to check for small reflectors in the beam paths to the notch.
5. A dimensional check of the notch.

These examinations revealed no apparent reason for the low (22%-25% DAC) amplitudes observed, by manual UT equipment, on RPV standard #2. The low amplitude appears to be due to the metallurgical characteristics, rather than the metallurgical condition of the standard.

Prepared by: Wade F. Miller
Wade F. Miller
GE DA&ESO ESD
Level III

WFM/jas
6/26/84

GENERAL ELECTRIC

NUCLEAR POWER

SYSTEMS DIVISIC

GENERAL ELECTRIC CC MPANY, 175 CURTNER AVE., SAN JOSE, CALIFORNIA 95125

F235387
F238731

Attachment 4

February 1, 19 4

TO: Wade Miller

FROM: B.R. Rajala

SUBJECT: NOTC AMPLITUDE/DATA RECORDING LEVEL

During notch c libraions prior to 11-12-83 there were occasions when the amplitude of the I.D. notch was less than the data recording level. The nozzle examinations affected are l sted in Figure #1. Each nozzle is listed by I.D. number, channel and number of urface indications, if any. Section V, Article 4, Paragraph T441.8.1 states that surface reflectors that produce a response equal to or greater than calibration amplitude of the surface notch in the basic calibration block shall be recorded. Therefore, these examinations appeared not to conform to Paragraph T441.8.1.

The impact of this would be that any indications that were below the recording level of 20%, as established from side drilled holes, and equal to or greater than the notch amplitude could not be recorded.

When this probl m was brought to the attention of the field personnel responsible for the examinations, an investigation into why the notch amplitudes were so low. It was found that "crud" buildup in the notch was damping the UT signal. When this "crud" was removed from the notch the response was increased to above the recording level of 20% DAC, as established from side drilled holes, and remained above this level for the remainder of the examinations.

Therefore, all indications down to 20% of DAC as established off side drilled holes were recorded. Comparison to the true notch amplitudes which in actuality exceeded recording level was performed.

In summary, it is our opinion that had the notch been cleaned prior to the start of examination the responses from the ID surface notch would have always been above the 20% DAC rec rding level. The data taken is valid, and no retesting is required.

B.R. Rajala

B.R. Rajala, Principal Engineer
NonDestructive Test Engineering

F235387
F238731

NOZZLE I.D.	CHANNEL I.D.	NUMBER OF SURFACE INDICATIONS
N5-A	2/45°	0
N4-E	2/45°	1
N4-D	2/45°	0
N4-C	2/45°	0
N4-B	2/45°	3
N3-D	2/45°	4
N3-C	2/45°	0
N3-B	2/45°	0
N3-A	2/45°	2
N2-G	2/45°	0
N2-F	2/45°	0
N2-E	2/45°	0
N2-B	2/45°	0

FIGURE - 1

USNRC REGULATORY GUIDE 1.150 REPORT

Attachment #5

This attachment contains the determination of the effectiveness of ultrasonic examination procedures LIM-UT-8 and LIM-UP-9 in accordance with Sections 3, 6 and 7 of Regulatory Guide 1.150, Revision 1, Alternate Method.

GENERAL ELECTRIC COMPANY

REPORT ON

DETECTION AND SIZING CAPABILITY TEST

FOR

REGULATORY GUIDE 1.150, REVISION 1

of FEBRUARY, 1983

INTRODUCTION:

This report documents the results of tests performed at the San Jose office of the General Electric Company, and at a BWR site, to demonstrate the ability of the G.E. Remote Inservice Inspection System to detect, record and size reflectors located within the inner and outer 1/4 thickness of RPV material during ultrasonic examination. The tests were performed to demonstrate the G.E. equipment's capability to comply with Regulatory Guide 1.150, Revision 1 of February 1983, "alternate method" (hereinafter referred to as "the Regulatory Guide).

The report concludes that, in accordance with the Regulatory Guide, Section 6 "Sizing", the Section 7 "Reporting of Results", the General Electric equipment is capable of detecting, recording and sizing the flaws delineated by ASME B&PV Code Section XI, Table IWB-3500.

The report also includes the determination of a measurement tolerance to be applied when sizing flaws.

METHODS USED FOR THE TEST:

Test data was gathered in two increments; the first was at the San Jose laboratory of the Nondestructive Examination Services unit. The second was at a BWR site during performance of the automated baseline examination.

A special test block was prepared by adding 1/8" side-drilled holes to a code calibration block. These holes were placed in the areas of interest, namely the inner and outer quarters of material thickness.

The block and the holes are shown in Figure 1. The test was performed as follows: A 45/60 degree shear wave package was mounted in the calibration scanner assembly and the ultrasonic testing system was calibrated using the three side-drilled code holes, setting screen height of the holes at 80 per cent). The calibration scanner mechanism was then placed in automatic operation and scanned the special side-drilled holes described above. (NOTE: The calibration scanner is equivalent to the scanner arms on the RPV weld and nozzle weld devices, including direction of scan and scan speed. For this reason it is not required to perform seperate tests using each different scanning device). All signals were recorded at 20 percent DAC, in accordance with the Regulatory Guide. The data from the above testing was analyzed, and the results are tabulated in Table 1. The post-processed data is in Appendix 1.

Analysis of the data from the first increment of testing led the examiners to the conclusion that additional data should be taken to completethe demonstration. To provide the additional information needed, an additional notch reflector was added to the special test block. This was accomplished as follows: A strip of clad two inches wide was machined off the block, and a notch .32" deep by .5" long was made in base metal by the process of Electro Discharge Machining (EDM). Cladding was replaced using a manual metal arc welding process. Depth of the notch following cladding replacement is estimated at .27" as a result of an estimated .050" closure in the fusion zone.

The special block with the notch added was then shipped to a BWR site, and another test was performed using methods identical to the first test. The data obtained in this test is summarized in Table 2, and the post-processed data is in Appendix 1.

DISCUSSION OF RESULTS

The results listed in Tables 1 and 2 include analyses of data at the 50 percent DAC level, and at the 20 percent DAC level. Recording of data at 20 percent DAC is required to detect the flaws in the inner and outer one inch increments of material thickness. The test results demonstrate that indications at the clad/base metal interface may be detected at 20 percent DAC, satisfying Secion 3.0 of the Regulatory Guide.

The calculated reflector sizes for the data given in Table 2 at 20 percent DAC are corrected by subtraction of beam width in accordance with Section 6.2c of Regulatory Guide 1.150, Revision 1. A beam width correction of .75" was used for the 60 degree transducer data, and a beam width correction of .50" was used for the 45 degree transducer. Where use of the beam width correction resulted in a size less than .05" or a single point (computer reports negative sizes as a single point), the reflector was assigned a size of .05" Additionally, all reflector sizes were rounded off to the nearest .05" dimension, in order to be in compliance with ASME Code Section XI, Paragraph IWA 3200.

Section 6.2e of the Regulatory Guide describes application of beam width correction factors for indications recorded to 20% DAC within the last 1/4 T (T = Thickness) of material examined. This correction factor will be applied for all indications detected in this volume. Where beam width correction factors result in a zero calculated throughwall dimension the indication will be assigned a conservative throughwall dimension of 2.5% of T. The data in Table 2 for the special 1/8 inch diameter side drilled holes and the 0.270 inch deep notch results in size measurements varying from 0.6 in. to 2.5% of T.

If 50% DAC data is required, the indication will also be sized at 50% DAC. In accordance with ASME Code Section XI the reported size will then be the larger of the two calculated sizes to ensure conservatism.

The electronic gating system was set as close as possible to concide with the inside and the outside surfaces of the vessel. Due to the water interface signals (test is performed from the O.D. surface of the vessel) and the size of the reflectors used for the test, no reflectors were recorded in the first 1/4" of material, with the 60° transducer, although they were observed in the recording gate at something less than 20% DAC. The 45° transducer recorded the reflector at 1/4" depth from the outside surface. Therefore, for this examination, less than 1/4" of vessel material (outside diameter) was gated out.

CONCLUSIONS:

1. The General Electric Remote Inservice Inspection System complies in all respects with the Regulatory Guide paragraphs relating to detecting, recording and sizing of indications.

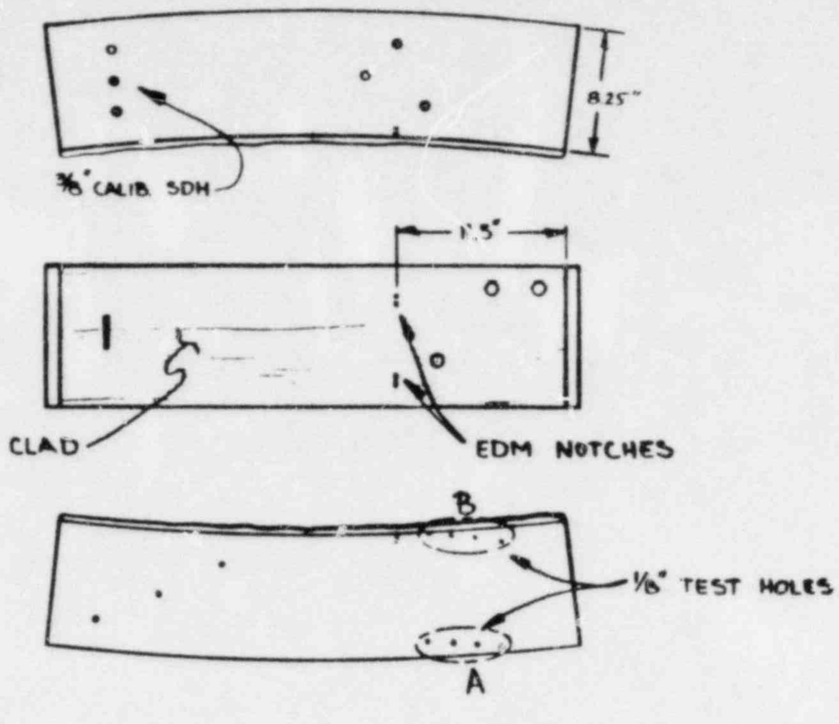
2. Based on the data available, the error band for the inner 25% of the vessel thickness is 5.3% of T for the 45° scan and 2.1% of T for the 60° scan.

3. When an indication is observed in the last 3/4" of material it will be given a minimum size of 2.5% of T. The error band on this will be 1.5% of T to reflect the through wall dimension represented by the special side-drilled holes used in the demonstration.

4. No base metal was gated out at the clad base metal surface (inside 25% of T) and therefore the total volume was examined. except for material less than 1/4" at the near (outside) surface.

Submitted [signature] R.E. Lindeman — [signature] B.R. Rajala

Approved [signature] J.P. Staley — [signature] J.P. Clark



"NOT TO SCALE"

NOTES:

A) 1/8" TEST HOLES ARE IN 1/4" INCREMENTS FROM THE O.D. SURFACE DOWN TO A DEPTH OF 1" WITH A 1½" SPACING BETWEEN HOLES.

B) 1/8" TEST HOLES ARE IN 1/4" INCREMENTS STARTING AT THE CLAD/BASE METAL INTERFACE TO A DEPTH OF 3/4" WITH A 1½" SPACING BETWEEN HOLES.

SKETCH # 1

Rev 1 5-8-84

REV. STATUS		REVISIONS	SH NO.
SH No.	REV.		

	ESSENTIAL COMPONENT THIS ITEM IS OR CONTAINS A SAFETY RELATED ITEM ☐ YES ☐ NO	IEEE CLASS 1E NUCLEAR SAFETY RELATED ☐ YES ☐ NO
SIGNATURES / DAY / MO / YR	GENERAL ELECTRIC	
DRAWN R. LINDEMAN	DEPT	
CHECKED	DOUGLAS POINT CALIB. BLOCK	
DFTG		
ENGRG		
APPLIED PRACTICES ____ UNLESS OTHERWISE SPECIFIED TOLERANCES ON 2 PLACE DECIMALS ± 3 PLACE DECIMALS ± FRACTIONS ± ANGLES ± ALL SURF ✓	ISSUE DATE / DWG No. SKETCH / REV.	
	FIRM No. / COMPL STAT / SH / CONT ON	DIST TO

TABLE I

SUMMARY OF GE SAN JOSE REGULATORY GUIDE 1.150 TEST

GE AUTOMATED ULTRASONIC EXAMINATION SYSTEM

	60° ANGLE BEAM TEST				45° ANGLE BEAM TEST			
	20% DAC			50% DAC	20% DAC			50% DAC
Reflector* Location	Detected Size	Beam Width Corrected	%T	Detected Size inches	Detected Size inches	Beam Width Corrected	%T	Detected Size inches
Near Surface								
1/4"	-			-	.03			-
1/2"	.21			-	.28			-
3/4"	.46			.32	.45			.28
1"	.43			.22	.41			.13
Far Surface								
3/4"	1.07	.32	3.9	.62	.42	Point .05	.6	-
1/2"	.59	point .05	0.6	-	-	-	-	-
1/4"	.28	point .05	0.6	-	-	-	-	-
	Unnotched				Unnotched			
Clad-base metal Interface	-	-	-	-	-	-	-	-

*1/8" diameter hole unless otherwise states

TABLE 2

SUMMARY OF THE BWR REGULATORY GUIDE 1.150 TEST

GE AUTOMATED ULTRASONIC EXAMINATION SYSTEM

	60° ANGLE BEAM TEST				45° ANGLE BEAM TEST			
	20% DAC			50% DAC	20% DAC			50% DAC
Reflector* Location	Detected Size inches	Beam Width corrected	%T	Detected Size inches	Detected Size inches	Beam Width corrected	%T	Detected Size inches
Near Surface								
1/4"	-		-	-	.08		1.0	-
1/2"	.18		2.2	-	.17		2.1	-
3/4"	.34		4.1	0.08	.49		5.9	.40
1"	.26		3.2	-	.41		4.9	0.04
Far Surface								
3/4"	.80	.05	0.6	.35	1.06	.56	6.9	.54
1/2"	.80	.05	0.6	-	.68	.18	2.2	-
1/4"	.10	point .05	0.6	-	.58	.08	1.0	-
.280 notch	Detected	point .05	0.6	-	Detected	point .05	0.6	-
Clad base metal Interface	0.20	point .05	0.6	-	Detected	point .05	0.6	-

*1/8 inch diameter side drilled hole unless otherwise stated.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

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		MAX AMPLITUDE				-50% DAC			+50% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
3	1	62	0.8	387.9	-15.1	0.8	387.6	-15.1	0.8	388.0	-15.1	0.9	9.1

INDICATION COMBINATIONS

CH#	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
3	1	S	X	412.22	412.59	-15.14	-15.14	0.75	0.83

FINAL EVALUATION TABLE

CH TYPE	IND=	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3 -60T	1	S	X	412.22	412.59	-15.14	-15.14	0.75	0.83	0.49	2.67	

COMMENT: REFLECTOR IS A 1/8" SDH 3/4" BELOW THE O.D. SURFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MABE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

CH	CS#	DEPTH TO SUBTRACT
3	27	0.75

3/4 THICKNESS = 6.15

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		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
3	1	41	0.6	389.9	-15.1	0.8	389.4	-15.1	0.6	390.3	-15.1	2.3	6.9
3	2	62	0.8	387.9	-15.1	1.0	386.9	-15.1	0.7	388.4	-15.1	4.2	8.0
3	3	32	1.1	384.9	-15.1	1.2	384.7	-15.1	0.9	385.9	-15.1	3.4	11.1

INDICATION COMBINATIONS

CH#	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
	1	S	X	414.02	414.88	-15.14	-15.14	0.56	0.74
3	2	S	X	411.50	413.02	-15.14	-15.14	0.65	0.99
3	3	S	X	409.29	410.45	-15.14	-15.14	0.92	1.18

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3	-60T	3	S	X	409.29	410.45	-15.14	-15.14	0.92	1.18	1.57	2.67	
3	-60T	2	S	X	411.50	413.02	-15.14	-15.14	0.65	0.99	2.07	2.68	
3	-60T	1	S	X	414.02	414.88	-15.14	-15.14	0.56	0.74	1.14	2.66	

COMMENT: REFLECTOR #1 IS A 1/8" SDH 1/2" BELOW THE O.D. SURFACE.
REFLECTOR #2 IS A 1/8" SDH 3/4" BELOW THE O.D. SURFACE.
REFLECTOR #3 IS A 1/8" SDH 1.0" BELOW THE O.D. SURFACE.

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

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TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

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EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

CH	CS=	DEPTH TO SUBTRACT
3	27	0.75

3/4 THICKNESS = 6.15

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
=	ID=	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
3	1	27	8.5	364.3	-3.6	8.6	363.8	-3.6	8.4	364.8	-3.6	3.0	-5.2

INDICATION COMBINATIONS

CH=	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
	1	I X	388.32	389.34	-3.63	-3.63	8.50	8.50

FINAL EVALUATION TABLE

CH	TYPE	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3	-60T	1	I X	388.32	389.34	-3.63	-3.63	8.50	8.50	-3.62	1.18	

COMMENT: REFLECTOR IS A 1/8" SDH AT THE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

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TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

[illegible]LUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20	0	-4.0	

DATA COUNT ERROR PRESENT: #DL= 10 #50= 0
$SCAN = 1 AZ 0.00 FROZEN ODOM = 3912 X = 408.3 Y = -6.3
#DL= 23 #50= 0
NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

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EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20	0	-4.0	

CH	CS#	DEPTH TO SUBTRACT
3	27	0.75

3/4 THICKNESS = 6.15

DATA COUNT ERROR PRESENT: #DL= 10 #50= 0
$SCAN = 1 AZ 0.00 FROZEN ODOM = 3912 X = 408.3 Y = -6.3
#DL= 23 #50= 0

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
3	1	24	8.4	366.0	-3.6	8.4	365.9	-3.6	8.3	366.4	-3.6	1.1	-2.9

INDICATION COMBINATIONS

	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
3	1	I	X	390.46	390.99	-3.63	-3.63	8.39	8.39

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3	-60T	1	I	X	390.46	390.99	-3.63	-3.63	8.39	8.39	-2.35	1.01	

COMMENT: REFLECTOR IS A 1/8" SDH 1/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

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TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MMBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT D.E. DATA AT FULL D.E. AMP
EVALUATE ALL D.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

CH	CS#	DEPTH TO SUBTRACT
3	27	0.75

3/4 THICKNESS = 6.15

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
3	1	30	7.9	367.2	-3.6	8.3	365.5	-3.6	7.5	368.7	-3.6	8.8	-0.6

INDICATION COMBINATIONS

CH#	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
3	1	I X	390.07	393.24	-3.63	-3.63	7.88	7.88

FINAL EVALUATION TABLE

CH	TYPE	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3	-60T	1	I X	390.07	393.24	-3.63	-3.63	7.88	7.88	19.33	3.48	****

COMMENT: REFLECTOR IS A 1/8" SDH 1/2" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

BREAK IN PAGE SEQUENCE

TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

DATA COUNT ERROR PRESENT: #DL= 60 #50= 27
$SCAN = 1 AZ 0.00 FROZEN ODOM = 3912 X = 408.3 Y = -6.3
#DL= 60 #50= 26

		MAX AMPLITUDE				-50% DAC			+50% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
3	1	53	7.7	369.5	-3.6	7.7	369.3	-3.6	7.3	370.9	-3.6	4.2	6.2

INDICATION COMBINATIONS

CH#	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
3	1	S	X	393.85	395.44	-3.63	-3.63	7.34	7.69

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3	-60T	1	S	X	393.85	395.44	-3.63	-3.63	7.34	7.69	2.15	2.67	

COMMENT: REFLECTOR IS A 1/8" SDH 3/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	HNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

CH	CS=	DEPTH TO SUBTRACT
3	27	0.75

3/4 THICKNESS = 6.15

DATA COUNT ERROR PRESENT: =DL= 60 =50= 27
$SCAN = 1 AZ 0.00 FROZEN ODOM = 3912 X = 408.3 Y = -6.3
=DL= 60 =50= 26

	MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
= ID=	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
1	53	7.7	369.5	-3.6	8.1	367.6	-3.6	7.3	371.1	-3.6	9.9	1.3

INDICATION COMBINATIONS

CH=	IND=	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
3	1	I	X	392.15	395.64	-3.63	-3.63	7.66	7.71

FINAL EVALUATION TABLE

CH	TYPE	IND=	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3	-60T	1	I	X	392.15	395.64	-3.63	-3.63	7.66	7.71	21.28	3.48	****

COMMENT: REFLECTOR IS A 1/8" SDH 3/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

BREAK IN PAGE SEQUENCE

		MAX AMPLITUDE				-50% DAC			+50% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
2	1	96	0.8	386.4	-14.7	1.0	385.6	-14.7	0.7	386.8	-14.7	4.6	8.0
2	2	52	1.0	384.3	-14.7	1.0	384.3	-14.7	1.0	384.4	-14.7	0.4	12.2

INDICATION COMBINATIONS

CH#	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
2	1	S	X	410.16	411.37	-14.70	-14.70	0.64	1.04
2	2	S	X	408.91	409.02	-14.70	-14.70	0.99	1.03

FINAL EVALUATION TABLE

CH	TYPE	IND=	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
2	-45T	2	S	X	408.91	409.02	-14.70	-14.70	0.99	1.03	0.24	3.13	
2	-45T	1	S	X	410.16	411.37	-14.70	-14.70	0.64	1.04	2.43	3.01	

COMMENT: REFLECTOR #1 IS A 1/8" SDH 3/4" BELOW THE O.D. SURFACE.
REFLECTOR #2 IS A 1/8" SDH 1.0" BELOW THE O.D. SURFACE.

REG. GUIDE 1.150 TEST

EVALUATION LEVEL = 20% DAC

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MMBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

CH	CS#	DEPTH TO SUBTRACT	
2	26	0.50	ERROR: SHELL COURSE NOT LISTED ON THIS CAL SHEET

3/4 THICKNESS = 6.15

BREAK IN PAGE SEQUENCE

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
2	1	20	0.6	389.6	-14.7	0.6	389.6	-14.7	0.5	389.9	-14.7	1.1	5.7
2	2	26	0.7	388.2	-14.7	0.8	387.9	-14.7	0.6	388.4	-14.7	1.9	7.2
2	3	96	0.8	386.4	-14.7	1.1	385.3	-14.7	0.7	386.9	-14.7	5.7	8.0
2	4	52	1.0	384.3	-14.7	1.3	383.4	-14.7	0.9	384.7	-14.7	5.3	11.1

INDICATION COMBINATIONS

CH	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
	1	S	X	414.21	414.44	-14.70	-14.70	0.47	0.55
2	2	S	X	412.45	412.94	-14.70	-14.70	0.58	0.75
2	3	S	X	409.91	411.45	-14.70	-14.70	0.64	1.13
2	4	S	X	408.02	409.30	-14.70	-14.70	0.92	1.33

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
2	-45T	4	S	X	408.02	409.30	-14.70	-14.70	0.92	1.33	2.51	2.98	
2	-45T	3	S	X	409.91	411.45	-14.70	-14.70	0.64	1.13	2.97	2.97	****
2	-45T	2	S	X	412.45	412.94	-14.70	-14.70	0.58	0.75	1.06	3.10	
2	-45T	1	S	X	414.21	414.44	-14.70	-14.70	0.47	0.55	0.49	3.07	

COMMENT: REFLECTOR #1 IS A 1/8" SDH 1/4" BELOW O.D. SURFACE.
REFLECTOR #2 IS A 1/8" SDH 1/2" BELOW O.D. SURFACE.
REFLECTOR #3 IS A 1/8" SDH 3/4" BELOW O.D. SURFACE.
REFLECTOR #4 IS A 1/8" SDH 1.0" BELOW O.D. SURFACE.

REG. GUIDE 1.150
EVALUATION LEVEL = 50% DAC

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TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.63
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

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EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

CH	CS#	DEPTH TO SUBTRACT	
2	26	0.50	ERROR: SHELL COURSE NOT LISTED ON THIS CAL SHEET

3/4 THICKNESS = 6.15

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
2	1	22	8.5	381.6	-12.9	8.5	381.6	-12.9	8.5	381.6	-12.9	0.0	-3.3
2	2	31	8.4	378.7	-12.9	8.4	378.7	-12.9	8.4	378.9	-12.9	0.8	-2.9

INDICATION COMBINATIONS

CH	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
2	1	I	Y	406.20	406.20	-12.94	-12.94	8.46	8.46
2	2	I	X	403.29	403.49	-12.94	-12.94	8.41	8.41

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
2	-45T	2	I	X	403.29	403.49	-12.94	-12.94	8.41	8.41	-2.59	-0.66	
2	-45T	1	I	Y	406.20	406.20	-12.94	-12.94	8.46	8.46	-3.23	1.88	

COMMENT: REFLECTOR #1 IS A 1/8" SDH AT THE CLAD/BASEMETAL INTERFACE.
REFLECTOR #2 IS A NOTCH APPROX. .280" DEEP AT THE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

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TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

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EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.59 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

CH	CS=	DEPTH TO SUBTRACT
2	26	0.50 ERROR: SHELL COURSE NOT LISTED ON THIS CAL SHEET

3/4 THICKNESS = 6.15

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID=	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
2	1	49	9.3	382.3	-12.9	9.4	381.9	-12.9	7.8	393.7	-12.9	6.9	-2.1

INDICATION COMBINATIONS

CHS	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
	1	I X	406.51	408.27	-12.94	-12.94	8.05	8.13

FINAL EVALUATION TABLE

CH	TYPE	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
2	-45T	1	I X	406.51	408.27	-12.94	-12.94	8.05	8.13	10.73	3.48	****

COMMENT: REFLECTOR IS A 1/8" SDH 1/4" ABOVE CLAD BASEMETAL INTERFACE.

REG. GUIDE 1.150 TEST

EVALUATION LEVEL = 50% DAC

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TABLE 3510.1

ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.09	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2

ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	S/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

```
GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

               REG. GUIDE 1.150 TEST
EVALUATION LEVEL =   20% DAC

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EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X=  24.58  Y=    0.00
THICKNESS = 8.200
SHELL COURSE  9  CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL =   1.00

CH T  LINK  ANGLE  X OFFSET  Y OFFSET  NNBE/IA 5/4TD XANGLE
 2 T        -45.0     -1.85      0.20         0  -2.0

CH  CS#  DEPTH TO SUBTRACT
 2  26                 0.50 ERROR: SHELL COURSE NOT LISTED ON THIS CAL SHEET
 3/4 THICKNESS =    6.15


       MAX AMPLITUDE                 -20% DAC            +20% DAC          % OF T
 # ID# %DAC DEP REL X RY/AZ    DEP REL X RY/AZ    DEP REL X RY/AZ   DEP  SDEP
 2   1  38  8.0 384.3 -12.9    8.4 383.3 -12.9    7.7 385.3 -12.9   8.4  -2.1

                INDICATION COMBINATIONS
     IND#   T    MINX    MAXX    MINY    MAXY    DMIN    DMAX
 2      1 I X 407.91 409.91 -12.94 -12.94    7.94    8.12

                    FINAL EVALUATION TABLE
CH TYPE  IND#   T    MINX    MAXX    MINY    MAXY    DMIN    DMAX VALUE  ALLOW  EVAL
 2 -45T     1 I X 407.91 409.91 -12.94 -12.94    7.94    8.12 12.20   3.48  ****


>
>
>COMMENT: REFLECTOR IS A 1/8" SDH 1/2" ABOVE CLAD/BASEMETAL INTERFACE.
```

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

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		MAX AMPLITUDE				-50% DAC			+50% DAC			% OF T	
#	ID=	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
2	1	79	7.6	387.0	-12.9	7.8	386.2	-12.9	7.3	387.9	-12.9	6.5	4.7

INDICATION COMBINATIONS

CH=	IND=	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
2	1	S	X	410.78	412. [illegible]9	-12.94	-12.94	7.28	7.82

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OF

FINAL EVALUATION TABLE

C[illegible]YPE	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
[illegible]-45T	1	S X	410.78	412.49	-12.94	-12.94	7.28	7.82	3.29	2.96	****

COMMENT: REFLECTOR IS A 1/8" SDH 3/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MMBE/IA	5/4TD	XANGLE
2	T		-45.0	-1.85	0.20		0	-2.0

CH	CS#	DEPTH TO SUBTRACT
2	26	0.50 ERROR: SHELL COURSE NOT LISTED ON THIS CAL SHEET

3/4 THICKNESS = 6.15

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		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
2	1	79	7.6	387.0	-12.9	8.2	385.2	-12.9	7.1	388.4	-12.9	13.0	0.2

INDICATION COMBINATIONS

CH	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
2	1	I	X	409.74	412.99	-12.94	-12.94	7.37	7.93

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
2	-45T	1	I	X	409.74	412.99	-12.94	-12.94	7.37	7.93	19.82	3.48	****

>COMMENT: REFLECTOR IS A 1/8" SDH 3/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

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TABLE 3510.1
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.42
0.45	3.48	5.86
0.50	3.48	6.51

TABLE 3510.2
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	10
6	10
8	20
10	30
12	40

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MMBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20		0	-4.0

DATA COUNT ERROR PRESENT: #DL= 2 #50= 0
$SCAN = 1 AZ 0.00 FROZEN ODOM = 3912 X = 408.3 Y = -6.3
#DL= 68 #50= 0
NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 24.58 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 9 CIRCUMFERENCE = 841.73
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		-60.0	-3.15	0.20	0	-4.0	

CH	CS=	DEPTH TO SUBTRACT
3	27	0.75

3/4 THICKNESS = 6.15

DATA COUNT ERROR PRESENT: =DL= 2 =50= 0
$SCAN = 1 AZ 0.00 FROZEN ODOM = 3912 X = 408.3 Y = -6.3
=DL= 68 =50= 0

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID=	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
3	1	26	8.7	358.1	-3.6	8.7	358.1	-3.6	8.7	358.2	-3.6	0.0	-5.9

INDICATION COMBINATIONS

	IND=	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
3	1	I	X	382.72	382.79	-3.63	-3.63	8.68	8.68

FINAL EVALUATION TABLE

CH	TYPE	IND=	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
3	-60T	1	I	X	382.72	382.79	-3.63	-3.63	8.68	8.68	-5.91	-14.73	****

COMMENT: REFLECTOR IS A NOTCH APPROX. .280" DEEP AT THE CLAD/BASEMETAL
INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

TABLE
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	0.00	0.00

TABLE
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	0

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	NNBE/IA	5/4TD	XANGLE
3	T		45.0	0.00	0.00	0	-8.0	
5	T		60.0	0.00	0.00	0	-6.0	

		MAX AMPLITUDE				-50% DAC			+50% DAC			% OF T	
#	ID=	%DAC	DEP	REL X	RY/AZ	DEP	REL X	R /AZ	DEP	REL X	RY/AZ	DEP	SDEP
~~9~~	~~1~~	~~61~~	~~5.9~~	~~13.2~~	~~0.0~~	~~5.0~~	~~13.3~~	~~0.0~~	~~[illegible]~~	~~13.1~~	~~0.0~~	~~4.9~~	~~26.4~~
3	2	56	1.0	-0.8	0.0	1.1	-0.8	0.0	0.9	-0.7	0.0	1.5	11.4
3	3	72	0.8	0.8	0.0	0.9	0.6	0.0	0.7	0.9	0.0	3.0	8.0

INDICATION COMBINATIONS

CH=	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
~~9~~	~~1 S~~	~~X~~	~~6.71~~	~~6.82~~	~~0.00~~	~~0.00~~	~~5.89~~	~~6.03~~
3	2 S	X	19.11	19.24	0.00	0.00	0.93	1.06
3	3 S	X	20.57	20.86	0.00	0.00	0.64	0.92

FINAL EVALUATION TABLE

CH	TYPE	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
~~9~~	~~45T~~	~~1 S~~	~~X~~	~~6.71~~	~~6.87~~	~~0.00~~	~~0.00~~	~~5.89~~	~~6.03~~	~~0.88~~	~~0.00~~	~~****~~
3	45T	2 S	X	19.11	19.24	0.00	0.00	0.93	1.06	0.80	0.00	****
3	45T	3 S	X	20.57	20.86	0.00	0.00	0.64	0.92	1.70	0.00	****

COMMENT: REFLECTOR #2 IS A 1/8" SDH 1.0" BELOW THE O.D. SURFACE.
REFLECTOR #3 IS A 1/8" SDH 3/4" BELOW THE O.D. SURFACE.

POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		45.0	0.00	0.00	0	-8.0	
5	T		60.0	0.00	0.00	0	-6.0	

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
~~3~~	~~1~~	~~64~~	~~5.9~~	~~13.2~~	~~0.0~~	~~6.0~~	~~13.9~~	~~0.0~~	~~5.8~~	~~12.9~~	~~0.0~~	[illegible]	~~26.4~~
3	2	46	7.2	3.2	0.0	7.4	3.0	0.0	7.0	3.4	0.0	5.0	9.3
3	3	56	1.0	-0.8	0.0	1.3	-1.0	0.0	0.8	-0.6	0.0	5.0	10.3
3	4	72	0.8	0.8	0.0	1.0	0.5	0.0	0.6	1.0	0.0	5.7	6.9
3	5	29	0.6	2.3	0.0	0.8	2.3	0.0	0.5	2.4	0.0	3.4	5.7
3	6	32	0.5	3.6	0.0	0.5	3.6	0.0	0.5	3.6	0.0	0.4	5.7

INDICATION COMBINATIONS

CH#	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
~~3~~	~~1 6~~	~~X~~	~~6.71~~	~~7.06~~	~~0.00~~	~~0.00~~	~~5.76~~	~~6.03~~
3	2 S	X	22.97	23.43	0.00	0.00	7.03	7.45
3	3 S	X	18.95	19.35	0.00	0.00	0.84	1.25
3	4 S	X	20.50	20.97	0.00	0.00	0.57	1.02
3	5 S	X	22.26	22.44	0.00	0.00	0.48	0.76
3	6 S	X	23.56	23.58	0.00	0.00	0.47	0.50

FINAL EVALUATION TABLE

CH	TYPE	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
~~3~~	~~45T~~	~~1 6~~	~~X~~	~~6.71~~	~~7.06~~	~~0.00~~	~~0.00~~	~~5.76~~	~~6.03~~	~~1.62~~	~~0.00~~	~~****~~
3	45T	3 S	X	18.95	19.35	0.00	0.00	0.84	1.25	2.47	0.00	****
3	45T	4 S	X	20.50	20.97	0.00	0.00	0.57	1.02	2.71	0.00	****
3	45T	5 S	X	22.26	22.44	0.00	0.00	0.48	0.76	1.73	0.00	****
3	45T	2 S	X	22.97	23.43	0.00	0.00	7.03	7.45	2.55	0.00	****
3	45T	6 S	X	23.56	23.58	0.00	0.00	0.47	0.50	0.14	0.00	****

COMMENT: REFLECTOR #2 IS A 1/8" SDH 3/4" ABOVE CLAD/BASEMETAL INTERFACE.
REFLECTOR #3 IS A 1/8" SDH 1.0" BELOW O.D. SURFACE.
REFLECTOR #4 IS A 1/8" SDH 3/4" BELOW O.D. SURFACE.
REFLECTOR #5 IS A 1/8" SDH 1/2"BELOW O.D. SURFACE.
REFLECTOR #6 IS A 1/8" SDH 1/4" BELOW O.D. SURFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

TABLE
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	0.00	0.00

TABLE
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	0

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
2	T		45.0	0.00	0.00	0	-8.0	
[illegible]	T		60.0	0.00	0.00	0	-6.0	

		MAX AMPLITUDE				-50% DAC			+50% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
5	1	72	7.2	7.9	0.0	7.5	7.7	0.0	6.8	8.1	0.0	7.6	8.9

INDICATION COMBINATIONS

CH#	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
5	1	S	X	27.71	28.10	0.00	0.00	6.85	7.47

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
5	60T	1	S	X	27.71	28.10	0.00	0.00	6.85	7.47	3.81	0.00	****

COMMENT: REFLECTOR IS A 1/8" SDH 3/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		45.0	0.00	0.00	0	-8.0	
5	T		60.0	0.00	0.00	0	-6.0	

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
5	1	72	7.2	7.9	0.0	7.6	7.7	0.0	6.5	8.3	0.0	13.3	7.8

INDICATION COMBINATIONS

CH	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
	1	S X	27.69	28.34	0.00	0.00	6.48	7.55

FINAL EVALUATION TABLE

CH	TYPE	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
5	60T	1	S X	27.69	28.34	0.00	0.00	6.48	7.55	6.52	0.00	****

COMMENT: REFLECTOR IS A 1/8" SDH 3/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

TABLE
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	0.00	0.00

TABLE
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	0

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MODE/IA	S/4TD	XANGLE
3	T		45.0	0.00	0.00	0	-8.0	
5	T		60.0	0.00	0.00	0	-6.0	

NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

[redacted] [redacted]

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		45.0	0.00	0.00	0	-8.0	
5	T		60.0	0.00	0.00	0	-6.0	

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	DDEP
5	1	40	7.3	6.5	0.0	7.5	6.4	0.0	6.9	6.7	0.0	7.2	8.

INDICATION COMBINATIONS

CH#	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
5	1	S X	26.36	26.69	0.00	0.00	6.94	7.53

FINAL EVALUATION TABLE

CH	TYPE	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
5	60T	1	S X	26.36	26.69	0.00	0.00	6.94	7.53	3.57	0.00	****

COMMENT: REFLECTOR IS A 1/8" SDH 1/2" ABOVE CLAD/BASEMETAL INTERFACE.

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GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

TABLE
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	0.00	0.00

TABLE
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	0

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3 T		45.0	0.00	0.00	0	-8.0	
5 T		60.0	0.00	0.00	0	-6.0	

NO INDICATIONS RECORDED REQUIRING EVALUATION ACCORDING TO SECTION XI

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT D.E. DATA AT 1/2 D.E. AMP
EVALUATE ALL D.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
3	T		45.0	0.00	0.00	0	-8.0	
5	T		60.0	0.00	0.00	0	-6.0	

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
5	1	33	7.4	5.0	0.0	7.5	5.0	0.0	7.2	5.2	0.0	3.4	8.5

INDICATION COMBINATIONS

CH#	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX
5	1	S	X	25.03	25.19	0.00	0.00	7.22	7.50

FINAL EVALUATION TABLE

CH	TYPE	IND#	T		MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
5	60T	1	S	X	25.03	25.19	0.00	0.00	7.22	7.50	1.73	0.00	****

COMMENT: REFLECTOR IS A 1/8" SDH 1/4" ABOVE CLAD/BASEMETAL INTERFACE.

GENERAL ELECTRIC
POST PROCESSOR: VERSION 5 - REV. 1

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 50% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

TABLE
ALLOWABLE PLANAR INDICATIONS

ASPECT RATIO A/L	SURFACE INDICATIONS A/T,%	SUBSURFACE INDICATIONS A/T,%
0.00	0.00	0.00

TABLE
ALLOWABLE LAMINAR INDICATIONS

COMPONENT THICKNESS T, IN.	LAMINAR AREA A, SQ IN.
0	0

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	MNBE/IA	5/4TD	XANGLE
[illegible]	T		45.0	0.00	0.00		0	-8.0
[illegible]	T		60.0	0.00	0.00		0	-6.0

		MAX AMPLITUDE				-50% DAC			+50% DAC			% OF T	
#	ID#	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
5	1	64	0.9	4.1	0.0	1.1	4.0	0.0	0.8	4.2	0.0	2.7	10.3
5	2	91	0.7	5.7	0.0	0.9	5.5	0.0	0.6	5.8	0.0	3.8	7.6

INDICATION COMBINATIONS

CH#	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
5	1 S	X	24.03	24.17	0.00	0.00	0.85	1.07
5	2 S	X	25.52	25.74	0.00	0.00	0.63	0.95

FINAL EVALUATION TABLE

CH	TYPE	IND#	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
5	60T	1 S	X	24.03	24.17	0.00	0.00	0.85	1.07	1.34	0.00	****
5	60T	2 S	X	25.52	25.74	0.00	0.00	0.63	0.95	1.93	0.00	****

COMMENT: REFLECTOR #1 IS A 1/8" SDH 1.0" BELOW THE O.D. SURFACE.
REFLECTOR #2 IS A 1/8" SDH 3/4" BELOW THE O.D. SURFACE.

SAN JOSE REG. GUIDE 1.150 TEST
EVALUATION LEVEL = 20% DAC

COMMENT: UT CAL BLOCK TEST 45 AND 60 VESSEL TRANSDUCERS.
BREAK IN PAGE SEQUENCE

EVALUATION PARAMETERS:
VESSEL MODE
WELD REFERENCE POINT: X= 20.00 Y= 0.00
THICKNESS = 8.200
SHELL COURSE 1 CIRCUMFERENCE = 800.00
COLLECT B.E. DATA AT FULL B.E. AMP
EVALUATE ALL B.E. DATA
MIN. X/Y IND. SEPARATION FOR BASE METAL = 1.00

CH	T	LINK	ANGLE	X OFFSET	Y OFFSET	ANBE/IA	S/4TD	XANGLE
3	T		45.0	0.00	0.00	0	-8.0	
5	T		60.0	0.00	0.00	0	-6.0	

		MAX AMPLITUDE				-20% DAC			+20% DAC			% OF T	
#	ID=	%DAC	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	REL X	RY/AZ	DEP	SDEP
~~5~~	~~1~~	~~[illegible]~~	~~7.0~~	~~14.8~~	~~0.0~~	~~7.5~~	~~14.1~~	~~0.0~~	~~7.0~~	~~14.7~~	~~0.0~~	~~[illegible]~~	~~[illegible]~~
5	2	64	0.9	4.1	0.0	1.2	3.9	0.0	0.8	4.3	0.0	5.3	9.5
~~5~~	~~3~~	~~28~~	~~6.4~~	~~15.3~~	~~0.0~~	~~6.5~~	~~15.9~~	~~0.0~~	~~6.2~~	~~15.3~~	~~0.0~~	~~[illegible]~~	~~[illegible]~~
5	4	91	0.7	5.7	0.0	1.0	5.5	0.0	0.6	5.8	0.0	5.7	6.9
~~5~~	~~5~~	~~31~~	~~5.6~~	~~15.6~~	~~0.0~~	~~5.0~~	~~15.6~~	~~0.0~~	~~[illegible]~~	~~15.0~~	~~0.0~~	~~[illegible]~~	~~[illegible]~~
5	6	49	0.6	7.2	0.0	0.8	7.1	0.0	0.6	7.2	0.0	2.3	7.2

INDICATION COMBINATIONS

	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX
~~5~~	~~1~~	~~S X~~	~~34.09~~	~~34.66~~	~~0.00~~	~~0.00~~	~~6.97~~	~~7.50~~
<	~~3~~	~~S X~~	~~35.00~~	~~25.32~~	~~0.00~~	~~0.00~~	~~5.29~~	~~6.47~~
~~5~~	~~1~~	~~SMX~~	~~34.09~~	~~25.32~~	~~0.00~~	~~0.00~~	~~6.29~~	~~7.50~~
5	2	S X	23.95	24.25	0.00	0.00	0.79	1.22
5	4	S X	25.48	25.81	0.00	0.00	0.57	1.03
~~5~~	~~5~~	~~S X~~	~~35.54~~	~~35.74~~	~~0.00~~	~~0.00~~	~~5.41~~	~~5.76~~
5	6	S X	27.03	27.29	0.00	0.00	0.58	0.79

FINAL EVALUATION TABLE

CH	TYPE	IND=	T	MINX	MAXX	MINY	MAXY	DMIN	DMAX	VALUE	ALLOW	EVAL
5	60T	2	S X	23.95	24.25	0.00	0.00	0.79	1.22	2.64	0.00	****
5	60T	4	S X	25.48	25.81	0.00	0.00	0.57	1.03	2.82	0.00	****
5	60T	6	S X	27.03	27.29	0.00	0.00	0.58	0.79	1.30	0.00	****
~~5~~	~~60T~~	~~1~~	~~SMX~~	~~34.09~~	~~35.32~~	~~0.00~~	~~0.00~~	~~6.23~~	~~7.50~~	~~7.73~~	~~0.00~~	~~****~~
~~5~~	~~60T~~	~~5~~	~~S X~~	~~35.54~~	~~35.74~~	~~0.00~~	~~0.00~~	~~5.44~~	~~5.76~~	~~2.15~~	~~0.00~~	~~****~~

COMMENT: REFLECTOR #2 IS A 1/8" SDH 1.0" BELOW O.D. SURFACE.
REFLECTOR #4 IS A 1/8" SDH 3/4" BELOW O.D. SURFACE.
REFLECTOR #6 IS A 1/8" SDH 1/2" BELOW O.D. SURFACE.

USNRC REGULATORY GUIDE 1.150 REPORT

ATTACHMENT 6

This attachment contains the determination of the effectiveness of Ultrasonic Examination Procedure LIM-UT-5 in accordance with Sections 3, 6 and 7 of Regulatory Guide 1.150, Revision 1, Alternate Method.

Reg. Guide 1.150 requires that the adequacy of ultrasonic examination procedures used to perform Preservice/Inservice Inspections be demonstrated. The requirements for items that must be demonstrated are found in Sections 3, 6, and 7 of the Reg. Guide. This attachment describes the methods used and the data gathered to demonstrate Procedure LIM-UT-5 for the Limerick Unit #1 Preservice Examination.

General Electric Company designed a Qualification Standard meeting the requirements of Reg. Guide 1.150. The Standard was fabricated in accordance with Drawing 160-83C-17 (attached). The Standard is dual thickness with the range of 3.44" unclad through 7.00" plus cladding. These thicknesses span the range of thicknesses found on a typical BWR. The Standard contains side-drilled calibration holes of the ASME Section V, Article 4 diameter specified for each thickness. The reflectors used during qualification of the Procedure were side-drilled holes and machined notches. The qualification reflectors were used as follows:

Side-Drilled Holes

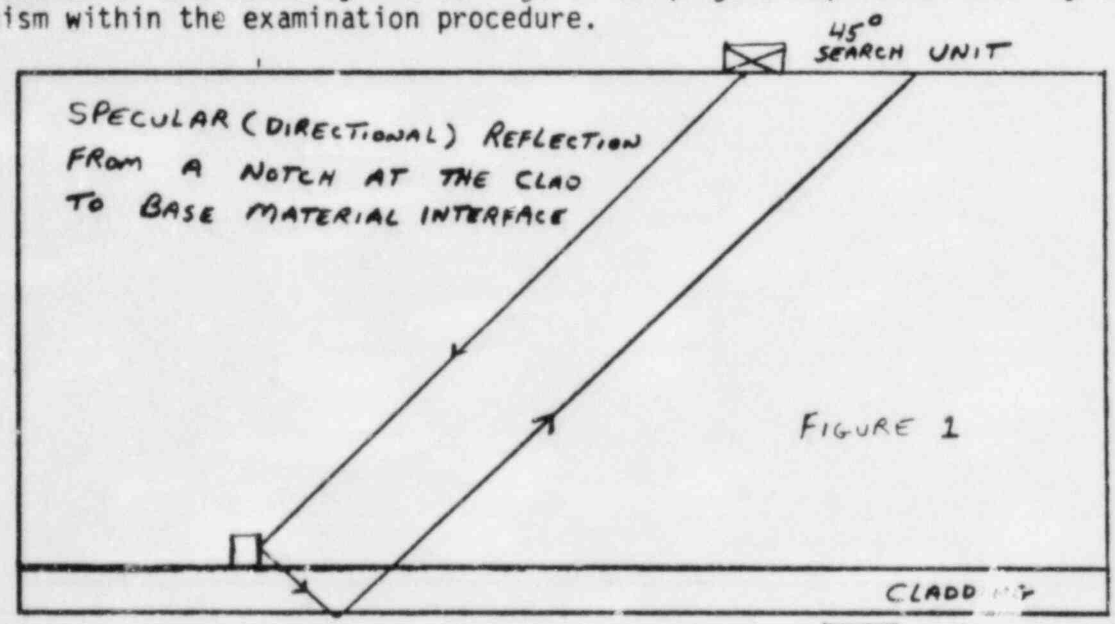
The side-drilled holes used for qualification are 50% of the ASME-specified calibration hole diameter for the thickness being examined. The holes were drilled at 1/4t, 1/2t, 3/4t, and, in the clad portion of the standard, 4/4t centered on the clad to base material interface. Four sets of data were gathered from each hole. The data was gathered by two inspection teams as a minimum. The use of more than one team was specified to average out differences in scanning and recording techniques that exist between different Level II technicians. Calibrations for these examinations were performed using the ASME Section V calibration holes in the Standard. Ultrasonic instruments from two manufacturers was used to average out differences in instrument operating characteristics.

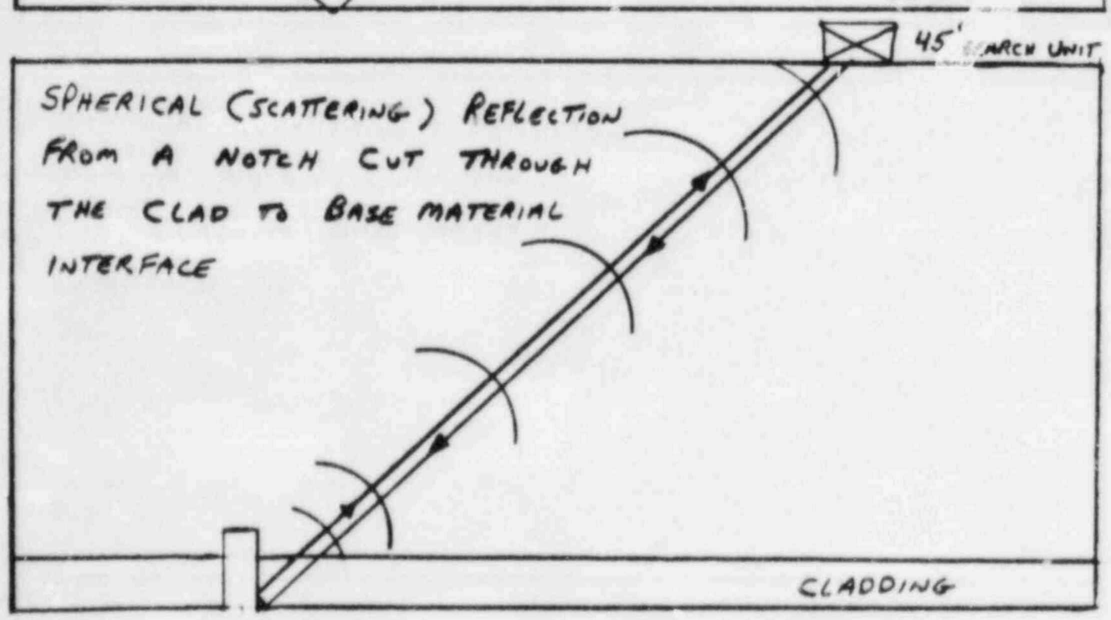
Machined Notches

Notches were machined in the Standard to represent aspect ratios (a/l) of .05 and .5 for each section thickness. These notches were machined prior to cladding of the 7" section. The notches in the 7" section were plugged with a granular ceramic substance, and the cladding was applied. The notches in the unclad section are open to the surface. As was specified for the side-drilled holes, four sets of notch data were gathered for each section thickness, and the data was gathered by a minimum of two inspection teams. The notch data was gathered using the ASME Section V side-drilled hole calibration used previously.

1.150
Attachment #6

The notch data from the 7" cladded section shows greatly reduced notch amplitudes. The amplitudes are approximately 20% to 30% of the amplitude that was expected. The reduced amplitude appears to be caused by the smooth-sided notch reflecting in a specular (directional) manner rather than the spherical (scattering) reflector found when the notch penetrates the cladding. The sketches below illustrate these reflections. It should be noted that the GE Standard contains an underclad (reheat) crack. This crack appears to be typical of the morphology of reheat cracks appearing in literature describing such cracking. The fracture faces of this crack provide good ultrasonic reflectors, and the crack was easily detected utilizing the calibration gain for both of the Standard thicknesses. No data for the crack is presented in this report. Due to the location of the crack, no sizing data could be gathered. There was just enough scanning surface to detect the crack. Detection of this faceted crack supports the conclusion that the low machined notch amplitude was caused by misdirection of the sound by the configuration (Figure #1) rather than by any mechanism within the examination procedure.





The adequacy of Procedure LIM-UT-5 was determined as follows:

1) Calibrations were performed using the Code size calibration holes for the thickness being examined.

2) Four sets of data were gathered from the 50% Code diameter holes and the notches in the Standard.

3) The resultant data was analyzed to determine the average return signal amplitude from the reflectors.

4) The return signal amplitudes were compared to Reg. Guide 1.150 requirements.

The results of these data analyses are tablulated below.

7" Thickness With Cladding

1/4t target hole, 45° beaming angle = 50% DAC

1/2t target hole, 45° beaming angle = 50% DAC

3/4t target hole, 45° beaming angle = 62.5% DAC

4/4t target hole, 45° beaming angle = 87.5% DAC

.05 a/l notch, 45° beaming angle = 20% DAC

.5 a/l notch, 45° beaming angle = 22% DAC

1/4t target hole, 60° beaming angle = 72% DAC

1/2t target hole, 60° beaming angle = 81% DAC

3/4t target hole, 60° beaming angle = 81% DAC

4/4t target hole, 60° beaming angle = 85% DAC

.05 a/l notch, 60° beaming angle = 17.5% DAC

.5 a/l notch, 60°, beaming angle = 17.5% DAC

3.44" Thickness Unclad

1/4t target hole, 45° beaming angle = 50% DAC

1/2t target hole, 45° beaming angle = 50% DAC

3/4t target hole, 45° beaming angle = 65% DAC

.05 a/l notch, 45° beaming angle	=	100+% DAC
.5 a/l notch, 45° beaming angle	=	100+% DAC
1/4t target hole, 60° beaming angle	=	63.75% DAC
1/2t target hole, 60° beaming angle	=	67.50% DAC
3/4t target hole, 60° beaming angle	=	81.88% DAC
.05 a/l notch, 60° beaming angle	=	52.50% DAC
.5 a/l notch, 60° beaming angle	=	55.00% DAC

As shown above, the calibration and examination techniques in Procedure LIM-UT-5 detect both ASME Section XI flaws and flaws located at the clad to base material interface as required by Reg. Guide 1.150. The General Electric Company therefore considers Procedure LIM-UT-5 to be adequate for reactor pressure vessel ultrasonic examinations.

Error Band Determination

The error band that affects sizing of indications detected using Procedure LIM-UT-5 was determined as follows:

1) The data gathered from the Qualification Standard was manually plotted.

2) The 20% DAC beam spreads were determined from the data sheets.

3) The 20% beam spread was applied to the through-wall dimensions on the plotted data.

4) The difference between the actual vs. apparent through-wall dimensions was determined.

5) The through-wall error percentage was calculated from the data above for both thicknesses on the Qualification Standard.

6) The average error was determined.

The calculations for through-wall sizing error band determination are shown in the tables below.

Columns A through H below represent:

A = The location of the reflector as measured from the scanning surface

B = The measured size of the target reflector

C = Apparent size of the target reflector as measured ultrasonically

D = 20% DAC beam spread as measured in the through-wall direction

E = C-D or D-C as applicable

F = E-B or B-E as applicable

G = Error as a percentage of thickness

H = Whether over-sized (+) or undersized (-)

7" Section Thickness, 45° Angle

A	B	C	D	E	F	G	H
1/4t	.156	.45	.30	.150	.006	.08	-
1/2t	.156	.80	.70	.100	.056	.80	-
3/4t	.156	1.10	1.00	.100	.056	.80	-
4/4t	.156	1.25	1.10	.150	.006	.08	-
.05 a/l notch		DETECTED - CANNOT BE SIZED					
.5 a/l notch		DETECTED - CANNOT BE SIZED					

7" Section Thickness, 60° Angle

1/4t	.156	1.10	.70	.40	.244	3.48	+
1/2t	.156	1.30	1.00	.30	.144	2.05	+
3/4t	.156	1.60	1.20	.40	.244	3.48	+
4/4t	.156	1.75	1.35	.30	.144	2.05	+
.05 a/l notch		DETECTED - CANNOT BE SIZED					
.5 a/l notch		DETECTED - CANNOT BE SIZED					

The average through-wall error for the 7" section with the 45° and 60° beaming angles = +2.33%t.

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3.44" Section Thickness, 45° Angle

A	B	C	D	E	F	G	H
1/4t	.094	.25	.20	.050	.044	1.28	-
1/2t	.094	.36	.35	.010	.084	2.44	-
3/4t	.094	.55	.50	.050	.044	1.28	-

.05 a/l notch
ASSIGNED VALUE = 2.0% of t
.5 a/l notch

3.44" Section Thickness, 60° Angle

A	B	C	D	E	F	G	H
1/4t	.094	.44	.50	.060	.034	1.00	-
1/2t	.094	.70	.70	-0-	.094	2.73	-
3/4t	.094	.89	.90	.010	.084	2.44	-

.05 a/l notch
ASSIGNED VALUE = 2.0% of t
.5 a/l notch

The average through-wall error for the 3.44" section with the 45° and 60° beaming angles = -2.79%t.

The sizing error band for the Limerick Unit #1 Preservice Manual Ultrasonic Examinations breaks down as follows:

Flaws with a through-wall dimension of .094" (2.73%t) in a 3.44" section thickness were undersized by an average of 2.79%t.

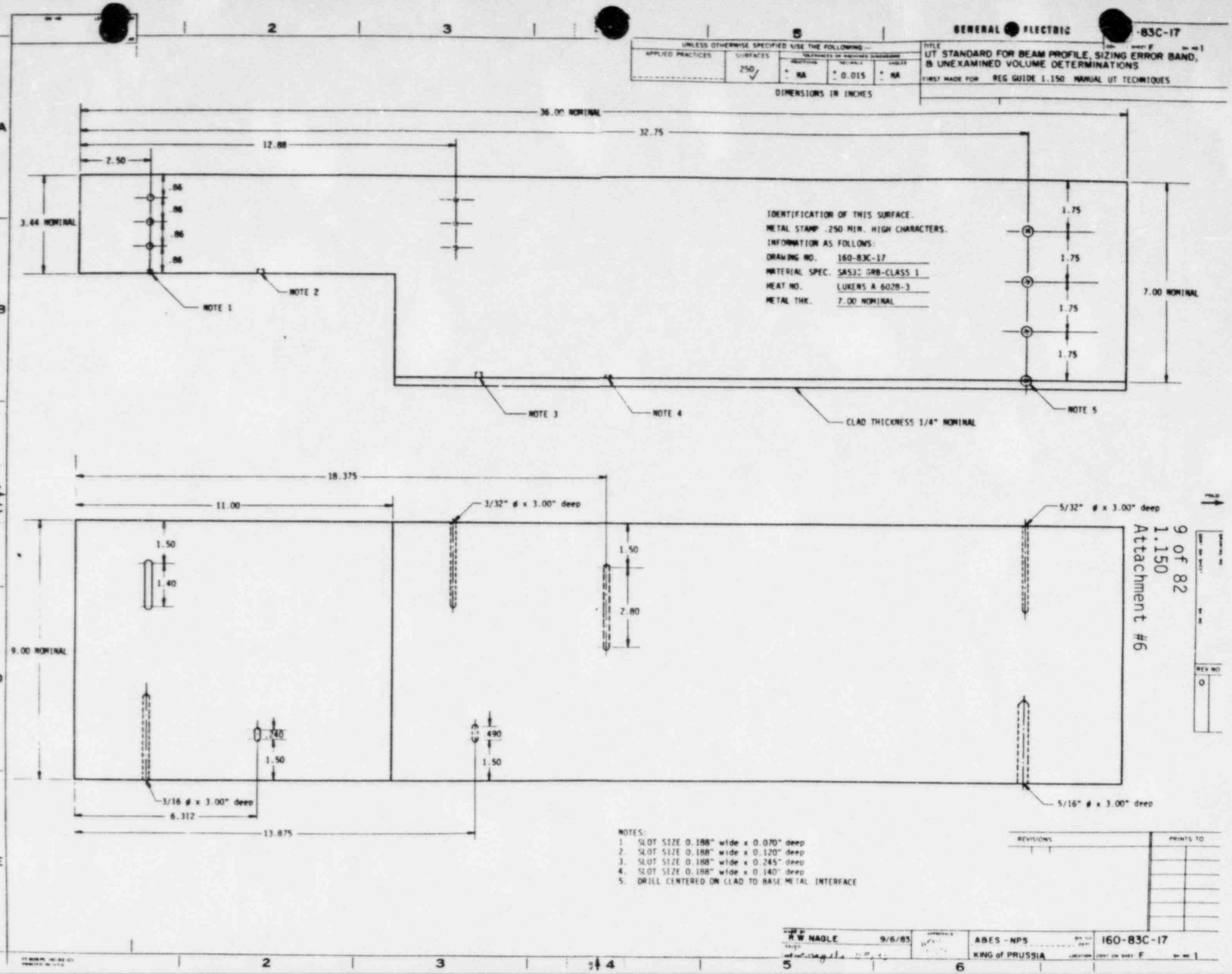
Flaws with a through-wall dimension of .156" (2.23%t) in a 7.00" section thickness were oversized by an average of 2.33%t.

The .05 a/l and .5 a/l notches, when corrected for beam spread, yielded negative values. They were assigned a value of 2.0%t.

The undersizing of the .094 holes is a common occurrence due to the small transducer movement between peak amplitude and 20% DAC points. As shown by the data for the .156 holes, as flaw size increases, there is a tendency to oversize the through-wall dimension.

Based on the data presented above, General Electric estimates the error band for flaw sizing using Procedure LIM-UT-5 to be plus or minus 2.56%t. No error band correction that decreased the apparent through-wall dimension of an indication was used. The 2.56%t sizing error band is considered by General Electric to be adequate for the initial evaluation of examination data.

The following pages contain a drawing of the Standard used to gather the data presented in this report as well as the calibration and examination data gathered from the Standard.


GENERAL ELECTRIC
160-83C-17
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING
APPLIED PRACTICES
SURFACES 250
± NA
± 0.015
± NA
DIMENSIONS IN INCHES
TITLE
UT STANDARD FOR BEAM PROFILE, SIZING ERROR BAND, & UNEXAMINED VOLUME DETERMINATIONS
FIRST MADE FOR REG GUIDE 1.150 MANUAL UT TECHNIQUES
36.00 NOMINAL
32.75
12.88
2.50
.86
.86
.86
.86
3.44 NOMINAL
NOTE 1
NOTE 2
NOTE 3
NOTE 4
NOTE 5
IDENTIFICATION OF THIS SURFACE.
METAL STAMP .250 MIN. HIGH CHARACTERS.
INFORMATION AS FOLLOWS:
DRAWING NO. 160-83C-17
MATERIAL SPEC. SA533 GRB-CLASS 1
HEAT NO. LUKENS A 6028-3
METAL THK. 7.00 NOMINAL
1.75
1.75
1.75
1.75
7.00 NOMINAL
CLAD THICKNESS 1/4" NOMINAL
18.375
11.00
3/32" ø x 3.00" deep
5/32" ø x 3.00" deep
1.50
1.40
1.50
2.80
9.00 NOMINAL
.240
1.50
.490
1.50
3/16 ø x 3.00" deep
5/16" ø x 3.00" deep
6.312
13.875
NOTES:
1. SLOT SIZE 0.188" wide x 0.070" deep
2. SLOT SIZE 0.188" wide x 0.120" deep
3. SLOT SIZE 0.188" wide x 0.245" deep
4. SLOT SIZE 0.188" wide x 0.140" deep
5. DRILL CENTERED ON CLAD TO BASE METAL INTERFACE
REVISIONS
PRINTS TO
REV NO
0
R W NAGLE 9/6/83
ABES - NPS
KING of PRUSSIA
160-83C-17

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1011

Site LIMERICK UNIT I ☑ Preoperational ☐ I.S.I.

Procedure No. LIM UT-5 Rev. REV. 2 Calib. Block No. 160-83C-17

Date 11-2-83 Couplant GLYCERINE Cal. Std. Temp. 71° °F

Examiner M. HENDRYX ASNT Level II

Recorder J. CONNER ASNT Level I

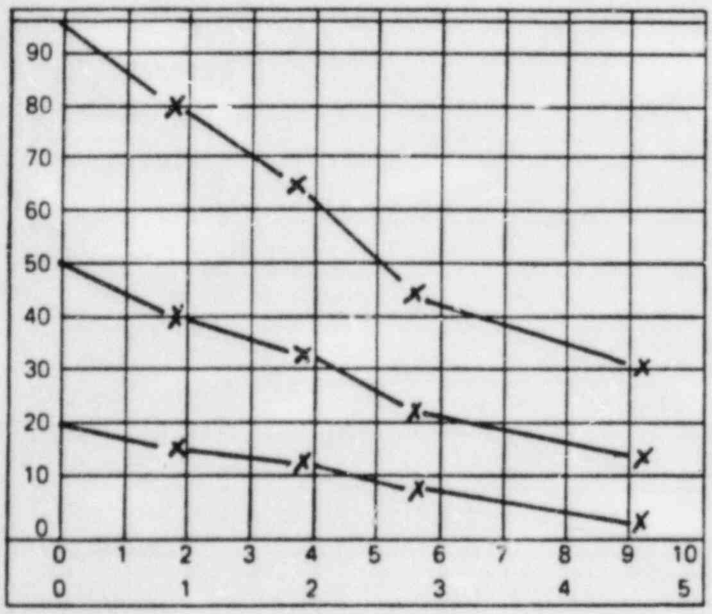
Equipment Data: Instrument Model No. SONIC MK-1 Shoe No. SST-3

Instrument Serial No. 00890 Cable No. C-1

Transducer Size .5" X 1.0" Frequency 2.25 MHz

Transducer Serial No. J08328 IIW-2 Beam Angle 45° °

DAC Curve: Range 0-5 ☐ 0-10 ☑ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	4.12	4.12
Delay	0.70	0.70
Scanning Gain	44db	44db
Evaluating Gain	38db	38db
Filter Position	Hi	Hi
Rep Rate	3K	3K
Damping	MiN	MiN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75"	1X	80%	1.8"	1.8	SDH
1/2	3.5"	1X	65%	3.7"	3.7	SDH
3/4	5.25"	1X	45%	5.4"	5.6	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 0930

Calibration Checks:

Time	Value	Last Data Sheet
1130	100%	1012

Final Check: 1130

wm

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45°_____ or 60°_____ 1011

Hole Depth	Trailing Ray 10% DAC W	Trailing Ray 10% DAC D or MP	Trailing Ray 20% DAC W	Trailing Ray 20% DAC D or MP	Trailing Ray 50% DAC W	Trailing Ray 50% DAC D or MP	100% DAC W	100% DAC D or MP	Leading Ray 50% DAC W	Leading Ray 50% DAC D or MP	Leading Ray 20% DAC W	Leading Ray 20% DAC D or MP	Leading Ray 10% DAC W	Leading Ray 10% DAC D or MP
1/4T														
1/2T														
3/4T														

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	32 "		

Control Linearity

80%FSH	−6db	38	(32−48)
80% "	−12db	18	(16−24)
40% "	+ 6db	81	(64−96)
20% "	+12db	78	(64−96)

Equipment Data For Linearity Checks

Code Block T 7"

Transducer Data:

Serial No. J08328

Beam Angle 45°

Size .5"X1.0" Freq 2.25 MHZ

Shoe No SSI-3 Cable No C-1

Check Made By:

MH

REMARKS

wm

Reviewed by: _______________ Level _______________

Exam Sheet No. 1012
Cal. Sheet No. 1011

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT I ☑ Preoperational ☐ I.S.I. Date 11-2-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

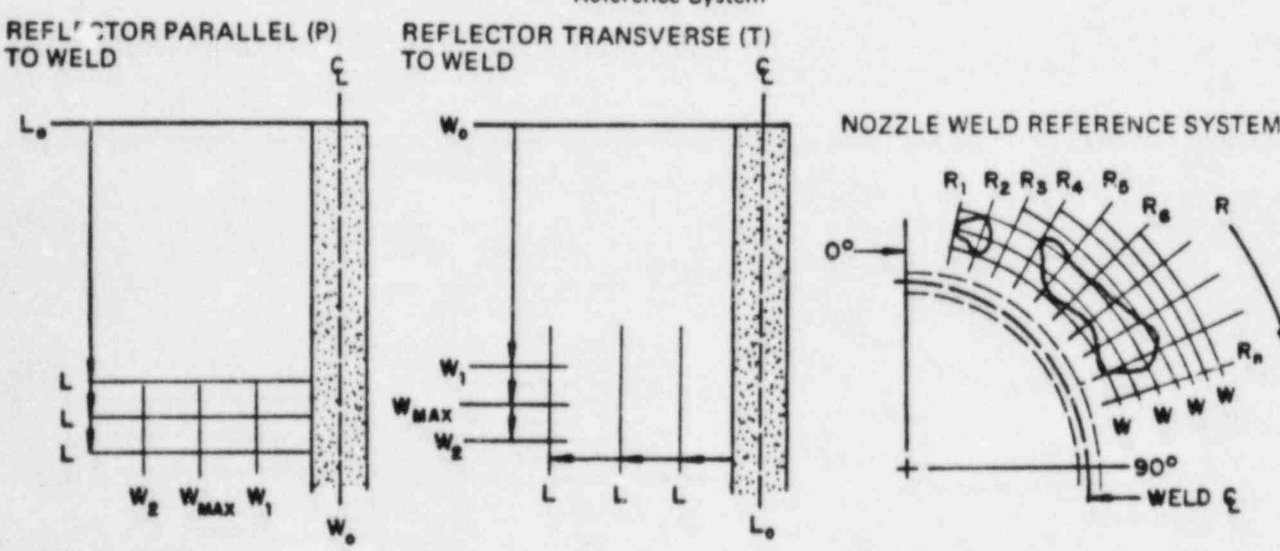
Procedure No. LIM UT-5 Revision REV. 2

Scan Sensitivity 44 db Evaluation Sensitivity 38 db

Couplant GLYCERINE Component Temperature 71° °F

L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
2.0	15%			7.0"					7.8			LONG	NOTCH
1.1	10%			7.8"					8.1			SHORT	NOTCH

Reference System



Reviewed by: wkm Level ______

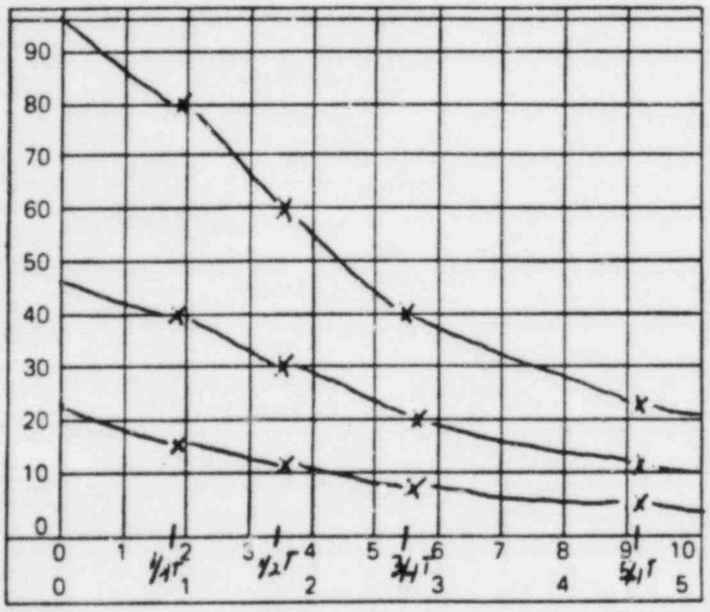
VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1061

Site LIMERICK UNIT 1 ☒ Preoperational ☐ I.S.I.
Procedure No. LIM UT-5 Rev. 2 Calib. Block No. 16C-83C-17
Date 11-26-83 Couplant GLYCERINE Cal. Std. Temp. 69 T-390 oF
Examiner M HENDRYX ASNT Level II
Recorder S DAIGREPONT ASNT Level I

Equipment Data: Instrument Model No. SONIC MK 1 Shoe No. SS1 3
Instrument Serial No. 780603 Cable No. C-1
Transducer Size .5 X 1.0 Frequency 2.25 MHz
Transducer Serial No. J08328 IIW-2 Beam Angle 45 °

DAC Curve: Range 0-5 ☐ 0-10 ☒ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	4.24	4.24
Delay	0.58	0.55
Scanning Gain	62	62
Evaluating Gain	56	56
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75	1X	80	1.8	1.8	SDH
1/2	3.5	1X	60	3.6	3.6	SDH
3/4	5.25	1X	40	5.4	5.5	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 1700

Calibration Checks:

Time	Value	Last Data Sheet
1800	100%	1062

Final Check: MH

WTM

1061

Angle Beam Spread @ 1X 45° X or 60° N/A

Hole Depth	Trailing Ray 10% DAC W	10% DAC D or MP	20% DAC W	20% DAC D or MP	50% DAC W	50% DAC D or MP	100% DAC W	100% DAC D or MP	Leading Ray 50% DAC W	50% DAC D or MP	20% DAC W	20% DAC D or MP	10% DAC W	10% DAC D or MP
1/4T	1.5	1.5	1.5	1.6	1.7	1.7	1.8	1.8	2.1	1.9	2.3	2.0	2.4	2.1
1/2T	N/A	N/A	3.1	3.3	3.3	3.4	3.7	3.6	4.1	3.4	4.4	4.1	N/A	N/A
3/4T	N/A	N/A	4.7	5.1	5.0	5.3	5.4	5.5	6.4	6.1	6.7	6.3	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	20	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	82	(64–96)

Equipment Data For Linearity Checks

Code Block T 7"

Transducer Data:

Serial No. JCB328

Beam Angle 45

Size .5X1.0 Freq 2.25

Shoe No SS1-3 Cable No C-1

Check Made By:

MH

REMARKS

9.0 = 12"

WFm

Reviewed by: ____________ Level ____________

Exam Sheet No. 1062
Cal. Sheet No. 1061

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☒ Preoperational ☐ I.S.I. Date 11-26-83

Examiner M HENDRYX Level II Recorder S. DAIGREPONT Level I

Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° X 60° N/A

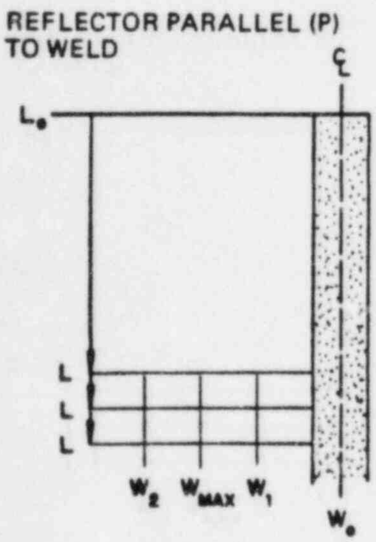
Procedure No. LIM UT-5 Revision 2

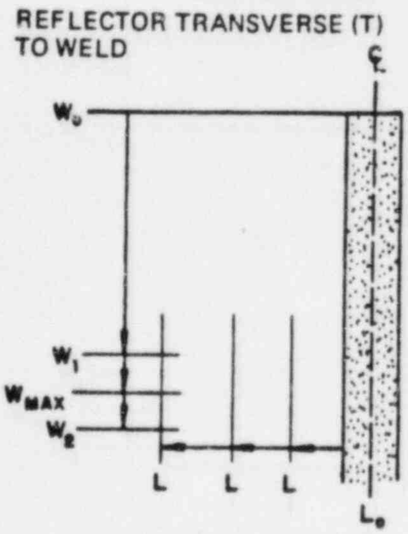
Scan Sensitivity 62 Evaluation Sensitivity 56

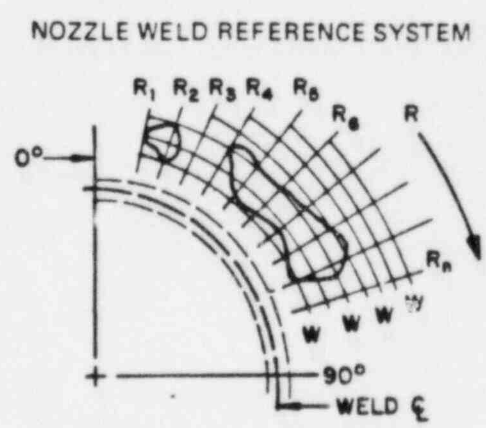
Couplant GLYCERINE Component Temperature 69 °F

L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
2.3	2FSH			8.2					7.8			LONG NOTCH	
1.7	3FSH			7.7					7.9			SHORT NOTCH	

Reference System







Reviewed by: WFM Level

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1063

Site LIMERICK ☒ Preoperational ☐ I.S.I.

Procedure No. LIM-UT-5 Rev. 2 Calib. Block No. 160-83C-17

Date 11-26-83 Couplant GLYCERINE Cal. Std. Temp. T-390 69°F

Examiner M. HENDRYX ASNT Level II

Recorder S. DAIGREPONT ASNT Level I

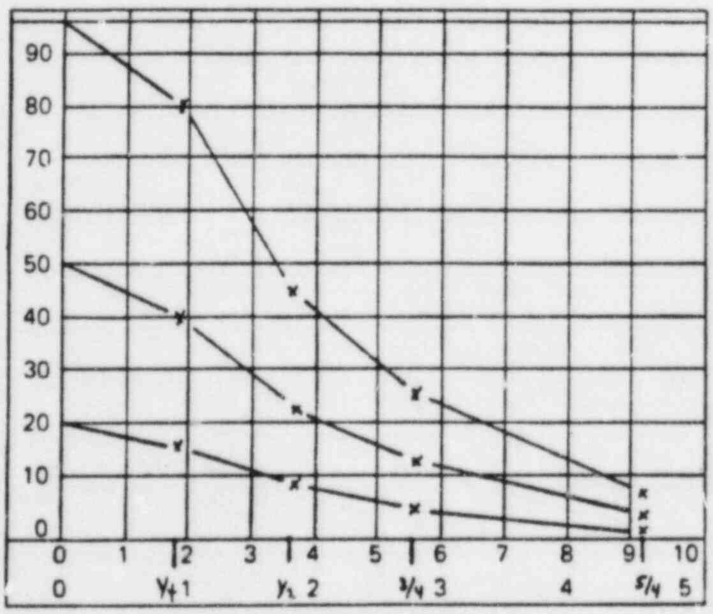
Equipment Data: Instrument Model No. USL-38 Shoe No. SS1-3

Instrument Serial No. 211009 Cable No. C-1

Transducer Size 0.5" x 1.0" Frequency 2.25 MHz

Transducer Serial No. J08328 IIW-2 Beam Angle 45°

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	7.24	7.24
Delay	6.53	6.53
Scanning Gain	44 dB.	44 dB.
Evaluating Gain	38 dB.	38 dB
Filter Position	N/A	N/A
Rep Rate	N/A	N/A
Damping	S.F.D.	S.F.D.
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	DIV. ~~MP Inch~~	SDH or FBH
1/4	1.75	1X	80	1.8	1.8	SDH
1/2	3.50	1X	45	3.7	3.7	SDH
3/4	5.25	1X	25	5.5	5.6	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 1810

Calibration Checks:

Time	Value	Last Data Sheet
1900	100 %	1065

Final Check: ____________

WEM

Angle Beam Spread @ 1X 45° X or 60° ____

1C63

Hole Depth	Trailing Ray								Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~
1/4T	1.5	1.5	1.5	1.6	1.7	1.7	1.8	1.8	2.1	1.9	2.3	2.0	2.4	2.1
1/2T	N/A	N/A	3.1	3.3	3.3	3.4	3.7	3.6	4.1	3.9	4.4	4.1	N/A	N/A
3/4T	N/A	N/A	4.7	5.1	5.0	5.3	5.4	5.5	6.4	6.1	6.7	6.3	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	11 "
60% "	30 "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	20	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	80	(64–96)

Equipment Data For Linearity Checks

Code Block T 7.00"

Transducer Data:

Serial No. J08328

Beam Angle 45°

Size 0.5" x 1.0" Freq 2.25 MHz

Shoe No SS1-3 Cable No C-1

Check Made By:

M. HENDRYX

REMARKS

5/4 T @ 9.2 DIVISIONS @ 8 % F.S.H.

4 dB. DIFFERENCE THRU CLAD INTERFACE BETWEEN 3/4 T + 5/4 T.

wtm

Reviewed by: ____________________ Level ____________________

Exam Sheet No. 1064
Cal. Sheet No. 1063

VESSEL EXAMINATION DATA SHEET

Site LIMERICK ☒ Preoperational ☐ I.S.I. Date 11-26-83

Examiner M. HENDRYX Level II Recorder S. DAIGREPONT Level I

Weld Seam ID No. N/A Beam Angle 0° ____ 45° X 60° ____

Procedure No. LIM-UT-5 Revision 2

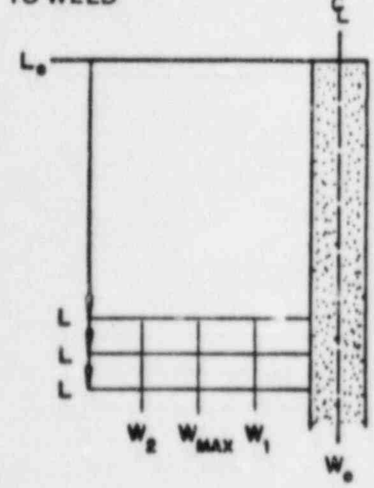
Scan Sensitivity 44 dB. Evaluation Sensitivity 38 dB.

Couplant GLYCERINE Component Temperature 69°F

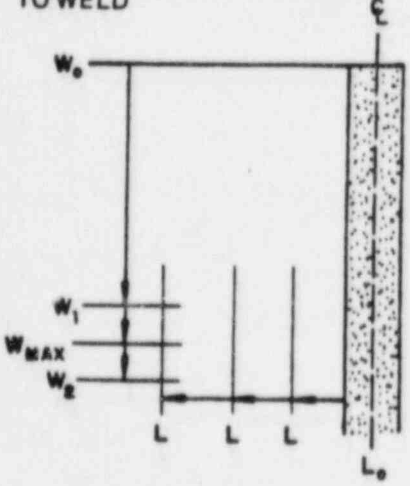
L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	DIV ~~MP~~ Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
2.0	4% F.S.H.			9.5					8.3			LONG NOTCH	
1.7	4% F.S.H.			7.5					8.4			SHORT NOTCH	

Reference System

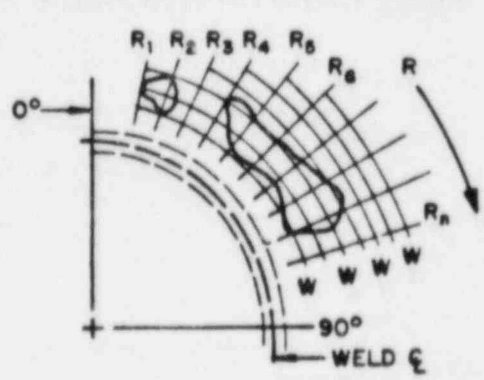
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: wfm Level ____

GENERAL ELECTRIC

Exam Sheet No. 1065
Cal. Sheet No. 1063

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT-I ☒ Preoperational ☐ I.S.I. Date 11-26-83

Examiner M. HENDRYX Level II Recorders DAIGREMONT Level I

Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° X 60° N/A

Procedure No. LIM-UT-5 Revision 2

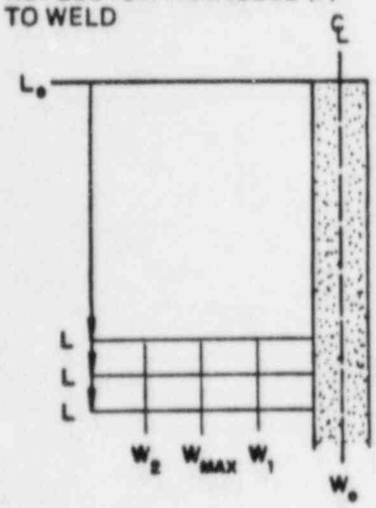
Scan Sensitivity 44 Evaluation Sensitivity 38

Couplant GLYCERINE Component Temperature 69° °F

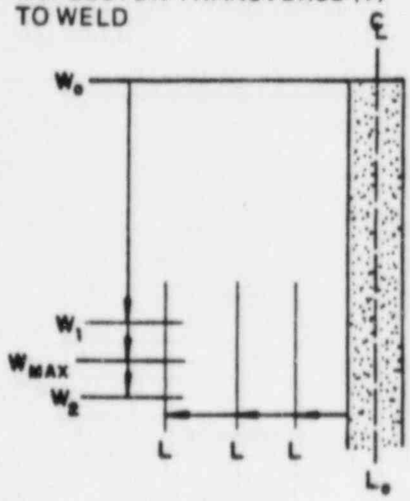
L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	D.U. ~~MP~~ Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
2.0"	FSH 4%			9.5"					8.3			LONG NOTCH	
1.7"	FSH 4%			7.5"					8.4			SHORT NOTCH	

Reference System

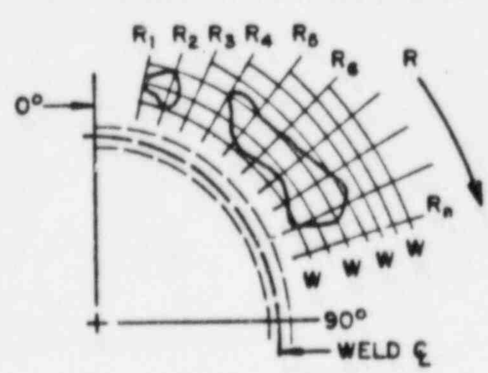
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WM Level

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 2000

Site LIMERICK UNIT ☑ Preoperational ☐ I.S.I.

Procedure No. LIM UT 5 Rev. 2 Calib. Block No. 160 - 83C - 17

Date 10-27-83 Couplant GLYCERINE Cal. Std. Temp. 68° °F

Examiner BOB HOUSE ASNT Level II

Recorder STEVEN DAIGREPONT ASNT Level I

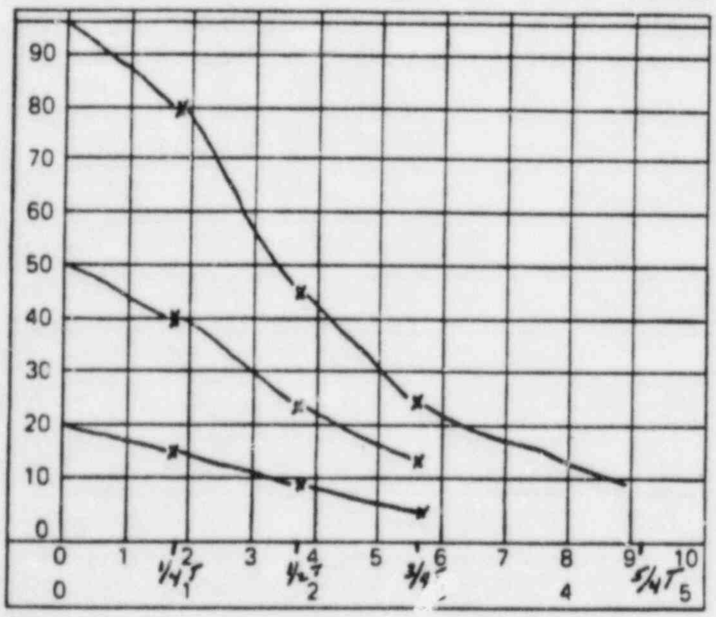
Equipment Data: Instrument Model No. USL-38 Shoe No. SSI-9

Instrument Serial No. 211009 Cable No. C-2

Transducer Size .5" X 1.0" Frequency 2.25 MHz

Transducer Serial No. J08326 IIW-2 Beam Angle 45° °

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	7.52	7.52
Delay	6.79	6.79
Scanning Gain	34	34
Evaluating Gain	28	28
Filter Position	N/A	N/A
Rep Rate	N/A	N/A
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75	1X	80%	1.8"	1.8	SDH
1/2	3.5	1X	45%	3.7"	3.7	SDH
3/4	5.25	1X	25%	5.3"	5.6	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 0830

Calibration Checks:

Time	Value	Last Data Sheet
01110	100%	2001

Final Check: 01110

wem

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° ✓ or 60° ____

2OCC

Hole Depth	Trailing Ray 10% DAC W	10% DAC D or MP	20% DAC W	20% DAC D or MP	50% DAC W	50% DAC D or MP	100% DAC W	100% DAC D or MP	Leading Ray 50% DAC W	50% DAC D or MP	20% DAC W	20% DAC D or MP	10% DAC W	10% DAC D or MP
1/4T	1.1"	1.5	1.3"	1.6	1.5"	1.7	1.8"	1.8	2.1"	1.9	2.3"	2.0	2.5"	2.1
1/2T	2.9"	3.3	3.2"	3.4	3.4"	3.6	3.5"	3.7	4.0"	3.9	4.6"	4.3	N/A	N/A
3/4T	N/A	N/A	4.7"	5.2	4.9"	5.3	5.5"	5.6	6.3"	6.1	7.0"	6.5	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	~~30~~ 40 50	(32–48)
80% "	−12db	~~40~~ 20 50	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	81	(64–96)

Equipment Data For Linearity Checks

Code Block T 7"

Transducer Data:

Serial No. J08326

Beam Angle 45°

Size .5" X 1.0" Freq 2.25MHz

Shoe No SSI-9 Cable No C-2

Check Made By:

REMARKS

WCM

Reviewed by: ____ Level ____

Exam Sheet No. 2001
Cal. Sheet No. 2000

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT-I ☒ Preoperational ☐ I.S.I. Date 10-27-83

Examiner B HOUSE Level II Recorders DAIGREPONT Level I

Weld Seam ID No. ______ Beam Angle 0° N/A 45° X 60° N/A

Procedure No. LIM-UT-5 Revision 2

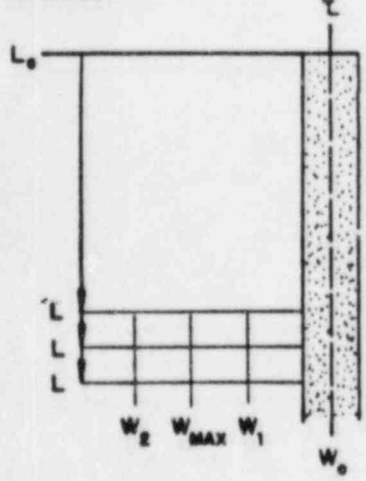
Scan Sensitivity 34 Evaluation Sensitivity 28

Couplant GLYCERINE Component Temperature 68° °F

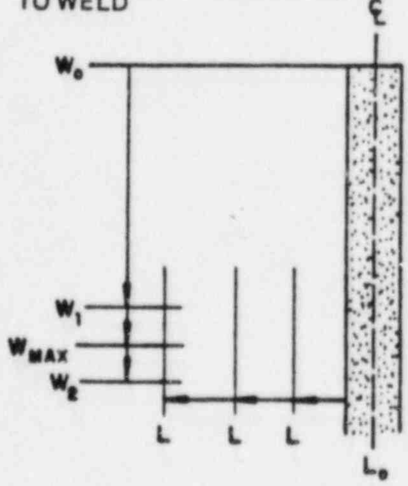
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.5"	50%	1.5"		1.8"		2.0"	1.8		1.9		2.0		
	2.0"	50%	1.6"		1.8"		2.0"	1.8		1.9		2.0		
1/2T	1.1"	50%	3.4"		3.6"		4.4"	3.6		3.7		4.2		
	2.5"	50%	3.4"		3.6"		4.4"	3.6		3.7		4.2		
3/4T	1.1"	50%	4.9"		5.4"		6.4"	5.4		5.7		6.2		
	2.3"	50%	4.9"		5.4"		6.4"	5.4		5.7		6.2		

Reference System

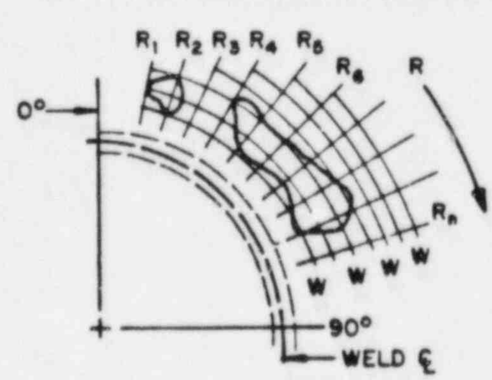
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WAM Level ______

GENERAL ELECTRIC

Exam Sheet No. 2001
Cal. Sheet No. 2000

VESSEL EXAMINATION DATA SHEET

Site LIMERICK ☒ Preoperational ☐ I.S.I. Date 10-27-83

Examiner BOB HOUSE Level II Recorder STEVEN DRIGREAN Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° X 60° ______

Procedure No. LIM UT 5 Revision 2

Scan Sensitivity 34 dB Evaluation Sensitivity 28 dB

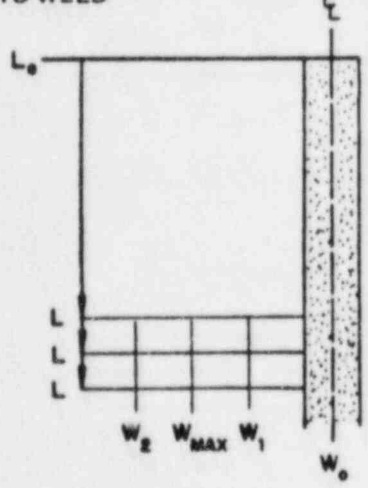
Couplant GLYCERINE Component Temperature 68°F °F

1T

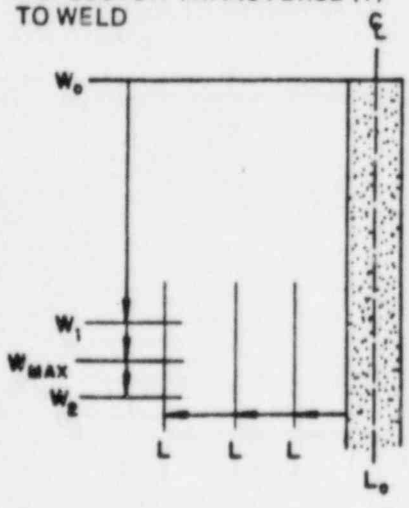
L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1.9"	75%		6.9"	7.4"	8.3"			7.4	7.9	8.2	~~8.2~~	SD-10-27	
2.4"	75%		6.8"	7.4"	8.3"			7.4	7.8	8.2	~~8.2~~	SD-10-27	

Reference System

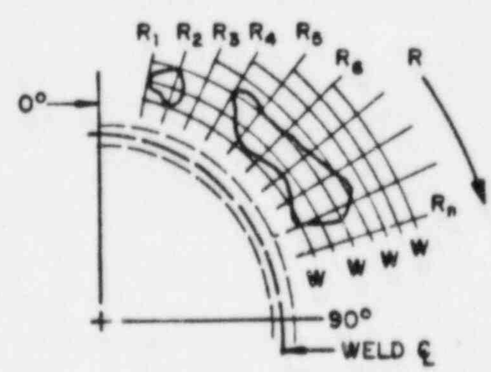
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WFM Level ______

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1002

Site LIMERICK UNIT 1

☑ Preoperational ☐ I.S.I.

Procedure No. LIM UT-5 Rev. REV. 2

Calib. Block No. 160-83C-17

Date 10-25-83 Couplant GLYCERINE

Cal. Std. Temp. 60° oF

Examiner M. HENDRYX

ASNT Level II

Recorder J. CONNER

ASNT Level I

Equipment Data:

Instrument Model No. SONIC

Shoe No. SSI-3

Instrument Serial No. 00890

Cable No. C1

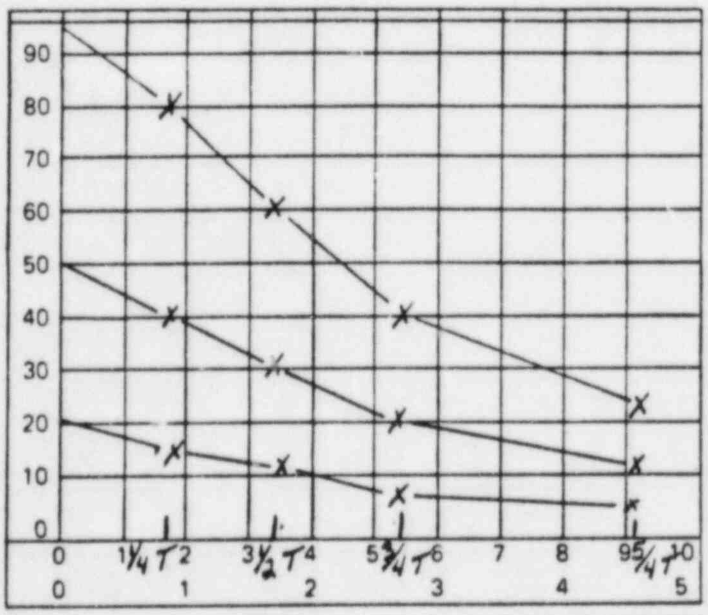
Transducer Size .5" X 1.0"

Frequency 2.25 MHz

Transducer Serial No. J08328

IIW-2 Beam Angle 45 °

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	4.24	4.24
Delay	0.58	0.58
Scanning Gain	45db	45db
Evaluating Gain	39db	39db
Filter Position	Hi	Hi
Rep Rate	3K	3K
Damping	MIN	MIN
Reject	Off	Off

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75	1X	80%	1.8	1.8	SDH
1/2	3.5	1X	60%	3.6	3.6	SDH
3/4	5.25	1X	40%	5.4	5.5	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 0900

Calibration Checks:

Time	Value	Last Data Sheet
1130	100%	
1300	100%	
1430	100%	1004

Final Check: 1430 100%

wm

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° ✓ or 60° ____

1002

Hole Depth	Trailing Ray 10% DAC W	Trailing Ray 10% DAC D or MP	Trailing Ray 20% DAC W	Trailing Ray 20% DAC D or MP	Trailing Ray 50% DAC W	Trailing Ray 50% DAC D or MP	100% DAC W	100% DAC D or MP	Leading Ray 50% DAC W	Leading Ray 50% DAC D or MP	Leading Ray 20% DAC W	Leading Ray 20% DAC D or MP	Leading Ray 10% DAC W	Leading Ray 10% DAC D or MP
1/4T	1.5"	1.5	1.5"	1.6	1.7"	1.7	1.8"	1.8	2.1"	1.9	2.3"	2.0	2.4"	2.1
1/2T	N/A	N/A	3.1"	3.3	3.3"	3.4	3.7"	3.6	4.1"	3.9	4.4"	4.1	N/A	N/A
3/4T	N/A	N/A	4.7"	5.1	5.0"	5.3	5.4"	5.5	6.4"	6.1	6.7"	6.3	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	20	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	82	(64–96)

Equipment Data For Linearity Checks

Code Block T 7" "

Transducer Data:

Serial No. T08328

Beam Angle 45°

Size .5"X1.0" Freq 2.25MHZ

Shoe No SSI-3 Cable No C1

Check Made By:

MH

REMARKS

W-MEASUREMENT TAKEN FROM ℄ OF HOLE.

L-MEASUREMENT TAKEN FROM SIDE OF BLOCK.

WFM

Reviewed by: E. O. [signature] Level III

Exam Sheet No. 1003
Cal. Sheet No. 1002

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 10-25-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

Procedure No. LIM UT 5 Revision REV 2

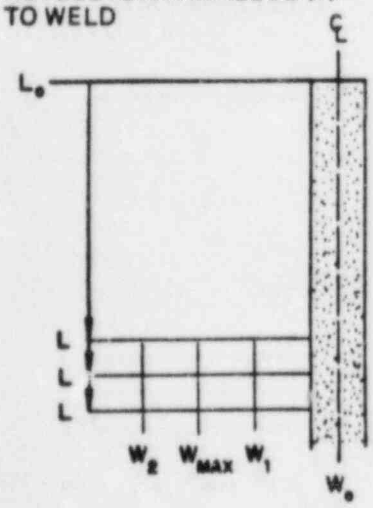
Scan Sensitivity 45 db Evaluation Sensitivity 39db

Couplant GLYCERINE Component Temperature 60° °F

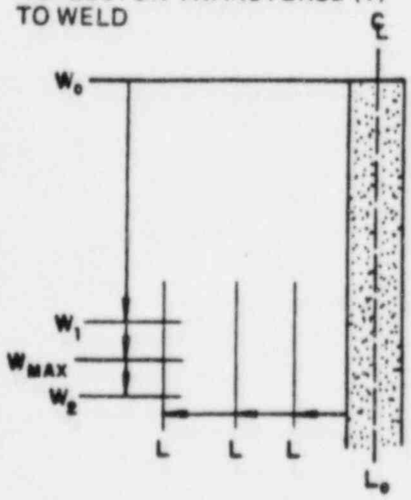
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4 T	1.1"	50%	1.6"		1.8"		2.1"	1.8		1.9		2.0		
HOLE	1.8"	50%	1.6"		1.8"		2.1"	1.8		1.9		2.0		
1/2 T	.8"	50%	3.3"		3.7"		4.4"	3.5		3.7		4.1		
HOLE	1.9"	50%	3.3"		3.6"		4.3"	3.5		3.7		4.1		
3/4 T	1.1"	75%	4.7"	5.1"	5.3"	6.2"	6.4"	5.2	5.4	5.6	6.1	6.3		
HOLE	1.6"	75%	4.8"	5.0"	5.3"	6.2"	6.4"	5.3	5.4	5.6	6.1	6.3		

Reference System

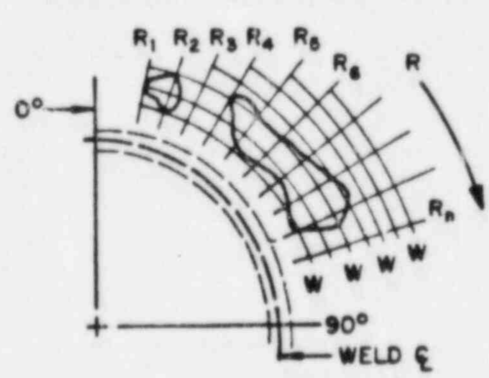
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WFM Level ______

SHT. 2 OF 2

Exam Sheet No. 1003
Cal. Sheet No. 1002

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 10-25-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

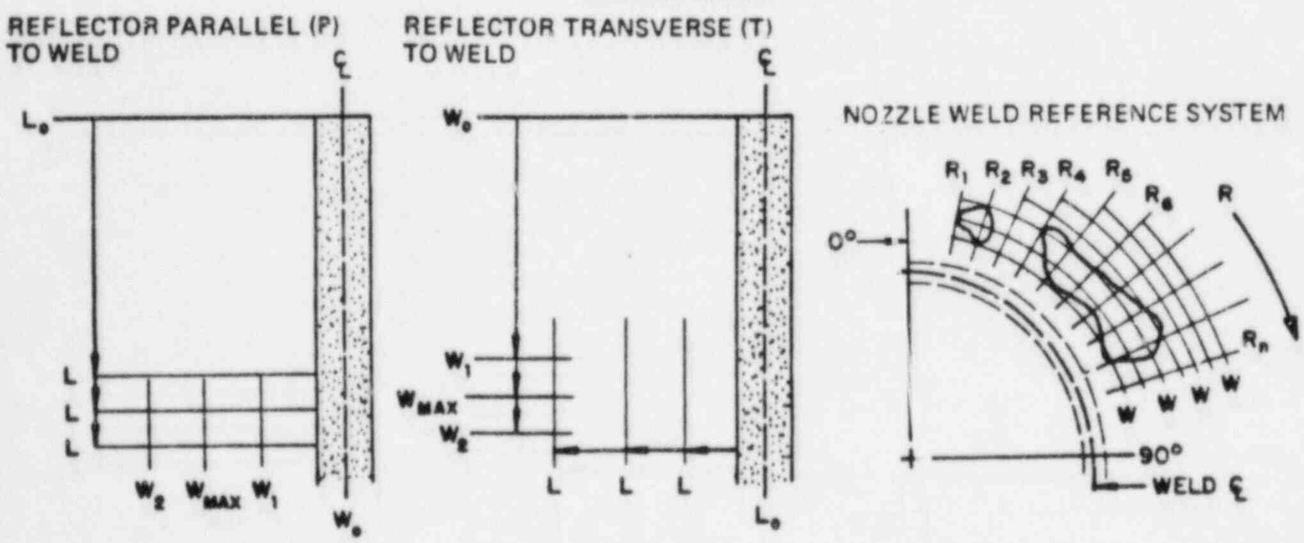
Procedure No. LIM UT 5 Revision REV. 2

Scan Sensitivity 45 db Evaluation Sensitivity 39 db

Couplant GLYCERINE Component Temperature 60° °F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1T	1.1"	100%	6.2"	6.6"	7.1"	8.1"	8.5"	6.9	7.2	7.5	8.0	8.2		
	2.3"	100%	6.3"	6.7"	7.1"	8.0"	8.3"	7.0	7.2	7.5	7.9	8.1		

Reference System



Reviewed by: WFM Level ______

GENERAL ELECTRIC

Exam Sheet No. 1004
Cal. Sheet No. ~~1003~~ 1002
glr 11/4/83

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 10-25-83

Examiner M HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

Procedure No LIM UT-5 Revision REV 2

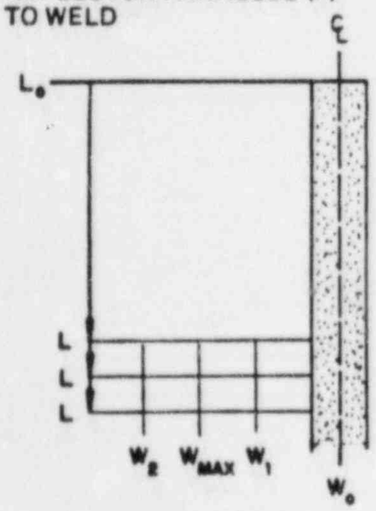
Scan Sensitivity 45 db Evaluation Sensitivity 39 db

Couplant GLYCERINE Component Temperature 60° °F

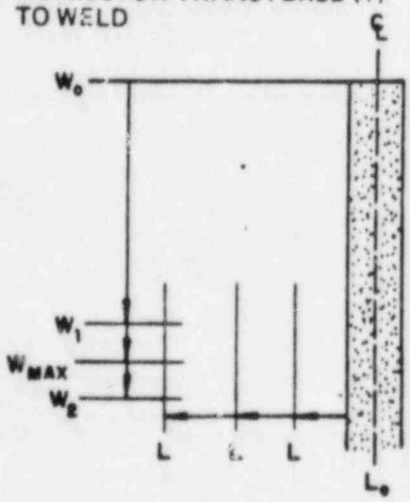
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
¼ T	.9"	50%	1.6"		1.8"		2.1"	1.7		1.9		2.0		
HOLE	1.6"	50%	1.6"		1.8"		2.1"	1.7		1.9		2.0		
½ T	.9"	50%	3.3"		3.7"		4.4"	3.5		3.8		4.1		
[illegible]E	1.5"	50%	3.3"		3.7"		4.4"	3.5		3.8		4.1		
¾ T	.9"	75%	4.8"	5.1"	5.4"	6.1"	6.6"	5.3	5.4	5.6	6.0	6.3		
HOLE	1.4"	75%	4.8"	5.1"	5.4"	6.1"	6.5"	5.3	5.4	5.6	6.0	6.3		

Reference System

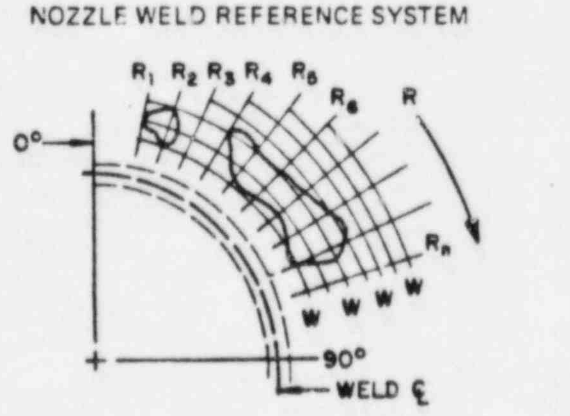
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: wtm Level ______

GENERAL ELECTRIC

Exam Sheet No. 1004
Cal. Sheet No. 1002

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 10-25-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

Procedure No. LIM UT 5 Revision REV. 2

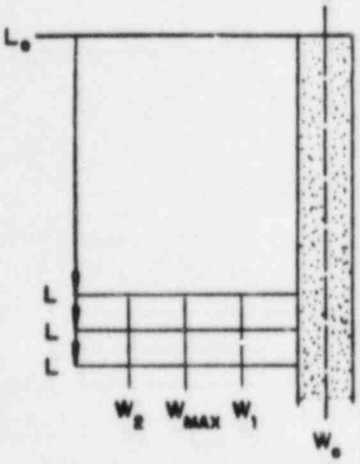
Scan Sensitivity 45db Evaluation Sensitivity 39 db

Couplant GLYCERINE Component Temperature 60° °F

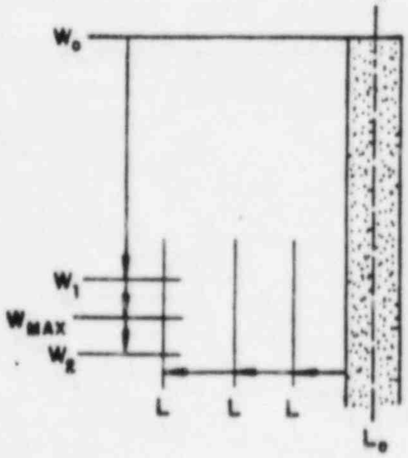
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1T	2.3"	100%	6.4"	6.7"	7.3"	8.0"	8.1"	7.0	7.2	7.5	7.9	8.1		
	1.2"	100%	6.4"	6.8"	7.3"	8.1"	8.3"	7.0	7.2	7.5	7.9	8.1		

Reference System

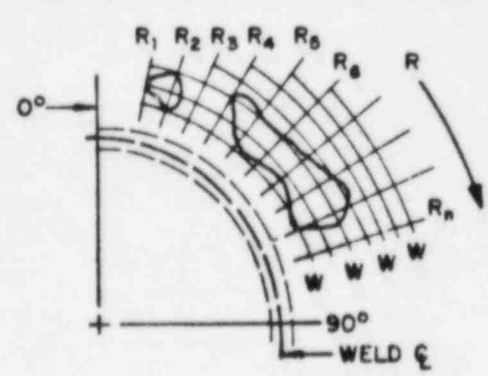
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WCM Level ______

GENERAL ELECTRIC

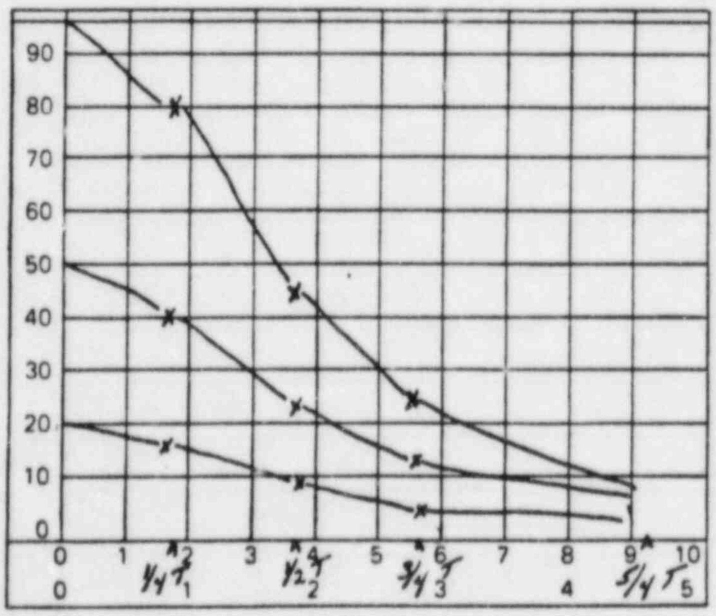
VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 2002

Site LIMERICK | ☒ Preoperational ☐ I.S.I.
Procedure No. LIM UT 5 Rev. 2 | Calib. Block No. 160-83C-17
Date 10-27-83 Couplant GLYCERINE | Cal. Std. Temp. 68° °F
Examiner BOB HOUSE | ASNT Level II
Recorder STEVEN DAIGREPONT | ASNT Level I

Equipment Data:
Instrument Model No. USL-38 | Shoe No. SSI-9
Instrument Serial No. 211009 | Cable No. C-2
Transducer Size .5" X 1.0" | Frequency 2.25 MHz
Transducer Serial No. J08326 | IIW-2 Beam Angle 45° °

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☒



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	7.52	7.52
Delay	6.79	6.79
Scanning Gain	34	34
Evaluating Gain	28	28
Filter Position	N/A	N/A
Rep Rate	N/A	N/A
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75	1X	80%	1.8"	1.8	SDH
1/2	3.5	1X	45%	3.7"	3.7	SDH
3/4	5.25	1X	25%	5.6"	5.6	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 1300

Calibration Checks:

Time	Value	Last Data Sheet
1550	100%	2003

Final Check: 1550

wm

Angle Beam Spread @ 1X 45° ✓ or 60° ____

ZCCZ

Hole Depth	Trailing Ray 10% DAC W	D or MP	20% DAC W	D or MP	50% DAC W	D or MP	100% DAC W	D or MP	Leading Ray 50% DAC W	D or MP	20% DAC W	D or MP	10% DAC W	D or MP
1/4T	1.2"	1.5	1.4"	1.6	1.6"	1.7	1.8"	1.8	2.1"	1.9	2.4"	2.0	2.6"	2.1
1/2T	2.9"	3.3	3.2"	3.4	3.4"	3.6	3.6"	3.7	4.1"	3.9	4.7"	4.3	N/A	N/A
3/4T	N/A	N/A	4.7"	5.2	4.9"	5.3	5.5"	5.6	6.3"	6.1	7.0"	6.5	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	11 "
60% "	30 "		

Control Linearity

80%FSH	−6db	~~80~~ 40 50 10-27	(32–48)
80% "	−12db	~~40~~ 20 50-10-27	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	82	(64–96)

Equipment Data For Linearity Checks

Code Block T 7"

Transducer Data:

Serial No. 211009

Beam Angle 45°

Size .5"X1.0" Freq 2.25MHz

Shoe No SSI-9 Cable No C-2

Check Made By: [signature]

REMARKS

W measurements taken from centerline of hole
L measurements takens from side of block

WFM

Reviewed by: ____________________ Level ____________

Exam Sheet No. 2003
Cal. Sheet No. 2002

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT-I ☒ Preoperational ☐ I.S.I. Date 10-27-83

Examiner B HOUSE Level II Recorders DAIGREPONT Level I

Weld Seam ID No. ______ Beam Angle 0° N/A 45° X 60° N/A

Procedure No. LIM-UT-5 Revision 2

Scan Sensitivity 34 Evaluation Sensitivity 28

Couplant GLYCERINE Component Temperature 68 °F

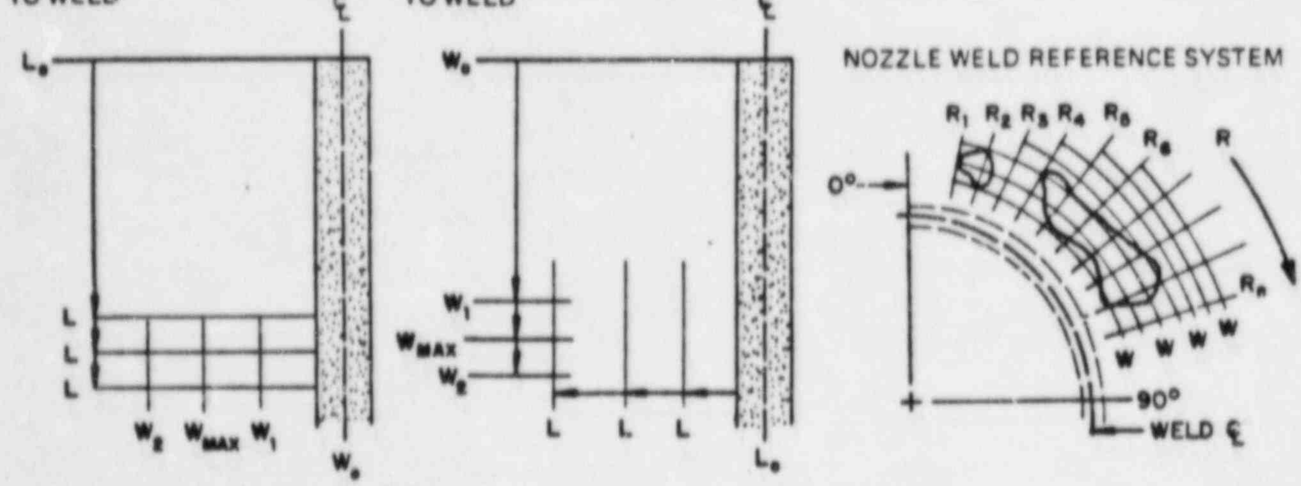
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.1"	60%	1.6"		1.8"		2.1"	1.8		1.9		2.0		
	2.0"	50%	1.6"		1.8"		2.3"	1.8		1.9		2.1		
1/2T	1.0"	50%	3.4"		3.6"		4.3"	3.6		3.7		4.2		
	2.4"	50%	3.4"		3.7"		4.4"	3.6		3.7		4.2		
3/4T	.9"	50%	4.9"		5.4"		6.3"	5.4		5.6		6.1		
	2.7"	50%	4.9"		5.4"		6.4"	5.4		5.6		6.2		

Reference System

REFLECTOR PARALLEL (P) TO WELD

REFLECTOR TRANSVERSE (T) TO WELD

NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WCM Level ______

Exam Sheet No. 2003
Cal. Sheet No. 2002

VESSEL EXAMINATION DATA SHEET

Site LIMERICK
☑ Preoperational ☐ I.S.I. Date 10-27-83

Examiner BOB HOUSE
Level II Recorder STEVEN DAIGREPONT Level I

Weld Seam ID No. ______
Beam Angle 0° ____ 45° ✓ 60° ____

Procedure No. LIM UT 5
Revision 2

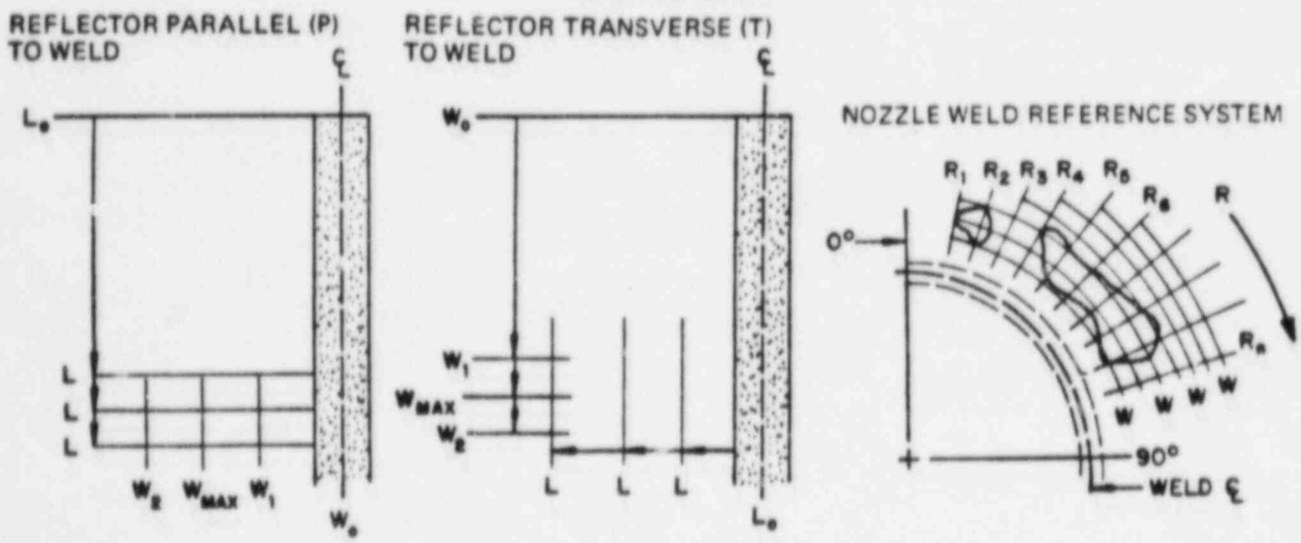
Scan Sensitivity 34 dB
Evaluation Sensitivity 28 dB

Couplant GLYCERINE
Component Temperature 68°F °F

1T

L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1.1"	75%		6.8"	7.4"	8.2"			7.4	7.8	8.1	~~8.2~~	SD 10-27	
2.5"	75%		6.9"	7.5"	8.1"			7.3	7.7	8.0	~~8.2~~	SD 10-27	

Reference System



Reviewed by: WEM Level ______

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 2020

Site LIMERICK UNIT-I ☑ Preoperational ☐ I.S.I.

Procedure No. LIM-UT-5 Rev. 2 Calib. Block No. 160-83C-17

Date 11-10-83 Couplant GLYCERINE Cal. Std. Temp. 70° °F

Examiner B. HOUSE ASNT Level II

Recorder B. DIETRICK ASNT Level I

Equipment Data:

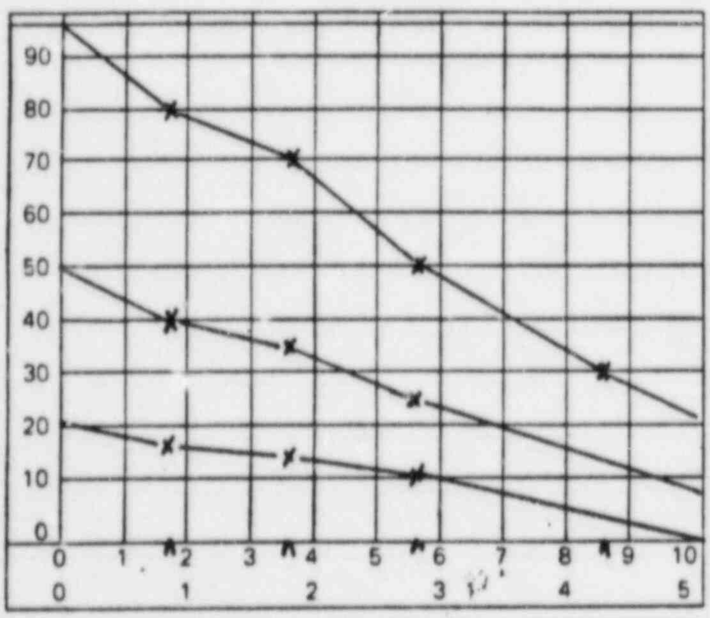
Instrument Model No. SONIC MK-I Shoe No. SSI-1

Instrument Serial No. 08212E Cable No. C-2

Transducer Size .5" X 1.0" Frequency 2.25 MHz

Transducer Serial No. J08326 IIW-2 Beam Angle 60 °

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☑



Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75"	1X	80%	3.2"	1.8	SDH
1/2	3.50"	1X	70%	6.4"	3.6	SDH
3/4	5.25"	1X	50%	9.7"	5.6	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	6.20	6.20
Delay	1.60	1.60
Scanning Gain	40	40
Evaluating Gain	34	34
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Initial Calibration Time 0930

Calibration Checks:

Time	Value	Last Data Sheet
1125	100%	2021

Final Check: ______

WCM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° N/A or 60° ✓

2020

Hole Depth	Trailing Ray								Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T	2.4"	1.2	2.5"	1.3	2.7"	1.4	3.2"	3.2	4.0"	2.0	4.2"	2.1	4.5"	2.3
1/2T	4.9"	2.9	5.0"	3.0	5.8"	3.3	6.4"	3.6	7.9"	4.4	8.3"	4.5	8.4"	4.6
3/4T	7.5"	4.6	7.6"	4.7	8.1"	4.9	9.6"	5.7	8.1"	6.5	11.8"	6.8	12.6"	7.2

Amplitude Linearity Check

100%FSH	50 %FSH	50%FSH	25 %FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	18	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	75	(64–96)

Equipment Data For Linearity Checks

Code Block T 7"

Transducer Data:

Serial No. J08326

Beam Angle 60°

Size .5" X 1.0" Freq 2.25

Shoe No SSJ-1 Cable No C-2

Check Made By: ____________

REMARKS

WEM

Reviewed by: ____________ Level ____________

Exam Sheet No. 2021
Cal. Sheet No. 2020

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I | ■ Preoperational ☐ I.S.I. Date 11-10-83

Examiner R. Hance | Level II Recorder B. Garland Level I

Weld Seam ID No. 160-83C-17 | Beam Angle 0° N/A 45° N/A 60° X

Procedure No. Lim UT-5 | Revision 2

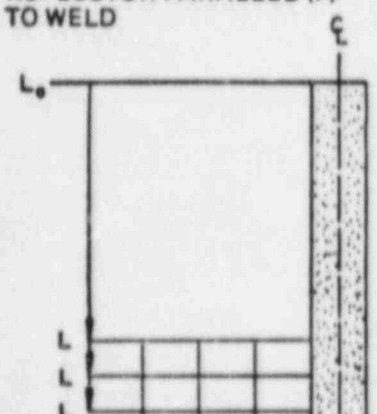
Scan Sensitivity 40 | Evaluation Sensitivity 34

Couplant GLYCERINE | Component Temperature 70 °F

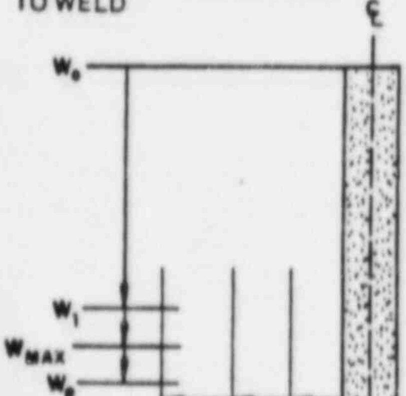
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L-M	1.8°	20%			12.7					7.8				
LM	22°	10%			12.4					7.6				

Reference System

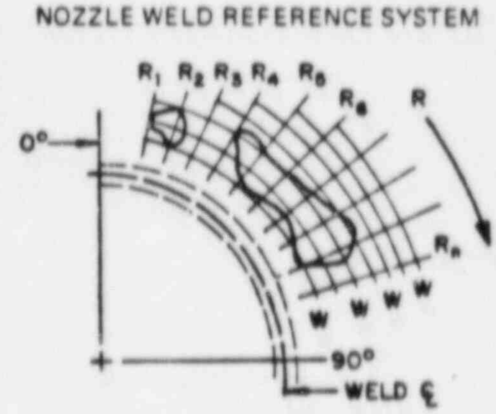
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WEM Level

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1059

Site LIMERICK UNIT-I ☒ Preoperational ☐ I.S.I.

Procedure No. LIM-UT-5 Rev. 2

Calib. Block No. 160-836-17

Date 11-26-83 Couplant GLYCERINE

Cal. Std. Temp. 69° (T-390) °F

Examiner M. HENDRYX ASNT Level II

Recorder S. DAIGREPONT ASNT Level I

Equipment Data:

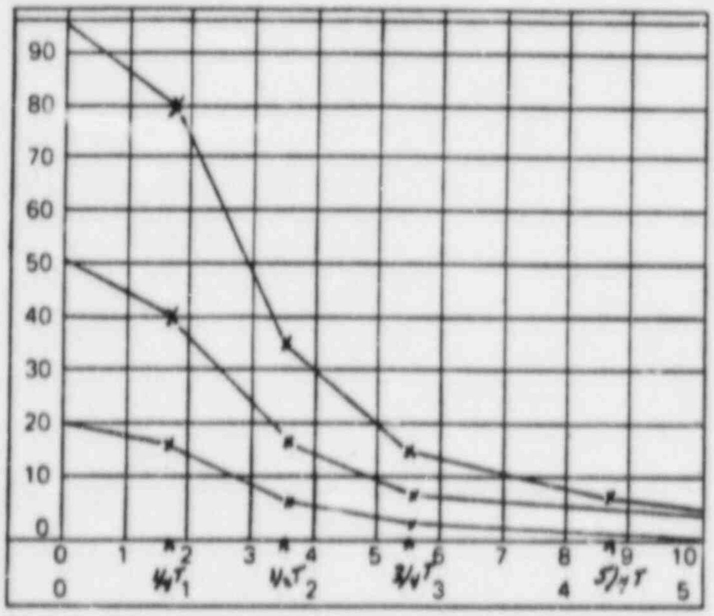
Instrument Model No. SONIC MK-I Shoe No. SSI-2

Instrument Serial No. 780603 Cable No. C-1

Transducer Size .5"X1.0" Frequency 2.25 MHz

Transducer Serial No. J08328 IIW-2 Beam Angle 60 °

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	3.57	3.57
Delay	1.83	1.83
Scanning Gain	74	74
Evaluating Gain	68	68
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75"	1X	80%	3.5"	1.8	SDH
1/2	3.5"	1X	35%	6.6"	3.5	SDH
3/4	5.25"	1X	15%	10.0"	5.5	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 1500

Calibration Checks:

Time	Value	Last Data Sheet
1650	100%	1060

Final Check: MH

WEM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° N/A or 60° X

1054

Hole Depth	Trailing Ray								Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T	2.4"	1.3	2.5"	1.4	2.7"	1.5	3.5"	1.8	3.8"	2.0	4.1"	2.2	4.4"	2.4
1/2T	N/A	N/A	5.4"	3.1	5.7"	3.2	6.6"	3.6	6.8"	4.1	7.3"	4.4	N/A	N/A
3/4T	N/A	N/A	N/A	N/A	8.4"	4.8	10.0"	5.5	11.7"	6.3	N/A	N/A	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	-6db	38	(32-48)
80% "	-12db	20	(16-24)
40% "	+ 6db	82	(64-96)
20% "	+12db	80	(64-96)

Equipment Data For Linearity Checks

Code Block T 7" "

Transducer Data:

Serial No. J08328

Beam Angle 60°

Size .5"X1.0" Freq 2.25MHz

Shoe No SSI-2 Cable No C-1

Check Made By:

MM

REMARKS

WFM

Reviewed by: ______ Level ______

Exam Sheet No. 1060
Cal. Sheet No. 1069

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT-I ☒ Preoperational ☐ I.S.I. Date 11-26-83

Examiner M. HENDRYX Level II Recorder S. DAIGNEAULT Level I

Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° N/A 60° X

Procedure No. LIM UT-5 Revision 2

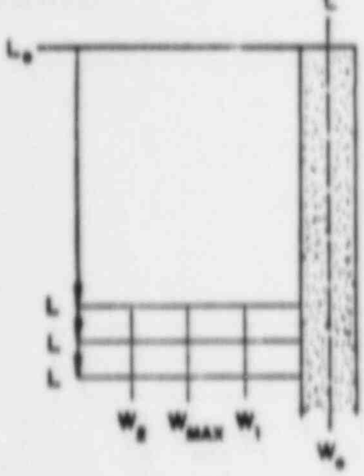
Scan Sensitivity 74 Evaluation Sensitivity 68

Couplant GLYCERINE Component Temperature 69° °F

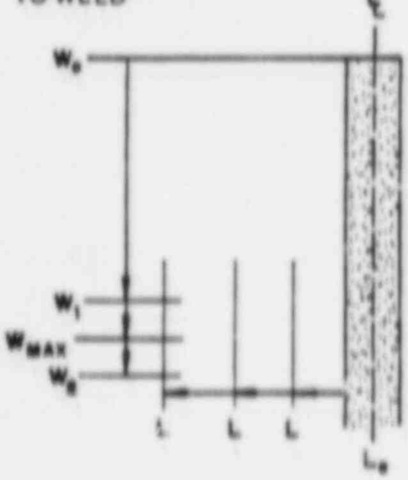
	L/R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.6"	38%	2.9"		3.4"		3.9"	1.6		1.8		2.1		
1/2T	1.5"	50%	6.8"		6.5"		7.8"	3.3		3.6		4.2		
3/4T	1.5"	50%	8.8"		9.8"		10.5"	5.1		5.5		5.8		
1T	1.6"	FSH 5%	12.2"		13.1"		14.9"	7.0		7.4		8.2		

Reference System

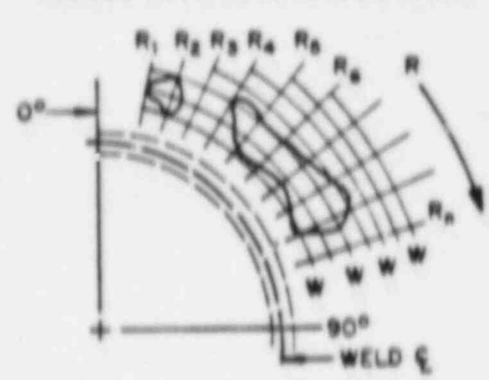
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: LFB Level

GENERAL ELECTRIC

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 3000

Site LIMERICK

☒ Preoperational ☐ I.S.I.

Procedure No. LIM-UT-5 Rev. 2

Calib. Block No. 160-83C-17

Date 11-17-83 Couplant GLYCERINE

Cal. Std. Temp. T-389 68 °F

Examiner T. MOORE ASNT Level II

Recorder R. MAY ASNT Level I

Equipment Data:

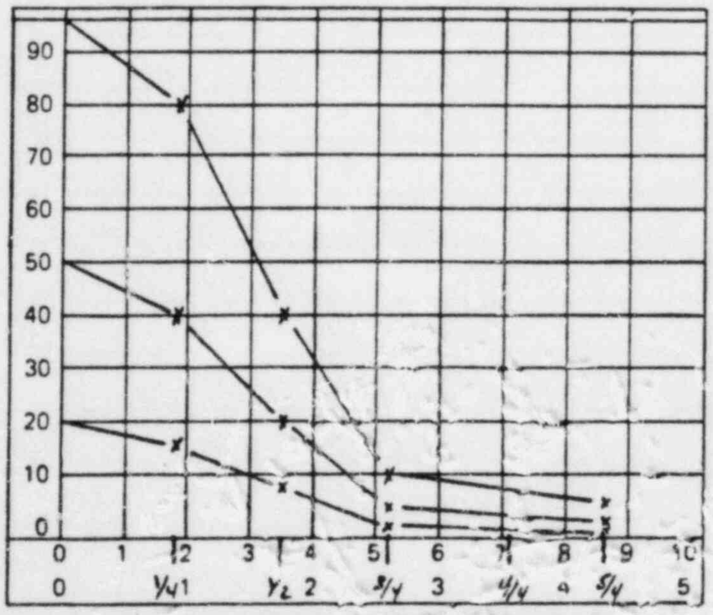
Instrument Model No. USL-38 Shoe No. SS1-4

Instrument Serial No. 211009 Cable No. C-3

Transducer Size 0.5" x 1.0" Frequency 2.25 MHz

Transducer Serial No. J08325 IIW-2 Beam Angle 60°

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☒



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	9.08	9.08
Delay	6.84	6.84
Scanning Gain	60 dB.	60 dB.
Evaluating Gain	54 dB.	54 dB.
Filter Position	N/A	N/A
Rep Rate	N/A	N/A
Damping	S.F.D.	S.F.D.
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	D.I.V. Inch	SDH or FSH
1/4	1.75	1X	80	3.7	1.8	SDH
1/2	3.50	1X	40	6.2	3.5	SDH
3/4	5.25	1X	10	9.3	5.2	SDH
2% Notch	7.00	1X	8	12.6	7.1	N/A

Initial Calibration Time 1031

Calibration Checks:

Time	Value	Last Data Sheet
1120	100 %	3001

Final Check: Tm.

WEM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° ____ or 60° X

3000

Hole Depth	Trailing Ray								Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~	W	D or ~~MP~~
1/4T	2.0	1.2	2.4	1.4	3.1	1.6	3.7	1.8	4.1	2.2	4.5	2.4	5.0	2.8
1/2T	5.0	2.9	5.3	3.1	5.7	3.3	6.2	3.5	6.9	3.8	7.4	4.0	7.7	4.2
3/4T	N/A	N/A	N/A	N/A	8.8	5.0	9.3	5.2	10.0	5.6	N/A	N/A	N/A	N/A

Amplitude Linearity Check

100%FSH	50	% FSH	50%FSH	25	% FSH
90% "	N/A	"	40% "	20	"
80% "	40	"	30% "	15	"
70% "	N/A	"	20% "	10	"
60% "	N/A	"			

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	21	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	80	(64–96)

Equipment Data For Linearity Checks

Code Block T 7.0 "

Transducer Data:

Serial No. J08325

Beam Angle 60°

Size 0.5" x 1.0" Freq 2.25 MHz

Shoe No SS1-4 Cable No C-3

Check Made By:

T. MOORE

REMARKS

CALIBRATED 20.0" SWEEP.

5/4 T @ 8.75" DEPTH @ 5 % F.S.H.
@ 15.1" "W" @ 8.7 DIVISIONS.

4 dB. DIFFERENCE THRU CLAD
INTERFACE BETWEEN
3/4 T + 5/4 T.

Reviewed by: ____________ Level ____________

WFM

Exam Sheet No. 3001 1 OF 2
Cal. Sheet No. 3000

VESSEL EXAMINATION DATA SHEET

Site LIMERICK ☒ Preoperational ☐ I.S.I. Date 11-17-83

Examiner T. MOORE Level II Recorder R. MAY Level I

Weld Seam ID No. N/A Beam Angle 0° ____ 45° ____ 60° X

Procedure No. LIM - UT- 5 Revision 2

Scan Sensitivity 60 dB. Evaluation Sensitivity 54 dB.

Couplant GLYCERINE Component Temperature 70°F

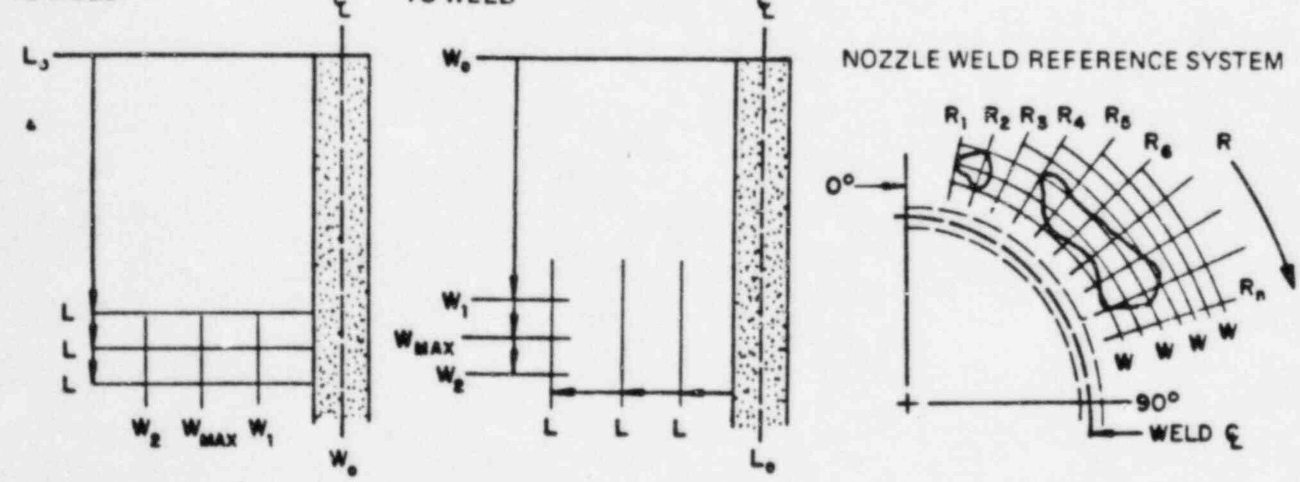
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	DIV. ~~MP_1~~ 20% DAC	DIV. ~~MP_{F1}~~ 50% DAC	DIV. ~~MP~~ Max DAC	DIV. ~~MP_{F2}~~ 50% DAC	DIV. ~~MP_2~~ 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	8.0	100	2.6	3.0	3.4	3.8	4.3	1.3	1.6	1.8	2.1	2.3		
	6.0	100	2.8	3.1	3.4	3.9	4.2	1.4	1.6	1.8	2.2	2.3		
1/2T	7.5	100	5.1	5.6	6.3	6.7	7.2	3.1	3.3	3.5	3.8	4.0		
	5.8	100	5.5	5.9	6.3	6.7	6.9	3.1	3.3	3.5	3.8	4.0		
3/4T	8.0	100^{+2}	N/A	8.2	9.4	10.4	N/A	N/A	4.8	5.3	5.8	N/A		
	5.8	100	N/A	8.4	9.4	10.3	N/A	N/A	4.8	5.2	5.8	N/A		

Reference System

REFLECTOR PARALLEL (P) TO WELD

REFLECTOR TRANSVERSE (T) TO WELD

NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WEM Level ________

Exam Sheet No. 3001 2 of 2
Cal. Sheet No. 3000

VESSEL EXAMINATION DATA SHEET

Site LIMERICK ☒ Preoperational ☐ I.S.I. Date 11-17-83

Examiner T. MOORE Level II Recorder R. MAY Level I

Weld Seam ID No. N/A Beam Angle 0° ____ 45° ____ 60° x

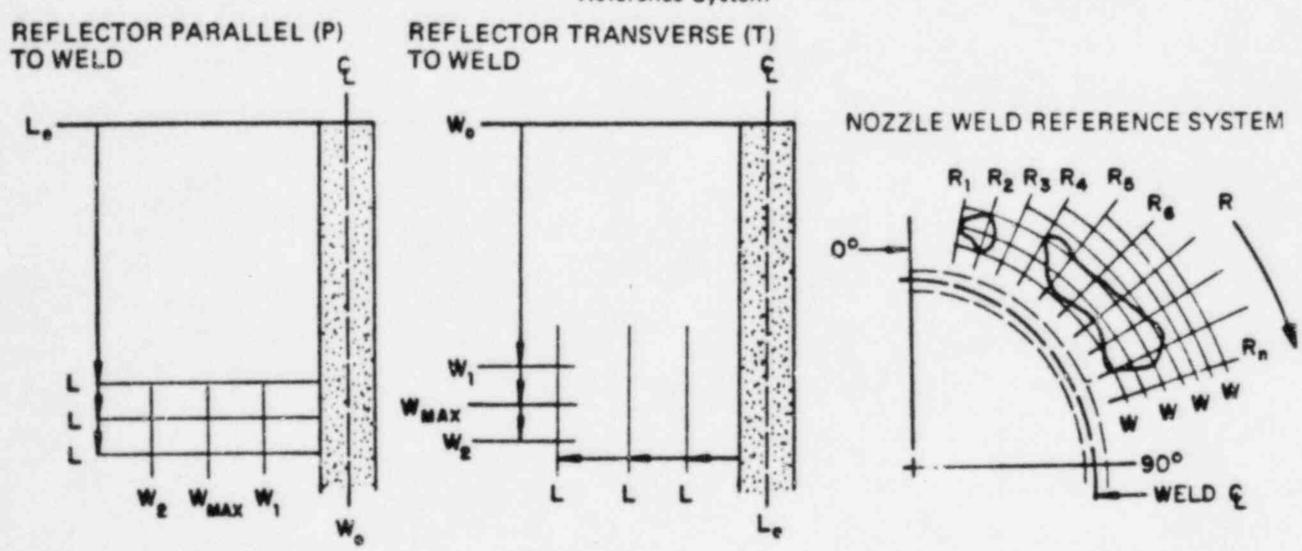
Procedure No. LIM-UT-5 Revision 2

Scan Sensitivity 60 dB. Evaluation Sensitivity 54 dB.

Couplant GLYCERINE Component Temperature 70 °F

L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	DIV. ~~MP_1~~ 20% DAC	DIV. ~~MP_{F1}~~ 50% DAC	DIV. ~~MP~~ Max DAC	DIV. ~~MP_{F2}~~ 50% DAC	DIV. ~~MP_2~~ 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
4/4 T 6.0	100	N/A	11.6	12.4	12.8	N/A	N/A	6.7	7.1	7.4	N/A		
8.0	100	N/A	11.6	12.4	13.0	N/A	N/A	6.8	7.2	7.5	N/A		
1.6	20	N/A	N/A	12.6	N/A	N/A	N/A	N/A	7.2	N/A	N/A	0.3" LENGTH	(1.5"-1.8")
6.3	20	N/A	N/A	12.8	N/A	N/A	N/A	N/A	7.1	N/A	N/A	2.2" LENGTH	(5.0"-7.2")

Reference System



Reviewed by: WCM Level ____

GENERAL ELECTRIC

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 3018

Site LIMERICK — ☒ Preoperational ☐ I.S.I.

Procedure No. LIM·UT·5 Rev. 2 — Calib. Block No. 160·83C·17

Date 11·15·83 Couplant GLYCERINE — Cal. Std. Temp. 75° (T·389) °F

Examiner T. MOORE — ASNT Level II

Recorder R. MAY — ASNT Level I

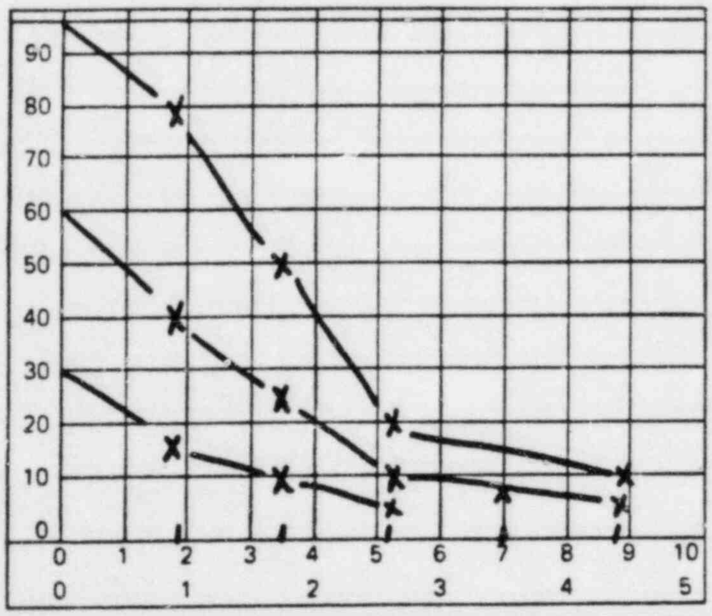
Equipment Data: Instrument Model No. USL·38 — Shoe No. SSI·4

Instrument Serial No. 211009 — Cable No. C·3

Transducer Size .5"X1.0" — Frequency 2.25 MHz

Transducer Serial No. J08325 — IIW-2 Beam Angle 60 °

DAC Curve: Range 0-5☐ 0-10☐ Other ☒



Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75	1X	80	3.4	1.8	SDH
1/2	3.50	1X	50	6.0	3.5	SDH
3/4	5.25	1X	20	8.4	5.2	SDH
2% Notch	7.0	1X	8	11.5	7.0	N/A

Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	8.84	8.84
Delay	6.38	6.38
Scanning Gain	62	62
Evaluating Gain	56	56
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	SFD	SFD
Reject	off	off

6 db Change for 2 X

Initial Calibration Time 0945

Calibration Checks:

Time	Value	Last Data Sheet
1100	100%	
1300	100%	3019

Final Check: T MOORE 1300

WAM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° ____ or 60° X

301E

Hole Depth	Trailing Ray						100% DAC		Leading Ray					
	10% DAC		20% DAC		50% DAC				50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T	2.4	1.2	2.6	1.4	2.9	1.6	3.4	1.8	4.0	2.2	4.2	2.3	4.4	2.5
1/2T	N/A	N/A	5.2	3.1	5.7	3.3	6.0	3.5	6.8	3.9	7.1	4.1	N/A	N/A
3/4T	N/A	N/A	N/A	N/A	8.1	4.9	8.4	5.2	8.9	5.3	N/A	N/A	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	N/A "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	N/A "	20% "	10 "
60% "	N/A "		

Control Linearity

80%FSH	−6db	41	(32–48)
80% "	−12db	20	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	81	(64–96)

Equipment Data For Linearity Checks

Code Block T 7.0"

Transducer Data:

Serial No. J08325

Beam Angle 60°

Size .5"X1.0" Freq 2.25MHz

Shoe No SSI-4 Cable No C-3

Check Made By:

T. MOORE

REMARKS

CALIBRATED 20" METAL PATH.

WEM

Reviewed by: ____________________ Level ____________

Pg. 1 of 2

Exam Sheet No. 3019
Cal. Sheet No. 3018

VESSEL EXAMINATION DATA SHEET

Site LIMERICK ☒ Preoperational ☐ I.S.I. Date 11-15-83

Examiner T. MOORE Level II Recorder R. MAY Level I

Weld Seam ID No. N/A Beam Angle 0° ______ 45° ______ 60° X

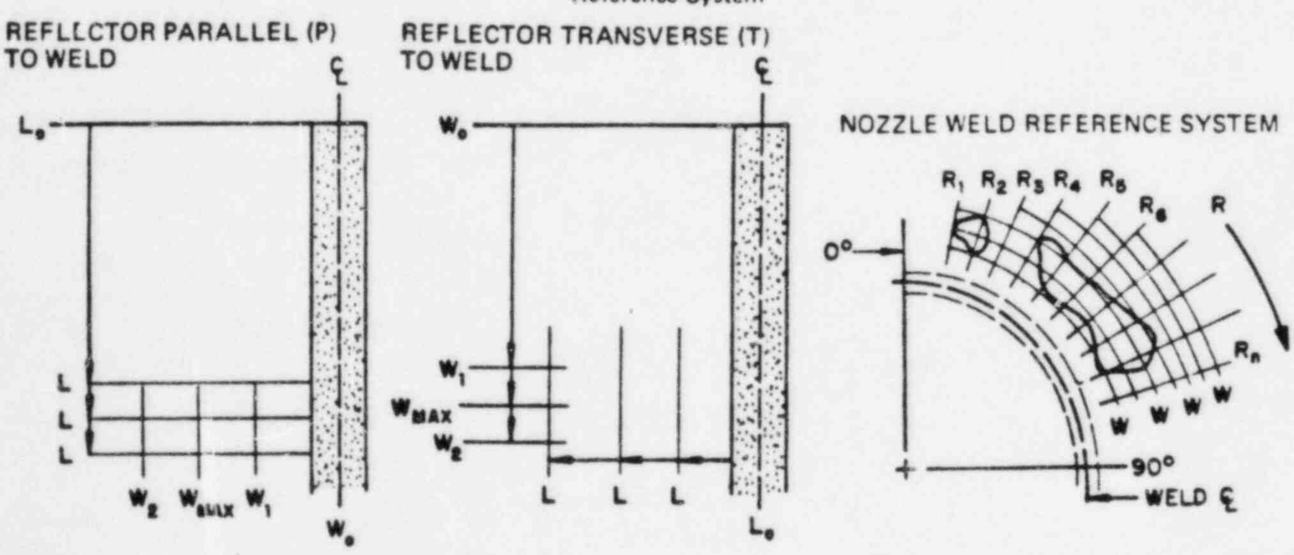
Procedure No. LIM-UT-5 Revision 2

Scan Sensitivity 62dB Evaluation Sensitivity 56dB

Couplant GLYCERINE Component Temperature 75 °F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	6.5	100%	2.4	2.6	3.1	3.7	4.0	1.5	1.6	1.8	2.0	2.2		
	7.9	100%	2.7	3.0	3.3	4.1	4.4	1.5	1.6	1.8	2.2	2.4		
1/2T	6.3	100%	5.7	6.3	6.6	7.2	7.7	3.4	3.7	3.9	4.2	4.4		
	8.0	100%	5.4	6.3	6.7	7.2	7.8	3.3	3.8	4.0	4.2	4.5		
3/4T	6.0	100%	N/A	8.3	9.2	10.3	N/A	N/A	5.1	5.4	6.0	N/A		
	7.6	100%	N/A	8.1	8.3	8.8	N/A	N/A	5.0	5.2	5.4	N/A		

Reference System



Reviewed by: WGM Level ______

GENERAL ELECTRIC

Exam Sheet No. 3019
Cal. Sheet No. 3018

VESSEL EXAMINATION DATA SHEET

Site Limerick ■ Preoperational ☐ I.S.I. Date 11-15-83

Examiner T. Moore Level II Recorder R. May Level I

Weld Seam ID No. N/A Beam Angle 0° ______ 45° ______ 60° X

Procedure No. LIM-UT-5 Revision 2

Scan Sensitivity 62dB Evaluation Sensitivity 56dB

Couplant GLYCERINE Component Temperature 75 °F

IT

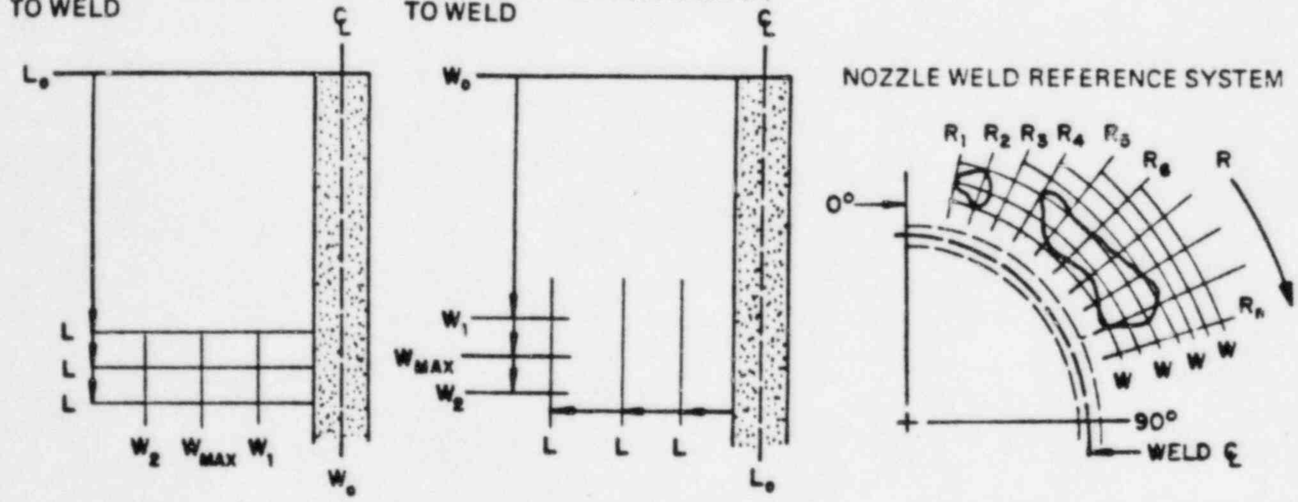
L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
7.0	100%	N/A	11.7	12.3	12.7	N/A	N/A	7.0	7.4	7.6	N/A		
7.5	100%	N/A	11.2	12.1	12.6	N/A	N/A	7.0	7.4	7.6	N/A		
4.6	2%FSH			12.3					7.2			total Length 2.60"	
1.5	2%FSH			12.3					7.4			total LENGth .40"	

Reference System

REFLECTOR PARALLEL (P) TO WELD

REFLECTOR TRANSVERSE (T) TO WELD

NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WCM Level ______

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 2014

Site LIMERICK UNIT-I ☑ Preoperational ☐ I.S.I.

Procedure No. LIM-UT-5 Rev. 2

Calib. Block No. 160-83C-17

Date 11-3-83 Couplant GLYCERINE

Cal. Std. Temp. 76° F

Examiner B. HOUSE

ASNT Level II

Recorder S. DAIGREPONT

ASNT Level I

Equipment Data:

Instrument Model No. SONIC MK-I

Shoe No. SSI-1

Instrument Serial No. 08212E

Cable No. C-2

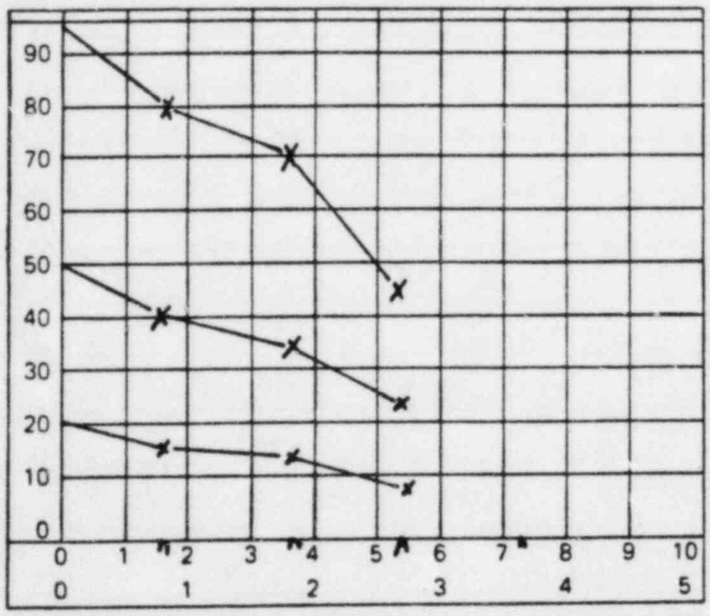
Transducer Size .5" X 1.0"

Frequency 2.25 MHz

Transducer Serial No. JO8326

IIW-2 Beam Angle 60 °

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☑



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	0.32	0.32
Delay	1.84	1.84
Scanning Gain	40	40
Evaluating Gain	34	34
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	1.75"	1X	90%	3.2"	1.7	SDH
1/2	3.5"	1X	70%	6.3"	3.6	SDH
3/4	5.25"	1X	45%	9.1"	5.4	SDH
2% Notch	N/A	1X	N/A	N/A	N/A	N/A

Initial Calibration Time 1400

Calibration Checks:

Time	Value	Last Data Sheet
1745	100%	2015

Final Check: ________

WEM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° N/A or 60° ✓

2014

Hole Depth	Trailing Ray 10% DAC W	Trailing Ray 10% DAC D or MP	Trailing Ray 20% DAC W	Trailing Ray 20% DAC D or MP	Trailing Ray 50% DAC W	Trailing Ray 50% DAC D or MP	100% DAC W	100% DAC D or MP	Leading Ray 50% DAC W	Leading Ray 50% DAC D or MP	Leading Ray 20% DAC W	Leading Ray 20% DAC D or MP	Leading Ray 10% DAC W	Leading Ray 10% DAC D or MP
1/4T	2.4	1.2	2.5	1.3	2.7	1.4	3.2	3.2	4.0	2.0	4.2	2.1	4.5	2.3
1/2T	4.9	2.9	5.0	3.0	5.8	3.3	6.4	3.6	7.9	4.4	8.3	4.5	8.4	4.6
3/4T	7.5	4.6	7.6	4.7	8.1	4.9	9.6	5.7	9.1	6.5	11.8	6.8	12.6	7.2

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	18	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	75	(64–96)

Equipment Data For Linearity Checks

Code Block T 7"

Transducer Data:

Serial No J08326

Beam Angle 60°

Size .5" x 1.0" Freq 2.25

Shoe No 551-1 Cable No C-2

Check Made By: ______

REMARKS

WCM

Reviewed by: ______ Level ______

Sheet 1 of 3

Exam Sheet No. 2015
Cal. Sheet No. 2014

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 11-3-83

Examiner B. HOUSE Level II Recorder S. DAIGREPONT Level I

Weld Seam ID No. ____ Beam Angle 0° ____ 45° ____ 60° x

Procedure No. LIM-UT 5 Revision 2

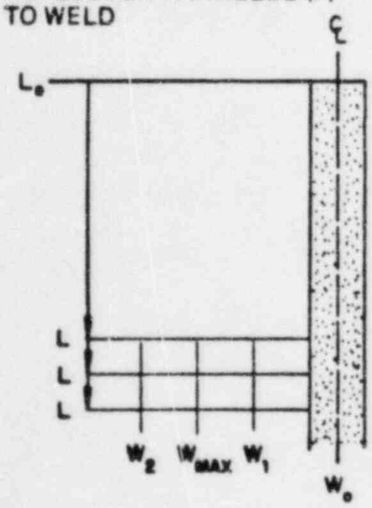
Scan Sensitivity 40 dB Evaluation Sensitivity 34 dB

Couplant GLYCERINE Component Temperature 68 °F

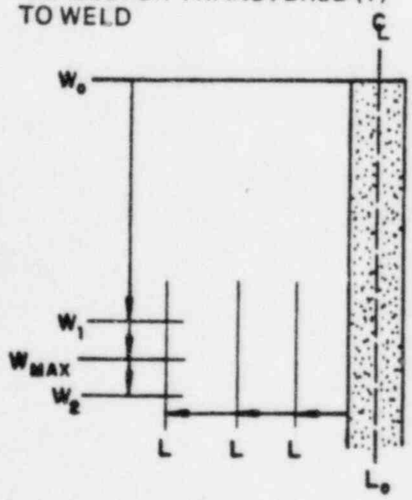
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.4"	50%	2.9"		3.4"		4.2"	1.8		1.9		2.3		
	2.7"	50%	2.9"		3.3"		4.1"	1.7		1.9		2.3		
1/2T	2.0"	75%	5.6"	6.0"	6.4"	7.0"	7.7"	3.3	3.5	3.7	4.0	4.3		
	1.0"	75%	5.7"	6.0"	6.5"	7.0"	7.9"	3.3	3.6	3.8	4.0	4.5		
3/4T	2.2"	75%	8.6"	9.1"	9.4"	9.7"	10.5"	5.2	5.5	5.6	5.7	6.1		
	1.5"	75%	8.7"	9.3"	9.6"	10.1"	10.5"	5.3	5.6	5.7	5.9	6.1		

Reference System

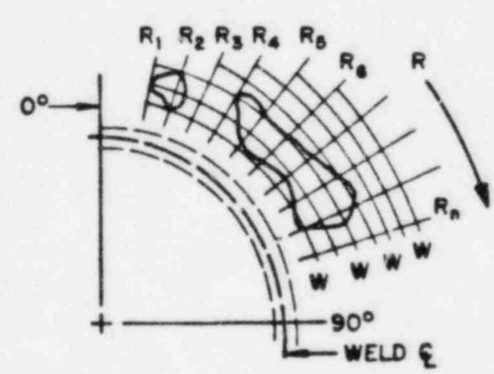
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WEM Level ____

sheet 2 of 3

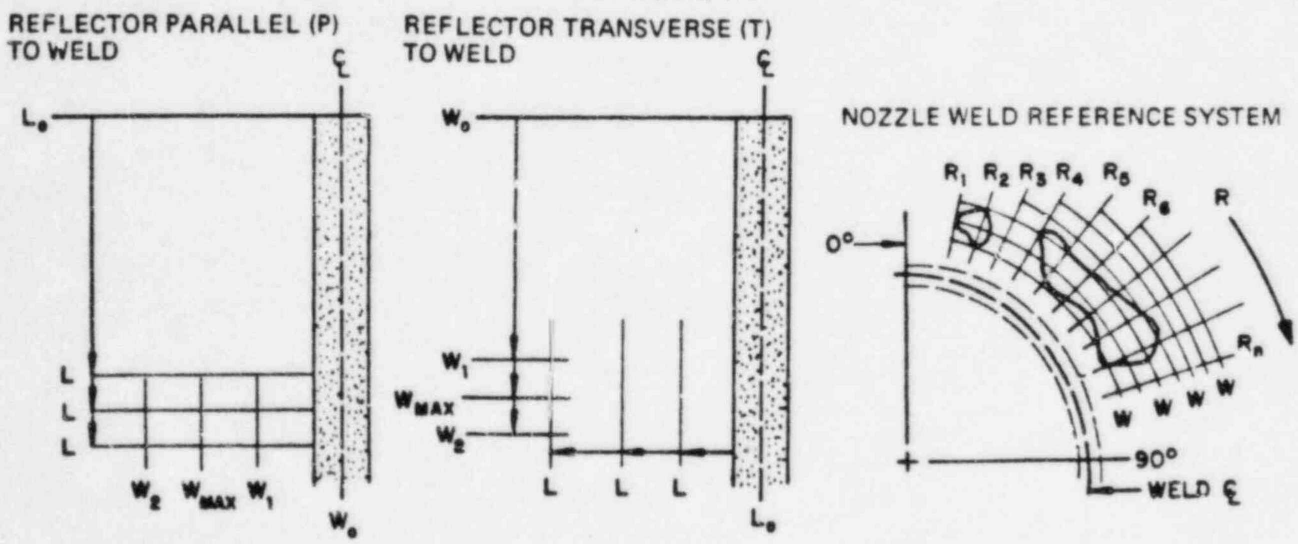
Exam Sheet No. 2015
Cal. Sheet No. 2014

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 11-3-83
Examiner B. HOUSE Level II Recorder S.DAIGREPONT Level I
Weld Seam ID No. ______ Beam Angle 0° ______ 45° ______ 60° x
Procedure No. LIM-UT 5 Revision 2
Scan Sensitivity 40 dB Evaluation Sensitivity 34 dB
Couplant GLYCERINE Component Temperature 68 °F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1T	1.0°	95%	12.1°	13.0°	13.3°	13.9°	15.9°	5.2	5.5	5.6	5.7	6.1		
	2.3°	90%	12.1°	12.5°	13.1°	13.8°	16.0°	7.3	7.5	7.8	8.1	9.1		

Reference System



Reviewed by: WGM Level ______

sheet 3 of 3
Exam Sheet No. 2015
Cal. Sheet No. 2014

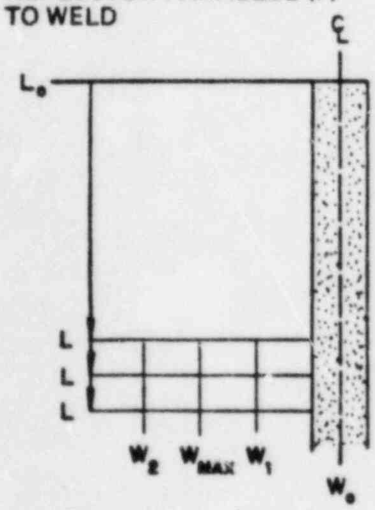
VESSEL EXAMINATION DATA SHEET

Site Limerick ☒ Preoperational ☐ I.S.I. Date 11-3-83
Examiner R House Level II Recorder S. Daigremont Level I
Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° N/A 60° X
Procedure No. Lim-UT-5 Revision 2
Scan Sensitivity 40 db Evaluation Sensitivity 34db
Couplant GlYCERINE Component Temperature ~~46°~~ RWH 68 °F

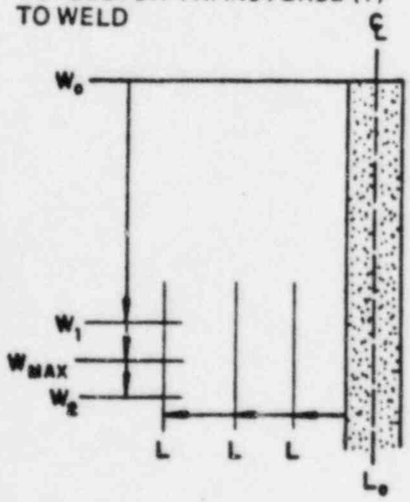
L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1.8	10%			11.7°					7.1			short	notch
2.4	10%			12.2					7.4			Long	notch

Reference System

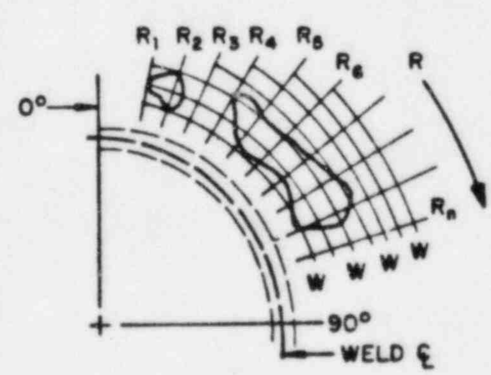
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WEM Level

GENERAL ELECTRIC

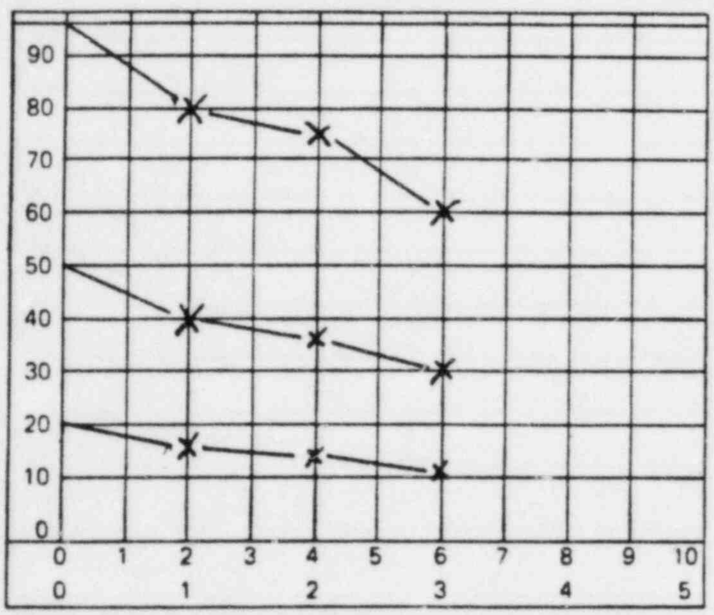
VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1009

Site LIMERICK UNIT I ☑ Preoperational ☐ I.S.I.
Procedure No. LIM UT-5 Rev. REV 2 Calib. Block No. 160-83C-17
Date 11-1-83 Couplant GLYCERINE Cal. Std. Temp. 71° oF
Examiner M. HENDRYX ASNT Level II
Recorder J. CONNER ASNT Level I

Equipment Data:
Instrument Model No. SONIC MKI Shoe No. SSI-3
Instrument Serial No. 08212E Cable No. C-I
Transducer Size .5"X1.0" Frequency 2.25 MHz
Transducer Serial No. T08328 IIW-2 Beam Angle 45° °

DAC Curve: Range 0-5 ☑ 0-10 ☐ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	3.70	3.70
Delay	2.97	2.97
Scanning Gain	37db	37db
Evaluating Gain	31db	31db
Filter Position	Hi	Hi
Rep Rate	3K	3K
Damping	MiN	MiN
Reject	OFF	OFF

6 db Change for 2 X

Initial Calibration Time 1100

Calibration Checks:

Time	Value	Last Data Sheet
1200	100%	
1330	100%	1010

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	.87"	1X	80%	1.0"	2.0	SDH
1/2	1.75"	1X	75%	1.9"	4.0	SDH
3/4	2.62"	1X	60%	2.7"	6.0	SDH
2% Notch	3.5"	1X	80%	3.7"	8.4	N/A

Final Check: 1330

WEM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° ✓ or 60° ____

1CC9

Hole Depth	Trailing Ray						100% DAC		Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T	.6"	1.6	.7"	1.7	.8"	1.8	1.0"	2.0	1.1"	2.1	1.2"	2.2	1.3"	2.3
1/2T	N/A	N/A	1.5"	3.6	1.7"	3.7	1.9"	4.0	2.2"	4.4	2.5"	4.6	N/A	N/A
3/4T	N/A	N/A	2.3"	5.4	2.5"	5.6	2.7"	6.0	3.4"	6.8	3.7	7.1	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	16 "
70% "	36 "	20% "	11 "
60% "	30 "		

Control Linearity

80%FSH	-6db	40	(32-48)
80% "	-12db	20	(16-24)
40% "	+ 6db	80	(64-96)
20% "	+12db	82	(64-96)

Equipment Data For Linearity Checks

Code Block T 3.5"

Transducer Data:

Serial No. J08328

Beam Angle 45°

Size .5"X 1.0" Freq 2.25MHz

Shoe No ____ Cable No ____

Check Made By:

MH

REMARKS

WFM

Reviewed by: ____________________ Level ____________

SHT. 1 OF 3

Exam Sheet No. 1010
Cal. Sheet No. 1009

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT I ☐ Preoperational ☐ I.S.I. Date 11-1-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

Procedure No. LIM UT-5 Revision REV. 2

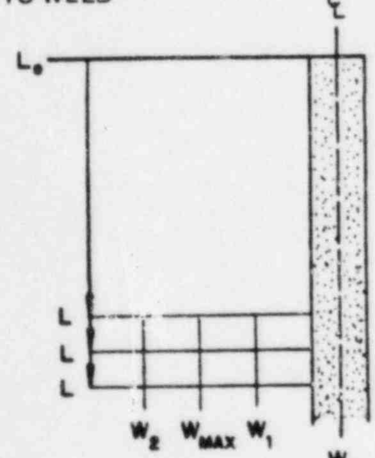
Scan Sensitivity 37db Evaluation Sensitivity 31db

Couplant GLYCERINE Component Temperature 71° °F

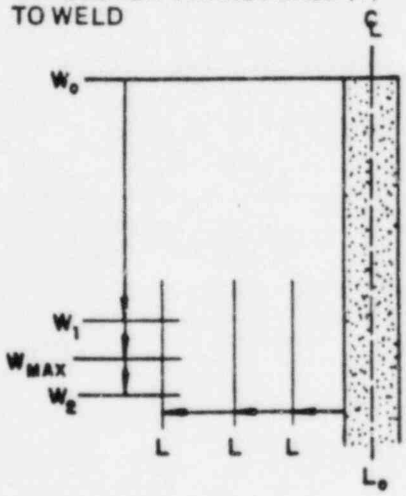
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L-1			1.1"	1.3"							8.4	8.4		
L-MAX	2.2"	100 10+	2.9"	3.2"	3.7"	4.5"	4.7"	7.6	7.8	8.3	9.4	9.5		
L-2			3.3"	3.1"							8.4	8.4		
L-1			6.8"	6.9"							8.2	8.2		
L-MAX	7.4"	100 8+	3.0"	3.1"	3.6"	4.4"	4.5"	7.5	7.6	8.3	9.4	9.4		
L-2			8.1"	8.0"							8.2	8.2		

Reference System

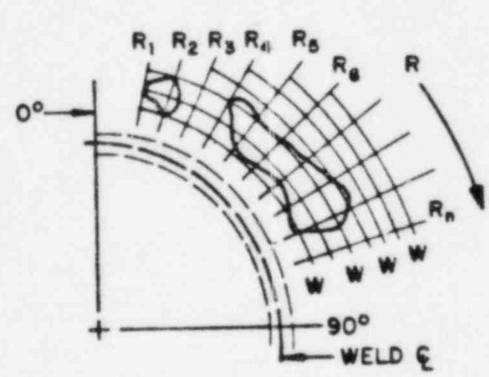
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: ______ Level ______

SHT. 2 OF 3
Exam Sheet No. 1010
Cal. Sheet No. 1009

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT I ☑ Preoperational ☐ I.S.I. Date 11-1-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

Procedure No. LIM UT-5 Revision REV. 2

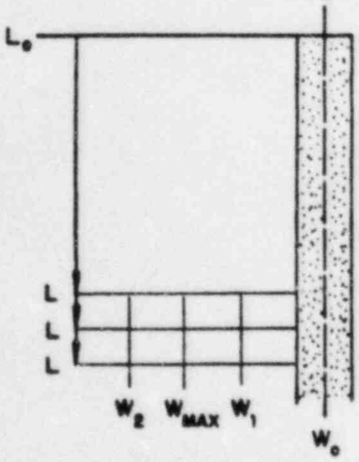
Scan Sensitivity 37 db Evaluation Sensitivity 31db

Couplant GLYCERINE Component Temperature 71db °F

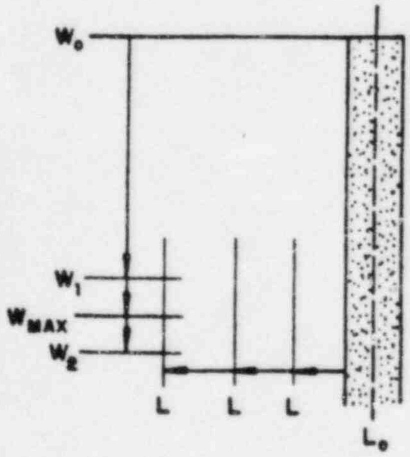
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4-T	1.5"	50%	.8"		1.0"		1.2"	1.9		2.1		2.3		
	1.0"	50%	.8"		1.0"		1.2"	1.9		2.1		2.3		
1/2-T	1.6"	50%	1.6"		1.9"		2.1"	3.8		4.0		4.3		
	1.4"	50%	1.6"		1.9"		2.0	3.8		4.0		4.2		
3/4-T	1.5"	70%	2.4"	2.6"	2.7"	2.9"	3.1"	5.7	5.9	6.0	6.3	6.6		
	1.7"	70%	2.4"	2.5"	2.7"	2.9"	3.1"	5.7	5.9	6.0	6.3	6.6		

Reference System

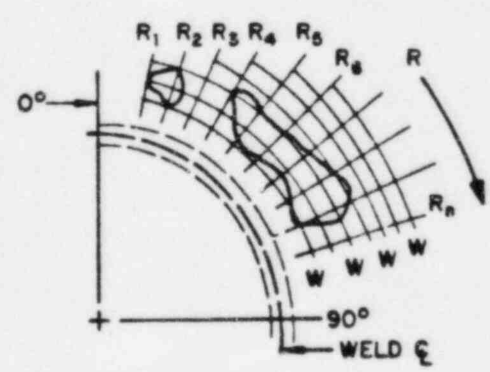
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WCM Level ______

SHT. 3 OF 3
Exam Sheet No. 1010
Cal. Sheet No. 1009

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT I ☑ Preoperational ☐ I.S.I. Date 11-1-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

Procedure No. LIM UT-5 Revision REV 2

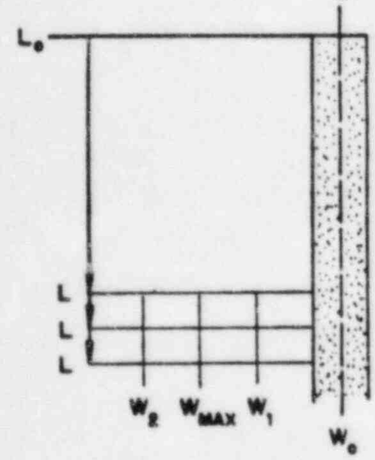
Scan Sensitivity 37 db Evaluation Sensitivity 31 db

Couplant GLYCERINE Component Temperature 71° °F

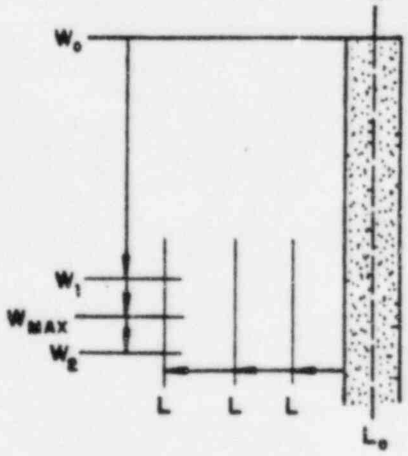
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4-T	1.5"	50%	.8"		1.0"		1.2"	1.9		2.1		2.3		
	1.0"	50%	.8"		1.0"		1.2"	1.9		2.1		2.3		
1/2-T	1.6"	50%	1.6"		1.9"		2.1"	3.8		4.0		4.3		
	1.4"	50%	1.6"		1.9"		2.0"	3.8		4.0		4.2		
3/4-T	1.5"	70%	2.4"	2.6"	2.7"	2.9"	3.1"	5.7	5.9	6.0	6.3	6.6		
	1.7"	70%	2.4"	2.5"	2.7"	2.9"	3.1"	5.7	5.9	6.0	6.3	6.6		

Reference System

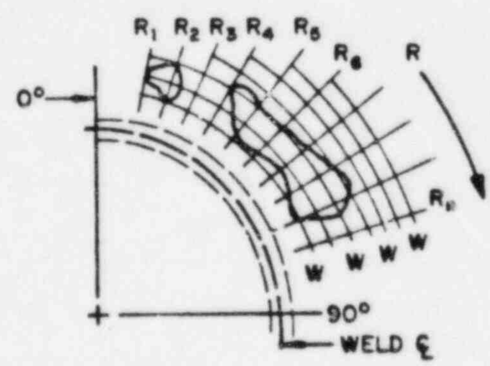
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WFM Level ______

GENERAL ELECTRIC

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 2006

Site Limerick Unit I | ☑ Preoperational ☐ I.S.I.

Procedure No. Lim UT-5 Rev. 2 | Calib. Block No. 160-83C-17

Date 31 Oct 83 Couplant Glycerine | Cal. Std. Temp. 60° oF

Examiner R. House | ASNT Level II

Recorder J. Conner | ASNT Level I

Equipment Data:

Instrument Model No. KB USL-38 | Shoe No. SSI-9

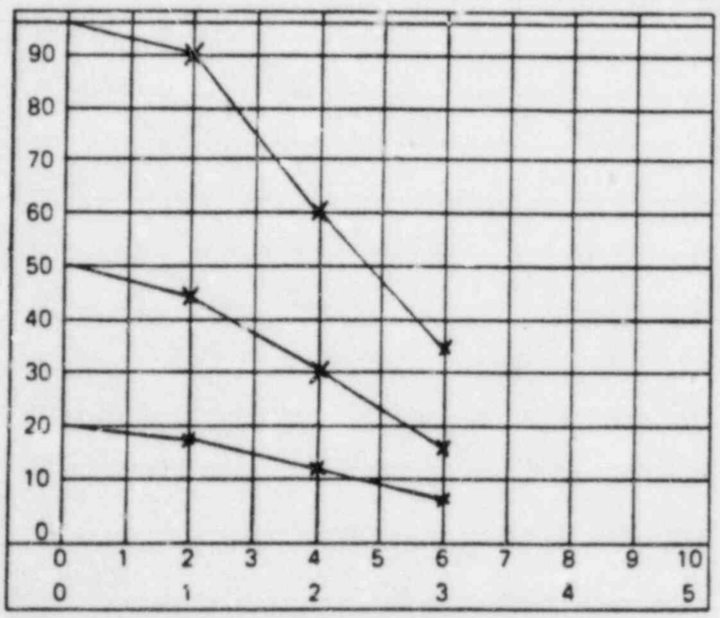
Instrument Serial No. 211009 | Cable No.

Transducer Size .5" x 1.0" | Frequency 2.25 MHz

Transducer Serial No. J08326 | IIW-2 Beam Angle 45 °

Thermometer T-387

DAC Curve: Range 0-5 ☐ 0-10 ☑ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	2.48	2.48
Delay	6.34	6.34
Scanning Gain	36db	36db
Evaluating Gain	30db	30db
Filter Position	Hi	Hi
Rep Rate	3K	3K
Damping	Min	Min
Reject	off	off

6 db Change for 2 X

Hole Depth "T"	Hole Depth inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	.86"	1X	90%	1.0"	2.0"	SDH
1/2	1.72"	1X	60%	1.9"	4.0"	SDH
3/4	2.58"	1X	35%	2.8"	6.0"	SDH
2% Notch	3.5"	1X	80%	3.7"	8.4"	N/A

Initial Calibration Time 10:00

Calibration Checks:

Time	Value	Last Data Sheet
1430	100%	2007

Final Check: [signature]

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° X or 60° ____

2006

Hole Depth	Trailing Ray 10% DAC W	D or MP	20% DAC W	D or MP	50% DAC W	D or MP	100% DAC W	D or MP	Leading Ray 50% DAC W	D or MP	20% DAC W	D or MP	10% DAC W	D or MP
1/4T	.4"	1.5	.6"	1.8	.8"	1.9	1.0"	2.0	1.2"	2.2	1.3"	2.3	1.4"	2.5
1/2T	1.4"	3.5	1.6"	3.7	1.7"	3.8	1.9"	4.0	2.2"	4.5	2.4"	4.7	2.5"	4.8
3/4T	2.3"	5.4	2.5"	5.5	2.9"	5.6	3.5"	6.0	3.7	6.7	N/A	N/A	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	____ "	40% "	20 "
80% "	40 "	30% "	____ "
70% "	____ "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	20	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	76	(64–96)

Equipment Data For Linearity Checks

Code Block T 3.5" "

Transducer Data:

Serial No. J08326

Beam Angle 45°

Size .5x1.0" Freq 2.25 Mhz

Shoe No SSJ-9 Cable No C-2

Check Made By: RWA

REMARKS

W measurement taken from center line of holes

L measurement taken from side of block

WEM

Reviewed by: ____________________ Level ____________

SHT. 1 of 4

Exam Sheet No. 2007

Cal. Sheet No. 2006

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I ☒ Preoperational ☐ I.S.I. Date 31 OCT 83

Examiner R. House Level II Recorder J. Conner Level I

Weld Seam ID No. NA Beam Angle 0° ____ 45° X 60° ____

Procedure No. Lim UT-5 Revision 2

Scan Sensitivity 36 db Evaluation Sensitivity 30 db

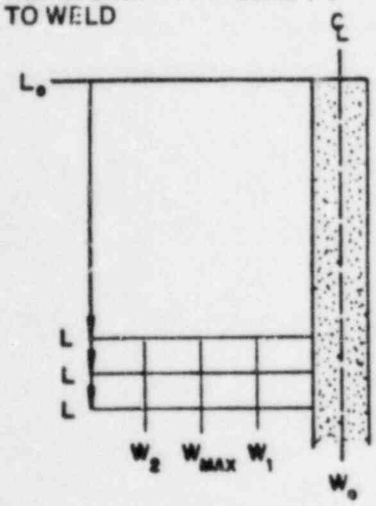
Couplant Glycerine Component Temperature 60°F °F

Thermometer T-387
Cal 3.5 T END of block

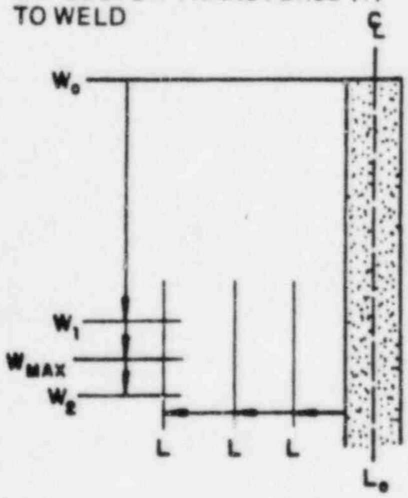
	L/R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.5	50%	.8"		1.0"		1.2"	2.0		2.1		2.4		
	1.1	50%	.8"		1.0"		1.2"	2.0		2.1		2.4		
1/2T	1.3	50%	1.6"		1.8"		2.2"	3.8		4.0		4.5		
	.8	50%	1.7"		1.8"		2.2"	3.9		4.0		4.5		
3/4T	2.3	60%	2.2"	2.5"	2.8"	3.1"	3.4"	5.6"	5.7"	6.0	6.5	6.8		
	1.1	60%	2.3"	2.5"	2.7"	3.1"	3.3"	5.6"	5.8"	6.0	6.4	6.7		

Reference System

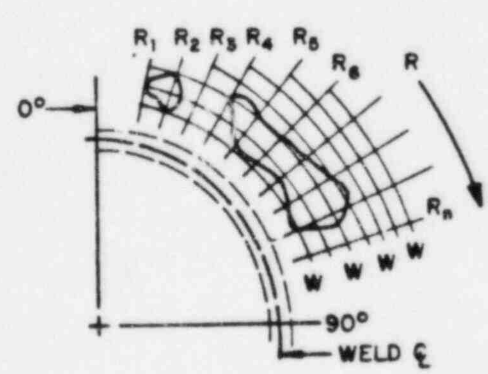
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: UCM Level ____

GENERAL ELECTRIC

SHT 2 of 4

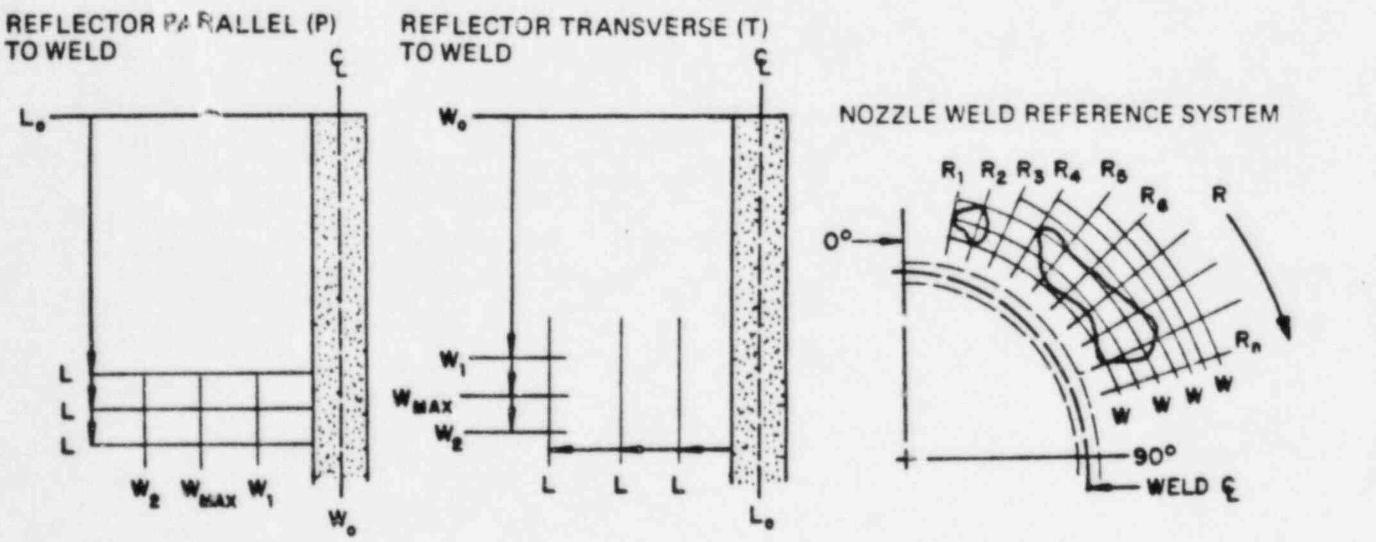
Exam Sheet No. 2007
Cal. Sheet No. 2006

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I ☑ Preoperational ☐ I.S.I. Date 31 Oct 83
Examiner R. House Level II Recorder J. Connor Level I
Weld Seam ID No. NA Beam Angle 0° ____ 45° ✓ 60° ____
Procedure No. Lim UT-5 Revision 2
Scan Sensitivity 36 db Evaluation Sensitivity 30 db
Couplant GLYCERINE Component Temperature 60 °F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.0"	50%	.9"		1.0"		1.2"	2.0		2.1		2.4		
	2.4"	50%	.8"		1.0"		1.2"	1.8		2.1		2.3		
1/2T	1.0"	50%	1.7"		1.9"		2.2"	3.9		4.1		4.5		
	2.6"	50%	1.7"		2.0"		2.3"	3.9		4.1		4.5		
3/4T	1.0"	60%	2.4"	2.7"	2.8"	3.1"	3.3"	5.7	6.0	6.1	6.5	6.8		
	2.3"	60%	2.4"	2.7"	2.9"	3.2"	3.5"	5.7	5.9	6.1	6.5	6.8		

Reference System



Reviewed by: ______ Level ______

GENERAL ELECTRIC

SHT 3 of 4

Exam Sheet No. 2007

Cal. Sheet No. 2006

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I

☑ Preoperational ☐ I.S.I. Date 31 Oct 83

Examiner R. House

Level II Recorder J. Connick Level I

Weld Seam ID No. NA

Beam Angle 0° ____ 45° x 60° ____

Procedure No. Lim UT-5

Revision 2

Scan Sensitivity 36 db

Evaluation Sensitivity 30 db

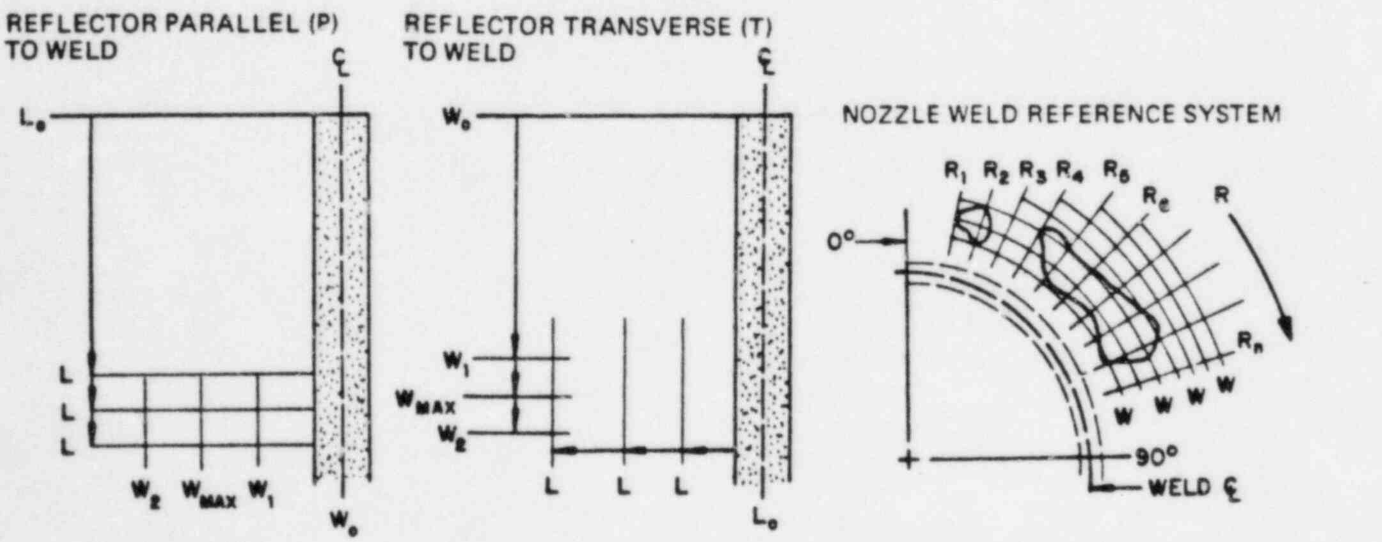
Couplant GLYCERINE

Component Temperature 60 °F

3.5" T

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L I			6.8"	6.9"						8.1	8.1	8.1		
L max	7.6	100+6	2.8"	3.1"	3.6"	4.4"	4.8"	7.3	7.5	8.1	9.2	9.4	Short Notch	
L 2			8.1"	8.0"						8.1	8.1	8.1		
L-1			1.1	1.2						8.4	8.4	8.4		
L max	20"	100+8	3.0"	3.2"	3.7"	4.5"	4.8"	7.6	7.7	8.4	9.3	9.6	Long Notch	
L-2			3.2	3.1						8.4	8.4	8.4		

Reference System



Reviewed by: [signature] Level ____

SHT 4 of 4
Exam Sheet No. 2007
Cal. Sheet No. 2006

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I ☑ Preoperational ☐ I.S.I. Date 31 Oct 83

Examiner R. House Level II Recorder J. Cooper Level I

Weld Seam ID No. NA Beam Angle 0° ____ 45° ✓ 60° ____

Procedure No. Lim UT-5 Revision 2

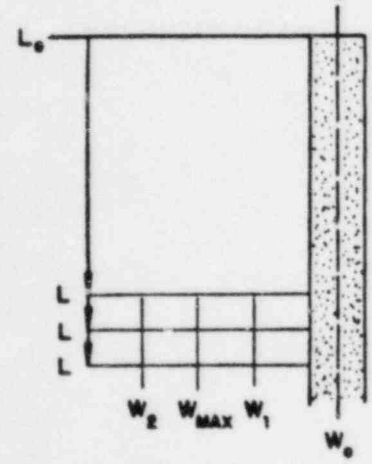
Scan Sensitivity 36 db Evaluation Sensitivity 30 db

Couplant Glycerine Component Temperature 60 °F

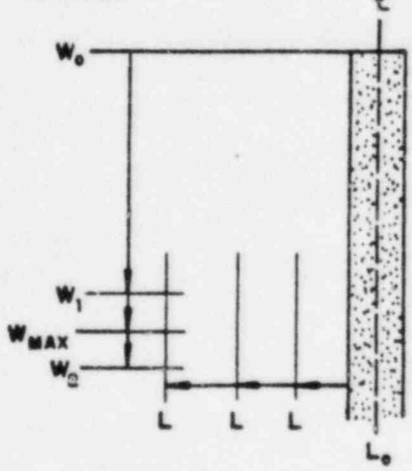
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L-1			6.7"	6.9"						8.2	8.2	8.2		
L-MAX	7.5"	100+4	2.8"	3.1"	3.7"	4.6"	4.4"	7.3	7.5	8.2	9.3	9.5	Short Notch	
L-2			8.1"	8.0"						8.2	8.2	8.2		
L-1			1.0"	1.2"						8.4	8.4	8.4		
L MAX	1.9"	100 TH	3.0"	3.2"	3.8"	4.5"	4.8"	7.5	7.7	8.4	9.3	9.6	Long Notch	
L-2			3.2"	3.1"						8.4	8.4	8.4		

Reference System

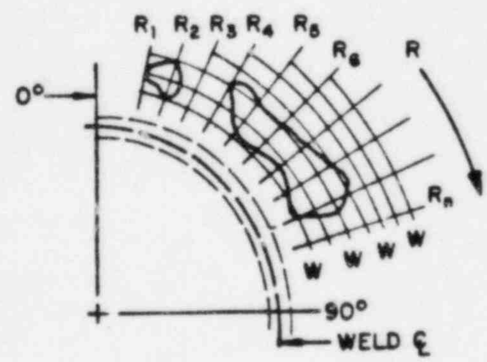
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: rtm Level ____

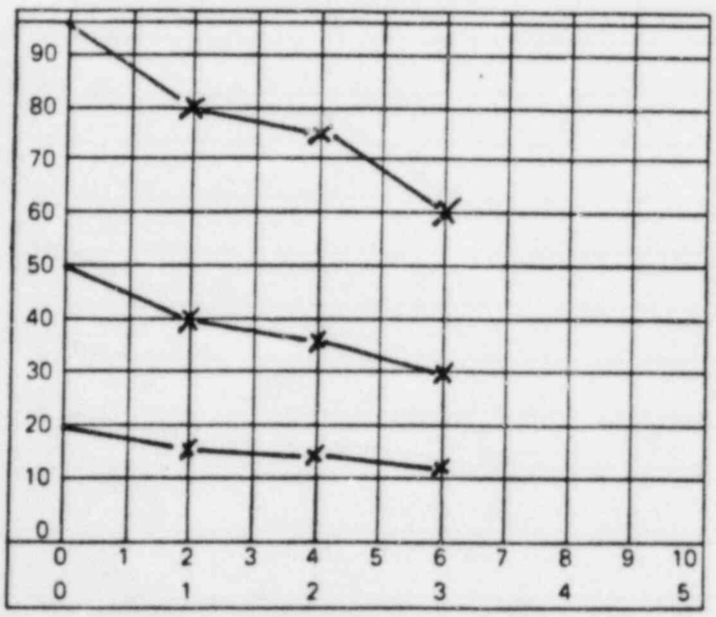
VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1005

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I.
Procedure No. LIM UT-5 Rev. REV. 2
Calib. Block No. 160-83C-17
Date 10-27-83 Couplant GLYCERINE
Cal. Std. Temp. ______ oF
Examiner M. HENDRYX ASNT Level II
Recorder J. CONNER ASNT Level I

Equipment Data:
Instrument Model No. SONIC
Shoe No. SSI-3
Instrument Serial No. 00890
Cable No. C1
Transducer Size .5"X1.0"
Frequency 2.25 MHz
Transducer Serial No. J08328
IIW-2 Beam Angle 45° o

DAC Curve: Range 0-5 ☑ 0-10 ☐ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	3.87	3.87
Delay	1.68	1.68
Scanning Gain	53db	53db
Evaluating Gain	47db	47db
Filter Position	Hi	Hi
Rep Rate	3K	3K
Damping	MiN	MiN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	.87"	1X	80%	.9"	2.0	SDH
1/2	1.75"	1X	75%	1.8"	4.0	SDH
3/4	2.62"	1X	60%	2.7"	6.0	SDH
2% Notch	3.5"	1X	80%	3.7"	8.4	N/A

Initial Calibration Time 1000

Calibration Checks:

Time	Value	Last Data Sheet
1200	100%	1006

Final Check: 1200

WFM

Angle Beam Spread @ 1X 45°____ or 60°____

1005

Hole Depth	Trailing Ray							Leading Ray						
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T														
1/2T														
3/4T														

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	37 "	20% "	10 "
60% "	32 "		

Control Linearity

80%FSH	−6db	38	(32–48)
80% "	−12db	18	(16–24)
40% "	+ 6db	81	(64–96)
20% "	+12db	78	(64–96)

Equipment Data For Linearity Checks

Code Block T 3.5"

Transducer Data:

Serial No. J08328

Beam Angle 45°

Size .5"X1.0" Freq 2.25 MHZ

Shoe No SSI-3 Cable No C-1

Check Made By:

MH

REMARKS

W- MEASUREMENT TAKEN FROM ℄ OF HOLES

L- MEASUREMENT TAKEN FROM SIDE OF BLOCK

THERMOMETER - T-387

WFM

Reviewed by: ______________________ Level ______________

Exam Sheet No. 1006
Cal. Sheet No. 1005

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 10-27-83

Examiner M. HENDRYX Level II Recorder J. CONNER Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ✓ 60° ______

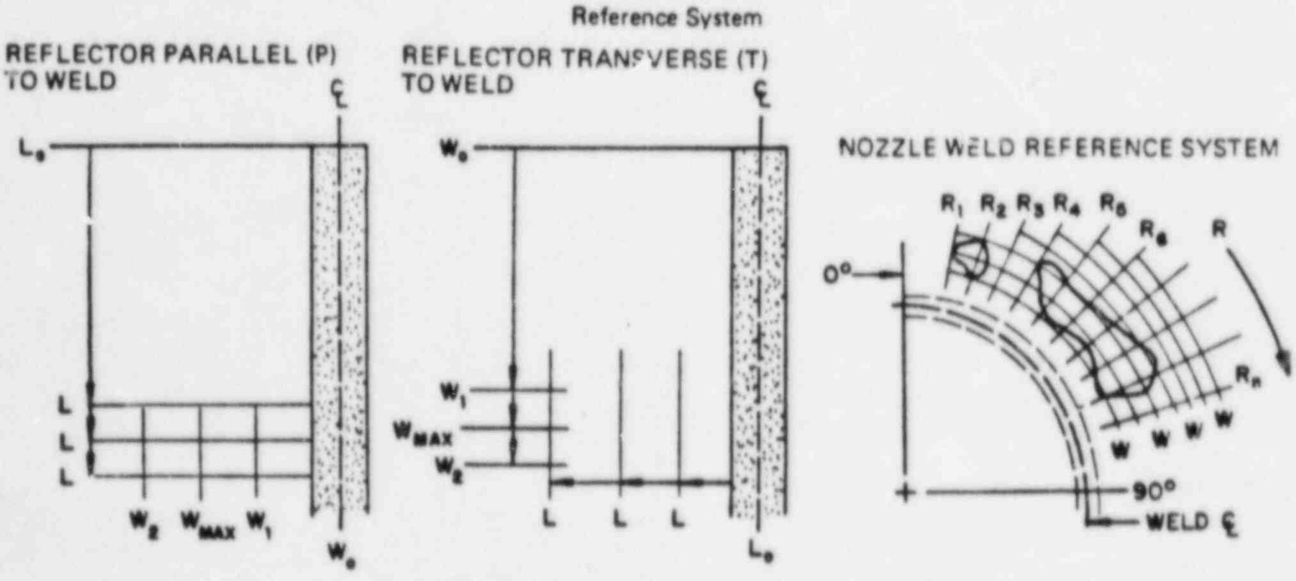
Procedure No. LIM UT-5 Revision REV. 2

Scan Sensitivity 53 db Evaluation Sensitivity 47 db

Couplant GLYCERINE Component Temperature 68° °F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L-1			1.1"	1.3"							8.4	8.4		
L-MAX	2.2"	100+10	2.9"	3.2"	3.7"	4.5"	4.7"	7.6	7.8	8.4	9.4	9.6	LONG	NOTCH
L-2			3.3"	3.1							8.4	8.4		
1			6.8"	6.9"							8.2	8.2		
MAX	7.4"	100+8	3.0"	3.1"	3.6"	4.4"	4.5"	7.5	7.6	8.2	9.3	9.4	SHORT	NOTCH
L-2			8.1"	8.0"							8.2	8.2		

Reference System



Reviewed by: WJM Level ______

GENERAL ELECTRIC

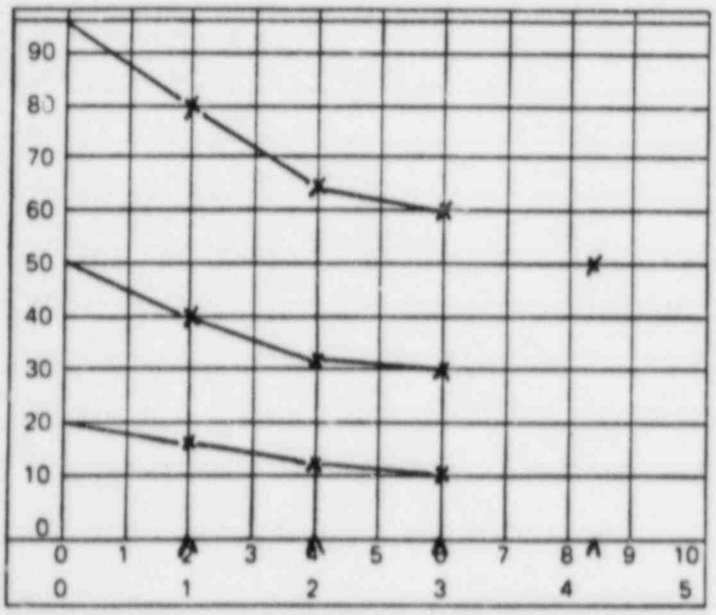
VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 2016

Site LIMERICK UNIT I ☑ Preoperational ☐ I.S.I.
Procedure No. LIM-UT-5 Rev. 2 Calib. Block No. 160-83C-17
Date 11-8-83 Couplant GLYCERINE Cal. Std. Temp. 70 (T 390) °F
Examiner B. HOUSE ASNT Level II
Recorder S. DAIGREPONT ASNT Level I

Equipment Data: Instrument Model No. SONIC MK-I Shoe No. SSI-1
Instrument Serial No. 08212E Cable No. C-2
Transducer Size .5" X 1.0" Frequency 2.25 MHz
Transducer Serial No. J0832~~X~~6 SD IIW-2 Beam Angle 60 °

DAC Curve: Range 0-5 ☐ 0-10 ☑ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	2.60	2.60
Delay	1.92	1.92
Scanning Gain	42	42
Evaluating Gain	36	36
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	.86"	1X	80%	1.7"	2.0	SDH
1/2	1.72"	1X	65%	3.4"	4.1	SDH
3/4	2.58"	1X	60%	5.1"	6.0	SDH
2% Notch	3.44"	1X	50%	6.8"	8.4	N/A

Initial Calibration Time 1045

Calibration Checks:

Time	Value	Last Data Sheet
1315	100%	2017

Final Check: RWH

WEM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° N/A or 60° ✓

2016

Hole Depth	Trailing Ray								Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T	1.1"	1.6	1.2"	1.7	1.4"	1.8	1.7"	2.0	2.2"	2.3	2.5"	2.8	2.6"	2.9
1/2T	2.7"	3.4	2.9"	3.5	3.1"	3.7	3.4"	4.1	4.1"	4.6	4.2"	4.8	4.3"	4.9
3/4T	3.8"	5.0	3.9"	5.1	4.2"	5.2	5.1"	6.0	5.6"	6.6	6.2"	7.2	6.5"	7.6

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	36	(32–48)
80% "	−12db	18	(16–24)
40% "	+ 6db	86	(64–96)
20% "	+12db	94	(64–96)

Equipment Data For Linearity Checks

Code Block T 3.44"

Transducer Data:

Serial No. J0832 1/2 50

Beam Angle 60°

Size .5" X 1.0" Freq 2.25 MHz

Shoe No SSI-1 Cable No C-2

Check Made By:

RWA

REMARKS

[illegible]

Reviewed by: ______________________ Level ______________

Exam Sheet No. 2017 PAGE 1 of 2
Cal. Sheet No. 2016

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I ☒ Preoperational ☐ I.S.I. Date 11-8-83

Examiner R House Level II Recorder S Dalorsponty Level I

Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° N/A 60° X

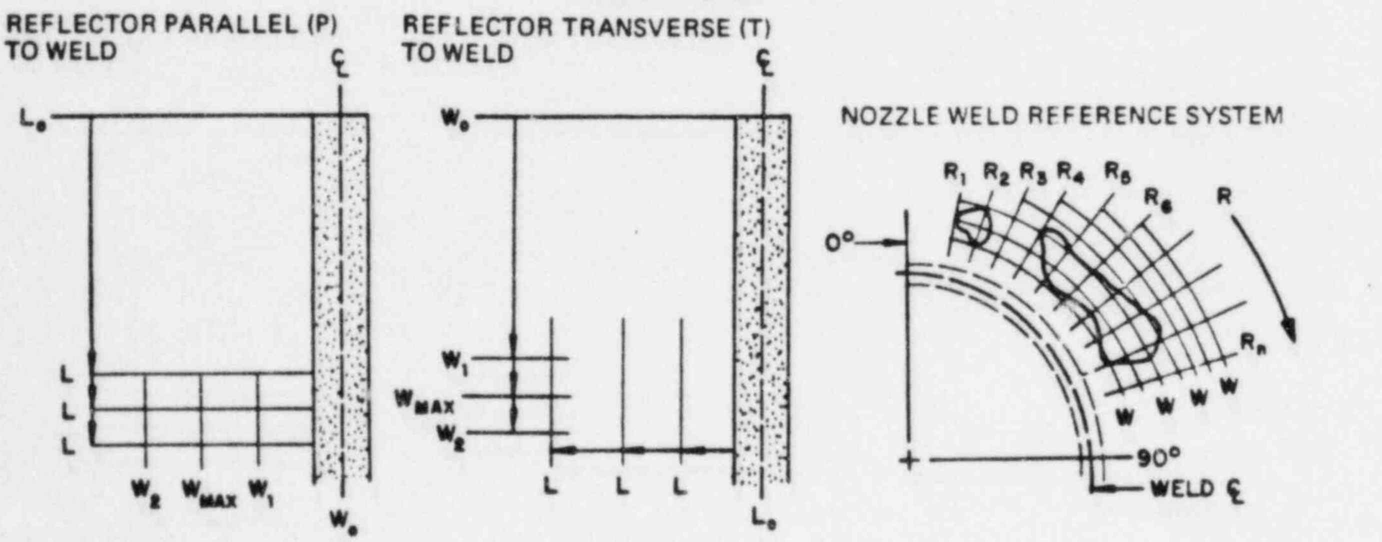
Procedure No. Lim-UT-5 Revision 2

Scan Sensitivity 42 Evaluation Sensitivity 36

Couplant Glycerine Component Temperature 70 °F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L-1	5.9"	20%			6.3"					8.15				
L-M	6.4"	30%	5.2"		6.3"		7.1"	7.3		8.15		8.8	SHORT	NOTCH
L-2	6.6"	20%			6.3"					8.15				
L-1	2.9"	20%			6.2"					8.1				
L-M	1.5"	30%	5.2"		6.2"		7.0"	7.3		8.1		8.4	LONG NOTCH	
L-2	1.4"	20%			6.2"					8.1				

Reference System



Reviewed by: WFM Level

Exam Sheet No. 2017 PAGE 2 oF 2
Cal. Sheet No. 2016

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT-I ☑ Preoperational ☐ I.S.I. Date 11-8-83

Examiner B. HOUSE Level II Recorders S. DAIGREPONT Level I

Weld Seam ID No. ______ Beam Angle 0° N/A 45° N/A 60° ✓

Procedure No. LIM-UT-5 Revision 2

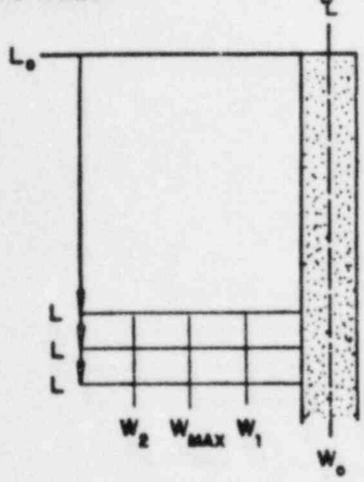
Scan Sensitivity 42 Evaluation Sensitivity 36

Couplant GLYCERINE Component Temperature 70° °F

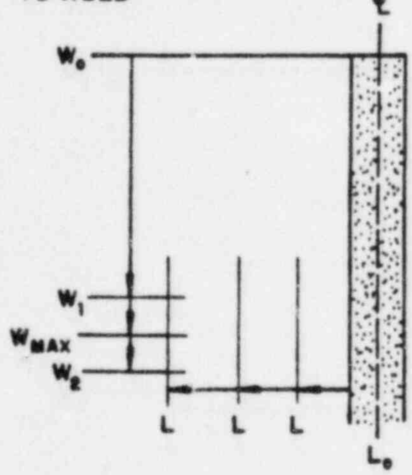
	L/R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	2.2"	70%	1.4"	1.6"	1.6"	1.9"	2.2"	1.8	1.9	2.0	2.3	2.6		
	1.5"	70%	1.4"	1.6"	1.7"	2.1"	2.2"	1.8	1.9	2.0	2.4	2.6		
1/2T	2.1"	952	2.9"	3.0"	3.3"	4.0"	4.4"	3.7	3.8	4.0	4.6	5.1		
	1.3"	60%	2.8"	3.1"	3.4"	3.8"	4.3"	3.6	3.8	4.0	4.5	5.0		
3/4T	2.0"	95%	4.2"	4.6"	5.0"	5.6"	5.9"	5.2	5.7	6.0	6.6	7.0		
	1.4"	90%	4.1"	4.5"	5.0"	5.8"	6.2"	5.3	5.7	6.0	6.8	7.2		

Reference System

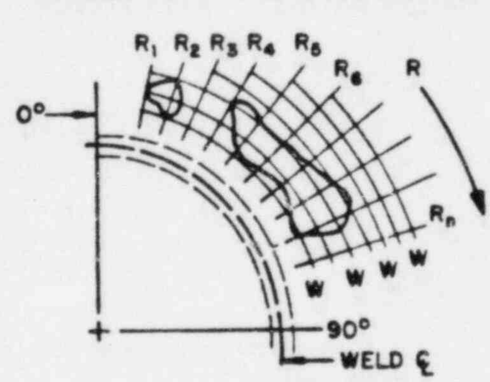
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WFM Level ______

GENERAL ELECTRIC

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 2018

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I.

Procedure No. LIM-UT 5 Rev. 2 Calib. Block No. 160-83C-17

Date 11-8-83 Couplant GLYCERINE Cal. Std. Temp. 70 oF

Examiner B. HOUSE ASNT Level II

Recorder S. DAIGREPONT ASNT Level I

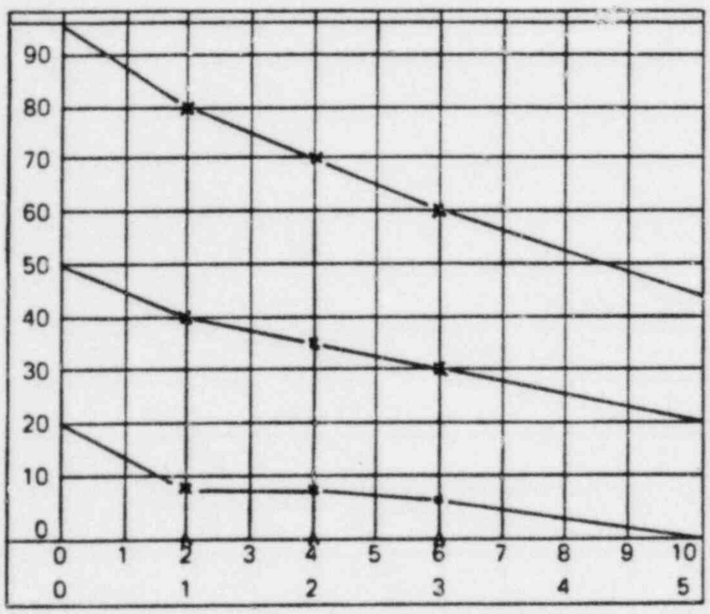
Equipment Data: Instrument Model No. SONIC MK-1 Shoe No. SSI-1

Instrument Serial No. 08212E Cable No. C-2

Transducer Size .5" x 1.0" Frequency 2.25 MHz

Transducer Serial No. JO8326 IIW-2 Beam Angle 60 °

DAC Curve: Range 0-5 ☐ 0-10 ☑ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	2.60	2.60
Delay	1.92	1.92
Scanning Gain	42dB	42dB
Evaluating Gain	36dB	36dB
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	MIN.	MIN.
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	.86	1X	80%	1.7"	2.0"	SDH
1/2	1.72	1X	70%	3.4"	4.1"	SDH
3/4	2.58	1X	60%	5.0"	6.0"	SDH
2% Notch	3.44	1X	20%	6.8"	8.3"	N/A

Initial Calibration Time 1600

Calibration Checks:

Time	Value	Last Data Sheet
1805	100%	2019

Final Check: RWA

WEM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° ____ or 60° ✓

2015

Hole Depth	Trailing Ray								Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T	1.2"	1.6	1.3"	1.7	1.5"	1.8	1.7"	2.0	2.2"	2.6	2.5"	2.8	2.6"	2.9
1/2T	2.7"	3.4	2.8"	3.5	3.0"	3.6	3.4"	4.1	4.0"	4.6	4.2"	4.9	4.3"	5.3
3/4T	3.8"	4.9	3.9"	5.0	4.1"	5.2	5.0"	6.0	5.8"	6.7	6.3"	7.3	6.7"	7.7

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	45 "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	35 "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	36	(32–48)
80% "	−12db	18	(16–24)
40% "	+ 6db	86	(64–96)
20% "	+12db	94	(64–96)

Equipment Data For Linearity Checks

Code Block T 3.44"

Transducer Data:

Serial No. J08326

Beam Angle 60°

Size .5" x 1.0" Freq 2.25 MHZ

Shoe No 6SJ-1 Cable No C-2

Check Made By

RWH

REMARKS

[illegible]

Reviewed by: ____________ Level ____________

Exam Sheet No. 2019 Page 1 of 2
Cal. Sheet No. 2018

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT 1 ☑ Preoperational ☐ I.S.I. Date 11-8-83

Examiner B. HOUSE Level II Recorder S.DAIGREPONT Level I

Weld Seam ID No. ______ Beam Angle 0° ______ 45° ______ 60° x

Procedure No. LIM-UT 5 Revision 2

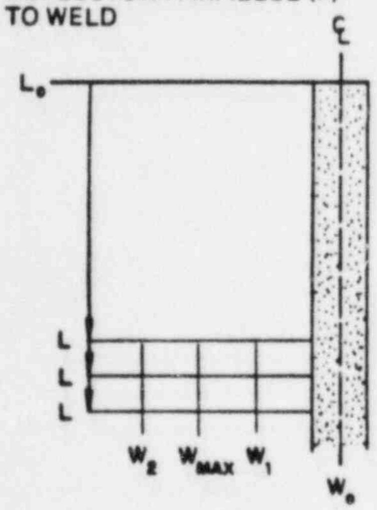
Scan Sensitivity 42 dB Evaluation Sensitivity 36 dB

Couplant GLYCERINE Component Temperature 70 °F

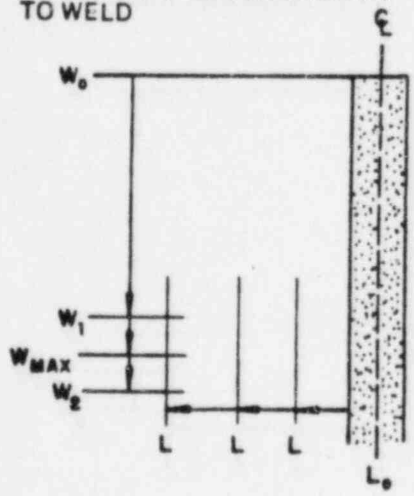
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.0"	65%	1.3"	1.5"	1.8"	1.9"	2.1"	1.8	2.0	2.1	2.3	2.5		
	2.0"	65%	1.4"	1.5"	1.7"	1.9"	2.1"	1.8	2.0	2.1	2.4	2.5		
1/2T	1.2"	60%	2.7"	2.9"	3.2"	3.6"	3.9"	3.5	3.6	4.0	4.2	4.5		
	2.2"	55%	2.9"	3.2"	3.3"	3.6"	4.0"	3.6	3.9	4.0	4.2	4.7		
3/4T	1.0"	80%	4.0"	4.4"	5.1"	5.4"	5.9"	5.1	5.5	6.1	6.4	6.9		
	2.1"	80%	4.0"	4.5"	5.0"	5.4"	5.8"	5.1	5.8	6.0	6.4	6.8		

Reference System

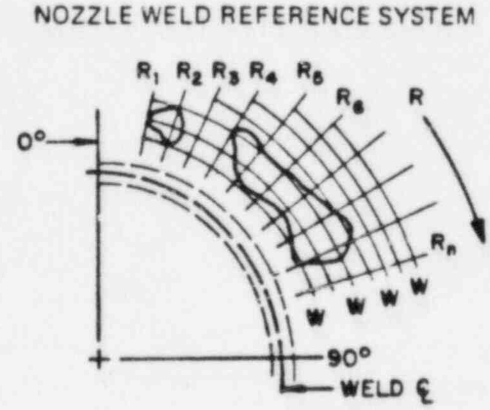
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WCM Level ______

GENERAL ELECTRIC

Exam Sheet No. 2019 Page 2 of 2
Cal. Sheet No. 2018

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I ☒ Preoperational ☐ I.S.I. Date 11-8-83

Examiner R. Howe Level II Recorder S. Davenport Level I

Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° N/A 60° X

Procedure No. Lim-UT-5 Revision 2

Scan Sensitivity 42 db Evaluation Sensitivity 36 db

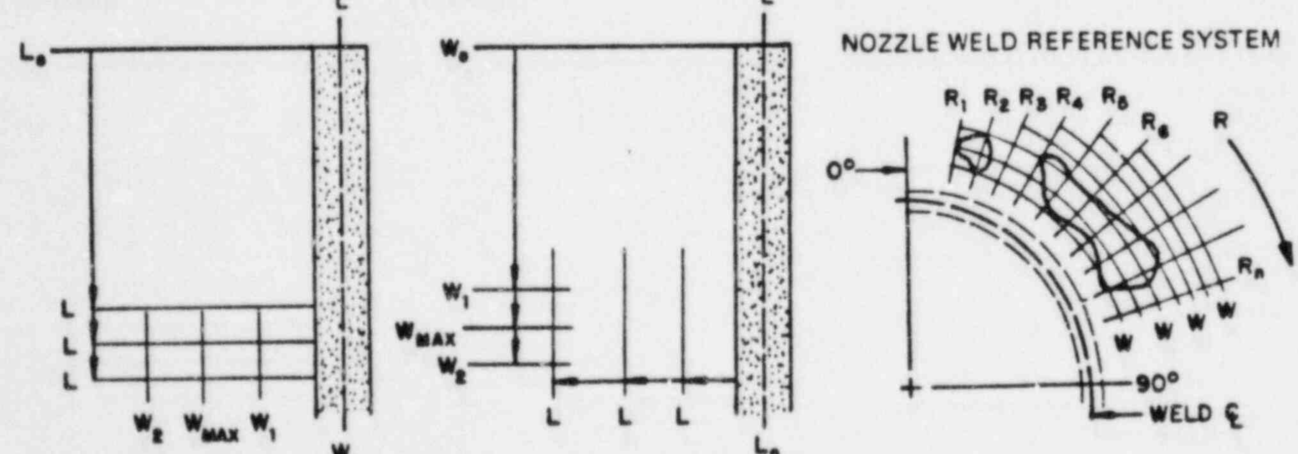
Couplant Glycerine Component Temperature 70 °F

	L/R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L1	7.1"	20%			6.2"					8.15				
Lm	7.4"	30%	5.2"		6.2"		7.1"	7.25		8.15		8.7	short notch	
L2	7.6"	20%			6.2"					8.15				
L1	1.6"	20%			6.3"					8.1				
Lm	2.5"	40%	5.2"		6.3"		7.1"	7.3		8.1		8.8	Long Notch	
L2	2.5"	20%			6.3"					8.1				

Reference System

REFLECTOR PARALLEL (P) TO WELD

REFLECTOR TRANSVERSE (T) TO WELD



Reviewed by: WFM Level

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 3002

Site LIMERICK ☒ Preoperational ☐ I.S.I.

Procedure No. LIM-UT-5 Rev. 2 Calib. Block No. 160-83C-17

Date 11-15-83 Couplant GLYCERINE Cal. Std. Temp. 75 °F

Examiner T. MOORE ASNT Level II

Recorder R. MAY ASNT Level I

Equipment Data:

Instrument Model No. USL-38 Shoe No. SS1-4

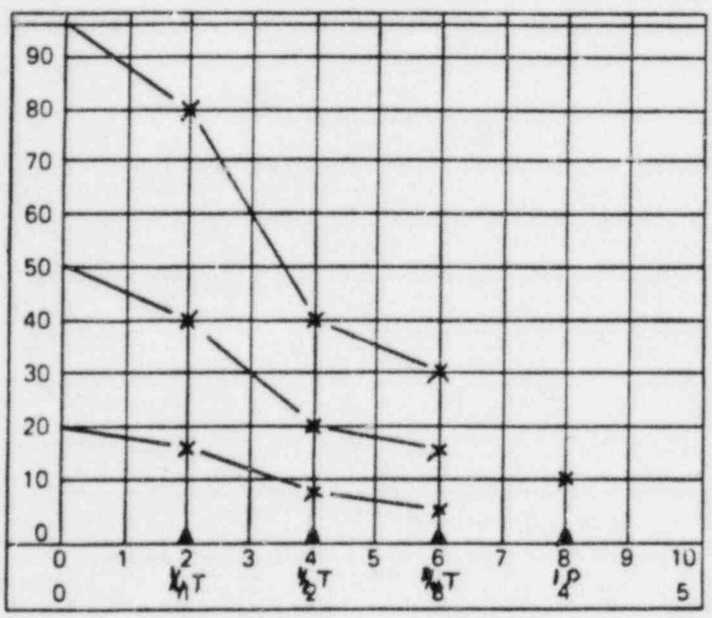
Instrument Serial No. 211009 Cable No. C-3

Transducer Size 0.5" x 1.0" Frequency 2.25 MHz

Transducer Serial No. J08325 IIW-2 Beam Angle 60°

THERMOMETER NO. T-389

DAC Curve: Range 0-5 ☐ 0-10 ☒ Other ☐



Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	5.77	5.77
Delay	5.96	5.96
Scanning Gain	56 dB	56 dB
Evaluating Gain	50 dB	50 dB
Filter Position	HI	HI
Rep Rate	3K	3K
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	0.86	1X	80 %	1.80	2.0	SDH
1/2	1.72	1X	40 %	3.40	4.0	SDH
3/4	2.58	1X	30 %	5.10	6.0	SDH
2% Notch	3.44	1X	10 %	6.80	8.0	N/A

Initial Calibration Time 1500 HR.

Calibration Checks:

Time	Value	Last Data Sheet
1615	100 %	3003

Final Check: 1615 HR.

WEM

Angle Beam Spread @ 1X 45° ____ or 60° X

3002

Hole Depth	Trailing Ray								Leading Ray					
	10% DAC		20% DAC		50% DAC		100% DAC		50% DAC		20% DAC		10% DAC	
	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP	W	D or MP
1/4T	.90	1.2	1.2	1.4	1.3	1.7	1.8	2.0	2.0	2.2	2.2	2.3	2.4	2.5
1/2T	N/A	N/A	2.6	3.2	3.0	3.6	3.4	4.0	4.0	4.4	4.5	4.9	N/A	N/A
3/4T	N/A	N/A	4.0	5.0	4.5	5.4	5.1	6.0	6.0	6.6	6.5	7.1	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	25 % FSH
90% "	N/A "	40% "	20 "
80% "	40 "	30% "	15 "
70% "	N/A "	20% "	10 "
60% "	N/A "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	20	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	80	(64–96)

Equipment Data For Linearity Checks

Code Block T 3.44"

Transducer Data:

Serial No. 508325

Beam Angle 60°

Size 0.5" x 1.0" Freq 2.25 MHz

Shoe No SS1-4 Cable No C-3

Check Made By:

T. MOORE

REMARKS

WFN

Reviewed by: ____________________ Level ____________

Exam Sheet No. 3003 1 of 2
Cal. Sheet No. 3002

VESSEL EXAMINATION DATA SHEET

Site LIMERICK ☒ Preoperational ☐ I.S.I. Date 11-15-83

Examiner T. MOORE Level II Recorder R. MAY Level I

Weld Seam ID No. N/A Beam Angle 0° ____ 45° ____ 60° x

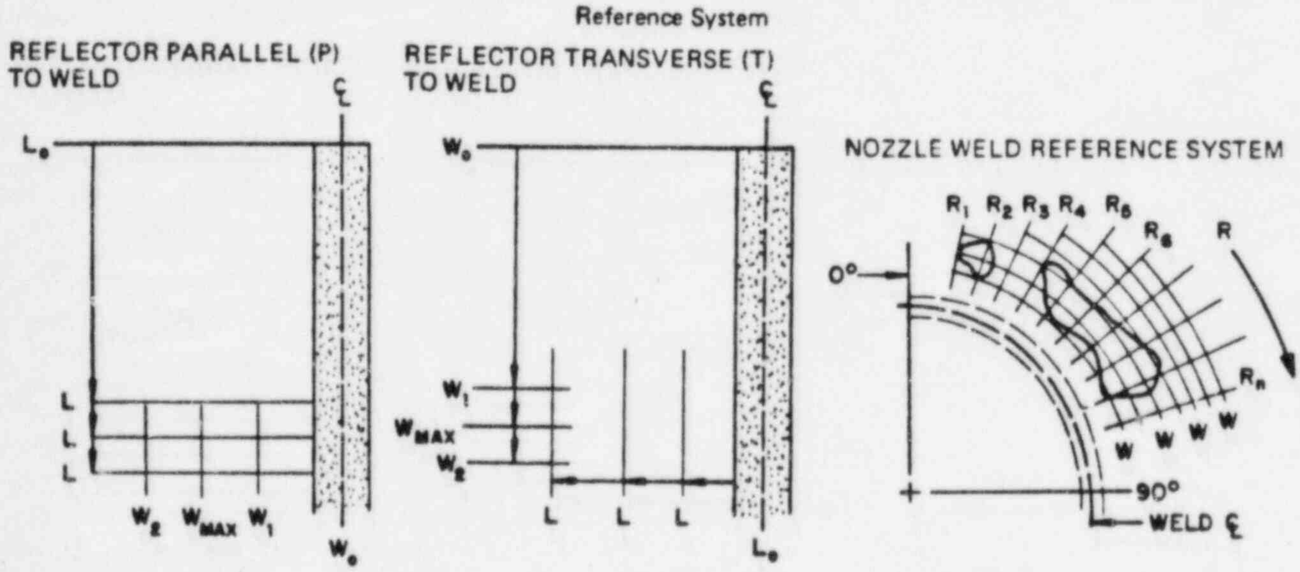
Procedure No. LIM-UT-5 Revision 2

Scan Sensitivity 56 dB Evaluation Sensitivity 50 dB

Couplant GLYCERINE Component Temperature 75°F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4 T	8.2	75	1.4	1.5	1.7	1.9	2.3	1.5	1.8	1.9	2.1	2.4		
	7.0	65	1.4	1.6	1.8	1.9	2.4	1.5	1.7	1.9	2.1	2.4		
1/2 T	8.5	60	2.8	3.3	3.5	3.7	4.3	3.2	3.8	4.0	4.1	4.6		
	7.0	60	2.7	3.1	3.5	3.8	4.5	3.2	3.6	4.0	4.2	4.8		
3/4 T	8.5	75	4.0	4.7	5.3	5.7	N/A	4.9	5.4	6.0	6.4	N/A		
	7.0	75	4.0	4.5	5.3	5.6	N/A	4.9	5.4	6.0	6.2	N/A		

Reference System



Reviewed by: [signature] Level ____

GENERAL ELECTRIC

Exam Sheet No. 3003 Pg. 2 of 2
Cal. Sheet No. 3002

VESSEL EXAMINATION DATA SHEET

Site Limerick ☒ Preoperational ☐ I.S.I. Date 11-15-83

Examiner T. MOORE Level II Recorder R. MAY Level I

Weld Seam ID No. N/A Beam Angle 0° N/A 45° N/A 60° X

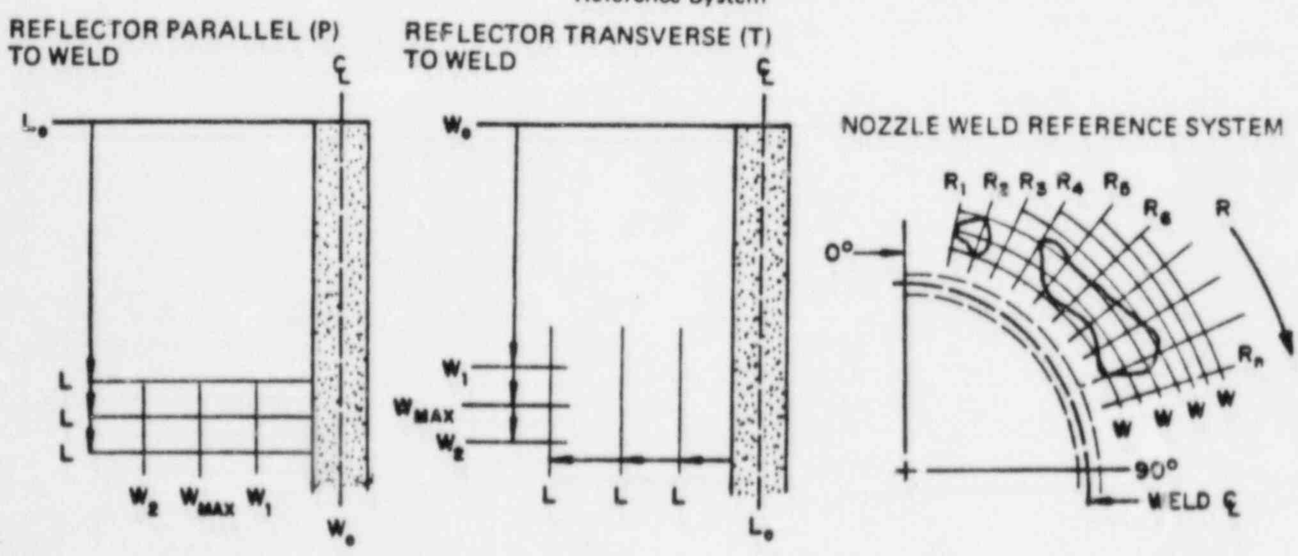
Procedure No. LIM-UT-5 Revision 2

Scan Sensitivity 56dB Evaluation Sensitivity 50dB

Couplant GLYCERINE Component Temperature 75° °F

	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1T	6.0	100%	5.3		6.35		7.0	7.2		8.1		8.7	Total Length	1.50"
1T	1.5	100%	5.2		6.3		7.1	7.3		8.1		8.8	Total Length	.25"

Reference System



Reviewed by: WEM Level

VESSEL UT CALIBRATION DATA SHEET

Calibration Sheet No. 1057

Site LIMERICK UNIT-I ☒ Preoperational ☐ I.S.I.

Procedure No. LIM UT-5 Rev. 2 Calib. Block No. 160-83C-17

Date 11-26-83 Couplant GLYCERINE Cal. Std. Temp. 68° °F

Examiner M. HENDRYX ASNT Level II

Recorder S. DRIGRRPANT ASNT Level I

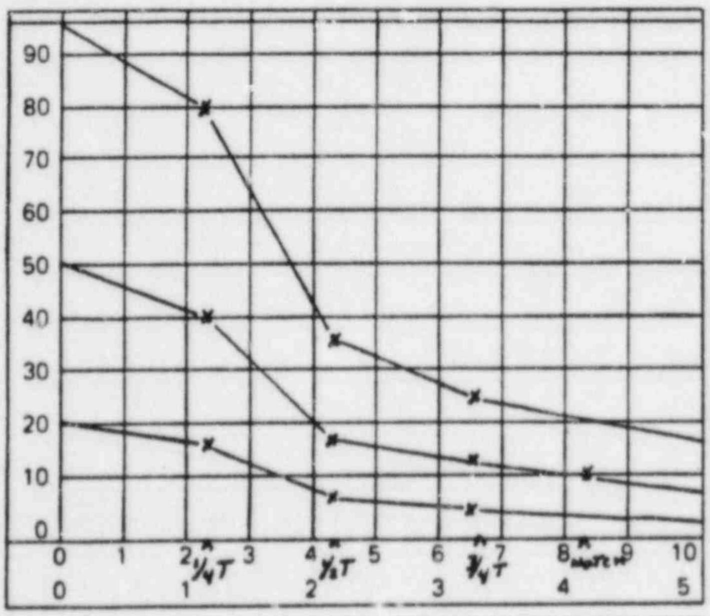
Equipment Data: Instrument Model No. USL-38 Shoe No. SSI-2

Instrument Serial No. 211009 Cable No. C-1

Transducer Size .5" X 1.0" Frequency 2.25 MHz

Transducer Serial No. J08328 IIW-2 Beam Angle 60 °

DAC Curve: Range 0-5 ☐ 0-10 ☐ Other ☒



Hole Depth "T"	Hole Depth Inches	Gain @ 1X	Max. Amp.	"W" Inch	MP Inch	SDH or FBH
1/4	.86"	1X	80%	1.6"	2.3	SDH
1/2	1.72"	1X	35%	2.9"	4.3	SDH
3/4	2.58"	1X	25%	4.8"	6.7	SDH
2% Notch	3.44"	1X	(FSH) 10%	5.6"	8.2	N/A

Instrument Settings:

	Start	Finish
Attenuation	N/A	N/A
Sweep	4.70	4.70
Delay	6.26	6.26
Scanning Gain	54	54
Evaluating Gain	48	48
Filter Position	N/A	N/A
Rep Rate	N/A	N/A
Damping	MIN	MIN
Reject	OFF	OFF

6 db Change for 2 X

Initial Calibration Time 1220

Calibration Checks:

Time	Value	Last Data Sheet
1320	100%	1058

Final Check: MH

WEM

GENERAL ELECTRIC

Angle Beam Spread @ 1X 45° N/A or 60° X

1057

Hole Depth	Trailing Ray 10% DAC W	10% DAC D or MP	20% DAC W	20% DAC D or MP	50% DAC W	50% DAC D or MP	100% DAC W	100% DAC D or MP	Leading Ray 50% DAC W	50% DAC D or MP	20% DAC W	20% DAC D or MP	10% DAC W	10% DAC D or MP
1/4T	1.0"	1.7	1.2"	1.9	1.4"	2.0	1.6"	2.3	2.2"	3.0	2.5"	3.3	2.6"	3.3
1/2T	N/A	N/A	2.5"	3.7	2.6"	3.9	2.9"	4.3	4.1"	5.5	4.8"	6.3	N/A	N/A
3/4T	N/A	N/A	3.9"	5.8	4.1"	6.0	4.8"	6.7	5.8"	7.9	6.2"	8.3	N/A	N/A

Amplitude Linearity Check

100%FSH	50 % FSH	50%FSH	28 % FSH
90% "	N/A "	40% "	20 "
80% "	40 "	30% "	17 "
70% "	N/A "	20% "	10 "
60% "	30 "		

Control Linearity

80%FSH	−6db	40	(32–48)
80% "	−12db	22	(16–24)
40% "	+ 6db	80	(64–96)
20% "	+12db	80	(64–96)

Equipment Data For Linearity Checks

Code Block T 7.00" "

Transducer Data:

Serial No J08328

Beam Angle 60°

Size .5"X1.0" Freq 2.25MHz

Shoe No SSI-2 Cable No C-1

Check Made By:

MH

REMARKS

10.0 = 8"

LFm

Reviewed by: ______ Level ______

Exam Sheet No. 1058 PAGE 1 OF 2
Cal. Sheet No. 1057

VESSEL EXAMINATION DATA SHEET

Site LIMERICK UNIT-I ☒ Preoperational ☐ I.S.I. Date 11-26-83

Examiner M. HENDRYX Level II Recorders. DAIGREPONT Level I

Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° N/A 60° X

Procedure No. LIM- UT-5 Revision 2

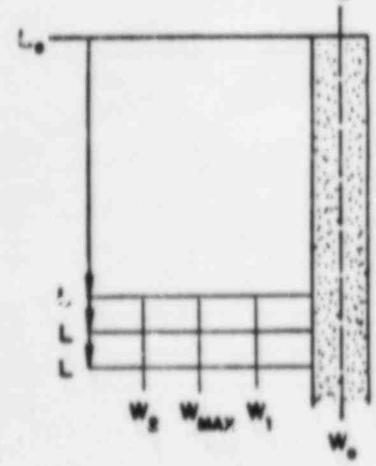
Scan Sensitivity 54 Evaluation Sensitivity 48

Couplant GLYCERINE Component Temperature 68° °F

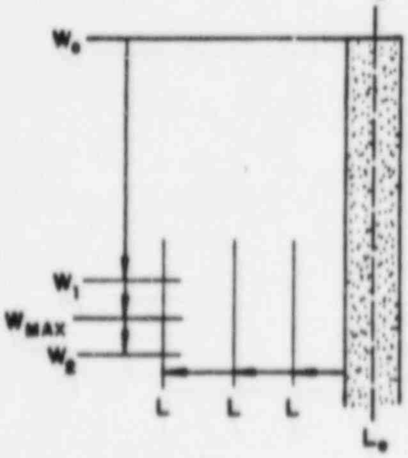
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
1/4T	1.5"	50%	1.3"		1.6"		2.2"	2.0		2.3		3.0		
1/2T	1.7"	75%	2.4"	2.6"	3.0"	3.9"	4.3"	3.7	3.9	4.3	5.2	5.7		
3/4T	1.5"	80%	3.8"	4.1"	4.8"	5.5"	5.9"	5.7	6.0	6.7	7.5	8.0		

Reference System

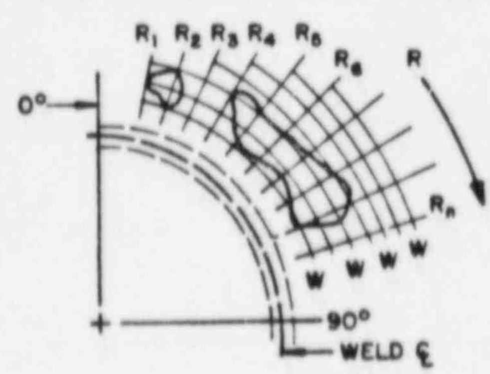
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: WFM Level

Exam Sheet No. 1058 Page 2 of 2
Cal. Sheet No. 1057

VESSEL EXAMINATION DATA SHEET

Site Limerick Unit I ☒ Preoperational ☐ I.S.I. Date 11-26-83

Examiner M. Hendryx Level II Recorder S Davidson Level I

Weld Seam ID No. 160-83C-17 Beam Angle 0° N/A 45° N/A 60° X

Procedure No. Lim-UT-5 Revision 2

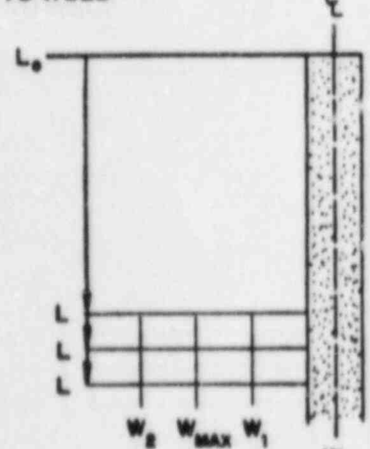
Scan Sensitivity 54 Evaluation Sensitivity 48

Couplant Glycerine Component Temperature 68 °F

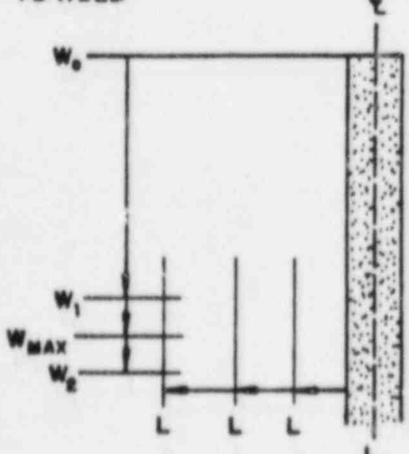
	L / R	% DAC (Max)	W_1 20% DAC	W_{F1} 50% DAC	W_m Max DAC	W_{F2} 50% DAC	W_2 20% DAC	MP_1 20% DAC	MP_{F1} 50% DAC	MP Max DAC	MP_{F2} 50% DAC	MP_2 20% DAC	Continuous or spot, T or P	CW or CCW if Applicable
L-1	1.5°	5% FSH			6.3°					8.1				
L-M	2.1°	10% FSH	5.3°		6.3°		7.0°	7.4		8.1		8.8	Long Notch	
L-2	2.9°	5% FSH			6.3°					8.1				
L-1	6.0	5% FSH			6.35°					8.1				
L-M	6.3	10% FSH	5.25°		6.35°		7.1°	7.3		8.1		8.85	Short Notch	
L-2	6.8	5% FSH			6.35°					8.1				

Reference System

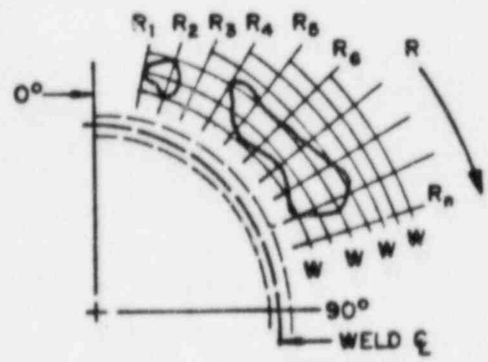
REFLECTOR PARALLEL (P) TO WELD



REFLECTOR TRANSVERSE (T) TO WELD



NOZZLE WELD REFERENCE SYSTEM



Reviewed by: LFM Level

GENERAL ELECTRIC

The following pages detail the examination coverage of the Category BA and Category BD vessel assembly welds for the Limerick Unit #1 preservice ultrasonic examination.

The report lists the weld examined, the examination technique used, the calculations of the areas examined in accordance with Section XI requirements, and calculations of unexamined volumes.

In areas where only partial code examination (less than 100% coverage for 45° or 60° examinations) is possible, no examination credit is taken even though the area was examined to the maximum extent possible. This yields conservative percentages on calculations of unexamined volumes.

The examination of the Limerick Unit #1 RPV was performed in a composite manner consisting of remote automatic examination on some welds, manual examination on some welds, and a combination of both methods on some welds. The examination method or combination of methods was dictated by the RPV and biological shield design.

GENERAL ELECTRIC

160-838-18

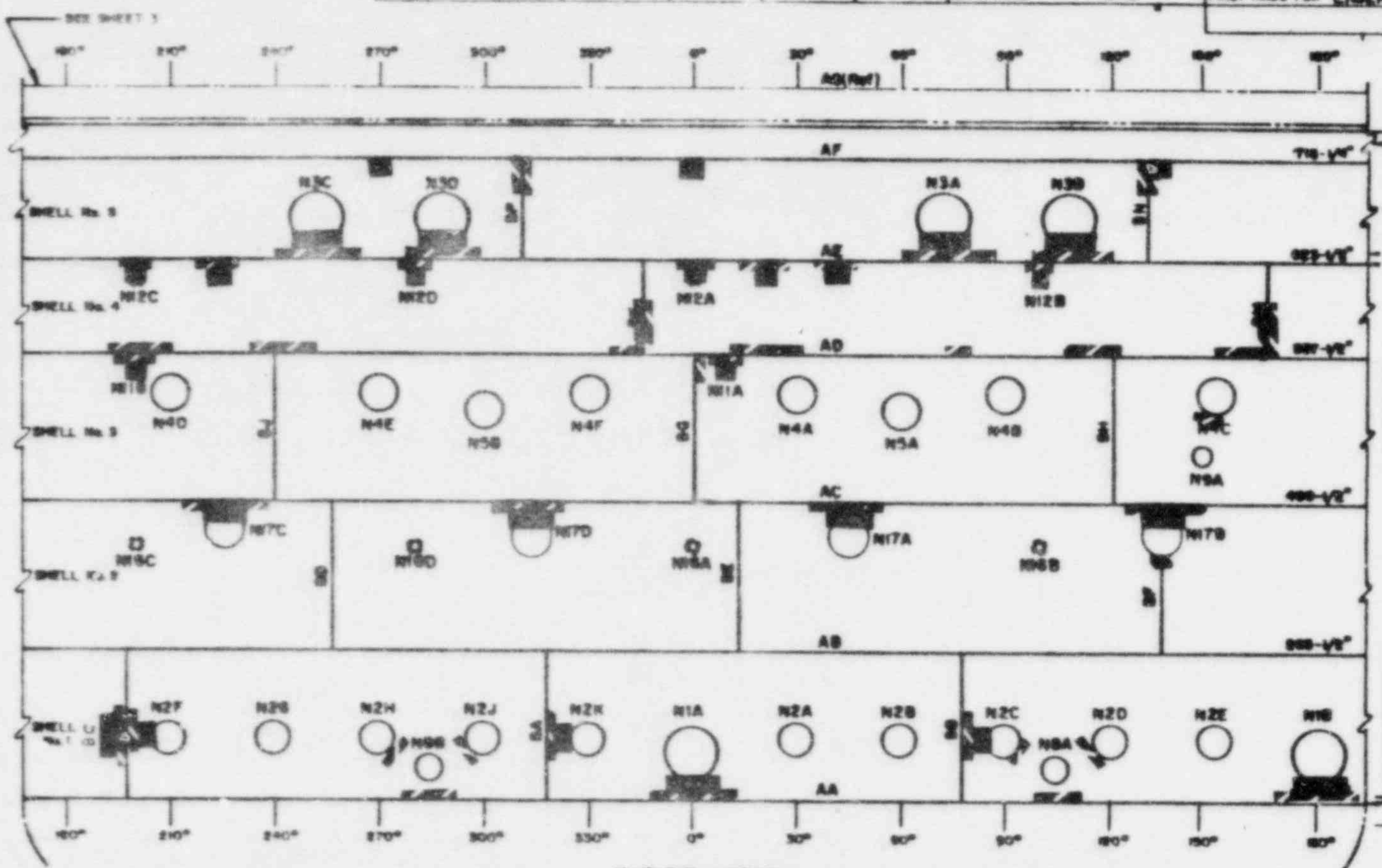
WELD IDENTIFICATION (RPV)

FIRST MADE FOR LIMERICK I

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING

APPLIED PRACTICES	SURFACES	FRACTIONS	DECIMALS	ANGLES
	✓	± NA	± NA	± NA

NOT TO SCALE



REPRESENTS AN AREA THAT CANNOT BE COMPLETELY EXAMINED BY REMOTE AUTOMATIC EQUIPMENT.

REPRESENTS AN AREA THAT CANNOT BE COMPLETELY EXAMINED BY MANUAL EQUIPMENT. THESE AREAS REPRESENT INCOMPLETE EXAMS.

INSIDE VIEW

EL. 0"(Ref)

NOTE:
SEE SHEET 2 FOR AZIMUTH & ELEVATION TABLES.

FIGURE 1

Page 1 of 2

R.W. NAGLE 7/22/83

7/25/83

AQES-NPS
KING of PRUSSIA

160-838-18 SHEET 2

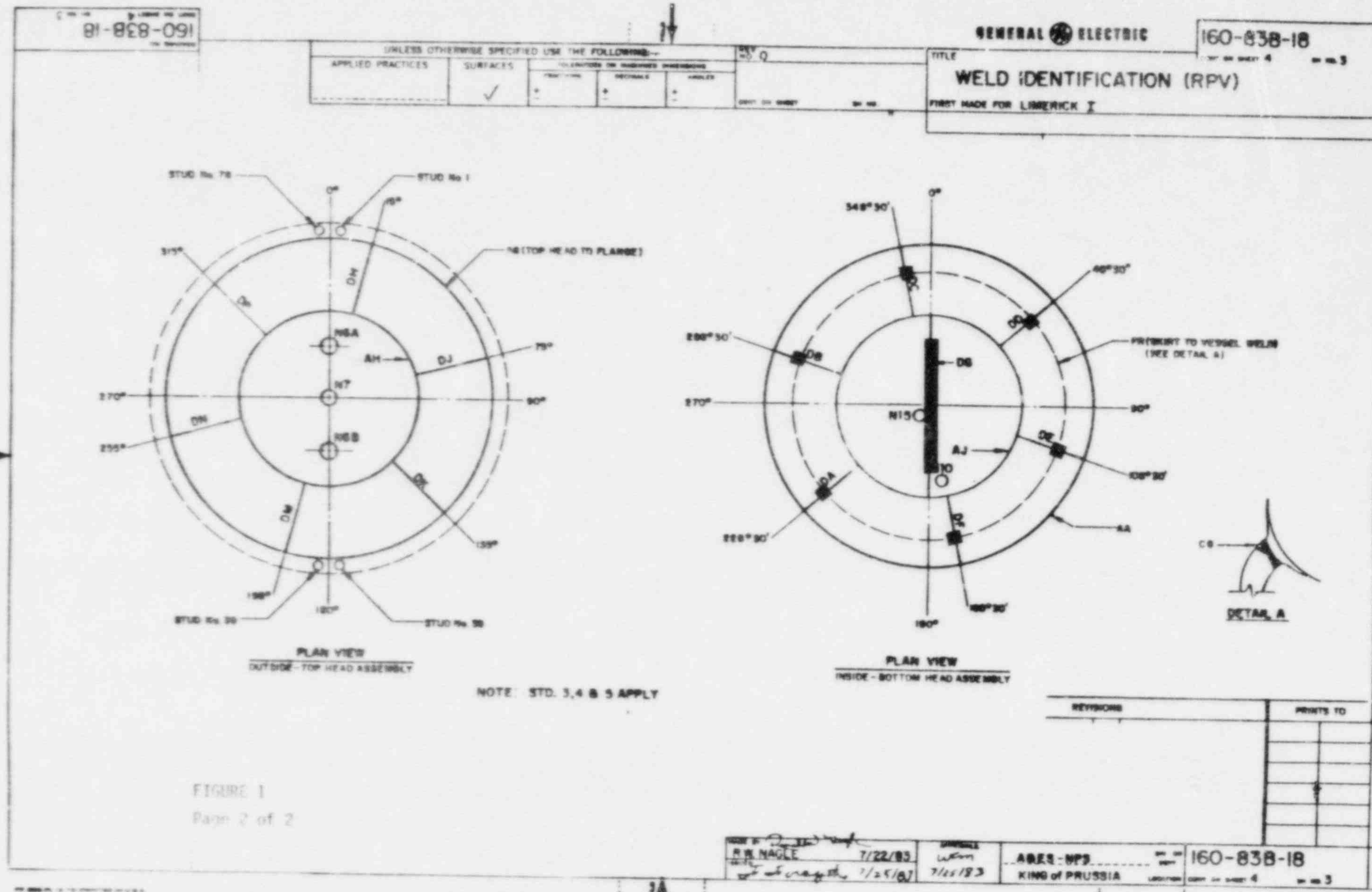


FIGURE 1
Page 2 of 2

CATEGORY BA

PRESSURE RETAINING WELDS IN REACTOR VESSEL

CIRCUMFERENTIAL WELD SEAM AA

AA TOP SIDE

Remote Automatic Examination Coverage

There were four (4) interferences on weld seam AA top that caused missed areas (see figure 1) during the remote automatic examination. These were:

Nozzle N1A	From X = 803.4"	to X = 41.7"	Total of 73.6"
Nozzle N1B	From X = 385.0"	to X = 455.9"	Total of 70.9"
Nozzle N8A	From X = 224.8"	to X = 270.3"	Total of 45.5"
Nozzle N8B	From X = 640.7"	to X = 683.7"	Total of 43.0"

Total Missed Area 233"

The circumference of weld seam AA is 835.3".

These interferences caused 27.9% (233") of weld seam AA top to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The four (4) areas missed due to Nozzle Interferences were manually examined to reduce the percentage of unexamined weld volume on weld seam AA top side. The interferences to automatic examination caused by Nozzles N8A and N8B do not exist for manual examination techniques. These areas (88.5" total) were completely examined in accordance with Section XI Requirements. The interferences to automatic examination from Nozzles N1A and N1B also affected manual examination of these areas. The interferences caused the following areas to be partially examined manually:

Nozzle N1A

45°T scan	From X = 825.3"	to X = 10"	Total of 20" Partially (50%) examined
60°T scan	From X = 812.3"	to X = 23"	Total of 46" Partially (42%) examined

Nozzle N1B

45°T scan	From X = 407.7"	to X = 427.7"	Total of 20" Partially (50%) examined
60°T scan	From X = 394.7"	to X = 440.7"	Total of 46" Partially (42%) examined

Composite (Automatic & Manual) Coverage of Weld Seam AA Top Side

Since only partial angle beam coverage of the areas near Nozzles N1A and N1B is possible, no examination credit can be taken for 92" of weld seam AA top. This missed area represents 11% of the code required examination for this portion of weld AA.

AA BOTTOM SIDE

Remote Automatic Examination — Not Performed

Manual Examination Coverage

No interference, 100% of the Section XI Required examination for AA Bottom was performed manually.

Summary of Weld Seam AA Examination

94.5% of weld seam AA was completely examined in accordance with Section XI Requirements. 5.5% of weld seam AA was partially (42% - 50% of Code Requirement for T scan) examined manually without credit. Total code examination coverage for weld seam AA therefore equals 94.5%.

CIRCUMFERENTIAL WELD SEAM AB

Remote Automatic Examination Coverage

Weld seam AB was examined 100% by the automatic equipment in accordance with Section XI Requirements.

CIRCUMFERENTIAL WELD SEAM AC

AC TOP SIDE

Remote Automatic Examination Coverage

The top side of weld seam AC wes examined 100% by the automatic equipment in accordance with Section XI Requirements.

AC BOTTOM SIDE

Remote Automatic Examination Coverage

There were four (4) interferences on weld seam AC bottom that caused missed areas (see figure 1) during the remote automatic examination. These were:

Nozzle N17A	From X	=	80.7"	to X	=	126.9"	Total of 46.2"
Nozzle N17B	From X	=	292.7"	to X	=	335.4"	Total of 42.7"
Nozzle N17C	From X	=	499.2"	to X	=	546.0"	Total of 46.8"
Nozzle N17D	From X	=	710.1"	to X	=	754.8"	Total of 44.7"

Total Missed Area = 180.4"

The circumference of weld seam AC is 837.25".

These interferences caused 21.6% (180.4") of weld seam AC bottom to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The four (4) areas missed due to Nozzle Interferences were manually examined to reduce the percentage of unexamined weld volume on weld seam AC bottom side. The interferences to automatic examination from Nozzles N17A, B, C, and D also affected manual examination of these areas. The interferences caused the following areas to be partially examined manually:

Nozzle N17A

60°T scan From X = 90.2" to X = 119.2" Total of 29" Partially (45%) examined

Nozzle N17B

60°T scan From X = 299.5" to X = 328.5" Total of 29" Partially (45%) examined

Nozzle N17C

60°T scan From X = 508.8" to X = 537.8" Total of 29" Partially (45%) examined

Nozzle N17D

60°T scan From X = 718.1" to X = 747.1" Total of 29" Partially (45%) examined

Composite (Automatic & Manual) Coverage of Weld Seam AC Bottom Side

Since only partial angle beam coverage of the areas near Nozzles N17A, B, C, and D is possible, no examination credit can be taken for 116" of weld seam AC bottom. This missed area represents 13.9% of the code required examination for this portion of weld AC.

Summary of Weld Seam AC Examination

93% of weld seam AC was completely examined in accordance with Section XI Requirements. 7% of weld seam AC was partially (45% of Code Requirement for 60°T scan) examined manually without credit. Total code examination coverage for weld seam AC therefore equals 93%.

CIRCUMFERENTIAL WELD SEAM AD

AD TOP SIDE

Remote Automatic Examination Coverage

There were seven (7) interferences on weld seam AD top that caused missed areas (see figure 1) during the remote automatic examination. These were:

Biological Shield Bracket and Nozzle N11A	From X = 11.6"	to X = 73.8"	Total of 62.2"
Biological Shield Bracket	From X = 177.0"	to X = 180.6"	Total of 3.6"
Biological Shield Bracket	From X = 241.0"	to X = 283.3"	Total of 42.3"
Biological Shield Bracket	From X = 340.8"	to X = 389.1"	Total of 48.3"
Nozzle N11B	From X = 451.4"	to X = 484.6"	Total of 33.2"
Biological Shield Bracket	From X = 553.0"	to X = 598.1"	Total of 45.1"
Biological Shield Bracket	From X = 799.1"	to X = 807.3"	Total of 8.2"

Total Missed Area = 242.9"

The circumference of weld seam AD is 837.25".

The interferences caused 29% (242.9") of weld seam AD top to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The seven (7) areas missed due to Nozzle and Biological Shield Bracket Interferences were manually examined to reduce the percentage of unexamined weld volume on weld seam AD top side. The interferences to automatic examination caused by Nozzles N11A and N11B, and the Biological Shield Brackets do not exist for manual examination techniques. These areas (242.9" total) were completely examined in accordance with Section XI Requirements.

Composite (Automatic & Manual) Coverage of Weld Seam AD Top Side

The composite examination of weld seam AD top covered 100% of the Section XI Requirement for this portion of weld seam AD.

AD BOTTOM SIDE

Remote Automatic Examination Coverage

There were two (2) interferences on weld seam AD bottom that caused missed areas (see Figure 1) during the remote automatic examination. These were:

Nozzle N11A	From X = 5.8"	to X = 41.3"	Total of 35.5"
Nozzle N11B	From X = 445.9"	to X = 484.6"	Total of 38.7"

Total Missed Area = 74.2"

The circumference of weld seam AD is 837.25".

The interferences caused 8.9% (74.2") of weld seam AD bottom to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The two (2) areas missed due to Nozzle Interferences were manually examined to reduce the percentage of unexamined weld volume on weld seam AD bottom side. The interferences to automatic examination caused by Nozzles N11A and N11B also affected manual examination of these areas. The interferences cause the following areas to be partially examined manually:

Nozzle N11A

60°T scan From X = 15.3" to X = 31.3" Total of 16" Partially (72.7%) examined

Nozzle N11B

60°T scan From X = 458.0" to X = 474.0" Total of 16" Partially (72.7%) examined

Composite (Automatic & Manual) Coverage of Weld Seam AD Bottom Side

Since only partial angle beam coverage of the areas near Nozzles N11A and N11B is possible, no examination credit can be taken for 32" of weld seam AD bottom. This missed area represents 3.8% of the code required examination of this portion of AD.

Summary of Weld Seam AD Examination

98.1% of weld seam AD was completely examined in accordance with Section XI Requirements. 1.9% of weld seam AD was partially (72.7% of Code Requirement for 60°T scan) examined manually without credit. Total examination coverage for weld seam AD therefore equals 98.1%.

CIRCUMFERENTIAL WELD SEAM AE

AE TOP SIDE

Remote Automatic Examination Coverage

There were four (4) interferences on weld seam AE top that caused missed areas (see Figure 1) during the remote automatic examination. These were:

Nozzle N3A	From X = 141.6"	to X = 193.7"	Total of 52.1"
Nozzle N3B	From X = 227.6"	to X = 277.7"	Total of 50.1"
Nozzle N3C	From X = 564.0"	to X = 615.1"	Total of 51.1"
Nozzle N3D	From X = 647.6"	to X = 701.7"	Total of 54.1"

Total Missed Area = 207.4"

The circumference of weld seam AE is 842.00"

The interferences caused 24.6% (207.4") of weld seam AE top to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The four (4) areas missed due to Nozzle Interferences were manually examined to reduce the percentage of unexamined weld volume on weld seam AE top side. The interferences to automatic examination from Nozzles N3A, B, C and D also affected manual examination of these areas. The interferences caused the following areas to be partially examined manually:

Nozzle N3A

45°T scan	From X = 156.4"	to X = 180.4"	Total of 24"	Partially (76%) examined
60°T scan	From X = 154.4"	to X = 182.4"	Total of 28"	Partially (43%) examined

Nozzle N3B

45°T scan	From X =	240.6" to X =	264.6"	Total of 24"	Partially	(76%)	examined
60°T scan	From X =	238.6" to X =	266.6"	Total of 28"	Partially	(43%)	examined

Nozzle N3C

45°T scan	From X =	577.4" to X =	601.4"	Total of 24"	Partially	(76%)	examined
60°T scan	From X =	575.4" to X =	603.4"	Total of 28"	Partially	(43%)	examined

Nozzle N3D

45°T scan	From X =	661.6" to X =	685.6"	Total of 24"	Partially	(76%)	examined
60°T scan	From X =	659.6" to X =	687.6"	Total of 28"	Partially	(43%)	examined

Composite (Automatic & Manual) Coverage of Weld Seam AA Top Side

Since only partial angle beam coverage of the areas near Nozzles N3A, B, C, and D is possible, no examination credit can be taken for 112" of weld seam AE top. This missed area represents 13.8% of the code required examination for this portion of weld AE.

AE BOTTOM SIDE

Remote Automatic Examination Coverage

There were seven (7) interferences on weld seam AE bottom that caused missed areas (see figure 1) during the remote automatic examination. These were:

Nozzle N12A	From X =	819.2" to X =	19.4"	Total of 37.5"
Vessel Nameplate	From X =	33.7" to X =	65.6"	Total of 31.9"
Weld Pad	From X =	75.2" to X =	111.2"	Total of 36.0"
Nozzle N12B	From X =	212.2" to X =	252.6"	Total of 40.4"
Nozzle N12C	From X =	447.4" to X =	484.7"	Total of 37.3"
Weld pad	From X =	495.6" to X =	529.6"	Total of 34.0"
Nozzle N12D	From X =	630.2" to X =	669.7"	Total of 39.5"

Total Missed Area 256.6"

The circumference of weld seam AE is 837.25".

These interferences caused 30.6% (256.6") of weld seam AE bottom to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The seven (7) areas missed due to Nozzles N12A, B, C, and D, the Vessel Nameplate, and two (2) Welded Pads were manually examined to reduce the percentage of unexamined weld volume on weld seam AE bottom side. The interferences to automatic examination from the Nozzles and Welded Pads also affected manual examination of these areas. The interferences caused the following areas to be partially examined manually:

Nozzle N12A

60°T scan From X = 828.75" to X = 8.5" Total of 17" Partially (87.8%) examined

Vessel Nameplate

60°T scan From X = 38.1" to X = 55.1" Total of 17" Partially (87.8%) examined

Welded Pad

60°T scan From X = 84.7" to X = 101.7" Total of 17" Partially (87.8%) examined

Nozzle N12B

60°T scan From X = 224.5" to X = 241.5" Total of 17" Partially (87.8%) examined

Nozzle N12C

60°T scan From X = 457.5" to X = 474.5" Total of 17" Partially (87.8%) examined

Welded Pad

60°T scan From X = 504.1" to X = 521.1" Total of 17" Partially (87.8%) examined

Nozzle N12D

60°T scan From X = 643.9" to X = 660.9" Total of 17" Partially (87.8%) examined

Composite (Automatic & Manual) Coverage of Weld Seam AE Bottom Side

Since only partial angle beam coverage of the areas near Nozzles N12A, B, C, and D and the Welded Pads is possible, no examination credit can be taken for 119" of weld seam AE bottom. This missed area represents 14.2% of the code required examination for this portion of weld AE.

Summary of Weld Seam AE Examination

86.0% of weld seam AE was completely examined in accordance with Section XI Requirements. 14.0% of weld seam AE was partially (87.8% of Code Requirement for 60°T scan) examined manually without credit. Total examination coverage for weld seam AE therefore equals 86.0%.

VESSEL TO FLANGE WELD AF

Manual Examination Coverage

AF TOP SIDE

Examination of weld seam AF from the top side was performed for the flange sealing surface. There were no interferences to this examination.

AF BOTTOM SIDE

There were three (3) interferences on weld seam AF bottom that caused missed areas (see figure 1) during the manual examination. These were:

Thermocouple Pad	From X	=	839.50" to X	=	2.5"	Total of 5"
Thermocouple Pad	From X	=	312.10" to X	=	317.1"	Total of 5"
Thermocouple Pad	From X	=	626.60" to X	=	631.6"	Total of 5"

Total Missed Area = 15"

The circumference of weld seam AF is 842.0".

The interferences caused 1.8% (15") of weld seam AF bottom to be missed during the manual examination.

Summary of Weld Seam AF Examination

98.2% of weld seam AF was completely examined in accordance with Section XI Requirements. 1.8% of AF cannot be examined manually.

LONGITUDINAL WELD SEAM BA

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BA that caused missed areas (see figure 1) during the remote automatic examination. It was:

Nozzle N2K From Y = 158.5" to Y = 204.2" Total of 45.7"

The length of weld seam BA is 137".

The interference caused 33.4% (45.7") of the left side of weld seam BA to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The area missed due to a Nozzle Interference was manually examined to reduce the percentage of unexamined weld volume on weld seam BA. The interference to automatic examination from Nozzle N2K also affected manual examination of the area. The interference caused the following area to be partially examined manually:

Nozzle N2K

45°T scan From Y = 175.0" to Y = 187.0" Total of 12" Partially (83.2%) examined

60°T scan From Y = 167.5" to Y = 194.5" Total of 27" Partially (59.2%) examined

Composite (Automatic & Manual) Coverage of Weld Seam BA

Since only partial angle beam coverage of the area near Nozzle N2K is possible, no examination credit can be taken for 27" of weld seam BA left side. The missed area represents 19.7% of the code requirement for this portion of weld BA.

Summary of Weld Seam BA Examination

90.1% of weld seam BA was completely examined in accordance with Section XI Requirements. 9.9% of weld seam BA was partially (59.2% - 83.2% of Code Requirement for T scan) examined manually without credit. Total code examination coverage for weld seam BA therefore equals 90.1%.

LONGITUDINAL WELD SEAM BB

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BB that caused a missed area (see figure 1) during the remote automatic examination. It was:

Nozzle N2C From Y = 155.9" to Y = 203.3" Total of 47.4"

The length of weld seam BB is 137".

The interference caused 34.6% (47.4") of the left side of weld seam BB to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The area missed due to a Nozzle Interference was manually examined to reduce the percentage of unexamined weld volume on weld seam BB. The interference to automatic examination from Nozzle N2C also affected manual examination of the area. The interference caused the following area to be partially examined manually:

Nozzle N2C

45°T scan	From Y = 175.0" to Y = 187.0"	Total of 12"	Partially (83.2%) examined
60°T scan	From Y = 167.5" to Y = 194.5"	Total of 27"	Partially (59.2%) examined

Composite (Automatic & Manual) Coverage of Weld Seam BB

Since only partial angle beam coverage of the area near Nozzle N2C is possible, no examination credit can be taken for 27" of weld seam BB left side. The missed area represents 19.7% of the code requirement for this portion of weld BB.

Summary of Weld Seam BB Examination

90.1% of weld seam BB was completely examined in accordance with Section XI Requirements. 9.9% of weld seam BB was partially (59.2% - 83.2% of Code Requirement for T scan) examined manually without credit. Total code examination coverage for weld seam BB therefore equals 90.1%.

LONGITUDINAL WELD SEAM BC

Remote Automatic Examination Coverage

There were two (2) interferences on weld seam BC that caused missed areas (see figure 1) during the remote automatic examination. They were:

Nozzle N1B	From Y = 136.4"	to Y = 188.6"	Total of 52.2"
Nozzle N2F	From Y = 157.3"	to Y = 204.5"	Total of 47.2"

Total Missed Area = 99.4"

The length of weld seam BC is 137".

The interferences caused 34.5% (47.2") of the left side and 38.1% (52.2") of the right side of weld seam BC to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The areas missed due to Nozzle Interferences were manually examined to reduce the percentage of unexamined weld volume on weld seam BC. The interferences to automatic examination from Nozzles N1B and N2F also affected manual examination of the area. The interferences caused the following areas to be partially examined manually:

Nozzle N1B

45°T scan	From Y = 153.5"	to Y = 169.5"	Total of 16" Partially (86.3%) examined
60°T scan	From Y = 149.5"	to Y = 173.5"	Total of 24" Partially (74.8%) examined

Nozzle N2F

45°T scan	From Y = 175.0"	to Y = 187.0"	Total of 12" Partially (83.2%) examined
60°T scan	From Y = 167.5"	to Y = 194.5"	Total of 27" Partially (59.2%) examined

Composite (Automatic & Manual) Coverage of Weld Seam BC

Since only partial angle beam coverage of the areas near Nozzles N1B and N2F is possible, no examination credit can be taken for 27" of the right side and 24" of the left side of weld seam BC. The missed areas represent 18.8% of the code requirement for the right side and 17.6% of the code requirement for the left side of weld BC.

Summary of Weld Seam BC Examination

81.8% of weld seam BC was completely examined in accordance with Section XI Requirements. 18.2% of weld seam BB was partially (59.2% - 86.3% of Code Requirement for T scan) examined manually without credit. Total code examination coverage for weld seam BC therefore equals 81.8%.

LONGITUDINAL WELD SEAM BD

Remote Automatic Examination Coverage

Weld seam BD was examined 100% by the automatic equipment in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BE

Remote Automatic Examination Coverage

Weld seam BE was examined 100% by the automatic equipment in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BF

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BF that caused missed areas (see figure 1) during the remote automatic examination. It was:

Nozzle N17B From Y = 345" to Y = 400.5" Total of 55.5"

The length of weld seam BF is *137".

*The interference is caused by the installation of Nozzle N17B directly through weld seam BF. This Nozzle causes a reduction in the length of BF that is available for examination. The examinable length of weld seam BF is 101.9". All calculations for weld seam BF are based on the examinable length.

The interference caused 20% (20.4") of both the left and right sides of weld seam BF to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The areas missed due to the Nozzle Interference were manually examined to reduce the percentage of unexamined weld volume on weld seam BF. The interferences to automatic examination caused by Nozzle N17B do not exist for manual examination techniques. These areas 20.4" on each side were completely examined in accordance with Section XI Requirements.

Composite (Automatic & Manual) Coverage of Weld Seam BF

The composite examination of weld seam BF covered 100% of the examinable portion of the weld in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BG

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BG that caused a missed area (see figure 1) during the remote automatic examination. It was:

Nozzle N11A From Y = 502.7" to Y = 537.5" Total of 34.8"

The length of weld seam BG is 137".

The interference caused 25.4% (34.8") of the left side of weld seam BG to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The area missed due to Nozzle Interference was manually examined to reduce the percentage of unexamined weld volume on weld seam BG. The interference to automatic examination caused by Nozzle N11A does not exist for manual examination techniques. This area 34.8" of the left side of BG was completely examined in accordance with Section XI Requirements.

Composite (Automatic & Manual) Coverage of Weld Seam BG

The composite examination of weld seam BG covered 100% of the weld in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BH

Remote Automatic Examination Coverage

Weld seam BH was examined 100% by the automatic equipment in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BJ

Remote Automatic Examination Coverage

Weld seam BJ was examined 100% by the automatic equipment in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BK

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BK that cause missed areas (see figure 1) during the remote automatic examination. It was:

Biological Shield Bracket From Y = 537.5" to Y = 585.7" Total of 48.2"

The length of weld seam BK is 86".

The interference caused 56.1% (48.2") of the left side and 45.9% (39.5") of the right side of weld seam BK to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The areas missed due to Biological Shield Bracket Interference were manually examined to reduce the percentage of unexamined weld volume on weld seam BK. The interference to automatic examination caused by the bracket does not exist for manual examination techniques. These areas 48.2" of the left side and 39.5" of the right side were completely examined in accordance with Section XI Requirements.

Composite (Automatic & Manual) Coverage of Weld Seam BK

The composite examination of weld seam BK covered 100% of the weld in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BM

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BM that caused missed areas (see figure 1) during the remote automatic examination. It was:

Biological Shield Bracket From Y = 537.5" to Y = 583.8" Total of 46.3"

The length of weld seam BM is 86".

The interference caused 53.8% (46.3") of the left side and 46.1% (39.6") of the right side of weld seam BM to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The areas missed due to Biological Shield Bracket Interference were manually examined to reduce the percentage of unexamined weld volume on weld seam BM. The interference to automatic examination caused by the bracket does not exist for manual examination techniques. These areas 46.3" of the left side and 39.6" of the right side were completely examined in accordance with Section XI Requirements.

Composite (Automatic & Manual) Coverage of Weld Seam BM

The composite examination of weld seam BM covered 100% of the weld in accordance with Section XI Requirements.

LONGITUDINAL WELD SEAM BN

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BN that caused missed areas (see figure 1) during the remote automatic examination. It was:

Refueling Bellows Skirt From Y = 694.6" to Y = 716.3" Total of 21.7"

The length of weld seam BN is 92.75".

The interference caused 23.4% (21.7") of the left side and 16.8% (15.6") of the right side of weld seam BN to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The areas missed due to Refueling Bellow Skirt Interference were manually examined to reduce the percentage of unexamined weld volume on weld seam BN. The interference to automatic examination caused by the Skirt does not exist for manual examination techniques. There is however a Thermocouple Pad that caused a 3" long missed area on the right side of the weld. This missed area is 1.5% of the code requirement for weld seam BN.

Composite (Automatic & Manual) Coverage of Weld Seam BN

98.5% of weld seam BN was completely examined in accordance with Section XI Requirements. 1.5% can not be examined due to Thermocouple placement. Total code examination coverage for weld seam BN therefore equals 98.5%.

LONGITUDINAL WELD SEAM BP

Remote Automatic Examination Coverage

There was one (1) interference on weld seam BP that caused missed areas (see figure 1) during the remote automatic examination. It was:

Refueling Bellows Skirt From Y = 694.3" to Y = 716.3" Total of 22"

The length of weld seam BP is 92.75"

The interference caused 21.2% (19.7") of the left side and 23.7% (22") of the right side of weld seam BP to be missed during the remote automatic examination.

Manual Examination of Interference Areas

The areas missed due to Refueling Bellow Skirt Interference were manually examined to reduce the percentage of unexamined weld volume on weld seam BP. The interference to automatic examination caused by the Skirt does not exist for manual examination techniques. These areas 19.7" on the left side and 22" on the right side were completely examined in accordance with Section XI Requirements.

Composite (Automatic & Manual) Coverage of Weld Seam BP

The composite examination of weld seam BP covered 100% of the weld in accordance with Section XI Requirements.

BOTTOM HEAD CIRCUMFERENTIAL WELD SEAM AJ

Manual Examination Coverage

Weld seam AJ was examined 100% by manual examination techniques in accordance with Section XI Requirements.

BOTTOM HEAD LONGITUDINAL (SIDE PLATE) WELD SEAMS DA - DF

Manual Examination Coverage

There was one (1) interference that caused a missed area on weld seams DA - DF. It was:

Support Skirt To RPV Knuckle   Area missed 12" (each weld)

The length of weld seams DA - DF is 76.5" (each).

The interference caused 15.7% (12") of each weld seam to remain unexamined.

Summary of Weld Seams DA - DF Examination

84.3% of weld seams DA - DF were completely examined in accordance with Section XI Requirements.

BOTTOM HEAD LONGITUDINAL (DOLLAR PLATE) WELD SEAM DG

Manual Examination Coverage

The accessible portions of weld seam DG were completely examined in accordance with Section XI Requirements. 18.5" at each end (37" total) of the weld was examined. The remainder of this weld is unexaminable due to installed CRD housings.

CLOSURE HEAD CIRCUMFERENTIAL WELDS SEAM AH

Manual Examination Coverage

Weld seam AH was examined 100% by manual examination techniques in accordance with Section XI Requirements.

CLOSURE HEAD LONGITUDINAL (SIDE PLATE) WELD SEAMS DH - DP

Manual Examination Coverage

Weld seams DH - DP were examined 100% by manual examination techniques in accordance with Section XI Requirements.

CLOSURE HEAD TO FLANGE WELD SEAM AG

Manual Examination Coverage

Weld seam AG was examined 100% by manual examination techniques from one side only. Two sided examination of this weld configuration is not feasible. The one sided examination is permitted per ASME V, Article 4, Paragraph T-441.4.4. In addition to the ultrasonic examination, a surface (MT) examination was performed per Section XI Figure IWB-2500-5.

CATEGORY BD

Full Penetration Welds of Nozzles in Vessels

The following full penetration nozzle to vessel welds were examined 100% from the shell side only using remote automatic examination equipment. The one sided examination, due to the nozzle to vessel weld configuration, is permissible per ASME V, Article 4, Paragraph T-441.4.4.

Recirculation Outlet Nozzles

N1 A and B	100% Code Examination Coverage

Recirculation Inlet Nozzles

N2 A, B, E, F, G, and K	100% Code Examination Coverage

Steam Outlet Nozzles

N3 A, B, C, and D	100% Code Examination Coverage

Feedwater Inlet Nozzles

N4 A, B, E, and F	100% Code Examination Coverage

Core Spray Inlet Nozzles

N5 A and B	100% Code Examination Coverage

Low Pressure Coolant Injection Nozzles

N17 A, B, C and D	100% Code Examination Coverage

The following full penetration nozzle to vessel welds were examined 100% from the shell side only using a combination of automatic and manual examination equipment. The one sided examination, due to the nozzle to vessel weld configuration, is permissible per ASME V, Article 4, Paragraph T-441.4.4.

Recirculation inlet nozzles N2C and N2D interference to automatic examination due to placement of Nozzle N8A.

N2C	From AZ = 136.8° to AZ = 157.3°	Total of 6.2"
N2D	From AZ = 16.3° to AZ = 54.9°	Total of 11.5"

The restriction to automatic examination was caused by nozzle N8A interfereing with movement of the scanner arm. The interference does not exist for manual examination techniques. The missed areas were examined 100% manually in accordance with Section XI Requirements.

Recirculation inlet Nozzles N2H and N2J interference to automatic examination due to placement of Nozzle N8B.

N2H	From AZ = 118.2°	to AZ = 159.9°	Total of 12.4"
N2J	From AZ = 16.4°	to AZ = 55.1°	Total of 11.5"

The restriction to automatic examination was caused by Nozzle N8B interfering with movement of the scanner arm. The interference does not exist for manual examination techniques. The missed areas were examined 100% manually in accordance with Section XI Requirements.

Feed water inlet Nozzle N4C interference to automatic examination due to placment of Nozzle N9.

N4C From AZ = 62.6° to AZ = 69.0° Total of 1.9"

The restriction to automatic examination was caused by Nozzle N9 interfering with movement of the scanner arm. The interference does not exist for manual examination techniques. The missed area was examined 100% manually in accordance with Section XI Requirements.

The following full penetration to vessel weld was partially (83.3%) examined from the shell side only using remote automatic examination equipment. The one sided examination due to the nozzle to vessel weld configuration is permissible per ASME V, Article 4, Paragraph T-441.4.4.

Feed water inlet Nozzle N4D interference to automatic examination due to placement of Nozzle N11B.

N4D From AZ - 288.3° to AZ -348.3° Total of 17.9"

Due to the placement of Nozzle N11B, no reduction to the percentage of unexamined weld volume on Nozzle N4D is possible. There is no scanning surface to allow examination of this area manually. Essentially 100% of the examinable portion of nozzle to vessel weld N4D was examined in accordance with Section XI Requirements.

The following full penetration nozzle to vessel welds were examined 100% from the shell side only using manual examination equipment. The one sided examination due to the nozzle to vessel weld configuration is permissible per ASME V, Article 4, Paragraph T-441.4.4.

Head Instrumentation Nozzle

N6A	100% Code Examination Coverage

Head Spare Nozzle

N6B — 100% Code Examination Coverage

Head Vent Nozzle

N7 — 100% Code Examination Coverage

Jet Pump Instrumentation Nozzles

N8 A and B — 100% Code Examination Coverage

Control Rod Drive Return Nozzle

N9 — 100% Code Examination Coverage

The nozzle inside radiused sections were examined 100% manually in accordance with Section XI Requirements. The examinations were performed using either a single zone or a three zone technique as determined by nozzle bore size. The three zone technique offers examination coverage that exceeds that required by Section XI, Figure 1 WB-2500-7(b) while the single zone meets the requirement.

The following nozzle inside radiused sections were manually examined using the three zone technique:

Recirculation Outlet Nozzles

N1 A and B

Recirculation Inlet Nozzles

N2 A, B, C, D, E, F, G, H, J, and K

Steam Outlet Nozzles

N3 A, B, C, and D

Feed Water Inlet Nozzles

N4 A, B, C, D, E, and F

Core Spray Inlet Nozzles

N5 A and B

Low Pressure Coolant Injection Nozzles

N17 A, B, C, and D

The following nozzle inside radiused sections were manually examined using the single zone technique:

Head Instrumentation Nozzle

N6A

Head Spare Nozzle

N6B

Head Vent Nozzle

N7

Jet Pump Instrumentation Nozzles

N8 A and B

Control Rod Drive Return Nozzle

N9

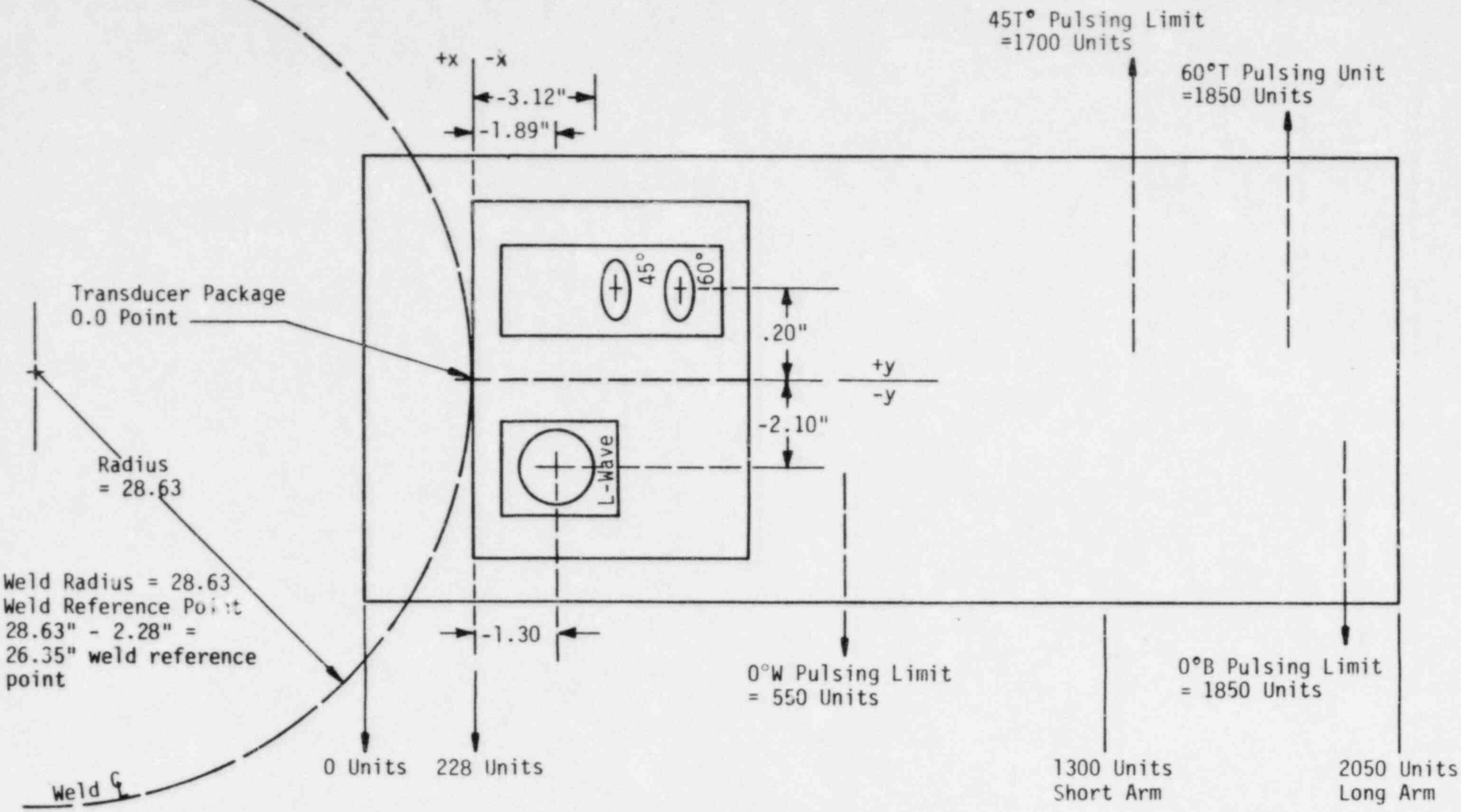
USNRC REGULATORY GUIDE 1.150 REPORT

ATTACHMENT 8

This attachment contains the Regulatory Guide 1.150 required equipment sketches for automatic examination search unit location.

Nozzle T Scan

Example Nozzle
Not to Scale



100 Units = 1.0"

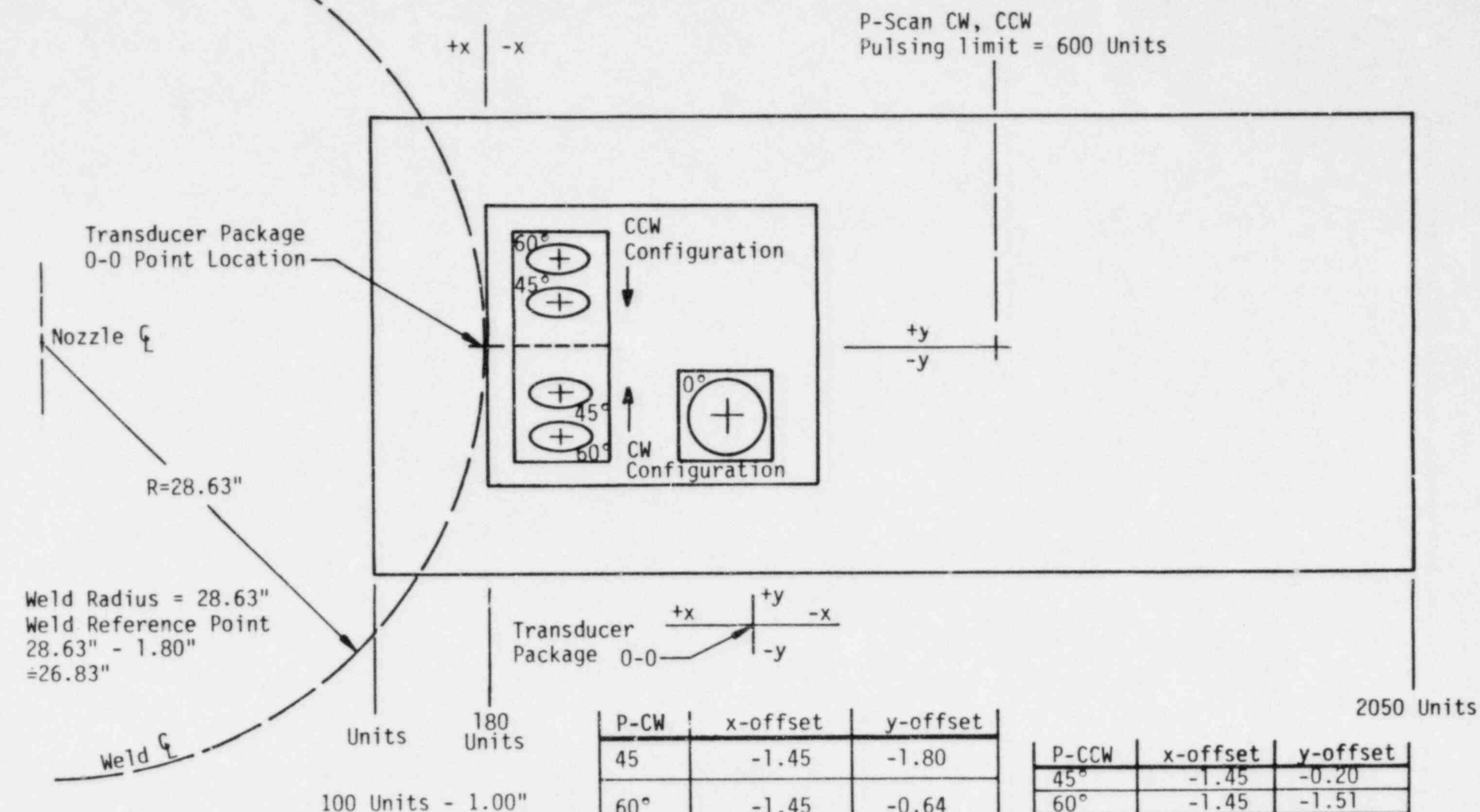
"T"	x-offset	y-offset
45°	-1.89	.20
60°	-3.12	.20
0°	-1.30	-2.10

Limerick Unit #1

Example Nozzle

Not to Scale

Nozzle P-Scan

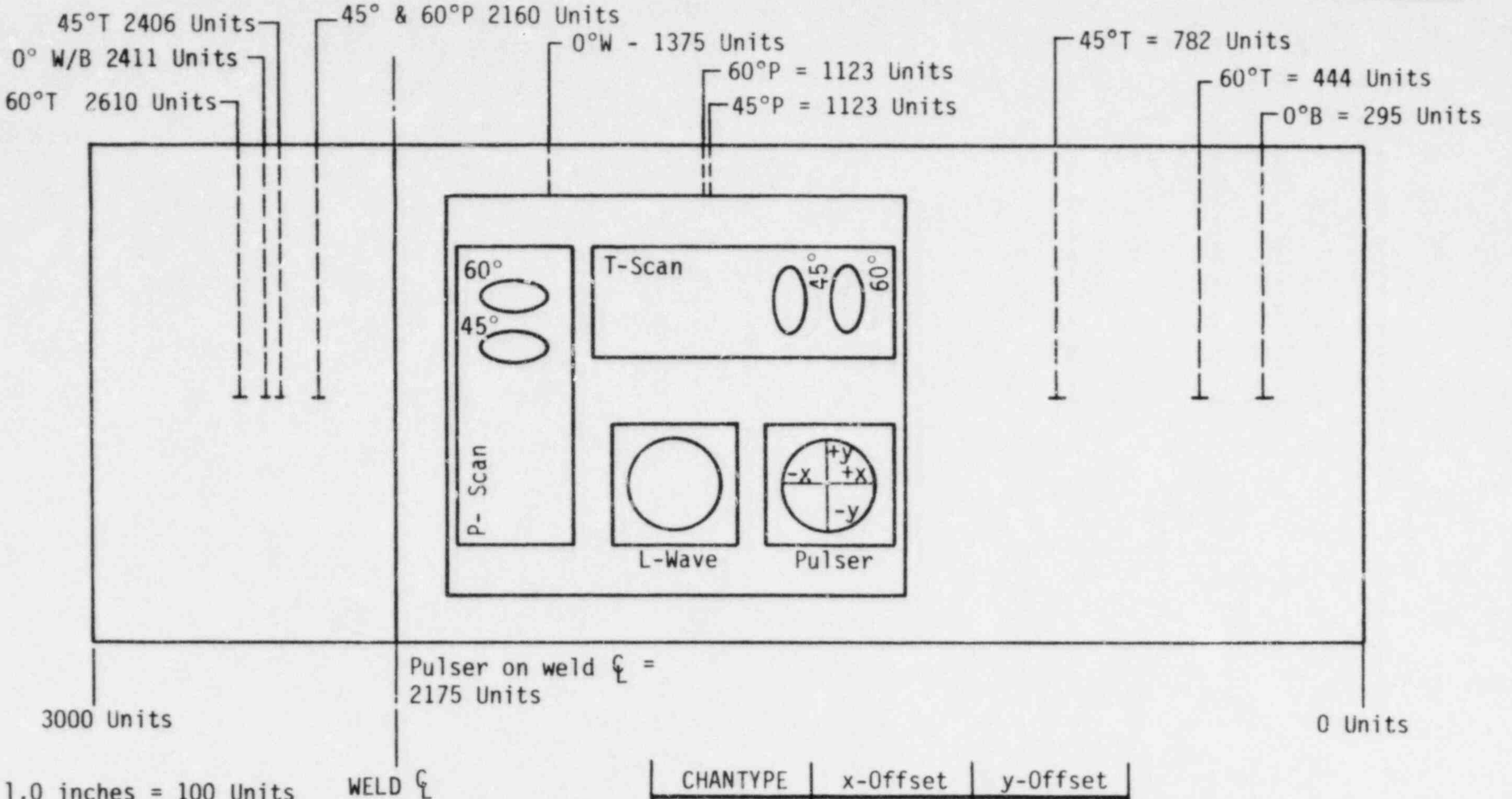


P-CW	x-offset	y-offset
45	-1.45	-1.80
60°	-1.45	-0.64
0°	-3.75	-2.40

P-CCW	x-offset	y-offset
45°	-1.45	-0.20
60°	-1.45	-1.51
0°	-3.72	-2.40

Vessel T and P Scans

Limerick Unit #1
Example, Vessel
Not to Scale



CHANTYPE	x-Offset	y-Offset
45°T	-2.13	2.47
60°T	-0.81	2.47
45°P	-5.31	0.39
60°P	-5.31	1.67
0°-W	-2.30	0.00
0°-8	-2.30	0.00

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Attachment 9

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BECHTEL POWER CORPORATION	JOB NO. 8031

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BY F. V. Martin DATE 10/27/83

PHILADELPHIA ELECTRIC CO.	LIMERICK STATION UNITS 1 & 2

LIMERICK PRE SERVICE INSPECTION
PROJECT NO. L-PSI-83
SUBCONTRACT NO. 8031-M-246B

8031-M-246B-57-2

MD- 25

LIM UT-1, Rev. 1

REGULATORY GUIDE 1.150
METHOD FOR COMPLIANCE

DOCUMENT RELEASED FOR PRODUCTION

A. F. Pleh 11-2-83
ENGINEERING DATE

KJ Rose 11-2-83
QUALITY ASSURANCE DATE

GE/I & SE

EASTERN SERVICE DEPARTMENT	SUBJECT REGULATORY GUIDE 1.150 METHOD FOR COMPLIANCE FILE NO. 10.4.26
	No. LIM-UT-1 REV. 1 PAGE 1 OF 7
	PREPARED BY/DATE F. Forsythe 10/10/83
LIMERICK NUCLEAR GENERATING STATION UNIT #1	APPROVED BY/DATE W. F. Miller 10/11/83
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FILE NO 10.4.26

1.0 SCOPE

1.1 The equipment certification methods described herein are applicable to both remote automatic and manual ultrasonic equipment when used to perform preservice examination of "Reactor Vessel Welds" at Limerick Unit #1.

1.2 In this procedure, "Reactor Vessel Welds" are those assembly welds in the Limerick RPV that are categorized as either BA or BD under the rules of ASME Section XI.

2.0 APPLICABLE DOCUMENTS, CODES, AND STANDARDS

2.1 Codes and Standards The following codes and standards form a part of this procedure to the extent specified herein.

2.1.1 American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

2.1.1.1 Section V "Nondestructive Examination," 1980 Edition, Winter 1980 Addenda.

2.1.1.2 Section XI "Inservice Inspection of Nuclear Power Plant Components" 1980 Edition, Winter 1980 Addenda.

2.1.2 United States Nuclear Regulatory Commission (USNRC).

2.1.2.1 Regulatory Guide 1.150, Revision 1, February 1983, "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examination" * alternate method.

Note: In this procedure asterisk refers to sections of the alternate method.

3.0 PURPOSE

3.1 The purpose of this procedure is to assure that activities described herein are performed and that records specified by Reg. Guide 1.150 are generated, gathered, stored, and reported in a manner consistent with both Reg. Guide and General Electric Company Quality Assurance Requirements.

3.2 It is NOT the purpose of this procedure to provide definitive instructions to the operator of the analysis and recording equipment used to generate the required records. It is, however, a requirement of this procedure that all analysis and recording equipment used be operated in accordance with the manufacturer's recommendations.

4.0 METHOD(S) OF COMPLIANCE

The method(s) of compliance with Reg. Guide 1.150 are delineated in the sub-paragraphs that follow. Each sub-paragraph corresponds with a section of Reg. Guide 1.150 alternate method. *(Note that Sections 4 and 5 have been deleted from Revision 1 of Reg. Guide 1.150.)

4.1 Inspection System Performance Checks

4.1.1 Pre-Exam Performance Checks specified in Paragraph *1.1 will not be performed separately. These checks are identical to the checks required in 4.1.2 below, and the reliability of checks performed up to six months prior to the examination does not satisfy the quality assurance requirements of the General Electric Company.

4.1.2 Field Performance Checks specified in Paragraph *1.2 shall be performed before, during, and after the examination of Reactor Vessel welds as specified below.

4.1.2.1 RF Waveform and frequency amplitude information shall be recorded for each transducer involved with the examination. These records may be photographic, computer generated, or a combination of both. The reflector used to generate the required information shall be a calibration hole in one of the Owner's RPV calibration standards. Identification of the calibration standard and the reflector used shall be documented to allow future RF Waveform data to be gathered from the same reflector.

4.1.2.2 Screen Height Linearity Information shall be recorded daily during the first calibration performed on each ultrasonic examination system. The data shall be gathered in accordance with the requirements specified in the procedure being used during calibration. The record of screen height linearity shall be the calibration data sheet.

4.1.2.3 Amplitude Control Linearity Information shall be recorded daily during the first calibration performed on each ultrasonic examination system. The data shall be gathered and sensitivity set in accordance with the requirements specified in the procedure being used during calibration. The record of amplitude control linearity shall be the calibration data sheet.

4.1.2.4 Angle Beam Profile Characterization shall be performed for each transducer/wedge combination used to examine reactor vessel welds. The profiling shall be performed both before the search unit is used to examine the first weld and after the search unit is used to examine the last weld during the examination. The data shall be gathered in accordance with the requirements of the applicable examination procedure. The record of vertical beam profile determinations shall be per the requirements of the procedure(s) used during the examination.

4.2 Calibration

4.2.1 Calibration for Manual Examinations shall be performed in accordance with the applicable manual ultrasonic examination procedure. Calibration checks shall be performed at the intervals specified in the applicable examination procedure. The record of manual ultrasonic calibrations shall be the calibration data sheet.

4.2.2 Calibration for Mechanized Scanning shall be performed in accordance with the applicable remote ultrasonic examination procedure. Calibration checks shall be performed at the intervals specified in the applicable examination procedure. The record of remote ultrasonic calibrations shall be the calibration data sheet.

4.2.3 Calibration Confirmation shall be as specified in the applicable ultrasonic examination procedure (Ref.4.2.1 - 4.2.2).

4.2.4 Calibration Blocks used during the preservice examination of the Limerick Unit #1 Reactor Vessel Welds shall be those furnished by the Owner. Where possible, the same calibration block(s) should be used to perform successive RPV examinations. Where use of the same block(s) is not possible, the provisions of Section *2.4 shall apply.

4.3 Examination scope and extent shall be in accordance with Reference 2.1.1.2. The use of electronic gating is addressed in the applicable ultrasonic examination procedure(s).

10.4.26

4.3.1 Internal Surface examination requirements per Section *3.1 are demonstrated during each ultrasonic examination system angle beam calibration. The demonstration shall document the ability of the ultrasonic examination system to differentiate between an indication from "clad roll" and an indication from the ID notch in the calibration standard. The record of this demonstration shall be the calibration data sheet.

4.3.2 Scanning Weld-Metal Interface The ultrasonic examination procedures developed by General Electric for preservice inspection of the Limerick Unit #1 RPV utilize the ASME Section V Article 4 specified beaming angles of 0°, 45°, and 60°. These search unit angles are not based on weld preparation geometry; therefore, the ability of these beaming angles to detect an unfavorably oriented planar flaw must be demonstrated. The record of this demonstration will be included in the "Reporting of Results" required by Paragraph 4.5.

4.4 Recording and Sizing The capability of General Electric examination procdures to detect and size flaws during the Limerick Unit #1 preservice inspection must be demonstrated. The record of this demonstration will be included in the "Reporting of Results" required by Paragraph 4.5.

The procedures developed by General Electric for preservice inspection of the Limerick Unit #1 Reactor Vessel Welds require all data to be recorded to 20% DAC end points and, if the indication amplitude equals or exceeds 50% DAC, the 50% DAC data is also recorded. All data is recorded at scanning intervals of 1/4" or less. Determination of the adequacy of the recorded data and data evaluation will be made by a certified Level III individual other than the one performing the examination.

4.4.1 Geometric Indications All indications will be evaluated by a certified Level III individual. If Level III analysis of the data determines that the indication is geometric in nature, the basis for the determination will be described in the report of the examination.

4.4.2 Indications with Changing Metal Path All indications will be evaluated by a certifed Level III individual. The Level III will determine the location, through-wall dimension, and proper DAC evaluation. No determinations need to be made by the examination teams since, by procedural requirements, all data shall be recorded if it equals or exceeds 20% DAC in amplitude.

10.4.26

4.4.3 Indications Without Changing Metal Path See explanation in 4.4.2 above. Also, see precautionary note in *6.3 C for consideration.

4.4.4 Evaluation of Indications All indications without changing metal path and all indications in the outer 75% of the RPV wall thickness shall be sized using 50% DAC end point data.

All indications with changing metal path in the inner 25% of the RPV wall thickness shall be sized using both 20% DAC and 50% DAC end point data. The determined size of these indications shall be the larger of:

a) Indication size determined using 50% DAC end point data,

- OR -

b) Indication size determined using 20% DAC end point data minus the predetermined 20% DAC beam spread.

4.5 Reporting of Results The records detailed in Section *7 become a part of the report of the preservice examination. Retention of these records is the responsibility of the Owner. Any indication that exceeds the allowable limits detailed in Section XI will be reported to the Owner in accordance with contractual and General Electric Quality Assurance Manual requirements. The reporting of any indication(s) indicative of "Abnormal Degradation of Reactor Pressure Boundary" is the responsibility of the Owner.

4.5.1 The best estimate of the tolerances (error band) in sizing flaws will be determined using standards developed by the General Electric Company for this purpose. The two blocks, (GE drawing 160-83C-17 for manual equipment and DP Block # for Automated equipment) together represent the range of thicknesses to be examined on the Limerick Unit #1 RPV. The data and engineering analyses used to develop these error bands will be included as a part of a report documenting the requirements of Section *7.

4.5.2 The effectiveness of the ultrasonic examination procedures will be domonstrated on the standards used for error band determinations (4.5.1 above). Documentation of these demonstrations will be included in the Section *7 report.

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4.5.3 The actual volumes that have not been examined due to vessel configuration, such as nozzle interferences or volumes that are shadowed by vessel flaws, will be documented in the report of the examination. Volumes not effectively examined due to near field effects, cladding to base material interface, electronic gating, or opposite surface interferences will be determined using the standards discussed in Paragraph 4.5.1. Calculations for determination of these effects will be included in the Section *7 report.

The calculated effect of these items will be applied to the results of the preservice examination. Areas not examined (configuration) or not effectively examined (near field, etc.) will be reported to the Owner in accordance with contractual and General Electric Quality assurance Manual requirements. Any "Relief Requests" necessitated by these items will be the Owner's responsibility.

4.5.4 Sketches to clarify the effect of vessel configuration on the preservice examination of the Limerick Unit #1 RPV will be included in the report of the examination.

4.5.5 Sketches of mechanized scanning equipment with necessary reference points and dimensions will be furnished with the Section *7 report. These sketches will allow the Owner to follow the mechanized scanning equipment's indication location method.

4.5.6 Alternative volumetric examination, if used, will be documented, and the results of such examinations will be included in the report of the examination.

5.0 PERSONNEL

All calculations and reporting required by Reg. Guide 1.150 will be performed by a certified Level III individual. Data required to perform these calculations and evaluations may be gathered by either a certified Level II or a certified Level III individual.

Attachment 10

GENERAL ELECTRIC

APPARATUS AND ENGINEERING SERVICES OPERATIONS
GENERAL ELECTRIC COMPANY • MASCHELLMAC OFFICE COMPLEX, 1000 FIRST AVENUE • KING OF PRUSSIA, PENNSYLVANIA 19406

May 24, 1984

Serial Letter No. 246B-134

BECHTEL POWER CORPORATION
Limerick Generating Station
P. O. Box A - Sanatoga Branch
Pottstown, Pennsylvania 19464

Attention: T. M. Gwin
Project Construction Manager

Subject: PHILADELPHIA ELECTRIC COMPANY
Limerick Generating Station
Units 1 & 2, Job No. 8031
PRESERVICE AND Inservice Inspection of RPV
Subcontract 8031-M-246B

Reference: Comp 1

Gentlemen:

The attached report represents General Electric's undated response to the PECo/Bechtel concerns regarding the referenced item.

If you have any questions, please contact Fred Plefka (215-962-6093).

Very truly yours,

A. F. Plefka

A. F. Plefka
Project Manager
Nuclear Plant Services

AFP/jas

cc: S. J. Kepler
J. J. Honer (2)

SUMMARY REPORT

COMPARISON OF SENSITIVITY BETWEEN THE REMOTE AUTOMATIC AND THE MANUAL EXAMINATION SYSTEMS USED DURING THE LIMERICK #1 PRESERVICE EXAMINATION

REFERENCE:

PHILADELPHIA ELECTRIC COMPANY
Limerick Nuclear Generating Station
Contract No. 8031-M-246B
Unit #1 - Preservice Ultrasonic Examination

The data gathered during the Limerick Unit #1 Preservice Examination provides the baseline against which future inservice exam data will be evaluated. Since the Limerick examination was a composite that used two differing examination systems, correlation between these systems must be established. The purpose of this report is to establish the limits of this correlation.

There are several factors that, taken alone or in combination with the others, affect the comparison of data gathered using differing examination systems. The impact of each of these items affects the examination systems in different ways, rendering exact correlation of data between systems an impossibility. What can be done, however, is to establish an upper and lower bound factor that can be applied as needed. The most likely use of this factor would be during a manual check on an indication that was originally detected using the Remote Automatic System. Such checks are often used by utilities to monitor indications, between scheduled examinations, for information purposes.

The factors affecting ultrasonic data can be grouped in three broad categories. The categories are:

1. The system operating characteristics

2. The equipment manufacturing tolerances for instruments.

3. Transducer characteristics.

The following pages contain a discussion of these items, a comparison of the item between systems, and a discussion of the item's affect on the correlation factor.

SYSTEM OPERATING CHARACTERISTICS

The examination systems used for Limerick Unit #1 vary in operating characteristics due to their design. The major design variations between systems are the receiver bandwidth and the RF/video circuitry. The differences are:

Remote Automatic System

Receiver Bandwidth is considered to be narrow. The receiver is tuned to operate at its optimum for a single selected frequency. This frequency is 2.25 MHz.

	RF/Video Circuitry provides relatively narrow band input to the receiver by conditioning the broader band return signal from the transducer.
Manual Examination System	Receiver Bandwidth is considered to be broad. The receiver is designed to operate adequately over a range of frequencies from 1.0 - 10.0 MHz. Each receiver, however, has an optimum operating frequency within the band. This optimum varies widely even between instruments from the same manufacturer.
	RF/Video Circuitry for manual systems is designed to provide adequate performance with transducers in the instruments frequency range. The circuit contains bandpass filtering that conditions the return signal to the bandwidth selected regardless of the true frequency of the transducer.

As shown above, the systems used at Limerick differ in operating characteristics by design. Presently, neither the ASME nor the NRC consider these differences. This results in a lack of research data to quantify the effect. Research performed at Pacific Northwest Laboratory (NUREG/CR2264) indicates that an instrument tuned to operate within a narrow band of parameters offers more consistent results than one designed to operate over a broad band.

Receiver bandwidth and RF/video circuitry are known to affect the results of ultrasonic examinations. Presently, limited research data indicates that the effect could be as much as ± 3 dB's. Until sufficient research is performed to quantify the effects of these items, they will continue to affect correlation of ultrasonic data, gathered by systems with differing operating characteristics, in an adverse manner. For purposes of this report, the 6 dB spread referenced above will be assigned a value of 3 dB's to remain conservative.

MANUFACTURING TOLERANCES FOR INSTRUMENTS

The ultrasonic test instruments used in examination systems are built to operate within a tolerance band specified by the manufacturer. The bands vary somewhat between manufacturers but are consistent between instruments produced by a single manufacturer. The acceptable tolerance is determined by the manufacturer consistent with the end use intended for the instrument.

The Remote Automatic System used at Limerick contains a single multiplexed ultrasonic instrument. Therefore, the affect of tolerances on the Limerick data is negligible.

The Manual Examination Systems used at Limerick contained several instruments produced by the same manufacturer. The affect of manufacturing tolerances on the manual data is present and must be accounted for.

It has been learned through experience that different ultrasonic instruments, each operating within the manufacturers specifications, may offer widely varying responses from the same reflector. One case at an operating plant involved a reflector that was present, disappeared the following year, and reappeared the third year. The cause was found to be the ultrasonic instruments used even though all were operating within specs.

Research performed by General Electric concerning the differences between manual instruments (see Attachment #1) shows that a spread of ± 5.5 dB's exists between instruments from the same manufacturer. It is reasonable to expect the spread between instruments of different manufacturers to be even higher. The GE data was generated using the same transducer and reflectors with only the instruments as a variable. The data does not cover instruments from all manufacturers but it is a reasonable assumption that the data provides sufficient comparison for data correlation. For purposes of this report, the 11 dB spread referenced above will be assigned a value of 5.5 dB's to remain conservative.

TRANSDUCER CHARACTERISTICS

The transducers used in an examination system have been shown to be the most variable component of the system. The variations within a single transducer over a period of time are caused by mechanical damage, aging of the active element, and wear. The variations between transducers, especially those from different manufacturers, result from design, assembly techniques, materials, damping, and electromechanical efficiency. The range of performance between transducers is wide. A 6 dB difference between two transducers of the same nominal rating, when examining the same reflector, are not unusual. Another factor that affects ultrasonic data is the shape of the transducer itself. Of the items above, only electromechanical efficiency and transducer shape have been thoroughly documented through research efforts. Their affects on the correlation of Limerick data is as follows.

<u>Remote Automatic System</u>

<u>Electromechanical Efficiency</u> for the transducers used in the Remote Automatic System is determined at the time of manufacture by a measurement of relative sensitivity. Relative sensitivity is calculated by measuring the attenuation required to reduce the amplitude of a return signal to a predetermined value. This measurement is made during the transducer certification process. Variations in test results attributable to transducer efficiency happen due to a wide mismatch in efficiency between transducers. The six transducers used in the automatic system have ratings in the range of 31 - 38 dB's and are considered to be closely matched.

<u>Transducer Shape</u> for all transducers used in the Remote Automatic System is round with a 1" diameter element. The round element has

been shown to offer a uniform sound pattern with a larger portion of the pattern in the -1 to -6 dB range than either square or rectangular elements. This means that a small reflector is more likely to be interrogated by the strongest portion of the beam when using a round transducer.

Manual Examination System

Electromechanical Effici--y for the transducers used in the Manual Examination Systems is determined in the same manner as used for the automatic system. The seven transducers used in the manual systems have ratings in the range of 38 - 53 dB's which is more than twice the range found in the automatic transducers. This increase in the range of transducer efficiency for the manual transducers can affect the correlation factor.

Transducer Shape for transducers used in the Manual Examination Systems ranged from round 1" diameter for the 0° longitudinal wave transducers to rectangular 1/2" x 1" elements. The 1" diameter L wave transducers compare favorably with the L wave used in the automatic system. The 1/2" x 1" rectangular elements have been shown in laboratory testing to have a non-uniform sound pattern with a very narrow portion of the pattern falling in the -1 to -6 dB range. This means that a small reflector is less likely to be interrogated by the strongest portion of the sound beam when using a rectangular transducer.

The data presented above shows that, while all transducers used at Limerick meet the requirements of the ASME for examination, those used with the automatic system are more likely to detect small reflectors at recordable amplitudes. This also indicates that direct comparison of data from small reflectors using both the automatic and the manual systems does not yield meaningful results. The differences between transducer shape becomes smaller with increasing reflector size.

COMP-1

At the beginning of the Limerick preservice examination, General Electric, at the request of PECo/Bechtel, developed a program designed to quantify the average sensitivity difference between the GE remote examination system and the manual systems used on the project. The data gathered for the L wave portion of the program correlated well with a 6 dB difference. Unfortunately, the angle beam indications proved to be too small for comparison purposes. The lack of directly comparable data necessitated the development of a correlation factor based on laboratory studies.

DISCUSSION

As presented in the preceeding paragraphs, equipment differences ranging from 3 dB's for operating characteristics, to 5.5 dB's for instrument manufacturing tolerances, to 6 dB's for transducer characteristics affect correlation of data between the GE Remote Automatic Examination System and Manual Examination Systems. The effect of these differences is addative, yielding maximum theoretical spread of 29 dB's between systems. It should be noted, however, that the theoretical maximum and the actual observed performance seldom agree. The performance differences for the equipment used at Limerick was estimated as follows:

	Theoretical	Observed
Differences in Receiver and RF/Video Characteristics	± 3 dB's	Negligible
Differences in Instrument Manufacturing Tolerances	Known Only to Manufacturers	± 5.5 dB's
Differences in Transducer Characteristics	± 6 dB's	± 3 dB's
Differences Due to Transducer Shape	Not Clearly Estimated	~ ± 2 dB's

The estimates above yield a maximum expected spread of ± 10.5 dB's for the system differences. This compares favorably with measured differences between the GE remote system and manual systems performed at other plants. The measured differences at these plants ranged from 4 dB's through 11.1 dB's for an average of 7.55 dB's.

CONCLUSION

If manual examination of indications detected by the Remote Automatic System should ever be required at Limerick, several precautions should be exercised. They are:

1. The manual instrument selected should operate with similar characteristics. An instrument from the same manufacturer should be sufficient. The GE remote system used at Limerick is based on a Krautkramer-Branson Pulser/Receiver.

2. The transducer selected for the examination should match the operating characteristics of those used with the automatic equipment as closely as possible. The transducer should be round 1" diameter with a relative sensitivity (electromechanical efficiency) of ~ 34 dB's. The transducers used with the automatic equipment were Aerotech, Gamma Series, 1" diameter, 2.25 MHz.

3. The examination personnel and Level III performing the exam should be aware that direct comparison may be impossible and a ± 10.5 dB sensitivity difference could exist.

4. Due to system design and components, the Remote Automatic System is much more likely to find return signals from very small reflectors to be recordable. This is especially true at 20% DAC recording levels. In the case of small, unfavorably oriented reflectors, comparison by manual techniques may be impossible.

5. As the state of the art in both automatic and manual equipment improves, the changes should be evaluated for their affect on the correlation factor. The changes should then be applied during the comparisons.

Prepared by: Wade F. Miller

Wade F. Miller
GE DA&ESO ESD
NDE Specialist

WFM/jas

REVISION STATUS SHEET

CONT ON SHEET 2 SH NO. 1

GENERAL ELECTRIC

NUCLEAR ENERGY BUSINESS OPERATIONS

DOCUMENT TITLE Test Methods for Determination of Distance Amplitude Correction (DAC) Curve Difference Between Ultrasonic (UT) Instruments - Procedure B

TYPE

FMF

MPL ITEM NO.

LEGEND OR DESCRIPTION OF GROUPS

REVISIONS

PRINTS TO

MADE BY	APPROVALS	DEPT	LOCATION
R.E. Lindemann			
CHKD BY	ISSUED		
B.R. Rajala		CONT ON SHEET 2	SH NO. 1

NEO 805 (REV 1/82)

Test Methods for Determination of Distance Amplitude Correction (DAC)
Curve Difference Between Ultrasonic (UT) Instrument

Procedure B

Purpose of the test is to determine whether differences occur between ultrasonic instruments which produce varying results.

Test No. 1

1.) Select ultrasonic instruments that have been electronically calibrated.

2.) Perform a linearity check on each instrument before performing the various tests. Those instruments that do not meet the requirements of Steps 1 and 2 shall not be used.

3.) The same transducer/wedge/cable combination shall be used for all tests.

4.) Using the test block shown in Sketch #1, calibrate the ultrasonic instrument by setting the peak amplitude response from the 2" deep, 1/4" diameter hole to approximately 75 - 90% Full Screen Height (FSH).

5.) Without changing the gain, scan and record the peak amplitude response from the 3, 4, 5, and 6 inch deep, 1/4" diameter holes. This will be the reference gain.

6.) Go to the 1/8" diameter holes and record the peak amplitude responses from corresponding holes (2, 3, 4, 5, and 6 inch depths).

7.) All data is to be recorded in % FSH.

8.) Repeat the above test for each instrument.

Test No. 2

1.) Use the same transducer/wedge/cable, test block, and ultrasonic instruments used in Test 1, Step 3.

2.) Starting with the 1/4" diameter hole at 2 inches in depth, set the peak amplitude response to between 75 and 90% FSH. Go to the 1/8" diameter hole at the corresponding depth and record the peak amplitude response.

3.) Repeat Step 2 for the 3, 4, 5, and 6 inch deep holes.

Procedure B

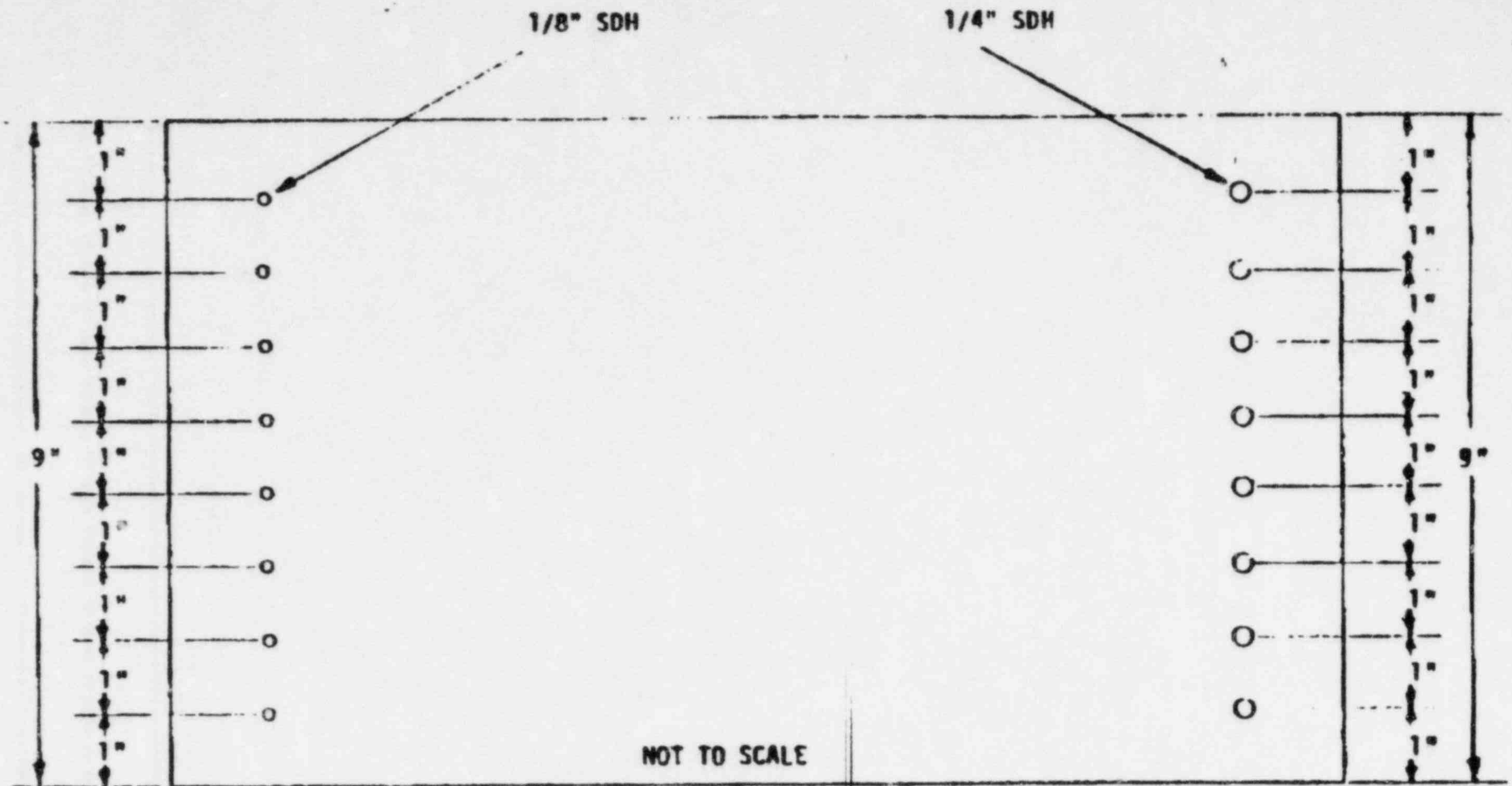
The objective of Procedure B was to determine the extent of response variations between individual ultrasonic instruments.

Test #1

A DAC curve was established using the 1/4" SDH at depths of 2, 3, 4, 5, and 6 inches on the test block shown in figure #2. The peak amplitude response was noted from 1/8" SDH at corresponding depths. The results from eight different ultrasonic instruments show a variation ranging from 1.4 to 5.6 db depending on depth of reflector. The results are shown in table #5 and figure #3.

TEST #2

This test was a repeat of test #1, except that all 1/4" SDH responses were set to 80% FSH and then the corresponding 1/8" SDH responses were recorded. The results of this test show that individual ultrasonic instrument differences are decreased when the reference scale is increased. The range of difference was .7 to 2.1 db for this test. The results are shown in table #6 and figure #4.



LAMINATED TEST BLOCK

FIGURE #2

PROCEDURE B TEST #1

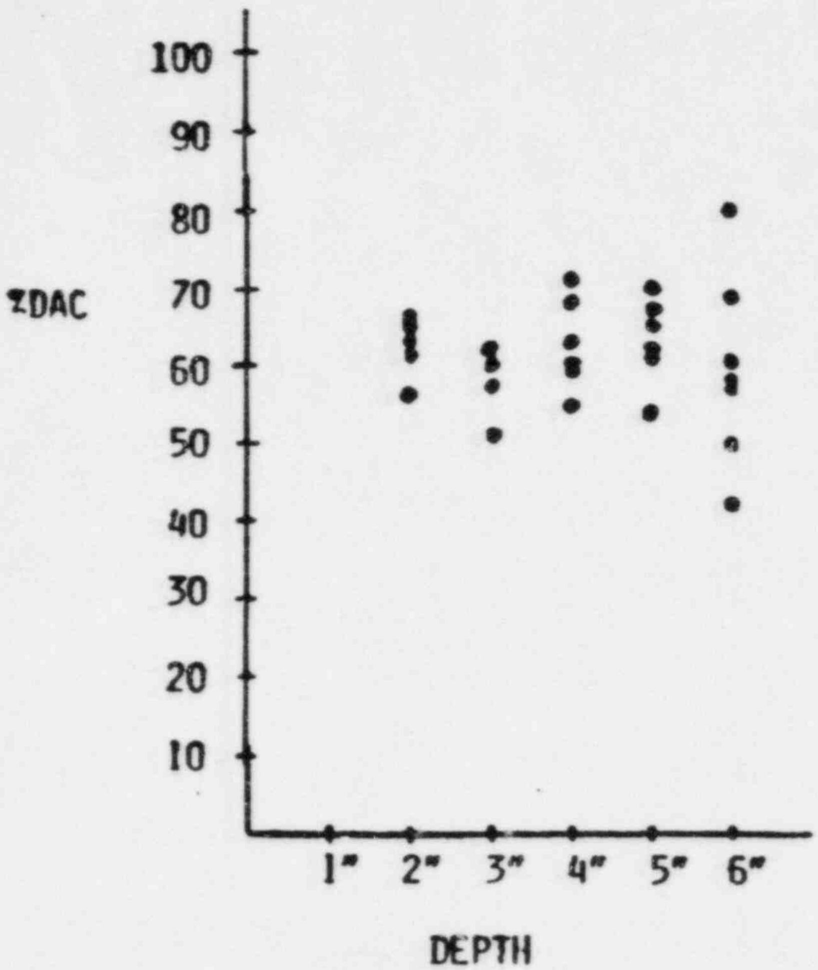
TABLE #5

INSTRUMENT

		USIP 11 S/N 3299	USIP 11 S/N 3984	USIP 11 S/N 3402	NORTEC 131 S/N D103
	2"	60% FSH	80% FSH	80% FSH	82% FSH
1/4"	3"	42% FSH	45% FSH	47% FSH	53% FSH
SDH	4"	24% FSH	28% FSH	28% FSH	34% FSH
	5"	13% FSH	18% FSH	20% FSH	21% FSH
	6"	6" FSH	10% FSH	13% FSH	14% FSH
	2"	49% FSH (61% DAC)	52% FSH (65% DAC)	53% FSH (66% DAC)	54% FSH (66% DAC)
1/16"	3"	24% FSH (57% DAC)	28% FSH (62% DAC)	27% FSH (57% DAC)	33% FSH (62% DAC)
SDH	4"	17% FSH (71% DAC)	19% FSH (68% DAC)	20% FSH (71% DAC)	20% FSH (59% DAC)
	5"	7% FSH (54% DAC)	11% FSH (61% DAC)	13% FSH (65% DAC)	14% FSH (67% DAC)
	6"	3% FSH (50% DAC)	8% FSH (80% DAC)	9% FSH (69% DAC)	8% FSH (57% DAC)

		USM-2 S/N 69024	USM-2 S/N 69084	USL-38 S/N 1011	USL-38 S/N 911176
	2"	82% FSH	82% FSH	80% FSH	80% FSH
1/4"	3"	45% FSH	45% FSH	50% FSH	45% FSH
SDH	4"	22% FSH	25% FSH	32% FSH	29% FSH
	5"	13% FSH	13% FSH	20% FSH	17% FSH
	6"	5% FSH	7% FSH	13% FSH	12% FSH
	2"	50% FSH (61% DAC)	52% FSH (63% DAC)	50% FSH (63% DAC)	45% FSH (56% DAC)
1/16"	3"	23% FSH (51% DAC)	23% FSH (51% DAC)	30% FSH (60% DAC)	27% FSH (60% DAC)
SDH	4"	12% FSH (55% DAC)	15% FSH (60% DAC)	20% FSH (63% DAC)	16% FSH (55% DAC)
	5"	8% FSH (61% DAC)	8% FSH (61% DAC)	14% FSH (70% DAC)	11% FSH (65% DAC)
	6"	3% FSH (60% DAC)	3% FSH (42% DAC)	9% FSH (69% DAC)	7% FSH (58% DAC)

- SAME TRANSDUCER USED FOR ALL TESTS
- SAME TEAM PERFORMED ALL TESTS
- 8 MANUAL INSTRUMENTS USED
- 1/4" HOLE AT 2" DEPTH SET TO 80% FSH



DEPTH	DB VARIATION
2"	1.4 DB
3"	1.7 DB
4"	2.2 DB
5"	2.3 DB
6"	5.6 DB

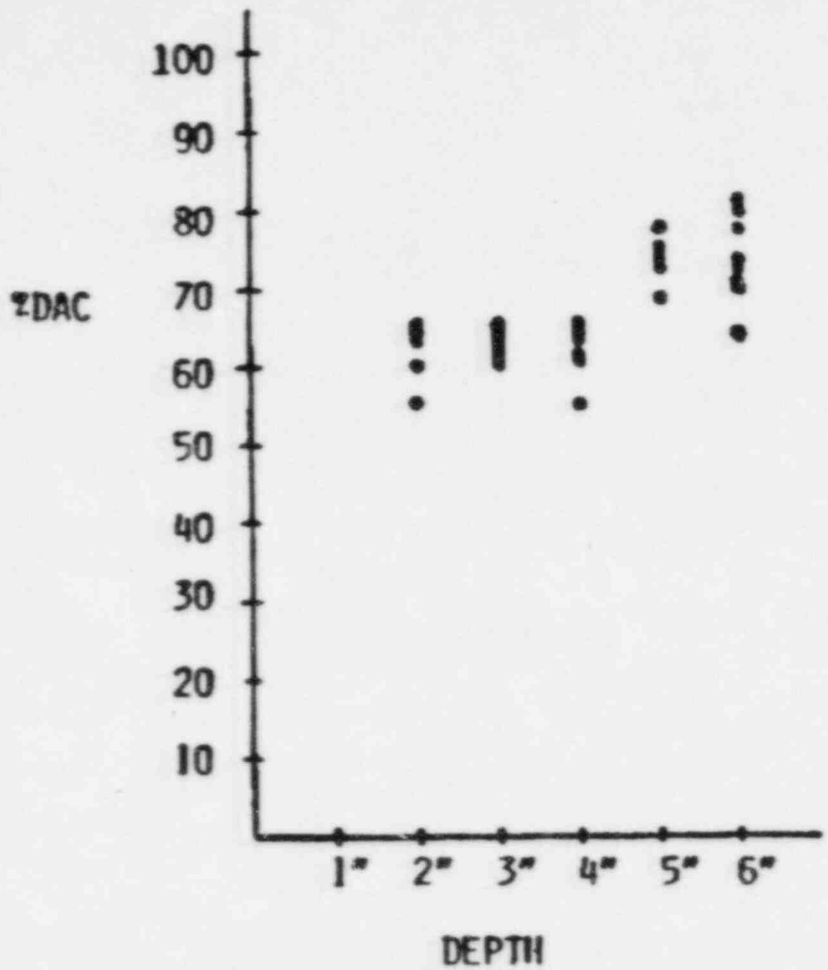
FIGURE #3

PROCEDURE B TEST #2

INSTRUMENT	Depth	2"	3"	4"	5"	6"
USIP 11 S/N 3402	1/4" SDH 1/8" SDH	80%FSH 52%FSH (65% DAC)	80%FSH 50%FSH (63% DAC)	80%FSH 52%FSH (65% DAC)	80%FSH 62%FSH (78% DAC)	80%FSH 65%FSH (81% DAC)
USIP 11 S/N 3299	1/4" SDH 1/8" SDH	80%FSH 44%FSH (55% DAC)	80%FSH 48%FSH (60% DAC)	80%FSH 50%FSH (63% DAC)	80%FSH 60%FSH (75% DAC)	80%FSH 56%FSH (70% DAC)
USIP 11 S/N 3984	1/4" SDH 1/8" SDH	80%FSH 51%FSH (64% DAC)	80%FSH 48%FSH (60% DAC)	80%FSH 49%FSH (61% DAC)	80%FSH 60%FSH (75% DAC)	80%FSH 59%FSH (74% DAC)
NORTEC S/N D103	1/4" SDH 1/8" SDH	78%FSH 50%FSH (64% DAC)	77%FSH 48%FSH (62% DAC)	85%FSH 53%FSH (62% DAC)	82%FSH 60%FSH (73% DAC)	80%FSH 57%FSH (71% DAC)
USM-2 S/N 69024	1/4" SDH 1/8" SDH	88%FSH 55%FSH (63% DAC)	84%FSH 50%FSH (60% DAC)	78%FSH 43%FSH (55% DAC)	88%FSH 65%FSH (74% DAC)	90%FSH 70%FSH (78% DAC)
USM-2 S/N 69084	1/4" SDH 1/8" SDH	77%FSH 46%FSH (60% DAC)	82%FSH 50%FSH (61% DAC)	79%FSH 50%FSH (63% DAC)	90%FSH 68%FSH (76% DAC)	85%FSH 68%FSH (80% DAC)
USL-38 S/N 911174	1/4" SDH 1/8" SDH	80%FSH 50%FSH (63% DAC)	80%FSH 52% FSH (65% DAC)	80%FSH 51%FSH (64% DAC)	80%FSH 55%FSH (69% DAC)	80%FSH 51%FSH (64% DAC)
USL-38 S/N 1011	1/4" SDH 1/8" SDH	80%FSH 50%FSH (63% DAC)	80%FSH 51%FSH (64% DAC)	80%FSH 50%FSH (63% DAC)	80%FSH 58%FSH (73% DAC)	80%FSH 58%FSH (73% DAC)

TABLE 6

- 8 MANUAL INSTRUMENTS USED
- SAME TRANSDUCER FOR ALL TESTS
- 1/4" HOLE SET TO 75% FSH - 90% FSH AT EACH DEPTH
- SAME TEAM PERFORMED ALL TESTS



DEPTH	db VARIATION
2"	1.4 db
3"	0.7 db
4"	1.4 db
5"	1.1 db
6"	2.1 db

FIGURE # 4

Attachment 4

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, REV. 0

The Component Summary Table is presented in two parts. Part 1 is an itemized listing of the pressure retaining components, welded attachments and supports for which complete preservice examinations in accordance with ASME Section XI, Tables IWB-2600 and IWC-2600 were not concluded due to various physical impediments. Part 2 is a listing of Class 1 valves for which the manufacturer's internal surface visual examinations under ASME Section III are considered adequate to meet the requirements of Section XI Examination Category B-M-2, Item B6.7. Both parts of the table include components previously identified for relief request.

The data provided in the Component Summary Table is based on Incomplete Examination Analysis Reports (IEAR's) and Revision 7 of the Preservice Inspection Program Plan as submitted by NES.

It is recognized that this Component Summary Table, as presented in this Revision 0, is subject to change, contingent upon the conclusion of current examination data analyses and modifications on the plant design and as-built configuration.

The following is an abbreviation index for use with the Component Summary Table:

General

N/A - Not Applicable.

SIC - Safety Impact Category - The Category number identified relates to a description in the Safety Impact Summary which follows the Component Summary Table.

Systems

Residual Heat Removal	-	RH
High Pressure Coolant Injection	-	HP
Main Steam	-	MS
Core Spray	-	CS
Feedwater	-	FW
Reactor Core Isolation Cooling	-	RC
Reactor Recirculation	-	RR
Reactor Water Clean-up	-	RW
Control Rod Drive	-	RD

Component Suffixes

A -	New or additional weld
LD -	Longitudinal Seam (Downstream)
LU -	Longitudinal Seam (Upstream)
Min -	Inner Radius of Elbow Seam
Max -	Outer Radius of Elbow Seam
R -	Repair Weld

Examination Code

MT -	Magnetic Particle Examination
RT -	Radiographic Examination
UT -	Ultrasonic Examination
	Long. - Longitudinal as defined in ASME Section XI, Article III-4430, "Longitudinal Reflectors".
	Circ. - Circumferential as defined in ASME Section XI, Article III-4420, "Circumferential Reflectors".
VT -	Visual Examination

RSL/pd 2/2

Addendum to Component Summary Table, Part 1, Rev. 0

Component Identification:	HP-117
Isometric Drawing Number:	02-04
Component Description:	14" x 14" x 10" Tee to Valve (HV-1F007)
Code Category/Item No.:	C-F/C2.1
IEAR No.:	N/A
Obstruction/Remarks:	Indication Exceeded 20% DAC, Sized at 50% DAC
Percent Complete:	N/A
Method of Examination:	UT
SIC:	8
Relief Request Number:	20

Component Identification:	761E920-HAW
Isometric Drawing Number:	07-101
Component Description:	Pump Support, Lug Weld
Code Category/Item No.:	B-K-1/B5.4
IEAR No.:	N/A
Obstruction/Remarks:	Forged Lug to Cast Base Metal
Percent Complete:	0% Long. & Circ.
Method of Examination:	UT
SIC:	4
Relief Request Number:	8

RSL/pd07098403

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RHA-001A 01-01	Nozzle to 12" Pipe B-J/B4.5	2036	Joint Configuration Fitting to Pipe Weld	60% Long 100% Circ.	UT	4	6
RHA-013 01-01	12" Flued Head (x-45A) to Valve (HV-1F017A) B-J/B4.5	2212	Joint Configuration Fitting to Fitting Weld	60% Long. & Circ.	UT	2	6
RHA-092 01-01	12" Flued Head (x-13A) to Valve (HV-1F015A) B-J/B4.5	2228	Joint Configuration Fitting to Fitting Weld	50% Long. 30% Circ.	UT	2	6
RHA-140AR 01-02	16" Flued Head (x-39A) to Valve (HV-F021A) C-F/C2.1	2088	Joint Configuration Fitting to Fitting Weld	60% Long. 100% Circ.	UT	1	13
RHA-152A 01-02	6" Flued Head (x-205A) to Valve (HV-1F027A) C-F/C2.1	2087	Joint Configuration Fitting to Fitting Weld	80% Long & Circ.	UT	1	13
RHA-034R 01-03	18" Pipe to Flange (FE-IN014A) C-F/C2.1	2257	Joint configuration Fitting to Pipe Weld	75% Long. 100% Circ.	UT	1	13
RHA-065A 01-03	30" x 24" Reducer to 24" Pipe B-J/B4.5	2242	Joint Configuration Fitting to Pipe Weld	80% Long & Circ.	UT	11	6
RHA-094A 01-03	12" Pipe to 18" x 12" Reducer C-F/C2.1	2208	Proximity of Adjacent Drain Line to Scan Path On Pipe side and Columnar Structure of Dendritic Weld	100% Long & Circ.	UT	1	13
RHB-003 01-04	Valve (1F065B) to 12" Pipe B-J/B4.5	2008	Insufficient Distance Between Welds RHB-003 and RHB-004 for Full Scan Path	100% Long & Circ.	UT	4	6
RHB-004 01-04	12" Pipe to Elbow B-J/B4.5	2009	Insufficient Distance Between Welds RHB-003 and RHB-004 for Full Scan Path	100% Long & Circ.	UT	4	6
RHB-005LD-Max. 01-04	Elbow Seam Max. Radius B-J/B4.5	N/A	Indication Exceeded 20% DAC, sized at 50% DAC	N/A	UT	4	19

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RHB-013 01-04	12" Flued Head (x-45B) to Valve (HV-1F017B) B-J/B4.5	2212	Joint Configuration Fitting to Fitting Weld	60% Long & Circ.	UT	2	6
RHB-082 01-04	12" Flued Head (x-13B) to Valve (HV-1F015B) B-J/B4.5	2111	Joint Configuration Fitting to Fitting Weld	80% Long 50% Circ.	UT	2	6
RHB-132A 01-05	16" Flued Head (x-39B) to Valve (HV-1F021B) C-F/C2.1	2101	Joint Configuration Fitting to Fitting Weld	80% Long & Circ.	UT	1	13
RHB-149AR 01-05	6" Flued Head (x-205B) to Valve (HV-1F327B) C-F/C2.1	2103	Joint Configuration Fitting to Fitting Weld	80% Long & Circ.	UT	1	13
RHB-053R 01-06	30" Pipe to Flange C-F/C2.1	2207	Joint Configuration Pipe to Fitting Weld	40% Long & Circ.	UT	11	13
RHB-067A 01-06	Valve (HV-1F004B) to 24" Flued Head (x-203B) C-F/C2.1	2048	Joint Configuration Fitting to Fitting Weld	75% Long & Circ.	UT	5	13
RHC-013 01-07	12" Flued Head (x-45C) to Valve (HV-1V017C) B-J/B4.5	2212	Joint Configuration Fitting to Fitting Weld	60% Long & Circ.	UT	2	6
RHC-017R 01-07	18" x 12" Reducer to 18" Pipe C-F/C2.1	2060	Proximity of Weld to Penetration Limiting Scan Path	45% Long & Circ.	UT	1	13
RHC-053R 01-08	30" Pipe to Flange C-F/C2.1	2094	Weld Configuration Loss of X-Ducer Contact in Weld Toe	90% Long & Circ.	UT	11	13
RHC-054LU to RHC-055LD 01-08	Longitudinal Elbow Seam C-F/C2.2	2019	"Permanent" Welded Support Brace on Weld Seam	80% Long & Circ.	UT	11	14
RHC-056LU to RHC-057LD 01-08	Longitudinal Elbow Seam C-F/C2.2	2020	"Permanent" Welded Support Brace on Weld Seam	80% Long. & Circ.	UT	11	14
RHC-065A 01-08	Valve (HV-1F004C) to 24" Flued Head (x-203C) C-F/C2.1	2043	Joint Configuration Fitting to Fitting Weld I-Beam Obstruction	75% Long & Circ.	UT	5	13

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RHD-004 01-09	12" Pipe to Elbow B-J/B4.5	2007	Insufficient Distance Between Welds RHD-003 and RHD-004 for Full Scan Path	100% Long 60% Circ.	UT	4	6
RHD-013 01-09	12" Flued Head (x-45D) to Valve (HV-1F017D) B-J/B4.5	2212	Joint Configuration Fitting to Fitting Weld	60% Long & Circ	UT	2	6
RHD-014R 01-09	Valve (HV-1F017D) to 12" Pipe C-F/C2.1	2086	Joint Configuration Fitting to Pipe Weld	90% Long & Circ.	UT	1	13
RHD-015R 01-09	12" Pipe to Elbow C-F/C2.1	2248	6" Sweep-o-Let in Pipe 1/2" from Weld Limiting Scan Path	100% Long 98% Circ.	UT	1	13
RHD-059 01-10	Flange to 30" Pipe C-F/C2.1	2243	Two Nozzles Partially Blocking Scan Path	100% Long 95% Circ.	UT	11	13
RHD-061LU to RHD-062LD 01-10	Longitudinal Elbow Seam C-F/C2.2	2044	"Permanent" Welded Support Brace on Weld Seam	100% Long 70% Circ.	UT	11	14
RHD-063LU to RHD-064LD 01-10	Longitudinal Elbow Seam C-F/C2.2	2018	"Permanent" Welded Support Brace on Weld Seam	80% Long & Circ.	UT	11	14
RHD-072A 01-10	Valve (HV-1F004D) to 45" Flued Head (x-203D) C-F/C2.1	2217	Joint Configuration Fitting to Fitting Weld	75% Long & Circ.	UT	5	13
RH-015 01-11	20" Flued Head (x-12) to Valve (HV-1F008) B-J/B4.5	2196	Joint Configuration Fitting to Fitting Weld	80% Long & Circ.	UT	3	6
RH-016ALD-Max. 01-12	Longitudinal Elbow Seam C-F/C2.2	2054	Nozzle Welded on Seam Centerline 3.8" from Weld RH-016B	92% Long & Circ.	UT	3	14
RH-023 01-13	24" Tee to 24" x 24" x 20" Tee C-F/C2.1	2089	Joint Configuration Fitting to Fitting Weld	98% Long & Circ.	UT	3	13

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
51-1F067A-B 01-13	20" Gate Valve Bolting 16 Studs and Nuts C-D/C4.2	2253	Valve Body Blocking Access to One End of Studs and Nuts	80% Surface	MT	3,11	24
51-1F067B-B 01-13	20" Gate Valve Bolting 16 Studs and Nuts C-D/C4.2	2253	Valve Body Blocking Access to One End of Studs and Nuts	80% Surface	MT	3,11	24
51-HV-1F006A-B 01-13	20" Motorized Gate Valve Bolting. 16 Studs & Nuts C-D/C4.2	2253	Valve Body Blocking Access to One End of Studs and Nuts	80% Surface	MT	3,11	24
51-HV-1F006B-B 01-13	20" Motorized Gate Valve Bolting. 16 Studs & Nuts C-D/C4.2	2253	Valve Body Blocking Access to One End of Studs and Nuts	80% Surface	MT	3,11	24
RH-109 01-14	Valve (PV-C-1F051A) to 14" x 6" Reducer C-F/C2.1	2247	Joint Configuration Fitting to Fitting Weld	80% Long 70% Circ.	UT	1	13
RH-146 01-14	10" x 6" Reducer to Valve (PV-C-1F051B) C-F/C2.1	2059	1" Drain Line Weld Partial Obstruction of Scan Path	100% Long 98% Circ.	UT	1	13
RH-160 01-14	Valve (HV-C-154A) to 10" x 6" Reducer C-F/C2.1	2074	Joint Configuration Fitting to Fitting Weld	75% Long 60% Circ.	UT	1	13
RHA-190A 01-15	6" Pipe to Flange B-J/B4.5	2235	Joint Configuration Fitting to Pipe Weld Columnar Structure of Dendritic Weld	30% Long & Circ.	UT	2	6
RHA-218 01-16	6" Flued Head (x-17) to Valve (HV-1F023) B-J/B4.5	2077	Joint Configuration Fitting to Fitting Weld	60% Long.& Circ.	UT	7	6
RH-177 01-20	8" x 6" Reducer to Valve (HV-130) C-F/C2.1	2256	Joint Configuration Fitting to Fitting Weld	75% Long. 100% Circ.	UT	6	13
RH-190A 01-20	6" Pipe to Pipe C-F/C2.1	2230	"Permanent" Hanger Complete Obstruction (Refer to Section III Surface and R.T. Exam. Results)	0% Long & Circ.	UT	16	13

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RH-194A 01-20	6" Pipe to Pipe C-F/C2.1	2231	"Permanent" Hanger Complete Obstruction (Refer to Section III Surface and R.T. Exam. Results)	0% Long. & Circ.	UT	16	13
51-PSV-1F097-B 01-21	4" x 6" Relief Valve Bolting. 8 Studs & Nuts C-D/C4.2	2253	Valve Body Blocking Access to One End of Studs and Nuts	80% Surface	MT		24
RHA-244 01-22	Valve (HV-125A) to 18" Pipe C-F/C2.1	2066	Joint Configuration Fitting to Pipe Weld	60% Long. & Circ.	UT	7	13
RHB-185 01-23	Valve (HV-125B) to 18" Pipe C-F/C2.1	2064	Joint Configuration Fitting to Pipe Weld	60% Long. & Circ.	UT	1	13
RHR-HXA-N3 01-24	Heat Exchanger Nozzle to Head Weld C-B/C1.2	2224	Sock-O-Let Welded in Scan Path	98% Long & Circ.	UT	1	11
RHR-HXB-N3 01-24	Heat Exchanger Nozzle to Head Weld C-B/C1.2	2224	Sock-O-Let Welded in Scan Path	98% Long. & Circ.	UT	1	11
RHR-HXA-N4 01-24	Heat Exchanger Nozzle to Shell 1 Weld C-B/C1.2	2042	Joint Configuration (Refer to Section III R.T. Results)	80% Long. & Circ.	UT	1	11
RHR-HXB-N4 01-24	Heat Exchanger Nozzle to Shell 1 Weld C-B/C1.2	2057	Joint Configuration (Refer to Section III R.T. Results)	90% Long. & Circ.	UT	1	11
RHR-HXA-3 01-24	Heat Exchanger Shell 3 to Shell 2 Weld C-A/C1.1	2056	Joint Configuration (Refer to Section III R.T. Results)	90% Long. & Circ.	UT	1	21
RHR-HXB-3 01-24	Heat Exchanger Shell 3 To Shell 2 Weld C-A/C1.1	2061	Joint Configuration (Refer to Section III R.T. Results)	90% Long. & Circ.	UT	1	21
RHR-HXA-4 01-24	Heat Exchanger Shell 1 to Flange Weld C-A/C1.1	2233	Studs and Nuts on Flange Side	50% Long. 100% Circ.	UT	1	21

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RHR-HXB-4 01-24	Heat Exchanger Shell to Flange Weld C-A/C1.1	2234	Studs and Nuts on Flange Side	50% Long. 100% Circ.	UT	1	21
RHR-HXB-1 01-24	Heat Exchanger Head to Shell 4 Weld C-A/C1.1	2227	Post-Grind Weld Contour.	80% Long. 100% Circ.	UT	1	21
RHR-HXB-1-A 01-25	Top Mounting Support A Heat Exchanger C-C/C1.3	2178	Inside Fillet Weld Not Accessible to Exam	100% Outside 0% Inside Fillet	MT	1	12
RHR-HXB-1-B 01-25	Top Mounting Support B Heat Exchanger C-C/C1.3	2177	Inside Fillet Weld Not Accessible to Exam Lifting Lug on Outside	90% Outside 0% Inside Fillet	MT	1	12
RHR-HXB-1-C 01-25	Top Mounting Support C Heat Exchanger C-C/C1.3	2176	Inside Fillet Weld Not Accessible to Exam	100% Outside 0% Inside Fillet	MT	1	12
RHR-HXB-1-D 01-25	Top Mounting Support D Heat Exchanger C-C/C1.3	2186	Inside Fillet Weld Not Accessible to Exam	100% Outside 0% Inside Fillet	MT	1	12
RHR-HXB-2-A 01-25	Bottom Mounting Support A Heat Exchanger C-C/C1.3	2186	I-Beam Obstructing Bottom Outside Fillet Weld	75%Outside 100% Inside Fillet	MT	1	12
RHR-HXB-2-C 01-25	Bottom Mounting Support C Heat Exchanger C-C/C1.3	2203	I-Beam Obstructing Bottom Outside Fillet Weld	75% Outside 100% Inside Fillet	MT	1	12
RHR-HXB-2-D 01-25	Bottom Mounting Support D Heat Exchanger C-C/C1.3	2199	I-Beam Obstructing Bottom Outside Fillet Weld	75% Outside 100% Inside Fillet	MT	1	12
RHR-HXA-1-A 01-25	Top Mounting Support A Heat Exchanger C-C/C1.3	2255	Inside Fillet Weld Not Accessible to Exam	100% Outside 0% Inside Fillet	MT	1	12
RHR-HXA-1-B 01-25	Top Mounting Support B Heat Exchanger C-C/C1.3	2185	Inside Fillet Weld Not Accessible to Exam	100% Outside 0% Inside Fillet	MT	1	12

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RHR-HXA-1-C 01-25	Top Mounting Support C Heat Exchanger C-C/C1.3	2188	Inside Fillet Weld Not Accessible to Exam	100% Outside 0% Inside Fillet	MT	1	12
RHR-HXA-1-D 01-25	Top Mounting Support D Heat Exchanger C-C/C1.3	2189	Inside Fillet Welds Not Accessible to Exam	100% Outside 0% Inside Fillet	MT	1	12
RHR-HXA-2A 01-25	Bottom Mounting Support A Heat Exchanger C-C/C1.3	2204	Inside Fillet Weld I-Beam Obstructing Outside Not Accessible to Exam	75% Outside 0% Inside Fillet	MT	1	12
RHR-HXA-2B 01-25	Bottom Mounting Support B Heat Exchanger C-C/C1.3	2179	Inside Fillet Weld I-Beam Obstructing Outside Not Accessible to Exam	75% Outside 0% Inside Fillet	MT	1	12
RHR-HXA-2C 01-25	Bottom Mounting Support C Heat Exchanger C-C/C1.3	2195	Inside Fillet Weld I-Beam Obstructing Outside Not Accessible to Exam	75% Outside 0% Inside Fillet	MT	1	12
RHR-HXA-2D 01-25	Bottom Mounting Support D Heat Exchanger C-C/C1.3	2183	Inside Fillet Weld I-Beam Obstructing Outside Not Accessible to Exam	75% Outside 0% Inside Fillet	MT	1	12
RHA-258 01-26	22" Elbow to Valve (HV-0182A) C-F/C2.1	2062	Joint Configuration Fitting to Pipe Weld	75% Long. & Circ.	UT	1	13
RHA-259 01-26	Valve (HV-182A) to 18" x 22" Reducer C-F/C2.1	2250	Joint Configuration Fitting to Fitting Weld	80% Long. & Circ.	UT	1	13
RHB-193 01-26	18" x 22" Reducer to Valve (HV-182B) C-F/C2.1	2091	Sock-O-Let in Weld Scan Path	95% Long. & Circ.	UT	1	13
RHB-194 01-26	Valve (HV-182B) to 18" x 22" Reducer C-F/C2.1	2091	Sock-O-Let in Weld Scan Area. Indication Exceeded 20% DAC. Sized at 50% DAC	100% Long. 95% Circ.	UT	1	13,20

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RHA-P-E 01-27	Elbow to Outlet Head Weld, Pump A C-F/C3.1	2097	Joint Configuration	90% Long. & Circ.	UT	11	17
RHA-P-F 01-27	Flange to Outlet Elbow Weld, Pump A C-F/C3.1	2097	Joint Configuration	90% Long. & Circ.	UT	11	17
RHA-P-G 01-27	Stuffing Box to Outlet Elbow Weld, Pump A C-F/C3.1	2097	Joint Configuration	90% Long. & Circ.	UT	11	17
RHA-P-A1 01-27	Pump A Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	11	18
RHB-P-E 01-27	Elbow to Outlet Head Weld, Pump B C-F/C3.1	2097	Joint Configuration	90% Long. & Circ.	UT	11	17
RHB-P-F 01-27	Flange to Outlet Elbow Weld, Pump B C-F/C3.1	2097	Joint configuration	90% Long & Circ.	UT	11	17
RHB-P-G 01-27	Stuffing Box to Outlet Elbow Weld, Pump B C-F/C3.1	2097	Joint Configuration	90% Long. & Circ.	UT	11	17
RHB-P-A1 01-27	Pump B Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	11	18
RHC-P-E 01-27	Elbow to Outlet Head Weld, Pump C C-F/C3.1	2063	Joint Configuration	50% Long. & Circ.	UT	11	17
RHC-P-F 01-27	Flange to Outlet Elbow Weld Pump, C C-F/C3.1	2063	Joint Configuration	50% Long. & Circ.	UT	11	17
RHC-P-G 01-27	Stuffing Box to Outlet Elbow Weld, Pump C C-F/C3.1	2063	Joint Configuration	50% Long. & Circ.	UT	11	17

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RHC-P-A1 01-27	Pump C Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	11	18
RHD-P-E 01-27	Elbow to Outlet Head Weld, Pump D C-F/C3.1	2070	Joint Configuration	90% Long. & Circ.	UT	11	17
RHD-P-F 01-27	Flange to Outlet Elbow Weld, Pump D C-F/C3.1	2070	Joint Configuration	90% Long. & Circ.	UT	11	17
RHD-P-G 01-27	Stuffing Box to Outlet Elbow Weld, Pump D C-F/C3.1	2070	Joint Configuration	90% Long. & Circ.	UT	11	17
RHD-P-A1 01-27	Pump D Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	11	18
GBB-118-H8 01-102	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-118-H901 01-102	Pipe Support, Anchor Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-118-H73 01-102	Pipe Support, 16 Lugs C-E-1/C2.5	2135	Adjoining Clamp Refer to ASME Section III Inspection Results	80% Surface	MT	1	16
GBB-118-H1 01-103	Pipe Support, 8 Lugs C-E-1/C2.5	2118	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-118-H902 01-103	Pipe Support, Saddle C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-101-H21 01-103	Pipe Support, 8 Lugs C-E-1/C2.5	2139	Adjoining Clamp Refer to ASME Section III Inspection Results	70% Surface	MT	1	16
GBB-101-H18 01-103	Pipe Support, 4 Lugs C-E-1/C2.5	2142	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
HBB-117-H18 01-103	Pipe Support, 8 Lugs C-E-1/C2.5	2182	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	11	16
HBB-117-H1 01-103	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-117-X-203A 01-103	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	11	16
GBB-118-H17 01-103	Pipe Support, 4 Lugs C-E-1/C2.5	2127	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-117-H20 01-103	Pipe Support, 8 Lugs C-E-1/C2.5	2116	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-117-H6 01-103	Pipe Support, 8 Lugs C-E-1/C2.5	2147	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-117-H18 01-103	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-102-H34 01-103	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-118-H903 01-105	Pipe Support, Sleeve C-E-1/C2.5	2144	Adjacent Hanger Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-118-H904 01-105	Pipe Support, Sleeve C-E-1/C2.5	2191	Adjacent Hanger and House Steel. Refer to ASME Section III Inspection Results	20% Surface	MT	1	16
GBB-107-H19 01-105	Pipe Support, 4 Lugs C-E-1/C2.5	2184	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBF-118-H49 01-106	Pipe Support, 8 Lugs C-E-1/C2.5	2167	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
GBB-118-H16 01-106	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-118-H905 01-106	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-118-H62 01-106	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-101-H7 01-106	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-101-H4 01-106	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-101-H26 01-106	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-118-H50 01-106	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-117-H19 01-106	Pipe Support C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-117-H6 01-106	Pipe Support C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-117-H5 01-106	Pipe Support C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-117-X-203B 01-106	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	11	16
GBB-120-H7 01-106	Pipe Support, 12 Lugs C-E-1/C2.5	2166	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-118-H11 01-106	Pipe Support, 4 Lugs C-E-1/C2.5	2172	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
GBB-117-H4 01-106	Pipe Support, 8 Lugs C-E-1/C2.5	2175	Adjoining Clamp Refer to ASME Section III Inspection Results	80% Surface	MT	1	16
GBB-117-H3 01-106	Pipe Support, 8 Lugs C-E-1/C2.5	2214	Adjoining Clamp Refer to ASME Section III Inspection Results	80% Surface	MT	1	16
GBB-119-H15 01-107	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H12 01-107	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H902 01-107	Pipe Support, Sleeve C-E-1/C2.5	2154	Hanger Configuration. Longitudinal Weld Inaccessible. Refer to ASME Section III Inspection Results.	50% Surface	MT	1	16
GBB-119-H2 01-107	Pipe Support, 4 Lugs C-E-1/C2.5	2109	Adjacent Hanger, Pipe and Wall. Refer to ASME Section III Inspection Results.	50% Surface	MT	1	16
GBB-119-H41 01-107	Pipe Support, 8 Lugs C-E-1/C2.5	2128	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-119-H44 01-107	Pipe Support, 8 Lugs C-E-1/C2.5	2180	Adjoining Clamp Refer to ASME Section III Inspections Results	90% Surface	MT	1	16
GBB-119-H901 01-107	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H23 01-107	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H92 01-107	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H95 01-107	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
GBB-119-H11 01-108	Pipe Support, 8 Lugs C-E-1/C2.5	2122	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
HBB-118-H81 01-108	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
HBB-118-H80 01-108	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
HBB-117-H22 01-108	Pipe Support, 8 Lugs C-E-1/C2.5	2124	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
HBB-117-X-203C 01-108	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspections Results	0% Surface	MT	11	16
GBB-119-H27 01-109	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H32 01-109	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H904 01-109	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H68 01-109	Pipe Support, 4 Lugs C-E-1/C2.5	2126	Adjoining Clamp Refer to ASME Section III Inspections Results	90% Surface	MT	1	16
GBB-119-H903 01-109	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H18 01-109	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
GBB-119-H60 01-109	Pipe Support, 4 Lugs C-E-1/C2.5	2120	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-119-H17 01-110	Pipe Support, 12 Lugs C-E-1/C2.5	2155	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
HBB-118-H84 01-110	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
HBB-118-H83 01-110	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
HBB-117-H21 01-110	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
HBB-117-X-203D 01-110	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	11	16
HBB-118-H1 01-112	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	3	16
HBB-118-H3 01-112	Pipe Support, 12 Lugs C-E-1/C2.5	2148	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	3	16
HBB-119-H2 01-112	Pipe Support, 12 Lugs C-E-1/C2.5	2132	HBB-119-H8 Hanger Refer to ASME Section III Inspection Results	95% Surface	MT	3	16
HBB-119-H901 01-112	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	3	16
HBB-119-H902 01-112	Pipe Support, Sleeve C-E-1/C2.5	2117	Attachment Plate on Sleeve Refer to ASME Section III Inspection Results	98%	MT	3	16
HBB-118-H35 01-113	Pipe Support, 12 Lugs C-E-1/C2.5	2202	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	3	16
HBB-118-H2 01-113	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	3	16
HBB-118-H13 01-113	Pipe Support, Saddle C-E-1/C2.5	N/A	N/A	100% Surface	MT	3	16
HBB-118-H42 01-113	Pipe Support, 8 Lugs C-E-1/C2.5	2164	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	3	16

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
EBB-121-H902 01-114	Pipe Support, Sleeve C-E-1/C2.5	2105	Floor Elevation 217 Blocking Access Refer to ASME Section III Inspection Results	65% Surface	MT	1	16
EBB-103-H1 01-114	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16
ECB-111-H1 01-116	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	18	16
GBB-111-H4 01-117	Pipe Support, 8 Lugs C-E-1/C2.5	2123	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
HBB-140-H10 01-118	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	17	16
HBB-140-H1 01-119	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	17	16
HBB-160-X-225 01-120	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	6	16
HBB-160-H1 01-120	Pipe Support, 8 Lugs C-E-1/C2.5	2136	Adjoining Clamp and Hanger. Refer to ASME Section III Inspection Results	60% Surface	MT	6	16
HBB-160-H2 01-120	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	6	16
HBB-160-H16 01-120	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	6	16
GBB-108-H11 01-122	Pipe Support, 8 Lugs C-E-1/C2.5	2174	Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-108-H4 01-123	Pipe Support, 12 Lugs C-E-1/C2.5	2152	Adjoining Clamp and Hanger Refer to ASME Section III Inspection Results	90% Surface	MT	1	16
GBB-119-H100 01-126	Pipe Support C-E-1/C2.5	N/A	N/A	100% Surface	MT	1	16

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
HP-013A 02-01	10" Tee to Blind Flange B-J/B4.5	2192	Joint Configuration Fitting to Fitting Weld	70% Long. & Circ.	UT	4	6
HP-021 02-01	10" Flued Head (X-11) to Valve (HV-1F003) B-J/B4.5	2141	Joint Configuration Fitting to Fitting Weld	90% Long. & Circ.	UT	2	6
HP-022 02-01	Valve (HV-1F003) to 10" x 12" Reducer C-F/C2.1	2246	Proximity of Adjacent Sock-O-Let to Weld	100% Long. 90% Circ.	UT	2	13
55-HV-1F001-B 02-02	10" Motorized Globe Valve Bolting 8 Studs and Nuts C-D/C4.2	2254	Valve Cover Blocking Access to 1 Flat on 4 Nuts	92% Surface	MT	2	24
HP-085 02-03	12" Pipe to Elbow C-F/C2.1	2157	Proximity of Adjacent Welded Drain Line in Pipe to Scan Path	80% Long. & Circ.	UT	8	13
HP-087 02-03	Valve (HV-1F072) to Flued Head (X-210) C-F/C2.1	2206	Joint Configuration Fitting to Fitting Weld	70% Long. & Circ.	UT	7	13
55-HV-1F006-B 02-04	12" Motorized Gate Valve Bolting 8 Studs and Nuts C-D/C4.2	2254	Valve Cover Blocking Access to 1 Flat on 4 Nuts	92% Surface	MT	8	24
HP-102 02-04	14" Pipe to Elbow C-F/C2.1	2106	Penetration blocking 50% of Scan Path	50% Long. 75% Circ.	UT	8	13
HP-113 02-04	14" x 14" x 10" Tee to Flange (FO-1D010A) C-F/C2.1	2098	Joint Configuration Fitting to Fitting Weld	100% Long. 40% Circ.	UT	8	13
55-HV-1F007-B 02-04	14" Motorized Gate Valve Bolting 8 Studs and Nuts C-D/C4.2	2254	Valve Cover Blocking Access to 1 Flat on 4 Nuts	92% Surface	MT	8	24
HP-122 02-05	Elbow to 14" Pipe C-F/C2.1	2002	Proximity of Weld to Floor Penetration	50% Long. & Circ.	UT	8	13

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
HP-137R 02-05	14" x 10" Reducer to Pump (10P204) Discharge C-F/C2.1	2053	Joint Configuration Fitting to Fitting Weld	80% Long. 100% Circ.	UT	8	13
EBB-108-H22 02-101	Pipe Support, 4 Lugs C-E-1/C2.5	2138	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-108-H901 02-102	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	8	16
EBB-108-H8 02-102	Pipe Support, 8 Lugs C-E-1/C2.5	2218	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-108-H4 02-102	Pipe Support, 8 Lugs C-E-1/C2.5	2143	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-108-H38 02-102	Pipe Support, 4 Lugs C-E-1/C2.5	2131	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
HBB-108-H4 02-103	Pipe Support, 12 Lugs C-E-1/C2.5	2223	Adjoining Clamp Refer to ASME Section III Inspection Results	80% Surface	MT	8	16
HBB-108-H3A 02-103	Pipe Support, 8 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	8	16
HBB-108-H6 02-103	Pipe Support, 8 Lugs C-E-1/C2.5	2134	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
HBB-108-H5 02-103	Pipe Support, 8 Lugs C-E-1/C2.5	2133	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-129-H43 02-104	Pipe Support, 8 Lugs C-E-1/C2.5	2173	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-129-H902 02-104	Pipe Support, Stanchion C-E-1/C2.5	2108	Hanger, Floor and Wall Refer to ASME Section III Inspection Results	75% Surface	MT	8	16

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
EBB-129-H11 02-104	Pipe Support, Saddle C-E-1/C2.5	N/A	N/A	100% Surface	MT	8	16
EBB-129-H901 02-105	Pipe Support, Saddle C-E-1/C2.5	2110	Hanger and Wall Refer to ASME Section III Inspection Results	50% Surface	MT	8	15
EBB-129-H5 02-105	Pipe Support, Saddle C-E-1/C2.5	2114	Hanger Clamp EBB-129-H4 Refer to ASME Section III Inspection Results	50% Surface	MT	8	16
EBB-129-H4 02-105	Pipe Support, 8 Lugs C-E-1/C2.5	2115	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
HP-P-B 02-106	Pump Casing Stud Bolting 38 1-3/4" Dia. Studs C-D/C3.2	2232	Pump Manufacturer's Visual Inspection Considered Adequate	100% UT 0% Visual	VT	8	23
HP-P-A 02-106	Pump Support, Anchor 8 1-1/4" Dia. Studs C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	8	18
EBB-129-H903 02-107	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	8	16
MSA-023 03-01	26" Flued Head (x-7A) to Valve (HV-1F028A) B-J/B4.5	2037	Joint Configuration Fitting to Fitting Weld	95% Long. 70% Circ.	UT	2	6
MSB-025 03-01	26" Flued Head (x-7B) to Valve (HV-1F028B) B-J/B4.5	2050	Joint Configuration Fitting to Fitting Weld	60% Long. 85% Circ.	UT	2	6
MSA-025 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSA-025LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-025LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSA-026 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSA-026LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-026LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-027 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSA-027LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-027LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-028 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSA-028LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-028LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-029 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSA-029LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2337	Base Metal	100%	RT	13	15
MSA-029LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-030 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSA-030LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-030LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-031 03-03	26" Pipe to Elbow C-F/C2.1	2337	Base Metal	100%	RT	13	15
MSA-031LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-031LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-032 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSA-032LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-032LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-034 03-03	26" x 26" x 14"Tee to 26" Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSA-034LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-034LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-035 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSA-035LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSA-035LU-Max. 03 03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-027 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-027LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-027LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-028 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-028LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-028LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-029 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-029LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-029LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-030 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSB-030LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-030LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-031 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-031LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-031LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-032 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-032LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-032LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-034 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-034LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-034LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-035 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSB-035LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-035LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-038 03-03	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-038LD-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-038LD-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-039 03-03	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSB-039LU-Min. 03-03	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSB-039LU-Max. 03-03	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-023 03-04	26" Flued Head (x-7D) to Valve (HV-1F028D) B-J/C4.5	2039	Joint Configuration Fitting to Fitting Weld	75% Long. 90% Circ.	UT	2	6
MSC-025 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-025LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-025LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSC-026 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-026LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-026LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-027 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-027LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-027LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-028 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-028LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-028LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-029 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-029RLD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-029RLD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-030 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15

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COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSC-030LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-030LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-031 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-031LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-031LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-032 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-032LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-032LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-034 03-05	24" x 26" x 14" Tee to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSC-034LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-034LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-035 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSC-035LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-035LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSC-036 03-05	26" Pipe to 8" Sweep-O-Let C-F/C2.3	2003	Adjacent Nozzle Blocking Scan Path	100% Long. 90% Circ.	UT	13	22
41-HV-111-B 03-05	8" Motorized Gate Valve Bolting 8 Studs and Nuts C-D/C4.2	2252	Valve Cover Blocking Access to 1/2 of 4 Nuts	75% Surface	MT	13	24
MSD-025 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-025LD-Min. 03-02	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-025LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-026 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-026LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-026LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-027 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-027LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSD-027LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-028 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-028LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-028-LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-029 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-029LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-029LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-030 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-030LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-030LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-031 03-05	26" Pipe to Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-031LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
MSD-031LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-032 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-032LU-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-032LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-034 03-05	26" x 26" x 14" Tee to 26" Elbow C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-034LD-Min. 03-05	Elbow Seam Min. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-034LD-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-035 03-05	26" Elbow to Pipe C-F/C2.1	2237	Base Metal	100%	RT	13	15
MSD-035LU-Min. 03-05	Elbow Seam Min.Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MSD-035LU-Max. 03-05	Elbow Seam Max. Radius C-F/C2.2	2237	Base Metal	100%	RT	13	15
MS-034 03-06	18" Elbow to Turbine By-Pass Valves C-F/C2.1	2001	Proximity of Welded Hanger to Weld Scan Area	100% Long. 65% Circ.	UT	15	13
EBB-104-H13 03-103	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	13	16

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
EBB-103-H13 03-103	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	13	16
EBB-102-H3 03-105	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	13	16
EBB-101-H13 03-105	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	13	16
EBB-106-H6 03-106	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	13	16
CSA-015 04-01	Flued Head (x-16A) to Valve (HV-1F005) B-J/B4.5	2067	Joint Configuration Fitting to Fitting Weld	60% Long. & Circ.	UT	2	6
CSA-043 04-03	12" Elbow to Valve (1F003A) C-F/C2.1	2238	Joint Configuration Fitting to Fitting Weld	90% Long. & Circ.	UT	14	13
CSA-069 04-03	12" Elbow to Valve (1F003C) C-F/C2.1	2238	Joint Configuration Fitting to Fitting Weld Weld-O-Let in Scan Path	95% Long. & Circ.	UT	14	13
CSB-010 04-04	Valve (HV-1F006B) to 12" Pipe B-J/B4.5	2105	Joint Configuration Fitting to Pipe Weld	95% Long. 90% Circ.	UT	2	6
CSB-015 04-04	Flued Head (x-16B) to Valve (HV-108) B-J/B4.5	2085	Joint Configuration Fitting to Fitting Weld	40% Long & Circ.	UT	2	6
CSB-049 04-06	12" Elbow to Valve (1F003B) C-F/C2.1	2238	Joint Configuration Fitting to Fitting Weld Weld-O-Let in Scan Path	90% Long. & Circ.	UT	14	13
CSB-075 04-06	12" Elbow to Valve (1F003D) C-F/C2.1	2238	Joint Configuration Fitting to Fitting Weld Weld-O-Let in Scan Path	95% Long. & Circ.	UT	14	13
CSB-071A 04-07	Valve (HV-1F001B) to Flued Head (x-206B) C-F/C2.1	2071	Joint Configuration Fitting to Fitting Weld	70% Long. & Circ.	UT	5	13

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 2

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
CSA-P-A 04-09	Pump A Inlet Flange to Nozzle Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSA-P-B 04-09	Pump A Inlet Nozzle to Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSA-P-C 04-09	Pump A Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSA-P-D 04-09	Pump A Outlet Head to Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSA-P-E 04-09	Pump A Elbow to Outlet Head Weld C-F/C3.1	2095	Joint Configuration	90% Long. & Circ.	UT	14	17
CSA-P-F 04-09	Pump A Flange to Outlet Elbow Weld C-F/C3.1	2095	Joint Configuration	90% Long. & Circ.	UT	14	17
CSA-P-G 04-09	Pump A Stuffing Box to Outlet Elbow Weld C-F/C3.1	2095	Joint Configuration	90% Long. & Circ.	UT	14	17
CSA-P-A1 04-09	Pump A Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	14	18
CSB-P-A 04-09	Pump B Inlet Flange to Nozzle Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSB-P-B 04-09	Pump B Inlet Nozzle to Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSB-P-C 04-09	Pump B Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSB-P-D 04-09	Pump B Outlet Head to Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
CSB-P-E 04-09	Pump B Elbow to Outlet Head Weld C-F/C3.1	2093	Joint Configuration	90% Long. & Circ.	UT	14	17
CSB-P-F 04-09	Pump B Flange to Outlet Elbow Weld C-F/C3.1	2093	Joint Configuration	90% Long. & Circ.	UT	14	17
CSB-P-G 04-09	Pump B Stuffing Box to Outlet Elbow Weld	2093	Joint Configuration	75% Long. & Circ.	UT	14	17
CSB-P-A1 04-09	Pump B Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	14	18
CSC-P-A 04-09	Pump C Inlet Flange to Nozzle Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSC-P-B 04-09	Pump C Inlet Nozzle to Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSC-P-C 04-09	Pump C Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long.& Circ.	UT	14	17
CSC-P-D 04-09	Pump C Outlet Head to Casing Weld C-F/C3.1	2225	Incased in Cement	0% Long. & Circ.	UT	14	17
CSC-P-E 04-09	Pump C Elbow to Outlet Head Weld C-F/C3.1	2095	Joint Configuration	90% Long. & Circ.	UT	14	17
CSC-P-F 04-09	Pump C Flange to Outlet Elbow Weld C-F/C3.1	2095	Joint Configuration	90% Long. & Circ.	UT	14	17
CSC-P-G 04-09	Pump C Stuffing Box to Outlet Elbow Weld C-F/C3.1	2095	Joint Configuration	90% Long. & Circ.	UT	14	17
CSC-P-A1 04-09	Pump C Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	14	18

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
CSD-P-A 04-09	Pump D Inlet Flange to Nozzle Weld C-F/C3.1	2225	Incased in Weld	0% Long. & Circ.	UT	14	17
CSD-P-B 04-09	Pump D Inlet Nozzle to Casing Weld C-F/C3.1	2225	Incased in Weld	0% Long. & Circ.	UT	14	17
CSD-P-C 04-09	Pump D Casing Weld C-F/C3.1	2225	Incased in Weld	0% Long. & Circ.	UT	14	17
CSD-P-D 04-09	Pump D Outlet Head to Casing Weld C-F/C3.1	2225	Incased in Weld	0% Long. & Circ.	UT	14	17
CSD-P-E 04-09	Pump D Elbow to Outlet Head Weld C-F/C3.1	2093	Joint Configuration	90% Long. & Circ.	UT	14	17
CSD-P-F 04-09	Pump D Flange to Outlet Elbow Weld C-F/C3.1	2093	Joint Configuration	90% Long. & Circ.	UT	14	17
CSD-P-G 04-09	Pump D Stuffing Box to Outlet Elbow Weld C-F/C3.1	2093	Joint Configuration	90% Long. & Circ.	UT	14	17
CSD-P-A1 04-09	Pump D Support Anchor 1-1/4" Dia. Bolted C-E-2/C3.4	N/A	Incased in Cement	100% of Accessible Bolting	VT	14	18
GBB-113-H9 04-102	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
GBB-113-H8 04-102	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
GBB-113-H7 04-102	Pipe Support, 4 Lugs C-E-1/C2.5	2181	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	14	16
GBB-113-H901 04-102	Pipe Support, Sleeve C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
GBB-115-X-207A 04-102	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	14	16
GBB-113-H1 04-103	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
HBB-120-H30 04-103	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-120-H19 04-103	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
HBB-120-X-206A 04-103	Penetration Support, Suppression Pool Liner Insert Plate Weld	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	5	16
GBB-113-H6 04-103	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
HBB-120-H3[illegible] 04-103	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	11	16
HBB-120-X-206C 04-103	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	N/A	5	16
EBB-131-H8 04-105	Pipe Support, 8 Lugs C-E-1/C2.5	2209	Adjoining Hanger Refer to ASME Section III Inspection Results	95% Surface	MT	8	16
GBB-112-H50 04-105	Pipe Support, 16 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
GBB-112-H37 04-105	Pipe Support, 4 Lugs C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
GBB-112-H901 04-105	Pipe Support, Anchor C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
GBB-114-X-207B 04-105	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	14	16

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
GBB-112-H1 04-106	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
GBB-112-H10 04-106	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
HBB-120-H32 04-107	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
HBB-120-X-206B 04-107	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	5	16
HBB-120-H13 04-107	Pipe Support, Stanchion C-E-1/C2.5	N/A	N/A	100% Surface	MT	14	16
HBB-120-X-206D 04-107	Penetration Support, Suppression Pool Liner Insert Plate Weld C-E-1/C2.5	N/A	Refer to ASME Section III Inspection Results	0% Surface	MT	5	16
FWA-028 05-01	24" x 24" x 12" Tee to 24" Elbow B-J/B4.5	2241	Joint Configuration Fitting to Fitting Weld	60% Long. & Circ.	UT	4	6
FWA-032 05-01	24" Elbow to Valve (1F010A) B-J/B4.5	2052	Joint Configuration Fitting to Fitting Weld	75%Long. & Circ.	UT	4,9	6
FWA-034 05-01	24" Flued Head (x-9A) to Valve (HV-1F074A) B-J/B4.5	2055	Joint Configuration Fitting to Fitting Weld	40% Long. & Circ.	UT	2	6
FWA-037 05-02	24" x 24" x 16" Tee to Valve (HV-1F032A) C-F/C2.1	2058	Joint Configuration Fitting to Fitting Weld	60% Long. & Circ.	UT	12	13
FWA-038 05-02	24" x 24" x 16" Tee to 16" Elbow C-F/C2.1	2244	Joint Configuration Fitting to Fitting Weld	60% Long. & Circ.	UT	12	13
FWB-007 05-03	12" x 20" Reducer to 20" x 20" x 12" Tee B-J/B4.5	2193	Joint Configuration Fitting to Fitting Weld	60% Long. & Circ.	UT	4	6

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
FWB-025 05-03	24" x 24" x 12" Tee to 24" Elbow B-J/B4.5	2078	Joint Configuration Fitting to Fitting Weld	60% Long. & Circ.	UT	4	6
FWB-028 05-03	24" Valve (HV-1F011B) to 24" Elbow B-J/B4.5	2236	Joint Configuration Fitting to Fitting Weld Indication Exceeded 20% DAC, Sized at 50% DAC	90% Long. & Circ.	UT	4,9	6, 19
FWB-029 05-03	24" Elbow to Valve (1F010B) B-J/B4.5	2051	Joint Configuration Fitting to Fitting Weld	100% Long. 75% Circ.	UT	4,9	6
FWB-030 05-03	Valve (1F010B) to 24" Flued Head (x-9B) B-J/B4.5	2205	Joint Configuration Fitting to Fitting Weld	90% Long. & Circ.	UT	2	6
FWB-031 05-03	24" Flued Head (x-9B) to Valve (1F074B) B-J/B4.5	2043	Joint Configuration Fitting to Fitting Weld	55% Long. 90% Circ.	UT	2	6
FWB-032 05-04	Valve (HV-1F074B) to 24" Pipe C-F/C2.1	2040	Joint Configuration Fitting to Pipe Weld	75% Long. 90% Circ.	UT	12	13
FWB-035 05-04	24" x 24" x 16" Tee to Valve (HV-1F032B) C-F/C2.1	2022	Joint Configuration Fitting to Fitting Weld	80% Long. & Circ.	UT	12	13
FWB-036 05-04	16" x 24" x 24" Tee to 16" Elbow C-F/C2.1	2245	Joint Configuration Fitting to Fitting Weld	100% Long. 60% Circ.	UT	12	13
RC-058R 06-03	6" Pipe to 6" x 6" x 4" Tee C-F/C2.1	2006	Hanger and 4" Leg of Tee Blocking Scan Paths	100% Long. 85% Circ.	UT	8	13
RC-059R 06-03	6" x 6" x 4" Tee to Valve (HV-1F013) C-F/C2.1	2011	4" Leg of Tee Blocking Scan Path	100% Long. 85% Circ.	UT	8	13
RC-101 06-04	10" Pipe to Cap C-F/C2.1	2005	Sock-O-Let Blocking Scan Path	85% Long. & Circ.	UT	8	13

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RC-123 06-04	Valve (MO-1F060) to Flued Head (x-215)	2068	Joint Configuration Fitting to Fitting Weld	50% Long. & Circ.	UT	7	13
EBB-109-H9 06-102	Pipe Support, 8 Lugs C-E-1/C2.5	2163	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-109-H4 06-102	Pipe Support, 4 Lugs C-E-1/C2.5	2160	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-135-H25 06-103	Pipe Support, 8 Lugs C-E-1/C2.5	2162	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Suface	MT	8	16
EBB-135-H28 06-103	Pipe Support, 4 Lugs C-E-1/C2.5	2161	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-H135-H902 06-103	Pipe Support, Saddle C-E-1/C2.5	N/A	N/A	100% Surface	MT	8	16
EBB-135-H2 06-103	Pipe Support, 4 Lugs C-E-1/C2.5	2140	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
EBB-135-H901 06-103	Pipe Support, Sleeve C-E-1/C2.5	2171	Gusset to Sleeve Welds Blocking Partial Base Metal Examination. Refer to ASME Section III Inspection Results	95% Surface	MT	8	16
EBB-126-H2 06-103	Pipe Support, 4 Lugs C-E-1/C2.5	2158	Adjacent Hanger Clamps Refer to ASME Section III Inspection Results	80% Surface	MT	8	16
EBB-126-H5 06-103	Pipe Support, 4 Lugs C-E-1/C2.5	2170	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
HBB-101-H1 06-104	Pipe Support, 4 Lugs C-E-1/C2.5	2169	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16

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Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
HBB-101-H11 06-104	Pipe Support, 4 Lugs C-E-1/C2.5	2159	Adjoining Clamp Refer to ASME Section III Inspection REsults	90% Surface	MT	8	15
HBB-101-H6 06-104	Pipe Support, 4 Lugs C-E-1/C2.5	2165	Adjoining Clamp Refer to ASME Section III Inspection Results	90% Surface	MT	8	16
RRA-006LD-Min. 07-01	Elbow Seam Min. Radius B-J/B4.5 07-01	2014	Sock-O-Let Blocking Scan Path	100% Long. 95% Circ.	UT	4	6
RRA-006LD-Max. 07-01	Elbow Seam Max. Radius B-J/B4.5	2013	Sock-O-Let Blocking Scan Path	100% Long. 95% Circ.	UT	4	6
RRA-007LU-Min. 07-01	Elbow Seam Min. Radius B-J/B4.5	2014	Sock-O-Let Blocking Scan Path	100% Long. 95% Circ.	UT	4	6
RRA-007LU-Max. 07-01	Elbow Seam Max. Radius B-J/B4.5	2013	Sock-O-Let Blocking Scan Path	100% Long. 95% Circ.	UT	4	6
RRA-008 07-01	Valve (HV-1F023A) to 28" Pipe B-J/B4.5	2239	Sock-O-Let Blocking Scan Path	100% Long. 97% Circ.	UT	4, 10	6
RRA-022 07-01	28" Pipe to 28" x 28" x 12" Tee B-J/B4.5	2197	Joint Configuration Fitting to Pipe Weld	80% Long. & Circ.	UT	4	6
RRA-023 07-01	28" x 28" x 12" Tee to 28" x 22" Cross B-J/B4.5	2080	Joint Configuration Fitting to Fitting Weld	40% Long. & Circ.	UT	4	6
RRA-027LD-Min. 07-01	Elbow Seam Min. Radius B-J/B4.5	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	N/A	UT	4	19
RRA-027LD-Max. 07-01	Elbow Seam Max. Radius B-J/B4.5	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	N/A	UT	4	19

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RRA-028LU-Min. 07-01	Elbow Seam Min. Radius B-J/B4.5	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	N/A	UT	4	19
RRA-028LU-Max. 07-01	Elbow Seam Max. Radius B-J/B4.5	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	N/A	UT	4	19
RRA-035 07-01	28" x 22" Cross to 28" x 12" Reducer B-J/B4.5	2030	Joint Configuration Fitting to Fitting Weld	70% Long. 40% Circ.	UT	4	6
RRA-037LD-Max. 07-01	Elbow Seam Max. Radius B-J/B4.5	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	N/A	UT	4	19
RRA-038LU-Max. 07-01	Elbow Seam Max. Radius B-J/B4.5	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	N/A	UT	4	19
RRA-P-C001A 07-01	Pump A Internal Casing B-L-2/B5.7	N/A	Pump Manufacturer's Visual Inspection Considered Adequate	0%	VT	4	9
RRB-005LD-Min. 07-02	Elbow Seam Min. Radius B-J/B4.5	2029	Sock-O-Let Blocking Scan Path	85% Long. & Circ.	UT	4	6
RRB-005LD-Max. 07-02	Elbow Seam Max. Radius B-J/B4.5	2240	Sock-O-Let Blocking Scan Path	97% Long. & Circ.	UT	4	6
RRB-006LU-Min. 07-02	Elbow Seam Min. Radius B-J/B4.5	2033	Sock-O-Let Blocking Scan Path	85% Long. & Circ.	UT	4	6
RRB-006LU-Max. 07-02	Elbow Seam Max. Radius B-J/B4.5	2033	Sock-O-Let Blocking Scan Path	85% Long. & Circ.	UT	4	6
RRB-021 07-02	28" Pipe to 28" x 28" x 12" Tee B-J/B4.5	2194	Joint Configuration Fitting to Pipe Weld	90% Long. 100% Circ.	UT	4	6

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RRB-022 07-02	28" x 28" x 12" Tee to 28" x 22" Cross B-J/B4.5	2031	Joint Configuration Fitting to Fitting Weld	40% Long. & Circ.	UT	4	6
RRB-033 07-02	28" x 22" Cross to 28" x 22" Reducer B-J/B4.5	2079	Joint Configuration Fitting to Fitting Weld	40% Long. & Circ.	UT	4	6
RRB-P-C001B 07-02	Pump B Internal Casing B-L-2/B5.7	N/A	Pump Manufacturer's Visual Inspection Considered Adequate	0%	VT	4	9
RRA-050 07-03	Reducer to 2" Elbow B-J/B4.5	2082	Joint Configuration Fitting to Fitting Weld Proximity of Weld to Min. Elbow Radius	70% Long. & Circ.	UT	4,10	6
RRB-048 07-04	Reducer to 2" Elbow B-J/B4.5	2083	Joint Configuration Fitting to Fitting Weld Proximity of Weld to Min. Elbow Radius	85% Long. & Circ. .	UT	4,10	6
761E920-SSA2 07-101	Pump Support, Lug Weld B-K-1/B5.4	N/A	Forged Lug to Cast Base Metal	0% Long. & Circ.	UT	4	8
761E920-SSA3 07-101	Pump Support, Lug Weld B-K-1/B5.4	N/A	Forged Lug to Cast Base Metal	0% Long. & Circ.	UT	4	3
761E920-HBW 07-102	Pump Support, Lug Weld B-K-1/B5.4	N/A	Forged Lug to Cast Base Metal	0% Long. & Circ.	UT	4	8
761E920-SSB2 07-102	Pump Support, Lug Weld B-K-1/B5.4	N/A	Forged Lug to Cast Base Metal	0% Long. & Circ.	UT	4	8
761E920-SSB3 07-102	Pump Support, Lug Weld B-K-1/B5.4	N/A	Forged Lug to Cast Base Metal	0% Long. & Circ.	UT	4	8
RW-019 08-02	6" Flued Head (x-14) to Valve (HV-1F004) B-J/B4.5	2099	Joint Configuration Fitting to Fitting Weld	70% Long. & Circ.	UT	2	6
RW-087 08-03	2-1/2" Pipe to 2-1/2" Tee B-J/B4.5	2015	Penetration (x-38) Support Blocking Scan Path	100% Long. 66% Circ.	UT	4	6

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 1, REV. 0

Component Ident. No. Isometric Dwg. No.	Component Description Code Category/Item No.	IEAR No.	Obstruction/Remarks	% Complete	Method	SIC	Relief Request No.
RW-091 08-03	2" Pipe to Elbow B-J/B4.5	2046	Proximity to Min. Radius of Elbow and to Reducer on Either Side of Weld	60% Long. & Circ.	UT	4	6
RW-092 08-03	2" Elbow to Pipe B-J/B4.5	2045	Proximity to Min. Radius of Elbow and to Valve (1F029) on Either Side of Weld	50% Long. & Circ.	UT	4	6
RW-099 08-04	4" Tee to Cap B-J/B4.5	2021	Sock-O-Let Blocking Scan Path	100% Long. 70% Circ.	UT	4	6
RW-110 08-04	6" Valve (HV-1F100) to 4" x 6" Reducer B-J/B4.5	2025	Joint Configuration Fitting to Fitting Weld	100% Long. 40% Circ.	UT	4	6
RW-113 08-04	2" Weld-O-Let to 2" Pipe B-J/B4.5	2032	Joint Configuration Fitting to Pipe Weld. Overprep in Weld Toe	80% Long. 100% Circ.	UT	4	6
RW-123 08-04	4" Pipe to Flow Element (FE-1N038) B-J/B4.5	2076	Joint Configuration Fitting to Pipe Weld	90% Long. & Circ.	UT	4	6
RW-133 08-04	4" Pipe to Elbow B-J/B4.5	2047	Joint Configuration Fitting to Pipe Weld	75% Long. & Circ.	UT	4	6
RDA-019 09-01	8" Elbow to Pipe C-G/C2.1	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	NA	UT	N/A	20
RDB-011 09-02	8" Pipe to Elbow C-G/C2.1	N/A	Indication Exceeded 20% DAC, Sized at 50% DAC	N/A	UT	N/A	20

psi/isi table

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 2, REV. 0
CLASS 1 VALVES, EXAMINATION CATEGORY B-M-2, B6.7

System	Valve Number	Manufacturer	Size And Construction Type	Mfg. Method	Relief Request No.
MS	41-HV-1F028A,B,C,D	Atwood & Morrill	26" Globe Valve	Cast	10
MS	41-HV-1F022A,B,C,D	Atwood & Morrill	26" Globe Valve	Cast	10
MS	41-PSV-1F013A thru H, J thru N,S	Target Rock	8" Relief Valve	Cast	10
FW	41-HV-1F011A,B	Anchor Darling	24" Gate Valve	Cast	10
FW	41-1F010A,B	Atwood & Morrill	24" Check Valve	Cast	10
FW	41-HV-1F074A,B	Atwood & Morrill	24" Check Valve	Cast	10
RR	43-HV-1F023A,B	Lunkenheimer	24" Gate Valve	Cast	10
RR	43-HV-1F031A	Lunkenheimer	24" Gate Valve	Cast	10
RW	44-HV-1F001	Anchor Darling	6" Globe Valve	Cast	10
RW	44-HV-1F004	Anchor Darling	6" Globe Valve	Cast	10
RW	[illegible]-C-1F105	Anchor Darling	6" Gate Valve	Cast	10
RW	[illegible]	Anchor Darling	6" Gate Valve	Cast	10
RW	[illegible]	Velan	6" Gate Valve	Forged	10
RH	51-1F077	Anchor Darling	20" Gate Valve	Cast	10
RH	51-HV-1F017A,B,C,D	Anchor Darling	12" Gate Valve	Cast	10
RH	51-1F060A,B	Anchor Darling	12" Gate Valve	Cast	10
RH	51-1F065A,B,C,D	Velan	12" Gate Valve	Forged	10
RH	51-HV-1F015A,B	Anchor Darling	12" Globe Valve	Cast	10
RH	51-HV-1F023	Anchor Darling	6" Globe Valve	Cast	10
RH	51-1F019	Anchor Darling	6" Check Valve	Cast	10

LIMERICK GENERATING STATION, UNIT 1
COMPONENT SUMMARY TABLE, PART 2, REV. 0
CLASS 1 VALVES, EXAMINATION CATEGORY B-M-2, B6.7

System	Valve Number	Manufacturer	Size And Construction Type	Mfg. Method	Relief Request No.
RH	51-HV-1F050A,B	Atwood & Morrill	12" Check Valve	Cast	10
RH	51-HV-1F041A,B,C,D	Atwood & Morrill	12" Check Valve	Cast	10
RH	51-HV-1F008	Velan	20" Gate Valve	Forged	10
RH	51-HV-1F009	Velan	20" Gate Valve	Forged	10
RH	51-HV-1F022	Velan	6" Gate Valve	Forged	10
CS	52-HV-108	Anchor Darling	12" Check Valve	Cast	10
CS	52-HV-1F005	Anchor Darling	12" Gate Valve	Cast	10
CS	52-HV-1F006A,B	Atwood & Morrill	12" Check Valve	Cast	10
CS	52-1F007A,B	Velan	12" Gate Valve	Forged	10
HP	55-HV-1F002	Anchor Darling	10" Globe Valve	Cast	10
HP	55-HV-1F003	Anchor Darling	10" Globe Valve	Cast	10

psi/isi table 2

Limerick Generating Station, Unit 1
Safety Impact Summary, Rev. 0

1. RHR system weld outside containment, downstream of pump discharge check valves: During normal plant power operation, weld is slightly pressurized by keep-full systems. Significant leakage may affect pressure boundary of one RHR loop. Significant leakage is detected by leak detection systems or loss of system function. If leak is within the shutdown cooling loop the plant can be safely shut down using the main condenser and the unaffected RHR loop.

2. Reactor coolant pressure boundary weld (RCPB): Weld is normally pressurized during power operation. Inboard containment isolation valve performs RCPB isolation function. Significant RCPB leakage is detected by leak detection systems. The plant can be safely shut down using unaffected systems.

3. RHR shutdown cooling suction line weld between normally closed valves: During normal plant operation, significant leakage is detected by leak detection systems. Th plant can be safely shut down using the main condenser and the alternate shutdown cooling method.

4. RCPB weld between the nozzle and the inboard isolation valve: Weld cannot be isolated. RCPB leak detection systems detect significant leakage. Plant technical specifications require plant shutdown when significant unidentified leakage occurs. The plant can be safely shut down using the normal shutdown methods.

5. Suppression pool boundary weld: During normal plant and system operation, weld is pressurized with less than 30 feet of hydrostatic head. Weld cannot be isolated. Significant leakage is detected by leak detection systems. Several means of providing makeup water to the suppression pool are available. Pump compartments adjacent to the suppression pool are watertight. If leak affects one loop of RHR, the plant can be safely shut down using the main condenser and the unaffected RHR loop.

6. Containment atmosphere boundary weld: Weld is not pressurized during normal plant operation. Normal plant operation is not affected by leakage. Leakage will be detected during containment local or integrated leak rate tests. The plant can be safely shut down using the normal shutdown methods.

7. System boundary weld: Weld is not normally pressurized during plant power operation. During normal plant operation significant leakage is detected by leak detection systems. The plant can be safely shut down using the normal shutdown methods.

Limerick Generating Station, Unit 1
Safety Impact Summary, Rev. 0

8. HPCI, RCIC and RWCU system welds outside containment: During plant power operation, significant leakage from lines which are pressurized with steam or hot water is detected and automatically isolated by leak detection systems. None of these systems are required for normal plant shutdown. Plant can be safely shut down using normal shutdown methods.

9. Feedwater system weld inside containment: Significant leakage is detected by leak detection systems. Leak can be isolated by remote actuation of valve HV41-F011A or B. Plant can be safely shut down using normal shutdown methods.

10. Reactor Recirculation weld: Significant leakage is detected by leak detection systems. Leak can be isolated by remote actuation of valve HV43-F023 & HV43-F031. Plant can be safely shut down using normal shutdown methods.

11. RHR and Core Spray system welds between pump suction and pump discharge check valve: During plant power operation, weld is pressurized with less than 30 feet of hydrostatic head. Significant leakage is detected by leak detection systems. If the leak is within an RHR shutdown cooling loop the plant can be safely shutdown using the main condenser and the unaffected RHR loop.

12. Feedwater system weld outside containment: Weld is pressurized during plant power operation. Leak detection systems detect significant leakage. Containment isolation occurs automatically upon loss of feedwater flow. Other systems are available to provide makeup water to the RPV during plant shutdown.

13. Main steam system weld outside containment: Weld is pressurized during plant power operation. Significant leakage is detected by leak detection systems and automatically isolated. The plant can be safely shut down by depressurizing via the suppression pool and removing heat via the RHR system.

14. Core spray system weld outside containment: During plant power operation, weld is slightly pressurized by hydrostatic head or keep-full systems. Leak detection systems detect significant leakage. The plant can be safely shut down using normal shut down methods.

Limerick Generating Station, Unit 1
Safety Impact Summary, Rev. 0

15. Main steam system weld inside the turbine enclosure: Weld is pressurized during plant power operation. If leak is not large enough to be detected and automatically isolated as per Category 13, leakage would be detected by other methods (e.g. area and stack radiation monitors) and manually isolated. The plant can be safely shut down by depressurizing via the suppression pool and removing heat via the RHR system.

16. RHR system, vacuum relief line weld outside containment: Weld is not pressurized during normal plant or RHR system operation. Plant can be safely shut down using normal shutdown methods.

17. RHR system, pressure relief line weld outside containment: Weld is not pressurized during normal plant or RHR system operation. The plant can be safely shut down using the normal shutdown methods.

18. RHR system, RPV head spray weld inside containment between normally closed valves: Weld is not pressurized during plant power operation. Significant leakage is detected by leak detection systems. The plant can be safely shut down using the normal shutdown methods.

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