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APRIL 2011

INSPECTION OF

BOILER HEADERS

UNIT NO. 1

MITCHELL GENERATING STATION

AMERICAN ELECTRIC POWER

MOUNDSVILLE, WEST VIRGINIA

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EXECUTIVE SUMMARY

In April of 2011, Thielsch Engineering performed an inspection of the boiler headers in Unit No. 1 at the Mitchell Generating Station of American Electric Power (AEP) located in Moundsville, West Virginia. This represents the first inspection of these headers performed by Thielsch Engineering.

The table provided below identifies the headers included in the scope of inspection. It also identifies the various examination techniques used. Finally, it provides the results of the examinations as well as any recommendations arising from the inspection.

Component	Examination Type	Results	Recommendations	Remaining Useful Life
Platen Superheater Inlet Header	VT, MT, UTT, UTPA, Rep, HD	The magnetic particle examination revealed multiple recordable surface indications in tube subs 5J, 9G, 9P, and 26L. The ultrasonic phased-array examination of the girth welds revealed a 3" long inclusion-type indication in girth weld No. GW-2. The inclusion is indicative of an original manufacturing defect.	Monitor the surface and subsurface indications during future inspections. Girth weld No. GW-2 should be monitored during future inspections.	The header material has consumed 20% of its remaining useful life.

Component	Examination Type	Results	Recommendations	Remaining Useful Life
Platen Superheater Inlet Header (cont.)	VT, MT, UTT, UTPA, Rep, HD	No evidence of wall thinning was noted. Operating in Class 1 creep range.	Perform a re-inspection after three years of continued operation (2014).	The header material has consumed 20% of its remaining useful life.
Platen Superheater Outlet Header	VT, MT, UTT, UTPA, Rep, HD	A 5" surface indication in saddle weld No. SW-1 was noted. The 5" indication was removed by plant personnel during the current outage. No evidence of wall thinning was noted. Operating in Class 1 creep range.	Perform an inspection similar in scope after five to seven years of continued operation (2016 to 2018).	Header material has consumed less than 20% of its remaining useful life.
Finishing Superheater Inlet Header	VT, MT, UTT, UTPA, Rep, HD	No recordable surface or sub-surface indications were noted. No evidence of wall thinning was noted. Operating in Class 1 creep range.	Perform an inspection similar in scope after five to seven years of continued service (2016 to 2018).	Header material has consumed less than 20% of its remaining useful life.

Component	Examination Type	Results	Recommendations	Remaining Useful Life
Finishing Superheater Outlet Headers (Upper and Lower)	VT, Dim, MT, UTT, UTPA, Rep, HD	Multiple recordable surface indications in the header-to-tube stub welds were noted. These indications require removal and repairs by welding. Operating in Class 1 creep range.	Plant personnel performed repairs by welding on the more severe tube stub indications. Monitor the remaining surface indications during future inspections. Reinspect the repairs on the tube stubs after one year of continued operation (2012). Perform a similar inspection after three years of continued service (2014).	Header material has consumed less than 20% of its remaining useful life.
HP Reheat Outlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD	Multiple recordable surface indications were noted. Thinning was noted on a section of header at girth weld Nos. GW-2 and GW-3.	Plant personnel performed weld repairs on some of the tube stub indications. Monitor the remaining surface indications during future inspections. Closely monitor the thinning of the header at girth weld Nos. GW-2 and GW-3 during future inspections. Reinspect the repairs on the tube stubs after one year of continued service (2012).	Header material has consumed less than 20% of its remaining useful life.

Component	Examination Type	Results	Recommendations	Remaining Useful Life
HP Reheat Outlet Header (cont.)	VT, Dim, MT, UTT, UTPA, Rep, HD	Operating in Class 1 creep range.	Perform an in-spection of the thinned area after one to three years of continued service (2012 to 2014). Perform a similar inspection after five to seven years of additional service (2015 to 2017).	Header material has consumed less than 20% of its remaining useful life.
LP Reheat Outlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD	Multiple record-able surface indications were noted. Operating in Class 1 creep range.	Monitor tube stub indications during future inspections. Reinspect the re-pairs after one year of continued service (2012). Reinspect after three years of continued service (2014).	Header material has con-sumed less than 20% of its re-maining useful life.

Examination Types	
VT - Visual Examination	UTT - Ultrasonic Wall Thickness Examination
Dim - Diameter Measurements	Rep - Replication
MT - Magnetic Particle Examination	HD - Hardness Determinations
	UTPA - Ultrasonic Phased-Array Examination

INTRODUCTION

In April of 2011, Thielsch Engineering performed an inspection of the boiler headers in Unit No. 1 at the Mitchell Generating Station of AEP located in Moundsville, West Virginia. This represents the first inspection of these headers performed by Thielsch Engineering.

The results of the inspection were evaluated on an engineering basis to identify any service-related deterioration that may have occurred in these components and to confirm their suitability for continued service under the intended operating conditions.

BACKGROUND INFORMATION

The boiler in Unit No. 1 is a Foster Wheeler designed boiler. The design and erection of this boiler would have been carried out in accordance with the requirements of Section I of the ASME Boiler and Pressure Vessel Code. (This Section of the Code covers "Power Boilers".)

The boiler was originally placed into commercial service (along with the balance of Unit No. 1) in 1969. Since that time, it has been operated in a base-loaded manner. At the time of this inspection, the unit had accumulated approximately 224,256 hours of service.

APRIL 2011 INSPECTION

In April of 2011, Thielsch Engineering performed an inspection of the Platen Superheater Inlet and Outlet, Finishing Superheater Inlet and Outlet, and High Pressure (HP) and Low Pressure (LP) Reheat Outlet headers in Unit No. 1 at the Mitchell Generating Station of AEP located in Moundsville, West Virginia.

In preparation for the inspection, the exposed welds along the headers were sandblasted to bare, gray metal. Thielsch Engineering then performed a variety of nondestructive examination techniques on the headers. These included detailed visual, wet fluorescent magnetic particle, and ultrasonic phased-array examinations as well as ultrasonic wall thickness measurements. A metallurgical evaluation was performed in the form of in-situ metallographic examination (replication), diameter measurements, and hardness determinations.

Where applicable, the nondestructive examinations were performed in accordance with procedures that conformed to the requirements of Section V of the ASME Boiler and Pressure Vessel Code. (This section of the Code covers "Nondestructive Examination".) Also where applicable, the nondestructive examinations were performed by personnel qualified to the requirements of ASNT SNT TC-1A as Level II or Level III examiners.

Identification System

For identification purposes, each location along each of the headers was assigned an identification number. To locate a particular position, the following system was used in all instances:

1.) Horizontal Header Sections - The top of the header was identified at the 12:00 o'clock position. Other positions along the circumference were identified clockwise while facing north.

2.) Horizontal Inlet Pipe Sections - The top of the pipe was identified at the 12:00 o'clock position. Other positions along the circumference were identified clockwise while looking downstream.

The Finishing Superheater Outlet headers in Unit No. 1 consist of two headers, labeled "Upper" and "Lower."

The results of the inspection performed on the headers are provided in separate sections of this report. Each section includes, where applicable, detailed sketches of the headers, photographs of the headers, and the various conditions revealed by the inspection.

Platen Superheater Inlet Header

The Platen Superheater Inlet header was reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-204, Grade A. (For reference purposes, this specification is for "Pressure Vessel Steels, Alloy Steel, Molybdenum". Grade A involves a C - 1/2 Mo low-alloy steel material.

The Platen Superheater Inlet header receives superheated steam from 26 elements, each containing 18 tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-213, Grade T12 (1Cr-1/2 Mo) which covers "Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes".

The following table lists the available data concerning the header/tube dimensions, header/tube material, and design conditions for the Platen Superheater Inlet header. This table also includes the results of the minimum wall thickness calculations performed by Thielsch Engineering. (These minimum wall thickness calculations, which are provided in Appendix A, were performed in accordance with the original 1968 ASME Code.)

Component	Pipe Dimensions			ASME Specification	Design Conditions	
	OD (")	Specified MWT (")	Calculated MWT (")		Temperature (°F)	Pressure (psig)
Header	22.00	3.255"	2.928"	SA-204, Gr. A	850	4,075

Component	Pipe Dimensions			ASME Specification	Design Conditions	
	OD (")	Specified MWT (")	Calculated MWT (")		Temperature (°F)	Pressure (psig)
Tube Stubs	2.25	0.336"	N/A	SA-213, Gr. T12	850	4,075

A sketch of the Platen Superheater Inlet header is provided in Fig. 1. Photographs of inspection locations on the header are provided in Figs. 2 through 6. All nondestructive examination reports for the Platen Superheater Inlet header are provided in Appendix A.

Visual Examination

The visual examination of the Platen Superheater Inlet header did not reveal any evidence of cracking, distortion, or other deterioration. No evidence of sagging or bowing was noted along the header.

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the Platen Superheater Inlet header as well as the tube stubs in every fifth row from the north end of the header. This examination was performed to identify any surface defects such as fissuring or cracking.

During the wet fluorescent magnetic particle examination, an AC yoke is placed parallel to the weld. The yoke is then energized and a water-based solution of fluorescent magnetic particles is sprayed onto the surface of the weld. The weld is then examined with the aid of an ultraviolet (black) light. Any discontinuities in the magnetic field (such as might be produced by a crack) will be effectively outlined by the fluorescent magnetic particles. The yoke is then rotated by 90° and this procedure is repeated.

Each accessible weld along the header and tube stubs were examined in this manner. The examination revealed 1/8" linear surface indications in tube stubs Nos. 5J, 9G,

9P, and 26L. These indications are considered minor, with no immediate repair actions required. It is recommended that these indications be monitored during future inspections. No other relevant indications were revealed during the examination.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were performed on the exposed girth welds on the Platen Superheater Inlet header. Measurements were recorded on either side of each girth weld at four locations around the circumference and at selected locations along the length of the piping.

The results of the ultrasonic wall thickness measurements are summarized in the following table:

Dimensions	Calculated MWT	Field Readings	
Specified MWT		Min.	Max.
3.255"	2.928"	3.263"	3.457"

All of the wall thickness measurements on the header were above the reported specified minimum and calculated minimum wall thicknesses. This confirms that the header has not experienced significant reductions in wall thickness in the areas included in the scope of inspection.

Ultrasonic Phased-Array Examination

As part of the inspection of the Platen Superheater Inlet header, selected circumferential girth and seam welds were also inspected volumetrically using the ultrasonic phased-array technique. This technique utilizes an array probe that contains multiple elements. The characteristics of the probe are modified by introducing time shifts in the signals sent to and received from the individual elements. The ultrasonic phased-array technique permits high-speed electronic scanning without moving parts, improved inspection capabilities through software control of beam characteristics, inspection with multiple angles with a single electronically

controlled probe, many configurations, and greater flexibility for inspection of complex geometries.

The phased-array system utilized during this examination incorporated a complete range of 30° to 80° shear waves, in 1° increments, during a single scan. The ultrasonic phased-array examination of the girth welds revealed a 3" long inclusion-type indication in girth weld No. GW-2 detected from 41" to 44" location around the weld. The indication did not exhibit any throughwall dimensions. The inclusion is indicative of a slag inclusion from the original manufacturing. Girth weld No. GW-2 should be monitored during future inspections.

The ultrasonic phased-array examination of the seam welds did not reveal any subsurface indications.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the Platen Superheater Inlet header was performed utilizing in-situ metallographic examination (replication). This evaluation was performed to identify any microstructural changes that may have occurred in this header as a result of the prior years of high-temperature service.

Eight replica foils were removed from the Platen Superheater Inlet header. These replica foils were sputtered with gold to provide contrast and then examined comprehensively by optical microscopy at magnifications of 100X to 500X. Photomicrographs were taken to document the typical conditions observed in these replica foils.

During the examination process, care was taken to identify and disregard irrelevant indications produced by the replication foil material, the replication technique, the environment in which the replication was performed, etc. For example, a replication foil may contain "bubbles" which are the result of moisture on the metal surface or air trapped beneath the replica foil as it solidifies. Dust on the metal surface may provide

irrelevant indications. Other indications may result from the dislodgement of inclusions during the polishing process, or etch pitting. Actual inclusions such as oxides, sulfides, carbides, etc., may appear as dark spots in the replica foils.

Photomicrographs were taken to document the typical conditions observed in the replica foils. The microstructures observed were compared with standards developed over the last 40 years. This comparison would allow the condition of the Platen Superheater Inlet header to be assessed.

The microstructures were also compared with the creep classification developed by EPRI. (For reference purposes, this classification contains five different stages of creep ranging from Class 1 to Class 5. Class 1 involves no damage. Class 5 involves the formation of macrocracking.)

The following table identifies the locations from which the replica foils were removed. This table also identifies the microstructural condition of the replica foils with respect to the EPRI creep classification. Finally, this table identifies the figures in which photomicrographs of the replica foils are provided.

Replica	Location	Creep Classification	Fig.
PSIH-R1	Girth weld No. GW-1 and seam weld No. LS-1A at the 11:00 o'clock position.	1	7
PSIH-R2	Girth weld No. GW-1 and seam weld No. LS-2A at the 11:00 o'clock position.	1	8
PSIH-R3	Girth weld No. GW-2 and seam weld No. LS-2A at the 11:00 o'clock position.	1	9
PSIH-R4	Girth weld No. GW-2 and seam weld No. LS-3A at the 11:00 o'clock position.	1	10
PSIH-R5	Girth weld No. GW-3 and seam weld No. LS-3A at the 11:00 o'clock position.	1	11
PSIH-R6	Girth weld No. GW-3 and seam weld No. LS-4A at the 11:00 o'clock position.	1	12
PSIH-R7	Girth weld No. GW-4 and seam weld No. LS-4A at the 11:00 o'clock position.	1	13
PSIH-R8	Girth weld No. GW-4 and seam weld No. LS-5A at the 11:00 o'clock position.	1	14

The replica foils removed from the tubes on the Platen Superheater Inlet header also exhibited similar microstructures. The microstructure exhibited by the welds consisted of tempered bainite with limited amount of ferrite. The microstructure exhibited by heat affected zone consisted of ferrite and spheroidized pearlite. The microstructure exhibited by the heat-affected zones consisted of spheroidized pearlite and ferrite. The microstructure exhibited by the base material also consisted of ferrite and pearlite matrix, but with a slightly different grain size. The microstructures observed in these replica foils are typical for C - 1/2 Mo alloy plate produced in accordance with ASME SA-204 Grade A and filler material of the equivalent chemical composition that has been subjected to high-temperature service for approximately 225,000 hours.

The base material did exhibit some microstructural transformations as a result of approximately 225,000 hours of high-temperature service. This included partial decomposition and spheroidization of pearlite. These microstructural transformations are not unexpected for carbon and low-alloy steel materials and subsequent to prolonged high-temperature service.

As noted previously, spheroidization of pearlite, along with carbide precipitation and agglomeration, are the early precursors to graphitization and /or creep deterioration. Despite this, none of the replica foils removed from the Platen Superheater Inlet header exhibited evidence of graphitization and/or creep deterioration. Specifically, the replica foils were free of void formation, void linkage, and microfissuring.

Hardness Determinations

As part of the inspection of the Platen Superheater Inlet header, hardness determinations were performed in the eight areas that were metallographically prepared for replication. The hardness determinations, which were performed using a portable hardness tester, included the base material and the weld deposit. Multiple readings were recorded in each area and averaged.

The results of the hardness determinations are provided in the following table. The table also includes the corresponding tensile strength for each of the average

hardness values. (For low-alloy steels, there is a distinct relationship between hardness and tensile strength. As such, the results of the hardness determinations performed on the Platen Superheater Inlet header can be used to evaluate the tensile strength of the header.)

Location	Average Hardness (BHN)		Corresponding Tensile Strength (PSI)	
	Low	High	Low	High
Base	133	155	64,000	74,000
Weld	149	207	71,000	98,000

Some of the base values fell slightly below the allowable tensile strength for C - 1/2 Mo low-alloy steel plate (which has a minimum required tensile strength of 65,000 psi).

The deviation is attributable to two factors. The first involves the fact that the outside diameter surface of the pipe and fittings would be decarburized during original manufacture. The decarburization will result in the "skin" of the pipe and fittings being softer than the remaining cross-sectional thickness. This condition is inherent to the manufacturing process and does not have a significant adverse effect on the integrity of the pipe or fittings.

The second factor involves the microstructural transformations that have occurred during the prior years of high-temperature service. These microstructural transformations, which include carbide precipitation and agglomeration, are expected to result in some softening of the pipe and fittings.

All of the values recorded on the weld deposits were greater than 65,000 psi, the minimum required tensile strength for the base material.

There was nothing about the results of the hardness determinations that would call into doubt the integrity of the header.

Although the hardness (and correlating tensile strength) of this header had probably decreased slightly during the prior years of high-temperature service, there was nothing about the results of the hardness determinations that would call into doubt the integrity of the Platen Superheater Inlet header.

Platen Superheater Outlet Header

The Platen Superheater Outlet header was reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-335, Grade P11. (For reference purposes, this specification covers "Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service". Grade P11 involves a 1-1/4 Cr - 1/2 Mo low-alloy steel material.) Grade T12 involves a 1 Cr - 1/2 Mo Low alloy steel material.

The Platen Superheater Outlet header receives superheated steam from 26 elements, each containing 18 tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-213, Grade T12.

The following table lists the available data concerning the pipe/tube dimensions, pipe/tube material, and design conditions for the Platen Superheater Outlet header. This table also includes the results of the minimum wall thickness calculations performed by Thielsch Engineering. (These minimum wall thickness calculations, which are provided in Appendix B, were performed in accordance with the original 1968 ASME Code.)

Component	Pipe Dimensions			ASME Specification	Design Conditions	
	OD (")	Specified MWT (")	Calculated MWT (")		Temperature (°F)	Pressure (psig)
Header	20.50	3.375"	3.204"	SA-335, Gr. P11	944	4,020
Tube Stubs	2.50	0.396"	N/A	SA-213, Gr. T12	944	4,075

A sketch of the Platen Superheater Outlet header is provided in Fig. 15. Photographs of inspection locations on the header are provided in Figs. 16 through 21. All nondestructive examination reports for the Platen Superheater Outlet header are provided in Appendix B.

Visual Examination

The visual examination of the Platen Superheater Outlet header did not reveal any indications of cracking, distortion, or other deterioration. No evidence of sagging or bowing was noted along the header.

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the Platen Superheater Outlet header as well as the tube stubs in every fifth row from the north end of the header. The magnetic particle examination revealed a 5" long, 1/8" deep surface indication in saddle weld No. SW-1. Photographs of the indication are provided in Fig. 22. The indication was removed by light surface grinding by plant personnel. No further action is required. No other indications were revealed during the examination.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were recorded at the girth welds included in the scope of inspection. The ultrasonic wall thickness values were recorded on either side of each weld at four locations around the pipe circumference.

The results of the ultrasonic wall thickness measurements are summarized in the following table:

Component	Dimensions	Calculated MWT	Field Readings	
	Specified MWT		Min.	Max.
Link Piping	N/A	N/A	2.105"	3.040"
Header	3.375"	3.204"	3.488"	3.697"

All of the wall thickness measurements on the header were above the reported specified minimum and calculated minimum wall thickness. This confirms that the header has not experienced significant reductions in wall thickness in the areas included in the scope of inspection.

Ultrasonic Phased-Array Examination

An ultrasonic phased-array examination was performed at each accessible girth weld on the Platen Superheater Outlet header. The ultrasonic phased-array examination did not reveal any subsurface indications.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the Platen Superheater Outlet header was performed utilizing in-situ metallographic examination (replication). This evaluation was performed to identify any microstructural changes that may have occurred in this header as a result of the prior years of high-temperature service. Eight replica foils were removed from the Platen Superheater Outlet header. The following table identifies the locations from which the replica foils were removed. This table also identifies the microstructural condition of each replica foil with respect to the EPRI creep classification. Finally, this table identifies the figure in which photomicrographs of a particular replica foil are provided.

Replica	Location	Creep Classification	Fig.
PSOH-R1	Girth weld No. GW-1 at the 11:00 o'clock position.	1	23
PSOH-R2	Girth weld No. GW-2 at the 11:00 o'clock position.	1	24
PSOH-R3	Girth weld No. GW-3 at the 11:00 o'clock position	1	25
PSOH-R4	Girth weld No. GW-5 at the 11:00 o'clock position.	1	26
PSOH-R5	Girth weld No. GW-6 at the 11:00 o'clock position.	1	27
PSOH-R6-1	Girth weld No. GW-8 on the west side of the header.	1	28A
PSOH-R6-2	Girth weld No. GW-8 on the west side of the header.	1	28B
PSOH-R7	Girth weld No. GW-11 on the west side of the header.	1	29
PSOH-R8	Saddle weld No. SW-1 on the west side of the header.	1	30

The replica foils removed from the tubes on the Platen Superheater Outlet header also exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of bainite with limited amount of ferrite. The microstructure exhibited by the heat-affected zones consisted of tempered bainite, carbides and ferrite. The microstructure exhibited by the base material also consisted of ferrite and partially decomposed bainite, but with a slightly different grain size. The microstructures observed in these replica foils are typical for 1-1/4 Cr - 1/2 Mo low-alloy, pipe produced in accordance with ASME SA-335 Grade P11 and filler material of the equivalent chemical composition that has been subjected to high-temperature service for approximately 225,000 hours.

The base material did exhibit some microstructural transformations as a result of approximately 225,000 hours of high-temperature service. This included partial decomposition of bainite and carbide precipitation and agglomeration at the grain boundaries. These microstructural transformations are not unexpected for pipe materials and subsequent to prolonged high-temperature service.

As noted previously, bainite decomposition, along with carbide precipitation and agglomeration, are the early precursors to creep deterioration. Despite this, none of the replica foils removed from the Platen Superheater Outlet header exhibited evidence of creep deterioration. Specifically, the replica foils were free of void formation, void linkage and microfissuring.

Hardness Determinations

As part of the inspection of the Platen Superheater Outlet header, hardness determinations were performed in the eight areas that were metallographically prepared for replication. The results of the hardness determinations are provided in the following table. The table also includes the corresponding tensile strength for each of the average hardness values. (For low-alloy steels, there is a distinct relationship between hardness and tensile strength. As such, the results of the hardness determinations performed on the Platen Superheater Outlet header can be used to evaluate the tensile strength of the header.)

Location	Average Hardness (BHN)		Corresponding Tensile Strength (PSI)	
	Low	High	Low	High
Base	123	177	60,000	84,000
Weld	144	163	69,000	78,000

All of these values are above the allowable tensile strength for SA-335 P11 Mo low-alloy steel pipe (which has a minimum required tensile strength of 60,000 psi).

Finishing Superheater Inlet Header

The Finishing Superheater Inlet header was reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-335, Grade P11.

The Finishing Superheater Inlet header receives superheated steam from 56 elements, each containing 10 tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-213, Grade T2.

The following table lists the available data concerning the pipe/tube dimensions, pipe/tube material, and design conditions for the Finishing Superheater Inlet header. This table also includes the results of the minimum wall thickness calculations performed by Thielsch Engineering. (These minimum wall thickness calculations, which are provided in Appendix C, were performed in accordance with the original 1968 ASME Code.)

Component	Pipe Dimensions			ASME Specification	Design Conditions	
	OD (")	Specified MWT (")	Calculated MWT (")		Temperature (°F)	Pressure (psig)
Header	19.25	2.845"	2.619"	SA-335, Gr. P11	900	4,000
Tube Stubs	2.00	0.475"	N/A	SA-213, Gr. T2		

A sketch of the Finishing Superheater Inlet header is provided in Fig. 31. Photographs of inspection locations on the header are provided in Figs. 32 through 39. All nondestructive examination reports for the Finishing Superheater Inlet header are provided in Appendix C.

Visual Examination

The visual examination of the Finishing Superheater Inlet header did not reveal any indications of cracking, distortion, or other deterioration. No evidence of sagging or bowing was noted along the header.

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at the 14 girth welds and three penetration welds on the Finishing Superheater Inlet header. The magnetic particle examination did not reveal any recordable surface indications.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were recorded at the girth welds included in the scope of inspection. The ultrasonic wall thickness values were recorded on either side of each weld at four locations around the pipe circumference.

The results of the ultrasonic wall thickness measurements are summarized in the following table:

Dimensions	Calculated MWT	Field Readings	
Specified MWT		Min.	Max.
2.845"	2.619"	2.675"	3.066"

All of the wall thickness measurements on the header were above the calculated minimum wall thickness. This confirms that the header has not experienced significant reductions in wall thickness in the areas included in the scope of inspection.

Ultrasonic Phased-Array Examination

An ultrasonic phased-array examination was performed at each accessible girth weld on the Finishing Superheater Inlet header. The ultrasonic phased-array examination did not reveal any subsurface indications.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the Finishing Superheater Inlet header was performed utilizing in-situ metallographic examination (replication). This evaluation was performed to identify any microstructural changes that may have occurred in this

header as a result of the prior years of high-temperature service. Eight replica foils were removed from the Finishing Superheater Inlet header.

The following table identifies the locations from which the replica foils were removed. This table also identifies the microstructural condition of each replica foil with respect to the EPRI creep classification. Finally, this table identifies the figure in which photomicrographs of a particular replica foil are provided.

Replica	Location	Creep Classification	Fig.
FSIH-R1	Girth weld No. GW-1 at the 10:00 o'clock position	1	40
FSIH-R2	Girth weld No. GW-2 at the 10:00 o'clock position	1	41
FSIH-R3	Girth weld No. GW-3 at the 10:00 o'clock position	1	42
FSIH-R4	Girth weld No. GW-4 at the 10:00 o'clock position	1	43
FSIH-R5	Girth weld No. GW-5 at the 10:00 o'clock position	1	44
FSIH-R6	Girth weld No. GW-6 at the 10:00 o'clock position	1	45
FSIH-R7	Girth weld No. GW-7 at the 10:00 o'clock position	1	46
FSIH-R8	Girth weld No. GW-11 on the west side of the header	1	47

The replica foils removed from the tubes on the Finishing Superheater Inlet header also exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of bainite with limited amount of ferrite. The microstructure exhibited by the heat-affected zones consisted of tempered bainite, carbides and ferrite. The microstructure exhibited by the base material also consisted of ferrite and partially decomposed bainite, but with a slightly different grain size. The microstructures observed in these replica foils are typical for 1-1/4 Cr - 1/2 Mo low-alloy, pipe produced in accordance with ASME SA-335 Grade P11 and filler material of the equivalent chemical composition that has been subjected to high temperature service for approximately 225,000 hours.

The base material did exhibit some microstructural transformations as a result of approximately 225,000 hours of high-temperature service. This included partial decomposition of bainite and carbide precipitation and agglomeration at the grain boundaries. These microstructural transformations are not unexpected for carbon and low-alloy steel materials and subsequent to prolonged high-temperature service.

As noted previously, bainite decomposition, along with carbide precipitation and agglomeration, are the early precursors to creep deterioration. Despite this, none of the replica foils removed from the Finishing Superheater Inlet header exhibited evidence of creep deterioration. Specifically, the replica foils were free of void formation, void linkage, and microfissuring.

Hardness Determinations

As part of the inspection of the Finishing Superheater Inlet header, hardness determinations were performed in the eight areas that were metallographically prepared for replication. The results of the hardness determinations are provided in the following table. The table also includes the corresponding tensile strength for each of the average hardness values. (For low-alloy steels, there is a distinct relationship between hardness and tensile strength. As such, the results of the hardness determinations performed on the Finishing Superheater Inlet header can be used to evaluate the tensile strength of the header.)

Location	Average Hardness (BHN)		Corresponding Tensile Strength (PSI)	
	Low	High	Low	High
Base	133	185	64,000	88,000
Weld	148	185	70,000	88,000

All of these values are above the allowable tensile strength for 1-1/4 Cr - 1/2 Mo low-alloy steel pipe (which has a minimum required tensile strength of 60,000 psi).

Upper and Lower Finishing Superheater Outlet Headers

The Upper and Lower Finishing Superheater Outlet headers were reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-335, Grade P22. (For reference purposes, Grade P22 involves a 2-1/4 Cr - 1 Mo low-alloy steel material.)

The Upper and Lower Finishing Superheater Outlet headers receive superheated steam from 56 elements, each containing five tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-213, Grade T22.

The following table lists the available data concerning the pipe/tube dimensions, pipe/tube material, and design conditions for the Finishing Superheater Outlet headers. This table also includes the results of the minimum wall thickness calculations performed by Thielsch Engineering. (These minimum wall thickness calculations, which are provided in Appendix D, were performed in accordance with the original 1968 ASME Code.)

Component	Pipe Dimensions			ASME Specification	Design Conditions	
	OD (")	Specified MWT (")	Calculated MWT (")		Temperature (°F)	Pressure (psig)
Headers	28.00	6.00"	5.692"	SA-335, Gr. P22	1025	3,865
Tube Stubs	2.00	0.475"	N/A	SA-213, Gr. T22	1030	4,000

Sketches of the Upper and Lower Finishing Superheater Outlet headers are provided in Figs. 48 and 49. Photographs of the inspection locations on the headers are provided in Figs. 50 through 56. All nondestructive examination reports for the Finishing Superheater Outlet headers are provided in Appendix D.

Visual Examination

The visual examination of the Upper and Lower Finishing Superheater Outlet headers did not reveal any indications of distortion or other deterioration. No evidence of sagging or bowing was noted along the headers. The visual examination of the upper and lower Finishing Superheater Outlet tube stubs revealed multiple 1/16" to 1/4" recordable surface indications.

The following tube stubs require repair by welding:

- Upper header: 31D, 40A, 42D, 51B, 52B, 53B, 54B and C, and 55C.
- Lower header: 1E, 17E, 18A and E, 22A, 25A, 27A, 34D, 47E, 48E, and 55D, 56A, B, C, D, and E.

The remaining indications should be monitored during future inspections. The repairs were to be performed by plant personnel during the current outage.

Diameter Measurements

As part of the inspection of the Upper Finishing Superheater Outlet header, diameter measurements were recorded upstream and downstream of each girth weld. The diameter measurements would confirm whether the Upper Finishing Superheater Outlet header had been fabricated using pipe of the specified outside diameter (OD). These diameter measurements would also confirm whether the header had experienced dimensional changes, i.e., swelling, during the prior years of service.

The diameter measurements recorded on the Upper Finishing Superheater Outlet header are summarized in the following table:

Header	OD	ASME SA-335 Manufacturing Tolerances		Field Readings	
		Under	Over	Min.	Max.
Upper	28.00"	27.27"	28.280"	28.185"	28.344"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASTM Specification A-335. This specification covers "General Requirements for Specialized Carbon and Alloy Steel Pipe".

Given that all of the diameter measurements were well above those specified for 28" OD pipe, it is not likely the pipe was made to 28.250" OD material, given that there were no signs of creep damage in the metallurgical evaluation.

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the Finishing Superheater Outlet headers. The magnetic particle examination did not reveal any recordable surface indications on the upper or lower header.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were recorded at the girth welds included in the scope of inspection. The ultrasonic wall thickness values were recorded on either side of each weld at four locations around the pipe circumference.

The results of the ultrasonic wall thickness measurements are summarized in the following table:

Header	Dimensions	Calculated MWT	Field Readings	
	Specified MWT		Min.	Max.
Upper	6.00"	5.692"	5.983"	6.285"
Lower			5.995"	6.267"

All of the wall thickness measurements on the headers were above the calculated minimum wall thickness. This confirms that the headers have not experienced significant reductions in wall thickness in the areas included in the scope of inspection.

Ultrasonic Phased-Array Examination

An ultrasonic phased-array examination was performed at each accessible girth weld on the Upper and Lower Finishing Superheater Outlet headers. The ultrasonic phased-array examination did not reveal any subsurface indications.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the Upper and Lower Finishing Superheater Outlet headers was performed utilizing in-situ metallographic examination (replication). This evaluation was performed to identify any microstructural changes that may have occurred in these headers as a result of the prior years of high-temperature service.

Fifteen replica foils were removed from the Finishing Superheater Outlet headers. (seven from the Upper header and eight from the Lower header.) These replica foils were sputtered with gold to provide contrast. They were then examined comprehensively by optical microscopy at magnifications of 100X to 500X. The examination included the base material, the weld deposit, and the associated heat-affected zones.

The following table identifies the locations from which the replica foils were removed. This table also identifies the microstructural condition of each replica foil with respect to the EPRI creep classification. Finally, this table identifies the figure in which photomicrographs of a particular replica foil are provided.

Replica	Location	Creep Classification	Fig.
FSOH-UPR-R1	Girth weld No. GW-1 at the 10:00 o'clock position	1	57
FSOH-UPR-R2	Girth weld No. GW-2 at the 10:00 o'clock position	1	58
FSOH-UPR-R3	Girth weld No. GW-3 at the 10:00 o'clock position	1	59
FSOH-UPR-R4	Girth weld No. GW-4 at the 10:00 o'clock position	1	60
FSOH-UPR-R5	Girth weld No. GW-5 at the 10:00 o'clock position	1	61

Replica	Location	Creep Classification	Fig.
FSOH-UPR-R6	Girth weld No. GW-6 at the 10:00 o'clock position	1	62
FSOH-UPR-R7	Girth weld No. GW-7 at the 10:00 o'clock position	1	63
FSOH-LWR-R1	Girth weld No. GW-1 at the 11:00 o'clock position	1	64
FSOH-LWR-R2	Girth weld No. GW-2 at the 11:00 o'clock position	1	65
FSOH-LWR-R3	Girth weld No. GW-3 at the 11:00 o'clock position	1	66
FSOH-LWR-R4	Girth weld No. GW-4 at the 11:00 o'clock position	1	67
FSOH-LWR-R5	Girth weld No. GW-5 at the 11:00 o'clock position	1	68
FSOH-LWR-R6	Girth weld No. GW-6 at the 11:00 o'clock position	1	69
FSOH-LWR-R7	Girth weld No. GW-7 at the 11:00 o'clock position	1	70
FSOH-LWR-R8	Girth weld No. GW-8 at the 11:00 o'clock position	1	71

The replica foils removed from the tubes on the Upper and Lower Finishing Superheater Outlet headers exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of bainite with limited amount of ferrite. The microstructure exhibited by the heat-affected zones consisted of tempered bainite, carbides and ferrite. The microstructure exhibited by the base material also consisted of ferrite and partially decomposed bainite, but with a slightly different grain size. The microstructures observed in these replica foils are typical for 2-1/4Cr - 1Mo low-alloy, pipe produced in accordance with ASME SA-335 Grade P22 and filler material of the equivalent chemical composition that has been subjected to high temperature service for approximately 225,000 hours.

The base material did exhibit some microstructural transformations as a result of approximately 225,000 hours of high-temperature service. This included partial decomposition of bainite and carbide precipitation and agglomeration at the grain boundaries. These microstructural transformations are not unexpected for low-alloy steel materials and subsequent to prolonged high-temperature service.

As noted previously, bainite decomposition, along with carbide precipitation and agglomeration, are the early precursors to creep deterioration. Despite this, none of the replica foils removed from the Upper and Lower Finishing Superheater Outlet headers exhibited evidence of creep deterioration. Specifically, the replica foils were free of void formation, void linkage and microfissuring.

Hardness Determinations

As part of the inspection of the Upper and Lower Finishing Superheater Outlet headers, hardness determinations were performed in the fifteen areas that were metallographically prepared for replication. The results of the hardness determinations are provided in the following table. The table also includes the corresponding tensile strength for each of the average hardness values. (For low-alloy steels, there is a distinct relationship between hardness and tensile strength. As such, the results of the hardness determinations performed on the Upper and Lower Finishing Superheater Outlet headers can be used to evaluate the tensile strength of the header.)

Location	Average Hardness (BHN)		Corresponding Tensile Strength (PSI)	
	Low	High	Low	High
Upper Base	145	164	69,000	78,000
Upper Weld	146	180	70,000	86,000
Lower Base	144	172	69,000	82,000
Lower Weld	146	178	70,000	85,000

All of these values are above the allowable tensile strength for 2-1/4 Cr - 1 Mo low-alloy steel pipe (which has a minimum required tensile strength of 60,000 psi).

High-Pressure Reheat Outlet Header

The HP Reheat Outlet header was reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-387, Grade D. (For reference purposes, this specification covers "Pressure Vessel, Plates, Alloy Steel, Chromium-Molybdenum". Grade D involves a 2-1/4 Cr - 1 Mo low-alloy steel material.)

The HP Reheat Outlet header receives superheated steam from 112 elements, each containing 10 tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-213, Grade T22.

The following table lists the available data concerning the pipe/tube dimensions, pipe/tube material, and design conditions for the HP Reheat Outlet header. This table also includes the results of the minimum wall thickness calculations performed by Thielsch Engineering. (These minimum wall thickness calculations, which are provided in Appendix E, were performed in accordance with the original 1968 ASME Code.)

Component	Pipe Dimensions			ASME Specification	Design Conditions	
	OD (")	Specified MWT (")	Calculated MWT (")		Temperature (°F)	Pressure (psig)
Header	35.25 (ID)	4.598"	4.502"	SA-387, Gr. D	1040	1,200
Tube Stubs	2.25	0.261"	N/A	SA-213, Gr. T22	1080	

A sketch of the High-Pressure Reheat Outlet header is provided in Fig. 72. Photographs of inspection locations on the header are provided in Figs. 73 through 75. All nondestructive examination reports for the HP Reheat Outlet header are provided in Appendix E.

Visual Examination

The visual examination of the HP Reheat Outlet header did not reveal any indications of cracking, distortion, or other deterioration. No evidence of sagging or bowing was noted along the header.

Diameter Measurements

Diameter measurements were recorded at selected locations along the length of the HP Reheat Outlet header. The results of the diameter measurements are summarized in the following table:

OD	ASME SA-530 Manufacturing Tolerances		Field Readings	
	Under	Over	Min.	Max.
44.45"	44.00"	44.894"	44.904"	

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASTM Specification A-530. This specification covers "General Requirements for Specialized Carbon and Alloy Steel Pipe". For piping over 12" OD the tolerances are +/-% of the specified outside diameter.

The diameter measurements performed on the HP Reheat Outlet header fell beyond the permissible manufacturing tolerances. The discrepancy is believed to be the result in inherent limitations in the measurement technique. There was no evidence of general swelling such as would be produced by creep deterioration. (This conclusion is further corroborated by the results of the metallurgical evaluation, which did not reveal any evidence of creep deterioration in the header.)

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the HP Reheat Outlet header as well as the tube stubs in every fifth row from the north end of the header. The magnetic particle examination on the header revealed a 1/4" longitudinal surface indication on girth weld No. GW-3 and a 3"

indication in the toe of the weld on attachment weld No. AW-3. The indications require removal and, if necessary, repair. All repairs were to be performed by plant personnel during the current outage.

Multiple 1/8" to 1" surface indications were revealed in the tube stubs. The indications on tube stubs 80J, 88J (1/2" x 2), and 96J were removed by light surface grinding by plant personnel. The remaining indications should be monitored during future inspections. No other recordable surface indications were revealed during the examination.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were recorded at the girth welds included in the scope of inspection. The ultrasonic wall thickness values were recorded either side of each weld at four locations around the pipe circumference.

The results of the ultrasonic wall thickness measurements are summarized in the following table:

Dimensions	Calculated MWT	Field Readings	
Specified MWT		Min.	Max.
4.598"	4.502"	4.345"	4.865"

Some of the wall thickness measurements were slightly below the calculated minimum wall thickness for the header. The thinned section of the header should be closely monitored during future inspections.

Ultrasonic Phased-Array Examination

An ultrasonic phased-array examination was performed at each accessible girth and seam welds on the HP Reheat Outlet header. The ultrasonic phased-array examination did not reveal any subsurface indications.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the HP Reheat Outlet header was performed utilizing in-situ metallographic examination (replication). This evaluation was performed to identify any microstructural changes that may have occurred in this header as a result of the prior years of high-temperature service.

Eight replica foils were removed from the HP Reheat Outlet header. These replica foils were sputtered with gold to provide contrast. They were then examined comprehensively by optical microscopy at magnifications of 100X to 500X. The examination included the base material, the weld deposit, and the associated heat-affected zones.

The following table identifies the locations from which the replica foils were removed. This table also identifies the microstructural condition of each replica foil with respect to the EPRI creep classification. Finally, this table identifies the figure in which photomicrographs of a particular replica foil are provided.

Replica	Location	Creep Classification	Fig.
HPROH-R1	Girth weld No. GW-2 and seam weld No. LS-1E at the 3:00 o'clock position, north east.	1	76
HPROH-R2	Girth weld No. GW-2 and seam weld No. LS-2E at the 3:00 o'clock position, south east.	1	77
HPROH-R3	Girth weld No. GW-3 and seam weld No. LS-2E at the 3:00 o'clock position, north east.	1	78
HPROH-R4	Girth weld No. GW-3 and seam weld No. LS-3E at the 3:00 o'clock position, north east.	1	79
HPROH-R5	Girth weld No. GW-2 and seam weld No. LS-1W at the 9:00 o'clock position, north west.	1	80
HPROH-R6	Girth weld No. GW-2 and seam weld No. LS-2W at the 9:00 o'clock position, south west.	1	81
HPROH-R7	Girth weld No. GW-3 and seam weld No. LS-2W at the 9:00 o'clock position, north west.	1	82
HPROH-R8	Girth weld No. GW-3 and seam weld No. LS-3W at the 9:00 o'clock position, south west.	1	83

All of the replica foils removed from the HP Reheat Outlet header exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of acicular bainite and ferrite with limited carbides. The microstructure exhibited by the heat-affected zones consisted of tempered bainite and ferrite. The microstructure exhibited by the base material also consisted of ferrite and tempered bainite, but with a slightly different grain size. The microstructures observed in these replica foils are typical for 2-1/4 Cr - 1 Mo low-alloy steel plate material, manufactured in accordance with the requirements of ASME Specification SA-387, Grade D covering "Chromium-Molybdenum Alloy Steel Plates for Pressure Vessels" and filler material of the equivalent chemical composition. There was no evidence of microstructural anomalies relating to the original manufacture of the pipe or the subsequent fabrication of the Superheater Outlet header.

The base material did exhibit some microstructural transformations as a result of the previous years of high-temperature service. This included partial decomposition of the bainite. It also included carbide precipitation and agglomeration at the grain boundaries. These microstructural transformations are not unexpected for low-alloy steel subsequent to prolonged high-temperature service.

As noted previously, bainite decomposition, along with carbide precipitation and agglomeration, are the early precursors to creep deterioration. Despite this, none of the replica foils removed from the HP Reheat Outlet header exhibited evidence of creep deterioration. Specifically, these replica foils were free of void formation, void linkage and microfissuring.

Hardness Determinations

As part of the inspection of the HP Reheat Outlet header, hardness determinations were performed in the eight areas that were metallographically prepared for replication. The results of the hardness determinations are provided in the following table. The table also includes the corresponding tensile strength for each of the average hardness values. (For low-alloy steels, there is a distinct relationship between hardness and tensile strength. As such, the results of the hardness

determinations performed on the HP Reheat Outlet header can be used to evaluate the tensile strength of the header.)

Location	Average Hardness (BHN)		Corresponding Tensile Strength (PSI)	
	Low	High	Low	High
Base	131	161	64,000	77,000
Weld	147	193	70,000	91,000

All of these values are above the allowable tensile strength for 2-1/4 Cr - 1 Mo low-alloy steel pipe (which has a minimum required tensile strength of 60,000 psi).

Low-Pressure Reheat Outlet Header

The LP Reheat Outlet header was reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-387, Grade 91 Class 2. (For reference purposes, Grade 91 involves a 9 Cr - 1 Mo-V alloy steel material.)

The LP Reheat Outlet header receives superheated steam from 112 elements, each containing 10 tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-213, Grade T91.

The following table lists the available data concerning the pipe/tube dimensions, pipe/tube material, and design conditions for the LP Reheat Outlet header. This table also includes the results of the minimum wall thickness calculations performed by Thielsch Engineering. (These minimum wall thickness calculations, which are provided in Appendix F, were performed in accordance with the 2010 ASME Code.)

Component	Pipe Dimensions			ASME Specification	Design Conditions	
	OD (")	Specified MWT (")	Calculated MWT (")		Temperature (°F)	Pressure (psig)
Header	50.625	1.875"	1.103"	SA-387, Gr. 91 Class 2	1065	475
Tube Stubs	2.25	0.180"	N/A	SA-213, Gr. T91		

A sketch of the LP Reheat Outlet header is provided in Fig. 84. Photographs of the inspection locations are provided in Figs. 85 through 89. All nondestructive examination reports for the LP Reheat Outlet header are provided in Appendix F.

Visual Examination

The visual examination of the LP Reheat Outlet header did not reveal any indications of cracking, distortion, or other deterioration. No evidence of sagging or bowing was noted along the header.

Diameter Measurements

Diameter measurements were recorded at selected locations along the length of the LP Reheat Outlet header. The results of the diameter measurements are summarized in the following table:

OD	ASME SA-530 Manufacturing Tolerances		Field Readings	
	Under	Over	Min.	Max.
50.625"	50.594"	50.812"	50.637"	51.035"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASTM Specification A-530. This specification covers "General Requirements for Specialized Carbon and Alloy Steel Pipe". For pipe over 12" OD the tolerance are +/-% of the specified outside diameter.

For the most part, the diameter measurements performed on the LP Reheat Outlet header fell within the permissible manufacturing tolerances. However, in some cases, the recorded diameters fell beyond these tolerances. Some of these discrepancies are explained by the fact that the diameter measurements were recorded on fittings rather than pipe. (Fittings do not have to conform to the same dimensional tolerances as pipe.) The remaining discrepancies are believed to be the result in inherent limitations in the measurement technique. There was no evidence of general swelling such as would be produced by creep deterioration. (This conclusion is further corroborated by the results of the metallurgical evaluation, which did not reveal any evidence of creep deterioration in the header.)

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the LP Reheat Outlet header as well as the tube stubs in every fourth row from the north end of the header. The magnetic particle examination on the header revealed a 1/8" surface indication on girth weld No. GW-3. The indication was removed by light surface grinding by plant personnel. No further action is required. A 1" and a 1/2" surface indication was revealed in seam weld No. LS-07, a 10" linear and a 3/4" transverse indication was revealed on attachment weld No. AW-1, and two 10" indications were revealed on attachment weld No. AW-3. The indications require removal and, if necessary, repair by welding. The repairs were to be performed by plant personnel during the current outage.

Multiple 1/8" to 1" surface indications were revealed in the tube stubs. Selected indications were removed by grinding by plant personnel during the current outage. These indications are indicative of manufacturing defects and should be monitored during future inspections. No other recordable surface indications were revealed during the examination. Photographs of the indications are provided in Figs. 90 through 92.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were recorded at the girth welds included in the scope of inspection. The ultrasonic wall thickness values were recorded upstream and downstream of each weld at four locations around the pipe circumference.

The results of the ultrasonic wall thickness measurements summarized in the following table:

Dimensions	Calculated MWT	Field Readings	
Specified MWT		Min.	Max.
1.875"	1.172"	1.869"	1.964"

All of the wall thickness measurements on the header were above the calculated minimum wall thickness. This confirms that the header has not experienced significant reductions in wall thickness in the areas included in the scope of inspection.

Ultrasonic Phased-Array Examination

An ultrasonic phased-array examination was performed at each accessible girth and seam weld on the LP Reheat Outlet header.

The ultrasonic phased-array examination of the girth welds did not reveal any subsurface indications.

The ultrasonic phased-array examination of the seam welds did not reveal any relevant subsurface indications. The results of the ultrasonic phased-array examination are provided in Appendix F.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the LP Reheat Outlet header was performed utilizing in-situ metallographic examination (replication). This evaluation was performed to identify any microstructural changes that may have occurred in this header as a result of the prior years of high-temperature service.

Eight replica foils were removed from the LP Reheat Outlet header. These replica foils were sputtered with gold to provide contrast. They were then examined comprehensively by optical microscopy at magnifications of 100X to 500X. The examination included the base material, the weld deposit, and the associated heat-affected zones.

The following table identifies the locations from which the replica foils were removed. This table also identifies the microstructural condition of each replica foil with respect to the EPRI creep classification. Finally, this table identifies the figure in which photomicrographs of a particular replica foil are provided.

Replica	Location	Creep Classification	Fig.
LPROH-R1	Girth weld No. GW-1 and seam weld No. LS-1 at the 4:00 o'clock position.	1	93
LPROH-R2	Girth weld No. GW-2 and seam weld No. LS-2 at the 7:00 o'clock position.	1	94
LPROH-R3	Girth weld No. GW-4 and seam weld No. LS-3 at the 4:00 o'clock position.	1	95
LPROH-R4	Girth weld No. GW-4 and seam weld No. LS-4 at the 7:00 o'clock position.	1	96
LPROH-R5	Girth weld No. GW-5 and seam weld No. LS-5 at the 4:00 o'clock position.	1	97
LPROH-R6	Girth weld No. GW-6 and seam weld No. LS-6 at the 7:00 o'clock position.	1	98
LPROH-R7	Girth weld No. GW-7 and seam weld No. LS-7 at the 4:00 o'clock position.	1	99
LPROH-R8	Girth weld No. GW-8 and seam weld No. LS-8 at the 7:00 o'clock position.	1	100

All of the replica foils removed from the Low-Pressure Reheat Outlet header exhibited similar microstructures. Specifically, the microstructure exhibited by the welds and the heat affected zones consisted of martensite and free ferrite. The microstructure exhibited by the base material consisted of ferrite and tempered martensite. The microstructures observed in these replica foils are typical for 9 Cr - 1 Mo low-alloy steel pipe, manufactured in accordance with the requirements of ASME Specification SA-335, Grade P9 covering “Seamless Ferritic Alloy-Steel Pipe for High Temperature Service” and filler material of the equivalent chemical composition that has been subjected to high temperature service for approximately 225,000 hours. There was no evidence of microstructural anomalies relating to the original manufacture of the pipe or the subsequent fabrication of the Low-Pressure Reheat Outlet header.

None of the replica foils removed from the Low-Pressure Reheat Outlet header exhibited evidence of creep deterioration. Specifically, these replica foils were free of void formation, void linkage and microfissuring.

Hardness Determinations

As part of the inspection of the LP Reheat Outlet header, hardness determinations were performed in the eight areas that were metallographically prepared for replication. The results of the hardness determinations are provided in the following table. The table also includes the corresponding tensile strength for each of the average hardness values. (For low-alloy steels, there is a distinct relationship between hardness and tensile strength. As such, the results of the hardness determinations performed on the LP Reheat Outlet header can be used to evaluate the tensile strength of the header.)

Location	Average Hardness (BHN)		Corresponding Tensile Strength (PSI)	
	Low	High	Low	High
Base	160	190	77,000	90,000
Weld	153	218	73,000	102,000

Some of the average hardness values recorded in the base material fell below the allowable tensile strength for 9 Cr - 1 Mo low-alloy steel pipe (which has a minimum required tensile strength of 85,000 psi).

Some of the values recorded on the weld deposits fell below 85,000 psi, the minimum required tensile strength for the base material.

Although the hardness (and correlating tensile strength) of this header had probably decreased slightly during the prior years of high-temperature service, there was nothing about the results of the hardness determinations that would call into doubt the integrity of the LP Reheat Outlet header.

CONCLUSIONS AND RECOMMENDATIONS

In April of 2011, Thielsch Engineering performed an inspection of selected headers in Unit No. 1 at the Mitchell Generating Station of American Electric Power located in Moundville, West Virginia. Based upon the results of this inspection and subsequent engineering evaluation, the following conclusions and recommendations are offered:

Platen Superheater Inlet Header

- The magnetic particle examination revealed multiple recordable surface indications in tube subs 5J, 9G, 9P, and 26L. These indications should be monitored during future inspections.
- The ultrasonic phased-array examination of the girth welds revealed a 3" long inclusion type indication in girth weld No. GW-2. The inclusion is indicative of an original manufacturing defect. Girth weld No. GW-2 should be monitored during future inspections.
- The header material has consumed 20% of its remaining useful life.
- Operating in Class 1 creep range.

- The Platen Superheater Inlet header is considered suitable for continued service under the intended operating conditions.
- Reinspect after three years of continued service (2014).

Platen Superheater Outlet Header

- The magnetic particle examination revealed a 5" surface indication in saddle weld No. SW-1. The indication was removed by light surface grinding by plant personnel. No further action is required. No other indications were revealed during the examination.
- Operating in Class 1 creep range.
- The header material has consumed less than 20% of its remaining useful life.
- The Platen Superheater Outlet header is considered suitable for continued service under the intended operating conditions.
- Perform an inspection similar in nature after five to seven years of continued operation (2016 to 2018).

Finishing Superheater Inlet Header

- Operating in Class 1 creep range.
- The header material has consumed less than 20% of its remaining useful life.
- The Finishing Superheater Inlet header is considered suitable for continued service under the intended operating conditions.
- Perform an inspection similar in nature after five to seven years of continued operation (2016 to 2018).

Finishing Superheater Outlet Headers (Upper and Lower)

- The visual examination of the upper and lower Finishing Superheater Outlet headers revealed multiple recordable surface indications in the tube stubs. The following tube stubs require repair: Upper header: 31D, 40A, 42D, 51B, 52B, 53B, 54B and C, and 55C. Lower header: 1E, 17E, 18A and E, 22A, 25A, 27A, 34D, 47E, 48E, and 55C. The repairs were to be performed on the more severe indications by plant personnel during the current outage. The remaining indications should be monitored during future inspections.
- Operating in Class 1 creep range.
- Subsequent to the recommended repairs by welding, the Upper and Lower Finishing Superheater Outlet headers are considered suitable for continued service under the intended operating conditions.
- The header has consumed less than 20% of its remaining useful life.
- Reinspect the repairs on the tube stubs after one year of continued operation (2012).
- Reinspect after three years of continued operation (2014).

HP Reheat Outlet Header

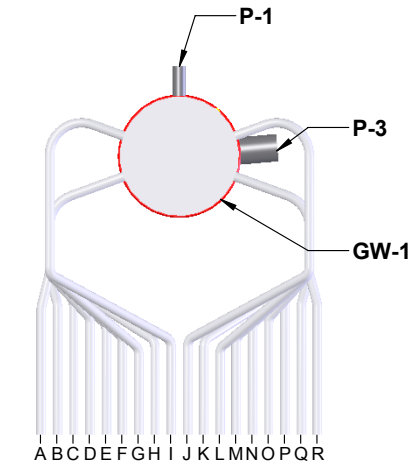
- The magnetic particle examination revealed a ¼" surface indication on girth weld No. GW-3 and a 3" indication on attachment weld No. AW-3. The indications require removal and, if necessary, repair. All repairs were to be performed by plant personnel during the current outage. Multiple surface indications were revealed in the tube stubs. The indications on tube stubs 80J, 88J (1/2" x 2), and 96J were removed by light surface grinding by plant personnel. The remaining indications should be monitored during future inspections.
- The ultrasonic wall thickness measurements revealed evidence of wall thinning in the section of the header at girth weld Nos. GW-2 and GW-3. The thinned section should be monitored closely during future inspections.

- Operating in Class 1 creep range.
- Subsequent to the recommended repairs by welding, the HP Reheat Outlet header is considered suitable for continued service under the intended operating conditions.
- The header material has consumed less than 20% of its remaining useful life.
- Reinspect the repairs on the tube stubs after one year of continued operation (2012).
- Perform an inspection of the thinned area after one to three years of continued operation (2012 to 2014).
- Perform a similar inspection after five to seven years of additional service (2015 to 2017).

LP Reheat Outlet Header

- The magnetic particle examination revealed a 1/8" surface indication on girth weld No. GW-3. The indication was removed by light surface grinding by plant personnel. No further action is required. Surface indications were revealed in seam weld No. LS-07, attachment weld Nos. AW-1, and AW-3. The indications require removal and, if necessary, repair by welding. The repairs were to be performed by plant personnel during the current outage. Multiple 1/8" to 1" surface indications were revealed in the tube stubs. Selected indications were removed by grinding by plant personnel during the current outage. The indications are indicative of manufacturing defects and should be monitored during future inspections.
- The ultrasonic wall thickness measurements did not reveal any evidence of wall thinning.
- The ultrasonic phased-array examination of the girth and seam welds did not reveal any subsurface indications.

- The header material has consumed less than 20% of its remaining useful life.
- Operating in Class 1 creep range.
- Subsequent to the recommended repairs by welding, the LP Reheat Outlet header is considered suitable for continued service under the intended operating conditions.
- Reinspect the repairs after one year of continued operation (2012).
- Reinspect after three years of continued operation (2014).



Front View (Looking South)
Scale 1:30

Right View (Looking East)
26 Rows, 18 Tubes per row
Scale 1:95

North **South**

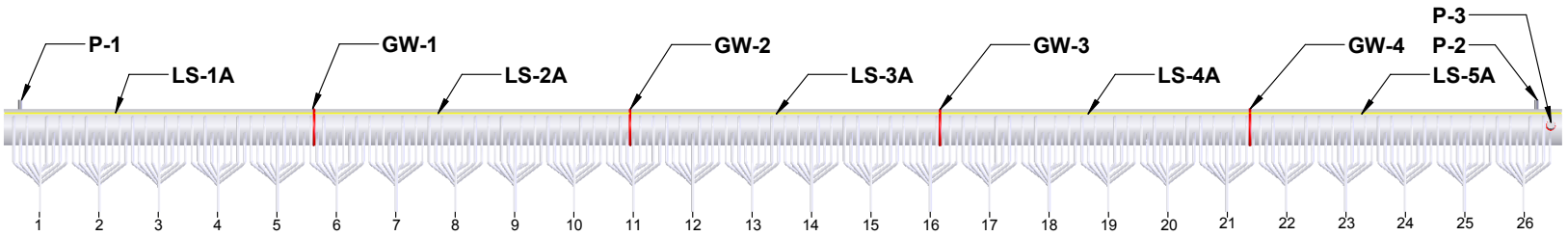


Fig. 1. An overall sketch of the Platen Superheater Inlet header

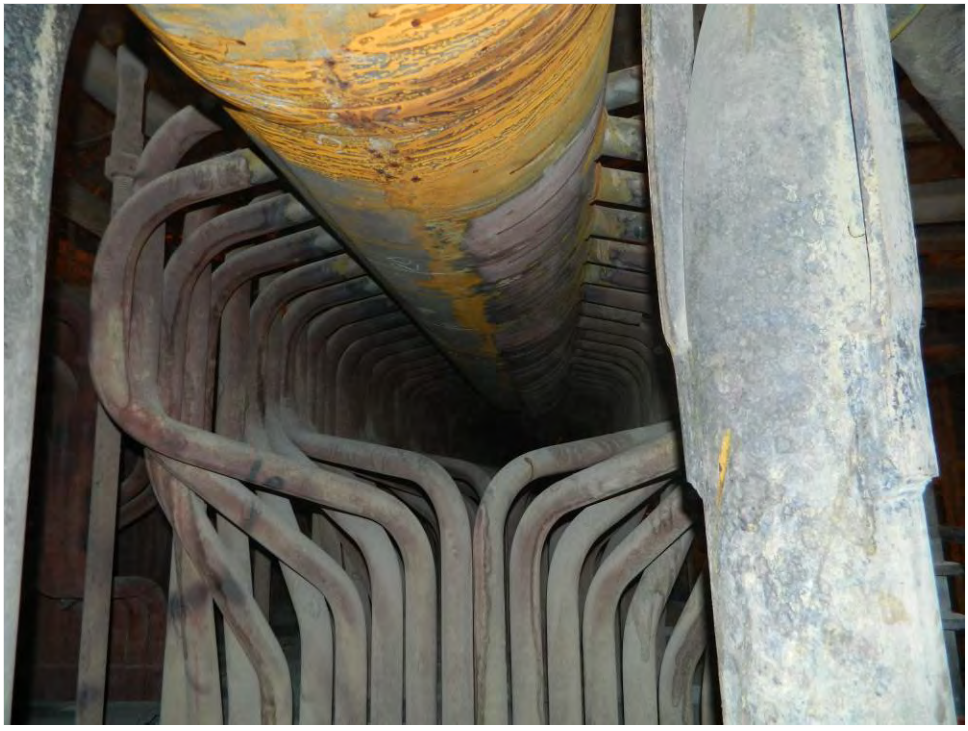
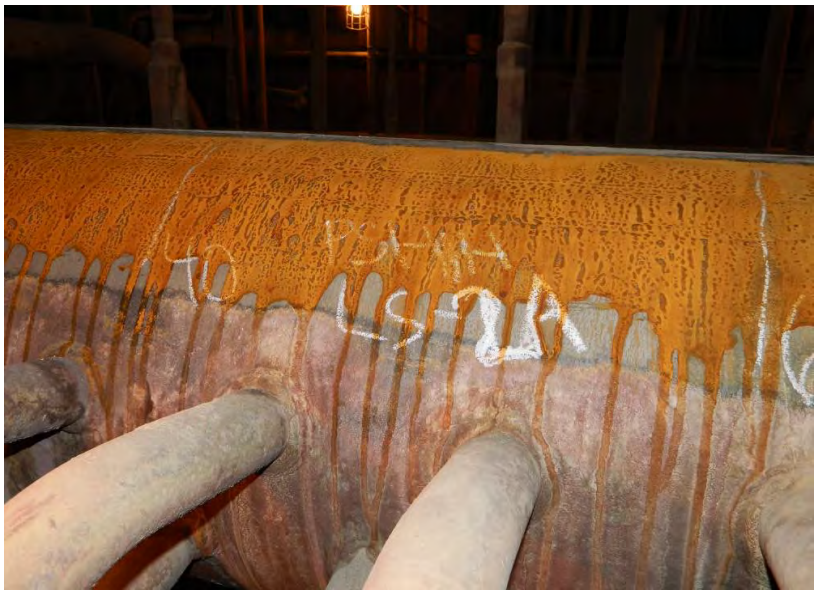


Fig. 2. Photographs of the Platen Superheater Inlet header and tubing.



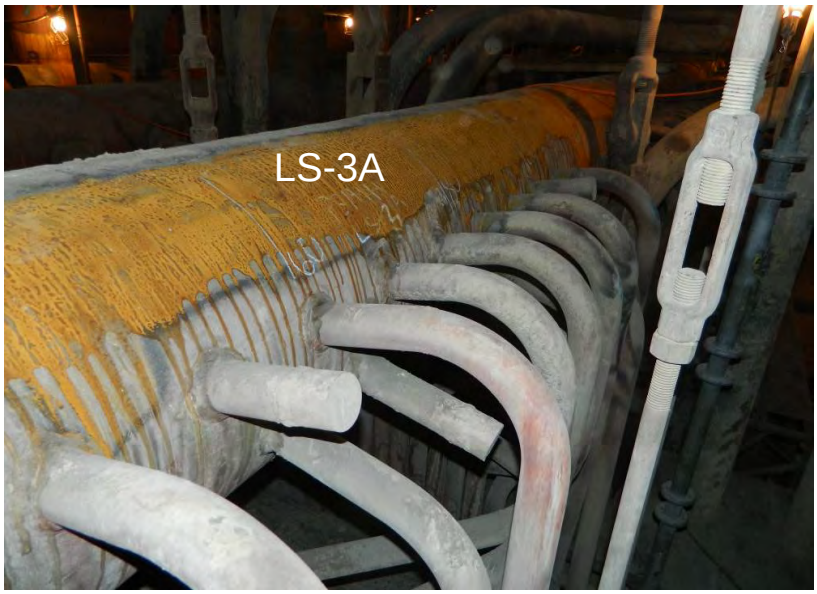


Fig. 3.

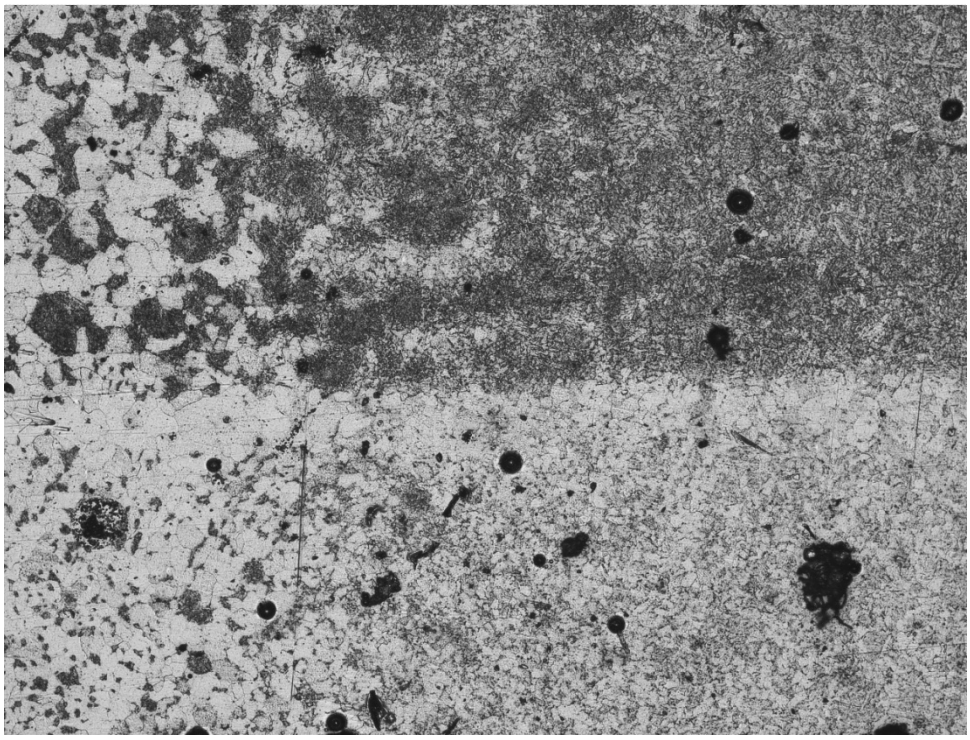
Photographs of seam weld Nos. LS-1A, LS-2A, and LS-3A on the Platen Superheater Inlet header.

Fig. 4. Photographs of seam weld Nos. LS-4A and LS-5A on the Platen Superheater Inlet header.

Fig. 5. Photographs of girth weld Nos. GW-1 and GW-2 on the Platen Superheater Inlet header.

Fig. 6.

Photographs of girth weld Nos. GW-3, GW-4, and penetration No. P-3 on the Platen Superheater Inlet header.



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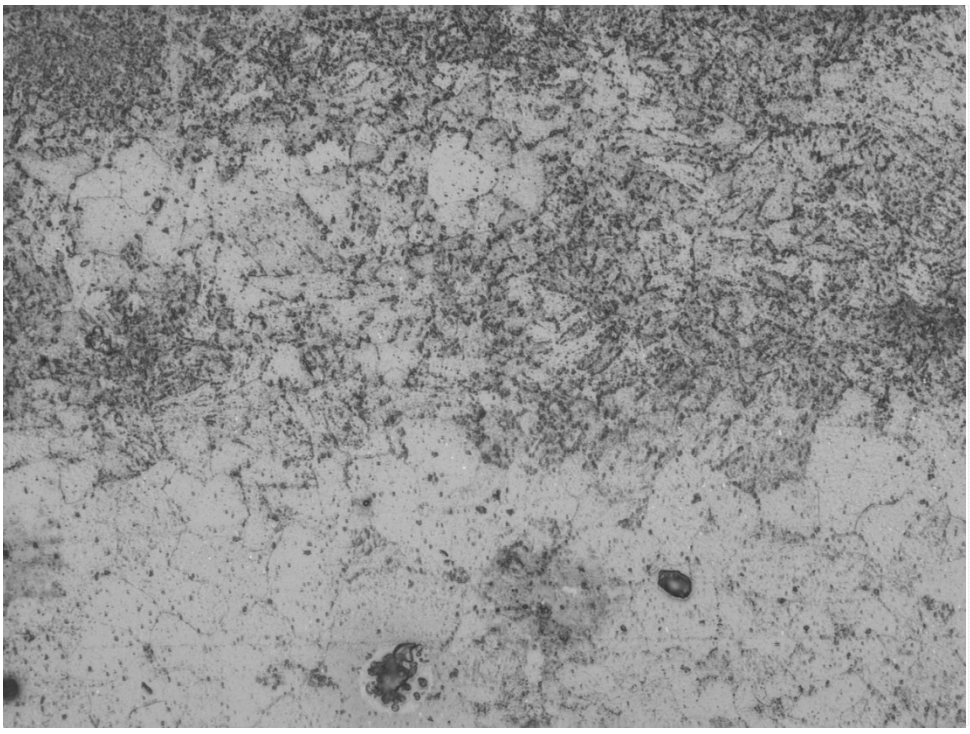
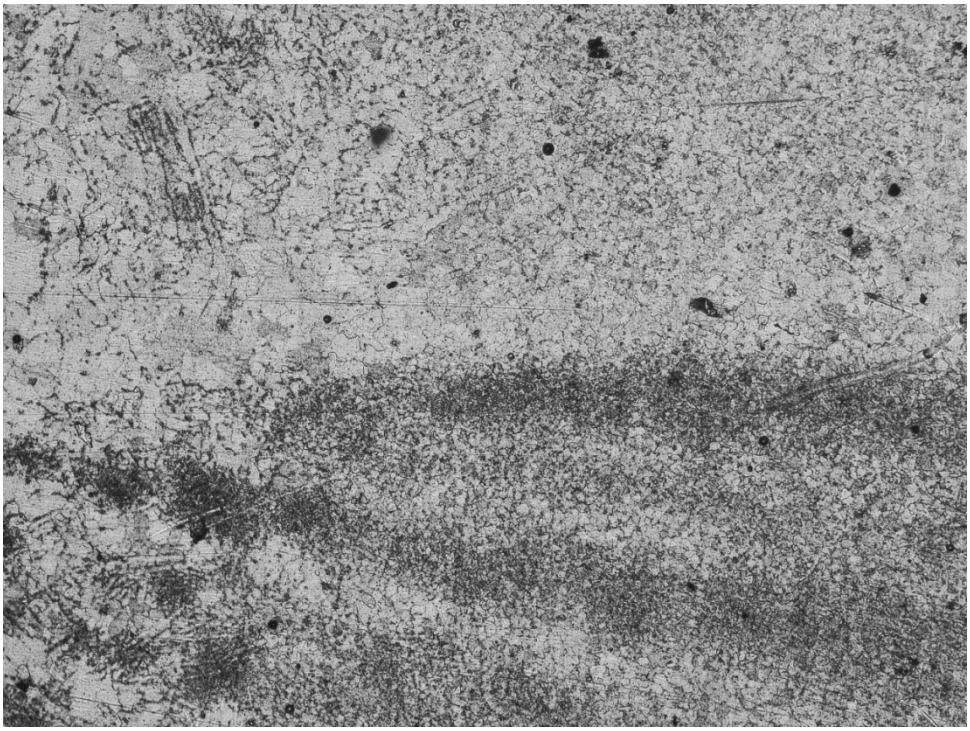


500X

Fig. 7. Replica No. PSIH-R1.



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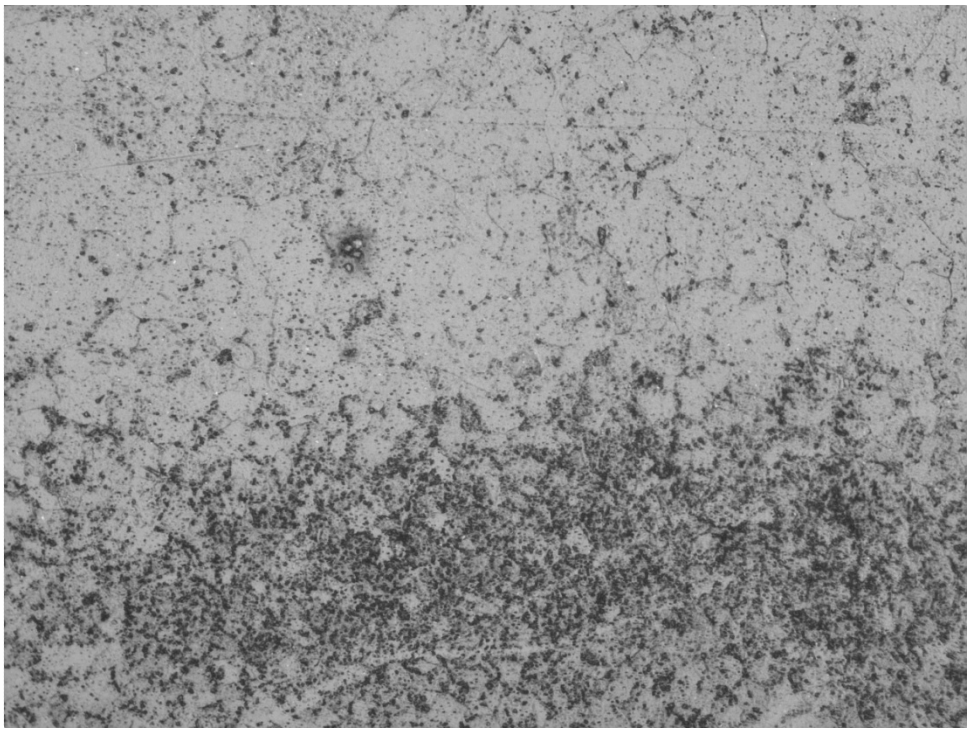

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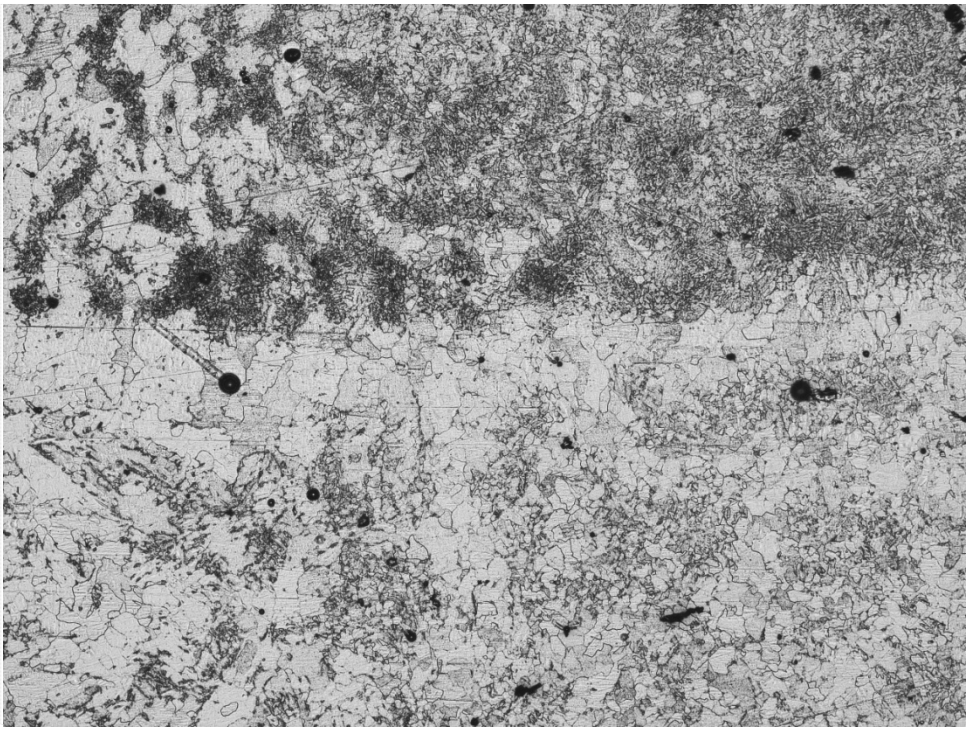
Fig. 8. Replica No. PSIH-R2.



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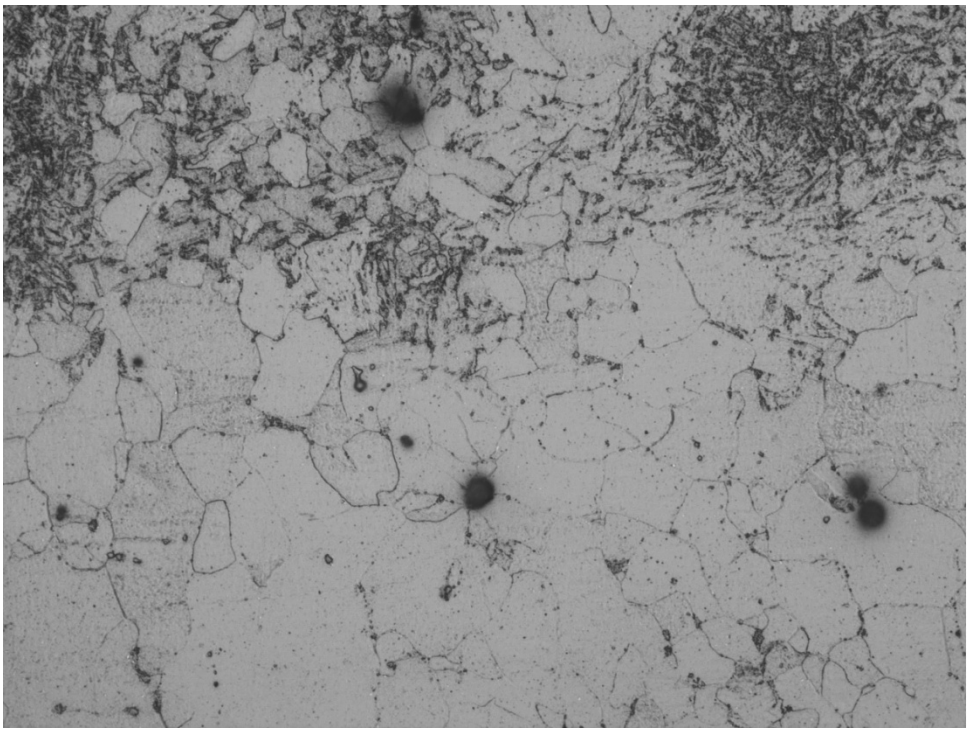
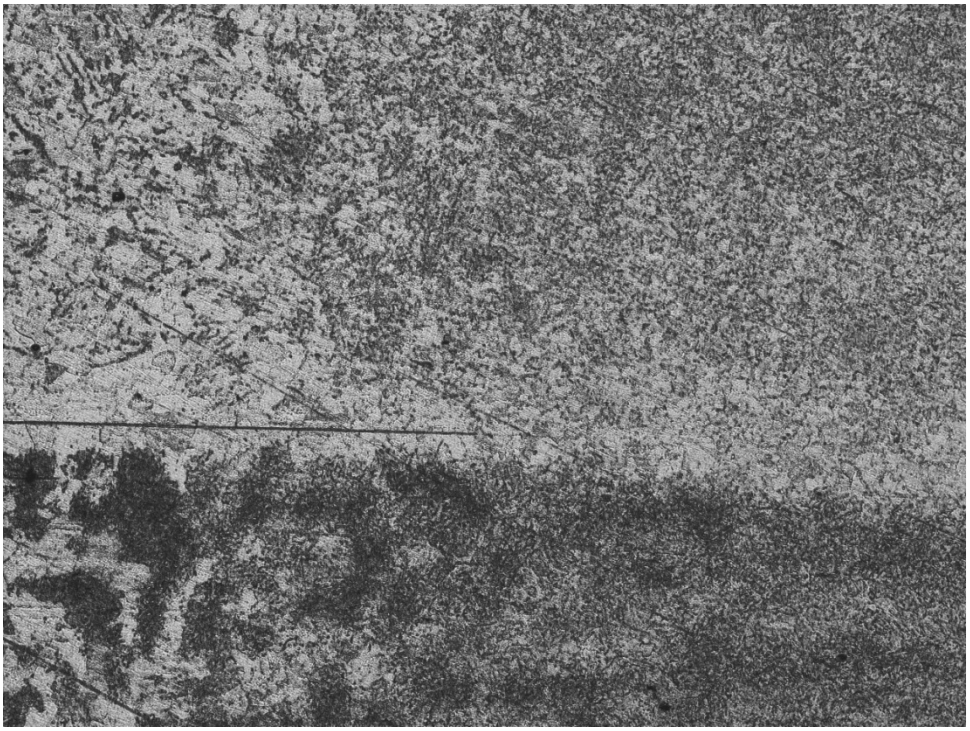


500X

Fig. 9. Replica No. PSIH-R3.



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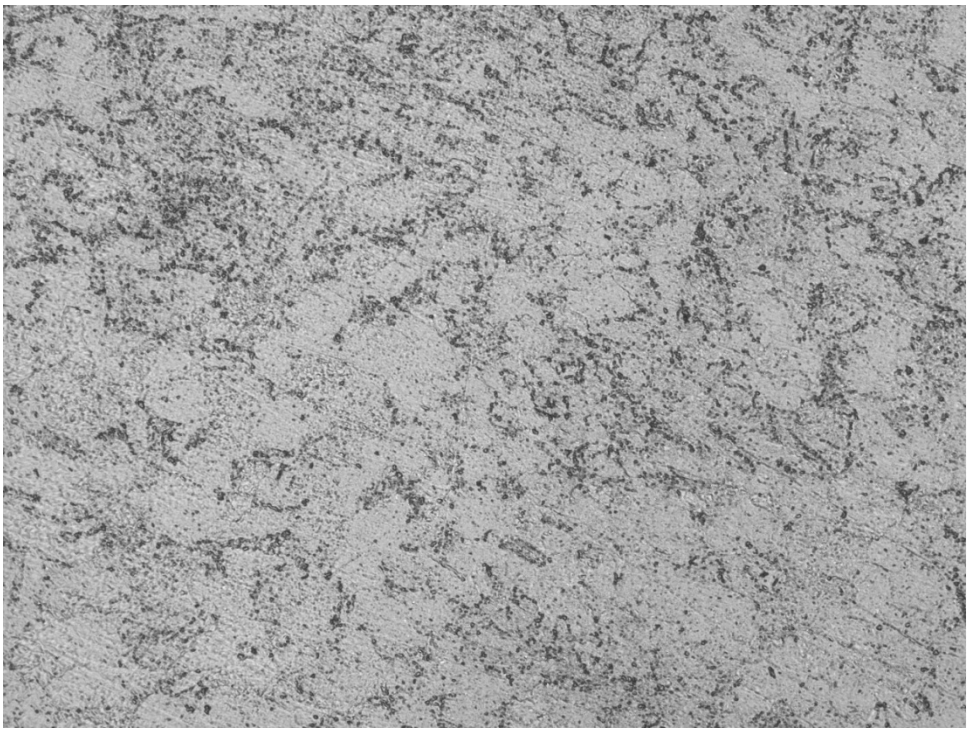

500X

Fig. 10. Replica No. PSIH-R4.

100X

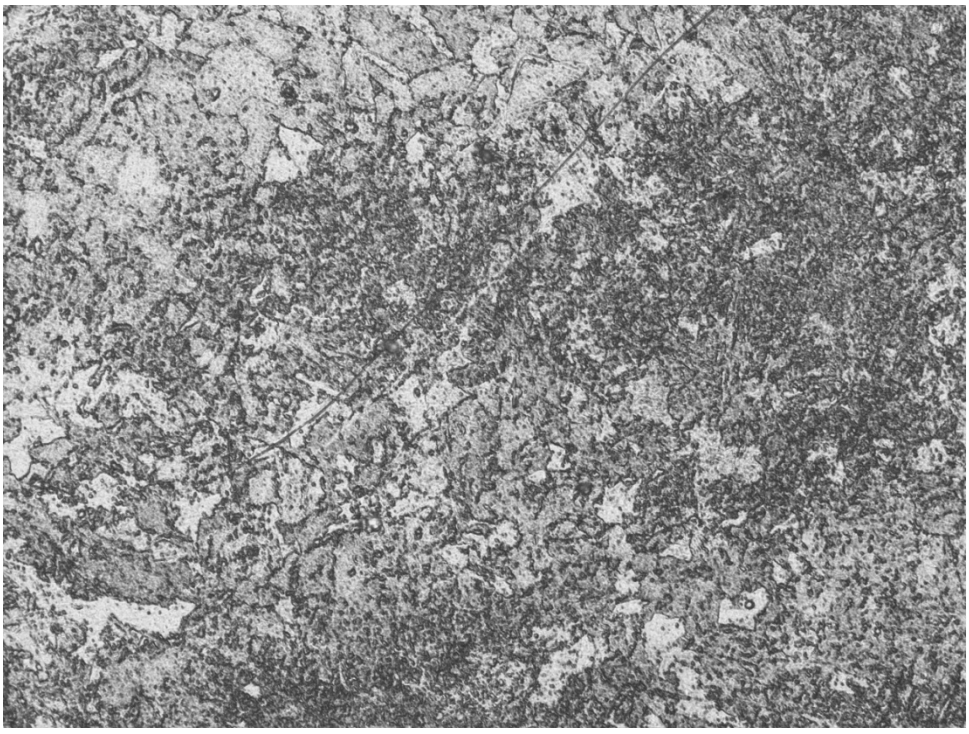

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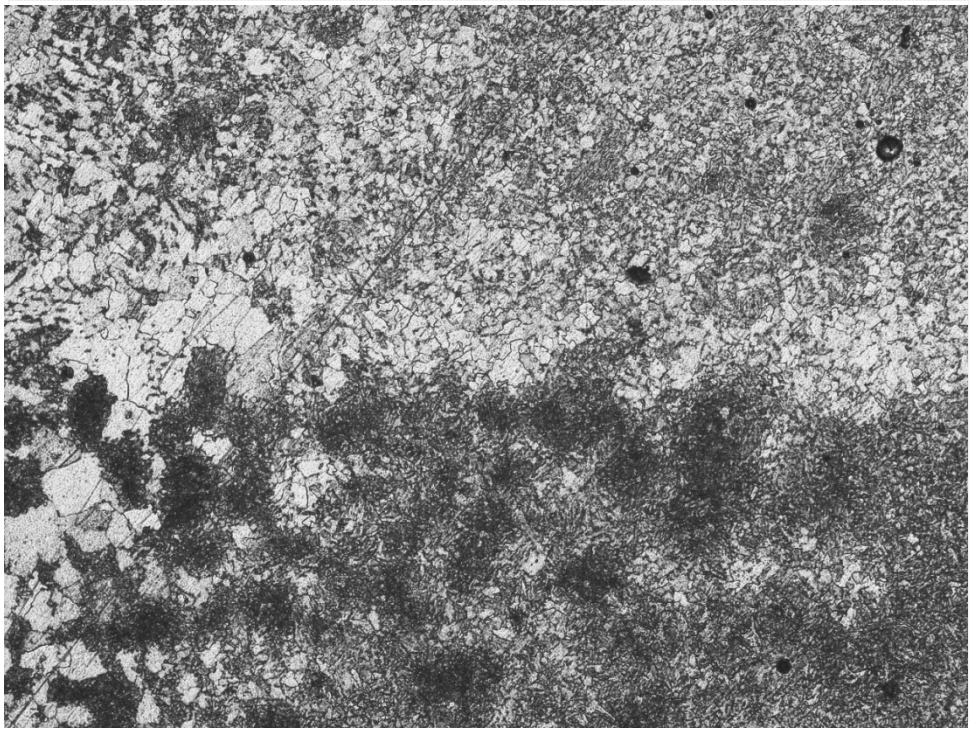
Fig. 11. Replica No. PSIH-R5.



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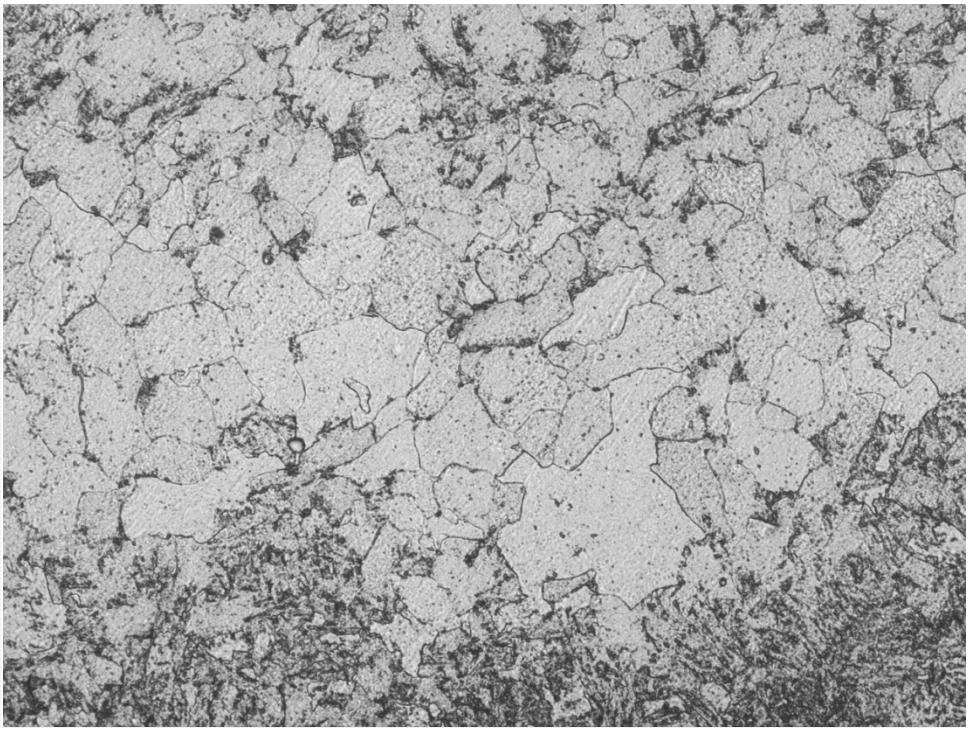

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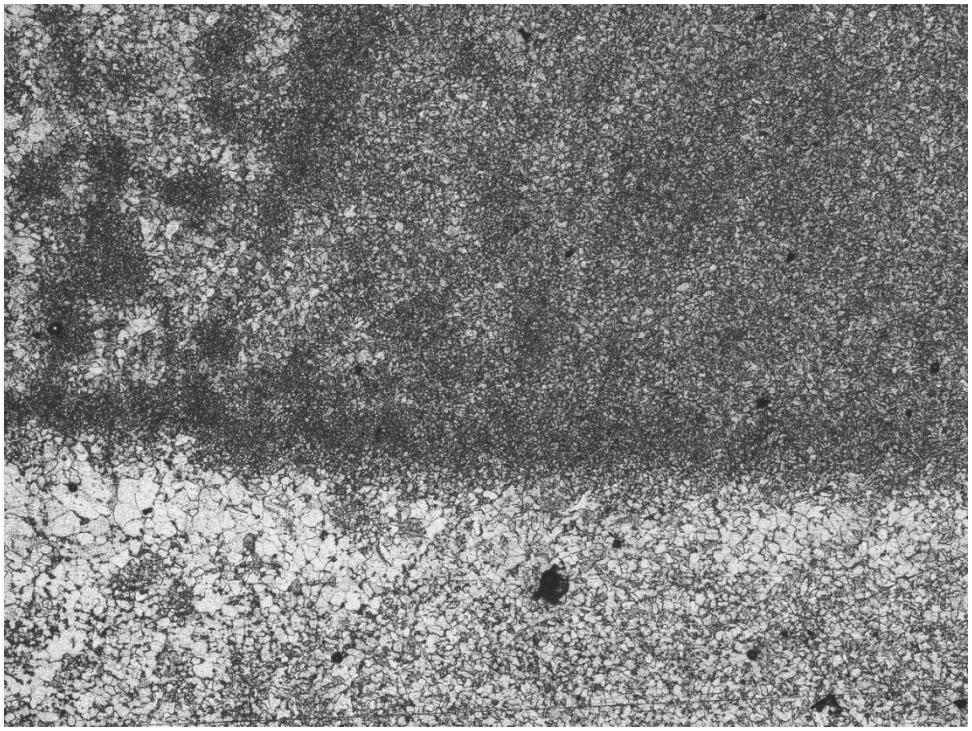
Fig. 12. Replica No. PSIH-R6.



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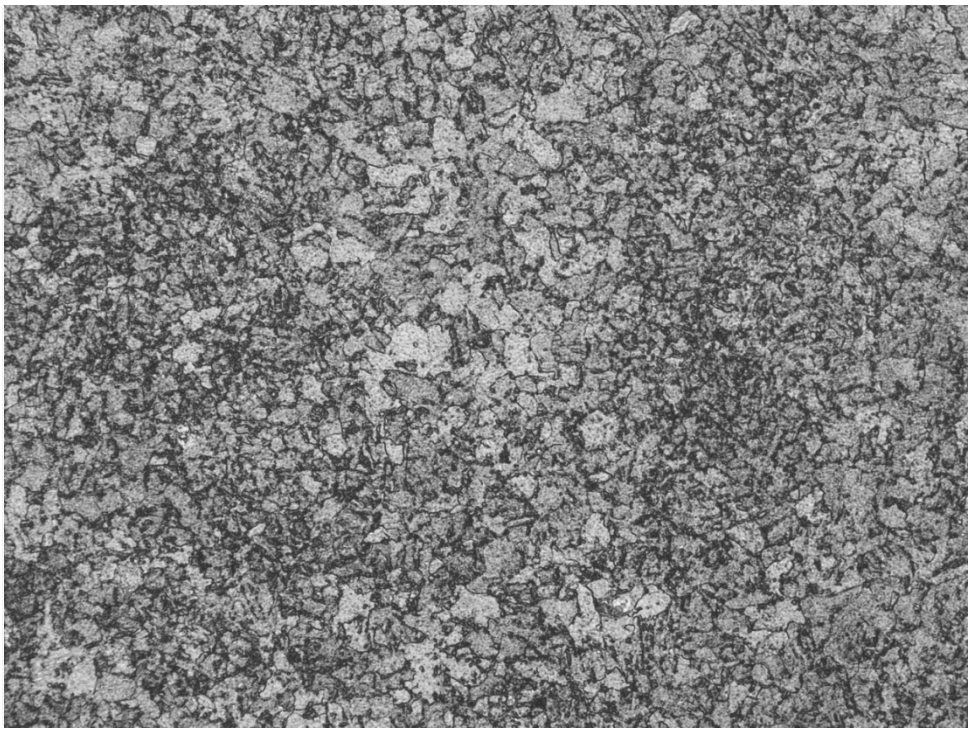

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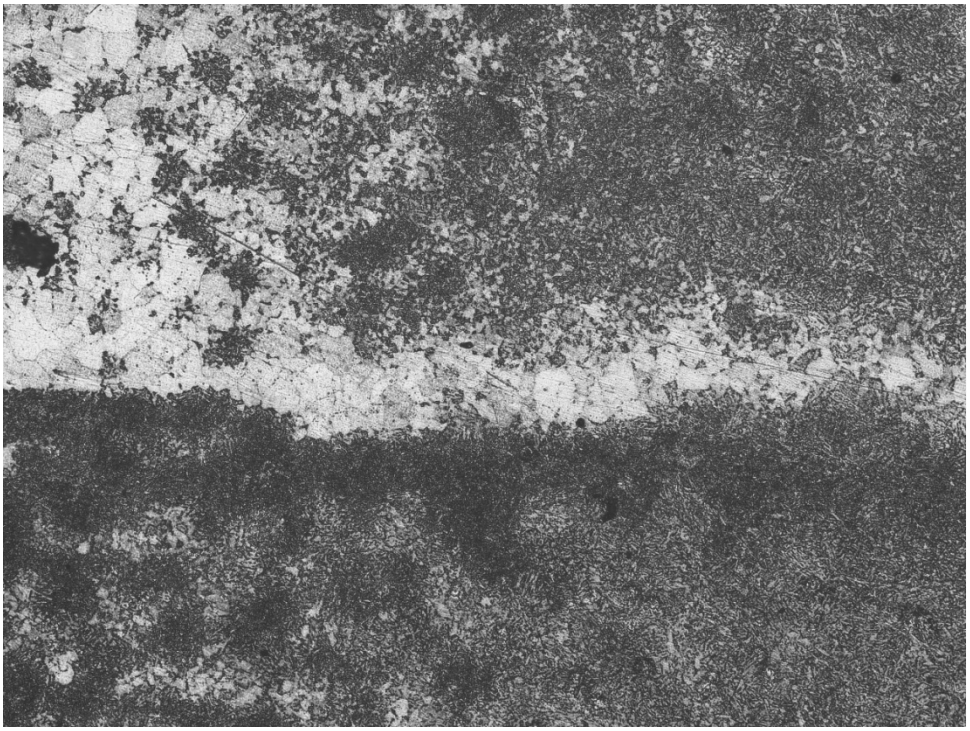
Fig. 13. Replica No. PSIH-R7.



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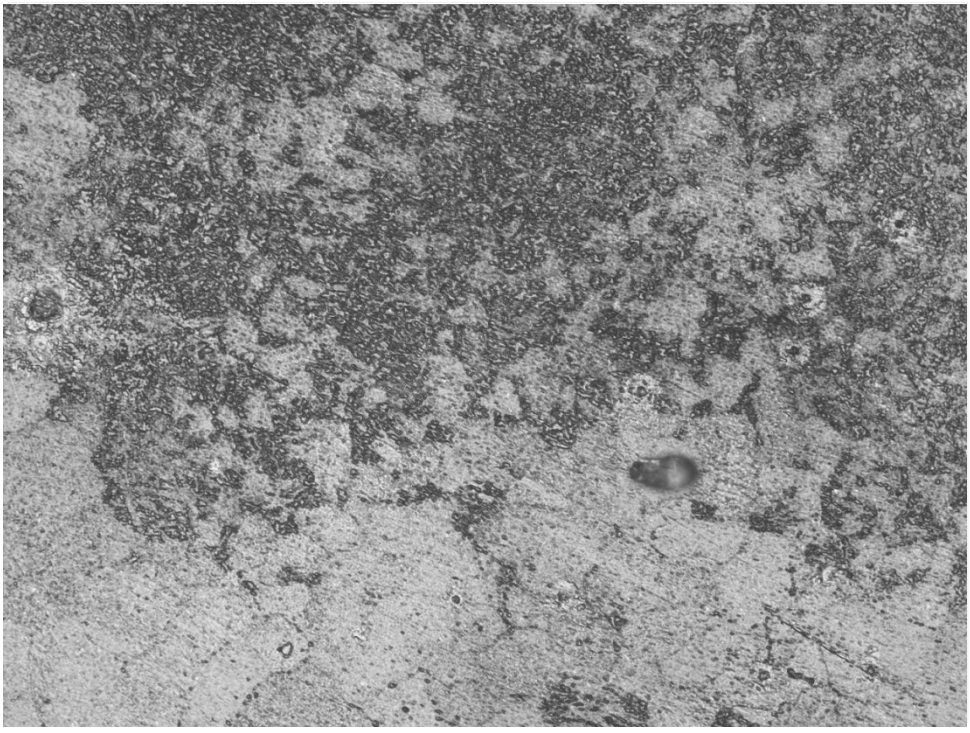

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Fig. 14. Replica No. PSIH-R8.

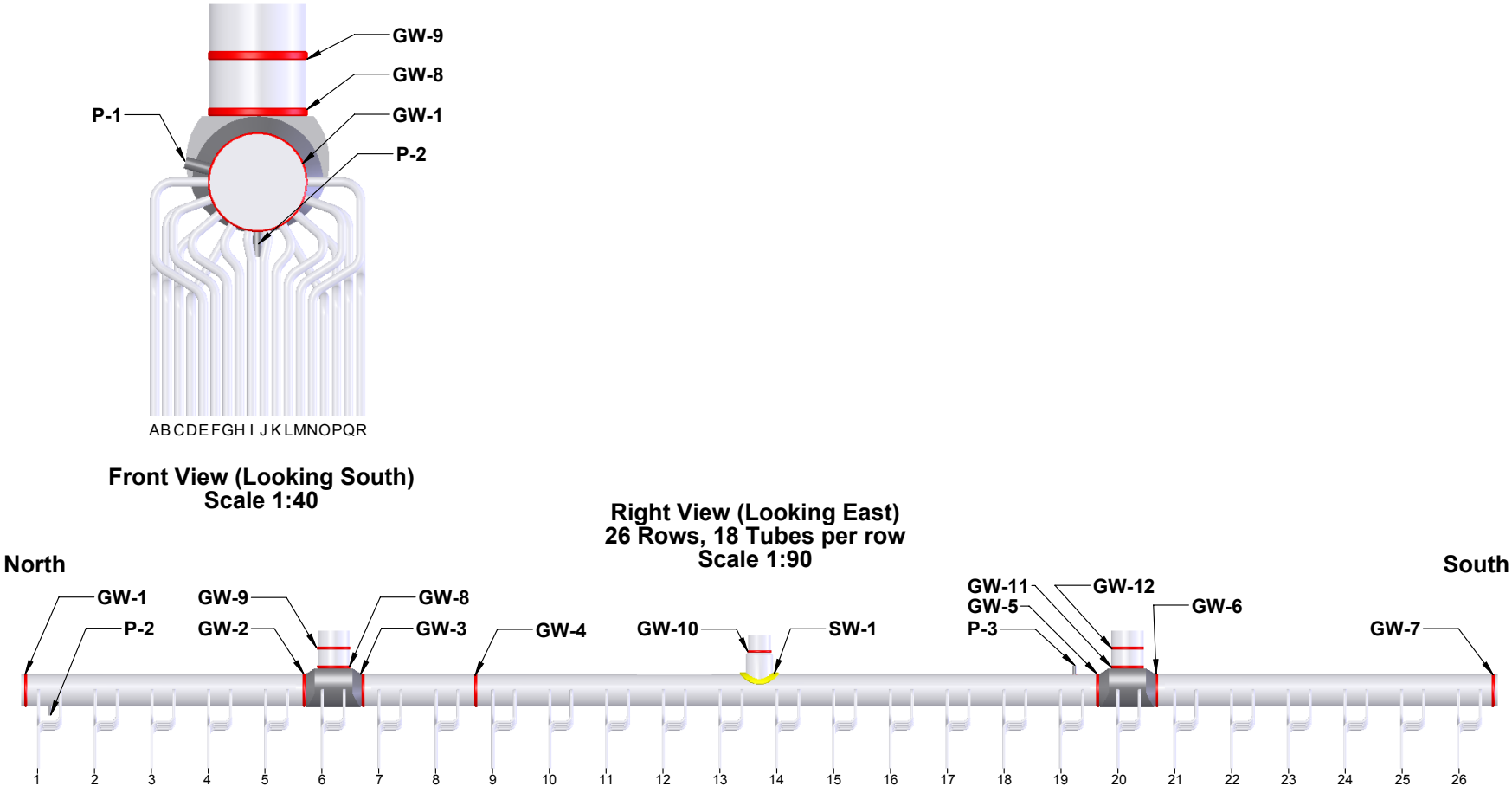


Fig. 15. An overall sketch of the Platen Superheater Outlet header

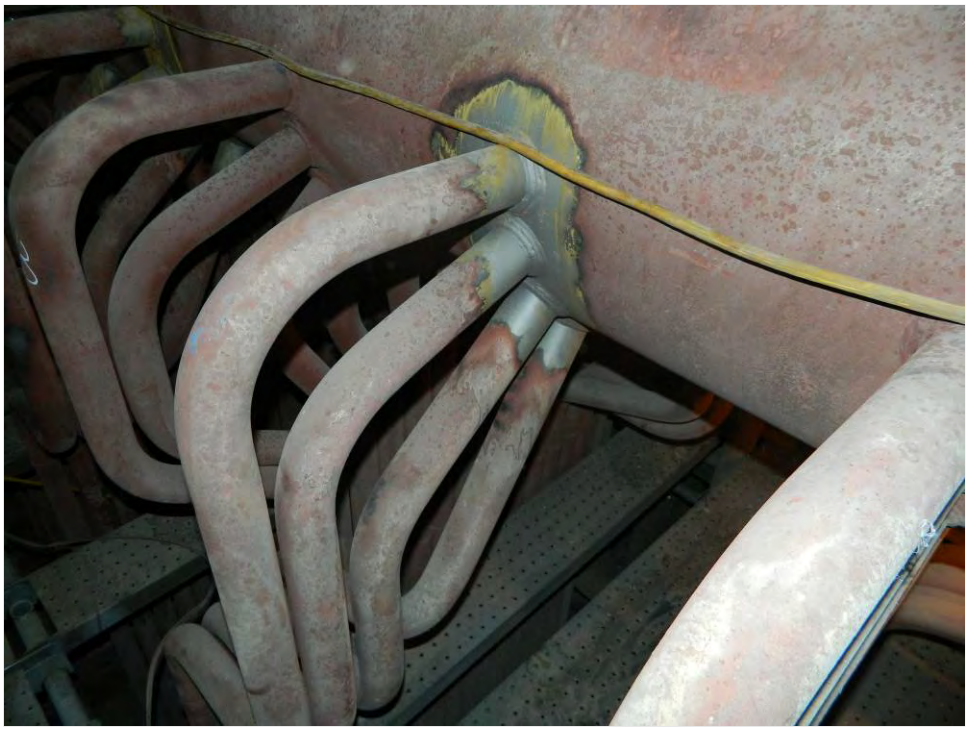


Fig. 16. Photographs of the Platen Superheater Outlet header tubing.

Fig. 17. Photographs of girth weld Nos. GW-1 and GW-2 on the Platen Superheater Outlet header.

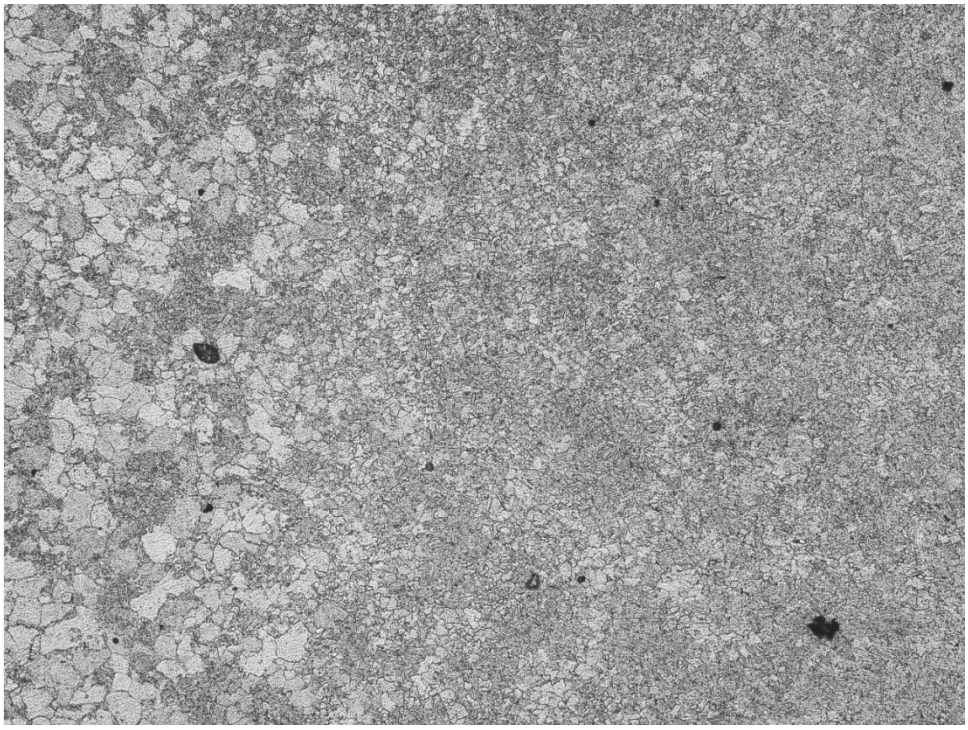
Fig. 18. Photographs of girth weld Nos. GW-4 and GW-5 on the Platen Superheater Outlet header.

Fig. 19. Photographs of girth weld Nos. GW-6 and GW-7 on the Platen Superheater Outlet header.

Fig. 20. Photographs of girth weld Nos. GW-8 and GW-10 on the Platen Superheater Outlet header.

Fig. 21. Photographs of girth weld Nos. GW-11 and GW-12 on the Platen Superheater Outlet header

Fig. 22. Photographs of the indication on saddle weld No. SW-1 of the Platen Superheater Outlet header.



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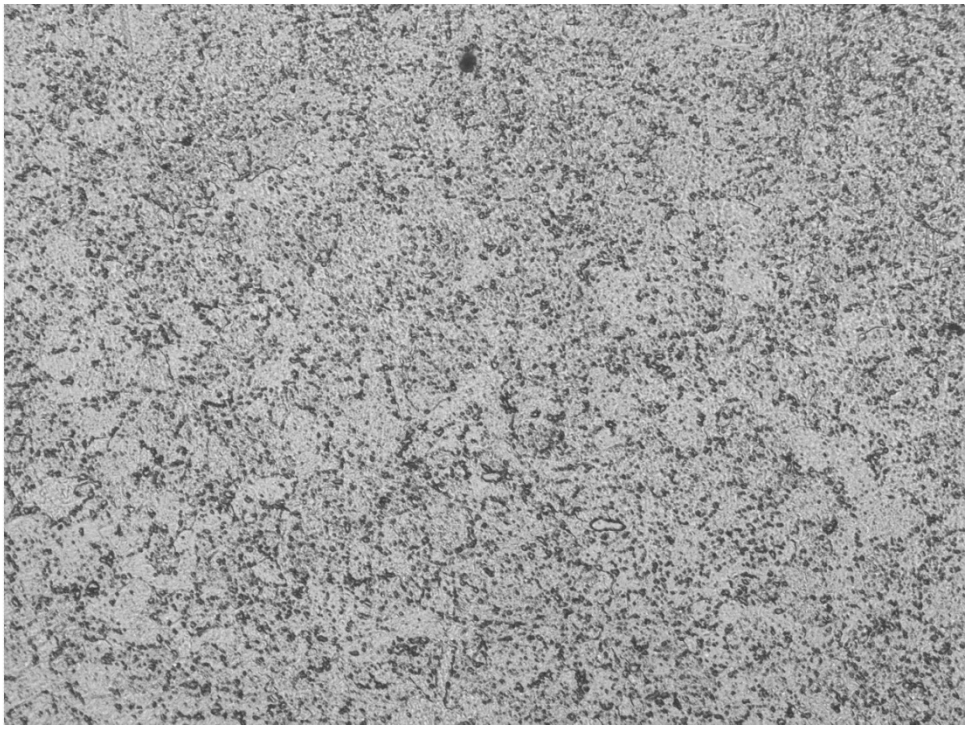

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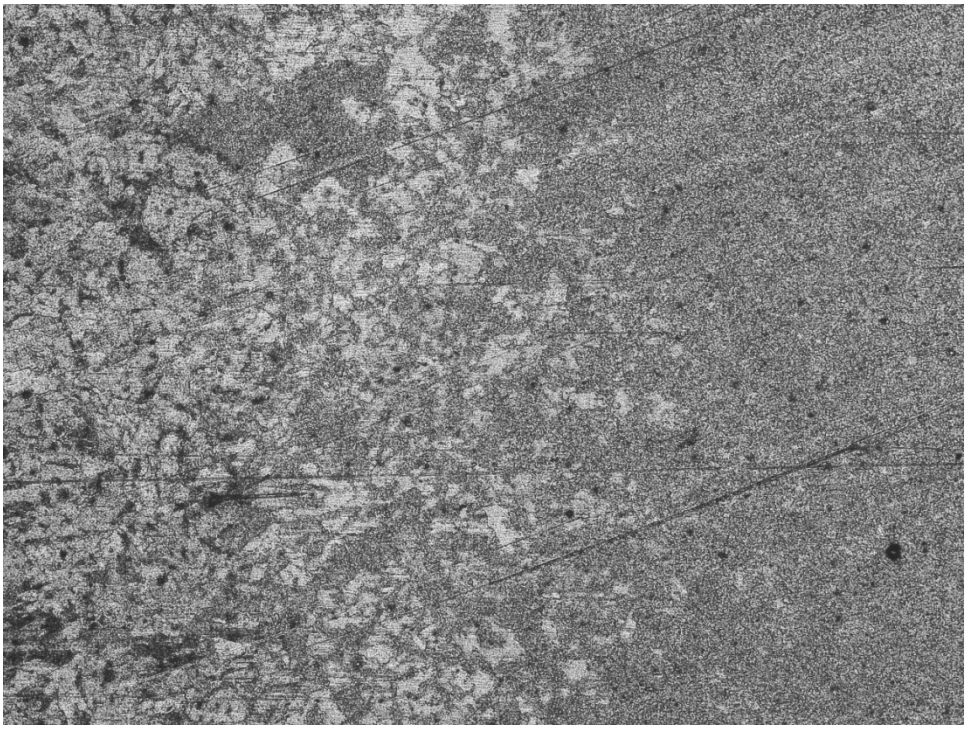
Fig. 23. Replica No. PSOH-R1.



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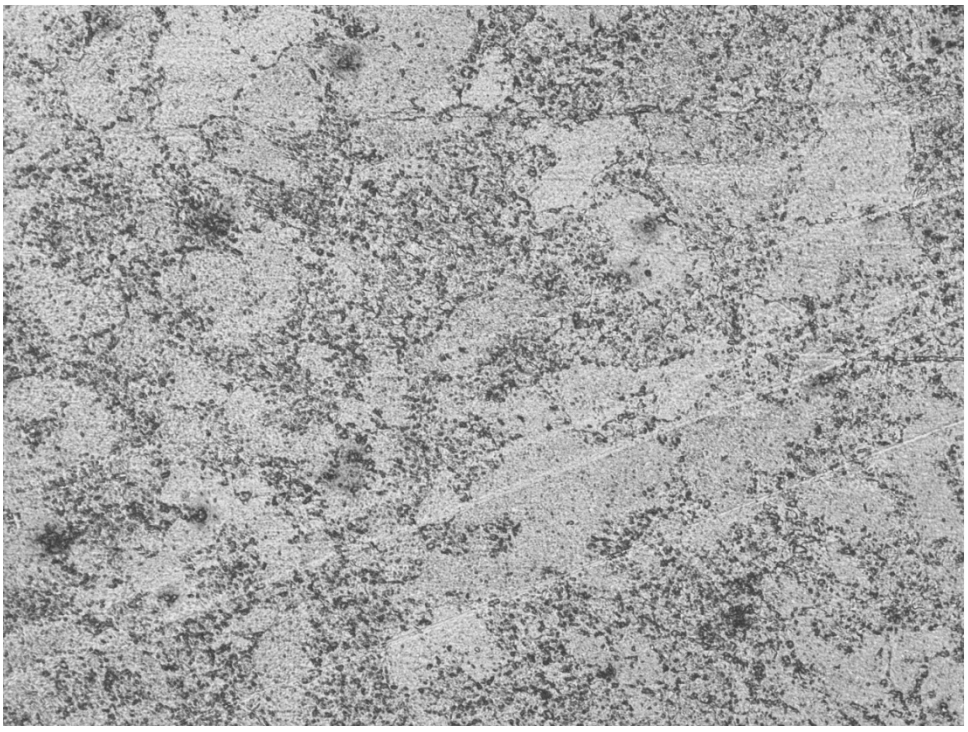
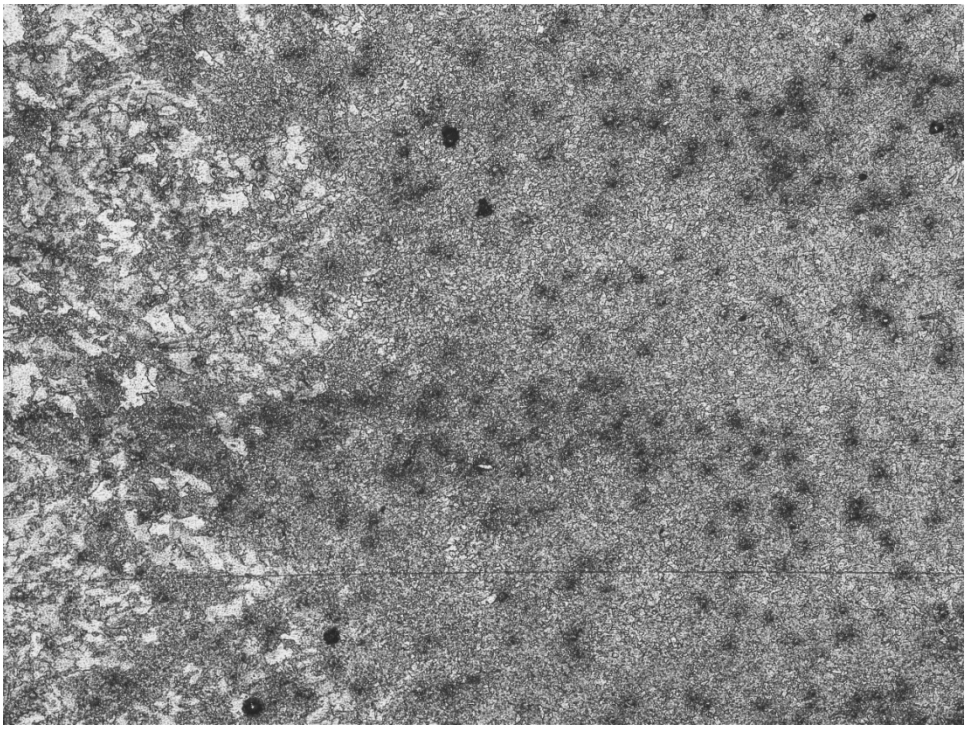


500X

Fig. 24. Replica No. PSOH-R2.



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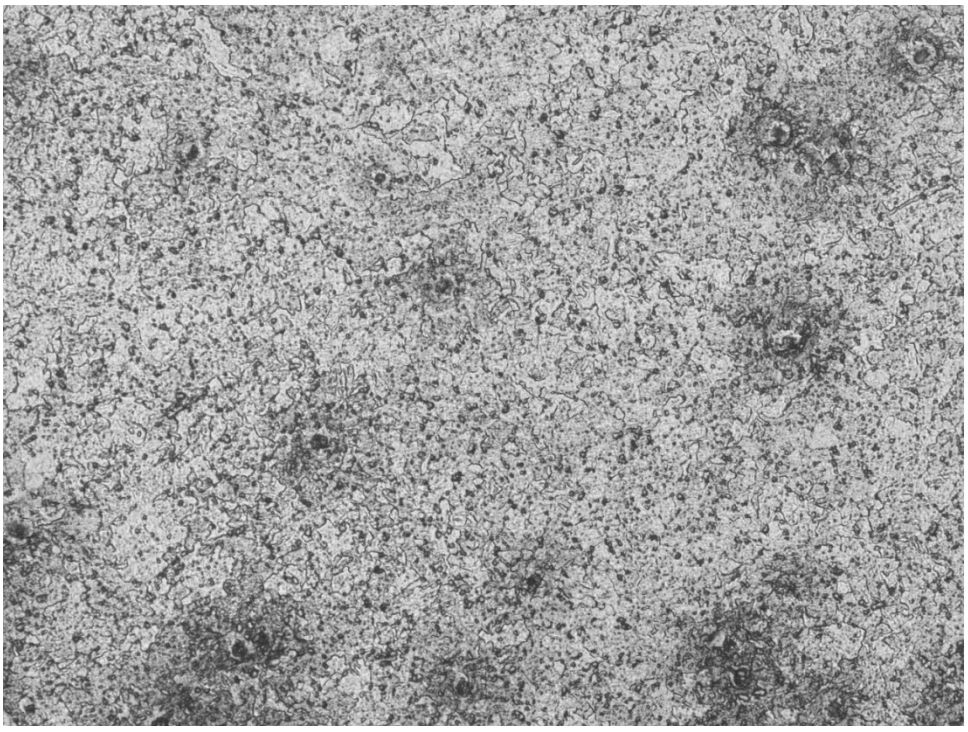
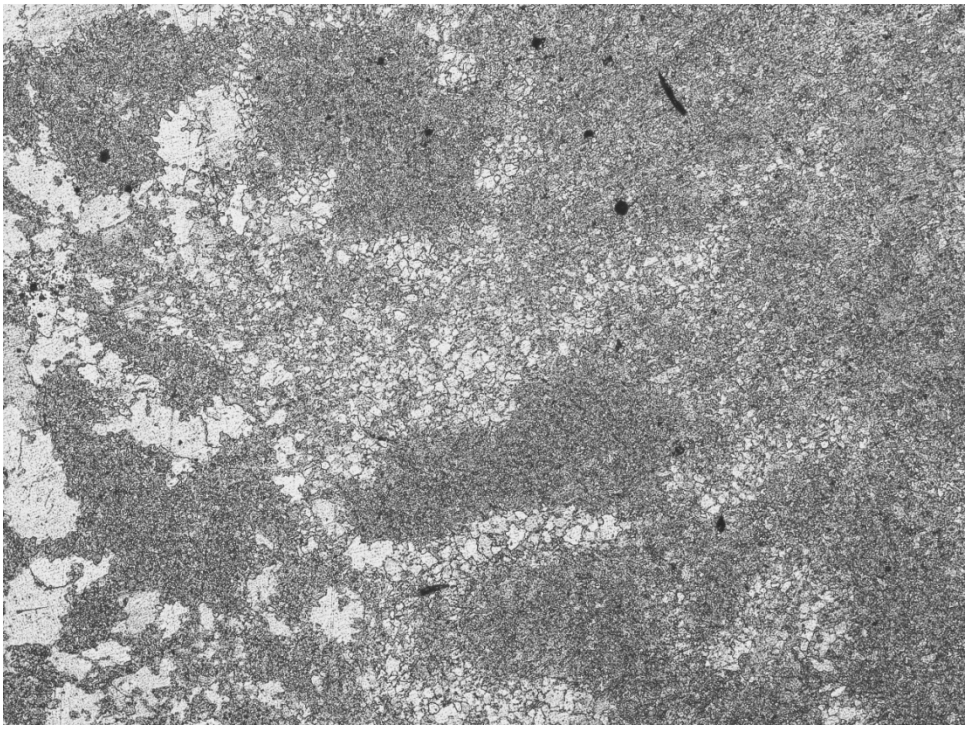


500X

Fig. 25. Replica No. PSOH-R3.



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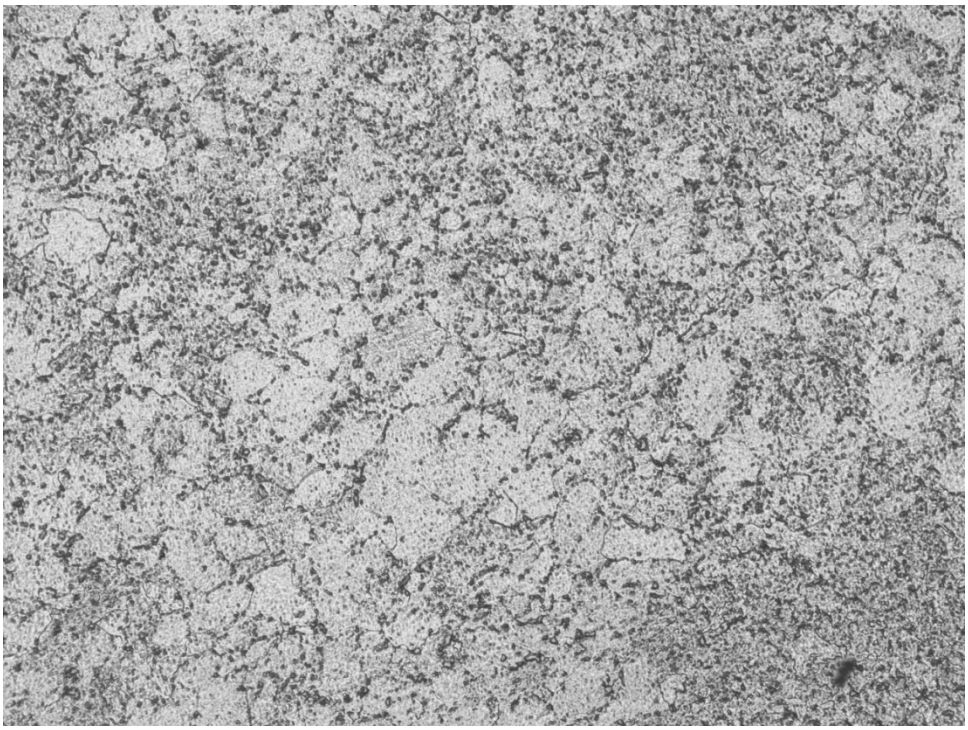

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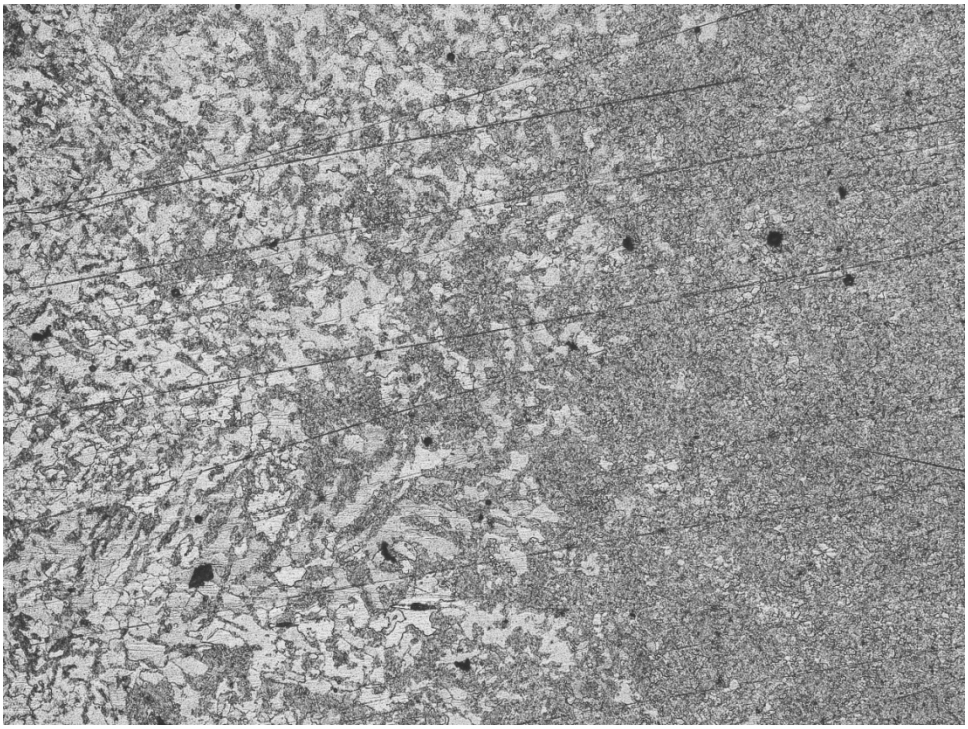
Fig. 26. Replica No. PSOH-R4.



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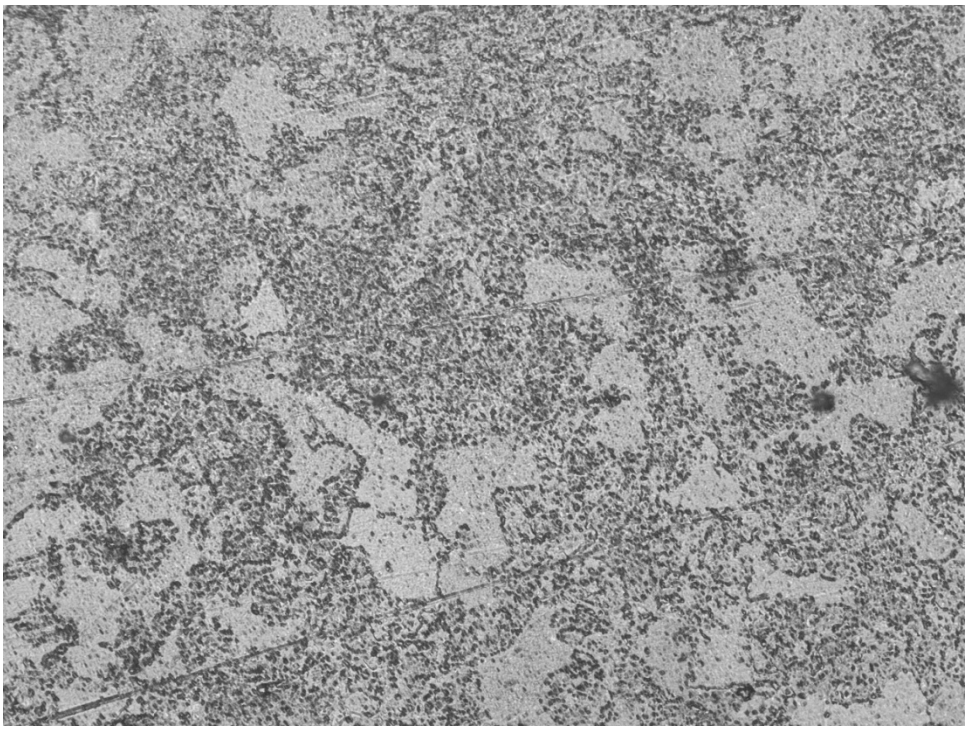

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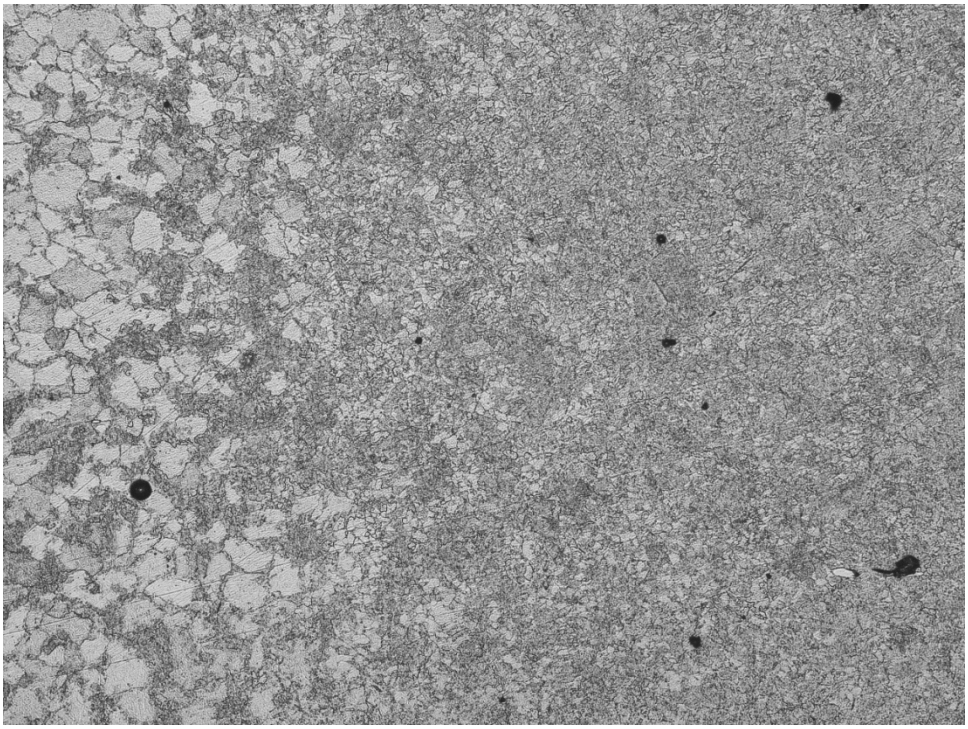
Fig. 27. Replica No. PSOH-R5.



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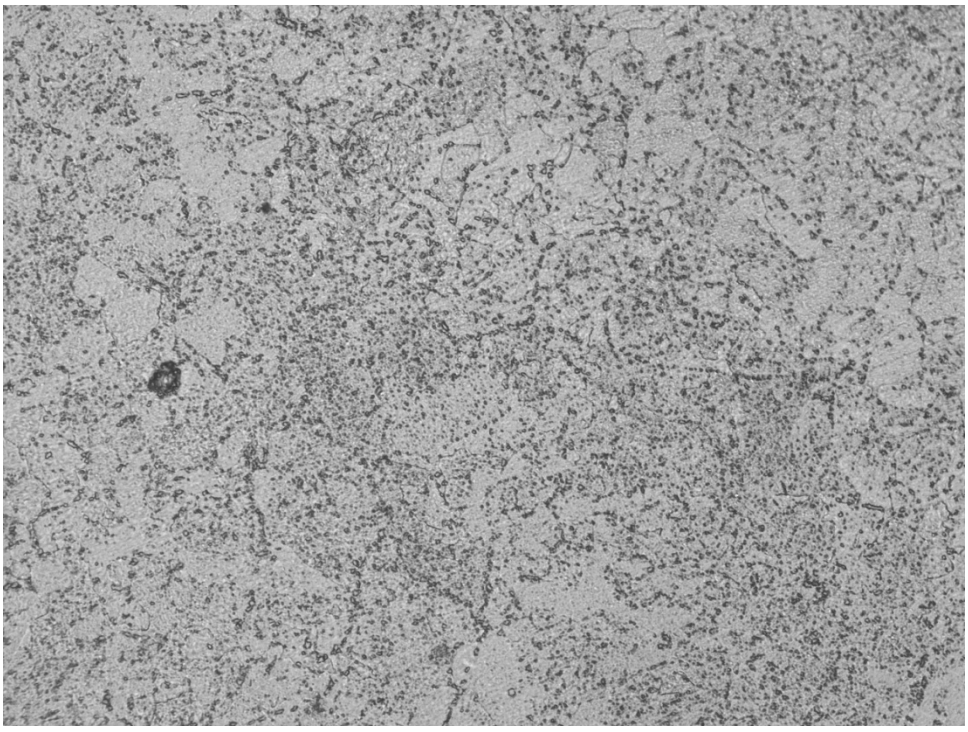

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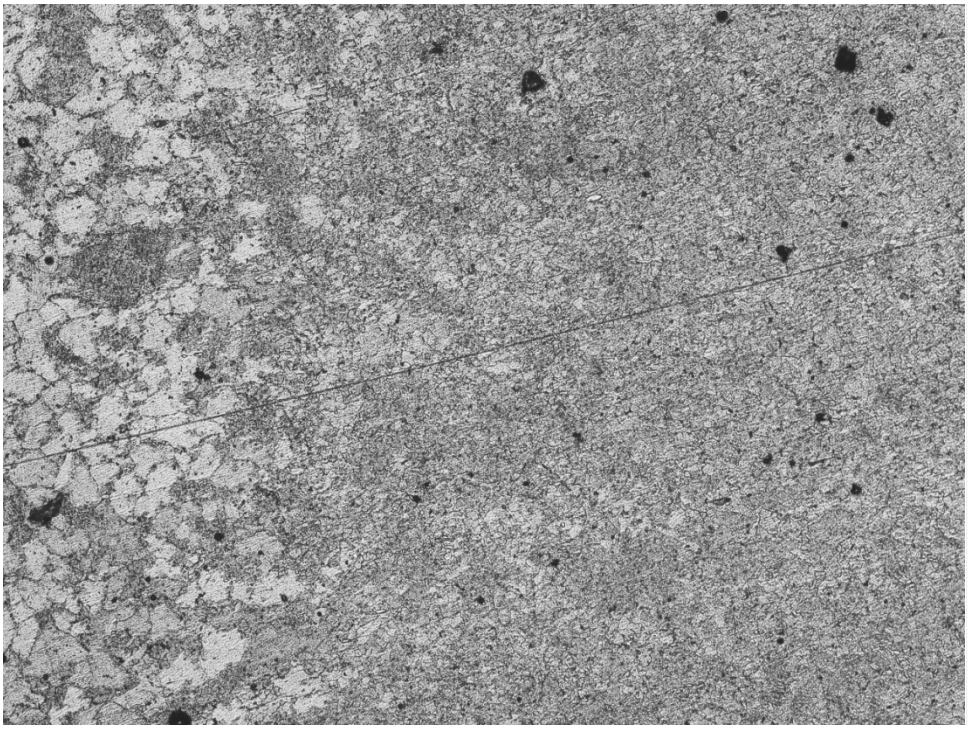
Fig. 28A. Replica No. PSOH-R6-1.



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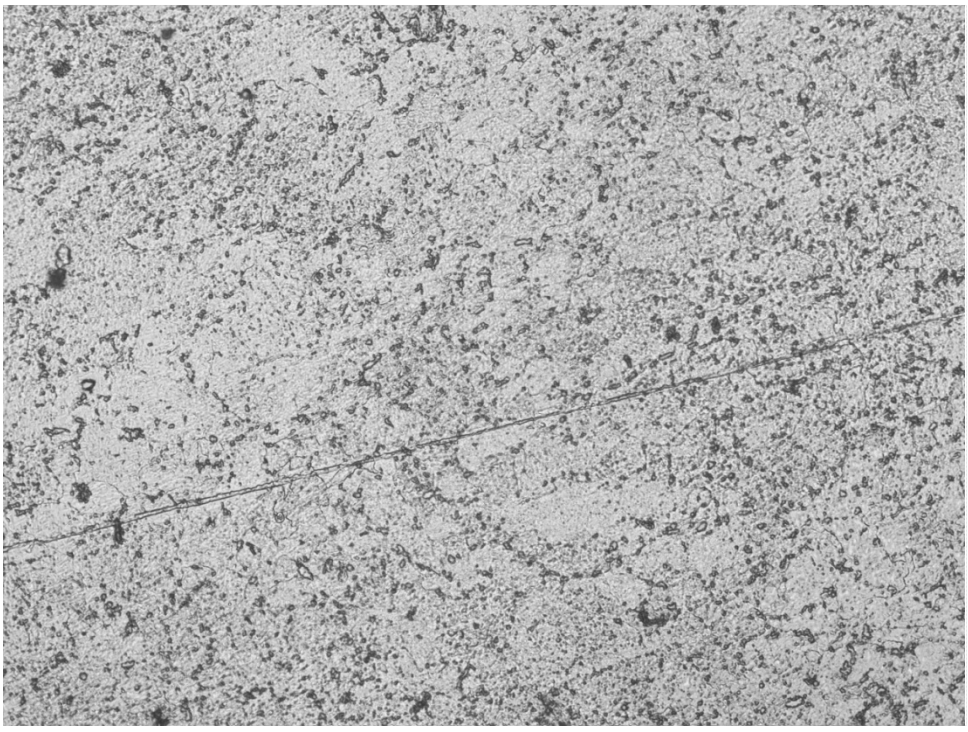

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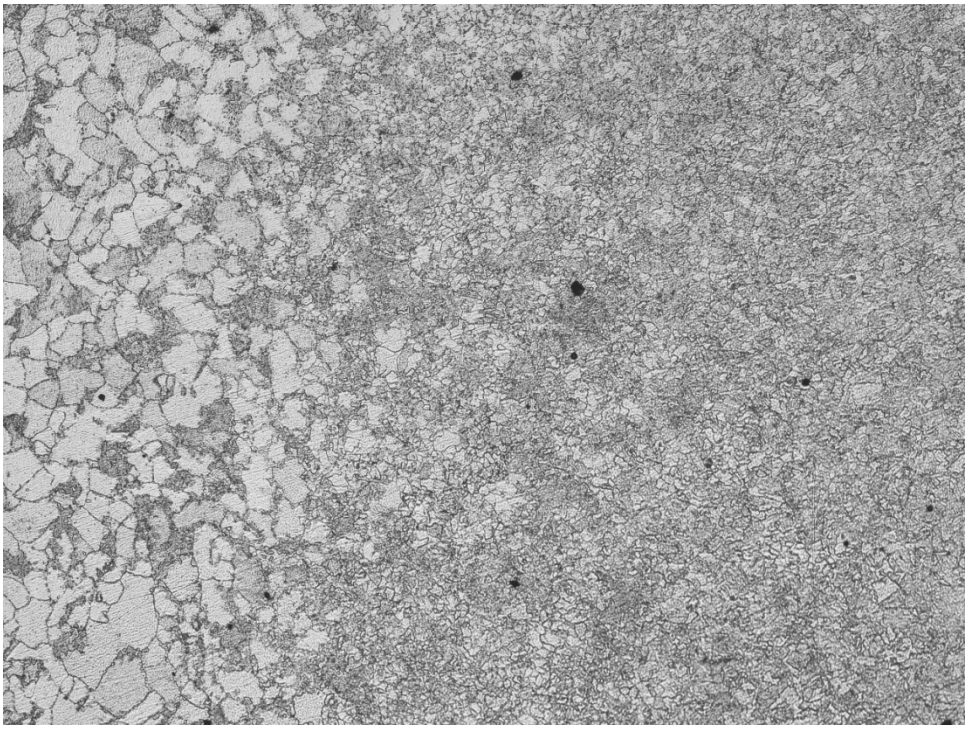
Fig. 28B. Replica No. PSOH-R6-2.



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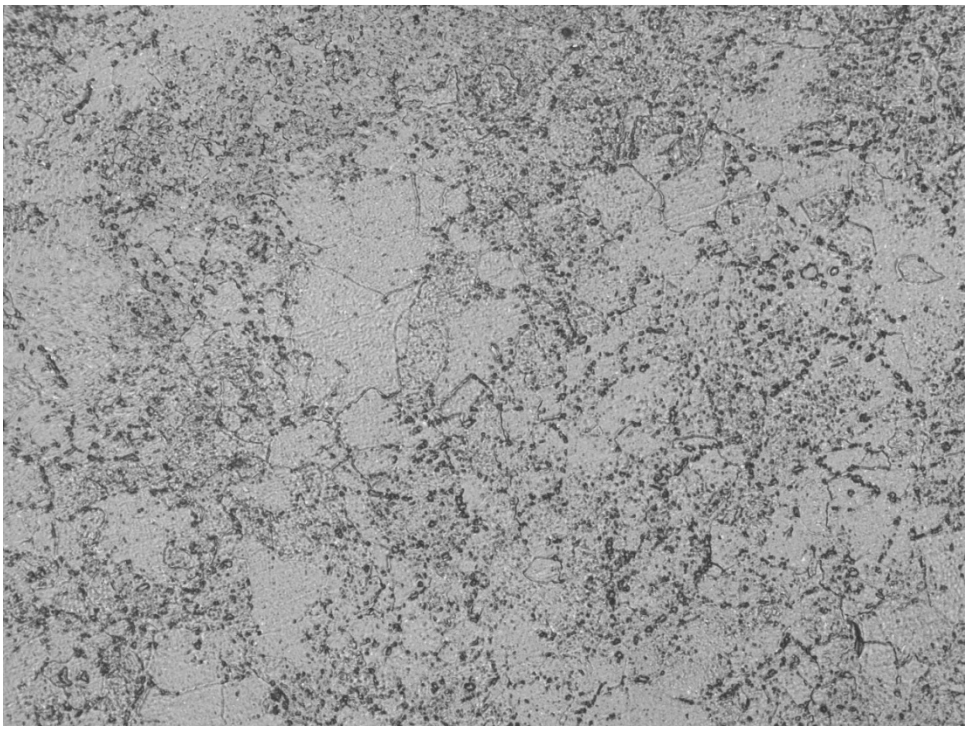

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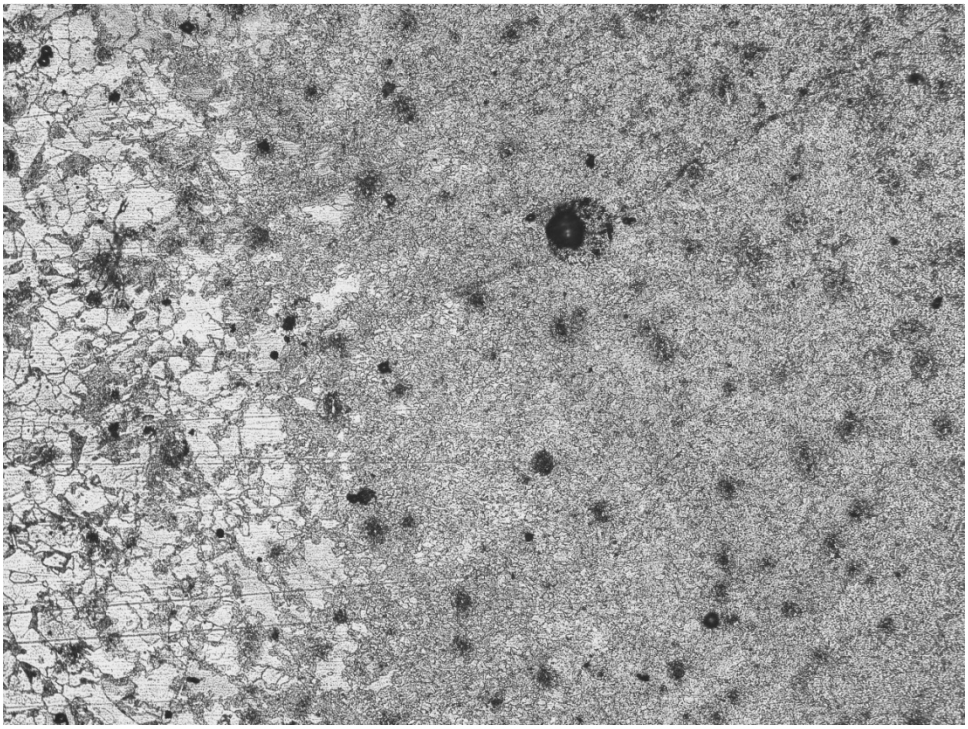
Fig. 29. Replica No. PSOH-R7.



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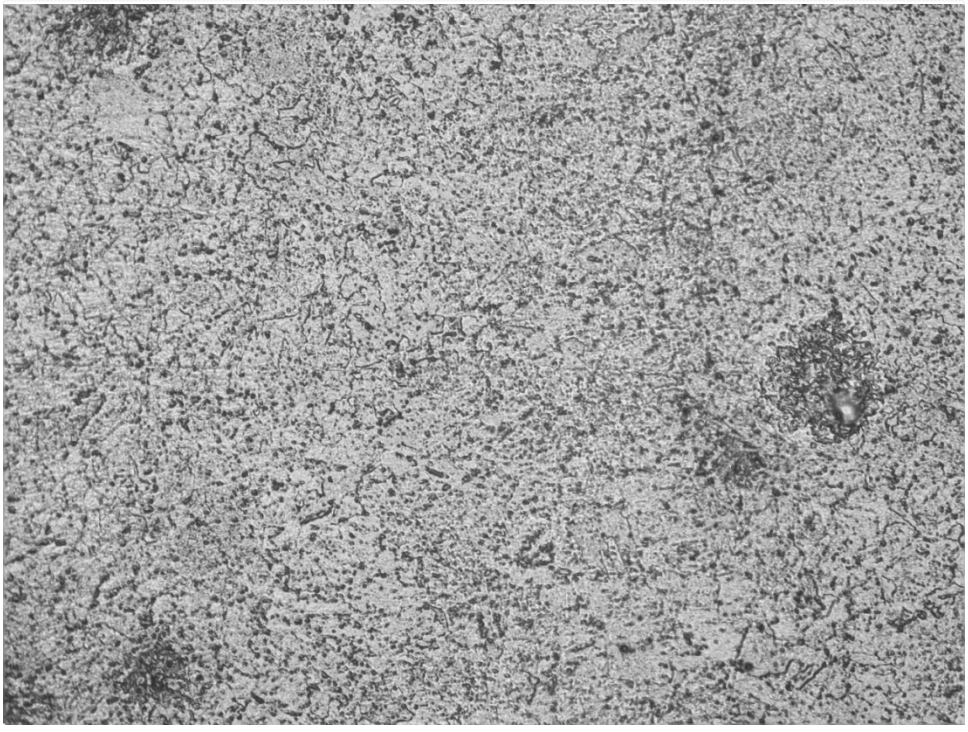

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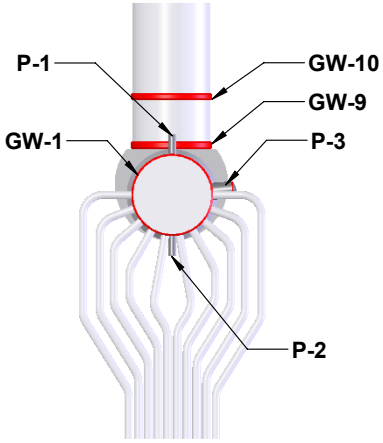
Fig. 30. Replica No. PSOH-R7.



Front View (Looking South)
Scale 1:40

Right View (Looking East)
56 Rows, 10 Tubes per row
Scale 1:70

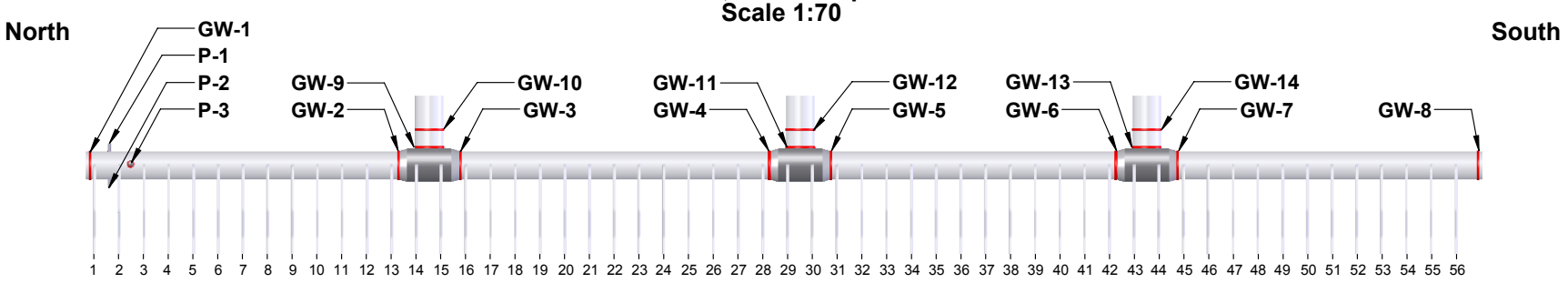
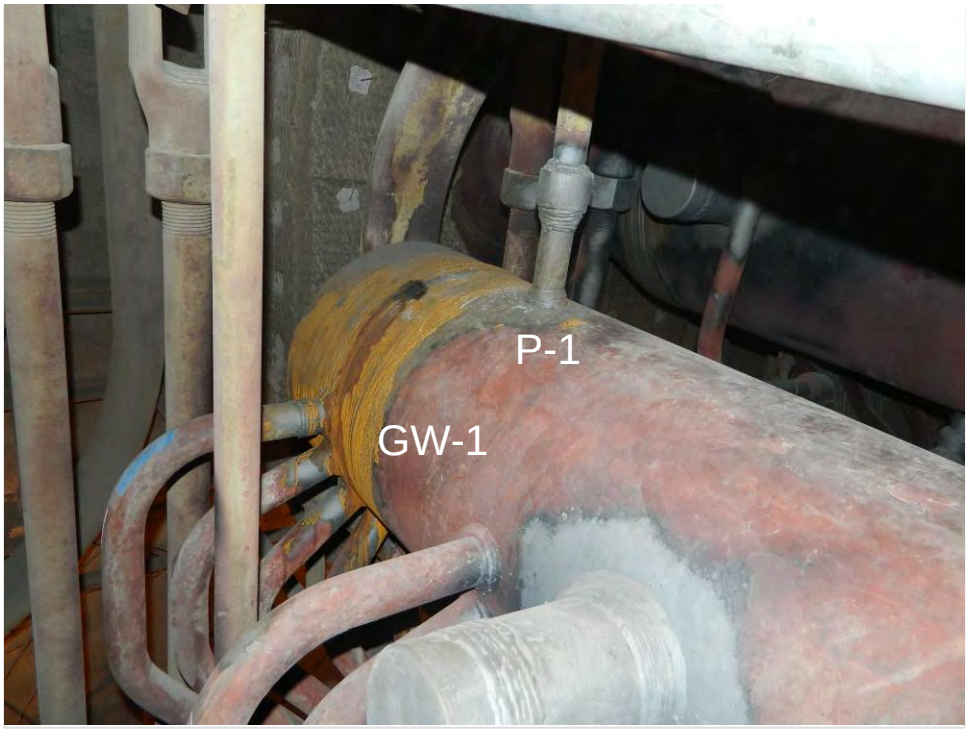


Fig. 31. A sketch of the Finishing Superheater Inlet header

Fig. 32. Photographs of the Finishing Superheater Inlet header and tubing.



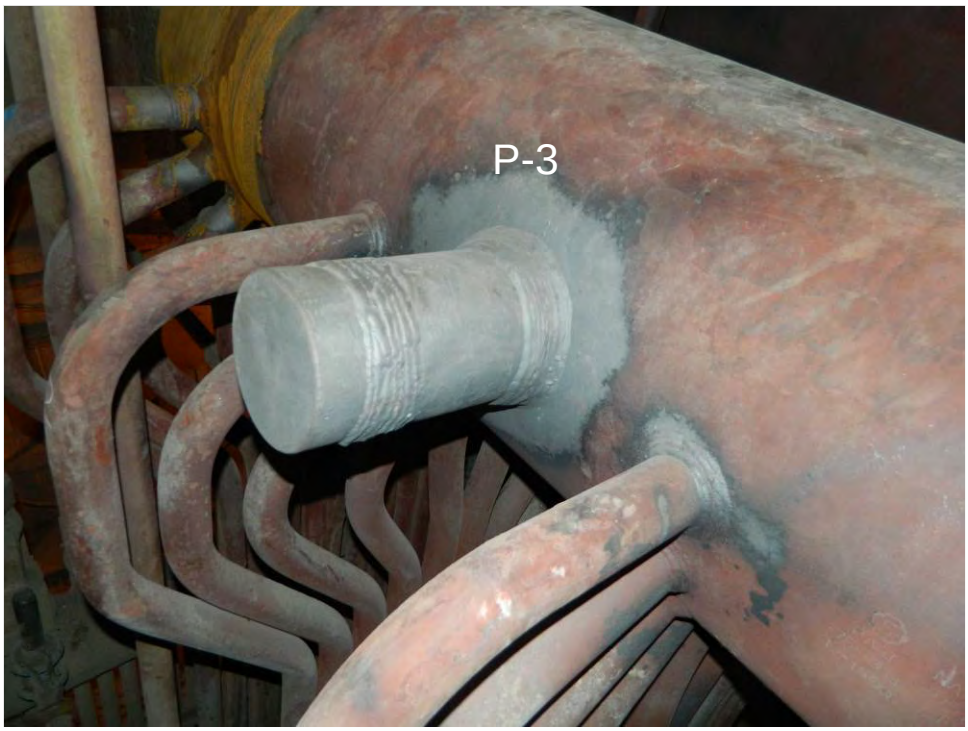


Fig. 33. Photographs of girth weld No. GW-1 and penetration Nos. P-1 and P-3 on the Finishing Superheater Inlet header.

Fig. 34.

Photographs of girth weld Nos. GW-2, GW-3, and GW-4 on the Finishing Superheater Inlet header.

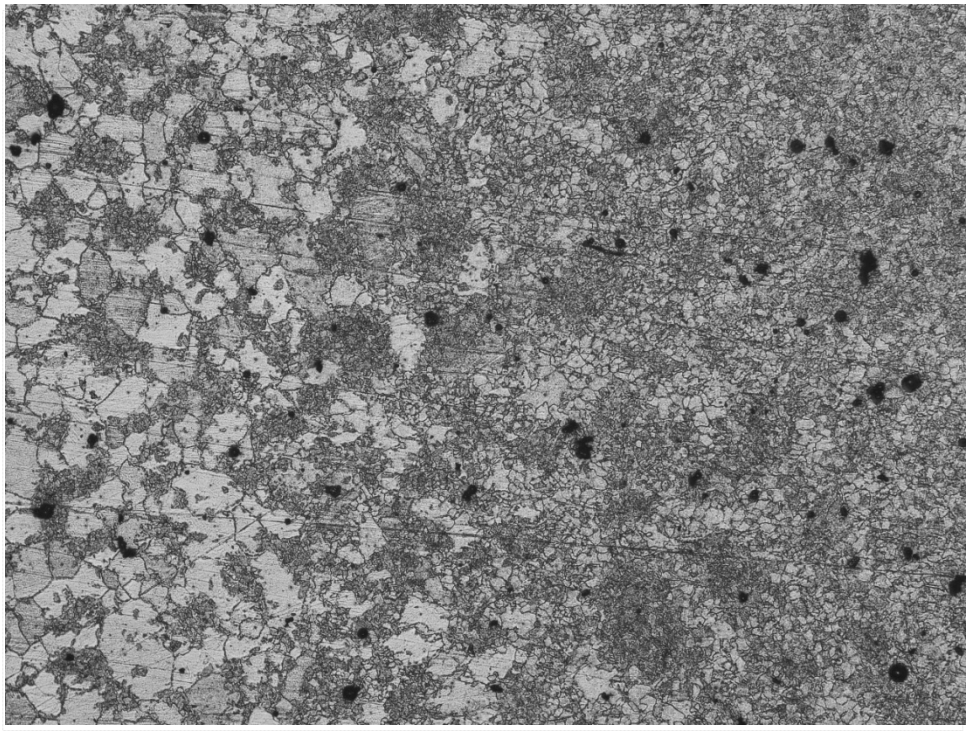
Fig. 35. Photographs of girth weld Nos. GW-5 and GW-6 on the Finishing Superheater Inlet header.

Fig. 36. Photographs of girth weld Nos. GW-7 and GW-8 on the Finishing Superheater Inlet header.

Fig. 37. Photographs of girth weld Nos.GW-9 and GW-10 on the Finishing Superheater Inlet header.

Fig. 38. Photographs of girth weld Nos.GW-11 and GW-12 on the Finishing Superheater Inlet header.

Fig. 39. Photographs of girth weld Nos. GW-13 and GW-14 on the Finishing Superheater Inlet header



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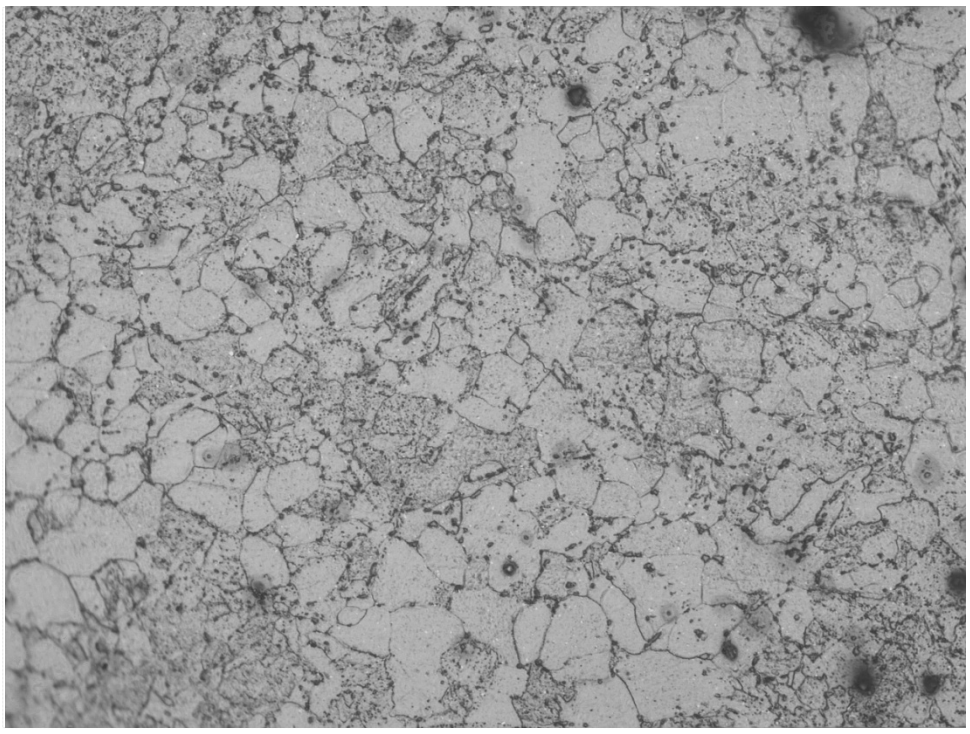

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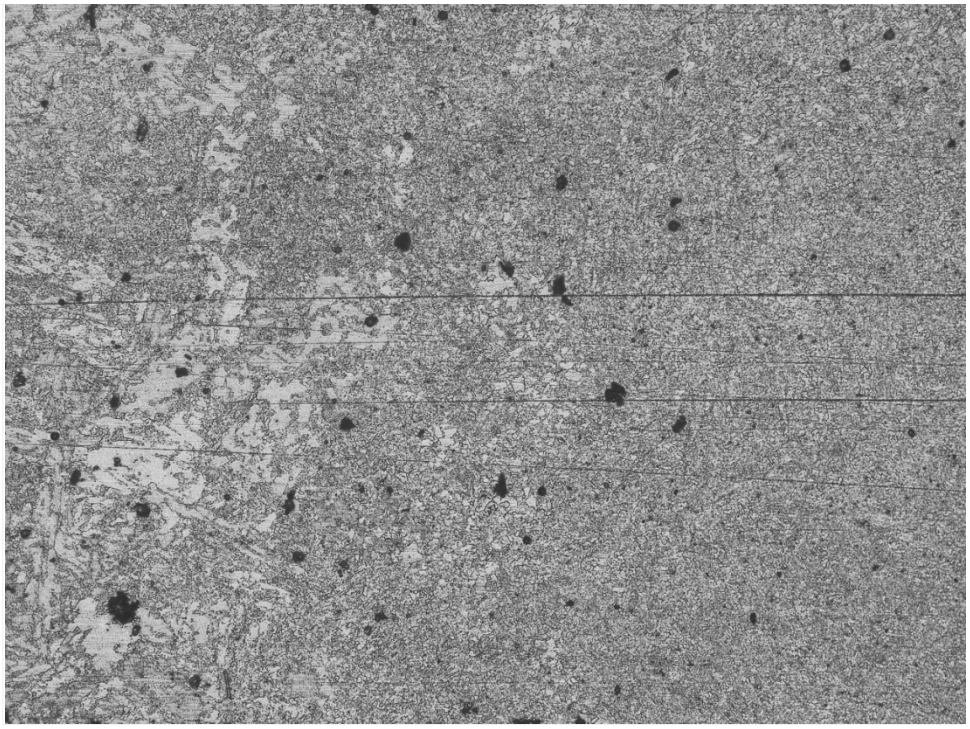
Fig. 40. Replica No. FSIH-R1.



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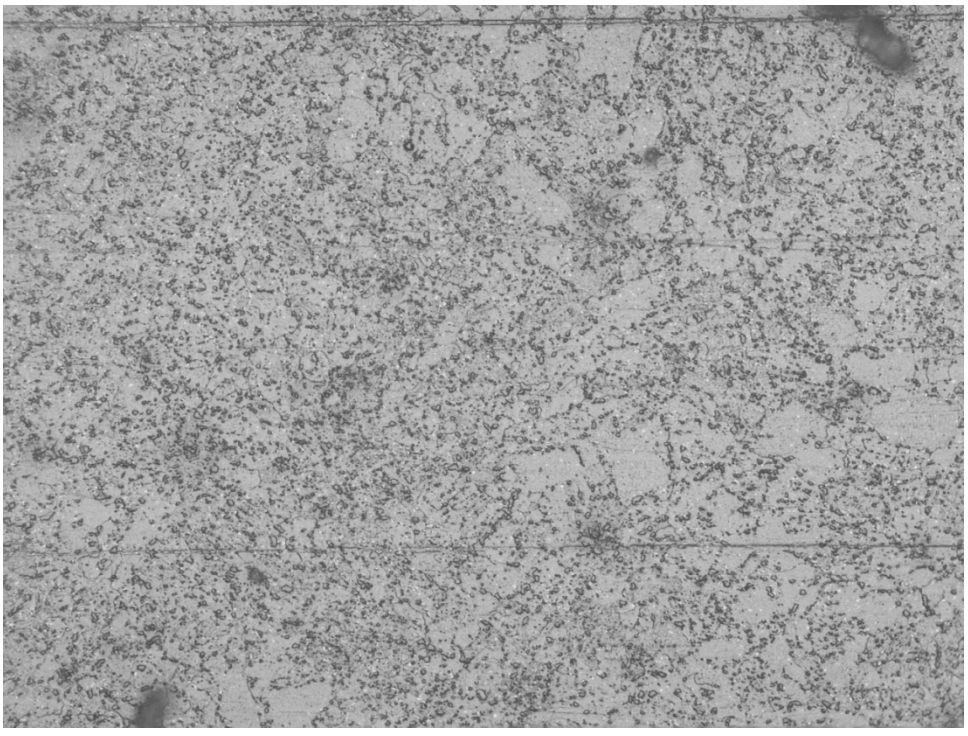
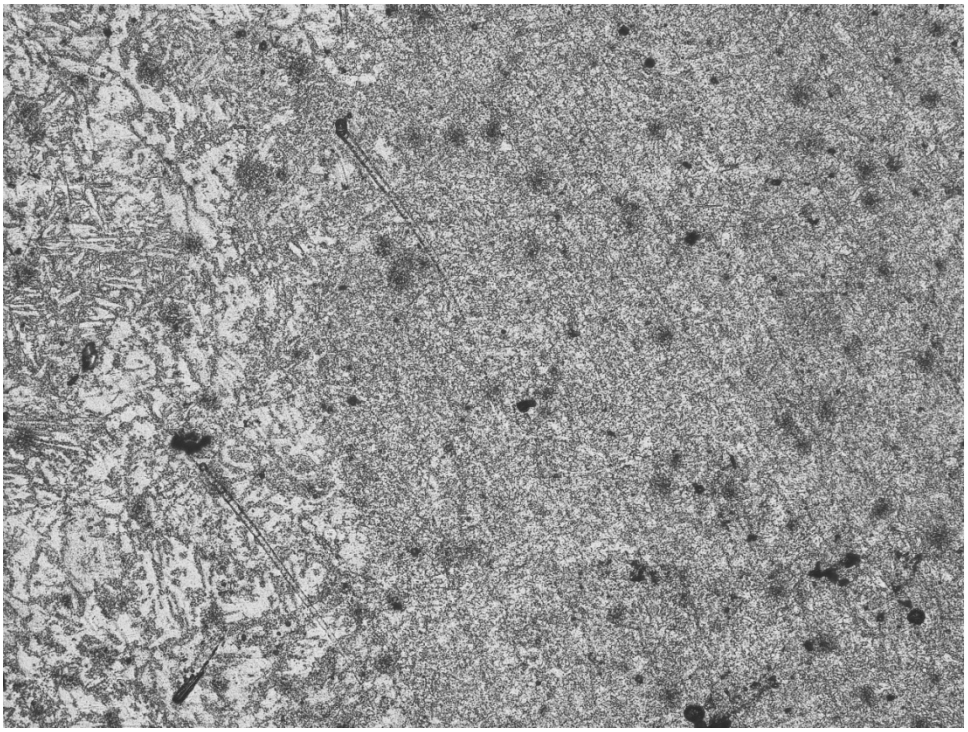
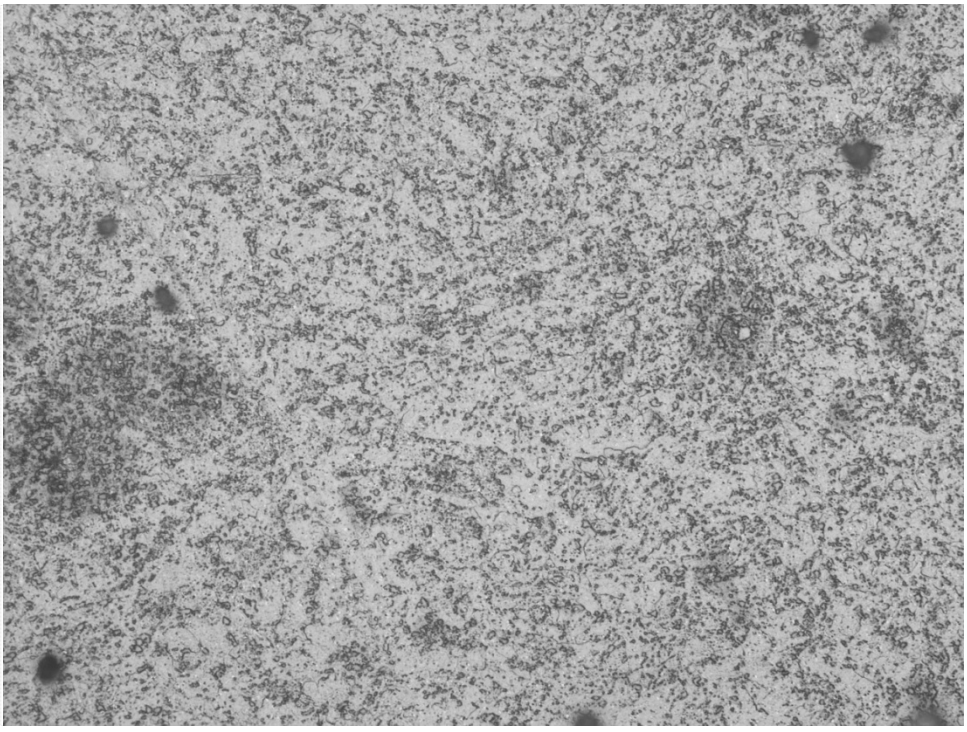


500X

Fig. 41. Replica No. FSIH-R2.

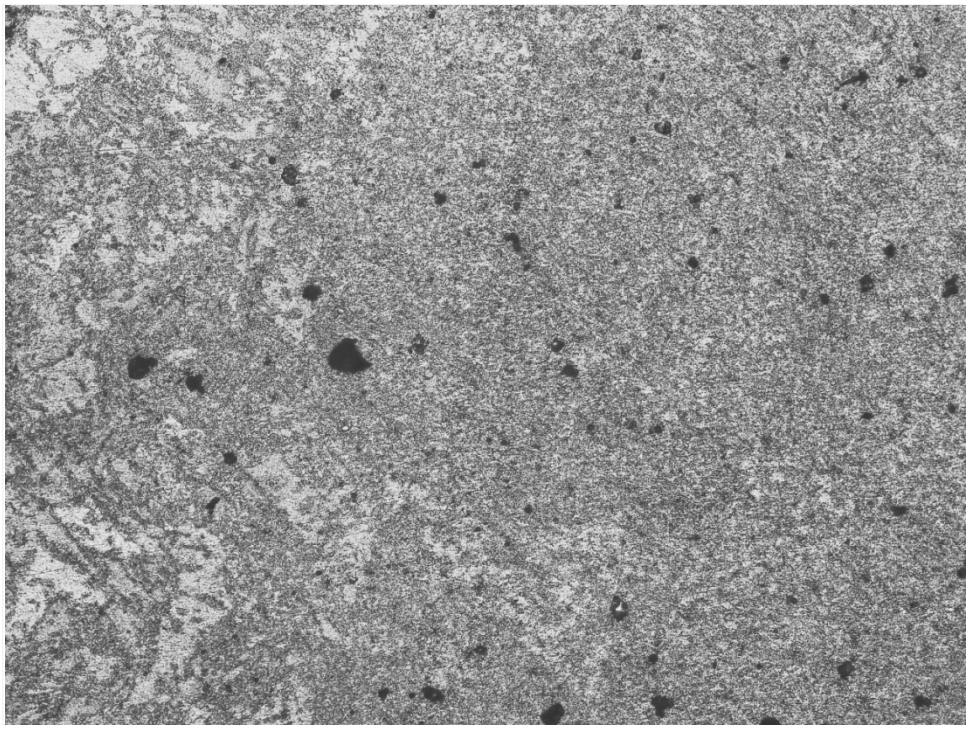


100X

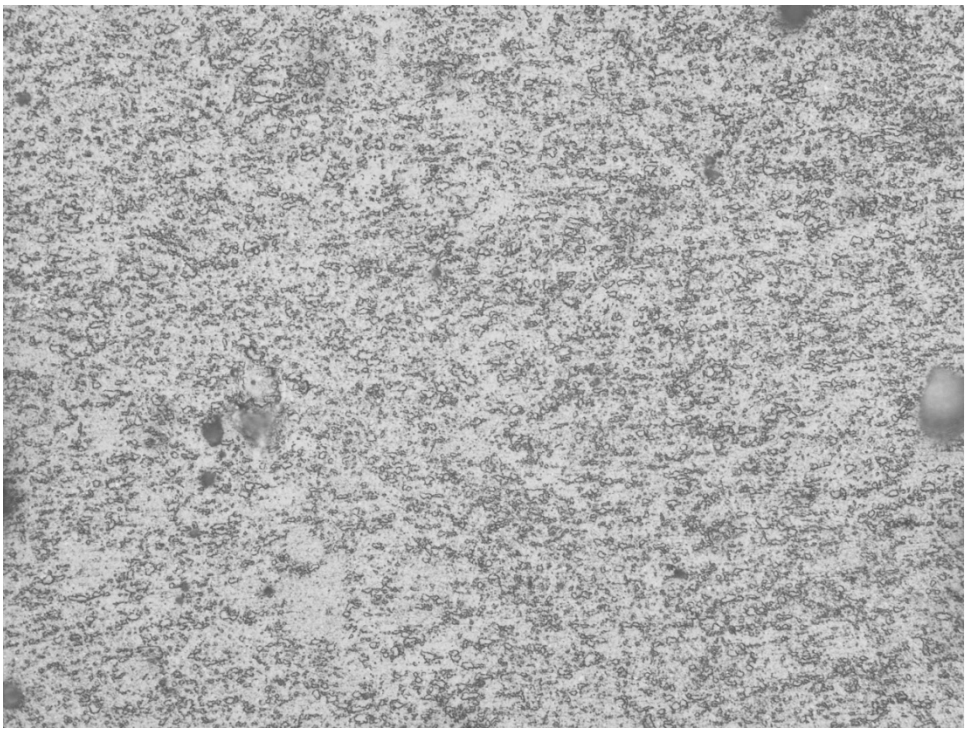


500X

Fig. 42. Replica No. FSIH-R3.

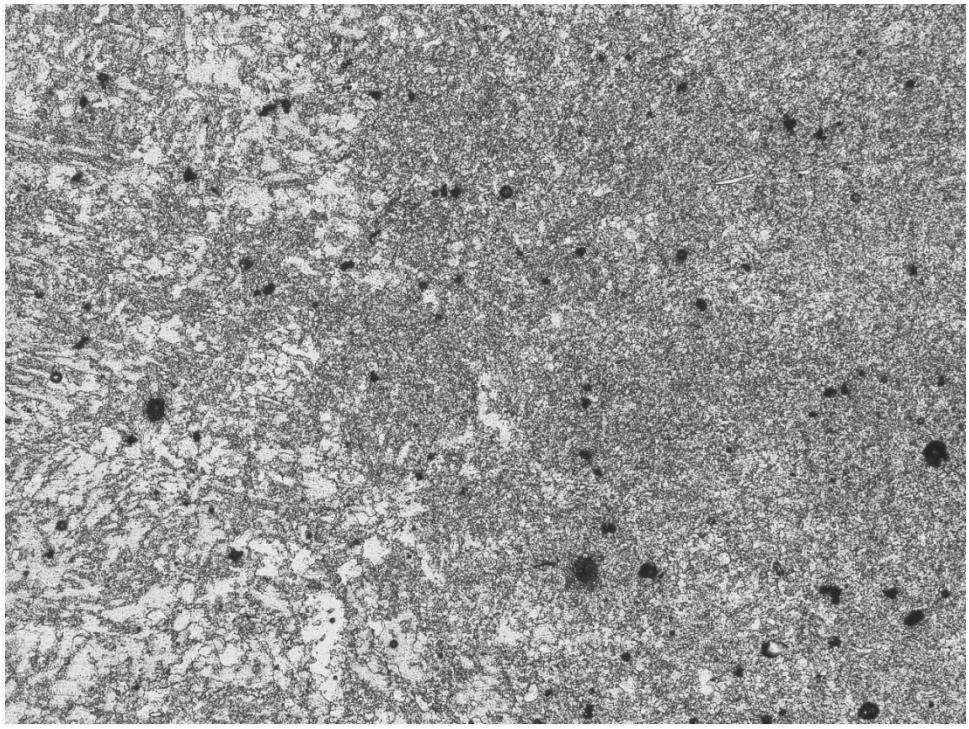


100X

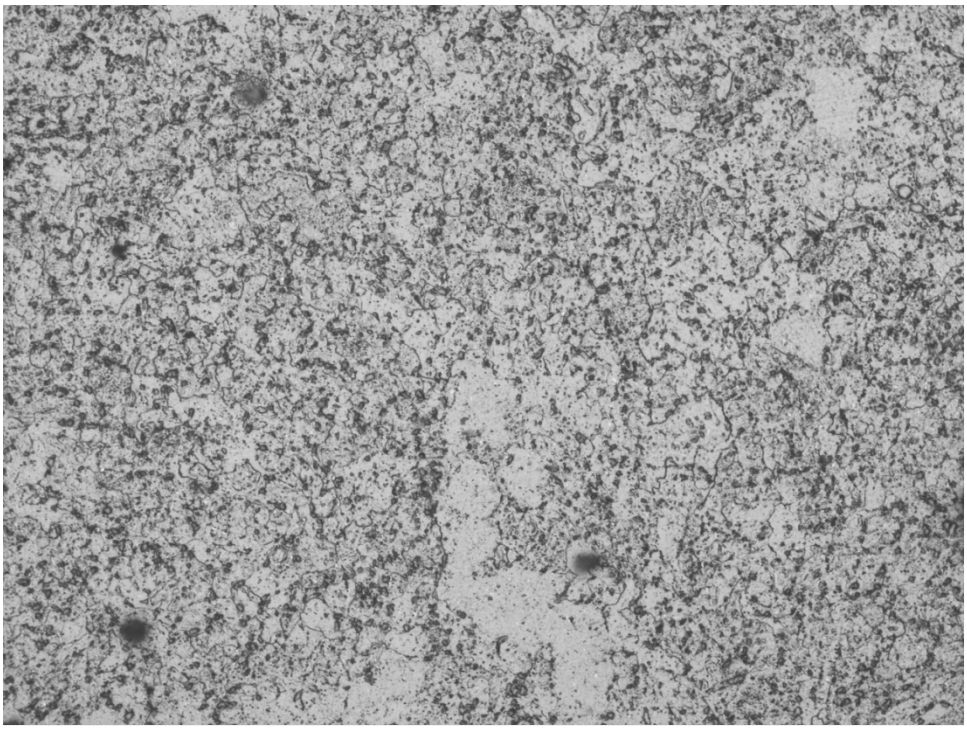


500X

Fig. 43. Replica No. FSIH-R4.

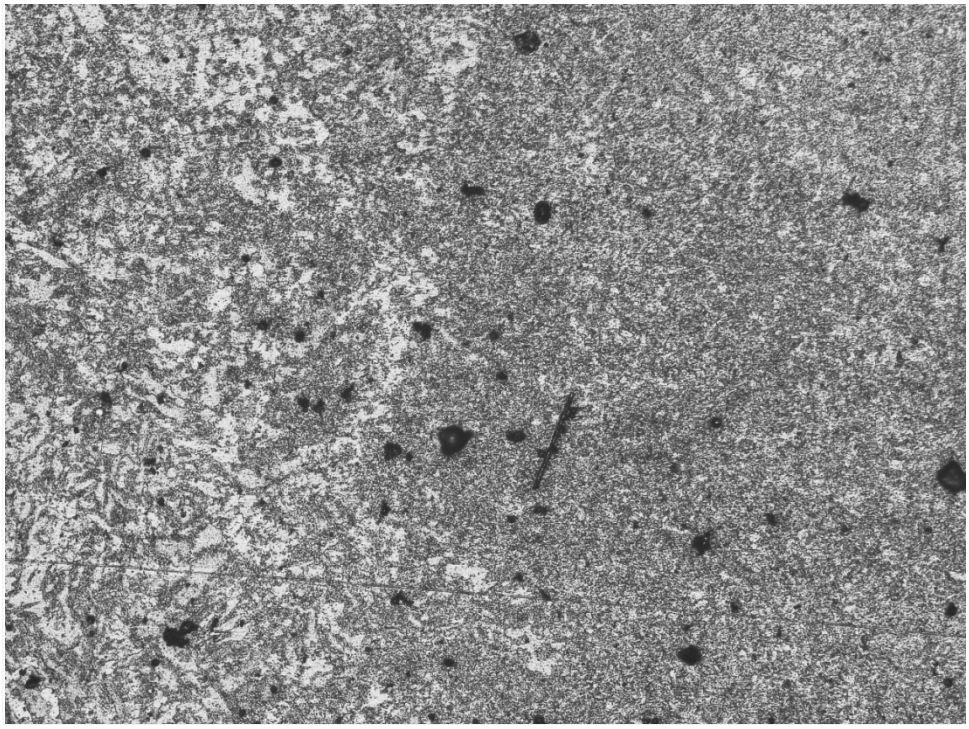


100X

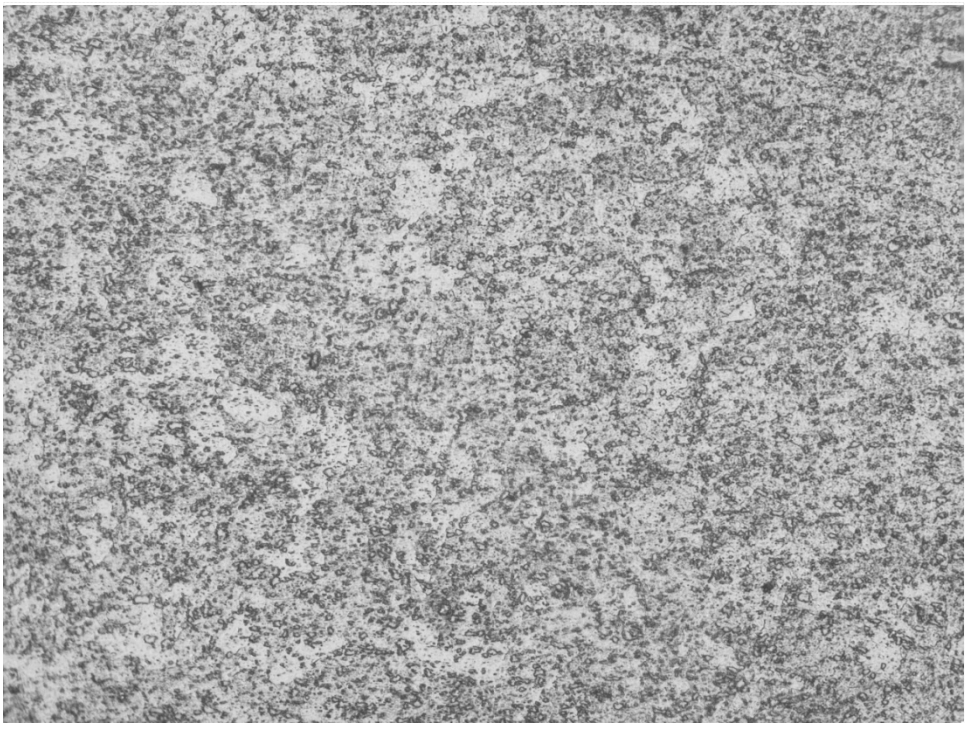


500X

Fig. 44. Replica No. FSIH-R5.

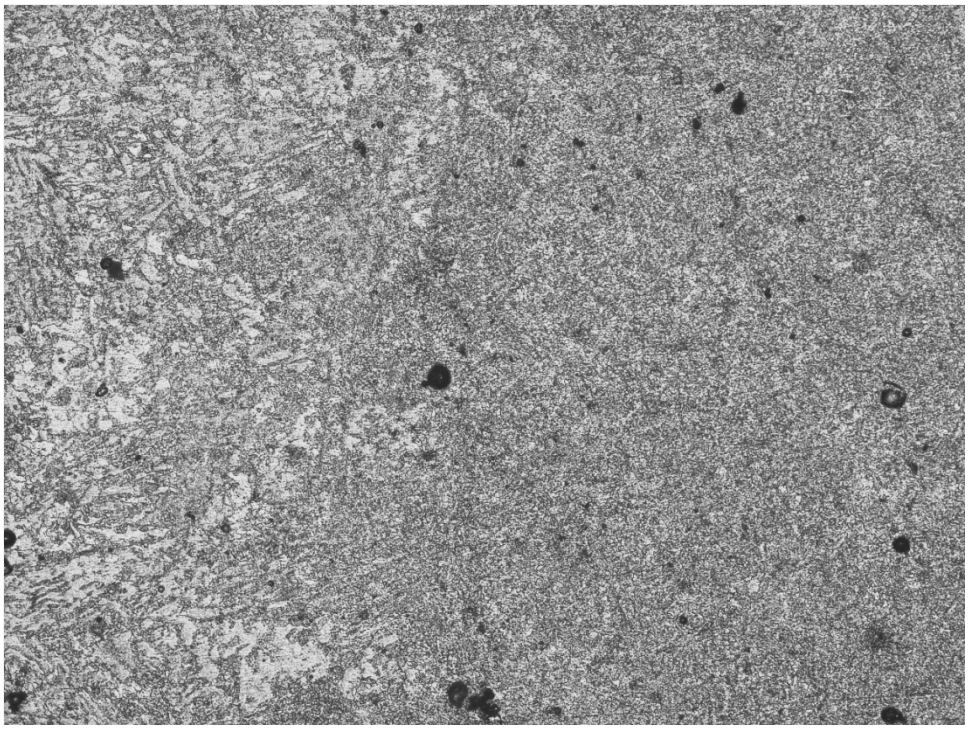


100X



500X

Fig. 45. Replica No. FSIH-R6.



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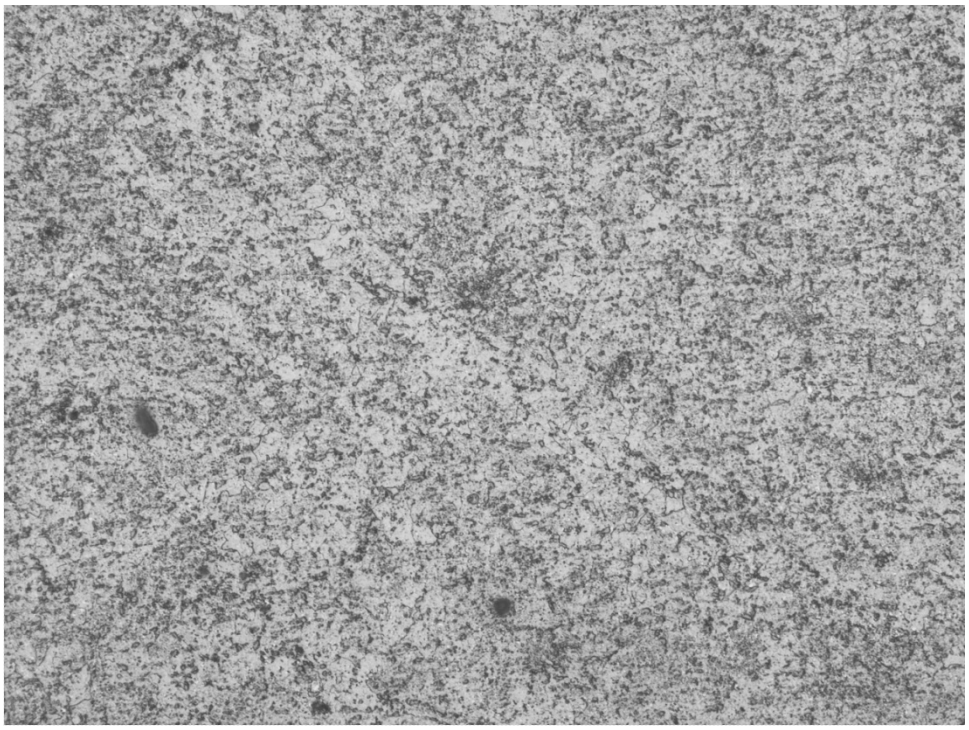
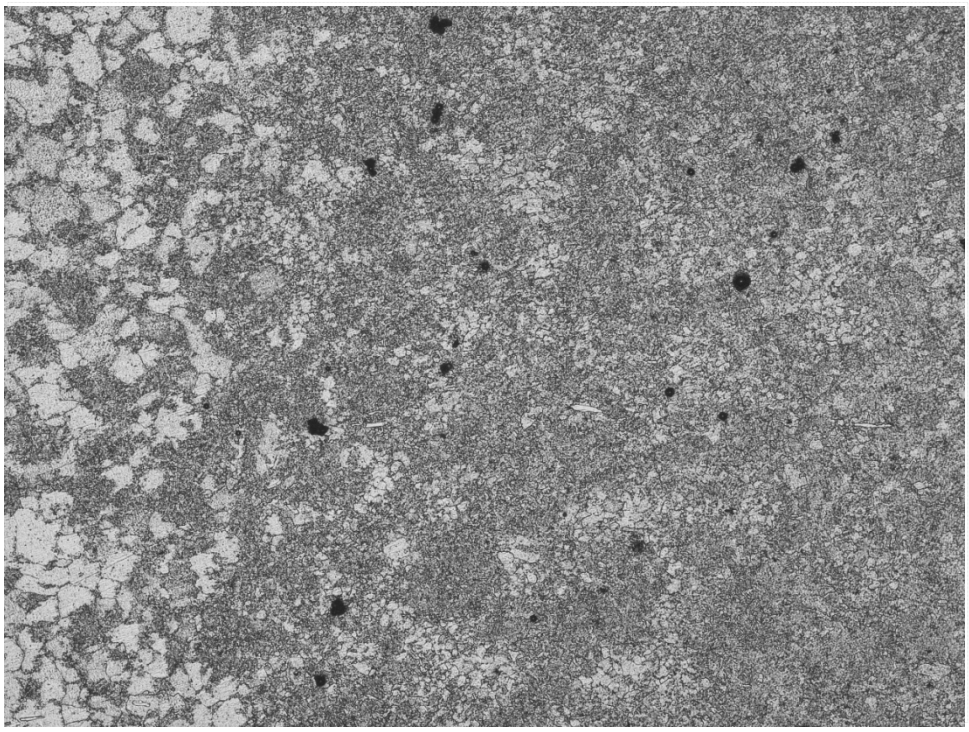


500X

Fig. 46. Replica No. FSIH-R7.



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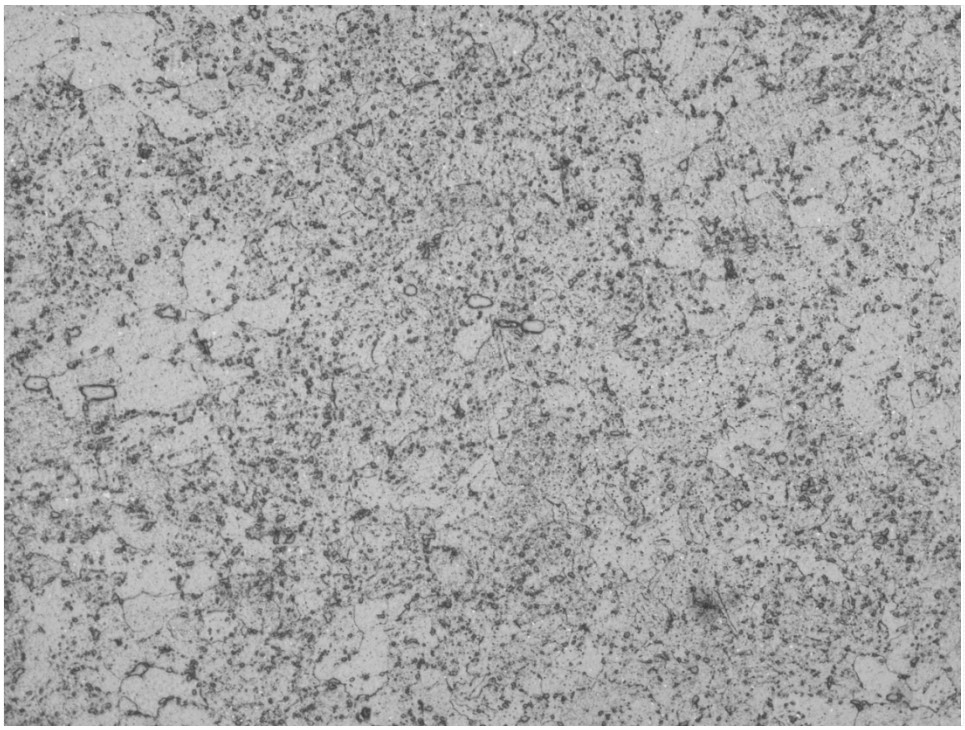
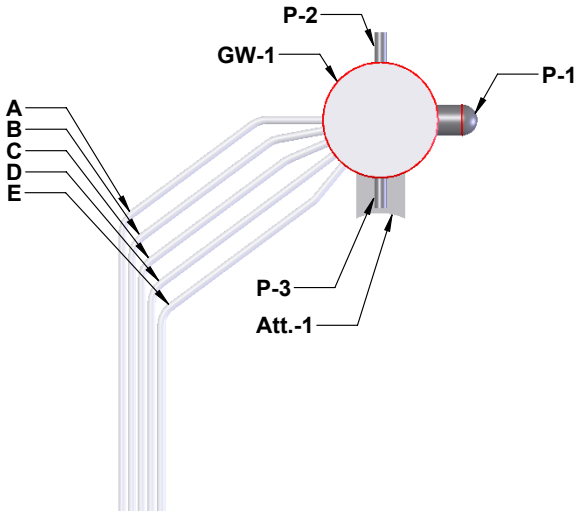


500X

Fig. 47. Replica No. FSIH-R8.



Front Veiw (Looking South)
Scale 1:40

Right Veiw (Looking East)
56 Rows, 5 Tubes per row
Scale 1:70

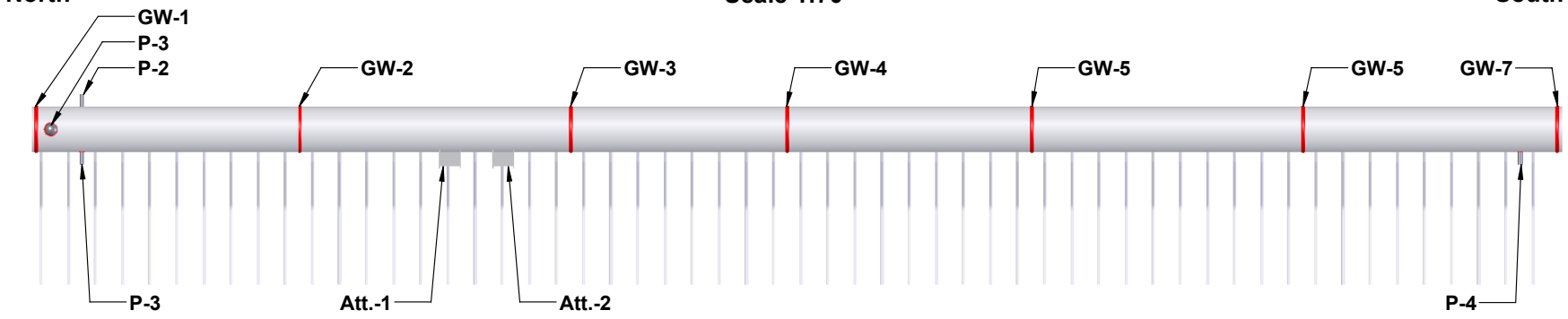


Fig. 48. An overall sketch of the Upper Finishing Superheater Outlet

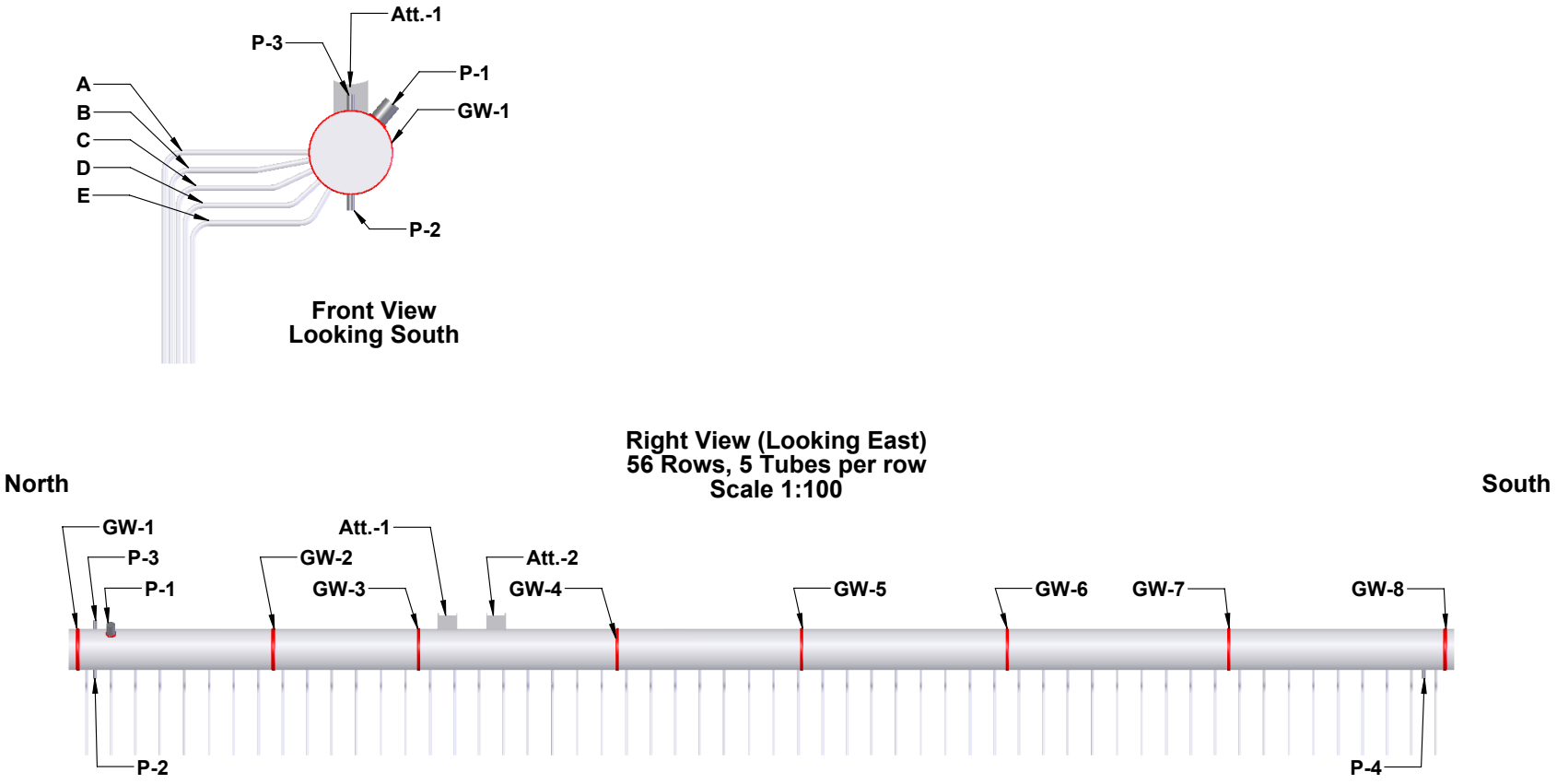


Fig. 49. An overall sketch of the Lower Finishing Superheater Outlet

Fig. 50.

Photographs of penetration No. P-1 and girth weld Nos. GW-1, GW-2, and GW-3 on the Upper Finishing Superheater Outlet header.

Fig. 51. Photographs of girth weld Nos. GW-4 and GW-5 on the Upper Finishing Superheater Outlet header.

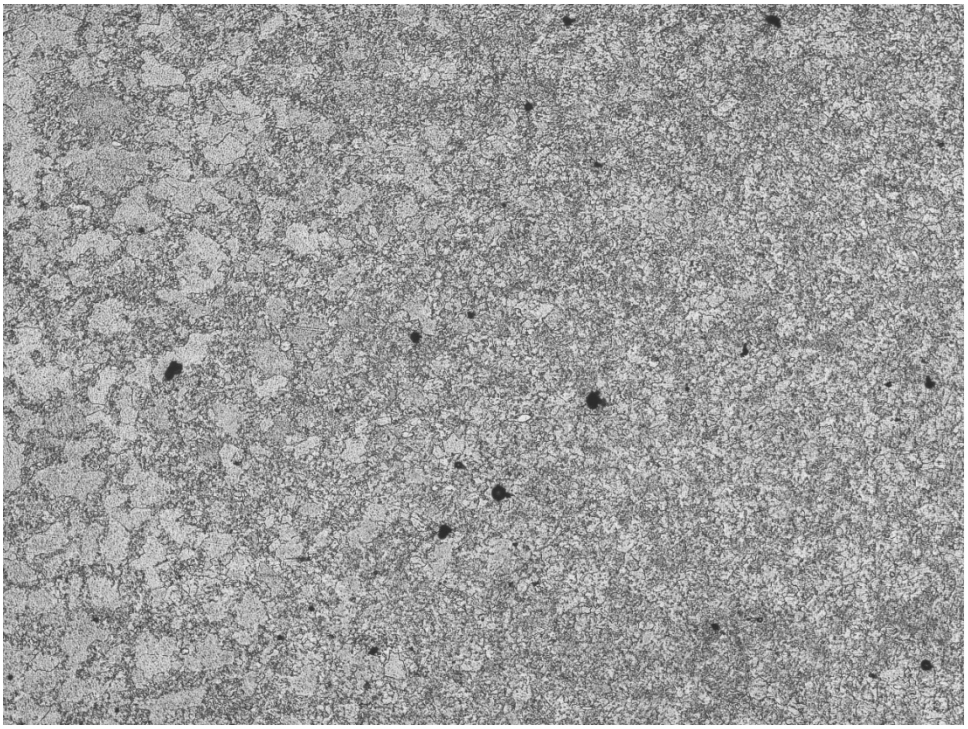
Fig. 52. Photographs of girth weld Nos. GW-6 and GW-7 on the Upper Finishing Superheater Outlet header.

Fig. 53. Photographs of penetration Nos. P-1, P-2, and girth weld Nos. GW-1 and GW-2 on the Lower Finishing Superheater Outlet header.

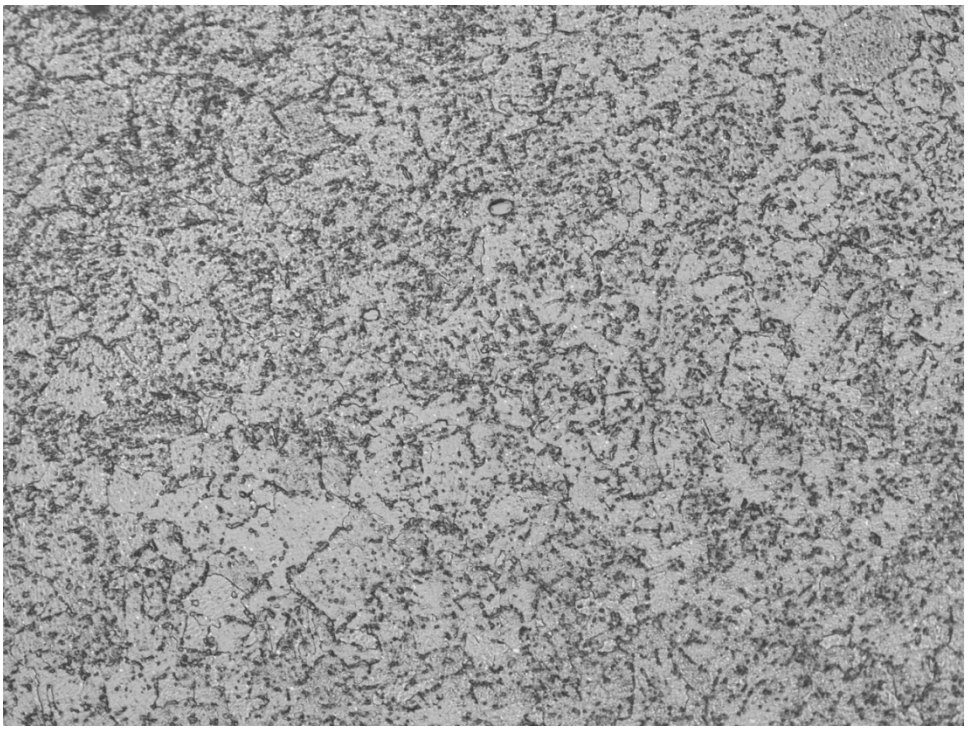
Fig. 54. Photographs of girth weld Nos. GW-3 and GW-4 on the Lower Finishing Superheater Outlet header.

Fig. 55. Photographs of girth weld Nos. GW-5 and GW-6 on the Lower Finishing Superheater Outlet header.

Fig. 56. Photographs of girth weld Nos. GW-7 and GW-8 on the Lower Finishing Superheater Outlet header.

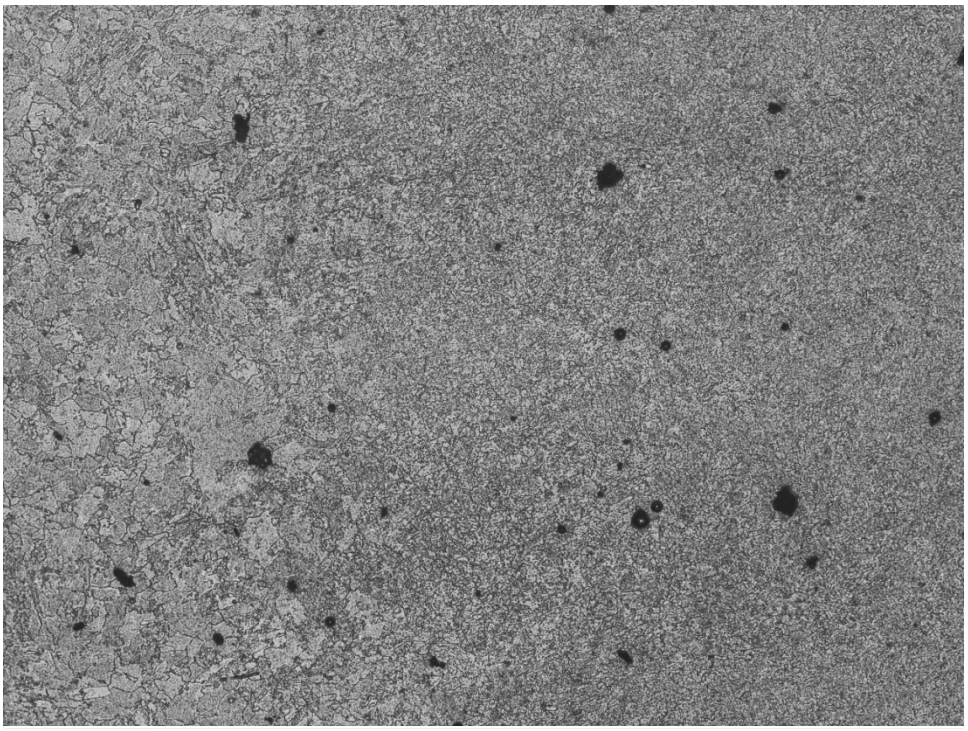


100X

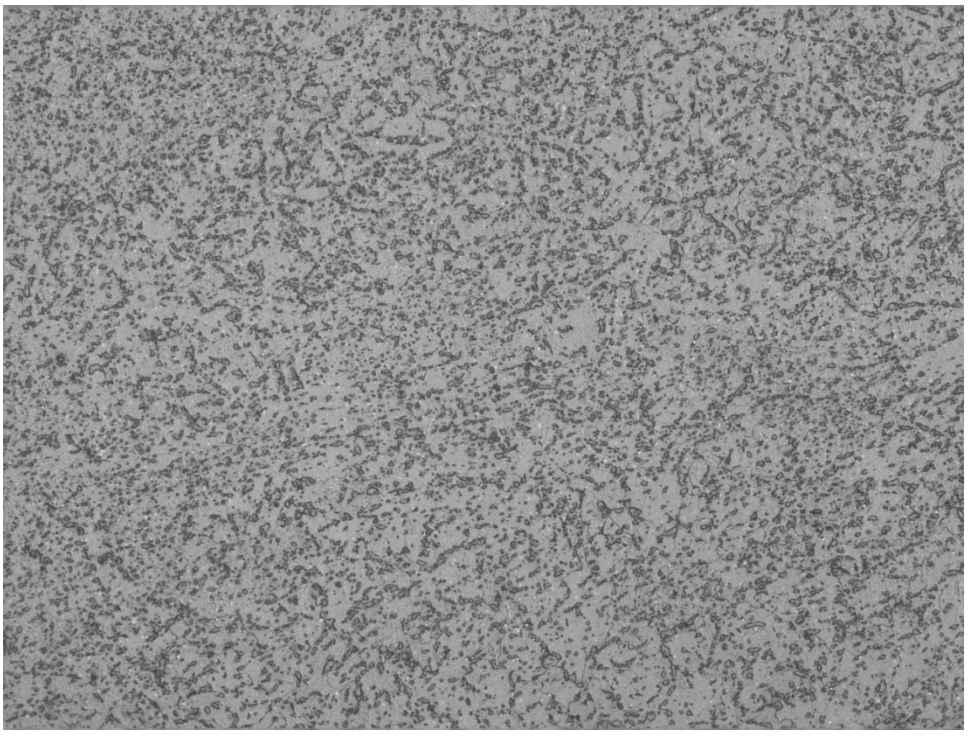


500X

Fig. 57. Replica No. FSOH-UPR-R1.

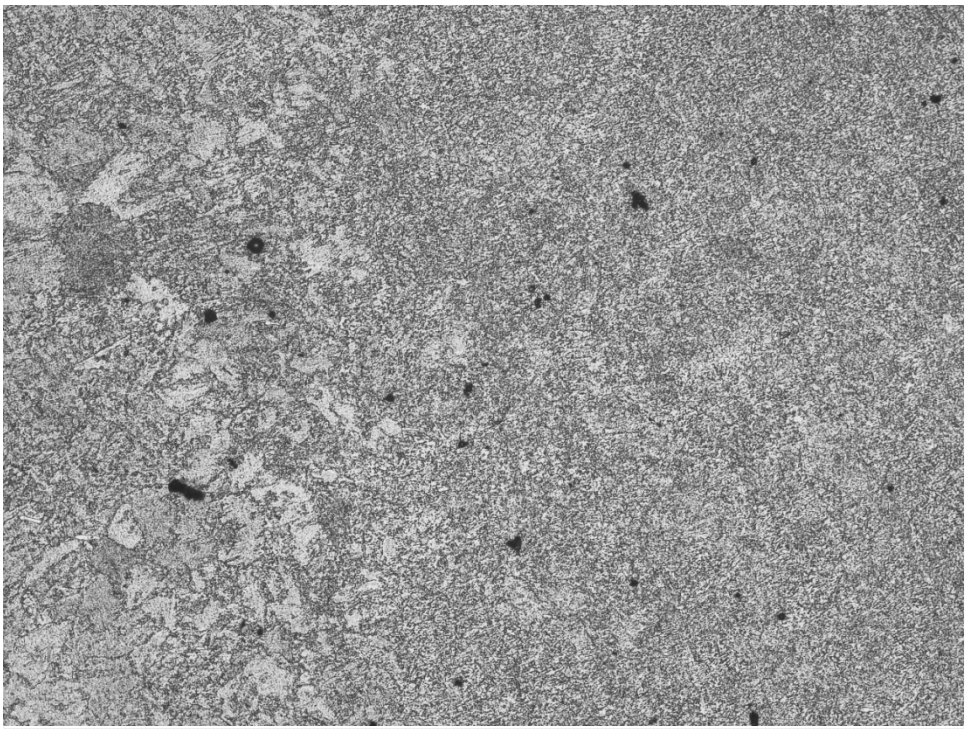


100X



500X

Fig. 58. Replica No. FSOH-UPR-R2.



100X

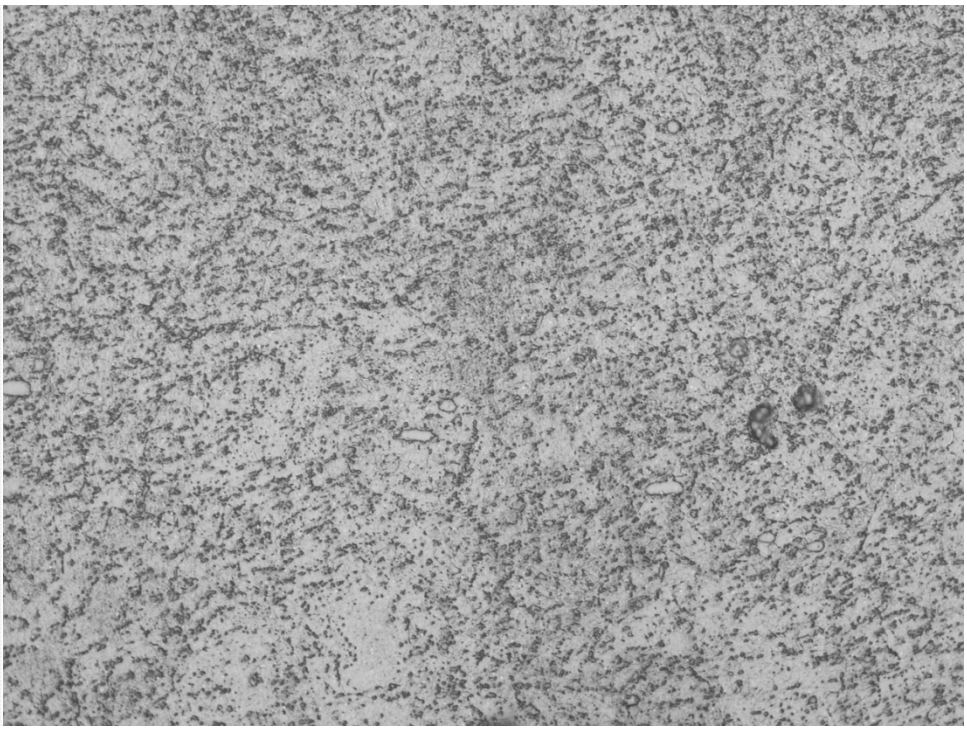


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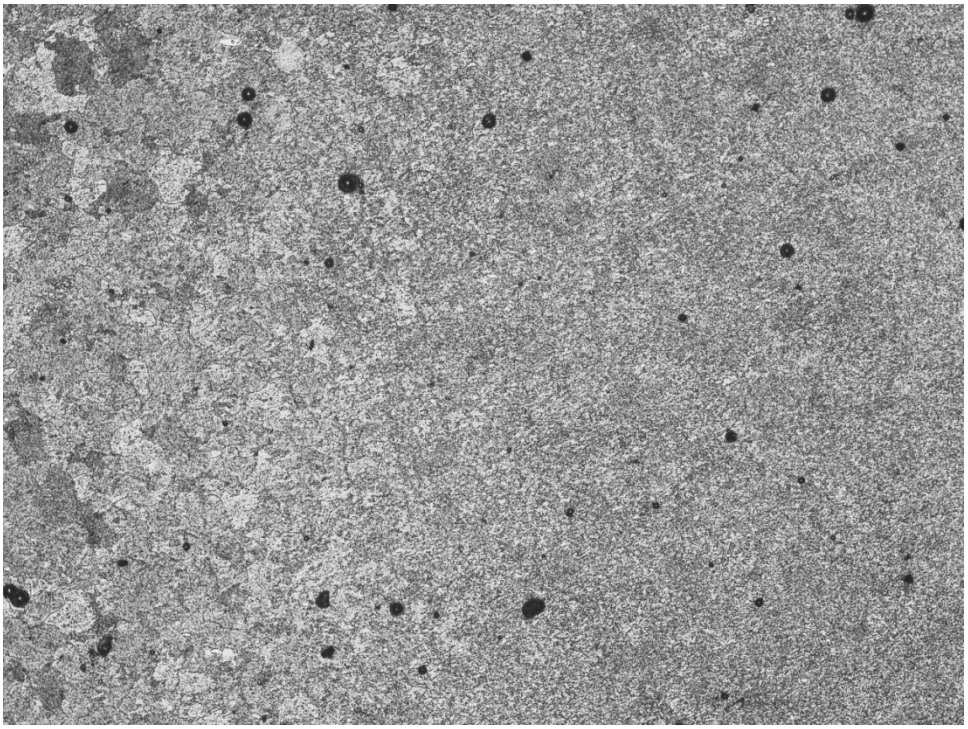
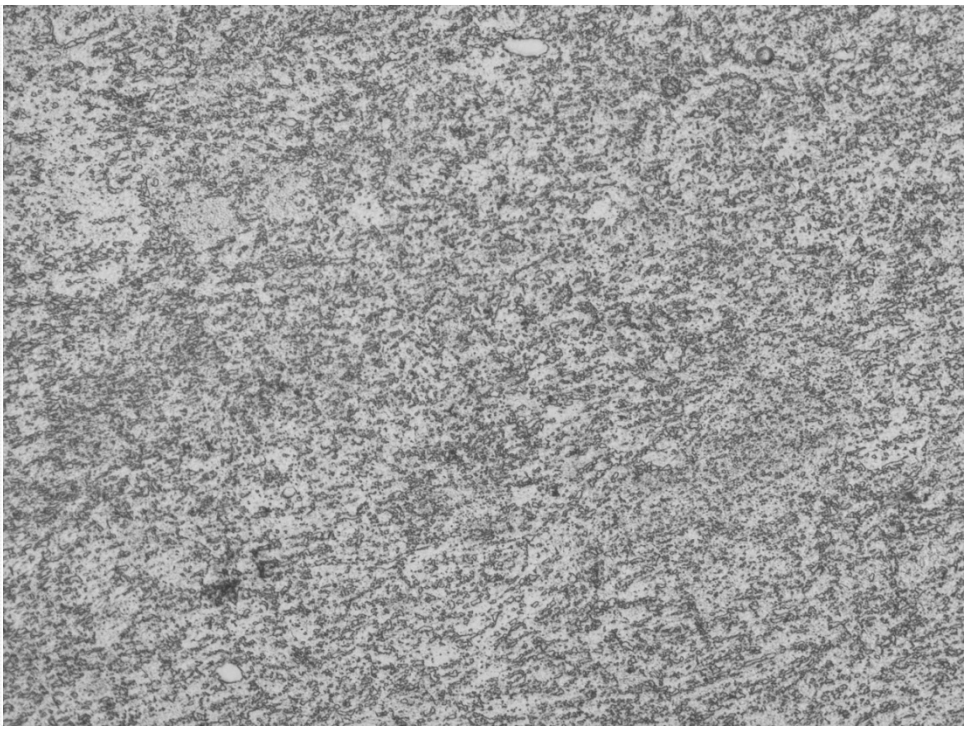
Fig. 59. Replica No. FSOH-UPR-R3.

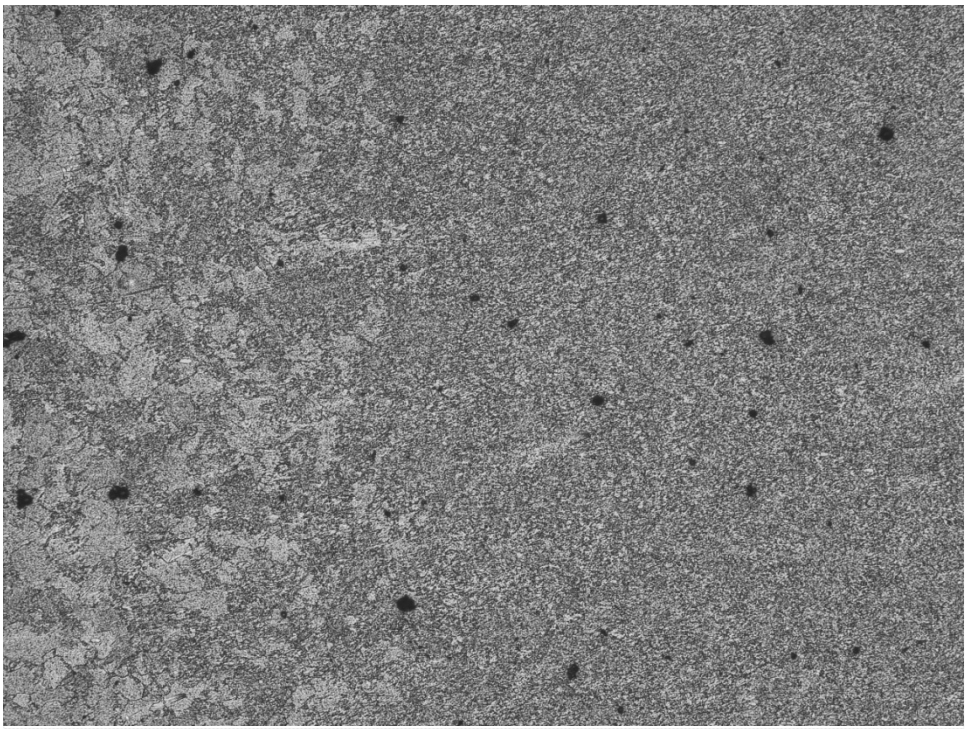


100X

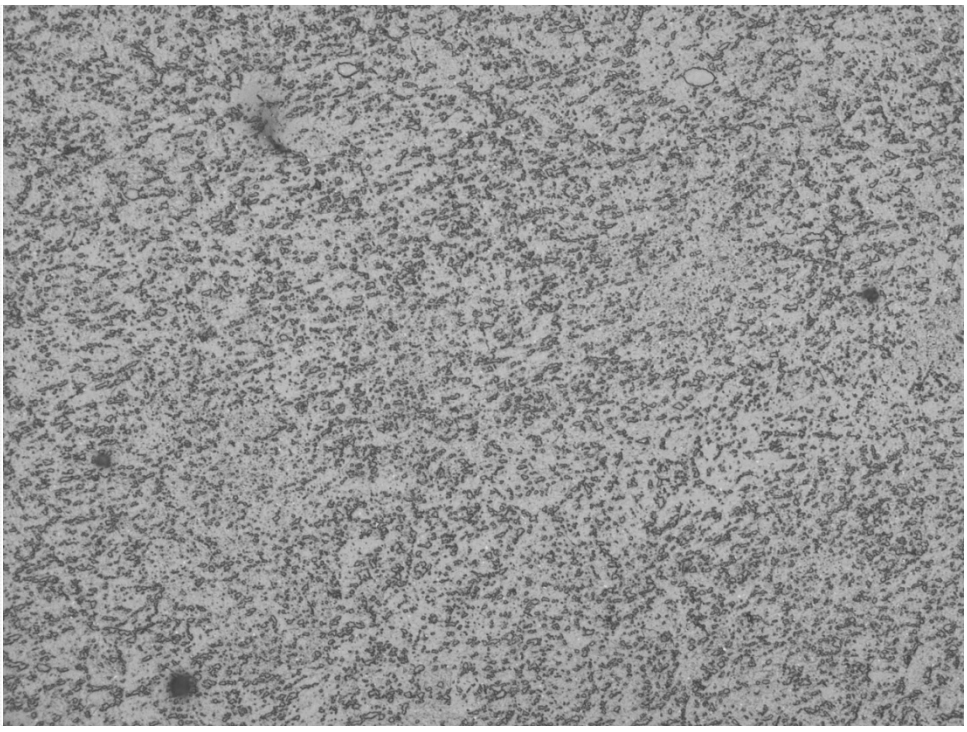


500X

Fig. 60. Replica No. FSOH-UPR-R4.

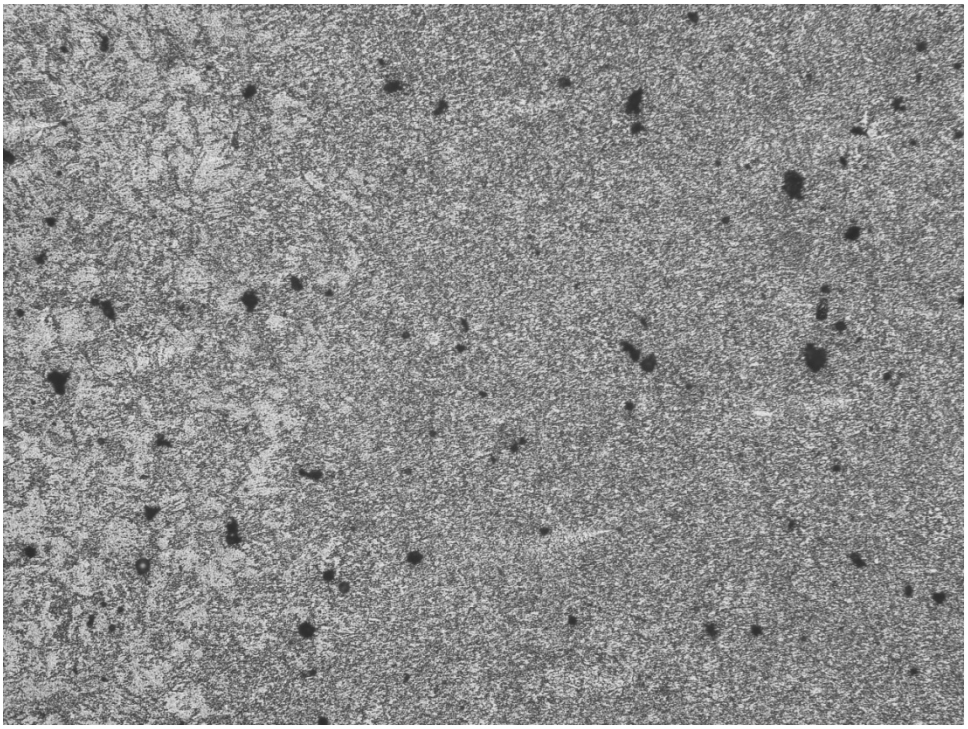


100X

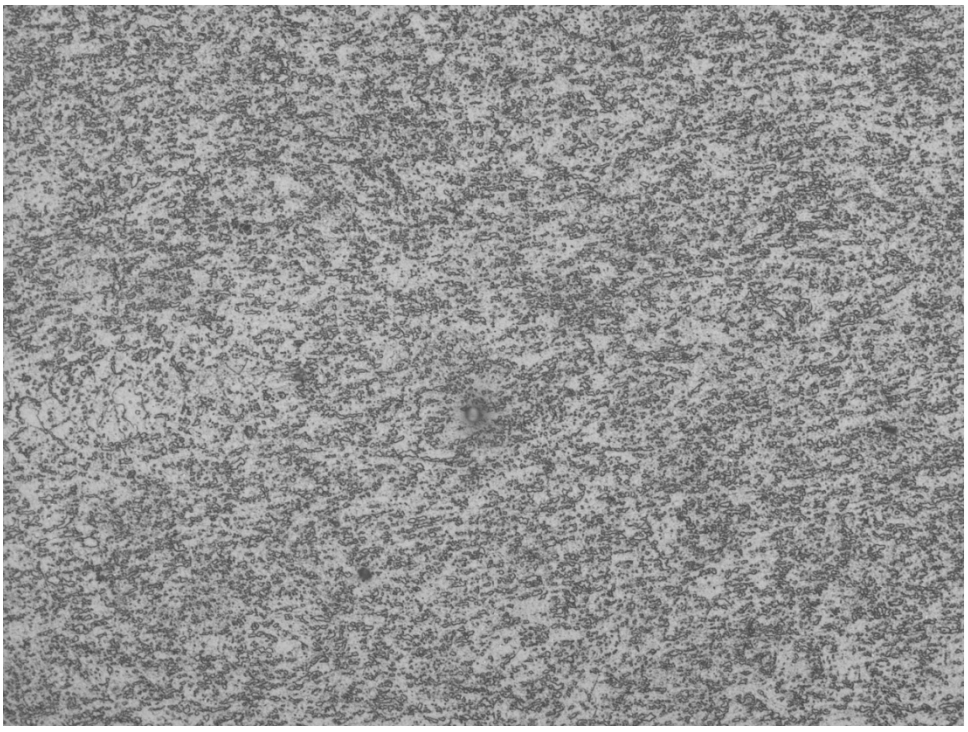


500X

Fig. 61. Replica No. FSOH-UPR-R5.

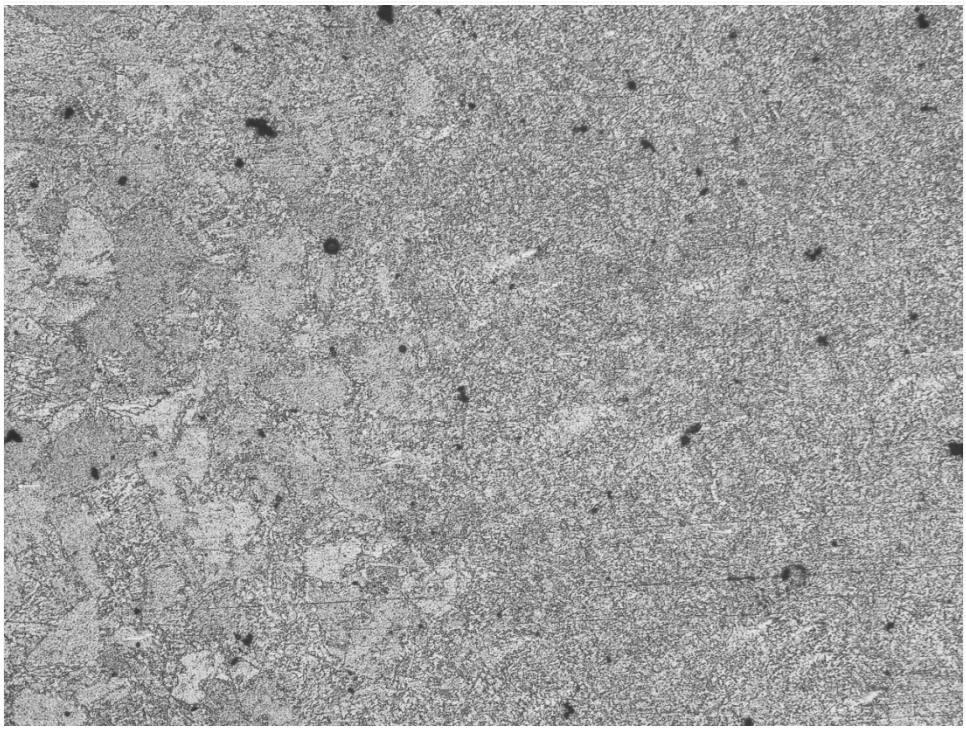


100X

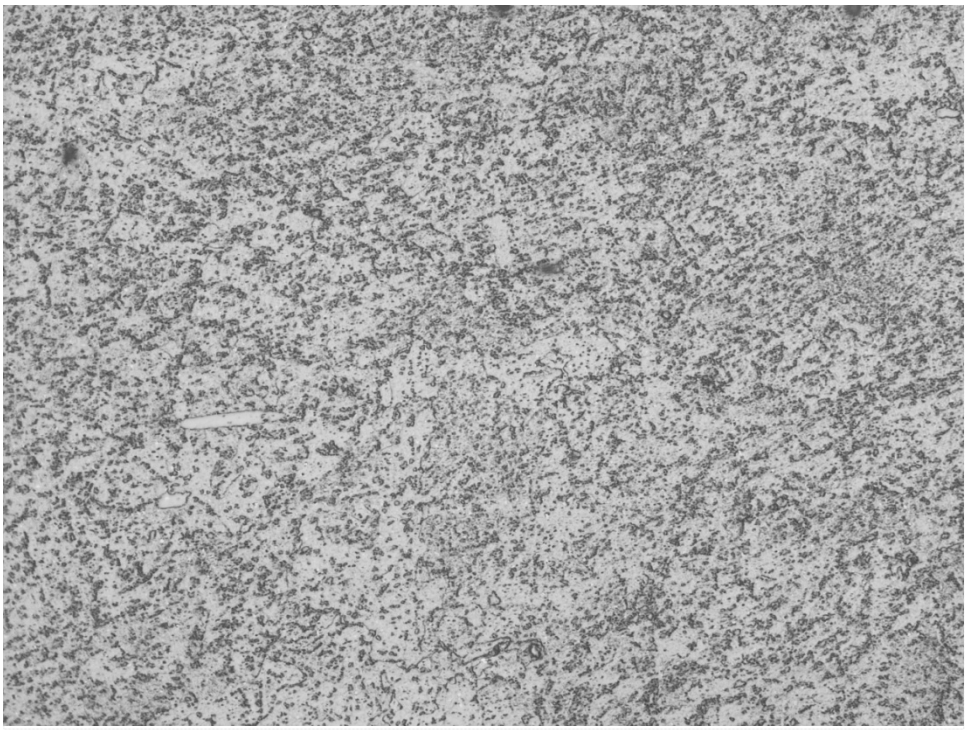


500X

Fig. 62. Replica No. FSOH-UPR-R6.

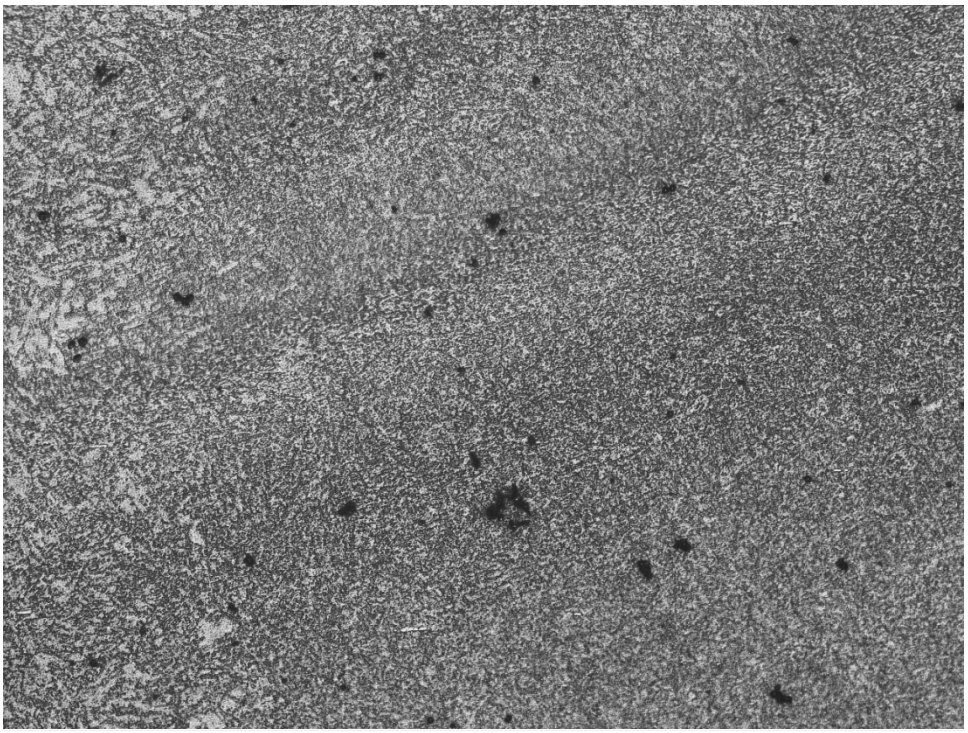


100X

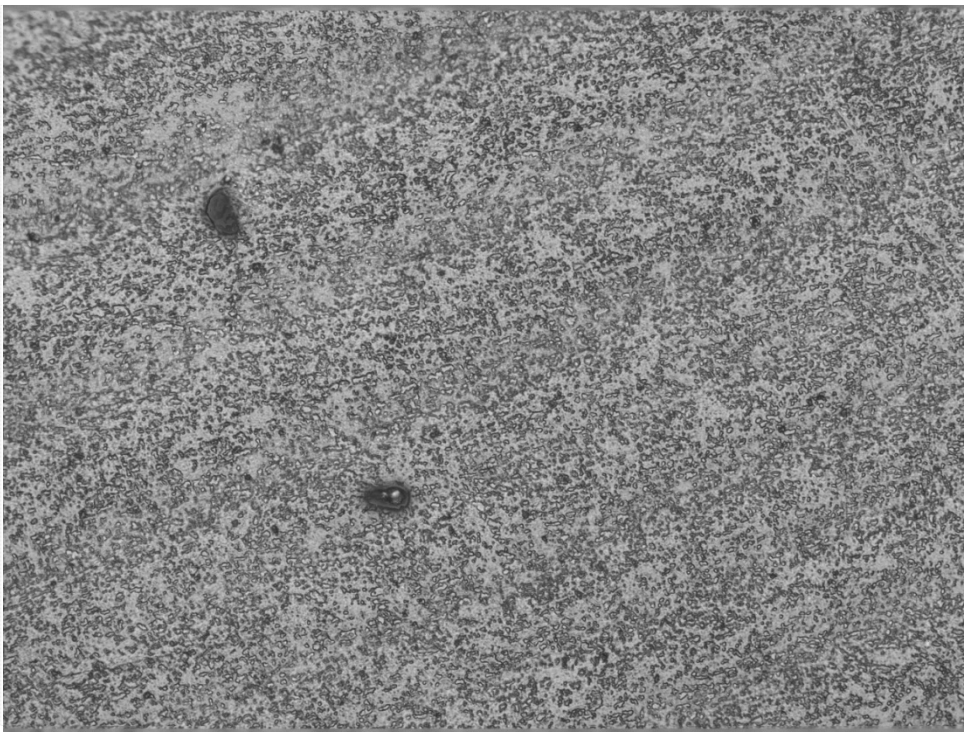


500X

Fig. 63. Replica No. FSOH-UPR-R7.

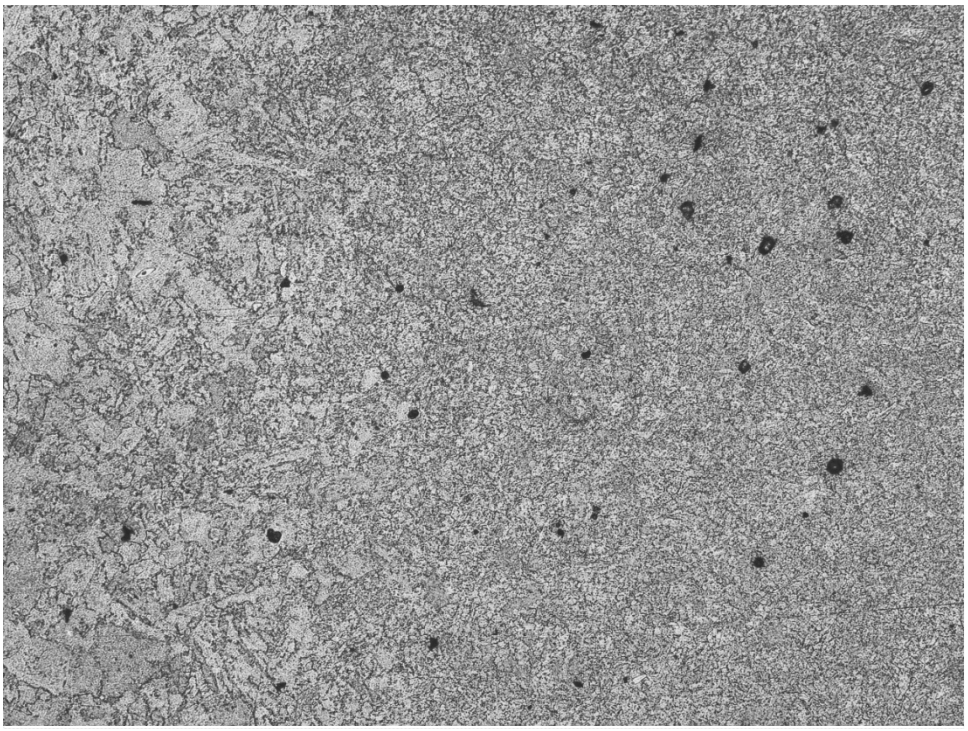


100X

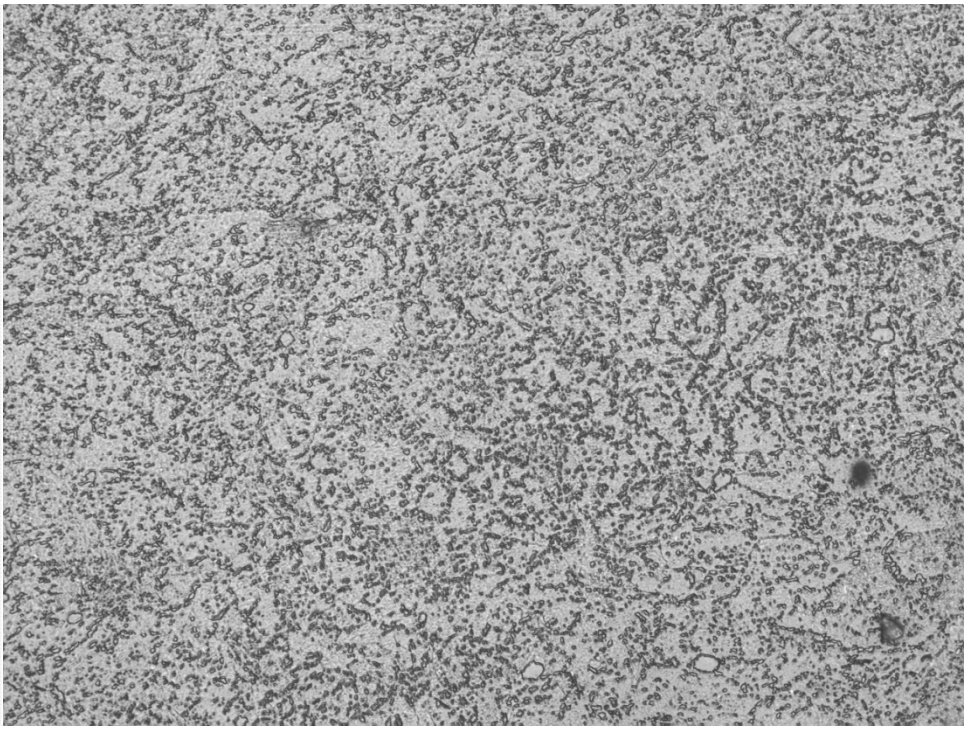


500X

Fig. 64. Replica No. FSOH-LWR-R1.

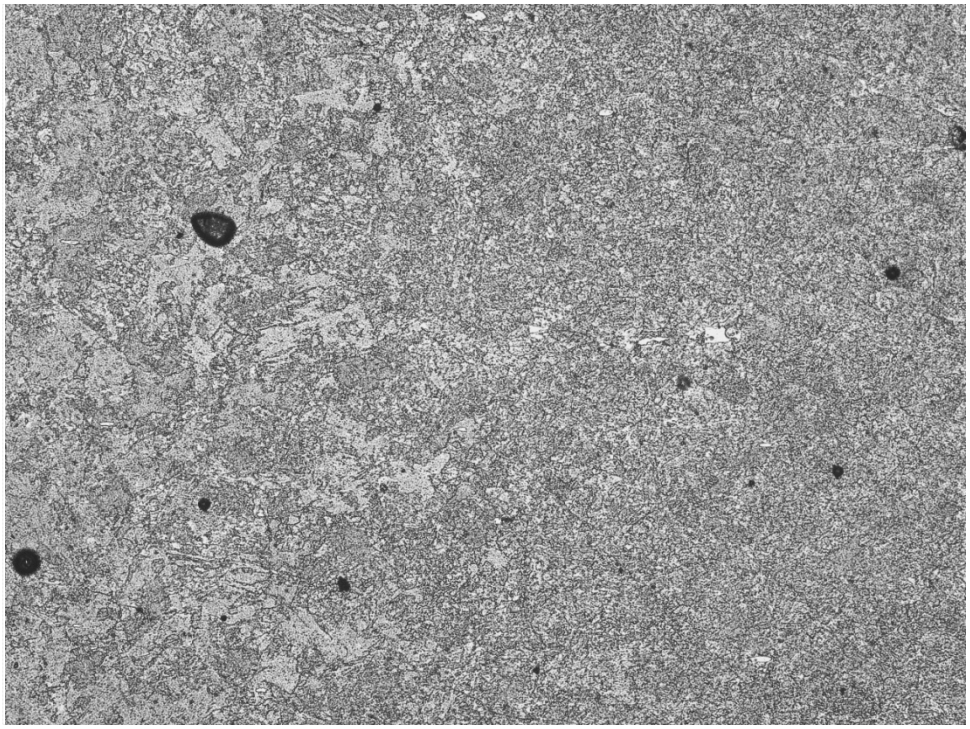


100X

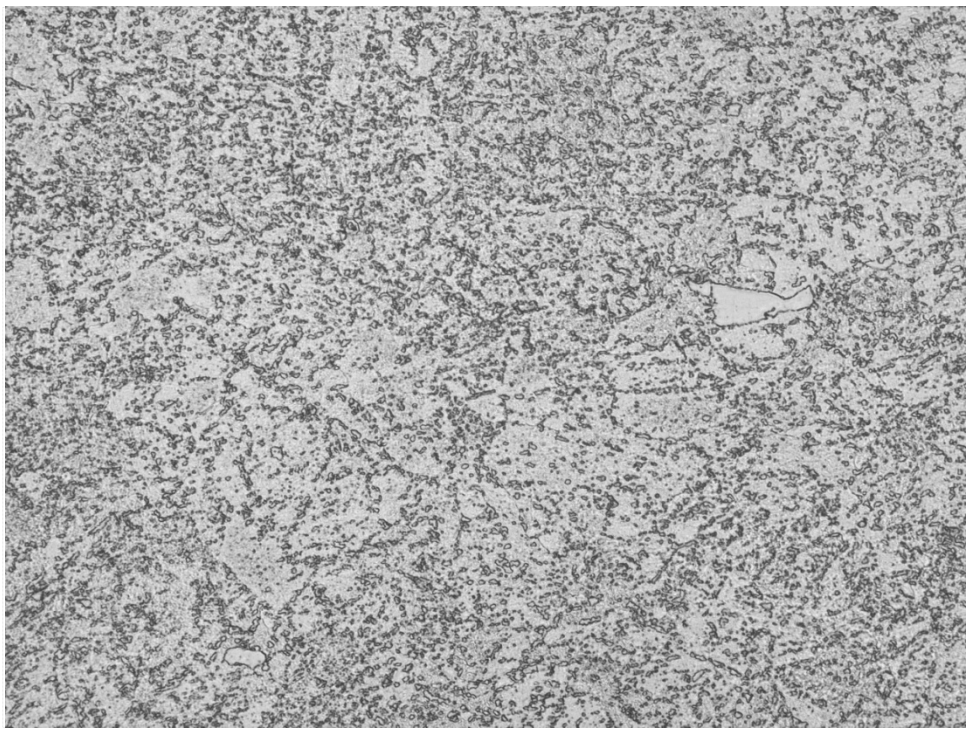


500X

Fig. 65. Replica No. FSOH-LWR-R2.

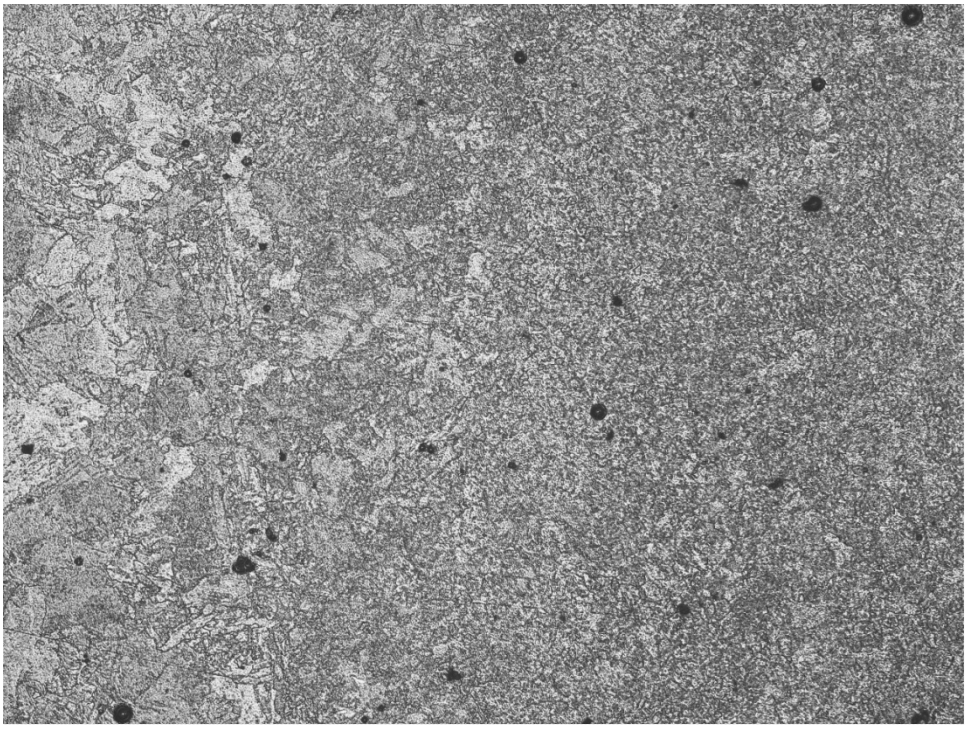


100X

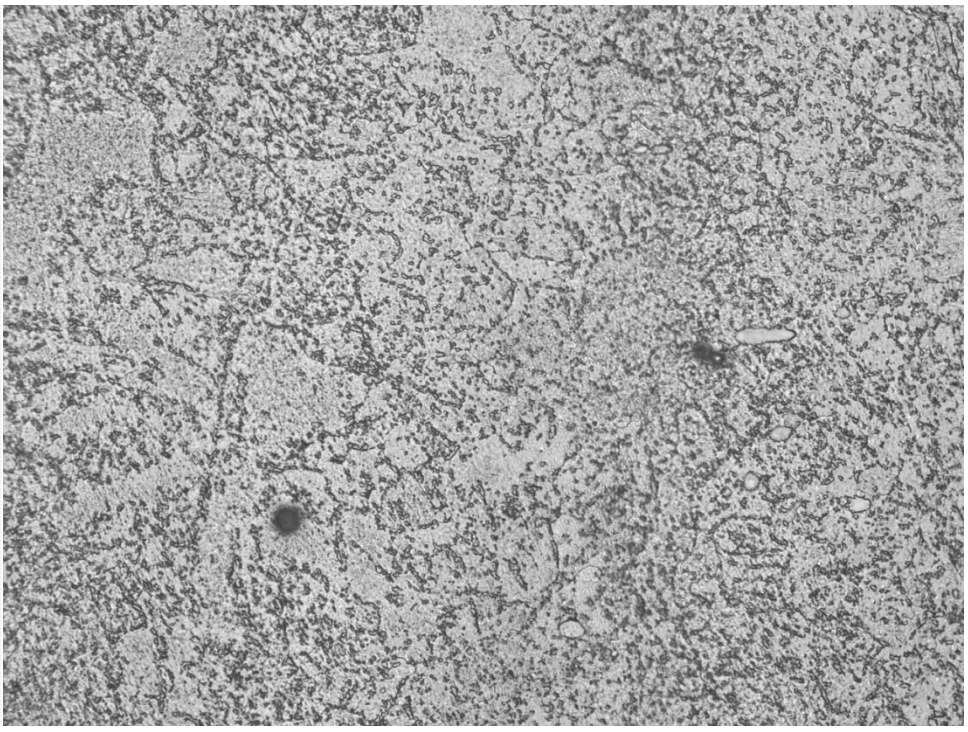


500X

Fig. 66. Replica No. FSOH-LWR-R3.

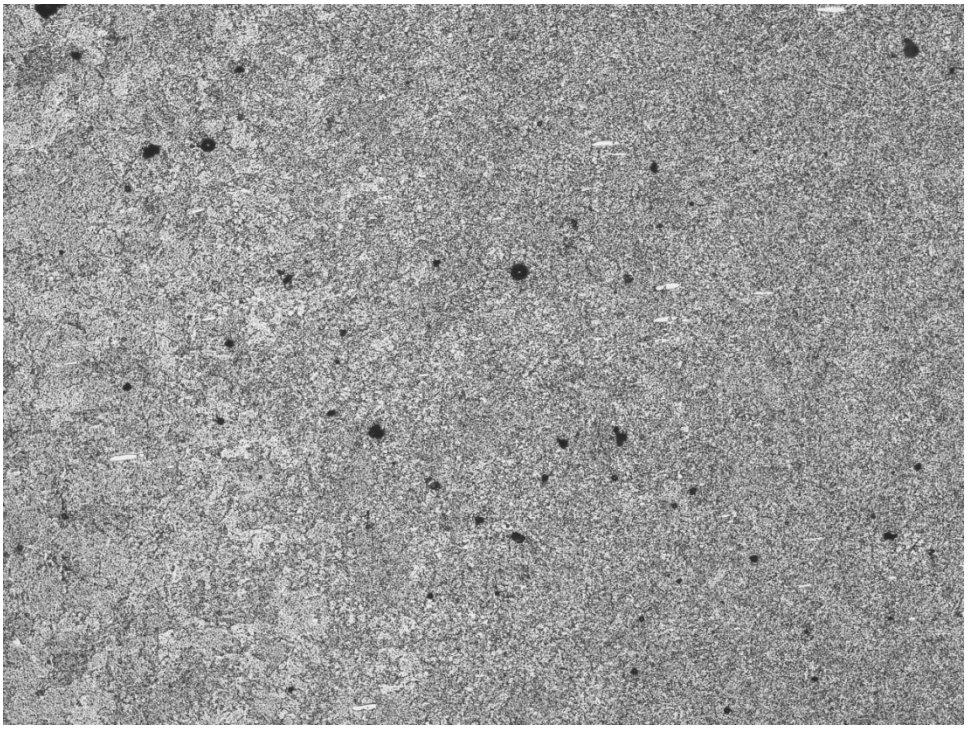


100X

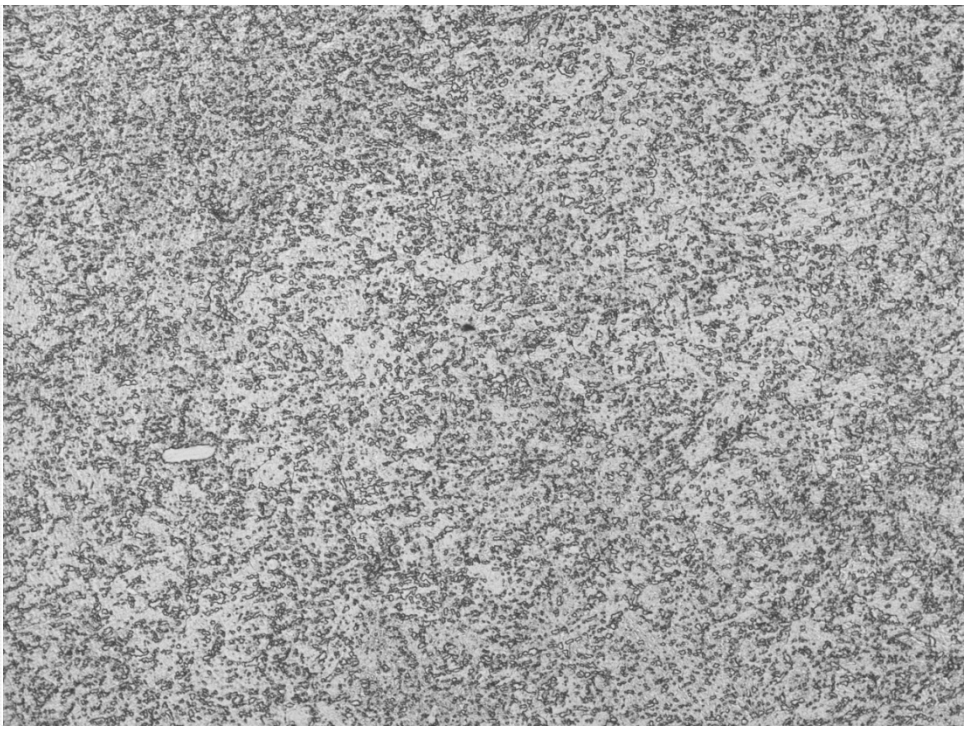


500X

Fig. 67. Replica No. FSOH-LWR-R4.

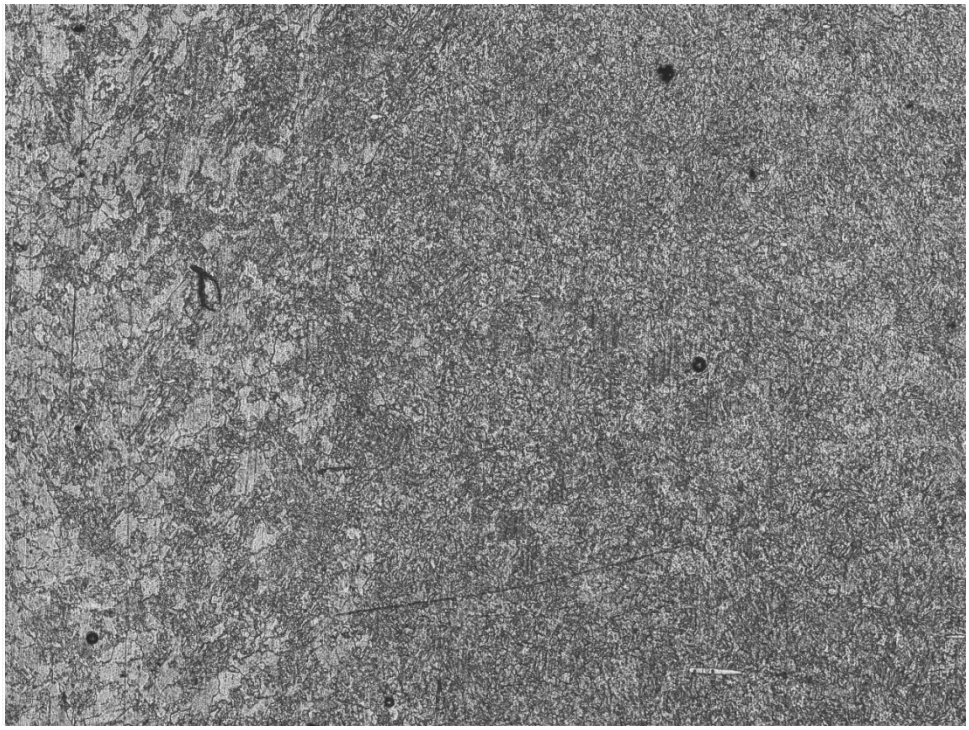


100X

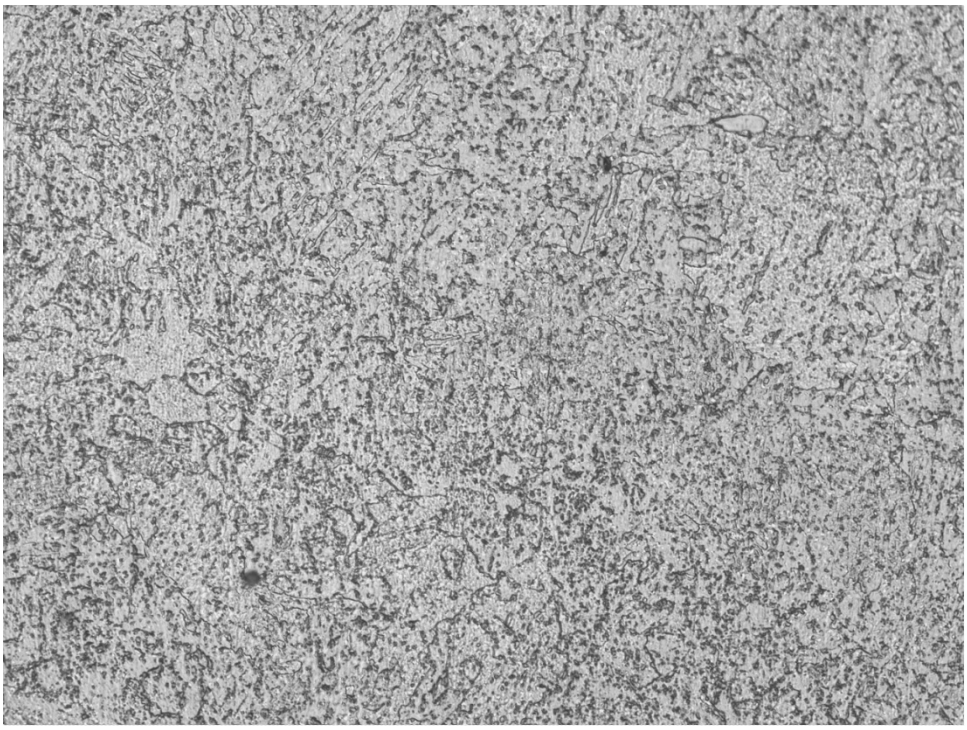


500X

Fig. 68. Replica No. FSOH-LWR-R5.

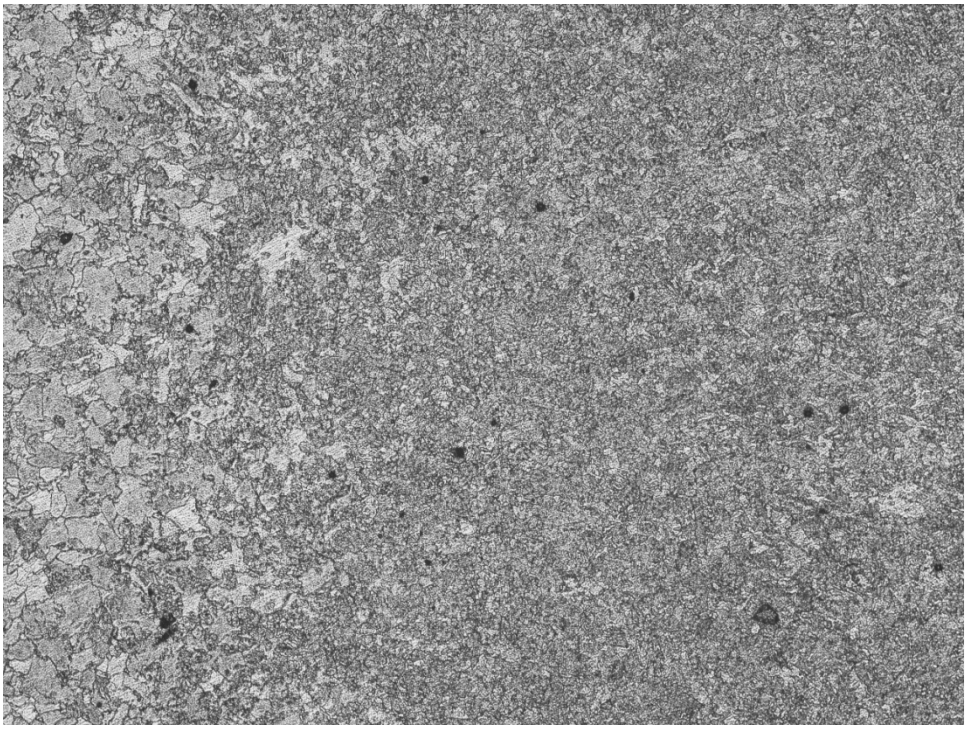


100X

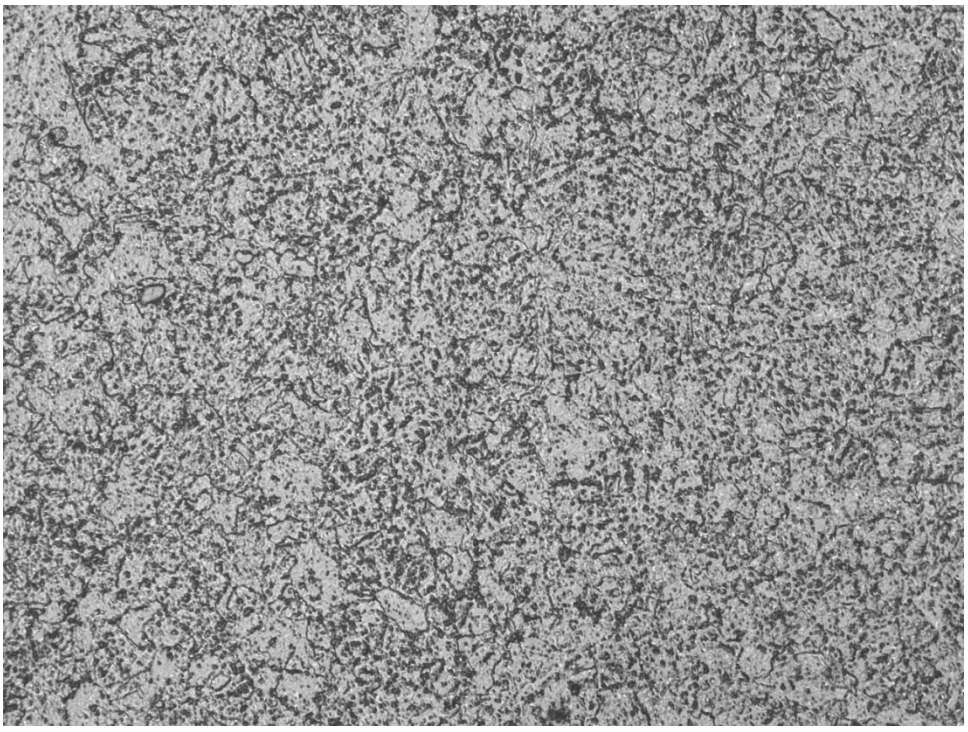


500X

Fig. 69. Replica No. FSOH-LWR-R6.

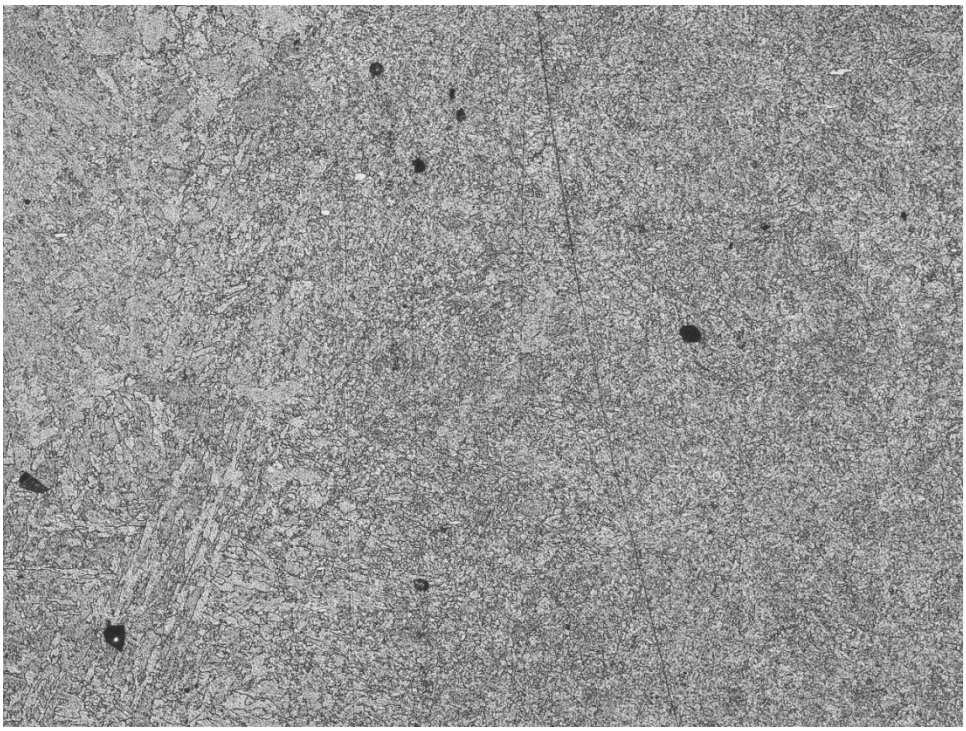


100X

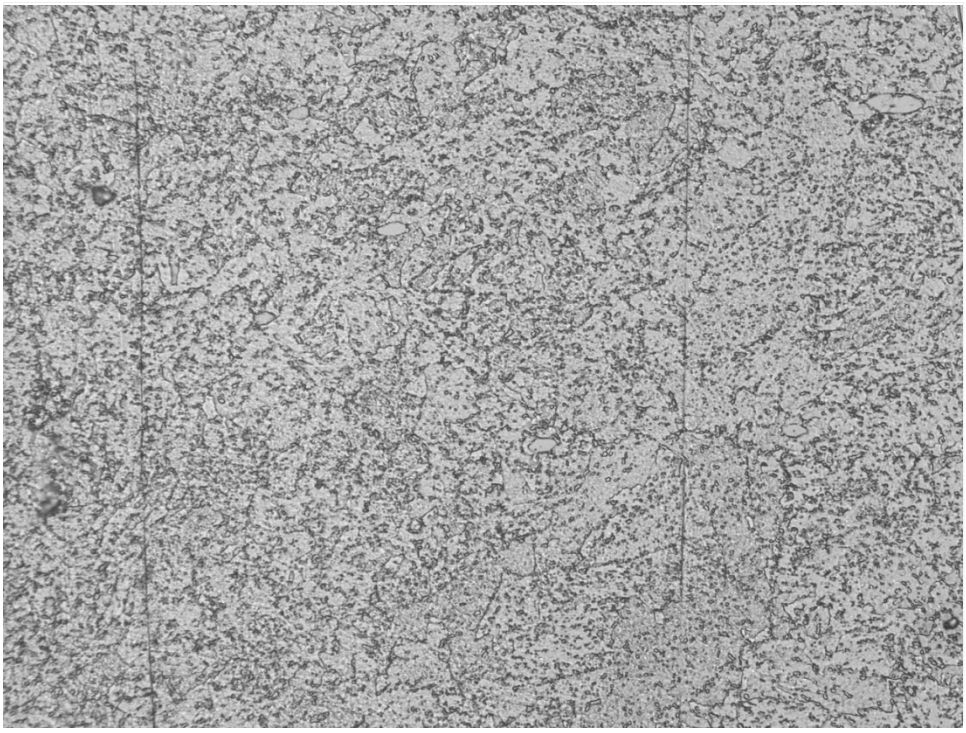


500X

Fig. 70. Replica No. FSOH-LWR-R7.



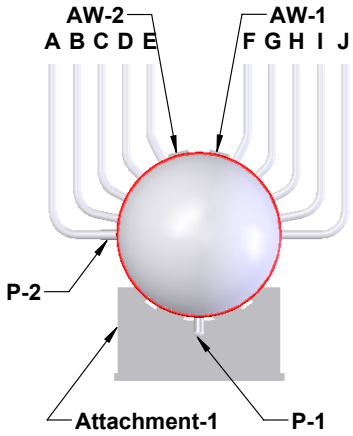
100X



500X

Fig. 71. Replica No. FSOH-LWR-R8.

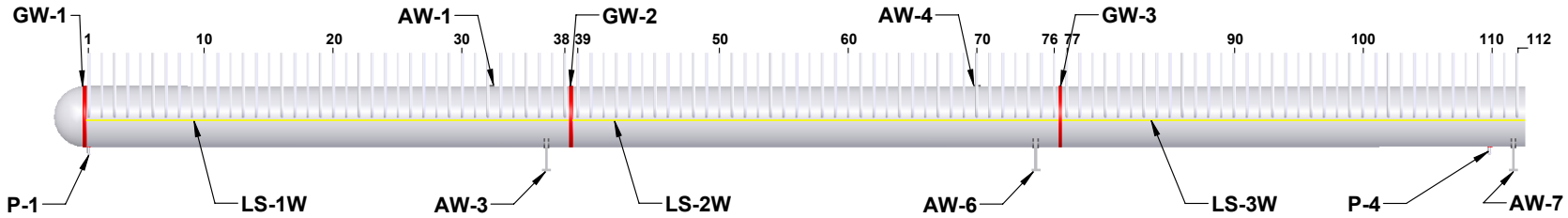
.



Front View (Looking South)
Scale 1:40

Right View (Looking East)
112 Rows, 10 Tubes Per Row
Scale 1:100

North **South**



Left View (Looking West)

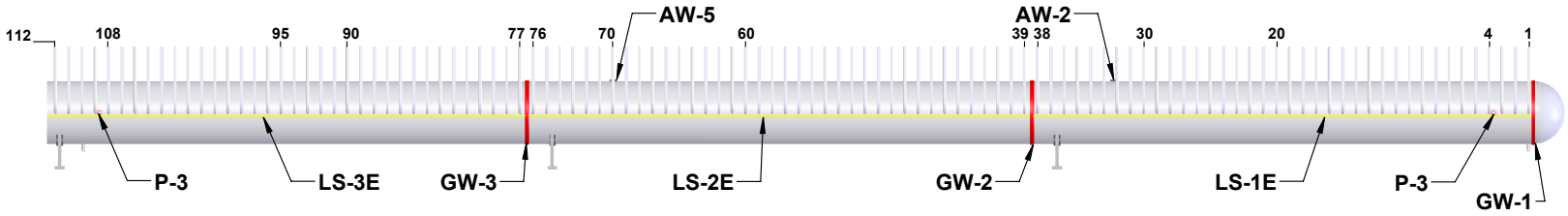


Fig. 72. An overall sketch of the High-Pressure Reheat Outlet header

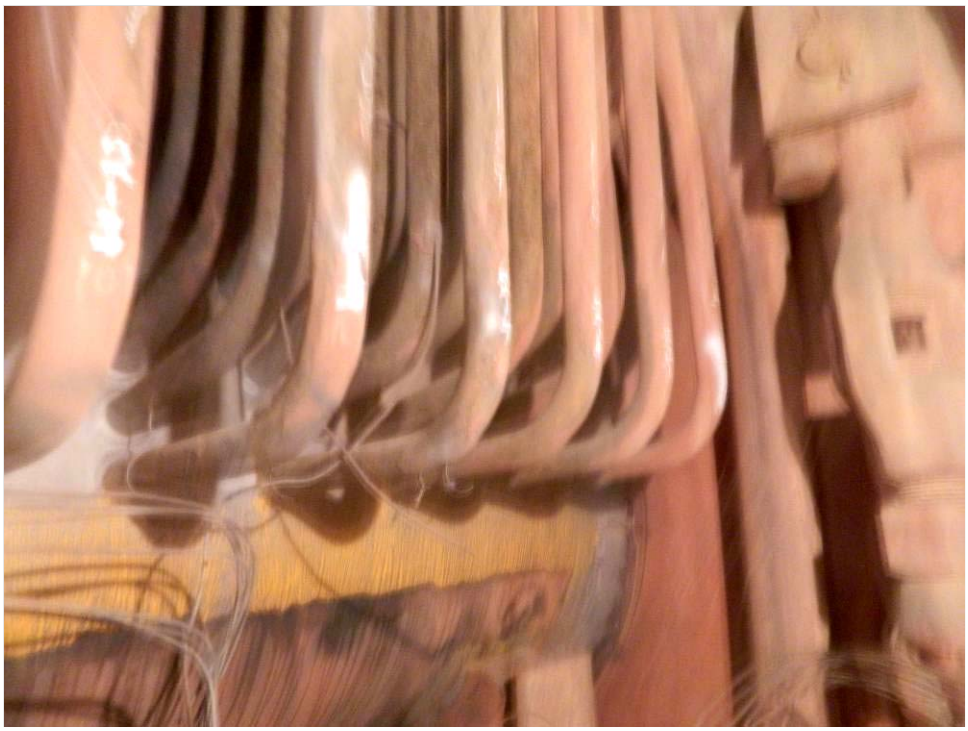


Fig. 73. Photographs of the HP Reheat Outlet header and tubing.

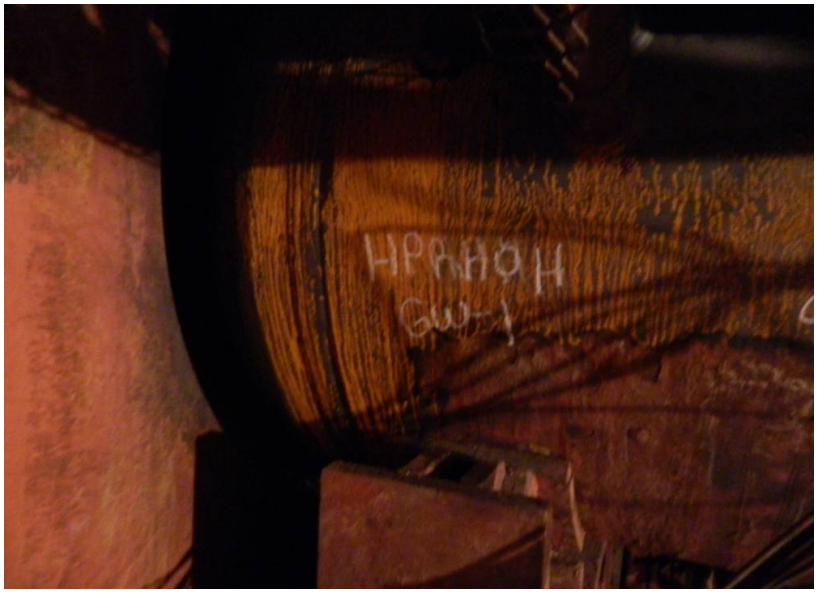
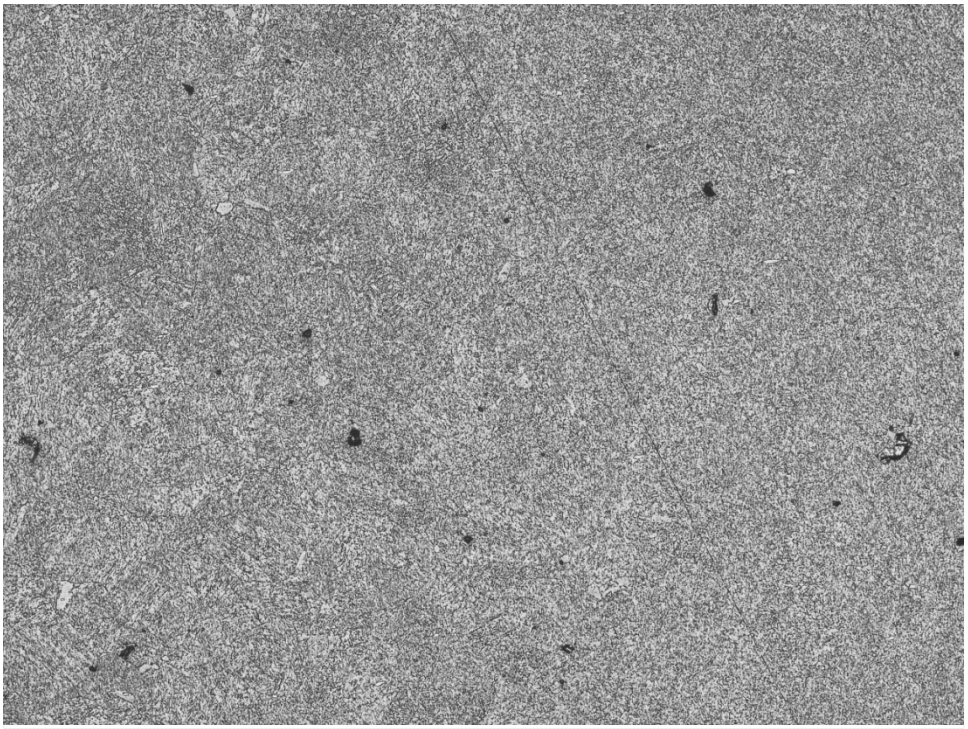


Fig. 74.

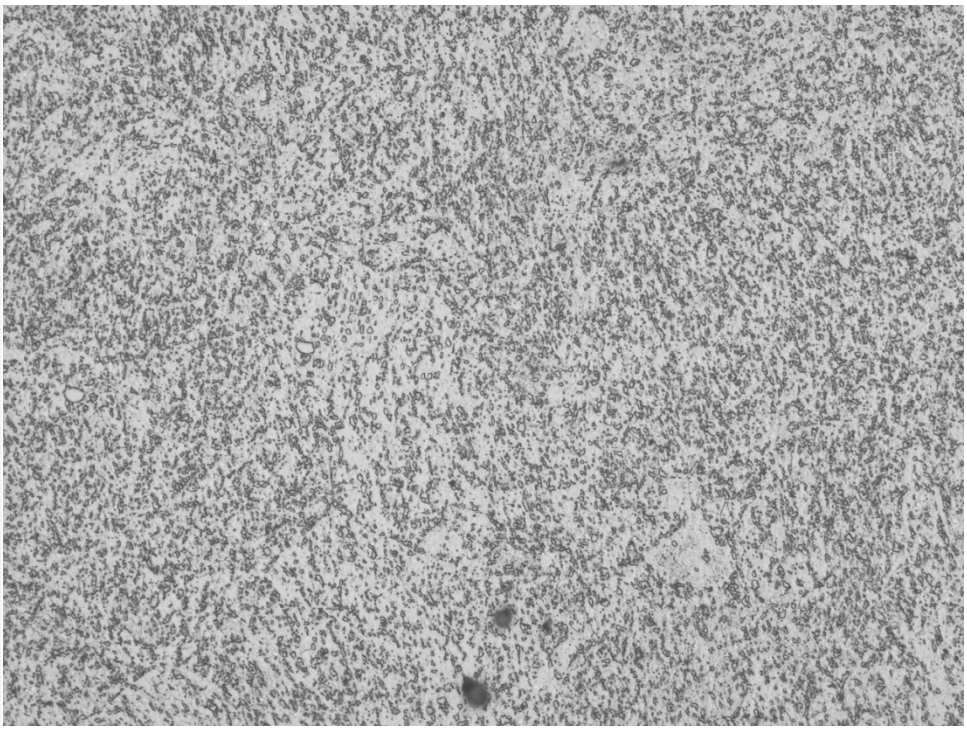
Photographs of girth weld Nos. GW-1, GW-2, and GW-3 on the HP Reheat Outlet header.

Fig. 75.

Photographs of seam weld Nos. LS-1W, LS-2W, and LS-2E on the HP Reheat Outlet header.

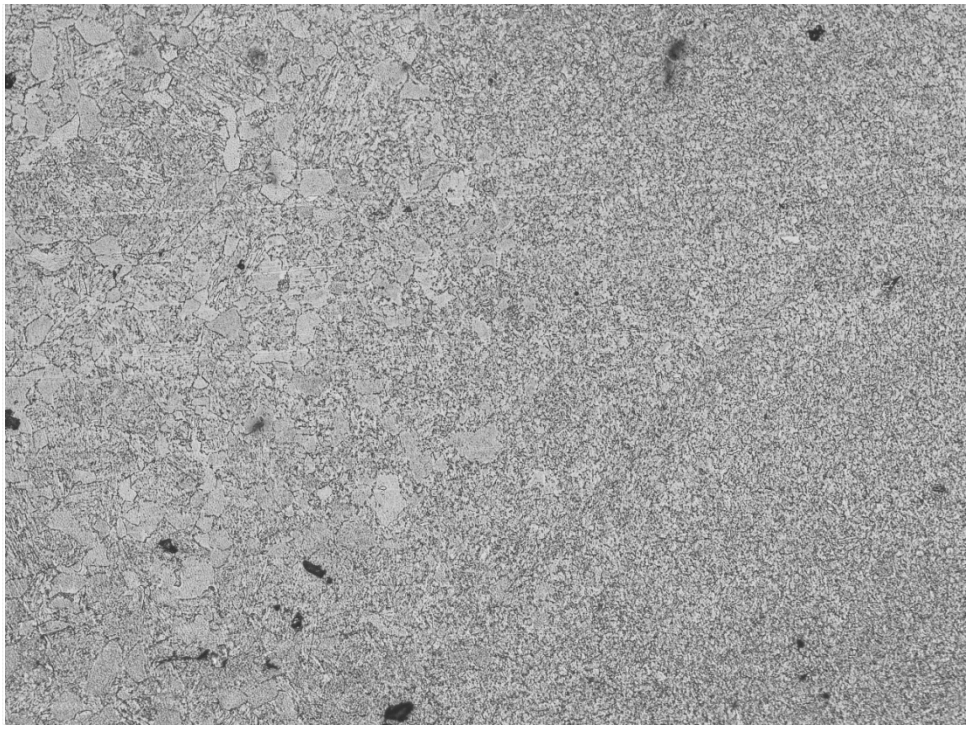


100X



500X

Fig. 76. Replica No. HPROH-R1.



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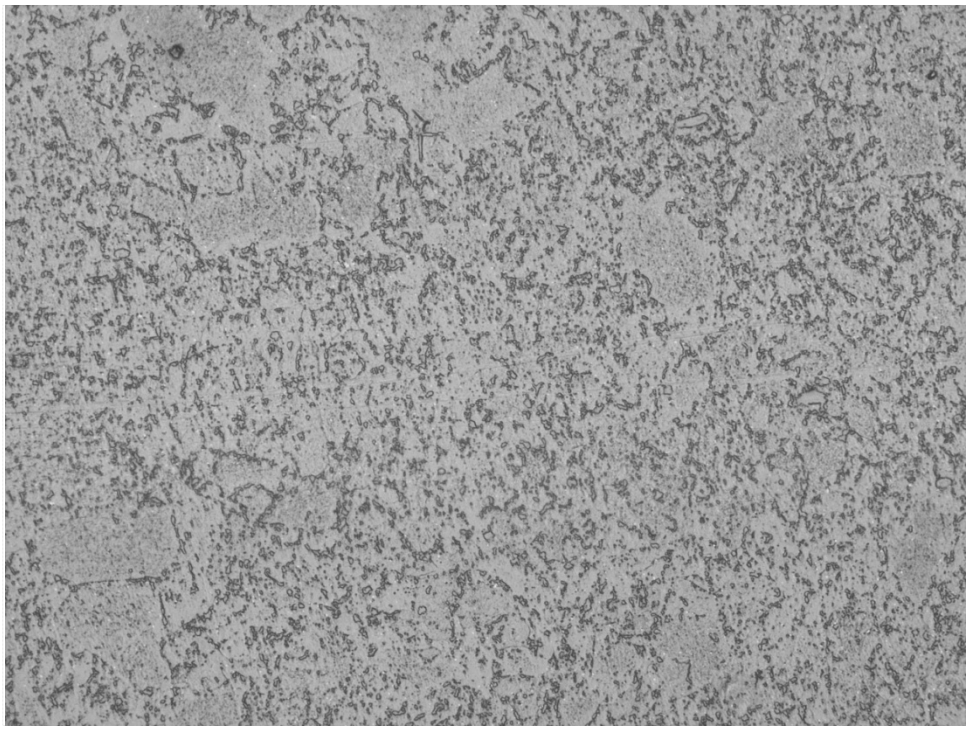
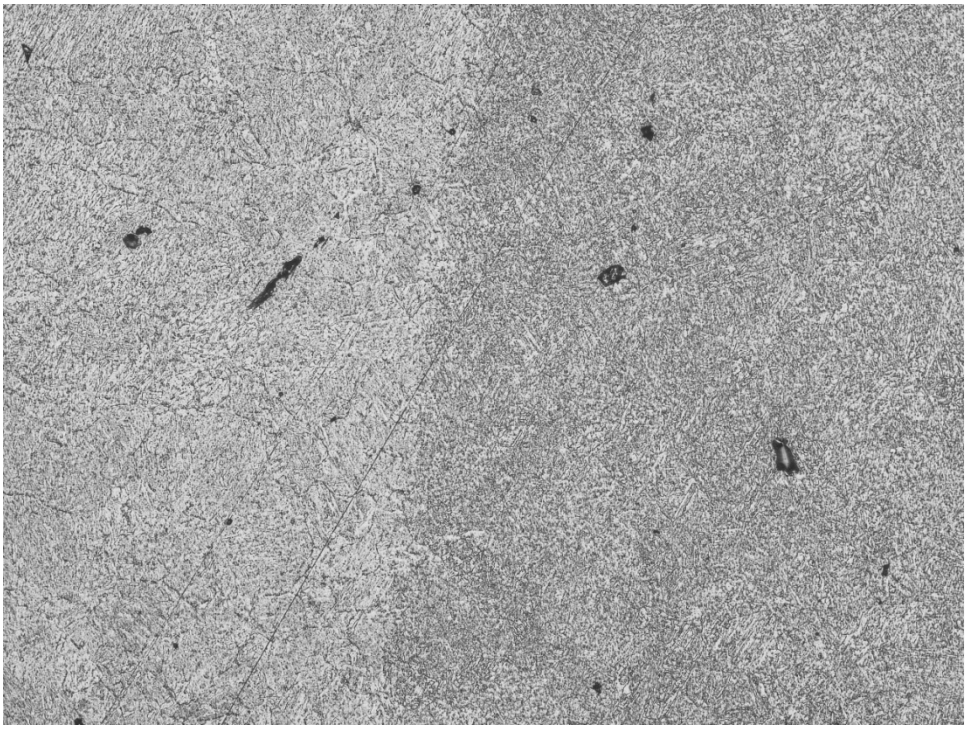
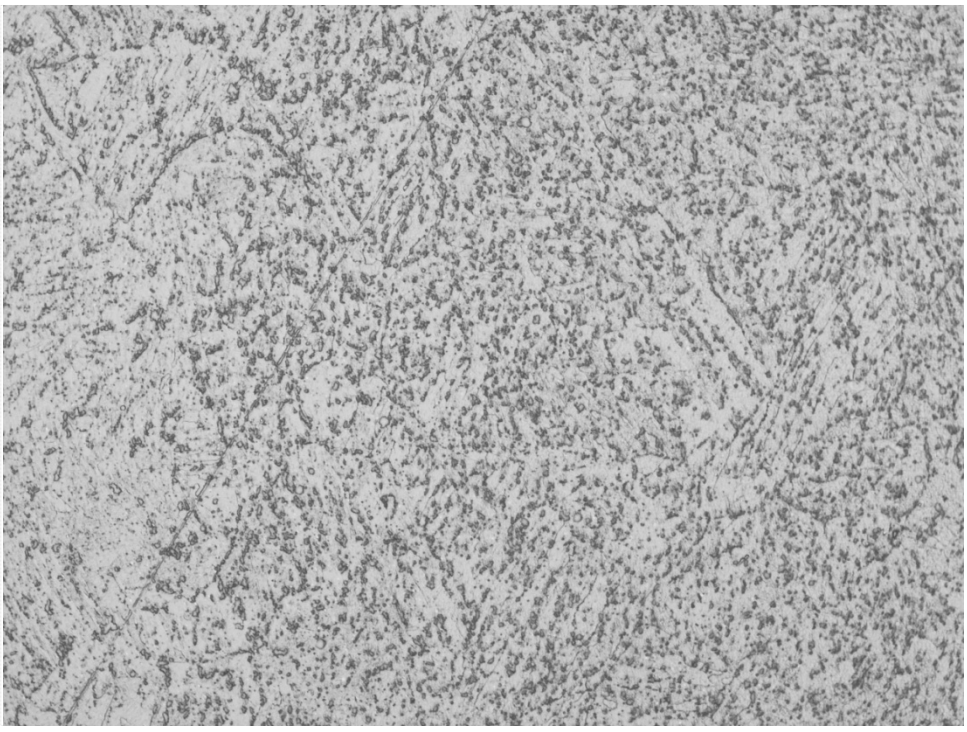


500X

Fig. 77. Replica No. HPROH-R2.

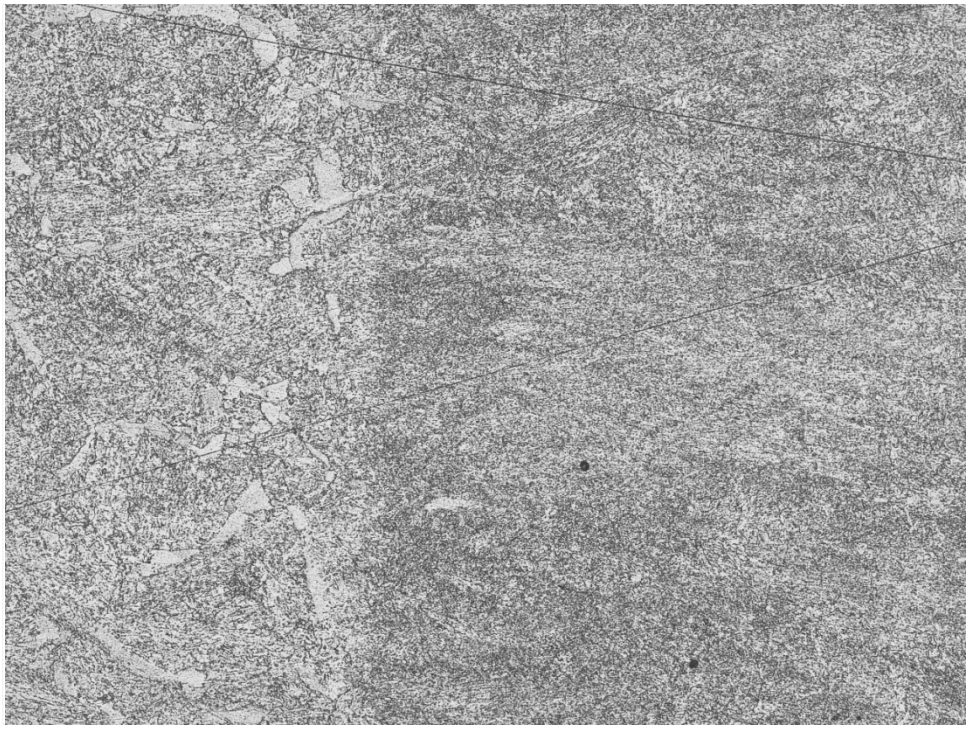


100X



500X

Fig. 78. Replica No. HPROH-R3.



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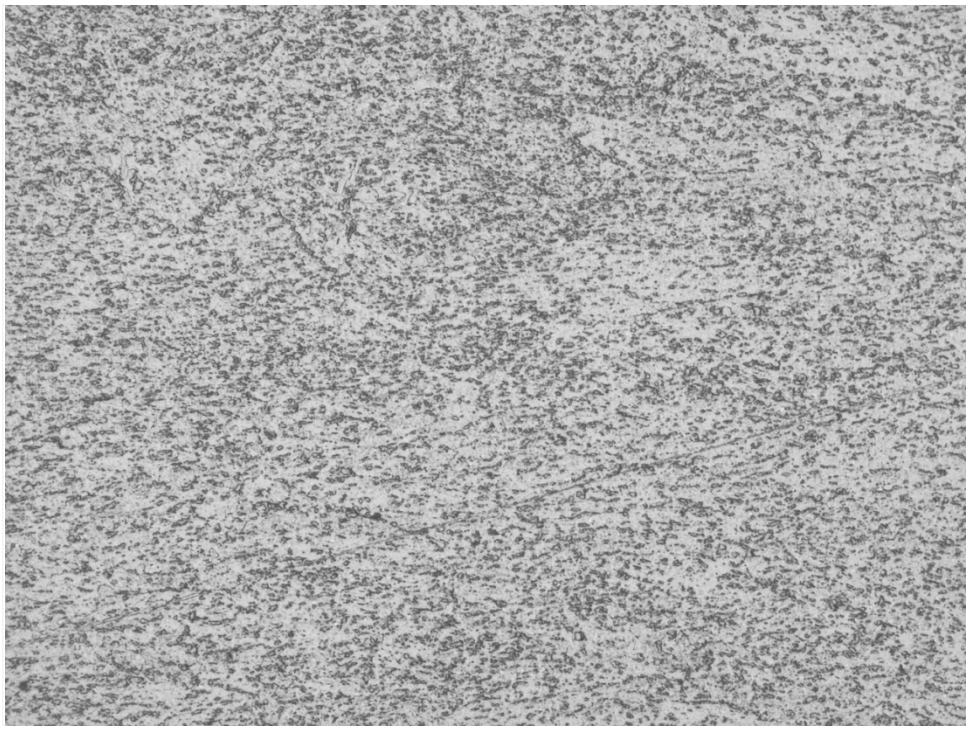
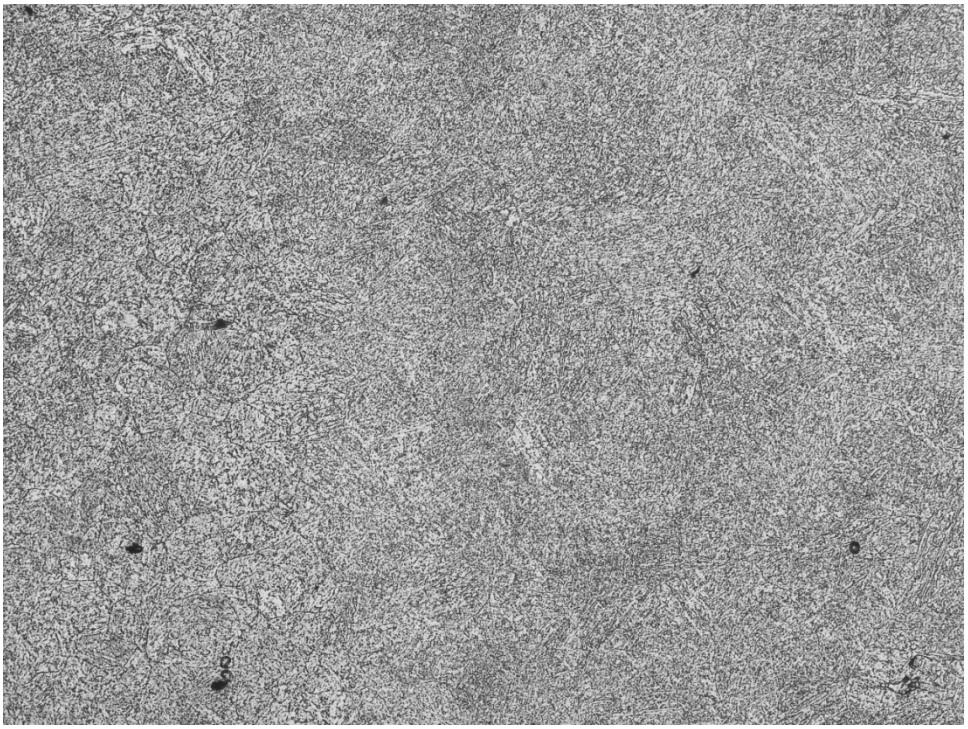


500X

Fig. 79. Replica No. HPROH-R4.



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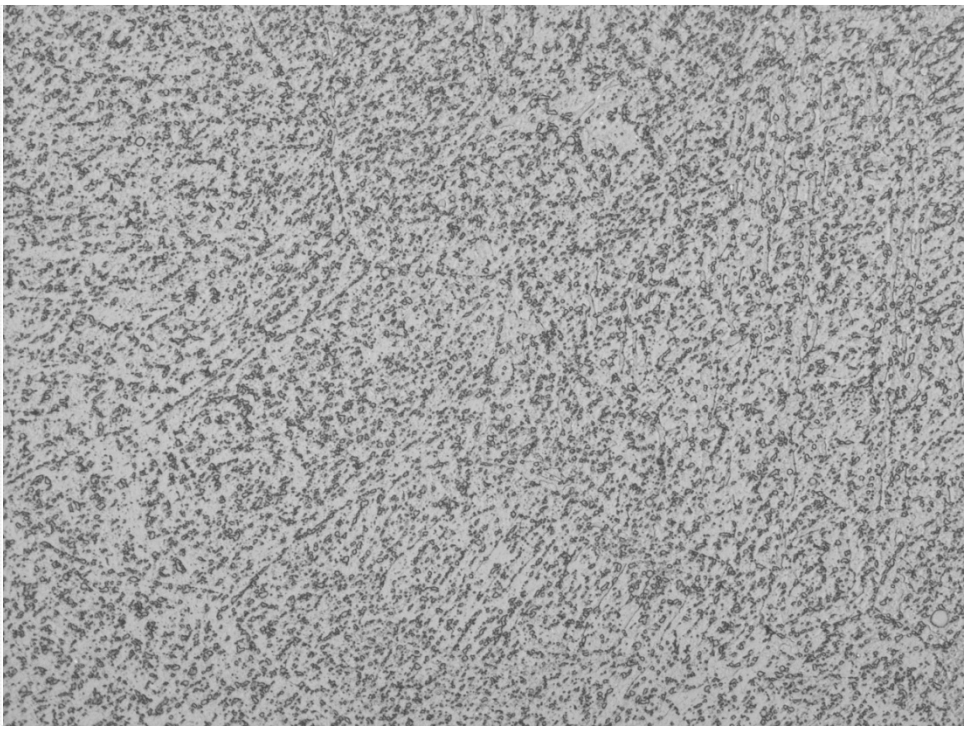
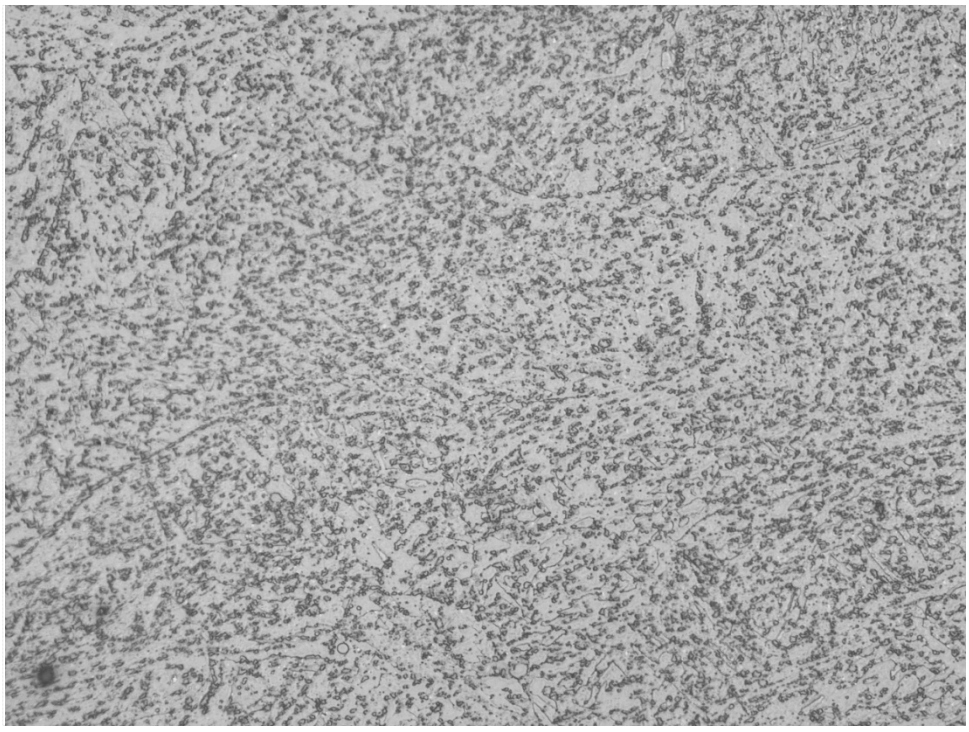


500X

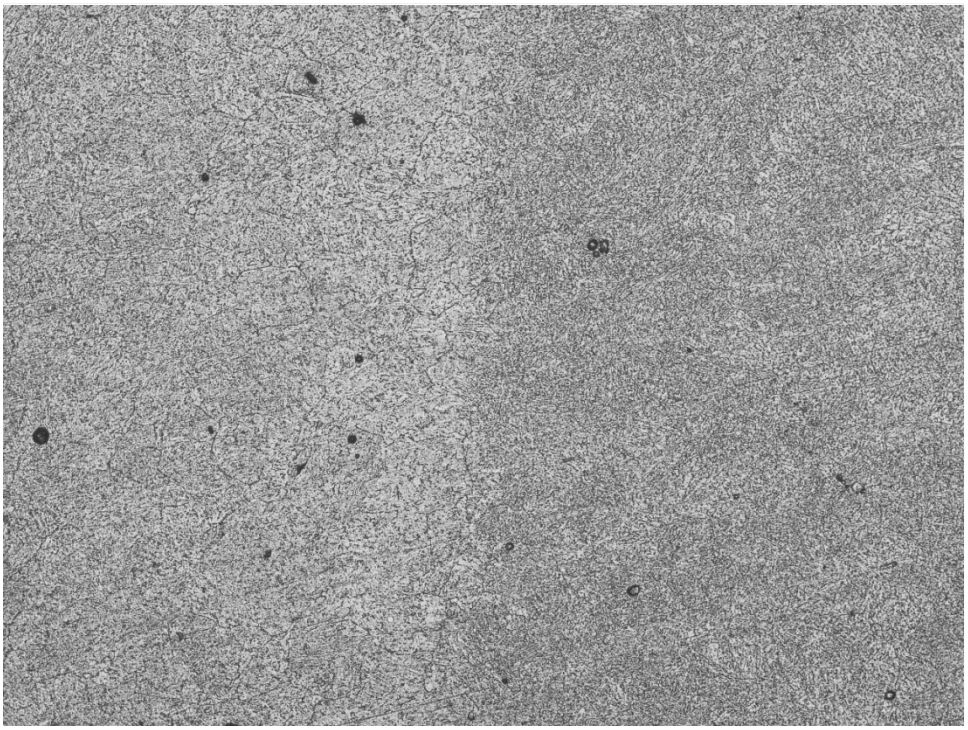
Fig. 80. Replica No. HPROH-R5.

100X



500X

Fig. 81. Replica No. HPROH-R6.



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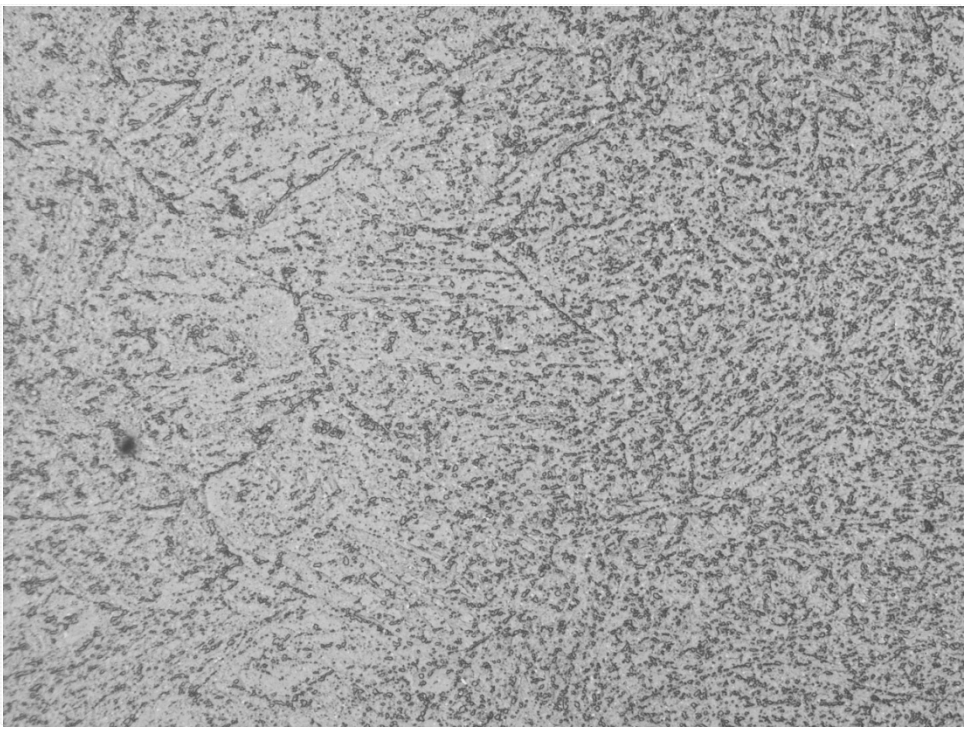
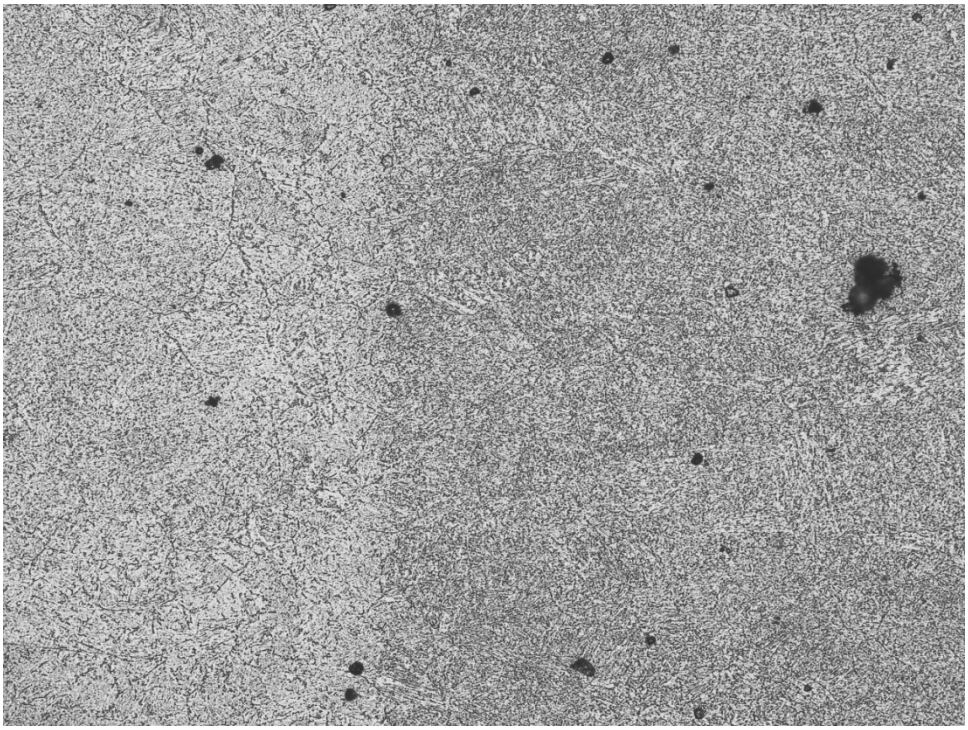


500X

Fig. 82. Replica No. HPROH-R7.



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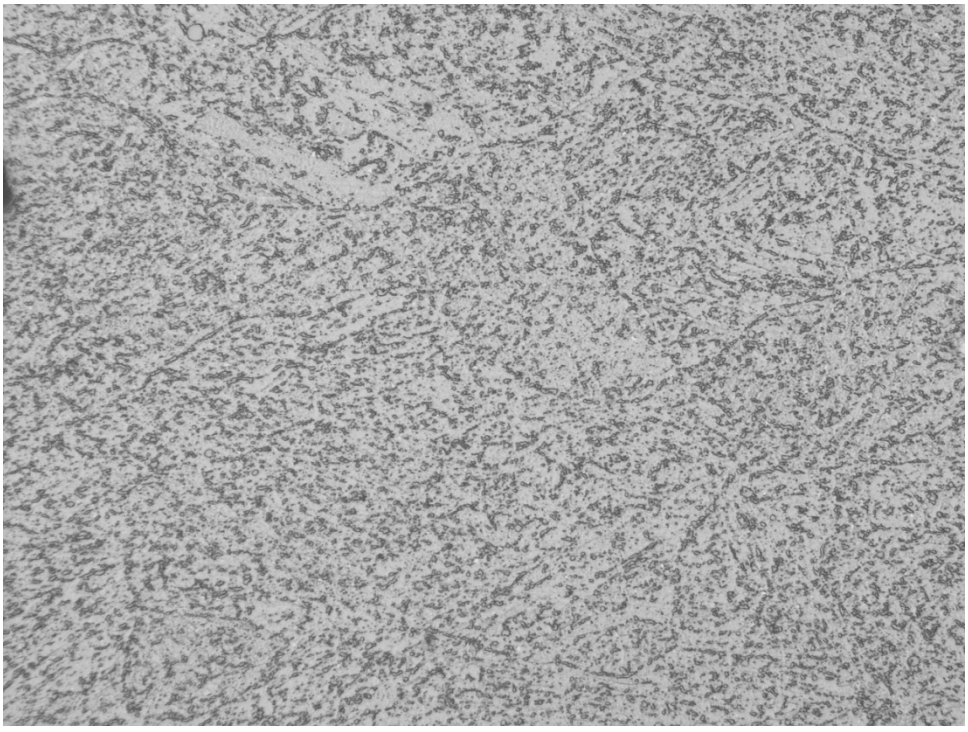


500X

Fig. 83. Replica No. HPROH-R8.

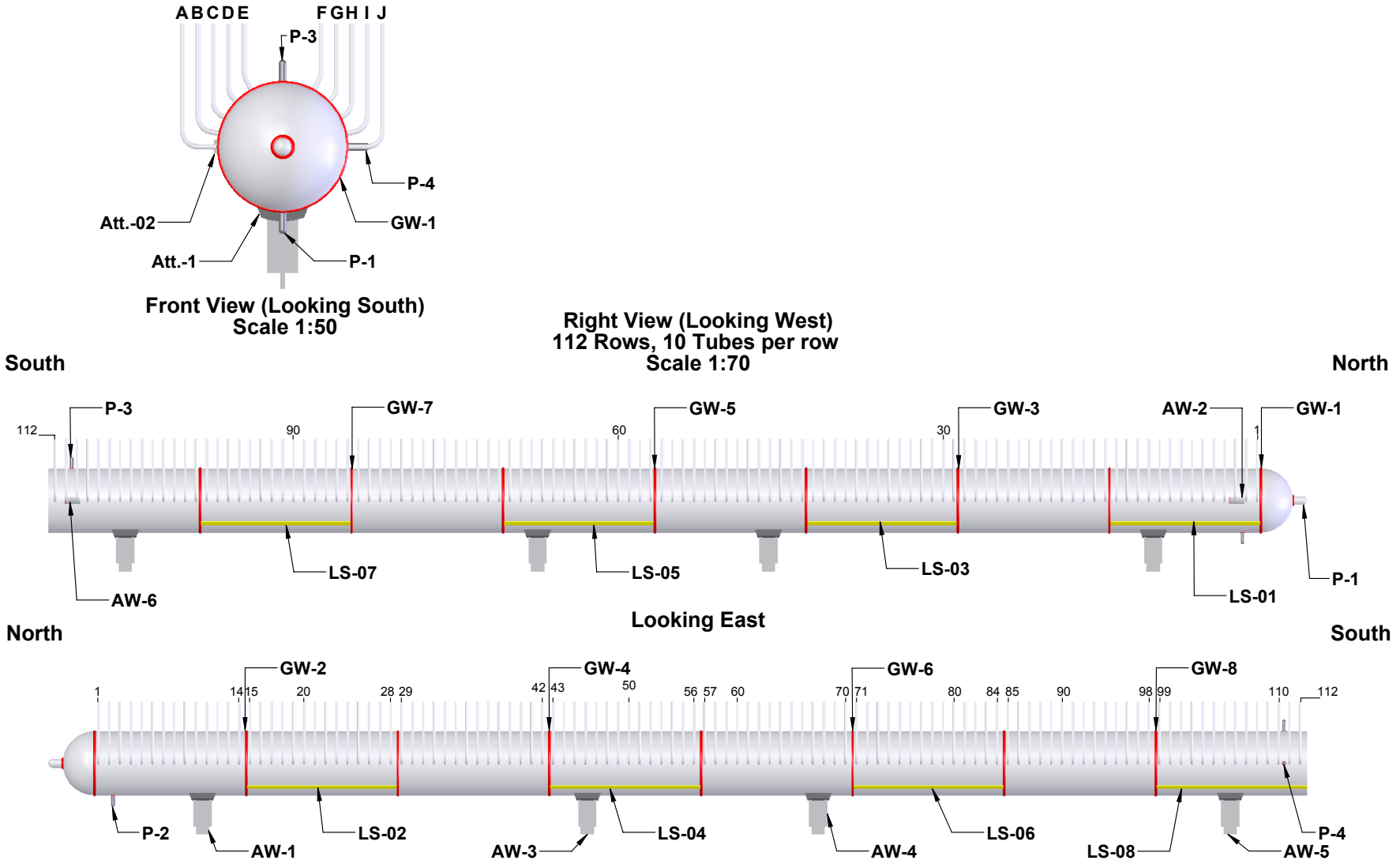


Fig. 84. An overall sketch of the Low-Pressure Reheat Outlet header

Fig. 85.

Photographs of penetration No. P-1 and girth weld Nos. GW-1 and GW-2 on the LP Reheat Outlet header.

Fig. 86. Photographs of girth weld Nos. GW-5 and GW-6 on the LP Reheat Outlet header

Fig. 87. Photographs of girth weld Nos. GW-7 and GW-8 on the LP Reheat Outlet header.

Fig. 88. Photographs of seam weld Nos.LS-01 and LS-02 on the LP Reheat Outlet header.

Fig. 89. Photographs of seam weld Nos.LS-04 and LS-06 on the LP Reheat Outlet header.

Fig. 90. Photographs of the indications on girth weld No. GW-3 of the LP Reheat Outlet header.

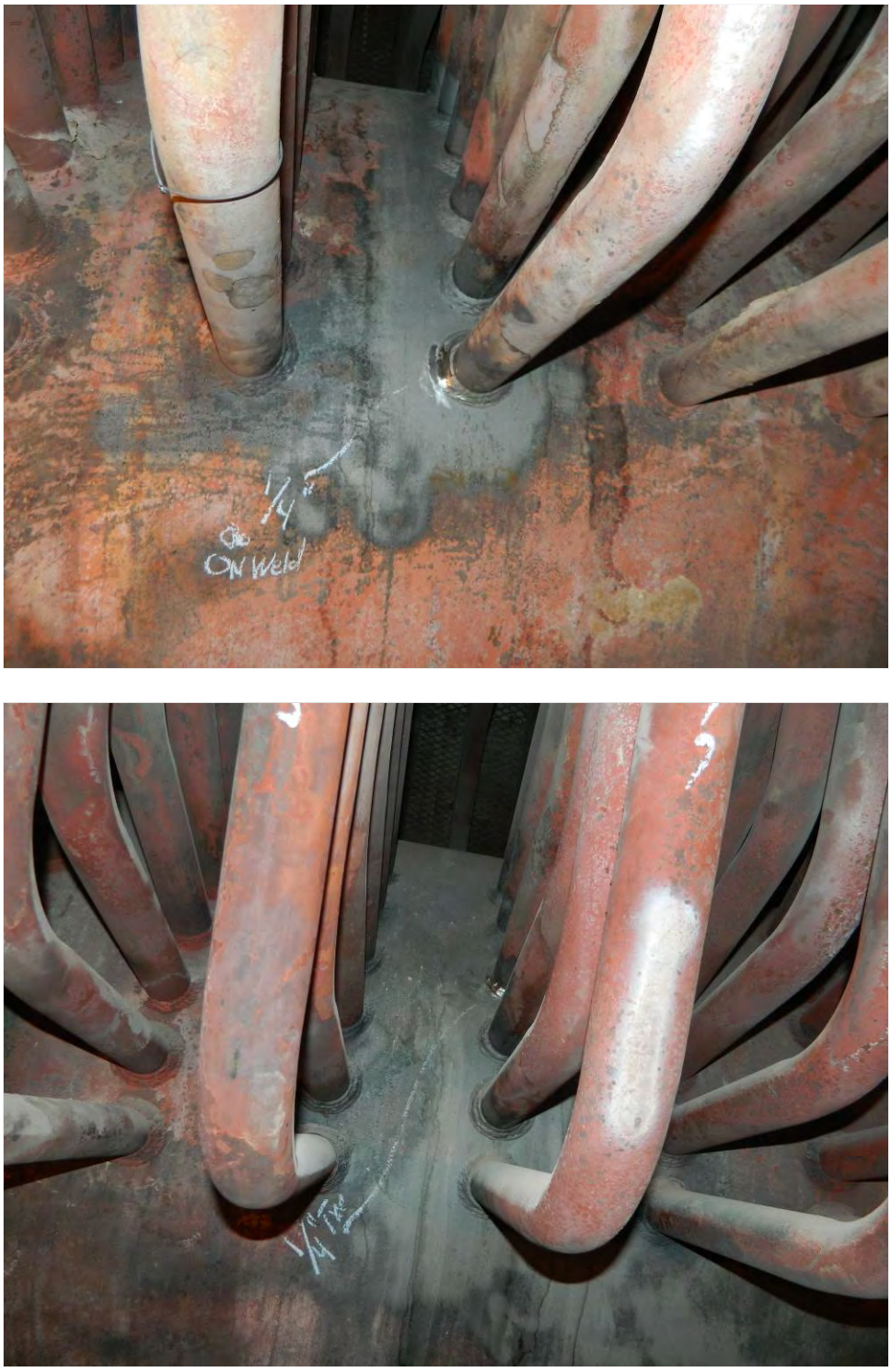


Fig. 91. Photographs of the indications on the tube stubs of the LP Reheat Outlet header.

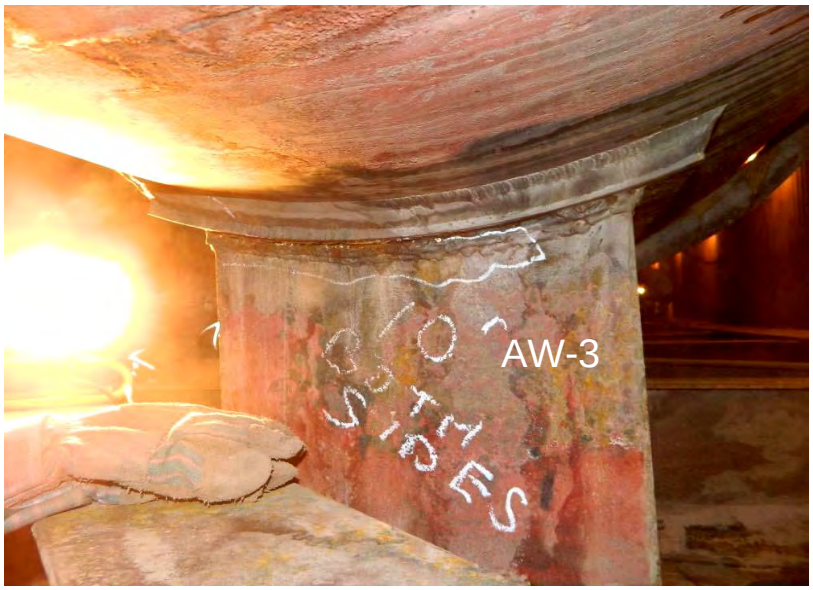
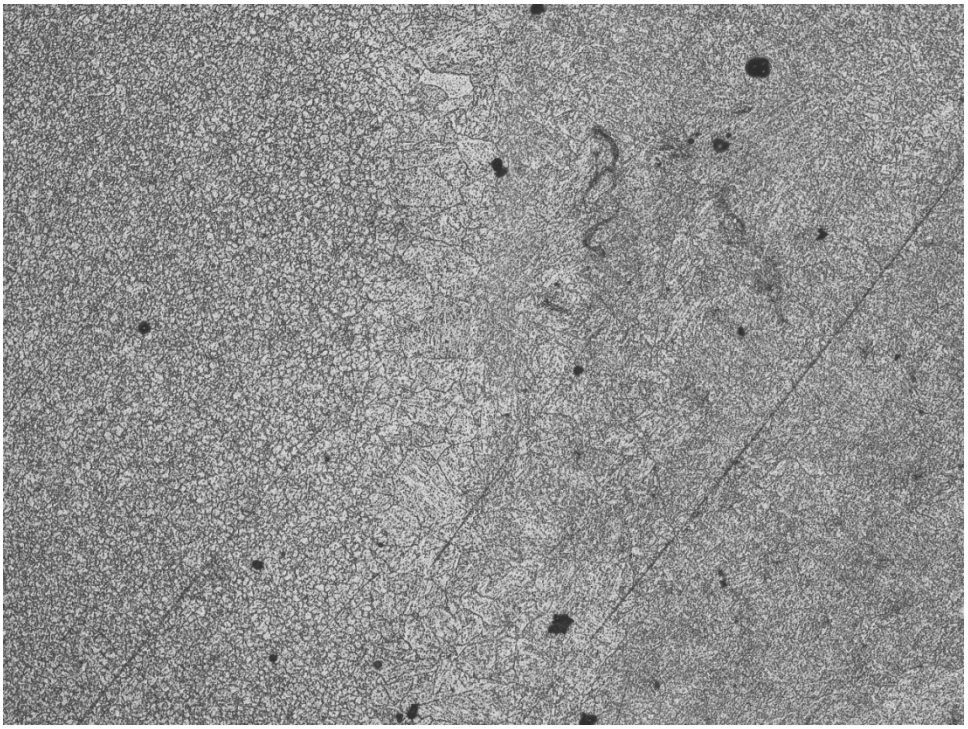
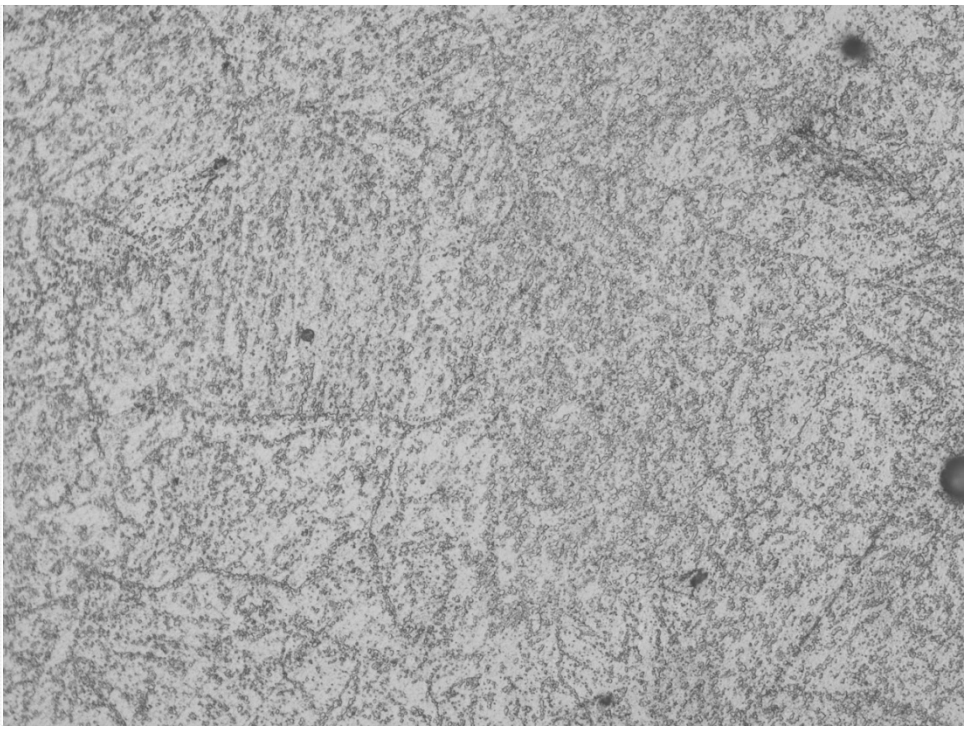


Fig. 92.

Photographs of indications on attachment weld Nos. AW-1 and AW-3 of the LP Reheat Outlet header.

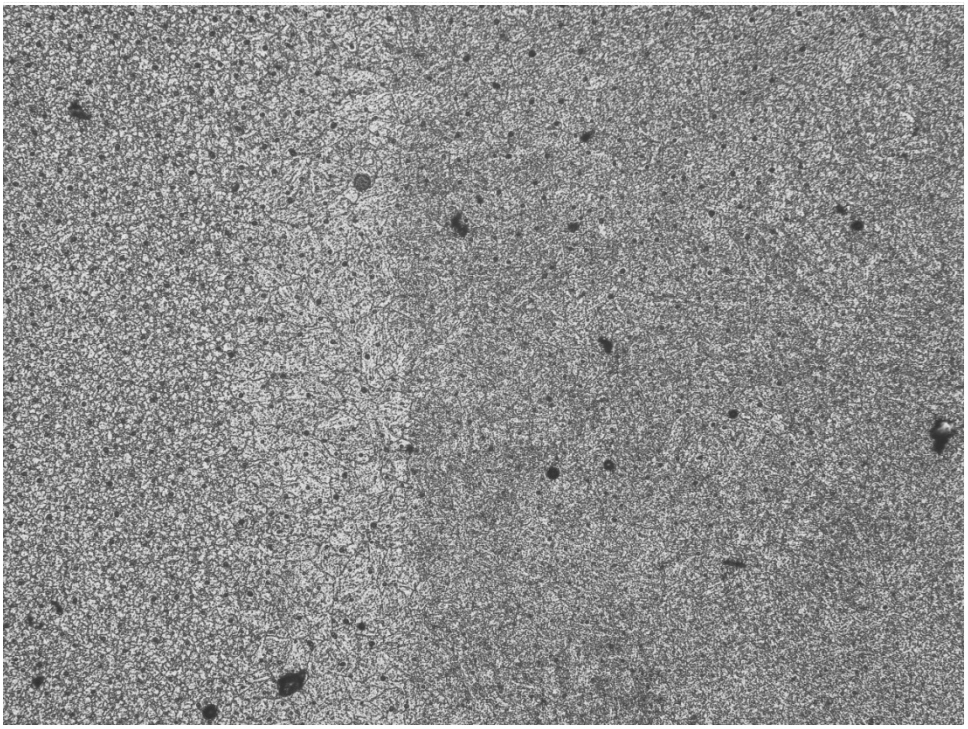


100X

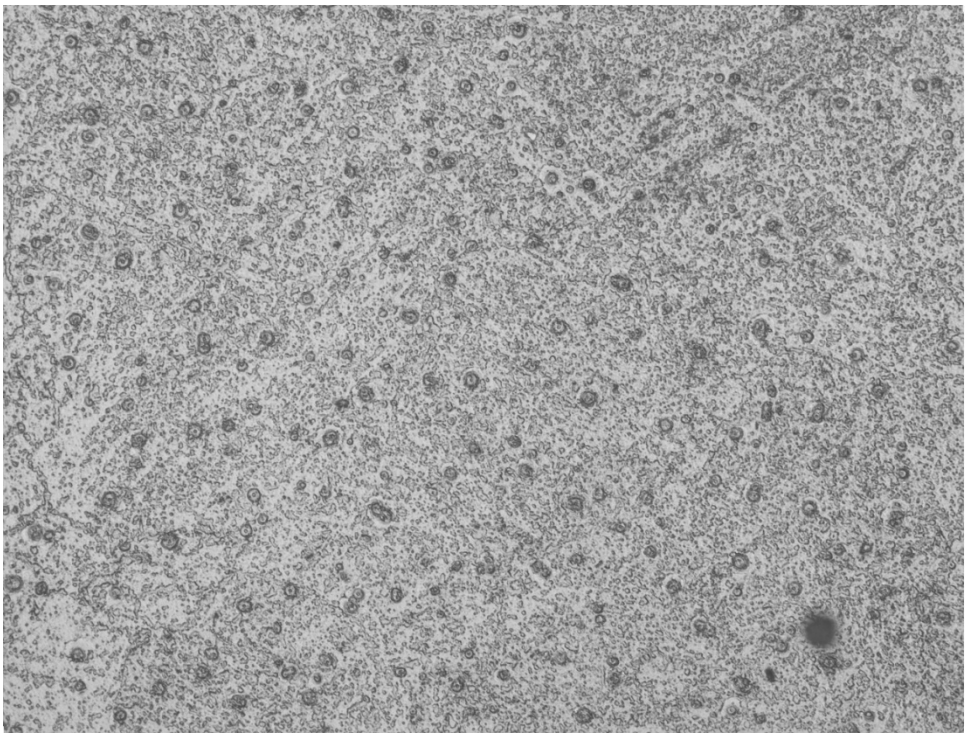


500X

Fig. 93. Replica No. LPROH-R1.

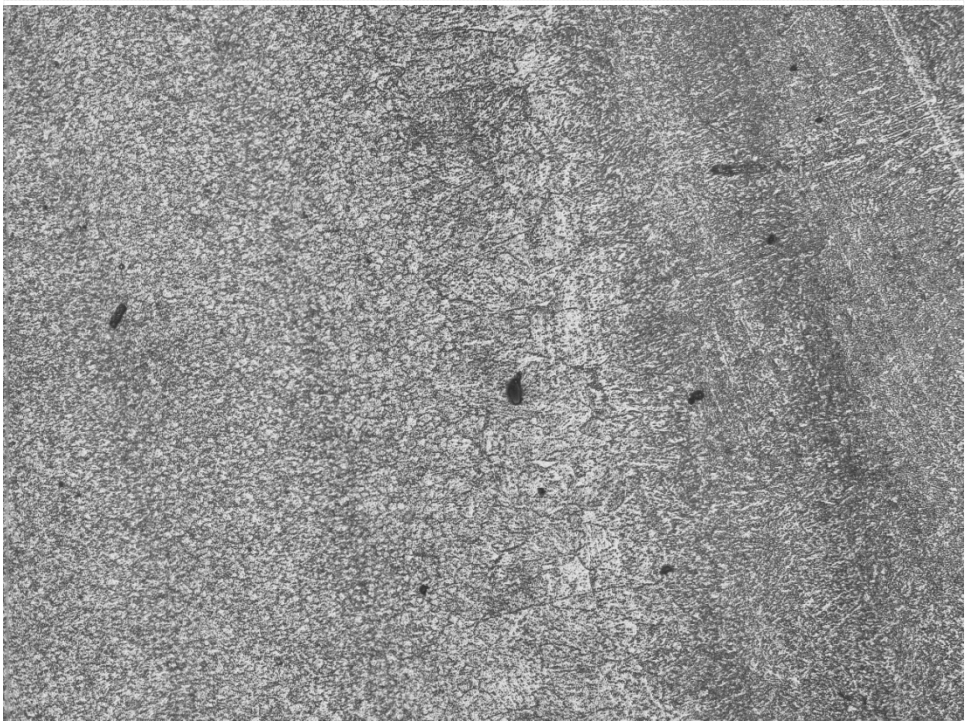


100X



500X

Fig. 94. Replica No. LPROH-R2.



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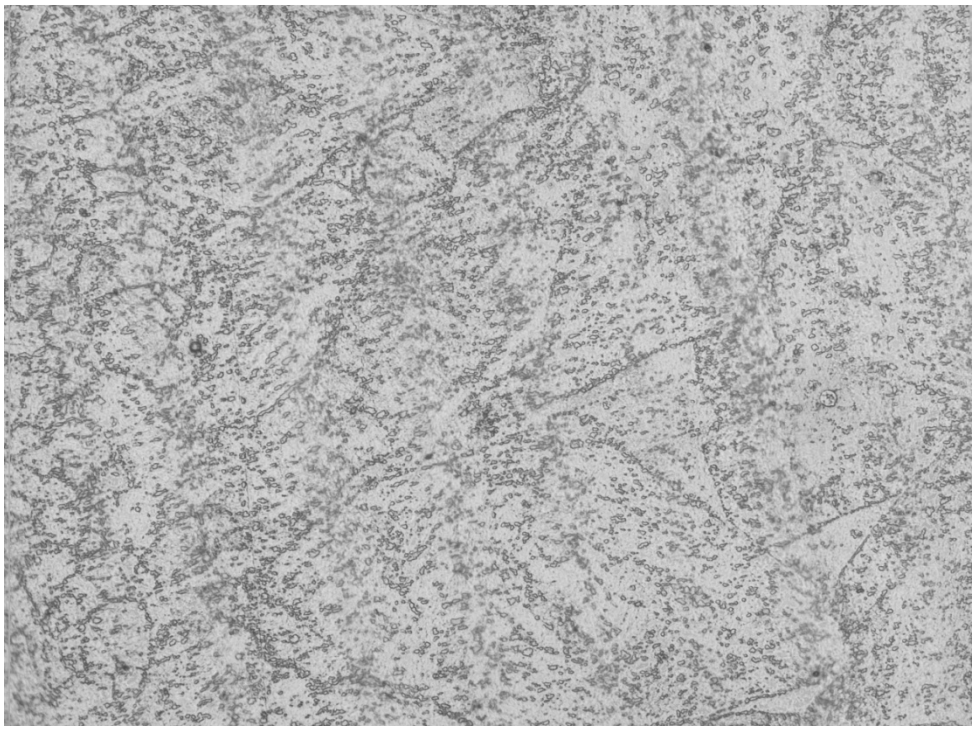
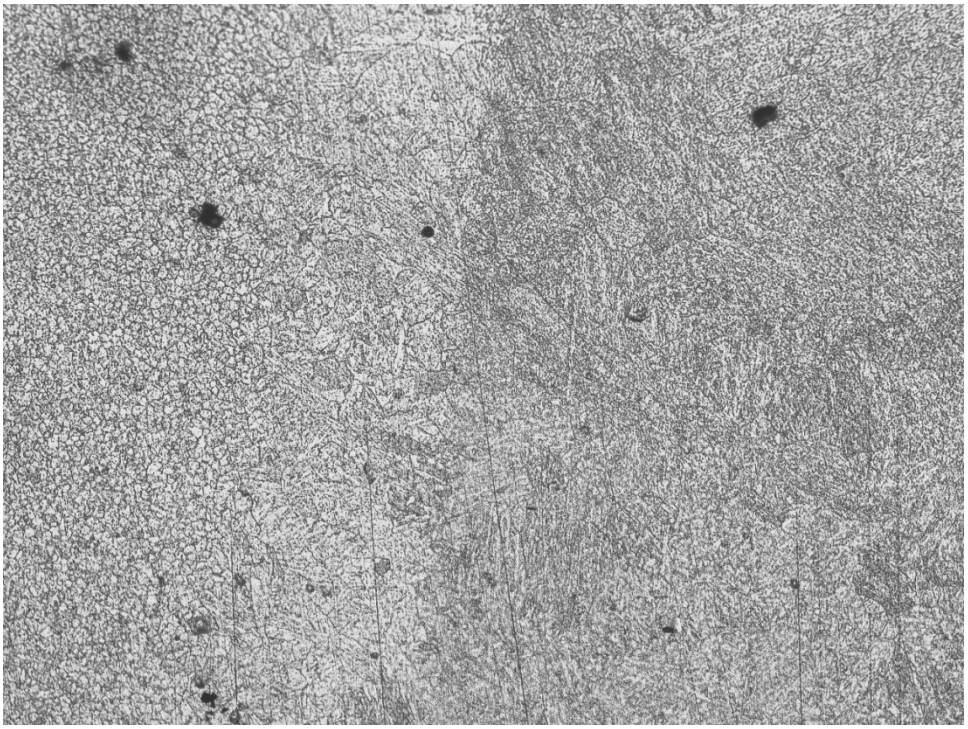


500X

Fig. 95. Replica No. LPROH-R3.



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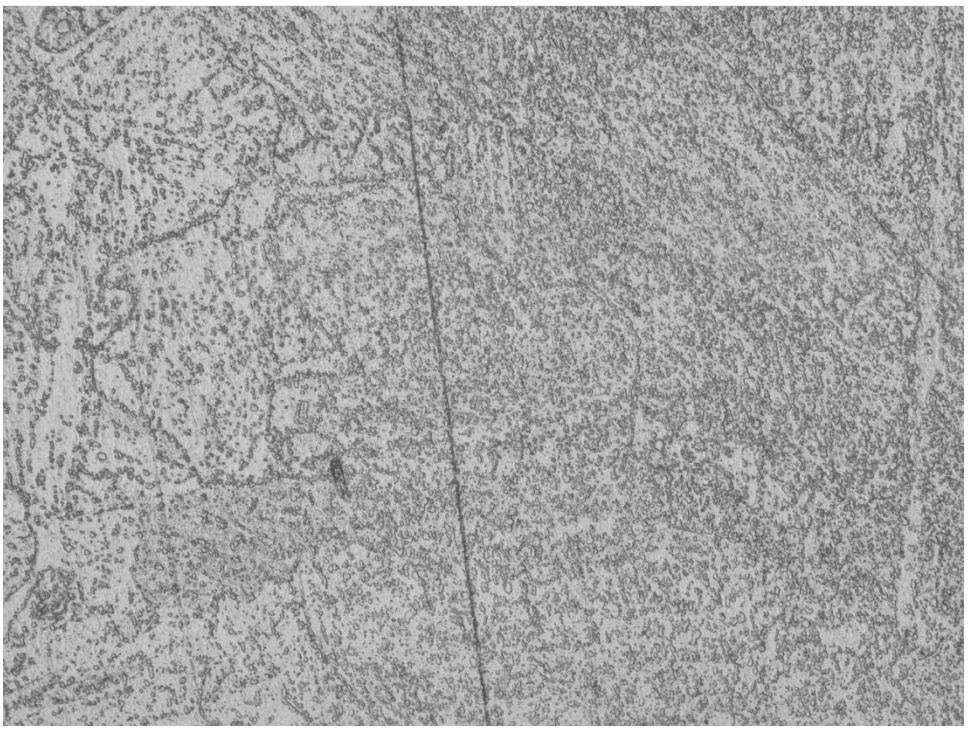
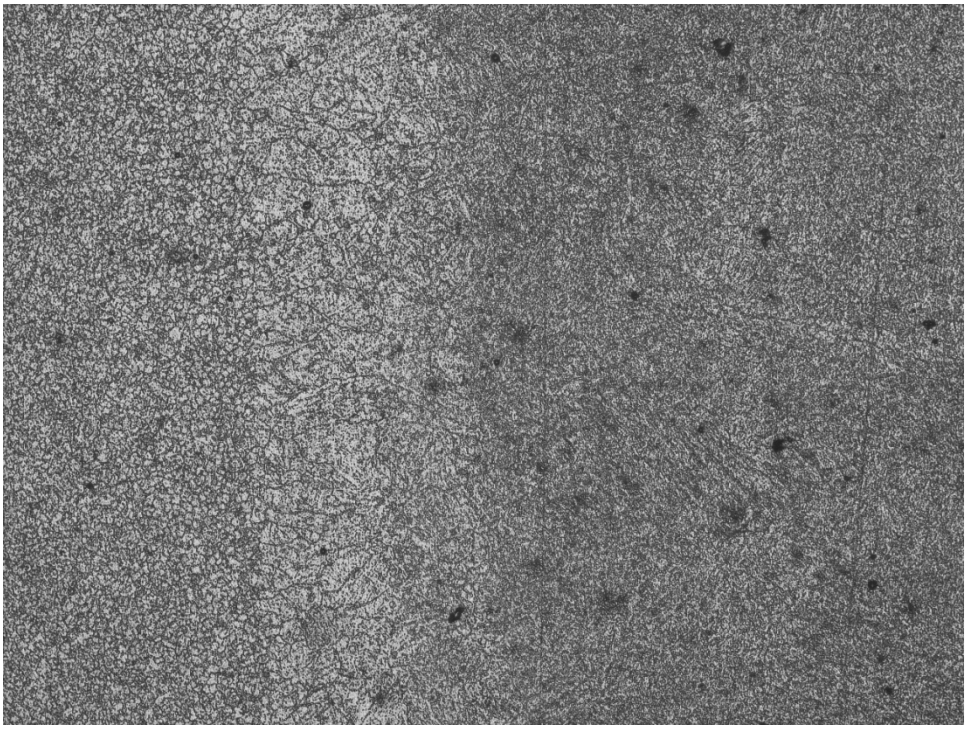


500X

Fig. 96. Replica No. LPROH-R4.



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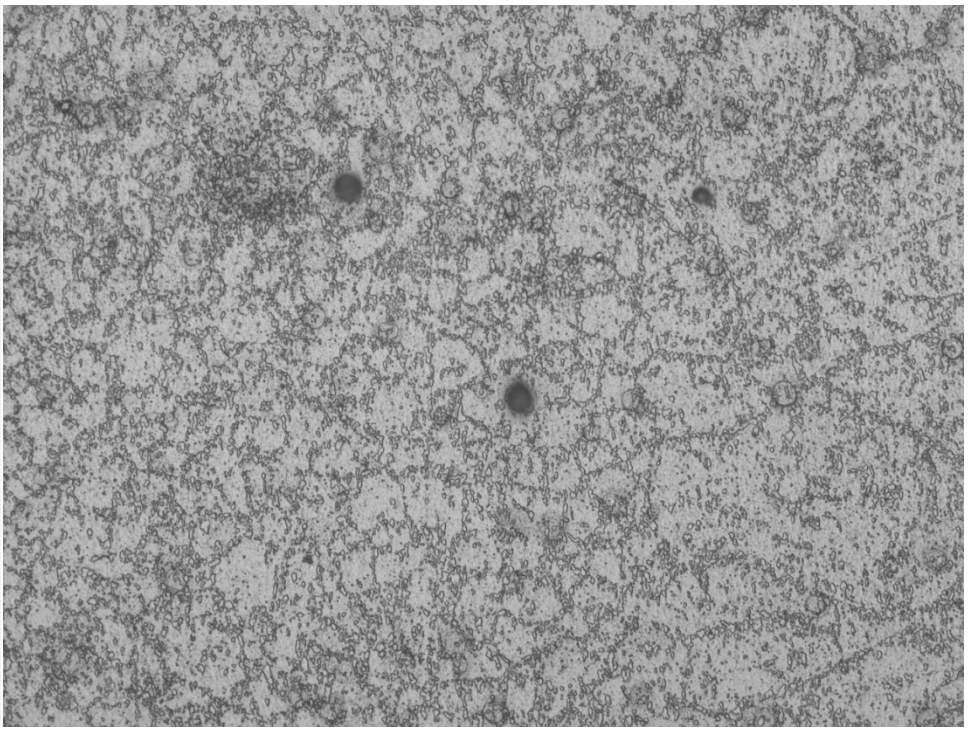
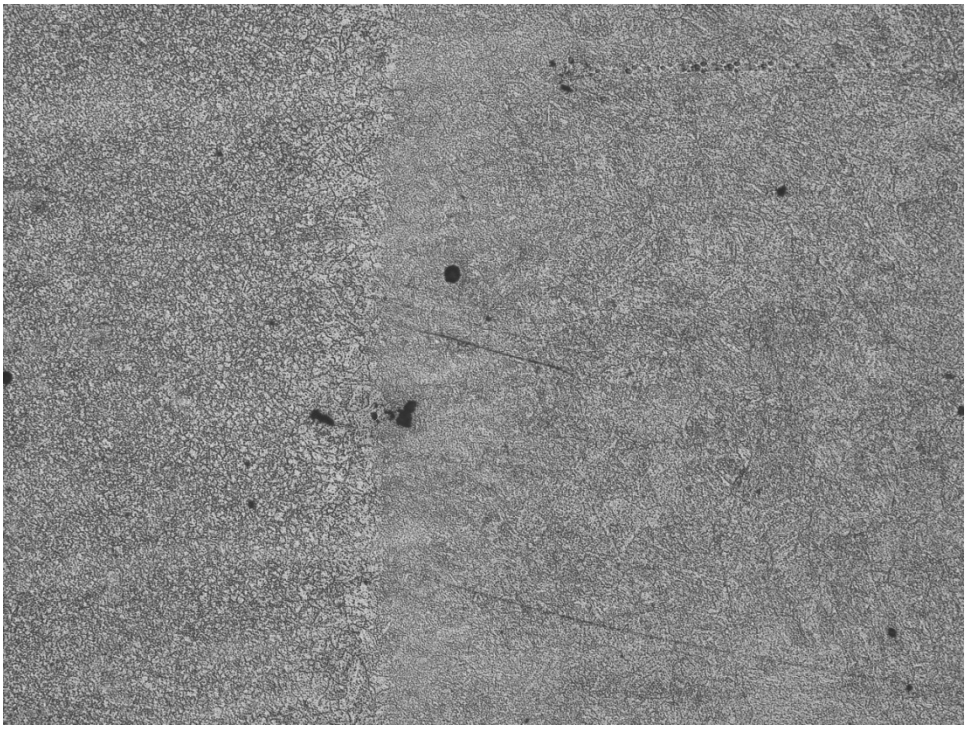


500X

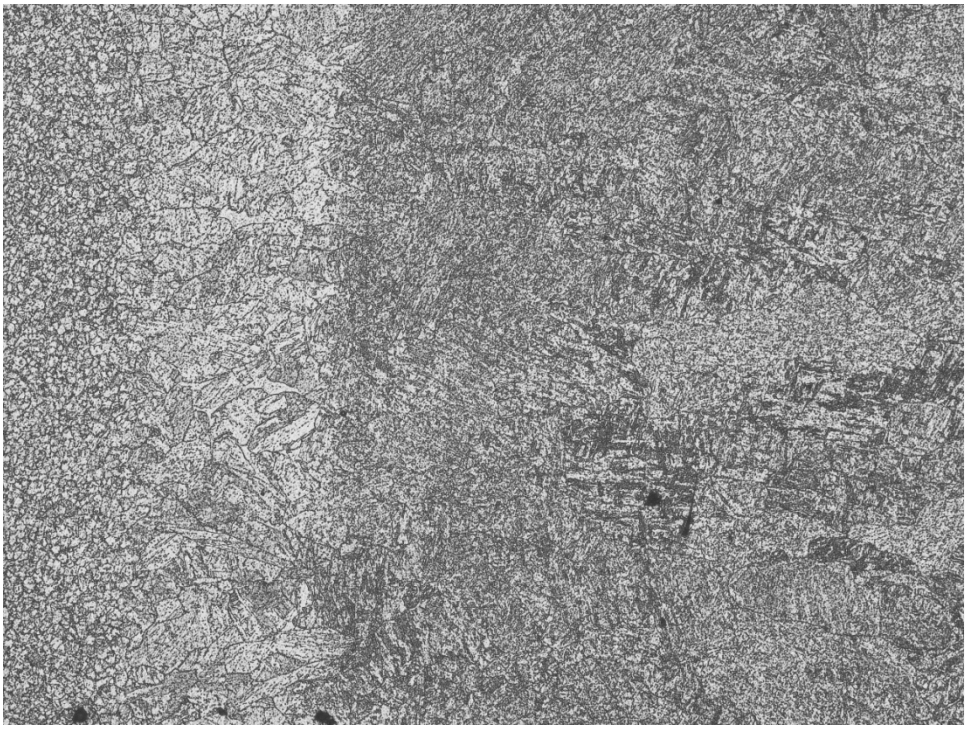
Fig. 97. Replica No. LPROH-R5.



100X

500X

Fig. 98. Replica No. LPROH-R6.



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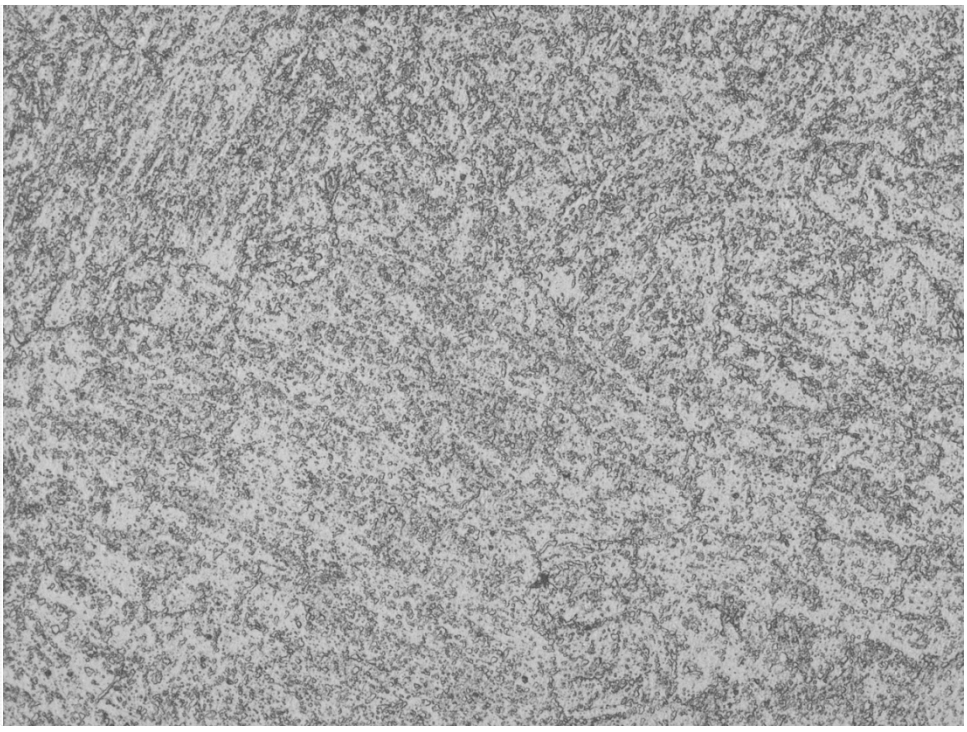
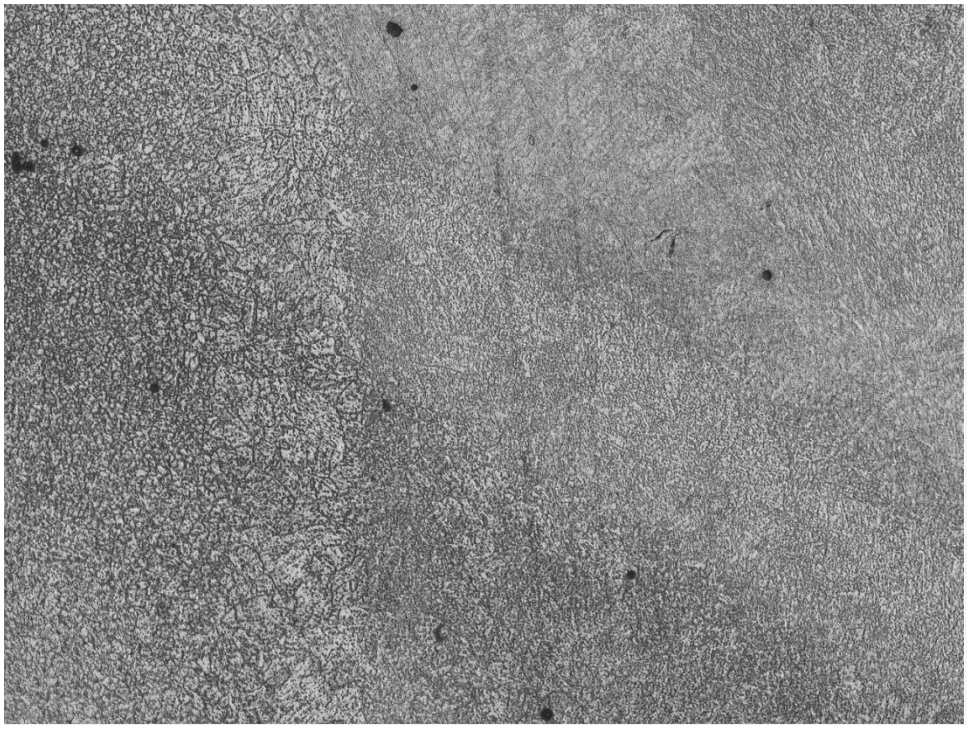


500X

Fig. 99. Replica No. LPROH-R7.



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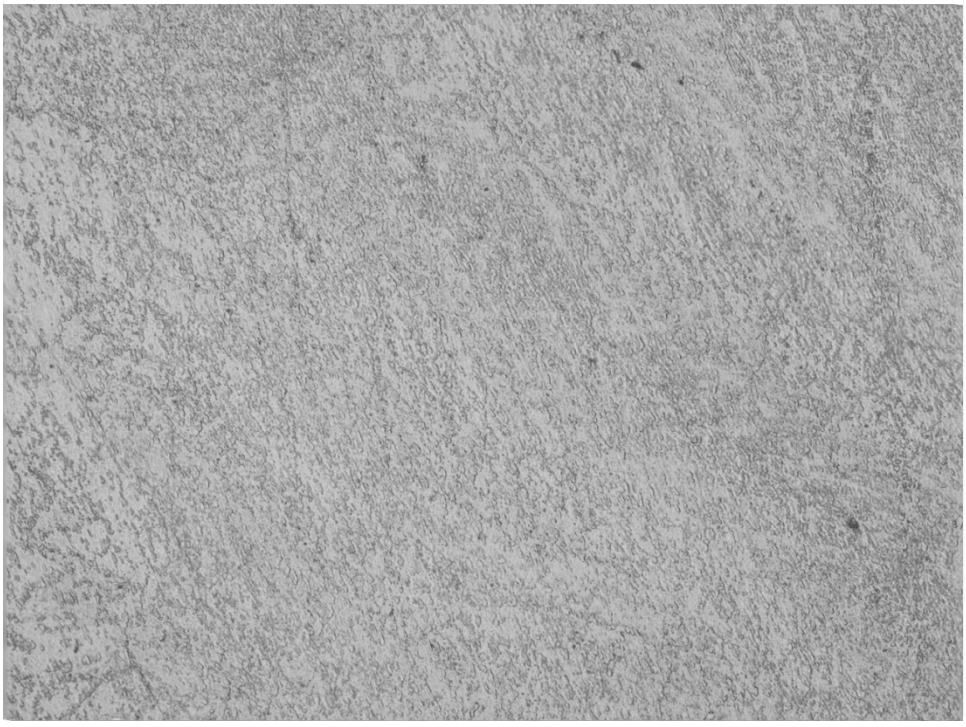


500X

Fig. 100. Replica No. LPROH-R8.

APPENDIX A

NONDESTRUCTIVE EXAMINATION REPORTS
PLATEN SUPERHEATER INLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station
Unit No. 1 - Platen Superheater Inlet Header
Seam Welded

The minimum wall thickness requirements were calculated for the Platen Superheater Inlet header. These calculations are based on the Original 1968 ASME Code for Boiler and Pressure Vessels.

ASTM Material Specifications for:	SA-204, Gr. A	

Where:

T- Design Temperature	850	°F
P- Maximum Allowable Pressure	4,075	psig
D- Outside Diameter	22.00	in
SE- Maximum Stress Value	14,400	psi
W-Weld Strength Reduction Factor	0.95	
y-Temperature Coefficient	0.40	
A- Additional Thickness	0.000	in

The following equation applies:
Per. Sect I, PG 27.2.2

t_m=(PD/(2(SEW+PY))+A	2.928	in

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Platen Superheater Inlet Header - Unit No. 1	Material: SA-204, Gr. A	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ AMP Turns _____
☐ DC ☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications.	x	
GW-2	N/A	No recordable indications.	x	
GW-3	N/A	No recordable indications.	x	
GW-4	N/A	No recordable indications.	x	
Seam Welds				
LS-1A	N/A	No recordable indications.	x	
LS-2A	N/A	No recordable indications.	x	
LS-3A	N/A	No recordable indications.	x	
LS-4A	N/A	No recordable indications.	x	
LS-5A	N/A	No recordable indications.	x	
Penetrations				
P-1	N/A	No recordable indications.	x	
P-2	N/A	No recordable indications.	x	
P-3	N/A	No recordable indications.	x	
Tube Stubs				
Row 5, Tube J	1/8"	Indication on weld.	Monitor	
Row 9, Tube G	1/8"	Indication on weld.	Monitor	
Row 9, Tube P	1/8"	Indication on weld.	Monitor	
Row 26, Tube L	1/8"	Indication on weld.	Monitor	

Note: Tube stubs in every 5th row from the north end were examined. No other recordable indications were revealed.

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066	
Component: Platen Superheater Inlet Header - Unit No. 1	Material: SA-204, Gr. A	Nominal Wall: 3.249"	Minimum Wall: 2.928"

EQUIPMENT NorthED:

- ☑ D-Meter
- ☐ Pi-Tape
- ☐ Other
- ☐ Micrometer
- ☐ Calipers

KEY:

North - Upstream

South -Downstream

IDENTIFICATION		DIAMETER MEASUREMENTS (IN.)			THICKNESS MEASUREMENTS (IN.)			
		Pi-TAPE	CALIPERS		12:00	3:00	6:00	9:00
			12 to 6	3 to 9				
GW-1	North				3.332	3.338	3.358	3.375
	South				3.316	3.317	3.432	3.328
GW-2	North				3.360	3.331	3.457	3.310
	South				3.415	3.403	3.369	3.378
GW-3	North				3.422	3.263	3.318	3.291
	South				3.263	3.332	3.369	3.289
GW-4	North				3.296	3.300	3.395	3.282
	South				3.370	3.341	3.351	3.335

INSPECTOR: M. Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Platen Superheater Inlet Header
Unit Number:	1	**Weld Number:**	PSHIH-GW1
Project Number:	43-11-0066	**Weld Configuration**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.35"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

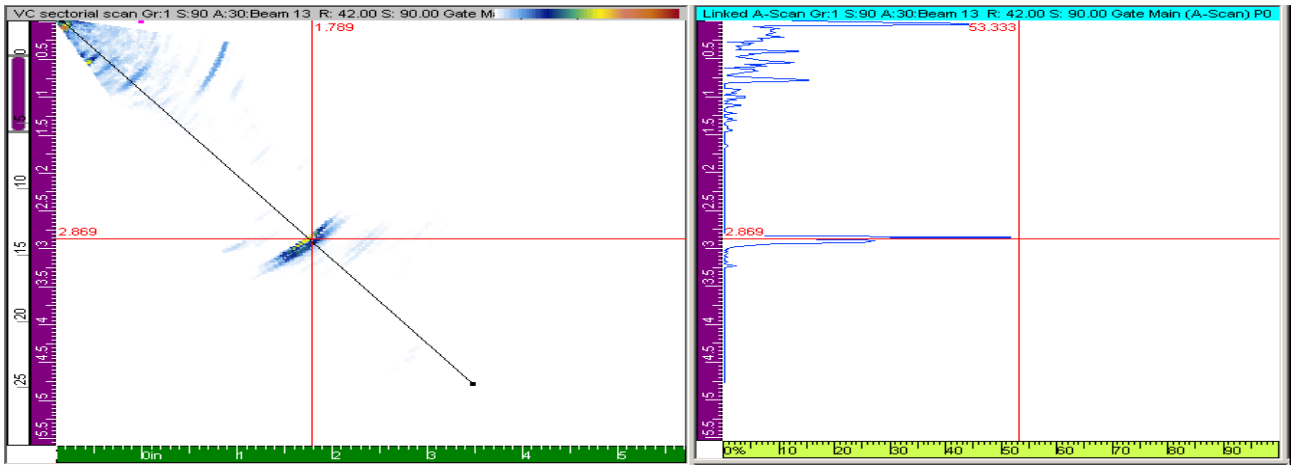
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456in	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry.
No relevant indications were detected.

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Platen Superheater Inlet Header
Unit Number:	1	**Weld Number:**	PSHIH-GW2
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.35"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

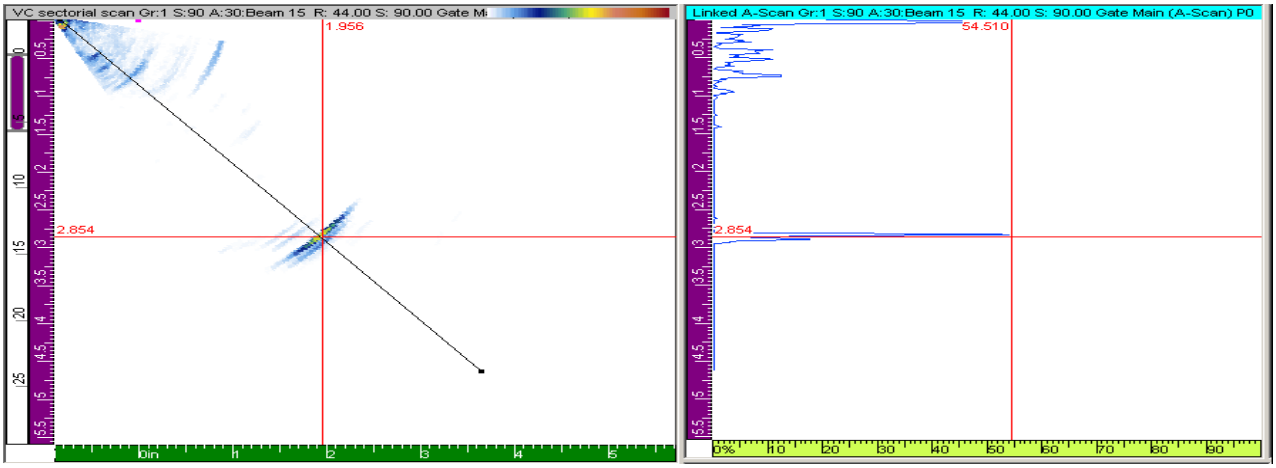
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456in	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

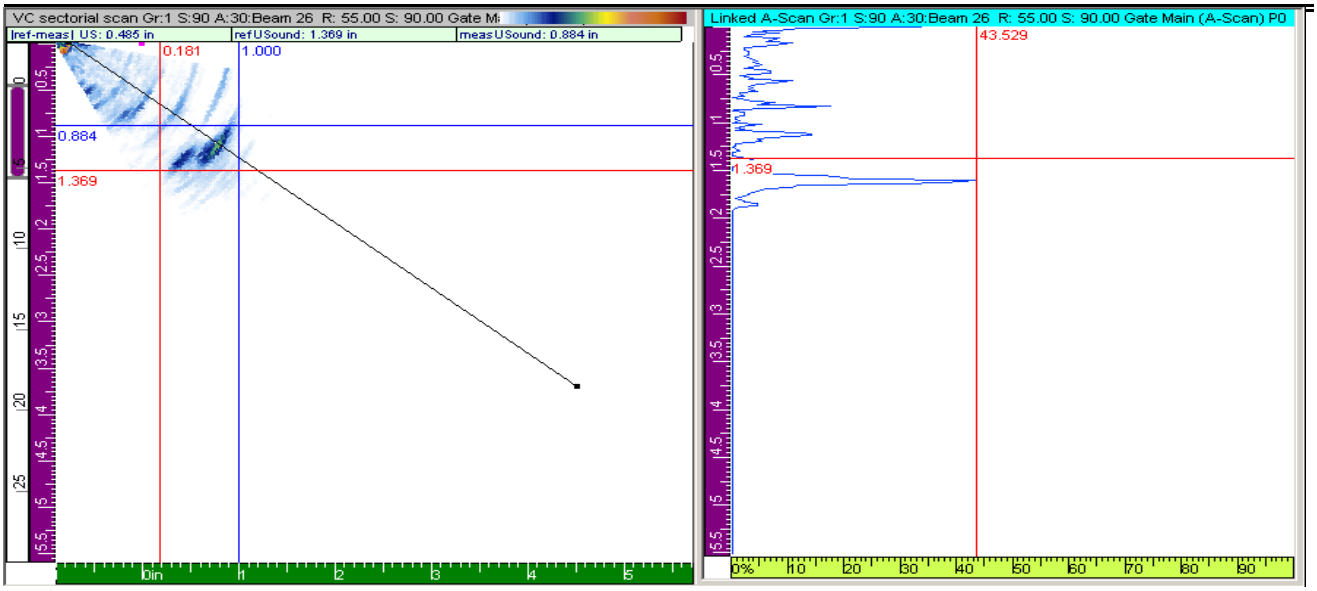
Image of typical 360° non-relevant root signal / Root geometry
An inclusion-type indication indicative of original manufacturing was detected from 41" to 44" / Image of indication attached.

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Component: AEP - Mitchell Generating Station
Weld Number: 1



Indication Comments and Location:
3" long inclusion-type indication detected from 41" to 44" around weld / Inclusion approximately 1" in depth indication is indicative of original manufacturing and not service related.

Component:
Weld Number:

Indication Comments and Location:

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**5/9/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Platen Superheater Inlet Header
Unit Number:	1	**Weld Number:**	PSHIH-GW3
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.35"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

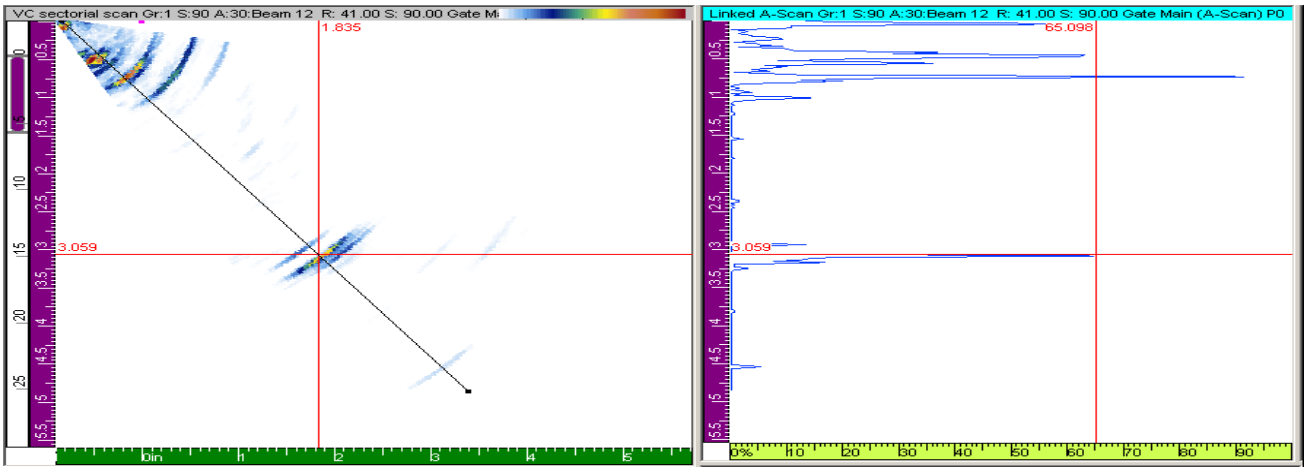
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456in	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry.
No relevant indications were detected.

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Platen Superheater Inlet Header
Unit Number:	1	**Weld Number:**	PSHIH-GW4
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.35"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

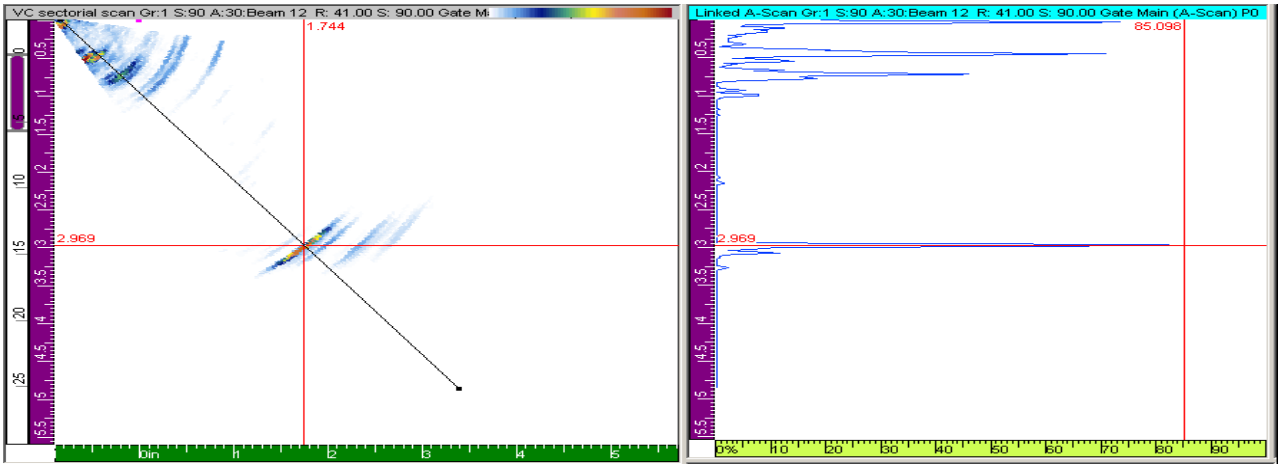
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456in	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No relevant indication detected.

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Calibration

Customer:	AEP - Mitchell Generating Station	**Component:**	Platen Superheater Inlet Header
Unit Number:	1	**Weld Number:**	See Attached Report
Project Number:	43-11-0066	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.4"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Calibration ID#
Omni Scan MX	Omni-1179	Scan:Omni-2.0R5 Analysis:TomoView-2.4R1		43011-3.0"

Probe Characterization

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10/A1	G1745/C0055	5MHz	55.0 Degrees	0.378 in

Setup

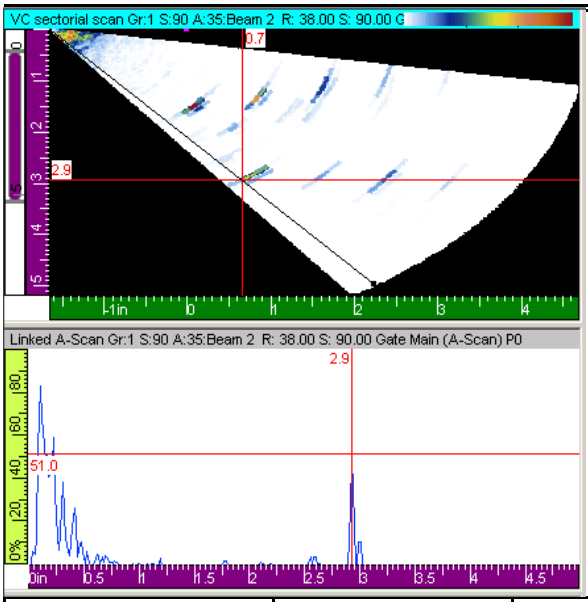
Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.690/10.464us	0.000in	6.327/6.327in	32/32	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	31/31	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(High)	33/35dB	PE(Pulse Echo)	Shear	100ns

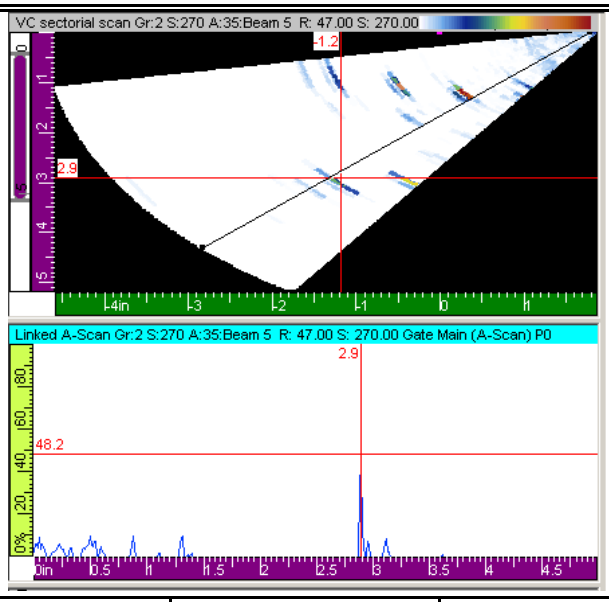
Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	2.0 Degrees	3.5in	0.126 in/us

Encoder / Scan Area

Encoder Model	Serial #	Type	Resolution	Polarity
USDigital	USD3127	Quadrature	220.0step/in	Normal
Scan Resolution	**Max Scan Speed**	**Couplant**	**PCS**	**Cal. Block Reflector**
0.050in	9.842in/sec	Sonatech	2.5"	NAV-0.040"SDH





Date / Time	Date / Time	Date / Time	Date / Time	Date / Time
4/30 - 7AM				

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **4/30/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Platen Superheater Inlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.35"
Calibration ID #:	43011-3.0"	**Part Diameter:**	22"

Weld #	Indication	Scan Location	Range of Depth	Comments / Obstructions
LS-1A	No Relevant Indications Detected			
LS-1B	No Relevant Indications Detected			
LS-2A	No Relevant Indications Detected			
LS-2B	No Relevant Indications Detected			
LS-3A	No Relevant Indications Detected			
LS-3B	No Relevant Indications Detected			
LS-4A	No Relevant Indications Detected			
LS-4B	No Relevant Indications Detected			
LS-5A	No Relevant Indications Detected			
LS-5B	No Relevant Indications Detected			

Notes and Comments

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/30/2011**

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

HARDNESS MEASUREMENT SHEET

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Platen Superheater Inlet Header - Unit No. 1	Material: SA-204, Gr. A	Hardness Scale: BHN

Location:		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
PSIH-R1	Seam	193	208	207	183	206	199	94,000
	Girth	208	206	204	210	207	207	98,000
	Base	156	158	144	161	156	155	74,000
PSIH-R2	Seam	173	175	173	176	169	173	83,000
	Girth	188	193	208	183	213	197	93,000
	Base	142	148	146	145	145	145	69,000
PSIH-R3	Seam	164	163	165	190	168	170	81,000
	Girth	167	213	209	237	196	204	96,000
	Base	137	138	135	146	132	138	66,000
PSIH-R4	Seam	185	179	180	187	178	182	86,000
	Girth	207	185	173	181	151	179	86,000
	Base	136	143	134	142	143	140	67,000
PSIH-R5	Seam	208	180	189	209	186	194	92,000
	Girth	150	140	135	154	166	149	71,000
	Base	145	125	135	131	129	133	64,000
PSIH-R6	Seam	158	160	178	162	148	161	77,000
	Girth	151	202	186	209	184	186	90,000
	Base	141	131	136	134	139	136	66,000
PSIH-R7	Seam	177	155	184	160	162	168	80,000
	Girth	204	230	187	197	195	203	95,000
	Base	151	143	142	134	161	146	70,000
PSIH-R8	Seam	153	142	148	162	149	151	72,000
	Girth	196	182	213	187	180	192	90,000
	Base	166	148	150	154	148	153	73,000

Inspector: Manny Gracie, John McCarthy	Date: 05/04/2011

APPENDIX B

NONDESTRUCTIVE EXAMINATION REPORTS
PLATEN SUPERHEATER OUTLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 1 - Platen Superheater Oulet header

The minimum wall thickness requirements were calculated for the Platen Superheater Outlet header. These calculations are based on the Original 1968 ASME Code for Boiler and Pressure Vessels.

ASME Material Specifications for:	SA-335, Gr. P11		

Where:

T- Design Temperature	944	°F	
P- Maximum Allowable Pressure	4,020	psig	
D- Outside Diameter	20.50	in	
S- Maximum Stress Value	11,252	psi	Per. Sect II D, Table 1A
E- Efficency	1.000		Per. Sect I, PG 27.4 Note 1
y-Temperature Coefficient	0.400		Per. Sect I, PG 27.4 Note 6

The following equation applies:
Per. Sect I, PG 27.2.2

$t_m=(PD/(2(SE)+2(yP))$	3.204	in

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Platen Superheater Outlet Header - Unit No. 1	Material: SA-335, P11	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ AMP Turns _____
☐ DC ☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications.	x	
GW-2	N/A	No recordable indications.	x	
GW-3	N/A	No recordable indications.	x	
GW-4	N/A	No recordable indications.	x	
GW-5	N/A	No recordable indications.	x	
GW-6	N/A	No recordable indications.	x	
GW-7	N/A	No recordable indications.	x	
GW-8	N/A	No recordable indications.	x	
GW-9	N/A	No recordable indications.	x	
GW-10	N/A	No recordable indications.	x	
GW-11	N/A	No recordable indications.	x	
GW-12	N/A	No recordable indications.	x	
Penetrations				
P-1	N/A	No recordable indications.	x	
P-2	N/A	No recordable indications.	x	
P-3	N/A	No recordable indications.	x	
Saddle Weld				
SW-1	5"	Indication 1/8" deep. Removed by grinding.	x	

Note: Tube stubs in every 5th row from the north end were examined. No recordable indications were revealed.

INSPECTOR: M. Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066	
Component: Platen Superheater Outlet Header - Unit No. 1	Material: SA-335, P11	Nominal Wall: 3.375"	Minimum Wall: 3.204"

EQUIPMENT NorthED:

☑ D-Meter ☐ Pi-Tape ☐ Other
☐ Micrometer ☐ Calipers

KEY:

North - Upstream

South -Downstream

IDENTIFICATION		DIAMETER MEASUREMENTS (IN.)			THICKNESS MEASUREMENTS (IN.)			
		Pi-TAPE	CALIPERS		12:00	3:00	6:00	9:00
			12 to 6	3 to 9				
GW-1	North				3.490	3.492	3.489	3.488
	South				3.665	3.660	3.623	3.643
GW-2	North				3.680	3.616	3.659	3.664
	South				N/A	N/A	N/A	N/A
GW-3	North				N/A	N/A	N/A	N/A
	South				3.628	3.620	3.641	3.665
GW-4	North				3.662	3.622	3.588	3.620
	South				3.613	3.572	3.650	3.599
GW-5	North				3.592	3.605	3.565	3.616
	South				N/A	N/A	N/A	N/A
GW-6	North				N/A	N/A	N/A	N/A
	South				3.600	3.639	3.684	3.624
GW-7	North				3.587	3.613	3.697	3.620
	South				3.488	3.565	3.492	3.495
GW-8	US				N/A	N/A	N/A	N/A
	DS				3.003	3.016	3.003	3.002
GW-9	US				2.992	3.009	2.992	3.004
	DS				2.992	2.987	3.003	2.995
GW-10	US				N/A	N/A	N/A	N/A
	DS				2.225	2.185	2.105	2.152
GW-12	US				2.998	3.000	3.012	3.000
	DS				3.026	3.034	3.038	3.040

INSPECTOR: M. Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW1
Project Number:	43-11-0066	**Weld Configuration:**	Header to End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

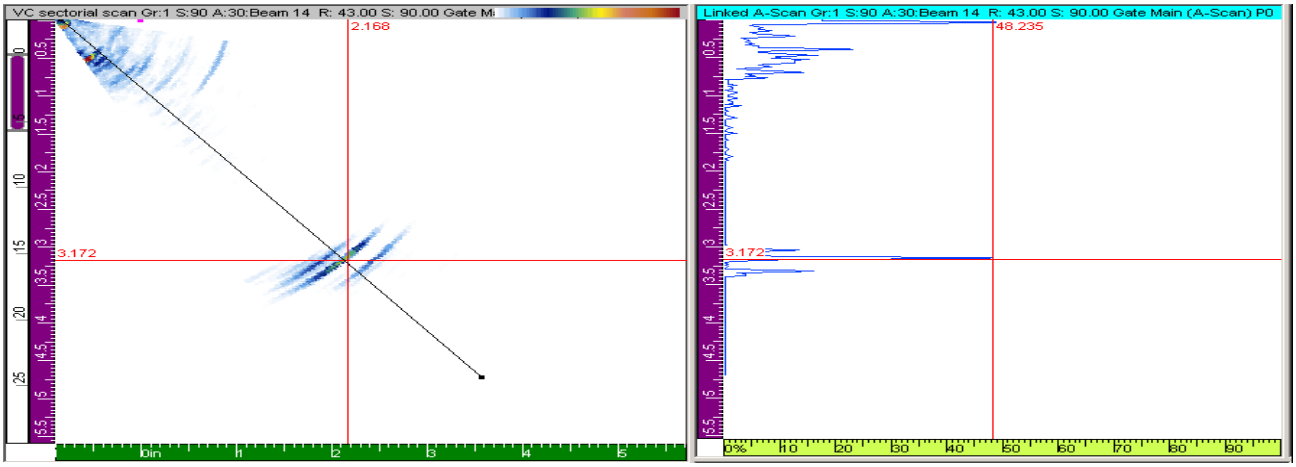
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW2
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

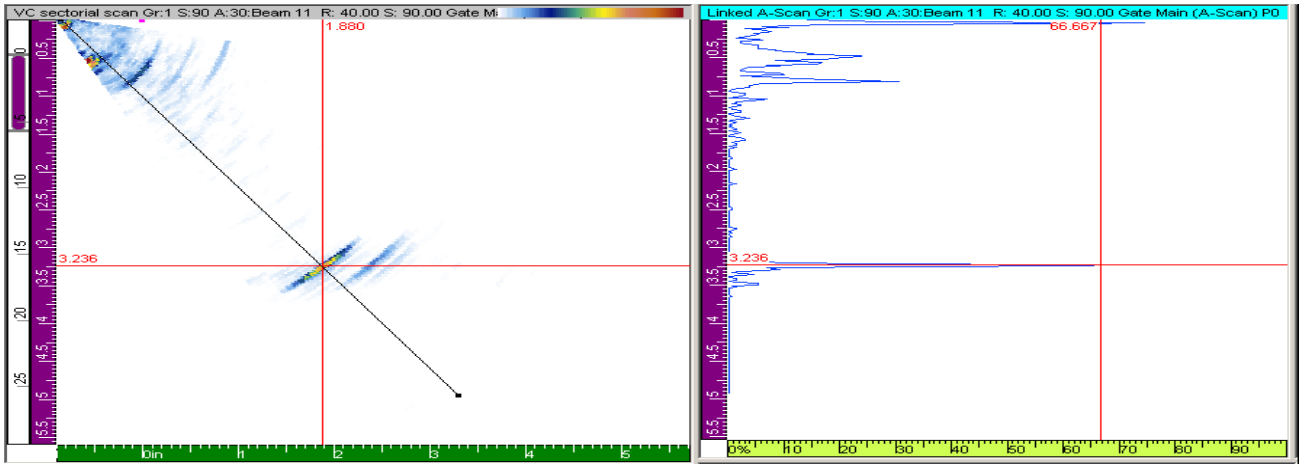
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the north side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW3
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

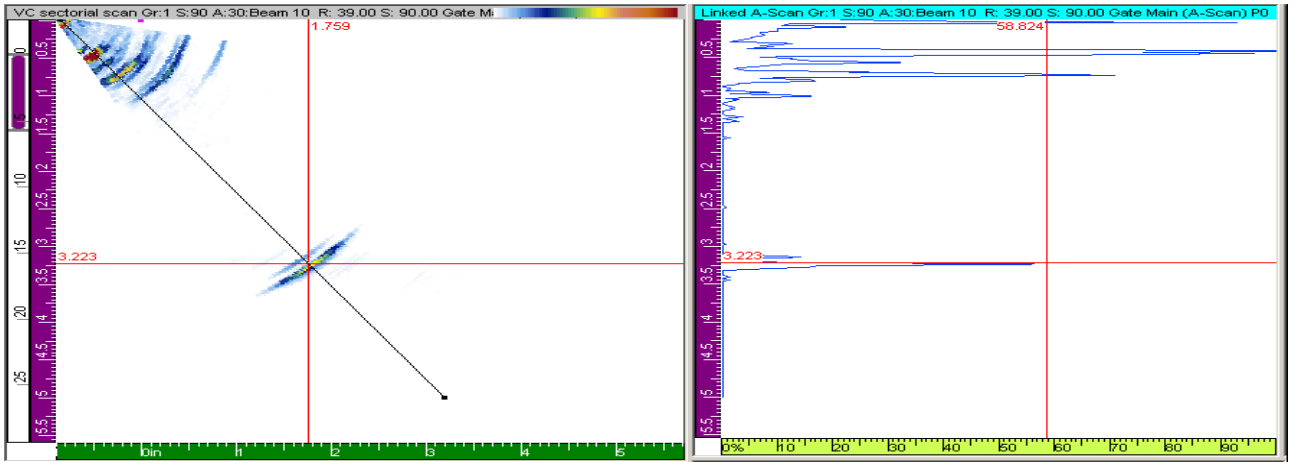
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the south side of weld was accessible for scanning due to the outside configuration.

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW4
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

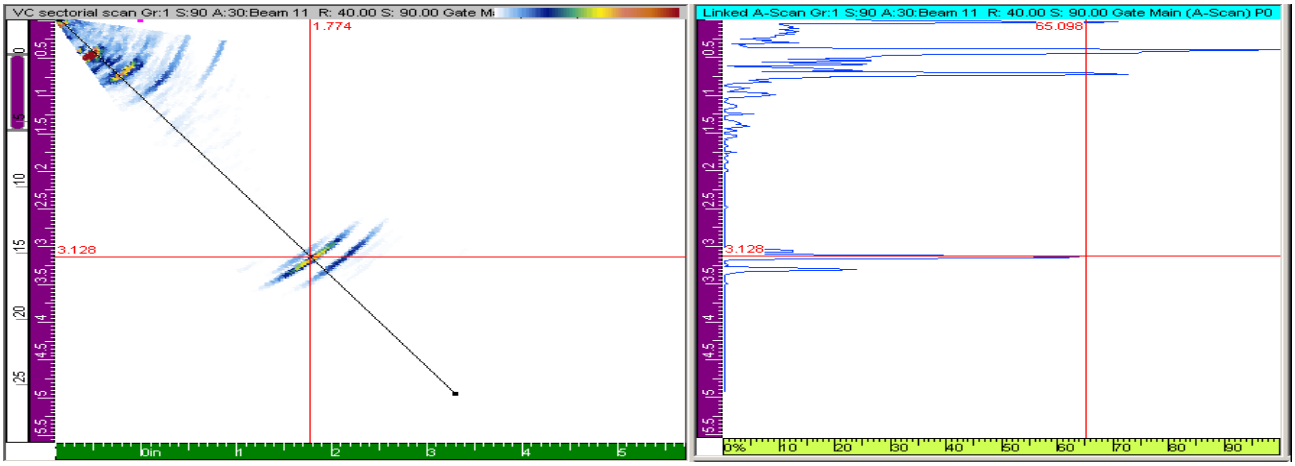
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW5
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

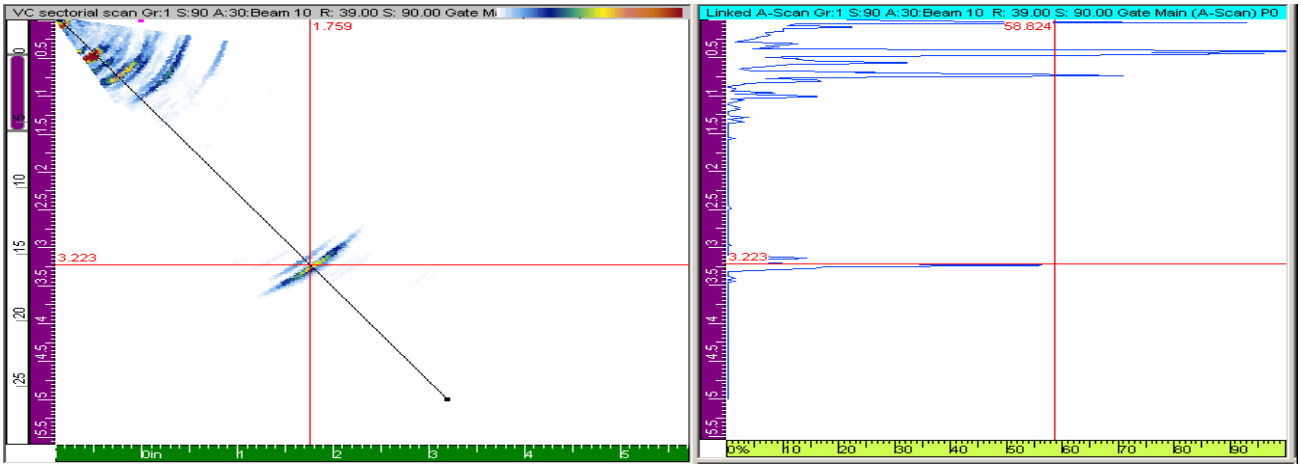
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	**1st Element**	**Last Element**	**Resolution**	**Scan Type**
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the north side of weld was accessible for scanning due to the outside configuration

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**5/9/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW6
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

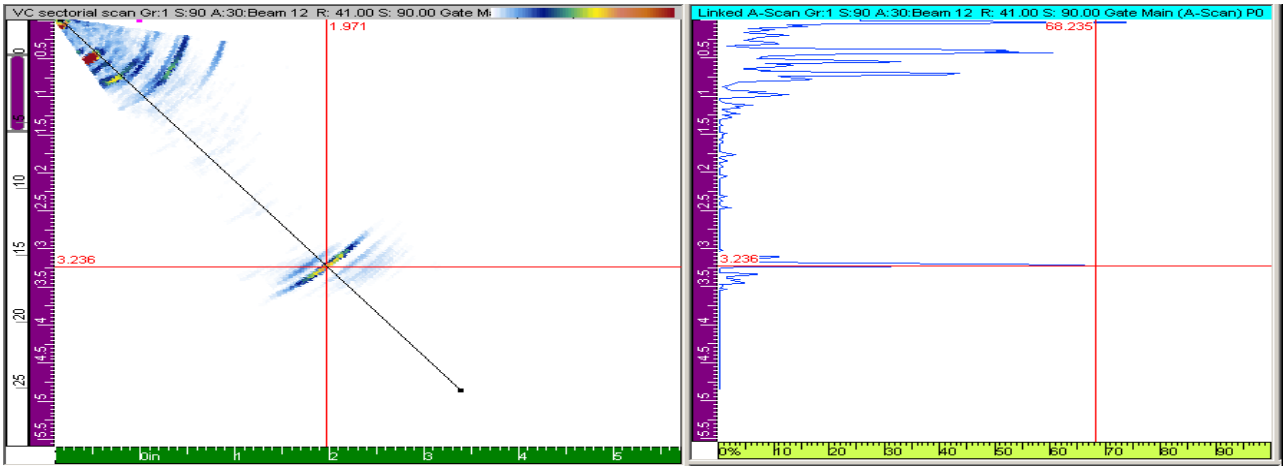
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the south side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW7
Project Number:	43-11-0066	**Weld Configuration:**	Header to End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

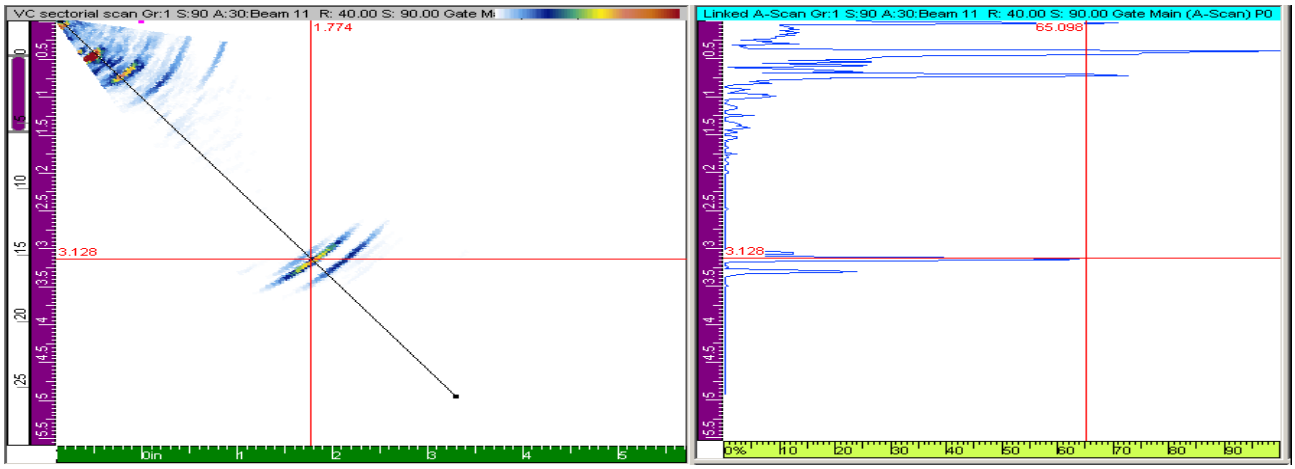
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW8
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

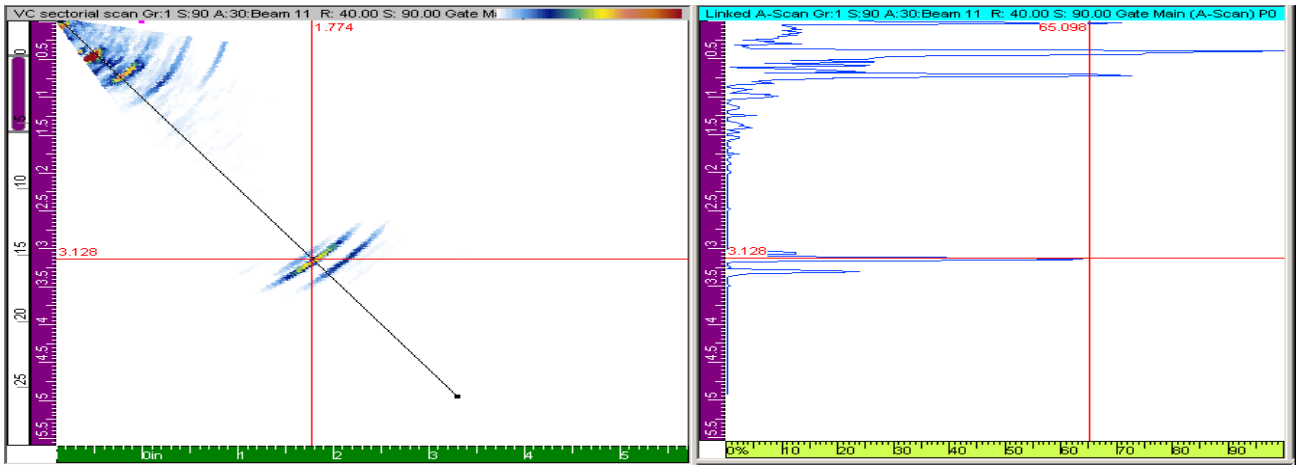
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the downstream side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW9
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Pipe
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

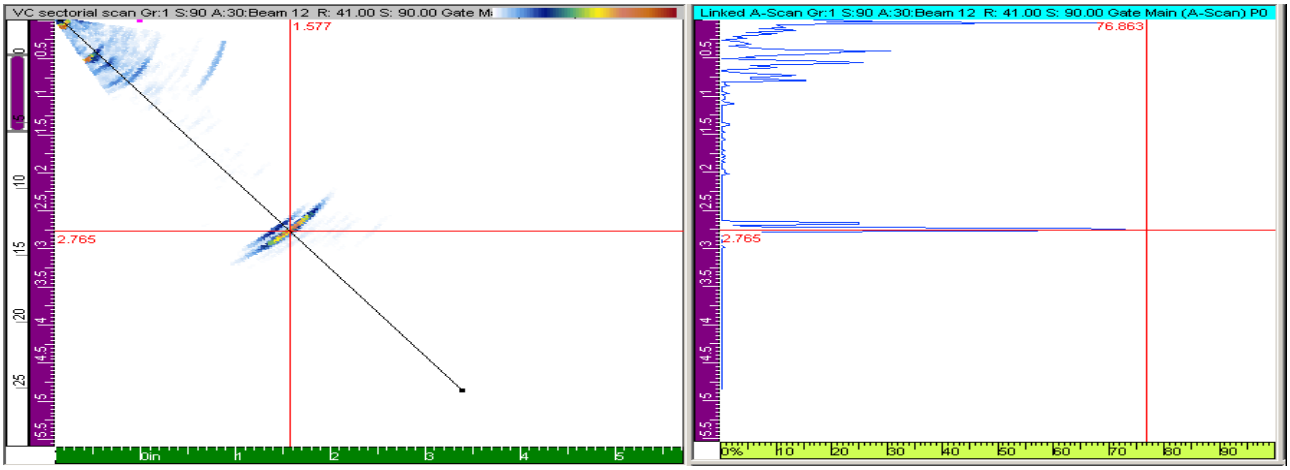
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW10
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Reducer
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	2.2"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
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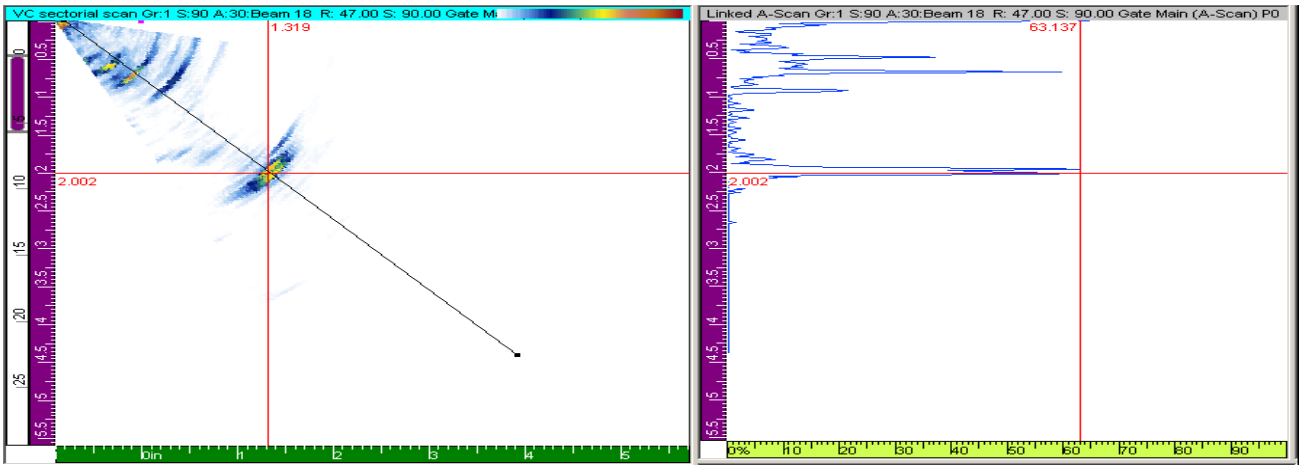
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the downstream side of weld was accessible for scanning due to the outside configuratior

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW11
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

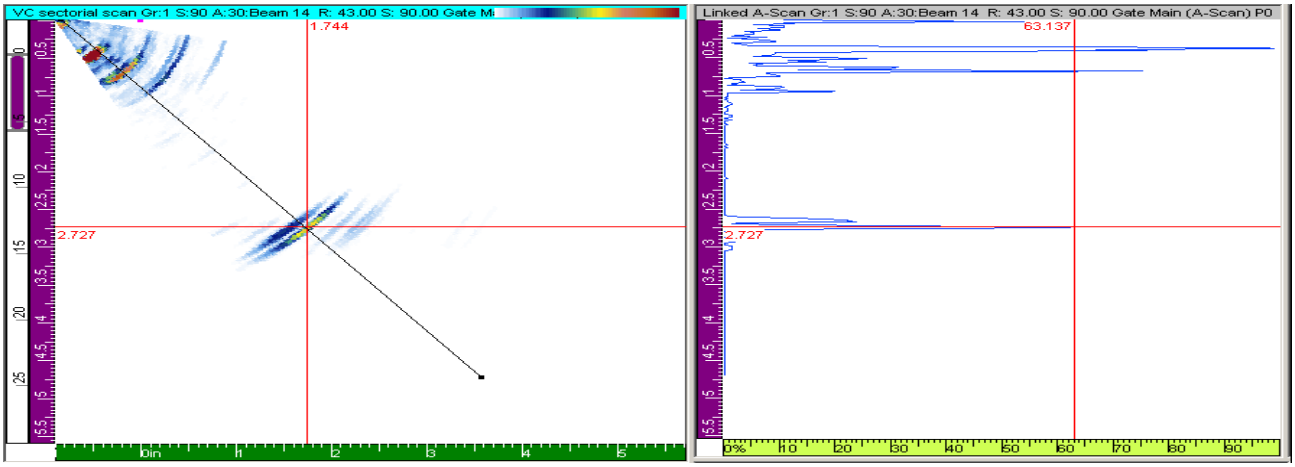
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the downstream side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Platen Superheater Outlet Header
Unit Number:	1	**Weld Number:**	PSHOH-GW12
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Pipe
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.6"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

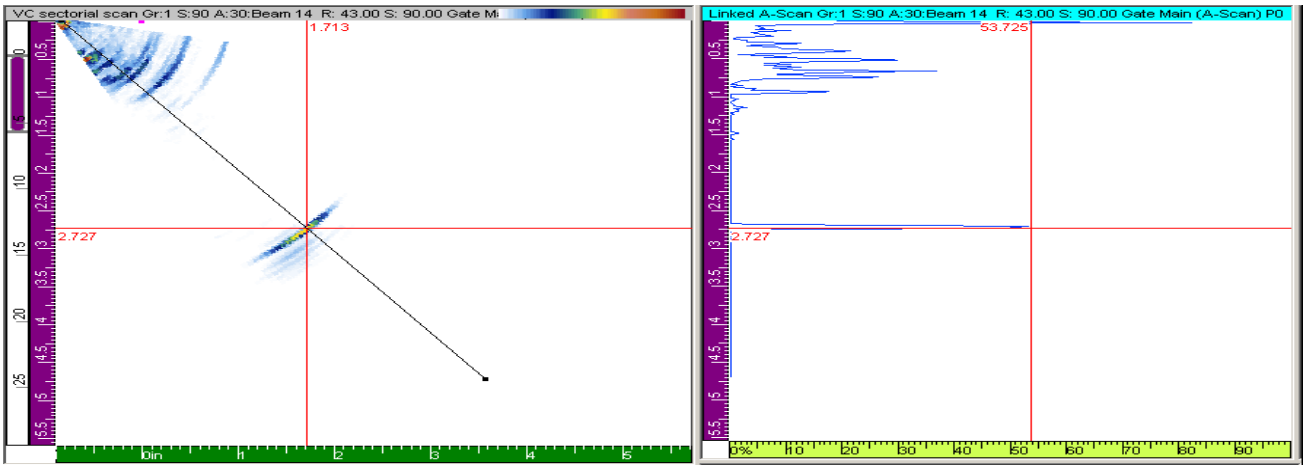
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

HARDNESS MEASUREMENT SHEET

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Platen Superheater Outlet Header - Unit No. 1	Material: SA-335, P11	Hardness Scale: HBN

Location:		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
PSOH-R1	Weld	153	156	159	161	162	158	76,000
	Base	154	149	150	150	149	150	72,000
PSOH-R2	Weld	161	165	158	163	167	163	78,000
	Base	184	195	186	159	160	177	84,000
PSOH-R3	Weld	160	138	142	150	167	151	72,000
	Base	164	181	176	174	184	176	84,000
PSOH-R4	Weld	139	131	138	139	134	136	66,000
	Base	149	155	161	150	151	153	73,000
PSOH-R5	Weld	160	162	161	155	162	160	77,000
	Base	159	139	139	130	134	140	67,000
PSOH-R6	Weld	139	141	149	141	152	144	69,000
	Base	153	160	152	150	165	156	75,000
PSOH-R7	Weld	147	157	142	139	155	148	71,000
	Base	116	127	110	127	133	123	60,000
PSOH-R8	Weld	143	147	160	152	163	153	73,000
	Base	139	154	162	154	154	153	73,000

Inspector: Manny Gracie, John McCarthy	Date: 05/04/2011

APPENDIX C

NONDESTRUCTIVE EXAMINATION REPORTS
FINISHING SUPERHEATER INLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 1 - Finishing Superheater Inlet header

The minimum wall thickness requirements were calculated for the Finishing Superheater Inlet header. These calculations are based on the Original 1968 ASME Code for Boiler and Pressure Vessels.

ASME Material Specifications for: SA-335, Gr. P11

Where:

T- Design Temperature	900	°F	
P- Maximum Allowable Pressure	4,000	psig	
D- Outside Diameter	19.25	in	
S- Maximum Stress Value	13,100	psi	Per. Sect II D, Table 1A
E- Efficency	1.000		Per. Sect I, PG 27.4 Note 1
y-Temperature Coefficient	0.400		Per. Sect I, PG 27.4 Note 6

The following equation applies:
Per. Sect I, PG 27.2.2

$t_m=(PD/(2(SE)+2(yP))$ 2.619 in

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component:Finishing Superheater Inlet Header - Unit No. 1	Material: SA-335, P11	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ DC
☐ AMP Turns _____
☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications	x	
GW-2	N/A	No recordable indications	x	
GW-3	N/A	No recordable indications	x	
GW-4	N/A	No recordable indications	x	
GW-5	N/A	No recordable indications	x	
GW-6	N/A	No recordable indications	x	
GW-7	N/A	No recordable indications	x	
GW-8	N/A	No recordable indications	x	
GW-9	N/A	No recordable indications	x	
GW-10	N/A	No recordable indications	x	
GW-11	N/A	No recordable indications	x	
GW-12	N/A	No recordable indications	x	
GW-13	N/A	No recordable indications	x	
GW-14	N/A	No recordable indications	x	
Penetrations				
P-1	N/A	No recordable indications	x	
P-2	N/A	No recordable indications	x	
P-3	N/A	No recordable indications	x	

INSPECTOR: Manny Gracie, John McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066	
Component: Finishing Superheater Inlet Header - Unit No. 1	Material: SA-335, P11	Nominal Wall: 2.845"	Minimum Wall: 2.619"

EQUIPMENT USED:

☐ D-Meter ☐ Pi-Tape ☐ Other
☐ Micrometer ☐ Calipers

KEY:
US - Upstream
DS -Downstream

IDENTIFICATION		DIAMETER MEASUREMENTS (IN.)			THICKNESS MEASUREMENTS (IN.)			
		Pi-TAPE	CALIPERS		12:00	3:00	6:00	9:00
			12 to 6	3 to 9				
GW-1	North				2.967	2.954	2.971	2.968
	South				2.924	2.922	2.935	2.926
GW-2	North				2.933	2.938	2.937	2.930
	South				N/A	N/A	N/A	N/A
GW-3	North				N/A	N/A	N/A	N/A
	South				2.901	2.923	2.918	2.900
GW-4	North				2.899	2.900	2.900	2.900
	South				N/A	N/A	N/A	N/A
GW-5	North				N/A	N/A	N/A	N/A
	South				2.899	2.892	2.900	2.895
GW-6	North				2.928	2.875	2.914	2.912
	South				N/A	N/A	N/A	N/A
GW-7	North				N/A	N/A	N/A	N/A
	South				2.923	2.918	2.912	2.937
GW-8	North				2.931	2.923	2.923	2.921
	South				2.982	2.964	2.967	2.970
GW-9	US				2.994	3.005	3.010	3.002
	DS				N/A	N/A	N/A	N/A
GW-10	US				3.042	3.044	3.043	3.039
	DS				3.002	2.974	3.021	3.017
GW-11	US				2.740	2.675	2.697	2.844
	DS				N/A	N/A	N/A	N/A
GW-12	US				2.783	2.812	2.845	2.712
	DS				2.719	2.680	2.705	2.836
GW-13	US				3.003	3.001	3.005	3.005
	DS				N/A	N/A	N/A	N/A
GW-14	US				3.065	3.056	3.064	3.066
	DS				3.001	2.996	3.023	2.993

INSPECTOR: Tom Blazetic, Dave Jakubowski	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW1
Project Number:	43-11-0066	**Weld Configuration:**	Header to End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
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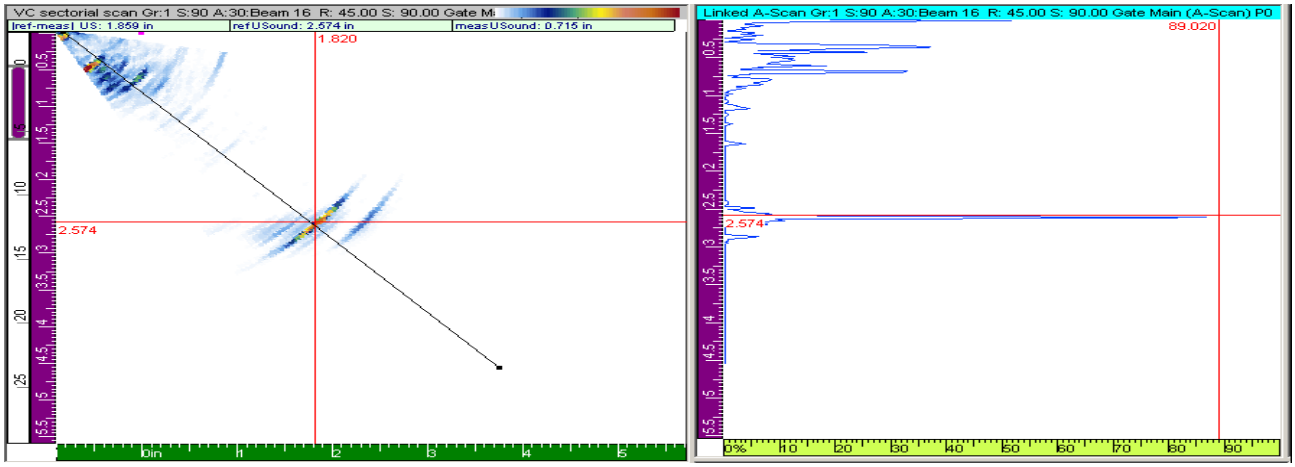

COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW2
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
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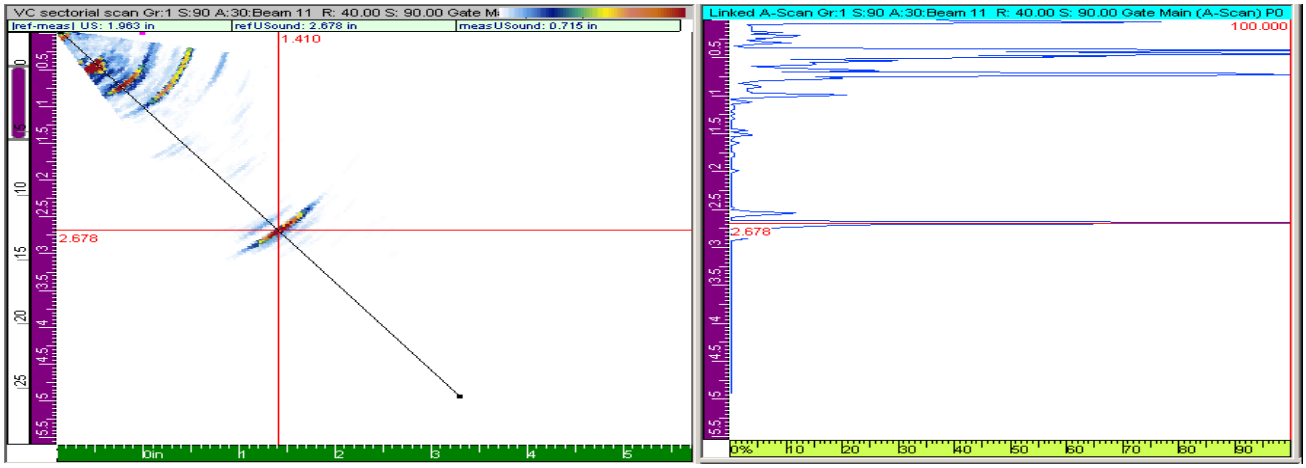

COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the north side of weld was accessible for scanning due to the outside configuration

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**5/8/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW3
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
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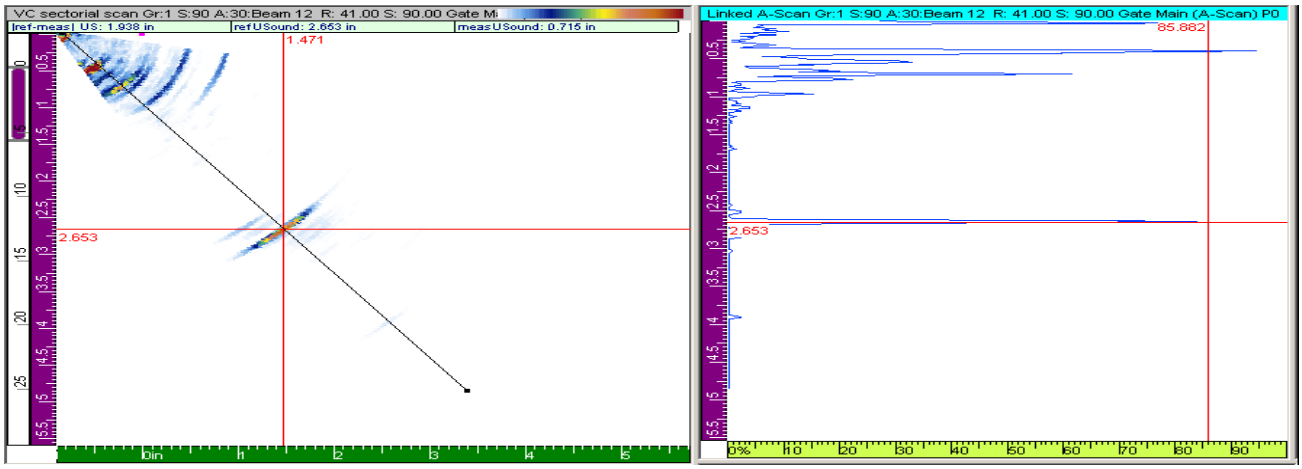
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the south side of weld was accessible for scanning due to the outside configuration

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**5/8/2011**

THIELSCH ENGINEERING Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW4
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

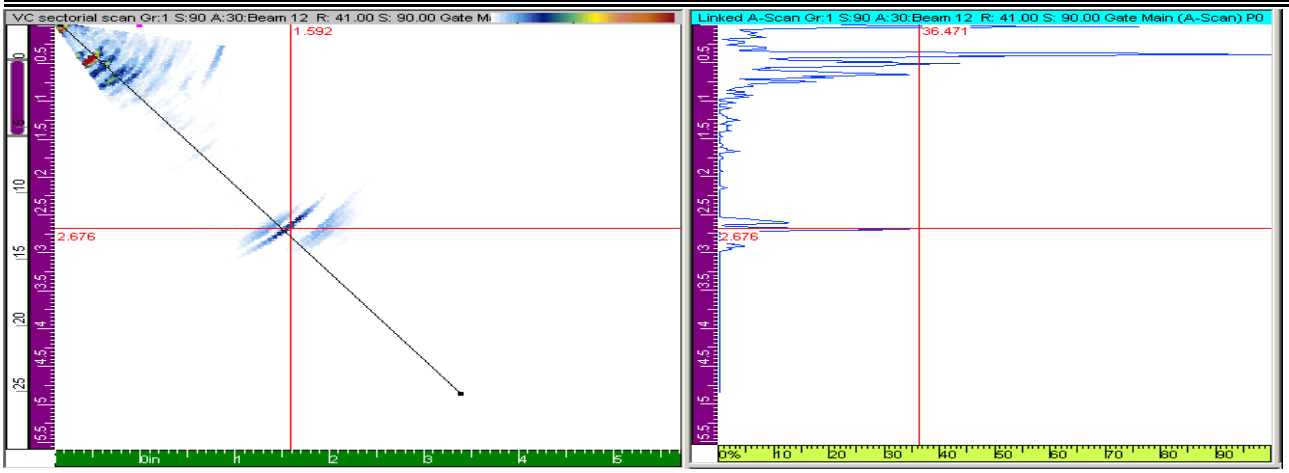
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the north side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW5
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

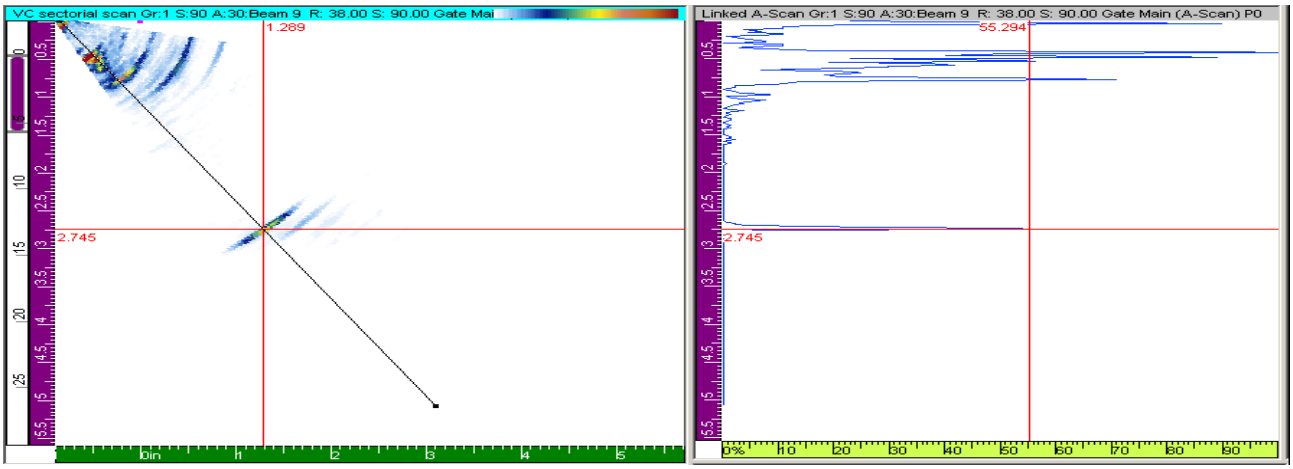
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the south side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW6
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

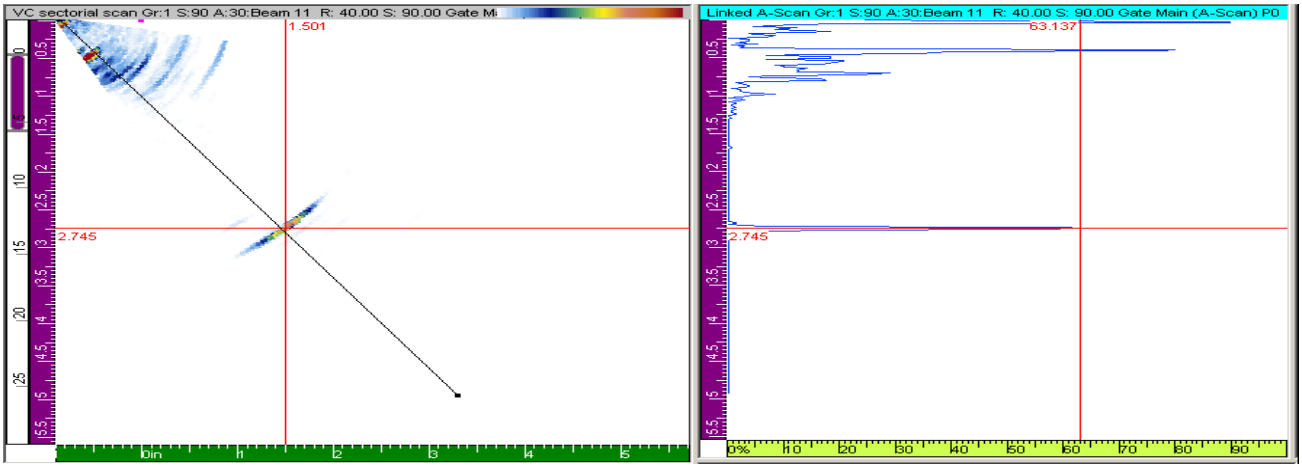
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the north side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW7
Project Number:	43-11-0066	**Weld Configuration:**	Header to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

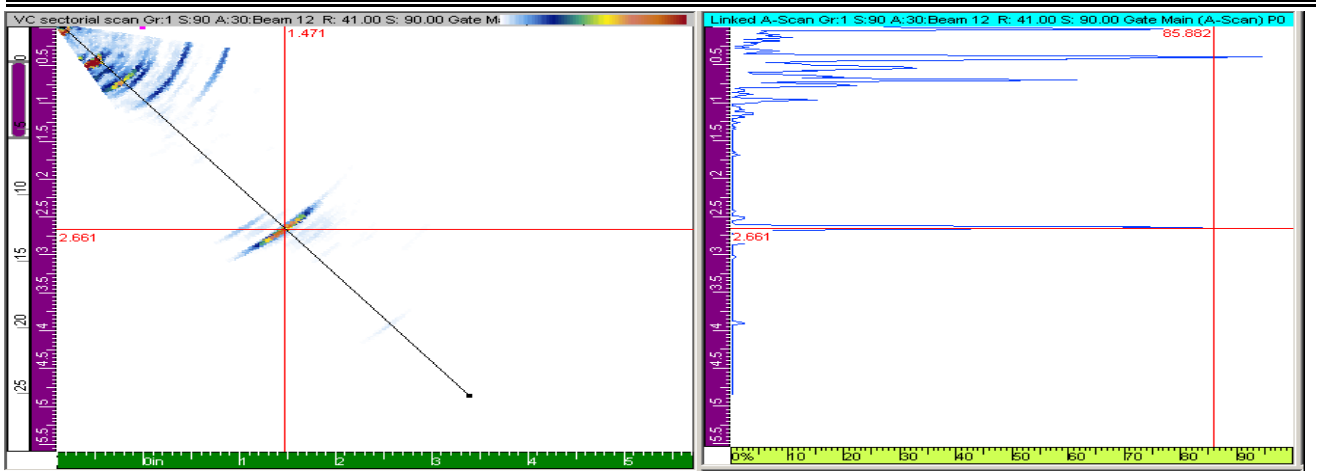
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the south side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW8
Project Number:	43-11-0066	**Weld Configuration:**	Header to End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

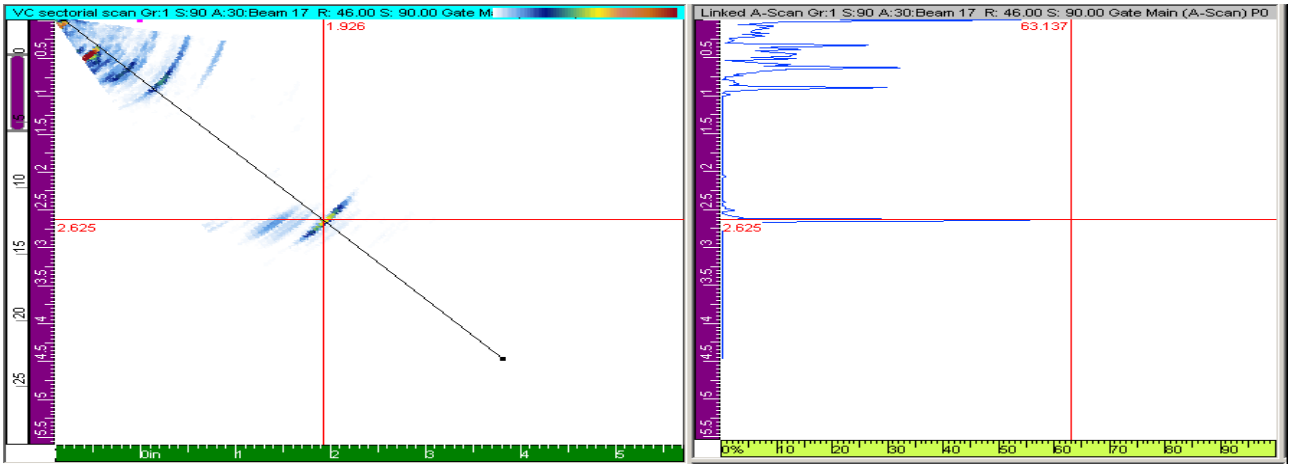
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW9
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

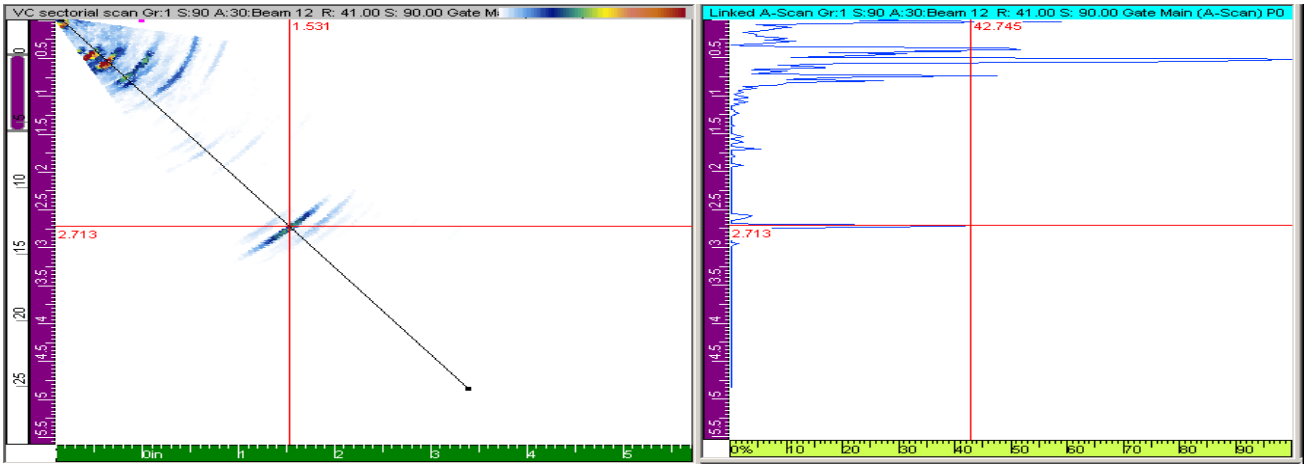
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the upstream side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW10
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Pipe
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

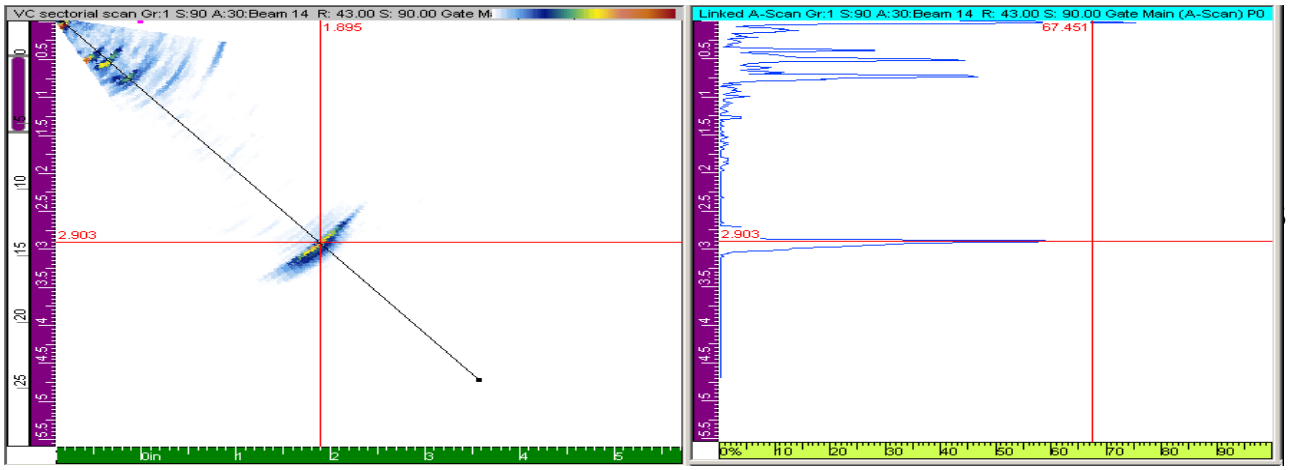
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW11
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

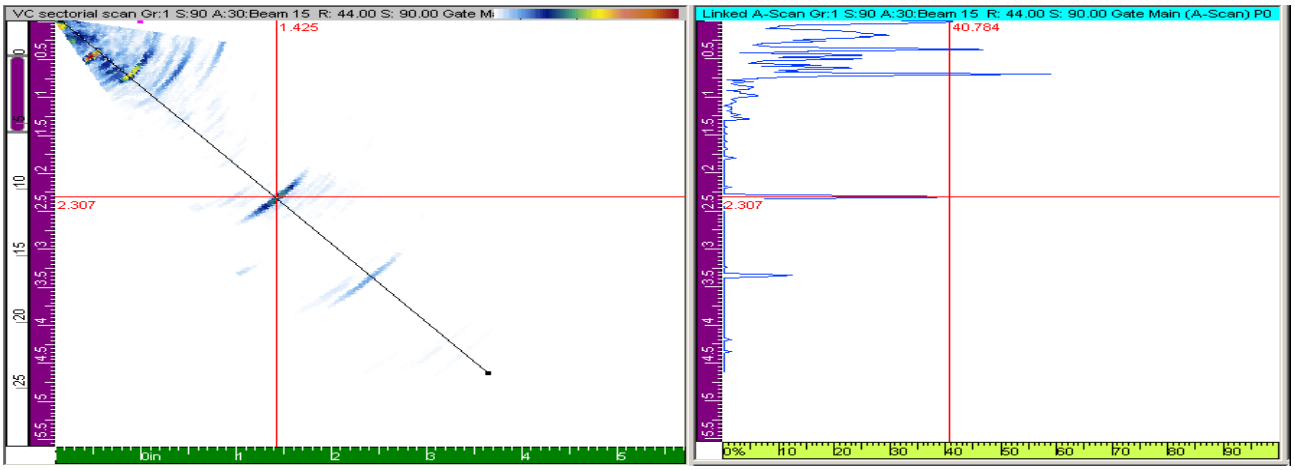
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the upstream side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW12
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Pipe
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

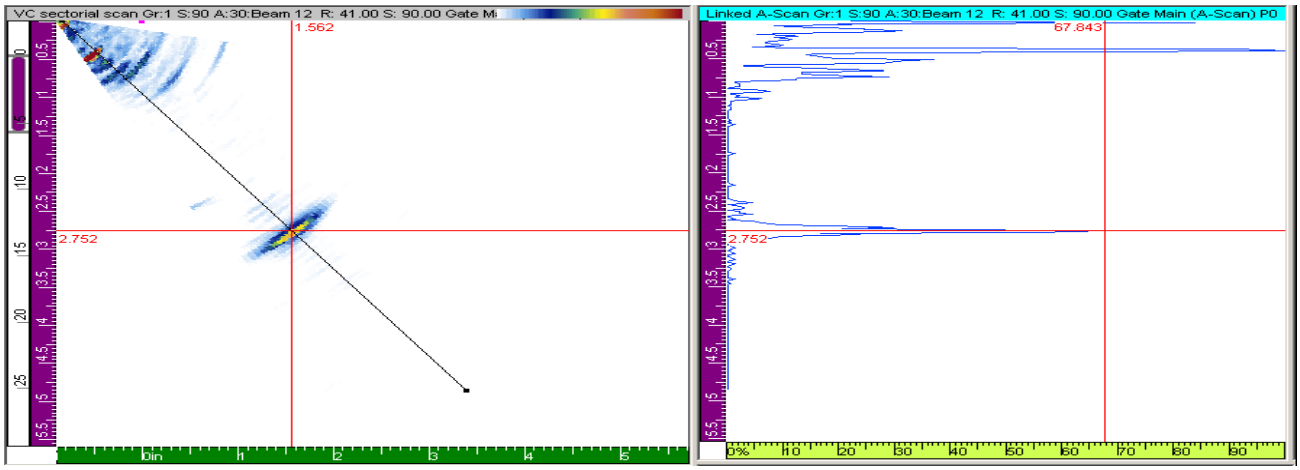
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW13
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Tee Connection
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

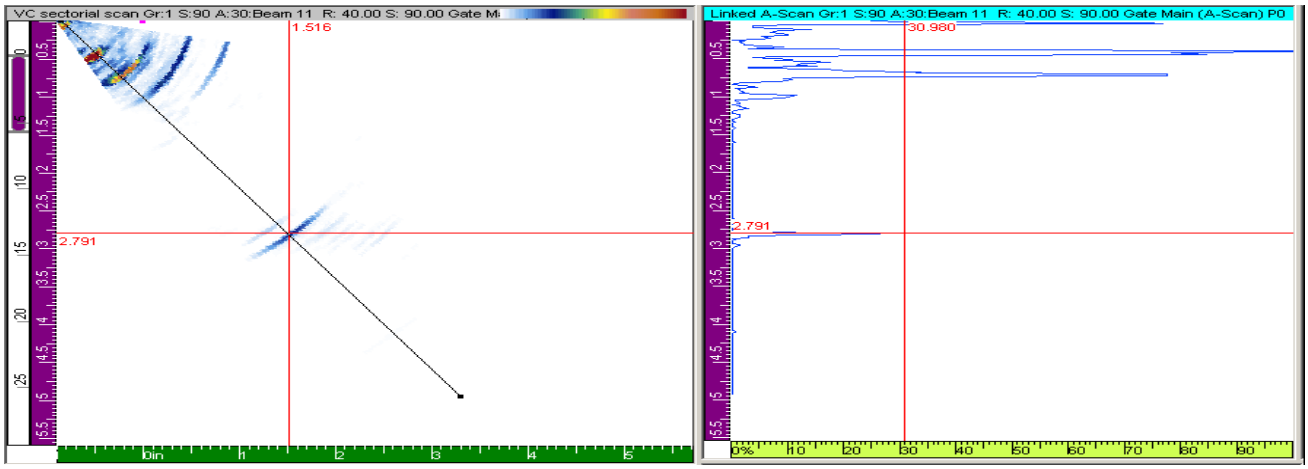
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360 ° non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the upstream side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP - Mitchell Generating Station	**Component:**	Finishing Superheater Inlet Header
Unit Number:	1	**Weld Number:**	FSHIH-GW14
Project Number:	43-11-0066	**Weld Configuration:**	Pipe to Pipe
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	3.0"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

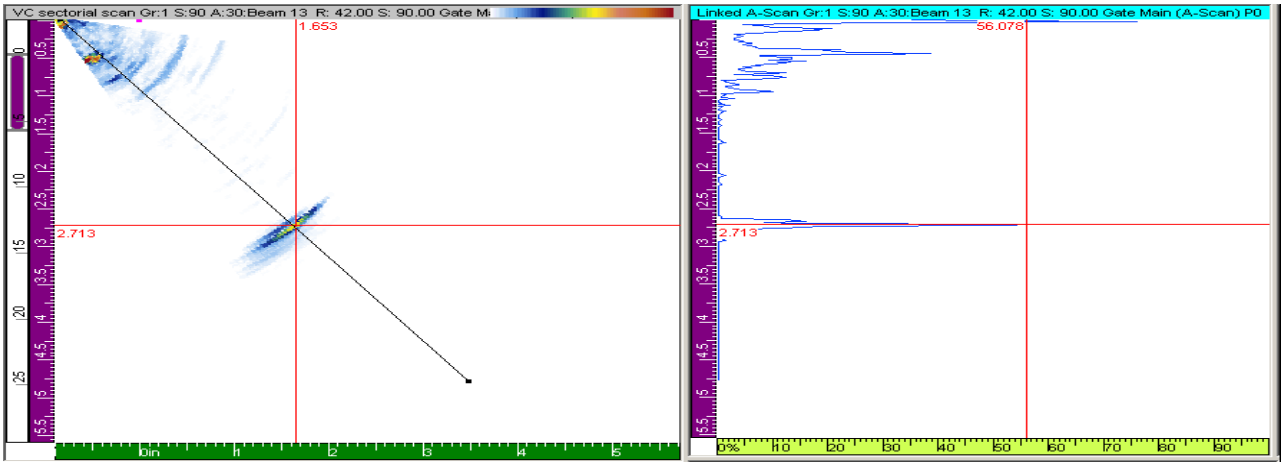
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.454us	0.000in	6.456	4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	32	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	40dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	3.5in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/8/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

HARDNESS MEASUREMENT SHEET

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Finishing Superheater Inlet Header - Unit No. 1	Material: SA-335, P11	Hardness Scale: HBN

Location:		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
FSIH-R1	Weld	182	181	183	185	185	183	87,000
	Base	189	187	186	182	181	185	88,000
FSIH-R2	Weld	176	178	190	189	191	185	88,000
	Base	181	182	181	179	178	180	86,000
FSIH-R3	Weld	176	177	178	178	189	180	86,000
	Base	169	171	173	174	175	172	82,000
FSIH-R4	Weld	172	171	175	162	157	167	80,000
	Base	157	137	156	150	129	146	69,000
FSIH-R5	Weld	150	153	137	146	153	148	70,000
	Base	150	151	159	173	152	157	75,000
FSIH-R6	Weld	167	188	171	151	174	170	81,000
	Base	130	132	148	141	144	139	67,000
FSIH-R7	Weld	154	162	159	165	164	161	77,000
	Base	159	162	155	162	166	161	77,000
FSIH-R8	Weld	157	156	161	146	166	157	75,000
	Base	134	150	135	125	120	133	64,000

Inspector: Manny Gracie, John McCarthy	Date: 05/04/2011

APPENDIX D

NONDESTRUCTIVE EXAMINATION REPORTS
FINISHING SUPERHEATER OUTLET HEADERS

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 1 - Finishing Superheater Outlet Header

The minimum wall thickness requirements were calculated for the Finishing Superheater Outlet header. These calculations are based on the Original 1968 ASME Code for Boiler and Pressure Vessels.

ASME Material Specifications for:	SA-335, Gr. P22

Where:

T- Design Temperature	1025	°F	
P- Maximum Allowable Pressure	3,865	psig	
D- Outside Diameter	28.00	in	
S- Maximum Stress Value	6,800	psi	Per. Sect II D, Table 1A
E- Efficency	1.000		Per. Sect I, PG 27.4 Note 1
y-Temperature Coefficient	0.700		Per. Sect I, PG 27.4 Note 6

The following equation applies:
Per. Sect I, PG 27.2.2

$t_m=(PD/(2(SE)+2(yP))$	5.692	in

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

VISUAL EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Number: 43-11-0066	Job Date: April 2011
Component: Upper Finishing Superheater Outlet Header - Unit No. 1	Material: SA-213, T22	Procedure: NDT 11 FS

Surface Condition:

☐ Welded ☐ Cast ☐ Worked ☐ Paint ☑ Other
☐ Ground ☐ As Fabricated ☐ Grit Blast ☐ Light Rust

Examination Method:

☑ Direct ☐ Remote

Aids Used _____ Equipment _____

*Sketch or Other Detail:

LOCATION	SIZE(Inches)	DESCRIPTION	ACTION (ACCEPT/REJECT AND COMMENT)
Row-1 Tube-D	1/16"	Indication on weld	Monitor
Row-1 Tube-E	1/16"	Indication on weld	Monitor
Row-2 Tube-C	1/16"	Indication on weld	Monitor
Row-2 Tube-E	1/16"	Indication on weld	Monitor
Row-4 Tube-D	1/16"	Indication on weld	Monitor
Row-9 Tube-E	1/16"	Indication on weld	Monitor
Row-22 Tube-B	1/16"	Pitting	Monitor
Row-28 Tube-E	1/16"	Indication on weld	Monitor
Row-29 Tube-C	1/16"	Indication on weld	Monitor
Row-30 Tube-A	1/16"	Indication on weld	Monitor
Row-30 Tube-B	1/16"	Indication on weld	Monitor
Row-30 Tube-C	1/16"	Indication on weld	Monitor
Row-31 Tube-D	3/16"	Indication on weld	Reject - Requires repair
Row-34 Tube-A	1/16"	Indication on weld	Monitor
Row-39 Tube-B	1/16"	Indication on weld	Monitor
Row-40 Tube-A	1/4"	Indication on weld	Reject - Requires repair
	1/16"	Indication on weld	Monitor
Row-41 Tube-D	1/16"	Indication on weld	Monitor
Row-42 Tube-D	3/16"	Indication on weld	Reject - Requires repair
Row-48 Tube-C	1/16"	Indication on weld	Monitor
Row-51 Tube-B	3/16"	Indication on weld	Reject - Requires repair
Row-52 Tube-B	1/4"	Indication on weld	Reject - Requires repair

Inspector: Manny Gracie, J. McCarthy	Level: II	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

VISUAL EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Number: 43-11-0066	Job Date: April 2011
Component: Upper Finishing Superheater Outlet Header - Unit No. 1	Material: SA-213, T22	Procedure: NDT 11 FS

Surface Condition:

☐ Welded ☐ Cast ☐ Worked ☐ Paint ☑ Other
☐ Ground ☐ As Fabricated ☐ Grit Blast ☐ Light Rust

Examination Method:

☑ Direct ☐ Remote

Aids Used _____ Equipment _____

*Sketch or Other Detail:

LOCATION	SIZE(Inches)	DESCRIPTION	ACTION (ACCEPT/REJECT AND COMMENT)
Row-52 Tube-D	1/16"	Indication on weld	Monitor
Row-52 Tube-E	1/16"	Indication on weld	Monitor
Row-53 Tube-B	1/8"	Indication on weld	Reject - Requires repair
Row-53 Tube-C	1/16"	Indication on weld	Monitor
Row-54 Tube-A	1/16"	Indication on weld	Monitor
Row-54 Tube-B	3/16"	Indication on weld	Reject - Requires repair
Row-54 Tube-C	3/16"	Indication on weld	Reject - Requires repair
Row-54 Tube-D	1/16"	Indication on weld	Monitor
Row-54 Tube-E	1/16"	Indication on weld	Monitor
Row-55 Tube-A	1/16"	Indication on weld	Monitor
Row-55 Tube-B	1/16"	Indication on weld	Monitor
Row-55 Tube-C	1/8"	Indication on weld	Reject - Requires repair
Row-55 Tube-E	1/16"	Indication on weld	Monitor
Row-56 Tube-A	1/16"	Indication on weld	Monitor
Row-56 Tube-B	1/16"	Indication on weld	Monitor
Row-56 Tube-C	1/16"	Indication on weld	Monitor
Row-56 Tube-D	1/16"	Indication on weld	Monitor
Row-56 Tube-E	1/16"	Indication on weld	Monitor

Inspector: Manny Gracie, J. McCarthy	Level: II	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

VISUAL EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Number: 43-11-0066	Job Date: April 2011
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-213, T22	Procedure: NDT 11 FS

Surface Condition:

☐ Welded ☐ Cast ☐ Worked ☐ Paint ☑ Other

☐ Ground ☐ As Fabricated ☐ Grit Blast ☐ Light Rust

Examination Method:

☑ Direct ☐ Remote

Aids Used _____ Equipment _____

*Sketch or Other Detail:

LOCATION	SIZE (Inches)	DESCRIPTION	ACTION (ACCEPT/REJECT AND COMMENT)
Row-1 Tube-A	1/16"	Indication on weld	Monitor
Row-1 Tube-B	1/16"	Indication on weld	Monitor
Row-1 Tube-C	1/16"	Indication on weld	Monitor
Row-1 Tube-D	1/16"	Indication on weld	Monitor
Row-1 Tube-E	1/4"	Indication on weld	Reject - Requires repair
Row-2 Tube-C	1/16"	Indication on weld	Monitor
Row-2 Tube-D	1/16"	Indication on weld	Monitor
Row-2 Tube-E	1/16"	Indication on weld	Monitor
Row-3 Tube-B	1/16"	Indication on weld	Monitor
Row-3 Tube-C	1/16"	Indication on weld	Monitor
Row-3 Tube-D	1/16"	Indication on weld	Monitor
Row-3 Tube-E	1/16"	Indication on weld	Monitor
Row-4 Tube-A	1/16"	Indication on weld	Monitor
Row-4 Tube-B	1/16"	Indication on weld	Monitor
Row-4 Tube-C	1/16"	Indication on weld	Monitor
Row-4 Tube-D	1/16"	Indication on weld	Monitor
Row-4 Tube-E	1/16"	Indication on weld	Monitor
Row-5 Tube-B	1/16"	Indication on weld	Monitor
Row-5 Tube-C	1/16"	Indication on weld	Monitor
Row-5 Tube-D	1/16"	Indication on weld	Monitor

Inspector: Manny Gracie, J. McCarthy	Level: II	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

VISUAL EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Number: 43-11-0066	Job Date: April 2011
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-213, T22	Procedure: NDT 11 FS

Surface Condition:

☐ Welded ☐ Cast ☐ Worked ☐ Paint ☑ Other

☐ Ground ☐ As Fabricated ☐ Grit Blast ☐ Light Rust

Examination Method:

☑ Direct ☐ Remote

Aids Used _____ Equipment _____

*Sketch or Other Detail:

LOCATION	SIZE (Inches)	DESCRIPTION	ACTION (ACCEPT/REJECT AND COMMENT)
Row-7 Tube-A	1/16"	Indication on weld	Monitor
Row-9 Tube-B	1/16"	Indication on weld	Monitor
Row-10 Tube-E	1/16"	Indication on weld	Monitor
Row-13 Tube-E	1/16"	Indication on weld	Monitor
Row-14 Tube-C	1/16"	Indication on weld	Monitor
Row-16 Tube-C	1/16"	Indication on weld	Monitor
Row-17 Tube-A	1/8"	Indication on weld	Monitor
Row-17 Tube-B	1/16"	Indication on weld	Monitor
Row-17 Tube-E	3/16"	Indication on weld	Reject - Requires repair
Row-18 Tube-A	3/16"	Indication on weld	Reject - Requires repair
Row-18 Tube-E	3/16"	Indication on weld	Reject - Requires repair
Row-19 Tube-A	1/16"	Indication on weld	Monitor
Row-20 Tube-A	1/16"	Indication on weld	Monitor
Row-20 Tube-E	1/16"	Indication on weld	Monitor
Row-22 Tube-A	3/16"	Indication on weld	Reject - Requires repair
Row-22 Tube-B	1/16"	Indication on weld	Monitor
Row-24 Tube-B	1/16"	Indication on weld	Monitor
Row-24 Tube-C	1/16"	Indication on weld	Monitor
Row-25 Tube-A	1/4"	Indication on weld	Reject - Requires repair
Row-26 Tube-D	1/16"	Indication on weld	Monitor

Inspector: Manny Gracie, J. McCarthy	Level: II	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

VISUAL EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Number: 43-11-0066	Job Date: April 2011
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-213, T22	Procedure: NDT 11 FS

Surface Condition:

☐ Welded ☐ Cast ☐ Worked ☐ Paint ☑ Other

☐ Ground ☐ As Fabricated ☐ Grit Blast ☐ Light Rust

Examination Method:

☑ Direct ☐ Remote

Aids Used _____ Equipment _____

*Sketch or Other Detail:

LOCATION	SIZE (Inches)	DESCRIPTION	ACTION (ACCEPT/REJECT AND COMMENT)
Row-27 Tube-A	3/16"	Indication on weld	Reject - Requires repair
Row-29 Tube-E	1/16"	Indication on weld	Monitor
Row-30 Tube-C	1/16"	Indication on weld	Monitor
Row-31 Tube-A	1/8"	Indication on weld	Monitor
Row-31 Tube-E	1/16"	Indication on weld	Monitor
Row-33 Tube-D	1/16"	Indication on weld	Monitor
Row-34 Tube-D	3/16"	Indication on weld	Reject - Requires repair
Row-36 Tube-E	1/16"	Indication on weld	Monitor
Row-37 Tube-D	1/16"	Porosity/Indication on weld	Monitor
Row-44 Tube-A	1/16"	Indication on weld	Monitor
Row-47 Tube-A	1/16"	Indication on weld	Monitor
Row-47 Tube-E	1/4"	Indication on weld	Reject - Requires repair
Row-48 Tube-E	3/16"	Indication on weld	Reject - Requires repair
Row-49 Tube-A	1/16"	Indication on weld	Monitor
Row-49 Tube-B	1/16"	Indication on weld	Monitor
Row-49 Tube-C	1/16"	Indication on weld	Monitor
Row-49 Tube-D	1/16"	Indication on weld	Monitor
Row-50 Tube-B	1/16"	Indication on weld	Monitor
Row-50 Tube-C	1/16"	Indication on weld	Monitor
Row-50 Tube-D	1/16"	Indication on weld	Monitor
Row-50 Tube-E	1/16"	Indication on weld	Monitor

Inspector: Manny Gracie, J. McCarthy	Level: II	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

VISUAL EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Number: 43-11-0066	Job Date: April 2011
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-213, T22	Procedure: NDT 11 FS

Surface Condition:

☐ Welded ☐ Cast ☐ Worked ☐ Paint ☑ Other

☐ Ground ☐ As Fabricated ☐ Grit Blast ☐ Light Rust

Examination Method:

☑ Direct ☐ Remote

Aids Used _____ Equipment _____

*Sketch or Other Detail:

LOCATION	SIZE (Inches)	DESCRIPTION	ACTION (ACCEPT/REJECT AND COMMENT)
Row-51 Tube-A	1/16"	Indication on weld	Monitor
Row-51 Tube-C	1/16"	Indication on weld	Monitor
Row-51 Tube-D	1/16"	Indication on weld	Monitor
Row-51 Tube-E	1/8"	Indication on weld	Monitor
Row-52 Tube-A	1/16"	Indication on weld	Monitor
Row-52 Tube-B	1/16"	Indication on weld	Monitor
Row-52 Tube-C	1/16"	Indication on weld	Monitor
Row-52 Tube-D	1/16"	Indication on weld	Monitor
Row-52 Tube-E	1/16"	Indication on weld	Monitor
Row-53 Tube-A	1/8"	Indication on weld	Monitor
Row-53 Tube-B	1/16"	Indication on weld	Monitor
Row-53 Tube-C	1/16"	Indication on weld	Monitor
Row-53 Tube-D	1/16"	Indication on weld	Monitor
Row-53 Tube-E	1/16"	Indication on weld	Monitor
Row-54 Tube-B	1/16"	Indication on weld	Monitor
Row-54 Tube-C	1/16"	Indication on weld	Monitor
Row-54 Tube-D	1/16"	Indication on weld	Monitor
Row-54 Tube-E	1/16"	Indication on weld	Monitor
Row-55 Tube-A	1/16"	Indication on weld	Monitor
Row-55 Tube-B	1/16"	Indication on weld	Monitor

Inspector: Manny Gracie, J. McCarthy	Level: II	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

VISUAL EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Number: 43-11-0066	Job Date: April 2011
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-213, T22	Procedure: NDT 11 FS

Surface Condition:

☐ Welded ☐ Cast ☐ Worked ☐ Paint ☑ Other

☐ Ground ☐ As Fabricated ☐ Grit Blast ☐ Light Rust

Examination Method:

☑ Direct ☐ Remote

Aids Used _____ Equipment _____

*Sketch or Other Detail:

LOCATION	SIZE (Inches)	DESCRIPTION	ACTION (ACCEPT/REJECT AND COMMENT)
Row-55 Tube-C	1/16"	Indication on weld	Monitor
Row-55 Tube-D	3/16"	Indication on weld	Reject - Requires repair
Row-56 Tube-A	3/16"	Indication on weld	Reject - Requires repair
Row-56 Tube-B	3/16"	Indication on weld	Reject - Requires repair
Row-56 Tube-C	3/16"	Indication on weld	Reject - Requires repair
Row-56 Tube-D	3/16"	Indication on weld	Reject - Requires repair
Row-56 Tube-E	3/16"	Indication on weld	Reject - Requires repair

Inspector: Manny Gracie, J. McCarthy	Level: II	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Upper Finishing Superheater Outlet Header - Unit No. 1	Material: SA-335, P22	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ AMP Turns _____
☐ DC ☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications.	x	
GW-2	N/A	No recordable indications.	x	
GW-3	N/A	No recordable indications.	x	
GW-4	N/A	No recordable indications.	x	
GW-5	N/A	No recordable indications.	x	
GW-6	N/A	No recordable indications.	x	
GW-7	N/A	No recordable indications.	x	
Attachment Welds				
AW-1	N/A	No recordable indications.	x	
AW-2	N/A	No recordable indications.	x	
Penetrations				
P-1	N/A	No recordable indications.	x	
P-2	N/A	No recordable indications.	x	
P-3	N/A	No recordable indications.	x	
P-4	N/A	No recordable indications.	x	

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generatting Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-335, P22	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

- ☑ Continuous
- ☐ Circular
- ☐ Residual
- ☐ Longitudinal

TECHNIQUE

- ☑ Yoke
- ☐ Headshot
- ☐ Coil
- ☐ Prods
- ☐ Central Cond.
- ☐ Other

CURRENT

- ☑ AC
- ☐ DC
- ☐ AMP Turns _____
- ☐ Amperage _____
- ☐ Other _____

WET

- ☐ 14AM
- ☑ 20B
- ☐ Other

DRY

- ☐ Red
- ☐ Gray
- ☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications.	x	
GW-2	N/A	No recordable indications.	x	
GW-3	N/A	No recordable indications.	x	
GW-4	N/A	No recordable indications.	x	
GW-5	N/A	No recordable indications.	x	
GW-6	N/A	No recordable indications.	x	
GW-7	N/A	No recordable indications.	x	
GW-8	N/A	No recordable indications.	x	
Attachment Welds				
AW-1	N/A	No recordable indications.	x	
AW-2	N/A	No recordable indications.	x	
Penetrations				
P-1	N/A	No recordable indications.	x	
P-2	N/A	No recordable indications.	x	
P-3	N/A	No recordable indications.	x	
P-4	N/A	No recordable indications.	x	

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066	
Component: Upper Finishing Superheater Outlet Header - Unit No. 1	Material: SA-335, P22	Nominal Wall: 6.00"	Minimum Wall: 5.692"

EQUIPMENT NorthED:

☑ D-Meter ☑ Pi-Tape ☐ Other
☐ Micrometer ☐ Calipers

KEY:
North - Upstream
South -Downstream

IDENTIFICATION		DIAMETER MEASUREMENTS (IN.)			THICKNESS MEASUREMENTS (IN.)			
		Pi-TAPE	CALIPERS		12:00	3:00	6:00	9:00
			12 to 6	3 to 9				
GW-1	North	28.344			6.075	6.060	6.053	6.068
	South	28.344			6.188	6.197	6.235	6.209
GW-2	North	28.344			6.148	6.198	6.140	6.155
	South	28.344			6.243	6.279	6.199	6.188
GW-3	North	28.344			6.075	6.068	6.080	5.983
	South	28.344			6.260	6.285	6.199	6.249
GW-4	North	28.344			6.242	6.248	6.214	6.200
	South	28.344			6.065	6.128	6.108	6.098
GW-5	North	28.344			6.191	6.194	6.156	6.067
	South	28.344			6.082	6.052	6.150	6.105
GW-6	North	28.344			6.219	6.156	6.141	6.205
	South	28.344			6.242	6.270	6.204	6.209
GW-7	North	28.185			6.197	6.265	6.213	6.070
	South	28.185			6.115	6.108	6.102	6.093

INSPECTOR: T. Blazetic, D. Jakubowski | LEVEL: II | DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066	
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-335, P22	Nominal Wall: 6.00"	Minimum Wall: 5.692"

EQUIPMENT NorthED:

☑ D-Meter ☐ Pi-Tape ☐ Other
☐ Micrometer ☐ Calipers

KEY:

North - Upstream
South -Downstream

IDENTIFICATION		DIAMETER MEASUREMENTS (IN.)			THICKNESS MEASUREMENTS (IN.)			
		Pi-TAPE	CALIPERS		12:00	3:00	6:00	9:00
			12 to 6	3 to 9				
GW-1	North				6.049	6.044	6.044	6.050
	South				6.078	6.080	6.068	6.043
GW-2	North				6.199	6.214	6.172	6.136
	South				5.995	6.046	6.065	6.105
GW-3	North				6.164	6.130	6.254	6.239
	South				6.256	6.242	6.180	6.206
GW-4	North				6.120	6.103	6.154	6.201
	South				6.127	6.159	6.267	6.240
GW-5	North				6.188	6.122	6.086	6.126
	South				6.197	6.221	6.166	6.190
GW-6	North				6.129	6.133	6.157	6.106
	South				6.065	6.008	6.078	6.108
GW-7	North				6.205	6.240	6.250	6.239
	South				6.074	6.161	6.178	6.122
GW-8	North				6.257	6.256	6.229	6.218
	South				6.129	6.127	6.140	6.145

INSPECTOR: T. Blazetic, D. Jakubowski | LEVEL: II | DATE: 05/02/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	UFSHOH-GW1
Project Number:	43-11-0066	**Weld Configuration:**	Header to Reducer
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

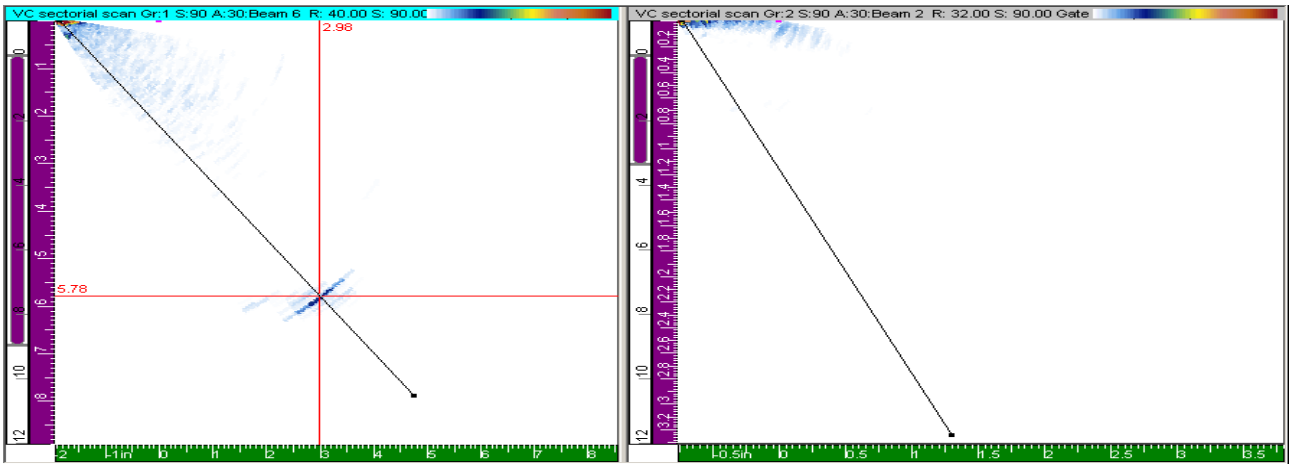
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected
Only the south side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	UFSHOH-GW2
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

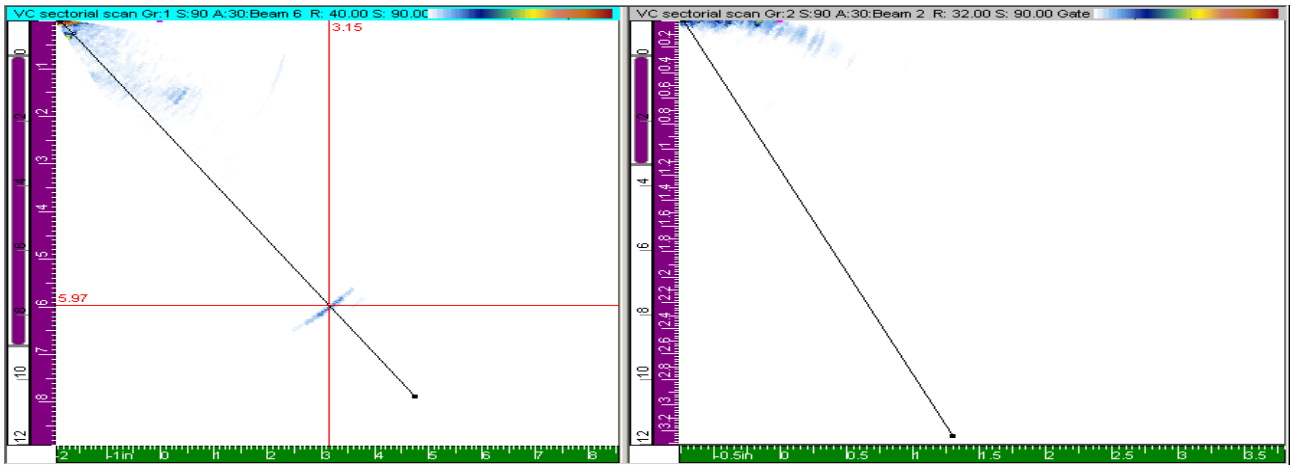
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	UFSHOH-GW3
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

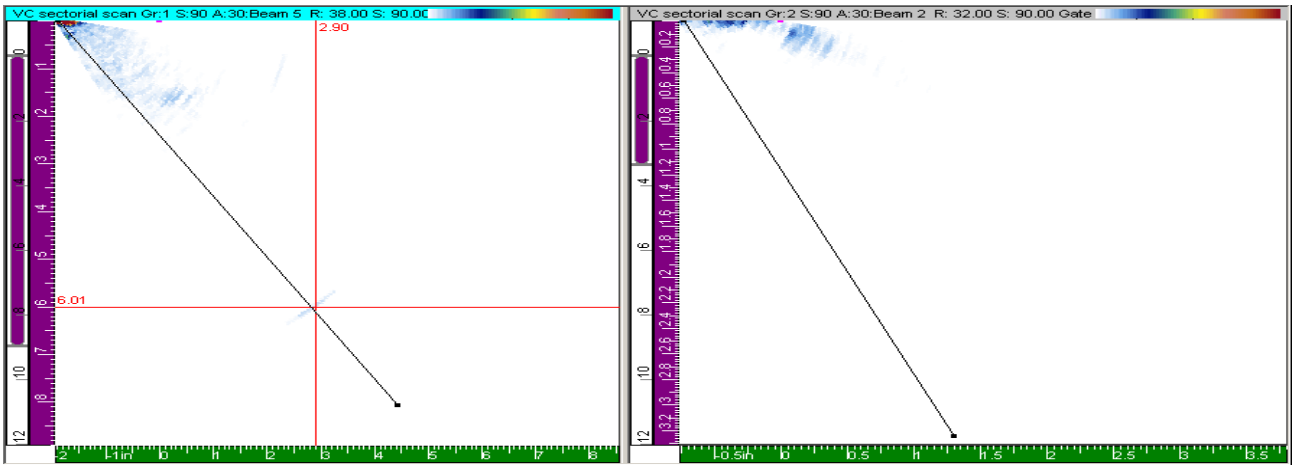
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**5/9/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	UFSHOH-GW4
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

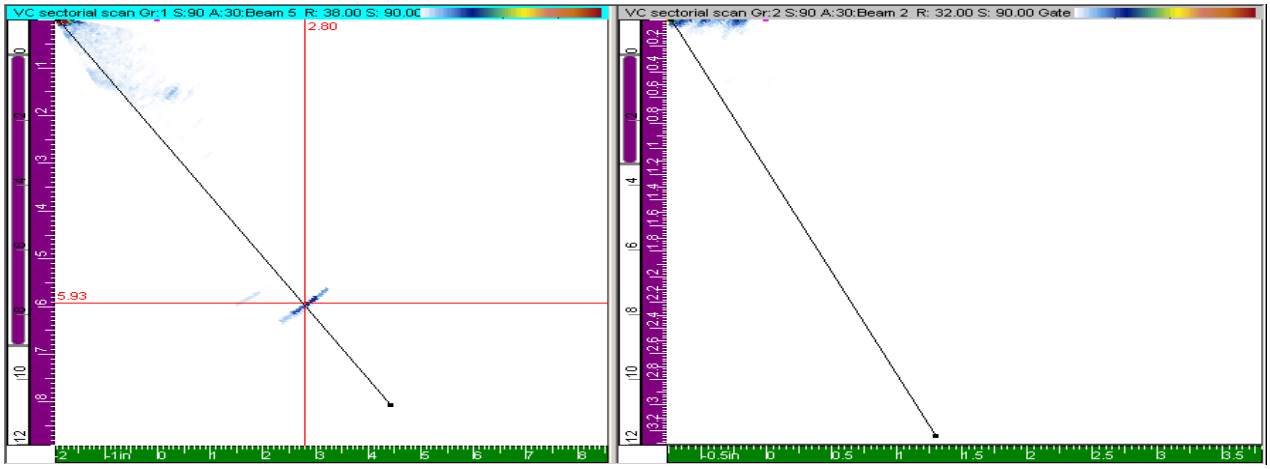
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	UFSHOH-GW5
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

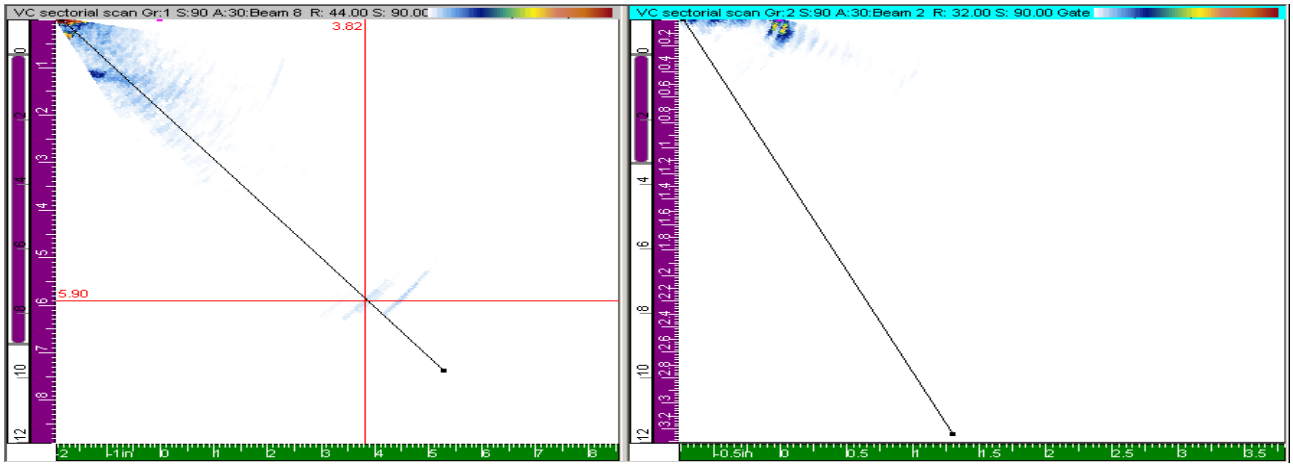
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	UFSHOH-GW6
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

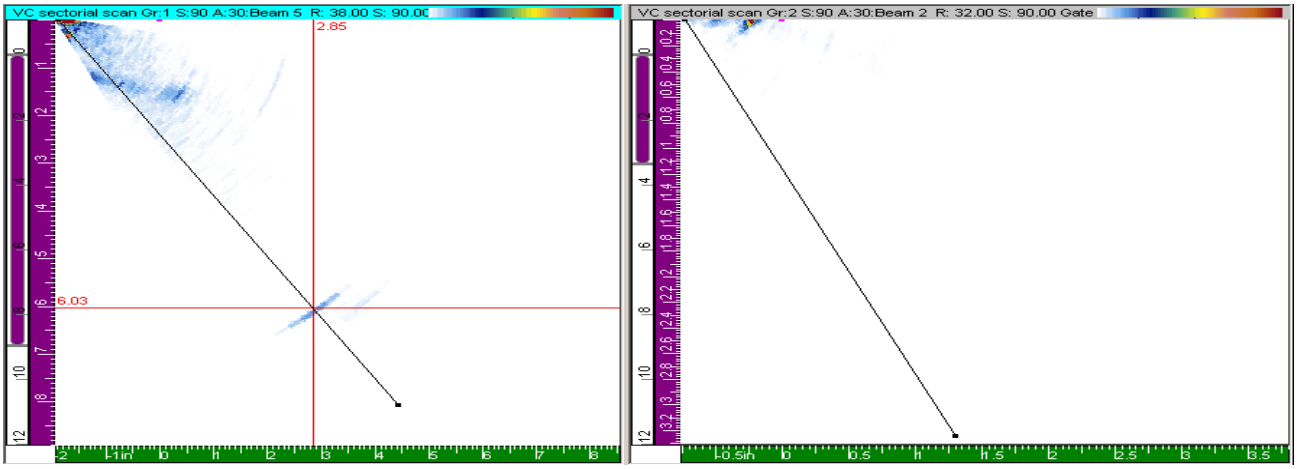
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	UFSHOH-GW7
Project Number:	43-11-0066	**Weld Configuration:**	Header to End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

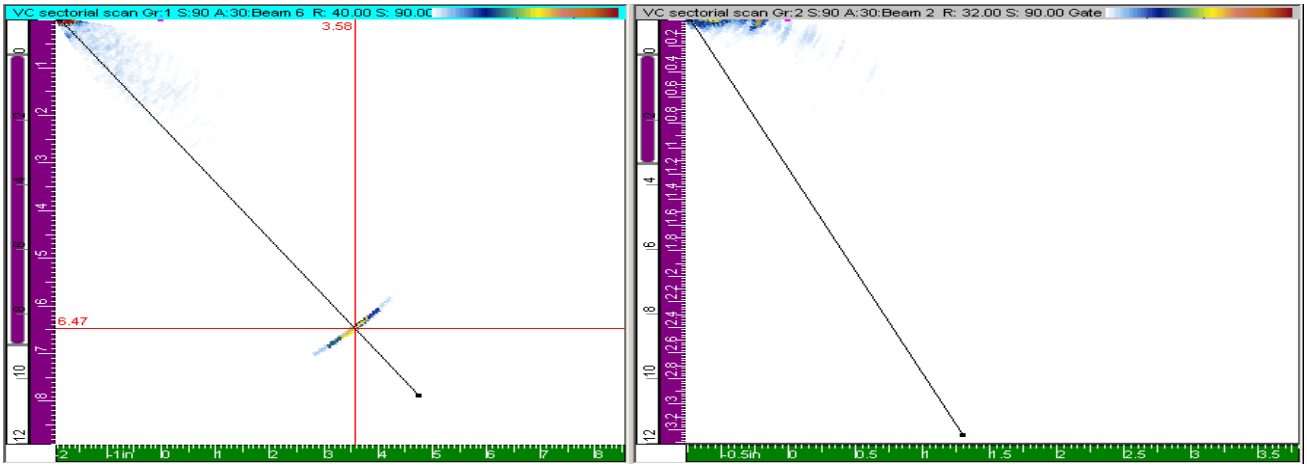
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW1
Project Number:	43-11-0066	**Weld Configuration:**	Header to Reducer
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

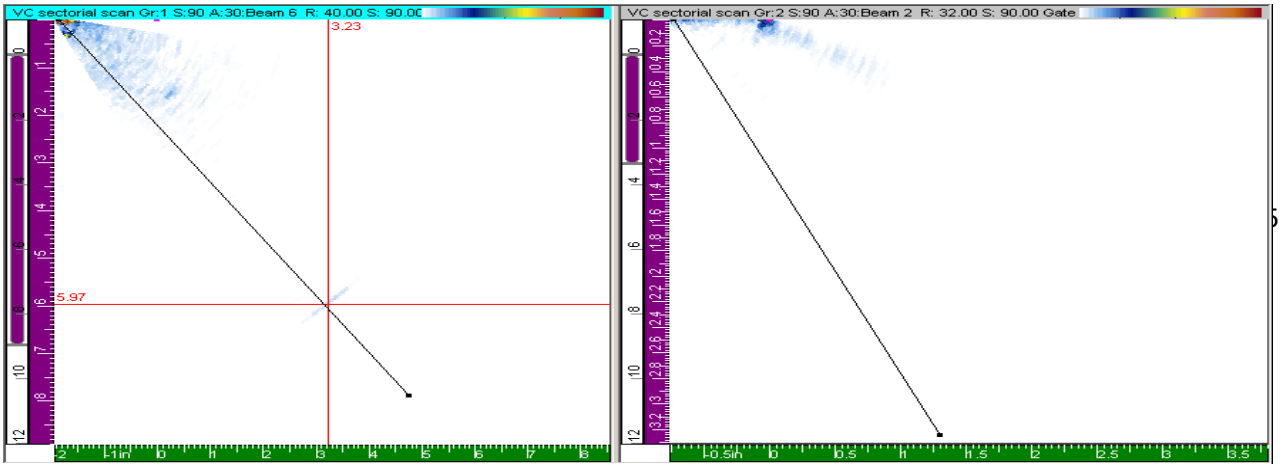
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected
Only the south side of weld was accessible for scanning due to the outside configuration

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW2
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

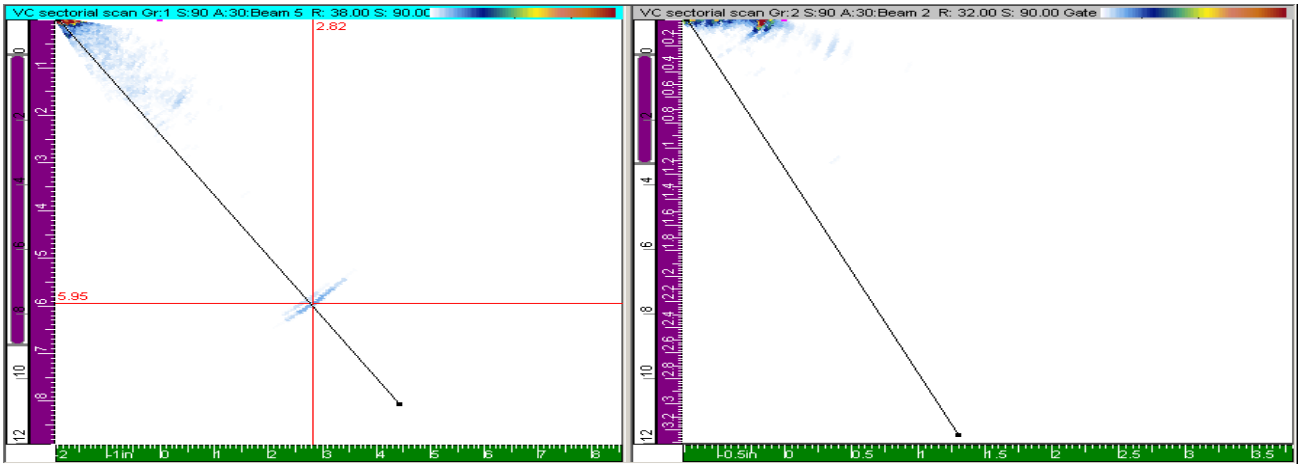
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW3
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

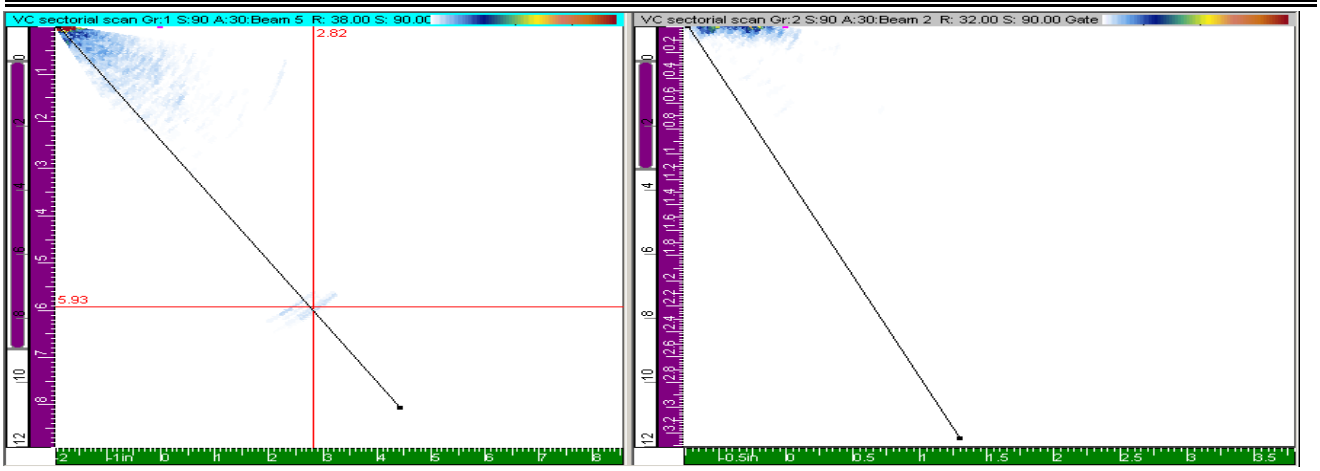
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW4
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

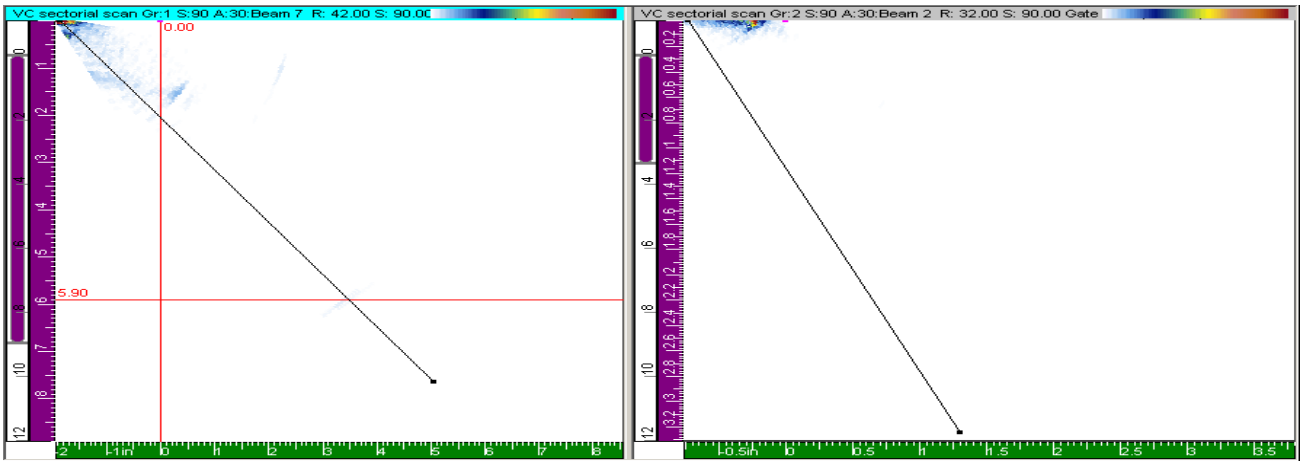
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW5
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

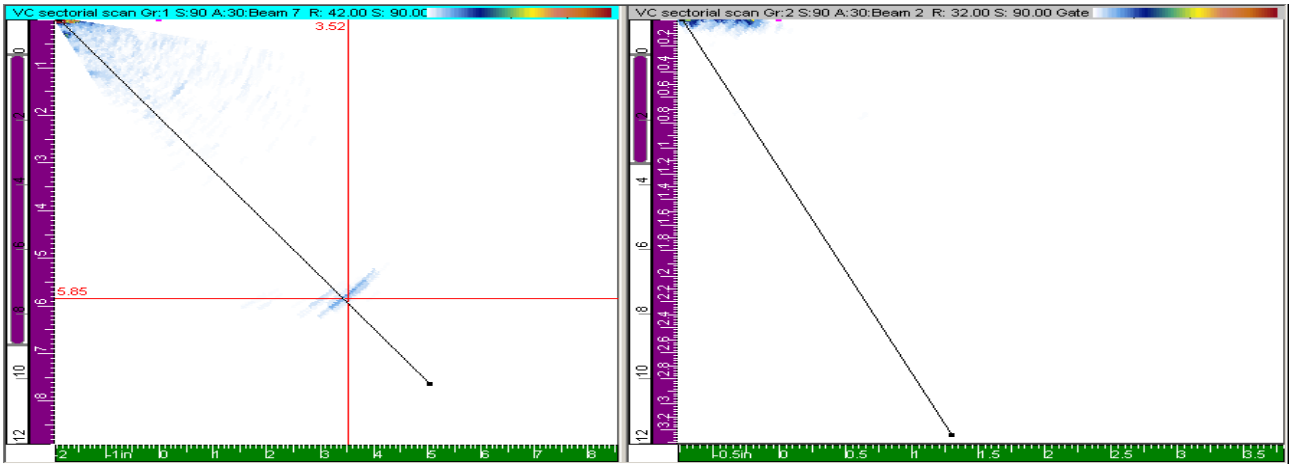
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**5/9/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW6
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

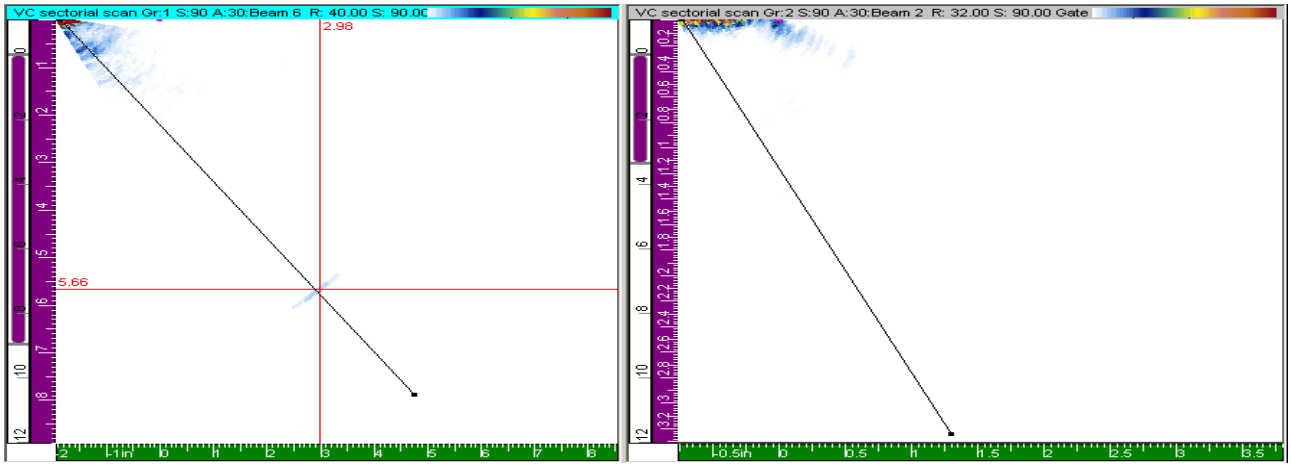
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW7
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

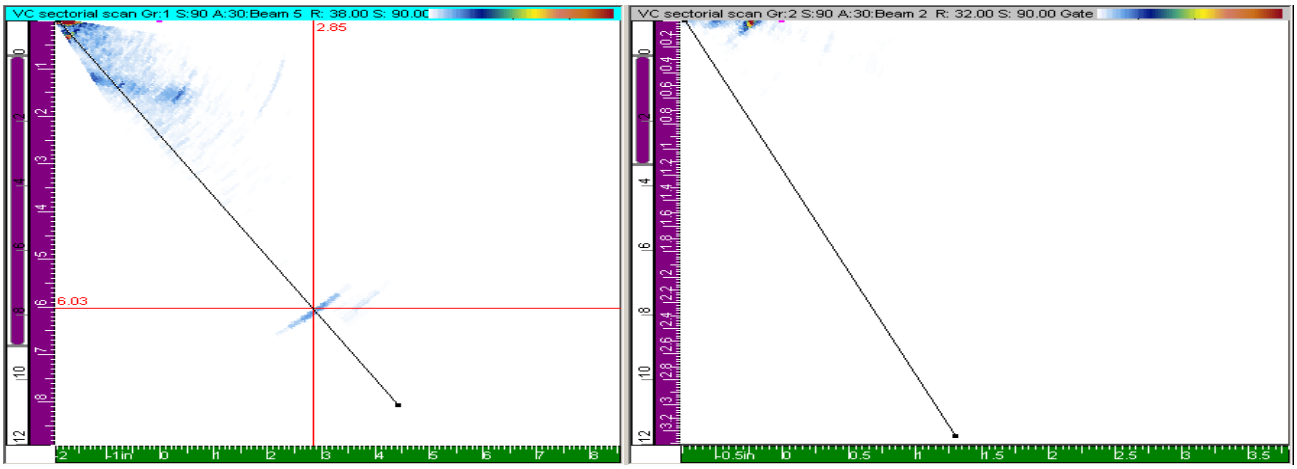
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	1	**Weld Number:**	LFSHOH-GW8
Project Number:	43-11-0066	**Weld Configuration:**	Header to End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	6.0" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

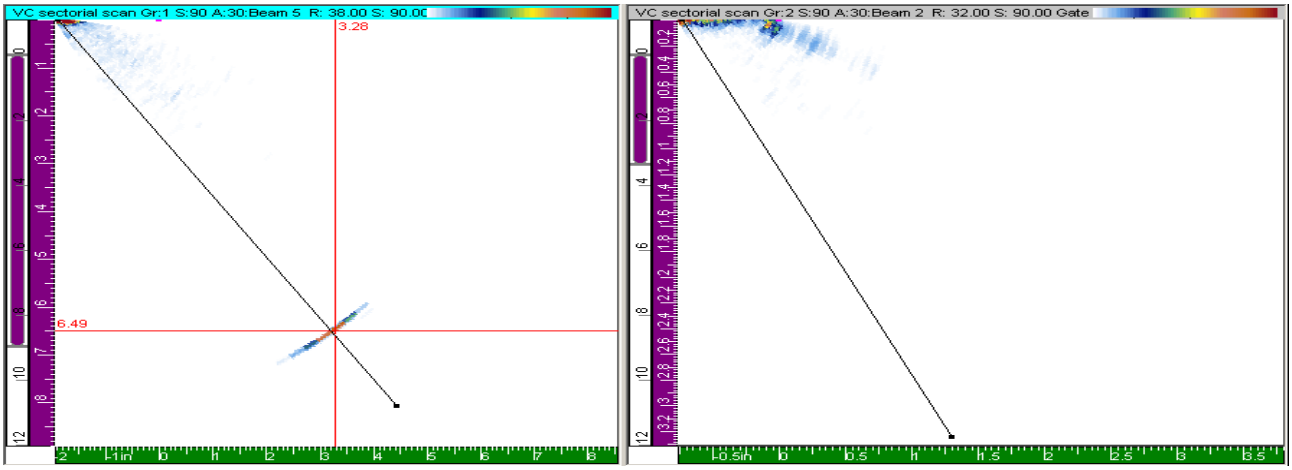
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L64-A2	D0462	5MHz	55.0 Degrees	0.756in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
14.502/30.122us	0.000in	10.280/3.830in	28/28	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	51/19	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	42/35dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	6.0/3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	5/9/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

HARDNESS MEASUREMENT SHEET

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Upper Finishing Superheater Outlet Header - Unit No. 1	Material: SA-335, P22	Hardness Scale: HBN

Location:		Hardness Measurements 1	2	3	4	5	Average	Corresponding Tensile Strength
FSHOH-UPR-R1	Weld	165	167	192	189	185	180	86,000
	Base	161	160	159	157	154	158	76,000
FSHOH-UPR-R2	Weld	169	170	173	180	178	174	83,000
	Base	159	161	166	165	167	164	78,000
FSHOH-UPR-R3	Weld	164	165	163	159	160	162	78,000
	Base	173	172	171	150	149	163	78,000
FSHOH-UPR-R4	Weld	159	159	160	173	177	166	79,000
	Base	158	158	159	157	157	158	75,000
FSHOH-UPR-R5	Weld	177	196	169	171	172	177	85,000
	Base	148	164	153	143	144	150	72,000
FSHOH-UPR-R6	Weld	165	167	165	172	170	168	80,000
	Base	154	150	137	146	139	145	69,000
FSHOH-UPR-R7	Weld	151	143	136	144	157	146	70,000
	Base	149	150	151	160	151	152	73,000

Inspector: Manny Gracie, John McCarthy	Date: 05/04/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

HARDNESS MEASUREMENT SHEET

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Lower Finishing Superheater Outlet Header - Unit No. 1	Material: SA-335, P22	Hardness Scale: HBN

Location:		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
FSHOH-LWR-R1	Weld	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Base	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FSHOH-LWR-R2	Weld	161	164	166	168	169	166	79,000
	Base	170	167	164	161	160	164	79,000
FSHOH-LWR-R3	Weld	165	170	171	173	175	171	81,000
	Base	159	158	155	159	161	158	76,000
FSHOH-LWR-R4	Weld	170	170	171	172	174	171	82,000
	Base	174	172	172	171	169	172	82,000
FSHOH-LWR-R5	Weld	158	156	149	134	133	146	70,000
	Base	169	167	166	164	166	166	80,000
FSHOH-LWR-R6	Weld	155	163	186	160	158	164	79,000
	Base	147	138	143	146	147	144	69,000
FSHOH-LWR-R7	Weld	180	186	173	176	173	178	85,000
	Base	148	155	149	137	141	146	70,000
FSHOH-LWR-R8	Weld	180	178	155	156	169	168	80,000
	Base	149	155	153	149	147	151	72,000

Inspector: Manny Gracie, John McCarthy	Date: 05/04/2011

APPENDIX E

NONDESTRUCTIVE EXAMINATION REPORTS
HIGH-PRESSURE REHEAT OUTLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station
HP Reheat Outlet Header - Unit No. 1
Seam Welded

The minimum wall thickness requirements were calculated for the HP Reheat Outlet header. These calculations are based on the Original 1968 ASME Code for Boiler and Pressure Vessels, Per ASME Sect I, PG27.2.2.

ASTM Material Specifications for:	SA-387, Gr. D	

Where:

T- Design Temperature	1040	°F
P- Maximum Allowable Pressure	1,200	psig
D- Outside Diameter	44.446	in
SE- Maximum Stress Value	6,200	psi
W-Weld Strength Reduction Factor	0.82	
y-Temperature Coefficient	0.70	
A- Additional Thickness	0.000	in

The following equation applies:
Per. Sect I, PG 27.2.2

t_m=(PD/(2(SEW+PY))+A	4.502	in

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: High-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, Gr. D	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ AMP Turns _____
☐ DC ☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications.	x	
GW-2	N/A	No recordable indications.	x	
GW-3	1/4"	Longitudinal indication. Requires repair		x
Attachment Welds				
AW-1	N/A	No recordable indications.	x	
AW-2	N/A	No recordable indications.	x	
AW-3	3"	Indication in toe of weld. Requires repair.		x
AW-4	N/A	No recordable indications.	x	
AW-5	N/A	No recordable indications.	x	
AW-6	N/A	No recordable indications.	x	
AW-7	N/A	No recordable indications.	x	
Seam Welds				
LS-1W	N/A	No recordable indications.	x	
LS-2W	N/A	No recordable indications.	x	
LS-3W	N/A	No recordable indications.	x	
LS-1E	N/A	No recordable indications.	x	
LS-2E	N/A	No recordable indications.	x	
LS-3E	N/A	No recordable indications.	x	
Penetrations				
P-1	N/A	No recordable indications.	x	
P-2	N/A	No recordable indications.	x	
P-3	N/A	No recordable indications.	x	
P-4	N/A	No recordable indications.	x	

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: High-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, D	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ AMP Turns _____
☐ DC ☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Tube Stubs				
Row 52, Tube I	1" LT	Linear indication in toe of weld.	Monitor	
Row 77, Tube E	1/8" LT	Linear indication in toe of weld.	Monitor	
Row 80, Tube J	1/8" TW	Transverse indication removed by grinding.	x	
Row 88, Tube J	1/2" TW (x2)	Transverse indication removed by grinding.	x	
	1" LT	Linear indication in toe of weld.	Monitor	
Row 96, Tube J	1/4" TW	Transverse indication removed by grinding.	x	
Row 97, Tube C	1/2" LT	Linear indication in toe of weld.	Monitor	

Note: Tube stubs in every 5th row from the north end were examined. No other recordable indications were revealed.

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066	
Component: High-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, D	Nominal Wall: 4.598"	Minimum Wall: 4.502"

EQUIPMENT USED:

☑ D-Meter ☑ Pi-Tape ☐ Other
☐ Micrometer ☐ Calipers

KEY:

US - Upstream
DS -Downstream

IDENTIFICATION		DIAMETER MEASUREMENTS (IN.)			THICKNESS MEASUREMENTS (IN.)			
		Pi-TAPE	CALIPERS		12:00	3:00	6:00	9:00
			12 to 6	3 to 9				
GW-1	US	N/A			N/A	4.345	N/A	N/A
	DS	N/A			N/A	4.842	N/A	N/A
GW-2	US	N/A			4.782	4.793	4.385	4.773
	DS	44.904			4.800	4.795	4.375	4.756
GW-3	US	N/A			4.817	4.865	4.425	4.855
	DS	44.904			4.758	4.765	4.393	4.799

INSPECTOR: T. Blazetic, D. Jakubowski	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	1	**Weld Number:**	HPRHOH-GW-1
Project Number:	43-11-0066	**Weld Configuration:**	Header to End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	4.598" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

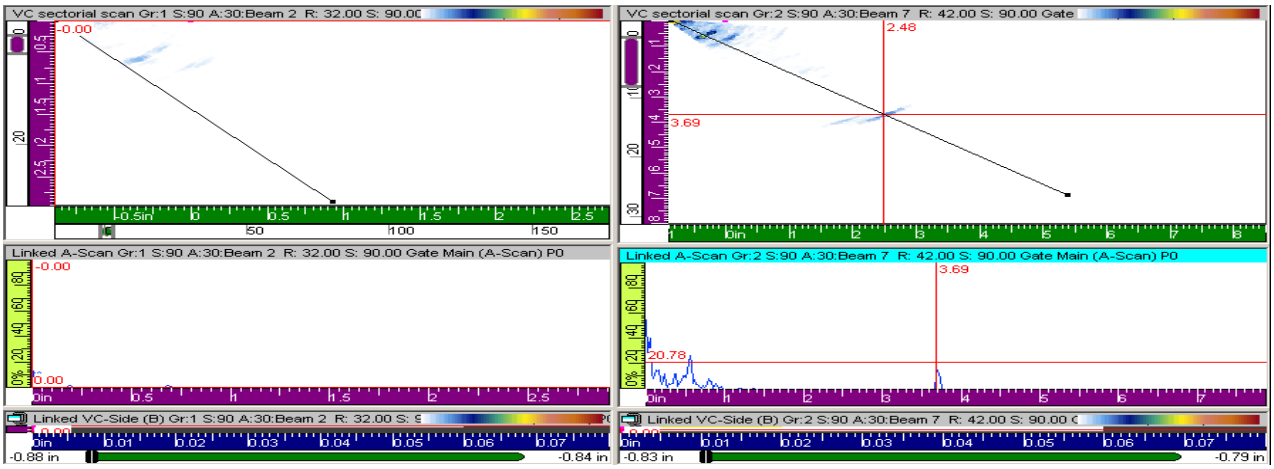
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.471/10.440us	0.000in	3.430/9.281in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17/46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	27/37dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	5.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected
Only the 2:00 to 5:00 location was accessible for scanning / Clockwise looking south

Inspector:	Manuel Gracie	Level:	III	Date:	4/27/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	1	**Weld Number:**	HPRHOH-GW-2
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	4.598" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

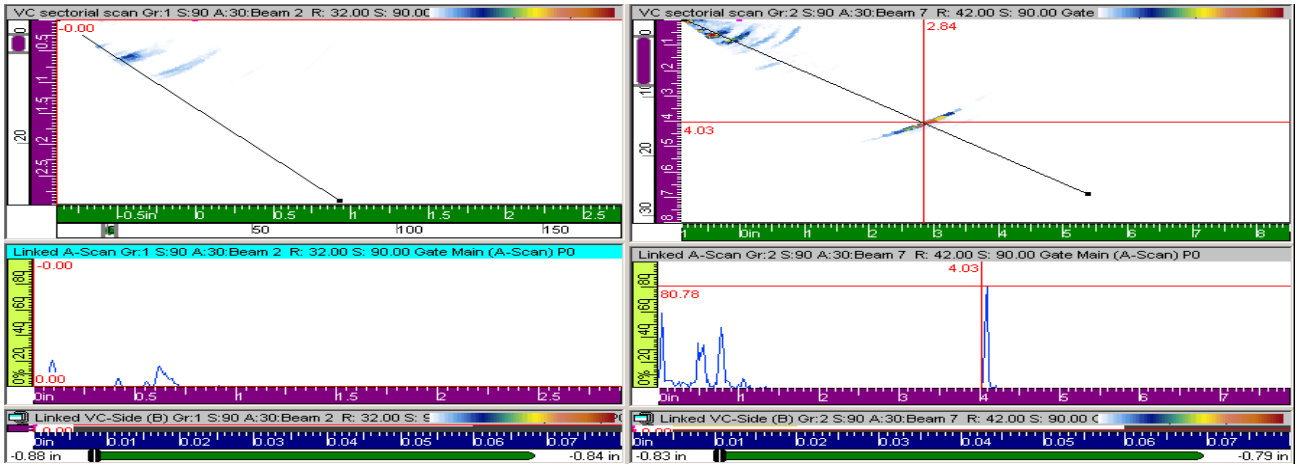
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.471/10.440us	0.000in	3.430/9.281in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17/46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	27/37dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	5.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/27/2011

THIELSCH ENGINEERING Phased-Array Report

Customer:	American Electric Power	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	1	**Weld Number:**	HPRHOH-GW-3
Project Number:	43-11-0066	**Weld Configuration:**	Header to Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	4.598" MW

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterization

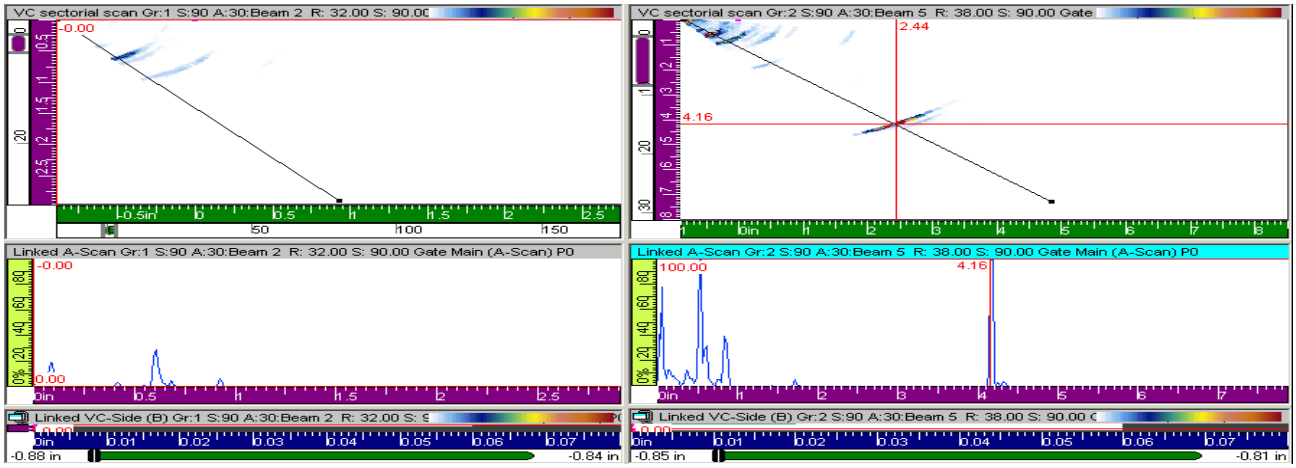
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.471/10.440us	0.000in	3.430/9.281in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17/46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	27/37dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	5.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
No Relevant Indications Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/27/2011

THIELSCH ENGINEERING

Phased Array Calibration

Customer:	American Electric Power	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	1	**Weld Number:**	See Attached Report
Project Number:	43-11-0066	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	4.598" MW

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Calibration ID#
Omni Scan MX	Omni-1179	Scan:Omni-2.0R5 Analysis:TomoView-2.4R1	8/11	42811.5.0"

Probe Characterizatior

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

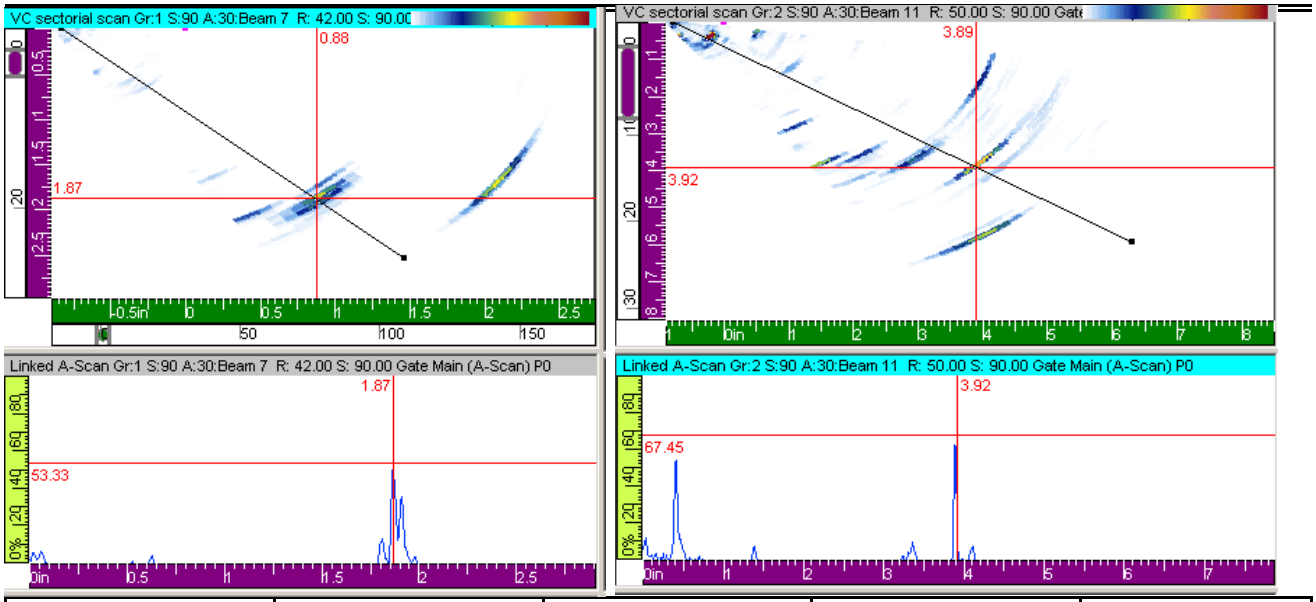
Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.471/10.440us	0.000in	3.430/9.281in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17/46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	27/37dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	2.0 Degrees	5.0in	0.126 in/us

Encoder / Scan Area

Encoder Model	Serial #	Type	Resolution	Polarity
USDigital	USD3127	Quadrature	220.0step/in	Normal
Scan Resolution	**Max Scan Speed**	**Couplant**	**PCS**	**Cal. Block Reflector**
0.050in	9.842in/sec	Sonatech	0in	NAV-0.040"SDH



Date / Time	Date / Time	Date / Time	Date / Time	Date / Time
4/28 - 7AM	4/29 - 7AM			

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **4/28/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	1	**Weld Configuration:**	Longitudinal Seam
Project Number:	43-11-0066	**Part Thickness:**	4.598" MW
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Diameter:**	40"
Calibration ID #:	42811-5.0"		

Weld #	Indication	Scan Location	Range of Depth	Comments / Obstructions
LS-1E	No Relevant Indications Detected			Hand Scanned / Non-Encoded
LS-1W	No Relevant Indications Detected			Hand Scanned / Non-Encoded
LS-2E	No Relevant Indications Detected			Hand Scanned / Non-Encoded
LS-2W	No Relevant Indications Detected			Hand Scanned / Non-Encoded
LS-3E	No Relevant Indications Detected			Hand Scanned / Non-Encoded
LS-3W	No Relevant Indications Detected			Hand Scanned / Non-Encoded

Notes and Comments

All seam welds were hand scanned non-encoded due to accessibility because of adjacent tube rows

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/28/2011**

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

HARDNESS MEASUREMENT SHEET

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: High-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, D	Hardness Scale: HBN

Location:		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
HPROH-R1	Girth	166	171	173	177	175	172	82,000
	Seam	156	169	167	191	156	168	80,000
	Base	138	149	145	159	153	149	71,000
HPROH-R2	Girth	155	163	170	172	187	169	81,000
	Seam	160	161	155	164	153	159	76,000
	Base	140	133	151	153	144	144	69,000
HPROH-R3	Girth	149	151	149	139	149	147	70,000
	Seam	159	169	168	151	159	161	77,000
	Base	134	152	139	136	137	140	67,000
HPROH-R4	Girth	152	159	138	157	172	156	74,000
	Seam	134	154	153	165	158	153	73,000
	Base	125	129	122	145	136	131	64,000
HPROH-R5	Girth	166	164	155	160	166	162	78,000
	Seam	138	139	145	145	151	144	69,000
	Base	160	160	170	170	146	161	77,000
HPROH-R6	Girth	154	145	140	153	168	152	73,000
	Seam	157	154	153	138	128	146	71,000
	Base	156	157	148	137	141	148	70,000
HPROH-R7	Girth	189	197	194	196	191	193	91,000
	Seam	178	154	179	177	184	174	83,000
	Base	142	141	143	154	141	144	69,000
HPROH-R8	Girth	156	154	150	178	151	158	75,000
	Seam	152	154	145	138	134	145	69,000
	Base	151	150	152	137	135	145	69,000

Inspector: Manny Gracie, J. McCarthy — Date: 05/02/2011

APPENDIX F

NONDESTRUCTIVE EXAMINATION REPORTS
LOW-PRESSURE REHEAT OUTLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station
Unit No. 1 - Low-Pressure Reheat Outlet Header
Seam Welded

The minimum wall thickness requirements were calculated for the LP Reheat Outlet header. These calculations are based on the 2010 ASME Code for Boiler and Pressure Vessels, Per ASME Sect I, PG27.2.2.

ASTM Material Specifications for:	SA-387, Gr. 91, Cl. 2	

Where:

T- Design Temperature	1065	°F
P- Maximum Allowable Pressure	475	psig
D- Outside Diameter	50.625	in
SE- Maximum Stress Value	12,890	psi
W-Weld Strength Reduction Factor	0.90	
y-Temperature Coefficient	0.70	
A- Additional Thickness	0.000	in

The following equation applies:
Per. Sect I, PG 27.2.2

t_m=(PD/(2(SEW+PY))+A	1.013	in

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Low-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, Gr. 91 Cl. 2	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ AMP Turns _____
☐ DC ☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications.	x	
GW-2	N/A	No recordable indications.	x	
GW-3	1/8"	Indication on weld. Removed by grinding.	x	
GW-4	N/A	No recordable indications.	x	
GW-5	N/A	No recordable indications.	x	
GW-6	N/A	No recordable indications.	x	
GW-7	N/A	No recordable indications.	x	
GW-8	N/A	No recordable indications.	x	
Attachment Welds				
AW-1	10" LT	Linear indication on toe of weld.		x
	3/4" TW	Transverse indication on weld.		x
AW-2	N/A	No recordable indications.	x	
AW-3	10" (x2)	Indication on both sides.		x
AW-4	N/A	No recordable indications.	x	
AW-5	N/A	No recordable indications.	x	
AW-6	N/A	No recordable indications.	x	
Seam Welds				
LS-01	N/A	No recordable indications.	x	
LS-02	N/A	No recordable indications.	x	
LS-03	N/A	No recordable indications.	x	
LS-04	N/A	No recordable indications.	x	
LS-05	N/A	No recordable indications.	x	
LS-06	N/A	No recordable indications.	x	
LS-07	1"	Linear indication on toe of weld. Ground to 1/2"		x
	1/2"	Linear indication on toe of weld.		x
LS-08	N/A	No recordable indications.	x	

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Low-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, Gr. 91 Cl. 2, SA-213, Gr. T22	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ DC
☐ AMP Turns _____
☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Penetration Welds				
P-1	N/A	No recordable indications.	x	
P-2	N/A	No recordable indications.	x	
P-3	N/A	No recordable indications.	x	
P-4	N/A	No recordable indications.	x	
Tube Stubs				
Row 5, Tube C	1/4"	Indication on weld. Removed.	x	
Row 5, Tube D	1/4"	Indication on weld.	Monitor	
Row 5, Tube E	1/8"	Indication on weld.	Monitor	
Row 5, Tube J	1/4"	Indication on weld.	Monitor	
Row 9, Tube E	1/4"	Indication on weld.	Monitor	
Row 9, Tube F	1/4"	Indication on weld.	Monitor	
Row 13, Tube F	1/4"	Indication on weld.	Monitor	
Row 15, Tube H	1"	Linear indication on toe of weld.	Monitor	
Row 17, Tube F	1/4"	Indication on weld.	Monitor	
Row 17, Tube G	1/4"	Indication on weld.	Monitor	
Row 21, Tube E	1/4"	Indication on weld.	Monitor	
Row 21, Tube F	1/4"	Indication on weld.	Monitor	
Row 25, Tube I	1/4"	Indication on toe of weld.	Monitor	
Row 29, Tube E	1/4"	Indication on toe of weld.	Monitor	
Row 29, Tube F	1/4"	Indication on toe of weld.	Monitor	
Row 29, Tube G	1/4"	Indication on toe of weld.	Monitor	
Row 29, Tube I	1/4"	Indication on toe of weld.	Monitor	
Row 33, Tube E	1/4"	Indication on toe of weld.	Monitor	
Row 33, Tube F	1/4"	Indication on toe of weld.	Monitor	

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Low-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, Gr. 91 Cl. 2	Procedure: NDT-21FS, Rev. 8

EXAMINATION METHOD

☑ Continuous ☐ Circular
☐ Residual ☐ Longitudinal

TECHNIQUE

☑ Yoke ☐ Headshot ☐ Coil
☐ Prods ☐ Central Cond. ☐ Other

CURRENT

☑ AC ☐ AMP Turns _____
☐ DC ☐ Amperage _____
☐ Other _____

WET

☐ 14AM
☑ 20B
☐ Other

DRY

☐ Red
☐ Gray
☐ Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Tube Stubs				
Row 37, Tube F	1/4"	Indication on toe of weld.	Monitor	
Row 37, Tube G	1/4"	Indication on toe of weld.	Monitor	
Row 41, Tube E	1/4"	Indication on toe of weld.	Monitor	
Row 41, Tube F	1/4"	Indication on toe of weld.	Monitor	
Row 45, Tube E	1/4"	Indication on toe of weld.	Monitor	
Row 45, Tube F	1/4"	Indication on toe of weld.	Monitor	
Row 49, Tube E	1/4"	Indication on toe of weld.	Monitor	
Row 57, Tube F	1/4"	Indication on toe of weld.	Monitor	
Row 89, Tube H	1/4"	Indication on weld. Removed.	x	

Note: Tube stubs in every 4th row from the north end were examined. No other recordable indications were revealed.

INSPECTOR: Manny Gracie, J. McCarthy	LEVEL: II	DATE: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066	
Component: Low-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387, Gr. 91 Cl. 2	Nominal Wall: 1.875"	Minimum Wall: 1.013"

EQUIPMENT NorthED:

☑ D-Meter ☑ Pi-Tape ☐ Other
☐ Micrometer ☐ Calipers

KEY:

North - Upstream
South -Downstream

IDENTIFICATION		DIAMETER MEASUREMENTS (IN.)			THICKNESS MEASUREMENTS (IN.)			
		Pi-TAPE	CALIPERS		12:00	3:00	6:00	9:00
			12 to 6	3 to 9				
GW-1	North	N/A			1.885	1.964	1.955	1.895
	South	51.035			1.900	1.904	1.904	1.908
GW-2	North	50.876			1.900	1.905	1.908	1.895
	South	50.756			1.885	1.877	1.887	1.893
GW-3	North	50.717			1.904	1.890	1.892	1.887
	South	50.637			1.901	1.902	1.902	1.898
GW-4	North	50.637			1.904	1.904	1.911	1.908
	South	50.717			1.900	1.891	1.898	1.899
GW-5	North	50.916			1.902	1.883	1.900	1.895
	South	50.916			1.893	1.876	1.888	1.891
GW-6	North	50.637			1.909	1.900	1.893	1.922
	South	50.637			1.880	1.881	1.870	1.884
GW-7	North	50.637			1.900	1.891	1.881	1.895
	South	50.916			1.885	1.881	1.873	1.893
GW-8	North	50.916			1.899	1.879	1.869	1.885
	South	50.756			1.909	1.905	1.894	1.907

INSPECTOR: M. Gracie, J. McCarthy | LEVEL: II | DATE: 05/02/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to End Cap
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

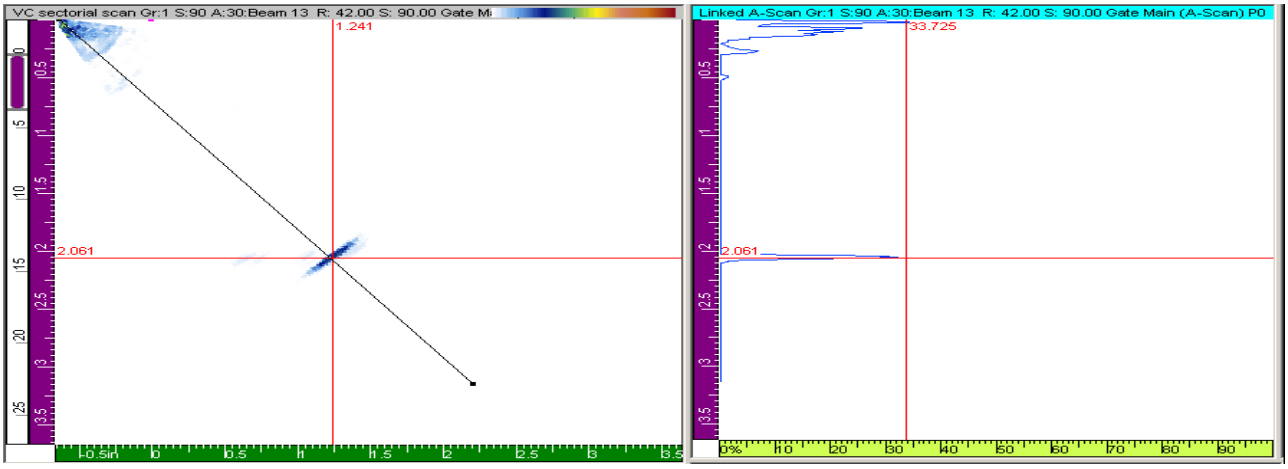
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

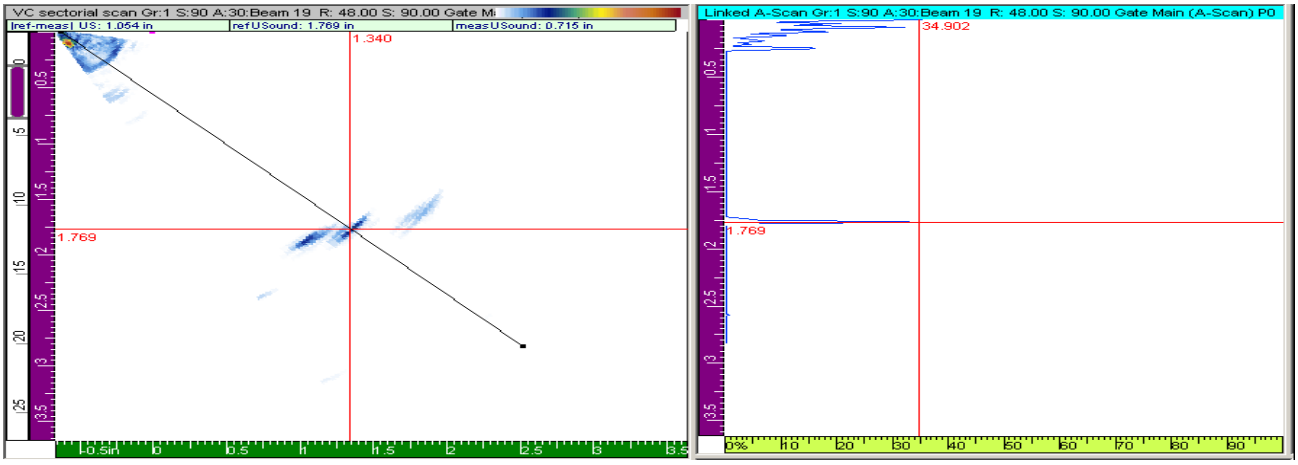
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

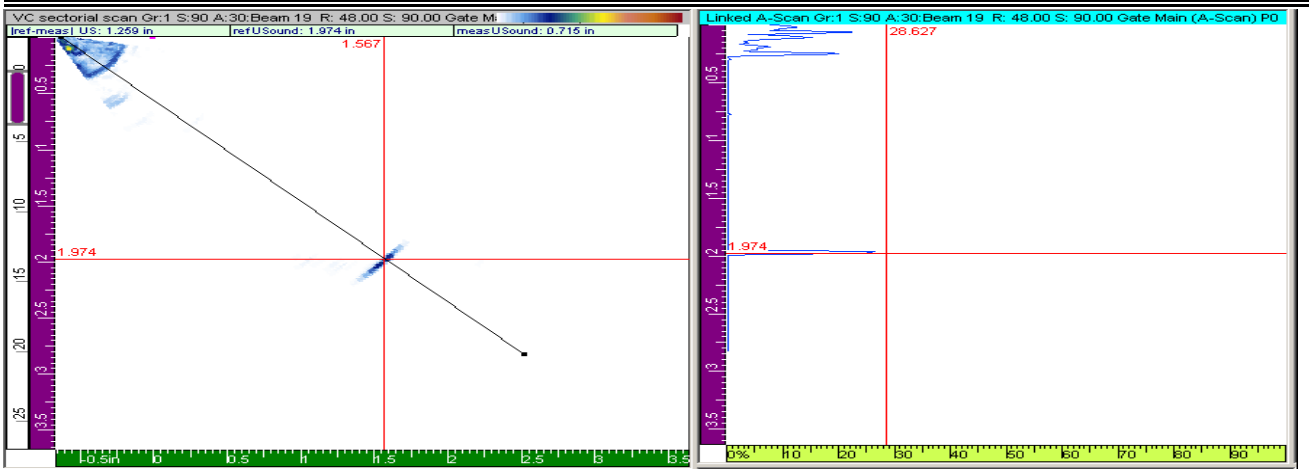
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected
Only the north side of weld was accessible for scanning due to hanger attachment

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW4
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

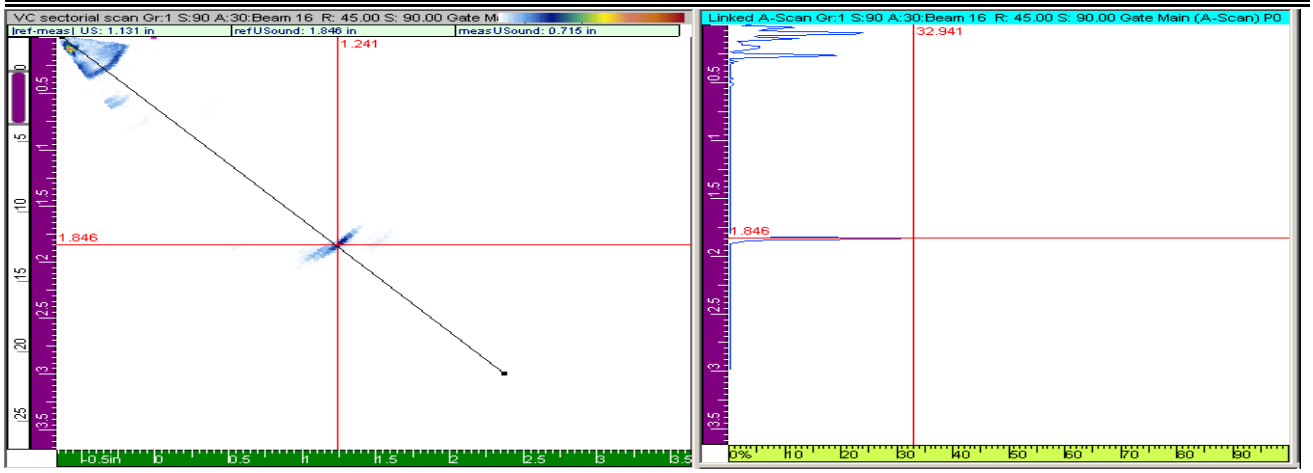
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW5
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

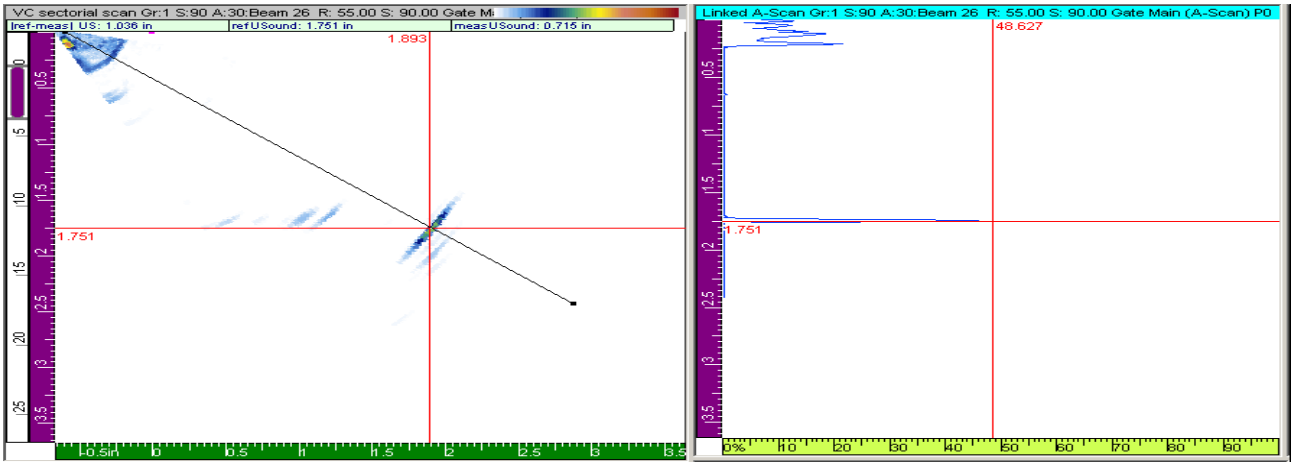
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW6
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

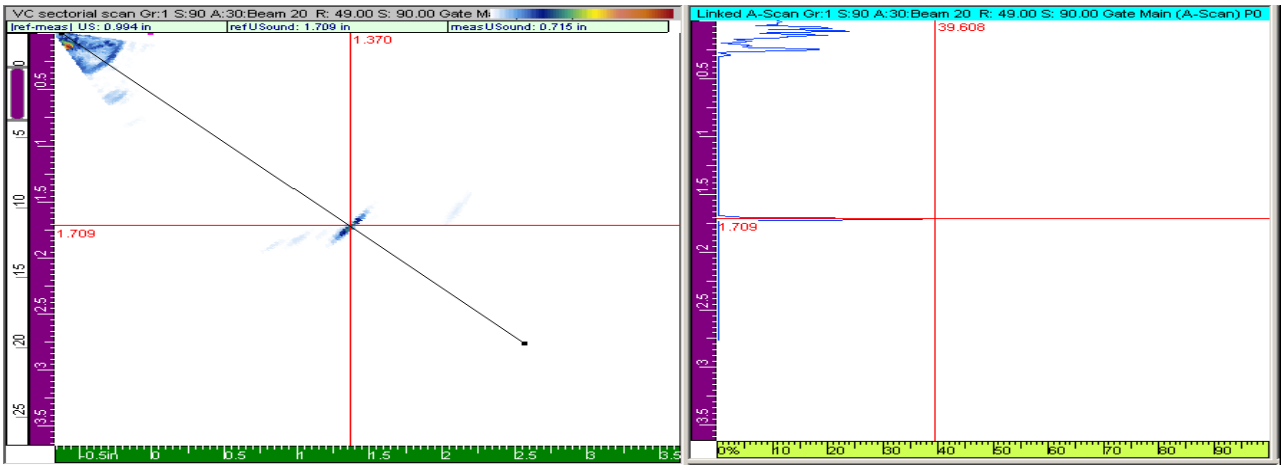
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW7
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

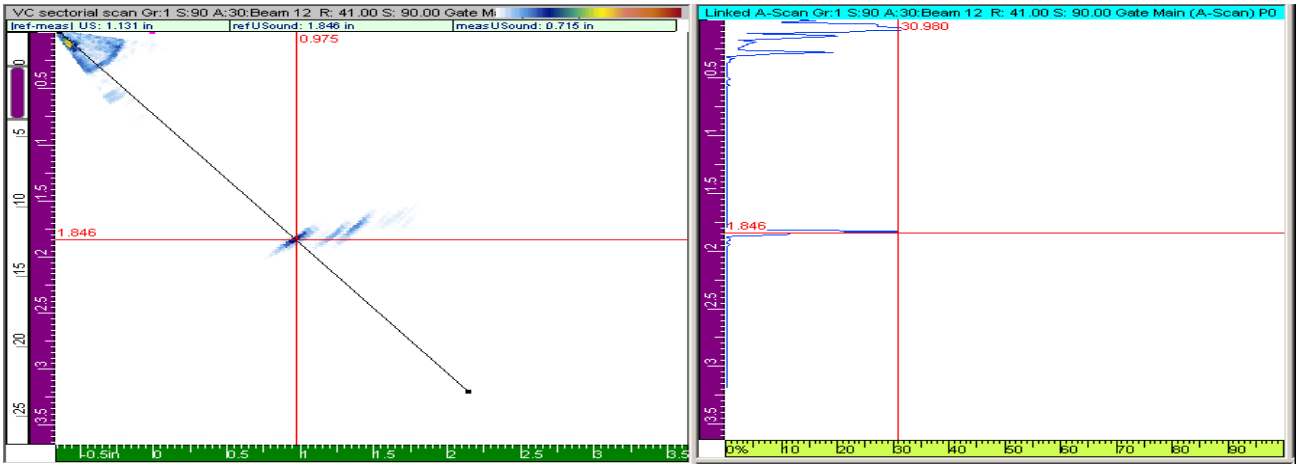
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected
No transverse scans due to hanger attachment

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	LPRHOH-GW8
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 1179	Scan:Omni-2.0R20 TomoView-2.4R15	8/11	A-Scan

Probe Characterizatior

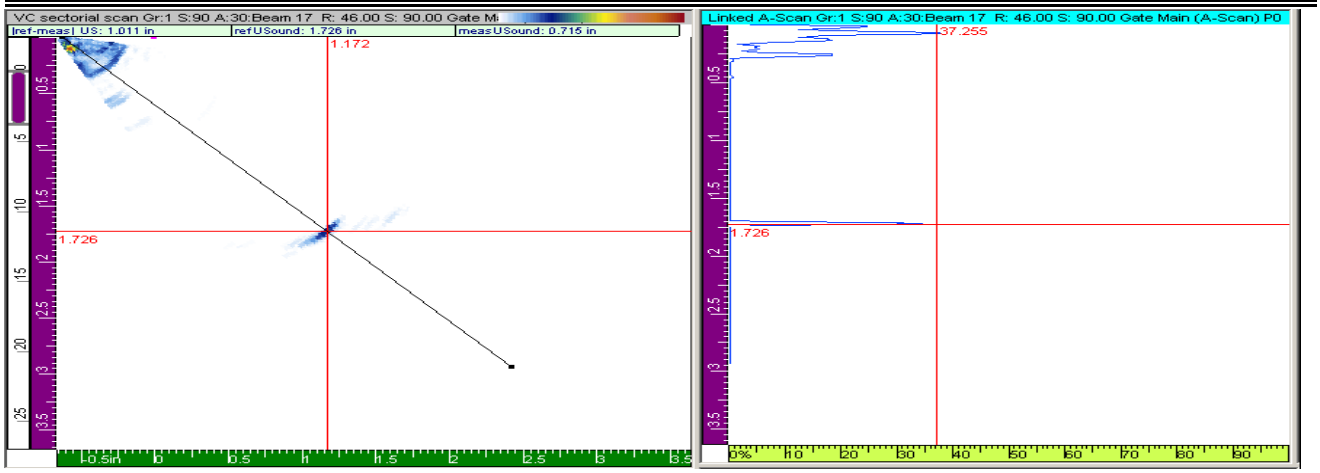
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.820us	0.000in	4.237in	5	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	21	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
40/80(volts)	29dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculatoı

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	1 Degrees	2.0in	0.126 in/us



COMMENTS:

Image of typical 360 degree non-relevant root signal / Root geometry
No Relevant Indication Detected

Inspector:	Manuel Gracie	Level:	III	Date:	4/30/2011

THIELSCH ENGINEERING

Phased-Array Calibration

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Number:**	See Attached Report
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Longitudinal Seam
Machine Information		**Part Thickness:**	1.875"

Model #	Serial #	Software Version	Calibration Due	Calibration ID#
Omni Scan MX	Omni-1179	Scan:Omni-2.0R5 Analysis:TomoView-2.4R1		42811-3.0"

Probe Characterizatior

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10/A1	G1745/C0055	5MHz	55.0 Degrees	0.378 in

Setup

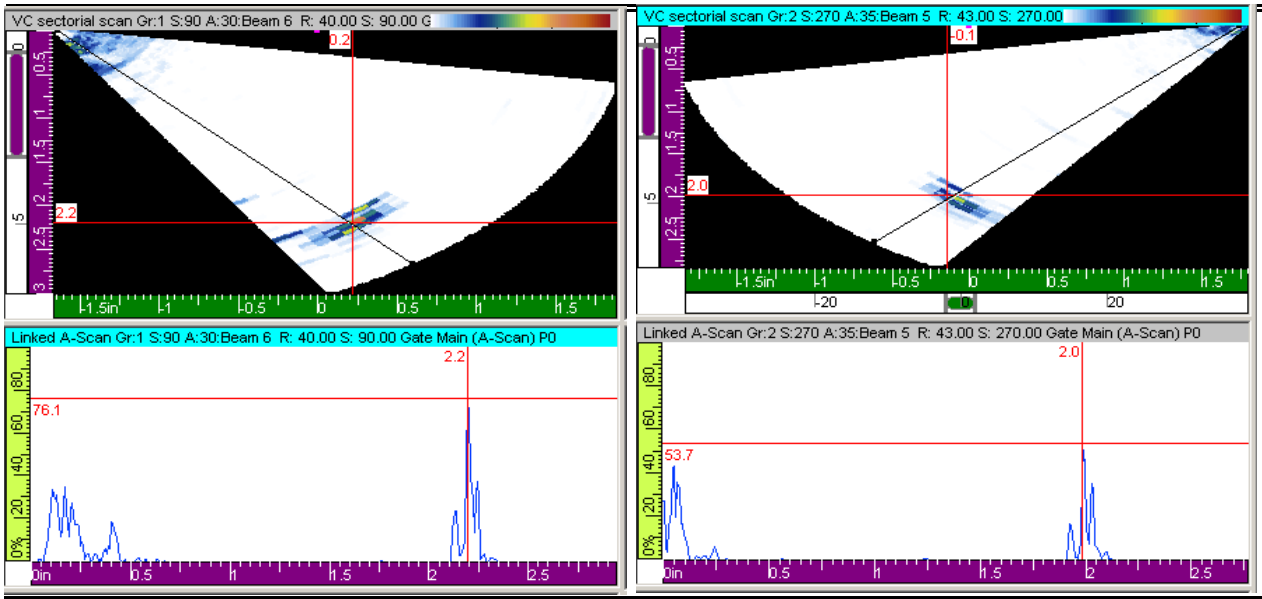
Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
5.827/10.899us	0.000in	3.470/3.470in	50/50	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17/17	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(High)	27/25dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

Element Quantity	1st Element	Last Element	Resolution	Scan Type
16	1	16	1.0	Sectoral
Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
30.0 Degrees	80.0 Degrees	2.0 Degrees	2.0in	0.126 in/us

Encoder / Scan Area

Encoder Model	Serial #	Type	Resolution	Polarity
USDigital	USD3127	Quadrature	220.0step/in	Normal
Scan Resolution	**Max Scan Speed**	**Couplant**	**PCS**	**Cal. Block Reflector**
0.050in	9.842in/sec	Sonatech	2.5"	NAV-0.040"SDH



Date / Time	Date / Time	Date / Time	Date / Time	Date / Time
4/28 - 7AM	4/29 - 7AM			

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **4/28/2011**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	American Electric Power	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	1		
Project Number:	43-11-0066	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	1.875"
Calibration ID #:	42811-2.0"	**Part Diameter:**	50"

Weld #	Indication	Scan Location	Range of Depth	Comments / Obstructions
LS-1	No Relevant Indications Detected			
LS-2	No Relevant Indications Detected			
LS-3	No Relevant Indications Detected			
LS-4	No Relevant Indications Detected			
LS-5	No Relevant Indications Detected			
LS-6	No Relevant Indications Detected			
LS-7	No Relevant Indications Detected			
LS-8	No Relevant Indications Detected			

Notes and Comments

All seam welds inspected had intermittent non-relevant root signals through out the entire length of weld Indications were of inside root geometry / Random examples are shown in Figures # 1 and # 2

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/29/2011**

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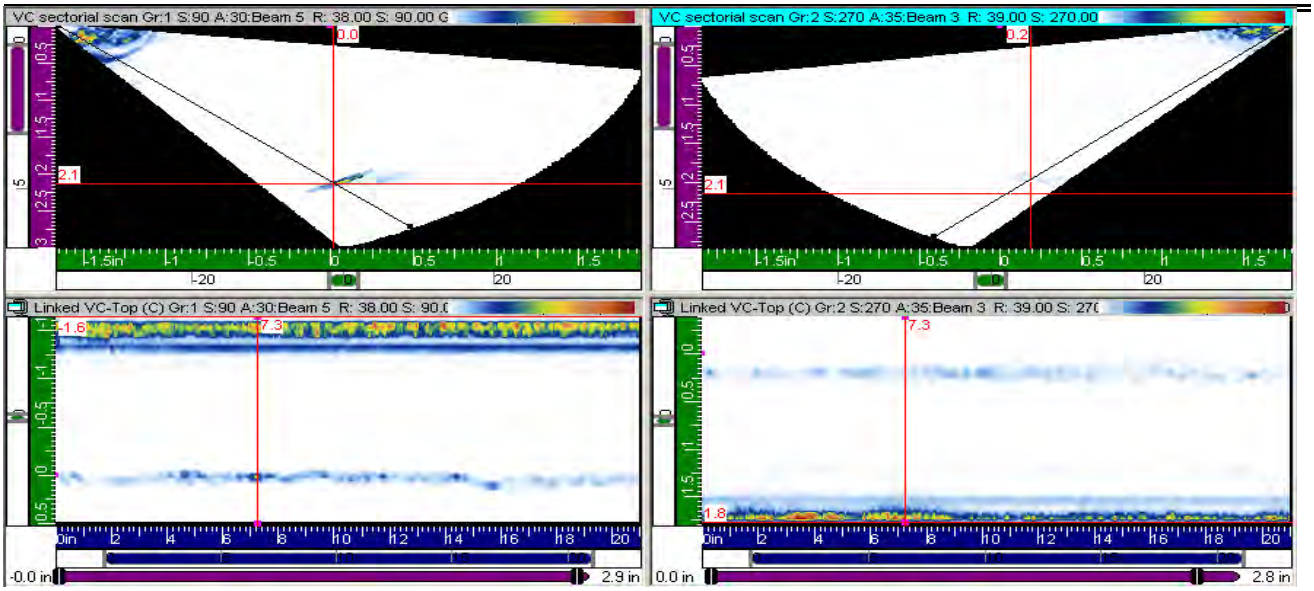
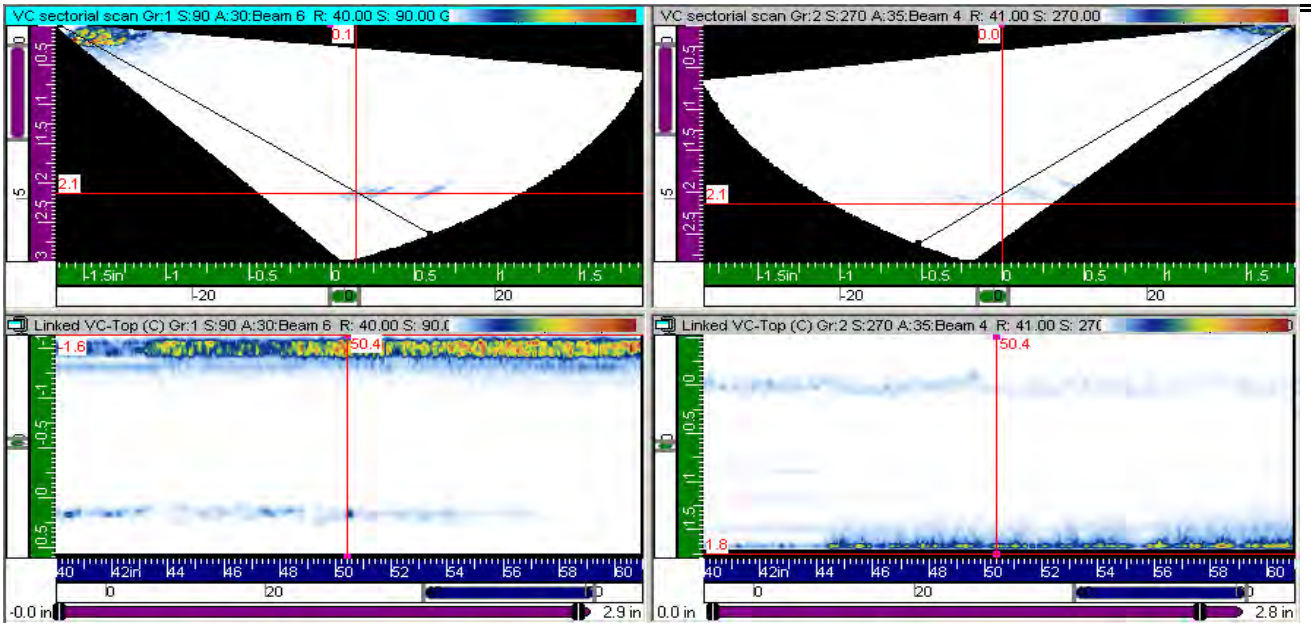
Phased-Array Report

Component: Low-Pressure Reheat Outlet Header / Longitudinal Seam Weld
Weld Number: LS-2 / 0" to 21" scan



Indication Comments and Location:
Image of typical non-relevant root signal found along all seam welds inspected / Inside geometry
Above image taken on LS-2 at the 7.3" location along weld

Component: Low-Pressure Reheat Outlet Header / Longitudinal Seam Weld
Weld Number: LS-7 / 40" to 61" scan



Indication Comments and Location:
Image of typical non-relevant root signal found along all seam welds inspected / Inside geometry
Above image taken on LS-7 at the 50.4" location along weld

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/29/2011**

THIELSCH ENGINEERING, INC.

195 Frances Avenue - Cranston, RI 02910 - (401) 467-6454

HARDNESS MEASUREMENT SHEET

Job Name: AEP - Mitchell Generating Station	Job Date: April 2011	Job Number: 43-11-0066
Component: Low-Pressure Reheat Outlet Header - Unit No. 1	Material: SA-387 Gr. 91, Cl. 2	Hardness Scale: HBN

Location:		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
LPROH-R1	Girth	210	214	246	218	201	218	102,000
	Seam	206	209	214	211	214	211	99,000
	Base	189	201	183	180	196	190	90,000
LPROH-R2	Girth	180	177	190	181	199	185	88,000
	Seam	168	194	158	193	169	176	84,000
	Base	156	163	154	165	163	160	77,000
LPROH-R3	Girth	192	194	200	187	194	193	91,000
	Seam	209	213	214	206	207	210	99,000
	Base	186	191	187	193	192	190	90,000
LPROH-R4	Girth	139	145	155	170	157	153	73,000
	Seam	186	190	180	203	196	191	90,000
	Base	160	161	152	163	164	160	77,000
LPROH-R5	Girth	191	184	177	193	185	186	88,000
	Seam	172	168	179	181	159	172	82,000
	Base	189	192	189	195	183	190	90,000
LPROH-R6	Girth	191	206	203	196	171	193	91,000
	Seam	190	186	180	200	196	190	90,000
	Base	167	169	168	174	188	173	83,000
LPROH-R7	Girth	189	186	162	189	201	185	88,000
	Seam	187	157	158	172	155	166	79,000
	Base	180	182	170	196	187	183	87,000
LPROH-R8	Girth	167	168	170	173	153	166	80,000
	Seam	158	187	168	163	200	175	84,000
	Base	174	162	171	159	163	166	79,000

Inspector: Manny Gracie, J. McCarthy	Date: 05/02/2011

THIELSCH ENGINEERING, INC.

195 Frances Avenue
Cranston, Rhode Island 02910-2211
Tel. (401) 467-6454
Fax (401) 467-2398

November 8, 2011

Mr. Ben Hackett
American Electric Power
1 Riverside Plaza
Columbus, OH 43215

SUBJECT: Inspection of Boiler Headers in Unit No. 1

Dear Mr. Hackett:

Enclosed are two copies of Report No. 13796 summarizing the inspection of the boiler headers in Unit No. 1 at the Mitchell Generating Station of AEP.

We appreciated the opportunity to be of service and look forward to working with you again in the future. If you have any questions or would like further assistance, please do not hesitate to contact us.

Very truly yours,

THIELSCH ENGINEERING, INC.

Peter Kennefick
Vice President
Field Engineering Services

Enclosure:
Job No. 43-11-0066

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