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MARCH 2012 INSPECTION OF BOILER HEADERS UNIT NO. 2 MITCHELL GENERATING STATION AMERICAN ELECTRIC POWER MOUNDSVILLE, WEST VIRGINIA

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EXECUTIVE SUMMARY

In March of 2012, Thielsch Engineering performed an inspection of selected boiler headers in Unit No. 2 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, Dim, MT, UTT, UTPA, Rep, HD	No recordable surface or sub-surface indications revealed. No evidence of pipe swelling or wall thinning noted. Operating in Class 1 creep range.	No immediate repair actions required. Perform an inspection similar in scope after three to five years of continued operation (2015 to 2017).	Header has consumed less than 20% of useful life
Platen Superheater Outlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD	Fatigue cracking at tube stub weld. Repaired on-site. No evidence of wall thinning was noted. Operating in Class 1 creep range.	Perform an inspection similar in scope after three to five years of continued operation (2015 to 2017).	Header material has consumed less than 20% of remaining useful life

Component	Examination Type	Results	Recommendations	Remaining Useful Life
Finishing Superheater Inlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD	Surface indications at the tube stub weld. Evaluated as acceptable. No evidence of pipe swelling or wall thinning was noted. Operating in Class 1 creep range.	No immediate repair actions required. Perform an inspection similar in scope after three to five years of continued service (2015 to 2017).	Header material has consumed less than 20% of useful life
Finishing Superheater Outlet Headers (Upper and Lower)	VT, Dim, MT, UTT, UTPA, Rep, HD, OS	Fatigue-type cracking revealed at multiple tube stub welds. Repair welded by plant personnel during current outage. Subsurface indication at girth weld evaluated as acceptable. Moderate terminal tube thinning (Lower 5.7% to Upper 14.9%) noted. Operating in Class 1 creep range.	Replace tubes that have a remaining useful life of less than 50,000 hours. Reinspect weld repairs after one year of continued operation (in 2013). Perform a similar inspection after three years of continued service (in 2015).	Headers materials have consumed less than 20% of their useful life. Most tubes revealed an estimated remaining useful life of >140,000 hours. Lowest remaining useful life of -15,892 hours was observed.

Component	Examination Type	Results	Recommendations	Remaining Useful Life
High-Pressure Reheat Outlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD, OS	Multiple fatigue-type indications were evaluated and repair welded by plant personnel during the outage. Several weld defects identified and evaluated as acceptable. Heavy internal oxide scale growth on terminal tubes. Evaluated as nearing end of operational life. Operating in Class 1 creep range.	Remove tube sample for laboratory analysis within the next 12 months. Reinspect weld repairs after one year of continued operation (in 2013). Perform a similar inspection after three years of additional service (in 2015).	Header material has consumed less than 20% of useful life. Most tubes revealed an estimated remaining useful life of >102,000 hours. Lowest remaining useful life of -37,089 hours was observed.
Low-Pressure Reheat Outlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD, OS	Significant cracking identified at attachment welds. Several sub-surface indications within girth welds. Evaluated as acceptable. Operating in Class 1 creep range.	Repair the attachment welds within next 24 months. Monitor the sub-surface indications during future inspections. Reinspect after three years of continued service (2015).	Header materials have consumed less than 20% of remaining useful life. All tubes revealed an estimated remaining useful life of >200,000 hours.

Component	Examination Type	Results	Recommendations	Remaining Useful Life
High-Pressure (1st) Reheat Inlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD	Surface and subsurface indications revealed on seam welds. Indications repaired by plant personnel during outage. No evidence of pipe swelling or wall thinning was noted. Operating in Class 1 creep range.	Reinspect the weld repairs after one year of continued operation (2013). Perform a similar inspection after three years of additional service (2015).	Header material has consumed less than 20% of remaining useful life.
High-Pressure (2nd) Reheat Inlet Header	VT, Dim, MT, UTT, UTPA, Rep, HD	No recordable surface or subsurface indications. No evidence of pipe swelling or wall thinning was noted. Operating in Class 1 creep range.	Perform a similar inspection after three to five years of additional service (2015 to 2017).	Header material has consumed less than 20% of remaining useful life.

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

INTRODUCTION

In March of 2012, Thielsch Engineering performed an inspection of selected boiler headers in Unit No. 2 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. 2 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. 2) in 1970. Since that time, it has been operated in a base-loaded and cyclic manner. At the time of this inspection, the unit had accumulated approximately 260,000 hours of service according to plant personnel.

MARCH 2012 INSPECTION

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, or replication, with hardness determinations taken at each replication site. Diameter and oxide scale thickness measurements were also performed.

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 pipe was identified at the 12:00 o'clock position. Other positions along the circumference were identified clockwise while facing north.

2.) Vertical Header Sections - The north side 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. 2 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-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.)

The Platen Superheater Inlet header receives superheated steam from 26 elements, each containing 16 tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-213, Grade T2. (For reference purposes, this specification covers "Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes". Grade T2 involves a 1/2 Cr - 1/2 Mo low-alloy steel material.)

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 for the Platen Superheater Inlet header which are provided in Appendix A, were performed in accordance with the original 1968 ASME Code.)

Component	Design		ASME Specification	Pipe Dimensions		
	Temp.	Pressure		OD	Specified MWT	Calculated MWT
Header	850°F	4,075 psig	SA-335, Gr. P11	22.00"	3.249"	2.796"
Tube Stubs			SA-213, Gr. T2	2.50"	0.336"	N/A

Sketches of the Platen Superheater Inlet header are provided in Fig. 1. Photographs of the inspection locations on the header are provided in Figs. 2 through 4. 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.

Diameter Measurements

As part of the inspection of the Platen Superheater Inlet header, diameter measurements were recorded on either side of each girth weld. The diameter measurements would confirm whether the Platen Superheater Inlet 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 Platen Superheater Inlet header are summarized in the following table:

OD	ASME SA-335 Manufacturing Tolerances		Field Readings	
	Under	Over	Min.	Max.
22.00"	21.780"	22.220"	22.094"	22.156"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-335.

The diameter measurements performed on the Platen Superheater Inlet header fell within the permissible manufacturing tolerances. 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 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 magnetic particle examination did not reveal any recordable surface indications.

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:

Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
Low	**High**	**Specified**	**Calculated**
3.277"	3.680"	3.249"	2.796"

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 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 did not reveal any rejectable 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 at the 2:00 o'clock position, north side of the weld	1	5
PSIH-R2	Girth weld No. GW-1 at the 2:30 o'clock position, south side of the weld	1	6
PSIH-R3	Girth weld No. GW-2 at the 2:00 o'clock position, north side of the weld	1	7
PSIH-R4	Girth weld No. GW-2 at the 2:30 o'clock position, south side of the weld	1	8
PSIH-R5	Girth weld No. GW-3 at the 1:30 o'clock position, north side of the weld	1	9
PSIH-R6	Girth weld No. GW-3 at the 2:00 o'clock position, south side of the weld	1	10
PSIH-R7	Girth weld No. GW-7 at the 1:30 o'clock position, south side of the weld	1	11
PSIH-R8	Girth weld No. GW-5 at the 1:00 o'clock position, south side of the weld	1	12

All of the replica foils removed from the Platen Superheater Inlet header (PSIH) exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of bainite and limited amount of ferrite martensite. 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 in a matrix of spheroidized pearlite. Even though the material specified for the header is ASME SA-335 P11, the microstructure observed in these replica foils are typical of ASME SA-204 Grade A steel plate. The microstructures observed in these replica foils are typical for low-alloy C - 1/2 Mo steel pipe produces in accordance with ASME SA-204 Grade A plate, and filler material of the equivalent chemical composition that has been subjected to high-temperature service for extended period of time.

The base material did exhibit some microstructural transformations as a result of high-temperature service for an extended period of time. This included partial decomposition of bainite and spheroidization of pearlite. It also included 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 and spheroidization of pearlite, 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 Inlet header and the tubes exhibited evidence of creep deterioration.

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, heat-affected zone, 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	152	184	72,000	87,000
HAZ	154	193	74,000	91,000
Weld	151	183	72,000	87,000

All of the values recorded on the base material 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).

All of the values recorded on the heat affect zone and weld deposits were greater than 60,000 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 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.

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. (For reference purposes, Grade T12 involves a 1 Cr - 1/2 Mo low-alloy steel material.)

The following table lists the available data concerning the header/tube dimensions, header/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	Design		ASME Specification	Pipe Dimensions		
	Temp.	Pressure		OD	Specified MWT	Calculated MWT
Header	944°F	4,020 psig	SA-335, Gr. P11	20.50"	3.375"	3.107"
Tube Stubs			SA-213, Gr. T12	2.25"	0.396"	N/A

Sketches of the Platen Superheater Outlet header are provided in Fig. 13. Photographs of the inspection locations on the header are provided in Figs. 14

through 17. 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.

Diameter Measurements

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

Component	OD	ASME SA-335 Manufacturing Tolerances		Field Readings	
		Under	Over	Min.	Max.
Header	20.50"	20.295"	20.705"	20.563"	20.719"
Outlets (GW-8, GW-9, GW-11, and GW-12)	N/A	N/A	N/A	19.563"	19.781"
Outlets (GW-10)	N/A	N/A	N/A	12.781"	

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-335.

For the most part, the diameter measurements performed on the Platen Superheater 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 Platen Superheater Outlet 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 1" long recordable surface indication in girth weld No. GW-9. The indication was removed by grinding at 1/16" by plant personnel. No further action is required. A photograph of the indication is provided in Fig. 18. The examination also revealed a 2" long surface indication in tube stub 8K. The indication was removed and repaired by welding by plant personnel. A final wet fluorescent magnetic particle examination was performed on the repaired tube. No other indications were revealed during the examination. The results of the wet fluorescent magnetic particle examination are provided in Appendix B.

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 provided in Appendix B. They are summarized in the following table:

Component	Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
	Low	High	Specified	Calculated
Header	3.362"	3.696"	3.375"	3.107"
Outlets (GW-8, GW-9, GW-11, and GW-12)	2.967"	3.021"	N/A	N/A

Component	Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
	Low	High	Specified	Calculated
Outlets (GW-10)	2.207"	2.242"	N/A	N/A

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 Platen Superheater Outlet header. The ultrasonic phased-array examination did not reveal any rejectable 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. Eleven 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 10:30 o'clock position, south side of the weld	1	19
PSOH-R2	Girth weld No. GW-2 at the 10:30 o'clock position, south side of the weld	1	20

Replica	Location	Creep Classification	Fig.
PSOH-R3	Girth weld No. GW-3 at the 11:30 o'clock position, north (tee side) side of the weld	1	21
PSOH-R4	Girth weld No. GW-3 at the 1:30 o'clock position, south side of the weld	1	22
PSOH-R5	Girth weld No. GW-3 at the 12:00 o'clock position, south side of the weld	1	23
PSOH-R6	Saddle weld No. SW-1 at the 4:00 o'clock position, top side of the weld	1	24
PSOH-R7	Saddle weld No. SW-1 at the 4:30 o'clock position, bottom side of the weld	1	25
PSOH-R8	Girth weld No. GW-4 at the 11:00 o'clock position, north side of the weld	1	26
PSOH-R9	Girth weld No. GW-4 at the 11:30 o'clock position, south side of the weld	1	27
PSOH-R10	Girth weld No. GW-6 at the 11:00 o'clock position, north side of the weld	1	28
PSOH-R11	Girth weld No. GW-7 at the 10:30 o'clock position, north side of the weld	1	29

The replica foils, except for replica PSOH-R8, removed from the Platen Superheater Outlet header 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 pearlite and bainite. The microstructure exhibited by replica PSOH-R8 revealed void formation, void linkage, and cracking in the heat-affected zone of the girth weld. Repair or replacement of the girth weld with creep cracking damage should be planned for the next outage. 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 Specification SA-335, Grade P11 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 Platen Superheater Outlet header.

The base material did exhibit some microstructural transformations as a result of many years of operation at high-temperatures. 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 Platen Superheater Outlet header exhibited evidence of creep deterioration. Specifically, there 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 eleven 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	145	196	69,000	92,000
HAZ	157	203	75,000	95,000
Weld	157	204	75,000	96,000

All of the values recorded on the base material 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).

All of the values recorded on the heat affect zone and weld deposits were greater than 60,000 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 Platen Superheater Outlet header.

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 header/tube dimensions, header/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	Design		ASME Specification	Pipe Dimensions		
	Temp.	Pressure		OD	Specified MWT	Calculated MWT
Header	903°F	4,000 psig	SA-335, Gr. P11	19.25"	2.845"	2.571"
Tube Stubs			SA-213, Gr. T2	2.25"	0.322"	N/A

Sketches of the Finishing Superheater Inlet header are provided in Fig. 30. Photographs of typical inspection locations on the header are provided in Figs. 31 through 33. 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.

Diameter Measurements

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

Component	OD	ASME SA-335 Manufacturing Tolerances		Field Readings	
		Under	Over	Min.	Max.
Header	19.250"	19.058"	19.443"	19.266"	19.359"
Outlets (GW-10, GW-11, GW-14, and GW-15)	N/A	N/A	N/A	19.531"	19.594"
Outlets (GW-12 and GW-13)	N/A	N/A	N/A	17.547"	17.594"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-335.

The diameter measurements performed on the Finishing Superheater Inlet header fell within the permissible manufacturing tolerances. 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 Finishing Superheater Inlet header as well as the tube stubs in every fifth row from the north end of the header. The magnetic particle examination revealed a 1-1/2" indication on tube stub No. 55A. Photographs of the indication are provided in Fig. 34. The indication was removed and repaired by welding by plant personnel. A final wet fluorescent magnetic particle examination was performed on the repaired tube. No other indications were revealed during the examination. The results of the wet fluorescent magnetic particle examination are provided in Appendix C.

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	Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
	Low	High	Specified	Calculated
Header	2.790"	3.197"	2.845"	2.619"
Outlets (GW-10, GW-11, GW-14, and GW-15)	2.945"	3.084"	N/A	N/A
Outlets (GW-12 and GW-13)	2.526"	2.913"	N/A	N/A

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 rejectable 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. Eleven 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 10:30 o'clock position, south side of the weld	1	35
FSIH-R2	Girth weld No. GW-2 at the 10:30 o'clock position, south side of the weld	1	36
FSIH-R3	Girth weld No. GW-3 at the 11:00 o'clock position, south (tee side) side of the weld	1	37
FSIH-R4	Girth weld No. GW-4 at the 11:30 o'clock position, north (tee side) side of the weld	1	38
FSIH-R5	Girth weld No. GW-5 at the 11:30 o'clock position, north side of the weld	1	39
FSIH-R6	Girth weld No. GW-5 at the 12:30 o'clock position, south (tee side) side of the weld	1	40
FSIH-R7	Girth weld No. GW-6 at the 11:30 o'clock position, south side of the weld	1	41
FSIH-R8	Girth weld No. GW-7 at the 11:00 o'clock position, south (tee side) side of the weld	1	42
FSIH-R9	Girth weld No. GW-8 at the 11:00 o'clock position, north (tee side)side of the weld	1	43

Replica	Location	Creep Classification	Fig.
FSIH-R10	Girth weld No. GW-8 at the 11:30 o'clock position, south side of the weld	1	44
FSIH-R11	Girth weld No. GW-9 at the 10:30 o'clock position, north side of the weld	1	45

The replica foils removed from the Finishing Superheater Inlet header 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 pearlite and bainite. The microstructures observed in these replica foils are typical for 1-1/4 Cr - 1/2 Mo low-alloy pipe, produced in accordance with ASTM Specification A-335, Grade P11 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 Finishing Superheater Inlet header.

The base material did exhibit some microstructural transformations as a result of many 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 Finishing Superheater Inlet header exhibited evidence of creep deterioration. Specifically, there 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 eleven 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	157	186	75,000	88,000
HAZ	168	209	80,000	98,000
Weld	176	236	84,000	114,000

All of the values recorded on the base material 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).

All of the values recorded on the heat affect zone and weld deposits were greater than 60,000 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 Finishing Superheater Inlet header.

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. (For reference purposes, Grade T22 involves a 2 1/4 Cr - 1 Mo Low alloy steel material.)

The following table lists the available data concerning the header/tube dimensions, header/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	**Design**		**ASME Specification**	**Pipe Dimensions**		
	Temp. (°F)	**Pressure (psig)**		**OD**	**Specified MWT**	**Calculated MWT**
Headers	1025°F	3,865 psig	SA-335, Gr. P22	28.00	6.00"	5.692"
Tube Stubs			SA-213, Gr. T22	2.00	0.475"	0.453"

Sketches of the Upper and Lower Finishing Superheater Outlet headers are provided in Figs. 46 and 47. Photographs of the inspection locations on the headers are provided in Figs. 48 through 53. 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 sagging, bowing, or distortion. The visual examination of the upper and lower Finishing Superheater Outlet tube stubs revealed multiple surface indications. These indications were evaluated during the magnetic particle examination and results are provided in the corresponding section of this report.

Diameter Measurements

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

Header	OD	ASME SA-335 Manufacturing Tolerances		Field Readings	
		Under	Over	Min.	Max.
Upper	28.000"	27.720"	28.280"	28.078"	28.234"
Lower				28.094"	28.172"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-335.

The diameter measurements performed on the Upper and Lower Finishing Superheater Outlet headers fell within the permissible manufacturing tolerances. 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 Finishing Superheater Outlet headers as well as the tube stubs. The magnetic particle examination revealed the following indications:

Upper header

- Penetration No. P-5 - a 360° recordable surface indication. The indication was removed by light surface grinding by plant personnel. No further action is required.
- Tube Stubs with recordable surface indications: 1A, 1B, 1C, 1D, 1E, 2B, 5A, 17C, 17D, 20A, 20D, 21E, 22D, 24D, 25A, 25D, 26E, 27E, 30E, 31E, 32D, 35C, 45A, 50B, 51B, 52A, 52B, 53C, 53D, 54A, 54B, 54C, 54D, 55A, 55B, 55C, 55D, 56A, 56B, 56C, and 56D. The indications were removed and repaired by welding by plant personnel during the current outage. A final wet fluorescent magnetic particle examination was performed on the repaired tubes. No further indications were revealed.

Lower header

- Girth Weld No. GW-4 – a 24" recordable surface indication at the 9:00 o'clock position. The indication was removed by light surface grinding by plant personnel. No further action is required. Penetration No. P-2 – a 2-1/2" recordable surface indication. The indication was removed by light surface grinding by plant personnel. No further action is required.
- Penetration No. P-5 – a 360° recordable surface indication. The indication was removed by light surface grinding by plant personnel. No further action is required.
- Tube stubs with recordable surface indications: 1B, 1C, 2B, 2D, 4A, 4B, 5C, 5D, 8E, 12E, 15E, 18A, 19E, 21A, 22E, 24E, 25D, 26D, 27D, 29D, 30C, 30D, 31A, 31B, 31D, 33E, 38E, 41E, 47B, 48B, 50C, 50D, 50E, 51A, 51B, 51D, 52A, 52B, 52C, 52D, 53A, 53B, 53C, 53D, 53E, 54A, 54B, 54C, 54D, 54E, 55A, 55B, 55C, 55D, 55E, 56A, 56B, 56C, 56D, and 56E. The indications were removed and repaired by welding by plant personnel during the current outage. A final wet fluorescent magnetic particle examination was performed on the repaired tubes. No further indications were revealed.

Photographs of the indications are provided in Figs. 54 through 57. No other indications were revealed during the examination. The results of the wet fluorescent magnetic particle examination are provided in Appendix D.

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 provided in Appendix D. They are summarized in the following table:

Header	Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
	Low	High	Specified	Calculated
Upper	5.982"	6.284"	6.00"	5.69"
Lower	5.916"	6.264"		

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 wall thickness measurements were recorded on the Finishing Superheater Outlet tubing. The results of the ultrasonic wall thickness measurements performed on the Finishing Superheater Outlet tubing revealed that it had experienced significant (Lower: 5.7% to Upper: 14.9%) reductions in wall thickness. These areas should be monitored during future inspections and consideration should be given to eventually replacing the thinned tubes. The results of the ultrasonic wall thickness measurements recorded on the Finishing Superheater Outlet tubing are provided in Appendix D. They are summarized in the following table:

Tubing	Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
	Low	High	Specified	Calculated
Upper, A through E	0.404"	0.523"	0.475"	0.453"
Lower, A through E	0.448"	0.517"		

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 rejectable indications; however, one intermittent subsurface indication was revealed on girth weld No. GW-4. The indication was detected along the 4:00 to 8:00 o'clock position and was approximately 2.80" deep from the outside surface. The indication is an inclusion resulting from the original manufacturing process. It should be monitored during future inspections. The phased-array examination reports are provided in Appendix D.

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.

Thirty-two replica foils were removed from the Finishing Superheater Outlet headers and tubing. (eight from the Upper header, eight from the upper tubing, eight from the Lower header, and eight from the lower tubing.) 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.
UFSOH-R1	Girth weld No. GW-1 at the 11:30 o'clock position, north side of the weld	1	58
UFSOH-R2	Girth weld No. GW-2 at the 10:00 o'clock position, north side of the weld	1	59
UFSOH-R3	Girth weld No. GW-2 at the 9:30 o'clock position, south side of the weld	1	60
UFSOH-R4	Girth weld No. GW-4 at the 10:00 o'clock position, north side of the weld	1	61
UFSOH-R5	Girth weld No. GW-4 at the 9:30 o'clock position, south side of the weld	1	62
UFSOH-R6	Girth weld No. GW-6 at the 10:00 o'clock position, north side of the weld	1	63
UFSOH-R7	Girth weld No. GW-6 at the 9:30 o'clock position, south side of the weld	1	64
UFSOH-R8	Girth weld No. GW-7 at the 9:00 o'clock position, south side of the weld	1	65
UFSHO-R1	Tube Row 11, Tube A	1	66
UFSOH-R2	Tube Row 13, Tube A	1	67
UFSOH-R3	Tube Row 38, Tube A	1	68
UFSOH-R4	Tube Row 39, Tube A	1	69
UFSOH-R5	Tube Row 44, Tube A	1	70
UFSOH-R6	Tube Row 46, Tube A	1	71
UFSOH-R7	Tube Row 47, Tube A	1	72
UFSOH-R8	Tube Row 49, Tube A	1	73
LFSOH-R1	Girth weld No. GW-1 at the 11:00 o'clock position, north side of the weld	1	74
LFSOH-R2	Girth weld No. GW-2 at the 11:00 o'clock position, north side of the weld	1	75
LFSOH-R3	Girth weld No. GW-2 at the 11:30 o'clock position, south side of the weld	1	76
LFSOH-R4	Girth weld No. GW-4 at the 11:00 o'clock position, north side of the weld	1	77

Replica	Location	Creep Classification	Fig.
LFSOH-R5	Girth weld No. GW-4 at the 11:30 o'clock position, south side of the weld	1	78
LFSOH-R6	Girth weld No. GW-6 at the 11:00 o'clock position, north side of the weld	1	79
LFSOH-R7	Girth weld No. GW-6 at the 10:30 o'clock position, south side of the weld	1	80
LFSOH-R8	Girth weld No. GW-7 at the 11:00 o'clock position, south side of the weld	1	81
LFSO-R1	Tube Row 33, Tube A	1	82
LFSOH-R2	Tube Row 36, Tube A	1	83
LFSOH-R3	Tube Row 46, Tube A	1	84
LFSOH-R4	Tube Row 13, Tube E	1	85
LFSOH-R5	Tube Row 20, Tube E	1	86
LFSOH-R6	Tube Row 25, Tube E	1	87
LFSOH-R7	Tube Row 26, Tube E	1	88
LFSOH-R8	Tube Row 51, Tube E	1	89

All of the replica foils removed from the Upper and Lower Finishing Superheater Outlet headers exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of acicular bainite, with limited amounts of free ferrite. 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 all of the replica foils are typical for low-alloy steel pipe produced in accordance with ASME Specification SA-335, Grade P22 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 Upper and Lower Finishing Superheater Outlet headers.

The base material did exhibit some microstructural transformations as a result of previous years of high-temperature service. This included partial decomposition (spheroidization) 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 extended period of high-temperature service.

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, these replica foils were free of void formation, void linkage, and microfissuring.

All of the replica foils removed from the Upper and Lower Finishing Superheater Outlet headers exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of acicular bainite, with limited amounts of free ferrite. 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 all of the replica foils are typical for low-alloy steel pipe produced in accordance with ASME Specification SA-335, Grade P22 or fittings and filler material of the equivalent chemical composition. There was no evidence of microstructural anomalies relating to the original manufacture of the Upper and Lower Finishing Superheater Outlet headers.

The base material did exhibit some microstructural transformations as a result of previous years of high-temperature service. This included partial decomposition (spheroidization) 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 extended period of high-temperature service.

Bainite decomposition, along with carbide precipitation and agglomeration, are the early precursors to creep deterioration. Despite this, none of the replica foils removed from of the Upper and Lower Finishing Superheater Outlet headers 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 Upper and Lower Finishing Superheater Outlet headers, hardness determinations were performed in the sixteen 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.)

Header	Location	Average Hardness (BHN)		Corresponding Tensile Strength (PSI)	
		Low	High	Low	High
Upper	Weld	160	175	77,000	83,000
	HAZ	157	176	75,000	84,000
	Base	146	164	69,000	78,000
Lower	Weld	157	190	75,000	90,000
	HAZ	154	193	74,000	91,000
	Base	151	190	72,000	90,000

All of the values recorded on the base material 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).

All of the values recorded on the heat-affected zone and weld deposits were greater than 60,000 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 Upper and Lower Finishing Superheater Outlet headers.

Oxide Scale Thickness Measurements

Ultrasonic internal oxide scale thickness measurements were recorded on the Upper and Lower Finishing Superheater Outlet tubing. The oxide scale measurement was conducted using a standard ultrasonic pulser receiver with a high-speed analog-to-digital converter. This allows the normal analog ultrasonic signal to be digitized and recorded onto a computer disc. Once recorded, several analytical tools can be used to evaluate and characterize the signal, including filtering, frequency analysis, and power spectrum.

The oxide scale thickness generally provides a meaningful indication of the temperature history of the tube. In addition, as the tube ages, the scale thickness will tend to increase. Typically, tubes with scale thickness levels greater than 30 mils have consumed the majority of their life.

During the field evaluation, the TESTLA system was used to ultrasonically measure the wall and oxide scale thickness. This data was used to compute remaining useful tube life and tube metal temperatures. These represent the first oxide scale thickness measurements recorded on these tubes by Thielsch Engineering. Therefore, the results should represent baseline data to be used for future assessments to determine trends in wall loss and oxide scale buildup.

The table below summarizes the oxide scale thickness readings that were taken on tube stub rows A through E on the upper and lower tubing.

Location	Tube	Oxide Scale Thickness Readings (Mils)		Corresponding Tube Metal Temperature (°F)		Estimated Remaining Useful Life (Hours)	
		Low	High	Low	High	Low	High
Upper	A	16	42	1032	1109	-15,892	200,000
	B	14	39	1021	1103	18,025	200,000
	C	16	36	1032	1097	62,143	200,000
	D	15	45	1027	1115	35,023	200,000
	E	16	39	1032	1103	70,585	200,000
Lower	A	13	37	1015	1099	64,492	200,000
	B	14	33	1021	1090	101,611	200,000
	C	15	34	1027	1092	104,715	200,000
	D	12	28	1009	1077	150,626	200,000
	E	15	35	1027	1095	65,131	200,000

A summary of the Upper Finishing Superheater Outlet tubes with an estimated remaining life of less than 75,000 hours is provided in the following table:

Location	Element No.	Tube No.	Wall Thickness	ID Scale (Mils)	Current Temperature	Remaining Useful Life Estimate (Hours)
Upper	A	5	0.452"	34	1092°F	52,575
	A	11	0.448"	41	1108°F	8,833
	A	13	0.437"	42	1109°F	-5,338
	A	16	0.437"	30	1082°F	60,620
	A	17	0.446"	30	1082°F	72,483
	A	20	0.444"	38	1101°F	20,348
	A	21	0.412"	27	1074°F	50,137
	A	22	0.440"	31	1085°F	57,637
	A	24	0.456"	38	1101°F	32,767
	A	25	0.418"	41	1108°F	-15,892
	A	26	0.404"	24	1064°F	60,524

Location	Element No.	Tube No.	Wall Thickness	ID Scale (Mils)	Current Temperature	Remaining Useful Life Estimate (Hours)
Upper	A	29	0.446"	33	1090°F	51,852
	A	31	0.437"	30	1082°F	60,620
	A	32	0.443"	30	1082°F	68,425
	A	33	0.441"	36	1097°F	28,196
	A	35	0.442"	38	1101°F	18,387
	A	36	0.437"	31	1085°F	53,936
	A	37	0.446"	37	1099°F	27,816
	A	38	0.445"	40	1106°F	11,020
	A	39	0.439"	40	1106°F	5,581
	A	40	0.437"	39	1103°F	8,632
	A	41	0.438"	30	1082°F	61,893
	A	42	0.443"	38	1101°F	19,364
	A	44	0.442"	40	1106°F	8,271
	A	45	0.442"	30	1082°F	67,096
	A	46	0.456"	40	1106°F	21,638
	A	47	0.455"	41	1108°F	15,398
	A	52	0.460"	35	1095°F	56,036
	B	22	0.451"	36	1097°F	39,005
	B	24	0.458"	36	1097°F	47,104
	B	25	0.462"	34	1092°F	65,477
	B	26	0.468"	37	1099°F	52,849
	B	31	0.444"	31	1085°F	62,721
	B	33	0.450"	32	1097°F	63,596
	B	34	0.460"	36	1074°F	49,506
	B	41	0.451"	31	1085°F	72,051
	B	44	0.447"	39	1103°F	18,025
	C	25	0.470"	36	1097°F	62,143
	C	26	0.473"	35	1095°F	73,386
	D	21	0.495"	45	1115°F	35,023
	E	38	0.450"	31	1085°F	70,682
	E	45	0.471"	35	1095°F	70,585
Lower	A	12	0.477"	37	1099°F	64,492
	E	25	0.467"	35	1095°F	65,131

The oxide scale thickness and remaining useful life calculations revealed that several of the tubes have suffered significant deterioration as a result of the prior years of service. The lowest remaining useful life estimates on the Upper Finishing Superheater Outlet tubing was -15,892 hours and on the Lower Finishing Superheater Outlet tubing was 64,492 hours. Tube replacements should be considered when tubes show an estimated remaining life of less than 50,000 hours. (It should also be noted that the remaining useful life estimates have a margin of error of ±30,000 hours.)

The results of the oxide scale thickness measurements and remaining useful life estimates are provided in Appendix D.

High-Pressure Reheat Outlet Header

The High-Pressure 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 High-Pressure 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 header/tube dimensions, header/tube material, and design conditions for the High-Pressure 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	Design		ASME Specification	Pipe Dimensions		
	Temp. (°F)	Pressure (psig)		OD	Specified MWT	Calculated MWT
Header	1040	1,200	SA-387, Gr. D	35.25" (ID)	4.598"	3.788"
Tube Stubs			SA-213, Gr. T22	2.25"	0.261"	0.210"

Sketches of the High-Pressure Reheat Outlet header are provided in Fig. 90. Photographs of the inspection locations on the header are provided in Fig. 91. All nondestructive examination reports for the High-Pressure Reheat Outlet header are provided in Appendix E.

Visual Examination

The visual examination of the High-Pressure 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 High-Pressure 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.
44.446"	44.415"	44.633"	44.141"	44.813"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-530. This specification covers "General Requirements for Specialized Carbon and Alloy Steel Pipe".

The diameter measurements performed on the High-Pressure Reheat Outlet header fell outside the permissible manufacturing 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 High-Pressure Reheat Outlet header.)

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the High-Pressure Reheat Outlet header as well as the tube stubs in every fifth row from the north end of the header. The magnetic particle examination revealed the following surface indications:

- Girth Weld No. GW-3 - indications from 7:00 to 11:30 o'clock positions (south), 2:30 to 6:00 o'clock positions (south), 6:00 to 9:00 o'clock positions (north), and 11:00 to 5:30 o'clock positions (north). The indications were removed by grinding at 1/16" during the current outage by plant personnel. No further action is required.
- Seam Weld No. LS-1 - a 36" long indication between tube rows 6 and 10. The indication was removed by grinding at 1/16" during the current outage by plant personnel. No further action is required.
- Seam weld No. LS-2 - 2" indications between tube rows 61 and 62, 62 and 63, 64 and 65, and a 1/4" indication between tube rows 75 and 76. The indications were removed by grinding at 1/16" during the current outage by plant personnel. No further action is required.
- Seam weld No. LS-1A - multiple 1/4" indications between tube rows 10 and 11. The indication was removed by grinding at 1/16" during the current outage by plant personnel. No further action is required.

- Penetration No. P-3 - an 8" long indication in the toe of the weld, on the header side. The indications were removed by grinding at 1/16" during the current outage by plant personnel. No further action is required.
- Attachment Weld AW-1 - a 20" long indication on the east header side, a 3" long indication on the east attachment side, a 6" long indication on the west header side, and a 5" long indication on the west attachment side.
- Attachment Weld AW-2 - a 28" long indication on the east header side, a 6" long indication on the east attachment side, a 6" long indication on the west header side, and a 9" long indication on the west attachment side.

The attachment weld indications were removed and/or repaired by welding during the current outage by plant personnel. A final wet fluorescent magnetic particle examination was performed on the repaired attachment welds. No other indications were revealed during the examination. Photographs of the indications are provided in Figs. 92 through 95. The results of the wet fluorescent magnetic particle examination are provided in Appendix E.

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:

Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
Low	High	Specified	Calculated
4.383"	4.887"	4.598"	3.788"

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 wall thickness measurements were recorded on the High-Pressure Reheat Outlet tubing. The results of the ultrasonic wall thickness measurements performed on the High-Pressure Reheat Outlet tubing revealed that it had experienced significant reductions in wall thickness. These areas should be monitored during future inspections and consideration should be given to eventually replacing the thinned tubes. The results of the ultrasonic wall thickness measurements recorded on the High-Pressure Reheat Outlet tubing are provided in Appendix E. They are summarized in the following table:

Tubing	Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
	Low	High	Specified	Calculated
Tubes A through J	0.207"	0.289"	0.261"	0.210"

Ultrasonic Phased-Array Examination

An ultrasonic phased-array examination was performed at each accessible girth and seam welds on the High-Pressure Reheat Outlet header. The ultrasonic phased-array examination revealed the following subsurface indications.

- Girth Weld No. GW- 3 - a 1-1/2" long indication at the 12 o'clock position approximately 1.7" deep from the outside surface and a 2-1/2" long indication above the E tube row and adjacent to the girth weld between 1-1/2" to 2" deep from the outside surface.
- Seam weld No. LS-1 – a transverse indication between tube rows 9 and 10 an indication between tube rows 33 and 34.

All indications were caused by lack of fusion during the original manufacturing process. They should be monitored during future inspections. No other subsurface indications were revealed during the examination.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the High-Pressure 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.

A total of sixteen replica foils were removed from the High-Pressure Reheat Outlet header and tubing. (Eight were removed from the header and eight from the welds between the tube stubs and the header on the header side of the weld.)

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-1 at the 1:00 o'clock position, north side of the weld	1	96
HPROH-R2	Girth weld No. GW-1 at the 1:30 o'clock position, south side of the weld	1	97
HPROH-R3	Seam weld No. LS-1A near tube row 22 at the 9:00 o'clock position, bottom side of the weld	1	98
HPROH-R4	Girth weld No. GW-2 at the 4:00 o'clock position, north side of the weld	1	99
HPROH-R5	Girth weld No. GW-2 at the 4:00 o'clock position, south side of the weld	1	100
HPROH-R6	Girth weld No. GW-3 at the 8:00 o'clock position, north side of the weld	1	101
HPROH-R7	Girth weld No. GW-3 at the 7:30 o'clock position, south side of the weld	1	102

Replica	Location	Creep Classification	Fig.
HPROH-R8	Seam weld No. LS-3A near tube row 101/102 at the 9:00 o'clock position, bottom side of the weld	1	103
HPROH-R1	Tube Row 15, Tube A	1	104
HPROH-R2	Tube Row 47, Tube A	1	105
HPROH-R3	Tube Row 48, Tube A	1	106
HPROH-R4	Tube Row 48, Tube F	1	107
HPROH-R5	Tube Row 50, Tube F	1	108
HPROH-R6	Tube Row 65, Tube F	1	109
HPROH-R7	Tube Row 87, Tube A	1	110
HPROH-R8	Tube Row 92, Tube F	1	111

The replica foils removed from the High Pressure Reheat Outlet header all exhibited similar microstructures. Specifically, the microstructure exhibited by the welds consisted of acicular bainite with limited amounts of free ferrite. 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. These microstructures were typical for 2-1/4 Cr-1 Mo low-alloy steel pipe produced in accordance with the requirements of ASME SA-387 Grade D and filler material of the equivalent chemical composition that have been in service at elevated temperatures for many years. There was no evidence of microstructural anomalies relating to the original manufacture of the pipe, or the subsequent fabrication of the High Pressure Reheat Outlet header.

The base material had experienced some microstructural transformations as a result of many years of high temperature service. This included partial decomposition of the bainite. It also included carbide precipitation and agglomeration at the ground boundaries. Despite the observed microstructural transformations, the replica foils were free 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 High-Pressure 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 High-Pressure 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	147	166	70,000	80,000
HAZ	154	185	74,000	88,000
Weld	142	185	68,000	88,000

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

All of the values recorded on the heat-affected zone and weld deposits were greater than 60,000 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 High-Pressure Reheat Outlet header.

Oxide Scale/Remaining Useful Life Evaluation

Ultrasonic internal oxide scale thickness measurements were recorded on the High-Pressure Reheat Outlet tubing. The oxide scale measurement was conducted using a standard ultrasonic pulser receiver with a high-speed analog-to-digital converter. This allows the normal analog ultrasonic signal to be digitized and recorded onto a computer disc. Once recorded, several analytical tools can be used to evaluate and characterize the signal, including filtering, frequency analysis, and power spectrum.

The oxide scale thickness generally provides a meaningful indication of the temperature history of the tube. In addition, as the tube ages, the scale thickness will tend to increase. Typically, tubes with scale thickness levels greater than 30 mils have consumed the majority of their life.

During the field evaluation, the TESTLA system was used to ultrasonically measure the wall and oxide scale thickness. This data was used to compute remaining useful tube life and tube metal temperatures. These represent the first oxide scale thickness measurements recorded on these tubes by Thielsch Engineering. Therefore, the results should represent baseline data to be used for future assessments to determine trends in wall loss and oxide scale buildup.

The table below summarizes the oxide scale thickness readings that were taken on tube stub rows A through J.

Tubes	**Oxide Scale Thickness Readings (Mils)**		**Corresponding Tube Metal Temperature (°F)**		**Estimated Remaining Useful Life (Hours)**	
	Low	**High**	**Low**	**High**	**Low**	**High**
A	8	29	976	1080	-36,082	200,000
B	8	27	976	1074	-37,089	200,000
C	8	26	976	1071	-11,529	200,000
D	8	24	976	1064	27,392	200,000
E	11	24	1002	1064	12,400	200,000
F	8	27	976	1074	2,310	200,000
G	8	26	976	1071	8,158	200,000
H	8	29	976	1080	-23,830	200,000
I	8	26	976	1071	53,160	200,000
J	8	26	976	1071	25,657	200,000

The oxide scale thickness and remaining useful life calculations revealed that the majority of the tubes remaining useful life values were greater than 102,000 hours.

210 tubes were identified as having less than 50,000 hours of remaining useful life. Tube replacements should be considered when tubes show an estimated remaining life of less than 50,000 hours. (It should also be noted that the remaining useful life estimates have a margin of error of ±30,000 hours.)

The results of the oxide scale thickness measurements and remaining useful life estimates are provided in Appendix E.

Low-Pressure Reheat Outlet Header

The Low-Pressure Reheat Outlet header was reportedly fabricated using plate 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.) This header was originally designed by Foster Wheeler but was replaced by a Babcock and Wilcox designed header in the early 90's. The operating hours for this header were assumed to be around 160,000 hours based on 7,500 hours per year since 1990.

The Low-Pressure 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. (For reference purposes, Grade T91 involves a 9 Cr - 1 Mo - V low alloy steel material.)

The following table lists the available data concerning the header/tube dimensions, header/tube material, and design conditions for the Low-Pressure 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 current 2010 ASME Code.)

Component	Design		ASME Specification	Pipe Dimensions		
	Temp.	Pressure		OD	Specified MWT	Calculated MWT
Header	1065°F	475 psig	SA-387, Gr. 91 Cl 2	50.625"	1.875"	1.172"
Tube Stubs			SA-213, Gr. T91	2.250"	0.180"	0.052"

Sketches of the Low-Pressure Reheat Outlet header are provided in Fig. 112. Photographs of the inspection locations on the header are provided in Fig. 113. All nondestructive examination reports for the Low-Pressure Reheat Outlet header are provided in Appendix F.

Visual Examination

The visual examination of the Low-Pressure Reheat Outlet header did not reveal any indications of distortion or other deterioration with the exception of severe signs of cracking on attachment welds Nos. AW-2, AW-3, AW-4, and AW-5. The attachments are located underneath the header to provide extra support. Plant personnel were aware of the cracking and plan to repair or replace the attachments during a future outage. No other indications were discovered.

No evidence of sagging or bowing was noted along the header. The visual examination of the header revealed

Diameter Measurements

Diameter measurements were recorded at selected locations along the length of the Low-Pressure 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"	50.484"	50.734"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-530. This specification covers "General Requirements for Specialized Carbon and Alloy Steel Pipe".

For the most part, the diameter measurements performed on the Low-Pressure 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 Low-Pressure Reheat Outlet header.)

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the Low-Pressure Reheat Outlet header as well as the tube stubs in every fifth row from the north end of the header. The magnetic particle examination did not reveal any recordable surface indications. The results of the wet fluorescent magnetic particle examination are provided in Appendix F.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were performed on the exposed girth welds on the Low-Pressure Reheat Outlet 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:

Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
Low	**High**	**Specified**	**Calculated**
1.872"	2.090"	1.875"	1.172"

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 wall thickness measurements were recorded on the Low-Pressure Reheat Outlet tubing. The results of the ultrasonic wall thickness measurements performed on the Low-Pressure Reheat Outlet tubing revealed that it had experienced some reductions in wall thickness. The results of the ultrasonic wall thickness measurements recorded on the Low-Pressure Reheat Outlet tubing are provided in Appendix F. They are summarized in the following table:

Tubing	Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
	Low	**High**	**Specified**	**Calculated**
Tubes A through L	0.164"	0.252"	0.180"	0.052"

Ultrasonic Phased-Array Examination

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

The ultrasonic phased-array examination of the girth welds revealed the following subsurface indications:

- Girth weld No. GW-2 – an indication approximately 0.600" deep and less than 1/2" long from the outside surface located at the 7:00 o'clock position.

- Girth Weld No. GW-6 – an indication approximately 0.500" deep and les than 1/2" long from the outside surface located at the 4:00 o'clock position

The indications are inclusions resulting from the original manufacturing process. They should be monitored during future inspections.

The ultrasonic phased-array examination of the seam welds did not reveal any rejectable subsurface indications; however, high amplitude root signals were detected on all seam weld inspected. The indications were excessive root cap on the inside surface of each seam weld and verified by the borosonic examination. The results of the ultrasonic phased-array examination are provided in Appendix F.

Oxide Scale Thickness Measurements

Ultrasonic internal oxide scale thickness measurements were recorded on the Low-Pressure Reheat Outlet tubing. The oxide scale measurement was conducted using a standard ultrasonic pulser receiver with a high-speed analog-to-digital converter. This allows the normal analog ultrasonic signal to be digitized and recorded onto a computer disc. Once recorded, several analytical tools can be used to evaluate and characterize the signal, including filtering, frequency analysis, and power spectrum.

The oxide scale thickness generally provides a meaningful indication of the temperature history of the tube. In addition, as the tube ages, the scale thickness will tend to increase. Typically, tubes with scale thickness levels greater than 30 mils have consumed the majority of their life.

During the field evaluation, the TESTLA system was used to ultrasonically measure the wall and oxide scale thickness. This data was used to compute remaining useful tube life and tube metal temperatures. These represent the first oxide scale thickness measurements recorded on these tubes by Thielsch Engineering. Therefore, the results should represent baseline data to be used for future assessments to determine trends in wall loss and oxide scale buildup.

The table below summarizes the oxide scale thickness readings that were taken on tube stub rows A through L.

Oxide Scale Thickness Readings (Mils)		Corresponding Tube Metal Temperature (°F)		Estimated Remaining Useful Life (Hours)	
Low	High	Low	High	Low	High
1	1	823		200,000	

The oxide scale thickness and remaining useful life calculations revealed that the all of the tubes remaining useful life values were greater than 200,000 hours. (It should also be noted that the remaining useful life estimates have a margin of error of ±30,000 hours.)

The results of the oxide scale thickness measurements and remaining useful life estimates are provided in Appendix F.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the Low-Pressure 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. At total of nine replica foils were removed from the Low-Pressure Reheat 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.
LPROH-R1	Girth weld No. GW-1 at the 10:00 o'clock position, north side of the weld	1	114

Replica	Location	Creep Classification	Fig.
LPROH-R2	Girth weld No. GW-2 at the 9:00 o'clock position, north side of the weld	1	115
LPROH-R3	Girth weld No. GW-2 and seam weld No. LS-2 at the 7:00 o'clock position, south side of the weld	1	116
LPROH-R4	Girth weld No. GW-4 at the 9:00 o'clock position, north side of the weld	1	117
LPROH-R5	Girth weld No. GW-4 and seam weld No. LS-4 at the 7:00 o'clock position, south side of the weld	1	118
LPROH-R6	Girth weld No. GW-6 at the 9:00 o'clock position, north side of the weld	1	119
LPROH-R7	Girth weld No. GW-6 and seam weld No. LS-6 at the 7:00 o'clock position, south side of the weld	1	120
LPROH-R8	Girth weld No. GW-8 at the 1:00 o'clock position, north side of the weld	1	121
LPROH-R9	Girth weld No. GW-8 and seam weld No. LS-8 at the 1:00 o'clock position, south side of the weld	1	122

All of the replica foils LPROH-R1 through LPROH-R9 exhibited similar microstructures. They consisted of tempered martensite with limited amounts of retained austenite. This is typical for modified 9 Cr - 1 Mo alloy steel manufactured in accordance with ASME Specification SA-387, Grade 91 Class 2 plate material. There was no evidence of microstructural anomalies relating to the original manufacture of the header and filler metal of equivalent chemical composition or the subsequent fabrication of this header.

The base material did not exhibit any microstructural transformations as a result of the previous years of high-temperature service. Moreover, none of the replica foils removed from the Low Pressure Reheat Outlet Header exhibited any evidence of creep deterioration. Specifically, it was free of void formation, void linkage, and microfissuring.

Hardness Determinations

As part of the inspection of the Low-Pressure Reheat Outlet header, hardness determinations were performed in the nine 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 Low-Pressure 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	183	224	87,000	105,000
HAZ	194	222	91,000	104,000
Weld	179	234	85,000	113,000

All of the values recorded on the base material are above the allowable tensile strength for 9 Cr - 1Mo V low-alloy steel material (which has a minimum required tensile strength of 85,000 psi).

All of the values recorded on the heat affect zone and weld deposits were greater than 85,000 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 Low-Pressure Reheat Outlet header.

High-Pressure (1st) Reheat Inlet Header

The High-Pressure (1st) Reheat Inlet header was reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-387, Grade C. (For reference purposes, Grade C involves a 1-1/4 Cr - 1/2 Mo alloy steel material.)

The High-Pressure (1st) Reheat Inlet 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-178, Grade C. (For reference purposes, this specification covers "Electric-Resistance-Welded Carbon Steel and Carbon-Manganese Boiler Tubes". Grade C involves a carbon steel material.)

The following table lists the available data concerning the header/tube dimensions, header/tube material, and design conditions for the High-Pressure (1st) Reheat 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 G, were performed in accordance with the original 1968 ASME Code.)

Component	**Design**		**ASME Specification**	**Pipe Dimensions**		
	Temp. (°F)	**Pressure (psig)**		**OD**	**Specified MWT**	**Calculated MWT**
Header	964	1,200	SA-387, Gr. C	34.00" (ID)	3.068"	2.250"
Tube Stubs			SA-178, Gr. C	2.50"	0.155"	N/A

Sketches of the High-Pressure (1st) Reheat Inlet header are provided in Fig. 123. Photographs of the inspection locations are provided in Fig. 124. All nondestructive examination reports for the High-Pressure (1st) Reheat Inlet header are provided in Appendix G.

Visual Examination

The visual examination of the High-Pressure (1st) Reheat Inlet 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 1st Reheat Inlet 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.
40.136"	40.105"	40.323"	39.625"	40.438"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-530. This specification covers "General Requirements for Specialized Carbon and Alloy Steel Pipe".

All but one of the diameter measurements performed on the High-Pressure (1st) Reheat Inlet header fell within the permissible manufacturing tolerances. 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 High-Pressure (1st) Reheat Inlet header.)

Magnetic Particle Examination

A wet fluorescent magnetic particle examination was performed at all accessible welds on the High-Pressure (1st) Reheat Inlet 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 the following surface indications:

- Seam Weld No. LS-3 - a 12" indication between tube stubs 82 and 84, a 6" indication at tube stub 95, and a 3" indication at tube stub 100.
- Seam Weld No. LS-1A - a 1" indication between tube rows 14 and 15.

The indications were removed and repaired by welding during the current outage by plant personnel. A final wet fluorescent magnetic particle examination was performed on the repaired seam welds. No other indications were revealed during the examination. Photographs of these indications are provided in Figs. 125 and 126. The results of the wet fluorescent magnetic particle examination are provided in Appendix G.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were performed on the exposed girth welds on the High-Pressure (1st) Reheat 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:

Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
Low	**High**	**Specified**	**Calculated**
2.705"	3.186"	3.068"	2.250"

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 High-Pressure (1st) Reheat Inlet header.

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

The ultrasonic phased-array examination of the seam welds revealed the following subsurface indications:

- Seam Weld LS-1A – Transverse indications detected in the areas where surface indications were revealed during the magnetic particle examination. The maximum depth from the outside surface between tube rows 14 and 15 is approximately 0.250". 0.500" transverse indication detected adjacent to tube row 15 ranging in depth from 1.50" to 2.10" from the outside surface. The indications appear to be due to lack of fusion at the end of weld pass during original manufacturing.

- Seam Weld LS-3 – Multiple transverse indications detected in the three areas where surface indications were revealed during the magnetic particle examination. The maximum depth from the outside surface adjacent to tube row 83 is 0.350". The maximum depth from the outside surface adjacent to tube row 95 and between tube rows 100 and 101 is approximately 0.150".

The results of the ultrasonic phased-array examination are provided in Appendix G.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the High-Pressure (1st) Reheat 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 High-Pressure (1st) Reheat 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.
HPRIH-R1	Girth weld No. GW-1 at the 12:30 o'clock position, north side of the weld	1	127
HPRIH-R2	Girth weld No. GW-1 at the 1:00 o'clock position, south side of the weld	1	128
HPRIH-R3	Girth weld No. GW-2 at the 3:30 o'clock position, north side of the weld	1	129
HPRIH-R4	Girth weld No. GW-2 and seam weld No. LS-2 at the 3:00 o'clock position, south side of the weld	1	130
HPRIH-R5	Girth weld No. GW-3 and seam weld No. LS-2 at the 3:00 o'clock position, north side of the weld	1	131
HPRIH-R6	Girth weld No. GW-3 at the 3:30 o'clock position, south side of the weld	1	132
HPRIH-R7	Seam weld No. LS-3A near tube row 83 at the 9:00 o'clock position, top side of the weld	1	133a, 133b
HPRIH-R8	Seam weld No. LS-3A near tube row 100 at the 9:00 o'clock position, bottom side of the weld	1	134

All of the replica foils, except for replica HPRIH-R7, removed from the High-Pressure (1st) Reheat Inlet header (HPRIH) exhibited similar microstructures. In each case, the microstructure of the welds consisted of acicular bainite with limited amounts of free ferrite. The microstructure of the heat-affected zones consisted of tempered bainite, spheroidized carbide particles and ferrite. The microstructure of the base material also consisted of tempered bainite, spheroidized carbide and ferrite, but slightly with different grains. The microstructure of replica HPRIH-R7 exhibited several fissures with transgranular cracking that would most likely represent surface laps on the surface of plate material used in the fabrication of the header. This replica location should be re-examined during the next available outage. The microstructure observed in all of the replica foils is considered typical for 1-1/4 Cr - 1/2 Mo low-alloy steel pipe produced in accordance with ASME Specification SA-387, Grade C, and filler material of the equivalent chemical composition. There was no evidence of microstructural anomalies relating to the original manufacture or the fabrication of the High-Pressure (1st) Reheat Inlet header.

The base material did exhibit some microstructural transformations as a result of the previous years of high-temperature service. This included carbide precipitation at the grain boundaries. Some agglomeration of the carbides was also observed. The carbide precipitation and agglomeration are not unexpected for 1-1/4 Cr - 1/2 Mo low alloy steel subsequent to many years of high-temperature service.

As noted previously, bainite decomposition, along with carbide precipitation and agglomeration are the precursors to creep deterioration. Except for replica R-7, none of the replica foils removed from the High-Pressure (1st) Reheat Inlet 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 High-Pressure (1st) Reheat 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 High-Pressure (1st) Reheat 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	140	187	67,000	88,000
HAZ	135	206	65,000	97,000
Weld	141	189	68,000	89,000

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

All of the values recorded on the heat affect zone and weld deposits were greater than 60,000 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 High-Pressure (1st) Reheat Inlet header.

Low-Pressure (2nd) Reheat Inlet Header

The Low-Pressure (2nd) Reheat Inlet header was reportedly fabricated using pipe manufactured in accordance with the requirements of ASME Specification SA-387, Grade C.

The Low-Pressure (2nd) Reheat Inlet header receives superheated steam from 112 elements, each containing 12 tubes. All tube stubs were reportedly fabricated using tube manufactured in accordance with the requirements of ASME Specification SA-178 Grade C.

The following table lists the available data concerning the header/tube dimensions, header/tube material, and design conditions for the Low-Pressure (2nd) Reheat 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 G, were performed in accordance with the original 1968 ASME Code.)

Component	Design		ASME Specification	Pipe Dimensions		
	Temp. (°F)	Pressure (psig)		OD	Specified MWT	Calculated MWT
Header	940	475	SA-387, Gr. C	42.50" (ID)	1.257"	0.917"
Tube Stubs			SA-178, Gr. C	2.25"	0.150"	N/A

Sketches of the Low-Pressure (2nd) Reheat Inlet header are provided in Fig. 135. Photographs of inspection locations on the header are provided in Figs. 136 and 137. All nondestructive examination reports for the Low-Pressure (2nd) Reheat Inlet header are provided in Appendix H.

Visual Examination

The visual examination of the Low-Pressure (2nd) Reheat Inlet 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 Low-Pressure (2nd) Reheat Inlet 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.
45.014"	44.983"	45.201"	45.016"	45.219"

The diameter measurements were compared to the manufacturing tolerances for pipe set forth in ASME Specification SA-530. This specification covers "General Requirements for Specialized Carbon and Alloy Steel Pipe".

For the most part, the diameter measurements performed on the Low-Pressure (2nd) Reheat Inlet header fell within the permissible manufacturing tolerances. 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 Low-Pressure (2nd) Reheat Inlet header as well as the tube stubs in every fifth row from the north end of the header. The magnetic particle examination did not reveal any recordable surface indications. The results of the wet fluorescent magnetic particle examination are provided in Appendix H.

Ultrasonic Wall Thickness Measurements

Ultrasonic wall thickness measurements were performed on the exposed girth welds on the Low-Pressure (2nd) Reheat 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:

Wall Thickness Measurement Readings		Minimum Required Wall Thickness	
Low	High	Specified	Calculated
1.139"	1.375"	1.275"	0.917"

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 Low-Pressure (2nd) Reheat Inlet header. The ultrasonic phased-array examination of the girth and seam welds did not reveal any rejectable subsurface indications. The results of the ultrasonic phased-array examination are provided in Appendix H.

Metallurgical Evaluation - Replication

A metallurgical evaluation of the Low-Pressure (2nd) Reheat 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 Low-Pressure (2nd) Reheat 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.
LPRIH-R1	Girth weld No. GW-1 at the 12:30 o'clock position, north side of the weld	1	138
LPRIH-R2	Girth weld No. GW-1 at the 1:00 o'clock position, south side of the weld	1	139
LPRIH-R3	Girth weld No. GW-2 and seam weld No. LS-1A at the 3:30 o'clock position, north side of the weld	1	140

Replica	Location	Creep Classification	Fig.
LPRIH-R4	Girth weld No. GW-2 and seam weld No. LS-2A at the 3:00 o'clock position, south side of the weld	1	141
LPRIH-R5	Girth weld No. GW-3 and seam weld No. LS-2A at the 9:00 o'clock position, north side of the weld	1	142
LPRIH-R6	Girth weld No. GW-3 and seam weld No. LS-3A at the 8:30 o'clock position, south side of the weld	1	143
LPRIH-R7	Seam weld No. LS-3A near tube row 102 at the 9:00 o'clock position, top side of the weld	1	144
LPRIH-R8	Seam weld No. LS-3A near tube row 103 at the 9:00 o'clock position, bottom side of the weld	1	145

All of the replica foils removed from the Low-Pressure (2nd) Reheat Inlet header exhibited similar microstructures. In each case, the microstructure of the welds consisted of acicular bainite with limited amounts of free ferrite. The microstructure of the heat-affected zones consisted of bainite, spheroidized carbide and ferrite. The microstructure of the base material also consisted of partially decomposed tempered bainite, spheroidized carbide and ferrite, but with a slightly different grain size. The microstructure observed in all of the replica foils is considered typical for 1-1/4 Cr - 1/2 Mo low-alloy steel pipe produced in accordance with ASME Specification SA-387, Grade C and filler material of the equivalent chemical composition. There was no evidence of microstructural anomalies relating to the original manufacture or the fabrication of the Low-Pressure (2nd) Reheat Inlet header.

The base material did exhibit some microstructural transformations as a result of the previous years of high-temperature service. This included carbide precipitation at the grain boundaries. Some agglomeration of the carbides was also observed. The carbide precipitation and agglomeration are not unexpected for 1-1/4 Cr - 1/2 Mo low-alloy steel subsequent to many years of high-temperature service.

As noted previously, bainite decomposition, along with carbide precipitation and agglomeration are the precursors to creep deterioration. Despite this, none of the replica foils removed from the Low-Pressure (2nd) Reheat Inlet 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 Low-Pressure (2nd) Reheat 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 Low-Pressure (2nd) Reheat 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	154	190	74,000	90,000
HAZ	152	206	73,000	97,000
Weld	152	198	73,000	93,000

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

All of the values recorded on the heat affect zone and weld deposits were greater than 60,000 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 Low-Pressure (2nd) Reheat Inlet header.

DISCUSSION

General Comments on High-Temperature Headers

Major failures in Superheater and Reheat Outlet headers are relatively infrequent. Unfortunately, when these types of headers do fail, the necessary repairs may require several weeks to complete, and wholesale replacement can require from six months to a year. Due to the substantial costs associated with any forced outage, it is imperative to perform routine inspections of headers. In this manner, conditions with the potential to result in failures can be identified, monitored, and addressed before they do result in failures.

Ideally, the inspection of a high-temperature header should include magnetic particle examination of all of the welds on the header. (This includes the circumferential butt welds, any seam welds, all of the header-to-tube stub welds, and any penetration and attachment welds.) This would then be followed by volumetric examination of any butt welds. It should also include a remote visual (borescopic) examination of the interior of the header, in-situ metallographic examination (replication), and hardness testing.

If budgetary or time constraints prohibit a comprehensive inspection of a high-temperature header, plant personnel should give consideration to performing a limited inspection of the high-temperature header that focuses on areas that historically have been more susceptible to service-related deterioration.

This includes any area where a row of tube holes substantially overlaps a circumferential butt weld. Recent experience has indicated that high-temperature headers may be susceptible to severe ligament cracking where a row of tube holes bisects a circumferential butt weld. This susceptibility arises from a combination of several factors. These include the design of the header, the design of the circumferential butt weld, the composition of the filler material used to complete the circumferential butt weld, and the stresses associated with normal operation.

In components such as Superheater and Reheat Outlet headers, which incorporate multiple radial tube bores, the ligaments between adjacent tube bores are subject to higher stresses than encountered elsewhere in the body of the header. This is due to the fact that each tube hole effectively reduces the cross-sectional area of the header and thus its load-bearing capacity. To compensate for this reduction in cross-sectional area, it is necessary to make high-temperature headers very thick.

As the cost of fabricating headers increases significantly with increasing thickness, certain Original Equipment Manufacturers (OEMs), in an effort to reduce costs, would supply headers that had wall thickness values at or only slightly above the minimum wall thickness required by the applicable code. Headers that incorporated this type of marginal design would be more susceptible to failure than headers that incorporated more conservative designs. This is particularly true if the header is subject to stresses not anticipated by the designer. (This could include applied bending stresses created by malfunctioning supports, thermal stresses created by too rapid of a start-up, or the thermal stresses associated with cyclic operation.)

Headers are typically fabricated using several sections of pipe and one or more fittings. These components are joined together by circumferential butt welds. Various OEMs, when joining together pipe and/or fittings, will counterbore the inside diameter surface of the applicable components. The counterboring is performed in an effort to prevent or at least reduce mismatch caused by out of round and/or variations in wall thickness (such as might be the case between pipe and fittings.) The counterboring, while it makes it easier to fit-up circumferential butt welds, reduces the cross-sectional thickness of the header by approximately 1/4" to 3/8". This, of course, has an adverse effect on the load-bearing capacity of the header and provides a location more highly susceptible to mechanical fatigue.

The situation may be further complicated if the OEM elects to "flat-top" the circumferential girth welds. This practice, which appears to be an effort to avoid any possibility of excessive reinforcement and provide an aesthetically appealing surface, sometimes, may result in the removal of too much material from the header.

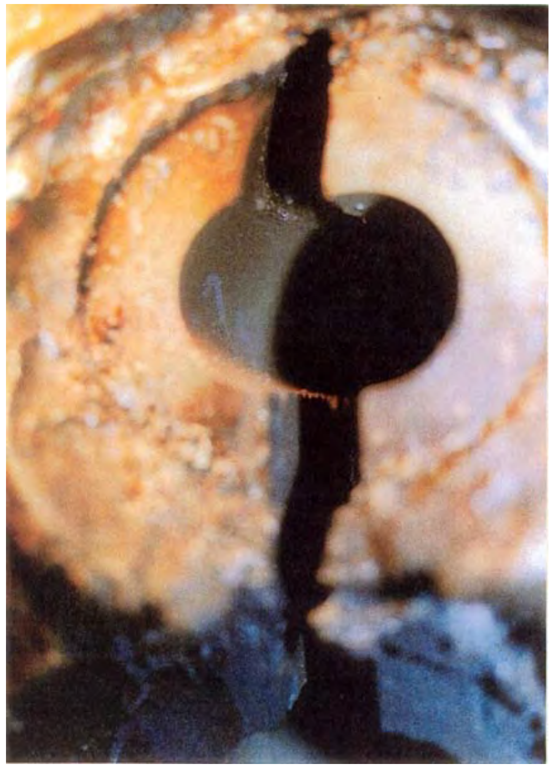
During the 1940's to the 1970's, certain OEMs supplying the power generation industry marketed and sold Croloy electrodes, with the promotions idea that preheating would be less important for the 1-1/4 Cr - 1/2 Mo low-alloy steels or 2-1/4 Cr - 1 Mo low-alloy steels when the carbon content was very low. For that reason, these electrodes are also called the AWS E-8018L or E-9018L Grades.

These low-carbon Croloy welding electrodes were subjected to extensive laboratory testing. This testing proved that the low-carbon, low-alloy steel electrodes showed significantly lower strength volumes at elevated temperatures than that of the standard chromium-molybdenum alloy steel electrodes. This resulted in a location along the length of the header more highly susceptible to creep damage.

The creep strength of the standard electrodes was about 20% to 30% higher than the creep strength for the Croloy electrodes. Although on boiler tubes, the difference in creep resistance will probably have a minor effect in the life expectancy; on heavy wall components such as Superheater and Reheat Outlet Headers, the higher creep strength heavily influenced the life expectancy.

Over the years, these factors, acting alone or in combination, have resulted in severe ligament cracking in a number of high-temperature headers. This ligament cracking, at the circumferential butt weld locations, has resulted in leaks and the associated forced outages.

The header shown below is a case in point. The inspection of this header, located at a midwestern utility, revealed ligament cracking in multiple tube rows. The most severe cracking was located in tube holes that overlapped the circumferential girth welds. (The girth welds had been counterbored and flat-topped during original fabrication.) The subsequent metallurgical evaluation confirmed that the girth welds, which had been completed using low-carbon filler material, were subject to advanced creep deterioration (even though the header base material showed no evidence of creep deterioration).



The header shown below is another case in point. This header, located in the southeastern United States, began leaking after 28 years of high-temperature service. The subsequent investigation confirmed that in the area where the leak occurred, the tube holes substantially overlapped a circumferential girth weld. (Again, the girth weld had been completed using low-carbon filler material. In addition, it had been counterbored.) The investigation confirmed that in this area, the header was subject to cracking of the header-to-tube stub welds. It was also subject to ligament cracking that extended through the available cross-sectional thickness. No additional cracking was revealed at any of the other 250 header-to-tube stub welds.

North

South

North

South

CONCLUSIONS AND RECOMMENDATIONS

In March of 2012, Thielsch Engineering performed an inspection of selected headers in Unit No. 2 at the Mitchell Generating Station of American Electric Power located in Moundsville, West Virginia. Based upon the results of this inspection and subsequent engineering evaluation, the following conclusions and recommendations are offered:

Platen Superheater Inlet Header

- No immediate repair actions required.

- No pipe swelling or wall thinning noted.
- Operating in Class 1 creep range.
- Header materials have consumed less than 20% of useful life.
- The Platen Superheater Inlet header is considered suitable for continued service under the intended operating conditions.
- Perform a similar inspection after three to five years of continued operation (2015 to 2017).

Platen Superheater Outlet Header

- Fatigue cracking was revealed at GW-9 and tube stub No. 8K. These indications were removed and repaired on-site.
- No pipe swelling or wall thinning noted.
- Operating in Class 1 creep range.
- Header material has consumed less than 20% of useful life.
- The Platen Superheater Outlet header is considered suitable for continued service under the intended operating conditions.
- Perform a similar inspection after three to five years of continued operation (2015 to 2017).

Finishing Superheater Inlet Header

- A surface indication was revealed at tube stub No. 55A. This indication was evaluated and deemed acceptable. No immediate repair actions are required.
- No pipe swelling or wall thinning noted.
- Operating in Class 1 creep range.

- Header material has consumed less than 20% of useful life.
- The Finishing Superheater Inlet header is considered suitable for continued service under the intended operating conditions.
- Perform a similar inspection after three to five years of continued operation (2015 to 2017).

Finishing Superheater Outlet Headers (Upper and Lower)

- Fatigue-type cracking was revealed at multiple tube stub welds, girth welds, and penetrations. These indications were repair-welded by plant personnel during the current outage.
- A subsurface indication was identified at girth weld No. GW-4 of the Lower Finishing Superheater Outlet header. This indication was evaluated and deemed acceptable.
- Moderate terminal tube thinning (Lower 5.7% to Upper 14.9%) was noted.
- The results of the remaining useful life survey revealed that the majority of the tubes included in the scope of inspection have more than 140,000 hours of remaining life. Several tubes with less than 50,000 hours of remaining life were noted and should be replaced.
- The header materials have consumed less than 20% of their useful life.
- Operating in Class 1 creep range.
- Subsequent to the recommended tube replacements, the Upper and Lower Finishing Superheater Outlet headers are considered suitable for continued service under the intended operating conditions.
- Reinspect the weld repairs after one year of continued operation (in 2013).
- Perform a similar inspection after three years of continued operation (in 2015).

High-Pressure Reheat Outlet Header

- Multiple fatigue-type indications were evaluated and repair welded by plant personnel during the current outage.
- Several subsurface weld defects were identified and evaluated as acceptable.
- Heavy internal oxide scale growth on the terminal tubes was identified and evaluated as nearing the end of its operational life. It is recommended that a tube sample be removed for lab analysis within the next 12 months.
- Operating in Class 1 creep range.
- The header material has consumed less than 20% of its useful life.
- Subsequent to the recommended tube replacements, the High-Pressure Reheat Outlet header is considered suitable for continued service under the intended operating conditions.
- Reinspect the weld repairs after one year of continued operation (in 2013).
- Perform a similar inspection after three years of continued operation (in 2015).

Low-Pressure Reheat Outlet Header

- Significant fatigue cracking identified at multiple attachment welds. It is recommended that the attachment welds be repaired within the next 24 months.
- Several subsurface indications were identified in girth weld Nos. GW-2 and GW-6. These were evaluated as acceptable weld defects. These indications should be monitored during future inspections.
- Header materials have consumed less than 20% of their useful life.

- The results of the remaining useful life survey revealed that all of the tubes included in the scope of inspection have more than 200,000 hours of useful life remaining.
- Operating in Class 1 creep range.
- Subsequent to the recommended attachment weld repairs, the Low-Pressure Reheat Outlet header is considered suitable for continued service under the intended operating conditions.
- Repair attachment welds during next scheduled outage.
- Perform a similar inspection after three years of continued operation (in 2015).

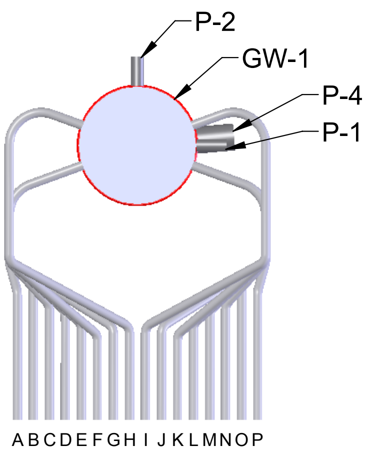
High-Pressure (1st) Reheat Inlet Header

- Surface and subsurface indications were revealed on seam weld Nos. LS-3 LS-1A. These indications were repaired by plant personnel.
- No pipe swelling or wall thinning noted.
- The header has consumed less than 20% of its remaining useful life.
- Operating in Class 1 creep range.
- The High-Pressure (1st) Reheat Inlet header is considered suitable for continued service under the intended operating conditions.
- Reinspect the weld repairs after one year of continued operation (2013).
- Perform a similar inspection after three years of continued operation (2015).

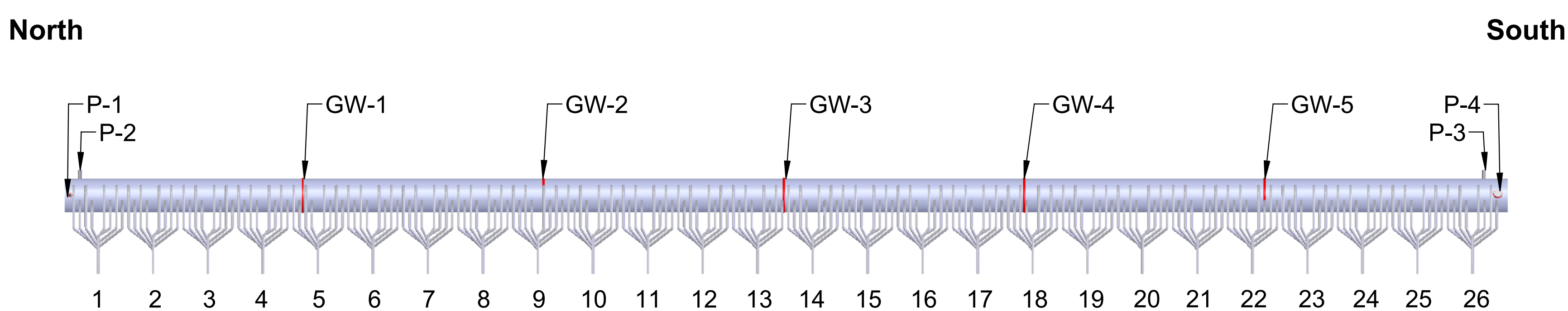
Low-Pressure (2nd) Reheat Inlet Header

- No recordable surface or subsurface indications were identified.
- No pipe swelling or wall thinning noted.

- Operating in Class 1 creep range.
- The header material has consumed less than 20% of its remaining useful life.
- The Low-Pressure (2nd) Reheat Inlet header is considered suitable for continued service under the intended operating conditions.
- Perform a similar inspection after three to five years of continued operation (2015 to 2017).



Front View
(Looking South)



Right View
(Looking East)

Fig. 1. Sketch of the Platen Superheater Inlet header

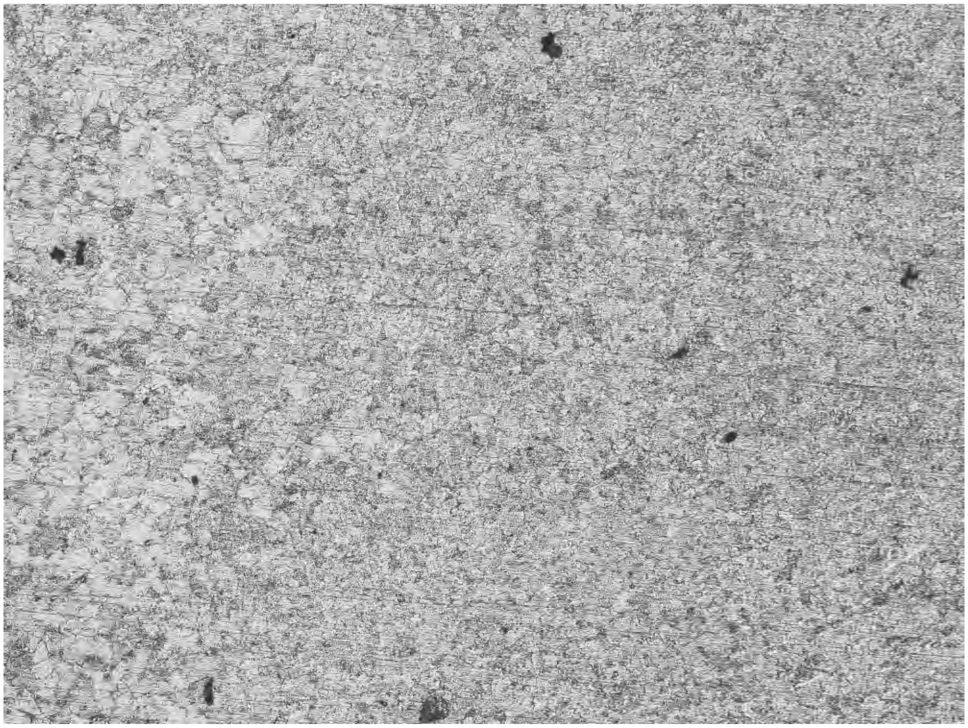
Thielsch Engineering,

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

Fig. 3. Photographs of the inspection locations on the Platen Superheater Inlet header.

Fig. 4.

Photographs of the inspection locations on the Platen Superheater Inlet header.



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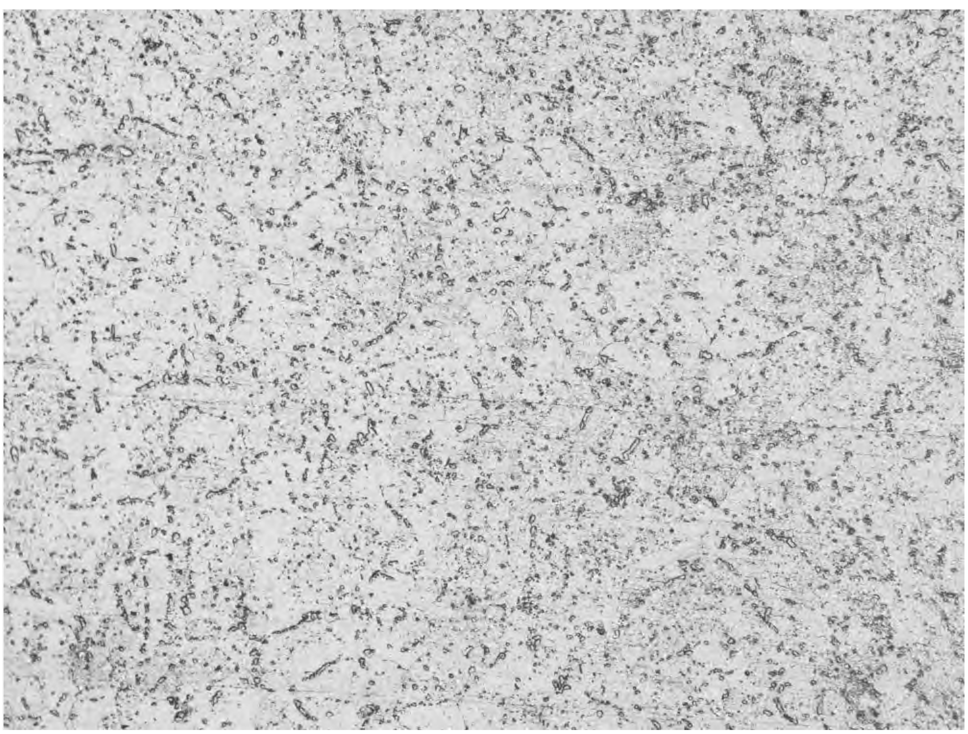

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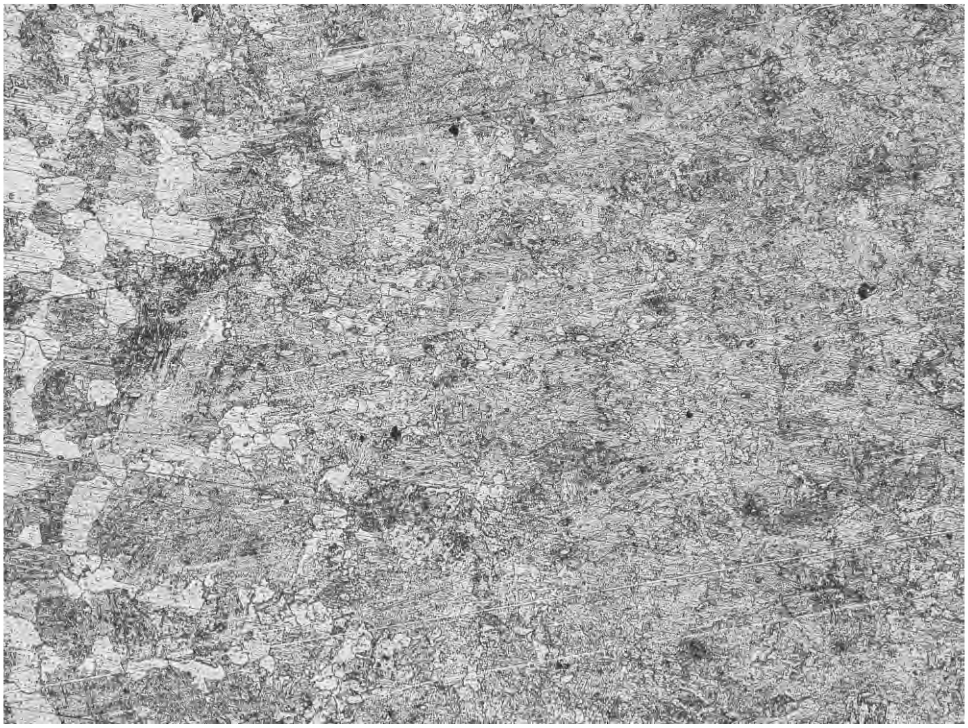
Fig. 5. Replica No. PSIH-R1.



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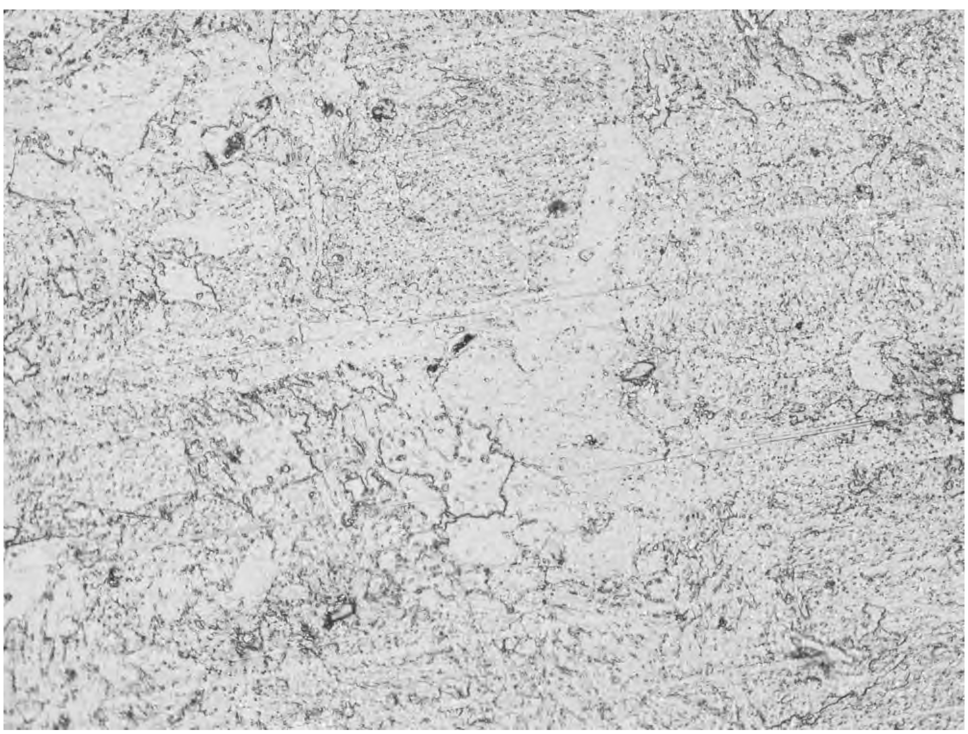

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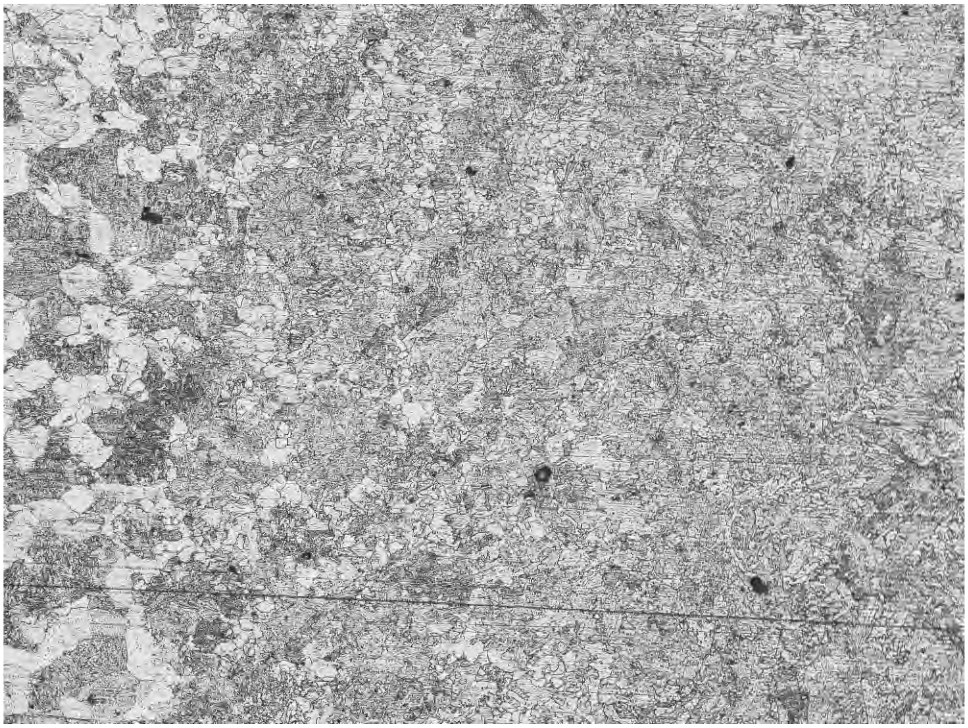
Fig. 6. Replica No. PSIH-R2.



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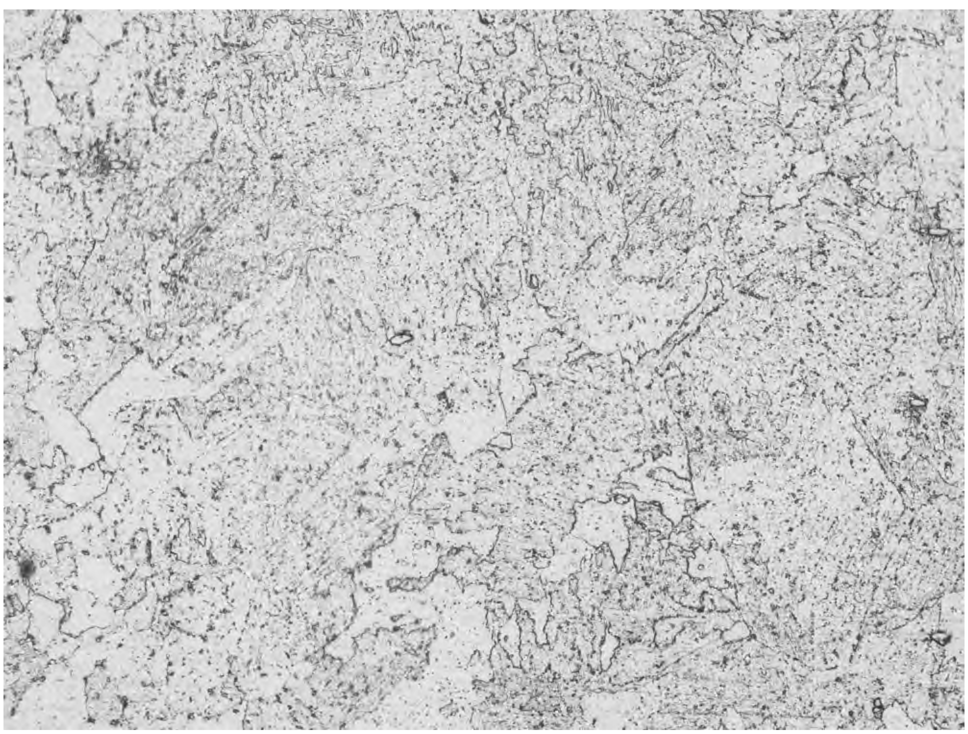

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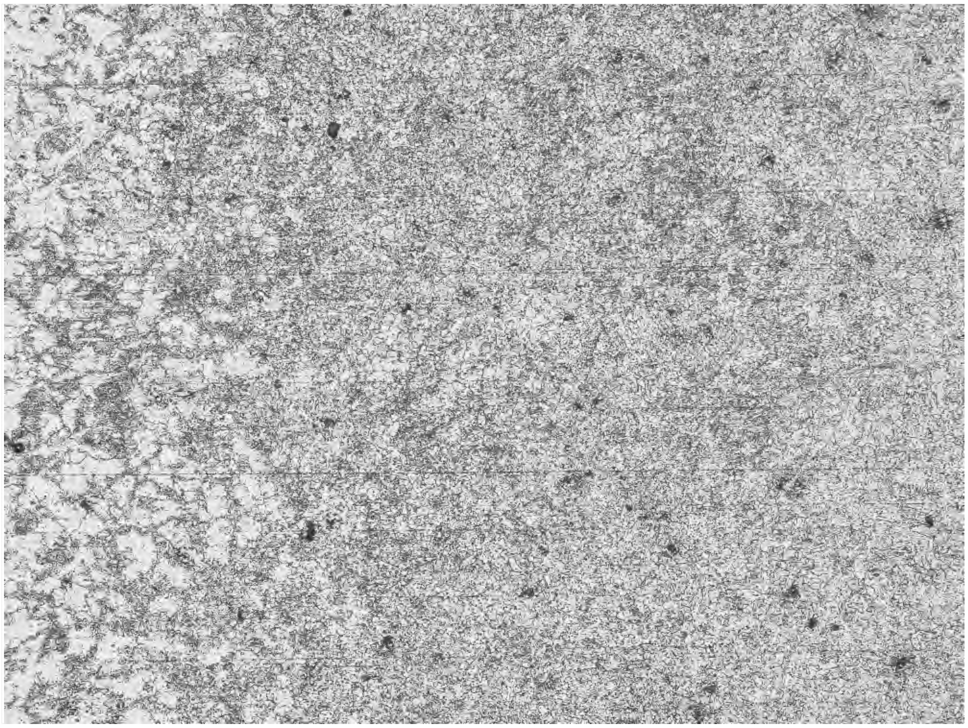
Fig. 7. Replica No. PSIH-R3.



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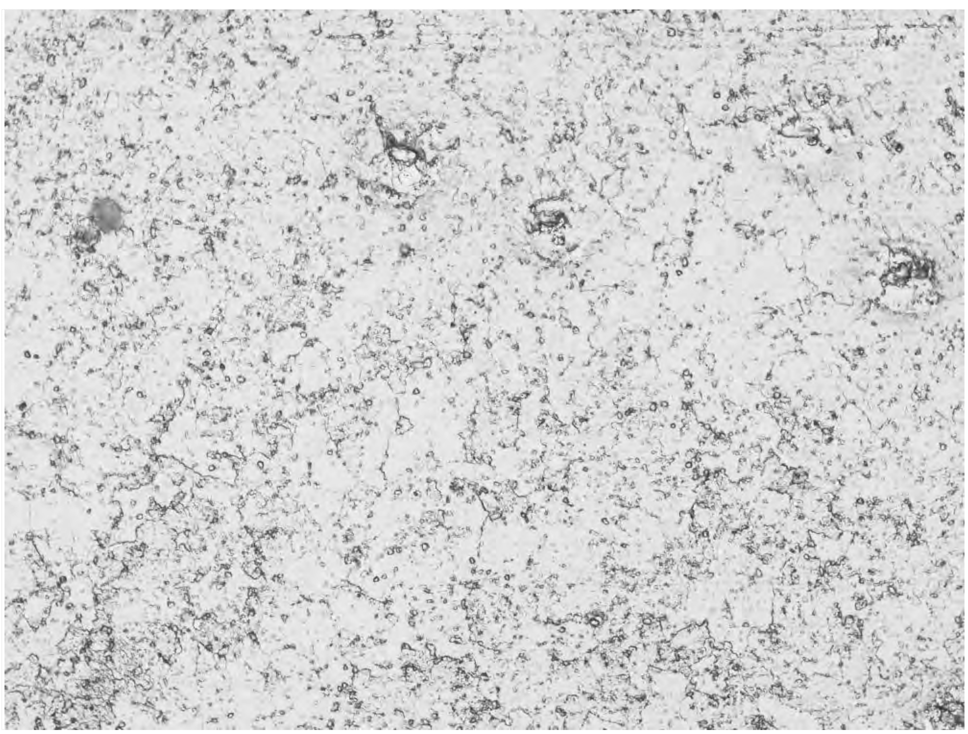

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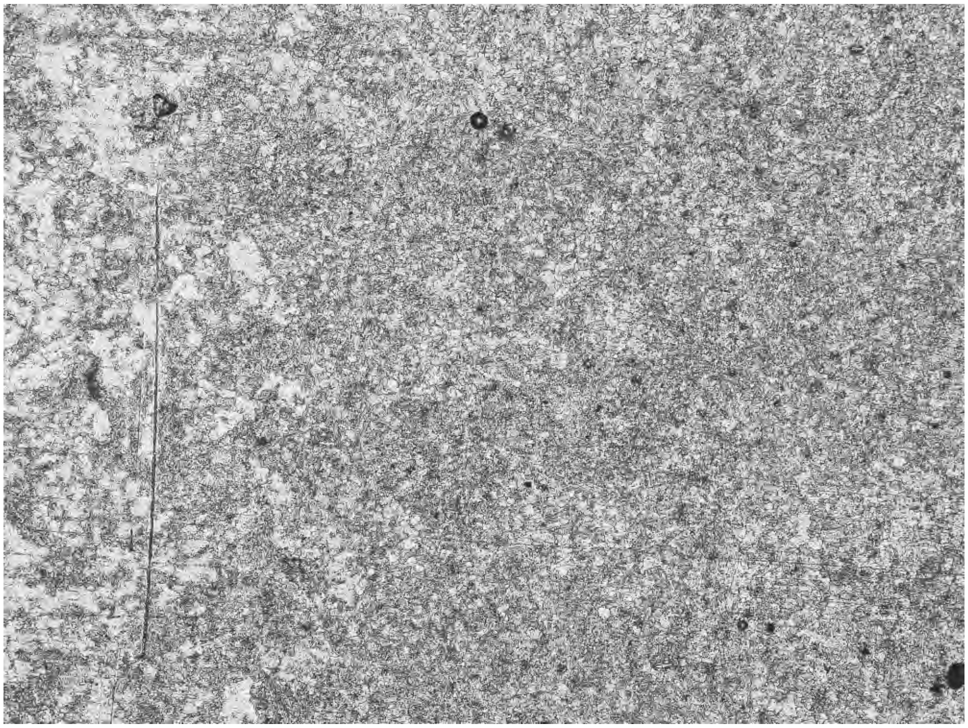
Fig. 8. Replica No. PSIH-R4.



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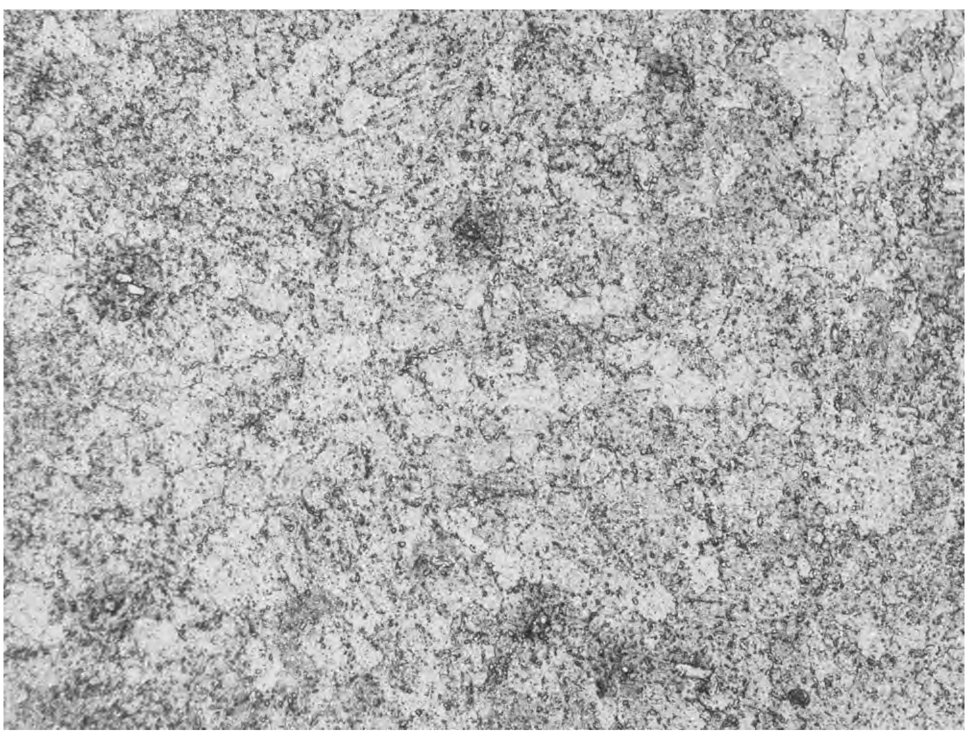

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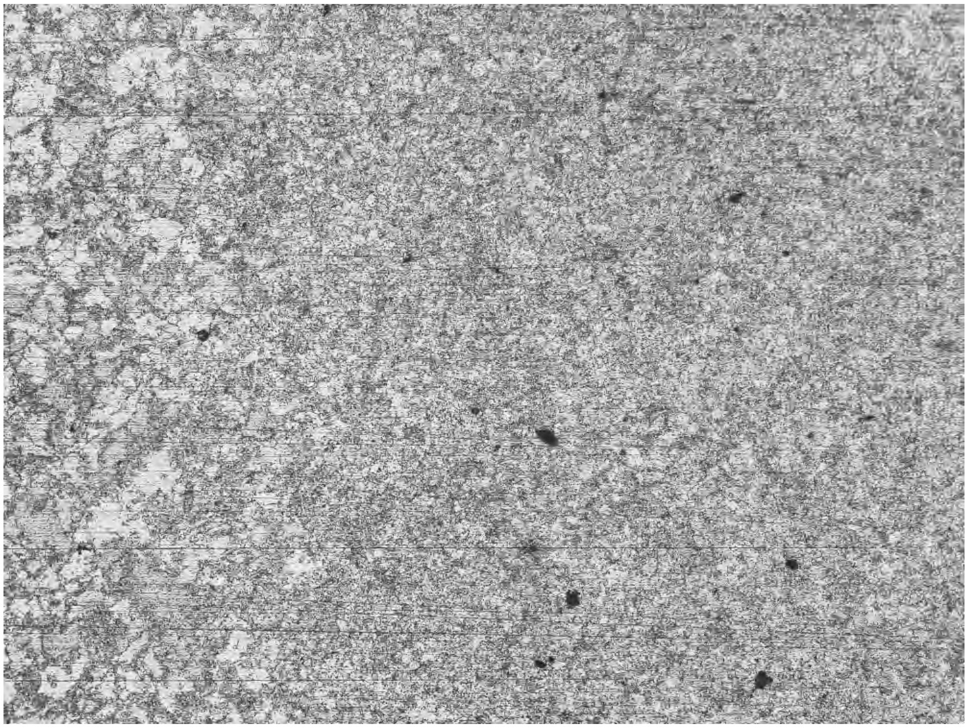
Fig. 9. Replica No. PSIH-R5.



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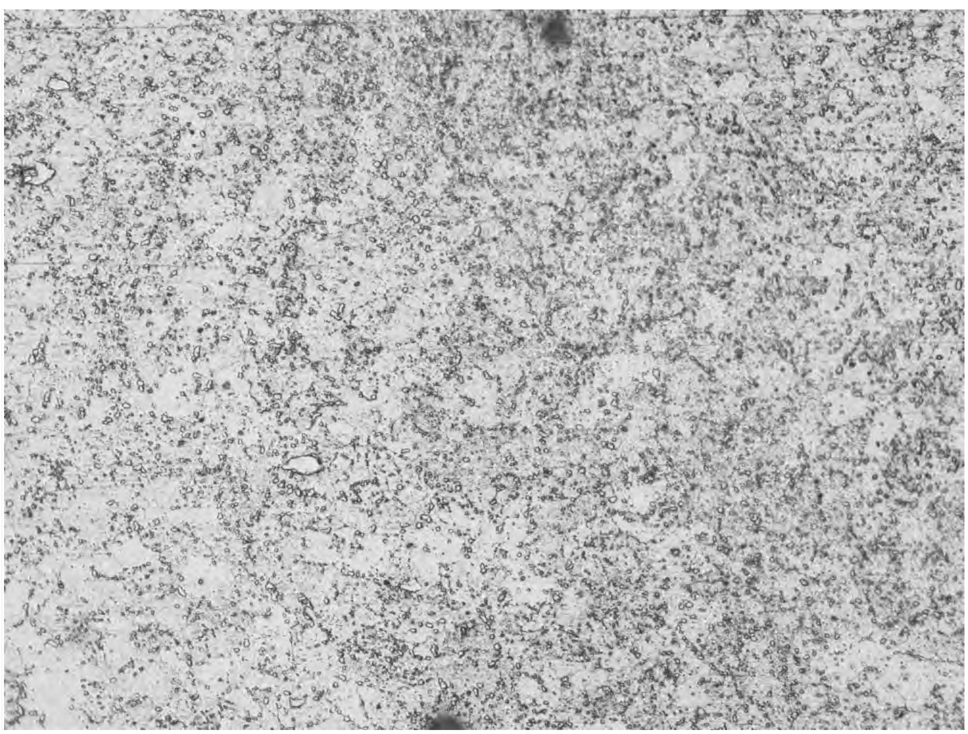

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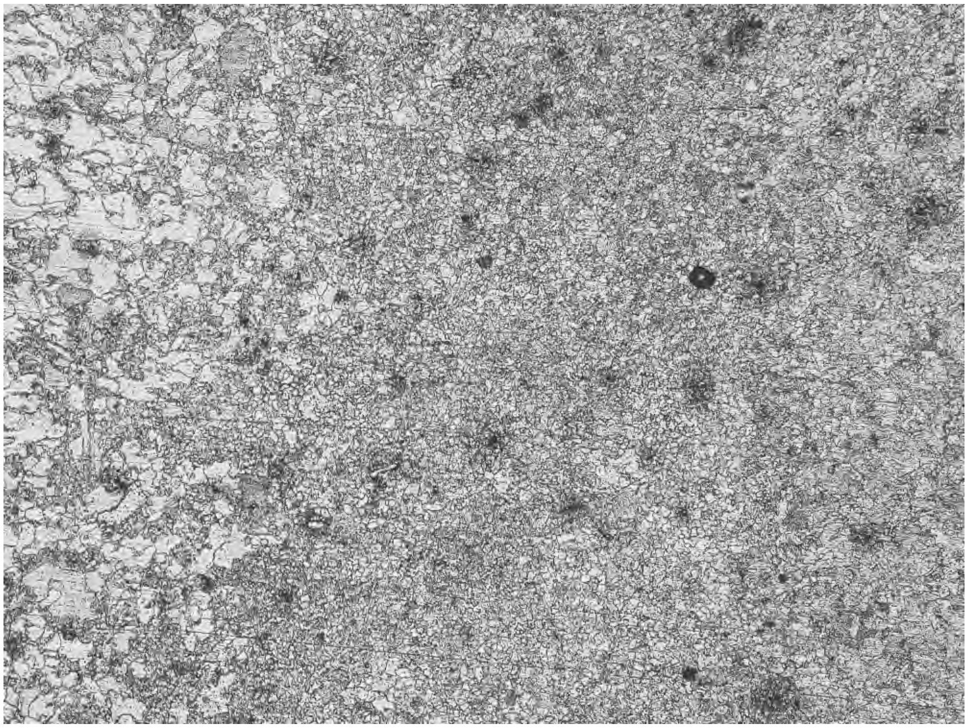
Fig. 10. Replica No. PSIH-R6.



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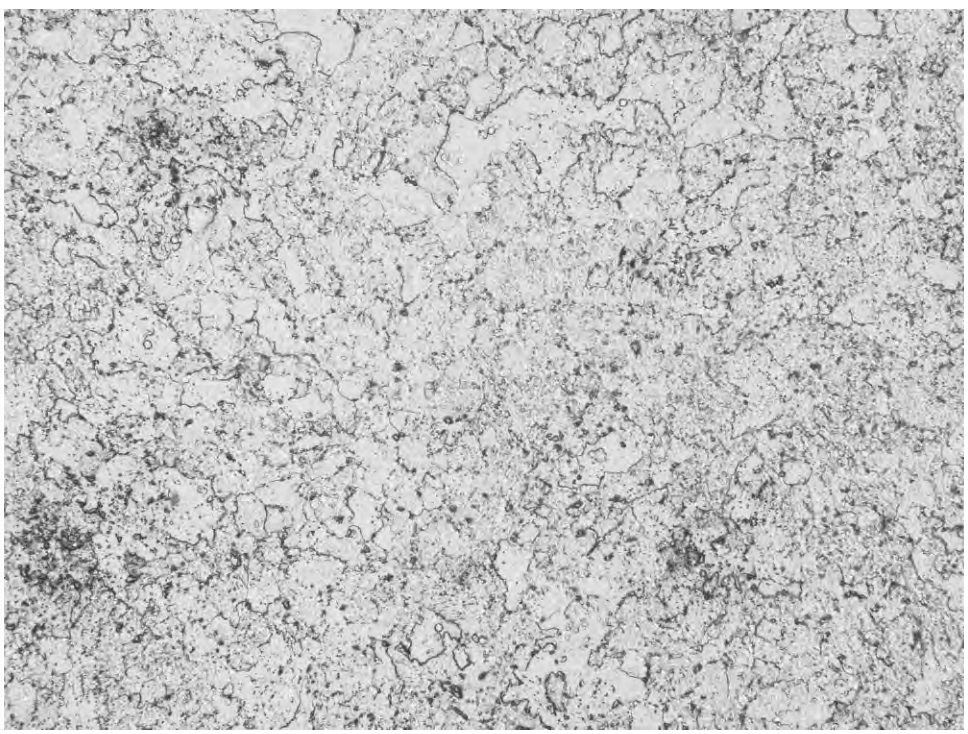

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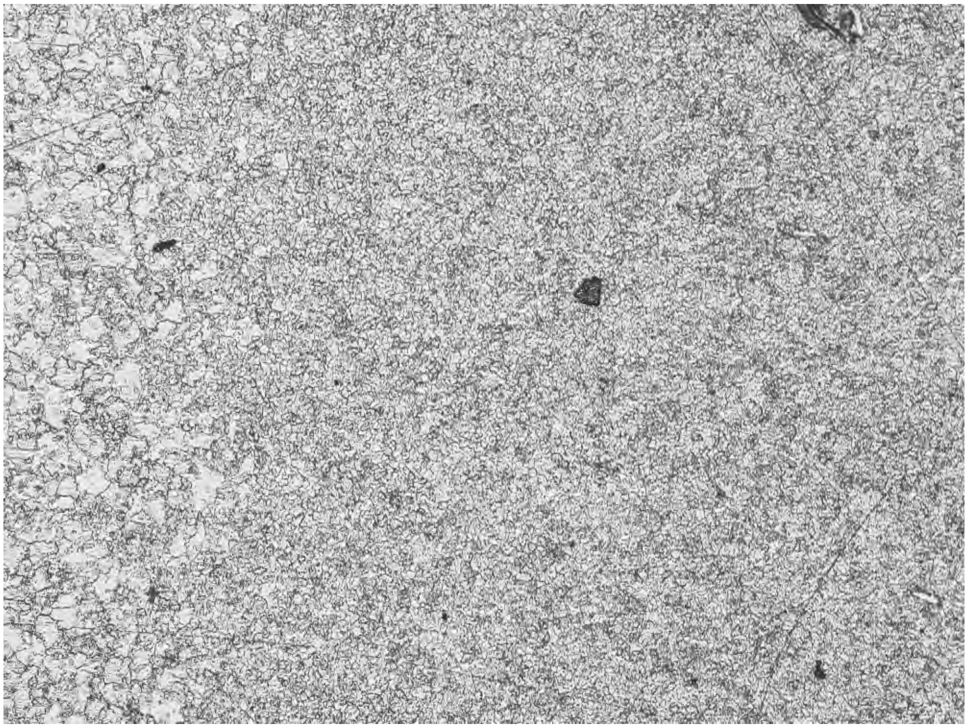
Fig. 11. Replica No. PSIH-R7.



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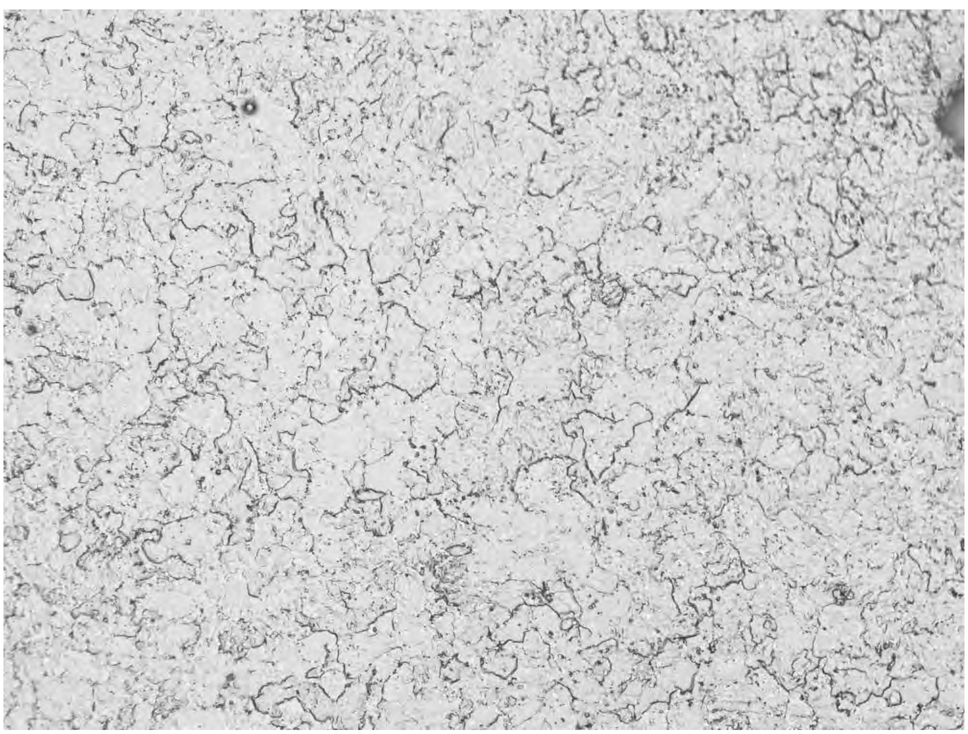

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Fig. 12. Replica No. PSIH-R8.

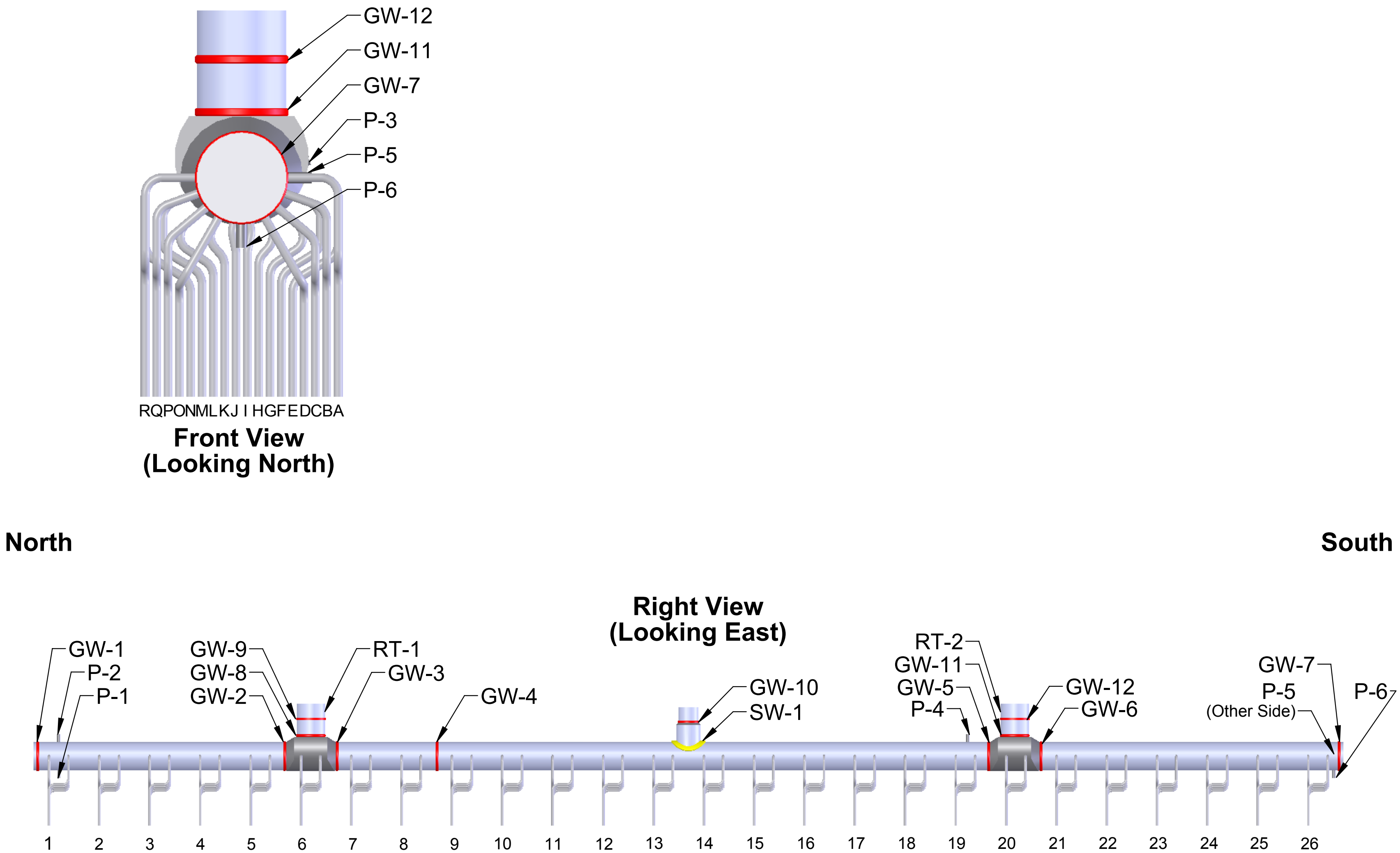

Fig. 13. Sketches of the Platen Superheater Outlet header

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Fig. 14. Photographs of the inspection locations on the Platen Superheater Outlet header.

Fig. 15.

Photographs of the inspection locations on the Platen Superheater Outlet header.

Fig. 16.

Photographs of the inspection locations on the Platen Superheater Outlet header.

Fig. 17. Photographs of the inspection locations on the Platen Superheater Outlet header.

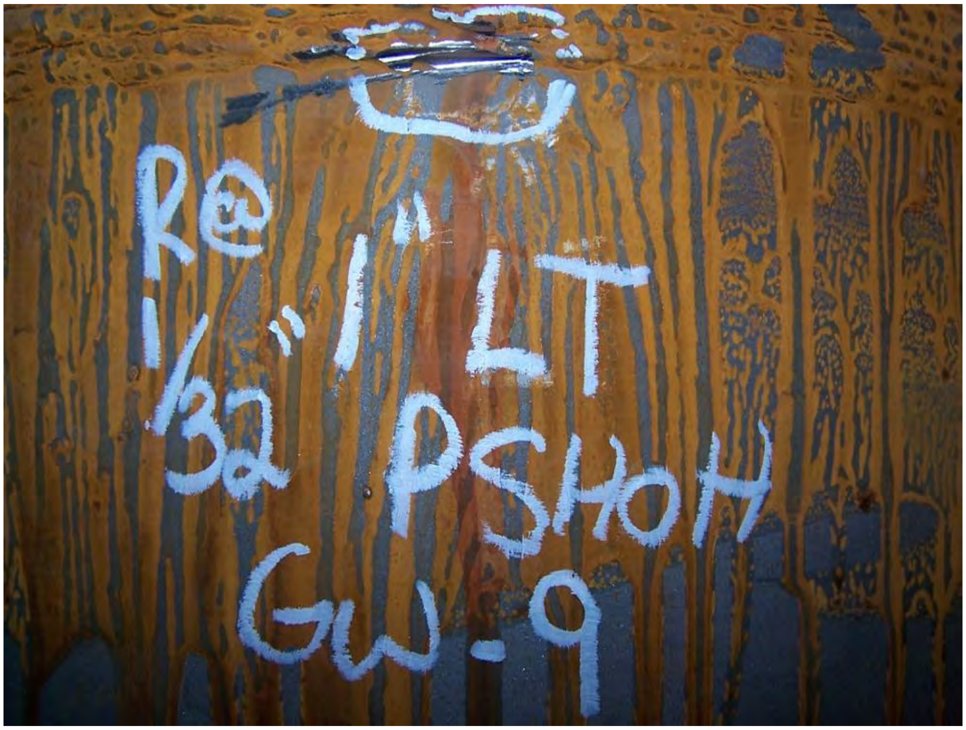
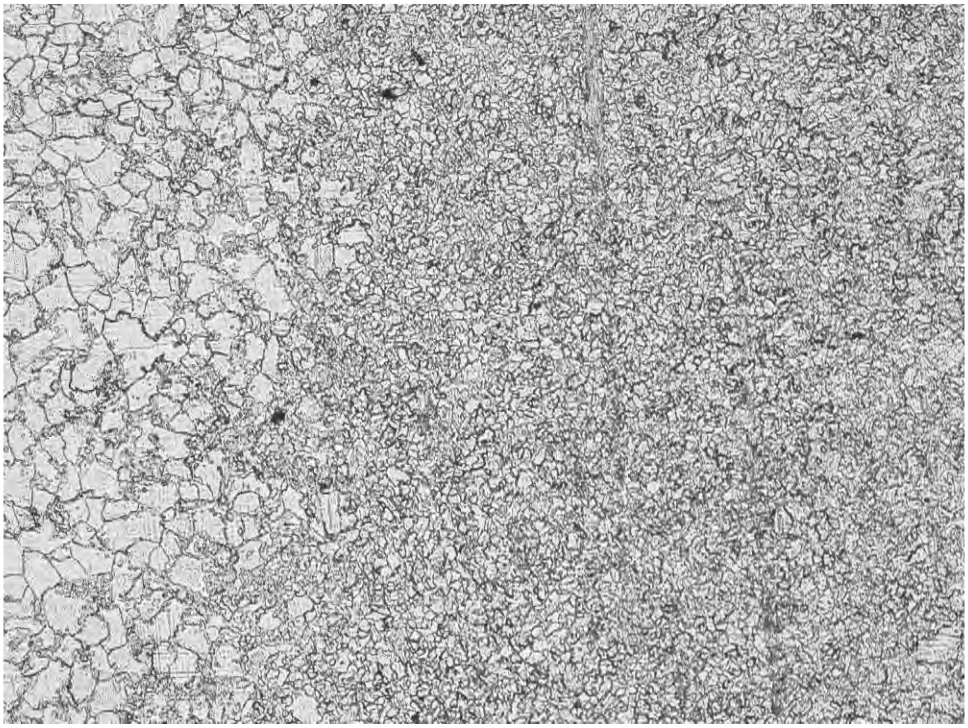


Fig. 18. Photograph of indication removal on girth weld No. GW-9 on the Platen Superheater Outlet header.



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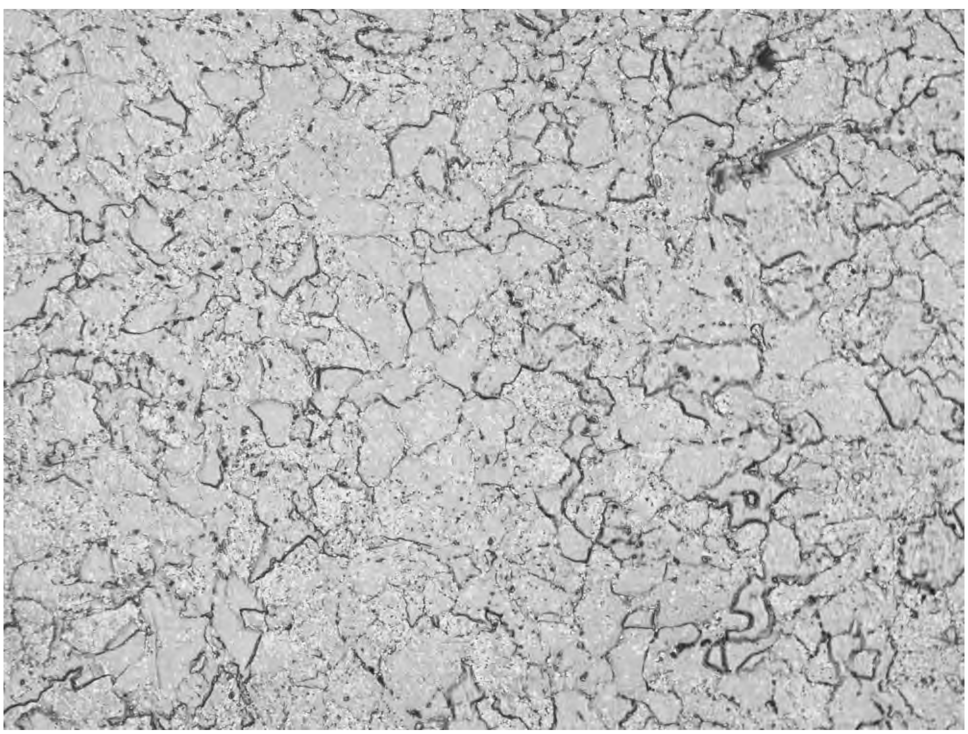

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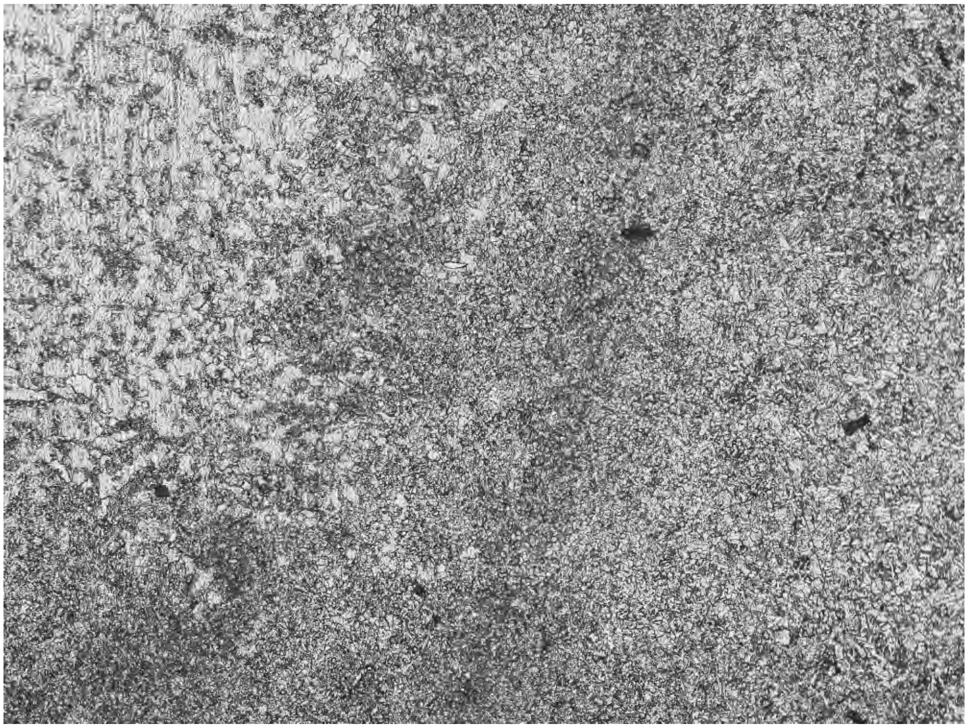
Fig. 19. Replica No. PSOH-R1.



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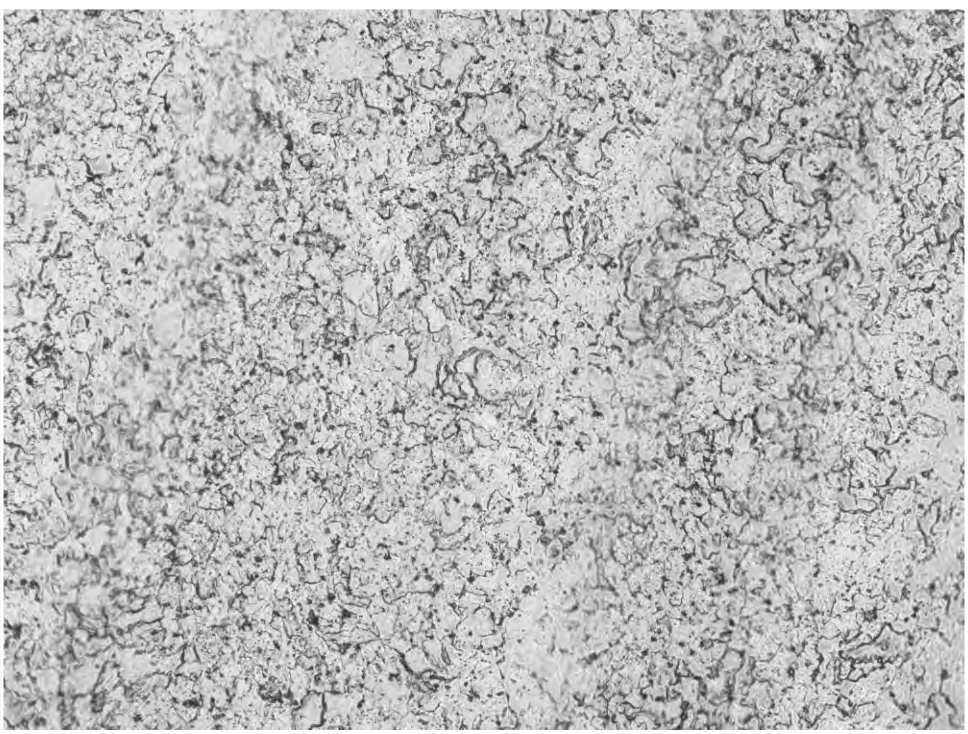

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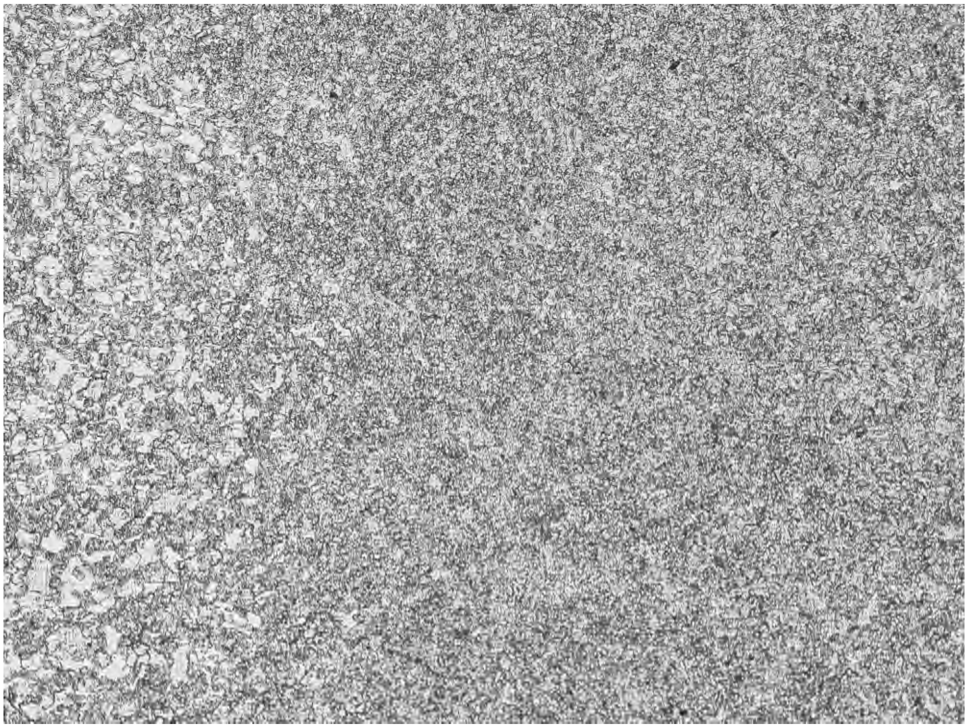
Fig. 20. Replica No. PSOH-R2.



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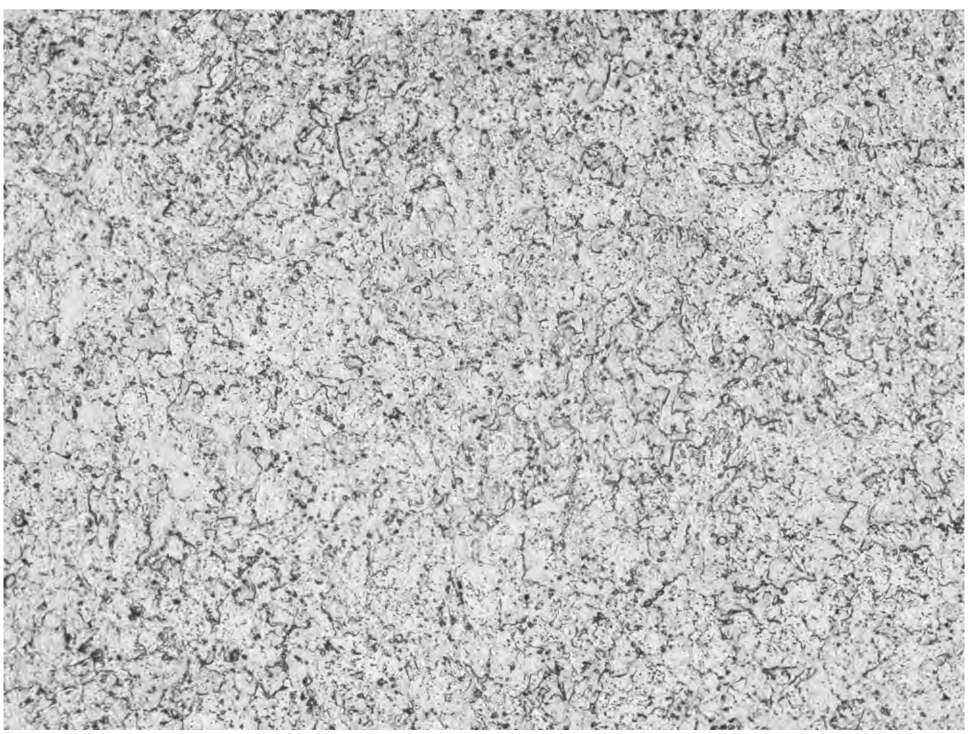

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Fig. 21. Replica No. PSOH-R3.

100X

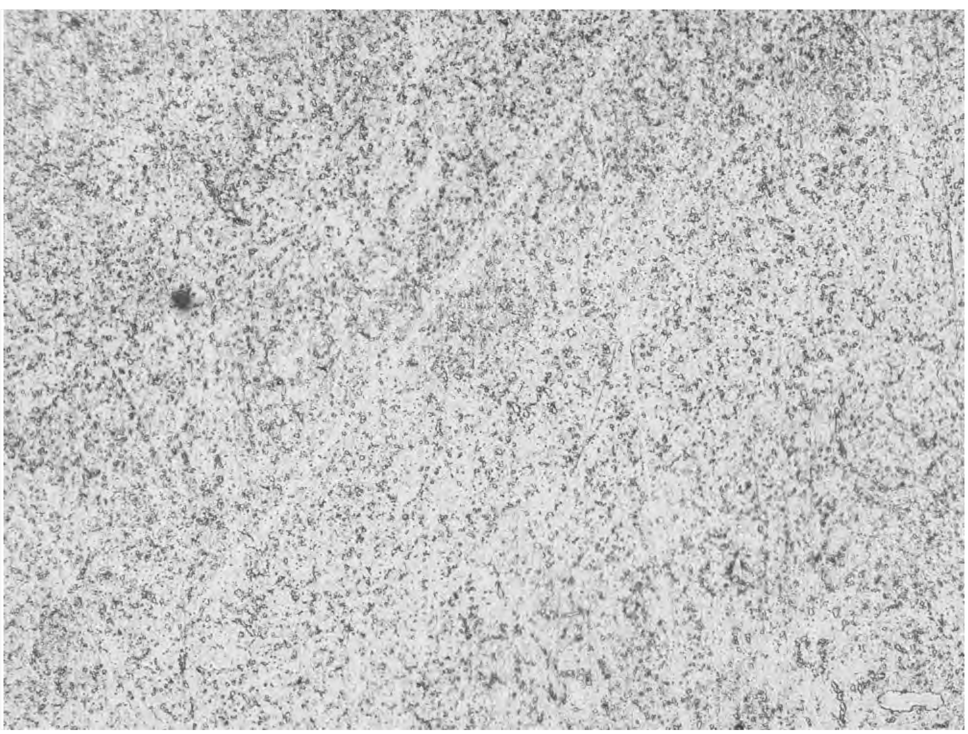

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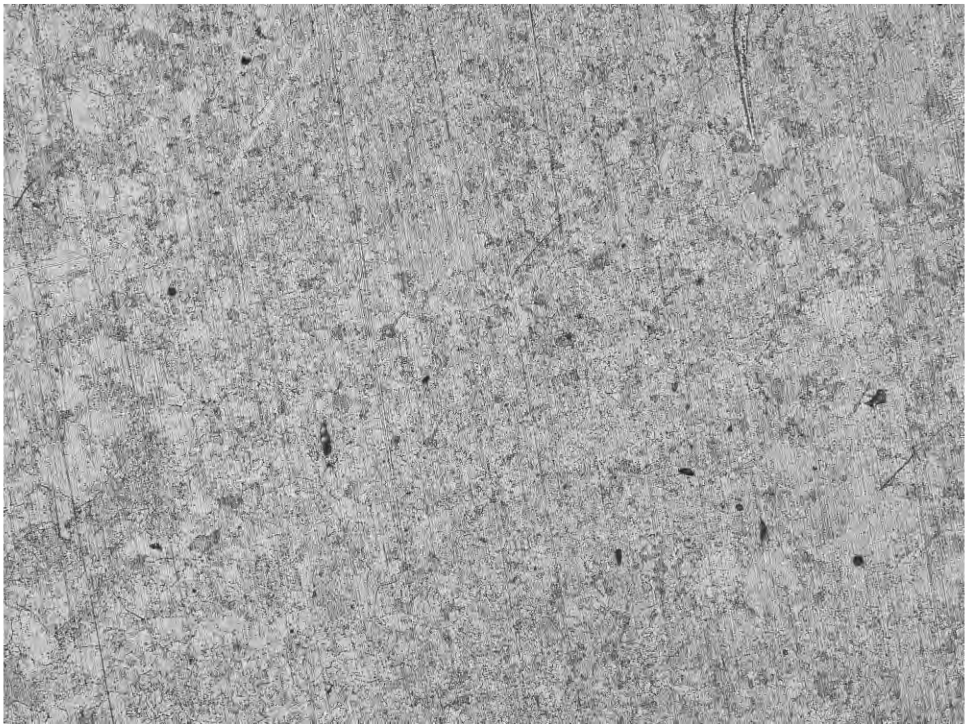
Fig. 22. Replica No. PSOH-R4.



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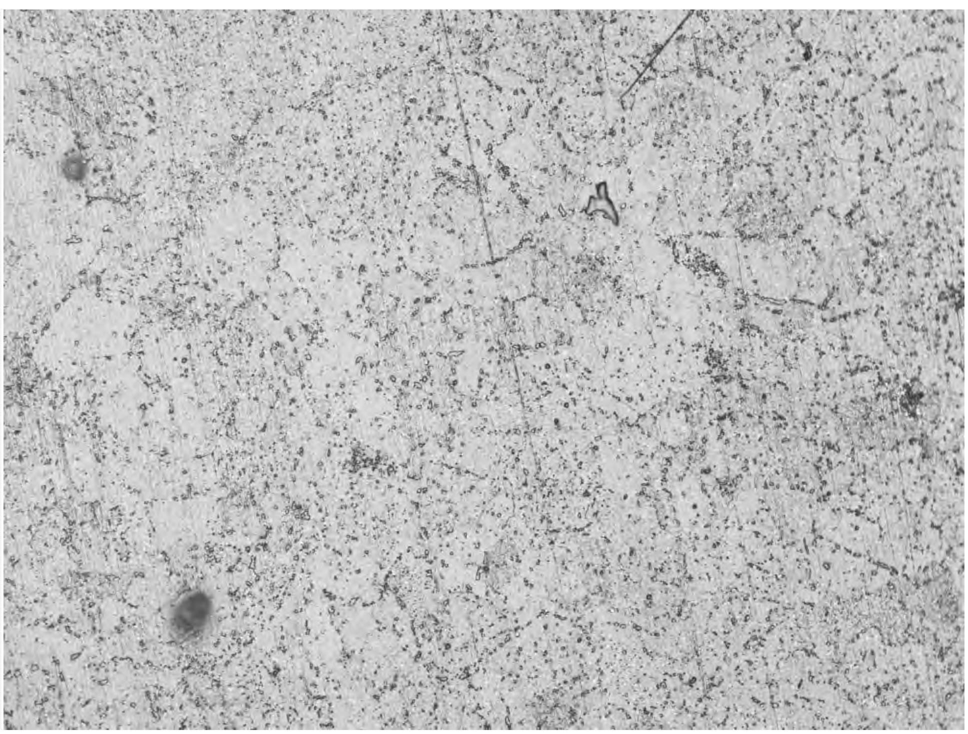

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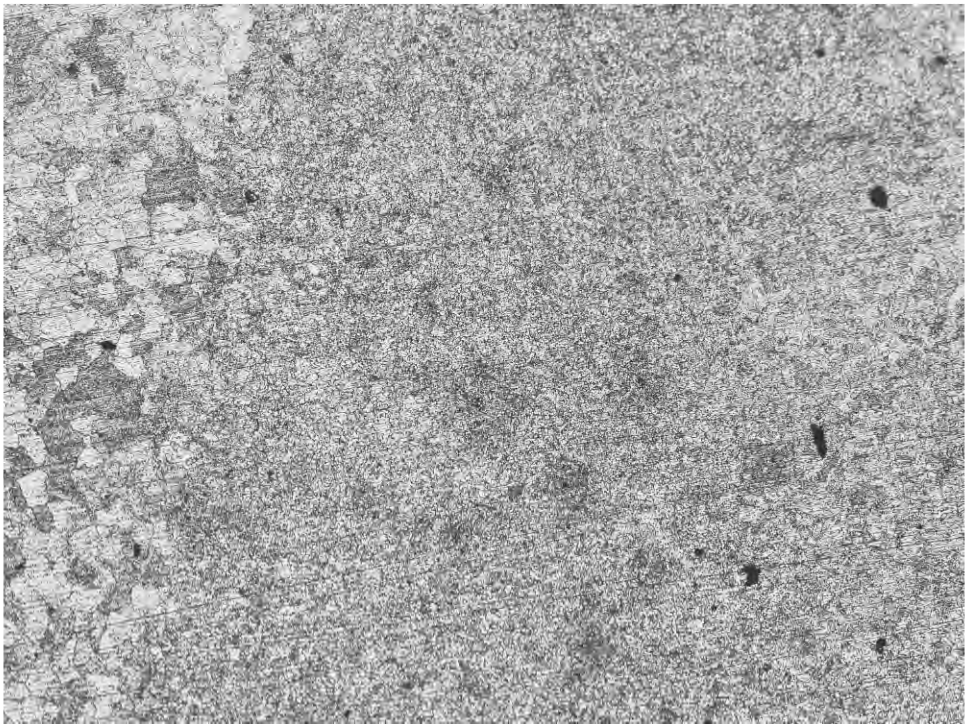
Fig. 23. Replica No. PSOH-R5.



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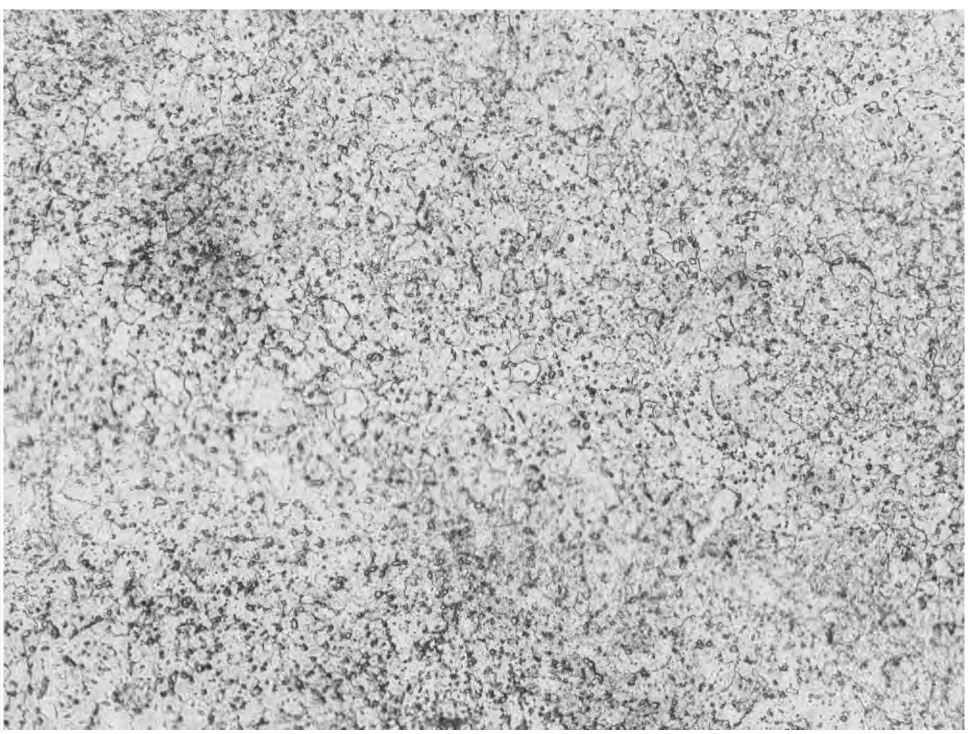

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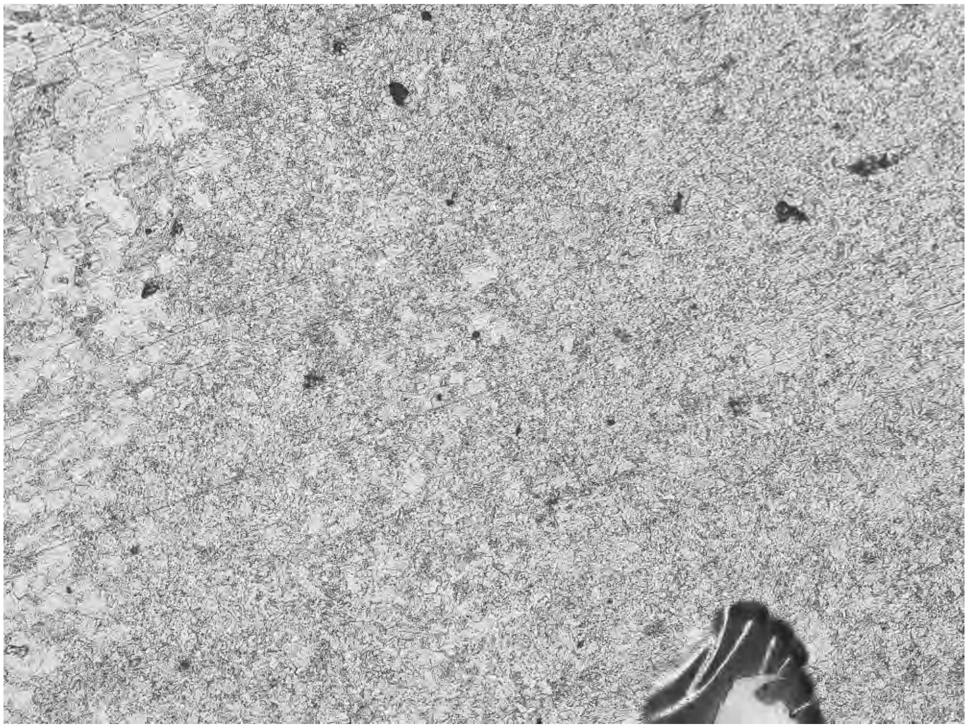
Fig. 24. Replica No. PSOH-R6.



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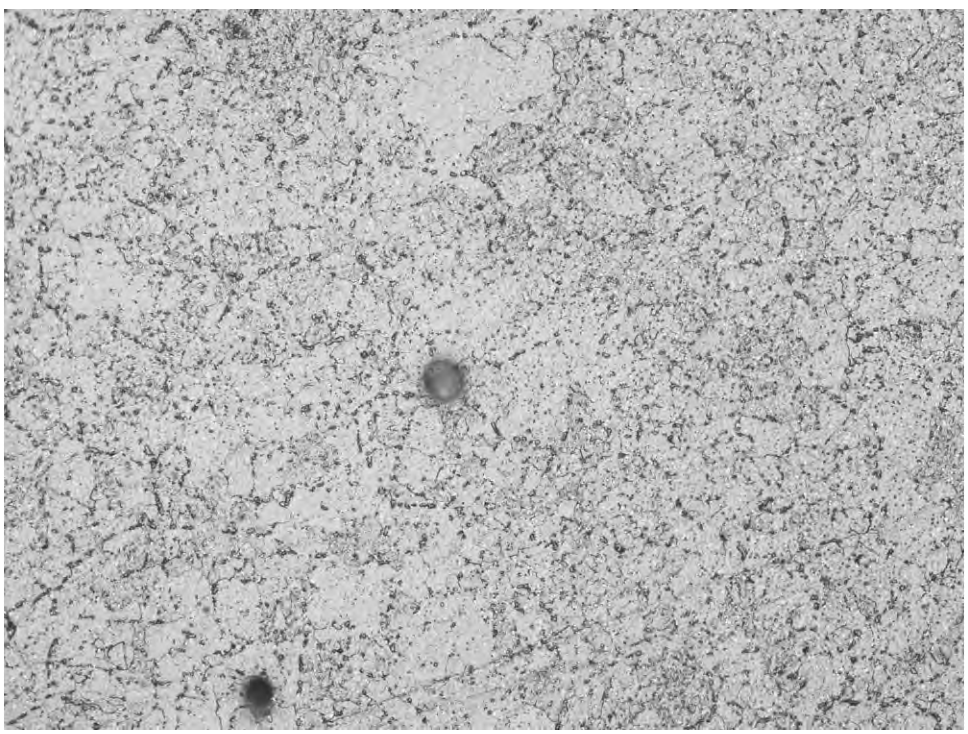

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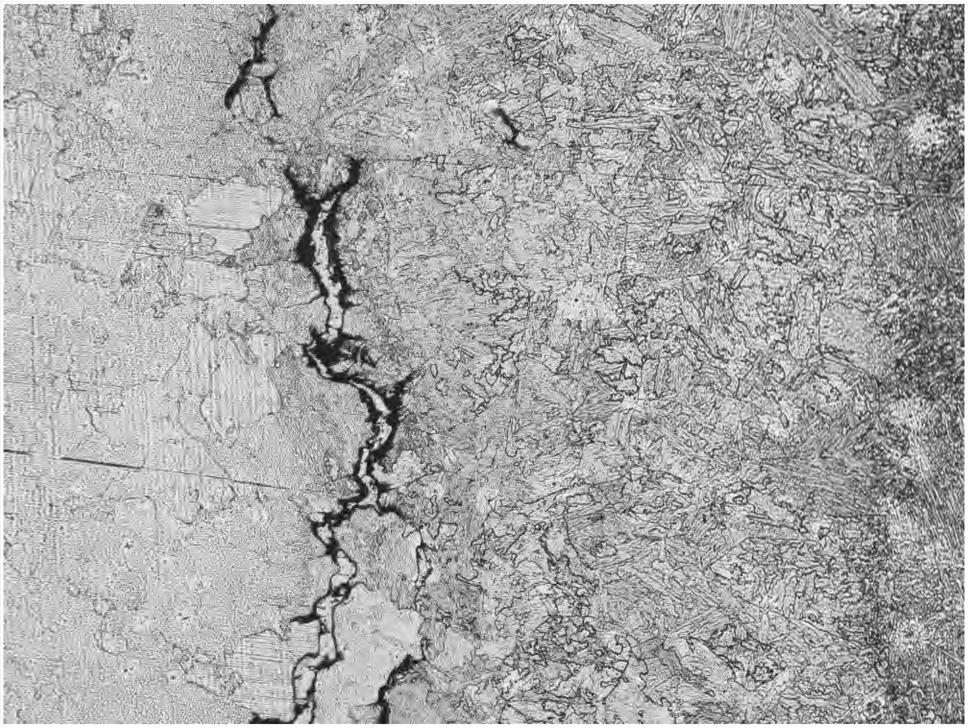
Fig. 25. Replica No. PSOH-R7.



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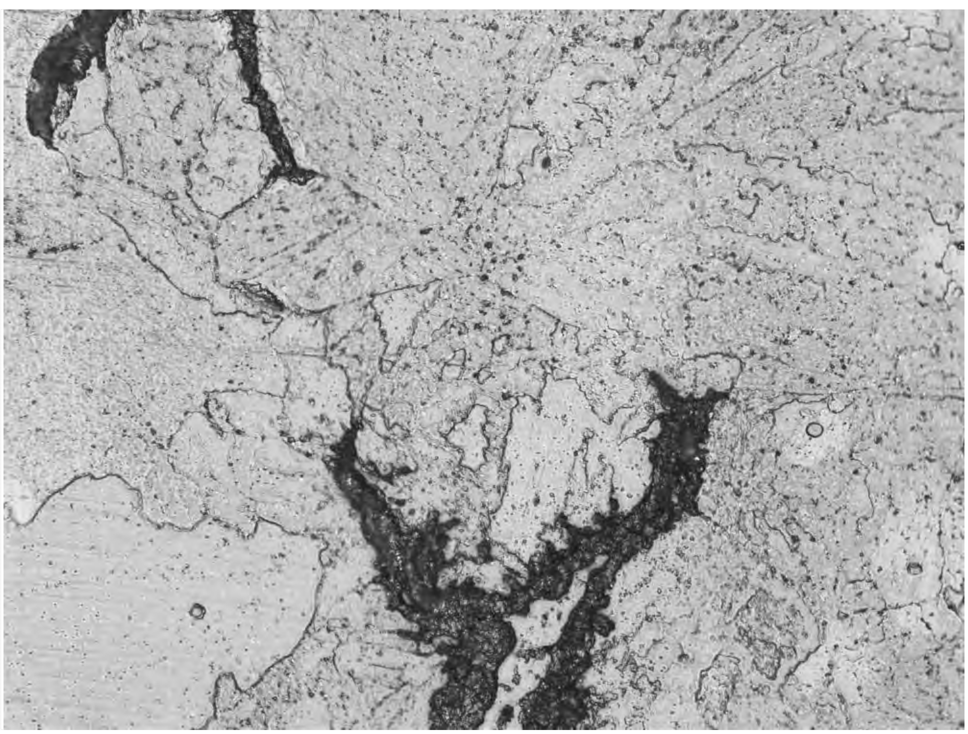

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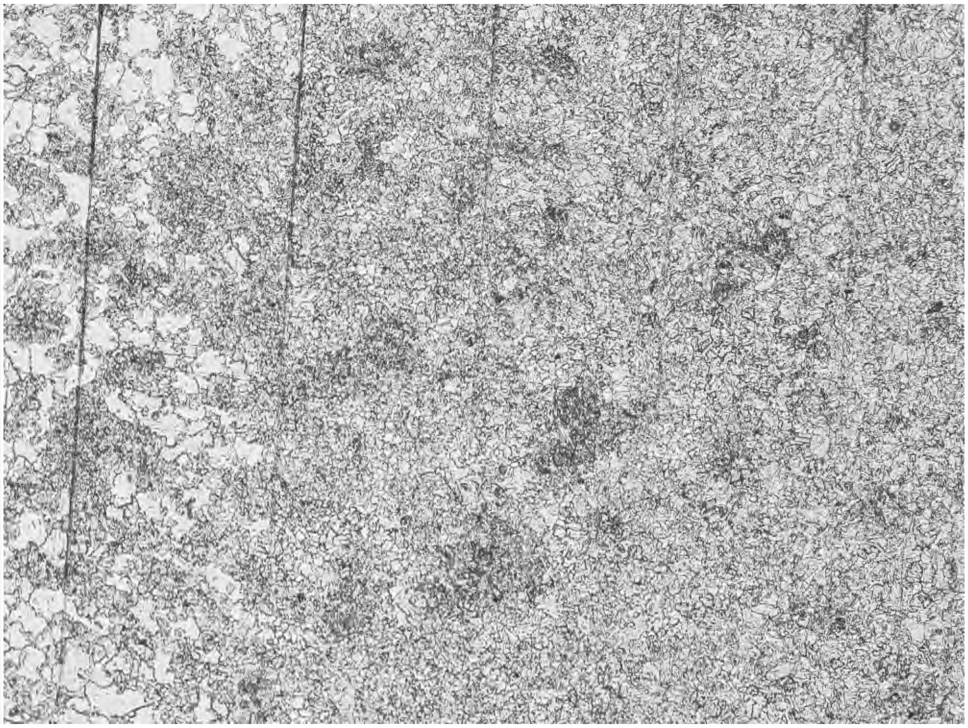
Fig. 26. Replica No. PSOH-R8.



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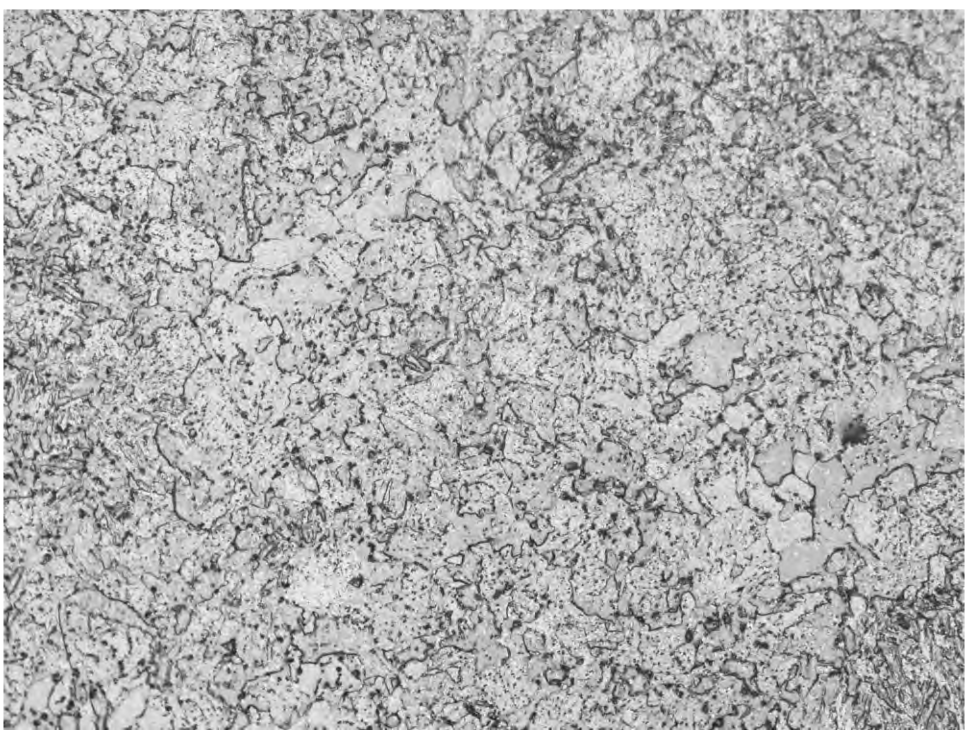

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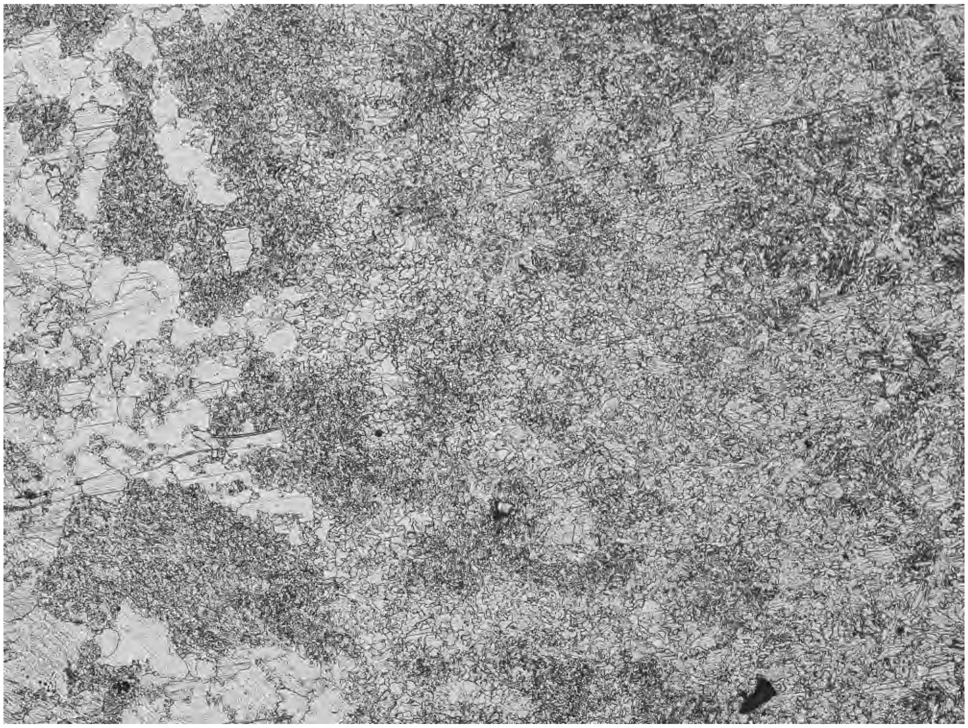
Fig. 27. Replica No. PSOH-R9.



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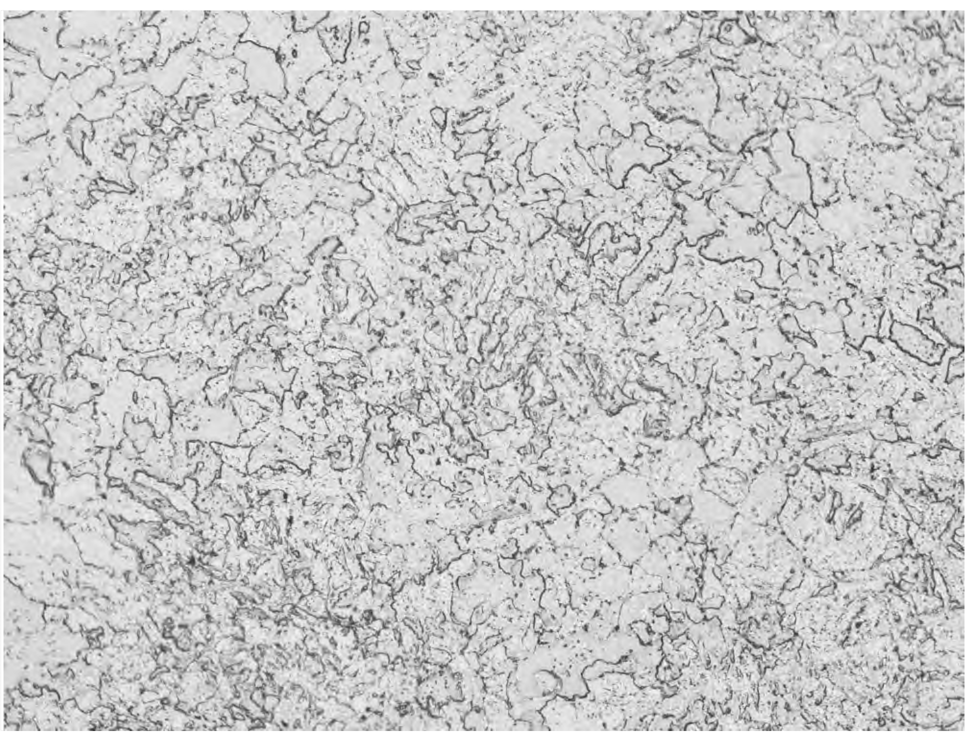

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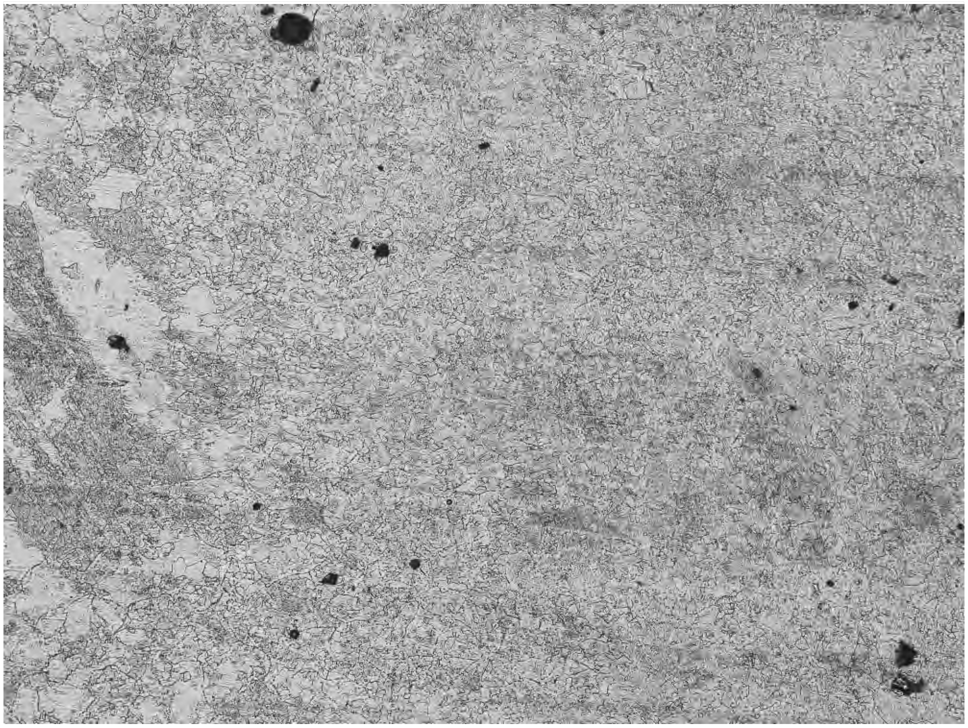
Fig. 28. Replica No. PSOH-R10.



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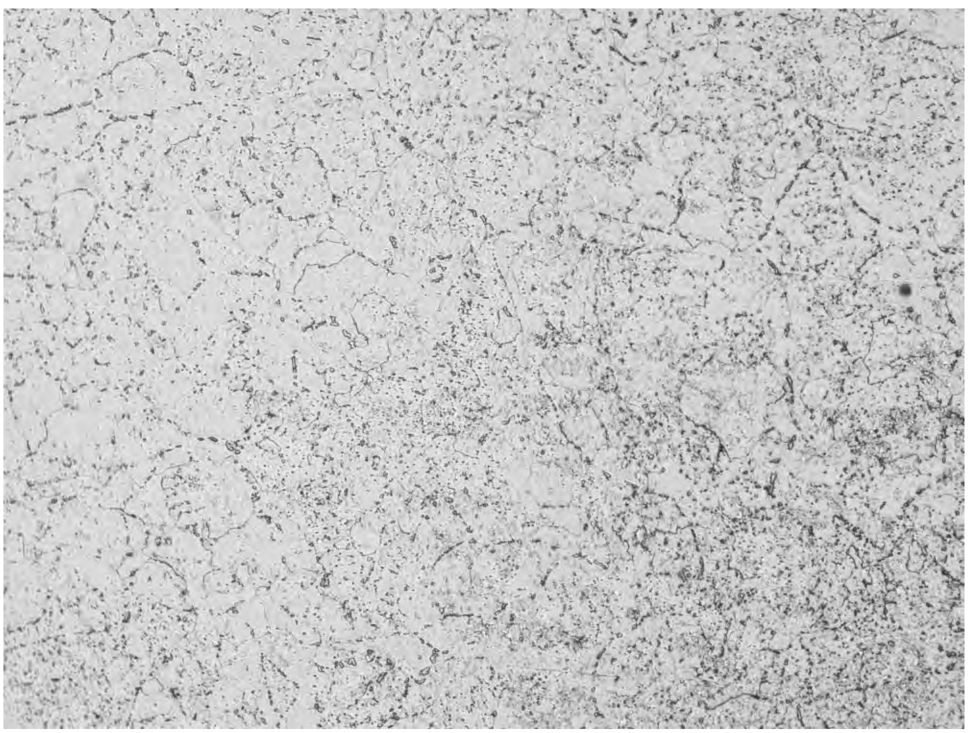

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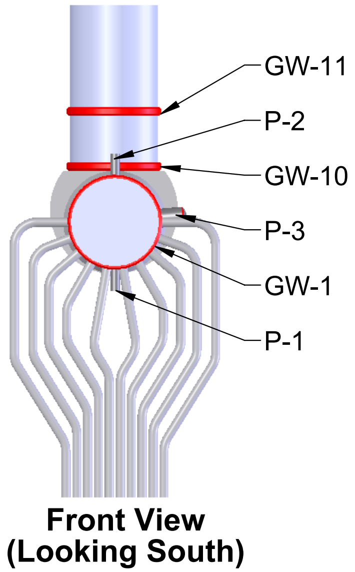
Fig. 29. Replica No. PSOH-R11.



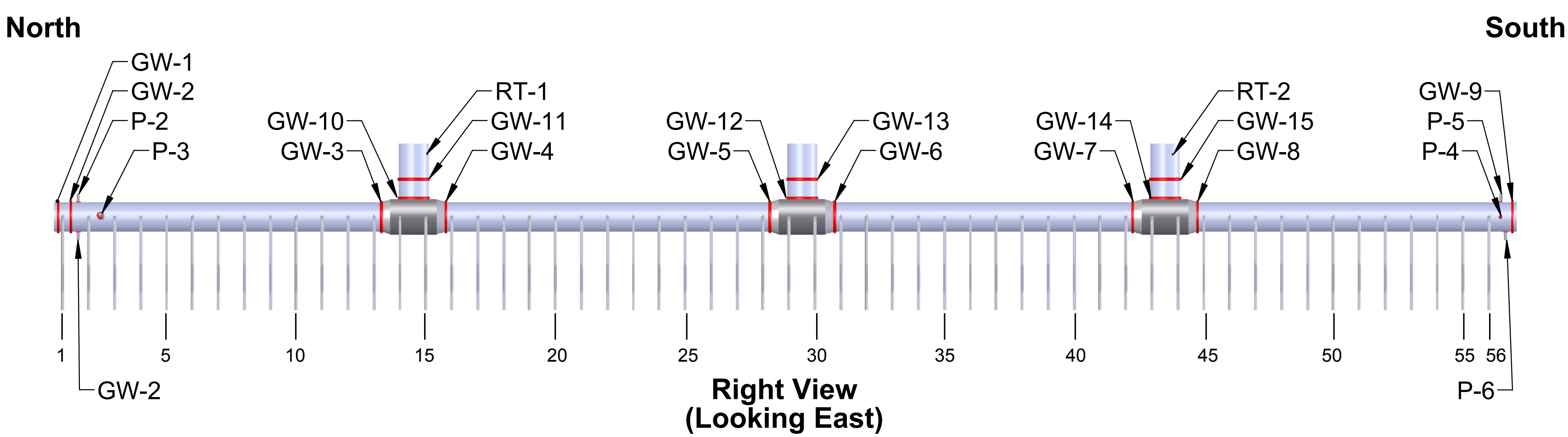


Fig. 30. Sketch of the Finishing Superheater Inlet header

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Fig. 31.

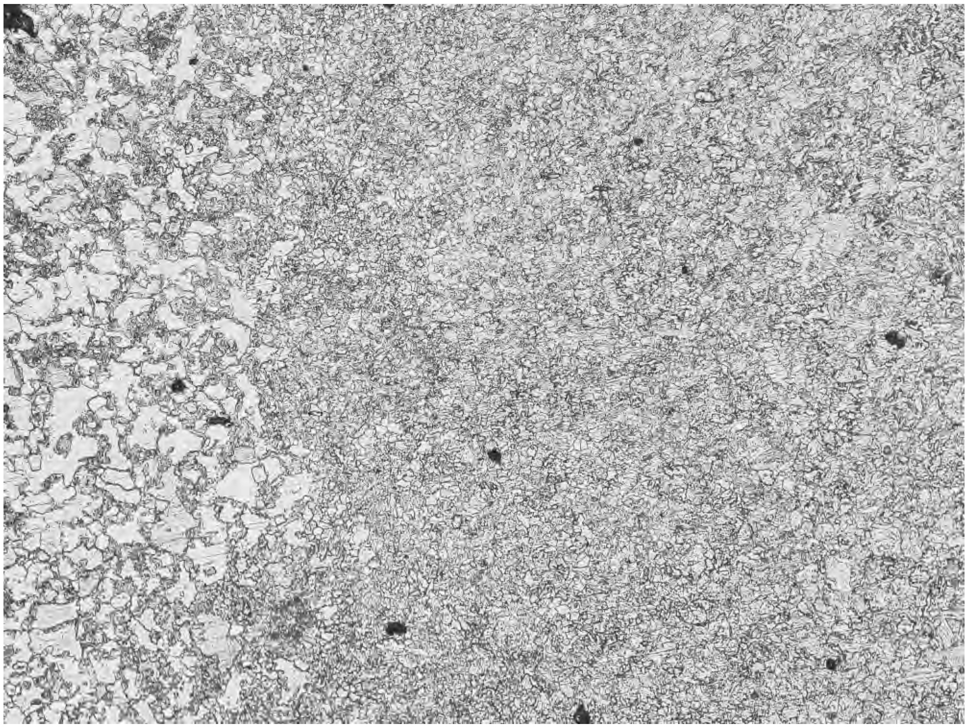
Photographs of the inspection locations on the Finishing Super-heater Inlet header.

Fig. 32.

Photographs of the inspection locations on the Finishing Super-heater Inlet header.

Fig. 33. Photographs of the inspection locations on the Finishing Superheater Inlet header.

Fig. 34. Photograph of indication before and after removal in tube stub 55A on the Finishing Superheater Inlet header.



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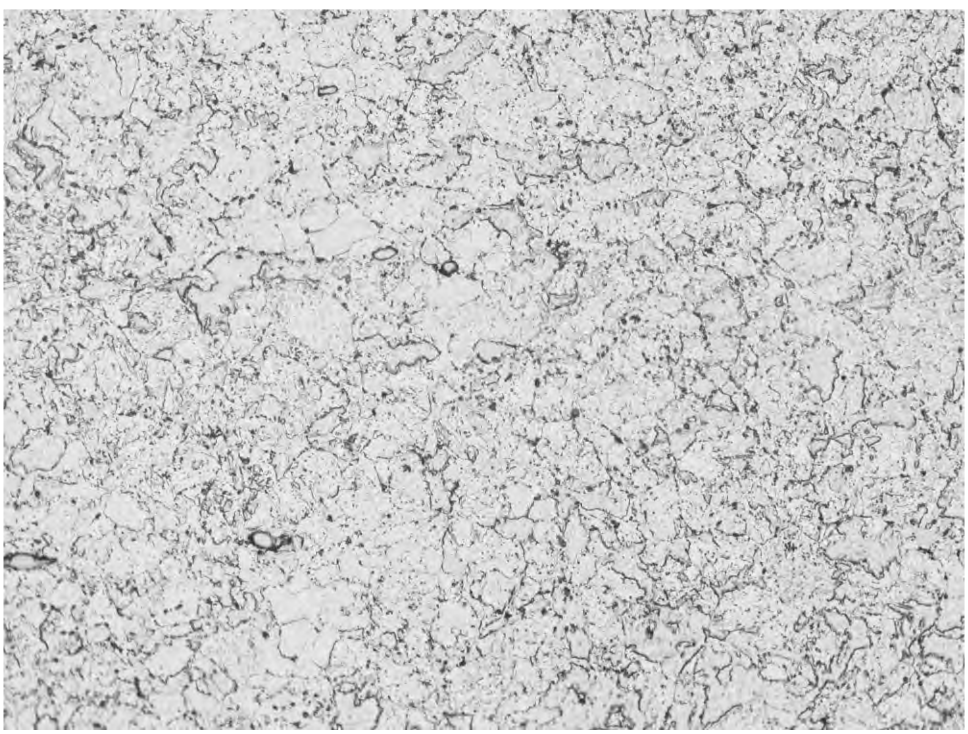

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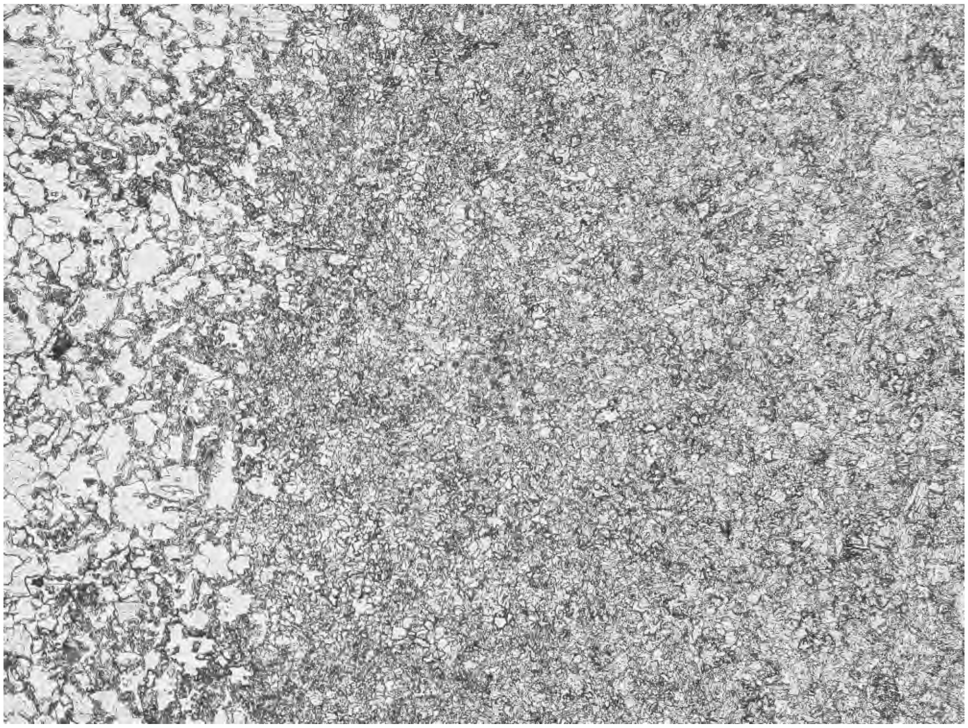
Fig. 35. Replica No. FSIH-R1.



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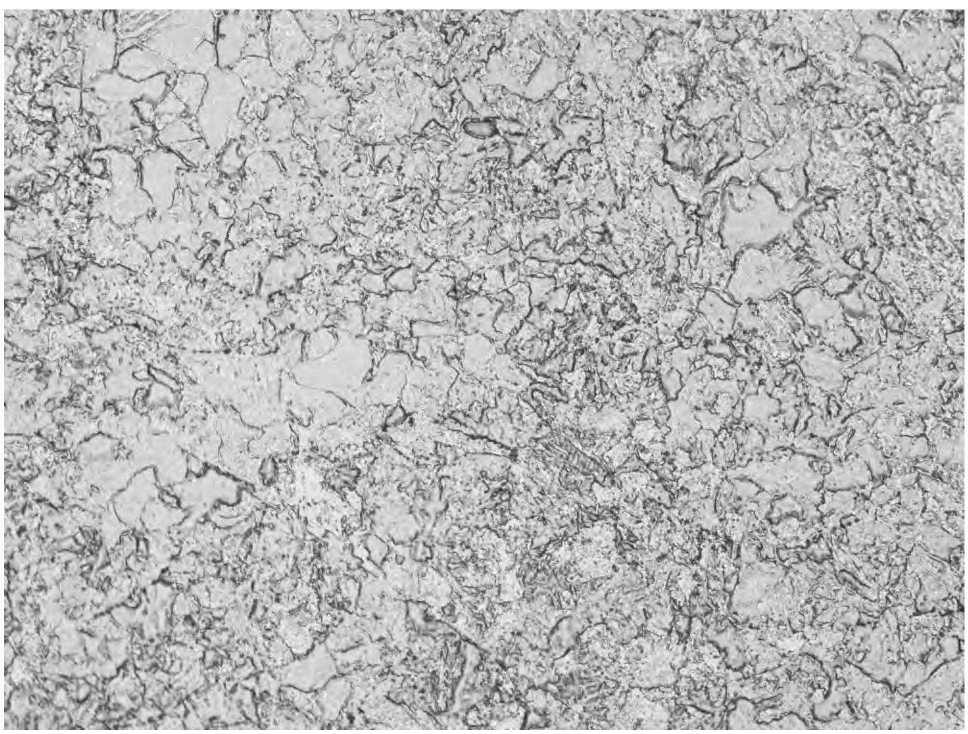

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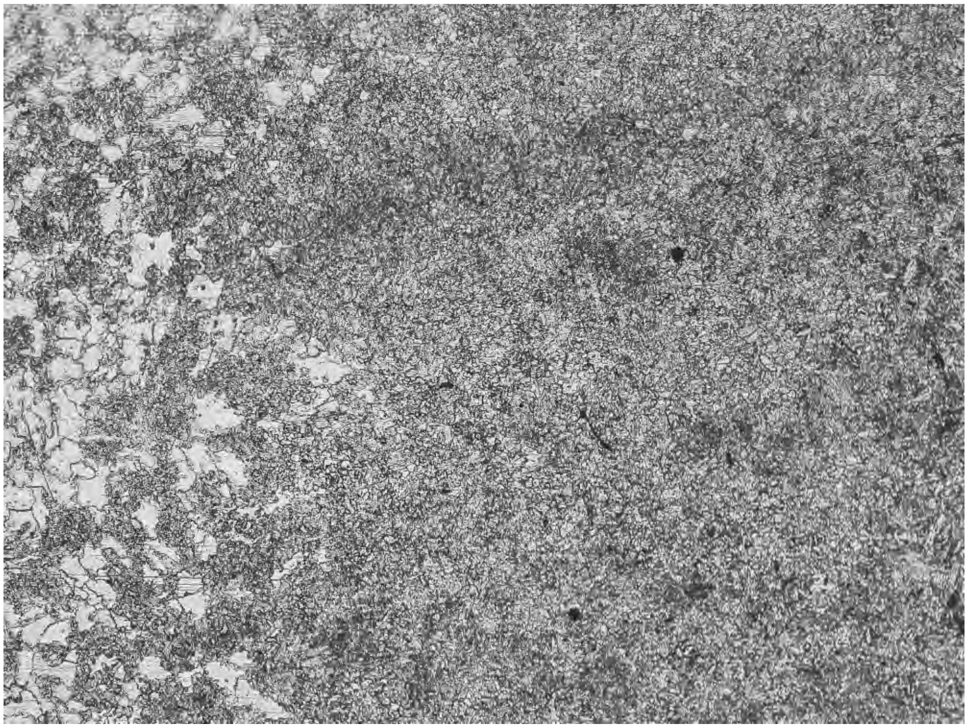
Fig. 36. Replica No. FSIH-R2.



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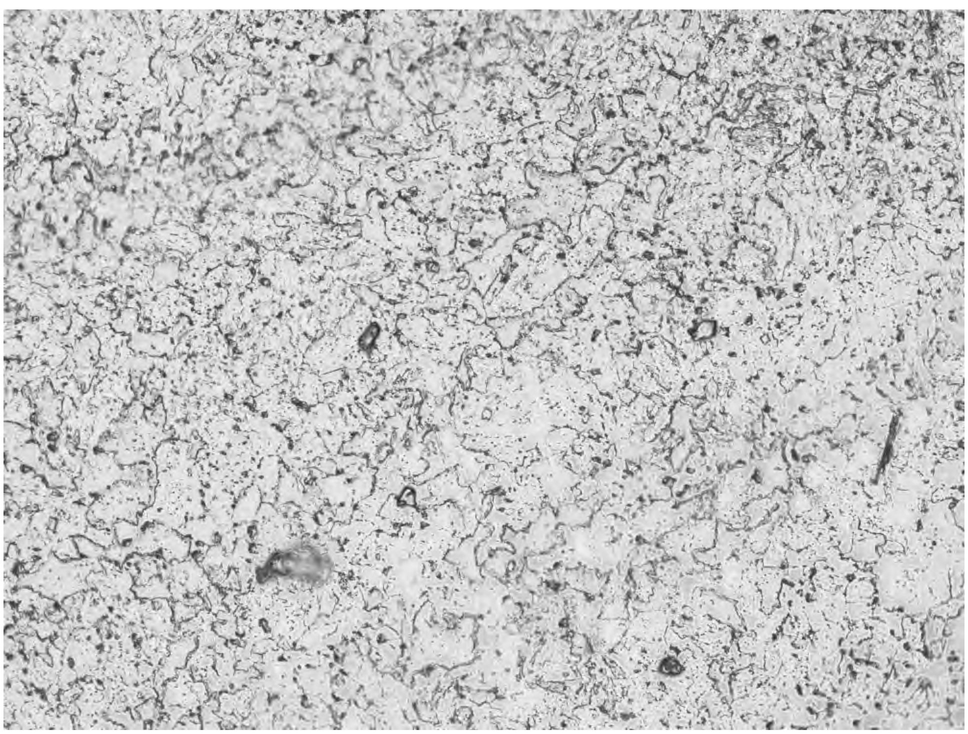

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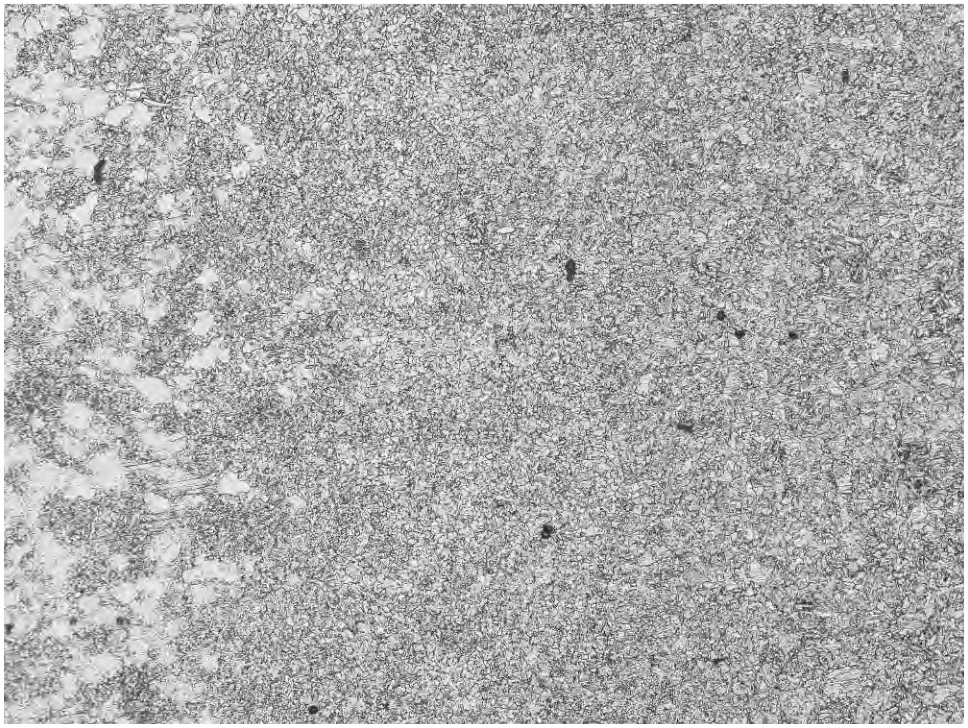
Fig. 37. Replica No. FSIH-R3.



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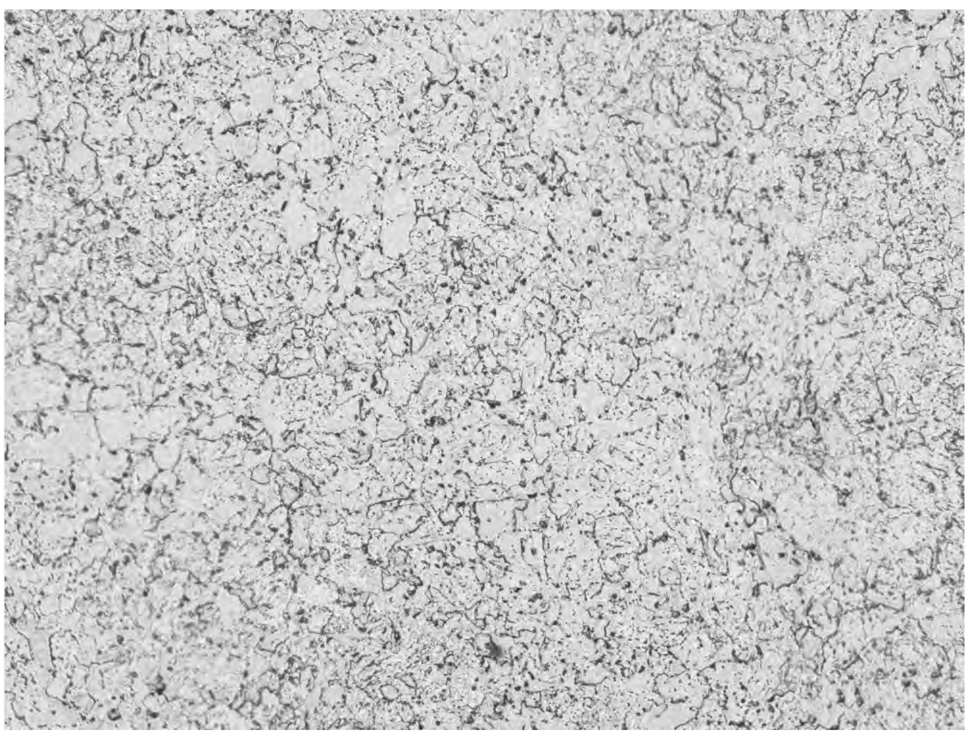

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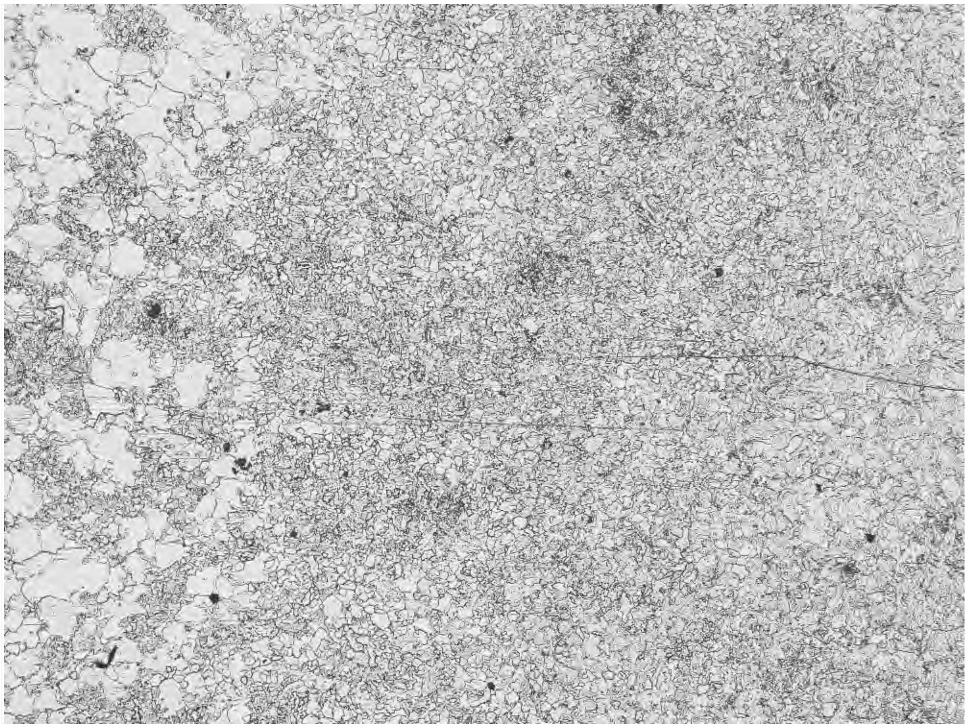
Fig. 38. Replica No. FSIH-R4.



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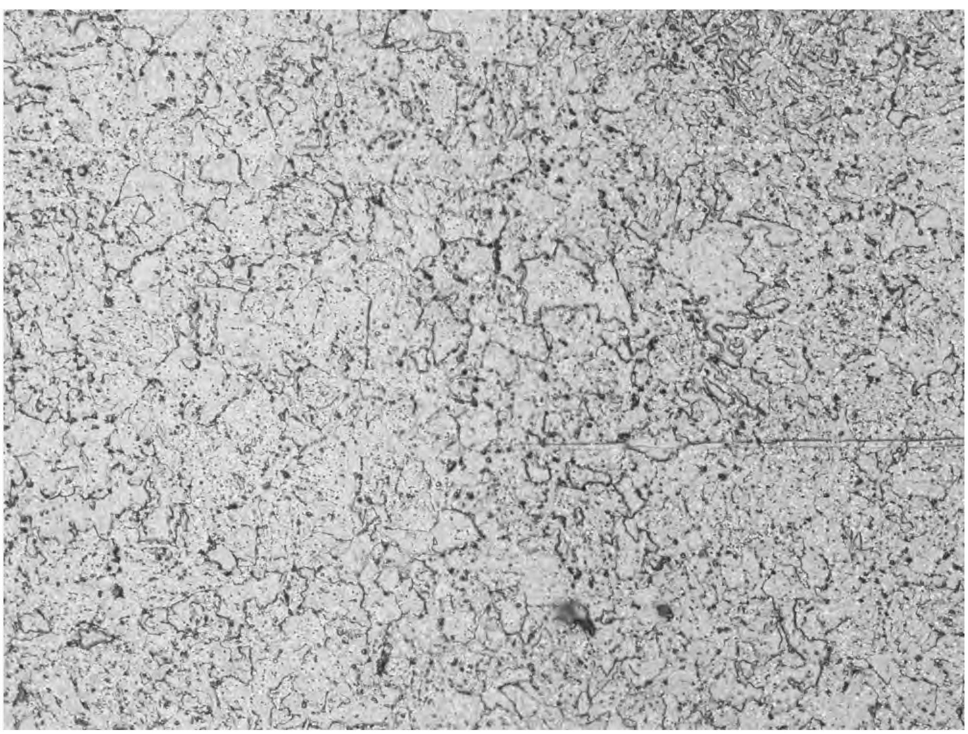

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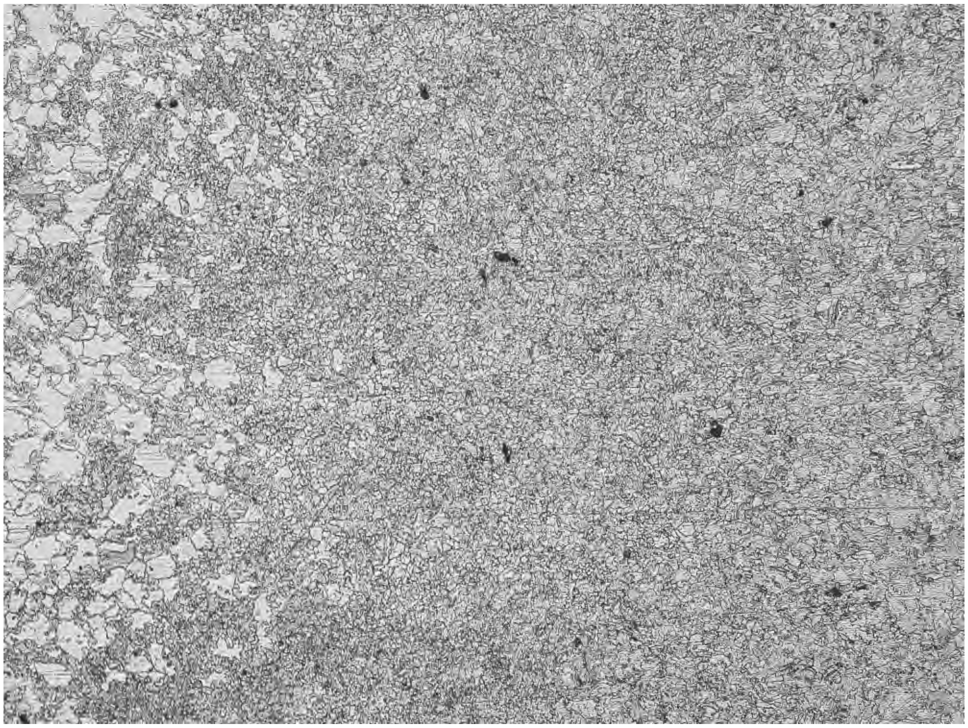
Fig. 39. Replica No. FSIH-R5.



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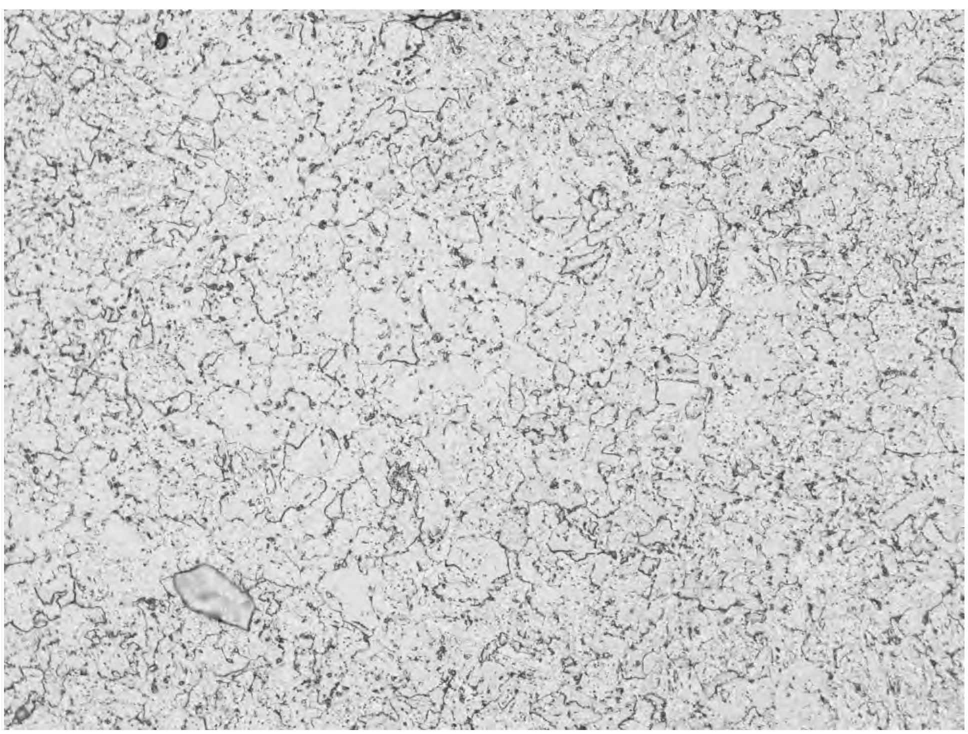

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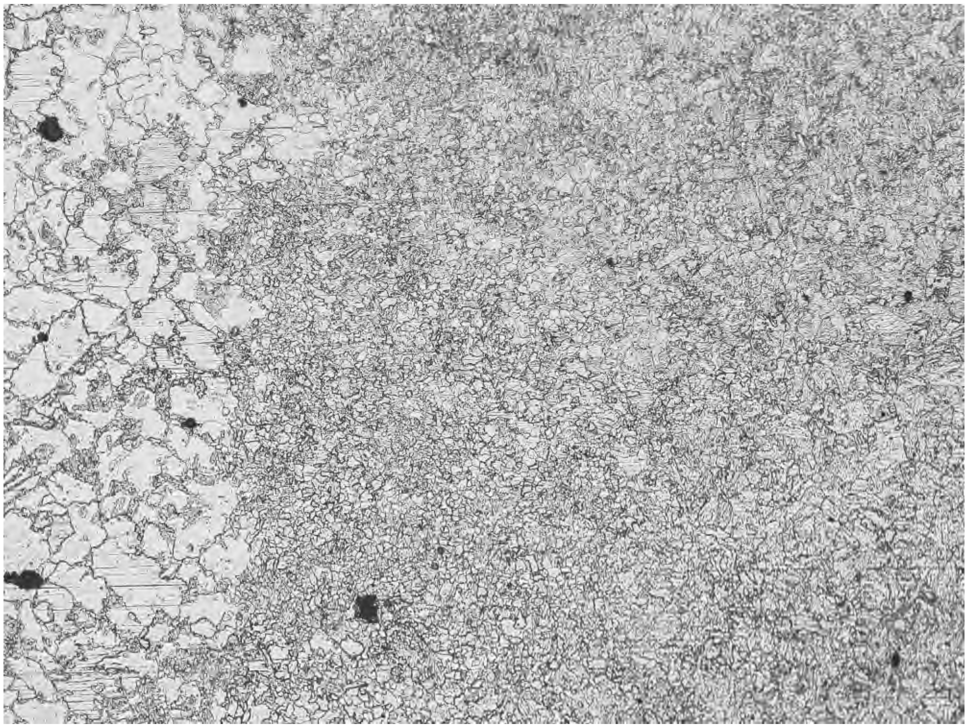
Fig. 40. Replica No. FSIH-R6.



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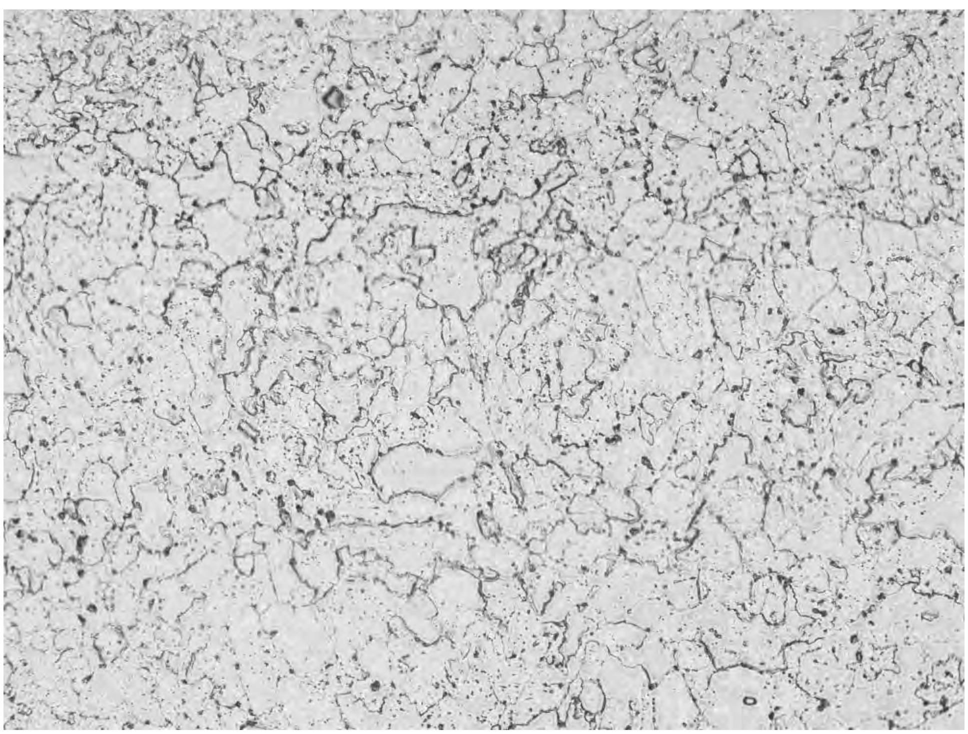

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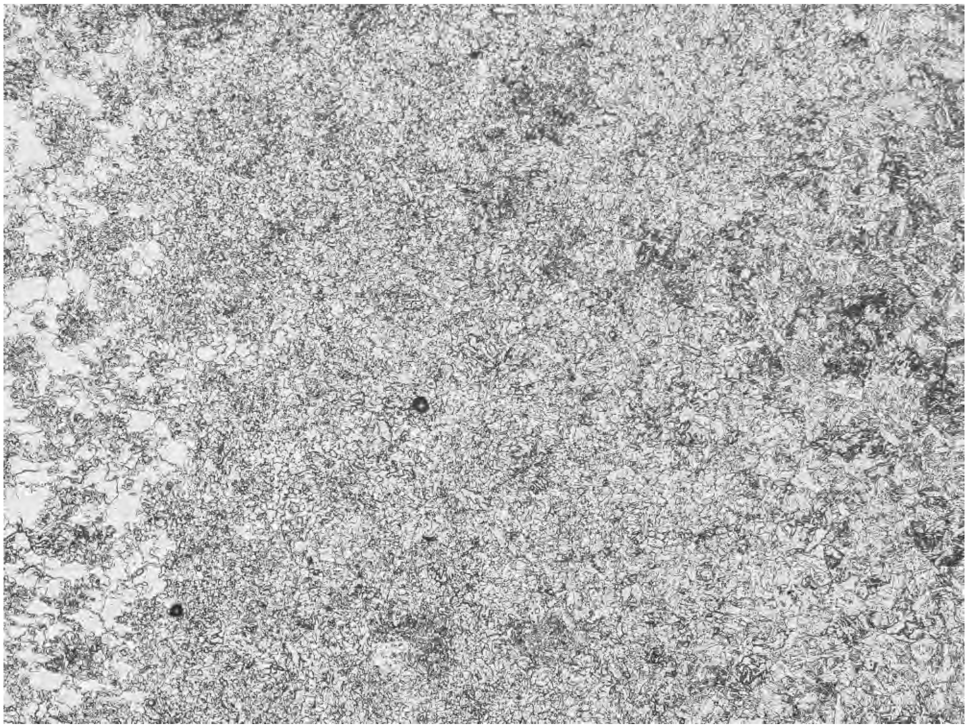
Fig. 41. Replica No. FSIH-R7.



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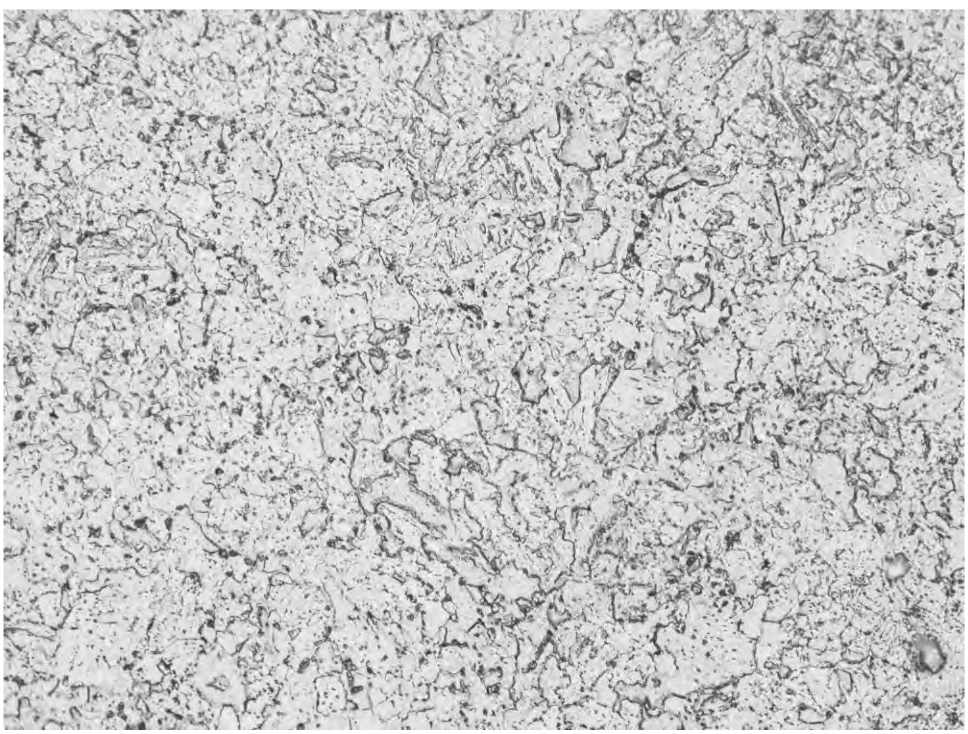

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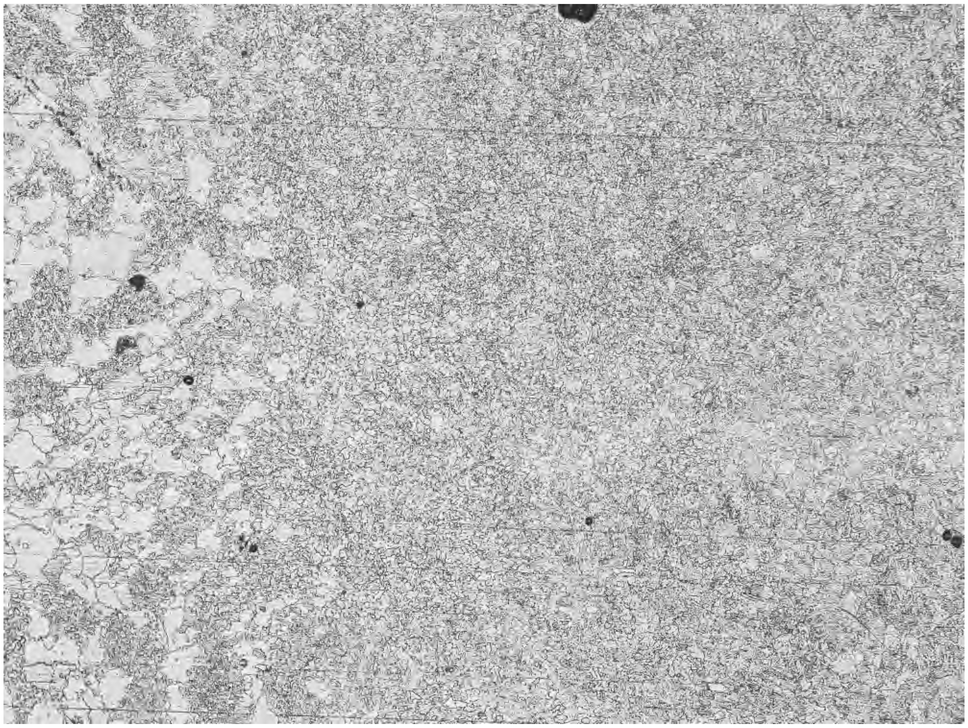
Fig. 42. Replica No. FSIH-R8.



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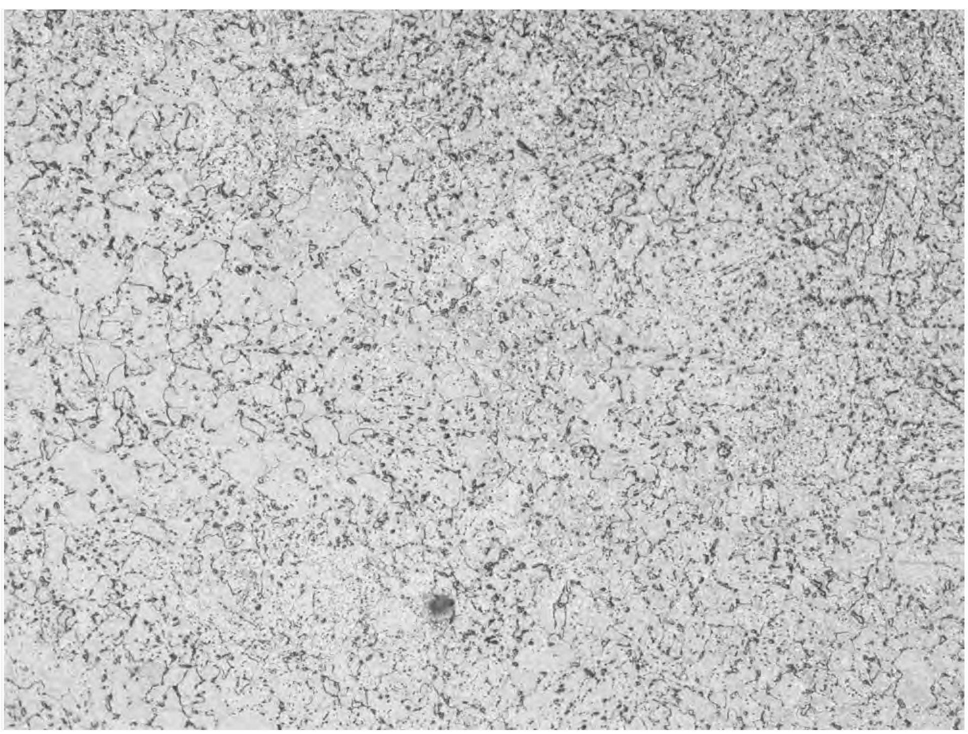

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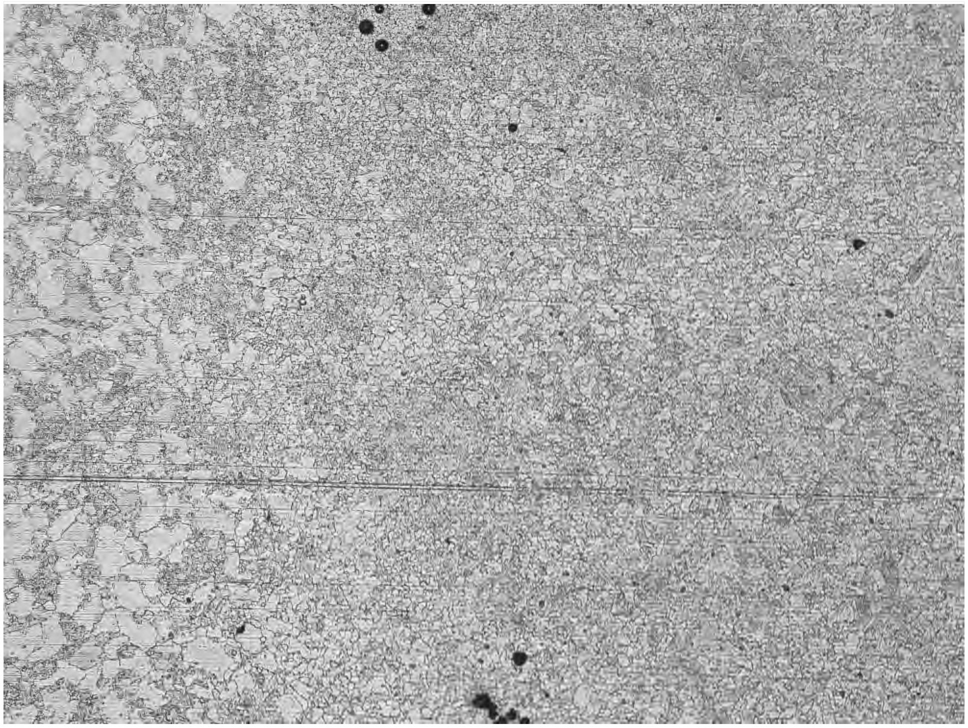
Fig. 43. Replica No. FSIH-R9.



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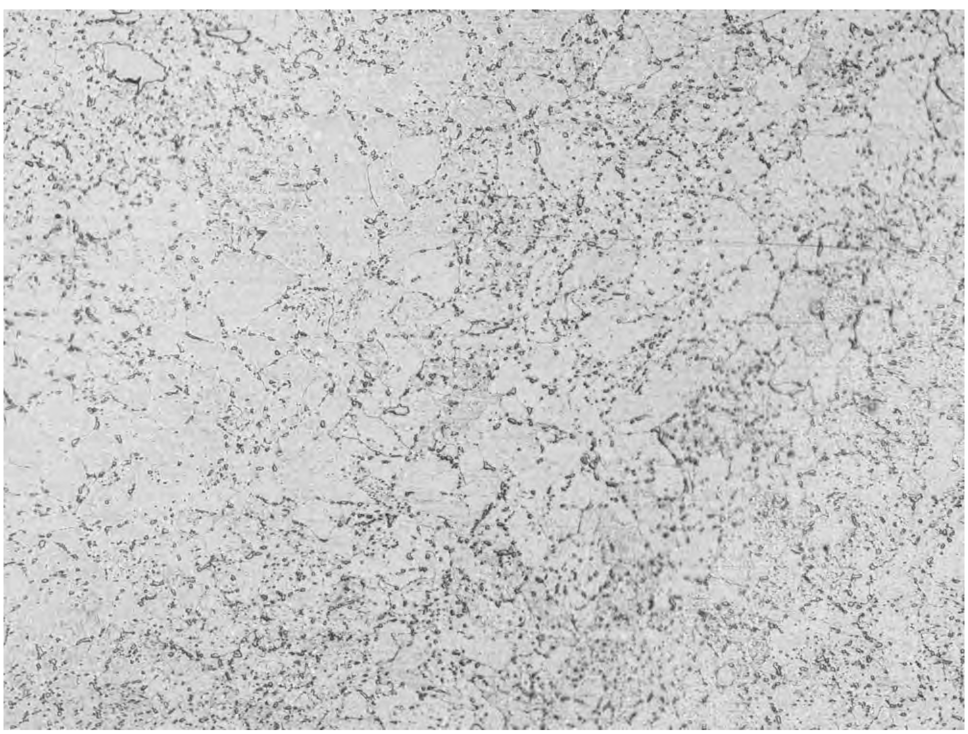

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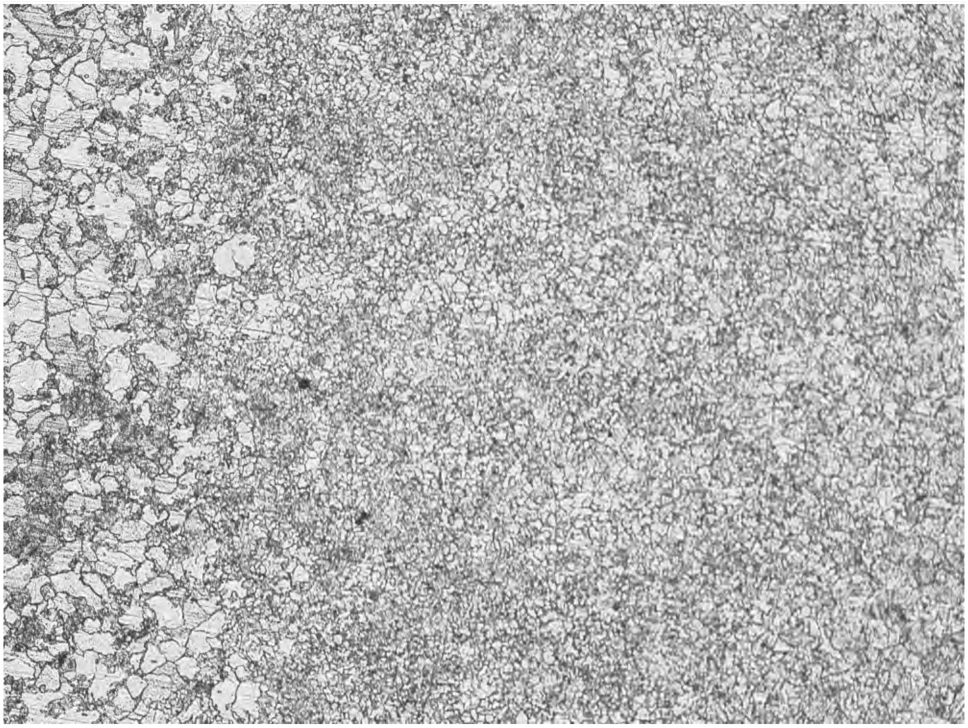
Fig. 44. Replica No. FSIH-R10.



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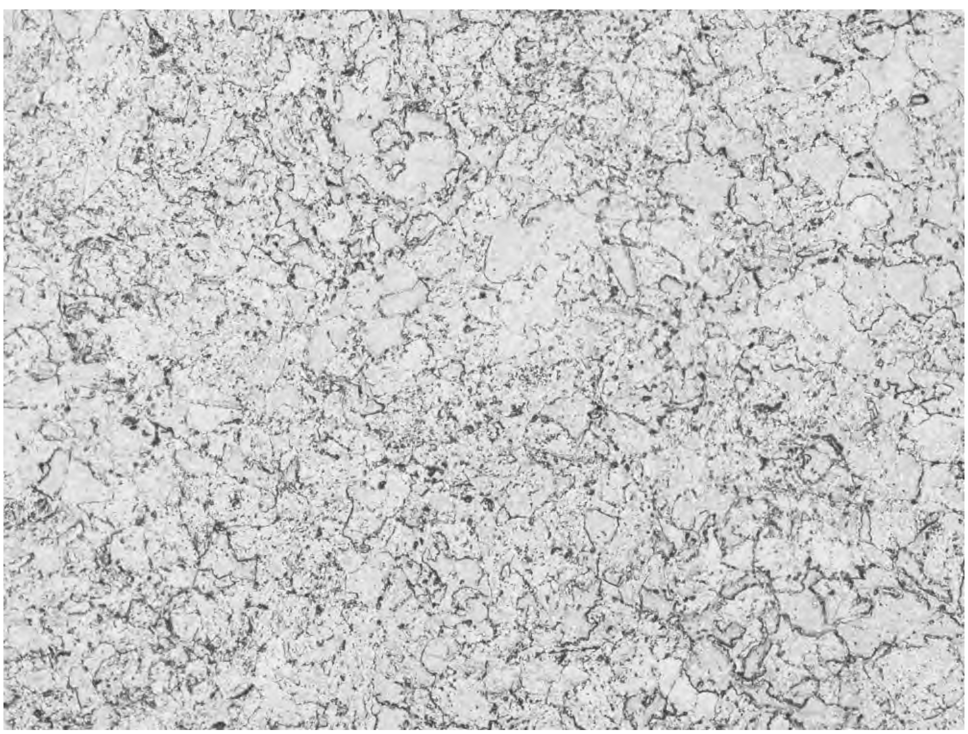

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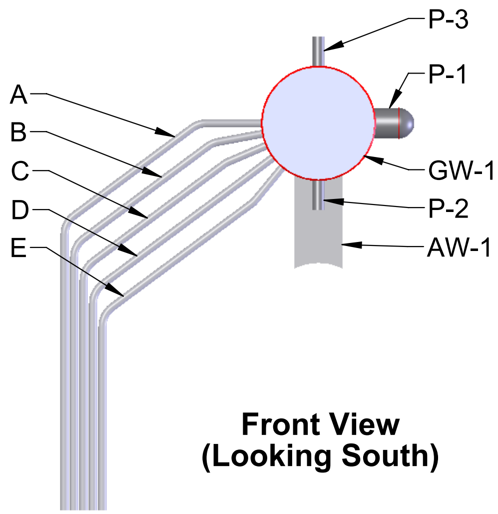
Fig. 45. Replica No. FSIH-R11.



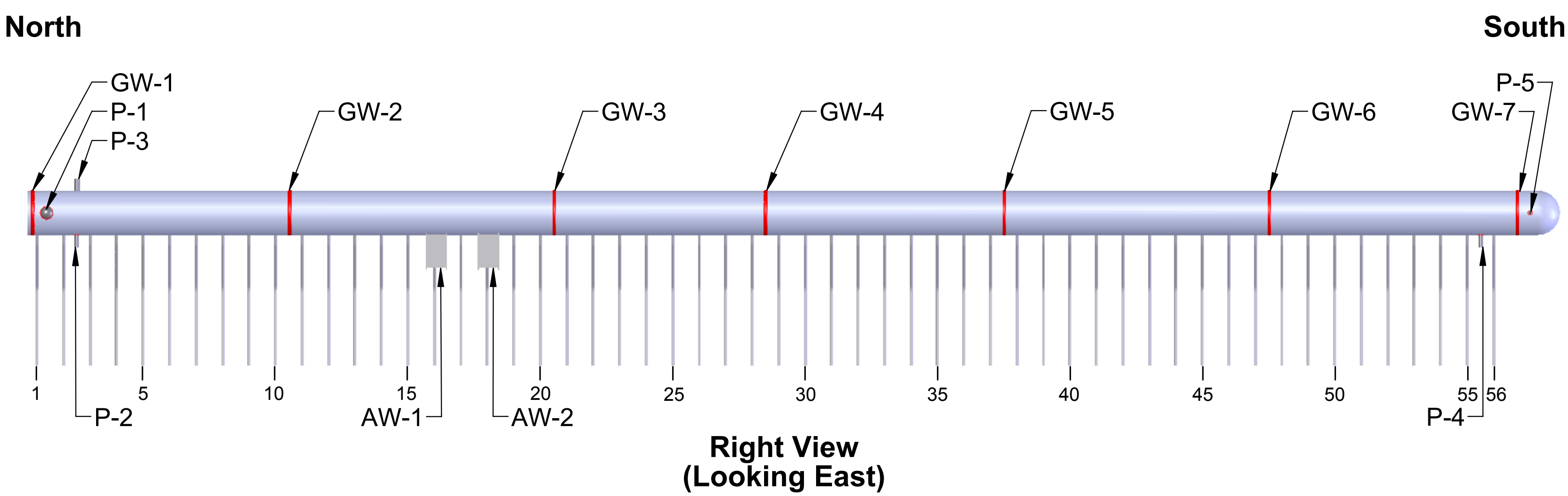


Fig. 46. Sketches of the Upper Finishing Superheater Outlet header

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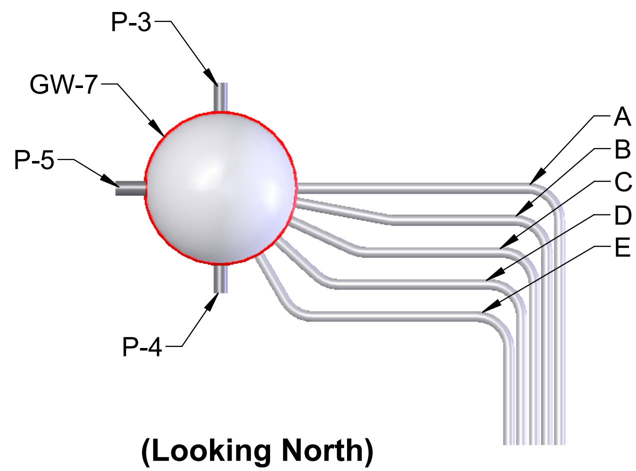


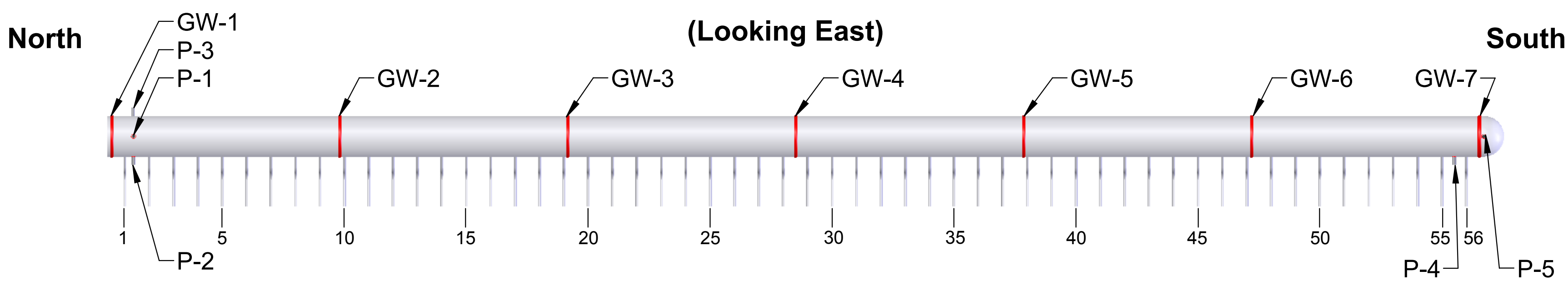


Fig. 47. Sketches of the Lower Finishing Superheater Outlet header

Thielsch

Fig. 48. Photographs of the inspection locations on the Upper Finishing Superheater Outlet header.

Fig. 49. Photographs of the inspection locations on the Upper Finishing Superheater Outlet header.

Fig. 50.

Photographs of the inspection locations on the Upper Finishing Superheater Outlet header.

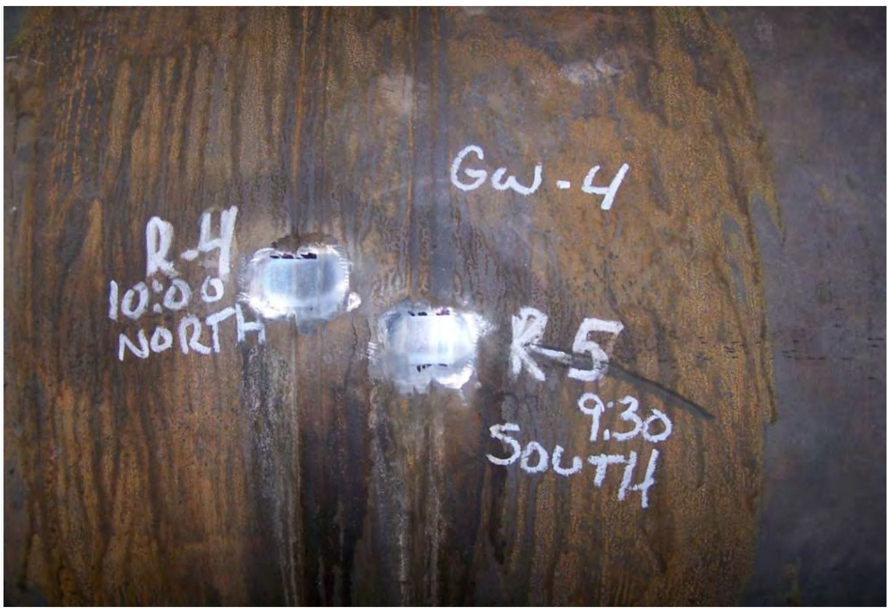


Fig. 51. Photographs of the inspection locations on the Upper Finishing Superheater Outlet header.

Fig. 52.

Photographs of the inspection locations on the Lower Finishing Superheater Outlet header.

Fig. 53.

Photographs of the inspection locations on the Lower Finishing Superheater Outlet header.

Fig. 54.

Photographs of the indications in the tube stubs on the Upper Finishing Superheater Outlet header.

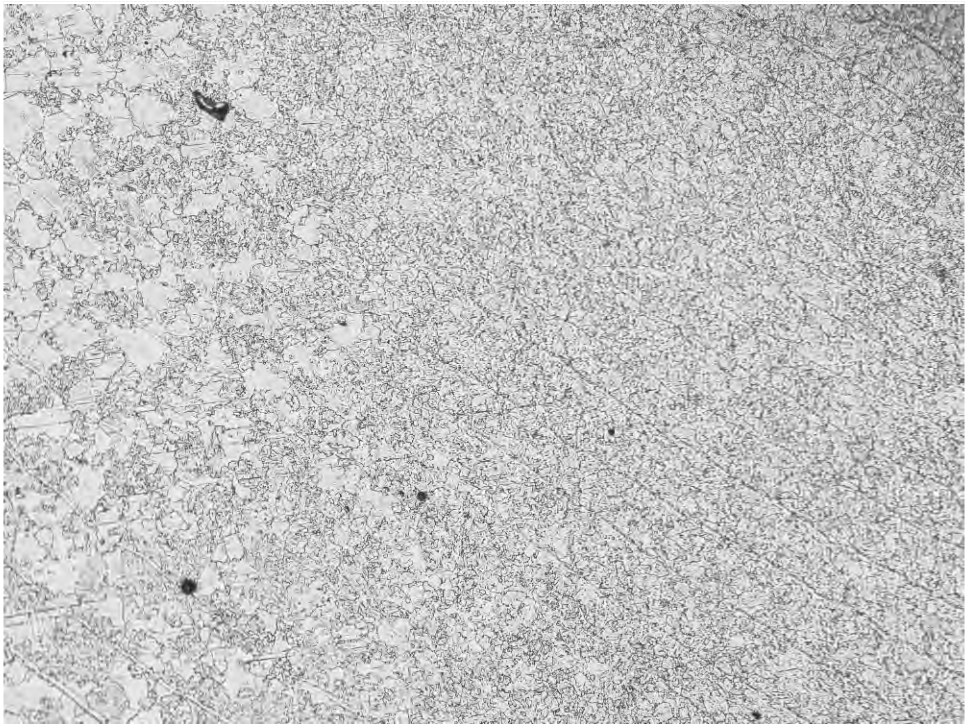
Fig. 55.

Photographs of the indications in the tube stubs on the Upper Finishing Superheater Outlet header.

Fig. 56. Photographs of the indications in girth weld No. GW-4 on the Lower Finishing Superheater Outlet header.

Fig. 57.

Photographs of the indications in the tube stubs on the Lower Finishing Superheater Outlet header.



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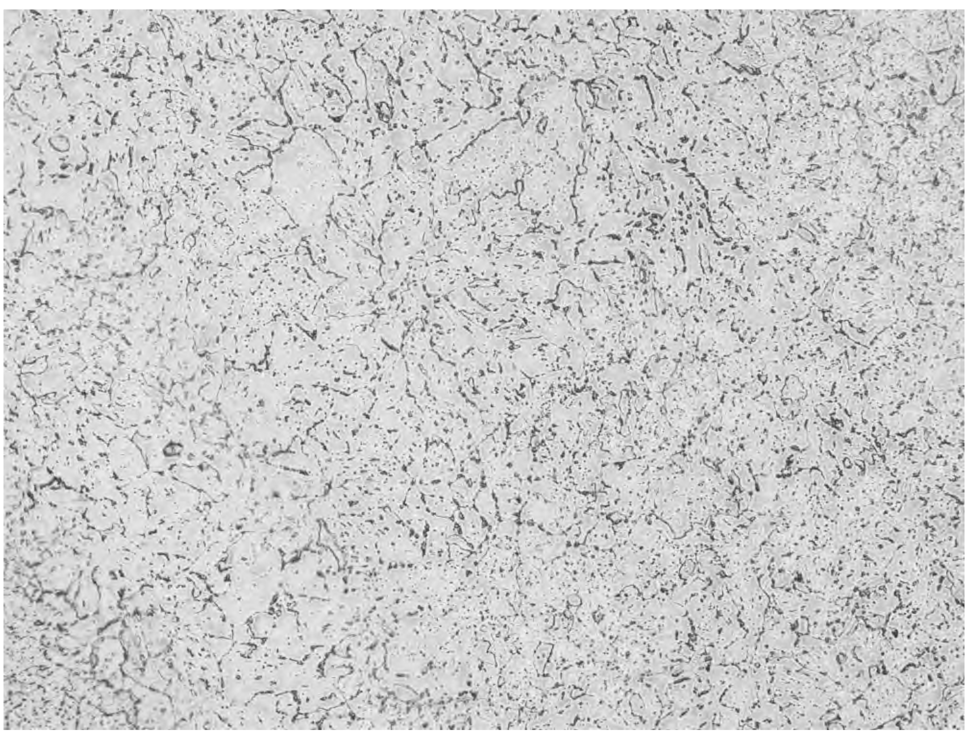
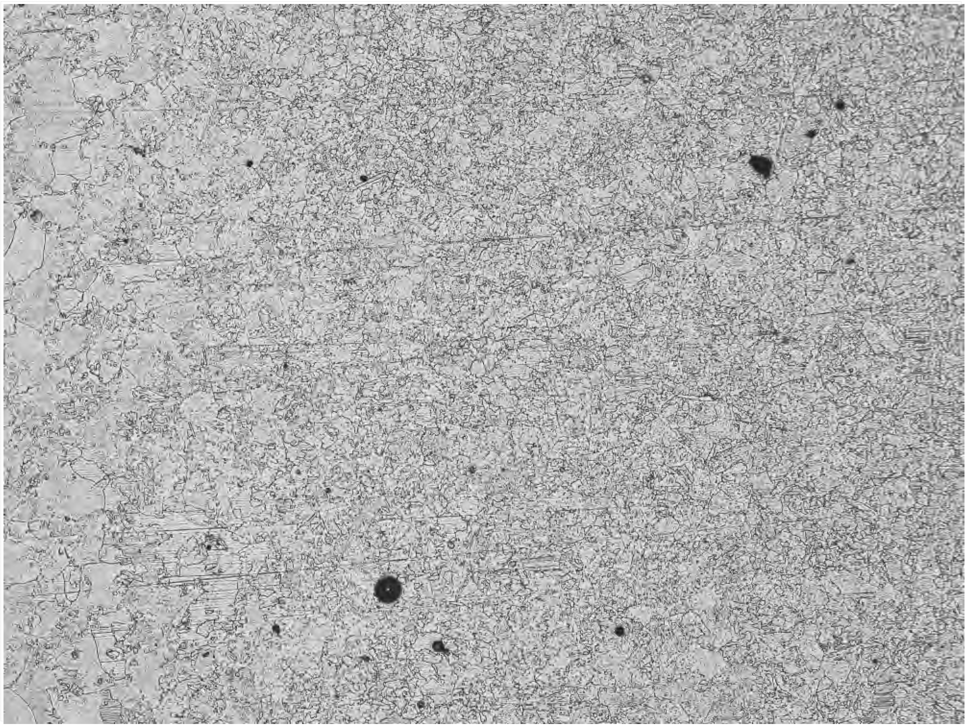


500X

Fig. 58. Replica No. UFSHOH-R1.



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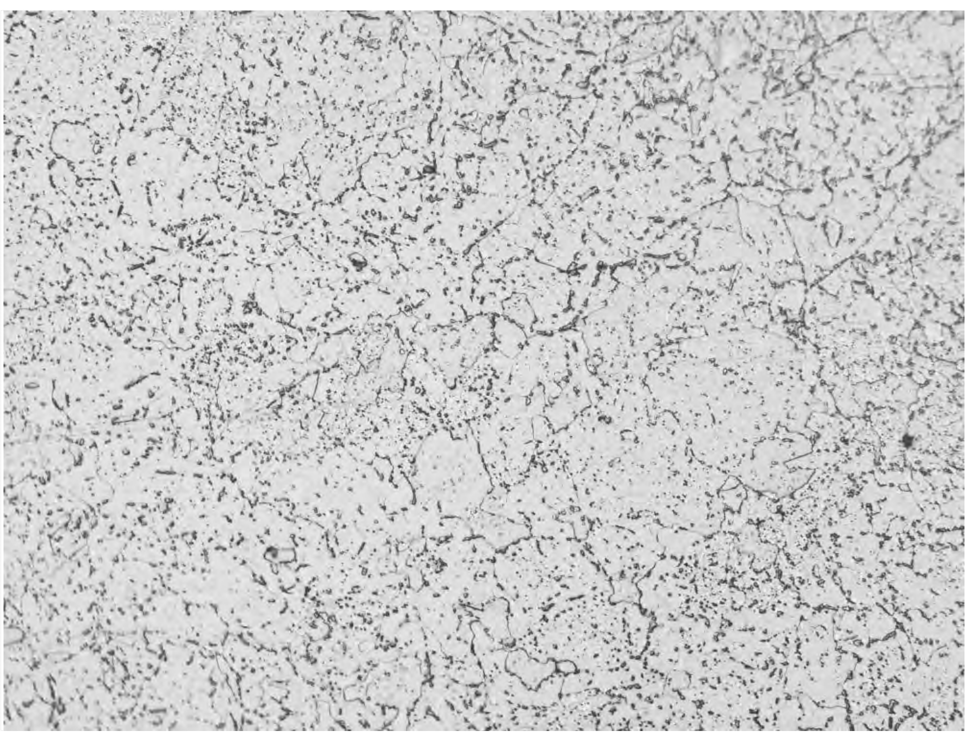

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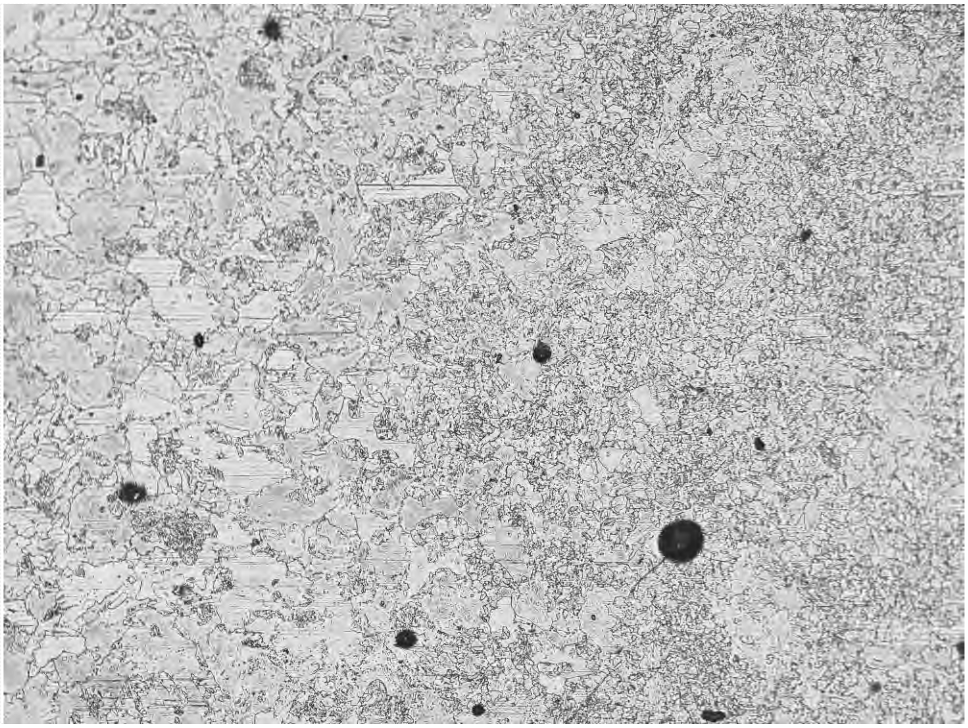
Fig. 59. Replica No. UFSHOH-R2.



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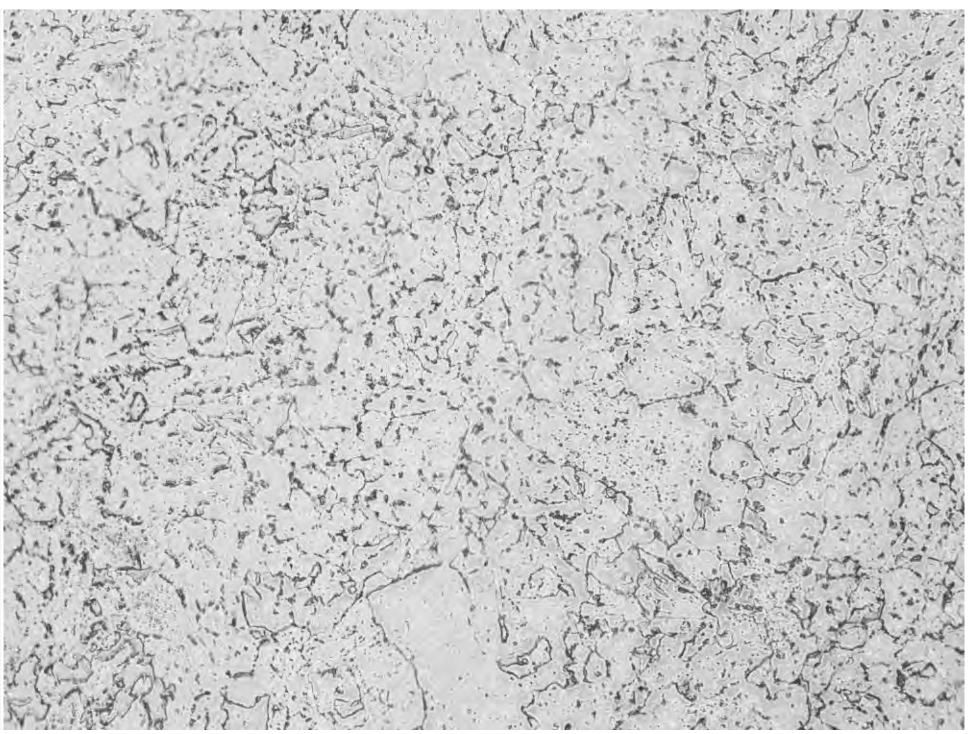

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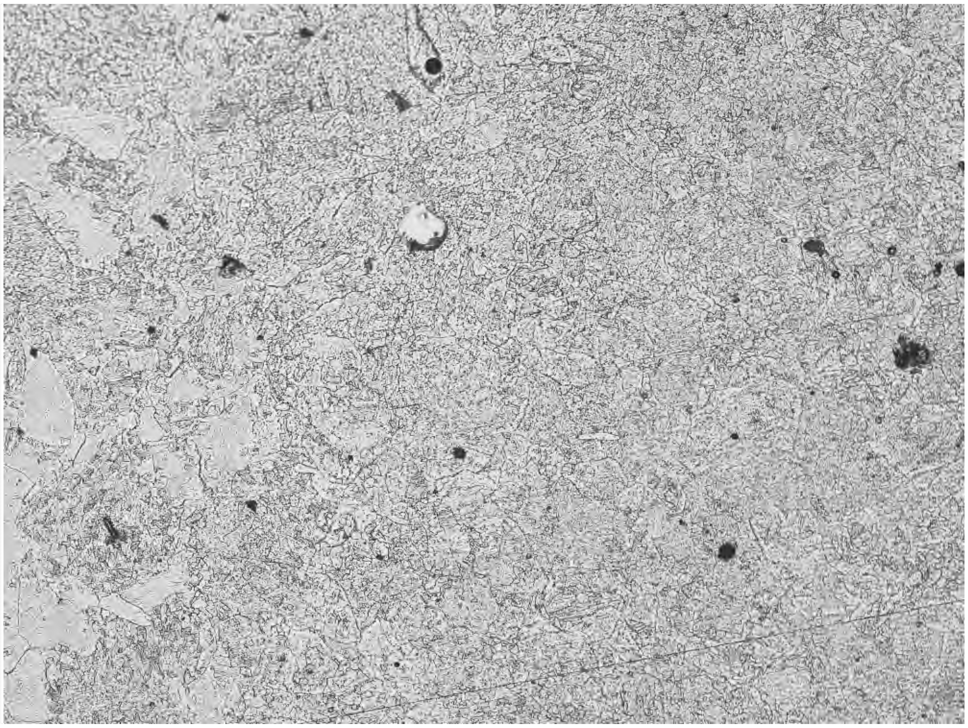
Fig. 60. Replica No. UFSHOH-R3.



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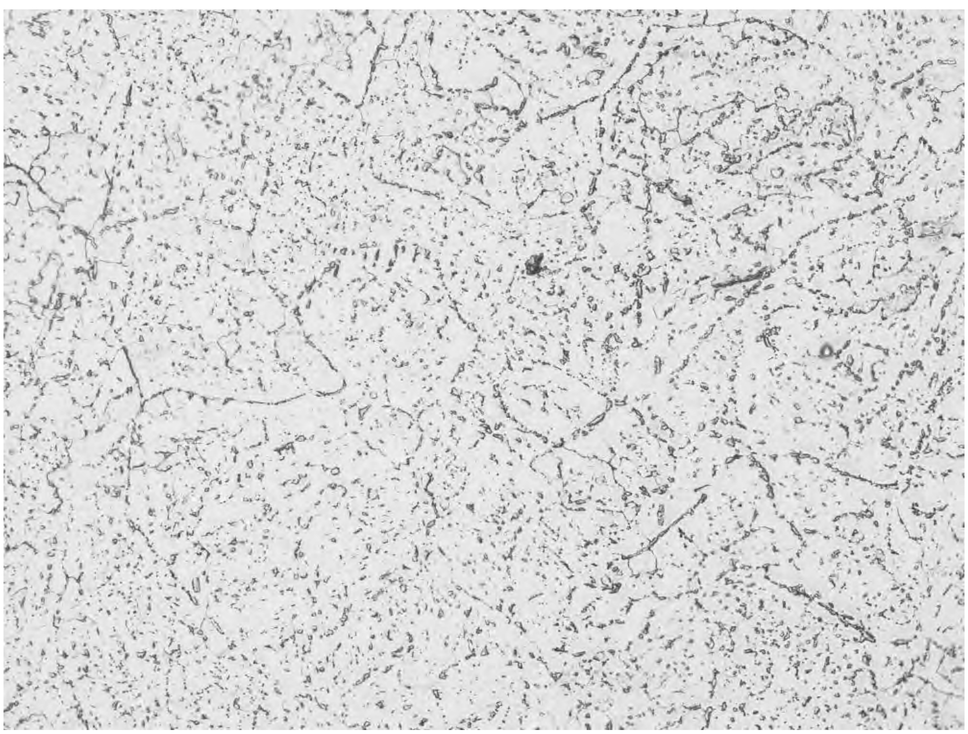
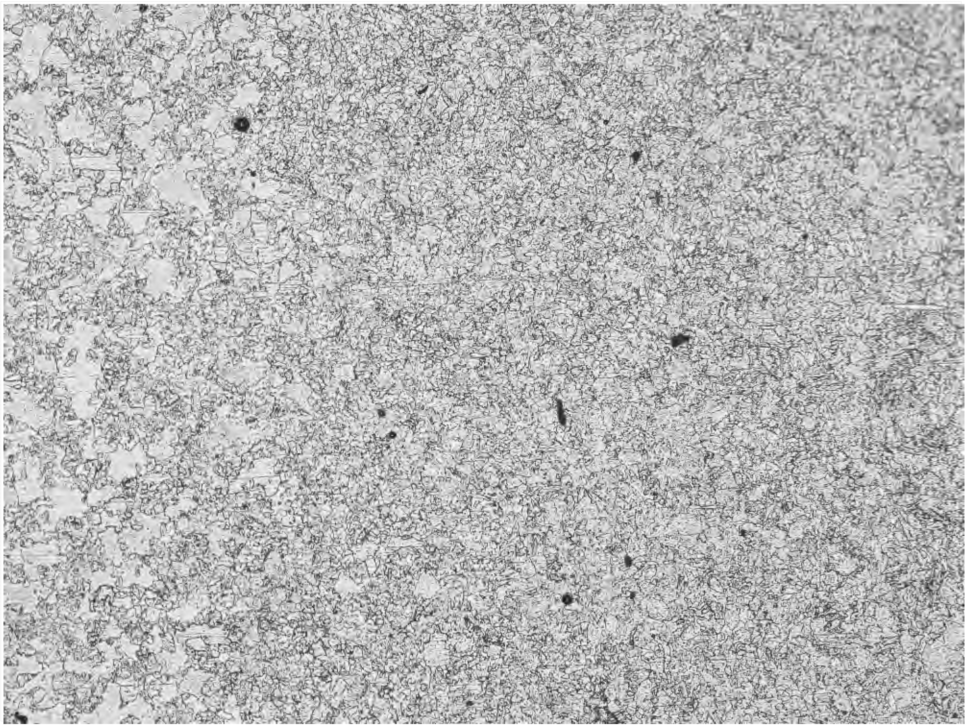


500X

Fig. 61. Replica No. UFSHOH-R4.



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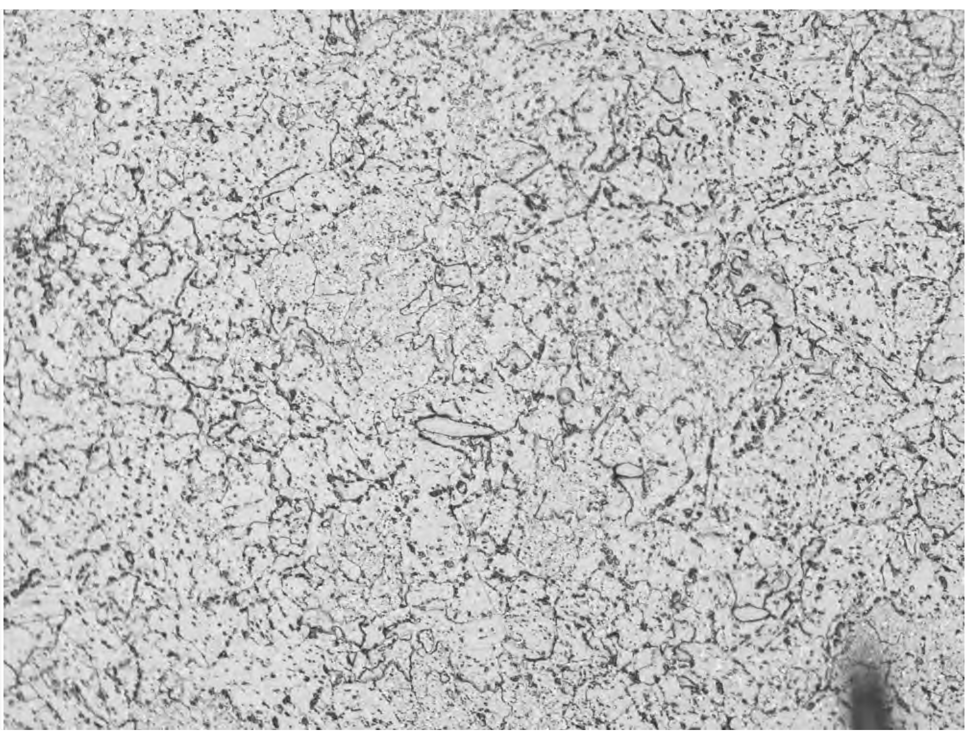
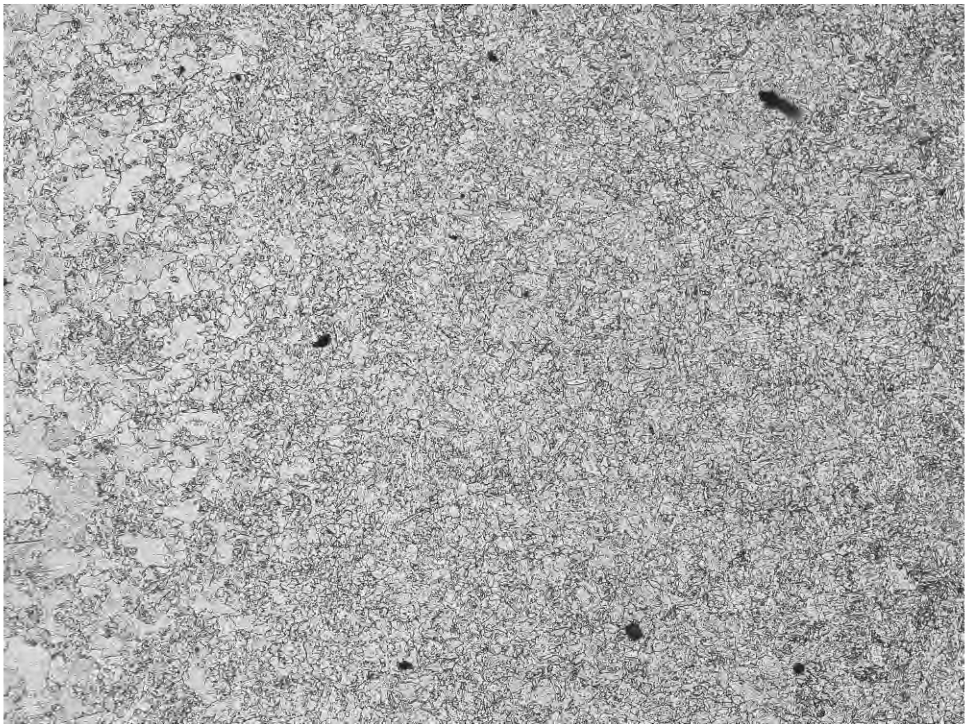


500X

Fig. 62. Replica No. UFSHOH-R5.



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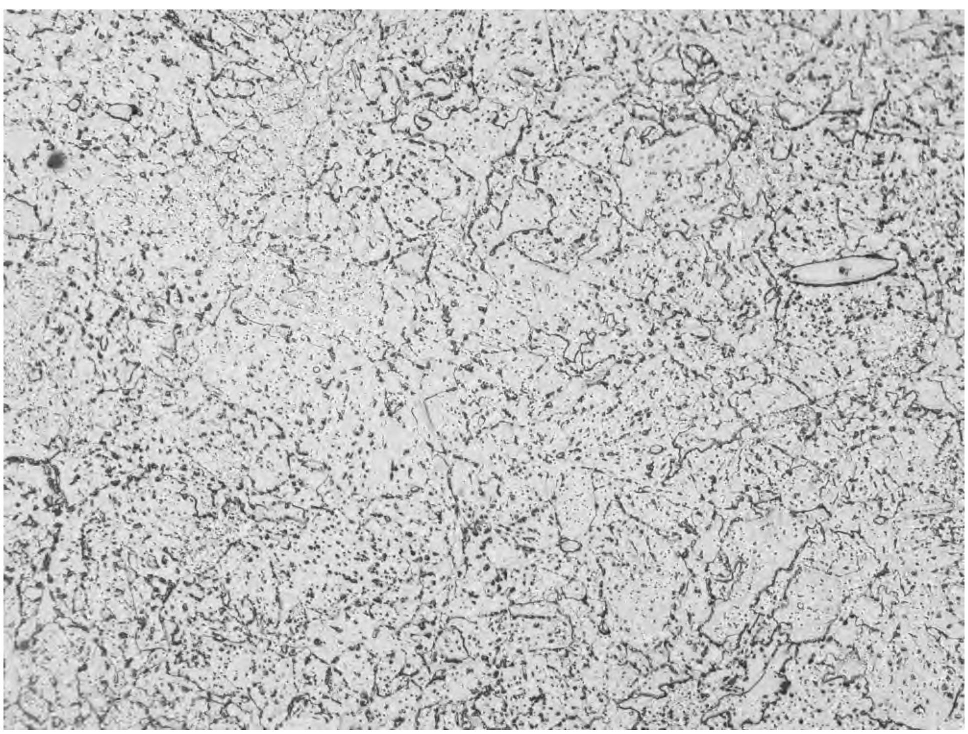
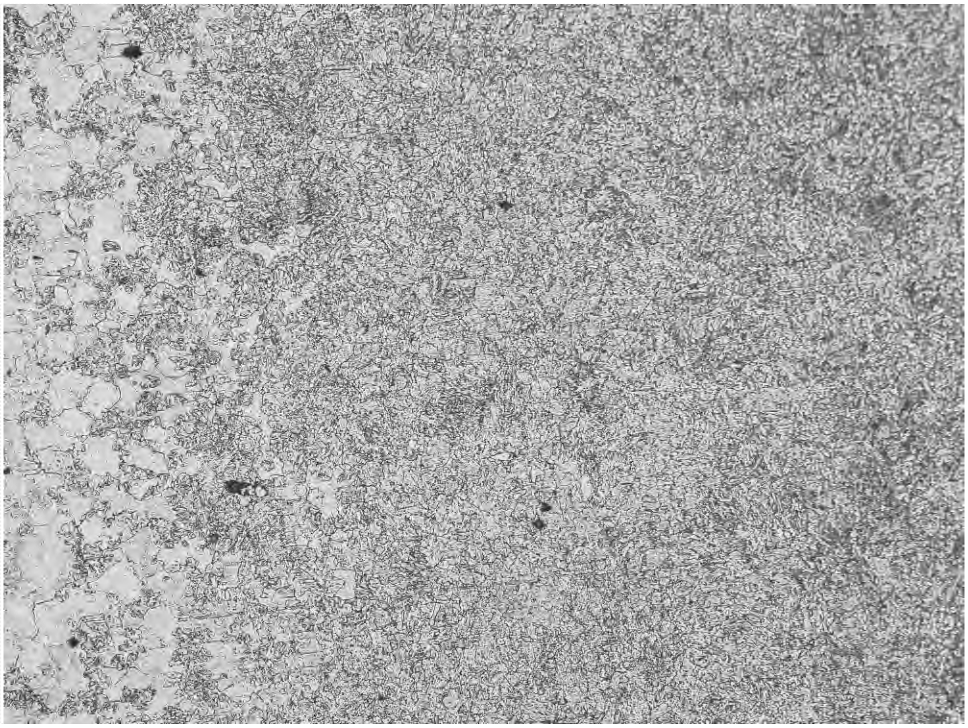


500X

Fig. 63. Replica No. UFSHOH-R6.



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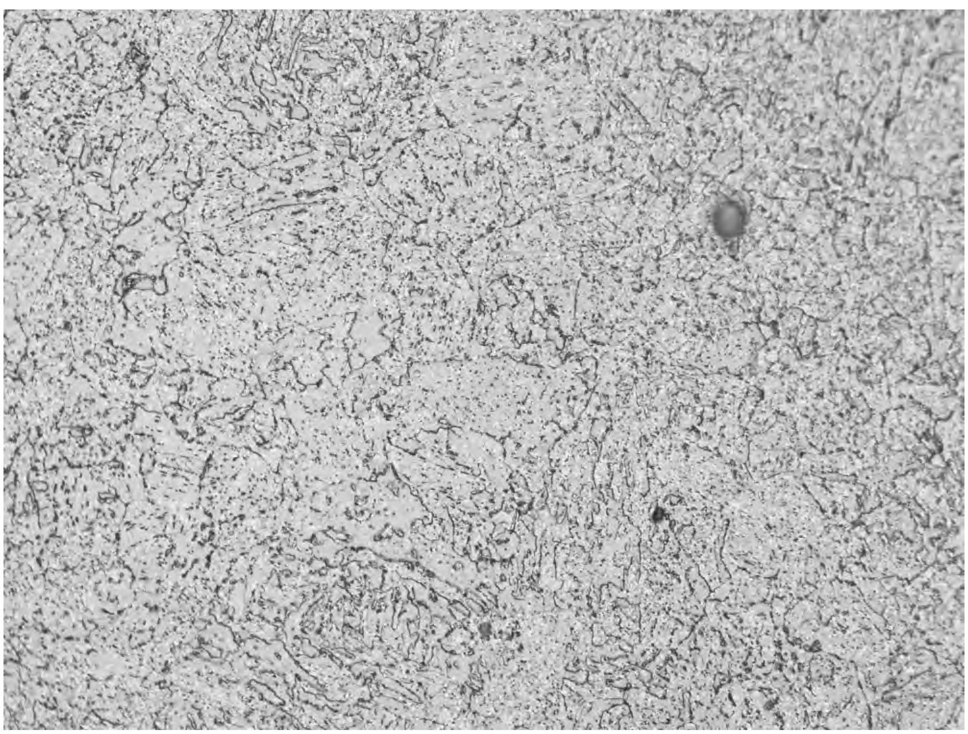

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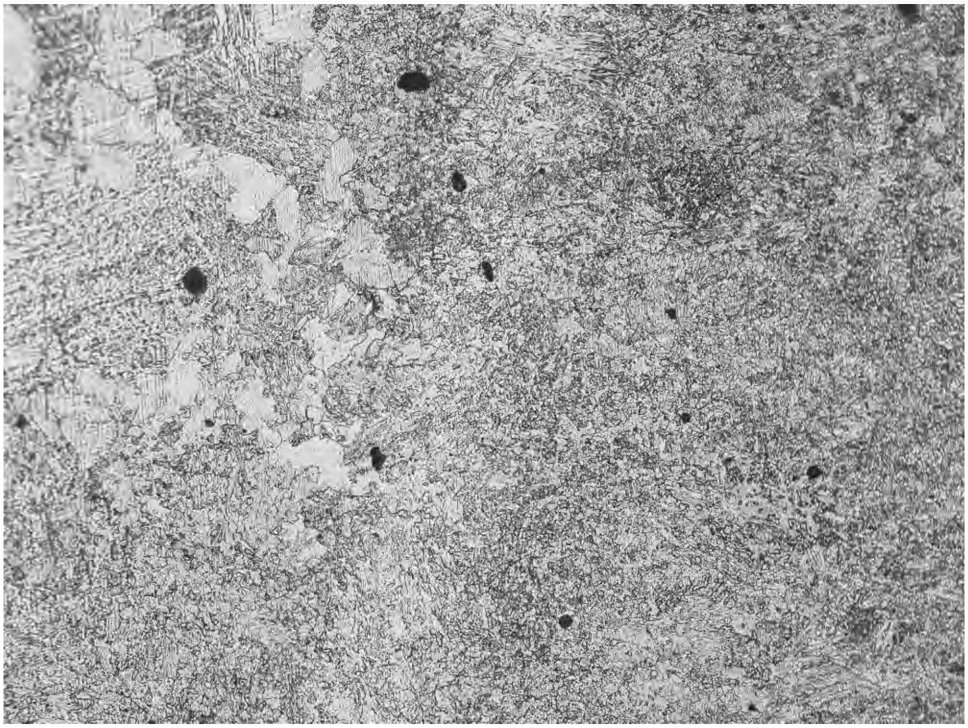
Fig. 64 Replica No. UFSHOH-R7.



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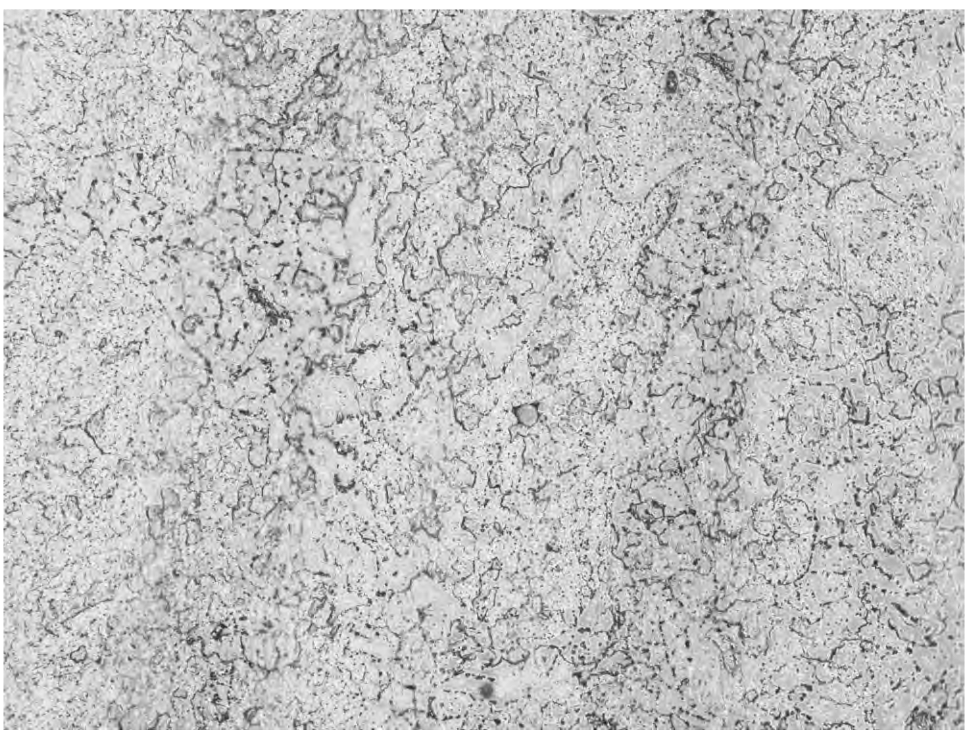
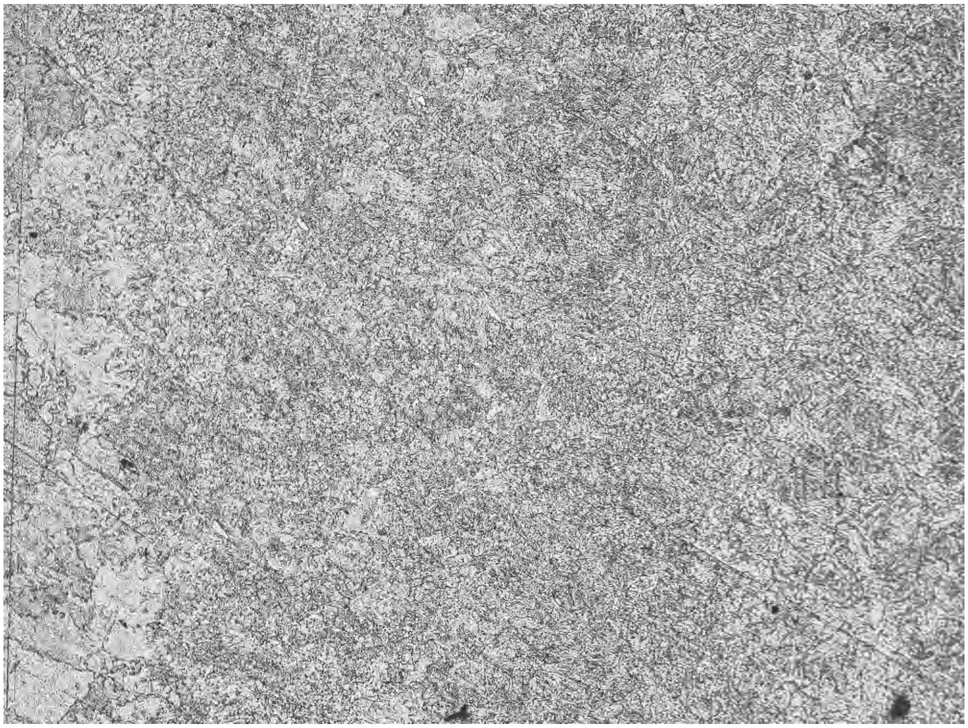


500X

Fig. 65. Replica No. UFSHOH-R8.



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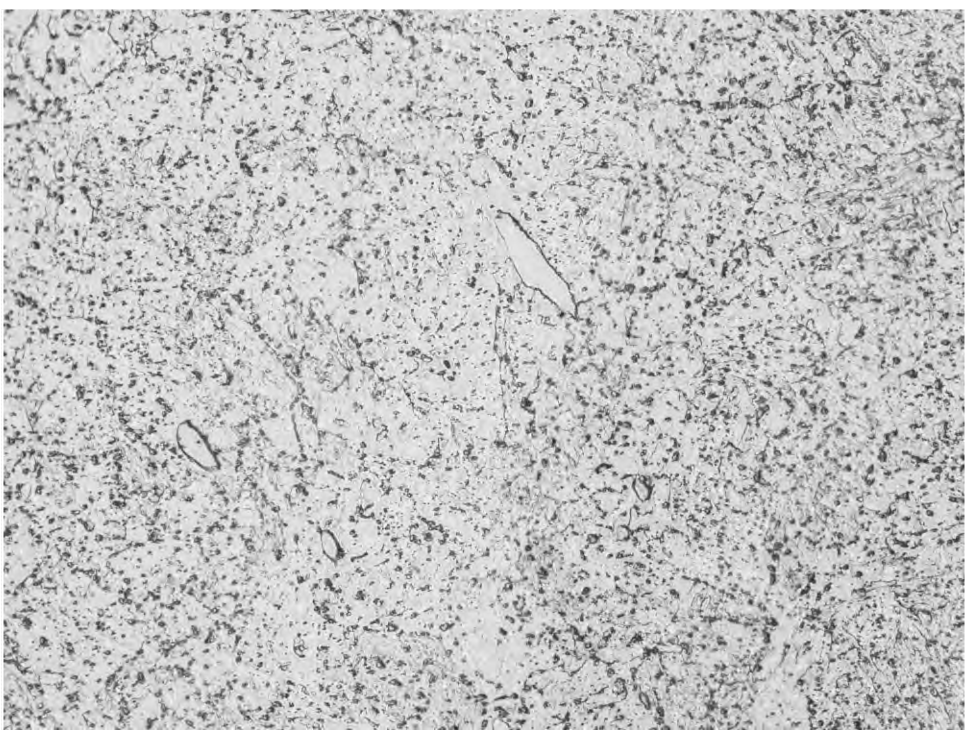

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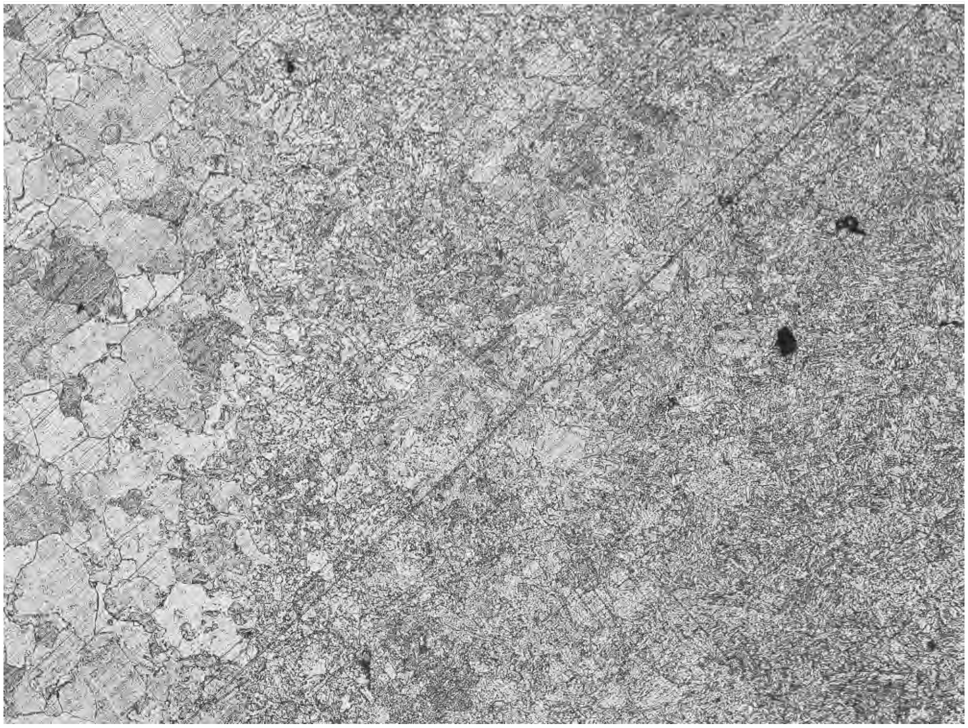
Fig. 66. Replica No. UFSOH-R1.



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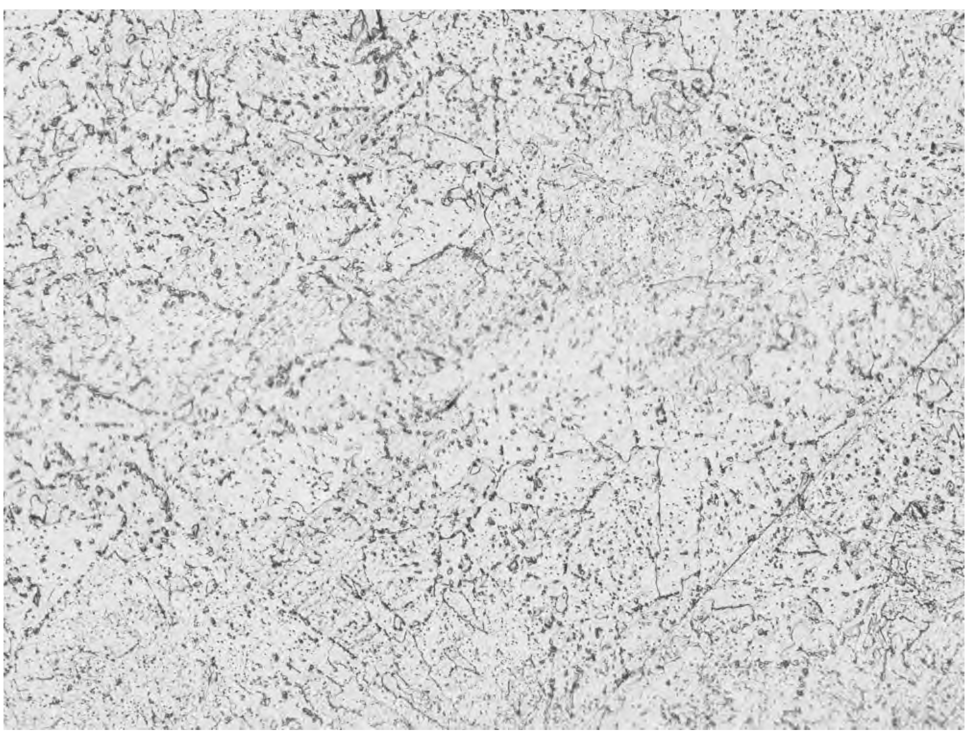

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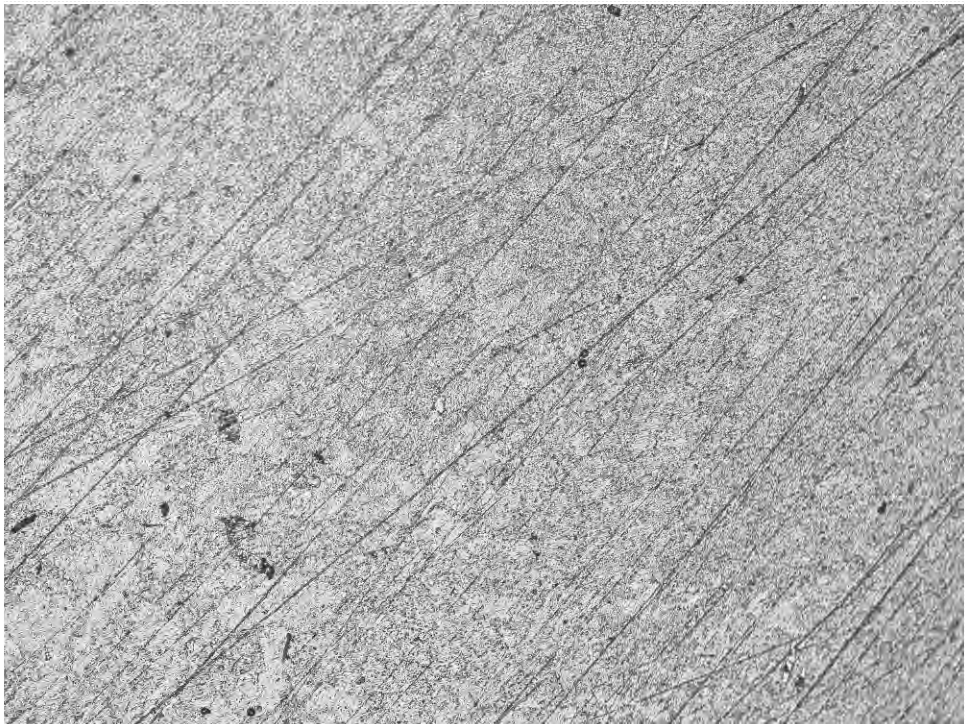
Fig. 67. Replica No. UFSOH-R2.



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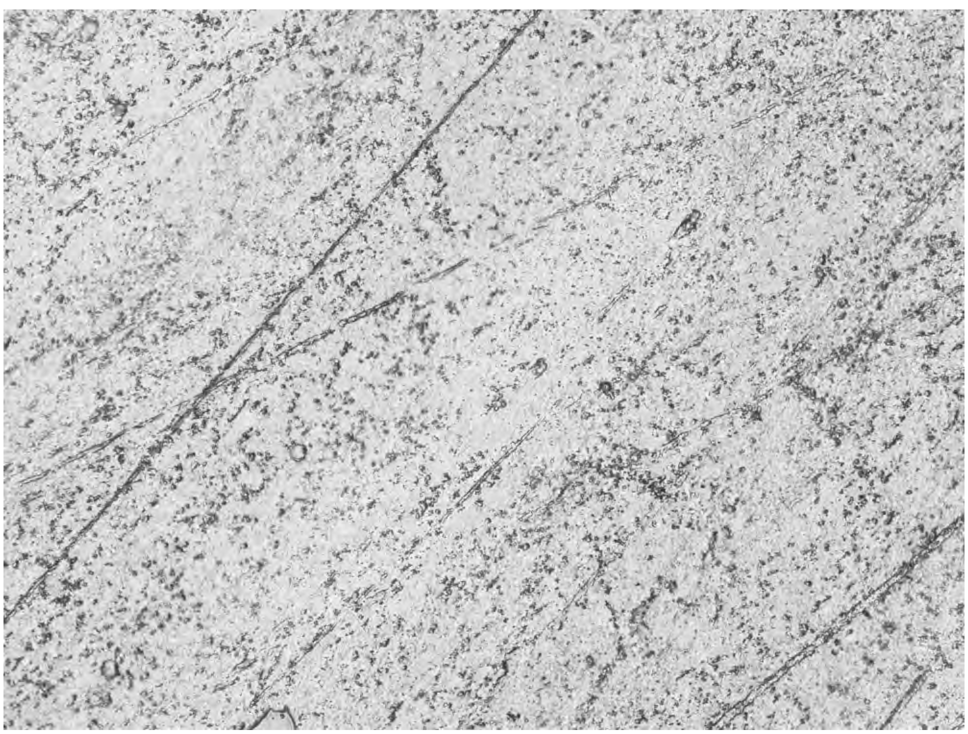

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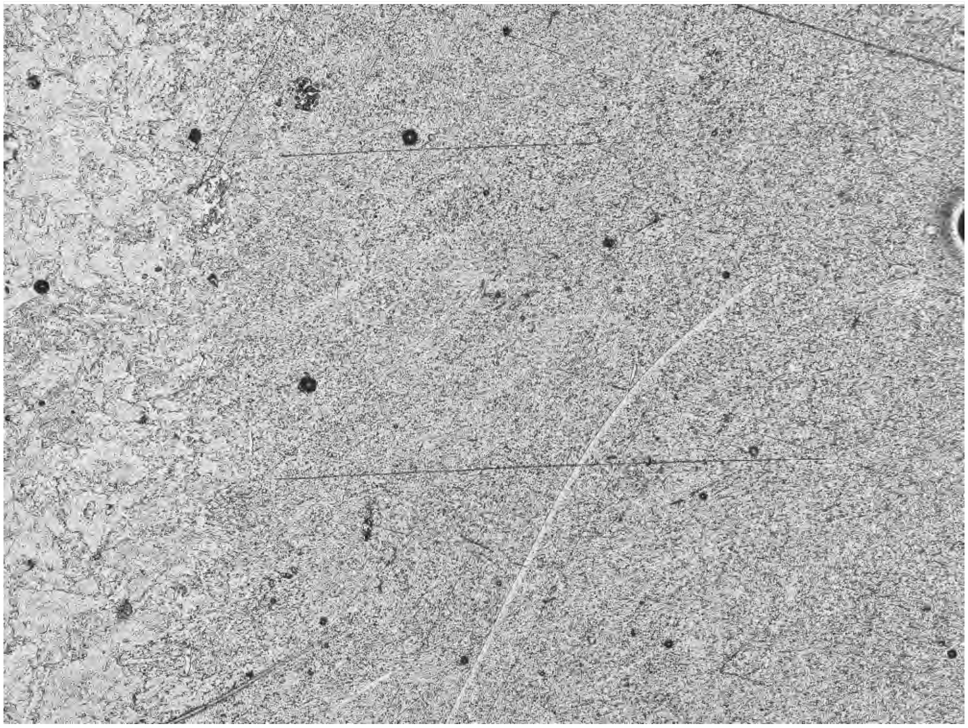
Fig. 68. Replica No. UFSOH-R3.



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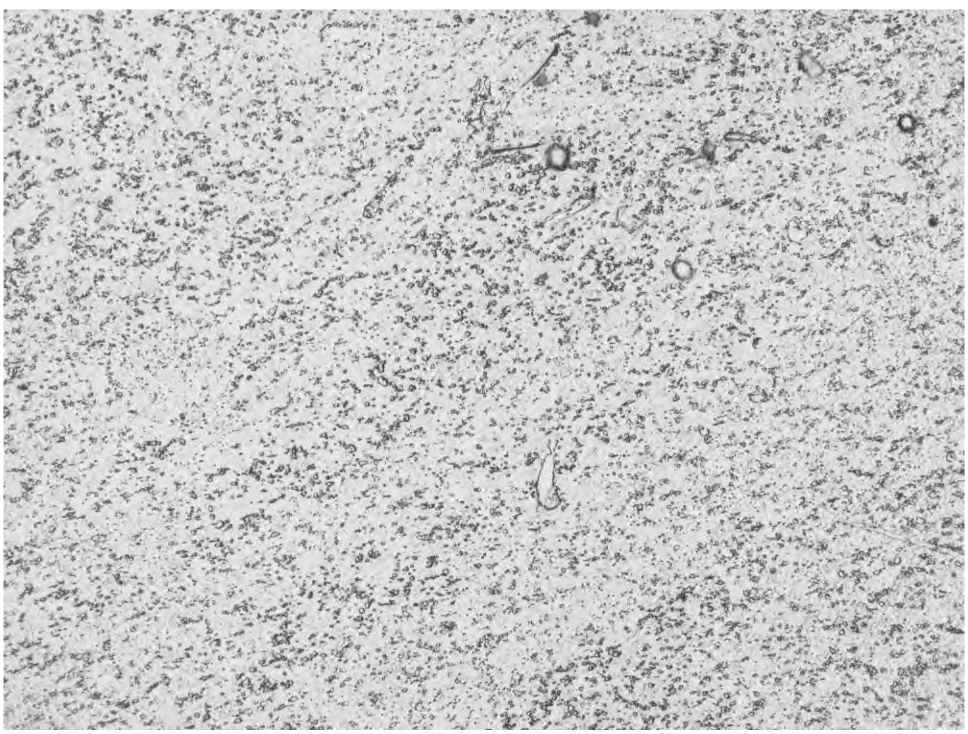

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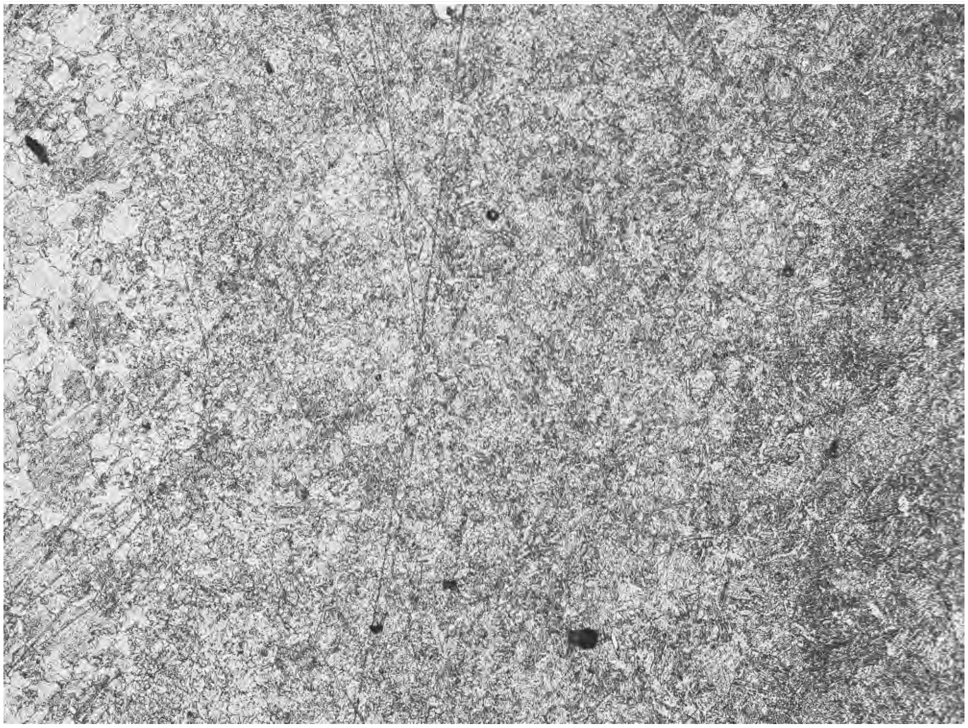
Fig. 69. Replica No. UFSOH-R4.



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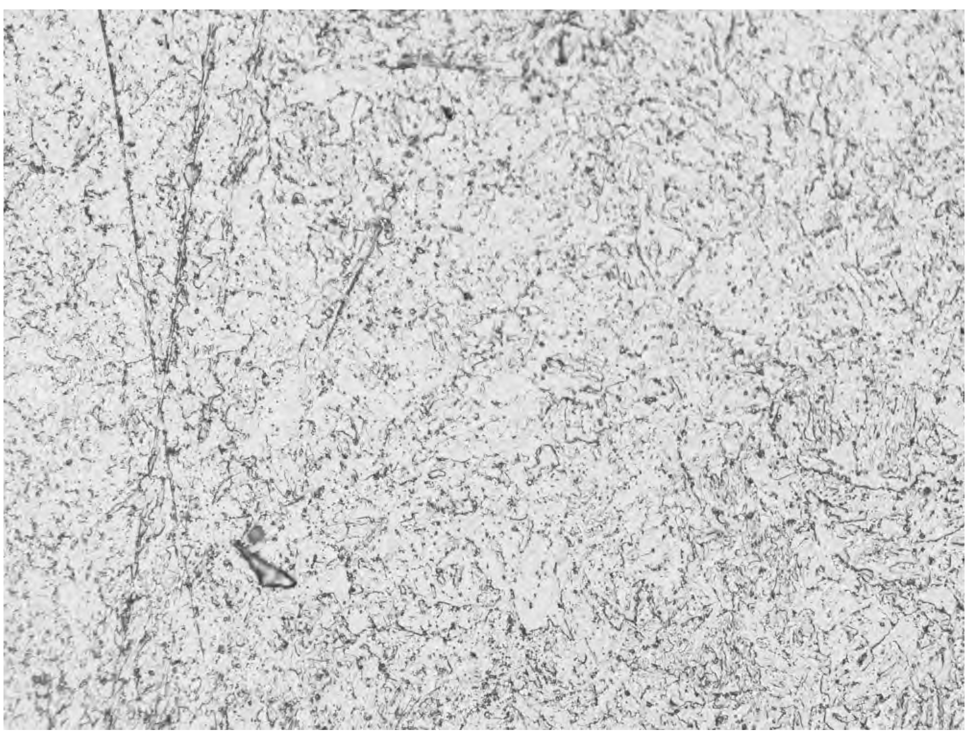

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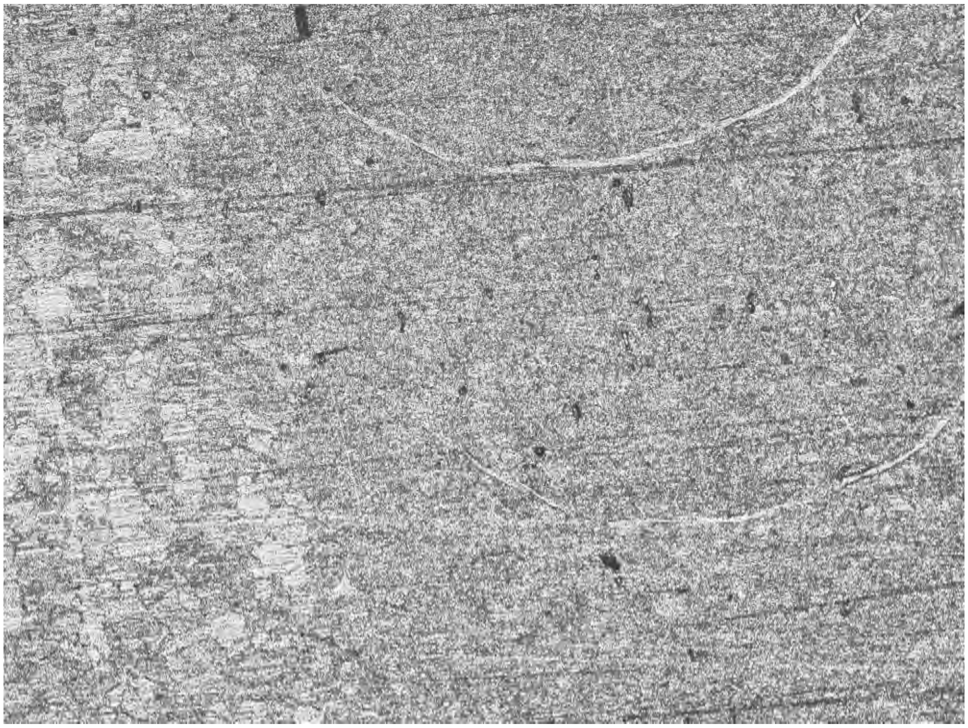
Fig. 70. Replica No. UFSOH-R5.



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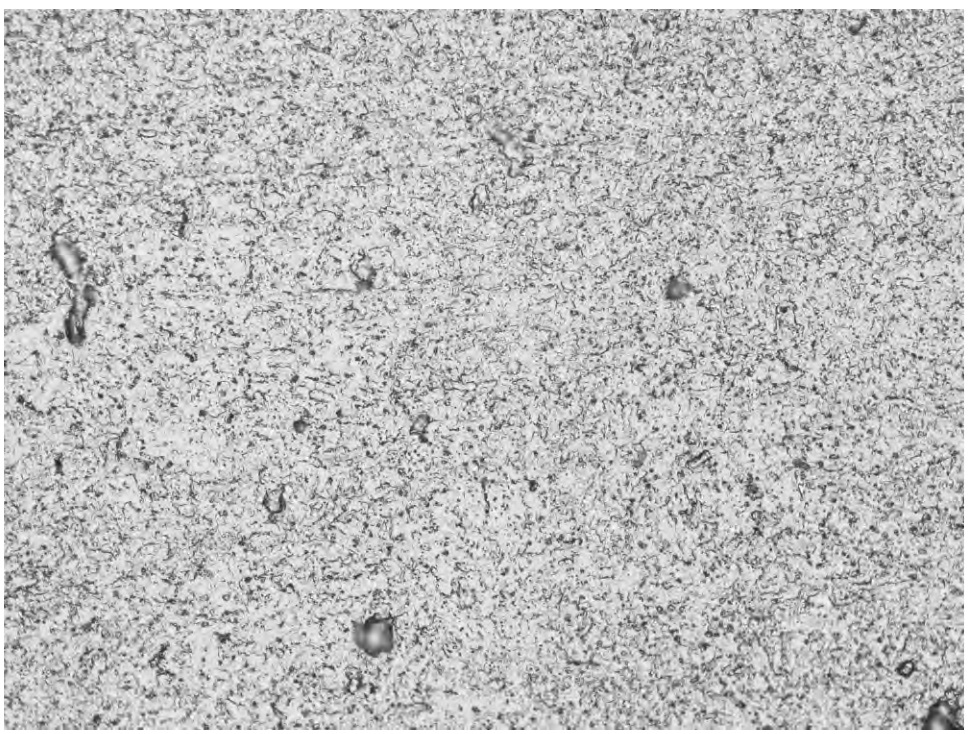

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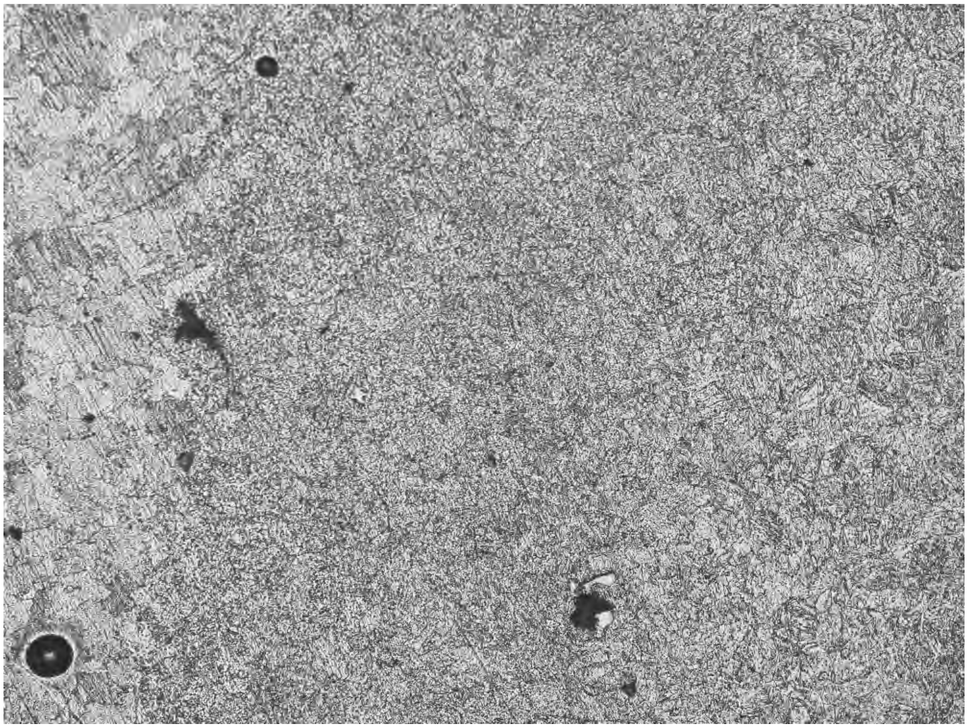
Fig. 71. Replica No. UFSOH-R6.



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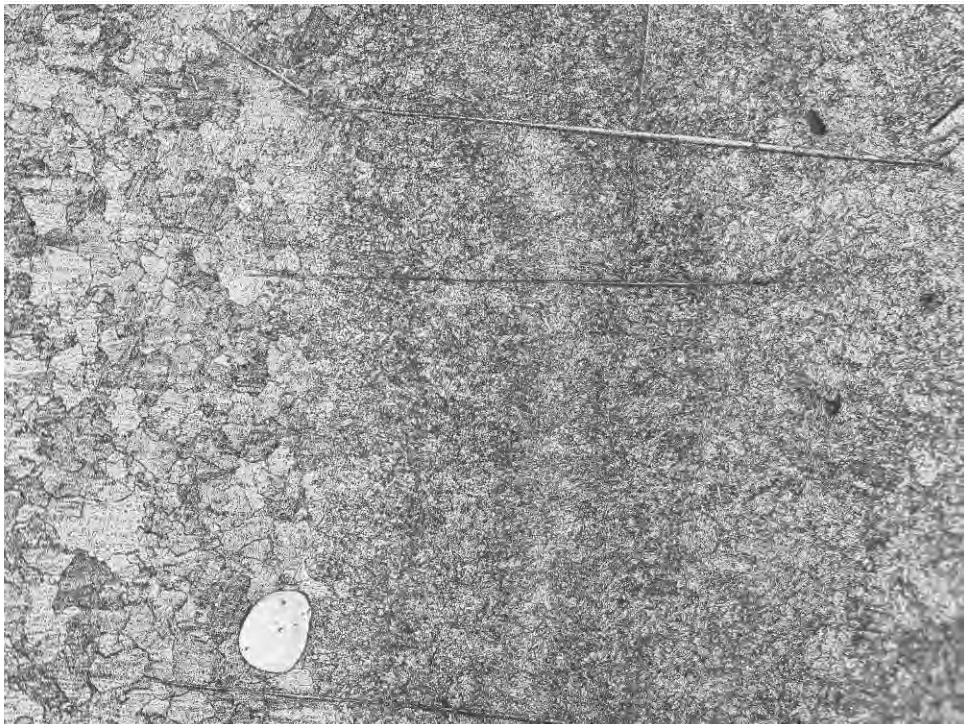
500X

Fig. 72. Replica No. UFSOH-R7.



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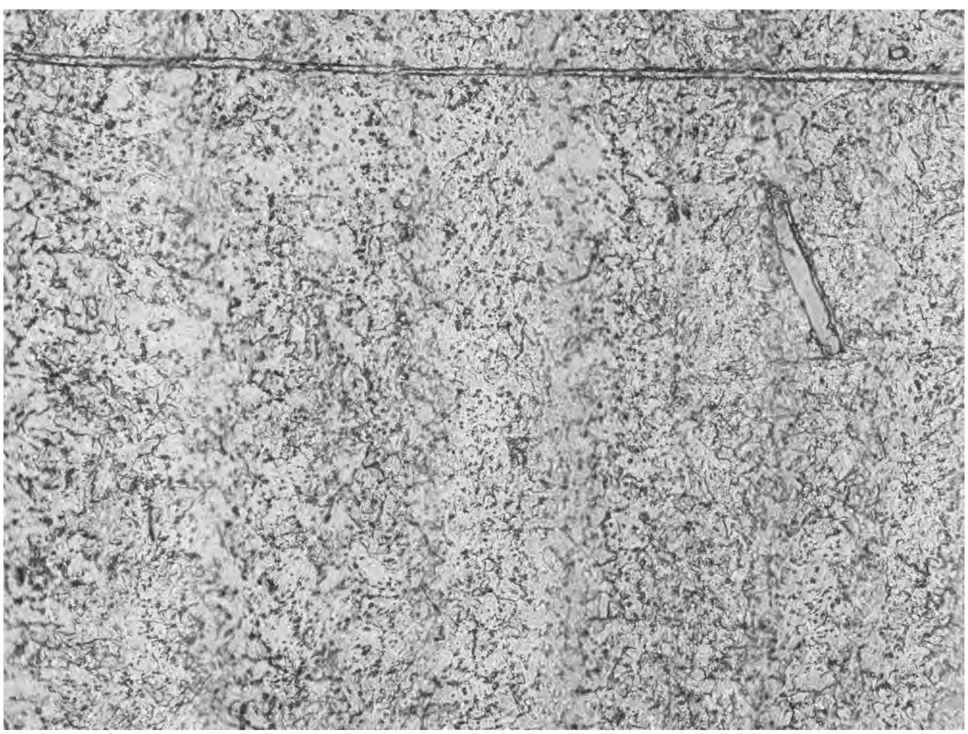

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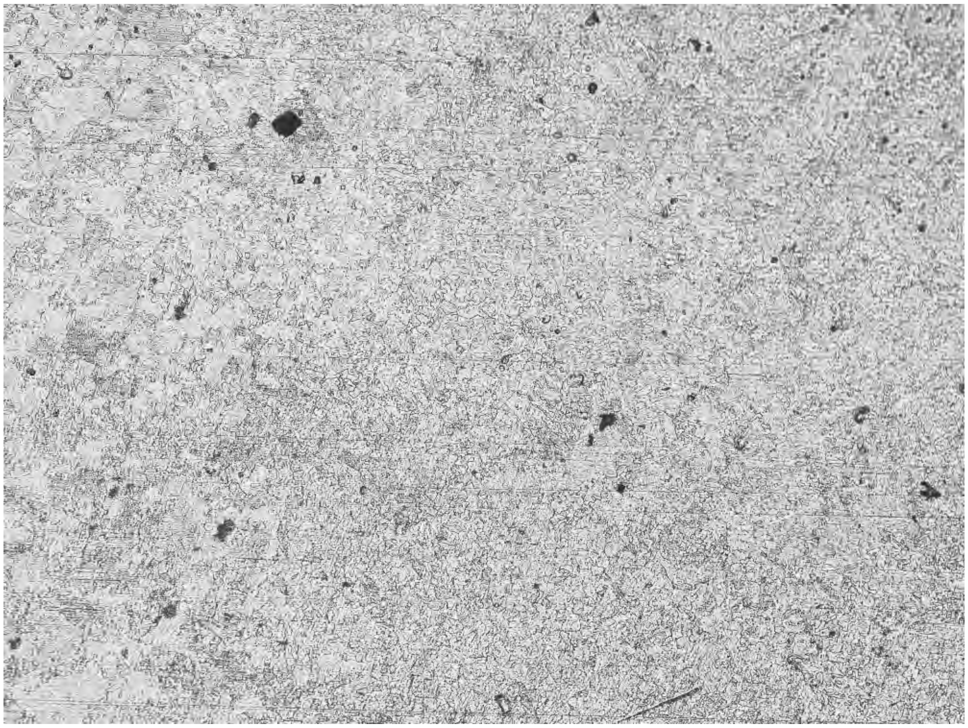
Fig. 73. Replica No. UFSOH-R8.



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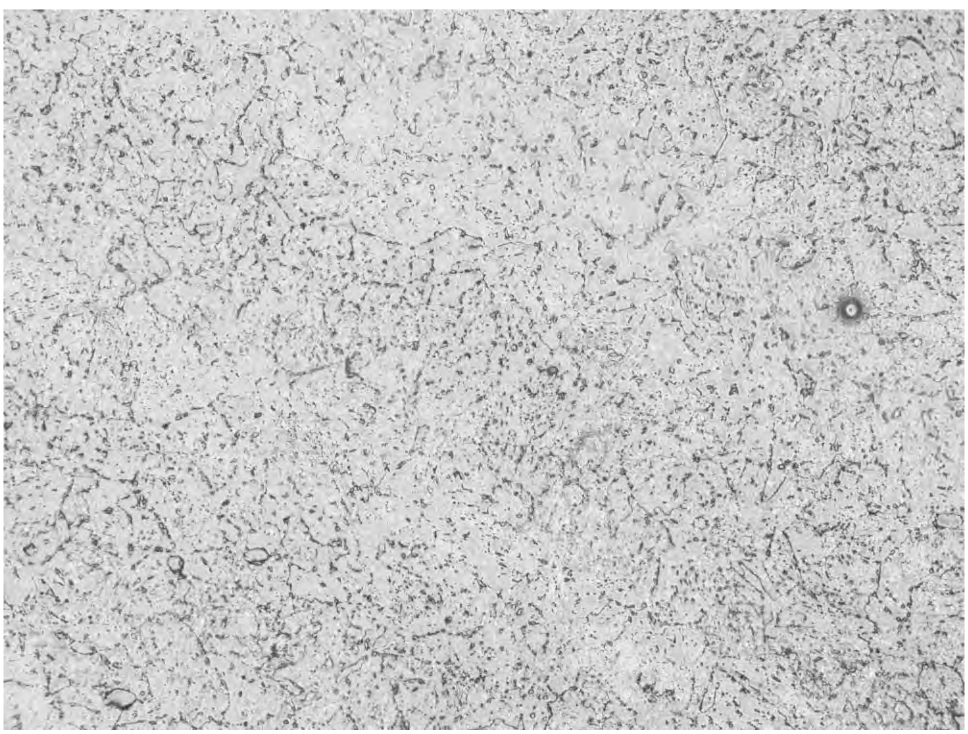

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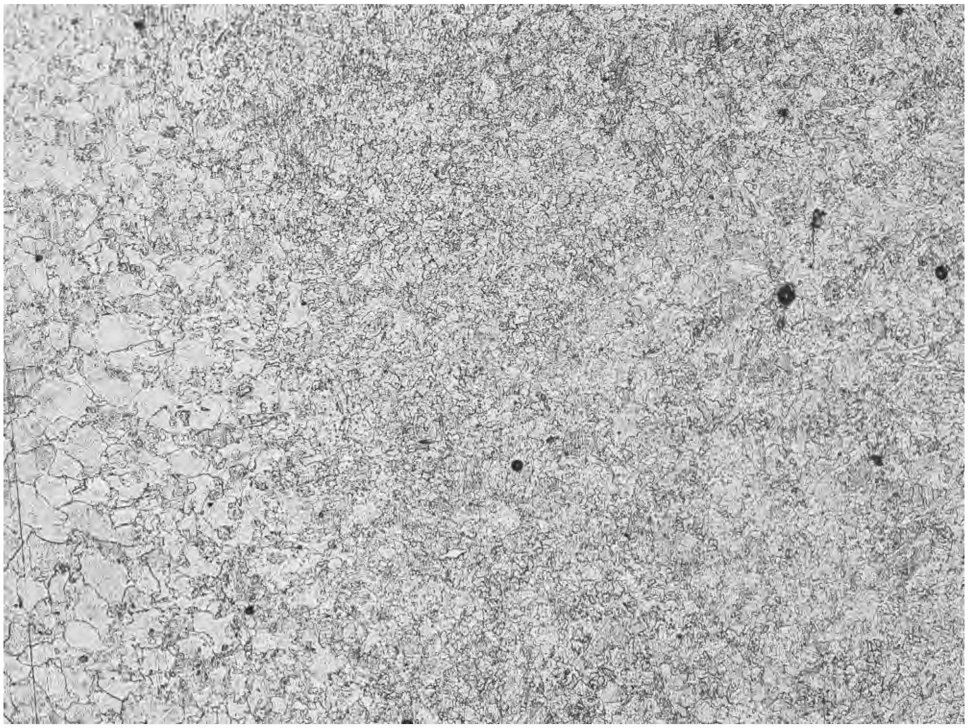
Fig. 74. Replica No. LFSHOH-R1.



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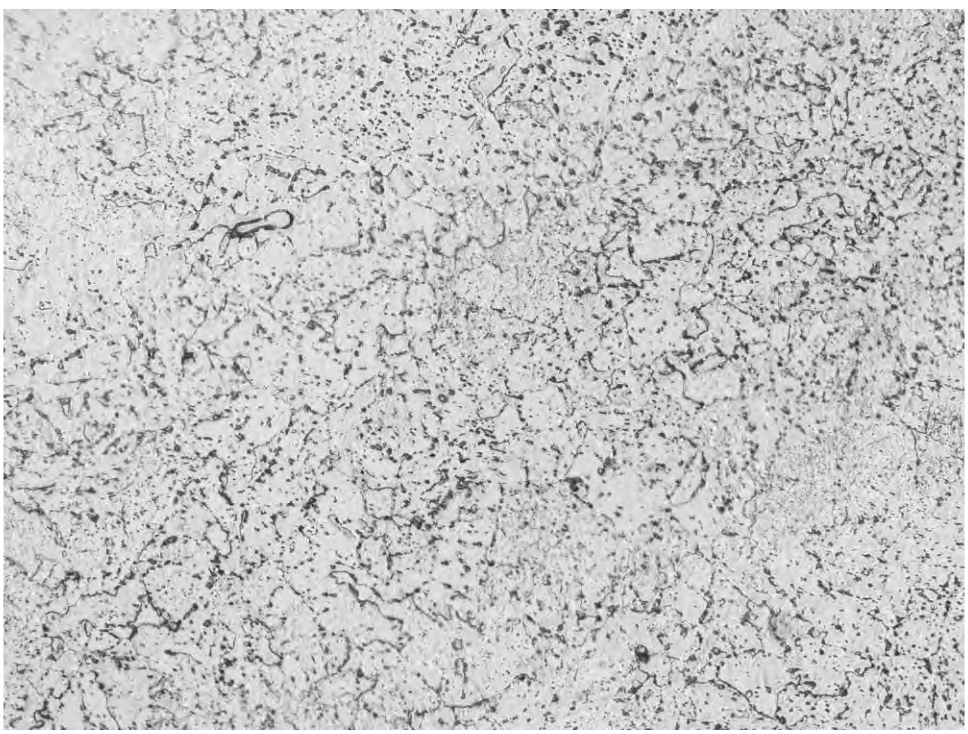

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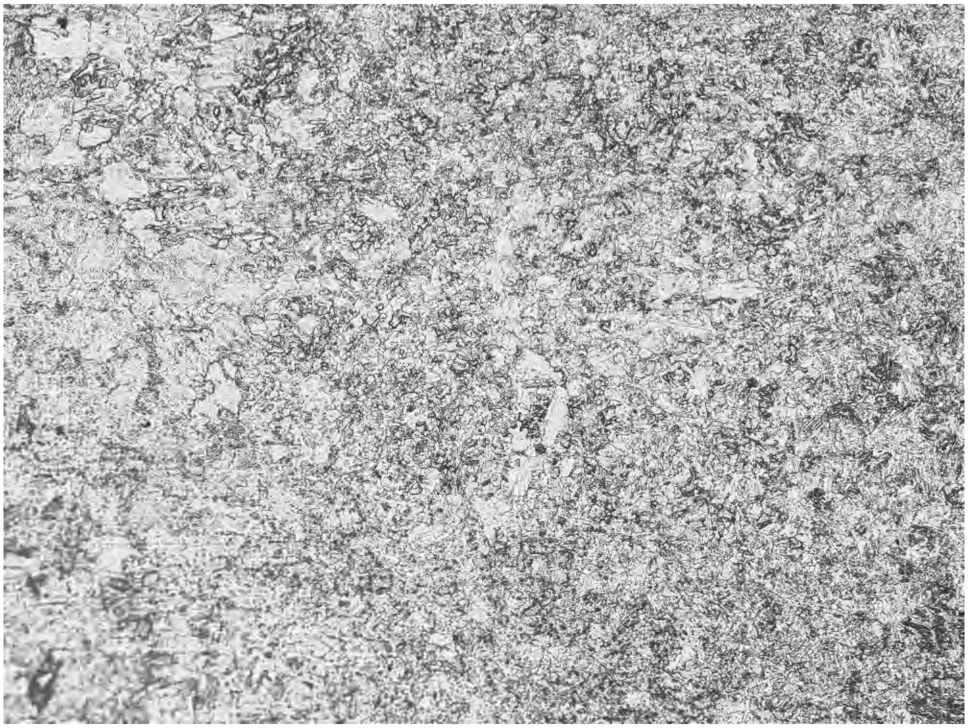
Fig. 75. Replica No. LFSHOH-R2.



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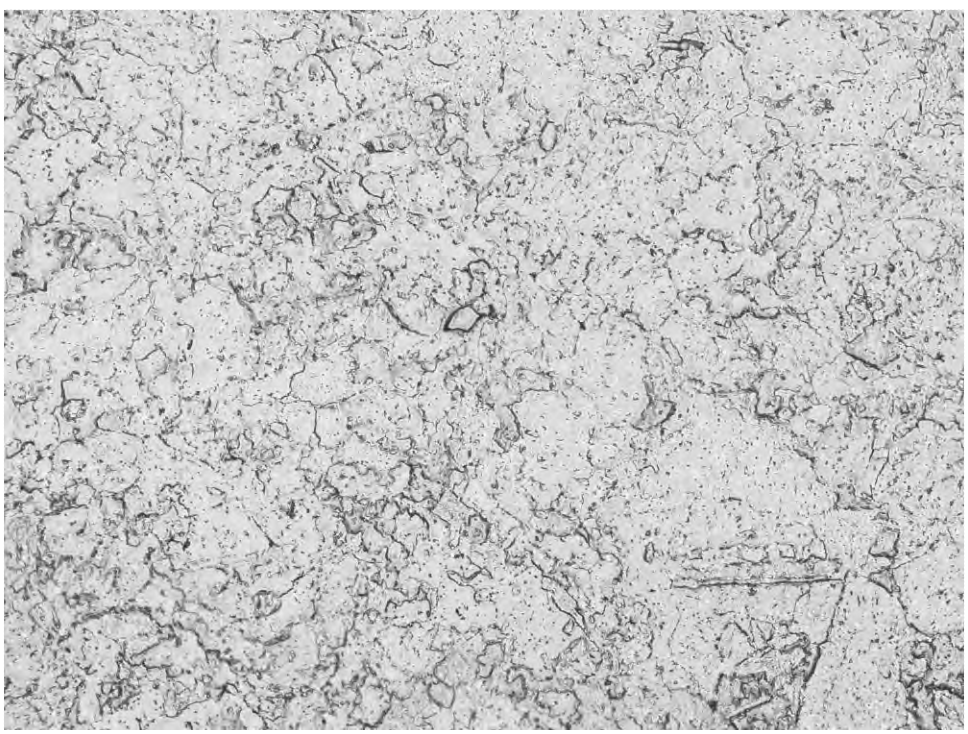

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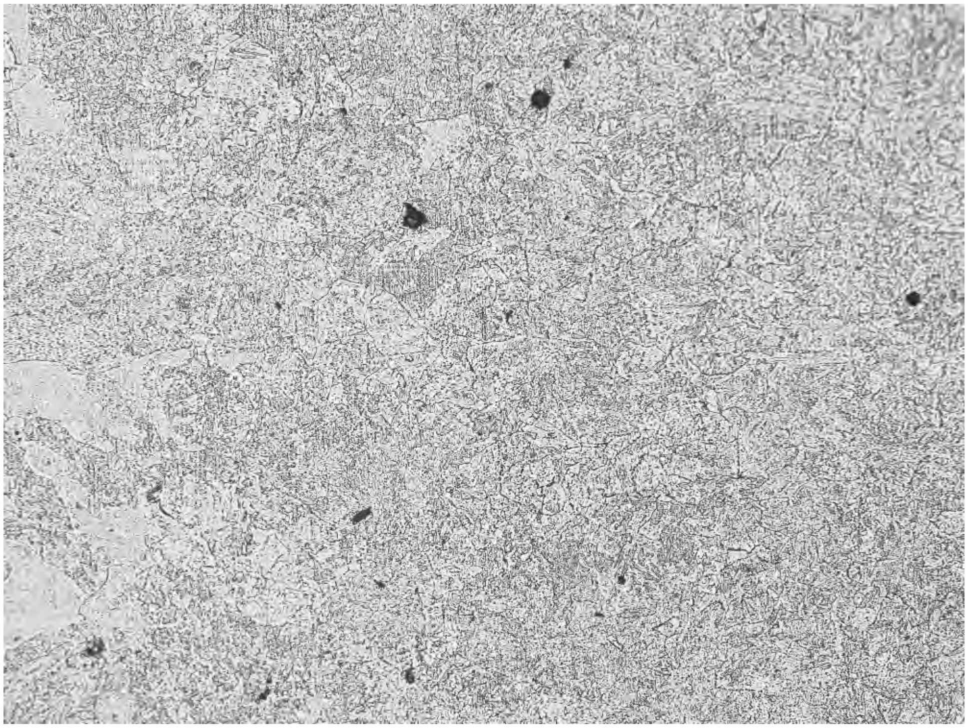
Fig. 76. Replica No. LFSHOH-R3.



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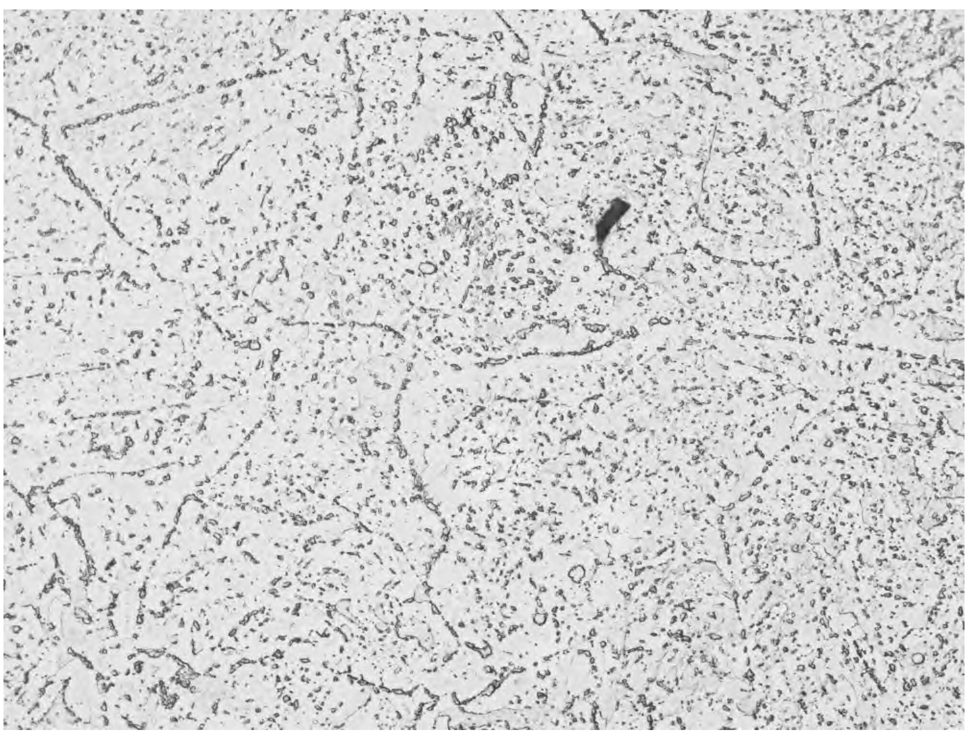

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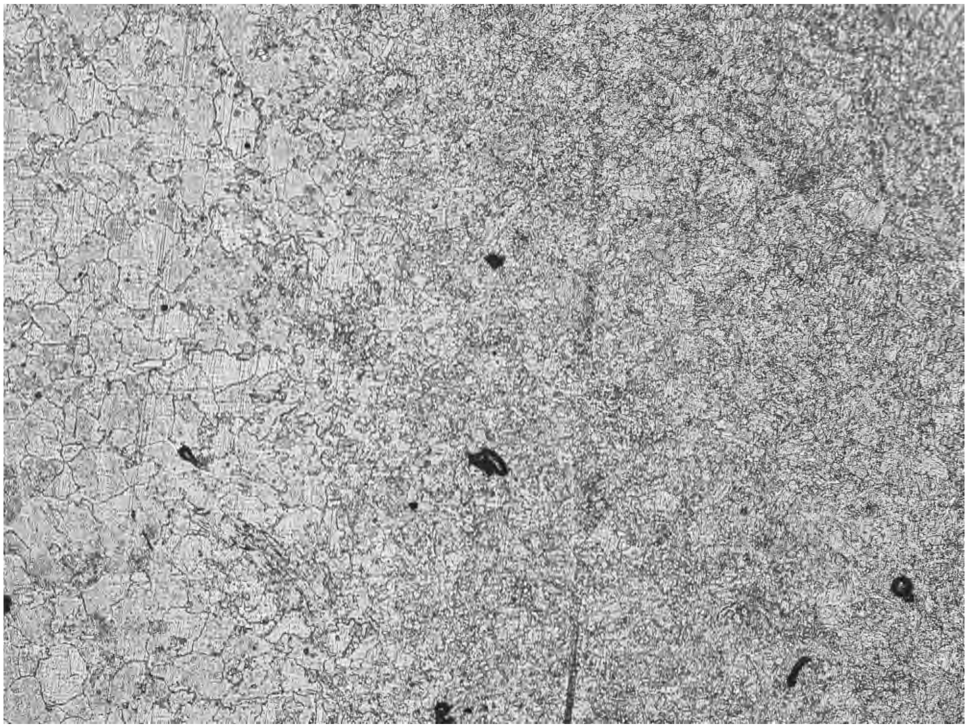
Fig. 77. Replica No. LFSHOH-R4.



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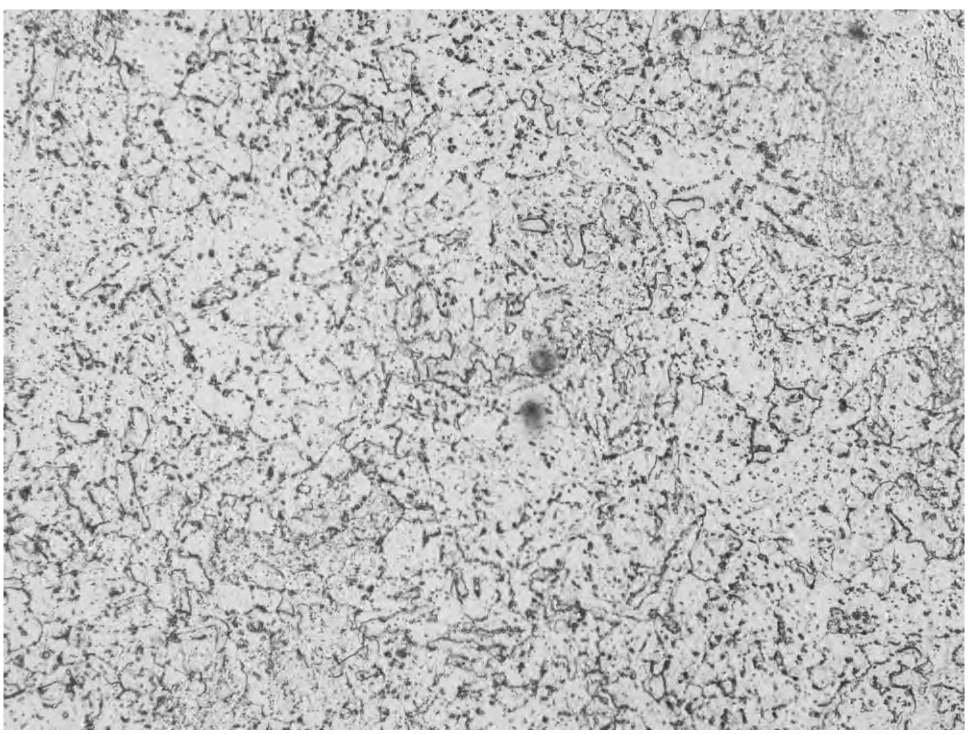

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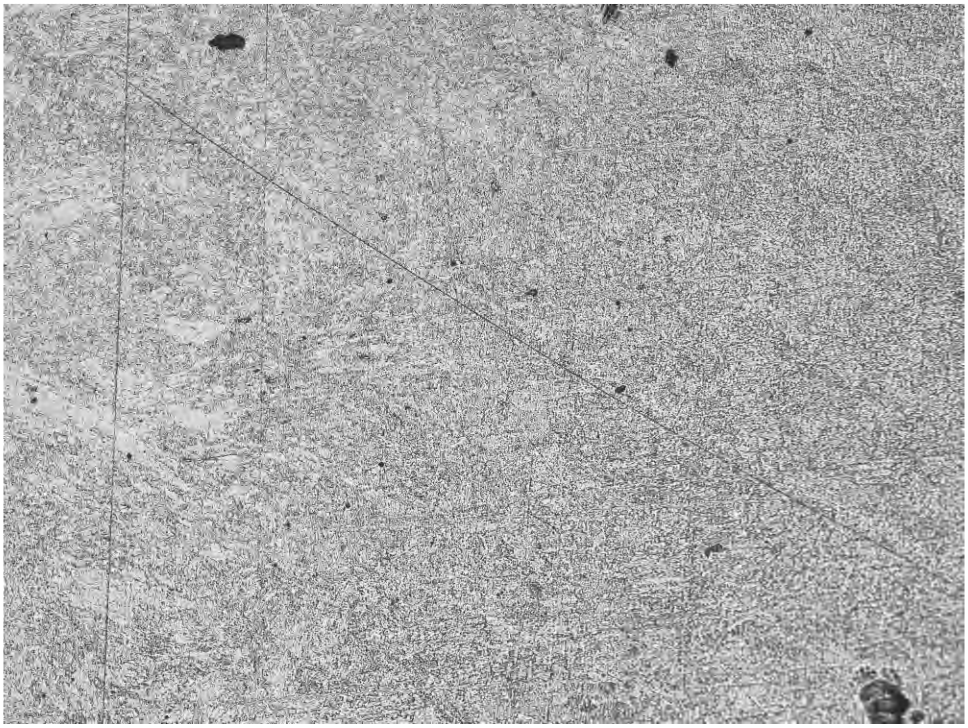
Fig. 78. Replica No. LFSHOH-R5.



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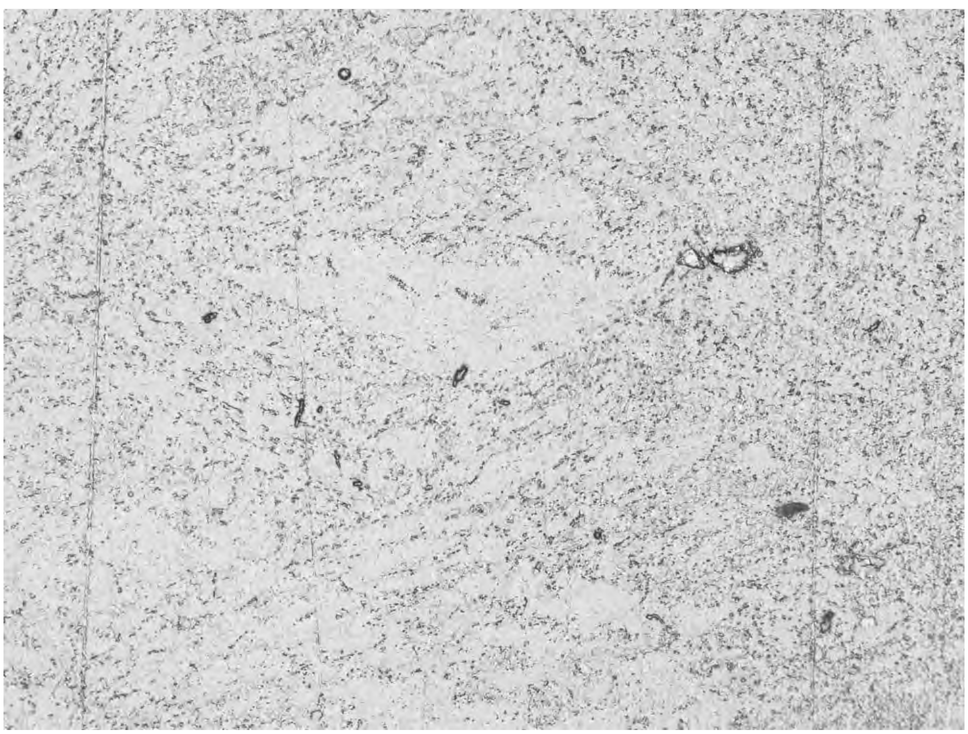

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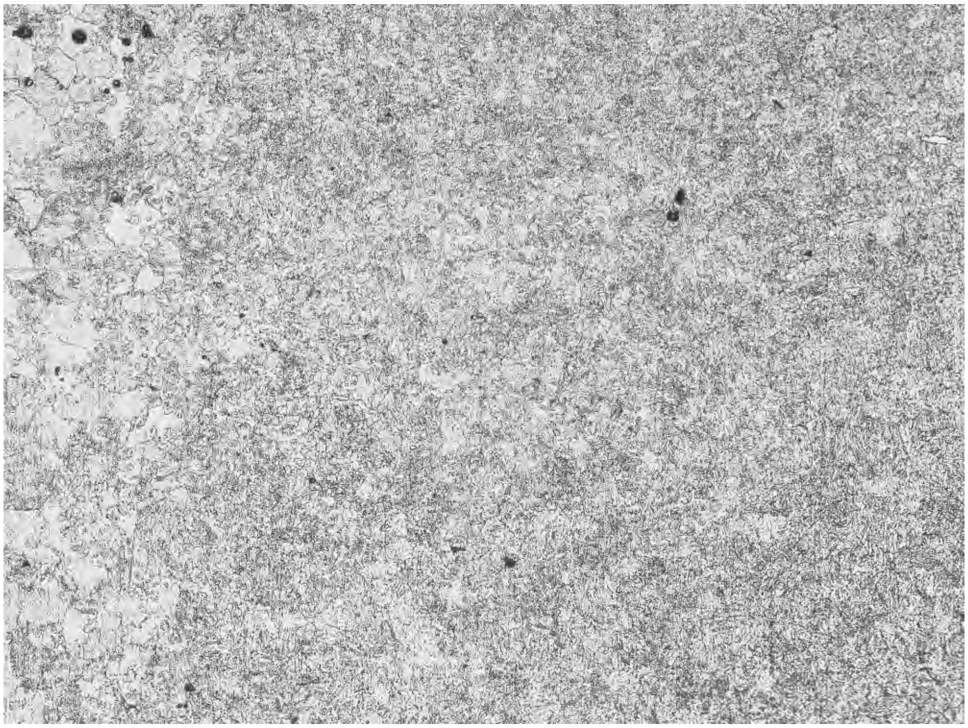
Fig. 79. Replica No. LFSHOH-R6.



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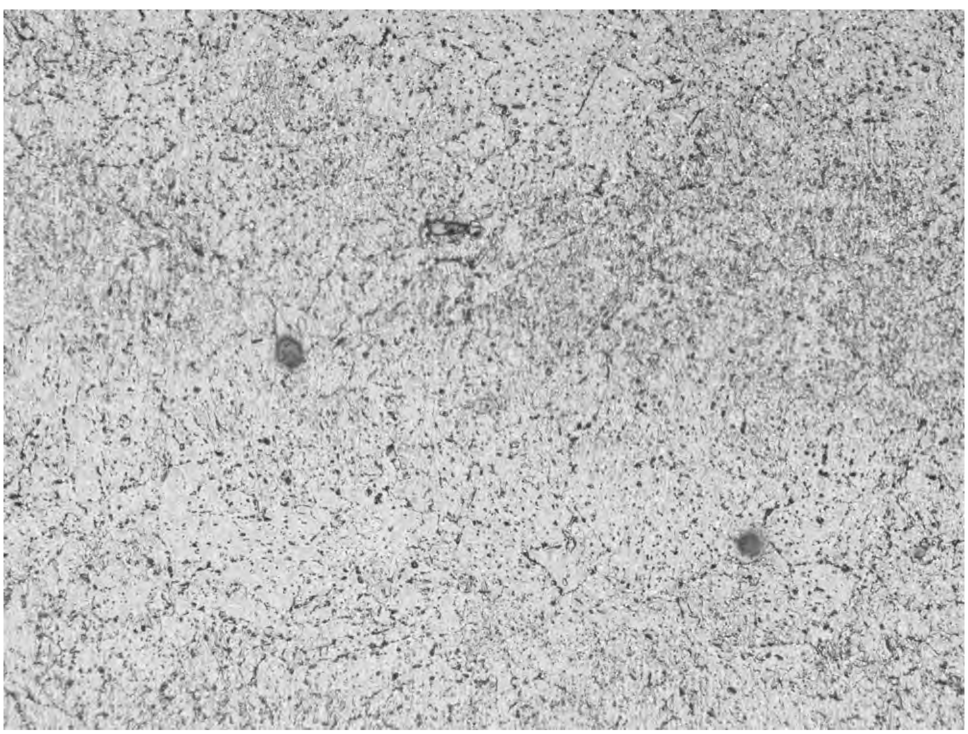

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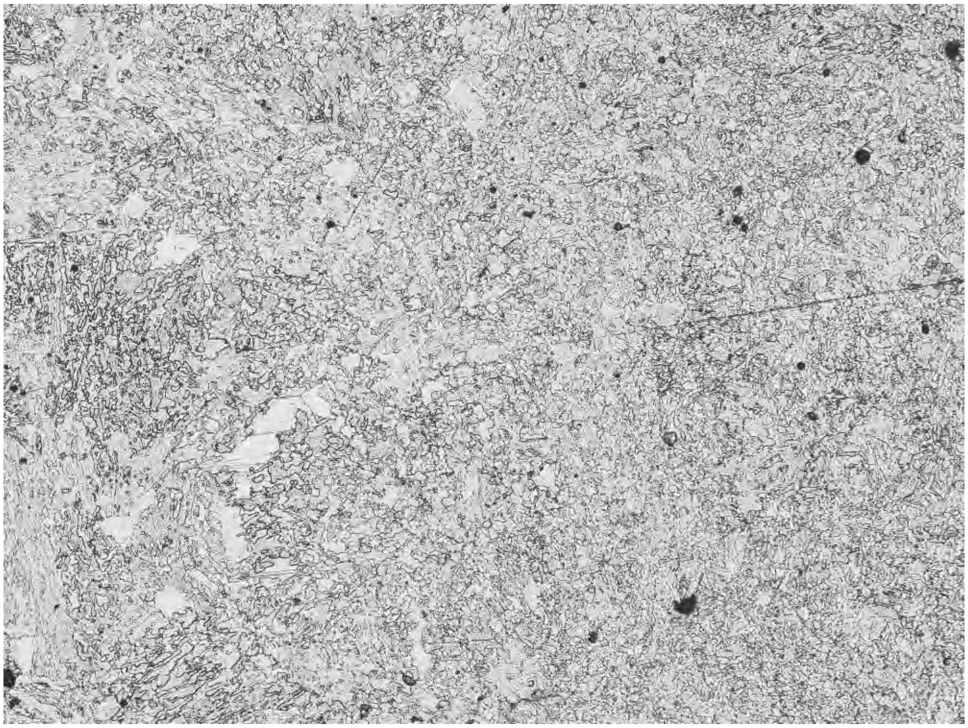
Fig. 80. Replica No. LFSHOH-R7.



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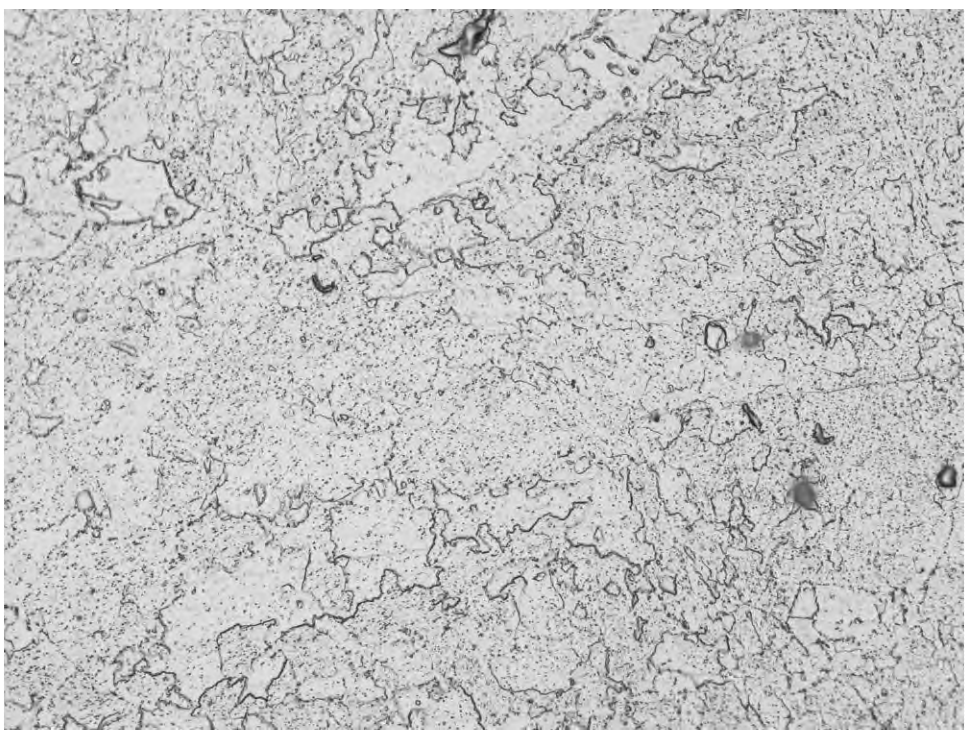

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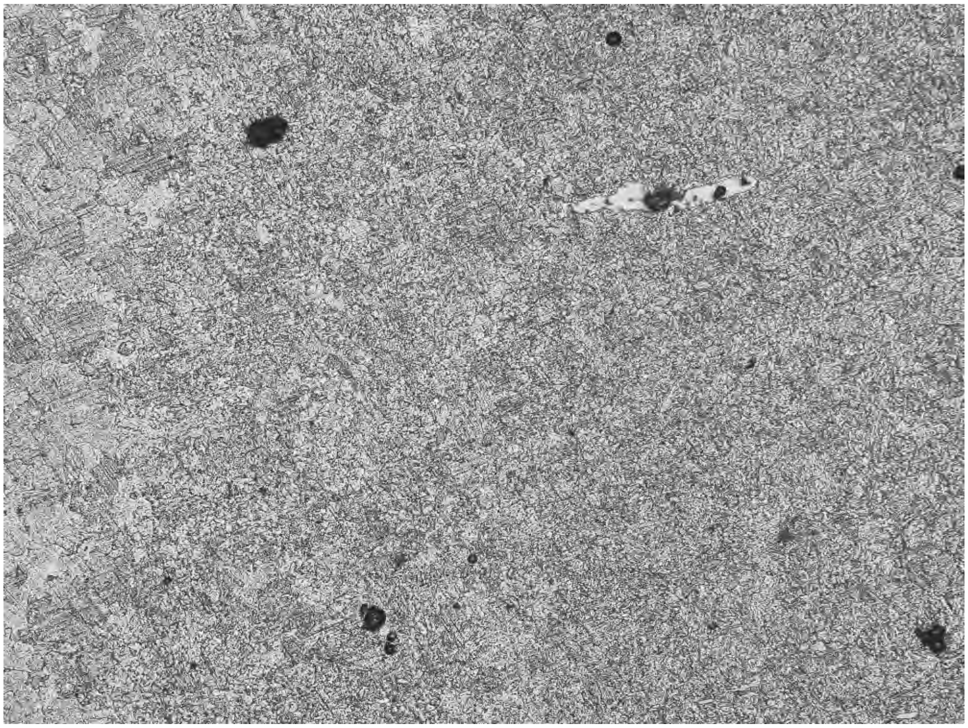
Fig. 81. Replica No. LFSHOH-R8.



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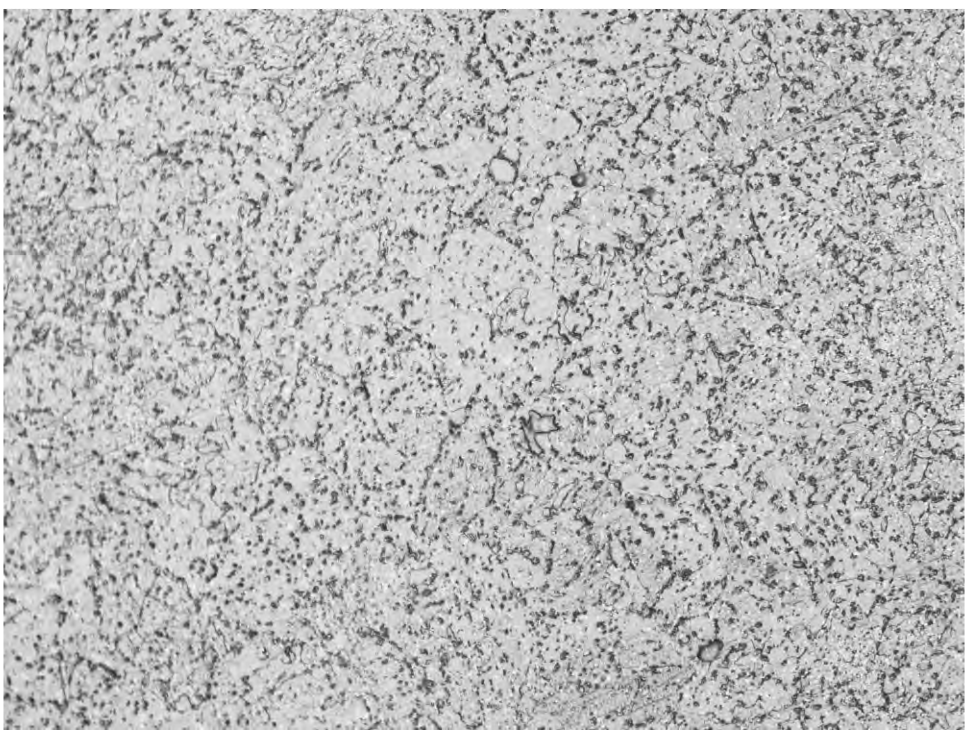

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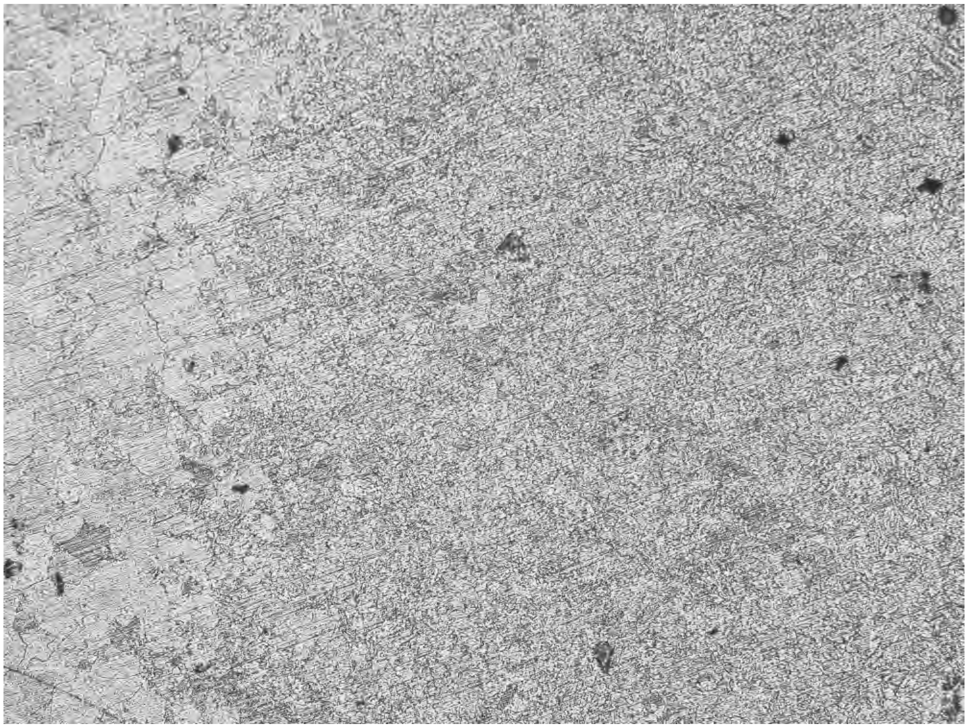
Fig. 82. Replica No. LFSHOH-R1.



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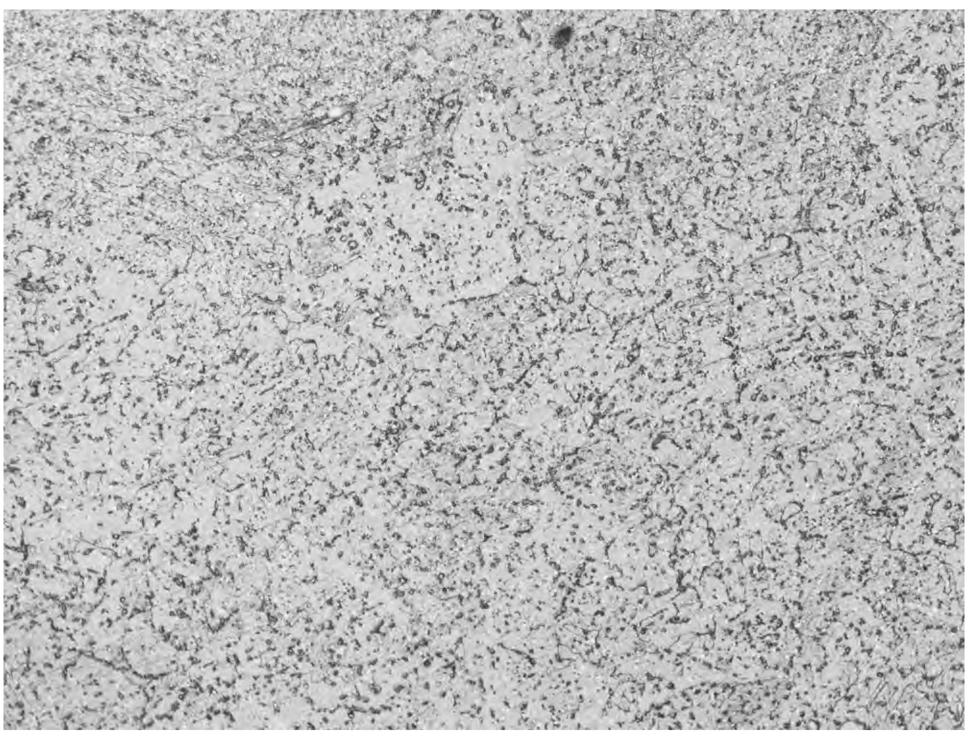

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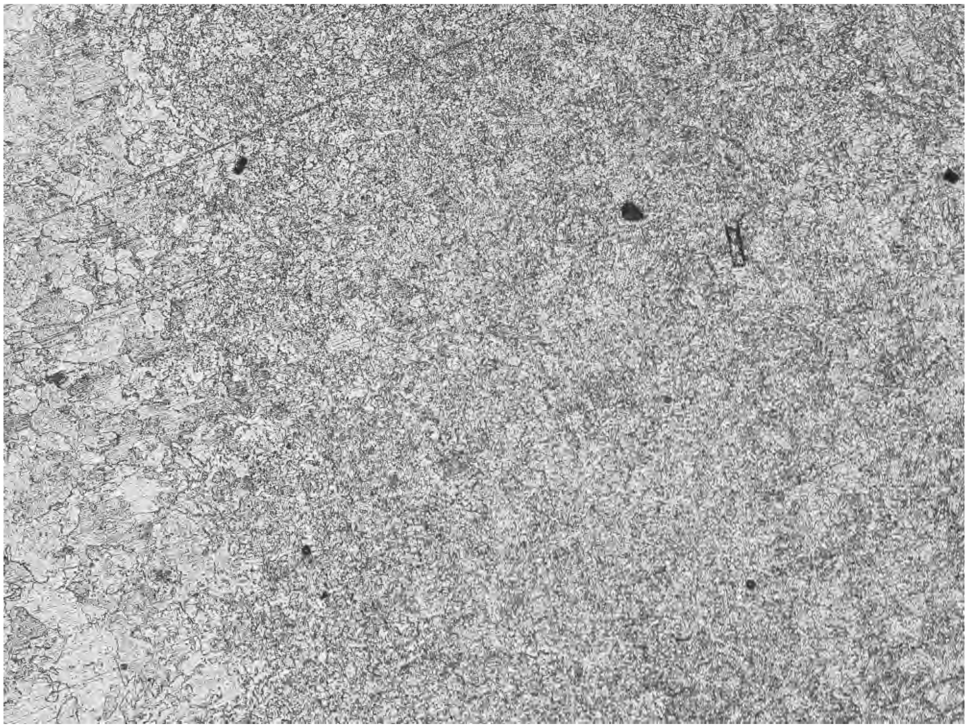
Fig. 83. Replica No. LFSHOH-R2.



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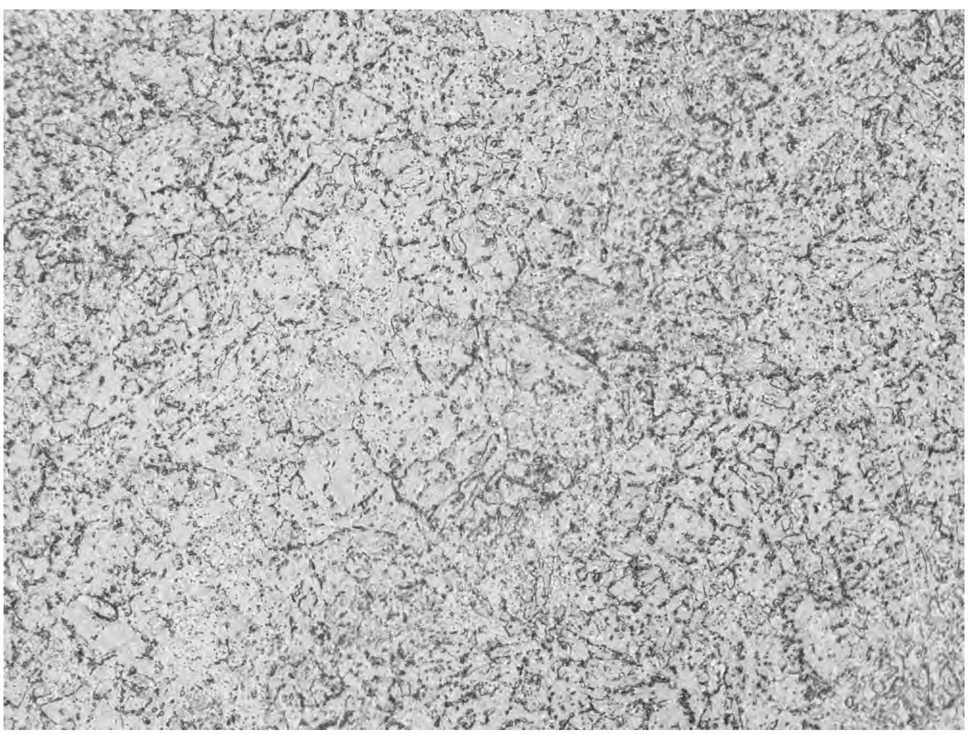

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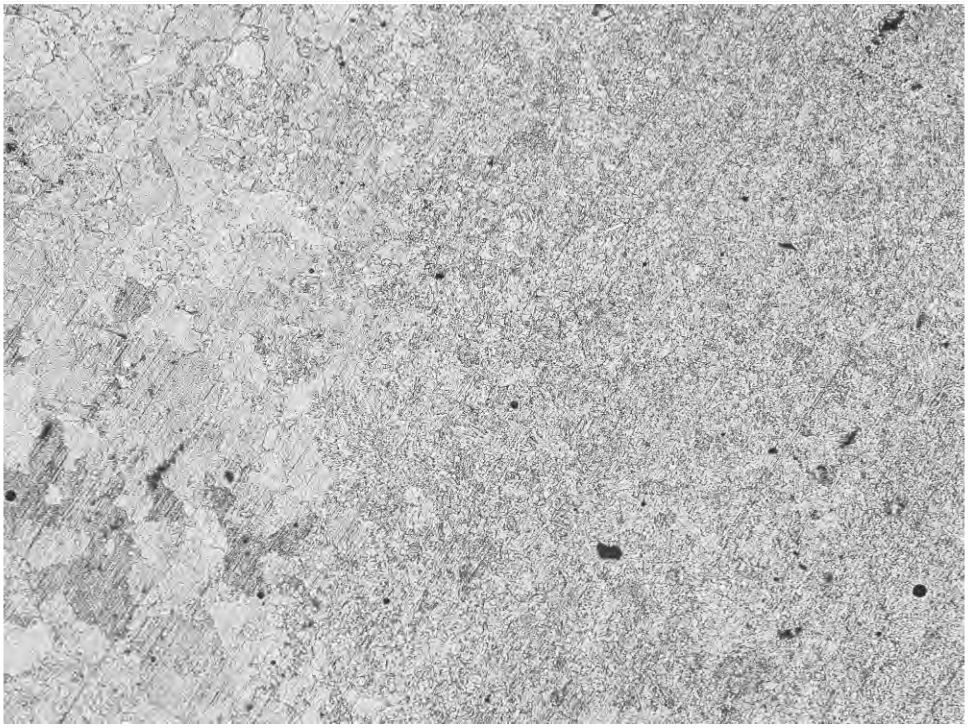
Fig. 84. Replica No. LFSHOH-R3.



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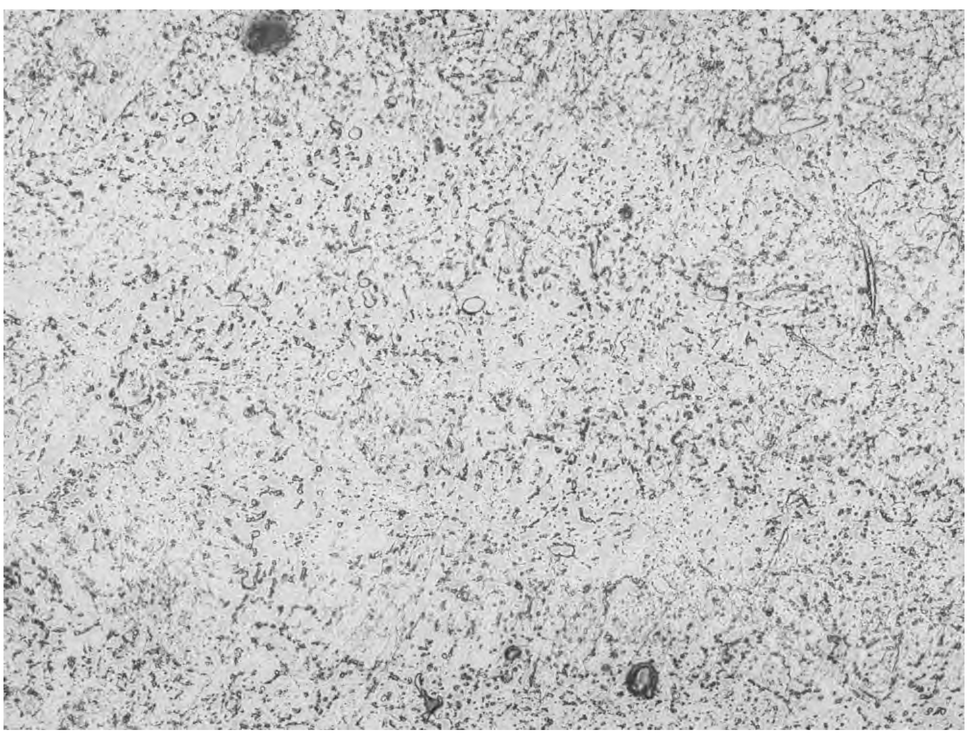

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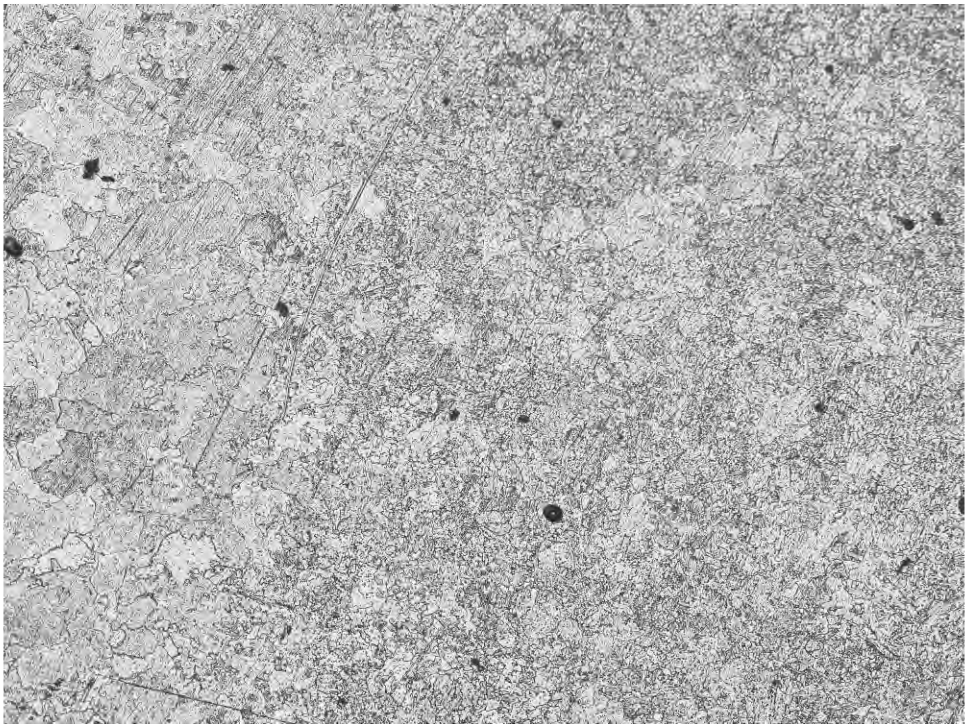
Fig. 85. Replica No. LFSHOH-R4.



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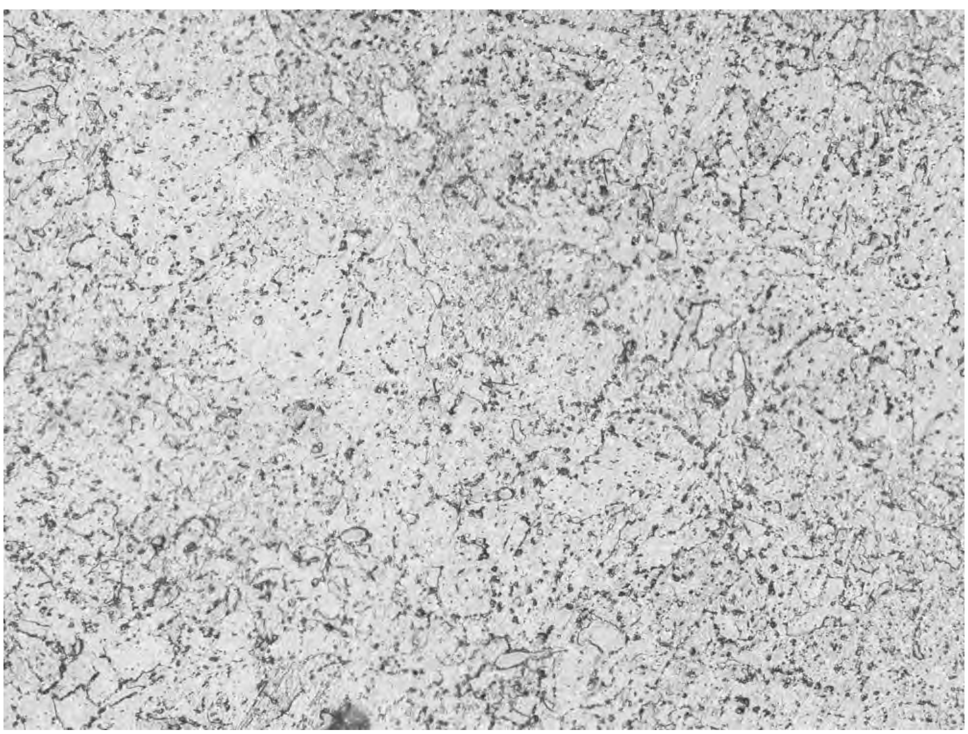

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Fig. 86. Replica No. LFSHOH-R5.

100X

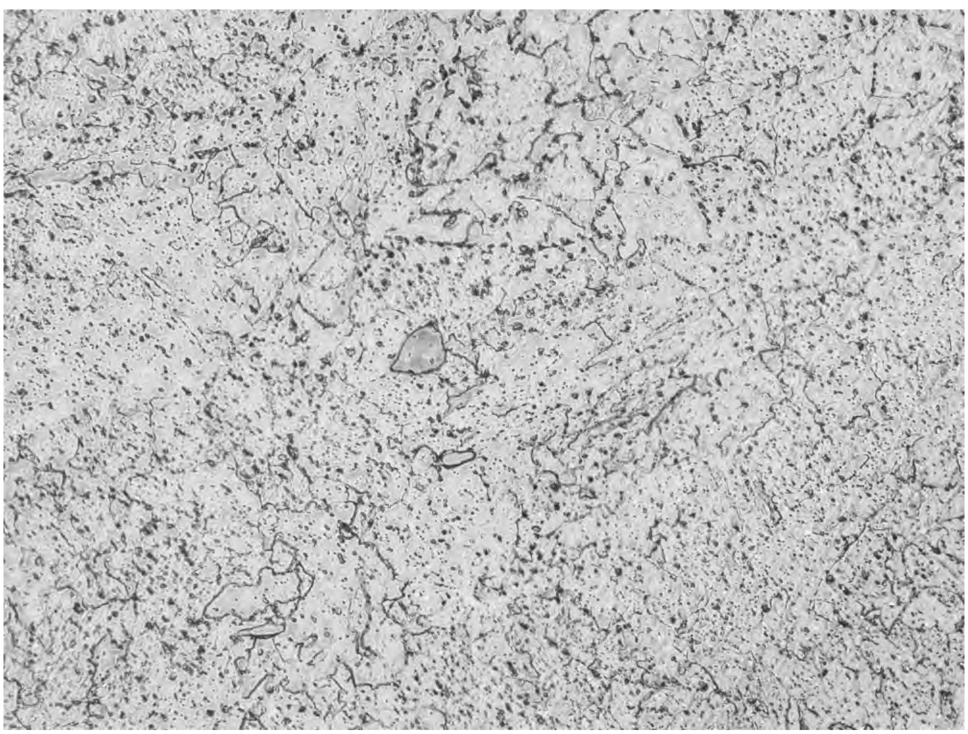

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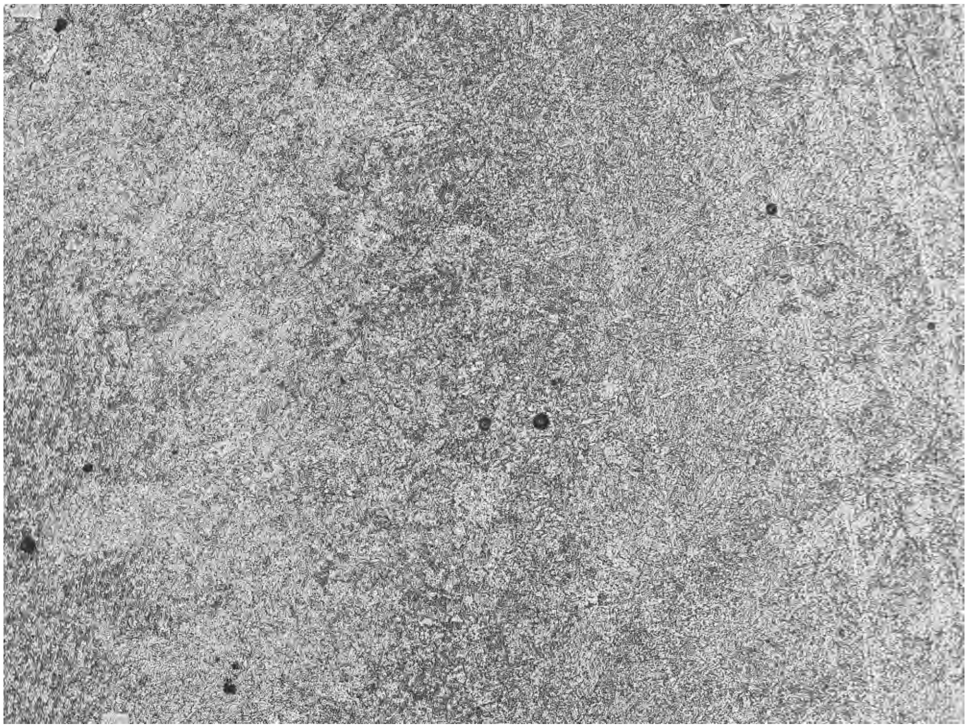
Fig. 87. Replica No. LFSHOH-R6.



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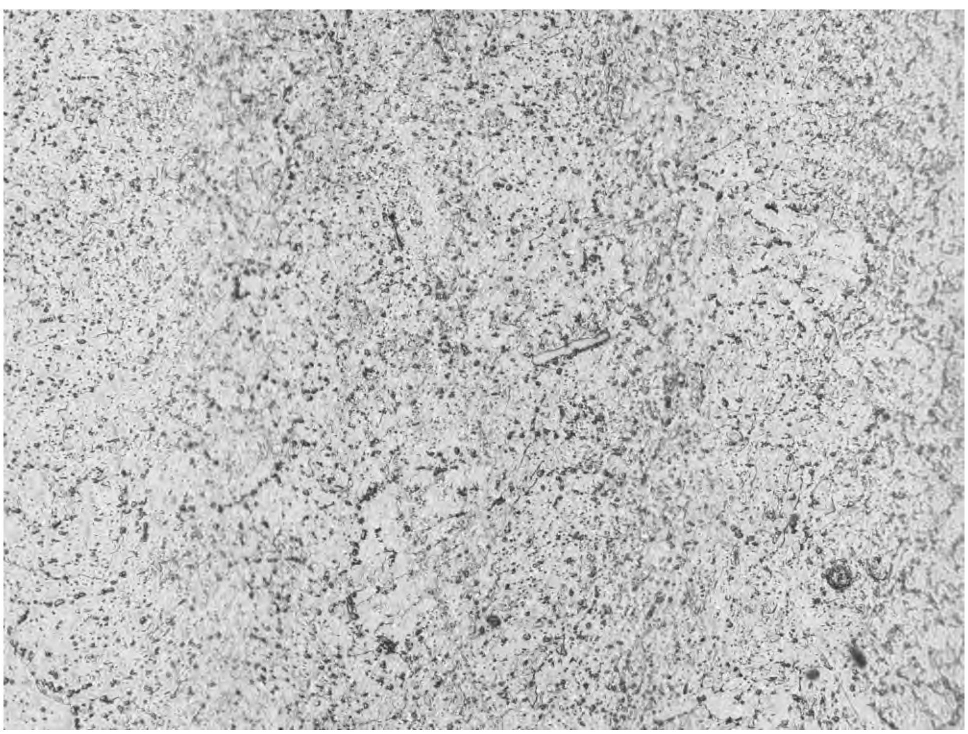

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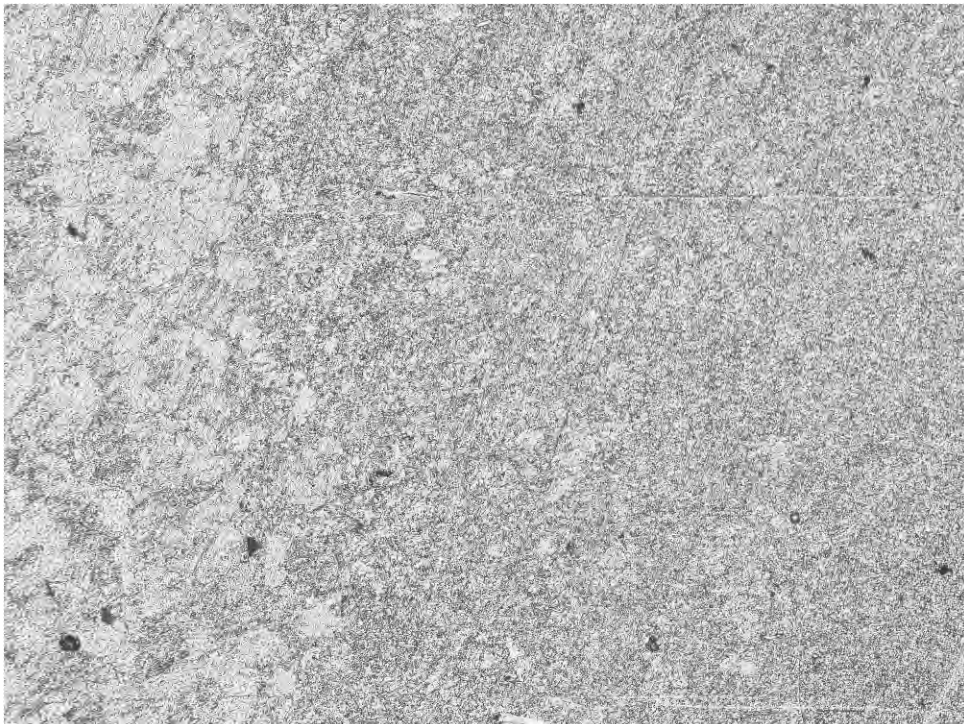
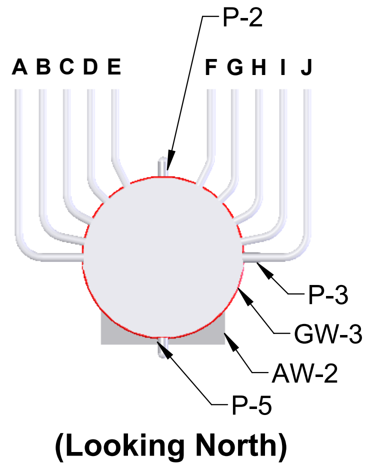
Fig. 88. Replica No. LFSHOH-R7.



100X

500X

Fig. 89. Replica No. LFSHOH-R8.



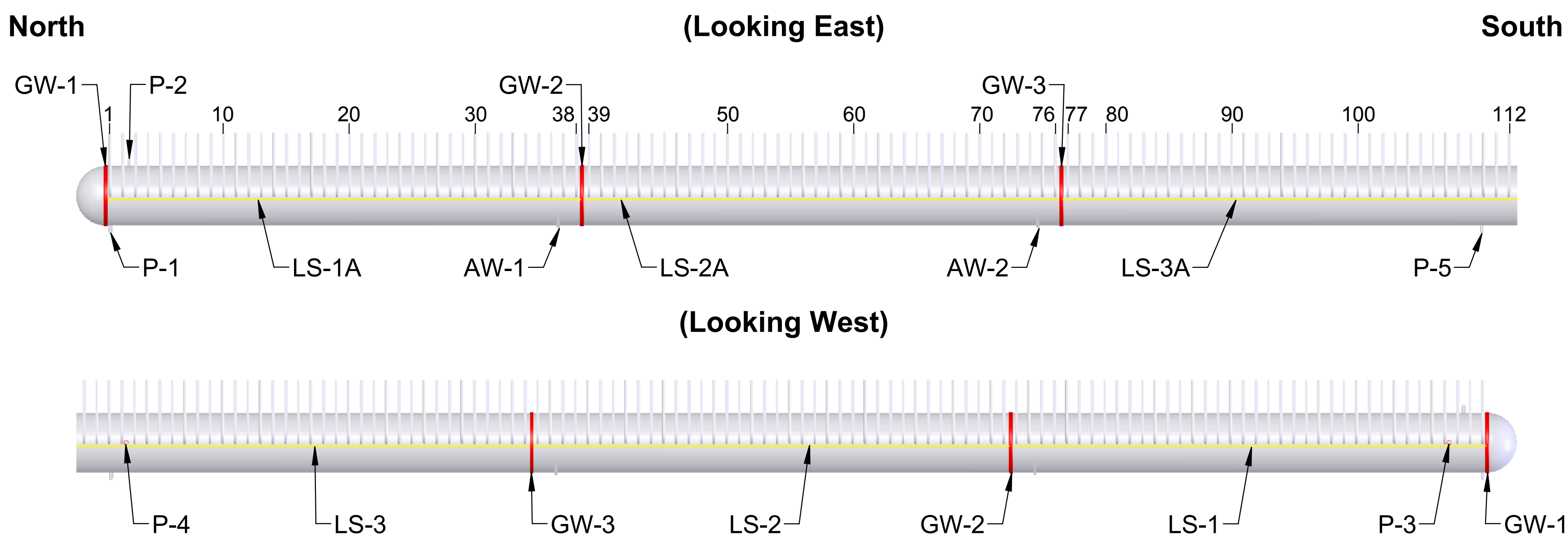


Fig. 90. Sketches of the High-Pressure Reheat Outlet header

Thielsch

Fig. 91.

Photographs of the inspection locations on the High-Pressure Reheat Outlet header.

Fig. 92.

Photographs of indications in girth weld No. GW-3 and attachment weld No. AW-1 on the High-Pressure Reheat Outlet header.

Fig. 93.

Photographs of indications in seam welds Nos. LS-1 and LS-1A on the High-Pressure Reheat Outlet header.

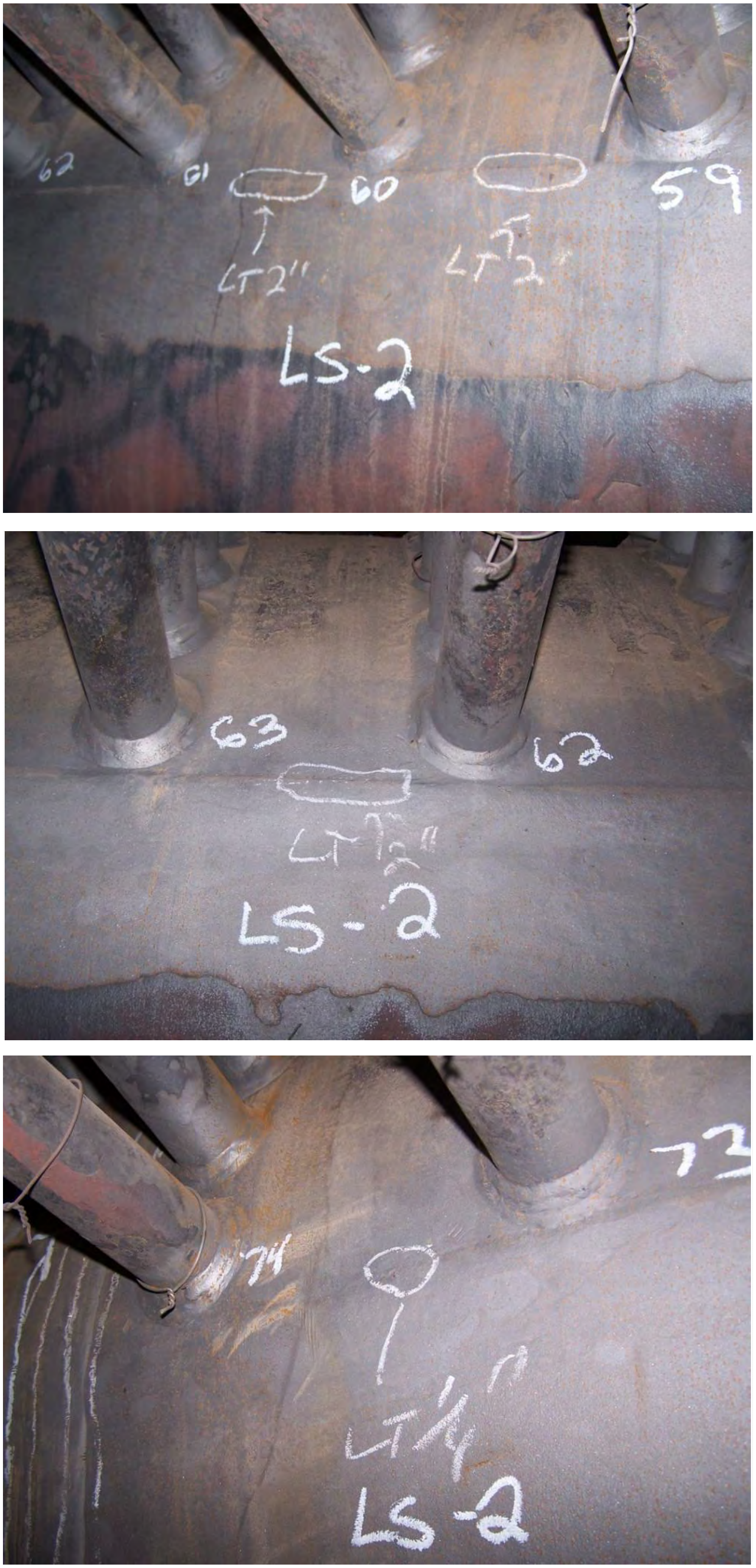
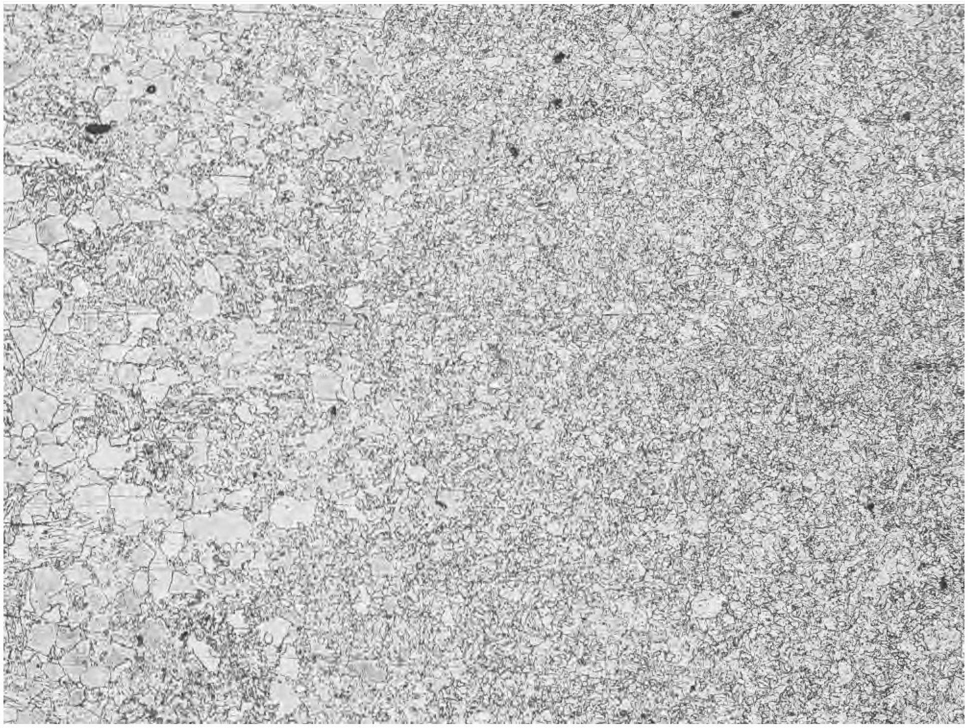


Fig. 94.

Photographs of indications in seam weld No. LS-2 on the High-Pressure Reheat Outlet header.

Fig. 95. Photographs of indications in attachment weld No. AW-2 on the High-Pressure Reheat Outlet header.



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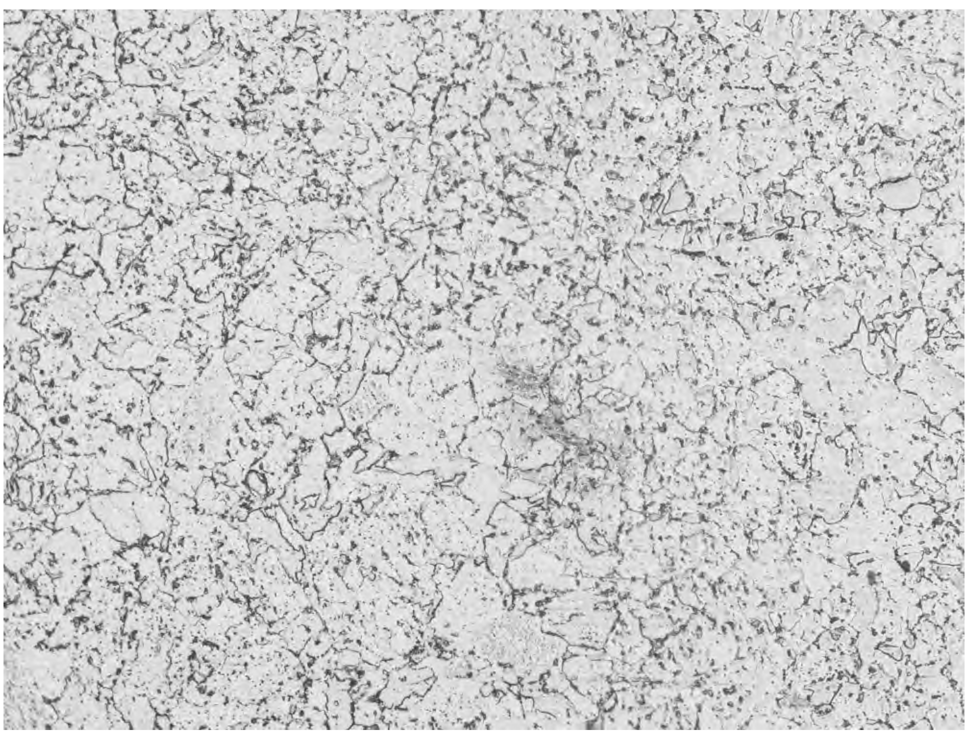

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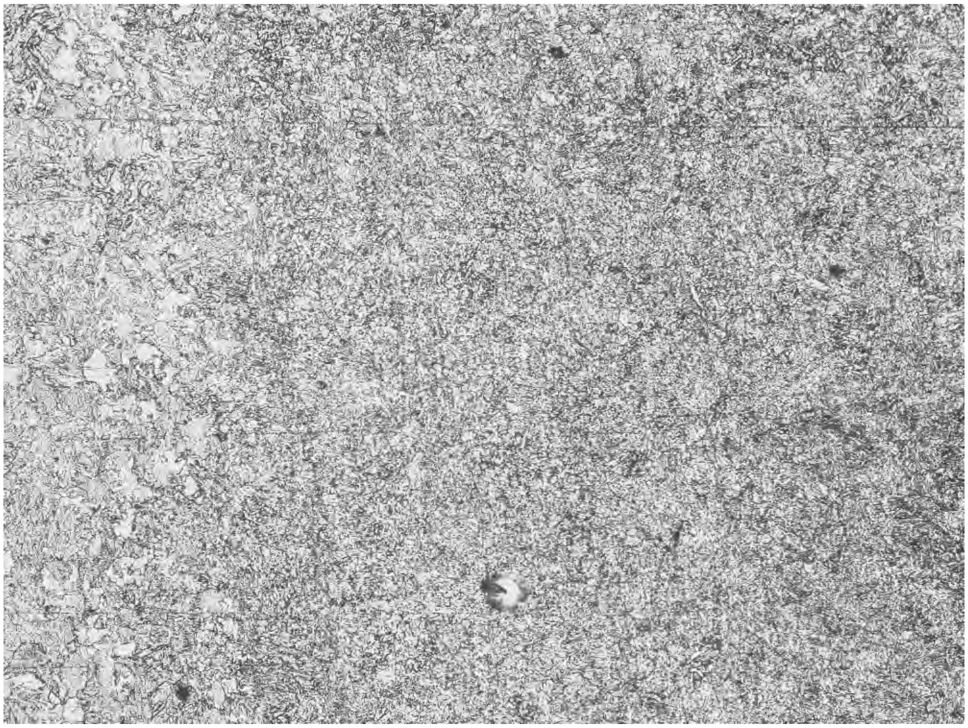
Fig. 96. Replica No. HPROH-R1.



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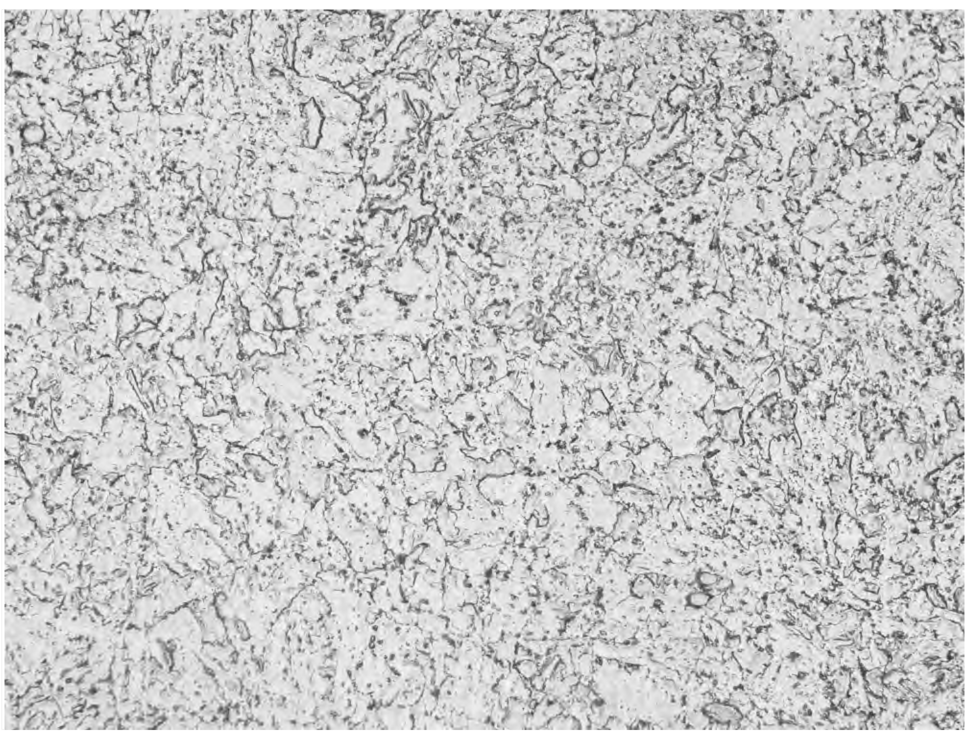

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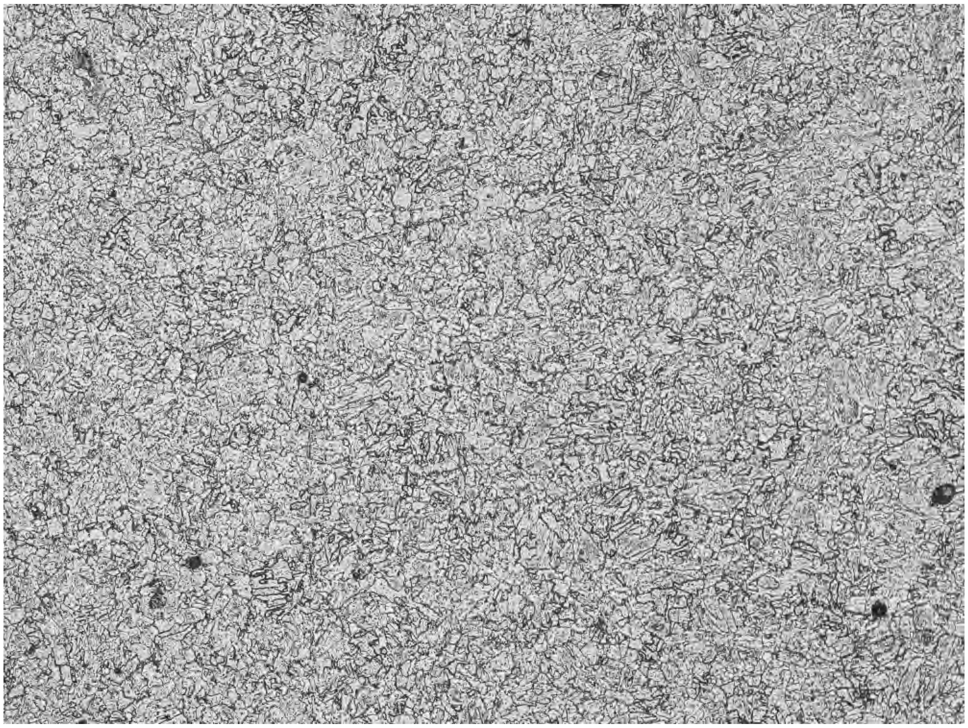
Fig. 97. Replica No. HPROH-R2.



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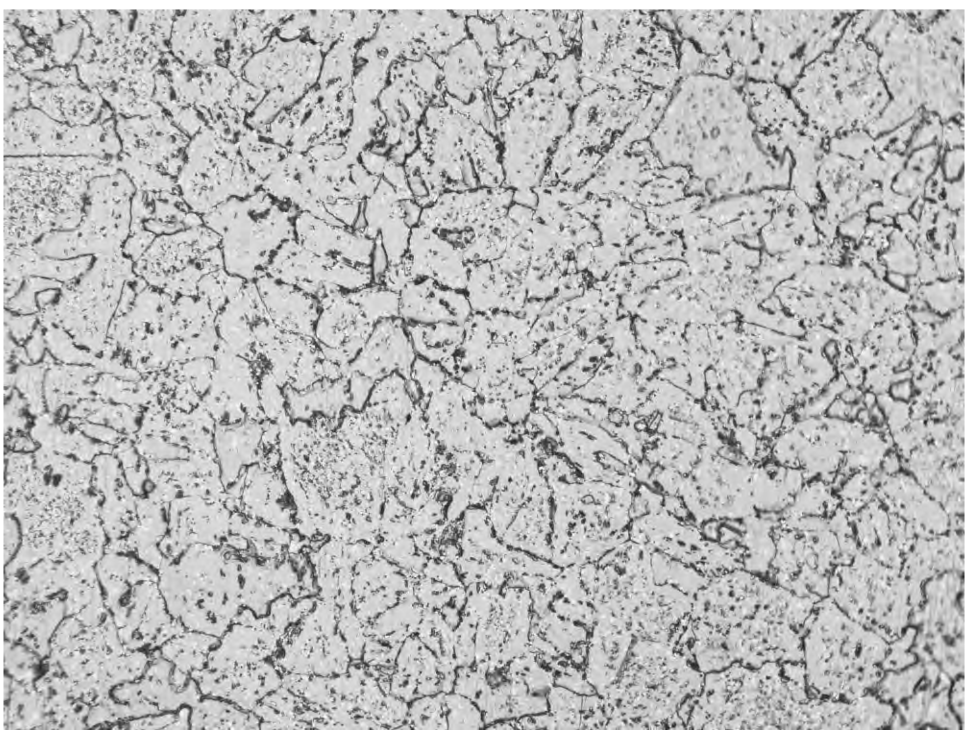

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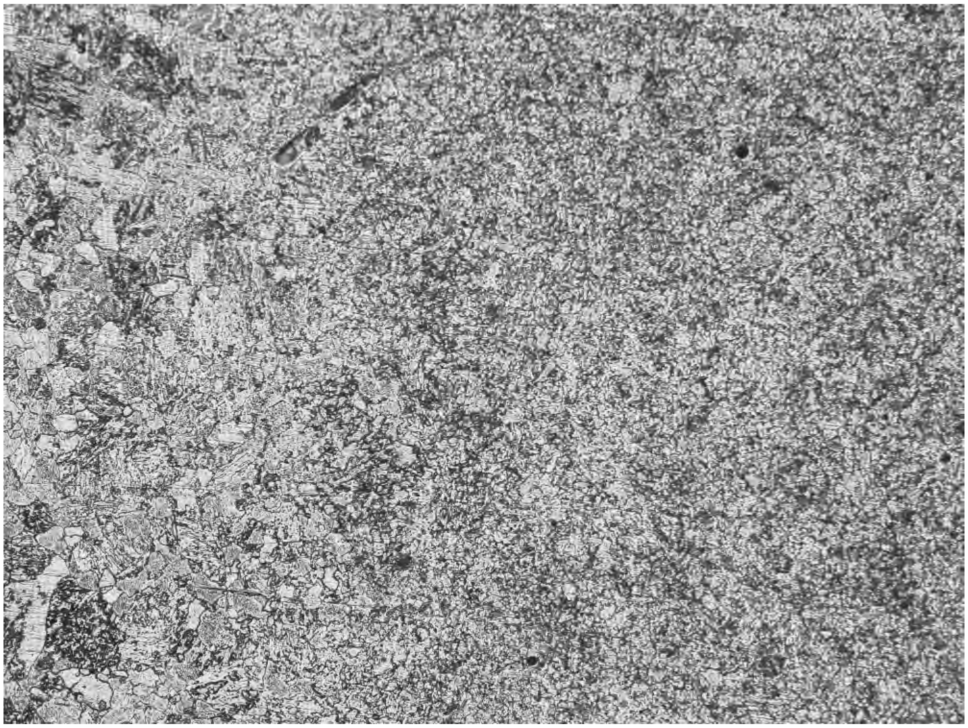
Fig. 98. Replica No. HPROH-R3.



100X

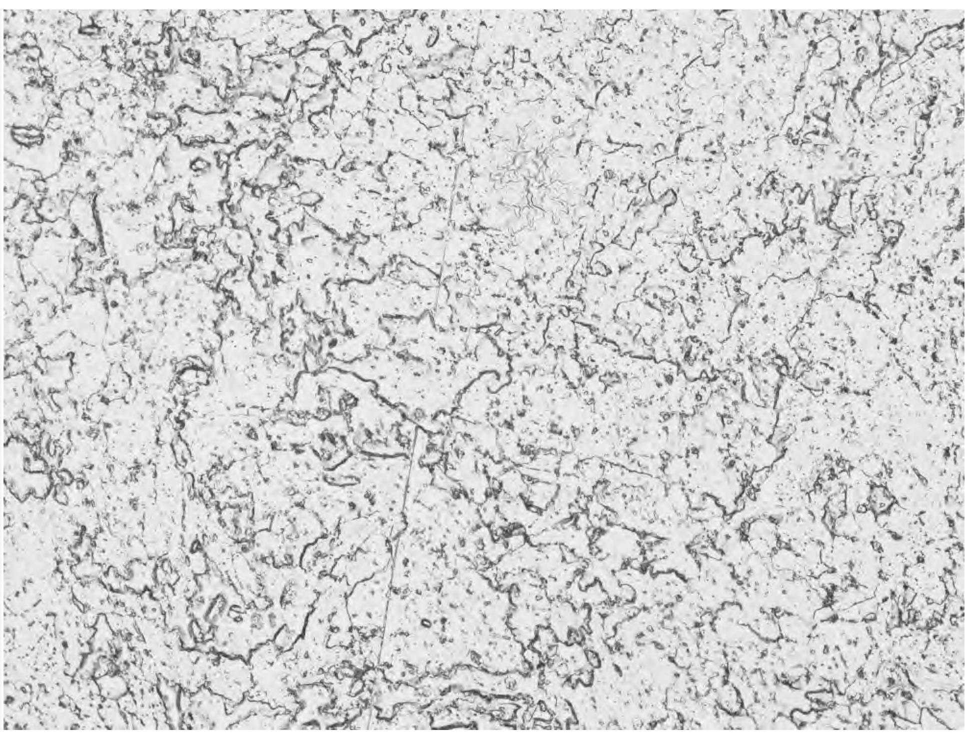


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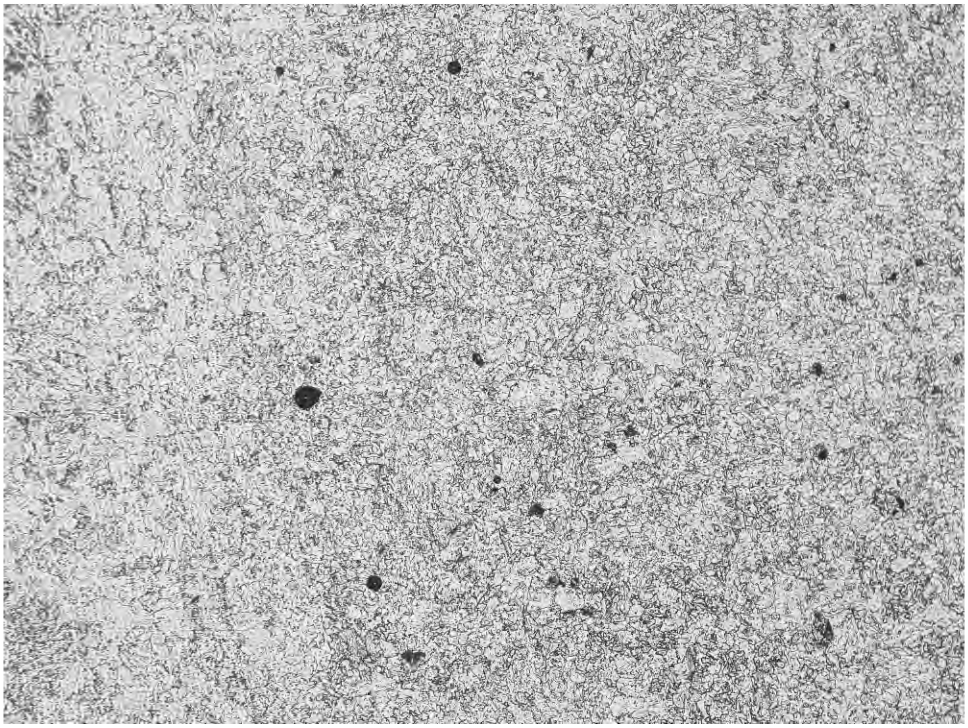
Fig. 99. Replica No. HPROH-R4.



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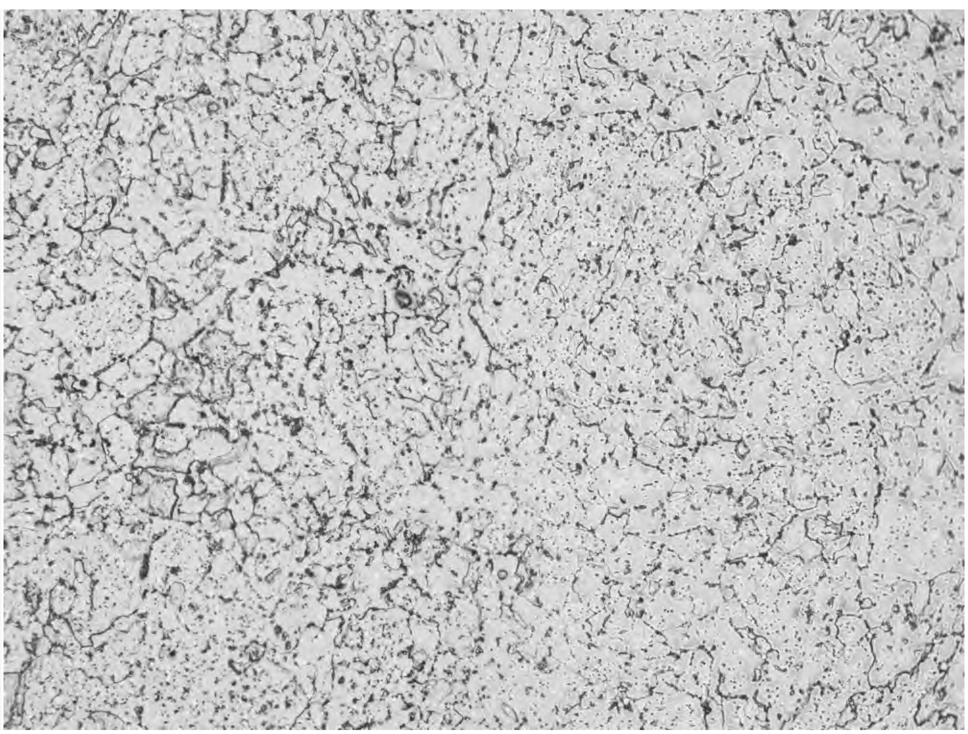

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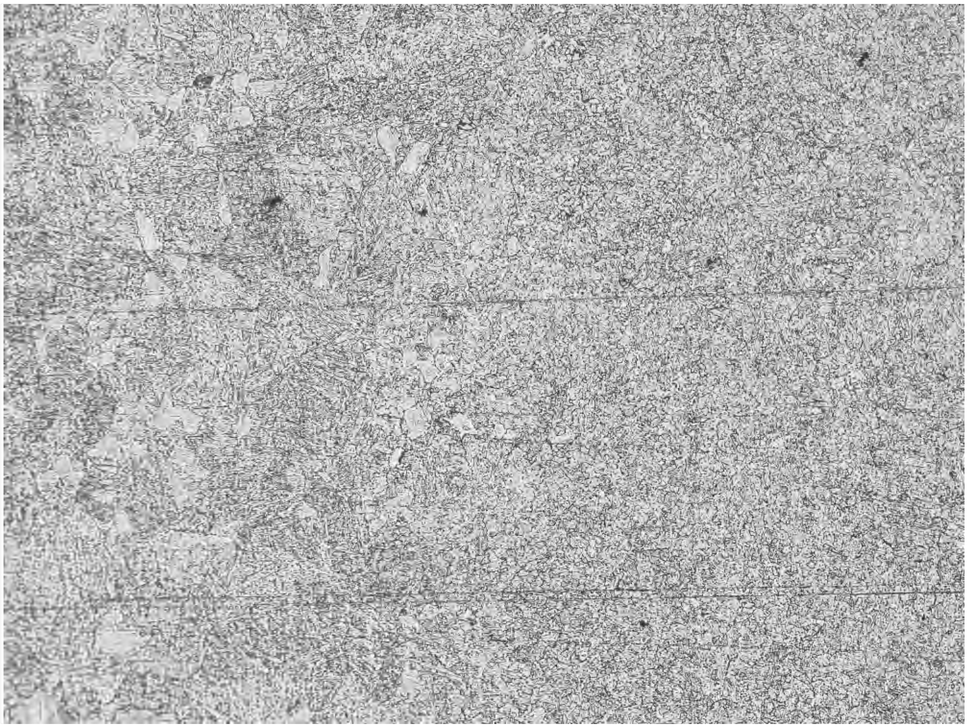
Fig. 100. Replica No. HPROH-R5.



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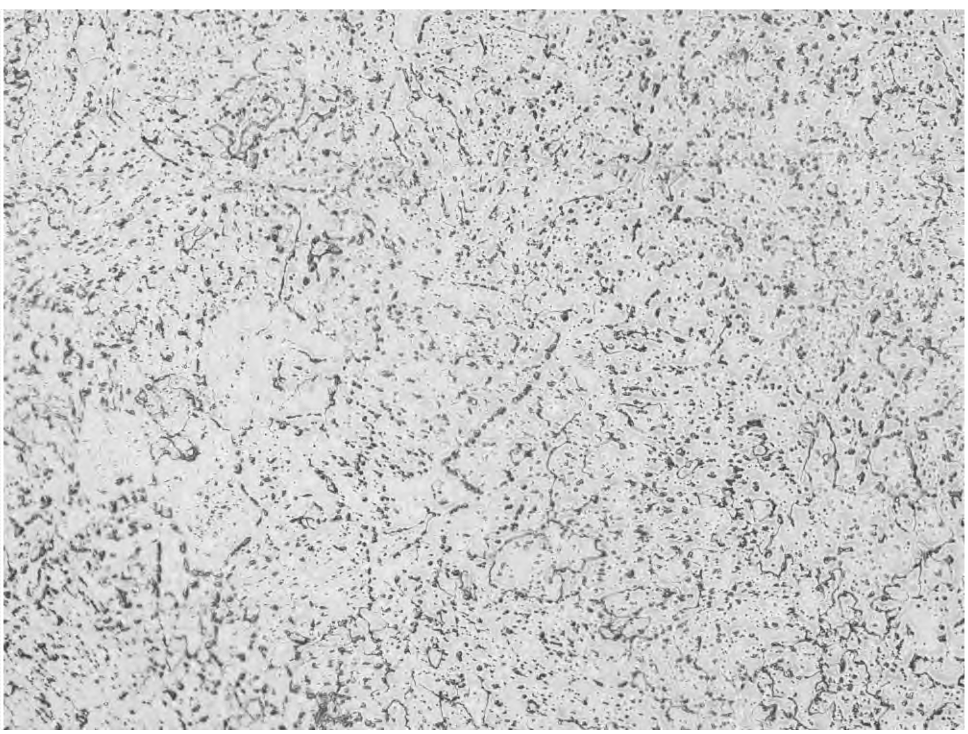

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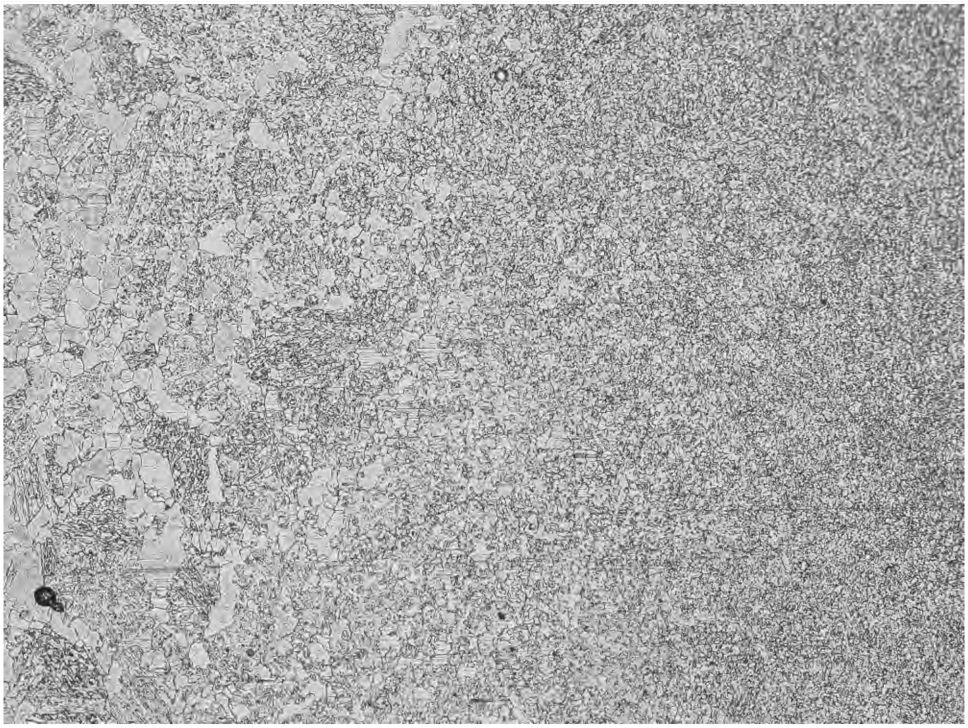
Fig. 101. Replica No. HPROH-R6.



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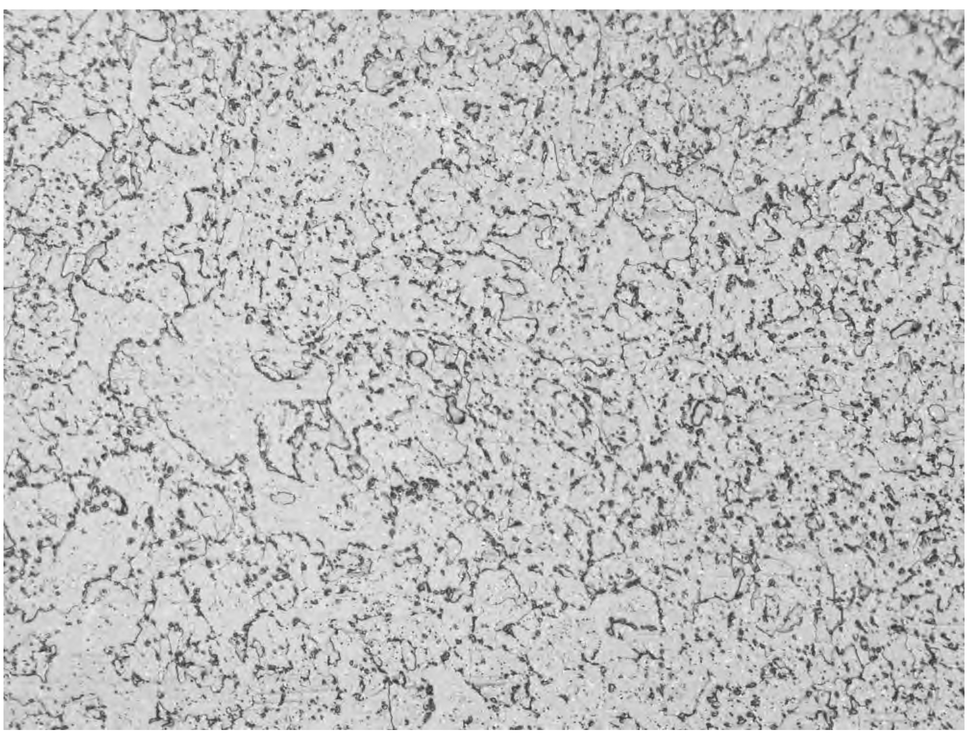
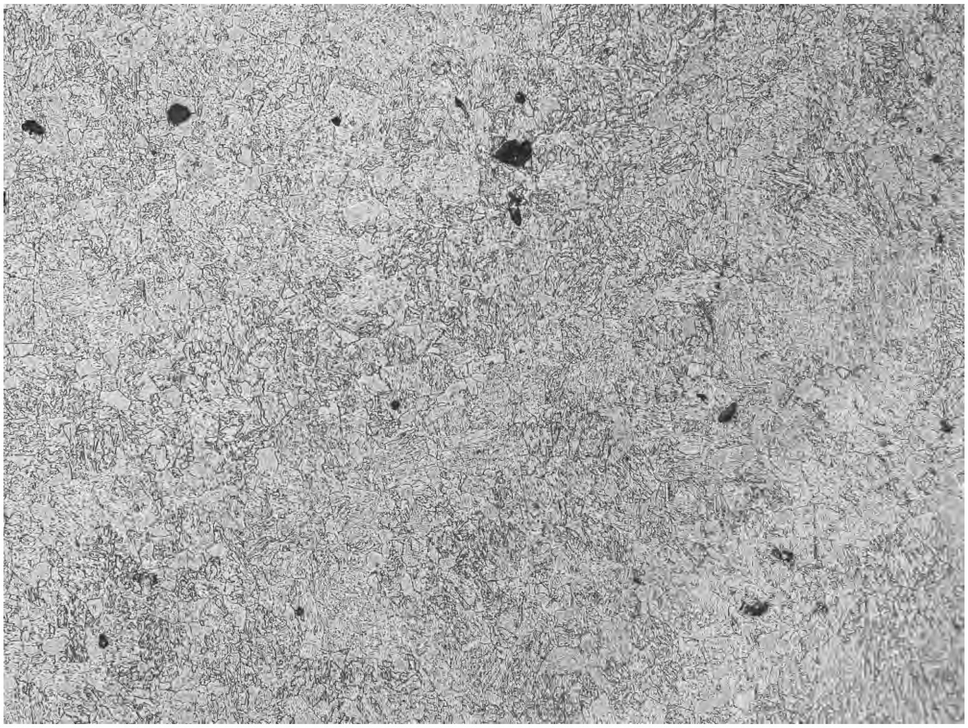


500X

Fig. 102. Replica No. HPROH-R7.



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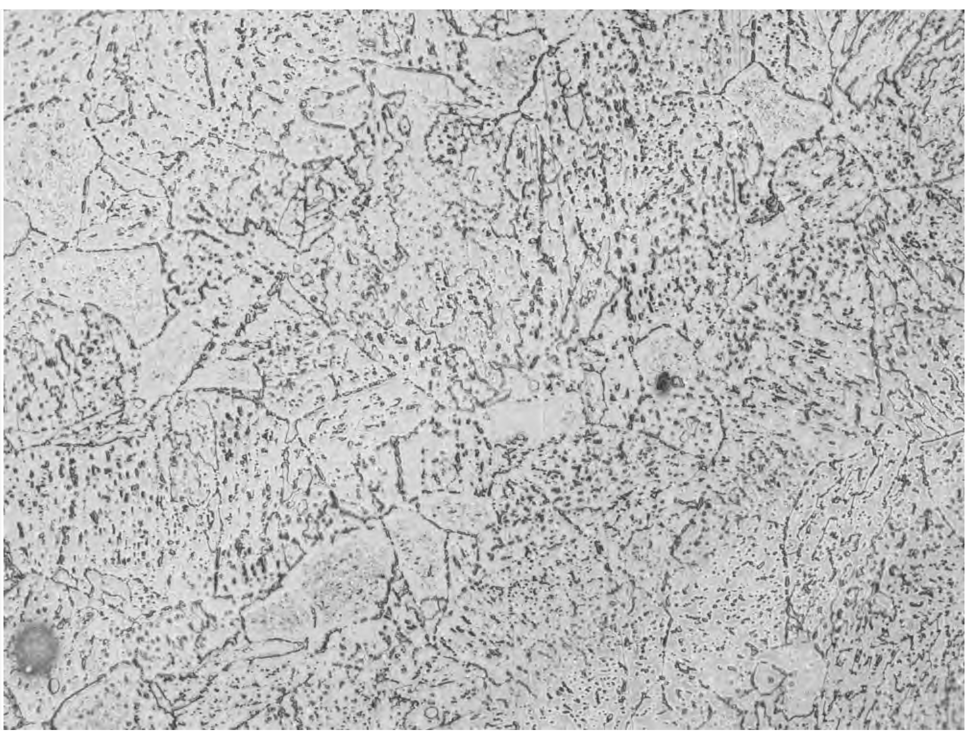
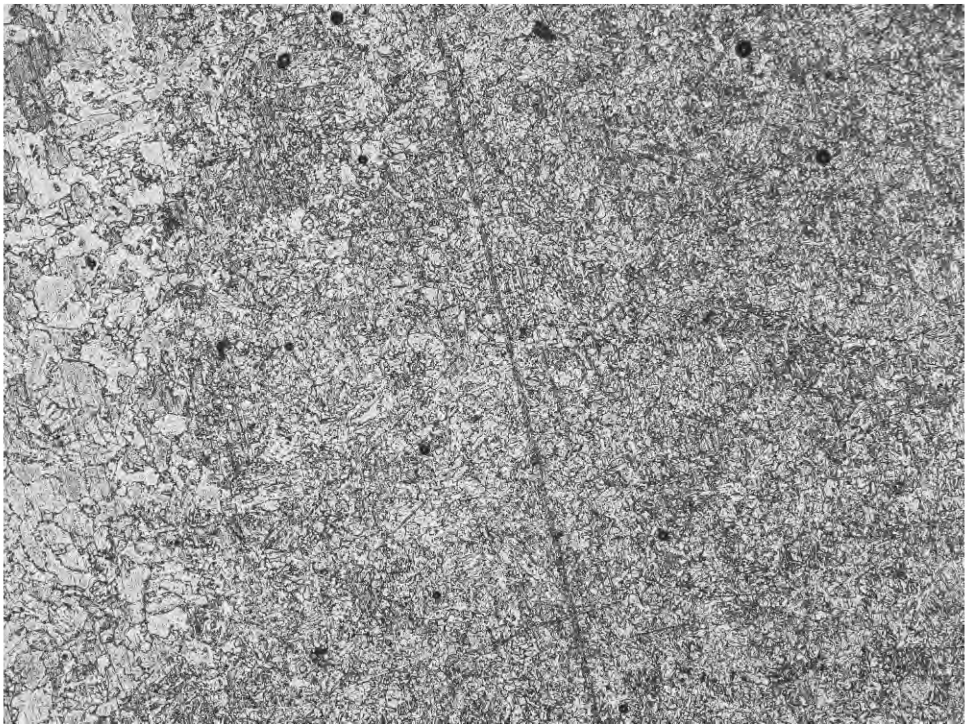


500X

Fig. 103. Replica No. HPROH-R8.



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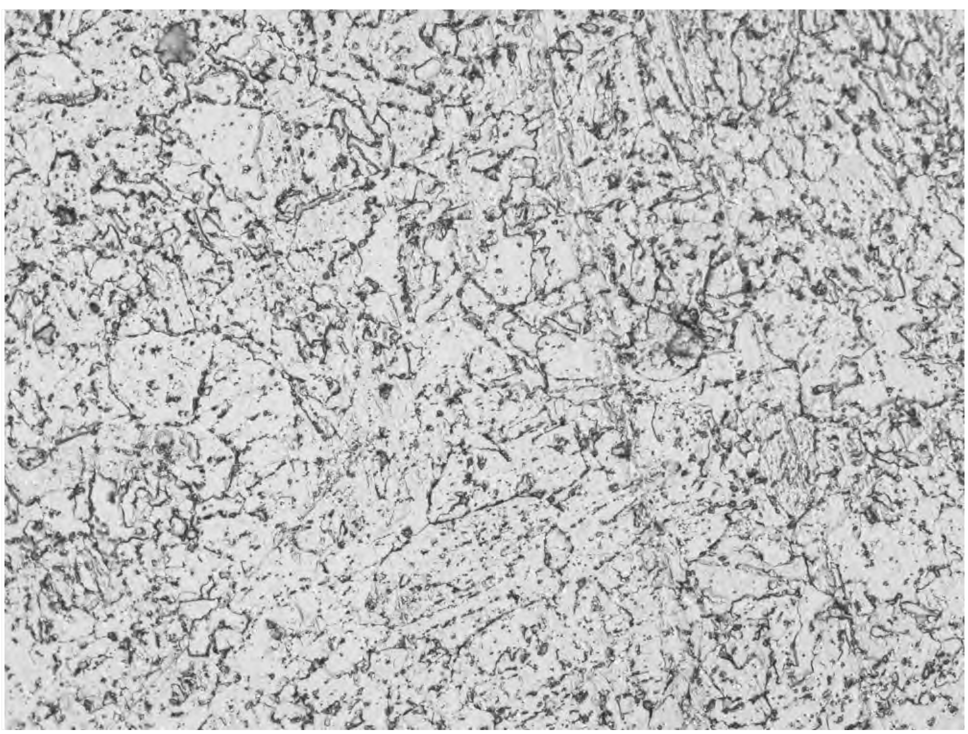
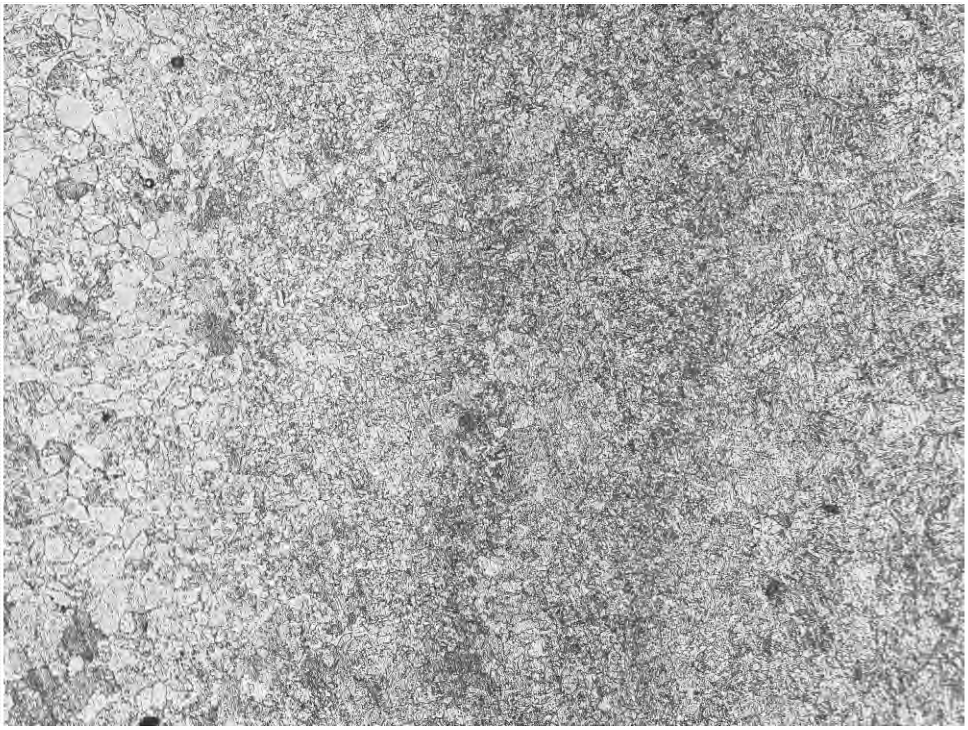


500X

Fig. 104. Replica No. HPROH-R1.



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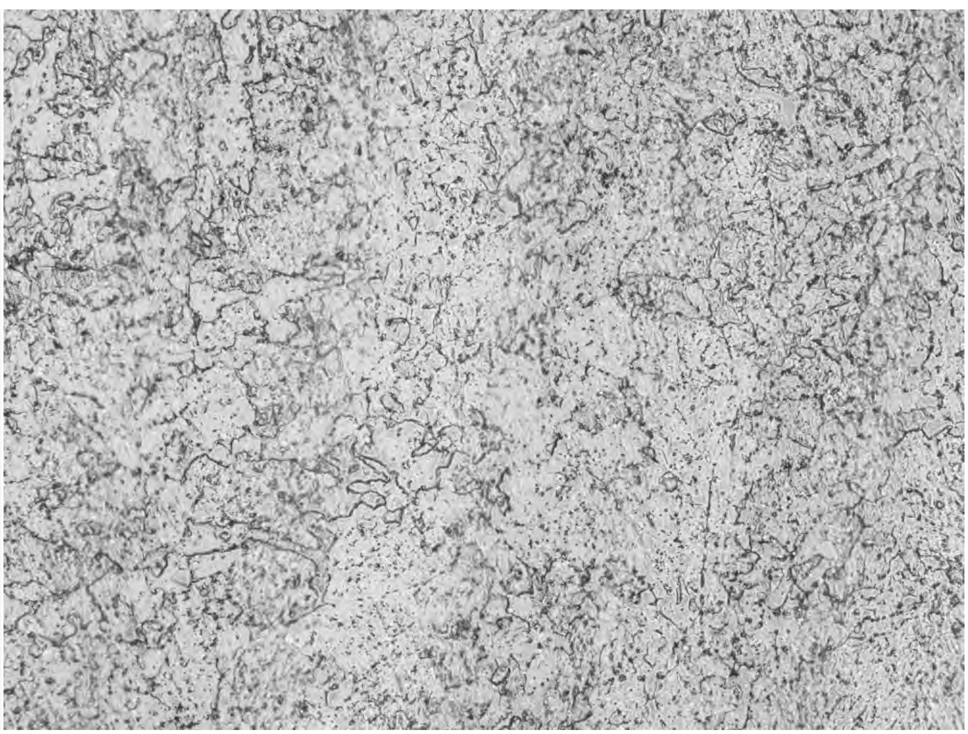

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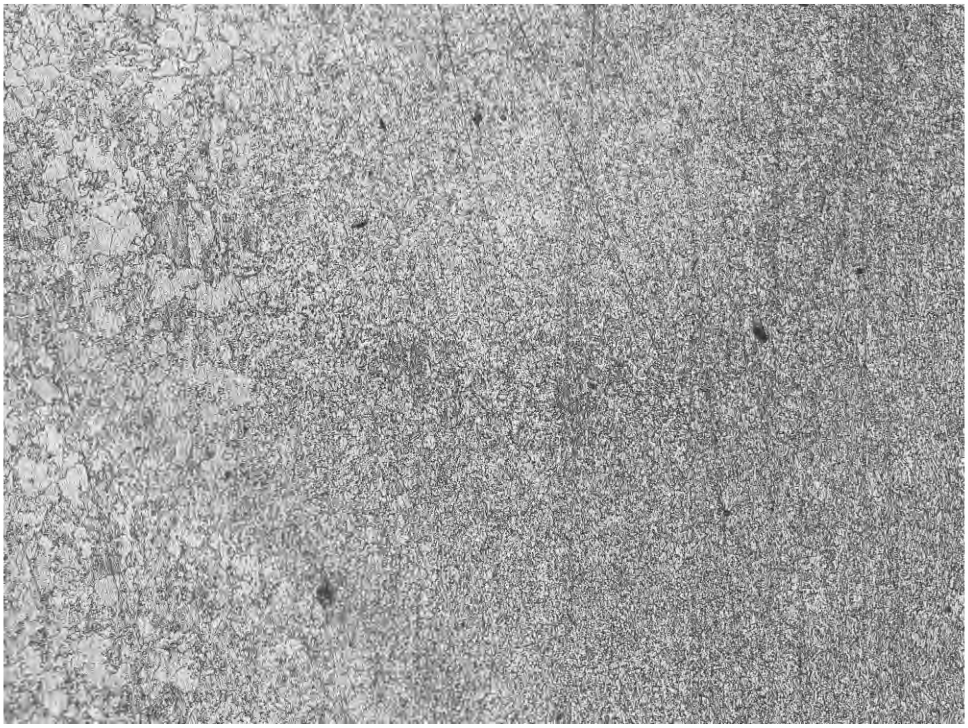
Fig. 105. Replica No. HPROH-R2.



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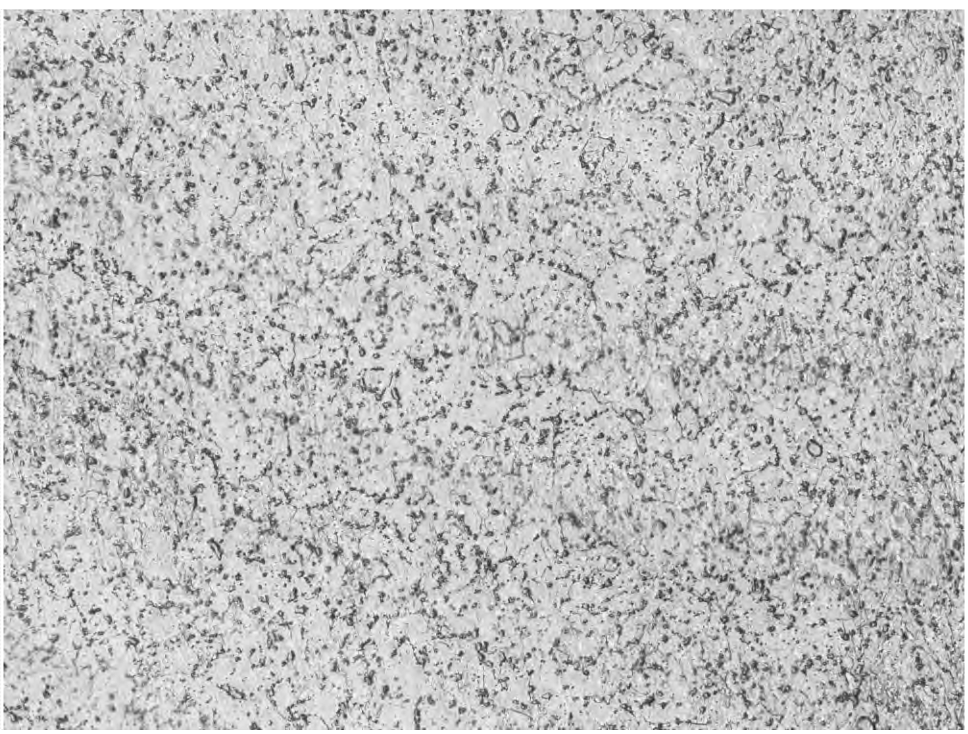

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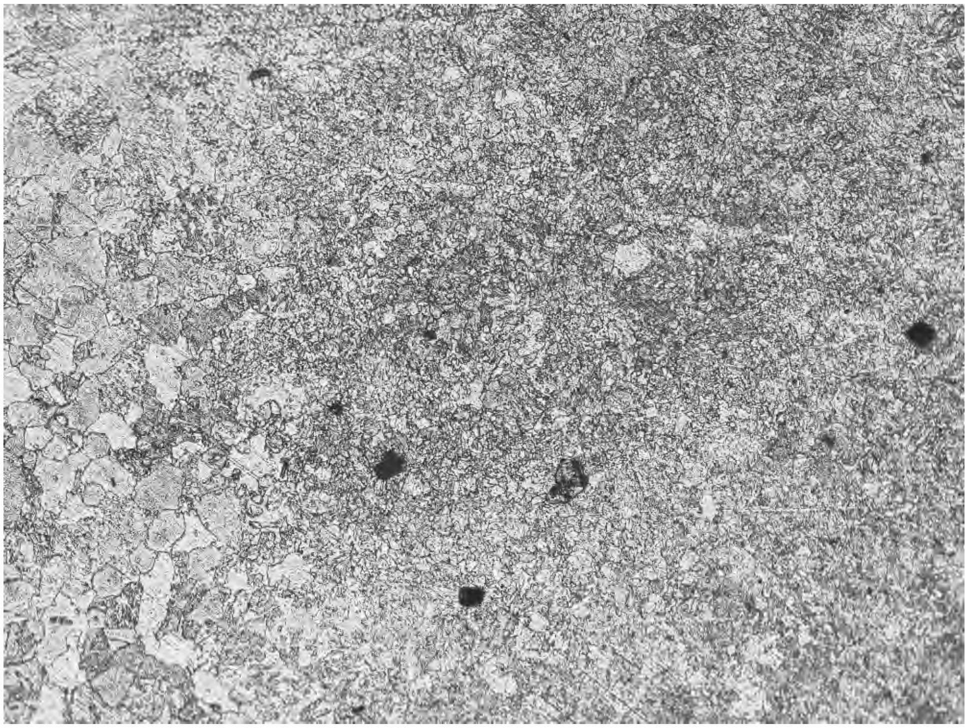
Fig. 106. Replica No. HPROH-R3.



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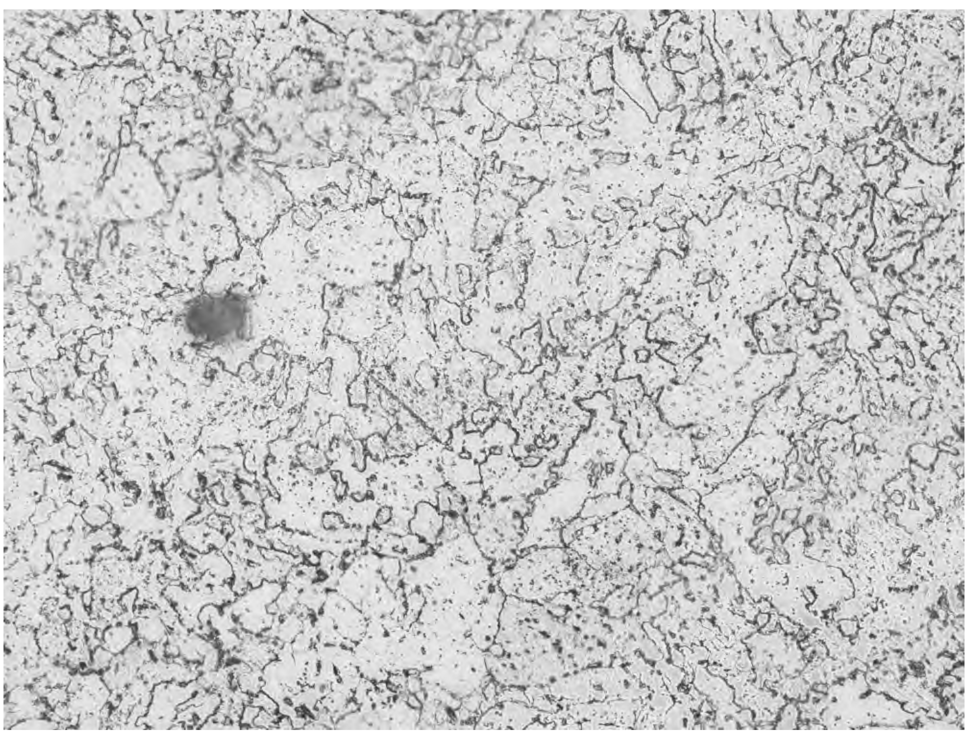

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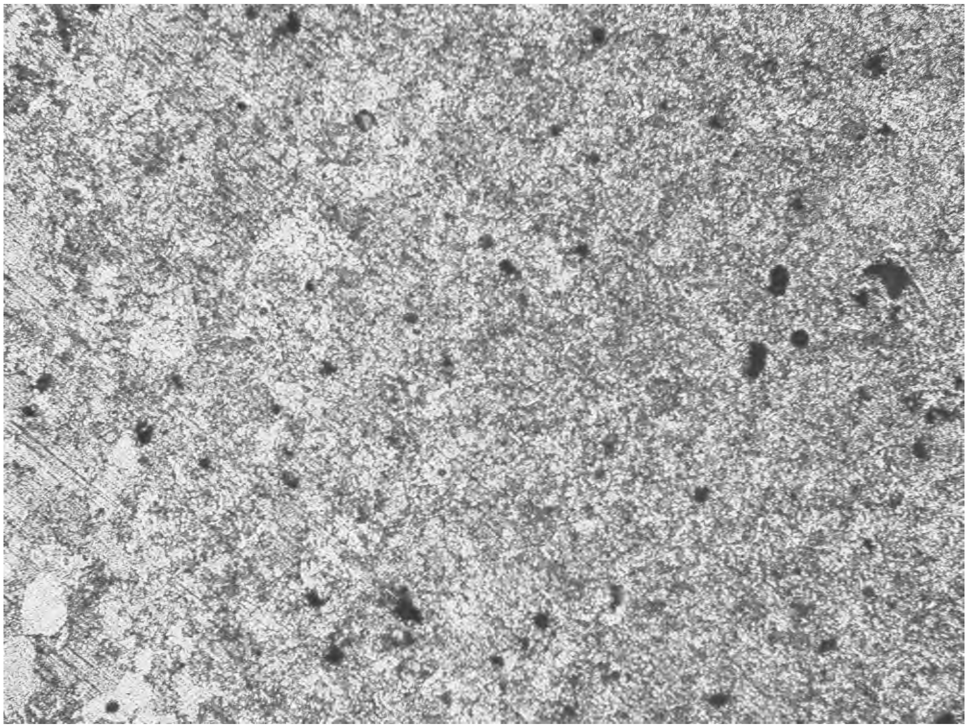
Fig. 107. Replica No. HPROH-R4.



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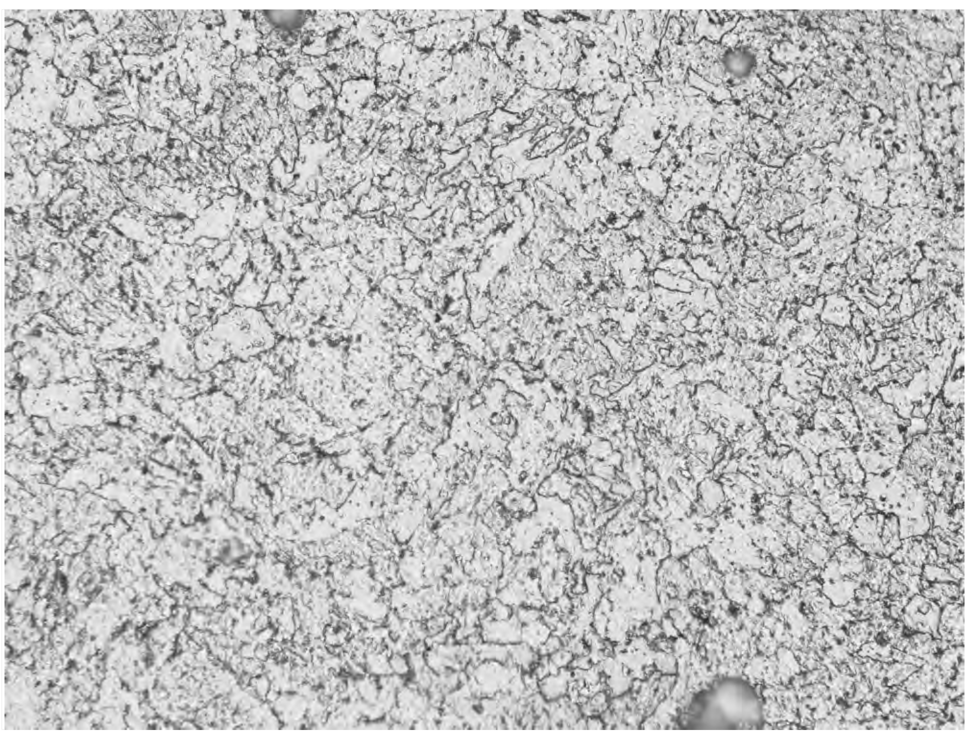
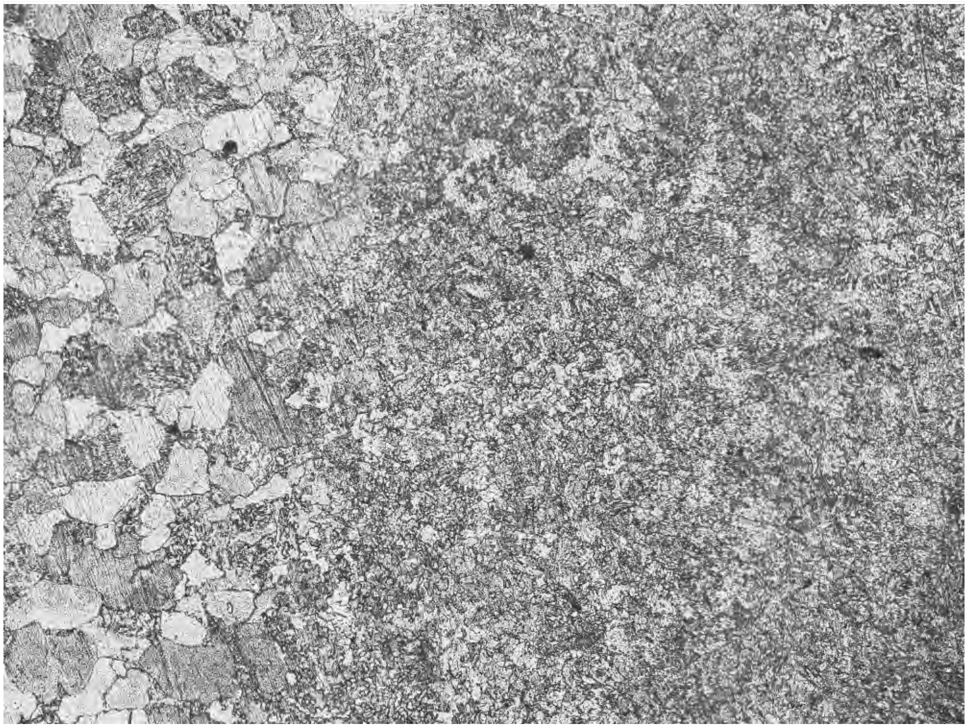


500X

Fig. 108. Replica No. HPROH-R5.



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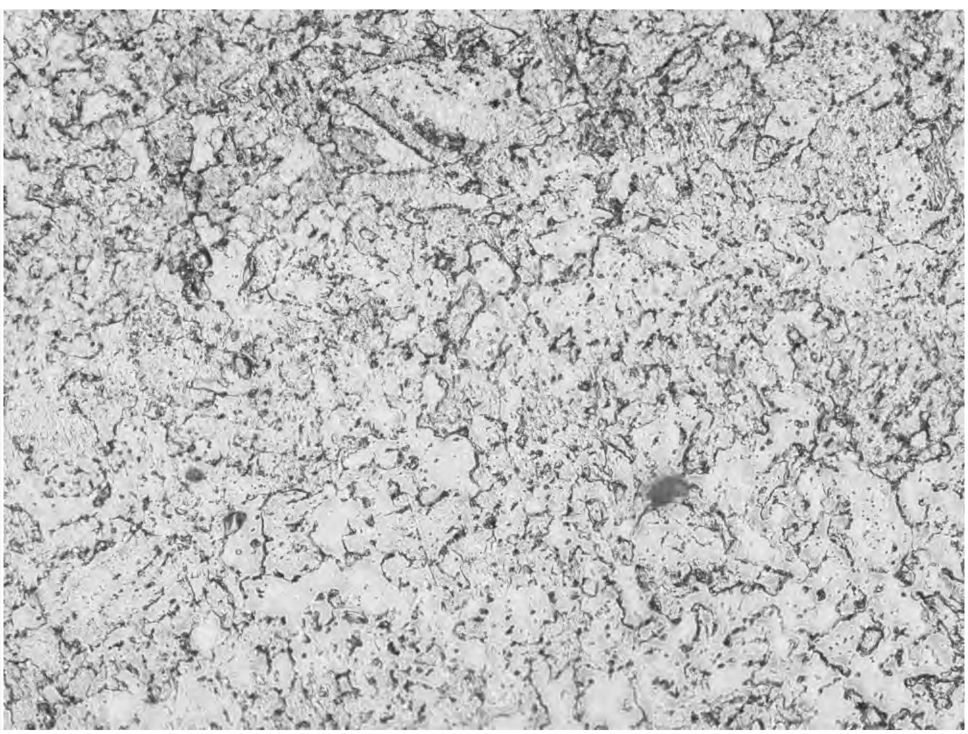

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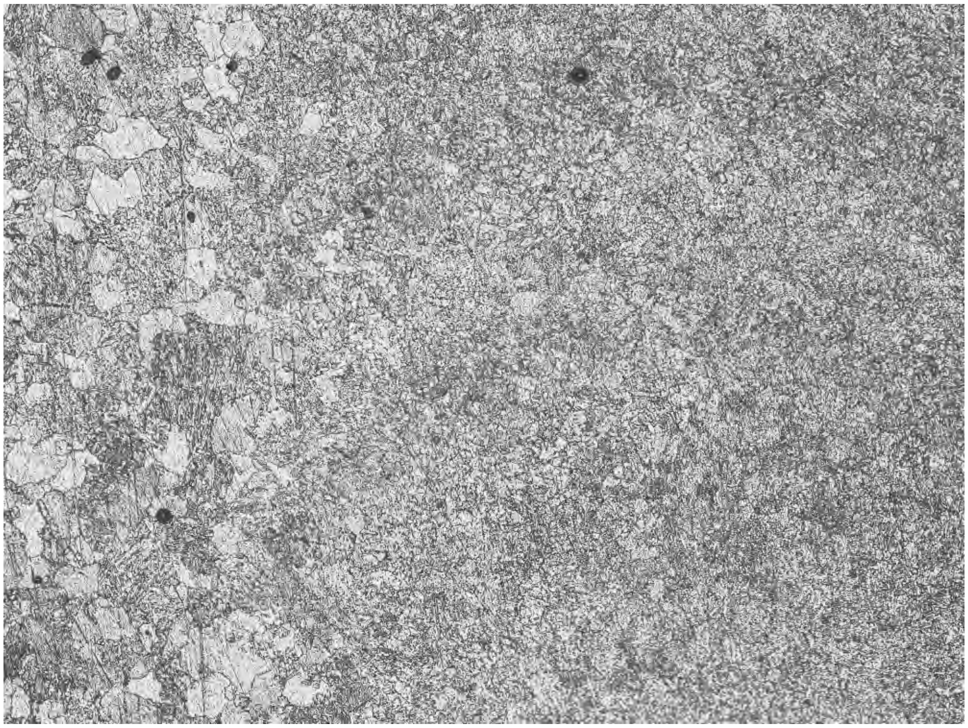
Fig. 109. Replica No. HPROH-R6.



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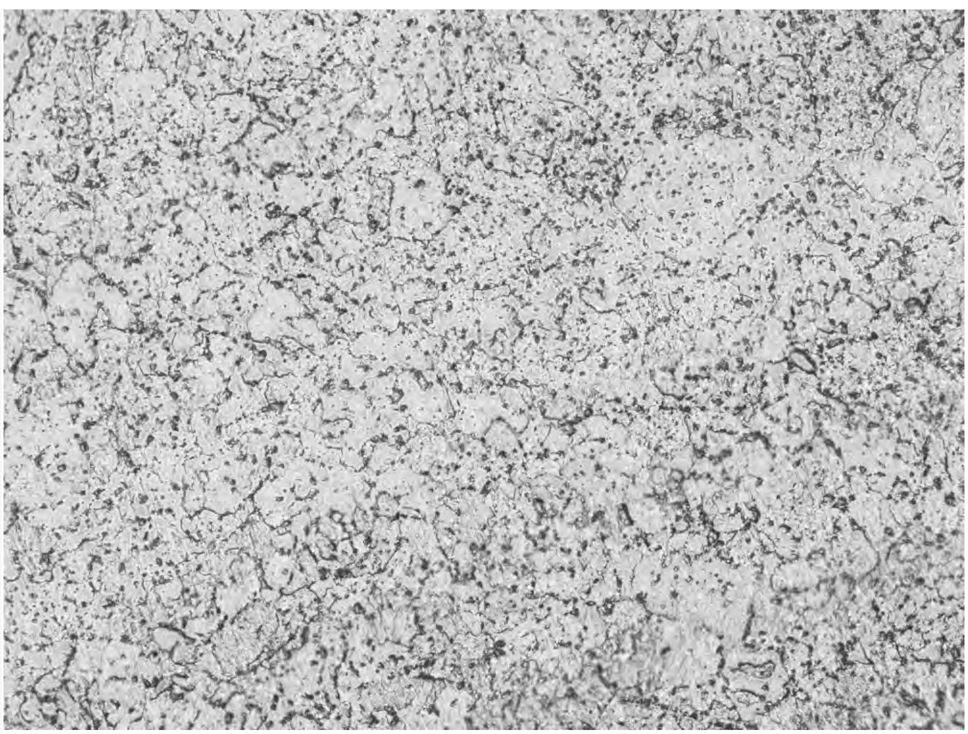

500X

Fig. 110. Replica No. HPROH-R7.

100X

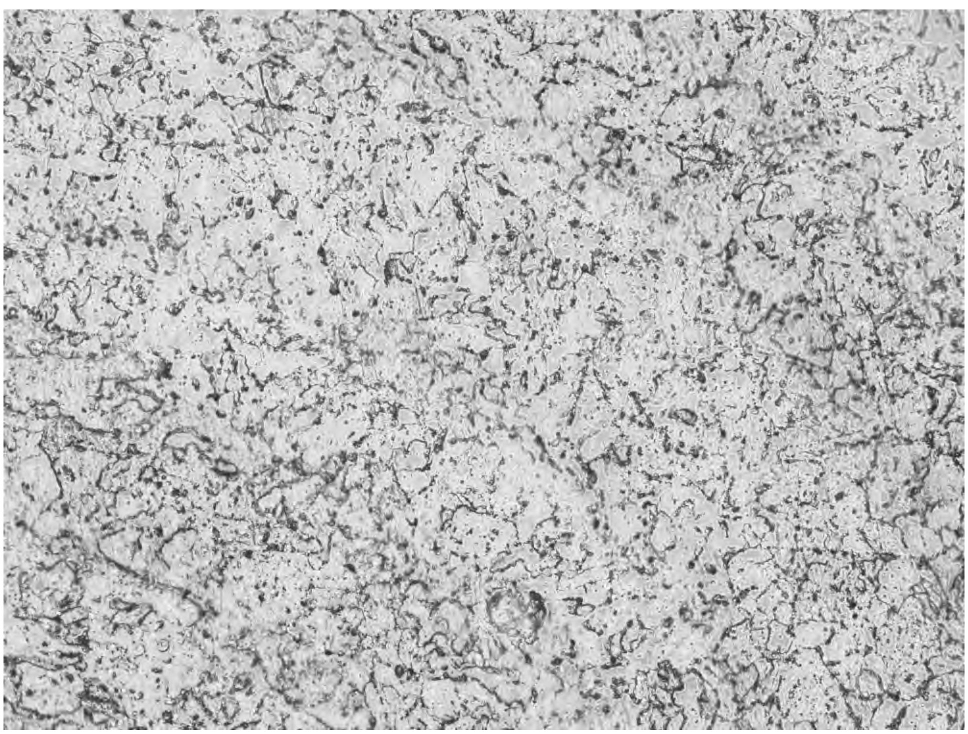

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Fig. 111. Replica No. HPROH-R8.

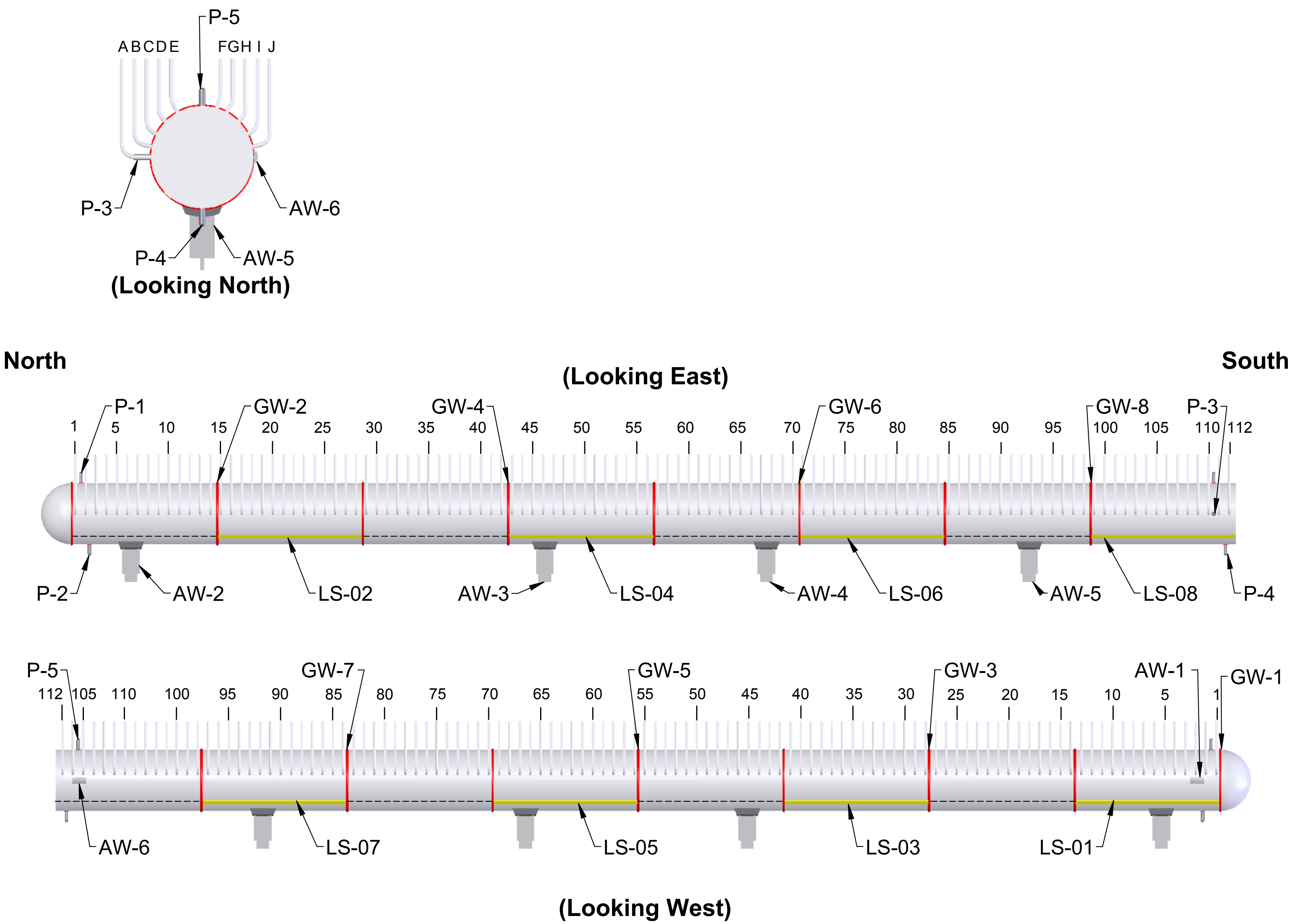
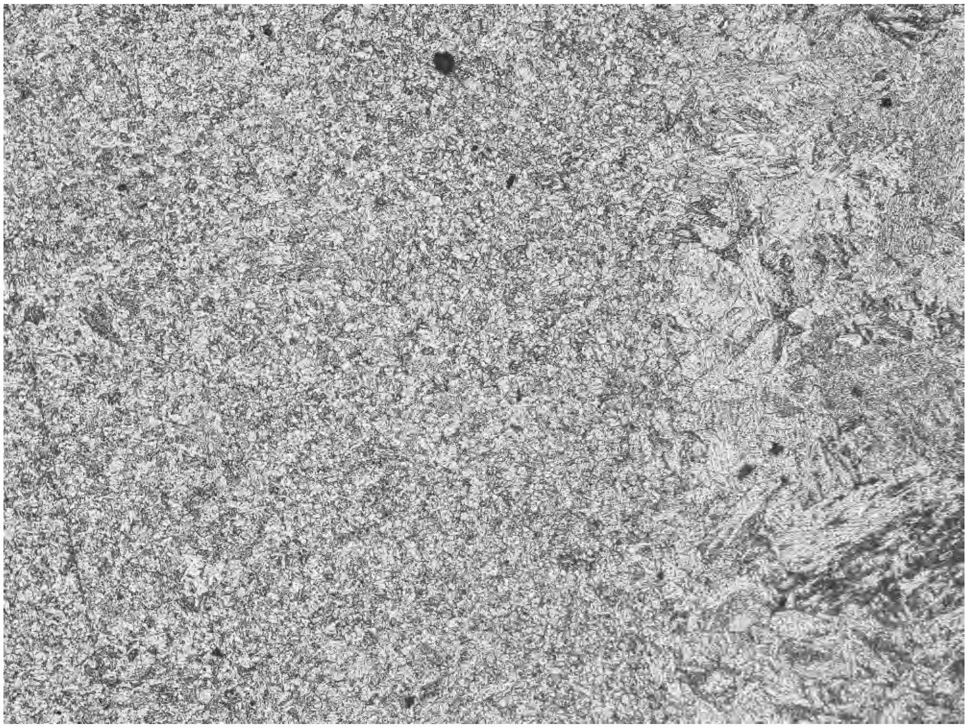


Fig. 112. Sketch of the Low-Pressure Reheat Outlet header

Thielsch

Fig. 113. Photographs of the inspection locations on the Low-Pressure Reheat Outlet header and tube stubs.



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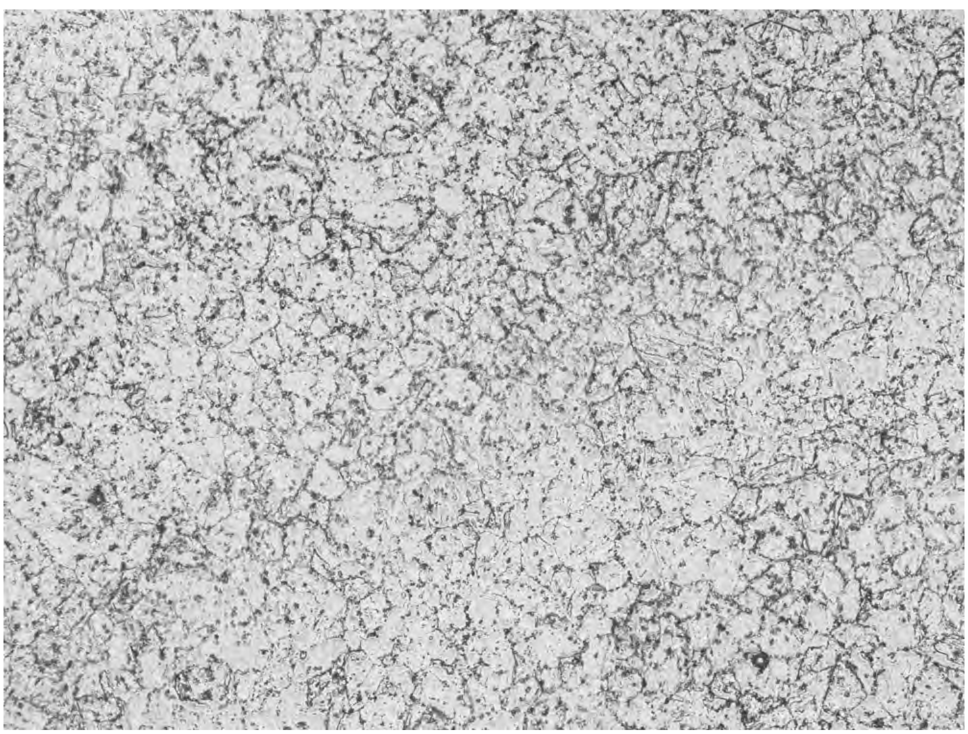

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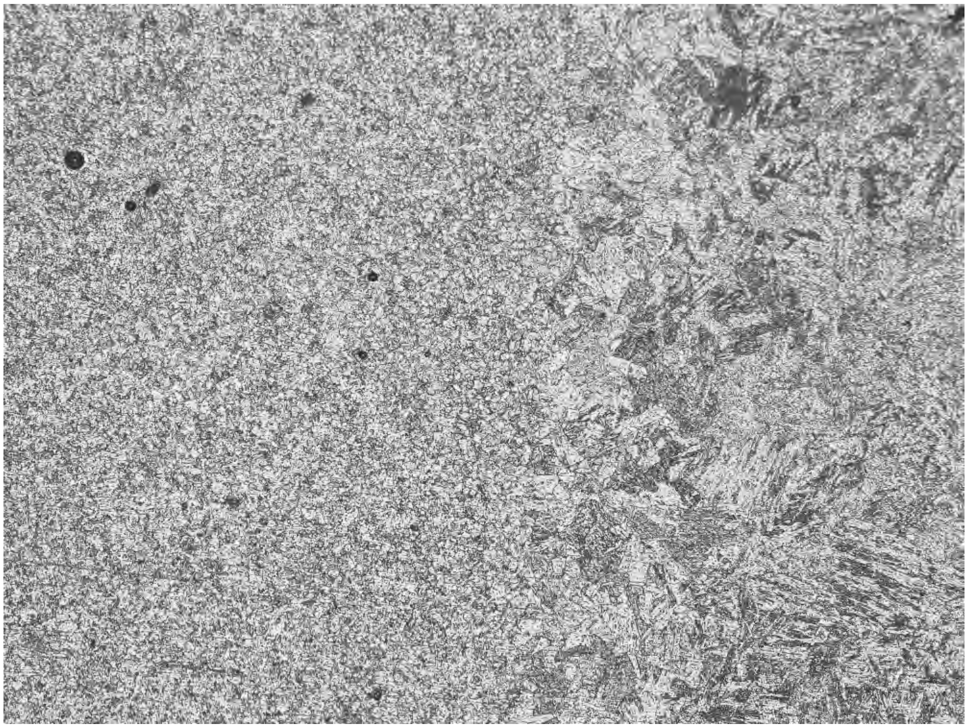
Fig. 114. Replica No. LPROH-R1.



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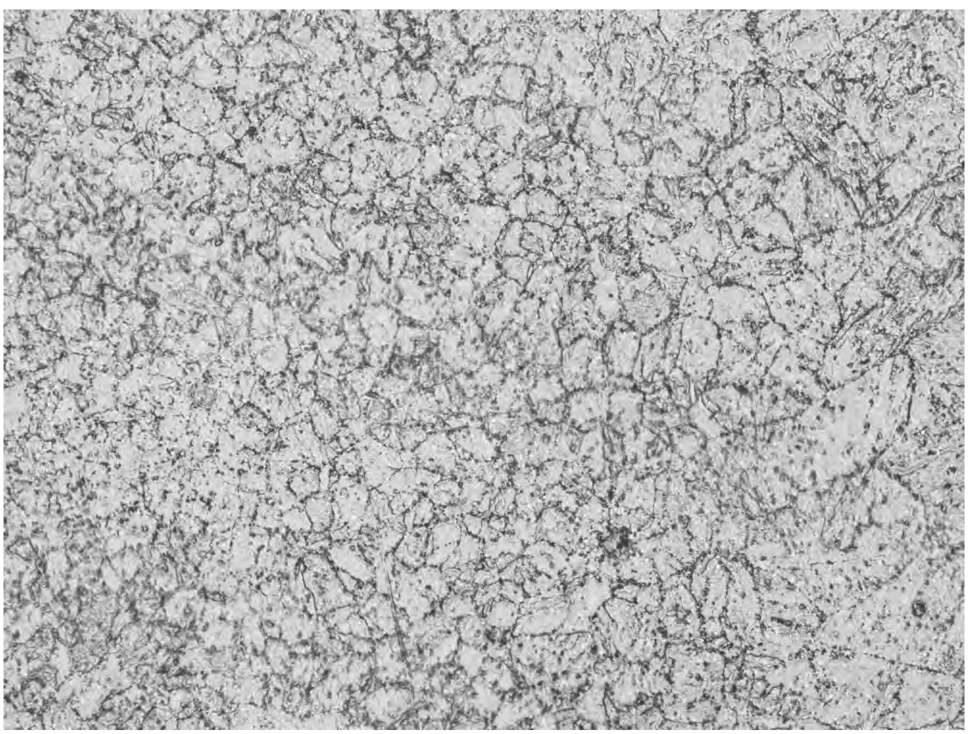

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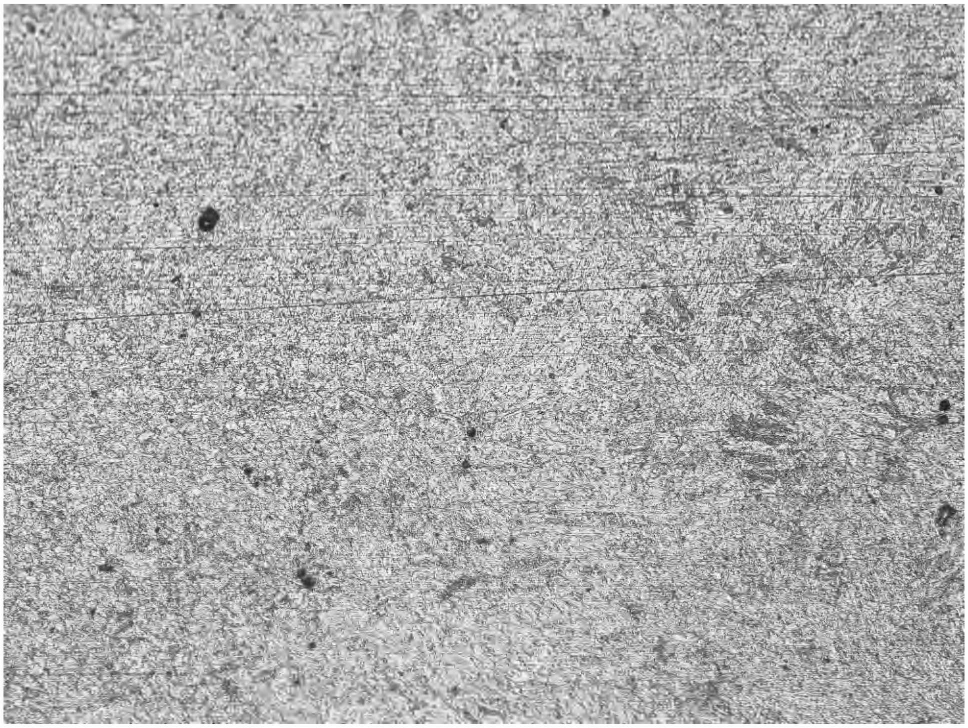
Fig. 115. Replica No. LPROH-R2.



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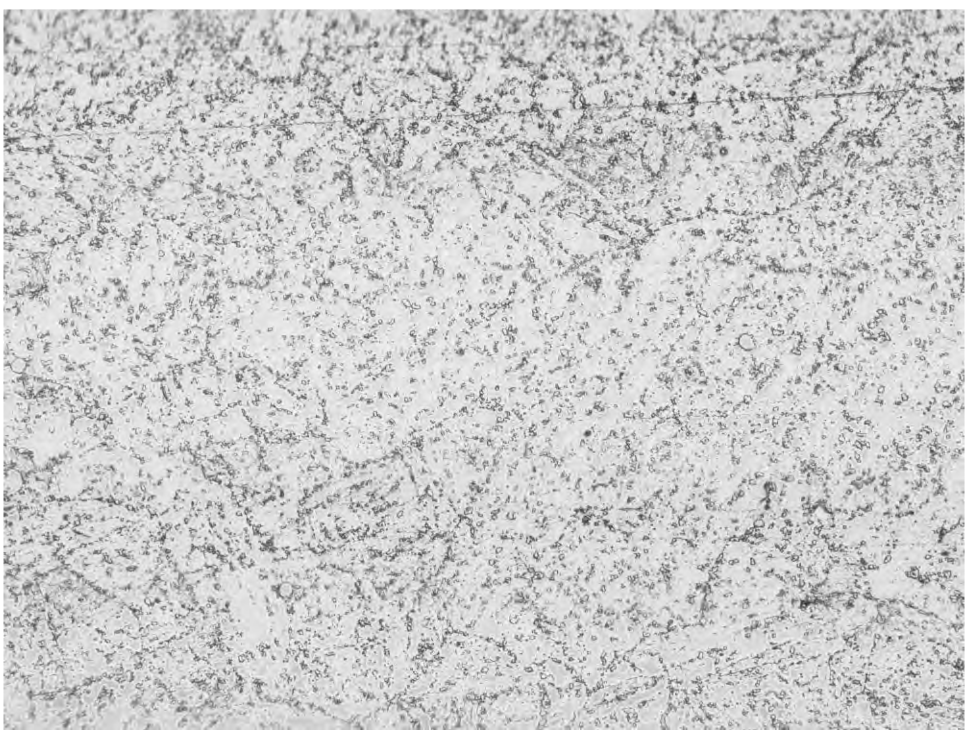

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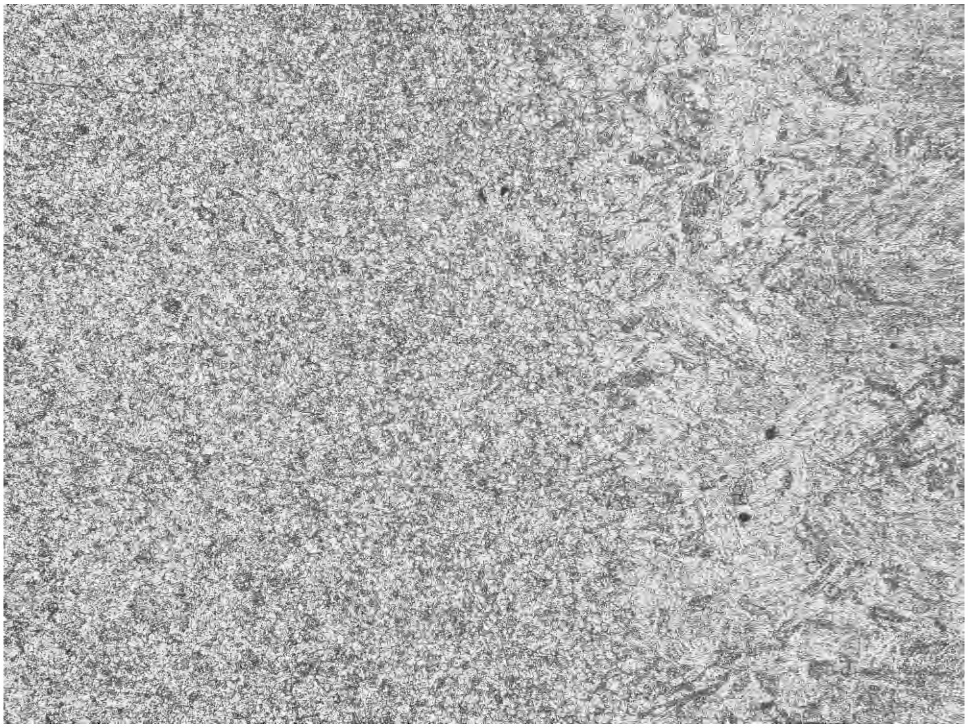
Fig. 116. Replica No. LPROH-R3.



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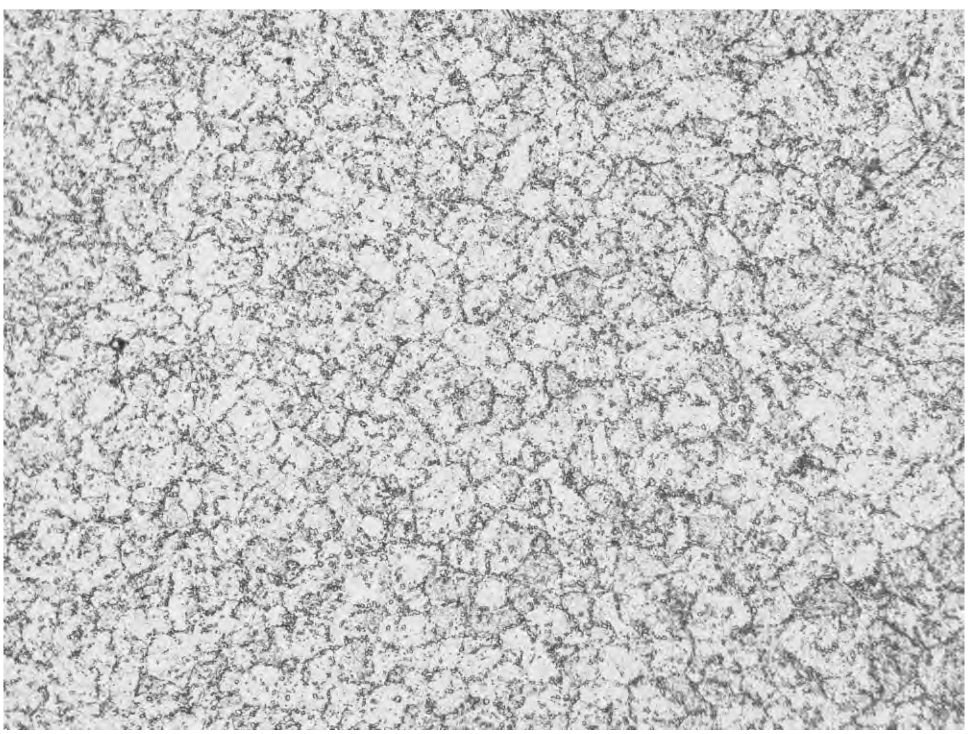

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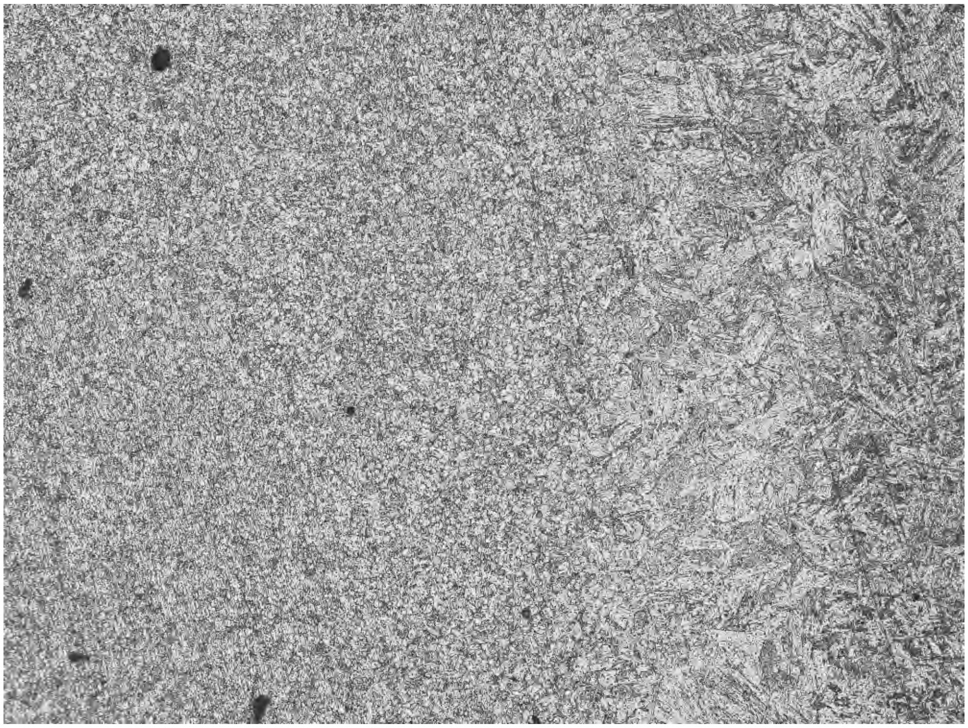
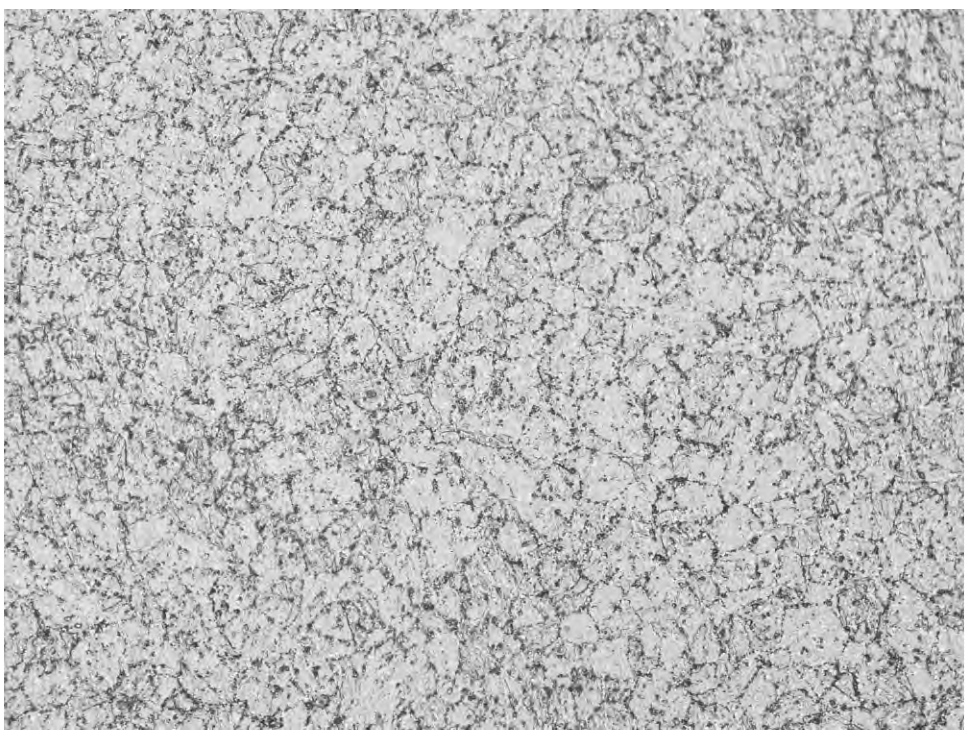
Fig. 117. Replica No. LPROH-R4.

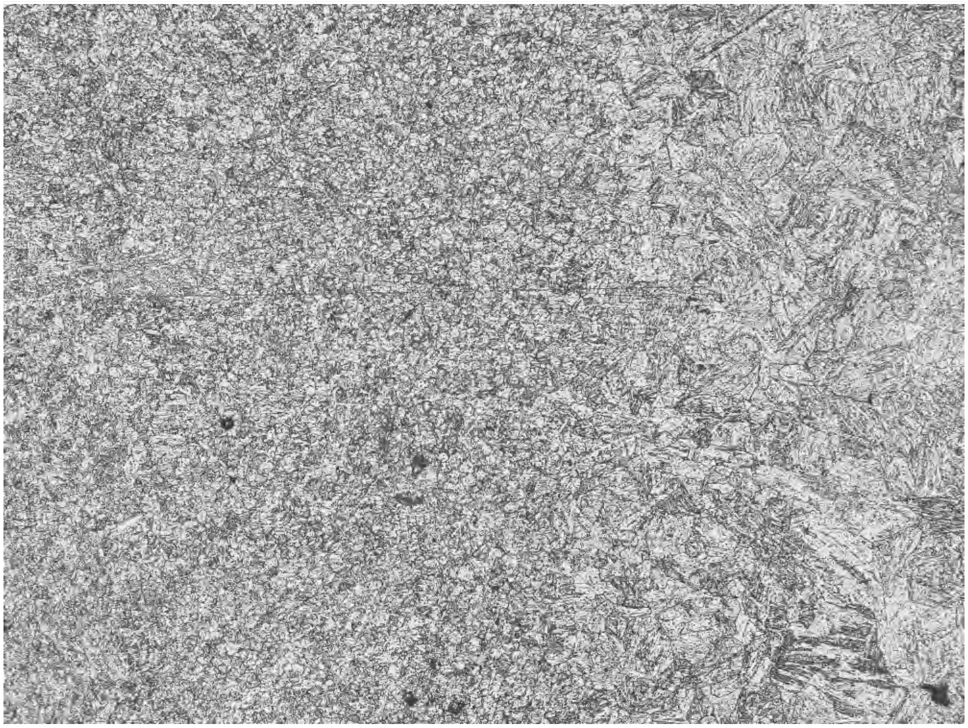


100X



500X

Fig. 118. Replica No. LPROH-R5.



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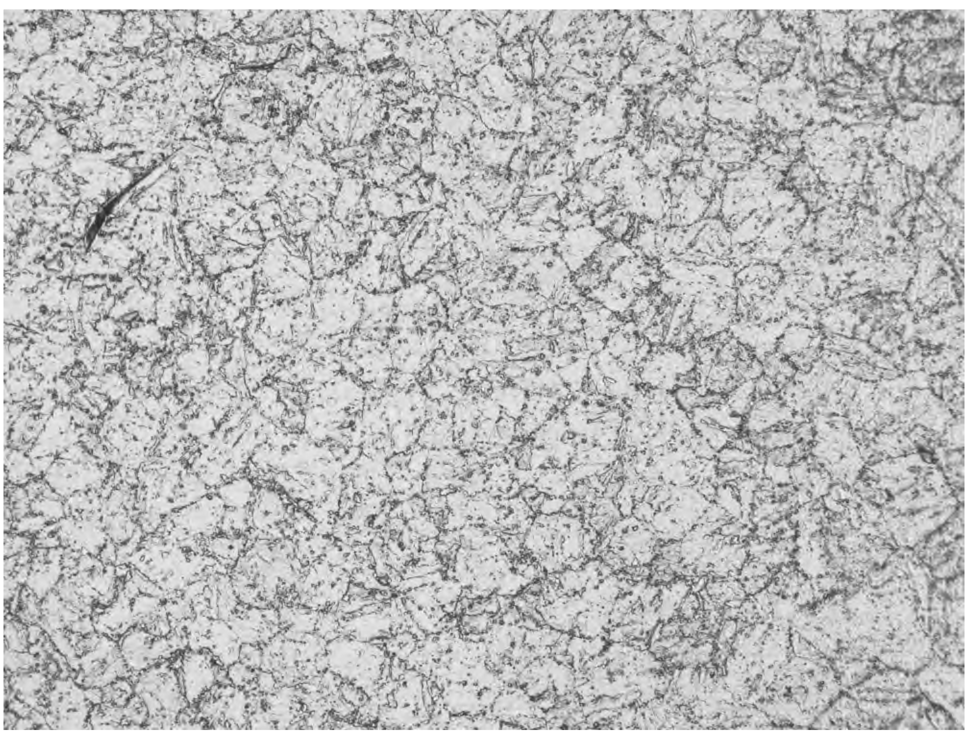
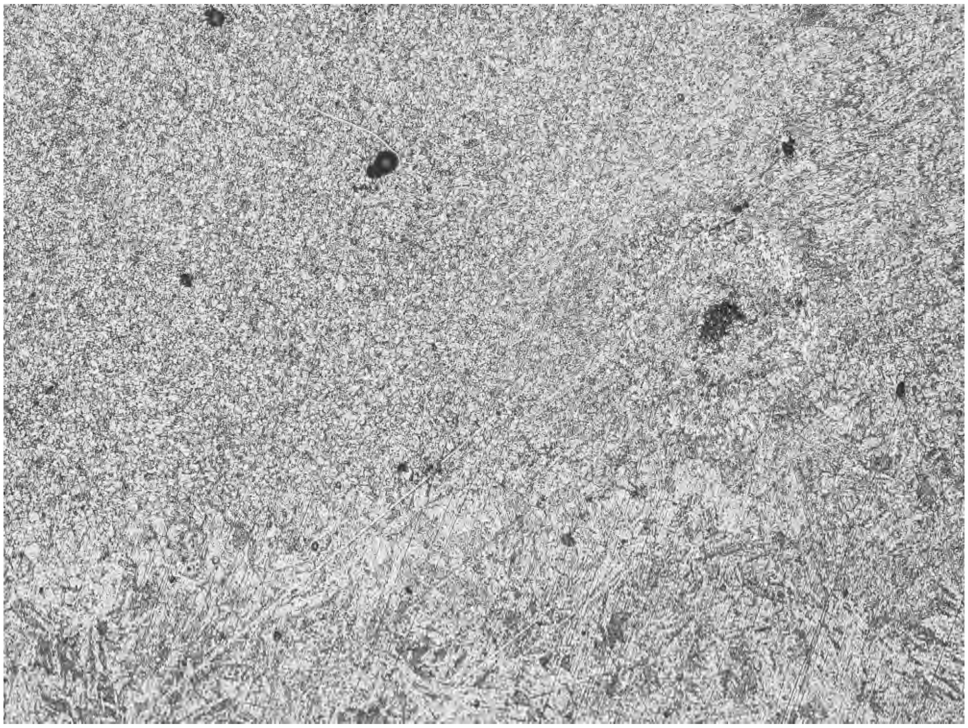


500X

Fig. 119. Replica No. LPROH-R6.



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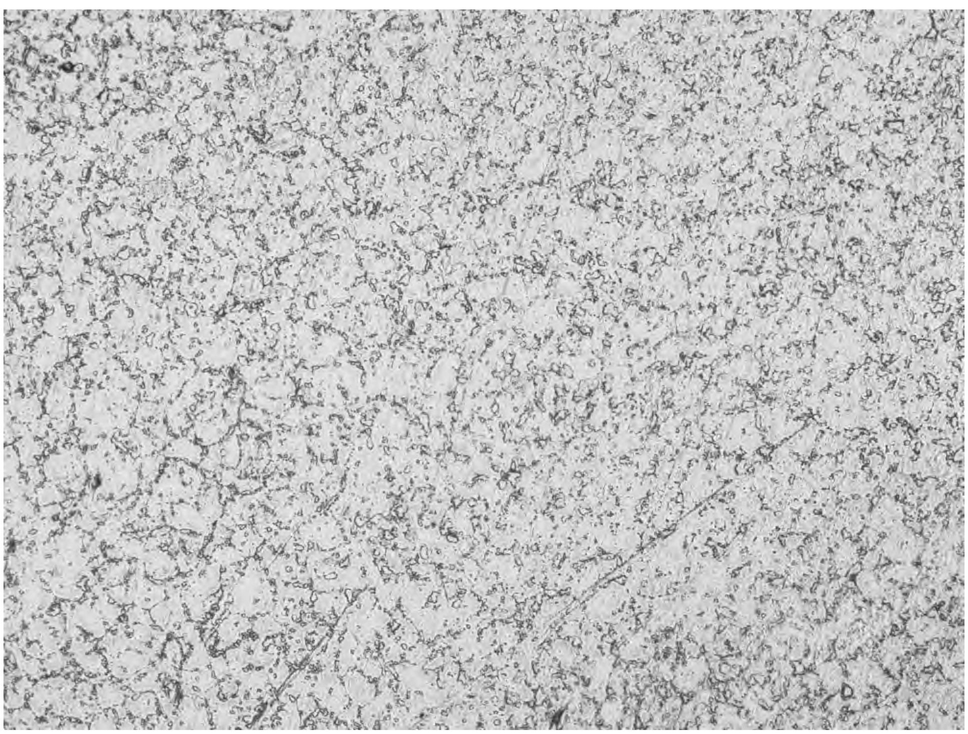

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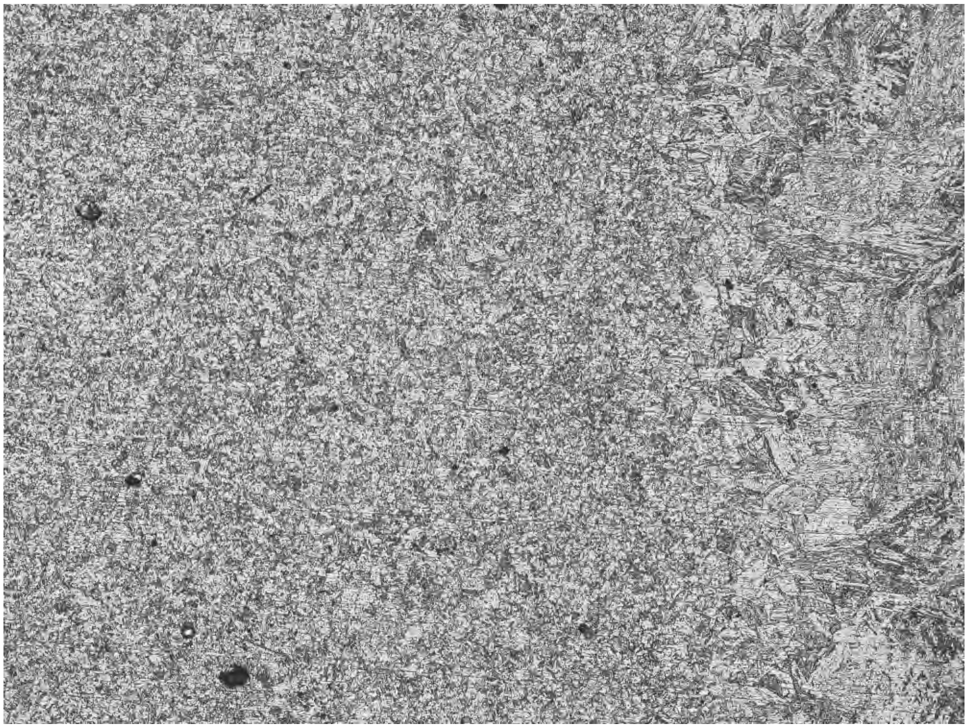
Fig. 120. Replica No. LPROH-R7.



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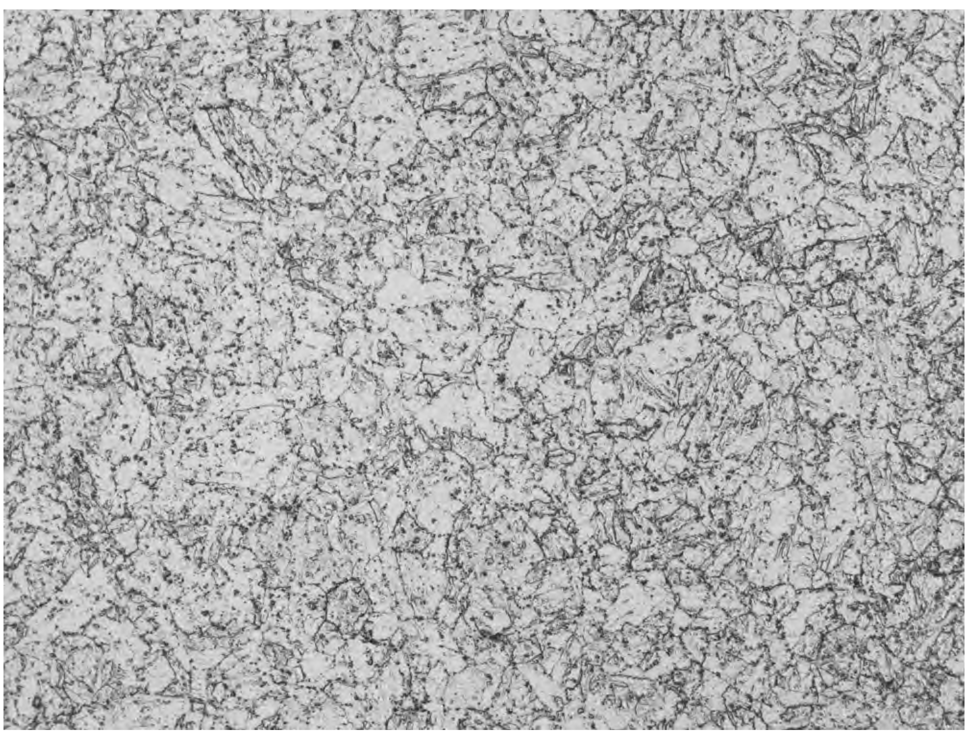

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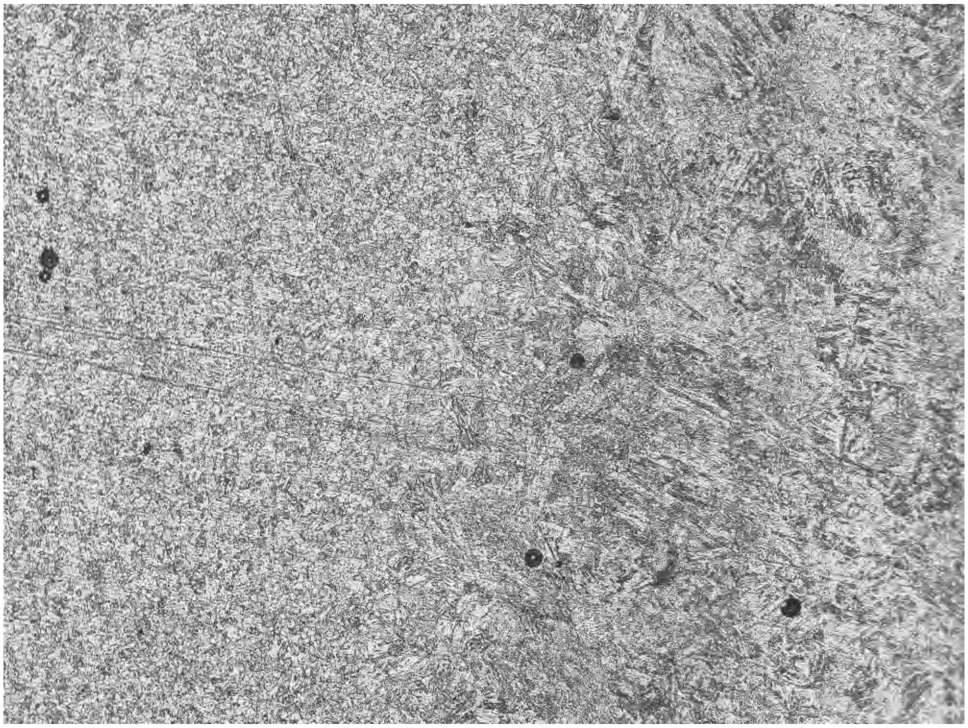
Fig. 121. Replica No. LPROH-R8.



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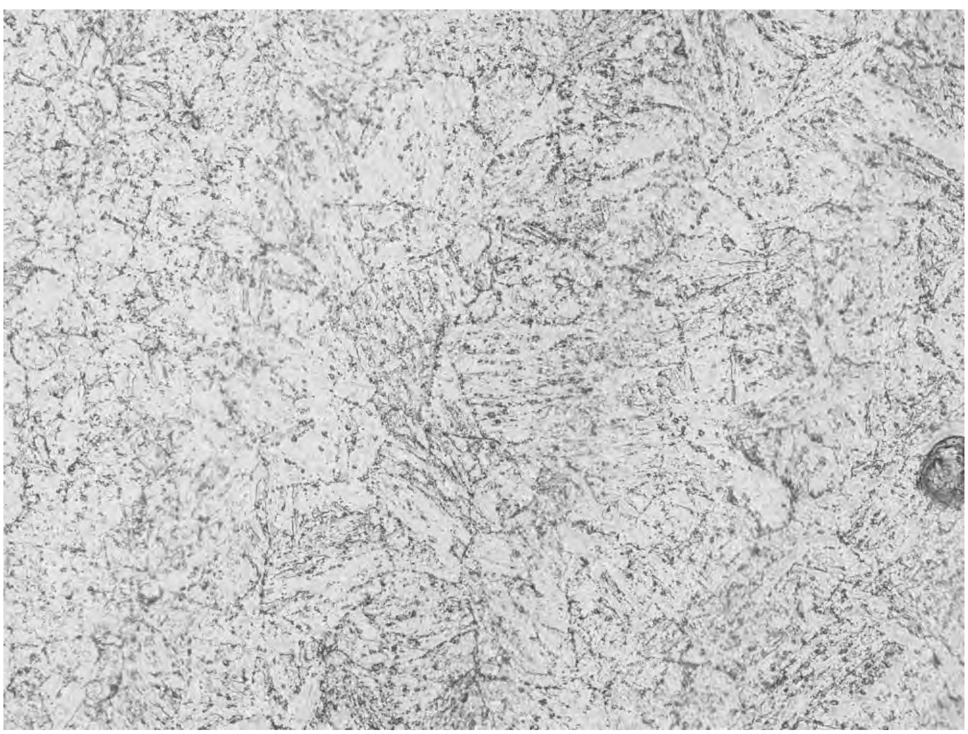

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Fig. 122. Replica No. LPROH-R9.

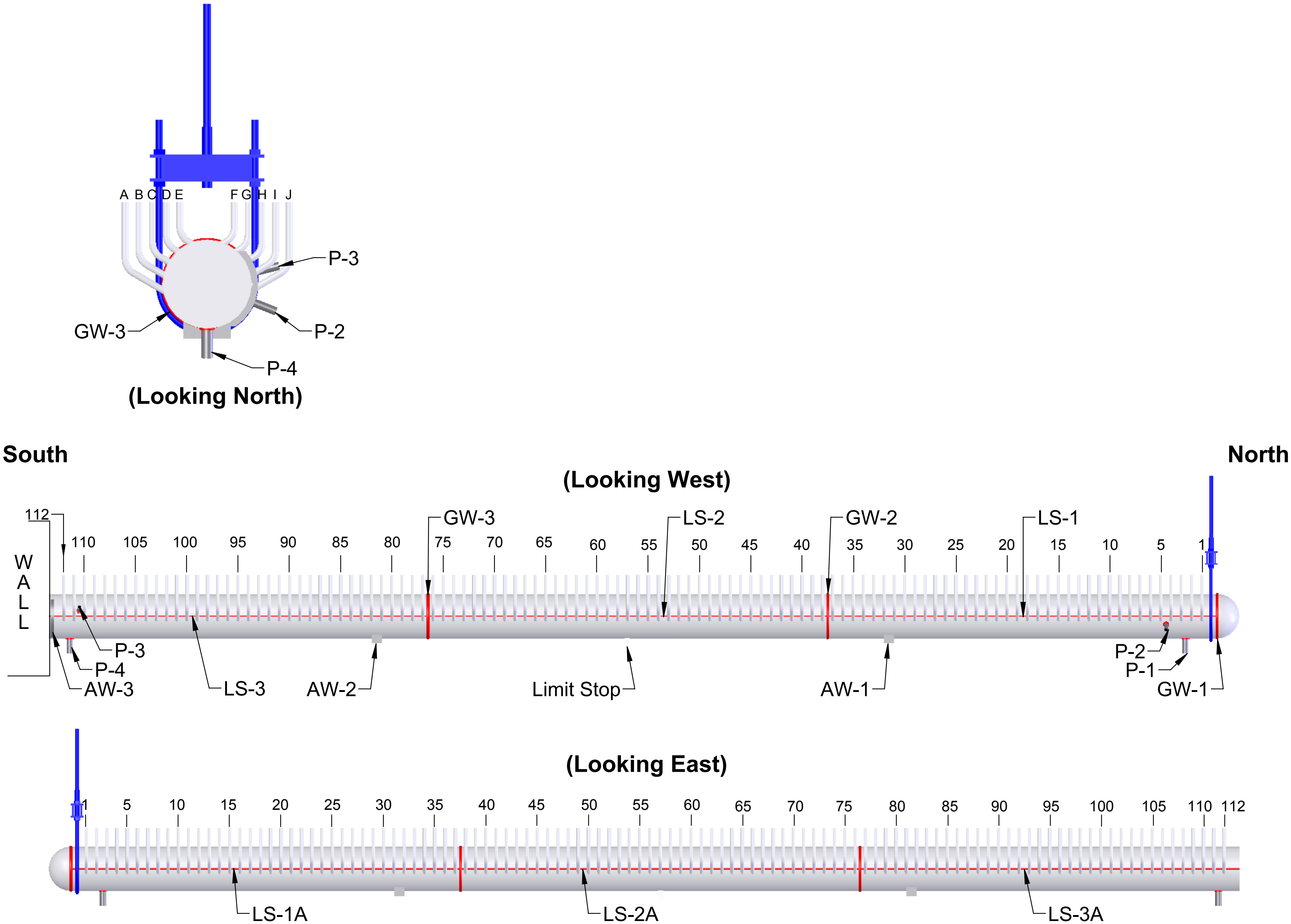


Fig. 123. Sketches of the High-Pressure (1st) Reheat Inlet header

Thielsch

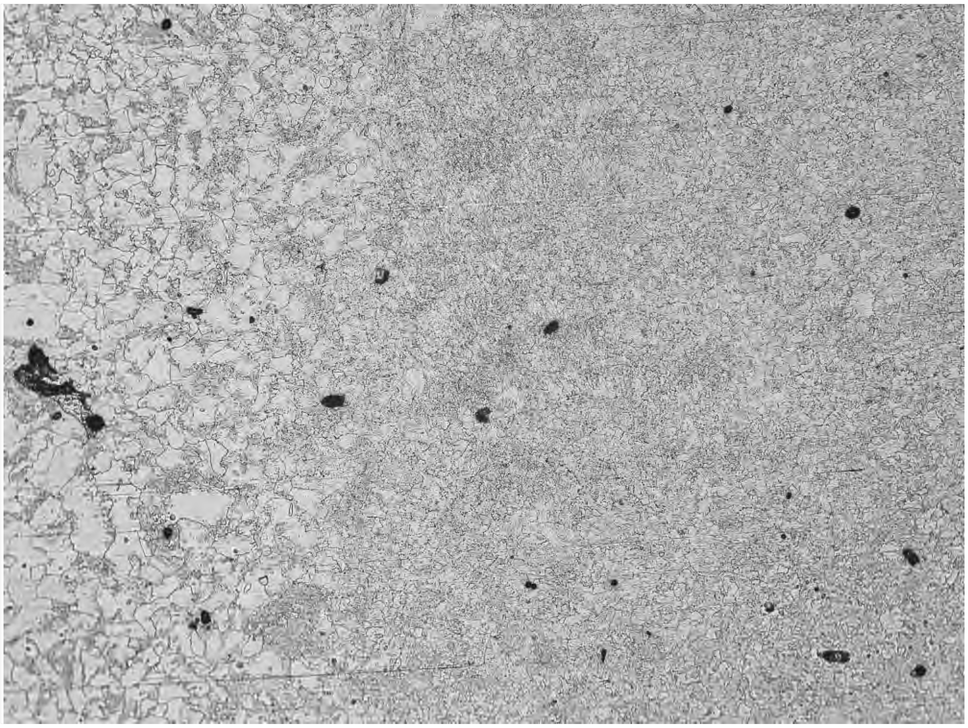
Fig. 124. Photographs of the inspection locations on the High-Pressure (1st) Reheat Inlet header and tube stubs.

Fig. 125.

Photographs of indications in seam weld No. LS-3 on the High-Pressure (1st) Reheat Inlet header.

Fig. 126.

Photographs of repaired indications in seam weld No. LS-3 on the 1st High-Pressure Reheat Inlet header.



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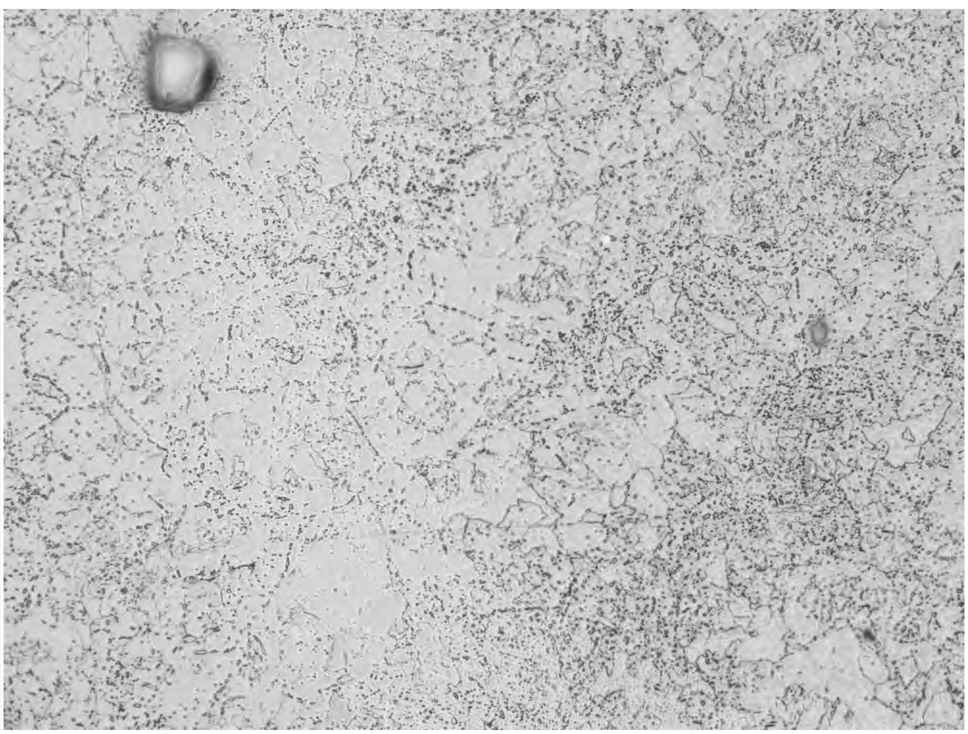

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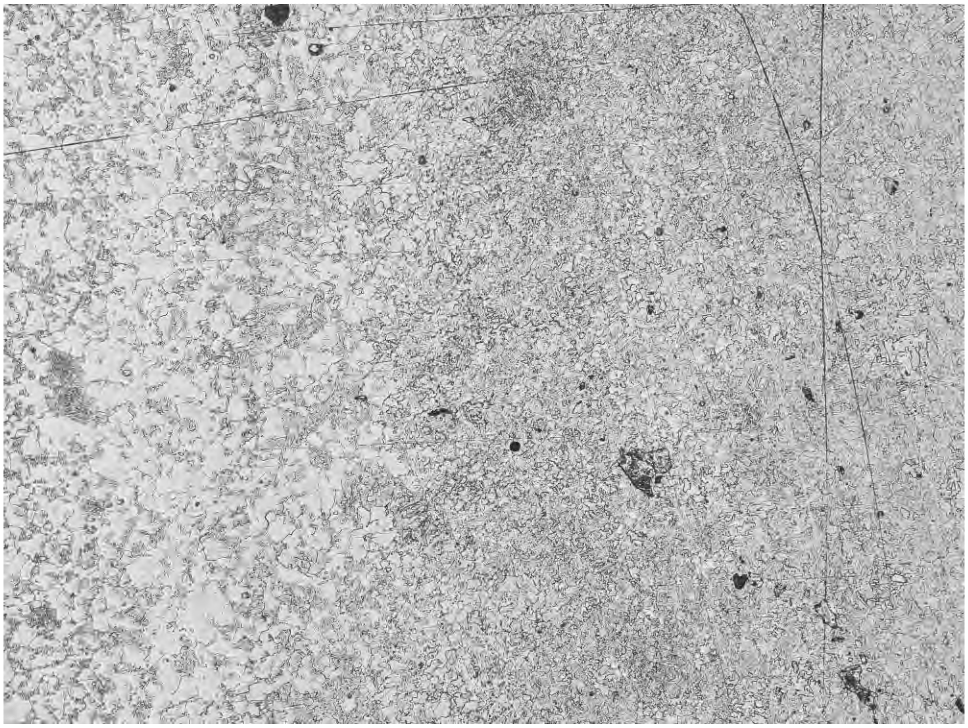
Fig. 127. Replica No. HPRIH-R1.



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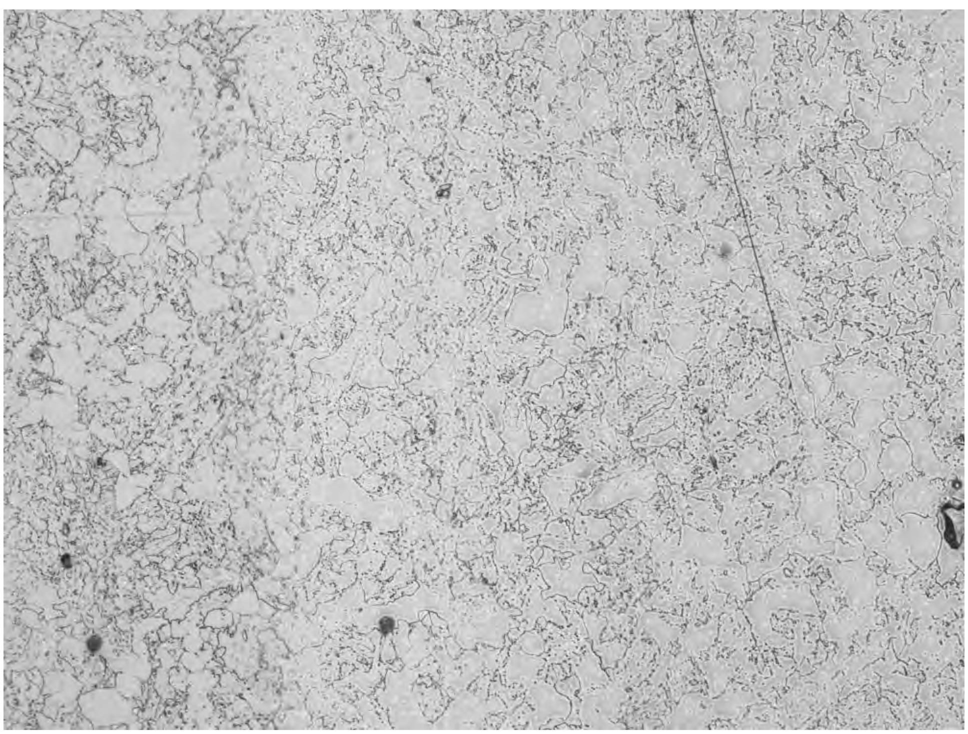

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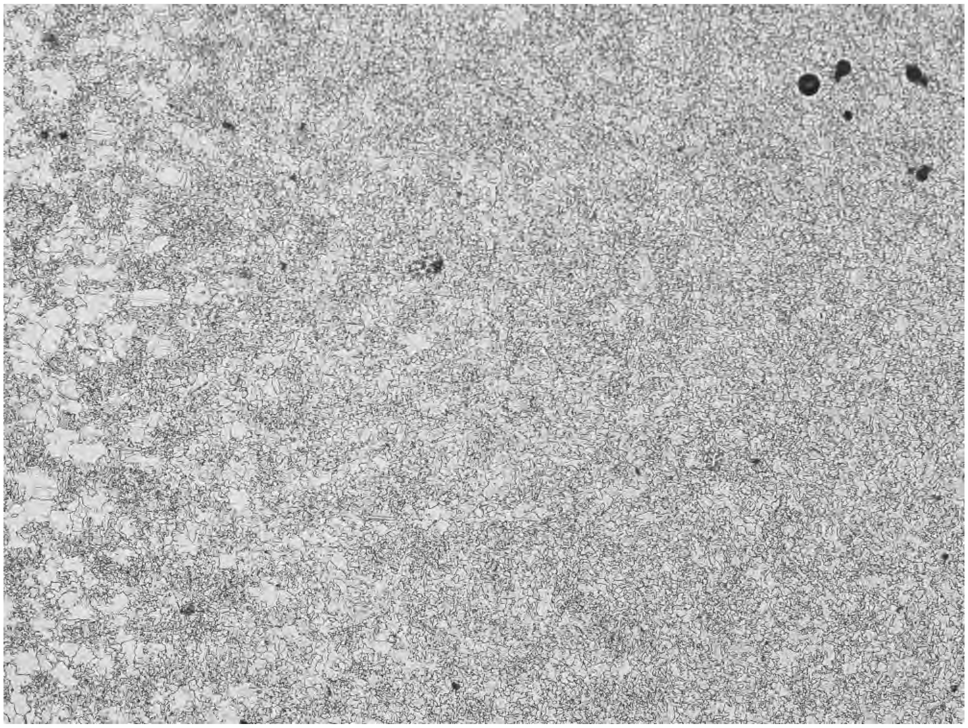
Fig. 128. Replica No. HPRIH-R2.



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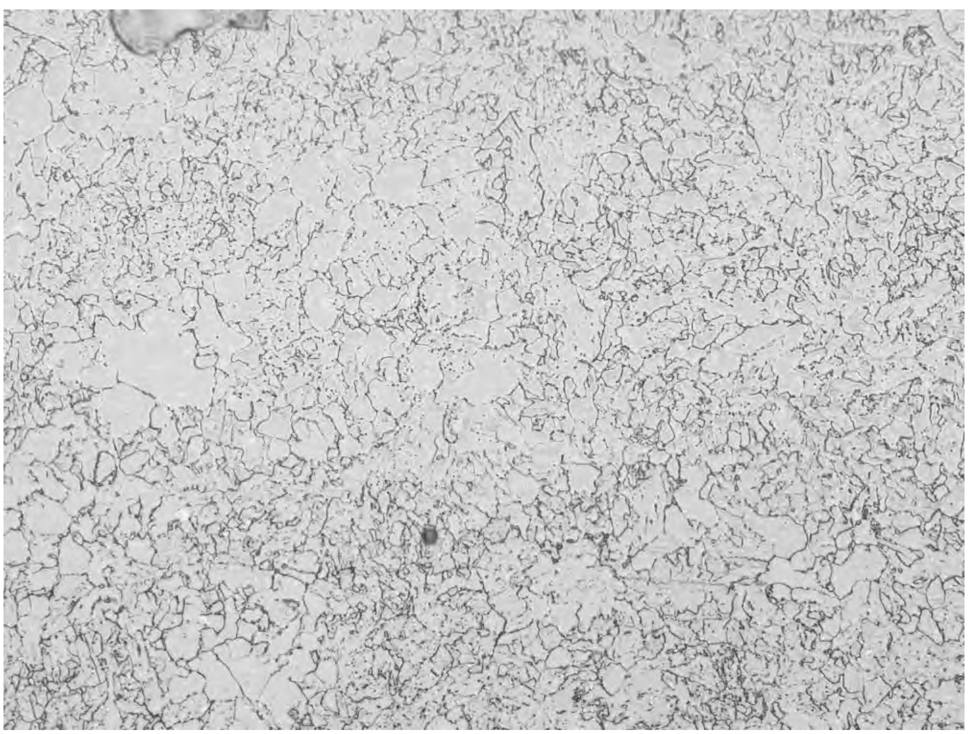

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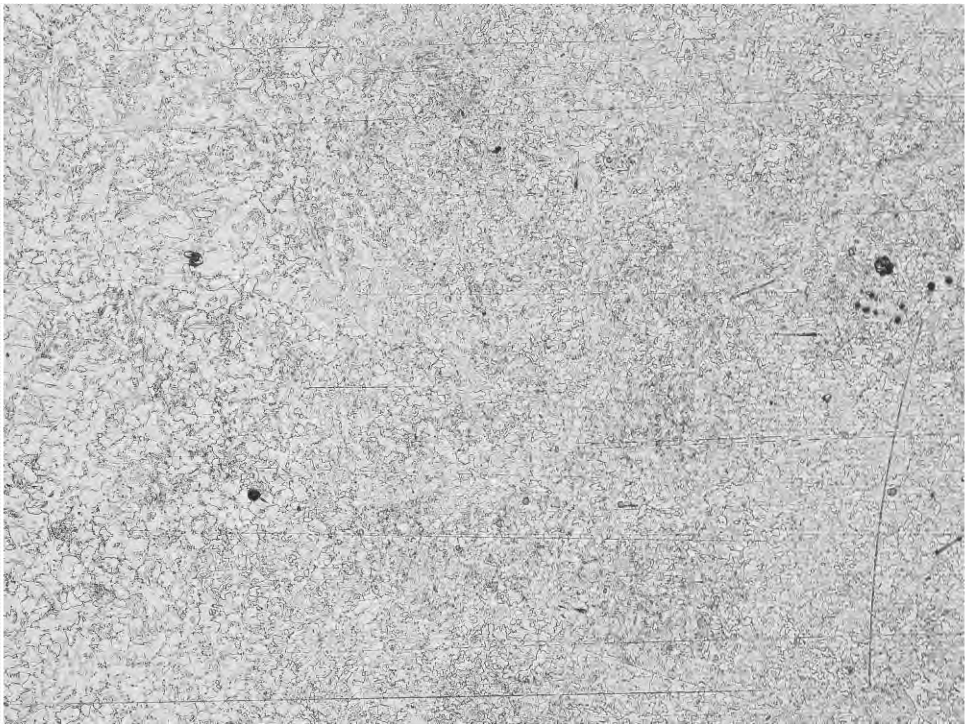
Fig. 129. Replica No. HPRIH-R3.



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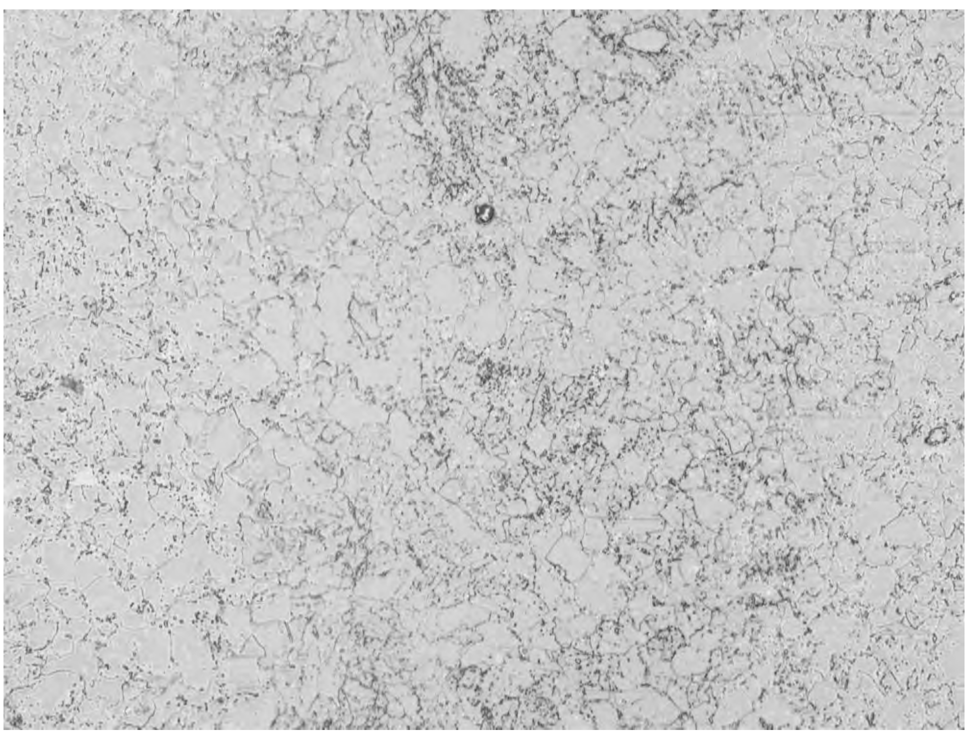
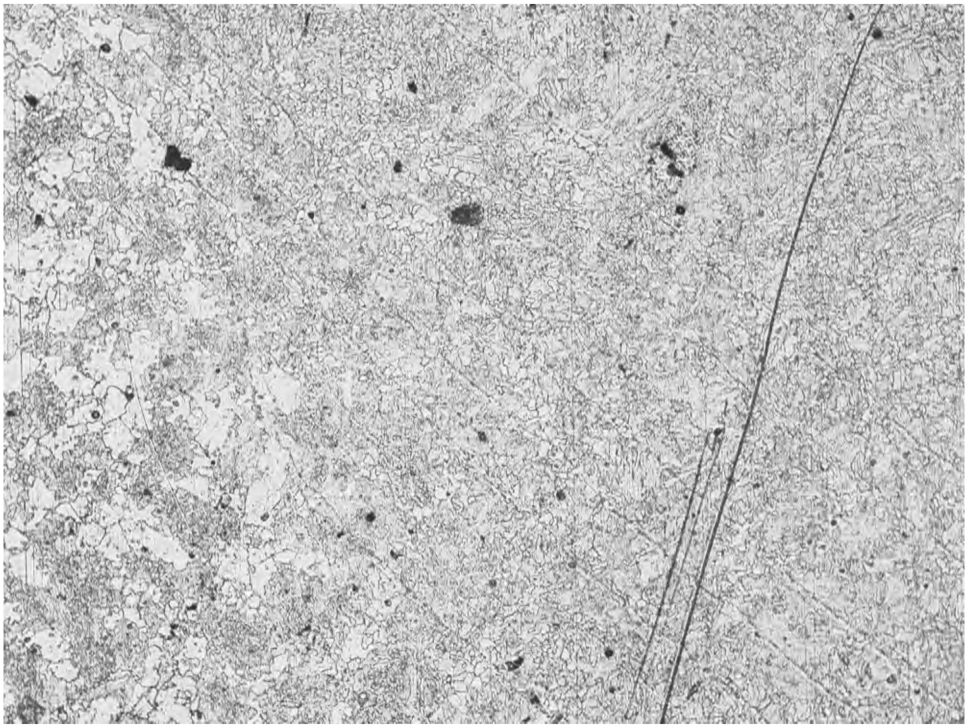


500X

Fig. 130. Replica No. HPRIH-R4.



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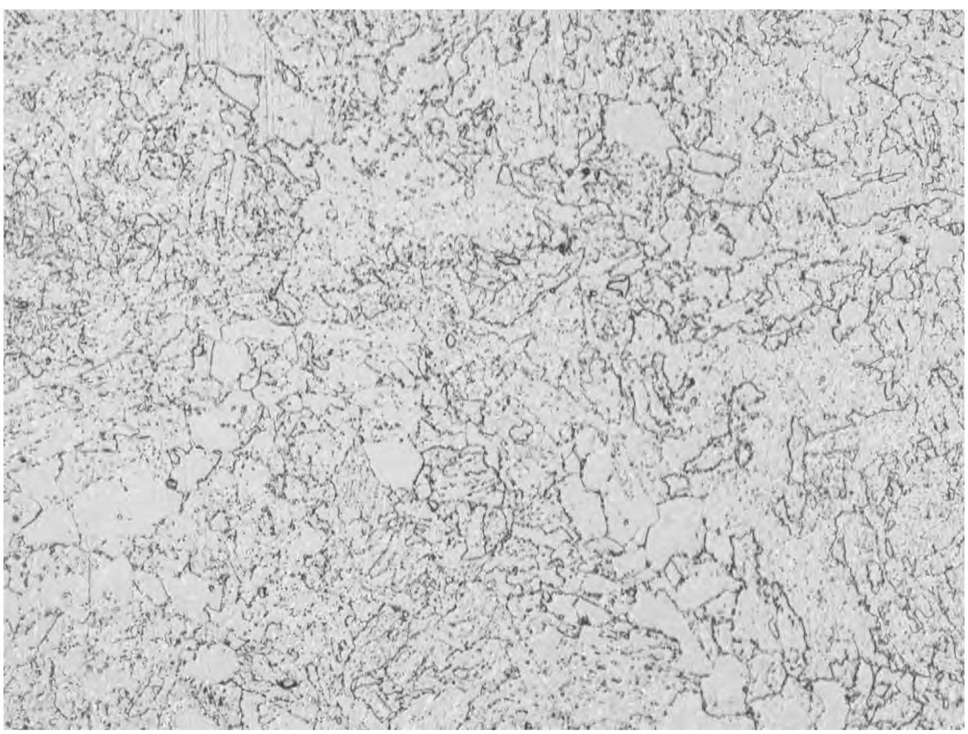

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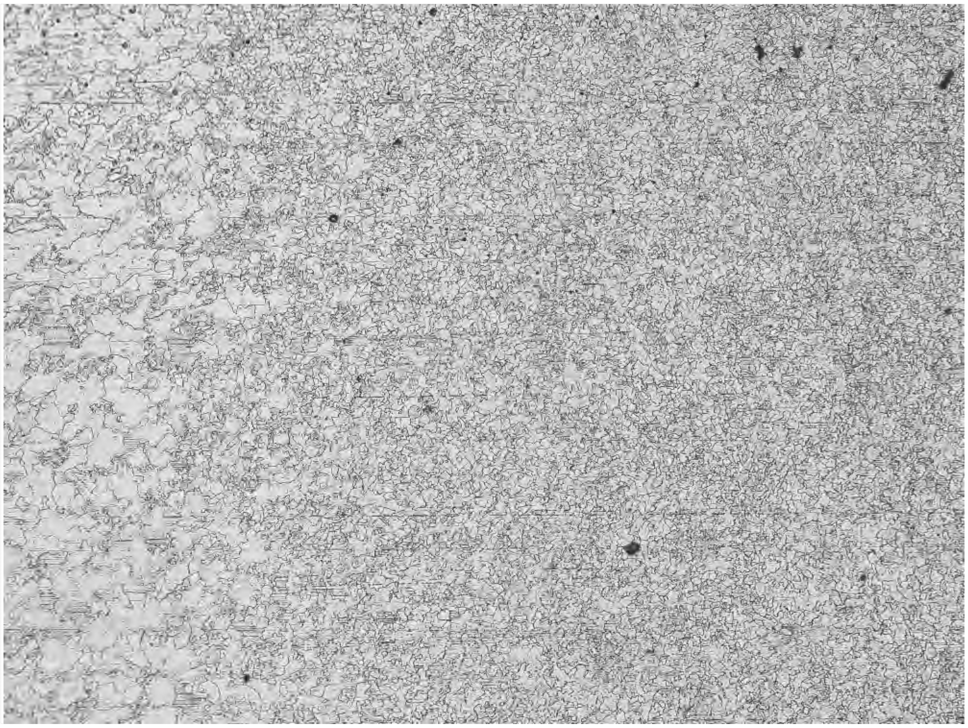
Fig. 131. Replica No. HPRIH-R5.



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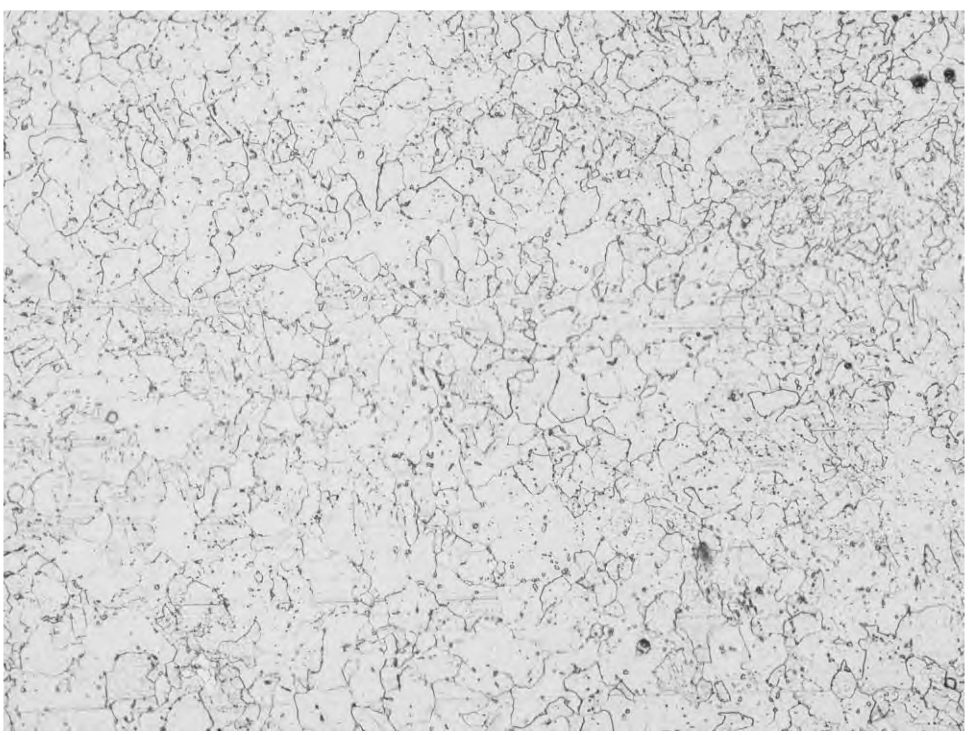
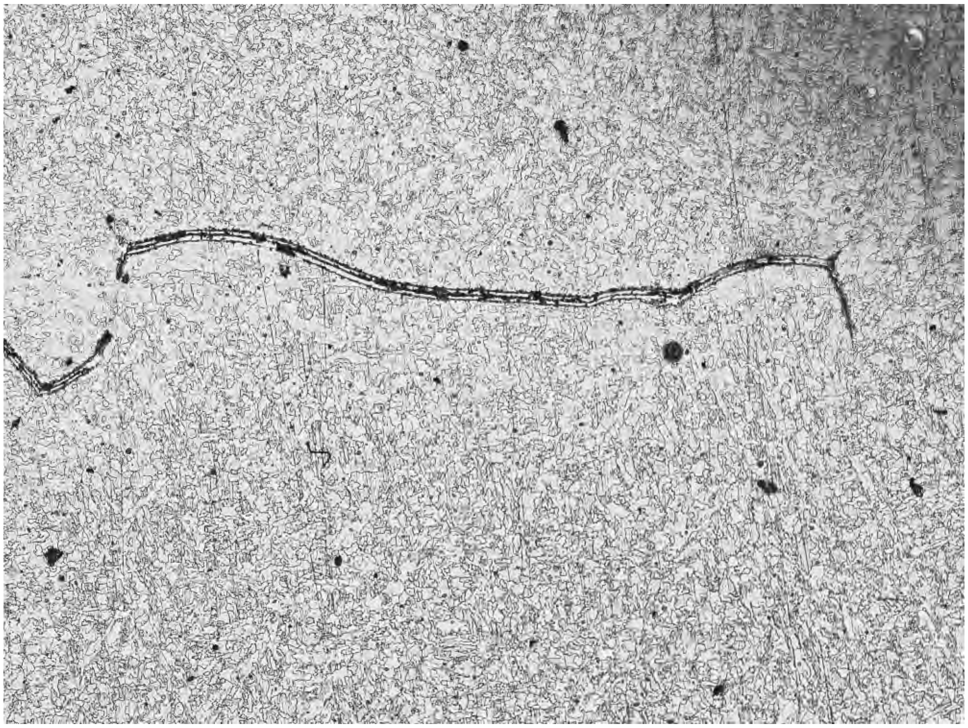


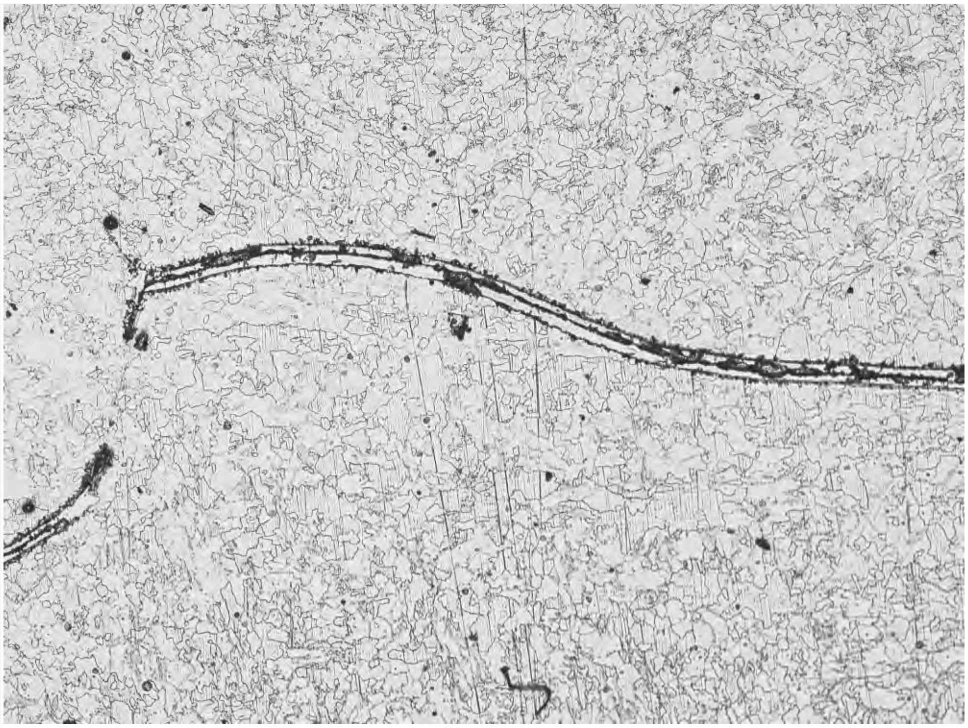
500X

Fig. 132. Replica No. HPRIH-R6.



50X

Fig. No. 133a. Replica No. HPRIH-R6.



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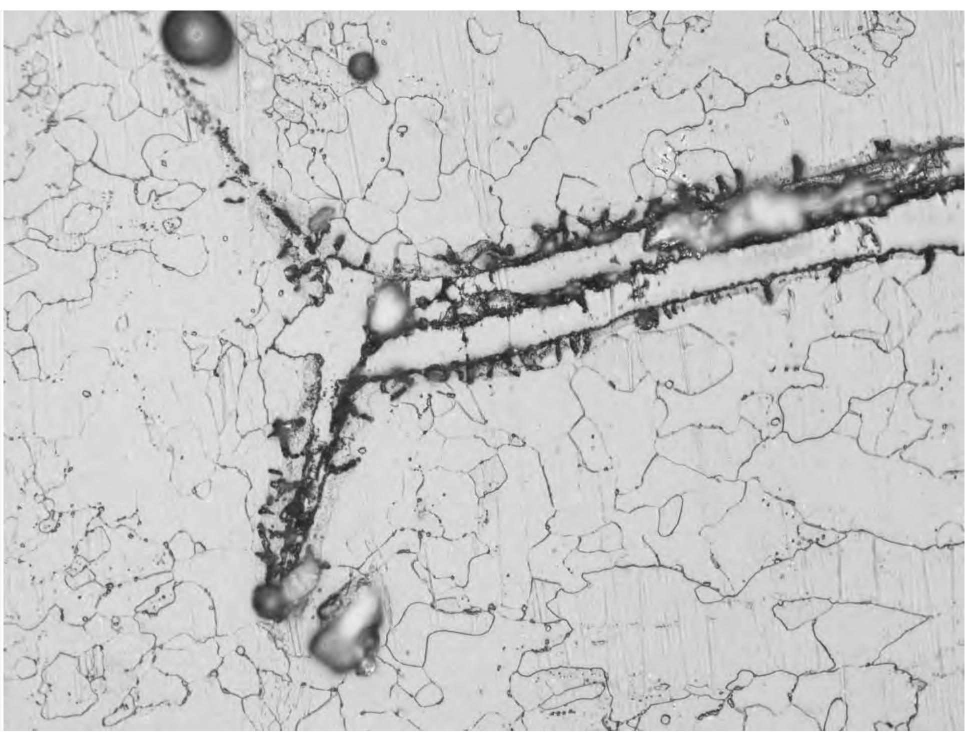
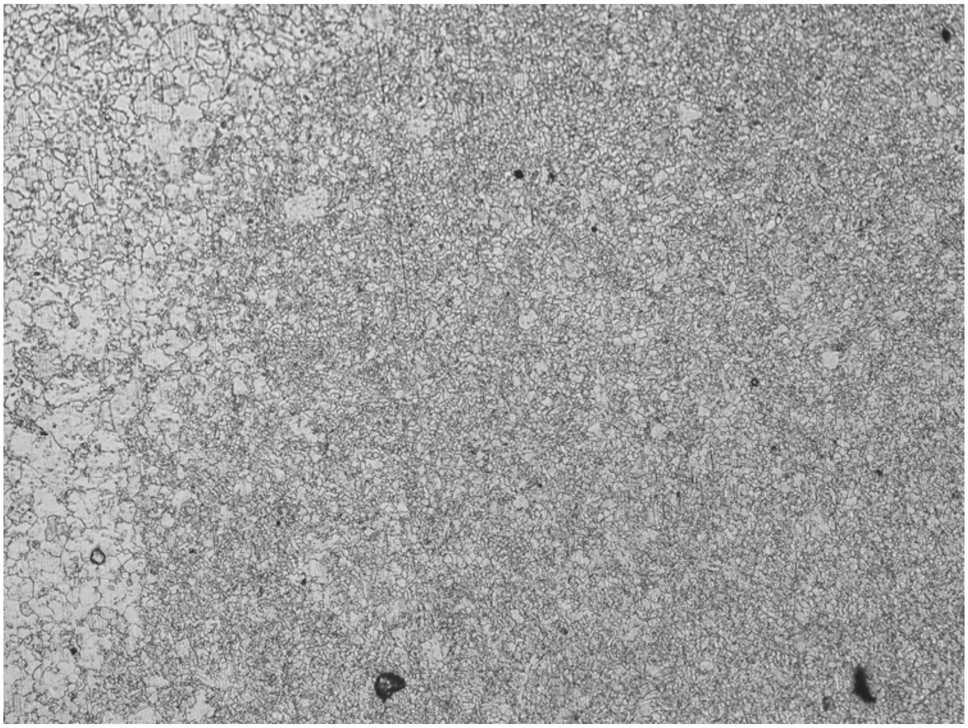


500X

Fig. 133b. Replica No. HPRIH-R7.



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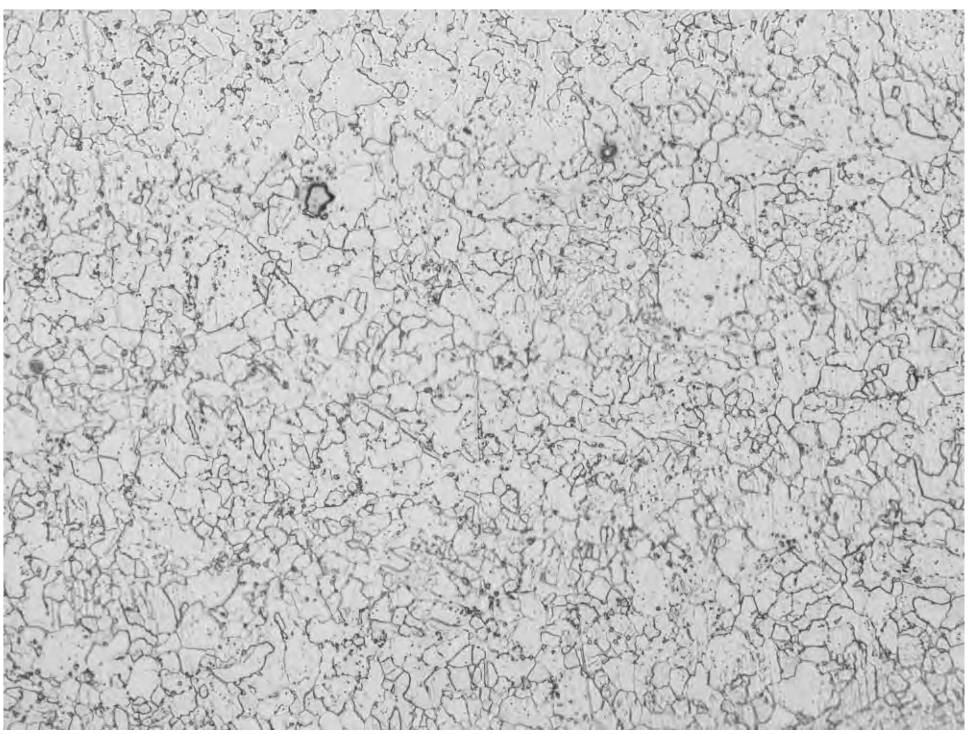


500X

Fig. 134. Replica No. HPRIH-R8.

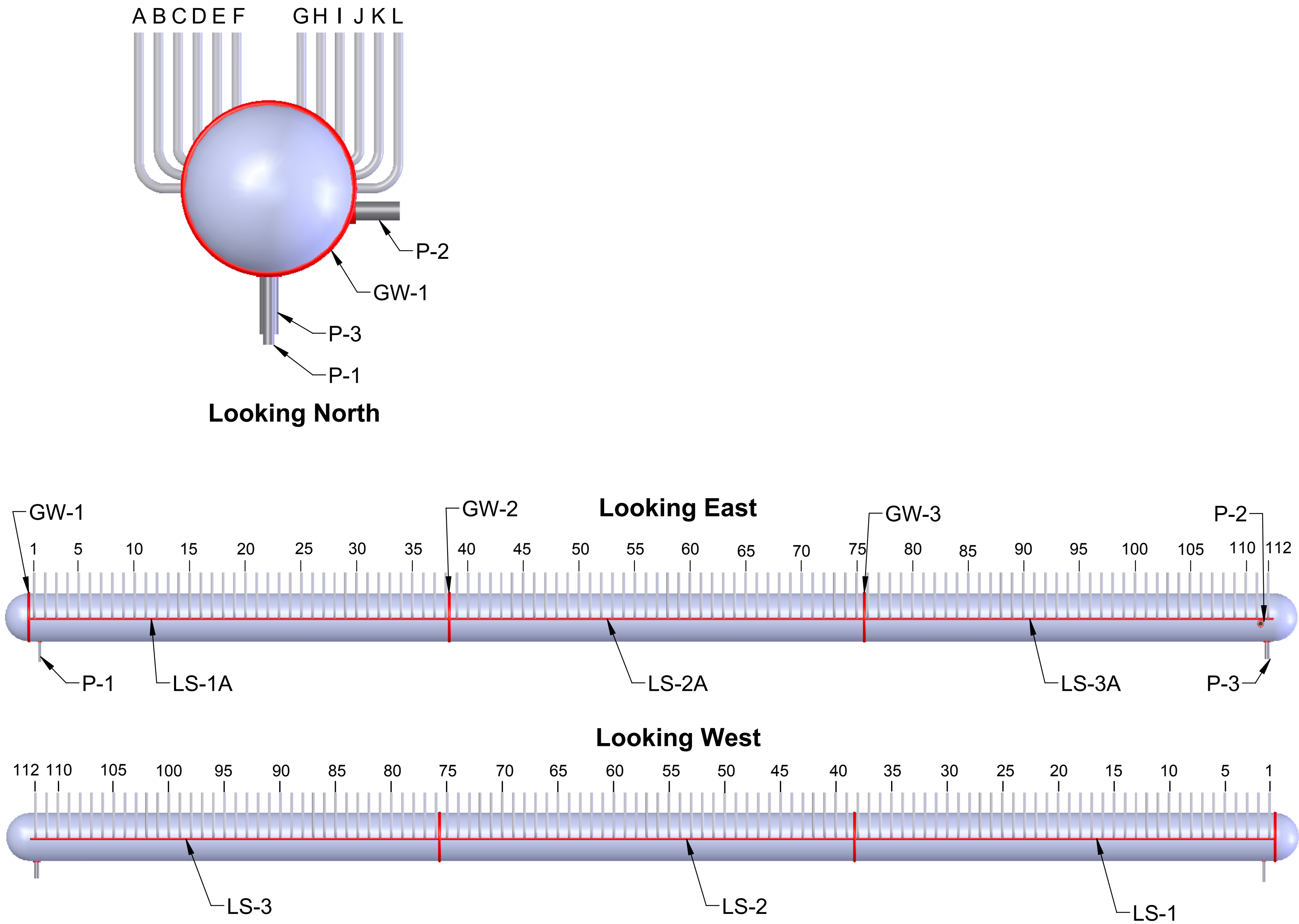


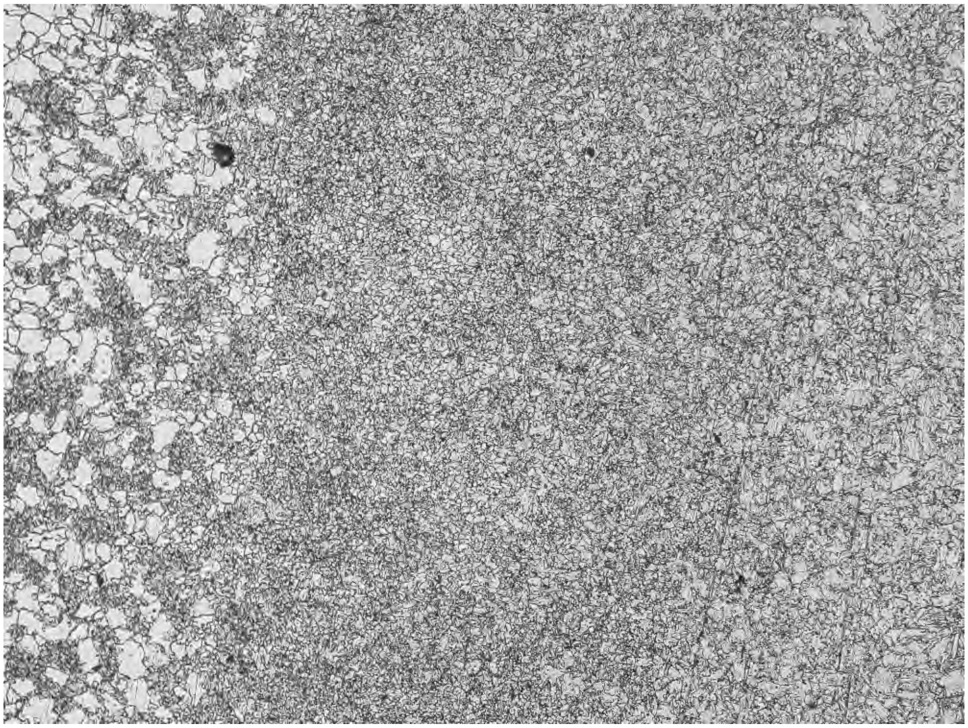
Fig. 135. Sketches of the Low-Pressure (2nd) Reheat Inlet header

Thielsch

Fig. 136. Photographs of the inspection locations on the Low-Pressure (2nd) Reheat Inlet header and tube stubs.

Fig. 137.

Photographs of the inspection locations on the Low-Pressure (2nd) Reheat Inlet header and tube stubs.



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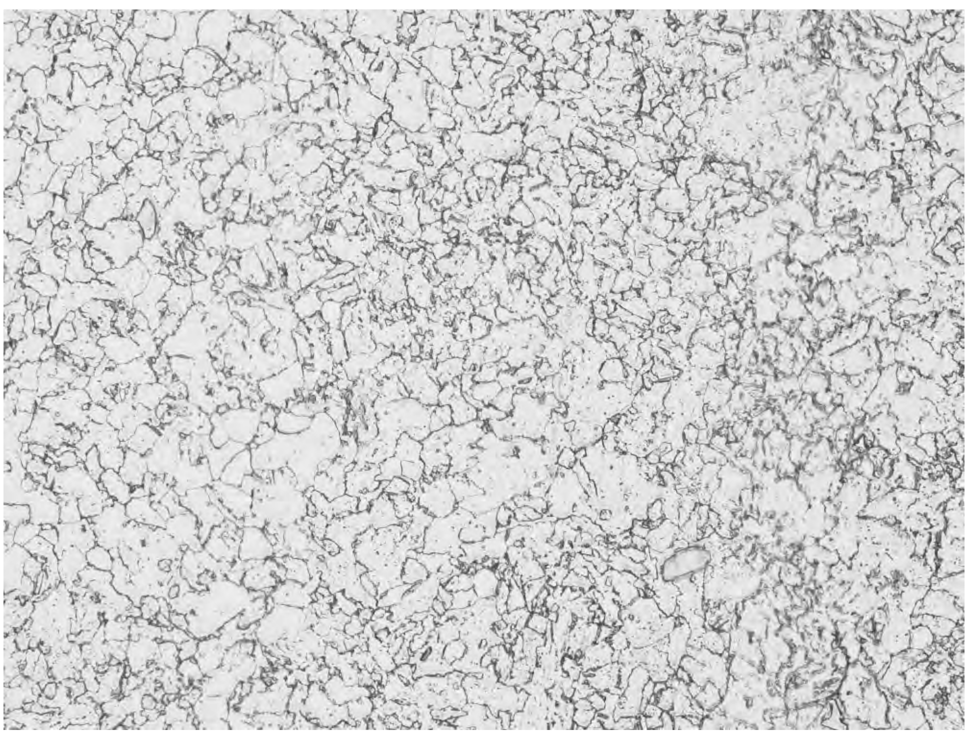
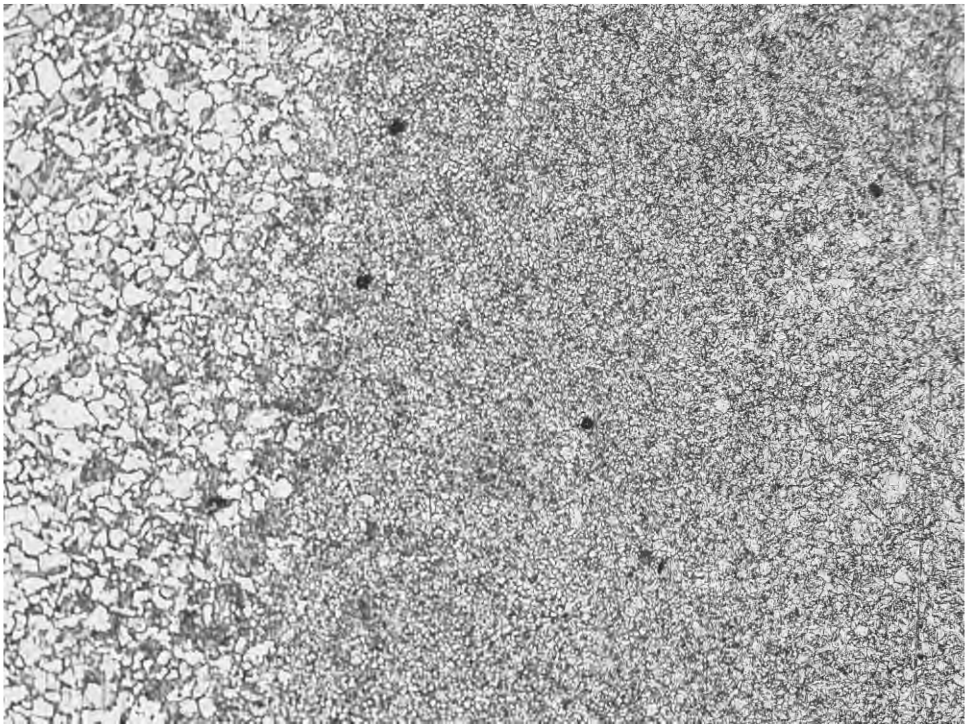


500X

Fig. 138. Replica No. LPRIH-R1.



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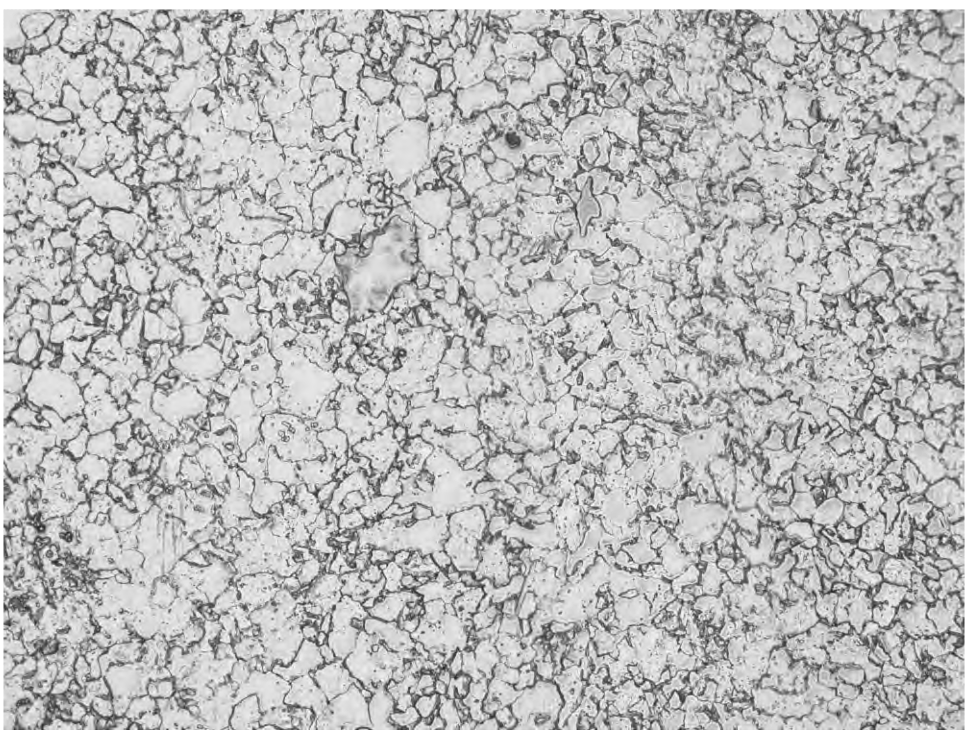
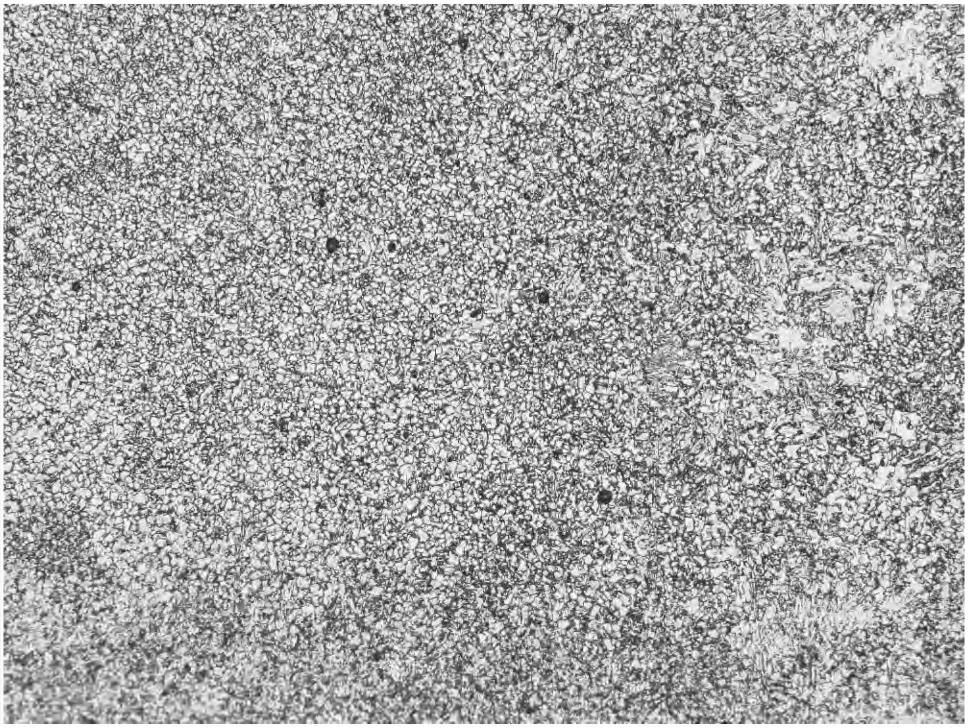
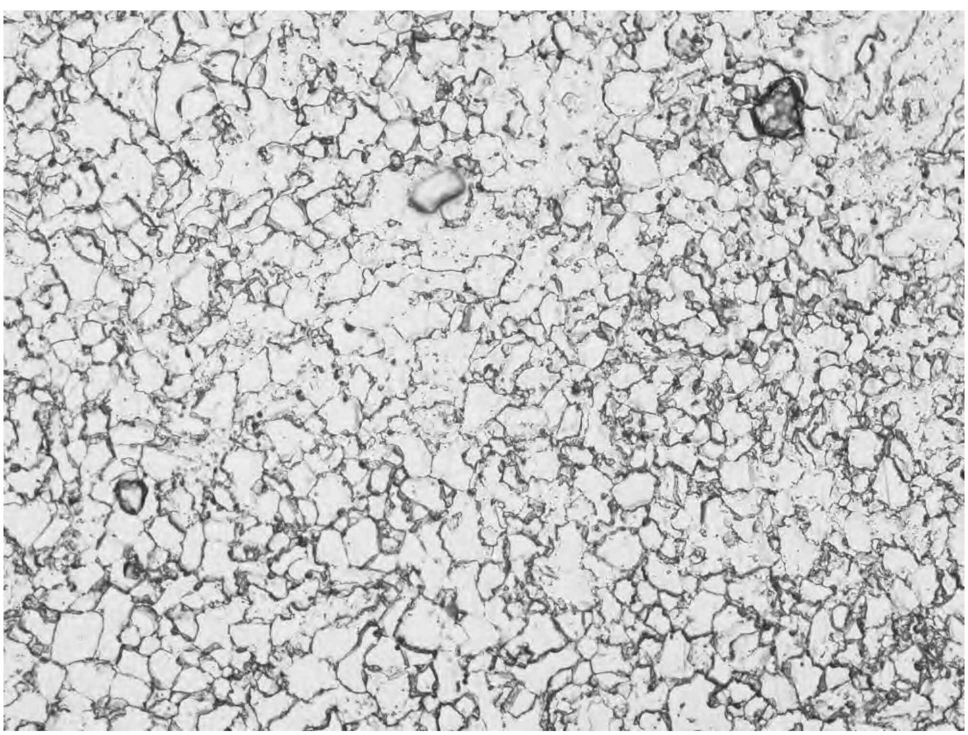


500X

Fig. 139. Replica No. LPRIH-R2.

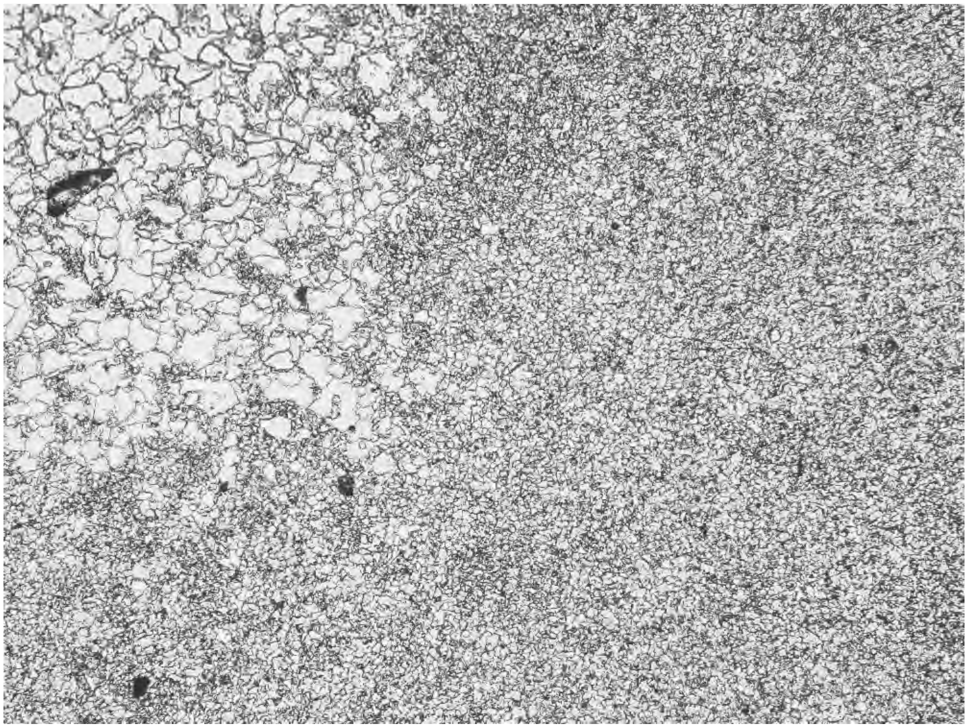


100X

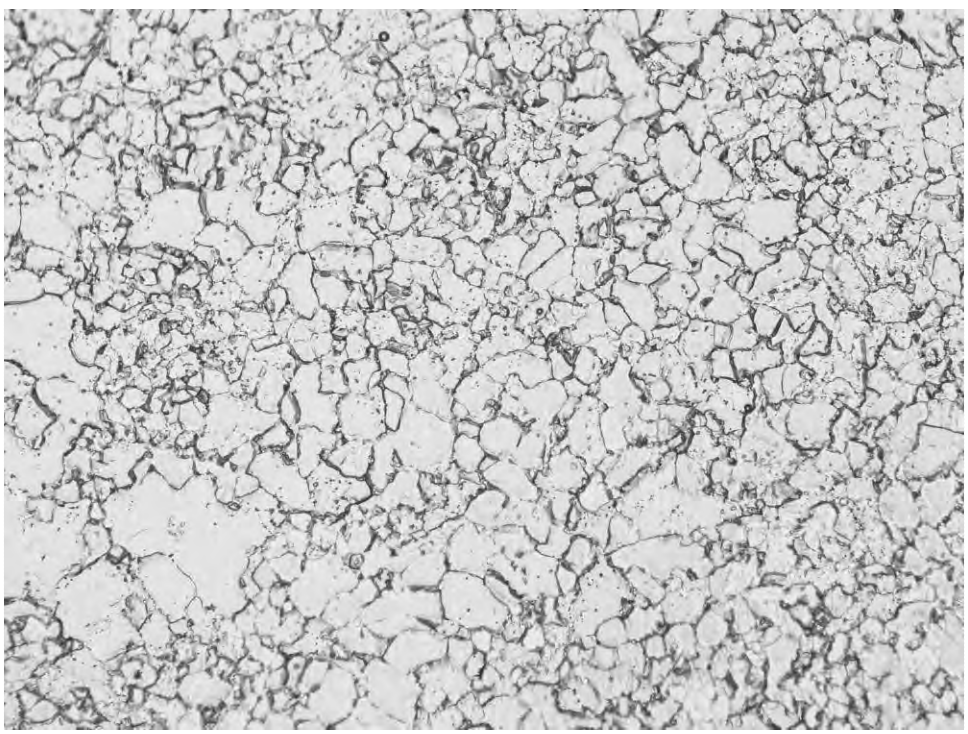


500X

Fig. 140. Replica No. LPRIH-R3.

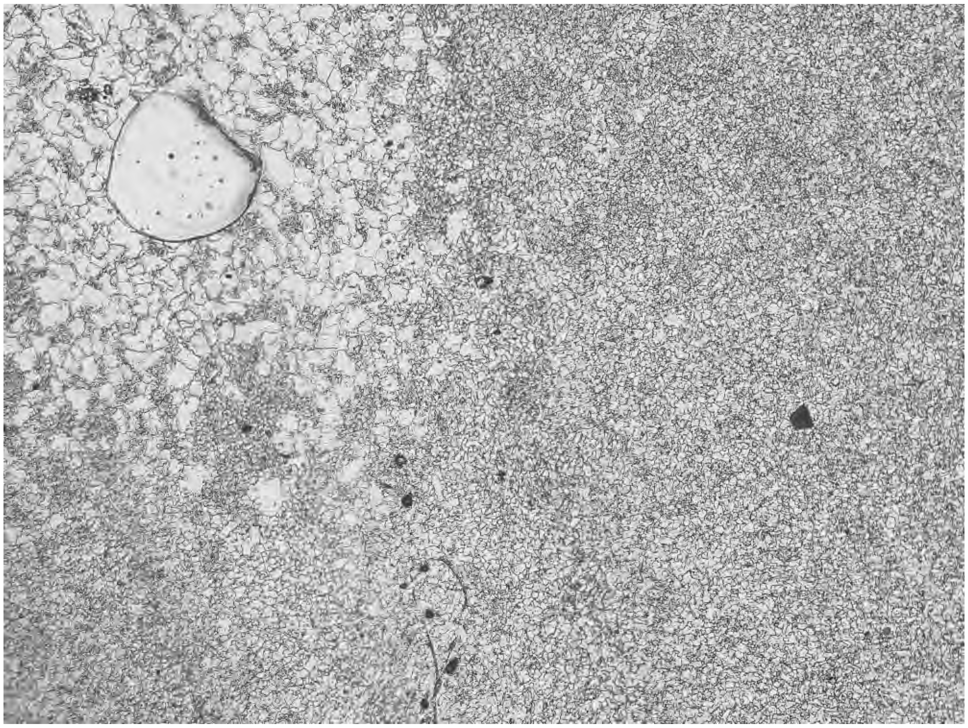


100X



500X

Fig. 141. Replica No. LPRIH-R4.



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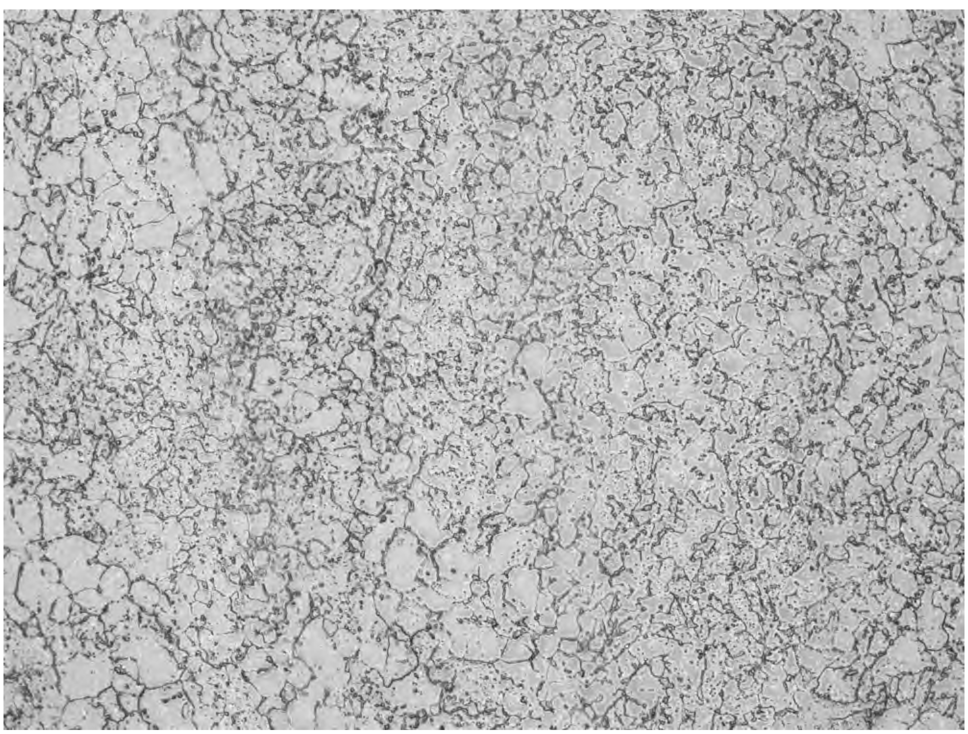
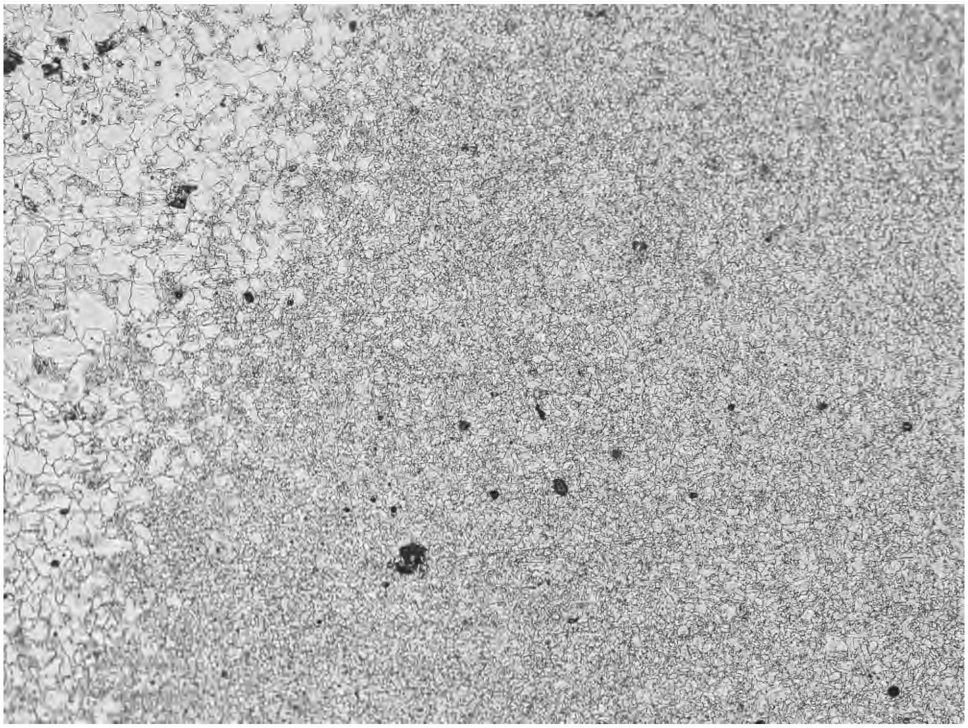


500X

Fig. 142. Replica No. LPRIH-R5.



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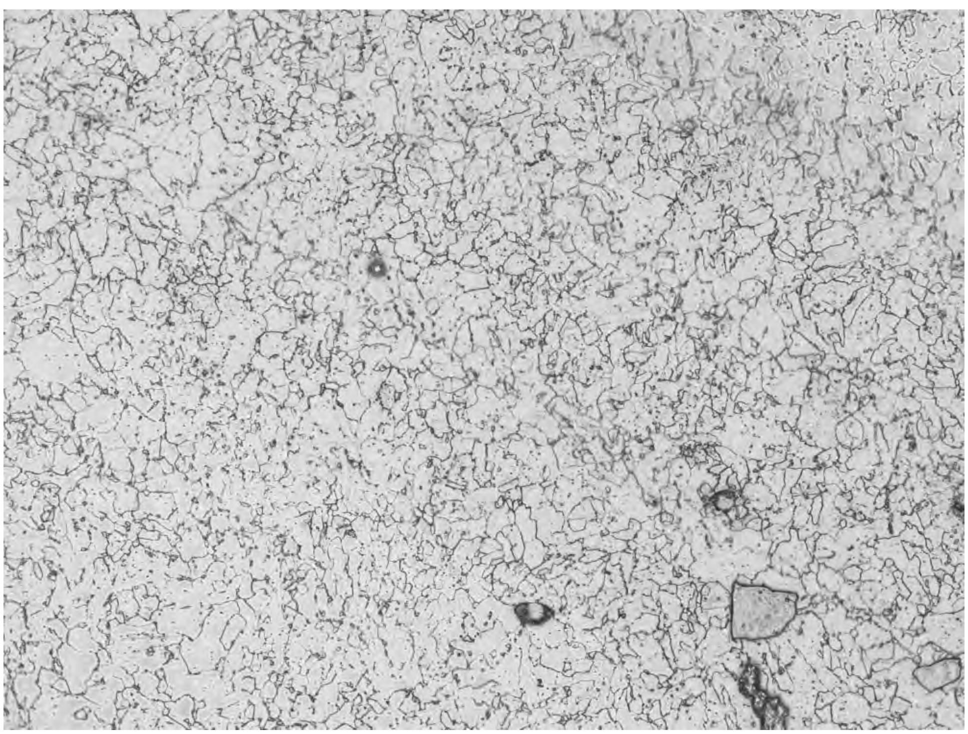
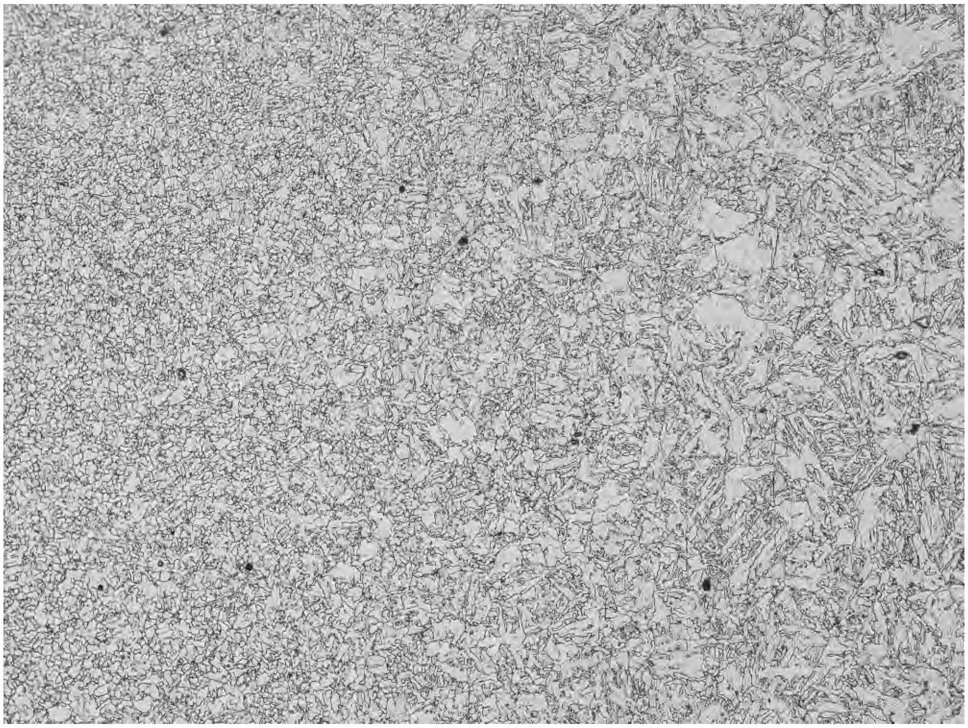
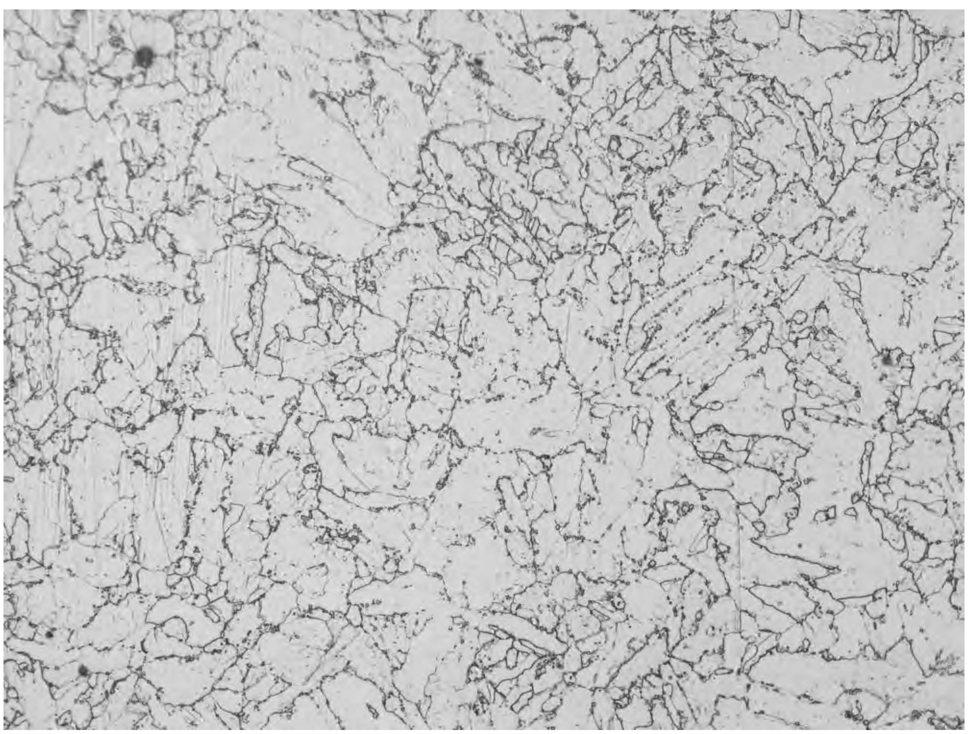


500X

Fig. 143. Replica No. LPRIH-R6.

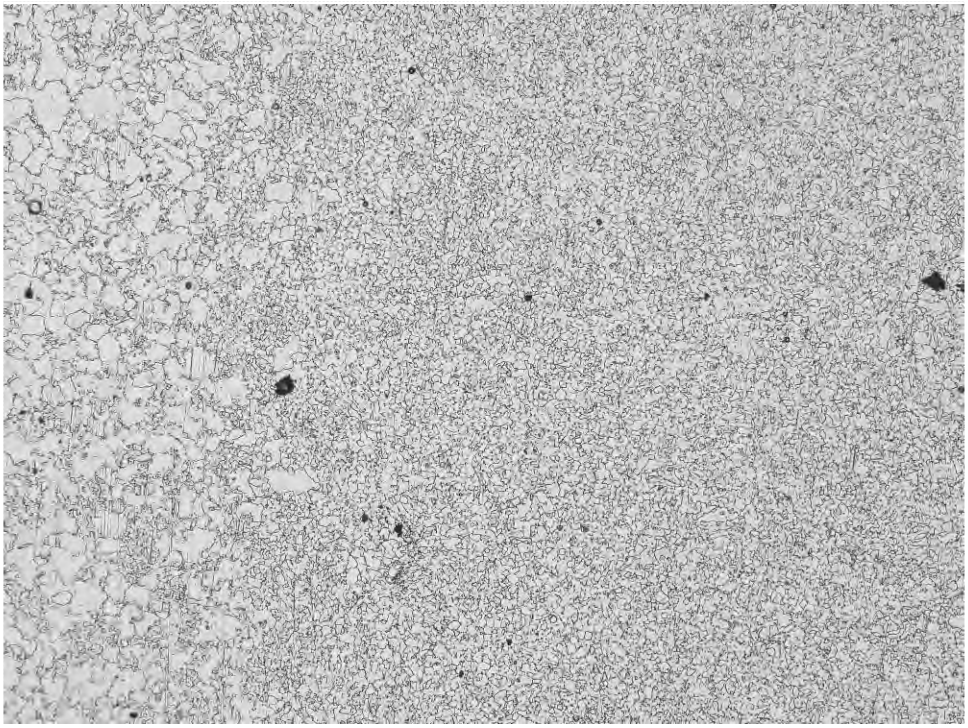


100X



500X

Fig. 144. Replica No. LPRIH-R7.



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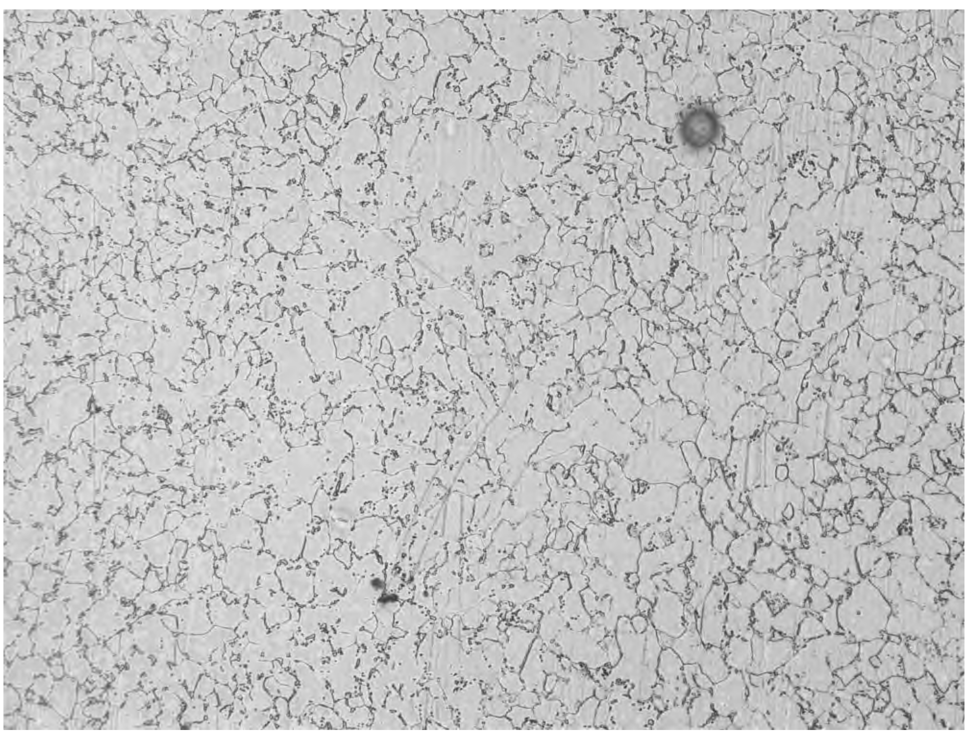


500X

Fig. 145. Replica No. LPRIH-R8.

APPENDIX A

NONDESTRUCTIVE EXAMINATION REPORTS
PLATEN SUPERHEATER INLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Platen Superheater Inlet Header - Unit No. 2

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

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

Where:

T- Design Temperature	850	°F	
P- Maximum Allowable Pressure	4,075	psig	
D- Outside Diameter	22.00	in	
S- Maximum Stress Value	14,400	psi	Per. Sect II D, Table 1A
E- Efficency	1.000		Per. Sect I, PG 27.4 Note 1
y- Temperature Coefficient	0.40		Per. Sect I, PG 27.4 Note 6

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

t_m=(PD/(2(SE)+2(yP)) 2.796 in

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Platen Superheater Inlet Header	Material: SA-335 , Gr. P11	Procedure: TEI 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	
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	

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

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: Platen Superheater Inlet Header	Material: SA-335, Gr. P11	Nominal Wall: 3.249"	Minimum Wall: 2.796"

EQUIPMENT USED:

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

KEY:

IDENTIFICATION		CONFIGURATION	MEASUREMENTS (in.) PI TAPE	THICKNESS MEASUREMENTS 12:00	3:00	6:00	9:00
GW-1	North	Pipe	22.156	3.531	3.581	3.464	3.385
	South	Pipe	22.109	3.643	3.630	3.585	3.468
GW-2	North	Pipe	22.141	3.478	3.435	3.504	3.475
	South	Pipe	22.125	3.477	3.555	3.445	3.444
GW-3	North	Pipe	22.125	3.474	3.498	3.469	3.522
	South	Pipe	22.156	3.525	3.456	3.545	3.441
GW-4	North	Pipe	22.156	3.590	3.502	3.472	3.579
	South	Pipe	22.125	3.408	3.568	3.680	3.507
GW-5	North	Pipe	22.109	3.426	3.489	3.470	3.277
	South	Pipe	22.094	3.396	3.442	3.482	3.387
				Min	3.277		
				Max	3.680		
				Avg	3.493		

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/22/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSIH-GW-1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	3.4"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

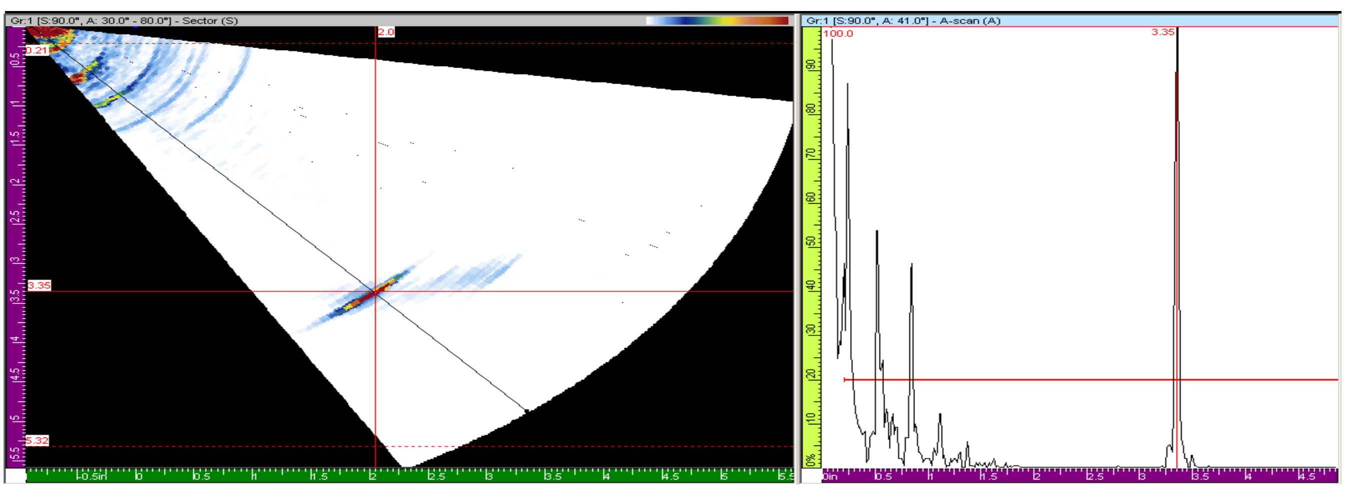
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/22/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSIH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	3.2"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

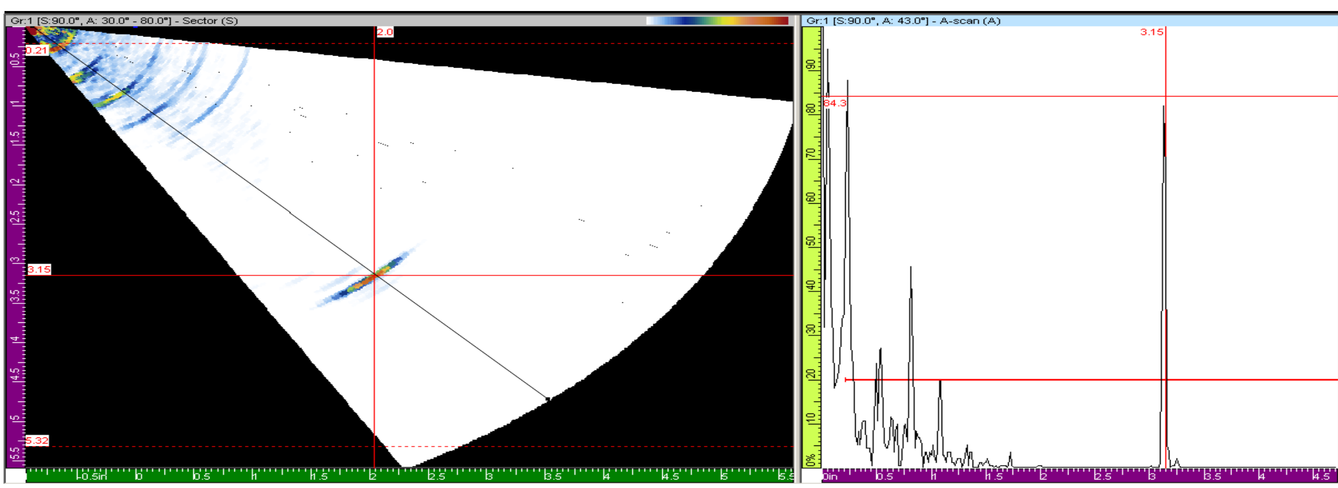
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/22/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSIH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	3.2"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

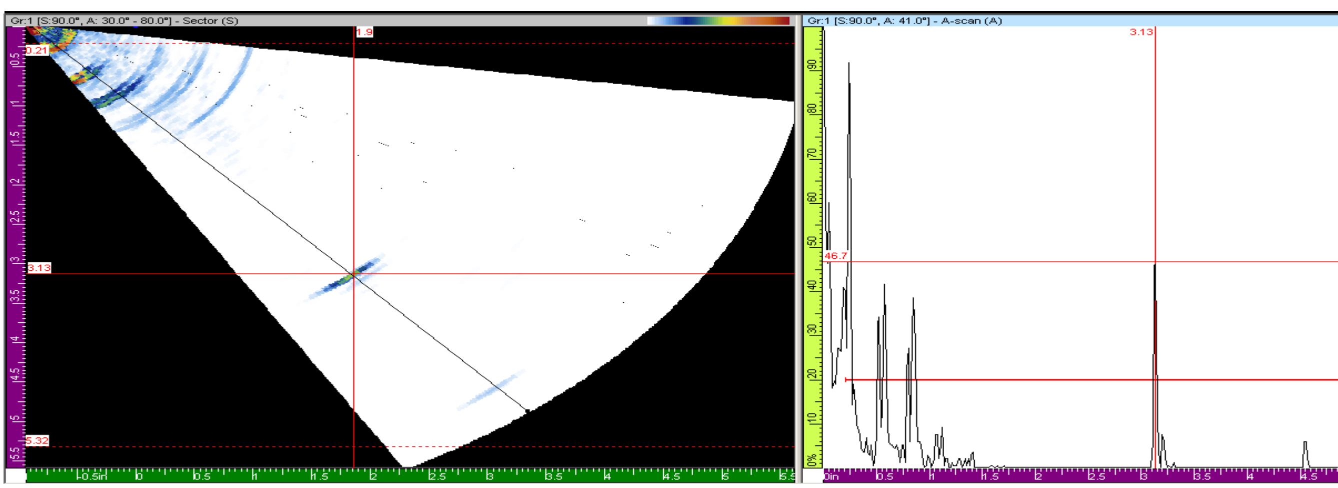
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/22/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSIH-GW-4
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	3.2"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

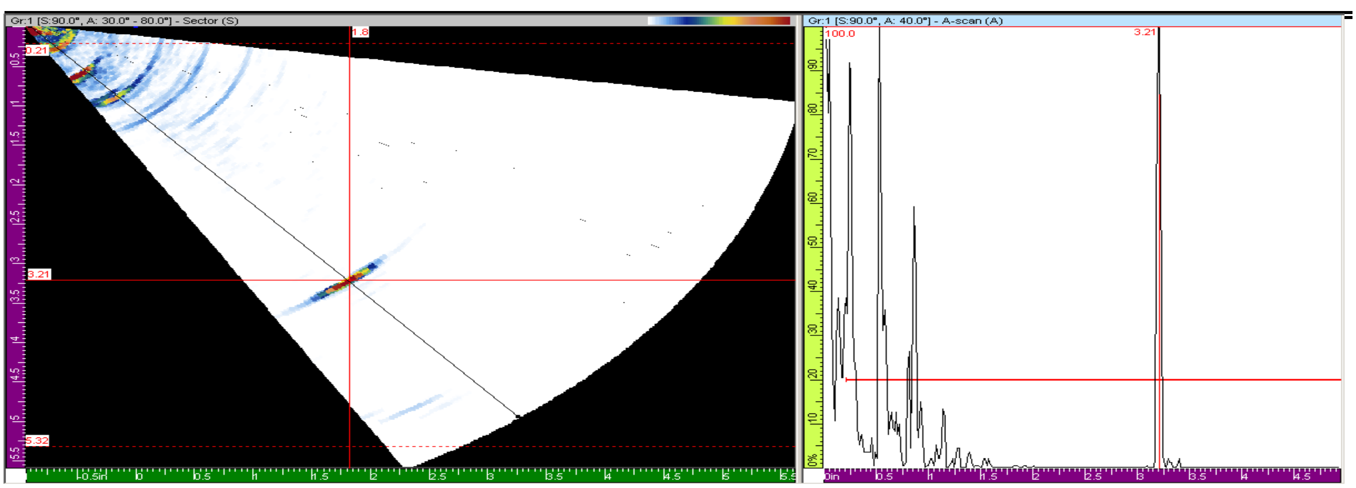
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/22/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSIH-GW-5
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	3.2"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

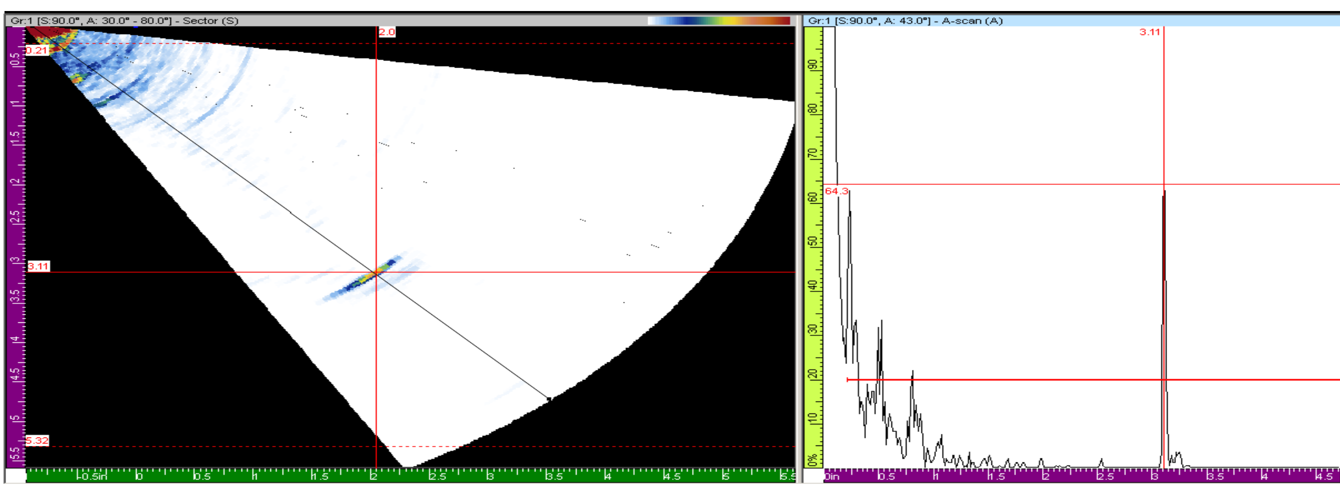
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/22/2012**

THIELSCH ENGINEERING, INC.

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

HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Platen Superheater Inlet Header	Material: SA-335 Gr. P11	Hardness Scale: HBN

Location		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
PSIH-R1	Weld	176	183	185	162	174	176	84,000
	HAZ	196	195	184	186	202	193	91,000
	Base	178	166	190	199	185	184	87,000
PSIH-R2	Weld	181	176	168	183	177	177	85,000
	HAZ	196	195	191	201	181	193	91,000
	Base	183	164	182	164	171	173	82,000
PSIH-R3	Weld	168	132	144	163	150	151	72,000
	HAZ	152	179	155	172	156	163	78,000
	Base	148	152	161	141	156	152	72,000
PSIH-R4	Weld	159	147	153	164	179	160	77,000
	HAZ	171	158	180	182	147	168	80,000
	Base	157	163	154	152	157	157	75,000
PSIH-R5	Weld	187	172	168	160	163	170	81,000
	HAZ	174	154	152	162	159	160	77,000
	Base	167	148	160	161	140	155	74,000
PSIH-R6	Weld	147	170	187	178	156	168	80,000
	HAZ	183	171	141	184	162	168	81,000
	Base	161	172	143	163	160	160	76,000
PSIH-R7	Weld	175	160	170	183	176	173	82,000
	HAZ	150	157	152	155	156	154	74,000
	Base	154	160	168	159	160	160	77,000
PSIH-R8	Weld	185	183	188	175	183	183	87,000
	HAZ	200	175	205	168	193	188	89,000
	Base	167	162	165	168	169	166	80,000

INSPECTOR: M. Olszewski	DATE: 3/26/2012

APPENDIX B

NONDESTRUCTIVE EXAMINATION REPORTS
PLATEN SUPERHEATER OUTLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 2 - Platen Superheater Outlet 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	0.500		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)) 3.107 in

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Platen Superheater Outlet Header	Material: SA-335, Gr. P11	Procedure: TEI 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	1" LT	Indication at 3:00 o'clock position. Removed at 1/16". No further action required.	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	
Saddle Weld SW-1	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	
P-5	N/A	No recordable indications.	x	
P-6	N/A	No recordable indications.	x	
RT Plugs				
RT-1	N/A	No recordable indications.	x	
RT-2	N/A	No recordable indications.	x	
Tube Stubs				
Tube 8K	2" LT	Indication in the toe of the weld, tube side.		x

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

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Platen Superheater Outlet Header	Material: SA-335, Gr. P11	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ______
- [ ] Amperage ______
- [ ] Other ______

WET

- [ ] 14AM
- [x] 20B
- [ ] Other

DRY

- [ ] Red
- [ ] Gray
- [ ] Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Final Examination After Removal and Repair by Welding				
Tube Stub				
Tube 8K	**N/A**	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: Platen Superheater Outlet Header	Material: SA-335, Gr. P11	Nominal Wall: 3.375"	Minimum Wall: 3.107"

EQUIPMENT USED:

☑ D-Meter ☑ Pi-Tape ☐ Other

☐ Micrometer ☐ calipers

KEY:

IDENTIFICATION		CONFIGURATION	MEASUREMENTS (in.)	THICKNESS MEASUREMENTS			
			PI TAPE	12:00	3:00	6:00	9:00
GW-1	North	Pipe	20.578	3.696	3.579	3.582	3.602
	South	Pipe	20.719	3.598	3.397	3.462	3.407
GW-2	North	Pipe	20.594	3.416	3.383	3.384	3.397
	South	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-3	North	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
	South	Pipe	20.563	3.426	3.421	3.404	3.419
GW-4	North	Pipe	20.609	3.374	3.368	3.362	3.379
	South	Pipe	20.563	3.391	3.411	3.388	OBST
GW-5	North	Pipe	20.563	3.378	3.404	3.380	3.378
	South	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-6	North	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
	South	Pipe	20.594	3.403	3.421	3.401	3.395
GW-7	North	Pipe	20.563	3.402	3.401	3.432	3.422
	South	Pipe	20.688	Obstr.	Obstr.	Obstr.	Obstr.
GW-8	Top	Outlet Pipe	19.781	3.002	2.994	2.976	3.021
	Bottom	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-9	Top	Outlet Pipe	19.594	3.018	2.998	2.984	2.986
	Bottom	Outlet Pipe	19.594	2.995	3.009	2.989	3.001
GW-10	Top	Outlet Pipe	12.781	2.235	2.207	2.235	2.242
	Bottom	Outlet Pipe	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-11	Top	Outlet Pipe	19.563	2.971	2.978	2.967	3.004
	Bottom	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-12	Top	Outlet Pipe	19.609	2.990	2.989	3.003	3.020
	Bottom	Outlet Pipe	19.578	2.985	2.993	2.970	3.018

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/22/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header to End Cap
		Part Thickness:	3.4"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

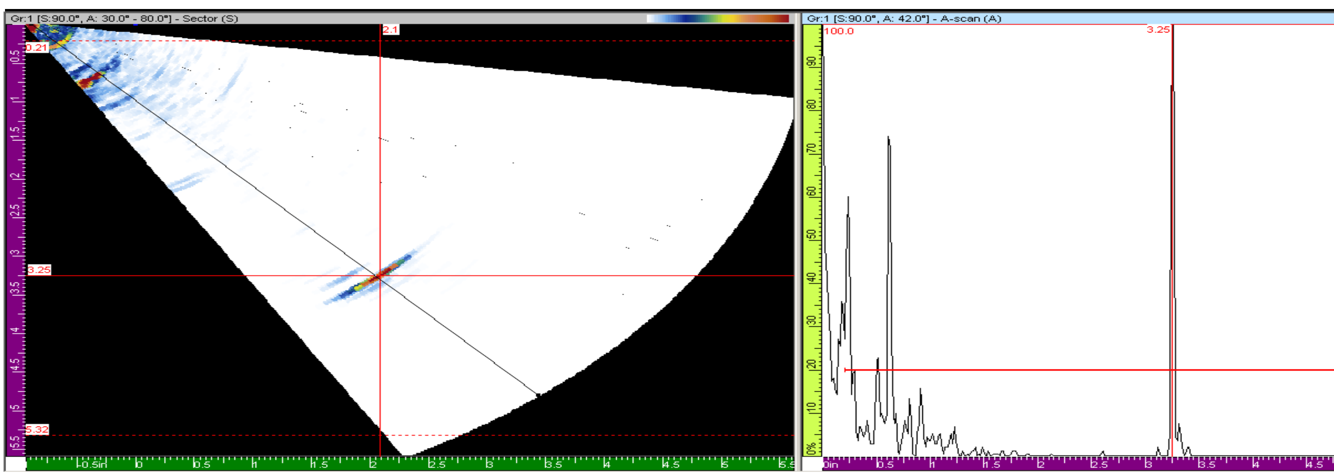
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header to Tee Connection
		Part Thickness:	3.3"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

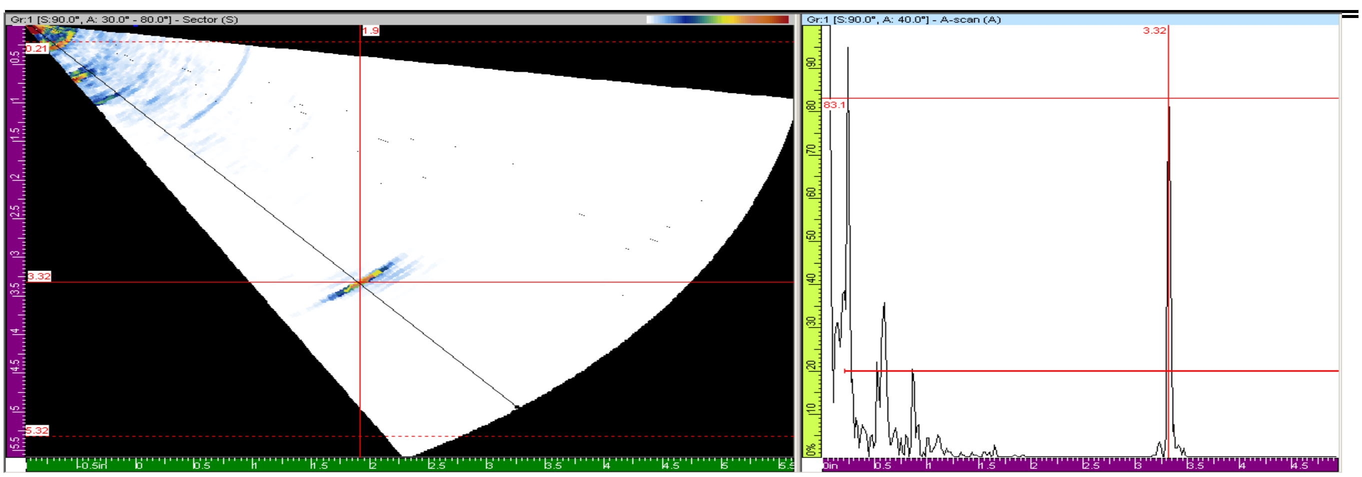
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
Machine Information		**Part Thickness:**	3.3"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

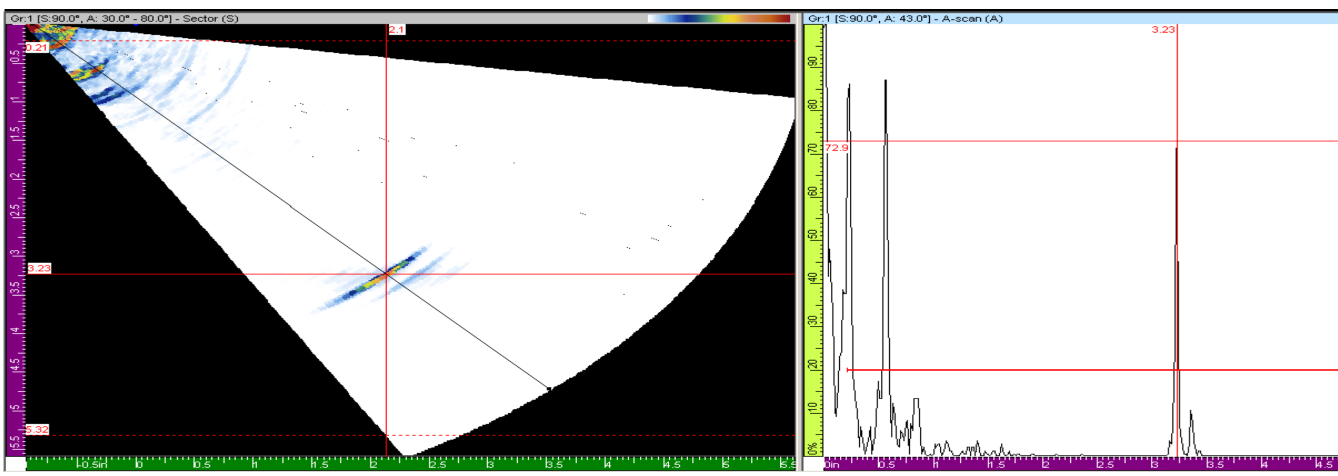
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-4
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	3.3"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

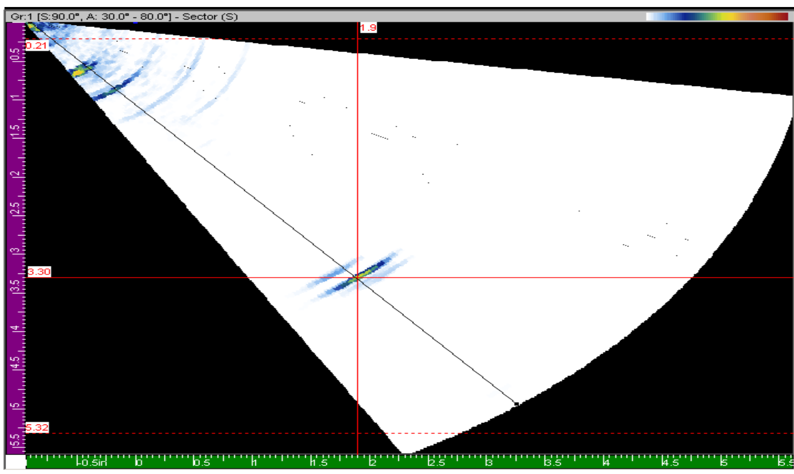
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

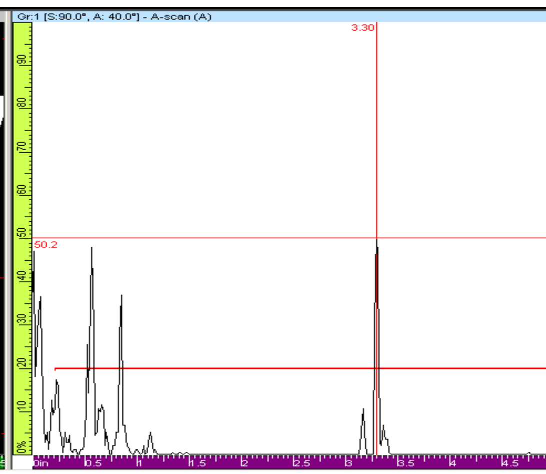
Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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 indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-5
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
		Part Thickness:	3.3"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

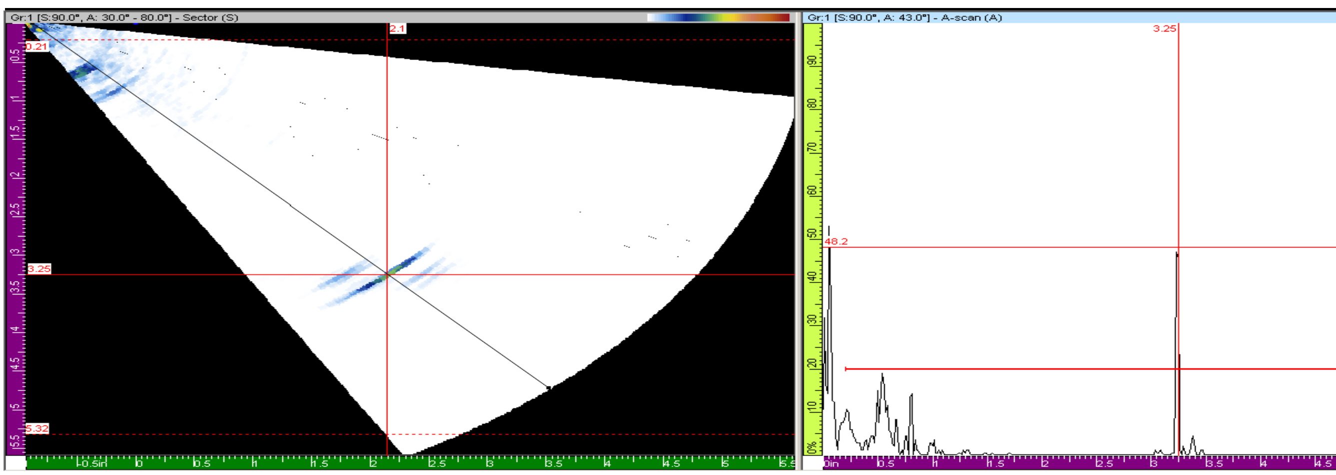
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-6
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
		Part Thickness:	3.3"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatioi

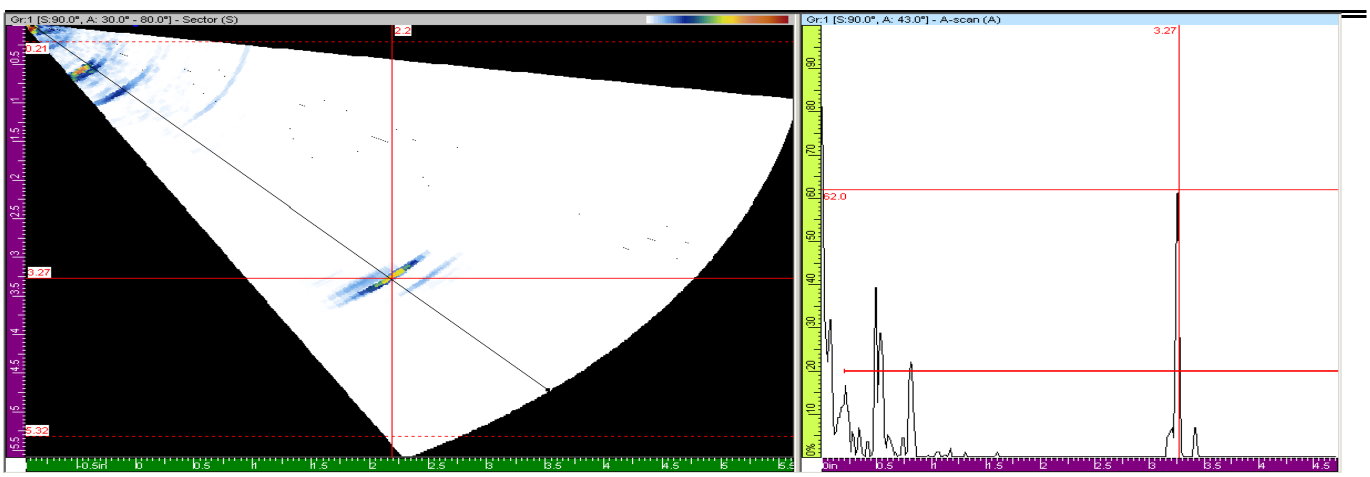
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-7
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-End Cap
		Part Thickness:	3.4"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

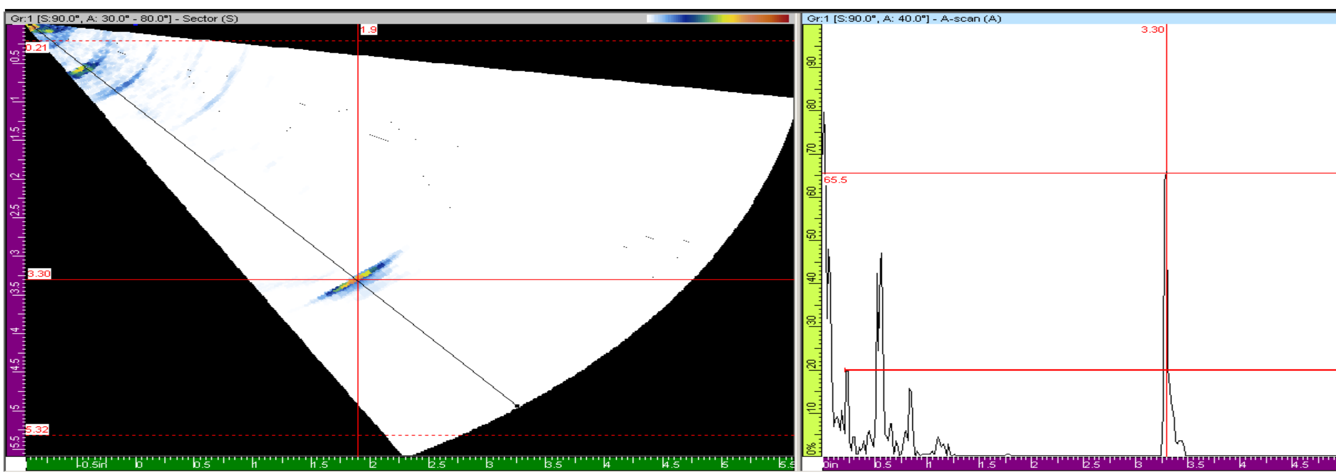
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-8
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Tee Connection
Machine Information		**Part Thickness:**	3.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

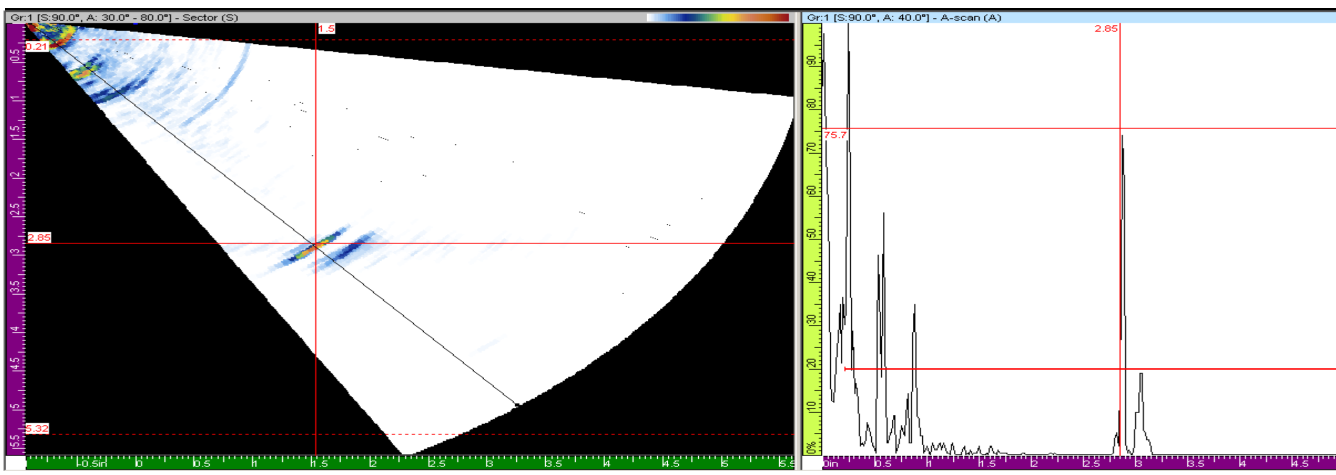
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-9
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Pipe
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

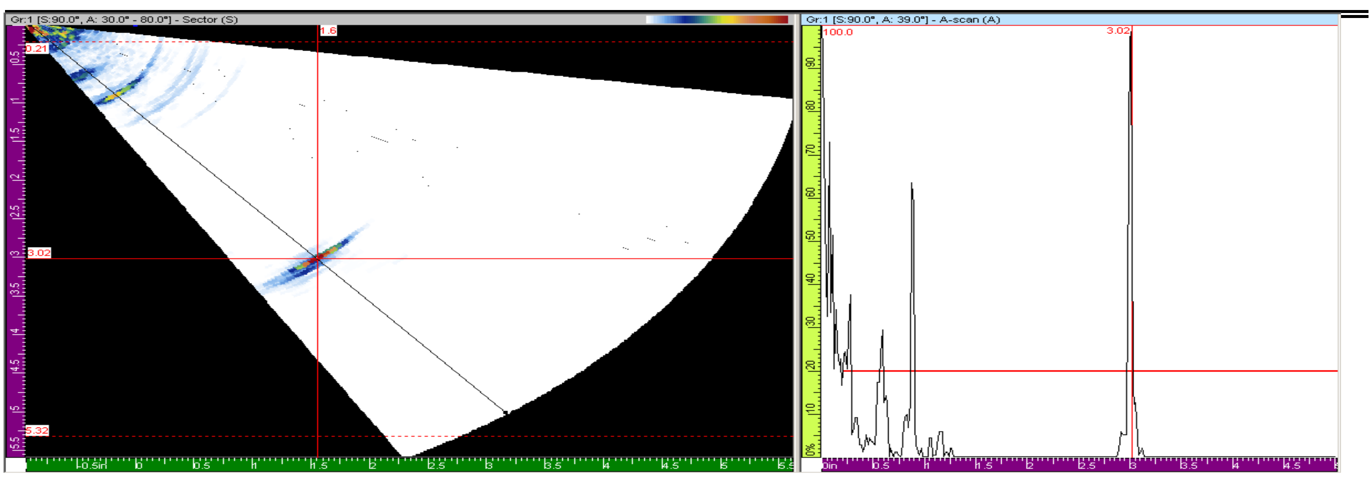
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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 indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-10
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Reducer
Machine Information		**Part Thickness:**	3.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

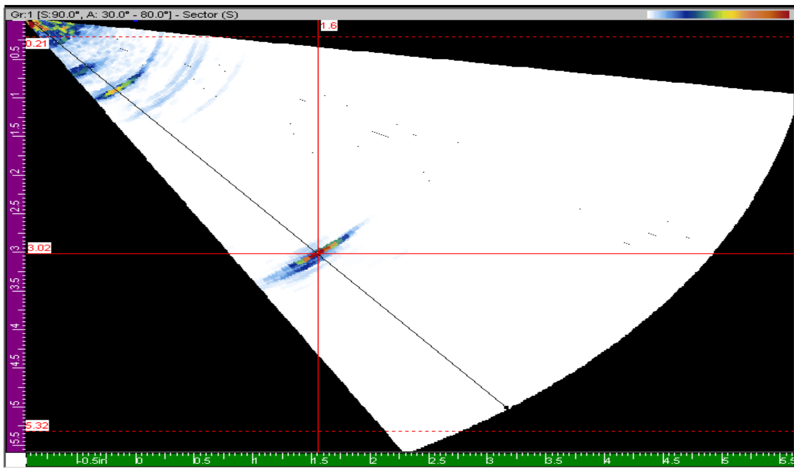
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

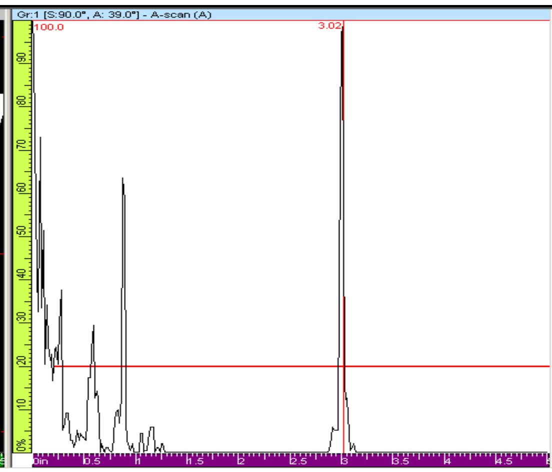
Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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 indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-11
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Tee Connection
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

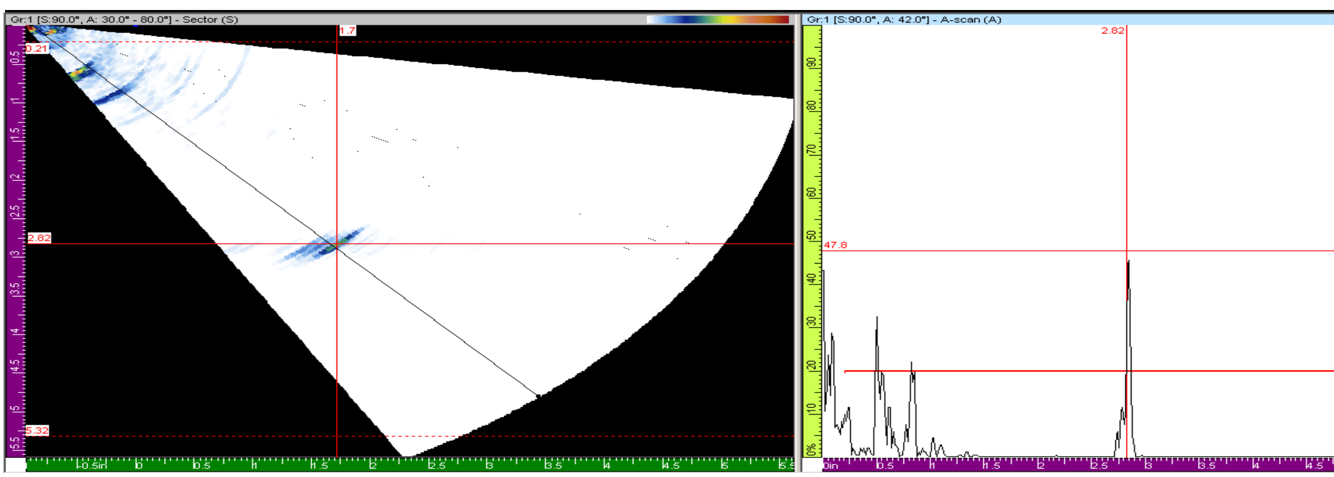
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Platen Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	PSOH-GW-12
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Pipe
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

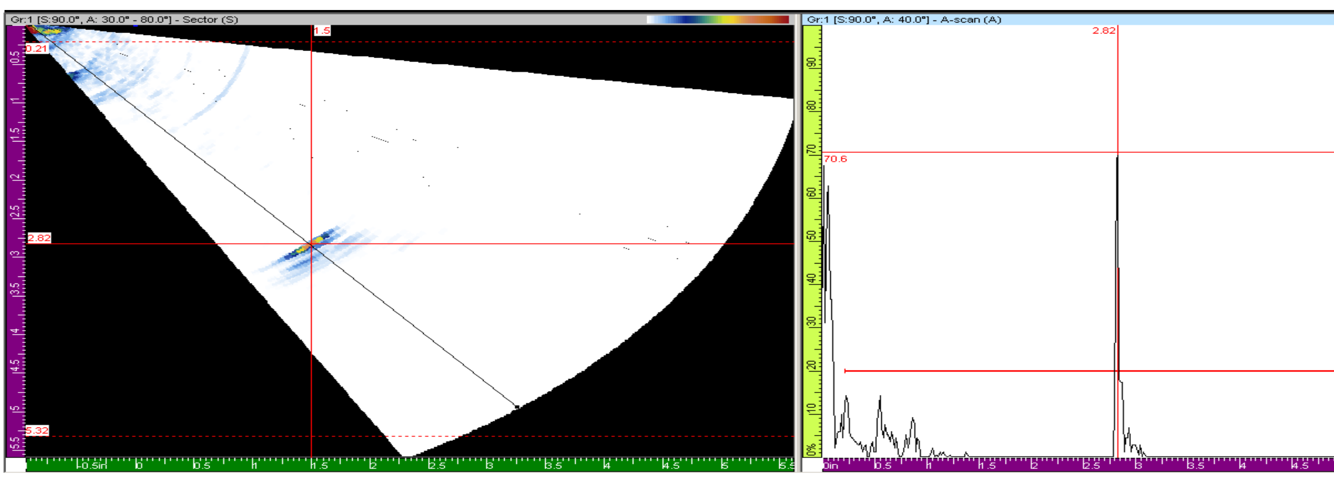
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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 indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/26/2012**

THIELSCH ENGINEERING, INC.

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

HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Platen Superheater Outlet Header	Material: SA-335, Gr. P11	Hardness Scale: HBN

Location		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
PSOH-R1	Weld	155	148	157	175	151	157	75,000
	HAZ	162	173	140	145	163	157	75,000
	Base	160	155	150	154	151	154	74,000
PSOH-R2	Weld	208	200	189	208	217	204	96,000
	HAZ	191	211	189	219	204	203	95,000
	Base	205	193	187	187	209	196	92,000
PSOH-R3	Weld	182	186	187	182	181	184	87,000
	HAZ	183	198	206	195	192	195	92,000
	Base	176	182	160	185	201	181	86,000
PSOH-R4	Weld	154	173	173	185	180	173	83,000
	HAZ	158	172	161	176	144	162	78,000
	Base	162	159	152	153	157	157	75,000
PSOH-R5	Weld	189	178	186	174	164	178	85,000
	HAZ	142	161	170	173	147	159	76,000
	Base	144	158	142	155	152	150	72,000
PSOH-R6	Weld	184	192	195	191	183	189	90,000
	HAZ	161	197	181	186	153	176	84,000
	Base	157	149	153	161	154	155	74,000
PSOH-R7	Weld	174	192	170	199	181	183	87,000
	HAZ	197	171	147	169	182	173	83,000
	Base	146	143	133	154	150	145	69,000
PSOH-R8	Weld	181	186	181	178	186	182	87,000
	HAZ	190	191	184	183	187	187	89,000
	Base	155	148	162	157	148	154	74,000
PSOH-R9	Weld	173	176	178	186	193	181	86,000
	HAZ	172	202	212	209	198	199	93,000
	Base	176	182	180	171	172	176	84,000
PSOH-R10	Weld	195	186	192	190	190	191	90,000
	HAZ	179	166	187	194	176	180	86,000
	Base	184	189	182	198	180	187	88,000
PSOH-R11	Weld	187	176	188	185	167	181	86,000
	HAZ	190	182	183	140	156	170	81,000
	Base	162	158	156	155	156	157	75,000

INSPECTOR: M. Olszewski	DATE: 3/26/2012

APPENDIX C

NONDESTRUCTIVE EXAMINATION REPORTS
FINISHING SUPERHEATER INLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 2 - 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	903	°F	
P- Maximum Allowable Pressure	4,000	psig	
D- Outside Diameter	19.25	in	
S- Maximum Stress Value	12,974	psi	Per. Sect II D, Table 1A
E- Efficency	1.000		Per. Sect I, PG 27.4 Note 1
y- Temperature Coefficient	0.500		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)) 2.571 in

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Finishing Superheater Inlet Header	Material: SA-335 Gr. P-11	Procedure: TEI 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	
GW-15	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	
P-5	N/A	No recordable indications.	x	
P-6	N/A	No recordable indications.	x	
P-6	N/A	No recordable indications.	x	
RT Plugs				
RT-1	N/A	No recordable indications.	x	
RT-2	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Finishing Superheater Inlet Header	Material: SA-335 Gr. P-11	Procedure: TEI 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
Tube Stubs				
Tube 55A	1-1/2" LT	Indication in toe of weld, header side.		x

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

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Finishing Superheater Inlet Header	Material: SA-335 Gr. P-11	Procedure: TEI 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
Final Examination After Removal and Repair by Welding				
Tube Stub				
Tube 55A	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: Finishing Superheater Inlet Header	Material: SA-335, Gr. P11	Nominal Wall: 2.845"	Minimum Wall: 2.571"

EQUIPMENT USED:

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

KEY:

IDENTIFICATION		CONFIGURATION	DIAMETER MEASUREMENTS (in.)	THICKNESS MEASUREMENTS			
			PI TAPE	12:00	3:00	6:00	9:00
GW-1	North	Pipe	19.266	Obstr.	Obstr.	Obstr.	Obstr.
	South	Pipe	19.344	3.101	3.104	3.120	3.092
GW-2	North	Pipe	19.344	3.101	3.104	3.102	3.092
	South	Pipe	19.313	Obstr.	3.117	3.089	3.120
GW-3	North	Pipe	19.359	2.790	3.117	3.160	3.143
	South	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-4	North	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
	South	Pipe	19.328	3.197	3.175	3.016	2.959
GW-5	North	Pipe	19.344	3.144	3.140	3.116	3.072
	South	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-6	North	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
	South	Pipe	19.328	3.141	3.146	3.153	3.167
GW-7	North	Pipe	19.328	3.097	3.083	3.187	3.131
	South	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-8	North	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
	South	Pipe	19.313	3.090	3.098	3.046	3.084
GW-9	North	Pipe	19.328	3.080	3.109	3.180	3.081
	South	Pipe	19.313	3.016	2.959	3.089	3.045
GW-10	Top	Outlet Pipe	19.547	2.950	2.961	2.945	2.948
	Bottom	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-11	Top	Outlet Pipe	19.578	2.997	2.994	2.988	3.008
	Bottom	Outlet Pipe	19.594	2.963	2.977	2.975	2.998
GW-12	Top	Outlet Pipe	17.578	2.779	2.828	2.672	2.574
	Bottom	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-13	Top	Outlet Pipe	17.594	2.526	2.809	2.913	2.674
	Bottom	Outlet Pipe	17.547	2.791	2.825	2.684	2.599
GW-14	Top	Outlet Pipe	19.563	2.999	2.984	2.980	3.018
	Bottom	Tee	Obstr.	Obstr.	Obstr.	Obstr.	Obstr.
GW-15	Top	Outlet Pipe	19.531	2.995	2.994	2.992	3.084
	Bottom	Outlet Pipe	19.594	3.026	3.004	2.974	2.982

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/22/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-End Cap
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

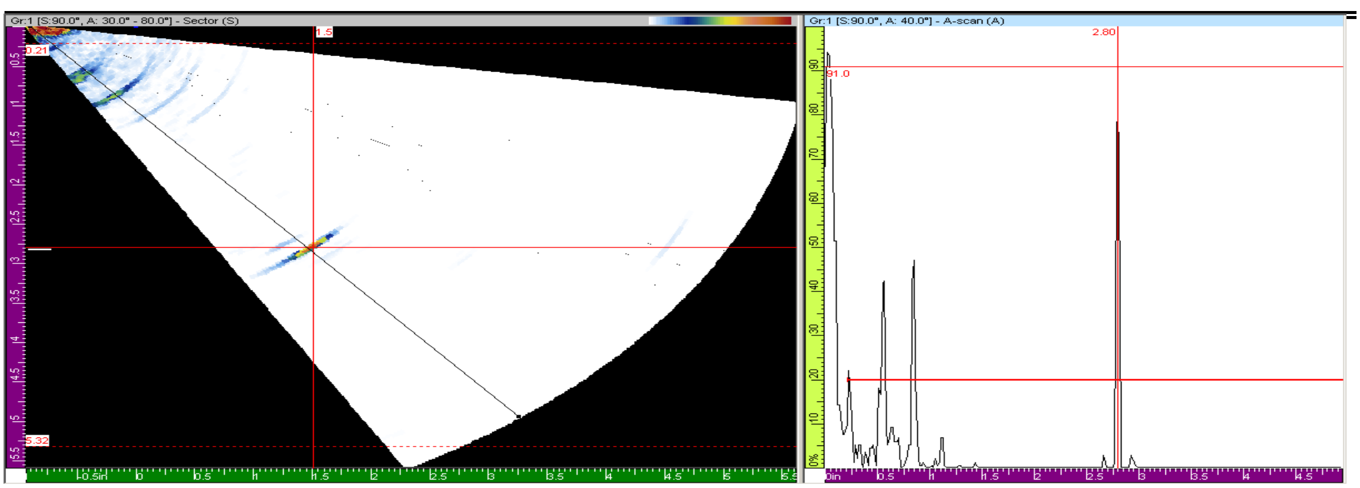
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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 detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

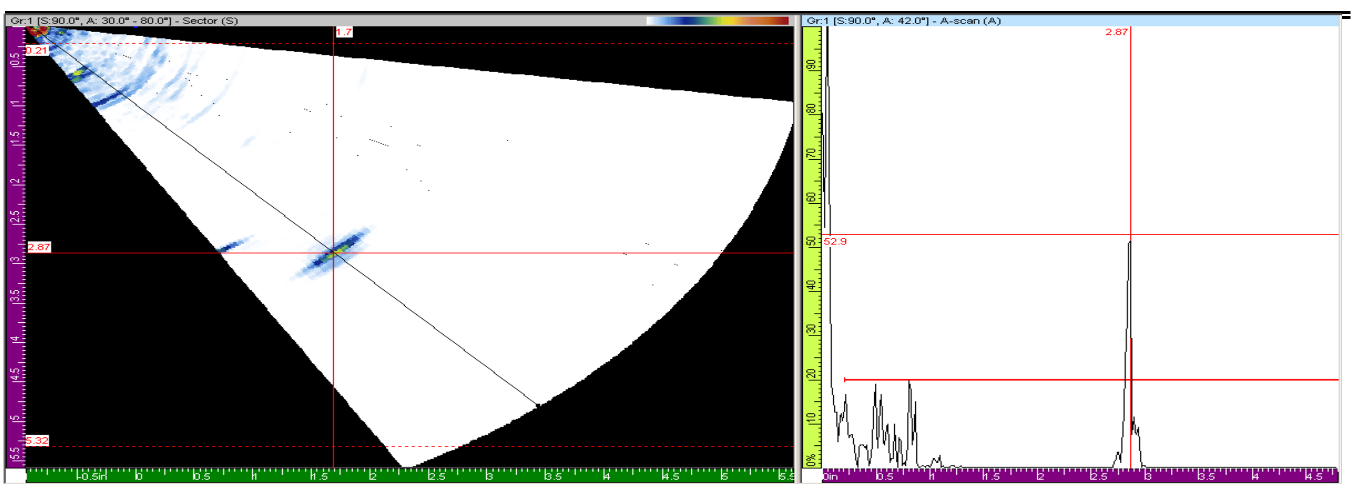
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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 detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH
ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

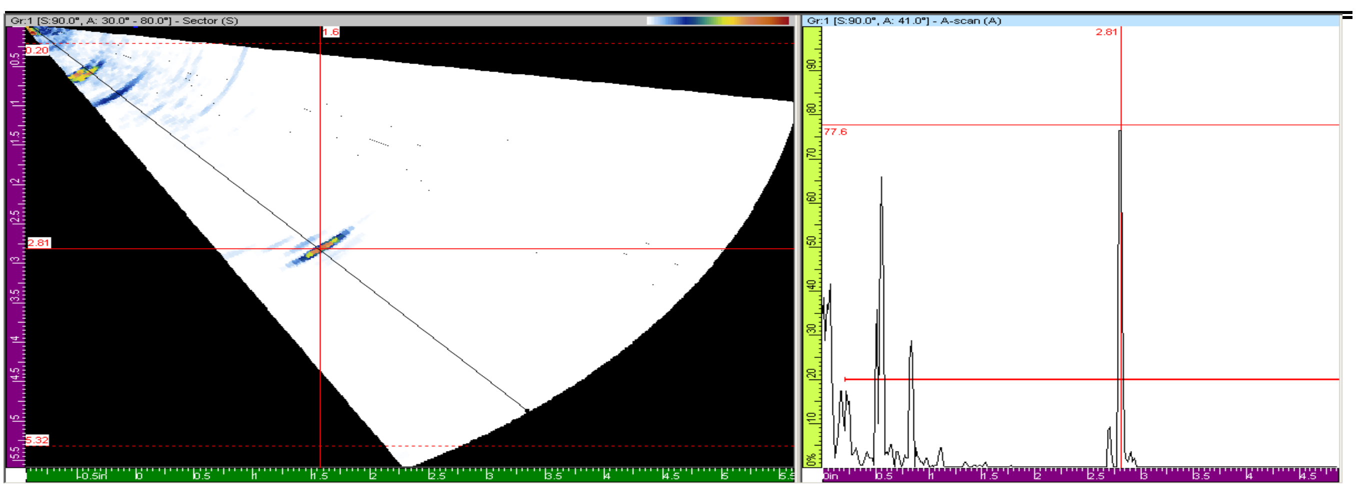
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-4
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

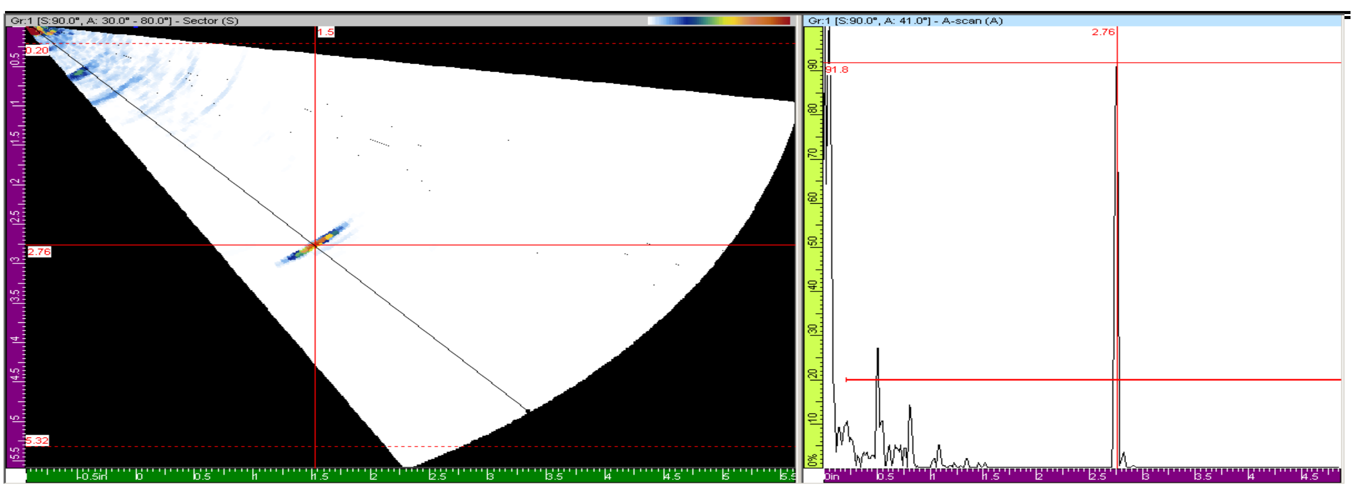
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-5
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

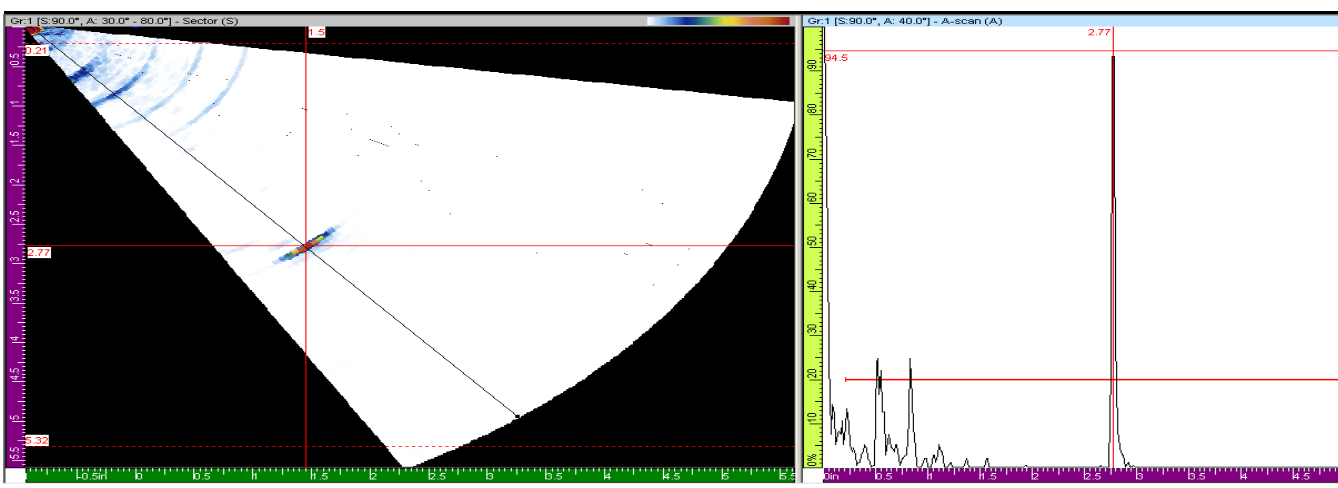
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-6
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

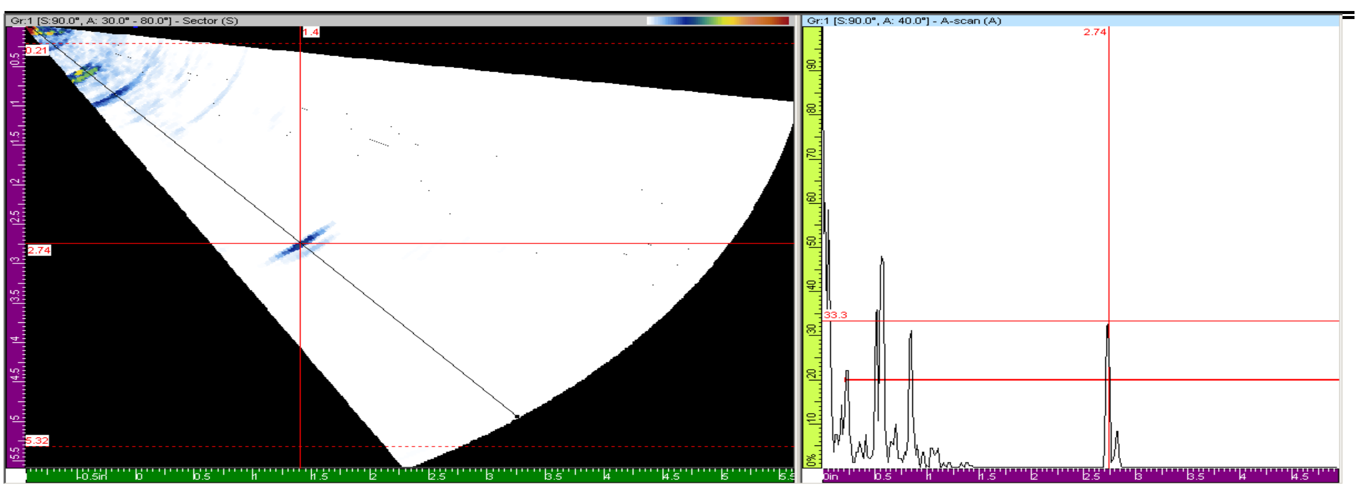
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Only one side accessible for scanning due to the outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-7
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
Machine Information		**Part Thickness:**	3.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

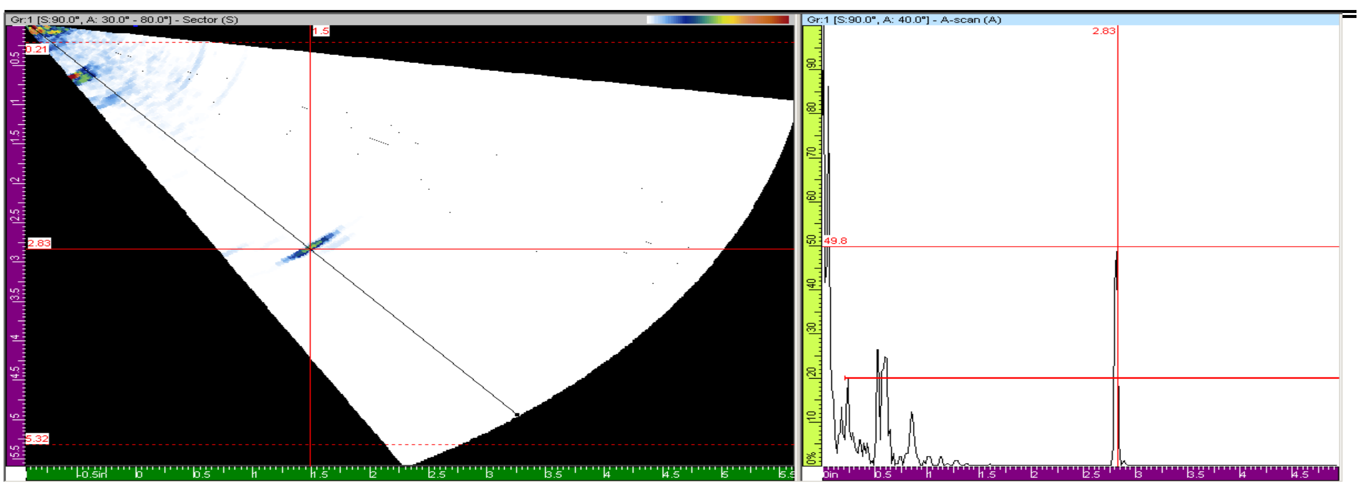
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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



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Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-8
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Tee Connection
Machine Information		**Part Thickness:**	3.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	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**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
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Transducer Calculator

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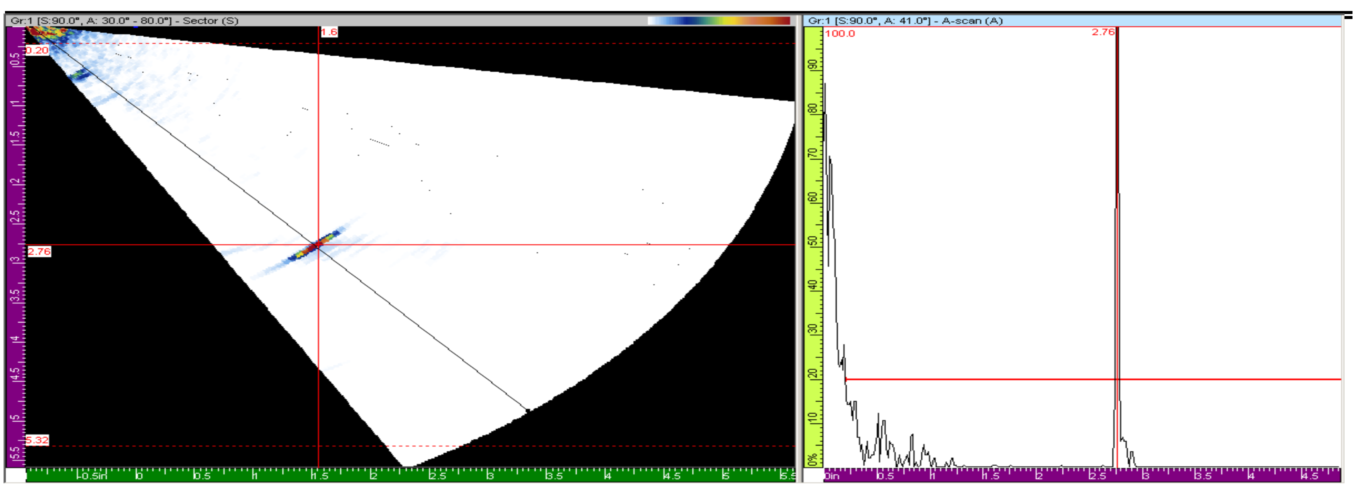

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No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-9
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-End Cap
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	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**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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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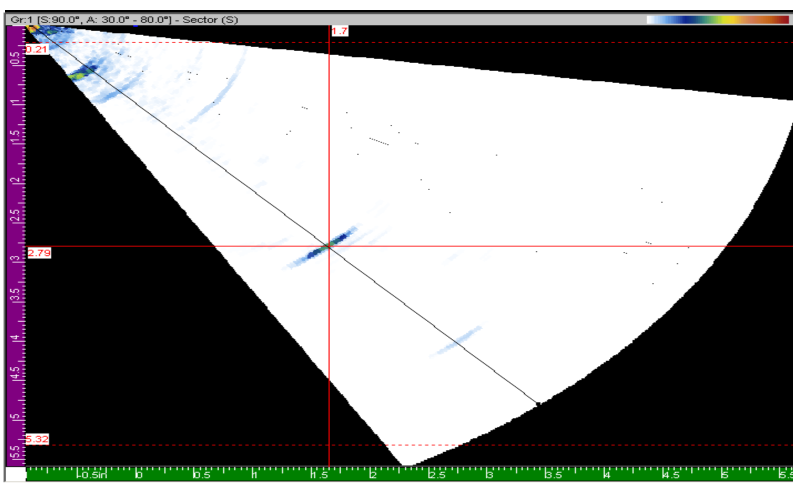

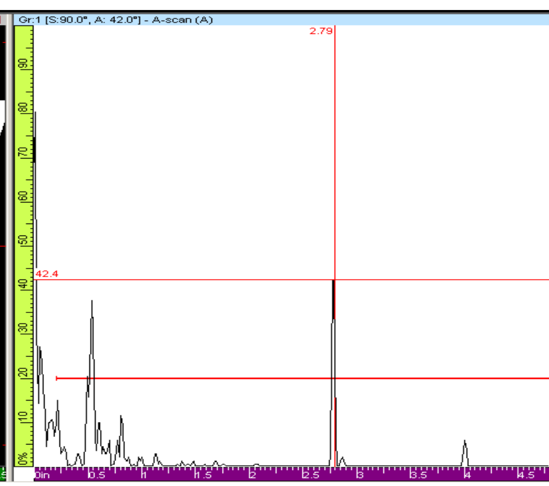

COMMENTS:

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No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-10
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Tee Connection
Machine Information		**Part Thickness:**	3.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	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**
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Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
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Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	PE(Pulse Echo)	Shear	100ns

Transducer Calculator

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Start Angle	**Stop Angle**	**Angle Resolution**	**Focus Depth**	**Sound Velocity**
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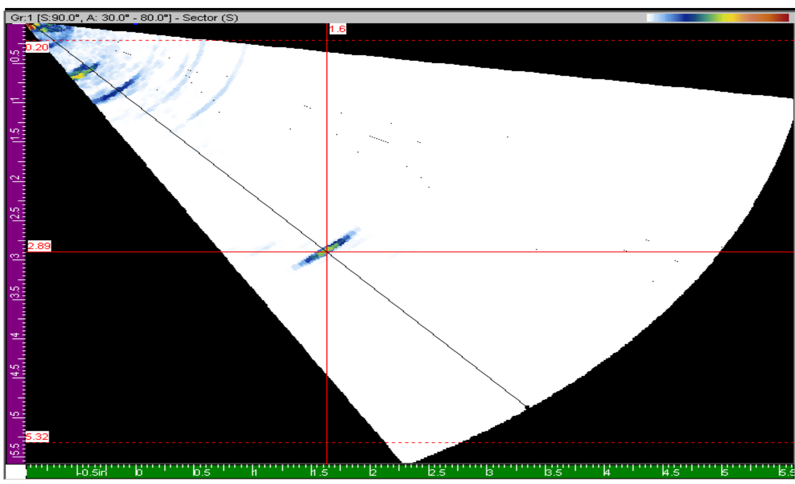

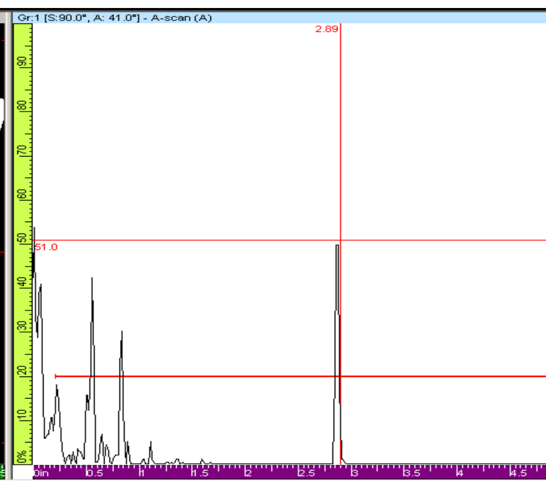

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No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-11
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Pipe
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	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**
10.444us	0.000in	7.264in	20	PA(Phased Array)
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Transducer Calculator

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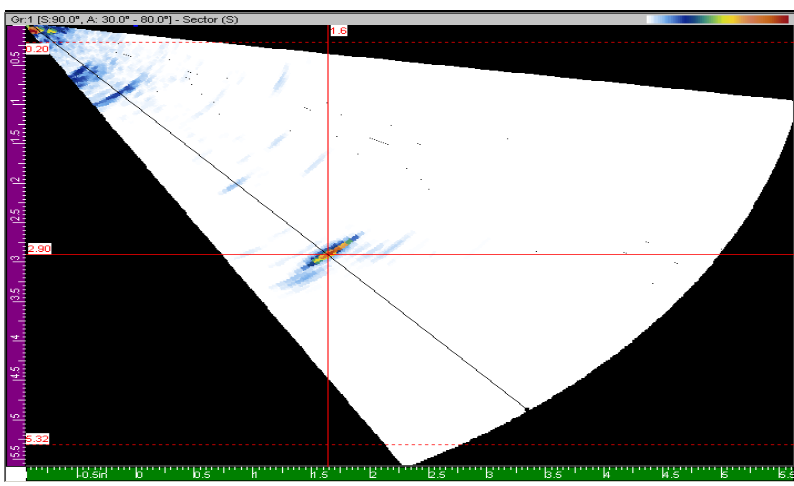

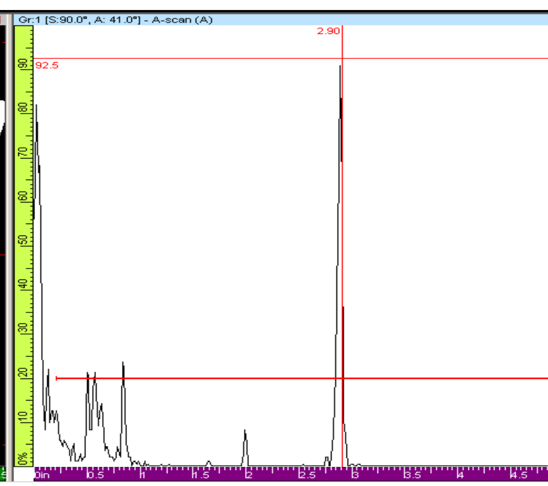

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Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-12
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Tee Connection
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

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

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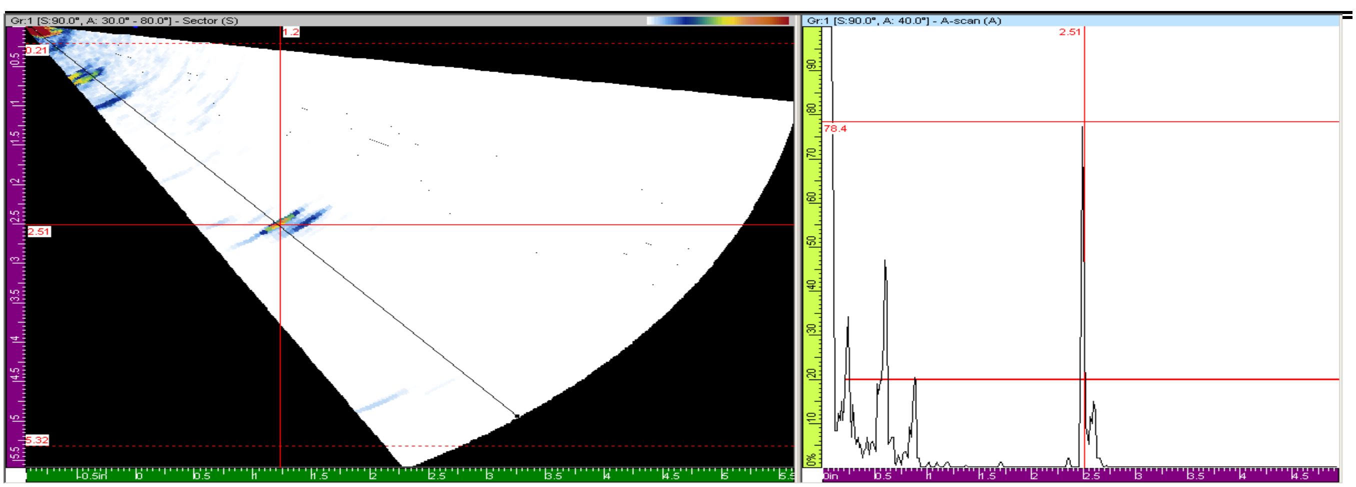

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Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-13
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Pipe
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
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Setup

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Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
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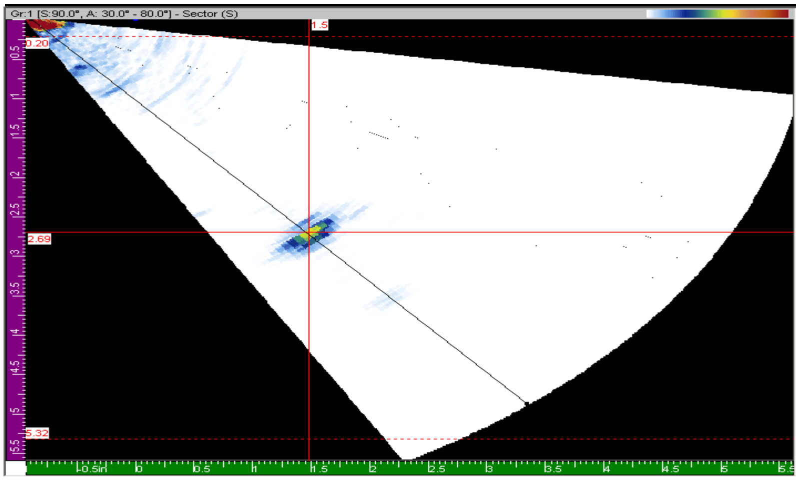

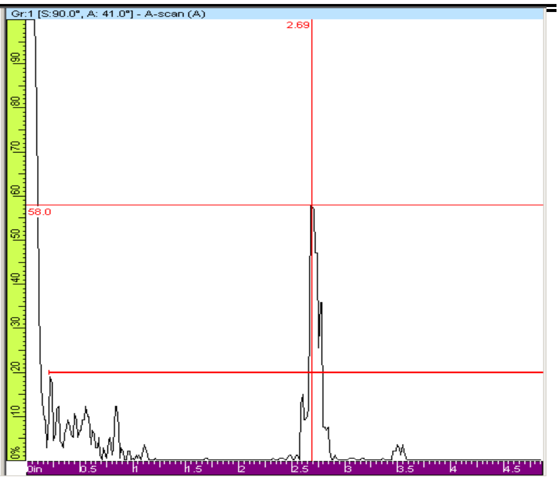

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Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH
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Phased-Array Report

Customer:	AEP	**Component:**	Finishing Superheater Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	FSIH-GW-14
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Pipe-to-Tee Connection
		Part Thickness:	3.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

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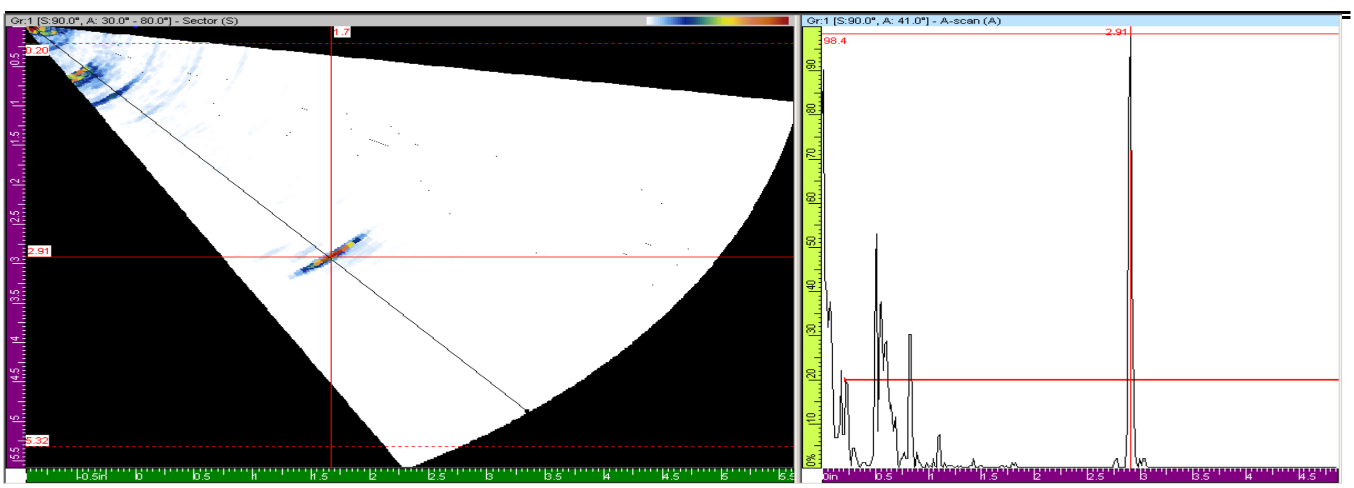

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Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/27/2012**

THIELSCH ENGINEERING, INC.

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

HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Finishing Superheater Inlet Header	Material: SA-335, Gr. P-11	Hardness Scale: HBN

Location		Hardness Measurements 1	2	3	4	5	Average	Corresponding Tensile Strength
FSIH-R1	Weld	204	201	207	203	190	201	95,000
	HAZ	168	175	170	199	178	178	85,000
	Base	163	174	169	166	173	169	81,000
FSIH-R2	Weld	231	221	235	244	250	236	114,000
	HAZ	171	161	176	173	182	173	82,000
	Base	164	175	174	165	161	168	80,000
FSIH-R3	Weld	182	177	180	182	161	176	84,000
	HAZ	204	210	212	211	198	207	98,000
	Base	191	180	174	188	197	186	88,000
FSIH-R4	Weld	196	196	204	188	193	195	92,000
	HAZ	207	165	190	190	162	183	87,000
	Base	173	187	188	180	176	181	86,000
FSIH-R5	Weld	189	174	191	184	193	186	88,000
	HAZ	195	193	197	189	199	195	92,000
	Base	162	164	179	180	165	170	81,000
FSIH-R6	Weld	165	185	178	191	194	183	87,000
	HAZ	177	197	193	215	195	195	92,000
	Base	174	171	172	173	169	172	82,000
FSIH-R7	Weld	192	189	180	188	187	187	89,000
	HAZ	179	166	162	168	166	168	81,000
	Base	167	169	164	159	162	164	79,000
FSIH-R8	Weld	170	182	161	178	188	176	84,000
	HAZ	212	177	216	207	211	205	96,000
	Base	180	178	179	185	172	179	85,000
FSIH-R9	Weld	188	198	205	205	209	201	95,000
	HAZ	217	214	217	195	201	209	98,000
	Base	179	175	182	182	169	177	85,000
FSIH-R10	Weld	191	174	173	179	184	180	86,000
	HAZ	178	191	186	166	186	181	86,000
	Base	167	159	157	153	148	157	75,000
FSIH-R11	Weld	184	193	199	200	212	198	93,000
	HAZ	195	205	204	206	203	203	95,000
	Base	163	165	155	163	158	161	77,000

INSPECTOR: M. Olszewski	DATE: 3/26/2012

APPENDIX D

NONDESTRUCTIVE EXAMINATION REPORTS
FINISHING SUPERHEATER OUTLET HEADERS

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 2 - Finishing Superheater Outlet Header (Upper and Lower)

The minimum wall thickness requirements were calculated for the Finishing Superheater Outlet headers. 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

ASME Boiler Tube Minimum Wall Thickness Calculation

AEP - Mitchell Generating Station

Unit No. 2 - Finishing Superheater Outlet Tubing (Upper and Lower)

The minimum wall thickness requirements were calculated for the Finishing Superheater Outlet tubing based upon the original 1968 ASME Boiler and Pressure Vessel Code.

ASME Material Specification: SA-213, Grade T22

Where:

T- Design Temperature	1025	°F
P- Maximum Allowable Pressure	3,865	psig
D- Outside Diameter	2.00	inches
S- Maximum Allowable Stress Value	6,800	psi
E- Efficiency	0	
e-Thickness Factor	0	inches
y- Temperature Coefficient	0	

The following equation applies:

Tubing:

Minimum Wall Thickness Calculations (Per. ASME, Sect I, PG 27.2.1)

t_{tube}=((PD)/(2S+P))+.005D+e — 0.453 inches

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Upper Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI 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	
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	
P-5	360° LT	Indication header side. Removed by light surface grinding. No further action required.	x	
Attachment Welds				
AW-1	N/A	No recordable indications.	x	
AW-2	N/A	No recordable indications.	x	
Tube Stubs				
Tube 1A	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 1B	1" LT	Indication in toe of weld, tube side.		x
Tube 1C	1" LT	Indication in toe of weld, tube side.		x
Tube 1D	1"	Indication in toe of weld, tube side.		x
Tube 1E	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 2B	1" LT	Indication in toe of weld, tube side.		x
Tube 5A	1" LT	Indication in toe of weld, tube side.		x

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Upper Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI 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
Tube Stubs continued				
Tube 17C	1" LT	Indication in toe of weld, tube side.		x
Tube 17D	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 20A	2" LT	Indication in toe of weld, tube side.		x
Tube 20D	1" LT	Indication in toe of weld, tube side.		x
Tube 21E	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 22D	1" LT	Indication in toe of weld, tube side.		x
Tube 24D	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 25A	1" LT	Indication in toe of weld, tube side.		x
Tube 25D	3/4" LT	Indication in toe of weld, tube side.		x
Tube 26E	2" LT	Indication in toe of weld, tube side.		x
Tube 27E	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 30E	1/4" LT	Indication in toe of weld, tube side.		x
Tube 31E	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 32D	2-1/2" LT	Indication in toe of weld, tube side.		x
Tube 35C	1/2" LT	Indication in toe of weld, tube side.		x
Tube 45A	1/2" LT	Indication in toe of weld, tube side.		x
Tube 50B	1/4" LT	Indication in toe of weld, tube side.		x
Tube 51B	1/4" LT	Indication in toe of weld, tube side.		x
Tube 52A	1-1/2" LT	Indication in toe of weld, tube side.		x
	1/2" LT	Indication in toe of weld, tube side.		x
Tube 52B	1/2" LT	Indication in toe of weld, tube side.		x
Tube 53C	1" LT	Indication in toe of weld, tube side.		x
Tube 53D	1" LT	Indication in toe of weld, tube side.		x
Tube 54A	3" LT	Indication in toe of weld, tube side.		x
	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 54B	2" LT	Indication in toe of weld, tube side.		x
Tube 54C	1-1/2" LT	Indication in toe of weld, tube side.		x

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Upper Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ______
- [ ] Amperage ______
- [ ] Other ______

WET

- [ ] 14AM
- [x] 20B
- [ ] Other

DRY

- [ ] Red
- [ ] Gray
- [ ] Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Tube Stubs continued				
Tube 54D	2" LT	Indication in toe of weld, tube side.		x
Tube 55A	3" LT	Indication in toe of weld, tube side.		x
	2" LT	Indication in toe of weld, tube side.		x
Tube 55B	2-1/2" LT	Indication in toe of weld, tube side.		x
	2" LT	Indication in toe of weld, tube side.		x
Tube 55C	2" LT	Indication in toe of weld, tube side.		x
	1/2" LT	Indication in toe of weld, tube side.		x
Tube 55D	2" LT	Indication in toe of weld, tube side.		x
Tube 56A	3" LT	Indication in toe of weld, tube side.		x
	2" LT	Indication in toe of weld, tube side.		x
Tube 56B	2-1/2" LT	Indication in toe of weld, tube side.		x
	2" LT	Indication in toe of weld, tube side.		x
Tube 56C	2" LT	Indication in toe of weld, tube side.		x
Tube 56D	1-1/2" LT	Indication in toe of weld, tube side.		x
	2" LT	Indication in toe of weld, tube side.		x

Note: All tube stubs were examined. No other recordable indications were revealed.

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Upper Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ______
- [ ] Amperage ______
- [ ] Other ______

WET

- [ ] 14AM
- [x] 20B
- [ ] Other

DRY

- [ ] Red
- [ ] Gray
- [ ] Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Final Examination After Removal and Repair by Welding				
Tube Stubs				
Tube 1A	N/A	No recordable indications.	x	
Tube 1B	N/A	No recordable indications.	x	
Tube 1C	N/A	No recordable indications.	x	
Tube 1D	N/A	No recordable indications.	x	
Tube 1E	N/A	No recordable indications.	x	
Tube 2B	N/A	No recordable indications.	x	
Tube 5A	N/A	No recordable indications.	x	
Tube 17C	N/A	No recordable indications.	x	
Tube 17D	N/A	No recordable indications.	x	
Tube 20A	N/A	No recordable indications.	x	
Tube 20D	N/A	No recordable indications.	x	
Tube 21E	N/A	No recordable indications.	x	
Tube 22D	N/A	No recordable indications.	x	
Tube 24D	N/A	No recordable indications.	x	
Tube 25A	N/A	No recordable indications.	x	
Tube 25D	N/A	No recordable indications.	x	
Tube 26E	N/A	No recordable indications.	x	
Tube 27E	N/A	No recordable indications.	x	
Tube 30E	N/A	No recordable indications.	x	
Tube 31E	N/A	No recordable indications.	x	
Tube 32D	N/A	No recordable indications.	x	
Tube 35C	N/A	No recordable indications.	x	
Tube 45A	N/A	No recordable indications.	x	
Tube 50B	N/A	No recordable indications.	x	
Tube 51B	N/A	No recordable indications.	x	
Tube 52A	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Upper Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI 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
Final Examination After Removal and Repair by Welding				
Tube Stubs				
Tube 52B	N/A	No recordable indications.	x	
Tube 53C	N/A	No recordable indications.	x	
Tube 53D	N/A	No recordable indications.	x	
Tube 54A	N/A	No recordable indications.	x	
Tube 54B	N/A	No recordable indications.	x	
Tube 54C	N/A	No recordable indications.	x	
Tube 54D	N/A	No recordable indications.	x	
Tube 55A	N/A	No recordable indications.	x	
Tube 55B	N/A	No recordable indications.	x	
Tube 55C	N/A	No recordable indications.	x	
Tube 55D	N/A	No recordable indications.	x	
Tube 56A	N/A	No recordable indications.	x	
Tube 56B	N/A	No recordable indications.	x	
Tube 56C	N/A	No recordable indications.	x	
Tube 56D	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

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MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-2012
Component: Lower Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ______
- [ ] Amperage ______
- [ ] Other ______

WET

- [ ] 14AM
- [x] 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	24" LT	Indication at 9:00 o'clock. Removed by light surface grinding. No further action required.	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	
Penetrations				
P-1	N/A	No recordable indications.	x	
P-2	2-1/2" LT	Indication, header side. Removed by light surface grinding. No further action required.	x	
P-3	N/A	No recordable indications.	x	
P-4	N/A	No recordable indications.	x	
P-5	360° LT	Indication header side. Removed by light surface grinding. No further action required.	x	
Tube Stubs				
Tube 1B	1" LT	Indication in toe of weld, tube side.		x
Tube 1C	1" LT	Indication in toe of weld, tube side.		x
	1" LT	Indication in toe of weld, header side.		x
Tube 2B	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 2D	1" LT	Indication in toe of weld, tube side.		x
Tube 4A	2" LT	Indication in toe of weld, tube side.		x
Tube 4B	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 5C	2" LT	Indication in toe of weld, header side.		x
Tube 5D	2" LT	Indication in toe of weld, header side.		x
Tube 8E	1-1/2" LT	Indication in toe of weld, header side.		x

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

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MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-2012
Component: Lower Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ________
- [ ] Amperage ________
- [ ] Other ________

WET

- [ ] 14AM
- [x] 20B
- [ ] Other

DRY

- [ ] Red
- [ ] Gray
- [ ] Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Tube Stubs continued				
Tube 12E	2" LT	Indication in toe of weld, header side.		x
Tube 15E	1/2" LT	Indication in toe of weld, header side.		x
Tube 18A	1" LT	Indication in toe of weld, tube side.		x
Tube 19E	1" LT	Indication in toe of weld, tube side.		x
	1-1/2" LT	Indication in toe of weld, header side.		x
Tube 21A	2-1/2" LT	Indication in toe of weld, header side.		x
Tube 22E	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 24E	2" LT	Indication in toe of weld, tube side.		x
Tube 25D	2" LT	Indication in toe of weld, header side.		x
Tube 26D	2" LT	Indication in toe of weld, header side.		x
Tube 27D	1" LT	Indication in toe of weld, header side.		x
Tube 29D	1-1/2" LT	Indication in toe of weld, header side.		x
	1-1/2" LT	Indication in toe of weld, header side.		x
	1" LT	Indication in toe of weld, tube side.		x
Tube 30C	1" LT	Indication in toe of weld, header side.		x
Tube 30D	1" LT	Indication in toe of weld, tube side.		x
Tube 31A	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 31B	1-1/2" LT	Indication in toe of weld, header side.		x
Tube 31D	1" LT	Indication in toe of weld, header side.		x
Tube 33E	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 38E	1/2" LT	Indication in toe of weld, header side.		x
	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 41E	2" LT	Indication in toe of weld, tube side.		x
Tube 47B	2" LT	Indication in toe of weld, tube side.		x
Tube 48B	1" LT	Indication in toe of weld, tube side.		x
Tube 50C	1" LT	Indication in toe of weld, tube side.		x

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-2012
Component: Lower Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ______
- [ ] Amperage ______
- [ ] Other ______

WET

- [ ] 14AM
- [x] 20B
- [ ] Other

DRY

- [ ] Red
- [ ] Gray
- [ ] Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Tube Stubs continued				
Tube 50D	2" LT	Indication in toe of weld, tube side.		x
Tube 50E	1" LT	Indication in toe of weld, header side.		x
Tube 51A	2" LT	Indication in toe of weld, tube side.		x
Tube 51B	2" LT	Indication in toe of weld, header side.		x
Tube 51D	1" LT	Indication in toe of weld, tube side.		x
Tube 52A	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 52B	2" LT	Indication in toe of weld, tube side.		x
Tube 52C	1/2"LT	Indication in toe of weld, header side.		x
	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 52D	1/4" LT	Indication in toe of weld, tube side.		x
	2" LT	Indication in toe of weld, tube side.		x
Tube 53A	2" LT	Indication in toe of weld, tube side.		x
Tube 53B	3" LT	Indication in toe of weld, tube side.		x
Tube 53C	2" LT	Indication in toe of weld, tube side.		x
Tube 53D	2" LT	Indication in toe of weld, tube side.		x
Tube 53E	2" LT	Indication in toe of weld, tube side.		x
Tube 54A	3" LT	Indication in toe of weld, tube side.		x
Tube 54B	2" LT	Indication in toe of weld, tube side.		x
Tube 54C	1-1/2" LT	Indication in toe of weld, tube side.		x
	2" LT	Indication in toe of weld, tube side.		x
Tube 54D	1-1/2" LT	Indication in toe of weld, tube side.		x
	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 54E	1" LT	Indication in toe of weld, tube side.		x
Tube 55A	2" LT	Indication in toe of weld, tube side.		x
Tube 55B	2-1/2" LT	Indication in toe of weld, tube side.		x

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-2012
Component: Lower Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ______
- [ ] Amperage ______
- [ ] Other ______

WET

- [ ] 14AM
- [x] 20B
- [ ] Other

DRY

- [ ] Red
- [ ] Gray
- [ ] Black

IDENTIFICATION	INDICATION SIZE	COMMENTS ON RESULTS	ACCEPT	REJECT
Tube Stubs continued				
Tube 55C	2-1/2" LT	Indication in toe of weld, tube side.		x
Tube 55D	2" LT	Indication in toe of weld, tube side.		x
Tube 55E	3" LT	Indication in toe of weld, tube side.		x
Tube 56A	1" LT	Indication in toe of weld, tube side.		x
	1" LT	Indication in toe of weld, tube side.		x
Tube 56B	2" LT	Indication in toe of weld, tube side.		x
Tube 56C	360° LT	Indication in toe of weld, tube side.		x
Tube 56D	1-1/2" LT	Indication in toe of weld, tube side.		x
Tube 56E	2" LT	Indication in toe of weld, tube side.		x

Note: All tube stubs were examined. No other recordable indications were revealed.

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-2012
Component: Lower Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI 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
Final Examination After Removal and Repair by Welding				
Tube Stubs				
Tube 1B	N/A	No recordable indications.	x	
Tube 1C	N/A	No recordable indications.	x	
Tube 2B	N/A	No recordable indications.	x	
Tube 2D	N/A	No recordable indications.	x	
Tube 4A	N/A	No recordable indications.	x	
Tube 4B	N/A	No recordable indications.	x	
Tube 5C	N/A	No recordable indications.	x	
Tube 5D	N/A	No recordable indications.	x	
Tube 8E	N/A	No recordable indications.	x	
Tube 12E	N/A	No recordable indications.	x	
Tube 15E	N/A	No recordable indications.	x	
Tube 18A	N/A	No recordable indications.	x	
Tube 19E	N/A	No recordable indications.	x	
Tube 21A	N/A	No recordable indications.	x	
Tube 22E	N/A	No recordable indications.	x	
Tube 24E	N/A	No recordable indications.	x	
Tube 25D	N/A	No recordable indications.	x	
Tube 26D	N/A	No recordable indications.	x	
Tube 27D	N/A	No recordable indications.	x	
Tube 29D	N/A	No recordable indications.	x	
Tube 30C	N/A	No recordable indications.	x	
Tube 30D	N/A	No recordable indications.	x	
Tube 31A	N/A	No recordable indications.	x	
Tube 31B	N/A	No recordable indications.	x	
Tube 31D	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-2012
Component: Lower Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI 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
Final Examination After Removal and Repair by Welding				
Tube Stubs				
Tube 33E	N/A	No recordable indications.	x	
Tube 38E	N/A	No recordable indications.	x	
Tube 41E	N/A	No recordable indications.	x	
Tube 47B	N/A	No recordable indications.	x	
Tube 48B	N/A	No recordable indications.	x	
Tube 50C	N/A	No recordable indications.	x	
Tube 50D	N/A	No recordable indications.	x	
Tube 50E	N/A	No recordable indications.	x	
Tube 51A	N/A	No recordable indications.	x	
Tube 51B	N/A	No recordable indications.	x	
Tube 51D	N/A	No recordable indications.	x	
Tube 52A	N/A	No recordable indications.	x	
Tube 52B	N/A	No recordable indications.	x	
Tube 52C	N/A	No recordable indications.	x	
Tube 52D	N/A	No recordable indications.	x	
Tube 53A	N/A	No recordable indications.	x	
Tube 53B	N/A	No recordable indications.	x	
Tube 53C	N/A	No recordable indications.	x	
Tube 53D	N/A	No recordable indications.	x	
Tube 53E	N/A	No recordable indications.	x	
Tube 54A	N/A	No recordable indications.	x	
Tube 54B	N/A	No recordable indications.	x	
Tube 54C	N/A	No recordable indications.	x	
Tube 54D	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-2012
Component: Lower Finishing Superheater Outlet Header	Material: SA-335 Gr. P22	Procedure: TEI 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
Final Examination After Removal and Repair by Welding				
Tube Stubs				
Tube 54E	N/A	No recordable indications.	x	
Tube 55A	N/A	No recordable indications.	x	
Tube 55B	N/A	No recordable indications.	x	
Tube 55C	N/A	No recordable indications.	x	
Tube 55D	N/A	No recordable indications.	x	
Tube 55E	N/A	No recordable indications.	x	
Tube 56A	N/A	No recordable indications.	x	
Tube 56B	N/A	No recordable indications.	x	
Tube 56C	N/A	No recordable indications.	x	
Tube 56D	N/A	No recordable indications.	x	
Tube 56E	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: Upper Finishing Superheater Outlet Header	Material: SA-335, Gr. P22	Nominal Wall: 6.00"	Minimum Wall: 5.69"

EQUIPMENT USED:

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

KEY:

IDENTIFICATION		CONFIGURATION	MEASUREMENTS (in.) PI TAPE	THICKNESS MEASUREMENTS 12:00	3:00	6:00	9:00
GW-1	North	Pipe	28.125	6.114	6.098	6.124	6.039
	South	Pipe	28.094	6.176	6.117	6.223	6.144
GW-2	North	Pipe	28.141	6.007	6.195	6.04	6.026
	South	Pipe	28.141	6.045	6.117	6.283	6.237
GW-3	North	Pipe	28.125	6.104	6.197	6.193	6.169
	South	Pipe	28.156	6.109	6.138	6.018	5.989
GW-4	North	Pipe	28.203	6.151	6.158	6.142	6.116
	South	Pipe	28.125	5.982	5.984	6.048	6.065
GW-5	North	Pipe	28.141	6.103	6.162	6.124	6.196
	South	Pipe	28.094	6.115	6.175	6.067	6.068
GW-6	North	Pipe	28.234	6.244	6.268	6.204	6.284
	South	Pipe	28.203	6.137	6.071	6.238	6.147
GW-7	North	Pipe	28.078	6.254	6.195	6.229	6.251
	South	Pipe	28.188	OBST	OBST	OBST	OBST
				Min	5.982		
				Max	6.284		
				Avg	6.136		

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/23/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: Lower Finishing Superheater Outlet Header	Material: SA-335, Gr. P22	Nominal Wall: 6.00"	Minimum Wall: 5.69"

EQUIPMENT USED:

- [x] D-Meter
- [x] Pi-Tape
- [ ] Other
- [ ] Micrometer
- [ ] calipers

KEY:

IDENTIFICATION		CONFIGURATION	MEASUREMENTS (in.) PI TAPE	THICKNESS MEASUREMENTS 12:00	3:00	6:00	9:00
GW-1	North	Pipe	28.156	6.113	6.104	6.097	6.109
	South	Pipe	28.156	6.086	6.216	6.144	6.174
GW-2	North	Pipe	28.141	5.988	6.087	6.048	6.045
	South	Pipe	28.109	5.93	6.014	6.026	6.036
GW-3	North	Pipe	28.156	6.14	6.116	6.139	6.185
	South	Pipe	28.125	6.148	6.132	6.11	6.146
GW-4	North	Pipe	28.141	6.135	6.125	6.169	6.194
	South	Pipe	28.141	6.051	6.264	5.989	5.984
GW-5	North	Pipe	28.125	6.184	6.176	6.146	6.221
	South	Pipe	28.141	6.134	6.181	6.155	6.119
GW-6	North	Pipe	28.172	6.024	6.085	6.135	6.157
	South	Pipe	28.141	6.126	6.162	5.967	5.916
GW-7	North	Pipe	28.094	6.221	6.108	6.168	6.121
	South	Pipe	28.125	Obstr.	Obstr.	Obstr.	Obstr.
				Min	5.916		
				Max	6.264		
				Avg	6.111		

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/23/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	UFSOH-GW-1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-End Cap
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

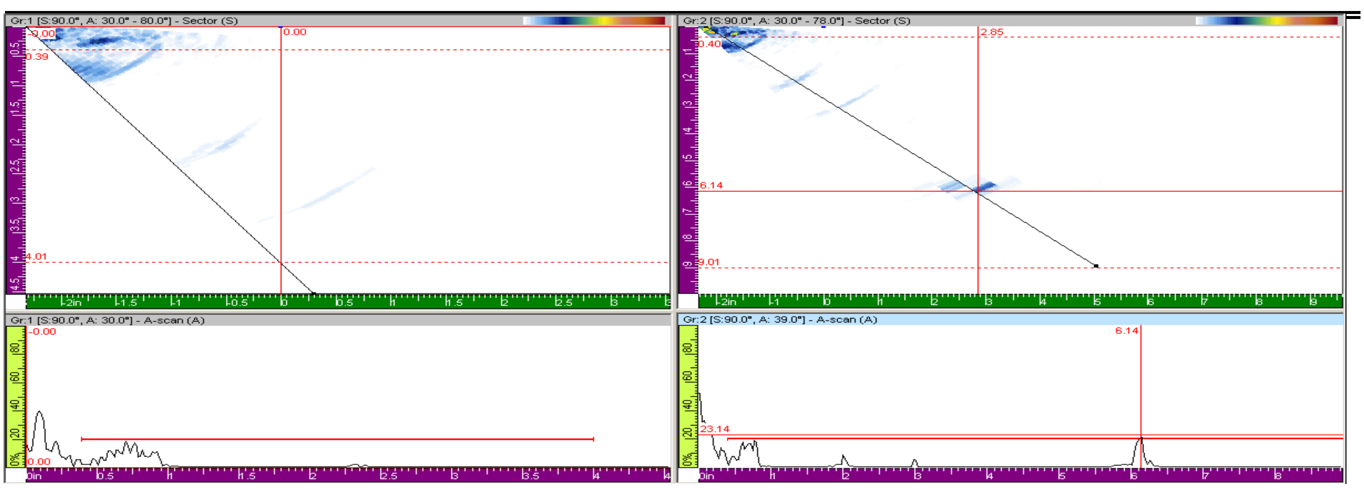
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	UFSOH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

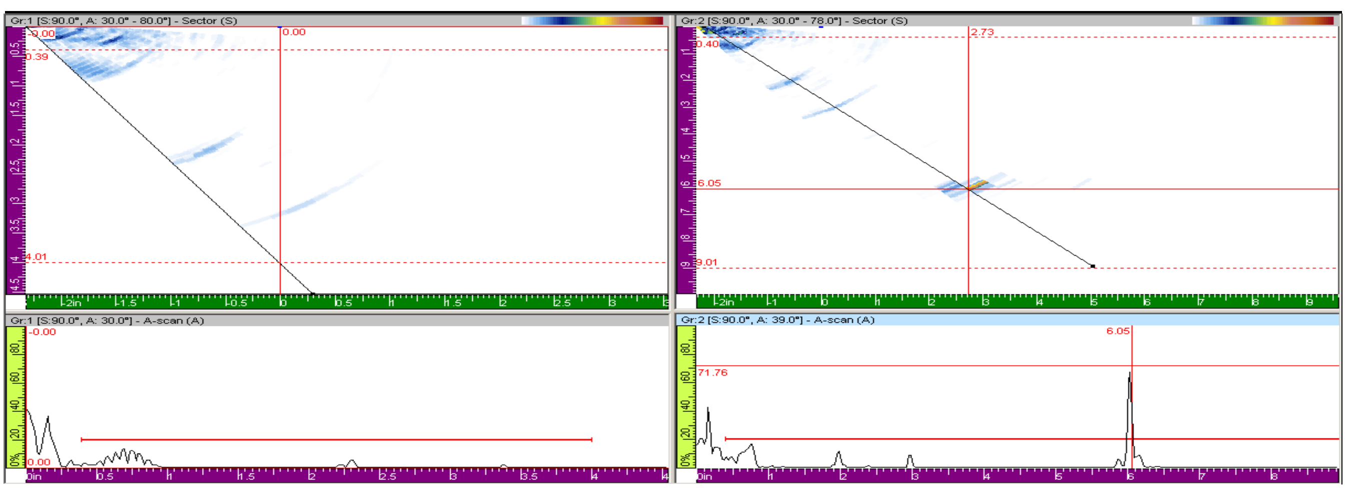
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	UFSOH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
Machine Information		**Part Thickness:**	6.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

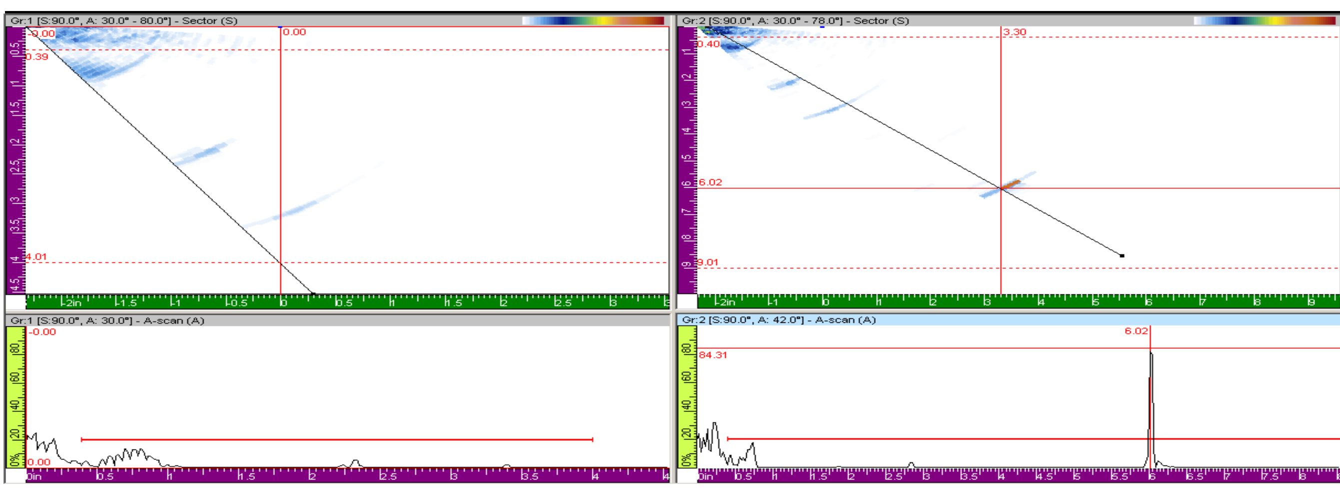
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	UFSOH-GW-4
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	6.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

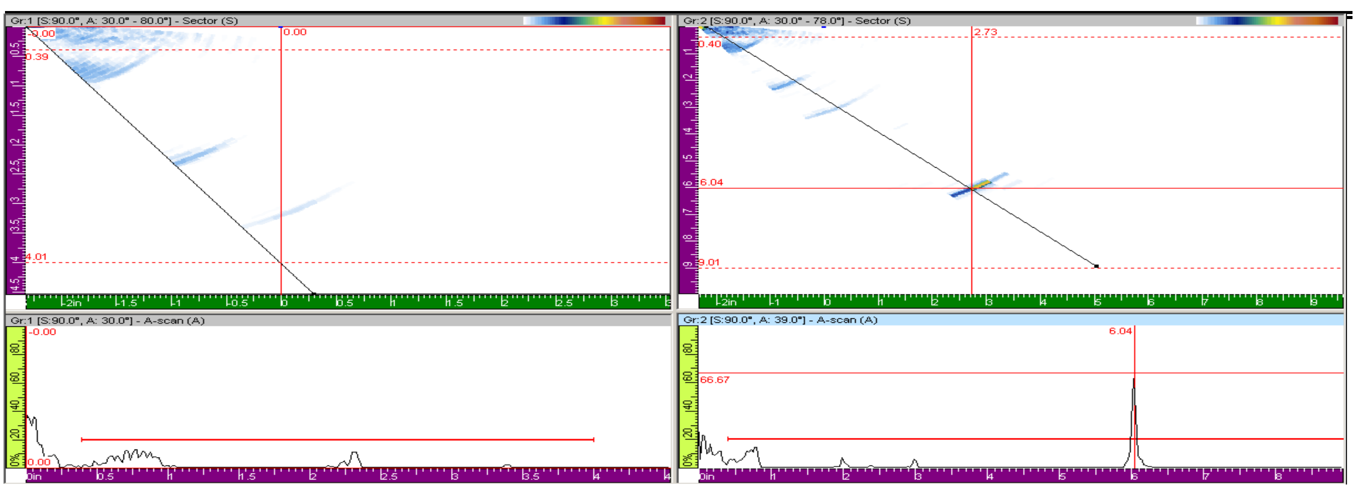
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Upper Finishing Superheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	UFSOH-GW-5
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

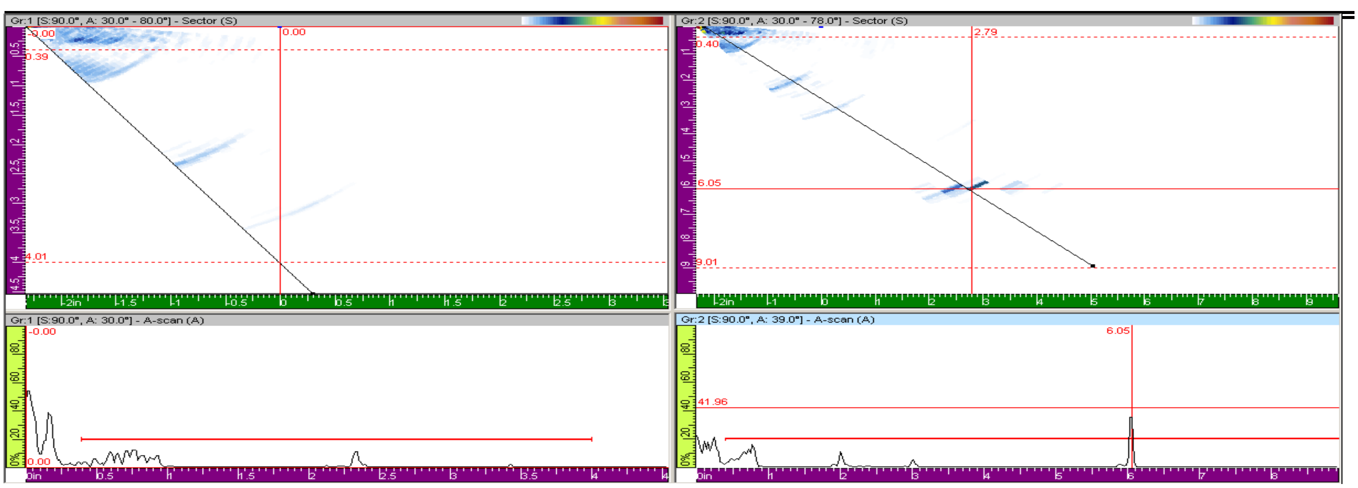
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Upper Finishing Superheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	UFSOH-GW-6
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

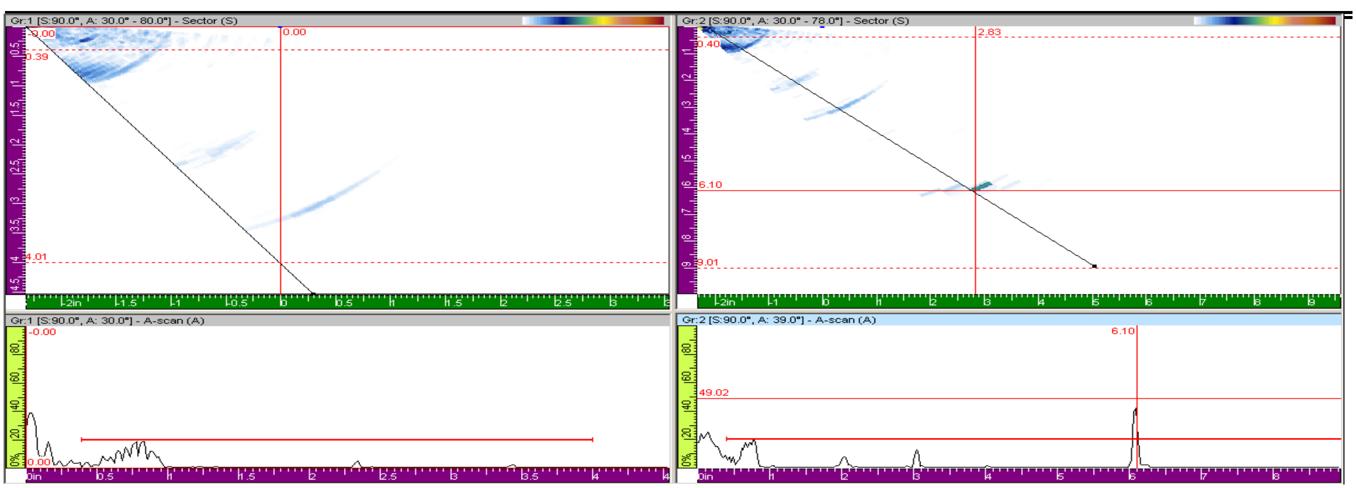
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Upper Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	UFSOH-GW-7
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
Machine Information		**Part Thickness:**	6.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

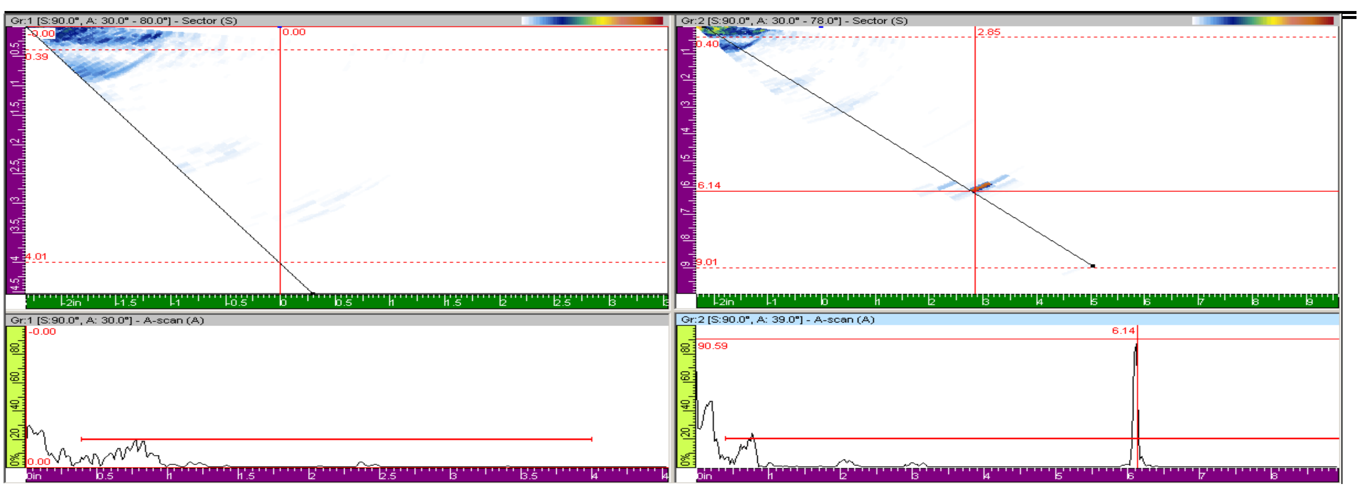
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LFSOH-GW-1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-End Cap
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

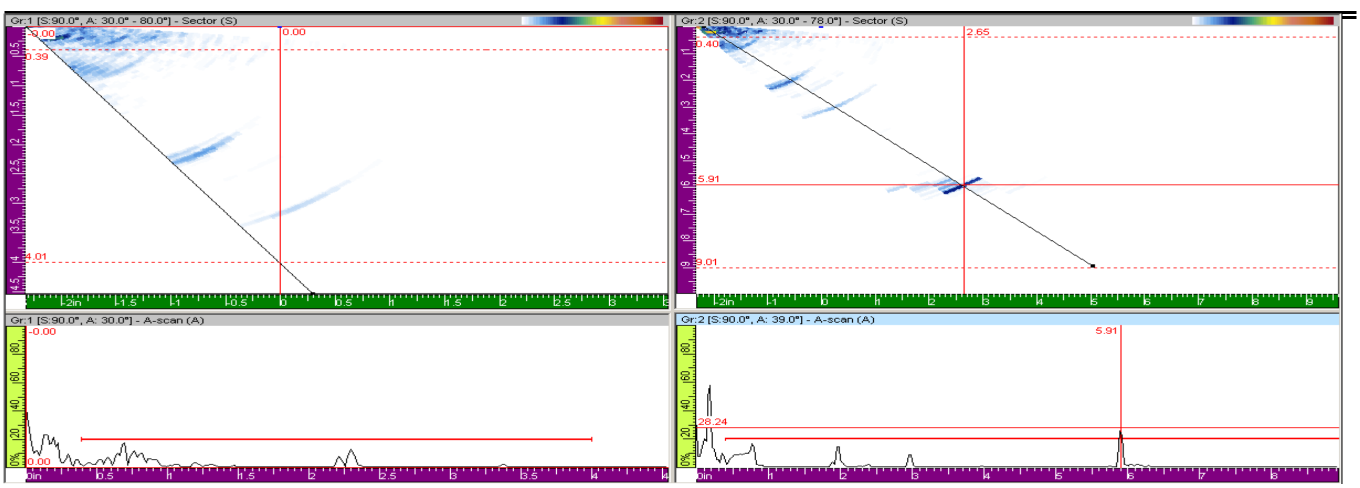
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LFSOH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

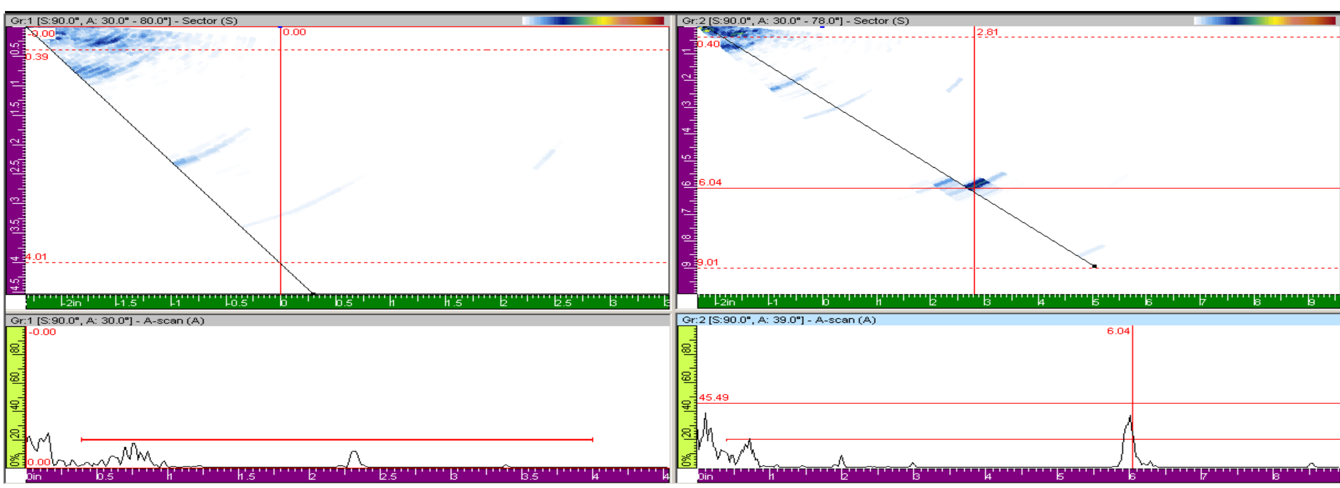
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LFSOH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	6.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

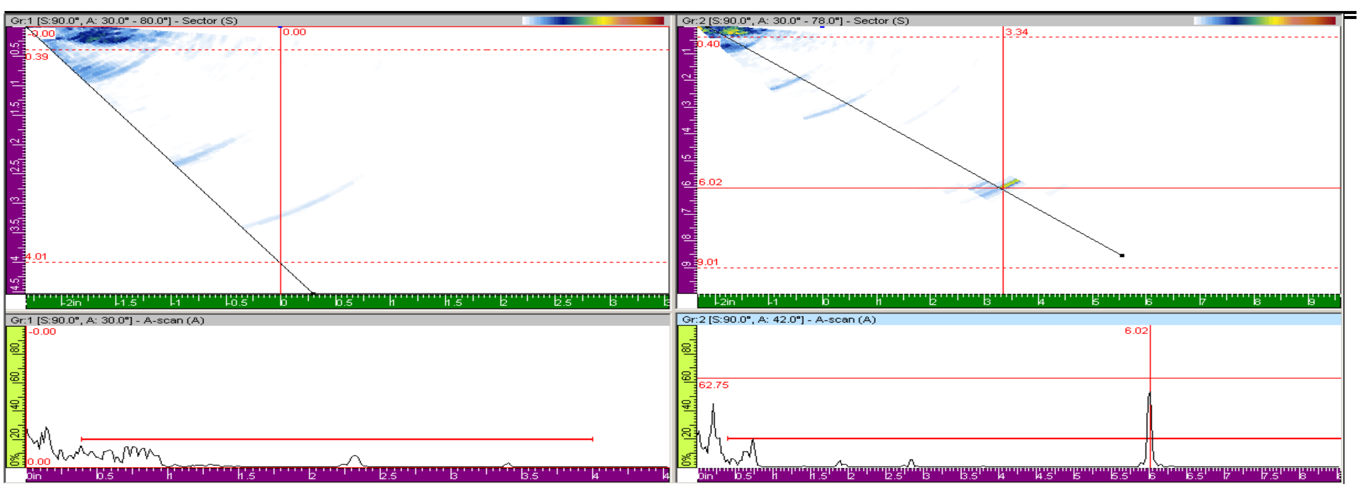
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Lower Finishing Superheater Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LFSOH-GW-4
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header-to-Header
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

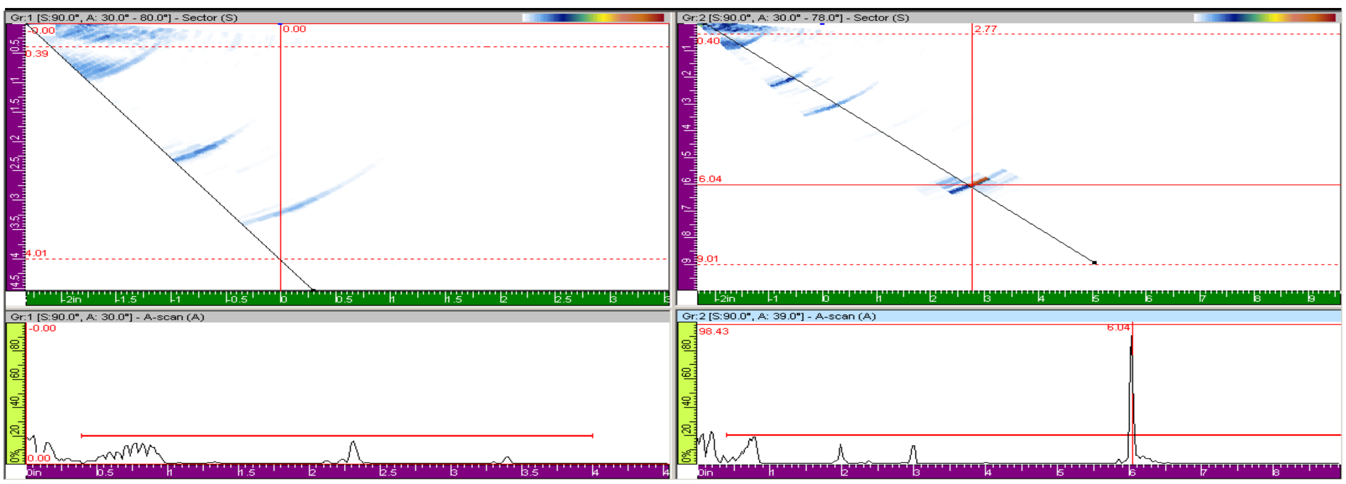
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
Intermittent indication detected between the 4:00 o'clock and the 8:00 o'clock positions/Figures 1 and 2 are images and details of indication.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased Array Report

Component: AEP
Weld Number: 2

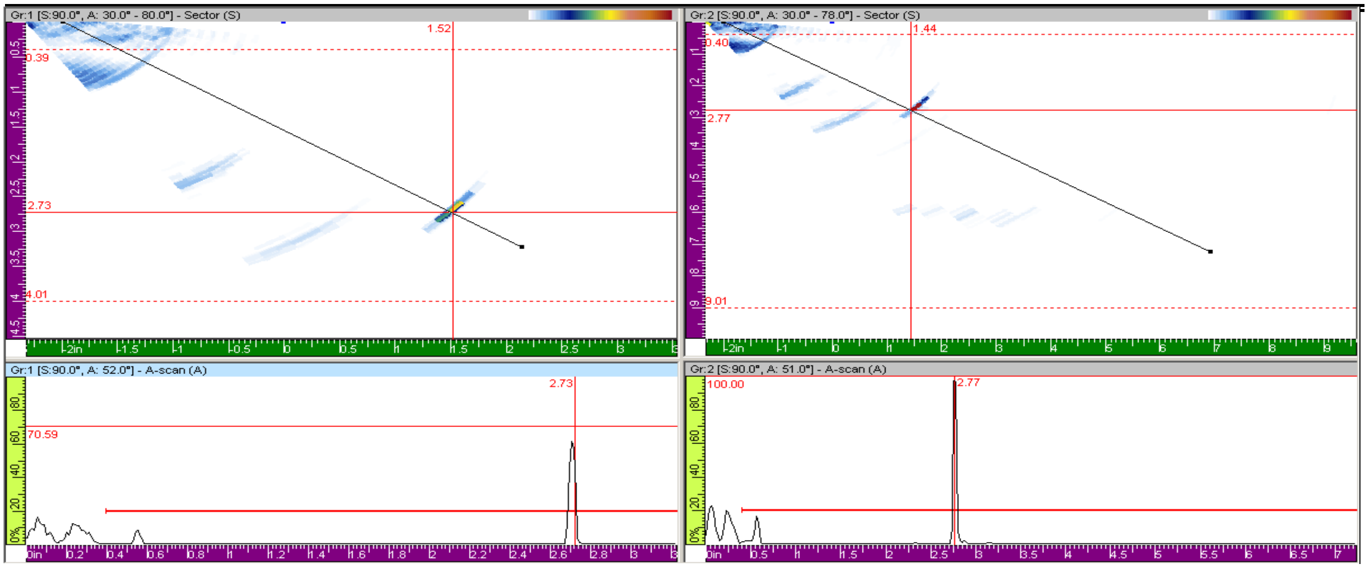


Figure 1

Indication Comments and Location:

Intermittent indication detected along the 4:00 to 8 o'clock positions / Indication was approximately 2.8" deep from the outside surface / Intermittent inclusion from original manufacturing

Component: Lower Finishing Superheat Outlet Header
Weld Number: LFSOH-GW-4

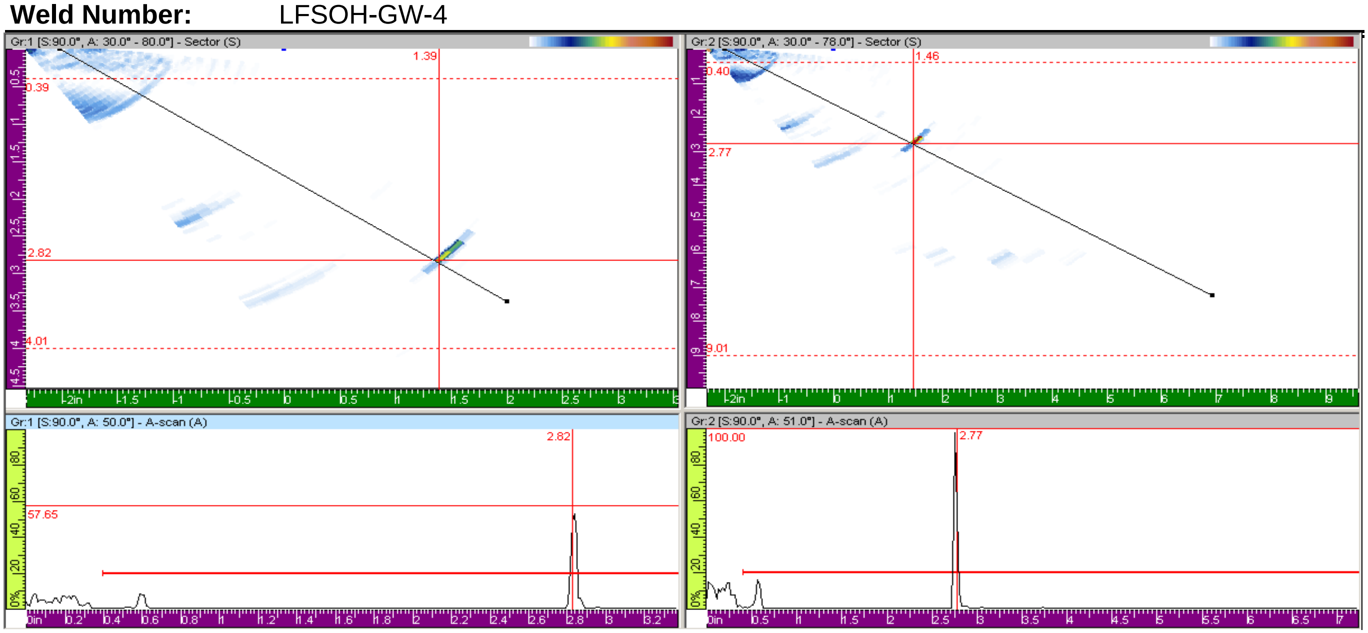


Figure 2

Indication Comments and Location:

Intermittent indication detected along the 4:00 to 8:00 o'clock positions/Indication was approximately 2.8" deep from the outside surface/Intermittent inclusion from original manufacturing.

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Lower Finishing Superheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LFSOH-GW-5
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header to Header
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

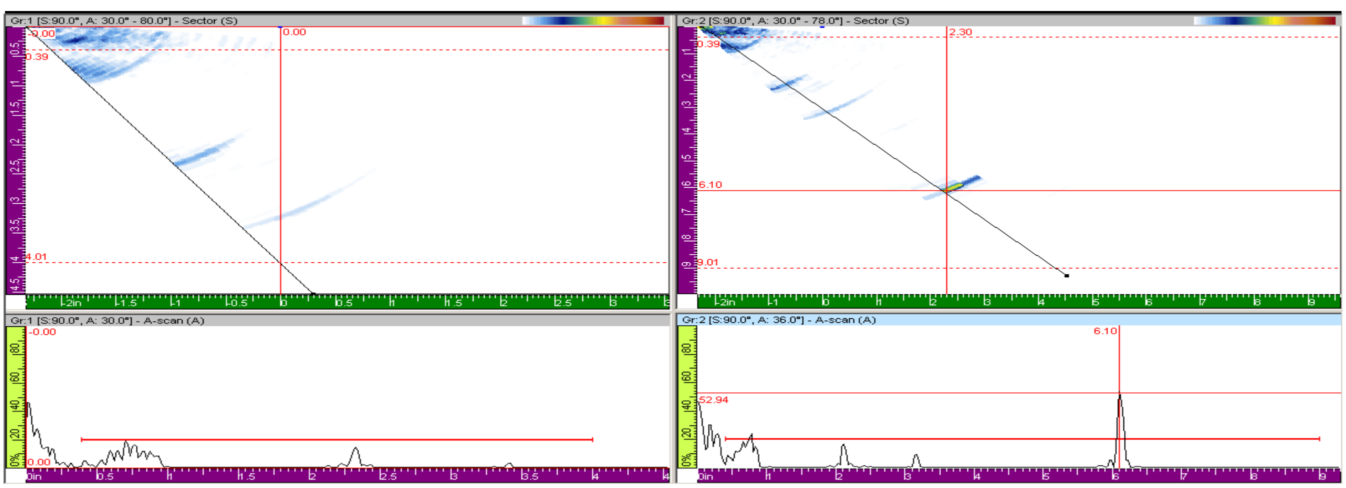
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Lower Finishing Superheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LFSOH-GW-6
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header to Header
		Part Thickness:	6.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

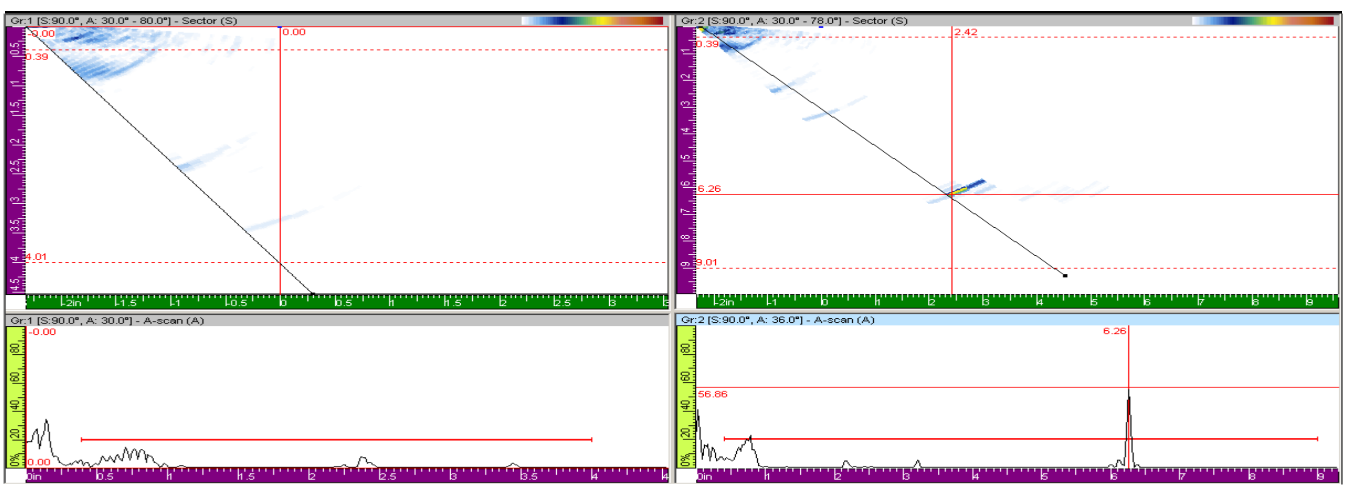
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Lower Finishing Superheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LFSOH-GW-7
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Butt / Header to End Cap
		Part Thickness:	6.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

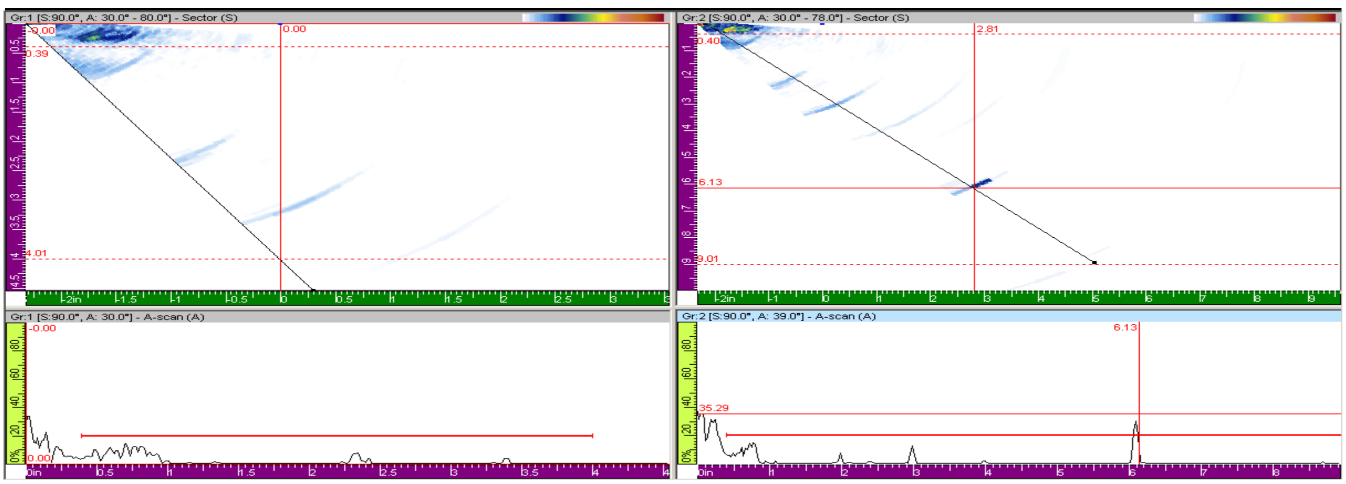
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
2L16-A4	E0890	2.25MHz	45.0 Degrees	1.260 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
27.937/27.805us	0.000in	5.246/11.501in	4/4	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	26/57	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	20/24dB	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	4"/7"	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/2/2012**

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	3865	Utility:		AEP	
OD:	2	Plant:		Mitchell	
Design Wall (MWT):	0.475	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		Finishing SH Outlet	
Superheater (Y/N)	Y	Location:		Upper Tube Stubs	
Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
A	1	0.455	16	1032	200,000
A	2	0.468	20	1050	200,000
A	3	0.450	25	1068	120,149
A	4	0.472	31	1085	103,885
A	5	0.452	34	1092	52,676
A	6	0.449	27	1074	100,578
A	7	0.471	32	1088	93,796
A	8	0.455	26	1071	119,645
A	9	0.453	23	1061	145,816
A	10	0.479	35	1095	82,103
A	11	0.448	41	1108	8,833
A	12	0.486	20	1050	200,000
A	13	0.437	42	1109	-5,338
A	14	0.469	34	1092	75,129
A	15	0.487	20	1050	200,000
A	16	0.437	30	1082	60,620
A	17	0.446	30	1082	72,483
A	18	0.426	17	1037	157,058
A	19	0.431	25	1068	89,379
A	20	0.444	38	1101	20,348
A	21	0.412	27	1074	50,137
A	22	0.440	31	1085	57,637
A	23	0.454	28	1077	100,110
A	24	0.456	38	1101	32,767
A	25	0.418	41	1108	-15,892
A	26	0.404	24	1064	60,524
A	27	0.469	26	1071	146,458
A	28	0.461	26	1071	130,658
A	29	0.446	33	1090	51,852
A	30	0.455	23	1061	149,885
A	31	0.437	30	1082	60,620
A	32	0.443	30	1082	68,425
A	33	0.441	36	1097	28,196
A	34	0.432	26	1071	82,948
A	35	0.442	38	1101	18,387
A	36	0.437	31	1085	53,936
A	37	0.446	37	1099	27,816
A	38	0.445	40	1106	11,020
A	39	0.439	40	1106	5,581
A	40	0.437	39	1103	8,632
A	41	0.438	30	1082	61,893
A	42	0.443	38	1101	19,364
A	43	0.454	29	1080	91,805

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	3865	Utility:		AEP	
OD:	2	Plant:		Mitchell	
Design Wall (MWT):	0.475	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		Finishing SH Outlet	
Superheater (Y/N)	Y	Location:		Upper Tube Stubs	
Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
A	44	0.442	40	1106	8,271
A	45	0.442	30	1082	67,096
A	46	0.456	40	1106	21,638
A	47	0.455	41	1108	15,398
A	48	0.441	27	1074	88,222
A	49	0.499	39	1103	81,021
A	50	0.459	26	1071	126,912
A	51	0.459	30	1082	91,392
A	52	0.460	35	1095	56,036
A	53	0.435	27	1074	79,536
A	54	0.444	23	1061	128,531
A	55	0.458	26	1071	125,067
A	56	0.458	22	1057	167,596
B	1	0.460	14	1021	200,000
B	2	0.463	22	1057	179,096
B	3	0.460	20	1050	197,392
B	4	0.459	29	1080	99,685
B	5	0.455	25	1068	129,245
B	6	0.513	21	1054	200,000
B	7	0.459	26	1071	126,912
B	8	0.463	24	1064	155,665
B	9	0.458	26	1071	125,067
B	10	0.467	27	1074	132,160
B	11	0.460	18	1041	200,000
B	12	0.472	30	1082	112,769
B	13	0.464	29	1080	107,953
B	14	0.476	27	1074	150,301
B	15	0.462	29	1080	104,597
B	16	0.466	28	1077	120,594
B	17	0.465	29	1080	109,656
B	18	0.461	28	1077	111,762
B	19	0.458	28	1077	106,671
B	20	0.484	29	1080	145,564
B	21	0.449	28	1077	92,255
B	22	0.451	36	1097	39,005
B	23	0.470	33	1090	84,224
B	24	0.458	36	1097	47,104
B	25	0.462	34	1092	65,477
B	26	0.468	37	1099	52,849
B	27	0.489	29	1080	156,297
B	28	0.471	22	1057	198,950
B	29	0.456	24	1064	141,281
B	30	0.459	26	1071	126,912

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	3865	Utility:		AEP	
OD:	2	Plant:		Mitchell	
Design Wall (MWT):	0.475	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		Finishing SH Outlet	
Superheater (Y/N)	Y	Location:		Upper Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
B	31	0.444	31	1085	62,721
B	32	0.468	31	1088	97,324
B	33	0.450	32	1097	63,596
B	34	0.460	36	1074	49,506
B	35	0.487	27	1080	175,085
B	36	0.466	29	1085	111,376
B	37	0.466	31	1085	94,138
B	38	0.460	31	1080	84,934
B	39	0.456	29	1080	94,912
B	40	0.461	30	1082	94,508
B	41	0.451	31	1085	72,051
B	42	0.466	20	1050	200,000
B	43	0.472	26	1071	152,744
B	44	0.447	39	1103	18,025
B	45	0.454	28	1077	100,110
B	46	0.454	29	1080	91,805
B	47	0.449	28	1077	92,255
B	48	0.450	24	1064	129,775
B	49	0.487	24	1064	200,000
B	50	0.472	30	1082	112,769
B	51	0.487	24	1064	200,000
B	52	0.465	19	1046	200,000
B	53	0.456	29	1080	94,912
B	54	0.471	24	1064	173,527
B	55	0.463	20	1050	200,000
B	56	0.461	20	1050	199,951
C	1	0.457	16	1032	200,000
C	2	0.489	19	1046	200,000
C	3	0.487	22	1057	200,000
C	4	0.476	24	1064	185,556
C	5	0.486	26	1071	185,073
C	6	0.486	20	1050	200,000
C	7	0.473	23	1064	190,886
C	8	0.486	24	1064	200,000
C	9	0.465	26	1071	138,390
C	10	0.487	25	1068	200,000
C	11	0.480	28	1077	147,910
C	12	0.493	26	1071	200,000
C	13	0.486	27	1074	172,700
C	14	0.485	23	1061	200,000
C	15	0.507	22	1057	200,000
C	16	0.502	30	1082	174,696
C	17	0.506	31	1085	172,194

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**	43-12-0010		
Pressure:	3865	**Utility:**	AEP		
OD:	2	**Plant:**	Mitchell		
Design Wall (MWT):	0.475	**Unit No.:**	2		
Material:	SA-213, T22	**Tube Group:**	Finishing SH Outlet		
Superheater (Y/N)	Y	**Location:**	Upper Tube Stubs		
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
C	18	0.484	31	1085	125,214
C	19	0.452	21	1054	165,993
C	20	0.497	29	1080	174,793
C	21	0.481	34	1092	93,185
C	22	0.489	31	1085	134,913
C	23	0.486	27	1074	172,700
C	24	0.475	29	1080	127,664
C	25	0.470	36	1097	62,143
C	26	0.473	35	1095	73,386
C	27	0.501	26	1071	200,000
C	28	0.475	23	1061	195,995
C	29	0.465	20	1050	200,000
C	30	0.494	30	1082	156,119
C	31	0.466	25	1068	151,004
C	32	0.473	25	1068	166,270
C	33	0.472	27	1074	142,021
C	34	0.480	31	1085	117,812
C	35	0.488	27	1074	177,498
C	36	0.466	28	1077	120,594
C	37	0.495	27	1074	195,229
C	38	0.467	29	1080	113,113
C	39	0.483	28	1077	154,321
C	40	0.471	21	1054	200,000
C	41	0.478	29	1080	133,440
C	42	0.488	26	1071	190,141
C	43	0.496	26	1071	200,000
C	44	0.472	29	1080	122,067
C	45	0.487	31	1085	130,971
C	46	0.466	26	1071	140,375
C	47	0.465	26	1071	138,390
C	48	0.475	22	1057	200,000
C	49	0.497	30	1082	162,884
C	50	0.482	26	1071	175,293
C	51	0.493	30	1082	153,915
C	52	0.478	26	1071	165,963
C	53	0.467	30	1082	104,224
C	54	0.486	27	1074	172,700
C	55	0.491	16	1032	200,000
C	56	0.467	16	1032	200,000
D	1	0.523	21	1054	200,000
D	2	0.487	20	1050	200,000
D	3	0.495	16	1032	200,000
D	4	0.499	23	1061	200,000

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	3865	**Utility:**		AEP	
OD:	2	**Plant:**		Mitchell	
Design Wall (MWT):	0.475	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		Finishing SH Outlet	
Superheater (Y/N)	Y	**Location:**		Upper Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
D	5	0.502	29	1080	187,273
D	6	0.503	22	1057	200,000
D	7	0.488	23	1061	200,000
D	8	0.493	26	1071	200,000
D	9	0.493	23	1061	200,000
D	10	0.499	26	1071	200,000
D	11	0.485	22	1057	200,000
D	12	0.499	38	1101	88,974
D	13	0.491	26	1071	197,980
D	14	0.495	20	1050	200,000
D	15	0.503	22	1057	200,000
D	16	0.498	25	1068	200,000
D	17	0.501	24	1064	200,000
D	18	0.490	24	1064	200,000
D	19	0.516	29	1080	200,000
D	20	0.504	26	1071	200,000
D	21	0.495	45	1115	35,023
D	22	0.505	30	1082	182,127
D	23	0.497	31	1085	151,568
D	24	0.476	22	1057	200,000
D	25	0.503	40	1106	79,270
D	26	0.487	29	1080	151,931
D	27	0.490	31	1085	136,916
D	28	0.495	17	1037	200,000
D	29	0.483	17	1037	200,000
D	30	0.477	24	1064	188,048
D	31	0.497	23	1061	200,000
D	32	0.479	27	1074	156,756
D	33	0.486	27	1074	172,700
D	34	0.480	28	1077	147,910
D	35	0.494	27	1074	192,603
D	36	0.481	21	1054	200,000
D	37	0.495	25	1068	200,000
D	38	0.484	33	1090	106,685
D	39	0.495	38	1101	82,787
D	40	0.493	36	1097	95,878
D	41	0.508	38	1101	103,799
D	42	0.489	28	1077	167,815
D	43	0.491	23	1061	200,000
D	44	0.496	25	1068	200,000
D	45	0.509	29	1080	200,000
D	46	0.497	26	1071	200,000
D	47	0.489	23	1061	200,000

Remaining Life Assessment

Operating Hours:	260,000	Project No.:	43-12-0010
Pressure:	3865	Utility:	AEP
OD:	2	Plant:	Mitchell
Design Wall (MWT):	0.475	Unit No.:	2
Material:	SA-213, T22	Tube Group:	Finishing SH Outlet
Superheater (Y/N)	Y	Location:	Upper Tube Stubs

Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
D	48	0.505	15	1027	200,000
D	49	0.491	27	1074	184,913
D	50	0.505	31	1085	169,794
D	51	0.480	22	1057	200,000
D	52	0.498	29	1080	177,230
D	53	0.483	27	1074	165,709
D	54	0.494	26	1071	200,000
D	55	0.504	21	1054	200,000
D	56	0.495	16	1032	200,000
E	1	0.495	16	1032	200,000
E	2	0.523	22	1057	200,000
E	3	0.512	20	1050	200,000
E	4	0.500	27	1074	200,000
E	5	0.484	24	1064	200,000
E	6	0.505	30	1082	182,127
E	7	0.502	26	1071	200,000
E	8	0.493	31	1085	143,058
E	9	0.508	27	1074	200,000
E	10	0.504	28	1077	200,000
E	11	0.494	29	1080	167,655
E	12	0.503	28	1077	200,000
E	13	0.492	29	1080	163,033
E	14	0.475	20	1050	200,000
E	15	0.497	28	1077	187,342
E	16	0.478	34	1092	88,478
E	17	0.497	29	1080	174,793
E	18	0.476	32	1088	101,903
E	19	0.487	26	1071	187,592
E	20	0.479	24	1064	193,124
E	21	0.490	22	1057	200,000
E	22	0.509	34	1092	144,690
E	23	0.472	22	1057	200,000
E	24	0.456	20	1050	187,458
E	25	0.453	29	1080	90,273
E	26	0.491	31	1085	138,941
E	27	0.502	27	1074	200,000
E	28	0.493	23	1061	200,000
E	29	0.499	24	1064	200,000
E	30	0.503	26	1071	200,000
E	31	0.495	33	1090	126,665
E	32	0.487	36	1097	86,369
E	33	0.491	31	1085	138,941
E	34	0.471	23	1061	185,898

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	3865	**Utility:**		AEP	
OD:	2	**Plant:**		Mitchell	
Design Wall (MWT):	0.475	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		Finishing SH Outlet	
Superheater (Y/N)	Y	**Location:**		Upper Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
E	35	0.460	30	1082	92,943
E	36	0.465	23	1061	171,621
E	37	0.473	24	1064	178,254
E	38	0.450	31	1085	70,682
E	39	0.456	29	1080	94,912
E	40	0.503	28	1077	200,000
E	41	0.467	23	1061	176,270
E	42	0.472	33	1090	87,251
E	43	0.482	28	1077	152,160
E	44	0.463	29	1080	106,267
E	45	0.471	35	1095	70,585
E	46	0.485	32	1088	117,546
E	47	0.497	39	1103	78,036
E	48	0.470	27	1074	138,013
E	49	0.487	35	1095	94,512
E	50	0.472	24	1064	175,877
E	51	0.486	29	1080	149,785
E	52	0.495	26	1071	200,000
E	53	0.503	29	1080	189,862
E	54	0.479	28	1077	145,820
E	55	0.486	22	1057	200,000
E	56	0.501	23	1061	200,000
	Min.	0.404	14	1021	-15,892
	Max.	0.523	45	1115	200,000
	Average	0.475	28	1074	141,151

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	3865	Utility:		AEP	
OD:	2	Plant:		Mitchell	
Design Wall (MWT):	0.475	Unit No.:		2	
Material:	SA 213 T22	Tube Group:		Finishing SH Outlet	
Superheater (Y/N)	Y	Location:		Lower Tube Stubs	
Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
A	1	0.497	19	1046	200,000
A	2	0.500	16	1032	200,000
A	3	0.495	21	1054	200,000
A	4	0.499	26	1071	200,000
A	5	0.498	25	1068	200,000
A	6	0.495	24	1064	200,000
A	7	0.493	27	1074	190,008
A	8	0.475	22	1057	200,000
A	9	0.484	26	1071	180,125
A	10	0.509	27	1074	200,000
A	11	0.475	34	1092	83,904
A	12	0.477	37	1099	64,492
A	13	0.473	20	1050	200,000
A	14	0.478	24	1064	190,571
A	15	0.489	32	1088	124,972
A	16	0.469	25	1068	157,401
A	17	0.491	30	1082	149,581
A	18	0.463	22	1057	179,096
A	19	0.455	19	1046	198,081
A	20	0.468	27	1074	134,091
A	21	0.448	24	1064	126,095
A	22	0.517	30	1082	200,000
A	23	0.486	29	1080	149,785
A	24	0.466	30	1082	102,566
A	25	0.466	27	1074	130,250
A	26	0.501	31	1085	160,471
A	27	0.508	25	1068	200,000
A	28	0.500	16	1032	200,000
A	29	0.482	26	1071	175,293
A	30	0.489	27	1074	179,940
A	31	0.480	20	1050	200,000
A	32	0.491	34	1092	109,906
A	33	0.482	21	1054	200,000
A	34	0.473	22	1057	200,000
A	35	0.479	26	1071	168,255
A	36	0.493	21	1054	200,000
A	37	0.506	19	1046	200,000
A	38	0.466	22	1057	186,322
A	39	0.469	22	1057	193,807
A	40	0.469	21	1054	200,000
A	41	0.493	22	1057	200,000
A	42	0.479	23	1061	200,000
A	43	0.475	26	1071	159,242

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**	43-12-0010
Pressure:	3865	**Utility:**	AEP
OD:	2	**Plant:**	Mitchell
Design Wall (MWT):	0.475	**Unit No.:**	2
Material:	SA 213 T22	**Tube Group:**	Finishing SH Outlet
Superheater (Y/N)	Y	**Location:**	Lower Tube Stubs

Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
A	44	0.490	29	1080	158,516
A	45	0.488	23	1061	200,000
A	46	0.482	20	1050	200,000
A	47	0.481	23	1061	200,000
A	48	0.471	24	1064	173,527
A	49	0.483	27	1074	165,709
A	50	0.490	19	1046	200,000
A	51	0.478	27	1074	154,580
A	52	0.486	17	1037	200,000
A	53	0.494	16	1032	200,000
A	54	0.501	17	1037	200,000
A	55	0.479	15	1027	200,000
A	56	0.501	13	1015	200,000
B	1	0.491	15	1027	200,000
B	2	0.507	22	1057	200,000
B	3	0.484	24	1064	200,000
B	4	0.486	23	1061	200,000
B	5	0.493	24	1064	200,000
B	6	0.473	22	1057	200,000
B	7	0.490	19	1046	200,000
B	8	0.493	23	1061	200,000
B	9	0.497	26	1071	200,000
B	10	0.489	19	1046	200,000
B	11	0.484	19	1046	200,000
B	12	0.488	28	1077	165,501
B	13	0.495	16	1032	200,000
B	14	0.496	19	1046	200,000
B	15	0.487	16	1032	200,000
B	16	0.484	23	1061	200,000
B	17	0.495	18	1041	200,000
B	18	0.470	24	1064	171,205
B	19	0.490	30	1082	147,450
B	20	0.489	14	1021	200,000
B	21	0.493	26	1071	200,000
B	22	0.506	30	1082	184,664
B	23	0.493	17	1037	200,000
B	24	0.481	33	1090	101,611
B	25	0.483	32	1088	113,946
B	26	0.476	14	1021	200,000
B	27	0.509	24	1064	200,000
B	28	0.501	18	1041	200,000
B	29	0.487	21	1054	200,000
B	30	0.481	23	1061	200,000

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	3865	**Utility:**		AEP	
OD:	2	**Plant:**		Mitchell	
Design Wall (MWT):	0.475	**Unit No.:**		2	
Material:	SA 213 T22	**Tube Group:**		Finishing SH Outlet	
Superheater (Y/N)	Y	**Location:**		Lower Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
B	31	0.491	26	1071	197,980
B	32	0.485	22	1057	200,000
B	33	0.483	27	1074	165,709
B	34	0.473	28	1077	133,745
B	35	0.475	29	1080	127,664
B	36	0.476	24	1064	185,556
B	37	0.482	26	1071	175,293
B	38	0.476	30	1082	119,921
B	39	0.466	29	1080	111,376
B	40	0.472	28	1077	131,807
B	41	0.487	28	1077	163,213
B	42	0.483	26	1071	177,695
B	43	0.484	26	1071	180,125
B	44	0.475	25	1068	170,859
B	45	0.500	32	1088	147,104
B	46	0.482	26	1071	175,293
B	47	0.483	28	1077	154,321
B	48	0.486	28	1077	160,952
B	49	0.500	29	1080	182,191
B	50	0.490	24	1064	200,000
B	51	0.495	17	1037	200,000
B	52	0.477	16	1032	200,000
B	53	0.489	17	1037	200,000
B	54	0.493	23	1061	200,000
B	55	0.495	24	1064	200,000
B	56	0.494	27	1074	192,603
C	1	0.488	15	1027	200,000
C	2	0.489	19	1046	200,000
C	3	0.498	22	1057	200,000
C	4	0.490	20	1050	200,000
C	5	0.492	22	1057	200,000
C	6	0.485	22	1057	200,000
C	7	0.498	23	1061	200,000
C	8	0.493	23	1061	200,000
C	9	0.490	23	1061	200,000
C	10	0.514	25	1068	200,000
C	11	0.487	22	1057	200,000
C	12	0.488	21	1054	200,000
C	13	0.487	16	1032	200,000
C	14	0.501	26	1071	200,000
C	15	0.498	24	1064	200,000
C	16	0.485	23	1061	200,000
C	17	0.481	25	1068	185,284

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**	43-12-0010
Pressure:	3865	**Utility:**	AEP
OD:	2	**Plant:**	Mitchell
Design Wall (MWT):	0.475	**Unit No.:**	2
Material:	SA 213 T22	**Tube Group:**	Finishing SH Outlet
Superheater (Y/N)	Y	**Location:**	Lower Tube Stubs

Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
C	18	0.492	22	1057	200,000
C	19	0.482	24	1064	200,000
C	20	0.487	26	1071	187,592
C	21	0.469	23	1061	181,028
C	22	0.491	29	1080	160,762
C	23	0.503	27	1074	200,000
C	24	0.474	24	1064	180,659
C	25	0.488	34	1092	104,715
C	26	0.484	26	1071	180,125
C	27	0.483	24	1064	200,000
C	28	0.495	17	1037	200,000
C	29	0.494	16	1032	200,000
C	30	0.507	20	1050	200,000
C	31	0.489	26	1071	192,722
C	32	0.503	24	1064	200,000
C	33	0.484	27	1074	168,012
C	34	0.491	26	1071	197,980
C	35	0.475	28	1077	137,683
C	36	0.489	32	1088	124,972
C	37	0.469	27	1074	136,042
C	38	0.483	30	1082	133,171
C	39	0.492	28	1077	174,920
C	40	0.489	23	1061	200,000
C	41	0.489	20	1050	200,000
C	42	0.492	17	1037	200,000
C	43	0.484	28	1077	156,507
C	44	0.473	15	1027	200,000
C	45	0.496	29	1080	172,386
C	46	0.471	22	1057	198,950
C	47	0.486	19	1046	200,000
C	48	0.492	23	1061	200,000
C	49	0.494	22	1057	200,000
C	50	0.489	26	1071	192,722
C	51	0.482	24	1064	200,000
C	52	0.485	24	1064	200,000
C	53	0.491	23	1061	200,000
C	54	0.499	22	1057	200,000
C	55	0.491	21	1054	200,000
C	56	0.493	26	1071	200,000
D	1	0.505	12	1009	200,000
D	2	0.506	17	1037	200,000
D	3	0.492	19	1046	200,000
D	4	0.495	19	1046	200,000

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	3865	**Utility:**		AEP	
OD:	2	**Plant:**		Mitchell	
Design Wall (MWT):	0.475	**Unit No.:**		2	
Material:	SA 213 T22	**Tube Group:**		Finishing SH Outlet	
Superheater (Y/N)	Y	**Location:**		Lower Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
D	5	0.498	22	1057	200,000
D	6	0.491	20	1050	200,000
D	7	0.499	19	1046	200,000
D	8	0.490	22	1057	200,000
D	9	0.497	19	1046	200,000
D	10	0.481	19	1046	200,000
D	11	0.497	20	1050	200,000
D	12	0.471	22	1057	198,950
D	13	0.487	22	1057	200,000
D	14	0.468	19	1046	200,000
D	15	0.480	17	1037	200,000
D	16	0.491	22	1057	200,000
D	17	0.497	24	1064	200,000
D	18	0.500	24	1064	200,000
D	19	0.499	25	1068	200,000
D	20	0.478	26	1071	165,963
D	21	0.463	22	1057	179,096
D	22	0.471	26	1071	150,626
D	23	0.512	24	1064	200,000
D	24	0.509	28	1077	200,000
D	25	0.517	22	1057	200,000
D	26	0.503	26	1071	200,000
D	27	0.497	20	1050	200,000
D	28	0.489	20	1050	200,000
D	29	0.489	18	1041	200,000
D	30	0.503	22	1057	200,000
D	31	0.491	22	1057	200,000
D	32	0.501	20	1050	200,000
D	33	0.489	26	1071	192,722
D	34	0.503	22	1057	200,000
D	35	0.490	24	1064	200,000
D	36	0.488	21	1054	200,000
D	37	0.496	24	1064	200,000
D	38	0.491	26	1071	197,980
D	39	0.490	26	1071	195,335
D	40	0.512	24	1064	200,000
D	41	0.491	23	1061	200,000
D	42	0.488	23	1061	200,000
D	43	0.510	24	1064	200,000
D	44	0.492	23	1061	200,000
D	45	0.486	25	1068	198,122
D	46	0.485	19	1046	200,000
D	47	0.494	26	1071	200,000

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	3865	**Utility:**		AEP	
OD:	2	**Plant:**		Mitchell	
Design Wall (MWT):	0.475	**Unit No.:**		2	
Material:	SA 213 T22	**Tube Group:**		Finishing SH Outlet	
Superheater (Y/N)	Y	**Location:**		Lower Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
D	48	0.493	23	1061	200,000
D	49	0.496	23	1061	200,000
D	50	0.493	25	1068	200,000
D	51	0.488	23	1061	200,000
D	52	0.511	23	1061	200,000
D	53	0.491	19	1046	200,000
D	54	0.508	20	1050	200,000
D	55	0.490	19	1046	200,000
D	56	0.505	17	1037	200,000
E	1	0.488	16	1032	200,000
E	2	0.495	20	1050	200,000
E	3	0.514	21	1054	200,000
E	4	0.493	23	1061	200,000
E	5	0.485	20	1050	200,000
E	6	0.498	23	1061	200,000
E	7	0.504	25	1068	200,000
E	8	0.496	19	1046	200,000
E	9	0.489	29	1080	156,297
E	10	0.491	21	1054	200,000
E	11	0.466	27	1074	130,250
E	12	0.481	26	1071	172,920
E	13	0.495	33	1090	126,665
E	14	0.474	27	1074	146,116
E	15	0.500	22	1057	200,000
E	16	0.489	29	1080	156,297
E	17	0.475	24	1064	183,093
E	18	0.478	27	1074	154,580
E	19	0.481	28	1077	150,023
E	20	0.482	35	1095	86,646
E	21	0.471	30	1082	111,026
E	22	0.492	23	1061	200,000
E	23	0.485	29	1080	147,663
E	24	0.475	27	1074	148,197
E	25	0.467	35	1095	65,131
E	26	0.498	33	1090	132,524
E	27	0.515	24	1064	200,000
E	28	0.497	19	1046	200,000
E	29	0.503	26	1071	200,000
E	30	0.503	31	1085	165,078
E	31	0.477	29	1080	131,494
E	32	0.477	29	1080	131,494
E	33	0.469	34	1092	75,129
E	34	0.481	21	1054	200,000

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	3865	**Utility:**		AEP	
OD:	2	**Plant:**		Mitchell	
Design Wall (MWT):	0.475	**Unit No.:**		2	
Material:	SA 213 T22	**Tube Group:**		Finishing SH Outlet	
Superheater (Y/N)	Y	**Location:**		Lower Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
E	35	0.449	30	1082	76,651
E	36	0.492	34	1092	111,671
E	37	0.499	27	1074	200,000
E	38	0.469	29	1080	116,640
E	39	0.479	22	1057	200,000
E	40	0.490	26	1071	195,335
E	41	0.487	17	1037	200,000
E	42	0.488	29	1080	154,102
E	43	0.483	27	1074	165,709
E	44	0.457	22	1057	165,373
E	45	0.456	27	1074	112,190
E	46	0.491	33	1090	119,136
E	47	0.473	24	1064	178,254
E	48	0.478	19	1046	200,000
E	49	0.483	28	1077	154,321
E	50	0.471	21	1054	200,000
E	51	0.489	31	1085	134,913
E	52	0.489	31	1085	134,913
E	53	0.494	29	1080	167,655
E	54	0.496	26	1071	200,000
E	55	0.493	23	1061	200,000
E	56	0.509	15	1027	200,000
	Min.	0.448	12	1009	64,492
	Max.	0.517	37	1099	200,000
	Average	0.488	24	1062	181,739

THIELSCH ENGINEERING, INC.

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

HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Upper Finishing SH Outlet	Material: SA-335 Gr. P22	Hardness Scale: HBN

Location		Hardness Measurements 1	2	3	4	5	Average	Corresponding Tensile Strength
UFSHOH-R1	Weld	161	156	163	169	159	162	77,000
	HAZ	154	161	158	149	165	157	75,000
	Base	161	171	158	162	167	164	78,000
UFSHOH-R2	Weld	179	157	177	181	168	172	82,000
	HAZ	169	167	157	170	159	164	79,000
	Base	153	156	144	136	154	149	71,000
UFSHOH-R3	Weld	165	171	162	184	172	171	81,000
	HAZ	165	166	171	157	165	165	79,000
	Base	151	174	149	162	160	159	76,000
UFSHOH-R4	Weld	186	178	175	165	170	175	83,000
	HAZ	167	166	177	182	188	176	84,000
	Base	151	158	161	162	159	158	76,000
UFSHOH-R5	Weld	160	178	176	180	171	173	83,000
	HAZ	176	164	175	176	167	172	82,000
	Base	158	148	158	152	164	156	75,000
UFSHOH-R6	Weld	167	172	174	166	173	170	81,000
	HAZ	159	175	171	168	170	169	81,000
	Base	171	174	153	142	149	158	75,000
UFSHOH-R7	Weld	154	159	177	179	147	163	78,000
	HAZ	165	167	178	169	178	171	82,000
	Base	129	162	143	136	159	146	69,000
UFSHOH-R8	Weld	155	157	165	156	168	160	77,000
	HAZ	153	156	155	167	170	160	77,000
	Base	158	168	156	146	151	156	74,000

INSPECTOR: M. Olszewski

DATE: 3/28/2012

THIELSCH ENGINEERING, INC.

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

HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: 03/2012	Job Number: 43-12-0010
Component: Lower Finishing SH Outlet Header	Material: SA-335, Gr. P22	Hardness Scale: HBN

Location		Hardness Measurements 1	2	3	4	5	Average	Corresponding Tensile Strength
LFSHOH-R1	Weld	187	168	174	189	181	180	86,000
	HAZ	193	201	187	194	191	193	91,000
	Base	171	176	192	184	190	183	87,000
LFSHOH-R2	Weld	186	166	168	171	155	169	81,000
	HAZ	159	163	159	164	150	159	76,000
	Base	158	154	153	152	136	151	72,000
LFSHOH-R3	Weld	167	173	183	168	173	173	82,000
	HAZ	145	162	150	156	158	154	74,000
	Base	146	153	151	148	160	152	72,000
LFSHOH-R4	Weld	165	164	160	151	143	157	75,000
	HAZ	163	164	161	158	166	162	78,000
	Base	160	176	171	161	155	165	79,000
LFSHOH-R5	Weld	151	152	155	167	168	159	76,000
	HAZ	161	178	173	171	167	170	81,000
	Base	165	148	162	165	154	159	76,000
LFSHOH-R6	Weld	169	170	180	169	178	173	83,000
	HAZ	167	172	158	181	174	170	81,000
	Base	166	153	157	161	162	160	76,000
LFSHOH-R7	Weld	167	163	165	181	163	168	80,000
	HAZ	153	161	164	160	158	159	76,000
	Base	160	163	154	161	153	158	76,000
LFSHOH-R8	Weld	190	183	193	196	186	190	90,000
	HAZ	196	193	203	182	181	191	90,000
	Base	190	183	193	196	186	190	90,000

INSPECTOR: M. Olszewski

DATE: 3/26/2012

APPENDIX E

NONDESTRUCTIVE EXAMINATION REPORTS
HIGH-PRESSURE REHEAT OUTLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 2 - High-Pressure Reheat Outlet Header

The minimum wall thickness requirements were calculated for the High-Pressure 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
y- Temperature Coefficient	0.700	
A- Additional Thickness	0.000	in

The following equation applies per B31.1 Section 104.1.2

t_m=(PD/(2(SE+PY))+A 3.788 in

ASME Boiler Tube Minimum Wall Thickness Calculation

AEP - Mitchell Generating Station

Unit No. 2 - High Pressure Reheat Outlet Tubing

The minimum wall thickness requirements were calculated for the HP Reheat Outlet tubing based upon the original 1968 ASME Boiler and Pressure Vessel Code.

ASME Material Specification: SA-213, Grade T22

Where:

T- Design Temperature	1040	°F
P- Maximum Allowable Pressure	1,200	psig
D- Outside Diameter	2.250	inches
S- Maximum Allowable Stress Value	6,200	psi
E- Efficiency	0	
e-Thickness Factor	0	inches
y- Temperature Coefficient	0	

The following equation applies:

Tubing:

Minimum Wall Thickness Calculations (Per. ASME, Sect I, PG 27.2.1)

t_{tube}=((PD)/(2S+P))+.005D+e — 0.210 inches

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: High-Pressure Reheat Outlet Header	Material: SA-387, Gr. D	Procedure: TEI 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	Multiple LT	Indications from 2:30 to 6:00 and 7:00 to 11:30, south side and from 6:00 to 9:00 and 11:00 to 5:30 o'clock positions, north side. Removed at 1/16". No further action is required.	x	
Seam Welds				
LS-1	36" LT	Indication from tube row 6 to 10. Removed at 1/16". No further action is required.	x	
LS-2	2" (x3) LT	Indication between tube rows 61 and 62, 62 and 63, and 64 and 65. Removed at 1/16". No further action is required.	x	
	1/4" LT	Indication between tube rows 75 and 76. Removed at 1/16". No further action is required.	x	
LS-3	N/A	No recordable indications.	x	
LS-1A	1/4" TW	Multiple indications between tube rows 10 and 11. Removed at 1/16". No further action is required.	x	
LS-2A	N/A	No recordable indications.	x	
LS-3A	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	8" LT	Indication in toe of weld, header side. Removed at 1/16". No further action is required.	x	
P-4	N/A	No recordable indications.	x	
P-5	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: High-Pressure Reheat Outlet Header	Material: SA-387, Gr. D	Procedure: TEI 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
Attachment Welds				
AW-1	20" LT	Indication in toe of weld, east header side. Removed at 1/16". No further action required.	x	
	3" LT	Indication in toe of weld, east attach. Side.		x
	6" LT	Indication in toe of weld, west header side.		x
	5" LT	Indication in toe of weld, west, attach. side.		x
AW-2	28" LT	Indication in toe of weld, east header side.		x
	6" LT	Indication in toe of weld, east attach. Side.		x
	6" LT	Indication in toe of weld, west header side.		x
	9" LT	Indication in toe of weld, west, attach. side.		x

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

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: High-Pressure Reheat Outlet Header	Material: SA-387, Gr. D	Procedure: TEI 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
Final Examination After Removal and Repair by Welding				
Attachement Welds				
AW-1	N/A	No recordable indications.	x	
AW-2	N/A	No recordable indications.	x	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: High-Pressure Reheat Outlet Header	Material: SA-387, Gr. D	Nominal Wall: 4.598"	Minimum Wall: 3.788"

EQUIPMENT USED:

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

KEY:

IDENTIFICATION		CONFIGURATION	DIAMETER MEASUREMENTS (in.)	THICKNESS MEASUREMENTS			
			PI TAPE	12:00	3:00	6:00	9:00
GW-1	North	End Cap	44.375	4.406	4.393	4.389	4.403
	South	Pipe	Obstr.	4.798	4.808	4.414	4.502
GW-2	North	Pipe	44.172	4.446	4.402	4.409	4.406
	South	Pipe	44.141	4.502	4.460	4.401	4.427
GW-3	North	Pipe	44.813	4.397	4.469	4.438	4.496
	South	Pipe	44.750	4.509	4.529	4.487	4.476
Tube Stub/Seam Weld				**Above Seam**	**Below Seam**		
Tube Row 10/LS-1	East			4.827	4.390		
Tube Row 10/LS-1A	West			4.815	4.468		
Tube Row 20/LS-1	East			4.819	4.383		
Tube Row 20/LS-1A	West			4.803	4.472		
Tube Row 30/LS-1	East			4.821	4.396		
Tube Row 30/LS-1A	West			4.806	4.434		
Tube Row 40/LS-2	East			4.791	4.401		
Tube Row 40/LS-2A	West			4.798	4.507	**Min**	4.383
Tube Row 50/LS-2	East			4.819	4.470	**Max**	4.887
Tube Row 50/LS-2A	West			4.814	4.498	**Avg**	4.577
Tube Row 60/LS-2	East			4.796	4.429		
Tube Row 60/LS-2A	West			4.758	4.496		
Tube Row 70/LS-2	East			4.802	4.475		
Tube Row 70/LS-2A	West			4.772	4.417		
Tube Row 80/LS-3	East			4.817	4.482		
Tube Row 80/LS-3A	West			4.776	4.475		
Tube Row 90/LS-3	East			4.838	4.517		
Tube Row 90/LS-3A	West			4.887	4.450		
Tube Row 100/LS-3	East			4.821	4.505		
Tube Row 100/LS-3A	West			4.823	4.417		
Tube Row 110/LS-3	East			4.817	4.496		
Tube Row 110/LS-3A	West			4.834	4.439		

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/23/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	HP-HROH-GW-1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-End Cap
Machine Information		**Part Thickness:**	4.4" / 4.9"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

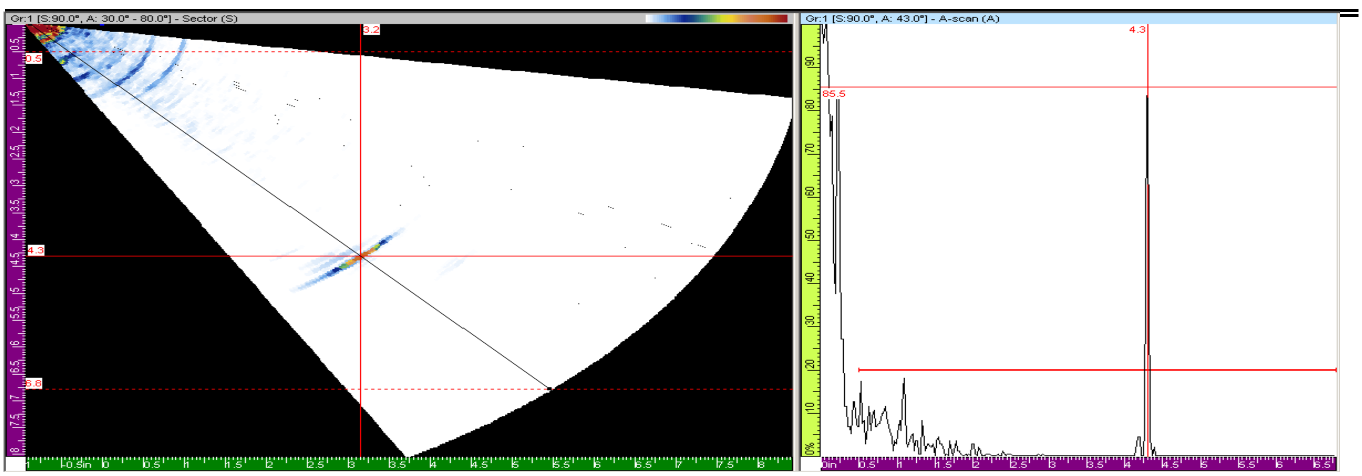
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
8.106us	0.000in	9.281in	18	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	38dB	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	5.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry
Limited scanning accessibility due to outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/20/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	HP-HROH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
Machine Information		**Part Thickness:**	4.4" / 4.9"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

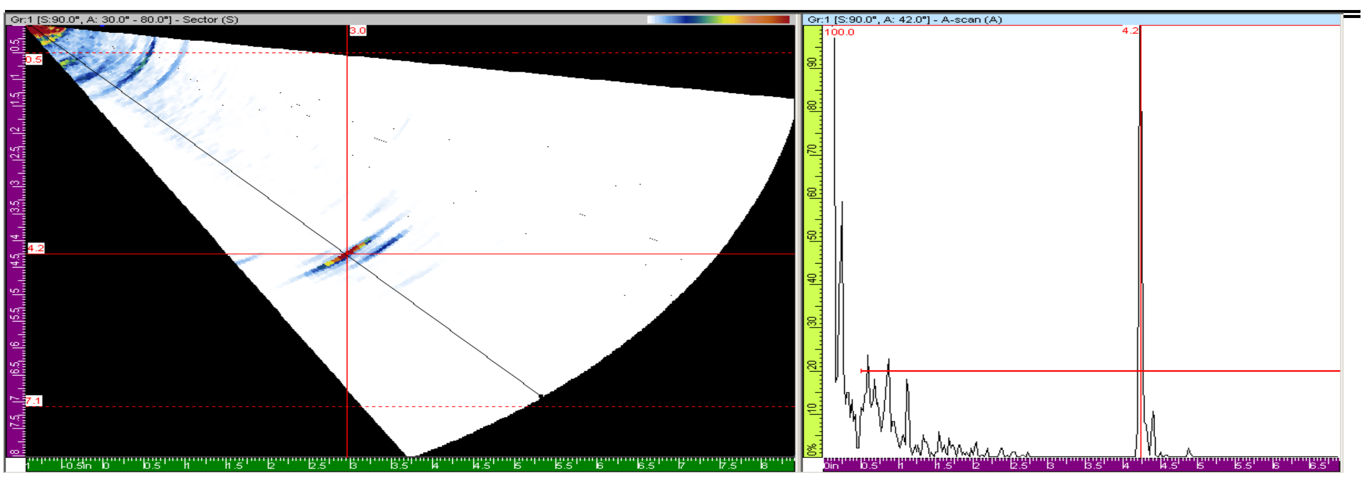
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
8.106us	0.000in	9.281in	18	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	38dB	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	5.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to outside geometrical configuration.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/20/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	HP-HROH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
Machine Information		**Part Thickness:**	4.4" / 4.9"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatioı

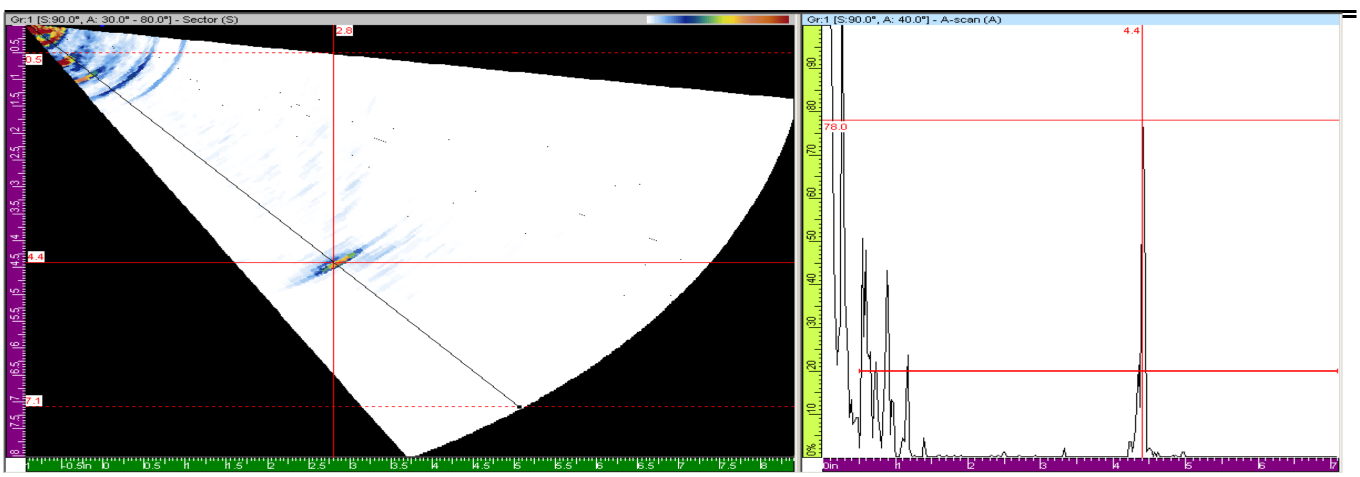
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
8.106us	0.000in	9.281in	18	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	38dB	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	5.0in	0.126 in/us



COMMENTS:

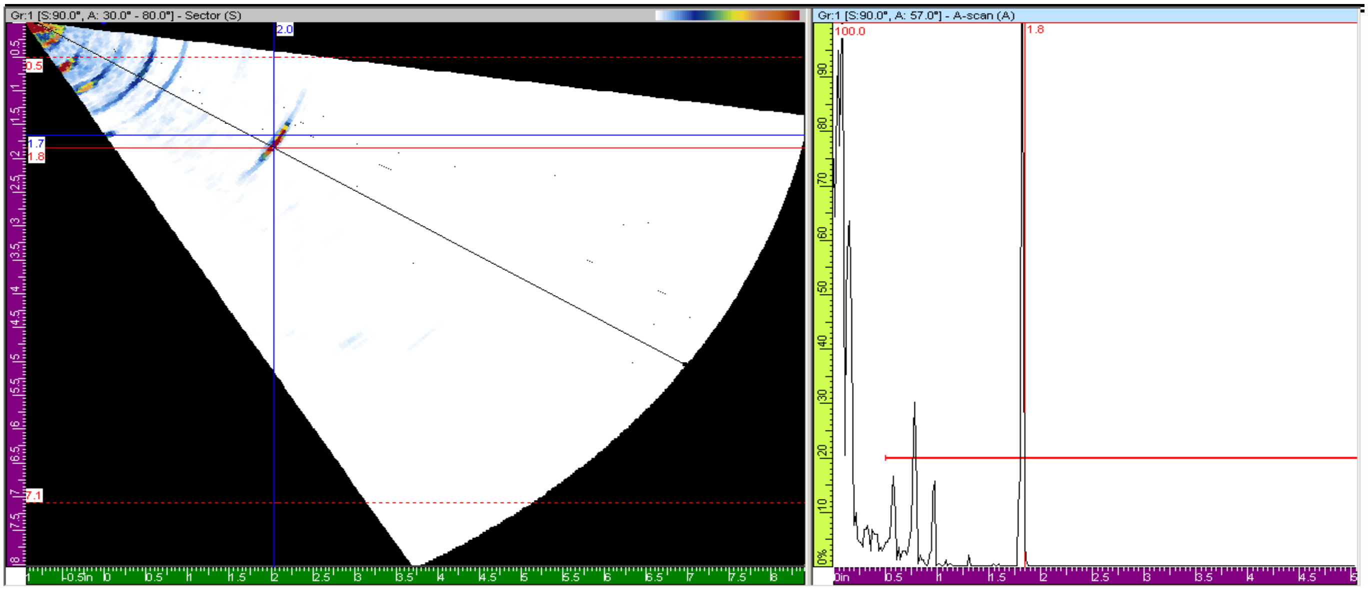
Image of typical 360° non-relevant root signal/root geometry
Limited scanning accessibility due to outside geometrical configuration.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/20/2012**

THIELSCH ENGINEERING

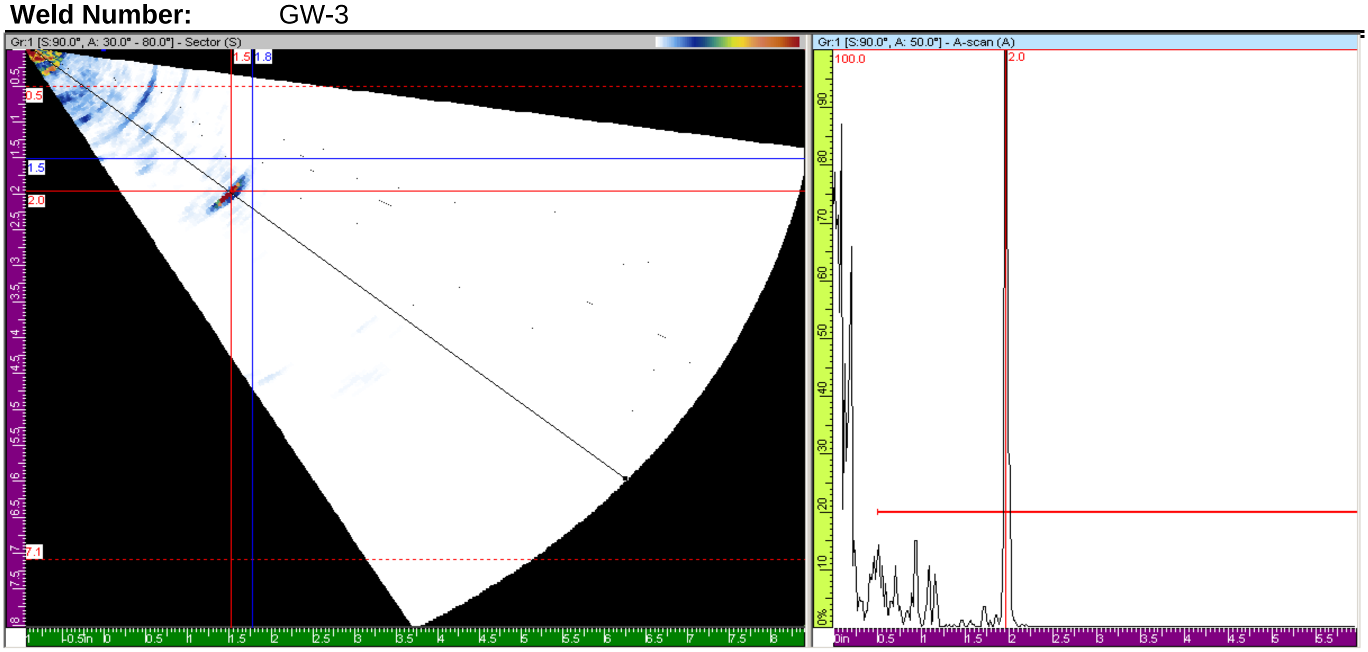
Phased Array Report

Component: High-Pressure Reheat Outlet Header
Weld Number: GW-3



Indication Comments and Location:
Above image of 1-1/2" long subsurface indication located at the 12:00 o'clock position/indication is approximately 0.100" in the through thickness dimension/inclusion from original manufacturing.
Range of indication depth is between 1.7" to 1.8" from the outside surface.

Component: High-Pressure Reheat Outlet Header
Weld Number: GW-3



Indication Comments and Location:
Above image of 2-1/2" long subsurface indication located directly above the E tube row adjacent GW-3. Indication is approximately 0.500" in the through thickness dimension/inclusion from original. Manufacturing/range of indication depth is between 1.5" to 2.0" from the outside surface.

THIELSCH ENGINEERING

Phased Array Calibration

Customer:	AEP	**Component:**	HP Reheat Outlet Header
Unit Number:	2	**Weld Number:**	See Attached Report
Project Number:	43-12-0010	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	4.4" - 4.9"

Machine Informatior

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Calibration ID#**
Omni Scan MX	Omni-1179	Scan:Omni-2.0R5 Analysis:TomoView-2.4R1	8/12	31912-5.0

Probe Characterizatior

Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55 Degrees	0.378 in

Setup

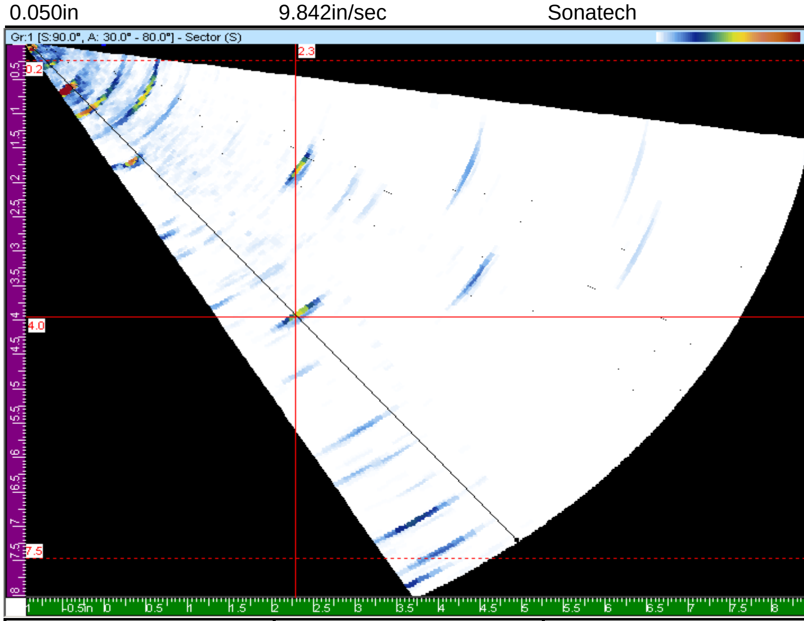
Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
8.106us	0.000in	9.281in	18	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	46	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(High)	38dB	PE(Pulse Echo)	Shear	100ns

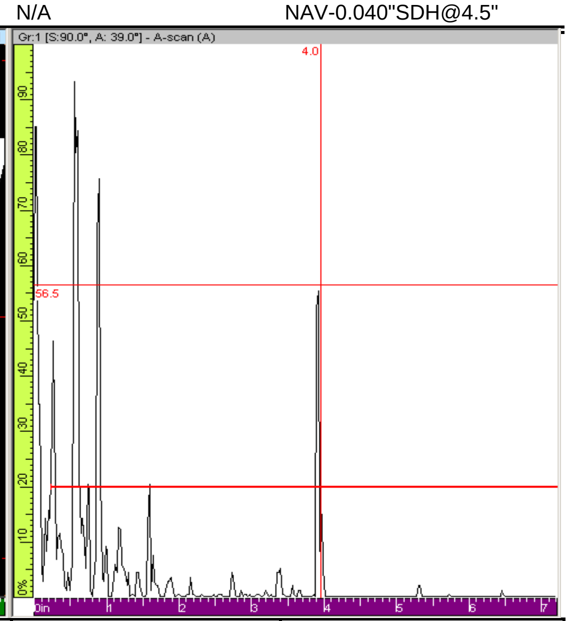
Transducer Calculatoı

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	1.0 Degrees	5.0"	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	N/A	NAV-0.040"SDH@4.5"





Date / Time	**Date / Time**	**Date / Time**	**Date / Time**	**Date / Time**
3/20-7AM				

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/19/2012**

THIELSCH ENGINEERING

Phased Array Report

Customer:	AEP	**Component:**	High-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Line Identification:**	High-Pressure Reheat
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Longitudinal Seam
Calibration ID #:	31912-5.0	**Part Thickness:**	4.4" - 4.9"
		Part Diameter:	44"

Weld #	Indication	Scan Location	Range of Depth	Comments / Obstructions
LS-1	No relevant indications detected.			Indication between tube rows 9 and 10, see figure 1 and 2. Indication between tube rows 33 and 34, see figure 3 and 4.
LS-2	No relevant indications detected.			
LS-3	No relevant indications detected.			
LS-1A	No relevant indications detected.			
LS-2A	No relevant indications detected.			
LS-3A	No relevant indications detected.			

Notes and Comments

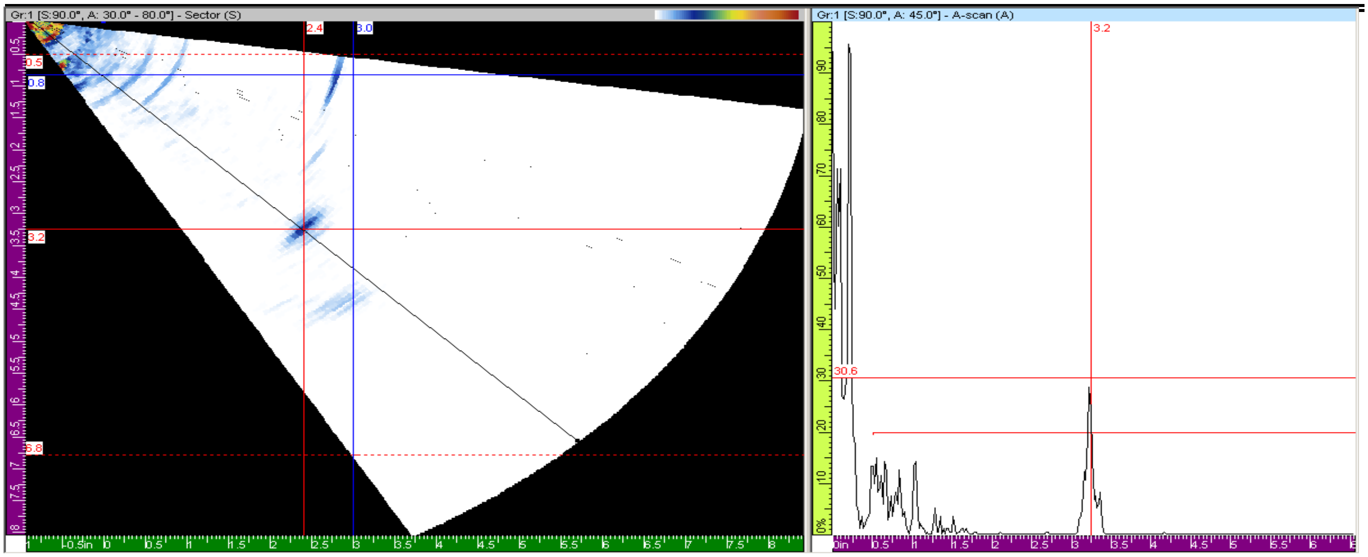
Limited scanning accessibility on all seam welds inspected due to tube stub configuration on outside surface.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/20/2012**

THIELSCH ENGINEERING

Phased-Array Report

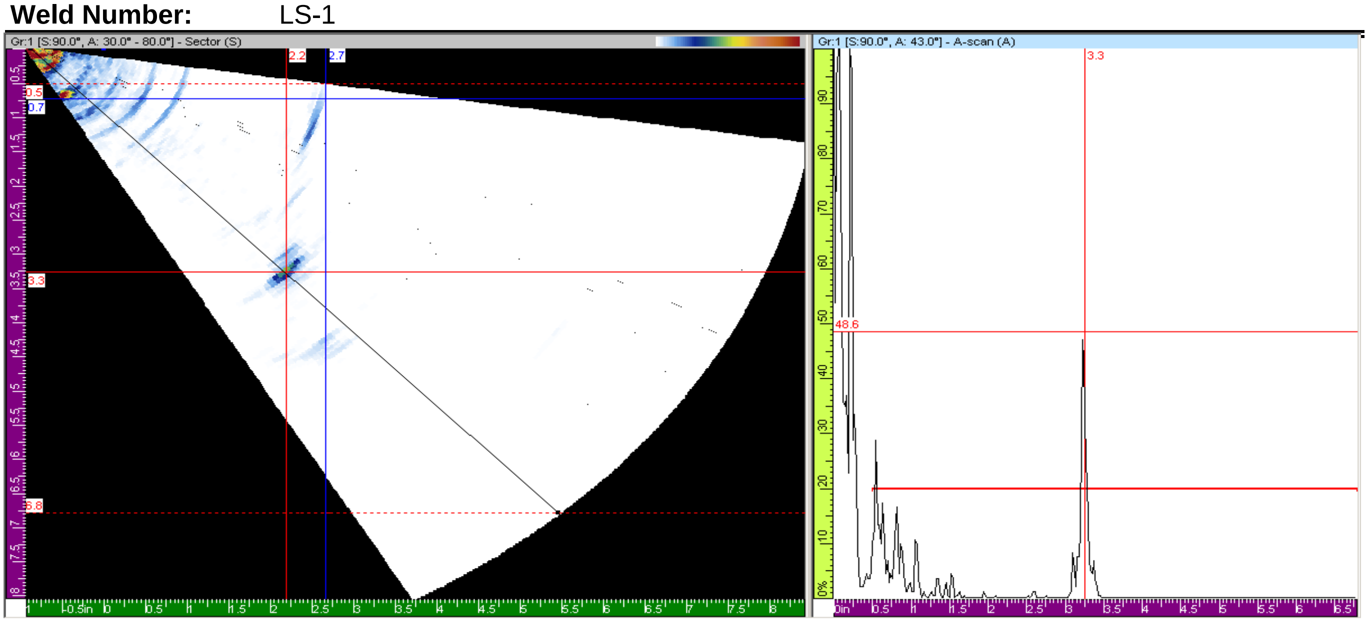
Component: High-Pressure Reheat Outlet Header
Weld Number: LS-1



(FIGURE 1)

Indication Comments and Location:
Image of transverse indication located between tube rows 9 and 10/very low amplitude/width of weld in length/small area of lack of fusion in an area which from the surface condition was a past repair area

Component: High-Pressure Reheat Outlet Header
Weld Number: LS-1



(FIGURE 2)

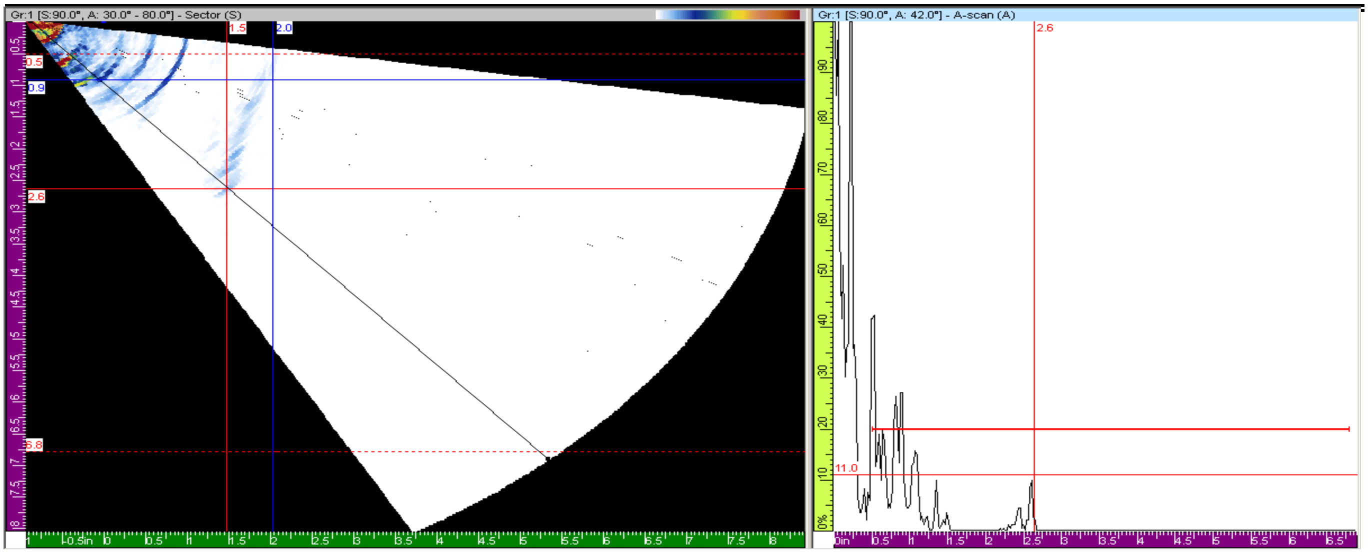
Indication Comments and Location:
Image of transverse indication located between tube rows 9 and 10/very low amplitude/width of weld in length/small area of lack of fusion in an area which from the surface condition was a past repair area.

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/20/2012**

THIELSCH ENGINEERING

Phased-Array Report

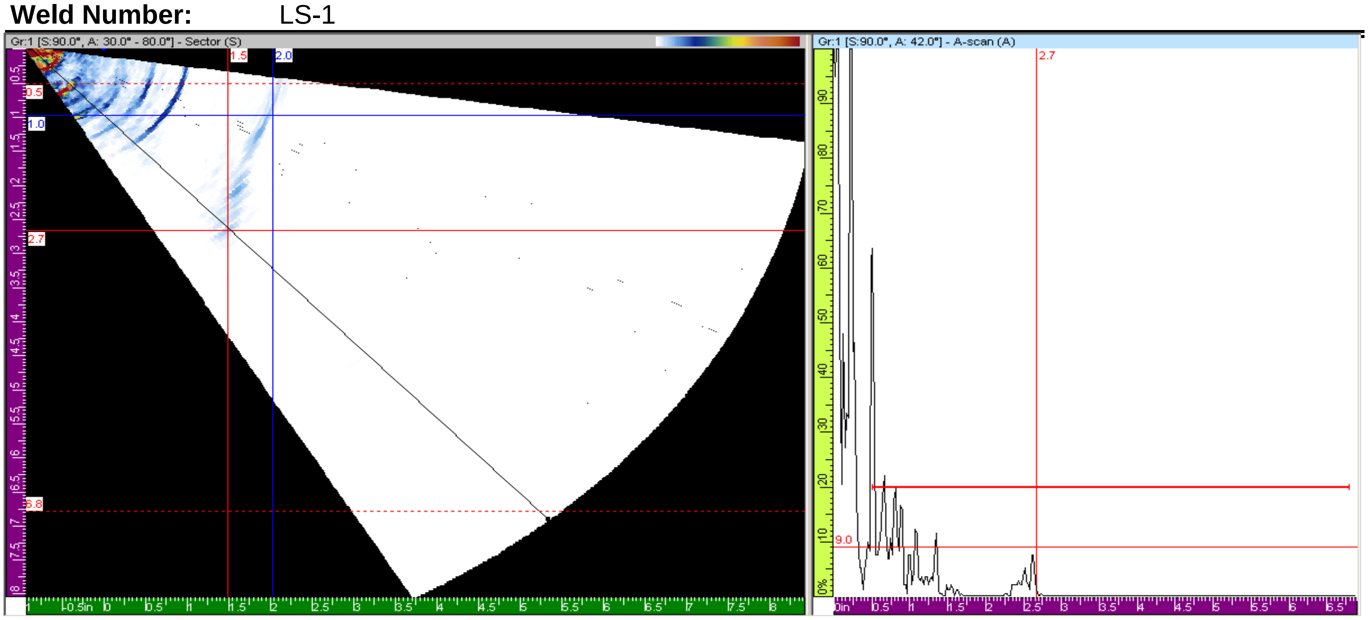
Component: High-Pressure Reheat Outlet Header
Weld Number: LS-1



(FIGURE 3)

Indication Comments and Location:
Above image of approximately 2" long area of lack of fusion between tube rows 33 and 34. Indication is very low in amplitude/original fabrication indication.

Component: High-Pressure Reheat Outlet Header
Weld Number: LS-1



(FIGURE 4)

Indication Comments and Location:
Above image of approximately 2" long area of lack of fusion between tube rows 33 and 34. Indication is very low in amplitude/original fabrication indication.

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/20/2012**

THIELSCH ENGINEERING, INC.

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

HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: HP Reheat Outlet Header	Material: SA-387, Gr. D	Hardness Scale: HBN

Location		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
HPROH-R1	Weld	151	169	157	156	178	162	78,000
	HAZ	160	172	155	158	177	164	79,000
	Base	164	163	168	141	159	159	76,000
HPROH-R2	Weld	164	170	171	154	187	169	81,000
	HAZ	167	182	161	167	172	170	81,000
	Base	151	145	145	153	143	147	70,000
HPROH-R3	Weld	163	169	170	175	166	169	81,000
	HAZ	156	154	152	155	155	154	74,000
	Base	134	153	155	146	159	149	71,000
HPROH-R4	Weld	140	138	140	144	148	142	68,000
	HAZ	161	152	157	156	155	156	75,000
	Base	148	149	152	155	153	151	72,000
HPROH-R5	Weld	174	181	181	172	175	177	84,000
	HAZ	163	167	154	155	153	158	76,000
	Base	162	161	162	155	155	159	76,000
HPROH-R6	Weld	155	163	145	147	163	155	74,000
	HAZ	160	159	161	166	148	159	76,000
	Base	151	164	163	160	159	159	76,000
HPROH-R7	Weld	156	169	165	169	154	163	78,000
	HAZ	148	162	179	178	176	169	81,000
	Base	161	169	167	169	166	166	80,000
HPROH-R8	Weld	183	190	186	187	181	185	88,000
	HAZ	194	185	169	184	192	185	88,000
	Base	163	158	159	158	154	158	76,000

INSPECTOR: M. Olszewski	DATE: 03/26/2012

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	

Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
A	1	0.273	8	976	200,000
A	2	0.245	19	1046	89,064
A	3	0.253	22	1057	73,419
A	4	0.230	24	1064	10,971
A	5	0.238	23	1061	32,497
A	6	0.257	19	1046	122,915
A	7	0.243	20	1050	72,482
A	8	0.254	22	1057	75,796
A	9	0.256	22	1057	80,656
A	10	0.257	19	1046	122,915
A	11	0.244	23	1061	43,756
A	12	0.248	22	1057	62,039
A	13	0.238	22	1057	41,539
A	14	0.239	23	1061	34,313
A	15	0.232	26	1071	-665
A	16	0.239	24	1064	25,657
A	17	0.243	23	1061	41,817
A	18	0.234	22	1057	34,080
A	19	0.247	21	1054	70,617
A	20	0.230	22	1057	26,996
A	21	0.237	22	1057	39,637
A	22	0.233	20	1050	50,810
A	23	0.236	24	1064	20,581
A	24	0.236	20	1050	56,995
A	25	0.230	22	1057	26,996
A	26	0.213	28	1077	-36,082
A	27	0.222	25	1068	-7,622
A	28	0.238	22	1057	41,539
A	29	0.242	22	1057	49,404
A	30	0.246	19	1046	91,645
A	31	0.234	22	1057	34,080
A	32	0.245	21	1054	66,065
A	33	0.238	21	1054	51,112
A	34	0.250	19	1046	102,382
A	35	0.257	20	1050	108,747
A	36	0.248	22	1057	62,039
A	37	0.231	23	1061	20,412

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
A	38	0.223	25	1068	-6,278
A	39	0.231	22	1057	28,734
A	40	0.238	24	1064	23,944
A	41	0.236	23	1061	28,934
A	42	0.246	23	1061	47,712
A	43	0.243	22	1057	51,438
A	44	0.237	23	1061	30,704
A	45	0.236	23	1061	28,934
A	46	0.231	23	1061	20,412
A	47	0.219	29	1080	-35,050
A	48	0.217	27	1074	-26,167
A	49	0.211	26	1071	-27,294
A	50	0.218	25	1068	-12,852
A	51	0.222	24	1064	-822
A	52	0.231	22	1057	28,734
A	53	0.233	19	1046	60,919
A	54	0.239	19	1046	74,372
A	55	0.258	19	1046	126,048
A	56	0.244	18	1041	99,001
A	57	0.227	22	1057	21,914
A	58	0.243	19	1046	84,018
A	59	0.261	19	1046	135,774
A	60	0.248	19	1046	96,929
A	61	0.248	19	1046	96,929
A	62	0.236	19	1046	67,500
A	63	0.246	19	1046	91,645
A	64	0.245	19	1046	89,064
A	65	0.254	22	1057	75,796
A	66	0.233	22	1057	32,275
A	67	0.240	21	1054	55,236
A	68	0.233	21	1054	41,278
A	69	0.250	22	1057	66,493
A	70	0.239	21	1054	53,160
A	71	0.257	18	1041	138,125
A	72	0.248	18	1041	110,158
A	73	0.260	19	1046	132,476
A	74	0.243	18	1041	96,320

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
A	75	0.255	20	1050	103,069
A	76	0.245	20	1050	77,202
A	77	0.254	17	1037	143,899
A	78	0.267	17	1037	194,396
A	79	0.254	21	1054	87,648
A	80	0.248	20	1050	84,550
A	81	0.251	19	1046	105,174
A	82	0.252	20	1050	94,885
A	83	0.254	21	1054	87,648
A	84	0.240	17	1037	101,114
A	85	0.255	19	1046	116,805
A	86	0.236	20	1050	56,995
A	87	0.231	27	1074	-8,846
A	88	0.260	20	1050	117,617
A	89	0.262	19	1046	139,130
A	90	0.249	20	1050	87,075
A	91	0.240	18	1041	88,526
A	92	0.247	19	1046	94,267
A	93	0.267	22	1057	110,217
A	94	0.258	17	1037	158,151
A	95	0.249	16	1032	142,900
A	96	0.247	20	1050	82,064
A	97	0.251	21	1054	80,131
A	98	0.255	23	1061	66,926
A	99	0.265	20	1050	133,425
A	100	0.272	16	1032	200,000
A	101	0.261	19	1046	135,774
A	102	Obstr	17	1037	N/A
A	103	Obstr	19	1046	N/A
A	104	0.244	19	1046	86,522
A	105	0.253	19	1046	110,895
A	106	0.264	15	1027	200,000
A	107	0.253	15	1027	174,789
A	108	0.230	10	994	178,220
A	109	0.246	22	1057	57,710
A	110	0.259	21	1054	100,974
A	111	0.251	21	1054	80,131

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**	43-12-0010
Pressure:	1200	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.261	**Unit No.:**	2
Material:	SA-213, T22	**Tube Group:**	HP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
A	112	0.278	8	976	200,000
B	1	0.266	8	976	200,000
B	2	0.237	17	1037	93,150
B	3	0.234	21	1054	43,193
B	4	0.229	22	1057	25,281
B	5	0.240	23	1061	36,152
B	6	0.256	18	1041	134,801
B	7	0.258	19	1046	126,048
B	8	0.255	20	1050	103,069
B	9	0.256	19	1046	119,835
B	10	0.263	19	1046	142,546
B	11	0.251	20	1050	92,241
B	12	0.238	20	1050	61,264
B	13	0.234	20	1050	52,844
B	14	0.237	20	1050	59,114
B	15	0.235	23	1061	27,187
B	16	0.238	20	1050	61,264
B	17	0.234	20	1050	52,844
B	18	0.256	20	1050	105,885
B	19	0.244	20	1050	74,824
B	20	0.236	19	1046	67,500
B	21	0.240	19	1046	76,730
B	22	0.248	20	1050	84,550
B	23	0.228	22	1057	23,587
B	24	0.247	20	1050	82,064
B	25	0.246	20	1050	79,615
B	26	0.207	27	1074	-37,089
B	27	0.238	20	1050	61,264
B	28	0.245	23	1061	45,721
B	29	0.244	22	1057	53,500
B	30	0.249	19	1046	99,634
B	31	0.247	21	1054	70,617
B	32	0.243	21	1054	61,641
B	33	0.236	20	1050	56,995
B	34	0.249	19	1046	99,634
B	35	0.250	18	1041	116,013
B	36	0.241	22	1057	47,398

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
B	37	0.242	23	1061	39,904
B	38	0.233	22	1057	32,275
B	39	0.246	22	1057	57,710
B	40	0.232	20	1050	48,805
B	41	0.260	20	1050	117,617
B	42	0.237	22	1057	39,637
B	43	0.246	22	1057	57,710
B	44	0.236	20	1050	56,995
B	45	0.228	22	1057	23,587
B	46	0.235	22	1057	35,908
B	47	0.223	23	1061	7,818
B	48	0.229	23	1061	17,149
B	49	0.243	22	1057	51,438
B	50	0.245	21	1054	66,065
B	51	0.222	21	1054	21,778
B	52	0.245	20	1050	77,202
B	53	0.240	17	1037	101,114
B	54	0.255	17	1037	147,366
B	55	0.259	18	1041	144,949
B	56	0.256	16	1032	168,250
B	57	0.240	20	1050	65,655
B	58	0.249	16	1032	142,900
B	59	0.261	18	1041	152,022
B	60	0.242	19	1046	81,552
B	61	0.247	20	1050	82,064
B	62	0.250	18	1041	116,013
B	63	0.247	19	1046	94,267
B	64	0.238	18	1041	83,525
B	65	0.249	20	1050	87,075
B	66	0.254	22	1057	75,796
B	67	0.240	23	1061	36,152
B	68	0.252	20	1050	94,885
B	69	0.246	20	1050	79,615
B	70	0.246	19	1046	91,645
B	71	0.255	18	1041	131,535
B	72	0.252	19	1046	108,011
B	73	0.265	17	1037	185,789

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
B	74	0.263	17	1037	177,512
B	75	0.256	20	1050	105,885
B	76	0.255	19	1046	116,805
B	77	0.254	19	1046	113,826
B	78	0.256	16	1032	168,250
B	79	0.262	17	1037	173,492
B	80	0.267	16	1032	200,000
B	81	0.260	16	1032	184,296
B	82	0.261	19	1046	135,774
B	83	0.270	18	1041	187,298
B	84	0.252	17	1037	137,146
B	85	0.264	18	1041	163,125
B	86	0.249	20	1050	87,075
B	87	0.232	23	1061	22,075
B	88	0.267	19	1046	156,833
B	89	0.273	13	1015	200,000
B	90	0.256	18	1041	134,801
B	91	0.240	14	1021	144,528
B	92	0.247	17	1037	121,253
B	93	0.240	20	1050	65,655
B	94	0.257	16	1032	172,147
B	95	0.243	16	1032	123,543
B	96	0.256	17	1037	150,896
B	97	0.243	19	1046	84,018
B	98	0.247	20	1050	82,064
B	99	0.262	20	1050	123,781
B	100	0.259	18	1041	144,949
B	101	0.264	18	1041	163,125
B	102	Obstr	16	1032	N/A
B	103	Obstr	20	1050	N/A
B	104	0.250	20	1050	89,638
B	105	0.260	18	1041	148,454
B	106	0.263	13	1015	200,000
B	107	0.258	15	1027	195,572
B	108	0.246	10	994	200,000
B	109	0.259	22	1057	88,226
B	110	0.258	20	1050	111,655

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
B	111	0.266	19	1046	153,164
B	112	0.278	8	976	200,000
C	1	0.243	10	994	200,000
C	2	0.248	17	1037	124,325
C	3	0.246	19	1046	91,645
C	4	0.245	22	1057	55,590
C	5	0.229	22	1057	25,281
C	6	0.245	18	1041	101,723
C	7	0.251	20	1050	92,241
C	8	0.249	18	1041	113,061
C	9	0.253	17	1037	140,493
C	10	0.252	17	1037	137,146
C	11	0.240	19	1046	76,730
C	12	0.242	22	1057	49,404
C	13	0.251	20	1050	92,241
C	14	0.250	22	1057	66,493
C	15	0.225	23	1061	10,854
C	16	0.219	20	1050	25,001
C	17	Obstr	22	1057	N/A
C	18	0.237	22	1057	39,637
C	19	0.244	20	1050	74,824
C	20	0.223	20	1050	31,905
C	21	0.224	22	1057	17,017
C	22	0.241	20	1050	67,897
C	23	0.229	21	1054	33,867
C	24	0.225	19	1046	44,653
C	25	0.230	23	1061	18,771
C	26	0.228	22	1057	23,587
C	27	0.230	20	1050	44,873
C	28	0.229	22	1057	25,281
C	29	0.239	22	1057	43,466
C	30	0.245	21	1054	66,065
C	31	0.236	23	1061	28,934
C	32	0.259	20	1050	114,612
C	33	0.239	22	1057	43,466
C	34	0.241	22	1057	47,398
C	35	0.235	20	1050	54,905

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**	43-12-0010
Pressure:	1200	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.261	**Unit No.:**	2
Material:	SA-213, T22	**Tube Group:**	HP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
C	36	0.231	22	1057	28,734
C	37	0.232	21	1054	39,389
C	38	0.245	22	1057	55,590
C	39	0.236	24	1064	20,581
C	40	0.243	23	1061	41,817
C	41	0.231	23	1061	20,412
C	42	0.224	21	1054	25,125
C	43	0.234	21	1054	43,193
C	44	0.240	20	1050	65,655
C	45	0.225	24	1064	3,473
C	46	0.234	23	1061	25,461
C	47	0.228	25	1068	673
C	48	0.224	26	1071	-11,529
C	49	0.237	26	1071	6,644
C	50	0.240	24	1064	27,392
C	51	0.224	24	1064	2,025
C	52	0.241	21	1054	57,341
C	53	0.245	20	1050	77,202
C	54	0.253	19	1046	110,895
C	55	0.246	21	1054	68,325
C	56	0.253	19	1046	110,895
C	57	0.236	21	1054	47,099
C	58	0.255	20	1050	103,069
C	59	0.244	20	1050	74,824
C	60	0.232	23	1061	22,075
C	61	0.238	21	1054	51,112
C	62	0.242	20	1050	70,173
C	63	0.238	22	1057	41,539
C	64	0.248	20	1050	84,550
C	65	0.252	22	1057	71,076
C	66	0.244	23	1061	43,756
C	67	0.230	25	1068	3,566
C	68	0.231	23	1061	20,412
C	69	0.246	19	1046	91,645
C	70	0.256	22	1057	80,656
C	71	0.249	19	1046	99,634
C	72	0.246	19	1046	91,645

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
C	73	0.266	17	1037	190,050
C	74	0.259	19	1046	129,235
C	75	0.248	22	1057	62,039
C	76	0.235	19	1046	65,275
C	77	0.244	20	1050	74,824
C	78	0.255	18	1041	131,535
C	79	0.274	20	1050	165,601
C	80	0.268	19	1046	160,569
C	81	0.258	18	1041	141,507
C	82	0.255	20	1050	103,069
C	83	0.252	20	1050	94,885
C	84	0.234	20	1050	52,844
C	85	0.256	16	1032	168,250
C	86	0.258	17	1037	158,151
C	87	0.247	20	1050	82,064
C	88	0.259	19	1046	129,235
C	89	0.255	19	1046	116,805
C	90	0.249	22	1057	64,250
C	91	0.253	17	1037	140,493
C	92	0.256	22	1057	80,656
C	93	0.259	22	1057	88,226
C	94	0.268	19	1046	160,569
C	95	Obstr	19	1046	N/A
C	96	0.260	19	1046	132,476
C	97	0.250	21	1054	77,699
C	98	0.238	22	1057	41,539
C	99	0.268	19	1046	160,569
C	100	0.272	20	1050	157,993
C	101	0.265	18	1041	166,965
C	102	0.249	20	1050	87,075
C	103	Obstr	19	1046	N/A
C	104	0.253	20	1050	97,570
C	105	0.258	19	1046	126,048
C	106	0.255	15	1027	182,860
C	107	0.269	18	1041	183,073
C	108	0.248	16	1032	139,532
C	109	0.241	23	1061	38,016

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
C	110	0.255	24	1064	56,321
C	111	0.268	20	1050	143,582
C	112	0.263	8	976	200,000
D	1	0.247	8	976	200,000
D	2	0.243	17	1037	109,465
D	3	0.249	18	1041	113,061
D	4	0.232	21	1054	39,389
D	5	0.254	24	1064	54,206
D	6	0.245	17	1037	115,262
D	7	0.260	20	1050	117,617
D	8	0.267	19	1046	156,833
D	9	0.257	20	1050	108,747
D	10	0.267	20	1050	140,137
D	11	0.260	20	1050	117,617
D	12	0.261	17	1037	169,548
D	13	0.258	19	1046	126,048
D	14	0.253	20	1050	97,570
D	15	0.247	19	1046	94,267
D	16	0.246	22	1057	57,710
D	17	0.253	20	1050	97,570
D	18	0.248	19	1046	96,929
D	19	0.249	22	1057	64,250
D	20	0.258	20	1050	111,655
D	21	0.254	17	1037	143,899
D	22	0.265	19	1046	149,561
D	23	0.250	22	1057	66,493
D	24	0.263	19	1046	142,546
D	25	0.255	20	1050	103,069
D	26	0.240	24	1064	27,392
D	27	0.257	18	1041	138,125
D	28	0.250	19	1046	102,382
D	29	0.252	22	1057	71,076
D	30	0.267	22	1057	110,217
D	31	0.258	22	1057	85,664
D	32	0.250	19	1046	102,382
D	33	0.267	19	1046	156,833
D	34	0.265	19	1046	149,561

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
D	35	0.264	19	1046	146,022
D	36	0.258	19	1046	126,048
D	37	0.249	23	1061	53,852
D	38	0.255	23	1061	66,926
D	39	0.259	21	1054	100,974
D	40	0.254	22	1057	75,796
D	41	0.261	22	1057	93,468
D	42	0.256	19	1046	119,835
D	43	0.254	19	1046	113,826
D	44	0.266	20	1050	136,752
D	45	0.260	18	1041	148,454
D	46	0.243	21	1054	61,641
D	47	0.252	22	1057	71,076
D	48	0.249	22	1057	64,250
D	49	0.249	20	1050	87,075
D	50	0.246	21	1054	68,325
D	51	0.276	19	1046	193,135
D	52	0.249	19	1046	99,634
D	53	0.259	17	1037	161,879
D	54	0.262	17	1037	173,492
D	55	0.260	17	1037	165,678
D	56	0.274	17	1037	200,000
D	57	0.236	22	1057	37,760
D	58	0.269	19	1046	164,376
D	59	0.262	17	1037	173,492
D	60	0.259	19	1046	129,235
D	61	0.258	17	1037	158,151
D	62	0.256	17	1037	150,896
D	63	0.267	19	1046	156,833
D	64	0.263	19	1046	142,546
D	65	0.250	21	1054	77,699
D	66	0.250	20	1050	89,638
D	67	0.254	19	1046	113,826
D	68	0.253	17	1037	140,493
D	69	0.247	19	1046	94,267
D	70	0.255	19	1046	116,805
D	71	0.267	15	1027	200,000

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
D	72	0.259	19	1046	129,235
D	73	0.268	17	1037	198,831
D	74	0.272	17	1037	200,000
D	75	0.266	17	1037	190,050
D	76	0.260	18	1041	148,454
D	77	0.269	18	1041	183,073
D	78	0.273	16	1032	200,000
D	79	0.276	17	1037	200,000
D	80	0.267	18	1041	174,865
D	81	0.264	18	1041	163,125
D	82	0.274	19	1046	184,519
D	83	0.268	18	1041	178,930
D	84	0.273	21	1054	144,592
D	85	0.266	17	1037	190,050
D	86	0.264	18	1041	163,125
D	87	0.256	22	1057	80,656
D	88	0.262	18	1041	155,655
D	89	0.276	20	1050	173,496
D	90	0.267	17	1037	194,396
D	91	0.245	18	1041	101,723
D	92	0.258	17	1037	158,151
D	93	0.247	21	1054	70,617
D	94	0.247	20	1050	82,064
D	95	Obstr	19	1046	N/A
D	96	0.238	19	1046	72,048
D	97	0.242	19	1046	81,552
D	98	0.231	21	1054	37,524
D	99	0.278	20	1050	181,695
D	100	0.259	17	1037	161,879
D	101	0.271	19	1046	172,204
D	102	0.274	19	1046	184,519
D	103	0.257	19	1046	122,915
D	104	0.262	20	1050	123,781
D	105	0.270	19	1046	168,253
D	106	0.269	18	1041	183,073
D	107	0.263	12	1009	200,000
D	108	0.276	13	1015	200,000

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
D	109	0.266	22	1057	107,314
D	110	0.272	19	1046	176,231
D	111	0.256	19	1046	119,835
D	112	0.276	8	976	200,000
E	1	0.251	11	1002	200,000
E	2	0.245	18	1041	101,723
E	3	0.234	20	1050	52,844
E	4	0.249	23	1061	53,852
E	5	0.243	24	1064	32,732
E	6	0.237	19	1046	69,758
E	7	0.246	19	1046	91,645
E	8	0.258	17	1037	158,151
E	9	0.266	20	1050	136,752
E	10	0.247	18	1041	107,301
E	11	0.251	21	1054	80,131
E	12	0.244	20	1050	74,824
E	13	0.249	21	1054	75,304
E	14	0.255	22	1057	78,208
E	15	0.240	23	1061	36,152
E	16	0.234	21	1054	43,193
E	17	0.241	22	1057	47,398
E	18	0.226	23	1061	12,400
E	19	0.258	19	1046	126,048
E	20	0.236	19	1046	67,500
E	21	0.251	23	1061	58,088
E	22	0.249	22	1057	64,250
E	23	0.238	21	1054	51,112
E	24	0.236	20	1050	56,995
E	25	0.249	22	1057	64,250
E	26	0.239	23	1061	34,313
E	27	0.239	22	1057	43,466
E	28	0.237	22	1057	39,637
E	29	0.247	21	1054	70,617
E	30	0.249	24	1064	44,053
E	31	0.243	21	1054	61,641
E	32	0.240	24	1064	27,392
E	33	0.238	23	1061	32,497

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
E	34	0.249	22	1057	64,250
E	35	0.255	20	1050	103,069
E	36	0.249	23	1061	53,852
E	37	0.246	24	1064	38,281
E	38	0.243	24	1064	32,732
E	39	0.252	20	1050	94,885
E	40	0.241	23	1061	38,016
E	41	0.232	23	1061	22,075
E	42	0.243	23	1061	41,817
E	43	0.238	21	1054	51,112
E	44	0.243	21	1054	61,641
E	45	0.242	22	1057	49,404
E	46	0.238	22	1057	41,539
E	47	0.234	23	1061	25,461
E	48	0.237	22	1057	39,637
E	49	0.243	24	1064	32,732
E	50	0.240	23	1061	36,152
E	51	0.242	23	1061	39,904
E	52	0.233	19	1046	60,919
E	53	0.245	19	1046	89,064
E	54	0.249	21	1054	75,304
E	55	0.236	22	1057	37,760
E	56	0.243	18	1041	96,320
E	57	0.249	17	1037	127,448
E	58	0.262	20	1050	123,781
E	59	0.248	20	1050	84,550
E	60	0.245	22	1057	55,590
E	61	0.249	23	1061	53,852
E	62	0.245	22	1057	55,590
E	63	0.240	24	1064	27,392
E	64	0.254	19	1046	113,826
E	65	0.253	22	1057	73,419
E	66	0.231	22	1057	28,734
E	67	0.251	23	1061	58,088
E	68	0.244	24	1064	34,557
E	69	0.245	20	1050	77,202
E	70	0.254	20	1050	100,298

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
E	71	0.252	20	1050	94,885
E	72	0.249	22	1057	64,250
E	73	0.265	20	1050	133,425
E	74	0.249	19	1046	99,634
E	75	0.243	23	1061	41,817
E	76	0.253	23	1061	62,444
E	77	0.265	20	1050	133,425
E	78	0.261	19	1046	135,774
E	79	0.254	20	1050	100,298
E	80	0.254	20	1050	100,298
E	81	0.268	17	1037	198,831
E	82	0.269	22	1057	116,168
E	83	0.258	21	1054	98,224
E	84	0.266	19	1046	153,164
E	85	0.271	19	1046	172,204
E	86	0.254	22	1057	75,796
E	87	0.243	22	1057	51,438
E	88	0.264	20	1050	130,155
E	89	0.262	20	1050	123,781
E	90	0.244	20	1050	74,824
E	91	0.260	20	1050	117,617
E	92	0.265	20	1050	133,425
E	93	0.267	23	1061	96,766
E	94	0.280	19	1046	200,000
E	95	0.252	21	1054	82,599
E	96	0.261	22	1057	93,468
E	97	0.277	20	1050	177,556
E	98	0.266	20	1050	136,752
E	99	0.273	21	1054	144,592
E	100	0.264	20	1050	130,155
E	101	0.248	20	1050	84,550
E	102	0.259	22	1057	88,226
E	103	0.261	22	1057	93,468
E	104	0.259	21	1054	100,974
E	105	0.273	21	1054	144,592
E	106	0.269	19	1046	164,376
E	107	0.276	15	1027	200,000

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
E	108	0.260	18	1041	148,454
E	109	0.266	23	1061	94,068
E	110	0.256	21	1054	92,854
E	111	0.268	20	1050	143,582
E	112	0.279	Obstr	N/A	N/A
F	1	0.287	10	994	200,000
F	2	0.283	20	1050	200,000
F	3	0.279	21	1054	166,771
F	4	0.276	23	1061	123,084
F	5	0.267	24	1064	84,194
F	6	0.272	19	1046	176,231
F	7	0.261	19	1046	135,774
F	8	0.241	21	1054	57,341
F	9	0.267	19	1046	156,833
F	10	0.246	23	1061	47,712
F	11	0.253	21	1054	85,104
F	12	0.245	23	1061	45,721
F	13	0.249	26	1071	26,065
F	14	0.254	24	1064	54,206
F	15	0.241	26	1071	12,807
F	16	0.245	27	1074	11,377
F	17	0.246	23	1061	47,712
F	18	0.251	20	1050	92,241
F	19	0.248	23	1061	51,777
F	20	0.267	22	1057	110,217
F	21	0.240	24	1064	27,392
F	22	0.250	22	1057	66,493
F	23	0.234	23	1061	25,461
F	24	0.243	21	1054	61,641
F	25	0.245	23	1061	45,721
F	26	0.246	25	1068	29,370
F	27	0.250	24	1064	46,029
F	28	0.237	23	1061	30,704
F	29	0.237	23	1061	30,704
F	30	0.242	24	1064	30,929
F	31	0.243	26	1071	16,001
F	32	0.240	24	1064	27,392

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
F	33	0.244	22	1057	53,500
F	34	0.256	22	1057	80,656
F	35	0.241	23	1061	38,016
F	36	0.243	23	1061	41,817
F	37	0.240	23	1061	36,152
F	38	0.239	24	1064	25,657
F	39	0.255	26	1071	36,916
F	40	0.246	22	1057	57,710
F	41	0.249	24	1064	44,053
F	42	0.246	24	1064	38,281
F	43	0.258	24	1064	62,846
F	44	0.251	24	1064	48,032
F	45	0.241	26	1071	12,807
F	46	0.251	26	1071	29,590
F	47	0.243	25	1068	24,139
F	48	0.239	27	1074	2,310
F	49	0.237	23	1061	30,704
F	50	0.246	27	1074	12,952
F	51	0.276	26	1071	82,585
F	52	0.243	23	1061	41,817
F	53	0.259	19	1046	129,235
F	54	0.272	22	1057	125,470
F	55	0.263	19	1046	142,546
F	56	0.249	21	1054	75,304
F	57	0.262	19	1046	139,130
F	58	0.260	23	1061	78,714
F	59	0.251	24	1064	48,032
F	60	0.248	21	1054	72,943
F	61	0.244	22	1057	53,500
F	62	0.259	22	1057	88,226
F	63	0.247	20	1050	82,064
F	64	0.247	22	1057	59,859
F	65	0.247	27	1074	14,545
F	66	0.249	22	1057	64,250
F	67	0.261	24	1064	69,654
F	68	0.255	20	1050	103,069
F	69	0.269	20	1050	147,089

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
F	70	0.273	19	1046	180,335
F	71	0.269	19	1046	164,376
F	72	0.271	20	1050	154,293
F	73	0.256	23	1061	69,215
F	74	0.256	20	1050	105,885
F	75	0.246	23	1061	47,712
F	76	0.262	19	1046	139,130
F	77	0.254	19	1046	113,826
F	78	0.263	20	1050	126,941
F	79	0.247	19	1046	94,267
F	80	0.260	18	1041	148,454
F	81	0.257	20	1050	108,747
F	82	0.256	22	1057	80,656
F	83	0.243	24	1064	32,732
F	84	0.259	19	1046	129,235
F	85	0.252	22	1057	71,076
F	86	0.243	20	1050	72,482
F	87	0.263	21	1054	112,420
F	88	0.264	22	1057	101,644
F	89	0.257	21	1054	95,518
F	90	0.264	20	1050	130,155
F	91	0.260	19	1046	132,476
F	92	0.273	27	1074	63,924
F	93	0.248	19	1046	96,929
F	94	0.268	21	1054	127,824
F	95	0.251	19	1046	105,174
F	96	0.242	22	1057	49,404
F	97	0.263	20	1050	126,941
F	98	0.270	19	1046	168,253
F	99	0.265	19	1046	149,561
F	100	0.257	19	1046	122,915
F	101	0.266	19	1046	153,164
F	102	0.256	18	1041	134,801
F	103	0.266	20	1050	136,752
F	104	0.276	17	1037	200,000
F	105	0.267	19	1046	156,833
F	106	0.285	17	1037	200,000

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
F	107	0.273	23	1061	113,884
F	108	0.265	22	1057	104,456
F	109	0.251	21	1054	80,131
F	110	0.274	16	1032	200,000
F	111	0.276	8	976	200,000
F	112	Obstr	Obstr	N/A	N/A
G	1	0.289	12	1009	200,000
G	2	0.276	19	1046	193,135
G	3	0.268	20	1050	143,582
G	4	0.274	22	1057	131,936
G	5	0.288	21	1054	200,000
G	6	0.281	21	1054	174,722
G	7	0.270	19	1046	168,253
G	8	0.261	20	1050	120,673
G	9	0.265	23	1061	91,410
G	10	0.263	19	1046	142,546
G	11	0.255	22	1057	78,208
G	12	0.251	21	1054	80,131
G	13	0.252	22	1057	71,076
G	14	0.261	23	1061	81,177
G	15	0.236	24	1064	20,581
G	16	0.246	26	1071	20,940
G	17	0.249	21	1054	75,304
G	18	0.248	23	1061	51,777
G	19	0.260	20	1050	117,617
G	20	0.256	23	1061	69,215
G	21	0.251	23	1061	58,088
G	22	0.248	23	1061	51,777
G	23	0.258	23	1061	73,895
G	24	0.247	22	1057	59,859
G	25	0.252	21	1054	82,599
G	26	0.245	23	1061	45,721
G	27	0.251	24	1064	48,032
G	28	0.255	22	1057	78,208
G	29	0.249	23	1061	53,852
G	30	0.257	22	1057	83,141
G	31	0.261	26	1071	48,649

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
G	32	0.249	22	1057	64,250
G	33	0.247	22	1057	59,859
G	34	0.260	23	1061	78,714
G	35	0.263	24	1064	74,359
G	36	0.258	20	1050	111,655
G	37	0.251	21	1054	80,131
G	38	0.245	23	1061	45,721
G	39	0.259	24	1064	65,083
G	40	0.246	21	1054	68,325
G	41	0.247	21	1054	70,617
G	42	0.254	22	1057	75,796
G	43	0.242	26	1071	14,394
G	44	0.244	24	1064	34,557
G	45	0.254	23	1061	64,669
G	46	0.248	22	1057	62,039
G	47	0.252	24	1064	50,062
G	48	0.237	25	1068	14,243
G	49	0.238	26	1071	8,158
G	50	0.272	24	1064	97,350
G	51	0.272	22	1057	125,470
G	52	0.265	22	1057	104,456
G	53	0.274	22	1057	131,936
G	54	0.257	20	1050	108,747
G	55	0.264	20	1050	130,155
G	56	0.254	20	1050	100,298
G	57	0.270	19	1046	168,253
G	58	0.261	22	1057	93,468
G	59	0.254	22	1057	75,796
G	60	0.269	20	1050	147,089
G	61	0.258	20	1050	111,655
G	62	0.259	19	1046	129,235
G	63	0.267	21	1054	124,639
G	64	0.258	21	1054	98,224
G	65	0.253	26	1071	33,206
G	66	0.258	22	1057	85,664
G	67	0.265	24	1064	79,204
G	68	0.272	23	1061	110,916

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
G	69	0.281	21	1054	174,722
G	70	0.270	21	1054	134,358
G	71	0.265	20	1050	133,425
G	72	0.270	18	1041	187,298
G	73	0.267	21	1054	124,639
G	74	0.256	21	1054	92,854
G	75	0.259	22	1057	88,226
G	76	0.271	18	1041	191,606
G	77	0.272	21	1054	141,121
G	78	0.264	22	1057	101,644
G	79	0.270	18	1041	187,298
G	80	0.274	20	1050	165,601
G	81	0.258	20	1050	111,655
G	82	0.258	22	1057	85,664
G	83	0.259	22	1057	88,226
G	84	0.264	21	1054	115,399
G	85	0.247	22	1057	59,859
G	86	0.255	20	1050	103,069
G	87	0.260	19	1046	132,476
G	88	0.259	21	1054	100,974
G	89	0.255	20	1050	103,069
G	90	0.252	19	1046	108,011
G	91	0.262	19	1046	139,130
G	92	0.262	24	1064	71,990
G	93	0.254	19	1046	113,826
G	94	0.263	22	1057	98,876
G	95	0.255	23	1061	66,926
G	96	0.258	22	1057	85,664
G	97	0.256	20	1050	105,885
G	98	0.269	17	1037	200,000
G	99	0.263	17	1037	177,512
G	100	0.276	20	1050	173,496
G	101	0.267	20	1050	140,137
G	102	0.268	19	1046	160,569
G	103	0.253	18	1041	125,168
G	104	0.270	16	1032	200,000
G	105	0.274	15	1027	200,000

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
G	106	0.285	17	1037	200,000
G	107	0.269	22	1057	116,168
G	108	0.254	20	1050	100,298
G	109	0.283	19	1046	200,000
G	110	0.278	19	1046	200,000
G	111	0.268	8	976	200,000
G	112	Obstr	Obstr	N/A	N/A
H	1	0.270	8	976	200,000
H	2	0.247	20	1050	82,064
H	3	0.243	22	1057	51,438
H	4	0.231	25	1068	5,038
H	5	0.258	22	1057	85,664
H	6	0.240	17	1037	101,114
H	7	0.256	18	1041	134,801
H	8	0.243	20	1050	72,482
H	9	0.255	17	1037	147,366
H	10	0.250	18	1041	116,013
H	11	0.243	19	1046	84,018
H	12	0.253	20	1050	97,570
H	13	0.245	21	1054	66,065
H	14	0.229	22	1057	25,281
H	15	0.245	22	1057	55,590
H	16	0.229	20	1050	42,947
H	17	0.241	23	1061	38,016
H	18	0.233	26	1071	764
H	19	0.233	20	1050	50,810
H	20	0.240	22	1057	45,419
H	21	0.247	21	1054	70,617
H	22	0.227	21	1054	30,304
H	23	0.250	23	1061	55,955
H	24	0.232	22	1057	30,493
H	25	0.242	23	1061	39,904
H	26	0.244	24	1064	34,557
H	27	0.237	22	1057	39,637
H	28	0.248	22	1057	62,039
H	29	0.236	26	1071	5,148
H	30	0.242	24	1064	30,929

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
H	31	0.254	20	1050	100,298
H	32	0.251	25	1068	38,548
H	33	0.262	21	1054	109,489
H	34	0.257	20	1050	108,747
H	35	0.232	22	1057	30,493
H	36	0.236	21	1054	47,099
H	37	0.250	22	1057	66,493
H	38	0.226	22	1057	20,261
H	39	0.239	24	1064	25,657
H	40	0.239	23	1061	34,313
H	41	0.227	23	1061	13,964
H	42	0.239	20	1050	63,444
H	43	0.238	22	1057	41,539
H	44	0.242	21	1054	59,476
H	45	0.225	20	1050	35,490
H	46	0.232	24	1064	14,097
H	47	0.234	26	1071	2,208
H	48	0.227	22	1057	21,914
H	49	0.229	29	1080	-23,830
H	50	0.230	23	1061	18,771
H	51	0.229	24	1064	9,436
H	52	0.247	22	1057	59,859
H	53	0.253	17	1037	140,493
H	54	0.258	19	1046	126,048
H	55	0.259	16	1032	180,168
H	56	0.245	18	1041	101,723
H	57	0.260	16	1032	184,296
H	58	0.254	21	1054	87,648
H	59	0.249	22	1057	64,250
H	60	0.248	20	1050	84,550
H	61	0.248	20	1050	84,550
H	62	0.247	21	1054	70,617
H	63	0.245	20	1050	77,202
H	64	0.239	22	1057	43,466
H	65	0.240	21	1054	55,236
H	66	0.237	22	1057	39,637
H	67	0.243	21	1054	61,641

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
H	68	0.240	19	1046	76,730
H	69	0.259	20	1050	114,612
H	70	0.262	20	1050	123,781
H	71	0.239	19	1046	74,372
H	72	0.263	17	1037	177,512
H	73	0.246	17	1037	118,233
H	74	0.273	19	1046	180,335
H	75	0.241	19	1046	79,123
H	76	0.275	16	1032	200,000
H	77	0.260	19	1046	132,476
H	78	0.262	21	1054	109,489
H	79	0.247	19	1046	94,267
H	80	0.248	19	1046	96,929
H	81	0.244	21	1054	63,837
H	82	0.244	22	1057	53,500
H	83	0.259	21	1054	100,974
H	84	0.244	19	1046	86,522
H	85	0.250	23	1061	55,955
H	86	0.239	19	1046	74,372
H	87	0.262	22	1057	96,151
H	88	0.271	22	1057	122,318
H	89	0.239	22	1057	43,466
H	90	0.258	21	1054	98,224
H	91	0.252	22	1057	71,076
H	92	0.264	19	1046	146,022
H	93	0.250	19	1046	102,382
H	94	0.245	20	1050	77,202
H	95	0.254	20	1050	100,298
H	96	0.237	20	1050	59,114
H	97	0.263	22	1057	98,876
H	98	0.260	20	1050	117,617
H	99	0.251	19	1046	105,174
H	100	0.256	19	1046	119,835
H	101	0.261	22	1057	93,468
H	102	0.245	20	1050	77,202
H	103	0.243	22	1057	51,438
H	104	0.261	20	1050	120,673

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
H	105	0.267	17	1037	194,396
H	106	0.242	17	1037	106,637
H	107	0.254	22	1057	75,796
H	108	0.249	13	1015	196,968
H	109	0.252	21	1054	82,599
H	110	0.272	19	1046	176,231
H	111	0.270	19	1046	168,253
H	112	Obstr	Obstr	N/A	N/A
I	1	0.267	8	976	200,000
I	2	0.270	16	1032	200,000
I	3	0.259	17	1037	161,879
I	4	0.260	20	1050	117,617
I	5	0.271	25	1068	82,154
I	6	0.250	15	1027	163,245
I	7	0.273	19	1046	180,335
I	8	0.254	17	1037	143,899
I	9	0.270	19	1046	168,253
I	10	0.252	19	1046	108,011
I	11	0.271	26	1071	70,462
I	12	0.256	17	1037	150,896
I	13	0.259	19	1046	129,235
I	14	0.256	16	1032	168,250
I	15	0.249	19	1046	99,634
I	16	0.254	19	1046	113,826
I	17	0.255	23	1061	66,926
I	18	0.256	19	1046	119,835
I	19	0.266	19	1046	153,164
I	20	0.269	18	1041	183,073
I	21	0.264	19	1046	146,022
I	22	0.257	19	1046	122,915
I	23	0.257	17	1037	154,491
I	24	0.268	19	1046	160,569
I	25	0.260	19	1046	132,476
I	26	0.258	20	1050	111,655
I	27	0.254	18	1041	128,324
I	28	0.265	19	1046	149,561
I	29	0.262	19	1046	139,130

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	Tube #	Wall	ID Scale (Mils)	Current Temp.	Useful Remaining Life Estimate
I	30	0.262	19	1046	139,130
I	31	0.259	19	1046	129,235
I	32	0.265	19	1046	149,561
I	33	0.267	17	1037	194,396
I	34	0.252	17	1037	137,146
I	35	0.259	18	1041	144,949
I	36	0.266	19	1046	153,164
I	37	0.265	20	1050	133,425
I	38	0.239	21	1054	53,160
I	39	0.248	20	1050	84,550
I	40	0.241	20	1050	67,897
I	41	0.244	20	1050	74,824
I	42	0.255	17	1037	147,366
I	43	0.249	20	1050	87,075
I	44	0.241	19	1046	79,123
I	45	0.256	20	1050	105,885
I	46	0.249	20	1050	87,075
I	47	0.241	20	1050	67,897
I	48	0.258	18	1041	141,507
I	49	0.243	21	1054	61,641
I	50	0.243	21	1054	61,641
I	51	0.245	22	1057	55,590
I	52	0.254	19	1046	113,826
I	53	0.274	17	1037	200,000
I	54	0.252	16	1032	153,370
I	55	0.246	17	1037	118,233
I	56	0.271	17	1037	200,000
I	57	0.269	15	1027	200,000
I	58	0.266	17	1037	190,050
I	59	0.252	18	1041	122,065
I	60	0.267	17	1037	194,396
I	61	0.256	18	1041	134,801
I	62	0.258	17	1037	158,151
I	63	0.258	17	1037	158,151
I	64	0.259	17	1037	161,879
I	65	0.249	21	1054	75,304
I	66	0.266	17	1037	190,050

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
I	67	0.261	18	1041	152,022
I	68	0.263	16	1032	197,178
I	69	0.267	15	1027	200,000
I	70	0.256	15	1027	187,014
I	71	0.265	17	1037	185,789
I	72	0.287	23	1061	161,104
I	73	0.276	16	1032	200,000
I	74	0.270	17	1037	200,000
I	75	0.262	17	1037	173,492
I	76	0.276	13	1015	200,000
I	77	0.269	17	1037	200,000
I	78	0.257	16	1032	172,147
I	79	0.272	16	1032	200,000
I	80	0.276	15	1027	200,000
I	81	0.264	16	1032	200,000
I	82	0.258	16	1032	176,119
I	83	0.267	17	1037	194,396
I	84	0.270	16	1032	200,000
I	85	0.266	19	1046	153,164
I	86	0.259	19	1046	129,235
I	87	0.270	17	1037	200,000
I	88	0.273	18	1041	200,000
I	89	0.270	17	1037	200,000
I	90	0.275	18	1041	200,000
I	91	0.270	17	1037	200,000
I	92	0.267	17	1037	194,396
I	93	0.265	16	1032	200,000
I	94	0.260	17	1037	165,678
I	95	0.275	18	1041	200,000
I	96	0.264	19	1046	146,022
I	97	0.278	19	1046	200,000
I	98	0.275	17	1037	200,000
I	99	0.279	16	1032	200,000
I	100	0.278	16	1032	200,000
I	101	0.266	19	1046	153,164
I	102	0.261	16	1032	188,505
I	103	0.274	17	1037	200,000

Remaining Life Assessment

Operating Hours:	260,000	Project No.:		43-12-0010	
Pressure:	1200	Utility:		AEP	
OD:	2.25	Plant:		Mitchell Generating Station	
Design Wall (MWT):	0.261	Unit No.:		2	
Material:	SA-213, T22	Tube Group:		HP Reheat Outlet	
Superheater (Y/N)	N	Location:		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
I	104	0.272	16	1032	200,000
I	105	0.259	13	1015	200,000
I	106	0.246	14	1021	165,900
I	107	0.263	20	1050	126,941
I	108	0.241	16	1032	117,517
I	109	0.259	22	1057	88,226
I	110	0.271	19	1046	172,204
I	111	0.260	14	1021	200,000
I	112	Obstr	Obstr	N/A	N/A
J	1	0.266	8	976	200,000
J	2	0.260	14	1021	200,000
J	3	0.240	22	1057	45,419
J	4	0.255	22	1057	78,208
J	5	0.272	24	1064	97,350
J	6	0.261	20	1050	120,673
J	7	0.262	19	1046	139,130
J	8	0.259	16	1032	180,168
J	9	0.257	19	1046	122,915
J	10	0.266	12	1009	200,000
J	11	0.251	19	1046	105,174
J	12	0.252	20	1050	94,885
J	13	0.246	19	1046	91,645
J	14	0.256	18	1041	134,801
J	15	0.254	25	1068	44,349
J	16	0.254	21	1054	87,648
J	17	0.245	22	1057	55,590
J	18	0.268	19	1046	160,569
J	19	0.258	19	1046	126,048
J	20	0.261	20	1050	120,673
J	21	0.268	18	1041	178,930
J	22	0.257	19	1046	122,915
J	23	0.249	21	1054	75,304
J	24	0.269	20	1050	147,089
J	25	0.266	20	1050	136,752
J	26	0.252	20	1050	94,885
J	27	0.268	19	1046	160,569
J	28	0.254	20	1050	100,298

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
J	29	0.258	20	1050	111,655
J	30	0.259	19	1046	129,235
J	31	0.254	19	1046	113,826
J	32	0.258	20	1050	111,655
J	33	0.259	20	1050	114,612
J	34	0.256	20	1050	105,885
J	35	0.261	19	1046	135,774
J	36	0.272	19	1046	176,231
J	37	0.259	20	1050	114,612
J	38	0.239	24	1064	25,657
J	39	0.260	19	1046	132,476
J	40	0.254	22	1057	75,796
J	41	0.258	20	1050	111,655
J	42	0.252	19	1046	108,011
J	43	0.249	19	1046	99,634
J	44	0.243	20	1050	72,482
J	45	0.245	19	1046	89,064
J	46	0.250	22	1057	66,493
J	47	0.263	21	1054	112,420
J	48	0.245	21	1054	66,065
J	49	0.244	23	1061	43,756
J	50	0.242	24	1064	30,929
J	51	0.251	22	1057	68,768
J	52	0.246	21	1054	68,325
J	53	0.275	19	1046	188,785
J	54	0.253	17	1037	140,493
J	55	0.276	17	1037	200,000
J	56	0.266	18	1041	170,878
J	57	0.265	17	1037	185,789
J	58	0.241	20	1050	67,897
J	59	0.256	19	1046	119,835
J	60	0.254	18	1041	128,324
J	61	0.260	17	1037	165,678
J	62	0.246	20	1050	79,615
J	63	0.262	17	1037	173,492
J	64	0.262	19	1046	139,130
J	65	0.258	21	1054	98,224

Remaining Life Assessment

Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
J	66	0.238	19	1046	72,048
J	67	0.254	19	1046	113,826
J	68	0.258	18	1041	141,507
J	69	0.252	19	1046	108,011
J	70	0.270	17	1037	200,000
J	71	0.260	17	1037	165,678
J	72	0.272	15	1027	200,000
J	73	0.262	16	1032	192,799
J	74	0.259	21	1054	100,974
J	75	0.263	18	1041	159,356
J	76	0.283	16	1032	200,000
J	77	0.268	15	1027	200,000
J	78	0.267	18	1041	174,865
J	79	0.274	16	1032	200,000
J	80	0.273	15	1027	200,000
J	81	0.276	17	1037	200,000
J	82	0.270	17	1037	200,000
J	83	0.267	17	1037	194,396
J	84	0.272	18	1041	196,001
J	85	0.252	18	1041	122,065
J	86	0.257	20	1050	108,747
J	87	0.262	19	1046	139,130
J	88	0.258	20	1050	111,655
J	89	0.246	17	1037	118,233
J	90	0.273	20	1050	161,762
J	91	0.267	17	1037	194,396
J	92	0.272	18	1041	196,001
J	93	0.279	25	1068	103,462
J	94	0.264	18	1041	163,125
J	95	0.264	20	1050	130,155
J	96	0.276	19	1046	193,135
J	97	0.260	19	1046	132,476
J	98	0.275	19	1046	188,785
J	99	0.276	16	1032	200,000
J	100	0.277	18	1041	200,000
J	101	0.272	18	1041	196,001
J	102	0.265	16	1032	200,000

Remaining Life Assessment					
Operating Hours:	260,000	**Project No.:**		43-12-0010	
Pressure:	1200	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.261	**Unit No.:**		2	
Material:	SA-213, T22	**Tube Group:**		HP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element #	**Tube #**	**Wall**	**ID Scale (Mils)**	**Current Temp.**	**Useful Remaining Life Estimate**
J	103	0.277	18	1041	200,000
J	104	0.271	26	1071	70,462
J	105	0.287	14	1021	200,000
J	106	0.256	16	1032	168,250
J	107	0.260	20	1050	117,617
J	108	0.240	15	1027	129,012
J	109	0.279	22	1057	149,105
J	110	0.271	19	1046	172,204
J	111	0.275	17	1037	200,000
J	112	Obstr	Obstr	N/A	N/A
	Min.	0.207	8	976	-37,089
	Max.	0.289	29	1080	200,000
	Average	0.253	20	1049	102,956

APPENDIX F

NONDESTRUCTIVE EXAMINATION REPORTS
LOW-PRESSURE REHEAT OUTLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station
Unit No. 2 - Low-Pressure Reheat Outlet Header
Seam-Welded

The minimum wall thickness requirements were calculated for the Low-Pressure Reheat Outlet header. These calculations are based on the current 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	0.770	
y- Temperature Coefficient	0.700	
A- Additional Thickness	0.000	in

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

t_m=(PD/(2(SEW+PY))+A — 1.172 in

ASME Boiler Tube Minimum Wall Thickness Calculation
AEP - Mitchell Generating Station
Unit No. 2 - Low Pressure Reheat Outlet Tubing

The minimum wall thickness requirements were calculated for the HP Reheat Outlet tubing based upon the current 2010 ASME Boiler and Pressure Vessel Code.

ASME Material Specification: SA-213, Grade T91

Where:

T- Design Temperature	1065	°F
P- Maximum Allowable Pressure	475	psig
D- Outside Diameter	2.25	inches
S- Maximum Allowable Stress Value	12,890	psi
E- Efficiency	0	
e-Thickness Factor	0	inches
y-Temperature Coefficient	0	

The following equation applies:

Tubing:
Minimum Wall Thickness Calculations (Per. ASME, Sect I, PG 27.2.1)

t_{tube}=((PD)/(2S+P))+.005D+e   0.052 inches

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: 03/2012	Job Number: 43-12-0010
Component: Low-Pressure Reheat Outlet Header	Material: SA-387, Gr. 91, Cl. 2	Procedure: TEI 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	
Seam Welds				
LS-1	N/A	No recordable indications.	x	
LS-2	N/A	No recordable indications.	x	
LS-3	N/A	No recordable indications.	x	
LS-4	N/A	No recordable indications.	x	
LS-5	N/A	No recordable indications.	x	
LS-6	N/A	No recordable indications.	x	
LS-7	N/A	No recordable indications.	x	
LS-8	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	
P-5	N/A	No recordable indications.	x	

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

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: Low-Pressure Reheat Outlet Header	Material: SA-387, Gr. 91 CL2	Nominal Wall: 1.875"	Minimum Wall: 1.172"

EQUIPMENT USED:

- [x] D-Meter
- [x] Pi-Tape
- [ ] Other
- [ ] Micrometer
- [ ] calipers

KEY:

IDENTIFICATION		CONFIGURATION	DIAMETER PI TAPE	THICKNESS MEASUREMENTS 12:00	3:00	6:00	9:00
GW-1	North	End Cap	50.688	1.891	1.971	1.904	1.934
	South	Pipe	50.609	1.885	1.881	1.881	1.904
GW-2	North	Pipe	50.719	1.894	1.889	1.920	1.891
	South	Pipe	50.703	1.898	1.887	1.896	1.884
GW-3	North	Pipe	50.734	1.887	1.877	1.873	1.891
	South	Pipe	50.719	1.937	1.917	1.905	1.918
GW-4	North	Pipe	50.625	1.932	1.909	1.937	1.917
	South	Pipe	50.609	1.914	1.889	1.916	1.885
GW-5	North	Pipe	50.484	1.933	1.888	1.908	1.892
	South	Pipe	50.516	1.935	1.917	1.886	1.943
GW-6	North	Pipe	50.641	1.939	1.912	1.934	1.921
	South	Pipe	50.719	1.934	1.914	1.938	1.932
GW-7	North	Pipe	50.641	2.090	1.918	1.916	1.949
	South	Pipe	50.625	1.917	1.892	1.884	1.894
GW-8	North	Pipe	50.672	1.886	1.872	1.901	1.884
	South	Pipe	50.672	1.903	1.904	1.909	1.910
				Min	1.872		
				Max	2.090		
				Avg	1.910		

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/23/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-1
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-End Cap
		Part Thickness:	2.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

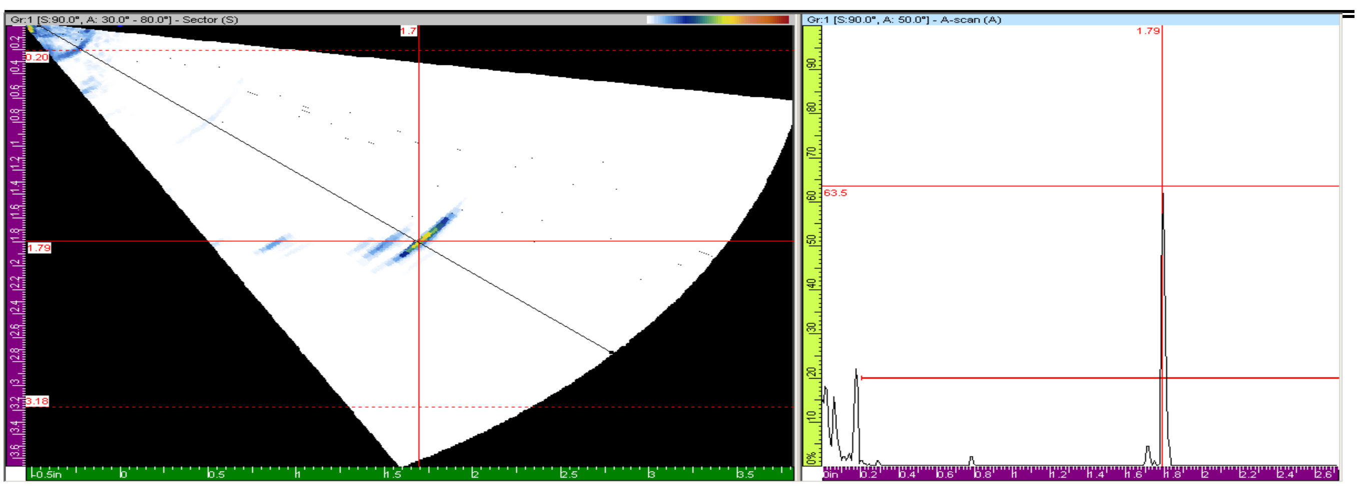
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
7.660us	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**
80(volts)	33dB	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	3.0in	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:** **4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
Machine Information		**Part Thickness:**	2.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

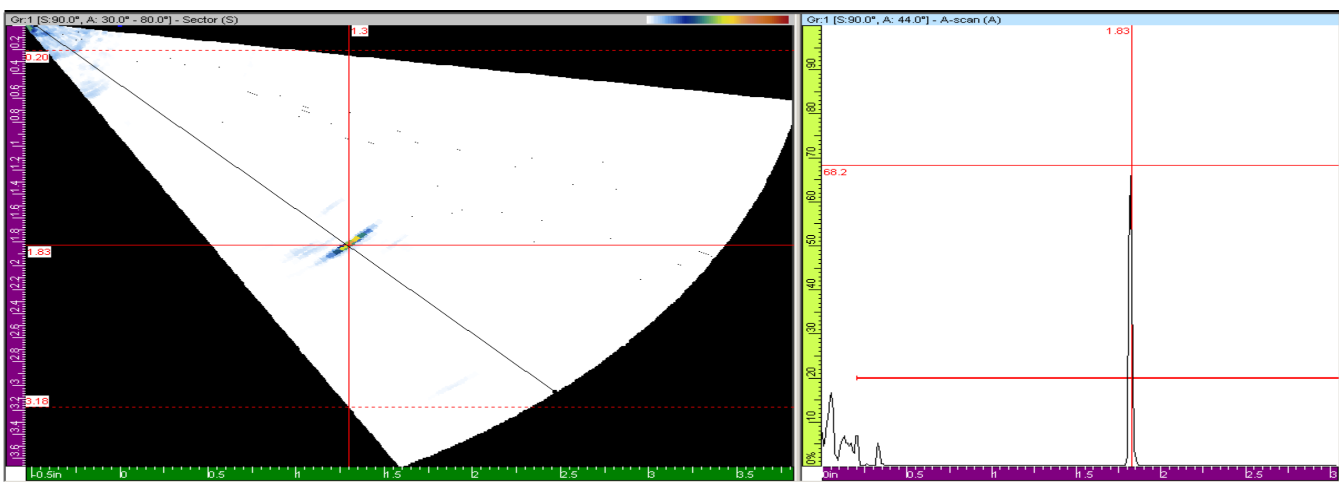
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
7.660us	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**
80(volts)	33dB	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	3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
Small indication detected at the 7:00 o'clock position shown in figure 1.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
		Part Thickness:	2.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

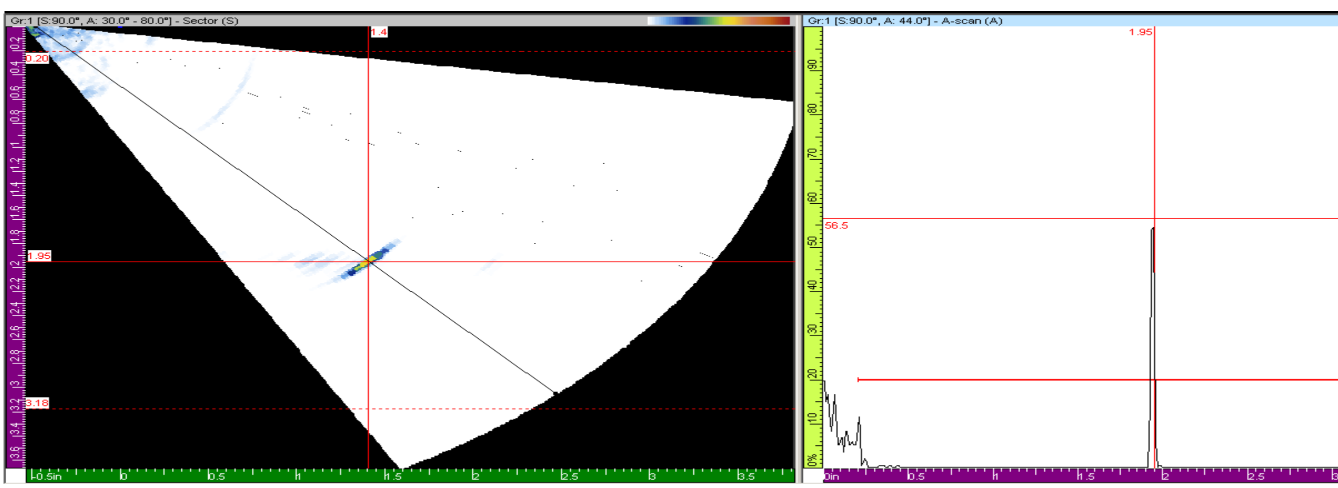
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
7.660us	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**
80(volts)	33dB	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	3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-4
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
Machine Information		**Part Thickness:**	2.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

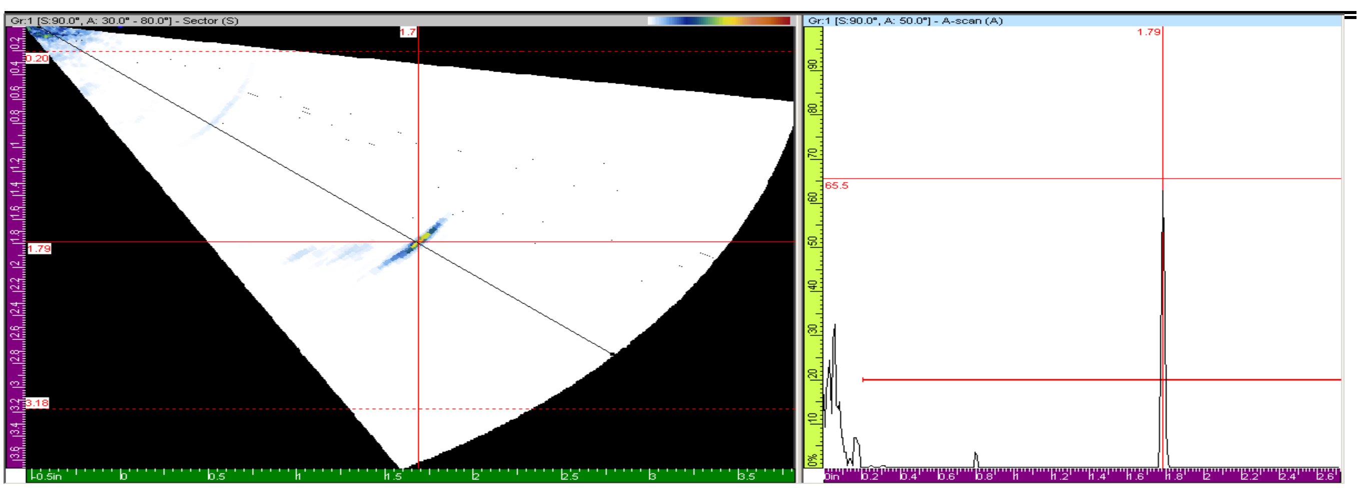
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
7.660us	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**
80(volts)	33dB	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	3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-5
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Heade-to-Header
		Part Thickness:	2.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

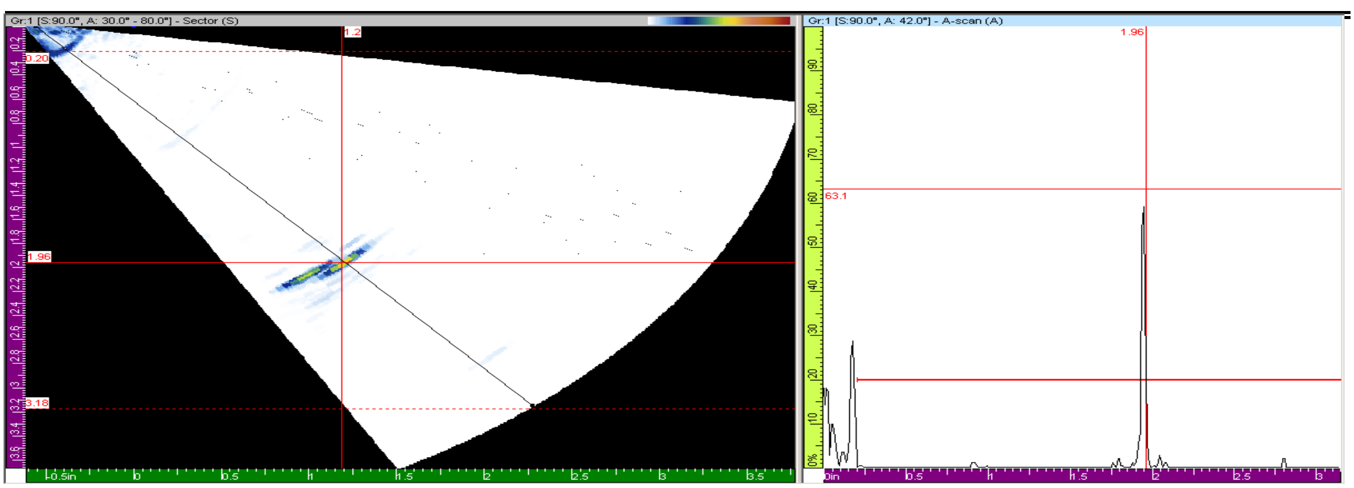
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
7.660us	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**
80(volts)	33dB	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	3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-6
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
		Part Thickness:	2.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

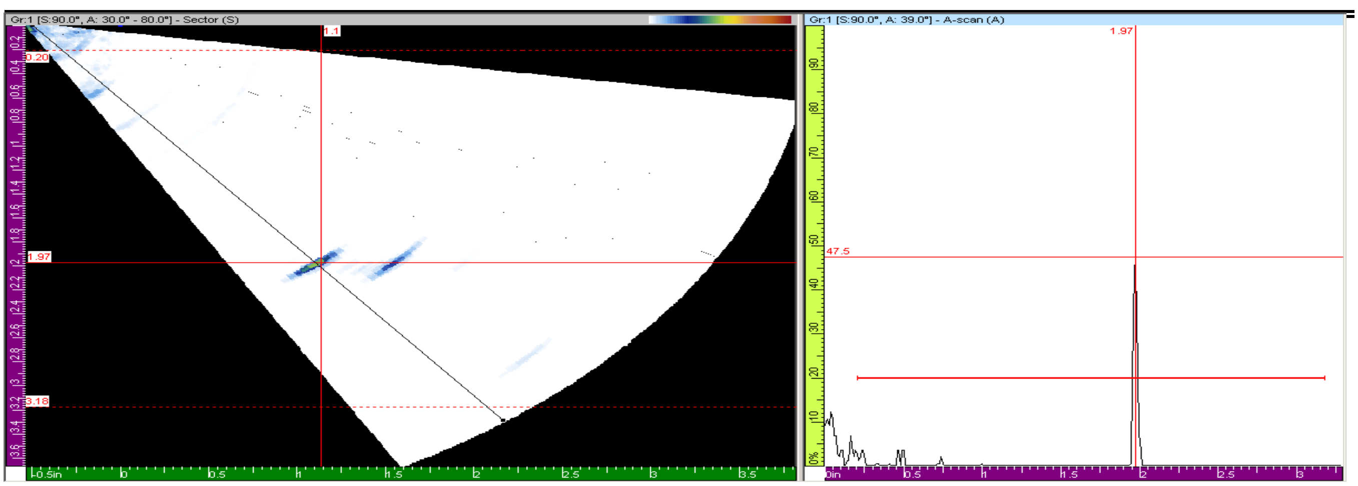
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
7.660us	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**
80(volts)	33dB	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	3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
Small indication detected at the 7:00 o'clock position shown in figure 2.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Component: AEP

Weld Number: 2

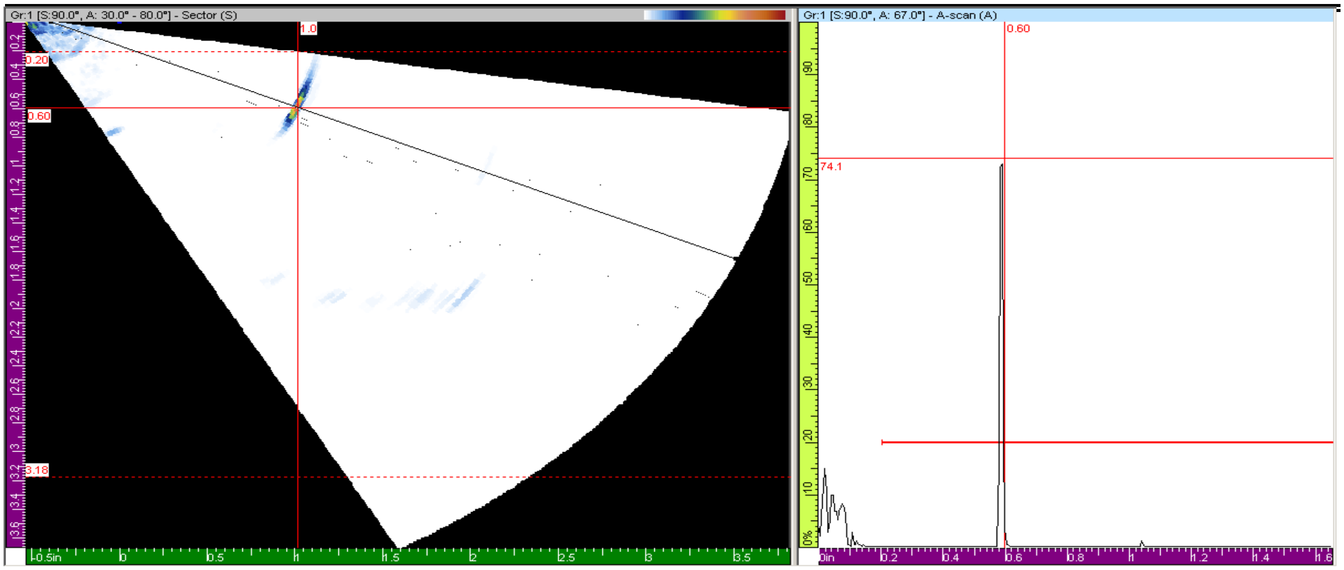


Figure 1

Indication Comments and Location:

Located at the 7:00 o'clock position / Less than 1/2" in length and was 0.600" deep from the outside surface/Indication inclusion from original fabrication.

Component: Low-Pressure Reheat Outlet Header

Weld Number: LP-HROH-GW-6

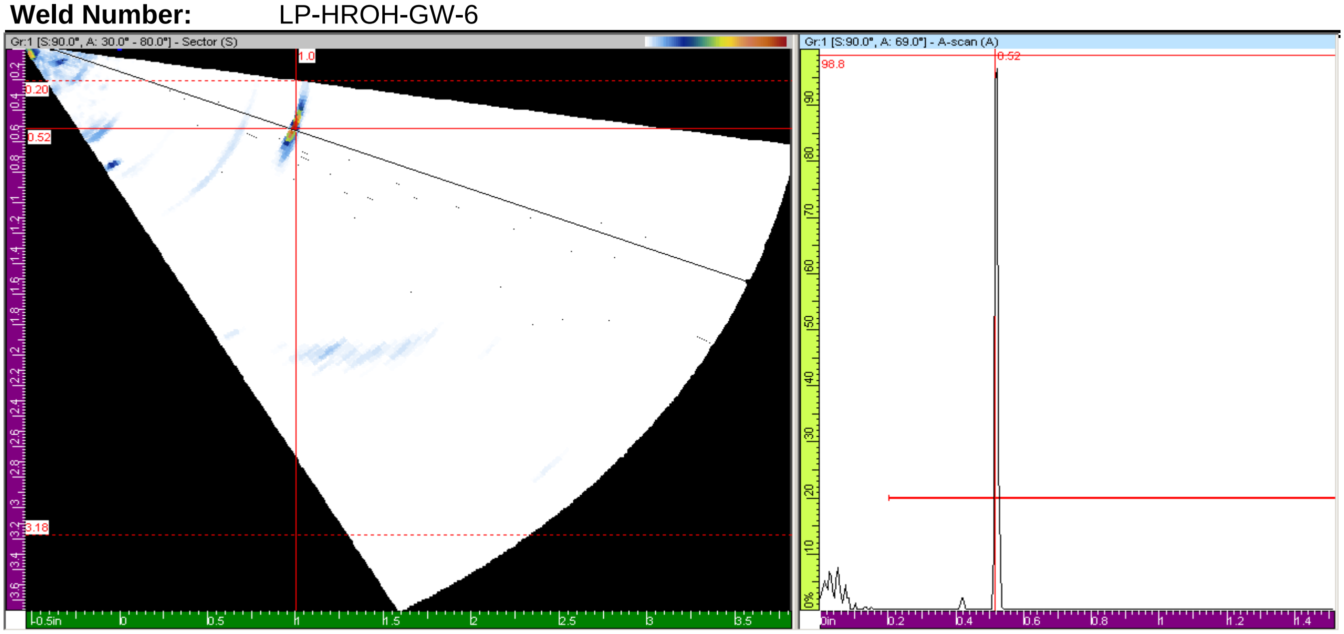


Figure 2

Indication Comments and Location:

Located at the 4:00 o'clock position / Less than 1/2" in length and was 0.500" deep from the outside surface/indication inclusion from original fabrication.

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-7
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
		Part Thickness:	2.0"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

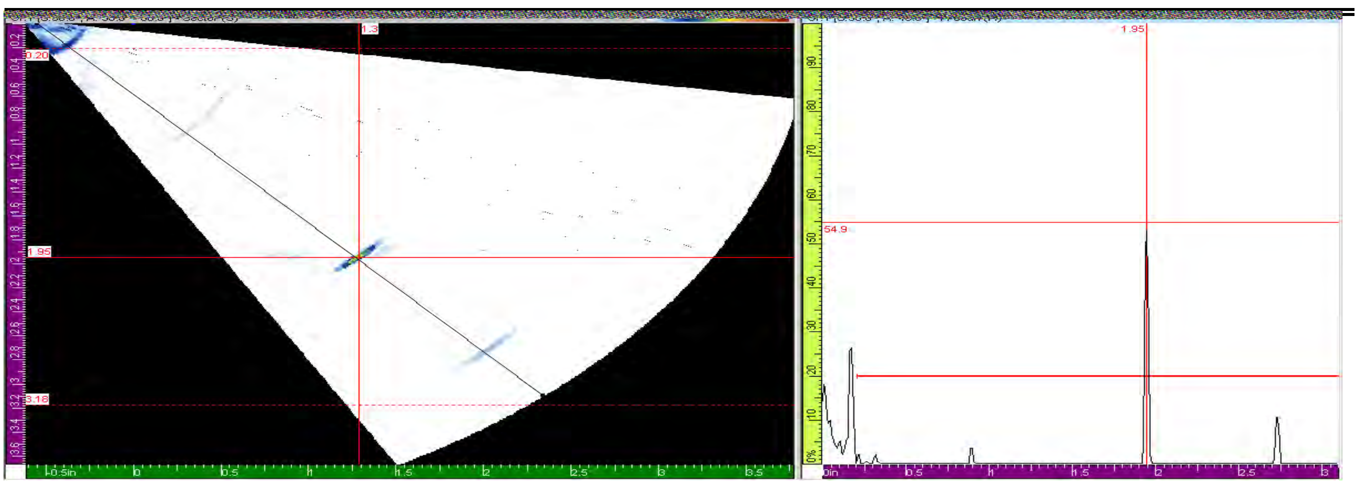
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
7.660us	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**
80(volts)	33dB	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	3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs and hanger clamp.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	LP-HROH-GW-8
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header-to-Header
Machine Information		**Part Thickness:**	2.0"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterization

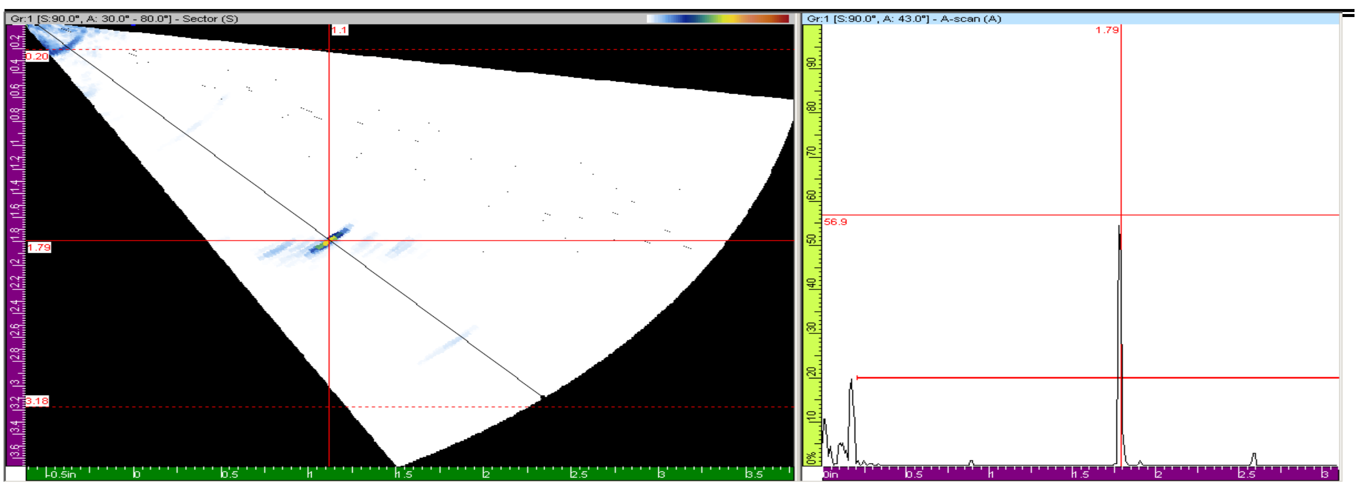
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A10	G1745	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
7.660us	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**
80(volts)	33dB	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	3.0in	0.126 in/us



COMMENTS:

Image of typical 360° non-relevant root signal / Root geometry
Limited scanning accessibility due to tube stubs
No Relevant Indications Detected

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**4/3/2012**

THIELSCH ENGINEERING

Phased Array Calibration

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	See Attached Report
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Longitudinal Seam
		Part Thickness:	2.0"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Calibration ID#
Omni Scan MX	Omni-1179	Scan:Omni-2.0R5 Analysis:TomoView-2.4R1	8/12	4212-2.0

Probe Characterization

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A10/A1	C0055/G1745	5MHz	55 Degrees	0.378 in

Setup

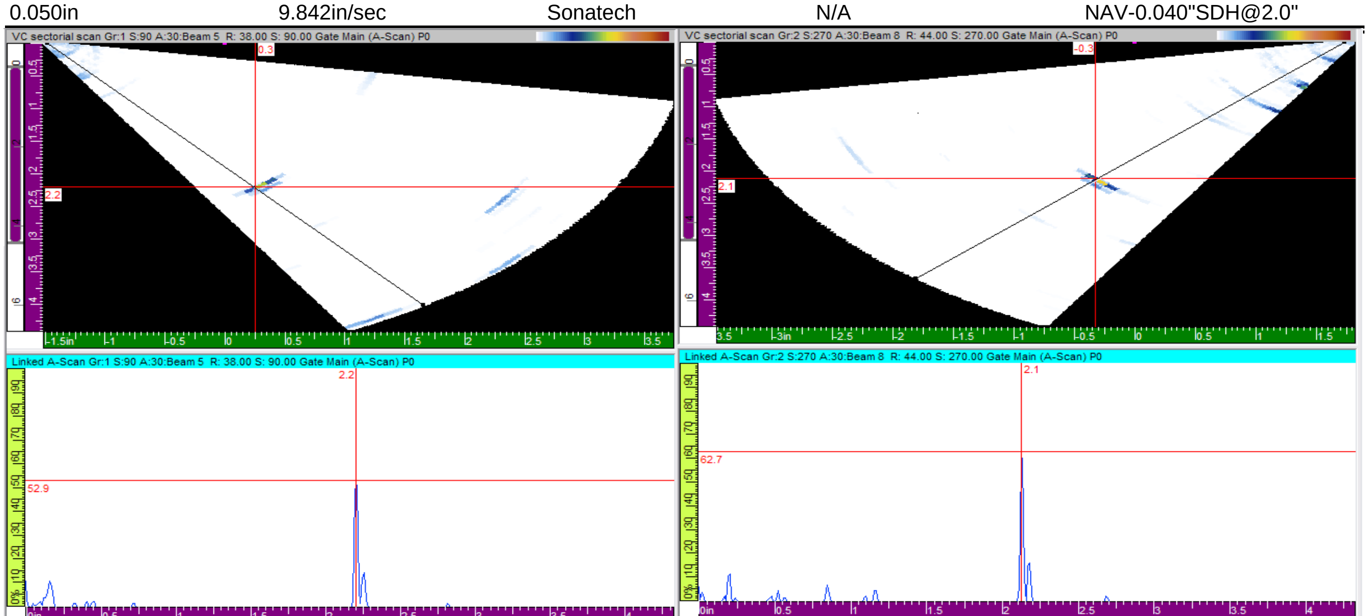
Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
9.878/10.858us	0.000in	4.082/4.082in	90/90	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	20/20	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(High)	23/26dB	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	1.0 Degrees	2.0"	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	N/A	NAV-0.040"SDH@2.0"



Date / Time	Date / Time	Date / Time	Date / Time	Date / Time
4/3-7AM				

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **4/2/2012**

THIELSCH ENGINEERING

Phased Array Report

Customer:	AEP	**Component:**	Low-Pressure Reheat Outlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Line Identification:**	Low Pressure-Hot Reheat
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Longitudinal Seam
Calibration ID #:	4212-2.0	**Part Thickness:**	2.0"
		Part Diameter:	50"

Weld #	Indication	Scan Location	Range of Depth	Comments / Obstructions
LS-1	No Relevant Indications Detected			See NOTE Below
LS-2	No Relevant Indications Detected			See NOTE Below
LS-3	No Relevant Indications Detected			See NOTE Below
LS-4	No Relevant Indications Detected			See NOTE Below
LS-5	No Relevant Indications Detected			See NOTE Below
LS-6	No Relevant Indications Detected			See NOTE Below
LS-7	No Relevant Indications Detected			See NOTE Below
LS-8	No Relevant Indications Detected			See NOTE Below

Notes and Comments

High amplitude root signals were detected on all seam welds inspected/signal was at the inside surface and had no through thickness dimension / Indication was excessive root cap on inside surface and was verified by borosonic examination / Examples of typical signals can be seen in figures 3 and 4.

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **4/3/2012**

THIELSCH ENGINEERING

Phased-Array Report

Component: Low-Pressure- Reheat Outlet Header
Weld Number: Typical inside of all seam welds

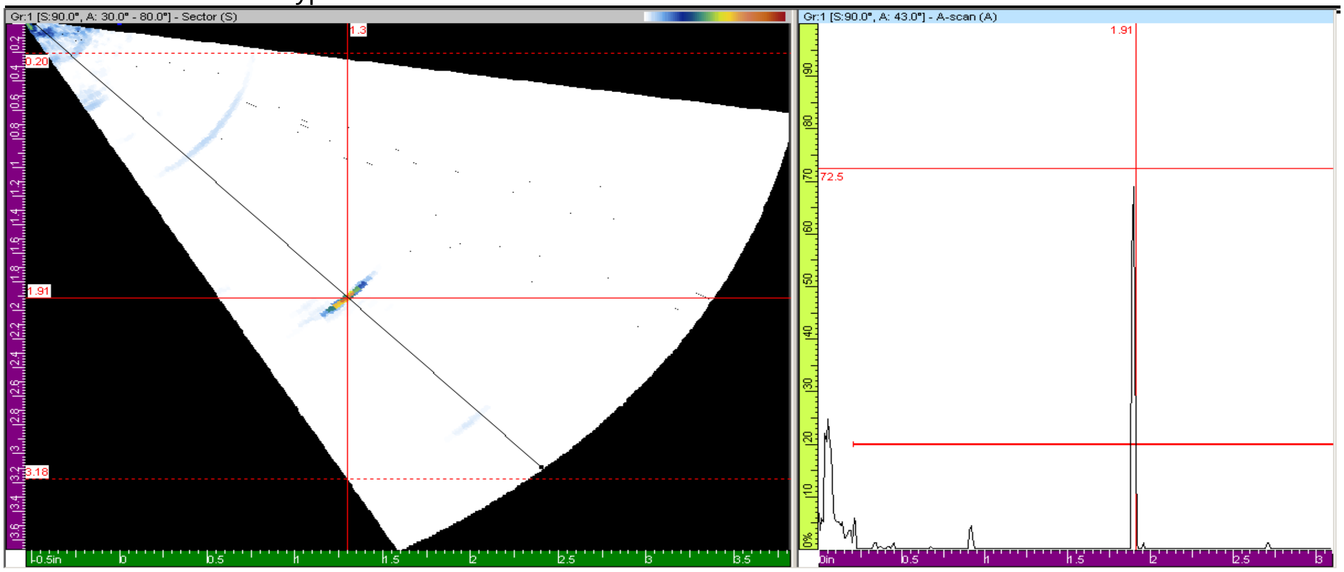


Figure 3

Indication Comments and Location:
Typical root signal found on all seams inspected/root geometry/visually verified by internal examination.

Component: Low-Pressure- Reheat Outlet Header
Weld Number: Typical inside of all seam welds

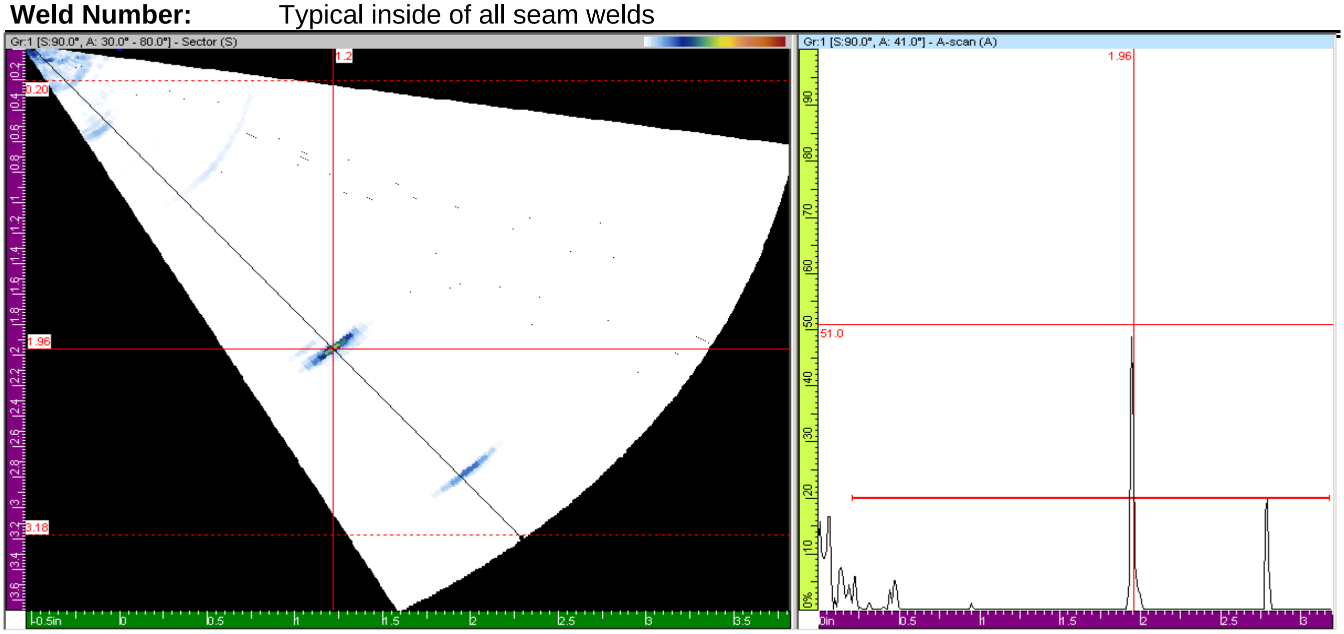


Figure 4

Indication Comments and Location:
Typical root signal found on all seams inspected/root geometry/visually verified by internal examination.

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
A	1	0.204	1	823	200,000
A	2	0.201	1	823	200,000
A	3	0.182	1	823	200,000
A	4	0.194	1	823	200,000
A	5	0.189	1	823	200,000
A	6	0.178	1	823	200,000
A	7	0.203	1	823	200,000
A	8	0.193	1	823	200,000
A	9	0.199	1	823	200,000
A	10	0.181	1	823	200,000
A	11	0.207	1	823	200,000
A	12	0.188	1	823	200,000
A	13	0.199	1	823	200,000
A	14	0.209	1	823	200,000
A	15	0.200	1	823	200,000
A	16	0.196	1	823	200,000
A	17	0.193	1	823	200,000
A	18	0.207	1	823	200,000
A	19	0.194	1	823	200,000
A	20	0.193	1	823	200,000
A	21	0.198	1	823	200,000
A	22	0.189	1	823	200,000
A	23	0.185	1	823	200,000
A	24	0.192	1	823	200,000
A	25	0.192	1	823	200,000
A	26	0.187	1	823	200,000
A	27	0.190	1	823	200,000
A	28	0.202	1	823	200,000
A	29	0.202	1	823	200,000
A	30	0.187	1	823	200,000
A	31	0.196	1	823	200,000
A	32	0.200	1	823	200,000
A	33	0.182	1	823	200,000
A	34	0.195	1	823	200,000
A	35	0.208	1	823	200,000
A	36	0.202	1	823	200,000
A	37	0.192	1	823	200,000
A	38	0.193	1	823	200,000
A	39	0.188	1	823	200,000
A	40	0.191	1	823	200,000
A	41	0.186	1	823	200,000
A	42	0.188	1	823	200,000
A	43	0.201	1	823	200,000
A	44	0.195	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
A	45	0.197	1	823	200,000
A	46	0.195	1	823	200,000
A	47	0.184	1	823	200,000
A	48	0.190	1	823	200,000
A	49	0.198	1	823	200,000
A	50	0.190	1	823	200,000
A	51	0.171	1	823	200,000
A	52	0.199	1	823	200,000
A	53	0.182	1	823	200,000
A	54	0.196	1	823	200,000
A	55	0.178	1	823	200,000
A	56	0.191	1	823	200,000
A	57	0.199	1	823	200,000
A	58	0.191	1	823	200,000
A	59	0.189	1	823	200,000
A	60	0.191	1	823	200,000
A	61	0.190	1	823	200,000
A	62	0.198	1	823	200,000
A	63	0.193	1	823	200,000
A	64	0.193	1	823	200,000
A	65	0.193	1	823	200,000
A	66	0.193	1	823	200,000
A	67	0.214	1	823	200,000
A	68	0.193	1	823	200,000
A	69	0.223	1	823	200,000
A	70	0.210	1	823	200,000
A	71	0.211	1	823	200,000
A	72	0.200	1	823	200,000
A	73	0.223	1	823	200,000
A	74	0.198	1	823	200,000
A	75	0.200	1	823	200,000
A	76	0.197	1	823	200,000
A	77	0.207	1	823	200,000
A	78	0.208	1	823	200,000
A	79	0.197	1	823	200,000
A	80	0.196	1	823	200,000
A	81	0.209	1	823	200,000
A	82	0.204	1	823	200,000
A	83	0.201	1	823	200,000
A	84	0.199	1	823	200,000
A	85	0.221	1	823	200,000
A	86	0.202	1	823	200,000
A	87	0.193	1	823	200,000
A	88	0.211	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
A	89	0.202	1	823	200,000
A	90	0.198	1	823	200,000
A	91	0.191	1	823	200,000
A	92	0.193	1	823	200,000
A	93	0.192	1	823	200,000
A	94	0.200	1	823	200,000
A	95	0.190	1	823	200,000
A	96	0.187	1	823	200,000
A	97	0.191	1	823	200,000
A	98	0.181	1	823	200,000
A	99	0.188	1	823	200,000
A	100	0.184	1	823	200,000
A	101	0.186	1	823	200,000
A	102	0.181	1	823	200,000
A	103	0.191	1	823	200,000
A	104	0.188	1	823	200,000
A	105	0.182	1	823	200,000
A	106	0.192	1	823	200,000
A	107	0.186	1	823	200,000
A	108	0.186	1	823	200,000
A	109	0.197	1	823	200,000
A	110	0.179	1	823	200,000
A	111	0.180	1	823	200,000
A	112	0.199	1	823	200,000
B	1	0.180	1	823	200,000
B	2	0.181	1	823	200,000
B	3	0.196	1	823	200,000
B	4	0.189	1	823	200,000
B	5	0.181	1	823	200,000
B	6	0.193	1	823	200,000
B	7	0.182	1	823	200,000
B	8	0.198	1	823	200,000
B	9	0.186	1	823	200,000
B	10	0.186	1	823	200,000
B	11	0.176	1	823	200,000
B	12	0.177	1	823	200,000
B	13	0.200	1	823	200,000
B	14	0.197	1	823	200,000
B	15	0.198	1	823	200,000
B	16	0.194	1	823	200,000
B	17	0.193	1	823	200,000
B	18	0.200	1	823	200,000
B	19	0.202	1	823	200,000
B	20	0.192	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
B	21	0.187	1	823	200,000
B	22	0.181	1	823	200,000
B	23	0.186	1	823	200,000
B	24	0.186	1	823	200,000
B	25	0.198	1	823	200,000
B	26	0.186	1	823	200,000
B	27	0.202	1	823	200,000
B	28	0.191	1	823	200,000
B	29	0.190	1	823	200,000
B	30	0.192	1	823	200,000
B	31	0.205	1	823	200,000
B	32	0.185	1	823	200,000
B	33	0.188	1	823	200,000
B	34	0.197	1	823	200,000
B	35	0.191	1	823	200,000
B	36	0.189	1	823	200,000
B	37	0.185	1	823	200,000
B	38	0.196	1	823	200,000
B	39	0.187	1	823	200,000
B	40	0.185	1	823	200,000
B	41	0.187	1	823	200,000
B	42	0.200	1	823	200,000
B	43	0.182	1	823	200,000
B	44	0.192	1	823	200,000
B	45	0.198	1	823	200,000
B	46	0.190	1	823	200,000
B	47	0.180	1	823	200,000
B	48	0.179	1	823	200,000
B	49	0.186	1	823	200,000
B	50	0.191	1	823	200,000
B	51	0.182	1	823	200,000
B	52	0.184	1	823	200,000
B	53	0.171	1	823	200,000
B	54	0.194	1	823	200,000
B	55	0.190	1	823	200,000
B	56	0.192	1	823	200,000
B	57	0.176	1	823	200,000
B	58	0.183	1	823	200,000
B	59	0.181	1	823	200,000
B	60	0.166	1	823	200,000
B	61	0.178	1	823	200,000
B	62	0.192	1	823	200,000
B	63	0.180	1	823	200,000
B	64	0.190	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
B	65	0.175	1	823	200,000
B	66	0.190	1	823	200,000
B	67	0.191	1	823	200,000
B	68	0.199	1	823	200,000
B	69	0.198	1	823	200,000
B	70	0.200	1	823	200,000
B	71	0.196	1	823	200,000
B	72	0.195	1	823	200,000
B	73	0.211	1	823	200,000
B	74	0.202	1	823	200,000
B	75	0.195	1	823	200,000
B	76	0.189	1	823	200,000
B	77	0.190	1	823	200,000
B	78	0.194	1	823	200,000
B	79	0.199	1	823	200,000
B	80	0.206	1	823	200,000
B	81	0.213	1	823	200,000
B	82	0.199	1	823	200,000
B	83	0.189	1	823	200,000
B	84	0.191	1	823	200,000
B	85	0.202	1	823	200,000
B	86	0.205	1	823	200,000
B	87	0.188	1	823	200,000
B	88	0.201	1	823	200,000
B	89	0.196	1	823	200,000
B	90	0.204	1	823	200,000
B	91	0.202	1	823	200,000
B	92	0.191	1	823	200,000
B	93	0.198	1	823	200,000
B	94	0.185	1	823	200,000
B	95	0.200	1	823	200,000
B	96	0.186	1	823	200,000
B	97	0.196	1	823	200,000
B	98	0.182	1	823	200,000
B	99	0.178	1	823	200,000
B	100	0.191	1	823	200,000
B	101	0.187	1	823	200,000
B	102	0.198	1	823	200,000
B	103	0.174	1	823	200,000
B	104	0.192	1	823	200,000
B	105	0.175	1	823	200,000
B	106	0.190	1	823	200,000
B	107	0.187	1	823	200,000
B	108	0.175	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
B	109	0.190	1	823	200,000
B	110	0.183	1	823	200,000
B	111	0.187	1	823	200,000
B	112	0.185	1	823	200,000
C	1	0.169	1	823	200,000
C	2	0.187	1	823	200,000
C	3	0.183	1	823	200,000
C	4	0.189	1	823	200,000
C	5	0.186	1	823	200,000
C	6	0.186	1	823	200,000
C	7	0.193	1	823	200,000
C	8	0.179	1	823	200,000
C	9	0.183	1	823	200,000
C	10	0.186	1	823	200,000
C	11	0.207	1	823	200,000
C	12	0.189	1	823	200,000
C	13	0.195	1	823	200,000
C	14	0.187	1	823	200,000
C	15	0.177	1	823	200,000
C	16	0.186	1	823	200,000
C	17	0.186	1	823	200,000
C	18	0.195	1	823	200,000
C	19	0.190	1	823	200,000
C	20	0.185	1	823	200,000
C	21	0.181	1	823	200,000
C	22	0.203	1	823	200,000
C	23	0.191	1	823	200,000
C	24	0.194	1	823	200,000
C	25	0.184	1	823	200,000
C	26	0.200	1	823	200,000
C	27	0.187	1	823	200,000
C	28	0.184	1	823	200,000
C	29	0.184	1	823	200,000
C	30	0.193	1	823	200,000
C	31	0.198	1	823	200,000
C	32	0.181	1	823	200,000
C	33	0.186	1	823	200,000
C	34	0.198	1	823	200,000
C	35	0.196	1	823	200,000
C	36	0.186	1	823	200,000
C	37	0.196	1	823	200,000
C	38	0.182	1	823	200,000
C	39	0.194	1	823	200,000
C	40	0.184	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
C	41	0.188	1	823	200,000
C	42	0.183	1	823	200,000
C	43	0.173	1	823	200,000
C	44	0.183	1	823	200,000
C	45	0.182	1	823	200,000
C	46	0.189	1	823	200,000
C	47	0.188	1	823	200,000
C	48	0.193	1	823	200,000
C	49	0.191	1	823	200,000
C	50	0.175	1	823	200,000
C	51	0.183	1	823	200,000
C	52	0.173	1	823	200,000
C	53	0.188	1	823	200,000
C	54	0.180	1	823	200,000
C	55	0.192	1	823	200,000
C	56	0.185	1	823	200,000
C	57	0.191	1	823	200,000
C	58	0.178	1	823	200,000
C	59	0.186	1	823	200,000
C	60	0.187	1	823	200,000
C	61	0.177	1	823	200,000
C	62	0.180	1	823	200,000
C	63	0.196	1	823	200,000
C	64	0.184	1	823	200,000
C	65	0.188	1	823	200,000
C	66	0.186	1	823	200,000
C	67	0.182	1	823	200,000
C	68	0.187	1	823	200,000
C	69	0.200	1	823	200,000
C	70	0.201	1	823	200,000
C	71	0.192	1	823	200,000
C	72	0.175	1	823	200,000
C	73	0.189	1	823	200,000
C	74	0.183	1	823	200,000
C	75	0.180	1	823	200,000
C	76	0.189	1	823	200,000
C	77	0.179	1	823	200,000
C	78	0.194	1	823	200,000
C	79	0.190	1	823	200,000
C	80	0.174	1	823	200,000
C	81	0.192	1	823	200,000
C	82	0.179	1	823	200,000
C	83	0.181	1	823	200,000
C	84	0.182	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
C	85	0.183	1	823	200,000
C	86	0.186	1	823	200,000
C	87	0.177	1	823	200,000
C	88	0.175	1	823	200,000
C	89	0.182	1	823	200,000
C	90	0.185	1	823	200,000
C	91	0.181	1	823	200,000
C	92	0.194	1	823	200,000
C	93	0.189	1	823	200,000
C	94	0.196	1	823	200,000
C	95	0.198	1	823	200,000
C	96	0.184	1	823	200,000
C	97	0.186	1	823	200,000
C	98	0.172	1	823	200,000
C	99	0.178	1	823	200,000
C	100	0.186	1	823	200,000
C	101	0.186	1	823	200,000
C	102	0.183	1	823	200,000
C	103	0.189	1	823	200,000
C	104	0.190	1	823	200,000
C	105	0.184	1	823	200,000
C	106	0.193	1	823	200,000
C	107	0.187	1	823	200,000
C	108	0.175	1	823	200,000
C	109	0.179	1	823	200,000
C	110	0.193	1	823	200,000
C	111	0.192	1	823	200,000
C	112	0.194	1	823	200,000
D	1	0.191	1	823	200,000
D	2	0.182	1	823	200,000
D	3	0.193	1	823	200,000
D	4	0.168	1	823	200,000
D	5	0.170	1	823	200,000
D	6	0.177	1	823	200,000
D	7	0.184	1	823	200,000
D	8	0.177	1	823	200,000
D	9	0.184	1	823	200,000
D	10	0.167	1	823	200,000
D	11	0.186	1	823	200,000
D	12	0.198	1	823	200,000
D	13	0.194	1	823	200,000
D	14	0.199	1	823	200,000
D	15	0.200	1	823	200,000
D	16	0.199	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
D	17	0.197	1	823	200,000
D	18	0.179	1	823	200,000
D	19	0.191	1	823	200,000
D	20	0.184	1	823	200,000
D	21	0.199	1	823	200,000
D	22	0.195	1	823	200,000
D	23	0.185	1	823	200,000
D	24	0.194	1	823	200,000
D	25	0.187	1	823	200,000
D	26	0.184	1	823	200,000
D	27	0.182	1	823	200,000
D	28	0.195	1	823	200,000
D	29	0.196	1	823	200,000
D	30	0.184	1	823	200,000
D	31	0.181	1	823	200,000
D	32	0.190	1	823	200,000
D	33	0.186	1	823	200,000
D	34	0.185	1	823	200,000
D	35	0.184	1	823	200,000
D	36	0.194	1	823	200,000
D	37	0.184	1	823	200,000
D	38	0.207	1	823	200,000
D	39	0.184	1	823	200,000
D	40	0.166	1	823	200,000
D	41	0.195	1	823	200,000
D	42	0.177	1	823	200,000
D	43	0.183	1	823	200,000
D	44	0.177	1	823	200,000
D	45	0.175	1	823	200,000
D	46	0.188	1	823	200,000
D	47	0.188	1	823	200,000
D	48	0.178	1	823	200,000
D	49	0.200	1	823	200,000
D	50	0.189	1	823	200,000
D	51	0.182	1	823	200,000
D	52	0.177	1	823	200,000
D	53	0.174	1	823	200,000
D	54	0.173	1	823	200,000
D	55	0.190	1	823	200,000
D	56	0.191	1	823	200,000
D	57	0.189	1	823	200,000
D	58	0.182	1	823	200,000
D	59	0.184	1	823	200,000
D	60	0.198	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
D	61	0.194	1	823	200,000
D	62	0.200	1	823	200,000
D	63	0.206	1	823	200,000
D	64	0.203	1	823	200,000
D	65	0.196	1	823	200,000
D	66	0.198	1	823	200,000
D	67	0.196	1	823	200,000
D	68	0.198	1	823	200,000
D	69	0.185	1	823	200,000
D	70	0.195	1	823	200,000
D	71	0.178	1	823	200,000
D	72	0.189	1	823	200,000
D	73	0.201	1	823	200,000
D	74	0.191	1	823	200,000
D	75	0.191	1	823	200,000
D	76	0.196	1	823	200,000
D	77	0.191	1	823	200,000
D	78	0.181	1	823	200,000
D	79	0.199	1	823	200,000
D	80	0.191	1	823	200,000
D	81	0.198	1	823	200,000
D	82	0.185	1	823	200,000
D	83	0.193	1	823	200,000
D	84	0.186	1	823	200,000
D	85	0.192	1	823	200,000
D	86	0.197	1	823	200,000
D	87	0.188	1	823	200,000
D	88	0.186	1	823	200,000
D	89	0.195	1	823	200,000
D	90	0.200	1	823	200,000
D	91	0.182	1	823	200,000
D	92	0.183	1	823	200,000
D	93	0.182	1	823	200,000
D	94	0.198	1	823	200,000
D	95	0.194	1	823	200,000
D	96	0.181	1	823	200,000
D	97	0.198	1	823	200,000
D	98	0.187	1	823	200,000
D	99	0.198	1	823	200,000
D	100	0.193	1	823	200,000
D	101	0.184	1	823	200,000
D	102	0.193	1	823	200,000
D	103	0.185	1	823	200,000
D	104	0.191	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
D	105	0.191	1	823	200,000
D	106	0.185	1	823	200,000
D	107	0.179	1	823	200,000
D	108	0.189	1	823	200,000
D	109	0.191	1	823	200,000
D	110	0.194	1	823	200,000
D	111	0.193	1	823	200,000
D	112	0.191	1	823	200,000
E	1	0.179	1	823	200,000
E	2	0.180	1	823	200,000
E	3	0.181	1	823	200,000
E	4	0.180	1	823	200,000
E	5	0.176	1	823	200,000
E	6	0.182	1	823	200,000
E	7	0.198	1	823	200,000
E	8	0.189	1	823	200,000
E	9	0.192	1	823	200,000
E	10	0.194	1	823	200,000
E	11	0.198	1	823	200,000
E	12	0.198	1	823	200,000
E	13	0.185	1	823	200,000
E	14	0.200	1	823	200,000
E	15	0.201	1	823	200,000
E	16	0.188	1	823	200,000
E	17	0.193	1	823	200,000
E	18	0.192	1	823	200,000
E	19	0.188	1	823	200,000
E	20	0.200	1	823	200,000
E	21	0.190	1	823	200,000
E	22	0.203	1	823	200,000
E	23	0.196	1	823	200,000
E	24	0.201	1	823	200,000
E	25	0.191	1	823	200,000
E	26	0.196	1	823	200,000
E	27	0.200	1	823	200,000
E	28	0.198	1	823	200,000
E	29	0.193	1	823	200,000
E	30	0.185	1	823	200,000
E	31	0.185	1	823	200,000
E	32	0.200	1	823	200,000
E	33	0.205	1	823	200,000
E	34	0.182	1	823	200,000
E	35	0.197	1	823	200,000
E	36	0.184	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
E	37	0.189	1	823	200,000
E	38	0.195	1	823	200,000
E	39	0.190	1	823	200,000
E	40	0.190	1	823	200,000
E	41	0.212	1	823	200,000
E	42	0.182	1	823	200,000
E	43	0.187	1	823	200,000
E	44	0.189	1	823	200,000
E	45	0.178	1	823	200,000
E	46	0.190	1	823	200,000
E	47	0.168	1	823	200,000
E	48	0.180	1	823	200,000
E	49	0.176	1	823	200,000
E	50	0.185	1	823	200,000
E	51	0.176	1	823	200,000
E	52	0.172	1	823	200,000
E	53	0.189	1	823	200,000
E	54	0.186	1	823	200,000
E	55	0.181	1	823	200,000
E	56	0.198	1	823	200,000
E	57	0.198	1	823	200,000
E	58	0.175	1	823	200,000
E	59	0.180	1	823	200,000
E	60	0.186	1	823	200,000
E	61	0.194	1	823	200,000
E	62	0.184	1	823	200,000
E	63	0.184	1	823	200,000
E	64	0.177	1	823	200,000
E	65	0.180	1	823	200,000
E	66	0.197	1	823	200,000
E	67	0.196	1	823	200,000
E	68	0.191	1	823	200,000
E	69	0.196	1	823	200,000
E	70	0.198	1	823	200,000
E	71	0.194	1	823	200,000
E	72	0.191	1	823	200,000
E	73	0.180	1	823	200,000
E	74	0.182	1	823	200,000
E	75	0.194	1	823	200,000
E	76	0.194	1	823	200,000
E	77	0.188	1	823	200,000
E	78	0.195	1	823	200,000
E	79	0.197	1	823	200,000
E	80	0.193	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
E	81	0.183	1	823	200,000
E	82	0.182	1	823	200,000
E	83	0.173	1	823	200,000
E	84	0.184	1	823	200,000
E	85	0.189	1	823	200,000
E	86	0.192	1	823	200,000
E	87	0.188	1	823	200,000
E	88	0.186	1	823	200,000
E	89	0.182	1	823	200,000
E	90	0.200	1	823	200,000
E	91	0.188	1	823	200,000
E	92	0.199	1	823	200,000
E	93	0.179	1	823	200,000
E	94	0.198	1	823	200,000
E	95	0.196	1	823	200,000
E	96	0.199	1	823	200,000
E	97	0.189	1	823	200,000
E	98	0.196	1	823	200,000
E	99	0.189	1	823	200,000
E	100	0.188	1	823	200,000
E	101	0.186	1	823	200,000
E	102	0.190	1	823	200,000
E	103	0.182	1	823	200,000
E	104	0.187	1	823	200,000
E	105	0.180	1	823	200,000
E	106	0.172	1	823	200,000
E	107	0.193	1	823	200,000
E	108	0.193	1	823	200,000
E	109	0.169	1	823	200,000
E	110	0.181	1	823	200,000
E	111	0.180	1	823	200,000
E	112	0.200	1	823	200,000
F	1	0.194	1	823	200,000
F	2	0.196	1	823	200,000
F	3	0.191	1	823	200,000
F	4	0.197	1	823	200,000
F	5	0.182	1	823	200,000
F	6	0.186	1	823	200,000
F	7	0.183	1	823	200,000
F	8	0.200	1	823	200,000
F	9	0.195	1	823	200,000
F	10	0.198	1	823	200,000
F	11	0.198	1	823	200,000
F	12	0.213	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
F	13	0.184	1	823	200,000
F	14	0.210	1	823	200,000
F	15	0.208	1	823	200,000
F	16	0.198	1	823	200,000
F	17	0.187	1	823	200,000
F	18	0.194	1	823	200,000
F	19	0.186	1	823	200,000
F	20	0.186	1	823	200,000
F	21	0.196	1	823	200,000
F	22	0.189	1	823	200,000
F	23	0.198	1	823	200,000
F	24	0.198	1	823	200,000
F	25	0.205	1	823	200,000
F	26	0.191	1	823	200,000
F	27	0.202	1	823	200,000
F	28	0.200	1	823	200,000
F	29	0.198	1	823	200,000
F	30	0.195	1	823	200,000
F	31	0.193	1	823	200,000
F	32	0.192	1	823	200,000
F	33	0.193	1	823	200,000
F	34	0.194	1	823	200,000
F	35	0.192	1	823	200,000
F	36	0.194	1	823	200,000
F	37	0.189	1	823	200,000
F	38	0.214	1	823	200,000
F	39	0.189	1	823	200,000
F	40	0.186	1	823	200,000
F	41	0.192	1	823	200,000
F	42	0.184	1	823	200,000
F	43	0.198	1	823	200,000
F	44	0.200	1	823	200,000
F	45	0.175	1	823	200,000
F	46	0.185	1	823	200,000
F	47	0.195	1	823	200,000
F	48	0.192	1	823	200,000
F	49	0.180	1	823	200,000
F	50	0.182	1	823	200,000
F	51	0.180	1	823	200,000
F	52	0.186	1	823	200,000
F	53	0.191	1	823	200,000
F	54	0.191	1	823	200,000
F	55	0.188	1	823	200,000
F	56	0.198	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
F	57	0.182	1	823	200,000
F	58	0.195	1	823	200,000
F	59	0.191	1	823	200,000
F	60	0.190	1	823	200,000
F	61	0.176	1	823	200,000
F	62	0.179	1	823	200,000
F	63	0.177	1	823	200,000
F	64	0.193	1	823	200,000
F	65	0.191	1	823	200,000
F	66	0.197	1	823	200,000
F	67	0.184	1	823	200,000
F	68	0.196	1	823	200,000
F	69	0.194	1	823	200,000
F	70	0.215	1	823	200,000
F	71	0.213	1	823	200,000
F	72	0.187	1	823	200,000
F	73	0.207	1	823	200,000
F	74	0.195	1	823	200,000
F	75	0.196	1	823	200,000
F	76	0.210	1	823	200,000
F	77	0.188	1	823	200,000
F	78	0.186	1	823	200,000
F	79	0.191	1	823	200,000
F	80	0.199	1	823	200,000
F	81	0.198	1	823	200,000
F	82	0.194	1	823	200,000
F	83	0.210	1	823	200,000
F	84	0.171	1	823	200,000
F	85	0.202	1	823	200,000
F	86	0.187	1	823	200,000
F	87	0.196	1	823	200,000
F	88	0.194	1	823	200,000
F	89	0.199	1	823	200,000
F	90	0.195	1	823	200,000
F	91	0.191	1	823	200,000
F	92	0.185	1	823	200,000
F	93	0.196	1	823	200,000
F	94	0.190	1	823	200,000
F	95	0.192	1	823	200,000
F	96	0.188	1	823	200,000
F	97	0.186	1	823	200,000
F	98	0.190	1	823	200,000
F	99	0.197	1	823	200,000
F	100	0.188	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
F	101	0.201	1	823	200,000
F	102	0.182	1	823	200,000
F	103	0.193	1	823	200,000
F	104	0.177	1	823	200,000
F	105	0.202	1	823	200,000
F	106	0.183	1	823	200,000
F	107	0.190	1	823	200,000
F	108	0.186	1	823	200,000
F	109	0.192	1	823	200,000
F	110	0.181	1	823	200,000
F	111	0.189	1	823	200,000
F	112	0.198	1	823	200,000
G	1	0.202	1	823	200,000
G	2	0.205	1	823	200,000
G	3	0.189	1	823	200,000
G	4	0.197	1	823	200,000
G	5	0.189	1	823	200,000
G	6	0.186	1	823	200,000
G	7	0.211	1	823	200,000
G	8	0.194	1	823	200,000
G	9	0.202	1	823	200,000
G	10	0.184	1	823	200,000
G	11	0.199	1	823	200,000
G	12	0.196	1	823	200,000
G	13	0.195	1	823	200,000
G	14	0.193	1	823	200,000
G	15	0.202	1	823	200,000
G	16	0.196	1	823	200,000
G	17	0.191	1	823	200,000
G	18	0.190	1	823	200,000
G	19	0.193	1	823	200,000
G	20	0.203	1	823	200,000
G	21	0.199	1	823	200,000
G	22	0.196	1	823	200,000
G	23	0.204	1	823	200,000
G	24	0.197	1	823	200,000
G	25	0.192	1	823	200,000
G	26	0.204	1	823	200,000
G	27	0.209	1	823	200,000
G	28	0.213	1	823	200,000
G	29	0.205	1	823	200,000
G	30	0.196	1	823	200,000
G	31	0.210	1	823	200,000
G	32	0.207	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
G	33	0.204	1	823	200,000
G	34	0.233	1	823	200,000
G	35	0.246	1	823	200,000
G	36	0.209	1	823	200,000
G	37	0.204	1	823	200,000
G	38	0.252	1	823	200,000
G	39	0.250	1	823	200,000
G	40	0.241	1	823	200,000
G	41	0.229	1	823	200,000
G	42	0.204	1	823	200,000
G	43	0.218	1	823	200,000
G	44	0.213	1	823	200,000
G	45	0.218	1	823	200,000
G	46	0.196	1	823	200,000
G	47	0.210	1	823	200,000
G	48	0.200	1	823	200,000
G	49	0.198	1	823	200,000
G	50	0.210	1	823	200,000
G	51	0.218	1	823	200,000
G	52	0.210	1	823	200,000
G	53	0.212	1	823	200,000
G	54	0.208	1	823	200,000
G	55	0.200	1	823	200,000
G	56	0.198	1	823	200,000
G	57	0.223	1	823	200,000
G	58	0.232	1	823	200,000
G	59	0.218	1	823	200,000
G	60	0.227	1	823	200,000
G	61	0.237	1	823	200,000
G	62	0.235	1	823	200,000
G	63	0.238	1	823	200,000
G	64	0.235	1	823	200,000
G	65	0.228	1	823	200,000
G	66	0.236	1	823	200,000
G	67	0.236	1	823	200,000
G	68	0.239	1	823	200,000
G	69	0.233	1	823	200,000
G	70	0.229	1	823	200,000
G	71	0.236	1	823	200,000
G	72	0.214	1	823	200,000
G	73	0.231	1	823	200,000
G	74	0.231	1	823	200,000
G	75	0.215	1	823	200,000
G	76	0.188	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
G	77	0.189	1	823	200,000
G	78	0.203	1	823	200,000
G	79	0.206	1	823	200,000
G	80	0.216	1	823	200,000
G	81	0.208	1	823	200,000
G	82	0.198	1	823	200,000
G	83	0.208	1	823	200,000
G	84	0.221	1	823	200,000
G	85	0.212	1	823	200,000
G	86	0.225	1	823	200,000
G	87	0.203	1	823	200,000
G	88	0.193	1	823	200,000
G	89	0.204	1	823	200,000
G	90	0.222	1	823	200,000
G	91	0.220	1	823	200,000
G	92	0.207	1	823	200,000
G	93	0.203	1	823	200,000
G	94	0.202	1	823	200,000
G	95	0.194	1	823	200,000
G	96	0.199	1	823	200,000
G	97	0.207	1	823	200,000
G	98	0.208	1	823	200,000
G	99	0.203	1	823	200,000
G	100	0.207	1	823	200,000
G	101	0.220	1	823	200,000
G	102	0.194	1	823	200,000
G	103	0.203	1	823	200,000
G	104	0.203	1	823	200,000
G	105	0.208	1	823	200,000
G	106	0.217	1	823	200,000
G	107	0.213	1	823	200,000
G	108	0.205	1	823	200,000
G	109	0.216	1	823	200,000
G	110	0.208	1	823	200,000
G	111	0.197	1	823	200,000
G	112	0.204	1	823	200,000
H	1	0.198	1	823	200,000
H	2	0.212	1	823	200,000
H	3	0.199	1	823	200,000
H	4	0.200	1	823	200,000
H	5	0.191	1	823	200,000
H	6	0.212	1	823	200,000
H	7	0.186	1	823	200,000
H	8	0.185	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
H	9	0.207	1	823	200,000
H	10	0.212	1	823	200,000
H	11	0.196	1	823	200,000
H	12	0.188	1	823	200,000
H	13	0.205	1	823	200,000
H	14	0.193	1	823	200,000
H	15	0.197	1	823	200,000
H	16	0.188	1	823	200,000
H	17	0.212	1	823	200,000
H	18	0.191	1	823	200,000
H	19	0.191	1	823	200,000
H	20	0.189	1	823	200,000
H	21	0.206	1	823	200,000
H	22	0.205	1	823	200,000
H	23	0.206	1	823	200,000
H	24	0.202	1	823	200,000
H	25	0.197	1	823	200,000
H	26	0.210	1	823	200,000
H	27	0.199	1	823	200,000
H	28	0.209	1	823	200,000
H	29	0.217	1	823	200,000
H	30	0.222	1	823	200,000
H	31	0.215	1	823	200,000
H	32	0.210	1	823	200,000
H	33	0.210	1	823	200,000
H	34	0.206	1	823	200,000
H	35	0.215	1	823	200,000
H	36	0.216	1	823	200,000
H	37	0.197	1	823	200,000
H	38	0.205	1	823	200,000
H	39	0.193	1	823	200,000
H	40	0.207	1	823	200,000
H	41	0.200	1	823	200,000
H	42	0.206	1	823	200,000
H	43	0.196	1	823	200,000
H	44	0.203	1	823	200,000
H	45	0.210	1	823	200,000
H	46	0.200	1	823	200,000
H	47	0.197	1	823	200,000
H	48	0.200	1	823	200,000
H	49	0.197	1	823	200,000
H	50	0.204	1	823	200,000
H	51	0.200	1	823	200,000
H	52	0.206	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
H	53	0.213	1	823	200,000
H	54	0.206	1	823	200,000
H	55	0.198	1	823	200,000
H	56	0.202	1	823	200,000
H	57	0.191	1	823	200,000
H	58	0.200	1	823	200,000
H	59	0.191	1	823	200,000
H	60	0.196	1	823	200,000
H	61	0.206	1	823	200,000
H	62	0.212	1	823	200,000
H	63	0.207	1	823	200,000
H	64	0.206	1	823	200,000
H	65	0.202	1	823	200,000
H	66	0.201	1	823	200,000
H	67	0.208	1	823	200,000
H	68	0.216	1	823	200,000
H	69	0.209	1	823	200,000
H	70	0.210	1	823	200,000
H	71	0.212	1	823	200,000
H	72	0.215	1	823	200,000
H	73	0.220	1	823	200,000
H	74	0.224	1	823	200,000
H	75	0.200	1	823	200,000
H	76	0.210	1	823	200,000
H	77	0.234	1	823	200,000
H	78	0.200	1	823	200,000
H	79	0.209	1	823	200,000
H	80	0.219	1	823	200,000
H	81	0.211	1	823	200,000
H	82	0.191	1	823	200,000
H	83	0.214	1	823	200,000
H	84	0.210	1	823	200,000
H	85	0.199	1	823	200,000
H	86	0.208	1	823	200,000
H	87	0.211	1	823	200,000
H	88	0.214	1	823	200,000
H	89	0.218	1	823	200,000
H	90	0.204	1	823	200,000
H	91	0.207	1	823	200,000
H	92	0.210	1	823	200,000
H	93	0.221	1	823	200,000
H	94	0.210	1	823	200,000
H	95	0.206	1	823	200,000
H	96	0.207	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
H	97	0.208	1	823	200,000
H	98	0.197	1	823	200,000
H	99	0.215	1	823	200,000
H	100	0.227	1	823	200,000
H	101	0.212	1	823	200,000
H	102	0.218	1	823	200,000
H	103	0.198	1	823	200,000
H	104	0.202	1	823	200,000
H	105	0.208	1	823	200,000
H	106	0.211	1	823	200,000
H	107	0.210	1	823	200,000
H	108	0.196	1	823	200,000
H	109	0.219	1	823	200,000
H	110	0.218	1	823	200,000
H	111	0.192	1	823	200,000
H	112	0.195	1	823	200,000
I	1	0.192	1	823	200,000
I	2	0.189	1	823	200,000
I	3	0.206	1	823	200,000
I	4	0.195	1	823	200,000
I	5	0.195	1	823	200,000
I	6	0.210	1	823	200,000
I	7	0.189	1	823	200,000
I	8	0.207	1	823	200,000
I	9	0.211	1	823	200,000
I	10	0.198	1	823	200,000
I	11	0.190	1	823	200,000
I	12	0.192	1	823	200,000
I	13	0.202	1	823	200,000
I	14	0.195	1	823	200,000
I	15	0.197	1	823	200,000
I	16	0.194	1	823	200,000
I	17	0.187	1	823	200,000
I	18	0.199	1	823	200,000
I	19	0.187	1	823	200,000
I	20	0.199	1	823	200,000
I	21	0.189	1	823	200,000
I	22	0.194	1	823	200,000
I	23	0.209	1	823	200,000
I	24	0.199	1	823	200,000
I	25	0.197	1	823	200,000
I	26	0.210	1	823	200,000
I	27	0.202	1	823	200,000
I	28	0.218	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
I	29	0.204	1	823	200,000
I	30	0.210	1	823	200,000
I	31	0.215	1	823	200,000
I	32	0.232	1	823	200,000
I	33	0.210	1	823	200,000
I	34	0.216	1	823	200,000
I	35	0.224	1	823	200,000
I	36	0.228	1	823	200,000
I	37	0.225	1	823	200,000
I	38	0.212	1	823	200,000
I	39	0.206	1	823	200,000
I	40	0.215	1	823	200,000
I	41	0.196	1	823	200,000
I	42	0.200	1	823	200,000
I	43	0.209	1	823	200,000
I	44	0.204	1	823	200,000
I	45	0.192	1	823	200,000
I	46	0.184	1	823	200,000
I	47	0.212	1	823	200,000
I	48	0.206	1	823	200,000
I	49	0.208	1	823	200,000
I	50	0.202	1	823	200,000
I	51	0.214	1	823	200,000
I	52	0.206	1	823	200,000
I	53	0.199	1	823	200,000
I	54	0.207	1	823	200,000
I	55	0.216	1	823	200,000
I	56	0.193	1	823	200,000
I	57	0.185	1	823	200,000
I	58	0.205	1	823	200,000
I	59	0.209	1	823	200,000
I	60	0.210	1	823	200,000
I	61	0.202	1	823	200,000
I	62	0.208	1	823	200,000
I	63	0.205	1	823	200,000
I	64	0.204	1	823	200,000
I	65	0.209	1	823	200,000
I	66	0.227	1	823	200,000
I	67	0.206	1	823	200,000
I	68	0.226	1	823	200,000
I	69	0.214	1	823	200,000
I	70	0.215	1	823	200,000
I	71	0.213	1	823	200,000
I	72	0.227	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
I	73	0.198	1	823	200,000
I	74	0.210	1	823	200,000
I	75	0.214	1	823	200,000
I	76	0.214	1	823	200,000
I	77	0.214	1	823	200,000
I	78	0.210	1	823	200,000
I	79	0.220	1	823	200,000
I	80	0.218	1	823	200,000
I	81	0.213	1	823	200,000
I	82	0.218	1	823	200,000
I	83	0.214	1	823	200,000
I	84	0.223	1	823	200,000
I	85	0.210	1	823	200,000
I	86	0.241	1	823	200,000
I	87	0.220	1	823	200,000
I	88	0.214	1	823	200,000
I	89	0.225	1	823	200,000
I	90	0.214	1	823	200,000
I	91	0.215	1	823	200,000
I	92	0.197	1	823	200,000
I	93	0.218	1	823	200,000
I	94	0.206	1	823	200,000
I	95	0.200	1	823	200,000
I	96	0.212	1	823	200,000
I	97	0.225	1	823	200,000
I	98	0.208	1	823	200,000
I	99	0.222	1	823	200,000
I	100	0.214	1	823	200,000
I	101	0.211	1	823	200,000
I	102	0.211	1	823	200,000
I	103	0.199	1	823	200,000
I	104	0.191	1	823	200,000
I	105	0.211	1	823	200,000
I	106	0.196	1	823	200,000
I	107	0.226	1	823	200,000
I	108	0.220	1	823	200,000
I	109	0.193	1	823	200,000
I	110	0.207	1	823	200,000
I	111	0.229	1	823	200,000
I	112	0.197	1	823	200,000
J	1	0.193	1	823	200,000
J	2	0.202	1	823	200,000
J	3	0.199	1	823	200,000
J	4	0.187	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
J	5	0.181	1	823	200,000
J	6	0.187	1	823	200,000
J	7	0.183	1	823	200,000
J	8	0.177	1	823	200,000
J	9	0.201	1	823	200,000
J	10	0.191	1	823	200,000
J	11	0.208	1	823	200,000
J	12	0.186	1	823	200,000
J	13	0.195	1	823	200,000
J	14	0.191	1	823	200,000
J	15	0.185	1	823	200,000
J	16	0.202	1	823	200,000
J	17	0.205	1	823	200,000
J	18	0.203	1	823	200,000
J	19	0.202	1	823	200,000
J	20	0.196	1	823	200,000
J	21	0.204	1	823	200,000
J	22	0.199	1	823	200,000
J	23	0.201	1	823	200,000
J	24	0.193	1	823	200,000
J	25	0.198	1	823	200,000
J	26	0.189	1	823	200,000
J	27	0.165	1	823	200,000
J	28	0.204	1	823	200,000
J	29	0.204	1	823	200,000
J	30	0.183	1	823	200,000
J	31	0.206	1	823	200,000
J	32	0.180	1	823	200,000
J	33	0.187	1	823	200,000
J	34	0.189	1	823	200,000
J	35	0.200	1	823	200,000
J	36	0.184	1	823	200,000
J	37	0.201	1	823	200,000
J	38	0.181	1	823	200,000
J	39	0.191	1	823	200,000
J	40	0.192	1	823	200,000
J	41	0.180	1	823	200,000
J	42	0.199	1	823	200,000
J	43	0.196	1	823	200,000
J	44	0.180	1	823	200,000
J	45	0.200	1	823	200,000
J	46	0.200	1	823	200,000
J	47	0.203	1	823	200,000
J	48	0.177	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
J	49	0.198	1	823	200,000
J	50	0.187	1	823	200,000
J	51	0.196	1	823	200,000
J	52	0.193	1	823	200,000
J	53	0.202	1	823	200,000
J	54	0.190	1	823	200,000
J	55	0.205	1	823	200,000
J	56	0.191	1	823	200,000
J	57	0.197	1	823	200,000
J	58	0.197	1	823	200,000
J	59	0.188	1	823	200,000
J	60	0.199	1	823	200,000
J	61	0.187	1	823	200,000
J	62	0.195	1	823	200,000
J	63	0.193	1	823	200,000
J	64	0.203	1	823	200,000
J	65	0.198	1	823	200,000
J	66	0.204	1	823	200,000
J	67	0.208	1	823	200,000
J	68	0.189	1	823	200,000
J	69	0.190	1	823	200,000
J	70	0.209	1	823	200,000
J	71	0.198	1	823	200,000
J	72	0.203	1	823	200,000
J	73	0.195	1	823	200,000
J	74	0.193	1	823	200,000
J	75	0.194	1	823	200,000
J	76	0.198	1	823	200,000
J	77	0.203	1	823	200,000
J	78	0.202	1	823	200,000
J	79	0.191	1	823	200,000
J	80	0.207	1	823	200,000
J	81	0.195	1	823	200,000
J	82	0.179	1	823	200,000
J	83	0.200	1	823	200,000
J	84	0.203	1	823	200,000
J	85	0.195	1	823	200,000
J	86	0.205	1	823	200,000
J	87	0.204	1	823	200,000
J	88	0.212	1	823	200,000
J	89	0.192	1	823	200,000
J	90	0.212	1	823	200,000
J	91	0.187	1	823	200,000
J	92	0.190	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
J	93	0.193	1	823	200,000
J	94	0.197	1	823	200,000
J	95	0.203	1	823	200,000
J	96	0.202	1	823	200,000
J	97	0.187	1	823	200,000
J	98	0.193	1	823	200,000
J	99	0.199	1	823	200,000
J	100	0.199	1	823	200,000
J	101	0.185	1	823	200,000
J	102	0.196	1	823	200,000
J	103	0.177	1	823	200,000
J	104	0.176	1	823	200,000
J	105	0.191	1	823	200,000
J	106	0.186	1	823	200,000
J	107	0.181	1	823	200,000
J	108	0.182	1	823	200,000
J	109	0.189	1	823	200,000
J	110	0.196	1	823	200,000
J	111	0.187	1	823	200,000
J	112	0.184	1	823	200,000
K	1	0.202	1	823	200,000
K	2	0.210	1	823	200,000
K	3	0.198	1	823	200,000
K	4	0.198	1	823	200,000
K	5	0.187	1	823	200,000
K	6	0.206	1	823	200,000
K	7	0.180	1	823	200,000
K	8	0.204	1	823	200,000
K	9	0.189	1	823	200,000
K	10	0.199	1	823	200,000
K	11	0.210	1	823	200,000
K	12	0.193	1	823	200,000
K	13	0.210	1	823	200,000
K	14	0.206	1	823	200,000
K	15	0.197	1	823	200,000
K	16	0.188	1	823	200,000
K	17	0.196	1	823	200,000
K	18	0.198	1	823	200,000
K	19	0.200	1	823	200,000
K	20	0.193	1	823	200,000
K	21	0.192	1	823	200,000
K	22	0.203	1	823	200,000
K	23	0.206	1	823	200,000
K	24	0.185	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
K	25	0.189	1	823	200,000
K	26	0.199	1	823	200,000
K	27	0.182	1	823	200,000
K	28	0.188	1	823	200,000
K	29	0.199	1	823	200,000
K	30	0.210	1	823	200,000
K	31	0.202	1	823	200,000
K	32	0.188	1	823	200,000
K	33	0.195	1	823	200,000
K	34	0.204	1	823	200,000
K	35	0.196	1	823	200,000
K	36	0.191	1	823	200,000
K	37	0.208	1	823	200,000
K	38	0.194	1	823	200,000
K	39	0.188	1	823	200,000
K	40	0.188	1	823	200,000
K	41	0.188	1	823	200,000
K	42	0.192	1	823	200,000
K	43	0.205	1	823	200,000
K	44	0.208	1	823	200,000
K	45	0.189	1	823	200,000
K	46	0.189	1	823	200,000
K	47	0.192	1	823	200,000
K	48	0.175	1	823	200,000
K	49	0.193	1	823	200,000
K	50	0.194	1	823	200,000
K	51	0.189	1	823	200,000
K	52	0.197	1	823	200,000
K	53	0.191	1	823	200,000
K	54	0.198	1	823	200,000
K	55	0.186	1	823	200,000
K	56	0.204	1	823	200,000
K	57	0.191	1	823	200,000
K	58	0.198	1	823	200,000
K	59	0.181	1	823	200,000
K	60	0.194	1	823	200,000
K	61	0.183	1	823	200,000
K	62	0.181	1	823	200,000
K	63	0.192	1	823	200,000
K	64	0.208	1	823	200,000
K	65	0.197	1	823	200,000
K	66	0.198	1	823	200,000
K	67	0.200	1	823	200,000
K	68	0.203	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
K	69	0.197	1	823	200,000
K	70	0.203	1	823	200,000
K	71	0.210	1	823	200,000
K	72	0.187	1	823	200,000
K	73	0.197	1	823	200,000
K	74	0.204	1	823	200,000
K	75	0.204	1	823	200,000
K	76	0.202	1	823	200,000
K	77	0.198	1	823	200,000
K	78	0.197	1	823	200,000
K	79	0.195	1	823	200,000
K	80	0.195	1	823	200,000
K	81	0.207	1	823	200,000
K	82	0.201	1	823	200,000
K	83	0.204	1	823	200,000
K	84	0.204	1	823	200,000
K	85	0.193	1	823	200,000
K	86	0.202	1	823	200,000
K	87	0.201	1	823	200,000
K	88	0.200	1	823	200,000
K	89	0.201	1	823	200,000
K	90	0.193	1	823	200,000
K	91	0.201	1	823	200,000
K	92	0.197	1	823	200,000
K	93	0.189	1	823	200,000
K	94	0.181	1	823	200,000
K	95	0.198	1	823	200,000
K	96	0.200	1	823	200,000
K	97	0.197	1	823	200,000
K	98	0.200	1	823	200,000
K	99	0.191	1	823	200,000
K	100	0.196	1	823	200,000
K	101	0.199	1	823	200,000
K	102	0.197	1	823	200,000
K	103	0.195	1	823	200,000
K	104	0.183	1	823	200,000
K	105	0.181	1	823	200,000
K	106	0.173	1	823	200,000
K	107	0.170	1	823	200,000
K	108	0.183	1	823	200,000
K	109	0.197	1	823	200,000
K	110	0.199	1	823	200,000
K	111	0.184	1	823	200,000
K	112	0.187	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**	43-12-0010
Pressure:	475	**Utility:**	AEP
OD:	2.25	**Plant:**	Mitchell Generating Station
Design Wall (MWT):	0.18	**Unit No.:**	2
Material:	SA-213, Grade T91	**Tube Group:**	LP Reheat Outlet
Superheater (Y/N)	N	**Location:**	Tube Stubs

Element No.	Tube No.	Wall Thickness (Inches)	ID Scale (Mils)	Current Temp. (°F)	Remaining Useful Life Estimate (Hours)
L	1	0.179	1	823	200,000
L	2	0.206	1	823	200,000
L	3	0.207	1	823	200,000
L	4	0.206	1	823	200,000
L	5	0.193	1	823	200,000
L	6	0.204	1	823	200,000
L	7	0.201	1	823	200,000
L	8	0.202	1	823	200,000
L	9	0.197	1	823	200,000
L	10	0.200	1	823	200,000
L	11	0.206	1	823	200,000
L	12	0.186	1	823	200,000
L	13	0.216	1	823	200,000
L	14	0.196	1	823	200,000
L	15	0.190	1	823	200,000
L	16	0.210	1	823	200,000
L	17	0.189	1	823	200,000
L	18	0.191	1	823	200,000
L	19	0.191	1	823	200,000
L	20	0.181	1	823	200,000
L	21	0.177	1	823	200,000
L	22	0.191	1	823	200,000
L	23	0.195	1	823	200,000
L	24	0.196	1	823	200,000
L	25	0.180	1	823	200,000
L	26	0.206	1	823	200,000
L	27	0.195	1	823	200,000
L	28	0.198	1	823	200,000
L	29	0.185	1	823	200,000
L	30	0.187	1	823	200,000
L	31	0.191	1	823	200,000
L	32	0.188	1	823	200,000
L	33	0.197	1	823	200,000
L	34	0.210	1	823	200,000
L	35	0.196	1	823	200,000
L	36	0.187	1	823	200,000
L	37	0.199	1	823	200,000
L	38	0.185	1	823	200,000
L	39	0.199	1	823	200,000
L	40	0.193	1	823	200,000
L	41	0.200	1	823	200,000
L	42	0.184	1	823	200,000
L	43	0.186	1	823	200,000
L	44	0.179	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**		43-12-0010	
Pressure:	475	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.18	**Unit No.:**		2	
Material:	SA-213, Grade T91	**Tube Group:**		LP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element No.	**Tube No.**	**Wall Thickness (Inches)**	**ID Scale (Mils)**	**Current Temp. (°F)**	**Remaining Useful Life Estimate (Hours)**
L	45	0.196	1	823	200,000
L	46	0.191	1	823	200,000
L	47	0.190	1	823	200,000
L	48	0.193	1	823	200,000
L	49	0.181	1	823	200,000
L	50	0.187	1	823	200,000
L	51	0.202	1	823	200,000
L	52	0.193	1	823	200,000
L	53	0.184	1	823	200,000
L	54	0.179	1	823	200,000
L	55	0.204	1	823	200,000
L	56	0.187	1	823	200,000
L	57	0.195	1	823	200,000
L	58	0.191	1	823	200,000
L	59	0.182	1	823	200,000
L	60	0.185	1	823	200,000
L	61	0.188	1	823	200,000
L	62	0.200	1	823	200,000
L	63	0.191	1	823	200,000
L	64	0.204	1	823	200,000
L	65	0.214	1	823	200,000
L	66	0.208	1	823	200,000
L	67	0.196	1	823	200,000
L	68	0.204	1	823	200,000
L	69	0.198	1	823	200,000
L	70	0.191	1	823	200,000
L	71	0.201	1	823	200,000
L	72	0.204	1	823	200,000
L	73	0.197	1	823	200,000
L	74	0.185	1	823	200,000
L	75	0.197	1	823	200,000
L	76	0.188	1	823	200,000
L	77	0.199	1	823	200,000
L	78	0.202	1	823	200,000
L	79	0.201	1	823	200,000
L	80	0.190	1	823	200,000
L	81	0.200	1	823	200,000
L	82	0.206	1	823	200,000
L	83	0.202	1	823	200,000
L	84	0.200	1	823	200,000
L	85	0.201	1	823	200,000
L	86	0.192	1	823	200,000
L	87	0.205	1	823	200,000
L	88	0.199	1	823	200,000

Remaining Useful Life Assessment

Operating Hours:	160,000	**Project No.:**		43-12-0010	
Pressure:	475	**Utility:**		AEP	
OD:	2.25	**Plant:**		Mitchell Generating Station	
Design Wall (MWT):	0.18	**Unit No.:**		2	
Material:	SA-213, Grade T91	**Tube Group:**		LP Reheat Outlet	
Superheater (Y/N)	N	**Location:**		Tube Stubs	
Element No.	**Tube No.**	**Wall Thickness (Inches)**	**ID Scale (Mils)**	**Current Temp. (°F)**	**Remaining Useful Life Estimate (Hours)**
L	89	0.195	1	823	200,000
L	90	0.206	1	823	200,000
L	91	0.205	1	823	200,000
L	92	0.191	1	823	200,000
L	93	0.206	1	823	200,000
L	94	0.202	1	823	200,000
L	95	0.189	1	823	200,000
L	96	0.207	1	823	200,000
L	97	0.203	1	823	200,000
L	98	0.204	1	823	200,000
L	99	0.204	1	823	200,000
L	100	0.193	1	823	200,000
L	101	0.196	1	823	200,000
L	102	0.193	1	823	200,000
L	103	0.216	1	823	200,000
L	104	0.164	1	823	200,000
L	105	0.178	1	823	200,000
L	106	0.180	1	823	200,000
L	107	0.172	1	823	200,000
L	108	0.204	1	823	200,000
L	109	0.201	1	823	200,000
L	110	0.211	1	823	200,000
L	111	0.197	1	823	200,000
L	112	0.185	1	823	200,000
	Min.	0.164	1	823	200,000
	Max.	0.252	1	823	200,000
	Average	0.196	1	823	200,000

THIELSCH ENGINEERING, INC.

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HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Low-Pressure Reheat Outlet Header	Material: SA-387, Gr. 91	Hardness Scale: HBN

Location		Hardness Measurements 1	2	3	4	5	Average	Corresponding Tensile Strength
LPROH-R1	Weld	229	221	218	224	179	214	101,000
	HAZ	228	215	225	219	190	215	102,000
	Base	203	211	200	211	201	205	97,000
LPROH-R2	Weld	213	222	220	211	208	215	101,000
	HAZ	243	196	183	233	248	221	103,000
	Base	173	182	201	193	179	186	88,000
LPROH-R3	Weld	176	179	194	212	174	187	89,000
	HAZ	187	207	199	191	184	194	91,000
	Base	173	181	182	191	187	183	87,000
LPROH-R4	Weld	232	204	243	188	176	209	98,000
	HAZ	222	219	216	242	210	222	104,000
	Base	229	225	230	213	209	221	104,000
LPROH-R5	Weld	201	230	214	196	199	208	98,000
	HAZ	235	226	205	202	211	216	102,000
	Base	171	190	175	210	200	189	90,000
LPROH-R6	Weld	194	206	221	233	207	212	100,000
	HAZ	184	176	212	208	207	197	93,000
	Base	197	221	205	213	200	207	98,000
LPROH-R7	Weld	164	172	176	193	189	179	85,000
	HAZ	199	205	196	230	229	212	100,000
	Base	210	216	218	226	213	217	102,000
LPROH-R8	Weld	238	228	232	231	240	234	113,000
	HAZ	198	228	203	223	197	210	99,000
	Base	228	220	229	224	221	224	105,000
LPROH-R9	Weld	215	207	215	227	201	213	101,000
	HAZ	219	203	188	172	198	196	92,000
	Base	209	213	207	203	210	208	98,000

INSPECTOR: M. Olszewski	DATE: 03/26/2012

APPENDIX G

NONDESTRUCTIVE EXAMINATION REPORTS
HIGH-PRESSURE (1ST) REHEAT INLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 2 - High-Pressure (1st) Reheat Inlet Header

The minimum wall thickness requirements were calculated for the High-Pressure (1st) Reheat Inlet 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. C

Where:

T- Design Temperature	964	°F
P- Maximum Allowable Pressure	1,200	psig
D- Outside Diameter	40.14	in
SE- Maximum Stress Value	10,104	psi
y-Temperature Coefficient	0.50	
A- Additional Thickness	0.000	in

The following equation applies per B31.1 Section 104.1.2

t_m=(PD/(2(SE+PY))+A 2.250 in

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MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP Mitchell - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: High-Pressure (1st) Reheat Inlet Header	Material: SA-387 Gr. C	Procedure: TEI 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	COMMENTS ON RESULTS	ACCEPT	REJECT
Girth Welds				
GW-1	N/A	No recordable indications (NRI)	X	
GW-2	N/A	NRI	X	
GW-3	N/A	NRI	X	
Seam Welds				
LS-1	N/A	NRI	X	
LS-2	N/A	NRI	X	
LS-3	12" TW	Indication between tube stubs 82 and 84.		X
	6" TW	Indication at tube stub 95.		X
	3" TW	Indication at tube stub 100.		X
LS-1A	1" LT	Between tube rows 14 and 15, 0.400" depth		X
LS-2A	N/A	NRI	X	
LS-3A	N/A	NRI	X	
Penetrations				
P-1	N/A	NRI	X	
P-2	N/A	NRI	X	
P-3	N/A	NRI	X	
P-4	N/A	NRI	X	
Attachment Welds				
AW-1	N/A	NRI	X	
AW-2	N/A	NRI	X	
AW-3	N/A	NRI	X	

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

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: High-Pressure (1st) Reheat Inlet Header	Material: SA-387 Gr. C	Procedure: TEI 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
Final Examination After Removal and Repair by Welding				
Seam Welds				
LS-3	N/A	No recordable indications	X	
LS-1A	N/A	No recordable indications	X	

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/30/2012

THIELSCH ENGINEERING, INC.

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ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station-Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: High-Pressure (1st) Reheat Inlet Header	Material: SA-387, Gr. C	Nominal Wall: 3.068"	Minimum Wall: 2.250"

EQUIPMENT USED:

- [x] D-Meter
- [x] Pi-Tape
- [ ] Other
- [ ] Micrometer
- [ ] calipers

KEY:

IDENTIFICATION		CONFIGURATION	MEASUREMENTS (in.) PI TAPE	THICKNESS MEASUREMENTS 12:00	3:00	6:00	9:00
GW-1	North	End Cap	39.625	2.750	2.713	2.735	2.728
	South	Pipe	40.219	3.146	3.150	2.705	2.758
GW-2	North	Pipe	40.219	3.150	2.716	2.710	2.742
	South	Pipe	40.234	3.177	2.746	2.747	2.751
GW-3	North	Pipe	40.188	3.155	2.721	2.737	2.751
	South	Pipe	40.438	3.150	2.723	2.705	3.186
				Min	2.705		
				Max	3.186		
				Avg	2.856		

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/23/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	HP (1st) Reheat Inlet Header
Unit Number:	2	**Weld Number:**	HP-HRIH-GW-1
Project Number:	43-12-0010	**Weld Configuration:**	Header-to-End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	2.8" / 3.2"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatioı

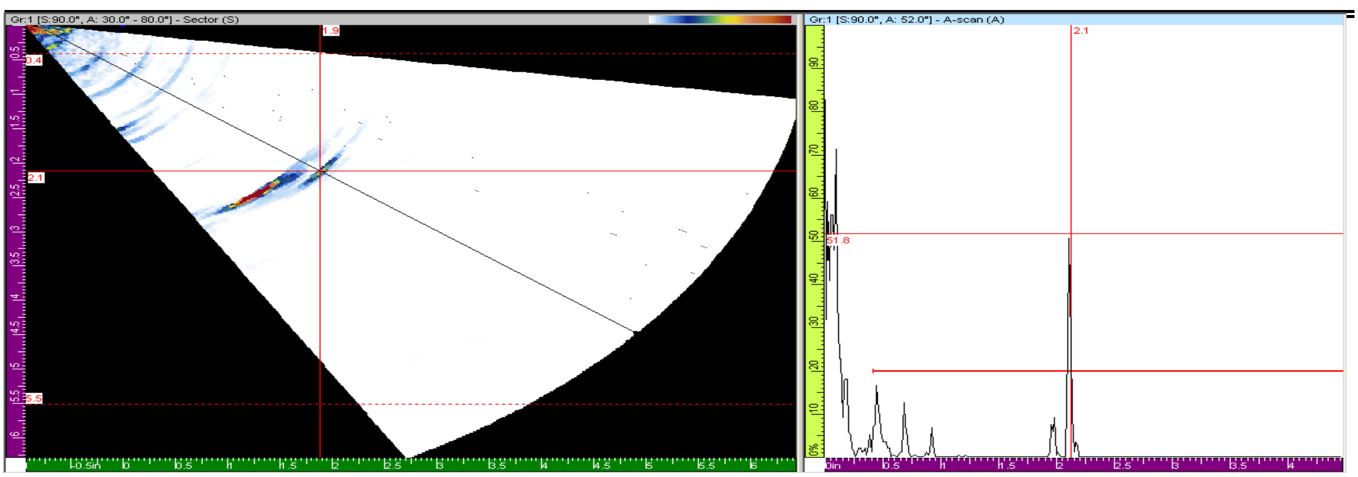
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to hanger clamp.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/18/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	HP (1st) Reheat Inlet Header Hot Reheat Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	HP-HRIH-GW-2
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
Machine Information		**Part Thickness:**	2.8" / 3.2"

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

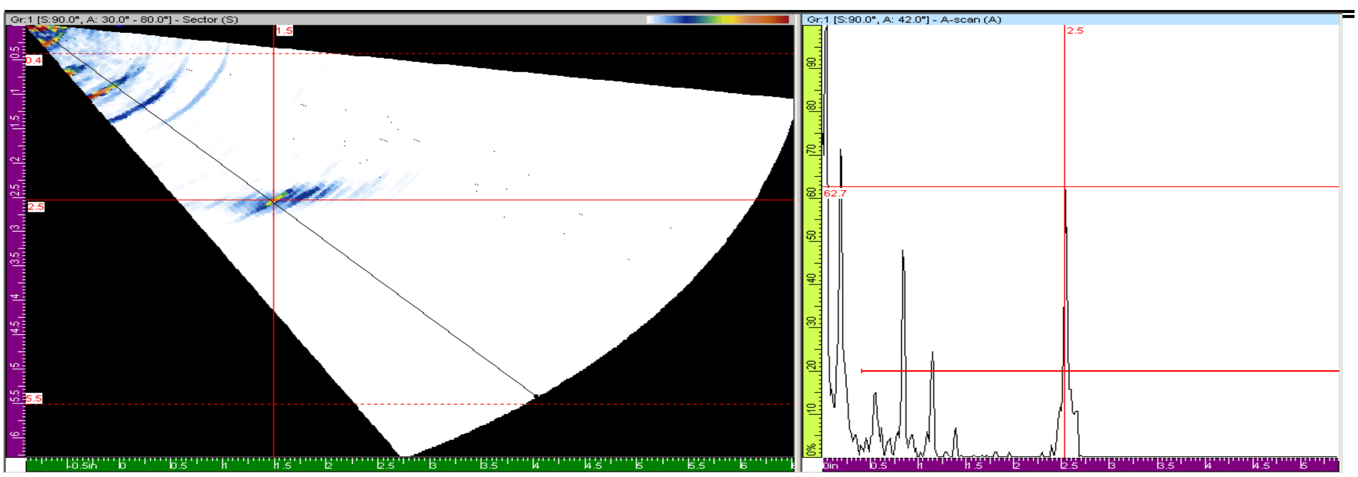
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/15/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	HP (1st) Reheat Inlet Header Hot Reheat Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Weld Number:**	HP-HRIH-GW-3
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Header to Header
		Part Thickness:	2.8" / 3.2"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatioı

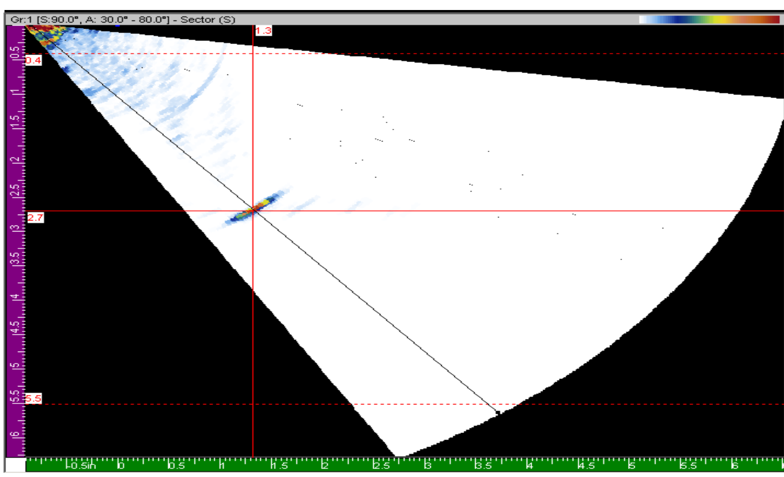
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

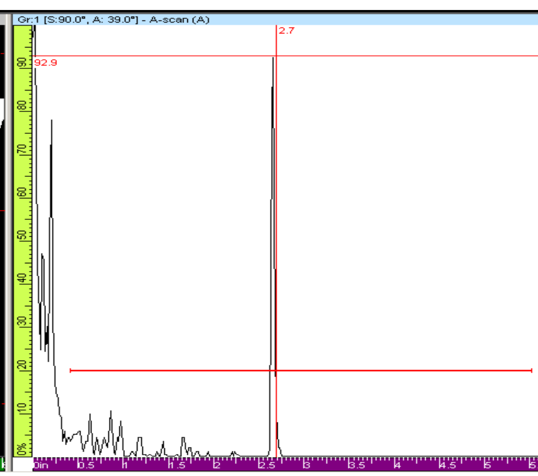
Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	32dB	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.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/15/2012**

THIELSCH ENGINEERING

Phased Array Calibration

Customer:	AEP	**Component:**	1st Reheat Inlet Header
Unit Number:	2	**Weld Number:**	See Attached Report
Project Number:	43-12-0010	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	2.8" - 3.2"

Machine Informatior

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Calibration ID#**
Omni Scan MX	Omni-1179	Scan:Omni-2.0R5 Analysis:TomoView-2.4R1	8/12	31512-3.2

Probe Characterizatior

Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55 Degrees	0.378 in

Setup

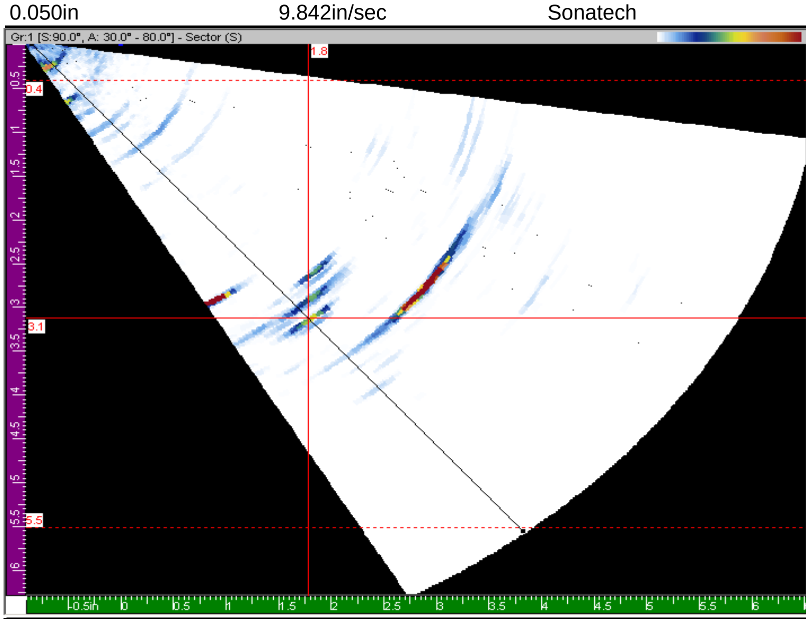
Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
10.444us	0.000in	7.264in	20	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	36	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(High)	32dB	PE(Pulse Echo)	Shear	100ns

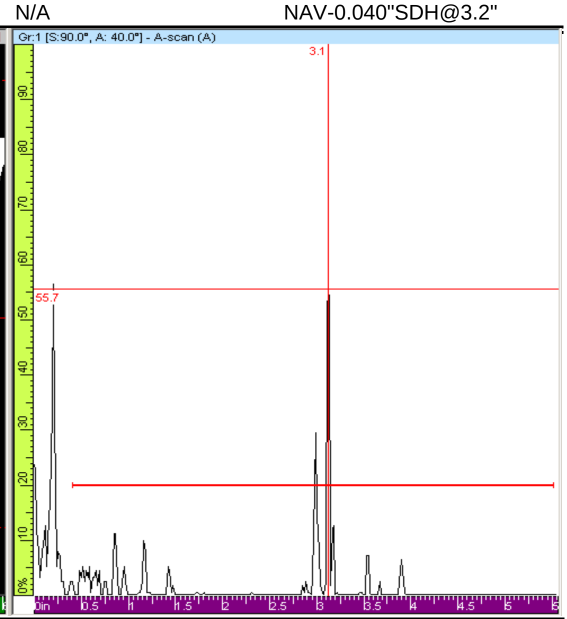
Transducer Calculatoı

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		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	N/A	NAV-0.040"SDH@3.2"





Date / Time	Date / Time	Date / Time	Date / Time	Date / Time
3/16-7AM				

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/15/2012**

THIELSCH ENGINEERING

Phased Array Report

Customer:	AEP	**Component:**	HP (1st) Reheat Inlet Header Inlet Header
Unit Number:	2		
Project Number:	43-12-0010	**Line Identification:**	High Pressure-Hot Reheat
Procedure:	TEI NDT 55 FS-PA Rev 0	**Weld Configuration:**	Longitudinal Seam
Calibration ID #:	31512-3.2	**Part Thickness:**	2.8" / 3.2"
		Part Diameter:	40"

Weld #	Indication	Scan Location	Range of Depth	Comments / Obstructions
LS-1	No Relevant Indications Detected			
LS-2	No Relevant Indications Detected			
LS-3	Multiple transverse indications detected in 3 areas during magnetic particle inspection Depth sizing was performed with linear phased-array/maximum depth and locations of indications are attached **(Figures 1,2,3 and 4)**			
LS-1A	Transverse surface indication was detected during magnetic particle inspection Depth sizing was performed with linear phased-array /maximum depth and location of indication are attached Transverse sub-surface indication was detected with linear phased-array Location and sizing of indication are attached **(Figures 5 and 6)**			
LS-2A	No Relevant Indications Detected			
LS-3A	No Relevant Indications Detected			

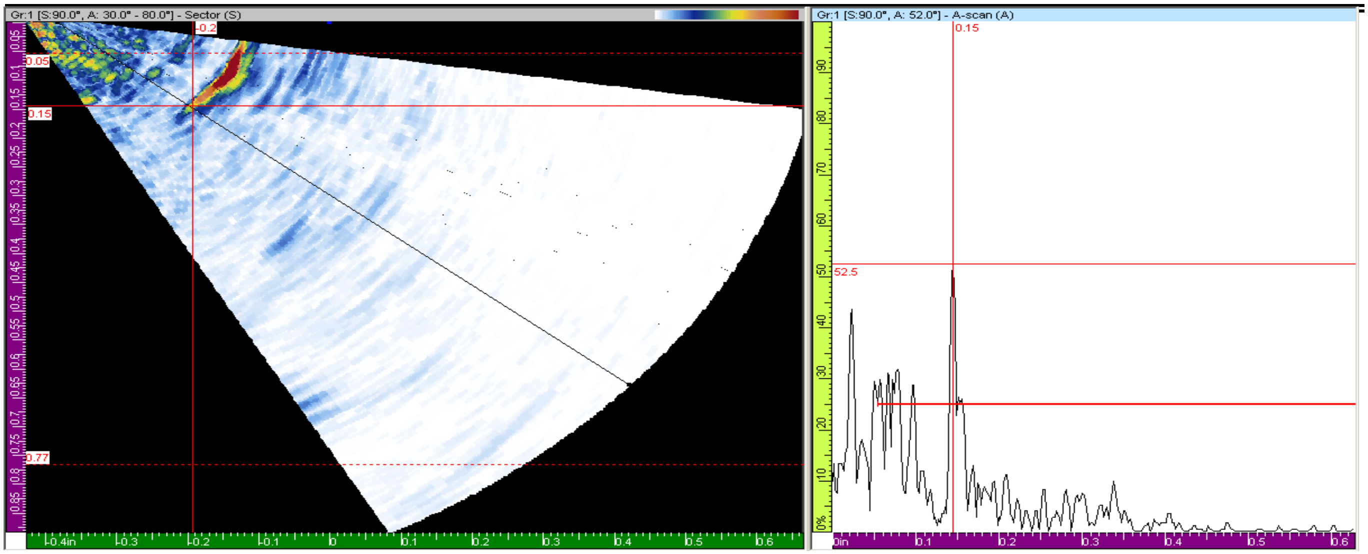
Notes and Comments

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/16/2012**

THIELSCH ENGINEERING

Phased Array Report

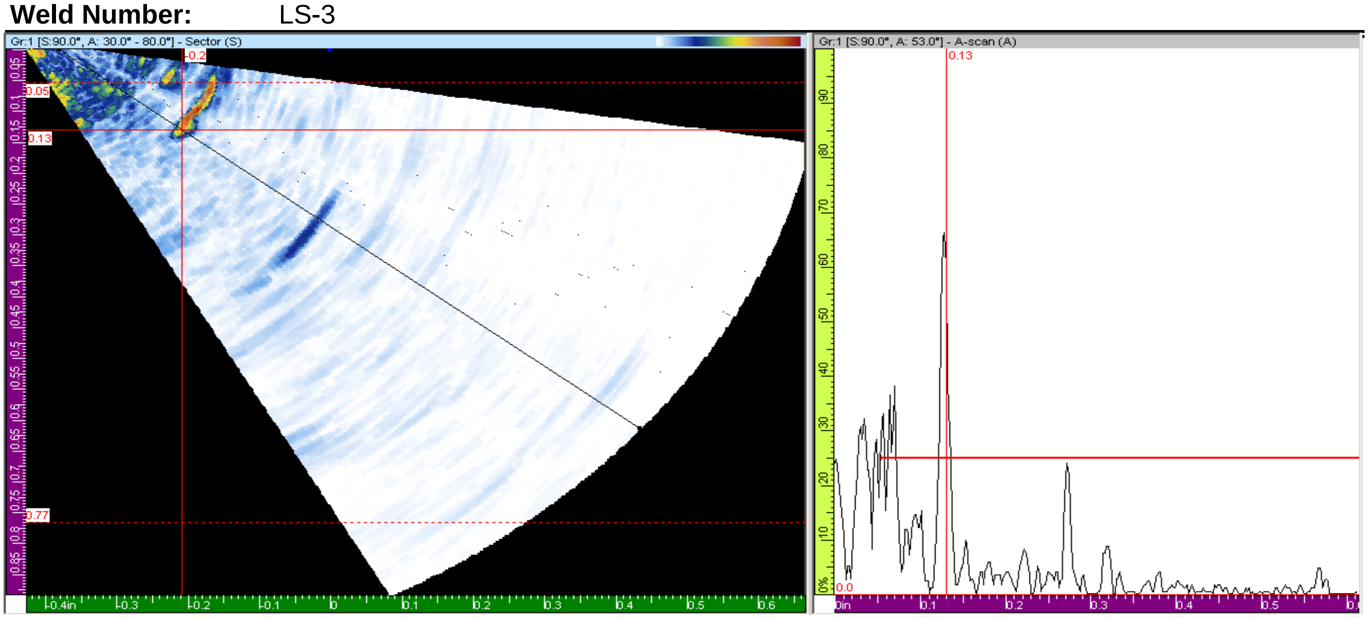
Component: HP (1st) Reheat Inlet Header
Weld Number: LS-3



(FIGURE 1)

Indication Comments and Location:
Above image of transverse indications detected by magnetic particle inspection/linear phased-array used to determine the depth of indications from outside surface/area imaged above was between tube rows 100 and 101 having a maximum depth of approximately 0.150 inches.

Component: HP (1st) Reheat Inlet Header
Weld Number: LS-3



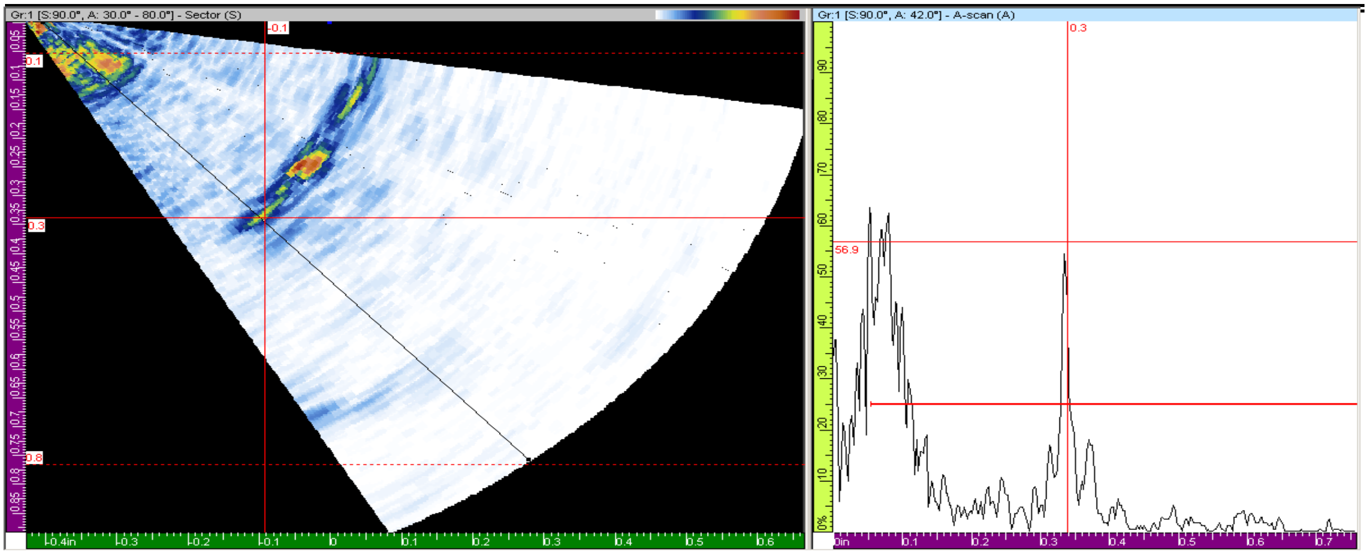
(FIGURE 2)

Indication Comments and Location:
Above image of transverse indications detected by magnetic particle inspection/linear phased-array used to determine the depth of indications from outside surface/area imaged above was adjacent tube row 95 having a maximum depth of approximately 0.150 inches.

THIELSCH ENGINEERING

Phased Array Report

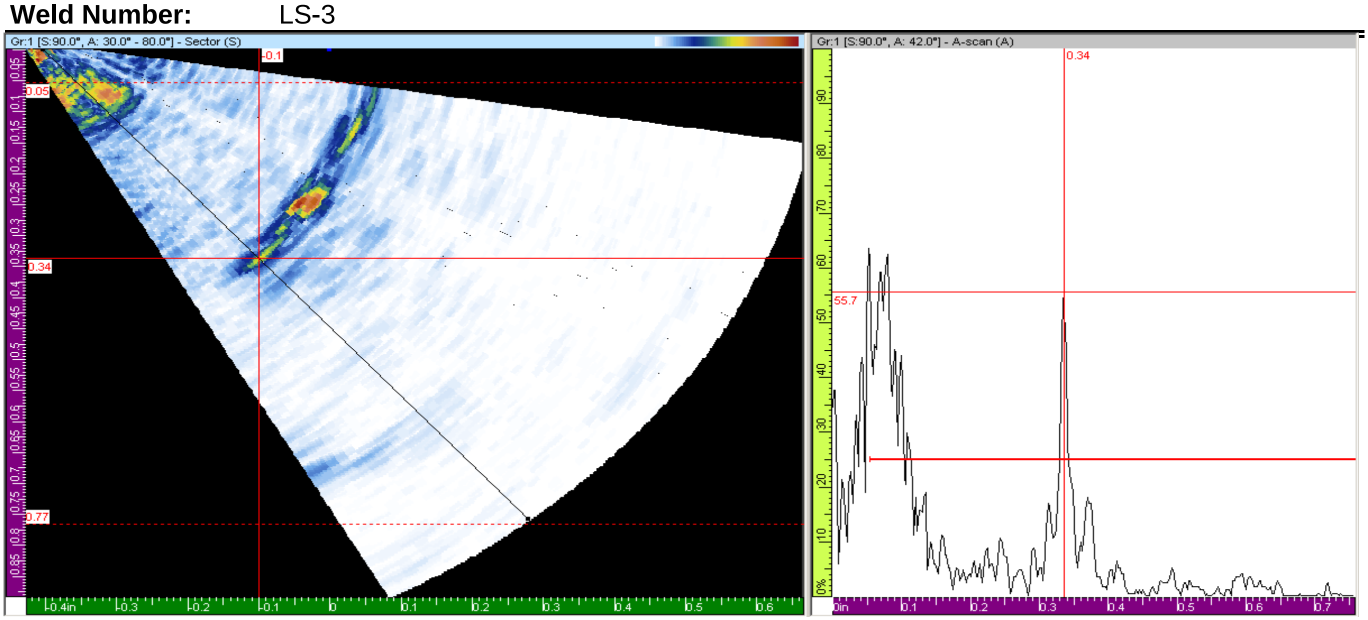
Component: HP (1st) Reheat Inlet Header
Weld Number: LS-3



(FIGURE 3)

Indication Comments and Location:
Above image of transverse indications detected by magnetic particle inspection/linear phased-array used to determine the depth of indications from outside surface/area imaged above was adjacent tube row 83 having a maximum depth of approximately 0.350 inches.

Component: HP (1st) Reheat Inlet Header
Weld Number: LS-3



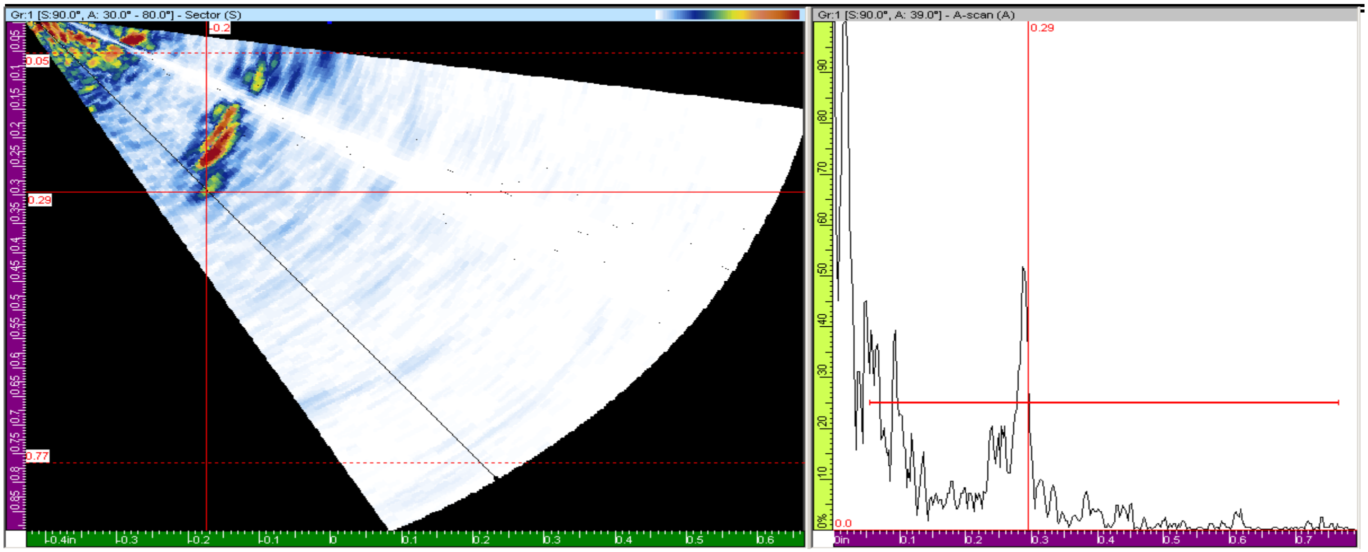
(FIGURE 4)

Indication Comments and Location:
Above image of transverse indications detected by magnetic particle inspection/linear phased-array used to determine the depth of indications from outside surface/area imaged above was adjacent tube row 83 having a maximum depth of approximately 0.350 inches.

THIELSCH ENGINEERING

Phased Array Report

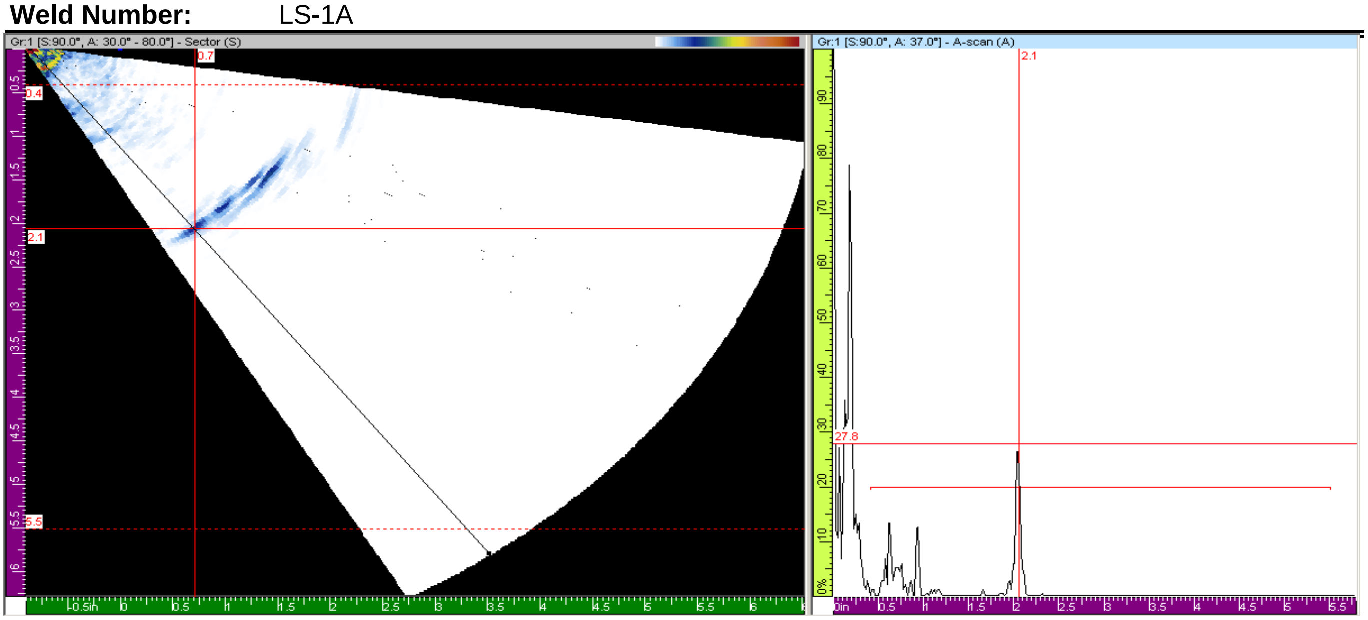
Component: HP (1st) Reheat Inlet Header
Weld Number: LS-1A



(FIGURE 5)

Indication Comments and Location:
Above image of transverse indications detected by magnetic particle inspection/linear phased-array used to determine the depth of indications from outside surface/area imaged above was between tube rows 14 and 15 having a maximum depth of approximately 0.250 inches.

Component: HP (1st) Reheat Inlet Header
Weld Number: LS-1A



(FIGURE 6)

Indication Comments and Location:
Image above of subsurface indication detected adjacent tube row 15/Indication is transverse having a length of approximately 1/2" and ranging in depth from 1.5" to 2.1" from the outside surface. Indication looks to be lack of fusion at the end of weld pass during original manufacturing.

THIELSCH ENGINEERING, INC.

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HARDNESS MEASUREMENT SHEET

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: High-Pressure (1st) Reheat Inlet Header	Material: SA-387, Gr. C	Hardness Scale: HBN

Location		Hardness Measurements 1	2	3	4	5	Average	Corresponding Tensile Strength
HPRIH-R1	Weld	184	194	182	196	183	188	89,000
	HAZ	160	158	152	179	156	161	77,000
	Base	151	148	148	146	144	147	70,000
HPRIH-R2	Weld	171	182	170	168	185	175	84,000
	HAZ	206	167	199	171	198	188	89,000
	Base	157	159	153	172	164	161	77,000
HPRIH-R3	Weld	172	179	187	175	178	178	85,000
	HAZ	200	194	202	187	183	193	91,000
	Base	163	166	163	160	175	165	79,000
HPRIH-R4	Weld	180	186	182	186	187	184	88,000
	HAZ	221	208	231	169	200	206	97,000
	Base	160	164	179	180	167	170	81,000
HPRIH-R5	Weld	189	193	195	190	176	189	89,000
	HAZ	178	213	218	210	197	203	96,000
	Base	210	177	173	205	169	187	88,000
HPRIH-R6	Weld	153	179	178	191	168	174	83,000
	HAZ	202	179	200	216	196	199	93,000
	Base	179	180	177	162	182	176	84,000
HPRIH-R7	Weld	181	187	176	178	181	181	86,000
	HAZ	189	201	194	191	207	196	92,000
	Base	163	163	174	169	165	167	80,000
HPRIH-R8	Weld	144	133	149	135	142	141	68,000
	HAZ	138	141	134	123	138	135	65,000
	Base	147	141	151	128	131	140	67,000

INSPECTOR: M. Olszewski

DATE: 3/26/2012

APPENDIX H

NONDESTRUCTIVE EXAMINATION REPORTS
LOW-PRESSURE (2ND) REHEAT INLET HEADER

Header Minimum Wall Calculation

AEP - Mitchell Generating Station

Unit No. 2 - Low-Pressure (2nd) Reheat Inlet Header

The minimum wall thickness requirements were calculated for the Low-Pressure (2nd) Reheat Inlet 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. C

Where:

T- Design Temperature	940	°F
P- Maximum Allowable Pressure	475	psig
D- Outside Diameter	45.014	in
SE- Maximum Stress Value	11,420	psi
y- Temperature Coefficient	0.50	
A- Additional Thickness	0.000	in

The following equation applies per B31.1 Section 104.1.2

t_m=(PD/(2(SE+PY))+A 0.917 in

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MAGNETIC PARTICLE EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010
Component: Low-Pressure (2nd) Reheat Inlet Header	Material: SA-387, Gr. C	Procedure: TEI NDT-21FS, Rev. 8

EXAMINATION METHOD

- [x] Continuous
- [ ] Circular
- [ ] Residual
- [x] Longitudinal

TECHNIQUE

- [x] Yoke
- [ ] Headshot
- [ ] Coil
- [ ] Prods
- [ ] Central Cond.
- [ ] Other

CURRENT

- [x] AC
- [ ] DC
- [ ] AMP Turns ______
- [ ] Amperage ______
- [ ] Other ______

WET

- [ ] 14AM
- [x] 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	
Seam Welds				
LS-1	N/A	No recordable indications	x	
LS-2	N/A	No recordable indications	x	
LS-3	N/A	No recordable indications	x	
LS-1A	N/A	No recordable indications	x	
LS-2A	N/A	No recordable indications	x	
LS-3A	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	

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

INSPECTOR: D. Harrison / A. Giulitto	LEVEL: II	DATE: 3/23/2012

THIELSCH ENGINEERING, INC.

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

ULTRASONIC THICKNESS EXAMINATION REPORT

Job Name: AEP, Mitchell Generating Station - Unit No. 2	Job Date: March 2012	Job Number: 43-12-0010	
Component: Low-Pressure (2nd) Reheat Inlet Header	Material: SA-387, Gr. C	Nominal Wall: 1.257"	Minimum 1.063"

EQUIPMENT USED:

- [x] D-Meter
- [x] Pi-Tape
- [ ] Other
- [ ] Micrometer
- [ ] calipers

KEY:

IDENTIFICATION		CONFIGURATION	MEASUREMENTS (in.)	THICKNESS MEASUREMENTS			
			PI TAPE	12:00	3:00	6:00	9:00
GW-1	North	End Cap	Not accessible	1.165	1.283	Obstr.	1.177
	South	Pipe	45.203	1.375	1.342	Obstr.	1.334
GW-2	North	Pipe	45.219	1.340	1.146	1.179	1.154
	South	Pipe	45.141	1.322	1.144	1.173	1.147
GW-3	North	Pipe	45.016	1.321	1.151	1.147	1.156
	South	End Cap	Not accessible	1.332	1.145	1.139	1.174
				Min	1.139		
				Max	1.375		
				Avg	1.220		

INSPECTOR: Kyle Veon	LEVEL: II	DATE: 03/23/2012

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	LP (2nd) Reheat Inlet Header
Unit Number:	2	**Weld Number:**	LP-HRIH-GW-1
Project Number:	43-12-0010	**Weld Configuration:**	Header-to-End Cap
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	1.2" - 1.4"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatior

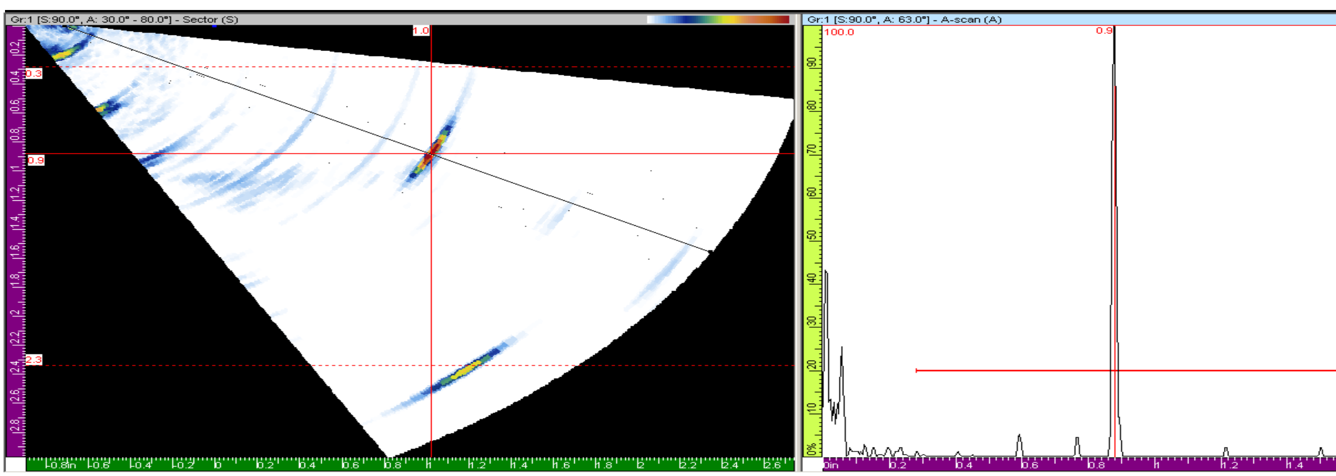
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
8.643us	0.000in	3.430in	25	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	27dB	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° non-relevant root signal/root geometry.
Limited scanning accessibility due to hanger clamp.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/18/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	LP (2nd) Reheat Inlet Header
Unit Number:	2	**Weld Number:**	LP-HRIH-GW-2
Project Number:	43-12-0010	**Weld Configuration:**	Header-to-Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	1.2" - 1.4"

Machine Information

Model #	**Serial #**	**Software Version**	**Calibration Due**	**Save Mode**
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatioı

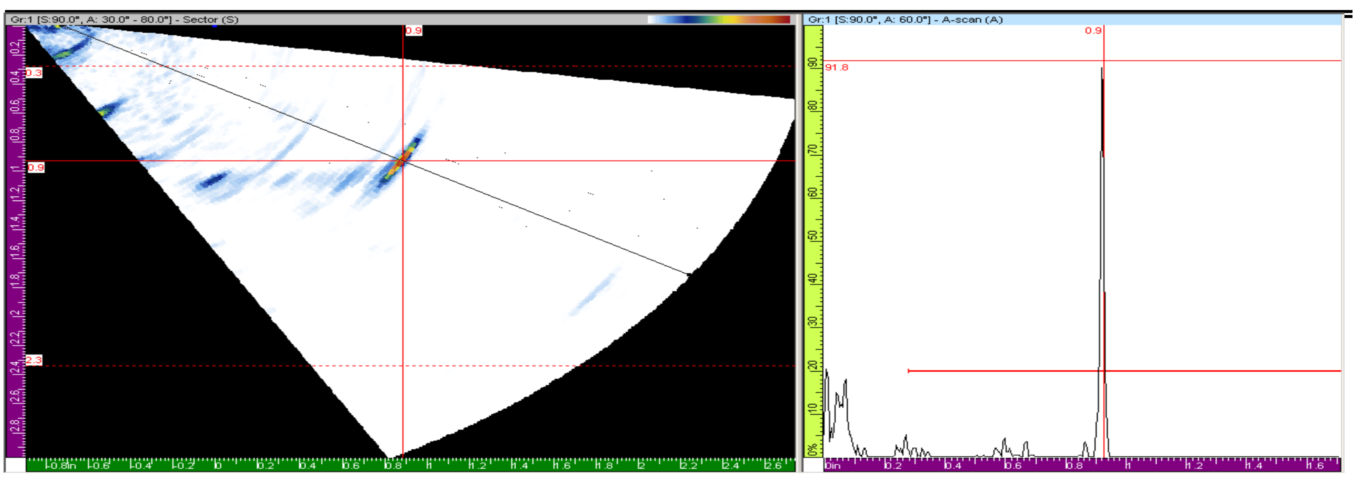
Probe Model	**Probe Serial**	**Probe Frequency**	**Wedge Angle**	**Probe Aperture**
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
8.643us	0.000in	3.430in	25	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	27dB	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° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/18/2012**

THIELSCH ENGINEERING

Phased-Array Report

Customer:	AEP	**Component:**	LP (2nd) Reheat Inlet Header
Unit Number:	2	**Weld Number:**	LP-HRIH-GW-3
Project Number:	43-12-0010	**Weld Configuration:**	Header-to-Header
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	1.2" - 1.4"

Machine Information

Model #	Serial #	Software Version	Calibration Due	Save Mode
Omni Scan MX	Omni- 2436	Scan:Omni-2.0R20 TomoView-2.4R15	8/12	A-Scan

Probe Characterizatioı

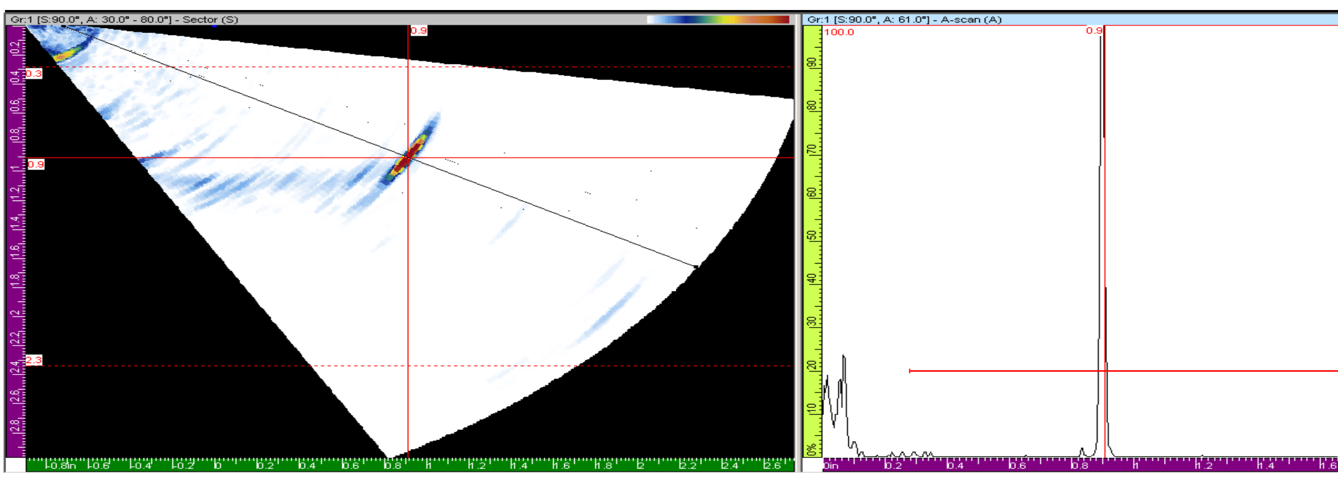
Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55.0 Degrees	0.378 in

Setup

Beam Delay	**Start(1/2 path)**	**Range(1/2 path)**	**PRF**	**Type**
8.643us	0.000in	3.430in	25	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(volts)	27dB	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° non-relevant root signal/root geometry.
Limited scanning accessibility due to tube stubs.
No relevant indications detected.

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/18/2012**

THIELSCH ENGINEERING

Phased Array Calibration

Customer:	AEP	**Component:**	LP (2nd) Reheat Inlet Header
Unit Number:	2	**Weld Number:**	See Attached Report
Project Number:	43-12-0010	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	1.2" - 1.4"

Machine Informatior

Model #	Serial #	Software Version	Calibration Due	Calibration ID#
Omni Scan MX	Omni-1179	Scan:Omni-2.0R5 Analysis:TomoView-2.4R1	8/12	31612-1.5

Probe Characterizatioı

Probe Model	Probe Serial	Probe Frequency	Wedge Angle	Probe Aperture
5L16-A1	C0055	5MHz	55 Degrees	0.378 in

Setup

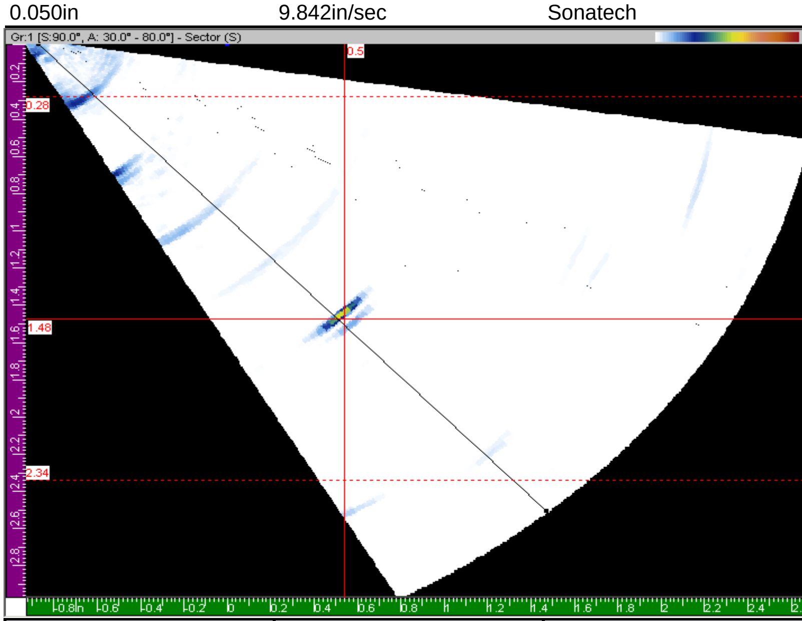
Beam Delay	Start(1/2 path)	Range(1/2 path)	PRF	Type
8.643us	0.000in	3.430in	25	PA(Phased Array)
Scale Type	**Scale Factor**	**Video Filter**	**Rectification**	**Band Pass Filter**
Compression	17	On	FW(Full Wave)	5MHz
Voltage	**Gain**	**Mode**	**Wave Type**	**Pulse Width**
80(High)	27dB	PE(Pulse Echo)	Shear	100ns

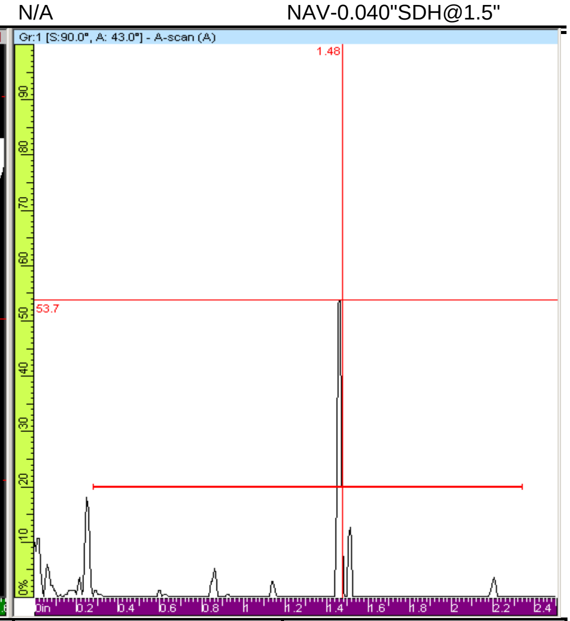
Transducer Calculatoı

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	1.0 Degrees	2.0"	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	N/A	NAV-0.040"SDH@1.5"





Date / Time	Date / Time	Date / Time	Date / Time	Date / Time
3/17-7AM	3/18-7AM			

Inspector: **Manuel Gracie** **Level:** **III** **Date:** **3/17/2012**

THIELSCH ENGINEERING

Phased Array Report

Customer:	AEP	**Component:**	LP (2nd) Reheat Inlet Header
Unit Number:	2	**Line Identification:**	Low Pressure-Hot Reheat
Project Number:	43-12-0010	**Weld Configuration:**	Longitudinal Seam
Procedure:	TEI NDT 55 FS-PA Rev 0	**Part Thickness:**	1.2" - 1.4"
Calibration ID #:	31512-3.2	**Part Diameter:**	45"

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-1A	No Relevant Indications Detected			
LS-2A	No Relevant Indications Detected			
LS-3A	No Relevant Indications Detected			

Notes and Comments

Inspector:	**Manuel Gracie**	**Level:**	**III**	**Date:**	**3/18/2012**

THIELSCH ENGINEERING, INC.

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

HARDNESS MEASUREMENT SHEET

Job Name: AEP Mitchell Generating Station - Unit No. 2	Job Date: 03/2012	Job Number: 43-12-0010
Component: Low-Pressure (2nd) Reheat Inlet Header	Material: SA-387, Gr. C	Hardness Scale: HBN

Location		Hardness Measurements						Corresponding Tensile Strength
		1	2	3	4	5	Average	
LPRIH-R1	Weld	195	187	204	201	202	198	93,000
	HAZ	207	200	210	200	212	206	97,000
	Base	173	169	172	178	170	172	82,000
LPRIH-R2	Weld	199	179	179	182	184	185	88,000
	HAZ	168	184	172	205	177	181	86,000
	Base	175	188	179	176	184	180	86,000
LPRIH-R3	Weld	165	177	183	158	162	169	81,000
	HAZ	203	154	174	185	192	182	86,000
	Base	164	168	174	179	173	172	82,000
LPRIH-R4	Weld	178	178	184	181	165	177	85,000
	HAZ	178	156	194	172	153	171	81,000
	Base	181	173	172	175	177	176	84,000
LPRIH-R5	Weld	189	189	168	181	191	184	87,000
	HAZ	205	207	214	207	196	206	97,000
	Base	164	145	165	158	160	158	76,000
LPRIH-R6	Weld	174	173	160	165	168	168	81,000
	HAZ	179	172	178	179	192	180	86,000
	Base	193	191	184	182	199	190	90,000
LPRIH-R7	Weld	119	148	160	165	168	152	73,000
	HAZ	155	145	153	146	163	152	73,000
	Base	174	118	177	173	152	159	76,000
LPRIH-R8	Weld	163	156	146	156	150	154	74,000
	HAZ	166	173	159	165	160	165	79,000
	Base	159	153	154	147	159	154	74,000

INSPECTOR: M. Olszewski	DATE: 3-26-2012