

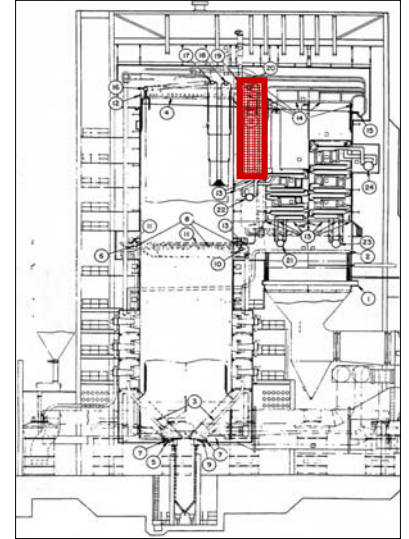
Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

AREA: Superheater Secondary Inlet

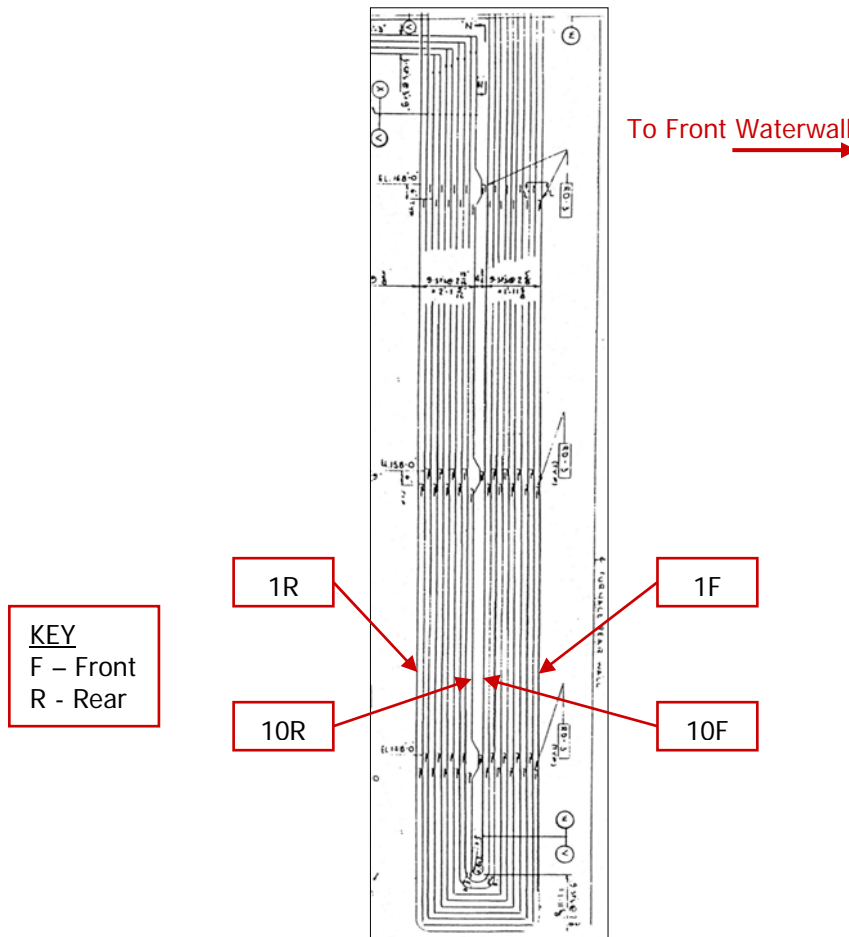
The area was numbered from boiler left side to boiler right side. Tubes were counted from front to rear or top to bottom unless otherwise specified.

Items were marked with white grease stick.



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SEE NEXT PAGE FOR REPAIRS
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Tube Numbering Orientation



Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

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P R I O R I T Y # 1 R E P A I R S

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Repair #: 1-a Record:# 21
Action: TUBE REPLACEMENT-P1
Priority #: 1
Inspector: Smith J.

General location is Superheater Secondary
Inlet, Leading Edge.
Elevation: 143'

Appearance: Tube Wall Loss

Material: 1.028" ID x .611" MWT x SA-213T22

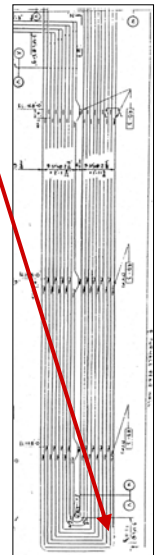
The IK/IR # is IK-7/8



It is recommended that the following tubes be replaced for a length of 3' to include one (1) 90 degree lower loop bend:

- Assembly/Tube(UT result)
- A27/2F(0.358)**
- A27/3F(not attainable)**

From the centerline of the lower loop bend, the cut lines will extend upward 2' and horizontally 1'. Note that both tubes have been previously pad weld repaired and the pad welds have washed out wherein tube material is exposed.



Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

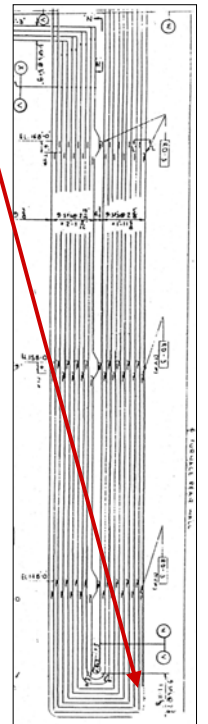
Repair #: 2-a Record:# 20
Action: TUBE RESTORATION WELD-P1
Priority #: 1
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.
Elevation: 143'

Appearance: Tube Wall Loss

Material: 1.028" ID x .611" MWT x SA-213T22

The IK/IR # is IK-7/8



Restore tubing to MWT by applying 18" x 2" pad welds on the leading edge side of the following assembly/tube(UT result):

- A26/2F(0.434)**
- A32/2F(0.435)**
- A32/3F(0.420)**

The area to be pad welded will begin at the centerline of the lower loop bend and extend upward for a length of 18".

Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 3-a Record:# 15
Action: GRIND FOR INSPECTION-P1
Priority #: 1
Inspector: Smith J.

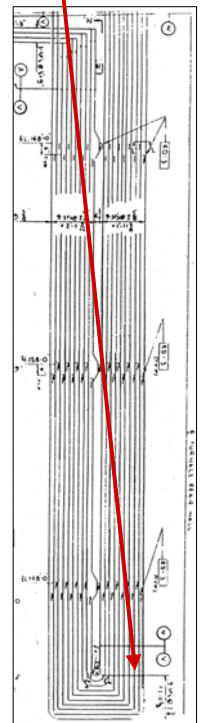
General location is Superheater Secondary Inlet, Leading Edge.

Elevation: 143'

Appearance: Tube Wall Loss

Material: 1.028" ID x .611" MWT x SA-213T22

The IK/IR # is IK-7/8



Grind a 6" x 2" (L x W) area on the leading edge of tube 3F at assembly 7 to a 'white' metal finish and call for re-inspection. As visually identified, a substantial amount of wall loss is evident. Given the current surface texture, UT could not be performed.

Work Order: _____

Status: Re-Inspect

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

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P R I O R I T Y # 2 R E P A I R S
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Repair #: 4-a Record:# 48
Action: TUBE RESTORATION WELD-P2
Priority #: 2
Inspector: Smith J.

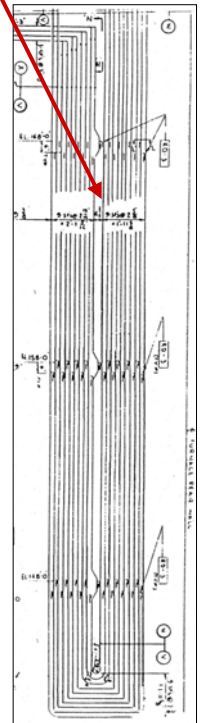
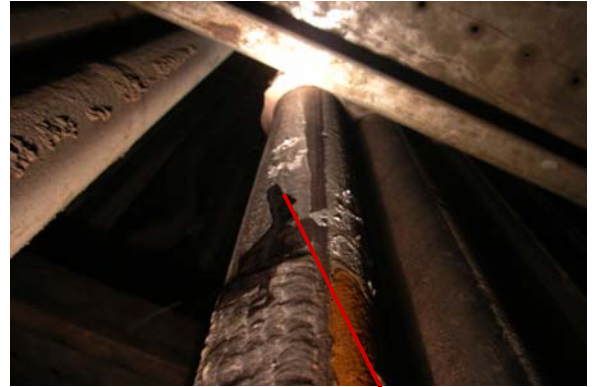
General location is Superheater Secondary Inlet, Trailing Side.

Elevation: 164'

Cause: Erosion (Soot Blower)
Appearance: Eroded

Material: 2.25" OD x .506" MWT x SA-213T22

The IK/IR # is IK-15/16



Restore tube 10F of assembly 18 by applying a 16" pad weld due to a remaining wall thickness of 0.395" (78% of MWT). The pad weld will be applied above an existing pad weld and extend to the split ring casting for the aforementioned length.

Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 5-a Record:# 5
Action: FLEX TIE REPLACEMENT-P2
Priority #: 2
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.

Appearance: Failed/ Cracked Flex Ties



Multiple flex ties throughout assemblies 1 through 56 at elevations 148'0", 158'0", and 168'0" were identified as deficient with the following scenarios:

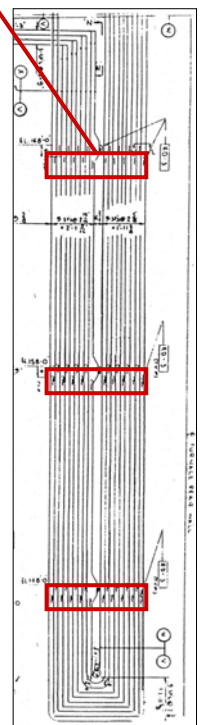
- (1) Completely failed
- (2) Cracked at the attachment weld
- (3) At the origin of failure, wall loss is present from weld fracture
- (4) Flex tie remnants at failure origin is abrading adjacent tubing
- (5) Tubing is out-of-plane 1 to 2 tube diameter from the centerline of the assemblies

It is recommended that all flex ties be replaced as documented in the spreadsheet at the close of this report. Note the following:

- (1) Install ties using the same rod as the parent material of the tube
- (2) Avoid installing the new tie in the previous location of the existing tie
- (3) Attach new tie a minimum of 3 inches from the previous location to avoid overlap of heat affected zones

As an alternative to flex tie replacement, consider installing split ring castings encompassing tubes 1F through 10F and 10R through 1R of all 56 assemblies at three elevations 149'0", 159'0", and 169'0".

All tube material is SA-213 T22



Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 6-a Record:# 22
Action: ALIGN AND ATTACH-P2
Priority #: 2
Inspector: Smith J.

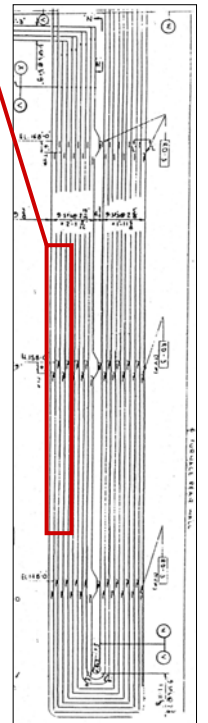
General location is Superheater Secondary Inlet, Leading Edge.

Appearance: Out of Alignment



Located at **assembly 47**, tubes 3F through 3R are out-of-plane from the centerline of the assembly approximately 1 tube diameter at the lower loop section (Elevation 143'0"). At elevation 153'0", tube 3R is bowed out-of-plane an estimated 1 to 1 1/2 tube diameters spanning for a length of 15'+. **It is recommended that the alignment of all tubing be restored; tube replacement may be required to restore the alignment of tube 3R.**

Consider using a 'vise' to re-position tubing and install split ring castings encompassing tubes 1F-10F and 10R-1R at elevations 149', 159' and 169'.



Work Order: _____

Status: Inspected

Inspection Report

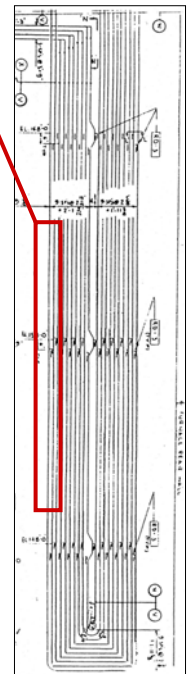
Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 6-b Record:# 33
Action: ALIGN AND ATTACH-P2
Priority #: 2
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.

Elevation: 153'

Appearance: Out of Alignment



At elevation 153'0", tubes 1R and 2R of assembly 37 are bowed out-of-plane an estimated 2 tube diameters spanning for a length of 20'+. It is recommended that the alignment of all tubing be restored; tube replacement may be required to restore the alignment of tubes 1R and 2R.

At time of flex tie or split ring casting installation, replacement may be necessary to align tube properly with assembly.

Work Order: _____

Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 7-a Record:# 12
Action: MONITOR CLOSELY-P2
Priority #: 2
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.

Elevation: 143'

Appearance: Tube Wall Loss

Material: 1.028" ID x .611" MWT x SA-213T22

The IK/IR # is IK-7/8

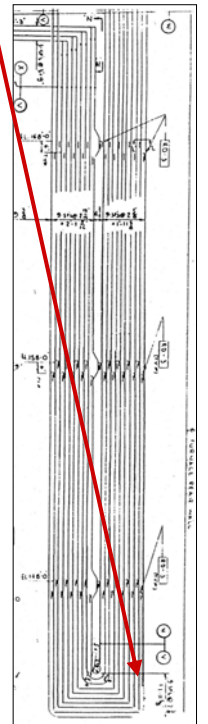


During future overhauls, monitor the following SSH inlet tubes for further wall loss:

Assembly/Tube(UT Result)

- A9/2F(0.516)
- A16/2F(0.504)
- A23/1F(0.539)
- A24/1F(0.530)
- A25/1F(0.529)
- A25/3F(0.490)
- A26/1F(0.537)
- A32/4F(0.528)

Currently, the tubing is within 76% to 85% of MWT as UT verified. Although this threshold is shield criteria, shielding is not recommended. Given the temperatures at this location, the shields are likely to degrade at a much higher rate from thermal fatigue.



Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

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P R I O R I T Y # 3 R E P A I R S
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Repair #: 14-a Record:# 17
Action: REMOVE SAMPLE FOR ANALYSIS-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.
Elevation: 143'

The IK/IR # is IK-7/8

Material: 1.028" ID x .611" MWT x SA-213T22



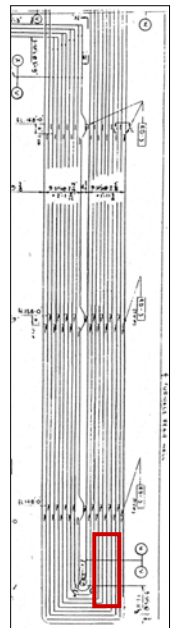
Visual indications of LTOH (long-term overheating) and/or coal ash corrosion were identified on the leading edge of the SSH inlet component. The indications were most prevalent on tubes 2F through 4F at elevation 143'0" on assemblies 5 through 38. It is recommended that three (3) tube samples be removed for a metallurgical analysis condition assessment to verify the indications.

Coal-Ash Corrosion

High temperature coal ash corrosion can occur at locations in superheaters that:

- (1) Have tube surface metal temperatures between 1000F (593C) and 1300F (704C). Maximum corrosion rates occur at 1200F (649C). High metal temperatures are likely to occur in tubes that surround a radiant cavity, are exposed to radiant heat, or contain the hottest steam prior to leaving the flue gas enclosure.
- (2) Have slag type corrosive ash deposits that are strongly bonded to the tube.

Coal ash corrosion is caused by the formation of complex alkali-iron



Inspection Report

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Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

trisulfates in the ash deposits when the tube metal temperature is between 1000F (5930C) and 1300F (704C). Certain coals contain constituents, which form ash deposits that are corrosive in the molten form. The corrosion becomes a significant concern when the wall thickness reduces rapidly. The root cause of coal ash corrosion can be verified by determining the corrosiveness of the coal ash and by measuring the tube metal temperature under the ash deposit. Coals with chloride content of less than 0.2% and sulfur content of less than 3.0% have not produced significant corrosion rates. Temporary thermocouples on the tube surface can show whether the metal temperatures are within the range to produce a molten form of deposit. Combustion ash deposits should be removed for chemical and melting point analysis.

Long Term Overheat (High Temperature Creep)

The external tube surface may have a thick hard oxide scale which could have an alligator hide appearance. High temperature creep (LTOH) occurs from a relatively continuous extended period of slight overheating above the design metal temperature, a slowly increasing level of temperature or stresses, or from the accumulation of periods of excessive overheating. Wall thickness measurements are necessary to verify that stress levels have not increased due to erosion or corrosion.

An alternative to removing tube samples which are believed to be affected from LTOH is oxide thickness testing. Remaining life of tubing can be predicted by measuring the thickness of the internal oxides on the ID of the tube.

Work Order: _____ Status: Inspected

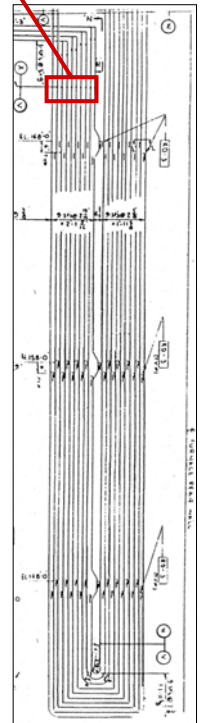
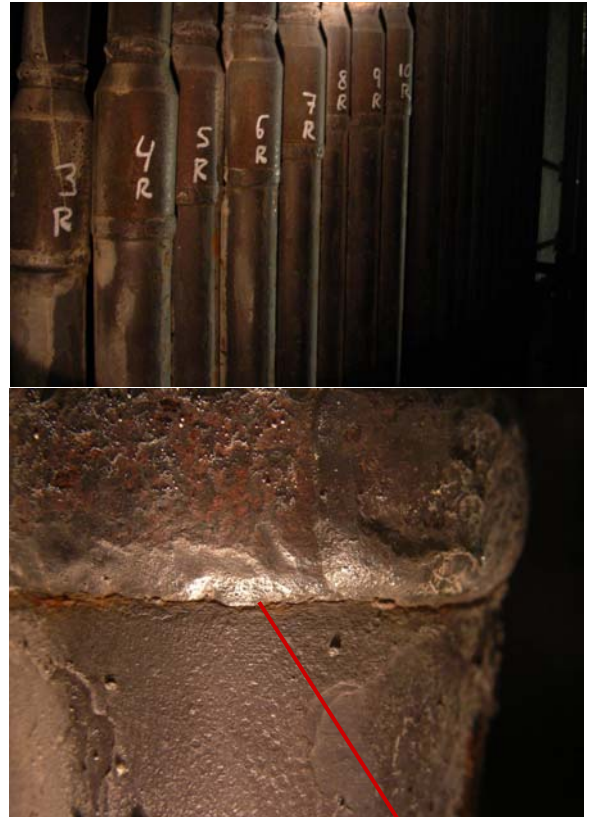
Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 16-a Record:# 51
Action: PLANNED REPLACEMENT OF DMW-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Trailing Side.

Elevation: 171'



It is recommended that a 5 year plan be implemented to replace all DMW's within the SSH Inlet at elevation 171'0" if in fact, the DMW's are original tubing. Replace the DMW's using shop fabricated safe ends with inconel welds. DMW's are present on tubes 3R through 10R of assemblies 1 through 56. A total of 448 safe ends will be required; determine a percentage of tubes to be replaced each planned overhaul.

Material is as follows

- SA-213 T22 x 2.25" OD x 0.506" MWT
- SA-213 TP304H x 1.875" OD x 0.295" MWT

Tube sampling and NDE methods should be applied to assess weld condition and to substantiate DMW replacement.

Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

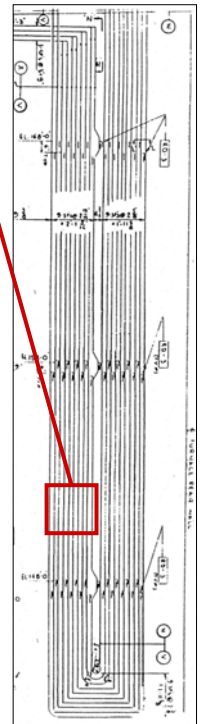
Repair #: 9-a Record:# 38
Action: PLAN FOR FUTURE REPLACEMENT-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Trailing Side.

Elevation: 151'

Cause: Erosion (Soot Blower)
Appearance: Eroded

The IK/IR # is IK-13/14



Plan for future replacement of the following tubes within IK-13/14 path:

A47/1R(3' replacement): From the centerline of the blower, cut lines will extend up 18" and down 18"

A54/10R(4'6" replacement): From the centerline of the blower, cut lines will extend up 2'6" and down 2'

Both tubes have been previously pad weld repaired and the pad welds have washed out wherein tubes are approaching base material.

Work Order: _____ Status: Inspected

Inspection Report

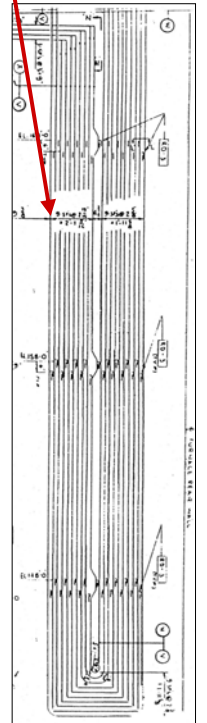
Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 9-b Record:# 44
Action: PLAN FOR FUTURE REPLACEMENT-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Trailing Side.
Elevation: 163'

Cause: Erosion (Soot Blower)
Appearance: Eroded

The IK/IR # is IK-15/16



Plan for future replacement of the following tubes within IK-15/16 path:

A20/1R(3'6" replacement): From the centerline of the blower, cut lines will extend up 24" and down 18".

Note: The pad weld on the tube has degraded and tube is approaching base material.

Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

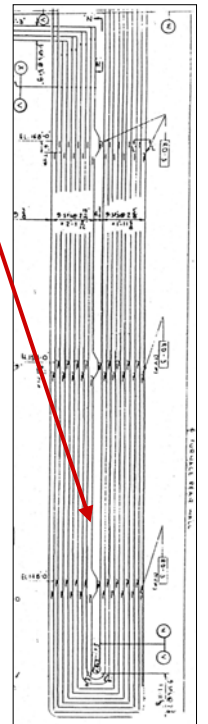
Repair #: 13-a Record:# 37
Action: MONITOR CLOSELY-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Trailing Side.

Elevation: 151'

Cause: Erosion (Soot Blower)
Appearance: Eroded

The IK/IR # is IK-13/14



Monitor the trailing side of the following tubes within IK-13/14 blower path:

- A6/5R(0.610)
- A6/10R(0.575)
- A50/10R(0.569)

No repairs are required at this time; tubing is above 85% of MWT.

Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

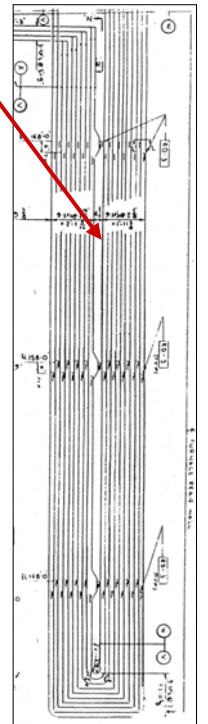
Repair #: 13-b Record:# 46
Action: MONITOR CLOSELY-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Trailing Side.
Elevation: 163'

Cause: Erosion (Soot Blower)
Appearance: Eroded

Material: 2.25" OD x .506" MWT x SA-213T22

The IK/IR # is IK-15/16



During future overhauls, monitor tube 10F of assemblies 1 through 56 for further wall loss from erosion degradation.

The lowest results obtained that were not within repair criteria were identified at:

- A18/10F(0.452 - below existing pad weld)
- A19/10F(0.440 - above existing pad weld)

Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 10-a Record:# 1
Action: FLEX TIE REPLACEMENT-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.

Elevation: 143'

Appearance: Failed/ Cracked Flex Ties

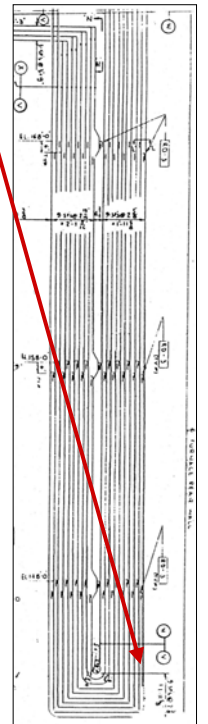


Flex ties were identified as either cracked or failed between tubes 1F through 3F on assemblies 1 through 56 at elevation 143'0". It is recommended that all flex ties at the aforementioned locations be replaced.

Note the following:

- (1) Install ties using the same rod as the parent material of the tube
- (2) Avoid installing the new tie in the previous location of the existing tie
- (3) Attach new tie a minimum of 3 inches from the previous location to avoid overlap of heat affected zones.

Tubes 1F through 3F at elevation 143'0" are SA-213 T22 x 1.028" ID x 0.611" MWT.



Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 11-a Record:# 31
Action: SPLIT RING CASTING INSTALL-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.

Elevation: 150'

Appearance: Disengaged from Tubes

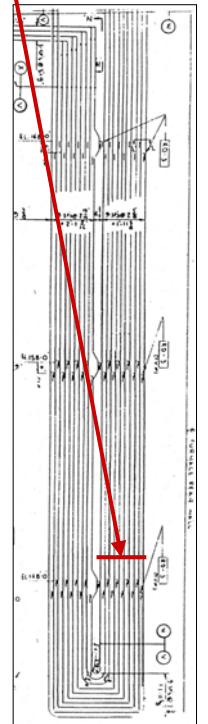


The split ring castings at elevation 150' on tubes 1F through 10F are starting to disengage at the following assemblies:

- 31
- 33
- 34
- 36

It is recommended that new castings be installed at the aforementioned locations.

Please see recommendation to install three elevations of split ring castings on page 5 of this report.



Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 15-a Record:# 35

Action: TIGHTEN HARDWARE-P3

Priority #: 3

Inspector: Simcoe T.

General location is Superheater Secondary Inlet, Leading Edge.

Appearance: Disengaged from Tubes



Tighten the hardware on the split ring castings which are beginning to extend off tubing at the following locations:

1st Scaffold Elevation (150'0")

5, 10, 11, 13, 14, 15, 16, 17, 18, 20, 27, 29, 38, 39, 40, and 43

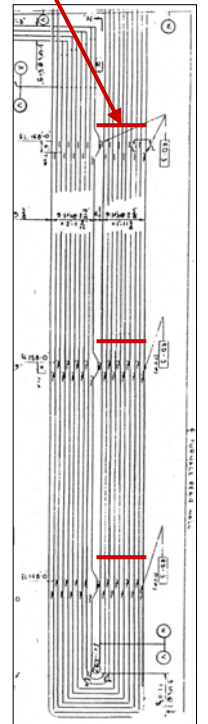
2nd Scaffold Elevation (160'0")

3, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 18, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 39, 44, and 45

3rd Scaffold Elevation (170'0")

1, 2, 3, 7, 9, 10, 12, 13, 16, 17, 18, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 43, 44, 45, 46, 47, 49, 53, 54, 55, and 56

The installation of additional nuts and bolts may be required where missing. Once installed and tightened, apply a tack weld between the bolt and nut to secure position.



Work Order: _____

Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 8-a Record:# 49

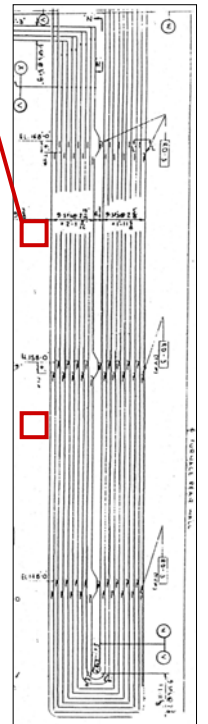
Action: WELD REPAIR-P3

Priority #: 3

Inspector: Smith J.

General location is Superheater Secondary Inlet, Trailing Side.

Appearance: Cracked Blower Sleeve



Weld repair the cracked blower sleeves at the following IK blowers:

- IK-13
- IK-14
- IK-15
- IK-16

Work Order: _____

Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 12-a Record:# 23
Action: REFRACTORY INSTALLATION-P3
Priority #: 3
Inspector: Smith J.

General location is Rear Waterwall Upper Slope.

Appearance: Deteriorated



The refractory seal between the rear waterwall upper slope and both left and right sidewalls has deteriorated and is no longer present. It is recommended that a new refractory seal be installed at both sidewalls spanning from the rear WW screen tubes to the nose of the deflection arch.

Work Order: _____ Status: Inspected

Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 12-b Record:# 53
Action: REFRACTORY INSTALLATION-P3
Priority #: 3
Inspector: Smith J.

General location is Roof Tubes.

Appearance: Deteriorated



The refractory seal between the roof tubes and both left and right sidewalls has deteriorated and is no longer present at various locations. It is recommended that a new refractory seal be installed at both sidewalls spanning from the front WW to the rear WW screen tubes.

Work Order: _____ Status: Inspected

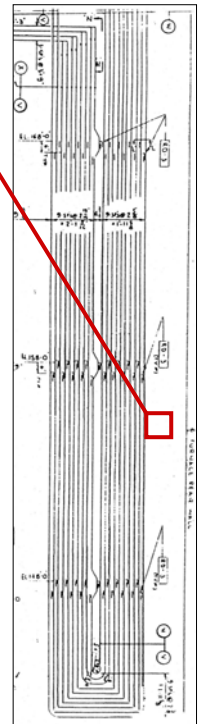
Inspection Report

Station: Any Station Unit: 0 Report Name: 1-Superheater Secondary Inlet

Repair #: 17-a Record:# 28
Action: VERIFY IK BLOWER FUNCTIONALITY-P3
Priority #: 3
Inspector: Smith J.

General location is Superheater Secondary Inlet, Leading Edge.
Elevation: 153'

The IK/IR # is IK-9/10



As interpreted from the fused ash on the leading edge side of the assemblies and the ash accumulation in the blower sleeves, either:

- (1) IK-9/10 blowers are not being used
- (2) IK-9/10 blowers are non-functional

Inquire with operations to determine if blowers are no longer in use.

Work Order: _____

Status: Inspected