

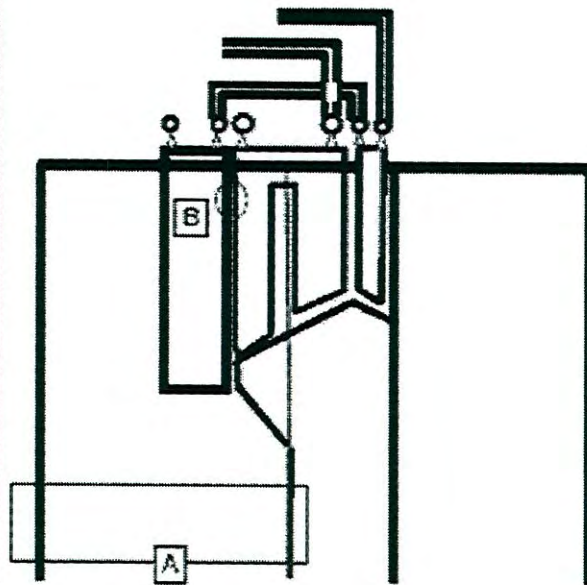
Findings (3) (Unchahar #2)

Components	INSPECTION	Unchahar #2 Brief comment
WATER WALL	VT	Erosion of a number of tubes around short soot blower were found. Erosion of corner tubes at soot blower level.(Thickness measurement 28points (Min.4.2mm))
	THICKNESS MEASUREMENT	Eroded tubes around short soot blower were meareured .(69points measured) Min 5.3mm (2nd short blower rear wall #1 form left)
SUPER HEATER	VT	Disorder of arrangement at lower part of panel with disjointed slide spacers. Slight erosion of rear tubes at the highest level of short soot blower.
	THICKNESS MEASUREMENT	Rear tubes at the highest level of short soot blower.(29points, Min.9.8mm) 2nd tubes from rear tubes at the highest level of short soot blower.(3points, Min.10.0mm) Rear tubes at the second highest level of short soot blower.(29points, Min.9.8mm)
	SAMPLE TUBE INSPECTION *	1 sample tube from Platen-SH in furnace (#3panel- 8th tube from rear) 2 sample tubes from Final-SH in furnace (#1-3rd tube from rear, #119-3rd tube from rear)
	CREEP RUPTURE TEST*	1 sample tube from Platen-SH in furnace (#3panel- 8th tube from rear), 1 sample tubes from Final-SH in furnace (#119-3rd tube from rear)
	SUS SCALE DEPOSITION INSPECTION	3 tubes with 15% fullness and 2 tubes with 10% fullness at front bend portion. 1 tube with 15% fullness and the others with less than 10%.
REHEATER	VT	No abnormality with panel ar r angement Slight erosion of tubes at the highest level of short soot blower.

Findings (4) (Unchahar #2)

Components	INSPECTION	Unchahar #2 Brief comment
SUPER HEATER HEADER	VT	No appearance abnormality in stubs and other weld portion.
	PT(DPT)	3 small circular indication patterns by ark strike at 4th tube from front.
	UT	No detection of flaw which echo exceeds L-line by UT. Continuous indication with fine flaws detected at 80mm depth from surface by TOFD.
	REPLICA INSPECTION	No crack in Base metal, HAZ(Heat Affected Zone) and weld metal. More detail microstructural observation is required in labo.
DE SUPER HEATER PIPE	REPLICA INSPECTION	No crack in Base metal, HAZ(Heat Affected Zone) and weld metal. More detail microstructural observation is required in labo.
REHEATER HEADER	VT	No appearance abnormality in stubs and other weld portion.
	REPLICA INSPECTION	No crack in Base metal, HAZ (Heat Affected Zone) and weld metal. Abnormal microstructure observed in base metal region of right-hand weld of header, which is considered to be the effect of ark during welding. More detail microstructural observation.
MAIN STEAM PIPE (near the stop valve weld joint)	REPLICA INSPECTION	No crack in Base metal, HAZ(Heat Affected Zone) and weld metal. More detail microstructural observation is required in labo.
HOT RHEAT PIPE	REPLICA INSPECTION	No crack in Base metal, HAZ(Heat Affected Zone) and weld metal. More detail microstructural observation is required in labo. Some deposit metal by welding attached to base metal near the weld ring.

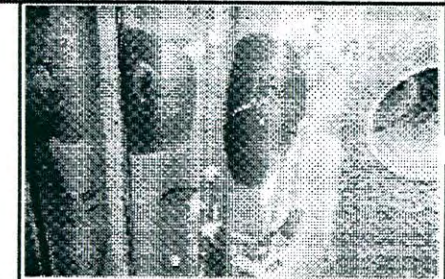
Visual inspection (Unchahar #2)



Portion noted

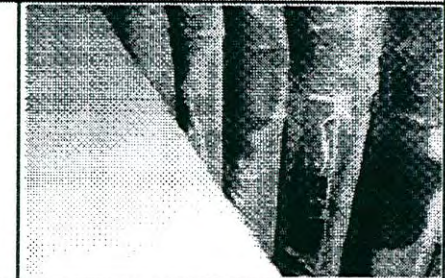
A: Erosion of water wall tube around short soot blowers.

Erosion of a number of tubes around short soot blower.
(Thickness measurement conducted)
Min. 5.3mm (1st tube from left in rear wall at 2nd blower)



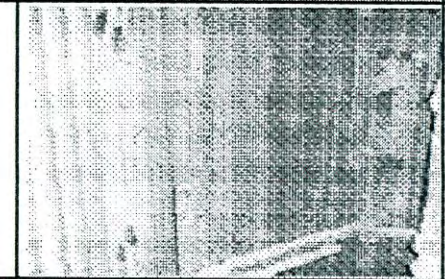
A: Erosion of water wall tubes around burners.

Erosion of several tubes around burners.
(Thickness measurement conducted)
Min. 4.7mm



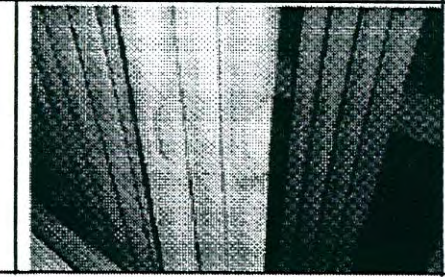
A: Erosion of water wall tubes near the corners.

Erosion of several tubes near the corners at short soot blower level.
(Thickness measurement conducted)
Min. 4.2mm



B: Erosion of Platen SH rear side tubes at the highest level of soot blower.

Slight erosion of rear side tubes at the highest level of soot blower.
(Thickness measurement conducted)
Min. 9.8mm



Thickness (Unchahar #2)

Thickness measurement of tubes

Tube	Material	Designed				Allowable Stress S (MPa)	tsr (mm)	Measured (Min) (mm)	Note
		O.D. D(mm)	t (mm)	Pressure P (kg/cm ²)	Temperature (°C)				
Water wall	SA-210, GR.A1	63.5	6.3	175.8	404	86.8	6.1	4.2	Erosion around short soot blower
Platten SH (ELE 1)	SA 213 T 22	51	9.6	175.8	566	39.7	9.4	9.8	Highest soot blower level
Platten SH (ELE 1)	SA 213 T 22	51	9.6	175.8	566	39.7	9.4	9.8	Second highest soot blower level
Platten SH (ELE 2)	SA 213 T 22	51	9.6	175.8	566	39.7	9.4	10.0	Highest soot blower level

O.D.:Outer Diameter

$$tsr = PD / (2S + P) + 0.005D$$

t:Thickness

Creep life calculation of header and pipe based on disigned condition

Header and Pipe	Material	Designed				Allowable Stress S (MPa)	tsr (mm)	Hoop stress (MPa)	Estimated Life(h) calculated by creep rupture data
		O.D. D(mm)	t (mm)	Pressure P (kg/cm ²)	Temperature (°C)				
Platen SH outlet header	SA 335 P-22	323.9	56	163.8	534	58.2	37.5	35.3	8.58E+06
Re-Heater outlet header	SA 335 P-22	558.8	45	44.1	555	45.4	25.0	23.8	9.19E+06
LTSH outlet header	SA 335 P12	323.9	40	167.6	450	101.0	24.7	60.0	4.81E+08
Links to DESH	SA 335 P12	406.4	45	167.6	450	101.0	31.0	67.6	2.57E+08
DESH	SA 335 P12	406.4	45	167.6	450	101.0	31.0	67.6	2.57E+08
Links from DESH	SA 335 P12	406.4	45	167.6	427	102.8	30.5	67.6	2.25E+09
Platen SH inlet header	SA 335 P12	323.9	40	167.6	427	102.8	24.3	60.0	4.30E+09
Platen SH outlet header	SA 335 P-22	323.9	56	163.8	534	58.2	37.5	35.3	8.58E+06
Links to Final SH	SA 335 P-22	406.4	70	163.4	534	58.2	47.0	35.4	8.49E+06
SH Finish inlet header	SA 335 P-22	406.4	65	163.4	534	58.2	47.0	39.0	5.54E+06
SH Finish outlet header	SA 335 P-22	457.2	100	160.6	555	45.4	63.8	25.0	7.76E+06
Main Steam Pipe	SA 335 P-22	355.6	50.3	160.5	540	54.4	42.8	44.6	1.98E+06
Hot Reheat Pipe	SA 335 P-22	508	28	37.6	540	54.4	16.4	30.9	9.91E+06

$$tsr = PD / (2S + 2kP) + a \quad (?=1, a=0)$$

k	Temperature(°C)						
	≤ 350	480	510	535	565	590	620
Feritic steel	0.4	0.4	0.5	0.7	0.7	0.7	0.7

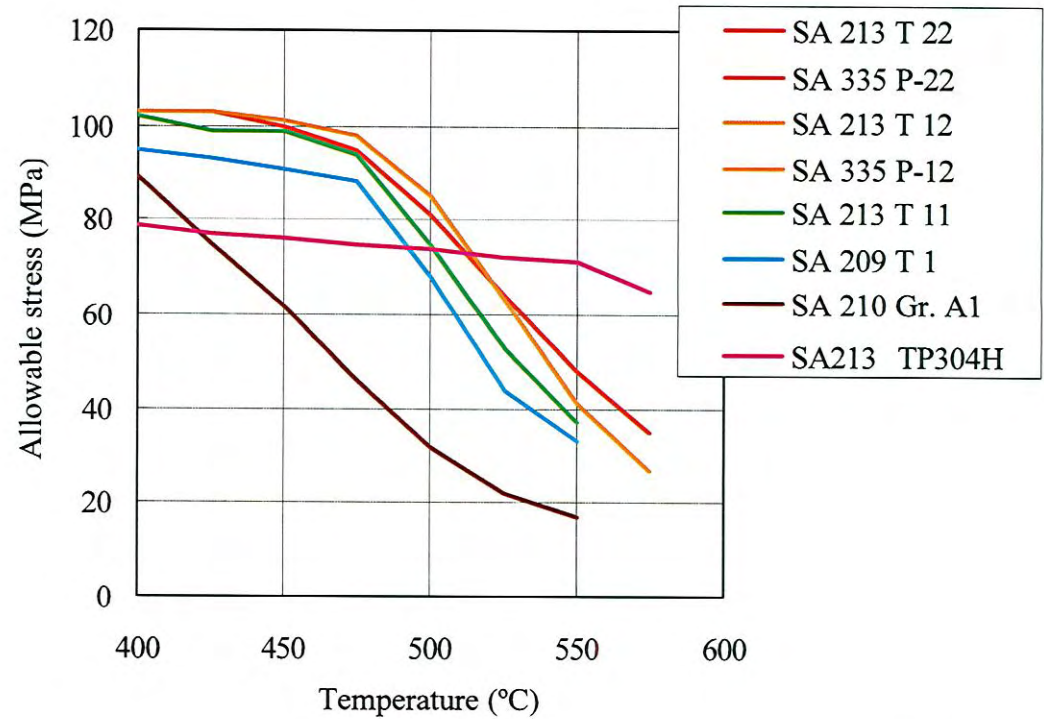
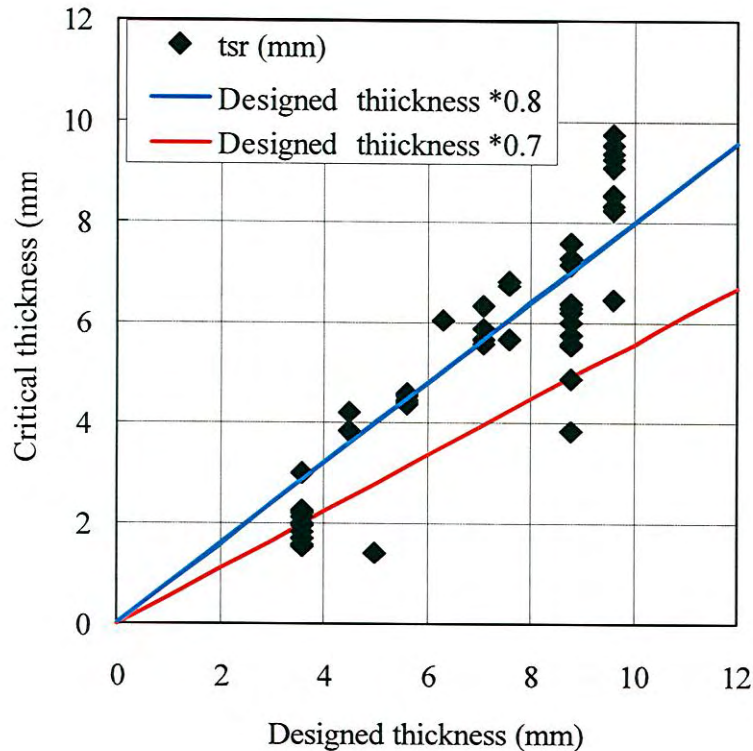
Thickness criterion (Unchahar #2)

Thickness measurement of tubes

Tube	Material	Designed				Allowable Stress S (MPa)	tsr (mm)	Measured (Min) (mm)	Note
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O.D.:Outer Diameter
t:Thickness

$$tsr = PD/(2S+P)+0.005D$$



Calculated designed creep life (Unchahar #2)

Creep life calculation of header and pipe based on disigned condition

Header and Pipe	Material	Designed				Allowable Stress S (MPa)	tsr (mm)	Hoop stress (MPa)	Estimated Life(h) calculated by creep rupture data
		O.D. D(mm)	t (mm)	Pressure P (kg/cm2)	Temperature (°C)				
Platen SH outlet header	SA 335 P-22	323.9	56	163.8	534	58.2	37.5	35.3	8.58E+06
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