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QUAD CITIES II

UPPER VESSEL FABRICATION SUMMARY

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CONTENTS OF THIS REPORT

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Quad Cities II Upper Vessel Fabrication Summary

1.0 INTRODUCTION

The following summary was initiated at Chicago Bridge & Iron (CBI) Records Center in Houston, Texas and Babcock & Wilcox Co. (B&W). B&W fabrication records were shipped to GE San Jose facilities, where the report was finalized. Fabrication of Quad Cities II Reactor Vessel originated at the B&W plant in Mt. Vernon, Indiana. During the fabrication, a portion of the vessel (Shell Ring #1 to Bottom Head Assembly) was subcontracted to Rotterdam Drydock, LTD. Works. Later, the entire vessel was transferred to CBI Nuclear Co. in Memphis, Tennessee in five subassembly sections for completion of fabrication. The vessel assembly is shown in Figure 1. These five subassemblies were:

1. Shell Ring #1 to Bottom Head
2. Shell Ring #2
3 Shell Ring #3
4 Shell Ring #4 to Flange
5. Top Head

The information contained in this summary, compiled from records generated by B&W and CBI during each of their portion of vessel fabrication, is limited to the Top Head Assembly and Shell Ring #4 to Flange Assembly including the girth seam of Shell Ring #3 to Shell Ring #4 (Seam CD). CBI records were presented to GE personnel in their original condition. The B&W fabrication records were on microfilm and were printed to hard copies and sorted before and during GE's review. The Postweld Heat Treatment (PWHT) Time/Temperature charts for B&W applied heat treatments were obtained from GE records files in San Jose.

QUAD CITIES II
CBI ASSEMBLY

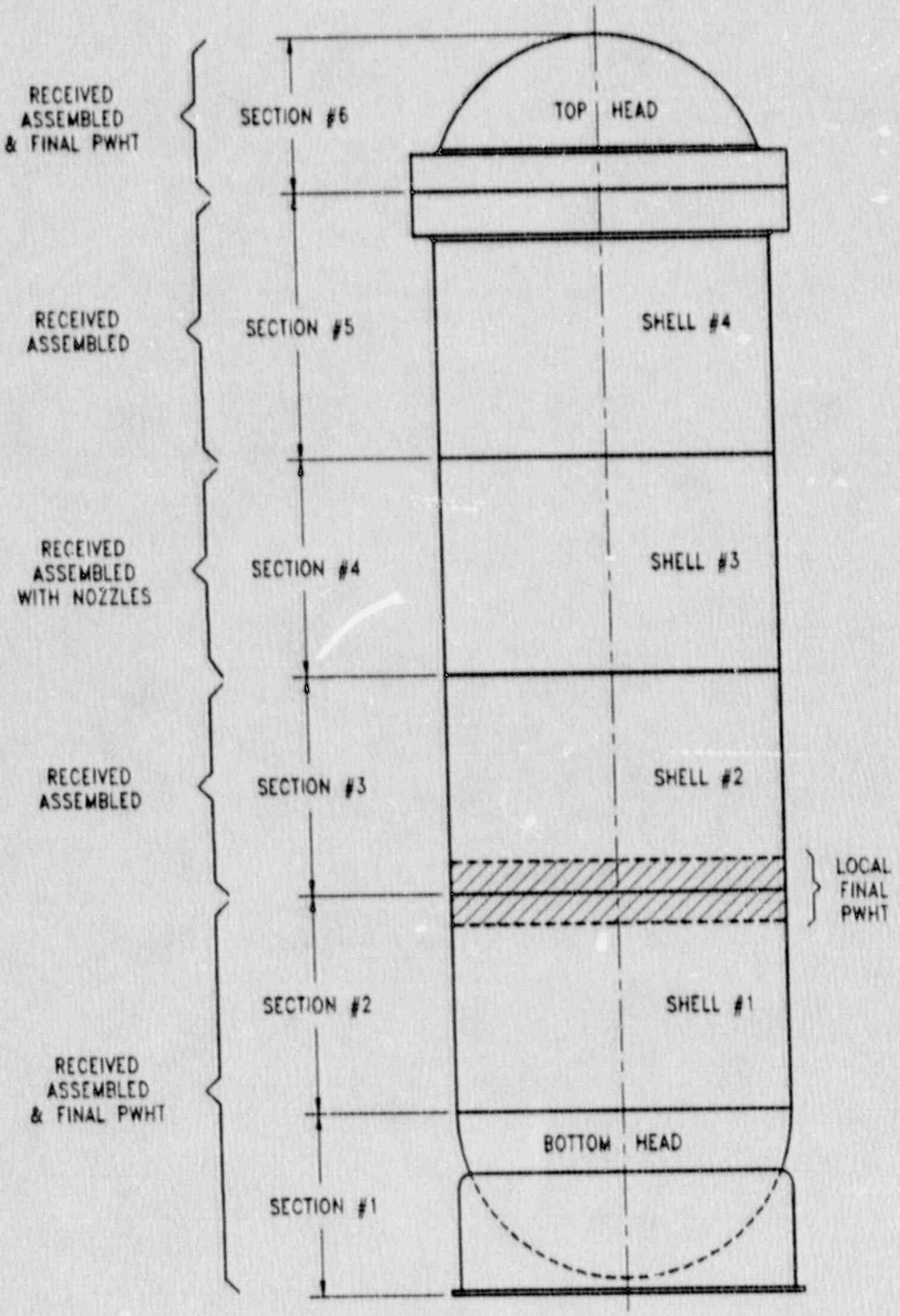


FIGURE 1

QUAD2CRI 06279J

2.0 MATERIAL CERTIFICATIONS

2.1 Top Head Dollar Plate (B&W MK 201)

MATERIAL: A-302, Grade B, Code Case 1339
MANUFACTURER: Lukens Steel Company.
HEAT NUMBER: B-5845-1
GRAIN SIZE: 7 or finer
VANADIUM CONTENT: not recorded
HEAT TREATMENT:
Normalized:
1600°F to 1650°F at 1 hour per inch and water quenched
1200°F to 1250°F at 1 hour per inch and water quenched
Stress Relieved:
1100°F to 1150°F for 30 hours and furnace cooled.

2.2 Top Head Side Plates (B&W MK 202)

MATERIAL: A-302, Grade B, Code Case 1339
MANUFACTURER: Lukens Steel Company
HEAT NUMBER: C-27481-1 (PC MK 202-139-1).
HEAT NUMBER: C-27481-1 (PC MK 202-139-2).
HEAT NUMBER: C-27481-1 (PC MK 202-139-4).
HEAT NUMBER: C-27481-3 (PC MK 202-139-3).
HEAT NUMBER: A-0313-1 (PC MK 202-122-7).
HEAT NUMBER: B-5853-1 (PC MK 202-127-1).
GRAIN SIZE: 5 or finer
VANADIUM CONTENT: not recorded
HEAT TREATMENT:
NORMALIZATION OF HEATS A-0313-1 and B-5853-1:
1750°F to 1800°F at 1 hour per inch and water quenched
1175°F to 1225°F at 1 hour per inch and water quenched
NORMALIZATION OF HEAT C-27481-1:
1750°F to 1800°F at 1 hour per inch and water quenched
1175°F to 1225°F at 1 hour per inch and water quenched

1225°F to 1275°F at 1 hour per inch and water quenched

NORMALIZATION OF HEAT C-27481-3:

1600°F to 1625°F at 1 hour per inch and water quenched

1175°F to 1225°F at 1 hour per inch and water quenched

STRESS RELIEVED: (all Heats)

1100°F to 1150°F for 30 hours and furnace cooled

2.3 Closure Head Flange (B&W MK 209)

MATERIAL:	SA-336, Code Case 1332, para. 5, & ASME Section III
MANUFACTURER:	Ladish Company
HEAT NUMBER:	3P1131
GRAIN SIZE:	6
VANADIUM CONTENT:	0.03% - 0.05%
HEAT TREATMENT:	
NORMALIZED:	1625°F to 1650°F for 20 hours and water quenched
STRESS RELIEVED:	1100°F to 1150°F for 30 hours, furnace cooled

2.4 Shell Flange (B&W MK 48)

MATERIAL:	SA-336, Code Case 1332, para. 5, & ASME Section III
MANUFACTURER:	Ladish Company.
HEAT NUMBER:	3P1118
GRAIN SIZE:	6
VANADIUM CONTENT:	0.03%
HEAT TREATMENT:	
HEATED TO	1625°F + 25°F for 8 hours, water quenched
TEMPERED:	1250°F + 20°F for 19 hours, water quenched

2.5 Shell Ring #4 Plate Segments (B&W MK 60)

MATERIAL:	A-302, Grade B, Code Case 1339
MANUFACTURER:	Lukens Steel Company
HEAT NUMBER:	A-0985-1 (PC MK 6-122-22)
HEAT NUMBER:	A-0942-1 (PC MK 6-122-23)

HEAT NUMBER: A-0998-1 (PC MK 6-122-24)
GRAIN SIZE: 5 or finer
VANADIUM CONTENT: not recorded
HEAT TREATMENT:
NORMALIZED:
1675°F to 1725°F for 1 Hr./In., water quenched
1600°F to 1650°F for 1 Hr./In., water quenched
STRESS RELIEVED:
1175°F to 1225°F for 1 Hr./In., water quenched
1100°F to 1150°F for 30 hours and furnace cooled

3.0 TOP HEAD SIDE PLATES (TORUS) (B&W MK 202)

The six (6) segments that form the assembled torus were positioned on the fitup tooling/jigs to produce the correct upper diameter of 143 5/16" and the correct lower diameter of 246.0". Strong backs, backing strips, runoff tabs, etc. were attached to the segments by Shielded Metal Arc Welding (SMAW). Mismatch was recorded in 3 locations on the OD between the adjacent segments. The greatest mismatch between segments was 1/4" on the small diameter of the torus. The 6 long seams were ground to bring the torus into contour on both OD and ID prior to welding.

The torus plates were preheated to 300°F (Seam G1 through G6) fitted and welded by the Submerged Arc Welding (SAW) process per B&W Specification WS-29 Rev. 0, and WR-02 Rev. 1 using 1/8" Mn-Mo-Ni filler metal. The torus received a PWHT for 4 hours, 18 minutes at 1100°F to 1150°F (Ref. Heat Run #523 dated 6/4/68). The torus long seams were examined by Radiographic Test (RT) which resulted in repairs. Records do not indicate which seams were effected nor to what extent the defects were. Records do show that repairs were made to the subject seam(s) and an additional PWHT was ran. The repairs were later radiographed with acceptable results. The repairs were made with the SMAW process per B&W Specification WS-35 Rev.7 using 1/8", E8015 electrodes (Heat Number 818-025611). Following the repair, the torus

received a PWHT for 3 hours, 30 minutes at 1100°F to 1130°F (Ref. Heat Run #554 dated 7/24/68).

4.0 DOLLAR PLATE AND TORUS

The results of the inspection of the trial fitting of the top head dollar plate and torus for weld seam AH resulted in an unacceptable misalignment with a maximum of +21/32" on the ID of the seam interface. A Contract Variation (CV), 122-54B, was submitted and approved. During the fit-up backing strips were welded in place on the inside and the misalignment was reverified as +21/32". Seam AH was welded up from the outside. Weld build up of the base metal was added to the low areas on the circle seam on the OD to correct the mismatch. The buildup was blend ground to a 3:1 taper. The backing strips were removed from the inside and the surface ground smooth to the base metal.

A 3/4" wide strip-back area adjacent to seam AG weld prep was removed by air arc gouging prior to the flame cutting of the weld prep. Seam AG weld prep was cut to a 6° bevel, ground, and Magnetic Particle Testing (MT) examined. An SMAW weld repair on the weld prep was performed per B&W Specification WS-35 Rev. 10, using 3/16", E8015 electrodes (Heat Number 818C).

5.0 TOP HEAD FLANGE (B&W MK 209)

5.1 Flange Repair

Inspection of the top head flange at the ven[illegible]s plant identified manufacturing or forming abnomalies which necc[illegible]ssitated two Contract Variations (CV's) for disposition. CV 122-2B was approved for B&W to make weld repairs to two areas containing unacceptable MT & UT indications. The majority of the indications were reported in the CV to be "located adjacent to the bore and confined to an area (17.5') long on the circumference by 3.625" wide as measured from the top face, by 3.0" - 3.75" deep into the forging". The defects were removed by

the forging vendor (Ladish Company) by machining away the defective areas. The machined areas were welded up by B&W per B&W Specification WS- 35 Rev. 10 using the following parameters:

Weld Control Record:	Mark No. 209, Seq. 50.
Process:	SAW (single wire, per procedure)
Electrode size:	0.125"
Electrode type:	Mn-Mo-Ni
Heat Number:	8T-1554B
Current (amps):	450 - 500
Voltage (volts):	32 - 36
Travel Speed (IPM)	11.5

In addition, the Weld Control Log shows some manual welding was performed using 1/8", 5/32" and 3/16" E8015 electrodes during this welding process. It appears the hand welding was for the repairs of the ID bore, although fabrication records to this fact were vague. A description of these additional areas were described in Inspection Report #F39996.

CV 122-6B was approved to make weld build up repairs to undersized areas on the ID of the top head flange forging. Two of these undersized (or low) areas would not permit the inside diameter to be final machined to the drawing requirement of 245.75". The inside diameter at the lower section or "tang" area was also undersized and would not permit final machining to the required 245.0625" diameter, according to the CV. The Contract Variation described a repair procedure which called for the flange vendor (Ladish Company) to perform certain portions of the repair process which included: (1) rough machining of the forging to leave 3/16" stock on the top face, 1/4" on the 3" radius, and 3/8" on the OD & ID; and (2) machining the bottom face to leave 1/8" minimum stock. However, insufficient stock would remain for machining the 245-1/16" diameter. Repair of the "tang" of the flange forging was made later during the flange to side plates (torus) fit-up. This repair process will be discussed in Section 6.0 of this report.

The first sequence of work on the flange by B&W, was to weld six (6) temporary hold down lugs to the OD of the flange. A PWHT was then applied for 2 hours, 6 minutes at 1100°F to 1130°F (Ref. Run #408 dated 9/25/67).

Next, the repair welding described in paragraph 5.1 was performed to Seq. 50 of deviation report dated 12/12/67. The flange went through another PWHT following the repairs. This PWHT was applied for 54 minutes at 1100°F to 1130°F (Ref. Run #444 Dated 12/12/67).

The flange was then inspected and rejected for out of round conditions (see Inspection Report #F89523). The flange was set up on an 800 ton jack to correct the concentricity. At that time retaining struts were installed and the bore was rechecked for dimensional tolerance. Inspection report #F89757 indicates it was still out of round. Disposition was to "accept as is."

5.2 Flange PWHT (CV 122-49) Furnace Control Malfunction

The next sequence was to perform a heat treat on the flange to PWHT specifications. The Furnace Run Number for this heat treatment was not available during the records review, however an Inspection Report (#G14312) rejected the stress relief due to a thermocouple reading of 1790°F. CV 122-49D (revised to 122-49E) was issued for resolution. The description of variation in CV 122-49E indicates the temperature readings were 1530°F to 1790°F for approximately eighty minutes due to the furnace controls malfunction.

Test samples (1"x2"x12") were removed from the flange forging for properties analysis. One was in the vicinity of the subject thermocouple the other was 180° out. The location of these areas were on the corner of the face to OD of the forging. Tests were ran of these samples to detect mechanical differences. Results of the tests were included in CV 122-49E. In addition, trepanning samples in the areas of two stud holes #23 & #69 (near the same locations as the

1x2x12 samples) were taken for analysis. These samples were not addressed in CV 122-49E. GE accepted the reported mechanical test results and approved the subject CV. The excavation areas where the 1 x 2 x 12" samples were removed from the flange were repaired per B&W Specification WS-35 Rev. 7 by SMAW process using 5/32, E8015 electrodes. Following the repair, a PWHT was applied (Ref. Heat Run #668 dated 5/1/69). The assembly was held at 1100°F to 1130°F for 54 minutes.

5.3 Flange Machining

The next step was to machine the repaired areas to contour. This suggests the ID area of the flange to side plates weld prep was repair welded. An inspection of the flange to side plate weld prep ID radius identified the radius as nonexistent due to the ID bore of the flange being machined straight throughout the bore. An inspection of machined stud holes was unacceptable due to machining marks and steps. Disposition was to accept as is until final machining is performed later. The forging was sand blasted and the clad limit lines were laid out for the face and bore.

5.4 Flange Seal Surface Cladding

An Inconel 82 clad build up 3/8" nominal thickness was applied to the flange face per B&W Specification WS 30 Rev. 5 using SAW process. The parameters were:

Weld Control Record:	WR-54 Rev. 6 Mark 209 Seq. 140
Process:	Single wire SAW
Electrode size:	0.0625
Electrode type:	82T
Heat Number:	567648
Current (amps):	260
Voltage (volts):	34
Travel Speed (IPM)	8

Following the Inconel clad build up, a PWHT was applied. (Ref. Heat Run #698 dated 9/6/69). The assembly was held at 1100°F to 1130°F for 1 hour, 12 minutes.

The next step was to machine a 360° groove in the Inconel build up to extend 3/8" into base material for the purpose of drilling 48 pockets for the O-ring retainer clips. The pockets were 5/8" diameter x 1/2" deep. The pockets were welded up by SMAW per B&W Specification WS-28 Rev. 2 and WR-79 Rev. 5, using 1/8" & 5/32" Inconel 182T electrodes. The groove was then welded up per B&W Specification WS-35 Rev. 10 and WR-54 Rev. 6 using the SAW welding process with the following parameters:

Weld Control Record:	Not Specified WR-54, Rev. 6 Seq. dated 10/24/69
Process:	Single wire SAW
Electrode size:	.0625
Electrode type:	82T
Heat Number:	567648
Current (amps):	230
Voltage (volts):	35
Travel Speed (IPM)	5

The final step on the flange forging was to machine the flange to side plates weld prep to a 6° bevel for welding from ID. The forging was then upgraded to the next process (B-201).

6.0 TOP HEAD & FLANGE ASSEMBLY

6.1 Welding of Seam AG

This section of the summary covers the fit-up and welding of the Top Head Dollar Plate and Torus Section (dome) to the Top Head Flange. This weld seam is designated Seam AG. The Top Head and Flange assembly is shown in Figure 2.

Quad Cities II Upper Vessel Fabrication Summary

The fabrication operations and the sequences in which they were performed are detailed in this section on a "best effort basis", since many records are unclear or incomplete as described below. In reviewing the process package many obstacles interfered with the accurate and concise reporting of events. These include:

- Operations performed out of sequence
- Continuity of Operations (jumping back and forth through the operation steps)
- Welding operations without referenced specification or process
- Non-legible writing
- Non-legible copies
- Welding records with missing information (i.e., no indication as to what was being welded, incorrect process sequence number, dates missing, non-legible writing, etc.)
- Statements such as "see NDT sign off sheet for weld repairs, PWHT, etc." and not identifying which of the many sign off sheetswas being referred to
- Weld Control Logs referencing wrong welding specification (i.e , deep groove procedure for backclad welding).
- Weld Control Logs documenting the same Heat Number for electrodes of different compositions.

Prior to fit-up for Seam AG, the dome was dimensionally checked for roundness at 12 locations on the ID and found to have ~7/8" variation between the two most extreme locations. To correct this, the dome ID was jacked to the specified diameter and held in position with struts welded to the ID until the dome went through a stress relief. The PWHT was performed for 1 hour at 1100^{o}F to 1130^{o}F (Ref. Heat Run #255 dated 11/5/69). An "information only" dimensional check was performed following the PWHT. This check indicated the greatest diameter variance to be ~ 9/16".

Quad Cities II Upper Vessel Fabrication Summary

A 6° weld prep was flame cut on the dome for Seam AG. A clad strip back was performed on the dome by arc gouging. A grinding of the strip back and AG weld prep followed.

Weld build up was applied to the head flange on the ID, adjacent to AG weld prep. This was due to the machining away of the radius area as described in paragraph 5.9. The reviewed records are undefinable as to the welding process or parameters used for this build up.

The dome and head flange was fit-up to be welded. An inspection of the fit-up identified a mismatch due, in part, to the head flange not having the 125-11/16" ID radius adjacent to the weld prep. A sketch in the inspection report showed the head flange machined straight from the seal surface to AG weld prep. This implies the build up described in paragraph 7.4 had not been applied. The next fabrication sequence called for strong backs and backing rings to be welded to the assembly on the inside. The next step was to "deposit one " of weld, 10 to 12" long at eight locations". Records do not indicate where those areas were located nor what they were for.

The struts, described in paraagraph 6.2, were removed by arc gouging and the assembly was set on a positioner for the welding of Seam AG. This seam was welded from inside [1]per B&W Specification WS-35 Rev. 10 and WR-58 Rev. 6 using the following parameters:

Weld Control Record:	Mark No. B201, Seq. 41
Process:	Single wire SAW
Electrode size:	0.125"
Electrode type:	Mn-Mo-Ni
Heat Number:	72105
Current (amps):	400 - 700
Voltage (volts):	35 - 39
Travel Speed (IPM):	16

1 Note: This was different from the standard vessel drawing and was obtained from a separate detail that applied to Quad Cities II.

The last entry in the Weld Control Record indicated the positioner broke down. The preheat was turned off and the assembly removed from the positioner. There is no documentation that tells if the welding was finished or not. Later on in the fabrication process, an inspection report rejects this weld for loss of preheat. The seam was UT examined, resulting in the repair of two areas. A subsequent RT examination revealed four separate areas of slag inclusions requiring repairs. Three repair cycles were required for acceptability. The next Weld Control Record was for the welding of a build up adjacent to seam AG on the ID of the head flange.

6.2 Flange ID Build up

The weld build up on the ID of the head flange was applied by SMAW per B&W Specification WS-53 Rev. 10 and WR-58 ALT. 1 Rev. 1, using 3/16" and 5/32" diameter, E8015-18 electrodes (Heat Numbers 818-026233, 818-027044, 818-026343, 818-026223 and 818- 077044). The build up was then ground to a 4:1 taper in all areas except area #20 which was ground to a 3:1. No permanent reference point could be found in the reviewed documents as to the location of area #20.

A weld buildup was applied to the OD of the Top Head Assembly to compensate for the OD mismatch of Seam AG. The build up was applied by SMAW per B&W Specification WS-35 Rev.10, using 5/32" diameter, type E8015 electrodes (Heat Number 818-027044. The Weld Control Record gave instructions to maintain 300°F preheat for 8 hours after completion of welding, then drop preheat. The build up was ground to a 3:1 taper.

Process Sequence #112 gave instructions to "Build up low areas on 3" radius with sufficient stock to grind per dwg." The drawing number was not given. A Weld Control Record was found for the deposition of weld metal for a 3" Radius. The weld was applied by SMAW per B&W Specification WS-35 Rev. 10, using 5/32" diameter, type E8015 electrodes (Heat Numbers 818-026225 and 818-027044). 400°F preheat was

maintained for 2 hours, then dropped. The build up was blend ground to a 3:1 taper.

6.3 Flange ID Cladding

The next welding operation was to clad the ID of the head flange in an area starting at the seal surface to a point 25" up from the seal surface. This cladding was applied by SMAW in two layers per B&W Specification WS-29 Rev.4 and WR-74 ALT. 2 Rev. 0. The first layer was applied using 5/32" E309-15 electrodes. (Heat Numbers WO4545 and 9C7B). The second layer was applied using 3/16" diameter, E308-16 electrodes. (Heat Numbers T03838 and T03934). Preheat was held at 200°F for 8 hours and dropped.

Weld Control Records indicated welding was performed on the Inconel build up at this time. It is uncertain what this welding was for. The welding was performed by SMAW per B&W Specification WS-35 Rev. 10, using 3/16", Inconel 182 electrodes (Heat Numbers 2382 and 2544).

6.4 Seam AG Back Clad

The back clad of Seam AG was performed next, using the same specification, process, and electrode type and size as for the flange cladding (Heat Numbers 9C7B, X31226, and T03934). Preheat was held for 8 hours after back cladding. The back clad was applied per WR-59 Rev. 3. A PWHT was ran for 1 hour, 48 minutes at 1100°F to 1130°F (Ref. Heat Run #724 dated 1/24/70). The Inconel cladded seal surface was UT examined for bond. The UT examination revealed 25 rejectable indications which were repaired by grinding and welding. Four of the cavities went into base metal.

After repairs, the seal surface was remachined. PT examinations of the seal surface, flange cladding and Seam AG back cladding revealed indications which were unacceptable. The indications were removed by grinding and the cavities welded. This required up to four repair

cycles to clear up the indications. At this point, the sequence of events pertaining to these repair areas could not be determined from any of the documents.

The reviewed records indicate the last PWHT recorded for this phase of fabrication process was performed on 1/24/70. The repairs identified in the previous paragraphs appear to have been made after that date.

6.5 Top Head Nozzles

The next phase of operation was the installation of the Top Head Nozzles. The nozzles to head seam were made by SMAW per B&W Specification WS-29 Rev.4, using 3/16", 5/32" and 1/4" E8015 electrodes (Heat Numbers 818-026223, 818-027044, 495V3011, and 818-026346). Inspection report #034161 recorded preheat down to 150°F during routine survey. The Weld Control Log documents the nozzles were then back cladded by SMAW per B&W Specification WS-29 Rev. 4 (since WS 29 is for groove welds this was an error in the records) The first layer was applied using 5/32", E309-15 electrodes (Heat Numbers X31226 and TO3950). The second layer was applied using 5/32" & 3/16", 308-15/16 (Heat Numbers 818-026241 and TO 3950). Note: Heat Number TO3950 was recorded for both E309 & E308 electrodes - another possible error. The Top Head Assembly received a PWHT for 15 minutes (min.) at 1100°F to 1130° F (Ref. Heat Run #733). Actual soak time and temperature records were not provided.

After PWHT, the nozzle to head seams were examined by RT and ultrasonic testing (UT). One of the nozzle seams was repaired due to RT indications (records do not indicate which one). The defects were removed by air arc and the cavities rewelded and back cladded using the same specifications and process as the original weld. The Top Head Assembly received a final PWHT for 9 hours, 33 minutes at 1100°F to 1130°F according to inspection report #078847. (Ref. Heat Run #284). Actual soak time and temperature records were not provided.

6.6 CBI Work On Top Head Assembly

The Top Head Assembly was transferred to CBI Nuclear Co. in Memphis, Tennessee for the remaining fabrication processes. A receiving inspection was performed and included the following: a physical measurement of the seal surface weld build up reported the thickness to be 11/32" All surfaces were examined by NDE upon receipt. All carbon steel surfaces were examined by MT and austenitic surfaces were examined by penetrant test (PT). In addition, all full penetration butt welds received a volumetric examination by UT, utilizing a 0 deg. longitudinal wave and a 45 deg. shear wave. No indications were reported during the MT and UT examinations. However, numerous PT indications were recorded on the entire circumference of the flange cladding. The indications were individually removed by blend grinding to a maximum depth of 0.062". No welding was required. The blended areas were reexamined with satisfactory results.

The six temporary lifting lugs installed by B&W on the OD surface of the flange were removed and the areas examined by MT. No indications were reported. Twelve temporary lugs (buttered with SS) were welded to the inside cladding per CBI Welding Procedure WPS 205-1F5, to support the machining rig used for seal surface machining. After the machining was completed, the lugs were removed and the areas were PT examined. Minor blend grinding was required to remove indications. The areas were reexamined with no indications reported. The location map of these temporary attachment areas was not included in the fabrication records.

After machining the O-ring grooves in the Inconel seal surface, two slag pocket indications were detected by PT. These areas were ground out to 1" long x 0.156" deep and 3" long by 0.156" deep and repair welded per CBI Repair Procedure GRP-3 Rev. 4. No preheat was required. The repairs were documented in Repair Traveler Card Sets 801-R15 and 800-R16. One additional repair in the inner O-ring groove of the Inconel seal surface was made after the O-ring groove was machined.

The cavity size after removing the PT indication was 3" long x 0.062" deep. This repair was documented in Repair Traveler Card Set 801-R17. The PT examination following final machining of the seal surface required light honing to remove slight bleed outs. The final PT examination showed no reportable indications. Figure 2 illustrates weld locations and weld repair areas.

7.0 SHELL FLANGE (B&W MK48)

7.1 Shell Flange Preparation

The first item of work on the Shell Flange following receipt inspection was the removal of the existing temporary fitting lugs by B&W at Mt. Vernon, Indiana. Six handling lugs were welded on per B&W Specification WR-53 Rev. 0, with 1/8" E8015 electrodes using the SMAW process. The Shell Flange then went through a PWHT at 1100°F to 1130°F for 2 hours, 6 minutes (Ref. Heat Run #390 dated 8/19 67). The upper vessel assembly is shown in Figure 3.

The next steps were the boring of the stud holes and the high pressure and low pressure monitoring holes. Carbon steel build up for the monitoring nozzles attachment was applied on the outside Shell Flange surface. The weld pads were applied using a SMAW process with 1/8", E7015-A1 electrodes (Heat #818-023766), per B&W Specification WS-29 Rev.3 and WR-65 Rev. 3. The preheat was held until the Shell Flange went to PWHT. No weld records were provided for the monitoring hole counterbore contour build up. The PWHT was performed at 1100°F to 1130°F for 54 minutes (Ref. Heat Run #573 dated 9/24/68).

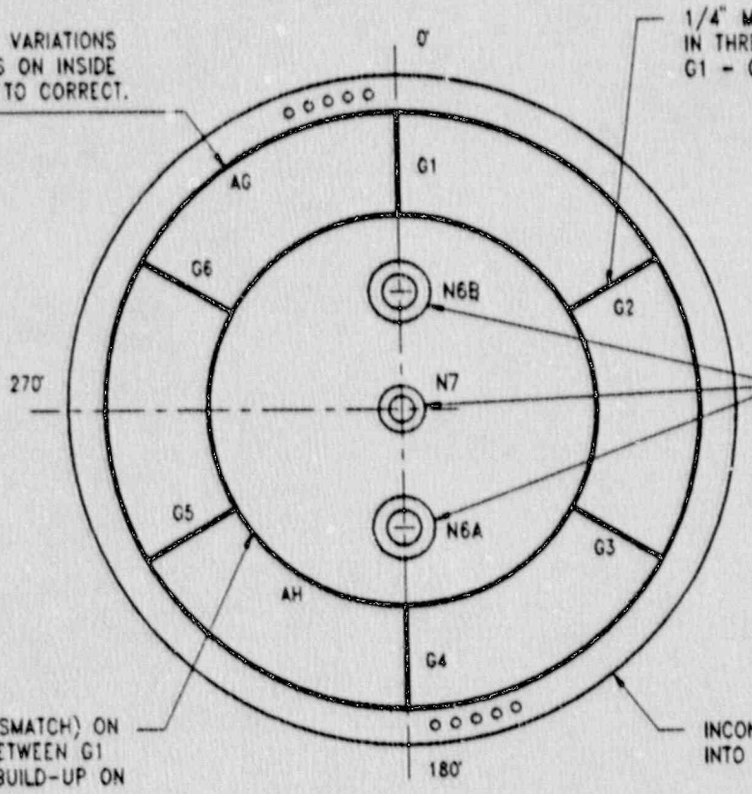
QUAD CITIES II
TOP HEAD ASSEMBLY

SEAM AG BAKCLAD, EXTENSIVE CLAD REPAIRS. UP TO FOUR CYCLES ON CAVITY REPAIRS.

1/2" - 1" ID MISMATCH 360', WELD BUILD-UP ON FLANGE BORE AND TORUS OD. NUMEROUS WELD AND CLAD REPAIRS, LOSS OF PREHEAT.

SEAM AG ROUNDNESS VARIATIONS AT TWELVE LOCATIONS ON INSIDE DIA. WELD BUILD-UP TO CORRECT.

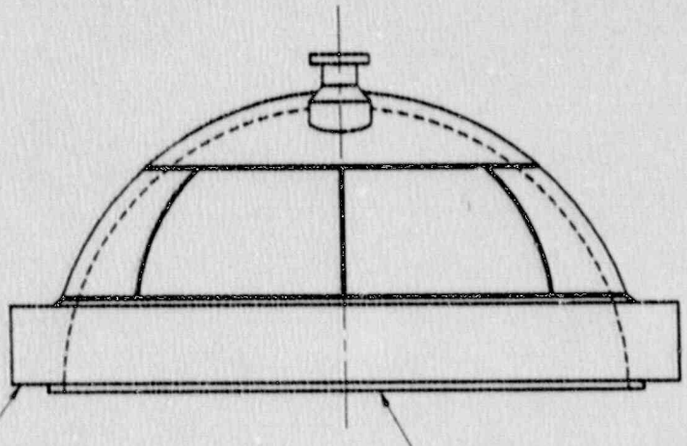
1/4" MISMATCH BETWEEN SEGMENTS IN THREE LOCATIONS, WELD REPAIRS G1 - G6.



LOW PREHEAT (150') BEFORE SEAM WELDING. NO REPAIR RECORDS ON BACKCLAD.

21/32" MAX GAP (MISMATCH) ON SEAM AH, IN AREA BETWEEN G1 AND G3 CCW. WELD BUILD-UP ON ID AND OD.

INCONEL CLAD REPAIRS, CAVITIES INTO BASE METAL 3/32"-3/16" DP.



MAJOR WELD REPAIRS IN AREA 17 FEET LONG X 3" - 3/4" DEEP BEFORE CLADDING. MACHINING ERRORS, PWHT AND DIMENSIONAL VARIATIONS.

INCONEL CLAD REPAIRS ON MIN. OF 24 LOCATIONS. FOUR CAVITIES INTO BASE METAL.

AFTER MACHINING CLAD REPAIRS IN TWO AREAS UP TO 3/16" DEEP.

FIGURE 2

QUAD2THD 062090

7.2 Shell Flange Surface Cladding

Inconel 82 clad build up for the seal surface was applied per B&W Specification WS-30 Rev.4 and WR-54 Rev. 6 under the following parameters:

Weld Control Record:	Seq. 193
Process:	Single wire SAW
Electrode size:	0.0625
Electrode type:	82
Heat Number:	567648
Current (amps):	230
Voltage (volts):	34
Travel Spee (IPM)	5.5

The clad build up welding was completed on 1/20/69. Weld Control Records show preheat was held until 1/23/69. The flange went to the furnace for PWHT on 1/27/69. The PWHT was applied at 1100°F to 1130°F for 42 minutes (Ref. Heat Run #143 dated 1/27/69).

During the UT examination, after PWHT, indications were found in the clad build up. The largest one being 3/8 x 7-3/4 x 3/16" deep. The indications were ground and PT examined until the indications cleared up. Two of the indications went 3/32" into base metal. One of the indications went 1/16" into base metal. The cavities were weld repaired by SMAW using 1/8" diameter, Inconel E182 electrodes (Heat #1821) per B&W Specification WS-35 Rev. 7. Weld Control Records show the preheat being held for approximately 24 hours following the repairs. There is no documentation of a PWHT following the repairs.

8.0 SHELL RING #4 (B&W MK 60)

8.1 Vertrical Welds

The Top Shell Ring #4 consists of three plate segments. The plates were hot rolled to dimensions for the Shell Ring by B&W at Mt. Vernon,

Indiana. The plate segments were fitted together (vertical seam D1, D2, and D3) and welded by an electroslag welding process per WPS-40 and WR-12 Rev. 5. The dimensional inspection after welding recorded the inside diameter to be below the minimum drawing requirements. Contract Variations numbers CV122-3A, CV122-3B, and CV122-3C were initiated. B&W's recommendation to make an additional vertical weld in the ring was approved. Shell Ring #4 received the following heat treatment cycles in addition to the vendor heat treatment as detailed in sec 2.5:

6-1/2 hours at 1675°F - 1725°F, brine solution quenched
6-1/2 hours at 1600°F - 1650°F, brine solution quenched
6-1/2 hours at 1175°F - 1225°F, brine solution quenched

Four thermocouples were attached to the Shell Ring 90° apart. The process sheets indicate the actual time and temperatures were recorded, however they were not located for review.

The Shell Ring was preheated with gas burners to 300°F - 800°F for the removal of eight samples from the top edge of the shell. After removal of samples with thermal cuts, a 3-1/2" section was flame cut 360° on the top end of the shell. This was followed by grinding of both ends of the shell to remove high spots. Some weld repairs of low areas on the inside surface were made as required, during the preheat in preparation for the stainless steel cladding. After these repairs, the shell received a PWHT for 15 minutes (min.) at 1100°F - 1130°F. Actual times and temperatures were not provided.

The inside surface of the Shell Ring received an MT examination, followed by a UT of the shell plates and welds. No indications were reported. The inside surface was sandblasted and released for cladding.

8.2 Shell Ring #4 Cladding

The shell assembly was preheated to 200° and the first 6-wire layer clad was applied by SAW using ER308L per Welding Data Sheet WR-28 ALT.

4. During the welding process the surface temperature dropped to 150°F a number of times. Welding parameters recorded in the weld log:

Amps:	1150 - 1200
Volts:	27 - 30
Travel:	5 IPM
Electrode:	1/8"

The deposited layers were ~4-1/2" wide. The first layer was removed by grinding, to within 1/32" of the base metal of the full 3600 of the circumference due to chemical analysis below GE specifications. The sample taken from the new deposited layer met the chemical requirements. Samples for chemical analysis were taken from each deposited layer and analyzed for C, Ni, and Cr. Composition of 33 analyzed samples indicated 0.044-0.068% C, 8.47-9.54% Ni, and 18.43-20.81% Cr. No further nonconformances are reported. Ferrite content was not reported in the reviewed documents. The weld log shows numerous weld repairs during the process due to equipment malfunctions. The repairs were made by grinding (depths 1/8 - 1/4") and welded up by SMAW process. Preheat was maintained without interruption until PWHT.

8.3 Shell Ring #4 Clad Examination and Repair

A 100% PT of the Shell Ring cladding identified a total of 29 areas requiring repair by either blend grinding or grinding and welding. Inspection reports indicate the depths of the repair cavities were 1/16"-1/4". Welded repairs in the base metal were performed under preheat, as required, using E8018 electrodes. A 100% UT of the overlay including the repaired areas was performed. No unacceptable indications were reported. The outside surface of the Shell Ring had eleven repair areas requiring grinding and welding. The largest was 73" long x 1-1/2" wide x 3/32" deep. The four vertical welds were radiographed and the shell received PWHT for 2 hours at 1100°F - 1130°F. Actual soak times and temperatures were not available.

A PT examination was performed on the cladding on the ID of the flange. This resulted in clad repairs requiring grinding and welding. When the

Weld Control Log was compared to Process Sheets no correlation could be made in many instances. For example, there were entries in the weld log for welding cavities for a process sequence, however, that sequence in the process sheet does not exist or else it was for another process operation. Although the regular process sheets had repairs documented, none of the reviewed inspection reports indicated a reject area to cause a repair. There were eight separate weld control logs for clad repairs (four required preheat). Of these, one matched the process sheet correctly. Another matched a repair that had five repair cycles (grind defect-weld cavity) PT-grind etc.), however, the weld control log only documents welding on the first cavity.

8.4 Instrumentation Nozzle Welding

The two instrumentation nozzles sockets on the ID of the ring were buttered with Inconel 182 in preparation for the instrumentation nozzle welds. The 200° preheat was held for 2 hours and dropped. The socket welds were then deposited using the same electrodes as for the butter. The welding process for both the butter and the weld was SMAW using 1/8", Inconel 182 electrodes (Heat Numbers 3204 & 2155).

8.5 Main Steam Nozzle Welding

The four Main Steam Nozzles were installed with double U-groove weld preps. Weld buildups to form pads were made on the shell side of the ID groove. The welded pad build ups were performed under 300°F preheat. The preheat was raised to 500°F, held for two hours and dropped. The pads were then machined to the specified radius. The reviewed process records indicate wedge block were welded to the pads to facilitate nozzle fit-up. The nozzle seam welds were deposited by the SMAW process per B&W Specification WS-29 Rev. 4 and WR-29 ALT. 3 Rev. 9, using E8015 electrodes. The root layer was applied with 1/8" followed by 5/32" for the remainder of the weld (Heat Numbers 818-025625, 818-026349, and 818-020655). The outside was welded first, followed by the removal (by air arc) of wedge blocks and pads on the ID. The welds

were then backgrooved by air arc and welded out on the ID of the shell. Each Main Steam Nozzle had weld build up applied to the outside, adjacent to the weld seam, for contouring the nozzle to the shell ring. Welding of the nozzle seams and contour build up on the OD were performed under 300°F preheat. Preheat was maintained to PWHT. The inspection ticket for the PWHT does not give the Furnace Run Number or the times and temperatures of the heat. It did verify that the PWHT was held at 1125°F for 15 minutes, minimum.

9.0 SHELL RING #4 & FLANGE ASSEMBLY.

9.1 Shell Ring #4 Flange Welding

The flange was fitted to the Ring #4 for welding the circumferential seam DF. The alignment inspection (Inspection Report #K41077) rejected the fit-up due to the overall mismatch and weld gap variation on both, inside and outside edges 360° around. The reported mismatch was from 1/16" to 3/4". The reviewed records show CV#122-56 cleared the condition. A backing strip was welded on the seam inside edges and the flange was preheated to 300°F minimum. The weld seam was made by SAW process per WR-71 Rev. 3. The weld metal was deposited slightly above flush. In the following fabrication sequence a weld build up 2 1/4" wide x 1 1/4" thick was applied on the outside flange surface. The weld seam was belt grounded to blend with adjacent base metal. The backing strip on the inside of the seam DF was removed and the back side of the weld was grounded as required.

The seam was MT examined, weld repairs were made according to the inspection reports. The locations and dimensions were not reported. The clad of Shell Ring #4 applied up to 3/4" from the weld prep edge was stripped 1/4" in the areas of mismatch as required to apply a weld build up. The weld build up was made with SMAW as required for grinding a 3:1 taper. Numerous probe grindings and cavity weld repairs were made on the inside weld seam surface. Preheat 300°F minimum was maintained during these weld repairs. The assembly was PWHT at

1100-1150°F, held for 15 minutes minimum. Reference heat run or actual soak time were not provided. After MT and RT examinations the flange inside surface was machined for clad application. The flange inside surface was cladded by a single wire SAW process per WR 74, Rev 3. The reviewed records show clad removal was required due to unacceptable chemistry. The location was identified as bead #60,67,68, and 69 on rejection ticket #J15149. Clad repair azimuth:

Bead #60 135°-0°
#67 180°-315°
#68 135°-45°
#69 135°-0°

The weld seam was back cladded by SMAW process using E309 and E308 electrodes. The clad thickness and WR# was not recorded. The repair procedure specified deposit of one layer of E308-15/16 over full width of bead in the areas indicated. The deposited layer was then ground flush with adjacent clad deposit by SAW. The Weld Log records shows numerous clad repairs were made. Their locations were not recorded in the reviewed documents. The face of the flange was cladded with Inconel 182. Clad repairs were made according to the Weld Log, the locations were not recorded or found in the review documents. The records show preheat was maintained during clad repairs up to PWHT. Reference heat number and actual soak time were not provided.

9.2 Receiving Examination at CBI

The Shell Ring #4 and Flange subassembly was shipped to CBI Nuclear Co. in Memphis for the continuation of fabrication. Upon receipt, CBI performed NDE on the subassembly. All carbon steel surfaces were examined by MT and the austenitic surfaces were examined using PT. A minor cold repair was made to remove a PT indication at a temporary attachment removal area on the stainless steel clad of the flange. The indication was removed by grinding. The final cavity dimension was 4.5" long x 1" wide x .109" deep. The cavity was welded per CBI Repair Procedure GRP-2 Rev. 2, the area ground and reexamined by PT. The

final PT was satisfactory. The repair was documented and the area mapped in Repair Traveler Card Set 800-R13. No other indications were reported during these surface examinations. A physical measurement of the ID cladding at the strip back area at Girth Seam CD (Shell Ring #3 to Shell Ring #4) reported the cladding thickness to be:

0° - 11/32"	120° - 11/32"	240° - 7/16
30° - 11/32"	150° - 13/32"	270° - 11/32
60° - 3/8"	180° - 11/32"	300° - 13/32
90° - 13/32"	210° - 5/16"	330° - 3/8

The next sequences included the layout of thermocouple pads, stabilizer brackets, steam dryer support brackets, and guide rod brackets. UT examinations were performed on all layout locations to a depth of three inches into the base material. A full plate thickness examination, by UT, was performed for the stabilizer brackets locations. No UT indications requiring repair were reported. The Shell Ring #4 and Flange Assembly was then released for fabrication.

9.3 Weld Preparation for Seam CD (Shell Ring #4)

The first fabrication step performed by CBI on this assembly was to preheat the assembly and strip back the ID clad from the edge where the weld prep for girth seam "CD" would be made. CBI records do not indicate the actual width of the strip back (fabrication drawing specifies 1"). The next step involved burning the weld prep for girth seam "CD". After grinding the flame cut weld prep and stripped back area, an MT examination was performed on all ground areas. The examination revealed seven plate indications on the weld prep face which were removed by arc gouging and/or grinding. The maximum cavity size after defect removal was 6.25" long x 1.50" wide x .375" deep. An MT exam of the cavities showed no further evidence of indications. The cavities were then welded out, blend ground, and reexamined with no indications reported in the repaired areas. Documentation of these repairs was in Repair Traveler Card Set 601-R7.

The next fabrication steps included the fit-up and welding of thermocouple pads and lifting trunions, and the UT examinations of all full penetration butt welds in the assembly. The assembly then received a final post weld heat treatment. This PWHT was documented on Furnace Heat Report #53. The Thermal History Report documents the soak time to be 6.66 hours at a temperature range of 1100 to 1150 degrees. This brings the accumulated soak time to 15.46 hrs. on the #4 Shell Ring and 19.06 hrs. on the shell flange, as documented on the CBI Thermal History Report.

Following the PWHT, the existing Inconel 182 seal surface build up was machined to drawing specifications. In process PT examinations revealed indications which required removal and surface repairing. The final PT of the polished seal surface was acceptable. Documentation of these repairs were in Repair Traveler Card Sets 601-R3, 601-R4, and 601-R5.

10.0 SHELL RING #3 TO SHELL RING #4 & FLANGE ASSEMBLY

10.1 Weld Preparation For Seam CD (Shell Ring #3)

Shell Ring #2 and Shell Ring #3 were shipped to CBI Nuclear Co. as two separate assemblies. CBI welded the two rings together to form this assembly. The first sequence in preparing Shell Ring #2 & 3 Assembly to be welded to Shell Ring #4 and Flange Assembly was to prepare the upper edge of Shell Ring #3 for welding. This weld seam is designated "CD". The operation began by preheating, burning, and grinding seam CD weld prep. Afterwards, the prep was examined by magnetic particles which revealed mid-wall plate indications ranging from .25"-.75" in length (see MT Report 701-18M). A UT examination attempted to locate the indications to trace them back into the plate and map the extent of the flaws. The indications could not be detected by UT. The indications were removed by grinding. The cavities were then welded up,

ground flush, and the areas reexamined by MT. No further indications were reported.

10.2 Weld Seam (CD)

The two assemblies were fitted together in a horizontal position on rollers and held in position with strongback attachments welded to the ID clad. A backup bar of 0.625" x 0.625" was fitted on the ID root of the seam prior to welding. No evidence of mismatch was indicated in the reviewed documents. Seam CD was then welded from the outside per WPS 323-2F4F6 Rev. 2. This WPS allows for using SMAW and/or SAW methods. Records do not describe which method was used. CBI personnel at this office indicated that weld seams of this type were typically made using the SAW method and that the SMAW was used for manual repairs and pickups. A hot MT was performed on the root pass and each inch of weld metal deposit during the welding operation. The back side of the weld was back gouged to remove the backup bar and to prep the back side for welding, after the strongback attachments were removed. The ID clad on the #3 ring side of seam CD was stripped back and acid etched to insure all stainless steel was removed in the area for welding the back side of the seam. The distance of the clad strip-back was not recorded (fabrication drawings require the clad to be stripped back for 1"). The clad removal area and the back gauged area received an MT examination, with no indications being reported. The weld was completed on the inside using the same welding process (WPS-323-2F4F6).

The final weld was ground for flatness to accommodate MT, UT, and RT examinations. The assembly was then released for intermediate PWHT and was documented on Furnace Heat Report #98. The Thermal History Report documents the soak time to be 6.50 hours at a temperature range of 1100 to 1150 degrees. This brings the accumulated soak time to 21.96 hrs. on the #4 Shell Ring, 25.56 hrs. on the Shell Flange, as documented on the CBI Thermal History Report. After the PWHT, seam CD was examined 100% by MT (inside and outside), UT, and RT.

The next step was to preheat seam CD to 200°F (min.) in preparation for the stainless steel cladding application (back cladding). The clad was applied in one layer per CBI Procedures WPS 123-1F7 Rev. 0. The parameters were:

Proce:	2 wire SAW
Electrode type:	ER309L
Electrode size:	0.156"
Current (amps):	400-425
Voltage (volts):	22-35
Travel (IPM):	9.5-10

WPS 143-1F5F7 Rev.1 (GMAW & SMAW) was also referenced in this traveler sequence, but was to be used in case of pickups or repairs. In process samples of clad deposit for chemical analysis and ferrite checks were taken per CBI Procedure CTP-1 Rev. 4. Ferrite content by Sevren gauge was reported >12.5% - <15%.

The steam dryer brackets and stabilizer brackets were attached with in-process and final surface examination performed in the next fabrication steps. Seam CD remained under preheat during the attachment of these brackets. The Final PWHT of Shell Ring #2,3, and the lower 3' of Shell Ring #4 performed and was documented on Furnace Heat Report #103. The Thermal History Report documents the soak time to be 10.92 hours at a temperature range of 1100 to 1150 degrees. This brings the accumulated soak time to 32.88 hrs. on the lower 3' of #4 Shell Ring and 17.41 on seam CD. (the shell flange plus the upper section of Ring #4 stuck out of the furnace and as insulated bulkhead was erected around the vessel where the furnace door would normally close. Therefore, this section of the vessel did not receive a PWHT). Figure 3 illustrates weld locations and weld repair areas.

QUAD CITIES II

SHELL COURSE #4 AND FLANGE ASSEMBLY

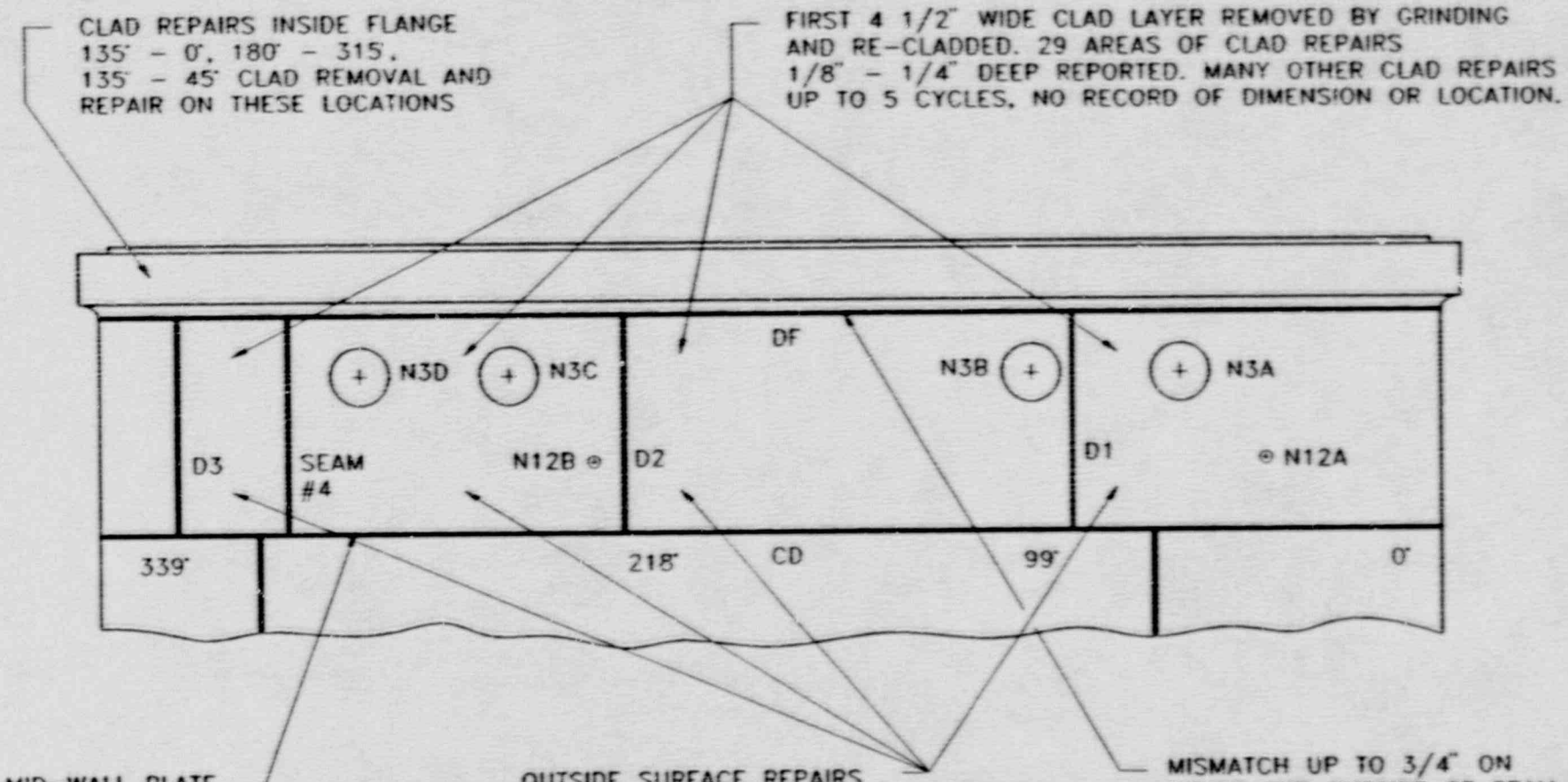


FIGURE 3

QUAD2SHL 062090

11.0 POST WELD HEAT TREATMENT SUMMARY FOR STAINLESS STEEL CLADDING

11.1 The following PWHT summary is for heat applied to the stainless steel cladding at B&W before transferring the reactor to CBI.

SUBASSEMBLY	WELD ID	COMPLETED	PWHT TIME
DOLLAR PLATE CLAD	WR-4	08/21/69	12.5 HOURS
TORUS CLAD	WR-8	08/16/69	12.5 HOURS
TOP HD NOZZ BACKCLAD		04/05/70	10.7 HOURS
SEAM AH BACKCLAD	WR-59	03/18/70	10.7 HOURS
HD FLANGE CLAD	WR-74	01/08/70	12.5 HOURS
SEAM AG BACK CLAD	WR-59	01/19/70	12.5 HOURS
SHELL FLANGE CLAD	WR-74	09/06/69	00.4 HOURS
*RING #4 CLAD	WR-28	04/30/68	01.6 HOURS
*#4 TO FLANGE BACKCLAD	WR-11	11/20/69	
*N3A BACKCLAD	WR-17/WR-18	11/20/69	
*N3B BACKCLAD	WR-17/WR-18	11/20/69	
*N3C BACKCLAD	WR-17/WR-18	11/20/69	
*N3D BACKCLAD	WR-17/WR-18	11/20/69	

* Complete records not available at this time.

11.2 The following individual heat treatment runs were recorded from the reviewed records.

RUN	DATE	APPLIED PWHT	SUBASSEMBLY
408	09/25/67	2 HOURS, 6 MINUTES	TOP HD FLANGE
444	12/12/67	54 MINUTES	TOP HD FLANGE
668	01/05/69	54 MINUTES	TOP HD FLANGE
698	06/09/69	1 HOUR, 12 MINUTES	TOP HD FLANGE
523	06/04/68	4 HOURS, 18 MINUTES	TORUS
554	07/24/68	3 HOURS, 30 MINUTES	TORUS
255	05/11/69	1 HOUR	TOP HEAD ASSEMBLY
724	01/24/70	1 HOUR, 48 MINUTES	TOP HEAD ASSEMBLY

Quad Cities II Upper Vessel Fabrication Summary

733	04/05/70		TOP HEAD ASSEMBLY
284	04/12/70		TOP HEAD ASSEMBLY
390	08/19/67	2 HOURS, 6 MINUTES	SHELL FLANGE
573	09/24/68	54 MINUTES	SHELL FLANGE
143	01/27/69	42 MINUTES	SHELL FLANGE
515	05/02/68		UPPER SHELL
661	04/17/69		UPPER SHELL
	11/16/69	24 MINUTES	UPPER SHELL

ATTACHMENT A

CONTRACT VARIATIONS REVIEWED

The documents below have been reviewed including the fabrication records covering these variations.

	Description
CV#122-2B -	Closure Head Flange, UT Indications, Weld Repair
CV#122-3C -	Upper Shell Course - Shell Undersize, Added Fourth Electroslag Weld
CV#122-5 -	MK48 Flange - Machining Error - UT Indications - Weld Repair
CV#122-36D -	Shell Course Plate - UT Indication - Weld Repair
CV#122-49E -	High Thermocouple Reading During Stress Relief
CV#122-54B -	Top Head Sub-Assembly - Mismatch Between MK201 and MK202
CV#122-6R -	Weld Build up - Undersized areas in Head Flange
CV#122-56 -	Top Shell Course Sub-Assembly - Dimensional Deviation of Vessel Flange
CV#122-72A -	Vessel Sub-Assembly - Mismatch Between MK2 Torus and MK57 Shell Course
CV#122-75 -	Top Head Sub-Assembly - Mismatch Between MK202 Torus and MK209

Quad Cities II Upper Vessel Fabrication Summary

CV#139-14 - Top Head Dollar Plate - Weld repair

APPENDIX A

GENERAL ELECTRIC COMPANY
ATOMIC POWER EQUIPMENT DEPARTMENT
QUALITY CONTROL PROCURED EQUIPMENT

Project: QC-II
P.O.: 205-55599

LIST OF CONTRACT VARIATIONS (B&W)

CV or VN #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
111-12	10-111-2 - Feedwater Nozzle - Dimensional Deviation	Approved	11-28-67	M4.4
111-26	A206-111-1 - Instrument Nozzle - Dimensional Deviation	Approved	4- 9-69	FM4.6, M4.6
122-28	209-122-1 - Closure Head Flange - UT Indications, Weld Repair	Approved	11- 9-70	M1.3
122-3C	60-122-2 - Upper Shell Course - Shell Undersize - Added Fourth Eslag Long. Seam	Approved	11- 9-70	FS2.1, M2.1, WR2.1
122-5	MK48 Flange - Machining Error - UT Indications - Weld Repair	Approved	3-28-67	FS2.1, M2.1A, WR2.1A
122-16	10-122-8 - Feedwater Nozzle - Dimensional Deviation	Approved	12-19-67	FM4.4, M4.4
122-19	A10-122-6 - Feedwater Nozzle - RT Reject - Weld Repair	Approved	1-29-68	FM4.4, M4.4
122-20	A14-122-8, A10-122-6 & 8 - RT Indications - Weld Repair	Approved	2-16-68	M4.3, M4.3A, FM4.4, M4.4
122-29B	C10-122-8 - Feedwater Nozzle - Dimensional Deviation - Weld Repair	Approved	6- 4-69	FM4.4, M4.4
122-32	61-122-86 - Closure Stud - Dimensional Deviation	Approved	10- 3-68	M6.1
122-33	61-122-85 - Closure Stud - Dimensional Deviation	Approved	10- 3-68	M6.1
122-34	61-122-83 - Closure Stud - Dimensional Deviation	Approved	12-18-68	M6.1

GENERAL ELECTRIC COMPANY
ATOMIC POWER EQUIPMENT DEPARTMENT
QUALITY CONTROL PROCURED EQUIPMENT

Project: QC-II
P.O.: 205-55599

LIST OF CONTRACT VARIATIONS (B&W)

V or VN #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
122-36D	57-122-2 - Shell Course Plate - 6-122-14 & 6-122-10 - UT Indications - Weld Repair	Approved	8-29-70	FS2.4, WR2.4
122-37	61-122-107 - Closure Stud - Dimensional Deviation	Approved	2- 8-69	M6.1
122-39	61-122-8 & 74 - Closure Studs - Dimensional Deviation	Approved	6- 4-69	M6.1
122-40A	C10-122-8 - Feedwater Nozzle Assembly - Machining Error - Weld Repair	Approved	3-31-69	FN4.4, M4.4A
122-49E	209-122-1 - High Thermocouple Reading During Stress Relief	Approved	4-15-70	FM1.0, M1.3
122-52	B1-122-2 - Lower Vessel Assembly - MK1 Dome - Weld Repair	Approved	9-22-69	FM3.0, W3.1
122-53B	B1-122-2 - Welder Qualified After Welding Performed	Approved	11- 9-70	FM3.0, W4.16, W3.1, W3.2D, W3.3D
122-54B	A201-122-2 - Top Head Sub-Assembly - Mismatch Between MK201 and MK202	Approved	8-28-70	FM1.0, W1.1A, WR1.1A, W5.1F
122-56	A48-122-2 - Top Shell Course Sub-Assembly - Dimensional Deviation of Vessel Flange	Approved	10- 8-69	FS2.1, M2.1
122-57	1-122-1 - Bottom Head Dollar Plate - RT Indications - Weld Repair	Approved	11-24-69	FM3.0, M3.1
122-62A	E1-122-2 - Vessel Sub-Assembly - CRD Stub Tubes - Dimensional Deviation - Weld Repair	Approved	5- 7-70	FM3.0, FN4.16, WR4.16

GENERAL ELECTRIC COMPANY
ATOMIC POWER EQUIPMENT DEPARTMENT
QUALITY CONTROL-PROCURED EQUIPMENT

Project: QC-II
P.O.: 205-55599

LIST OF CONTRACT VARIATIONS (B&W)

CV or VN #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
122-72A	E1-122-2 - Vessel Sub-Assembly - Mismatch Between MK2 Torus and MK57 Shell Course	Approved	5- 7-70	FM3.0
122-75	B201-122-2 - Top Head Sub-Assembly - Mismatch Between MK202] Torus and MK209 Flange	Approved	4-22-70	FM1.0, WR1.2B
122-76	E1-122-2 - Lower Vessel Sub-Assembly - Machining Error - CRD Penetrations - Dimensional Deviation	Approved	4-15-70	FM3.0, FM4.16
122-77A	E1-122-2 - Lower Vessel Sub-Assembly - Weld Repair - CRD Stub Tube Wall Thickness - Dimensional Deviation	Approved w/comm.	10- 1-70	FM3.0, FM4.16, WR4.16,
122-79	E1-122-2 - Lower Vessel Sub-Assembly - High Thermocouple Readings During PWHT	Approved	4-15-70	Final
122-81	E1-122-2 - Lower Vessel Sub-Assembly - CRD Stub Tube - "J" Prep - Dimensional Deviation	Approved	4-29-70	FM3.0, FM4.16
122-82A	E1-122-2 - Lower Vessel Sub-Assembly - CRD Bores in Bottom Head - Dimensional Deviation	Approved	6-20-70	FM3.0, FM4.16
122-83	E1-122-2 - Lower Vessel Sub-Assembly - B-122-1 & 3 - Recirc Outlet Nozzles - Dimensional Deviation	Approved	6-25-70	FM4.1
122-84	E1-122-2 - Lower Vessel Sub-Assembly - Flux Monitor Holes in Bottom Head - Dimensional Deviation	Approved	6-25-70	FM3.0, M4.15
122-85	E1-122-2 - Lower Vessel Sub-Assembly - Clad Thickness - "J" Preps - Bottom Head - Dimensional Deviation	Approved	5- 6-70	FM3.0, M4.15

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LIST OF CONTRACT VARIATIONS (B&W)

CV or VN #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
122-86	E1-122-2 - Lower Vessel Sub-Assembly - MK7 - Recirc Inlet Nozzles - Dimensional Deviation	Approved	6-24-70	FN4.2
122-87	E1-122-2 - Lower Vessel Sub-Assembly - MK19 - Jet Pump Nozzles - Dimensional Deviation	Approved	6-25-70	FN4.8, M4.8
122-88	E1-122-2 - Lower Vessel Sub-Assembly - Jet Pump Penetration - Shroud Support - Dimensional Deviation	Approved	4-22-70	FA5.1
122-89	E1-122-2 - Lower Vessel Sub-Assembly - CRD Penetrations - Bottom Head - Dimensional Deviation	Approved	4-22-70	FH3.0, FN4.16
122-91C	E1-122-2 - Lower Vessel Sub-Assembly - PT Indications - CRD Stub Tube Welds	Approved	11- 9-70	FH3.0, FN4.16
122-94	B70-122-2 - Refueling Containment Skirt Sub-Assembly - Dimensional Deviation	Approved	5- 7-70	FA5.9
122-101B	MK63 - Bushings - Dimensional Deviation	Approved	11- 9-70	M6.4
122-102A	E1-122-2 - Lower Vessel Sub-Assembly - MK1, MK2, MK4, MK40, MK41, MK8, MK7 - Excessive Accumulated Time at Temperature During PWHT of GE Specification	Approved	6-22-70	FH3.0, M3.1, M3.2, M3.2A, M3.3A, M3.3B, M4.1, M4.2
122-105	E1-122-2 - Lower Vessel Sub-Assembly - Weld Repair - at CB&I	Approved	6-22-70	M2.4
122-106A	E1-122-2 - Lower Vessel Sub-Assembly - CRD Stub Tubes - Dimensional Deviation	Approved	10- 7-70	FH3.0, FN4.16

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V or VN #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
122-107	19-139-3 & 4 - Jet Pump Nozzles - Drop Weight Tests Not Performed as Required by GE Specification	Approved	6-22-70	FN4.8, M4.8
122-108A	E1-122-2 - Lower Vessel Sub-Assembly - UT Indications - CRD Stub Welds - Bottom Head - Weld Repair	Approved	6-25-70	FH3.0, FN4.16
122-109A	32-122-5, 6, 7, 8; 10-111-2 & 3; 204-122-2; 206-111-1, 206-122-1 - Drop Weight Tests Not Performed	Approved	10-29-70	FN4.4, M4.4, M4.4A, FN4.7, FN4.6, M4.3A, M4.6, M4.7
122-110	E1-122-2 - Used Alternate Weld Procedure	Approved	8-29-70	FH3.0, W3.3D, W3.2D, W4.1C, W4.2C
122-111	E1-122-2 - Lower Vessel Sub-Assembly - Recorder Indicated Excessive Heating Rate - PWHT	Approved	8-31-70	Final
122-112	E1-122-2 - Lower Vessel Sub-Assembly - Contour of Weld - Vessel Support Skirt to Vessel - Dimensional Deviation	Approved	9-11-70	FH3.0, M3.3
122-113A	MK63 - Bushings - Substitution of Material	Approved	11- 9-70	M6.4
122-114	MK61 - Studs - Substitution of Material	Approved	11- 9-70	M6.1
127-12A	7-127-1 & 3 - RT Indications - Weld Repair - Redundant after Safe End Removal at CB&I	Approved	6-20-68	FN4.2, M4.2
127-18A	7-127-6 - Recirc Inlet Nozzle - Dimensional Deviation	Approved	12-18-68	FN4.2, M4.2

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V or VR #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
139-9	58-139-2 - Shell Course - Preheat Dropped After Cladding Prior to PWHT	Approved	4-17-69	FS2.3, M2.3, M2.3A
139-14	201-139-1 - Top Head Dollar Plate - Weld Repair	Approved	6-20-69	M1.1

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LIST OF CONTRACT VARIATIONS (CB&I)

DR #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
4824-1	Mismatch Between MK58 and MK59 Shell Course	Approved	4-22-70	FS2.3
4824-2	Bushing Holes in MK48 Flange - Dimensional Deviation	Approved	6- 8-70	FS2.1, M2.1A
4824-3	MK11 and MK13 Inconel Build-Up - Use of Unapproved Weld Procedure	Approved	10-15-70	FN4.5, FN4.9
4824-4	MK196 - Stabilizer Bracket - Dimensional Deviation	Approved	9-22-70	FA5.2
4824-5	MK57 - Shell Course - Exceeded Qualified PWHT Time - Requalified	Approved	10-15-70	M2.4
4824-6	MK209 - Flange - Dimensional Deviation	Approved	10- 1-70	FH1.0, M1.3
4824-7	MK28 - Safe Ends - Dimensional Deviation	Approved	11- 9-70	FM4.2
4824-8	Flux Monitor "J" Preps - Repair Weld - Cladding under 1/8" Minimum	Approved w/comm.	10-24-70	FH3.0, Final
4824-9	MK202 - Torus - Thin Spots in Material	Approved	10- 1-70	FH1.0, M1.2
4824-10	MK133 and MK134 - Steam Dryer Guide Brackets - Final Assembly - Dimensional Deviation	Approved	11- 9-70	FA5.3

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LIST OF CONTRACT VARIATIONS (CB&I)

DR #	Description and Corrective Action When Applicable	G.E. Disposition	Date	Checksheet Ref.
824-11	CRD Stub Tubes - PT Indications - Grind Repair	Approved	11-18-70	FH3.0
824-12	MK70 and MK72 - Refuel. Cont. Skirt and Flange - Final Assembly - Dimensional Deviation	Approved	11- 9-70	FA5.9
824-13	MK204 - Vent Nozzle - Small Depressions - Base Metal	Approved	11- 9-70	FN4.7, M4.7
824-14	Mismatch Between MK57 and MK58 Shell Courses	Approved	12-17-70	FS2.3
824-15	MK114 and MK124 - CRD Stub Tubes - PT Indications - Blend Grind	Approved	11-18-70	FH3.0, W4.16
824-16	MK39 - Thermal Sleeve - Dimensional Deviation	Approved	12- 2-70	M4.4