

TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

83 OCT 11 P 1: 39  
October 5, 1983

BLRD-50-438/83-23

U.S. Nuclear Regulatory Commission  
Region II

Attn: Mr. James P. O'Reilly, Regional Administrator  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

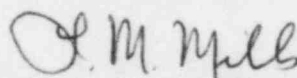
BELLEFONTE NUCLEAR PLANT UNIT 1 - WELDS ON BAFFLE PLATES IN CORE SUPPORT  
ASSEMBLY BY BABCOCK & WILCOX - BLRD-50-438/83-23 - SECOND INTERIM REPORT

The subject deficiency was initially reported to NRC-OIE Inspector P. E. Fredrickson on March 2, 1983 in accordance with 10 CFR 50.55(e) as NCR 2267. This was followed by our report dated March 30, 1983. Enclosed is our second interim report. We expect to submit our next report by February 21, 1984. We consider 10 CFR Part 21 applicable to this deficiency.

If you have any questions concerning this matter, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY



L. M. Mills, Manager  
Nuclear Licensing

Enclosure

cc: Mr. Richard C. DeYoung, Director (Enclosure)  
Office of Inspection and Enforcement  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Mr. R. J. Ansell, Manager (Enclosure)  
Bellefonte Project Services  
Babcock & Wilcox Company  
P.O. Box 1260  
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Records Center (Enclosure)  
Institute of Nuclear Power Operations  
1100 Circle 75 Parkway, Suite 1500  
Atlanta, Georgia 30339

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ENCLOSURE  
BELLEFONTE NUCLEAR PLANT UNIT 1  
WELDS ON BAFFLE PLATES IN CORE SUPPORT ASSEMBLY BY B&W  
10 CFR 50.55(e)  
BLRD-50-438/83-23  
NCR 2267  
SECOND INTERIM REPORT

Description of Deficiency

While performing onsite modifications to the unit 1 reactor internals (B&W field change package 194), defects were noticed in 12 of 20 wide baffle plates adjacent to the narrow baffle plates being modified. Former bolts are used to hold the baffle plates together. Nine of the twelve affected baffle plates have 24 bolts each and the other three have 48 bolts each, for a total of 360 bolts. The former bolts are prevented from backing out by the use of locking pins, which are secured by tack welding each end to its baffle plate. At 26 of the 360 locations, tack welds were found to be cracked. One of the 26 locking pins had cracked tack welds at each end. Additionally, three pins were welded to bolts, there was a lack of fusion indication on one pin, and one pin had a tungsten inclusion. The apparent cause of these defects is poor workmanship during fabrication at B&W.

Corrective Action

Preliminary inspection and mapping of the unit 1 baffle plate to former bolt joints were performed shortly after the discovery of cracked locking pin welds. In addition to cracked welds, the inspection revealed defects such as porosity, inclusions, lack of fusion, and undersize welds. B&W's laboratory analysis of three cracked weld samples showed that the cracks were a result of solidification cracking and that the cracked welds were made with Inconel 600 filler metal instead of the required stainless steel 308L. Five 308L welds were analyzed and no evidence of cracks was found.

Shop records show that the Bellefonte unit 1 core basket lock pin welds were made during the same time period and in the same shop bay as that for another job which utilizes 1/16" Inconel 600 weld rod. The 308L weld rod being used for the Bellefonte lock pin welds was also 1/16". It is hypothesized that several pieces of the inconel rod were inadvertently used on the Bellefonte unit 1 core basket. The unit 2 internals were examined visually and with an alloy separator and no reportable indications were found. B&W also conducted a visual inspection of internal locking pins on other contracts fabricated during the same general period as Bellefonte units 1 and 2. No inconel welds were found. Thus, B&W believes that inadvertent use of inconel filler wire in lieu of stainless steel was an isolated incident affecting only Bellefonte unit 1.

An inspection of all locking device weld applications in the unit 1 core basket, as listed in Table 3, has been completed to assure that all defects have been discovered. Table 1 identifies the results of the detailed visual inspection and inspection for inconel filler metal performed for the baffle plate to former bolt joints. Table 1 categorizes the defects based on the repair method for each specific defect. Figures 1 and 2 define the plate locations and bolt numbers shown in Table 1. All inconel welds in the baffle plate to former bolt joints have been identified using an alloy separator. All baffle plates to former bolt locking pin weld defects identified in Table 1 have been repaired in accordance with the recommended repair methods identified in Table 2. Inspection results for the other joints in Table 3 will be provided in the next report.

TVA's Quality Engineering Branch has alerted the appropriate regional quality control inspection office of the nonconforming condition and has instructed inspectors to perform closer surveillance of any locking pin welding in the future. Corrective action taken by B&W to preclude the possibility of future incidents of this nature is to increase emphasis on already established quality assurance (QA) and quality control procedures. The procedures in use in B&W's shop today are adequate to preclude such an occurrence and are reviewed periodically by B&W internal audits as well as by customer QA audits.

THE FIGURES SHOWN BELOW SHALL BE USED FOR INTERPRETATION OF  
TABLE 1

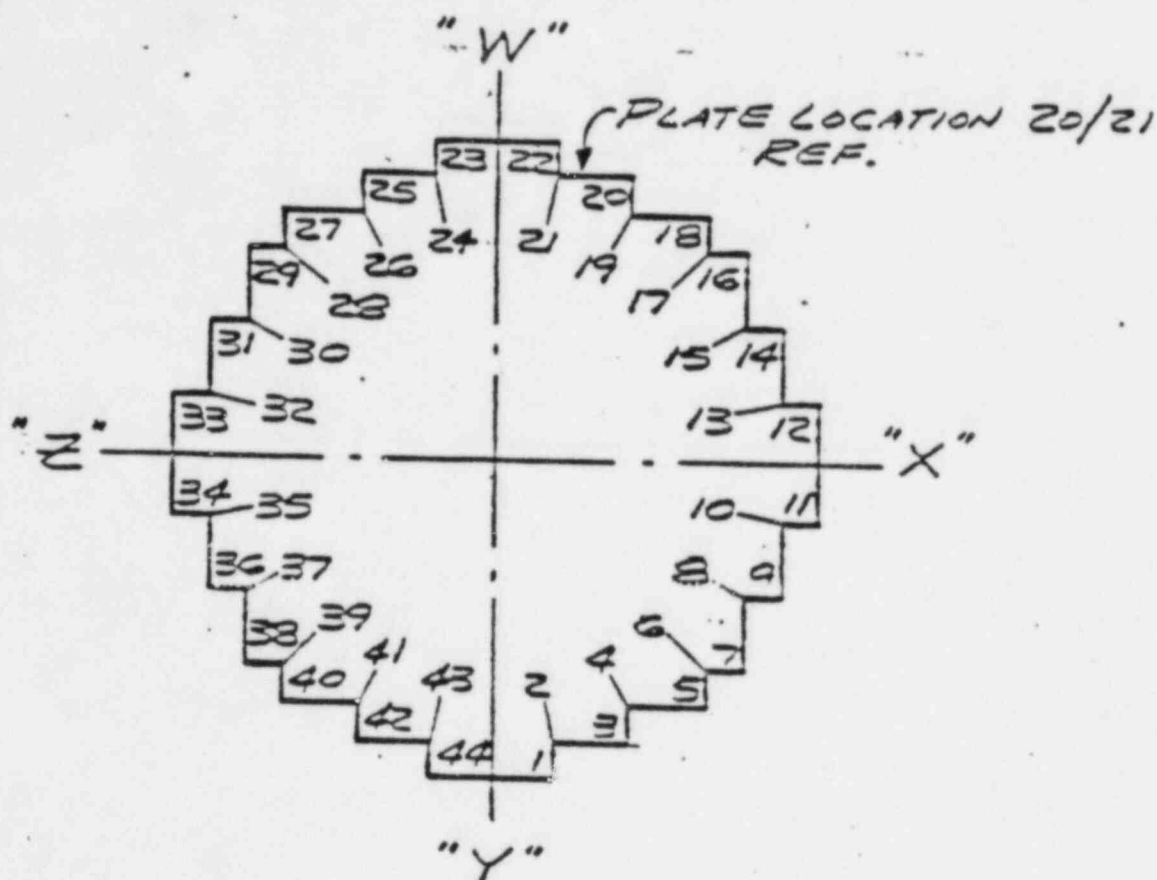


FIGURE 1: IDENTIFICATION OF PLATE LOCATIONS VIEWING FROM  
TOP OF CORE BASKET.

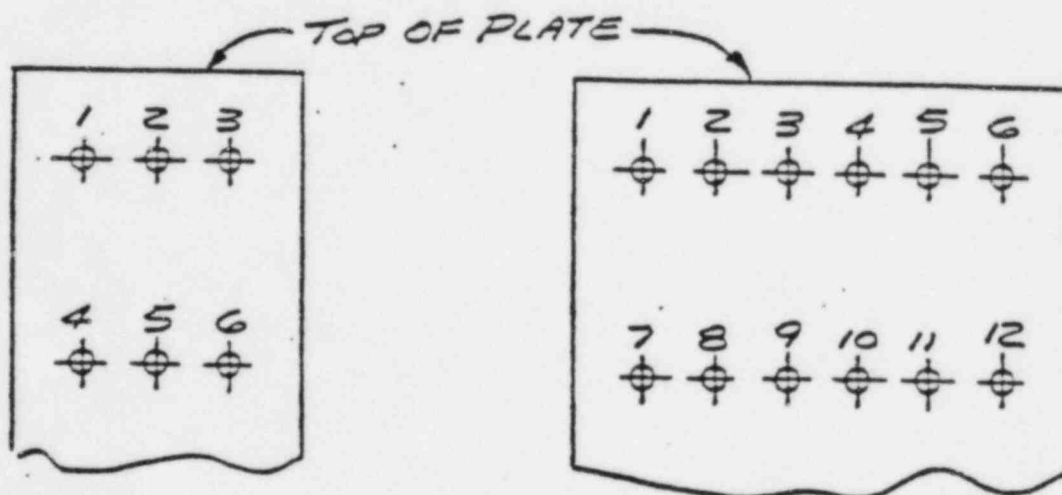


FIGURE 2: IDENTIFICATION OF BOLT NUMBERS VIEWING FROM INSIDE THE  
CORE BASKET AND FACING THE PLATE.

TABLE 1  
NSS-15 INSPECTION RESULTS  
BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 1: WELD CRACKED THRU OR PARTIALLY THRU OR INCONEL FILLER METAL

PLATE LOCATION	BOLT NUMBER	DESCRIPTION OF DEFECT
44/1	24	Cracked One End Thru
*18/19	10	Cracked One End Thru - Inconel
*26/27	15	Cracked One End Thru - Inconel
29/30	1	Cracked One End Thru - Inconel
33/34	21	Cracked One End Thru - Inconel
33/34	22	Cracked One End Thru - Inconel
37/38	6	Cracked One End Thru - Inconel
40/41	4	Cracked One End Thru - Inconel
44/1	17	Cracked Both Ends - One End Thru - Inconel
26/27	3	Cracked Both Ends - One End Thru - Inconel
29/30	4	Cracked Both Ends - One End Thru - Inconel
*40/41	10	Cracked Both Ends - One End Thru - Inconel
22/23	21	Partial Crack One End - Inconel
26/27	6	Partial Crack One End - Inconel
37/38	3	Partial Crack One End - Inconel
40/41	1	Partial Crack One End - Inconel
44/1	14	Partial Crack Both Ends
44/1	15	Partial Crack Both Ends - Inconel
4/5	6	Partial Crack Both Ends - Inconel
15/16	3	Partial Crack Both Ends - Inconel
15/16	6	Partial Crack Both Ends - Inconel
18/19	4	Partial Crack Both Ends - Inconel

\*Pin has been removed from this location and sent to lab for analysis.

TABLE 1 CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 1: WELD CRACKED THRU OR PARTIALLY THRU OR INCONEL FILLER METAL

<u>PLATE LOCATION</u>	<u>BOLT NUMBER</u>	<u>DESCRIPTION OF DEFECT</u>
44/1	3	Inconel
44/1	4	Inconel
44/1	13	Inconel
44/1	16	Inconel
44/1	18	Inconel
44/1	20	Inconel
44/1	21	Inconel
44/1	22	Inconel
4/5	3	Inconel
4/5	12	Inconel
7/8	1	Inconel
7/8	4	Inconel
11/12	1	Inconel
11/12	2	Inconel
11/12	3	Inconel
11/12	4	Inconel
11/12	5	Inconel
11/12	6	Inconel
11/12	21	Inconel
11/12	22	Inconel
18/19	1	Inconel
18/19	3	Inconel
22/23	3	Inconel
22/23	4	Inconel
22/23	22	Inconel
26/27	12	Inconel
29/30	10	Inconel

TABLE 1 CONTINUED  
NSS-15 INSPECTION RESULTS  
BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 1: WELD CRACKED THRU OR PARTIALLY THRU OR INCONEL FILLER METAL

PLATE LOCATION	BOLT NUMBER	DESCRIPTION OF DEFECT
29/30	13	Inconel
33/34	3	Inconel
33/34	4	Inconel
33/34	31	Inconel
35/36	23	Inconel
35/36	24	Inconel
37/38	12	Inconel
37/38	15	Inconel
40/41	13	Inconel



TABLE 1-CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 2: PARTIAL CRACKS

PLATE LOCATION	BOLT NUMBER	POSITION OF DEFECT (O'CLOCK)
44/1	28	5:00
44/1	38	11:00
44/1	48	4:00
2/3	1	4:00
2/3	9	10:00
4/5	23	10:00
7/8	6	1:00
7/8	11	7:00
9/10	24	2:00
11/12	27	10:00
11/12	28	2:00
11/12	42	10:00
13/14	4	1:00
13/14	15	2:00
15/16	2	5:00
15/16	13	5:00
15/16	15	7:00
18/19	7	8:00
18/19	13	10:00
18/19	21	4:00
20/21	14	9:00
20/21	15	7:00
24/25	24	4:00
29/30	3	4:00
33/34	12	4:00
40/41	1	4:00
40/41	24	5:00



TABLE 1 - CONTINUED  
NSS-15 INSPECTION RESULTS  
BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 3: MISCELLANEOUS DEFECTS

PLATE LOCATION	BOLT NUMBER	POSITION OF DEFECT (O'CLOCK)
44/1	9	Crator @ 5:00 & 11:00
15/16	5	Crator @ 3:00
44/1	38	Porosity @ 5:00
44/1	39	Porosity @ 5:00
22/23	36	Porosity @ 10:00
29/30	20	Porosity @ 7:00
4/5	10	Tungsten Inclusion @ 8:00
7/8	7	Tungsten Inclusion @ 5:00
20/21	13	Tungsten Inclusion @ 4:00

TABLE 1 - CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 4: INSUFFICIENT WELD (NOT 180° OR NOT 1/16" FILLET)

PLATE LOCATION	BOLT NUMBER	POSITION (O'CLOCK)
44/1	25	6:00
44/1	27	5:00
44/1	29	11:00
44/1	30	9:00
44/1	33	8:00
44/1	35	8:00
44/1	37	8:00
44/1	39	11:00
44/1	40	5:00
44/1	43	7:00
44/1	44	10:00
44/1	45	5:00
44/1	46	8:00
2/3	5	4:00 & 10:00
2/3	6	4:00
2/3	7	4:00
2/3	23	2:00
7/8	6	7:00
7/8	9	10:00
7/8	10	2:00
7/8	14	8:00
7/8	16	3:00 & 9:00
7/8	19	10:00
7/8	22	1:00 & 7:00
7/8	23	2:00 & 8:00
7/8	24	2:00

TABLE 1 - CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 4: INSUFFICIENT WELD (NOT 180° OR NOT 1/16" FILLET)

PLATE LOCATION	BOLT NUMBER	POSITION (O'CLOCK)
9/10	4	4:00
9/10	13	11:00
9/10	14	2:00
9/10	15	3:00 & 9:00
9/10	16	3:00
9/10	17	12:00
9/10	19	2:00
9/10	20	3:00
9/10	22	4:00
11/12	7	5:00
11/12	8	11:00
11/12	15	5:00
11/12	16	3:00
11/12	17	2:00
11/12	20	3:00
11/12	28	5:00 & 11:00
11/12	29	1:00
11/12	30	6:00 & 12:00
11/12	31	7:00
11/12	32	1:00
11/12	33	2:00
11/12	34	2:00 & 8:00
11/12	35	1:00 & 7:00
11/12	36	4:00
11/12	37	6:00
11/12	38	2:00 & 8:00
11/12	39	1:00
11/12	40	4:00
11/12	41	6:00 & 12:00

TABLE 1 - CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 4: INSUFFICIENT WELD (NOT 180° OR NOT 1/16" FILLET)

PLATE LOCATION	BOLT NUMBER	POSITION (O'CLOCK)
11/12	43	8:00
11/12	44	5:00
11/12	46	4:00 & 10:00
11/12	48	2:00
13/14	3	6:00 & 12:00
13/14	4	7:00
13/14	5	3:00 & 9:00
13/14	8	6:00
13/14	10	11:00
13/14	11	11:00
13/14	13	9:00
13/14	16	9:00
13/14	17	11:00
13/14	18	5:00
13/14	21	7:00
13/14	22	1:00 & 7:00
13/14	23	9:00
13/14	24	8:00
15/16	4	11:00
15/16	5	9:00
15/16	13	11:00
15/16	17	8:00
15/16	18	5:00 & 11:00
15/16	21	4:00
15/16	22	10:00
15/16	23	5:00 & 11:00
15/16	24	2:00

TABLE 1 - CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 4: INSUFFICIENT WELD (NOT 180° OR NOT 1/16" FILLET)

PLATE LOCATION	BOLT NUMBER	POSITION (O'CLOCK)
18/19	3	8:00
18/19	6	2:00
18/19	8	1:00
18/19	11	7:00
18/19	13	4:00
18/19	14	2:00
18/19	16	5:00 & 11:00
18/19	19	2:00 & <del>8:00</del>
18/19	22	1:00
18/19	24	2:00
20/21	2	1:00 & 7:00
20/21	3	3:00
20/21	6	3:00
20/21	9	3:00
20/21	10	6:00
20/21	12	7:00
20/21	15	1:00
20/21	18	4:00
20/21	19	5:00 & 11:00
20/21	21	4:00
20/21	22	7:00
20/21	23	6:00 & 12:00
20/21	24	1:00 & 7:00
22/23	6	12:00
22/23	24	12:00
22/23	39	1:00
22/23	44	3:00

TABLE 1 -CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER-BOLT LOCKING PIN WELDS

CATEGORY 4: INSUFFICIENT WELD (NOT 180° OR NOT 1/16" FILLET)

PLATE LOCATION	BOLT NUMBER	POSITION (O'CLOCK)
24/25	2	5:00
24/25	14	9:00
24/25	23	5:00
26/27	8	5:00
26/27	13	2:00
26/27	17	7:00
26/27	18	3:00
26/27	24	<del>1:00</del>
33/34	10	4:00
33/34	18	12:00
33/34	26	7:00
33/34	29	1:00
33/34	30	1:00
33/34	32	3:00
33/34	36	3:00
33/34	37	5:00
33/34	39	11:00
33/34	44	4:00
33/34	45	5:00 & 11:00
33/34	46	1:00
35/36	7	7:00
35/36	13	6:00 & 12:00
35/36	20	7:00
37/38	7	5:00
37/38	8	6:00
37/38	11	1:00 & 7:00
37/38	13	11:00

TABLE 1 - CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 4: INSUFFICIENT WELD (NOT 180° or NOT 1/16" FILLET)

<u>PALTE LOCATION</u>	<u>BOLT NUMBER</u>	<u>POSITION (O'CLOCK)</u>
37/38	16	5:00 & 11:00
37/38	17	1:00 & 7:00
37/38	18	5:00
37/38	22	1:00 & 7:00
37/38	23	6:00
40/41	18	9:00
40/41	23	2:00 & 8:00
42/43	*All 24 Bolts	Both Ends of Pin

\*Repair 42/43-10, 11, 14, & 15 in Accordance with Instructions Given for Category #5.



TABLE - 1 CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 5: LACK OF FUSION

PLATE LOCATION	BOLT NUMBER	POSITION (O'CLOCK)
4/5	16	2:00
13/14	2	2:00 & 8:00
13/14	6	1:00
13/14	9	2:00
15/16	7	4:00
15/16	16	2:00
18/19	7	2:00
20/21	5	8:00
20/21	6	9:00
20/21	7	5:00
20/21	9	9:00
20/21	11	4:00
22/23	5	7:00
22/23	27	11:00
22/23	35	1:00
24/25	7	4:00
24/25	20	11:00
24/25	23	11:00
26/27	17	1:00
33/34	38	8:00
33/34	39	4:00
35/36	5	7:00
37/38	4	1:00
42/43	10	5:00 & 11:00
42/43	11	7:00
42/43	14	3:00 & 9:00
42/43	15	11:00

TABLE 1 - CONTINUED

NSS-15 INSPECTION RESULTS

BAFFLE TO FORMER BOLT LOCKING PIN WELDS

CATEGORY 6: MISCELLANEOUS ABNORMALITIES

CATEGORY 6 INCLUDES ALL WELDS CATEGORIZED AS FOLLOWS:

- WELD METAL ON BOLT
- WELD SPANS BOLT - SPAN CRACKED
- MINOR MELTING OF BOLT
- CONCAVE CONDITION DUE TO SLOPING OUT
- OVERLAP
- ARC STRIKE
- CORROSION
- SPLATTER
- UNDERCUT
- UNACCEPTABLE CONTOUR

TABLE 2

CATEGORY OF DEFECTS AND RECOMMENDED REPAIR

RECOMMENDED REPAIR METHOD	CATEGORY #1 THRU CRACKS OR INCONEL	CATEGORY #2 PARTIAL CRACKS	CATEGORY #3 MISC. DEFECTS	CATEGORY #4 INSUFFICIENT WELD	CATEGORY #5 LACK OF FUSION	CATEGORY #6 MISCELLANEOUS ABNORMALITIES
1. Remove Pin and Replace with New Pin and New Weld	X					
2. Grind out Defect and Add Additional Filler Metal		X	X		X	
3. Add Additional Filler Metal				X		
4. Accept As Is						X

TABLE 3

JOINT IDENTIFICATION AND LOCKING MECHANISM WELDSTO BE INSPECTED ON NSS-15 CSA

Joint Identification	Quantity of Bolts	Bolt P/N	Locking Mechanism
*Upper Grid Pad Mtg. Screws	444	18-335	Weld to Head
*Lower Grid Pad Mtg. Screws	444	21-323	Weld to Head
*Column Weldment Flange to Upper Grid	356	16-322	Locking Pin
*Upper Grid to Plenum Cylinder	56	16-322	Locking Pin
*Plenum Cylinder to Plenum Cover	70	16-320	Locking Clip
*Rod Guide Caps to Plenum Cover	162	16-344	Locking Cup
*Vent Ass'y. Mounting Screws	64	12-347	Locking Cup
**Baffle to Former Bolts	576	11-324	Locking Pin
*Support Post to Lower Grid	52	21-334	Locking Pin
*Flow Distributor to Lower Grid	134	22-346	Locking Pin
Former to Core Barrel	992	11-325	Locking Pin
Brazement Set Screws (Inspect Lower Elevation Only)	81 of the 243 to be Inspected	23-330	Locking Cup

\*100% inspection req'd. for Hot Functional Testing

\*\*5% inspection req'd. for Hot Functional Testing

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