Stephen B. Bram
Vice President

Consolidated Edison Company of New York, Inc.
Indian Point Station
Broadway & Bleakley Avenue
Buchanan, NY 10511
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September 16, 1988

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
U.S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

SUBJECT: Response to NRC Bulletin No. 88-05
"Nonconforming Materials Supplied by Piping Supplies, Inc. at Folsom, New Jersey and West Jersey Manufacturing Company at Williamstown, New Jersey"

Transmitted as Attachment I to this letter is our response to NRC Bulletin No. 88-05, "Nonconforming Materials Supplied by Piping Supplies, Inc. at Folsom, New Jersey and West Jersey Manufacturing Company at Williamstown, New Jersey," dated May 6, 1988. The response to this Bulletin was requested within 120 days from the receipt of the bulletin, May 19, 1988.

Our response is provided pursuant to the provisions of Section 182a, Atomic Energy Act of 1954, as amended. Should you or your staff have any questions, please contact Mr. Jude G. Del Percio, Manager, Regulatory Affairs.

Very truly yours,

Subscribed and sworn to
before me this 16th day
of September, 1988.

Notary Public

ANTHONY R. ARNONE
Notary Public, State of New York
No. 4883047
Qualified in Westchester County
Commission Expires January 26, 19 89

IE11
1/1

cc: Mr. William Russell
Regional Administrator - Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
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Senior Resident Inspector
U.S. Nuclear Regulatory Commission
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Attachment I

Response to NRC Bulletin No. 88-05
"Nonconforming Materials Supplied by Piping
Supplies, Inc. at Folsom, New Jersey and West
Jersey Manufacturing Company at Williamstown, New Jersey"

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
September 16, 1988

1. Background:

On May 6, 1988, the NRC issued Bulletin No. 88-05 regarding nonconforming piping materials supplied by certain manufacturers. Radnor Alloys Inc. notified our Quality Assurance department on May 12, 1988, and we promptly commenced a records review. We received Bulletin No. 88-05 on May 19, 1988, at which point our review criteria was modified to encompass the Bulletin's requirements. Supplement No. 1 to the Bulletin was received on June 23, 1988 and modified certain requirements of the Bulletin. Supplement No. 2 was received on August 29, 1988. Pursuant to the Bulletin, as modified by Supplements No. 1 and 2, a description of our actions with regard to this subject are described herein.

Throughout our program we have maintained contact with NUMARC and various utilities through the use of the INPO Nuclear Network system. In addition, we have provided the results of our records review and field testing activities to NUMARC for their inclusion into a database they have been developing.

2. Records Review:

We reviewed all "Class A" purchase orders for piping materials supplied directly or indirectly from Piping Supplies, Inc. ("PSI") or West Jersey Manufacturing Company ("WJM"). At Indian Point Unit No. 2 ("IP-2"), "Class A" designates that a component was procured in accordance with Con Edison's Quality Assurance program which invokes 10 CFR §50 Appendix B criteria. The records review for PSI-supplied and WJM-supplied materials covered the period from January 1, 1976 through the present time.

Components that were identified as having been supplied directly or indirectly by PSI or WJM were tracked by our Quality Assurance Department Open Item Report ("OIR") system until a determination as to their suitability for use could be made.

On May 23, 1988 OIR No. 88-090 was issued to document and track twelve four-inch 150# rated raised-face ("RF") weld-neck ("WN") schedule 40 ("S/40") flanges supplied by Radnor Alloys Inc. Radnor Alloys Inc. had obtained the flanges from PSI. The material specification was ASME SA-105 and the heat ("HT") identification number was CMP. These flanges are installed in the Service Water System ("SWS") supply to the IP-2 Emergency Diesel Generator jacket water/lube oil coolers.

On June 17, 1988 OIR No. 88-116 was issued to document and track an additional fifteen three-inch 150# rated flanges indirectly supplied by PSI and WJM. These fifteen flanges consisted of:

a) five flat-faced ("FF") slip-on ("SO") flanges, HT #1T262, ASTM A-105
Chain of purchase: Con Edison-Bechtel-Pullman Power-WJM

b) five FF WN S/40 bore flanges, HT #1068, ASME SA-105
Chain of purchase: Con Edison-Bechtel-Pullman Power-WJM

c) three FF WN S/40 bore flanges, HT #2149, ASTM A-105
Chain of purchase: Con Edison-Bechtel-Canuso-PSI

d) two FF blind flanges, HT #CD12, ASTM A-105
Chain of purchase: Con Edison-Bechtel-Pullman Power-PSI

Eight of these flanges are installed in the Service Water System on three-inch headers to the Instrument Air Compressor Closed-Cooling Water Heat Exchanger; specifically:

a) one HT #1T262 three-inch 150# rated flange,

b) three HT #1068 three-inch WN 150# rated flanges,

c) three HT #2149 three-inch WN 150# rated flanges,

d) one HT #CD12 three-inch 150# rated blind flange is installed on a spare line (No. 1706) buried in an underground vault near the main twenty-four-inch service water supply headers in the Transformer Yard.

For remaining seven flanges,

a) one HT #1T262 three-inch 150# rated flange was discarded after it had been used for temporary header fabrication to facilitate a hydrostatic test,

b) three HT #1T262 three-inch 150# rated flanges had a QC "Hold-Tag" applied to them in our warehouse,

c) two HT #1068 three-inch 150# rated flanges had a QC "Hold-Tag" applied to them in our warehouse, and

d) one HT #CD12 three-inch 150# rated blind flange was discarded after it had been used for temporary header fabrication to facilitate a hydrostatic test.

On June 21, 1988 OIR No. 88-134 was issued to document and track eighty-six ten-inch 150# rated flanges supplied by Guyon Alloys Inc. Guyon Alloys had obtained the flanges from WJM. These eighty-six flanges consisted of:

a) fourteen WN flanges, HT #134A7, ASME SA-105

b) twelve WN flanges, HT #S8548, ASME SA-105

c) sixty SO flanges, HT #S8542, ASME SA-105

Sixteen of those ten-inch flanges (six from HT #134A7 and ten from HT #S8548) were located in the IP-2 warehouse. Of the remaining seventy flanges, fifty-one are installed in the Service Water System service water inlet and outlet lines to the Containment Fan Cooler Units. Based on our review, we were unable to locate the remaining nineteen flanges. However, these flanges had been used to fabricate spool-pieces for a temporary service water system modification and to the best of our knowledge these flanges were subsequently discarded.

On June 23, 1988 OIR No. 88-140 was issued to document and track three one-and-a quarter-inch 150# rated flanges. These flanges are ASME SA-105 material, are identified by HT #VK, and were supplied to us by Courter. WJM manufactured these flanges. These flanges could not be located and our review indicates that these flanges were most likely discarded.

Two additional three-quarter-inch 600# rated raised-face flanges were identified as having been received and were subsequently located in the IP-2 warehouse. These flanges are ASME SA-105 material, are identified by HT #44266, and were supplied to us by Guyon Alloys Inc. WJM manufactured these flanges.

In total 118 WJM/PSI flanges were identified as having been received by us or contractors working on our behalf. As stated previously, twenty-four of these 118 flanges are believed to have been discarded. Consequently, ninety-four flanges were included in our test program. Of these ninety-four flanges, twenty-three were on QC-hold in our warehouse and seventy-one are installed; all in our Service Water System.

3. <u>Test Program</u>:

Our test program consisted of hardness-testing, chemical analysis and, in selected cases, destructive examination of the flanges.

The twenty-three flanges located in our warehouse were sent to City Testing and Research Laboratories, Inc. for laboratory hardness testing and chemical analysis. Additionally, one flange from each heat was destructively tested at City Lab for yield strength, tensile strength, elongation, reduction-in-area, and hardness tested on the flange inner diameter. The remaining flanges, of the twenty-three spares, were hardness tested on the outer-diameter and chemical analysis was performed for Carbon, Manganese, Phosphorus, Sulphur, Silicon and Lead.

Of the seventy-one installed flanges, one blind flange was not tested because it was a three-inch 150# rated blind flange (HT #CD12) installed on an unpressurized unused spare line (No. 1706) buried in an underground vault.

While the Unit was shutdown for an outage in June, 1988, the remaining seventy flanges, both accessible and normally inaccessible during power operation, were hardness-tested and material specimens were taken from each flange. The material specimens were sent off-site to a laboratory for chemical analysis. A field test unit for measuring Brinell hardness was used to test each flange in three different locations on the outside diameter.

In-situ hardness testing of the installed flanges was conducted using a Tele-Brinell instrument. The use of this instrument was based on a comparison of the readings obtained from the use of a variety of test equipment on identical standard bars. The readings were then converted to Brinell Hardness and tensile strength using standard conversion tables. The reference point was based on four test bars manufactured to a hardness of 160 Brinell (78.3 ksi). From our data, we determined that the best method to acquire hardness (laboratory and field) data for tensile strength evaluation was a Brinell and Tele-Brinell type method, respectively.

4. Test Results:

A tabular listing of the results obtained from our test program are included in Attachment II. In addition, the test results have been sent to NUMARC and Bechtel. We also provided information on the INPO Nuclear Network system.

5. Conclusions:

On July 1, 1988, a Justification for Continued Operation ("JCO") was prepared and a notification was made to NRC as a consequence of hardness measurement test results which had been obtained. For those flanges identified as being installed, the test results indicated that seven flanges had hardness values below 137 Brinell Hardness Number ("BHN") or above 187 BHN; but all were above 121 BHN. A review of the IP-2 design specification for the Service Water System indicates that there is a minimum tensile strength requirement of 60,000 psi. Using the ASTM A-370 approximate relation of BHN to tensile strength, the minimum design Code acceptable value is 121 BHN for this IP-2 application. Furthermore, there is no upper limit requirement in the design Code. The value of 121 BHN (and the no upper limit requirement) was obtained from the ASTM Code in effect when IP-2's Service Water system was designed. Therefore, based on the hardness test results, all seven flanges were in compliance with the design Code and the design criteria for IP-2's Service Water System. Accordingly, the July 1, 1988 JCO concluded that continued operation was justified with those flanges installed.

On July 8, 1988, a second notification was made to the NRC pursuant to Bulletin No. 88-05, Supplement 1. That report was made to update the July 1, 1988 notification. The July 8, 1988 notification informed the NRC that IP-2 had identified 21 flanges supplied by WJM/PSI which are installed in the Service Water System, and did not meet all the

current ASTM-A-105 requirements of the material specification for chemical analyses. The installed flanges were tested for Carbon, Manganese, Phosphorus, Sulphur, Silicon, and Lead. Eighteen of those flanges had only one of the six tested elements not meet the required values. Furthermore, that July 8, 1988 notification stated that a JCO would be prepared prior to startup from the then-current outage in accordance with the Bulletin.

The material for the service water piping in Indian Point Unit No. 2 is specified in United Engineers and Constructors Inc. specification No. 9321-01-248-35, initial issue dated March 31, 1967, with the latest revision 5A dated October 20, 1982. The flanges for class SWN-CS are specified to be A-181 Gr.1 or A-105.

It should be noted that since 1968, there have been numerous changes in the relevant specification chemistry requirements. For example, A-105-68 and A-181-68, which were the requirements in effect at the time of plant design, specified Manganese as 0.90% maximum (no minimum), Phosphorus and Sulfur as 0.05% maximum (no minimum). Further, A-105-68 and A-181-68 both specify that when check analyses are made on a forging, Phosphorus and Sulfur may be 0.055% maximum. A-105-80 specifies Manganese as 0.60-1.05% and A-181-81 specifies Manganese as 1.10% maximum; both specifications provide that for each 0.01% reduction in Carbon the Manganese may be increased 0.04% to a maximum of 1.35%.

Our Metallurgical Engineering Department had reviewed the chemical analyses of the flanges and had determined that, where the analyses did not meet the material chemistry specifications exactly, the differences would not affect the serviceability of those flanges given their application in the plant. In every case, the variation was such that neither the mechanical properties nor the corrosion resistance of the flanges would be affected. Furthermore, hardness measurements indicated that the tensile strengths of the flanges were within the Service Water System design specification requirements. Consequently, continued operation with those flanges installed was justified.

We have completed all scheduled actions with regard to this issue.

Attachment II

Test Program Results

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
September 16, 1988

SPARE FLANGE MATRIX

MANUFACTURER	SIZE/HEAT NO.	YIELD STRENGTH 36K MIN	TENSILE STRENGTH 60K MIN	ELONGATION 22% MIN	REDUCTION IN AREA 30% MIN	BRINNELL HARDNESS 137 MIN. TEST O.D.	BRINNELL HARDNESS 137 MIN. TEST I.D.	CHEMICAL ANALYSIS C .35 MAX	Mn .60-1.05	P .040 MAX	S .050 MAX	Si .35 MAX	Pb NONE
WJM	3/4"-44266	42.3	70.2	34.0	62.1	137	137	.27	.75	.014	.046	.21	<.01
WJM	3/4"-44266					140		.18	.72	.032	.040	.17	<.01
WJM	3"-1068	38.4	70.3	33.5	61.6	137	134	.19	.71	.009	.049	.17	<.01
WJM	3"-1068					134		.16	.69	.016	.047	.17	<.01
WJM	3"-1T262	33.0	64.5	35.0	60.0	126	124	.16	.53	.022	.043	.20	<.01
WJM	3"-1T262	37.0	70.8	37.0	64.1	137	137	.20	.63	.013	.038	.17	<.01
WJM	3"-1T262	35.7	65.0	36.5	63.3	128	126	.21	.66	.020	.040	.16	<.01
WJM	10"-134A7	39.2	73.5	32.0	54.1	143	146	.24	.56	.016	.047	.19	<.01
WJM	10"-134A7					149		.25	.52	.033	.049	.20	<.01
WJM	10"-134A7					149		.25	.52	.035	.047	.16	<.01
WJM	10"-134A7					149		.27	.56	.017	.043	.26	<.01
WJM	10"-134A7					146		.19	.56	.014	.042	.23	<.01
WJM	10"-134A7					156		.27	.56	.035	.041	.16	<.01
WJM	10"-S8548	43.4	78.0	31.0	53.3	156	153	.23	.74	.066	.066	.12	<.01
WJM	10"-S8548					143		.21	.65	.050	.060	.02	<.01
WJM	10"-S8548					143		.25	.63	.063	.063	.16	<.01
WJM	10"-S8548					134		.17	.62	.058	.061	.04	<.01
WJM	10"-S8548					143		.29	.64	.070	.059	.26	<.01
WJM	10"-S8548					137		.22	.65	.063	.051	.03	<.01
WJM	10"-S8548					153		.27	.89	.064	.058	.16	<.01
WJM	10"-S8548					166		.34	.70	.052	.058	.10	<.01
WJM	10"-S8548					149		.23	.83	.058	.056	.16	<.01
WJM	10"-S8548					170		.22	.68	.059	.059	.10	<.01

FLANGE MATRIX

FLANGE NUMBER	MFG.	SIZE/HEAT NO.	YIELD STRENGTH 36K MIN	TENSILE STRENGTH 60K MIN	ELONGATION 22% MIN.	REDUCTION IN AREA 30% MIN	BRINNELL HARDNESS TEST PERFORMED	BRINNELL HARDNESS RESULTS AVERAGE >121	CHEMICAL ANALYSIS SAMPLE DELIVERED	C 3.5 MAX	Mn .60-1.05	P 0.040 MAX	S 0.050 MAX	Si .35 MAX	Pb NONE
EDG BUILDING - TOTAL 12															
SWN-62 IN	PSI	4"/CMP					YES	173.0	YES	.34	.69	.017	.023	.18	<.01
SWN-62 OUT	PSI	4"/CMP					YES	186.6	YES	.33	.66	.013	.035	.20	<.01
SWN-62-1 IN	PSI	4"/CMP					YES	176.0	YES	.35	.65	.016	.025	.21	<.01
SWN-62-1 OUT	PSI	4"/CMP					YES	181.6	YES	.31	.71	.018	.030	.19	<.01
SWN-62-2 IN	PSI	4"/CMP					YES	178.6	YES	.33	.70	.016	.024	.21	<.01
SWN-62-2 OUT	PSI	4"/CMP					YES	166.6	YES	.33	.66	.013	.025	.21	<.01
SWN-62-3 IN	PSI	4"/CMP					YES	176.0	YES	.35	.71	.015	.027	.19	<.01
SWN-62-3 OUT	PSI	4"/CMP					YES	170.0	YES	.35	.78	.018	.027	.18	<.01
SWN-62-4 IN	PSI	4"/CMP					YES	176.0	YES	.32	.67	.016	.023	.21	<.01
SWN-62-4 OUT	PSI	4"/CMP					YES	171.0	YES	.33	.66	.020	.025	.20	<.01
SWN-62-6 IN	PSI	4"/CMP					YES	176.0	YES	.29	.75	.012	.028	.21	<.01
SWN-62-6 OUT	PSI	4"/CMP					YES	176.0	YES	.35	.75	.017	.029	.20	<.01
4160V SWITCHGEAR ROOM - TOTAL 4															
SW-1703-1	WJM	3"/1T262					YES	156.3	YES	.20	.69	.021	.040	.13	<.01
SW-1703-2	PSI	3"/2149					YES	160.0	YES	.18	.74	.019	.039	.15	<.01
SW-1704-3	PSI	3"/2149					YES	152.3	YES	.20	.78	.023	.042	.14	<.01
SW-1705-4	PSI	3"/2149					YES	146.6	YES	.23	.74	.017	.041	.11	<.01
TRANSFORMER YARD - TOTAL 3															
SW-PIT-WEST	PSI	3"/2149					YES	200.3	YES	ND	.69	.013	.045	.20	<.01
SW-PIT-EAST	PSI	3"/2149					YES	185.3	YES	ND	.70	.034	.035	.19	<.01
SW-PIT-MIDDLE	PSI	3"/2149					YES	187.3	YES	ND	.62	.020	.038	.19	<.01

ND = NOT DETERMINED

FLANGE MATRIX

FLANGE NUMBER	MANUFACTURER	SIZE/HEAT NO.	YIELD STRENGTH 36K MIN	TENSILE STRENGTH 60K MIN	ELONGATION 22% MIN.	REDUCTION IN AREA 30% MIN	BRINNELL HARDNESS TEST PERFORMED	BRINNELL HARDNESS RESULTS AVERAGE >121	CHEMICAL ANALYSIS SAMPLE DELIVERED	C 3.5 MAX	Mn .60-1.05	P 0.040 MAX	S 0.050 MAX	Si .35 MAX	Pb NONE
VAPOR CONTAINMENT - TOTAL 26															
21-11A-2	WJM	16"/S8542					YES	171.3	YES	.29	.72	.035	.042	.18	<.01
21-11A-3	WJM	16"/S8542					YES	134.3	YES	.20	.53	.027	.048	.12	<.01
21-12B-5	WJM	16"/S8542					YES	143.3	YES	.29	.67	.025	.040	.02	<.01
21-12B-6	WJM	16"/S8542					YES	181.0	YES	.30	.73	.040	.041	.08	<.01
21-11A-1	WJM	16"/S8542					YES	134.6	YES	.22	.56	.040	.054	.02	<.01
21-12B-4	WJM	16"/S8542					YES	147.3	YES	.24	.64	.016	.038	.02	<.01
22-11D-7	WJM	16"/S8542					YES	150.6	YES	.34	.66	.034	.040	.04	<.01
22-12D-8	WJM	16"/S8542					YES	148.6	YES	.19	.60	.027	.053	.03	<.01
23-11B-10	WJM	16"/S8542					YES	190.3	YES	.35	1.05	.029	.035	.21	<.01
23-11B-11	WJM	16"/S8542					YES	178.0	YES	.23	.74	.039	.034	.02	<.01
23-12A-13	WJM	16"/S8542					YES	135.6	YES	.18	.67	.078	.050	.01	<.01
23-12A-14	WJM	16"/S8542					YES	147.6	YES	.17	.55	.017	.042	.01	<.01
23-12A-9	WJM	16"/S8542					YES	176.0	YES	.30	.82	.040	.046	.01	<.01
23-11B-12	WJM	16"/S8542					YES	135.0	YES	.24	.87	.040	.031	.04	<.01
24-11C-15	WJM	16"/S8542					YES	138.3	YES	.18	.83	.023	.040	.05	<.01
24-11C-16	WJM	16"/S8542					YES	137.3	YES	.25	.63	.081	.045	.01	<.01
24-11C-17	WJM	16"/S8542					YES	163.3	YES	.28	.85	.027	.037	.04	<.01
24-12C-18	WJM	16"/S8542					YES	167.6	YES	.27	.77	.031	.050	.33	<.01
24-12C-19	WJM	16"/S8542					YES	157.3	YES	.22	.53	.022	.041	.01	<.01
24-12C-20	WJM	16"/S8542					YES	139.0	YES	.26	.60	.035	.045	.01	<.01
25-11E-21	WJM	16"/S8542					YES	166.3	YES	.34	.68	.058	.040	.02	<.01
25-11E-22	WJM	16"/S8542					YES	152.3	YES	.22	.71	.051	.054	.01	<.01
25-11E-23	WJM	16"/S8542					YES	145.3	YES	.30	.71	.056	.050	.03	<.01
25-12E-24	WJM	16"/S8542					YES	174.6	YES	.32	.88	.062	.040	.03	<.01
25-12E-25	WJM	16"/S8542					YES	163.3	YES	.25	.98	.053	.045	.03	<.01
25-12E-26	WJM	16"/S8542					YES	170.0	YES	.35	.70	.032	.055	.24	<.01

FLANGE MATRIX

FLANGE NUMBER	MFG.	SIZE/HEAT NO.	YIELD STRENGTH 36K MIN	TENSILE STRENGTH 60K MIN	ELONGATION 22% MIN.	REDUCTION IN AREA 30% MIN	BRINNELL HARDNESS TEST PERFORMED	BRINNELL HARDNESS RESULTS AVERAGE >121	CHEMICAL ANALYSIS SAMPLE DELIVERED	C 3.5 MAX	Mn 1.60-1.05	P 0.040 MAX	S 0.050 MAX	Si .35 MAX	Pb NONE
PIPING PER - TOTAL 40															
24-11C-27	WJM	10"/S8542					YES	179.0	YES	.27	1.13	.034	.037	.22	<.01
24-11C-28	WJM	10"/S8542					YES	182.0	YES	.26	.82	.030	.045	.03	<.01
24-11C-29	WJM	10"/S8542					YES	166.3	YES	.22	.83	.027	.043	.02	<.01
24-11C-30	WJM	10"/S8542					YES	147.0	YES	.27	.53	.023	.035	.21	<.01
23-11B-31	WJM	10"/S8542					YES	156.0	YES	.32	.65	.047	.031	.05	<.01
23-11B-32	WJM	10"/S8542					YES	165.3	YES	.19	.60	.034	.039	.04	<.01
23-11B-33	WJM	10"/S8542					YES	159.6	YES	.35	.84	.040	.032	.04	<.01
23-11B-34	WJM	10"/S8542					YES	191.3	YES	.27	.57	.069	.032	.06	<.01
21-11A-35	WJM	10"/S8542					YES	157.3	YES	.25	.63	.030	.032	.02	<.01
21-11A-36	WJM	10"/S8542					YES	157.0	YES	.22	.62	.039	.043	.01	<.01
21-11A-37	WJM	10"/S8542					YES	140.0	YES	.34	.61	.017	.047	.21	<.01
21-11A-38	WJM	10"/S8542					YES	142.3	YES	.21	.70	.036	.039	.01	<.01
22-11D-39	WJM	10"/S8542					YES	166.3	YES	.22	.60	.031	.033	.04	<.01
22-11D-40	WJM	10"/S8542					YES	168.0	YES	.26	.63	.027	.047	.04	<.01
22-11D-41	WJM	10"/S8542					YES	166.6	YES	.19	.63	.085	.042	.03	<.01
22-11D-42	WJM	10"/S8542					YES	147.6	YES	.22	.81	.033	.037	.01	<.01
25-11E-43	WJM	10"/S8542					YES	169.0	YES	.27	.63	.038	.045	.10	<.01
25-11E-44	WJM	10"/S8542					YES	151.3	YES	.17	.65	.020	.030	.00	<.01
25-11E-45	WJM	10"/S8542					YES	157.3	YES	.19	.63	.040	.032	.04	<.01
25-11E-46	WJM	10"/S8542					YES	144.3	YES	.25	.60	.024	.040	.04	<.01
21-12E-47	WJM	10"/S8542					YES	162.3	YES	.33	.61	.066	.037	.05	<.01

FLANGE MATRIX

FLANGE NUMBER	MFG.	SIZE/HEAT NO.	YIELD STRENGTH 36K MIN	TENSILE STRENGTH 60K MIN	ELONGATION 22% MIN.	REDUCTION IN AREA 30% MIN	BRINNELL HARDNESS TEST PERFORMED	BRINNELL HARDNESS RESULTS AVERAGE >121	CHEMICAL ANALYSIS SAMPLE DELIVERED	C 3.5 MAX	Mn .60-1.05	P 0.040 MAX	S 0.050 MAX	Si .35 MAX	Pb NONE
PIPING PEN CONTINUED															
21-12A-51	WJH	10"/SS542					YES	153.3	YES	.26	.63	.016	.035	.05	<.01
24-12C-55	WJH	10"/SS542					YES	141.3	YES	.26	.60	.015	.037	.05	<.01
22-12D-59	WJH	10"/SS542					YES	145.0	YES	.23	.71	.016	.036	.04	<.01
25-12E-63	WJH	10"/SS542					YES	146.0	YES	.22	.60	.037	.036	.02	<.01