NRC FORM 195 (2-76)

U.S. NUCLEAR REGULATORY COMMISSION

DOCKET NUMBER 50-250/251

FILE NUMBER

## NRC DISTRIBUTION FOR PART 50 DOCKET MATERIAL

TO:
Mr. George Lear

FROM:
Florida Power & Light Company
Miami, Florida
Robert E. Uhrig

DATE OF DOCUMENT 10/21/77

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"Turkey Point Unit No. 3 Reactor Vessel Material Surveillance Program"

"Florida Power & Light Company - Turkey Point Unit No. 3 Reactor Vessel Radiation Surveillance Program"

DISTRIBUTION FOR MATERIAL ON REACTOR VESSEL
DATA PER R. INGRAM 5-26-77

PLANT NAME: Turkey Point Units 3 & 4
RJL 10.26/77 (1-P) (12-P)+(41-P)

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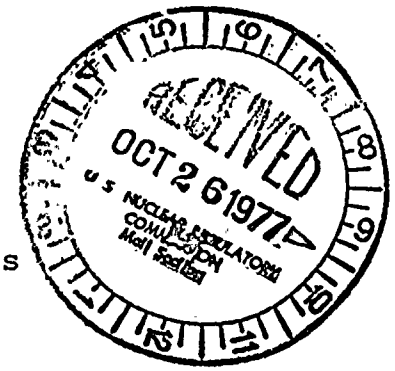
FLORIDA POWER & LIGHT COMPANY

October 21, 1977
L-77-326




Office of Nuclear Reactor Regulation
Attention: Mr. George Lear, Chief
Operating Reactors Branch #3
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Lear:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Reactor Vessel Material Information

Your letter of May 20, 1977 contained a Request for Information regarding the Reactor Vessel Material Surveillance Program at Turkey Point Units 3 and 4. On July 6, 1977 (L-77-211), we agreed to supply the information by October 22, 1977. The information you requested is attached.

Very truly yours,

Robert E. Uhrig
Vice President

REU/MAS/cpc

Attachment

cc: Mr. James P. O'Reilly, Region II
Robert Lowenstein, Esquire

# TURKEY POINT UNIT NO. 3 REACTOR VESSEL
# MATERIAL SURVEILLANCE PROGRAM

1.) The estimated maximum fluence (E > 1 Mev) at the inner surface of the reactor vessel wall as of March 31, 1977 is $5.65 \times 10^{18}$ n/cm$^2$.

2.) The effective full power years (EFPY) of operation accumulated as of March 31, 1977 is 2.87 EFPY.

3.) Fabrication of the reactor vessel was performed by the Babcock and Wilcox Company.

4.) a.) A sketch of the reactor vessel showing all materials in the beltline region is shown in Figure 1.

b.) Information on each of the welds in the beltline region is shown in Tables 1 through 4.

c.) Information on each of the forgings in the beltline region is shown in Tables 4 through 7.

5.) Information relative to weld and forging material included in the material surveillance program is shown in Tables 1 through 3 and 5 trough 7.

FIGURE 1

IDENTIFICATION AND LOCATION OF BELTLINE REGION MATERIAL IN THE TURKEY POINT UNIT NO. 3 REACTOR VESSEL

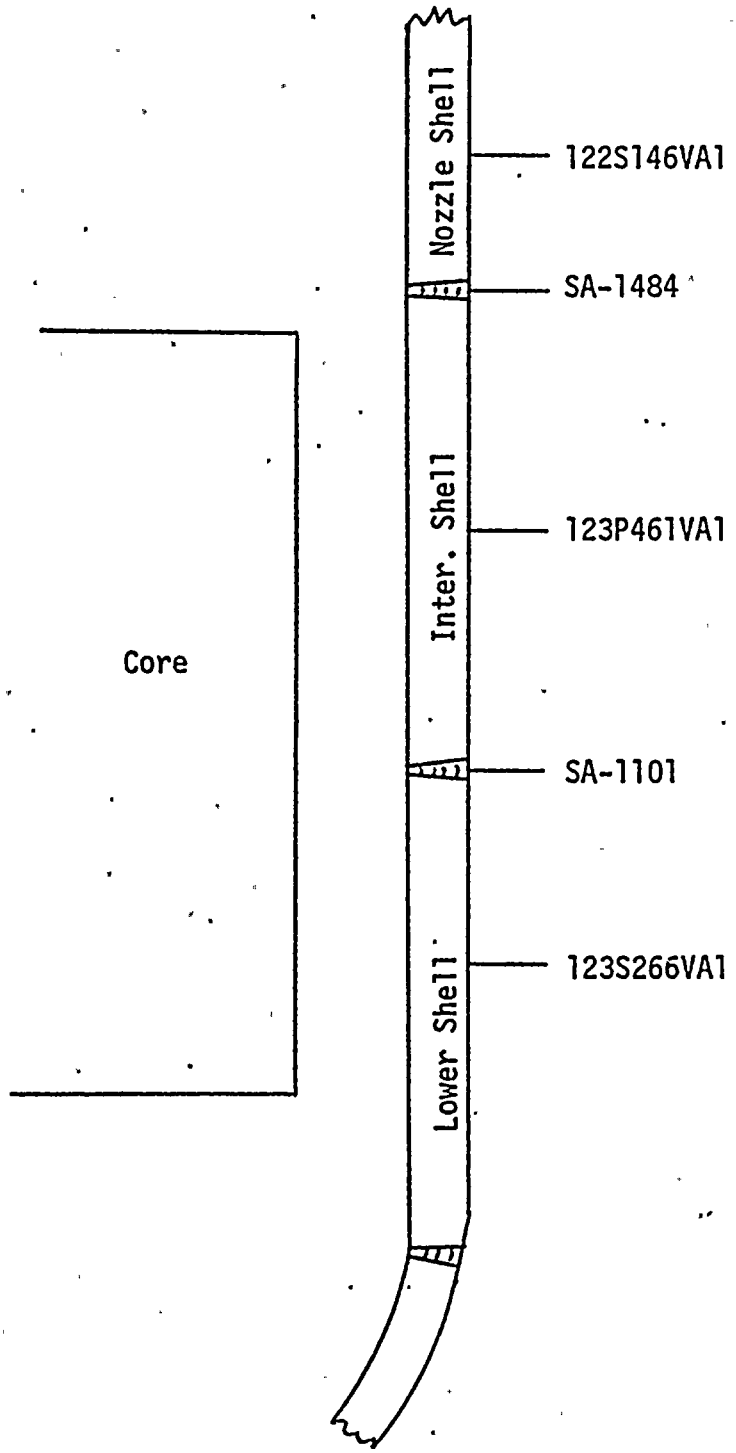


TABLE 1

IDENTIFICATION OF REACTOR VESSEL TURKEY POINT UNIT NO. 3

REACTOR VESSEL BELTLINE REGION WELD MATERIAL

| Weld Location | Weld Process | Weld Control No. | Weld Wire | | Flux | | Post Weld Heat Treatment |
|---|---|---|---|---|---|---|---|
| | | | Type | Heat No. | Type | Lot No. | |
| Nozzle Shell to Inter. Shell | Submerged Arc | SA-1484 | Mn Mo Ni | 72442 | Linde 80 | 8579 | 1100-1125°F-48 Hrs-FC |
| Inter. Shell to Lower Shell | Submerged Arc | SA-1101 | Mn Mo Ni | 71249 | Linde 80 | 8445 | 1100-1125°F-48 Hrs-FC |
| Surveillance Weld | Submerged Arc | SA-1101 | Mn Mo Ni | 71249 | Linde 80 | 8445 | 1125°F-10 1/4 Hrs-FC |

TABLE 2

CHEMICAL COMPOSITION OF VESSEL BELTLINE REGION WELD MATERIAL

| Weld Control No. | Weld Wire | | Flux | | Weight Percent | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Heat No. | Type | Lot No. | C | P | S | Mn | Si | Mo | Ni | Cr | Cu |
| SA-1484 | Mn Mo Ni | 72442 | Linde 80 | 8579 | .08 | .018 | .015 | 1.52 | .42 | .39 | .64 | .06 | .2 |
| SA-1101 | Mn Mo Ni | 71249 | Linde 80 | 8445 | .07 | .021 | .014 | 1.28 | .52 | .36 | .57 | .17 | .21 |
| Surveillance Weld | | | | | .076 | .011 | .018 | 1.26 | .66 | .42 | .57 | .14 | .31 |

TABLE 3

MECHANICAL PROPERTIES OF VESSEL BELTLINE REGION WELD MATERIAL

| Weld Control No. | Weld Wire Type | Weld Wire Heat No. | Flux Type | Flux Lot No. | $T_{NDT}$* °F | Energy at 10°F ft-lb | $RT_{NDT}$* °F | Shelf Energy ft-lb | YS ksi | UTS ksi | Elong. % | RA % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SA-1484 | Mn Mo Ni | 72442 | Linde 80 | 8579 | 0 | 40,52,41 | 0 | ---- | ----- | 84.00 | ---- | ---- |
| SA-1101 | Mn Mo Ni | 71249 | Linde 80 | 8445 | 0 | 45,45,46 | 0 | ---- | 68.63 | 84.26 | 28.5 | ---- |
| Surveillance Weld | | | | | 0 | 26,37,25 | 3 | 64.5 | 76.30 | 92.35 | 24.9 | 64.1 |

*Estimated Per NRC Standard Review Plan Section 5.3.2.

TABLE 4

MAXIMUM END-OF-LIFE FLUENCE AT VESSEL INNER WALL LOCATIONS

| Shell Forging or Weld Location | Fluence $n/cm^2$ |
|---|---|
| Nozzle Shell Forging | $9.5 \times 10^{18}$ |
| Nozzle Shell to Inter. Shell Circle Seam | $9.5 \times 10^{18}$ |
| Inter. Shell Forging | $6.3 \times 10^{19}$ |
| Inter. Shell to Lower Shell Circle Seam | $6.3 \times 10^{19}$ |
| Lower Shell Forging | $6.3 \times 10^{19}$ |

TABLE 5

IDENTIFICATION OF VESSEL BELTLINE REGION SHELL FORGING MATERIAL

| Component | Forging No. | Heat No. | Material Spec. | Supplier | Heat Treatment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Austenitize | Temper | Stress Relief |
| Nozzle Shell | 122S146VA1 | 122S146 | A508 CL 2 | Bethlehem | 1550°F-11 HR-WQ | 1220°F-22 HR-AC | 1125°F-40 HR-FC |
| Inter. Shell | 123P461VA1 | 123P461 | A508 CL 2 | Bethlehem | 1550°F-13 HR-WQ | 1210°F-18 HR-AC | 1125°F-40 HR-FC |
| Lower Shell | 123S266VA1 | 123S266 | A508 CL 2 | Bethlehem | 1550°F-13 HR-WQ | 1210°F-18 HR-AC | 1125°F-40 HR-FC |
| Surveillance Material - Inter. and Lower Shell as Above Except Stress Relieved by Westinghouse | | | | | | | 1125°F-10 1/4 HR FC |

TABLE 6

CHEMICAL COMPOSITION OF VESSEL BELTLINE REGION SHELL FORGING MATERIAL

| Forging No. | C | Mn | P | S | Si | Ni | Mo | Cr | V | Co | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 122S146VA1 | .22 | .64 | .010 | .013 | .25 | .68 | .59 | .35 | .03 | .014 | ---- |
| 123P461VA1 | .20 | .65 | .010 | .010 | .26 | .70 | .62 | .40 | .02 | .011 | .058* |
| 123S266VA1 | .20 | .62 | .010 | .008 | .20 | .67 | .59 | .38 | .02 | .016 | .079* |

*Analyses Performed by Westinghouse as Part of Surveillance Program

TABLE 7

MECHANICAL PROPERTIES OF VESSEL BELTLINE REGION SHELL FORGING MATERIAL

| Forging No. | $T_{NDT}$ °F | $RT_{NDT}$* °F | Shelf* Energy ft-lb | YS ksi | UTS ksi | Elong. % | RA % | |
|---|---|---|---|---|---|---|---|---|
| 122S146VA1 | 50 | 50 | 98.5 | 64.0 | 85.5 | 26.0 | 69.95 | |
| 123P461VA1 | 40 | 40 | 98.5 | 68.0 | 90.7 | 25.0 | 68.35 | |
| 123S266VA1 | 30 | 30 | 117.5 | 58.1 | 83.4 | 28.0 | 71.40 | |
| 123P461VA1 | -- | 40 | 94.0 | 64.4 | 96.2 | 26.1 | 70.35 | Surveillance Test Data |
| 123S266VA1 | -- | 30 | 96.0 | 57.4 | 92.6 | 26.1 | 70.70 | |

*Estimated From Test Data in the Major Working Direction Per NRC Standard Review Plan Section 5.3.2

# TURKEY POINT UNIT NO. 4 REACTOR VESSEL
# MATERIAL SURVEILLANCE PROGRAM

1.) The estimated maximum fluence (E > 1 Mev) of the inner surface of the reactor vessel as of March 31, 1977 is $4.79 \times 10^{18}$ n/cm$^2$.

2.) The effective full power years (EFPY) of operation accumulated as of March 31, 1977 is 2.43 EFPY.

3.) Fabrication of the reactor vessel was performed by the Babcock and Wilcox Co.

4.) a.) A sketch of the reactor vessel showing all materials in the beltline region is shown in Figure 1.

b.) Information on each of the welds in the beltline region is shown in Tables 1 through 4.

c.) Information on each of the forgings in the beltline region is shown in Tables 4 through 7.

5.) Information relative to weld and forging material included in the material surveillance program is shown in Tables 1 through 3 and 5 through 7.

FIGURE 1

IDENTIFICATION AND LOCATION OF BELTLINE REGION MATERIAL IN THE TURKEY POINT UNIT NO. 4 REACTOR VESSEL

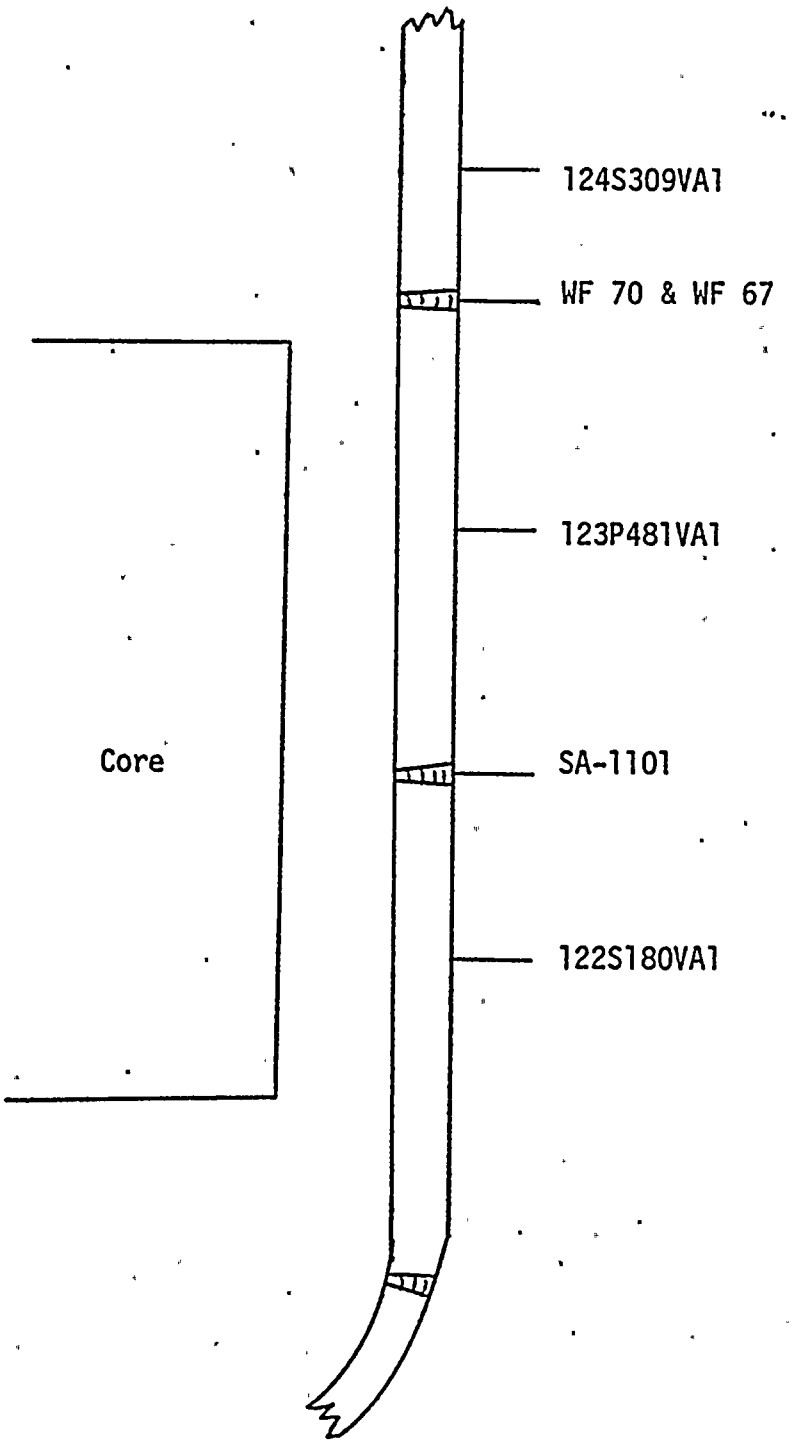


TABLE 1

IDENTIFICATION OF REACTOR VESSEL TURKEY POINT UNIT NO. 4

REACTOR VESSEL BELTLINE REGION WELD MATERIAL

| Weld Location | Weld Process | Weld Control No. | Weld Wire | | Flux | | Post Weld Heat Treatment |
|---|---|---|---|---|---|---|---|
| | | | Type | Heat No. | Type | Lot No. | |
| Nozzle Shell to Inter. Shell | Submerged Arc | WF-70 | Mn-Mo-Ni | 72105 | Linde 80 | 8669 | 1100-1150°F-48 HR |
| | Submerged Arc | WF-67 | Mn-Mo-Ni | 72442 | Linde 80 | 8669 | 1100-1150°F-48 HR |
| Inter Shell to Lower Shell | Submerged Arc | SA-1101 | Mn-Mo-Ni | 71249 | Linde 80 | 8445 | 1100-1150°F-48 HR |
| Surveillance Weld | Submerged Arc | SA-1094 | Mn-Mo-Ni | 71249 | Linde 80 | 8457 | 1125°F-10 1/4 HR-FC |

TABLE 2

CHEMICAL COMPOSITION OF VESSEL BELTLINE REGION WELD MATERIAL

| Weld Control No. | Weld Wire | | Flux | | Weight Percent | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Heat No. | Type | Lot No. | C | Mn | P | S | Si | Ni | Mo | Cr | Cu |
| WF-70 | Mn-Mo-Ni | 72105 | Linde 80 | 8669 | .070 | 1.60 | .014 | .011 | .48 | .46 | .40 | --- | .27 |
| WF-67 | Mn-Mo-Ni | 72442 | Linde 80 | 8669 | .064 | 1.49 | .014 | .017 | .54 | .57 | .41 | .02 | .2 |
| SA-1101 | Mn-Mo-Ni | 71249 | Linde 80 | 8445 | .070 | 1.28 | .021 | .014 | .52 | .57 | .36 | .17 | .21 |
| SA-1094 | | 71249 | Linde 80 | 8457 | .070 | 1.42 | .020 | .016 | .51 | .55 | .49 | .16 | .23 |
| Surveillance Weld | | | | | .098 | 1.44 | .014 | .011 | .50 | .60 | .36 | .14 | .30 |

TABLE 3

MECHANICAL PROPERTIES OF VESSEL BELTLINE REGION WELD MATERIAL

| Weld Control No. | Weld Wire Type | Weld Wire Heat No. | Flux Type | Flux Lot No. | $T_{NDT}$* °F | Energy at 10°F ft-lbs | $RT_{NDT}$* °F | Shelf Energy ft-lb | YS ksi | UTS ksi | Elong. % | RA % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WF-70 | Mn-Mo-Ni | 72105 | Linde 80 | 8669 | 0 | 39,35,44 | 0 | -- | 69.0 | 85.5 | 25.8 | 64.7 |
| WF-67 | Mn-Mo-Ni | 72442 | Linde 80 | 8669 | 0 | 29,35,30 | 0 | -- | 64.0 | 81.5 | 31.3 | 65.8 |
| SA-1101 | Mn-Mo-Ni | 71249 | Linde 80 | 8445 | 0 | 45,45,46 | 0 | -- | 68.6 | 84.3 | 28.5 | ---- |
| SA-1094 | Mn-Mo-Ni | 71249 | Linde 80 | 8457 | 0 | 38,34,52 | 0 | -- | 72.5 | 86.0 | 26.7 | 65.1 |
| Surveillance Weld | | | | | 0 | 29,39,36 | 0 | 66 | 70.2 | 91.3 | 23.8 | 64.7 |

*Estimated Per NRC Standard Review Plan Section 5.3.2

TABLE 4

MAXIMUM END-OF-LIFE FLUENCE AT VESSEL INNER WALL LOCATIONS

| Shell Forging or Weld Locations | Fluence $n/cm^2$ |
|---|---|
| Nozzle Shell Forging | $9.5 \times 10^{18}$ |
| Nozzle Shell to Inter. Shell Circle Seam | $9.5 \times 10^{18}$ |
| Inter. Shell Forging | $6.3 \times 10^{19}$ |
| Inter. Shell to Lower Shell Circle Seam | $6.3 \times 10^{19}$ |
| Lower Shell Forging | $6.3 \times 10^{19}$ |

TABLE 5

IDENTIFICATION OF VESSEL BELTLINE REGION SHELL FORGING MATERIAL

| Component | Forging No. | Heat No. | Material Spec. | Supplier | Heat Treatment | | |
|---|---|---|---|---|---|---|---|
| | | | | | Austenitize | Temper | Stress Relief |
| Nozzle Shell | 124S309VA1 | 124S309 | A508 CL 2 | Bethlehem | 1550°F-15 HR-WQ | 1220°F-22 HR-FC | 1125°F-40 HR-FC |
| Inter. Shell | 123P481VA1 | 123P481 | A508 CL 2 | Bethlehem | 1550°F-10 1/4HR-WQ | 1210°F-18 HR-AC | 1125°F-40 HR-FC |
| Lower Shell | 12S180VA1 | 122S180 | A508 CL 2 | Bethlehem | 1550°F-10 1/2 HR-WQ | 1200°F-18 HR-FC | 1125°F-40 HR-FC |
| Surveillance Material - Inter. and Lower Shell as Above Except Stress Relieved by Westinghouse | | | | | | | 1125°F-10 1/2 HR-FC |

TABLE 6

CHEMICAL COMPOSITION OF VESSEL BELTLINE REGION SHELL FORGING MATERIAL

| Forging No. | Weight Percent | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | C | Mn | P | S | Si | Ni | Mo | Cr | V | Co | Cu |
| 124S309VA1 | .20 | .60 | .010 | .012 | .27 | .70 | .57 | .33 | .02 | .008 | --- |
| 123P481VA1 | .21 | .65 | .010 | .011 | .25 | .69 | .59 | .33 | .02 | .011 | --- |
| 122S180VA1 | .22 | .60 | .010 | .009 | .23 | .74 | .60 | .34 | .02 | .013 | --- |
| 123P481VA1* | .22 | .67 | .010 | .009 | .20 | .71 | .56 | .33 | .002 | .017 | .054 |
| 122S180VA1* | .21 | .67 | .011 | .009 | .23 | .70 | .56 | .31 | .001 | .015 | .056 |

*Surveillance Material Analysis Performed by Westinghouse.

TABLE 7

MECHANICAL PROPERTIES OF VESSEL BELTLINE REGION SHELL FORGING MATERIAL

| Forging No. | $T_{NDT}$ °F | $RT_{NDT}$* °F | Shelf* Energy ft-lb | YS ksi | UTS ksi | Elong. % | RA % | |
|---|---|---|---|---|---|---|---|---|
| 124S309VA1 | 40 | 40 | 101 | 66.1 | 89.5 | 26.2 | 69.3 | |
| 123P481VA1 | 50 | 50 | 93 | 71.0 | 93.2 | 25.0 | 67.2 | |
| 122S180VA1 | 40 | 40 | 97 | 72.2 | 92.7 | 24.0 | 66.9 | |
| 123P481VA1 | -- | 50 | 88 | 68.5 | 90.1 | 25.4 | 68.1 | Surveillance Test Data |
| 122S180VA1 | -- | 40 | 86 | 70.8 | 91.5 | 24.2 | 67.8 | |

*Estimated From Test Data in the Major Working Direction Per NRC Standard Review Plan Section 5.3.2