ENCLOSURE 2

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

PROPOSED TECHNICAL SPECIFICATION (TS) CHANGE TS-349
MARKED PAGES

I. AFFECTED PAGE LIST

Unit 1	Unit 2	Unit 3
3.6/4.6-3	3.6/4.6-3	3.6/4.6-3
3.6/4.6-24	3.6/4.6-24	3.6/4.6-24
3.6/4.6-27	3.6/4.6-27	3.6/4.6-27
3.6/4.6-28		

II. MARKED PAGES

See attached.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
3.6.A. Thermal and Pressurization Limitations	4.6.A. Thermal and Pressurization Limitations
4. The beltline region of reactor vessel temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of Figure 3.6-1. The applicability of this curve to these tests is extended to nonnuclear heatup and ambient loss cooldown associated with these tests only if the heatup and cooldown rates do not exceed 15°F per hour.	4. DELETED
5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 80°F ~~100°F~~, and must remain above 80°F ~~100°F~~ while under full tension.	5. When the reactor vessel head bolting studs are tensioned and the reactor is in a cold condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

Replace with attached figure

JAN 08 1993

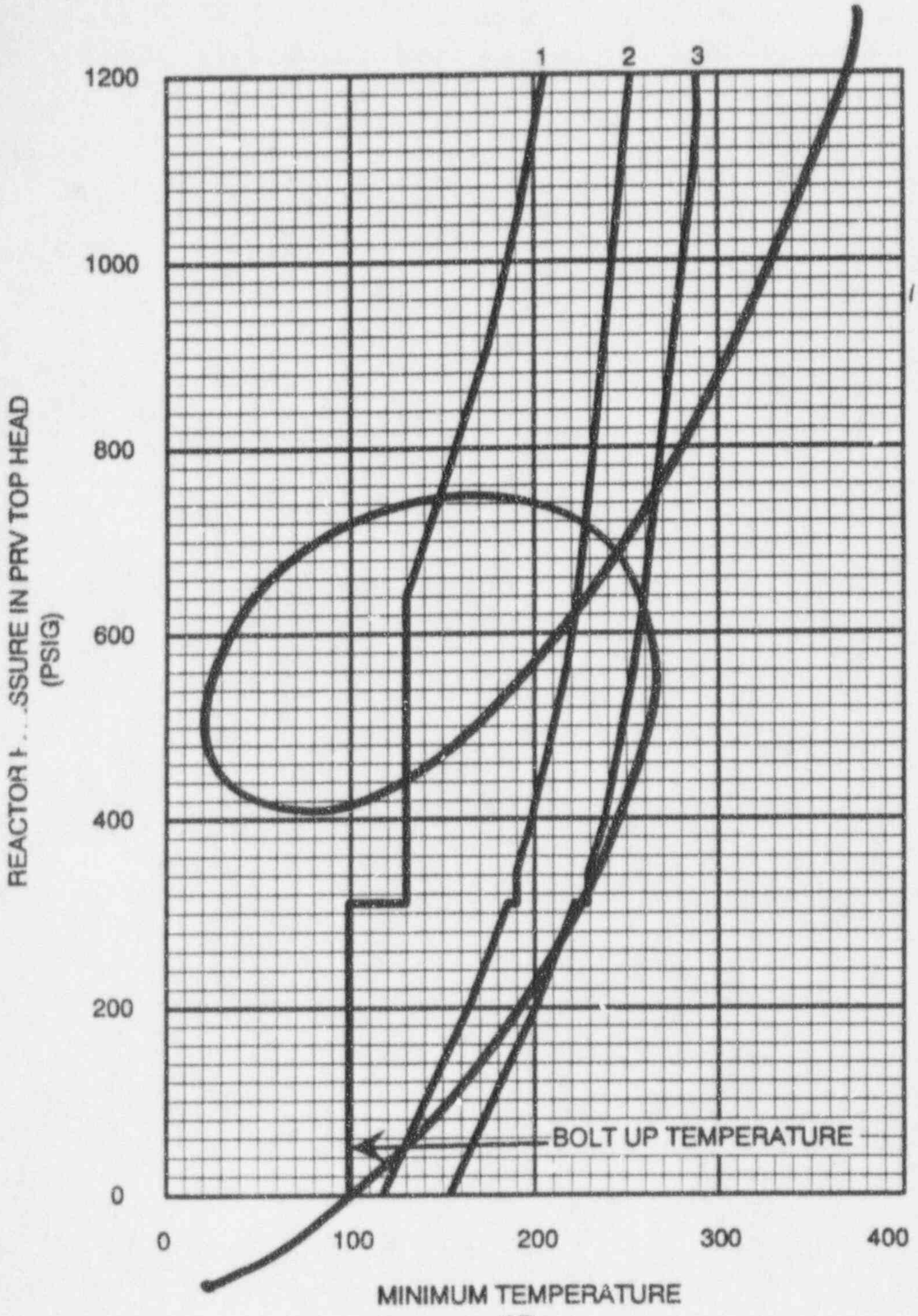

Figure 3.6.-1
(BFN Unit 1)

Curve No. 1
Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 191 ~~185~~ °F is required for test pressure of 1,100 psig.

Curve No. 2
Minimum temperature for mechanical heatup or cooldown following nuclear shutdown.

Curve No. 3
Minimum temperature for core operation (criticality) includes additional margin required for 10CFR50, Appendix G, Par. IV.A.3 which became effective July 26, 1983.

Notes
These curves include sufficient margin to provide protection against feedwater nozzle degradation. The curves allow for shifts in RT_{NDT} of the Reactor vessel beltline materials, in accordance with Reg. Guide 1.99 Rev. 2, to compensate for radiation embrittlement for 12 EFPY.

Figure 3.6-1

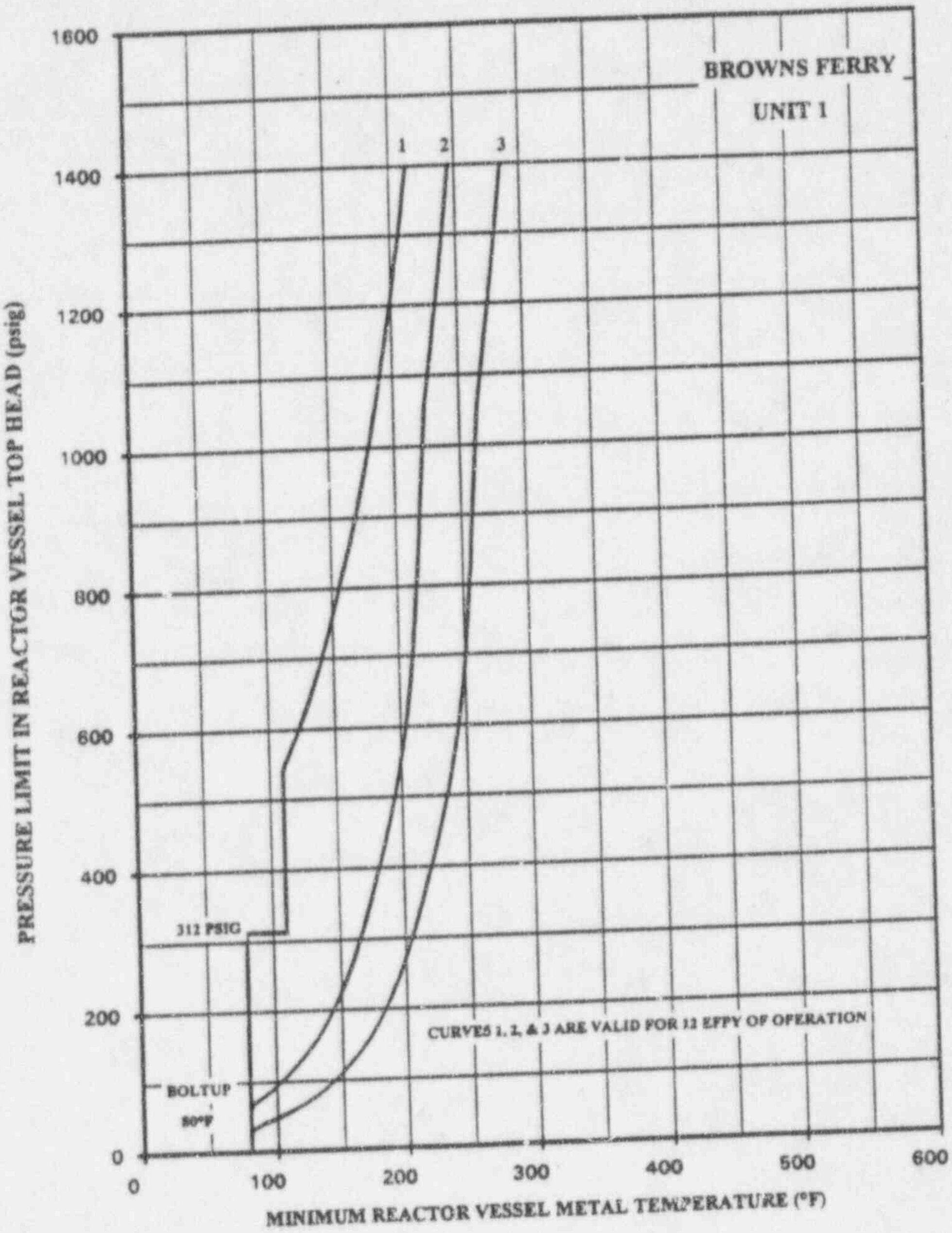

Figure 3.6.-1

Curve No. 1
Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 191°F is required for test pressure of 1,100 psig.

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Figure 3.6-1

 JAN 0 8 1993

3.6.A/4.6.A (Cont'd)

TVA letter dated May 15, 1987, proposed to withdraw the first set of reactor surveillance specimens from each reactor vessel at the end of each unit's cycle which most closely approximates 8.0 EFPY of operation. The reasoning was the development of an integrated surveillance program related to estimated fluence obtained from reactor vessel specimens prior to 8.0 EFPY would be premature because it would be based only on extrapolations of limited dosimetry measurements taken from unit 1 during the first cycle of operation. Dosimetry measurements for 8.0 EFPY would be more credible than cycle 1 dosimetry data. NRC letter dated December 2, 1988, stated that BFN could withdraw the first reactor vessel specimen from each reactor vessel at the end of each unit's cycle of operation that most closely approximates 8.0 EFPY of operation. After withdrawal of each unit's first sample, the remaining specimens will be withdrawn every 6.0 EFPY thereafter.

As described in paragraph 4.2.5 of the Safety Analysis Report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temperature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 40°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 40°F plus 60°F for a

20°F 20°F

3.6.A/4.6.A (Cont'd)

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80°F

total of ~~100°F~~. The partial boltup is restricted to the full loading of eight studs at 70°F, which is stud NDT temperature (10°F) plus 60°F. The neutron radiation fluence at the closure flanges is well below 10^{17} nvt $\geq$ 1 Mev; therefore, radiation effects will be minor and will not influence this temperature.

3.6.B/4.6.B Coolant Chemistry

Materials in the primary system are primarily 304 stainless steel and the Zircaloy cladding. The reactor water chemistry limits are established to prevent damage to these materials. Limits are placed on conductivity and chloride concentrations. Conductivity is limited because it is continuously measured and gives an indication of abnormal conditions and the presence of unusual materials in the coolant. Chloride limits are specified to prevent stress corrosion cracking of stainless steel.

Zircaloy does not exhibit similar stress corrosion failures. However, there are some operating conditions under which the dissolved oxygen content of the reactor coolant water could be higher than .2-.3 ppm, such as reactor STARTUP and Hot Standby. During these periods, the most restrictive limits for conductivity and chlorides have been established. When steaming rates exceed 100,000 lb/hr, boiling deaerates the reactor water. This reduces dissolved oxygen concentration and assures minimal chloride-oxygen content, which together tend to induce stress corrosion cracking.

When conductivity is in its normal range, pH and chloride and other impurities affecting conductivity must also be within their normal range. When conductivity becomes abnormal, then chloride measurements are made to determine whether or not they are also out of their normal operating values. This would not necessarily be the case. Conductivity could be high due to the presence of a neutral salt which would not have an effect on pH or chloride. In such a case, high conductivity alone is not a cause for shutdown. In some types of water-cooled reactors, conductivities are in fact high due to purposeful addition of additives. In the case of BWRs, however, where no additives are used and where near neutral pH is maintained, conductivity provides a very good measure of the quality of the reactor water. Significant changes therein provide the operator with a warning mechanism so he can investigate and remedy the condition causing the change before limiting conditions, with respect to variables affecting the boundaries of the reactor coolant, are exceeded. Methods available to the operator for correcting the off-standard condition include operation of the reactor cleanup system, reducing the input of impurities and placing the reactor in the Cold Shutdown condition. The major benefit of Cold Shutdown is to reduce the temperature dependent corrosion rates and provide time for the cleanup system to reestablish the purity of the reactor coolant.

The conductivity of the reactor coolant is continuously monitored when there is fuel in the reactor vessel. Once a week the continuous monitor is checked with an in-line flow cell and is considered adequate to assure accurate readings of the monitors. If conductivity is within its

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LIMITING CONDITIONS FOR OPERATION

3.6.A. Thermal and Pressurization Limitations (Cont'd)

4. The beltline region of reactor vessel temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of Figure 3.6-1. The applicability of this curve to these tests is extended to nonnuclear heatup and ambient loss cooldown associated with these tests only if the heatup and cooldown rates do not exceed 15°F per hour.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 82°F ~~100°F~~, and must remain above 82°F ~~100°F~~ while under full tension.

SURVEILLANCE REQUIREMENTS

4.6.A. Thermal and Pressurization Limitations (Cont'd)

4. DELETED

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a cold condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

Replace with attached figure

JAN 0 8 1993

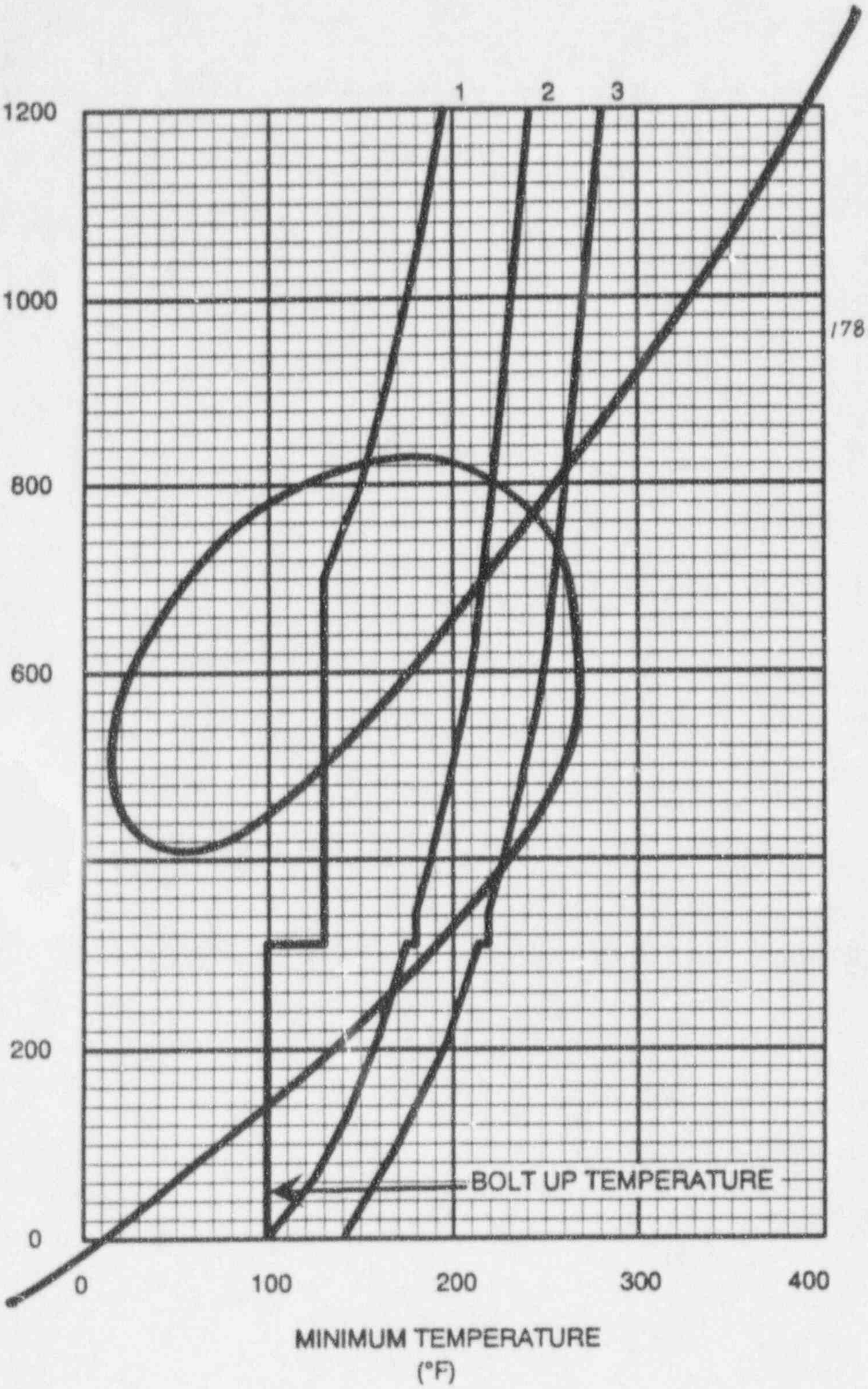

Figure 3.6-1

Figure 3.6.-1
(BFN Units 2 and 3)

Curve No. 1
Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 178 (185) °F is required for test pressure of 1,100 psig.

Curve No. 2
Minimum temperature for mechanical heatup or cooldown following nuclear shutdown.

Curve No. 3
Minimum temperature for core operation (criticality) includes additional margin required for 10CFR50, Appendix G, Par. IV.A.3 which became effective July 26, 1983.

Notes
These curves include sufficient margin to provide protection against feedwater nozzle degradation. The curves allow for shifts in RT_{NDT} of the Reactor vessel beltline materials, in accordance with Reg. Guide 1.99 Rev. 2, to compensate for radiation embrittlement for 12 EFPY.

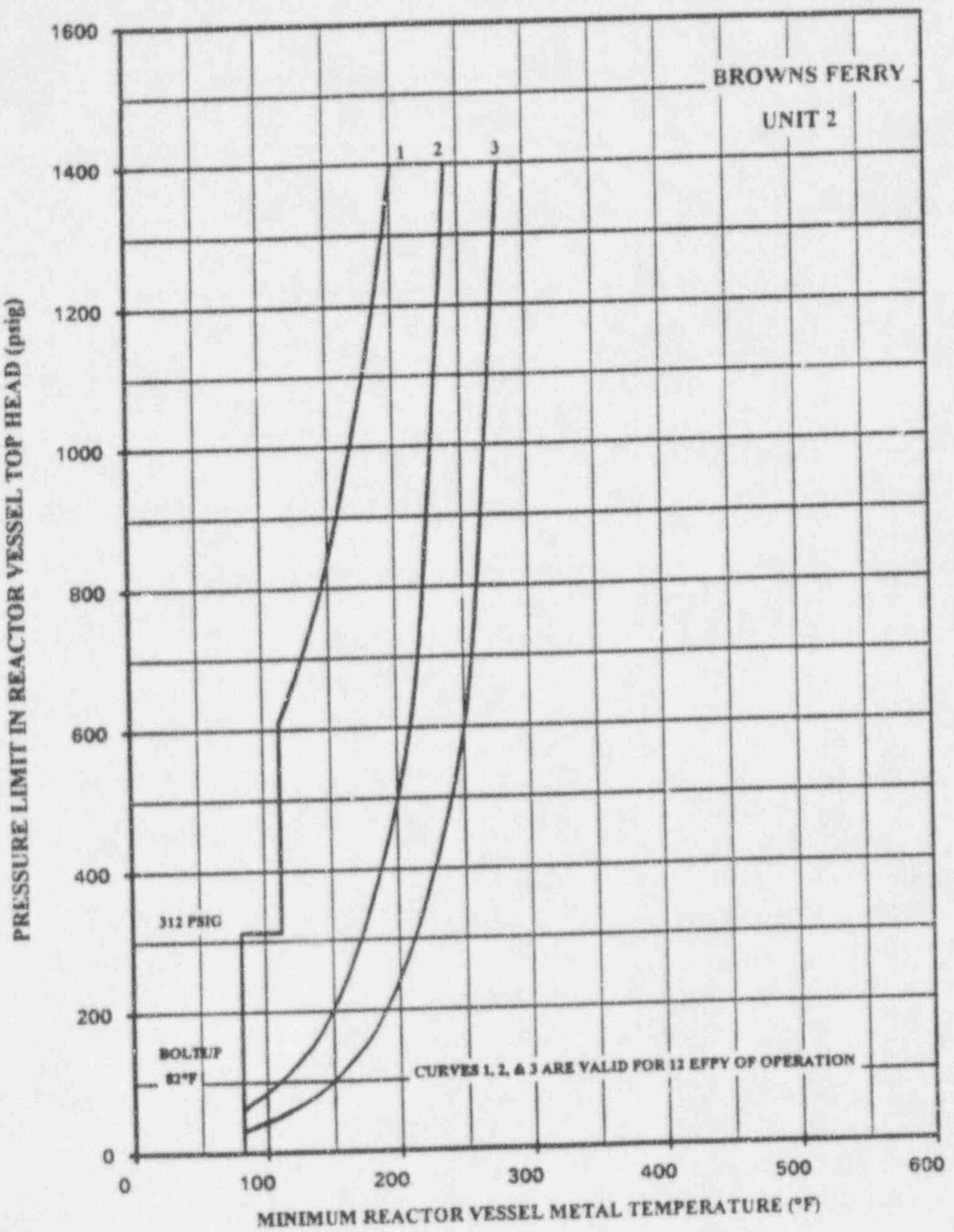

Figure 3.6.-1

Curve No. 1
Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 178° F is required for test pressure of 1,100 psig.

Curve No. 2
Minimum temperature for mechanical heatup or cooldown following nuclear shutdown.

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Figure 3.6-1

JAN 08 1993

3.6.A/4.6.A (Cont'd)

TVA letter dated May 15, 1987, proposed to withdraw the first set of reactor surveillance specimens from each reactor vessel at the end of each unit's cycle which most closely approximates 8.0 EFPY of operation. The reasoning was the development of an integrated surveillance program related to estimated fluence at this time would be premature because it would be based only on extrapolations of limited dosimetry measurements taken from unit 1 during the first cycle. Dosimetry measurements for 8.0 EFPY would be more credible than cycle 1 dosimetry data. NRC letter dated December 2, 1988, agreed and stated that BFN could withdraw the first specimen from each reactor vessel at the end of each unit's cycle of operation most closely approximates 8.0 EFPY of operation. After withdrawal of each unit's first sample, the remaining specimens will be withdrawn every 6.0 EFPY thereafter.

As described in paragraph 4.2.5 of the Safety Analysis Report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temperature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of ~~40°F~~ 22°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is ~~40°F~~ 22°F plus 60°F for a total of ~~100°F~~ 82°F. The partial boltup is restricted to the full loading of

LIMITING CONDITIONS FOR OPERATION

3.6.A. Thermal and Pressurization Limitations

4. The beltline region of reactor vessel temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of Figure 3.6-1. The applicability of this curve to these tests is extended to nonnuclear heatup and ambient loss cooldown associated with these tests only if the heatup and cooldown rates do not exceed 15°F per hour.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 70°F ~~100°F~~, and must remain above 70°F ~~100°F~~ while under full tension.

SURVEILLANCE REQUIREMENTS

4.6.A. Thermal and Pressurization Limitations

4. DELETED

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a Cold Condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

Replace with attached figure

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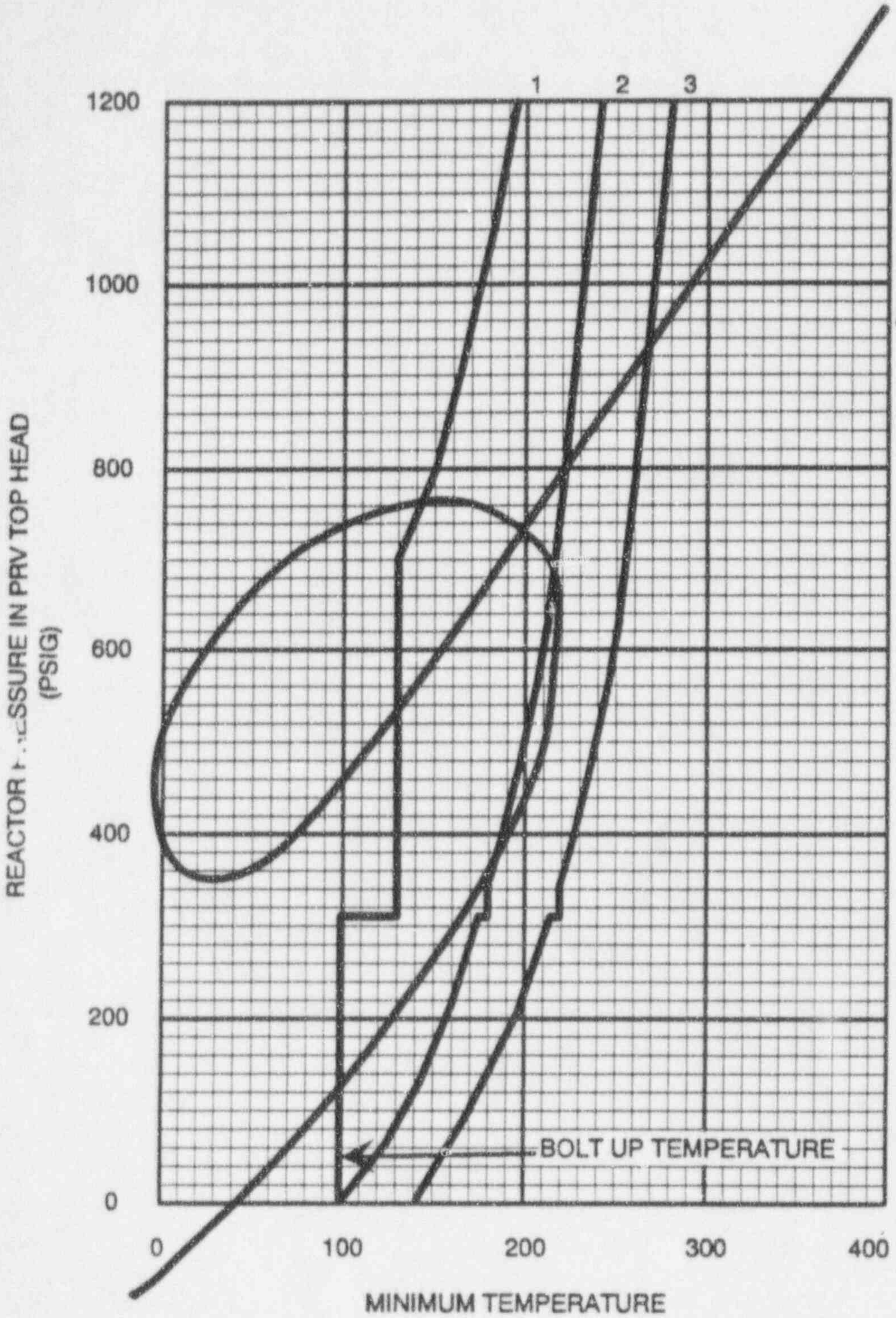


Figure 3.6.-1
(BFN Units 2 and 3)

Curve No. 1
Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 189 ~~185~~ °F is required for test pressure of 1,100 psig.

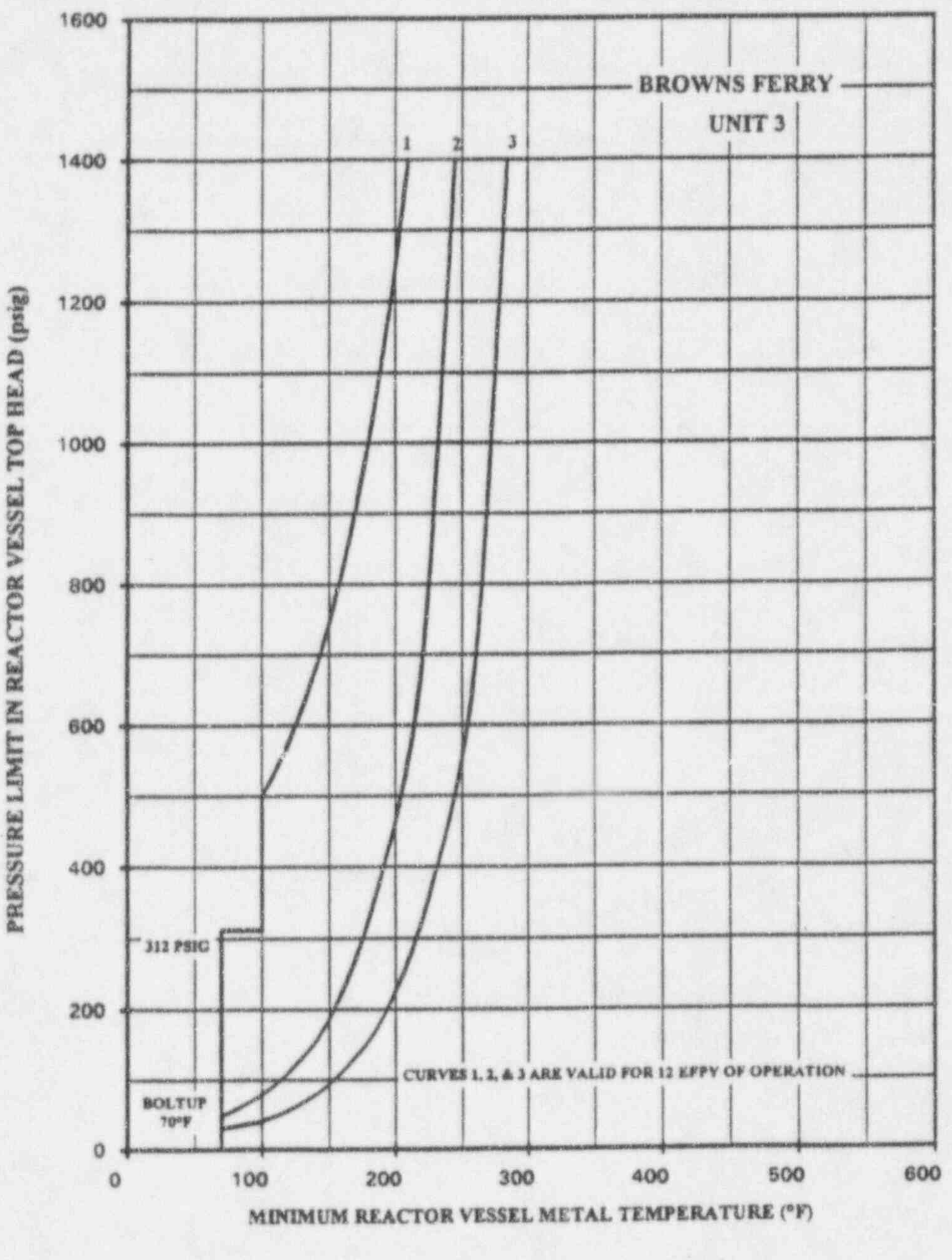
Curve No. 2
Minimum temperature for mechanical heatup or cooldown following nuclear shutdown.

Curve No. 3
Minimum temperature for core operation (criticality) includes additional margin required for 10CFR50, Appendix G, Par. IV.A.3 which became effective July 26, 1983.

Notes
These curves include sufficient margin to provide protection against feedwater nozzle degradation. The curves allow for shifts in RT_{NDT} of the Reactor vessel beltline materials, in accordance with Reg. Guide 1.99 Rev. 2, to compensate for radiation embrittlement for 12 EFPY.

Figure 3.6-1

Figure 3.6.-1



Curve No. 1
Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 189° F is required for test pressure of 1,100 psig.

Curve No. 2
Minimum temperature for mechanical heatup or cooldown following nuclear shutdown.

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Figure 3.6-1

TVA letter dated May 15, 1987, proposed to withdraw the first set of reactor surveillance specimens from each reactor vessel at the end of each unit's cycle which most closely approximates 8.0 EFPY of operation. The reasoning was the development of an integrated surveillance program related to estimated fluence at this time would be premature because it would be based only on extrapolations of limited dosimetry measurements taken from unit 1 during the first cycle. Dosimetry measurements for 8.0 EFPY would be more credible than cycle 1 dosimetry data. NRC letter dated December 2, 1988, agreed and stated that BFN could withdraw the first specimen from each reactor vessel at the end of each unit's cycle of operation most closely approximates 8.0 EFPY of operation. After withdrawal of each unit's first sample, the remaining specimens will be withdrawn every 6.0 EFPY thereafter.

As described in paragraph 4.2.5 of the Safety Analysis Report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temperature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 40°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 40°F plus 60°F for a total of 100°F. The partial boltup is restricted to the full loading of

70°F

10°F

10°F

ENCLOSURE 3

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2 AND 3

PROPOSED TECHNICAL SPECIFICATION (TS) CHANGE TS-349
REVISED PAGES

I. AFFECTED PAGE LIST

Unit 1	Unit 2	Unit 3
3.6/4.6-3	3.6/4.6-3	3.6/4.6-3
3.6/4.6-24	3.6/4.6-24	3.6/4.6-24
3.6/4.6-27	3.6/4.6-27	3.6/4.6-27
3.6/4.6-28		

II. REVISED PAGES

See attached.

LIMITING CONDITIONS FOR OPERATION

3.6.A. Thermal and Pressurization Limitations

4. The beltline region of reactor vessel temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of Figure 3.6-1. The applicability of this curve to these tests is extended to nonnuclear heatup and ambient loss cooldown associated with these tests only if the heatup and cooldown rates do not exceed 15°F per hour.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 80°F, and must remain above 80°F while under full tension.

SURVEILLANCE REQUIREMENTS

4.6.A. Thermal and Pressurization Limitations

4. DELETED

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a cold condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

Figure 3.6.-1

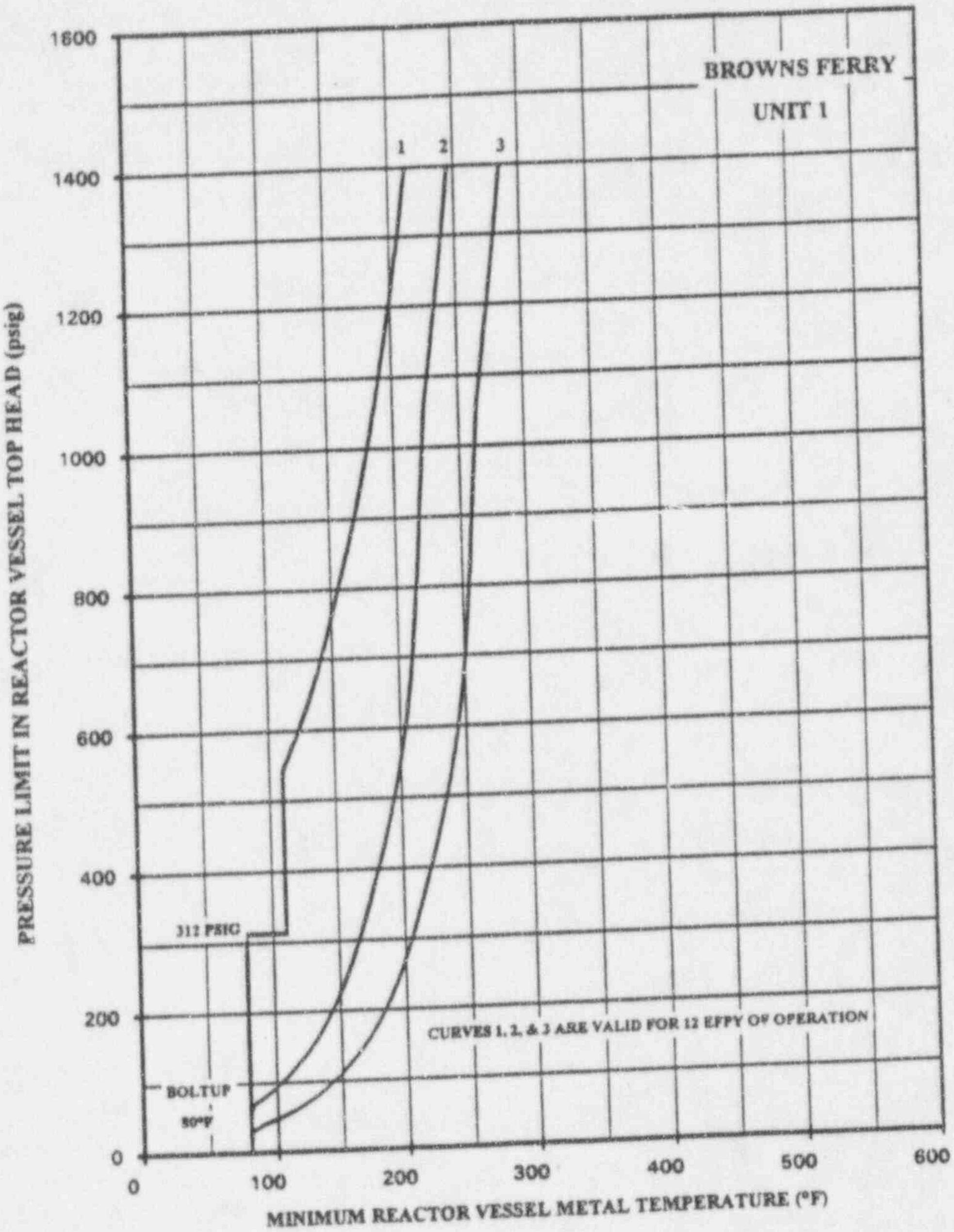

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Figure 3.6-1

3.6.A/4.6.A (Cont'd)

TVA letter dated May 15, 1987, proposed to withdraw the first set of reactor surveillance specimens from each reactor vessel at the end of each unit's cycle which most closely approximates 8.0 EFPY of operation. The reasoning was the development of an integrated surveillance program related to estimated fluence obtained from reactor vessel specimens prior to 8.0 EFPY would be premature because it would be based only on extrapolations of limited dosimetry measurements taken from unit 1 during the first cycle of operation. Dosimetry measurements for 8.0 EFPY would be more credible than cycle 1 dosimetry data. NRC letter dated December 2, 1988, stated that BFN could withdraw the first reactor vessel specimen from each reactor vessel at the end of each unit's cycle of operation that most closely approximates 8.0 EFPY of operation. After withdrawal of each unit's first sample, the remaining specimens will be withdrawn every 6.0 EFPY thereafter.

As described in paragraph 4.2.5 of the Safety Analysis Report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temperature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 20°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 20°F plus 60°F for a total of 80°F. The partial boltup is restricted to the full loading of eight studs at 70°F, which is stud NDT temperature (10°F) plus 60°F. The neutron radiation fluence at the closure flanges is well below 10^{17} nvt $\geq$ 1 Mev; therefore, radiation effects will be minor and will not influence this temperature.

3.6.B/4.6.B Coolant Chemistry

Materials in the primary system are primarily 304 stainless steel and the Zircaloy cladding. The reactor water chemistry limits are established to prevent damage to these materials. Limits are placed on conductivity and chloride concentrations. Conductivity is limited because it is continuously measured and gives an indication of abnormal conditions and the presence of unusual materials in the coolant. Chloride limits are specified to prevent stress corrosion cracking of stainless steel.

Zircaloy does not exhibit similar stress corrosion failures. However, there are some operating conditions under which the dissolved oxygen content of the reactor coolant water could be higher than .2-.3 ppm, such as reactor STARTUP and Hot Standby. During these periods, the most restrictive limits for conductivity and chlorides have been established. When steaming rates exceed 100,000 lb/hr, boiling deaerates the reactor water. This reduces dissolved oxygen concentration and assures minimal chloride-oxygen content, which together tend to induce stress corrosion cracking.

When conductivity is in its normal range, pH and chloride and other impurities affecting conductivity must also be within their normal range. When conductivity becomes abnormal, then chloride measurements are made to determine whether or not they are also out of their normal operating values. This would not necessarily be the case. Conductivity could be high due to the presence of a neutral salt which would not have an effect on pH or chloride. In such a case, high conductivity alone is not a cause for shutdown. In some types of water-cooled reactors, conductivities are in fact high due to purposeful addition of additives. In the case of BWRs, however, where no additives are used and where near neutral pH is maintained, conductivity provides a very good measure of the quality of the reactor water. Significant changes therein provide the operator with a warning mechanism so he can investigate and remedy the condition causing the change before limiting conditions, with respect to variables affecting the boundaries of the reactor coolant, are exceeded. Methods available to the operator for correcting the off-standard condition include operation of the reactor cleanup system, reducing the input of impurities and placing the reactor in the Cold Shutdown condition. The major benefit of Cold Shutdown is to reduce the temperature dependent corrosion rates and provide time for the cleanup system to reestablish the purity of the reactor coolant.

The conductivity of the reactor coolant is continuously monitored when there is fuel in the reactor vessel. Once a week the continuous monitor is checked with an in-line flow cell and is considered adequate to assure accurate readings of the monitors. If conductivity is within its

LIMITING CONDITIONS FOR OPERATION

3.6.A. Thermal and Pressurization Limitations (Cont'd)

4. The beltline region of reactor vessel temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of Figure 3.6-1. The applicability of this curve to these tests is extended to nonnuclear heatup and ambient loss cooldown associated with these tests only if the heatup and cooldown rates do not exceed 15°F per hour.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 82°F, and must remain above 82°F while under full tension.

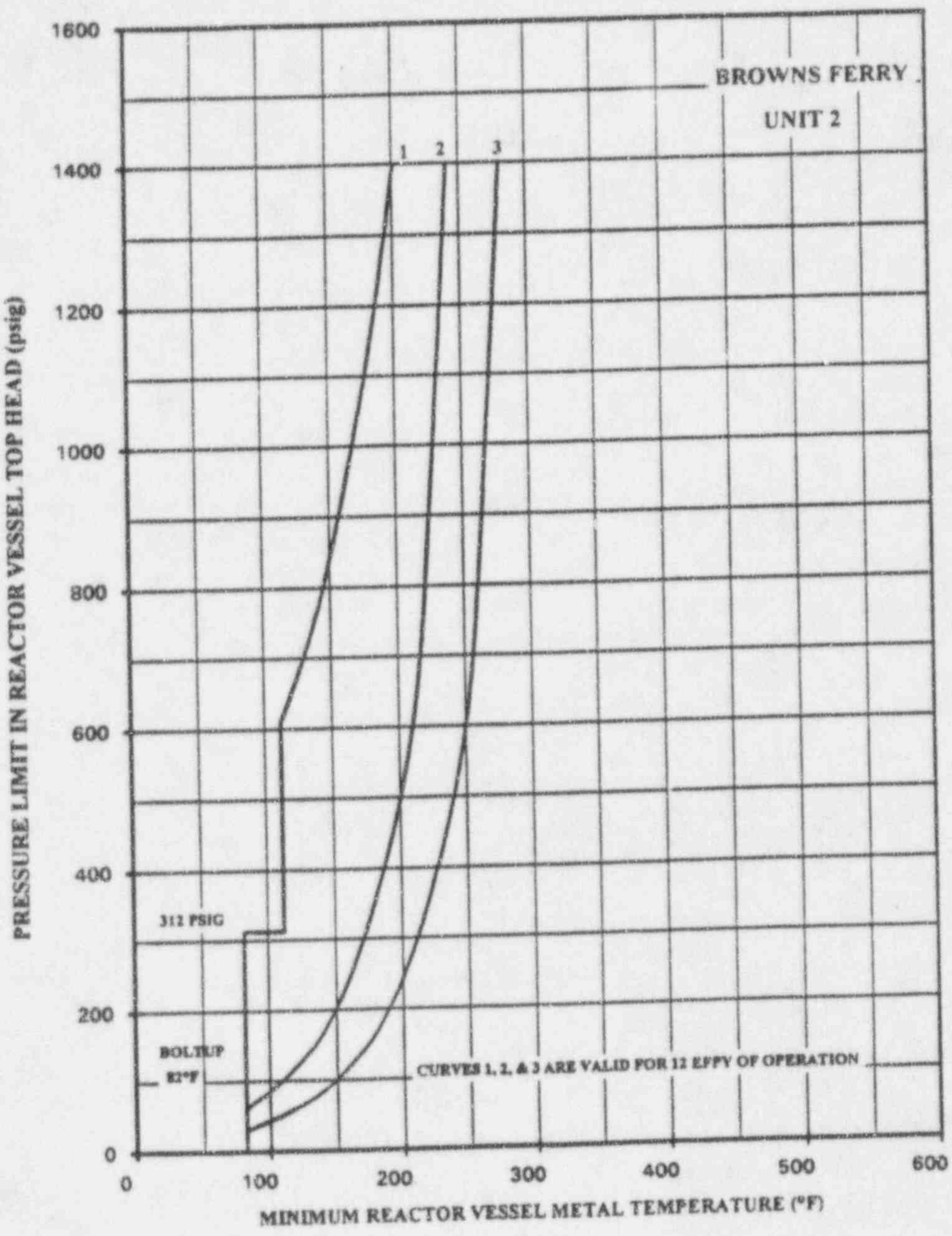
SURVEILLANCE REQUIREMENTS

4.6.A. Thermal and Pressurization Limitations (Cont'd)

4. DELETED

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a cold condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

Figure 3.6.-1



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Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 178°F is required for test pressure of 1,100 psig.

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Minimum temperature for mechanical heatup or cooldown following nuclear shutdown.

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Figure 3.6-1

3.6.A/4.6.A (Cont'd)

TVA letter dated May 15, 1987, proposed to withdraw the first set of reactor surveillance specimens from each reactor vessel at the end of each unit's cycle which most closely approximates 8.0 EFPY of operation. The reasoning was the development of an integrated surveillance program related to estimated fluence at this time would be premature because it would be based only on extrapolations of limited dosimetry measurements taken from unit 1 during the first cycle. Dosimetry measurements for 8.0 EFPY would be more credible than cycle 1 dosimetry data. NRC letter dated December 2, 1988, agreed and stated that BFN could withdraw the first specimen from each reactor vessel at the end of each unit's cycle of operation most closely approximates 8.0 EFPY of operation. After withdrawal of each unit's first sample, the remaining specimens will be withdrawn every 6.0 EFPY thereafter.

As described in paragraph 4.2.5 of the Safety Analysis Report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temperature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 22°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 22°F plus 60°F for a total of 82°F. The partial boltup is restricted to the full loading of

LIMITING CONDITIONS FOR OPERATION

3.6.A. Thermal and Pressurization Limitations

4. The beltline region of reactor vessel temperatures during inservice hydrostatic or leak testing shall be at or above the temperatures shown on curve #1 of Figure 3.6-1. The applicability of this curve to these tests is extended to nonnuclear heatup and ambient loss cooldown associated with these tests only if the heatup and cooldown rates do not exceed 15°F per hour.

5. The reactor vessel head bolting studs may be partially tensioned (four sequences of the seating pass) provided the studs and flange materials are above 70°F. Before loading the flanges any more, the vessel flange and head flange must be greater than 70°F, and must remain above 70°F while under full tension.

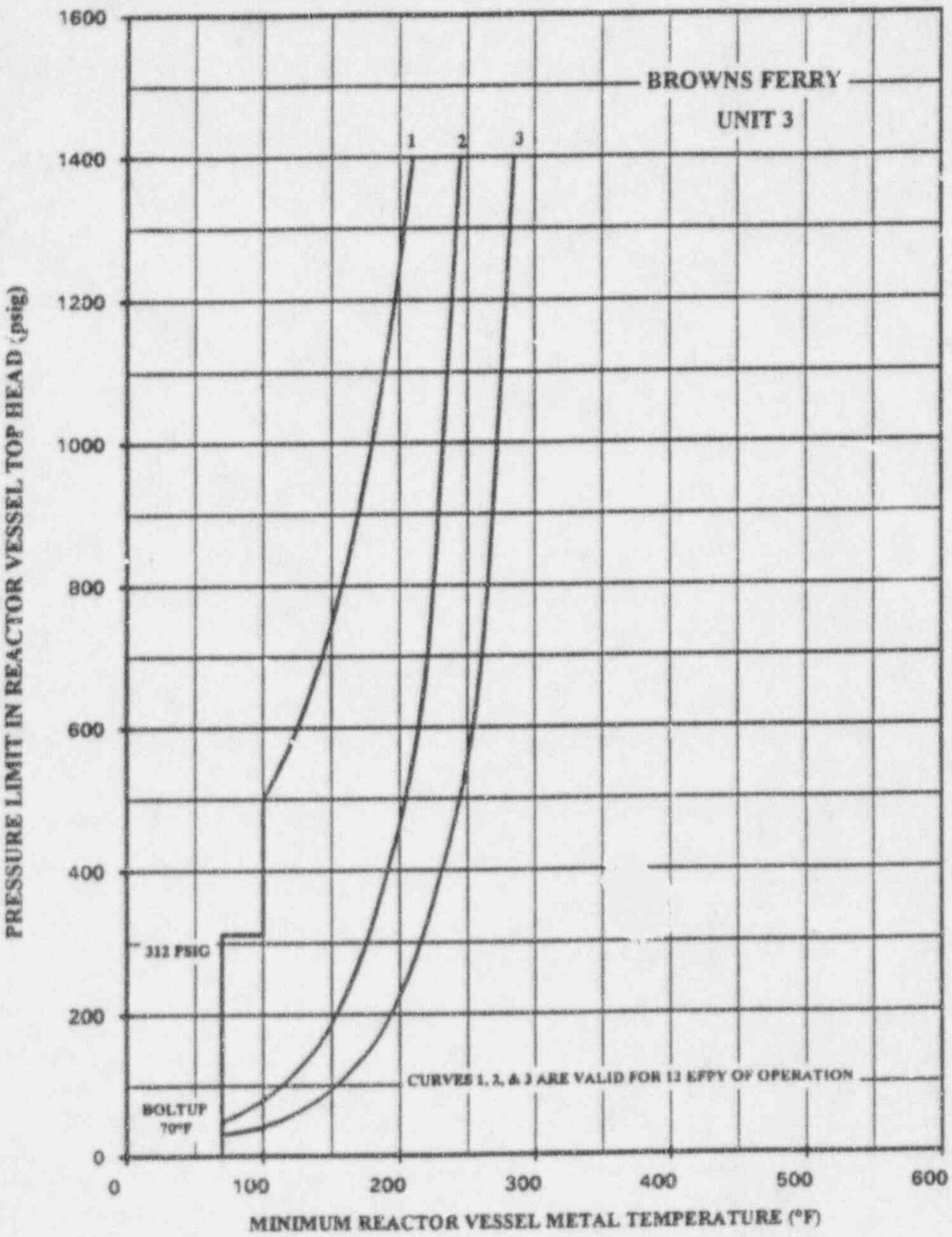
SURVEILLANCE REQUIREMENTS

4.6.A. Thermal and Pressurization Limitations

4. DELETED

5. When the reactor vessel head bolting studs are tensioned and the reactor is in a Cold Condition, the reactor vessel shell temperature immediately below the head flange shall be permanently recorded.

Figure 3.6.-1



Curve No. 1
Minimum temperature for pressure tests such as required by Section XI. Minimum temperature of 189° F is required for test pressure of 1,100 psig.

Curve No. 2
Minimum temperature for mechanical heatup or cooldown following nuclear shutdown.

Curve No. 3
Minimum temperature for core operation (criticality) includes additional margin required for 10CFR50, Appendix G, Par. IV.A.3 which became effective July 26, 1983.

Notes
These curves include sufficient margin to provide protection against feedwater nozzle degradation. The curves allow for shifts in RT_{NDT} of the Reactor vessel beltline materials, in accordance with Reg. Guide 1.99 Rev. 2, to compensate for radiation embrittlement for 12 EFPY.

Figure 3.6-1

3.6.A/4.6.A (Cont'd)

TVA letter dated May 15, 1987, proposed to withdraw the first set of reactor surveillance specimens from each reactor vessel at the end of each unit's cycle which most closely approximates 8.0 EFPY of operation. The reasoning was the development of an integrated surveillance program related to estimated fluence at this time would be premature because it would be based only on extrapolations of limited dosimetry measurements taken from unit 1 during the first cycle. Dosimetry measurements for 8.0 EFPY would be more credible than cycle 1 dosimetry data. NRC letter dated December 2, 1988, agreed and stated that BFN could withdraw the first specimen from each reactor vessel at the end of each unit's cycle of operation most closely approximates 8.0 EFPY of operation. After withdrawal of each unit's first sample, the remaining specimens will be withdrawn every 6.0 EFPY thereafter.

As described in paragraph 4.2.5 of the Safety Analysis Report, detailed stress analyses have been made on the reactor vessel for both steady-state and transient conditions with respect to material fatigue. The results of these analyses are compared to allowable stress limits. Requiring the coolant temperature in an idle recirculation loop to be within 50°F of the operating loop temperature before a recirculation pump is started assures that the changes in coolant temperature at the reactor vessel nozzles and bottom head region are acceptable.

The coolant in the bottom of the vessel is at a lower temperature than that in the upper regions of the vessel when there is no recirculation flow. This colder water is forced up when recirculation pumps are started. This will not result in stresses which exceed ASME Boiler and Pressure Vessel Code, Section III limits when the temperature differential is not greater than 145°F.

The requirements for full tension boltup of the reactor vessel closure are based on the NDT temperature plus 60°F. This is derived from the requirements of the ASME code to which the vessel was built. The NDT temperature of the closure flanges, adjacent head, and shell material is a maximum of 10°F and a maximum of 10°F for the stud material. Therefore, the minimum temperature for full tension boltup is 10°F plus 60°F for a total of 70°F. The partial boltup is restricted to the full loading of