APPENDIX A

PRESSURE INTEGRITY OF PIPING AND EQUIPMENT PRESSURE PARTS

APPENDIX A

PRESSURE INTEGRITY OF PIPING AND EQUIPMENT PRESSURE PARTS

1.0 SCOPE

This appendix provides additional information pertinent to the preceding sections concerning the pressure integrity of piping and equipment parts. It identifies the construction codes and supplementary requirements for design and installation. Repair or replacement of piping and equipment pressure parts may be performed to these requirements or to the requirements of later editions of the construction codes or ASME Section III provided the safety design bases described in the USAR are maintained.

Piping and equipment pressure parts are classified according to service and location. The design, fabrication, inspection, and testing requirements which are defined for the equipment of each classification assure the proper pressure integrity.

For the purpose of this appendix, the pressure boundary of the process fluid includes but is not necessarily limited to: branch outlet nozzles or nipples, instrument wells, reservoirs, pump casing closures, blind flanges and similar pressure closures, studs, nuts and fasteners in flanged joints between pressure parts and bodies and pressure parts of in-line components such as traps and strainers.

Specifically excluded from the scope of this appendix are pressure parts such as vessels and heat exchangers or any components which are within the scope of the ASME Pressure Vessel Code, Section III and VIII; and nonpressure parts such as pump motors, shafts, seals, impellers, wear rings, valve stems, gland followers, seat rings, guides, yokes, and operators; any nonmetallic material such as packing and gaskets; fasteners not in pressure part joints such as yoke studs and gland follower studs; and washers of any kind.

1.1 Codes and Specifications

The piping and equipment pressure parts in this station are designed, fabricated, inspected, and tested in accordance with recognized industrial codes and specifications. In some cases supplementary requirements are applied to increase safety and operational reliability. The application of the industrial codes and specifications is defined in this appendix as well as the application of the supplementary requirements. Where conflicts occur between the industrial codes and specifications and the supplementary requirements, the supplementary requirements take precedence.

United States of America Standards (USAS) referenced herein have been superceded by ANSI/ASME standards. The edition of the USA standard for piping design is:

> USAS B31.1.0 - Power Piping (1967) or ASME B31.1 - Power Piping, 2004 - 2005 Addenda for Maximum Allowable Stress values for materials as listed in Mandatory Appendix A, Table A-1, Carbon Steel.[19]

The editions of the USA standards for supplying and installing piping are:

> USAS-B31.1.0 - Power Piping (1967) or

USAS-B31.7 - Nuclear Power Piping (1969)

As detailed in Section A-3.1, certain repairs, replacements or modifications have been designed and constructed in accordance with ASME Section III.

2.0 CLASSIFICATION OF PIPING AND EQUIPMENT PRESSURE PARTS

For the purpose of identification and association of requirements, piping and equipment pressure parts were originally classified in accordance with one of two basic schemes. The GE classification scheme is no longer in use.

This section of Appendix A contains historical information as indicated by the italicized text. USAR Section I-3.4 provides a more detailed discussion of historical information. The information being presented in this section as historical has been preserved as it was originally submitted to the NRC in the CNS FSAR, as amended.

2.1 GE Company Classification and Pressure Integrity Requirements

Class A Piping and equipment pressure parts which cannot be isolated from the reactor vessel.

Class B Piping and equipment pressure parts, which can be isolated from the reactor vessel by only a single isolation valve.

Class C Piping and equipment pressure parts other than included in Classes A and B, for a high integrity system.

Class D Piping and equipment pressure parts which serve as an extension of containment and which operate at either pressures greater than 150 psig or temperatures greater than 212 °F.

Class E Piping and equipment pressure parts which serve as an extension of containment and which operate at pressures equal to or less than 150 psig of temperatures equal to or less than 212 °F.

Class F Piping and equipment pressure parts which transport fibrous or particulate materials such as resins or filter aids and which operate at pressures equal to or less than 150 psig and temperatures equal to or less than 212 °F.

Class G Piping and equipment pressure parts used for acids in concentrations of 60 to 100 percent at ambient temperatures or caustics in concentrations of 50 percent or less at temperatures less than 150 °F.

Class H Piping and equipment pressure parts used for acids in concentrations of 10 percent or less.

Class L Piping and equipment pressure parts which require materials considerations to maintain deionized water purity.

Class M Power piping and equipment pressure parts not otherwise classified and which are considered within the scope of USAS B31.1.0, Code for Power Piping.

Class N Miscellaneous piping and equipment not otherwise classified and not considered within the scope of USAS B31.1.0, Code for Power Piping.

2.2 Engineer - Constructor's Classification and Definition of Piping, Equipment and In-Line Pressure Parts

For this project, piping systems or subsystems, equipment and in-line pressure parts are functionally classified as IN, IIN, IIIN, or IVP, and seismically classified as IS or IIS.

CNS continues to use the Engineer - Constructor's classification system as a convenient reference to the original construction code requirements. These classifications also appear on the piping and instrument diagrams and other related drawings.

2.2.1 Functional Piping, Equipment and In-line Pressure Part Classifications

1. Class IN nuclear piping, equipment and in-line pressure parts are those, whose loss or failure could cause or increase the severity of nuclear incident.

2. Class IIN nuclear piping, equipment and in-line pressure parts are those, whose loss or failure could cause a hazard to plant personnel, but would represent no hazard to the public.

3. Class IIIN nuclear piping, equipment and in-line pressure parts, are those that normally would be Class IIN, except that the operating pressure does not exceed 150 psig and the operating temperature is below 212°F.

4. Class IVP power piping, equipment and in-line pressure parts are those, which are conventional steam and service piping and equipment pressure parts.

Note: Nuclear piping, equipment and in-line pressure parts may optionally be installed to a higher classification criterion.

2.2.2 Seismic Piping, Equipment and In-line Pressure Parts Classifications

1. Class IS (seismic) piping, equipment and in-line pressure parts are those whose failure could cause significant release of radioactivity or which are vital to a safe shutdown of the plant and removal of decay and sensible heat.

2. Class IIS (seismic) piping, equipment and in-line pressure parts are those which may be required for the operation of the station, but which are not required for a safe shutdown.

2.3 ASME XI Classification of Piping and Equipment

Piping and equipment is classified for the purpose of Inservice Inspection and Inservice Testing as follows:

1. Class 1 is the Reactor Coolant Pressure Boundary.
2. Class 2 performs emergency core cooling functions.
3. Class 3 supports emergency core cooling systems.
4. Class NC indicates piping outside the ASME code boundary.

2.4 Tabulation of Equivalencies

Table of Equivalencies

Description	ASME XI Class	GE Class	B&R Class	Design Code*	Construction Code*
Reactor Coolant Pressure Boundary	1	A, B	IN/IS	B31.1 or ASME III	B31.7 or ASME III
Emergency Core Cooling Systems RCIC and CRD	2	C, D, E, L, M	IIN/IS, IIN/IIS, IIIN/IS, IIIN/IIS	B31.1 or ASME III	B31.7 or ASME III
ECCS Support Systems	3	E, L, M	IIIN/IS, IIIN/IIS, IVP/IS, IVP/IIS	B31.1	B31.1
Non-essential systems containing radioactive material (RWCU, RW, FPC, etc.)	NC	D, E, F, G, L	IIN/IS, IIN/IIS, IIIN/IS, IIIN/IIS, IVP/IS, IVP/IIS	B31.1 or ASME III	B31.1 or B31.7 or ASME III
Balance of Plant Systems	NC	M, N	IVP/IS, IVP/IIS	B31.1 or ASME III	B31.1 or ASME III

* This table identifies the design and construction codes generally used for the listed equipment classes. The codes applicable to a specific system or component are detailed in the appropriate design or procurement documents. The piping stress analysis (seismic, fatigue, etc.) is discussed in USAR Appendix C.

3.0 DESIGN REQUIREMENTS

3.1 Piping Design

Original piping is designed in accordance with USAS B31.1.0, "Power Piping," except where indicated otherwise by Appendix C, which also outlines loading criteria to be met for high reliability for Class IN/IS piping designed using rational stress analysis techniques. Other Class IS piping is designed to meet the supplementary requirements included in this appendix, Section A-3.1.1. The terms utilized in this Section A-3.1 are either defined in the text, or pertain to definitions of USAS B31.1.0. Selection of design earthquakes is discussed in Section II-5.2 of the Cooper Nuclear Station USAR.

Repairs, replacements and modifications are generally performed in accordance with the original code requirements. As permitted by ASME Section XI, later editions of the code or ASME III have been used for the following modifications:

The Hardened Containment Venting System is designed and constructed in accordance with USAS (ANSI) B31.1-1967.[3]

The AOG components containing radioactive materials were designed and constructed to ASME Section III, 1971 edition, Winter 1972 Addenda.[4] This piping has been reclassified to USAS (ANSI) B31.1-1967.[15]

The SBNI system is designed and constructed in accordance with ASME Section III, 1974 Edition.[5]

After initial plant operation, the NRC required evaluation of previously undefined hydrodynamic loadings under the Mark I Containment program. ASME Section III, 1977 Edition, Summer 1977 Addenda, is the code used for the design and construction of the SRV Discharge Lines and the evaluation of the Torus Attached piping.[6,7]

To the extent practical, portions of the Class IN piping and nozzle safe-ends subject to IGSCC have been replaced with resistant material. The design code for the replaced piping is ASME Section III, 1983 Edition.[8]

To the extent practical, portions of the RWCU and the RPV Drain line piping subject to IGSCC have been replaced with resistant material. The design code for the replaced piping is USAS B31.1-1967.[13]

The H_2O_2 system piping is designed and constructed in accordance with ASME Section III, 1983 Edition, Summer 1983 Addenda.[9]

The ECCS Suction Strainers are designed and constructed in accordance with ASME Section III, 1977 Edition, Summer 1977 Addenda.[10]

The PAS system piping is designed and constructed in accordance with ANSI/ASME B31.1, 1980 Edition, Summer 1980 Addenda.[14]

Selected portions of the MSIV leakage pathway to the condenser, as shown in Drawing CNS-MS-43, were analyzed using the methods of the ASME Boiler and Pressure Vessel Code, Section III, Division 1, 2001 Edition, Appendix N.[15]

The Reactor Feedwater Check Valves RF-CV-13CV, -14CV, -15CV, and -16CV were installed in accordance with ASME Section III-1992 Edition.[17]

HPCI RO-135 is designed and constructed in accordance with ASME Section III, NC 1989 Edition.[18]

3.1.1 Analysis

3.1.1.1 Primary Stresses (Sp)

Primary stresses are as follows:

1. Circumferential Primary Stress (S_R)
Circumferential primary stresses are below the allowable stress (S_h) at the design pressure and temperature.

2. Longitudinal Primary Stresses (S_L)
The following loads are considered as producing longitudinal primary stresses: internal or external pressures; weight loads including valves, insulation, fluids, and equipment; hanger loads; static external loads and reactions; and the inertia load portion of seismic loads.

When the seismic load is due to the maximum probable earthquake (0.1g), the vectorial combination of all longitudinal primary stresses (S_L) does not exceed 1.2 times the allowable stress (S_h).

When the seismic load is due to the hypothetical maximum possible earthquake (0.20g), the vectorial combination of all longitudinal primary stresses does not exceed 1.8 times the allowable stress (S_h).

3.1.1.2 Secondary Stresses (S_E)

Secondary stresses are determined by use of the maximum shearing stress theory.

$$T\,Max = 1/2\sqrt{S_b^2 + 4S^2{}_t} = 1/2\,S_{E'}$$

where,

$$S_E = \sqrt{S_b^2 + 4S^2{}_t}$$

(See USAS B31.1.0)

The following loads are considered in determining longitudinal secondary stresses: (a) thermal expansion of piping, (b) movement of attachments due to thermal expansion, (c) forces applied by other piping systems as a result of their expansion, (d) any variations in pipe hanger loads resulting from expansion of the system, and (e) anchor point movement portion of seismic loads.

The vectorial combination of longitudinal secondary stresses (S_E) does not exceed the allowable stress range (S_A), i.e., $S_E \le S_A$.

Where

$$S_A = f\,[1.25(S_c + S_h) - S_L]$$

(This is equation 1 from paragraph 102.3.2 of USAS B31.1.0 modified to include the additional stress allowance permitted when S_L is less than S_h.)

3.1.1.3 Allowable Stress Values (S_c and S_h)

The allowable stress values for design are as follows:

1. For original piping, the allowable stress values of USAS B31.1.0 are used. For materials not covered by USAS B31.1.0, the higher stress values of the ASME Boiler and Pressure Code, Section 1, Appendix A-24 are used.

2. For certain repairs, replacements, modifications or reanalyzed piping systems, the allowable stress values of USAS B31.7 or ASME Section III are used.

3.1.2 Corrosion and Erosion

Adequate allowances for corrosion and erosion are made according to individual systems requirements for a design life of 40 years.

3.1.3 Wall Thickness

Pipe wall thickness, fitting, and flange ratings are in accordance with USAS B31.1.0 "Power Piping", and the additional requirements in this subsection or the applicable construction code.

3.1.4 Reactor Vessel Nozzle Loads

Piping connections to the reactor pressure vessel nozzles are designed so that forces and moments at those piping connections do not exceed the allowable limits for the nozzle involved.

3.2 Valve Design

Valves are designed and rated by their manufacturers to meet the highest service pressure and temperature in the piping to which attached. In accordance with USAS B31.1.0, "Power Piping," valves are designed to USAS B16.5, "Steel Pipe Flanges and Flanged Fittings," or Manufacturers Standardization Society, Standard Practice MSS-SP-66, "Pressure-Temperature Rating for Steel Butt-Welded End Valves." Valves RHR-MOV-MO27A, RHR-MOV-MO27B, RHR-MOV-MO34A, RHR-MOV-MO34B, CS-MOV-MO26A and CS-MOV-MO26B have been re-rated in accordance with ANSI B16.34-1977.[1,2] ANSI B16.34-1977 allows valves to be rated with intermediate pressure-temperature ratings.

3.3 Pump Design

The pressure retaining parts of pumps are designed to meet the highest service pressure and temperature in the piping to which they are attached. Since there were no issued industry codes applicable to the design of pumps for nuclear service when the plant was designed, the codes referenced below were used for guidance.

1. For pumps in the GE scope of supply used in piping systems classified as A and B, the requirements of Section III of the ASME Boiler and Pressure Vessel Code for Class C vessels are used as a guide in calculating the thickness of pressure retaining parts and in sizing the cover bolting. When the pump is of such a configuration that code calculations are not applicable or stress levels do not satisfy code criteria and the specific pump is a standard

commercial pump, standard design calculations are accepted when supplemented by a documented history of operational reliability.

2. For pumps in the GE scope of supply used in piping systems classified as C, D, E, L, or M, operated at pressures above 150 psi or temperatures above 212°F, the requirements of Section VIII of the ASME Boiler and Pressure Vessel Code are used as a guide in calculating the thickness of pressure retaining parts and in sizing the cover bolting. When the pump is of such a configuration that code calculations are not applicable or stress levels do not satisfy code criteria and the specific pump is a standard commercial pump, standard design calculations are accepted when supplemented by a documented history of operational reliability.

3. For pumps in the GE scope of supply used in piping systems classified as F, G, H, L, M, or N, which operate at pressures below 150 psi and temperatures below 212°F and are manufacturers' standard pumps for the required service, no submittal of calculations from the manufacturers is required.

4. Pumps in the Engineer Constructor's scope of supply are manufacturers' standard pumps for the required service. No submittal of calculations from the manufacturers is required.

4.0 MATERIALS

4.1 Material Application

The material for piping, valve and equipment pressure parts meets the following requirements as applicable.

4.1.1 Austenitic Materials

Materials with a chemical analysis equivalent to AISI Type 304 or 316 are used except where furnace sensitization of the material is unavoidable. In this case materials with a chemical analysis equivalent to Type 304L are used. Austenitic stainless steel is considered to be furnace sensitized if it has been heated by means other than welding within the range of 800°F to 1800°F, or if it is cooled slowly through this temperature range.

4.1.1.1 Intergranular Stress Corrosion Cracking (IGSCC)

1. The recirculation inlet and outlet nozzles, core spray inlet nozzles, and the core differential pressure and SLC nozzle safe-ends and portions of the reactor recirculation, core spray, and reactor water clean-up system piping inside containment are fabricated from low carbon stainless steel (316NG)[8] or 316L[13]. The jet pump instrumentation penetration seals are also fabricated from low carbon stainless steel (316NG). These materials mitigate the potential for Intergranular Stress Corrosion Cracking (IGSCC). The material is believed to be resistant to IGSCC based on industry studies[11] and regulatory guidance[12].

2. The design of the safe-end to thermal sleeve connections reduces stress concentrations at the connections. The safe-end is welded to the existing Inconel build-up on the vessel nozzle with Inconel filler metal. Weld procedures control the ferrite content to minimize future occurrence of IGSCC.

3. Induction heating stress improvement (IHSI) was performed on the safe-end to nozzle welds and piping welds on the recirculation, reactor water clean-up and core spray systems in an effort to redistribute the stresses in these welds and thereby retard the occurrence of IGSCC.

4.1.2 Welding Materials

Filler metals including consumable inserts used for austenitic stainless steel welds are selected and controlled to produce welds that contain a minimum of 3% to a maximum of 12% ferrite.

Similar metal welds are made using ASTM A298 or A371 Type-308 or 316 filler metal except where furnace sensitization occurs; in this case, Type 308L is used. Welded connections between austenitic stainless steel and carbon/low alloy steel are considered to be dissimilar metal welds.

Dissimilar metal welds are made using either Type-308 or Type-309 filler metal as specified in A-5.1.3.

Consumable inserts are of the same nominal chemical composition as the filler metal.

4.2 Brittle Fracture Control for Ferritic Steels

Classification IN (with suffix "D" or "d")*

The fracture or notch toughness properties and the operating temperature of ferritic materials of the reactor coolant pressure boundary are controlled to ensure adequate toughness when the system is pressurized to more than 20% of the design pressure. Such assurance is provided by maintaining a material service temperature at least 60°F above the nil ductility transition temperature (NDTT). Further interpretations and requirements are:

1. Charpy V-notch per ASTM A370 Type A or drop weight tests per ASTM E-208 are performed to demonstrate that all materials and weld metal will meet brittle fracture requirements at test temperature. Test specimens shall be prepared and tested with minimum impact energy requirements with Table N-421 and the general provisions of N-313, N-331, N-332, and N-511 of Section III of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The welding procedures used must be qualified by impact testing of weld metal and heat affected zone to the same requirements as the base metal in accordance with N-541. Consumable insert material does not have to meet the impact test requirements of N-511.

2. Impact testing is not required for the following:

a. Bolting, including nuts, one inch nominal diameter or less.

b. Bars with a nominal cross-sectional area not exceeding one square inch.

c. Materials with a nominal (section) wall thickness of less than 1/2 inch.

d. Components including pumps, valves, piping, and fittings with a nominal inlet pipe size of 6 inch diameter and less, regardless of thickness.

e. Consumable insert material, austenitic stainless steel, and nonferrous materials.

3. Impact testing is not required on components or piping within the boundary having a minimum service temperature of 250°F or more.

Example: Steam line is excluded from brittle fracture test requirements since the steam temperature will be over 250°F when the steamline pressure is at the 20% design limit.

* The suffix "D" or "d" applies to impact tested minimum ductility materials associated with certain portions of the reactor pressure envelope subject to intermittent cold water conditions. The "D" or "d" was used interchangeably.

4. Impact testing is not required on components or piping within the pressure boundary whose rupture could not result in the loss of coolant exceeding the capability of normal makeup systems to maintain adequate core cooling for the duration of a reactor shutdown and orderly cooldown.

5. Welding procedures shall be qualified by impact testing in accordance with Paragraph 1 or the applicable construction code.

6. These criteria apply to nuclear piping and equipment pressure parts of the reactor coolant pressure boundary; and do not apply to related components such as anchors, anchor bolts, hangers, suppressors, and restraints.

Classification IIN & IIIN

The possibility of brittle fracture was considered for ferritic steel piping and equipment pressure parts in Classes IIN & IIIN if the metal was subjected to temperatures below 30°F during operation or testing. In cases where ferritic metal may be subjected to temperatures below 30°F, brittle fracture control provisions include material evaluation, design, fabrication, or test requirements selected to assure adequate fracture toughness in the piping or component.

5.0 FABRICATION AND INSTALLATION REQUIREMENTS

Fabrication and erection of piping and equipment pressure parts are in accordance with USAS B31.1.0, "Power Piping," B31.7, "Nuclear Power Plant Piping," or ASME Section III, "Nuclear Power Plant Components."

5.1 Welding Procedures and Processes[1]

Welding procedures and processes are employed to produce welds of complete penetration, of complete fusion, and free of unacceptable defects. The finished surfaces of the weld (both root and crown) merge smoothly into the adjacent component surfaces. Weld layers are built up uniformly around the circumference and across the width of the joint. Weld starts and stops are staggered. Pressure-containing and attachment welds may be made by any of the following processes within the limitations described in this appendix: (The use of other processes or procedures is not allowed without special qualification and approval.)

1. Gas tungsten arc welding (GTAW)
2. Shielded metal arc welding (SMAW)
3. Submerged arc welding (SAW)
4. Gas metal arc welding (GMAW)

5.1.1 Austenitic Stainless Steel Welds

a) Groove Butt Welds

Austenitic stainless steel groove butt welds are subject to the following limitations:

1. Double welding (welded from both sides) by any of the preceding acceptable processes may be employed provided the first side is ground back to sound metal and visually inspected prior to welding the second side.

2. Single welding (welded from one side) may be used, employing the GTAW process with filler metal added for the first pass and a protective gas back purge held until a minimum thickness of 3/16 inch of weld thickness is completed. Completion of the weld may be by other acceptable welding processes.

b) Socket Welds

Austenitic stainless steel socket welds are made by any acceptable welding process. Protective gas back purging is not required.

5.1.2 Carbon Steel Welds

Carbon steel groove welds are subject to the following limitations:

1. Double welding (welded from both sides) by any acceptable processes may be employed. Double-welded joints are back ground to sound metal and visually inspected prior to welding the second side.

2. Single welding (welded from one side) may be used employing any acceptable process with filler metal added for the root and second layer. Completion of the weld may be by other acceptable processes.

5.1.3 Dissimilar Metal Welds

Welded connections between austenitic stainless steel and carbon/low alloy steel are considered to be dissimilar metal welds.

a) Groove Butt Welds

Dissimilar metal groove butt welds are in accordance with the following requirements:

1. When the carbon/low alloy steel component is over 3/4 inch thick, it is "buttered" with Type-309 filler metal and heat treated in accordance with the requirements of USAS B31.1.0. Completion of the weld joint is then accomplished with either Type-308 or Type-309 filler metal. The completed weld joint is not heat treated.

2. When the carbon/low alloy steel component is 3/4 inch or less in thickness it shall be welded utilizing the SMAW, GTAW or SAW process with Type-308 or Type-309 filler metal.

b) Socket Welds

Dissimilar metal socket welds shall be welded using any acceptable process with Type-309 filler metal. Protective gas back purging is not required.

5.2 Bending and Forming

Bending and forming are in accordance with Section 102.4.5 of USAS B31.1.0. Austenitic stainless steel piping may be hot or cold bent within the following limitations:

1. A pipe may be cold bent within the limitations of USAS B31.1.0 provided the maximum operating temperature does not exceed 200°F for more than 1% of the design life and the base material is in the solution-annealed condition prior to bending.

2. Pipe may be cold bent to a minimum radius equal to 20 pipe diameters regardless of the service temperature. Pipe may be cold bent to less than 20 nominal pipe diameters where the normal operating temperature is above 200°F provided the bending operation is followed by solution heat treatment.

3. Hot bending is permitted to a minimum radius equal to five nominal pipe diameters regardless of service temperature. Hot bending is followed by solution heat treatment.

4. Bending of austenitic stainless steel piping at temperatures below 800°F is considered cold bending.

5.3 Heat Treatment

5.3.1 Austenitic Stainless Steel

Austenitic stainless steel piping components and equipment pressure parts are solution heat treated at least once.

Austenitic stainless steel material is degreased and stripped in accordance with ASTM A380 "Descaling and Cleaning Stainless Steel Surfaces," paragraph 2, prior to heat treatment.

Material is heat treated by heating to a temperature between 1900°F and 2050°F and then held for 1 hour per inch of thickness but not less than 1/2 hour followed by rapid cooling to below 800°F.

5.3.2 Carbon and Low Alloy Steel

Carbon and low alloy steel piping components and equipment pressure parts are heat treated in accordance with the requirements of the applicable ASME or ASTM material specification.

5.3.3 Welds

Heat treatment of welds is in accordance with the requirements of the applicable construction code.

5.4 Descaling and Cleaning After Heat Treatment

5.4.1 Austenitic Stainless Steel

Austenitic stainless steel material is descaled and cleaned by one or a combination of the following methods:

1. Machining

2. Brushing (hand or driven) with austenitic stainless steel brushes which have not been used on carbon or low alloy steels.

3. Blast cleaning with clean sand or grit not previously used on carbon or low alloy steels. Steel grit is not used.

4. Pickling in accordance with ASTM A380 paragraph 4(b)5 with the following restrictions:

Stainless steel material is pickled a maximum of six immersions (10 minutes maximum each at room temperature, 3 minutes maximum at above 100°F) and when in the solution heat treated condition. Weldments, weld joints, or weld repairs are pickled only when the weldment and component have been solution heat treated subsequent to welding.

5.4.2 Carbon and Low Alloy Steels

Carbon and low alloy steels are descaled and cleaned by one or a combination of the following methods:

1. Machining or grinding.

2. Blasting in accordance with the Steel Structures Painting Council Standard, SP-5, except anchor patterns need not apply. When used, sandblasting is followed by vacuum or air-blast cleaning.

3. Pickling in accordance with the Steel Structures Painting Council Standard, SP-8.

5.5 Nondestructive Examination Techniques and Acceptance Standards

Nondestructive examinations are performed as required by applicable construction code. The techniques and acceptance standards comply with the requirements of the B31.1, B31.7, or ASME Section III.

During original construction nondestructive examinations in excess of code requirements were performed to provide additional assurance of quality. These additional examinations are not part of the design basis of the plant and are not required for the current operation or maintenance of the plant.

5.6 Pressure Testing

Pressure tests of original piping and equipment pressure parts are conducted in accordance with USA B31.1 or B31.7 as applicable.

Pressure tests of repaired or replaced piping and equipment pressure parts are conducted in accordance with ASME Section XI, "Rules For Inservice Inspection of Nuclear Power Plant Components." Pressure tests of new piping systems (not considered to be modifications of existing systems) are conducted in accordance with the applicable construction code requirements.

Pressure tests of repaired, replaced or modified piping and equipment pressure parts outside the scope of ASME XI follow the guidance of ASME XI to the extent practical or use the applicable construction code requirements. Pressure tests of new piping systems (not considered to be modifications of existing systems) are conducted in accordance with the applicable construction code requirements.

5.7 Personnel Qualification Requirements

Personnel performing nondestructive tests are qualified and certified in accordance with the applicable construction code requirements.

Personnel performing pressure tests are qualified and certified in accordance with the standards specified in Appendix D, "Quality Assurance Program for Operations," the construction code or ASME Section XI as applicable.

6.0 REFERENCES FOR APPENDIX A

1. Design Change 89-252A, 252B, 252D and 252E.

2. Design Change 90-283, Amendment 1.

3. CED 6036742.

4. Contract E72-17A.

5. Design Change 89-272.

6. Contract E80-28.

7. Design Change 79-042.

8. Design Change 84-150.

9. Design Change 87-36.

10. Design Change 96-132.

11. Alternative Alloys for BWR Pipe Applications, EPRI Report No. NP-2671-LD, September 1981.

12. NUREG 0313, Rev. 1, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," by C. Y, Chang, October 1979.

13. Design Change 89-256.

14. Minor Design Change 81-2.

15. Minor Design Change 83-034, Amendment 1.

16. EE 01-147, Summary of the Main Steam Isolation Valve (MSIV) Leakage Pathway to the Condenser Seismic Qualification.

17. CED 6011400.

18. CED 6036743.

19. Engineering Change 16-066.