6.6 Inservice Inspection of Class 2 and 3 Components

6.6.1 Components Subject to Examination

Preservice and inservice inspections of Quality Group B and C pressure retaining components (ASME Code, Section III Class 2 and 3 components) such as vessels, piping, pumps, valves, bolting, and supports as identified in subsection 3.2.2 are performed in accordance with the ASME Code, Section XI, as required by 10 CFR 50.55a(g). This includes the ASME Code Section XI Mandatory Appendices.

In conformance with ASME Code and NRC requirements, the preparation of inspection and testing programs is the responsibility of the Combined License applicant of each AP600. Preparation of the pre-service inspection program (nondestructive examination) is the responsibility of the Combined License applicant. The inservice inspection program is the responsibility of the Combined License applicant prior to commercial operation. These programs will address applicable inservice inspection provisions of 10 CFR 50.55a(g). The pre-service program will provide details of areas subject to inspection, as well as the method and extent of pre-service inspection. The inservice inspection program will detail the areas subject to inspection and method, extent, and frequency of inspection. The description of these programs is the responsibility of the Combined License applicant.

6.6.2 Accessibility

ASME Code Class 2 and 3 components are designed so that access is provided in the installed condition for visual, surface and volumetric examinations specified by the ASME Code. See subsection 5.2.1.1 for a discussion of the baseline ASME Code edition and Addenda. Design provisions, in accordance with Section XI, IWA-1500, are formally implemented in the Class 2 and 3 component design processes.

The goal of designing for inspectability is to provide for the inspectability access and conformance of component design with available inspection equipment and techniques. Factors such as examination requirements, examination techniques, accessibility, component geometry and material selection are used in evaluating component designs. Examination requirements and examination techniques are defined by inservice inspection personnel. Inservice inspection review as part of the design process provides component designs that conform to inspection requirements and establishes recommendations for enhanced inspections.

Considerable experience has been drawn on in designing, locating, and supporting Quality Group B and C (ASME Class 2 and 3) pressure-retaining components to permit pre-service and inservice inspection required by Section XI of the ASME Code. Factors such as examination requirements, examination techniques, accessibility, component geometry, and material selections are used in establishing the designs. The inspection design goals are to eliminate uninspectable components, reduce occupational radiation exposure, reduce inspection times, allow state-of-the-art inspection systems, and enhance detection and the reliability of

flaw characterization. There are no Quality Group B and C components which require inservice inspection during reactor operation.

Removable insulation is provided on piping systems requiring volumetric and surface inspection. Removable hangers and pipe whip restraints are provided, as necessary and practical, to facilitate inservice inspection. Working platforms are provided in areas requiring inspection and servicing of pumps and valves. Temporary or permanent platforms, scaffolding, and ladders are provided to facilitate access to piping welds. The components and welds requiring inservice inspection are designed to allow for the application of the required inservice inspection methods, that is, sufficient clearances for personnel and equipment, maximized examination surface distances, two-sided access, favorable materials, weld joint simplicity, elimination of geometrical interferences, and proper weld surface preparation.

Many of the ASME Code, Section III, Class 2 and 3 components are included in modules which are fabricated offsite and shipped to the site, as described in subsection 3.9.1.5. The modules are designed and engineered to provide access for in-service inspection and maintenance activities. The attention to detail that is engineered into the modules prior to construction improves the accessibility for inspection and maintenance.

Relief from Section XI requirements will not be required for ASME Code, Section III, Class 2 and 3 pressure-retaining components in the AP600 plant for the baseline design certification code. Future unanticipated changes in the Section XI requirements could, however, necessitate relief requests. Relief from the inspection requirements of Section XI will be requested when full compliance is not practical according to the requirements of 10 CFR 50.55a. In such cases, specific information will be provided to identify the applicable ASME Code requirements, justification for the relief request, and the inspection method to be used as an alternative.

Space is provided to handle and store insulation, structural members, shielding, and other material related to the inspection. Suitable hoists and other handling equipment, lighting, and sources of power for inspection equipment are installed at appropriate locations.

6.6.3 Examination Techniques and Procedures

The visual, surface, and volumetric examination techniques and procedures are in accordance with the requirements of ASME Code, Section XI, subarticle IWA-2000. Code cases listed in Regulatory Guide 1.147 are applied as the need arises during the pre-service inspection. Code cases determined as necessary to accomplish pre-service inspection activities are used.

The liquid penetrant or magnetic particle methods are used for surface examinations. Radiography, ultrasonic, or eddy current methods (whether manual or remote) are used for volumetric examinations.

The report format for reportable indications and data compilation provide for comparison of data from subsequent examinations.

6.6.4 Inspection Intervals

Inspection intervals included in the inspection program are as defined in subarticle IWA-2400 of the ASME Code, Section XI. The periods within each inspection interval may be extended by as much as one year to permit inspections to be concurrent with plant outages. It is intended that inservice examinations be performed during normal plant outages, such as refueling shutdown or maintenance shutdowns occurring during the inspection interval.

6.6.5 Examination Categories and Requirements

Examination categories and examination requirements (examination methods, acceptance criteria, extent of examination, and frequency of examination) for Class 2 components are in accordance with Subsection IWC and table IWC-2500 of the ASME Code, Section XI. Similar information for Class 3 components are in conformance with Article IWD-2000 and table IWD-2500 of ASME Code, Section XI. The pre-service examination of Class 2 components is according to the requirements of Subarticle IWC-2200. The pre-service examination of Class 3 components is according to the requirements of Subarticle IWD-2100. Inservice test requirements for component supports comply with ASME Code, Section XI, Article IWF-5000.

6.6.6 Evaluation of Examination Results

Examination results are evaluated per the acceptance standards found in IWA-3000, IWC-3000, and IWD-3000 of the ASME Code, Section XI. Repair procedures are in accordance with ASME Code, Section XI, Article IWA-4000. If the guidelines of IWA-4000 are inappropriate for the components, then the guidelines of ASME Code Section XI, IWC-4000 and IWD-4000 apply.

6.6.7 System Pressure Tests

System pressure tests comply with IWA-5000, IWC-5000 and IWD-5000 of the ASME Code, Section XI, for Class 2 and 3 components.

6.6.8 Augmented Inservice Inspection to Protect against Postulated Piping Failures

An augmented inspection program is developed for high-energy fluid systems piping between containment isolation valves. Such a program is also developed where no isolation valve is used inside containment between the first rigid pipe connection to the containment penetration or the first pipe whip restraint inside containment and the outside isolation valve. This program provides for 100 percent volumetric examination of welds in the affected piping during each inspection interval, conducted according to the ASME Code, Section XI. The

program covers the break exclusion portion of high-energy fluid systems described in subsections 3.6.1 and 3.6.2.

There is no requirement for an augmented inspection of ASME Code, Section III Class 1, 2, or 3 pipe to address erosion-corrosion-induced pipe wall thinning. Class 1, 2, and 3 pipe containing single-phase water or two-phase steam and water is fabricated of erosion-corrosion resistant material. See Section 10.1 for information on monitoring of nonsafety-related pipe for erosion-corrosion.

6.6.9 Combined License Information Items

6.6.9.1 Inspection Programs

Combined License applicants referencing the AP600 certified design will prepare a pre-service inspection program (nondestructive examination) and an inservice inspection program for ASME Code, Section III Class 2 and 3 systems, components, and supports. The pre-service inspection program will address the equipment and techniques used.

6.6.9.2 Construction Activities

Combined License applicants referencing the AP600 certified design will address the controls to preserve accessibility and inspectability for ASME Code, Section III, Class 2 and 3 components and piping during construction or other post design certification activities.