

TECHNICAL EVALUATION REPORT  
DRESDEN NUCLEAR POWER PLANT UNITS 2 & 3  
INSERVICE INSPECTION PROGRAM

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The revision to 10 CFR 50.55a, published in February 1976, required that Inservice Inspection (ISI) Programs be updated to meet the requirements (to the extent practical) of the Edition and Addenda of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (hereinafter referred to as Section XI or Code) incorporated in the Regulation by reference in paragraph (b). This updating of the programs was required to be done every 40 months to reflect the new requirements of the later editions of Section XI.

As specified in the February 1976 revision, for plants with Operating Licenses issued prior to March 1, 1976, the regulations became effective after September 1, 1976, at the start of the next regular 40-month inspection period. The initial inservice examinations conducted during the first 40-month period were to comply with the requirements in editions of Section XI and addenda in effect no more than six months prior to the date of start of facility commercial operation.

The Regulation recognized that the requirements of the later editions and addenda of the Section XI might not be practical to implement at facilities because of limitations of design, geometry, and materials of construction of components and systems. It therefore permitted determinations of impractical examination or testing requirements to be evaluated. Relief from these requirements could be granted provided health and safety of the public were not endangered, giving due consideration to the burden placed on the licensee if the requirements were imposed. The licensee, Common Wealth Edison, of Dresden Nuclear Power Plant Units 2 and 3, has recently submitted relief requests dealing with inservice examinations of components or with system pressure tests that were formally submitted to the Nuclear Regulatory Commission (NRC). Inservice tests of pumps and valves (IST programs) are being evaluated separately.

The revision to 10 CFR 50.55a, effective November 1, 1979, modified the time interval for updating ISI programs and incorporated by reference a later edition and addenda of Section XI. The updating intervals were extended from 40 months to 120 months to be consistent with intervals as defined in Section XI.

For plants with Operating Licenses issued prior to March 1, 1976, the provisions of the November 1, 1979, revision are effective after September 1, 1976, at the start of the next one-third of the 120-month interval. During the one-third of an interval and throughout the

remainder of the interval, inservice examinations shall comply with the latest edition and addenda of Section XI, incorporated by reference in the Regulation, on the date 12 months prior to the start of that one-third of an interval. For Dresden Units 2 and 3, the ISI program and relief requests submitted in conjunction with it cover the second ten year interval, starting March 1, 1982. This program was based upon the 1977 Edition of Section XI of the ASME Boiler and Pressure Vessel Code with Addenda through the Summer of 1979.

The November 1979 revision of the Regulation also provides that ISI programs may meet the requirements of subsequent Code editions and addenda, incorporated by reference in paragraph (b) and subject to NRC approval. Portions of such editions or addenda may be used, provided that all related requirements of the respective editions or addenda are met.

Finally, Section XI of the Code provides for certain components and systems to be exempted from its requirements. In some instances, these exemptions are not acceptable to NRC or are only acceptable with restrictions.

I. CLASS 1 COMPONENTS

A. Reactor Vessel

1. Request for Relief No. CR-1, Circumferential and Longitudinal Welds in the Beltline Region, Category B-A, Item Bl.11 and Bl.12

Code Requirement

Volumetric examination of 100% of the length of one circumferential and longitudinal beltline region welds each ten-year interval (Code Category B-A, Item Bl.1 and Bl.12).

Code Relief Request

Relief is requested from the Code required volumetric examination.

Proposed Alternative Examination

Dresden Station will, as an alternate inspection, volumetrically examine 100% of the accessible length of each longitudinal meridional and circumferential weld. This includes 100% of the length of six meridional and one circumferential closure head welds and the accessible length of the three longitudinal shell welds which rise above the biological shield.

We conclude that this augmented inspection will provide an acceptable level of safety and assurance that the vessel structural integrity will be maintained during the inspection interval.

Licensee's Basis for Requesting Relief

Accessibility for examination of certain reactor welds was not provided in the original plant design which occurred prior to the issuance of Section XI Inservice Inspection requirements.

As indicated on Figure 1, examination of the beltline region from the reactor vessel outer surface is precluded due to the close proximity to the biological shield wall and obstruction by the vessel insulation.

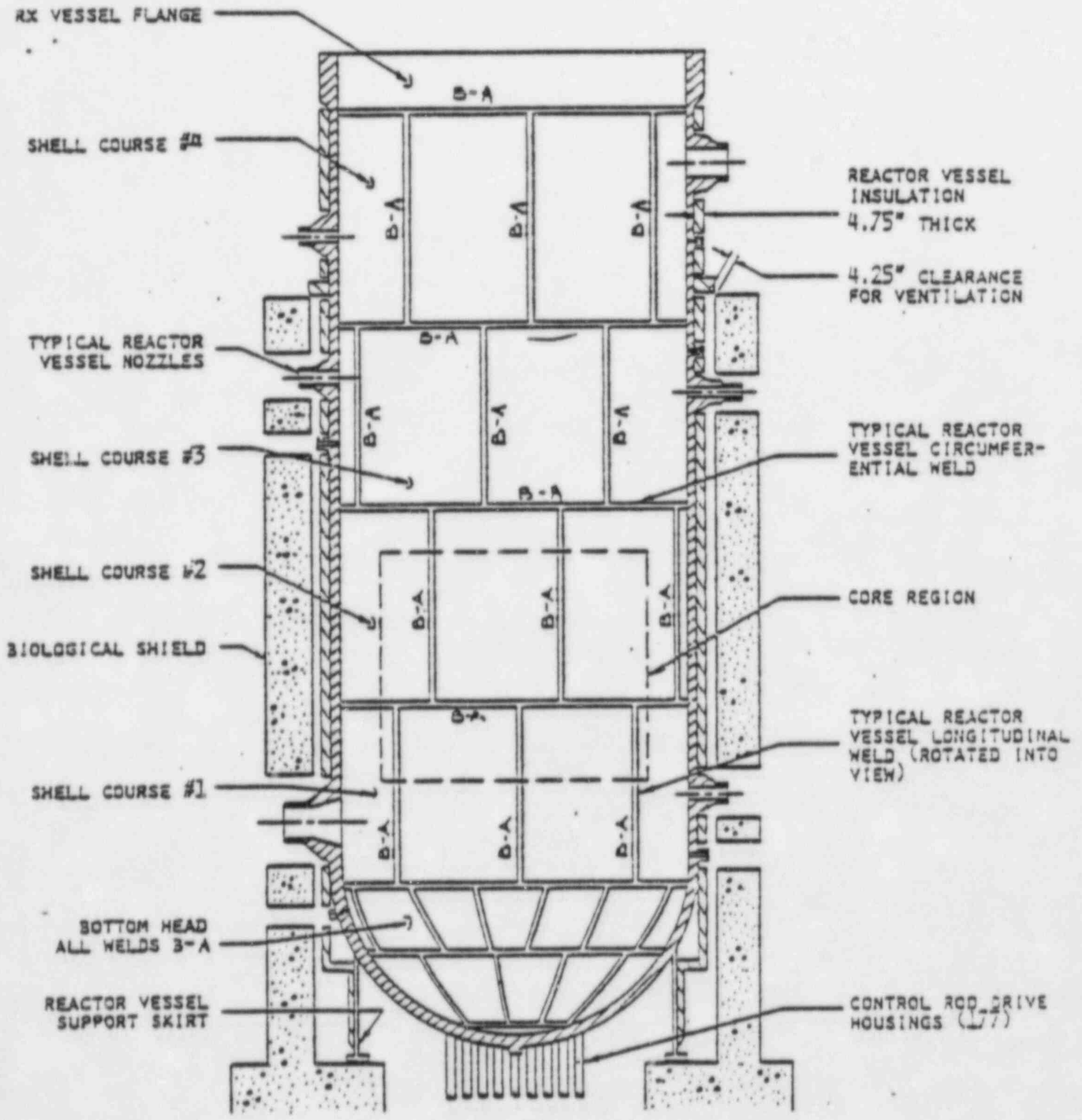


FIGURE 1  
 REACTOR VESSEL WELD IDENTIFICATION

The mirror type insulation consists of interlocking panels which were not designed to be easily removed at the weld locations. Furthermore, the annular dimensions between the shield wall and the insulation are not sufficient to allow direct access for personnel. Access through the biological shield wall is only provided at reactor vessel nozzle locations; however, there are no nozzle penetrations located in the beltline region.

Examination of the beltline region welds from inside the vessel is obstructed by vessel internal design features. The core shroud, jet pumps, and various brackets welded to vessel wall are not designed to be removed.

#### Evaluation

The design of the vessel makes these welds physically inaccessible. Imposition of the Code necessitates removal of portions of the biological shield and the permanently installed insulation to perform the required examination. In addition, according to best estimates\* the neutron fluence to the vessel I.D. will be approximately  $1.0 \times 10^{18}$  nvt. at the end of life. Both Units 2 and 3 have ongoing material surveillance programmed which exceed Code requirements. Radiographic examination is also precluded by radiation levels.

#### Conclusions and Recommendations

Based on the above evaluation, it is concluded that for the subject welds, Code requirements are impractical. It is further concluded that the alternate examination proposed by the licensee will provide the necessary assurance of structural integrity. It is recommended that relief be granted.

2. Relief Request CR-2, Standby Liquid Control Nozzle, Category B-D, Item B3.100

#### Code Requirement

Volumetric inspection of all reactor vessel inner radii sections (Code Category B-D, Item B3.100) each ten-year interval.

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\*Neto Report 21708, Table 2.2-2

### Code Relief Request

Relief is requested from the volumetric weld examination.

### Proposed Alternative Examination

None

### Licensee's Basis for Relief

The design of the SBLC nozzle piece does not lend itself to ultrasonic inspection. The nozzle has an integral socket to which the boron injection piping is fillet welded and consequently provides a geometry which will result in a meaningless ultrasonic examination.

### Evaluation

The design of the SBLC nozzle inner radius does not allow ultrasonic examination from the pipe side because of component geometry. The annular space between the biological shield and the vessel does not allow accessibility for ultrasonic examination from the vessel side or the weld.

### Conclusions and Recommendations

Based on the evaluation above, Code requirements for the subject welds are impractical. 10 CFR 50.55a (g)(i) states for plants whose construction permits were issued prior to January 1, 1971, components shall meet design requirements for inspectability to the extent practical. Since examination requirements for this area did not exist during the time Dresden was designed, it is recommended that relief be granted.

#### B. Pressurizer

Not applicable

#### C. Piping

1. Relief Request CR-3, Inaccessible Welds Inside Containment Penetration, Category B-J, Item 9.11

#### Code Requirement

Class 1 pipe welds be volumetrically examined (Code Category B-J, Item B9.11).

### Code Relief Request

Relief is requested from the volumetric examination requirement.

Relief applied to the penetration on the following lines:

CRD RETURN - 0308-4"  
SHUTDOWN COOLING - 1001A-16", 1001B-16"  
RX WATER CLEANUP - 1201-8"  
ISOLATION CONDENSER - 1302-14", 1303-12"  
CORE SPRAY - 1403-10", 1404-10"  
EPCI - 2305-10"  
LPCI - 1506-16", 1519-16"  
MAIN STEAM - 3001A, B, C, D-20"  
FEEDWATER - 3204A, B-18"

### Proposed Alternative Examination

As an alternate inspection, Dresden Station will perform a volumetric inspection of each of the outer out-of-containment welds over 100% of its length during the inspection interval. The inspections will be credited against the required 25% of the welds to be inspected each inspection interval. Additionally, Dresden Station will perform a visual inspection of the containment penetration during hydrostatic testing.

### Licensee's Basis for Relief

As stated in 10 CFR 50.55a(g) (1) for plants whose construction permits were issued prior to January 1, 1971, components shall meet Section XI requirements to the extent practical. Since examination requirements for these welds did not exist at the time Dresden Station was designed, accessibility for their examination was not a prime consideration. Figures 2 and 3 clearly illustrate the design constraints which make it extremely impractical to examine the subject welds by volumetric or surface techniques. Dresden feels this constitutes a basis for relief from the volumetric examination requirements of Section XI.

The safety implications of this exemption are minimal due to the fact that the safety margins in the subject welds are typical of those in all welds in the applicable systems. Since the exempted welds represent only a small fraction of the total number of welds

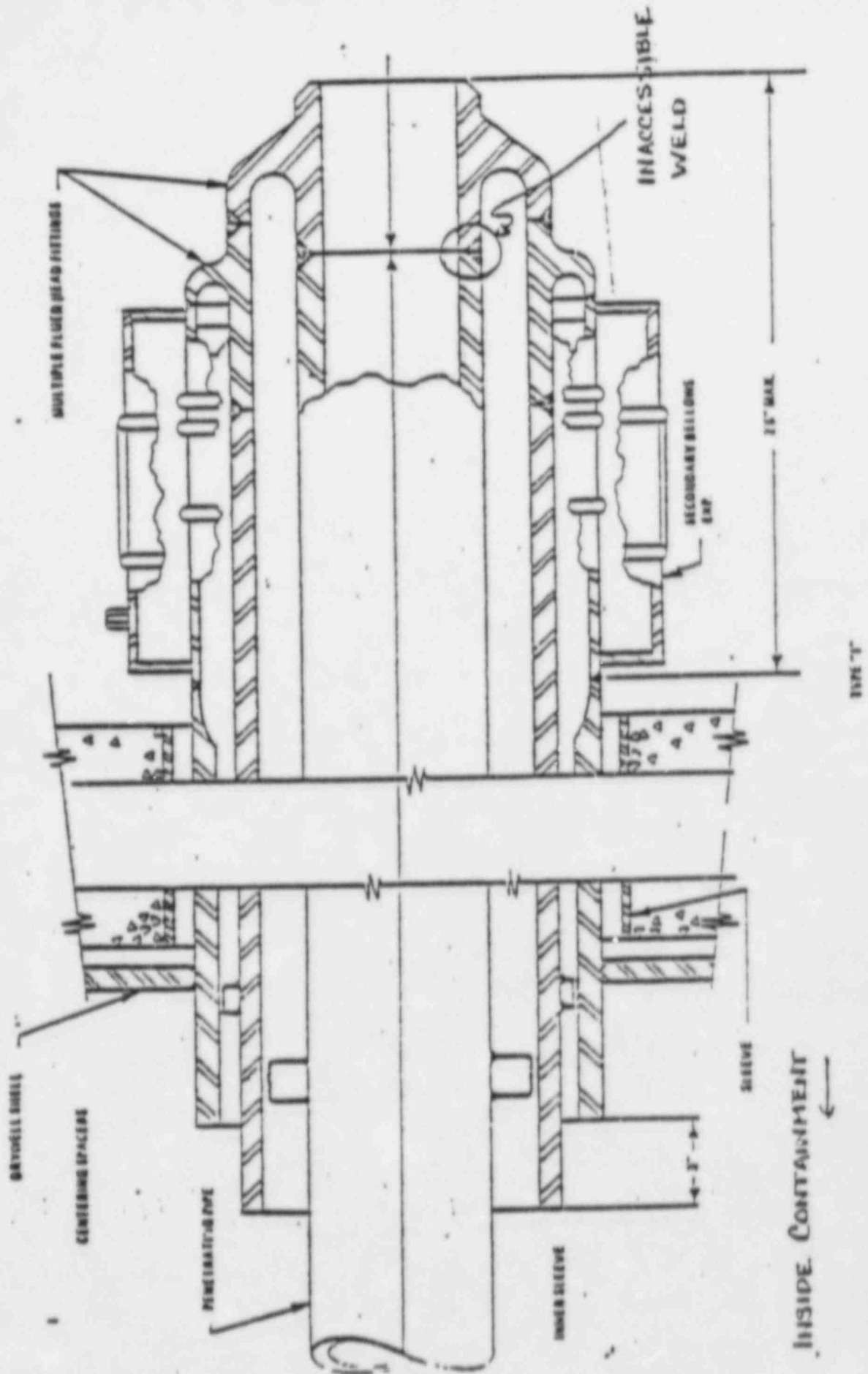


Figure 2. Center Section - Hot Fluid Piping Penetration Assembly

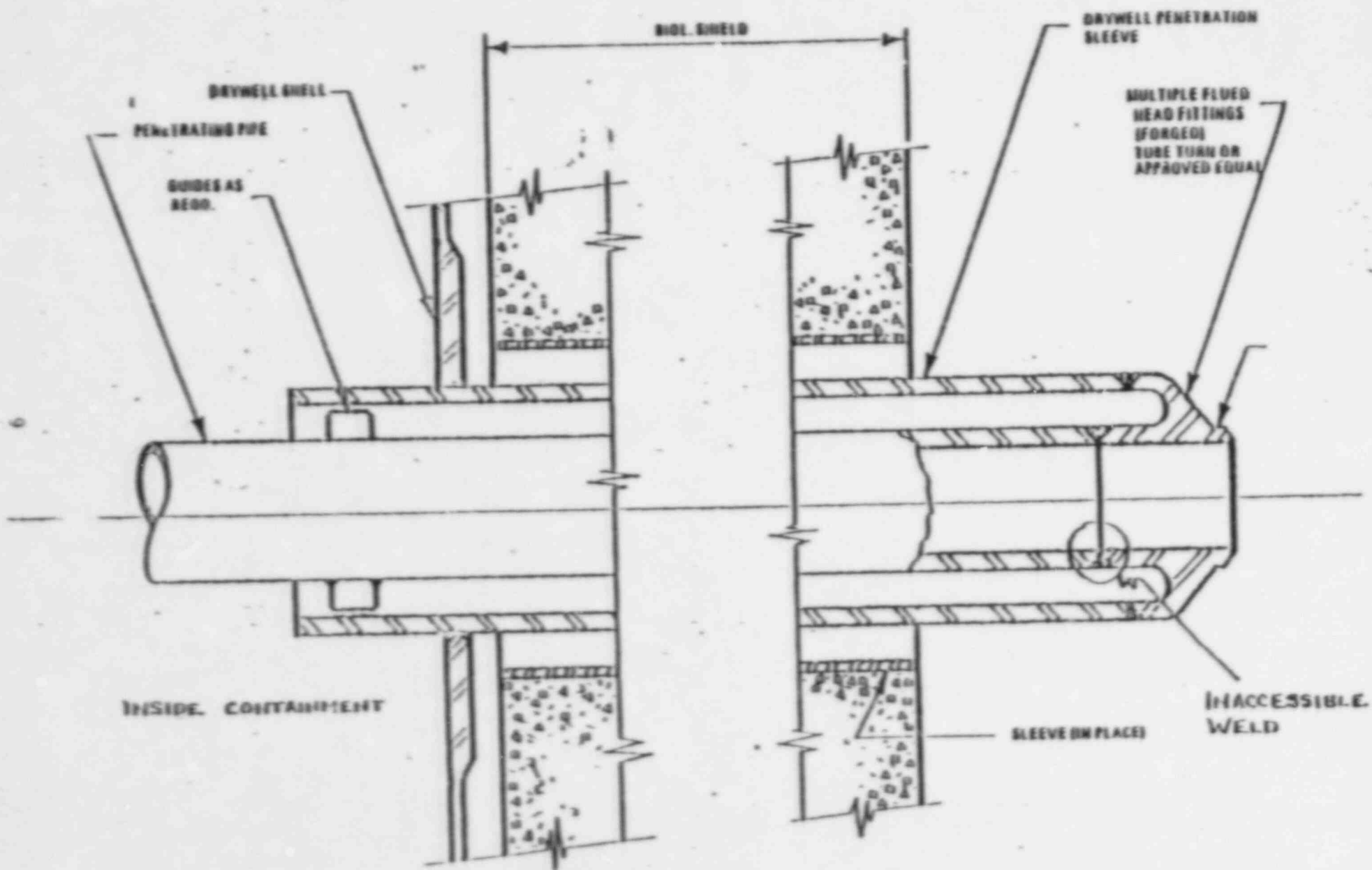


Figure 3. Center Section - Cold Fluid Piping Penetration Assembly

in these systems (17 out of 571), the statistical significance to the inspection sampling program due to exempting these welds is expected to be negligible.

#### Evaluation

The design of the containment penetrations makes physical access to the welds impossible. We agree with the licensee's basis for relief and alternate inspection program.

#### Conclusions and Recommendations

Based on the licensee's discussion, Code requirements for the subject welds are impractical. It is recommended that relief be granted.

2. Relief Requests CR-4 and CR-7, Welds Covered by Reinforcement Saddle, Category B-J, Item B9.30 and Category C-F, Items B5.20-B5.30

#### Code Requirement

Branch pipe connection welds exceeding two inches diameter be given a surface and volumetric examination and those two inches diameter and smaller be surface examined. Twenty-five percent of these welds are required to be examined each inspection interval (Code Category B-J, Item B9.30 and Category C-F, Items B5.20-B5.30).

#### Code Relief Request

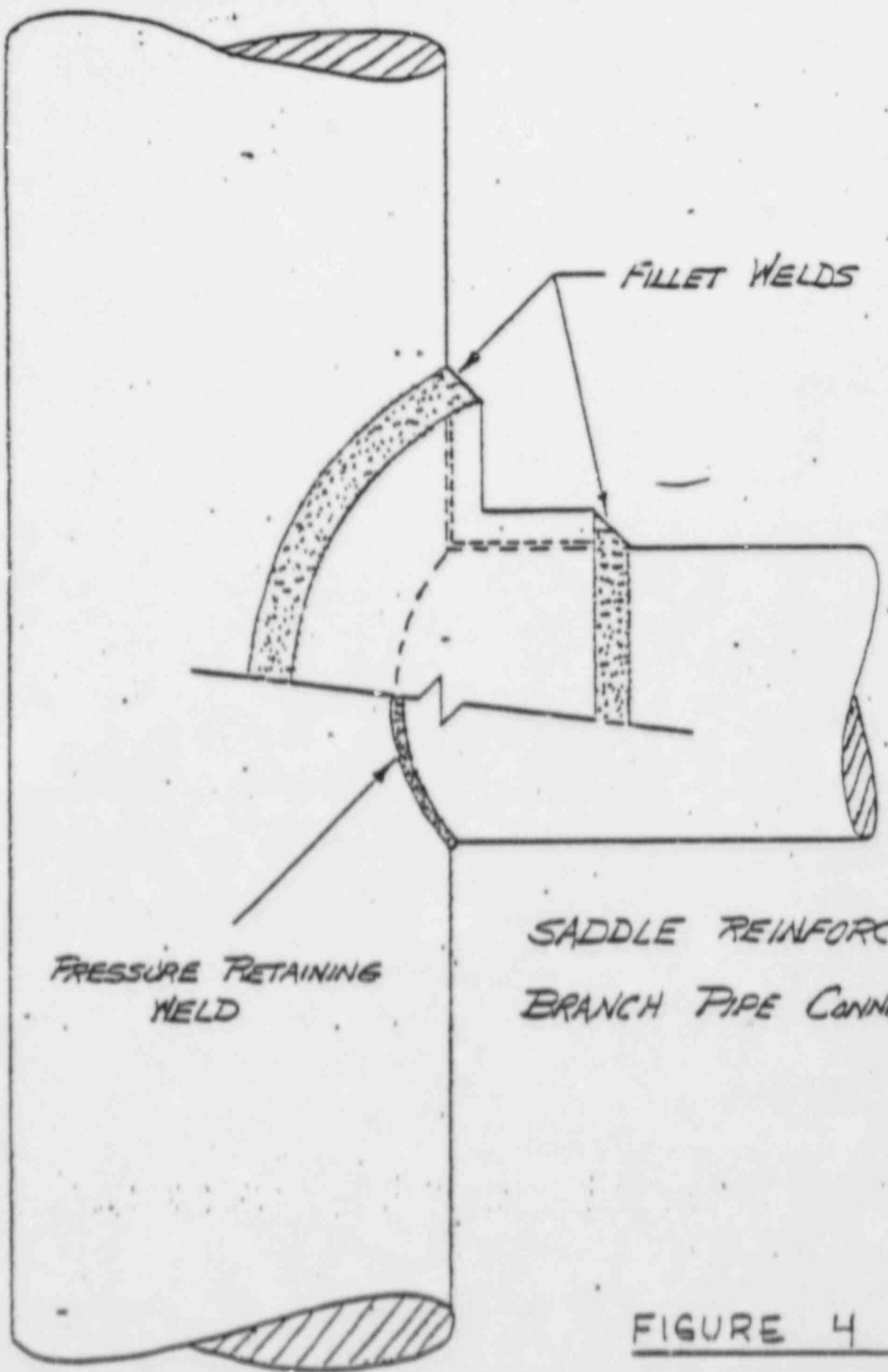
Relief is requested from the volumetric and surface examination requirements.

#### Proposed Alternative Examination

Visual examination during hydrostatic test.

#### Licensee's Basis for Relief

The design of certain Class 1 and 2 branch pipe connection welds calls for the use of reinforcement saddles. These saddles are fillet welded over the actual pressure retaining branch pipe to main pipe weld, completely encasing it as illustrated on Figure 4. The fabrication of these joints precludes any type of surface examination or meaningful volumetric examination. Additional assurance of the continued in-



PRESSURE RETAINING  
WELD

FILLET WELDS

SADDLE REINFORCED  
BRANCH PIPE CONNECTION

FIGURE 4

tegrity of joints fabricated in this fashion is afforded by the fact that the reinforcement saddle strengthens the joint and reduces the stresses on the internal weld.

#### Evaluation

The design of the saddle reinforcement used at Dresden prevents a volumetric examination from being performed on some pipe branch welds. However, the licensee has not provided adequate justification for not performing a surface examination on the fillet welded reinforcement.

#### Conclusions and Recommendations

The design of the reinforcement saddle prevents ultrasonic examination of the subject welds, but does not limit surface examination from being performed on the saddle fillet weld. It is recommended that relief be granted from Code required ultrasonic examinations and a surface examination of the saddle fillet weld be required.

#### D. Pumps

No relief requests

#### E. Valves

1. Relief Request CR-6, Visual Examination of Valve Internals, Category B-M-2, Item B12.40

#### Code Requirement

A visual examination of the internal pressure boundary surfaces of the valve in each group of valves of the same structural design and manufacturing method that perform similar functions in the system. These examinations are required to be completed each inspection interval (Code Category B-M-2, Item B12.40).

#### Code Relief Request

Relief is requested from Code requirements.

#### Proposed Alternative Examination

An examination of the internal pressure boundary

surfaces will be performed, to the extent practical, each time a valve is disassembled for maintenance purposes.

#### Licensee's Basis for Relief

The requirement to disassemble primary system valves for the sole purpose of performing a visual examination of the internal pressure boundary surfaces has only a very small potential of increasing plant safety margins and a very disproportionate impact on expenditures of plant manpower and radiation exposure.

Performing these visual examinations under such adverse conditions as high dose rates and poor as-cast surface condition, realistically, provides little additional information as to the valve casing integrity.

For approximately 20 percent of these valves, the reactor vessel core must be completely unloaded and the vessel drained to permit disassembly for examination. The performance of both carbon and stainless cast valve bodies has been excellent in all BWR applications. Based on this experience and both industry and regulatory acceptance of these alloys, continued excellent service performance is anticipated.

It has also been recommended that a valve thickness measurement program be developed to determine the integrity of Class 1 valves that are not disassembled, during the inspection interval, for maintenance purposes. Dresden Station has considered such a program; however, we feel that this alternative inspection is also impractical. Based on the existing radiation fields in the general area of these valves, typically .5-1.5 Rem/hour, a very large dose expenditure would be required to obtain what we consider very little additional assurance that the valves will continue to maintain the desired high degree of integrity.

Additionally, because these valves are mostly cast stainless steel, the combination of irregular surfaces (i.e., I.D. machining, OD and ID contouring, etc.) and varying ultrasonic properties produces a great deal of uncertainty, making interpretation and examination difficult. These added problems result in longer testing times and, consequently, larger exposures. This added exposure is not considered justified based on the excellent service performance of

these valve bodies; consequently, we do not feel that a valve wall thickness program is an acceptable method to assure valve integrity.

A more practical approach that would provide an adequate sampling program and significantly reduce radiation exposure to plant personnel is to examine the internal pressure boundary of only those valves that require disassembly for maintenance purposes. This would still provide a reasonable sampling of primary system valves and give adequate assurance that the integrity of these components is being maintained.

#### Evaluation

Disassembly of these valves for the sole purpose of a visual examination, in absence of other required maintenance, represents an unnecessary exposure to radiation and contamination.

Contamination levels in the valves associated with the recirculation loops are particularly high due to the physical location of these valves at the bottom of the system.

Class 1 valves are subject to system hydrostatic examination and containment isolation valves are leak-tested periodically. The licensee has agreed to visually examine any valves that are disassembled for routine maintenance.

#### Conclusions and Recommendations

Based on the evaluation and licensee discussion above, Code requirements are impractical. However, the licensee has not provided sufficient justification for not performing valve wall thickness measurements. Therefore, it is recommended that relief be granted from the visual examination requirements of B-M-2 provided that the licensee conducts a valve wall thickness examination on any valves that are not visually examined for routine maintenance.

## II. CLASS 2 COMPONENTS

### A. Vessels

1. Relief Request CR-9, Tube Sheet-to-Shell Welds, Category C-A, Item Cl.30

#### Code Requirement

A volumetric examination of tube sheet-to-shell welds.

#### Code Relief Request

Relief is requested from the volumetric Code requirements.

#### Proposed Alternative Examination

Monthly surveillance test for leaks of tubes which would verify integrity of heat exchangers. In addition, each refueling cycle a leak detection and reduction program and heat exchangers are visually inspected for leaks.

#### Licensee's Basis for Relief

These welds were made to Section VIII Code requirements of pre-1971 vintage and volumetric examination was not required.

An investigation of the ultrasonic testability of the subject welds indicates that a Section XI Code UT examination cannot satisfactorily be performed. Also, radiography cannot be performed because the joint geometry precludes the making of a meaningful radiograph.

#### Evaluation

During the last Unit 3 outage (January 1982 through May 1982), a mock-up was fabricated to be used as a calibration standard and an attempt was made to volumetrically inspect the upper sheet to tube weld on the 3B LPCI/CCSW heat exchanger. A reflection was detected coming from the root area on both the calibration standard and the weld. After consulting the corporate NDE expert and a welding specialist from the manufacturer of the heat exchanger, McQuay-Perfex, the utility determined that this type of weld cannot

be volumetrically examined satisfactorily and a relief request is warranted. These welds were made to Section VIII Code requirements of pre-1971 vintage, and volumetric examination was not required. Straight submerged arc technique was used to make these welds, which results in a varying inhomogeneity along the root of the weld, that produces sonic reflections. As a result of the weld, interpretations of indications from the root region would be unreliable. Radiography would not be a suitable alternative because the joint geometry precludes the making of a meaningful radiograph.

#### Conclusions and Recommendations

Based on the evaluation above, Code requirements for the subject weld are impractical. It is concluded that the alternate inspection program proposed by the licensee will provide adequate assurance of structural integrity. It is recommended that relief be granted.

B. Piping

See Section I.C.2.

C. Pumps

No relief requests

D. Valves

No relief requests

III. CLASS COMPONENTS

No relief requests

IV. PRESSURE TESTING

No relief requests

V. OTHER

1. Relief Request CR-8, Calibration Blocks

Code Requirement

"III-3400 BASIC CALIBRATION BLOCKS

"III-3410 MATERIAL

"The basic calibration blocks shall be made from material of the same nominal diameter and nominal wall thickness or pipe schedule as the pipe to be examined.

"III-3411 Material Specification

"(a) The calibration blocks shall be fabricated from one of the materials specified for the piping being joined by the weld.

"(b) Where the examination is to be performed from only one side of the joint, the calibration block material shall be of the same specification as the material on that side of the joint.

"(c) If material of the same specification is not available, material of similar chemical analysis, tensile properties, and metallurgical structure may be used."

Code Relief Request

Relief is requested from requirements of III-3411.

Proposed Alternative Examination

All future calibration blocks will be fabricated from material having the appropriate documentation to verify the equivalent chemical, physical, and acoustic properties.

Licensee's Basis for Relief

Dresden Station currently utilizes calibration blocks, some of which lack documentation consistent with requirements of current editions of the Code. The documentation requirements existing at the time of their fabrication did not require traceability to the material's chemical or physical certifications. As a result, the only documentation available for these existing blocks is verification of the appropriate P-number grouping.

It would be impractical to fabricate a new set of calibration blocks in order to satisfy the documentation requirements of the current Code. Existing records which indicate the appropriate material P-number grouping provide adequate assurance that the blocks will establish the proper ultrasonic calibration and sensitivity.

## Evaluation

The UT calibration standards currently being used at Dresden were purchased to the requirements of the 1971 Edition of the ASME Code which was in effect at the time. This edition required the calibration blocks to be of the same or equivalent P-number grouping. Consequently, this is the only certification presently existing for each standard. The requirements of the 1975 Summer Addenda to the 1974 Edition of the ASME Code requires a much stricter selection of material and metallurgical properties for each standard. The calibration standards presently in use at Dresden Station do not have these properties and certifications.

Technical publications have shown significant variation 12-14 dB in attenuation within the same pipe for austenitic materials. Therefore requiring the utility to acquire new calibration blocks would not necessarily ensure the new calibration blocks would have the same acoustic characteristics as in-plant pipe. For ferritic material, however, some attenuation and velocity measurements could be made between pipe and calibration blocks to ensure that adequate ultrasonic inspections were being performed.

## Conclusions and Recommendations

Based on the evaluation above, Code requirements for the subject calibration blocks are impractical. Therefore, the following is recommended:

- Based on a successful demonstration in response to IEB-82-03 and/or 83-01, no change need be made on austenitic calibration blocks.
- For ferritic calibration blocks, attenuation and velocity comparisons should be made between pipe and calibration standards to ensure adequate ultrasonic sensitivity.