ASME Boiler and Pressure Vessel Code

Subcommittee XI/Subgroup on Water-Cooled Systems

Working Group/Containment (WG/C)

Subsection IWE Commentary

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Subsection IWE Commentary

Notice

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ASME Boiler and Pressure Vessel Committee
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Subsection IWE Commentary

Background

There are two purposes for writing this commentary. The first is that users of standards that have been developed by other societies have found commentaries to be very useful. Many questions of intent or interpretation are averted by having available the rationale for rules and requirements. The second purpose of this commentary arises from the format of Subsection IWE. The requirements in Subsection IWE are less prescriptive than many of those in other subsections. Thus, Subsection IWE departs from the standard format ASME Code users have become accustomed to for Class 1, Class 2, and Class 3 components. It became apparent that the differences created confusion. Thus, the working group has developed this commentary to aid Code users in the development and implementation of their containment inspection program.

This commentary is periodically revised as Code changes are approved. It is the intent of the Working Group/Containment (WG/C) that this commentary be published with each new Edition of the Code, and that each publication include references to Committee actions affecting Subsection IWE that were the basis for commentary changes.

References

1. ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE, 1992 Edition with the 1992 Addenda through the 1998 Edition with the 2000 Addenda.
2. ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE, 2001 Edition with the 2002 and 2003 Addenda.
3. ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE, 2004 Edition with the 2005 and 2006 Addenda.

ARTICLE IWE-1000
SCOPE AND RESPONSIBILITY

IWE-1100 SCOPE

Subsection IWE addresses the examination of metal containments and the liners of concrete containments. Examination of the concrete and the post-tensioning system of a concrete containment is addressed by Subsection IWL. Subsection IWE contains ISI requirements for currently operating nuclear power plants, and also contains requirements which need to be addressed at the design and construction stage. It should be emphasized that these requirements apply to the pressure-retaining boundary. Section III Subsection NE defines the boundaries of jurisdiction for containment systems. However, Section XI Subsection IWE does not apply to all of the containment components addressed by the construction rules. The requirements of Subsection IWE apply to Class MC metal containments and their integral attachments, and to metallic shell and penetration liners of Class CC components and their integral attachments. It should be noted that several items such as seals, gaskets, and bolting, which were previously included in Subsection IWE, have been excluded in the 1998 Edition due to these items being addressed under plant maintenance activities. It shall be up to the Code user to define how their containment inspection program(s) addresses these items to meet Regulatory commitments. This commentary may assist in that determination.

It should be noted that the requirements of Subsection IWE may not apply to every item that serves a containment pressure retaining function, such as Class 1 or 2 penetration pipe caps, flued heads, and bellows, as shown in ASME Code, Section III, Figure NE-1120-1. Given the importance of these items in maintaining containment pressure boundary integrity, Owners should consider whether to extend the boundaries subject to IWE requirements to include these items. For bellows, Owners may want to refer to NRC Information Notice 92-20 for additional information on potential degradation concerns.

Boundaries for Class MC component supports (and Class MC surfaces at supports) are shown in Figure IWF-1300-1.

Date Revised: 11-24-2004

IWE-1200 COMPONENTS SUBJECT TO EXAMINATION

IWE-1210 EXAMINATION REQUIREMENTS

The requirements of Subsection IWE apply to Class MC components and to metallic shell and penetration liners of Class CC components. The US Nuclear Regulatory Commission issued an amendment to 10CFR50.55a in 1994 that requires all metal containments and metallic shell and penetration liners of concrete containments comply

with the requirements of Subsection IWE, regardless of what construction code was used to design and build the containment. As a result, in the United States, the requirements of Subsection IWE apply to all containments (i.e., all U.S. operating reactors have primary containments that are either metal or have a metal liner). Class MC (metal containment) is an ASME Code definition.

Date Revised: 9-18-02

IWE-1220 COMPONENTS EXEMPTED FROM EXAMINATION

IWE-1220 contains a list of components which are exempted from examination, including components which are inaccessible. No specific definition of inaccessibility is provided in these rules, but inaccessible areas should include those that are embedded or otherwise permanently obstructed from direct visual examination. An example of an area which should not be considered inaccessible is one which is covered by insulation, unless the insulated area is sealed to prevent the intrusion of moisture against the covered containment surfaces. Please note that containment metallic surfaces that are accessible from at least one side should not be considered inaccessible (See IWE-1231 for more information).

Historical Information:

1. Interpretation #XI-1-98-56, File #IN99-014 clarified that IWE-1220(d) does not require an Owner to classify piping that penetrates the containment as Class 1 or 2. The Owner is responsible for determining the appropriate classification for components.

Date Revised: 9-18-02

IWE-1230 ACCESSIBILITY FOR EXAMINATION

IWE-1231 Accessible Surface Areas

The requirements of IWE-1231 and IWE-1232 apply to operating nuclear power plants, but it is recognized that some accessibility questions can only be addressed during design and construction. Some plants were designed and built before these requirements were developed, and therefore, those plants may not be able to meet all of the accessibility provisions. Subsection IWE did not attempt to address each individual situation. A comprehensive list addressing all of the situations where plants could not meet the accessibility provisions would be resource intensive and unnecessary. Unnecessary because this situation is already addressed in 10 CFR 50.55a(g)(4). Section 50.55a(g)(4) contains the phrase "except design and access provisions and preservice examination requirements" to address situations where provisions of codes were developed after a plant was built.

IWE-1231(a)(3): Examination Category E-A requires examination of 100% of the accessible surfaces. This paragraph requires that 80% of the surface area defined in Examination Category E-A remain accessible for the life of the plant. Questions were raised as to whether the calculation of the 80% included areas such as the containment

shell under the basemat. A change was made from 80% of the surface area defined in Table IWE-2500-1 to 80% of the pressure-retaining boundary, excluding parts such as stiffening rings, manhole frames, and areas made inaccessible during construction, etc. This change means that the surface area of stiffening rings, etc., is not part of the 80% figure. However, these areas of the reinforcing structure are not exempt from examination and would be examined during the general visual examination.

IWE-1231(b): This provision is intended to be applicable only to:

(1) Existing containments where repairs, modifications, or replacements result in making additional surface areas inaccessible for direct visual examination, and

(2) New containments, the construction of which requires embedding portions of the containment.

The provisions of this paragraph do not apply to existing containments where no repairs, modifications, or replacements have been made which resulted in making additional surface areas inaccessible for direct visual examination.

Historical Information:

1. Prior to the 1998 Edition, IWE-1231(a)(3) listed "single-welded butt joints from the welded side" as one of the items that were required to remain accessible. This provision was deleted because IWE no longer contained weld-based examination requirements, and because welds are already included in the "80% of the pressure-retaining boundary" of the containment.

Date Revised: *9-18-02*

IWE-1232 Inaccessible Surface Areas

IWE-1232(a)(3): Subsection IWE originally contained requirements for weld examinations. Single-welded butt joints had been required to remain accessible from the weld side for examination. Subsection IWE has been revised and no longer contains any specific weld examination requirements. Therefore, accessibility requirements for embedded single-welded butt joints have been eliminated.

IWE-1232(c): This paragraph was added to assist users in determining what surfaces should be considered "inaccessible" for visual examination. Surface areas that do not meet this criteria shall be visually examined in accordance with Table IWE-2500-1, Examination Category E-A.

Historical Information:

1. IWE-1232(a)(3) was revised in the 1998 Edition to delete the requirement that "all weld joints that are not double butt welded remain accessible for examination from the weld side."
2. IWE-1232(c) was revised in the 2000 Edition. The change described above was made as a result of Interpretation #XI-1-98-71.

Date Revised: *9-18-02*

IWE-1240 SURFACE AREAS REQUIRING AUGMENTED EXAMINATION

IWE-1241 Examination Surface Areas

IWE-1241(a) and IWE-1241(b) contain examples of areas that should be considered for examination in accordance with Table IWE-2500-1, Examination Category E-C. The Owner is responsible for identifying areas that require augmented examination (areas susceptible to accelerated degradation and aging). These areas must be identified in the Owner's inspection program. Subsection IWE was developed in this manner as it is the Owner who is in the best position to develop this portion of the containment ISI program based on individual design considerations and plant operating history. Subsection IWE provides examples of areas that may require examination but does not require the examination of these areas. The requirement is that areas subject to accelerated degradation and aging are to be examined in accordance with Table IWE-2500-1, Examination Category E-C.

Date Revised: *9-18-02*

IWE-1242 Identification of Examination Surface Areas

Because of the significance of areas which require augmented examination, those areas must be identified in Owner's Inspection Program.

ARTICLE IWE-2000
EXAMINATION AND INSPECTION

IWE-2100 GENERAL

This paragraph was added to Subsection IWE to address the requirements in IWA-2200 regarding visual examination and qualification of personnel. The requirements in IWA-2200 were developed for detecting flaws in metal components, and thus are more stringent than those that would be required for the detection of degradation such as corrosion. It was realized that the requirements of IWA-2200 for lighting and resolution would preclude remote examination of many areas of containment. Remote examination of the entire containment should be sufficient to detect evidence of degradation. Thus, IWE-2100 was added to clarify that IWA-2210, Visual Examination; IWA-2300, Qualification of Nondestructive Personnel; IWA-2500, Extent of Examination; and IWA-2600, Weld Reference System for Table IWE-2500-1 examinations (i.e., visual examinations) are not mandatory for visual examinations. However, the provisions contained in these paragraphs are applicable during any examinations performed under Table IWE-2500-2 (ultrasonic thickness measurements).

Historical Information:

1. IWE-2100 was added in the 1998 Edition.

Date Revised: *9-18-02*

IWE-2200 PRESERVICE EXAMINATION

The preservice examination or baseline for those plants in operation as of September 9, 1996 was the expedited examination required by 10 CFR 50.55a to be completed no later than September 9, 2001. For new plants, the preservice examination requirements of IWE-2200 shall be met prior to start of commercial operation.

NDE Surface Examination requirements for containment areas have been eliminated from Subsection IWE. Therefore, requirements for preservice examination of these areas have been removed from IWE-2200.

Subsection IWE requires that a Preservice Examination need only be performed prior to initial plant startup, and following repair/replacement activities.

The preservice examinations of IWE-2200(a) apply only to pressure retaining portions of components and the examinations of IWE-2200(c), (d), and (e) apply only when a repair or replacement is performed. Per ASME Section III, NE-2100 (from 1971 Edition, Summer 1972 Addenda to the present), seals and gaskets are non-ASME materials not associated with the pressure retaining function. ASME Section XI, IWA-4120(b)(5) (2002 Addenda) correspondingly identifies seals and gaskets as non-pressure retaining

materials exempt from the ASME XI rules for repair and replacement. Additionally, Table IWE-2500-1, Examination Category E-D has been deleted, based upon seals and gaskets being considered as non-ASME, non-pressure retaining. Category E-D has been deleted with the intention of the examination of seals and gaskets being included as part of the Owner's program(s) for containment general visual inspection and pressure testing for determination of containment leak tight integrity in accordance with 10CFR50, Appendix J. It should be noted that where accessible, the seals used to insulate conductors on electrical penetrations need to be examined because penetrations are part of pressure-retaining boundary.

Moisture barriers are not considered as a seal or gasket. Because of the potential for serious degradation in inaccessible areas and the number of reported instances of breakdown of moisture barriers, the concrete-to-metal interface areas are crucial in preventing moisture from accessing embedded portions of the containment. While IWE-2200 no longer requires that preservice examinations be performed following maintenance activities affecting moisture barriers, Owners are cautioned to ensure that moisture barrier materials are properly installed. As part of the deletion of Category E-D, moisture barriers have been included as a separate item under Examination Category E-A and are subject to general visual examination meeting the acceptance criteria of IWE-3510.

Historical Information:

1. IWE-2200(c) was deleted in the 1998 Edition. IWE-2200(c) addressed preservice examination requirements for surface examinations. Because Table IWE-2500-1 no longer contained any surface examination requirements, this requirement was deleted. Surface examination requirements had been applicable previously when IWE had weld-based examination requirements. These weld-based examination requirements no longer existed after the 1992 Addenda was published.
2. IWE-2200(g) was deleted in the 1998 Edition. IWE-2200(g) had required that "When paint or coatings are reapplied, the condition of the new paint or coating shall be documented in the preservice examination records." This had been interpreted to require that preservice examination requirements also applied following reapplication of paint or coatings to containment surfaces. This requirement was deleted for two reasons:
    a. An Owner's 10CFR50, Appendix B QA Program should be sufficient to ensure that containment coatings are applied adequately.
    b. Coatings application and removal are maintenance activities, and are not subject to the repair/replacement requirements of IWE-4000/7000. Activities that are not considered to be repair/replacement activities are not subject to preservice examination requirements.
3. Interpretation #XI-1-98-30, File #IN97-036 clarified that preservice examination requirements of IWE-2200 do not apply when seals, gaskets, and moisture barriers are repaired or replaced.

Date Revised: 11-24-2004

IWE-2300 VISUAL EXAMINATION, PERSONNEL QUALIFICATION, AND RESPONSIBLE INDIVIDUAL

IWE-2310 VISUAL EXAMINATIONS

IWE-2310(a) specifies that it is the Owner's responsibility to define specific requirements for visual examination of containment surfaces. Also provided is guidance on how to perform these examinations from permanent vantage points, without requiring the installation of temporary access to make surfaces accessible that would otherwise be inaccessible (as defined by IWE-1232(c)). Owners are cautioned to ensure that at least 80% of the pressure retaining boundary remains accessible for visual examination, as required by IWE-1231. It may be necessary for an Owner to provide temporary access if less than 80% of the containment pressure retaining boundary is accessible for visual examination.

IWE-2310(b): General visual examinations are performed in accordance with Table IWE-2500-1, Examination Category E-A.

IWE-2310(c): Detailed visual examinations are performed:

1. In accordance with Table IWE-2500-1, Examination Category E-C, Item E4.11 on surface areas accessible for visual examination.

2. To assess the condition of suspect areas detected by general visual examination. This detailed visual examination may be used to satisfy the requirement of IWE-3122.1 (Acceptance by Examination) when the acceptance standards established by the Owner for detailed visual examinations are met.

3. To assess the structural condition of areas affected by repair/replacement activities, as required by IWE-2200 and IWE-5240.

Historical Information:

1. In reviewing the organization of Subsection IWE, the working group determined that the inclusion of requirements for the performance of general visual examinations was inappropriately included in IWE-3500 ACCEPTANCE STANDARDS. Subsequently, along with the deletion of VT-1 and VT-3 examinations and establishment of general and detailed visual examinations for Examination Categories E-A and E-C respectively in the 1998 Edition, the working group removed the requirements from IWE-3500 and redefined the requirements in IWE-2300.

Date Revised: 9-18-02

IWE-2320 RESPONSIBLE INDIVIDUAL

It was the working group's belief that the Owner was in the best position to develop examination procedures and train personnel to perform the examinations. Thus, the responsibility for defining the requirements for visual examination of containment

surfaces rests with the Owner. Because the Owner has been given this responsibility, the working group believed that one individual knowledgeable in the requirements for design, inservice inspection, and testing must be in charge of the program. 10 CFR Part 50, Appendix J, required a general inspection of the containment prior to a Type A test. However, Appendix J did not contain any specific examination requirements, and there was no single individual responsible for this inspection. The general visual examination in Subsection IWE was developed to be used to satisfy the Appendix J general inspection. The working group believed that the Responsible Individual (IWE-2320) would ensure that the Subsection IWE general visual examination was conducted properly, with sufficient detail. It is presumed that many Owners had previously performed 10CFR50, Appendix J general visual examinations in a cursory manner.

Examination Category E-A, Containment Surfaces, has been extensively reworked in order to give the appropriate emphasis to this 100% general visual examination of the containment. This examination is not a cursory look at the containment, but a thorough examination of the accessible containment surfaces, including coated and uncoated surfaces of base metal, weld metal (at the same time the base metal is being examined), moisture barriers including the concrete-to-metal interface areas, the reinforcing structure, attachment welds, the bellows including bellows seal circumferential welds. This purpose of this examination is to detect evidence of degradation which may affect either the containment structural integrity or leak-tightness. Paint and coatings are addressed by Subsection IWE because distress of the paint or coating is a possible indicator of base metal degradation.

The General Visual Examination of the containment required by Subsection IWE is not meant to be a duplication of the General Visual Examination required by Appendix J, (i.e., these are not two separate examinations, but are the same examination with the exception of consideration of those items that are defined as not performing a pressure retaining function that may impact containment leak tightness). The Appendix J General Visual Examination as it is generally being performed is a cursory examination not capable of detecting the types of containment degradation which are being reported. Hence, the specifics of which containment components are to be examined and how to examine those components are contained in Subsection IWE (i.e., with the other ISI criteria).

On occasion, the Type A test is conducted at the beginning of an outage. In those cases, a general visual examination of the containment must first be performed in order to satisfy the requirements of Appendix J. It is recognized that the Type A test is on the critical path, and that performing all of the examinations required by Subsection IWE may result in a longer schedule for the Type A test. Should an Owner choose to do so, it would be acceptable to perform an Appendix J general visual examination of the containment prior to the Type A test, and then perform a detailed Subsection IWE general visual examination at a later time. The cursory general visual examination of

Appendix J would not satisfy the requirements of Subsection IWE, but this approach would solve the time problem at the beginning of the outage.

Subsection IWE requires that the "Responsible Individual" perform or direct all general and detailed visual examinations. The requirement that this individual be a Registered Professional Engineer has been deleted from IWE. These visual examinations can be performed in one of two ways: by the Responsible Individual with the requisite knowledge, or by personnel under the direction of the Responsible Individual. This requirement is a departure from the manner in which ISI is performed for other classes. Having a Responsible Individual who is knowledgeable in the requirements for design, inservice inspection, and testing of Class MC components and liners of Class CC components will provide a degree of oversight not typically associated with ISI inspections. This approach has a number of advantages. The Code requirements do not have to be as prescriptive. With the oversight provided by the Responsible Individual, specific details on how to conduct containment examinations can be left to the Owner who is in the best position to make many of the determinations. The Responsible Individual should be qualified to make judgments regarding acceptability and the need for further examinations and the type of examinations needed.

This requirement is a departure from the manner in which ISI is performed for ASME Code Class 1, 2, and 3 systems. Having a Responsible Individual who is knowledgeable in the requirements for design, inservice inspection, and testing of Class MC components and liners of Class CC components will provide a degree of oversight not typically associated with ISI inspections. This approach has a number of advantages. The Code requirements do not have to be as prescriptive. With the oversight provided by the Responsible Individual, specific details on how to conduct containment examinations can be left to the Owner who is in the best position to make many of the determinations. The Responsible Individual should be qualified to make judgments regarding acceptability and the need for further examinations and the type of examinations needed.

Historical Information:

1. IWE-2320 was added in the 1998 Edition.

Date Revised: 9-18-02

IWE-2330 PERSONNEL QUALIFICATION

Examinations need not be performed solely by NDE personnel because VT-1 and VT-3 visual examination requirements have been deleted and replaced by the general and detailed visual examinations in Subsection IWE. The general and detailed visual examinations may be performed by engineering personnel. However, the conduct of these visual examinations must be directed by the Responsible Individual. In addition, visual examination requirements have been added for all personnel that perform visual examinations.

Historical Information:

1. IWE-2330 was added in the 1998 Edition.
2. Visual acuity requirements for examination personnel were added in the 2001 Edition.

Date Revised: 9-18-02

IWE-2400 INSPECTION SCHEDULE

All U.S. plants follow Inspection Program B. Examinations may be performed during plant outages. This requirement does not prohibit the performance of examinations during plant operation. Please note that when the general visual examination required by Table IWE-2500-1, Examination Category E-A, Item E1.11 is performed prior to the 10CFR50, Appendix J Type A Test (and the examination is to be credited for satisfying the requirements of 10CFR50, Appendix J), the examination may be restricted to the plant outage during which the Type A Test is to be performed. Owners are cautioned to ensure that the requirements of 10CFR50, Appendix J and Subsection IWE are met when these examinations are to satisfy both the regulation and the Code.

Historical Information:

1. Prior to the 1998 Edition, Table IWE-2500-1, Examination Category E-A, Item E1.12 and E1.20 examinations had been required to be performed "100% End of Interval". Additionally, deferral of these VT-3 examinations was not permissible. The Working Group - Containment had determined that the frequency requirement to perform 100% of the examinations by the End of Interval meant that these examinations were required to be performed during the 3rd inspection period of each interval. Thus, Code Case N-601 was developed as an alternative to permit the VT-3 examinations to be performed at any time during the interval provided that the requirements for successive inspections in IWE-2420 are met.

Date Revised: 9-18-02

IWE-2410 INSPECTION PROGRAM

IWE-2411 Inspection Program A

Table IWE-2411-1 specifies one of 2 acceptable methods for establishing inspection intervals and inspection periods. This table also specifies minimum percentage of examinations required to be performed and maximum percentage of examinations that can be credited during each interval and period. Currently, these percentages apply only to the following examinations:

1. Table IWE-2500-1, Examination Category E-A, Item E1.12 and E1.20 examinations. Please note that these examinations may be deferred to the end of the interval, which means that these examinations, if deferred, shall be performed during the 3rd period. See discussion under IWE-2400 and Code Case N-601.

2. Table IWE-2500-1, Examination Category E-C, Item E4.11 examinations performed during the 1st Inspection Interval only.

Historical Information:

1. Prior to the 1998 Edition, Deferral to End of Interval was "N/A" for Table IWE-2500-1, Examination Category E-A, Item E1.12 and E1.20 examinations. These examinations were required to be performed in the 3rd period, as discussed in IWE-2400 above.

Date Revised: 9-18-02

IWE-2412 Inspection Program B

Table IWE-2412-1 specifies the second of 2 acceptable methods for establishing inspection intervals and inspection periods. This table also specifies minimum percentage of examinations required to be performed and maximum percentage of examinations that can be credited during each interval and period. All U.S. plants currently follow Inspection Program B. Please note that the minimum percentage of examinations required to be performed and maximum percentage of examinations that can be credited during each interval and period apply to those examinations discussed in IWE-2411 above.

Date Revised: 9-18-02

IWE-2420 SUCCESSIVE INSPECTIONS

IWE-2420(b) Items with flaws, and areas of degradation that are accepted by evaluation in accordance with IWE-3122.3, these items or areas of degradation shall be examined in accordance with Table IWE-2500-1, Examination Category E-C during the next inspection period.

IWE-2420(c) The requirements for reexamination of augmented examination areas has been revised to be consistent with Class 1 and 2 such that only one additional examination is required during the next inspection period before the item can be removed from an Owner's augmented examination program. The committee believed that this would be sufficient since a root cause analysis is required in addition to the repair plan. As part of the repair plan, the Code requires a suitability of repair evaluation which includes a consideration of the repair over the plant's lifetime. Areas that have been evaluated and removed from the augmented examination program after successful completion of two examinations may be subject to augmented examination during successive Inservice Inspection Intervals if an Owner determines that conditions which could cause degradation in these areas still exist.

Historical Information:

1. Prior to the 1998 Edition, IWE-2420(b) also applied to areas that were repaired to meet the acceptance standards of the Code. As a result, these repaired areas had been required to be examined in accordance with Table IWE-2500-1, Examination Category E-C for 3 consecutive

periods. The Working Group believed that this requirement was excessive, especially for areas that had been repaired that continued to meet the acceptance standards of IWE-3000.

2. IWE-2420(c) was revised in the 1998 Edition to require that the flaws or areas of degradation remain essentially unchanged for the next inspection period. Prior to the 1998 Edition, IWE-2420(c) had required that these areas be examined for 3 consecutive inspection periods.

Date Revised: *9-18-02*

IWE-2500 EXAMINATION AND PRESSURE TEST REQUIREMENTS

IWE-2500(a): Examination methods for IWE examinations shall comply with Table IWE-2500-1.

Historical Information:

1. Reference to seals, gaskets, and bolts were removed from IWE-2500(a) in the 1998 Edition in conjunction with the deletion of Table IWE-2500-1, Examination Category E-D and E-G. Seals and gaskets are not Code items and are not associated with the pressure retaining function as defined by ASME III & ASME XI. However, Owners should consider whether accessible surfaces of seals and gaskets, including those used to insulate conductors on electrical penetrations, should be examined during Table IWE-2500-1, Examination Category E-A examinations.

Date Revised: *9-18-02*

IWE-2500(b): This paragraph now addresses requirements for items subject to augmented examination in accordance with IWE-1242 and Table IWE-2500-1, Examination Category E-C.

Historical Information:

1. Prior to the 1998 Edition, IWE-2500(b) had required that paint or coatings be visually examined in accordance with Table IWE-2500-1 prior to removal. This requirement essentially imposed ASME Code inspection requirements on non-Code maintenance activities. In conjunction with the elimination of IWE-2200(g) preservice examinations for paint or coatings, the IWE-2500(b) inservice inspection requirements were also deleted.

Date Revised: *9-18-02*

IWE-2500(b)(1): This paragraph was revised to clarify that only those sides of a component that are subject to augmented visual examination need be examined. There had been some confusion as to whether earlier editions and addenda of the Code required that both sides of a component be visually examined in accordance with IWE-2500-1, Examination Category E-C, Item E4.11 when only one side of the component was subject to conditions which warrant augmented examination. This was clearly not the intent, and this requirement was clarified in the 2001 Edition. A detailed visual examination is required for surface areas subject to augmented visual examination. The term "Surface Area" in IWE-2500(b)(1) and (2) applies to a single side of a component or part. Components and parts that are accessible on both sides have 2 surface areas.

Historical Information:

1. The 1998 Edition deleted provisions of IWE-2500(b) that required that "When paint or coatings are to be removed, the paint or coatings shall be visually examined in accordance with Table IWE-2500-1 prior to removal". Reasons for deleting this requirement include the following:
   a. IWE-2600(b) requires an Owner to ensure that coatings removal will not have a detrimental effect on the component.
   b. An Owner's 10CFR50, Appendix B QA Program should be sufficient to ensure that containment coatings are removed and reapplied adequately.
   c. Coatings application and removal are maintenance activities, and are not subject to the requirements of Section XI.
2. Prior to the 1998 Edition, the requirements currently found in IWE-2500(b) had been located in IWE-2500(c). Prior to the 1998 Edition, IWE-2500(c)(1) had required a VT-1 visual examination to be performed on surfaces subject to augmented visual examination in accordance with Table IWE-2500-1, Examination Category E-C, Item E4.11. This VT-1 examination has been replaced with a detailed visual examination. This change permits qualified personnel other than NDE certified visual examiners to perform visual examinations (under the direction of the Responsible Individual specified in IWE-2320).

Date Revised: 9-18-02

IWE-2500(b)(2): This paragraph was revised to clarify that only that side of a component that is subject to augmented examination is required to be examined. When the side requiring augmented examination is not accessible for visual examination, an ultrasonic thickness measurement method shall be used. This examination is performed from the side of the component that is accessible. There had been some confusion as to whether earlier editions and addenda of the Code required that ultrasonic thickness measurement be performed whenever either side of a component was inaccessible, whether or not the inaccessible side was subject to conditions which warrant augmented examination. This was clearly not the intent, and this requirement was clarified in the 2001 Edition. The term “Surface Area” in IWE-2500(b)(1) and (2) applies to a single side of a component or part. Components and parts that are accessible on both sides have 2 surface areas.

IWE-2500(b)(3): This paragraph specifies requirements for size and location of UT grids. Comments were received that attachments to the containment and other obstructions would prohibit the use of even a one foot square grid in some circumstances, so the requirement of IWE-2500(b)(3) was revised in the 2001 Edition to allow smaller grids to be used. This will enable an Owner to establish grids that avoid interferences such as structural obstructions

Historical Information:

1. In the 1998 Edition, additional specific requirements were added in Table IWE-2500-2. This table had been used to specify requirements for ultrasonic thickness examinations. This table specified that for ultrasonic thickness examination of contiguous areas not exceeding 100 square feet, grids should be established to enclose the examination area, and that all grid line intersections must be examined. Spacing of grid lines was established such that a minimum of 100 measurements were

to be obtained on each area subject to UT examination. Table IWE-2500-2 was deleted in the 2001 Edition because it was believed that the provisions currently incorporated into IWE-2500(b)(3) allow greater flexibility by the Owner in establishing UT grid sizes, numbers, and locations. In addition, IWE-2500(b)(4) provides guidance to Owners on establishing sampling plans for UT examinations on potentially large areas of containment. These newer provisions essentially replace those previously found in Table IWE-2500-2.

Date Revised: 9-18-02

IWE-2500(b)(4): Ultrasonic thickness measurements (UT) are to be performed at locations which are inaccessible for direct visual examination and which are subject to, or likely to experience, accelerated degradation and aging. Owners shall determine the total area subject to augmented examination, and shall determine the size of each contiguous examination area subject to ultrasonic thickness examination. UT measurement locations shall be marked or recorded so that periodic reexaminations may be performed. This paragraph also provides criteria for an Owner to use when establishing sampling plans for UT examination of potentially large areas.

Historical Information:

1. IWE-2500(b)(4) was added in the 2001 Edition and replaces UT sampling plan provisions previously contained in Table IWE-2500-2.

Date Revised: 9/18/02

IWE-2600 CONDITION OF SURFACE TO BE EXAMINED

Paint or coating distress may be a sign of base metal degradation. The intent is that, if surfaces are painted or coated, these examinations shall be performed without removing the paint or coatings. Although degradation of paint or coatings could be an indicator of possible degradation of the base metal or welds, the visual examinations required by IWE-2500 are not performed to assess the condition of the paint or coatings. IWE-2500 visual examinations should identify damaged paint or coatings as possible indicators of base metal degradation that warrant further close-up detailed visual examination to assess the condition of the base metal. Adverse paint or coatings conditions should be addressed by an Owner's maintenance program.

Historical Information:

1. IWE-2600(b) was revised in the 1998 Edition to delete the requirement that "Reapplied paint and coating systems shall be compatible with the existing system, and shall be examined in accordance with IWE-2200(g)". This change was made in conjunction with the deletion of IWE-2200(g) and because an Owner's QA Program should be sufficient to ensure the compatibility of paint or coating systems with the existing system. Furthermore, the removal or reapplication of paint or coatings is not a Section XI repair/replacement activity for which a preservice examination would be required.
2. Interpretation #XI-1-98-14, File #IN97-022 clarifies that coatings removal and repair is not a Section XI repair/replacement activity subject to the requirements of IWA-4000. This interpretation also clarifies that IWA-4000 and IWA-7000 do not apply to seals, gaskets, and moisture barriers.

Date Revised: 9/18/02

TABLE IWE-2500-1, EXAMINATION CATEGORY E-A, CONTAINMENT SURFACES

General visual examination of all accessible interior and exterior surfaces of the containment shall be performed during each inspection period. These examinations are not intended to be a cursory examination and should be conducted to the extent necessary to detect conditions on all containment surfaces which could adversely affect the containment structural integrity or leak-tightness.

General visual examinations of wetted surfaces of submerged areas, and BWR Vent System accessible surface areas shall be examined 100% each interval, in accordance with provisions of IWE-2411 or IWE-2412, except that these examinations may be deferred until the end of the inspection interval (shall be performed during the 3rd inspection period).

Containment items subject to the examinations of Category E-A include those items and areas identified in the footnotes to the table. Seals and gaskets are excluded from requirements for general visual examination invoked by Category E-A since seals and gaskets are defined, by ASME III & ASME XI, as not being associated with the pressure retaining function. The physical condition and acceptability of seals and gaskets is a function of the Owner's program(s) for containment general visual inspection and pressure testing for determination of containment leak tight integrity in accordance with 10CFR50, Appendix J. This is consistent with the deletion of Examination Category E-D from Table IWE-2500-1.

Moisture barriers are not considered as a seal or gasket. Moisture barriers are included based on the number of occurrences where the moisture barriers have lost their ability to stop water intrusion against inaccessible containment surfaces (e.g., at the concrete to shell interface). This has resulted in corrosion of metal containments and the liners of concrete containments. Because these barriers are crucial to the protection of embedded or otherwise inaccessible containment surfaces, exposed surfaces of moisture barriers are required to be examined to assure structural integrity and leak tightness. Please note that moisture barriers are not subject to the repair/replacement requirements of Section XI. As part of the deletion of Category E-D, moisture barriers have been included as a separate item under Examination Category E-A and are subject to general visual examination meeting the acceptance criteria of IWE-3510. Adequate inspection and maintenance of these moisture barriers eliminates the need to evaluate the condition of embedded or inaccessible areas.

Moisture barriers are not addressed under other requirements (e.g. the USNRC Maintenance Rule). Examination of inaccessible portions of moisture barriers is not required, unless specified as a result of the engineering evaluation performed in IWE-

3122.3.

Historical Information:

1. The following historical information pertains to requirements of Table IWE-2500-1, Category E-A, prior to the 1998 Edition:
    a. Items E1.12 and E1.20 required a VT-3 visual examination. This VT-3 visual examination was changed to a general visual examination in the 1998 Edition.
    b. Footnote (1) permitted visual examinations to be performed from either the inside or outside surface of the component. It was recognized that 10CFR50, Appendix J requires that both interior and exterior surfaces be examined, so the Working Group - Containment deleted this footnote in the 1998 Edition.
2. Interpretation #XI-1-98-24, File #IN97-032 clarifies that IWA-2210 and IWA-2300 do not apply for qualification of personnel performing general visual examinations in accordance with Table IWE-2500-1, Examination Category E-A.
3. Interpretation #XI-1-98-71, File #IN99-001 clarifies the intent of Table IWE-2500-1 "Accessible Surface Areas".

Date Revised: 9/18/02

TABLE IWE-2500-1, EXAMINATION CATEGORY E-B, PRESSURE RETAINING WELDS

This examination category has been deleted.

Historical Information:

1. This table was deleted in the 1998 Edition. Because all of the welds identified in this table are part of the pressure-retaining boundary of the containment, it was felt that accessible welds would be examined in conjunction with the general visual examination specified in Table IWE-2500-1, Examination Category E-A. Table IWE-2500-1, Examination Category E-A was revised in the 1998 Edition to clarify that these welds should be examined, as specified in the table footnotes. The previous examination requirement was a VT-1 visual examination.

Date Revised: 9/18/02

TABLE IWE-2500-1, EXAMINATION CATEGORY E-C, CONTAINMENT SURFACES REQUIRING AUGMENTED EXAMINATION

This category specifies the requirements for visual and volumetric examination of areas subject to augmented examination.

Examination requirements for Item 4.12 have been revised to reflect provisions for volumetric examination of large areas of containments.

Historical Information:

1. The visual examination requirements for Item E4.11 have been changed to "detailed visual" to permit visual examinations to be performed by personnel other than NDE certified visual examiners, as discussed in previous sections. This change was made in the 1998 Edition.

Date Revised: 9/18/02

TABLE IWE-2500-1, EXAMINATION CATEGORY E-D, SEALS, GASKETS, AND MOISTURE BARRIERS

This examination category has been deleted.

Historical Information:

1. General Information:
   a. ASME Section III, NE-2100 (from 1971 Edition, Summer 1972 Addenda to the present) identifies seals and gaskets as non-ASME materials not associated with the pressure retaining function and exempts them from ASME III requirements. ASME Section XI, IWA-4111(b)(5) correspondingly identifies seals and gaskets as non-pressure retaining materials exempt from the ASME XI rules for repair and replacement. Subsequently, seals and gaskets are not subject to the rules of ASME III or XI. Since ASME XI, IWE is applicable to pressure retaining items and seals and gaskets are specifically considered as non-ASME, non-pressure retaining, Category E-D has been deleted. Category E-D has been deleted with the understanding that 10CFR50, Appendix J pressure testing is adequate to assure the leak-tightness of seals and gaskets.
   b. Moisture barriers are not considered as a seal or gasket. The concrete-to-metal interface areas are required to be examined to assure structural integrity or leak tightness and moisture barriers at these locations are included as a separate Item #E1.30 in Table IWE-2500-1, Examination Category E-A, and are subject to general visual examination meeting the acceptance criteria of IWE-3510. Moisture barriers are not subject to the rules for repair/replacement of IWA-4000.
2. The committee changed Footnote (1) to Table IWE-2500-1, Examination Category E-D in the 1993 Addenda to clarify that connections did not have to be disassembled solely for the purpose of performing a visual examination.
3. Interpretation #XI-1-98-35, File #IN98-015 clarified that ceramic insulators of containment electrical penetrations (which perform a containment pressure retaining function) are not required to be examined in accordance with Table IWE-2500-1.

Date Revised: 9/18/02

TABLE IWE-2500-1, EXAMINATION CATEGORY E-F, PRESSURE RETAINING DISSIMILAR METAL WELDS

This examination category has been deleted.

Historical Information:

1. Pressure-retaining dissimilar metal welds as a separate category was eliminated. The previous requirement for surface examination of these welds has been eliminated, and a requirement for the surface of the weld to be visually examined during the general visual examination of the containment surfaces has been added to Examination Category E-A. Category E-F was deleted in the 1998 Edition.

Date Revised: 9-18-02

TABLE IWE-2500-1, EXAMINATION CATEGORY E-G, PRESSURE RETAINING BOLTING

This examination category has been deleted.

Historical Information:

1. Pressure-retaining bolting as a separate category was deleted in the 1998 Edition, and the examination requirements for pressure-retaining bolting have been consolidated into Category E-A. Examination of pressure-retaining bolting does not require removal or disassembly, and only those exposed surfaces of bolting materials need be examined.
2. Interpretation #XI-1-98-35, File #IN98-015 clarifies that mechanical/threaded connections associated with electrical penetrations are not required to be examined in accordance with Table IWE-2500-1, Examination Category E-G.
3. Interpretation #XI-1-98-45, File #IN98-022 clarifies the it is not a requirement of Table IWE-2500-1, Examination Category E-G, Item E8.10 that a VT-1 examination be performed on a bolted connection when it is disassembled if this visual examination has already been performed on the connection during the interval, with the bolting in place under tension.

Date Revised: 9/18/02

TABLE IWE-2500-1, EXAMINATION CATEGORY E-P, ALL PRESSURE RETAINING COMPONENTS

This examination category has been deleted.

Historical Information:

1. This category was included originally as a reminder for the Appendix J requirements (i.e., to have a listing in Subsection IWE of all of the pertinent requirements). However, including these requirements was found to raise more questions than the examination category answered, and it has been deleted. The requirements of 10CFR50, Appendix J apply, regardless of whether Category E-P specifies these pressure tests.

Date Revised: 9/18/02

TABLE IWE-2500-2, ULTRASONIC THICKNESS MEASUREMENTS FOR AUGMENTED EXAMINATIONS

This Table has been deleted.

Historical Information:

1. This table was not in earlier versions of Subsection IWE. IWE-2500(b)(2) requires that areas which are accessible from one side only must be examined for wall thinning using an ultrasonic thickness measurement method. In addition, earlier versions of Subsection IWE (IWE-2500(b)(3)) required that one foot square grids were to be used. It was realized that for some types of containments, extremely large surface areas could be subject to ultrasonic thickness measurements. Table IWE-2500-1 was developed to provide a basis for the Owner to create a sampling program for those areas greater than 100 square feet. The location and size of area to be examined is to be determined by the Owner. Given factors such as (1) each containment type may have particular areas where aggressive aqueous solutions are more likely to collect, and (2) the

differences in plate thicknesses between sections, the working group believed that the Owner was in the best position to determine the particular locations for sampling.

2. Table IWE-2500-2 was deleted in the 2001 Edition. Sampling plan requirements previously contained in Table IWE-2500-2 have been eliminated. New requirements for UT examination sampling plans were added to IWE-2500(b)(4) .

Date Revised: 9-18-02

ARTICLE IWE-3000
ACCEPTANCE STANDARDS

IWE-3100 EVALUATION OF EXAMINATION RESULTS

IWE-3110 PRESERVICE EXAMINATIONS

IWE-3111 General

IWE-3112 Acceptance

Components may be accepted by examination if flaws or degradation are not detected, or if flaws or areas of degradation are detected that do not exceed the acceptance standards of IWE-3500. Flaws and areas of degradation shall be recorded.
Components with flaws or areas of degradation that exceed the acceptance standards of IWE-3500 shall be corrected by repair/replacement activity prior to resumption of service.

Historical Information:

1. Comments were received that the acceptance standards contained in the 1992 Edition with the 1992 Addenda were not really acceptance standards but merely restating conditions to be noted during an examination. The Acceptance Standards of IWE-3500 were rewritten in an attempt to provide more realistic acceptance standards. It should be noted, however, that these acceptance standards still are somewhat nebulous because it is the Responsible Individual that is ultimately in charge of developing the acceptance standards to be used at a facility.

Date Revised: *9-18-02*

IWE-3114 Repair/Replacement Activity and Reexamination

IWE-3115 Review by Authorities

Historical Information:

1. IWE-3115 was deleted in the 1998 Edition.

Date Revised: *9-18-02*

IWE-3120 INSERVICE EXAMINATIONS

IWE-3121 General

IWE-3122 Acceptance

IWE-3122.1 Acceptance by Examination

IWE-3122.2 Acceptance by Repair/Replacement Activity

Historical Information:

1. IWE-3122.2 (Acceptance by Repair) and IWE-3122.3 (Acceptance by Replacement) were combined into IWE-3122.2 in the 1995 Addenda.

Date Revised: *9-18-02*

IWE-3122.3 Acceptance by Engineering Evaluation

If degradation is detected which does not meet the acceptance standards, continued service is allowed without repair provided that the degradation has no unacceptable effect on the structural integrity of the containment. However, if the nominal plate thickness of the base metal is reduced by more than 10%, the reduced thickness must be shown by analysis to satisfy the requirements of the Design Specifications to be acceptable by evaluation.

There are a number of reasons why 10% was selected as a screening criteria for conducting engineering evaluation and possibly performing repairs. The 10% limit in thickness reduction can be considered as a derivation from NE-3210.10 which allows a stress intensity of over 1.1 Smc for a specified area. A 10% increase in allowable stress means that a 10% reduction in thickness is acceptable since the design is based on elastic analysis.

Although the basis for applying the 10% criteria to metallic liners of concrete containments is not clear, the Working Group - Containment believed that this limit was reasonable. However, metallic shells of concrete containments may be able to withstand greater than a 10% loss and still satisfy the requirements of the original design specification and Construction Code. For these plants, the Owner may want to document an Engineering Evaluation that specifies the basis for allowable wall thinning. Although IWE-3511.3 still requires Owners to document the location of areas where 10% wall thickness loss has occurred (or is projected to occur), this evaluation could be cited for resolving and documenting the acceptability of these areas. Please note that there are some plants that credit some of their containment metallic liners for structural integrity. As a result, even the 10% limit specified in IWE-3122.3 may not be conservative for these plants.

IWE-3122.3(b) requires that areas accepted by evaluation be examined in accordance with IWE-2420(b) and (c). These areas shall be subject to augmented examination during the next inspection period in accordance with IWE-2420(b). IWE-2420(c) requires that these same areas be subject to augmented examination for one additional period after the initial augmented examination such that a total of 2 augmented examinations would be performed on areas initially accepted by evaluation. These areas would no longer require augmented examination after 2 successive augmented examinations if they remain essentially unchanged.

Historical Information:

1. Acceptance by Evaluation was moved from IWE-3122.4 to IWE-3122.3 in the 1995 Addenda.

Date Revised: *9-18-02*

IWE-3124 Repair/Replacement Activity and Reexamination

IWE-3125 Review by Authorities

This paragraph has been deleted.

Historical Information:

1. This paragraph was deleted in the 1998 Edition because enforcement authorities having jurisdiction at the plant site always have the authority to review the Owner's repair program and reexamination results. It was deemed unnecessary to specify this provision in the Code.

Date Revised: *9-18-02*

IWE-3130 INSERVICE VISUAL EXAMINATIONS

IWE-3200 SUPPLEMENTAL EXAMINATIONS

IWE-3400 STANDARDS

IWE-3410 ACCEPTANCE STANDARDS

IWE-3430 ACCEPTABILITY

IWE-3500 ACCEPTANCE STANDARDS

IWE-3510 STANDARDS FOR EXAMINATION CATEGORY E-A, CONTAINMENT SURFACES

IWE-3510.1 Visual Examinations - General

In reviewing the organization of Subsection IWE, the working group determined that the inclusion of requirements for the performance of general visual examinations was inappropriately included in IWE-3500 ACCEPTANCE STANDARDS. Subsequently, along with the deletion of VT-1 and VT-3 examinations and establishment of general and detailed visual examinations for Examination Categories E-A and E-C respectively, the working group removed the requirements from IWE-3500 and redefined the requirements in IWE-2300.

The requirements of IWA-2210 and IWA-2300 do not have to be met during the performance of a General Visual Examination. This is specified in IWE-2100, which

indicates that the requirements of IWA-2210, IWA-2300 are not mandatory for Table IWE-2500-1 visual examinations.

VT-3 visual examination requirements were deleted from Examination Category E-A because containment surfaces are too extensive to cost-effectively examine in this detail. Also, many containment surfaces are not subject to conditions that can cause accelerated degradation and aging, and therefore, do not warrant VT-3 visual examination. However, detailed visual examinations shall be performed when examining containment surfaces in accordance with the augmented examination program, and would be performed on degraded areas when evidence of degradation is discovered during general visual examinations. See IWE-2310 for specific information.

Distress of paint or coatings is a possible indicator of base metal degradation, but paint or coatings is not addressed as under Section XI. Owners should consider damaged paint or coatings as a possible indicator of potential base metal damage or degradation. However, damaged coatings (flaking, blistering, peeling paint, etc.) are not by themselves, indications that fail to meet the acceptance standards of IWE-3500. Owners should perform more detailed visual examinations, and/or perform an evaluation of affected areas that exhibit these conditions. If only the topcoating exhibits these conditions, the base metal may be acceptable and may very well meet the acceptance standards of IWE. When base metal is exposed as a result of coatings degradation, an Owner is now required to perform a detailed visual examination in accordance with IWE-2310(c)(2). If an engineering evaluation is performed to assess the acceptability of these conditions, supplemental surface or volumetric examinations may be required, as specified in IWE-3200. Please note that IWE-3510.1 no longer discusses coatings. The Owner is now responsible for establishing acceptance criteria for examination of coated surfaces.

Note: Although damaged coatings may not be an indicator that the containment metallic surfaces are degraded, Owners are cautioned to be aware of the potential impact of degraded (loose, flaking, delaminating) coatings on the operation of the Emergency Core Cooling and Containment Spray Systems. Reference NRC Generic Letter #98-04 and EPRI TR 109937 for additional information.

The committee has received several questions regarding the intent of Paragraphs IWE-3510.2, IWE-3510.3, IWE-3511.1, IWE-3511.2, IWE-3512.1, and IWE-3512.2; i.e., does Subsection IWE require an engineering evaluation for any area exhibiting any condition listed under the above paragraphs such as peeling paint. Because of the difficulty of codifying such conditions, Subsection IWE was written in a manner that only suspect areas as defined by the Owner need be accepted by engineering evaluation or corrected by repair/replacement. Please note that the above referenced paragraphs have been revised to assist in clarifying acceptance standards specified in IWE-3500.

Flaking, peeling, or blistering coatings should be considered a potential indicator of base metal degradation, and it is recommended that Owners address this when establishing acceptance criteria for general and detailed visual examination of containment surfaces.

Historical Information:

1. IWE-3510.1 was revised in the 1998 Edition to indicate that it is the Owner that is responsible for defining acceptance criteria for visual examination of containment surfaces. In conjunction with this change, IWE-2310 was revised to clarify visual examination requirements. In addition, IWE-2320 was added in the 1998 Edition to clarify the role of the "Responsible Individual". Prior to the 1998 Edition, the role of this individual was described only in IWE-3510.1.
2. Interpretation #XI-1-98-24, File #IN97-032 clarifies that it is not the intent of Table IWE-2500-1, Examination Category E-A and IWE-3510.1 that general visual examinations meet the requirements of IWA-2210 and that it is not the intent that IWA-2300 applies for qualification of NDE personnel.

Date Revised: 11-24-2004

IWE-3510.2 Visual Examination of Coated and Noncoated Areas

The Owner is responsible for establishing specific acceptance criteria for visual examination of coated and non-coated surfaces.

Historical Information:

1. IWE-3510.2 was revised in the 1998 Edition. This change added a new provision that required the Owner to establish specific acceptance criteria for visual examinations.
2. VT-3 visual examination requirements have been deleted from Examination Category E-A because containment surfaces are too extensive to cost-effectively examine in this detail. Also, many containment surfaces are not subject to conditions that can cause accelerated degradation and aging, and therefore, do not warrant VT-3 visual examination. However, detailed visual examinations shall be performed when examining containment surfaces in accordance with the augmented examination program, and would be performed on degraded areas when evidence of degradation is discovered during general visual examinations.

Date Revised: 9-18-02

IWE-3510.3 Visual Examination of Pressure-Retaining Bolting

Acceptance criteria for pressure-retaining bolting were added to IWE-3510 in conjunction with elimination of Examination Category E-G in the 1998 Edition. Exposed surfaces of pressure-retaining bolting are to receive a general visual examination during each inspection period. Any evidence of degradation which could affect the containment leak-tight or structural integrity must be evaluated. Bolting which is subject to degradation shall also require augmented examination in accordance with IWE-2420(b) and (c). Bolting need not be disassembled to perform these examinations, and only those portions of bolting that are exposed to environmental conditions require examination. Local pressure tests of bolted and gasketed joints performed in accordance with 10CFR50, Appendix J demonstrate containment leak-tight integrity. These visual examinations are performed to evaluate any inservice environmental effects that could

adversely affect the performance of bolted and gasketed joints on containment penetrations which have been adequately assembled and tested.

Bolting has been included in Subsection IWE because pressure-retaining bolting is not routinely addressed under current licensee programs (e.g., 10CFR50, Appendix B) unless the connection was disassembled for some reason. The committee believes it prudent to perform a visual examination for evidence of boric acid crystals, for example.
Historical Information:

The requirement to perform a bolt torque or tension test was deleted in the 1998 Edition in conjunction with the deletion of Table IWE-2500-1, Examination Category E-G.

Date Revised: 9-18-02

IWE-3510.4 Visual Examination of Moisture Barriers

Historical Information:

1. Examination Category E-D and the corresponding acceptance criteria of IWE-3513 for seals, gaskets and moisture barriers were deleted in the 1998 Edition. Requirements for general visual examination of moisture barriers was added as a separate item in Examination Category E-A with acceptance criteria being added to IWE-3510.

Date Revised: 9-18-02

IWE-3511 Standards for Examination Category E-C, Containment Surfaces Requiring Augmented Examination

IWE-3511.1 General

Visual examination on coated areas - Distress of paint or coatings is a possible indicator of base metal degradation, but paint or coatings is not addressed under Section XI. When base metal is exposed as a result of coatings degradation, an evaluation of the area must be performed. Please note that IWE-3511.1 has been revised and that reference to coatings acceptance standards has been deleted from this paragraph.

IWE-3511.2 Visual Examination of Coated and Noncoated Areas

The Owner is responsible for establishing specific acceptance criteria for visual examination of coated and non-coated surfaces.

Historical Information:

1. IWE-3511.2 was revised in the 1998 Edition. This change added a new provision that required the Owner to establish specific acceptance criteria for visual examinations.
2. VT-1 visual examination requirements have been deleted from Examination Category E-C in the 1998 Edition.

Date Revised: 9-18-02

IWE-3511.3 Ultrasonic Examination

Subsection IWE requires ultrasonic thickness measurements in two cases:

1. When an area subject to Augmented Examination in accordance with IWE-1240 is accessible from one-side only (IWE-2500(b)(2)).
2. To determine the minimum wall thickness of an area after degradation has been detected, if specified as a result of the engineering evaluation of the degraded area, as required by IWE-3200.

These requirements apply to both Class MC and metallic liners of Class CC components.

Historical Information:

1. Prior to the 1998 Edition, IWE-3511 contained requirements for acceptance standards for Examination Category E-B, Pressure Retaining Welds. Requirements for pressure retaining welds were deleted in the 1998 Edition in conjunction with the deletion of Table IWE-2500-1, Examination Category E-B. There is no evidence that these welds are experiencing any sort of degradation. Operating experience with piping systems subject to similar operating temperature and pressure to that of the containment also indicates that the welds have not experienced degradation. However, these welds are to be visually examined during the general visual examination of the containment base metal surfaces in accordance with Examination Category E-A.
2. In the 1995 Addenda this paragraph (numbered IWE-3512.3 at the time) was revised to indicate that it was applicable to Class MC components. In doing this, it became unclear whether these requirements were applicable to metallic liners of Class CC components. A number of industry comments indicated that the 10% wall thickness loss criteria was too strict for metallic liners that are generally 1/4" to 3/8" in thickness. However, the NRC imposed a modification [10CFR50.55a(b)(2)(ix)(I)] which required that this criteria also apply to metallic liners.
3. In the 2004 Edition, IWE-3511.3 was revised to clarify that these requirements apply to both Class MC components and to metallic shell and penetration liners of Class CC components. *(Reference: WG/C-E 00-02, SG/WCS 01-05, BC03-719).*

Date Revised: *11/24/04*

IWE-3513 Standards for Examination Category E-D, Seals, Gaskets, and Moisture Barriers

IWE-3513 has been deleted.

Historical Information:

1. IWE-3513 was deleted in the 1998 Edition in conjunction with the deletion of Table IWE-2500-1, Examination Category E-D. Examination requirements for seals and gaskets were deleted in their entirety, and examination requirements for moisture barriers were incorporated into Table IWE-2500-1, Examination Category E-A.
2. Interpretation #XI-1-98-27, File #IN97-035 clarified that repair and replacement of seals, gaskets, and moisture barriers is not an activity subject to the requirements of IWA-4000.

Date Revised: *9-18-02*

IWE-3514 Standards for Examination Category E-F, Pressure Retaining Dissimilar Metal Welds

IWE-3514 has been deleted.

Historical Information:

1. IWE-3514 was deleted in the 1998 Edition in conjunction with the deletion of Table IWE-2500-1, Examination Category E-F.

Date Revised: *9-18-02*

IWE-3515 Standards for Examination Category E-G, Pressure Retaining Bolting

IWE-3515 has been deleted.

Historical Information:

1. IWE-3515 was deleted in the 1998 Edition in conjunction with the deletion of Table IWE-2500-1, Examination Category E-G. Pressure retaining bolting should now be examined in conjunction with Table IWE-2500-1, Examination Category E-A to the extent that accessible surfaces of this bolting is considered part of the containment pressure boundary.

Date Revised: *9-18-02*

ARTICLE IWE-4000
REPAIR PROCEDURES

This Article has been deleted. The requirements of IWA-4000 apply.

Historical Information:

1. IWE-4000 was deleted in the 1994 Addenda.
2. Interpretation #XI-1-98-14, File #IN97-022 clarifies that coatings removal and repair is not a Section XI repair/replacement activity subject to the requirements of IWA-4000. This interpretation also clarifies that IWA-4000 and IWA-7000 do not apply to seals, gaskets, and moisture barriers.

Date Revised: 9-18-02

ARTICLE IWE-5000
SYSTEM PRESSURE TESTS

IWE-5200 SYSTEM TEST REQUIREMENTS

IWE-5210 GENERAL

Historical Information:

1. IWE-5210 was revised in the 2005 Addenda to delete reference to the exception noted in IWE-5240. The result of this revision is that IWE-5210 now clearly indicates that IWA-5000 does not apply. (Reference: BC03-1726).

Date Revised: *01-24-07*

IWE-5220 TESTS FOLLOWING REPAIR/REPLACEMENT ACTIVITIES

IWE-5221 Leakage Test

10 CFR 50, Appendix J requires a pneumatic leakage test after any major modification, or replacement of a component which is part of the primary reactor containment boundary. Neither Appendix J nor Subsection IWE requires that a containment Structural Integrity Test (SIT) be performed, nor is the SIT test pressure specified. The USNRC has been reviewing major containment repairs and subsequent pressure testing on a case-by-case basis. Containments whose design pressure is increased will need to evaluate the necessity of performing an SIT following the rerating of the containment, with or without any physical modification.

Owners are cautioned to ensure that system pressure tests specified by Subsection IWL-5000 are also met when the repair/replacement activity affects the concrete containment. See IWL-5000 for more specific information.

Historical Information:

1. Interpretation #XI-1-95-34, File #IN95-009 clarifies that the leakage test required by IWE-5221 is the only Section XI pressure test required following pressure boundary repair/replacement activities, including rewelding of the primary reactor containment following steam generator replacement activities.

Date Revised: *9-18-02*

IWE-5222 Deferral of Leakage Tests

This paragraph addresses appropriate repair criteria which is not specifically provided in 10CFR50, Appendix J. In addition, the committee believes that the criteria for deferring a leakage test is a sensible approach to scheduling a test after a repair. The tests can only deferred until the next scheduled leakage rate test if nondestructive examination is performed, and only for the three minor repairs or modifications cited.

Repair of welds attaching penetrations that are NPS 1 or smaller precludes an Owner from adding a NPS 1 or smaller penetration at a small area of degradation (e.g., a penetration is added where a small area of repairable degradation has been detected to avoid repairing and then having to conduct the pressure test).

Currently, the three exemptions listed in IWE-5222 are similar to, but not identical to, exemptions permitted by 10CFR50, Appendix J, Option B. Option B references Regulatory Guide 1.163 which references NEI 94-01. NEI 94-01 specifies exemptions which are endorsed by the NRC. Please note that there is a difference between the exemption in IWE-5222(c) and that currently specified in NEI 94-01. Owners should use care in determining whether an exemption satisfies both the requirements of IWE-5222 and 10CFR50, Appendix J.

Date Revised: 9-18-02

IWE-5240 VISUAL EXAMINATION

This paragraph originally required that the visual examination requirements of IWA-5246 apply. This IWA-5246 paragraph was subsequently moved to IWA-5240. The requirement of IWE-5240 thus implied that a VT-2 visual examination be performed during the pneumatic pressure test required by IWE-5000. In the 1998 Edition, this requirement was changed to require that a detailed visual examination (IWL-2310) be performed during the pressure test required by IWE-5220. This visual examination was intended to verify the structural integrity of the area affected by the repair/replacement activity and would be the second visual examination of an area to be conducted. The 100% general visual examination of the containment would have detected degradation which subsequently was determined to be a repairable condition. IWE-5240 would then require a visual examination of the repaired area only, not a visual examination of the entire containment.

Historical Information:

1. Interpretation #XI-1-98-15, File #IN97-015 clarifies that a VT-2 visual examination is required only following containment repair, replacement, or modification.
2. WG/C-E 98-10, SGWCS 03-04, ISI 98-35, BC03-1726 (Inquiry #IN02-001). A summary of the Technical Justification for this action is provided below:

   The inquiry was submitted to help clarify when VT-2 visual examinations are required by IWE-5240, and to seek clarification as to whether it is the intent of IWE-5240 to require a VT-2 visual examination during system pressure tests following certain types of repair/replacement activities.

   IWE-5240 (1989 Edition through the 1992 Edition with the 1992 Addenda) states "The requirements of IWA-5246 for visual examinations are applicable". Prior to the 1991 Addenda, IWA-5246 contained requirements pertaining to the VT-2 visual examination performed during system pressure tests required by IWA-5000. In the 1991 Addenda, IWA-5246 was replaced by IWA-5240. IWE-5240 was revised in the 1993 Addenda to change the reference from IWA-5246 to IWA-5240. Because IWA-5240 (1991 Addenda and later editions/addenda) and IWA-5246 (1990 Addenda and earlier editions/addenda) both address visual examination requirements (VT-

2) during system pressure tests, it appears that IWE-5240 (1997 Addenda and earlier editions/addenda) required a VT-2 visual examination during IWE-5000 system pressure tests.

Please note that IWE-5000 does not exempt any repair/replacement activities from a system pressure test. This is not consistent with system pressure test requirements for Class 1, 2, and 3 systems where system pressure tests are exempt following certain types of minor repair/replacement activities. Although IWE-5222 does permit system pressure tests to be deferred following certain types of minor repair/replacement activities, it is not clear whether IWE-5240 intended to require that a VT-2 visual examination also be performed during these deferred pressure tests, or during pressure tests performed following repair/replacement activities affecting pressure retaining bolting. The Working Group - Containment discussed this issue and unanimously agreed with the proposed responses to both questions submitted by the inquirer.

IWE-5222 (1992 Edition with the 1992 Addenda through the 1995 Edition) is provided below for your information. This paragraph specifies the types of repair/replacement activities for which the system pressure test may be deferred.

IWE-5222 Deferral of Leakage Tests

Leakage tests for the following minor repairs or modifications to the pressure boundary may be deferred until the next scheduled leakage test, provided nondestructive examination is performed in accordance with the approved repair program:

(a) welds of attachments to the surface of the pressure retaining boundary;

(b) repair cavities, the depth of which does not penetrate the required design wall by more than 10%; and

(c) welds attaching penetrations that are NPS 1 or smaller.

The minor repair/replacement activities described above, if performed on Class 1, 2, or 3 systems would not require a system pressure test, as prescribed in IWA-4700 (1992 Edition with the 1992 Addenda). Accordingly, a VT-2 visual examination would not be performed. Therefore, the pressure testing requirements of IWE-5000 are more strict than for Class 1.

The purpose of a VT-2 visual examination is to detect leakage from areas affected by repair/replacement activities. For certain repair/replacement activities such as welding of attachments to pressure boundary surfaces, welds connecting structural elements of supports, and minor weld cavity repairs, leakage should not be a concern. For replacement of Class 1, 2, or 3 bolting, the Code does not require that a system pressure test or VT-2 visual examination be performed, as confirmed by interpretation #XI-1-92-65. This interpretation is provided below for your information:

Interpretation: XI-1-92-65

Subject: Section XI, IWA-4710; Pressure Test - Replacement of Bolting (1992 Edition With 1993 Addenda)

Date Issued: February 7, 1994

File: IN94-001

Question: Is it a requirement of IWA-4170(c) to perform pressure testing following the replacement of bolting on a Code Class 1, 2, or 3 mechanical connection with or without the disassembly of the mechanical connection?

Reply: No.

Please note that IWA-4710(c) was subsequently changed to IWA-4540(c) and was deleted from the Code in the 1999 Addenda. If a pressure test (and VT-2 examination) is not required

following the replacement of pressure retaining bolting for Class 1, 2 or 3 systems, it appears inconsistent to require similar tests and inspections for Class MC and metallic shell and penetration liners of Class CC components.

Because test equipment and procedures used to perform the pneumatic leakage test required by IWE-5221 can detect leakage without performing the visual examination, the VT-2 visual examination is unnecessary. In fact, not only can the pneumatic leakage test equipment determine if leakage is occurring, the equipment must also be capable of quantifying the leakage rate when leakage is detected. A VT-2 visual examination may not even be capable of detecting a leak at extremely low leak rates which are easily detected by pneumatic test equipment. Because of this reason, IWE-5240 was revised in the 1998 Edition to require a detailed visual examination be performed to assess the structural condition of areas affected by repair/replacement activities, as follows:

> **IWE-5240 VISUAL EXAMINATION**
>
> During the pressure test required by IWE-5220, a detailed visual examination (IWE-2310) shall be performed on areas affected by repair/replacement activities.

This detailed visual examination was intended to serve as a verification of the structural integrity of the component following a repair/replacement, and was not intended to be used to detect leakage.

Because IWE-5240 has been revised to clarify that a VT-2 visual examination is not required following repair/replacement activities on Class MC and liners of Class CC components, no additional Code changes are necessary.

Date Revised: 11-24-2004

ARTICLE IWE-7000
REPLACEMENTS

This Article has been deleted. The requirements of IWA-4000 apply.

Historical Information:

1. IWE-7000 was deleted in the 1994 Addenda.
2. Interpretation #XI-1-98-14, File #IN97-022 clarifies that coatings removal and repair is not a Section XI repair/replacement activity subject to the requirements of IWA-4000. This interpretation also clarifies that IWA-4000 and IWA-7000 do not apply to seals, gaskets, and moisture barriers.

Date Revised: *9-18-02*