

SUBSECTION IWL REQUIREMENTS FOR CLASS CC CONCRETE COMPONENTS OF LIGHT-WATER COOLED PLANTS

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ARTICLE IWL-1000 SCOPE AND RESPONSIBILITY

IWL-1100 SCOPE

(a) This Subsection provides the rules and requirements for preservice examination, inservice inspection and repair of the reinforced concrete and the post-tensioning systems of Class CC components, herein referred to as concrete containments as defined by CC-1000.

(b) The rules and requirements of this Subsection do not apply to the following:

- (1) steel portions not backed by concrete;
- (2) shell metallic liners;
- (3) penetration liners extending the containment liner through the surrounding shell concrete.

IWL-1200 ITEMS SUBJECT TO EXAMINATION

IWL-1210 EXAMINATION REQUIREMENTS

The examination requirements of this Subsection shall apply to concrete containments.

IWL-1220 ITEMS EXEMPT FROM EXAMINATION

The following items are exempt from the examination requirements of IWL-2000:

(a) tendon end anchorages that are inaccessible, subject to the requirements of IWL-2521.1;

(b) portions of the concrete surface that are covered by the liner, foundation material, or backfill, or are otherwise obstructed by adjacent structures, components, parts, or appurtenances.

ARTICLE IWL-2000 EXAMINATION AND INSPECTION

IWL-2100 INSPECTION

Examinations shall be verified by an Inspector.

IWL-2200 PRESERVICE EXAMINATION

Preservice examination shall be performed in accordance with the requirements of IWL-2500.

IWL-2210 EXAMINATION SCHEDULE

Preservice examination shall be completed prior to initial plant startup.

IWL-2220 EXAMINATION REQUIREMENTS

IWL-2220.1 Concrete

(a) Preservice examination shall be performed in accordance with IWL-2510.

(b) The preservice examination shall be performed following completion of the containment Structural Integrity Test.

IWL-2220.2 Unbonded Post-Tensioning Systems.

The following information shall be documented in the preservice examination records. This information may be extracted from construction records.

(a) Date on which each tendon was tensioned.

(b) Initial seating force in each tendon.

(c) For each tendon anchorage, the location of all missing or broken wires or strands and unseated wires.

(d) For each tendon anchorage, the location of all missing or detached buttonheads or missing wedges.

(e) The product designation for the corrosion protection medium used to fill the tendon duct.

IWL-2230 PRESERVICE EXAMINATION OF REPAIRS AND MODIFICATIONS

(a) When a concrete containment or a portion thereof is repaired or modified during the service lifetime

of a plant, the preservice examination requirements shall be met for the repair or modification.

(b) When the repair or modification is performed while the plant is not in service, the preservice examination shall be performed prior to resumption of service.

(c) When the repair or modification is performed while the plant is in service, the preservice examination may be deferred to the next scheduled outage.

IWL-2300 VISUAL EXAMINATION, PERSONNEL QUALIFICATION, AND RESPONSIBLE ENGINEER

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IWL-2310 VISUAL EXAMINATION AND PERSONNEL QUALIFICATION

(a) VT-1C visual examinations are conducted to determine concrete deterioration and distress for suspect areas detected by VT-3C, and conditions (e.g., cracks, wear, or corrosion) of tendon anchorage and wires or strands. Minimum illumination, maximum direct examination distance, and maximum procedure demonstration lower case character height shall be as specified in IWA-2210 for VT-1 visual examination.

(b) VT-3C visual examinations are conducted to determine the general structural condition of concrete surfaces of containments by identifying areas of concrete deterioration and distress, such as defined in ACI 201.1 R-68. The minimum illumination, maximum direct examination distance, and maximum procedure demonstration lower case character height shall be as specified in IWA-2210 for VT-3 visual examination.

(c) The Owner's written practice shall define qualification requirements for concrete examination personnel in accordance with IWA-2300. Limited certification in accordance with IWA-2350 may be used for examiners limited to concrete.

IWL-2320

REQUIREMENTS FOR CLASS CC COMPONENTS

IWL-2420

IWL-2320 RESPONSIBLE ENGINEER

The Responsible Engineer shall be a Registered Professional Engineer experienced in evaluating the in-service condition of structural concrete. The Responsible Engineer shall have knowledge of the design and Construction Codes and other criteria used in design and construction of concrete containments in nuclear power plants.

The Responsible Engineer shall be responsible for the following:

- (a) development of plans and procedures for examination of concrete surfaces;
- (b) approval, instruction, and training of concrete examination personnel;
- (c) evaluation of examination results;
- (d) preparation of repair procedures;
- (e) submittal of report to the Owner documenting results of examinations and repairs.

IWL-2400 INSERVICE INSPECTION SCHEDULE**IWL-2410 CONCRETE**

(a) Concrete shall be examined in accordance with IWL-2510 at 1, 3, and 5 years following the comple-

tion of the containment Structural Integrity Test CC-6000 and every 5 years thereafter.

(b) The 1, 3, and 5 year examinations shall commence not more than 6 months prior to the specified dates and shall be completed not more than 6 months after such dates. If plant operating conditions are such that examination of portions of the concrete cannot be completed within this stated time interval, examination of those portions may be deferred until the next regularly scheduled plant outage.

(c) The 10 year and subsequent examinations shall commence not more than 1 year prior to the specified dates and shall be completed not more than 1 year after such dates.

IWL-2420 UNBONDED POST-TENSIONING SYSTEMS

(a) Unbonded post-tensioning systems shall be examined in accordance with IWL-2520 at 1, 3, and 5 years following the completion of the containment Structural Integrity Test and every 5 years thereafter.

(b) The 1, 3, and 5 year examinations shall com-

IWL-2420

REQUIREMENTS FOR CLASS CC COMPONENTS

IWL-2521.1

mence not more than 6 months prior to the specified dates and shall be completed not more than 6 months after such dates. If plant operating conditions are such that examination of portions of the post-tensioning system cannot be completed within this stated time interval, examination of those portions may be deferred until the next regularly scheduled plant outage.

(c) The 10 year and subsequent examinations shall commence not more than 1 year prior to the specified dates and shall be completed not more than 1 year after such dates.

IWL-2421 Sites With Two Plants

(a) For sites with two plants, the examination requirements for the concrete containments may be modified if both containments utilize the same prestressing system and are essentially identical in design, if post-tensioning operations for the two containments were completed not more than 2 years apart, and if both containments are similarly exposed to or protected from the outside environment.

(b) When the conditions of IWL-2421(a) are met, the inspection dates and examination requirements may be as follows:

(1) For the containment with the first Structural Integrity Test, all examinations required by IWL-2500 shall be performed at 1, 3, 10, 20, and 30 years. Only the examinations required by IWL-2524 and IWL-2525 need be performed at 5, 15, 25, and 35 years.

(2) For the containment with the second Structural Integrity Test, all examinations required by IWL-2500 shall be performed at 1, 5, 15, 25, and 35 years. Only the examinations required by IWL-2524 and IWL-2525 need be performed at 3, 10, 20, and 30 years.

IWL-2500 EXAMINATION REQUIREMENTS

Examination shall be performed in accordance with the requirements of Table IWL-2500-1.

A92 IWL-2510 EXAMINATION OF CONCRETE

(1) Concrete surface areas, including coated areas, except those exempted by IWL-1200(b), shall be VT-3C visual examined for evidence of conditions indicative of damage or degradation, such as defined in ACI

201.1 R-68, in accordance with IWL-2310(b). Selected areas, such as those that indicate suspect conditions, shall receive a VT-1C examination in accordance with IWL-2310(a).

(b) The examination shall be performed by, or under the direction of, the Responsible Engineer.

(c) Visual examinations may be performed from floors, roofs, platforms, walkways, ladders, ground surface, or other permanent vantage points, unless temporary close-in access is required by the inspection plan.

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IWL-2520 EXAMINATION OF UNBONDED POST-TENSIONING SYSTEMS

IWL-2521 Tendon Selection

(a) Tendons to be examined during an inspection shall be selected on a random basis except as noted in IWL-2521(b) and (c). The population from which the random sample is drawn shall consist of all tendons which have not been examined during earlier inspections. The number of tendons to be examined during an inspection shall be as specified in Table IWL-2521-1.

(b) One tendon of each type (as defined in Table IWL-2521-1) shall be selected from the first year inspection sample and designated as a common tendon. Each common tendon shall be examined during each inspection. A common tendon shall not be detensioned unless required by IWL-3300. If a common tendon is detensioned, another common tendon of the same type shall be selected from the first year inspection sample.

(c) If a containment with a stranded post-tensioning system is constructed with a predesignated number of detensionable tendons, one tendon of each type shall be selected from among those which are detensionable. The remaining tendons shall be selected from among those which cannot be detensioned.

IWL-2521.1 Exemptions. The following requirements shall apply to tendon anchorages that are not accessible for examination because of safety or radiological hazards or because of structural obstructions.

(a) After the process of randomly selecting tendons to be examined, any inaccessible tendons shall be designated as exempt and removed from the sample.

(b) Substitute tendons shall be selected for all tendons designated as exempt. Each substitute tendon shall be selected so that it is located as close as possible to

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TABLE IWL-2500-1
EXAMINATION CATEGORIES

EXAMINATION CATEGORY L-A, CONCRETE							
Item No.	Parts Examined	Test or Examination Requirement	Test or Examination Method	Acceptance Standard	Extent of Examination	Frequency of Examination	Deferral of Examination
L1.10	Concrete Surface						
L1.11	All Areas	IWL-2510	Visual, VT-3C	IWL-3210	IWL-2510	IWL-2410	NA
L1.12	Suspect Areas	IWL-2510	Visual, VT-1C	IWL-3210	IWL-2510	IWL-2410	NA

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EXAMINATION CATEGORY L-B, UNBONDED POST-TENSIONING SYSTEM							
Item No.	Parts Examined	Test or Examination Requirement	Test or Examination Method	Acceptance Standard	Extent of Examination	Frequency of Examination	Deferral of Examination
L2.10	Tendon	IWL-2522	IWL-2522	IWL-3221.1	IWL-2521	IWL-2420	NA
L2.20	Wire or Strand	IWL-2523	IWL-2523.2	IWL-3221.2	IWL-2523.1	IWL-2420	NA
L2.30	Anchorage Hardware and Surrounding Concrete	IWL-2524	Visual, VT-1 and VT-1C	IWL-3221.3	IWL-2524.1	IWL-2420	NA
L2.40	Corrosion Protection Medium	IWL-2525	IWL-2525.2(a)	IWL-3221.4	IWL-2525.1(a)	IWL-2420	NA
L2.50	Free Water	IWL-2525	IWL-2525.2(b)		IWL-2525.1(b)	IWL-2420	NA

**TABLE IWL-2521-1
NUMBER OF TENDONS FOR EXAMINATION**

Inspection Period	Percentage ^{1,2} of all Tendons of Each Type ³	Required Minimum ¹ Number of Each Type	Maximum Required Number of Each Type
1st year	4	4	10
3rd year	4	4	10
5th year	4	4	10
10th year	2	3	5
15th year	2	3	5
20th year	2	3	5
25th year	2	3	5
30th year	2	3	5
35th year	2	3	5

NOTES:

- (1) Fractional tendon numbers shall be rounded to the next higher integer. Actual number examined shall not be less than the minimum required number and need not be more than the maximum required number.
- (2) The reduced sample size listed for the 10th year and subsequent inspections is applicable only if the acceptance criteria of IWL-3221.1 are met during each of the earlier inspections.
- (3) A tendon type is defined by its geometry and position in the containment; e.g., hoop, vertical, dome, helical, and inverted U.

the exempted tendon, and shall be examined in accordance with IWL-2520.

(c) Each exempted tendon shall be examined in accordance with IWL-2524 and IWL-2525 to the extent that the end anchorages of the exempt tendon are accessible either during operation or at an outage.

IWL-2522 Tendon Force Measurements

(a) The prestressing force in all inspection sample tendons shall be measured by lift-off or an equivalent test.

(b) Equipment used to measure tendon force shall be calibrated in accordance with a calibration procedure prior to the first tendon force measurement and following the final tendon force measurement of the inspection period. Accuracy of the calibration shall be within 1.5% of the specified minimum ultimate strength of the tendon. If the post-test calibration differs from the pretest calibration by more than the specified accuracy tolerance, the results of the examination shall be evaluated.

IWL-2523 Tendon Wire and Strand Sample Examination and Testing

IWL-2523.1 Tendon Detensioning and Sample Removal. One sample tendon of each type shall be

completely detensioned. A single wire or strand shall be removed from each detensioned tendon.

IWL-2523.2 Sample Examination and Testing

(a) Each removed wire or strand shall be examined over its entire length for corrosion and mechanical damage. The examination shall determine the location of most severe corrosion, if any. Strand wires shall be examined for wedge slippage marks.

(b) Tension tests shall be performed on each removed wire or strand: one at each end, one at mid-length, and one in the location of the most corroded area, if any. The following information shall be obtained from each test:

- (1) yield strength
- (2) ultimate tensile strength
- (3) elongation

IWL-2523.3 Retensioning. Tendons that have been detensioned shall be retensioned to at least the force predicted for the tendon at the time of the test. However, the retensioning force shall not exceed 70% of the specified minimum ultimate tensile strength of the tendon based on the number of effective wires or strands in the tendon at the time of retensioning.

IWL-2524 Examination of Tendon Anchorage Areas

IWL-2524.1 Visual Examination. A ²²¹¹VT-1 visual examination in accordance with IWA-2411 shall be performed on the tendon anchorage hardware, including bearing plates, anchorheads, wedges, buttonheads, shims, and the concrete extending outward a distance of 2 ft from the edge of the bearing plate. The following shall be documented:

- (a) concrete cracks having widths greater than 0.01 in.;
- (b) corrosion, broken or protruding wires, missing buttonheads, broken strands, and cracks in tendon anchorage hardware;
- (c) broken wires or strands, protruding wires and detached buttonheads following retensioning of tendons which have been detensioned.

IWL-2524.2 Free Water Documentation. The quantity of free water contained in the anchorage end cap as well as any which drains from the tendon during the examination process shall be documented.

IWL-2525 Examination of Corrosion Protection Medium and Free Water

IWL-2525.1 Samples

(a) Samples of the corrosion protection medium shall

TABLE IWL-2525-1
CORROSION PROTECTION MEDIUM ANALYSIS

Characteristic	Test Method	Acceptance Limit
Water content	ASTM D 95	In course of preparation
Water soluble chlorides	ASTM D 512 [Note (1)]	10 ppm maximum
Water soluble nitrates	ASTM D 992 [Note (1)]	10 ppm maximum
Water soluble sulfides	APHA 427 [Note (1)] (Methylene blue)	10 ppm maximum
Reserve alkalinity (Base number)	ASTM D 974 Modified [Note (2)]	[Note (3)]

NOTES:

- (1) *Water Soluble Ion Tests.* The inside (bottom and sides) of a one (1) liter beaker, approx. OD 105 mm, height 145 mm, is thoroughly coated with 100 ± 10 grams of the sample. The coated beaker is filled with approximately 900 ml of distilled water and heated in an oven at a controlled temperature of 100°F (37.8°C) $\pm 2^{\circ}\text{F}$ for 4 hours. The water extraction is tested by the noted test procedures for the appropriate water soluble ions. Results are reported as PPM in the extracted water.
- (2) *ASTM D 974 Modified.* Place 10 g of sample in a 500 ml Erlenmeyer flask. Add 10 cc isopropyl alcohol and 5 cc toluene. Heat until sample goes into solution. Add 90 cc distilled water and 20 cc $1\text{N}\text{H}_2\text{SO}_4$. Place solution on a steam bath for $\frac{1}{2}$ hour. Stir well. Add a few drops of indicator (1% phenolphthalein) and titrate with $1\text{N}\text{NaOH}$ until the lower layer just turns pink. If acid or base solutions are not exactly 1N , the exact normalities should be used when calculating the base number. The Total Base Number (TBN), expressed as milligrams of KOH per gram of sample, is calculated as follows:

$$\text{TBN} = \frac{[(20)(N_A) - (B)(N_B)] 56.1}{W}$$

where

B = milliliters NaOH

N_A = normality of H_2SO_4 solution

N_B = normality of NaOH solution

W = weight of sample in grams

- (3) The base number shall be at least 50% of the as-installed value, unless the as-installed value is 5 or less, in which case the base number shall be no less than zero. If the tendon duct is filled with a mixture of materials having various as-installed base numbers, the lowest number shall govern acceptance.

be taken from each end of each tendon examined. Free water shall not be included in the samples.

(b) Samples of free water shall be taken where water is present in quantities sufficient for laboratory analysis.

IWL-2525.2 Sample Analysis

(a) Corrosion protection medium samples shall be thoroughly mixed and analyzed for reserve alkalinity, water content, and concentrations of water soluble chlorides, nitrates, and sulfides. Analyses shall be performed in accordance with the procedures specified in Table IWL-2525-1.

(b) Free water samples shall be analyzed to determine pH.

IWL-2526 Removal and Replacement of Corrosion Protection Medium

The amount of corrosion protection medium removed at each anchorage shall be measured and the total amount removed from each tendon (two anchorages) shall be recorded. The total amount replaced in each tendon shall be recorded and differences between amount removed and amount replaced shall be documented.

ARTICLE IWL-3000 ACCEPTANCE STANDARDS

IWL-3100 PRESERVICE EXAMINATION

IWL-3110 CONCRETE SURFACE CONDITION

IWL-3111 Acceptance by Examination

The condition of the surface is acceptable if the Responsible Engineer determines that there is no evidence of damage or degradation sufficient to warrant further evaluation or repair.

IWL-3112 Acceptance by Evaluation

Items with examination results that do not meet the acceptance standards of IWL-3111 shall be evaluated as required by IWL-3300.

IWL-3113 Acceptance by Repair

Repairs required to reestablish acceptability of an item shall be completed as required by IWL-3300. Acceptable completion of the repair shall constitute acceptability of the item.

IWL-3120 UNBONDED POST-TENSIONING SYSTEM

The condition of the unbonded post-tensioning system is acceptable if it met the requirements of the construction specification at the time of installation.

IWL-3200 INSERVICE EXAMINATION

IWL-3210 CONCRETE SURFACE CONDITION

IWL-3211 Acceptance by Examination

The condition of the concrete surface is acceptable if the Responsible Engineer determines that there is no evidence of damage or degradation sufficient to warrant further evaluation or repair.

IWL-3212 Acceptance by Evaluation

Items with examination results that do not meet the acceptance standards of IWL-3211 shall be evaluated as required by IWL-3300.

IWL-3213 Acceptance by Repair

Repairs to reestablish the acceptability of an item shall be completed as required by IWL-3300. Acceptable completion of the repair shall constitute acceptability of the item.

IWL-3220 UNBONDED POST-TENSIONING SYSTEMS

IWL-3221 Acceptance by Examination

IWL-3221.1 Tendon Force. Tendon forces are acceptable if:

(a) the average of all measured tendon forces, including those measured in IWL-3221.1(b)(2), for each type of tendon is equal to or greater than the minimum required prestress specified at the anchorage for that type of tendon;

(b) the measured force in each individual tendon is not less than 95% of the predicted force unless the following conditions are satisfied:

(1) the measured force in not more than one tendon is between 90% and 95% of the predicted force;

(2) the measured forces in two tendons located adjacent to the tendon in IWL-3221.1(b)(1) are not less than 95% of the predicted forces; and

(3) the measured forces in all the remaining sample tendons are not less than 95% of the predicted force.

IWL-3221.2 Tendon Wire or Strand Samples. The condition of wire or strand samples is acceptable if:

(a) samples are free of physical damage;

(b) sample ultimate tensile strength and elongation be not less than minimum specified values.

IWL-3221.3 Tendon Anchorage Areas. The condition of tendon anchorage areas is acceptable if:

(a) there is no evidence of cracking in anchor heads, shims, or bearing plates;

(b) there is no evidence of active corrosion;

(c) broken or unseated wires, broken strands, and detached buttonheads were documented and accepted during a preservice examination or during a previous inservice examination;

(d) cracks in the concrete adjacent to the bearing plates do not exceed 0.01 in. in width.

IWL-3221.4 Corrosion Protection Medium. Corrosion protection medium is acceptable when the reserve alkalinity, water content, and soluble ion concentrations of all samples are within the limits specified in Table IWL-2525-1.

IWL-3222 Acceptance by Evaluation

Items with examination results that do not meet the acceptance standards of IWL-3221 shall be evaluated as required by IWL-3300.

IWL-3223 Acceptance by Repair or Replacement

Repairs or replacements to reestablish acceptability of the condition of an item shall be completed as required by IWL-3300. Acceptable completion of the re-

pair or replacement shall constitute acceptability of the item.

IWL-3300 EVALUATION

IWL-3310 EVALUATION REPORT

Items with examination results that do not meet the acceptance standards of IWL-3100 or IWL-3200 shall be evaluated by the Owner. The Owner shall be responsible for preparation of an Engineering Evaluation Report stating the following:

(a) the cause of the condition which does not meet the acceptance standards;

(b) the acceptability of the concrete containment without repair of the item;

(c) whether or not repair or replacement is required and, if required, the extent, method, and completion date for the repair or replacement;

(d) extent, nature, and frequency of additional examinations.

IWL-3320 REVIEW BY AUTHORITIES

The Engineering Evaluation Report shall be subject to review by the regulatory and enforcement authorities having jurisdiction at the plant site.

ARTICLE IWL-4000 REPAIR PROCEDURES

IWL-4100 GENERAL

IWL-4110 SCOPE

This Article provides rules and requirements for repair of concrete containments.

IWL-4120 REPAIR/REPLACEMENT PROGRAM

(a) Repairs shall be performed in accordance with the Repair/Replacement Program required by IWA-4140.

(b) Repairs shall be completed in accordance with the Repair Plan of IWL-4200.

(c) The Repair/Replacement Program shall address concrete material control.

IWL-4200 REPAIR PLAN

The Repair Plan shall be developed under the direction of a Responsible Engineer (IWL-2500).

IWL-4210 CONCRETE REPAIR

(a) The Repair Plan shall specify requirements for removal of defective material.

(b) The affected area shall be visually examined to assure proper surface preparation of concrete and reinforcing steel prior to placement of repair material.

(c) When removal of defective material exposes reinforcing steel, the reinforcing steel shall receive a VT-1 visual examination. Reinforcing steel is acceptable when the Responsible Engineer determines that there is no evidence of damage or degradation sufficient to warrant further evaluation or repair. When required, reinforcing steel shall be repaired in accordance with IWL-4220. Repair of exposed-end anchors of the

post-tensioning system shall be in accordance with IWL-4230.

(d) Repair material shall be chemically, mechanically, and physically compatible with existing concrete.

(e) When detensioning of prestressing tendons is required for repair of the concrete surface adjacent to the tendon, the Repair Plan shall require the following:

(1) selection of repair material to minimize stress and strain incompatibilities between repair material and existing concrete;

(2) procedures for application of repair material;

(3) procedures for detensioning and retensioning of prestressing tendons.

(f) The Repair Plan shall specify requirements for in-process sampling and testing of repair material.

IWL-4220 REPAIR OF REINFORCING STEEL

Damaged reinforcing steel shall be repaired by any method permitted in the original Construction Code or in Section III, Division 2, with or without removal of the damaged reinforcing steel.

IWL-4230 REPAIR OF THE POST-TENSIONING SYSTEM

(a) Weld repair of bearing plates and shim plates of the post-tensioning system shall meet the applicable requirements of IWA-4000. The corrosion protection medium shall be restored following the repair.

(b) Procedures for detensioning and retensioning of prestressing tendons shall be specified in the Repair Plan.

IWL-4300 EXAMINATION

The repaired area shall be examined in accordance with IWL-2000 to establish a new preservice record and shall meet the acceptance standards of IWL-3000.

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ARTICLE IWL-5000

SYSTEM PRESSURE TESTS

IWL-5100 SCOPE

This Article provides requirements for pressure testing concrete containments following repair or replacement.

IWL-5200 SYSTEM TEST REQUIREMENTS

IWL-5210 GENERAL

A containment pressure test shall be performed following repair or replacement unless any of the following conditions exist:

(a) The Engineering Evaluation Report (IWL-3310) demonstrates that the structural integrity of containment in the existing unrepaired condition has not been reduced below that required by the original design criteria.

(b) The repair or replacement affects only the cover concrete external to the outermost layer of structural reinforcing steel or post-tensioning tendons.

(c) The repair or replacement involves only exchange of post-tensioning tendons, tendon anchorage hardware, shims, or corrosion protection medium.

IWL-5220 TEST PRESSURE

The pressure test shall be conducted at the design basis accident pressure, P_a .

IWL-5230 LEAKAGE TEST

If the repair or replacement penetrated the containment metallic liner, or otherwise breached containment leak-tight integrity, a leakage rate test shall be conducted as required by IWE-5000.

IWL-5240 SCHEDULE OF PRESSURE TEST

If the repair or replacement is performed with the plant shutdown, the pressure test shall be conducted prior to resumption of operation. If the repair or re-

placement is performed with the plant in operation, the pressure test may be deferred until the next scheduled integrated leak-rate test.

IWL-5250 TEST PROCEDURE AND EXAMINATIONS

The pressure test shall be conducted in accordance with a detailed procedure prepared under the direction of the Responsible Engineer. The surface of all containment concrete placed during repair or replacement operations shall be examined by VT-1 examination prior to start of pressurization, at test pressure, and following completion of depressurization. Extended surface examinations, additional examinations during pressurization, other examinations, and measurements of structural response to pressure shall be conducted as specified by the Responsible Engineer.

IWL-5260 CORRECTIVE MEASURES

If the surface examinations of IWL-5250 cannot satisfy the requirements specified by the Responsible Engineer, the area shall be examined to the extent necessary to establish requirements for corrective action. Repairs shall be performed in accordance with IWL-4000, and pressure testing shall be repeated in accordance with IWL-5200, prior to returning the containment to service.

IWL-5300 REPORT

A pressure test report shall be prepared under the direction of the Responsible Engineer. This report may be an addition to a previously-prepared Engineering Evaluation Report (IWL-3310). The report shall describe pressure test procedures and examination results and shall state whether or not the repair or replacement is acceptable. If the repair or replacement is not acceptable, the report shall specify corrective measures.

ARTICLE IWL-7000 REPLACEMENTS

IWL-7100 GENERAL REQUIREMENTS

IWL-7110 SCOPE

(a) This Article provides rules and requirements for reinstallation and replacement of post-tensioning system items for concrete containments.

(b) Grease caps and installation screws are exempt from the requirements of this Article.

IWL-7120 REPLACEMENT PROGRAM

The following items, as applicable, shall be contained in the Replacement Plan:

(a) requirements for removal of items that are to be replaced;

(b) surface preparation required prior to installation of replacement items;

(c) examinations required prior to installation of replacement items;

(d) detensioning and retensioning requirements for tendons affected by installation of replacement items;

(e) requirements and procedures applicable to installation of replacement items;

(f) in-process sampling and testing requirements to be performed during installation of replacement items.