UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 9, 1994

See Rpts

Docket No. 50-261

Mr. C. S. Hinnant, Vice President
Carolina Power & Light Company
H. B. Robinson Steam Electric Plant,
Unit No. 2
Post Office Box 790
Hartsville, South Carolina 29551-0790

Dear Mr. Hinnant:

SUBJECT: RESPONSE TO GENERIC LETTER (GL) 92-01, REVISION 1, "REACTOR VESSEL STRUCTURAL INTEGRITY," FOR THE H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2 (TAC NO. M83504)

By letters dated July 6, 1992, October 27, 1993, November 29, 1993, and December 21, 1993, Carolina Power & Light Company provided its response to GL 92-01, Revision 1 concerning the H. B. Robinson Steam Electric Plant, Unit No. 2 (HBR). The NRC staff has completed its review of your response. Based on its review, the staff has determined that Carolina Power & Light Company has provided the information requested in GL 92-01.

The GL is part of the staff's program to evaluate reactor vessel integrity for Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs). The information provided in response to GL 92-01, including previously docketed information, is being used to confirm that licensees satisfy the requirements and commitments necessary to ensure reactor vessel integrity for their facilities.

A substantial amount of information was provided in response to GL 92-01, Revision 1. These data have been entered into a computerized data base designated the Reactor Vessel Integrity Database (RVID). The RVID contains the following tables: A pressurized thermal shock (PTS) table for PWRs, a pressure-temperature limits table for BWRs and an upper-shelf energy (USE) table for PWRs and BWRs. Enclosure 1 provides the PTS table(s), Enclosure 2 provides the USE table(s) for your facility(ies), and Enclosure 3 provides a key for the nomenclature used in the tables. The tables include the data necessary to perform USE and RT_{pts} evaluations. These data were taken from your response(s) to GL 92-01 and previously docketed information. References to the specific source of the data are provided in the tables.

The applicability of the Westinghouse Owners Group (WOG) Equivalent Margins Analysis (WCAP-13587, Rev. 1) to HBR reactor vessel beltline materials was addressed in a letter to NRC dated November 29, 1993. Additional revised plant-specific calculations performed by Westinghouse and pertaining to the equivalent margins analysis were provided in a letter to NRC dated December 21, 1993. In these letters you did not request NRC review and approval. In addition, WCAP-13587, Rev. 1, was submitted for information only and not as a topical report. Therefore, we request, in accordance with the requirements of

DF01

10 CFR Part 50, Appendix G, that you submit a request for NRC review and approval of the equivalent margins analyses performed for the HBR beltline materials. This can be accomplished by either requesting review and approval of the letters previously submitted and referencing WCAP-13587, Rev. 1, or by providing a plant-specific analysis independent of the WCAP-13586, Rev. 1, analysis for our review and approval.

We request that you submit, within 30 days, a schedule for completing this action. Further, we request that you verify that the information you have provided for your facility has been accurately entered in the summary file. If no comments are made in your response to this request, the staff will use the information in the tables for future NRC assessments of your reactor pressure vessel. Once your response is received and your schedule is determined to be satisfactory, the staff will consider your actions related to GL 92-01, Revision 1, to be complete. When your request is received, your analysis will be reviewed as a plant-specific licensing action.

The information requested by this letter is within the scope of the overall burden estimated in GL 92-01, Revision 1, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)." The estimated average number of burden hours is 200 person hours for each addressee's response. This estimate pertains only to the identified response-related matters and does not include the time required to implement actions required by the regulations. This action is covered by the Office of Management and Budget Clearance Number 3150-0011, which expires June 30, 1994.

Sincerely,

ORIGINAL SIGNED BY:

Brenda Mozafari, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Pressurized Thermal Shock or Pressure-Temperature Limit Table(s)
2. Upper-Shelf Energy Table(s)
3. Nomenclature Key

cc w/enclosures:
See next page

OFC	LA:PD21:DRPE	PM:PD21:DRPE	D:PD21:DRPE	
NAME	PAnderson	BMozafari:jrm	WBateman	
DATE	5/9/94	5/9/94	5/9/94	

DOCUMENT NAME: G:\ROBINSON\ROB83504.LTR

10 CFR Part 50, Appendix G, that you submit a request for NRC review and approval of the equivalent margins analyses performed for the HBR beltline materials. This can be accomplished by either requesting review and approval of the letters previously submitted and referencing WCAP-13587, Rev. 1, or by providing a plant-specific analysis independent of the WCAP-13586, Rev. 1, analysis for our review and approval.

We request that you submit, within 30 days, a schedule for completing this action. Further, we request that you verify that the information you have provided for your facility has been accurately entered in the summary file. If no comments are made in your response to this request, the staff will use the information in the tables for future NRC assessments of your reactor pressure vessel. Once your response is received and your schedule is determined to be satisfactory, the staff will consider your actions related to GL 92-01, Revision 1, to be complete. When your request is received, your analysis will be reviewed as a plant-specific licensing action.

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Sincerely,

Brenda Mozafari

Brenda Mozafari, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Pressurized Thermal Shock or Pressure-Temperature Limit Table(s)
2. Upper-Shelf Energy Table(s)
3. Nomenclature Key

cc w/enclosures:
See next page

Mr. C. S. Hinnant
Carolina Power & Light Company

H. B. Robinson Steam Electric
Plant, Unit No. 2

cc:

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Karen E. Long
Assistant Attorney General
State of North Carolina
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NRC & Local PDRs
PD# II-1 Reading
S. Varga
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D. McDonald
J. Strosnider
E. Hackett
OGC
ACRS (10)
E. Merschoff, Region II

Summary File for Pressurized Thermal Shock

Plant Name	Beltline Ident.	Heat No. Ident.	ID Neut. Fluence at EOL/EFPY	IRT_{ndt}	Method of Determin. IRT_{ndt}	Chemistry Factor	Method of Determin. CF	%Cu	%Ni
Robinson 2 EOL: 7/31/2010	Upper Shell W10201-1	A6623-1	1.7E19	69°F	Plant Specific	62.9	Table	0.13	0.11
	Upper Shell W10201-2	A6520-1	1.7E19	30°F	Plant Specific	84.75	Table	0.15	0.25
	Upper Shell W10201-3	B1255-1	1.7E19	36°F	Plant Specific	51.8	Table	0.11	0.08
	Int. Shell W10201-4	A6604-1	4.7E19	20°F	Plant Specific	57.1	Table	0.12	0.09
	Int. Shell W10201-5	B1256-1	4.7E19	20°F	Plant Specific	43.79	Calculated	0.10	0.12
	Int. Shell W10201-6	B1250-1	4.7E19	45°F	Plant Specific	47.49	Calculated	0.09	0.09
	Lower Shell W9807-3	B0650-1	1.8E19	50°F	Plant Specific	58	Table	0.12	0.10
	Lower Shell W9807-5	A5891-1	1.8E19	33°F	Plant Specific	70.5	Table	0.15	0.10
	Lower Shell W9807-9	P1444-1	1.8E19	9°F	Plant Specific	70.5	Table	0.14	0.15
	Upper Shell Axial Welds 1-273ABC	86054B	1.8E19	-56°F	Generic	100.75	Table	0.22	0.05
	Int. Shell Axial Welds 2-273ABC	86054B	4.7E19	-56°F	Generic	100.75	Table	0.22	0.05
	Lower Shell Axial Welds 3-273ABC	86054B	2.0E19	-56°F	Generic	100.75	Table	0.22	0.05
	Upper Circ. Weld 10-273	W5214	1.8E19	-56°F	Generic	213.08	Calculated	0.2	1.02
	Lower Circ. Weld 11-273	34B009	2.0E19	-56°F	Generic	197.8	Table	0.17	0.92

REFERENCES FOR ROBINSON 2:

IRT_{ndt} data are from February 4, 1986, letter from S. R. Zimmerman (CP&L) to L. S. Rubinstein (USNRC), subject: Pressurized Thermal Shock; Correction to Response to Final Rule 10 CFR 50.61.

Fluence and chemistry data are from July 6, 1992, letter from R. B. Starkey (CP&L) to USNRC Document Control Desk, subject: Response to Generic Letter 92-01, Revision 1, Reactor Vessel Structural Integrity.

Chemical composition for welds fabricated using weld wire (heat no. W5214) is reported in a February 23, 1994 letter from D.W. Rogers (Consumer Power) to USNRC. Subject: Palisade Response to GL 92-01.

Summary File for Upper Shelf Energy

Plant Name	Beltline Ident.	Heat No.	Material Type	1/4T USE at EOL/EFPY	1/4T Neutron Fluence at EOL/EFPY	Unirrad. USE	Method of Determin. Unirrad. USE
Robinson 2	Upper Shell W10201-1	A6623-1	A 302A	42 (EMA)	0.97E19	52	65%
EOL: 7/31/2010	Upper Shell W10201-2	A6520-1	A 302A	59	0.97E19	77	65%
	Upper Shell W10201-3	B1255-1	A 302A	46 (EMA)	0.97E19	57	65%
	Int. Shell W10201-4	A6604-1	A 302A	46 (EMA)	2.69E19	59	65%
	Int. Shell W10201-5	B1256-1	A 302A	56	2.69E19	59	65%
	Int. Shell W10201-6	B1250-1	A 302A	68	2.69E19	73	65%
	Lower Shell W9807-3	B0650-1	A 302A	62	1.03E19	78	65%
	Lower Shell W9807-5	A5891-1	A 302A	53	1.03E19	70	65%
	Lower Shell W9807-9	P1444-1	A 302A	59	1.03E19	76	65%
	Upper Shell Axial Welds 1-273ABC	86054B RACO3	Arcos B-5, SAW	67	0.97E19	105	Sister Plant
	Int. Shell Axial Welds 2-273ABC	86054B RACO3	Arcos B-5, SAW	57	2.69E19	105	Sister Plant
	Lower Shell Axial Welds 3-273ABC	86054B RACO3	Arcos B-5, SAW	65	1.03E19	105	Sister Plant
	Upper Circ. Weld 10-273	W5214	Linde 1092, SAW	65	1.03E19	112	Sister Plant
	Lower Circ. Weld 11-273	34B009 RACO3+ N:200	Linde 1092, SAW	72	1.14E19	106	Sister Plant

Summary File for Upper Shelf Energy

Plant Name	Beltline Ident.	Heat No.	Material Type	1/4T USE at EOL/EFPY	1/4T Neutron Fluence at EOL/EFPY	Unirrad. USE	Method of Determin. Unirrad. USE

REFERENCES FOR ROBINSON 2:

Fluence, chemical composition, and UUSE data are from July 6, 1992, letter from R. B. Starkey (CP&L) to USNRC Document Control Desk, subject: Response to Generic Letter 92-01, Revision 1, Reactor Vessel Structural Integrity

Applicability of the Equivalent Margins Analysis (EMA) has been addressed in the letters of November 29 and December 21, 1993 from CP&L to USNRC. In accordance with Appendix G, 10 CFR 50, the licensee must request NRC review of this analysis.

PRESSURIZED THERMAL SHOCK AND USE TABLES FOR ALL PWR PLANTS

NOMENCLATURE

Pressurized Thermal Shock Table

Column 1: Plant name and date of expiration of license.
Column 2: Beltline material location identification.
Column 3: Beltline material heat number; for some welds that a single-wire or tandem-wire process has been reported, (S) indicates single wire was used in the SAW process, (T) indicates tandem wire was used in the SAW process.
Column 4: End-of-life (EOL) neutron fluence at vessel inner wall; cited directly from inner diameter (ID) value or calculated by using Regulatory Guide (RG) 1.99, Revision 2 neutron fluence attenuation methodology from the quarter thickness (T/4) value reported in the latest submittal (GL 92-01, PTS, or P/T limits submittals).
Column 5: Unirradiated reference temperature.
Column 6: Method of determining unirradiated reference temperature (IRT).

Plant-Specific
This indicates that the IRT was determined from tests on material removed from the same heat of the beltline material.

MTEB 5-2
This indicates that the unirradiated reference temperature was determined from following MTEB 5-2 guidelines for cases where the IRT was not determined using American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III, NB-2331, methodology.

Generic
This indicates that the unirradiated reference temperature was determined from the mean value of tests on material of similar types.

Column 7: Chemistry factor for irradiated reference temperature evaluation.
Column 8: Method of determining chemistry factor

Table
This indicates that the chemistry factor was determined from the chemistry factor tables in RG 1.99, Revision 2.

Calculated
This indicates that the chemistry factor was determined from surveillance data via procedures described in RG 1.99, Revision 2.

Column 9: Copper content; cited directly from licensee value except when more than one value was reported. (Staff used the average value in the latter case.)

<u>No Data</u>
This indicates that no copper data has been reported and the default value in RG 1.99, Revision 2, will be used by the staff.

Column 10: Nickel content; cited directly from licensee value except when more than one value was reported. (Staff used the average value in the latter case.)

<u>No Data</u>

This indicates that no nickel data has been reported and the default value in RG 1.99, Revision 2, will be used by the staff.

Upper Shelf Energy Table

Column 1: Plant name and date of expiration of license.
Column 2: Beltline material location identification.
Column 3: Beltline material heat number; for some welds that a single-wire or tandem-wire process has been reported, (S) indicates single wire was used in the SAW process. (T) indicates tandem wire was used in the SAW process.
Column 4: Material type; plate types include A 533B-1, A 302B, A 302B Mod., and forging A 508-2; weld types include SAW welds using Linde 80, 0091, 124, 1092, ARCOS-B5 flux, Rotterdam welds using Graw Lo, SMIT 89, LW 320, and SAF 89 flux, and SMAW welds using no flux.
Column 5: EOL upper-shelf energy (USE) at T/4; calculated by using the EOL fluence and either the cooper value or the surveillance data. (Both methods are described in RG 1.99, Revision 2.)

<u>EMA</u>
This indicates that the USE issue may be covered by either owners group or plant-specific equivalent margins analyses.

Column 6: EOL neutron fluence at T/4 from vessel inner wall; cited directly from T/4 value or calculated by using RG 1.99, Revision 2 neutron fluence attenuation methodology from the ID value reported in the latest submittal (GL 92-01, PTS, or P/T limits submittals).

Column 7: Unirradiated USE.

EMA
This indicates that the USE issue may be covered by either owners group or plant-specific equivalent margins analyses.

Column 8: Method of determining unirradiated USE

Direct
For plates, this indicates that the unirradiated USE was from a transverse specimen. For welds, this indicates that the unirradiated USE was from test date.

65%
This indicates that the unirradiated USE was 65% of the USE from a longitudinal specimen.

Generic
This indicates that the unirradiated USE was reported by the licensee from other plants with similar materials to the beltline material.

NRC generic
This indicates that the unirradiated USE was derived by the staff from other plants with similar materials to the beltline material.

10, 30, 40, or 50 °F
This indicates that the unirradiated USE was derived from Charpy test conducted at 10, 30, 40, or 50 °F.

Surv. Weld
This indicates that the unirradiated USE was from the surveillance weld having the same weld wire heat number.

Equiv. to Surv. Weld
This indicates that the unirradiated USE was from the surveillance weld having different weld wire heat number.

Sister Plant
This indicates that the unirradiated USE was derived by using the reported value from other plants with the same weld wire heat number.

Blank
indicates that there is insufficient data to determine the unirradiated USE.

/92

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 2 4 1990

MEMORANDUM FOR: Edward L. Jordan, Chairman
Committee to Review Generic Requirements

FROM: Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

SUBJECTS: 1. FINAL RULE - 10 CFR PART 50, APPENDIX J GENERAL REVISION, "LEAKAGE RATE TESTING OF CONTAINMENTS OF LIGHT-WATER-COOLED NUCLEAR POWER PLANTS"

2. FINAL GUIDE - (MS021-5) "CONTAINMENT SYSTEM LEAKAGE TESTING"

Enclosed for review and approval by the CRGR are the two subject documents which the NRC staff is recommending that the Commission issue in final form.

Both documents are being recommended for issuance by the Commission because of past Commission interest in the rule, and because the guide is integrally linked with the rule. The NRC staff does not intend to issue either document in final form without concurrent issuance of the other. The reason for this action is that the existing rule is overly prescriptive, such as in its endorsement of a national standard which has been superceded and in details of how to perform the leak test. Such details are now covered by the new guide's endorsement of a current national standard and guidance on acceptable leak testing techniques. Issuance of one document without the other would result in either a void or a conflict in the NRC's leak test criteria requirements and/or guidance on acceptable leak testing techniques.

The CRGR was briefed on these documents at Meetings #74 (April 17, 1985) and #76 (May 29, 1985). The CRGR initiated its review at Meeting #77 (June 3, 1985) and completed its review at Meeting #78 (July 8, 1985). The August 20, 1985 Minutes of Meeting #78 from the Chairman of the CRGR to the EDO contained several suggestions (which were followed by the NRC staff), and recommended that the EDO forward both documents to the Commission for its review and approval.

The ACRS Subcommittee on Regulatory Activities and the full Committee reviewed both documents on June 4 and 8, 1985, respectively, and recommended, in a June 11, 1985 memo from D. A. Ward to W. J. Dircks, that they both be issued for public comment.

SECY-86-167 was submitted to the Commission by the EDO on May 29, 1986. On September 18, 1986, the Secretary of the Commission advised the EDO that the Commission (with all Commissioners agreeing) approved publication of the proposed revisions to 10 CFR Part 50, Appendix J, and the related draft regulatory guide for public comment. This approval was subject to five requests which have been fulfilled, and also subject to the additional comments of Commissioner Bernthal which were published as requested (see draft SECY paper for details).

SEP 2 4 1990

The rule was published for comment in the Federal Register on October 29, 1986. Regulatory Guide MS 021-5 was published for comment in the Federal Register on October 28, 1986. At the request of several commenting parties, the public comment period was extended from three months to six months, ending on April 24, 1987.

Forty-five letters were received addressing either the rule or both the rule and the guide. An additional eight letters were received addressing only the guide, for a total of fifty-three comment letters.

The BWR Owners' Group (BWROG) has developed a draft Licensing Topical Report (LTR), entitled "Standardized Program for Primary Containment Integrity Testing", NEDO-31722, Class I, and dated August 8, 1989. The Owners' Group plans to develop an improved, standardized, more detailed leakage rate test program for use by its members. The draft BWROG LTR was submitted on August 21, 1989, and handled as a late but substantive comment package on the current revision to 10 CFR Part 50, Appendix J. The NRC staff has also reviewed the LTR comment package submitted and provided the results of this review to the BWROG Containment Testing Committee on or about September 21, 1990. The results were categorized as: (A) those recently included in the Appendix J final rule; (B) items with potential for future inclusion in Appendix J (or in its related regulatory guide); (C) items that it was recommended the BWROG add, revise, or clarify in the LTR; (D) items for which there exists potential for a consensus, but further review and discussion are needed; and (E) some remaining differences on which a consensus does not appear likely. It is expected that this constructive dialogue will continue beyond completion of both the rule and the LTR.

Included in this package are the Federal Register Notices for both the final rule and final guide. The final rule and guide differ from the proposed versions. A comparative text for comparing the proposed and final rules is furnished to aid in rapidly identifying the differences. A Comment Resolution Memo is also enclosed for each document explaining the NRC staff's disposition of the comments received. Supporting documents, sorting and describing the comments received, are provided as well.

The NRC staff believes that the wording of both documents as finally revised accurately represents the NRC staff's positions. All comments have been reviewed, considered, and addressed.

The Regulatory Analysis, Backfit Analysis, and other administrative reviews, such as reporting requirements, were all taken care of in the development, review, and approval of the proposed rule and For Comment guide.

The Office of General Counsel has reviewed and commented on this revised rule and final guide. The Office of Nuclear Reactor Regulation and Regional Offices I-V concur with both final documents. The Office of Administration has reviewed both documents and considers them to be in forms acceptable for publication. Congressional Affairs has reviewed the draft Congressional letter and concurred with it. Public Affairs has provided the enclosed public announcement. The ACRS, by copy of this memorandum, is being informed of the status of the rule and guide, and will place them on its agenda for formal review if it feels additional clarification and discussion are necessary.

SEP 24 1990

For further information contact E. Gunter Arndt, Task Leader, Structural and Seismic Engineering Branch, RES (492-3814).

Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

Enclosures:
RES memo to EDO w/its enclosures

cc: See attached list
CRGR (15)
ACRS (15)

DISTRIBUTION: (W/ENCLOSURE)

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RFaulkenberry,	RV
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CClark,	RV
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BShelton,	IRM/IRMB
EJakel,	OGC
SDuraiswamy,	ACRS
EIgne,	ACRS
MTaylor,	EDO
JBradburne,	CA
JFouchard,	PA
SGagner,	PA
RESReading	
DCS	(R2511)

Appendix J Documents List

			Date
1.	JCRGR	Beckjord memo to CRGR Chairman.	8/30/90
2.	DOCSLIST	List of documents in package.	As below
3.	JACRONYM	List of commentors & their acronyms.	7/25/90
4.	JLTRS	List of Appendix J comment letters.	7/25/90
5.	EDO	Beckjord memo to EDO.	7/11/90
6.	JSECY	SECY paper for EDO signature.	7/11/90
....			
7.	J-FRN	FRN Statement of Consideration, + Final Appendix J Rule	8/13/90
8.	J-COMP	Comparison between For Comment and Final rule.	8/16/90
9.	CR-MEMO	Comment Resolution Memo - App. J (responding to FRN & JCOMM).	8/08/90
10.	JCOMM	Public comments on October 29, 1986 proposed Appendix J general revision, by rule paragraph.	11/01/89
11.	FRN	Public responses to 15 October 1986 Federal Register Notice Questions, by question.	11/01/89
....			
12.	RG-FRN	Reg guide FR Notice of Availability. (RG-FINAL does not get added to this.)	7/12/90
13.	RG-FINAL	Final RG	9/14/90
14.	CR-MEMO'	Comment Resolution Memo - RG	9/16/90
15.	RGCOMM	Public comments on October 28, 1986 proposed Regulatory Guide MS 021-5.	11/01/89
....			
16.	CONGLTR	Draft Congressional letters.	7/09/90
17.	PA	Draft Public Announcement	6/20/90
18.	BACKFITA	Backfit Analysis for App J & RG	7/09/90
19.	JENVIRON	Environmental Assessment	7/09/90

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			Date
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6.	JSECY	SECY paper for EDO signature.	7/11/90
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8.	J-COMP	Comparison between For Comment and Final rule.	8/16/90
9.	CR-MEMO	Comment Resolution Memo - App. J (responding to FRN & JCOMM).	8/08/90
10.	JCOMM	Public comments on October 29, 1986 proposed Appendix J general revision, by rule paragraph.	11/01/89
11.	FRN	Public responses to 15 October 1986 Federal Register Notice Questions, by question.	11/01/89
....			
12.	RG-FRN	Reg guide FR Notice of Availability. (RG-FINAL does not get added to this.)	7/12/90
13.	RG-FINAL	Final RG	9/14/90
14.	CR-MEMO'	Comment Resolution Memo - RG	9/16/90
15.	RGCOMM	Public comments on October 28, 1986 proposed Regulatory Guide MS 021-5.	11/01/89
....			
16.	CONGLTR	Draft Congressional letters.	7/09/90
17.	PA	Draft Public Announcement	6/20/90
18.	BACKFITA	Backfit Analysis for App J & RG	7/09/90
19.	JENVIRON	Environmental Assessment	7/09/90

APPENDIX J COMMENTORS - ACRONYMS

Acronym	Name
AIF	Atomic Industrial Forum
ANI	American Nuclear Insurers
ANS	American Nuclear Society
APCO	Alabama Power
B&WOG	B&W Owners Group
BCPR	Bishop, Cook, Purcell, and Reynolds
BECHTEL	Bechtel Power Corp
BG&E	Balitimore Gas & Electric
BOSTED	Boston Edison
BWROG	BWR Owners' Group (1/06/86 ltr)
BWROG2	BWR Owners' Group (4/22/87 ltr)
BWROG3	BWR Owners' Group (8/21/89 ltr)
CE	Combustion Engineering
COMMED	Commonwealth Edison
DL	Duquesne Light
DPC	Duke Power Co
DRA	NRC Div. of Regulatory Applications, RES
EGA	E. Gunter Arndt
FP	Florida Power Corp
FP&L	Florida Power & Light
GLOVER	Jim Glover
GOODMAN	Lynne Goodman
GP	Georgia Power
GPU	GPU Nuclear
IAEA	International Atomic Energy Agency
LEWIS	Marvin I. Lewis
LILCO	Long Island Lighting Co
MEYANKEE	Maine Yankee
NPPD	Nebraska Public Power District
NU	Northeast Utilities
NUBARG	Nuclear Utility Backfitting & Reform Group
NYPA	NY Power Authority
OCRE	Ohio Citizens for Responsible Energy
PHILELEC	Philadelphia Electric
PP&L	Pennsylvania Power & Electric
RG&E	Rochester Gas & Electric
RI	NRC Region I
RII	NRC Region II
ROBLEDO	F. Robledo
S&W	Stone & Webster
SCE&G	South Carolina Electric & Gas Co
SERI	System Energy Resources, Inc
TE	Toledo Edison
TER	Testing, Engineering, & Research Services
TU	TU Electric
TVA	Tennessee Valley Authority
WCNOC	Wolf Creek Nuclear Operating Corp
WE	Wisconsin Electric
WPPS	Washington Public Power Supply System
WPSC	Wisconsin Public Service Crop
YAEC	Yankee Atomic Electric Co

APPENDIX J COMMENT LETTERS

Ltr #	Date	Commentator	Acronym
00	12/04/86	NE Utilities E. J. Mroczaka	NU
0	01/06/86	BWR Owners' Group T. A. Pickens	BWROG
1.	11/20/86	Amer. Nuclear Insurers Robert Sancore (Martin Marugg)	ANI
2.	01/06/87	Lynne Goodman (La Crosse, WI)	GOODMAN
3.	01/09/87	Bechtel Power Corp R. Schmitz	BECHTEL
4.	01/23/87	Florida Power Corp E. Simpson	FP
5.	01/15/87	Commonwealth Edison Dennis Farrar	COMMED
6.	01/14/87	F. Robledo (Consejo de Seguridad)	ROBLEDO
7.	01/26/87	Ohio Citizens for Responsible Energy Susan L. Hiatt	OCRE
8.	01/23/87	Boston Edison James Lydon	BOSTED
9.	01/23/87	B&W Owners' Group R.L.Grill	B&WOG
10.	01/26/87	Marvin I. Lewis	LEWIS
11.	01/29/87	Maine Yankee G. D. Whittier	MEYANKEE
12.	02/06/87	NY Power Authority John C. Brons	NYPA
13.	02/10/87	Stone & Webster R. B. Bradbury	S&W
14.	01/26/87	Rochester Gas & Electric Roger Kober	RG&G
15.	03/20/87	South Carolina Elec & Gas Co. Dan A. Nauman	SCE&G
16.	03/23/87	Philadelphia Electric Joseph Gallagher	PHILELEC
17.	03/25/87	Wolf Creek Nuclear Operating Corp Bart D. Withers	WCNOC
18.	04/08/87	Atomic Industric Forum J. W. Williams, Jr.	AIF
19.	04/22/87	Pennsylvania Power & Electric Harold W. Keiser	PP&L
20.	04/22/87	Baltimore Gas & Electric Joseph A. Tiernan	PG&E
21.	04/22/87	BWR Owners' Group T. A. Pickens	BWROG2
22.	04/23/87	Yankee Atomic Electric Co D. W. Edwards	YAEC

Ltr #	Date	Commentator	Acronym
23.	04/24/87	Alabama Power R. P. McDonald	APCO
24.	04/22/87	Georgia Power L. T. Gucwa	GP
25.	04/24/87	System Energy Resources, Inc. Oliver D. Kingsley, Jr.	SERI
26.	04/22/87	Florida Power & Light C. O. Woody	FPL
27.	04/24/87	TU Electric W. G. Counsil, G. S. Keeley	TU
28.	04/24/87	Wisconsin Public Service Corp D. C. Hintz	WPSC
29.	04/23/87	Duke Power Co. Hal B. Tucker	DPC
30.	04/24/87	Combustion Engineering A.E. Sherer	CE
31.	04/24/87	American Nuclear Society Ted M. Brown	ANS
32.	04/24/87	Northeast Utilities E. J. Mrozcka, C. F. Sears	NU
33.	04/24/87	Toledo Edison Donald C. Shelton	TE
34.	04/24/87	Bishop, Cook, Purcell & Reynolds Robert E. Helfrich	BCPR
35.	04/24/87	Nebraska Public Power District G. A. Trevors	NPPD
36.	04/24/87	Nuclear Utility Backfitting & Reform Group Nicholas S. Reynolds, Daniel F. Stenger	NUBARG
37.	04/23/87	Wisconsin Electric C. W. Fay	WE
38.	04/28/87	Washington Public Power Supply System G. C. Sorensen	WPPS
39.	04/24/87	Duquesne Light J. D. Sieber	DL
40.	04/30/87	GPU Nuclear J. R. Thorpe	GPU
41.	05/06/87	Tennessee Valley Authority R. L. Gridley	TVA
42.	04/30/87	International Atomic Energy Agency James K. Joosten	IAEA
43.	04/20/87	Testing, Eng'rg & Research Services (TER), T. Renton	TER
44.	05/04/87	Long Island Lighting Co. John D. Leonard, Jr.	LILCO
45.	08/21/89	BWR Owners' Group Stephen D. Floyd	BWROG3

Document Name:
EDO

Requestor's ID:
ARNDT

Author's Name:
arndt

Document Comments:

MEMORANDUM FOR: James M. Taylor
Executive Director for Operations

FROM: Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

SUBJECTS: 1. FINAL RULE - 10 CFR PART 50, APPENDIX J GENERAL REVISION, "LEAKAGE RATE TESTING OF CONTAINMENTS OF LIGHT-WATER-COOLED NUCLEAR POWER PLANTS"

2. FINAL GUIDE - (MS021-5) "CONTAINMENT SYSTEM LEAKAGE TESTING"

Enclosed for your signature is a SECY paper forwarding the two subject documents, which the NRC staff, CRGR, and ACRS are recommending that the Commission issue in final form.

Both documents are being recommended for issuance by the Commission because of past Commission interest in the rule, and because the guide is integrally linked with the rule. The NRC staff does not intend to issue either document in final form without the concurrent issuance of other. The reason for this action is that the existing rule is overly prescriptive, such as in its endorsement of a national standard which has been superceded and in details of how to perform the leak test. Such details are now covered by the new guide's endorsement of a current national standard and guidance on acceptable leak testing techniques. Issuance of one document without the other would result in either a void or a conflict in the NRC's leak test criteria requirements and/or guidance on acceptable leak testing techniques.

The CRGR was briefed on these documents at Meetings #74 (April 17, 1985) and #76 (May 29, 1985). The CRGR initiated its review at Meeting #77 (June 3, 1985) and completed its review at Meeting #78 (July 8, 1985). The August 20, 1985 Minutes of Meeting #78 from the Chairman of the CRGR to the EDO contained several suggestions (which were followed by the NRC staff), and recommended that the EDO forward both documents to the Commission for its review and approval. The CRGR recently reviewed the final documents, at Meeting # ... on .... 1990, and recommended that the Commission issue both documents in final form.

The ACRS Subcommittee on Regulatory Activities and the full Committee reviewed both documents on June 4 and 8, 1985, respectively, and recommended, in a June 11, 1985 memo from D. A. Ward to W. J. Dircks, that they both be issued for public comment. The ACRS recently reviewed the final documents, on .... 1990, and recommended that the Commission issue both documents in final form.

SECY-86-167 was submitted to the Commission by the EDO on May 29, 1986. On September 18, 1986, the Secretary of the Commission advised the EDO that the Commission (with all Commissioners agreeing) approved publication of the proposed revisions to 10 CFR Part 50, Appendix J, and the related draft regulatory guide for public comment. This approval was subject to five requests which have been fulfilled, and also subject to the additional comments of Commissioner Bernthal which were published as requested. A new SECY paper is enclosed as noted above, and it includes descriptions of Commission requests and the public responses to the requests.

The rule was published for comment in the Federal Register on October 29, 1986. Regulatory Guide MS 021-5 was published for comment in the Federal Register on October 28, 1986. At the request of several commenting parties, the public comment period was extended from three months to six months, ending on April 24, 1987.

Forty-five letters were received addressing either the rule or both the rule and the guide. An additional eight letters were received addressing only the guide, for a total of fifty-three comment letters.

The BWR Owners' Group (BWROG) has developed a draft Licensing Topical Report (LTR), entitled "Standardized Program for Primary Containment Integrity Testing", NEDO-31722, Class I, and dated August 8, 1989. The Owners' Group plans to develop an improved, standardized, more detailed leakage rate test program for use by its members. The draft BWROG LTR was submitted on August 21, 1989, and handled as a late but substantive comment package on the current revision to 10 CFR Part 50, Appendix J. The NRC staff has also reviewed the LTR comment package submitted and provided the results of this review to the BWROG Containment Testing Committee on or about September 21, 1990. The results were categorized as: (A) those recently included in the Appendix J final rule; (B) items with potential for future inclusion in Appendix J (or in its related regulatory guide); (C) items that it was recommended the BWROG add, revise, or clarify in the LTR; (D) items for which there exists potential for a consensus, but further review and discussion are needed; and (E) some remaining differences on which a consensus does not appear likely. It is expected that this constructive dialogue will continue beyond completion of both the rule and the LTR.

Included in this package are the Federal Register Notices for both the final rule and final guide. The final rule and guide differ from the proposed versions. A comparative text for comparing the proposed and final rules is furnished to aid in rapidly identifying the differences. A Comment Resolution Memo is also enclosed for each document explaining the NRC staff's disposition of the comments received. Supporting documents, sorting and describing the comments received, are provided as well.

The NRC staff believes that the wording of both documents as finally revised accurately represents the NRC staff's positions. All comments have been reviewed, considered, and addressed.

The Regulatory Analysis, Backfit Analysis, and other administrative reviews, such as reporting requirements, were all taken care of in the development, review, and approval of the proposed rule and For Comment guide.

The Office of General Counsel has reviewed and commented on this revised rule and final guide. The Office of Nuclear Reactor Regulation and Regional Offices I-V concur with both final documents. The Office of Administration has reviewed both documents and considers them to be in forms acceptable for publication. Congressional Affairs has reviewed the draft Congressional letter and concurred with it. Public Affairs has provided the enclosed public announcement. The CRGR and ACRS, as previously noted, have reviewed both documents and recommended they be issued in final form.

For further information contact E. Gunter Arndt, Task Leader, Structural and

Seismic Engineering Branch, RES (492-3814).

Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

Enclosures:
SECY paper w/ enclosures

cc: See attached list

DISTRIBUTION: (W/ENCLOSURE)

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MTaylor,	EDO
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DCS	(R2511)

Document Name:
JSECY

Requestor's ID:
ARNDT

Author's Name:
arndt

Document Comments:

(Month) (Day), 1990 SECY-90-XXX

For: The Commissioners

From: James M. Taylor
Executive Director for Operations

Subject: ISSUANCE OF FINAL REVISION TO APPENDIX J TO 10 CFR 50, AND RELATED FINAL REGULATORY GUIDE 1.XXX (MS 012-5)

Purpose: To obtain Commission approval to publish a final rule to update 10 CFR Part 50, Appendix J, Leakage Rate Testing of Containments of Light-Water-Cooled Nuclear Power Plants, and a related final regulatory guide 1.xxx, Containment System Leakage Testing.

Issue: Issuance of these two documents on containment leakage testing is for the purpose of updating the existing 1973 regulation and endorsing a related 1987 national standard. The final rule and regulatory guide are needed by the NRC licensing and enforcement staff in order to improve uniformity and efficiency in the regulation of this inservice inspection program and to reflect the current state-of-the-art of containment leakage testing.

Background A. Appendix J of 10 CFR Part 50 was originally issued as a proposed rule on August 27, 1971 (36 FR 17053); published as a final rule on February 14, 1973 (38 FR 4385); and became effective on March 16, 1973. The only amendments to this Appendix since 1973 were two limited ones. The first amendment modified the Type B (penetration) test requirements, particularly frequency of testing during periods of heavy air lock usage, to conform to what had become accepted NRC practice through the granting of exemptions. The first amendment was published for comment January 11, 1980 (45 FR 2330); published as a final rule September 22, 1980 (45 FR 62789); and became effective October 22, 1980. The second amendment incorporated the Mass Point statistical analysis technique into the NRC's regulations as a permissible alternative to the Total Time and Point-to-Point techniques specified in Appendix J. The Mass Point technique had already

Contact: E. Gunter Arndt, RES
492-3814

come into widespread use for reducing leak test data to a leakage rate. The second amendment was published for comment February 29, 1988 (53 FR 5985); and published as an immediately effective final rule on November 15, 1988 (53 FR 45890).

This revision of Appendix J will provide greater flexibility in meeting the rule's requirements when necessitated by variations in plant design. This revision also reflects acceptable changes in regulatory requirements resulting from: (1) experience in applying the existing requirements; (2) advances in containment leakage testing methods; (3) interpretive questions; (4) simplifying the text; (5) various external/internal comments since 1973; and (6) exemption requests received and approved.

B. The regulatory guide is based on the 1987 standard ANSI/ANS 56.8, "Containment System Leakage Testing Requirements," that details the consensus state-of-the-art in containment leakage testing procedures and data reduction and analysis. The standard is being endorsed in the guide rather than the rule. This approach limits the rule to test criteria, and leaves endorsement of detailed test procedures and statistical data reduction techniques to a guide that can be revised as the testing technology changes. Because much of the detail in the existing rule has been transferred to the guide, it is essential, for completeness and continuity in providing guidance to licensees and inspectors, that both the revised rule and guide be published in final form at the same time.

C. On August 20, 1985, the CRGR recommended that both draft documents be forwarded to the Commission for review and approval. The CRGR recently reviewed the final documents, at Meeting # ... on .... 1990, and recommended that the Commission issue both documents in final form.

The ACRS recommended, in a June 11, 1985 memo from D. A. Ward to W. J. Dircks, that both draft documents be issued for public comment. The ACRS recently reviewed the final documents, on .... 1990, and recommended that the Commission issue both documents in final form.

SECY-86-167 was submitted to the Commission by the EDO on May 29, 1986. On September 18, 1986, the Secretary of the Commission advised the EDO that the Commission (with all Commissioners agreeing) approved publication of the proposed revisions to 10 CFR Part 50 Appendix J and the related draft regulatory guide for public comment. This approval was subject to five requests which have been fulfilled, and also subject to the additional comments of Commissioner Bernthal which were published as requested.

The proposed rule was published for comment in the Federal Register on October 29, 1986. Regulatory Guide MS 021-5 was published for comment in the Federal Register on October 28, 1986. At the request of several commenting parties, the public comment period was extended from 3 months to 6 months, ending on April 24, 1987.

Forty-five letters were received addressing either the rule or both the rule and the guide. An additional eight letters were received addressing only the guide, for a total of 53 comment letters.

The BWR Owners' Group (BWROG) has developed a draft Licensing Topical Report (LTR), entitled "Standardized Program for Primary Containment Integrity Testing", NEDO-31722, Class I, and dated August 8, 1989. The Owners' Group plans to develop an improved, standardized, more detailed leakage rate test program for use by its members. The draft BWROG LTR was submitted on August 21, 1989, and handled as a late but substantive comment package on the current revision to 10 CFR Part 50, Appendix J. The NRC staff has also reviewed the LTR comment package submitted and provided the results of this review to the BWROG Containment Testing Committee on or about September 21, 1990. The results were categorized as: (A) those recently included in the Appendix J final rule; (B) items with potential for future inclusion in Appendix J (or in its related regulatory guide); (C) items that it was recommended the BWROG add, revise, or clarify in the LTR; (D) items for which there exists potential for a consensus, but further review and discussion are needed; and (E) some remaining differences on which a consensus does not appear likely. It is expected that this constructive dialogue will continue beyond completion of both the rule and the LTR.

Included in this package are the Federal Register Notices for both the final rule and final guide. The final rule and guide differ from the proposed versions. A comparative text for comparing the proposed and final rules is furnished to aid in rapidly identifying the differences. A Comment Resolution Memo is also enclosed for each document explaining the NRC staff's disposition of the comments received. Supporting documents, sorting and describing the comments received, are provided as well.

<u>Discussion:</u> Extensive comments were received on all aspects of this

rule, as well as on the 15 questions posed by the NRC staff and Commissioners in the proposed rule (Enclosure x).

The "Responses to October 1986 FRN Questions" (FRN.DOC - Enclosure x) and the "Comment Resolution Memo" (CR-MEMO.DOC - Enclosure x) summarize the responses to these questions. The questions presumed to be of particular interest to the Commission, based on comments provided in the Secretary's memo to the EDO of September 18, 1986 (revised), are #5, 7(b), 9, and 10, as well as the published separate views of Commissioner Bernthal regarding application of the Backfit Rule to the rulemaking process. It should be noted, however, that many of the negative comments provided in 1986-7 are somewhat out of date, because, following further discussions and consideration, licensees and owners' groups are generally viewing the proposed revision more favorably and would like to see Appendix J updated.

Commissioner Carr, in approving publication of the proposed rule for comment, requested input on whether present operating plants or plants under review should be given the opportunity to continue to meet the current Appendix J provisions if the proposed rule (reflecting considerations of public comments) becomes effective [FRN question (5)].

Eighteen "yes" responses apparently reflected the fact that licensees have learned over the years to operate under the existing rule.

Two "no" responses reflected support for one unified set of codified, improved test criteria.

The NRC staff feels that it would be regressive to have two different Appendix J-based leakage rate testing programs in use at the same time. It would compound the complexity of administering the already complex program, and would dilute the value of the information gained from the program.

Commissioner Zech, in approving publication of the proposed rule, solicited comments on the advisability of referencing the testing standard (ANSI/ANS 56.8) in the regulatory guide (MS 021-5) instead of in the text of Appendix J [FRN question (9)].

Fourteen responses supported the reference in the guide, while eight supported the reference in the rule.

The NRC staff believes that some of the eight that supported the reference in the rule would have chosen otherwise if the regulatory status of the guides had been better understood. The NRC staff is among the majority that consider the flexibility that results from referencing the standard in a guide rather than the rule to be beneficial to all involved.

Commissioner Zech also requested comments on the value of collecting data for the "as-found" condition of valves and seals and the need for acceptance criteria for the condition [FRN question (10)].

Twenty responses, while predominantly considering these data and criteria useful, varied considerably in degree of application. This accurately reflects discussions the NRC staff has had with the industry on this issue. While the concept has generally been acknowledged as valid, its implementation has been subject to much debate. Recent discussions have led to developing NRC staff-industry consensus on implementation.

Commissioner Roberts, in agreeing to publication of this proposed rule for comment only, solicited comments on a) whether it would be adopted voluntarily in lieu of the current Appendix J [FRN question (6)], and b) whether there are parts of the rule which don't constitute backfits but which would aid the staff, licensees, or both [FRN question (7)].

Commissioner Bernthal, although not concurring in the application of the Backfit Rule to rulemaking, agreed with Commissioner Roberts that comments be solicited specifically on whether all or part of the proposed Appendix J revisions would constitute a "backfit" under the definition of that term in the Commission's Backfit Rule [FRN question (7)].

On question (6), eleven would use the existing program with the less stringent criteria of the proposed program. Six commented that the propose rule contains changes that add cost without adding safety.

On question (7), extensive comments were received invoking the Backfit rule with regard to proposed positions or clarifications that were unfavorable received. Current exemptions to the existing rule were also requested to remain in effect when the proposed rule becomes effective (except of course for those provisions that would no longer need to be exempted under the new rule). The most contentious areas were: "as-found" testing (which the NRC staff contends is not a new position), a possible second preop test, redefinition of containment isolation valves to conform to the General Design Criteria, and use of the maximum leakage path for leakage testing of penetrations and valves.

One comment was received recommending repeal of the

Backfit Rule.

Due to the detailed and extensive, sometimes legal, arguments offered, any study of this issue should refer back to the source letters. The summary document (FRN.DOC - Enclosure x) provides a compact sense of the comments provided.

Recommendations

That the Commission:

1. Approve issuance of the enclosed notices of final rulemaking and availability of final regulatory guide.

2. Certify that this rule will not have a significant economic impact on a substantial number of small entities pursuant to the Regulatory Flexibility Act of 1980 (5 U.S.C. 605 (b)).

3. Note:

a. The final rule and a notice of availability of a final regulatory guide would be published in the Federal Register (Enclosures x and y).

b. A notice of availability of an Environmental Assessment and Finding of No Significant Environmental Impact is being supplied concurrently to the Public Document Room (Enclosure x).

c. The revised rule contains one new "information collection requirement" that has been approved by OMB (Enclosure x). It is a request for a schedule for compliance with the rule, in lieu of an imposed compliance date.

d. A public announcement (Enclosure x) will be issued when the notice of final rulemaking and notice of availability of final regulatory guide are filed with the Office of the Federal Register;

e. The appropriate Congressional committees will be informed (Enclosure x); and

f. Copies of the Federal Register notices will be distributed to all power reactor permittees and licensees. The notices will be sent to other interested parties upon request.

g. Copies of the Comment Resolution Memo and its supporting documents will be sent to all who submitted comments on the proposed rule and regulatory guide.

h. The Advisory Committee on Reactor Safeguards issued a letter on .... (Enclosure x) recommending that these two documents be issued in final form.

i. A Backfit Analysis prepared in accordance with § 50.109 appears as part of the statement of considerations for the final rule.

j. The Chief Counsel for Advocacy of the Small Business Administration was notified on .... of the Commission's determination, pursuant to the Regulatory Flexibility Act of 1980 (5 U.S.C. 605 (b)), that this rule and regulatory guide will not have a significant economic effect on a substantial number of small entities (Enclosure x).

James M. Taylor
Executive Director for Operations

Enclosures:

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. (Day), (Date).

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT (Day), (Date), with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be appraised of when comments may be expected.

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10 CFR Part 50, Appendix J

General Revision

Document Name:
J-FRN

Requestor's ID:
ARNDT

Author's Name:
Arndt

Document Comments:

[7590-01]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50
RIN 3/50-AA68

Leakage Rate Testing of Containments of Light-Water-Cooled Nuclear Power Plants

AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Nuclear Regulatory Commission is amending its regulations to update the criteria and clarify questions of interpretation in regard to leakage rate testing of containments of light-water-cooled nuclear power plants. The final rule is necessary to improve the licensing and enforcement program by eliminating conflicts, ambiguities, and lack of uniformity in the regulation of this inservice inspection program.

EFFECTIVE DATE: (Insert date = 30 days after publication.)

FOR FURTHER INFORMATION CONTACT: Mr. E. Gunter Arndt, Office of Nuclear Regulatory Research, Mail Stop NLS-007, U.S. Nuclear Regulatory Commission, Washington, DC 20555, telephone 301-492-3814.

SUPPLEMENTARY INFORMATION

Background

Appendix J of 10 CFR Part 50 was originally issued as a proposed rule on August 27, 1971 (36 FR 17053); published as a final rule on February 14, 1973

(38 FR 4385); and became effective on March 16, 1973. The only amendments to this Appendix since 1973 were two limited ones. The first amendment modified the Type B (penetration) test requirements, particularly frequency of testing during periods of heavy air lock usage, to conform to what had become accepted NRC practice through the granting of exemptions. The first amendment was published for comment January 11, 1980 (45 FR 2330); published as a final rule September 22, 1980 (45 FR 62789); and became effective October 22, 1980. The second amendment incorporated the Mass Point statistical analysis technique into the NRC's regulations as a permissible alternative to the "Total Time" and "Point-to-Point" techniques specified in Appendix J. The Mass Point technique had already come into widespread use for reducing leak test data to a leakage rate. The second amendment was published for comment February 29, 1988 (53 FR 5985); and published as an immediately effective rule on November 15, 1988 (53 FR 45890).

This revision of Appendix J will provide greater flexibility in applying alternative leak test requirements necessitated by variations in plant design and will reflect acceptable changes in regulatory requirements resulting from: (1) experience in applying the existing requirements; (2) advances in containment leakage testing methods; (3) interpretive questions; simplifying the text; (5) various external/internal comments since 1973; and (6) exemption requests received and approved.

Related Regulatory Guide

A final regulatory guide on the same subject, 1.xxx, "Containment System Leakage Testing" (formerly MS 021-5) is also being published with a separate

Federal Register Notice of Availability. The regulatory guide contains specific guidance on acceptable leakage test methods, procedures, and analyses that may be used to implement these requirements and criteria.

This companion regulatory guide has as its basis the 1987 standard ANSI/ANS 56.8, "Containment System Leakage Testing Requirements," that details a consensus state-of-the-art in containment leakage testing procedures and data reduction and analysis. The standard is being endorsed in the guide rather than the rule. This approach limits the rule to test criteria, and leaves endorsement of detailed test procedures and statistical data reduction techniques to a guide that can be revised as the testing technology changes.

The proposed rule was published for comment in the Federal Register on October 29, 1986 (51FR39538). The Regulatory Guide MS 021-5 was published for comment in the Federal Register on October 28, 1986 (51FR39394). At the request of several commenting parties, the public comment period for the proposed rule and the proposed regulatory guide was extended from three months to six months, ending on April 24, 1987.

Forty-five letters were received addressing either the rule or both the rule and the guide. An additional eight letters were received addressing only the guide, for a total of fifty-three comment letters.

The final rule and guide differ from the proposed rule and the regulatory guide published for comment. A comparative text for comparing the proposed and final rules is available to aid in rapidly identifying the differences. A Comment Resolution Memo is also available for each document explaining the NRC staff's disposition of the comments received. Supporting documents, which sort and describe the comments received are provided as well. Copies of these documents have been sent to all who mailed in comments, and copies have been placed in the NRC Public Document Room, 2120 L Street NW (lower level), Washington DC.

Extensive comments were received on all aspects of this rule, as well as on the 15 questions on which the NRC staff and Commissioners requested comment in the proposed rule. Because of the large number of questions and responses, as well as direct comments on the rule, the reader is directed to the Comment Resolution Memo and its two supporting documents, Responses to October 1986 FRN Questions, and Comments on October 1986 Proposed Revision.

Finding Of No Significant Environmental Impact: Availability

The Commission has determined under the National Environmental Policy Act of 1969, as amended, and the Commission's regulations in Subpart A of 10 CFR Part 51, that this rule is not a major Federal action significantly affecting the quality of the human environment, and therefore an environmental impact statement is not required. There will be no radiological environmental impact offsite, but there may be an occupational exposure onsite of about 3.0 man-rem per year of plant operation for plant personnel (about 0.4% increase). Alternatives to issuing this regulation were considered and found not acceptable. The environmental assessment and finding of no significant impact on which this determination was based are available for inspection at the NRC Public Document Room at 2120 L Street NW (Lower Level), Washington DC. Single copies of the environmental assessment and finding of no significant impact are available from Mr. E. Gunter Arndt, Office of Nuclear Regulatory Research, Mail Stop NLS-007, U.S. Nuclear Regulatory Commission, Washington DC 20555, telephone 301-492-3814.

Paperwork Reduction Act Statement

This final rule amends information collection requirements that are subject to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). These requirements were approved by the Office of Management and Budget approval number 3150-0011.

Public reporting burden for this collection of information is estimated to average 160 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Records and Reports Management Branch (P-530), U.S. Nuclear Regulatory Commission, Washington, DC 20555; and to the Paperwork Reduction Project (3150-0011), Office of Management and Budget, Washington, DC 20503.

Regulatory Analysis

The Commission has prepared a regulatory analysis for this final regulation. The analysis examines the costs and benefits of the alternatives considered by the Commission. Interested persons may examine a copy of the regulatory analysis at the NRC Public Document Room, 2120 L Street NW (Lower Level), Washington DC.

Regulatory Flexibility Certification

As required by the Regulatory Flexibility Act of 1980, (5 U.S.C. 605(b)), the Commission certified that this rule, as published for public comment, would not have a significant economic impact on a substantial number of small entities. That certification is still valid for this final rule. This rule affects only the licensing and operation of nuclear power plants. The companies that own these plants do not fall within the scope of the definition of "small entities" set forth in the Regulatory Flexibility Act or the Small Business Size Standards set out in the regulations issued by the Small Business Administration at 13 CFR Part 121.

Backfit Analysis

As required by 10 CFR 50.109, the Commission has completed a backfit analysis for the final rule. The Commission has not determined, based on this analysis, that backfitting to comply with the requirements of this final rule provides a substantial increase in protection to public health and safety or the common defense and security. However, the direct and indirect costs of implementation are justified due to better, more uniform tests and test reports, greater confidence in the reliability of the test results, fewer exemption requests, and fewer interpretive debates. For the benefit of the public, licensees, and the NRC staff, this revised rule is being issued at this time. The backfit analysis on which this determination is based reads as follows.

BACKFIT ANALYSIS AND CONCLUSION RELATING TO THE PROPOSED
REVISION TO 10 CFR PART 50, APPENDIX J
AND ITS COMPANION REGULATORY GUIDE

10 CFR Part 50, Section 50.109, states that the Commission shall require a systematic and documented analysis pursuant to paragraph (c) of this same section for backfits which it seeks to impose.

This revision of 10 CFR 50, Appendix J is not being implemented by the NRC staff on the basis of any substantial increase in safety or decrease in costs. Instead, it is being implemented as both safety and cost neutral. Justification for the revision is based on the need to conform present testing capabilities to the current state of the art, and to use the best available procedures, thereby not freezing a stale (1972) technology. The revision will keep rule requirements unambiguous, technically current, uniform in application and usefulness, legally consistent, and flexible enough to accommodate differing plant designs.

The following discussion and §50.109(c) analysis describe how these aspects, and the substantive elements of the backfit rule have been addressed in the review and oversight process that all rules and regulatory guides must go through prior to issue. Justifications for undertaking and completing such activities must be continually made throughout the development process. As a result, all of the issues and elements of interest under §50.109 have been scrutinized by a variety of reviewing bodies, and in public meetings. The conclusion presented is one believed to be supported through these previous reviews.

This rule is intended to be applied to the entire population of nuclear power reactors and it clearly constitutes a backfit.

Prior to the effective date of the backfit rule and its application to the rulemaking process, the NRC staff presented this as a proposed rulemaking activity, including its contents and the justification therefore, to the ACRS and the CRGR. After review and discussion of the proposed rulemaking activity, its relationship to other NRC activities related to containment integrity, a value-impact study, and related justifications for this updating activity, these review bodies recommended in favor of issuing the proposed rule revisions and companion regulatory guide (MS 021-5) for public comment.

The regulatory analysis written for this proposed revision was considered by the ACRS and CRGR review bodies, and also placed on file in the Public Document Room. Included in this regulatory analysis package was a cost analysis by Science & Engineering Associates, Inc.; Mathtec, Inc.; and S. Cohen & Associates, Inc.

Tables 1.3 and 1.4 in the cost analysis estimated that the Appendix J revision can result in a potential total cost saving ranging from about $98 million (@ 10% discount rate) to $164 million (@ 5% discount rate) but with a potential increase in routine occupational exposure on the order of 10,000 person-rem over the assumed operating life of all existing and planned power reactors.

This projected increase in occupational exposures would on average equate to less than four person-rem per reactor year. It should be noted that 1983 occupational exposure levels averaged annual collective doses of 753 person-rem per reactor year.

The analysis projected total costs to the NRC on the order of $4 million (@ 10%) to $5 million (@ 5%), principally due to increased manpower efforts associated with technical specification revisions. Of this, about $3 million would be incurred over the next few years during implementation. The remainder represents the present worth of all NRC costs incurred over the operating life of the reactor population.

Implementation costs to the nuclear industry of about $4 million (@ 10% & 5%) were projected due to preparation of technical specification changes minus the projected savings associated with reduced exemption requests necessitated by the current regulation. The major industry benefit would occur during the operating life of the power reactor population where present worth savings on the order of $106 million (@ 10%) to $173 million (@ 5%) were projected. Although the cost analysis also identified increased operating costs, these costs would be outweighed by significant savings in replacement energy costs. Savings in replacement energy costs would result because several of the changes to Appendix J will reduce the expected frequency of containment integrated leakage rate (Type A) tests. These tests currently require 3 to 5 days of reactor downtime per test.

A 10,000 person-rem increase in routine occupational exposure was estimated over the operating life of the power reactor population primarily due to an assumed increase in maintenance efforts for implementing Corrective Action Plans and in the industry's ability to substitute local penetration and valve (Type B and Type C) tests for Type A tests. On a per reactor-year basis, this represents an average projected increase in occupational exposure of approximately 0.4% relative to the 753 person-rem average from all other causes apart from Appendix J. This 1985 estimated impact of 10,000 rem is now somewhat less in 1990 due to current increased use of local testing.

The analysis of the costs and benefits for the Appendix J revision indicated a significantly favorable net cost benefit for the action when all tradeoffs and factors such as replacement energy savings are considered. However, the NRC staff is aware that it may not be appropriate to factor the economic benefits of avoiding penalty replacement energy savings into its regulatory safety decision process. The NRC staff is therefore not factoring these particular savings into its conclusions regarding benefits and costs. However, the NRC staff firmly believes that there exist regulatory and industry advantages that accrue from use of technically sound and unambiguous regulations that minimize the need for exemptions. Therefore, even if the favorable economic benefits to industry are minimized in the balancing of the overall costs and safety benefits involved, the staff estimates that, at worst, this revision should be considered neutral in its cost and safety effects.

This revision of Appendix J includes the following considerations:

* This revision of Appendix J is an administrative update due to changes in practice and replacement of a referenced ANSI standard. The revised regulation provides general test criteria for testing leakage

characteristics of the post-LOCA containment configuration. It also standardizes reporting requirements. The test method is basically the statistical evaluation of multiple pressure, temperature, and humidity readings needed to quantify a very small leakage rate from a very large volume. For example, a 0.1% per day leakage rate out of a containment volume of 2,000,000 cu. ft. under a pressure of 55 psia at 150°F is roughly equivalent to that represented by a hole with a diameter of about 1/16 inch. The actual allowable leakage rate is defined for each plant in its technical specifications, based on analyses conducted pursuant to 10 CFR Part 100, whereas Appendix J establishes the criteria and tests to be used to verify the achievement of technical specification limits on leakage.

* This revision allows greater flexibility for acceptance of alternative leakage rate test requirements to accommodate variations in containment system designs. While source term and risk studies may conclude that current containment system leakage limits are overly restrictive, changes to Appendix J would be unlikely so long as the rule's general test criteria were not affected. Any relaxation of these limits would require changes to plant technical specifications. Changes to ANSI/ANS 56.8 could also be needed for test conditions sensitive to changes in leakage rate, such as data error bands and instrument sensitivity. This enhances the stability of this regulation.

* The current leakage limits established by NRR for plant-specific siting are based on analyses pursuant to 10 CFR Part 100. These current leakage limits remain unchanged under this Appendix J revision.

* Discussions between NRC staff, nuclear industry representatives, and professional and standards groups indicate that Appendix J to 10 CFR Part 50 needed to be revised to update the criteria, clarify questions of interpretation, and delete references to an obsolete ANSI standard on leakage rate testing of containments of light-water-cooled nuclear power plants.

* This revision of Appendix J provides greater flexibility in applying alternative leakage test requirements, taking into account the variations in plant design. It also reflects experience in applying existing requirements, advances in containment leak testing methods, and multiple requests (since 1973) for exemptions.

* Appendix J contains only the general requirements and acceptance criteria (no testing techniques) for preoperational and subsequent periodic leak testing. Prescriptive and detailed testing techniques are not incorporated in this revision. Interested persons were offered an opportunity to comment on specific guidance concerning leakage test methods, procedures, and analyses that are acceptable to NRC staff to implement these requirements and criteria during the public comment review period of Regulatory Guide 1.xxx (MS 021-5).

Analysis of 50.109(c) Factors

50.109(c)

(1) Statement of the specific objectives that the proposed backfit is designed to achieve.

This revision of Appendix J provides greater flexibility in applying alternative leakage test requirements due to variations in plant design, and reflects changes based on: (1) experience in applying the existing requirements; (2) advances in containment leak testing methods; (3) interpretive questions; (4) simplifying the text; (5) various external/internal comments since 1973; and (6) exemption requests received and approved. There has also been a need to conform present testing capabilities to the current state of the art and to use the best available procedures, thereby not freezing a stale (1972) technology. The revision keeps rule requirements unambiguous, current, useful, consistent with practice, and flexible enough to accommodate differing plant designs. Also, the publication of an expanded and updated national standard on how to conduct such tests has made it appropriate to generalize the regulation by retaining test criteria and removing prescriptive testing details better left to the national standard.

(2) General description of the activity that would be required by the licensee or applicant in order to complete the backfit.

This action requires changes to the technical specifications, test procedures, data analyses, and test reports. In some cases it may entail modification of some systems to conform to all aspects of the revised leakage testing program, such as test taps to enable testing of some valve(s) not previously tested. In some regions, where improved Type B and C test programs have been implemented, hardly any modifications will be needed. With such minor exceptions, the activities required for compliance are administrative and procedural, rather than physical or hardware changes. For plants that have been doing Type A tests at reduced pressure, an additional 3-10 hours pumping time may be needed when testing at full pressure. Those few plants not reporting "as found" leakage results are explicitly required to do so.

Licensees will have to review plant test procedures against the revised requirements and recommendations. This will determine the extent of changes needed to the technical specifications. Following this evaluation, licensees will submit to the NRC staff an implementation schedule for conforming to the new requirements. This schedule will take into account where the plant is in its testing timetable and the amount of work needed to change procedures, tech specs, etc.

(3) Potential change in the risk to the public from the accidental off-site release of radioactive material.

Studies have indicated that containment systems of today's plants are strong and reliable against leakage of radioactivity for a spectrum of postulated design basis accidents including the presence of large amounts of radioactivity as is traditionally assumed for analyses pursuant to 10 CFR Part 100. This reliability against leakage has been brought about by NRC design requirements and use of industry codes and standards. The requirement to periodically test the containment system (Appendix J) is also an important way of assuring that this leaktight integrity is maintained over the plant's lifetime. The proposed revision to Appendix J is expected to continue this assurance of leaktight integrity of the containment system. However, experience over the past decade (since 1973) has revealed that the more likely leakage paths exist through penetrations and valves. Therefore, more focus is provided on penetrations and valve (Type B & C) leakage tests. This improved test focus is difficult to quantify because the available data from containment systems testing already indicates a high reliability for low leakage. Substantial safety benefits have derived from the existence of Appendix J itself. The proposed update and revision will at least continue these benefits, but will also produce greater confidence in the value of the test results, and do so, at worst, on an overall cost-neutral basis.

(4) Potential impact on radiological exposure of facility employees.

The changes to Appendix J are estimated to result in higher occupational radiation exposures than are presently experienced. The more frequent testing of individual containment penetrations may require additional time inside containment for test crews, resulting in higher occupational exposures. Data and derivations are provided in the Appendix to NUREG/CR-4398, "Cost Analysis of Revisions to 10 CFR Part 50, Appendix J, Leak Tests for Primary and Secondary Containment of Light-Water-Cooled Nuclear Power Plants." From these, average industry increases are about 3.0 person-rem per plant per year of operation. The high estimate is 5.6 person-rem per plant per year, and the low 0.5 person-rem. This compares with an average annual collective dose of 753 person-rem per plant (from NUREG 0713, Vol. 5, "Occupational Radiation Exposure at Nuclear Power Reactors," 1983), and represents an average potential increase of 0.4%.

(5) Installation and continuing costs associated with the backfit, including

the cost of facility downtime or the cost of construction delay.

A comprehensive cost analysis (NUREG/CR-4398) has been performed that indicated significant potential cost savings to the industry and public. These have been estimated for the remaining life of all water-cooled nuclear power plants in this country, in operation or under construction, as ranging from $106 million to $173 million. Industry implementation costs are estimated to be about $3 million to $4 million, due to revision of technical specifications less savings associated with reduced exemption requests.

Although the cost analysis estimated large potential savings, the NRC staff has conservatively viewed the impact of this revision as cost-neutral on an industry-wide basis. This is because the savings are mostly replacement power costs for extra penalty Type A tests that could be avoided by changes proposed in the revision. However, these costs could also be viewed as currently avoidable for licensees that are maintaining their containment systems within technical specification leakage limits.

(6) The potential safety impact of changes in plant or operational complexity, including the relationship to proposed and existing regulatory requirements.

As an updated inservice inspection program, no significant, quantifiable change is claimed to safety other than to occupational exposures, as previously noted. However, in return there will be indirect benefits of greater confidence in the reliability of the test results and plant hardware, better and more uniform tests and test reports, fewer exemption requests, and fewer interpretive debates. No changes in plant or operational complexity are foreseen. There is also no impact on other regulatory requirements.

(7) The estimated resource burden on the NRC associated with the proposed backfit and the availability of such resources.

For the total population of all water-cooled power plants in this country, the estimated NRC resource burden is about $3 - 4 million for implementation and $1 million for operation over their remaining life. This is due principally to increased manpower efforts associated with technical specification revisions. The resources necessary to accomplish these tasks have been considered in the NRC budget. Once the initial technical specification revision is done, the resulting standardization will reduce process time and the technical specifications will be more uniform.

(8) The potential impact of differences in facility type, design or age on the relevancy and practicality of the proposed backfit.

Uniformity in requirements, implementation, and reporting is being sought by the rule revision. Although plants of different design and vintage are involved, it is believed that the net impact will not vary significantly. Major problems with the existing rule that are unique to older (pre-Appendix J) plant designs have been handled by granting exemptions where justified. Such exemptions, where still needed, will remain in force. NUREG/CR-4398 notes that the net impact is not expected to vary significantly between BWR's and PWR's.

(9) Whether the proposed backfit is interim or final and, if interim, the justification for imposing the proposed backfit on the interim basis.

This revision to Appendix J and its associated backfit are being issued, after the public comment period, as final.

§50.109(a)(3) CONCLUSION

There is no substantial increase in the overall protection of the public health and safety or the common defense and security that can presently be quantified from the backfit of this revised rule. However, the direct and indirect costs of implementation are justified due to better, more uniform tests and test reports, greater confidence in the reliability of the test results, fewer exemption requests, and fewer interpretive debates. For the benefit of the public, licensees, and the NRC staff, this revised rule is being issued at this time.

List of Subjects in 10 CFR Part 50

Antitrust, Classified information, Fire protection, Incorporation by reference, Intergovernmental relations, Nuclear power plants and reactors, Penalty, Radiation protection, Reactor siting criteria, Reporting and recordkeeping requirements.

For the reasons set out in the preamble and under the authority of the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and 5 U.S.C. 553, the NRC is adopting the following amendments to 10 CFR Part 50.

PART 50 - DOMESTIC LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

1. The authority citation for Part 50 is revised to read as follows:

AUTHORITY: Secs. 102, 103, 104, 105, 161, 182, 183, 186, 189, 68 Stat. 936, 937, 938, 948, 953, 954, 955, 956, as amended, sec. 234, 83 Stat. 1244, as amended (42 U.S.C. 2132, 2133, 2134, 2135, 2201, 2232, 2233, 2236, 2239, 2282); secs. 201, as amended, 202, 206, 88 Stat. 1242, as amended, 1244, 1246 (42 U.S.C. 5841, 5842, 5846).

Section 50.7 also issued under Pub. L. 95-601, sec. 10, 92 Stat. 2951 (42 U.S.C. 5851). Section 50.10 also issued under secs. 101, 185, 68 Stat. 936, 955, as amended (42 U.S.C. 2131, 2235); sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.13, 50.54(dd) and 50.103 also issued under sec. 108, 68 Stat. 939, as amended (42 U.S.C. 2138). Sections 50.23, 50.35, 50.55, and 50.56 also issued under sec. 185, 68 Stat. 955 (42 U.S.C. 2235). Sections 50.33a, 50.55a and Appendix Q also issued under sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332). Sections 50.34 and 50.54 also issued under sec. 204, 88 Stat. 1245 (42 U.S.C. 5844). Sections 50.58, 50.91, and 50.92 also issued under Pub. L. 97-415, 96 Stat. 2073 (42 U.S.C. 2239). Section 50.78 also issued under sec. 122, 68 Stat. 939 (42 U.S.C. 2152). Sections 50.80 through 50.81 also issued under sec. 184, 68 Stat. 954, as amended (42 U.S.C.

2234). Appendix F also issued under sec. 187, 68 Stat. 955 (42 U.S.C. 2237).

For the purposes of sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273); __ 50.46(a) and (b), and 50.54(c) are issued under sec. 161b, 68 Stat. 948, as amended (42 U.S.C. 2201(b)); __ 50.7(a), 50.10(a)-(c), 50.34(a) and (e), 50.44(a)-(c), 50.46(a) and (b), 50.47(b), 50.48(a), (c), (d), and (e), 50.49(a), 50.54(a), (i), (i)(1), (1)-(n), (p), (q), (t), (v), and (y), 50.55(f) 50.55(a), (c)-(e), (g), and (h), 50.59(c), 50.60(a), 50.62(c), 50.64(b), and 50.80(a) and (b) are issued under sec. 1611, 68 Stat. 949, as amended (42 U.S.C. 2201(i)); and __50.49(d), (h), and (j), 50.54(w), (z), (bb), (cc), and (dd), 50.55(e), 50.59(b), 50.61(b), 50.62(b), 50.70(a), 50.71(a)-(c) and (e), 50.72(a), 50.73(a) and (b), 50.74, 50.78, and 50.90 are issued under sec. 161o, 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

Appendix J - Leakage Rate Testing of Containments of Light-Water-Cooled Nuclear Power Plants

10. Permissible Periods for Testing

B. Type B Test

1. Frequency

2. Pressure

3. Air Locks

4. Acceptance Criteria

5. Penetrations That Need Not Be Type B Tested

C. Type C Test

1. Frequency

2. Pressure/Medium

3. Acceptance Criteria

4. Valves That Need Not Be Type C Tested

IV. Special Leak Test Requirements

A. Containment Modification or Maintenance

B. Multiple Leakage Barriers or Subatmospheric Containments

V. Test Methods, Procedures, and Analyses

A. Type A, B, and C Test Details

B. Combination of Periodic Type A, B, and C Tests

VI. Reports

A. Submittal

B. Content

VII. Application

A. Applicability

B. Effective Date

I. Introduction.

One of the conditions of all operating licenses for light-water-cooled power reactors as specified in § 50.54(o) is that containments meet the leak test requirements set forth in this appendix. The tests ensure that (a) leakage through the containments or systems and components penetrating these containments does not exceed allowable leakage rates specified in the Technical Specifications and (b) inservice inspection of penetrations and isolation valves is performed so that proper maintenance and repairs are made during their service life. This appendix identifies the general requirements and acceptance criteria for preoperational and subsequent periodic leak testing.[1]

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[1] Specific guidance concerning acceptable leakage test methods, procedures, and analyses that may be used to implement these requirements and criteria are provided in Regulatory Guide 1.___, "Containment System Leakage Testing". Copies of the regulatory guide may be purchased from the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington, DC, 20013-7082.

II. Definitions.

"Acceptance criteria" means standards against which test results are to be compared for establishing the acceptability of the containment system as a leakage limiting boundary.

"As Found leakage rate" means the leakage rate prior to any repairs or adjustments that could affect the leaktightness of the barrier being tested.

"As Left leakage rate" means the leakage rate following any repairs or adjustments that could affect the leaktightness of the barrier being tested.

"Containment," as used in this appendix, means the "containment system."

"Containment integrated leak rate test (CILRT)" means the combination of a Type A test and its verification test. Often shortened to Integrated Leak Rate Test (ILRT).

"Containment isolation valve" means, for plants conforming to Appendix A, "General Design Criteria", of this part, any valves defined by General Design Criteria 55, 56, and 57.

For plants not required to conform to Appendix A, containment isolation valves are any valves which are intended to provide a barrier between the containment environment and the outside environment.

"Containment leak test program" means the comprehensive testing of the containment system that includes Type A, B, C, and verification tests.

"Containment system" means the principal barrier, after the reactor coolant pressure boundary, to prevent the release of quantities of radioactive material that would have a significant radiological effect on the health of the public. It includes:

(1) The primary containment, including access openings and penetrations,

(2) Containment isolation valves, pipes, closed systems, and other components used to effect isolation of the containment atmosphere from the outside environs, and

(3) Those systems or portions of systems that by their functions extend the primary containment boundary to include their system boundary.

The term "containment system" does not include: (1) a Boiling Water Reactor's (BWR) Secondary Containment (Reactor) Building, (2) a Pressurized Water Reactor's (PWR) Shield Building, and interior barriers such as (3) the BWR Mark II Drywell Floor and (4) the Drywell perimeters of the BWR Mark III and the PWR Ice Condenser.

"Continuous monitoring system" means a permanently installed, on-line pneumatic measurement system that is at a pressure not less than P_{ac}, continuously monitors the leakage rate, and is either alarmed or read at least daily.

L_a (weight percent/24 hours) means the maximum allowable Type A test leakage rate in units of weight percent per 24-hour period at pressure P_{ac} as specified in the Technical Specifications.

L_{am} (weight percent/24 hours) means the measured Type A test leakage rate in units of weight percent per 24-hour period at pressure P_{ac} obtained from testing the containment system in the state as close as practical to that that would exist under design basis accident conditions (e.g., vented, drained, flooded, or pressurized).

"Leak" means an opening that allows the passage of a fluid.

"Leakage" means the quantity of fluid escaping from a leak.

"Leakage rate" means the rate at which the contained fluid escapes from the test volume at a specified test pressure.

"Maximum pathway leakage" means the maximum leakage that can be attributed to a penetration leakage path (e.g., the larger, not total, leakage of two valves in series). This generally assumes a single active failure of the better of two leakage barriers in series when performing Type B or C tests.

"Minimum pathway leakage" means the minimum leakage rate that can be attributed to a penetration leakage path (e.g., the smallest leakage of two valves in series). This is used when correcting the measured value of containment leakage rate from the Type A test (L_{am}) to obtain the overall integrated leakage rate. This generally assumes no active single failure of redundant leakage barriers under these test conditions. An acceptable, conservative, alternative to use of the smallest leakage of two valves in series is to use 1/2 of the total leakage of the penetration.

"Overall integrated leakage rate" means the total leakage rate through all tested leakage paths, including containment welds, valves, fittings, and components that penetrate the containment system, expressed in units of weight percent of contained air mass at test pressure per 24 hours.

"P_{ac} (psig)" means the calculated peak containment internal pressure related to the design basis loss-of-coolant accident as specified in the Technical Specifications.

"Periodic test" means test conducted during plant operating lifetime.

"Preoperational test" means test conducted upon completion of construction of a primary or secondary containment, including installation of mechanical, fluid, electrical, and instrumentation systems penetrating these containment systems, and prior to the time containment integrity is required.

"Primary containment" means the structure or vessel that encloses the major components of the reactor coolant pressure boundary, as this boundary is defined in § 50.2 of this Part. It is designed to contain design basis accident pressure and serve as a leakage barrier against the uncontrolled release of radioactivity to the environment.

The term "primary containment" does not include: (1) a Boiling Water Reactor's (BWR) Secondary Containment (Reactor) Building, (2) a Pressurized Water Reactor's (PWR) Shield Building, and interior barriers such as (3) the BWR Mark II Drywell Floor and (4) the Drywell perimeters of the BWR Mark III and the PWR Ice Condenser.

"Qualified seal system" means a containment isolation valve seal system, using water, that has been accepted by the NRC staff as being capable of ensuring the water sealing function at a pressure of no less than 1.10 P_{ac} for at least 30 days following a design basis accident.

"Structural integrity test" means a pneumatic test that demonstrates the capability of a primary containment to withstand a specified internal design pressure load.

"Type A test" means a test to measure the containment system overall integrated leakage rate under conditions representing design basis loss-of-coolant accident containment pressure and systems alignments (1) after the containment system has been completed and is ready for operation and (2) at periodic intervals thereafter. The Type A test does not include the verification test (see CILRT).

"Type B test" means a pneumatic test to detect and measure local leakage across locally testable, pressure retaining, leakage limiting boundaries other than valves and welds. Examples of containment penetrations which must be Type B tested include, but are not limited to:

(1) Those whose design incorporates resilient seals, gaskets, sealant compounds, expansion bellows, or those fitted with flexible metal seal assemblies.

(2) Air locks, including door seals and door operating mechanism penetrations, that are part of the containment pressure boundary.

"Type C test" means a pneumatic test to measure containment isolation valve leakage rates.

"Verification test" means a test to confirm the capability of the Type A test method and equipment to measure L_a.

III. General Leak Test Requirements

A. Type A Test.

1. Preoperational Test. A preoperational Type A test must be conducted on the containment system and must be preceded by:

(a) To the extent practical, Type B and C tests, and
(b) A structural integrity test.

2. Periodic Test. A periodic Type A test must be performed on the containment system.

3. Test Frequency. Unless a longer interval is specifically approved by the NRC staff, the interval between the preoperational and first periodic Type A tests must not exceed three years, and the interval between subsequent periodic Type A tests must not exceed four years. The interval for the next test starts at the completion of the current test. If the initial fuel loading is delayed so that the three-year interval between the first preoperational test and the first periodic test is exceeded, another preoperational Type A test will be necessary. If such an additional preoperational Type A test or an additional Type A test required by Section

III.A.9. or IV.A. of this appendix is performed, the Type A test interval may be restarted. If the test interval ends while primary containment integrity is not required or is required solely for cold shutdown or refueling activities, that specific test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required. The test interval may be extended up to 25 percent of the specified interval, but the combined interval for any three consecutive tests may not exceed 3.25 times the specified test interval.

4. Test Duration. The Type A test must be conducted for a duration sufficient to establish accurately the leakage rate, but must be at least 8 hours after stabilization has been achieved.

5. Test Pressure. The Type A test pressure must be within 4 percent of P_{ac} at the start of the test, but must not exceed the maximum containment design pressure and must not fall more than 4 percent below P_{ac} for the duration of the test, not including the verification test. The test pressure must be established relative to the external pressure of the containment. This may be either atmospheric pressure or the subatmospheric pressure of a secondary containment. If the containment design pressure is equal to or less than P_{ac}, the NRC staff shall review the Type A, B, and C test pressures to be used.

6. Pretest Requirements. Closure of containment isolation valves for the Type A test must be accomplished by normal operation, whether by manual or automatic actuation, and without any preliminary exercising or adjustments for the purpose of improving leakage (e.g., no tightening of valves after closure

by valve motor). Repairs of malfunctioning or leaking valves must be made as necessary. Information on valve leakage that requires corrective action prior to, during, or after the test (See Section V.B.) must be included in the report submitted to the Commission as specified in Section VI. of this appendix.

7. Verification Test. A leakage rate verification test must be performed after each preoperational and periodic Type A test in which the leakage rate meets the criteria of III.A.8.(a) and III.A.8.(b)(ii). The verification test selected must be conducted for a duration sufficient to establish accurately the change in leakage rate between the Type A and verification tests, but must be at least 4 hours. The results of the Type A test are acceptable if the sum of the verification test imposed leakage and the containment leakage rate calculated from the Type A test (L_{am}) does not differ from the leakage rate calculated from the verification test by more than $\pm$ 0.25 L_a.

8. Acceptance Criteria.

(a) For the preoperational Type A test, the "as left" leakage rate must not exceed 0.75 L_a, as determined by a properly justified statistical analysis. The "as found" leakage rate does not apply to the preoperational test.

(b) For each periodic Type A test, the leakage rate, as determined by a properly justified statistical analysis, must not exceed:

(i) L_a for the "as found" condition.
(ii) 0.75 L_a for the "as left" condition.

(c) In meeting these Type A test acceptance criteria, isolation, repair, or adjustment to a leakage barrier that may affect the leakage rate through that barrier is permitted prior to or during the Type A test provided:

(i) All potential leakage paths of the isolated, repaired, or adjusted leakage barrier are locally leak testable, and

(ii) The local leakage rates are measured before and after the repair or adjustment or any other action taken that will affect the leakage rates, and are reported under Section VI of this appendix.

(iii) All changes in leakage rates resulting from isolation, repair, or adjustment of leakage barriers subject to Type B or Type C testing are determined using the minimum pathway leakage method and, when performed during an outage in which a Type A test is performed, are also added to the Type A test result to obtain the "as found" and "as left" containment leakage rates.

(d) The effects of isolation, repair, or adjustments to the containment boundary made after the start of the Type A test sequence on the Type A test results must be quantified or accounted for and the appropriate analytical or tested corrections made (this includes tightening valve stem packing, additional tightening of manual valves, or any action taken that will affect the leakage rates). If quantification of leakage is not possible, the as found or as left (or both) Type A test will be considered to have failed, depending on whether it is the as found or as left leakage value that cannot be determined at the local leakage barrier.

9. Retesting.

(a) If, for any periodic Type A test, the as found leakage rate fails to meet the acceptance criterion of 1.0 L_a, a Leakage Correction Plan that focuses attention on the cause of the problem and indicates what is to be accomplished before and after restart must be developed and implemented by the licensee and then submitted together with the Containment Leak Test Report as required by Section VI of this appendix. The test schedule applicable to subsequent Type A tests (III.A.3.) must be submitted to the NRC staff for review and approval. An as left Type A test that meets the acceptance criterion of 0.75 L_a is required prior to plant startup.

(b) If two consecutive periodic as found Type A tests exceed the as found acceptance criterion of 1.0 L_a:

(i) Regardless of the periodic retest schedule of III.A.3., a Type A test must be performed at each plant shutdown for refueling or at least every 26 months whichever is sooner, unless an alternative leakage test is acceptable to the NRC staff on some other defined basis. This testing must be performed until two consecutive periodic as found Type A tests meet the acceptance criterion of 1.0 L_a, after which the retest schedule in III.A.3. may be resumed. The testing interval may be restarted at the end of the last of these two successful Type A tests. If the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, that test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required.

(ii) Investigation as to the cause and nature of the Type A test failure might indicate that an alternative leakage test program, such as more frequent Type B or Type C testing, may be more appropriate than the performance of two consecutive successful Type A leakage tests. The licensee may then submit a Corrective Action Plan describing the problem, cause, what was or is being done to correct it, and preventative measures to preclude recurrence, as well as an alternative leakage test program proposal for NRC staff review. If this submittal is approved by the NRC staff, the licensee may implement the corrective action and alternative leakage test program in lieu of one or both of the Type A leakage tests required by Section III.A.9.(b)(i).

10. Permissible periods for testing. The performance of the Type A tests must be limited to periods when the plant facility is secured in the shutdown condition under the administrative controls and safety procedures defined in the license.

B. Type B Test

1. Frequency.

(a) Type B as found and as left tests, except for air locks, must be performed on containment penetrations prior to initial criticality and periodically thereafter during shutdown periods or normal plant operations, but in no case may any individual test be conducted at intervals greater than 30 months. If the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, that specific test interval may be extended provided that all deferred testing is successfully completed prior to the time containment integrity is required. The test interval may be extended by up to 25 percent of the specified interval, but the combined interval for any three consecutive tests may not exceed 3.25 times the specified test interval. If opened following a Type A or B test, containment penetrations subject to Type B testing must be Type B tested prior to returning the reactor to an operating mode requiring containment integrity.

(b) For containment penetrations employing a continuous leakage monitoring system that is at a pressure not less than P_{ac}, leakage readings of sufficient sensitivity to permit comparison with Type B test leak rates must be taken.

(i) These leakage readings must be part of the Type B reporting of Section VI.A.

(ii) When practical, continuous leakage monitoring systems must not be operating or pressurized during Type A tests.

(iii) If certain pressurized sealing or testing systems cannot be isolated, such as inflatable air lock door seals, leakage into the containment must be accounted for and the Type A test results corrected accordingly.

2. Pressure. Type B tests must be conducted, whether individually or in groups, at a pneumatic pressure not less than P_{ac} except as provided in paragraph III.B.3.(b) of this section or in the Technical Specifications.

3. Air Locks.

(a) Initial and periodic tests. Air locks must be tested prior to the preoperational Type A test and at least once each 6-month interval thereafter at an internal pressure not less than P_{ac}. Alternatively, if there have been no air lock openings within 6 months of the last successful test at P_{ac}, this interval may be extended to the next refueling outage or air lock opening, whichever comes first (but in no case may the interval exceed 30 months). Under this alternative, reduced pressure tests must continue to be performed on the air lock or its door seals at 6-month intervals. Opening of the air lock for the purpose of removing air lock testing equipment following an air lock test does not require further testing of the air lock. An air lock also will not be considered as "opened" for the purpose of this requirement if it has not been opened since its latest leak test, and if the outer door is being opened for no other reason than than to enable testing of the air lock's inner door seals. In this case, subsequent testing of the outer door's seals is sufficient.

(b) Intermediate Tests. These tests, performed in between the periodic

6-month air lock tests, must be conducted as follows:

(i) Air locks opened during periods when containment integrity is required must be tested within 3 days of being opened. For air lock doors opened more frequently than once every 3 days, the air lock doors must be tested at least once every 3 days during the period of frequent openings. Air lock doors opened during periods when containment integrity is not required need not be tested during these periods. However, they must be tested prior to establishing containment integrity. For air lock doors having testable seals, testing the seals fulfills the intermediate test requirements of this paragraph. In the event that this intermediate testing cannot be done at P_{ac}, the test pressure must be stated in the Technical Specifications.

(ii) Whenever maintenance has been performed on an air lock, a complete air lock test at a test pressure of not less than P_{ac} is required, if that maintenance could have affected the leakage rate of the pressure retaining boundary. Local leakage testing of air lock-penetrating components at not less than P_{ac}, if such are locally testable (e.g., shaft seals, equalization valves, or similar air lock-penetrating components), is permissible in place of full air lock tests after maintenance has been performed on the air lock, if the maintenance affected only the components being locally tested.

(iii) Air lock door seal testing or reduced-pressure testing may not be substituted for the initial or periodic full-pressure test of the entire air lock required in paragraph III.B.3.(a) of this section.

4. Acceptance Criteria.

(a) The sum of the as found or as left Type B and C test results must not exceed 0.60 L_a using maximum pathway leakage. This sum must add in leakage rate readings from continuous leakage monitoring systems, unless already accounted for in the Type B and C tests. If quantification of leakage is not possible, the as found or as left (or both) Type B test will be considered to have failed, depending on whether it is the as found or as left leakage value that cannot be determined at the local leakage barrier.

(b) Leakage measurements are acceptable if obtained through continuous leakage monitoring systems that maintain a pressure not less than P_{ac} at individual test chambers of those same containment penetrations during normal reactor operation. Similar penetrations not included in the continuous leakage monitoring system are still subject to individual Type B tests.

(c) An air lock, penetration, or set of penetrations that fails to pass a Type B test must be retested following determination of cause and completion of corrective action. Corrective action to correct the leak and to prevent its future recurrence must be developed, implemented, and reported in accordance with Section VI.

(d) Individual acceptance criteria for all air lock tests must be stated in the Technical Specifications.

5. Penetrations That Need Not Be Type B Tested.

(a) A containment penetration need not be Type B tested if the NRC staff approves that the penetration does not constitute a potential containment atmosphere leak path during or following an accident, considering the most limiting single active failure.

(b) Other penetrations may be excluded from Type B testing when approved by the NRC staff under the provisions of paragraph VII.A.

C. Type C Test

1. Frequency.

Type C as found and as left tests must be performed on containment isolation valves prior to initial criticality and periodically thereafter during shutdown periods or normal plant operations, but in no case may any individual test be conducted at intervals greater than 30 months. If the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, that specific test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required. The test interval may be extended by up to 25 percent of the specified interval, but the combined interval for any three consecutive tests may not exceed 3.25 times the specified test interval.

2. Pressure/Medium.

(a) Containment isolation valves, unless pressurized with a qualified seal system, must be pressurized with air or nitrogen at a pressure not less than

P_{ac}, or as specified in the Technical Specifications.

(b) Containment isolation valves that are sealed with a qualified seal system must be tested with water at a pressure not less than 1.10 P_{ac} or as specified in the Technical Specifications.

3. Direction of Testing. Containment isolation valves that require local leakage rate testing must be tested such that leakage through the valve is in the same direction that would occur subsequent to a leakage design basis loss of coolant accident, unless it can be shown that testing in the reverse direction is equivalent or more conservative.

4. Acceptance Criteria.

(a) The sum of the as found or as left Type B and C test results must not exceed 0.60 L_a using maximum pathway leakage. This sum must add in leakage rate readings from continuous leakage monitoring systems, unless already accounted for in the Type B and C tests. If quantification of leakage is not possible, the as found or as left (or both) Type C test will be considered to have failed, depending on whether it is the as found or as left leakage value that cannot be determined at the local leakage barrier.

(b) Leakage from containment isolation valves that are sealed with a qualified seal system may be excluded when determining the combined Type B and C leakage rate, provided that such valves have been demonstrated to have water leakage rates that do not exceed those specified in the Technical Specifications.

5. Valves That Need Not Be Type C Tested.

(a) A containment isolation valve need not be Type C tested if the NRC staff approves that the valve does not constitute a potential containment atmosphere leak path during or following an accident, considering the most limiting single active failure.

(b) Other valves may be excluded from Type C testing when approved by the NRC staff under the provisions of paragraph VII.A.

IV. Special Leak Test Requirements

A. Containment Modification or Maintenance

1. Any modification, repair, or replacement of a component that is part of the containment system boundary and that may affect containment integrity must be followed by either a Type A, Type B, or Type C test.

2. Any modification, repair, or replacement of a component subject to Type B or Type C testing must also be preceded by an as found Type B or Type C test, except for a component that is being replaced by a different one and for which no identical component remains in use in any of the licensee's nuclear power plants. If there is a known gross (greater than L_a) leakage failure at a local leakage path, it is not necessary to do an as found test at that location if the leak is considered to be unmeasurable and therefore failing both the as found local leak test and any as found Type A test which includes a correction for this local leak test. The measured leakage from this test must be included in the report to the Commission required by Section VI of this appendix.

3. The acceptance criteria of III.A.8., III.B.4., and III.C.4. of this appendix, as appropriate, must be met.

4. Following structural changes or repairs that affect the pressure boundary, the licensee shall demonstrate whether or not a structural integrity test is needed prior to the next Type A test.

5. Type A testing of certain minor modifications, repairs, or replacements may be deferred to the next regularly scheduled Type A test if local leakage testing is not possible and visual (leakage) examinations or nondestructive examinations have been conducted. These shall include welds of attachments to the surface of the pressure retaining boundary, repair cavities the depth of which does not penetrate the required design wall by more than 10 percent, and welds attaching penetrations whose outside diameter does not exceed one inch.

B. Multiple Leakage Barriers or Subatmospheric Containments

The primary containment, and its associated leakage barriers, of a multiple barrier or subatmospheric containment shall be subjected to Type A tests to verify that its leakage rate meets the requirements of this appendix. Other structures, and their associated leakage barriers, of multiple barrier or subatmospheric containments (e.g., secondary containments for boiling water reactors and shield buildings for pressurized water reactors that enclose the entire primary containment or portions thereof) shall be subject to individual tests in accordance with the procedures specified in the Technical Specifications.

V. Test Methods, Procedures, and Analyses

A. Type A, B, and C Test Details

Leak test methods, procedures, and analyses for a containment structure and its penetrations and isolation valves for light-water-cooled power reactors must be referenced or defined in the Technical Specifications.

B. Combination of Periodic Type A, B, and C Tests

Type B and C tests are considered to be conducted in conjunction with the periodic Type A test when performed during the same outage as the Type A test. The licensee shall perform, record, interpret, and report the tests in such a manner that the containment system leak-tight status is determined on both an as found and an as left basis, i.e., its leak status prior to this periodic Type A test together with the related Type B and C tests and its status following the conclusion of these tests.

VI. Reports

A. Submittal

1. The preoperational and periodic Type A tests, including summaries of the results of Type B and C tests conducted in conjunction with the Type A test, must be reported in a summary technical report sent not later than 3 months after the conduct of the Type A test to the Commission in the manner specified in §50.4. The report is to be titled "Containment Leakage Test"

2. Reports of periodic Type B and C tests conducted at intervals intermediate to the Type A tests must also be submitted to the NRC in the manner specified in §50.4 and at the time of the next Type A test submittal. Reports must be submitted to the NRC Regional Administrator within 30 days of completion of all Type B or C tests performed during an outage if any fail to meet their as found or as left acceptance criteria.

B. Content

A Type A test Leakage Correction Plan, when required under paragraph III.A.9.(a) of this appendix, must be included in the report. Any corrective action required for those Type B and C tests included as a part of the Type A test sequence must also be included in the report.

VII. Application

A. Applicability

The requirements of this appendix apply to all operating nuclear power reactor licensees as specified in §50.54 of this part unless it can be demonstrated that alternative leak test requirements (e.g., for certain containment designs, leakage mitigation systems, or different test pressures not specifically addressed in this appendix) are demonstrated to be adequate on some other defined basis. Alternative leak test requirements and the basis for them if approved by the NRC staff will be made a part of the plant Technical Specifications. Specific exemptions to previous versions of this rule that have been formally approved by the NRC, per 10 CFR Part 50.12, are still applicable unless specifically revoked by the NRC.

B. Effective Date

This appendix is effective (30 days after publication of the final rule). By (insert a date 180 days after the effective date of this revision), each licensee and each applicant for an operating license shall submit a plan to the Director of the Office of Nuclear Reactor Regulation for implementing this appendix. This submittal must include an implementation schedule, with a final implementation no later than (insert a date 48 months after the effective date of this revision). Until the licensee finally implements the provisions of this revision, the licensee shall continue to use in their entirety the existing Technical Specifications and the appendix on which they are based. Thereafter, the licensee shall use in their entirety this revision and the Technical Specifications conforming to this revision.

Dated at Rockville, Maryland this day of 1990.

For the Nuclear Regulatory Commmission

Samuel J. Chilk,

Secretary of the Commission

TEXT COMPARED WITH OCT '86 DRAFT RULE
////// = Deletion
xxxxxx = Addition or Revision

Appendix J - Leakage Rate Testing of Containments of Light-Water-Cooled Nuclear Power Plants

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I. Introduction

One of the conditions of all operating licenses for light-water-cooled power reactors as specified in 50.54(o) of this part is that ~~primary~~ containments meet the leak test requirements set forth in this appendix. The tests ensure that (a) leakage through the ~~primary~~ containments or systems and components penetrating these containments does not exceed allowable leakage rates specified in the Technical Specifications and (b) inservice inspection of penetrations and isolation valves is performed so that proper maintenance and repairs are made during their service life. This appendix identifies the general requirements and acceptance criteria for preoperational and subsequent periodic leak testing.[1]

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[1] Specific guidance concerning acceptable leakage test methods, procedures, and analyses that may be used to implement these requirements and criteria are provided in ~~a~~ Regulatory Guide 1.   , "Containment System Leakage Testing". Copies of the regulatory guide may be obtained from the ~~Nuclear Regulatory Commission, Document Management Branch, Washington, DC 20555~~ Superintendent of Documents, U.S. Government Printing Office, P.O. Box 37082, Washington,DC,20013-7082.

II. Definitions

~~1///Acceptance/Criteria~~

"Acceptance criteria" means ~~S~~standards against which test results are to be compared for establishing the ~~functional~~ acceptability of the containment system as a leakage limiting boundary.

~~2///"As/Found"/Leakage/Rate~~

"As Found leakage rate" means ~~T~~the leakage rate prior to any ~~needed~~ repairs or adjustments ~~to/the/leakage~~ that could affect the leaktightness of the barrier being tested.

~~3///"As/Left"/Leakage/Rate~~

"As Left leakage rate means ~~T~~the leakage rate following any ~~needed~~ repairs or adjustments ~~to the leakage~~ that could affect the leaktightness of the barrier being tested.

"Containment," as used in this appendix, means the "containment system."

~~4//Containment/Integrated/Leak/Rate/Test/(CILRT)~~

"Containment integrated leak rate test (CILRT)" means ~~T~~the combination of a Type A test and its verification test. Often shortened to Integrated Leak Rate Test (ILRT).

~~Containment/Isolation/System/Functional/Test~~

~~A/test/to/verify/the/proper/performance/of/the/isolation/system/by/normal operation/of/the/valves///For/automatic/containment/isolation/systems,/a/test of/the/automatic/isolation/system/performed/by/actuation/of/the/containment isolation/signals/~~

~~5//Containment/Isolation/Valve~~

"Containment isolation valve" means, for plants conforming to Appendix A, "General Design Criteria", of this part, ~~A~~any valve defined ~~in~~ by General Design Criteria 55, 56, ~~or~~ and 57. ~~of/Appendix/A,//"General/Design/Criteria/for Nuclear/Power/Plants,"/to/this/part/~~

For plants not required to conform to Appendix A, containment isolation valves are any valves which are intended to provide a barrier between the containment environment and the outside environment.

~~6//Containment/Leak/Test/Program~~

"Containment leak test program" means ~~T~~the comprehensive testing of the containment system that includes Type A, B, C, and verification tests.

~~7//Containment/System~~

"Containment system" means ~~T~~the principal barrier, after the reactor coolant pressure boundary, to prevent the release of quantities of radioactive material that would have a significant radiological effect on the health of the public. It includes:

(1) The primary containment, including access openings and penetrations,

(2) Containment isolation valves, pipes, closed systems, and other components used to effect isolation of the containment atmosphere from the outside environs, and

(3) Those systems or portions of systems that by their functions extend the primary containment boundary to include their system boundary.

The term "containment system" ~~This definition~~ does not include: (1) a ~~b~~Boiling ~~w~~Water ~~r~~Reactor's (BWR) Secondary Containment (Reactor) ~~reactor~~ ~~b~~Buildings~~s~~, (2) a ~~or~~ ~~p~~Pressurized ~~w~~Water ~~r~~Reactor's (PWR) ~~s~~Shield ~~b~~Buildings~~s.~~, ~~Also excluded from the provisions of this appendix are the~~ and interior barriers such as (3) the BWR Mark II Drywell Floor, and (4) the ~~d~~Drywell perimeters of the BWR Mark III and the PWR ~~i~~Ice ~~c~~Condenser.

"Continuous monitoring system" means a permanently installed, on-line pneumatic measurement system that is at a pressure not less than P_{ac}, continuously monitors the leakage rate, and is either alarmed or read at least daily.

~~8. La (weight percent/24 hours)~~

L_a (weight percent/24 hours) means ~~T~~the maximum allowable Type A test leakage rate in units of weight percent per 24-hour period at pressure P_{ac} as specified in the Technical Specifications.

~~9. Lam (weight percent/24 hours)~~

L_{am} (weight percent/24hours) means ~~T~~the measured Type A test leakage rate in units of weight percent per 24-hour period at pressure P_{ac} obtained from testing the containment system in the state as close as practical to that that would exist under design basis accident conditions (e.g., vented, drained, flooded, or pressurized).

~~10. Leak~~

"Leak" means ~~A~~an opening that allows the passage of a fluid.

~~11. Leakage~~

"Leakage" means ~~T~~the quantity of fluid escaping from a leak.

~~12. Leakage Rate~~

"Leakage rate" means ~~T~~the rate at which the contained fluid escapes from the test volume at a specified test pressure.

~~13. Maximum Pathway Leakage~~

"Maximum pathway leakage" means ~~T~~the maximum leakage that can be attributed to a penetration leakage path (e.g., the larger, not total, leakage of two valves in series). This generally assumes a single active failure of the better of two leakage barriers in series when performing Type B or C tests.

~~14. Minimum Pathway Leakage~~

"Minimum pathway leakage" means ~~T~~the minimum leakage rate that can be attributed to a penetration leakage path (e.g., the smallest leakage of two valves in series). This is used when correcting the measured value of containment leakage rate from the Type A test (L_{am}) to obtain the overall integrated leakage rate. ~~and~~ This generally assumes no active single failure of redundant leakage barriers under these test conditions. An acceptable, conservative, alternative to use of the smallest leakage of two valves in series is to use 1/2 of the total leakage of the penetration.

~~15. Overall Integrated Leakage Rate~~

"Overall integrated leakage rate" means ~~T~~the total leakage rate through all tested leakage paths, including containment welds, valves, fittings, and components that penetrate the containment system, expressed in units of weight percent of contained air mass at test pressure per 24 hours.

~~16. Pac (psig)~~

"P_{ac} (psig)" means ~~T~~the calculated peak containment internal pressure related to the design basis loss-of-coolant accident as specified in the ~~t~~Technical ~~s~~Specifications.

~~17. Periodic Leak Test~~

"Periodic test" means ~~T~~test conducted during plant operating lifetime.

~~18. Preoperational Leak Test~~

"Preoperational test" means ~~T~~test conducted upon completion of construction of a primary or secondary containment, including installation of mechanical, fluid, electrical, and instrumentation systems penetrating these containment systems, and prior to the time containment integrity is required. ~~by the Technical Specifications.~~

~~19. Primary Containment~~

"Primary containment" means ~~T~~the structure or vessel that encloses the major components of the reactor coolant pressure boundary, as this boundary is defined in 50.2~~(v)~~ of this part. It ~~and~~ is designed to contain design basis accident pressure and serve as a leakage barrier against the uncontrolled release of radioactivity to the environment. ~~The term "containment" as used in this appendix refers to the primary containment structure and associated leakage barriers.~~

The term "primary containment" does not include: (1) a Boiling Water Reactor's (BWR) Secondary Containment (Reactor) Building, (2) a Pressurized Water Reactor's (PWR) Shield Building and interior barriers such as (3) the BWR Mark II Drywell Floor and (4) the Drywell perimeters of the BWR Mark III and the PWR Ice Condenser.

"Qualified seal system" means a containment isolation valve system, using water, that has been accepted by the NRC staff as being capable of ensuring the sealing function at a pressure of no less than 1.10 P_{ac} for at least 30 days following a design basis accident.

~~20. Structural Integrity Test~~

"Structural integrity test" means ~~A~~a pneumatic test that demonstrates the capability of a primary containment to withstand a specified internal design pressure load.

~~21. Type A Test~~

"Type A test" means ~~A~~a test to measure the containment system overall integrated leakage rate under conditions representing design basis loss-of-coolant accident containment pressure and systems alignments (1) after the containment system has been completed and is ready for operation and (2) at periodic intervals thereafter. ~~The verification test is not part of this definition; see CILRT.~~ The Type A test does not include the verification test (see CILRT).

~~22. Type B Test~~

"Type B test" means ~~A~~a pneumatic test to detect and measure local leakage ~~through the following containment penetrations:~~ across locally testable, pressure retaining, leakage limiting boundaries other than valves and welds. Examples of containment penetrations which must be Type B tested include, but are not limited to:

(1) Those whose design incorporates resilient seals, gaskets, sealant compounds, expansion bellows, or those fitted with flexible metal seal assemblies.

(2) Air locks, including door seals and door operating mechanism penetrations, that are part of the containment pressure boundary.

~~23. Type C Test~~

"Type C test" means ~~A~~a pneumatic test to measure containment isolation valve leakage rates.

~~24. Verification Test~~

"Verification test" means ~~A~~a test to confirm the capability of the Type A test method and equipment to measure L_a.

III. General Leak Test Requirements

A. Type A Test

~~(1)~~. Preoperational Test. A preoperational Type A test must be conducted on the containment system and must be preceded by:

(a) To the extent practical, Type B and C tests, and
(b) A structural integrity test.

~~(2)~~. Periodic Test. A periodic Type A test must be performed on the containment system.

~~(3)~~. Test Frequency. Unless a longer interval is specifically approved by the NRC staff, the interval between the preoperational and first periodic Type A tests must not exceed three years, and the interval between subsequent periodic Type A tests must not exceed four years. The interval for the next test starts at the completion of the current test. If the initial fuel loading is delayed so that the three-year interval between the first preoperational test and the first periodic test is exceeded, another preoperational Type A test will be necessary. If such an additional preoperational Type A test or an additional Type A test required by Section III.A.~~8~~9 or IV.A. of this appendix is performed, the Type A test interval may be restarted. If the test interval ends while primary containment integrity is not required or is required solely for cold shutdown or refueling activities, the test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required. The test interval may be extended by up to 25 percent of the specified interval, but the combined interval for any three consecutive tests may not exceed 3.25 times the specified test interval.

4. Test Duration. The Type A test must be conducted for a duration sufficient to establish accurately the leakage rate, but must be at least 8 hours after stabilization has been achieved.

~~(4)~~ 5. Test Pressure. The Type A test pressure must be ~~equal to or greater than~~ within 4 percent of P_{ac} at the start of the test, but must not exceed the containment design pressure and must not fall more than ~~1 psi~~ 4 percent below P_{ac} for the duration of the test, not including the verification test. The test pressure must be established relative to the external pressure of the containment. This may be either atmospheric pressure or the subatmospheric pressure of a secondary containment. If the containment design pressure is equal to or less than P_{ac}, the NRC staff shall review the Type A, B, and C pressures to be used.

~~(5)~~ 6. Pretest Requirements. Closure of containment isolation valves for the Type A test must be accomplished by normal operation, whether by manual or automatic actuation, and without any preliminary exercising or adjustments for the purpose of improving ~~performance~~ leakage (e.g., no tightening of valves after closure by valve motor). Repairs of malfunctioning or leaking valves must be made as necessary. Information on valve leakage that requires corrective action prior to, during, or after the test (See Section V.B.) must be included in the report submitted to the Commission as specified in Section VI of this appendix.

~~(6)~~ 7. Verification Test. A leakage rate verification test must be performed after ~~a~~ each preoperational and periodic Type A test in which the leakage rate meets the ~~criterion in III.A.7.(b)(ii)~~ criteria of III.A.8.(a) and III.A.8.(b)(ii). The verification test selected must be conducted for a duration sufficient to establish accurately the change in leakage rate between the Type A and verification tests, but must be at least 4 hours. The results of the Type A test are acceptable if the sum of the verification test imposed leadkage and the containment leakage rate calculated from the Type A test (L_{am}) does not differ from the leakage rate calculated from the verification test by more than $\pm$ 0.25 L_a.

~~(7)~~ 8. Acceptance Criteria.

(a) For the preoperational Type A test, the "as left" leakage rate must not exceed 0.75 L_a, as determined by a properly justified statistical analysis. The "as found" leakage rate does not apply to the preoperational test.

(b) For each periodic Type A test, the leakage rate, as determined by a properly justified statistical analysis, must not exceed:

(i) L_a for the "as found" condition,
(ii) 0.75 L_a for the "as left" condition.

(c) In meeting these Type A test acceptance criteria, isolation, repair, or adjustment to a leakage barrier that may affect the leakage rate through that barrier is permitted prior to or during the Type A test provided:

(i) All potential leakage paths of the isolated, repaired, or adjusted leakage barrier are locally leak testable, and

(ii) the local leakage rates are measured before and after the repair or adjustment or any other action taken that will affect the leakage rates, and are reported under Section VI of this appendix.

(iii) All changes in leakage rates resulting from isolation, repair, or adjustment of leakage barriers subject to Type B or Type C testing are determined using the minimum pathway leakage method and, when performed during an outage in which a Type A test is performed, are also added to the Type A test result to obtain the "as found" and "as left" containment leakage rates.

(d) The effects of isolation, repair, or adjustments to the containment boundary made after the start of the Type A test sequence on the Type A test results must be quantified or accounted for and the appropriate analytical or tested corrections made (this includes tightening valve stem packing, additional tightening of manual valves, or any action taken that will affect the leakage rates). If quantification of leakage is not possible, the as found or as left (or both) Type A test will be considered to have failed, depending on whether it is the as found or as left leakage value that cannot be determined at the local leakage barrier.

~~(8)~~ 9. Retesting.

(a) If, for any periodic Type A test, the as found leakage rate fails to meet the acceptance criterion of 1.0 L_a, a ~~Corrective Action~~ Leakage

Correction Plan that focuses attention on the cause of the problem and indicates what is to be accomplished before and after restart must be developed and implemented by the licensee and then submitted together with the Containment Leak Test Report as required by Section VI of this appendix. The test schedule applicable to subsequent Type A tests (III.A.~~(~~3~~)~~.) shall be submitted to the NRC staff for review and approval. An as left Type A test that meets the acceptance criterion of 0.75 L_a is required prior to plant startup.

(b) If two consecutive periodic as found Type A tests exceed the as found acceptance criterion of 1.0 L_a:

(i) Regardless of the periodic retest schedule of III.A.~~(~~3~~)~~., a Type A test must be performed at each plant shutdown for refueling or at least every ~~24~~ 26 months ~~(based on a refueling cycle normally being about 18 months)~~ whichever is sooner, unless an alternative leakage test is acceptable to the NRC staff on some other defined basis. This testing must be performed until two consecutive periodic ~~"~~as found~~"~~ Type A tests meet the acceptance criterion of 1.0 L_a, after which the retest schedule in III.A.~~(~~3~~)~~. may be resumed. The testing interval may be restarted at the end of the last of these two successful Type A tests. If the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, that specific test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required.

(ii) Investigation as to the cause and nature of the Type A test failure might indicate that an alternative leakage test program, such as more frequent Type B or Type C testing, may be more appropriate than the performance of two consecutive successful Type A leakage tests. The licensee may then submit a Corrective Action Plan ~~and~~ describing the problem, cause, what was or is being done to correct it, and preventative measures to preclude recurrence, as well as an alternative leakage test program proposal for NRC staff review. If this submittal is approved by the NRC staff, the licensee may implement the corrective action and alternative leakage test program in lieu of one or both of the Type A leakage tests required by Section III.A.~~(8)~~9.(b)(i).

~~(9)~~ 10. Permissible periods for testing.

The performance of the Type A tests must be limited to periods when the plant facility is secured in the shutdown condition under the administrative controls and safety procedures defined in the license.

B. Type B Test

~~(1)~~. Frequency.

(a) Type B as found and as left tests, except ~~tests~~ for air locks, must be performed on containment penetrations ~~during shutdown for refueling or at other convenient intervals~~ prior to initial criticality and periodically thereafter during shutdown periods or normal plant operations, but in no case may any individual test be conducted at intervals greater than 2 ~~years~~ 30 months. If the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, that specific test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required. The test interval may be extended by up to 25 percent of the specified interval, but the combined interval for any three consecutive tests may not exceed 3.25 times the specified test interval. If opened following a Type A or B test, containment penetrations subject to Type B testing must be Type B tested prior to returning the reactor to an operating mode requiring containment integrity.

(b) For containment penetrations employing a continuous leakage monitoring system that is at a pressure not less than P_{ac}, leakage readings of sufficient sensitivity to permit comparison with Type B test leak rates must be taken ~~at intervals specified in the Technical Specifications~~.

(i) These leakage readings must be part of the Type B reporting of VI.A.

(ii) When practical, continuous monitoring systems must not be operating or pressurized during Type A tests.

(iii) If ~~the continuous leakage monitoring system~~ certain pressurized sealing or testing systems cannot be isolated, such as inflatable air lock door seals, leakage into the containment must be accounted for and the Type A test results corrected accordingly.

~~(2)~~. Pressure. Type B tests must be conducted, whether individually or in groups, at a pneumatic pressure not less than P_{ac} except as provided in paragraph III.B.~~(3)~~.(b) of this section or in the Technical Specifications.

~~(3)~~. Air Locks.

(a) Initial and periodic tests.

Air locks must be tested prior to ~~initial fuel loading~~ the preoperational Type A test and at least once each 6-month interval thereafter at an internal pressure not less than P_{ac}. Alternatively, if there have been no air lock openings within 6 months of the last successful test at P_{ac}, this interval may be extended to the next refueling outage or air lock opening, whichever comes first, (but in no case may the interval exceed 2 ~~years~~ 30 months). Under this alternative, ~~R~~reduced pressure tests must continue to be performed on the air lock or its door seals at 6-month intervals. Opening of the air lock for the purpose of removing air lock testing equipment following an air lock test does not require further testing of the air lock. An air lock also will not be considered as "opened" for the purpose of this requirement if it has not been opened for any other reason than to enable testing of the air lock's inner door seals. In this case, subsequent testing of the outer door's seals is sufficient.

(b) Intermediate Tests. These tests, performed in between the periodic 6-month air lock tests, must be conducted as follows:

(i) Air locks opened during periods when containment integrity is required ~~by the plant's Technical Specifications~~ must be tested within 3 days of being opened. For air lock doors opened more frequently than once every 3 days, the air lock doors must be tested at least once every 3 days during the period of frequent openings. Air lock~~s~~ doors opened during periods when containment integrity is not required ~~by the plant's Technical Specifications~~ need not be ~~repeatedly~~ tested during these periods. However, they must be tested prior to ~~the plant requiring~~ establishing containment integrity. For air lock doors having testable seals, testing the seals fulfills the intermediate test requirements of this paragraph. In the event that this intermediate testing cannot be done at P_{ac}, the test pressure must be as stated in the Technical Specifications.

(ii) Whenever maintenance ~~other than on door seals~~ has been performed on an air lock, a complete air lock test at a test pressure of not less than P_{ac} is required, if that maintenance ~~involved~~ could have affected the leakage rate of the pressure retaining boundary. Local leakage testing of air lock-penetrating components, if such are locally testable (e.g., shaft seals, equalization valves, or similar air-lock penetrating components), is permissible in place of full air lock tests after maintenance has been performed on the air lock, if the maintenance affected only the components being locally tested.

(iii) Air lock door seal testing or reduced-pressure testing may not be substituted for the initial or periodic full-pressure test of the entire air lock required in paragraph III.B.~~(~~3~~)~~.(a) of this Section.

~~(~~4~~)~~. Acceptance Criteria

(a) The sum of the as found or as left Type B and C test results must not exceed 0.60 L_a using maximum pathway leakage. This sum must add in ~~and including~~ leakage rate readings from continuous leakage monitoring systems, unless already accounted for in the Type B and C tests. If quantification of leakage is not possible, the as found or as left (or both) Type B test will be considered to have failed, depending on whether it is the as found or as left leakage value that cannot be determined at the local leakage barrier.

(b) Leakage measurements are acceptable if obtained through component leakage surveillance systems (e.g., continuous pressurization of individual or clustered containment components) that maintain a pressure not less than P_{ac} at individual test chambers of those same containment penetrations during normal reactor operation. Similar penetrations not included in the component leakage surveillance system are still subject to individual Type B tests.

(c) An air lock, penetration, or set of penetrations that fails to pass a Type B test must be retested following determination of cause and completion of corrective action. Corrective action to correct the leak and to prevent its future recurrence must be developed, ~~and~~ implemented, and reported in accordance with Section VI.

(d) Individual acceptance criteria for all air lock tests must be stated in the Technical Specifications.

5. Penetrations That Need Not Be Type B Tested.

(a) A containment penetration need not be Type B tested if the NRC staff approves that the penetration does not constitute a potential containment atmosphere leak path during or following an accident, considering the most limiting single active failure.

(b) Other penetrations may be excluded from Type B testing when approved by the NRC staff under the provisions of paragraph VII.A.

C. Type C Test

~~(~~1~~)~~. Frequency. Type C as found and as left tests must be performed on containment isolation valves ~~during each reactor shutdown for refueling or at other convenient intervals~~ prior to initial criticality and periodically thereafter during shutdown periods or normal plant operations, but in no case may any individual test be conducted at intervals greater than 2 ~~years~~ 30 months. If the test interval ends while containment integrity is not required or is required solely for cold shutdown or refueling activities, that specific test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required. The test interval may be extended by up to 25 percent of the specified interval, but the combined interval for any three consecutive tests may not exceed 3.25 times the specified test interval.

~~(~~2~~)~~. Pressure/Medium.

(a) Containment isolation valves, unless pressurized with a qualified ~~water~~ seal system, must be pressurized with air or nitrogen at a pressure not less than P_{ac}, or as specified in the Technical Specifications.

(b) Containment isolation valves that are sealed with ~~water from~~ a qualified seal system must be tested with water at a pressure not less than 1.10 P_{ac} or as specified in the Technical Specifications.

3. Direction of Testing. Containment isolation valves that require local leakage rate testing must be tested such that leakage through the valve is in the same direction that would occur subsequent to a leakage design basis loss of coolant accident, unless it can be shown that testing in the reverse direction is equivalent or more conservative.

~~(~~4~~)~~. Acceptance Criteria.

(a) The sum of the as found or as left Type B and C test results must not exceed 0.60 L_a using maximum pathway leakage. ~~and including~~ This sum must add in ~~and including~~ leakage rate readings from continuous leakage monitoring systems, unless already accounted for in the Type B and C tests. If quantification of leakage is not possible, the as found or as left (or both) Type C test will be considered to have failed, depending on whether it is the as found or as left leakage value that cannot be determined at the local leakage barrier.

(b) Leakage from containment isolation valves that are sealed with ~~water from~~ a qualified seal system may be excluded when determining the combined Type B and C leakage rate, ~~if~~ provided that such ~~(i) The~~ valves have been demonstrated to have water leakage rates that do not exceed those specified in the Technical Specifications~~; and~~.

~~(ii) The installed isolation valve seal system inventory is sufficient to ensure the sealing function for at least 30 days at a pressure of 1.10 Pa~~

(5) Valves That Need Not Be Type C Tested.

(a) A containment isolation valve need not be Type C tested if ~~it can be shown~~ the NRC staff approves that the valve does not constitute a potential containment atmosphere leak path during or following an accident, considering ~~a~~ the most limiting single active failure ~~of a system component~~.

(b) Other valves may be excluded from Type C testing only when approved by the NRC staff under the provisions of paragraph VII.A.

IV. Special Leak Test Requirements

A. Containment Modification or Maintenance

1. Any modification, repair, or replacement of a component that is part of the containment system boundary and that may affect containment integrity must be followed by either a Type A, Type B, or Type C test.

2. Any modification, repair, or replacement of a component subject to Type B or Type C testing must also be preceded by an as found Type B or Type C test, except for a component that is being replaced by a different one and for which no identical component remains in use in any the licensee's nuclear power plants. If there is a known gross (greater than L_a) leakage failure at a local leakage path, it is not necessary to do an as found test at that location if the leak is considered to be unmeasurable and therefore failing both the as found local leak test and any as found Type A test which includes a correction for this local leak test. The measured leakage from this test must be included in the report to the Commission required by Section VI of this appendix.

3. The acceptance criteria of III.A.~~(7)~~8., III.B.~~(4)~~., or III.C.~~(3)~~4. of this appendix, as appropriate, must be met.

4. Following structural changes or repairs that affect the pressure boundary, the licensee shall demonstrate whether or not a structural integrity test is needed prior to the next Type A test.

5. Type A testing of certain minor modifications, repairs, or replacements may be deferred to the next regularly scheduled Type A test if local leakage testing is not possible and visual (leakage) examinations or nondestructive examinations have been conducted. These shall include: Welds of attachments to the surface of the ~~steel~~ pressure retaining boundary; Repair cavities the

depth of which does not penetrate the required design ~~steel~~ wall by more than 10%; Welds attaching ~~to/the/steel/pressure/retaining/boundary~~ penetrations ~~the nominal~~ whose outside diameter ~~of/which~~ does not exceed one inch.

B. Multiple Leakage Barrier or Subatmospheric Containments

The primary ~~reactor~~ containment ~~barrier~~, and its associated leakage barriers, of a multiple barrier or subatmospheric containment shall be subjected to Type A tests to verify that its leakage rate meets the requirements of this appendix. Other structures, and their associated leakage barriers, of multiple barrier or subatmospheric containments (e.g., secondary containments for boiling water reactors and shield buildings for pressurized water reactors that enclose the entire primary ~~reactor~~ containment or portions thereof) shall be subject to individual tests in accordance with the procedures specified in the Technical Specifications.

V. Test Methods, Procedures, and Analyses

A. Type A, B, and C Test Details

Leak test methods, procedures, and analyses for a ~~steel,/concrete,/or combination/steel/and/concrete~~ containment structure and its penetrations and isolation valves for light-water-cooled power reactors must be referenced or defined in the Technical Specifications.

B. Combination of Periodic Type A, B, and C Tests

Type B and C tests are considered to be conducted in conjunction with the periodic Type A test when performed during the same outage as the Type A test. The licensee shall perform, record, interpret, and report the tests in such a manner that the containment system leak-tight status is determined on both an as found and an as left basis, i.e., its leak status prior to this periodic Type A test together with the related Type B and C tests and its status following the conclusion of these tests.

VI. Reports

A. Submittal

1. The preoperational and periodic Type A tests, including summaries of the results of Type B and C tests conducted in conjunction with the Type A test, must be reported in a summary technical report sent not later than 3 months after the conduct of ~~each~~ the Type A test to the Commission in the manner specified in 50.4. The report is to be titled "Containment Leakage Test".

2. Reports of periodic Type B and C tests conducted at intervals intermediate to the Type A tests must also be submitted to the NRC in the manner specified in 50.4 and at the time of the next Type A test submittal. Reports must be submitted to the NRC Regional Administrator within 30 days of completion of ~~any~~ all Type B or C tests ~~that~~ performed during an outage if any fail to meet their as found or as left acceptance criteria.

B. Content

A Type A test Leakage Correction ~~Action~~ Plan, when required under paragraph III.A.~~(8)~~9.(a) of this appendix, must be included in the report. Any corrective action required for those Type B and C tests included as a part of the Type A test sequence must also be included in the report.

VII. Application

A. Applicability

The requirements of this appendix apply to all operating nuclear power reactor licensees as specified in 50.54 of this part unless it can be demonstrated that alternative leak test requirements (e.g., for certain containment designs, leakage mitigation systems, or different test pressures not specifically addressed in this appendix) are demonstrated to be adequate on some other defined basis. Alternative leak test requirements and the basis for them if approved by the NRC staff will be made a part of the plant Technical Specifications. Specific exemptions to previous versions of this rule that have been formally approved by the NRC, per 10 CFR Part 50.12, are still applicable unless specifically revoked by the NRC.

B. Effective Date

This appendix is effective (30 days after publication of the final rule). By (insert a date 180 days after the effective date of this revision), each licensee and each applicant for an operating license shall submit a plan to the Director of the Office of Nuclear Reactor Regulation for implementing this appendix. This submittal must include an implementation schedule, with a final implementation no later than (insert a date 48 months after the effective date of this revision). Until the licensee finally implements the provisions of this revision, the licensee shall continue to use in their entirety the existing Technical Specifications and the Appendix J on which they are based. Thereafter, the licensee shall use in their entirety this revision and the Technical Specifications conforming to this revision.

Dated at Washington, DC, this day of 19~~86~~90.

For the Nuclear Regulatory Commission

Samuel J. Chilk,

Secretary of the Commission

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10 CFR PART 50, APPENDIX J, GENERAL REVISION

COMMENT RESOLUTION MEMO

INTRODUCTION

This memo addresses, in two parts, the responses received to the publication in the FEDERAL REGISTER on October 29, 1986, of the proposed general revision to 10 CFR Part 50, Appendix J, "Leakage Rate Testing of Containments of Light-Water-Cooled Nuclear Power Reactors."

Part I summarizes the responses to the 15 questions asked under the Invitation To Comment section of the Statement of Considerations, as well as Commissioner Bernthal's questions at the end of the Major Changes section. Since these questions were posed principally in order to obtain the opinions of those commenting, no NRC staff responses have been provided to the opinions expressed, other than where clarifications were needed.

Part II of this Comment Resolution Memo addresses specific comments on the rule, paragraph by paragraph of the proposed rule. NRC staff opinions, responses, and resolution or disposition of the comments provided are also furnished. In this part of the document, the source of the comment being responded to is indicated in parentheses at the end of the response.

Due to the large number of letters and comments received, and the different forms in which they were provided, Parts I and II have supporting documents which compile the comments. To facilitate processing these comments, the supporting documents compiled, to a large degree, paraphrased summaries of the comments. For this reason, the reader is referred back to the original letters and the summarizing supporting documents ("Responses to October 1986 FRN Questions" and "Comments on October 1986 Proposed Version") if any in-depth research on the comments is being conducted. Lists of commentors and letters have been provided to enable tracking back from the summarized comments to the original source letters, if desired.

PART I

SUMMARY OF RESPONSES TO OCTOBER 1986 FRN QUESTIONS

(1) The extent to which these positions in the proposed rule are already in use;

Wide variety of practices, even among similar reactor types.
Most significant variations:

1. Full vs reduced pressure Type A test pressure.
2. Use, or non-use, of "as found" Type A, B, and C testing.
3. More frequent testing of repeat leakers, or not.
4. Use of BN-TOP-1 Total Time or Mass Point data analyses.

(2) The extent to which those in use, and those not in use but proposed, are desirable;

Desirable Positions:

1. Increased local (Type B & C) testing, in lieu of increased Type A testing.
2. Additional and more precise definitions.
3. Reduced test duration.
4. Use of Mass Point analysis.
5. Provision for an approved alternative leakage test program.
6. Extensions to Type A, B, & C test intervals if in an outage.
7. Endorsing an updated standard (ANS 56.8 via Reg. Guide).
8. Definition of minimum pathway (Type A test) and maximum pathway (Type B & C tests), and requirements for their use.
9. Uncoupling ILRT from 10-yr ISI outage.
10. Defining allowable variation in test pressure.
11. "As found" Type A leakage criterion of 1.0 L_a in place of 0.75 L_a.
12. Corrective Action Plans.
13. Operation, draining, venting, and preparation of penetrations now left to ANS 56.8.
14. Deferral of testing of minor modifications, repairs, or replacements until next Type A test, done in between Type A tests.
15. Preop test at peak pressure only, not both peak and reduced pressure.
16. Type C testing allowable during operation.
17. Implementation of various test methods, procedures, and analyses left to ANS 56.8 or other appropriate basis.

Undesirable Aspects:

1. Increased local (Type B & C), in lieu of increased Type A testing, incurring increased downtime and radiation exposure.
2. More frequent reporting, as in the case of failed Type B and C tests.
3. Potential changes to tech specs.
4. Potential system modification due to expanded containment isolation valve definition.
5. Too much flexibility.
6. Possibility of second preop test.

7. "As found" testing
8. Elimination of option for periodic ILRT reduced test pressure.
9. Too many references to tech specs - remove to a licensee Containment Leak Rate Test Program.
10. Not enough allowable variation in test pressure.
11. Proposed maximum 48-month ILRT interval conflicts with some 40 $\pm$ 10 month tech spec intervals.
12. Corrective Action Plans.

(3) Whether there continues to be a further need for this regulation;

Yes, most with reservations. (12)
No. (1)

(4) Estimates of the costs and benefits of this proposed revision, as a whole and its separate provisions;

1. "As found" costs will be substantial and lengthen outages without substantial safety increase.

2. Greater emphasis on B & C tests will increase mid-cycle costs and exposures.

3. State Public Utility Commissions may exclude from the rate base costs associated with added outage time for testing.

4. Individual testing of valves would increase costs.

5. Backfitting piping penetrations (due to redefinition of containment isolation valves) could be several million dollars; could be $50,000 per penetration.

6. Water seal testing modifications to BWR ECCS penetrations could cost millions of dollars and substantial exposure increases.

7. Reworking computer test software could approach 1/2 million dollars.

8. Removal of reduced pressure option will add about $300,000 per year.

9. Time & manpower costs to review, analyze, revise procedures and tech specs would be involved.

(5) Whether present operating plants or plants under review should be given the opportunity to continue to meet the current Appendix J provisions if the proposed rule (reflecting considerations of public comments) becomes effective;

Yes. (18)
No. (2)

(6) If the existing rule or its proposed revision were completely voluntary, how many licensees would adopt either version in its entirety and why;

Combination of existing and proposed rules: Use existing program with less stringent criteria of the proposed program. (11)

Existing rule: Proposed rule contains changes that add cost without adding safety. (6)

Proposed rule: (0)

(7) Whether (a) all or part of the proposed Appendix J revisions would constitute a "backfit " under the definition of that term in the Commission's Backfit Rule, and (b) there are parts of the rule which do not constitute backfits, but which would aid the staff, licensees, or both;

Extensive comments were received invoking the Backfit Rule with regard to proposed positions or clarifications that were unfavorably received. Current exemptions to the existing rule were also requested to remain in effect when the proposed rule becomes effective (except, of course, for those provisions that would no longer need to be exempted under the new rule). The most contentious areas are: "as found" testing (which the NRC staff contends is not a new position), a possible second preop test, redefinition of containment isolation valves to conform to the General Design Criteria, and maximum leakage path concept for leakage testing of penetrations and valves.

One comment was received recommending repeal of the Backfit Rule.

Due to the detailed and extensive, sometimes legal, arguments offered, any study of this issue should refer back to the source letters. The summary document (FRN.DOC) provides a compact sense of the comments provided.

(8) Since the NRC is providing a broader, more comprehensive review of containment functional and testing requirements in the next year or two, whether it is then still worthwhile to go forward with this proposed revision as an interim updating of the existing regulation;

Yes, go forward and resolve obvious problems now. (6)

No, wait to avoid duplication and because this proposed rule is not a desirable alternative to the existing rule. (19)

NOTE: The impression was given in the October 1986 FEDERAL REGISTER Notice that a follow-on review and revision of Appendix J was imminent. The activity that was then being considered has been folded into this revision activity.

(9) The advisability of referencing the testing standard (ANSI/ANS 56.8) in the regulatory guide (MS 021-5) instead of in the text of Appendix J.

Yes - reference in the guide. (14)
No - reference in the rule. (8)

(10) The value of collecting data from the "as found" condition of valves and seals and the need for acceptance criteria for this condition.

Needed, or useful. (6)

Useful, except for undisturbed or replaced items. (8)
Useful, but should not be regulated. (1)
Could curtail elective maintenance and inspection, adversely affecting plant safety and reliability. (1)
Provide an alternative for utilities to do "as found" testing for problem valves on a case-by-case basis. (1)
Not Needed. (3)

(11) Whether the technical specification limits on allowable containment leakage should be relaxed and if so, to what extent and why, or if not, why not;

No. Would result in doses greater than Part 100 limits, and licensees' standards of maintenance would follow any relaxation of requirements. (1)

Yes. Base degree on more realistic accident analyses. Extent depends on source term and off-site dose calculation conservatisms. Accident pressure peaks in seconds and decays in minutes, compared with 24 hours at test pressure. Include Leak-before-Break. (17)

Yes, revise to 1.0 L_a in place of current 0.75 L_a (ILRT) and 0.60 L_a (LLRT) values. (1)

(12) What risk-important factors influence containment performance under severe accident conditions, to what degree these factors are considered in the current containment testing requirements, and what approaches should be considered in addressing factors not presently covered;

Quantitative standard is needed for containment performance under severe accidents. (1)

The Appendix J test is a post-LOCA configuration test, and severe accidents are totally different. The Appendix J test is run under ambient conditions + LOCA accident pressure. It is not practical to try to duplicate other post-accident conditions during an Appendix J test. (15)

(13) What other approaches to validating containment integrity could be used that might provide detection of leakage paths as they occur, whether they would result in any adjustments to the Appendix J test program and why;

Replace Type A test with continuous leakage testing for gross leaks. (5)

Continuous monitoring should permit a decrease in Type A testing frequency, but should not affect Type B and C testing frequency. (1)

Not aware of any practical alternative, especially for Type B and C testing, which addresses the most serious challenges to containment leaktight integrity. (11)

Alternate techniques are impractical to implement due to the unrealistically low magnitude of L_a. (1)

(14) What effect "leak-before-break" assumptions could have on the leakage test program. Current accident assumptions use instantaneous complete breaks

in piping systems, resulting in a test program based on pneumatic testing of vented, drained pipes. "Leak-before-break" assumptions presume that pipes will fail more gradually, leaking rather than instantly emptying.

Strengthen, not relax, containment design pressures and leakage rates. (1)

LBB would probably reduce source terms as well as accident and test pressures, and increase allowable leakage limits. (6)

Some systems and tests ("as found" B & C) could be removed from the leakage test program. Some currently vented and drained systems could remain filled with water. (7)

Reduced pressure testing is more realistic under the LBB scenario. (4)

(15) How to effectively adjust Type A results to reflect individual Type B and C test results obtained from inspections, repairs, adjustments, or replacements of penetrations and valves in the years between Type A tests.

Proposal 15 (b) would be a workable approach. (2)

Proposal 15 (c) would be a workable approach. (2)

Proposal 15 (c), using minimum pathway B & C leakage, would be a workable approach. (1)

B + C less than or equal to 0.60 L_a appears adequate. Do not implement any of the methods being considered by the NRC. (12)

Use Corrective Action Plan with an alternative leakage test program. (4)

Acceptance criteria for mid-cycle B & C tests may be set higher than 0.60 L_a maximum pathway leakage. (1)

Against increased B & C testing frequency. (1)

Running totals of B + C less than or equal to 0.60 L_a are being maintained. Running total of A + B + C not necessary. Degradation covered by 0.75 L_a (A tests) and 0.60 L_a (B & C tests). (3)

B & C test program should be on a continuous basis, spread out over entire operating cycle. (1)

"As found" B + C limits should be 0.75 L_a. (2)

"As found" B + C limits should be 0.75 L_a, using minimum pathway leakage. (1)

"As left" B + C limits should be 0.75 L_a. (2)

"As left" B + C limits should be based on maximum pathway leakage. (1)

"As left" B + C limits should be 0.60 L_a, using minimum pathway leakage. (1)

(15) a. There are problems with combining data collected over a long period, as well as with combining single and multiple (group) leakage values.
b. Test problem valves at mid-cycle, or next shutdown, until "fix" allows resumption of longer (original) frequency.
c. Concept should represent system alignments with single failure criteria vs. maximum pathway leakage for each penetration. (1)

NOTES:

1. Paragraphs (15) a., b., and c. are not 3 separate methods being considered by the NRC staff, but 3 elements of a single method under consideration.

2. The NRC technical staff responsible for the technical aspects of containment leakage testing continues to believe that public safety assurance requires as continual a determination of containment system integrity as is possible. This belief inherently requires that the application of the ALARA concept to containment leakage translates into "As Low As Reasonably Achievable", rather than "As Loose As Reasonably Achievable". This information is presented as background to better understand the NRC technical staff's responses, actions, and objectives in finalizing this rule and its associated regulatory guide.

COMMISSIONER BERNTHAL'S VIEWS

A. The public may therefore wish to comment directly on the question of whether the Commission should continue its attempts to apply the Backfit rule to all rulemaking, or whether the Rule should be revoked as it applies to rulemaking activity per se.

Apply the Backfit Rule. (10)

Revoke the Backfit Rule. (1)

B. Alternatively, the public may wish to consider whether the Commission should amend the Backfit rule to waive the "substantial increase" provision, and to indicate explicitly that non-monetary benefits may be weighed by the Commission in the cost-benefit balance, when such considerations are found by the Commission to be in the public interest.

Do not waive the "substantial increase" provision. (7)

Cost savings, without substantial increase in safety, are OK.
Added costs, without substantial increase in safety, are not OK. (1)

The Commission already has the authority to consider non-monetary benefits.
There is no need to amend the rule. (1)

PART II

RESPONSES TO COMMENTS ON OCTOBER 1986 PROPOSED REVISION

General:

It is correct that the proposed rule attempts to provide assurance that leakage never exceeded L_a during a completed operating cycle, instead of simply assuring that a containment is leaktight prior to resumption of operations. This is consistent with the expressed desire of the NRC staff and review and advisory groups, such as the Advisory Committee on Reactor Safeguards (ACRS) and the Committee to Review Generic Requirements (CRGR), to provide assurance of containment integrity at any point in time - not just at brief, periodic moments. (NU)

Although this comment describes a statistically correct approach, the current practice of adding LLRTs and ILRTs is workable. The current practice does not always add instrument errors, but it does add the minimum readable instrument LLRT value to the ILRT. This practice is considered to be conservative. (NU)

I. Introduction

Many of the current difficulties of using the existing rule stem from its inflexible, prescriptive nature, and the fact that it incorporates by reference a national standard that was replaced by a newer standard in 1981. To reference the new national standard in the revised rule would be to repeat the error of 1972. If referenced in the rule, the entire standard becomes mandatory unless specific exceptions are listed in the rule - and given the number of exceptions that the NRC staff has listed in the companion regulatory guide, this would be a cumbersome and inflexible approach.

Referencing the regulatory guide in the rule would make mandatory a nonmandatory document as well as provide all the same problems of inflexibility and technological obsolescence of referencing the national standard in the rule.

The NRC staff firmly believes that the approach taken is the most efficient one. The revised rule will contain the mandatory criteria on which leakage rate test programs must be based, while the companion regulatory guide will describe what the NRC staff considers to be acceptable ways of conducting the test program to show that the criteria have been met. Updating to keep current with changing testing technology will be easier to do. Present NRC procedures ensure that any future revisions to the guide would also be subjected to Regulatory and Backfit Analyses. Although the regulatory guide series is not mandatory, all but the most routine guides are issued for public comment before they are finalized. (BWROG2, et al)

The footnote will be retained, since it has been determined that it is not an incorporation by reference of the guide into the rule. It serves the useful purpose of giving advice to the reader on where to go for further information on what the NRC staff considers acceptable means of meeting the criteria imposed by the rule. The reference in Section V is the path by which the NRC staff will be informed of what means licensees will use to meet the rule's criteria. (TE)

II. Definitions

The definitions of GDC 55, 56, and 57 are found readily enough in 10 CFR Part 50, Appendix A, General Design Criteria, would add unnecessary bulk, and are therefore not included. Also, as noted below, multiple definitions of the same term in the same set of regulations is not prudent. (BECHTEL, et al)

Acceptance Criteria

Removal of the word "functional" was accepted, on the basis that it did not contribute any additional value to the definition. (BWROG2, et al)

[Accident]

A definition for this term was not added because 10 CFR Part 50, Appendix A, defines a loss-of-coolant accident in its DEFINITIONS AND EXPLANATIONS Section. Multiple definitions of the same term in the same set of regulations is not prudent. (WE)

"As Found" Leakage Rate

Although we feel that the previous definition was adequate, it has been made more explicit based on comments received. With this change, it is not necessary to define what a repair consists of, since it is the effect on leakage that is the focus, not the process by which the leakage rate is affected. (BWROG2, et al) (RII)

Applications of "maximum" and "minimum" are addressed under those terms. (YAEC)

The "as found" criteria are expressed as percentages of L_a. L_a is based on dose evaluations with source terms currently acceptable to the NRC and with site-specific meteorological conditions, and is within the dose limits specified in 10 CFR Part 100. Quantitative values of L_a are addressed in the Technical Specifications, not this rule. Also, at this time, source term studies are not finished. Therefore, no change is needed here. (DRA)

"As Left" Leakage Rate

Similar wording and rationale as for "as found" leakage rate. (BWROG2, et al) (RII)

Applications of "maximum" and "minimum" are addressed under those terms. (YAEC)

Quantitative values of L_a are addressed in the Technical Specifications, not this rule. However, consideration of site-specific meteorological conditions for "as found" and not for "as left" would be inconsistent and could allow "as left" limits to be higher than "as found" values. Neglecting site-specific conditions would be necessary if one were to attempt to apply a single, higher, "as left" value to all reactors of a given type. Since this is inconsistent with current containment system leakage testing philosophy, it has not been adopted. (DRA)

[Closed System]

A definition for this term is not considered to be necessary. For a definition and further details, see ANS 56.2-1984 (formerly ANSI N271-1976), "Containment Isolation Provisions for Fluid Systems After a LOCA", Regulatory Guide 1.141, "Containment Isolation Provisions for Fluid Systems", and Standard Review Plan section 6.2.4. (BWROG2, et al)

Containment Integrated Leak Rate Test (CILRT)

Current usage of this term is ambiguous and confusing. Therefore, it has been included, and will be retained, in an attempt to clarify it, and to provide a standard meaning. CILRT, sometimes simply called ILRT, is frequently used and it will be useful to have a standard reference for what it covers. (SERI)

Containment Isolation System Functional Test

This term has been removed since it is no longer in use in the rule, and its objective has been addressed by revising III.A.5. (BWROG2, et al) (ANS)

Containment Isolation Valve

In order to address concerns expressed by several commentors regarding older, pre-GDC plants, this definition has been revised to distinguish between plants that are, or are not, required to conform to Appendix A to 10 CFR Part 50.

It should be noted that on PWRs the containment system boundary has been considered to include the secondary system boundary, i.e., the steam generator and its attached piping. It is not intended that PWR MSIVs and PWR feedwater check valves be treated any differently under this revised rule - meaning, it does not require them to be tested. Under new App. J, III.C.5., Valves That Need Not Be Type C Tested, these valves do not constitute a potential containment atmosphere leak path during or following an accident, considering the most limiting single active failure of a system component.
(TE) (BWROG2, et al) (FP, BG&E)(GOODMAN) (NUBARG, FPL, LILCO) (GP) (WE)

Containment Leak Test Program

This term has been retained. The NRC staff agrees with an industry suggestion made quite some time ago that each nuclear power plant have such a program to provide centralized guidance to plant staff that run the leakage tests. This program also provides the necessary "corporate memory" in a program area where the frequency of staff turnover may be greater than the test frequency. The NRC staff's intent is to encourage the development and use of such programs. It is not the intent to require or regulate them, in order that as much information as possible can be put into them without incurring the strictures associated with a regulated document. However, the intent of this program is to supplement, not replace, Technical Specification requirements, as called for in Appendix J. It is not a regulatory document, as proposed in the comments by the B&W Owners' Group. (BWROG2, et al) (SERI)

The word "verification" was added to the list of tests for completeness.

Containment System

This term has been retained. The NRC staff considers it to be more helpful than confusing to be explicit about the boundaries to which Appendix J applies, especially in defining what is not covered by this testing program. (BWROG2, et al)

This definition has been provided to clarify a loosely used term, not to extend the Type A test boundary (PP&L)

The last paragraph has been reworded and made consistent with the definition used for Primary Containment.

"Continuous Monitoring System" This term is now defined. (BWROG3)

L_a	No comments received.
L_{am}	" " "
Leak	" " "
Leakage	" " "
Leakage Rate	" " "

Maximum Pathway Leakage

As a reminder, it may be helpful to note that the intent of the Maximum Pathway is to apply it to the 0.60 L_a limit as a maintenance quality indicator. The Minimum Pathway is intended to measure the effectiveness of containment integrity under post-LOCA conditions.

Using "1/2 of the total leakage of the penetration" is not conservative for a Maximum Pathway definition. The addition of the inboard/outboard example adds more complexity than is desired. (BWROG2, et al)

This definition is easier to meet than the existing rule, since it is not necessary to test and quantify the leakage through every valve in the leakage path, as the existing rule would require, in order to determine maximum leakage. (BG&E)

"Double-counting" of leakage from continuous monitoring systems is not intended. However, the intent is that leakage from continuous monitoring systems be included in the B + C less than or equal to 0.6 L_a limit. (YAEC)

The definition is valid, regardless of valve alignments in the leakage path. The parenthetical example is not intended to be all-inclusive. Therefore it has not been expanded. (SERI)

Assuming a single failure in each valve set being tested does not conflict with previous uses of the single failure concept. Since each set of valves could be subjected to the single failure, each set has to be evaluated against its performance as if the failure occurred there. It is a single failure criterion that is applied to each system being looked at. Since this is a maintenance quality indicator, not a systems check, the way in which the single failure criterion is applied is valid. The present regulation states that all Type B and C leakages, for each penetration or valve tested, are to be summed, without mentioning a reduction to only a maximum pathway, as the

NRC staff has accepted. This revision of the rule conforms to this practice of using maximum/minimum pathways instead of total summations of both valve leakages. It does not conflict with previous uses of the single failure concept. (FPL)

The same response applies here as to (TE) below. (ANS)

Redundancy is not a consideration when evaluating the performance of individual valve barriers, since any of these barriers could experience the failure. Passive barriers, including closed valves not subject to spurious action, are considered subject to active failure because these barriers (such as a closed valve that remains closed) are subject to human and administrative errors, and have been found in incorrect positions. (NU)

It is not intended to cover all possible situations in the definition, but to give an example as an aid. We do not consider it practical to add all permutations of serial/parallel installation/testing combinations and how to apply the definition to them. (TE)

Minimum Pathway Leakage

The recommended three-part clarification is too complex for the desired objective. (COMMED)

The addition of "1/2 of the total leakage of the penetration" is sufficiently simple and conservative that it achieves the desired objective without inserting excessive detail into the example, and is added as an acceptable alternative. (BWROG2, et al)

IE Information Notice 85-71 did not mandate the use of minimum and maximum pathway leakage. An IE Information Notice, by definition, only informs, not mandates. We agree, however, that it informed licensees of what the NRC staff considered to be its understanding and intent with regard to how licensees should test and report under Appendix J. However, it is obvious from other comments received that this issue needs explicit clarification in Appendix J. (FPL)

It is not intended to cover all possible situations in the definition, but to give an example as an aid. We do not consider it practical to add all permutations of serial/parallel installation/testing combinations and how to apply the definition to them. (TE)

Overall Integrated Leakage Rate No comments received.

P_{ac} " " "

Periodic ~~Leak~~ Test

Reference to the Technical Specifications has been dropped. (BWROG2, et al)

Preoperational ~~Leak~~ Test (BWROG2, et al) (SERI)

"...is required by the Technical Specifications."

These words have been removed, as requested, since the Tech Specs may not always be where the definition is of when containment integrity is required. (B&WOG)

Primary Containment

The NRC staff considers it to be more helpful than confusing to be explicit about the terms commonly used in containment leakage testing. There is currently a certain looseness and lack of specificity in the way a number of terms are used. This has the potential for creating misunderstandings - a potential already sufficiently large enough due to the complexity of the subject matter. (BWROG2, et al)

Revisions to the definitions, especially Containment Isolation Valves and Containment System, should alleviate concerns about overly narrow uses of these terms. (IAEA)

Qualified Seal System

This term is now defined. (S&W)

[Reduced Pressure Tests]

The recommendation to include this definition is not being followed, since the option to use reduced pressure tests remains eliminated. (BWROG2, et al) (NU)

Structural Integrity Test

Type A Test

The use of "Primary Containment" has not been substituted for "Containment System". For the reasons, see the two definitions involved. (BWROG2, et al)

Alternative testing of systems needed during plant shutdown to maintain the plant in safe condition, e.g. residual heat removal, is provided for in VII.A. (NU)

Type B Test

This term has been clarified. (RII)

Type C Test

Pneumatic leakage testing is required for containment isolation valves assumed to be exposed to a post-LOCA containment atmosphere. Hydraulic testing is not considered by the NRC staff to be a test method of equal sensitivity to pneumatic testing. Hydraulic testing with water is considered acceptable only for valves using a qualified water seal system, per III.C. (BWROG2, et al)

"... as described in the Technical Specifications" has not been added at the end, since it is not essential, and there are already objections to the degree to which this rule invokes the Tech Specs. (TE)

Verification Test

No comments received.

III. General Leak Test Requirements

According to the grammatical rules followed by the NRC and the Federal Register, "must" is used when the subject is inanimate, such as in this case. "Shall" is considered appropriate when the subject is a person, group, corporation, or other "animate" entity that can respond to the requirement being stated. (BECHTEL, et al)

A. Type A Test

1. Preoperational Test.

Has been revised to: "(a) To the extent practical, Type B and C tests, and". The phrase "to the extent practical" applies to <u>when</u> done, not <u>whether</u> done, and is acceptable so long as the Type A test is <u>corrected</u> for <u>those Type</u> B and C tests done after as well as before the Type A test. (ANS)

2. Periodic Test.

No comments received.

3. Test Frequency.

The frequency at which Type A, B, and C tests are to be conducted is considered by the NRC staff to be a fundamental enough criterion of the test program to justify retaining it in the regulation. (ANS)

The 4-year interval may be exceeded in certain justified cases, such as a 24-month refueling cycle that is not running on schedule. (ANI)

A number of different suggestions were made on how to provide some scheduling flexibility to accommodate 24-month refueling cycles and also plants on 18-month refueling cycles that may experience unexpected or unplanned events. The one selected was one that licensees are already familiar with since it has been in general use in the technical specifications for some time. This permits an aggregate 25% maximum extension beyond four years for periodic Type A, B, and C tests over any set of 3 consecutive test intervals, and allows deferral of testing while containment integrity is not required.
(BG&E, COMMED, BWROG3)

The arguments presented against the requirement for a second preoperational Type A test if more than 3 years elapse between the preop and first periodic Type A tests seem to assume a lack of potential deterioration or damage during this period. Regardless of administrative controls, such an assumption cannot be accepted by the NRC staff. A plant may be in a variety of states during this period, ranging from abandoned or inactive and cold state to critical and running at low power levels for extended periods prior to an official power generation date. The potentially degrading effects of delayed construction completion, final construction activities, plant initial startup testing and adjustment phase including startup and shutdown cycling, and/or low power system operations cannot continue untested indefinitely. No extension beyond the three year interval is provided due to the limited number of such anticipated situations. (COMMED, et al)

The second sentence was revised to read:

"... another preoperational Type A test will be necessary." (TU)

Schedule flexibility was added to the end of the paragraph.
(BWROG2, BWROG3, et al)

The wording on maximum test intervals has been redone to be specific as to what, if any, tolerances are acceptable. This recognizes 24-month refueling cycles as well as 18-month ones. (DL)

Continuous gross leakage test concepts are not advanced enough to accept the recommendation that Type A test frequency be reduced from 3 to 2 tests every 10 years based solely on their use. Also, an inherent problem with such a suggested trade-off is that a continuous gross leakage test can only monitor the containment operating configuration, not the post-LOCA configuration for which the Type A test is intended. In addition, a conscious effort has been made in this revision to uncouple the Type A, B, and C test cycle from the ASME 10-year inservice inspection interval, since the first such 10-year ISI interval starts on the date of commercial operation, a date less relevant to tracking degradation than the preop test date. It is not desirable to again require that they coincide, although such coincidence is not prohibited. (DRA)

4. Test Duration.

Type A test duration has been added back into this section, in a new paragraph II.A.4., using wording similar to that used to refer to the Verification Test duration. This will retain the test duration, and a minimum period, as an essential criterion in the test program, subject to NRC regulation, although the actual duration is specified somewhere other than in the regulation itself. (RI) (ANI)

5. Test Pressure

The rule does not require depressurization of qualified seal water systems during an ILRT. However, any water volume from this system injected into the containment ought to be accounted for.

No relief has been written into the rule for plants whose test pressure exceeds design pressure, since the number affected is too small to warrant generic relief, and since the rule has been modified to recognize past exemptions as valid. Instead, a case-by-case review by the NRC staff has been established. (BECHTEL, APCO, WE, S&W)

This paragraph has been revised to allow the test pressure to be within 4% of P_{ac} at the start of the test and during it, but not to exceed the containment design pressure. (TU, GP, RG&E)

Licensees that have plants with existing Appendix J exemptions allowing reduced pressure testing will be allowed to continue reduced pressure testing unless specifically revoked by the NRC. Technical Specifications allowing reduced pressure testing will be invalid unless they have been formally documented as an exemption. (NU)

If cycling containment structures 12 times in a 40-year plant lifetime raises fatigue concerns where the design and leak testing load was to be within working stress limits, then it would seem necessary to question whether the existing structure meets its design requirements. (WE)

The reduced pressure option is not being retained. The NRC staff still supports the position stated in the Supplementary Information portion of the October 29, 1986 Federal Register publication of this rule in proposed form for public comment. To repeat:

The option of performing periodic reduced pressure testing in lieu of testing at full calculated accident pressure has been dropped. This change reflects the opinion that extrapolating low pressure leakage test results to full pressure leakage test results has turned out to be unsuccessful. Reasonable argument can be made for low pressure testing. However, the NRC staff believes that the peak calculated accident pressure (a) has always been the intended reference test pressure, (b) is consistent with the typical practice for NRC staff evaluations of accident pressure for the first 24 hours in accordance with Regulatory Guides 1.3 and 1.4, (c) provides at least a nominal check for gross leak paths that a low pressure leak test does not provide for high pressure leak paths, (d) directly represents technical specification leakage rate limits, and (e) provides greater confidence in containment system leaktight integrity. For these reasons, the full, rather than reduced, pressure has been retained as the test pressure. (RG&E, TER, GP, FPL, DPC, WE)

6. Pretest Requirements

It is permissible to restart taking data after isolating a known leak, but the original leakage rate has to be quantified and the as-found condition of the containment has to be determined based on this original leakage rate. (GOODMAN)

Changed "improving performance" to "improving leakage". Also, "whether by manual or automatic actuation" has been added for clarity following "normal operation". (S&W)

It is not intended that this rule require individual valve leakage limits. However, it is intended to encourage movement in such a direction where practical, so that the smallest testable unit, whether it be a single valve/penetration or a valve/penetration group, will be tested. (GP)

Opening or closing CIVs as a necessary part of plant operations, such as venting and draining, does not conflict with the stated intent of this paragraph. That intent is to prevent manipulation of the valve for the purpose of representing the valve leakage as better than it actually would be under accident conditions. Although it is felt that this intent is sufficiently understood, the above word change should further clarify the intent. (NU)

7. Verification Test

In order to clear up an apparent ambiguity, the first sentence has been revised to read: "A leakage rate verification test must be performed after <u>each preoperational and periodic</u> Type A test in which ..." (BECHTEL, et al)

Doing the verification test after a Type A test does not constitute a change from the existing rule, and it does reflect current practice. Procedures have been established in the ANS 56.8 standard and its endorsing regulatory guide that ensure continuity between a Type A test and a following verification test. There are no procedural controls to ensure such continuity for a Type A test which is rerun after a prior Type A test and verification test combination. (COMMED)

Revised to include a minimum verification test duration. (RI)

8. Acceptance Criteria

These "as found" acceptance criteria are not new, since the NRC staff has consistently interpreted Appendix J as requiring this concept. Without "as found" testing, there would never be an occasion to invoke the existing rule's penalty of repeated Type A tests after two successive Type A test failures, since it is not permitted to fail an "as left" test. The more explicit statements of this concept have been accompanied by a relaxation of the "as found" Type A test acceptance criterion from 0.75 L_a to 1.0 L_a. (NUBARG, LILCO)

(a) For the preoperational Type A test,...

".. a properly justified statistical analysis,.." was originally ".. a statistical analysis acceptable to the NRC staff,.." but was revised to the current wording following NRC technical, administrative, and legal staff review on 10/15/85. As a result, the October 29, 1986, wording remains unchanged. (BWROG2, et al) (NU)

It is intended that it be known what statistical analyses are acceptable to the NRC staff before they are used. That is one reason why a companion regulatory guide has been issued by the NRC staff along with this revised rule. It would be an economic risk to perform an ILRT not knowing whether the test would be later accepted by the NRC staff. (SERI)

(b) For each periodic Type A test, ...

(i) L_a, for the "as found" condition,

The "as-found" issue has been discussed elsewhere. In summary, the NRC staff does not consider this application to be a new requirement. (BWROG2, et al) (NYPA) (ROBLEDO)

(ii) $0.75L_a$, for the "as left" condition,

(c) ... isolation ... permitted prior to or during the Type A test ...

Any as-found leakage path found during the Type A test that cannot be quantified has been, and will continue to be, considered to be infinite. The as-found Type A test will then have failed, and the as-left leakage rate must be quantified and be low enough in value for the as-left Type A test to pass. (ANS)

(i) All potential leakage paths ... are locally leak testable ...

This paragraph does not require that individual valves be leak testable.

What it does is stipulate that only penetrations or valves that are individually leak testable may be isolated, repaired, or adjusted prior to or during a Type A test. This is understood to also include groups of penetrations or valves that are testable only as a group, but that can be handled as single, quantifiable leakage path. The principal being applied here is that one can only isolate from the Type A test those leakage paths that can later be quantified, so that it is possible to add a local leakage value to the Type A test leakage rate to get an overall integrated leakage rate. (BECHTEL, et al)

If the leakage path cannot meet this test, then it must remain testable as a part of the containment boundary being subjected to the Type A test pressure, and cannot be isolated. (BECHTEL)

This is no change from the existing rule which states in III.A. that isolated leakage paths "... shall be measured using local leakage testing methods. Repairs and/or adjustments to equipment shall be made and a Type A test performed. The corrective action taken and the change in leakage rate determined from the tests and overall integrated leakage determined from the local leak and Type A tests shall be included in the report ..." (BECHTEL)

(ii) ...measured before and after ...

1) For consistency with existing requirements, the wording in III.A.7.(c)(ii), now III.A.8.(c)(ii), has been revised.
2) If the as-found local leakage is either not determined, or is not quantifiable, it is considered to be infinite. This approach, which will fail an as-found Type A test, is not changed by the revised rule.
3) It is also correct that "as found" leakages have no meaning when a preop test is performed, and no "as found" values are being required under preoperational test conditions in the revised rule. (COMMED)

It is considered neither prudent nor acceptable to exempt drywell head, and CRD & torus hatches, etc., from as-found LLRTs since these have been found to be leakage sources. (NYPA)

Some constraint is recognized on the availability of, and access to, certain isolation barriers during operation, and this limits the ability to increase testing frequencies for them if they are found to be chronic leakage problem areas. The NRC staff would expect the licensee to present practical and useful alternatives to increased testing frequencies if such increased frequencies were not practical. These alternatives should then provide the desired assurance of leaktight reliability on some other defined basis. (GP)

(iii) All changes ... added to the Type A test result ...

The following words have been added for clarification after "... minimum pathway leakage method and ...":

> "..., when performed during an outage in which a Type A test is performed, are also ..."

Although this revised rule does not require adding changes in LLRTs to the previous CILRT, this is a concept that the NRC staff has discussed and proposed in prior drafts of this revision (Working Paper D5, June 1984). Discussion and consideration of such a concept, or some equivalent, is still encouraged. (BWROG2, ,BWROG3, et al) (GP)

(d) The effects ... quantified and ... corrections made...

"Quantified" has been revised to "quantified or accounted for". (BECHTEL, et al) (BWROG2, et al) (NYPA)

"or tested" has been added between "analytical" and corrections". (NU)

The following has been added to this paragraph:
"If quantification of leakage is not possible, the as found or as left (or both) Type A test will be considered to have failed, depending on whether it is the as found or as left leakage value that cannot be determined at the local leakage barrier." (BECHTEL, et al)

Whether or not manual valves were properly fully closed in the Type A pretest valve lineup, any resultant leakage is properly included in adjustments to the Type A test leakage rate. If these valves are not properly closed under the optimal conditions existing during the routine Type A pretest valve lineup, there is no reason to expect any better performance under accident conditions. (COMMED)

"Additional tightening" can mean either excessive closure force or later proper valve positioning, since either would affect the leakage rate. (COMMED)

Unique, "excusable" events, for which no adjustment to the Type A test result is needed, are one reason for building more flexibility into the revised rule than previously existed. Due to the potential variety of such situations, they will have to be dealt with on a case-by-case basis.

The NRC staff may not always agree with a licensee as to which events properly fall into this category.

9. Retesting

It is correctly understood by the commentors that an alternative to more frequent Type A testing is allowed, but that such an alternative will be subject to review and acceptance by the NRC staff. (BECHTEL, et al)

(a) If, for any periodic Type A test, ...

Since some licensees would prefer to eliminate LERs, the Leakage Correction Plan, needed to indicate how problems will be prevented from recurring, will not be eliminated in favor of LERs. Instead, it may be that having a Leakage Correction Plan could support not submitting an LER. (COMMED, NUBARG, LILCO)

Some type of corrective action plan, similar to what is now being called the "Leakage Correction Plan", is already required. III.A.1.(a) of the existing rule states "The corrective action taken and the change in leakage rate determined from the tests ... shall be included in the report submitted to the Commission ..." Therefore, all that has been done is to put a label on the

actions already required to be taken. The NRC staff does not wish at this time to automatically allow licensees to substitute increased Type B and C tests for increased Type A testing. The NRC staff feels that licensees must first be able to demonstrate that they have a more effective local leakage rate testing program than can be automatically assumed at this time. [See VI.B.]
(BWROG2, et al)

Mid-cycle outages to do local leak rate testing have been presented in the rule as a possible option in place of repetitive Type A penalty tests. The rule still keeps the option for a licensee to do more frequent Type A tests instead of more frequent Type B and C testing, and to not focus on the real problem area. However, Appendix B, Criterion XVI, to 10 CFR 50 requires corrective action to prevent recurrence. The NRC staff does not consider it acceptable to have continuing maintenance problems that affect containment integrity and to not take responsible action to improve surveillance and maintenance programs. Also, see response below, under (b)(ii), to (APCO, et al). (PP&L) (FPL)

The mandatory "Corrective Action Plan", as used in this paragraph, has been renamed "Leakage Correction Plan", here and in § VI.B., to avoid confusion with the voluntary Corrective Action Plan in III.A.9.(b)(ii) [new numbering]. For both Plans, this would include a description of the problem, cause, what was being done to correct it, and preventative measures to preclude recurrence. [See VI.B.] (COMMED)

The first sentence has been reworded. (GPU)

(b) If two consecutive periodic as found Type A tests...

(i) This paragraph has been reworded to better accommodate varying refueling cycles, but a 25% time allowance for poor performers doing repetitive testing is not justified. (FP, BWROG2, et al)

Added: Restart of normal test interval at end of accelerated tests. (BWROG)
The objective of the containment leakage testing program and corrective action is well expressed by this comment. (NU)

(ii) Wording has been included reflecting the comment provided. (ANI)

A utility that considers it too costly to increase surveillance of valves or penetrations that are chronic sources of leakage to a level that will ensure the proper maintenance level, can opt to do more frequent Type A testing (which does not really address the problem directly), or to propose an alternative that achieves the same objective - an inspection and maintenance program that is capable of maintaining the containment boundary in the leaktight condition for which it was designed and licensed. The NRC staff will then review it and decide whether it is a responsible and effective proposal. (COMMED) (BWROG2)

These comments (cold shutdown? Valve replacement eliminate increased testing frequency? 2 OK tests should return test schedule to normal) have not been specifically addressed in the rule since there are too many possible courses of action to cover in a rule. This revised rule has been intentionally made more flexible to cover such situations. (GOODMAN)

The NRC staff considers it inappropriate to establish a legal time limit for reviewing and ruling on Corrective Action Plans. (BRWOG2, et al)

The flexibility provided in the revised rule is considered sufficient. There are too many possible courses of action to cover in a rule, and the NRC staff intends to continue to require NRC approval for increased LLRTs in lieu of increased ILRTs. (SERI)

A number of commentors seem to have missed the point that a possible option for increased Type B and C testing was proposed for the purpose of providing relief, not a penalty, for those utilities able to locate the leakage sources that caused them to repeatedly fail Type A tests. Increased testing of defined problem areas rather than of the entire containment system is technically justified. Since it is not intended as a penalty, and since it is not intended to generate, by itself, the need to pull a plant off line, it has not been made a requirement as others have suggested. (APCO, et al)

Increased frequency of any test does not, in itself, improve containment performance. It is supposed to be a reflection of the level of maintenance being performed as compared with the level of maintenance needed. It is assumed that increased testing would indicate that better maintenance is also needed. Opting for use of penalties, such as continual increased testing frequencies, in lieu of correcting the causal problem, may require the NRC to review of the competence of the quality assurance programs, maintenance programs, and management involved. (ANS)

Relaxation of the single failure criterion is not under consideration by the NRC staff. (ROBLEDO)

10. Permissible periods for testing.

"license" has not been changed to "technical specifications" since there are already objections to the degree to which this rule invokes the Tech Specs, and the term license appears to be sufficient for the intended purpose. (S&W)

B. Type B Test

1. Frequency.

Test frequency requirements are considered by the NRC staff to be fundamental test criteria, and therefore properly in the rule, not in the associated regulatory guide. (ANS)

(a)
A straight 25% extension is not considered appropriate. (FP)

A 25% extension has been added with a limitation that the combined interval for any 3 consecutive tests shall not exceed 3.25 times the specified test frequency. The recommended restriction to only plants whose previous leakage history can justify the extended period falls within the discretion of the NRC staff, but is not thought to be legally specific enough for incorporation into the rule. (BG&E)

To accommodate 24-month refueling cycles, the 1st sentence has been revised.

Schedule flexibility has been added after the first sentence. (TE)

(b)
The recommendation to use a "licensee's Appendix J program", not "tech specs" cannot be adopted at this time. An Appendix J Program in place of tech spec requirements has some merit, but would need controls on enforcement, unilateral licensee revision, and uniformity of use by NRC project managers and reviewers. Since these controls are not present, in a short time there would no longer be a standard test program for containment leakage. (B&WOG)

For continuous monitoring systems, leakage already included (or accounted for) through either Type A, B, or C testing or direct reading of the system in operation, the regulation does not require that they be additionally added to the summation of Type B and C test results. (YAEC)

The subjects of this paragraph are continuous monitoring systems. This paragraph has also been reworded to not call inflatable air lock door seals continuous monitoring systems. (SERI)

2. Pressure.

(See earlier comment above, III.B.1.(b), "program" vs "tech specs") (B&WOG)

3. Air Locks.

As before, test frequency requirements are considered by the NRC staff to be fundamental test criteria, and therefore properly in the rule, not in the associated regulatory guide. (ANS)

(a) Initial and periodic tests.

See III.B.1.(a) response. (FP)

See III.B.1.(a) response. (BG&E)

The first sentence has been revised as suggested. (S&W)

Wording has been added to eliminate a "Catch-22" wereby testing penalties might otherwise accrue solely from testing the inner door's seals. (BWROG3)

Reduced pressure tests are conducted at any pressure less than P_{ac}, consistent with manufacturers' designs and plant tech spec requirements. There is no term "intermediate pressure tests" that would suggest an intermediate pressure level, but there is the term "intermediate tests" that refers to those tests performed in between the regular full pressure tests performed at 6-month intervals. (SERI)

(b) Intermediate tests ...

Additional wording inserted to clarify this term as noted just above. (SERI)

(i) Deleted two occurrences of the phrase "by the plant's Technical

Specifications", as unnecessary. (B&WOG)

See III.B.1.(b) response, "program" vs "tech specs". (B&WOG)

Added "doors" after "air lock".
Changed "Air locks opened..." to "Air lock doors opened.."
Deleted "repeatedly".
Changed "the plant requiring" to "establishing" (S&W)

No second air lock test is normally needed. The first, critical path one, cannot, for safety reasons, be deferred until after containment integrity is required. (PHILELEC)

(ii) Revised to accommodate comments and to consolidate text.
(COMMED, GP) (ANS) (TE)

4. Acceptance Criteria.

See response to prior NUBARG comment under new paragraph number III.A.8.
(NUBARG)

(a) This summation is being explored in more detail in discussions on the BWROG draft Licensing Topical Report, "Standardized Program for Primary Containment Integrity Testing". (BWROG2, BWROG3, GP, ANS, NPPD, WPPS, LILCO, BG&E, YAEC, SERI)

The commentor correctly understands that when a leakage rate is not measurable, it is assumed to be greater than the acceptance limit, no matter what that is. This does result in a failure to meet the as-found criteria, not only for the leakage barrier component being tested, but also for any as-found Type A test which includes the leakage of that component. (DPC)

(b)

(c) Although it is not being required that individual penetrations have individual acceptance criteria, except for air locks as noted in the next paragraph, it is presumed that a prudent licensee would develop such information as a guideline to determine what action should be taken and when. Even without individual penetration acceptance criteria, however, a very large or unmeasurable leak would certainly cause that penetration to fail its Type B test - and also then to fail any Type A test being run during that outage. (BWROG2, et al) (WCNOC)

The last sentence has been revised. (S&W)

(d)
See II.B.1.(b) response, "program" vs "tech specs". (B&WOG)

For air locks, the existing regulation, in § III.D.2.(b)(iv), already requires that the acceptance criteria for air lock testing be stated in the Technical Specifications. As noted before, the NRC staff supports the establishment of individual local leakage rates wherever possible, but recognizing some practical difficulties in a generic requirement, is not making it mandatory - except for air locks which have been explicitly called out in this paragraph.

(GOODMAN, GPU)

5. Penetrations That Need Not Be Type B Tested

Added, for consistency between penetrations and valves.

C. Type C Test

"Qualified water seal system", "qualified seal system", and "seal system" have been conformed within this Section. A "qualified seal system" is now defined in II. Definitions. (BECHTEL, et al)

This revised rule does not require individual testing of each valve and penetration. It is recognized by the NRC staff that there are some that are tested in groups. The intent of the NRC staff is that licensees test the lowest unit that is practical to test, whether that is a group or a single penetration or valve. (BWROG)

As stated before, the NRC staff considers test frequencies important enough test criteria to continue to be included in this rule. (ANS)

See III.B.4.(a) response. (ANS)

1. Frequency. To accommodate 24-month refueling cycles, this paragraph has been revised. (BWROG2, et al)

See III.B.1.(a) response. (FP)

See III.B.1.(a) response. (BG&E)

2. Pressure/Medium

(a) Revised for consistency and to cover BWR main steam isolation valve leakage tests, which are generally run at lower pressures. (COMMED) (S&W) (GOODMAN) (SERI)

Replacing "must" with "may" would, in this case, provide flexibility in excess of that acceptable to the NRC staff. (WCNOC)

It is not clear what test medium other than air or nitrogen is being considered when reference is made to "other methods" "of equivalent sensitivity". The NRC staff does not recognize hydraulic testing as being of equivalent sensitivity to pneumatic testing. (NU)

(b) Revised to cover certain limited seal systems that would be impractical to operate at higher than atmospheric (+ hydraulic head) pressure, and which have a large, reliable source of sealing water. (GP) (ANS)

The NRC staff does not consider water testing to be as sensitive as pneumatic testing. Any leakage that takes place should therefore be into, rather than out of, the tested system. The 1.10 P_{ac} criterion provides this assurance, which an equalized pressure criterion would not. (GOODMAN)

A sealing function of 30 days at 1.10 P_{ac} provides the measure of reliability sought for handling a variety of situations that the design basis accident was designed to envelop. If a water seal is to be relied upon, then being able to maintain it for a 30 day period is considered by the NRC staff to be a responsible regulatory requirement. (NU)

3. Direction of Testing

The test condition has been retained from the existing rule and, using wording similar to that in ANS 56.8-1987, has been inserted here. (RII)

4. Acceptance Criteria.

(a)

See III.B.4.(a) response.(BWROG2, BWROG3, NPPD, WPPS, LILCO, BG&E, SERI, YAEC)

(b)

(i) See III.B.1.(b) response ("program" vs "tech specs"). This paragraph has been consolidated, since the proposed 4.(b)(ii) has been dropped. (B&WOG)

As before, individual valve leakage rates are not being required, just the lowest testable unit, whether it be a single valve or a group of valves. (GOODMAN)

(ii) This paragraph has been dropped, since the definition of a qualified seal system covers this information. (GP)

5. Valves That Need Not Be Type C Tested.

(a) There is no need to insert specific examples such as this (e.g., PWR secondary side systems valves) in the rule since it would make it far too complex. (TE)

The kind of single active failure to be considered has been clarified.

(b) The referenced paragraph, VII.A., has been revised to recognize prior exemptions. (NU)

IV. Special Leak Test Requirements

A. Containment Modification or Maintenance

This paragraph has been subdivided for ease of reference.

This paragraph is consistent with the NRC staff's position since the rule was issued in 1973, regardless of the degree of compliance. An exclusion has been provided for not doing an as-found test on a one-of-a-kind component being replaced by a different one. (BECHTEL, et al)

If there is a known gross (greater than L_a) leakage failure at a local leakage path, it is agreed that there is no need to do a local as-found test at that location, since it may be unmeasurable, and would, in any case, be considered a failed test. (COMMED)

Running totals of Type A, B, and C tests were dropped from an earlier draft, not because they could not be cost justified, but because a redefinition at that time of the scope of the general revision to 10 CFR Part 50 made it an inappropriate inclusion in later drafts. A running total for just Type B and C tests is not new. It is the only way that one can tell whether and when the 0.60 L_a criterion for the sum of all Type B and C test results is exceeded. The total gets updated each time LLRT as-found and as-left tests are run. (COMMED)

"Repair" is not a new requirement, since it was considered by the Regional inspectors to be included within the scope of the wording of the existing rule. This is one of those interpretive items that have contributed to the need for updating the 1973 rule. "Major" was deleted due to a legal lack of specificity. "As found", as has been discussed, is not new, but a more explicit statement of a consistent NRC staff interpretation of the existing rule. (BWROG2, et al)

See III.A.8.(c)(ii) response, regarding excluding some Type B penetrations prior to opening, such as drywell head, CRD hatch, torus seals) (NYPA)

See III.B.4.(a) response on as-found and as-left testing. (PP&L)

The rule does not automatically require a structural integrity test. It simply requires a licensee to be prudent and use common sense by considering, after impacting the pressure boundary structure, whether or not a structural integrity test is needed to restore or maintain confidence in the structure's behavior, and to inform the NRC about the decision and its basis. (SERI)

The part of the rule deferring leakage tests of minor modifications, originally based on ASME Code Case N-236-1, has been conformed to the current version, dated 9/5/88. Since the term "nominal diameter" has caused some confusion in practice, it has been cahnged to "outside diameter" to reflect the fact that it is the hole cut into the pressure boundary that is of concern. (SERI)

B. Multiple Leakage Barrier or Subatmospheric Containments

Revised editorially to conform to standard definitions used.

See III.B.1.(b) response, "program" vs "tech specs". (B&WOG)

This comment appears to take issue with an existing requirement which, if not followed, would currently result in a violation or a rejection of a Type A test. The reason for there being interest in the as-found Type A test is to 1) determine the rate of degradation of the containment boundary, and 2) determine what level of protection the containment would have provided the public if an accident had occurred. Since the design basis accident postulates broken lines and exposed isolation valves, penalizing the as-found Type A test for repairs that had to be made to an excessively leaking valve is not contradictory to the maintenance of a tight containment. (WCNOC)

V. Test Methods, Procedures, and Analyses

A. Type A, B, and C Test Details

This requirement is being retained, since it is felt necessary to stipulate that how a licensee intends to comply with the criteria in this rule must be described somewhere on the record. There is currently still some discussion as to whether the Technical Specifications are the appropriate place to put this information on the record. However, until revised otherwise, this information will be found in the Technical Specifications. If an ANSI standard or NRC regulatory guide serves the purpose, then a simple reference is sufficient. If the standard test program is being modified, and accepted, "on some other defined basis" then that basis will have to be defined or described. This paragraph forms the bridge from the "what is to be done" criteria to the "how to do it" methodology. (BWROG2, et al) (GOODMAN) (BG&E)

See III.B.1.(a) response, "program" vs "tech specs"; also, see discussion in paragraph above. (B&WOG, et al)

B. Combination of Periodic Type A, B, and C Tests

"As-found" requirement is not new, as previously discussed.
"Containment system" has been retained, as discussed in DEFINITIONS.
(BWROG2, et al)

Those who do not look back to see how well they have performed cannot expect to look forward and see good performance. If they do look back and see no lessons, no information, no patterns, and no evidence as to whether or not they have been doing a good job, they will have no basis on which to measure whether what they will do in the future will have any value. The "as-found" leakage results ought to be indicating whether the plant maintenance programs are properly focussed in frequency and application. Ignoring "as-found" results invites future maintenance problems. (SERI)

See III.B.1.(b) response regarding removing all tech spec references from this rule. (CE)

VI. Reports

A. Submittal

1. Paragraph has been revised as recommended, to clarify "each test". (NYPA)

2. See response to BWROG under Type C Testing regarding the revised rule not requiring individual testing of each containment barrier. The stated criteria are correct. (BECHTEL, et al)

Results of periodic B and C tests have always been required to be reported under V.B.3. of the original rule. The only significant change is that failed Type B and C tests are to be reported sooner than about every 4 years when a Type A test report is filed. One report per shutdown would be acceptable for reporting failed B and C test results. The schedule of report submittals (from end of each outage) does not change the schedule for retesting the individual B and C testable leakage barriers (from end of each B or C test). With regard to LER duplication, see response to COMMED, NUBARG, LILCO in III.A.9.(a). (BWROG2, et al) (NYPA) (S&W) (GOODMAN) (PHILELEC) (YAEC) (GPU)

This comment about submittal of all B and C test results not being worth the cost reflects an outlook expressed earlier under V.B. toward surveillance and maintenance that is likely to result in problems as the plant(s) involved age. (SERI)

A comment was submitted that Type B and C tests performed during Modes 4 & 5 do not represent conditions present under Modes 1, 2, & 3, and that B and C leakage under Modes 4 & 5 is not a safety concern. Until Type B and C tests are performed during Modes 1, 2, and 3, these tests when performed during Modes 4 and 5 will replicate and represent post-LOCA containment integrity during Modes 1, 2, and 3. (SERI)

B. Content

The first sentence is revised.

The mandatory "Corrective Action Plan", as used in this paragraph, has been renamed "Leakage Correction Plan", here and in III.A.9.(a) [new numbering], to avoid confusion with the voluntary Corrective Action Plan in III.A.9.(b)(ii) [new numbering]. For both Plans, this would include a description of the problem, cause, what was being done to correct it, and preventative measures to preclude recurrence.

Some type of corrective action plan, similar to what is now being called the "Leakage Correction Plan", is already required. III.A.1.(a) of the existing rule states "The corrective action taken and the change in leakage rate determined from the tests ... shall be included in the report submitted to the Commission ..." Therefore, all that has been done is to put a label on the actions already required to be taken. The NRC staff does not wish at this time to automatically allow licensees to substitute increased Type B and C tests for increased Type A testing. The NRC staff feels that licensees must first be able to demonstrate that they have a more effective local leakage rate testing program than can be automatically assumed at this time. [See III.A.9.(a) - new numbering]. (BWROG2, et al) (S&W)

VII. Application

A. Applicability

See III.B.(1)(b) response, regarding incorporating bases for alternative requirements in other documents such as FSAR, not in tech specs. (BWROG2, NPPD, WPPS, LILCO)

Revised to recognize prior exemptions.

See III.B.1.(b) response, "program" vs "tech specs". (B&WOG)

Providing for technically justifiable alternatives was part of the flexibility intended in the revised rule. (NU)

B. Effective Date

No comments received.

Document Name:
JCOMM

Requestor's ID:
ARNDT

Author's Name:
arndt

Document Comments:

10 CFR 50, APPENDIX J

COMMENTS ON OCTOBER 1986 PROPOSED REVISION

(Paraphrased Summaries)

Leakage Rate Testing of Containments of
Light-Water-Cooled Nuclear Power Plants

GENERAL:

The proposed version of Appendix J appears now to be attempting to provide assurance that leakage never exceeded L_a during a completed operating cycle, instead of simply that a containment is leaktight prior to resumption of operations. *NU*

Adjusting very accurate Type A test measurements with LLRT test results of lesser required accuracy poses several technical problems:
a) the combination of leakage results do not follow established significant figure rules for addition, and
b) the local leak rate error analysis uses a simple root-mean-square technique vs. the Student t-distribution method for ILRT calculations. The validity of simply adding the results and associated errors together is questionable. *NU*

I. Introduction

Delete the reference to the Regulatory Guide and include reference to the ANSI standard in the rule, or impose the Backfit requirements and assure that future changes to the Reg Guide are in accordance with the proposed/final rulemaking process (10CFR2.804). Reason: Referencing a Guide in the CFR is not a standard practice, since it could be interpreted to mean mandatory compliance instead of guidance. BWROG is concerned that future Guide changes could be (i) substantial and costly, (ii) made without a Backfit Analysis, and (iii) not allow for review in accordance with 10CFR2.804. *BWROG2* *NPPD* *WPPS* *LILCO*

Delete the footnote. Test methods, procedures,and analyses are described in Section V. of the proposed revision. Specific guidance concerning these test methods and analyses at present are contained in the tech specs. Thus, the footnote is redundant. *TE*

II. Definitions

Consider including definitions of GDC 55, 56, and 57. *BECHTEL* *APCO* *WE*

1. Acceptance Criteria

Remove "functional" since it is ambiguous and subject to individual interpretation. *BWROG2* *NPPD* *WPPS* *LILCO*

[Accident]

Define as "The design basis loss-of-coolant accident presented in the licensee's Final Safety Analysis Report". This is consistent with the background information published with the rule and would preclude the inclusion of valves such as the main steam isolation valves, feedwater check valves, and safety injection valves for PWRs in the Type C test program, unless relied upon to perform a containment isolation function in the design basis accident analysis. *WE*

2. "As Found" Leakage Rate

Reword: "The leakage rate prior to needed repairs or adjustments that could affect the leak tightness of the barrier being tested."
Also, add "Repair - A repair to a Type B or C pressure boundary is defined as work which affects a component's accident pressure retention capability". *BWROG2* *NPPD* *WPPS* *LILCO*

Delete "needed" and replace with "The leakage rate prior to any repairs or adjustments that affect the leakage barrier being tested". The change will be less subject to interpretation. *RII*

Measure leakage rates for individual barriers in series and report "as found" leakage based upon "minimum pathway" leakage. *YAEC*

The "as found" limit for each plant should be based on dose evaluations with realistic source terms and site-specific meteorological conditions and should be within the dose limits specified in 10 CFR Part 100. *DRA*

3. "As Left" Leakage Rate

Reword: "The leakage rate following needed repairs or adjustments that could affect the leak tightness of the barrier being tested". *BWROG2* *NPPD* *WPPS* *LILCO*

Similar change as for "As Found". *RII*

Report "as left" leakage based upon "maximum pathway" leakage and document corrective actions performed between "as found" and "as left" conditions. *YAEC*

The "as left" limit should be based on the allowable leakage rates currently permitted by the NRC. The value of the "as left" limit for reactor containments of a given reactor type could be obtained by selecting the largest value accepted by the NRC from the existing allowable leakage rates among reactors of the same type. Site-specific conditions need not be considered for the "as left" limit. *DRA*

[Closed System - Provide a definition for clarification.] *BWROG2* *S&W* *NPPD* *WPPS* *LILCO*

4. Containment Integrated Leak Rate Test

Delete this definition and its only use in the Revision, under "Type A Test", since it is not used elsewhere. *SERI*

5. Containment Isolation System Functional Test

Delete this because there is no mention of the test in the proposed rule. Also, this test is required by plant Tech Specs and other standards such as ASME Section XI. *BWROG2* *NYPA* *S&W* *SERI* *NPPD* *WPPS* *LILCO*

This test is separate from the Type A test and should not be defined in Appendix J. *ANS* *TE*

6. Containment Isolation Valve

Add: "Exemptions to the GDC will be indicated in the plant Safety Analysis report." *TE*

Reword: "Any valve which is intended to provide a barrier between the containment environment and the outside environment, and which must be in a closed condition to effect containment integrity."
Use of the ANS 56.8 definition provides consistency among all plants - especially those built prior to the implementation of the GDC. *BWROG2* *NPPD* *WPPS* *LILCO* *ANS*

"Any valve defined in GDC 55, 56, or 57 of Appendix A, "General Design Criteria for Nuclear Power Plants", to this part or any valve which is relied upon to perform a containment isolation function in accordance with the design previously reviewed and approved by the NRC." The proposed definition would require utilities whose containment isolation valve designs do not meet GDC 55, 56, or 57 to make significant modifications to their plants. By altering the definition with the suggested wording above, the definition is clarified without requiring earlier vintage plants to make modifications. *FP* *BG&E*

Older pre-GDC plants will have difficulty with this definition. Trouble will also be had in meeting the maximum pathway leakage rate requirement, in cases where only one valve is tested or the system is designed that either through or total leakage is measured. *GOODMAN*

Pre-GDC plants, whose containment isolation valves were not required to be designed to these criteria, may have to make modifications. No backfitting analysis of this change has been made. *NUBARG* *FPL* *LILCO*

Use current Appendix J definition. If the proposed definition is used, PWRs may have to start testing their MSIVs and feedwater check valves. These valves are not intended to be within the Appendix J scope. *GP* *FPL*

Modify: "...any valve which is relied upon to perform a containment isolation function in the design basis loss-of-coolant accident." Proposed definition is not applicable to plants that predate Appendix J. *WE*

7. Containment Leak Test Program

Delete: "...of the containment system". See discussion under "Containment System". *BWROG2* *NPPD* *WPPS* *LILCO*

Delete, since not used in the revision. *SERI*

8. Containment System

Delete definition and modify appropriate paragraphs in Section III.A.(2). The definitions of "Type A Test" and "Primary Containment", as reworded, adequately define the containment boundary. Adding "Containment System" only confuses. Also, this definition could be misinterpreted to include systems, or portions of systems, that NUREG-0737 identified as requiring testing to better identify leakage outside of containment. These systems are tested at normal operating pressure in accordance with ASME XI or other FSAR commitments. *BWROG2* *NPPD* *WPPS* *LILCO*

This new definition will extend the Type A test boundary, and should have been identified as a backfit and evaluated as such in the cost/benefit analysis. *PP&L*

9. L_a

10. L_{am}

11. Leak

12. Leakage

13. Leakage Rate

14. Maximum Pathway Leakage

See BWROG Minimum Pathway Leakage Comment. *BWROG2* *NPPD* *WPPS* *LILCO*

Multiple test connections as well as additional blocking valves may be needed at plants whose containment isolation systems were not designed to be tested in this manner. *BG&E*

The requirement for "maximum pathway" leakage, especially for "as found", is excessive in that it assumes that in every case where there are two barriers (or more) in series, the most leak-tight barrier has failed, even where these are passive barriers such as double seals or O-rings. An additional penalty is imposed by the requirement to add to the total B and C leakage that leakage measured by a continuous leakage monitoring system which may already be accounted for in the B and C leakage. *YAEC*

The Maximum and Minimum Pathway definitions simplistically assume all containment penetrations consist of single inboard and outboard isolation valves in series. Many penetrations have 2 or more inboard and/or outboard isolation valves in parallel. These definitions should be flexible enough to accommodate any containment penetration design. Suggest that the definition of Maximum Pathway Leakage be expanded to include the concepts in ANSI/ANS Standard 56.8-1981, Section 6.6, and that the definition of Minimum Pathway Leakage be expanded to include the guidance in Discussion Section 3 of IE Information Notice 85-71. *SERI*

On an individual penetration with 2 valves, use of the maximum pathway concept is a single failure as asserted in the discussion. However, the maximum pathway definition is actually to be applied to the entire containment isolation system. These systems are set up in independent trains. That is, most penetrations have one "A" train valve and one independent "B" train valve. When maximum pathway leakage is used, assuming the "best" valve in each penetration fails, the rule would impose the requirement to assume multiple independent failures in Appendix J. This appears to conflict with previous uses of the single failure concept. *FPL*

The definitions for both maximum and minimum pathway leakages should provide for simultaneous testing of the isolation valves. *ANS*

The application of Maximum Pathway Leakage Rate, as defined, results in reporting of leakage rates 1) higher than reasonably expected, and 2) not representative of actual containment performance. This approach generally assumes the active failure of one valve in each penetration, or over 50 individual failures in the typical containment. Furthermore, passive barriers, including closed valves not subject to spurious action, should not be viewed as components subject to active failure. While this approach is effective in improving the performance of some individual barriers, it does not give credit for the redundancy that exists. A more realistic basis and failure criterion are needed. *NU*

Revise: "The maximum leakage rate that can be attributed to a penetration leakage path (e.g., the larger, not total leakage of two valves in series; or if the valves are installed in series and tested in parallel, the larger leakage of the two valves; and if the valves are installed in parallel, the total leakage). This generally assumes a single active failure of the better of two leakage barriers in series or parallel when performing Type B or C tests." Valves tested in parallel are not defined. This could result in a leakage savings as analyzed in III.C.(3)(a) if repair or adjustment has been made on only one valve. *TE*

15. Minimum Pathway Leakage

Defining this as the smallest leakage of two valves in series is overly conservative, since it ignores the restriction of the worst of the two valves. Ignoring this restriction results in a calculated minimum path leakrate which can be up to 30% over-conservative compared with actual leakrate. Redefine as:
"1) the smallest leakage of two valves in series, or
2) the measured leakage from inboard of the first valve to outboard of the second valve in a dual valve isolation system with both valves closed, or
3) The measured individual valve leakages analytically combined using the orifice equations." There is no valid technical or regulatory reason not to include criteria 2) and 3). *COMMED*

Delete the examples in parentheses. A more complete explanation of alternative methods for determining valve penetration leakage (see IE IN 85-71) should be substituted, or else many plants may be forced to test each valve individually. An acceptable alternative for Minimum Pathway Leakage:
"(1) the smallest leakage of 2 valves in series, or
(2) the measured leakage from inboard of the first valve to outboard of the second valve in a dual valve isolation system with both valves closed, or
(3) 1/2 of the total leakage of the penetration."

Use a similar philosophy for the Maximum Pathway Leakage. *BWROG2* *NPPD* *WPPS* *LILCO*

The use of minimum and maximum pathway leakage for calculations showing success or failure of Type A, B, and C tests has already been mandated by an I&E Information Notice. It is our understanding that this portion of the rule change is of special importance to the NRC Staff. Because this aspect of testing is addressed under existing programs, it appears a rule change is not necessary. *FPL*

Revise: "The minimum leakage rate that can be attributed to a penetration leakage path (e.g., the smaller leakage of two valves in series, or for valves installed in series and tested in parallel, the as found minimum pathway leakage rate for the valve not repaired can be determined after repairs are completed on the other valve)." Valves tested in parallel are not defined. This could result in a leakage savings as analyzed in III.A.(7)(c)(iii). *TE*

See Maximum Pathway Leakage comment. *BG&E*

16. Overall Integrated Leakage Rate

17. P_{ac}

18. Periodic Leak Test

Delete as redundant to Section III definitions, or reword to be consistent with the text (i.e., periodic test, preoperational test). *BWROG2* *NPPD* *WPPS* *LILCO*

Remove "Leak" since not used in this term in this Revision. *SERI*

19. Preoperational Leak Test

See BWROG Periodic Leak Test comment. *BWROG2* *NPPD* *WPPS* *LILCO*

Remove "Leak" since not used in this term in this Revision. *SERI*

Delete "...by the Technical Specifications". The reference is unnecessary, since the time when containment integrity is required is clearly defined in plant documents as well as Technical Specifications. *B&WOG*

20. Primary Containment

Reword: " The structure or vessel that encloses the major components of the reactor coolant pressure boundary as defined in Section 50.2(v) of this Part. It is designed to contain design basis accident pressure and serve as a leakage barrier against an uncontrolled release of radioactivity to the environment. The term "containment", as used in this Appendix refers to the primary containment structures and associated leakage barriers.
This definition does not include a Boiling Water Reactor (BWR) Secondary Containment (Reactor) Building or a Pressurized Water Reactor (PWR) Shield Building. Also excluded are interior barriers such as the BWR Mark II Drywell Floor, and the Drywell perimeters of the BWR Mark III and the PWR Ice

Condenser". See comments under "Containment System". *BWROG2* *NPPD* *WPPS* *LILCO*

Staff and utilities have literally interpreted the definition in the existing Appendix J to mean only the single hermetically sealed structure surrounding the reactor coolant components during normal operation. However, they are surrounded by other structures or vessels both during operation and accident conditions. *IAEA*

One example is the steam generator's walls, piping, and tubes. The tube bundle has no containment, since this steel vessel is equipped with non-leaktight main steam isolation valves and atmospheric relief and safety valves which communicate directly with the outside environment. In a second example, a number of piping systems penetrate containment and are required to remain in service during an accident, such as the decay heat removal system. This system, an extension of the reactor pressure coolant boundary in an accident, is not leaktight, as was seen at TMI-2. However, the structures which house the this system's components and intersystem isolation valves are not included in the current interpretation of Appendix J even though their containment isolation function is assumed in the FSAR.

In the 1st example, the containment has been so narrowly defined that the majority of the reactor coolant pressure boundary has been excluded from the rule; and in the 2nd example it has been defined in terms of normal operation, not accident, alignment. The containment definition should be clarified and expanded to include all structures which enclose the primary containment pressure boundary and/or which are relied upon to perform a containment function. Consider the recently proposed OECD definition "to include both the primary and secondary enclosures, as well as the systems and components provided to establish an essentially leaktight barrier against uncontrolled release of radioactivity to the environment, and to assure the proper operation of systems important to safety as long as postulated accident conditions require." This definition includes human action in the containment concept insofar as accident management programs aim at influencing the sequence of events of a severe accident. *IAEA*

[Qualified Water Seal System]

Add definition, as used in paragraphs III.C.(2)(a) and (b).] *S&W*

[Reduced Pressure Tests]

Add definition. Deletion of reduced pressure testing option extends critical path outage time, and is tantamount to a new requirement. This should be considered in the backfit analysis. *BWROG2* *FPL* *NPPD* *WPPS* *LILCO*

Connecticut Yankee (CYAPCO) conducts reduced pressure tests, as do a number of other operating power reactors. A review of CYAPCO ILRT test results over the last 20 years indicates that consistent leakage measurements have been achieved. It is recommended that the reduced pressure option be retained. *NU*

21. Structural Integrity Test

22. Type A Test

Reword: "A test to measure the Primary Containment overall integrated leakage rate, under conditions representing a design basis loss-of-coolant accident containment pressure, and system alignments (1) after the primary containment has been completed and is ready for operation and (2) at periodic intervals thereafter. The verification test is not part of this definition - see CILRT." Also, see comments under "Containment System". *BWROG2* *NPPD* *WPPS* *LILCO*

This definition requires DBA-LOCA system alignments, but does not address operation of plant shutdown cooling systems, e.g., residual heat removal, which are necessary to maintain plants in a safe condition. Revise the definition to allow testing to be conducted using other methods of equal sensitivity. *NU*

23. Type B Test

24. Type C Test

Delete "pneumatic", so that water tests are also acceptable. *BWROG2* *NYPA* *NPPD* *WPPS* *LILCO*

Specifying these tests as pneumatic is inconsistent with Section III.C.(2) of the proposed revision. That section allows testing using other test mediums. Revise this definition to allow testing to be conducted using other methods of equal sensitivity.
* *

Add at end, "...as described in the Technical Specifications." Specific guidance is contained at present in the tech specs. *TE*

25. Verification Test

III. General Leak Test Requirements

General: Consider use of "shall" rather than "must" for consistency with codes & standards. *BECHTEL* *APCO* *WE*

A. Type A Test

(1) Preoperational Test.

Should be changed to read, "...,to the extent practical, Type B and Type C tests," *ANS*

(2) Periodic Test.

(3) Test Frequency.

Omit from Appendix J and incorporate in the regulatory guide. *ANS*

Adjust frequency as a result of identified problems, but do not exceed 4-yr Type A test interval. *ANI*

Add, after "...must not exceed three years" and "...must not exceed four years", (with a maximum allowable extension not to exceed 25% of the test interval). The proposed rule does not take into account plants which will soon be operating on a 24-month refueling interval. Theoretically, a plant on a 24-month refueling outage can just meet the 4 and 2 year requirements. However, the minimal tolerances proposed above and elsewhere would provide all plants, including those on a 24-month refueling interval, additional flexibility for scheduling and operational considerations. The proposed tolerance would be in accord with both the maximum allowable extension for Surveillance Requirements, as well as ANSI/ANS 56.8-1981 which allows a 5-year frequency for Type A tests. *FP* *BG&E*

For plants on a 24-month refueling schedule, provide a tolerance on the testing period. One method would allow a 25% maximum extension for the Type A, B, and C tests as well as the Type A retest requirements. The combined interval for any 3 consecutive tests could be limited to 3.25 times each of the test's specified frequency. These extensions could be restricted to only those plants whose previous leakage history justifies the extended period. This would allow much greater flexibility while still meeting the intent of the periodicity of each test. *BG&E*

ISI scheduled test dates have a 25% grace period, saving unit operation time or eliminating the need to obtain an exemption due to unexpected or unplanned events. The new Appendix J should explicitly state that decoupling Type A testing from the ISI schedule does not result in a loss of this grace period. *COMMED*

This section also imposes a new maximum interval of 3 years between the preop and first periodic Type A test. This is extremely costly because it will usually require an additional Type A test. The plant has not experienced any service life during that interval, and Type B and C tests require complete local leak testing prior to operation. The only new sources of leakage are from damage to the containment structure, and all plants have controls on work done in containment. These controls protect the containment structure as well as every other safety related component. If there are potential deficiencies in these controls, address them directly instead of retesting a system already turned over for operation. The cost-benefit analysis did not adequately address this change. *COMMED* *BWROG2* *NUBARG* *NPPD* *WPPS* *LILCO*

Due to construction schedule restraints at NTOL plants, it may not be reasonable to complete all Type B and C tests prior to the Type A test. Clearly, adjustment of preoperational Type A results based on post test repair or rework of Type B and C leakage paths is reasonable and within the intent of the regulation. Also, for clarity and consistency the second sentence of III.A.(3) should state "...another preoperational Type A test will be necessary". *TU*

Add: "If the test interval ends while primary containment integrity is not required, the test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required." *BWROG2* *COMMED* *PHILELEC* *GP* *NPPD* *WPPS* *LILCO*

Type A test no longer coupled with [ASME Code] 10 year inservice inspection period. Test frequency decreased slightly from approximately 3 times/10 yr. period to 3 times/12 yr. period. Overall effect will be small. *DPC*

The revised test frequency (periodic Type A tests must not exceed 4 years) will require tech spec changes since the existing ones identify the frequency of 40 months ± 10 months. Deletion of Type A tests during a 10-year plant inservice inspection will also require tech spec changes. However, it will eliminate the scheduling problems associated with a 10-year ISI. *TE*

The Standard Tech Specs (STS) state that Type A testing be conducted at 40 ± 10 month intervals. The STS interval would imply a maximum interval between periodic Type A tests of 50 months; whereas the revised App. J requires a maximum of 48 months. The proposed rule creates a conflict with the STS which should be resolved prior to issue as a Final Rule. *DL*

Reduce the test frequency for Type A tests from 3 tests to 2 tests in every 10 years if a continuous gross leakage test is used. The second Type A test in a decade should coincide with the 10-year inservice inspections. *DRA*

[(4) Test Duration.]

Keep a <u>general</u> reference to test duration in Appendix J to reinforce legal <u>basis to</u> control duration. *RI*

Guidance should be provided for determining a test duration based on a reasonable level of confidence. *ANI*

Most of the critical path time lost by performing full pressure (P_a) test can be recovered by shorter duration test described in ANS 56.8-1981. *DPC*

Spanish Type A tests last 8 hrs, at most 10 hrs. *ROBLEDO*

(4) Test Pressure.

Supports dropping reduced pressure option. *ANI*

Add "maximum" before "...containment design pressure". The Davis-Besse test pressure (38.0 psig) was established using the peak pressure of 36.95 psig plus maximum containment pressure of 1 psig at the beginning of the accident. *TE

Allow use of a qualified seal water system during an ILRT. The water volume injected into containment must be accounted for in the ILRT results. This would reflect current practice. *COMMED*

Test pressure must not exceed design pressure. For some containments P_a – P_d but is less than the maximum allowable containment pressure, e.g., Hatch Units 1 & 2. Change wording to allow pressure up to a maximum allowable (or equivalent wording) pressure. *BECHTEL* *APCO* *WE*

Add "If the design pressure is less than P_{ac}, the test pressure shall be reviewed by the NRC staff." *ANS*

Allow margin above test pressure for plants with P_{ac} equal to or very close to the design pressure. Add "by 2 psi" after "...containment design pressure ..." on the 4^{th} line of the paragraph. *S&W*

Continue to allow reduced pressure testing, since:
(1) Peak pressure decays to less than the reduced test pressure after 10 minutes,
(2) Leak-Before-Break concept means it is highly improbable that the containment would ever be subjected to the maximum design pressures produced by a theoretical worst case quillotine rupture,
(3) Containment leaktightness more likely to be affected by modifications and maintenance on penetrations typically LLRT tested at full containment design pressure. *MEYANKEE*

Allowing test pressure to fall up to 1 psi below P_{ac} during the test allows desirable flexibility. *GOODMAN*

As the proposed 1 psi pressure drop below P_{ac} appears to be an arbitrary number, a percent pressure drop is recommended. Using this criterion in relation to a P_a of 50 psi, a 2% drop is allowed, but for P_a of 15 psi a 6.5% drop is allowed. A 4% pressure drop below P_a is representative of a middle ground between various containment designs. *TU*

Deleting the reduced test pressure option will add approximately 10 hours to pressurize and depressurize the Ginna containment. Because of the difficulty in controlling the final pressure while pressurizing, a broader band than greater than P_{ac} to less than P_d should be allowed in those cases where P_{ac} approaches P_d. *RG&E*

Modify the Appendix to provide for a monitoring system as a trade-off (incentive) for full pressure ILRT at longer than 4 year interval (1 per 5 years). *TER*

About 15 ILRTs annually are performed at reduced pressure. While it is logical that an ILRT at full pressure best simulates a LOCA condition, provisions to preclude alternatives to reduced pressure (e.g., 2 psig) or subatmospheric as a monitoring device with the intent to extend the interval between ILRTs should not be thrown out (which this revision would do).
NUREG/CR-4398 assumes erroneously that there is no cost difference for BWRs vs PWRs. A typical PWR has an ILRT pressure of 40 psig where typical BWRs (I, II, & III) have an average ILRT pressure of 20 psig. Considering the designed volume and pressure differences, this revision represents a significant hardship to PWRs. This quantification, based on over 400 ILRT reports, is 20 psig divided by 5 psig/hr x 2 (press. & depress.) = additional 8 hours minimum. Further, not addressed is the increase in compressor costs for additional time and/or increased rate (faster than 5 psig/hr). *TER*

Some form of reduced pressure testing should be considered in this section because of the risks associated with pneumatic testing and because lower pressure testing may be more representative of containment function during the design basis LOCA. Since containments have been designed with a peak accident pressure ranging from approximately 11 psig (BWR Mk III) to approximately 57 psig (BWR Mk I), the allowable pressure drop during the test should be some percentage of P_{ac} rather than an arbitrary 1 psig as required by this proposed section. Further, some existing containments cannot be tested at P_{ac} because the design pressure is so close to the peak accident pressure that there is no margin for assuring design pressure would not be exceeded. *GP*

Keep the reduced pressure Type A test option. The full pressure test is longer and more costly, increases fire risk due to increased oxygen content and difficulty in fighting a fire, and risks damaging equipment in the containment, and is not representative of real accident pressure level and duration. *FPL*

Eliminating the option to do an ILRT at reduced pressure increases the critical path time for all units that currently perform reduced pressure tests (both pump up and blow down time is increased). *DPC*

This does not address existing plant tech specs or App. J exemptions allowing reduced pressure ILRTs. Conn. Yankee (CYAPCO) has conducted 7 reduced pressure tests over the past 20 years. Review of these tests concluded (a) reduced pressure testing provides adequate assurance of containment integrity, and (b) test results are valid and consistent. Retain the reduced pressure option. If it is not retained, the requirement that P_t must not exceed P_d at the start of the test may not be possible for plants in which $P_{ac} = P_d$, e.g., Haddam Neck or Millstone 2. *NU*

Normally, the test pressure = P_t plus the measurement uncertainty of the ILRT precision pressure measuring system to ensure that the requirements of the test are met. For some plants, this would make the test pressure greater than $P_{ac} = P_d$. Allow some amount of tolerance around P_t. *NU*

Although no specific unacceptable degradation mechanism has been associated with the full pressure tests, the higher fatigue usage from performing the full pressure test may reduce rather than improve containment functionality over the plant lifetime. We recognize that none of the justifications for reduced pressure testing are individually compelling, but in total they provide substantial justification for not eliminating that option. *WE*

(5) Pretest Requirements.

If a leak is detected and isolated after start of the Type A test, it should be permissible to re-start data taking for leak rate determination after the isolation. *GOODMAN*

On line 6, change "performance" to "leakage". *S&W*

" Information on valve leakage that requires corrective action...must be included in the report.." implies that valves have to be tested individually. Typical leakage testing programs have many procedures which test valves simultaneously and in the aggregate. A requirement to test them individually would require extensive retrofit. *GP*

Revise this section to account for plant shutdown operations and refueling mode system valve realignments. The requirement that Containment Isolation Valves (CIVs) undergo "...no preliminary exercising or adjustments for the purpose of improving performance ..." is confusing terminology, especially for those Type C penetrations that require draining and venting prior to an LLRT. After draining and venting operations, it is necessary to open and close CIVs to ensure CIV closure "...by normal operation...".
Add CIV closure verification operations to this section. *NU*

(6) Verification Test.

Can be interpreted to mean that the preop test does not require a verification test. *BECHTEL* *APCO* *WE*

This constitutes a change by requiring that the verification test be done after the leakage test. There is no technical reason for this. It can be shown that performing the verification test first is usually more conservative, because the leakrate must remain constant for a much longer time to pass a Type A test. In some instances, it makes sense to perform the verification test first. If a successful leakage test is performed first but the verification test fails due to a flaw in the initial leakage test, the subsequent passage of a new, corrected leakage test would not invalidate the previous verification test. Thus, a new verification test would be unnecessary. One example of a flawed leakage test is a decision to end the test with too great a rate of change of leakage rate. Such transient leakrates can be caused by unstable containment conditions, diurnal effects, or isolation of small leaks during the test without test restart. *COMMED*

On line 10, "leadkage" should be "leakage". *S&W*

(7) Acceptance Criteria.

These "As found" acceptance criteria are new, with significant cost impact without improving safety, and may significantly increase Type B and C testing and outage durations. Additional block valves and test connections may be needed. Backfit analysis does not consider cost of modifications or downtime of 8 to 24 hours per Type B or C test. *NUBARG* *LILCO*

(a) For the preoperational Type A test,...

Delete "properly justified". This is an ambiguous term which is subject to individual interpretation. *BWROG2* *NPPD* *WPPS* *LILCO*

Delete or clarify "...properly justified statistical analysis,...". Its meaning is not clear and could be interpreted to mean only analyses or analysis techniques which are specifically approved by the NRC prior to the Type A test. It should be noted that in SERI's experience Type A testing results are routinely reviewed by NRC inspectors and the analytical methods scrutinized. *SERI*

"...a properly justified statistical analysis..." is too vague and would be subject to a wide range of interpretations. Recommend referencing the draft [regulatory guide] and its associated ANS 56.8-1981 statistical analysis. *NU*

(b) For each periodic Type A test,...

See comment on (a) above. *BWROG2* *NPPD* *WPPS* *LILCO*

Supports "as found" Type A = 1.0 L_a, and "as left" = 0.75 L_a. LACBWR's Tech Specs spell out L_a = acceptance criterion and 0.75 L_a = startup criterion. *GOODMAN*

(i) L_a, for the "as found" condition,

Addresses a new requirement, "as found", and should have a thorough backfit analysis performed. *BWROG2* *NPPD* *WPPS* *LILCO*

Considers the "as found" acceptance criteria to constitute a new requirement. The Authority and other utilities have considered the applicable sections of the existing Appendix J and ANSI N45.4-1972 as a request by the NRC staff for the utilities to provide data which can be used to determine the "as found" condition of the containment, not as an "as found" acceptance criterion for the Type A test. *NYPA*

The NRC is currently requiring all stations to perform as found leakage rate calculations. The proposed rule change clearly emphasizes the requirement for performing as found leakage rate calculations. The As Found Acceptance Criterion has been increased to 1.0 L_a from 0.75 L_a. The increase in the as found requirement will benefit all stations. *DPC*

Delete the "as found" Type A test acceptance criterion. Keep Appendix J based on a 0.75 L_a "as left" basis with 0.25 L_a as a margin for deterioration until the next type A test. *ROBLEDO*

(ii) 0.75 L_a, for the "as left" condition,

(c) ... isolation ... permitted prior to or during the Type A test ...

Provide guidance for the case where as found leakage is found during the Type A test and cannot be quantified. *ANS*

(i) All potential leakage paths... are locally leak testable...

This will require retrofits to allow testing individual valves and will require additional leak testing to test each valve with attendant additional radiation exposure. *BECHTEL* *APCO* *GP* *WE*

See BG&E Maximum Pathway Leakage comment. *BG&E*

(ii) ... measured before and after ...

This change, requiring local leak testing of leakage paths both before and after they are isolated, repaired, or adjusted during a Type A test, will disallow 3 important current practices.
1) Current regulations allow isolation of a locally testable leakage path during a Type A test without local leak testing prior to the isolation. The Type A test is then completed, the leakage path tested, repaired, then retested. The appropriate penalties are then added to both the "as found" and "as left" Type A test results. This requires the leakage path to have been isolated in such a way that the "as found" leak rate was not affected.
2) Current regulations permit isolation, adjustment, or repair of a locally testable leakage path during a Type A test without prior local testing if the licensee concedes that the "as found" total containment leakage is greater than 0.75 L_a (i.e., failed "as found" Type A test with indeterminate leakage).
3) Under current regulations, "as found" leakages have no meaning when a preop test is performed. *COMMED*

The regulation should include exemptions or some mechanism to waive doing LLRTs before isolation, repair or adjustment when deemed impractical or undesirable from plant availability or ALARA considerations. Some Type B penetrations such as drywell head, CRD hatch, and torus hatch seals should be exempted in the regulation from being tested prior to opening. *NYPA*

Some isolation barriers can only be tested from inside the containment, requiring the containment to be depressurized and then repressurized. *GP*

(iii) All changes ... added to the Type A test results ...

Clarify (1) whether "added to Type A test results" refers to the previous or present Type A test results, and how or whether to incorporate non-ILRT refueling outages and intermittent tests. Currently different interpretations apply in different NRC Regions (IE IN 85-71). *BWROG2* *NPPD* *WPPS* *LILCO*

New and unreasonable requirement and a backfit. There is no correlation between Type B and C tests delta leakage rates before and after component adjustment or repair and the previous Type A test. No safety benefits or useful information would be gained by implementing this requirement. *GP

(d) The effects ... quantified and ... corrections made ...

Replace "quantified" with "quantified to the extent feasible", since some penetrations can not be tested accurately at test pressure, and this would require complete depressurization. *BECHTEL* *APCO* *WE*

This change requires accounting for effects of "...additional tightening of manual valves..." performed after start of a Type A test, and can be interpreted to require leakage penalties for manual valves not fully closed in the Type A pretest valve lineup. Such penalties would not accurately represent the valves' sealing abilities. Clarify whether "additional" means excessive closure force or later proper valve positioning. *COMMED*

"...or any action taken that will affect the leakage rates" should be stricken completely from the Appendix. A partial list of events that penalties would have to be unnecessarily assessed for:

- Failure to properly close or tighten a valve in the pretest valve lineup.
- Leakage due to correctly performing an incorrect valve lineup specified in the test procedure.
- Leakage through a qualified seal system that was not initially being used during the test, or through a valve pair that gets seal water from the system.
- Leakage through the inner door lock that was stopped during the Type A test by closing the outer door and equalizing the volume between the 2 doors. NOTE: It is common practice to start a Type A test with the inner airlock door closed and the outer door open. If this is not done, a leaky inner door will cause an undetectable containment leak, until the inner door volume is finally at test pressure.

Current regulations require no penalty for any of the above events, implying public health and safety are not affected. A change requiring penalties therefore penalizes licensees without any compensating increase in public health and safety. *COMMED*

Reword: " ...made after the start of the Type A test sequence must be accounted for in the final Type A test results and the appropriate analytical corrections made..."
BWROG2 *NPPD* *WPPS* *LILCO*

Add "when practical" after "...must be quantified..." *NYPA*

No known or acceptable "analytical" techniques exist today to adjust Type A test results due to effects of valve stem leakage or packing adjustments, e.g., X number of turns on a packing nut = Y decrease in valve total leakage. It is possible, however, to perform LLRTs on valves exhibiting evidence of stem leakage or after packing adjustments, and to use these test results to adjust the Type A tests. This requirement should be reworded to reflect these facts. *NU*

(8) Retesting.

An alternative to more frequent Type A testing is allowed, but the acceptability of such an alternative will be subject to interpretation. *BECHTEL* *APCO* *WE*

(a) If for any periodic Type A test,...

Delete the requirement for a "Corrective Action Plan" since it duplicates the LER that is written when a Type A, B, or C test is failed. *COMMED* *NUBARG* *LILCO*

"Corrective Action Plan" is a new requirement. Also, need for NRC required approval of the test schedule for Type A tests is questioned, since requirements for the test schedule are defined in the rule. *BWROG2* *SERI* *NPPD* *WPPS* *LILCO*

CAPs required for any failed periodic Type A test may necessitate mid-cycle outages to perform increased maintenance and testing of problem components. The Backfit Analysis does not address the cost of increased facility downtime for mid-cycle outages, and underestimates the additional radiation exposure resulting from the increased testing, since exposure during leakage rate tests will be greater during mid-cycle outages of short duration than during refueling outages. *PP&L*

The time "saved" by not having to do more Type A tests will be used, probably exceeded for PWRs, due to mid cycle shutdowns to do more frequent Type B and C testing. *FPL*

Rename the mandatory "Corrective Action Plan" as used in this paragraph. It appears to be the same as the voluntary "Corrective Action Plan" used in III.A.(8)(b)(ii). This results in confusion. *COMMED*

Clarify, to assure that it is understood that all corrective action need not be implemented prior to restart. Reword end of 1st sentence: "...a Corrective Action Plan that focuses attention on the cause of the problem and indicates what is to be accomplished before and after restart must be developed..." *GPU*

(b) If two consecutive periodic as found Type A tests ...

(i) Add, after "Regardless of the periodic retest schedule of III.A.(3), a Type A test must be performed at least every 24 months...", (with a maximum allowable extension not to exceed 25% of the test interval). *FP*

Add: "If the test interval ends while primary containment integrity is not required, the test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required." *BWROG2* *PHILELEC* *NPPD* *WPPS* *LILCO*

We concur with allowing the Type A retest schedule to be reviewed and approved by the NRC staff. A Corrective Action Plan focuses plant maintenance, modification, and testing resources on those penetrations and valves performing poorly. Enhanced rework and retesting efforts can reduce leakage significantly, and it is appropriate to consider these efforts when determining the necessity of repeated Type A testing. *NU*

(ii) Support Corrective Action Plan (CAP) including a description of the problem, cause, what was or is being done to correct it, and preventative measures to preclude recurrence. *ANI*

No analysis has been provided to justify the costly increase in the frequency of Type B or C tests which could be accomplished only through mid-cycle plant shutdowns. *COMMED* *BWROG*

Increasing Type B and C testing for this case makes sense provided a couple of issues are addressed. First, would a cold plant shutdown be required, or should the increased testing be scheduled to coincide with a cold shutdown? This requirement should not cause a cold, or any, shutdown. Some isolation valves can only be tested during cold shutdown. Second, would a major modification such as valve replacement eliminate the increased test frequency? In any case, two consecutive acceptable tests at the increased test frequency should be sufficient to return the test frequency to normal. *GOODMAN*

NRC approval is required prior to implementation of the Corrective Action Plan and alternative leakage test program. Due to plant scheduling requirements, it would be beneficial to have required maximum NRC response time (e.g., 90 days). *BWROG2* *NPPD* *WPPS* *LILCO*

The formality of requiring the utility to prepare and submit an alternate leakage test program and requiring the NRC to review and approve the program is costly and time-consuming. Rewrite (b)(i) and (ii) to require increased frequency Type B and C testing when that is clearly the appropriate action, without requiring NRC approval.
See also comment on III.A.(8)(a) on CAP, which also applies to this paragraph. *SERI*

Support flexibility of increased LLRT in lieu of increased CILRT, provided a cause and effect relationship can be determined. *WCNOC*

Increased Type B and C testing as a result of Type A failures is not technically justified. Any additional B and C testing required by an overly conservative application of Type A test results could require plant shutdowns for the sole purpose of testing. *APCO*

This proposed change provides for increased LLRTs on the affected penetrations in lieu of increased Type A test frequency. Revision applies the adjustment of test frequency directly to identified problem areas. It provides an alternative to Type A penalty tests by allowing Type B or C penalty tests and the submittal of a Corrective Action Plan. *DPC*

Increased frequency does not in itself improve the performance of the containment. This requirement could result in an owner electing to perform the Type A test on a 24 month basis instead of replacing a troublesome component. *ANS*

More frequent valve testing could be onerous, because the plant would have to be shut down to make the test. It could also be inefficient, because deterioration is rapid from sources such as vibrations and boron crystallization. These isolation valves have to act in case of a LOCA plus one single failure. Some relaxation in the application of the single failure criterion could be appropriate to prevent unnecessary LLRTs. *ROBLEDO*

(9) Permissible Periods for Testing.

Last word of paragraph, "license" should be changed to "technical specifications. *S&W*

B. Type B Test

(1) Frequency.

Move test frequency requirements into the regulatory guide. *ANS*

(a) Add, after "...2 years", (with a maximum allowable extension not to exceed 25% of the test interval). *FP*

Add, after "...2 years", (with a maximum allowable extension not to exceed 25% of the test interval. This allowable extension shall be restricted to only those plants whose previous leakage history can justify the extended period. The combined interval for any 3 consecutive tests shall not exceed 3.25 times the specified test frequency.) *BG&E*

Add: "If the test interval ends while primary containment integrity is not required, the test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required." *BWROG2* *COMMED* *PHILELEC* *GP* *NPPD* *WPPS* *LILCO*

The existing Appendix J states that all Type B or C tests must be performed at each refueling, but in no case at intervals exceeding 2 years. Proposed change will allow testing of penetrations during forced outages other than refueling to be included in the 2 year cycle. *DPC*

Revise the 1st sentence: "Type B tests, except for air locks, shall be performed prior to initial criticality and periodically thereafter during shutdown periods or normal plant operations, but in no case shall any individual test be conducted at intervals greater than 2 years. If the two-year interval ends while primary containment integrity is not required, the test interval may be extended provided all deferred testing is successfully completed before containment integrity is required in the plant." Regulatory Guide MS 021-5 and App J have conflicting statements with respect to the frequency of the Type B test. *TE*

(b) Replace "...specified in the Technical Specifications" with "...specified in the licensee's Appendix J Program".
Except for L_a and P_a, all other elements needed by a licensee to implement Appendix J should be implemented by a Program, rather than the Technical Specifications. *B&WOG*

For continuous monitoring systems, leakage which is already included (or accounted for) in Type A, B, or C testing, need not be additionally added to the summation of Type B and C test results. *YAEC*

The 2nd, 3rd, and 4th sentences are new and not addressed in the Backfit Analysis. The 3rd and 4th are Type A test requirements and should be in Section III.A.
The Revision, by use of "...such as..." in the 4th sentence, would include inflatable air lock door seals in a continuous leakage monitoring category. The requirement that leakage from these door seals be "...accounted for and the Type A test results corrected accordingly" is ambiguous and subject to interpretation. Grand Gulf's inflatable door seal systems were not designed for continuous monitoring. Currently,

there are no means to account for the leakage without modifications to the air locks, other than examining the door seal system tubing and components visually with leakage detection fluid. Grand Gulf tech specs require periodic surveillances of the air lock door seal system for leakage which provides adequate assurance that any leakage from the system will be insignificant. Exclude inflatable air lock door seals or clarify the requirement to account for leakage as it applies to the air lock door seal air systems installed at many nuclear plants. *SERI*

(2) Pressure.

Replace "...or in the Technical Specifications" with "...specified in the licensee's Appendix J Program". *B&WOG*

(3) Airlocks.

Move test frequency requirements into the regulatory guide. *ANS*

(a) Initial and periodic Tests.

Add, after "...each 6-month interval", "...exceed 2 years", and "...at 6-month intervals", (with a maximum allowable extension not to exceed 25% of the test interval). *FP*

Add, after "...each 6-month interval", "...exceed 2 years", (with a maximum allowable extension not to exceed 25% of the test interval.... This allowable extension shall be restricted to only those plants whose previous leakage history can justify the extended period. The combined interval for any 3 consecutive tests shall not exceed 3.25 times the specified test frequency.) *BG&E*

First full sentence should read "Air lock volumes must be tested prior to the preoperational Type A Test and at least..." *S&W*

Clarify "reduced pressure tests" and "intermediate pressure tests" for air locks. *SERI*

When performing manual seal LRT at MNS and CNS, the aux. bldg. door must be opened following completion of the LRT to remove test equipment, resulting in the need to reperform the LRT every 3 days. The proposed change eliminates the need to retest following the air lock opening for test equipment removal purposes. Extending the 6 month interval to 2 years will have little effect on stations, since it is unlikely that air locks will remain closed for extended periods. *DPC*

Greater flexibility to test air lock door seals instead of the entire air lock will have little effect on MNS and CNS, since these stations currently have exceptions in the tech specs to the existing rule. ONS currently performs a full hatch leak test following periods when containment integrity is not required, in accordance with the tech specs. This change will allow seal leak test to be performed in lieu of full hatch leak test. *DPC*

(b) Intermediate tests ...

(i) Delete "... by the plant's Technical Specifications" (2 occurrences). The reference is unnecessary since the time when containment integrity is required is clearly defined in plant documents as well as Technical Specifications. *B&WOG*

Replace "...in the Technical Specifications" with "...in the licensee's Appendix J Program". The air lock test pressure shall be located in the proposed Appendix J Program. *B&WOG*

On line 6, add "doors" after "air lock'.
On line 8, change "Air locks opened" to "Air lock doors opened".
On line 11, delete "repeatedly".
On line 13, change "the plant requiring" to "establishing". *S&W*

Since some Tech Specs require containment integrity at all times when the reactor is critical, two airlock tests might have to be performed only days apart - once prior to the reactor reaching criticality, and again after the reactor has reached full pressure and a leak inspection has been conducted inside containment. The first test would be a critical path item, since these tests require 24-hrs for stabilization and data gathering due to the large test volume of the air lock.
Replace " However, such testing must be initiated prior to the plant requiring containment integrity." with "However, such testing must be initiated prior to the plant resuming electrical power production, but in no case greater than 72 hours after attainment of full reactor pressure." *PHILELEC*

(ii) Only require local leakage tests on shaft seals or equalization valves following work in those areas (for plants that have locally testable shaft seals and equalization valves). Also allow local leakage testing of the door seals, shaft seals, and equalization valves in place of full airlock tests. *COMMED* *GP*

Add "or testable penetrations" after the words "...door seals..." *ANS*

Revise: "Whenever maintenance other than on door seals..., if that maintenance affected the leakage rate of the pressure retaining boundary." Maintenance not affecting the leakage rate should not require a leakage test. *TE*

(iii)

(4) Acceptance Criteria.

See NUBARG comment at III.A.(7). *NUBARG* *LILCO*

(a) Reword: "The sum of the as-found Type B and C test results must not exceed L_a using the minimum pathway leakage. The sum of the as-left Type B and C test results must not exceed 0.60 L_a using the maximum pathway leakage and including leakage rate readings from continuous monitoring systems." *BWROG2* *GP* *ANS* *NPPD* *WPPS* *LILCO* *BG&E*

Use minimum pathway for as-found, maximum pathway for as-left. 0.60 L_a is too restrictive. For Type A tests, the "as left" limit is 0.75 L_a to allow 0.25 L_a for deterioration over the next 4 year period to the next Type A test.[a] In this case, 0.75 L_a would allow 0.25 L_a for deterioration over a 2 year period, plus an allowance for leakage not measured by the Type B and C testing program and would conform with the ANS 56.8 standard.

If a Type B and C test program were developed to allow testing over the entire cycle, rather than only during refueling outages, the "running total" B and C leakage rates would be relatively constant, with little degradation over time. *YAEC*

Due to increased Type B testing alone, a substantial cost increase would be incurred, since all penetrations which are routinely opened at the beginning of each outage would require "as found" testing before they could be opened. At Grand Gulf this includes the containment equipment hatch, the fuel transfer tube door,and 2 containment air locks. If welds in process pipes are to be inspected to ASME Section XI during the outage, up to 22 guard pipe closure seals must also be tested. These tests could have a direct impact on critical path time since the outage could not proceed until "as found" testing was complete. The fuel transfer tube door test requires that the fuel transfer canal inside containment be drained. Draining the fuel transfer tube is prohibited during reactor operation. Therefore, this test could impact refueling operations for a day or more. Few "as found" tests could be performed during operation prior to a scheduled outage. These "as found" tests could also be required at the beginning of unscheduled outages, often without enough time to prepare, and could directly impact critical path outage time. Replaced power costs alone make the "as found" acceptance criterion a significant increase in costs. This criterion should be deleted until the Backfit Analysis addresses the above concerns.

This paragraph specifies that both "As found" and "as left" combined Type B and C leakage be calculated using the maximum pathway leakage concept, assuming a single active failure of the lowest leak rate of 2 leakage barriers in series. Maximum pathway may be appropriate for "as left" calculations since that calculation is used to determine if the plant is ready for service. It is not appropriate for "as found" leakage calculations since that calculation documents leakage after the service period is complete. When Grand Gulf shuts down for Type B and C testing the condition of each leakage barrier, including any failures, is known. The combined Type B and C leakage should be calculated to sum leakage across each overall containment penetration which is a minimum pathway leakage concept and should be used in calculating "as found" combined Type B and C leakage. *SERI*

All 3 Duke Nuclear stations currently do not report "as found" values for Type B and C leakage summations. This requirement will be difficult to meet since several penetrations during each test cycle are unable to be pressurized to full test pressure. Using the maximum leakage criterion, one must assume that the leakage is greater than 0.60 L_a, thereby resulting in the failure to meet the "as found" acceptance criteria. *DPC*

(b)

(c) Delete, as Type B tests do not have individual acceptance criteria. *BWROG2* *NPPD* *WPPS* *LILCO*

Unnecessary paragraph. Failure of a Type B test implies individual penetration acceptance criteria exist. If an acceptance criterion does exist, i.e. Tech spec for air locks, an action statement is already defined. If it does not exist, then the penetration leakage is included in 0.60 L_a. *WCNOC*

Change the last sentence to read "Corrective action to correct the leak must be developed, implemented, and reported in accordance with Section VI". *S&W*

(d) Replace "... in the Technical Specifications" with "...in the licensee's Appendix J Program". *B&WOG*

No need to specify individual limits for airlocks, since airlock leakage rates are included in the 0.60 L_a criterion. *GOODMAN* *GPU*

C. Type C Test

Refers to a "qualified water seal system", but does not state the requirements of such a system. *BECHTEL* *WCNOC* *APCO* *GP* *SERI* *WE*

In some BWR plants, the number of tested penetrations exceeds 100. Valves for some of these penetrations are tested in groups, not individually, especially older plants (pre-1973 Appendix J). Capital expenditures to individually test all penetrations could approach 10 million dollars per plant.
Also, LLRTs frequently require 8 to 24 hours (or more), not 3 hours, of labor. The NRC Backfit Analysis does not substantiate its conclusion that the Proposed Appendix J is both safety and cost neutral. *BWROG*

Retain statement on test pressure direction. It is as important as other test conditions given in this section, and retaining it would emphasize its importance. *RII*

Comments on III.B. regarding test frequency and "as found/as left" limits apply here also. *ANS*

(1) Frequency.

Add, "...after 2 years", (with a maximum allowable extension not to exceed 25% of the test interval) *FP*

Add, after "...2 years", (with a maximum allowable extension not to exceed 25% of the test interval. This allowable extension shall be restricted to only those plants whose previous leakage history can justify the extended period. The combined interval for any 3 consecutive tests shall not exceed 3.25 times the specified test frequency.) *BG&E*

Add: "If the test interval ends while primary containment integrity is not required, the test interval may be extended provided all deferred testing is successfully completed prior to the time containment integrity is required." *BWROG2* *COMMED* *PHILELEC* *GP* *NPPD* *WPPS* *LILCO*

(2) Pressure/Medium.

(a) Modify this requirement to explicitly provide for reduced pressure testing of MSIVs in BWR plants. *COMMED*

Add "or as specified in the technical specifications" to the end of the existing sentence to cover BWR main steam isolation valve leakage tests with limits of 25 psi which is generally less than P_{ac}. *S&W*

"Qualified seal system" should mean only that, post-LOCA, there will be water on the containment side of the valve for at least 30 days. *GOODMAN*

Replace "must" with "may". This will not compromise the Type C test validity, but will provide greater flexibility. *WCNOC*

"...unless pressurized with a qualified water seal.." implies that the seal system must be pressurized above atmospheric pressure. Numerous at

Grand Gulf are open to the suppression pool which provides the water seal; however, the suppression pool is at atmospheric pressure. If this pool does not qualify as a pressurized water seal it would be difficult to perform pneumatic Type C testing on these valves without extensive alterations. III.C.(2)(b) uses the word "sealed" instead of "pressurized". In the interest of clarity and consistency, the word "pressurized" in III.C.(2)(a) should be changed to "sealed". *SERI*

Requiring the test medium to be air or nitrogen will impact those plants which have penetrations that can only be tested by other methods. Revise to allow testing by methods of equivalent sensitivity. *NU*

(b) New item. Do not understand why valves tested with water must be tested at at least 1.10 P_{ac}, rather than at P_{ac}. *GOODMAN*

It appears to be overly conservative to require a demonstration of sealing function for 30 days at 1.1 P_a when accident analyses show plant pressures will return to normal in a much shorter time. Revise this requirement to reflect more realistic accident conditions. *NU*

For internal consistency, change "qualified seal system" to "qualified water seal system". *GP*

What is the definition of a qualified water seal system? Is the definition of III.C.(3)(b)(ii) sufficient to define the seal system? *ANS*

(3) Acceptance Criteria.

See YAEC comment at III.B.(4). *YAEC*

(a) Reword: "The sum of the as-found Type B and C test results must not exceed L_a using the minimum pathway leakage. The sum of the as-left Type B and C test results must not exceed 0.60 L_a using the maximum pathway leakage and including leakage rate readings from continuous monitoring systems." *BWROG2* *NPPD* *WPPS* *LILCO* *BG&E* *SERI*

(b) Same seal system as in III.C.(2)(a)? *GP*

(i) Replace "...in the Technical Specifications" with "...in the licensee's Appendix J Program". Type C valve leakage rate acceptance criteria shall be located in the proposed Appendix J Program. *B&WOG*

Will tech specs need to be modified to insert individual valve leakage rate limits for those valves tested with water? Tech specs should be simplified, not made more detailed. *GOODMAN*

(ii) Same comment as III.C.(3)(b). *GP*

(4) Valves That Need Not Be Type C Tested.

(a) Add at end "...(e.g., PWR secondary side systems valves.)" PWR secondary side systems do not fail considering single active failure due to closed loop inside containment. Pipe rupture is considered passive failure. *TE*

(b) Clarify to exclude from Type C testing those valves for which alternative leak test requirements have previously been approved by the NRC staff. *NU*

IV. Special Leak Test Requirements

A. Containment Modification or Maintenance

Requires an "as found" test to be performed prior to any modification, repair, or replacement. Current understanding of NRC requirements by utilities and AE personnel is that "as found" testing is required only during refueling outages, not during forced or other maintenance outages. This new requirement will have a large impact on maintenance activities and will increase radiation exposure to personnel. Data collection should not be the prime reason for conducting surveillance activities. *BECHTEL* *COMMED* *GOODMAN* *NUBARG* *APCO* *GP* *WE* *LILCO*

Do not require "as found" local leakage testing if:
The leakage is greater than L_a, due to gross failure such as a stuck open isolation valve or a valve whose packing has blown out; or
within a specified period prior to regularly scheduled Type B or C tests (the component must experience some service life prior to testing).
COMMED

This proposed change is, in effect, a requirement to keep running totals of Type B and C leakage. In the past, running totals for Type A testing was proposed and withdrawn because it could not be cost justified. This is the same kind of requirement, and it should be withdrawn for the same reasons. Local and integrated leak tests are spot checks, not a running total that must be continually updated. *COMMED*

"Repair" is a new requirement, and subject to a backfit analysis. "Major" has been deleted, and should remain in the rule. "As found" is new, and should have a thorough backfit analysis performed. *BWROG2* *SERI* *NPPD* *WPPS* *LILCO*

Exempt, in the regulation, testing some Type B penetrations prior to opening, such as drywell head, CRD hatch, torus hatch seals. *NYPA*

As-found leakage is specifically quantified at Susquehannah only as needed to support a Type A test, or to trend problematic components. This new requirement will increase outage durations, tie up critical resources, and effectively penalize preventative maintenance programs. Also, the duration of mid-cycle forced outages for containment boundary component repair will be increased in direct proportion to the duration of the as-found tests. An alternative is to require utilities to establish as-found testing programs to document leakage for problem valves and components on a case-by-case basis. The existence of sound maintenance programs should eliminate the perceived need to continually determine as-found Type B and C test results. *PP&L*

Delete the 4th sentence on structural repairs. The method and details of demonstrating the structural integrity of the pressure boundary is not discussed in the Revision. As this is a new requirement, the demonstration of structural integrity should be subject to a Backfit Analysis. *SERI*

Provide additional clarification by replacing the last 3 lines of the paragraph with "Non-isolable piping welds attaching to pressure retaining boundary penetrations, the nominal pipe diameters of which do not exceed one inch". *SERI*

B. Multiple Leakage Barrier or Subatmospheric Containments

Replace " ...in the technical specifications" with "...in the licensee's Appendix J Program". Special Leak Test Requirements shall be located in the proposed Appendix J Program. *B&WOG*

Reporting "as found" leakage rate for Type A testing by factoring the "as found" and "as left" results of the Type B and C tests is opposed because a penalty in the "as found" Type A test would be taken for repairing a penetration that is not exposed to containment atmosphere during the conduct of a Type A test. This is contradictory to the maintenance of a tight containment. *WCNOC*

V. Test Methods, Procedures, and Analyses

A. Type A, B, and C Test Details

Delete this requirement. Test methods, procedures, and analyses are not normally referenced in the tech specs and this would impose an undue requirement and restriction. *BWROG2* *NYPA* *NPPD* *WPPS* *LILCO*

Replace " ...in the Technical Specifications" with "...in the licensee's Appendix J Program". Test details shall be located in the proposed Appendix J Program. *B&WOG* *YAEC* *NU*

What is meant by this Section? How detailed is this to be? What analyses are to be referenced or defined in the tech specs? *GOODMAN*

B. Combination of Periodic Type A, B, and C Tests

"As found" requirement is new, and subject to a backfit analysis. "Containment system" should be replaced with "primary containment", consistent with our proposed deletion of the containment system definition. *BWROG2* *NPPD* *WPPS* *LILCO*

Replace "Leak rate test methods, procedures, and analyses" with "The ANSI Standard used to determine the method of leakage testing", and delete "or defined". *BG&E*

The concept of determining Type A, B, and C leakage on an "as found" basis is of no use in predicting the incipient failure of containment or penetration integrity. Type B and C tests at Grand Gulf have not shown any pattern of leakage trends. The Type A, B, and C tests are useful only to determine the integrity of the containment boundary and penetration at a given point in time. Determining and reporting "as found" leakage should not be required. *SERI*

The Tech Spec Improvement Project and the Commission's Interim Policy Statement on Technical Specification Improvements (52FR3788) support, we believe, the complete removal of any reference to the plant's tech specs from the proposed rule. Therefore, it is suggested that all such references be removed. *CE*

VI. Reports

A. Submittal

1. Report should be submitted not later than 3 months after the conduct of a Type A test not "each test". *NYPA*

2. May be interpreted to mean that each containment barrier (e.g., valves, flexible seals) has a separate acceptance criterion. The only stated criteria are that B + C total leakage must not exceed 0.60 L_a and the "as found-as left" A results must not exceed 1.0 and 0.75 L_a, respectively. *BECHTEL* *BG&E* *APCO* *WE*

Submittal of periodic B and C tests is a new requirement and subject to the Backfit Analysis. Also, to prepare this report, "as found acceptance criteria" must be defined (i.e., do plants use the previous Type A test?). To avoid duplication, one report should be required for each series of tests, not for each individual test as implied (i.e., one report per shutdown). Also reports of failed tests to the Regional Administrator are redundant to LERs presently required for failed tests. Delete this requirement. *BWROG2* *NPPD* *WPPS* *LILCO*

Clarify the 30 day reporting requirement, to require the reporting within a reasonable time period (perhaps 30 days) following completion of all Type B and C tests performed during an outage. At the time of a single test, there is no mechanism of evaluation with respect to the 0.6 L_a acceptance criterion since the acceptance criterion is based on the sum total of all of the Type B and C tests performed over a period of time. *NYPA*

Revise the last sentence to read " Any Type B or C test(s) whose results cause the as found or as left acceptance criteria to be exceeded shall be reported to the NRC Regional Administrator within 30 days of the performance of the test(s)". *S&W*

For periodic Type B and C tests conducted at intervals intermediate to Type A tests: Currently, a mention in the monthly operating report is needed if the test passes and an LER if it fails. Will a separate report be required? How often or how soon after testing? For example, often only an airlock test is performed during a month. How will that need to be reported? Will the Type B and C test reports need to include all the detail in the proposed Reg. guide (as contained in ANS 56.8-1981)? *GOODMAN*

Recommend: "Reports submitted to the NRC Regional Administrator pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(b) within 30 days of completion of any Type B or C tests that fail to meet the as found acceptance criteria. A combined report addressing subsequent valve failures may be submitted within 30 days following resumption of electrical power production as a revision to the report for the first failure experienced during the same outage." *PHILELEC*

Reporting requirements overly restrictive. Test results exceeding tech specs are subject to LER. *YAEC* *GPU*

Delete both sentences in this paragraph. Submittal of all B and C test results is not worth the cost. Acceptance criteria are only for combined B and C test results, so the individual test result that caused the acceptance criteria to be exceeded might not be the significant contributor to the excessive leakage. Therefore, attention could be focused on the wrong penetration. *SERI*

In Grand Gulf tech spec 3.6.1.2.b, the combined Type B and C leakage acceptance criteria are applicable only in Modes 1,2, and 3. Since the majority of Type B and C tests are performed in Modes 4 and 5, there is no tech spec violated if combined Type B and C leakage exceeds the acceptance criteria during Modes 4 and 5. It is not valid to assume that the plant has been operated without adequate containment integrity during Modes 1,2,and 3, based solely on results of test performed some time after the plant has been shut down. *SERI*

B. Content

"Corrective Action Plan" is a new requirement. Also, need for NRC required approval of the test schedule for Type A tests is questioned, since requirements for the test schedule are defined in the rule. *BWROG2* *NPPD* *WPPS* *LILCO* *SERI*

Change "reqort" to "report". *S&W*

VII. Application

A. Applicability

Bases for alternative leak test requirements should not be required in the tech specs. Incorporation in other plant documents, such as the FSAR, should also be acceptable.
Allow present exemptions under this revision, by adding: "Exemptions to previous revisions of this rule approved by the NRC are still applicable." *BWROG2* *NPPD* *WPPS* *LILCO*

Replace " ...plant Technical Specifications" with "...the licensee's Appendix J Program". Alternative leak test requirements and their bases shall be located in the proposed Appendix J Program. *B&WOG*

The most encouraging improvement is this Section, which specifically states that technically justifiable alternatives to Appendix J will be considered by the NRC. *NU*

B. Effective Date

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Requestor's ID:
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arndt

Document Comments:

10 CFR 50, APPENDIX J

GENERAL REVISION

RESPONSES TO OCTOBER 1986 FRN QUESTIONS

(Paraphrased summaries)

(1) The extent to which these positions in the proposed rule are already in use;

Many already in use, except "as found" acceptance criterion, which is considered to be new criterion. No effect from loss of P_t, since both plants' ILRTs @ P_{ac}. *NYPA*

Partial list of items already being used:
a. Trying to eliminate partial pressure Type A test.
b. Disallowing mass step change verification test.
c. "As found" Type A only used, informally, since 1982. Prior to 1982, many did not record "as found" local leakage rate test information, let alone determine an "as found" Type A leakage rate.
d. Testing of systems outside containment containing primary coolant sources is done under NUREG-0737 [Clarification of TMI Action Plan Requirements], Item III.D.1.1, not under 10CFR50, Appendix J.
GDC 54, 55, 56, &57 for "newer"plants.
f. LOCA for P_{ac} & system alignment justification.
g. Provisions for isolating excessive leakage paths during Type A test.
h. Type B & C acceptance criterion of 0.60 L_a.
i. More frequent testing of repeat offenders (e.g., the purge and vent valves).
j. ASME XI IWE-5222 for Type A test deferral.
k. Upper confidence limit.
General: Portions of ANS 56.8 conflicting with Appendix J or ANSI N45.4, i.e., 8-hr test, could not be used. Inconsistency of Regional inspections led to licensee reluctance to adopt new test requirements not required from licensing standpoint. Older plants designed prior to GDC will not satisfy proposed containment isolation valve definitions. *S&W*

Those in proposed Appendix J III.A. (1), (2), (5), (6), (9), and VA. Many utilities unable to use ANS 56.8 in its entirety due to inherent conflicts with current Appendix J requirements. *SCE&G*

Varies widely among BWROG members. Examples:
a. Some plants use reduced pressure.
b. "As found" Type A test provisions being used inconsistently. generally on an informal basis.
c. Extensions of containment boundaries are being interpreted and enforced inconsistently.
Also inconsistency between NRC Regional Inspectors. *BWROG2* *NPPD* *LILCO*

Many of the specific details such as test pressure, test duration, the maximum/minimum pathway leakage concept, and reporting requirements are not generally in use. A number of positions have been imposed by compliance inspectors and licensing reviewers such as, more frequent testing of repeat leakers, Type B and C acceptance criteria of $0.6L_a$, mass point analysis method, and test pressure. *YAEC* *SERI*

Currently implementing only the requirements of the existing Appendix J, and not the additional requirements of the proposed revision or draft regulatory guide. *APCO* *FPL*

Not testing air locks opened when containment integrity is not required.
Use of Maximum Pathway when comparing Type B and C test leakage to the acceptance criterion of 0.6 L_a.
Results of Type B and C tests performed during the same outage as a Type A test are combined with the Type A test results.
Pre- and post- modification Type B and C tests at containment boundary. *WPSC*

Although most approaches presented in the proposed Appendix J are used in our plants, some exceptions are:

a. Reduced pressure Type A testing with data extrapolation is still used at Haddam Neck.
b. Current Type B and C test programs do not use an error analysis. *NU*

If all of our comments on Appendix J are incorporated, Davis-Besse may meet the intent of the proposed rule. *TE*

Do not agree that the changes are limited to corrections and clarifications and exclude new criteria. *GOODMAN*

Being used:

a. Full design accident pressure (P_{ac}) for Type A test. Some utilities still use partial pressure test.
b. The "as found" Type A provisions which have only been used (generally on an informal basis) since 1982. Previous to 1982, many plants did not record "as found" LLRT information. Today, some plants only determine "as found" Type B and C leakage rates when necessary to support performance of a Type A test during an ILRT outage.
c. The Design Basis LOCA scenario for P_{ac} and system alignment justification.
d. Provisions for isolating excessive leakage paths during the Type A test.
e. More frequent testing of certain repeat offenders (e.g. the purge and vent valves).

Utilities can not implement those portions of ANSI/ANS 56.8 which conflict with the existing Appendix J and ANSI N45.4, such as performing an 8 hour Type A test. The inconsistency of different NRC Region inspectors has caused a reluctance by utilities to implement new test program requirements when they are not required from a licensing standpoint.

Older plants which were designed prior to the 10CFR50, Appendix A, General Design Criteria, will not satisfy the containment isolation valve definitions. *AIF*

(2) The extent to which those in use, and those not in use but proposed, are desirable;

Endorse ANSI/ANS 56.8 in place of ANSI N45.4. Benefits: reduced duration test, use of Mass Point Analysis Method, provisions for isolating excessive leakages during Type A test, potential to extend Type A frequency based on B & C program validity or CAP w/ more frequent testing, and air lock test extensions. Negatives: Tech spec changes, potential for more frequent testing + longer downtime, more frequent local test reporting, potential for NRC re-evaluation of previous exemptions by use of current design criteria and models on older plants, and uncertainty how future Reg Guide revisions are to be handled. *S&W*

Many advantages are found in:
a) having additional and more precise definitions,
b) the reduced duration of testing,
c) use of the mass point technique to compute leakage,
d) reducing excess isolation provisions during Type A testing,
e) provision for an approved alternative leakage test program,
f) airlock test extensions where no openings have occurred during 6 month interval since last successful test,
g) and the possible alternative to continue under the current requirements.

Negative aspects include:
a) provision for increased local testing incurring increased downtime and radiation exposure,
b) more frequent reporting, as in the case of failed Type B & C tests,
c) more detailed and stringent requirements for reporting, i.e., to prevent recurrence(having an allowed leakage rate suggests some recurrence under normal operating conditions),
d) potential for changes to Tech Specs and existing programs currently underway with possible system modifications requiring additional outage time. *SCE&G*

ANS N45.4 is outdated and a new endorsed standard would be helpful. Major advantages of proposed rule:
1. Possibility of reduced test duration.
2. Use of mass point analysis method.
3. Potential to not increase frequency of Type A tests by placing more emphasis on Type B and C test results.
4. Decreased frequency of air lock testing.

Negative features include:
1. It can be interpreted that all valves must be individually tested, requiring extensive additions of large block valves and test connections. These may require significant critical path outage time with little apparent benefit to public health or safety.
2. Potential for more frequent testing, resulting in longer and more frequent outages and increased radiation exposure.
3. More frequent reporting requirements for LLRTs.
4. Need to develop revised Tech Specs to incorporate these changes. *BWROG2* *NPPD* *LILCO* *AIF*

Further negative features include more frequent reporting for LLRTs, the potential for NRC reeevaluation of previous exemptions by use of current design criteria and models to analyze older plant designs, and uncertainty in how future revisions to the Regulatory Guide are to be handled. *AIF*

Desirable provisions of the proposed Appendix J:
1. The refocusing of corrective action toward the root cause of test failure.
2. Dropping the Type A test duration requirement will from Appendix J will allow some licensees to meet the intent of the test program at greatly reduced cost. *YAEC*

Has technically sound program based on existing Appendix J and Tech Specs. Draft rule and Reg. guide would require undue backfitting, and may result in extension of planned outages and imposition of others solely for additional containment testing. *APCO*

Desirable proposed positions include:
a. Endorsing an updated standard.
b. Clarification of calculation of leakage by minimum pathway leakage (Type A test) and maximum pathway (B & C).
c. Possibility of alternatives to increased frequency Type A testing.
d. Uncoupling the Type A test schedule from the 10-yr ISI outage.
e. Clarification of when and how much the Type A test pressure may drop below P_a.
f. Clarification that some minor modifications to non-isolatable penetrations do not require a Type A test immediately.

New, undesirable positions include:
a. Summing "as found" Type B and C leakage which requires pre-maintenance testing.
b. Reporting individual Type B and C test results in Type A test reports.
c. Corrective Action Plans.
d. Acceptance criteria for "as found" Type A test.
e. Extending the containment boundary through the definition of Containment System.
f. Possibility of a second pre-op Type A test.
g. Including inflatable air lock door seals within the meaning of continuous leakage monitoring systems. *SERI*

BN-TOP-1 is being used. No advantage to changing this accepted and proven methodology. Therefore the new proposed methodology is non-desirable and will be costly to implement (modify existing computer software and verify). *FPL*
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Positive Type A test changes:
- Replacement of 24-hr test duration with 8-hr.
- "As found" leakage criterion of 1.0 L_a.
- Corrective action plan in lieu of increased Type A testing frequency.
- Operation, draining, venting, and preparation of penetrations

now left to ANSI/ANS 56.8.
- Repairs and adjustments prior to and/or during Type A test now allowed provided Type A results adjusted using minimum pathway results.
- Deferral of minor modifications, repairs, or replacements until next Type A test.
- Requirement to perform preop test at peak pressure only, rather than peak and reduced pressure.

Positive Type B and C test changes:
- Implementation of various test methods, procedures, and analyses left to ANSI/ANS 56.8 or other appropriate basis.
- Definition of minimum and maximum pathway leakage rates and requirements for their use.
- Type C testing permissible during operation.
- Clarification and guidance for exempting valves from Type C testing, and use of alternate test methods
- Greater airlock testing flexibility.
- New definition of containment isolation valve consistent with other regulatory bases.

Proposed Appendix J requirements for "as found" Type B & C leakage and individual valve leakage criteria are not recommended for incorporation in the Appendix J revision. *TU*

Performing a full pressure test will increase pump up and depressurization times, but will be offset by shorter test duration, therefore its overall effect is not significant.

Meeting 0.60 L_a "as found" Type B + C limit using maximum pathway will be difficult, since invariably at least one penetration will not be able to be pressurized to test pressure during each test cycle.

Some provision should be added to allow an emergency repair without having to perform an "as found" Type B or C test.

No reference is made to determination of "as found" Type A adjustment for Type B and C tests performed in the years between ILRTs, as is done for B and C tests performed during a Type A test outage.

Appendix J ought to be implemented via a leakage test program or plan - not in the tech specs.

Refer to NUREG/CR-4330 for a study on raising allowable leakage rate to 10% per day. *DPC*

Our plants comply with the present version of Appendix J to the maximum extent possible, and are utilizing every measure presently available to assure containment integrity. Therefore, it is not desirable to contemplate major changes to Appendix J. *NU*

Revision to App. J, to clarify and simplify text, is desirable. It is not desirable to revise the requirements of a rule which has not been shown to be ineffective. *TE*

Defining CIVs in terms of GDC 55, 56, or 57 would not be applicable to plants predating the GDC. A more appropriate definition: "...any valve which is relied upon to perform a containment isolation function in the design basis loss-of-coolant accident."
Define "accident" as: "the design basis loss-of-coolant accident presented in the licensee's Final Safety Analysis Report".
Allow reduced pressure testing. Endorse Bechtel comments. *WE*

Resolve conflict between tech spec 40 ± 10 month intervals and proposed rule limit of 48 months. *DL*

About 15 ILRTs annually are performed at reduced pressure. Modify the Appendix to provide for a monitoring system as a trade-off (incentive) for full pressure ILRT at longer than 4 years (1 per 5 years). *TER*

Impact greatest at smaller, older plants with small staffs, and built before the GDC were established. Would only one CIV (backed by an accessible manual valve in the turbine plant) require installation of a redundant valve so that the original valve can be tested? Are plants that currently have an exemption from a portion of Appendix J going to have to reapply for an exemption even if the requirement in Appendix J is not revised (This would be a waste of time for licensees and NRC reviewers)? *GOODMAN*

(3) Whether there continues to be a further need for this regulation;

No. Current FSAR DBA doses overly conservative. Inherent design features of water-cooled reactors will maintain DBA doses well within Part 100, even with leakage rates well beyond current limits. For beyond DBA, gross containment failure, not leakage, is prime risk contributor. *NYPA*

Yes. Provides assurance that leakage rates do not exceed those postulated in accident analyses; provides insights as to severe accident mitigation & consequences; indicates trends in component performance or plant management/maintenance practices. *OCRE*

Yes. Requirements and criteria should be clearly stated in the regulation. Should greater leakage rates be allowed in the future, then less rigorous criteria and testing would be required. *S&W* *AIF*

Yes, only where need exists for stringent leaktightness requirements, and these should be considered in light of NUREG/CR-4330, Vol 2, June 1986: "Probabilistic risk assessments, beginning with the Reactor Safety Study, WASH-1400 (NRC 1975) have shown that containment leakage (at, or slightly above the design leakage rate) is a relatively minor contributor to overall nuclear reactor risk." *SCE&G* *SERI*

Yes, a uniform approach for demonstrating containment integrity is needed. There is sufficient justification to change the emphasis on these tests (i.e., increase allowable leakage rates, concentrate more on local leak rate tests, and concentrate less on ILRTs. *BWROG2* *NU* *NPPD* *LILCO*

Yes. There continues to be a need to be able to demonstrate that the containment structure is capable of functioning as designed under postulated accident conditions. One way to demonstrate this capability is by testing. A testing program which uses industry standards to meet performance objectives specified by NRC regulation is a sound approach. *YAEC*

Yes. Regulation is needed, but existing requirements are preferable to those proposed. *APCO*

Yes. FPL utilizes the regulations in Appendix J to meet Tech Spec and insurance requirements. *FPL*

Yes. The regulation should be limited to stating program need and goals. The licensee should develop a program , obtain NRC approval, and include it in the Tech Specs. *WPSC*

Yes, but Appendix J should contain program requirements and acceptance criteria for a "containment Leakage Rate Testing Program", and allow each licensee to develop their own plant-specific program, eliminating exemption submittals. *TE*

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(4) Estimates of the costs and benefits of this proposed revision, as a whole and of its separate provisions;

Benefits are minimal. Lack of clarity not sufficient justification. "As found" costs will be substantial and lengthen outages, without substantial safety increase. *NYPA*

Mid-cycle testing costs were not not included in the NRC's cost analysis. Added plant outage time and increased radiation exposures would result from more mid-cycle local tests. Revision of testing procedures to comply with ANS 56.8 and the reg guide needs to be addressed. *S&W* *NU* *AIF*

Consider more reporting, outage time, and radiation exposure, as well as NUREG/CR-4330, Vol 2, June '86. *SCE&G*

Not justified. Current methods provide an exceptionally high level of confidence that containment integrity will be provided during a postulated DBA. The proposed revision will not increase the level of confidence already provided. *WCNOC*

Difficult due to ambiguities in rule, however some significant increased costs would be due to:

Modifications to enable individual testing of valves.
Increased number of tests (individual vs group LLRTs).
Extension of containment boundaries.
Increased downtime between scheduled outages due to required CAPs.
Additional radiation exposure for testing performed during mid-cycle outages.

For discussion on benefits see response to Question 2. *BWROG2* *NPPD* *LILCO*

Not cost beneficial, as a whole. PRAs show containment leakage to be a minor contributor to overall plant risk. NUREG/CR-4330 indicated changing the regulations would have marginal affect on public health and safety because Tech Spec limits are so conservative that a factor of 10 to 100 increase in the leak rate may not even be risk significant. However, the cost impact is significant due to increased plant down time of 3 to 5 days. *YAEC* *AIF*

A detailed cost impact has not been performed for Farley Nuclear Plant; however, the cost of backfitting piping penetrations to accommodate the proposed testing requirements would be substantial, possibly as high as several million dollars. In addition, the imposition of "as found" leakage rate could approximately double the personnel exposure required to perform Appendix J testing. Should additional local or integrated leakage tests be required on a more frequent schedule, the costs would include weeks of lost generation, mobilization expense, and additional personnel exposure. *APCO*

Several new requirements will increase costs:
a. "As found " B and C tests are estimated to average about 12 additional B or C tests per refueling outage. Each test requires

about 6 man-hours direct labor for a total of 72 man-hours per outage. Radiation exposure is dependent on which components must be tested and could range from zero to several man-rem of added exposure.

Tests are assumed to take place during scheduled outages. During such outages there is sufficient other work and adequate planning to keep any "as found" testing off the critical path. Therefore, replaced power cost is ignored. If "as found" testing is required before critical corrective maintenance during an unscheduled outage, replaced power cost (at about $1 million /day) for the time needed to prepare for, set up, perform, and recover from the rest must be included. This time and cost could range from as little as 4 hours ($170,000) for the equipment hatch removal to several days if the test boundary involves several systems.

b. The possibility of requiring a second preop Type A test is a significant additional expense. It is most likely to occur just when the plant is ready for initial criticality or initial power ascension. It would require about a week for setup, performance, and recovery. It is unlikely that any critical maintenance or construction could be in progress at this time. The whole 7 days would be critical path time and the replaced power cost of $7 million would be the most important cost. *SERI*

FPL will incur fixed one-time costs and ongoing costs. The former comes from modifying two sets of computer software (for W and CE designs), verifying the changes meet QA requirements, and retraining test personnel. This cost could approach 1/2 million dollars.

The ongoing costs are associated with the removal of reduced pressure testing. All four containment designs utilize large volumes as opposed to negative pressure or ice condenser designs. The cost of a 24-hr full pressure test will accumulate at approximately $300,000 per year for FPL.

FPL will incur these costs with no increase in safety. *FPL*

Largest [negative] impact on Kewaunee would be redefining containment isolation valves designed prior to the GDC to be consistent with GDC 55, 56, and 57. Other revisions that separately would reduce unnecessary leakage testing burdens: Corrective Action Plan concept, deferral of Type A testing of minor modifications pending acceptable NDE, and allowing "as found" Type A test results of 1.0 L_a. On the whole, it appears most beneficial for Kewaunee to develop its own, technically correct, self-contained, leakage testing program, and include it in the Tech Specs. *WPSC*

Adding test vents and drains could cost as little as $50,000 per penetration. Modifications to accomplish water seal testing in BWR ECCS penetrations could cost millions of dollars, (with questionable benefits in terms of safety). Both types of modifications would likely result in a substantial increase in occupational radiation exposure. *NU*

Time and manpower for a) Engineering and Licensing detailed review and analysis, b) potential increased testing, c) procedure revision, and d) Tech Spec revision. There is no observable gain from this revision. *TE*

The methodology in the Reg. Guide complicates the ILRT, especially considering the extended ANSI method conditions. *GOODMAN*

NUREG/CR-4398 considered only the labor cost of the increased number of LLRTs, which was based on a 3 hour test duration. This is a large underestimate of the duration of LLRTs, which frequently run for 8 to 24 hours. The NRC Backfit Analysis does not substantiate its conclusion that the proposed App. J is both safety and cost neutral.

Another aspect of cost vs. benefit are the actions of the various State Public Utility Commissions. Many states are prescribing performance factors for setting rates and if additional outage time is required to perform these tests, then the additional costs associated with this downtime may be excluded from the rate base. *AIF*

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(5) Whether present operating plants or plants under review should be given the opportunity to continue to meet the current Appendix J provisions if the proposed rule (reflecting consideration of public comments) becomes effective;

Yes. Present program adequate and understood by licensees & contractor personnel. *BECHTEL* *WE* *AIF*

Yes. New rule should be optional guidance document. New plants will probably have to meet new rule except as otherwise controlled by 10CFR50.109 [Backfit Rule]. *S&W*

No. should be binding on all, since it contains improvements that warrant revising Appendix J. *OCRE*

Yes. This revision does not meet the requirements of 10CFR50.109, and should be deferred. *YAEC*

Yes. *SCE&G* *WCNOC* *BWROG2* *APCO* *GP* *SERI* *NU* *NPPD* *LILCO* *GOODMAN* *RG&E*

No. Commission should not allow two sets of testing criteria. Its reason for the proposed rule change was to unify and codify existing testing practices. *FPL*

Yes. Each licensee should be allowed to develop its own plant-specific leakage testing program. *WPSC* *TE*

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(6) If the existing rule or its proposed revision were completely voluntary, how many licensees would adopt either version in its entirety and why;

Present rule is OK except for "as found" interpretation. Proposed rule is not OK due to retrofit requirements + Extended ANS 56.8 Criteria. *BECHTEL* *WE*

Wants flexibility to continue existing program, but also use less stringent criteria of new program. *SCE&G*

Would not adopt either in its entirety. *WCNOC* *WPSC* *NU*

Member utilities would not adopt either version in its entirety. Although the revision clarifies some areas, it creates confusion in others. *BWROG2* *SERI* *NPPD* *LILCO*

Many would not adopt the proposed revision, since it contains changes that add cost without adding to safety. *YAEC* *APCO* *GP* *FPL* *TE*

Strongly recommend the staus quo over the proposed rule. Reasons include: additional valves installed and tested, increased complexity of the new method, the fixed Type A test start time, makeup flow rate measurement for Type C tests vs currently use leakage flow rate, and reservations of effect of new Type A test requirements on metal containment. However, appreciate the proposed option to increase Type B and C testing instead of Type A testing if specific valves or penetrations are causing problems. *GOODMAN*

Many, especially with older plants, who have worked to get relief in their FSAR and tech specs from the unnecessary aspects of the current rules would probably opt for the existing Appendix J. Some might opt for the proposed revision because they are already complying with many of its provisions. However, many are concerned with some of the more onerous and impractical aspects of Type B and C testing. *AIF*

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(7) Whether (a) all or part of the proposed Appendix J revisions would constitute a "backfit" under the definition of that term in the Commission's Backfit Rule, and (b) there are parts of the rule which do not constitute backfits, but which would aid the staff, licensees, or both;

Backfit Rule legality & practicality questioned & repeal recommended; Appendix J revisions, applying to test procedures, not hardware or plant design, should not be considered a backfit. *OCRE*

Certain items, such as "as found" testing and acceptance criteria, a second preop Type A test, and extension of the containment boundary are new & require full "Backfit Rule" analysis. Others are editorial, not requiring the same detailed analysis. *NYPA* *SERI*

Proposed rule is a backfit under 10CFR50.109. Appropriate to pursue rule changes such as this. Exemption criteria are in 10CFR50.12. Thus the regulations already provide a mechanism for exemptions to current regulations, & Backfit Rule should not be degraded. *S&W*

Individual utilities may oppose the proposed rule due to plant-specific impacts, despite obvious advantages to parts of the proposed revision. *SCE&G*

A thorough and complete backfit analysis should be imposed on this Appendix, except for sections that are only clarifications. Items such as the "as found" acceptance criteria and extension of containment boundary are new requirements and should be subject to the backfit rule. *BWROG2* *NPPD* *NUBARG* *LILCO*

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a. Significant portions constitute a backfit.
b. Portions of the proposed rule would be beneficial to both staff and licensees, but these do not outweigh significant concerns. *APCO* *WPSC* *GOODMAN*

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a) Three older plants would have to be backfit to meet changes in the definition of "containment isolation valve". Computer software would also have to be revised.

b) The rule change will aid those associated with leakage rate testing by providing more definitions and reworded acceptance criteria. *FPL*

New definitions of maximum and minimum pathway leakage (as opposed to those in I&E IN 85-71) imply the need for extensive backfitting at older plants. *NU*

This revision is clearly a backfit, except that clarification of wording or other changes which do not cause licensees to revise their procedures or Tech Specs do not constitute a "backfit". *TE*

There are objections to the proposed rule. The proposed rule will require backfitting of many facilities. Key aspects of the proposed rule fail to satisfy the Backfitting Rule. The current exemptions should remain intact. The Commission should consider alternatives to the proposed rule. We recommend that the Commission withdraw the proposed rule, and issue a Generic Letter making the provisions of the proposal voluntary as a means of satisfying

Appendix J. It is also unclear whether an intensified Appendix J program can be justified from a risk-reduction perspective. *BCPR*

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a. Part of the rule could constitute a backfit insofar as the new definitions of containment isolation valve and containment system. These concepts were generally not developed during the design of the older plants.

The basic concept of revising testing would be a backfit. Although, there are some beneficial aspects of the proposed rule (see Comment 2), the "as-found" and "maximum-leakage-path" provisions and their impact constitute a backfit and should be treated as such. Some plants would require physical changes, others software and procedural changes. (Also, see Comments 4&5). *AIF*

Promulgation of this rule is premature, and it does not meet the Backfit Rule requirements. Reliance on unquantifiable or intangible benefits is contrary to the central role of cost-benefit analysis in the Backfit Rule and is verging closely on de facto amendment to the Backfit Rule by exempting from it rules promulgated by the Commission. Edison opposes any such modification of the Backfit Rule without the opportunity for Notice or Comment guaranteed by the Administrative Procedure Act. *COMMED*

(8) Since the NRC is planning a broader, more comprehensive review of containment functional and testing requirements in the next year or two, whether it is then still worthwhile to go forward with this proposed revision as an interim updating of the existing regulation;

Yes. Quick adoption of ANSI/ANS 56.8 recommended; future potential relaxation or elimination of CILRT requirements is unacceptable. *OCRE*

Yes. In light of the extensive comments provided on this rule, it would be prudent to resolve the obvious problems in the near future. *BWROG2* *NPPD* *LILCO* *BG&E*

Yes. Revision is needed due to outdated ANSI N45.4. Based upon some explanation of how Items 5 and 7a are handled by the NRC, this would be a worthwhile revision. *S&W*

No. *BECHTEL* *NYPA* *YAEC* *APCO* *GP* *WPSC* *NU* *TE* *NUBARG* *WE* *LILCO* *GOODMAN* *AIF*

No. However, increased conflicts between regulations and current procedures would result. *SCE&G*

No. Containment integrity confidence is sufficient. If NRC does not share same confidence level, then more frequent Type B and C test monitoring and leakage trend analyses can be used with insignificant impact on the established programs. *WCNOC*

No. The proposed revision in its current form is not a desirable alternative to the existing rule. *SERI*

No. The computer codes may then have to be changed a second time before they can even be used after this first proposed change. *FPL*

No. Do not issue the rule in its current or modified form until the source term and containment functional testing studies are completed. *COMMED*

No. However, it would be prudent to expedite the more comprehensive rulemaking in order to resolve in the near future open issues concerning leak rate testing. *LILCO*

(9) The advisability of referencing the testing standard (ANSI/ANS 56.8) in the regulatory guide (MS 021-5) instead of in the text of Appendix J;

Reference in the guide. *BECHTEL* *OCRE* *WCNOC* *APCO* *WPSC* *NU* *TE* *WE* *GOODMAN* *S&W* *AIF* *BG&E*

Reference in the guide. It could allow flexibility to use 5 instead of 4 years between Type A tests. *SCE&G*

The standard is better referenced in the regulatory guide than the regulation. Problems have arisen between licensees and compliance inspectors when guidance presented in the latest revision of a standard was utilized, in apparent conflict with regulation. A regulatory guide can be revised to take advantage of advances in testing technology and corresponding changes to standards more easily than can a regulation. *YAEC*

Since the points in the guide are not complex, and the regulation takes precedence, the points and reference to Standard would be better written into the regulation. *NYPA*

As with other standards required by the regulation (i.e., 10CFR50.55a referencing ASME code), an ANSI/ANS standard should be referenced in this appendix and not endorsed through the Regulatory guide. Also, any references in the rule should be subject to a backfit analysis. *BWROG2* *GP* *SERI* *FPL* *NPPD* *LILCO*

Reference, as mandatory, a complete and acceptable ANSI Standard in lieu of the Reg. Guide. Any referenced Standard should have undergone a thorough and complete cost-benefit/backfit analysis.

Edison also opposes the proposal to provide greater regulatory flexibility by deleting from Appendix J the ANSI Standard, the criteria for venting and draining valves, and a description of what types of valves need not be leak tested. Greater flexibility would be very detrimental to licensees. Experience with the NRC's flexible enforcement of Appendix J requirements in recent years shows it to be inconsistent. *COMMED*

(10) The value of collecting data from the "as found" condition of valves and seals and the need for acceptance criteria for this condition:

Collection of "as found" data should not be required for 1-time events such as changing valves that need to be replaced, as well as for double O-ring seals that have not been disturbed. The value of such data should be compared with resultant operational impact and personnel radiation exposure. *BECHTEL* *GP* *WE*

Needed as indicators of actual performance & containment availability; individual valve & seal acceptance criteria may be more appropriate than summing B & C tests. *OCRE*

"As found" data could provide a way of evaluating App. J, but the industry is not doing it. Operational impact and personnel exposures can affect pre-maintenance testing. As a result, elective maintenance or inspection could be curtailed, adversely affecting plant safety and reliability. *NYPA*

Value outweighed by downtime disadvantages. Preventative maintenance (PM) programs equal to or better than continually testing. Pretesting should not be required for certain PM repairs and replacements, i.e., changing valves, or repairs made in which no disturbance of the seal has occurred. *SCE&G*

No need to collect and report "as found" condition of valves or seals, nor for acceptance criteria. WCNOC maintains sum of all leakages below 50% of $0.6L_a$ as recommended in EPRI NP-2726, "Containment Integrated Leak-Rate Testing Improvements". *WCNOC*

Weigh value of "as found" testing against operational impact and personnel radiation exposure. May affect decision to perform elective maintenance. "As found" Type A, B, C test acceptance criteria should be $1.0\ L_a$, based on minimum pathway leakage. "As left" criteria should be $0.75\ L_a$ (Type A) or $0.60L_a$ (Type B & C), based on maximum pathway for Type B & C tests and minimum pathway leakage for Type A tests. *BWROG2* *NPPD* *LILCO*

A realistic "as found" condition will provide a certain measure of how well the containment is performing over time. It should provide a basis for frequency of surveillance testing and definition of those components requiring more attention. "As found" leakages should be based upon minimum pathway leakage to allow credit for those components that actually perform under test conditions. An "as found" leakage based upon maximum pathway leakage assumes that the most leak-tight component in each pathway would fail if it were relied upon to function, which is an overconservative and restrictive assumption. *YAEC*

Alabama Power Co. currently performs "as found" testing of penetrations due to verbal commitments made to NRC, Region II. However, the value of such testing is questionable and APCo generally disagrees that it should be required, particularly prior to performing needed valve or seal repair, maintenance, or adjustment operations. *APCO*

FPL has been and will continue to collect the "as found" leak rate data because:

a) it provides information necessary to determine if preventative or corrective maintenance is required;
b) it allows containment leakage rates to be calculated for Tech Spec compliance;
c) current Appendix J requires reporting of Type B and C test results;
d) "as found" trending of leak rates is required by ASME Section XI, which requires a corrective action plan to be developed. *FPL*

Type B and C "as found" test data is valuable as it provides an indication of the amount of degradation that occurred since the previous B & C tests. Instead of maximum pathway, with its assumption of a single active failure, adopt a "Leakage" ALARA (leakage as low as reasonably achievable) outlook on each penetration, and set a total limit (i.e., L_a). *WPSC*

"As found " data is a valuable tool for the utilities, but it should not be regulated. *TE*

The "as found" condition measured for Type B and C tests is necessary to determine if a component has significantly degraded. Trending of "as found" and "as left" test results is a valuable tool in evaluating subsequent test results. *DL*

As-found data has its purpose, but ALARA has to be considered. Suggest that an as-found test be required, except if a boundary is being modified (valve is being removed). *GOODMAN*

Useful for assessing degradation, although may focus all attention and resources on penetrations feeding non-seismic systems. Place real emphasis on any valve group repeatedly exhibiting excessive degradation. *S&W*

Impacts: increase outage durations (non-ILRT ones by at least 2-3 days), increase critical path for valve preventative maintenance, tie up critical resources, and penalize preventative maintenance.

An alternative is to require utilities to establish "as-found" testing programs to document leakage for problem valves on a case by case basis. The existence of sound maintenance programs should eliminate the perceived need to determine continually "as-found" Type B and C test results. *AIF*

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(11) Whether the technical specification limits on allowable containment leakage should be relaxed and if so, to what extent and why, or if not, why not;

No. Relaxation would result in doses greater than Part 100 limits, and be imprudent due to importance of containment in mitigating a broad spectrum of accidents; licensees' standards of maintenance would follow any relaxation of requirements, and reported containment availability levels do not support relaxation. *OCRE*

Yes. Extent depends on source term & off-site dose calculation conservatisms. *BECHTEL* *GP* *WPSC* *WE* *GOODMAN* *S&W* *AIF* *COMMED*

Yes, if DBA doses do not exceed FSAR and new plant licensing bases - not using the overly conservative assumptions of the original licensing bases. Increase to 10% /day (PWRs & BWRs) has little effect on risk. *NYPA*

Yes. Refer to NUREG/CR-4330, Vol 2, June 1986, and to WASH-1400, and the final report of the ANS Committee on the Source Term. Original criteria entail extreme conservatism. *SCE&G* *BWROG2* *SERI* *NPPD* *LILCO*

Yes. Several orders of magnitude of conservatism are incorporated in the regulatory position on containment leakage. They include:
1. CP reviews use guideline exposures of 20 rem whole body and 150 rem thyroid, rather than 10CFR100.11 limits of 25 rem and 300 rem.
2. Primary containment assumed to leak at tech spec limit for the first 24 hrs and 50% of this for the remainder of 30 days, in spite of pressure peak being reached within a few seconds and decaying rapidly within minutes.
Leakage rates are approaching lower limit of measurability, and could be raised without measurable increase in public risk. *YAEC*

Yes. Existing Tech Spec limits are acceptable under the existing Appendix J. Should the proposed rule be enacted, Tech Spec limits should be revised to 1.0 L_a values as opposed to the 0.75 L_a and 0.6 L_a currently used for integrated and local leakage rate tests, respectively. The existing values were conservatively established to allow for normal degradation of the components between tests. Imposition of the "as found" testing will result in adjustments to the Type A test values on an ongoing basis such that the margins currently provided would become redundant. *APCO*

Yes. Relax L_a to reflect new source term knowledge. Delete individual penetration leakage limits (i.e., 5% L_a) - maintaining total B and C leakage less than 0.6 L_a is sufficient. Delete listings of CIVs from tech specs. Reference in tech specs to FSAR tabulation could be added. *NU*

Yes. Current appoach is very conservative and should be relaxed. Type A testing should be performed with valves in normal lineup. Leak-before-break effect should included. *TE*

AIF and Owners Groups tech spec improvement efforts have been aimed at simplification by removing parts that can be implemented by a separate program. Most App. J requirements are in that category. There is no need to repeat federal regulations in the tech specs, only L_a and P_a in the Design Features of the tech specs. *AIF* *BG&E*

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(12) What risk-important factors influence containment performance under severe accident conditions, to what degree these factors are considered in the current containment testing requirements, and what approaches should be considered in addressing factors not presently covered;

Severe accidents & LOCA testing are totally different. An Appendix J based on severe accidents would probably prevent any plants from operating due to design limitations. *BECHTEL* *WE*

Quantitative standard needed for containment performance under severe accidents (not less than 99% reliability of containment function within tech spec limits). *OCRE*

Impractical to impose testing requirements for severe accident phenomena not yet fully understood and still being investigated. *NYPA* *BWROG2* *NPPD* *LILCO*

Refer to NUREG/CR-4330. Gross failure of containment due to rupture or an isolation function appear to be the dominant risk factors. *SCE&G* *AIF*

Industry-sponsored groups currently studying this subject. Delay publication of this rule until results are available. *YAEC*

Severe accident scenarios should not be considered in Appendix J. *GP* *SERI*

Performance of containment penetrations could be affected by pressure, temperature, humidity, radiation, and other post-accident environmental factors. Appendix J can only measure leakage and valve actuation at ambient conditions (& test pressure in the case of leakage testing). It is not practical to try to duplicate other post-accident conditions during ILRT. *NU*

One factor affecting a containment isolation valve's leakage is its operating experience. Disagree with performing containment isolation functional tests before a Type A test. For example, during LOCA or plant shutdown, the MSIV is closed while the steam line is hot. There should not be a requirement for this valve to be cycled prior to the Type A test. A hot closure is similar to what it would experience during a LOCA, and so is an appropriate pre-Type A test condition. *GOODMAN*

Under Appendix J, the detailed system alignments would detect misaligned valves or missing administrative controls. Containment inspection would detect gross liner or penetration boundary degradation if the general area were accessible for inspection. Type C and A tests would detect valve or boundary degradation caused by water hammer. The Appendix J Test Program has to be considered as the double check on the overall plant work control program. It will also detect certain severe accident conditions, although it may not be timely, but should not be considered as the sole means of detection. As severe accident conditions are discovered, they need to be separately analyzed and specific corrective action plans should be developed to address them. *S&W* *AIF*

(13) What other approaches to validating containment integrity could be used that might provide detection of leakage paths as they occur, whether they would result in any adjustments to the Appendix J test program and why;

Continuous leakage testing for gross leaks, if feasible , should replace Type A test requirements. *BECHTEL* *GP* *WE*

Continuous leakage testing using slight negative or positive pressure + routine valve line-ups, verifications, and the ASME IST are sufficient to assure a relatively leak-tight containment system. *NYPA*

Other concepts should be explored further, but cannot be considered a substitute for Appendix J . *OCRE*

No practical alternative beyond routine testing and PM. Continuous leakage monitoring would be impractical to backfit. *SCE&G*

Not aware of any other practical approaches to provide detection of all leakage paths as soon as they occur. *BWROG2* *NPPD* *LILCO* *AIF*

Slightly positive or negative containment operating pressure would permit continuous measurement of containment leakage rate. This should permit a decrease in Type A testing frequency, but should have no effect on Type B or C testing frequency. *YAEC*

Allow a continuous monitoring system in conjunction with Type B and C testing to substitute for regular Type A periodic tests. *SERI*

FPL has reviewed proposals that would use tracer gases added to the containment atmosphere for routine monitoring at the containment surface during operation. These proposals were basic and provided for information purposes without validation testing. *FPL*

Any short cuts to provide a "quick check " of containment integrity would only result in partial, and redundant, information on the containment status. *WPSC*

Sensitivity of continuous monitoring systems must first be determined, and could not replace Type B and C testing. Other methods, such as ultrasonic flow noise signature analysis downstream of a closed CIV or infrared thermography of closed CIVs may be used to detect valve bypass leakage. However, practical cost-benefit considerations prohibit the use of such methods at this time. *NU*

Do not like idea of low pressure test just prior to normal operation following shutdown, since the preparations and dose would be almost as great as for a full blown Type A test. Periodic Type A tests are not needed, because Type A test leak paths can be caught by Type B and C tests. A preop test is needed, as is a test following maintenence or modifications to the containment boundary that cannot be adequately tested locally. *GOODMAN*

Continuous leakage monitoring would detect certain containment conditions, but not valve degradation - the most serious challenge to containment integrity. *S&W*

Alternate discovery techniques, such as continuous monitoring systems or a low pressure pump-up prior to start-up, are very difficult or impractical to implement because of the unrealistically low magnitude of L_a. *COMMED*

(14) What effect "leak-before-break" assumptions could have on the leakage test program. Current accident assumptions use instantaneous complete breaks in piping systems, resulting in a test program based on pneumatic testing of vented, drained lines. "Leak-before-break" assumptions presume that pipes will fail more gradually, leaking rather than instantly emptying;

LBB assumptions would reduce expected leakage; probably lower accident pressures & source terms, and increase allowable limits. *BECHTEL* *TE* *WE*

Containment design pressures and leakage rates should not be relaxed, but strengthened. *OCRE*

Proposed rule depends too greatly on LBB; leakage detection should be continuous and able to detect small leakages. *LEWIS*

If LBB were expanded beyond current application to primary system leakage detection requirements and pipe support designs, it should be applied to all systems currently governed by the most conservative instantaneous rupture scenario. *NYPA*

"Leak-before-break" (LBB) would be a less conservative approach. Since the risk factor of containment leakage rate has been described as relatively minor, it would be appropriate to take a less conservative approach, which would ultimately increase the allowable limits. *SCE&G*

Provides higher confidence that 10 CFR 100 exposure limits will not be exceeded during postulated accidents. It supports opinion that sufficient margin exists to preclude need for additional acceptance criteria for Type B and C tests, as in Question 10. *WCNOC*

Applying LBB criteria could remove some systems from leakage test programs. This would allow system alignment for leak rate tests to be simplified and more realistic. Venting & draining of some systems during testing may not be required. *BWROG2* *NPPD* *LILCO* *AIF*

Reduced pressure testing, which is prohibited under the proposed rule, is much more realistic under the LBB scenario. *YAEC* *GP*

Many penetrations Type C tested with air could be tested with water, eliminating need to drain and refill lines.
Some currently tested with water could be eliminated from testing.
Test connection valves could be eliminated from testing by substituting a valve and cap control program.
A number of penetrations vented & drained for the Type A test could remain water filled. Allowable leakage rates for Type A, B, and C tests could perhaps be raised.

Would allow for reactor shutdown, thereby reducing the source term and containment pressures. Reduced pressure testing will measure a more realistic accident leakage rate and still allow accurate peak pressure leakage rates to be calculated. *FPL*

The added conservatism of applying the leak-before-break concept to venting and draining of lines is not too unreasonable; however, the LBB consideration of the DBA, the double-ended guillotine rupture of an RCS leg, should be reconsidered. *WPSC*

LBB criteria may result in less Appendix J testing. *NU* *AIF*

A revised accident analysis would be required, in which a more realistic look at the leakage mechanisms, the system boundaries, specification of water rates, etc, would be developed. This would greatly aid the test program. *S&W*

(15) How to effectively adjust Type A test results to reflect individual Type B and C test results obtained from inspections, repairs, adjustments, or replacements of penetrations and valves in the years between Type A tests. Such an additional criterion, currently outside the scope of this proposed revision, would provide a more meaningful tracking of overall containment leaktightness on a more continuous basis than once every several years. The only existing or proposed criterion for Type B and C tests performed outside the outage in which a Type A test is performed is that the sum of Type B and C test must not exceed 60% of the allowable containment leakage. Currently being discussed by the NRC staff are:

a. All Type B and C tests performed during the same outage as a Type A test, or performed during a specified time period (nominally 12 months) prior to a Type A test, be factored into the determination of a Type A test "as found" condition.

b. If a particular penetration or valve fails two consecutive Type B or C tests, the frequency of testing that penetration must be increased until two satisfactory B or C tests are obtained at the nominal test frequency. Concurrently, existing requirements to increase the frequency of Type A tests due to consecutive "as found" failures are already being relaxed in the proposed revision of Appendix J. Instead, attention would be focused on correcting component degradation, no matter when tested, and the "as found" Type A test would reflect the actual condition of the overall containment boundary.

c. Increases or decreases in Type B or C "as found" test results (over the previous "as left" Type B or C test results) should be added to or subtracted from the previous "as left" Type A test result.

If this sum exceeds 0.75 L_a but is less than 1.0 L_a, measures shall be taken to reduce the sum to no more than 0.75 L_a. This will not be considered a reportable condition.

If this sum exceed 1.0 L_a, measures shall be taken to reduce the sum to no more than 0.75 L_a. This will be considered a reportable condition.

The existing requirements that the sum of all Type B and C tests be no greater than 0.60 L_a shall also remain in effect.

B + C not exceeding 0.60 L_a appears adequate. *BECHTEL* *WE*

More continuous leaktight assessment recommended; proposal (15)b. would be a workable approach. *OCRE*

Addressing "as found" B & C test failures is more useful than Type A test "as found" failures. Increased frequency of B & C tests based on "as found" B & C, rather than A, failures, is more logical, but would be new criteria and require a greater backfit analysis and justification. Consider corrective action plan, CAP, with alternative leakage test program. Acceptance criteria for mid-cycle B & C tests may be set higher than 0.6 L_a max pathway leakage. Containment isolation valve improvements under Appendix A & reg guide 1.97 could be a major part of a proposed CAP. *NYPA*

Against increased testing frequency. Use 1.0 for "as found" Type (B + C) total and 0.75 for "as left" total. Do not add any Type B or C test results to any past or upcoming Type A test results. *SCE&G*

WCNOC opposes factoring Type B and C tests into Type A test results for the following reasons:

1. Impractical to tie them together. Penetrations designed to GDC 56 will expose some leakage path to the test pressure under both conditions, while those designed to GDC 55 and 57 will normally be exposed only under one test condition.

2. CILRT and LLRTs are conservative.

3. Sum of all LLRTs maintained at less than 50% of $0.60L_a$.

4. Single failure criterion + acceptance criteria for Type A, B, and C tests provides exceedingly high confidence level.

5. The method of combining Type A, B, and C tests in Question (15)a. would penalize a utility for reworking a penetration whose isolation valves are not exposed to Type A test pressure. For those penetrations exposed to the Type A test pressure, the Type A "as found" leakage rate is unaffected. *WCNOC*

Running totals of B & C test results, not exceeding $0.60L_a$, are being maintained.

a. Adjusting Type A test results for any B or C tests performed in the 12 months preceding the Type A test deviates from the intent of the test to measure the existing leakage rate of the containment.

b. Any additional test requirements, such as increased frequency, should be on a case by case basis and part of the corrective action plan, instead of pre-determined.

c. "Running total" of leakage rate not necessary. Degradation of containment leakage rate between A tests is accounted for in the "as left" criteria of $0.75L_a$ (A tests) and $0.60L_a$ (B & C tests). *BWROG2* *NPPD* *LILCO*

Leakage measured during the Type A test should be comparable to a summation of all Type B and C test results using <u>minimum pathway leakage</u>. Type B and C testing should be encouraged to be performed on a continuous basis and not emphasize testing during refueling outages. Tech spec limits for summation of all B and C test results should be $0.75L_a$ for "as found" leakage based on "minimum pathway leakage". Documentation should be provided that each component is tested within its prescribed time intervals.

"Maximum pathway leakage" should also be determined and recorded for each pathway. Maintenance and repair should be performed so that "as left" "maximum pathway leakage" is also within tech spec limits. All maintenance and repair should be documented and included as part of the next Type A test report. This will provide licensees with the necessary incentive and guidance on frequency of preventative maintenance to maintain containment leakage within acceptable limits.

The test program should be spread over an entire operating cycle, with a number of penetrations tested during operation. It may then be possible to detect trends in leakage rate requiring attention. A "running total" of containment leakage can be maintained. Combining or comparing increases or decreases in Type B or C "as found" over previous "as left" and adjusting previous Type A would not be considered under this "running total" concept. *YAEC

Current Type B and C tests are sufficient, and can identify any necessary corrective actions. Therefore, their use to adjust previous Type A test results is not justified.

While the adjustment of Type A test results with B and C tests performed between Type A tests may not be within the scope of this revision, such an adjustment could be enforced as a result of the proposed changes to Appendix J, as they could be argued to codify the current interpretation by the NRC staff of the intent of IE Information Notice 85-71. Specifically, the concern is the provision of the IN that states that containment leak-tight integrity is to be monitored between CILRTs through the Type B and C test program. This provision could be interpreted (and enforced) in the future as requiring the above adjustment. Imposition of such an adjustment in the absence of a concise, technically accurate methodology defined in regulatory guidance or industry standards will result in widespread disagreement and confusion and a continuation of the current practice of the NRC staff in expanding the scope of the regulations while circumventing the rulemaking process. Since the results of such an adjustment would have a significant impact on future testing and corrective actions, a clearly defined and technically accepted methodology is essential prior to issuance of the proposed rules and regulations. *APCO*

The sum of the "as left" leakage for B and C tests using minimum pathway leakage should be compared only to 0.6 L_a during outages when a Type A test is not performed. Correcting back to a previous Type A test would force (out of concern of failing a Type A test) the plants into a retrofit situation. *GP*

Adjusting Type A tests results for Type B and C tests performed between Type A tests should not be required. There is no evidence that Type A test results can be trended to provide interpolation of results from one test to the next. None of the methods being considered by the NRC should be implemented. *SERI*

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a) Type A leak rate should not be adjusted by prior modifications, repairs, or adjustments. The Type A test result is the base line leakage rate already measuring the minimum leakage pathway for each penetration. A Type A test should only be called a failure if the calculated or measured leakage rate does not meet the Tech Spec criteria.
b) The acceptance criterion for Type A test is 0.75 L_a. Type B and C test criterion is 0.60 L_a. There is no adjustment from one to another.
c) Type B and C tests identify which valves degrade with operation. Trending of this data, in accordance with ASME Section XI, would identify those valves which need a corrective action plan to prevent continued degradation. Increasing the frequency of the Type A test does not resolve the root cause of Type B or C test failures. *FPL*

WPSC favors the method proposed by the Commission in point b. above for relating Type B and C testing to Type A testing. This quite closely resembles a leakage ALARA concept for local leakage rate testing, and it maintains the Type A test as an independent test of the overall containment boundary. *WPSC*

If it is necessary to adjust Type A results between Type A tests, it should be done as described in Option C (i.e., differences between "as found" and "as left" results are added or subtracted from the previous Type A leakage). *NU*

Type A, B, and C tests are based on different test criteria and should not be correlated. *TE*

Any adjustment to Type A test results during interim periods should use Type B and C minimum pathway penetration leakage rates. A method similar to adjusting Type A tests for B and C tests performed prior to the A test could also be used to adjust Type A results during interim test periods. Increases or decreases in any "as found" minimum pathway penetration leakage rate would be added to, or subtracted from, the previous Type A result. *DL*

Type A test results need not be adjusted for B and C tests conducted between Type A tests. Current 0.60 L_a criterion is adequate. Adding more criteria will adversely affect the ability of the people performing the test to determine if a test is acceptable. It is better to have the test personnel evaluating the results as they perform the tests rather than merely recording numbers. *GOODMAN*

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a. Problem with analyzing data collected over a long period. How to combine penetration leakages if only 1 valve out of total is tested (due to repair), or if multiple tests are done with various results. All penetrations should be retested during a refueling outage to rezero the surveillance clock.Use only current Type B and C tests to determine as found Type A leakage rates.

b. Penetrations failing 2 consecutive tests (assume at 2-yr frequency) have testing frequency increased until 2 successful tests are done.

At mid-cycle, or when the next shutdown occurs, not to exceed "x" months, the valve shall be tested to verify excessive degradation has not occurred. Once the degradation cycle is known, testing shall be done at this frequency until a "fix" is performed which allows resumption of a longer frequency - preferably the original cycle.

c. Method of combining B and C information should better represent system alignments considering single failure criteria as opposed to determining the maximum pathway analysis for each penetration. Also, new B and C information would replace the previous information if a one-for-one replacement can be made. If combination test data is all that is available, adequate documentation of methods used to develop replacement leakage rate shall be provided. The B and C limit should be increased to 0.75 L_a unless the NRC provides bases for current 0.60 L_a. Use the same limits for "as left" A, B and C tests.

i. If "as found" Type B and C tally more than 0.75 L_a but less than L_a, repair but trend problem valves. This would not be a reportable condition due to the conservative nature of the test program.

ii. If tally is more than L_a, repair, report, and consider more frequent testing.

iii. If tally is less than 0.75 L_a, consider extending frequencies if fixes on certain problem valves have been demonstrated to be acceptable. *S&W*

"As Found" Type A tests should only be determined when the Type B and C test results are fairly current to give a true picture of containment integrity at that moment. At all times, the Type B and C program limits should govern. The licensee should only be required to perform "as found" tests on Type B and C penetrations performed in conjunction with the ILRT refueling outage as needed for determination of the "as found" Type A test adjustment. No adjustment to the "as left" Type A test result should be required in the years between ILRT outages, since the information does not provide an accurate picture of containment integrity at that moment. By ensuring that the Type B and C test results do not exceed 0.60 L_a, containment integrity is verified in the years between ILRT outages. Therefore, no Type A adjustment should be required. *AIF*

15.c. Previous Type A test results should remain valid until superseded by a new Type A test. The 0.60 L_a requirement is sufficient control over local leakage without the complication of a running total for the Type A test. *GPU*

COMMISSIONER BERNTHAL'S VIEWS

A. The public may therefore wish to comment directly on the question of whether the Commission should continue its attempts to apply the Backfit Rule to all rulemaking, or whether the Rule should be revoked as it applies to rulemaking activity per se.

The Backfit Rule should be repealed since it exacts NRC resources wholly disproportionate to any conceivable benefit to the public, and since it has other flaws. *OCRE*

The Commission should continue to apply the Backfit Rule to all rulemaking. *SCE&G* *BG&E* *TU* *WPSC* *NU* *GPU* *COMMED*

The Authority endorses the Backfit Rule as a realistic and practical method of assessing the merits of changes in the regulatory environment. Bypassing the provisions of this rule to implement the proposed revision to Appendix J sets a precedent which defeats the intent of the Backfit Rule. *NYPA* *GP*

The backfitting rule should be applied regardless of whether the proposed backfit is to be effected by rule, regulation, order, or staff position. *NUBARG* *LILCO*

B. Alternatively, the public may wish to consider whether the Commission should amend the Backfit Rule to waive the "substantial increase" provision, and to indicate explicitly that non-monetary benefits may be weighed by the Commission in the cost-benefit balance, when such considerations are found by the Commission to be in the public interest.

The "substantial increase" provision should continue to be applied. *WPSC* *NUBARG* *GPU* *LILCO*

A substantial cost savings to a Utility, and therefore to the public, is within the intent of the Backfit Rule even if no substantial increase in safety is evident, i.e., as long as safety is not decreased, rule changes that save money are acceptable within the Backfit Rule. Changes that cost money without increasing safety are not in the best interests of industry or the public, and should not be required. *WPSC*

The Commission's authority to consider nonmonetary [qualitative] benefits in the backfitting analysis is clear, and there is no need to amend the backfitting rule to permit it to do so. *NUBARG* *LILCO*

Regulatory Guide MS 021-5

[7590-01]

NUCLEAR REGULATORY COMMISSION

Regulatory Guide; Issuance, Availability

The Nuclear Regulatory Commission has issued a final guide in its Regulatory Guide Series. This series has been developed to describe and make available to the public methods acceptable to the NRC staff for implementing specific parts of the Commission's regulations and, in some cases, to delineate techniques used by the staff in evaluating specific problems or postulated accidents and to provide guidance to applicants concerning certain of the information needed by the staff in its review of applications for permits and licenses.

The guide, identified as 1. ..., (which should be mentioned in all correspondence concerning this guide) is entitled "Containment System Leakage Testing" and is in Division 1, "Power Reactors." It was previously made available on October 28, 1986 (51 FR 39394) for public review and comment. At that time it was identified by its temporary task number of MS 021-5. It was developed to provide guidance on procedures acceptable to the NRC staff for conducting containment leakage tests. This guide endorses American National Standard ANSI/ANS 56.8-1987, "Containment System Leakage Testing Requirements." For information regarding ANSI/ANS 56.8, contact the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525.

A separate regulatory analysis has not been prepared for this guide. This is because an extensive analysis, including a contractor-generated cost/benefit analysis, was prepared and made available in conjunction with the proposed revision to 10 CFR Part 50, Appendix J, that was published for public comment on October 29, 1986 (51 FR 39538) in the Federal Register. This regulatory guide clarifies acceptable positions for implementing the criteria for the general revision to Appendix J. As such, it has been an inherent portion of the development package for the Appendix J general revision. Readers are therefore referred to the Appendix J general revision and to supporting documentation for a comprehensive perspective on the use of this guide.

Regulatory guides are available for inspection at the Commission's Public Document Room, 2120 L Street NW (Lower Level), Washington, DC. Requests for single copies of guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future draft guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, DC, 20555, Attention: Document Control Branch. Telephone requests cannot be accommodated. Regulatory guides are not copyrighted, and Commission approval is not required to reproduce them.

Dated at Rockville, Maryland, this .... day of .... 1990.

For the Nuclear Regulatory Commission,

Lawrence C. Shao, Director,

Division of Engineering,
Office of Nuclear Regulatory Research.

CONTAINMENT SYSTEM LEAKAGE TESTING

A. INTRODUCTION

General Design Criteria 1, "Quality Standards and Records," 16, "Containment Design," 50, "Containment Design Basis," 52, "Capability for Containment Leakage Rate Testing," 53, "Provisions for Containment Testing and Inspection," 54, "Piping Systems Penetrating Containment," 55, "Reactor Coolant Pressure Boundary Penetrating Containment," 56, "Primary Containment Isolation," and 57, "Closed System Isolation Valves," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," require, in part, that the containment system be designed and constructed for periodic integrated and local leakage rate testing at containment design pressure. The Commission has published amendments to Appendix J, "Leakage Tests for Containments of Light-Water-Cooled Nuclear Power Plants," to 10 CFR Part 50 that define the criteria for such testing. This guide describes a method acceptable to the NRC staff for complying with these regulations.

Any information collection activities mentioned in this regulatory guide are contained as requirements in the amended Appendix J of 10 CFR Part 50 that provides the regulatory basis for this guide. The amended rule was submitted to the Office of Management and Budget and its information collection requirements approved under the Paperwork Reduction Act. Such approval also applies to any information collection activities mentioned in this guide.

B. DISCUSSION

BACKGROUND

ANSI/ANS-56.8-1981, "Containment System Leakage Testing Requirements," was prepared by the American Nuclear Society Standards Committee, Working Group ANS 56.8, and published in 1981 as a replacement to ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors" (ANS-7.60). It was revised and reissued in 1987 as ANSI/ANS-56.8-1987.[1]

In 1973 ANSI N45.4-1972 was endorsed and incorporated by reference without exceptions in Appendix J to 10 CFR Part 50. ANSI/ANS-56.8 has been considerably expanded and updated compared to ANSI N45.4, and it is difficult to endorse this standard without some exceptions. As a result, the ANS 56.8-1987 standard has been endorsed in this regulatory guide instead of in the revised Appendix J to facilitate the listing of exceptions to the standard and their modification as the standard is revised or errata sheets are issued.

Appendix J to 10 CFR Part 50 limits the regulation to general test criteria and leaves detailed

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[1] Copies of ANSI/ANS-56.8-1987 may be obtained from the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, IL 60525. It may be inspected at the Nuclear Regulatory Commission's Public Document Room, 2120 L Street NW (Lower Level), Washington, DC.

testing techniques and analyses in the ANSI standard. Therefore, the standard and the regulatory guide endorsing it can be revised as the testing technology changes without affecting the basic test criteria in the regulation and without requiring frequent revision of the regulation to keep it up to date with testing technology.

There will always be some debate over whether certain positions are properly regulatory criteria or details of the testing procedures. However, this division of requirements and procedures is believed to provide the most responsive arrangement; it will ensure safe limits on containment system leakage while keeping current with technical advances in testing procedures and analysis methods. Also, by having the regulation address general test criteria and leaving the details of implementation to the standard and regulatory guide, it is expected that fewer license exemptions will have to be filed than have been necessary under the previous regulation, thereby reducing an unproductive administration burden on both licensees and the NRC staff.

DISCUSSION OF REGULATORY POSITIONS

When the provisions of the standard are insufficient for licensing or when special emphasis is desired, the staff has provided supplementary guidelines or recommendations in the regulatory position. Reasons for including them are given below (Note: Some of the positions in the draft guide are now in the 1987 issue of ANSI/ANS 56.8, so these positions are not included here. The numbers given in parentheses behind a position number correspond to the position numbers in the draft guide):

1. (1) Conflict. This position eliminates the need to identify every difference between the standard and the regulation and specifies how such differences should be handled.

2. (3) Pressurizing Considerations. It is not possible to isolate, vent, or disconnect some potential sources of gas leakage into the containment. This position allows for such situations.

3. (6) Verification Test.

3.1 (6.1) Based upon experience with the existing verification test criteria, several clarifications are needed.

3.2 (6.2) The measure of W_2 , as defined in the standard in paragraph 3.2.6, is subject to the same statistical errors as the measurement of the air mass values used in the calculation of the leakage rate. It is not likely that a believable determination of the step change could be made with one air mass data set. Since 20 sets of data points are required to establish the leakage rate (paragraph 5.4 of the standard), it would be appropriate to require a minimum number of data sets for the verification test also. The formula result is reformatted to more clearly represent the preceding text.

4. (10) Test Medium and Water-Filled Systems. The NRC staff always applies the single-failure criterion in the review of the containment-related systems.

5. (11) Calibration. This recommended rewording will check that the accuracy of the instrumentation remained within acceptable limits while in use.

6. (12) Containment Atmosphere Stabilization. and
7. (13) Data Recording and Analysis.

Use of supplementary recommendations 6 and 7 with ANSI/ANS-56.8-1987 will allow discontinuing the use in licensing reviews of Bechtel Topical Report BN-TOP-1, "Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants," Revision 1, November 7, 1972. It should be noted that these recommendations eliminate the requirement for a 24-hour periodic test. The preoperational test is still intended to be at least 24 hours to be available as a baseline test. Positions 6 and 7, which present recommendations for data collection and analysis, are being considered by the NRC staff for controlling the quality of the data obtained during the Type A and verification tests and for determining test acceptability.

For periodic Type A tests, Position 7.3 establishes additional conditions on the quality of the regression fit obtained using the method in ANSI/ANS-56.8-1987. These conditions are presented in the appendix to this guide as the Extended ANS Method. Condition 1 in the appendix represents a limit on the deviation of the data from a straight line.

Condition 2 gives a limit on the scatter of the data about the regression line. Condition 2 is analogous to the requirement that the ISG (instrument selection guide) does not exceed $0.25L_a$, although Condition 2 is applied to data scatter whereas the ISG applies to instrumentation errors.

Inequality (1.1) is a standard statistical test used to investigate whether a second order term in the model relating mass to time is warranted. If (1.1) is satisfied, it is concluded that a parabola does not fit the data significantly better than a straight line; therefore the test passed the first condition and (1.2) need not be checked. If (1.1) is not satisfied, inequalities (1.1.1) or (1.2) must be satisfied in order to pass Condition 1. Inequality (1.1.1) is a check that the curvature of the leakage rate decay curve is positive. Inequality (1.2) sets a limit on the ratio of the quadratic term to a function of the allowable leakage rate (L_a).

The left-hand side of inequality (2.1) is the coefficient of determination (the square of the correlation coefficient between mass and time). The corresponding limit on the right-hand side is derived using the following considerations: the standard deviation of the data scatter about the regression line is compared to the estimate made of the instrumentation errors; the resultant chi-square is allowed to vary up to the 95th percentile of the chi-square distribution with n - 2 degrees of freedom; and the condition is imposed that a function of the data scatter is less than $0.25L_a$.

In summary, this method does not change the way the leakage rate or upper confidence level are calculated. It imposes two additional conditions on the data behavior and puts limits on curvature and data scatter.

8. (16) Reporting of Results. A uniform format for reporting Type A, B, and C test results is being encouraged in order to make better use of the data history being generated.

9. (17) Flow Rate (Air, Water, Nitrogen). These recommendations are being made to avoid the use of an air discharge test method since there are many inherent inaccuracies in trying to capture and measure discharge air, e.g., leak paths from the tested volume other than that being metered.

C. REGULATORY POSITION

The procedures, requirements, measurements, and analytical techniques recommended by ANSI/ANS-56.8-1987, "Containment System Leakage Testing Requirements," together with its appendices, are generally acceptable to the NRC staff. They provide an adequate basis for complying with the Commission's regulations with regard to the leakage testing of containment systems, subject to the following:

1. (1) Conflict. If any provisions of ANS 56.8-1987 conflict with the requirements of Appendix J to 10 CFR Part 50, the requirements of Appendix J govern.

2. (2) Pressurizing Considerations. In paragraph 3.2.1.7 (page 4), add the following after the second sentence:

> "If certain pressurized sealing or testing systems cannot be isolated, such as inflatable airlock door seals, leakage into the containment must be accounted for and the Type A test results corrected accordingly. The correction shall include a value to account for instrument sensitivity and readability."

3. (6) Verification Test.

3.1 (6.1) Paragraph 3.2.6(b) (page 5) should be supplemented by the following:

> "(3) The purpose of the verification test is to verify the ability of the Type A test instrumentation to detect leakage rates approaching L_a.
>
> (4) The verification test should measure a change in the leakage

rate or a change in the mass. However, a "one-point check" is insufficient; sufficient points should be used to established a continuous definitive line slope extension following directly from the Type A test line plot.

(5) Data acquisition should not be interrupted without justification from the end of the successful Type A test to the start of the verification test. In some cases, this period of time could be several hours and may then be considered to be part of the Type A test. Data acquisition, of course, should also not be interrupted without justification from the start to the finish of the verification test.

3.2 (6.2) The method described in paragraph 3.2.6(b)(2) (page 5) is acceptable only if it is supplemented by a requirement for a sufficient number of air mass measurement data sets for the measure of W_2 used in the equation for the step-change verification test and if the resultant value is less than or equal to $0.25t_p / 24$, where t_p is the time required to pump daily allowable leakage at the rate being pumped.

3.3 Paragraph 3.2.6 should also be supplemented by the following:

> "For either a Type A test or a verification test, the test should not be ended until a minimum of 1 hour or 4 data sets (whichever is the longer time) confirm that an acceptable leakage rate has been achieved."

4. (10) <u>Test Medium</u> and <u>Water-Filled Systems</u>. The valves referred to in the first sentence of 3.3.5(b) (page 7) and the first sentence of 6.4 (page 15) should be assumed to remain

filled with water for 30 days, considering the most limiting single active failure.

5. (11) Calibration. The two sentences should be revised to read:

4.2.2 Instrumentation used for Type A tests shall be individually calibrated no more than 6 months prior to use. Instead of precalibration within 6 months prior to use, B and C test equipment may be calibrated in accordance with the plant's Quality Assurance requirements, provided that it is recalibrated within 2 months after use and the calibrations reviewed for accuracy.

6. (12) Containment Atmosphere Stabilization.

6.1 (12.1) Paragraph 5.2.1 should be supplemented by the following statistical limitation on the determination of stabilization:

"The 95% upper confidence limit of containment leakage rate should be equal to or greater than zero prior to declaring the start of the test."

6.2. (12.2) In paragraph 5.3.1.3, the following should be used in place of the second sentence:

" After reaching test pressure, the containment air temperature is stabilized when (a) the slope of the temperature vs. time curve is less than 0.5°F/hr (0.3°C/hr) averaged over the last 4 hours and (b) the rate of change of the slope of the temperature vs. time curve is less than $0.5°F/hr^2$ ($0.3°C/hr^2$) averaged over the last 4 hours."

6.3. (12.3) Paragraph 5.3.1 should be supplemented with the following:

"5.3.1.4 Containment air temperature should remain stablized over the entire test period, including the verification test, and the tests should be continued only so long as the temperature is stabilized. If the unstable temperature appears to be due to a problem with the test procedures (such as a mechanical error/failure) rather than leakage, the test may be continued if the problem has been identified and corrected."

7. (13) Data Recording and Analysis.

7.1 (13.1) In place of the last paragraph in 5.4, the following should be used:

"The start time of the containment integrated leakage rate test should be declared following a determination that test conditions have stabilized, and the start time is not subject to change during or after data collection. A test may be restarted if conditions require it to be aborted, and it has been declared a failure. (All test starts or restarts should be selected as "time forward" not as "time backward.") The minimum test duration after the containment atmosphere and instrument readings have stabilized should be 24 hours for a pre-operational Type A test and 8 hours for periodic Type A tests."

7.2. (13.2) Paragraph 5.6 should be supplemented by:

"Instantaneous (unaveraged) sensor readings should be recorded at approximately equal intervals but in no case at intervals greater than 1 hour."

7.3 (13.3) In paragraph 5.7.4, additional conditions should be applied to limit nonlinearity and data scatter when a Type A test is conducted, regardless of the test duration. The data scatter condition, but not the linearity condition, applies to the verification test as well. The application of these additional conditions is to control the quality of the least squares fit obtained from the mass point technique of ANSI/ANS-56.8-1987. Such conditions are recommended in the appendix to this guide, but the use of alternative conditions will also be considered if demonstrated to be adequate and approved by the NRC staff in advance.

8. (16) Reporting of Results. The format and content of paragraph 5.8 (page 13) should be used for submitting reports that are required by Appendix J to 10 CFR Part 50, including any individual Type A, B, and C "as found" and "as left" leakage readings that would be required by Appendix J.

9. (17) Flow Rate (Air, Water, Nitrogen).

9.1 (17.1) In paragraph 6.5.2 (page 15), the following should be used in place of the second sentence:

> "Makeup fluid to the test volume required to maintain test pressure shall be the same as the test fluid or a less viscous fluid and shall be measured using a flowmeter that directly measures valve leakage rate."

9.2 (17.2) Paragraph 6.5.2 should be supplemented by:

> "The air discharge method shall not be used."

9.3 Paragraph 6.5.3 (page 15) should be supplemented by:

"The water collection method shall only be used for tests required to demonstrate the acceptability of seal sytems."

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this regulatory guide.

Except in those cases in which an applicant proposes an acceptable alternative method, the method described in this guide will be used by the NRC staff in evaluating procedures for containment system leakage testing for compliance with Appendix J to 10 CFR Part 50.

APPENDIX

Extended ANS Method

Data generated during Type A and verification tests are analyzed by the mass point method described in Appendix B of ANSI/ANS 56.8-1987. The extension of the ANS method requires two additional conditions--above and beyond the ANS requirements--which must be satisfied at time t, the end of the test, by which n points (t_i, W_i) are collected. The Type A test is not considered acceptable until both Condition 1 and Condition 2 have been satisfied, and the verification test is not considered acceptable until Condition 2 has been satisfied. As noted in Regulatory Position 3.3, for either a Type A test or a verification test, the test should not be ended until a minimum of 1 hour or four data sets (whichever is the longer time) confirm that an acceptable leakage rate has been achieved.

Condition 1: A Limit on Curvature

Three inequalities, (1.1), (1.1.1) and (1.2), are listed under this condition. If inequality (1.1) is met, Condition 1 is satisfied, and (1.1.1) or (1.2) need not be checked. If inequality (1.1) is not satisfied, (1.1.1) is checked. If (1.1.1) is met, condition 1 is satisfied, and (1.2) need not be checked. If (1.1.1) is not satisfied, then (1.2) must be satisfied. If neither (1.1), (1.1.1), nor (1.2) is satisfied, Condition 1 of the Extended ANS Method is not met and the test is not acceptable.

$$\frac{(B' - B)\Sigma W_i + (A' - A)\Sigma W_i t_i + C'\Sigma W_i (t_i)^2}{\Sigma (W_i)^2 - B'\Sigma W_i - A'\Sigma W_i t_i - C'\Sigma W_i (t_i)^2} (n - 3) < F(1, n - 3, 0.95) \qquad (1.1)$$

$$C' > 0 \qquad (1.1.1)$$

$$2400 \left| \frac{24C'}{B'(L_a - L_{am})} \right| < 0.25 \text{ where } (L_a - L_{am}) \geq 0.25 L_a \qquad (1.2)$$

The symbols A, B, W_i, t_i, and L_a are defined by ANSI/ANS-56.8-1987. The terms A', B', and C' are the solutions to the equations

$$\begin{aligned} \Sigma W_i &= B'n + A'\Sigma t_i + C'\Sigma(t_i)^2 \\ \Sigma W_i t_i &= B'\Sigma t_i + A'\Sigma(t_i)^2 + C'\Sigma(t_i)^3 \\ \Sigma W_i(t_i)^2 &= B'\Sigma(t_i)^2 + A'\Sigma(t_i)^3 + C'\Sigma(t_i)^4 \end{aligned} \tag{1.3}$$

and are the coefficients for the least squares parabola

$$W_i = B' + A't_i + C'(t_i)^2 \tag{1.4}$$

and F(1, n - 3 , 0.95) is the 95th percentile of the F distribution with 1 degree of freedom in the numerator and n - 3 degrees of freedom in the denominator.

The left side of inequality (1.1) can also be written as

$$\frac{\Sigma(W_i - B - At_i)^2 - \Sigma(W_i - B' - A't_i - C'(t_i)^2)^2}{\Sigma(W_i - B' - A't_i - C'(t_i)^2)^2} (n - 3) \tag{1.5}$$

which is the statistic used to test whether the contribution of a quadratic term (above and beyond the contribution of the linear term) in the leakage rate model is statistically significant.

The ancillary inequality (1.2) sets a 25% limit on the ratio of the quadratic term to a function of the allowable leakage rate (L_a).

Finally, F(1, n - 3 , 0.95) can be approximated by

$$F(1, n - 3 , 0.95) \sim \frac{3.8414 (n^2 - 5.3n + 8.0394)}{n^2 - 7.7098n + 14.9069} \tag{1.6}$$

Other approximations to F(1, n - 3 , 0.95) can be found in the statistical literature.

Condition 2: Limit on Data Scatter

The second condition for passing the test is satisfaction of inequality (2.1). In order to have an acceptable Type A or verification test, (2.1) must be met.

$$r^2 > \frac{(L_{am})^2\Sigma(t_i - \bar{t})^2}{(L_{am})^2\Sigma(t_i - \bar{t})^2 + (L_a)^2 t^2\, \chi^2(n - 2\,,\, 0.95) / 122.93} \tag{2.1}$$

where r^2 is the coefficient of determination (the square of the linear correlation coefficient between time t_i and mass W_i), $\chi^2(n - 2\,,\, 0.95)$ is the 95th percentile of the chi-square distribution with $n - 2$ degrees of freedom, and L_{am} is defined by ANSI/ANS-56.8-1987.

The motivation for criterion (2.1) is that a high r^2 reflects a tight scatter of the points about the regression line.

The coefficient of determination may be written in several forms, some of which are given below.

$$r^2 = \frac{[n(\Sigma t_i W_i) - (\Sigma t_i)(\Sigma W_i)]^2}{[n(\Sigma(t_i)^2) - (\Sigma t_i)^2]\,[n(\Sigma(W_i)^2) - (\Sigma W_i)^2)]} \tag{2.2}$$

$$r^2 = \frac{\Sigma(\hat{W}_i - \bar{W})^2}{\Sigma(W_i - \hat{W}_i)^2 + \Sigma(\hat{W}_i - \bar{W})^2} \tag{2.3}$$

$$r^2 = \frac{1}{1 + \dfrac{\Sigma(W_i - \hat{W}_i)^2}{\Sigma(W_i - \bar{W}_i)^2}} \tag{2.4}$$

$$r^2 = \frac{1}{1 + \left(\dfrac{S_w}{At}\right)^2 \dfrac{(n - 2)t^2}{\Sigma(t_i - \bar{t})^2}} \tag{2.5}$$

where

$$\hat{W}_i = B + At_i \qquad (2.6)$$

$$\bar{W} = \frac{\Sigma W_i}{n} = B + \frac{A\Sigma t_i}{n} = B + A\bar{t} \qquad (2.7)$$

$$(S_w)^2 = \frac{\Sigma(W_i - \hat{W}_i)^2}{(n - 2)} \qquad (2.8)$$

$(S_w)^2$ is the calculated variance of the mass data points about the regression line and should be related to θ^2, the instrument reproducibility error used by the Instrument Selection Guide (ISG) in ANSI/ANS-56.8-1987, Appendix G. The relation between $(S_w)^2$ and θ^2 can be investigated by the ratio

$$\chi^2 = \frac{(n - 2)\,(S_w)^2}{\theta^2} \qquad (2.9)$$

which is distributed as a chi-square statistic with n - 2 degrees of freedom. Let $\chi^2(n - 2\ ,\ 0.95)$ denote the upper 95th percentile of this statistic. Then the following inequality holds with 95% probability

$$(S_w)^2 < \theta^2\chi^2\,(n - 2\ ,\ 0.95)\ /\ (n - 2) \qquad (2.10)$$

Let e_w denote the error associated with W_i. In analogy to the formulation of the ISG given by ANSI/ANS-56.8-1987 in Appendix G,

$$ISG^2 = \left(\frac{2400}{t}\right)^2 \left[2\left(\frac{e_p}{p}\right)^2 + 2\left(\frac{e_{p_v}}{p}\right)^2 + 2\left(\frac{e_T}{T}\right)^2\right] \qquad (2.11)$$

write

$$(e_w)^2 = (W_i)^2 \left[\left(\frac{e_p}{p}\right)^2 + \left(\frac{e_{p_v}}{p}\right)^2 + \left(\frac{e_T}{T}\right)^2\right] \qquad (2.12)$$

from which

$$\left(\frac{e_W}{W_i}\right)^2 = \frac{t^2 ISG^2}{2(2400)^2} \qquad (2.13)$$

The error e_W is expected to be proportional to θ. If θ represents one standard deviation of the instrumentation error, then, under normality assumption, 1.96θ represents a 95% confidence band on the true value of W_i. Substituting 1.96θ for e_{W_i} in (2.13) and solving for θ^2 gives

$$\theta^2 = \left(\frac{ISG\ W_i t}{\sqrt{2}(1.96)(2400)}\right)^2 \qquad (2.14)$$

Since W_i changes very little during the test, it is replaced by B, the intercept of the regression line. Then θ^2 is substituted into (2.10) to yield

$$(S_w)^2 < \left(\frac{ISG \cdot B \cdot t}{\sqrt{2}(1.96)(2400)}\right)^2 \frac{\chi^2(n-2\ ,\ 0.95)}{(n-2)} \qquad (2.15)$$

Next divide both sides of (2.15) by $(At)^2$. Replacing $(2400)^2A^2$ by $B^2(L_{am})^2$ and θ by its limit of $0.25L_a$ gives

$$\left(\frac{S_W}{At}\right)^2 < \left(\frac{0.25L_a}{\sqrt{2}\ 1.96L_{am}}\right)^2 \frac{\chi^2(n-2\ ,\ 0.95)}{(n-2)} \qquad (2.16)$$

for which, after some manipulation,

$$\left(\frac{S_w}{At}\right)^2 \frac{(n-2)t^2}{\Sigma(t-\bar{t})^2} < \frac{1}{122.93}\left(\frac{L_a}{L_{am}}\right)^2 \frac{t^2}{\Sigma(t-\bar{t})^2}\ \chi^2(n-2\ ,\ 0.95) \qquad (2.17)$$

$$\frac{1}{1+\left(\frac{S_w}{At}\right)^2 \frac{(n-2)t^2}{\Sigma(t-\bar{t})^2}} > \frac{1}{1+\left(\frac{L_a}{L_{am}}\right)^2 \frac{t^2}{\Sigma(t-\bar{t})}\ \chi^2(n-2\ ,\ 0.95)\ /\ 122.93} \qquad (2.18)$$

By (2.5), the left side of (2.18) is recognized as r^2. Hence, after some further manipulation, obtain

$$r^2 > \frac{(L_{am})^2 \ \Sigma(t - \bar{t})^2}{(L_{am})^2 \ \Sigma(t - \bar{t})^2 + (L_a)^2 \bar{t}^2 \ \chi^2(n - 2\ ,\ 0.95) \ / \ 122.93} \tag{2.19}$$

The numerical entry for χ^2 (n - 2 , 0.95) can be taken from a statistical table or approximated. One approximation is given by E. B. Wilson and M. M. Hilferty.* Let $Q = 2 / [9(n - 2)]$, then

$$\chi^2(n - 2\ ,\ 0.95) \sim (n - 2) \ \{1 - Q + (1.645) \sqrt{Q}\ \}^3 \tag{2.20}$$

Another approximation to $\chi^2(n - 2, 0.95)$ is given as

$$\chi^2(n - 2, 0.95) \sim 1.08916 \ \frac{(n + 1.33)(n + 42.603)}{(n - 1.202)(n + 28.155)} \ (n - 2) \tag{2.21}$$

Other approximations to χ^2 can be found in the statistical literature.

*Proceedings of the National Academy of Science, Vol. 17, pp. 684-688, 1931.

REGULATORY ANALYSIS

A separate regulatory analysis was not prepared for this regulatory guide. A regulatory analysis that examines the costs and benefits of the rule as implemented by the guide was prepared for the amendments to Appendix J of 10 CFR Part 50, which provide the regulatory basis for this guide. The analysis is available for inspection and copying for a fee in the NRC Public Document Room, 2120 L Street NW (Lower Level), Washington, DC. Free single copies may be obtained upon written request to the Document Control Branch , U.S. Nuclear Regulatory Commission, Washington, DC 20555.

RESOLUTION OF MS 021-5 COMMENTS

CONTAINMENT SYSTEM LEAKAGE TESTING

BACKGROUND

DISCUSSION OF REGULATORY POSITIONS

1. CONFLICT

Comment:

Five letters received (Commonwealth Edison, the BWR Owners' Group, TU Electric, Georgia Power, and the American Nuclear Society) suggested that the ANSI-/ANS-56.8-1987 version be endorsed in the regulatory guide instead of the 1981 version.

Response:

The 1987 version will be endorsed instead of the 1981 version.

Comment:

The Atomic Industrial Forum, Inc, Commonwealth Edison, and Baltimore Gas & Electric believe that the new source term study will show that minor 1 or 2% effects are meaningless when the maximum allowable containment leakrates (La) will be many times larger than those currently permitted.

Response:

When the effort on NUREG-0956, "Reassessment of the Technical Bases for Estimating Source Terms", was initiated, it was expected that the study would show a reduction of several orders of magnitude in calculated source terms. Such clear-cut reductions in source terms were not found, however, and its method of evaluating source terms has demonstrated a high degree of plant-specific variation.

Comment:

The draft Regulatory Guide only permits "time forward" for the restart of a Type A test which might possibly adversely impact outage durations (Bechtel and Georgia Power).

Response:

Some of the methods currently accepted for evaluating a Type A test are very dependent on the first data point. To assure that the data is truly random and statistically sound, only "time forward" restarts will be permitted.

Comment:

Commonwealth Edison suggested referencing a complete and acceptable ANSI standard in the rule, in lieu of a reg guide, and Lynne Goodman suggests using either the ANSI standard or the reg guide because one document is easier to use than two.

Response:

The NRC staff has worked with the ANSI/ANS committee to resolve differences in positions. But the staff continues to take exception with some of the ANSI/-ANS positions, necessitating two documents. Because of the lengthy schedules involved in rulemaking, the NRC staff can be more responsive to test improvements in a regulatory guide.

2. TYPE A TEST REQUIREMENTS

3. PRESSURIZING CONSIDERATIONS

Comment:

Lynne Goodman feels the addition of the recommended containment atmosphere stabilization criteria complicates the test, and that the results of the formulas are difficult to interpret. Also, these formulas could not be done by hand in the event of a computer failure.

Response:

Rather than the containment atmosphere stabilization criteria, we assume that you are referring to the Extended ANS equations with your comment about a 24 hour test. We agree that in the event of computer failure these equations would be difficult to do by hand. Please see the responses in the Appendix in regard to your other comments.

Comment:

Stone & Webster Engineering Corporation comments that Regulatory Position 3 is in conflict with Paragraph III.B.(1).(b) of the proposed rule which permits in-flatable air lock door seals to remain pressurized during the Type A test pro-vided that corrections for inleakage are taken into account.

Response:

The regulatory position has been changed to be consistent with the rule. The staff's concern is inleakage (i.e., is the method of accounting for inleakage correct?).

8. TYPE B AND C TEST PRESSURES

Comment:

Because of the design of the airlock doors at Sequoyah and Watts Bar Nuclear Plants, the door seals cannot be tested at Pac.

Response:

The first sentence in this paragraph of ANS 56.8 provides relief for cases where Type B and C tests cannot be conducted at P_{ac}, by stating "...except as provided by the technical specifications...". If an air lock cannot be tested at P_{ac} with either positive pressure or vacuum-induced differential, then, with prior NRC approval, the technical specifications can reflect an acceptable alternative test pressure.

C. REGULATORY POSITION

1. Conflict

Comment:

TU Electric notes that ANSI/ANS-56.8 allows a five year Type A test interval whereas Appendix J specifies a four year interval. Because of the emphasis on Type B and C testing, corrective action plans, and increased Type A frequency for failures, the five year interval is preferred.

Response:

The 4 year interval specified in Appendix J has had certain relaxations applied, especially when 24-month refueling cycles are involved. However, extending the interval universally from 4 years to 5 years will only be considered by the NRC staff when it has sufficient evidence that the shifted emphasis to local leak rate testing is producing the desired results.

Comment:

TU Electric feels that the proposed Appendix J requirement for the combined leakage rate plus standard deviation of the leakage rate to be less than 60% of the maximum allowed leakage La is in conflict with the ANSI/ANS-56.8 requirement for the combined leakage rate to be less than 75%. Yankee Atomic Electric Company questions this limit also.

Response:

This requirement has not changed from the 1972 version of Appendix J, and continues to reflect the fact that not all penetrations and isolation valves are locally leak tested.

Comment:

TU Electric feels that there is a third area of conflict concerning the test pressure and requirements for water testing. Appendix J requires a test pressure of 1.1 Pa whereas ANSI/ANS-56.8 specifies a pressure of Pa. Sub-stitution of water testing for pneumatic testing is somewhat nebulous because neither the proposed rule nor the draft guide state the requirements of a "qualified water seal system".

Response:

Appendix J, as revised following public comments on the October 1986 publication, clarifies a "qualified water seal system". It should be noted, however, that this does not constitute substitution of water testing for pneumatic testing, since the NRC staff does not accept such substitute determinations of leak rate. This position only eliminates the need to determine a leak rate for isolation barriers using a qualified water seal system.

2. TYPE A TEST REQUIREMENTS

Comment:

Alabama Power Company, Yankee Atomic Electric Company, and Wolf Creek Nuclear Operating Corporation find technical problems adjusting the Type A test results with the results of the Type B and C testing, and TU Electric questions how this is to be done.

Response:

The staff feels this is the best method to account for repairs and the adjustments made. Type A testing is one of the few areas where, after local testing is done, the leaks are fixed and then the large scale test is run with the expectation that it will almost surely pass at that point. The repairs and adjustments have to be accounted for to get an idea what the condition of the containment was beforehand. This should already be done during a Type A test outage. It is not, now, being extended beyond that.

Comment:

Six commentors (The BWR Owners' Group, GPU Nuclear, Commonwealth Edison, TU Electric, and Baltimore Gas & Electric) either questioned including the small effect of instrumentation error in the local leakages used to correct Type A test results, or had questions on how this was to be done.

Response:

Although the statistically correct approach is to include instrument errors, it is also true that the current practice of adding ILRTs and LLRTs is workable. The current practice does not always add instrument errors, but it should add the minimum readable instrument LLRT value to the ILRT. This practice is considered to be conservative.

Comment:

Wisconsin Electric Power Company feels that Paragraph 3.2.1.3 of ANSI/ANS 56.8-1981 concerning the containment isolation system functional test should be changed.

Response:

The term "containment isolation system functional test" has been removed from Appendix J. Although this proposal is a good idea, it would be more conservative than the rule, and is not considered necessary.

Comment:

GPU Nuclear requests a clarification on the addition of instrumentation system error, and clarification of Section 3.2.4 and reg guide Position 2.

Response:

Section E3 in Appendix E of the ANS standard deals with instrumentation error and leakage. Position 2 does not change the confidence limit. The ANS standard deals with Type A test instrumentation error. The reg guide position 2 deals with Type B and C test instrumentation error.

Comment:

Wolf Creek Nuclear Operating Corporation opposes factoring Type B and C tests into Type A test results.

Response:

The NRC wants to know the repairs and adjustments to ascertain the condition of the containment prior to repairs. We believe there are only two reasons for not venting valves during a Type A test:

a. A particular pipe has to remain in operation (e.g., RHR system).
b. If a LOCA occurred, those particular penetrations would not be vented to containment atmosphere.

A point seemingly overlooked by several commentors is that the assumption is being made that any, not all, lines or valves may fail in a LOCA. However, this does mean that all paths have to be tested as if the line or valve in that path had failed.

Comment:

Yankee Atomic Electric Company has some suggestions regarding maximum and minimum pathway leakage.

Response:

The NRC staff finds two methods acceptable. One, adding up all leakage rates using maximum pathway leakages, or two, the more conservative method of adding up all of the individual leak rates. Neither of these methods is a change from previously accepted practice.

3. PRESSURIZING CONSIDERATIONS

Comment:

This regulatory position should identify an exception for components with inflatable seals using air or nitrogen as the pressure medium (The BWR Owners's Group, System Energy Resources, Inc).

Comment:

Wisconsin Electric Power Company finds a contradiction between Paragraph 3 of the Regulatory Guide and the second paragraph of 3.2.1.5 of ANSI/ANS-56.8-1981 regarding gas sources in containment. A comment from Wolf Creek Nuclear Operating Corporation points out a contradiction between the regulatory position and the discussion of the regulatory position. The regulatory position says that all sources of gas leakage "shall be" isolated, whereas the discussion says "where possible" such lines need to be isolated.

Response:

The two comments above are representative of the comments received on Pressurizing Considerations. The staff agrees that pneumatic accumulators which aid in the closure of inboard MSIVs or pressurization of containment air lock door inflatable seals need not be vented. But non-safety grade portions of the air systems should be isolated or disconnected from the safety grade side. A seal should not be dependent on non-safety grade equipment. And, if a system is not vented, inleakage must be accounted for by measuring the system pressure drop and calculating the volume leakage (the calculation must include instrument sensitivity and readability).

Comment:

Inleakage, if properly accounted for, should be allowed (Atomic Industrical Forum, Inc., Bechtel Western Power Corporation, TU Electric, Georgia Power, Baltimore Gas & Electric).

Response:

The staff feels that isolation is the best method, but IF inleakage is properly accounted for (including instrument sensitivity and readability), we agree. If it is justifiable, the staff will accept this on a case-by-case basis. The reg guide has been rewritten to account for this.

Comment:

Wolf Creek Nuclear Operating Corporation and Wisconsin Electric Power Company believe reduced pressure testing should be allowed.

Response:

Extrapolating low pressure leakage test results to full pressure leakage test results has turned out to be unsuccessful. Reasonable argument can be made for low pressure testing. However, the NRC staff believes that the peak calculated accident pressure (a) has always been the intended reference pressure, (b) is consistent with the typical practice for NRC staff evaluations of accident pressure for the first 24 hours in accordance with Regulatory Guides 1.3 and 1.4, (c) provides at least a nominal check for gross low pressure leak paths that a low pressure leak test does not provide for high pressure leak paths, (d) directly represents technical specification leakage limits, and (e) provides greater confidence in containment system integrity. For these reasons, the full, rather than reduced, pressure has been retained as the test pressure.

4. LIQUID LEVEL MONITORING

Comment:

A clarification of paragraph 3.2.1.8 is discussed by TU Electric.

Response:

The 1987 ANS standard deletes the second of the three paragraphs in the 1981 standard. The proposed rule and the standard are in agreement.

5. TYPE A TEST FREQUENCY

Comment:

Duke Power and Wolf Creek Nuclear Operating Corporation note a conflict between the 5 year interval limit in Paragraph 3.2.3 and the 4 year interval specified in Appendix J.

Response:

A maximum value of 4 years has been included in the revised rule. Under certain conditions listed, a 5 year interval will be allowed between tests.

Comment:

The American Nuclear Society suggests the required test interval be specified in the regulatory guide.

Response:

10 CFR 50, Appendix J, rather than the guide, provides required minimum test intervals, since the NRC staff considers this criterion to be fundamental to the test program.

6. VERIFICATION TEST

6.1

Comment:

Data between the end of the Type A test and start of the verification test should not be included in the Type A test data (TVA).

Response:

The staff agrees with much of this comment. But, since the leak is superimposed a stabilization period is usually not needed. As soon as the leak is superimposed, that is considered the start of the verification test. Also, coupling the two tests together precludes computer manipulation of the data.

Comment:

Zero-pressure testing should not be required (Commonwealth Edison).

Response:

Zero-pressure testing is not a requirement.

6.3

Comment:

Wisconsin Electric Power Company notes a conflict between the current Appendix J, the proposed Appendix J, and past interpretations of some regional inspectors regarding the definition of a verification test.

Response:

We used the same definition in both the rule and the guide, even though the wording differs.

6.4

Comment:

Wisconsin Electric Power Company would like to see a definite time period specified. Also, there is a question regarding stabilization of the leakage rate or change in mass within the band they feel will lead to misunderstandings between inspectors and licensees.

Response:

The staff feels that every test is run under slightly different conditions and it is too difficult to say just what the right amount of time between tests should be. With regard to mass change acceptability band question, this is only a concern when using mass step verification. This does not apply when using the superimposed leakage method.

6.5

Comment:

TU Electric believes certain conditions warrant interruptions of data acquisition during stablilization periods.

Response:

Although establishment of a stable verification test leakage and sampling of containment atmosphere can affect how the data is used, data acquisition should not be interrupted so long as the containment remains pressurized between the Type A and verification tests.

Comment:

System Energy Resources, Inc. and Stone & Webster Engineering Corporation suggest that this position be clarified so that the start time for the verification test be as soon as the new test conditions have stabilized for the verification test following each Type A test.

Response:

This is dealt with in the new version.

Comment:

The period of time between the end of the Type A test and the verification test should not be considered part of the Type A test (Atomic Industrial Forum, Inc., Georgia Power, Baltimore Gas & Electric, and Bechtel Western Power Corporation). System Energy Resources, Inc. agrees with these commentors, but believes that data acquisition should not be interrupted without justification.

Response:

The verification test should be run as soon as possible so that the verification test's containment conditions are as reasonably close to the containment conditions uder which the Type A test was run. With regard to Georgia Power's comment, adding make-up water would change the containment volume. Because of the varying conditions from test to test, time limits cannot be set. However, a minimum time or number of data sets has been defined to establish when an acceptable leakage rate has been achieved.

7. DATA REJECTION

Comment:

There is no justification to continue recording data from a sensor that has undoubtedly failed.

Response:

Since acquisition systems will continue to record each sensor, there is no hardship involved. After the test, the data can be analyzed to decide what to do with the values obtained. The data can also be used later as proof that the sensor did fail, or for other analyses that may be needed.

8. TYPE B AND C TEST PRESSURES

Comment:

Testing the Main Steam Isolation Valves (MSIVs) in most BWRs at full design basis accident pressure would lift the seat of the inboard valve, and therefore these valves are tested at a reduced pressure. To test the inboard valves in the accident pressure direction, some BWRs must remove the drywell and reactor vessel heads to install plugs. This would require a backfit (BWR Owners' Group and Commonwealth Edison).

Response:

MSIVs will be tested at reduced pressure as is currently done. This section refers to the option of using vacuum tests.

9. TYPE B AND TEST SCHEDULE

Comment:

Alabama Power Company feels the provision for increased Type B and C testing as a result of Type A failures is not technically justified.

Response:

This is addressed in responses to the proposed rule.

Comment:

This position is in conflict with the proposed rule, section III.B(1)(a) and III.C(1) regarding testing intervals. The draft guide positions are more reasonable and preferred (Atomic Industrial Forum, Inc. and Commonwealth Edison).

Response:

The rule and guide now both have this same additional schedule flexibility.

10. TEST MEDIUM AND WATER FILLED SYSTEMS

Comment:

I disagree with the proposed regulatory guide item 10. To me is is apparent that the accident referred to in the first sentences of the standard section 3.3.5(b) and 6.4 is a LOCA. Additionally, I feel an approximate conversion of water leakage to air leakage should be made, so it can be considered part of the 60 percent La (Lynne Goodman).

Response:

The accident referred to in the first sentence is indeed a LOCA. With regard to the conversion, Appendix J measures pneumatic leakage. The NRC staff does not consider water testing to be as sensitive as pneumatic testing, and therefore does not normally recognize conversions from water to air in Appendix J.

11. CALIBRATION

11.1

Comment:

For instruments related to Type B and C test, this may result in considerable hardship. Many of the flowmeters cannot be calibrated onsite, and the several week turnaround time could result significantly on outage schedule. The calibration requirements should be deleted (BWR Owners' Group, Duke Power Company, and Commonwealth Edison).

Response:

The ANS standard added B and C instruments between the 1981 and the 1987 versions. We agree that this will require better planning for the outages. Also, it should be noted that the NRC technical staff still prefers that flow meters used in Type B and C testing be post test recalibrated (within 2 months after completion of use).

Comment:

Instrumentation used for Type B and C tests should not be required to have a semiannual calibration (Atomic Industrial Forum, Inc., Tennessee Valley Authority, and Baltimore Gas & Electric). TU Electric recommends additional clarification to explicitly state performance of an in-situ check.

Comment:

Some instrumentation will stay in calibration for longer than 6 months. There should be established calibration intervals, and this position needs more clarification (TU Electric and Northeast Utilities).

Response:

The regulatory guide is in agreement with the standard.

11.3

Comment:

A requirement for the daily calibration of Type B and C test instruments would present a significant impact on testing efforts (Lynne Goodman, BWR Owners' Group, Systems Energy Resources, Inc., Tennessee Valley Authority, Atomic Industrial Forum, Inc.).

Comment:

By applying this rule, LLRT instrumentation must be calibrated to NBS standards every day, or at frequencies which will assure minimum retest liability (Bechtel Western Power Corporation).

Comment:

It appears that Part 11.3 has overlooked the distinction between a calibration and a calibration check (Georgia Power, Wisconsin Electric Power Company, Baltimore Gas & Electric, Stone & Webster Engineering Corporation, Wolf Creek Nuclear Operating Corporation).

Response:

A calibration check is a one-point check. Our intention in this section is a calibration to NBS standards before Type A tests. An option is presented for B and C test equipment to be calibrated after the tests, and the results analyzed.

12. CONTAINMENT ATMOSPHERE STABILIZATION

Comment:

These additional requirements will substantially increase testing time and costs, as well as requiring new software documentation (Systems Energy Resources, Inc., Atomic Industrial Forum, Inc., and Baltimore Gas & Electric).

Response:

The NRC staff has found that stabilization cannot be left entirely to judgement. NRC inspectors were having to make too many on-the-spot calls. By putting this in the standard, situations of this type are eliminated. With regard to the possibility of increased testing time and costs, any increase in time due to extending the stabilization period will be recovered by being able to run the test for the shortest allowable period without running longer as a result of not being sufficiently stabilized.

12.1

Comment:

Does this position require calculation of 95% UCL on leakage or leakage rate? Will a positive or zero leakage rate or 95% UCL leakage rate be sufficient to meet this requirement? (GPU Nuclear).

Response:

We want a 95% UCL just as is calculated during the actual test; not a point to point leakage rate. With regard to the second question, the answer is yes.

Comment:

Is there a time limit for which the UCL should be equal to zero or will a single data set suffice? (Bechtel Western Power Corporation).

Response:

The recommended addition to paragraph 5.3.1.3 will define when the temperature has sufficiently stabilized.

Comment:

TU Electric does not endorse this position to compute the 95% UCL of containment leakage during the stabilization period to verify a UCL equal or greater than zero prior to declaring the start of the test.

Response:

We feel that there are not always proper volume fractions, etc. Finding a negative UCL would indicate that something is very wrong as the UCL should be positive almost always (even with randomness and data scatter). This position is included as a red flag indicating trouble.

12.2

Comment:

The criterion for temperature stabilization in paragraph 12.2 is a good definition of stabilization; however, it is too restrictive in respect to the supplemental requirements of paragraph 12.3 (Tennessee Valley Authority). The 0.5xF/hr/hr criteria specified may be well below the fastest transient that most plants can handle. Also, dealing with transient effects during a test should be left up to those performing the test. These additional requirements will substantially increase testing time and costs (Commonwealth Edison).

Comment:

These criteria are endorsed by TU Electric with exception of the temperature limit in criteria (a). Also, for additional clarity, a Regulatory Position similar to Appendix F in ANSI/ANS-56.8 should be added.

Response:

Stability of the air mass has been looked at in detail by various organizations. But no one has yet found a good way to use this as a criterion. The temperature should also be stable, and is easy to check for stability. We cannot agree with a case-by-case establishment of criteria which would dilute the intention of setting more specific, generic criteria. It is not likely that an Appendix similar to Appendix F will be added to the guide.

Comment:

12.2 (b) The statement "...the rate of change of the slope of the temperature versus time curve...averaged over the last two hours." can only be approximated because ILRT data are discrete and not continuous. What approximation is acceptable? (Bechtel Western Power Corporation).

Response:

The first criterion is that we want the rate of change of temperature to be fairly constant (temperature divided by time). The second criterion is that the rate of change of the rate of change has to be fairly constant.

12.3

Comment:

The paragraph adds another acceptance criterion to all tests which appears to be unnecessary and burdensome (Bechtel Western Power Corporation, GPU Nuclear, Lynne Goodman). Can this criterion be used to reject a single data point due to a temperature outlier? (Bechtel Western Power Corporation).

Response:

The recommendation for meeting stabilization criteria is a very minimal calculation, and is only becomes a problem is there is too much temperature scatter and the test would have to be terminated. The purpose here is that the temperature must remain stable for the equations that these methods are based on to remain valid. With regard to the outlier question, this criterion cannot be used to reject outliers.

13. DATA RECORDING AND ANALYSIS

13.1

Comment:

The additional conditions to limit nonlinearity and data scatter are not necessary (Wolf Creek Nuclear Operating Corporation, Systems Energy Resources, Inc., and Duke Power Company).

Response:

We have seen tests where the data was all over the graph and yet passed the ANSI/ANS-56.8 criteria. The NRC staff felt that some limits on curvature and data scatter were needed.

Comment:

Duke Power Company points out that Position 13.1 says that after a start time is selected it is not subject to change. Then the next sentence tells how the time may be changed. Bechtel Western Power Corporation, GPU Nuclear, Lynne Goodman, Stone & Webster Engineering Corporation, and Northeast Utilities have some question about "start time" vs "restart time".

Response:

With regard to the question on conflict in start time, this section does not mean a new start for an old test, it is referring to a new test (retest) which was started due to some limiting condition. The wording has been clarified to explicitly allow a test restar if the prior test has been declared a failure.

Comment:

The Atomic Industrial Forum, Inc., Georgia Power, and Baltimore Gas & Electric believe if the data supports a restart as of "time backward" then it should be allowed.

Response:

Some Type A acceptance methods are very dependent on the first data point. With the capability of computers, one would be given the luxury of fishing around for an advantageous data point.

Comment:

TU Electric endorses this position provided the minimum periodic test duration of eight hours remains.

Response:

This minimum periodic test duration of eight hours will remain.

13.2 DATA RECORDING AND ANALYSIS

Comment:

Increased readings yield less scatter and better resolution. Also, average data is preferable and does not adversely affect Type A results (BWR Owners' Group).

Response:

The statistical equations are based on the assumption that the data is independent and random. Averaging the data skews the results smoothing the curve and lowering the UCL.

13.3

Comment:

Based on Bechtel Western Power Corporation's analysis of the Extended ANSI Method, The Atomic Industrial Forum, Inc., The BWR Owners' Group, Georgia Power, and Baltimore Gas & Electric believe these are new criteria for termination of a successful test for which no technical basis has been provided.

Comment:

The parabolic inequalities method presented in the appendix of the regulatory guide would be a significant technical imposition on utilities, requiring substantial statistical analyses with minimal benefit (Wisconsin Electric Power Company and TU Electric).

Response:

Over the past year, Sentry Equipment Corporation in Oconomowoc, Wisconsin has been under contract to the NRC to study various CILRT methods. Their findings show that not only is the Extended ANS method the most reliable test method, but it is also the method that will pass the most Type A tests. The NRC staff finds this to be the optimal situation. This may be improved in the future, but is currently a recommended method for determining test duration.

14. TEST MEASUREMENT

14.1

Comment:

Tennessee Valley Authority would like further clarification regarding the suitability of existing temperature surveys for similar plants.

Response:

With regard to TVA's question, it cannot be assumed that one plant is the same as another. Separate temperature surveys should be done.

Comment:

TU Electric questions reassignment of a failed sensor's volume fraction, and reviewing of volume fractions after the initial periodic test to determine their continued validity.

Response:

Because of the many different designs and conditions between containments, it is impossible to be prescriptive in this area. It must be left to the people running the test to use their best judgement concerning reassignment of volume fractions. With regard to review of volume fractions prior to each Type A test, the NRC staff feels it is good engineering practice to check a good percentage of the sensor locations before each Type A test.

Comment:

Will the proposed regulatory guide require plants to redo the temperature surveys? (Lynne Goodman)

Response:

The regulatory guide does not recommend that the initial temperature survey be redone, but the NRC staff feels that it is good engineering practice to recheck parts of the temperature survey before each Type A test.

14.2 TEMPERATURE MEASUREMENT

Comment:

The BWR Owners' Group, Commonwealth Edison, and TU Electric question the practice of performing temperature surveys using the ventilation configuration.

Response:

For a temperature survey to be useful, it ought to be conducted under the same conditions as the test for which the survey is being made. If personnel safety conditions dictate using fans, then the test ought to be run with the fans on. Difficulties would arise, however, with interpreting the acceptability of the test should the fans be cut off for some reason during the test.

14.3

Comment:

Northeast Utilities believes that psychrometric readings should not be required, as variations of humidity over time and varied plant conditions would result in initial surveys being nonrepresentative. TU Electric points out that even though this position is acceptable, it will require performance of several temperature surveys.

Response:

This regulatory guide position is not a perfect solution, but we feel that it is the best that we can practically do. With regard to TU Electric's comment, it would be prudent to do several temperature surveys during plant operating life.

15. ABSOLUTE TEST METHOD

Comment:

Northeast Utilities believes the proposal of redefining containment air temperature (T_i) is not recommended or needed, and outlines a recommended methodology.

Response:

The methodology proposed is mathematically more correct but not necessary. We do not belive it to be a practical generic replacement for the new temperature equation.

Comment:

Tennessee Valley Authority believes the equation is in error.

Response:

The use of the previous temperature equation used in Type A testing and the inverse temperature equation in the proposed regulatory guide has been debated since the beginning of Type A testing. It was recognized that the inverse equation was mathematically more correct, but practically speaking made very little difference in accuracy. Also, this method requires the use of computers which were not readily available in the early days of testing. Now that computers are commonplace, the NRC staff feels that this small change to the computer program makes sense.

16. REPORTING OF RESULTS

Comment:

Will the reports covering strictly Type B and/or C testing be required to follow the format and content specified? For example, if an airlock test is performed, does a report similar to that described have to be submitted? Currently, all that is required is a mention in the monthly operating report if the test passed and LER if it failed. (Lynne Goodman; System Energy Resources, Inc. had similar question).

Response:

The regulatory guide mainly covers the reporting requirements for Type A tests. Type B and C tests that did not fail only have to be reported once every 3 to 4 years with the Type A tests. The LER reporting practice for failed tests outlined in the comment is the normal procedure.

17. FLOW RATE (AIR, WATER, NITROGEN)

17.1

Comment:

We believe that the makeup fluid should be the same as or less viscous than the system fluid not the test fluid (Tennessee Valley Authority).

Response:

The makeup fluid should be the same as the test fluid, which should be the same or less viscous than the system fluid.

Comment:

My strongest objection to the proposed reg guide involves the leak rate measurement methodology during the type C tests. I definitely believe leakage flow should be an acceptable alternative (Lynne Goodman).

Response:

See previous responses to comments on recommended changes to 6.5 in ANS 56.8.

17.2 FLOWRATE

Comment:

The BWR Owners' Group needs clarification regarding what is meant by the term "air discharge method". If this means measuring the outleakage from a test volume instead of the makeup flow, this restriction could present a considerable problem for many BWR's.

Response:

You have interpreted this correctly in your comment. We feel the changes are advisable per the comments on air discharge method in the regulatory guide. Additional clarification has been provided regarding the limited conditions under which the NRC staff considers the water collection method suitable.

20. RECORDING OF LEAKAGE RATES

Comment:

Accounting for packing leaks outside the primary containment is a major backfit, especially in BWR plants (The BWR Owners' Group, The Atomic Industrial Forum, Inc., and Commonwealth Edison).

Response:

We have not changed our position. The regulatory guide is just more explicit. This is not a backfit.

Comment:

GPU Nuclear believes the statment on packing would meet the probable intent better if reworded.

Response:

We feel the wording proposed by GPU Nuclear is probably acceptable, but not an improvement. The packing either could or couldn't be a leakage path.

D. IMPLEMENTATION

APPENDIX

Extended ANS Method

Comments were received from The BWR Owners' Group, The Atomic Industrial Forum, Inc., Rochester Gas and Electric Corporation, Commonwealth Edison, Bechtel Western Power Corporation, Northeast Utilities, The American Nuclear Society, Testing, Engineering & Research Services, and Baltimore Gas & Electric on the modification to the Mass Point Method. The comments generally can be con-densed into the following:

Comment:

There has never been shown any need for the additional conditions on curvature and scatter. The Mass Point Method has proven to be accurate and reliable method in its current form in hundreds of tests over the last ten years. Therefore, there is no need for additional conditions. Moreover, because the two additional conditions are unnecessarily stringent, they would result in the failure of many valid Type A tests.

Response:

NRC inspectors have noticed that some tests that passed ANSI/ANS-56.8 had excessive data scatter. The NRC staff felt that some additional criteria were needed in order to make sure that the data curve was indeed approaching linearity. As previously discussed in the response to similar comments on Position 13.3 and on the Appendix, Sentry Equipment has looked at over 80 tests and the Extended ANS Method has yet to fail a valid test.

Comment:

The results of the extended ANS method are unpredictable and the limits for verification test results are unrealistic. The use of single active failure criteria as a leakage rate testing requirement again poses the problem of testing each valve individually.

Response:

Sentry's study results show the Extended ANS Method to be the more reliable method. The single active failure criterion ensures that isolation valves will be tested, whether individually, or in groups.

Comment:

The source of the statistical equations and literature used to develop equations 1.1, 1.5, and 1.6 should be referenced.

Response:

Equation 1.5 is a direct outcome of the definitions of the F statistic for testing the contribution of the quadratic term above and beyond the linear contribution to the regression. Most regression textbooks would report it in a matrix form.

Equation 1.1 has been developed by the NRC staff. It can be verified by applying Equations 1.1 and 1.5 to the same set of numbers.

Equation 1.6 was also developed by the NRC staff. It gives an excellent approximation to the tabulated F statistic. Of course, other approximations are available in the literature.

Comment:

The bad data that will occur when pressure, temperature, or humidity extrusions have not had time to dissipate or stabilize before data is obtained, and the ability of the Type A instrument system to accurately detect extremely low leakage will result in a large scatter in data and result in a low correlation coefficent. This penalizes tight primary containment by the fact that this scatter causes a large error in the confidence level of the measured leakage rate and the ability to get agreement during the verification test.

Response:

With regard to the comment on extrusions, this is the exact reason for the stabilization criteria. In fact, Type A test requirements are met even sooner if the stabilization period is sometimes extended beyond the four hour time period to allow for even further stabilization. The study we have contracted out shows that the tightest containments have little trouble in meeting the requirements if the test is conducted properly.

REGULATORY ANALYSIS

Comment:

A full and complete regulatory analysis should be performed including a backfit analysis (The BWR Owners' Group and Commonwealth Edison).

Response:

A regulatory analysis was previously prepared that examined the costs and benefits of the rule as implemented by the guide. The analysis is available for inspection and copying for a fee in the NRC Public Document Room, 2120 L Street NW, Washington, DC. Free single copies may be obtained upon written request to the Document Control Branch, U.S. Nuclear Regulatory Commission, Washington, DC, 20555. With regard to the suggestion that an impartial analysis should be done, this was done with both the regulatory analysis and the study of various CILRT methods having been contracted out. In response to the suggestion that the ANS-56.8 standard also should have a regulatory analysis, since this is a consensus national standard, the NRC does not do such an analysis. Any further request for such an analysis should be directed to the ANS 56.8 committee.

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resolution of rg MS 021-5 comments

COMMENTS ON OCTOBER 1986 VERSION

REGULATORY GUIDE MS 021-5

Containment System Leakage Testing

A. INTRODUCTION

B. DISCUSSION

BACKGROUND

DISCUSSION OF REGULATORY POSITIONS

1. CONFLICT.

Commentor: BWR Owner's Group

The draft regulatory guide currently endorses ANSI/ANS-56.8-1981. A draft of 56.8 dated September, 1986 is available. The regulatory guide should be updated concurrently with the revision of the standard as appropriate.

Commentor: Atomic Industrial Forum, Inc.

Current evaluations of the source terms and of the leak before break concept are likely to result in change in the containment leak testing within a year or two. When this occurs, 10CFR50, Appendix J, the companion Regulatory Guide, and ANSI/ANS-56.8 will all need major change. Under this scenario the most reasonable approach to this draft Regulatory Guide is to defer it until a more long term view is possible.

Commentor: Commonwealth Edison

Examples of the potential waste of resources are provided by some aspects of the proposed Regulatory Guide which would accompany the new Appendix J. That Reg. Guide would include several minor contributions to leak rate analysis including: daily leak testing rig calibrations, local leak testing instrument error correction and valve directionally leak testing requirements. It would be wasteful to now require the expenditure of resources on these minor 1 or 2% effects when we believe that the new source term study will show that the public health and safety is adequately assured by maximum allowable containment leakrates (La) many times larger than those currently permitted.

This proposal can be implemented by ensuring that the new version of Appendix J:

4) References as mandatory, a complete and acceptable ANSI standard in lieu of the Reg. Guide. (Any referenced standard should have undergone a thorough and complete cost-benefit/backfit analysis.)

Commentor: TU Electric

With exception of the recommendations noted below, incorporation of ANSI/ANS-56.8 and associated Regulatory Guide positions into the existing Appendix J program at TU Electric should have minimal program impact. Portions of

ANSI/-ANS-56.8 are already in use at TU Electric. It is anticipated and recommended that the draft Regulatory Guide be revised to endorse the recently approved 1987 edition of ANSI/ANS 56.8 so as to minimize the number of exceptions taken and incorporate current industry and TU Electric comments.

Commentor: Georgia Power

Regulatory Guide MS021-5, referenced by the proposed rulemaking, requires the use of the extended ANSI method. This method is complex, ambiguous, and may be difficult to apply. The limits that it imposes on the verification tests are unrealistic and the predict ability of the results has been questioned.

The draft Regulatory Guide only permits "time forward" for the restart of a type A test. This limitation could excessively delay test conclusions when using present day test equipment and experienced test personnel, possibly resulting in an adverse impact to outage durations.

Commentor: American Nuclear Society

The regulatory guide should reference ANSI/ANS 56.8-1987.

Commentor: Lynne Goodman

The scope of the changes which will be required by this guide go considerably beyond corrections and clarifications. The impact will be felt the most at the smaller, older plants, where the staff size is smaller and the plants were built before the general design criteria.

Commentor: Lynne Goodman

It is somewhat difficult to use the regulatory guide, since it requires going back and forth from reg guide to standard. One document including all the the requirements would be easier to use.

Commentor: Stone & Webster Engineering Company

There will be a need for an implementation statement to be contained in subsequent revisions of the Regulatory Guide.

2. TYPE A TEST REQUIREMENT.

Commentor: Atomic Industrial Forum, Inc.

If, in spite of this, the draft change effort is to go ahead, it should endorse ANSI/ANS-56.8 standard without so many additional unneeded and confusing requirements. These additional requirements would require expenditure of resources on minor 1 or 2 % effects when source term studies show that the public health and safety is adequately assured with a maximum allowable containment leakrate (La) that is many times larger than currently permitted. Also, the "Extended ANSI Method" prescribed in the Draft Regulatory Guide adds two new conditions for passing a Type A test which are unnecessarily stringent. Although the scope of the revision to the 10 CFR 50 Appendix J is stated to exclude new criteria, the extended ANSI method in the Draft Regulatory Guide is, in effect, the addition of new criteria for the termination of a successful test.

Commentor: Duke Power Company

We do not feel that the additional requirements of the draft regulatory guide are warranted and should be deleted prior to final issuance of these two documents. Please see our detailed comments on the draft regulatory.

3. PRESSURIZING CONSIDERATIONS.

Commentor: Lynne Goodman

The addition of the recommended containment atmosphere stabilization criteria considerably complicates the conduct of the test. The formulas are such that a feel for whether or not the criteria are met would be hard to experience. The calculations will need to be performed by computer and could not be done by hand in the event of a computer failure. I do not think the benefit gained is worth the extra complication. Possibly, as an alternative, the licensee could have a choice between a 24 hour test or meeting these criteria.

Commentor: Stone & Webster Engineering Corporation

This position is in conflict with Paragraph III.B.(1).(b) of the proposed rule set forth at 51FR39543 which permits inflatable air lock door seals to remain pressurized during the Type A test provided that corrections for in-leakage are taken into account. It is recommended that this portion be clarified to allow for this option.

4. LIQUID LEVEL MONITORING.

5. TYPE A TEST FREQUENCY.

6. VERIFICATION TEST.

7. DATA REJECTION.

8. TYPE B AND C TEST PRESSURES.

Commentor: Tennessee Valley Authority

Page 4, item 8 - The design of the airlock doors at Sequoyah and Watts Bar Nuclear Plants precludes testing the door seals at Pac.

9. TYPE B AND C TEST SCHEDULE.

10. TEST MEDIUM AND WATER-FILLED SYSTEMS.

11. CALIBRATION.

12. CONTAINMENT ATMOSPHERE STABILIZATION.

13. DATA RECORDING AND ANALYSIS.

14. TEST MEASUREMENT.

15. ABSOLUTE TEST METHOD.

16. REPORTING OF RESULTS.

17. FLOW RATE (AIR, WATER, NITROGEN).

18. WATER COLLECTION.

19. VACUUM RETENTION.

20. RECORDING OF LEAKAGE RATES.

C. REGULATORY POSITION

1. CONFLICT.

Commentor: Wisconsin Electric Power Company

We agree and believe that this is an important point to make.

Commentor: TU Electric

Three areas of direct conflict are noted between the proposed Appendix J and ANSI/ANS-56.8. The areas are Type A test frequency, the acceptance criterion for Type B and C tests, and the pressure for hydraulic tests. As noted earlier, the proposed revision to Appendix J specifies a four year Type A test interval, whereas ANSI/ANS-56.8 allows five years. Obviously the five year interval is preferred. Recent emphasis on Type B and C testing, corrective action plans, and increased Type A test frequency for failures would substantiate the five year interval.

Another item of conflict concerns the acceptance criterion for Type B and C results. To be acceptable, ANSI-56.8 requires the combined leakage rate plus standard deviation of the leakage rate to be less than 75% of the maximum allowed leakage La. The proposed Appendix J requires the combined leakage rate to be less than 0.60 La at all times. As noted in the Appendix J discussion, the current TU Electric Type C valve programs are structured around an "As Left" leakage limit of 0.60 La. The implicit impact on Type A test results and related changes proposed for Appendix J dictates the use of the conserva-tive criterion of 0.60 La until such time that sufficient justification is available for an increase to the ANSI/ANS-56.8 criteria.

The final area of conflict concerns the test pressure and requirements for water testing. Appendix J requires a test pressure of 1.1 Pa whereas ANSI/-ANS-56.8 specifies a pressure of Pa. Independent of the test pressure used for water testing, leak test requirements and their associated basis must be made part of Technical Specifications and approved by NRC staff. Obviously, test pressure requirement will be established and justified as part of the Technical Specification revision process. Substitution of water testing for pneumatic testing is somewhat nebulous because neither the proposed revision to Appendix J nor the draft Regulatory Guide state the requirements of a "qualified water seal system".

2. TYPE A TEST REQUIREMENTS.

Commentor: Alabama Power Company

Of particular concern to Alabama Power Company is the NRC intent to adjust the Type A test results with the results of the Type B and C testing. The Type A test allows for testing of containment integrity in a manner which tests the actual design of the plant in a configuration similar to that which would be seen in a postulated accident. The proposed change to Appendix J would negate this actual design configuration by introducing artificialities into the test results by use of adjustments. Any such adjustments are not based on established technical information. To combine the Type B and C test results to the Type A test results will add additional and unnecessary conservatism to an already conservative criteria. This combination is considered to be a redefinition of the Type A test for which the original design of the plant was, in part, based.

Commentor: BWR Owner's Group

The stated position requires that test instrument error be included in the local leakages used to correct Type A test results. Inclusion of this in the calculations and report would have negligible effect on the overall results, i.e. from .00001 to .0001 La.

Commentor: GPU Nuclear

1) Position 2 - Type A Test Requirements states that the instrumentation system error shall be included in the leakages, but does not define how this is to be done. Equation 2.13 of the appendix seems to be a way to do this. How is this instrumentation error to be applied to the leakage?

Presumably this will cause a change in the calculation of the reportable leakage. It is assumed that the change will not be major as the ISG calculation is already performed in the ILRT code.

2) Section 3.2.4 of the ANSI 56.3 standard indicates that the confidence limit calculation adequately accounts for instrument errors in the leakage measurement system. Does Position 2 change this?

Commentor: Wisconsin Electric Power Company

2. We agree with this point but believe that one of the referenced paragraphs, 3.2.1.3 of ANSI/ANS 56.8-1981, requires further change. The first sentence of this paragraph should be replaced with the following:

The containment isolation system functional test should be conducted prior to the Type A test. Those systems whose lineups must be altered to support the Type A test must have their Type B and C tests completed prior to the Type A test. The remainder should be conducted after the Type A test.

This method is recommended because it performs the Type A as close to the "as found" condition as possible. This means that the Type A test must be performed early in the outage, but it is the best way to determine the true "as found" integrated leak rate as required by 10 CFR 50 Appendix J.

Commentor: Commonwealth Edison

This position requires the inclusion of instrument system error in the local leakages used to correct Type A test results. Inclusion of this small effect in the calculations and reports cannot be justified because local leak testing equipment typically is accurate to only a few percent. Moreover, the inclusion of such small effects is not justified when results of the new source term study indicate that our current allowable leakrates are already much too conservative. Therefore, because this requirement would not benefit public safety, it should be deleted.

Commentor: TU Electric

Although not expressly stated, it is assumed that this requires the Type B and C leakages that are added to the Type A test results be based on minimum pathway and include instrument error. Although rewording is required for explicit clarity, the requirement is consistent with proposed Appendix J changes and Type A testing at TU Electric.

Commentor: Baltimore Gas & Electric

This position requires the inclusion of instrument system error in the local leakages used to correct Type A test results. Inclusion of this small effect in the calculations and reports cannot be justified because local leak testing equipment typically is accurate to only a few percent. Moreover, the inclusion of such small effects is not justified when results of the new source term study indicate that our current allowable leak rates are already much too conservative. Therefore, because this requirement would not benefit public safety, it should be deleted.

Commentor: Wolf Creek Nuclear Operating Corporation

The second sentence of paragraph 3.2.1.3 of ANSI/ANS 56.8-1981 should be deleted. Wolf Creek Nuclear Operating Corporation (WCNOC) opposes factoring Type B and C tests into Type A test results for the following reasons:

1. It is impractical to tie the Type A tests and Type B and C tests together. The "integrated" test and the "local"tests will expose some leakage paths to test pressure P_{ac} under both conditions, i.e. those penetrations designed in accordance with GDC 56, while penetrations designed in accordance with GDC 55 and 57 will normally be exposed to test pressure under one but not both test conditions.

2. The Type A test measured leakage rate is conservative. During the performance of a Type A test, all penetrations designated as Type A, are exposed to containment atmosphere. This leakage rate is not credible during postulated accident scenarios due to the principle of single-failure-criteria. The Type B and C reported leakage rate is also conservative. As for Type A penetrations, the reported leakage rate is the summation of all penetrations and this is more conservative than is the principle of single-failure criterion. Additionally, the individual penetration leakage reported is the maximum pathway leakage rate, adding more conservatism to the reported total Type B and C leakage rate.

3. The Type B and C leakage rate acceptance criteria of $0.60L_a$ is met and the total leakage rate attributed to Type B and C penetrations is accounted for and procedurally tracked at all times. Wolf Creek Generating Station (WCGS) maintains a sum of all leakages below the 50% of $0.60L_a$ as recommended in EPRI NP-2726, "Containment Integrated Leak-Rate Testing Improvements". This provides a high level of confidence that any one isolation valve or penetration will not disproportionately

contribute to containment leakage.

4. Single-failure-criteria precludes the possibility of failure of both a penetration designated as Type A and a penetration designated as Type B or C. Design parameters used to meet single-failure-criteria coupled with acceptance criteria already established for both Type A testing, and Type B and C testing provides an exceedingly high level of confidence that exposure limits as specified in 10 CFR 100 are not exceeded during a postulated accident.

5. The method for adjusting a Type A test for the Type B and C tests described in the proposed rule on Leakage Rate Testing of Containments of Light-Water-Cooled Nuclear Power Plant (51 FR 39539) would penalize a utility for reworking a penetration whose isolation valves are not exposed to containment pressure during the conduct of a Type A test.

Commentor Yankee Atomic Electric Company

No basis is provided either in this proposed regulation or associated draft regulatory guide (MS 021-5) for limiting the summation of all "as-found" leakages to 60% of the limit. One can speculate that the reason is 40% of the leakage limit is not measured by Type B and C testings. This being the case, one would expect the Type A test result to be greater than the summation of Type B and C test results by some substantial fraction of the 40%. Reported test results do not generally support this assumption. The requirement for "maximum pathway leakage," especially for "as-found," is excessive in that it assumes that in every case where there are two barriers (or more) in series, the most leak-tight barrier has failed, even where these are passive barriers such as double seals or O-rings. An additional penalty is imposed by the requirement to add to the total B and C leakage that leakage measured by a continuous leakage monitoring system which may already be accounted for in the B and C leakage.

We suggest the following approach for your consideration:

0 Acceptance Criteria For "As-Found" Conditions

Measure leakage rates for individual barriers in series and report "as-found" leakage based upon "minimum pathway" leakage.

0 Acceptance Criteria for "As-Left" Conditions

Report "as-left" leakage based upon "maximum pathway" leakage and document corrective actions performed between "as-found" and "as-left" conditions.

In this manner, credit is allowed, for barriers that are functional at time of testing, documents corrective actions taken to maintain leakage as low as is reasonable and provides assurance that the containment will function as designed, if required, after test completion.

3. PRESSURIZING CONSIDERATIONS.

Commentor: BWR Owner's Group

This regulatory position should identify an exception for components (i.e., valves) with inflatable seals using air or nitrogen as the pressure medium.

Commentor: System Energy Resources, Inc.

The regulatory position and Paragraph 3.2.1.7 of ANSI/ANS 56.8 1981 do not consider potential sources of gas leakage which cannot be isolated or vented because they are essential to containment sealing. The inflatable door seals on the containment air locks at Grand Gulf Nuclear Station (GGNS) and at some other plants are required to be pressurized above Pa for sealing the doors. Portions of the seal system are located inside the containment boundary. These systems are not designed as continuous leakage monitoring systems (see Comment 2 on Paragraph III.B.(1).b of the proposed Appendix J Rule Revision in Attachment 1). This regulatory position should address non-isolable pressure sources. Commentor: Atomic Industrial Forum, Inc.

Inleakage should be allowed if it can be properly accounted for. For example, the inboard MSIVs at some plants have pneumatic accumulators which aid in their closure. The inleakage could easily be accounted for, but under this section they would have to be vented and drained.

Commentor: Wisconsin Electric Power Company

The second paragraph of 3.2.1.5 of ANSI/ANS 56.8-1981 states, "Systems that are required for proper conduct of the test or to maintain the plant in a safe condition during the test shall be operable in their normal mode and need not be vented or drained." Paragraph 3 of the regulatory guide, which prohibits gas sources in containment, seems to contradict this statement because some of the systems needed to maintain the plant in a safe condition are gas systems. At Point Beach Nuclear Plant, we must have either instrument air or a temporary gas source to the power operated relief valves. Our technical specifications require that they be operable to maintain pressure relief capability of the reactor coolant system.

We also believe that it is better to keep the safety injection accumulators pressurized throughout the test. If they are vented, nitrogen gas that has been dissolved in the boric acid solution will continue to come out of solution for some time. These gas additions to containment could not be measured and may introduce a significant error to the test. For these reasons, we believe that this paragraph of the regulatory guide should state the gas sources that are needed for reactor safety or for proper conduct of the test may be kept in operation if monitored for leakage into containment and factored into the test results.

Commentor: Bechtel Western Power Corporation

Inleakage, if properly accounted for, should be allowed.

Commentor: TU Electric

TU Electric is in agreement with this Regulatory Position. However, inleakage if properly accounted for should be allowed.

Commentor: Georgia Power

Inleakage should be allowed if leakage rates can properly be accounted for. For example, the inboard MSIVs may have pneumatic accumulators which aid in their closure. The inleakage could easily be accounted for, but under this Section they would have to be vented and drained.

Commentor: Baltimore Gas & Electric

Inleakage should be allowed if it can be properly accounted for.

Commentor: Wolf Creek Nuclear Operating Corporation

This position is basically acceptable. There is a discrepancy between the regulatory position and the discussion of the regulatory position. The position on page 8 requires that all sources of gas leakage "shall be" isolat-ed. The discussion on page 3 says "where possible" such lines need to be iso-lated. For Technical Specifications or operational reasons, it is not always desirable or possible to isolate all lines. In light of this, changing "shall be" to "should be" in the regulatory position would be beneficial. Any leak-age from these lines into Containment would have to be documented and the Type A results would have to be adjusted accordingly.

Commentor: Wisconsin Electric Power Company

We believe that Paragraph 3.2.2 of ANSI/ANS 56.8-1981 should be modified to specifically allow reduced pressure testing and should be referenced in the regulatory guide. This paragraph specifies that the Type A test pressure should be equal to or greater than accident pressure (P_{ac}). The current regulations allow testing at pressures at one half of P_{ac}, and we believe that there are several good reasons for continuing reduced pressure testing. First, the density of the containment atmosphere at reduced pressure is very close to that of the steam-air mixture that would be present in an accident. The flow rate of a compressible fluid through a penetration is affected by fluid friction, which is density dependent. Secondly, many penetrations have resilient seals and many valves are installed so that higher containment side pressure seals them tighter. This can make a full pressure test less conservative than a reduced pressure test. In fact, the actual pressure in an accident will reach P_{ac} for only a second and will be greater than one-half P_{ac} for less than nine minutes at our Point Beach Nuclear Plant. This is typical of most nuclear containments. For these reasons, the reduced pressure test may be a better model of the post-accident conditions in the containment. Since the purpose of the test is to ensure that containment leakage will re-main below the allowable limit in an accident, the reduced pressure test should be permissible.

Commentor: Wolf Creek Nuclear Operating Corporation

Additionally, WCNOC believes that paragraph 3.2.2 of ANSI/ANS 56.8-1981 should be revised to allow for reduced pressure testing and should be refer-enced in the regulatory guide. This position is based upon the following:

1. The Type A test pressure change described in Item 5 of the proposed rule on 10 CFR 50 Appendix J (51 Fr 39539) is not believed to be a prudent change. The statement "This change reflects the opinion that extrapolating low pressure leakage test results to full pressure leakage test results has turned out to be unsuccessful" appears to be an unsubstantiated statement when applied to Pressurized Water Reactors (PWRs). It is believed that the reduced pressure test is more conservative for PWRs since many leakage barriers, such as euipment hatches and air locks, seal tighter with higher pressure.

2. WCNOC performed an evaluation using accident analysis parameters defined in Updated Safety Analysis Report Chapter 6. Results of the evaluation indicate that Integrated Leakage Rate Testing at reduced pressure would produce containment conditions more closely matching that which would exist under design basis accident (DBA) conditions for leakage considerstions than testing at the DBA peak pressure.

   One factor that supports this reduced pressure testing is the similarity in densities. Air density difference would affect leakage flow rates. Containment air density at reduced pressure testing conditions more closely resembles the containment densities experienced in a DBA. Another factor which supports performance of a reduced pressure test program is the existence of choked flow conditions in containment during part of the DBA. Comparison of the choked flow conditions experienced during a DBA with the peak and reduced pressure tests indicates that the choking conditions at the reduced pressure test would more closely match that of a DBA.

3. The reduced pressure test is as mathematically sound as the full pressure test. The data collection process for a reduced pressure test continues until the same confidence level is met as that for a full pressure test.

4. Equipment inside containment as well as the containment structure itself is not subjected to the high stress levels associated with a full pressure test. Therefore, the level of confidence in the equipment to perform its safety function during a postulated accident is increased.

4. LIQUID LEVEL MONITORING.

Commentor: TU Electric

The proposed deletion in paragraph 3.2.1.8 is endorsed, however, it should be realized that only the last paragraph provides guidance for containment free volume corrections. In those cases where an initial and a final level reading are used, current guidance in ANSI/ANS-56.8 is not specific and would allow a post test data adjustment based on a variety of methods and assumptions. For levels lacking adequate instrumentation, determination of when the level change occurred is not possible. Changes that occurred only during test pressurization, depressurization, instantaneously or progressively, would all have a different impact on the test results. TU Electric has interpreted paragraph 3.2.1.8 to allow an analysis of level change with analytical results incorporated into test data. This analysis and possible test result adjustment for all level changes that impact containment free volume will probably be done in a post test situation.

5. TYPE A TEST FREQUENCY.

Commentor: Duke Power Company

The test frequency in ANSI/ANS-56.8-1981 is in direct conflict with the proposed Appendix J revision. These types of problems should be corrected prior to approval of either document. Test frequency change will require a tech spec change.

Commentor: TU Electric

TU Electric is in total agreement with this exception proposed by the Regulatory Position.

Commentor: American Nuclear Society

Required test interval should be identified in the regulatory guide.

Commentor: Wolf Creek Nuclear Operating Corporation

WCNOC agrees with the regulatory position but believes that paragraph 3.2.3 of ANSI/ANS 56.8-1981 requires additional changes. Paragraph 3.2.3 indicates a five year limit on the interval between periodic Type A tests and Section III. A(3) of the proposed Appendix J of 10 CFR 50 requires a four year limit on the test interval.

6. Verification Test.

6.1

Commentor: GPU Nuclear

Position 6.1 indicates that a plot is able to be generated of the masses and/or the leakage rates in which the verification results are a direct extension of the Type A test line. Also, the Type A test period should not be ended a significant period of time before the Verification test begins.

This position indicates that it may be desired for the calculation of the leakage rate during the first five sets of the Verification test to be calculated using Type A test data and data from the induced leak setup period, rather than have the leakage set to zero until five sets of Verification data have been collected and statistics can be calculated. This would allow a continuous plot to be generated including the Type A and Verification test periods.

The position imposes requirements on those running the test, but there should be only small changes to the code to calculate leakage rates as defined in the pervious paragraph. Once calculated in this manner, plots can be generated using existing functions as desired.

Commentor: Tennessee Valley Authority

Pages 8 and 9, item 6.1 - In some cases, the time duration from the end of the Type A test to the start of the verification test can be several hours. This data should not be included in the Type A test data. During this time, stable conditions are being established for the start of the verification test. Data taken during this time period does not reflect either the Type A test conditions, since a leak has been superimposed, or stable conditions for the verification test.

Commentor: Commonwealth Edison

Zero-pressure testing should not be required. Zero-pressure testing requires over four hours of critical path time but yields no additional useful information. Zero-pressure testing has never been shown to be useful by any valid technical study. Because zero-pressure testing is technically flawed, it should be abandoned.

(3)

Commentor: Wisconsin Electric Power Company

The purpose stated here for the verification test is not consistent with the current Appendix J, the proposed Appendix J, or the past interpretation of some regional inspectors. The inspectors interpret the verification test as a quality check on the data and measured containment leakage. The current Appendix J states that the supplemental test is done to verify the accuracy of the Type A test. The proposed Appendix J states the purpose is to confirm the capability of the Type A test method and equipment to measure the maximum allowed leakage rate. We recommend that the definition in the current Appendix J be used in this regulatory guide.

(4)

Commentor: Wisconsin Electric Power Company

(4) This statement allows for a straight line that does not stabilize within the mass change acceptability band. Inspectors require stabilization of the leakage rate or change in mass within the band. A linear regression fit line may be in the band while the actual data is out. Furthermore, this statement is vague and could cause misunderstanding between inspectors and licensees. A definite period of time or number of data points should be specified rather than just saying "sufficient points". A one-hour time period would be appropriate here.

(5)

Commentor: BWR Owner's Group

In some cases the time duration from the end of the Type A test to the start of the verification test can be several hours. During this time, stable conditions are being established for the start of the verification test. Data taken during this time period does not reflect either the Type A test conditions, since a leak has been superimposed, or stable conditions for the verification test. This data should not be included in the Type A test data.

Commentor: System Energy Resources, Inc.

The supplemental Paragraph (5) should be changed to the following:

"(5) The start time for the verification test should be as soon as the new test conditions have stabilized for the verification test following each Type A test."

Commentor: Northeast Utilities

Items (5) and (6) should not be added , as the Items (5) and (6) period between the Type A test and the verification test is needed to prepare for the verification test. In addition, RCS adjustments may be done during this time period.

Commentor: Stone & Webster Engineering Corporation

With respect to the start time addressed in Position Paragraph 6.1(5), the start time for the verification test is generally one hour after the superimposed flow has been established, or until this self-induced perturbation has decayed out. It is recommended that this position be clarified to start the induced flow as soon as possible after the Type A test and start the verification test as soon as possible after the induced flow perturbation has stabilized.

Commentor: Duke Power Company

This position requires the verification test to be coupled to the Type A test without allowing a period of time to set up the verification. This is unreasonable and should be reconsidered by NRC.

Commentor: TU Electric

TU Electric uses a superimposed leak method for the Type A verification test. Proposed Regulatory Positions are endorsed subject to the following clarifications. The purpose of the verification test is to verify the ability of the Type A test to accurately measure/determine leakage rates approaching La. It is interpreted that prerequisites such as establishment of a stable verification test leakage and containment atmospheric sampling requirements for discharge are acceptable justifications for data acquisition interruptions.

(6)

Commentor: System Energy Resources, Inc.

The supplemental Paragraph (6) should be changed to the following:

"(6) Data acquisition should not be interrupted without justification from the end of the successful Type A test to the start of the verification test. In some cases, this period of time could be several hours and should not be considered to be part of either the Type A test or the verification test. Data acquisition should also not be interrupted without justification from the start to the finish of the verification test."

Commentor: Atomic Industrial Forum, Inc.

The period of time between the end of the Type A test and the verification test should not be considered part of the Type A test. In the past this time has been used to take reactor water samples, air samples, and add makeup water to the reactor vessel. These activities could significantly disturb the containment atmosphere. Stable conditions must be established for the start of the verification test. To include this additional time as part of the Type A test adds an unwarranted penalty.

Commentor: Georgia Power

The period of time between the end of the type A test and the verification test should not be considered part of the Type A test. In the past, this time has been used to take reactor water samples, air samples, and make up water to the reactor vessel. These activities could significantly disturb the contain-ment atmosphere and to include this as part of the Type A test adds an unwar-ranted regulatory penalty.

Commentor: Baltimore Gas & Electric

The period of time between the end of the Type A test and the verification test should not be considered part of the Type A test. In the past this time has been used to take reactor water samples, air samples, and add make-up water to the reactor vessel. These activities could significantly disturb the containment atmosphere. Stable conditions must be established for the start of the verification test. To include this additional time as part of the Type A test adds an unwarranted penalty.

Commentor: Bechtel Western Power Corporation

6.1(6) The containment atmosphere may have been disturbed significantly by sample taking or other activities at the end of the test. To include this additional time adds an unwarranted penalty. Data should be collected during this period, and reported if necessary to show the disturbance.

Commentor: Georgia Power

The period of time between the end of the Type A test and the beginning of the verification test is not required as specified in 6.1.(6).

Commentor: Atomic Industrial Forum, Inc.

There should not be a requirement to use a data point between the end of the Type A test and the beginning of the verification test as specified in item 6. 1(6). This should be clarified by adding "of the official Type A test " to the end of the sentence.

Commentor: Baltimore Gas & Electric

There should not be a requirement to use a data point between the end of the Type A test and the beginning of the verification test as specified in 6.1(6).

(7)

Commentor: Bechtel Western Power Corporation

6.1(7) This section should allow deletion of data sets not representative of Lam, such as water inventory changes or air sampling done between the end of the Type A test and the beginning of the verification test.

7. DATA REJECTION.

Commentor: Duke Power Company

There is no justification to continue recording data from a sensor that has undoubtedly failed. However, this position requires this to be done.

Commentor: TU Electric

All data obtained from test sensors including data rejected by faulty sensors will be recorded and evaluated as required during post-test data analysis. Specific sensor rejection criteria, and statistical data rejection techniques will be addressed or referenced in the summary test report submitted pursuant to the requirements of 10CFR50 Appendix J Section VI.

8. TYPE B AND C TEST PRESSURES.

Commentor: BWR Owner's Group

In most BWRs, the Main Steam Isolation Valves (MSIVs) are local leak rate tested by pressurizing the volume between them. This results in the inboard valve being tested in the reverse direction. Testing the MSIV at full design basis accident pressure would lift the seat of the inboard valve, and therefore these valves are tested at a reduced pressure.

To test the inboard valves in the accident pressure direction, some BWR's must remove the drywell and reactor vessel heads to install plugs. Therefore, a requirement of full pressure testing could be implemented only after backfits.

Commentor: Commonwealth Edison

At almost all Boiling Water Reactors ("BWR"), the main Steam Isolation Valves ("MSIV") are angle valves. They are leak tested locally by pressurizing between them. Testing the MSIV at full pressure would lift the inboard valve. Therefore, a requirement of full pressure testing could be implemented only after major backfits. Such backfits could not be justified under the backfit rule.

Commentor: TU Electric

TU Electric is in agreement with this exception proposed by the Regulatory Guide.

9. TYPE B AND C TEST SCHEDULE.

Commentor: Alabama Power Company

The provision for increased Type B and C testing as a result of Type A failures is also not technically justified. The current Appendix J rule requires Type B and C testing and has established an acceptance criteria of 0.6 La. This acceptance criteria includes an allowance for degradation during operation. Since existing requirements provide sufficient margin to ensure that containment leakage is minimal and the NRC is furnished detailed test reports, no additional requirements are needed. In addition, Farley Nuclear Plant is currently utilizing 18 month fuel cycles. Any additional Type B and C testing required by an overly conservative application of Type A test results could require plant shutdowns for the sole purpose of testing.

Commentor: Atomic Industrial Forum, Inc.

This regulatory position allows Type B and C testing intervals to exceed two years if containment integrity is not needed. This position is in conflict with the proposed rule, Appendix J, sections III.B(1)(a) and III.C(1). However, we prefer the draft Regulatory Guide position which is more reasonable.

Commentor: Commonwealth Edison

These two positions would permit the test intervals to be extended during periods when containment integrity is not required. Such an extension provision has long been needed and would remove the need for many of the current requests for exemptions from Appendix J. Unfortunately, these positions are in direct conflict with sections III.A.3 and III.B.1 of the proposed Appendix J. Accordingly, these sections of Appendix J should be amended to provide for the extension of test intervals.

Commentor: TU Electric

This Regulatory Guide position provides clarification of regulatory requirements and is endorsed by TU Electric.

10. TEST MEDIUM AND WATER FILLED SYSTEMS.

Commentor: TU Electric

TU Electric agrees with this assumption. Commentor: Lynne Goodman

I disagree with the proposed regulatory guide item 10. To me it is apparent that the accident referred to in the first sentences of the standard section 3.3.5(b) and 6.4 is a LOCA. Additionally, I feel an approximate conversion of water leakage to air leakage should be made, so it can be considered part of the 60 percent La.

11. CALIBRATION.

11.1

Commentor: Bechtel Western Power Corporation

By applying this rule, LLRT instrumentation must be calibrated to NBS standards every day, or at frequencies which will assure minimum retest liabil-ity.

Commentor: BWR Owner's Group

For instruments related to Type B and C tests, this may result in considerable hardship. Many of the flowmeters cannot be calibrated onsite and must be sent to an outside laboratory for calibration. Due to scheduling policies of these labs, there may be a turn-around time of several weeks during which the instruments are off site and unavailable for use. Since these instruments are generally needed throughout an outage, there could be a significant impact on an outage schedule.

Commentor: Atomic Industrial Forum, Inc.

Instrumentation used for Type B and C tests should not be required to have a semiannual calibration. Some instruments are currently on a one-year calibration cycle. Many of the flowmeters cannot be calibrated on-site and must be sent to an outside laboratory for calibration.

Commentor: Duke Power Company

In-situ calibrations of instrumentation should not be required. The only requirement should be to verify there is no installation error. This can be done by attaching dummy loads to the data acquisition system to verify there is no error introduced in the system. This can be done in-situ with no impact of test duration.

Commentor: Tennessee Valley Authority

Page 10, item 11.1 - Instrumentation used for Type B and C tests should not be required to have a semiannual calibration. If an instrument is used within its calibration cycle and is not found out of tolerance on its subsequent calibra-tion, its use should not be restricted to a six-month period. Some instruments are currently on a one-year calibration cycle.

Commentor: Commonwealth Edison

These requirements for instrument calibration are unnecessary. Experience shows that the instruments are very reliable and stable. Instruments sent out for recalibration after storage for years prior to a test usually meet calibration standards in their as found condition. Instrument failure almost always has been due to the failure of a cable or connector; not calibration errors. Therefore, instrument failure modes are easily observed because they cause a rather obvious massive failure. These circumstances show that the calibration requirements would not substantially improve instrument precision. Accordingly, the calibration requirements should be deleted.

Commentor: TU Electric

11.1 & 11.2 The intended pretest instrumentation calibration philosophy of the Regulatory Positions is to perform a calibration within six months of the test in addition to an in-situ check one month prior to the test. To provide additional clarity, TU Electric recommends that Regulatory Position 11.2 explicitly state performance of an in-situ check.

Commentor: Baltimore Gas & Electric

Instrumentation used for Type B and C tests should not be required to have a semi-annual calibration. If an instrument is used within its calibration cycle and is not found out-of-tolerance on its subsequent calibration, it use should not be restricted to a six-month period. Some instruments are currently on a one-year calibration cycle. Many of the flowmeters cannot be calibrated on-site and must be sent to an outside laboratory for calibration.

Commentor: Wolf Creek Nuclear Operating Corporation

Paragraph 4.2.2 of ANSI/ANS 56.9-1981, as modified by regulatory position 11.1, defines the instrumentation calibration requirements for Type A, B, and C tests, paragraph 4.2.4 does not. Paragraph 4.2.4 covers calibration checks for instruments used during Type B and C tests, and paragraph 4.2.3 similarly covers calibration checks for instruments used during Type A tests. The concepts of calibration and calibration check should not be used interchange-ably.

11.3 CALIBRATION

Commentor: Lynne Goodman

Regarding calibration of leak rate test equipment, I feel having to calibrate type B and C test equipment daily when is use is not practical. The standard is not clear on this matter. I would agree if a requirement was established similar to that for the type A test, requiring calibration within a specified interval of the tests. If the equipment had to be calibrated daily, it could involve time consuming decontamination daily and so have a significant impact of the test scheduling. Regarding the proposed check of type A test equipment prior to ILRT, I feel the time interval should be two or three months, not one month. The proposed (item 11.2) one month period would not allow for much slip in the test schedule. If the outage schedule slipped a few weeks, the one month requirement could result in the check having to be reperformed, which would involve more dose to personnel. If two or three months were allowed, this would build in some schedule flexibility without having the instrumentation check performed many months before use.

Commentor: BWR Owner's Group

A requirement for the daily calibration of Type B and C test instruments would present a significant impact on testing efforts. This is particularly true for test rigs that use rotometers. Calibration of rotometers is time consuming and in some cases, cannot be accomplished onsite. Calibration intervals should be based on the type of instrument used and the respective manufacturer's recommendation. In addition, there are already frequent and in many cases daily "checks" on instruments and it is not clear that daily "calibration" is necessary or justified.

Commentor: Systems Energy Resources, Inc.

To require calibration (not just calibration check) of all Type B and C test instruments on a daily basis would place undue hardship on utilities. This requirement would require each utility to purchase large numbers of additional pressure gauges, rotometers, thermometers, etc., to replace those that were being calibrated and to expend additional manpower to calibrate the instruments. For many plants the instruments (rotometers) cannot be calibrated on-site and must be sent to outside laboratories for calibration. Due to scheduling policies of these labs there may be a turn-around time of several weeks during which the instruments are off site and unavailable for use. As these instruments are generally needed for testing everyday in an outage there could be a significant impact on an outage schedule.

In view of the fact that utilities are required to maintain acceptable calibration programs and evaluate the effects on the plant of any instrument that fails calibration, daily calibration is not justified. This regulatory position should be deleted.

Commentor: Atomic Industrial Forum, Inc.

Substituting the word "calibration" for "calibration checks" in Section 4.2.4 of ANSI/ANS-56.8-1981 may require that LLRT instrumentation be calibrated to NBS standards every day. It is not practical, nor possible in some instances, nor necessary to perform daily calibration on all pieces of equipment used for Type B and C tests. This is particularly true for test rigs that use rotometors. Calibration of rotometers is time consuming and, in some cases, cannot be accomplished onsite. If an instrument is found to be out-of-tolerance or calibration, there are existing measures that can be taken to ensure an accurate leakage rate (i.e.; retests, statistical analysis.)

Commentor: Tennessee Valley Authority

It is not practical, nor possible in some instances, to perform daily calibration on all pieces of equipment used for Type B and C tests. If an instrument is found to be out of tolerance or calibration, there are existing measures that can be taken to ensure an accurate leakage rate (i.e., retests, statistical analysis).

Commentor: TU Electric

Calibration of Type B and C instrumentation shall be performed within established calibration intervals. It may be prudent in certain situations to perform frequent or daily calibration checks. With instrumentation technology available today, devices with longer calibration intervals are readily available. Also many onsite calibration facilities lack adequate flow standards and rely on outside assistance. The Regulatory Position should be modified by requiring calibrations to be performed within owner specified periodic intervals. Trying to force this concept by a simple work substitution is not appropriate and lacks the clarity noted in other Regulatory Positions. Regulatory Position 11.3 is not endorsed by TU Electric. Commentor: Georgia Power

Substituting the word "calibration" for "calibration checks" in 4.2.4 of ANSI/-ANS-56.8-1981 may require LLRT instrumentation to be calibrated to NBS standards every day or at a frequency that would require retests if the instru-ments fail to "calibrate out".

Commentor: Baltimore Gas & Electric

Substituting the word "calibration" for "calibration checks" in Section 4.2.4 of ANSI/ANS-56.8-1981 may require that LLRT instrumentation be calibrated to NBS standards every day. It is not practical, nor possible in some instances, to perform daily calibration on all pieces of equipment used for Type B and C tests. This is particularly true for test rigs that use rotometers. Calibration of rotometers is time-consuming and, in some cases, cannot be accomplished on-site. If an instrument is found to be out-of-tolerance or calibration, there are existing measures that can be taken to ensure an accurate leakage rate (i.e., retests, statistical analysis).

Commentor: Wisconsin Electric Power Company

Parts 11.1 and 11.2 are an improvement of ANSI/ANS 56.8-1981; however, it appears that Part 11.3 has overlooked the distinction between a calibration and a calibration check. Instruments used in Type B and C tests should be calibrated as stated in Paragraph 4.2.2 as modified by Part 11.1 of the regulatory guide. Part 11.3 should be deleted, and Paragraph 4.2.4 should stand as written. It is impractical to perform a detailed calibration on a daily basis, but periodic calibration checks both prior to and following a series of tests are practical and worthwhile.

Commentor: Northeast Utilities

Instrumentation for B and C tests, particularly Items 11.1 and items such as stop watches or thermometers, may remain in calibration for greater than six months. Some flexibility should be allowed.

CYAPCO and NNECO recommend deletion of 11.3 because a calibration check (as opposed to a calibration) is sufficient to routinely assure instrumentation accuracy.

Commentor: Stone & Webster Engineering Corporation

With respect to the position addressed in Position Paragraph 11.3, a channel check or calibration check is not the equivalent to a calibration (reference the Technical Specification definitions). It is recommended that the word "checked" be left in the first two sentences of Paragraph 4.2.4.1.

Commentor: Wolf Creek Nuclear Operating Corporation

Substituting the words "calibration", "calibrations", or "calibrated" for "calibration checks", "checks" and "checked" defeats the purpose of paragraph 4.2.4 of ANSI/ANS 56.8-1981. WCNOC recommends that the substitutions identified in the regulatory position on paragraph 4.2.4 of ANSI/ANS 56.8-1981 not be made.

12. CONTAINMENT ATMOSPHERE STABILIZATION.

Commentor Systems Energy Resources, Inc.

These additional requirements will substantially increase testing time and costs. The effects of transient atmospheric conditions on the final test results depends on the speed of the transient the containment geometry, and the ability of the instrumentation system to respond to transient conditions, i.e., instrument response time. The magnitude of errors induced by transient effect upon the final results are not known. Therefore, it is premature to specify an exact numerical acceptance criteria in the regulations. Rather, the procedures and criteria for dealing with transients should be left up to the judgement of those performing the tests, as long as temperature stabiliza-tion is met.

Commentor: Atomic Industrial Forum, Inc.

These items add new criteria that will require further evaluation and additional software documentation. It is estimated that these additional requirements will substantially increase testing time and costs.

Commentor: Baltimore Gas & Electric

These items (12.1, 12.2, and 12.3) add new criteria that will require further evaluation and additional software documentation. It is estimated that these additional requirements will substantially increase testing time and costs.

12.1

Commentor: GPU Nuclear

Position 12.1 indicates that the 95% UCL of the leakage shall be zero or positive before starting the Type A test. Currently we do not calculate 95% UCL on the leakage, but only on the leakage rate. Does this position relate to leakage rate or is there now a requirement to calculate 95% UCL for leakage? Will a positive or zero leakage rate or 95% UCL leakage rate be sufficient to meet this requirement? Not clear at all how these calculations would be done. Recommend an additional statement as follows:

> "Each interval between temperature readings has a point-to-point change in average temperature and rate of change in average temperature associated with it. The total of these divided by the number of points gives the average change or rate of change."

Commentor: Tennessee Valley Authority

The word "leakage" in the second sentence should be "pressure."

Commentor: Bechtel Western Power Corporation

Is there a time limit for which the UCL should be equal to zero or will a single data set suffice?

Commentor: TU Electric

ANSI/ANS 56.8 section 5.2.1 currently requires a minimum four hour stabilization period and satisfactory temperature stabilization criterion before proceeding with the integrated leakage rate period. In addition, this Regulatory Position recommends that computation of the 95% upper confidence limit (UCL) of containment leakage be performed during the stabilization period to verify an UCL equal to or greater than zero prior to declaring the start of the test. This recommendation is not endorsed by TU Electric and should be deleted. ANSI/ANS 56.8 formulations for the air mass calculation assume uniform temperature. Calculation of the UCL during the stabilization period would use data subjected to atmospheric instabilities. Most tests which initially exhibit a negative value for UCL eventually increase to a positive value and yield satisfactory results. Indication of a negative leakage rate could result from air inleakage or transient temperature variations caused by operational changes to systems. Independent of the cause, TU Electric recommends a case by case approach to evaluate the most effective approach and analysis of negative UCL's. Obviously if the UCL remains negative despite corrective measures the test should be restarted. If the containment is adequately instrumented, volume fractions properly assigned, and stabilization criteria of Regulatory Position 12.2 met then temperature variations will be adequately accounted for in the calculation of containment mass.

Commentor: American Nuclear Society

ANSI 56.8 contains requirements for conducting a type A test in 8 hours including twenty data sets at approximately equal intervals. The consensus of the working group is that the ANS 56.8 criteria is sufficiently conservative. It is recognized by accepting a 95 percent upper confidence limit that there may be 5 percent of the reported results above the reported upper limit. And if the 95 percent UCL is equivalent to 0.75 La then we also accept the fact that 5 percent of the tests may statistically exceed the 0.75 La criteria.

Commentor: Stone & Webster Engineering Company

With respect to the position addressed in Position Paragraph 12.1, the 95 percent upper confidence limit is zeroed for the first three data sets. Thus the test has to be started to collect the data, and the fourth data set checked to be equal to or greater than zero.

12.2

Commentor: Tennessee Valley Authority

Page 10, item 12.2 and page 11, item 12.3 - The criterion for temperature stabilization in paragraph 12.2 is a good definition of stabilization; however, it is too restrictive in respect to the supplemental requirements of paragraph 12.3. Deviations to this during the Type A test should be evaluated. They should not be the basis for satisfactory Type A test completion especially since the requirements for determining the location, quantity, and weighting values are already specified by Regulatory Positions, 7, 11, 13.2, 13.3, 14.1, 14.2, 14.3, and 15. These positions will result in pressures, humidities, and temperatures being representative of the test volume which are necessary for the use of the ideal gas laws to determine the leakage. It will also be noted that the temperature, function $(^{o}t/T)^2$ in equation 2.1 has the least impact on the accuracy of the calculated leakage.

Commentor: Commonwealth Edison

These additional requirements will substantially increase testing time and costs. The effects of transient atmospheric conditions on the final test results depends on the speed of the transient, the containment geometry, and, the ability of the instrumentation system to model transient conditions. The magnitude of errors induced by transient effects upon the final results are not known. The 0.5^{o}F/hr/hr criteria specified may be well below the fastest transient that most plants can handle. Therefore, it is premature to specify an exact numerical acceptance criteria in the regulations. Rather, the procedures and criteria for dealing with transients should be left up to the judgment of those performing the tests. The stability of calculated dry air mass points, and not the average air temperature, is the appropriate evaluation tool. The licensees should establish their own plant specific maximum acceptable scatter of dry air mass points during the test and slope at the end of the test. The verification test is the ultimate indicator of containment stability, especially in PWRs.

Commentor: Bechtel Western Power Corporation

12.2 (b) The statement "...the rate of change of the slope of the temperature versus time curve...averaged over the last two hours." can only be approximated because ILRT data are discrete and not continuous. What approximation is acceptable?

Commentor: TU Electric

These criteria are endorsed by TU Electric. With exception of the temperature limit in criteria (a) these stabilization criteria are based on the short duration test criterion of BN TOP-1. Stabilization criteria of ANSI/ANS 56.8 and BN-TOP-1 are based on empirical observation and experience rather than scientific principles. Their usefulness is dependent on proper instrumentation, weighting fraction assignment, and analysis of containment test data. Regulatory Position 12.2 will replace ANSI/ANS 56.8 requirements, therefore for additional clarity, the Regulatory Position should contain an Appendix similar to Appendix F in ANSI/ANS 56.8.

12.3

Commentor: Bechtel Western Power Corporation

12.3 Can this criterion be used to reject a single data point due to a temperature outlier? Experience points to a conclusion that the temperature is changing to such a great extent the UCL will be unacceptable because of scatter. The paragraph adds another acceptance criterion to all tests.

Commentor: TU Electric

This Position is endorsed by TU Electric and provides allowances for unstable temperature condition identification and correction without impacting test continuation/leakage rate data collection. Instabilities are anticipated at the start of the verification test.

Commentor: GPU Nuclear

The Position 12.3 requirement for meeting stabilization criteria throughout the Type A test and Verification appears to be an unnecessary and burdensome requirement. The two additional conditions on the Mass Point curve slope and data scatter should suffice to assure quality data.

Commentor: Lynne Goodman

I believe that the addition proposed by item 12.3 regarding containment air temperature stabilization will add more work with little benefit. I do not see the need to continue taking and analyzing temperature stabilization data during the type A test. If there is a significant change in temperature, it will be noted by the test coordinator, who can evaluate it at the time.

13. DATA RECORDING AND ANALYSIS.

13.1

Commentor: Wolf Creek Nuclear Operating Corporation

This regulatory position states that additional conditions should be applied to limit nonlinearity and data scatter. This is not necessary. This re-quirement may well be an excessive burden on test performance in both time and in test acceptance. The Type A leak rate test acceptance criteria is now adequately and conservatively defined. Our recommendation is to let para-graph 5.7.4 of ANSI/ANS 56.8-1981 stand as it is, and not implement regula-tory position 13.3

Commentor: Systems Energy Resources, Inc.

This regulatory position should be deleted. It does not improve the data of the Type A test and could cost the utility additional plant controlling time. As long as the recorded data indicates that the Type A test has satisfied all validity requirements, the start time should not be of concern, even if it was not declared until all data collection was completed.

Commentor: Atomic Industrial Forum, Inc.

If the data supports a restart as of "time backward" then it should be al-lowed. Start time should be representative of the actual leakage rate, not a time chosen arbitrarily in the future. As an example, sensor malfunctions may not be apparent after the end of pressurization, and, once the sensor is deleted from calculations, the leakage rate appears stable and acceptable. In such a case, the early elapsed time that has passed should be allowed to be included in the test.

Commentor: Duke Power Company

Position 13.1 says that after a start time is selected it is not subject to change. Then the next sentence tells how the time may be changed. This paragraph is contradictory and should be changed. The start time should be subject to change in any direction and any rule to the contrary without further justification is unreasonable.

Two statistical tests of the airmass vs. time data are introduced in the proposed regulatory guide MS-021-5. The first test is intended to set an upper limit on curvature of the data, and the second an upper limit on the scatter of the data.

These tests are presented as equations 1.1, 1.2, and 2.1 in the proposed regulatory guide. To facilitate evaluation condition ratios a1, a2, and b were derived from the above equations using:

$$a1 = \frac{\text{left hand side of equation 1.1}}{\text{right hand side of equation 1.1}}$$

$$a2 = \frac{\text{left hand side of equation 1.2}}{\text{right hand side of equation 1.2}}$$

$$b = \frac{\text{left hand side of equation 2.1}}{\text{right hand side of equation 2.1}}$$

The acceptance criteria for the statistical tests in terms of a1, a2, and b are:

1. a1 and/or a2 less than 1

2. b greater than 1

These ratios were then generated and plotted for each data reading of three actual Type A tests using an inhouse generated Lotus 123 macro routine. The resulting plots (attached) show the pass-fail condition of these previous tests through the 24 hours in which they were conducted.

Upon examination of these plots one notes that equations 1.1 and 1.2 yield erratic results with little or no trending. Equation 2.1 on the other hand trends toward passing in a reasonably smooth fashion after an initial setting period. In all three cases equation 2.1 yielded a unique passing point. In addition it should be noted that the sharp upturn in the a1 and a2 plots on the McGuire Unit 2 graph, starting at about 19 hours into the test, is probab-ly due to the leak rate reduction that occurs during the transition from maximum pathway leakage to minimum pathway leakage (see attached McGuire Unit 2 ILRT Data). This upturn suggests that a test may have to be extended signi-ficantly simply to accommodate this otherwise acceptable transition.

Based on the erratic behavior of ratios a1, and a2 and the effects that the transition between maximum and minimum pathway leakage has on a1, and a2 the proposed limit on curvature is an unreasonable condition to place on the Type A test.

The same criteria when applied to the verification tests corresponding to the Type A tests above yields failing results in every case. The indication is that if the criteria is applied to the verification tests as well as the Type A tests as paragraph 13.3 of section C in the proposed regulatory guide states, the verification tests will have to be conducted for approximately the same length of time as the Type A tests. For this reason the new extended ANSI criteria should be relaxed or eliminated from the verification tests require-ments.

Commentor: GPU Nuclear

In position 13.1, some clarification is need as to "start time" vs. "restart time." Also a definition should be provided for "time forward." For example, does this mean time forward from the "start time" or time forward from the time when the decision to restart the test is made?

The minimum duration of the test being lowered to eight hours will require some changes to the code as will limits on the ability to restart the test.

Commentor: Bechtel Western Power Corporation

13.1 Can start time be time backward? The paragraph states "...restarted..." In any case, start time should be representative of the actual leakage rate, not a time chosen arbitrarily in the future. As an example, sensor malfunctions may not be apparent until hours after the end of pressurization, and, once the sensor is deleted from calculations, the leakage rate appears stable and acceptable. In such a case, the time that has passed should be allowed to be included in the test.

Commentor: Northeast Utilities

The period of valid data collection should be determined by careful engineering evaluation, justifying the non-inclusion of any data. The proposed use of a declared restart to determine valid data does not permit reconsideration of the test conditions, and should be deleted.

Commentor: TU Electric

This Regulatory Position is endorsed by TU Electric provided the minimum periodic test duration of eight hours remains. It is assumed that the requirements of Regulatory Position 12.2 and 12.3 for containment atmospheric considerations will be coordinated with this position relative to test restart. Restart would then be predicated on the previous two hours of containment atmospheric stabilization data subject to appropriate problem identification and allowances of Regulatory Position 12.3.

Commentor: Georgia Power

If the data supports a restart of as "time backward" then it should be allowed. For example, the temperature stabilization criteria during a Type A test was not met because malfunctioning temperature sensor time goes on, eventually the malfunctioning sensor is found and its found that when the erroneous data is purged from the data base, the temperature stabilization criteria was met many hours earlier. Moving the start time back in this case would be justifiable.

Commentor: Lynne Goodman

As I briefly mentioned before, I disagree with the idea of a fixed start time. Some flexibility is needed, especially for a metal containment on a day with non-steady environmental conditions. If the outside temperature drops or increases rapidly, or the sun comes out, this can affect the test over a period of time. Therefore, flexibility in declaring and revising the start time, including going backwards after a period of time shows conditions stabilized, is beneficial.

Commentor: Stone & Webster Engineering Company

With respect to Position Paragraph 13.1, the additional conditions for curvature and for data scatter require a restart using the "time forward" ap-proach.

Commentor: Baltimore Gas & Electric

If the data supports a restart of "time backward" then it should be allowed. Start time should be representative of the actual leakage rate, not a time chosen arbitrarily in the future. As as example, sensor malfunctions may not be apparent until hours after the end of pressurization, and, once the sensor is deleted from calculations, the leakage rate appears stable and acceptable. In such cases, the early elapsed time that has passed should be allowed to be included in the test.

13.2 DATA RECORDING AND ANALYSIS

Commentor: BWR Owner's Group

Increased readings yield less scatter and better resolution. Also, average data is preferable and does not adversely affect Type A results.

Commentor: TU Electric

TU Electric is in agreement with this Regulatory Position.

13.3

Commentor: BWR Owner's Group

The BWROG endorses the comments on this section submitted by Bechtel Power Corporation on January 9, 1987.

Commentor: Atomic Industrial Forum, Inc.

The "Extended ANSI Method" acceptance criteria for Type A and verification tests is new criteria for termination of a successful test for which no technical basis has been provided. The very extensive comments on the "Extended ANSI Acceptance Criteria" by Bechtel Power Corporation and submittcd to the NRC in January 9, 1987, provides an excellent analysis of the "Extended ANSI Method." We conclude that this additional criteria add nothing to the interpretation or understanding of test results. It is recommended that the NRC delete this item and the Appendix, "Extended ANSI Method" from the Draft Regulatory Guide.

Commentor: Wisconsin Electric Power Company

Part 13.3 states that additional conditions need to be applied to limit nonlinearity and data scatter during a Type A test; however it fails to prescribe these additional requirements. Instead, it provides a discussion of the parabolic inequality method, which the NRC inspectors use as an alternative. In theory, any system that can adequately control the quality of the least squares fit from the mass point technique should be acceptable.

The parabolic inequalities method presented in the appendix of the regulatory guide would be a significant technical imposition on utilities, requiring substantial statistical analyses with minimal benefit. If there is excessive data scatter or nonlinearity, the 95% UCL will remain high and the test will fail. The value of further constraints on data is questionable. Both the current and proposed versions of Appendix J to 10 CFR 50 state that the purpose of the test is to ensure that the containment does not exceed the leakage rate allowed by technical specifications and to provide surveillance so that proper maintenance and repairs are done. This is adequately provided by conservatively bounding the leak rate, and the proposed mathematical leak rate linearity test and data scatter analysis are not needed. This additional criteria will fail or lengthen some tests that have demonstrated that leakage is within required limits.

Commentor: Bechtel Western Power Corporation

This paragraph is covered in some detail in the following Attachment C. Generally, equation 1.1 is a poor test for linearity, it is erratic and may be satisfied by data being more cubic than linear. Equation 2.1 should not apply to the verification test due to the allowable shorter duration of the test. Alternately, if the 2.1 equation is used, its limit should be doubled.

Commentor: TU Electric

The Extended ANSI Method proposed by Regulatory Position 13.3 is not endorsed by TU Electric. The two conditions of the Extended ANSI Method are intended to control the quality of the Least Squares Fit (LSF) results obtained from the mass point technique. Use of the Extended ANSI Method is unnecessary with judicious use and execution of the ANSI/ANS 56.8 requirements as well as application of additional, easier to use qualitative guidelines.

Abnormal or erratic data can be caused by cyclical diurnal effects, instrument noise/surges, unexpected operational heating/cooling occurrences, temperature instability or inaccurate containment volume modeling. A conscientious use and knowledgeable execution of current ANSI/ANS 56.8 requirements could miti-gate data scatter and unacceptable LSF results. Expanded containment modeling-/analysis, instrumentation enhancements and upgrades, application of data rejection criteria, increased attention analysis to stabilization trends, strin-gent control of containment integrity, and detailed operational requirements for system isothermal conditions would all optimize test conditions and thus enhance data quality. Reasonable application of ANSI/ANS 56.8 and its regula-tory guide endorsements provide minimum criteria for the following fundamen-tals of acceptable Type A and verification test results: stable containment environment, good instrumentation, representative containment atmospheric mo-deling and uniform data sets.

Properly justified and expanded test performance requirements would improve data quality and are favored in lieu of the superfluous statistical analysis of the Expanded ANSI Method. Rather than generically impose the rigorous statistical tests of the Extended ANSI Method, additional test prerequisites and-/or performance guidelines should be used that achieve equivalent results. Upper Confidence Limit (UCL) values obtained using the ANSI 56.8 mass point method already measure the confidence placed in the accuracy of the LSF of the actual leakage rate. Obviously, a time dependent decrease in the difference between the UCL and the LSF indicates the scatter in data is constant or decreasing. Once this correlation is established, then each additional data set should increase the confidence in the LSF leakage rate.

Several other less complex and easier to use approaches have been suggested that analyze the trends between the UCL and the LSF as well as their associa-ted slopes. EPRI Report No. NP 3400 and a paper by Ted Brown published in the Proceedings of the 1982 ANS Containment Leakage Rate Testing Workshop are ex-amples of proposed alternate methods. Although these methods were proposed to establish test duration, their application to control the quality of Type A test data is readily apparent. It is doubtful if the statistical tests of the Extended ANSI Method could be easily applied to the Type A test or the verification test with any meaningful and consistent results. A paper by Larry Young in NUREG/CP-0076 (Aug. 86) con-cluded that an iteration of inequality 1.2 used as a statistical test was too complex, would complicate the analysis of ILRT data, and exhibited erratic be-havior in various test cases. Application of the two conditions of the Extend-ed ANSI Method to the verification test is similarly not sufficiently justi-fied nor demonstrated, especially considering that the verification is less than half the duration of the Type A test.

Use of Condition 2 (Limit on Data Scatter) as a statistical criterion of the Type A test data is the more statistically acceptable and the easier to use of the two conditions of the Extended ANSI Methods. Despite this, use of UCL-LSF trend/slope analysis and better test execution are still favored over the statistical tests of the Extended ANSI Method.

Commentor: Georgia Power

During the Third Workshop on Containment Integrity held on May 21 thru 23, 1986 at the Washington Marriott in Washington, D. C., Mr. Larry R. Young of the Bechtel Power Corporation presented his paper titled "Methods for Determi-ning Integrated Leakage Rate Test Duration - Case Studies". In the study he found that the proposed "Extended ANSI Method" would have incorrectly identi-fied two successful tests as failures and concluded that the proposed criteria is too conservative. In the paper he made the following recommendation:

"Based on a consensus of Bechtel ILRT engineers and this study the following recommendation is made. After a valid start time is determined, the Predictor, Mass Point on ANSI 56.8 combined criteria method is preferred and sufficient to determine the success or failure and duration of an ILRT".

This recommendation should be considered and the proposed rule should be amended accordingly if the recommendation is determined to be desirable.

Commentor: GPU Nuclear

Position 13.3 requires additional statistics to be calculated on the air mass data for non-linearity and data scatter. This will be a significant change in code, as these statistics will be used in other places besides the statistics subroutine. The statistics to be calculated involve some complex equations, however they are all defined in the literature. This position requires a parabolic curve fit of the air mass data to be done. Space must be allocated for the new statistics and the parabolic constants in the AIRMASSDATAFILE so the results can be used in criteria checks. Another implementations is to have these statistics, and the appropriate checks, be calculated only on user demand.

Commentor: Baltimore Gas & Electric

The "Extended ANSI Method" acceptance criteria for Type A and verification tests is new criteria for termination of a successful test for which no tech-nical basis has been provided. The very extensive comments on the"Extended ANSI Acceptance Criteria" by Bechtel Power Corporation and submitted to the NRC on January 19, 1987, provide an excellent analysis of the "Extended ANSI Method". We conclude that these additional criteria add nothing to the inter-pretation or understanding of test results. It is recommended that the NRC delete this item and the Appendix, "Extended ANSI Method" from the Draft Reg-ulatory Guide.

14. TEST MEASUREMENT.

Commentor: Tennessee Valley Authority

We would like further clarification regarding the suitability of existing temperature surveys for similar plants.

14.1

Commentor: TU Electric

Initial assignment and confirmation of sensors based on pretest surveys and volume fraction calculations is within the original intent of ANSI/ANS-56.8. It should be recognized that reassignment of a sensor's volume fraction based on pretest atmospheric survey results represents a conjectured engineering judgement of containment atmospheric conditions without explicit acceptance criteria. Primary concerns for a failed sensor must continue to be the satis-faction of ISG calculations and minimum sensor quantities. The Regulatory Position for review of volume fractions after the initial periodic test to determine their continued validity is a requirement lacking explicit basis or acceptance criteria and therefore not recommended. Acceptable compliance with this requirement could either require repeating a complete temperature survey or a simple evaluation of displayed sensor data with approximate ranges from previous tests. Unless a substantial containment design modification or sy-stem operation procedure is modified, significant deviations are not anticipat-ed from initial survey results. The preoperational and initial periodic sur-veys are intended to establish and validate the positioning of the sensors within assigned volume fractions. Radical temperature differences should be discovered and measures taken to minimize their effects during these initial surveys. Until a definitive basis or clarification for periodic volume frac-tion review is established, it is recommended that the portion of this regula-tory position requiring this review be deleted.

Commentor: Lynne Goodman

Regarding area surveys and determination of volume fractions, will the pro-posed regulatory guide require plants that have previously done surveys and determined weighting fractions to redo this survey? To redo it on a one time basis? To redo it prior to each test? The proposed wording could use some clarification. I do not feel the surveys need to be redone, since they can involve significant dose.

14.2 TEMPERATURE MEASUREMENT

Commentor: BWR Owner's Group

For the following reasons, we question the practice of performing temperature surveys using the ventilation configuration for the Type A test and the re-quirement to re-run a survey for the first periodic Type A test due to differ-ent heat sources from preoperational conditions.

The failure to ventilate continuously could result in great personal safety hazards to those making temperature surveys. In recent tests, temperatures of 125 °F have been measured in BWR containments when the ventilation system was turned off to simulate test conditions.
Moreover, when the Type A test is performed at the start of the outage, the failure to continuously ventilate could result in nitrogen (inerting medium) pockets. These potential safety hazards show that survey requirements must be supported by comprehensive technical studies which establish a clear relationship between temperature surveys and leak rate calculations.

Commentor: Commonwealth Edison

For the following reasons, we question the validity of performing temperature surveys using the ventilation configuration for the Type A test and the requirement to re-run a survey for the first periodic Type A test due to different heat sources from Pre-Op conditions.

No good comprehensive technical study has ever shown a quantitative relationship between temperature distributions and calculated containment leak rates. The small modeling errors resulting from ignoring the above requirements would probably have a trivial effect on final calculated leak rates. Moreover, the failure to ventilate continuously could result in great personal safety hazards to those making temperature surveys. In recent tests, temperatures of 125°F have been measured in BWR containments in which the ventilation system was turned off to simulate test conditions. Moreover, when the Type A test is performed at the start of the outage, the failure to continuously ventilate could result in nitrogen (inerting medium) pockets. These potential safety hazards show that survey requirements must be supported by comprehensive technical studies which establish a clear relationship between temperature sur-veys and leakrate calculations.

Commentor: Bechtel Western Power Corporation

Since sensor reassignment must be based on the temperature survey, at least a survey check to revalidate the first periodic test survey temperature distribution should be required before each test.

Commentor: TU Electric

14.2 & 14.3. This requirement is acceptable; however, it will require performance of several temperature surveys. Several surveys will be required to validate various air circulation modes required due to seasonal, diurnal or operational variances.

14.3

Commentor: Northeast Utilities

Psychrometric readings should not be required, as variations of humidity over time and varied plant conditions would result in initial surveys being non-representative.

15. ABSOLUTE TEST METHOD.

Commentor: GPU Nuclear

This position indicates a change in the calculation of the spatially-averaged containment temperature. The new calculation is not difficult to program but will take some time.

Commentor: Tennessee Valley Authority

We believe that the equation is in error and should read as follows:

$$T_i = \overset{m}{\underset{j=1}{}} t_{ij} \cdot W_j$$

Commentor: Northeast Utilities

The proposal of redefining containment air temperature (T_i) is not recom-mended or needed.

The current method of weighting sensor readings should be retained. The new "T_i" attempts to correct for spatial oscillations of containment dry bulb temperatures, a phemomena which has never been observed in over 12 ILRTs conducted by CYPAPCO and NNECO.

CYAPCO and NNECO recommend the following methodology be utilized to ensure achievement of valid and consistent "T_i" and ILRT test results:

(a) Determine RTD and dewcell sensor locations utilizing methods outlined in EPRI Report NP-2726, Appendix M. Verify sensor volume weight fractions are less than or equal to 10%.

(b) Model RTD and dewcell sensor temperature responses over an expected containment temperature range such that the ANS 56.8 RTD accuracy requirement of + or - 0.5°F is met.

(c) Locate RTD and dewcell sensors within 5 ft. of theoretical center of imaginary sensor sub-volumes. Do not place near heat sinks or sources.

(d) Calculate single failure RTD and dewcell sensor volume fractions, and ensure revised sensor fractions meet ANS 56.8 requirement of less than or equal to 10%.

(e) Control average containment air temperature change during ILRT Lt_m measurement period to less than 0.35°/hr.

This will ensure non-linear temperature effects (thermal masking of real leakage rate) are minimized and a linear regression analysis of mass point versus time would yield valid values for L_{tm}.

Containment air temperature control can be achieved by following guidance contained in EPRI Report NP-2726, Appendices G and T.

CYPACO utilized these techniques during the 1986 ILRT and achieved excellent results.

Commentor: TU Electric

This Position is endorsed and provides a mathematically correct equation for mean temperature to account for spatial temperature variations.

16. REPORTING OF RESULTS.

Commentor: BWR Owner's Group

This item is covered by the BWROG Comments on the proposed revisions to 10CFR50 Appendix J (attachment 2).

Commentor: System Energy Resources, Inc.

Reporting of "as found" Type B and C leakage results should not be required. See comments on the Proposed Appendix J Revision in Attachment I.

Commentor: TU Electric

This is an acceptable recommendation for report format and content. "As Found" and "As Left" test data will be provided consistent with Appendix J require-ments.

Commentor: Lynne Goodman

My next question regards reporting. Will the reports covering strictly type B and/or type C testing be required to follow the format and content speci-fied? For example, if an airlock test is performed, does a report similar to that described have to be submitted? Currently, all that is required is a mention in the monthly operating report if the test passed and an LER if it failed.

17. FLOW RATE (AIR, WATER, NITROGEN).

17.1

Commentor: Tennessee Valley Authority

We believe that the makeup fluid should be the same as or less viscous than the system fluid not the test fluid.

Commentor: Lynne Goodman

My strongest objection to the proposed reg guide involves the leak rate measurement methodology during the type C tests. The proposal would require fluid makeup flow rate be measured, rather than leakage rate through the valve. I definitely believe leakage flow should be an acceptable alternative. For example, at LACBWR, primary system valves which serve as containment isolation valves are tested by pressurizing the primary system, closing a manual valve in each line, opening a test connection between the isolation valve and the manual valve, and measuring the leakage rate. This methodology permits the leakage through the individual system isolation valve to be de-termined, rather than a joint rate for all primary system containment iso-lation valves. Additionally, leakage through other primary system connections that are not associated with containment isolation is not erroneously in-cluded as would be the case if makeup flow was measured. Any leakage through the valve being tested will travel the path of least resistance, which would be through the open test connection to the flow rate meter, so essentially all the valve leakage rate is measured by the method currently in use.

17.2 FLOWRATE

Commentor: BWR Owner's Group

The term "air discharge method" is not defined. If this means measuring the outleakage from a test volume instead of the makeup flow, this restriction could present a considerable problem for many BWR's. In order to meet the requirement for testing valves in the accident direction, using the outleakage technique, considerable backfit of Class 1 piping systems may be required. Affected systems include main steam, HPCI, and RCIC.

Commentor: TU Electric

Regulatory Positions regarding test fluid and air discharge method are endorsed by TU Electric.

18. WATER COLLECTION.

Commentor: TU Electric

Use of the water makeup test method is an acceptable and extremely conservative technique. It should be recognized that this technique will also be employed on systems without adequate provisions for water collection (i.e., no drain point or multiple valve leakages at a common drain point).

19. VACUUM RETENTION.

Commentor: TU Electric

This Regulatory Position is endorsed by TU Electric.

20. RECORDING OF LEAKAGE RATES.

Commentor: BWR Owner's Group

Accounting for packing leaks outside the primary containment is a major backfit, especially in BWR plants. Many containment isolation valve pairs are designed to be tested by pressurizing through a test tap between the two valves. Consequently, the packing on the inboard valves does not experience the test pressure. Therefore, to account for packing leaks, valves would have to be tested in the accident pressure direction. To accomplish this, test taps and/or block valves would need to be installed in containment. The costs of such modifications would not seem to be justified, especially when considering that valve packing is normally tested during the Type A tests.

Commentor: Atomic Industrial Forum, Inc.

Accounting for packing leakages outside the primary containment is a significant backfit, especially in BWR plants. Many containment isolation valve pairs have to be tested by pressurizing through a test tap between two valves. But for some valve designs, the packing on the inboard valves does not experi-ence the test pressure. Therefore, to account for packing leaks test taps and/or block valves would need to be installed in containment. The costs of such modifications cannot be justified, especially in light of the testing of the packing by Type A leak tests.

Commentor: GPU Nuclear

Recording of Leakage Rates

The statement on packing would meet the probable intent better if reworded as follows:

> "Packing leakage which would provide a leak path in parallel with containment isolation valve seats must be accounted for in reported Type C leakage rates. Both valve design and installed orientation can determine if the packing leakage is a significant leak path."

Commentor: Commonwealth Edison

Accounting for packing leakages outside the primary containment is a major backfit, especially in BWR plants. Many containment isolation valve pairs have to be tested by pressurizing through a test tap between the two valves. But for some valve designs, the packing on the inboard valves does not experience the test pressure. Therefore, to account for packing leaks, test taps and/or block valves would need to be installed in containment. The costs of such modifications cannot be justified, especially in light of the frequent testing of the packing by Type A leak tests.

Commentor: TU Electric

This Regulatory Position is endorsed by TU Electric.

D. IMPLEMENTATION

APPENDIX

Extended ANS Method

Commentor: BWR Owner's Group

The BWROG endorses the comments submitted by Bechtel Power Corporation on January 9, 1987.

Commentor: Atomic Industrial Forum, Inc.

This modification to the Mass Point Method would allow the performance of Type A tests for periods shorter than 24 hours. However, all Type A tests, including the shorter tests, would also have to meet two new conditions for passage. These additional conditions should not be required. There has never been shown any need for additional conditions on curvature and scatter. The Mass Point Method has proven to be an accurate and reliable method in its current form in hundreds of tests over the last ten years. Therefore, there is no need for additional conditions on curvature and scatter. Moreover, because the two additional conditions are unnecessarily stringent, they would result in the failure of many valid A tests. For these reasons, the proposed conditions should not be required.

Commentor: Rochester Gas and Electric Corporation

Test data analysis methods require further study and justification before they are included in any containment leak rate test regulatory guide. Work performed for RG&E by a testing contractor established that our two most recent tests quickly meet the "Extended ANSI" acceptance criteria of the proposed regulatory guide. However, the calculated parameters may not be well behaved and may not converge predictably from unacceptable to acceptable results with certain data sets. The adoption of this analysis technique is, at least, premature. Other analysis methods should be investigated as a minimum. Formulation of the specific technique in the regulatory guide may make other analysis methods, which are equally acceptable or preferable, more difficult to establish.

Commentor: Commonwealth Edison

This modification to the Mass Plot Method would allow the performance of Type A tests for periods shorter than 24 hours. However, all Type A tests, including the shorter tests, would also have to meet two new conditions for passage. These additional conditions should not be required. There is no (nor has there ever been shown) any need for additional conditions on curvature and scatter. The Mass Plot Method has proven itself to be an accurate and reliable method in its current form in hundreds of tests over the last ten years. Therefore, there is no need for additional conditions on curvature and scatter. Moreover, because the two additional conditions are unnecessarily stringent, they would result in the failure of many valid Type A tests. For these reasons, the proposed conditions should not be required.

Commentor: Bechtel Western Power Corporation

Attachments B and C. The biggest problem foreseen with the draft regulatory guide is the mandatory use of the extended ANSI method during both the Type A test and the verification test. Our experience in using this method of analysis is that the results are unpredictable and that the limits for verification test results are unrealistic. The use of single active failure criteria as a leakage rate testing requirement again poses the problem of testing each valve individually, with consequences as mentioned before. In addition, the requirement for restarting a test only "time forward" can excessively delay test conclusion for reasons not warranted using state-of-the-art testing equipment and with the extensive testing experience found in licensee and contractor organi-zations.

Commentor: Bechtel Western Power Corporation

Proposed Regulatory Guide MS021-5 introduces two statistical tests that must be satisfied by the containment airmass vs. time data during the Type A and verification tests. The first test sets an upper limit on the curvature of the data, and the second test sets an upper limit on the data scatter.

In order to evaluate the above statistical tests they have been applied to data from 14 actual Type A tests. Figures 1-14 a, b, and c show plots of air-mass and parameters a1, a2, and b for the 14 cases where:

$$a1 = \frac{\text{right hand side of equation 1.1}}{\text{left hand side of equation 1.1}}$$

$$a2 = \frac{\text{right hand side of equation 1.2}}{\text{left hand side of equation 1.2}}$$

$$b = \frac{\text{left hand side of equation 2.1}}{\text{right hand side of equation 2.1}}$$

For these ratios, equations 1.1, 1.2 and 2.1 are the statistical tests presented as are the equations in the proposed Regulatory Guide.

Values of a1, a2 and b in the plots which are attached are clipped for values greater than approximately 2. The acceptance criteria for the statistical tests in terms of a1, a2, and b are:

1. a1 and/or a2 < 1

2. b > 1

Condition 1 sets a limit on the curvature and condition 2 sets a limit on the data scatter.

The statistical tests were originally applied for 16 cases in Reference 1. (Cases 10 and 15 of the 16 cases studied in Reference 1 are not considered here because the program used in this study cannot correctly use their data-bases). In Reference 1, the original NRC formulation of equation 1.2 was used,

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Reference 1. Larry R. Young "Method for Determining Integrated Leakage Test Duration - Case Studies". Proceeding from the Third Workshop on Containment Integrity "NUREG/CP - 0076, SAND86 - 0618, August 1986. i.e. $|c't/A'| < 0.25$ as apposed to the revised criteria $2400\ |c't/B'La| < 0.25$. The paper concludes that the statistical tests on the curvature exhi-bit "eratic behavior (and) complicate the analysis of ILRT data" also, the method is "too complex".

The general trend observed in Figures 1 - 14c are,

1. Parameters a1 and a2 are very erratic and do not progress from a no pass region, >1, to a pass region, <1, with any obvious predictability.

2. Parameter b behaves smoothly and progresses from a no pass region, <1, to a pass region, >1, predictably.

Because of the erratic behavior of the a1 and a2 parameters, the proposed limit on curvature is not a reasonable condition to place on the Type A test.

Applying these same criteria to the verification test suggests that the duration of the verification test should be approximately the same as the Type A test duration. since the verification test duration is normally not greater than half the Type A test duration, the new extended ANSI criteria should be relaxed or eliminated for the verification test. An additional arguement against the use of the limit of curvature criteria is that satisfying equation

1.1 does not necessarily indicate that the data are linear. Cubic regressions were applied to the 14 cases studied above, and Figures 1 - 14d present plots of the quadratic and cubic contributions to the data. As can be seen, in general small quadratic terms indicate that the cubic term is larger. According to Bethea, Reference 2, a general rule is for determining significance of higher order regressions is to include higher order terms until two consecutive terms are insignificant, i.e., quadratic and cubic, not just the quadratic term as required by the proposed Regulatory Guide.

To summarize, the only criteria of those presented that should be considered is to apply the limit on scatter condition to the Type A test and neither condition (as currently proposed) to the verification test. By itself, the limit on scatter test is fairly easy to pass. It is therefore recommended that an additional acceptance criteria be adopted. Reference 1 reaches the conclusion that the predictor of Reference 3 be used. Since the NRC choose not to incorporate this method in the proposed Regulatory Guide it is not clear that the predictor would be accepted as an alternative to the limit on curvature test. Therefore, the following "window" test is proposed as an alternate. The window criterion would require that the leakage rate calculated for all intervals equal to 1/2 the test duration must be less than .75 La. Windows of 1/3 the test duration were also considered in evaluating the method.

Reference 2, Bethea, R. M., Duran, B. S.. Boullion, T. L., "Statistical Methods for Engineers and Scientists" 2ndEdition Marcel Dekker, Inc., New York 1985.

Reference 3 "Suggested Criteria for a Short Duration ILRT", Ted Brown and Louis Estengsoro, Wiss, Janney, Elstner and Associates, January 18, 1982. Presented at Reactor Operations Division, ANS, First Workshop on Containment Leakage Rate Testing.

Figures 1 - 14e and f present plots of the maximum leakage rates for windows equal to 1/3 and 1/2 of the test duration. The criterion is satisfied if the maximum window leakage rate is less than .75 La. For example, in Figure 7f (window = 1/2 test duration) the criterion is first satisfied at 0100 606, or a duration of 16.5 hours. For this duration, the maximum leakage rate for any 8.25 hour interval in the range 0830 605 to 0100 606 is .088%/day (.75 La = .090%/day).

Figures 1 - 14e and f indicate that both window criteria behave smoothly and progress from a no pass region, > .75 La, to a pass region, < .75 La, is predictable. The slight stepping character of the plot is caused by truncating the window to correspond to the interval between data points.

Table 1 lists the intervals over which the 1/2 and 1/3 of test duration window criterion is satisfied, and also the intervals over which the NRC proposed limit on curvature (a1, a2,) and limit of scatter (b) are satisfied.

Table 2 presents minimum test durations (> 8 hrs.) for the MS021-5; 1/2 and 1/3 duration windows plus equation b; and the predictor plus equation b methods. The following points should be noted about the results in Table 2.

1. MS021-5 and the 1/2 duration window plus b criteria pass and fail the same tests, with MS021-5 giving shorter test durations.

2. The predictor plus b criteria pass, case 6 a case which is failed by the other 3 criteria.

3. While case 8 is failed by the 1/3 duration window plus b and the predictor plus b criteria, it is reasonable to assume that they would have passed the test at some point after the 9 hours of test data.

4. The 1/3 duration window plus b criteria fail cases 5 and 16, which are passed by the other 3 criteria.

While the test duration criteria of MS021-5 give the shortest test duration, the criteria are also the least predictable. The lack of predictability could lead to serious consequences if the criteria results change from pass to no pass immediately before imposing the verification flow. The licensee could then find itself in a position of having imposed the flow for a test that hasn't passed the acceptance criteria.

From the studies conducted with the extended ANSI method, both the current and previous versions, it is Bechtel's conclusion that consideration should be given the 1/2 window and predictor criteria as additional criteria to satisfying test requirements, rather than the Extended ANSI method of MS021-5. The formulae and derivation of the equations used are on file in Bechtel's San Francisco offices, should you require more information.

TABLE I

CRITERIA SATISFACTION RANGES (HOURS OF TEST)
(includes UCL < .75 La)

	MS021-5		Window (Minimum 4 hours)	
Case	a1 and/or a2	b	1/2 duration	1/3 Duration
1	3-4 6 1/2-24	3-24	4 1/2-24	6 3/4-24
2	3-10 12-12 1/4 13-24	2 1/4-24	4-24	7 1/2-24
3	12 3/4-15 3/4	NS	NS	NS
4	1 3/4-3 3/4 4-24	2-24	4-24	5 1/4-24
5	1/2-4 1/4 12 3/4-24	3-24	4-5 21-24	4
6	NS	21-26 1/2	NS	NS
7	12 1/4-17 17 3/4-28	4 1/4-5 12 1/2-30 1/2	16 1/2-30 1/2	24 3/4-30 1/2
8	2-6 1/2	3-9	4-9	4 1/2-6 1/4

	8-9			
9	1 1/4-10	1/2-10	4-10	4-10
10	-	-	-	-
11	1 1/2-3 1/4 3 3/4-8	1 1/2-8	4-8	4-8
12	1 3/4-24	2 1/4-24	4-24	4 1/2-24
13	1 1/4 2 3/4-10	1 1/4 2 3 1/4-10	4-10	5 1/4-10
14	3 3/4-4 1/4 7 1/2-10 3/4 12-12 3/4 18-24	3 1/4-24	4-24	7 1/2-11 1/4 12-24
15	-	-	-	-
16	1 3/4-3 1/2 8 3/4-10 3/4 16 1/4-25	3 1/2 9 3/4-25	13 1/2-18 18 1/2 22 1/2-25	NS

NS = never satisfied.

TABLE 2

MINIMUM DURATION (> 8 HRS)

CASE	MS021-5	1/2 DURATION WINDOW PLUS B	1/3 DURATION WINDOW PLUS B	PREDICTOR PLUS B
1	8	8	8	8
2	8	8	8	8
3	NS	NS	NS	NS
4	8	8	8	8
5	12 3/4	21	NS	11 3/4
6	NS	NS	NS	21
7	12 1/2	16 1/2	24 3/4	13 1/4
8	8	8	NS	NS
9	8	8	8	8
10	-	-	-	-
11	8	8	8	8
12	8	8	8	8
13	8	8	8	8
14	8	8	8	8
15	-	-	-	-
16	9 3/4	13 1/2	NS	11

Commentor: Tennessee Valley Authority

Condition 1: A Limit on Curvature

10. Page 15, Appendix, Condition 1 - The source of the statistical equations and literature used to develop equations 1.1, 1.5, and 1.6 should be refer-enced.

Commentor: Tennessee Valley Authority

Condition 2: Limit on Data Scatter

11. Page 16, Appendix, Condition 2 - As in all types of testing, "obviously" bad data is occasionally encountered. This data occurs when pressure, temperature, or humidity extrusions (such as when fans are tripped, pressure relief panels cycle, and when water level changes occur) have not had time to dissipate or stabilize before data is obtained. In addition, the ability of the Type A instrument system to accurately detect extremely low leakage (less than what the system was designed to detect) will result in a large scatter in data and result in a low correlation coefficient. This penalizes tight primary containments by the fact that this scatter causes a large error in the confidence level of the measured rate and the ability to get agreement during the verification test.

The ISG^2 (equation 2.11) also does not consider all variables encountered during testing that could have an effect on the measurement of leakage. This equation is used only to size the instrument system prior to purchase, installation and use. When installed, the data obtained by it is evaluated to determine if it behaves in accordance with parameters used to design or size it. The use of the equation 2.11 in developing equation 2.1 is invalid, and we recommend that it not be used as a basis for test acceptance.

Commentor: Northeast Utilities

The proposed changes are not required or necessary. The extended ANSI method attempts to verify: (a) that Ltm is represented by a linear mass point versus time plot, and (b) that mass point data scatter is minimized. Both of these considerations are reflected in the calculated confidence limit, and the use of the UCL is sufficient to prevent significant variation is either case. Use of measurement equipment that meets ANS 56.8 requirements and tight control of temperature as previously mentioned, eliminates these problems and the need for these requirements.

Commentor: American Nuclear Society

The additional conditions required by the regulatory guide appear to be complicated, not practically defined and unnecessary. The working group members have reviewed about fifty ILRT's utilizing the additional conditions from the Appendix of the Draft Regulatory Guide. The assumed basis of these conditions is to further evaluate the test data quality and provide a mathematical mini-mum to that quality. The fifty ILRT's do not demonstrate the adequacy or consistency of these additional conditions in actual test situations. Certainly a larger sample of ILRT's is needed in verifying any additional conditions.

In a paper entitled "Methods for Determining Integrated Leakage Rate Test Duration - Case Studies" Larry Young examines 16 test results. Of the 16 tests one (Case 3) satisfied the 56.8 criteria but did not satisfy the other criteria contained in this paper. Case 3 only marginally exceeded the test criteria (0.078 vs 0.075) as the test continued for more than 24 hours. The working group feels the additional criteria is not required, however, we also feel that if the NRC insists on additional criteria there are better ap-proaches than that contained in the Appendix to this Draft Regulatory Guide.

Commentor: Testing, Engineering & Research Services

Comment: Attachment 1 is a list of 32 cases in which the Guide formulas were applied. Since many plant already perform a 24 hour ILRT there exist individually some saving of time but a potential for all to run the Type A and Verification far longer than the current 36 hour rule-of-thumb. For those plants that perform a BN-TOP short duration ILRT, this revision offers little in terms of time economics and offers little more in statistical improvement. With regard to the formulas per se, after running all these data sets, there is not a closed mathematical expression for A', B', and C' therefore, prob-lems can take place. Further, it is difficult to visualize the physical containment based on the results. A least squares fit assumes a constant leakage rate where a parabola assumes a nonuniform leak time independent.

Rec: To apply the criteria to both the Type A and Verification, is not necessary and should be deleted. A mathematically closed equation should be in the Reg Guide for A', B', and C' along with the correction of Formulas 2.17, 2.18, and 2.19 for ti and definitions for all variables. The formulas should be evaluated against as many ILRT's as possible as to identify prob-lems (industry generic, containment type relevant, or by plant method), or for equation refinement. The practical details are not yet clear. If both conditions are SAT (satisfied) for the first time, does the user quit and perform the verification? My review indicates that the condition may change of (sic) [and] may be intermittantly SAT. What does the user do if the test is run "too long" and then one condition becomes UNSAT? Examples of practical applications will re-sult in a better understanding of intended use. Also, I firmly believe that there exists two better Type A termination criterias (EPRI NP-3400 and WJE&A's predictor).

Commentor: Baltimore Gas & Electric

The "Extended ANSI Method" proposed in the Appendix to the Draft Regulatory Guide requires two additional conditions above and beyond the ANSI requirements. These must be satisfied before the Type A and verification tests are considered acceptable. These additional conditions should not be required. The Mass Point Method has proven to be an accurate and reliable method in its current form in hundreds of tests over the last ten years. Therefore, there is no need for additional conditions on curvature and scatter. Moreover, be-cause the two additional conditions are unnecessarily stringent, they would result in the failure of many previously valid Type A tests. For these rea-sons, the proposed conditions should not be required.

REGULATORY ANALYSIS

Commentor: BWR Owner's Group

A full and complete regulatory analysis must be performed including a backfit analysis in accordance with 10CFR50.109.

Commentor: Commonwealth Edison

A separate regulatory analysis was not prepared for this draft regulatory guide. A full and complete analysis should be performed. This would include a cost-benefit and backfit analysis. In order to insure an objective study, the

NRC should contract out the analysis to an impartial organization that has no ties to the authors of this Reg. Guide. Moreover, to the extent that the regulatory guide is based on ANSI 56.8, that ANSI Standard also should be subjected to the same vigorous regulatory analysis.

Procedural Documents

The Honorable John B Breaux, Chairman
Subcommittee on Nuclear Regulation
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

The NRC has sent to the Office of the Federal Register for publication the enclosed amendment to the Commission's rules in 10 CFR Part 50, as well as a Notice of Availability for the enclosed related Regulatory Guide 1.xxx.

The amendment is a general revision to Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," of 10 CFR Part 50. It will update the existing regulation to reflect current practices in leak testing technology and existing national standards on this subject.

The Regulatory Guide is "Containment System Leakage Testing", and endorses American National Standard ANSI/ANS 56.8-1987, "Containment System Leakage Testing Requirements".

Sincerely,

Eric S. Beckjord, Director
Office of Nuclear Regulatory Research

Enclosures:
Appendix J Federal Register Notice
RG 1.xxx Federal Register Notice

cc: Senator Alan K. Simpson

CONGLTR

18 June 1989

The Honorable Morris K. Udall, Chairman
Subcommittee on Energy and the Environment
Committee on Interior and Insular Affairs
United States House of Representatives
Washington, DC 20515

cc: Representative James V. Hansen

The Honorable Philip R. Sharp, Chairman
Subcommittee on Energy and Power
Committee on Energy and Commerce
Unites States House of Representatives
Washington, DC 20515

cc: Representative Carlos J. Moorhead

Document Name:
CONGLTR

Requestor's ID:
MILLER

Author's Name:
arndt

Document Comments:

DRAFT PUBLIC ANNOUNCEMENT

NRC CHANGES CONTAINMENT LEAKAGE RATE TEST RULES

The Nuclear Regulatory Commission is amending its regulations dealing with the leakage rate testing of commercial power reactor containment systems.

The changes provide greater flexibility in applying alternative leakage rate testing procedures to coincide with variations in plant designs. They also reflect experience in applying the existing requirements, advances in containment leakage testing methods, simplification of the present text of the regulation, and requests for exemptions from the requirements received and approved over the years since the requirements went into effect in March 1973.

The amendments are to the Commission's regulations in Appendix J of Part 50, which specifies tests that must be conducted before and during operation of a nuclear power plant to ensure that leakage through the containment or systems and components penetrating the containment does not exceed allowable leakage rates specified in the technical specifications of the plant's license.

Major changes in the revised regulation include (1) elimination of an option to perform periodic reduced pressure testing in lieu of testing at full calculated accident pressure, (2) revision of test frequency requirements, and (3) renewed emphasis on the requirement that containments be tested "as is."

An NRC regulatory guide is also being published to endorse a current national standard on the same subject and to provide guidance on acceptable leak testing procedures.

The revised rule will be effective on ______________________________. By ______________________________, each licensee and applicant for an operating permit must submit a plan and implementation schedule that includes a final implementation date no later than ________________.

A proposed regulation on this subject was published in the Federal Register for public comment on October 29, 1986. A proposed regulatory guide on leakage rate testing was issued at the same time. The final regulation and guide reflect consideration of the comments received.

Document Name:
PA ARNDT

Requestor's ID:
MILLER

Author's Name:
arndt

Document Comments:

§50.109 BACKFIT ANALYSIS

FOR

PROPOSED 10 CFR 50, APP. J

AND

PROPOSED RG MS 021-5

BACKFIT ANALYSIS AND CONCLUSION RELATING TO THE PROPOSED REVISION TO 10 CFR PART 50, APPENDIX J AND ITS COMPANION REGULATORY GUIDE

10 CFR Part 50, Section 50.109, states that the Commission shall require a systematic and documented analysis pursuant to paragraph (c) of this same section for backfits which it seeks to impose.

This revision of 10 CFR 50, Appendix J is not being implemented by the NRC staff on the basis of any substantial increase in safety or decrease in costs. Instead, it is being implemented as both safety and cost neutral. Justification for the revision is based on the need to conform present testing capabilities to the current state of the art, and to use the best available procedures, thereby not freezing a stale (1972) technology. The revision will keep rule requirements unambiguous, technically current, uniform in application and usefulness, legally consistent, and flexible enough to accommodate differing plant designs.

The following discussion and §50.109(c) analysis describe how these aspects, and the substantive elements of the backfit rule have been addressed in the review and oversight process that all rules and regulatory guides must go through prior to issue. Justifications for undertaking and completing such activities must be continually made throughout the development process. As a result, all of the issues and elements of interest under §50.109 have been scrutinized by a variety of reviewing bodies, and in public meetings. The conclusion presented is one believed to be supported through these previous reviews.

This rule is intended to be applied to the entire population of nuclear power reactors and it clearly constitutes a backfit.

Prior to the effective date of the backfit rule and its application to the rulemaking process, the NRC staff presented this as a proposed rulemaking activity, including its contents and the justification therefor, to the ACRS and the CRGR. After review and discussion of the proposed rulemaking activity, its relationship to other NRC activities related to containment integrity, a value-impact study, and related justifications for this updating activity, these review bodies recommended in favor of issuing the proposed rule revisions and companion regulatory guide (MS 021-5) for public comment.

The regulatory analysis written for this proposed revision was considered by the ACRS and CRGR review bodies, and also placed on file in the Public Document Room. Included in this regulatory analysis package was a cost analysis by Science & Engineering Associates, Inc.; Mathtec, Inc.; and S. Cohen & Associates, Inc.

Tables 1.3 and 1.4 in the cost analysis estimated that the Appendix J revision can result in a potential total cost saving ranging from about $98 million (@ 10% discount rate) to $164 million (@ 5% discount rate) but with a potential increase in routine occupational exposure on the order of 10,000 person-rem over the assumed operating life of all existing and planned power reactors. This projected increase in occupational exposures would on average equate to less than four person-rem per reactor year. It should be noted that 1983 occupational exposure levels averaged annual collective doses of 753 person-rem per reactor year.

The analysis projected total costs to the NRC on the order of $4 million (@ 10%) to $5 million (@ 5%), principally due to increased manpower efforts associated with technical specification revisions. Of this, about $3 million would be incurred over the next few years during implementation. The remainder represents the present worth of all NRC costs incurred over the operating life of the reactor population.

Implementation costs to the nuclear industry of about $4 million (@ 10% & 5%) were projected due to preparation of technical specification changes minus the projected savings associated with reduced exemption requests necessitated by the current regulation. The major industry benefit would occur during the operating life of the power reactor population where present worth savings on the order of $106 million (@ 10%) to $173 million (@ 5%) were projected. Although the cost analysis also identified increased operating costs, these costs would be outweighed by significant savings in replacement energy costs. Savings in replacement energy costs would result because several of the changes to Appendix J will reduce the expected frequency of containment integrated leakage rate (Type A) tests. These tests currently require 3 to 5 days of reactor downtime per test.

A 10,000 person-rem increase in routine occupational exposure was estimated over the operating life of the power reactor population primarily due to an assumed increase in maintenance efforts for implementing Corrective Action Plans and in the industry's ability to substitute local penetration and valve (Type B and Type C) tests for Type A tests. On a per reactor-year basis, this represents an average projected increase in occupational exposure of approximately 0.4% relative to the 753 person-rem average from all other causes apart from Appendix J.

The analysis of the costs and benefits for the Appendix J revision indicated a significantly favorable net cost benefit for the action when all tradeoffs and factors such as replacement energy savings are considered. However, the NRC staff is aware that it may not be appropriate to factor the economic benefits of avoiding penalty replacement energy savings into its regulatory safety decision process. The NRC staff is therefore not factoring these particular savings into its conclusions regarding benefits and costs. However, the NRC staff firmly believes that there exist regulatory and industry advantages that accrue from use of technically sound and unambiguous regulations that minimize the need for exemptions. Therefore, even if the favorable economic benefits to industry are minimized in the balancing of the overall costs and safety benefits involved, the staff estimates that, at worst, this revision should be considered neutral in its cost and safety effects.

This revision of Appendix J includes the following considerations:

- This revision of Appendix J is an administrative update due to changes in practice and replacement of a referenced ANSI standard. The revised regulation provides general test criteria for testing leakage characteristics of the post-LOCA containment configuration. It also standardizes reporting requirements. The test method is basically the statistical evaluation of multiple pressure, temperature, and humidity readings needed to quantify a very small leakage rate from a very large volume. For example, a 0.1% per day leakage rate out of a containment volume of 2,000,000 cu. ft. under a pressure of 55 psia at 150°F is roughly equivalent to that represented by a hole with a diameter of about 1/16 inch. The actual allowable leakage rate is defined for each plant in its technical specifications, based on analyses conducted pursuant to 10 CFR Part 100, whereas Appendix J establishes the criteria and tests to be used to verify the achievement of technical specification limits on leakage.

Relaxing to some degree the current leakage limits (if these are found to be overly restrictive through ongoing source term and risk profiling studies) would necessitate change to existing plant technical specifications and perhaps cause revision to the ANSI/ANS 56.8 standard that controls data error bands, instrument sensitivity, and test duration. It would be unlikely to cause another significant revision to Appendix J, so long as the general test criteria contained in this revision would not be affected. This should enhance the stability of this regulation, and allow greater flexibility for acceptance of alternative leak-test requirements to accommodate variations in containment systems designs.

- The current leakage limits established by NRR for plant-specific siting are based on analyses pursuant to 10 CFR Part 100. These current leakage limits remain unchanged under this Appendix J revision.

- Discussions between NRC staff, nuclear industry representatives, and professional and standards groups indicate that Appendix J to 10 CFR Part 50 needed to be revised to update the criteria, clarify questions of interpretation, and delete references to an obsolete ANSI standard on leakage rate testing of containments of light-water-cooled nuclear power plants.

- This revision of Appendix J provides greater flexibility in applying alternative leakage test requirements, taking into account the variations in plant design. It also reflects experience in applying existing requirements, advances in containment leak testing methods, and multiple requests (since 1973) for exemptions.

- Appendix J contains only the general requirements and acceptance criteria (no testing techniques) for preoperational and subsequent periodic leak testing. Prescriptive and detailed testing techniques are not incorporated in this revision. Interested persons were offered an opportunity to comment on specific guidance concerning leakage test methods, procedures, and analyses that are acceptable to NRC staff to implement these requirements and criteria during the public comment review period of Regulatory Guide 1.xxx (MS 021-5).

Analysis of 50.109(c) Factors

50.109(c)

(1) Statement of the specific objectives that the proposed backfit is designed to achieve.

This revision of Appendix J provides greater flexibility in applying alternative leakage test requirements due to variations in plant design, and reflects changes based on: (1) experience in applying the existing requirements; (2) advances in containment leak testing methods; (3) interpretive questions; (4) simplifying the text; (5) various external/internal comments since 1973; and (6) exemption requests received and approved. There has also been a need to conform present testing capabilities to the current state of the art and to use the best available procedures, thereby not freezing a stale (1972) technology. The revision keeps rule requirements unambiguous, current, useful, consistent with practice, and flexible enough to accommodate differing plant designs. Also, the publication of an expanded and updated national standard on how to conduct such tests has made it appropriate to generalize the regulation by retaining test criteria and removing prescriptive testing details better left to the national standard.

(2) General description of the activity that would be required by the licensee or applicant in order to complete the backfit.

This action requires changes to the technical specifications, test procedures, data analyses, and test reports. In some cases it may entail modification of some systems to conform to all aspects of the revised leakage testing program, such as test taps to enable testing of some valve(s) not previously tested. With such minor exceptions, the activities required for compliance are administrative and procedural, rather than physical or hardware changes. For plants that have been doing Type A tests at reduced pressure, an additional 3-10 hours pumping time may be needed when testing at full pressure. Those plants not reporting "as found" leakage results are explicitly required to do so.

Licensees will have to review plant test procedures against the revised requirements and recommendations. This will determine the extent of changes needed to the technical specifications. Following this evaluation, licensees will submit to the NRC staff an implementation schedule for conforming to the new requirements. This schedule will take into account where the plant is in its testing timetable and the amount of work needed to change procedures, tech specs, etc.

(3) Potential change in the risk to the public from the accidental off-site release of radioactive material.

Studies have indicated that containment systems of today's plants are strong and reliable against leakage of radioactivity for a spectrum of postulated design basis accidents including the presence of large amounts of radioactivity as is traditionally assumed for analyses pursuant to 10 CFR Part 100. This reliability against leakage has been brought about by NRC design requirements and use of industry codes and standards. The requirement to periodically test the containment system (Appendix J) is also an important way of assuring that this leaktight integrity is maintained over the plant's lifetime. The proposed revision to Appendix J is expected to continue this assurance of leaktight integrity of the containment system. However, experience over the past decade (since 1973) has revealed that the more likely leakage paths exist through penetrations and valves. Therefore, more focus is provided on penetrations and valve (Type B & C) leakage tests. This improved test focus is difficult to quantify because the available data from containment systems testing already indicates a high reliability for low leakage. Substantial safety benefits have derived from the existence of Appendix J itself. The proposed update and revision will at least continue these benefits, but will also produce greater confidence in the value of the test results, and do so, at worst, on an overall cost-neutral basis.

(4) Potential impact on radiological exposure of facility employees.

The changes to Appendix J are estimated to result in higher occupational radiation exposures than are presently experienced. The more frequent testing of individual containment penetrations does require additional time inside containment for test crews, resulting in higher occupational exposures. Data and derivations are provided in the Appendix to NUREG/CR-4398, "Cost Analysis of Revisions to 10 CFR Part 50, Appendix J, Leak Tests for Primary and Secondary Containment of Light-Water-Cooled Nuclear Power Plants." From these, average industry increases are about 3.0 person-rem per plant per year of operation. The high estimate is 5.6 person-rem per plant per year, and the low 0.5 person-rem. This compares with an average annual collective dose of 753 person-rem per plant (from NUREG 0713, Vol. 5, "Occupational Radiation Exposure at Nuclear Power Reactors," 1983), and represents an average potential increase of 0.4%.

(5) Installation and continuing costs associated with the backfit, including the cost of facility downtime or the cost of construction delay.

A comprehensive cost analysis (NUREG/CR-4398) has been performed that indicated significant potential cost savings to the industry and public. These have been estimated for the remaining life of all water-cooled nuclear power plants in this country, in operation or under construction, as ranging from $106 million to $173 million. Industry implementation costs are estimated to be about $3 million to $4 million, due to revision of technical specifications less savings associated with reduced exemption requests.

Although the cost analysis estimated large potential savings, the NRC staff has conservatively viewed the impact of this revision as cost-neutral on an industry-wide basis. This is because the savings are mostly replacement power costs for extra penalty Type A tests that could be avoided by changes proposed in the revision. However, these costs could also be viewed as currently avoidable for licensees that are maintaining their containment systems within technical specification leakage limits.

(6) The potential safety impact of changes in plant or operational complexity, including the relationship to proposed and existing regulatory requirements.

As an updated inservice inspection program, no significant, quantifiable change is claimed to safety other than to occupational exposures, as previously noted. However, in return there will be indirect benefits of greater confidence in the reliability of the test results, better and more uniform tests and test reports, fewer exemption requests, and fewer interpretive debates. No changes in plant or operational complexity are foreseen. There is also no impact on other regulatory requirements.

(7) The estimated resource burden on the NRC associated with the proposed backfit and the availability of such resources.

For the total population of all water-cooled power plants in this country, the estimated NRC resource burden is about $3 - 4 million for implementation and $1 million for operation over their remaining life. This is due principally to increased manpower efforts associated with technical specification revisions. The resources necessary to accomplish these tasks have been considered in the NRC budget.

(8) The potential impact of differences in facility type, design or age on the relevancy and practicality of the proposed backfit.

Uniformity in requirements, implementation, and reporting is being sought by the rule revision. Although plants of different design and vintage are involved, it is believed that the net impact will not vary significantly. Major problems with the existing rule that are unique to older (pre-Appendix J) plant designs have been handled by granting exemptions where justified. Such exemptions, where still needed, will remain in force. NUREG/CR-4398 notes that the net impact is not expected to vary significantly between BWR's and PWR's.

(9) Whether the proposed backfit is interim or final and, if interim, the justification for imposing the proposed backfit on the interim basis.

This revision to Appendix J and its associated backfit are being issued, after the public comment period, as final.

§50.109(a)(3) CONCLUSION

There is no substantial increase in the overall protection of the public health and safety or the common defense and security that can presently be quantified from the backfit of this revised rule. However, the direct and indirect costs of implementation are justified due to better, more uniform tests and test reports, greater confidence in the reliability of the test results, fewer exemption requests, and fewer interpretive debates. For the benefit of the public, licensees, and the NRC staff, this revised rule is being issued at this time.

ENVIRONMENTAL ASSESSMENT

AND

FINDING OF NO SIGNIFICANT IMPACT

(1990)

ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT;

REVISION TO APPENDIX J OF 10 CFR PART 50

The Nuclear Regulatory Commission is amending its regulations to update the criteria and clarify questions of interpretation in regard to leakage testing of containments of light-water-cooled nuclear power plants.

Environmental Assessment

Identification of Proposed Action

Appendix J of 10 CFR Part 50 was originally issued as a proposed rule on August 27, 1971 (36 FR 17053); published as a final rule on February 14, 1973 (38 FR 4385); and became effective on March 16, 1973. The only amendments to this Appendix since 1973 were two limited ones. The first amendment modified Type B (penetration) test requirements, particularly frequency of testing during periods of heavy air lock usage, to conform to what had become accepted practice through a number of granted exemptions. It was published for comment January 11, 1980 (45 FR 2330); published as a final rule September 22, 1980 (45 FR 62789); and became effective October 22, 1980. The second amendment provided a legal option to use the Mass Point statistical analysis technique, which had already come into widespread use for reducing leak test data to a leakage rate. It was published for comment February 29, 1988 (53 FR 5985); and published as an immediately effective final rule on November 15, 1988 (53 FR 45890).

The proposed rule was published for comment in the Federal Register on October 29, 1986 (51 FR 39538). The regulatory guide MS 021-5 was published for comment in the Federal Register on October 28, 1986 (51 FR 39394). At the request of several commenting parties, the public comment period was extended from three months to six months, ending on April 24, 1987.

This revision of Appendix J has been in preparation for some time. It provides greater flexibility in applying alternative requirements due to variations in plant design and reflects changes based on: (1) experience in applying the existing requirements; (2) advances in containment leak testing methods; (3) interpretive questions; (4) simplifying the text; (5) various external/internal comments since 1973; and (6) exemption requests received and approved.

Need for the Proposed Action

Changes in the state-of-the-art of leakage testing, experience with using the test criteria, and the evolution and variety of plant designs have made it necessary to update the 1973 criteria.

Environmental Impacts of the Proposed Action

This revision of Appendix J will have no radiological environmental impact offsite. However, there will be an average increase in occupational radiation exposure onsite of about 3.0 man-rem per year of plant operation for inspection personnel (i.e., occupational radiation exposure in increased on average about 0.4 percent). This is due to the increase in the number of inspections in order to improve the confidence level in the data. The amendment does not affect non-radiological plant effluents and has no other environmental impact. Therefore, the Commission concludes that there are no significant non-radiological environmental impacts associated with the proposed amendment.

Alternatives to the Proposed Action

As required by Section 102(2)(E) of NEPA (42 U.S.C.A. 4332(2)(E)), the staff has considered possible alternatives to the proposed action. One alternative was not to initiate a rulemaking proceeding. This is not acceptable as there would be increasing conflicts between the regulation and current testing procedures. This would only produce more exemption requests; a further drain on applicant and staff resources. There would be no environmental impact change but problems incurred in using the present rule would not be resolved.

Issuing a regulatory guide and abolishing the rule was considered. This is not acceptable because a regulatory guide is non-mandatory. The staff feels that there could be an increase in exposure to the public if the testing were non-mandatory and containment integrity were not maintained.

The present approach of revising the rule was chosen as the best alternative, benefitting all. The public benefits from improved reliability of containment leakage integrity. The NRC staff benefits from fewer exemption requests, clearer and more complete test criteria, increased regulatory flexibility, fewer interpretive debates, more useful test reports, and improved, more representative, and uniform testing programs. Utilities derive the same benefits, as well as having test criteria that focus more accurately on problem areas and which could result in significant cost savings.

Alternative Use of Resources

No alternative use of resources was considered.

Agencies and Persons Consulted

The staff relied on an analysis performed by Science and Engineering Associates, and a study performed by Oak Ridge National Laboratory.

Finding of No Significant Impact

The Commission has determined not to prepare an environmental impact statement for the proposed amendment.

Based on the the foregoing environmental assessment, we conclude that the proposed action will not have a significant effect on the quality of the human environment.

For further details with respect to this action, see the Final Report by Science and Engineering Associates, dated April 1985, and NUREG/CR-3549, "Evaluation of Containment Leak Rate Testing Criteria" which are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C.