Duke Energy

D.M. JAMIL
Vice President

Catawba Nuclear Station
4800 Concord Rd. / CN01VP
York, SC 29745-9635

803 831 4251
803 831 3221 fax

May 22, 2006

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Duke Power Company LLC d/b/a Duke Energy Carolinas, LLC (Duke)
Catawba Nuclear Station, Unit 1
Docket Number 50-413
Request for Relief Number 05-CN-002
Request for Relief to Allow Use of Alternate Requirements for Snubber Inspection and Testing
Reply to Request for Additional Information
(TAC Number MC6942)

Reference: Letter from Duke Energy Corporation to NRC dated April 29, 2005

Please find attached Catawba's reply to the subject Request for Additional Information (RAI). The RAI was received on April 6, 2006 via electronic mail. The format of the attachment is to restate each NRC question, followed by our response.

There are no regulatory commitments contained in this letter or its attachment.

If you have any questions concerning this material, please call L.J. Rudy at (803) 831-3084.

Very truly yours,

D.M. Jamil

LJR/s

Attachment

A047

xc (with attachment):

W.D. Travers, Regional Administrator
U.S. Nuclear Regulatory Commission, Region II
Atlanta Federal Center
61 Forsyth St., SW, Suite 23T85
Atlanta, GA 30303

E.F. Guthrie, Senior Resident Inspector
U.S. Nuclear Regulatory Commission
Catawba Nuclear Station

J.F. Stang Jr., Senior Project Manager (addressee only)
U.S. Nuclear Regulatory Commission
Mail Stop 8-H4A
Washington, D.C. 20555-0001

ATTACHMENT

REPLY TO REQUEST FOR ADDITIONAL INFORMATION

Request for Additional Information (RAI)
Catawba Nuclear Station Unit 1
Third 10-year Interval Snubbers Inspection and Testing
Relief Request No. 05-CN-002
Docket No. 50-413 (TAC No. MC6942)

References:

(1) Duke Energy Corporation, letter to NRC "Catawba Nuclear Station, Unit 1, Docket Number 50-413, Request for Relief Number 05-CN-002, Request for Relief to Allow Use of Alternative Requirements for Snubber Inspection and Testing, dated April 29, 2005."

(2) NEI White Paper Revision 1, June 2004, "Standard Format for Request from Commercial Reactor Licensees Pursuant to 10 CFR 50.55a," Template 1

The NRC staff needs the following additional information to complete its review. These RAIs are applicable to snubbers inspection and testing.

RAI 1: Relief Request, Section II(b), The licensee requests an alternative for the inservice test requirements of ASME/OM Part 4. Please identify for which Section(s) of ASME/OM Part 4 relief is requested.

Duke Response:

The response to RAI 2 will cover both RAI 1 and RAI 2.

RAI 2: Relief Request, Section III, Basis for Relief, first paragraph, the licensee states snubber examinations and tests be performed in accordance with the first addenda to ASME/ANSI OM, Part 4 (published in 1998). The ASME/ANSI OM Part 4 published year should be 1988 instead of 1998. Please clarify.

Duke Response:

The original Relief Request inadvertently utilized wording from a previous interval request referencing the first addenda to the OM Code published in 1988 (a typographical error resulted in a reference to 1998). Section XI IWF-5000 in the 1998 Edition through 2000 Addenda invokes ASME/ANSI OM, Part 4 with no reference to either edition or year of publication. Part 4 was replaced by Subsection ISTD in the OM Code in the 1990 Edition; therefore, the reference is assumed to be to the latest code edition containing Part 4, the 1987 Edition through

OMc-1990 Addenda. All references to Part 4 herein are taken from that document.

Relief is requested from Section 6 (Inservice Examination) and Section 7 (Inservice Operability Testing) of ASME/ANSI OM, Part 4. Relief is requested from the sections in their entirety even though only subsections are in conflict with the SLC and licensee procedures. Relief from the individual subsections is not requested due to the existence of multiple cross references between and interdependence of the various code subsections. Attachment A to this document provides a comparison of the Part 4 and SLC requirements for the requested sections.

In addition, 10 CFR 50.55a(b)(3)(v) provides for the alternative use of Subsection ISTD in place of the requirements for IWF-5300(a) and (b). Attachment B provides a comparison of the ISTD and SLC requirements pertinent to this request.

RAI 3: Relief Request, Section II, the licensee requested relief from the requirements of Article IWF-5000, Subarticle IWF-5300(a), (b), and (c). The Article IWF-5000 also contains IWF-5200 (a), (b), and (c) and IWF-5400 requirements for snubbers preservice examinations and tests, and repair/replacement activities. Please explain, whether and how OM-4 requirements of IWF-5200 and IWF-5400 will be met.

Duke Response:

Relief is not sought for Subarticles IWF-5200 or IWF-5400. Preservice requirements outlined in OM, Part 4 Section 4 (Preservice Examination) and Section 5 (Preservice Operability Testing) will continue to be satisfied by appropriate station procedures and processes and are unchanged by this request. Repair/replacement activities will continue to be performed in accordance with IWA-4000. Snubbers installed, corrected, or modified by repair/replacement activities will continue to be examined and tested in accordance with the applicable requirements of IWF-5200.

RAI 4: Relief Request, Section III, Basis for Relief, third paragraph, the licensee states that "Selected Licensee Commitment (SLC) provides for an acceptable level of quality and safety equal to or greater than that of the proposed OM Standard, as described for key areas." Please identify

areas where SLC activities are less than OM-4 and provide technical basis why SLC is acceptable.

Duke Response:

See Attachment A for a comparison of OM, Part 4 and SLC requirements.

RAI 5: Relief Request, Section III, Basis for Relief, under Failure Mode Grouping, the licensee states "Under the SLC program, all snubbers in the population would be placed in a shortened inspection interval. On this basis, the use of SLC program is more conservative." The OM-4, Section 2.3.4.3 and Section 3.2.4.2 states that "An examination or test failure mode group shall include all unacceptable snubbers which have failure and all other snubbers subject to the same failure." It is not apparent why SLC is more conservative than OM-4. Therefore, please provide comparison between SLC and OM-4 requirements for "Failure Mode Grouping for visual examination and functional test (OM-4 Sections 2.3.4.3 and 3.2.4.2)," and explain how SLC method for Failure Mode Grouping is more conservative.

Duke Response:

As noted in Attachment A, the SLC does not utilize Failure Mode Grouping for snubber examinations as that method was not included in the basis for examination intervals as approved per Generic Letter 90-09. Since the SLC examination requirements are in accordance with GL 90-09, it does not provide for groupings other than accessible and inaccessible categories. Therefore, any reduction in the examination interval is applied to the entire category and not just to a subgroup (FMG). Reduction of the interval for the entire category is conservative as compared to applying the reduction to only a selected subgroup.

RAI 6: The licensee does not discuss how SLC meets the Inservice Operability Testing (OM-4 Section 3.2) requirements. Please discuss and provide details.

Duke Response:

See Attachment A for a comparison of OM, Part 4 and SLC requirements.

RAI 7: Relief Request, Section III, Basis for Relief, Page 3, last paragraph, the licensee states that "The SLC makes no distinction between integral and non-integral

attachments. All are included in the examination to verify overall structural integrity." This means SLC is being used for inservice inspection of supports (containing snubbers) instead of IWF-2000, as required by ASME Section XI. However, SLC requirements are different than the requirements of IWF-2000 for supports (integral and non-integral attachments). IWF-2000 provides various requirements such as VT-3, ANI, frequency of inservice inspection, etc. Please explain your plan to meet two different requirements (SLC and IWF-2000) for supports and its attachments.

Duke Response:

Examinations performed per the SLC are NOT credited to the satisfaction of IWF-2000 examination requirements at Catawba. The IWF-2000 examinations and the SLC 16.9-13 examinations are two separate and independent programs. All examinations performed per the SLC are in addition to those examinations required and performed per IWF-2000.

RAI 8: Relief Request, Section III, Basis for Relief, Page 4, the licensee states that "there are some aspects of the ISTD requirements that are non-conservative when compared to the SLC program." Conversely, please identify where SLC requirements are less conservative than ISTD and provide your technical assessment.

Duke Response:

See Attachment B for comparison of SLC and ISTD requirements.

OM-4 Section 6

Section 6 of OM-4 addresses Inservice Examination. The title paragraph for Section 6 states:
"Snubbers shall be visually examined inservice for operational readiness. The number of snubbers and the frequency of reexamination are determined by the number of unacceptable snubbers within an FMG and the corrective action taken." Catawba Nuclear Station SLC 16.9-13 similarly requires that snubbers be visually examined. The primary difference between the two documents in the area of inservice examinations is that OM-4 allows the use of FMGs to determine both the number and frequency of examinations, while the SLC requires that the number of examinations is fixed at 100% but allows for frequency changes based upon the number of unacceptable snubbers. The details of these differences will be further examined in the following discussions of the pertinent OM-4 sections.

OM-4 6.1

OM-4 Subsection 6.1 discusses the method and objective of the examinations. The stated objective is to identify physical damage, leakage, corrosion, or degradation from environmental exposure or operating conditions. External features that may indicate operability are to be examined and a checklist is to be prepared. SLC 16.9-13 also states that the visual examination shall verify that: (1) the snubber has no visible indications of damage or impaired operability, (2) attachments to the foundation or supporting structure are functional, and (3) fasteners for the attachment of the snubber to the component and to the snubber anchorage are functional. Catawba Procedure MP/0/A/7650/085 is used to implement the SLC requirements for visual examinations and includes a checklist of items as shown:

A. Verify that snubber position is within the appropriate working range for the snubber stroke.
B. For hydraulic snubbers, verify that the fluid level is acceptable.
C. Snubber lug (part which contains self-aligning bearing) is not interfering with rear bracket ear or pipe clamp ear alignment.
D. Welding arc strikes, weld splatter, paint, scoring, roughness, or general corrosion.
E. Cylinder shaft and/or cylinder sleeve is bent, dented, or damaged in any way.
F. Damaged/loose fasteners, springs, or clamps; cracks in welds, or support members; bent support members; or corrosion of support items.
G. Attachments to the foundation or supporting structures are functional.
H. Fasteners for the attachment of the snubber to the component and to the snubber anchorage are functional.

I. In addition, inspect steam generator snubbers for the following:
   a. Plugs, fittings, valves, and end closures for leakage or damage.
   b. Fluid level in reservoir.

It is noted that in OM-4 Section 2.1 the examination boundary is defined as the snubber assembly from pin to pin, whereas the SLC and Catawba procedures include the entire support back to the building structure.

Per the above comparison the requirements of OM-4 6.1 are satisfied by the SLC and the referenced procedure.

OM-4 6.2

The OM Code states that "Snubbers may be categorized as accessible and inaccessible and may be considered separately for examination". SLC requirement TR 16.9-13-1 states that "Snubbers are categorized as inaccessible or accessible during reactor operation and may be inspected independently..." The SLC requirement is the same as OM-4 6.2.

OM-4 6.3

Section 6.3 of OM-4 addresses visual examination requirements. Included are requirements that the snubber must restrain movement (6.3.1) as well as permit thermal movement (6.3.2). In addition, guidance is given with regard to the detection of defects generic to particular designs (6.3.3). The requirements of 6.3.1 are to be satisfied by visual observation of loose fasteners, corroded or deformed members, disconnected components or other conditions that may impair proper restraint. Section 6.3.2 provisions are satisfied if there are no indications of binding, misalignment, or deformation. Design specific observations per 6.3.2 include items such as fluid supply or content for hydraulic snubbers. As noted in the discussion of OM Section 6.1 the Catawba SLC and implementing procedure MP/0/A/7650/085 addresses each of these items and any snubbers not meeting the acceptance criteria are considered unacceptable. The SLC meets the requirements for those items addressed in OM-4 6.3.

OM-4 6.4

OM-4 6.4 provides for a functional test evaluation of snubbers found to be unacceptable as a result of inservice examination. The OM code allows that a snubber found to be unacceptable per the visual examination criteria may be re-categorized as acceptable provided that testing shows that the unacceptable condition did not affect operability. Likewise, the SLC provides for similar re-categorization. The SLC reads:

"Snubbers which appear inoperable as a result of visual inspections shall be classified as unacceptable and may be reclassified acceptable for the purpose of establishing the next visual inspection interval, provided that: (i) the cause of the rejection is clearly established and remedied for that particular snubber and for other snubbers irrespective of type that may be generically susceptible; and (ii) the affected snubber is functionally tested in the as-found condition and determined OPERABLE."

In this instance the SLC is more conservative than the code in that it requires that the cause be established and addressed for not only the snubber in question but any others that may be susceptible. This is a more rigorous requirement than that of the code.

OM-4 6.5, 6.6, 6.7, and 6.8

These sections of the code address examination intervals, sample sizes, evaluations, corrective actions, and changes to examination frequency. In general, these sections refer to Table 1 for interval definition and frequency, and include the use of Failure Mode Groups for visual examinations and evaluations. Per Table 1, the maximum interval is 18 months and any failures reduces the time to the next examination depending upon the number of failures. This approach has been determined to be overly conservative by the NRC and was addressed in Generic Letter 90-09, which provided for extended intervals dependent upon population size and failure quantity. The GL 90-09 methodology does not include the use of FMGs for examinations and essentially supersedes the requirements in these sections of OM-4. The Catawba SLC has been previously revised to incorporate Generic Letter 90-09 methodology. Since the Generic Letter documents the basis for the change from the OM-4 requirements, that justification for the SLC program versus the OM-4 requirements is not reproduced here.

OM-4 Section 7

Section 7 of OM-4 addresses requirements for Inservice Operability Testing. The general requirement is that operability tests be performed on representative samples of snubbers at specific intervals. Additional sample lots shall be tested for each unacceptable snubber, with FMGs assigned for each failure and corrective actions defined. In general, the Catawba SLC invokes the same requirements, with the primary differences being in the area of FMG requirements. These differences are addressed in the following sections.

OM-4 7.1

This section states that operability testing shall verify the following:

a) That breakaway force, drag force, or both, as required by the Owner's procedures, are within specified limits in both tension and compression.
b) That activation is within the specified range of velocity or acceleration in both tension and compression.
c) That release rate, when applicable, is within the specified range in tension and compression. For units specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement shall be demonstrated.

The Catawba SLC states that the snubber functional test shall verify that:

1) Activation (restraining action) is achieved within the specified range in both tension and compression, except that inertia dependent, acceleration limiting mechanical snubbers may be tested to verify only that activation takes place in both directions of travel;
2) Snubber bleed, or release rate where required, is present in both tension and compression, within the specified range;
3) For mechanical snubbers, the force required to initiate or maintain motion of the snubber is within the specified range in both directions of travel; and
4) For snubbers specifically required not to displace under continuous load, the ability of the snubber to withstand load without displacement.

Comparison of the requirements shows them to be equivalent in intent. The sole significant difference is that the SLC reflects an allowance from the original Technical Specification requirements for acceleration limiting snubbers in order to match the requirements that were in place during initial design and construction. The station procedures and specifications that govern the implementation of the inservice testing program verify that activation in each direction takes place within prescribed limits and snubbers that fail to do so are not returned to service. The allowance to verify only that activation takes place was relocated from the original Technical Specifications to the SLC during conversion to Improved Technical Specifications in order not to impose a stricter requirement than that contained in the original license basis.

OM-4 7.2

This section outlines testing methods and restrictions. The basic requirements of the code are: snubbers are to be tested as near to the as-found condition as practicable; test methods are not to alter the snubber condition; in-place or bench testing may be used; testing of subcomponents and correlation of indirect measurements may be used. In addition, the code provides guidance as to counting parallel and

multiple installations as well as to the rounding up of fractional sample sizes. Although the SLC does not explicitly address each of these items, the governing procedures and plant processes incorporate the same intent. Procedures require that tested snubbers are not altered prior to testing and bench testing is performed in accordance with approved procedures per the code requirements. Each snubber in parallel or multiple installations is identified individually in the station controlled equipment and component lists. Fractional sizes of all samples are rounded up. In general, these items are all governed by the Inservice Testing guidance provided in Section XI and OM code general sections, as well as generic industry and regulatory guidance. There are no significant differences between the OM-4 and SLC programs in this area.

OM-4 7.3

Section 7.3 addresses Qualitative Testing of snubbers and allows for non-quantitative measures to be used provided a basis is provided. This is an allowance that the SLC does not explicitly address. However, the SLC allowance to verify only that activation takes place in certain snubbers does have a similar basis as this section. This is not seen as a significant dissimilarity between the two documents and their implementation.

OM-4 7.4

In this section the OM code requires that testing be performed at least every refueling outage using a sample of snubbers in the facility. The SLC states "At least once per 18 months during shutdown, a representative sample of snubbers of each type shall be tested..." These requirements are judged to be identical.

OM-4 7.5 & 7.6

Sections 7.5 & 7.6 address Inservice Operability Testing Failure Evaluation requirements. The primary requirement is that snubbers failing to meet the test acceptance criteria must be evaluated to determine the cause of failure. SLC 16.9-13 also states that, "An engineering evaluation shall be made of each failure to meet the functional test acceptance criteria to determine the cause of the failure." The OM code also includes a requirement that unacceptable snubbers be categorized into FMG for purposes of further testing and the appropriate corrective actions. Sections 7.5.1 through 7.5.4 provide details on the implementation of this requirement. The Catawba SLC does not mandate that a FMG be defined for every failure, although it does allow for such groupings when deemed appropriate. In instances of single failures the use of FMG methodology can result in fewer total tests than testing in the general population. While this is desirable from a work scope perspective, it may in some instances be less conservative in terms of defining the reliability of the

entire snubber population, especially for single failures that are forced to fit into a defined FMG. The details of this will be addressed in more detail in the comparison of those code sections dealing with the individual sample plan corrective actions.

OM-4 7.7

Section 7.7 requires that testing be conducted using either the 10% or 37 Sample Plans. In addition, the code requires that the sample plan to be used is determined prior to beginning the test interval, and the same plan is to be used throughout that interval. Test plan groups shall encompass all snubbers and shall be grouped by size, design, application, or other means as determined by engineering evaluation.

SLC 16.9-13 has the following wording: "At least once per 18 months during shutdown, a representative sample of snubbers of each type shall be tested using one of the following Sample Plans. The large-bore steam generator hydraulic snubbers shall be treated as a separate type (population) for functional test purposes. A 10% random sample shall be tested at least once per 18 months during refueling with continued testing based on a failure evaluation. The Sample Plan shall be selected prior to the test period and cannot be changed during the test period. The NRC shall be notified in writing of the Sample Plan selected for each snubber type prior to the test period or the Sample Plan used in the prior test period shall be implemented."

Further wording from the SLC provides that, "The representative sample selected for the functional test Sample Plans shall be randomly selected from all snubbers and reviewed before beginning the testing. The review shall ensure, as far as practicable, that they are representative of the various configurations, operating environments, range of size, and capacity of snubbers. Snubbers placed in the same location as snubbers which failed the previous functional test shall be retested at the time of the next functional test but shall not be included in the Sample Plan."

The SLC also states: "Snubbers are classified and grouped by design and manufacturer but not by size. For example, mechanical snubbers utilizing the same design features of the 2-kip, 10-kip, and 100-kip capacity manufactured by Company "A" are of the same type. The same design mechanical snubbers manufactured by Company "B" for the purposes of this SLC would be of a different type, as would hydraulic snubbers from either manufacturer."

One difference between the code and SLC is that the Catawba SLC offers a third possible test plan in addition to the 10% and 37 plan that the code provides. The SLC includes a "55 Plan" retained from original generic Technical Specifications. It has never been implemented at

Catawba and there are no plans to do so. Currently Catawba utilizes four groupings for testing. Separate 10% plans are used for small bore Lisega hydraulic snubbers, Anchor/Darling mechanical snubbers, and the large bore steam generator snubbers. A 37 plan sample is used for the PSA mechanical snubber population. Any change in the sample plans used must be communicated to the NRC prior to the testing interval per the SLC.

Two other differences between code and SLC requirements are noted, both of which provide more conservatism in the SLC program with respect to the code. The SLC explicitly requires that the steam generator snubbers be tested as a separate population, whereas OM-4 does not address those snubbers. Similarly, the SLC requires that snubbers in locations that failed during the previous testing period be retested separate from the sample testing. The code is silent on previous failure location requirements and does not require subsequent retests.

OM-4 7.8

This section describes the code required 10% Test Sample Plan lot size and composition. The code requires that the initial sample under this plan be a representative random sample making up 10% of the defined group. For unacceptable snubbers additional samples equal to at least one-half the size of the initial sample shall be tested for each unacceptable snubber until the pertinent equation is satisfied or all snubbers in the FMG are tested. The code also states that the additional samples shall include the following:

a) snubbers of the same design;
b) snubbers immediately adjacent to the unacceptable snubber(s);
c) snubbers from the same system;
d) snubbers that have similar operating conditions;
e) snubbers that are previously untested.

SLC 16.9-13 requires that at least 10% of all snubbers shall be functionally tested either in-place or in a bench test. For each snubber of a type that does not meet the functional test acceptance criteria, an additional 10% of all snubbers shall be functionally tested until no more failures are found or until all snubbers have been functionally tested. If during the functional testing, additional sampling is required due to failure of only one type of snubber, the functional test results shall be reviewed at that time to determine if additional samples should be limited to the type of snubber which has failed the functional testing. An engineering evaluation shall be made of each failure to meet the functional test acceptance criteria to determine the cause of the failure. The results of this evaluation shall be used, if applicable, in selecting snubbers to be tested in an effort to determine the operability of

other snubbers irrespective of type which may be subject to the same failure mode.

In comparing the requirements it is noted that the SLC differs from the code in that the additional sample size per the SLC is double that of the code requirement. This is conservative in that more snubbers are tested. As stated previously in this document, a significant difference between the code and SLC is that the code requires the use of Failure Mode Grouping for all failures. The wording in the SLC allows for subsequent samples to be limited to a particular type due to the failure cause, or the evaluation may be used to define other snubbers to be tested regardless of type. This process matches the intent of the code to ensure that a sufficient number of the appropriate snubbers are tested to assure the reliability of the entire population. For single (or few) failures, the mandatory use of FMG testing may not be conservative in that it may encourage testing in a smaller sub-group of the population based upon failure data that is too limited to define a trend. This could result in less than desirable testing of the population at large.

In view of the larger additional sample size and the defined process of identifying appropriate additional sample composition based upon the failure evaluation, the SLC is judged to be at least as conservative as the code requirements in providing for population reliability.

OM-4 7.9

Section 7.9 of OM-4 addresses corrective actions specific to the failure mode groups of the 10% plan. The required corrective actions are summarized below.

1) For failures in Design, Manufacturing, Maintenance, Repair, Installation, and Application-Induced FMGs the following options are presented:
   a) replace or modify all snubbers in the FMG and do no further testing in the at-large population; or
   b) replace or repair the unacceptable snubbers in the FMG and perform supplemental tests in the FMG; or
   c) in Application-Induced FMGs replace or repair the unacceptable snubbers and ensure that the application and environment for all snubbers in the group are compatible with design parameters, and do no further testing in the at-large population.

2) For isolated FMG snubbers the corrective action is to repair or replace the unacceptable snubbers. The snubbers are then categorized as acceptable and no further testing is required.

3) For unexplained FMG snubbers the unacceptable snubbers are to be repaired or replaced and further testing is required from the at-large population.

Using the existing SLC requirements the following comparisons may be made. For failures as defined in 1) above, all snubbers susceptible to the same failure conditions would be identified and evaluated, tested, or replaced. An additional sample equal in size to the initial sample would be tested from the at-large population for each unacceptable snubber. This is conservative in comparison to 1)a) and 1)c) above, where no further testing is required.

The SLC makes no allowances for isolated failures as the code does. The unacceptable snubbers would be repaired or replaced and an additional sample equal in size to the initial sample would be tested from the at-large population for each unacceptable snubber. This is conservative in comparison to the code, where no further testing is required.

Both the code and the SLC treat unexplained failures in the same way.

Essentially, the SLC initially treats all snubber failures equal to the way the code treats unexplained failures until further testing reveals a discernable trend in failure causes. At that point the SLC requirements are more stringent in terms of numbers of additional snubbers tested. A non-conservative aspect of the code is that single failures could potentially be incorrectly categorized as an Isolated FMG based upon limited information or experience, as this is a subjective judgment. In such a case no further testing would be performed in the at-large population to assure a sufficient confidence of reliability.

OM-4 7.10 through 7.13

Section 7.10 through 7.13 of OM-4 outlines the 37 Sample Plan requirements. Per 7.10 the code requires a sample of 37 snubbers be selected in a random manner from the design test plan group, and that additional samples will also be selected randomly from the remaining population. The SLC requirement is the same as it requires a representative random sample of each test group to satisfy the equation $C=0.055N - 2.007$, where N = the number tested and C = the number of unacceptable snubbers. Substitution results in an initial sample (C=0) of 36.5 snubbers, rounding up to 37. Likewise, for each failure the additional snubber tests required will round up to 18, which matches the number required in the code equation $N = 36.49 + 18C$ as specified in 7.12.

The difference between the OM requirements and those of the SLC lie in the fact that OM-4 7.11 specifies the use of FMG testing and the SLC does not require FMG as such. For single or few failures the results are not significantly different in terms of the number of snubbers tested, since in most such cases the FMG defined per the code would be the entire population, unless a very specific failure mode could be identified. For multiple failures it is possible to perform trending of the failure cause. Per the code this permits FMG testing that would result in fewer numbers of tests than that required by the SLC, which would count each individual failure against the acceptance equation value rather than a single failure representing all FMG failures. The intent of FMG testing is to ensure that common failure modes are identified and evaluated, as well as to reduce unnecessary testing in the at-large population. The SLC requires that the failure cause be identified and appropriate corrective actions (i.e., further testing) be taken for susceptible snubbers. This is equal to the FMG methodology with regard to population reliability. Not using the FMG methodology results in equal or larger numbers of snubbers being tested, and is thus conservative.

Attachment B
ASME ISTD Comparison to SLC 16.9-13

This attachment will compare the pertinent sections of ISTD to Catawba SLC 16.9-13 as related to the OM-4 comparison to the SLC that is documented in Attachment A. The ISTD sections that correspond to OM-4 Sections 6 and 7 are ISTD 4200 (Inservice Examination) and ISTD 5200 (Inservice Operational Readiness Testing). Since much of this information duplicates the OM-4 requirements that have previously been compared in Attachment A, only those portions of the ISTD sections that differ from OM-4 will be reviewed in detail.

ISTD-4200

The general description of this section differs from OM-4 only in that ISTD does not mention FMGs for examinations. The SLC requirements match the ISTD requirements as detailed in the following sub-section discussions.

ISTD-4210

ISTD-4210 discusses the method and objective of the examinations. The stated objective is to identify physical damage, leakage, corrosion, or degradation from environmental exposure or operating conditions. External features that may indicate operability are to be examined and a checklist is to be prepared. SLC 16.9-13 also states that the visual examination shall verify that: (1) the snubber has no visible indications of damage or impaired operability, (2) attachments to the foundation or supporting structure are functional, and (3) fasteners for the attachment of the snubber to the component and to the snubber anchorage are functional. Catawba Procedure MP/0/A/7650/085 is used to implement the SLC requirements for visual examinations and includes a checklist of items as shown:

A. Verify that snubber position is within the appropriate working range for the snubber stroke
B. For hydraulic snubbers, verify that the fluid level is acceptable.
C. Snubber lug (part which contains self-aligning bearing) is not interfering with rear bracket ear or pipe clamp ear alignment.
D. Welding arc strikes, weld splatter, paint, scoring, roughness, or general corrosion.
E. Cylinder shaft and/or cylinder sleeve is bent, dented, or damaged in any way.

F. Damaged/loose fasteners, springs, or clamps; cracks in welds, or support members; bent supports members; or corrosion of support items.
G. Attachments to the foundation or supporting structures are functional.
H. Fasteners for the attachment of the snubber to the component and to the snubber anchorage are functional.
I. In addition, inspect Steam generator snubbers for the following:
   a. Plugs, fittings, valves, and end closures for leakage or damage.
   b. Fluid level in reservoir.

It is noted that in ISTD-3110 the examination boundary is defined as the snubber assembly from pin to pin, whereas the SLC and Catawba procedures include the entire support back to the building structure.

Per the above comparison, the requirements of ISTD-4210 are satisfied by the SLC and the referenced procedure.

ISTD-4220

ISTD states that all snubbers shall be considered one population for examination, but allows that they may be categorized as accessible or inaccessible and considered separately. The decision to categorize must be made before the scheduled examination and cannot be changed during the examination. When recombining categories the shorter of the intervals is to be used. The SLC states "Snubbers may be categorized, based upon their accessibility during power operation, as accessible or inaccessible. These categories may be examined separately or jointly. However, the licensee must make and document that decision before any inspection and shall use that decision as the basis upon which to determine the next inspection interval for that category." The SLC and ISTD requirements are judged to be equivalent.

ISTD-4230 through ISTD-4240

These sections are identical to OM-4 Sections 6.3 and 6.4 that were reviewed in Attachment A.

Attachment B
ASME ISTD Comparison to SLC 16.9-13

ISTD-4250 through ISTD-4280
These sections address examination intervals, sample sizes, evaluations, and corrective actions. The information contained here was incorporated from Generic Letter 90-09. The Catawba SLC also incorporates that information and matches the ISTD requirements.

ISTD-5200
This section addresses requirements for Inservice Operability Testing. The general requirement is that operability tests be performed on representative samples of snubbers at specific intervals. Additional sample lots shall be tested for each unacceptable snubber. In general, the Catawba SLC invokes the same requirements, with the primary differences being in the area of FMG requirements. These differences are addressed in the following sections.

ISTD-5210 through ISTD-5240
These sections are equivalent to OM-4 Sections 7.1 through 7.4 that were reviewed in Attachment A.

ISTD-5250 and ISTD-5260
These sections address Defined Test Plan Groups and Testing Sample Plans. As noted in the following discussion, the SLC matches these requirements with some minor exceptions.

ISTD-5261 requires that testing be conducted using either the 10% or 37 Sample Plans. In addition, the code requires that the sample plan to be used is determined prior to beginning the test interval, and the same plan is to be used throughout that interval. Test plan groups shall encompass all snubbers and may be grouped by size, design, application, or type.

SLC 16.9-13 has the following wording: "At least once per 18 months during shutdown, a representative sample of snubbers of each type shall be tested using one of the following Sample Plans. The large-bore steam generator hydraulic snubbers shall be treated as a separate type (population) for functional test purposes. A 10% random sample shall be tested at least once per 18 months during refueling with continued testing based on a failure evaluation. The Sample Plan shall be selected prior to the test period and cannot be changed during the test period. The NRC shall be notified in writing of the Sample Plan selected

for each snubber type prior to the test period or the Sample Plan used in the prior test period shall be implemented."

Further wording from the SLC provides that, "The representative sample selected for the functional test Sample Plans shall be randomly selected from all snubbers and reviewed before beginning the testing. The review shall ensure, as far as practicable, that they are representative of the various configurations, operating environments, range of size, and capacity of snubbers. Snubbers placed in the same location as snubbers which failed the previous functional test shall be retested at the time of the next functional test but shall not be included in the Sample Plan."

The SLC also states: "Snubbers are classified and grouped by design and manufacturer but not by size. For example, mechanical snubbers utilizing the same design features of the 2-kip, 10-kip, and 100-kip capacity manufactured by Company "A" are of the same type. The same design mechanical snubbers manufactured by Company "B" for the purposes of this SLC would be of a different type, as would hydraulic snubbers from either manufacturer."

One difference between ISTD and the SLC is that the Catawba SLC offers a third possible test plan in addition to the 10% and 37 plan that the code provides. The SLC includes a "55 Plan" retained from original generic Technical Specifications. It has never been implemented at Catawba and there are no plans to do so. Currently Catawba utilizes four groupings for testing. Separate 10% plans are used for small bore Lisega hydraulic snubbers, Anchor/Darling mechanical snubbers, and the large bore steam generator snubbers. A 37 plan sample is used for the PSA mechanical snubber population. Any change in the sample plans used must be communicated to the NRC prior to the testing interval per the SLC.

ISTD-5270

This section addresses actions required with regard to continued testing as a result of unacceptable test results. These actions include cause evaluation and possible Failure Mode Groups.

ISTD-5271 requires that snubbers failing to meet test requirements shall be evaluated to determine the cause of failure, and that the evaluation shall include review of

information related to other unacceptable snubbers found during the testing period. The evaluation is to be used, as applicable, to determine applicable FMG assignments. Sections ISTD-5272 through ISTD-5275 provide further guidance on the definition and use of FMGs. It is noted that this is somewhat different from the OM-4 requirements in that the assignment to and use of a FMG is not a definite requirement.

The Catawba SLC states the following:
"An engineering evaluation shall be made of each failure to meet the functional test acceptance criteria to determine the cause of the failure. The results of this evaluation shall be used, if applicable, in selecting snubbers to be tested in an effort to determine the OPERABILITY of other snubbers irrespective of type which may be subject to the same failure mode.

For the snubbers found inoperable, an engineering evaluation shall be performed on the components to which the inoperable snubbers are attached. The purpose of this engineering evaluation shall be to determine if the components to which the inoperable snubbers are attached were adversely affected by the inoperability of the snubbers in order to ensure that the component remains capable of meeting the designed service.

If any snubber selected for functional testing either fails to lock up or fails to move, i.e., frozen in place, the cause will be evaluated and, if caused by manufacturer or design deficiency, all snubbers of the same type subject to the same defect shall be functionally tested."

"All snubbers that fail to meet the functional test criteria must be evaluated to determine the cause, and the potential for applicability of the failure mode to other snubbers."

"If during the functional testing, additional sampling is required due to failure of only one type of snubber, the functional test results shall be reviewed at that time to determine if additional samples should be limited to the type of snubber which has failed the functional testing."

The SLC requires evaluations and follow up actions equivalent to ISTD with regard to failed snubbers. The SLC does not specifically address failure mode grouping, although it is not

precluded. In general, continued testing in the original Design Test Plan Group (DTPG) is conservative in terms of numbers tested as compared to using FMGs. The evaluations and extent of condition reviews required per the SLC wording above is of equal or greater rigor than that which is required by the use of FMGs. Review of following ISTD sections pertaining to the individual test plans provides further detail.

ISTD-5280

ISTD-5280 (Corrective Action) requires that unacceptable snubbers be adjusted, repaired, modified, or replaced. SLC 16.9-13 requires the following: "Snubbers which fail the visual inspection or the functional test acceptance criteria shall be repaired or replaced. Replacement snubbers and snubbers which have repairs which might affect the functional test results shall be tested to meet the functional test criteria before installation in the unit. Mechanical snubbers shall have met the acceptance criteria subsequent to their most recent service, and the freedom of motion test shall have been performed within 12 months before being installed in the unit." The SLC requirement satisfies the ISTD requirements.

ISTD-5310

This section describes the ISTD required 10% Test Sample Plan lot size and composition. The code requires that the initial sample under this plan be a representative random sample making up 10% of the defined group. For unacceptable snubbers additional samples equal to at least one-half the size of the initial sample are required. The code also states that the additional samples shall include the following:

a) snubbers of the same design;
b) snubbers immediately adjacent to the unacceptable snubber(s);
c) snubbers from the same system;
d) snubbers that have similar operating conditions;
e) snubbers that are previously untested.

SLC 16.9-13 requires that at least 10% of all snubbers shall be functionally tested either in-place or in a bench test. For each snubber of a type that does not meet the functional test acceptance criteria, an additional 10% of all snubbers shall be functionally tested until no more failures are found or until all snubbers have been functionally tested. If during the functional

testing, additional sampling is required due to failure of only one type of snubber, the functional test results shall be reviewed at that time to determine if additional samples should be limited to the type of snubber which has failed the functional testing. An engineering evaluation shall be made of each failure to meet the functional test acceptance criteria to determine the cause of the failure. The results of this evaluation shall be used, if applicable, in selecting snubbers to be tested in an effort to determine the operability of other snubbers irrespective of type which may be subject to the same failure mode.

In comparing the requirements it is noted that the SLC differs from the code in that the additional sample size per the SLC is double that of the code requirement. This is conservative in that more snubbers are tested. The wording in the SLC allows for subsequent samples to be limited to a particular type due to the failure cause, or the evaluation may be used to define other snubbers to be tested regardless of type. This process matches the intent of the code to ensure that a sufficient number of the appropriate snubbers are tested to assure the reliability of the entire population. In view of the larger additional sample size and the defined process of identifying appropriate additional sample composition based upon the failure evaluation, the SLC is judged to be at least as conservative as the code requirements in providing for population reliability.

ISTD-5320

This section addresses corrective actions required for the 10% plan. These are defined in terms specific to identified failure mode groups. The required corrective actions are summarized below.

1) When a FMG has not been established additional samples are taken from the at-large population as described in the previous discussion.
2) For isolated failures no additional tests are required.
3) For failures in Design, Manufacturing, or Application-Induced FMGs the following options are presented:
   a) replace or modify all snubbers in the FMG and do no further testing in the at-large population; or
   b) in Application-Induced FMGs replace or repair the unacceptable snubbers and ensure that the application and

environment for all snubbers in the group are compatible with design parameters, and do no further testing in the at-large population.

4) For failures in Design, Manufacturing, Maintenance, Repair, Installation, and Application-Induced FMGs the following options are presented when the actions in 3) above are not applicable:
   a) Testing in the FMG shall be based both on the number of unacceptable snubbers in the DTPG and determined by the failure evaluation to be appropriate for establishing the FMG, and on the number of unacceptable snubbers subsequently found in the FMG.
   b) Testing shall continue until equation ISTD-5331(b) is satisfied or all snubbers in the FMG have been tested.
5) Additional tests are not required for Transient Event FMG failures, but the operational readiness of all snubbers in this group shall be evaluated by stroking or testing.

For Item 1 above, the SLC requirement is the same as ISTD except that additional samples are equal in size to the original sample instead of one-half the size as ISTD requires.

With regard to Item 2 the SLC makes no allowances for isolated failures as the code does. The unacceptable snubbers would be repaired or replaced and an additional sample equal in size to the initial sample would be tested from the at-large population for each unacceptable snubber. This is conservative in comparison to ISTD, where no further testing is required.

Using the existing SLC requirements the following comparisons may be made for Items 3 and 4. For failures as defined in these categories all snubbers susceptible to the same failure conditions would be identified and evaluated, tested, or replaced. An additional sample equal in size to the initial sample would be tested from the at-large population for each unacceptable snubber. This is conservative in comparison to Item 3 above, where no further testing is required.

The SLC and ISTD requirements for Transient Event failures are the same in that all snubbers identified in the susceptible group are to be evaluated by stroke or test.

Essentially, the SLC initially addresses all snubber failures equal to the way ISTD addresses unexplained failures until further testing reveals a discernable trend in failure causes. At that point the SLC requirements are more stringent in terms of numbers of additional snubbers tested. A non-conservative aspect of ISTD is that single failures could potentially be incorrectly categorized as an Isolated FMG based upon limited information or experience, as this is a subjective judgment. In such a case no further testing would be performed in the at-large population to assure a sufficient confidence of reliability.

ISTD 5330

This section provides requirements for completing 10% Plan testing. As noted previously, satisfying the required equation in ISTD assures that an additional sample of 5% of the DTPG is tested for each failure. The SLC requires that another 10% sample be tested for each failure.

ISTD-5410

Section 5410 of ISTD provides requirements for the 37 Sample Plan. ISTD-5410 requires that an initial sample of 37 snubbers is selected randomly for each DTPG, and that additional samples of 18 snubbers be selected for each unacceptable test. The acceptance equation from Figure 16.9-13-1 of the Catawba SLC results in the same sample requirements.

ISTD-5420

This section addresses corrective actions required for the 37 plan. These are defined in terms specific to identified failure mode groups. The required corrective actions are summarized below.

1) When a FMG has not been established additional samples are taken randomly from untested snubbers in the at-large population.
2) For isolated failures no additional tests are required.
3) For failures in Design, Manufacturing, or Application-Induced FMGs the following options are presented:
   a) replace or modify all snubbers in the FMG and do no further testing in the at-large population; or
   b) in Application-Induced FMGs replace or repair the unacceptable snubbers and ensure that the application and environment for all snubbers in the group are compatible

with design parameters, and do no further testing in the at-large population.

4) For failures in Design, Manufacturing, Maintenance, Repair, Installation, and Application-Induced FMGs the following options are presented when the actions in 3) above are not applicable:
   a) Testing in the FMG shall be based both on the number of unacceptable snubbers in the DTPG and determined by the failure evaluation to be appropriate for establishing the FMG, and on the number of unacceptable snubbers subsequently found in the FMG.
   b) Failures in a FMG shall require additional tests in the FMG unless an evaluation indicates that another grouping is appropriate for more tests.
   c) An additional sample from the DTPG shall be tested for each FMG established. Failures in the supplemental sample require additional tests unless evaluation indicates that another grouping is appropriate for more tests.
5) Additional tests are not required for Transient Event FMG failures, but the operational readiness of all snubbers in this group shall be evaluated by stroking or testing.

For Item 1 above, the SLC requirement is the same as ISTD.

With regard to Item 2 the SLC makes no allowances for isolated failures as ISTD does. The unacceptable snubbers would be repaired or replaced and an additional sample of 18 snubbers would be tested from the at-large population for each unacceptable snubber. This is conservative in comparison to ISTD, where no further testing is required.

It is noted that the 37 Plan is based upon "Wald's Sequential Probability Ratio Plan" as described in "Quality Control and Industrial Statistics" by Acheson J. Duncan. The plan is intended to provide a 95/90 confidence level in the population based upon successfully completing 37 tests. In cases where 37 successful tests are not achieved an additional sample is needed to achieve the desired confidence level. It is noted that the ISTD allowance to exempt additional testing for isolated failures appears to fall short of the desired statistical confidence level, since only 36 successful tests would be completed. In this regard the ISTD methodology is not conservative.

Attachment B
ASME ISTD Comparison to SLC 16.9-13

Using the existing SLC requirements the following comparisons may be made for Items 3 and 4. For failures as defined in these categories all snubbers susceptible to the same failure conditions would be identified and evaluated, tested, or replaced. An additional sample equal in size to the initial sample would be tested from the at-large population for each unacceptable snubber. This is conservative in comparison to Item 3 above, where no further testing is required. As noted previously, the ISTD allowance to do no further testing is statistically non-conservative. Although corrective actions are performed on the susceptible snubbers, the confidence level for the at-large population is not confirmed statistically if the original 37 plan testing scheme is not completed.

The SLC and ISTD requirements for Transient Event failures are the same in that all snubbers identified in the susceptible group are to be evaluated by stroke or test.

Essentially, the SLC initially addresses all snubber failures equal to the way ISTD addresses unexplained failures until further testing reveals a discernable trend in failure causes. At that point the SLC requirements are more stringent in terms of numbers of additional snubbers tested. A non-conservative aspect of ISTD is that failures may be categorized as an Isolated FMG and no further testing would be performed in the at-large population to assure a sufficient confidence of reliability. Likewise, if the corrective actions of ISTD-5423 are applied a similar lack of further testing is performed.

ISTD-5430
This section provides that testing in the DTPG is complete when the equation in ISTD-5431(a) is satisfied. This equation and the SLC equation from Figure 16.9-13.1 are equivalent. In addition, ISTD provides requirements for satisfying equation ISTD-5431(b) for FMG testing. Although the SLC does not specifically address FMG testing, DTPG testing as previously described provides an equal or better level of confidence in the general population as previously described.

ISTD-5500
This ISTD requirement is that snubbers placed in the same location as snubbers that failed the previous inservice operational readiness test shall be retested at the time of the

next tests. The SLC states "Snubbers placed in the same location as snubbers which failed the previous functional test shall be retested at the time of the next functional test."