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Secretary of the Commission
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Docketing and Service Branch

Subject: Comments/Alternative Proposals to Proposed Regulatory Guide; Qualification and Acceptance Tests for Snubbers used in Systems Important to Safety; Dated February, 1981

Comments and alternative proposals for the subject regulatory guide are attached.

Please proprive specific response directly to the writer.

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KAS/bfo

Attachment

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COMMENTS

Draft Regulatory Guide and Value/Impact Statement

Dated February 1981

Qualification and Acceptance Tests for Snubbers

Used in Systems Important to Safety

Paragraph B.4

A. Direct measurement of deadband is not accurately achieved for the assembled snubber, even with dynamic testing. For direct measurements during quasi-static loadings, it is not certain exactly what load is needed to completely "bottom out" the deadband in the direction of loading without introducing elastic deformation in some of the structural members. Also, there is some springback associated with any hydraulically driven load-test cylinder. Dynamic testing can give some measure of the deadbank by graphically indicating a region of low load versus deflection, but even these measurements are not completely accurate since the slope of the low-load region is never zero, indicating some deflection proportional to load.

Deadband determination should be incorporated into the dynamic qualification test for spring rate. If the spring rate (including deflection associated with deadband) achieved during qualification is consistent with the spring rate modeled in the system dynamic analysis, direct measurement of the deadband serves no useful purpose. For "simultaneous" lockup considerations, the maximum deadband can be controlled by fabrication drawing tolerances to negate this concern. Recent ETEC studies, as presented in the April 13/14, 1981 NRC snubber conference, indicate that deadbands less than 0.050 inches are adequate to assure proper lockup and load sharing of parallel snubbers. Tolerancing of drawings can easily control the deadband within this range consistent with qualified spring rates and preclude the need for direct production and qualification testing for deadband.

Because of the aforementioned reasons, deletion of the requirement to directly measure deadband during production and qualification testing and incorporate this measurement with the spring rate measurement is proposed as an acceptable alternative method for complying with this portion of the regulatory guide.

B. The necessity and value of determining the ultimate load capacity is not understood. Consider the following:

1. Differences in the ultimate strength of materials, especially among different heats, will cause the actual fracture of the snubber structural components to vary considerably. Except for a few cases (such as the maximum ultimate imposed for materials subject to stress corrosion cracking), materials are ordered to a minimum ultimate strength. Does the NRC intend that all load-carrying material be heat treated within a narrow strength range to make the ultimate load capacity meaningful?

2. Does the NRC intend that any design changes to accomodate specific customer requirements will require an additional analysis for utlimate load and a destructive test to determine the failure mode at ultimate load? For instance, different materials are used for contracts that require impact tests per NF-2300 and those that do not have an impact requirement. Moreover, design changes (such as rod extensions) can change the failure mode even if the same materials are utilized. If it is intended that these types of variations require additional destructive testing for failure mode of each design, this appears to be a high price to pay for such meaningless data, especially for large capacity snubbers that are usually custom designed and could have a value as high as $50,000 each.

3. The actual failure mode is dependent upon the structural integrity of the total snubber system including any customer supplied equipment. To determine the real failure mode, the total system will have to be load tested to failure and it is in doubt as to who has this responsibility. Appendix B allows analysis for failure mode but it is not understood how analysis can predict failure mode.

4. This paragraph ignores the more important aspect of failure mode: those can cause the snubber to become locked prior to ultimate failure. Plastic deformation of structural components could occur without ultimate failure and cause the snubber to fail locked for any subsequent thermal cycles; whereas, applying a load all the way to ultimate could cause the snubber to fail "open." Moreover, corrosion and vibration can cause the snubber to become locked (such as by a broken capston spring) during normal operational loadings.

5. NRC rules are in place to determine loadings for snubbers to preclude overloading. If overloading has occurred, the methods for determining the loadings should be changed instead of adding requirements on equipment to accomodate the overloading. If not, how can it be assumed that the restrained equipment is not the "weak link" in the snubber system.

   Based on the aforementioned, deletion of the requirement for determining the ultimate load capacity and the attendant failure mode for snubbers and revising the methods used to determine loadings to preclude overloading is proposed as an acceptable alternative for complying with this portion of the regulatory guide.

<u>Paragraph B.5</u>

Add a paragraph to state the following:

> "Since jamming/lockup of mechanical snubbers during normal operation is an operating problem, the possibiliy of inadvertant lockup in mechanical snubbers would require special attention during all tests on mechanical snubbers. Since lockup of a snubber during normal operating conditions can have catastrophic consequences, all environmentally induced failures (including vibrational failures) that can possibly cause inadvertant lockup should be completely eliminated as a failure mode, especially those failures that are not generic and that could not be determined by an external visual examination of the snubber."

If problems are being highlighted for on particular type of snubber, the known, specific problems for other types should also be specified or the reference to specific problems deleted altogether. If differentiation within general snubber types is to be made (such as the design differences between INC and Pacific Scientific mechanical snubbers), then the problems reported for hydraulic snubbers should be differentiated to identify that the problems were associated with viton/EPR seals and not TEFZEL seals.

Paragraph B.6.3

Delete the direct testing for deadband or state that confirmation of drawing tolerances within the maximum acceptable deadband is adequate for deadband verification. See comments for Paragraph B.4.

Paragraph C.3, C.4 & C.6

Revise these paragraphs to delete reference to 10 CFR 50, Appendix B. Appendix B is alredy invoked by law to require that the quality assurance program for all components in nuclear power plants provide control of activities and quality to an extent consistent with their importance to safety. The reiteration of this requirement in these paragraphs is redendant and misleading in that it appears to invoke the total Appendix B requirements on all materials regardless of their importance to safety. Also, the footnote needs clarification. 10CFR21 defines a defect/deviation as a departure from the technical requirements included in a procurement document. The procurement documents for snubbers already supplied were fully complied with before this draft regulatory guide was issued.

Appendix A, Paragraph 3

A. It is suggested that the definition for deadband be revised to the "axial movement not proportional to load" since, with friction, there should be no "free" axial movement.

B. It is suggested that a definition be added for peak force since, under the definition for spring rate, it appears to be any force range above rated load.

Appendix A, Paragraph 4.4

A. Delete the requirement to specify the functional parameters at the maximum and minimum working temperatures. The owner or his agent should specify enveloping requirements for all working temperatures since it is doubtful that the owner has prior knowledge of the specific effect of temperature variances on these parameters. Also, in general, only one working temperature is developed by the owner.

B. Delete the requirement for the owner or his agent to specify the rease rate for ten (10) different load ratings. A temperature enveloping release rate should be specified for the maximum load that the snubber should see in service. This sets the maximum release rate for consistency with the system dynamic analysis with all other release rates being predetermined by the flow characteristics of the particular bleed orifice. Moreover, a certain minimum release (bleed) rate is needed to assure proper bleed off of pressure following an accident which must be determined by the snubber manufactures. It is not feasible for the owner to know in advance the flow characteristics of all bleed orifices or the proper post-accident bleed off rate.

C. Delete the requirement that the owner should specify the spring rate at the ¼, ½, and 3/4 stroke location. The owner should specify the spring rate at his proposed hot operating condition. On snubbers with relatively long strokes, specification by the owner of spring rate a the ¼, ½, and 3/4 stroke locations is absolutely useless if the snubber is to operate at the 7/8 stroke location. Moreover, with linear dynamic analysis, only one spring rate is modeled, not a wide range of spring rates. Also, the hot operating condition is the condition of concern regarding safety; if the ambient temperature is in the $40^{\circ}F$ to $70^{\circ}F$ range the plant is already in a safe shutdown condition. This regulatory guide (without a definition of working temperature) could mislead the owner into specifying exact function parameters for the installation phase of construction (refer to R.G. paragraph 4.3.1) before any fuel is loaded. The specification by the owner or his agent of enveloping functional parameters at the hot operating (safety concerning) condition; the release rate at the maximum load the snubber will see in service; and, the spring rate at the hot operating stroke location are proposed as acceptable alternatives for complying with this portion of the regulatory guide.

Appendix B, Paragraph 3.0

It is suggested that essential design variables be specified and that these variables be flexible enough to preclude the qualification tests from becoming production tests. This guide appears to assume that all snubber are standard with model numbers. This is not the case, especially for large, equipment snubbers. Most snubbers are customed designed for specific application with varying extensions, brackets, release rates, reservoir heights, lockup velocities, materials, (impacts/material availability), orientations, etc. Much of the divergence can be eliminated if the qualification is limited to the pin-to-pin snubber and orientation is eliminated as an essential variable. This seems feasible since none of the customer supplied equipment requires qualification anyway and adequate calculation methods are available to qualify hardware. Material changes should be allowed without requalification if only the structrual aspects are changed (sliding surfaces are not involved).

Additionally, the reference to load rating should be eliminated and replaced by a statement that enveloping of load ratings is allowed for qualification. On hydraulic snubbers, size does not change the functional operating requirements except for the valve lockup and bleed settings and these are required to be verified by production testing on each snubber anyway.

Revise to eliminate any reference to rated load or emergency load. The rated load as defined has no meaning since the snubber is specifically designed not to lockup during service level "A/B" loads and the only load it sees is the drag load. Many components are now designed without a Service Level "C" load being specified. Revise to allow all qualification tests to be performed at one load only and that this load should be compatible with the maximum load the snubber will see in service and available, industry test equipment. There is no test equipment available in the industry to apply a Level "C" load to the higher rated snubbers (200 kips to 2500 kips) at all required frequency ranges.

Based on the aforementioned, the qualification of one pin-to-pin snubber of each basic design type in the horizontal position and at a specified load compatible with the maximum service load and existing test equipment is proposed as an acceptable alternative for this portion of the regulatory guide as long as production testing is used to verify the lockup and release rate for each snubber and analysis is used to verify the structural attachments.

Appendix B, 3.2

Revise to allow use of qualification units for safety related functions if snubber is refurbished (new seals, fluid, etc.) and retested to the required production test.

Appendix B, 3.4

Revise to state that analysis can be used for mountings if it demonstrates that the snubber performance is not altered in such a manner that the specification requirements are violated.

Appendix B, 3.7

Delete the requirement for direct measurement of deadband. See comments on paragraph B.4. Also, add a statement that radiation environment compatibility can be proven independently by performing independent tests on susceptible non-metallic materials (lubricants, seals, fluid, etc.).

Appendix B, 3.9.1.2

Delete the requirement that activation be determined at 5%, 10%, 25%, 50%, and 100% of rated load. The snubber locks up at a very low load and the results are independent of the load eventually achieved. The lockup of a hydraulic snubber is velocity dependent, not load dependent. Revise to state that the acceleration or velocity (as applicable) is to be measured. The aforementioned is proposed as an acceptable alternative to meeting this portion of the regulatory guide.

Appendix B, Paragraph 3.9.1.3

Delete the requirement for direct measurement of deadband. The deadband measurement would only verify to tolerancing stackup of the test setup and not those in the field. Drawing tolerancing must be used for the field installation. See comments on paragraph B.4.

Appendix B, Paragraph 3.9.1.5 & 6

Delete the qualification spring rate requirement for snubbers with Level "D" load ratings greater than 200 kips. The largest test load available at 33 Hz is about 200 kips. For snubbers with large load ratings (up to 3000 kips), the minute deflections realized in conjunction with normal instrumentation error would make the test results meaningless. As an alternative to these regulatory guide requirements, it is proposed that qualification of snubbers with load ratings 200 kips be replaced by a quasi-static production test on each snubber at the Level "D" load rating and at a temperature approximating the normal operating temperature. The stroke location should be that anticipated for hot condition in service. This will approximate the proposed "one-cycle dynamic" test since more than one cycle is necessary to effect any appreciable dynamic effect.

Appendix B, Paragraph 3.9.b

Revised to state 200°F or the specified operating ambient temperature, whichever is lower.

Appendix B, Paragraph 3.11

Revise to allow one retest without design changes to preclude non-generic type failures or test apparatus malfunction.

Appendix B, Paragraph 3.12

Delete in its entirety. If the NRC is stating that its methods for analytically generating component loads is inadequate, this will have a greater affect on undermining public confidence in the safety of nuclear power plants than a snubber problem that has already been basically resolved.

Appendix C

All general Appendix B comments concerning mounting requirements, direct measurement of deadband, stroke location, etc., also apply to these tests. Revise the hydraulic fluid leakage requirements to determine if the snubber is leaking exclusive of rod wiping. There is no practical method to determine a leakage rate. It is not understood in 3.6.a how the snubber is cycled with no load applied or the value of this test. The test for activation, drag, etc. will determine the snubber is in working order.

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4/30/81