



**U.S.NRC**

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**Inservice Examination and Testing Issues for  
Dynamic Restraint (Snubber)  
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## Disclaimer

- This presentation was prepared by staff of the U.S. Nuclear Regulatory Commission (NRC). It may present information that does not currently represent an agreed upon NRC staff position. NRC has neither approved nor disapproved the technical content.



## Topics for Discussion

- This presentation is from the 13<sup>th</sup> ASME/NRC Symposium on Valves, Pumps, and Inservice Testing, dated July 2017 with some additional snubber related issues.



## Topics for Discussion

### (1) Regulatory and Programmatic Issues:

- Temporary Instruction (TI) 2515/189, “Inspection to Determine Compliance of Dynamic Restraint (Snubber) Program with 10 CFR 50.55a Regulatory Requirements for Inservice Examination and Testing of Snubbers,” and its inspection results
- Snubber inservice examination and testing program (snubber program) and its submittal
- Scope of Snubber Program



## Topics for Discussion (Cont.)

### (2) Snubber Operational Readiness Issues:

- NRC Information Notice (IN) 2015-09, “Mechanical Dynamic Restraint (Snubber) Lubricant Degradation Not Identified Due to Insufficient Service Life Monitoring,” dated September 24, 2015
- Event Notice 51788, “Part 21 - Hydraulic Snubber Seal Material Deviation Interim Report,” dated March 14, 2016

### (3) Fleet’s Combined Snubber Program Issues

### (4) Clinton Power Station – Non-Cited Violation

### (5) Concussions



## TI 2515/189 and its Inspection Results

### Background and Action Taken:

- In 2008, NRC staff has discovered that some licensees are not following the regulation requirements for inservice examination and testing of snubbers as specified in 10 CFR 50.55a.
- NRC issued Regulatory Issue Summary (RIS) 2010-06, “Inservice Inspection and Testing Requirements of Dynamic Restraints (Snubbers)” and Enforcement Guidance Memorandum (EGM) 2010-01, “Disposition Violation of Inservice Examination and Testing Requirements for Dynamic Restraints (Snubbers),” on June 1, 2010.
- NRC expected that licensees not meeting the 10 CFR 50.55a regulations should have completed all actions noted in RIS 2010-06 and EGM 2010-01, by June 1, 2012.



## TI 2515/189 and its Inspection Results (cont.)

### Background and Action Taken (cont.):

- Licensees should have corrected any noncompliances with their snubber programs by June 01, 2012 or submitted relief request(s) to NRC for approval.
- NRC issued TI 2515/189 on September 25, 2013 to review the compliance of licensees' snubber programs with the 10 CFR 50.55a and ASME Code requirements.
- Based on TI 2515/189, NRC randomly selected 10 plants and performed TI 2515/189 inspection with two plants from each Region and two additional plants from Region II.



## TI 2515/189 and its Inspection Results (cont.)

### Results and Conclusion:

- All of the randomly selected 10 plants meet the plant's snubber program requirements as specified in their plant's documents with following observations:
  - Confusion exists between ASME B&PV Code Section XI (ASME/American National Standards Institute (ANSI) OM Part 4), and ASME OM Code requirements.
  - Confusion exists between ASME B&PV Code Section XI and ASME OM Code requirements for snubber examination and testing.
  - Confusion exists while using plant Technical Specifications (TS) for snubber examination and testing and meeting 10 CFR 50.55a requirements. While using TS, some licensees did not update their TS to the latest applicable ASME Code while updating their plants' 120-month inservice inspection and inservice testing interval programs as required by 10 CFR 50.55a.



## Snubber Program and its Submittal Requirement

### Regulatory Requirement:

- ASME Section XI, Article IWA-1000, “General Requirements,” and ASME OM Code, Subsection ISTA-3000, “General Requirements,” provide the requirements for preparation of test plans, documentation plan (snubber program), and submittal requirements for inservice examination and testing of certain components in light-water nuclear power plants.
- Similar requirements are provided in detail in RIS 2010-06 and NUREG-1482, Revision 2, Appendix-A.



## Snubber Program and its Submittal Requirement (Cont.)

### Issue and Resolution:

- The NRC staff observed that some licensees have not submitted their snubber test plan (and/or snubber program) to the NRC and that some of the submitted snubber programs do not meet all of the ASME Code requirements. The following are examples of problems identified in the submitted programs:
  - Some 10-year interval inservice inspection (ISI) or inservice testing (IST) programs state that licensees have developed their snubber programs in accordance with the ASME OM Code as required by 10 CFR 50.55a(b)(3)(v) and the programs are included in their plants' procedures.

The licensees should have included the snubber test plan (and/or snubber program) in their submittal instead of just stating that snubber programs are included and available in their plants' procedures.



## Snubber Program and its Submittal Requirement (Cont.)

### Issue and Resolution (cont.):

- Some plants submitted their TS pages containing snubber examination and testing requirements as plants' snubber test plan (or snubber program). These submitted TS pages have already been deleted from the plants' TS.

The licensees should have developed a new updated snubber test plan (and/or snubber program) based of their current applicable ASME B&PV Code Section XI or ASME OM Code requirements instead of just submitting deleted TS pages containing the snubber requirements.

## **Snubber Program and its Submittal Requirement (Cont.)**

### Issue and Resolution (cont.):

- Some 10-year interval ISI or IST programs state that the snubber test plan (and/or snubber program) is being developed under snubber programs without giving additional information in the submittal.

The licensees should have submitted the developed snubber test plan (and/or snubber program) with the current 10-year ISI or IST interval instead of just saying that it is being developed.



## Snubber Program and its Submittal Requirement (Cont.)

### Issue and Resolution (cont.):

- Some 10-year interval ISI or IST programs include snubber program sections that contain very limited information about snubber examination and testing. Some of these sections do not provide any information about SLM, which is an integral part of the snubber program.

As a minimum, licensees should have developed a snubber test plan (and/or snubber program) and its bases containing all the requirements as specified under ISTA-3100, “Test and Examination Programs,” and ISTD-3000, “General Requirements,” including (1) Visual Examination; (2) Functional Testing; and (3) SLM Requirements. For details see Appendix-A, NUREG-1482, Revision 2.

## Scope of the Snubber Program

### ISSUE

- NRC staff has observed an issue that some licensees have used ASME BPV Code Section XI, IWF-1230 to eliminate certain snubbers from inservice inspection (ISI) scope while exempting supports from ISI examination.
- NRC staff has also observed that some vendor/contractor reports have referenced IWF-1230 to eliminate certain snubbers from ISI scope.



## Scope of the Snubber Program (cont.)

### NRC Position

- The Snubber Program must include all snubbers used in a system that performs a specific function in shutting down a reactor to the safe shutdown condition, in maintaining the safe shutdown condition, in mitigating the consequences of an accident, or to ensure the integrity of the reactor coolant pressure boundary.
- Licensees have the responsibility to demonstrate the continued operability of all snubbers within the scope of their snubber inservice examination and testing program.
- Plants use ASME B&PV Code Section XI, IWF-1230 to exempt specific supports from inservice examination. IWF-1230 should not be used to exempt snubbers from inservice inspection and testing.



## Scope of the Snubber Program (cont.)

### Regulatory Requirements:

- The following regulatory documents and guidelines should be considered in determining the full scope of the Snubber Program:
  - Title 10 of the Code of Federal Regulations (10 CFR) Section 50.55a
    - ASME *Boiler & Pressure Vessel Code* (BPV Code), Section XI
    - ASME Code for *Operation and Maintenance* (OM Code)
  - TS; or Technical Requirements Manual (TRM)
  - 10 CFR Part 50
    - Appendix A, “General Design Criteria for Nuclear Power Plants”
    - Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants”
  - 10 CFR Part 100, “Reactor Site Criteria”
  - NRC Standard Review Plan (SRP) Section 3.9.6, “Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints”

## Scope of the Snubber Program (cont.)

### Regulatory Requirements (cont.):

- ASME BPV Code, Section XI
  - ASME BPV Code, Section XI, IWF-1230, “Supports Exempt from Examination,” states that supports exempt from the examination requirements of the IWF-2000 are those connected to piping and other items exempt from volumetric, surface, or VT-1 or VT-3 visual examination by IWB-1220, IWC-1220, IWD-1220, and IWE-1220.
  - IWF-2100 states that “The requirements of this Article IWF-2000 apply to the examination and inspection of component supports, but not to the inservice test requirements of IWF-5000.”

## Scope of the Snubber Program (cont.)

### Regulatory Requirements (cont.):

- ASME OM Code
  - ISTA-1100 states that dynamic restraints (snubbers) include those used in a system that performs a specific function in shutting down a reactor to the safe shutdown condition, in maintaining the safe shutdown condition, in mitigating the consequences of an accident, or to ensure the integrity of the reactor coolant pressure boundary.



## Scope of the Snubber Program (cont.)

### Discussion:

- All the above regulatory documents and guidelines show that the Snubber Program must include all snubbers used in a system that performs a specific function in shutting down a reactor to the safe shutdown condition, in maintaining the safe shutdown condition, in mitigating the consequences of an accident, or to ensure the integrity of the reactor coolant pressure boundary.
- IWF-1230 should not be used to exempt snubbers from inservice inspection and testing.



## Scope of the Snubber Program (cont.)

### Conclusion:

- Licensees are cautioned that while using IWF-1230 to exempt specific supports from inspection and tests, IWF-1230 shall not be used to exempt snubbers from inservice examination and testing.
- NRC staff may prepare a Regulatory Issue Summary (RIS) in the future to clarify the Scope of the Snubber Program.



## Information Notice (IN) 2015-09

### Issue:

- While reviewing Institute of Nuclear Power Operations (INPO), operating experience (OEs), NRC staff discovered that a large number of the mechanical snubbers failed during inservice inspection at various plants' outages during the first quarter of 2014.
- Review of failed snubber reports, NRC staff discovered that most of the snubber failures were caused by grease degradation, such as:
  - (1) oil separation from grease;
  - (2) dried or “caked” grease;
  - (3) excessive grease;
  - (4) sticky and tacky grease; and
  - (5) hardened or missing grease.



## Information Notice (IN) 2015-09 (cont.)

### Cause of the failures:

- The grease degradation might result from the following:
  - Vibration
  - Elevated temperature for extended periods of time (e.g., high room temperature, high fluid temperature, or snubber installed in close proximity to high-temperature components)
  - Hazardous environment at snubber location
  - Aging of the snubber and grease
  - Snubber installed from spare inventory without a recent preservice test
  - Shelf life of the grease exceeding the manufacturer's recommendation.



## Information Notice (IN) 2015-09 (cont.)

### Regulatory Requirement:

- The operational readiness of snubbers at a nuclear power plant is established by the combination of (1) inservice examination, (2) functional testing, and (3) Service Life Monitoring (SLM) of snubbers during refueling outages as required by 10 CFR 50.55a and the applicable ASME BPV Code or ASME OM Code.



## Information Notice (IN) 2015-09 (cont.)

### Discussion:

- Past industry experience with snubber failures has demonstrated that the failure modes of mechanical snubbers might not be identified by visual inspection or physical stroking.
- With the small sample (10 % or 37 snubber plan) of snubbers selected for functional testing each refueling outage, it might take decades before all of a plant's snubbers are tested. Furthermore, some snubbers might never be tested during their service life.
- During refueling outage, only a small sample of the snubber population is selected for testing, SLM plays a very important role in maintaining the operational readiness of snubbers at a Nuclear Power Plant.



## Information Notice (IN) 2015-09 (cont.)

### Conclusion:

- Review of plants' failed mechanical snubbers' reports revealed that these failures (lubricant degradation) were due to insufficient SLM programs at various plants.
- NRC issued IN 2015-09 to remind licensees regarding importance of SLM along with visual examination and functional testing for operational readiness of snubbers at their plants.

## Event Notice # 51788

### Findings:

- During routine refueling outage activities in October 2015 at Peach Bottom Power Station, it was discovered that 9 out of 14 hydraulic snubbers had no fluid in their reservoirs.
- Peach Bottom installed these new hydraulic snubbers during the recent Extended Power Uprate (EPU) on the modified Main Steam System piping.

## **Event Notice # 51788 (cont.)**

### Evaluation of Findings by Peach Bottom:

- The licensee determined that the cause of the hydraulic fluid leak was due to premature aging of the reservoir piston seal due to vibration induced friction heat.
- Licensee performed laboratory testing of the seal material which revealed that a material substitution of different grade of Ethylene Propylene (EP) was used instead of previously vendor approved EP.

## Event Notice # 51788 (cont.)

### Evaluation by Snubber Vendor:

- Snubber vendor confirmed that a seal material substitute was made by the seal vendor.
- Vendor performed additional qualification testing of substitute seal material and found it acceptable.
- In a follow-up qualification testing, vendor determined that a specific defect is not due to seal material change by seal vendor.



## Event Notice # 51788 (cont.)

### Conclusion of Findings:

- This Event Notice concludes that during EPU, licensees should use the guidelines provided in RG 1.20, “Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing,” to avoid the snubber failures due to vibration.
- For more details see Event Notice 51788 dated March 14, 2016 related to 10 CFR Part 21- Hydraulic Snubber Seal Material Deviation Report (ADAMS No. ML16076A262).

## Fleet's Snubber Program Issues

- NRC staff has observed that some of the fleets have developed a common Snubber Inservice Inspection and Testing Plan or Program for various plants (more than 10 plants) with the following:
  - Applicable 10-year ISI or IST intervals including start and end dates are not specified for plants
  - Various Editions & Addendas of ASME BPV, Section XI and ASME OM Code are used for various plants to develop common document
  - Use of 10% plan or 37 snubber plan specified without specifying which plant is using 10% plan or 37 snubber plan
  - No guidelines provided to develop a separate Defined Test Plan Group (DTPG) for Large Bore snubbers attached to steam generator and reactor coolant pumps, as required by the ASME OM Code Subsection ISTD-5253

## **Fleet's Snubber Program Issues (cont.)**

- Snubber Program Plan states that Code Case OMN-13 may be used to extend the visual examination, if applicable conditions are met (without specifying which plant is using OMN-13)
  - Code Case OMN-13, Revision 1, Section 3.7(b) is ignored. If the cumulative number of unacceptable snubbers exceeds the applicable values in Table ISTD-4252-1, the use of Code Case OMN-13 ends.
  - Fleet's combined snubber program cover sheet shows as snubber program. Inside the document it states snubber procedure.
- All the above items will create confusion for the snubber program owners, users, and as well as for the NRC inspectors.



## Clinton Power Station - Non-Cited Violation

- Clinton Power Station (CPS) committed to ASME OM Code, Subsection ISTD for snubber inservice examination and testing.
- In September 2017, NRC inspectors selected a mechanical snubber failure condition reports for in-depth review at CPS.
- NRC inspectors identified a finding of low safety significant and associated Non-Cited Violation (NCV) of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” for the licensee’s failure to demonstrate compliance with the requirement as prescribed in procedure ER-CL-330, “CPS Snubber Program,” Revisions 1 and 2. (ADAMS Accession No. ML17313A039)



## Clinton Power Station - Non-Cited Violation (cont.)

- NRC inspector discovered that for three continuous refueling outages (2013, 2015 & 2017), the licensee failed to perform engineering evaluations to determine the cause of failure of snubbers that did not satisfy their functional testing acceptance criteria.
- The CPS Snubber Program is governed by Clinton Plant Procedure ER-CL-330, which established the requirements for activities including inservice testing and data evaluation. CPS Procedure ER-CL-330, Section 7.1.2 states, in part, that “[..] If a snubber fails to satisfy the acceptance criteria of an operational readiness test, then an engineering evaluation of the failed snubber shall be performed within 72 hours to determine the cause of the failure [....].”



## Clinton Power Station - Non-Cited Violation (Cont.)

### Summary:

- Snubber failure evaluation during inservice functional testing must have two parts:
  - Evaluation to determine the cause of the snubber failure, and
  - Evaluation to determine the effect to the piping components supported by the failed snubber.
- The CPS failed to determine the cause of the snubber failure.
- There is no operability concern because, as part of their corrective actions, the licensee evaluated the components affected by the failed snubbers. Further, CPS replaced the failed snubbers with fully functional ones to restore the affected piping systems to original design configuration.

## Conclusions

- The purpose of this presentation is to make licensees aware of a number of snubber inservice examination and testing issues that NRC staff has encountered.
- Licensees who believe that some of the items discussed are applicable to their facilities may wish to review their current snubber program and modify their program as appropriate.



Questions?

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