



S N U B B E R U S E R S G R O U P

SNUBBER USERS GROUP 2024 SUMMER CONFERENCE & TRADE SHOW

Call To Order
Bob Fandetti

ADMINISTRATIVE ITEMS

- Safety Items & Logistics
- Introduce Directors and Officers
- Agenda Review
- Beverage Break @ 9:15; sponsored by SNUG
- Lunch @ 11:30; sponsored by Lisega/NEPCO
- Beverage Break @ 2:30; sponsored by SNUG



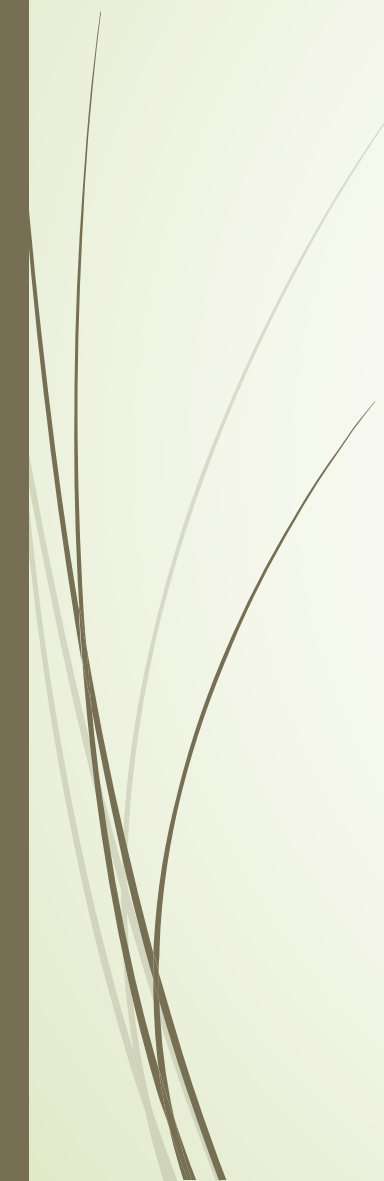


Online Snubber Work

Presented by Gustavo Avila

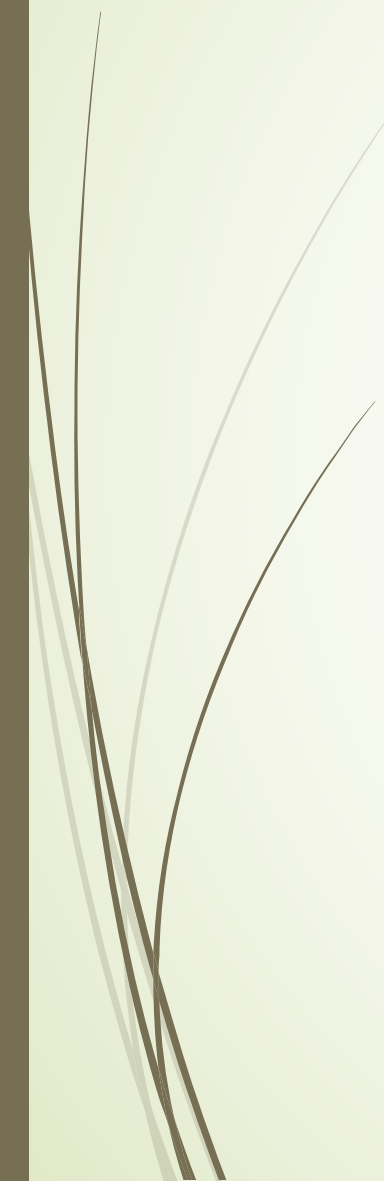


ASME OM Code ISTD-5240 Test Frequency

- ▶ 2017 and earlier editions = 60 days prior to the outage start date
 - ▶ 2020 edition = 92 days prior to the outage start date
- 



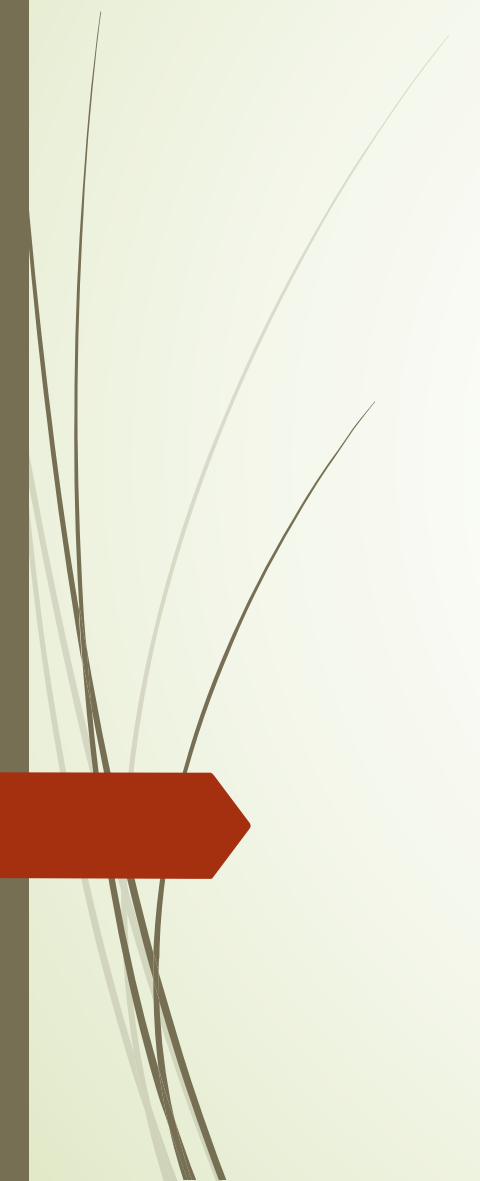
Constellation Sites Performing Online Work

- Calvert Cliffs
 - Lasalle
 - Limerick
 - Nine Mile
 - Fitzpatrick
 - Clinton (planning in 2025)
- 



How do we accomplish this?

- Only 1 snubber is removed per subsystem
- Operable system vs non-operable system
- Systems that have snubbers removed are typically not the operable train
- Pull/Put method used
- 10% and 37 Plan done in the 60/92-day window
- SLM can be done at anytime, but we aim at adding them into the outage window



Questions?



WHEN IS A VISUAL FAILURE, A FAILURE?

PRESENTED BY GUSTAVO AVILA

ASME OM-2020 ISTD 4200

- ISTD-4210 Method and Objective
 - Division I, Nonmandatory Appendix B.
- ISTD-4231 Restrained Movement
- ISTD-4232 Thermal Movement
- ISTD-4233 Design-Specific Characteristics
- ISTD-4240 Operational Readiness Test Evaluation

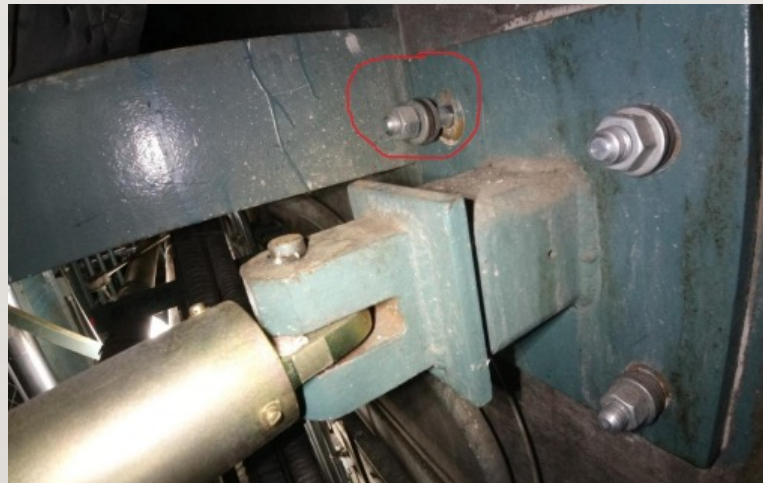
EXAMPLES OF VISUAL INDICATIONS

1. Inadequate position setting.
2. Loose, missing or incorrectly installed structural connections or fasteners.
3. Degradation of fluid reservoir
4. Inadequate fluid reservoir level.
5. Corrosion or solid deposits that result in unacceptable snubber performance.

EXAMPLE I



EXAMPLE 2



EXAMPLE 3



EXAMPLE 4

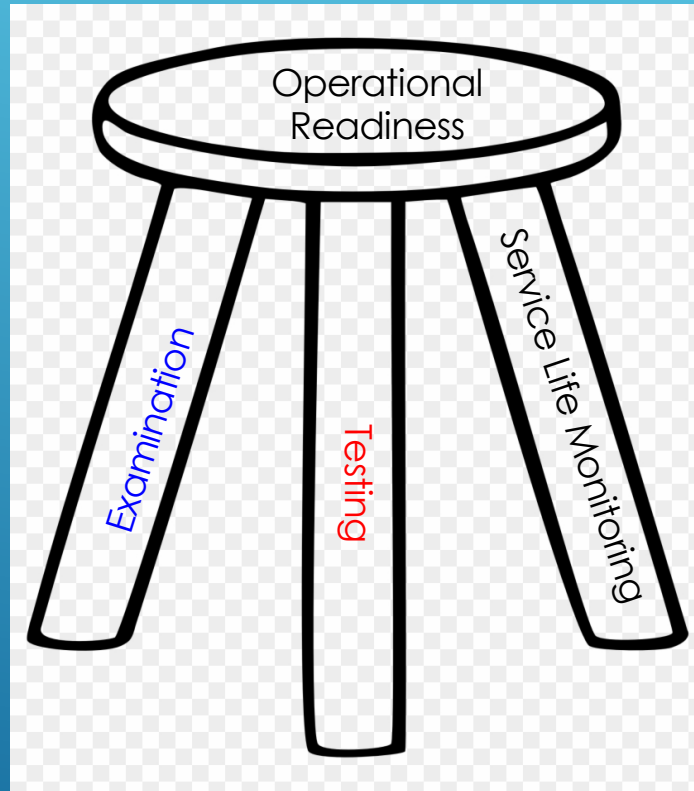


CONCLUSION

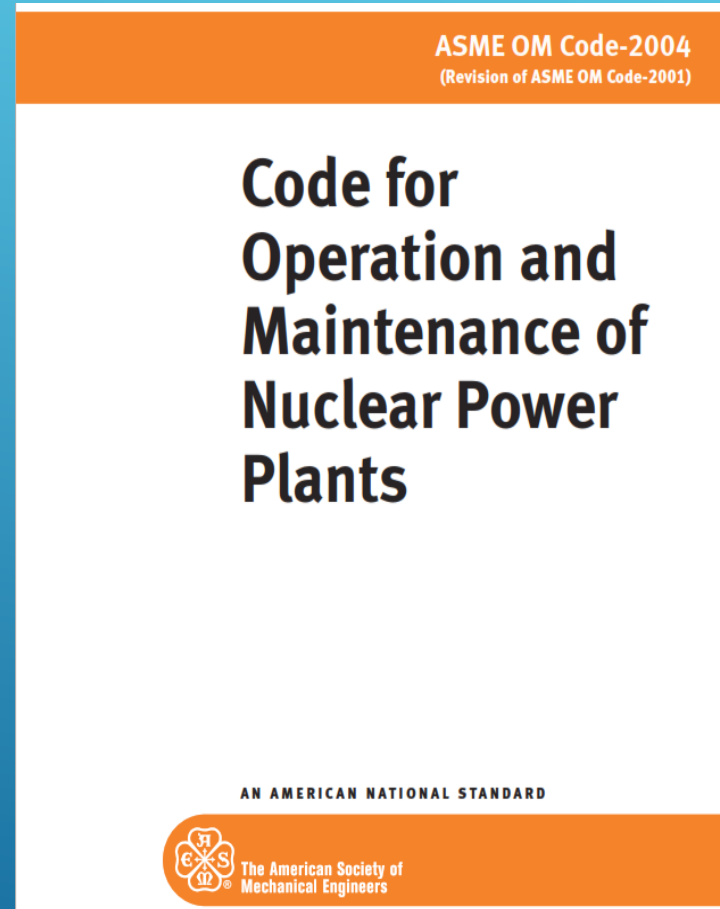
- Visual indication does not mean failure.
- Functional testing should be performed to determine if the snubber is degraded or UNSAT.
- Snubbers can be evaluated to determine operational readiness
- Industry peers may have seen your example.
- Issue reports for indications.

QUESTIONS?

THE THREE LEGGED STOOL



CODE 101



CODE 101 - ISTD

The Three-Legged Stool

- ▶ ISTD-4000, Visual Examination
- ▶ ISTD-5000, Testing
- ▶ ISTD-6000, Service Life Monitoring

Remove one leg, and the stool falls over. All three are required for snubbers in the scope of OM Code to provide reasonable assurance the snubber can perform its function.

(ISTA- Discusses Qualification)

CODE 101 – SOME DEFINITIONS

- ▶ OM Code – Contains the Inservice Testing Program (IST) Requirements for snubbers
- ▶ Interval – Each site must update and Inservice Inspection Program periodically, adopting the latest edition of the Code for the update. The period between updates is the interval.
- ▶ ISTD – The section of OM Code on Dynamic Restraints (Snubbers)
- ▶ Section XI – The Inservice Inspection Code that may contain visual examination and qualification requirements for snubber examiners
- ▶ Code Case – an alternate to the code.
- ▶ Code of Record – the Edition of the Code you are operating under.

Code 101 – code requirements are often identified by the section and number. for example, you may hear, “the site tests its snubbers per ISTD-5311(b)”

ISTD-5300 The 10% Testing Sample

ISTD-5310 The 10% Testing Sample Plan, Sample Size, and Composition

ISTD-5311 Initial Sample Size and Composition.

The initial sample shall be 10% of the DTPG, composed according to either ISTD-5311(a) or ISTD-5311(b).

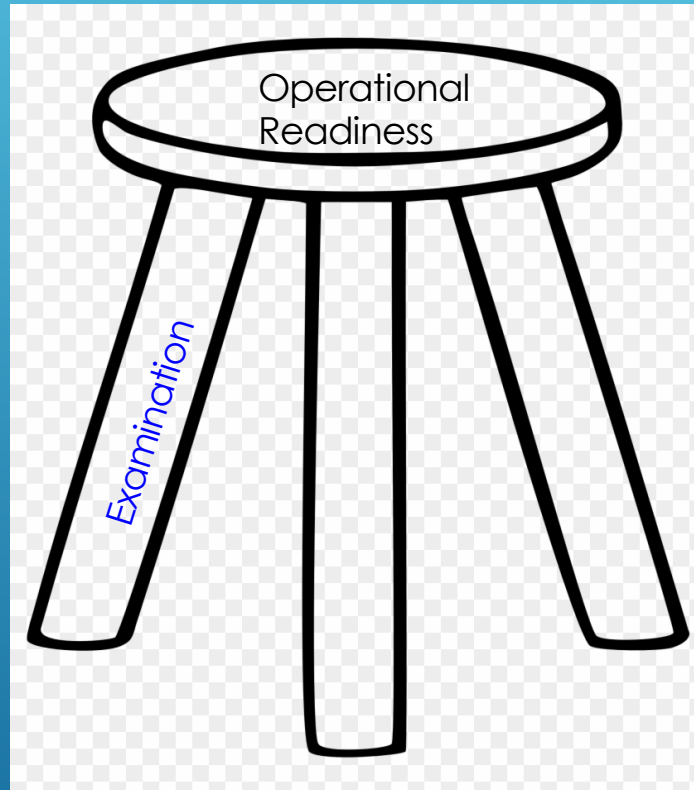
(a) As practicable, the sample shall include representation from the DTPG based on the significant features (i.e., the various designs, configurations, operating environments, sizes, and capacities) and based on the ratio of the number of snubbers of each significant feature, to the total number of snubbers in the DTPG. Selection of the representative snubbers shall be random.

(b) The sample shall be generally representative as specified in ISTD-5311(a), but may also be selected from snubbers concurrently scheduled for seal replacement or other similar activity related to service life monitoring. The snubbers shall be tested on a generally rotational basis to coincide with the service life monitoring activity.

Site Examination and Testing Requirements

- Licensing Basis Requirements:
 - Technical Specifications (Tech Spec)
 - TRMs (Owner Controlled Documents)
 - ASME (American Society of Mechanical Engineers) Code (OM – ISTD)
 - Combinations of the above
- 
- Several white lines of varying lengths and angles are positioned in the bottom right corner of the slide, creating a modern, abstract graphic element.

THE THREE LEGGED STOOL



What is in the examination boundary?



VISUAL EXAMINATION BOUNDARY

Boundary defined as pin to pin inclusive

Examiners must be qualified

A checklist shall be used (documentation of the exam and that critical attributes were examined)



VISUAL EXAMINATION BOUNDARY

Structural attachments fall under Section XI and must be examined by VT-3 qualified individuals



ABOUT VISUAL EXAMINATION FINDINGS

Be aware of Precursors

Questions to ask

Are we sure we have the right information?

Do we need to test it to verify operational readiness?

Is it UNSAT?

Can we see the pins?

What if an issue with the support was observed?

Does the ISI engineer need to know?

Take a Picture!

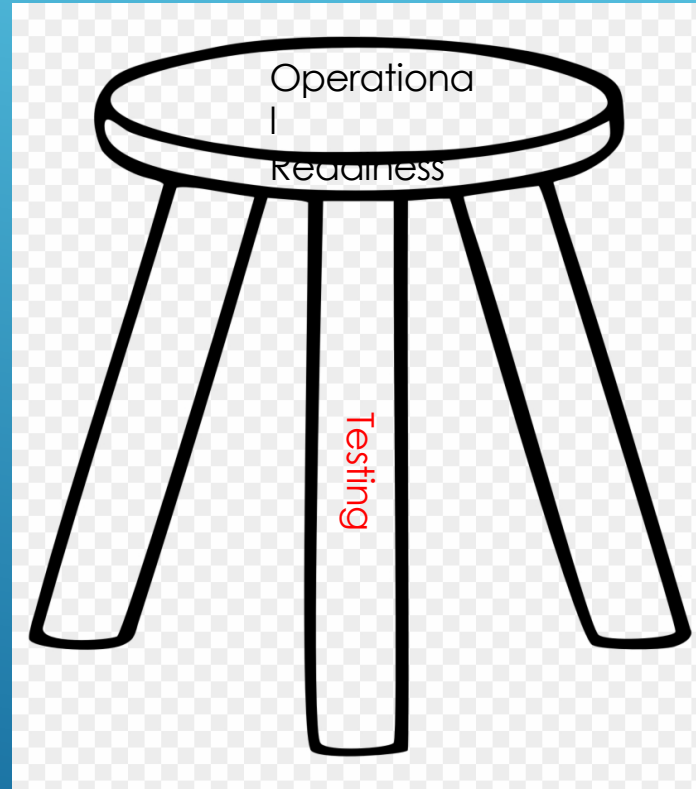
ABOUT OMN-13 CODE CASE

- ▶ Allows up to 10 years between examinations of each snubber
 - ▶ Requires an As Found examination if a snubber is removed for any reason
 - ▶ May not be suitable for small populations
- 
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Table ISTD-4252-1 Visual Examination Table

Population or Category [Note (1)]	Number of Unacceptable Snubbers		
	Column A for Extended Interval [Notes (2), (3)]	Column B for Interval Same as Previous [Notes (2), (4), (5)]	Column C for Interval Reduction to $\frac{2}{3}$ [Notes (2), (5), (6)]
1	0	0	1
80	0	0	2
100	0	1	4
150	0	3	8
200	2	5	13
300	5	12	25
400	8	18	36
500	12	24	48
750	20	40	78
≥1000	29	56	109

THE THREE LEGGED STOOL



SNUBBER TESTING REQUIREMENTS

Current Sample plans fall under 3 options

- 10% Plan – Random/representative. Generally used for populations of under 370 snubbers
- 37 Plan – Used for larger populations. Testing 37 snubbers provides a statistical minimum to be able to make ascertions about the health of the entire population
- A combination of the two above

(One plant is on a Code Case specific to their population)

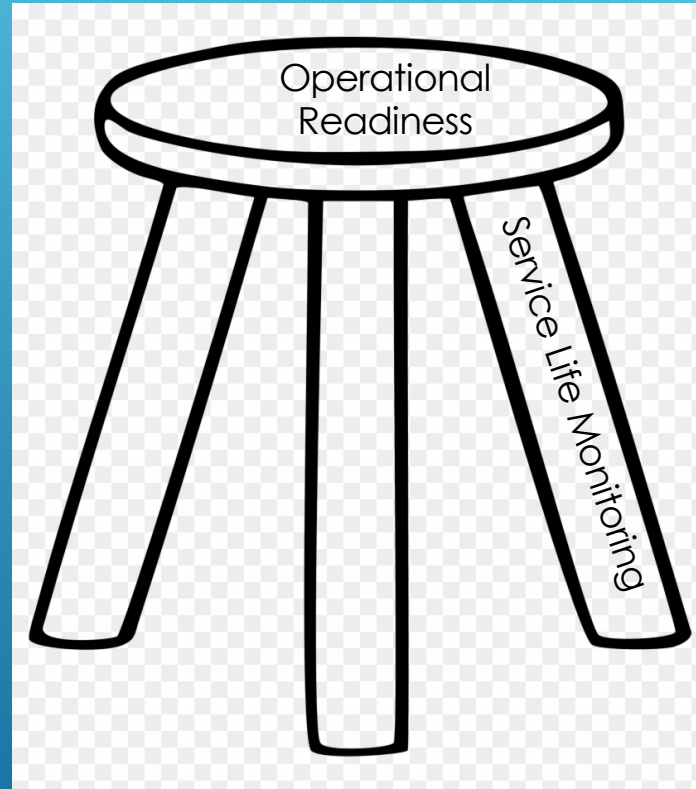
FAILED ACTIONS

Follow your procedures

- ▶ Failure

- ▶ Who calls “failure”? Maintenance? Engineer?
- ▶ Recommend a Time Out be taken – check test criteria, load cell used, load pin used, etc... This may not change the test result, but it can avoid a tear down WO, failure analysis, and other actions.
- ▶ Function of the system requires further evaluation
- ▶ Determining the cause of the failure is required
- ▶ Service Life Review is recommended

THE THREE LEGGED STOOL

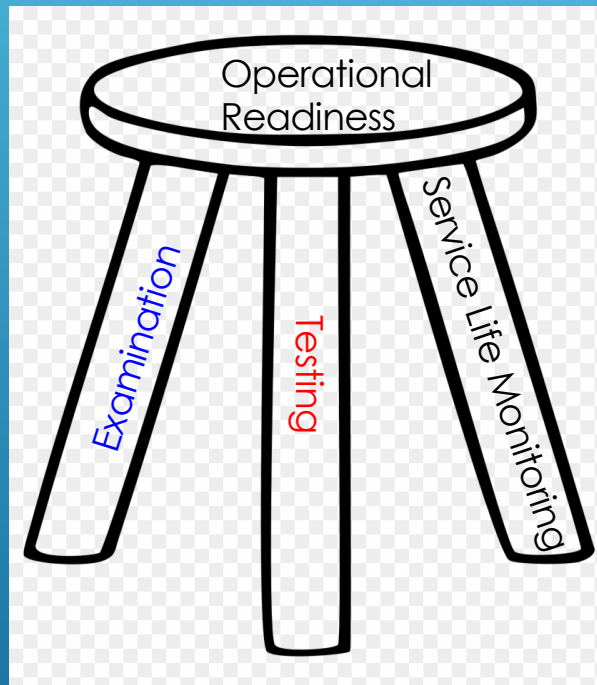


SERVICE LIFE MONITORING (SLM)

At a minimum, know the manufacturer's service life for each snubber.

- ▶ Monitoring of service life is not an option.
- ▶ Hydraulics are different than Mechanicals.
- ▶ Hand-Stroking or regreasing of mechanicals may not just be a good practice. It may be a requirement in your service life monitoring procedure.
- ▶ Large Bore Snubbers with external reservoirs have special requirements.

QUESTIONS?





NRC Liaison Report & Updates
Snubber User Group (SNUG) 2024 Meeting
Cleveland, OH

Gurjendra S. Bedi, PE
Mechanical Engineering and Inservice Testing Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation
July 15-17, 2024

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

- Current 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a.
- Proposed Rulemaking to update 10 CFR 50.55a
- Code Cases- Current in 10 CR 50.55a and Regulatory Guide (RG) 1.192, – OM Code Case Acceptability
- Proposed Rulemaking to update Code Cases RG 1.192
- Proposed Extension of Code of Record (COR) Update Intervals for IST and ISI Programs
- Code Case OMN-31, “Alternative to Allow Extension of ISTA-3120 Inservice Examination and Test Intervals From 10 Years to 12 Years”
- General Communication

Current 10 CFR 50.55a

- Last ASME Code Rulemaking
 - Issued on October 27, 2022
 - *Federal Register*, Vol. 87, No. 207, pages 65128-65157
 - Effective on November 28, 2022
- Incorporates by Reference in 10 CFR 50.55a:
 - 2020 Edition of ASME OM Code, Division 1, with Conditions
 - 2019 Edition of ASME BPV Code, Section III, Division 1, with Conditions
 - 2019 Edition of ASME BPV Code, Section XI, Division 1, with Conditions
- For current 10 CFR 50.55a, see www.ecfr.gov

Current 10 CFR 50.55a (cont.)

- Specific changes to 10 CFR 50.55a regarding ASME OM Code (2020 Edition) included:
 - Removed incorporation by reference of 2011 Addenda of ASME OM Code from 10 CFR 50.55a(a)(1)(iv)(B)(2) and consequently removed condition on use of 2011 Addenda specified in 10 CFR 50.55a(b)(3)(vii) as well as reference to 2011 Addenda in 10 CFR 50.55a(b)(3)(ix).
 - Removed incorporation by reference of 2015 Edition of ASME OM Code from 10 CFR 50.55a(a)(1)(iv)(C)(2) and reference to 2015 Edition in 10 CFR 50.55a(b)(3)(ix).
 - Removed condition on use of Subsection ISTB in 2011 Addenda of the ASME OM Code based on removal of its incorporation by reference in 10 CFR 50.55a.

Current 10 CFR 50.55a (cont.)

- Specific 10 CFR 50.55a changes (continued):
 - Modified 10 CFR 50.55a(f)(4) and (g)(4) to clarify relationship between 50.55a(f)(4) and (g)(4) regarding IST or ISI programs for snubbers.
 - When using 2006 Addenda or later edition of ASME BPV Code, Section XI, the inservice examination, testing, and service life monitoring requirements for dynamic restraints (snubbers) must meet requirements set forth in applicable ASME OM Code as specified in 10 CFR 50.55a(b)(3)(v)(B).
 - When using 2005 Addenda or earlier edition or addenda of ASME BPV Code, Section XI, the inservice examination, testing, and service life monitoring requirements for dynamic restraints (snubbers) must meet requirements set forth in either applicable ASME OM Code or ASME BPV Code, Section XI as specified 10 CFR 50.55a(b)(3)(v)(A).

Current 10 CFR 50.55a (cont.)

- Specific 10 CFR 50.55a changes (continued):
 - In light of removal of IST Program Plan submittal requirement from 2020 Edition of ASME OM Code, added 10 CFR 50.55a(f)(7), Inservice testing reporting requirements.
 - Inservice Testing Program Test and Examination Plans (IST Plans) for pumps, valves, and dynamic restraints (snubbers) prepared to meet requirements of ASME OM Code must be submitted.
 - IST Plans must be submitted within 90 days of implementation for applicable 120-month IST Program interval. Electronic submission is preferred.

Current 10 CFR 50.55a (cont.)

- Specific 10 CFR 50.55a changes (continued):
 - In 10 CFR 50.55a(b)(3)(xi), provided additional provisions for extending the interval for position indication testing required in ISTC-3700 for valves not susceptible to stem-disk separation.
 - Incorporated by reference Subsection ISTE for risk-informed IST programs in the 2020 Edition of the ASME OM Code without conditions.

Proposed Rulemaking Update to Incorporate by Reference New ASME Codes in 10 CFR 50.55a

- NRC staff issued proposed rulemaking on August 8, 2023 (88 FR 53384) to incorporate by reference the following:
 - 2021 Edition of the ASME BPV Code, Division 1, Sections III and XI, with conditions as appropriate.
 - 2022 Edition of the ASME OM Code with conditions as appropriate.

Proposed Rulemaking Update to Incorporate by Reference New ASME Codes in 10 CFR 50.55a (cont.)

- IST proposed changes:
 - Remove conditions (b)(3)(ii)(A), (B), and (C) for 2022 Edition because incorporated in that edition
 - Remove condition (b)(3)(iii)(B) for check valve bidirectional testing for new reactors because required in recent code editions used by new reactors
 - Remove condition (b)(3)(iii)(C) for flow-induced vibration monitoring for new reactors because required by other regulations
 - New condition (b)(3)(vii) to clarify use of snubber code cases
 - New condition (b)(3)(x) to clarify sample expansion of Class 1 pressure relief valve testing based on setpoint testing

Proposed Rulemaking Update to Incorporate by Reference New ASME Codes in 10 CFR 50.55a (cont.)

- New condition (b)(3)(vii) to clarify use of Code Case OMN-15 :
(vii) *OM condition: Snubber visual examination interval extension.*
When implementing Subsection ISTD, paragraph ISTD-4253, and Note 7 of Table ISTD-4252-1, in the 2022 Edition of the ASME OM Code, incorporated by reference in paragraph (a)(1)(iv) of this section, to extend snubber visual examination beyond 2 refueling cycles (48 months), the licensee is prohibited from applying OM Code Case OMN-15, Revision 2, to extend the operational readiness testing interval of snubbers.
- NRC staff reviewing public comments
- Final rule scheduled to be issued in January 2025.

Code Cases in Current 10 CFR 50.55a

- Revision 4 of RG 1.192, Revision 39 of RG 1.84, and Revision 20 of RG 1.147 address the acceptability of:
 - ASME OM Code Cases OMN-22 to 27 available on the ASME Codes & Standard (C&S) Connect Website. Other OM Code Cases remain the same in Revision 4 as in Revision 3 to RG 1.192.
 - Code Cases from ASME BPV Code, Sections III and XI, listed in Supplement 0 through 7 to 2015 Edition of ASME BPV Code, Section XI, and Supplement 1 to 2019 Edition of ASME BPV Code.
 - Current NRC regulations in 10 CFR 50.55a incorporate by reference these specific revisions to RGs 1.192, 1.84, and 1.147.

10 CFR 50.55a Proposed Rulemaking Update – Code Cases and Extension of IST/ISI COR Update Interval

- Proposed Rulemaking for New Code Cases and IST/ISI COR Update Interval Extension:
 - Issued on March 6, 2023, for public comments in *Federal Register*, Vol. 88, No. 43, pages 13717-13735
 - Address acceptability of recent ASME BPV Code Cases and OM Code Cases by updating the applicable RGs.
 - Draft RG 1.192, Revision 5 (DG-1407) accepts new ASME OM Code Cases OMN-28 through OMN-30 without conditions and OMN-31 with conditions.

10 CFR 50.55a Proposed Rulemaking Update – Code Cases and Extension of IST/ISI COR Update Interval (cont.)

- Proposed rule also extends ISI and IST Code Of Record (COR) update requirements in 10 CFR 50.55a from 10 years to 20 or 24 years for licensees that are implementing (as their IST and ISI COR) the 2020 Edition of the ASME OM Code and 2019 Edition of the ASME BPV Code, or later editions and addenda, as incorporated by reference in 10 CFR 50.55a.
- For a licensee implementing ASME OM 2020 Edition and BPV 2019 Edition or later edition as its IST/ISI Program COR, the rule proposed a 20-year or 24-year COR update interval requirement depending on whether the licensee is implementing a 10-year or 12-year OM Examination and Test interval and Section XI Inspection interval as applicable to the ASME OM and BPV Codes.

10 CFR 50.55a Proposed Rulemaking Update – Code Cases and Extension of IST/ISI COR Update Interval (cont.)

- Based on a request, the NRC extended the public comment period for the proposed rule to June 16, 2023.
- The NRC staff is reviewing the public comments with issuance of the final rule scheduled for October 2024.

ASME OM Code Case OMN-31

- Code Case OMN-31 available on ASME C&S Connect website.
- ASME Code Case OMN-31 allows extension of ISTA-3120 Inservice Examination and Test Intervals from 10 Years to 12 Years provided all other requirements of ISTA-3120 are satisfied.
- ASME Code Case Index specifies applicability of Code Case OMN-31 as 2001 Edition through 2020 Edition of ASME OM Code.
- In RG 1.192 (Revision 5), NRC proposed a condition that use of Code Case OMN-31 is limited to licensees implementing the 2020 Edition through the latest edition of the ASME OM Code incorporated by reference in 10 CFR 50.55a as the COR for their IST Program.

NUREG-1482 Update

- NRC Staff is preparing NUREG-1482, Revision 4, “Inservice Testing of Pumps and Valves and Inservice Examination and Testing of Dynamic Restraints (Snubbers) at Nuclear Power Plants,” to provide additional information on the proposed new Code of Record update requirements and other recent developments and lessons learned for implementation of IST Programs.

Proposed ASME OM-2 Code

- ASME has prepared a proposed IST Code for pumps, valves, and dynamic restraints (or components that perform similar functions) in new and advanced reactors.
- The new IST Code is referred to as the OM-2 Code.
- ASME has distributed the proposed OM-2 Code for review by ASME OM Code committee members.
- ASME plans to issue the OM-2 Code in 2024.
- NRC staff is considering a new RG for acceptance of the OM-2 Code with applicable conditions.

ASME QME-1-2023 and Reformatting QME-1

- ASME Standard Committee updated QME-1 in 2023
- ASME is reformatting QME-1 standard to be more applicable for new and advanced reactors that might not use water-cooled systems
- NRC staff plans to revise RG 1.100 to accept QME-1-2023 and reformatted QME-1 with conditions when available

NRC/ASME O&M Code and IST Symposium

- NRC/ASME O&M (formally Pumps, Valves, and Snubbers) Fifteenth Symposium is being planned for July 28 and 29, 2025, with ASME OM Code committee meetings on July 30, 31, and August 1, 2025.
- Symposium and ASME OM meetings are planned to be held in person at Bethesda North Marriott (across from NRC Headquarters While Flint building) in Washington, DC.
- Call for papers will be issued soon.

QUESTIONS?
Future Questions
[Gurjendra. Bedi@nrc.gov](mailto:Gurjendra.Bedi@nrc.gov)

MORNING BEVERAGE BREAK

SPONSORED BY



RETURN BY 10:00 AM





ASME QME QDR **(Qualification of Dynamic Restraints)** **Subcommittee** **Liaison Report**

Presented by Steve Norman
Summer 2024 SNUG Conference

QDR Subcommittee Meeting Summary

QDR Ballots:

QDR has had no ballots for the membership to vote on since December of 2023

QDR Subcommittee Meeting Summary

The following items are being worked by the Subcommittee:

- **QDR 17-4; Reports**
- **QDR 21-1; Add Energy Absorbing Wire Rope Devices to Section QDR of QME-1**
- **QDR 23-01; Code Review for Section QDR of 2023 Edition of QME-1**
- **Errata**

QDR 17-4 - Reports

This Task Group is working to review the current content of all reports that are required to be completed by a dynamic restraint manufacturer and simplify them and make them more generic so that all types of dynamic restraint devices are documented similarly.

QDR 21-1 – Add Energy Absorbing Wire Rope Devices to Section QDR of QME-1

Record 19-3304 has been completed for creation of a new Code Case for these devices. New QDR Item QDR 21-1 has been opened for revising QDR to add these devices to the body of the section. Tim Canter is looking at QDR to determine what changes will be required to incorporate those changes and asked Vincent Cauley and Ben Eder of ITT Enidine for their help in an 11/04/21 email. Comments received from ITT Enidine on 04/14/22. Tim has incorporated these comments as well as any information that can be gleaned from ASME Section III Record 20-2924 and sent the marked up version to the subcommittee members for additional comments.

QDR 23-01– Code Review for QDR Section of 2023 Edition of QME-1

- Record 20-1559 for the 2017 Edition has been completed. New QDR Item QDR 21-2 has been opened for Code Review for the 2022 Edition.
- Since the 2022 Edition has turned into the 2023 Edition based on publication of a new edition, Item 21-2 will be changed to 23-01 and we will begin to process records for the 2023 Code Review Task Group.

Record 24-794 – Errata

- Record 24-794 has been created for errata associated with Record 20-1559.

QDR Subcommittee Meeting Summary

Top Issues (utility participation & overall membership)

- The number of utility members has been dropping due to retirements and normal attrition.
- With the increase in interest of new advanced reactor designs, we need to continue to be diligent in recruiting new and younger members, especially members employed by utilities.
- Anyone interested in becoming a QDR member??

QDR Subcommittee Meeting Summary

New Business for 2024:

- Close Code Review item for 2017 Edition and open new Code Review item when new edition is published (**2023 Edition has now been published**).
- Risk Informed Qualification - In previous QDR meetings this item was brought up for discussion on whether QDR needs to consider risk informed qualification. Need follow up with Rick Grantom regarding functions requiring qualification and impact to QDR.
- QME-1 rewrite.

QDR Subcommittee Meeting Summary

QDR Meetings:

- The last meeting of the QDR Subcommittee was held virtually on Thursday, July 11, 2024.
- The next scheduled QDR meeting will be a face-to-face meeting and is scheduled to be held on a date and time still to be determined; but will be held at the Sheraton Sand Key Resort in Clearwater Beach, Florida in conjunction with ASME OM Code Week.

QDR Subcommittee Meeting Summary

Questions
or
Comments
?

The background is a dark blue gradient with faint, stylized mechanical gears and a scale. The scale is a semi-circular arc with tick marks and numbers ranging from 150 to 260. Several circular paths with arrows indicate rotational movement.

ASME OM SUBCOMMITTEE ON DYNAMIC RESTRAINTS (ISTD) LIAISON REPORT

Presented by Steve Norman

Summer 2024

SNUbber User Group Conference & Trade Show

CURRENT ISSUES

- Service Life Monitoring
- Grace Period for Code 10 Year Visual Examination Interval
- Revise Code Case OMN-15 to Address Usage with Extended Visual Examination Interval
- Contingency Sample Testing
- Code Review for 2022 Edition
- Grace Period for Code Case OMN-13 10 Year Visual Examination Interval

USE OF THE ASME OM CODE IS REQUIRED BY THE NRC

- Latest Rulemaking includes the 2020 Edition of the OM Code
- Final Rule issued October 27, 2022
- Federal Register 87 FR 65128
- The NRC Staff is initiating a proposed Rulemaking to incorporate by reference the 2022 Edition of the OM Code, with conditions as appropriate.

ISTD ASME OM-2022

- ASME OM Code, 2022 Edition has been published
- The OM Code is currently on a two-year publishing schedule (even years)
- Addenda are no longer published

CHANGES INCLUDED IN THE 2022 EDITION

- ISTD-4200 “Inservice Examination” Revised

ISTD-4200 INSERVICE EXAMINATION

In previous editions, ISTD-4200 only stated:

Snubbers shall be visually examined on the required schedule and evaluated to determine their operational readiness.

ISTD-4200 now reads:

Snubbers shall be visually examined on the required schedule and evaluated to determine their operational readiness. The inservice intervals represent the maximum time between examinations for any individual snubber. Examinations may be performed at any time during the interval, but any snubber that exceeds this time between examinations shall be classified as unacceptable until such time as an acceptable examination or test in accordance with ISTD-4240 is completed.

CHANGES INCLUDED IN THE 2022 EDITION (CONT'D)

- ISTD-4200 “Inservice Examination” Revised
- ISTD-4234 “Examination Prior to Maintenance or Testing” added

ISTD-4234

EXAMINATION PRIOR TO MAINTENANCE OR TESTING

ISTD-4234 did not exist in previous editions

ISTD-4234 reads:

All snubbers shall be examined in accordance with the requirements of ISTD-4210 through ISTD-4240 prior to conducting any maintenance, stroking, or testing, and prior to removal, for any reason, from their installed location.

2022 PUBLISHED CHANGES (CONT'D)

- ISTD-4200 “Inservice Examination” Revised
- ISTD-4234 “Examination Prior to Maintenance or Testing” added
- ISTD-4252 (a) and (e) revised

ISTD-4252

SUBSEQUENT EXAMINATION INTERVALS

ISTD-4252(a) did read:

- a) Subsequent examination intervals shall begin at the end of the previous examination interval, and conclude at the end of the next refueling outage.

ISTD-4252(a) has been revised to read:

- a) Subsequent examination intervals shall begin at the end of the previous examination interval, ~~and conclude at the end of the next refueling outage.~~

ISTD-4252

SUBSEQUENT EXAMINATION INTERVALS

ISTD-4252(e) did read:

- (e) Snubbers determined to be unacceptable based on the visual examination acceptance criteria at any time during the interval shall be counted in determining the subsequent examination interval in accordance with Table ISTD-4252-1.

ISTD-4252(e) has been revised to read:

- (e) Snubbers determined to be unacceptable based on the visual examination acceptance criteria at any time during the interval shall be counted in determining the subsequent examination interval in accordance with Table ISTD-4252-1, regardless of the means of discovery. This shall include, for example, all unacceptable snubbers found during scheduled visual examinations; observed during walkdowns, maintenance, testing, snubber replacement, reservoir fluid level monitoring, transient dynamic event or water hammer evaluations; or service life monitoring activities. The total number of unacceptable snubbers shall be applied when using Table ISTD-4252-1 and ISTD-4253.

2022 PUBLISHED CHANGES (CONT'D)

- ISTD-4200 “Inservice Examination” Revised
- ISTD-4234 “Examination Prior to Maintenance or Testing” added
- ISTD-4252 (a) and (e) revised
- Notes (1) through (6) of Table ISTD-4252-1 revised and Note (7) added

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE

NOTES

NOTES (1) through (6) did read:

- (1) Interpolation between population or category sizes and the number of unacceptable snubbers is permissible. The next lower integer shall be used when interpolation results in a fraction.
- (2) The basic interval shall be the normal fuel cycle up to 24 mo. The examination interval may be as great as twice, the same, or as small as fractions of the previous interval as required by the following notes. The examination interval may vary $\pm 25\%$ only to accommodate an extended outage or an unplanned event during the examination interval. The $\pm 25\%$ variance is specifically not to be used to extend an examination for an additional refueling cycle.
- (3) If the number of unacceptable snubbers is equal to or less than the number in Column A, then the next examination interval may be increased to twice the previous examination interval, not to exceed 48 mo [$\pm 25\%$ of the current interval as defined in Note (2) above]. In that case, the next examination according to the previous interval may be skipped.
- (4) If the number of unacceptable snubbers exceeds the number in Column A, but is equal to or less than the number in Column B, then the next visual examination shall be conducted at the same interval as the previous interval.
- (5) If the number of unacceptable snubbers exceeds the number in Column B, but is equal to or less than the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous examination interval or, in accordance with the interpolation between Columns B and C, in proportion to the exact number of unacceptable snubbers.
- (6) If the number of unacceptable snubbers exceeds the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous interval.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE

NOTES

NOTES (1) through (7) have been revised extensively and now read:

- (1) Reference ISTD-4252(e) for considerations regarding unacceptable snubbers. Interpolation between population or category sizes and the number of unacceptable snubbers is permissible. The next lower integer shall be used when interpolation results in a fraction.
- (2) The basic interval shall be the length of the normal fuel cycle up to 24 months. The examination interval may be as great as twice, the same, or as small as fractions of the previous interval as required by Notes (3) through (6). The following grace periods may be applied to the resulting intervals:
 - (a) For intervals less than 2 yr, completion of the examinations may be extended by up to 25% of the interval.
 - (b) For intervals greater than or equal to 2 yr, completion of the examinations may be extended by up to 6 months except as noted in Note (7). The examination interval grace period noted above shall not be used to extend an examination period for an additional fuel cycle.
- (3) For intervals up to and including 24 months, if the number of unacceptable snubbers is equal to or less than the number in Column A, then the next examination interval may be increased to twice the previous examination interval, with a maximum nominal interval of 48 months and limitations as defined in Note (2) above.
- (4) If the number of unacceptable snubbers is equal to or less than the number in Column B, then the next visual examination may be conducted at the same interval as the previous interval.
- (5) For extended intervals up to 48 months, if the number of unacceptable snubbers exceeds the number in Column B, but is equal to or less than the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous examination interval or, in accordance with the interpolation between Columns B and C, in proportion to the exact number of unacceptable snubbers.
- (6) For extended intervals up to 48 months, if the number of unacceptable snubbers exceeds the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous interval.
- (7) If the previous examination was performed at the maximum interval of two fuel cycles as described in Note (3) and the number of unacceptable snubbers is equal to or less than the number in Column A, the subsequent examination interval may be extended to a maximum of 10 yr provided all requirements of ISTD-4253 are met. No grace period extension is applicable to extend any visual examination beyond 10 yr.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE NOTES

Let's look at each note individually.

NOTE (1) did read:

- (1) Interpolation between population or category sizes and the number of unacceptable snubbers is permissible. The next lower integer shall be used when interpolation results in a fraction.

NOTE (1) now reads:

- (1) Reference ISTD-4252(e) for considerations regarding unacceptable snubbers. Interpolation between population or category sizes and the number of unacceptable snubbers is permissible. The next lower integer shall be used when interpolation results in a fraction.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE NOTES

NOTE (2) did read:

The basic interval shall be the normal fuel cycle up to 24 months. The examination interval may be as great as twice, the same, or as small as fractions of the previous interval as required by the following notes. The examination interval may vary $\pm 25\%$ only to accommodate an extended outage or an unplanned event during the examination interval. The $\pm 25\%$ variance is specifically not to be used to extend an examination for an additional refueling cycle.

NOTE (2) now reads:

The basic interval shall be the length of the normal fuel cycle up to 24 months. The examination interval may be as great as twice, the same, or as small as fractions of the previous interval as required by Notes (3) through (6). The following grace periods may be applied to the resulting intervals:

- (a) For intervals less than 2 yr, completion of the examinations may be extended by up to 25% of the interval.
- (b) (b) For intervals greater than or equal to 2 yr, completion of the examinations may be extended by up to 6 months except as noted in Note (7). The examination interval grace period noted above shall not be used to extend an examination period for an additional fuel cycle.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE

NOTES

NOTE (3) did read:

If the number of unacceptable snubbers is equal to or less than the number in Column A, then the next examination interval may be increased to twice the previous examination interval, not to exceed 48 mo [$\pm 25\%$ of the current interval as defined in Note (2) above]. In that case, the next examination according to the previous interval may be skipped.

NOTE (3) now reads:

For intervals up to and including 24 months, if the number of unacceptable snubbers is equal to or less than the number in Column A, then the next examination interval may be increased to twice the previous examination interval, with a maximum nominal interval of 48 months and limitations as defined in Note (2) above.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE NOTES

NOTE (4) did read:

If the number of unacceptable snubbers exceeds the number in Column A, but is equal to or less than the number in Column B, then the next visual examination shall be conducted at the same interval as the previous interval.

NOTE (4) now reads:

If the number of unacceptable snubbers is equal to or less than the number in Column B, then the next visual examination may be conducted at the same interval as the previous interval.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE

NOTES

NOTE (5) did read:

If the number of unacceptable snubbers exceeds the number in Column B, but is equal to or less than the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous examination interval or, in accordance with the interpolation between Columns B and C, in proportion to the exact number of unacceptable snubbers.

NOTE (5) now reads:

For extended intervals up to 48 months, if the number of unacceptable snubbers exceeds the number in Column B, but is equal to or less than the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous examination interval or, in accordance with the interpolation between Columns B and C, in proportion to the exact number of unacceptable snubbers.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE

NOTES

NOTE (6) did read:

If the number of unacceptable snubbers exceeds the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous interval.

NOTE (6) now reads:

For extended intervals up to 48 months, if the number of unacceptable snubbers exceeds the number in Column C, then the next examination interval shall be decreased to two-thirds of the previous interval.

TABLE ISTD-4252-1 VISUAL EXAMINATION TABLE NOTES

New NOTE (7) has been added, which reads:

If the previous examination was performed at the maximum interval of two fuel cycles as described in Note (3) and the number of unacceptable snubbers is equal to or less than the number in Column A, the subsequent examination interval may be extended to a maximum of 10 yr provided all requirements of ISTD-4253 are met. No grace period extension is applicable to extend any visual examination beyond 10 yr.

2022 PUBLISHED CHANGES (CONT'D)

- ISTD-4200 “Inservice Examination” Revised
- ISTD-4234 “Examination Prior to Maintenance or Testing” added
- ISTD-4252 (a) and (e) revised
- Notes (1) through (6) of Table ISTD-4252-1 revised and Note (7) added
- ISTD-4253 “Additional Requirements for 10-yr Interval” added

ISTD-4253

ADDITIONAL REQUIREMENTS FOR 10-YR INTERVAL

ISTD-4253 did not exist in previous editions

ISTD-4253 reads:

All snubbers within the scope of Subsection ISTD may be examined and evaluated at least once every 10 yr in accordance with Table ISTD-4252-1, Note (7) provided the following requirements are satisfied:

- (a) If at any time during an examination interval the cumulative number of unacceptable snubbers per ISTD-4252(e) exceeds the applicable value from Table ISTD-4252-1, Column B, the current examination interval shall end, and all remaining examinations must be completed within the current fuel cycle. The duration of the subsequent examination interval shall be reduced to the 48-month maximum cycle examination interval used prior to implementing the 10-yr interval. The beginning of the subsequent fuel cycle shall be the starting date for the new examination interval.
- (b) No alternatives to ISTD-5200 testing requirements that allow for extended test intervals shall be used in conjunction with examination intervals that exceed a nominal value of 48 months.

2022 PUBLISHED CHANGES (CONT'D)

- ISTD-4200 “Inservice Examination” Revised
- ISTD-4234 “Examination Prior to Maintenance or Testing” added
- ISTD-4252 (a) and (e) revised
- Notes (1) through (6) of Table ISTD-4252-1 revised and Note (7) added
- ISTD-4253 “Additional Requirements for 10-yr Interval” added
- ISTD-6600 “Review of Operational Readiness Test Data” added

ISTD-6600

REVIEW OF OPERATIONAL READINESS TEST DATA

ISTD-6600 did not exist in previous editions

ISTD-6600 reads:

All inservice test data shall be evaluated for indications of snubber degradation or other anomalies. This includes a review of test traces, where available. The results of this evaluation shall be used

- (a) to identify snubbers that are subject to progressive degradation
- (b) to identify severe operating environments not previously identified

2022 PUBLISHED CHANGES (CONT'D)

- ISTD-4200 “Inservice Examination” Revised
- ISTD-4234 “Examination Prior to Maintenance or Testing” added
- ISTD-4252 (a) and (e) revised
- Notes (1) through (6) of Table ISTD-4252-1 revised and Note (7) added
- ISTD-4253 “Additional Requirements for 10-yr Interval” added
- ISTD-6600 “Review of Operational Readiness Test Data” added
- ISTD-6700 “Examination During Assembly” added

ISTD-6700

EXAMINATION DURING ASSEMBLY

ISTD-6700 did not exist in previous editions

ISTD-6700 reads:

Snubbers and snubber parts that are disassembled (during failure evaluation, refurbishment, etc.) shall be examined for indications of degradation and severe operating environments.

UPCOMING CHANGES

Record 23-498 was approved by SCDR on Ballot 23-728 to change paragraph 3.4 of Code Case OMN-15 regarding the use of the Case along with extended visual examination intervals.

Paragraph 3.4 did read:

3.4 Code Case OMN-13

This Code Case shall not be used in conjunction with Code Case OMN-13.

Subparagraph 3.4 proposed to read:

3.4 Code Case Use with 10-yr Visual Examination Interval

This Code Case shall not be used in conjunction with a 10-yr visual examination interval without prior authorization from the regulator having jurisdiction at the plant site.

UPCOMING CHANGES

However, this record received numerous comments when sent out for “world review” to all OM subcommittees. The item will therefore come back to SCDR for additional work.

UPCOMING CHANGES

- Ballot 24-68 for Record 24-22 (Grace Period for Code Case OMN-13 10 Year Visual Examination Interval) closed on 01/31/24 with five (5) negatives and three (3) comments. The record Project Manager must respond to all comments and negatives before ASME will take any further action. This item will most likely have to be reballoted.
- Ballot 24-71 for Record 24-23 (Grace Period for Code 10 Year Visual Examination Interval) closed on 01/31/24 with six (6) negatives and three (3) comments. The record Project Manager must respond to all comments and negatives before ASME will take any further action. This item will most likely have to be reballoted.
- Ballot 24-1685 for Record 24-1270 (Code Review for 2022 Edition) is a four-week review and comment ballot and was issued to all OM subcommittees on 05/28/24. The ballot is scheduled to close on 06/25/24.

FUTURE MEETINGS

- Thursday, July 18, 2024. This will be a face-to-face meeting and will be held at the Cleveland Marriott East Hotel in Cleveland, Ohio in conjunction with the Summer 2024 SNUBBER Users Group Conference & Trade Show.
- Wednesday, December 11, 2024. Again, this will be a face-to-face meeting and will be held at the Sheraton Sand Key Resort in Clearwater Beach, Florida in conjunction with the December 2024 ASME OM Code Week.

The background is a dark blue gradient with faint, light blue technical drawing elements. These include several concentric circles, some with dashed lines, and circular arcs with tick marks and numerical labels such as 160, 170, 180, 190, 220, 230, 240, 250, and 260. Some of these elements have small arrows indicating direction or rotation.

ASME OM SUBCOMMITTEE ON DYNAMIC RESTRAINTS (ISTD) LIAISON REPORT



Functional Test Plots

Comparing Plots from different Test Benches

By: Jeffrey Stallman

Test Bench Operation

Barker/Diacon Bench

DRAG TESTS:

- Velocity is maintained at the rate set by the user. Pump speed is adjusted during the test to maintain constant velocity.

ACCELERATION (PSA MECHANICAL):

- Pressure is preset at the level desired by the user to limit force applied to the required load. No adjustments made during the test.

BLEED ONLY (AD MECHANICAL):

- Load is monitored in real time during the test and adjusted to maintain user set level.

ACTIVATION (HYDRAULIC LOCKUP AND BLEED):

- Initially velocity is controlled to generate a user specified velocity ramp rate. When the snubber activates, the bench will switch to active load control to maintain the bleed load at the user specified level.

Wyle (Element) Bench

DRAG TESTS:

- Low pressure is set to move the snubber. A closed loop is used to control the position of the snubber and keep the bench moving at the desired set point velocity.

ACCELERATION (PSA MECHANICAL):

- Pressure is preset at the level desired by the user to achieve the required load.

BLEED ONLY (AD MECHANICAL):

- Pressure is preset at the level desired by the user to achieve the required load.

ACTIVATION (HYDRAULIC LOCKUP AND BLEED):

- Pressure is preset at the level desired by the user to achieve the required load.

Basic Pacific Scientific (PSA) - Mechanical

(1/4NF, 1/2NF, 1NF, 3NF, 10NF, 35NF, & 100NF)

Operation:

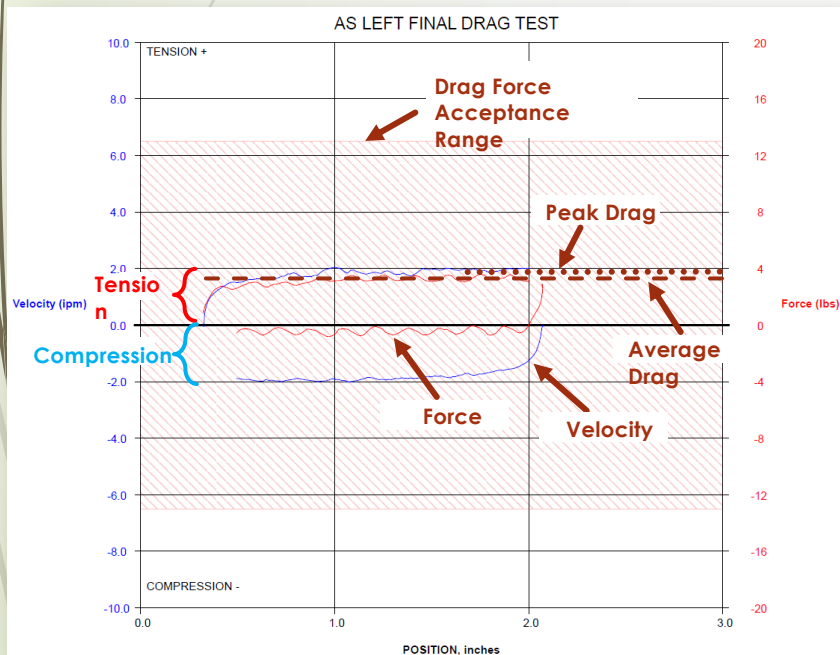
- Mechanical
- Limits Acceleration
- Converts linear movement to rotational motion of inertial mass
- Internal capstan spring tightens around the support cylinder to resist inertial mass rotation
 - A braking force is applied
 - Gradual thermal movement is possible
- Braking force releases
 - load is removed, or
 - inertial mass is spinning such that the capstan spring is relaxed



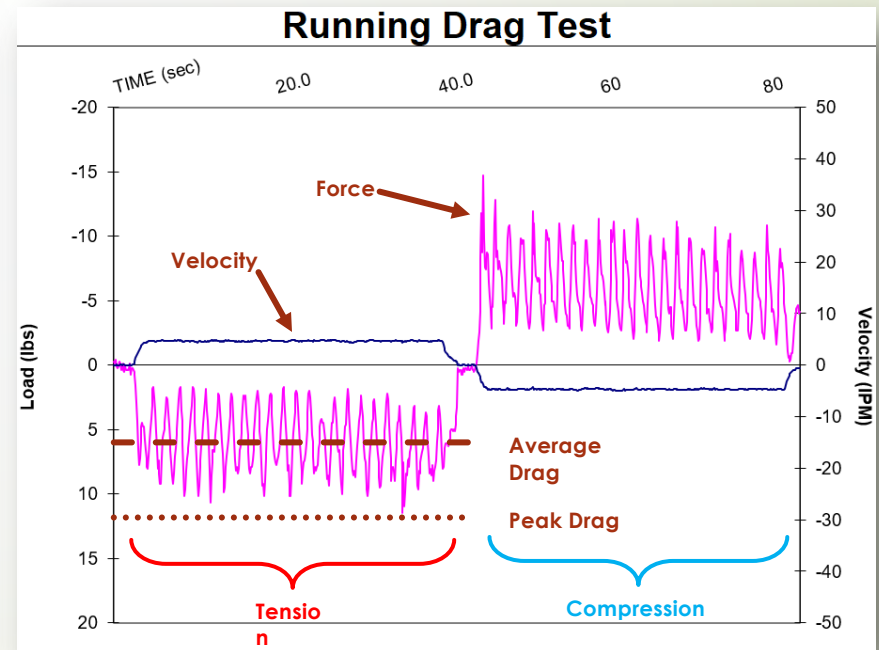
Basic Pacific Scientific (PSA) - Mechanical

(1/4NF, 1/2NF, 1NF, 3NF, 10NF, 35NF, & 100NF)

Barker/Diacon Bench



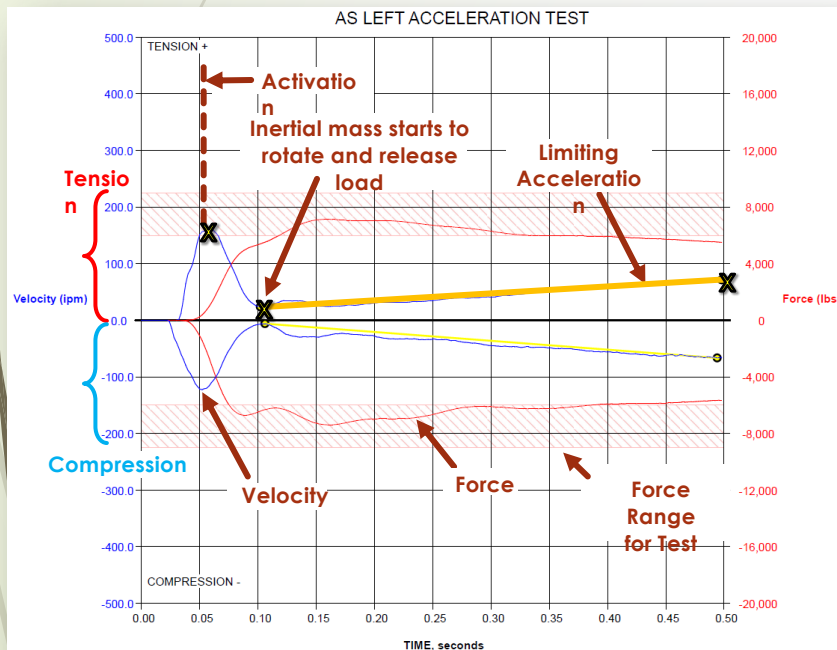
Wyle (Element) Bench



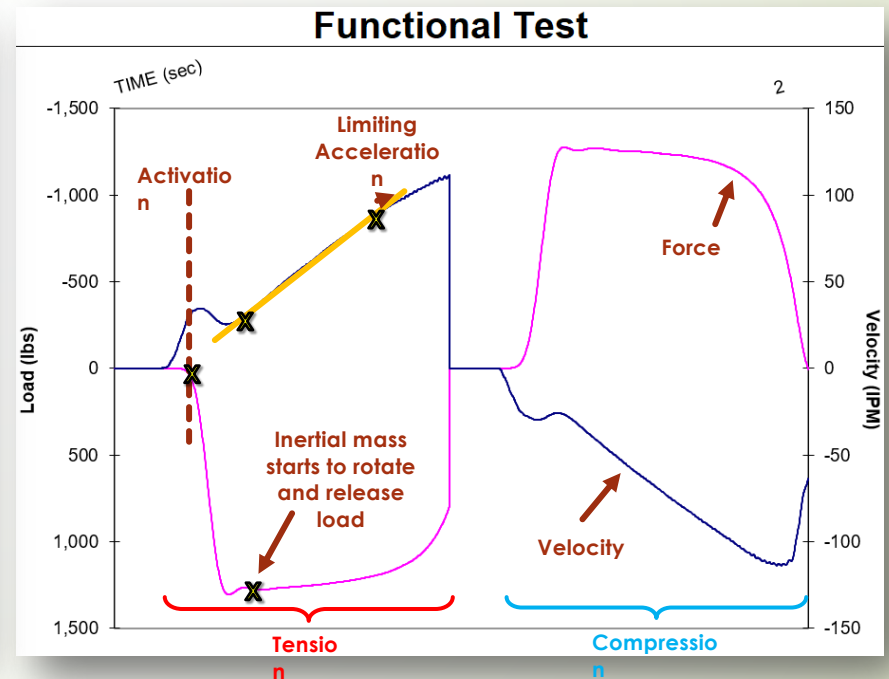
Basic Pacific Scientific (PSA) - Mechanical

(1/4NF, 1/2NF, 1NF, 3NF, 10NF, 35NF, & 100NF)

Barker/Diacon Bench



Wyle (Element) Bench



Anchor Darling (AD) - Mechanical

(40, 70, 150, 500, 1600, 5500, & 12500)

Operation:

- Mechanical
- Limits Velocity
- Converts linear movement to rotational motion of internal gears
- Size 40, 70, 150, & 500
 - Motion is translated by a geared rack
 - Two internal verges oscillate and limit the velocity of a geared rack
- Size 1600, 5500, & 12500
 - Same concept as above
 - Motion translated by a ball screw mechanism and step-up gearing
 - Three internal verges

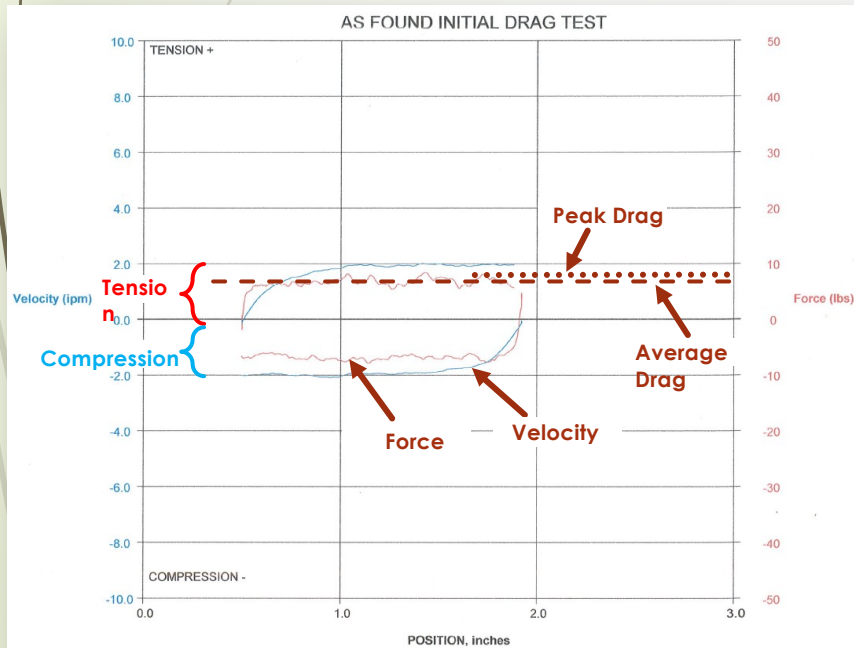


Anchor Darling (AD) - Mechanical

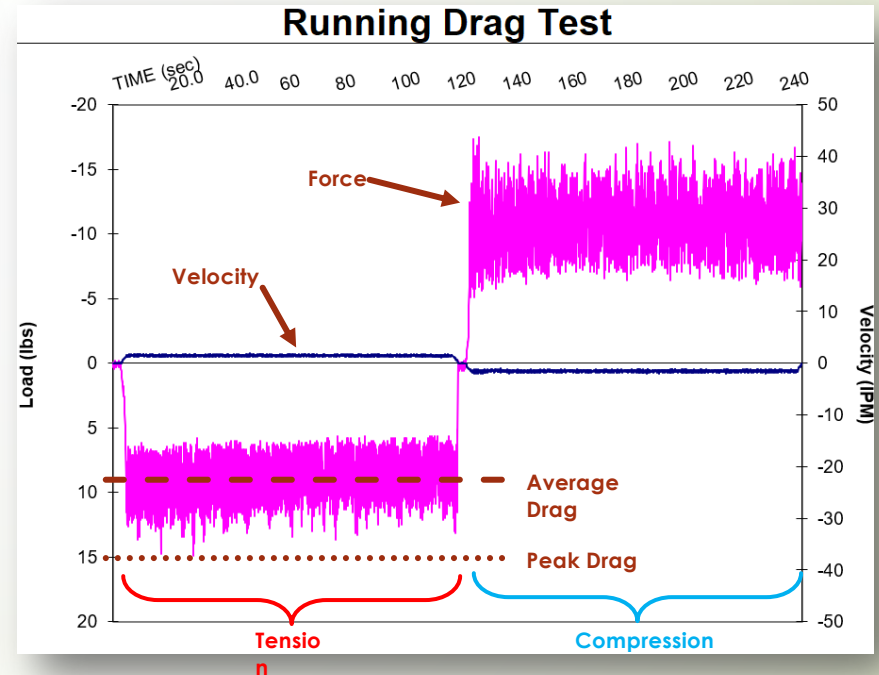
(40, 70, 150, & 500)

12-117SL AD 71 SN 52

Barker/Diacon Bench



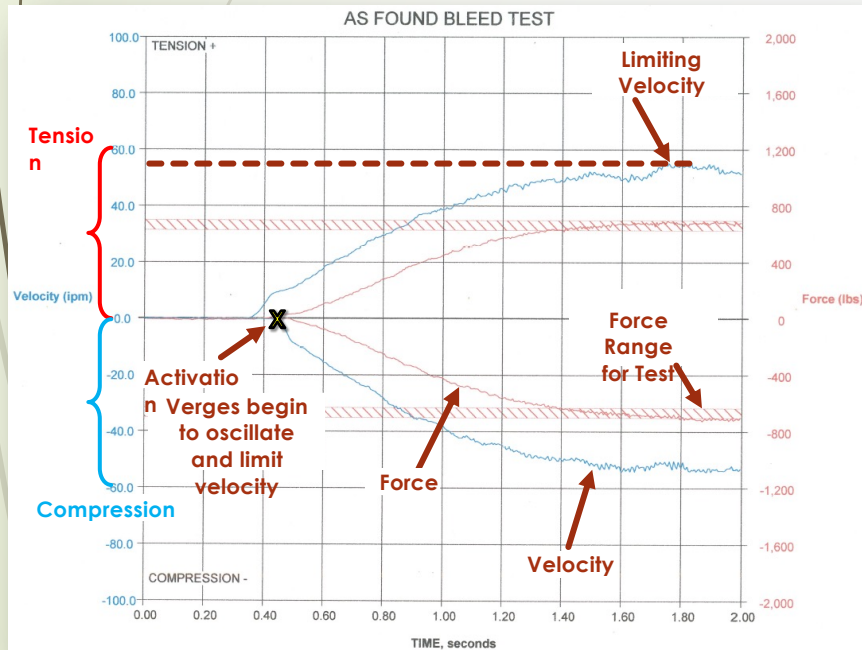
Wyle (Element) Bench



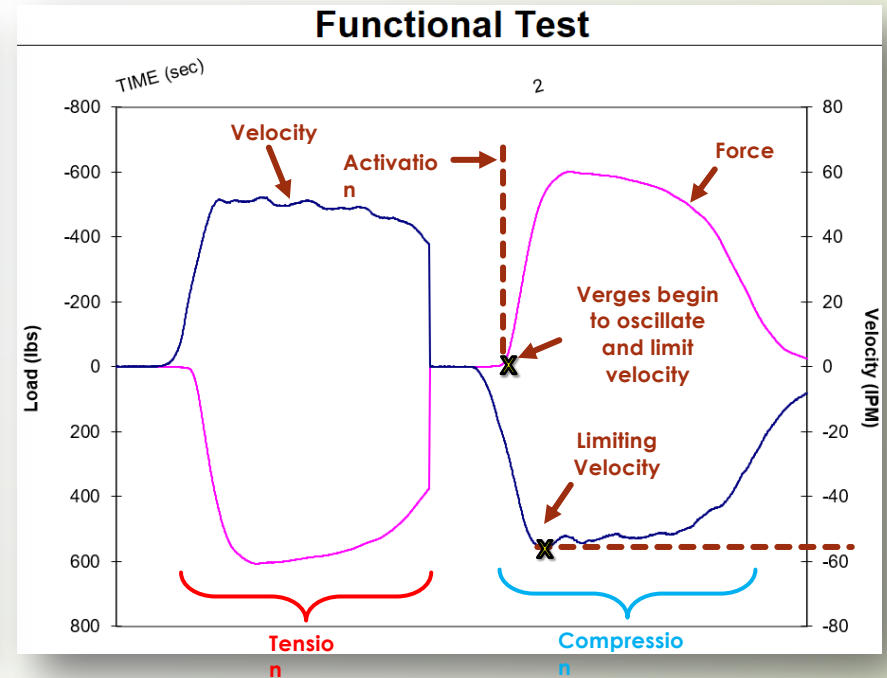
Anchor Darling (AD) - Mechanical

(40, 70, 150, & 500)

Barker/Diacon Bench



Wyle (Element) Bench

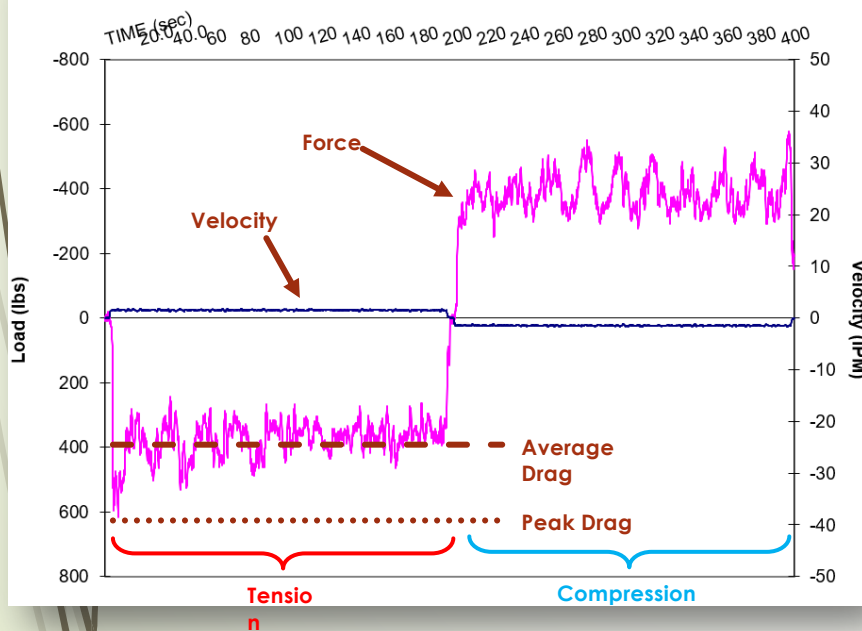


Anchor Darling (AD) - Mechanical

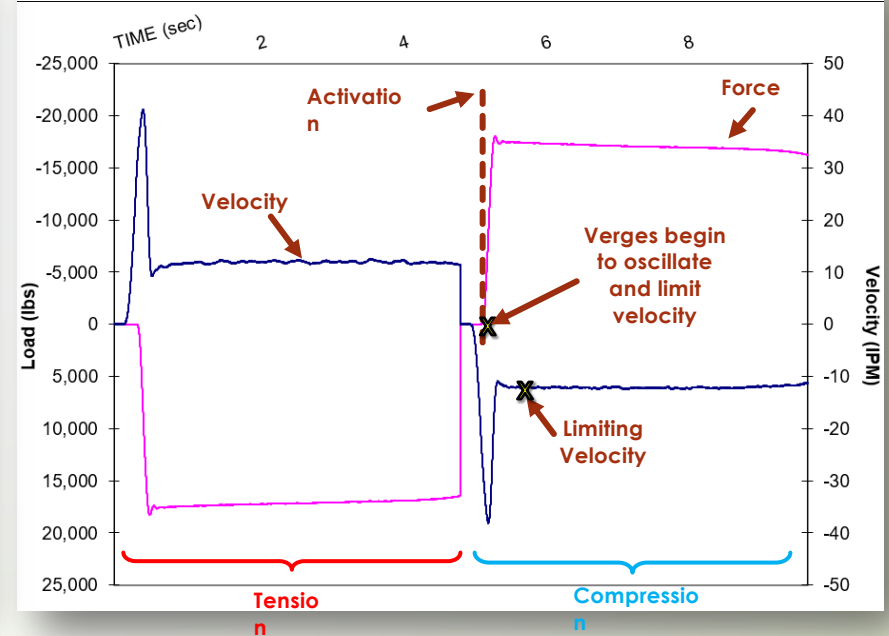
(1600, 5500, & 12500)

Wyle (Element) Bench

Running Drag Test



Functional Test



Hydraulic – Grinnell, Anvil, Lisega, & Bergen-Paterson

Operation:

- Hydraulic
- Limits Velocity
- Movement of a piston rod forces fluid through a biased check valve (poppet valve or disk valve)
 - Valves are held open by spring force and are calibrated in the factory
 - At a set velocity/back pressure the valve closes and resists movement creating a stiff strut
 - A small bypass orifice/flow path allows for continued thermal movement during the event
 - As the event dissipates, the valve reopens allowing normal free thermal movement again



Bergen-Paterson



Lisega type 30

Anvil 3306N/3307N size: 1/2 x 4

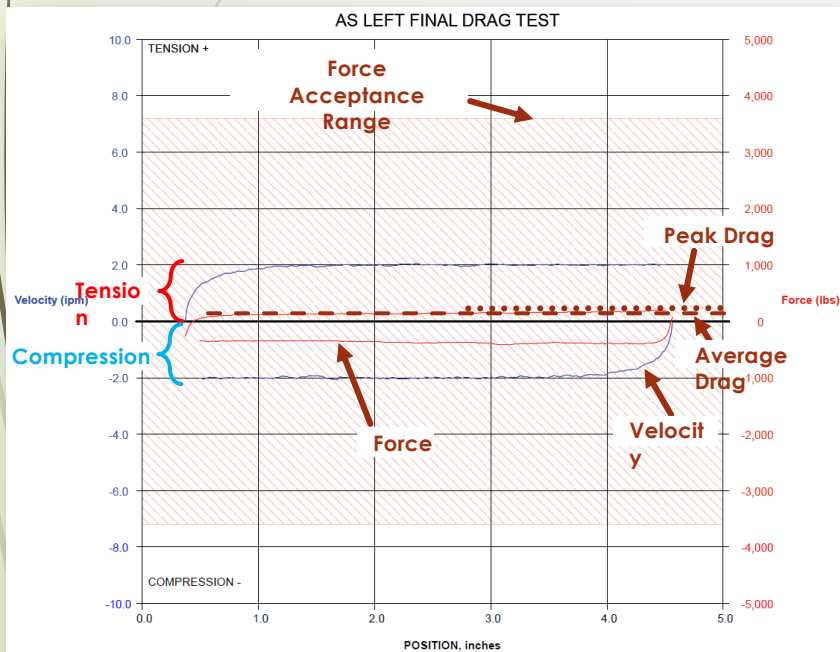


Grinnell Fig 200N/201N size: 4 x 10

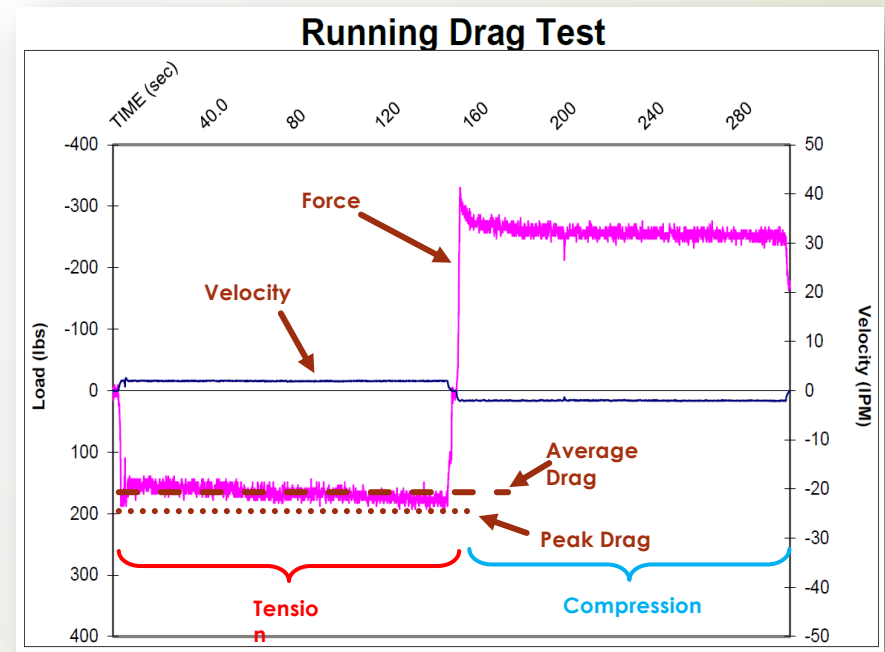


Hydraulic – Grinnell, Anvil, Lisega, & Bergen-Paterson

Barker/Diacon Bench

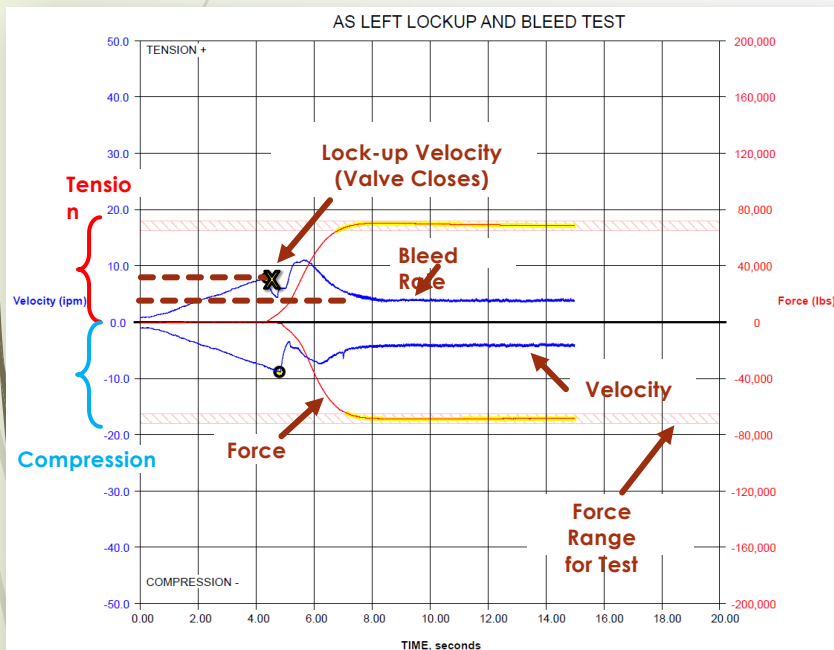


Wyle (Element) Bench

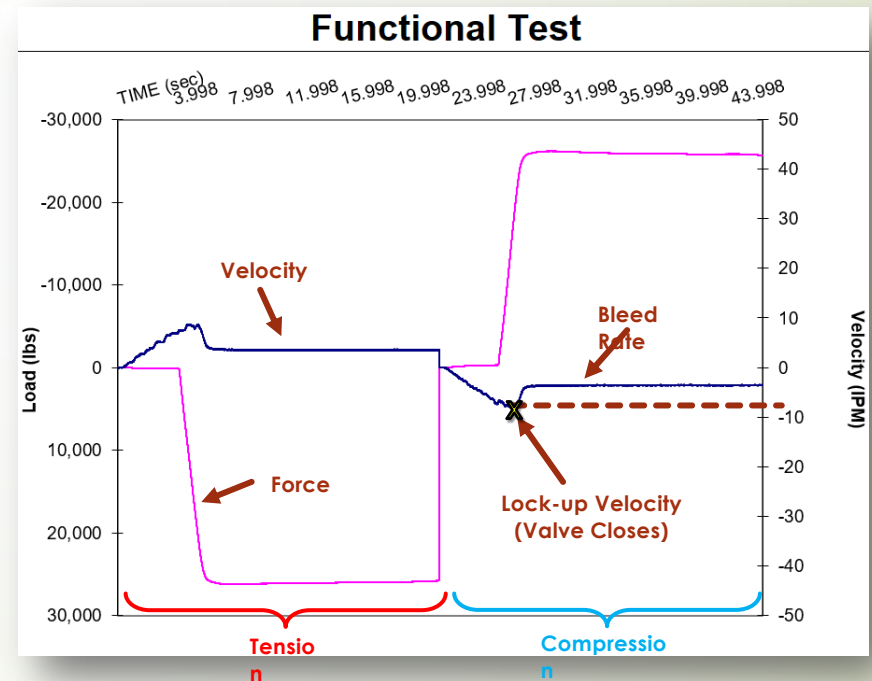


Hydraulic – Grinnell, Anvil, Lisega, & Bergen-Paterson

Barker/Diacon Bench



Wyle (Element) Bench



Large Bore - Hydraulic

(Paul Munroe and Lisega)

Operation:

- Hydraulic
- Limits Velocity
- Movement of a piston rod forces fluid through a biased check valve (poppet valve or disk valve)
 - Valves are held open by spring force and are calibrated in the factory
 - At a set velocity/back pressure the valve closes and resists movement creating a stiff strut
 - A small bypass groove/flow path allows for continued thermal movement during the event
 - As the event dissipates, the valve reopens allowing normal free thermal movement again

Lisega type 31



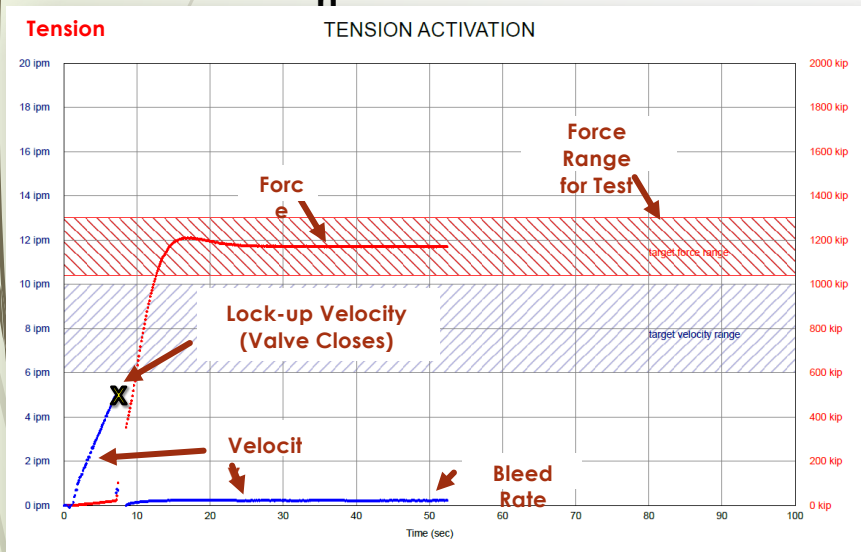
Paul Munroe size: 20 x 3



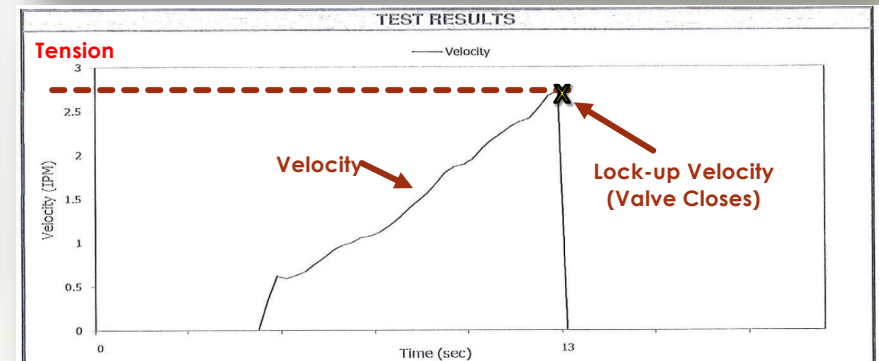
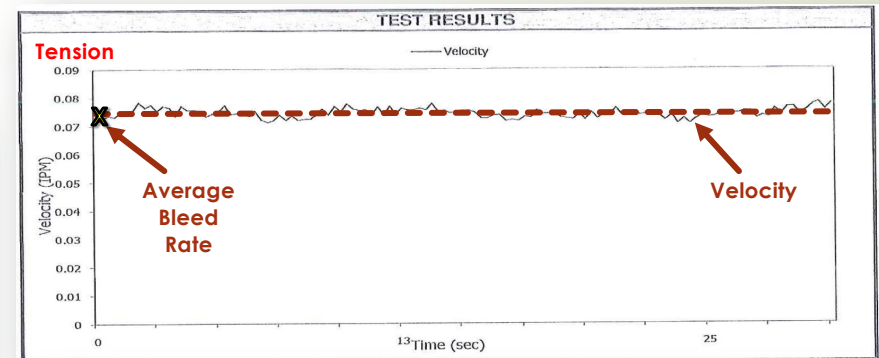
Large Bore - Hydraulic

(Paul Munroe and Lisega)

Barker/Diaco



Curtiss-Wright (Enertech)



Questions?

- ▀ Thank you for your time
- ▀ Thank you to everyone that helped provide input to this presentation



Functional Test Plans Failure Mode Grouping

Scott Esposito

2024 SNUG Conference

Snubber Type

- Type was generally defined as design type - usually interpreted as mechanical vs hydraulic
 - Sample may encompass the entire population
 - Different sample for each manufacturer
 - Different sample for each snubber manufacturer sub-type broken down by model design

Random vs Representative

- ▶ Random samples are just that – samples chosen purely at random with no weighting or categorization
- ▶ Representative samples are weighted by one or more categories such that the percentage of each category in the sample matches the percentage of the overall sampled population

Random Representative

- ▶ Combines two concepts of random and representative
- ▶ Samples are randomly selected from within each sub-group of the population
- ▶ If random is not required, representative samples can be pre-planned on a rotational basis to align with service life monitoring activities

Representative

- ▶ Samples are often representative by type, size, location, etc.
- ▶ Example
 - ▶ Population is mechanical
 - ▶ Proportional by sizes within each group
 - ▶ Proportional by system within each group
 - ▶ Selected by location (inside containment/outside)

ISTD

- ▶ ISTD defines Defined Test Plan Group (DTPG) as “a population of snubbers from which samples are selected for testing”.
- ▶ A single DTPG consisting of the entire population can be used
- ▶ Alternatively, the population can be subdivided into multiple DTPGs
- ▶ Each DTPG has a sample plan associated with it – either 10% or the 37 Plan

ISTD

- ▶ 10% Plan is random representative
 - ▶ Allows for including snubbers concurrently scheduled for seal replacement or other similar activity related to service life monitoring
 - ▶ Additional samples must be at least one-half the size of original
- ▶ 37 Plan is random within each DTPG
 - ▶ Additional samples either 18 or 19 snubbers

Failure Mode Grouping

- Failure mode grouping as related to snubber testing is not defined or used as a term in most TRMs as converted from tech specs.
- ASME ISTD defines a failure mode group (FMG) as: “*a group of snubbers that have failed and those other snubbers that have similar potential for similar failure.*”

FMG is...

Failure mode grouping is a methodology for addressing specific, identifiable failure causes that potentially affect multiple snubbers as a subset of the larger overall population.

The desired result is to identify and correct all potential deficiencies so as to retain or restore the desired confidence level of quality within the population.

FMG is not...

Failure mode grouping is NOT intended to be a method for avoiding extended testing. Although FMG testing MAY reduce the extent of expanded sample testing, it is not guaranteed to do so and that is not the primary intent.

In other words, it is NOT a shortcut.

General Process

1. Failure(s) identified in initial testing.
2. Failure cause(s) determined.
3. Common cause identified.
4. Potentially vulnerable sub-population identified (FMG).
5. FMG fully addressed to resolve the potential deficiencies.
6. Overall population testing completed.

Sample Plan Differences

ISTD allows the use of one of two testing plans, the 10% Plan or the 37 Plan.

The biggest difference between sample plans regarding FMGs is in the requirements for expansion samples for failures.

Using the 37 Plan one additional expansion sample is required for each FMG utilized (in addition to testing within the FMG).

Under the 10% Plan no additional expansions are required for failures assigned to FMGs.

ISTD-5271

Test Failure Evaluation. Snubbers that do not meet requirements specified in IsTD-5210 shall be evaluated to determine the cause of failure.

- (a) The evaluation shall include review of information related to other unacceptable snubbers found during the testing campaign.
- (b) The evaluation results should be used, if applicable to determine FMGs to which snubbers may be assigned.

ASME ISTD FMG SECTIONS

ISTD-5272 defines the FMGs to be used for categorization:

- a) Design or manufacturing
- b) Application induced
- c) Maintenance, repair, or installation
- d) Transient dynamic event

ASME ISTD General FMG Sections

ISTD 5272 - FMGs

ISTD 5273 – FMG Boundaries

ISTD 5274 – Snubbers in More Than One FMG

ISTD 5275 – Additional FMG Review

ASME ISTD 10% Plan FMG

ISTD 5314 – FMG Sample Composition

ISTD 5320 – The 10% Testing Sample Plan
Additional Testing

ISTD 5321 – DTPG Testing

ISTD 5323 – FMG Testing

ISTD 5323(a) – Transient Dynamic Event FMG

ISTD 5323(b) – Other FMGs

ISTD 5330 – 10% Testing Sample Plan Completion

ISTD 5331 – Testing Plan Mathematical Expression

ISTD-5323(a)

Transient Dynamic Event FMG Tests

The operational readiness of all snubbers in the FMG shall be evaluated by either stroking or testing. All operationally ready snubbers in the FMG remain eligible for selection and testing for the initial DTPG and other FMGs as appropriate.

ISTD 5323(b)

Other FMGs

Tests in each FMG shall be based both on the number of unacceptable snubbers found in the DTPG, and on the number of unacceptable snubbers subsequently found in the FMG. Testing shall continue until the mathematical expression of ISTD-5331(b) is satisfied or all snubbers in the FMG have been tested. Failures in an FMG shall require additional tests within the FMG unless the failure evaluation indicates that an additional and separate FMG is appropriate for additional tests from the DTPG.

ASME ISTD 37 Plan FMG

ISTD 5413 – Additional Sample Selection

ISTD 5420 – The 37 Plan Additional Testing

ISTD 5421 – DTPG Testing

ISTD 5422 – FMG Testing

ISTD 5423(a) – Transient Dynamic Event FMG

ISTD 5423(b) – Other FMGs

ISTD 5423(c) – Additional DTPG Testing Requirements

ISTD 5430 – The 37 Testing Sample Plan Completion

ISTD 5431 – Testing Plan Mathematical Expressions

ISTD 5423(c)

Additional DTPG Testing Requirements

A supplemental sample shall be tested from the applicable DTPG for each FMG established to satisfy ISTD-5431(a). Failures in a supplemental sample require additional tests in the DTPG unless the failure evaluation indicates that an additional FMG is appropriate.

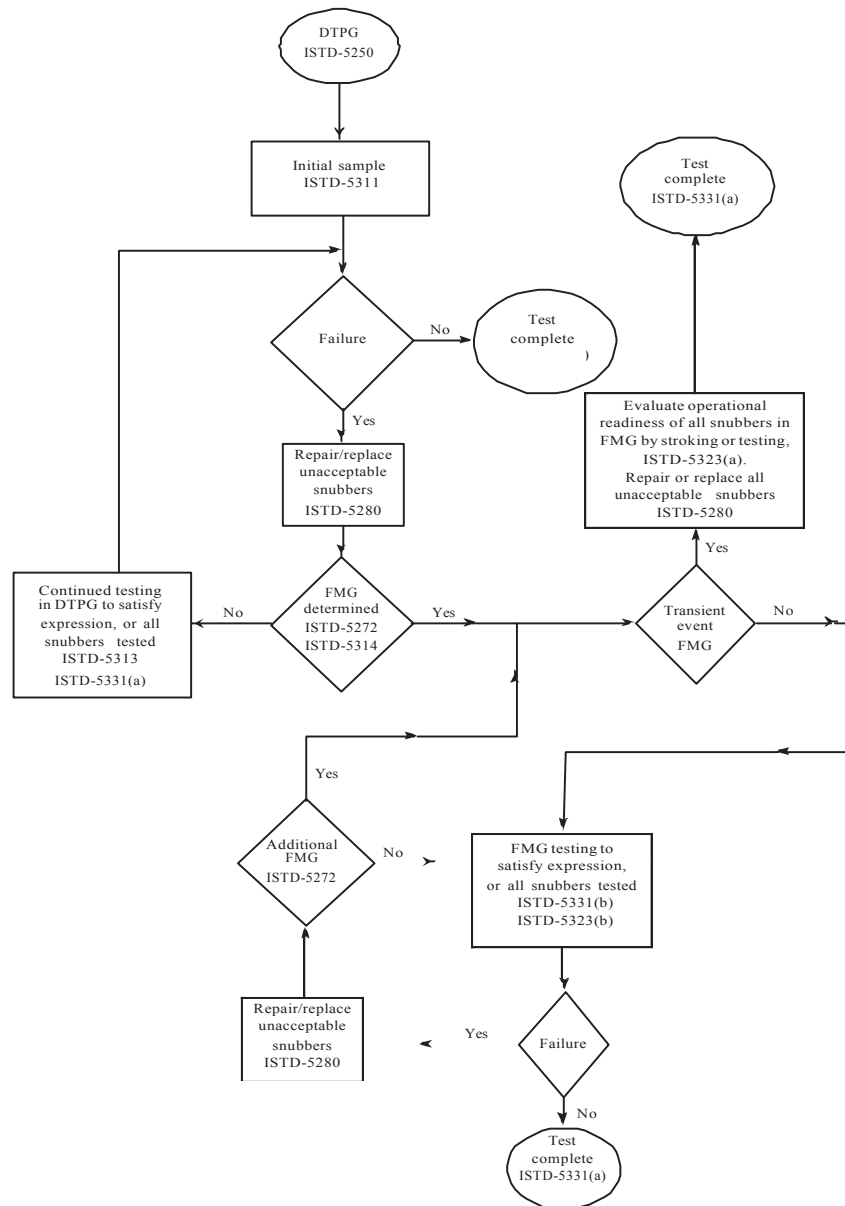
General Comments on ISTD FMGs

- More than one FMG may be defined in a single test campaign.
- It is possible for snubbers to be assigned to more than one FMG.

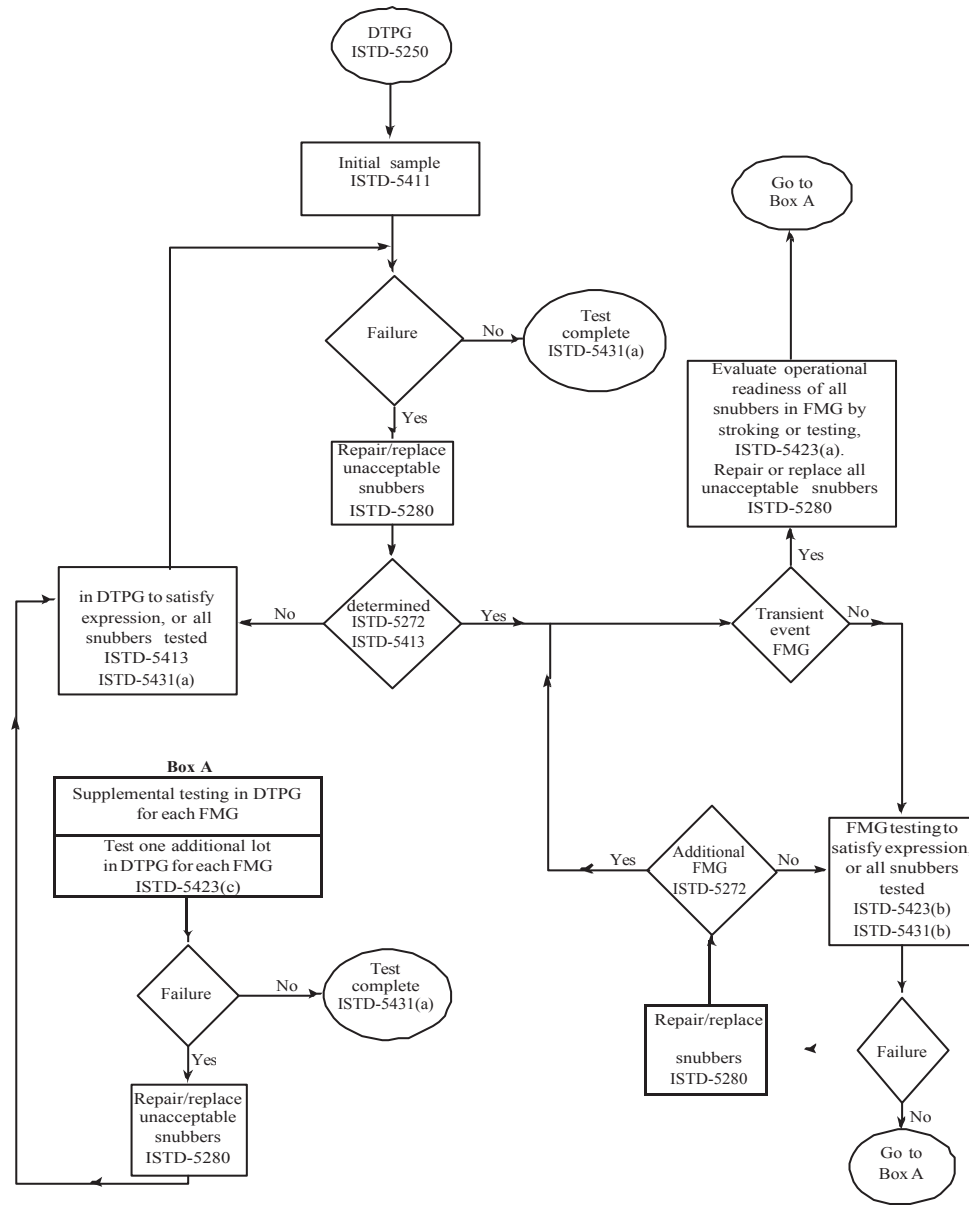
General Comments on TRM

- TRMs are mostly silent on the use of FMGs.
- Carefully review licensing basis and commitments prior to utilizing any type of failure grouping methodology under TRM.
- Using ISTD as a “guide” for FMG methodology is sensible. Ensure the number of snubbers ultimately tested is defensible and not considered “cherry picking” the code.

10% Plan Flow Chart from ISTD



37 Plan Flow Chart from ISTD



Example: 1

37 Plan used to test a total population of 500 mechanical snubbers.

- 1st failure (Org. Scope) causes an expansion of sample of 18 snubbers
 - Cause of failure MS system, condenser bay room, high heat & extreme vibration
- 2nd failure (1st Exp. Scope) causes an expansion of sample of 18 snubbers
 - Cause of failure MS system, condenser bay room, high heat & extreme vibration
 - FMG established for all snubbers in the condenser bay room (total = 15), all FMG snubbers tested, with multiple failures identified. Shortened service life to 2 years at some locations
- 3rd Expansion sample of 19 snubbers tested SAT

Example: 2

10% Plan used to test a total population of 47 small mechanical snubbers = 5 DTPG Org. scope

- 1st failure (Org. Scope) causes an expansion of sample of 3 snubbers from the DTPG
 - Cause of failure dried grease, high heat, vibration, no insulation on vessel instrument pod
- 2nd failure (Org. Scope) causes an expansion of sample of 3 snubbers from the DTPG
 - Cause of failure dried grease, high heat, vibration, no insulation on vessel instrument line
 - FMG established for all instrument line snubbers in the drywell (total = 17)

Example: 2 Cont.

10% Plan used to test a total population of 47 small mechanical snubbers = 5 DTPG Org. snubbers

- 3rd Expansion sample of 3 snubbers tested from the DTPG, all SAT
- 1st Expansion sample of 3 snubbers from the FMG, 1 failure
- 2nd Expansion sample of 3 snubbers tested from the FMG, all SAT

Questions?

Snubber Mythbusters

SNUG summer 2024

SNUBBER MYTHBUSTERS

- ▶ Our Task - Examine the truth behind several snubber “myths”
 - ▶ Related to Program implementation
 - ▶ Beliefs held by organizations outside Engineering & Maintenance
 - ▶ Not meant to be a deep dive into any one topic
- ▶ Disclaimer: Code references are based on ASME OM-2020. Check your Code of record, TRM, basis documents as they may have different requirements.

**OM code snubber visual
exams are required to be
VT-3 exams performed by
certified individuals**

VT-3 for OM Code snubber visuals?

Where does this question come from?

- ▶ Once upon a time we had Article IWF-5000 of ASME Section XI (Inservice Inspection Requirements for Snubbers).
- ▶ Article IWF-5000 of ASME Section XI was deleted in the 2006 Addenda. It called for snubbers to be examined using the VT-3 method. Many plants conservatively interpreted this as all examinations must be performed by VT-3 certified inspectors.

VT-3 for OM Code snubber visuals?

- ▶ IWF-1220 now says: "The inservice inspection requirements for snubbers are outside the scope of this Division" and refers to the OM Code for snubber exam and test requirements.
- ▶ ISTD-4000 provides the minimum examination requirements. Typical items to be considered are listed in Nonmandatory Appendix B. ISTA-1500 leaves it up to the Owner to determine qualification of personnel who perform exams.
- ▶ Note this applies to "OM Code Snubber visual exams". Exams performed on snubber supports under your ISI/Section XI component supports program may still require VT-3 exams.

**Rocking a snubber is required
as part of a visual exam**

Rocking a snubber during visual exam

ISTD-4232

- ▶ Snubber installations shall not restrain thermal movement to an extent that unacceptable stresses could develop in the snubber, the pipe, or other equipment that the snubber is designed to protect or restrain. This requirement is satisfied if no indication of binding, misalignment, or deformation of the snubber is observed.

“No indication of binding” - how do you determine that?

Rocking a snubber during visual exam

- ▶ NUREG-5870 identifies Rotation in Place as an Augmented inspection method (i.e. inspections in addition to that required during routine ISI) which could be useful for evaluating snubbers suspected of being locked-up (or jammed). It could be helpful in determining if a snubber has experienced a transient.
- ▶ Make sure you know and can defend how you meet the “no indication of binding” requirement at your plant(s).
 - ▶ Do you measure and evaluate position setting?
 - ▶ Do you rock the snubber?
 - ▶ Do you check for misaligned or deformed support members?

**All snubber test failures
require scope expansion**

All snubber test failures require scope expansion

ISTD-5270

- For unacceptable snubber(s), the additional testing shall continue in the DTPG or FMG per para. ISTD-5330 or ISTD-5430

ISTD-5330 and -5430 refer to the mathematical expressions of the 10% Plan and 37 Plan respectively

Additional testing (scope expansion) is required for sample plan failures until the mathematical expression(s) are satisfied

All snubber test failures require scope expansion

ISTD-6500

- ▶ If testing is conducted specifically for service life monitoring purposes, the results of such testing do not require testing of additional snubbers in accordance with para. ISTD-5320 or ISTD-5420, but shall be evaluated for appropriate corrective action.

“...but shall be evaluated for appropriate corrective action.”

Appropriate corrective action may include additional exams, strokes, or tests

Keep this in mind this when communicating outage scopes and risks to Outage & Scheduling and Management

Stroke testing of mechanical snubbers is preconditioning

Stroke Testing of Mechanical Snubbers

ISTD-1510

- **Maintenance or Repair Before Examination or Testing** - Snubbers shall not be adjusted, maintained, or repaired before an examination or test specifically to meet the examination or test requirements.

Nonmandatory Appendix F (F-4000)

- **Shortened Service Life** - It may be necessary to shorten the service life of snubbers subjected to severe environments, such as excessively high temperatures and vibration. Snubbers in severe environments may require augmented surveillance, including "hands-on" evaluations (e.g., stroking) or in-situ monitoring.

Stroke Testing of Mechanical Snubbers

IN 97-16 Preconditioning of Plant Structures, Systems, and Components Before ASME Code Inservice Testing or Technical Specification Surveillance Testing

IP 62707, "Maintenance Observation," cautions inspectors to verify that preventive maintenance (PM) activities are not routinely being scheduled to "precondition" equipment before performing surveillance tests in order to ensure that the test is passed satisfactorily. It directs inspectors to examine the sequence of PM activities to determine whether the licensee routinely schedules PM activities before surveillance tests.

Stroke Testing of Mechanical Snubbers

Caveats:

- ▶ It has to do with purpose and timing:
 - ▶ Can not schedule PM prior to surveillance activities for the purpose of passing the test
 - ▶ Stroking must be part of a comprehensive PM/SLM program - can not target only snubbers scheduled to be tested
- ▶ In order to defend it, document it

**Fluid Sampling and Seal
Integrity monitoring activities
are required to be performed
every cycle (ISTD-6400)**

Fluid sampling and seal integrity monitoring are required every cycle

ISTD-6400

- ▶ The service life evaluation, for hydraulic snubbers that are tested without applying a load to the snubber piston rod, shall consider the results of the following requirements:
 - (a) monitoring the particulate, viscosity, and moisture content of one or more samples of hydraulic fluid from the main cylinder of the snubber. This may be accomplished using snubbers of the same design in a similar or more severe environment.
 - (b) monitoring of piston seal, piston rod seal, and cylinder seal integrity. If seal integrity is monitored by pressurization, pressures less than the snubber's rated load pressure may be used. Minimum pressure allowed shall be specified by the Owner.

Fluid sampling and seal integrity monitoring are required every cycle

ISTD-6200

- ▶ The service life for each location where a snubber is installed shall be evaluated at least once each fuel cycle. Reevaluation shall be based on examination, maintenance, performance, and operating service-life history data associated with representative snubbers that have been in service in the plant, as well as other information related to service life.

Fluid sampling and seal integrity monitoring are required every cycle

Inquiry# 20-1632

- ▶ Question (1): Is it a requirement of ISTD-6400 that fluid monitoring of large bore hydraulic snubbers that are tested without applying a load to the snubber piston rod be performed, regardless of whether the snubber has a vented reservoir or a sealed pressurized reservoir?

Response (1): Yes.

- ▶ Question (2): Is it a requirement of ISTD-6400 to perform fluid monitoring each cycle?

Response (2): No.

- ▶ Question (3): Is it a requirement of ISTD-6400 that fluid monitoring be periodically performed on representative large bore hydraulic snubbers that are tested without applying a load to the snubber piston rod?

Response (3): Yes.

Fluid sampling and seal integrity monitoring are required every cycle

Inquiry# 20-1632, cont.

- ▶ Question (4): Is it a requirement of ISTD-6400 to perform periodic monitoring of piston seals of large bore hydraulic snubbers that are tested without applying a load to the snubber piston rod if the snubber does not have installed test ports?

Response (4): Yes.

- ▶ Question (5): Is it a requirement of ISTD-6400 that seals must be monitored by pressurization?

Response (5): No.

**Issues outside of the snubber
pin-to-pin found during
Inservice Visual Examination
do not impact the exam result**



Visual exam classification - issues outside of pin-to-pin

Example: Rotated pipe clamp

Visual exam classification - issues outside of pin-to-pin

ISTD-1100 Applicability

- ▶ The requirements of this Subsection apply to certain dynamic restraints (snubbers, pin to pin, inclusive).

ISTD-4231 Restrained Movement

- ▶ Snubbers shall be installed so they are capable of restraining movement when activated. Examinations shall include observations for the following and the conditions shall be evaluated when found:

(a) loose fasteners, or members that are corroded or deformed

(b) disconnected components or other conditions that might interfere with the proper restraint of movement

Snubbers evaluated to be incapable of restraining movement shall be classified unacceptable.

Visual exam classification - issues outside of pin-to-pin

ISTD-4232 Thermal Movement

- ▶ Snubber installations shall not restrain thermal movement to an extent that unacceptable stresses could develop in the snubber, the pipe, or other equipment that the snubber is designed to protect or restrain. This requirement is satisfied if no indication of binding, misalignment, or deformation of the snubber is observed.

**Snubbers reinstalled following
a bench test shall have the
position setting verified**

Snubbers reinstalled following a bench test shall have the position setting verified

ISTD-5224

- ▶ Snubbers may be removed and bench tested in accordance with Owner-approved procedures. After reinstallation, the applicable requirements of ISTD-4200 shall be met. Also, the position setting shall be verified.

**If a system grades out as RISC-3
under 50.69 then all snubbers in
that system are eligible for
alternate treatment**

**If a system grades out as RISC-3
under 50.69 then all snubbers in
that system are eligible for
alternate treatment**

- ▶ The primary issue with any snubber categorization effort is that since the snubbers are an important part of system structural integrity any classification must be uniform from anchor-to-anchor of the system structural model

SNUBBER MYTHBUSTERS

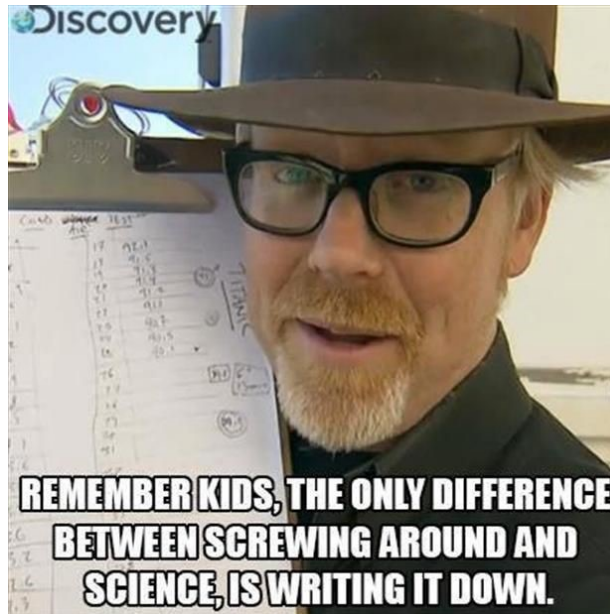
Big Ideas:

- ▶ Know your Basis Documents. Check your Code of record, TRM, Tech Specs, or other Basis documents as they may have different requirements.
- ▶ Many common snubber myths may have been requirements at one time but are practices that have been carried on even though they may no longer be Code requirements.

SNUBBER MYTHBUSTERS

Big Ideas:

- In order to defend it, document it. The Code is not specific in every area and leaves much up to the Owner. For this reason it is especially important to document your basis for what you do and why you do it.





2 responses submitted

Any snubber test failure requires a scope expansion

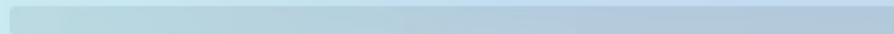
Scan the QR or use
link to join



[https://forms.office.com/
r/BSK1A1WMs4](https://forms.office.com/r/BSK1A1WMs4)

Copy link

Busted



Plausible



Confirmed



Treemap

Bar



3 of 8



Lunch Sponsored By



RETURN BY 1:00 PM

ADMINISTRATIVE ITEMS

NATE FRANK

- Snubber Cut-a-ways and breakdowns in Salon VI
- Beverage break at 2:30 PM
- ASC Removal & Installation of Snubbers
- 10CFR50.69 Challenges at Vogtle 1 & 2
- Case Study ; Modular Snubber Test Machine
- Question Cards
- All attendees are invited to the Curtiss-Wright facility after today's sessions. Food and a guided tour will be provided.



AFTERNOON BEVERAGE BREAK SPONSORED BY



RETURN BY 3:00 PM





ASC Engineered Solutions / Basic PSA

2024 SNUG PRESENTATION-
OVERVIEW REMOVAL AND
INSTALLATION OF SNUBBERS

Dos & Don'ts when Removing & Installing Snubber

Dos

- Assure VT Exam is complete (if required).
- Set up a Pre-Outage brief with Removal and Installation Technicians to discuss the do's and don'ts and open the door for communication when there is a question. Don't think of it as I have done this before, or they have done this before that everyone couldn't use a refresher. Discuss expectations.
- Use Brass and Brass Hammers to remove load pins.
- 3-way communication and verification of correct serial/hanger # with co-workers.
- For snubbers requiring rigging, rig unit horizontal, not allowing the unit to extend or contract under its own weight. As much as possible given the condition and orientation of the snubber. Some hydraulic units with non-pressurized reservoirs will need to maintain horizontal configuration to avoid possibly introducing air or spill fluid out of the attached reservoir. When rigging knowing the proper weights for balance is necessary.

Dos

- Secure snubber in transit to the Test facility, to avoid extending, contracting or drops. As much as possible given the condition and orientation of the snubber. Not many facilities have controls to mitigate the movement of the snubber during transport. My saying is - “Control the Snubber and its components, don’t let them control you.”

Don'ts

- Fully extend or contract snubber. Don't play with the snubber. If Rad Protection should need to move the snubber be sure they are not forcefully bottoming them out in either direction.
- Side load snubber in removal /installation process. Also applies when testing a snubber.
- Rig snubber vertical through the rod eye or forward bracket. Some plants do not allow their fitter crews to use this method.
- Do not rotate the ends of snubbers to gauge proper alignment into the hanger. If there is any issues with alignment they should be addressed in a pre-job briefing with crews that may not be familiar with the units. Common installation mistakes are trying to adjust the End Plug on a PSA-1/4 and PSA -1/2. Improper adjustment of the End Plug improperly on a PSA-35 and PSA-100.
- Do not assume a "drop-in replacement snubber" whether it be Mechanical for Mechanical, Mechanical for Hydraulic, Hydraulic for Mechanical, or Hydraulic for Hydraulic will automatically fit. Be sure you have adequate clearance for the spherical bearing to line up properly, the body sizes will fit considering the area surrounding the snubber, and/or modifications are accepted per your program.

Don'ts

- Don't use the "Get a bigger hammer mentality". If the load pin or load stud isn't moving, you risk possibly damaging the snubber by the use of excessive force. Listen to the pin and the sound it makes, you can tell if the load pin is not coming out it could be bound up or pin could be mushroomed already. Pre-lubricate the load pins with approved lubricant, file the ends of the load pin, readjust the rigging, and some severe cases may need to restrain the pipe and cut the load pin out with use of a sawz-all (last resort).
- When transporting snubbers to test facilities, handle snubber as if it was an M&TE tool. Document any drops, over extension/compression, fluid leaks, missing parts, etc.



NEVER SIDE LOAD

Examples:

- Ladders
- Rigging
- Climbing



BRASS HAMMER

- Brass Hammers & Drifts – ALWAYS



STEEL HAMMERS



Snubber Program Owner



DROPPED TORQUE WRENCH

- Avoid the out-of-calibration issues following start-up. RECALIBRATE when suspect.



IMPROPER RIGGING - HYDRAULIC





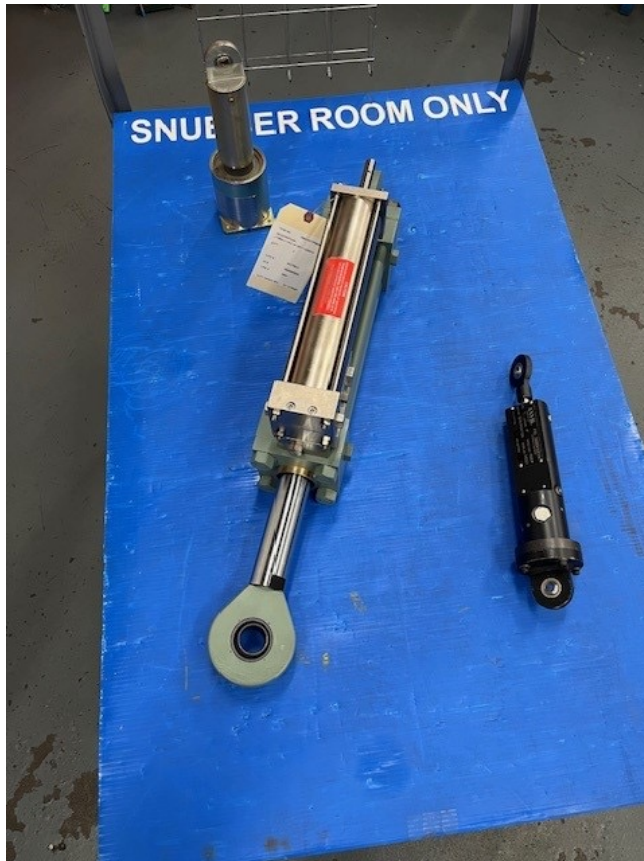
IMPROPER RIGGING - MECHANICAL



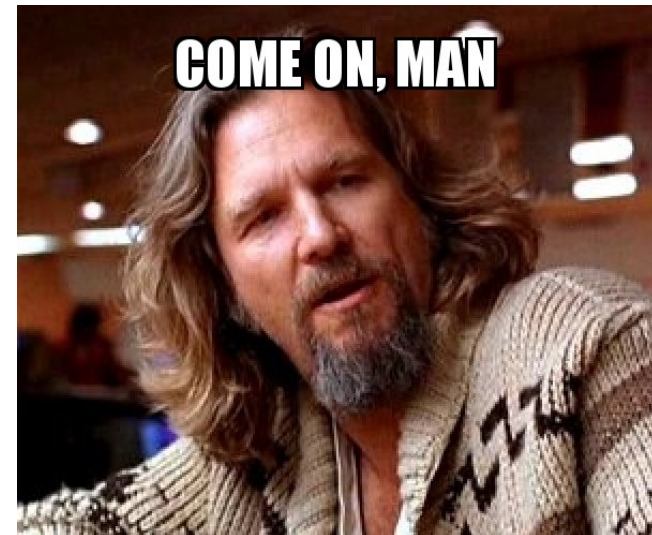


BASKET RIGGING - MECHANICAL





TRANSPORT – NO SHIMS OR STRAPS





TRANSPORT - NO SHIMS OR STRAPS





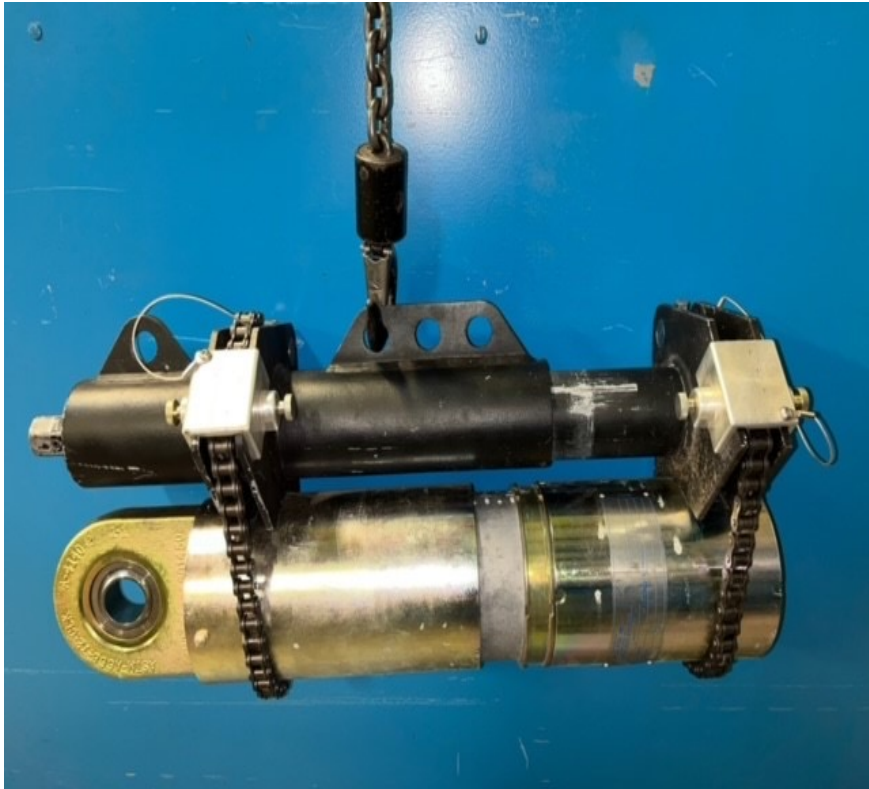
CHOKE RIGGING - MECHANICAL





CART SHIMMED





STROKING TOOL



QUESTIONS AND ANSWERS

THANK YOU





Southern
Nuclear

10CFR50.69 Challenges at Vogtle 1&2

SNUG 2024

Mitchell Etten-Bohm

Categorization Process

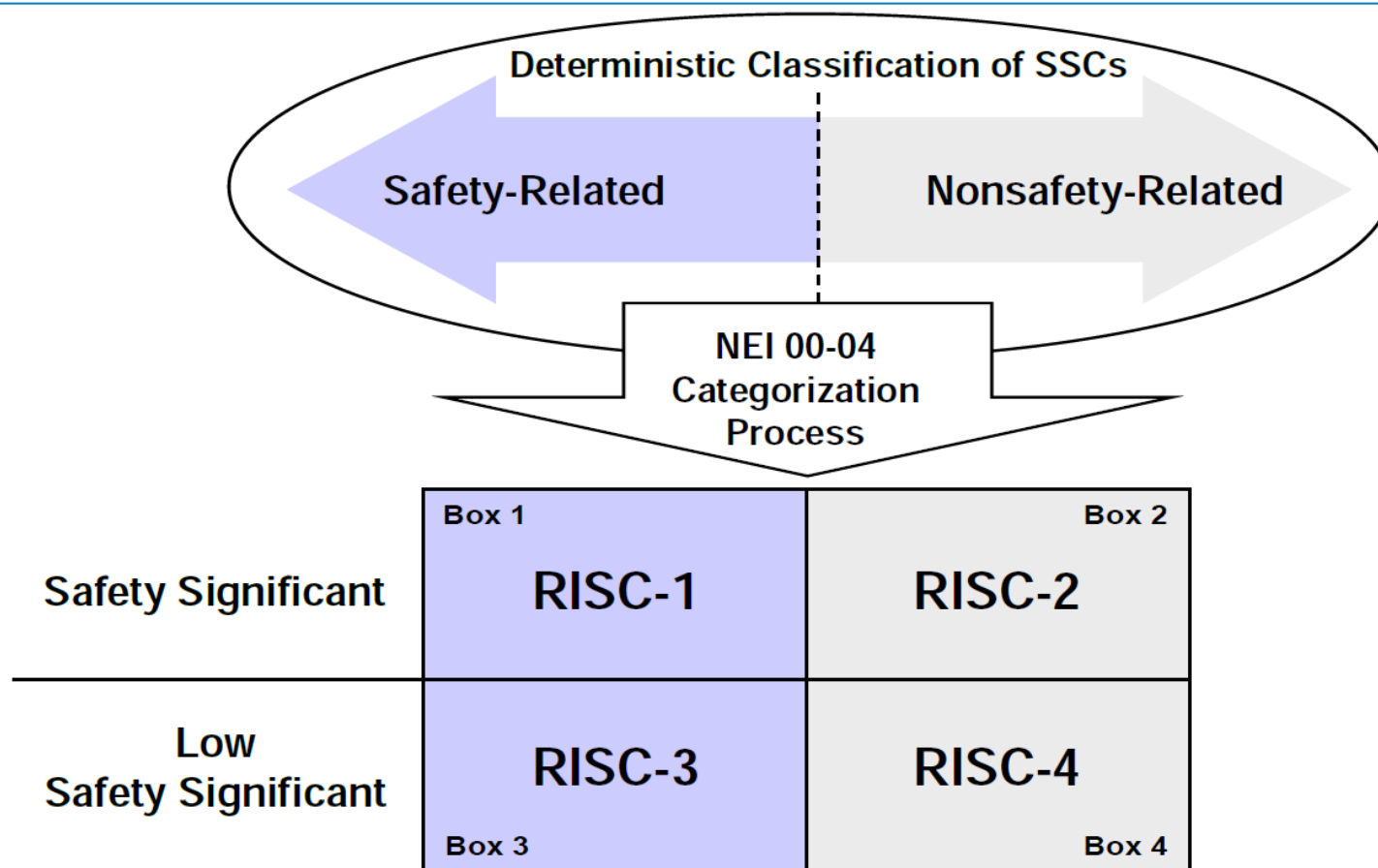


Figure 2-1
Risk Informed Safety Categorizations
Sources: 10 CFR 50.69 and NEI 00-04

10 CFR 50.69 Categorization Guidance Document. EPRI, Palo Alto, CA: 2018. 3002012984.

50.69 Impacts

Local Leak Rate Testing [10 CFR 50 Appendix J]	Quality Requirements [10 CFR 50 Appendix B]	In-service Inspection [10 CFR 50.55a(g)]	ASME XI repair & replacements, applicable portions, with limitations [10 CFR 50.55a(g)]
Maintenance Rule [10 CFR 50.65]	In-service Testing [10 CFR 50.55a(f)]	Environmental Qualification [10 CFR 50.49]	Event Reporting [10 CFR 50.55(e)]
Seismic Qualification [Portions of Appendix A to 10 CFR Part 100]	Deficiency Reporting [10 CFR Part 21]	Applicable Portions of IEEE standards [10 CFR 50.55a(h)]	Notification Requirements [10 CFR 50.72, 50.73]

Reasonable Assurance (Trust but Verify)

- Deterministic approach
- Safety function confirmed using Special Treatments defined by regulation.



Reasonable Confidence (Trust but Monitor)

- Risk based approach
- Safety function **confirmed** via Alternative Treatments defined by licensee.

Savings

Programs

- Remove components from special treatment programs and extend or eliminate PMs
- Example: Equipment Qualification Program, In-Service Testing
- Right Work at the Right Time!

Procurement - Daily and Outage

- Reduce parts cost by 80%
- Solve obsolescence issues
- Cut lead time in half or more

Removal of Components from Special Requirements

Approximate categorization results to date can be summarized as follows:

- RISC-1 – about 25% of all safety-related SSCs
- RISC-3 – about 75% of all safety-related SSCs
- RISC-2 – about 1% of all non-safety-related SSCs
- RISC-4 – about 99% of all non-safety-related SSCs

NRC Requirements Do Not Go Away

- All RISC-3 SSCs, SHALL, as a minimum, be subject to the following alternative treatments that ensure, with reasonable confidence, that RISC-3 SSCs remain capable of performing their safety-related functions under design basis conditions, including seismic conditions and environmental conditions and effects throughout their service life per 10CFR50.69:
 - Periodic inspection and testing to determine that RISC-3 SSCs will remain capable of performing their safety-related functions under design basis conditions.

Program Owner Involvement

- Program Owners are not involved with the Categorization of a System which is strictly a risk-based approach following EPRI guidance.
- Program Owners are not required to be involved in the development of alternate treatment. Lack of understanding of the needs for the component may result in MORE work.
- Program Owners are asked to remove the RISC-3 and RISC-4 components from their program and the 50.69 team will address alternate treatment.
- Code requirements will continue to be applied until the alternate treatment is established.

Challenge 1 – Program Owner Concerns

- How do we know if special treatments or alternate treatments are being applied if we have no input or feedback? Some scopes are established using a known number of components in the program (i.e. - Snubber Test samples)
- Can a component moved to alternate treatment be used in a special treatment location later? For instance, RISC-3 and RISC-4 snubbers would no longer be required to follow the actions under Repair/Replacement.
- Some service life programs are based on performance of the components. If we do not have a say in the alternate treatment, the service life program is weaker.
- Event Reporting requirements no longer apply. Issues with RISC-3 and RISC-4 components could lie hidden from the industry.
- System changes are “metered out” to the Programs with the expectation the scope will be changed within 60 days.

Challenge 1 – Reconciliation and Solutions

- Program Owners refused to remove components from their program without knowing when an alternate treatment is being established.
- Repair/Replacement actions will continue for snubbers in locations where alternate treatment is applied.
- Owners requested input into what the alternate treatment would be to leverage plant failure history in establishing an effective alternate treatment.
- While not required, OE requirements are applied to snubbers removed from special treatments (Corrective Action Procedures still require it).
- System updates are incorporated once annually for snubbers.

Challenge 2 - RISC-4 Snubbers

- Most programs do not have many RISC-4 components incorporated into the program.
 - Due to the use of snubbers to support the non-safety side of code boundaries before the first anchor points, many snubbers are RISC-4.
 - Per EPRI/NEI Guidance
 - RISC-4 SSCs can be removed from any programs and/or procedures listed in 10 CFR 50.69 (e.g., Maintenance Rule) and are no longer required to comply with these requirements. (Programs Engineering)
- 10 CFR 50.69 does not require the application of any alternative treatments for RISC-4 SSCs.

Challenge 2 - RISC-4 Snubbers

- RISC-4 SSCs can be evaluated for Preventive Maintenance (PM) scope reduction. (Engineering)

For snubbers RISC-3 = RISC-4,
and alternate treatments are
required

The Large Bore
Snubbers at Vogtle
1&2 were
categorized as
RISC-3

Challenge 3 – Can we change anything?

The Vogtle 1&2 Alternate Treatment Plan for Snubbers is Based on Internal OE - Failure History

- Fluid sampling from gravity feed reservoirs (fluid samples were evaluated as UNSAT in the past)
- Snubbers are too big to be tested so control valves are tested (UNSAT tests in the past)
- Visual exams (UNSAT in the past – fitting leaks, hoses)
- Piston seal monitoring needed for seal life extension
- Rod end seals are replaced on a 10-year frequency. (seal life extension not implemented.)
- Hoses have a PM for replacement

Challenge 3 – Proposed “skip” outage

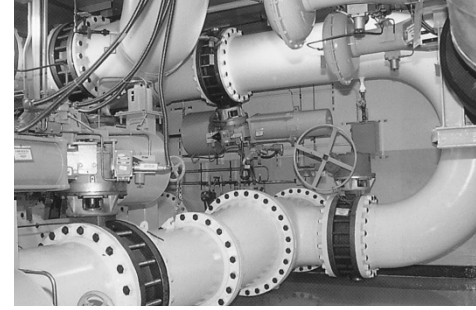
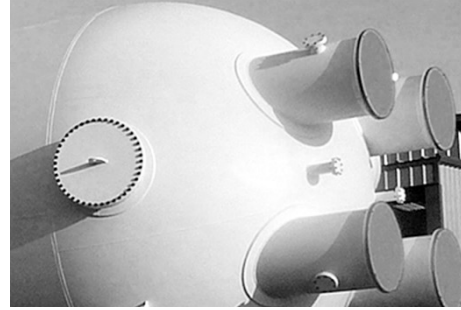
- Change frequency only
- Pull up some PMs to perform all activities every other outage

Save dose and \$85K in scaffold costs every other outage, if adopted.

Summary - Lessons Learned

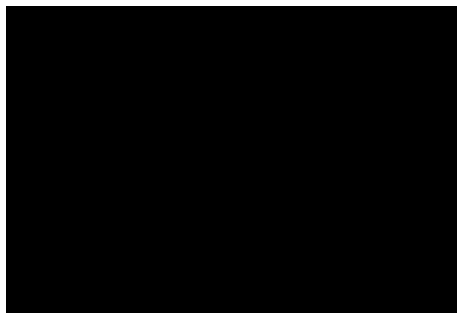
- 50.69 is coming. Savings of \$50M over the life of each Unit are expected.
- Be involved. Own your program.
- Communicate your concerns and be willing to get involved to create a solution.
- Utilize YOUR plant OE to create and effective alternate treatment. These snubbers still have to work!
- Know how other programs interface with your program.
- Look beyond the PMs for savings
 - Scaffolds
 - Dose
 - Outage time
 - Commercial grade components

Questions?



Case Study: Modular Snubber Test Machine

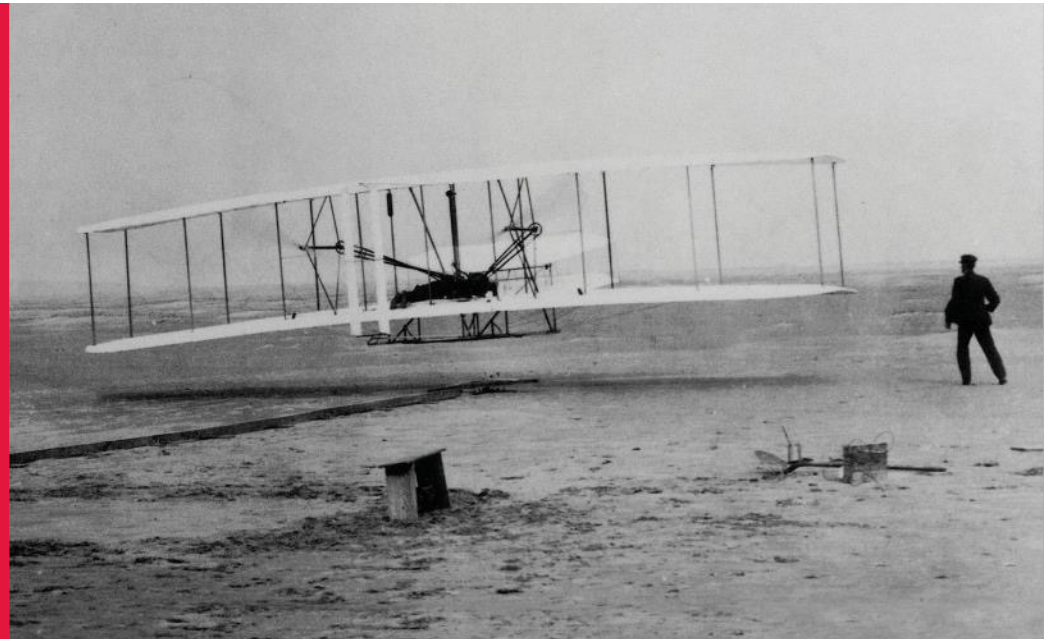
Guy Levy, Business Development Manager



Curtiss-Wright Corporation

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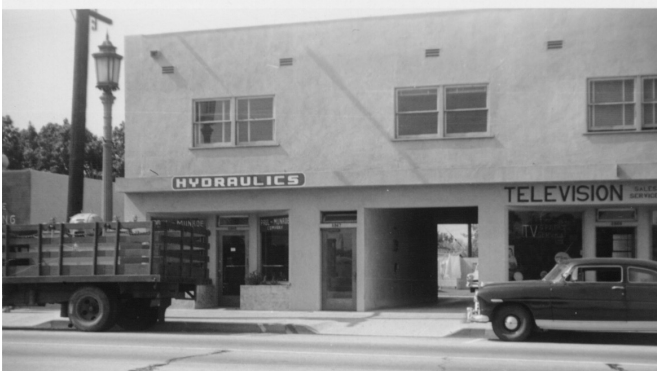
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>700 Employees **13** Major Facilities

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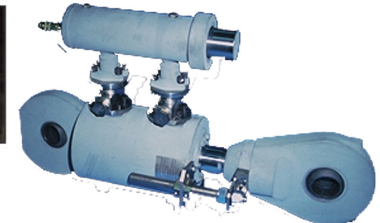
Paul-Munroe Hydraulics Inc. – Enertech's Heritage



1952

- Paul-Munroe Hydraulics Inc.
- California hydraulic distributor, manufacturer
- Enertech established 1967: P-M Energy Products

- Technology-defined company
- Hydraulic snubbers, EHOs
- Bettis distributor



History Timeline



1967 – Energy Products
Division- Enertech



1987 – Enertech
becomes independent
private owned
corporation



1998 – Curtiss Wright
acquires Enertech

Presentation Outline

- Overview of hydraulic snubber testing
- Testing options
- Testan machine for **T**esting **I**n **P**lace
- Case Study: Innovative, modular low weight Testan

Why Test?

ISTD-5200 Inservice Operational Readiness Testing

Snubbers shall be tested for operational readiness during each fuel cycle. Tests are required to be in accordance with a specified sampling plan. Testing shall be performed during normal system operation, or during system or plant outages. The Owner's administrative



What To Test For?

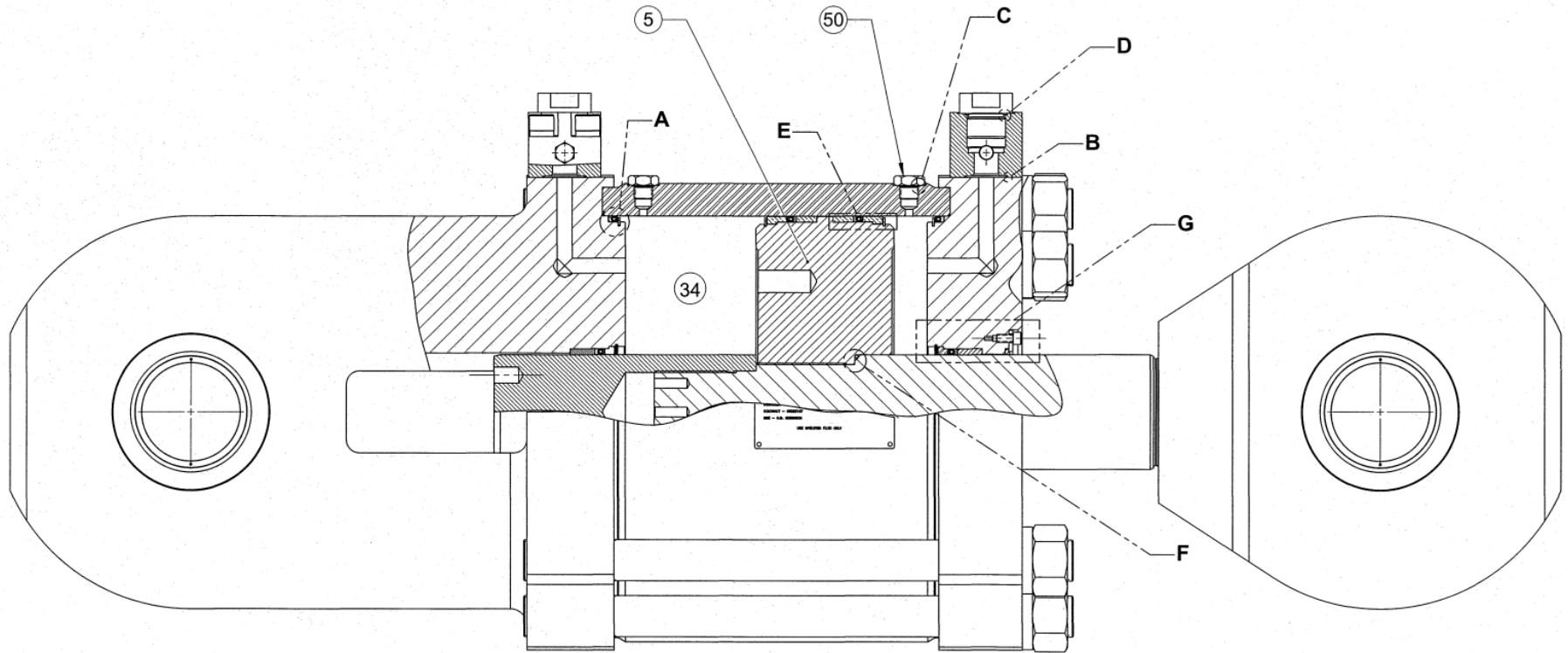
ISTD-5210 Test Parameters. Snubber operational readiness tests shall verify the following:

(a) activation is within the specified range of velocity or acceleration in tension and in compression.

(b) release rate, when applicable, is within the specified range in tension and in compression. For units specifically required not to displace under continuous load, ability of the snubber to withstand load without displacement.

- Will the snubber “lock up” and become a rigid support? If so, at what speed?
- After the snubber locks up, will it allow adequate movement for connected equipment?

Snubber Tests



- Lockup
- Bleed
- Breakaway
- Drag
- Seal Integrity

Flexibility with Testing

ISTD-5225 Subcomponent Test. When snubber size, test equipment limitations, or inaccessibility prevents use of methods in ISTD-5223 and ISTD-5224, snubber subcomponents that control the parameters to be verified shall be examined and tested in accordance with Owner-approved test methods. Reassembly shall be in accordance with approved procedures that include the requirements of ISTD-4110(a), (d), and (e). Service life

Option: Remove Snubber for Testing

Paul-Munroe is a broad-based engineering and service organization with a 35-year worldwide reputation for supplying quality systems, products and services.

The Energy Products Division specializes in providing complete engineering, manufacturing and field service capabilities to the nuclear power industry. The division's years of experience give its personnel an in-depth understanding of nuclear utilities needs and the necessity for immediate response to on-site outage service requirements. Paul-Munroe's full complement of on-site field service and field support includes maintenance, fluid analysis, repair, retrofitting, spare parts and testing of all manufacturers' large bore snubbers, mechanical and hydraulic pipe snubbers, valve operators, hydraulic systems and equipment.

A specialized On-Site Service Group is organized to respond rapidly to the snubber testing requirements of operating nuclear power plants. The group provides a comprehensive on-site snubber operability verification program that meets the requirements of the utilities and regulatory agencies. This "turnkey" program, which includes visual inspection, stroke and functional testing, in-place testing, removal and reinstallation, on-site teardown and repair provides the utilities with a single source for examination and testing service of all sizes and types of mechanical and hydraulic snubbers.

Paul-Munroe is committed to continually upgrading its on-site program to insure the utilities are provided with only the highest quality, up-to-date, timely, and cost efficient field service available in the industry. Their advanced computer controlled equipment, experienced crew and single source on-site test and repair capabilities make Paul-Munroe second to none.

Paul-Munroe On-Site Outage Services



Experienced Qualified Specialists

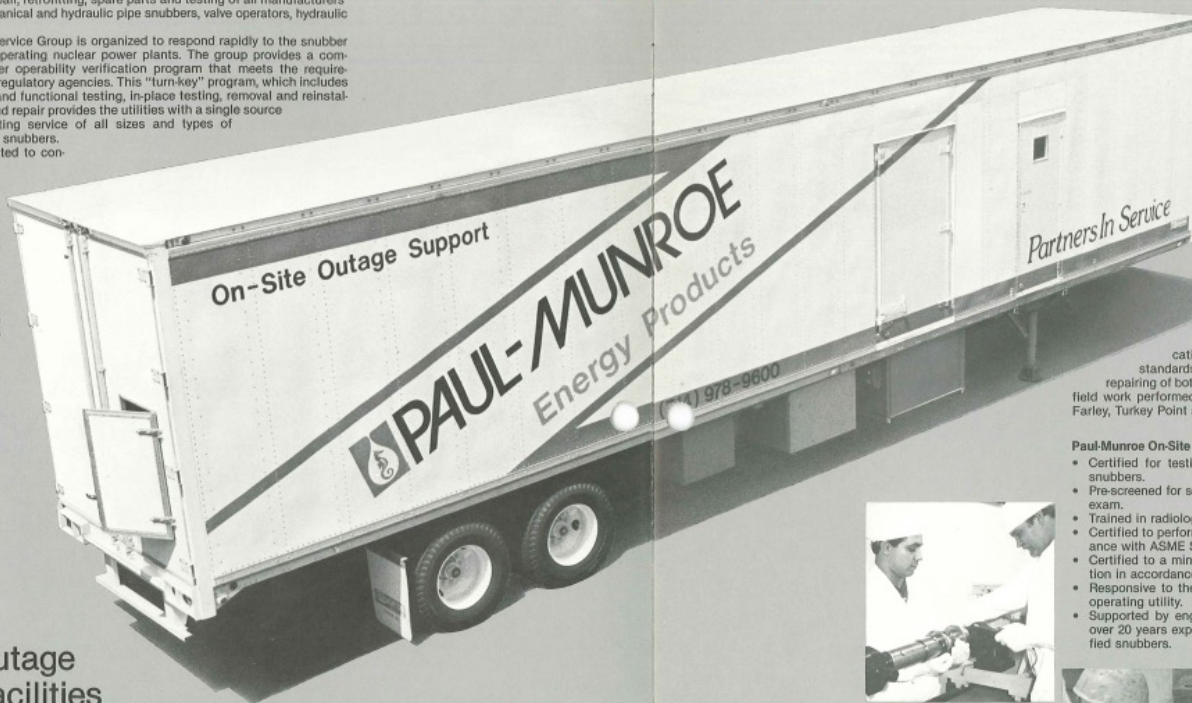
The Paul-Munroe on-site service team is a group of carefully selected, well-trained professionals, committed to excellence, accomplishment, and the provision of timely, cost-efficient service. Members of the on-site team have completed comprehensive training and qualifications programs that meet or exceed industry standards. Their extensive experience in testing and repairing of both mechanical and hydraulic snubbers includes field work performed at St. Lucie, Surry, Arkansas Nuclear One, Farley, Turkey Point and Trojan power plants.

Paul-Munroe On-Site Service inspection and test technicians are...

- Certified for testing and repairing mechanical and hydraulic snubbers.
- Pre-screened for security/psychological, pulmonary and physical exam.
- Trained in radiological operations and safety procedures.
- Certified to perform VT-3 and VT-4 visual examination in accordance with ASME Section XI, Subarticle IWA-2300.
- Certified to a minimum Level II for performing visual examination in accordance with ANSI N45.2.6 and ASNT SNT-TC-1A.
- Responsive to the needs and time frame requirements of the operating utility.
- Supported by engineering and manufacturing personnel with over 20 years experience designing and building nuclear qualified snubbers.

On-Site Outage Service Facilities

- 48 foot mobile laboratories dedicated to snubber testing and repair.
- Equipped with Paul-Munroe state-of-the-art pipe snubber or large bore snubber test machine.
- Advanced test-in-place testing machines.
- Totally integrated work area with tooling, fixtures and instrumentation to provide efficient testing and rebuilding of all sizes and types of mechanical and hydraulic snubbers.
- Mobile test trailers equipped with an environmental and radiation control system that includes HEPA Filtration.
- Bridge crane capabilities for ease of snubber handling.
- On-board anti-contamination clothing.
- 40 foot office/tool support trailer for staging, record preparation, craft labor support scheduling, and special rigging and equipment storage.
- Self-contained mobile testing labs and office/tool trailers require minimum utility support.
- Regionally dispatched for responsive service and reduced transport costs.



Apply External Load

The Paul-Munroe Model 2000 Large Bore Test Machine provides...

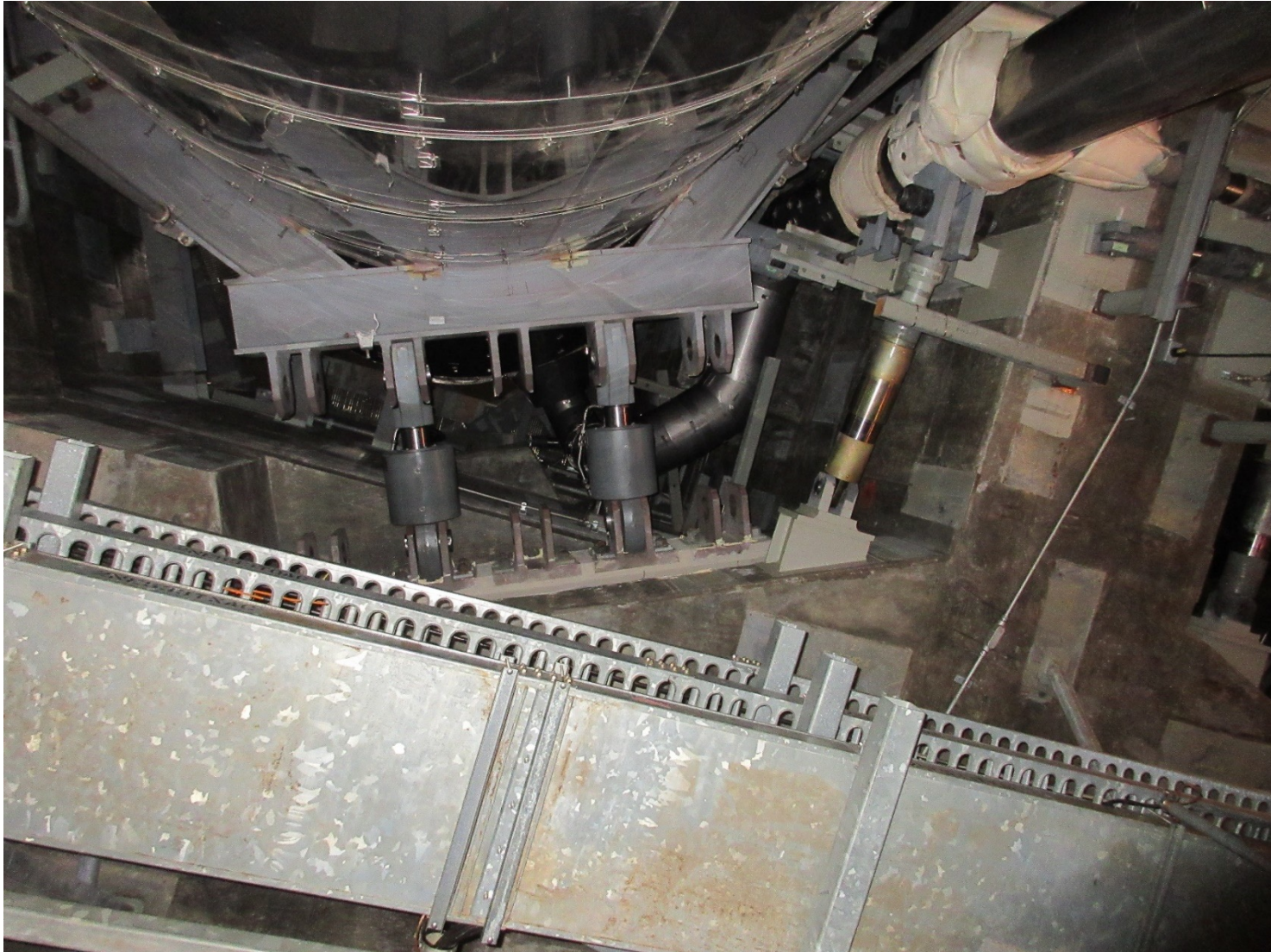
- Testing capacity up to 22" bore and 10" rod.
- Accommodation for snubbers with remote or integral reservoirs.
- High accuracy measurements at low breakaway and drag loads.
- Ease of test equipment operation reduces reconfiguration time when testing different size snubbers.
- Data acquisition and plot generated with an HP xy measurement plotting system.
- Testing parameters to properly validate snubber performance including full load (level D), breakaway and drag force, lock-up velocity (activation), bleed release rate (faulted or partial load), spring rate and hydrostatic test.



Options...

- **Remove Complete Snubber - no external load**
 - Test with fluid
 - Snubber fully extends/retracts
 - Tests breakaway and drag
- **Unpin One Side**
 - Fully extend/retract, includes breakaway and drag
- **Remove and test only Control Valves**
 - Only tests lockup and bleed
- **Do not remove Control Valves: Test In Place**
 - Tests lockup, bleed, and seal integrity

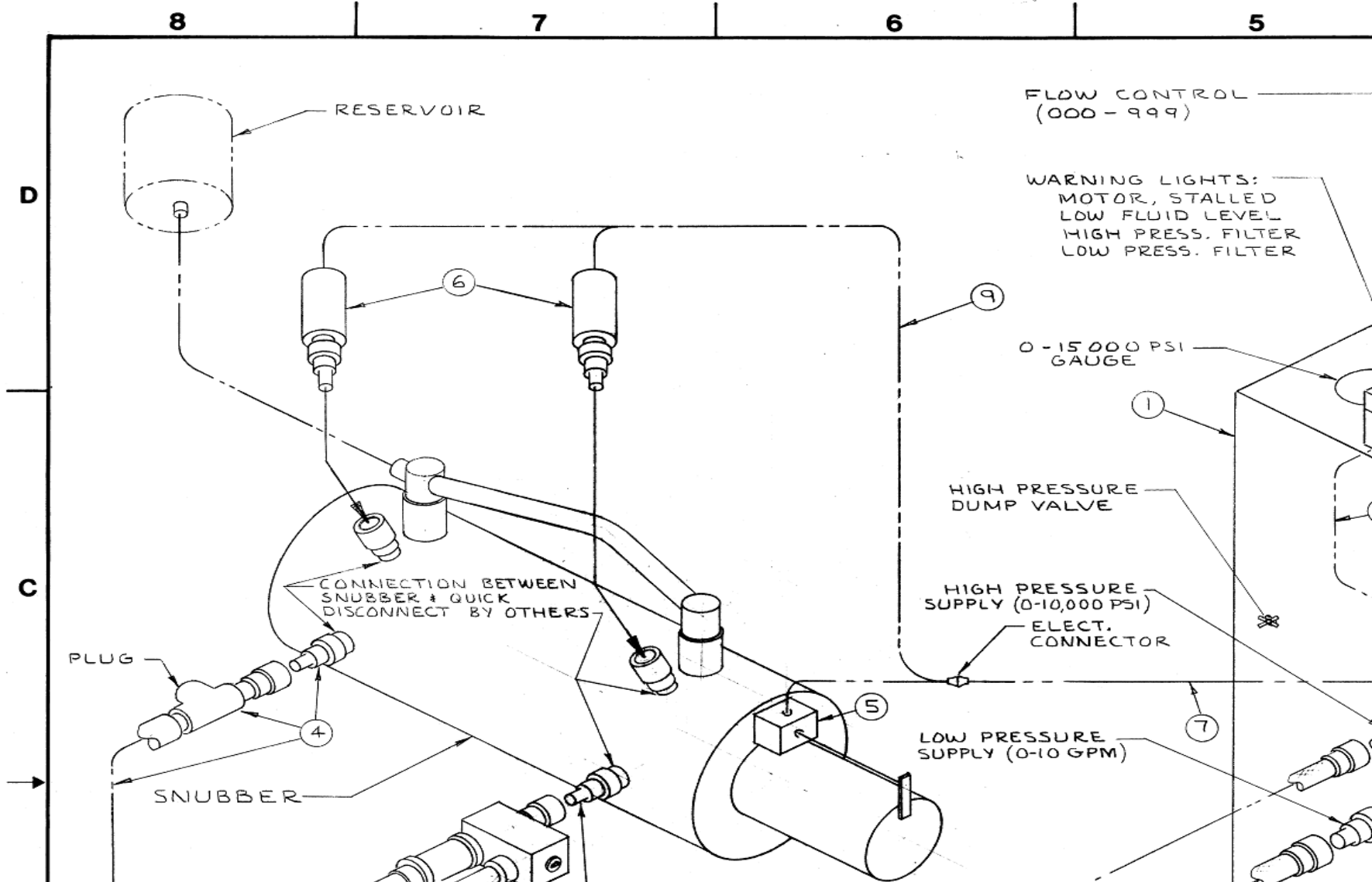
Removing a Snubber can be Challenging



Testan – Test In Place



1976 Testan



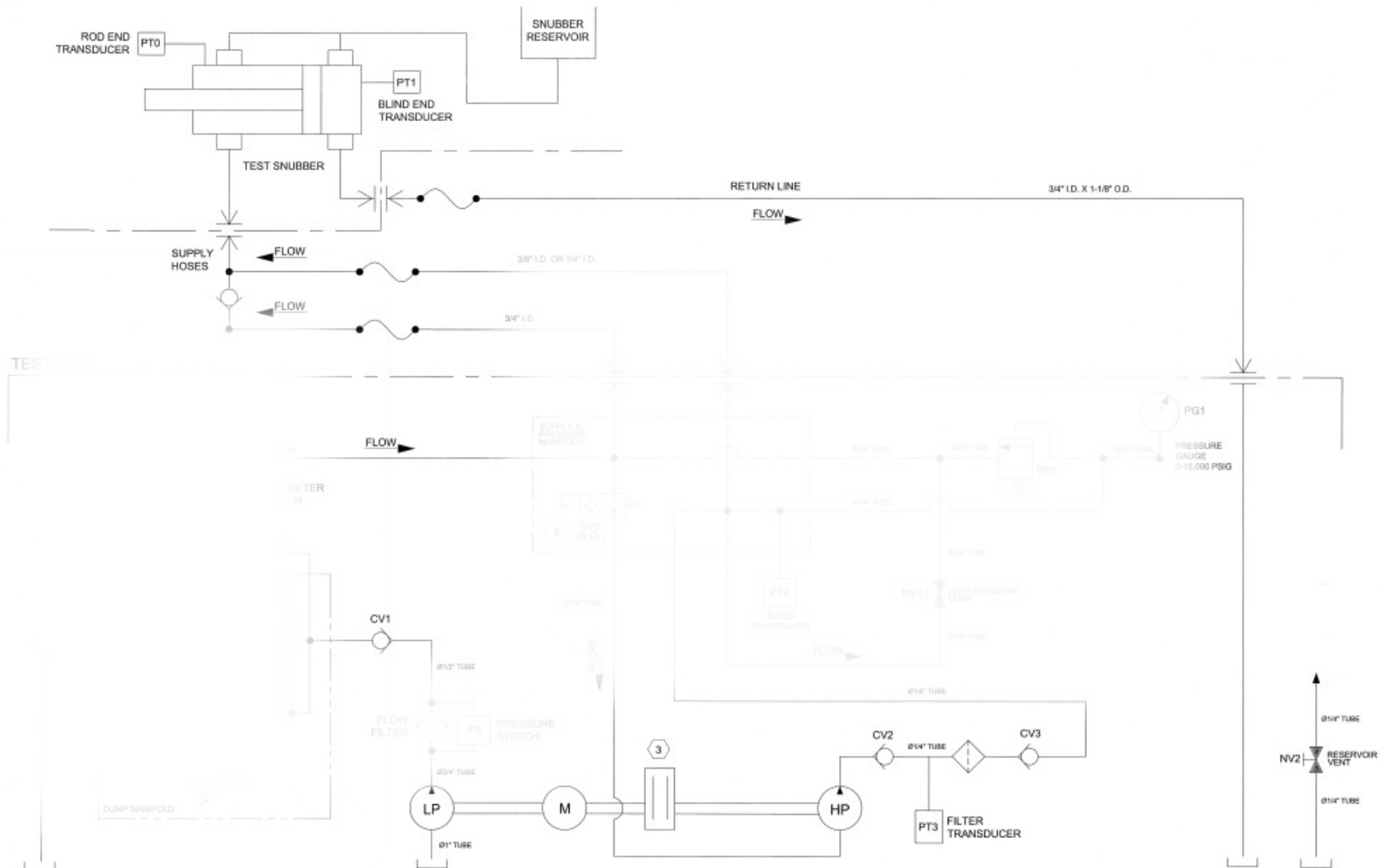
Case Study: The Problems

- High outage demand for polar crane, bigger priorities than carrying the Testan

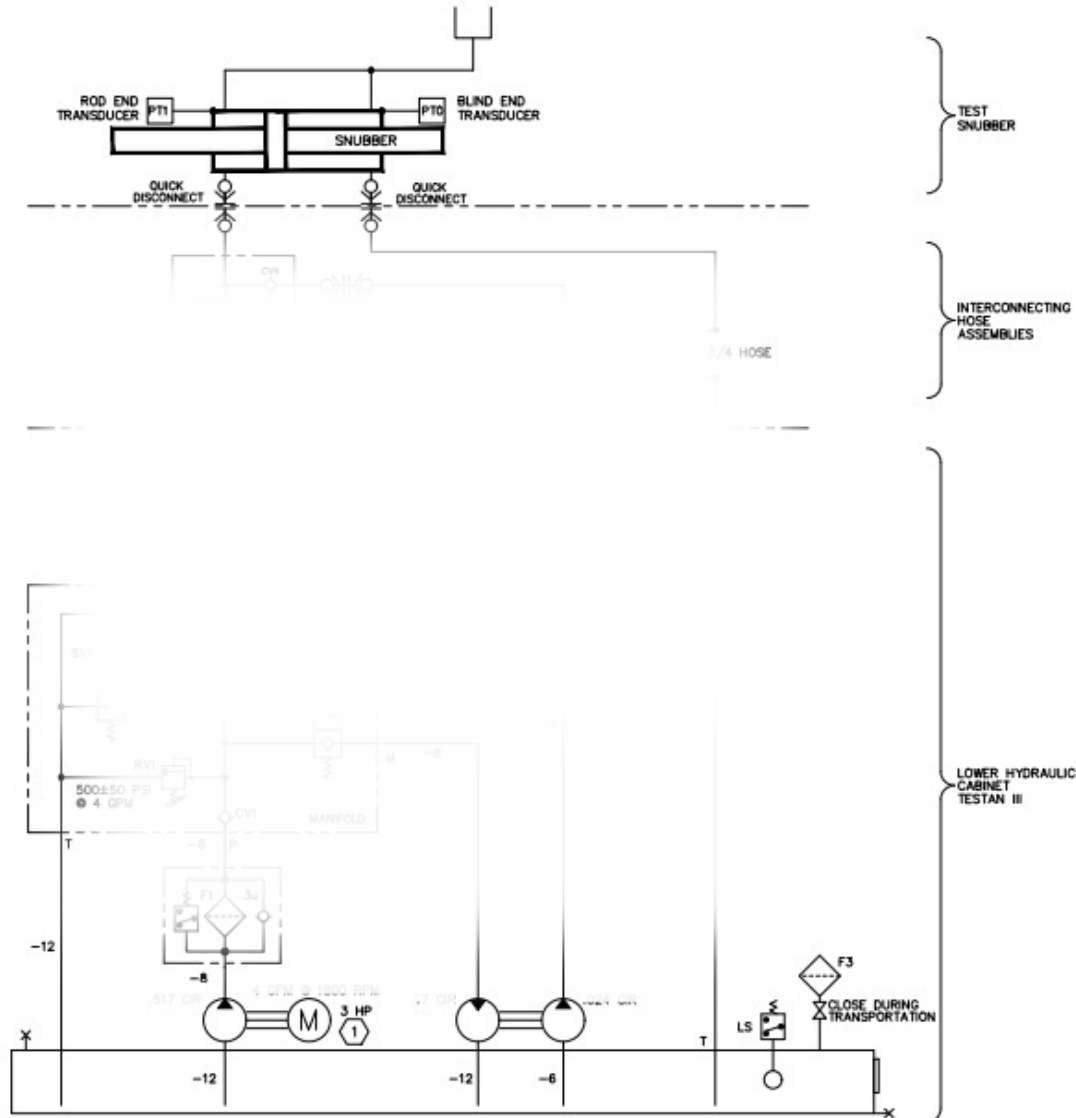


- Tight space... need a smaller Testan

Original Schematic

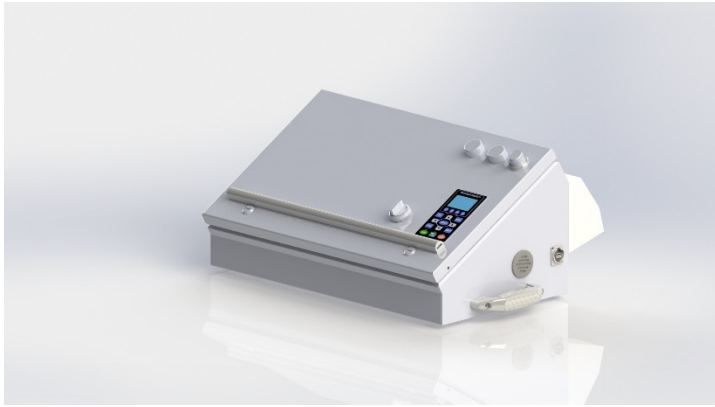


New Schematic

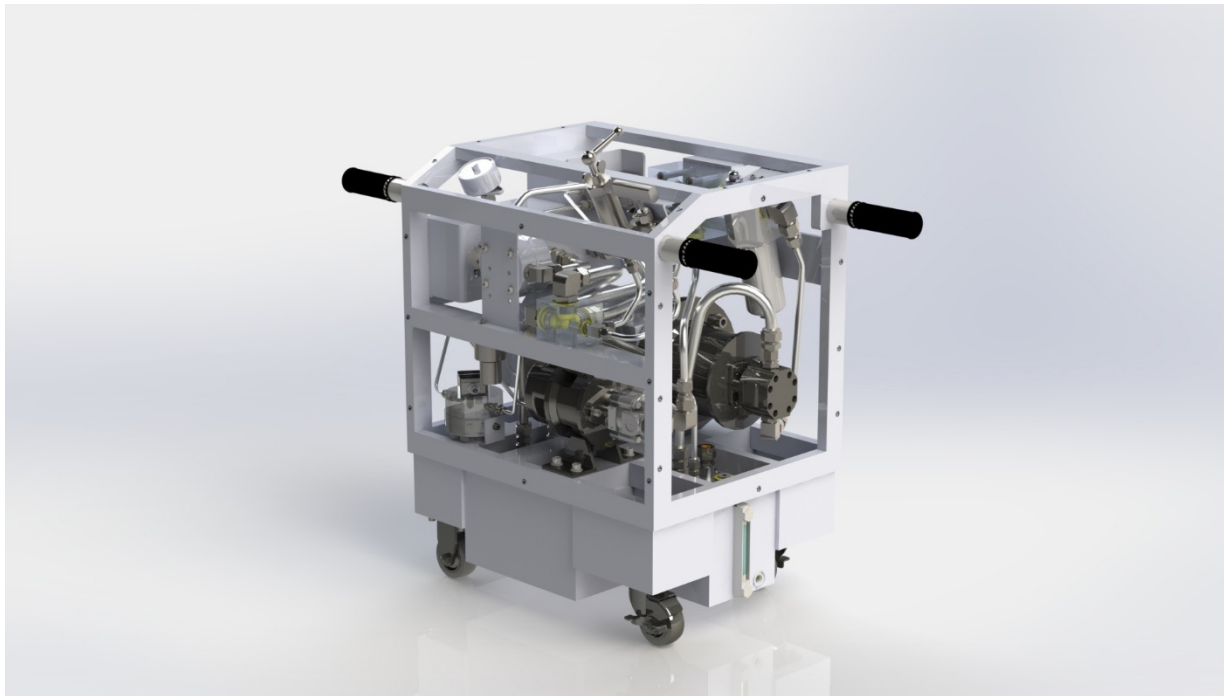


- **Disconnect High / Low pressure pumps**
- **Use hydraulic motor**
- **Reduce overall length**

The Solution: Redesign the Testan



- **Modular design: Separate Electronics from Hydraulics**



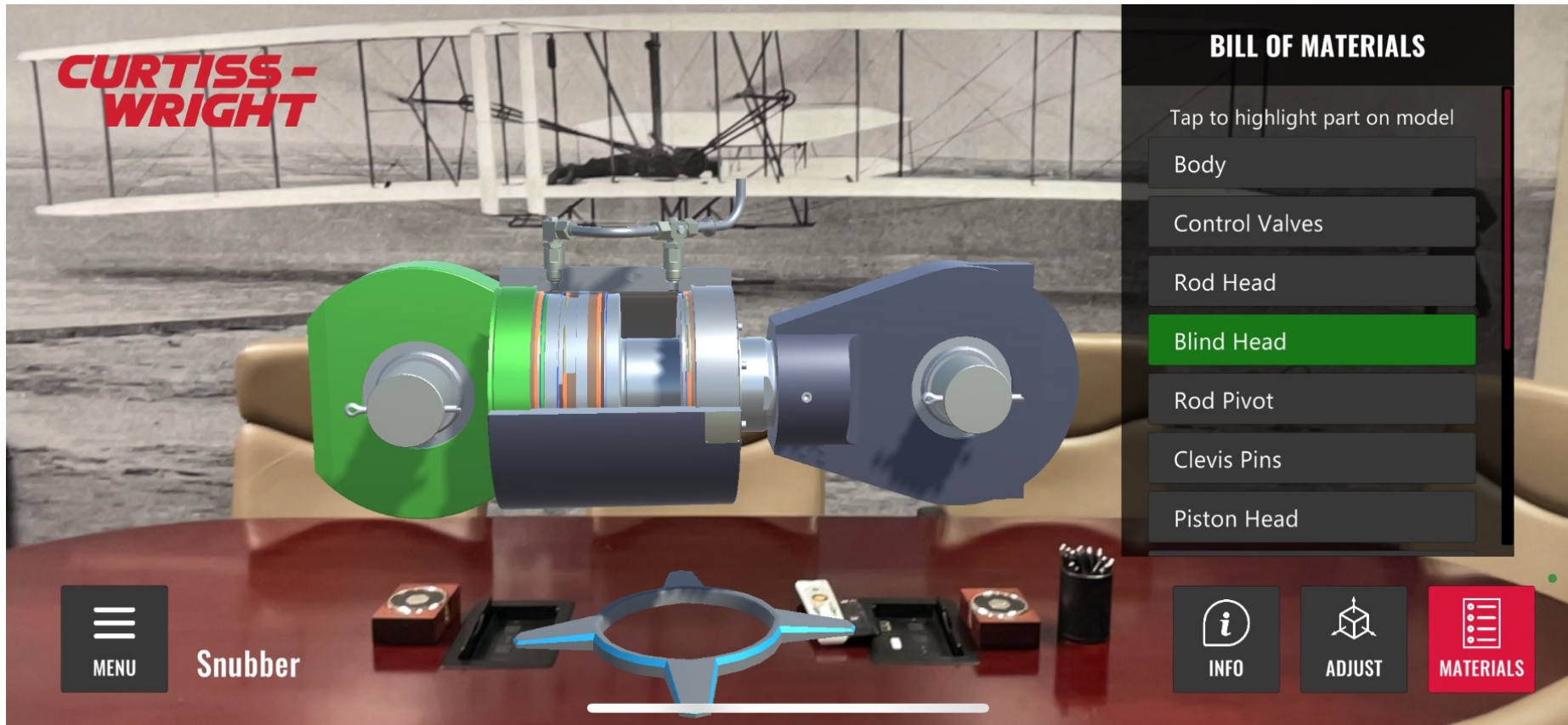
- **Lower weight, carry by hand**

Combined at Test Location



Augmented Reality App – Snubber

- Training and educational tool
- Demonstrates snubber extending and retracting



Augmented Reality App – Snubber

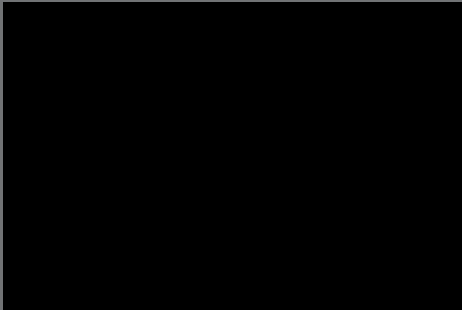
- Scan the QR code to download the Curtiss-Wright Augmented Reality app



Thank You!

***CURTISS -
WRIGHT***

Questions?



QUESTION CARDS

?



DAILY ADJOURNMENT

WEDNESDAY'S SESSION BEGINS
8:00 AM

