



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555-0001

April 29, 1994

Mr. Richard H.F. Jackson, Deputy Director
Manufacturing Engineering Laboratory
National Institute of Standards and Technology
Building 220, Room B322
United States Department of Commerce
Gaithersburg, Maryland 20899-0001

Dear Mr. Jackson:

This letter is to confirm our meeting with you and your staff on Wednesday, May 4, 1994, at 4:00 P.M. at the NIST offices in Gaithersburg. The purpose of this meeting is to discuss concerns that have recently been brought to the attention of the NRC by Mr. Stanley P. Johnson, of the Johnson Gage Company, regarding the acceptability of System 21 to gauge class 1 and 2 fasteners for use in commercial nuclear power plants. Specifically, Mr. Johnson and his associate, Mr. James H. Harrington, appear concerned that because System 21 does not assure dimensional conformity to all of the threaded fastener specifications contained in ANSI B1.1, that failures of class 1 and 2 threaded fasteners due to dimensional nonconformity cannot be precluded. The implication is that this is somehow unacceptable for nuclear applications. Moreover, they have been strongly advocating that the NRC endorse or perhaps require the use of System 22 by utilities to gauge class 1 and 2 threaded fasteners used in commercial nuclear power plants.

For approximately the past three years, NIST has written several letters to various individuals and associations (Enclosure 1) stating that System 21 does not assure compliance with the material limits in ANSI B1.1. We fully agree with NIST that System 21 does not assure dimensional conformance with the material limits in ANSI B1.1. However, your letters appear to have been written in response to concerns regarding the acceptability of System 21's use in gauging class 3 threaded fasteners, and not with regard to the acceptability of its use in gauging class 1 and 2 threaded fasteners. In bringing this issue to the NRC, Mr. Johnson and Mr. Harrington have provided us copies of these NIST letters and have included them in an advertising brochure for the Johnson Gage Company. In both letters to the NRC as well as in the advertising brochure, Mr. Johnson has made a very deliberate attempt to imply the NIST positions apply to all classes of fasteners, and not just class 3 fasteners.

Hence, one of the things we would like to discuss with you and your staff is clarification of NIST's position regarding the acceptability of System 21 for gauging class 1 and 2 threaded fasteners and whether Johnson Gage Company is properly or improperly interpreting and representing the NIST position. We have also analyzed the impact on threaded fastener performance due to failure to pass System 22 gauging while passing System 21 gauging and we would like to share our conclusions with you. Lastly, we are currently preparing a response to Mr. Johnson's most recent letter (Enclosure 2) to Chairman Selin, and because of Mr. Johnson's implication of NIST endorsement of his concern, we would like to discuss our proposed response.

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ENCLOSURE 1

- 1) John A. Simpson of NIST to Mr. C. T. Gustafson of the Portsmouth Naval Station on June 20, 1977
- 2) John A. Simpson of NIST to Colonel James H. Harrington on January 14, 1991
- 3) John A. Simpson of NIST to the Honorable Donald B. Rice, the Secretary of the Air Force on July 1, 1991
- 4) John A. Simpson of NIST to Mr. Don Fuqua of the Aerospace Industries Association (AIA) on February 7, 1992 based on information from James H. Harrington of the Johnson Gage Company
- 5) John W. Lyons of NIST to Mr. Don Fuqua of AIA on October 22, 1992
- 6) John W. Lyons of NIST to Mr. Kurt Wessely of the American Society of Mechanical Engineers

ENCLOSURE 2

The
JOHNSON GAGE COMPANY

April 12, 1994

Mr. Ivan Selin, Chairman
Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Mr. Selin:

I am in receipt of your staff's response to my March 8, 1994 letter. This response generates serious concern for me. I am certain you did not have the opportunity to review this response before its release, because it does not address the issue(s) raised; the nuclear industry's acceptance and use of dimensionally sub-standard, non-conforming threaded product. The low probability of a core meltdown is encouraging, but the probability of even this grave failure still exists. But what about the many other potential failures due to substandard threaded product use?

Please clarify the statement, "...The NRC staff does not consider System 21 or the use of go no-go gauges to be inappropriate ("flawed") for accepting certain fastener threads based on the following discussion." I find it strange that the U. S. automotive, aerospace, and defense industries have had problems with and moved away from System 21 thread gaging yet the nuclear industry has not taken any such action. Does the NRC condone the acceptance and use of non-conforming products within U. S. nuclear power plants? What are the "certain fastener threads" referenced in the NRC response that can be dimensionally non-conforming, accepted and used and in what applications are these authorized by 10 CFR 50? This response statement, "certain fastener threads", also alludes to the premise that all OTHER fastener threads require at least a System 22 measurement. What are these fasteners?

The thread standards that the nuclear industry uses cite engineering drawings, design thread forms, and dimensional tables and the design engineers assume these threads meet those specified dimensional limits to achieve the required performance. Use of System 21 thread gaging can not assure thread dimensional conformance thus questioning the thread's ability to perform or to develop a proper torque/preload relationship in maintaining an adequate clamping force load while the thread component is in service. This includes Class 1, 2, and 3 tolerance threads. Please note that a System 22 measurement verifies Functional Size, Pitch Diameter, lead, angle, taper, 2 and 3 point

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out-of-round conditions, Major and Minor Diameters conformance within the threads standards' limits of size. Does the NRC have evidence disproving the findings of the National Institute of Standards and Technology (NIST) and the Department of Defense (DoD) in that System 21 can not assure thread dimensional conformance to the thread limits and characteristics required by the thread specifications and standards? (See the enclosed NIST letter.)

I have reviewed the cited references reportedly supporting the conclusions offered in the NRC response, specifically NUREG-1339 and Generic Letter 91-17. I have also reviewed available NRC documents (Generic Letters, Bulletins, studies, etc.) and I have found NO information citing actual measurement data of failed fasteners or that measurements were ever taken to confirm thread dimensional conformance or non-conformance. Nuclear industry employees have confirmed that actual thread dimensions have never been measured, in failure analysis, and that the threads were always assumed to be dimensionally conforming. Please provide me with hard thread dimensional measurement data showing evidence of actual thread dimensional measurement of the threaded products involved in the failures referenced. It has been verified that the nuclear industry, in its threaded product failure analysis, has only addressed the areas of product material composition, corrosion, and heat treatment (hardness). No, I am not aware of any documented threaded dimensional analysis, in the area of failure analysis in the Nuclear Industry.

Another major problem that has clouded the issue of product screw thread dimensional non-conformance is that the industry has not recognized the fact that a threaded product does not have to shear or strip to fail, it only has to loosen. In many situations, a loose threaded connection can cause more damage than a threaded product that has sheared.

Dimensional thread measurements at numerous nuclear plants have shown massive threaded product dimensional non-conformance; some product in excess of 100% out of tolerance. I provided you actual thread measurement results in my March 8, 1994 letter. Thread measurements at additional plants have shown similar non-conformance. **THIS PROBLEM IS REAL!** I offer to supply, at no charge, the NRC with the necessary System 22 measuring equipment to verify these findings. The NRC has the responsibility to advise and provide guidance in the industry. It would be reasonable to expect the NRC to exercise their responsibility by taking immediate, positive corrective action with the release of a Generic Letter, Information Notice, or a Bulletin, as appropriate. The industry deserves this guidance to eliminate the problem of thread dimensional non-conformance.

Mr. Selin, I am not trying to shut down or adversely impact the nuclear industry. This industry provides a very valuable service, but needs NRC guidance if it is to operate in a safe and proper manner relative to screw thread dimensional conformance. I suggest that the nuclear industry follow the DoD's example in addressing this issue. The DoD

addressed this problem in that: (1) they "drew a line in the sand" and ensured that all NEW threaded product procurements were dimensionally conforming per System 22, and (2) they inspected all safety critical threaded products in existing inventories, before being placed into service. Other inventory items were used until exhausted, then replaced with stock that was conforming to specifications relative to thread dimensions, hardness, and metal composition. This approach will have the least impact on the nuclear industry while improving the safe operation and quality of the threaded products used.

Your staff's response concludes that, "...the NRC staff has not found evidence that failures due to dimensionally non-conforming fasteners are occurring and therefore, does not consider it to be a safety concern". To my knowledge, the nuclear industry and the NRC has never performed proper thread measurement inspections (System 22), as part of their threaded product failure analysis. Thread dimensional non-conformance leads to such problems as joint relaxation, leakage, galling, vibration loosening, and premature fatigue failure to name a few. Is your staff saying these resultant thread dimensional non-conformance problems do not exist? It is a known fact that the majority of nuclear power plants today do not have the thread gaging capability, System 22, to properly inspect incoming product or to investigate threaded product failures. Without proper equipment and the knowledge of the importance of thread dimensional conformance, it is no surprise that the NRC has not received any reports or Licensee Event Reports of product failure due to thread dimensional non-conformance.

Mr. Selin, I would like to arrange a meeting, as soon as possible, with you and your staff to demonstrate System 21 and System 22 thread measurement and to support, in full, our response to this entire issue of threaded product dimensional non-conformance and its impact on the nuclear industry. Resolution of this issue is simple and extremely cost effective. I look forward to meeting you and assisting the NRC in resolving this issue in a timely manner.

Respectfully,

THE JOHNSON GAGE COMPANY



Stanley P. Johnson
CEO

Encl.



NIST

UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-0001

March 10, 1994

Dr. James A. Davis
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Dr. Davis:

I understand that you have had some correspondence with our NIST staff on the issue of dimensional conformance for screw threads, and that you are unclear as to the NIST position. For the record, the NIST position is:

"System 21 (plug and ring) acceptance methods do not assure dimensional conformance with the material limits specified in ASME B1.1, MIL-S-8879, MIL-S-7742, and Federal Standard H-38."

This is a long and strongly held position at NIST and has not changed.

Sincerely,

Richard E.F. Jackson
Deputy Director
Manufacturing Engineering Laboratory

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