

The
JOHNSON GAGE COMPANY

March 17, 1994

Mr. Charles E. Rossi
Nuclear Regulatory Commission
NRR/DRIL
11555 Rockville Pike
Rockville, MD 20852

Dear Mr. Rossi,

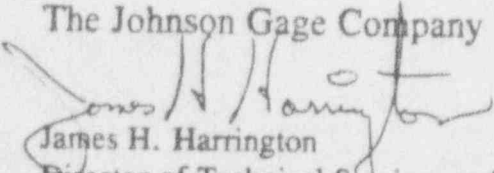
Reference the visit of Mr. Stanley P. Johnson and myself on March 8, 1994, in which we discussed the problem of dimensionally non-conforming, sub-standard threaded product use within the nuclear power industry. This problem has occurred through the use of a flawed thread gaging system called System 21 that the National Institute of Standards and Technology has proved will not assure thread dimensional conformance to the recognized ASME thread standards.

During that visit Mr. Johnson offered to draft a "Strawman" Information Notice to alert nuclear utilities to the issue with this gaging system. Enclosed is that draft Strawman for your use.

Contact me at 719-481-9661 if you have any questions.

Respectfully,

The Johnson Gage Company


James H. Harrington

Director of Technical Services and Operations

9405270272 940308
PDR COMMS NRCC
CORRESPONDENCE PDR

STRAWMAN

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D. C. 20555

March 7, 1994

NRC INFORMATION NOTICE 94-XX: THREADED PRODUCT DIMENSIONAL
CONFORMANCE

Addressees

All operating licenses or construction permit holders for nuclear power reactors.

Purpose

This Information Notice is to alert addressees that System 21, commonly called Go - No Go, thread gaging acceptance methods do not assure thread dimensional conformance with the material limits specified in ASME B1.1 and other thread specifications and standards. All recipients will review their procurement, receipt inspection, and maintenance procedures to assure that only dimensional conforming threaded products are procured and used per 10 CFR 50 and ASME Boiler and Pressure Vessel Code Sections III and IX.

Discussion

The National Institute of Standards and Technology has proved that System 21 thread acceptance methods will not assure thread dimensional conformance to the thread specifications and standards' material limits. The flaw within this thread gaging system first surfaced within the Department of Defense (DoD) in that the DoD experienced loss of weapon systems and life as the result of non-conforming threaded product accepted using System 21 gaging. The General Accounting Office documented these findings in their Report NSIAD-91-309 titled, "MILITARY FASTENERS -- Changes to Specifications Are Justified." As a result, the DoD revised their procurement procedures and specifications to eliminate System 21 gaging. Likewise the automotive and aerospace industries have eliminated System 21 thread gaging use.

ASME B1.3M - 1992, "Screw Thread Gaging Systems for Dimensional Acceptability - Inch and Metric Screw Threads (UN, UNR, UNJ, M and MJ)" presents four accountable levels of thread inspection, System 21, System 21A (Metric threads per ANSI B1.18M), System 22, and System 23. By ASME definition, System 21 provides control of the maximum material limit but does not control the minimum material limit. Systems 22 and 23 provides control of both the minimum and maximum material limits. This fact is

also reflected in B1.3M Tables 1 and 2 listing the capabilities of available gaging equipment. These tables show that Threaded Ring and Plug Gages, Split or Solid (System 21) is not capable of determining the thread Minimum Material condition.

The Minimum Material condition, also called Pitch Diameter Size, determines if there is sufficient thread material present to maintain the joint clamping force once properly installed. The Maximum Material condition, also called Functional Size, determines if a threaded component will properly assemble with its mating part. Common problems caused by dimensionally non-conforming threaded components include: leakage, galling, joint relaxation, vibration loosening, reduction in thread static shear strength (thread stripping), and fatigue life reduction. Specific threaded component problem areas include: valve bonnet to body bolting, pump casing bolting, incore instrumentation flange bolts, turbine casing bolts, reactor vessel flange studs, pressure vessel access and inspection manways, gear pumps, and diesel generator threaded components.

In the past, threaded component failure analysis has focused on hardness (heat treatment) and material composition and thread dimensions were assumed to be conforming. Surveys at numerous facilities have revealed high levels of thread dimensional non-conformance in the areas listed above.

The principle thread used within the nuclear power industry is the Unified Inch Screw Threads (UN and UNR Thread Form) per ASME B1.1. This document defines the thread profile and the engineering thread allowances and tolerances used in the manufacture and use of this thread. Conformance to these allowances and tolerances are essential for proper thread and joint performance. Similar documents define other threads (ACME, BUTTRESS, etc.) used but all require dimensional conformance as do the ASME Boiler and Pressure Vessel Codes and 10 CFR 50.

This information notice requires specific action by all holders of operating or construction permits for nuclear power reactors. All recipients will amend procedures to ensure that dimensionally conforming threaded products are procured, received, and used. All holders of operating or construction permits will sample existing inventories, prior to being placed into service, to assert that the threaded products are dimensionally conforming to the specifications and standards defining the thread used. All holders will notify this office when procedures and equipment are in place to implement this information notice but in no circumstances with this be later than 12 months from the date of this information notice. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate office of Nuclear Reactor Regulation (NRR) project manager.

GARY A. FRANKS
District, Connecticut

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ENERGY AND COMMERCE

SUBCOMMITTEES
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Energy and Power

CHAIRMAN
REPUBLICAN TASK FORCE
ON WELFARE REFORM



Congress of the United States
House of Representatives

February 24, 1994

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

Dear Chairman Selin:

It has come to my attention that the nuclear industry is still using a piece of equipment the Defense Department found faulty three years ago.

In 1991, the Department of Defense revised their screw thread specifications to eliminate a flawed gaging system that was responsible for acceptance of dimensionally non-conforming product that resulted in several accidents with loss of life. The flawed gaging is called System 21 or Go-No Go gaging. I understand that System 21 is still being used throughout many industries. The U.S. automotive industry eliminated use of this gaging several years ago and adopted use of System 22 measurement to ensure the proper fitting of the nuts and bolts being used.

I would like to know if the Nuclear Regulatory Commission has addressed this safety issue in the nuclear energy plants throughout the United States. My concern lies in the problem that only a few plants may be aware of the problems with the System 21 gage.

Please feel free to contact me or my Legislative Director, Shane Schriefer, regarding this issue. I would like to be able to assure my constituents that this is a problem that is being corrected, not an ongoing one.

Best regards,

Gary A. Franks
Member of Congress

GAF:sts

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UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

March 28, 1994

The Honorable Gary A. Franks
United States House of Representatives
Washington, D.C. 20515-0705

Dear Congressman Franks:

I am responding to your letter of February 24, 1994, to Chairman Selin concerning the use of certain equipment for identifying dimensionally nonconforming fasteners in the nuclear power industry. We are quite familiar with the controversy surrounding the use of System 21 for thread gauging as a means of identifying dimensionally nonconforming fasteners. Although System 22 verifies additional thread characteristics such as the pitch diameter, the NRC staff does not consider System 21 or the use of go-no-go gauges to be inappropriate for accepting certain fastener threads based on the following discussion.

Because of an increase in the number of bolting failures during the 1970s, the U.S. Nuclear Regulatory Commission (NRC) established a generic safety issue on bolting in the early 1980s to study the potential safety implication of these failures. The primary causes of these failures were stress corrosion cracking of overly hard fasteners, boric acid corrosion of steel fasteners, and metal fatigue. We have found no evidence to indicate that the failures were directly attributable to dimensionally nonconforming fasteners.

The Atomic Industrial Forum (AIF), the Metals Properties Council (MPC), and the Electric Power Research Institute (EPRI) also conducted major studies on bolting. As a result, EPRI issued a number of documents addressing NRC's concerns about bolting. Further, the NRC conducted two independent assessments of the probable risk of bolting failures in nuclear power plants. Both assessments indicated that the probability of a core meltdown caused by a bolting failure was low because of the highly redundant design of bolted connections, and because the bolted connection would leak and the leakage would be detected before the connection completely fails. The NRC staff published NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," in June 1990, which documented the staff review of studies by AIF, MPC, and EPRI and recommended the closure of Generic Safety Issue 29. On October 17, 1991, the NRC staff officially closed Generic Safety Issue 29 by issuing Generic Letter 91-17, "Bolting Degradation or Failure in Nuclear Power Plant." In summary, the NRC staff does not consider the failures due to dimensionally nonconforming fasteners to be a significant, immediate safety concern.

Notwithstanding the closure of the generic safety issue on bolting, the NRC staff continues to be vigilant regarding any bolting problems. Through regulatory requirements in Appendix B, "Quality Assurance Criteria for Nuclear

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Power Plants and Fuel Reprocessing Plants," to Title 10 of the Code of Federal Regulations (10 CFR) Part 50, the NRC requires that each licensee establish a quality assurance program to ensure items, such as fasteners, used in safety-related applications, conform to applicable specifications. The NRC conducts periodic inspections of licensees to ensure that their quality assurance programs are being effectively implemented. Part 21, "Reporting of Defects and Noncompliances," of 10 CFR requires the reporting of defective items to the NRC and other nuclear facilities that may have also received the defective items. The NRC staff has reviewed the Part 21 submittals since 1990 and has not identified any bolting failures directly attributable to dimensionally nonconforming fastener threads.

In addition, nuclear power plant licensees are required to report any safety significant problems including fastener failures to the NRC in licensee event reports (LERs). The staff has reviewed LERs submitted since the mid-1980s and has not found any reports of fastener failures that could be attributed to dimensionally nonconforming fastener threads, giving additional credence to the conclusion that this is not an immediate safety concern.

The NRC staff is examining the relative merits of System 21 and System 22 for the gauging of fastener threads. Our preliminary conclusions indicate that, although System 22 may be an improvement over System 21, there is no sufficient basis to make its use a requirement for NRC licensees.

I hope this letter adequately responds to your inquiry. We appreciate having the opportunity to provide information on this matter.

Sincerely,

Original signed by
James M. Taylor
Executive Director
for Operations

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