



Public Service of New Hampshire

New Hampshire Yankee Division

George S. Thomas  
Vice President - Nuclear Production

NYN-88004

January 21, 1988

United States Nuclear Regulatory Commission  
Region I  
631 Park Avenue  
King of Prussia, PA 19406

Attention: Mr. William T. Russell  
Regional Administrator

- References: (a) Facility Operating License NPF-56, Construction Permit  
CPPR-136, Docket Nos. 50-443 and 50-444
- (b) NRC Compliance Bulletin No. 87-02 "Fastener Testing  
to Determine Conformance with Applicable Material  
Specifications," dated November 6, 1987

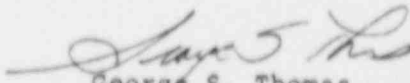
Subject: Response to NRC Compliance Bulletin 87-02

Dear Sir:

In response to NRC Compliance Bulletin 87-02, the Enclosure provides the report of test results and supporting information relating to testing of fasteners from Seabrook Station inventory. Based upon test results, one bolt was found to be slightly out of specification with respect to hardness; but this deviation was determined to have no significance. As a result, no further actions are planned.

We regret that this response is several days overdue; however, the delay was the result of late receipt of all necessary laboratory test reports. Should you have any questions regarding this information, please contact Mr. Warren J. Hall at (603) 474-9574, extension 4046.

Very truly yours,

  
George S. Thomas

8802030048 880121  
PDR ADOCK 05000443  
Q PDR

Enclosure

cc: Document Control Desk  
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Washington, DC 20555

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Project Directorate I-3  
Division of Reactor Projects  
United States Nuclear Regulatory Commission  
Washington, DC 20555

Mr. A. C. Cerne  
NRC Senior Resident Inspector  
Seabrook Station  
Seabrook, NH 03874

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STATE OF NEW HAMPSHIRE

Rockingham, ss

January 21, 1988

Then personally appeared before me, the above-named George S. Thomas who, being duly sworn, did state that he is Vice President - Nuclear Production of Public Service Company of New Hampshire, that he is duly authorized to execute and file the foregoing information in the name and on the behalf of Public Service Company of New Hampshire, and that the statements therein are true to the best of his knowledge and belief.

Beverly E. Silboway  
Beverly E. Silboway, Notary Public  
My Commission Expires March 6, 1990

Enclosure to NYN-88004

In response to NRC Compliance Bulletin 87-02, a sample group of fasteners, representing to the extent possible those fastener types of interest as defined by the Bulletin, was drawn from stock. This group of fasteners was tested by an independent laboratory and the results were evaluated. The process by which the above was accomplished is described below.

A list was compiled from inventory records identifying all the material specifications which pertained to the fasteners currently in Seabrook Station stock. The material types of interest identified in Bulletin 87-02 were matched to those material types available in current, in use, stock. Twenty safety class and ten non-safety class fasteners were then selected from this stock to serve as test samples. The twenty safety class fasteners were grouped into ten pairs - each pair consisting of material procured to meet the same material specification. The ten safety class pairs were assigned identification numbers beginning with "NHY-S1" and ending with "NHY-S10". Each individual fastener of a pair was identified as either "A" or "B". For example, a particular fastener was identified as "NHY-S5A". Similarly, the ten non-safety class fasteners were grouped into five pairs, each pair consisting of material procured to meet the same material specification and assigned identification numbers sequentially from "NHY-N1" to "NHY-N5". The number of pairs of non-safety class fasteners was limited by the availability of in-stock fasteners of the material type of interest as defined by the Bulletin.

A group of thirty typical nuts (twenty safety class and ten non-safety class) was selected to accompany the fasteners. The nuts were paired and assigned identification numbers in a similar manner to that described above for fasteners. Nuts procured to meet material specification A-194 were selected to the extent possible. The selection of the fasteners and accompanying nuts was made by New Hampshire Yankee (NHY) personnel with the participation of the NRC Senior Resident Inspector.

The selected fasteners and nuts were sent to Dirats Testing Laboratories of Westfield, Massachusetts, a NHY approved vendor, for chemical and mechanical testing. Testing was performed in accordance with the requirements of the fastener's material specification. Test reports for the fasteners and nuts were provided to NHY by the laboratory. The test results and supporting information requested by Bulletin 87-02 are attached to this Enclosure. Attachment 1 summarizes the receipt inspection requirements and the storage and issuance controls applicable to fasteners. Attachment 2 provides the markings for the sample fasteners and nuts. Attachment 3 includes the Fastener Testing Data Sheets in a format based upon that prescribed by the Bulletin. Attachment 4 provides the test data summary in a format based upon that prescribed in the Bulletin. Attachment 5 provides special notes relevant to the data presented in Attachments 3 and 4. Attachment 6 provides a summary of test results.

The laboratory tested each pair of the safety class fasteners such that a portion of the testing was performed on the "A" fastener and the remainder of the testing was performed on the "B" fastener. Typically, either the "A" or the "B" fastener was chemically tested and the remaining fastener of the pair was mechanically tested. In a similar manner, the safety class nut pairs were subjected to chemical and hardness testing. As a result, the test data presented in Attachment 4 for safety class fasteners and nuts is a composite result for the pair. Because of the limited number of non-safety class fastener samples, the laboratory conducted a complete test on both the "A" and the "B" fastener in each pair. In a similar manner, each non-safety class nut was completely tested. Attachment 4 reflects this by including the "A" and "B" designations as part of the sample identification numbers. These test methods were discussed with the Senior Resident Inspector.

Following receipt of the laboratory test reports, the test results were compared against applicable material specifications. All fasteners and nuts met specified requirements with one exception. Bolt NHY-S6 was found to be slightly out of specification with respect to hardness; but this deviation was determined to have no significance.

The results of tests performed to date indicate that the current stock of fasteners meets requisite specifications and requirements. Therefore, the operability of plant components utilizing such fasteners is not adversely affected. Receipt inspection, storage and issuance practices summarized in Attachment 1 are considered adequate to assure continued quality of fasteners in stock and in use. Therefore, no further actions are planned.

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Identification of Attachments

- Attachment 1 - Receipt Inspection Requirements,  
Storage and Issuance Controls
- Attachment 2 - Head, End or Nut Markings
- Attachment 3 - Fastener Testing Data Sheets
- Attachment 4 - Mechanical and Chemical Analyses  
Data Summary
- Attachment 5 - Notes Pertaining to Attachments 3  
and 4
- Attachment 6 - Test Results Review

Attachment 1

Receipt Inspection Requirements,  
Storage and Issuance Controls

Fasteners presently used at Seabrook Station were purchased under two different procurement programs: the construction procurement program and the operations procurement program.

The receipt inspection requirements, storage practices and issuance controls for each of these two procurement programs are summarized below.

Construction Procurement Program:

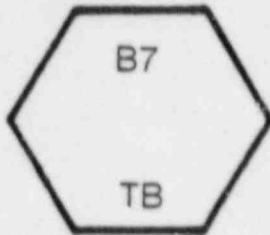
- A. During receipt inspection, fasteners received a visual inspection for markings, workmanship, and damage. Certified material test reports or certificates of conformance as required by the purchase documents were reviewed.
- B. After fasteners passed receipt inspection, they were stored in a controlled access warehouse. When fasteners are requested for issue from construction stock, an issue document is prepared. Information placed on the issue document includes safety classification, fastener description, size, type and material. This document is reviewed and signed by a quality control inspector prior to issuance of the fasteners.

Operations Procurement Program

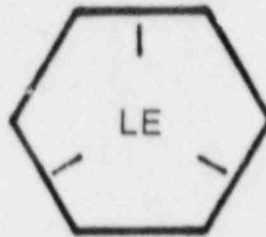
- A. During receipt inspection, fasteners receive a visual inspection for marking, workmanship, and damage. Certified material test reports or certificates of conformance, as required by the purchase documents, are reviewed. Samples from each lot of fasteners are tested for hardness. Sample size and the acceptance/rejection criteria are based on MIL-STD-105 with an acceptable quality level of 1.5. Samples from rejected lots are tested off site to determine ultimate tensile strength.
- B. After fasteners pass receipt inspection, they are stored in a controlled access warehouse. When fasteners are requested for issue from stock, an issue document is prepared. Information placed on the issue document includes safety classification, fastener description, size, type and material. This issue document is reviewed and signed by both the requestor and the issuing clerk prior to issuance of the fasteners.

**Attachment 2**  
**Bolt/Stud Head/End Markings**

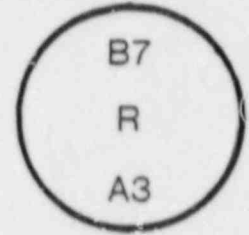
**NHY S1**



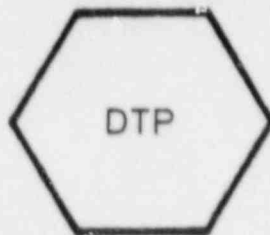
**NHY S6**



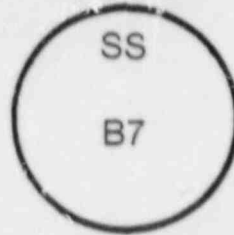
**NHY N1**



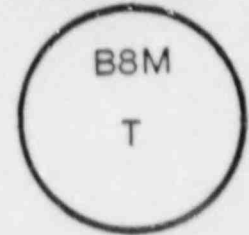
**NHY S2**



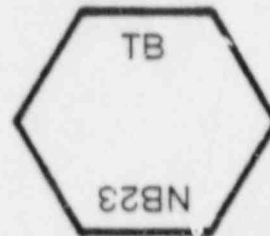
**NHY S7**



**NHY N2**



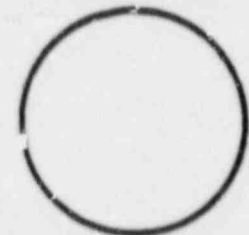
**NHY S3**



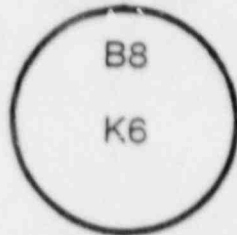
**NHY S8**



**NHY N3**



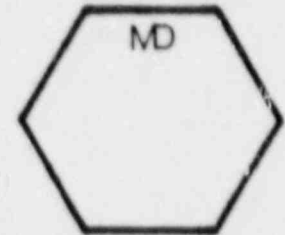
**NHY S4**



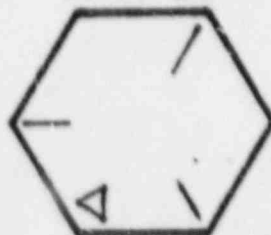
**NHY S9**



**NHY N4**



**NHY S5**



**NHY S10**

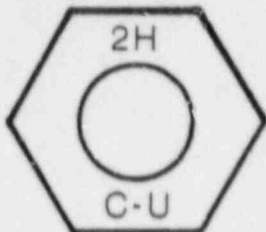


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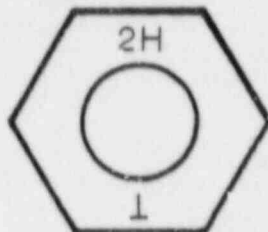


## Nut Markings

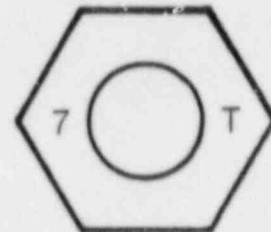
NHY S1



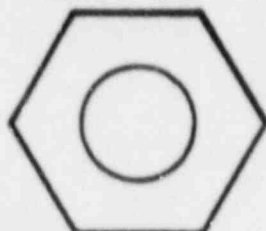
NHY S6



NHY N1



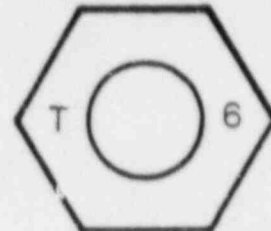
NHY S2



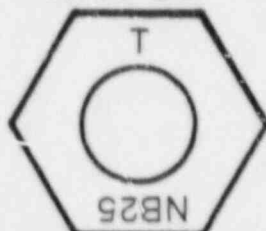
NHY S7



NHY N2



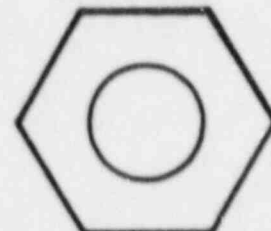
NHY S3



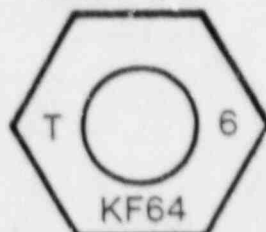
NHY S8



NHY N3



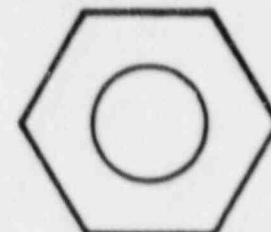
NHY S4



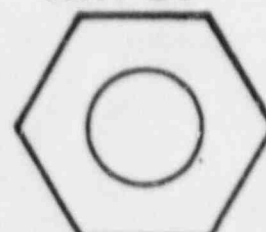
NHY S9



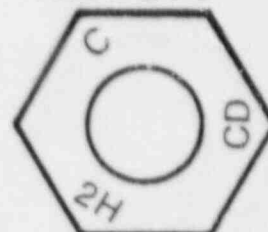
NHY N4



NHY S5



NHY S10



NHY N5





Attachment 3

Fastener Testing Data Sheet

Sample ID#: NHY-S1

Fastener Description: 7/8" - 9 x 3-3/4" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 193 B7

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition thru Winter 1977 Addenda,  
NCA 3800

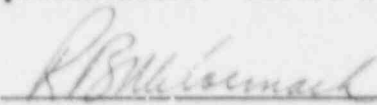
Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Pressure Boundary

Vendor: Texas Bolt Company, Houston, Texas

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature  Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S1

Fastener Description: 7/8" - 9 Heavy Hex Head Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 194-2H

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition thru Winter 1977 Addenda,  
NCA 3800

Procurement Level: Safety Class: purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Pressure Boundary

Vendor: Cardinal Industrial Products Corporation, Las Vegas, Nevada

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature RB McCormack Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S2

Fastener Description: 5/16" - 18 x 2" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 307 Grade B

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: ASME Section III, Subsection NF, 1977 Edition thru Winter 1977 Addenda

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Structural (ASME)

Vendor: Diversified Threaded Products Company, Middleburg Heights, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature

RB McCormack

Date

January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S2

Fastener Description: 5/16" - 18 Hex Head Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 307 Grade B

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: ASME Section III, Subsection NF, 1977 Edition thru Winter 1977 Addenda

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Structural (ASME)

Vendor: Diversified Threaded Products Company, Middleburg Heights, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature  Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S3

Fastener Description: 5/8" - 11 x 3-1/2" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 307 Grade B  
(Hot Dip Galvanized per ASME SA153 Class C)

Head Marking (Specification and Manufacturer.): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition thru Winter 1977 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

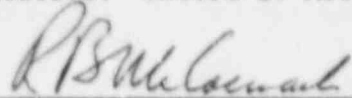
General Plant Application: Pressure Boundary

Vendor: Texas Bolt Company, Houston, Texas

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S3

Fastener Description: 5/8" - 11 Hex Head Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 307 Grade B  
(Hot Dip Galvanized per ASME SA 153 Class C)

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition; thru Winter 1977 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

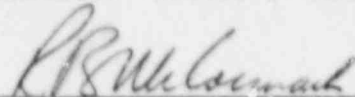
General Plant Application: Pressure Boundary

Vendor: Texas Bolt Company, Houston, Texas

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S4

Fastener Description: 3/4" - 10 x 4-1/2" Stud

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 193 B8 Class 1

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition thru Winter 1977 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

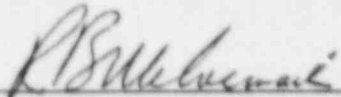
General Plant Application: Pressure Boundary

Vendor: Cardinal Industrial Products Corporation, Las Vegas, Nevada

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormick

Signature



Date

January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S4

Fastener Description: 3/4" - 10 Heavy Hex Head Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 194 Grade 6

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1974 Edition thru Summer 1974 Addenda

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

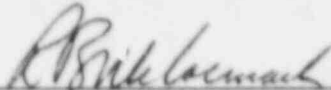
General Plant Application: Pressure Boundary

Vendor: Texas Bolt Company, Houston, Texas

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date

January 18, 1988



Fastener Testing Data Sheet

Sample ID#: NHY-35

Fastener Description: 1/4" - 20 Hex Head Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 563 Grade A  
(Zinc plated per ASTM A 563)

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, Subsection NF, 1977 Edition thru Winter  
1977 Addenda and/or Code Cases N-71 and N-225

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

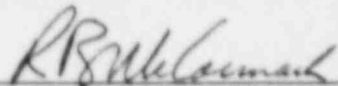
General Plant Application: Structural

Vendor: James C. White Company, Greenville, South Carolina

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S5

Fastener Description: 1/4" - 20 x 2-1/2" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SAE J429 Grade 5

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 1E; ANSI B18.2.1

Procurement Level: Commercial Item; Verified on-site to be acceptable for use in IEEE Class 1E applications by receipt inspection.

General Plant Application: Structural (Non-ASME, electrical and instrumentation panel mounting bolts)

Vendor: Northeast Fasteners, East Hartford, Connecticut

QA Requirements Imposed on Vendor: (See Attachment 5, Note 6)

Licensee Representative: Robert B. McCormack

Signature RB McCormack Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S6

Fastener Description: 5/16" - 18 Heavy Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 194 2H/  
A 563-83a Grade DH

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition thru Winter 1977 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Pressure Boundary

Vendor: Cardinal Industrial Products Corporation, Las Vegas, Nevada

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature RB McCormack Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S6

Fastener Description: 5/16" - 18 x 2" Hex Head Cap Screw

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 449

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition thru Winter 1977 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from ar. approved vendor;  
requirements defined by specification

General Plant Application: Pressure Boundary

Vendor: Nova Machine Products, Middleburg Heights, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature RB McCormack Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S7

Fastener Description: 7/8" - 9 Heavy Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 194 Grade 7

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1974 Edition thru Summer 1974 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

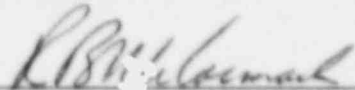
General Plant Application: Pressure Boundary

Vendor: Texas Bolt Company, Houston, Texas

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date

January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S7

Fastener Description: 7/8" - 9 Stud

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 193 B7

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1974 Edition thru Summer 1974 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Pressure Boundary

Vendor: Guyon Alloys, Harrison, New Jersey

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S8

Fastener Description: 1/2" - 13 Heavy Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 325/SA 194 2H

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, Subsection NF, 1977 Edition thru Winter  
1977 Addenda, NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification


General Plant Application: Structural

Vendor: Hardware Specialty Company, Long Island, New York

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date

January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S8

Fastener Description: 1/2" - 13 x 4-1/2" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 325 Type 1

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, Subsection NF, 1977 Edition thru Winter  
1977 Addenda, NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Structural

Vendor: Hardware Specialty Company, Long Island, New York

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date

January 18, 1988



Fastener Testing Data Sheet

Sample ID#: NHY-S9

Fastener Description: 5/8" - 11 x 3" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 325

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, Subsection NF, 1977 Edition thru Winter  
1977 Addenda, NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

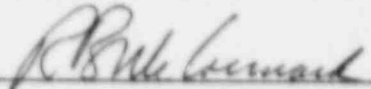
General Plant Application: Structural

Vendor: Guyon Alloys, Harrison, New Jersey

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S9

Fastener Description: 5/8" - 11 Hex Head Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 325/SA 194 2H

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, Subsection NF, 1977 Edition thru Winter  
1977 Addenda, NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

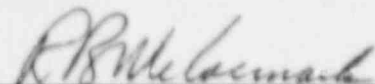
General Plant Application: Structural

Vendor: Guyon Alloys, Harrison, New Jersey

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date

January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S10

Fastener Description: 5/8" - 11 Heavy Hex Head Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: SA 194 2H

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 2; ASME Section III, 1977 Edition thru Winter 1977 Addenda,  
NCA 3800

Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

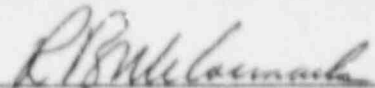
General Plant Application: Pressure Boundary

Vendor: Cardinal Industrial Products Corporation, Las Vegas, Nevada

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature



Date January 18, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-S10

Fastener Description: 5/8" - 11 x 4" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: AMHH,\* Alloy Steel

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Class 1; ASME Section III, 1983 Edition thru Winter 1985 Addenda

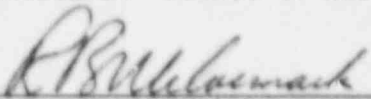
Procurement Level: Safety Class; purchased from an approved vendor;  
requirements defined by specification

General Plant Application: Pressure Boundary

Vendor: Cardinal Industrial Products Corporation, Las Vegas, Nevada

QA Requirements Imposed on Vendor: (See Attachment 5, Note 2)

Licensee Representative: Robert B. McCormack

Signature  Date January 18, 1988

\*Cardinal Industrial Products Specification

Fastener Testing Data Sheet

Sample ID#: NHY-N1A, NHY-N1B

Fastener Description: 7/8" - 9 Heavy Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 194 Grade 7

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Purchased as safety class from an approved vendor with requirements defined by specification.

General Plant Application: Pressure Boundary

Vendor: Dravo Corporation, Marietta, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 4)

Licensee Representative: Robert B. McCormack

Signature RB McCormack Date January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N1A, NHY-N1B

Fastener Description: 7/8" - 9 x 5-1/2" Stud

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 193 Grade B7

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Purchased as safety class from an approved vendor with requirements defined by specification.

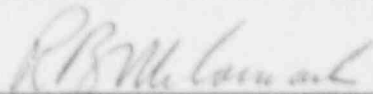
General Plant Application: Pressure Boundary

Vendor: Dravo Corporation, Marietta, Ohio

QA Requirements Imposed on Vendor: (see Attachment 5, Note 4)

Licensee Representative: Robert B. McCormack

Signature



Date

January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N2A, NHY-N2B

Fastener Description: 3/4" - 10 Heavy Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 194 Grade 6

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Purchased as safety class from an approved vendor with requirements defined by specification.

General Plant Application: Pressure Boundary

Vendor: Dravo Corporation, Marietta, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 4)

Licensee Representative: Robert B. McCormack

Signature  Date January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N2A, NHY-N2B

Fastener Description: 3/4" - 10 x 4-1/4" Stud

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 193 Grade B8M

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Purchased as safety class from an approved vendor with requirements defined by specification.


General Plant Application: Pressure Boundary

Vendor: Dravo Corporation, Marietta, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 4)

Licensee Representative: Robert B. McCormack

Signature



Date

January 20, 1988



Fastener Testing Data Sheet

Sample ID#: NHY-1.3A, NHY-N3B

Fastener Description: 1/2" - 13 Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 307 Cadmium  
Plated

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Procured as non-safety class

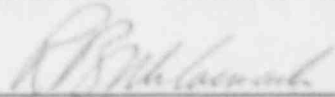
General Plant Application: Structural

Vendor: New England Bolt Corporation, Everett, Massachusetts

QA Requirements Imposed on Vendor: (See Attachment 5, Note 3)

Licensee Representative: Robert B. McCormack

Signature



Date

January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N3A, NHY-N3B

Fastener Description: 1/2" - 13 x 3" Stud

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 307 Cadmium  
Plated

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Procured as non-safety class

General Plant Application: Structural

Vendor: New England Bolt Corporation, Everett, Massachusetts

QA Requirements Imposed on Vendor: (See Attachment 5, Note 3)

Licensee Representative: Robert B. McCormack

Signature



Date January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N4A, NHY-N4B

Fastener Description: 7/8" - 8 Heavy Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 307

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Purchased as safety class from an approved vendor with requirements defined by specification.

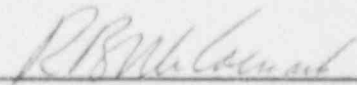
General Plant Application: Pressure Boundary

Vendor: Dravo Corporation, Marietta, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 5)

Licensee Representative: Robert B. McCormack

Signature



Date January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N4A, NHY-N4B

Fastener Description: 7/8" - 8 x 4-1/2" Stud

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 307 Grade B  
Galvanized

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Purchased as safety class from an approved vendor with  
requirements defined by specification.

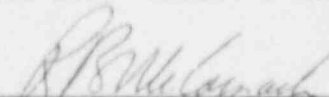
General Plant Application: Pressure Boundary

Vendor: Dravo Corporation, Marietta, Ohio

QA Requirements Imposed on Vendor: (See Attachment 5, Note 5)

Licensee Representative: Robert B. McCormack

Signature



Date

January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N5A, NHY-N5B

Fastener Description: 3/4" - 10 Heavy Hex Nut

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 325

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Procured as non-safety class

General Plant Application: Structural

Vendor: New England Bolt Corporation, Everett, Massachusetts

QA Requirements Imposed on Vendor: (See Attachment 5, Note 3)

Licensee Representative: Robert B. McCormack

Signature

*Robert B. McCormack*

Date

January 20, 1988

Fastener Testing Data Sheet

Sample ID#: NHY-N5A, NHY-N5B

Fastener Description: 3/4" - 10 x 2-3/4" Hex Head Bolt

Description of Sample Stock Location: (See Attachment 5, Note 1)

Material Specification as Documented by Licensee Records: A 325

Head Marking (Specification and Manufacturer): (See Attachment 2)

Class: Non-safety

Procurement Level: Procured as non-safety class

General Plant Application: Structural

Vendor: New England Bolt Corporation, Everett, Massachusetts

QA Requirements Imposed on Vendor: (See Attachment 5, Note 3)

Licensee Representative: Robert B. McCormack

Signature



Date

January 20, 1988

## Attachment 4

Data Summary<sup>1</sup> (Studs/Bolts)Mechanical and Chemical Analyses

<u>ID#</u>	<u>Hardness</u>	<u>UTS</u>	<u>0.2% YS</u>	<u>C</u>	<u>Mn</u>	<u>P</u>	<u>S</u>	<u>Si</u>	<u>Mo</u>	<u>Cr</u>	<u>Ni</u>
NHY-S1	HRC 33.0	154.2 KSI	136.3 KSI	.42	.92	.014	.024	.21	.20	1.08	
NHY-S2	HRB 89.0	4960 lbF	N/A			.012	.020				
NHY-S3	HRB 95.0	20850 lbF	N/A			.014	.036				
NHY-S4	HRB 93.0	93.7 KSI	60.2 KSI	.02	1.69	.032	.002	.47		18.07	9.07
NHY-S5	HRC 33.0	4488 lbF	2700 lbF <sup>2</sup>	.35		.008	.015				
NHY-S6	HRC 34.0*	8399 lbF	4450 lbF <sup>2</sup>	.38	1.43	.017	.018				
NHY-S7	HRC 33.0	142.9 KSI	126.8 KSI	.40	.85	.019	.030	.21	.21	1.03	
NHY-S8	HRC 31.5	21110 lbF	N/A	.45	.79	.016	.037				
NHY-S9	HRC 32.0	31500 lbF	N/A	.46	.82	.030	.013				
NHY-S10	HRC 28.5	135.5 KSI	23,730 lbF <sup>2</sup>	.40	.96	.023	.027	.18	.18	1.03	

Note: UTS-Ultimate Tensile Strength; YS-Yield Strength; C-Carbon; Mn-Manganese; P-Phosphorous; S-Sulfur; Si-Silicon; Mo-Molybdenum; Cr-Chromium; Ni-Nickel

<sup>1</sup>The elements reported for materials tested are those specified in the applicable material specification. Properties found out of specification are noted with an asterisk. Refer to Attachment 5, Note 7, for additional test results for the NHY-S10 bolt.

<sup>2</sup>Results reported are for proof load tests.

Data Summary<sup>1</sup> (Studs/Bolts)

(continued)

Mechanical and Chemical Analyses

<u>ID#</u>	<u>Hardness</u>	<u>UTS</u>	<u>0.2% YS</u>	<u>C</u>	<u>Mn</u>	<u>P</u>	<u>S</u>	<u>Si</u>	<u>Mo</u>	<u>Cr</u>	<u>Ni</u>
NHY-N1A	HRC 32.0	N/A	N/A	.44	.92	.013	.021	.24	.18	1.03	
NHY-N1B	HRC 34.0	N/A	N/A	.42	.92	.015	.022	.28	.18	1.03	
NHY-N2A	HRB 98.0	N/A	N/A	.06	1.66	.027	.002	.65	2.27	17.09	12.08
NHY-N2B	HRB 102.0	N/A	N/A	.06	1.66	.024	.002	.64	2.28	17.12	12.09
NHY-N3A	HRB 83.4	N/A	N/A			.013	.022				
NHY-N3B	HRB 87.0	N/A	N/A			.002	.023				
NHY-N4A	HRB 82.0	N/A	N/A			.017	.014				
NHY-N4B	HRB 90.0	N/A	N/A			.015	.014				
NHY-N5A	HRC 30.5	N/A	N/A	.50	.81	.006	.037				
NHY-N5B	HRC 35.0	N/A	N/A	.48	.82	.025	.035				

Note: UTS-Ultimate Tensile Strength; YS-Yield Strength; C-Carbon; Mn-Manganese; P-Phosphorous; S-Sulfur; Si-Silicon; Mo-Molybdenum; Cr-Chromium; Ni-Nickel

<sup>1</sup> The elements reported for materials tested are those specified in the applicable material specification. Properties found out of specification are noted with an asterisk.



Data Summary<sup>1</sup> (Nuts)

Mechanical and Chemical Analyses

<u>ID#</u>	<u>Hardness</u>	<u>UTS</u>	<u>0.2% YS</u>	<u>C</u>	<u>Mn</u>	<u>P</u>	<u>S</u>	<u>Si</u>	<u>Mo</u>	<u>Cr</u>	<u>Ni</u>
NHY-S1	HRC 29.0	N/A	N/A	.42		.022	.015				
NHY-S2	HRB 74.0	N/A	N/A			.004	.028				
NHY-S3	HRB 90.0	N/A	N/A			.008	.014				
NHY-S4	HRC 25.5	N/A	N/A	.12	.52	.018	.004	.18		11.88	
NHY-S5	HRB 87.0	N/A	N/A	.07	.28	.01	.018				
NHY-S6	HRC 30.0	N/A	N/A	.42	.72	.026	.023				
NHY-S7	HRC 30.5	N/A	N/A	.41	.90	.011	.032	.23	.24	1.09	
NHY-S8	HRC 32.0	N/A	N/A	.42		.008					
NHY-S9	HRC 31.0	N/A	N/A	.41		.027					
NHY-S10	HRC 29.5	N/A	N/A	.39		.026	.022				

Note: UTS-Ultimate Tensile Strength; YS-Yield Strength; C-Carbon; Mn-Manganese; P-Phosphorous; S-Sulfur; Si-Silicon; Mo-Molybdenum; Cr-Chromium; Ni-Nickel

<sup>1</sup>The elements reported for materials tested are those specified in the applicable material specification. Properties found out of specification are noted with an asterisk.

Data Summary<sup>1</sup> (Nuts)

(continued)

Mechanical and Chemical Analyses

<u>ID#</u>	<u>Hardness</u>	<u>UTS</u>	<u>0.2% YS</u>	<u>C</u>	<u>Mn</u>	<u>P</u>	<u>S</u>	<u>Si</u>	<u>Mo</u>	<u>Cr</u>	<u>Ni</u>
NHY-N1A	HRC 29.0	N/A	N/A	.38	.94	.011	.026	.25	.17	1.02	
NHY-N1B	HRC 28.0	N/A	N/A	.39	.94	.010	.024	.25	.17	1.02	
NHY-N2A	HRC 27.0	N/A	N/A	.13	.53	.018	.004	.18		11.92	
NHY-N2B	HRC 27.5	N/A	N/A	.12	.53	.020	.004	.19		11.86	
NHY-N3A	HRB 92.0	N/A	N/A			.009	.014				
NHY-N3B	HRB 91.0	N/A	N/A			.004	.018				
NHY-N4A	HRB 88.0	N/A	N/A			.013	.027				
NHY-N4B	HRB 87.0	N/A	N/A			.013	.027				
NHY-N5A	HRB 93.0	N/A	N/A	.14		.002					
NHY-N5B	HRB 93.0	N/A	N/A	.14		.007					

Note: UTS-Ultimate Tensile Strength; YS-Yield Strength; C-Carbon; Mn-Manganese; P-Phosphorous; S-Sulfur; Si-Silicon; Mo-Molybdenum; Cr-Chromium; Ni-Nickel

<sup>1</sup>

The elements reported for materials tested are those specified in the applicable material specification. Properties found out of specification are noted with an asterisk.

Attachment 5

Notes

NOTE 1: Sample stock was maintained in controlled access, Level B storage location.

NOTE 2: Safety Class bolting was subject to the following quality assurance requirements, except for the sample bolt designated as NHY-S5.

The vendor was required to:

- a. maintain a quality assurance program in accordance with the ASME Code, Section III, paragraph NCA 3800,
- b. provide documentation in accordance with the ASME Code, Section III, paragraphs NCA 3860, NX<sup>1</sup>2130 and NX<sup>1</sup>2610, and
- c. perform product testing in accordance with the ASME Code, Section III, paragraph NX<sup>1</sup>2580.

(1) "X" denotes either B, C, D, or F for Safety Class 1, 2, 3 or Structural (ASME) respectively.

NOTE 3: This sample of non-safety class bolting was subject to quality assurance requirements which are summarized as follows:

- a. material shall conform to the referenced material specification,
- b. mill test reports shall be supplied,
- c. compliance with U.S. codes, regulations and standards applicable to the work shall be supplied in writing, and
- d. controls on repair of defective materials were imposed.

NOTE 4: This sample of non-safety class bolting was subject to quality assurance requirements which are summarized as follows:

- a. the supplier shall maintain a quality assurance program which includes programmatic requirements similar to selected criteria of 10 CFR 50, Appendix B,
- b. material shall conform to the referenced material specification,
- c. mill test reports shall be supplied,
- d. visual testing and additional inspections were specified to be performed and documented, and
- e. controls on repair of defective material were imposed.

Notes

(continued)

NOTE 5: This sample of non-safety class bolting was subject to quality assurance requirements which are summarized as follows:

- a. the supplier shall maintain a quality assurance program which includes programmatic requirements similar to selected criteria of 10 CFR 50, Appendix B,
- b. material shall conform to the referenced material specification,
- c. mill test reports shall be supplied,
- d. visual testing and additional inspections were specified to be performed and documented,
- e. controls on repair of defective material were imposed, and
- f. magnetic particle testing was required.

NOTE 6: This sample of non-safety class bolting was subject to quality assurance requirements which are summarized as follows:

- a. material shall conform to the referenced material specification with no substitutions.

NOTE 7: Additional test results for the NHY-S10 bolt are as follows. These tests were required by the Cardinal Industrial Products Specification AMHH.

Point of Yield:	124.0 KSI
Elongation:	17.4%
Reduction of Area:	61.8%
Wedge Tensile Strength:	29,500 lbf

## Attachment 6

### Test Results Review

Test results were within the allowable limits as defined by the governing material specifications except for bolt NHY-S6. The evaluation of test results for bolt NHY-S6 is as follows.

All chemical composition requirements of material specification SA 449 are satisfied. Tensile and proof load tests are also satisfactory.

The hardness test result is very slightly outside the specification limit of the ASME Code, 1977 Edition.

Test Result	=	HRC 34.0
Allowable	≤	HRC 32.0

The hardness test is qualitative only and is not directly utilized in design. Hardness readings provide an indication of material tensile strength and are useful where tensile tests have not been or cannot be performed. An upper limit on hardness, when a tensile limit is not specified, provides a degree of protection from susceptibility to stress corrosion cracking (SCC).

Two points on the Rockwell (C) scale above the specification limit is insignificant to degree of susceptibility to SCC.

This conclusion is supported by the fact that later ASME Code Editions, starting with the Winter 1979 Addenda, increased the upper hardness limit for SA 449 to HRC 34.

Thus, bolt NHY-S6 meets all requirements of Code Editions following the Winter 1979 Addenda.

This minor deviation from 1977 Code limit has no safety impact or significance.