



**GULF STATES UTILITIES COMPANY**

RIVER BEND STATION POST OFFICE BOX 220 ST. FRANCISVILLE, LOUISIANA 70775  
AREA CODE 504 635-6094 346-8651

January 29, 1988  
RBG - 27359  
File Nos. G9.5, G9.33.1

U. S. Nuclear Regulatory Commission  
Region IV  
611 Ryan Plaza Drive, Suite 1000  
Arlington, TX 76011

Gentlemen:

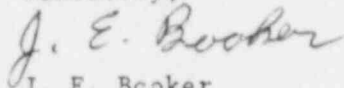
River Bend Station - Unit 1  
Docket No. 50/458  
NRC Compliance Bulletin 87-02

Attached is Gulf States Utilities Company's (GSU) response to NRC Compliance Bulletin 87-02 "Fastener Testing to Determine Conformance with Applicable Material Specifications".

The attachments provide the information requested by Action Items 1 to 6 in the bulletin. For convenience, this letter provides a complete response, resubmitting and superseding GSU's initial response on this subject dated January 15, 1988 (RBG-27292).

If you have any questions or require additional information, please contact Mr. L. L. Dietrich of my staff at (409) 838-6631, ext. 4603.

Sincerely,



J. E. Boker  
Manager-River Bend Oversight

JEB/LLD/ch

Attachments

cc: U. S. Nuclear Regulatory Commission  
Document Control Desk  
Washington, D. C. 20555

Senior Resident Inspector  
Post Office Box 1051  
St. Francisville, LA 70775

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PDR ADDCK 05000458  
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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

STATE OF LOUISIANA

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PARISH OF WEST FELICIANA

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In the Matter of

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Docket No. 50-458

GULF STATES UTILITIES COMPANY

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(River Bend Station

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Unit 1)

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AFFIDAVIT

J. E. Booker, being duly sworn, states that he is Manager-River Bend Oversight for Gulf States Utilities Company; that he is authorized on the part of said Company to sign and file with the Nuclear Regulatory Commission the documents attached hereto; that he has read all of the statements contained in such documents attached thereto and made a part thereof; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information and belief.

J. E. Booker  
J. E. Booker

Subscribed and sworn to before me, a Notary Public in and for the State and Parish above named, this 29th day of January, 1988.

Gladys B. Shultz  
Notary Public in and for  
West Feliciana Parish, Louisiana

My Commission is For Life.

## ATTACHMENT 1

### Response to Actions Requested in NRC Compliance Bulletin 87-02

#### Action

1. Describe a) the characteristics currently examined during receipt inspection of fasteners, and b) the internal controls utilized during storage and issuance from stock to assure the appropriate use of fasteners.

#### Response

- 1a. For ASME fasteners the necessary requirements are developed into purchase orders from specifications by Engineering. Once this is accomplished, QA reviews and approves the purchase order and prepares a Receiving Inspection Report (RIR) for QC. This delineates the required inspection attributes to be verified. During receipt inspection, QC Receiving Inspectors review the purchase documents and the RIR to obtain the applicable documentation required, material type ordered, and the material code specification (edition/addenda). Once all the requirements are established, the documentation received is reviewed for compliance as to completeness, accuracy, and legibility along with material type and grade, quantity certified, identification, and marking per ASTM and/or code requirements. Also, included in this review are the following:
  - a) That the vendor's (supplier's) name and address appears on the Qualified Suppliers List (QSL) and that the vendor is approved to supply ASME material as required.
  - b) That the Certification of Compliance (COC) and/or Certified Material Test Report (CMTR) reference the applicable material grade heat number, or heat code of material supplied as required.
  - c) When invoking Section III Quality System Program, that the material supplier or material manufacturer and supplier holding Quality System Certification (QSC) provides the certification number and expiration date on the COC and/or CMTR.
  - d) If the material supplier/material manufacturer is not a QSC holder, evidence shall be verified that the CMTR or related documents are traceable to the CMTR and that the material furnished was manufactured and supplied to requirements of the Quality System Program approved by the material supplier.
  - e) Chemical and physical data as referenced on the CMTR are verified to be in compliance with the applicable code year as certified by the material supplier.

NOTE: QA verifies c) and d) above during preplanned scheduled audits and surveillances of vendor's facilities to approve and maintain the vendor on the QSL.

Fastener materials with satisfactory inspection results are entered into the "Traceable Material Code Log" by bolting heat/code number along with inspection report number, P. O. number, material type, material supplier, quantity received and material description. This log is maintained and controlled by QC.

The receipt inspection of non-safety related fasteners is a commercial inspection conducted by trained storeroom personnel. The receipt inspection includes:

- a) Examining the items and packaging for evidence of damage or exposure to detrimental conditions.
- b) Comparison of the items received against the vendor's packing list and against the purchase order requirements for:
  - 1) Quantities
  - 2) Description
  - 3) Identification (labeling, tagging)
  - 4) Special marking such as batch, lot, heat, and serial numbers, as applicable
- c) If the purchase order required any special certifications, they are verified to apply to the material received and that all required documentation has been received.
- d) If discrepancies exist in the commercial receipt, they may be resolved by warehouse supervision, with the assistance of Expediting for communications with the vendor, or with the assistance of Design Engineering for questions beyond the expertise of the warehouse supervision.

Results of the commercial receipt inspection are recorded on a Material Receiving Report (MRR).

- 1b. The internal controls utilized during storage and issuance are discussed below.

#### Storage

After satisfactory receipt, fasteners to be stocked are stored in bins, drawers or other containers which separate them from other dissimilar items. Through the use of box tags or stock cards, the identity and traceability of both safety and non-safety related material is maintained. Additionally, for safety related material, the QC inspection tags/stickers are attached to the item or container to maintain association of the item to the receipt inspection performed.

### Issuance

At time of issuance, the requesting discipline provides a description of the material required and/or stock code number used to identify the material. The quality class of the job and whether or not it is an ASME job is indicated on the stores requisition. For ASME jobs, engineering prepares and approves the stores requisition indicating ASME code class; material type and grade; size and thickness, as appropriate; and applicable code year and addenda. For ASME jobs, a QC Inspector verifies correctness and traceability of the material prior to issue. For other safety related jobs, the storeroom personnel issue appropriate quality class material as indicated by the quality class of the job. Quality Control inspectors attach inspection stickers/tags on the quantity issued if the initial inspection had resulted in the tag being attached to the container from which the items were being issued. For non-safety related jobs, fasteners are issued as requested by the user. Fasteners which were procured to a more restrictive quality class may be issued to a non-safety related application if no non-safety related items are available.

### Action

2. Select a minimum sample of ten (10) non-safety related fasteners and ten(10) safety related fasteners from current, in use, stock.
3. For the selected sample of fasteners in item 2, include a sample of typical nuts that would be used with each fastener.

### Response

- 2,3. The sample selected, under NRC supervision, for RBS is listed below and is shown in Attachment 2 (B = bolt or stud, N = nut). The majority of the fasteners at RBS were procured as QA Category I. The samples were selected in approximate proportion to in-plant usage. Note that the following materials identified as being of interest in the bulletin are not in stock: A193 grade B16, SAE J429 grade 5 and 8, A325 types 2 and 3; A354 grades BB and BC, A490 and A-320 LTM.

<u>ITEM</u>	<u>MATL</u>	<u>ASME</u>	<u>GRADE</u>	<u>Q-CLASS</u>
1B	SA193	(CL I)	B6	1
1N	SA194	(CL I)	6	1
2B	SA193	(CL I)	B7	1
2N	SA194	(CL I)	2H	1
3B	SA193	(CL I)	B7	1
3N	SA194	(CL I)	2H	1
4B	SA193	(CL I)	B7	1
4N	SA194	(CL I)	2H	1
5B	SA193	(CL I)	B7	1
5N	SA194	(CL II)	7	1

<u>ITEM</u>	<u>MATL</u>	<u>ASME</u>	<u>GRADE</u>	<u>Q-CLASS</u>
6B	SA193	(CL I)	B8	1
6N	SA194	(CL I)	8	1
7B	SA307	(CL I)	A	1
7N	SA307	(CL II)	B	1
8B	SA325	(CL I)	1	1
8N	SA194	(CL I)	2H	1
9B	A307		A	1
9N	A194		2H	1
10B	A307		A	1
10N	A194		2H	1
11B	A325		1	1
11N	A194		2H	1
12B	A325		1	1
12N	A194		2H	1
13B	A325		1	1
13N	A563		C	1
14B	A325		1	1
14N	A194		2H	1
15B	A449		NA	1
15N	A194		2H	1
16B	A574		NA	1
16N	A563		DH	1
17B	A307		A	2
17N	A194		2H	1
18B	A193		B7	2
18N	A194		2H	1
19B	A354		BD	2
19N	A563		DH	1
20B	A307		A	1
20N	A194		2H	1

#### Action

4. Chemical testing shall be performed on all samples. Mechanical testing shall be performed on each safety related fastener. Hardness testing shall be performed on each nut and non-safety related fastener.

#### Response

4. Chemical testing, mechanical testing, and hardness testing have been performed on the samples as required by the bulletin by Massachusetts Materials Research, Inc., of West Boylston, Massachusetts. Testing was done in accordance with the requirements of the fasteners specification, grade, and class, and the tests have evaluated the ultimate tensile strength, hardness, and chemical properties as required by the fasteners specification grade and class. Additional tests, (e.g. proof load or impact testing) were also performed as applicable.

#### Action

5. The results of all tests are to be reported to the NRC utilizing the format shown in the attachments to Bulletin 87-02. For any fastener found out of specification, provide a evaluation of the safety significance including consideration of the most limiting condition.

#### Response

5. Test results for all tests performed are provided in Attachment 3.

Test results on seven of the fasteners tested (1B, 1N, 5N, 8B, 12N, 13B, and 16N) contained out of specification conditions. None of these out of specification conditions resulted in an adverse impact on the safety of operations. A summary and a detailed safety evaluation for all of these out of specification conditions are provided in Attachment 4.

#### Action

6. Based on the results of the testing and review of current procedures, describe any further actions being taken to assure that fasteners used in the plant meet the requisite specifications and requirements and that the operability of safety related plant components is not affected.

#### Response

6. This testing program and subsequent safety evaluation resulted in all fasteners tested being acceptable for use as is with no adverse impact on the operability of safety related plant components. A review of current, related RBS procedures identified no procedural deficiencies. Currently existing GSU programs ensure that if concerns are identified with fasteners at RBS or elsewhere within the nuclear industry, that they will be promptly evaluated, including, as appropriate, an assessment of root cause and a failure analysis.

GSU therefore concludes that current programs ensure that fasteners procured for use at RBS meet the requisite requirements to assure that the operability of safety related components is not affected.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 1 of 45

\*Sample ID# FBS-18-75-X-1.25

Fastener Description: 1/4 - 8 UN(2A) x 5/4 HEAVY HEX CAP SCREW WITH WASHER FACE

Description of Sample Stock Location: PRC1B1

Material Specification as Documented by Licensee Records: SA-193 GR. B6

Head Marking (Specification and Manufacturer): (NU)

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

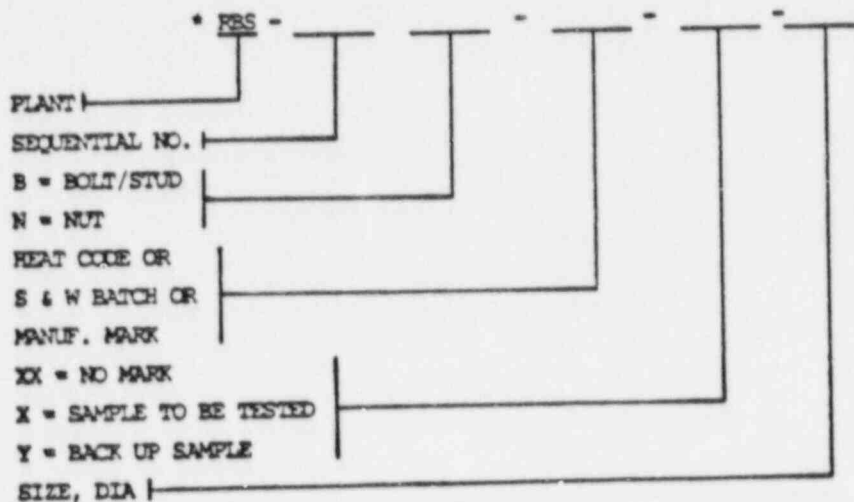
Vendor: LONE STAR SCREW CO., P.O. BOX 15211, HOUSTON TX. 77020

MFG.: TAKENAKA SEISAKUSHO CO., LTD (JAPAN); HIGASHIOSAKA PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MN Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

SAMPLES "X2" & "X3" WERE SENT FOR IMPACT TESTING

Backup sample Y3 was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 2 of 45

\*Sample ID# RBS-18-75-4-1.25

Fastener Description: 1 1/4 - 8 UN (2A) x 5 1/4 HEAVY HEX CAP SCREW WITH WASHER FACE

Description of Sample Stock Location: PRCIB1

Material Specification as Documented by Licensee Records: SA-193 GR. B6

Head Marking (Specification and Manufacturer): (NU)

\*\*Class/Procurement Level: I

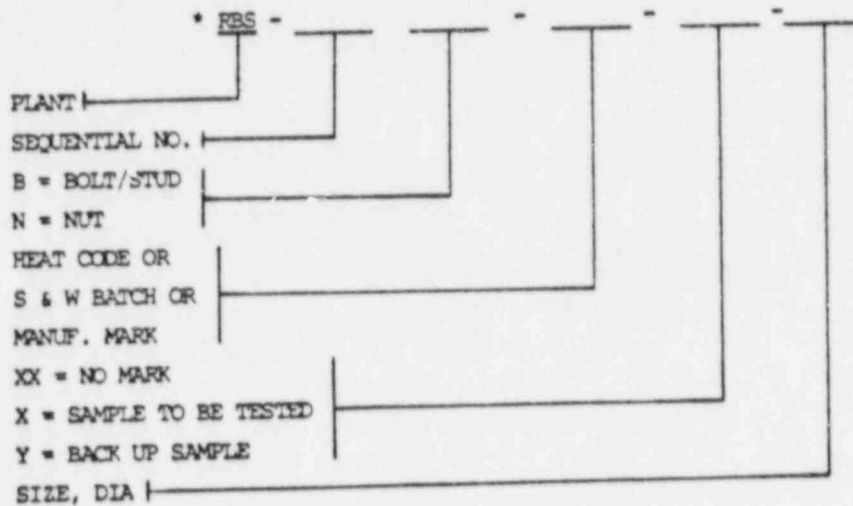
General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: LONE STAR SCREW CO., P.O. BOX 15211, HOUSTON TX. 77020  
MFG.: TAKENAKA SEISAKUSHO CO., LTD (JAPAN); HIGASHIOSAKA PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

SAMPLES "Y2" & "Y3" WERE SENT FOR IMPACT TESTING

Back up sample Y3 was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 3 of 45

\*Sample ID# RBS- 1N-19-X-1.25

Fastener Description: 1 1/4" HEAVY HEX NUT

Description of Sample Stock Location: LWE12A

Material Specification as Documented by Licensee Records: SA-194 GR. 6

Head Marking (Specification and Manufacturer): (NL)

\*\*Class/Procurement Level: I

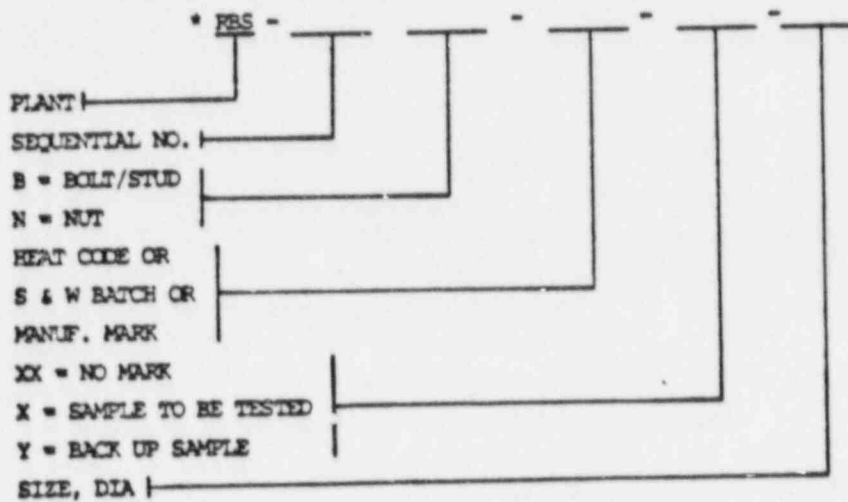
General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: GULFALLOY, INC. P.O. BOX 52518, HOUSTON TX., 77052

MANUF.: TAKENAKA SEISAKUSHO CO. LTD. (JAPAN), HIGASHIOSAKA PLANT.  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



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SAMPLES "X 2" & "X 3" WERE SENT <sup>for</sup> IMPACT TESTING

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 4 of 45

\*Sample ID# RBS- 2B-DHP-X-0.75

Fastener Description: 3/4-10 x 3 3/4 HEX CAP SCREWS

Description of Sample Stock Location: NWP 44B

Material Specification as Documented by Licensee Records: SA-193 GR. B7

Head Marking (Specification and Manufacturer): TB

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

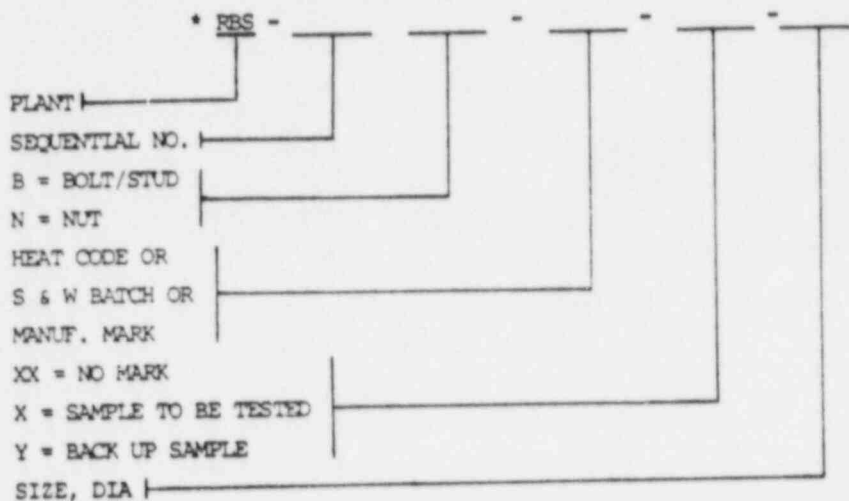
Vendor: A & G ENGINEERING CO. 4640 E. LAPALMA AVE.

MANUF.: TEXAS BOLT, HOUSTON TX.

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 5 of 45

\*Sample ID# RBS- 2N-ADC-X-0.75

Fastener Description: 3/4" HEAVY HEX NUTS

Description of Sample Stock Location: LWN 43A

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

Head Marking (Specification and Manufacturer): (↔)

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: A + G ENGINEERING CO., 4640 E. LAPALMA AVE., ANAHEIM CA. 92807  
MANUF.: HAMINAKA NUT MFG. CO. LTD (HIMEJI JAPAN)  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88

\* RBS -

PLANT	
SEQUENTIAL NO.	
B = BOLT/STUD	
N = NUT	
HEAT CODE OR	
S & W BATCH OR	
MANUF. MARK	
XX = NO MARK	
X = SAMPLE TO BE TESTED	
Y = BACK UP SAMPLE	
SIZE, DIA	

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ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 6 of 45

\*Sample ID# RBS- 3B-COG-X-0.875

Fastener Description: 7/8-9UNC(2A) x 5 1/2 TFL STD

Description of Sample Stock Location: UWH43B

Material Specification as Documented by Licensee Records: SA-193 GR. B7

Head Marking (Specification and Manufacturer): ↔

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

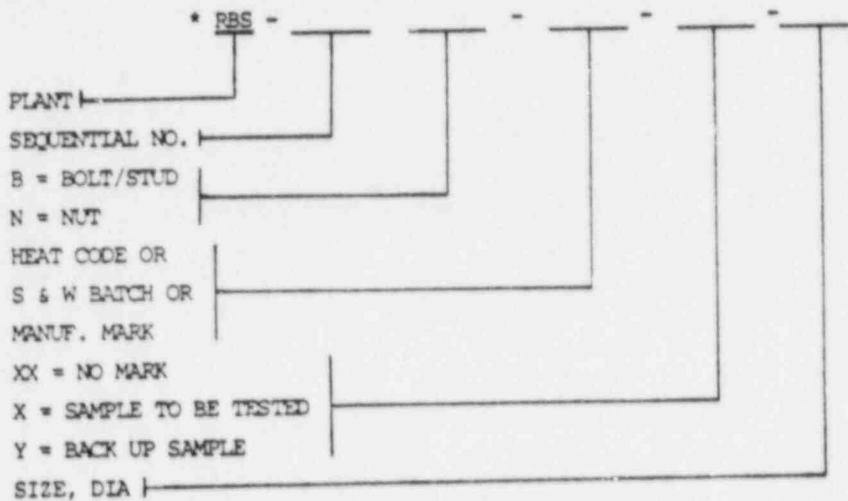
Vendor: AVG ENGINEERING CO. 4640 E. LAPALMA AVE.

MANUF.: HAMANAKA NUT MFG. CO. LTD (JAPAN)

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MN Hazra Date 1/13/88



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QUALIFIED SUPPLIER'S LIST

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ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 7 of 45

\*Sample ID# RBS-3N-J41-X-0.875

Fastener Description: 7/8" - 9 HEAVY HEX NUTS

Description of Sample Stock Location: LWP51A

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

Head Marking (Specification and Manufacturer): ↔

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: LONE STAR SCREW CO., 5826 ARMOUR DR., P.O. BOX 15211, HOUSTON TX.

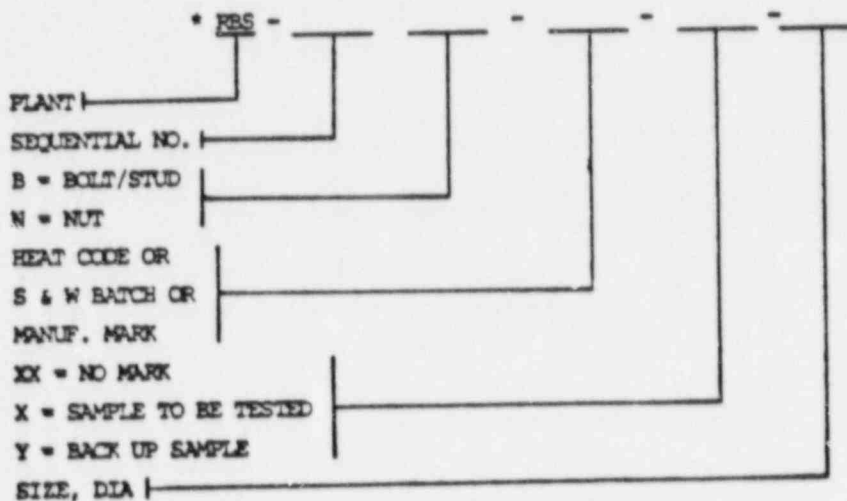
77020

MANUF: HAMANAKA NUT MFG. CO. LTD. (HIMEJI JAPAN)

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



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ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 8 of 45

\*Sample ID# RES- 4B-BAS6C1-X-1.0

Fastener Description: 1" - 8 UNC X 3" LONG BOLT

Description of Sample Stock Location: URA 24A

Material Specification as Documented by Licensee Records: SA-193 GR. B7

Head Marking (Specification and Manufacturer): S

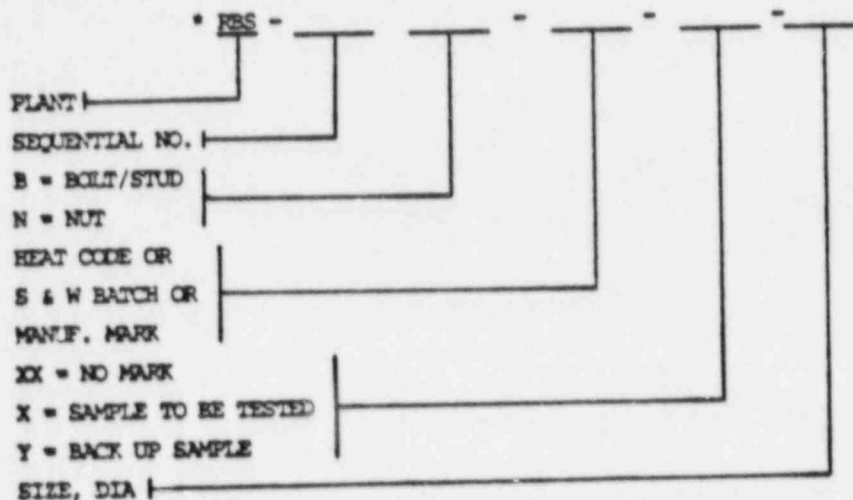
\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: POWER + ENGINEERED PRODUCTS P.O. BOX 382, S. PLAINFIELD NJ 07080  
MANUF. : SULLIVAN BOLT CO., 3435 SO. MALT AVE., COMMERCE CA. 90040  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



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ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 9 of 45

\*Sample ID# RBS- 4N-KSS-X-1.0

Fastener Description: 1" HEAVY HEX NUT

Description of Sample Stock Location: P414F

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

Head Marking (Specification and Manufacturer): (NH)

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

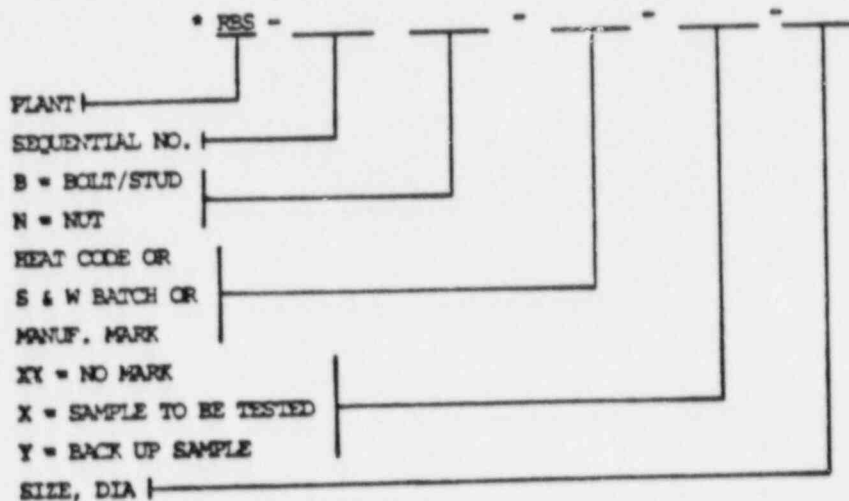
Vendor: LONE STAR SCREW CO., 3826 ARMOUR DR., P.O. BOX 15211, HOUSTON T. 77020

MANUF.: HAMANAKA NUT MFG. CO. LTD. (HIMETI JAPAN)

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



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ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 10 of 45

\*Sample ID: RBS- 58-OK14-X-1.25

Fastener Description: 1/4 X 5/4 HEAVY HEX HEAD BOLT

Description of Sample Stock Location: URA 33A

Material Specification as Documented by Licensee Records: SA-193 GR. B7

Head Marking (Specification and Manufacturer): TB

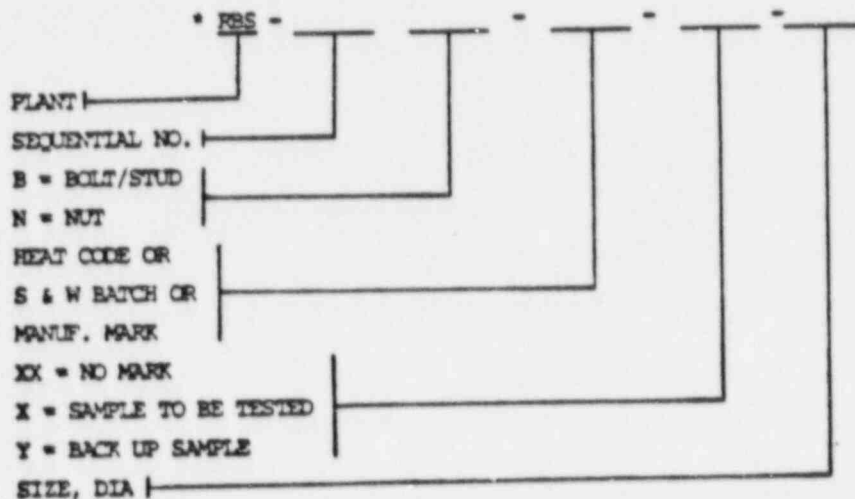
\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: NOVA MACHINE PRODUCTS 18685 SHELDON RD. MIDDLEBURG HEIGHTS  
MANUF. : TEXAS BOLT CO. P.O. BOX 1211 HOUSTON TX. 77251 OHIO 44130  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/86



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SAMPLES "X2" & "X3" WERE SENT FOR IMPACT TESTING

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 11 of 45

\*Sample ID# RBS-5N-AE-X-1.25

Fastener Description: 1 1/4" HEAVY HEX NUTS

Description of Sample Stock Location: LRH12

Material Specification as Documented by Licensee Records: SA-194 GR. 7

Head Marking (Specification and Manufacturer): JS

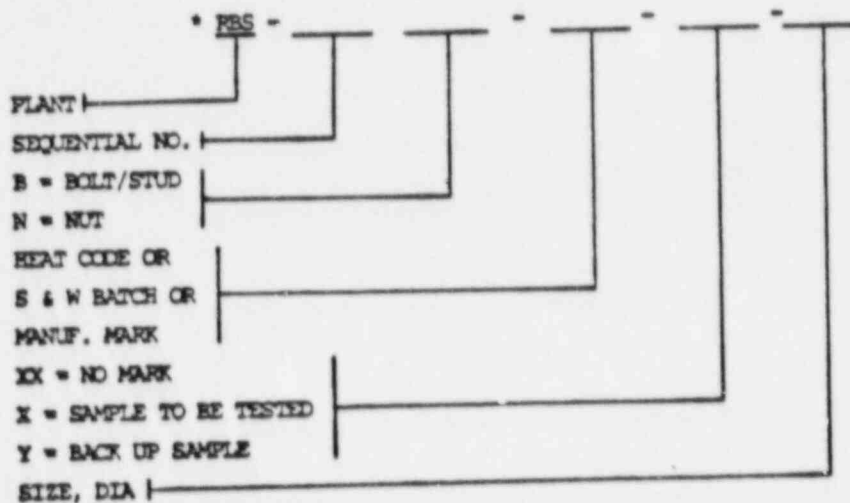
\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: GULFALLOY, INC. P.O. BOX 52518 HOUSTON TX. 77052  
MANUF.: JOH. SMIT P.O. BOX 75 2980 AB RIDDERKERK HOLLAND  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Nazra

Signature M. N. Nazra Date 1/13/88



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SAMPLES "X2", "X3" WERE SENT FOR IMPACT TESTING

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 12 of 45

\*Sample ID# RBS- 68-MS19-X-0.625

Fastener Description: 5/8 X 6 STD BOLTS, CONTINUOUSLY THREADED

Description of Sample Stock Location: UBD 22A

Material Specification as Documented by Licensee Records: SA-193 GR. B8

Head Marking (Specification and Manufacturer): T

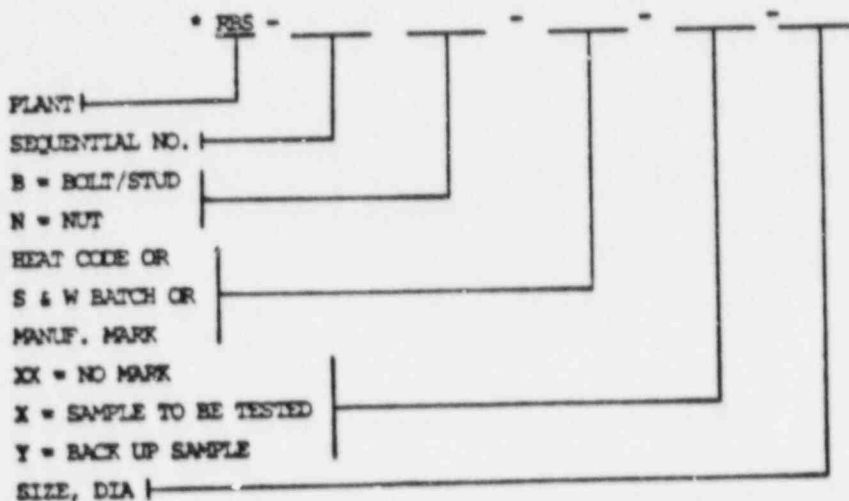
\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

Vendor: HARDWARE SPECIALTY CO., 48-75 36<sup>TH</sup> ST., LONG ISLAND CITY NY  
MANUF. : TEXAS BOLT CO. P.O. BOX 1211 HOUSTON TX. 77001 11101  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR OR  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 13 of 45

\*Sample ID# FBS- 6N-PK50-X-0.625

Fastener Description: 5/8 - 11 HEAVY HEX NUTS

Description of Sample Stock Location: RFI - B12

Material Specification as Documented by Licensee Records: SA-194 GR.8

Head Marking (Specification and Manufacturer):

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

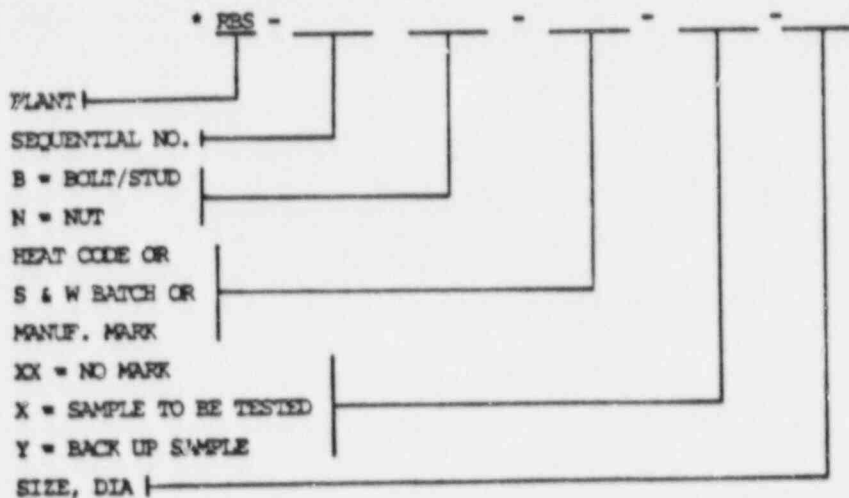
Vendor: A + G ENGINEERING CO., 4640 E. LAPALMA AVE., ANAHEIM CA. 92807

MANUF. : TEXAS BOLT CO., P.O. BOX 1211, HOUSTON TX. 77251

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 14 of 45

\*Sample ID# RBS- 7B-GLB-X-0.25

Fastener Description: 1/4-20 UNC (2A) x 2 1/2 HEX CAP SCREW

Description of Sample Stock Location: UUN 43B

Material Specification as Documented by Licensee Records: SA-307 GR. A

Head Marking (Specification and Manufacturer): ↔

\*\*Class/Procurement Level: I

General Plan: Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: R+G ENGINEERING CO. 4640 E. LAPALMA AVE. ANAHEIM CA. 92807

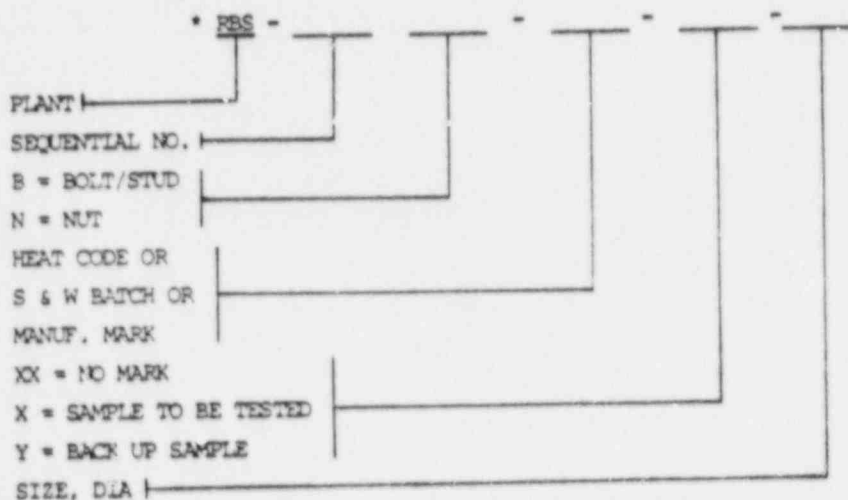
MANUF.: HAMANAKA NUT MFG. CO. LTD. (JAPAN)

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 15 of 45

\*Sample ID# FBS- 7N-AM10F2-X-0.25

Fastener Description: 1/4" NUT

Description of Sample Stock Location: LRJ14B

Material Specification as Documented by Licensee Records: SA-307 GR. B

Head Marking (Specification and Manufacturer):

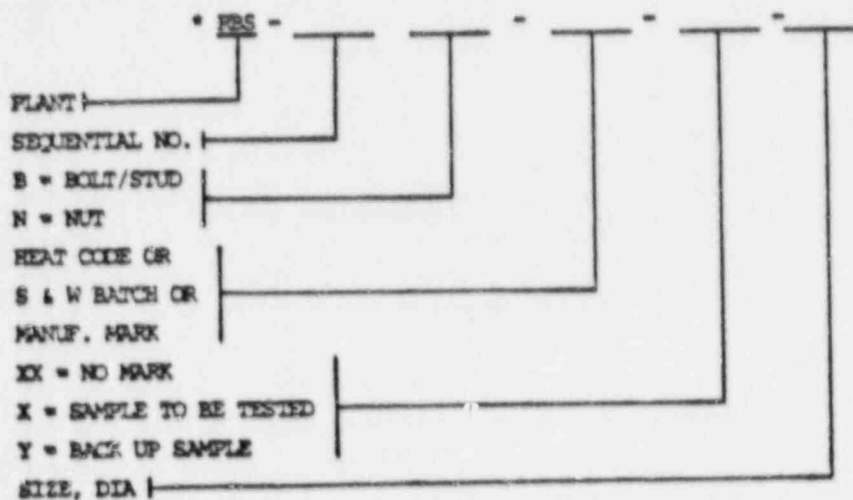
\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: BERGEN PATTERSON 34 MOULTON ST. LACONIA N.H.  
MANUF.: LEONARD JED CO., MT. WASHINGTON, BALTIMORE MD.  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Razza

Signature M. N. Razza Date 1/13/85



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 16 of 45

\*Sample ID# FBS- 88-H95-X-1.0

Fastener Description: 1-8 X 3 HEAVY HEX BOLT

Description of Sample Stock Location: URH33A

Material Specification as Documented by Licensee Records: SA-325 TYPE 1

Head Marking (Specification and Manufacturer): QTS

\*\*Class/Procurement Level: I

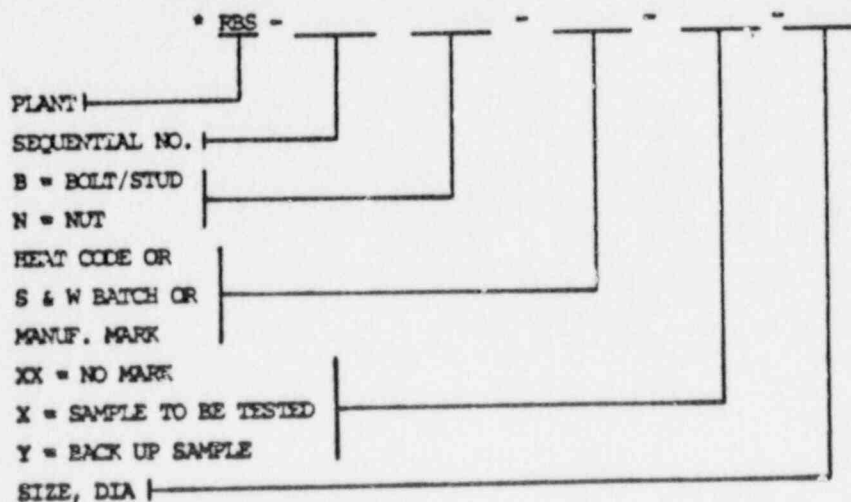
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: LONE STAR SCREW CO. P.O. BOX 297515 HOUSTON TX. 77297

MANUF. : BETHLEHEM STEEL CORP. LEBANON PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 17 of 45

\*Sample ID# FBS- 8B-H95-4-1.0

Fastener Description: 1-8 X 3 HEAVY HEX BOLT

Description of Sample Stock Location: URH33A

Material Specification as Documented by Licensee Records: SA-325 TYPE 1

Head Marking (Specification and Manufacturer): 315

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

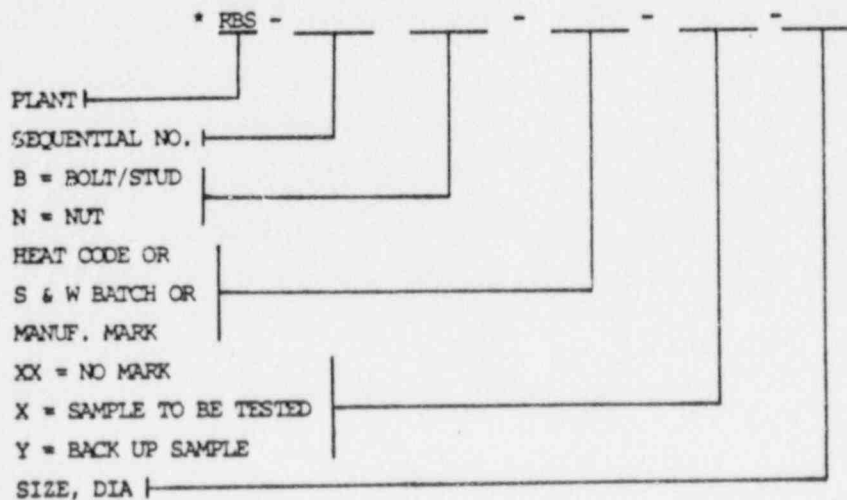
Vendor: LONE STAR SCREW CO. P.O. BOX 297515 HOUSTON TX. 77297

MANUF. % BETHLEHEM STEEL CORP. LEBANON PLANT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MN Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 18 of 45

\*Sample ID# RBS- 8N-T4L-X-1.0

Fastener Description: 1"-8 HEAVY HEX NUTS

Description of Sample Stock Location: PR14E

Material Specification as Documented by Licensee Records: SF. 194 GR. 2H

Head Marking (Specification and Manufacturer): L \* S

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) PRESSURE BOUNDARY

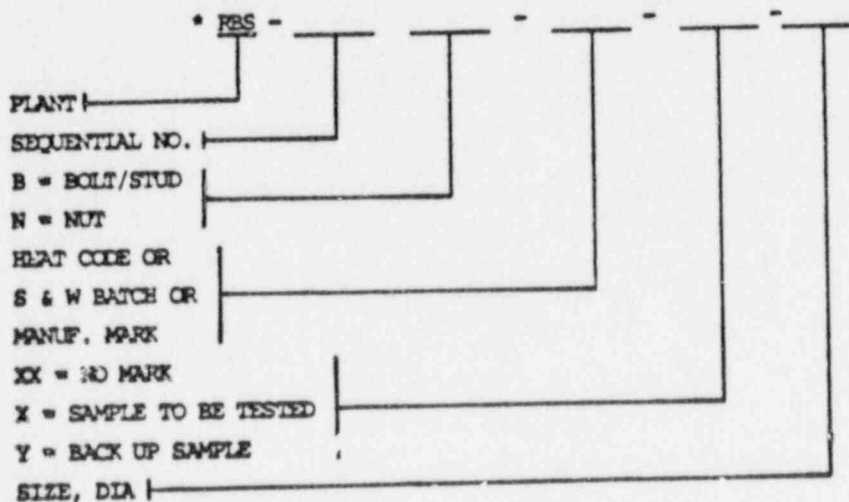
Vendor: LONE STAR SCREW CO. P.O. BOX 1393 HOUSTON TX. 77001

MANUF. : JOH. SMIT P.O. BOX 75 2980 AB RIDDERKERK HOLLAND

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 19 of 45

\*Sample ID# RBS- 9B-ΔU-X-0.375

Fastener Description: 3/8 X 1 1/2 CAP SCREWS, ELECTROPLATED

Description of Sample Stock Location: PRC 601

Material Specification as Documented by Licensee Records: ASTM A-307 GR. A

Head Marking (Specification and Manufacturer): ΔU

\*\*Class/Procurement Level: I

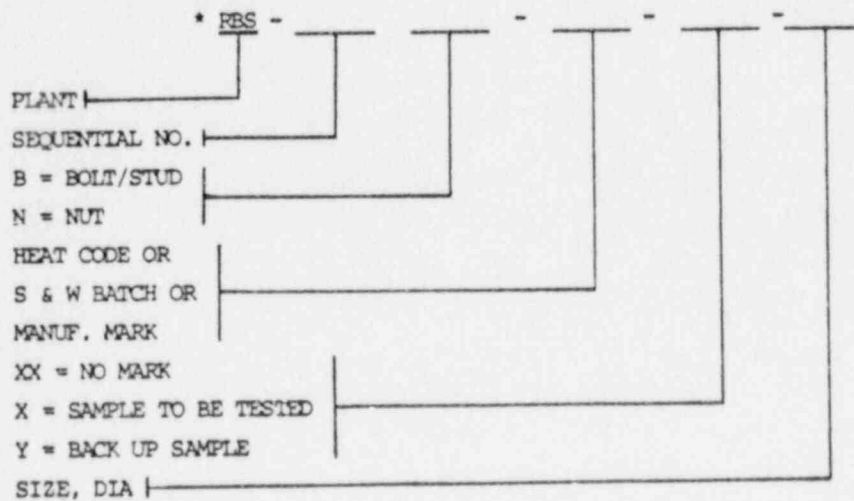
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: GRAYBAR ELECTRIC CO.

MANUF.: INDUSTRIAL FASTENERS LTD. 700 OUELLETTE ST. QUEBEC CANADA  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 20 of 45

\*Sample ID# RBS- 9N-X-X-Ø.375

Fastener Description: 3/8" HEAVY HEX NUT, ZINC COATED

Description of Sample Stock Location: PRC3D1

Material Specification as Documented by Licensee Records: ASTM A-194 GR 2H

Head Marking (Specification and Manufacturer): GI

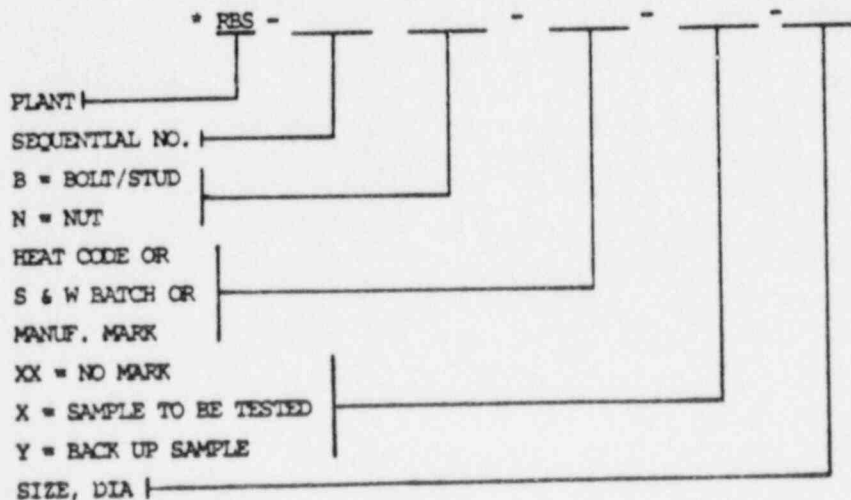
\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: POWER ENGINEERING PRODUCTS INC, P.O. BOX 382  
SOUTH PLAINFIELD N.J. 07010  
MANUF. : BETHLEHEM STEEL CORP. LEBANON PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 21 of 45

\*Sample ID# RBS- 103 - PS - X - 0.5

Fastener Description: 1/2 - 13 X 1 1/2 POWER STRUT BOLT

Description of Sample Stock Location: PRC 531

Material Specification as Documented by Licensee Records: ASTM A-307 TYPE A

Head Marking (Specification and Manufacturer): Δ

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: WESTINGHOUSE ELECTRIC SUPPLY CO. P.O. BOX 15365 BATON ROUGE LA.  
70895

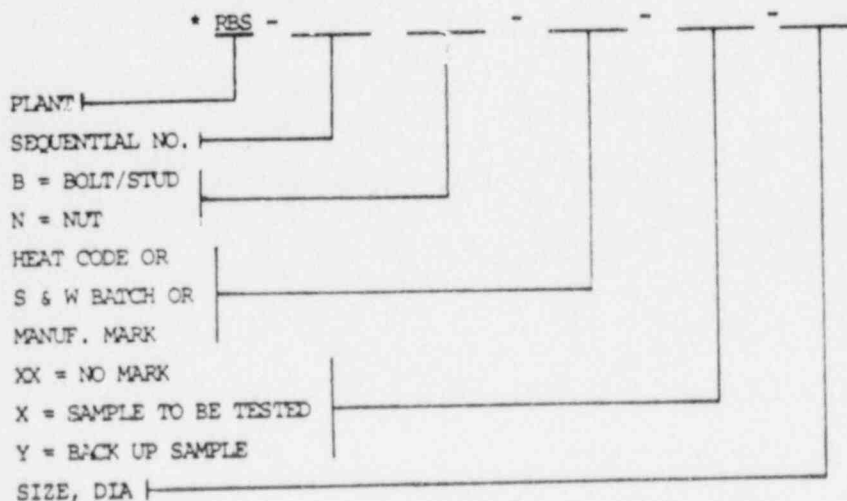
MANUF.: INDUSTRIAL FASTENERS, QUEBEC CANADA

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 22 of 45

\*Sample ID# RBS- 10N-P-X-0.5

Fastener Description: 1/2" HEAVY HEX NUTS, ZINC COATED

Description of Sample Stock Location: PRC 232

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): P

\*\*Class/Procurement Level: I

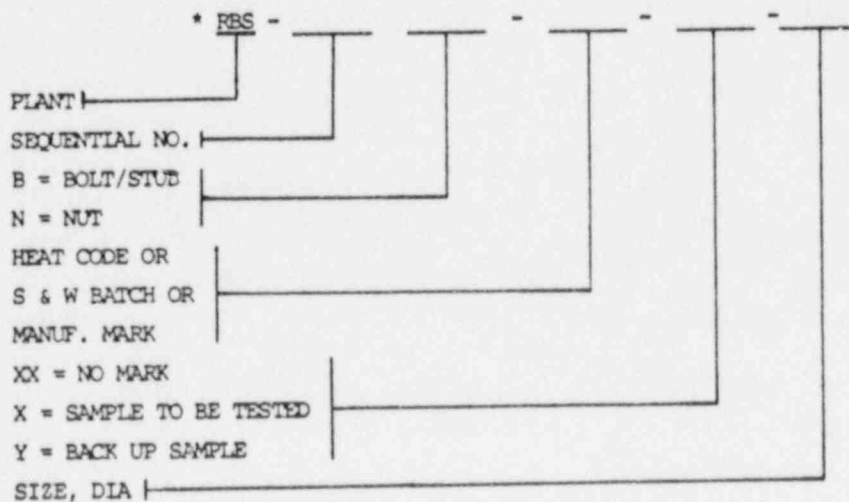
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: POWER + ENGINEERED PRODUCTS INC. P.O. BOX 382 S. PLAINFIELD N.J. 07080

MANUF.: MODULUS CORP. 1000 MODULUS RD. MT. PLEASANT PA. 15666  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MNHazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

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ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 23 of 45

\*Sample ID# RBS- 11B-BIS-X-0.5

Fastener Description: 1/2-13 UNC x 2 1/2 HEAVY HEX HEAD BOLT ZINC COATED

Description of Sample Stock Location: PRC 5B1

Material Specification as Documented by Licensee Records: ASTM A-325 TYPE 1

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

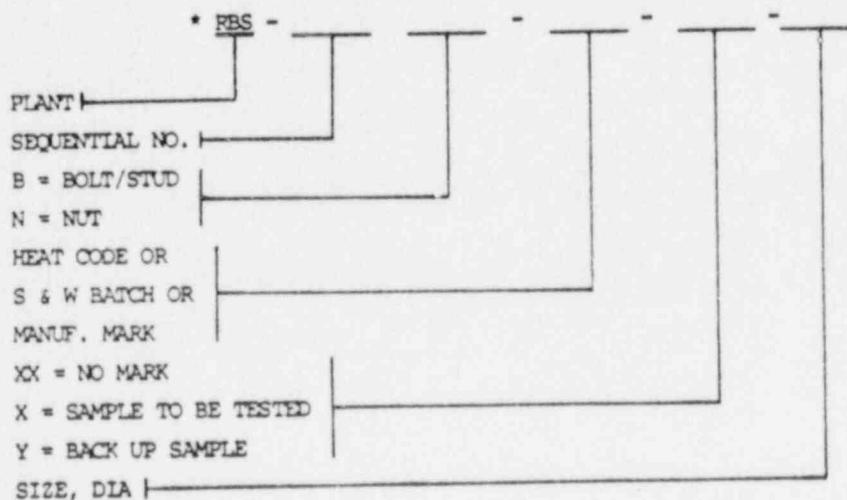
Vendor: HARDWARE SPECIALTY CO. 48-75 36<sup>TH</sup> ST. LONG ISLAND CITY NY 11101

MANUF.: BETHLEHEM STEEL, LEBANON PLANT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 24 of 45

\*Sample ID# RBS- 11N - JS - X - 0.5

Fastener Description: 1/2 - 13 HEAVY HEX NUTS, RED ZINC PLATED

Description of Sample Stock Location: PRC 301

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): JS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: LONE STAR SCREW CO. 5826 ARMOUR DR. HOUSTON TX. 77020

MANUF.: JOH SMIT, HOLLAND

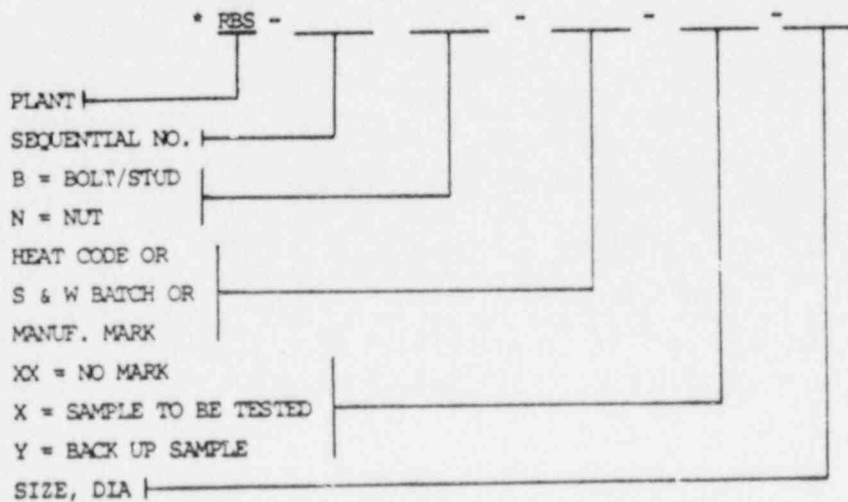
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature

M N Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 25 of 45

\*Sample ID# FBS- 12B-AS-X-0.75

Fastener Description: 3/4-10 X 2 1/2 HEAVY HEX BOLTS, RED ZINC PLATED

Description of Sample Stock Location: PRCSE2

Material Specification as Documented by Licensee Records: ASTM A-325 TYPE 1

Head Marking (Specification and Manufacturer): AS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: LONE STAR SCREW CO., P.O. BOX 15211 HOUSTON TX. 77020

MANUF.: ARMCO STEEL CORP.

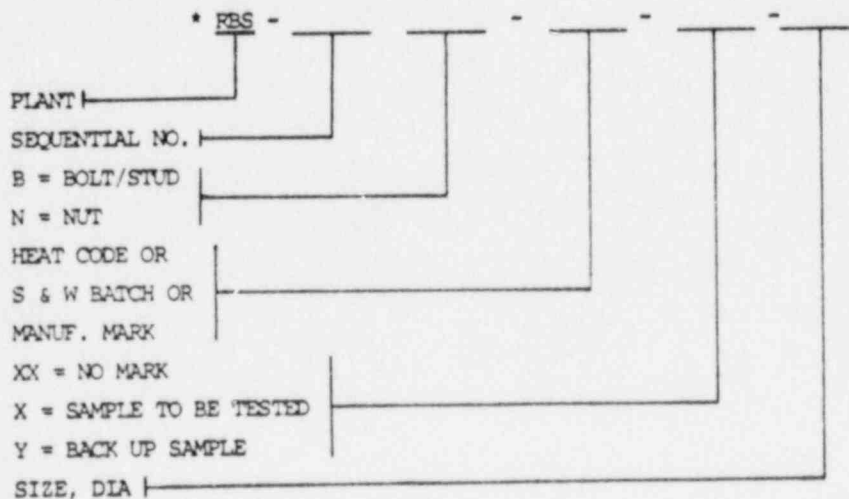
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature

MN Hazra

Date 1/13/85



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 26 of 45

\*Sample ID# RBS- 12N-BIS-X-0.75

Fastener Description: 3/4-10 HEAVY HEX NUTS, ZINC COATED

Description of Sample Stock Location: PRC 301

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

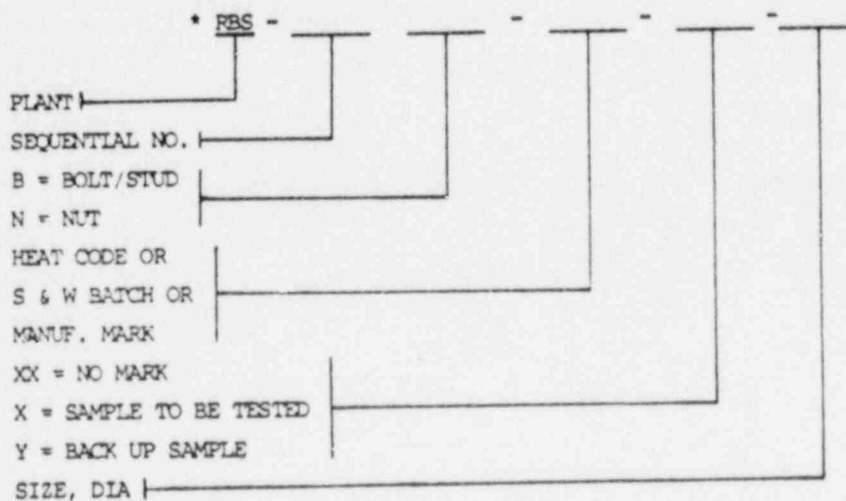
Vendor: HARDWARE SPECIALTY CO. 48-75 36<sup>TH</sup> ST. LONG ISLAND CITY N.Y. 11101

MANUF.: BETHLEHEM STEEL, LEBANON PLANT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 27 of 45

\*Sample ID# RBS- 12N-BIS-Y-0.75

Fastener Description: 3/4-10 HEAVY HEX NUTS, ZINC COATED

Description of Sample Stock Location: PRC 301

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: HARDWARE SPECIALTY CO. 48-75 36<sup>TH</sup> ST. LONG ISLAND CITY N.Y. 11101

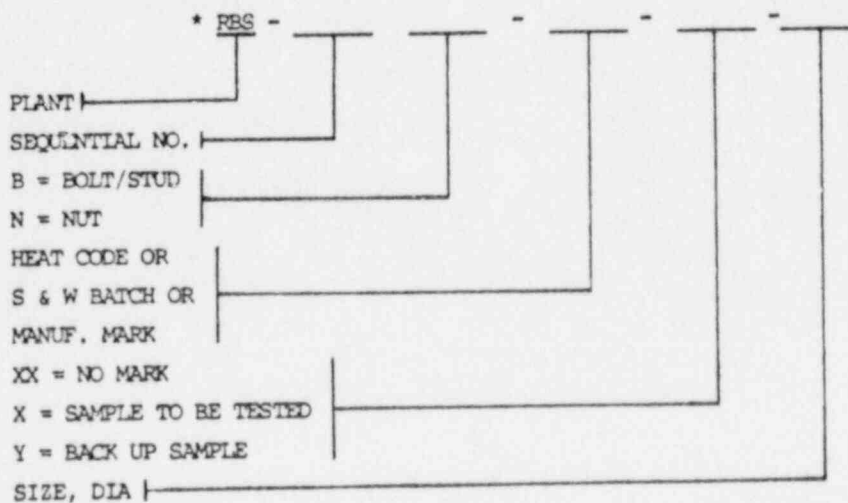
MANUF.: BETHLEHEM STEEL, LEBANON PLANT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature Manindra Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 28 of 45

\*Sample ID# FBS- 13B-BIS-X-0.875

Fastener Description: 7/8 X 3 1/2 HEAVY HEX BOLT

Description of Sample Stock Location: PRC4B1

Material Specification as Documented by Licensee Records: ASTM A-325 TYPE 1

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: HARDWARE SPECIALTY CO. 48-75 36<sup>TH</sup> ST. LONG ISLAND CITY N.Y. 11101

MANUF.: BETHLEHEM STEEL, LEBANON PLANT

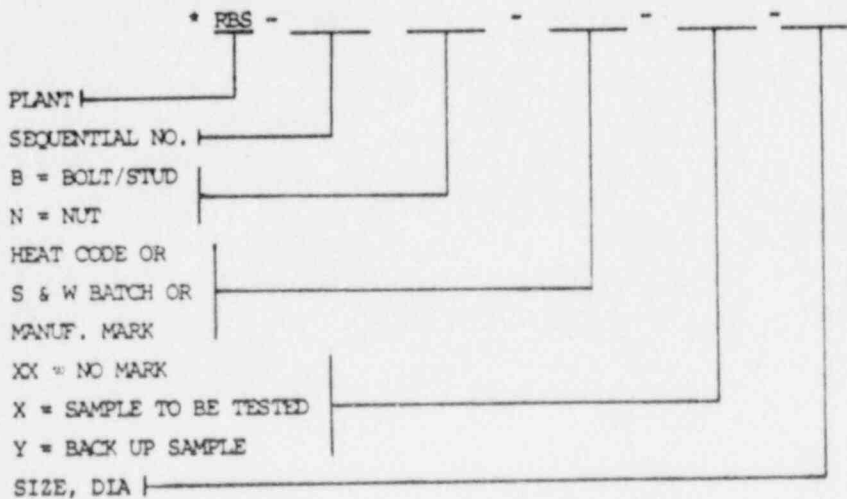
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature

MN Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 29 of 45

\*Sample ID# RBS- 13B-BIS-4-0.875

Fastener Description: 7/8 x 3 1/2 HEAVY HEX BOLT

Description of Sample Stock Location: PRC4B1

Material Specification as Documented by Licensee Records: ASTM A-325 TYPE 1

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

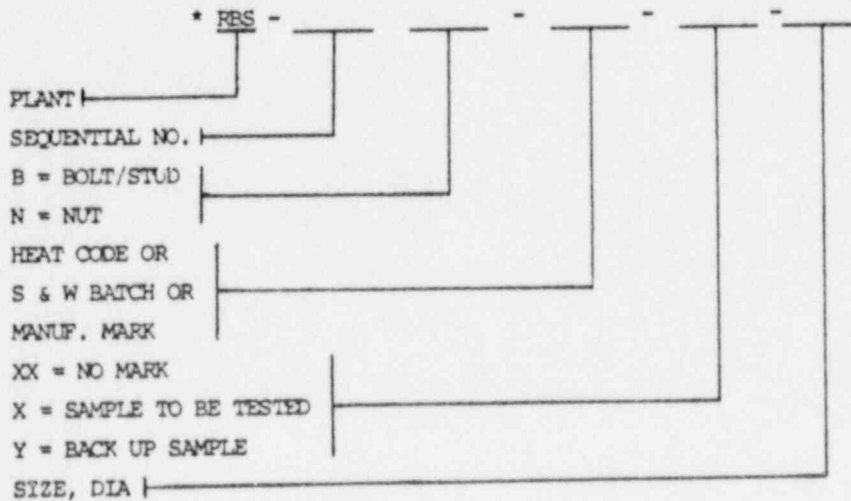
Vendor: HARDWARE SPECIALTY CO. 48-75 36<sup>TH</sup> ST. LONG ISLAND CITY N.Y. 11101

MANUF. : BETHLEHEM STEEL, LEBANON PLANT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 30 of 45

\*Sample ID# RBS- 13N - 3IS - X - 0.875

Fastener Description: 7/8 - 9 NUTS, UNFINISHED

Description of Sample Stock Location: PRC 3E1

Material Specification as Documented by Licensee Records: ASTM A-563 GR. C

Head Marking (Specification and Manufacturer): 3IS

\*\*Class/Procurement Level: I

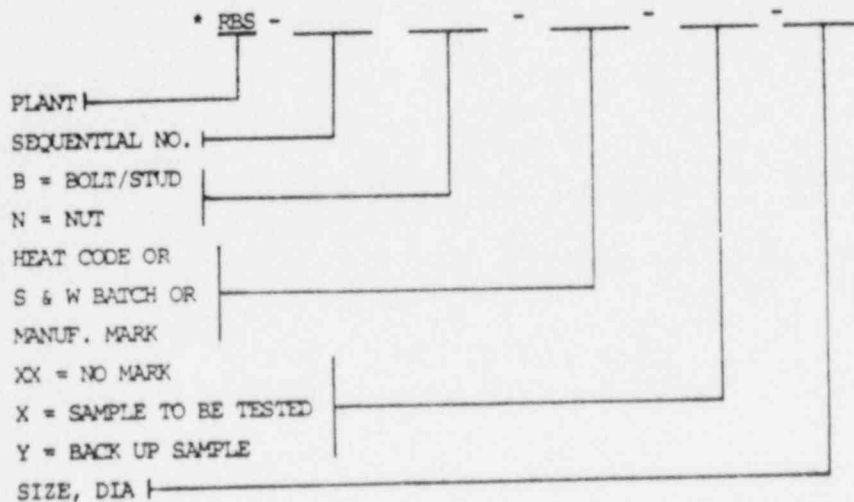
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: LONE STAR SCREW CO., 5826 ARMOUR DR. HOUSTON TX. 77020

MANUF.: BETHLEHEM STEEL, LEBANON PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 31 of 45

\*Sample ID# RBS- 14B-SB-X-0.875

Fastener Description: 7/8 X 5 1/2 GALVANIZED BOLTS

Description of Sample Stock Location: PRC 4B2

Material Specification as Documented by Licensee Records: ASTM A-325 TYPE 1

Head Marking (Specification and Manufacturer): SB

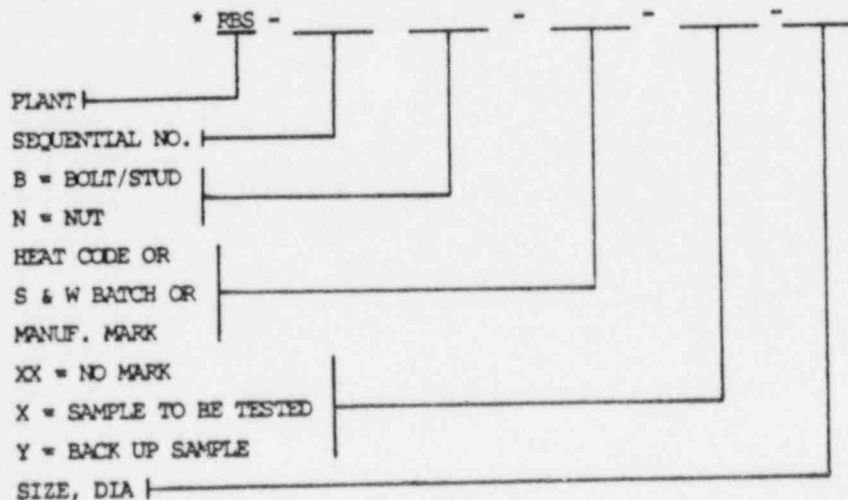
\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: LONE STAR SCREW CO, P.O. BOX 1393 HUSTON, TX 77001  
MFG: MODULUS CORP. SCREW AND BOLT DIV. 1000 MODULUS RD. MT. PLEASANT,  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster PA. 15066

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 32 of 45

\*Sample ID# RBS- 14N-BIS-X-0.875

Fastener Description: 7/8" 9 HEAVY HEX NUTS, ZINC COATED

Description of Sample Stock Location: PRC 3 E 1

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): BTS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

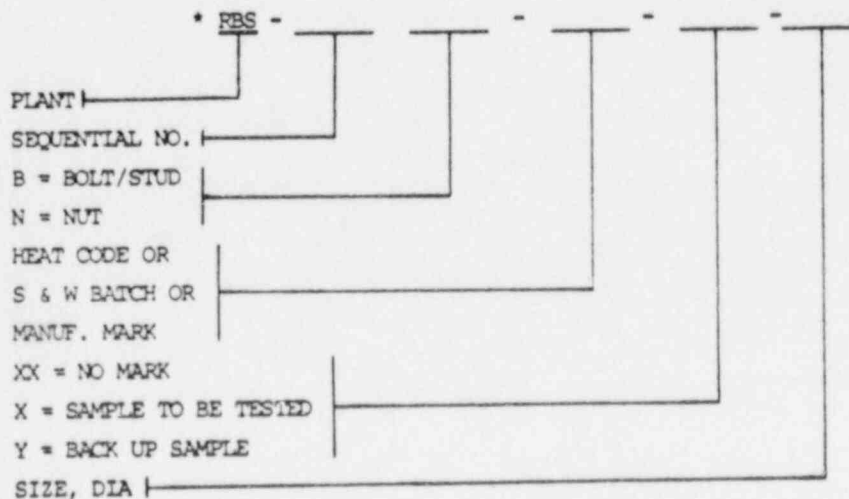
Vendor: HARDWARE SPECIALTY CO. 48-75 36TH ST. LONG ISLAND CITY N.Y. 11101

MANUF.: BETHLEHEM STEEL, LEBANON PLANT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MNHazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 33 of 45

\*Sample ID# RBS- 15B-BIS-X-0.375

Fastener Description: 3/8 x 1 1/2 HEAVY HEX BOLTS, GALVANIZED

Description of Sample Stock Location: PRC 6C1

Material Specification as Documented by Licensee Records: ASTM A-449

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

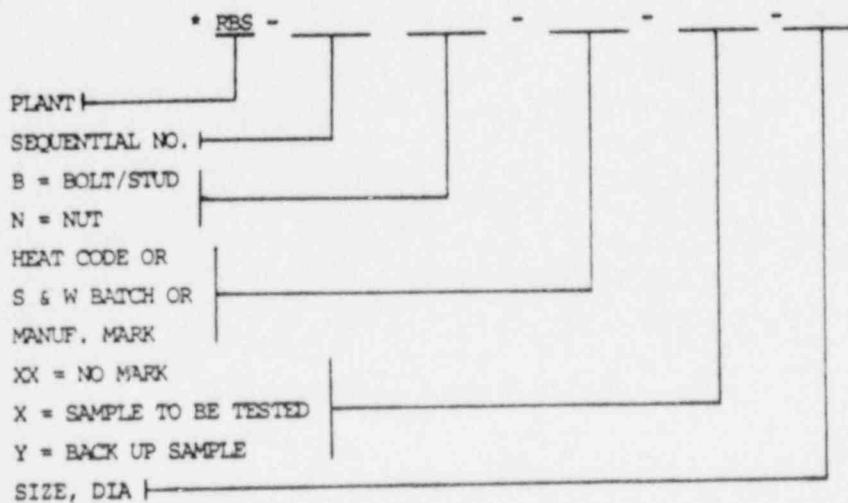
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: HARDWARE SPECIALTY CO. 48-75 36<sup>TH</sup> ST. LONG ISLAND CITY N.Y. 11101

MANUF. : BETHLEHEM STEEL, LEBANON PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 34 of 45

\*Sample ID# RBS- 15N-M-X-0.375

Fastener Description: 3/8-16 HEAVY HEX NUT, ZINC PLATED

Description of Sample Stock Location: PRC332

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): M

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: LONE STAR SCREW CO. P.O. BOX 15211 HOUSTON TX. 77020

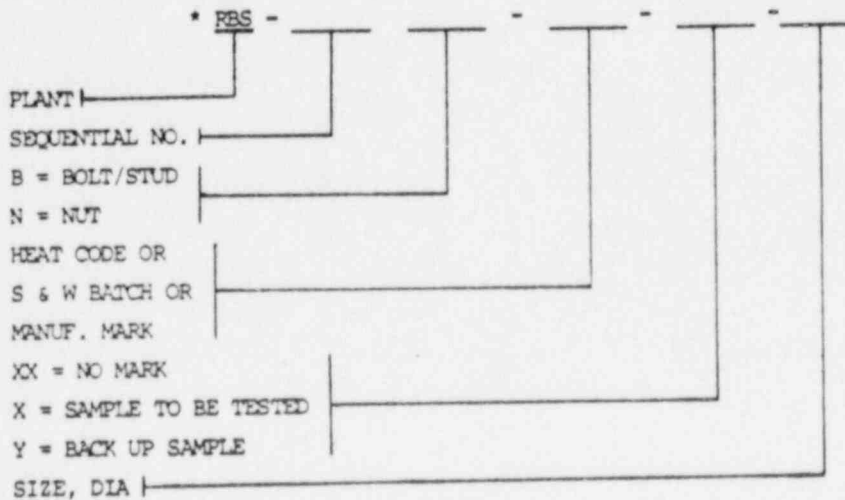
MANUF.: MSP INDUSTRIES CORP.

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MN Hazra

Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 35 of 45

\*Sample ID# RBS- 16B-XX-X-1.25

Fastener Description: 1/4 x 4 1/2 HEAVY HEX BOLT, 7UNC 3A

Description of Sample Stock Location: RB20011A

Material Specification as Documented by Licensee Records: ASTM A-574

Head Marking (Specification and Manufacturer): NONE

\*\*Class/Procurement Level: I

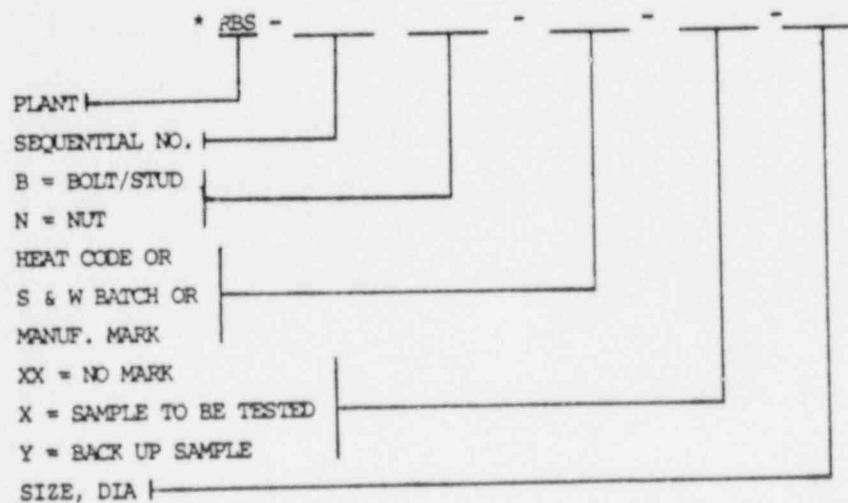
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: A+G ENGINEERING CO. 4640 E. LAPALMA AVE. ANAHEIM CA. 92806

MANUF.: HARDWARE SPECIALTY CO. 48-75 36TH ST. LONG ISLAND CITY N.Y.  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster 11101

Licensee Representative: M. N. Hazra

Signature MNHazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 36 of 45

\*Sample ID# RBS- 16N-BIS-X-1.25

Fastener Description: 1/4"-8 HEAVY HEX NUTS, NON COATED BLACK

Description of Sample Stock Location: PRC201

Material Specification as Documented by Licensee Records: ASTM A-563 GR. 0H

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

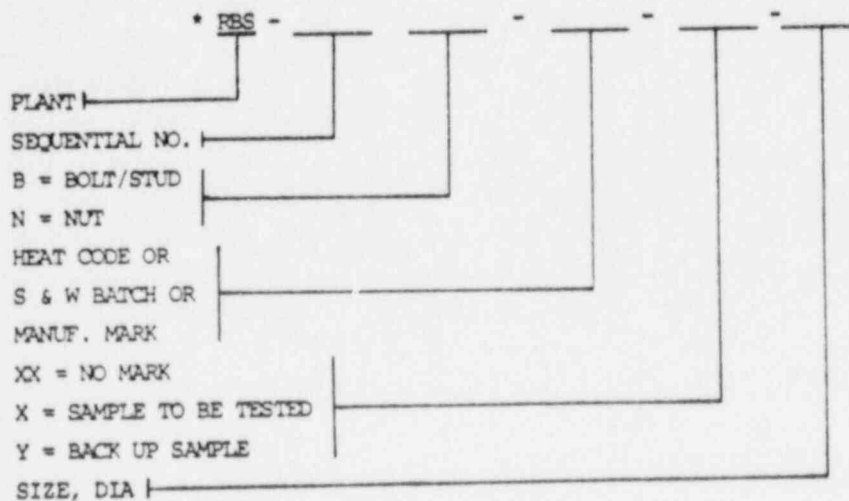
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: HARDWARE SPECIALTY CO., 48-75 36TH ST. LONG ISLAND CITY N.Y. 11101

MANUF.: GETHLEHEM STEEL, LEBANON PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MN Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 37 of 45

\*Sample ID# RBS- 16N - BIS - Y - 1.25

Fastener Description: 1/4 - 8 HEAVY HEX NUTS, NON-COATED BLACK

Description of Sample Stock Location: PRC201

Material Specification as Documented by Licensee Records: ASTM A-563 GR. 0H

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

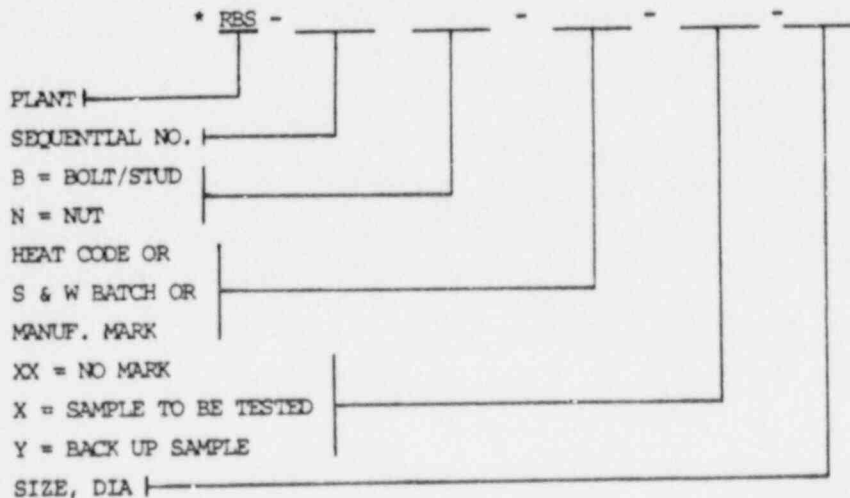
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: HARDWARE SPECIALTY CO., 48-75 36TH ST. LONG ISLAND CITY N.Y. 11101

MANUF.: BETHLEHEM STEEL, LEBANON PLANT  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature MNHazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

Back up sample Y was also tested.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 38 of 45

\*Sample ID# RBS- 17B-XX-X-0.5

Fastener Description: 1/2 X 2 HEX HEAD BOLT

Description of Sample Stock Location: PRD18F

Material Specification as Documented by Licensee Records: ASTM A-307 GRA

Head Marking (Specification and Manufacturer): NONE

\*\*Class/Procurement Level: II

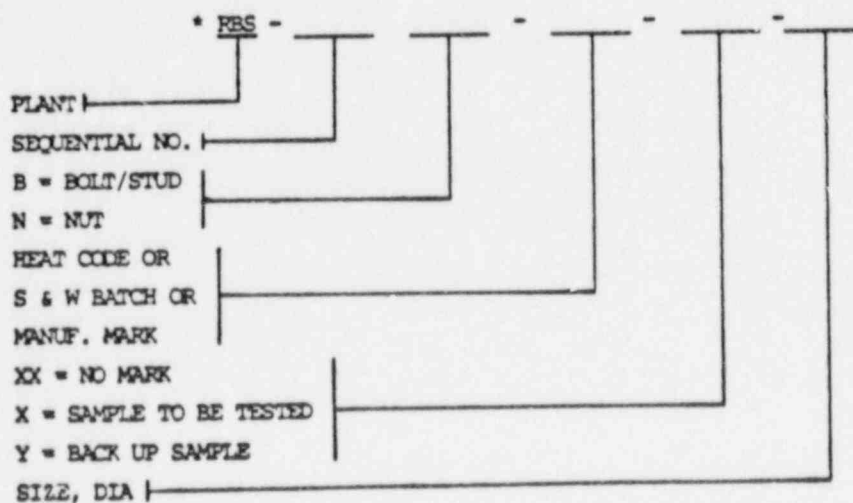
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: DELTA BOLT CORP. P.O. BOX 15585 BATON ROUGE LA.  
MFG: N/A 70895

QA Requirements Imposed on Vendor: NONE

Licensee Representative: M. N. Hazra

Signature MN Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 39 of 45

\*Sample ID# RBS- 17N-P-X-0.5

Fastener Description: 1/2" HEAVY HEX NUTS, HOT DIP GALVANIZED

Description of Sample Stock Location: PRC 232

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): P

\*\*Class/Procurement Level: I

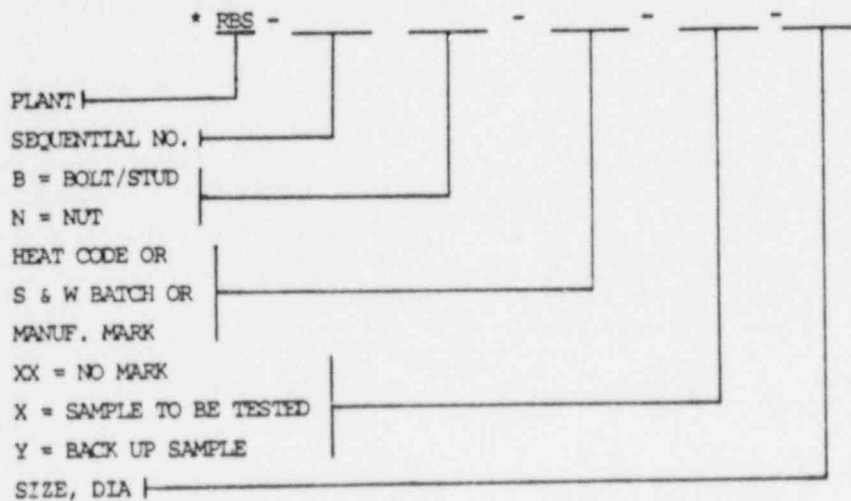
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: POWER & ENGINEERED PRODUCTS INC. P.O. BOX 382 S. PLAINFIELD N.J. 07080

MANUF.: MODULUS CORP. 1000 MODULUS RD. MT. PLEASANT PA. 15666  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 40 of 45

\*Sample ID# RBS- 188 - T3 - X - 0.875

Fastener Description:  $\frac{7}{8} \times 2\frac{1}{2}$ , 9THD./INCH UNC, HEAVY HEX HEAD BOLT  
WITH WASHER FACE

Description of Sample Stock Location: PROD 60

Material Specification as Documented by Licensee Records: ASTM A-193 GR. B7

Head Marking (Specification and Manufacturer): T3

\*\*Class/Procurement Level: II

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

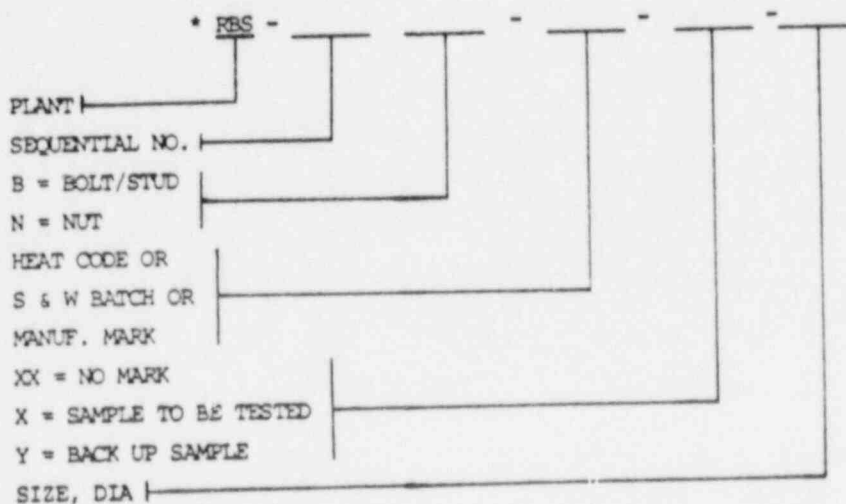
Vendor: CAPITAL BOLT 11888 DARRYL DR. P.O. BOX 52790 BATON ROUGE LA. 70815

MANUF.: TEXAS BOLT, HOUSTON TX.

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster N/A

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 41 of 45

\*Sample ID# RBS- 18N-P-X-O.875

Fastener Description: 7/8" HEAVY HEX NUT, ZINC COATED

Description of Sample Stock Location: PRC 232

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): P

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: POWER ENGINEERED PRODUCTS, INC. P.O. BOX 382 S. PLAINFIELD N.J.  
07080

MANUF.: MODULUS CORP. 1000 MODULUS RD. MT. PLEASANT PA. 15666

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

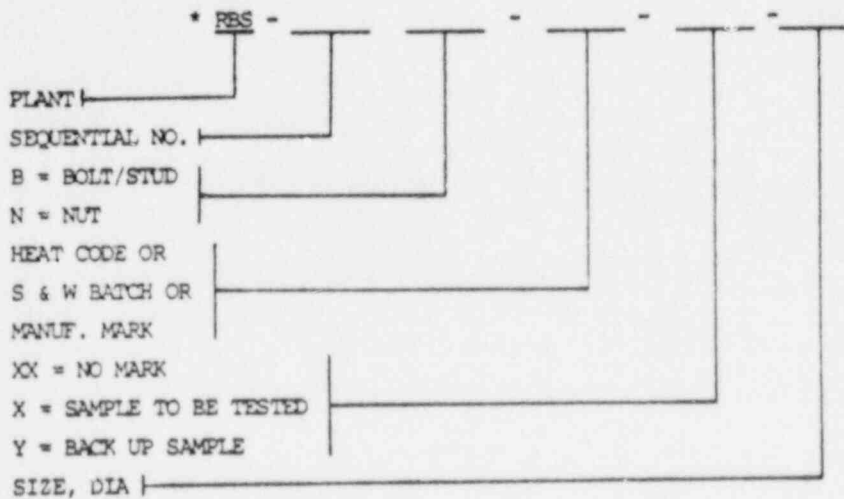
Licensee Representative: M. N. Hazra

Signature

MN Hazra

Date

1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 42 of 45

\*Sample ID# RBS- 193 - DARL - X - 1.75

Fastener Description: 1 3/4 x 4 1/2 BOLT

Description of Sample Stock Location: RFI-16A

Material Specification as Documented by Licensee Records: ASTM A-354 GR. 80

Head Marking (Specification and Manufacturer): DARLING BOLT

\*\*Class/Procurement Level: III

General Plant Application (e.g., Pressure Boundary, Structural)

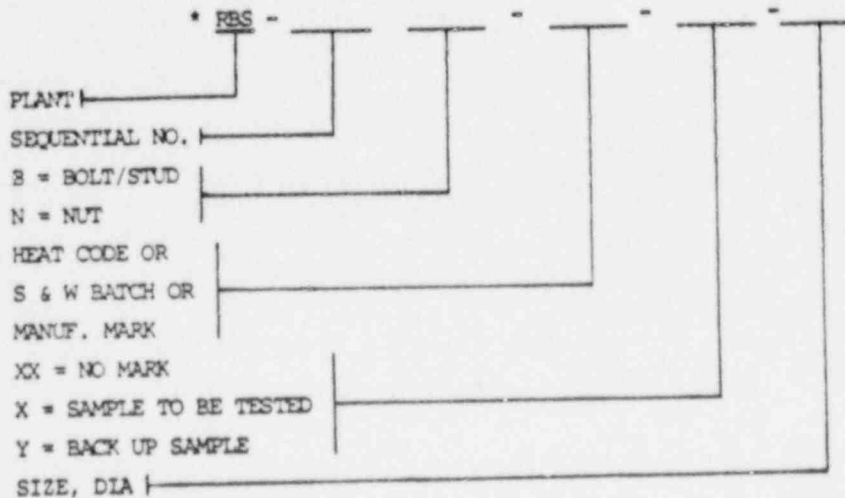
Vendor: DELTA BOLT CORP. P.O. BOX 15385 BATON ROUGE LA. 70895

MANUF.: DARLING BOLT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster N/A

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

\*Sample ID# FBS- 19N-BIS-X-1.75

Fastener Description: 1 3/4 - 8 HEAVY HEX NUTS, NON-COATED BLACK

Description of Sample Stock Location: PRC 2 E2

Material Specification as Documented by Licensee Records: ASTM A-563 GR. 0H

Head Marking (Specification and Manufacturer): BIS

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

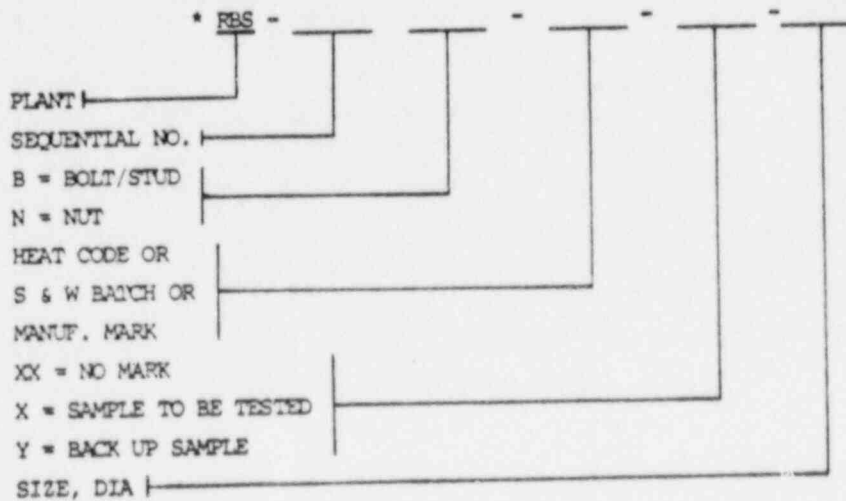
Vendor: HARDWARE SPECIALTY CO. 48-75 36<sup>TH</sup> ST. LONG ISLAND CITY N.Y. 11101

MANUF.: BETHLEHEM STEEL, LEBANON PLANT

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 44 of 45

\*Sample ID# RBS- 208-A-X-0.5

Fastener Description: 1/2-13 x 1 1/2 POWER STRUT BOLT

Description of Sample Stock Location: PRCSB1

Material Specification as Documented by Licensee Records: ASTM A-307 TYPE A

Head Marking (Specification and Manufacturer): A

\*\*Class/Procurement Level: I

General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: WESTINGHOUSE ELECTRIC SUPPLY CO. P.O. BOX 15365 BATON ROUGE LA. 70895

MANUF.: INDUSTRIAL FASTENERS, QUEBEC CANADA

QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M. N. Hazra Date 1/13/88

\* RBS - - - - -

PLANT	
SEQUENTIAL NO.	
B = BOLT/STUD	
N = NUT	
HEAT CODE OR	
S & W BATCH OR	
MANUF. MARK	
XX = NO MARK	
X = SAMPLE TO BE TESTED	
Y = BACK UP SAMPLE	
SIZE, DIA	

\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

ATTACHMENT - 2  
FASTENER TESTING DATA SHEET

Page 45 of 45

\*Sample ID# RBS- 20N-P-X-0.5

Fastener Description: 1/2" HEAVY HEX NUT, ZINC COATED

Description of Sample Stock Location: PRC202

Material Specification as Documented by Licensee Records: ASTM A-194 GR. 2H

Head Marking (Specification and Manufacturer): P

\*\*Class/Procurement Level: I

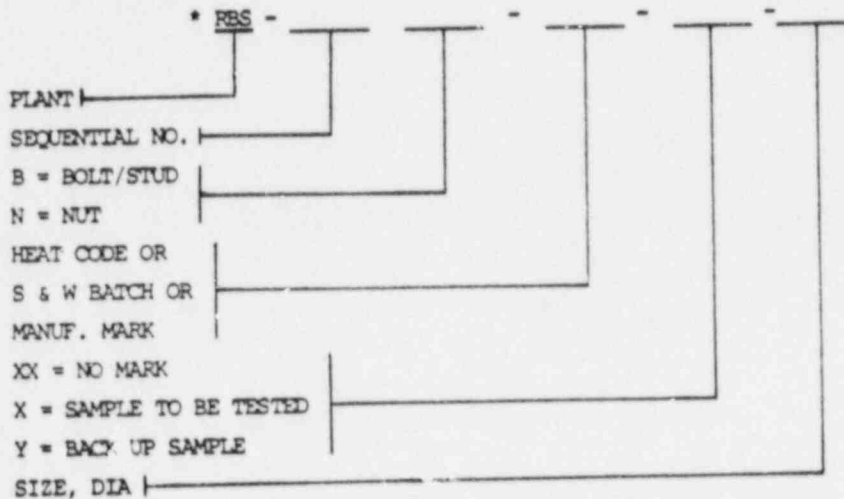
General Plant Application (e.g., Pressure Boundary, Structural) STRUCTURAL

Vendor: POWER + ENGINEERED PRODUCTS INC. P.O. BOX 382 S. PLAINFIELD N.J. 07080

MANUF.: MODULUS CORP. 1000 MODULUS RD. MT. PLEASANT N.J. 08660  
QA Requirements Imposed on Vendor: Q.A Program Approved by Stone & Webster

Licensee Representative: M. N. Hazra

Signature M N Hazra Date 1/13/88



\*\* CATEGORY I = SAFETY RELATED. PROCURED FROM VENDOR ON  
QUALIFIED SUPPLIER'S LIST

II & III = COMMERCIAL GRADE, NON SAFETY RELATED.

## FASTNER TEST RESULTS (I&amp;E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-1B-75-X-1.25

MATERIAL SPECIFICATION: SA-193 GR. G6 ASME III CL.1 1977 EDITION  
+ ADDENDUM THRU SUMMER OF 78CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
X	Carbon - 0.15 MAX.	.16
X	Chromium - 11.50 - 13.50	11.17
X	Manganese - 1.00 MAX.	.67
N/A	Molybdenum -	
X	Silicon - 1.00 MAX.	.25
X	Phosphorus - 0.04 MAX	.013
X	Sulfur - 0.03 MAX.	.014
N/A	Boron -	
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

MECHANICAL PROPERTIESAcceptance Criteria for Mechanical SpecificationsACTUAL MECHANICAL RESULTS

X	Ultimate Tensile Strength - 110 KSI	105,000 (psi)
X	0.2% Offset Yield Strength - 85 KSI	83,500 (psi)
X	Elongation - 15%	22 (%) 4XD
X	Reduction in area - 50%	67 (%)
X	Hardness - NONE	232 BHN

N/A X Impact - ASME NB 2300

\* testing cancelled per M. Hazra

N/A Proof Load -

\* IMPACT TEST NOT REQUIRED FOR GR 86 MATL

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

M. W. Hazra 12/15/87  
PREPARED BYChris J. Brandt 12/13/87  
REVIEWED BY

1/26/88

Allan S. Davis 1/26/88  
FINAL ACCEPTANCE

VENDOR

TECHNICIAN

ON/CC

APPROVED BY



PASINER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-1B-75-Y3-1.25

MATERIAL SPECIFICATION: SA-193 GR. B6 ASME III CLASS 1 1977 EDITION

\* ADDENDA THRU SUMMER OF 78

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
X	Carbon - 0.15 MAX.	.16, .14*
X	Chromium - 11.50-13.50	12.12
X	Manganese - 1.00 MAX.	.70
N/A	Molybdenum -	
X	Silicon - 1.00 MAX.	.29
X	Phosphorus - 0.04 MAX.	.040
X	Sulfur - 0.03 MAX.	.014
N/A	Boron -	
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

\*recheck

MECHANICAL PROPERTIES

Acceptance Criteria for Mechanical Specifications

ACTUAL MECHANICAL RESULTS

X	Ultimate Tensile Strength - 110 KSI	106,000 (psi)
X	0.2% Offset Yield Strength - 85 KSI	82,000 (psi)
X	Elongation - 15%	22.5 (%) 4XD
X	Reduction in area - 50%	68 (%)
X	Hardness - NONE	225 BHN

NA X Impact - ASME NB-2300

\* testing cancelled per M.Hazr

N/A Proof Load -

REMARKS:

\* IMPACT TEST NOT REQUIRED FOR GR-B6 MAT'L

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

John Hazr 12/21/87  
PREPARED

Chris J. Beaudet 12-21-87  
REVIEWER

Veron  
1/26/88

Allan D. Smith  
FINAL ACCEPTANCE

VENDOR

Thomas K. Conte  
TECHNICIAN  
OKrashes  
QA/QC  
Thomas W. Bate  
APPROVED BY



PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: *RBS - IN - 19 - X - 1.25*

MATERIAL SPECIFICATION: *SA 194 GR 6, ASME III CL. 1, NB-2000  
1974 ED, 578 ADD.*

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<i>X</i>	Carbon - <i>0.15 MAX</i>	<i>.14</i>
<i>X</i>	Chromium - <i>11.50 - 13.50</i>	<i>13.27</i>
<i>X</i>	Manganese - <i>1.0 MAX</i>	<i>.61</i>
<i>N/A</i>	Molybdenum -	
<i>X</i>	Silicon - <i>1.00 MAX</i>	<i>.27</i>
<i>X</i>	Phosphorus - <i>0.040 MAX</i>	<i>.007</i>
<i>X</i>	Sulfur - <i>0.030 MAX</i>	<i>.005</i>
<i>N/A</i>	Boron -	
<i>N/A</i>	Copper -	
<i>N/A</i>	Nickel -	
<i>N/A</i>	Vanadium -	

MECHANICAL PROPERTIES

Acceptance Criteria for Mechanical Specifications

ACTUAL MECHANICAL RESULTS

<i>N/A</i>	Ultimate Tensile Strength -	
<i>N/A</i>	0.2% Offset Yield Strength -	
<i>N/A</i>	Elongation -	
<i>N/A</i>	Reduction in area -	
<i>X</i>	Hardness - <i>228-271 BHN</i>	<i>227 BHN</i>
<i>NA</i> <i>X</i>	Impact - <i>ASME-NB-2300</i>	<i>*testing cancelled per M. Hazra</i>
<i>N/A</i>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

*M. Hazra 12/15/87*  
PREPARED BY

*Don Hall 12-15-87*  
REVIEWER

*Allan P. Jones*  
FINAL ACCEPTANCE

VENDOR

*Thomas W. Bost*  
TECHNICIAN  
*Thomas W. Bost*  
QA/QC  
APPROVED BY



PASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-IN-19-X3-1.25

MATERIAL SPECIFICATION: SA-194 GR.6 ASME III CLASS 1 NB-2000

1974 EDITION SUMMER 78 ADDENDUM

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
X	Carbon - 0.15 MAX.	.12
X	Chromium - 11.50 - 13.50	12.75
X	Manganese - 1.00 MAX.	.87
N/A	Molybdenum -	
X	Silicon - 1.00 MAX.	.41
X	Phosphorus - 0.040 MAX.	.022
X	Sulfur - 0.030 MAX.	.010
N/A	Boron -	
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

MECHANICAL PROPERTIES

Acceptance Criteria for Mechanical Specifications

ACTUAL MECHANICAL RESULTS

N/A	Ultimate Tensile Strength -	
N/A	0.2% Offset Yield Strength -	
N/A	Elongation -	
N/A	Reduction in area -	
X	Hardness - 228 - 271 BHN	227 BHN

NA X Impact - ASME NB-2300

\*testing cancelled per M. Hazra

N/A Proof Load -

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

M. Hazra 12/21/87  
PREPARED

Chris J. Beaudet 12.21.87  
REVIEWER

William J. Smith  
FINAL ACCEPTANCE

VENDOR

Technician  
QA/QC  
APPROVED BY



NA  
1/24/88

NA  
1/24/88

PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-2B-DHP-X-0.75

MATERIAL SPECIFICATION: SA-193 GR. B7 ASME III CL.1 1980 EDITION  
AND ADDENDA THRU SUMMER OF 82

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
X	Carbon - 0.37 - 0.49	.45
X	Chromium - 0.75 - 1.20	1.00
X	Manganese - 0.65 - 1.10	.92
X	Molybdenum - 0.15 - 0.25	.19
X	Silicon - 0.15 - 0.35	.19
X	Phosphorus - 0.04 MAX.	.010
X	Sulfur - 0.04 MAX.	.023
N/A	Boron -	
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

MECHANICAL PROPERTIES

	Acceptance Criteria for Mechanical Specifications	ACTUAL MECHANICAL RESULTS
X	Ultimate Tensile Strength - 125 KSI	150,000 (psi)
X	0.2% Offset Yield Strength - 105 KSI	140,000 (Point Yield) (psi)
X	Elongation - 16%	17 (%) 4XD
X	Reduction in area - 50%	58 (%)
X	Hardness - NONE	293 BHN
N/A	Impact -	
N/A	Proof Load -	



REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

John H. Sazza 12/15/87  
PREPARED BY

Chris J. Beaulieu 12-15-87  
REVIEWED BY

William J. Adams  
FINAL ACCEPTANCE

VENDOR

Thomas W. G. Co.  
INSPECTOR

Thomas W. G. Co.  
QV/QC

Thomas W. G. Co.  
APPROVED BY

new  
1/26/88

FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: *RBS-2N-ADC-X-0.75*  
MATERIAL SPECIFICATION: *SA-194 GR 2H, ASME III CL.1*  
*1977 ED. THRU 578 ADD.*

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
<u>X</u>	Carbon - <i>0.40 MIN</i>	<u>.47</u>
<u>N/A</u>	Chromium -	<u>          </u>
<u>  </u>	Manganese -	<u>          </u>
<u>  </u>	Molybdenum -	<u>          </u>
<u>  </u>	Silicon -	<u>          </u>
<u>X</u>	Phosphorus - <i>0.040 MAX</i>	<u>.009</u>
<u>X</u>	Sulfur - <i>0.050 MAX</i>	<u>.010</u>
<u>N/A</u>	Boron -	<u>          </u>
<u>  </u>	Copper -	<u>          </u>
<u>  </u>	Nickel -	<u>          </u>
<u>  </u>	Vanadium -	<u>          </u>

MECHANICAL PROPERTIES

	Acceptance Criteria for Mechanical Specifications	ACTUAL MECHANICAL RESULTS
<u>N/A</u>	Ultimate Tensile Strength -	<u>          </u>
<u>N/A</u>	0.2% Offset Yield Strength -	<u>          </u>
<u>N/A</u>	Elongation -	<u>          </u>
<u>N/A</u>	Reduction in area -	<u>          </u>
<u>X</u>	Hardness - <i>248 - 352 BHN</i>	<u>272 BHN</u>
<u>N/A</u>	Impact -	<u>          </u>
<u>X</u>	Proof Load - <i>58,450 LB.</i>	<u>58,450 Lb.</u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

*Don Hazen* 12/15/87  
PREPARED

*Don Hazen* 12-15-87  
REVIEWER

*William J. Smith*  
FINAL ACCEPTANCE

VENDOR

*K. G. Smith*  
TECHNICIAN

*OK*  
QA/QC

*Thomas W. Bate*  
APPROVED BY



*MSR*  
*1/6/88*

FASNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-3B-CDG-X-0.875

MATERIAL SPECIFICATION: SA-193 GR. B7 ASME III CLASS I 1980 EDITION  
AND ADDENDA THRU THE SUMMER OF 82

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
X	Carbon - 0.37 - 0.49	.42
X	Chromium - 0.75 - 1.20	1.04
X	Manganese - 0.65 - 1.10	.99
X	Molybdenum - 0.15 - 0.25	.20
X	Silicon - 0.15 - 0.35	.29
X	Phosphorus - 0.04 MAX.	.015
X	Sulfur - 0.04 MAX.	.031
N/A	Boron -	
	Copper -	
	Nickel -	
	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
X	Ultimate Tensile Strength - 125 KSI	132,000 (psi)
X	0.2% Offset Yield Strength - 105 KSI	111,000 (Point Yield) (psi)
X	Elongation - 16%	20 (%) 4XD
X	Reduction in area - 50%	56 (%)
X	Hardness - NONE	272 BHN
N/A	Impact -	
N/A	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

Ken Hazra 12/15/87  
PREPARED

Chris J. Beaudet 12-15-87  
REVIEWER

Allan S. Spon  
FINAL ACCEPTANCE

VENDOR

Thomas W. B. Co.  
TECHNICIAN

OKashes  
QA/QC

Thomas W. B. Co.  
APPROVED BY



PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: *RBS-3N-J41-X-0.875*  
MATERIAL SPECIFICATION: *SA-194 GR 2H, ASME III CL.1*  
*1977 ED. NO ADD.*

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
<i>X</i>	Carbon - <i>0.40 MIN</i>	<i>.46</i>
<i>N/A</i>	Chromium -	
<i>N/A</i>	Manganese -	
<i>N/A</i>	Molybdenum -	
<i>N/A</i>	Silicon -	
<i>X</i>	Phosphorus - <i>0.040 MAX</i>	<i>.005</i>
<i>X</i>	Sulfur - <i>0.050 MAX</i>	<i>.013</i>
<i>N/A</i>	Boron -	
<i>N/A</i>	Copper -	
<i>N/A</i>	Nickel -	
<i>N/A</i>	Vanadium -	

MECHANICAL PROPERTIES

	Acceptance Criteria for Mechanical Specifications	ACTUAL MECHANICAL RESULTS
<i>N/A</i>	Ultimate Tensile Strength -	
<i>N/A</i>	0.2% Offset Yield Strength -	
<i>N/A</i>	Elongation -	
<i>N/A</i>	Reduction in area -	
<i>X</i>	Hardness - <i>248 TO 352 BHN</i>	<i>272 BHN</i>
<i>N/A</i>	Impact -	
<i>N/A</i>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

*GSU*  
*M. Nazra* 12/15/87  
PREPARED  
*Don H. H. H.* 12-15-87  
REVIEWER  
*Alta S. S.*  
FINAL ACCEPTANCE

VENDOR  
*Ken K. Conto*  
TECHNICIAN  
*Okrashe*  
QA/QC  
*Thomas H. H.*  
APPROVED BY



PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: R85-48-BAS6C1-X-1.0

MATERIAL SPECIFICATION: SA-193 GR. B7 ASME III CLASS I

1977 EDITION THRU SUMMER 78 ADDENDA

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.38 - 0.48	.46
<u>X</u>	Chromium - 0.80 - 1.10	1.09
<u>X</u>	Manganese - 0.75 - 1.00	.87
<u>X</u>	Molybdenum - 0.15 - 0.25	.17
<u>X</u>	Silicon - 0.20 - 0.35	.25
<u>X</u>	Phosphorus - 0.04 MAX	.009
<u>X</u>	Sulfur - 0.04 MAX	.013
<u>N/A</u>	Boron -	
<u>—</u>	Copper -	
<u>—</u>	Nickel -	
<u>—</u>	Vanadium -	

MECHANICAL PROPERTIES

Acceptance Criteria for Mechanical Specifications

	<u>ACTUAL MECHANIC RESULTS</u>
<u>X</u> Ultimate Tensile Strength - 125 KSI	139,000 (psi)
<u>X</u> 0.2% Offset Yield Strength - 105 KSI	124,000 (Point Yield) (psi)
<u>X</u> Elongation - 16%	20 (%) 4XD
<u>X</u> Reduction in area - 50%	75 (%)
<u>X</u> Hardness - NONE	289 BHN
<u>N/A</u> Impact -	
<u>N/A</u> Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

Chris J. Beaudet  
PREPARED

Chris J. Beaudet 12-15-87  
REVIEWER

Allen P. Dima  
FINAL ACCEPTANCE

VENDOR

Thomas K. Kates  
TECHNICIAN

Thomas K. Kates  
QA/QC

Thomas K. Kates  
APPROVED BY



MAN  
1/26/88

PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: *RBS-4N-K65-X-1.0*  
MATERIAL SPECIFICATION: *SA-194 GR 2H, ASME III CLASS-1*  
*1980 ED, NO ADD*

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<i>X</i>	Carbon - <i>0.40 MIN</i>	<i>.41</i>
<i>N/A</i>	Chromium -	
<i> </i>	Manganese -	
<i> </i>	Molybdenum -	
<i> </i>	Silicon -	
<i>X</i>	Phosphorus - <i>0.040 MAX</i>	<i>&lt;.002</i>
<i>X</i>	Sulfur - <i>0.050 MAX</i>	<i>.018</i>
<i>N/A</i>	Boron -	
<i> </i>	Copper -	
<i> </i>	Nickel -	
<i> </i>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<i>N/A</i> Ultimate Tensile Strength -	
<i>N/A</i> 0.2% Offset Yield Strength -	
<i>N/A</i> Elongation -	
<i>N/A</i> Reduction in area -	
<i>X</i> Hardness - <i>248-352 BHN</i>	<i>265 BHN</i>
<i>N/A</i> Impact -	
<i>X</i> Proof Load - <i>106,000 LB</i>	<i>*</i>

REMARKS: \* Unable to proof load nut due to limitations of equipment

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

*John Hazra* 12/15/87  
PREPARER

*Ken Hedges* 12-15-87  
REVIEWER

*Allen A. [Signature]*  
FINAL ACCEPTANCE

VENDOR

*[Signature]*  
TECHNICIAN  
*[Signature]*  
QA/QC  
*[Signature]*  
APPROVED BY



*1/26/88*

FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-5B-OK14-X-1.25

MATERIAL SPECIFICATION: SA-193 GR. B7 ASME III CLASS I 1974 EDITION  
AND SUMMER 78 ADDENDUM

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
X	Carbon - 0.38 - 0.48	.44
X	Chromium - 0.80 - 1.10	1.00
X	Manganese - 0.75 - 1.00	.89
X	Molybdenum - 0.15 - 0.25	.17
X	Silicon - 0.20 - 0.35	.23
X	Phosphorus - 0.04 MAX.	.005
X	Sulfur - 0.04 MAX.	.025
N/A	Boron -	
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
X Ultimate Tensile Strength - 125 KSI	143,000 (psi)
X 0.2% Offset Yield Strength - 105 KSI	128,000 (psi)
X Elongation - 16%	18.5 (%) (4XD)
X Reduction in area - 50%	58 (%)
X Hardness - NONE	298 BHN
X Impact - ASME NB-2300 (full size specimens)	56.0 (ft/lbs), 33 (MILS) *
N/A Proof Load -	

REMARKS: \*Average of 3 tests

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

Sen Hazra 12/16/87  
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Chris J. Beaudet 12-16-87  
REVIEWER

William A. Penn  
FINAL ACCEPTANCE

VENDOR

Thomas K. Co. & Co.  
TECHNICIAN  
Dr. Ashes  
QA/QC  
Thomas W. Bette  
APPROVED BY

MAR 1/26/88

FASTENER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-5N-AE-X-1.25

MATERIAL SPECIFICATION: SA-194 GR.7 ASME III CLASS 1 1974 EDITION

NO ADDENDA

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
X	Carbon - 0.38 - 0.48	.43
X	Chromium - 0.80 - 1.10	1.03
X	Manganese - 0.75 - 1.00	.72
X	Molybdenum - 0.15 - 0.25	.15
X	Silicon - 0.20 - 0.35	.22
X	Phosphorus - 0.04 MAX.	<.005
X	Sulfur - 0.04 MAX.	.036
N/A	Boron -	
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

MECHANICAL PROPERTIES

	Acceptance Criteria for Mechanical Specifications	ACTUAL MECHANICAL RESULTS
N/A	Ultimate Tensile Strength -	
N/A	0.2% Offset Yield Strength -	
N/A	Elongation -	
N/A	Reduction in area -	
X	Hardness - 248 - 352 BHN	298 BHN
X	Impact - NG 2300 (3/4 size specimens)	12.0 (ft/lbs), 9 (MILS)**
X	Proof Load - 175,000 Lbf	*

REMARKS: \*Unable to proof load due to limitations of testing machine (120,000 Lbs.) \*\*Average of 3 tests

1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.

2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

John H. Hager 12/21/87  
PREPARED BY

Chris J. Beaudet 12.21.87  
REVIEWER

Allen J. Smith  
FINAL ACCEPTANCE

VENDOR

Frank Lunt  
TECHNICIAN

Pharshes

QA/QC

Thomas W. Bate  
APPROVED BY



sent  
1/26/88

FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: *RBS-68-MS19-X-0.625*

MATERIAL SPECIFICATION: *SA-193 GR. B8, ASME III CL.1*  
*1977 ED. THRU 578 ADD.*

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - <i>0.08 MAX</i>	<u>.066</u>
<u>X</u>	Chromium - <i>18.00 - 20.00</i>	<u>18.53</u>
<u>X</u>	Manganese - <i>2.00 MAX</i>	<u>.81</u>
<u>N/A</u>	Molybdenum -	<u></u>
<u>X</u>	Silicon - <i>1.00 MAX</i>	<u>.65</u>
<u>X</u>	Phosphorus - <i>0.045 MAX</i>	<u>.030</u>
<u>X</u>	Sulfur - <i>0.030 MAX</i>	<u>.015</u>
<u>N/A</u>	Boron -	<u></u>
<u>N/A</u>	Copper -	<u></u>
<u>X</u>	Nickel - <i>8.00 - 12.00</i>	<u>8.79</u>
<u>N/A</u>	Vanadium -	<u></u>

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>Actual Mechanical Results</u>
<u>X</u>	Ultimate Tensile Strength - <i>75 KSI</i>	<u>90,500 (psi)</u>
<u>X</u>	0.2% Offset Yield Strength - <i>30 KSI</i>	<u>48,200 (psi)</u>
<u>X</u>	Elongation - <i>2<sup>n</sup></i> <i>30 %</i>	<u>61.5 (%) (4XD)</u>
<u>X</u>	Reduction in area - <i>50 %</i>	<u>73 (%)</u>
<u>X</u>	Hardness - <i>223 BHN MAX</i>	<u>185 BHN</u>
<u>N/A</u>	Impact -	<u></u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'YES' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

*J. H. Hazra 12/16/87*  
PREPARED

*Don Haddock 12-16-87*  
REVIEWER

*Allan J. Smith*  
FINAL ACCEPTANCE

VENDOR

*Wm. K. Conner*  
TECHNICIAN  
*OK*  
WCC  
*Thomas G. Bate*  
APPROVED BY



*1/26/88*

FASNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-6N-PK50-X-0.625

MATERIAL SPECIFICATION: SA-194 GR. 8 ASME III CLASS 1 1980 EDITION  
AND ADDENDA THRU SUMMER OF 82

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.08 MAX	.03
<u>X</u>	Chromium - 18.00 - 20.00	18.80
<u>X</u>	Manganese - 2.00 MAX	.84
<u>N/A</u>	Molybdenum -	
<u>X</u>	Silicon - 1.00 MAX	.61
<u>X</u>	Phosphorus - 0.045 MAX	.025
<u>X</u>	Sulfur - 0.030 MAX	.011
<u>N/A</u>	Boron -	
<u>N/A</u>	Cooper -	
<u>X</u>	Nickel - 8.00 - 10.50	9.53
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - 126 - 300 BHN	147 BHN
<u>N/A</u> Impact -	
<u>X</u> Proof Load - 18,080 LBF	18,080 Lbs.

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

PREPARED

REVIEWER

FINAL ACCEPTANCE

VENDOR

TECHNICIAN

QA/QC

APPROVED BY



1/26/88

FASTENER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-7B-BLG-X-0.25

MATERIAL SPECIFICATION: SA-307 GR. A ASME III CLASS 1 1980 EDITION

AND ADDENDA THRU SUMMER OF 82

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - <u>NONE</u>	<u>.25</u>
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - <u>NONE</u>	<u>.73</u>
<u>N/A</u>	Molybdenum -	
<u>X</u>	Silicon - <u>NONE</u>	<u>.090</u>
<u>X</u>	Phosphorus - <u>0.06 MAX.</u>	<u>.021</u>
<u>X</u>	Sulfur - <u>0.15 MAX.</u>	<u>.013</u>
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Tensile Strength - <u>1900 LBA</u>	<u>2,460 Lb.</u>
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - <u>121 - 241 BHN</u>	<u>217 BHN</u>
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

Ken Babbitt 12-21-87  
PREPARED

Ken Babbitt 12/21/87  
REVIEWER

Ken Babbitt 1/26/88  
FINAL ACCEPTANCE

VENDOR

Ken Babbitt  
INSPECTOR  
Ken Babbitt  
QA/QC  
Ken Babbitt  
APPROVED BY



PASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-7N-AM10F2-X-0.25

MATERIAL SPECIFICATION: SA-307 GR. B ASME III CLASS 2 1974 EDITION  
SUMMER OF 74 ADDENDUM

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - NONE	<u>.09</u>
<u>N/A</u>	Chromium -	<u></u>
<u>X</u>	Manganese - NONE	<u>.52</u>
<u>N/A</u>	Molybdenum -	<u></u>
<u>X</u>	Silicon - NONE	<u>&lt;.01</u>
<u>X</u>	Phosphorus - 0.12 MAX.	<u>.007</u>
<u>X</u>	Sulfur - 0.15 MAX.	<u>.011</u>
<u>N/A</u>	Boron -	<u></u>
<u>N/A</u>	Copper -	<u></u>
<u>N/A</u>	Nickel -	<u></u>
<u>N/A</u>	Vanadium -	<u></u>

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	<u></u>
<u>N/A</u> 0.2% Offset Yield Strength -	<u></u>
<u>N/A</u> Elongation -	<u></u>
<u>N/A</u> Reduction in area -	<u></u>
<u>X</u> Hardness - 121-212 BHN	<u>189 BHN</u>
<u>N/A</u> Impact -	<u></u>
<u>X</u> Proof Load - 2850 LBS.	<u>2,850 Lb.</u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

Sen Hazra 12/16/87  
PREPARED

Chris J. Beaudet 12/16/87  
REVIEWER

Allen P. Smith  
FINAL ACCEPTANCE

VENDOR

Thomas K. Carr  
TECHNICIAN

Okraszes

QA/QC

Thomas W. Bate  
APPROVED BY

PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-8B-H95-X-1.0

MATERIAL SPECIFICATION: SA 325 TYPE 1 ASME III CLASS 1 1974 EDITION  
AND ADDENDUM THRU SUMMER OF 74

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.27 MIN.	<u>.42</u>
<u>N/A</u>	Chromium -	<u></u>
<u>X</u>	Manganese - 0.47 MIN.	<u>.77</u>
<u>N/A</u>	Molybdenum -	<u></u>
<u>N/A</u>	Silicon -	<u></u>
<u>X</u>	Phosphorus - 0.048 MAX.	<u>.005</u>
<u>X</u>	Sulfur - 0.058 MAX.	<u>.016</u>
<u>X</u>	Boron - NONE	<u>&lt;.001</u>
<u>N/A</u>	Copper -	<u></u>
<u>N/A</u>	Nickel -	<u></u>
<u>N/A</u>	Vanadium -	<u></u>

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u> Ultimate Tensile Strength - 72,700 LB.	<u>112,000 (psi)</u>
<u>N/A</u> 0.2% Offset Yield Strength -	<u>79,000 (psi)</u>
<u>N/A</u> Elongation -	<u>23 (%) (4XD)</u>
<u>N/A</u> Reduction in area -	<u>67 (%)</u>
<u>X</u> Hardness - 248 - 331 BHN	<u>262 BHN</u>
<u>N/A</u> Impact -	<u></u>
<u>N/A</u> Proof Load -	<u></u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

Mr. Nazra 12/16/87  
PREPARED

Chris J. Beaudet 12.16.87  
REVIEWER

Allan A. Shaw  
FINAL ACCEPTANCE

VENDOR

Kevin K. Condit  
TECHNICIAN

Phashes  
QA/QC

Thompson W. B. Jr.  
APPROVED BY



JEAN  
1/26/88

PASNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-8B-H95-4-1.0

MATERIAL SPECIFICATION: SA-325 TYPE 1 ASME III CLASS 1 1974 EDITION  
AND ADDENDUM THRU SUMMER OF 74

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
X	Carbon - 0.27 MIN.	.42
N/A	Chromium -	
X	Manganese - 0.47 MIN.	.58
N/A	Molybdenum -	
N/A	Silicon -	
X	Phosphorus - 0.048 MAX.	<.005
X	Sulfur - 0.058 MAX.	.020
X	Boron - NONE	<.005
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
X Ultimate Tensile Strength - 72,700 LB.	116,000 (psi)
N/A 0.2% Offset Yield Strength -	87,000 (psi)
N/A Elongation -	22 (%) 4XD
N/A Reduction in area -	65 (%)
X Hardness - 248-331 BHN	269 BHN
N/A Impact -	
N/A Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

John Hazia 12/16/87  
PREPARER

Chris J. Beaudet 12-16-87  
REVIEWER

Allen J. Smith  
FINAL ACCEPTANCE

VENDOR

Thomas K. Klotz  
TECHNICIAN  
Thomas K. Klotz  
QV/QC  
Thomas K. Klotz  
APPROVED BY



PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-8N-T4L-X-1.0

MATERIAL SPECIFICATION: SA-194 GR. 2H ASME III CLASS I 1974 EDITION  
AND ADDENDUM THREE SUMMER OF 78

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
X	Carbon - 0.40 MIN.	.45
N/A	Chromium -	
N/A	Manganese -	
N/A	Molybdenum -	
N/A	Silicon -	
X	Phosphorus - 0.040 MAX.	<.005
X	Sulfur - 0.050 MAX.	.034
N/A	Boron -	
N/A	Copper -	
N/A	Nickel -	
N/A	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
N/A	Ultimate Tensile Strength -	
N/A	0.2% Offset Yield Strength -	
N/A	Elongation -	
N/A	Reduction in area -	
X	Hardness - 248-352 BHN	258 BHN
N/A	Impact -	
X	Proof Load - 106,000 LBF	*

REMARKS: \*unable to proof load due to limitations of equipment.

- 1) Acceptance Criteria are based on the mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU  
Mr. Hazra 12/16/87  
PREPARED  
Chris J. Beaudet 12.16.87  
REVIEWER  
William S. [Signature]  
FINAL ACCEPTANCE

VENDOR  
[Signature]  
TECHNICIAN  
[Signature]  
QA/QC  
Thomas W. [Signature]  
APPROVED BY

1/26/88

PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-9B-0U-X-0.375  
MATERIAL SPECIFICATION: ASTM A 307 GRA, 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - <u>NONE</u>	<u>.19</u>
<u>NA</u>	Chromium -	
<u>X</u>	Manganese - <u>NONE</u>	<u>.51</u>
<u>NA</u>	Molybdenum -	
<u>X</u>	Silicon - <u>NONE</u>	<u>.023</u>
<u>X</u>	Phosphorus - <u>0.06 MAX</u>	<u>.009</u>
<u>X</u>	Sulfur - <u>0.15 MAX</u>	<u>.021</u>
<u>NA</u>	Boron -	
<u>NA</u>	Copper -	
<u>NA</u>	Nickel -	
<u>NA</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Tensile Strength - <u>4650 LBF</u>	<u>7,300 Lb.</u>
<u>NA</u>	0.2% Offset Yield Strength -	
<u>NA</u>	Elongation -	
<u>NA</u>	Reduction in area -	
<u>X</u>	Hardness - <u>121-241 BHN</u>	<u>226 BHN</u>
<u>NA</u>	Impact -	
<u>NA</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU  
Ben Hall 12-28-87  
PREPARED  
Ben Haza 12/21/87  
REVIEWER  
Allen  
FINAL ACCEPTANCE

VENDOR  
Ben Haza  
TECHNICIAN  
Phonew  
QC/QC  
APPROVED BY

11/26/87

PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-9N·X·X - 0.375

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1979

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.40 MIN	.42
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	.019
<u>X</u>	Sulfur - 0.050 MAX	.022
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u>	Ultimate Tensile Strength -	
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 248 - 352 BHN	277 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

MC Hays 12/16/87  
PREPARER

Don Harrell 12-16-87  
REVIEWER

Allen A. Sen  
FINAL ACCEPTANCE

VENDOR

Thomas W. Bate  
TECHNICIAN  
ON/OC  
APPROVED BY

PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-103-PS-X-O.5

MATERIAL SPECIFICATION: ASTM A-307 TYPE A 1980

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - <u>NONE</u>	<u>.17</u>
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - <u>NONE</u>	<u>.56</u>
<u>N/A</u>	Molybdenum -	
<u>X</u>	Silicon - <u>NONE</u>	<u>.11</u>
<u>X</u>	Phosphorus - <u>0.06 MAX.</u>	<u>.012</u>
<u>X</u>	Sulfur - <u>0.15 MAX.</u>	<u>.015</u>
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u> Tensile Strength - <u>8500 LBF</u>	<u>13,275 Lb.</u>
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - <u>121-241 BHN</u>	<u>223 BHN</u>
<u>N/A</u> Impact -	
<u>N/A</u> Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

Am. H. H. 12-21-87  
PREPARED

M. W. Nazra 12/21/87  
REVIEWER

Am. H. H. 12/21/87  
FINAL ACCEPTANCE

VENDOR

Ken K. G. 12/21/87  
TECHNICIAN

Dr. K. S. 12/21/87  
QAC

Thomas W. G. 12/21/87  
APPROVED BY



FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-10N-P-X-0.5

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1981

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.40 MIN	.42
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	.012
<u>X</u>	Sulfur - 0.050 MAX	.011
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - 248 - 352 BHN	306 BHN
<u>N/A</u> Impact -	
<u>N/A</u> Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

PREPARED

REVIEWER

FINAL ACCEPTANCE

VENDOR

TECHNICIAN

QA/QC

APPROVED BY

1/2/88  
1/2/88

PASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-11B-BIS-X-0.50

MATERIAL SPECIFICATION: ASTM A-325 TYPE 1 1980

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.27 MIN.	.42
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - 0.47 MIN.	.79
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.048 MAX.	.004
<u>X</u>	Sulfur - 0.058 MAX.	.011
<u>X</u>	Boron - NONE	<.001
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

Acceptance Criteria for Mechanical Specifications

		<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Ultimate Tensile Strength - 17,050 LB.	21,050 Lb.
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 248-331 BHN	289 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

Mark Hays 12/16/87  
PREPARED BY

Chris J. Beaulieu 12-16-87  
REVIEWER

NEW  
1/26/88

Alfred J. Smith  
FINAL ACCEPTANCE

VENDOR

Thomas W. Bort  
TECHNICIAN  
Thomas W. Bort  
QA/QC  
APPROVED BY



FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-11N-JS-X-0.5

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1980

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.40 MIN	.45
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	.004
<u>X</u>	Sulfur - 0.050 MAX	.032
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u>	Ultimate Tensile Strength -	
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 248-352 BHN	274 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

M. W. Hazra 12/16/87  
PREPARED

Ron Halden 12-16-87  
REVIEWER

Allen P. Smith  
FINAL ACCEPTANCE

VENDOR

Thomas W. Bate  
INSPECTOR  
Thomas W. Bate  
QA/QC  
APPROVED BY



JEAN  
1/26/88

FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-12B-AS-X-0.75

MATERIAL SPECIFICATION: ASTM A-325 TYPE 1 1981

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.27 MIN.	<u>.27</u>
<u>N/A</u>	Chromium -	<u></u>
<u>X</u>	Manganese - 0.47 MIN.	<u>.74</u>
<u>N/A</u>	Molybdenum -	<u></u>
<u>N/A</u>	Silicon -	<u></u>
<u>X</u>	Phosphorus - 0.048 MAX.	<u>.015</u>
<u>X</u>	Sulfur - 0.058 MAX.	<u>.021</u>
<u>N/A</u>	Boron -	<u></u>
<u>N/A</u>	Copper -	<u></u>
<u>N/A</u>	Nickel -	<u></u>
<u>N/A</u>	Vanadium -	<u></u>

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Ultimate Tensile Strength - 40,100 LBF	<u>47,500 (Lb)</u>
<u>N/A</u>	0.2% Offset Yield Strength -	<u></u>
<u>N/A</u>	Elongation -	<u></u>
<u>N/A</u>	Reduction in area -	<u></u>
<u>X</u>	Hardness - 248-331 BHN	<u>298 BHN</u>
<u>N/A</u>	Impact -	<u></u>
<u>N/A</u>	Proof Load -	<u></u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

M. N. Hayes 12/16/87  
PREPARED BY

Don Helled 12-16-87  
REVIEWER

Allen P. Sami  
FINAL ACCEPTANCE

VENDOR

Frank Carr  
TECHNICIAN

Phashes  
QA/QC

Thomas W. Bustin  
APPROVED BY

N/A  
1/26/88

FASNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-12N-BIS-X-0.75

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - <u>0.40 MIN</u>	<u>.42</u>
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - <u>0.040 MAX</u>	<u>&lt;.005</u>
<u>X</u>	Sulfur - <u>0.050 MAX</u>	<u>.012</u>
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - <u>248 - 352 BHN</u>	<u>281 BHN</u>
<u>N/A</u> Impact -	
<u>X</u> Proof Load - <u>58,450 LBF</u>	<u>36,000 Lb.</u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

M. V. Hager 12/17/87  
PREPARED

Don Hager 12-17-87  
REVIEWER

Allen J. Smith  
FINAL ACCEPTANCE

VENDOR

Thomas K. Canto  
TECHNICIAN  
Chasches  
QA/QC  
Thomas W. Byle  
APPROVED BY

2000  
11/26/88

PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-12N-BIS-Y-0.75

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - <u>0.40 MIN</u>	<u>.42</u>
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - <u>0.040 MAX</u>	<u>.014</u>
<u>X</u>	Sulfur - <u>0.050 MAX</u>	<u>.013</u>
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - <u>248 - 352 BHN</u>	<u>281 BHN</u>
<u>N/A</u> Impact -	
<u>X</u> Proof Load - <u>58,450 LBF</u>	<u>54,600 Lb.</u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

Rev. Hagera 12/17/87

PREPARER

Ron Hagera 12-17-87

REVIEWER

Allen J. Smith

FINAL ACCEPTANCE

VENDOR

RECEIVED

QA/QC

APPROVED BY

Rev 11/24/88



PASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-13B-BIS-Y-0.875

MATERIAL SPECIFICATION: ASTM A-325 TYPE 1 1981

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.27 MIN	.40
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - 0.47 MIN	.59
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.048 MAX	.031
<u>X</u>	Sulfur - 0.058 MAX	.014
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Ultimate Tensile Strength - 55,450 LBF.	132,000 (psi)
<u>N/A</u>	0.2% Offset Yield Strength - (Point Yield)	105,000 (psi)
<u>N/A</u>	Elongation -	19 (%) 4XD
<u>N/A</u>	Reduction in area -	62 (%)
<u>X</u>	Hardness - 248 - 331 BHN	293 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

Ken Nazra 12/16/87  
PREPARED

Ken Nazra 12-16-87  
REVIEWER

Allen S. Smith  
FINAL ACCEPTANCE

VENDOR

Ken Nazra  
TECHNICIAN

Ken Nazra  
QA/QC

Thomas W. Bate  
APPROVED BY



MEM  
1/26/88

FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-13N-BIS-X-0.875

MATERIAL SPECIFICATION: ASTM A-563 GR. C 1978A

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
<u>X</u>	Carbon - 0.55 MAX	.16
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.12 MAX	<.005
<u>X</u>	Sulfur - 0.15 MAX	.012
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

Acceptance Criteria for Mechanical Specifications

		ACTUAL MECHANICAL RESULTS
<u>N/A</u>	Ultimate Tensile Strength -	
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 143 - 352 BHN	207 BHN
<u>N/A</u>	Impact -	
<u>X</u>	Proof Load - 144 KSI	66,528 Lbs.
	OR 66,528 LBF	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



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Ron Haddock 12-16-87  
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Allan [Signature]  
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TECHNICIAN  
[Signature]  
QA/QC  
[Signature]  
APPROVED BY

new  
1/26/88

PASINER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-143-SG-X-0.875

MATERIAL SPECIFICATION: ASTM A-325 TYPE 1 1976C

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
<u>X</u>	Carbon - 0.27 MIN	.36
<u>N/A</u>	Chromium	
<u>X</u>	Manganese - 0.47 MIN	.76
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.048 MAX	.015
<u>X</u>	Sulfur - 0.058 MAX	.010
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	Acceptance Criteria for Mechanical Specifications	ACTUAL MECHANICAL RESULTS
<u>X</u>	Ultimate Tensile Strength - 55,450 LBF OR 120,000 PSI	130,000 (psi)
<u>N/A</u>	0.2% Offset Yield Strength - 103,000 (psi) OR 92,000 (psi)	* 88,888 9B
<u>N/A</u>	Elongation - 16 (%) (4XD)	* 16 9B
<u>N/A</u>	Reduction in area - 54 (%)	* 54 9B
<u>X</u>	Hardness - 248 - 331 BHN	298 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

\*information not required

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

Men Dazra 12/16/87  
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Allen P. D...  
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VENDOR

Thomas W. B...  
TECHNICIAN

Thomas W. B...  
APPROVED BY

MEM  
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PASINER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-14N-BIS-X-0.875  
MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.40 MIN	.58
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	.015
<u>X</u>	Sulfur - 0.050 MAX	.014
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u>	Ultimate Tensile Strength -	
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 248-352 BHN	311 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

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REVIEWER

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QA/QC

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PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-153-BIS-X-0.375  
MATERIAL SPECIFICATION: ASTM A-449, 1980

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.25 - 0.58	<u>.43</u>
<u>N/A</u>	Chromium -	<u>                    </u>
<u>X</u>	Manganese - 0.57 MIN.	<u>.88</u>
<u>N/A</u>	Molybdenum -	<u>                    </u>
<u>N/A</u>	Silicon -	<u>                    </u>
<u>X</u>	Phosphorus - 0.048 MAX.	<u>.005</u>
<u>X</u>	Sulfur - 0.058 MAX.	<u>.008</u>
<u>N/A</u>	Boron -	<u>                    </u>
<u>N/A</u>	Copper -	<u>                    </u>
<u>N/A</u>	Nickel -	<u>                    </u>
<u>N/A</u>	Vanadium -	<u>                    </u>

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Ultimate Tensile Strength - 9,300 LB.	<u>10,850 (Lb)</u>
<u>N/A</u>	0.2% Offset Yield Strength -	<u>                    </u>
<u>N/A</u>	Elongation -	<u>                    </u>
<u>N/A</u>	Reduction in area -	<u>                    </u>
<u>X</u>	Hardness - 255 - 321 BHN	<u>302 BHN</u>
<u>N/A</u>	Impact -	<u>                    </u>
<u>N/A</u>	Proof Load -	<u>                    </u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

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VENDOR  
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Dr. Rashes  
QA/QC  
Thomas W. B. Jr.  
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1/26/88

FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-15N-M-X-0.375

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1980

CHEMICAL COMPOSITION (wt%)

Required Test	ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION	ACTUAL CHEMICAL RESULTS
<u>X</u>	Carbon - 0.40 MIN	.46
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	<.005
<u>X</u>	Sulfur - 0.050 MAX	.012
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	Acceptance Criteria for Mechanical Specifications	ACTUAL MECHANICAL RESULTS
<u>N/A</u>	Ultimate Tensile Strength -	
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 248 - 352 BHN	293 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

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PASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-163-XX-X-1.25  
MATERIAL SPECIFICATION: ASTM A-574 1986

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.31 TO 0.50	.47
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.035 MAX	.013
<u>X</u>	Sulfur - 0.035 MAX	.009
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u> AXIAL Tensile Strength - 165,000 LBF	203,000 (psi)
<u>N/A</u> 0.2% Offset Yield Strength - OR 170,278 PSI	188,000 (psi)
<u>N/A</u> Elongation -	13 (%) (4XD)
<u>N/A</u> Reduction in area -	50 (%)
<u>X</u> Hardness - 37 TO 45 HRC	43.5 Rockwell C
<u>N/A</u> Impact -	
<u>N/A</u> Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



GSU

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FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-16N-BIS-X-1.25

MATERIAL SPECIFICATION: ASTM A-563 GR.0H 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.18 - 0.58	.44
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - 0.57 MIN	.75
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.048 MAX	.007
<u>X</u>	Sulfur - 0.058 MAX	.018
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - 248-352 BHN	220 BHN
<u>N/A</u> Impact -	
<u>X</u> Proof Load - 175 KSI	*

\*Unable to proof load due to limitations of testing machine (120,000 lbs).

- REMARKS:
- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
  - 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

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Next  
1/26/88

FASNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-16N-BIS-Y-1.25

MATERIAL SPECIFICATION: ASTM A-563 GR.0H 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.18 - 0.58	.44, .44*
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - 0.57 MIN	.58
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.048 MAX	<.005
<u>X</u>	Sulfur - 0.058 MAX	.016
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

\*recheck

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - 248-352 BHN	277 BHN
<u>N/A</u> Impact -	
<u>X</u> Proof Load - 175 KSI	*

REMARKS: \*Unable to proof load due to limitations of testing machine (120,000 Lbs.)

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

John H. Hays 12/16/87  
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Don H. Hays 12-16-87  
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Allen J. Hays  
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VENDOR

Thomas W. Bate  
INSPECTOR  
QA/QC  
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NEW  
11/24/88

FASTNER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-17B-XX-X-0.5

MATERIAL SPECIFICATION: ASTM A-307 GR. A 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - NONE	<u>.076</u>
<u>N/A</u>	Chromium -	<u></u>
<u>X</u>	Manganese - NONE	<u>.60</u>
<u>N/A</u>	Molybdenum -	<u></u>
<u>X</u>	Silicon - NONE	<u>.16</u>
<u>X</u>	Phosphorus - 0.06 MAX.	<u>.008</u>
<u>X</u>	Sulfur - 0.15 MAX.	<u>.017</u>
<u>N/A</u>	Boron -	<u></u>
<u>N/A</u>	Copper -	<u></u>
<u>N/A</u>	Nickel -	<u></u>
<u>N/A</u>	Vanadium -	<u></u>

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Tensile Strength - <u>8500 LBF</u>	<u>12,900 lb.</u>
<u>N/A</u>	0.2% Offset Yield Strength -	<u></u>
<u>N/A</u>	Elongation -	<u></u>
<u>N/A</u>	Reduction in area -	<u></u>
<u>X</u>	Hardness - <u>121 - 241 BHN</u>	<u>235 BHN</u>
<u>N/A</u>	Impact -	<u></u>
<u>N/A</u>	Proof Load -	<u></u>

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



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TECHNICIAN  
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PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-17N-P-X-0.5

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1981

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.40 MIN	.41
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	.010
<u>X</u>	Sulfur - 0.050 MAX	.011
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u>	Ultimate Tensile Strength -	
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>Y</u>	Hardness - 248 - 352 BHN	311 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

M. H. Haza 12/16/87  
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PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-183-TB-X-0.875

MATERIAL SPECIFICATION: ASTM A-193 GR. B1 1981

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.37-0.49	.45
<u>X</u>	Chromium - 0.75-1.20	1.03
<u>X</u>	Manganese - 0.65-1.10	.87
<u>X</u>	Molybdenum - 0.15-0.25	.19
<u>X</u>	Silicon - 0.15-0.35	.17
<u>X</u>	Phosphorus - 0.035 MAX	<.005
<u>X</u>	Sulfur - 0.040 MAX	.022
<u>NA</u>	Boron -	
<u>NA</u>	Copper -	
<u>NA</u>	Nickel -	
<u>NA</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u>	Ultimate Tensile Strength - 125 KSI MIN	145,000 (psi)
<u>X</u>	0.2% Offset Yield Strength - 105 KSI MIN	136,000 (Point Yield) (psi)
<u>X</u>	Elongation - 16% MIN	18 (%) 4XD
<u>X</u>	Reduction in area - 50% MIN	61 (%)
<u>X</u>	Hardness - NONE	289 BHN
<u>NA</u>	Impact -	
<u>NA</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

GSU

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DRashes  
QA/QC  
Thomas W. Bate  
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sent  
1/16/88

PASTNER TEST RESULTS (IAE BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-18N-P-X-0.875

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1981

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.40 MIN	.48
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	.009
<u>X</u>	Sulfur - 0.050 MAX	.024
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u>	Ultimate Tensile Strength -	
<u>N/A</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 248 - 352 BHN	302 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

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PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-19B-DARL-X-1.75

MATERIAL SPECIFICATION: ASTM A-334 GR. 30, 1981 ED.

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.33 TO 0.55	.36
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX	.013
<u>X</u>	Sulfur - 0.045 MAX	.021
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

	<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>NA</u>	Ultimate Tensile Strength -	
<u>NA</u>	0.2% Offset Yield Strength -	
<u>N/A</u>	Elongation -	
<u>N/A</u>	Reduction in area -	
<u>X</u>	Hardness - 311 - 352 BHN	351 BHN
<u>N/A</u>	Impact -	
<u>N/A</u>	Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



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PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-19N-BIS-X-1.75

MATERIAL SPECIFICATION: ASTM A-563 GR.0H 1982

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.18 - 0.58	.51
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - 0.57 MIN	.89
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.048 MAX	.018
<u>X</u>	Sulfur - 0.058 MAX	.021
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - 248 - 352 BHN	248 BHN
<u>N/A</u> Impact -	
<u>X</u> Proof Load - 175 KSI	*

\*Unable to proof load due to limitations of testing machine (120,000 Lbs).

- REMARKS:
- Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
  - Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE

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PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RGS-203-APS-X-0.5

MATERIAL SPECIFICATION: ASTM A-307 TYPE A 1980

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - <u>NONE</u>	<u>.14</u>
<u>N/A</u>	Chromium -	
<u>X</u>	Manganese - <u>NONE</u>	<u>.54</u>
<u>N/A</u>	Molybdenum -	
<u>X</u>	Silicon - <u>NONE</u>	<u>.13</u>
<u>X</u>	Phosphorus - <u>0.06 MAX.</u>	<u>.011</u>
<u>X</u>	Sulfur - <u>0.15 MAX.</u>	<u>.014</u>
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>X</u> Tensile Strength - <u>8500 LBF</u>	<u>8,500 (Lb)</u>
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - <u>121 - 241 BHN</u>	<u>238 BHN</u>
<u>N/A</u> Impact -	
<u>N/A</u> Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



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PASTER TEST RESULTS (I&E BULLETIN 87-02)

SAMPLE IDENTIFICATION: RBS-20N-P-X-0.5

MATERIAL SPECIFICATION: ASTM A-194 GR. 2H 1981

CHEMICAL COMPOSITION (wt%)

<u>Required Test</u>	<u>ACCEPTANCE CRITERIA FOR CHEMICAL COMPOSITION</u>	<u>ACTUAL CHEMICAL RESULTS</u>
<u>X</u>	Carbon - 0.40 MIN.	.40
<u>N/A</u>	Chromium -	
<u>N/A</u>	Manganese -	
<u>N/A</u>	Molybdenum -	
<u>N/A</u>	Silicon -	
<u>X</u>	Phosphorus - 0.040 MAX.	.013
<u>X</u>	Sulfur - 0.050 MAX.	.011
<u>N/A</u>	Boron -	
<u>N/A</u>	Copper -	
<u>N/A</u>	Nickel -	
<u>N/A</u>	Vanadium -	

MECHANICAL PROPERTIES

<u>Acceptance Criteria for Mechanical Specifications</u>	<u>ACTUAL MECHANICAL RESULTS</u>
<u>N/A</u> Ultimate Tensile Strength -	
<u>N/A</u> 0.2% Offset Yield Strength -	
<u>N/A</u> Elongation -	
<u>N/A</u> Reduction in area -	
<u>X</u> Hardness - 248-352 BHN	314 BHN
<u>N/A</u> Impact -	
<u>N/A</u> Proof Load -	

REMARKS:

- 1) Acceptance Criteria are based on the above mentioned ASTM/ASME material specification.
- 2) Items to be tested are checked 'X' under the column 'REQUIRED TEST'  
N/A = NOT APPLICABLE



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ATTACHMENT 4

ENGINEERING EVALUATION

1 of 7

1. SAMPLE: RBS-1B-75-X-1.25

MATERIAL SPECIFICATION: SA-193 GR B6, ASME III,  
Class-1 1977 Edition, thru  
summer 78, Addenda.

SIZE: 1 1/4" x 5 1/4" long bolt

VENDOR: Lone Star Screw, P.O. Box 15211, Houston,  
TX 77020

MANUFACTURER: Takenaka Seisakusho Co, Ltd,  
Higshiosaka Plant, Japan.

REQUIREMENT: C = 0.15% Max; Cr = 11.50 - 13.50%; Ultimate Tensile  
(UT) = 110 ksi  
Yield Point (YP) = 85 ksi

LAB RESULT: Sample 'x': C = 0.16%; Cr = 11.17%; UT = 105 ksi; YP  
= 83.5 ksi  
Sample 'y3': C = 0.16%; & 0.14%; Cr = 12.12%; UT =  
106 ksi; YP = 82 ksi

SAFETY EVALUATION: The SA-193 Grade B6 bolts are acceptable for use  
at RBS because the minimum yield point found was  
82.0 ksi. The allowable stress for the material  
is 28.3 ksi at 100°F (Reference ASME III,  
Division 1, Appendix I, Table I-1.3). The  
minimum yield point found in test is 2.9 times  
greater than the code allowable value of 28.3  
ksi. In addition, the RBS design stress level  
has been limited to the code allowable as  
defined in the RBS USAR, paragraph 3.9.3.1.4.A.  
The minor variations in Chromium contents  
(11.17-12.12%) is insignificant and has no  
deleterious effect on the structural integrity  
of the bolt. The 0.16% Carbon content falls  
within the + or -0.01% tolerance allowed for the  
material (Ref. ASTM A.29, Table 6).  
Microstructure analysis of the specimen revealed  
the acceptable quenched and tempered structure  
of a B-6 material.

ATTACHMENT 4

ENGINEERING EVALUATION

2 of 7

2. SAMPLE: RBS-1N-19-X-1.25

MATERIAL SPECIFICATION: SA-194 GR 6, ASME III, Class-1, 1974  
Edition thru summer 1978, Addenda.

SIZE: 1 1/4" HVY HX Nut

VENDOR: Gulfalloy Inc, P.O. Box-52518, Houston, TX-77052

MANUFACTURER: Takenaka Seisakusho Co, Ltd, Higashiosaka Plant,  
Japan

REQUIREMENT: (Hardness: 228-271 BHN/20-28 Rc)

LAB RESULT: Sample 'x': = (227 BHN/20.5 Rc)  
Sample 'x3': = (227 BHN/20.0 Rc)

SAFETY EVALUATION: The hardness test performed by Massachusetts Material Research was in Rockwell C Scale, however, the test requirements were given using the Brinnel Hardness scale. The average Rc hardness reported by the test laboratory for sample x was 20.5 and for sample x3 was 20.0 which is within the range (20-28 Rc) required by SA-194, Gr 6. The conversion of the Rc values to Brinnel values resulted in the BHN value of 227 versus the required value of 228. The Rockwell hardness results indicate that the material is within the specification requirements.

ATTACHMENT 4

ENGINEERING EVALUATION

3 of 7

3. SAMPLE: RBS-8B-H95-X-1.0

MATERIAL SPECIFICATION: SA-325 Type 1, ASME III, Class-1, 1974  
Edition thru summer 74, Addenda.

SIZE: 1" x 3" long bolt.

VENDOR: Lone Star Screw, P.O. Box 297515, Houston, TX 77297.

MANUFACTURER: Bethelchem Steel Corp., Lebanon Plant.

REQUIREMENT: Ultimate Tensile (UT) = 120 ksi  
Yield Point (YP) = 92 ksi  
Boron (B) = No Requirement

LAB RESULT: Sample 'x': UT = 112 ksi  
YP = 79 ksi  
B less than .001%  
Sample 'y': UT = 116 ksi  
YP = 87 ksi  
B less than .005%

SAFETY EVALUATION: The SA325 Type 1 bolts are acceptable for use at RBS. The minimum yield point found during testing was 79 ksi and the allowable stress for this material is 40.48 ksi (Reference ASME III, Division 1-Subsection NA, Appendix XVII, Table XVII-2461.1-1). This type and size bolt was used on large bore (1-1/4-in and large) pipe supports. The pipe supports were designed using stiffness criteria as opposed to maximum allowable stress levels. The stiffness criteria is very conservative. Review of maximum stress in large bore supports designed by stiffness criteria revealed actual stresses one-tenth of the code allowable stress. The presence of Boron is not prohibited by the material specification and has no deleterious effect on the structural integrity of this bolt.

ATTACHMENT 4

ENGINEERING EVALUATION

4 of 7

4. SAMPLE: RBS-13B-BIS-X-0.875

MATERIAL SPECIFICATION: ASTM A 325 Type 1, 1981.

SIZE: 7/8" x 3 1/2" long bolt.

VENDOR: Hardware Specialty Co, 48-75, 36th St, Long Island City,  
N.Y 11101

MANUFACTURER: Bethlehem Steel, Lebanon Plant

REQUIREMENT: Ultimate Tensile (UT) = 120 ksi  
Yield Point (YP) = 92 ksi

LAB RESULT: Sample 'x': UT = 115 ksi  
YP = 88.5 ksi  
'y' UT = 132 ksi  
YP = 105 ksi

SAFETY EVALUATION: The A325 Type 1 bolts are acceptable for use at RBS because the minimum yield point found during testing was 88.5 ksi. The allowable stress for this material is 44.0 ksi (AISC Handbook, 8th edition, Table 1.5.2.4). An actual safety factor of 2.0 provides reasonable assurance that the bolt will perform as intended under all design conditions when the conservative design methods and load cases used in construction of RBS are considered. Test of the second sample demonstrated yield and ultimate tensile strengths that exceeded the specification requirements. These bolts were used for the erection of structural steel. Connections were designed to equal or exceed the uniform load capacity of the structural member to which it is connected (Reference RBS specification 210.310, page 1-29; and AISC Handbook, 8th Edition, page 4-13). Therefore the structural member will be the weaker of the two components, and a yield point slightly below the ASTM specification will not degrade the integrity of the structure.

ATTACHMENT 4

ENGINEERING EVALUATION

5 of 7

5. SAMPLE: RBS-12N-BIS-X-0.75

MATERIAL SPECIFICATION: ASTM A-194 GR 2H, 1982

SIZE: 3/4" Galvanized HVY HX

VENDOR: Hardware Specialty Co, 48-75, 36th St, Long Island City,  
N.Y 11101

MANUFACTURER: Bethlehem Steel, Lebanon Plant

REQUIREMENT: Proof Load = 58, 450 lb

LAB RESULT: Sample 'x': UT = 36,000 lb  
Sample 'y': UT = 54,600 lb

SAFETY EVALUATION: The ASTM A-194 Grade 2H nuts are acceptable for use at RBS as demonstrated by the Chemistry and hardness tests. The hardness of the test specimen was measured as 29.5 Rockwell C (approximately 281 BHN) which is within the required specification range of 24-38 Rc (248-352 BHN). The only variance in the verification of the material capabilities was the low proof load value. The low proof load values apparently resulted from the use of an undersized mandrel. The stripped nut showed that the shearing of the thread occurred approximately at the mid-point of the threads rather than at the full depth of the thread. The hot-dipped galvanized nuts are threaded using an oversize tap to provide adequate clearance for the coating layer thicknesses on both the bolt and the nut. However the test mandrel was not sized accordingly. The hot-dipped galvanized nuts are used only with galvanized ASTM A325, Type 1 bolts at RBS which assures proper fit of bolt to nut. In addition, the metallographic evaluation indicates proper microstructure and heat treatment for Grade 2H material. On this basis, the nuts exceed the application requirements at RBS.

ATTACHMENT 4

ENGINEERING EVALUATION

6 of 7

6. SAMPLE: RBS-16N-BIS-X-1.25

MATERIAL SPECIFICATION: ASTM A563 GR DH, 1982

SIZE: 1 1/4" HVY HX Nut

VENDOR: Hardware Specialty Co, 48-75 36th St, Long Island City, NY  
11101

MANUFACTURER: Bethlehem Steel, Lebanon Plant

REQUIREMENT: Hardness 248-352 BHN

LAB RESULT: Sample 'x': Hardness 220 BHN  
Sample 'y': Hardness 277 BHN

SAFETY EVALUATION: The ASTM A563 Grade DH nuts are acceptable for use at RBS. The hardness found on sample x is 220 BHN which is below the minimum requirement of 248 BHN. The nut dimensions are such that the shear area of the threads is greater than the tensile stress area of the bolt by more than 100% (Reference ASM Handbook, Volume I Page 176). For ASTM A-370 Table 3A, the 220 BHN (96.5  $R_B$ ) converts to a tensile strength of approximately 103 ksi which is equivalent to 133,000 lbf. The ASTM A563 Grade DH nuts are used with ASTM A325 and A193, Grade B7 bolts at RBS. The A325 bolt has a tensile strength of 105,000 lbf. An A193 Grade B7 bolt has a tensile strength of 125,000 lbf. The tensile strength of the nut (133,000 lbf) exceeds the tensile strength of either of the two bolts and is acceptable for use in these applications. Moreover, the hardness found on sample y is 277 BHN which satisfies the minimum hardness requirement of 248 BHN.

ATTACHMENT 4

ENGINEERING EVALUATION

7 of 7

7. SAMPLE: RBS-5N-AE-X-1.25

MATERIAL SPECIFICATION: SA-194 GR7, ASME III, Class 1, 1974  
Edition. No Addenda.

SIZE: 1 1/4" HVY HX.

VENDOR: Galfalloy, Inc, P.O. Box 52518, Houston, TX 77052

MANUFACTURER: JOH Smit, P.O. Box 75 2980 AB, Ridderkerk, Holland

REQUIREMENT: Manganese (Mn) = 0.75 - 1.00%  
Lateral Expansion = 25 mil

LAB RESULT: Charpy = 12 ft/lb, Lateral Expansion = 9 mil  
Mn = 0.72%

SAFETY EVALUATION: The Charpy impact test is considered invalid  
because of the following reasons:

Test coupons could not be prepared in accordance with the requirements of ASME III, paragraph NB 2322. The nut was insufficient in size to prepare a standard Charpy impact test coupon, therefore the test result is provided for information only. The finished nut sample is not suitable for impact testing due to specimen size restrictions. The normal impact specimen orientation as required by ASME III is axial, i.e., parallel to the major direction of hot working. The specimen orientation, along with the non-standard specimen configuration may have contributed to the low impact test values.

The chemical composition and hardness test results demonstrate the acceptability of the material for use at RBS. The 0.03% deviation in the Manganese content is permissible by ASTM A-29 Table 6. A review of the sample microstructure revealed tempered martensite structure which is considered normal for this material.