B. Ralph Sylvia
Senior Vice President

Detroit Edison

6400 North Dixie Highway
Newport, Michigan 48166
(313) 586-4150

August 18, 1988
NRC-88-0197

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

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) NRC Bulletin No. 87-02,
"Fastener Testing to Determine
Conformance with Applicable
Material Specifications" dated
November 6, 1987

3) Detroit Edison Letter to NRC, "Response
to NRC Bulletin No. 87-02", NRC-88-0003,
dated January 14, 1988

4) Supplements 1 and 2 to the NRC
Bulletin No. 87-02, dated
April 22, 1988 and June 10, 1988

Subject: Response to Supplements 1 and 2 to NRC
Bulletin 87-02, and Submittal of Testing
Results for Additional Fastener Sample

This letter is to submit Detroit Edison Company's response to Supplement 1 and 2 to Bulletin 87-02 (Reference 4), and to transmit testing results for an additional fastener sample selected in response to Bulletin 87-02.

Enclosure 1 provides a list of manufacturers and suppliers from which safety-related and non safety-related fasteners, under the scope of Supplement 1 and 2 to Bulletin 87-02, may have been purchased for Fermi 2 within the past 10 years. Information concerning manufacturer is not available for the cases where a supplier is not a manufacturer.

Enclosure 2 provides testing results for another sample of fasteners selected with the participation of the NRC Senior Resident Inspector, as committed in Reference 3. Further evaluation of a previous sample is also provided with this enclosure.

IE57
1/1

If you have any questions, please contact Mr. Girija Shukla at (313) 586-4270.

Sincerely,

B Ralph Sylvia

Enclosures

cc: Mr. A. B. Davis
Mr. R. C. Knop
Mr. T. R. Quay
Mr. W. G. Rogers

I, B. RALPH SYLVIA, do hereby affirm that the foregoing statements are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

B. RALPH SYLVIA
Senior Vice President

On this 18th day of August, 1988, before me personally appeared B. Ralph Sylvia, being first duly sworn and says that he executed the foregoing as his free act and deed.

Marcia Buck
Notary Public

MARCIA BUCK
Notary Public, Washtenaw County, MI
My Commission Expires Jan. 11, 1992

Acting in Monroe County, Mi

ENCLOSURE 1

LIST OF MANUFACTURERS AND SUPPLIERS

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Acme Bolt & Nut Co. 414 S. Oakwood Detroit, MI 48217	Bolt 18-8-SS	Yes
Acme Bolt & Nut Co.	Bolts ASTM A-193 GR B7	No
Acme Bolt & Nut Co.	Nut 18-8-SS	Yes
Acme Bolt & Nut Co.	Bolts C.S. Slotted	No
Acme Bolt & Nut Co.	Carriage Bolts C.S. GR5	Yes
Acme Bolt & Nut Co.	Machine Bolts C.S. GR5	Yes
Acme Bolt & Nut Co.	Machine Screws SS W/Hex HD Nut	Yes
Acme Bolt & Nut Co.	Nuts C.S.	No
Acme Bolt & Nut Co.	Sheet Metal Screws	No
All Metal Screw Prod. 1150 E. 9 Mile Rd. Ferndale, MI 48220	Bolts & Nuts S.S.	No
All State Fastener 14495 E. 8 Mile Rd. Warren, MI 48092	Nuts & Bolts ASTM A-325	Yes
All State Fastener	Head Cap Screw Zinc Gr.2	No
All State Fastener	Hex Nuts Zinc	No
All State Fastener	Nuts & Screws C.S.	No
All State Fastener	Shoulder Screw Alloy Steel	No
All State Fastener	Bolt A-325 w/Nut	Yes
All State Fastener	Bolt A-490 w/Nut	Yes
All State Fastener	Bolts ASTM F467-81	No
All State Fastener	Bolts ASTM A-193 GRB-7	Yes
All State Fastener	Bolts ASTM A-325	Yes
All State Fastener	Nuts ASTM A-563 GRC	Yes
All State Fastener	Screw UNC-2A	No
All State Fastener	Treaded Rod ASTM A-307 GRB	Yes
All State Fastener	Pan Head Screw CAD.	No
All State Fastener	5/8" Hex Nuts & 3/4" Bolt A325	No
All State Fastener	Bolt SAE GR 2	No
All State Fastener	Bolt Steel Cad PLTD	No
All State Fastener	Bolt w/Nut ASTM A-307	No
All State Fastener	Bolts Cad. PLTD	No

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
All State Fastener	Bolts S.S. ASTM A-193 GR B-8	Yes
All State Fastener	Capscrews	No
All State Fastener	Nut Steel Cad PLTD	No
All State Fastener	Nut Steel Zinc CTD	Yes
All State Fastener	Nuts & Bolts Zinc	Yes
All State Fastener	Nuts ASTM A-194	Yes
All State Fastener	Nuts S.S. ASTM A-194 GR. B	Yes
All State Fastener	Nuts Zinc	No
All State Fastener	Nuts-Ansi B18.2.2	Yes
All State Fastener	Screw	Yes
All State Fastener	Screw Steel Cad PLTD	No
All State Fastener	Screws ANSI B18.3	No
All State Fastener	Screws Nickel Plated	No
All State Fastener	Screws Zinc ASTM A-307 GR.2	Yes
All State Fastener	Tek Screws	Yes
All State Fastener	Threaded Rod ASTM A-36	Yes
All State Fastener	Threaded Rod, Zinc	No
All State Fastener	Bolts S.S.	Yes
All State Fastener	Nuts S.S.	Yes
All State Fastener	#14 Screws	No
All State Fastener	1-1/2" Nuts and Bolts C.S.	No
All State Fastener	1-1/4" Screws, Cadmium	No
All State Fastener	1/2" Hex Nuts & Screws S.S.	No
All State Fastener	3/4" Hex Nuts A-194 B8	No
All State Fastener	3/4" Studs A-193 B8	No
All State Fastener	3/8" Galv Bolts	No
All State Fastener	5/8" Hex Bolts Mild Steel	No
All State Fastener	A193-87 Studs	No
All State Fastener	All-Threaded Rod ASTM A-36	Yes
All State Fastener	Bolts A-193 GRB8 Type 304	Yes
All State Fastener	Bolts ASTM A-307 GRA	Yes
All State Fastener	Cap Screw A-325	Yes
All State Fastener	Cap Screws ANSI B18.6.3	Yes
All State Fastener	Capscrew 18-8 S.S.	Yes
All State Fastener	Carriage Nut & Bolt ASTM A-307	Yes
All State Fastener	Coupling Nuts Zinc Plated	No
All State Fastener	Hex Nuts ASTM A-563	No
All State Fastener	Eye Bolt ASTM Z325	Yes
All State Fastener	Locknut UNC-2B	No.
All State Fastener	Nut 20 UNC-2B GR18-8 S.S.	Yes
All State Fastener	Nut ASTM A-563 GRA	Yes

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
All State Fastener	Nuts ASTM A-563 GRA	Yes
All State Fastener	Screw 20 UNC-3A GR18-8 S.S.	Yes
All State Fastener	Screw ASTM A-307	Yes
All State Fastener	Screw ASTM A-574	No
All State Fastener	Screws Zinc Coated	Yes
All State Fastener	Slotted Screw 18-8 S.S.	Yes
American Air Filter 17570 12 Mile Rd. Southfield, MI 48076	Screw Fastner	No
American Bolt & Sup 2244 E. 14 Mile Rd. Warren, MI 48092	1/2" Bolt Stainless Steel	No
American Bolt & Sup	1/2" Bolts, C.S.	No
American Bolt & Sup	5/8" Cap Screws	No
Atwood & Morrill 285 Canal St. Salem, MA 01970	Bolts	Yes
Atwood Ind 1315 Main Cleveland, OH 44113	3/8" Cap Screw	No
Atwood Ind.	1-1/2" Bolts, High Tensile	No
Atwood Ind.	1/2" Hex Nuts	No
Cardinal Ind Prod 3873 Cquendo Las Vegas, NV 89118	Bolt A-307	Yes
Cardinal Ind Prod	Bolt GR A ASTM A-307	Yes
Cardinal Ind Prod	Bolts ASTM A-325	Yes
Cardinal Ind Prod	Cap Screws SAE GR-5	Yes
Cardinal Ind Prod	Nut ASTM A-563	Yes

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Cardinal Ind Prod	Nuts, HEX A-325	Yes
Cardinal Ind Prod	3/8" Hex Bolts A-307 GR2	Yes
Cardinal Ind Prod	Nuts ASTM A-563 Type 307	Yes
Cardinal Ind Prod	Threaded Stock A-307	Yes
Cardinal Ind Prod	Bolts A-193 B-7	Yes
Cardinal Ind Prod	Bolts A-490	Yes
Cardinal Ind Prod	Nut 5/8" SS 304 ASTM A194GR8	Yes
Cardinal Ind Prod	Nuts A-194 2H	Yes
Cardinal Ind Prod	Nuts F-436	Yes
Cardinal Ind Prod	Bolt & Nuts S.S.	Yes
Chicago Bridge & Iron 20600 Chagrin Shaker Hts., OH 44122	Bolt SA-193 GRB7	Yes
Chicago Bridge & Iron	NUTS SA-194 GR4, 7 or 8 CL 2B	Yes
Chicago Bullet Equip 2250 Western Ave. Prk Forest, IL 60466	1/4"/20 Hex Nuts	No
Colt Ind 701 Lawton Av. Beloit, WI 53511	Bolts	Yes
Colt Ind	Capscrews	Yes
Colt Ind	Locknuts	Yes
Crane Co. 884 South Broadway Salem, OH 44460	316 SS Screws	No
Dragon Valves 13457 Excelsier Norwalk, CA 90650	Capscrew	No

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
English Electric 500 Executive Blvd. Elmsford, NY 105?3	//8" Studs, British Std	No
English Electric Fermi 2 Monroe, MI 48161	Bolts, B.F.	No
English Electric	Bolts, Coupling & Nuts	No
English Electric	Bolts, Fitted	No
English Electric	Bolts, Off	No
English Electric	Caps, Hex Head w/Nuts	No
English Electric	Nuts BSF	No
English Electric	Nuts, Full 8 U.N.	No
English Electric	Nuts, Lock 8 U.N.	No
English Electric	Screw, Jacking BSP	No
English Electric	Screw, RSE Carriage	No
English Electric	Screw, S.S. Hex Head	No
English Electric	Screws, Hex	No
English Electric	Screws, Set	No
English Electric	Studs, Nuts	No
English Electric	Studs, Nuts, Screws BSF	No
F. B. Wright Co. 9999 Mercier Dearborn, MI 48121	Hex Nut	Yes
General Electric 12000 Globe Rd. Livonia, MI 48150	2" Bolts, ASTM A-307A	No
General Electric 8157 S. Cass Ave. Darien, IL 60559	Bolts ASTM A-193 B7	No
General Electric	Nuts ASTM-194	No
General Electric	Studs ASTM	No

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Gould Pumps Inc STE 3222 30600 Tele Birmingham, MI 48010	Cap Screws ASTM A-193 GR B7	Yes
Gould Pumps Inc	Nus ASTM A-194-2H	Yes
Gould Pumps Inc	Split Ring ASTM A-108 GR 1213	Yes
GPE Controls 6511 W. Oakton Morton Grv., IL 60053	Hex Bolts	Yes
Hilti 37473 Schoolcraft Livonia, MI 48150	Hex Nuts	No
Ingersoll Rand 888 Industrial Elmhurst, IL 60106	Bolts	No
Ingersoll Rand	Bolts,Coupling	No
Ingersoll Rand 22122 Telegraph Southfield, MI 48075	Coupling Bolts w/Nuts	No
Interstate Fastner 32458 W. 8 Mile Rd. Farmington, MI 48024	Bolt, Machine	No
Interstate Fastner	Nut, Hex Head	No
Interstate Fastener	Bolt, Hex Head w/Nut	No
Interstate Fastener	Nuts & Bolts A-307	No
Interstate Fastener	Bolts, Machine	No
Interstate Fastener	Nuts, Hex Head	No
Interstate Fastener	Bolts, A-325	No

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Interstate Fastener 6051 Telegraph Toledo, OH 43612	Nuts & Bolts ASTM A-325	Yes
ITT Grinnell 26155 Trolly Dr. Taylor, MI 48180	Nuts SA-194-2H	Yes
ITT Grinnell	Stud SA-193 GR B7	Yes
Johnston Pump Co. 154 Eisenhower LN.S. Lombard, IL 60148	Capscrews, Allen	No
Joy Manufacturing 338 S. Broadway New Phil., OH 44663	Nuts	No
Kilbourn Eng. Co 9226 W. Blagg Ave Milwaukee, WI 53225	Nuts ASTM A-194	Yes
Kilbourn Eng. Co.	Nuts, Jam	Yes
Kilbourn Eng.Co.	Studs ASTM A 193 GR B7	No
Kilbourn Eng. Co.	All Thread Bolt ASTM A-325	Yes
Kilbourn Eng. Co.	Bolt ASTM A-193 GR B7	Yes
Kilbourn Eng. Co.	Bolts ASTM A-307	Yes
Kilbourn Eng. Co.	Capscrew ASTMA-193	Yes
Kilbourn Eng. Co.	Nuts ASTM A-194 GR 2H	Yes
Kilbourn Eng. Co.	Nuts ASTM A-325	Yes
Kilbourn Eng. Co.	Nuts ASTM A-563	Yes
Kilbourn Eng. Co.	Bolts ASTM A-325	Yes
Kilbourn Eng. Co.	Bolts ASTM A-490	Yes

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Lone Star Screw P.O. Box 15211 Houston, TX 77020	Bolt W/Nut ASTM A-325	Yes
Lone Star Screw	Nuts & Studs GR-25 AE	Yes
Lone Star Screw	Misc Nuts & Screws S.S.	Yes
Marley Cooling TWR 1500 N. Stephenson Royal Oak, MI 48068	3/8-16 NC x 1-1/4" Cap Screws SS	Yes
MCC Powers Regulator 3400 Oakton Skokie, IL 60076	Bolt	Yes
McCalley Tool & Sup 2874 Farmington Rd. Livonia, MI 48150	Bolt, Hex Head	No
McCalley Tool & Sup	Nuts, Hex Head	No
McMaster Carr P.O. Box 4355 Chicago, IL 60680	Button Head Socket 18-8 SS	No
McMaster Carr	Cap Screw	No
McMaster Carr	Capscrew GR5 Zinc	Yes
McMaster Carr	Locknut	Yes
McMaster Carr	Nuts	No
McMaster Carr	Screw Zinc Gr. 5	Yes
McMaster Carr	Threaded Rod SS	No
McMaster Carr	Bolts Zinc GR. 2	Yes
McMaster Carr	Nuts Zinc	Yes
McMaster Carr	Screws Zinc	No

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Metric Components 8228 W. 47th St. Lyons, IL 60534	Bolt & Nut BSF	No
Metric Components	BSW Screws	No
Monroe Welding 810 W. Front St. Monroe, MI 48161	Nuts & Bolts ASTM A-325	Yes
Monroe Welding	Bolt A-325	No
Monroe Welding	Nuts	No
Monroe Welding	Studs	No
Premier Ind. 513 N. Dixie Hwy. Monroe, MI 48161	1-1/8" Hex Nut A-193 B7	No
Premier Ind.	Bolts, A-193 B7	No
Premier Ind.	T-Bolt & Nut	Yes
Quality BDG/THRD Co. 5140 Stanton Detroit, MI 48208	Nuts & bolts ASTM A-325	yes
Rexnord Ind. 22150 Greenfield Rd. Oak Park, MI 48237	Bolt, Coupling	No
Rexnord, Inc.	Nut, Lock	No
Schrieber Mfg. Co. 1400 W. 14 Mile Rd. Clawson, MI 48017	HH Nut	No
Schrieber Mfg.Co.	T-Bolt	No

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Spadone Mach. Co. 507 Westport Ave. Norwalk, CA 90650	Bolt Hext, Nut,S.S.	No
Suburban Bolt & Supp. 27670 Groesbeck Roseville, MI 48066	Hex Nut S.S.	No
Talley Fastener 1616 Construction Dr. Kalamazoo, MI 49001	Bolt ASTM A-325	Yes
Talley Fastener	Bolts & Nuts	Yes
Talley Fastener	Bolts ASTM A-307 GR B	Yes
Talley Fastener	Nuts ASTM A-194	Yes
Talley Fastener	Nuts ASTM A-307 GR B	Yes
Talley Fastener	Nuts SA-194	Yes
Talley Fastener	Stud SA-193 GR B7	Yes
Talley Fastener	Studs ASTM A-193-B7	Yes
Talley Fastener	Bolts & Nuts SS	No
Talley Fastener	Nuts & Screws Zinc or Cad. PL	No
Texas Bolt P.O.Box 121? Houston, TX 77001	Nuts, ASTM A-194	Yes
Texas Bolt	Nuts, ASTM A-194-2H	Yes
Texas Bolt	Studs, ASTM A-193	Yes
Trans Delaval 30161 Southfield Southfield, MI 48076	1-3/4" Bolts & Nuts	No
U.S. Fastner Corp. 8100 Schoolcraft Detroit, MI 48238	2" ASTM 325 Gal Bolts	No

FASTENER MANUFACTURER AND SUPPLIER LIST FOR FERMI 2

SUPPLIER	ITEM	SAFETY RELATED
Wayne Bolt & Nut 14471 Livernois Detroit, MI 48238	Bolt GR18-8 S.S.	No
Wayne Bolt & Nut	Screw Cad PLTD Stl	No
Wayne Bolt & Nut	Bolt & Nut A-325	No
Williams Form Eng. Co. 1501 Madison Ave. Grand Rpds., MI 49507	Nuts, Hex	Yes
Y. C. Smith 900 Tower Dr. Troy, MI 48098	Bolts/Nuts	No

ENCLOSURE 2

TESTING RESULTS FOR ADDITIONAL SAMPLE OF FASTENERS AND FURTHER EVALUATION OF A PREVIOUS SAMPLE

o **Response to Bulletin 87-02 Action Nos. 2 through 4**

Forty (40) different samples were obtained from stock in warehouse A and B, with the participation of the NRC Senior Resident Inspector. Of the selected samples, 30 were sent to Detroit Edison's Engineering Research Laboratory and 10 were sent to Consumers Power Company for testing per NRC Bulletin 87-02 Action No. 4.

Identification system for samples is as follows.

```
E  F  2  x  x  -  x
.  .  .  .  .     .
|  |  |  |  |     |.........Sample Unique Number
|  |  |  |  |
|  |  |  |  |.............B-Bolt or Stud
|  |  |  |                N-Nut
|  |  |  |
|  |  |  |................Q-Safety Related
|  |  |                   N-Non-Safety Related
|  |  |
|..|..|..................Fermi 2 Power Plant
```

Fasteners testing data and fasteners test reports are given in Attachment 1 and 2, respectively.

o **Response to Bulletin 87-02 Action Nos. 5 and 6**

The results of tests are provided under Test Reports as requested per requisition tabled below.

Test Report	Requisition
88C71-6	685-360
87C71-7 Rev. 1	685-361
88C71-8	685-362
FEM project 138854-101-001	685-359

Summary sheets have been completed for each sample and are provided in Attachment 2.

Based upon test reports all but four samples were found to meet the requisite specification requirements. Engineering Research Report 88C63-7 has evaluated these four test results and found two test results for samples EF2ND-3 and EF2ND-6 having only typographical errors. These samples did meet the specification requirements. Sample EF2NN-1 is acceptable for use with the exception that the nut should not be welded. These are non-safety related nuts that are used in non-safety related applications. Sample EF2QB-4 was found to be having lower carbon content but determined to be acceptable for its intended use. Based on these conclusions the use of these fasteners is acceptable and do not adversely impact the quality or safety of the plant. Thus, the recommendation for additional testing to determine the variability of the bolt lot was not followed.

As per Engineering Research report 88C71-6 samples EF2QN3 and 6 were found to be out of Specification for carbon content (0.398 and 0.399 vs. 0.4 minimum). However, the review indicated that this insignificant variation from Specification does not adversely impact the quality of the sample and all other properties met the Specification requirements. Thus, this sample was concluded to be acceptable for its intended use.

o **Further Evaluation of the Previous Sample No. DENB-9**

Enclosure 2 of Reference 3 stated that per Engineering Research Report 87C71-21, Revision 2, Sample No. DENB-9 was found to be much harder than the Specification requirements and is being further evaluated by the Detroit Edison Engineering Research Department.

Two more samples from the same bin were tested and per Engineering Research Report 88C71-6 found to demonstrate the same physical and chemical properties as the sample DENB-9. By further investigation of paperwork and inquiring with the vendor, it was identified that though grade-2 or equivalent bolts were requested, grade-8 bolts were ordered and received. These high strength fasteners are susceptible to failure by stress corrosion cracking. However, it was concluded by calculations that stress corrosion cracking will not be expected for these bolts due to their use in grade-2 applications. Of the 100 pieces bought, 6 have been used in the plant, 3 were destroyed in the test, and 91 still in stock are being scrapped. Since these bolts are being scrapped, the recommendation for additional testing to verify stress corrosion cracking resistance was not followed.

Those used in the plant are non-safety related bolts in non-safety related applications and do not adversely impact the quality or safety of the plant. No further action is required on this sample.

ATTACHMENT 1

Fasteners Testing Data Sheets

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QB-1 P.O.#317976 REQ.#5-586937

Fastener Description: 1/2" -13x3" STUD

Description of Sample Stock Location: B1-RR-4E

Material Specification as Documented by Licensee Records:
SA193 GR. B7 ASME III CL.2

Head Marking (Specification and Manufacturer): KB7/XXZ

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: SAME

Manufacturer: KILBOURN ENGINEERING CO. INC. 9226 W. FLAGG AVE.
MILWAUKEE, WI. 53225

QA Requirements Imposed on Vendor: STANDARD ATTACHMENT 11A, ASME III CL 2
1971/WINTER 1972

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

QUALITY ASSURANCE PROCUREMENT CONDITIONS - NUCLEAR SAFETY-RELATED

SHIPPING IDENTIFICATION: All material shipped against this order must be tagged with the Edison purchase order and item number or with the Edison number so that identification is clear. Similarly, the packing slip must identify all items included in the shipment so that comparison may be made against the Edison purchase order. All communication on this order must be in the English language. To expedite payment of your invoice, each line item invoiced must reference the corresponding purchase order line item and Edison number if applicable. Failure to comply with any of these requirements may constitute cause to reject a shipment.

NO SUBSTITUTIONS TO THIS P.O. No substitutions are authorized. Should the vendor be unable to fill this purchase order exactly as written and in compliance with the referenced specifications and codes, the vendor shall promptly notify Detroit Edison Company in writing prior to proceeding with the questionable item. Alteration or modification of the requirements of this purchase order can be made only by a written change to this purchase order. Upon receipt, this order will be inspected for conformance to requirements. Non-conforming items will be rejected.

CERTIFICATE OF CONFORMANCE: The vendor shall provide a certificate of conformance stating that the items furnished meet the requirements of this purchase order.

RIGHT OF ACCESS: Upon request, personnel from Detroit Edison Company or its authorized agent shall be permitted access to the vendors or his subtier supplier's facilities and records (other than commercial grade vendors) for the purpose of performing inprocess inspections, final inspections or other inspections and audit activities pertinent to the items ordered herein. The vendor shall advise Detroit Edison Company of any advance notice requirements which must be met in order to gain access to said premises.

FEDERAL REG., PART 21: Work performed on this purchase order involves a safety related item, defined by Edison as QA Level I, for installation in a nuclear power plant and is subject to the requirements of Title 10 Code of Federal Regulations, Part 21. In particular we draw your attention to Paragraph 21.21 (A) (1) (ii).

ANSI 45.2.2: This shipment shall be prepared in such a manner as to ensure arrival at the destination in an undamaged condition and shall conform to ANSI N 45.2.2. "Packaging Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants" for Level B storage. Each part shall be packaged for long term storage, with adequate moisture protection required.

QUALITY ASSURANCE PROCUREMENT CONDITIONS - NUCLEAR SAFETY-RELATED

ANSI N45.2 - 1977: The vendor/manufacturer and subtier supplier shall ensure that they have implemented a quality assurance program that meets or exceeds all requirements of ANSI N45.2 - 1977 "Quality Assurance Requirements for Nuclear Power Plants", in addition to other codes and standards listed.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QB-2 P.O.#317898 REQ.#5-586738

Fastener Description: 1-1/8" -12x6-1/4" BOLT

Description of Sample Stock Location: B1-NN-2B

Material Specification as Documented by Licensee Records:
SA193 GR.B7 ASME III CL.1

Head Marking (Specification and Manufacturer): B S B7 LICS

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: G.E. CO. 175 CURTNER AVE. SAN JOSE, CALIF. 95125

Manufacturer: BETHLEHEM STEEL

QA Requirements Imposed on Vendor: STANDARD ATTACHMENT 13A, ASME III CL.1

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

GE SPARE PARTS CONTRACT - NUCLEAR SAFETY-RELATED ITEMS

SHIPPING IDENTIFICATION: All material shipped against this order must be tagged with the Edison purchase order and item number or with the Edison number so that identification is clear. Similarly, the packing slip must identify all items included in the shipment so that comparison may be made against the Edison purchase order. All communication on this order must be in the English language. To expedite payment of your invoice, each line item invoiced must reference the corresponding purchase order line item and Edison number if applicable. Failure to comply with any of these requirements may constitute cause to reject a shipment.

GENERAL ELECTRIC CONTRACT: This purchase order shall be processed in accordance with General Electric and Detroit Edison Spare Parts Contract 1E-86783. All special requirements must be specified or if no special requirements, this also must be specified to purchaser in writing prior to shipment.

NO SUBSTITUTIONS TO ORIGINAL P.O.: No substitutions are authorized. Should the vendor be unable to fill this purchase order exactly as written and in accordance with the requirements of the original purchase order, the vendor shall promptly notify Detroit Edison Company in writing prior to proceeding with the questionable item. Such notification shall provide a statement of the code, design or other process change and justification for attesting to the functional equivalency of the item to that furnished with the original equipment. Alterations or modification of the requirements of this purchase order can be made only by a written change to this purchase order. Upon receipt, this order will be inspected for conformance to requirements. Non-conforming items will be rejected.

FEDERAL REG., PART 21: Work performed on this purchase order involves a safety-related item, defined by Edison as QA Level I, for installation in a nuclear power plant and is subject to the requirements of Title 10 Code of Federal Regulations, Part 21. In particular we draw your attention to Paragraph 21.21 (A) (1) (11).

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QB-3 P.O.#296178 REQ.#5-490676

Fastener Description: 1-1/4" -7x3-3/4" CAP SCREW

Description of Sample Stock Location: B1-UU-38A

Material Specification as Documented by Licensee Records: ASTM A449

Head Marking (Specification and Manufacturer):  DARLING

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: WM. POWELL CO. P.O. BOX 14006 2503 SPRING GROVE AVE.
CINCINNATI, OHIO 45214

Manufacturer: N/A — Not Available.

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QB-4 P.O.#149481 REQ.#606-890

Fastener Description: 1/2" -13x1-1/2" BOLT

Description of Sample Stock Location: B1-UU-380

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer):  LE

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: HUB INC. 2146 FLINTSTONE DR. TUCKER, GEORGIA 30085

Manufacturer: CARDINAL PRODUCTS INC. 3873 WEST OQUENDO
LAS VEGAS, NEVADA 89118

QA Requirements Imposed on Vendor: CERT. OF CONFORMANCE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

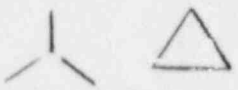
Fastener Testing Data Sheet

* Sample ID# EF2QB-5 REQ.#587016

Fastener Description: 1-1/4" -7x8 BOLT

Description of Sample Stock Location: WHSE A (1B)

Material Specification as Documented by Licensee Records: ASTM A449

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: N/A - Not Available

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W.
CLEVELAND, OHIO 44435

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QB-6 REQ.#527736

Fastener Description: 3/4" -10x2" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: ASTM A325

Head Marking (Specification and Manufacturer):  A325

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: GENERAL FASTENERS CO., 11820 GLOBE RD, LIVONIA, MI. 48150

Manufacturer: N/A — Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QB-7 REQ.#587016

Fastener Description: 1/2" -13x1-1/4" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records:
SAE J429 GR.5

Head Marking (Specification and Manufacturer):  USF 

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: N/A - Not Available.

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W.
CLEVELAND, OHIO 44435

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

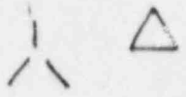
Fastener Testing Data Sheet

* Sample ID# EF2QB-8 REQ.#491301

Fastener Description: 5/16" -24x1-1/2" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: N/A — Not Available

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W., CLEVELAND, OHIO 44135

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature _____ Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

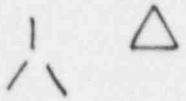
Fastener Testing Data Sheet

* Sample ID# EF2QB-9 REQ.#414577

Fastener Description: 5/8" -18x1" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records:
SAE J429 GR.5

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: ALL-STATE FASTENER CORPORATION 14495 EIGHT MILE RD.
P.O. BOX 356 EAST DETROIT, MI. 48021

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W.,
CLEVELAND, OHIO 44135

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

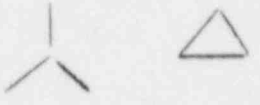
Fastener Testing Data Sheet

* Sample ID# EF2QB-10 REQ.#587016

Fastener Description: 7/8" -9x4" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: N/A - Not Available

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W., CLEVELAND, OHIO 44135

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-1 P.O.#142816 REQ.#R0256436

Fastener Description: 1-1/8"-7 NUT

Description of Sample Stock Location: B1MM3C

Material Specification as Documented by Licensee Records:
SA194 GR.B7 ASME III CL.1

Head Marking (Specification and Manufacturer): K7B AUX

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: SAME

Manufacturer: KILBOURN ENGINEEERING CO. INC. 9226 W. FLAGG AVE.
MILWAUKEE, WI. 53225

QA Requirements Imposed on Vendor: CMTR W/STATEMENT OF HEAT TREATMENT, CHARPY V-NOTCH TEST, MAGNETIC PARTICLE OR LIQUID PENETRANT EXAMINATION REPORT, C OF C TO ASME III CL. 1

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-2 P.O.#129663 REQ.#R0256435

Fastener Description: 7/8" -9 NUT

Description of Sample Stock Location: B1WW9E.

Material Specification as Documented by Licensee Records:
SA 194 GR.2H ASME III CL.1

Head Marking (Specification and Manufacturer): 2HB (X18)HEAT

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: TIOGA PIPE SUPPLY CO. INC. 2450 WHEATSHEAF LANE
P.O. BOX 5997 PHILADELPHIA, PA. 19137

Manufacturer: VITCO NUCLEAR PRODUCTS, INC. 4445 HAMANN PKWY.
WILLOUGHBY, OHIO 44094

QA Requirements Imposed on Vendor: STANDARD ATTACHMENT 16B

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

EF20N-2

ASME PROCUREMENT CONDITIONS - NUCLEAR SAFETY-RELATED

SHIPPING IDENTIFICATION: All material shipped against this order must be tagged with the Edison purchase order and item number or with the Edison number so that identification is clear. Similarly, the packing slip must identify all items included in the shipment so that comparison may be made against the Edison purchase order. All communication on this order must be in the English language. To expedite payment of your invoice, each line item invoiced must reference the corresponding purchase order line item and Edison number if applicable. Failure to comply with any of these requirements may constitute cause to reject a shipment.

NO SUBSTITUTIONS TO THIS P.O.: No substitutions of [redacted] are authorized. Should the vendor be unable to fill this purchase order exactly as written and in accordance with the referenced specifications and codes, the vendor shall promptly notify Detroit Edison Company in writing prior to proceeding with the questionable item. Such notification shall provide a statement of the code, design or other process change and justification for attesting to the functional equivalency of the item to that specified by this order. Alterations or modification of the requirements of this purchase order can be made only by a written change to this purchase order. Upon receipt, this order will be inspected for conformance to requirements. Nonconforming items will be rejected. If referenced, this order must also be filled in accordance with the requirements of the original Purchase Order.

CERTIFICATE OF CONFORMANCE TO THIS P.O. AND ASME III: The vendor shall provide a Certificate of Conformance stating that the items furnished meet the requirements of this purchase order, and if referenced, the requirements of Edison's original purchase order, and that the material meets the requirements of the ASME Boiler Pressure Vessel Code, Section III, subsections NB-(Class-1), NC-(Class-2), or ND-(Class-3) as applicable for each line item. The vendor shall meet the requirements of the ASME Code Section III, 1971 and winter addenda 1972 or an equal later edition. The year and addenda of the ASME Code for which each line item is manufactured shall be identified. When an original purchase order is referenced, the vendor shall list the original and current purchase order numbers on the Certificate of Conformance.

RIGHT OF ACCESS: Upon request, personnel from Detroit Edison Company or its authorized agent shall be permitted access to the vendor's or his subtier supplier's facilities and records (other than commercial grade vendors) for the purpose of performing inprocess inspections, final inspections or other inspections and audit activities pertinent to the items ordered herein. The vendor shall advise Detroit Edison Company of any advance notice requirements which must be met in order to gain access to said premises.

EF2BN-2

ASME PROCUREMENT CONDITIONS - NUCLEAR SAFETY-RELATED

FEDERAL REG., PART 21: Work performed on this purchase order involves a safety-related item, defined by Edison as QA Level 1, for installation in a nuclear power plant and is subject to the requirements of Title 10 Code of Federal Regulations, Part 21. In particular we draw your attention to Paragraph 21.21 (a) (1) (ii).

ANSI N45.2.2: This shipment shall be prepared in such a manner as to ensure arrival at the destination in an undamaged condition and shall conform to ANSI N45.2.2. "Packaging Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants" for Level B storage. Each part shall be packaged for long term storage, with adequate moisture protection required.

ANSI N45.2 - 1977: The vendor/manufacturer and subtier supplier shall ensure that they have implemented a quality assurance program that meets or exceeds the applicable sections and elements of ANSI N45.2 - 1977 "Quality Assurance Requirements for Nuclear Power Plants", in addition to other codes and standards listed.

NONCONFORMANCES: Nonconformances shall contain a proposed disposition and be sumitted for approval to: Detroit Edison, 6400 North Dixie Highway, Newport, MI 48166, Attention: Approval Control (136 EF2 NOC).

The transmittal letter should reference the Edison PO number. The following types of nonconformances shall be submitted:

a. Nonconformance to technical or material requirements.

b. Nonconformance to vendor documents previously approved by Edison.

c. Nonconformance to original requirements even though the item can be restored to a condition such that the capability of the item to function is unimpaired.

A copy of the Edison approved nonconformance shall be shipped with the item.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-3 P.O.#A118500 REQ.#415-475

Fastener Description: 5/8" -11 NUT

Description of Sample Stock Location: B1-UU-11C

Material Specification as Documented by Licensee Records: ASTM A194 GR.2H

Head Marking (Specification and Manufacturer): 2H T EQ44

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: WM. POWELL CO. 2503 SPRING GROVE RD.
P.O BOX 145434 CINCINNATI, OHIO 45214

Manufacturer: TEXAS BOLT CO. P.O. BOX 1211 HOUSTON, TEXAS 77001

QA Requirements Imposed on Vendor: SEE ATTACHED

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

CF2GN-3

CERTIFICATIONS - 1) CERTIFICATE OF CONFORMANCE - ALL ITEMS
2) CMTR's WITH HEAT TREAT REPORTS - ALL ITEMS
3) ~~M/T, RT, AND PT INSPECTION REPORTS - ITEM 1~~ S-1

ASME REQUIREMENTS - The Manufacturer shall meet the requirements of the ASME BOILER PRESSURE VESSEL CODE, Section III, 1971 EDITION AND WINTER ADDENDA, AND SHALL PROVIDE CERTIFICATION TO THESE REQUIREMENTS.
N-2 CODE DATA REPORT REQUIRED.

R. Lane 4/19/84
noted BBS 5-2-84

EF20N-3

CERTIFICATE OF CONFORMANCE

THE VENDOR SHALL PROVIDE A CERTIFICATE OF CONFORMANCE STATING THAT THE ITEMS ORDERED HEREIN MEET THE REQUIREMENTS OF THIS PURCHASE ORDER.

EF2ON-3

RIGHT OF ACCESS

UPON REQUEST, PERSONNEL FROM DETROIT EDISON COMPANY OR ITS AUTHORIZED AGENT SHALL BE PERMITTED ACCESS TO THE VENDORS OR HIS SUBTEIR SUPPLIER'S FACILITIES AND RECORDS FOR THE PURPOSE OF PERFORMING INPROCESS INSPECTIONS, FINAL INSPECTIONS, OR OTHER INSPECTIONS AND AUDIT ACTIVITIES PERTINENT TO THE ITEMS ORDERED HEREIN. THE VENDOR SHALL ADVISE DETROIT EDISON COMPANY OF ANY ADVANCE NOTICE REQUIREMENTS WHICH MUST BE MET IN ORDER TO GAIN ACCESS TO SAID PREMISES.

FEDERAL REG., PART 21 EF2QN-3

WORK PERFORMED ON THIS PURCHASE ORDER INVOLVES A SAFETY RELATED ITEM, DEFINED AS QA LEVEL I, FOR INSTALLATION IN A NUCLEAR POWER PLANT AND IS SUBJECT TO THE REQUIREMENTS OF TITLE 10 CODE OF FEDERAL REGULATIONS, PART 21. IN PARTICULAR WE DRAW YOUR ATTENTION TO PARAGRAPH 21.21 (A) (1) (ii).

ANSI 45.2.2

EPRI N-3

THIS SHIPMENT SHALL BE PREPARED IN SUCH A MANNER AS TO ENSURE ARRIVAL AT THE DESTINATION IN AN UNDAMAGED CONDITION AND SHALL CONFORM TO ANSI N 45.2.2. "PACKAGING SHIPPING, RECEIVING, STORAGE AND HANDLING OF ITEMS FOR NUCLEAR POWER PLANTS" FOR LEVEL B STORAGE. EACH PART SHALL BE PACKAGED FOR LONG TERM STORAGE, WITH ADEQUATE MOISTURE PROTECTION REQUIRED.

ANSI N45.2 - 1977 EF2&N-3

THE VENDOR/MANUFACTURE AND SUBTIER SUPPLIER SHALL ENSURE THAT THEY HAVE IMPLEMENTED A QUALITY ASSURANCE PROGRAM THAT MEETS OR EXCEEDS ALL REQUIREMENTS OF ANSI N45.2 - 1977 "QUALITY ASSURANCE REQUIREMENTS FOR NUCLEAR POWER PLANTS", IN ADDITION TO OTHER CODES AND STANDARDS LISTED.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-4 P.O.#106235 REQ.#5575224

Fastener Description: 1-1/4" -8 NUT

Description of Sample Stock Location: B1F19B

Material Specification as Documented by Licensee Records:
SA194 GR.2H ASME III CL.3

Head Marking (Specification and Manufacturer): 2H P53

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: WM. POWELL CO. P.O BOX 145434 CINCINNATI, OHIO 45214

Manufacturer: TEXAS BOLT CO. 3233 WEST 11TH ST. P.O BOX 1211
HOUSTON, TEXAS 77001

QA Requirements Imposed on Vendor: STANDARD ATTACHMENT 16A, CMTR W/STATEMENT OF HEAT TREATMENT, C OF C TO P.O. 1E86734.

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

EF2BN-4

ASME PROCUREMENT CONDITIONS - NUCLEAR SAFETY-RELATED

SHIPPING IDENTIFICATION: All material shipped against this order must be tagged with the Edison purchase order and item number or with the Edison number so that identification is clear. Similarly, the packing slip must identify all items included in the shipment so that comparison may be made against the Edison purchase order. All communication on this order must be in the English language. To expedite payment of your invoice, each line item invoiced must reference the corresponding purchase order line item and Edison number if applicable. Failure to comply with any of these requirements may constitute cause to reject a shipment.

NO SUBSTITUTIONS TO ORIGINAL P.O.: No substitutions are authorized. Should the vendor be unable to fill this purchase order exactly as written and in accordance with the requirements of the original purchase order, the vendor shall promptly notify Detroit Edison Company in writing prior to proceeding with the questionable item. Such notification shall provide a statement of the code, design or other process change and justification for attesting to the functional equivalency of the item to that furnished with the original equipment. Alterations or modification of the requirements of this purchase order can be made only by a written change to this purchase order. Upon receipt, this order will be inspected for conformance to requirements. Non-conforming items will be rejected.

CERTIFICATE OF CONFORMANCE TO ASME: The vendor shall supply, with the material, a certificate of conformance stating that the items furnished meet the requirements of this purchase order and that the material meets the requirements of the ASME Boiler Pressure Vessel Code, Section III, subsections NB-(Class-1), NC-(Class-2) or ND-(Class-3) as applicable for each line item. The vendor shall meet the requirements of the ASME Code Section III, 1971 and winter addenda 1972 or an equal later edition. The year and addenda of the ASME Code for which each line item is manufactured shall be identified.

RIGHT OF ACCESS: Upon request, personnel from Detroit Edison Company or its authorized agent shall be permitted access to the vendor's or his subtier supplier's facilities and records (other than commercial grade vendors) for the purpose of performing inprocess inspections, final inspections or other inspections and audit activities pertinent to the items ordered herein. The vendor shall advise Detroit Edison Company of any advance notice requirements which must be met in order to gain access to said premises.

FEDERAL REG., PART 21: Work performed on this purchase order involves a safety-related item, defined by Edison as QA Level 1, for installation in a nuclear power plant and is subject to the requirements of Title 10 Code of Federal Regulations, Part 21. In particular we draw your attention to Paragraph 21.21 (A) (1) (ii).

100/R296/9.0
062884

EF2BN-4

ASME PROCUREMENT CONDITIONS - NUCLEAR SAFETY-RELATED

ANSI 45.2.2: This shipment shall be prepared in such a manner as to ensure arrival at the destination in an undamaged condition and shall conform to ANSI N 45.2.2. "Packaging Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants" for Level B storage. Each part shall be packaged for long term, storage, with adequate moisture protection required.

ANSI N45.2 - 1977: The vendor/manufacturer and subtier supplier shall ensure that they have implemented a quality assurance program that meets or exceeds all requirements of ANSI N45.2 - 1977 "Quality Assurance Requirements for Nuclear Power Plants", in addition to other codes and standards listed.

100/R290/9.12
062884

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-5 P.O.#1D50859 REQ.#C-3732-P

Fastener Description: 3/4" - 10 NUT

Description of Sample Stock Location: WHSE. A

Material Specification as Documented by Licensee Records: ASTM A563 GR.C

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: (CQ) SAFETY-RELATED

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

Supplier: INTERSTATE FASTENER 32458 W. 8 MILE RD.
FARMINGTON, MI. 46024

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE, DEDICATED UNDER REQ.#587-202.

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-6 P.O.#A119303 REQ.#5-415151

Fastener Description: 3/4" -10 [illegible]

Description of Sample Stock Location: B1WW9B

Material Specification as Documented by Licensee Records:
SA194 GR.2H ASME III CL.1

Head Marking (Specification and Manufacturer): 2H T P51

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: WM. POWELL CO. P.O. BOX 14006 CINCINNATI, OHIO 45214

Manufacturer: TEXAS BOLT CO. 3233 WEST 11TH ST. P.O. BOX 1211
HOUSTON, TEXAS 77001

QA Requirements Imposed on Vendor: C OF C ASME III CL.1, CMTR'S W/HEAT TREAT REPORT, CERT. OF CONFORMANCE, 10CFR PART 21.

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-7 P.O.#104347 REQ.#587-613

Fastener Description: 1-1/4" -7 NUT

Description of Sample Stock Location: B1WW14G

Material Specification as Documented by Licensee Records: ASTM A194 GR.2H

Head Marking (Specification and Manufacturer): 2H E

**Class/Procurement Level: SAFETY-RELATED (CQ)

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

Supplier: GENERAL FASTENERS CO. 11820 GLOBE RD. LIVONIA, MI. 48150

Manufacturer: EATON MFG. CO.

QA Requirements Imposed on Vendor: STANDARD ATTACHMENT 51A

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

EF2BN-7

PROCUREMENT INSTRUCTIONS TO OUR MANUFACTURER/SUPPLIER

SHIPPING IDENTIFICATION: All material shipped against this order must be tagged with the Edison purchase order and item number or with the Edison number so that identification is clear. Similarly, the packing slip must identify all items included in the shipment so that comparison may be made against the Edison purchase order. All communication on this order must be in the English language. To expedite payment of your invoice, each line item invoiced must reference the corresponding purchase order line item and Edison number if applicable. Failure to comply with any of these requirements may constitute cause to reject a shipment.

NO SUBSTITUTIONS TO THIS P.O. No substitutions are authorized. Should the vendor be unable to fill this purchase order exactly as written and in compliance with the referenced specifications and codes, the vendor shall promptly notify Detroit Edison Company in writing prior to proceeding with the questionable item. Alteration or modification of the requirements of this purchase order can be made only by a written change to this purchase order. Upon receipt, this order will be inspected for conformance to requirements. Non-conforming items will be rejected.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-8 P.O.#A118687 REQ.#5-446730

Fastener Description: 1" -8 NUT

Description of Sample Stock Location: B1JJ49B

Material Specification as Documented by Licensee Records: ASTM A194 GR.2H

Head Marking (Specification and Manufacturer): 2H B K AHC

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: SAME

Manufacturer: KILBOURN ENGINEERING CO. 9226 WEST FLAG AVE.
MILWAUKEE, WI. 53225

QA Requirements Imposed on Vendor: CMTR, C OF C

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-9 P.O.#143057 REQ.#R0258748

Fastener Description: 1-1/8" -12 NUT

Description of Sample Stock Location: B1NN2C

Material Specification as Documented by Licensee Records:
SA194 GR. 7 ASME III CL.1

Head Marking (Specification and Manufacturer): HS 7B CWB

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: GENERAL ELECTRIC CO. ORDER SERVICE M/C 847 175 CURTNER AVE.
SAN JOSE, CA. 95125

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

QA Requirements Imposed on Vendor: C OF C, PQC, CODE DATA REPORT, CMTR

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2QN-10 P.O.#318001 REQ.#553-918

Fastener Description: 2" -8 NUT

Description of Sample Stock Location: B12/F

Material Specification as Documented by Licensee Records:
SA194 GR. 2H ASME III CL.1

Head Marking (Specification and Manufacturer): 2H K1469

**Class/Procurement Level: SAFETY-RELATED (Q)

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

Supplier: GENERAL ELECTRIC CO. ORDER SERVICE M/C 847
175 CURTNER AVE. SAN JOSE, CA. 95125

Manufacturer: SAME

QA Requirements Imposed on Vendor: G.E. PQC

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-1

Fastener Description: 1" -8 NUT

Description of Sample Stock Location: JJ57B

Material Specification as Documented by Licensee Records: ASTM A194 GR.6

Head Marking (Specification and Manufacturer): A194 B6 C 5 HT 61827 R94 899

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Vendor: BYRON JACKSON

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

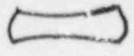
Fastener Testing Data Sheet

* Sample ID# EF2NN-2 P.O.#A033790 REQ.#168758

Fastener Description: 1-1/8" -7 NUT

Description of Sample Stock Location: WHSE. A

Material Specification as Documented by Licensee Records: ASTM A194 GR.2H

Head Marking (Specification and Manufacturer): 2H 

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A — Not Available

Manufacturer: N/A — Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-3 P.O.#A033790 REQ.#168758

Fastener Description: 7/8" -9 NUT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: ASTM A194 GR.2H

Head Marking (Specification and Manufacturer): 2H E

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: EATON MANUFACTURING CO.

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-4 REQ.#489-420

Fastener Description: 3/8" -16 NUT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: ASTM A194 GR.2H

Head Marking (Specification and Manufacturer): CA 2H

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-5 REQ.#489-420

Fastener Description: 3/4" -10 NUT

Description of Sample Stock Location: WHSE - A

Material Specification as Documented by Licensee Records: ASTM A194 GR.2H

Head Marking (Specification and Manufacturer): 2H C-U A

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-6

Fastener Description: 9/16" -11 NUT

Description of Sample Stock Location: B1WW22G

Material Specification as Documented by Licensee Records: ASTM A563 GR.A

Head Marking (Specification and Manufacturer): NONE

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-7 P.O.#A117394

Fastener Description: 7/16" -13 NUT

Description of Sample Stock Location: B1JJ26H

Material Specification as Documented by Licensee Records: ASTM A563 GR.A

Head Marking (Specification and Manufacturer): NONE

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: WM. POWELL CO. 2503 SPRING GROVE RD. CINCINNATI, OHIO

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-8 P.O.#A117394

Fastener Description: 7/16" -14 NUT

Description of Sample Stock Location: B1JJ33A

Material Specification as Documented by Licensee Records: ASTM A563 GR.A

Head Marking (Specification and Manufacturer): NONE

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: WM. POWELL CO. 2503 SPRING GROVE RD. CINCINNATI, OHIO

Manufacturer: N/A – Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-9 P.O.#A110802-42

Fastener Description: 5/8" -10 NUT

Description of Sample Stock Location: B1JJ33G

Material Specification as Documented by Licensee Records: ASTM A563 GR.A

Head Marking (Specification and Manufacturer): NONE

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: MICHIGAN INDUSTRIAL PIPING SUPPLY CO. P.O. BOX 282
WYANDOTTE, MICH. 48192

Manufacturer: N/A – Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NN-10 P.O.#A117394

Fastener Description: 7/8" -9 NUT

Description of Sample Stock Location: B1WW14F

Material Specification as Documented by Licensee Records: ASTM A563 GR.A

Head Marking (Specification and Manufacturer): NONE

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: WM. POWELL CO. 2503 SPRING GROVE RD. CINCINNATI, OHIO

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NB-1 P.O.#297489 REQ.#5-578089

Fastener Description: 3/4" -10x2-1/4" BOLT

Description of Sample Stock Location: B1JJ5E

Material Specification as Documented by Licensee Records: ASTM A307 GR.B

Head Marking (Specification and Manufacturer): B I S

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: WM. POWELL CO. P.O. BOX 145434 CINCINNATI, OHIO 45214

Manufacturer: ~~SSS~~ BETHLEHEM STEEL

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-86

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NB-2 P.O.#134996 REQ.#R0262699

Fastener Description: 3/8" -16x13/16" BOLT

Description of Sample Stock Location: B1JJ49C

Material Specification as Documented by Licensee Records: ASTM A193 GR.B7

Head Marking (Specification and Manufacturer): B7 TB

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

General Plant Application (e.g., Pressure Boundary, Structural)
VALVE - BONNET BOLTING FOR NON-SAFETY RELATED VALVE

Supplier: MICHIGAN INDUSTRIAL PIPING SUPPLY CO. INC.
4410 13TH ST. / P.O. BOX 282
WYANDOTTE, MI. 48192

Manufacturer: TEXAS BOLT CO.

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NB-3 P.O.#241352

Fastener Description: 1-1/4" -7x6" BOLT

Description of Sample Stock Location: B1JJ51A

Material Specification as Documented by Licensee Records: ASTM A325

Head Marking (Specification and Manufacturer):  SO

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Vendor: BYRON JACKSON

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NB-4

Fastener Description: 1" -8 x 2-1/2" LONG BOLT

Description of Sample Stock Location: B1JJ55E

Material Specification as Documented by Licensee Records: ASTM A193 GR.B8

Head Marking (Specification and Manufacturer): B8 C

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Vendor: BYRON JACKSON

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-89

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

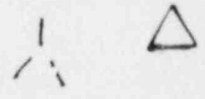
Fastener Testing Data Sheet

* Sample ID# EF2NB-5

Fastener Description: 1/2" -13x5" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY.
CLEVELAND, OHIO 44135

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

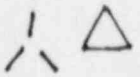
Fastener Testing Data Sheet

* Sample ID# EF2NB-6 REQ.#576929

Fastener Description: 7/8" -9x3-1/4" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: ASTM A325

Head Marking (Specification and Manufacturer):  A325

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available.

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W., CLEVELAND, OHIO 44435

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

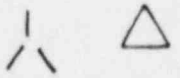
Fastener Testing Data Sheet

* Sample ID# EF2NB-7

Fastener Description: 3/4" -16x4" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W., CLEVELAND, OHIO 44435

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NB-8

Fastener Description: 5/16" -24x5/8" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer): M

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

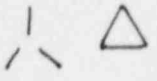
Fastener Testing Data Sheet

* Sample ID# EF2NB-9

Fastener Description: 3/4" -16x3-1/2" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: THE TRIAD METAL PRODUCTS CO. 14701 INDUSTRIAL PKWY., S.W. , CLEVELAND, OHIO 44435

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6.20.88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

Attachment 1

Fastener Testing Data Sheet

* Sample ID# EF2NB-10 REQ.#279269

Fastener Description: 5/8" -11x2-1/2" BOLT

Description of Sample Stock Location: WHSE A

Material Specification as Documented by Licensee Records: SAE J429 GR.5

Head Marking (Specification and Manufacturer): 

**Class/Procurement Level: NON SAFETY-RELATED (NQ)

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

Supplier: N/A - Not Available

Manufacturer: N/A - Not Available

QA Requirements Imposed on Vendor: NONE

Licensee Representative: S. SHARMA

Signature S. Sharma Date 6-20-88

*The sample ID# shall have a prefix that contains the licensee facility initials.

**If applicable, please provide an explanation for your classification system.

ATTACHMENT 2

Fasteners Test Reports

ATTACHMENT 2

Detroit Edison

Date: February 3, 1988

To: S. K. Sharma
Fermi 2

From: R. L. Colwell RLC
P. M. Beckwith PMB
Engineering Research

Subject: Chemical and Physical Testing of Fasteners for Fermi 2.
Fermi Test Req. 685 360
Engineering Research Report 88C71-6

Ten items were delivered to Engineering Research for material analysis. They are described as follows:

Item #	EF2QN #	Description
1	1	1-1/8" - 7 Nut SA 194 Gr. 7
2	2	7/8" - 9 Nut SA 194 Gr. 2H
3	3	5/8" - 11 Nut SA 194 Gr. 2H
4	4	1-1/4" - 8 Nut SA 194 Gr. 2H
5	5	3/4" - 10 Nut A 563 Gr. C
6	6	3/4" - 10 Nut A 194 Gr. 2H
7	7	1-1/4" - 7 Nut A 194 Gr. 2H
8	8	1" - 8 Nut A 194 Gr. 2H
9	9	1-1/8" - 12 Nut SA 194 Gr. 7
10	10	2" - 8 Nut SA 194 Gr. 2H

The testing results are displayed on the attached NRC Data Summary Form with the appropriate specifications for each item.

All work was performed in Accordance with the Engineering Research Quality Assurance Program.
Q. A. Traveler #0091.

Approved by: J. D. Cyrulewski
J. D. Cyrulewski
Supervisor

W. D. Gilbert
W. D. Gilbert
Supervisor

Q. A. Administrator R L Gamble
R. L. Gamble

Copies to: R. L. McIntyre (File)
Fermi 2 Dist.

RLC/gc
PE.14/47

DATA SUMMARY

Item #	Mechanical Analysis Grade	Hardness	Chemical Analysis (wt.%) C	P	S	Mn	Si	Cr	Mo
1	SA194 Gr. 7	29.0 (HRC)	0.421	<0.020	0.013	0.91	0.21	0.92	0.20
9	" "	32.3 "	0.387	<0.020	<0.010	0.83	0.19	0.98	0.22
(Spec.)	" "	24<HRC<38	(.37-.49)	(<0.04)	(<0.04)	(.65-1.1)	(.15-.35)	(.75-1.20)	(.15-.25)
2	SA194 Gr. 2H	28.5 (HRC)	0.454	<0.02[illegible]	0.033				
3	" "	29.5 "	0.398*	0.025	0.022				
4	" "	28.8 "	0.469	<0.020	0.020				
6	" "	25.8 "	0.399*	"	0.023				
7	" "	29.3 "	0.443	"	0.035				
8	" "	28.8 "	0.435	"	0.018				
10	" "	36.0 "	0.451	"	0.028				
(Spec.)	" "	24<HRC<38	(0.4 min)	(<.04)	(<.05)				
5	A563 Gr. C	28.0 (HRC)	0.300	<0.020	0.028				
(Spec.)	" "	(78 HRB-38 HRC)	(0.55 max)	(0.12 max)	(0.15 max)				

Corresponding specifications in brackets ( ).

* Denotes out of specification.

ATTACHMENT 2

Detroit Edison

Date: June 18, 1988

To: P. I. Temple
Nuclear Engineering

From: M. L. Holly MLH
Engineering Research

Subject: Metallurgical Review of Nonconforming Fasteners for Fermi 2.
Engineering Research Report 88C63-7

Recently, forty(40) fasteners selected from Fermi 2 storage were tested for conformance to specification requirements. These tests were performed in response to an NRC request for evaluation of bolt quality at Nuclear facilities. Five(5) items were found to have non-specification conditions as a result of this program. The request was made by Fermi 2 Nuclear Engineering to review the non-specification conditions and provide recommendations. The fasteners are listed below:

Item	Report No.	Description
1	87C71-7	1 inch-8 Nut, ASTM A194 Gr. 6. Sulfur and Chromium exceed specification.
3&6	87C71-8	1.25 inch-7 and 7/8 inch-9 Bolts, ASTM A325. Manganese below specification.
9	87C71-21	3/8 inch-24 Cap Screw, SAE J429 Gr. 2. Hardness exceeds specification.
4	138854-101-001*	1/2 inch-13 Bolt, SAE J429 Gr. 5. Carbon below specification.

* = Tested by Consumers Power Company Research and Testing Laboratory, Jackson, MI.

PE.17/22

Conclusions

Metallurgical review of each item revealed the following:

Item 1, 87C71-7
The nut was manufactured from a resulphurized martensitic stainless steel ASTM A194 Gr. 6F, commonly known as grade 416 (S=0.15% minimum). The specification, ASTM A194 Gr. 6, requires grade 410 (S=0.030% maximum) martensitic stainless steel. Resulphurized stainless steels are utilized in applications where heavy machining is employed, manufacture of a nut typically requires several metal removal operations. Sulphur combines with manganese forming manganese sulfide inclusions which improve machinability, they act as chip breakers, and reduce the cost of manufacturing. Grade 416 stainless is a modification of Grade 410, the increased sulphur content in 416 is normally accompanied by higher manganese and chromium contents.

Increased sulfur content can reduce the ductility and fatigue properties perpendicular to the hot rolling direction (refs. 1 and 2). However, longitudinal mechanical and fatigue properties for 416 and 410 are the same when given identical thermal treatments. With intermediate manganese content (0.40 to 1.80%), similar to the composition of Item 1, chromium rich manganese sulfides are formed which improves the corrosion resistance of 416 stainless steel (reference 2). Polarization curves indicate type 416 is more noble than 410 in the hardened and tempered condition, see Figure 1 (reference 3). Notch toughness values for type 416 are lower than 410, 40 ft-lb. for 416 vs 75 ft-lb. for 410 @ room temperature, and are adversely affected by increased carbon content for both grades. Resulphurized stainless steels are not readily weldable.

Items 3 and 6, 87C71-8
Both items meet specification A 325 and are acceptable. The manganese content was incorrectly listed as a maximum and should have been denoted as a minimum of 0.57% Mn. Additionally, the specification requirements for chemistry incorrectly list heat analysis and should be product analysis. These changes will be made in a revision to the test report.

Item 9, 87C71-21
The cap screws were identified as grade 2 carbon steel (hardness 80-100 HRB), however, they were found to be a quench and tempered alloy steel (hardness HRC 38-40). High strength fasteners, Hardness > 40 HRC, are susceptible to failure by Stress Corrosion Cracking. The calculated stress intensity factor, K, for a 3/8 inch-24 cap screw torqued to maximum grade 2 requirement (21.9 ft-lb. @ 70% yield) is 11 ksi$\sqrt{in}$ see attachment 1. Alloy steel (SAE 4140) heat treated to HRC 40 (Y.S. = 165 ksi) has a K_{ISCC} of 35 ksi$\sqrt{in}$ when tested in a combined aqueous NaCl and distilled water environment, see Figure 2. Since K is less than K_{ISCC}, failure by stress corrosion cracking would not be expected.

Item 4, 138854-101-001
Chemical analysis of the 1/2 inch-24 SAE grade 5 bolt found the carbon content below specification, 0.23% examination vs 0.28% minimum required. All mechanical properties met specification. Grade 5 fasteners are heat treated by oil or water quenching and tempered to achieve the required properties. A medium carbon steel is specified in order to provide adequate hardenability for proper response to the heat treatment operation. Calculation of the ideal diameter or DI, the diameter which will heat treat to a 50% martensitic microstructure under ideal quenching, and converting this value to an actual critical diameter, DC, for a water quenched part is a method for assessing material hardenability. These values are listed below:

	DI	DC
Examined bolt (Item 4)	0.6 inch	0.25 inch (approx.)
0.28% carbon steel	0.8 inch	0.3 inch (approx.)

Under ideal quenching conditions both of the above materials have sufficient hardenability to produce a martensitic microstructure in a 1/2 inch diameter section. Neither material has sufficient hardenability with water quenching techniques, however, adequate mechanical properties were produced with the lower carbon content and the bolt will be fit for use.

Recommendations

Based on metallurgical analysis the following recommendations are made:

- Item 1 is acceptable for use provided the nut is not welded. Impact properties for type 416 are lower than type 410 stainless steel, however, fasteners are normally loaded in tension and are rarely subjected to impact loads.

- Items 3 and 6 are acceptable.

- Item 9 has adequate resistance to Stress Corrosion Cracking when torqued to the maximum value of a grade 2 fastener. The recommendation is made to verify stress corrosion cracking resistance using the methods detailed in ASTM G-36. Testing in several corrosive solutions would be conducted on full size bolts torqued in an assembly which allows migration of the solution into the threaded section. Contact ER metallurgists for specific details if a test verification program is deemed necessary.

- Recommend additional samples of Item 4, the 1/2 inch diameter grade 5 bolt, be submitted for chemistry, hardness and microstructure examination. These additional samples are required to determine the variability of this bolt lot.

References:

1. D. H. Breen and E. M. Wene, "Fatigue in Machine and Structures", Fatigue and Microstructure, ASM, 1979, 83-86

2. Peckner and Bernstein, "Handbook of Stainless Steels", 1977, 14-9 to 14-11

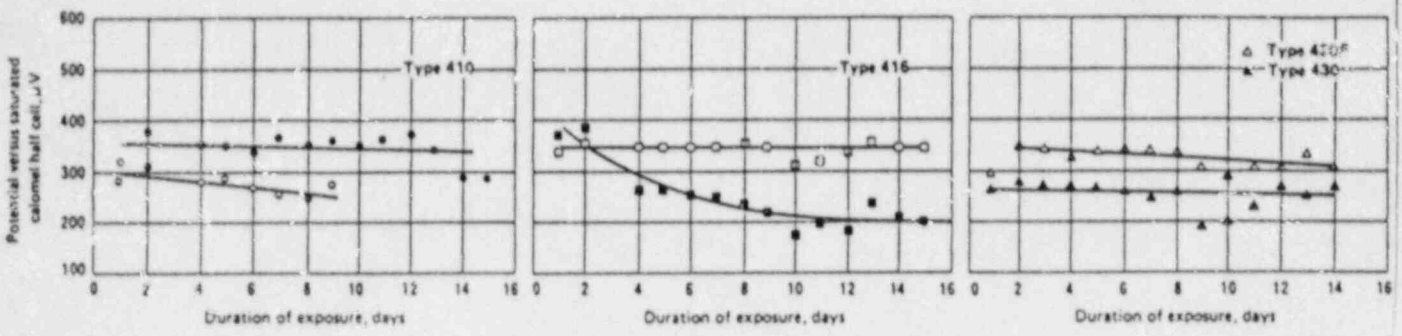
3. ASM, Vol. 13 "Corrosion", ASM, 1987, 70-74

Approved: J. D. Cyrulewski

J. D. Cyrulewski
Supervisor

Copies to: Fermi 2 Distribution
R. L. Colwell
L. C. Fron
R. L. Gamble
A. K. [illegible]
R. L. McIntyre (File)
J. E. Schaefer
S. K. Sharma

MH/gc
PE.17/22



Type 410 (sulfur free) and type 416 (sulfur bearing) quenched from 980 °C (1800 °F); open symbols are for hardened and stress relieved material, solid symbols for hardened and tempered material. Type 430 (sulfur free) and type 430F (sulfur bearing) annealed 1 h at 730 °C (1350 °F). (Ref 8)

Figure 1. Polarization curves for 410 and 416 stainless steel. Type 416 is more noble than 410 in the quench and tempered condition.

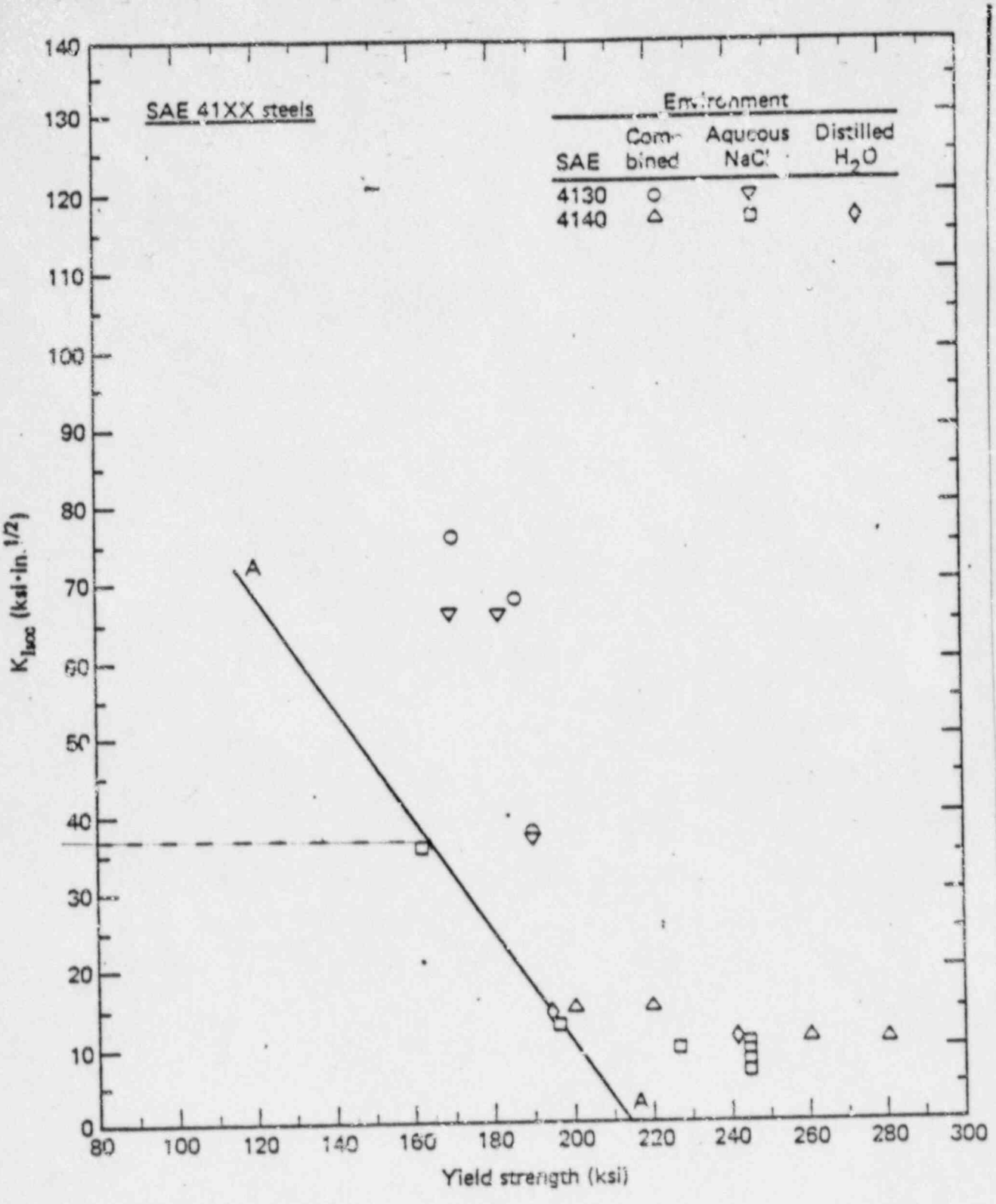


Figure 2. K_{ISCC} versus yield strength for SAE 4130 and 4140 alloy steels reported for combined aqueous NaCl, and distilled H_2O environments. Dashed line denotes 165 ksi yield strength. From lower bound K_{ISCC} values for bolting materials, Lawrence Livermore National Lab, 1981

FERMI BOLT 6/17/88

GR2-GR8 FASTENERS MH

FERMI M1-MOSS (SQ)
TORQUE TO 60-70% OF YIELD

FROM EPRI "GOOD BOLTING PRACTICES MANUAL"

$T = KDMS_y A_s / 12$

WHERE
T = TORQUE
K = NUT FACTOR
D = NOMINAL DIA (IN)
M = % OF YIELD
S_y = YIELD STRENGTH (PSI)
A_s = TENSILE STRESS AREA $(IN)^2$

FOR GR2 SAE J429
S_y = 57,000 PSI MIN.

FERMI 2 3/8 INCH - 24
$K = 0.2$
$D = .375$ IN
$M = .70$
$S_y = 57,000$ PSI
$A_s = 0.7854 (D - \frac{0.9743}{N})^2$
$N = 24$
$A_s = .0878\ IN^2$

$T = 0.2 \times 0.375 \times .70 \times 57,000 \times .0878 / 12$

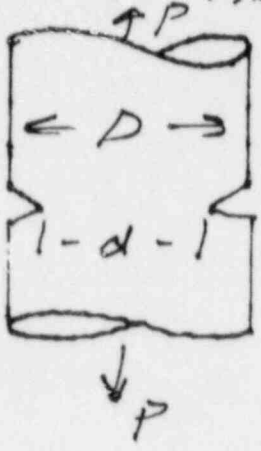
$= 21.9$ FT-LB

$P = 12T / KD = 3504$ LB

6/17/88

GR2-GR8 CONT.

FROM: PG 281 DEFORMATION & FRACTURE MECHANICS OF ENGINEERING MATERIALS R. W. HERTZBURG



$$K_1 = Y \frac{P}{D^{3/2}}$$

$$Y = 1.72\, D/d - 1.27$$

FOR 3/8 - 24

$D = .375$ IN

$d = 0.3239$ IN

$Y = .72$

$$K_1 = .72 \cdot \frac{3504\ lb}{(.375\ in)^{3/2}} = 10.99\ ksi \cdot in^{1/2}$$

FOR 4140 ALLOY STEEL @ RC 40 (BHN 370)

T.S. = 181 KSI

Y.S. = 165 KSI

FROM: LAWRENCE LIVERMORE LABS "LOW BOUNDARY K_{ISCC} VALUES FOR BOLTING MATERIALS

K_{ISSC} = 35 KSI · $IN^{1/2}$, IN AQUEOUS NACL & DISTILLED H_2O

$K_1 < K_{ISCC}$

ATTACHMENT 2

Detroit Edison

Date: March 9, 1988

To: S. K. Sharma
Fermi 2

From: R. L. Colwell
P. M. Beckwith
Engineering Research

Subject: Chemical and Physical Testing of Fasteners for Fermi 2.
Fermi Test Req. 685 361
Engineering Research Report 87C71-7, Rev. 1

Ten items were delivered to Engineering Research for material analysis. They are described below.

Item #	EF2NN #		Description
1	1		1" - 8 Nut A 194 Gr. 6
2	2		1-1/8" - 7 Nut A 194 Gr. 2H
3	3		7/8" - 9 Nut A 194 Gr. 2H
4	4	(Four)	3/8 - 16 Nuts A 194 Gr. 2H
5	5		3/4" - 10 Nut A 194 Gr. 2H
6	6		9/16" - 11 Nut A 563 Gr. A
7	7	(Two)	7/16" - 13 Nuts A 563 Gr. A
8	8	(Two)	7/16" - 14 Nuts A 563 Gr. A
9	9		5/8" - 10 Nut A 563 Gr. A
10	10		7/8" - 9 Nut A 563 Gr. A

The testing results are displayed on the attached NRC Data Summary Form with the appropriate specifications for each item.

All work was performed in Accordance with the Engineering Research Quality Assurance Program.
Q. A. Traveler #0092.

Approved by: J. D. Cyrulewski
Supervisor

W. D. Gilbert
Supervisor

Q. A. Administrator R. L. Gamble

Copies to: R. L. McIntyre (File)
Fermi 2 Dist.

RLC/gc
22.14/48

DATA SUMMARY

Item #	Mechanical Analysis Grade	Hardness	Chemical Analysis (wt.%) C	P	S	Mn	Si	Cr
1	A194 Gr. 6	25.0 HRC	0.13	<0.020	0.354*	0.50	0.57	14.1*
(Spec.)	" "	(20-28 HRC)	(0.15 max)	(.04 max)	(.03 max)	(1.0 max)	(1.0 max)	(11.5-13.5)
2	194 Gr. 2H	30.3 (HRC)	0.51	<0.020	0.036			
3	" "	27.8 "	0.44	"	0.022			
4A	" "	28.8 "	0.45	"	0.014			
4B	" "	28.3 "	0.45	"	0.018			
4C	" "	29.0 "	0.44	"	0.018			
4D	" "	28.0 "	0.44	"	0.015			
5	" "	29.0 "	0.45	"	0.016			
(Spec.)	" "	(24-38 HRC)	(0.4 min)	(.04 max)	(.05 max)			
6	A563 Gr. A	84.0 (HRB)	0.22	<0.020	0.034			
7A	" "	94.0 "	0.07	"	0.015			
7B	" "	95.8 "	0.07	"	0.016			
8A	" "	91.8 "	0.07	"	0.014			
8B	" "	91.3 "	0.05	"	<0.010			
9	" "	73.0 "	0.14	"	0.010			
10	" "	97.8 "	0.05	"	0.020			
(Spec.)	" "	(B68-C32)	(0.55 max)	(0.12 max)	(0.15 max)			

Corresponding specifications in brackets ( ).

*Denotes out of specification.
Sulfur and phosphorous concentrations were not determined.

ATTACHMENT 2

Detroit Edison

Date: February 3, 1988

To: S. K. Sharma
Fermi 2

From: R. L. Colwell
P. M. Beckwith
Engineering Research

Subject: Chemical and Physical Testing of Fasteners for Fermi 2.
Fermi Test Req. 685 362
Engineering Research Report 88C71-8

Ten items were delivered to Engineering Research for material analysis. They are described below.

Item #	EF2 NB #		Description
1	1		3/4" - 10 x 2-1/4" Bolt A307 Gr. B
2	2	(Two)	3/8" - 16 x 13/16" Bolts A193 Gr. B7
3	3		1-1/4" - 7 x 6" Bolt A325
4	4		1" - 8 x 2-1/2" Bolt A193 Gr. B8
5	5		1/2" - 13 x 5" Bolt SAE J429 Gr. 5
6	6		7/8" - 9 x 3-1/4" Bolt A325
7	7		3/4" - 16 x 4" Bolt SAE J429 Gr. 5
8	8	(Three)	5/16" - 24 x 5/8" Bolt SAE J429 Gr. 5
9	9		3/4" - 16 x 3-1/2" Bolt SAE J429 Gr. 5
10	10		5/8" - 11 - 2-1/2" Bolt SAE J429 Gr. 5

The testing results are displayed on the attached NRC Data Summary Form with the appropriate specifications for each item.

All work was performed in Accordance with the Engineering Research Quality Assurance Program.
Q. A. Traveler #0093.

Approved by: J. D. Cyrulewski
Supervisor

W. D. Gilbert
Supervisor

Q. A. Administrator R. L. Gamble
R. L. Gamble

Copies to: R. L. McIntyre (File)
Fermi 2 Dist.

RLC/gc
PE.14/49

DATA SUMMARY

Item #	Grade	Hardness	C	Mn	P	S	Si	Mo	Cr	Ni
	Mechanical Analysis		Chemical Analysis (wt.%)							
2A	A193 Gr. B7	29.5 HRC	.41	0.97	<0.020	0.025	0.22	0.20	1.01	0.07
2B	" "	29.8	.41	0.88	<0.020	0.014	0.21	0.17	1.01	0.13
(Spec.)	" "	(---)	(.37-49)	(.65-1.10)	(<.035)	(<.040)	(.15-.35)	(.15-.25)	(.75-1.2)	(---)
4	A193 Gr. B8	76.8 HRB	0.06	1.42	0.030	0.022	0.27	0.4	19.9	9.5
(Spec.)	" "	(<96 HRB)	(0.08 max)	(2.0 max)	(<.045)	(<.03[illegible])	(1.0 max)	(--------)	(18.0-20.0)	(8.0-10.5)
1	A307 Gr. B	93.3 HRB	0.17		<0.020	0.021				
(Spec.)	" "	(69-95 HRB)	(---)		(<0.040)	(<0.050)				
3	A325	22.8 HRC	0.41	0.82*	<0.020	0.036				
(Spec.)	"	(19-31 HRC)	(.28-.55)	(<0.60)	(<0.040)	(<0.050)				
6	A325	28.8	0.38	0.68*	0.020	0.028				
(Spec.)	"	(24-35 HRC)	(.28-.55)	(<0.60)	(<0.040)	(<0.050)				

		HARDNESS		Chemical Analysis (wt%)		
		CORE (HRC)	Superficial (30-N)	C	P	S
5	SAE J429 Gr.5	30.0	52.0	.34	<0.020	0.033
7	" "	29.8	50.8	.34	"	0.017
8A	" "	30.8	49.8	.38	"	0.012
8B	" "	30.0	50.8	.39	"	0.012
8C	" "	29.8	50.0	.38	"	0.012
9	" "	28.8	49.8	.38	0.021	0.016
10	" "	29.5	50.0	.28	<0.020	0.014
(Spec.)	" "	(25-34)	(<54)	(.28-.55)	(<.048)	(<.058)

A325 samples lie within the composition range of Type 1 and Type 2 material. The hardness specifications are a function of bolt size.

*Denotes out of specifications.

PE.14/49

LABORATORY COMMERCIAL SERVICES
A Division of Consumers Power Company
135 West Trail Street
Jackson, Michigan 49201

ATTACHMENT 2

EEM Project: 138854-101-001
Detroit Edison PO NR-176637
UFI: A-200/42*30
Detroit Edison Fermi II Plant

Report

TESTING OF TEN "Q" FASTENER ITEMS TO DETERMINE CONFORMANCE TO THEIR ASTM REQUIREMENTS FOR DETROIT EDISON FERMI II NUCLEAR POWER STATION

Prepared by: Dr William R Pavlichko
Staff Engineer
Engineering Evaluations and
Metallurgy Department
Consumers Power Company
135 West Trail Street
Jackson, MI 49201

Report date: March 3, 1988

EEM Project: 138854-101-001

TESTING OF TEN "Q" FASTENER ITEMS TO DETERMINE CONFORMANCE TO THEIR ASTM REQUIREMENTS

Requested by: H Valenta, Fermi II 260-TAC
Report date: March 3, 1988
Report by: WRPavlichko, Laboratory Services

Distribution: EEM File (2)
DCC: A-200/42*30

==========

INTRODUCTION

Ten items/sets of "Q" fasteners were received from the Detroit Edison Fermi II Plant for chemical and mechanical testing to verify conformance to their respective ASTM requirements. Each item was identified by a unique Enrico Fermi II Plant designation, EF2QB. A list and description of the ten items received follows:

EF2QB-1	1/2" - 13 X 3"	Stud SA-193 GR B7 CL-2
	RIR 586937	
EF2QB-2	1-1/8" - 12 X 6-1/4"	Bolt SA-193 GR B7 CL-1
	RIR 5-586738	
EF2QB-3	1-1/4" - 7 X 3-3/4"	Cap Screw SA-449
	RIR 5-490676	
	Tag V8-2139 Item 1	
	PO NR 296178	
EF2QB-4	1/2" - 13 X 1-1/2"	Bolt SAE J429 GR 5
	RIR 606890	
EF2QB-5	1-1/4" - 7 X 8"	Bolt SA449
	RIR 587016	
EF2QB-6	3/4" - 10 X 2"	Bolt SA325
	RIR 527736	
EF2QB-7	1/2" - 13 X 1-1/4"	Bolt SAE J429 GR 5
	RIR 587016	
EF2QB-8	5/16" - 24 X 1-1/2"	Bolt SAE J429 GR 5
EF2QB-9	5/8" - 18 X 1"	Bolt SAE J429 GR 5
	RIR 414577	
EF2QB-10	7/8" - 9 X 4"	Bolt SAE J429 GR 5
	RIR 587086	

Chemical analyses, hardness tests and the appropriate tensile testing per specification requirements were performed on samples from each item. Charpy V-notch impact tests were performed on item 2 samples. The Detroit Edison Purchase Order was NR 176637.

CHEMICAL ANALYSES

Samples from each item were chemically analyzed by emission spectroscopy, except for carbon analyses, which was accomplished by combustion IR testing - Leco Tester. Chicago Spectro performed the tests. Chemistry test data for the items and the item specification chemistry requirements are presented in Table I.

MECHANICAL TESTING

Hardness tests were performed on samples from each item. Tensile tests were performed on samples from each item. Either machined samples or full size bolts were tested depending on the ASTM specification requirements. Charpy V-notch impact test were run on samples from item 2.

Hardness Tests

Rockwell "C" hardness tests (HRC) were run on samples from each item per MET-02 procedure. Results for the ten items are presented in Table II along with item ASTM specification requirements. Hardness tests were run on either top (head) or side (flat) of the fastener.

Tensile Tests

Tensile tests were performed per Consumers Power Company MET-02 procedures and ASTM SA-370 specifications for machined tensile testing and full size bolt testing. Items EF2QB-1 and EF2QB-2 were tested using machined tensile specimens and UTS, YS, elongation and reduction in area were obtained. Items EF2QB-3 to EF2QB-10 were tested full size as per their ASTM specifications.

Yield load for full size bolt tested specimens was not obtained. Three items had ASTM requirements which specified yield load, EF2QB-3, -5 and -6. Attempts were made to obtain the yield load during full size testing by the pointer method, however no discernible load drops occurred so only the failure load was determined. An extensometer could not be employed.

For Table III (tensile requirements) in SA-449-80, there is a relationship between failure load and yield load for all sizes. This is approximately .772 (yield is approximately .772 of failure load). An approximate relationship between failure load and yield load also exists in Table IV of SA-325-81 for all sizes. This value is approximately .766 (yield is approximately .766 of failure load). Using these values, an estimated yield load was calculated for EF2QB-3, EF2QB-5 and EF2QB-6 and placed in Table II. Basically, if the failure is above minimum failure specification, the yield load should also be above minimum yield specification. Tensile data results are in Table II along with item ASTM specifications.

Charpy Impact Tests

A set of three Charpy impact V-notch specimens were tested on item 2 (EF2QB-2) material. Item 2 is SA-193 GR B7 CL-1 material. The specification refers to SA-320 when Charpy impact tests are required. Impact tests were performed per MET-02, SA-320 and SA-370 requirements for Charpy Impact testing of V-Notch specimens. The test temperature specified by Detroit Edison was -20°F. Test data for item 2 is in Table II.

SUMMARY

1. All tests met chemistry specifications except item EF2QB-4, sample carbon level was 0.23 (specification 0.28-0.55).

2. All items met mechanical specifications (hardness, tensile and Charpy test requirements per the appropriate ASTM specification).

3. All items were stamped with correct markings as required by the appropriate ASTM specification.

4. The hardness values of tested items were converted to tensile equivalents from data tables and these are with the hardness data in Table II.

5. Items 3 and 5 did not fail during full size tensile testing, tests were run to machine load limit. However, both tests exceeded the tensile minimum required per specifications.

6. Item 9 did not fail during full size tensile testing because the fixture threading failed, however specimen load had exceeded the minimum load required per specification.

Approved G J Kloock Date 3-11-88

G J Kloock

Engineering Evaluations and Metallurgy Supervisor

Item Number	Specification	Chemistry Test Data (wt %)											
		Carbon C	Manganese Mn	Phosphorus P	Sulfur S	Silicon Si	Molybdenum Mo	Chromium Cr	Nickel Ni	Copper Cu	Vanadium V	Titanium Ti	Boron B
E72QB-1	SA-193-79a B7 CL-2	.37-.49	.65-1.10	.04 Max	.04 Max	.15-.35	.15-.25	.75-1.20	-	-	-	-	-
Sample	-	.44	.91	.012	.032	.25	.16	1.05	.19	.13	-	-	-
E72QB-2	SA-193-79a B7 CL-1	.37-.49	.65-1.10	.04 Max	.04 Max	.15-.35	.15-.25	.75-1.20	-	-	-	-	-
Sample	-	.42	.80	.014	.018	.24	.18	.94	.01	.01	-	-	-
E72QB-3	SA-449-80	.28-.55	.60 Min	.040 Max	.050 Max	-	-	-	-	-	-	-	-
Sample	-	.36	.74	.006	.022	.018	<.01	.01	<.01	.01	-	.030	.0007
E72QB-4	SAE J429-78 GR-5	.28-.55	-	.048 Max	.058 Max	-	-	-	-	-	-	-	-
Sample	-	.23	.94	.18	.010	.19	.01	.03	.03	.07	-	-	-
E72QB-5	SA-449-80	.28-.55	.60 Min	.040 Max	.050 Max	-	-	-	-	-	-	-	-
Sample	-	.35	.69	.007	.013	.21	<.01	.07	<.01	.01	-	-	-
E72QB-6	SA-325-81 Type 1	.27 Min	.47 Min	.048 Max	.058 Max	-	-	-	-	-	-	-	-
Sample	-	.39	.67	.009	.028	.20	<.01	.20	.04	.03	-	-	-
E72QB-7	SAE J429-78 GR-5	.28-.55	-	.048 Max	.058 Max	-	-	-	-	-	-	-	-
Sample	-	.32	.70	.005	.020	.20	<.01	.05	<.01	.03	-	-	-
E72QB-8	SAE J429-78 GR-5	.28-.55	-	.048 Max	.058 Max	-	-	-	-	-	-	-	-
Sample	-	.34	.62	.015	.017	.22	<.01	.08	.03	.13	-	-	-
E72QB-9	SAE J429-78 GR-5	.28-.55	-	.048 Max	.058 Max	-	-	-	-	-	-	-	-
Sample	-	.37	.63	.005	.020	.18	.01	.09	.10	.17	-	-	-
E72QB-10	SAE J429-78 GR-5	.28-.55	-	.048 Max	.058 Max	-	-	-	-	-	-	-	-
Sample	-	.37	.65	.013	.005	.19	<.01	.02	.04	.03	-	-	-

0368-015-647

TABLE I. Chemistry Test Data

Item Number	Specification	Size Inch	Marking	Hardness	Machined Tensile Data KSI UTS	KSI (0.2) YS	Min % Elong	Min Reduction Area %	Bolts Full Size Testing LB Failure Load	PSI UTS	PSI YS	Charpy (-20°F) V-Notch (FT-LB)
EF2QB-1	SA-193-79a B7 Cl-2	1/2	B7	-	125	105	16	50	-	-	-	-
Sample			KB7	HRC33.2 UTS EQ 148 KSI	153	140.8	20.3	59	-	-	-	-
EF2QB-2	SA-193-79a B7 Cl-1	1-1/8	B7	-	125	105	16	50	-	-	-	20 Min
Sample			B7	HRC28.7 UTS EQ 131 KSI	135	118.5	22.4	63	-	-	-	65 Ave (3)
EF2QB-3	SA-449-80	1-1/4		HRC19-30	-	-	-	-	101,700	-	78,500	-
Sample				HRC26.3 UTS EQ 124 KSI	-	-	-	-	120,000+ - Sample Did Not Break	-	92,640 Cal	-
EF2QB-4	SAE J429-78 GR-5	1/2		HRC25-34	-	-	-	-	17,028 Cal	120,000	Not Req	-
Sample				HRC31.6 UTS EQ 142 KSI	-	-	-	-	20,600	145,200	-	-
EF2QB-5	SA-449-80	1-1/4		HRC19-30	-	-	-	-	101,700	-	78,500	-
Sample				HRC30.3 UTS EQ 137 KSI	-	-	-	-	120,000+ - Sample Did Not Break	-	92,640 Cal	-
EF2QB-6	SA-325-81 Type 1	3/4	A-325	HRC24-35	-	-	-	-	40,100	-	30,700	-
Sample			A-325	HRC32 UTS EQ 144 KSI	-	-	-	-	47,500	-	36,385 Cal	-
EF2QB-7	SAE J429-78 GR-5	1/2		HRC25-34	-	-	-	-	17,028 Cal	120,000	Not Req	-
Sample				HRC27.9 UTS EQ 129 KSI	-	-	-	-	18,200	128,300	-	-
EF2QB-8	SAE J429-78 GR-5	5/16		HRC25-34	-	-	-	-	6,960 Cal	120,000	Not Req	-
Sample				HRC28.9 UTS EQ 132 KSI	-	-	-	-	8,200	141,400	-	-
EF2QB-9	SAE J429-78 GR-5	5/8		HRC25-34	-	-	-	-	30,720 Cal	120,000	Not Req	-
Sample				HRC31.1 UTS EQ 140 KSI	-	-	-	-	33,100	129,300	Fixture Failure Sample Did Not Break	-
EF2QB-10	SAE J429-78 GR-5	7/8		HRC25-34	-	-	-	-	55,440 Cal	120,000	Not Req	-
Sample				HRC29.3 UTS EQ 133 KSI	-	-	-	-	61,500	133,100	Tensile Specimen	-
				HRC Test Run on Both EF2QB-10 Samples								
				HRC30.3 UTS EQ 137	-	-	-	-	-	-	Hardness Specimen	-

0388-015-647

TABLE II. Mechanical Test Data

CHICAGO SPECTRO SERVICE LABORATORY, INC.

Spectrographic and Chemical Analysts

Metallurgists

4848 S. KEDZIE AVE. • CHICAGO, ILL. 60632

AREA CODE 312 - 523-7088

EEM Proj: 138854-101-001

ANALYSIS REPORT FOR:

• Consumers Power Company
Research & Testing Laboratory
• 135 West Trail Street
Jackson, Michigan 49201
•
Attention: Dr, William Pavlichko

PURCHASE ORDER NO. RMR706-6932

DATE 2/23/88

Report Number: 9165

Sample Identification: 138854101001

	No. 1	No. 2	No. 3	No. 4	No. 5
Carbon	0.44 %	0.42 %	0.36 %	0.23 %	0.35 %
Manganese	0.91	0.80	0.74	0.94	0.69
Phosphorus	0.012	0.014	0.006	0.018	0.007
Sulfur	0.032	0.018	0.022	0.010	0.013
Silicon	0.25	0.24	0.18	0.19	0.21
Nickel	0.19	0.01	< 0.01	0.03	< 0.01
Chromium	1.05	0.94	0.01	0.03	0.07
Molybdenum	0.16	0.18	< 0.01	0.01	< 0.01
Copper	0.13	0.01	0.01	0.07	0.01
Titanium	-----	-----	0.030	-----	-----
Boron	-----	-----	0.0007	-----	-----

	No. 6	No. 7	No. 8	No. 9	No. 10
Carbon	0.39 %	0.32 %	0.34 %	0.37 %	0.37 %
Manganese	0.67	0.70	0.62	0.63	0.65
Phosphorus	0.009	0.005	0.015	0.005	0.013
Sulfur	0.028	0.020	0.017	0.020	0.005
Silicon	0.20	0.20	0.22	0.18	0.19
Nickel	0.04	0.01	0.08	0.10	0.04
Chromium	0.20	0.05	0.06	0.09	0.02
Molybdenum	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Copper	0.03	0.03	0.13	0.17	0.03

CHICAGO SPECTRO SERVICE LABORATORY, INC.

BY _____

ATTACHMENT 2

Detroit Edison

Date: February 11, 1988

To: S. K. Sharma
Fermi 2

From: R. L. Colwell
Engineering Research

Subject: Material Analysis of Fasteners for Fermi 2.
Test Req. #685336
Engineering Research Report 88C71-5

Two identical bolts were delivered to Engineering Research for evaluation. They were labled DENB-9A, and were the cap screw type, measuring 3/8" - 24x2". They were both identified as SAE J429 Grade 2 material.

Chemical analysis was obtained by Argon Plasma Spectroscopy and infrared spectroscopy. The results are tabulated below.

Elemental Composition (wt.%)

Bolt	C	Cr	Mn	Si	P	S
1	0.36	1.04	0.74	0.24	0.022	0.027
2	0.37	0.98	0.74	0.26	0.020	0.027
(Spec)	(<0.55)	(--)	(--)	(--)	(<0.048)	(<0.058)
Item 9 Test Req. 610143	0.37				0.020	0.028

Tested hardness values are listed below.

Item	Hardness (HRC)
1	40.4
2	38.2
(5 Spec)	(80-100) HRB
Item 9 Test Req. 610143	40.4 HRC

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Conclusion

It has been demonstrated that these bolts have the same physical and chemical properties as the bolt (Item #9) tested in test req. #610-143.

The bolts are fabricated from medium carbon, low alloy steel, which very closely corresponds to a grade 8 material.

The bolts' high strengths contribute to increased sensitivity to Stress Corrosion Cracking (SCC). "SCC is a mechanical environmental failure process in which mechanical stress and chemical attack combine to initiate and propogate fracture in a metal part. Stress-corrosion cracking is produced by the synergistic action of sustained tensile stress and a specific corrosive environment; this action causes failure to occur more rapidly than it would if the separate effects of the stress and the corrosive environment were simply added together.

Failure by SCC frequently is caused by simultaneous exposure to a seemingly mild chemical environment and to a tensile stress far below the yield strength of the metal. Under such conditions, fine cracks can penetrate deeply into the part while the surface exhibits only insignificant amounts of corrosion. Hence, there may be no macroscopic indications of an impending failure." (Metals Handbook, 9th. Ed. Vol. 1 pg. 687).

The chemical agents which can cause SCC are usually aqueous acids or salts and gaseous halogens and acids.

If the bolts are being utilized in a dry environment and in areas where the formerly mentioned gases are not present, the bolts will perform as required, since they are made from a material that is superior to a Grade 7.

All work was performed in accordance with the Engineering Research Quality Assurance Program. Q.A. Traveler #0089.

Approved by: _____
J. D. Cyrulewski
Supervisor

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Fermi 2 Dist.

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