NSP

NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

March 19, 1980

Director of Nuclear Reactor Regulation
U S Nuclear Regulatory Commission
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket No. 50-282 License No. DPR-42
50-306 DPR-60

Information on Turbine Disc Cracking

In a letter dated February 25, 1980 from Mr Darrell Eisenhut, Acting Director, Division of Operating Reactors, USNRC, we were requested to provide information related to turbine disc cracking in Westinghouse 1800 rpm low pressure turbines.

In response to that request, Northern States Power Company (NSP) herein submits the following information:

(1) Five copies of a proprietary response to the NRC site specific general questions consisting of the following:

(a) Five copies of this letter of transmittal

(b) Three originals and two conformed copies of NSP's statement of oath and affirmation pursuant to 10 CFR 50.54(f)

(c) One original and four conformed copies of Westinghouse's Application for Withholding Proprietary Information from Public Disclosure (labeled Attachment 1)

(d) One original and four copies of the Westinghouse Affidavit (labeled Attachment 2)

(e) Five copies of responses to the NRC site specific questions (labeled Attachment 3)

(f) Appendix A, which is referenced in Attachment 3 and which contains Westinghouse proprietary information

(2) 40 copies of a non-proprietary response to the NRC site specific general questions consisting of the following:

(a) Forty copies of this letter of transmittal

(b) Forty conformed copies of NSP's statement of oath and affirmation pursuant to 10 CFR 50.54(f)

(c) Forty copies of responses to the NRC site specific questions (labeled Attachment 3)

(d) Appendix B, which is referenced in Attachment 3 and which is a non-proprietary document

It is our understanding that Westinghouse will submit, directly to the NRC on or before March 24, 1980, the Turbine Disc Integrity Task Force's response to the NRC generic questions. NSP requests that the generic response be referenced in Dockets 50-282 and 50-306 to eliminate the need for duplicate submittals by NSP.

L. O. Mayer

L O Mayer, PE
nager of Nuclear Support Services

LOM/jh

cc J G Keppler
G Charnoff

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

Docket No. 50-282
50-306

LETTER DATED MARCH 19, 1980
RESPONDING TO NRC REQUEST DATED FEBRUARY 25, 1980
FOR INFORMATION ON TURBINE DISC CRACKING

Northern States Power Company, a Minnesota corporation, by this letter dated March 19, 1980 hereby submits information in response to NRC request for information concerning turbine disc cracking.

This request contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

By /s/ L O Mayer
L O Mayer
Manager of Nuclear Support Services

On this 19th day of March, 1980, before me a notary public in and for said County, personally appeared L O Mayer, Manager of Nuclear Support Services, and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Northern States Power Company, that he knows the contents thereof and that to the best of his knowledge, information and belief, the statements made in it are true and that it is not interposed for delay.

/s/ Jeanne M Hacker
Jeanne M Hacker
Notary Public - Minnesota
Hennepin County
My Commission Expires May 6, 1986

Attachment 3

Prairie Island Nuclear Generating Plant

Unit No. 1

Site Specific General Questions

I. A. Turbine Type

Prairie Island 1 consists of one tandem compound four flow, three casing, condensing 1800 RPM turbine utilizing 40 inch last row blades in each LP element. The LP element is designated as a Building Block 80.

B. Number of hours for each LP turbine at postulated inspection date 9-1-80.

LP1	39309
LP2	41056

C. LP1 6 overspeeds, 42 trips
LP2 9 overspeeds, 48 trips

An overspeed is any event where the turbine is believed to have gone above 1820 RPM.

D. 1. Material is Ni-Cr-Mo-V alloy similar to ASTM A-471. See section B & C of Appendix B for material data.

2. See Section B & C of Appendix B.

3. See Section B & C of Appendix B.

4. See Section G.1 of Appendix B.

5. See Section G.3 of Appendix B.

6. See Section F of Appendix B.

7. See G.4 of Appendix B.

8. See G.2 of Appendix B.

9. See E of Appendix B.

10. See Sections B & C of Appendix B.

11. See Section B of Appendix B.

II. Prairie Island Unit 1 has not been inspected.

III. Low pressure steam is not a normally sampled point at Prairie Island. However, typical steam generator bulk water parameters as determined in an EPRI funded study in the Fall of 1979 are as follows:

Oxygen	<1 ppb
Hydrazine	40 ppb
Sodium	10 ppb
Chloride	4 ppb
Sulfate	6 ppb
Calcium	5 ppb
Magnesium	3 ppb
Silica	100 ppb
Ammonia	1 ppm

As a result, the EPRI report concludes that "Impurity levels throughout the secondary system at both Prairie Island units are very low...".

Unit One went commercial in December, 1973 with phosphate control of secondary chemistry. In the Fall of 1974, the unit was shifted to AVT chemistry. Unit Two went commercial in December, 1974 on AVT chemistry control. Condenser inleakage values are determined weekly on both units. Historically a unit has been brought off line upon detection of a condenser leak and the tube(s) identified and plugged. An overview of condenser leak history is listed below:

Date	Condenser	Pass	Tubes Plugged	Estimated Leakage m^3/h	Estimated Leakage gpm
7/24/74	1B	Inner	4	1.1	5
9/27/74	1B	Outer	1	0.7	3
11/29/74	1B	Inner	1	0.3 to 0.5	1.5 to 2.0
12/26/74	1B	Inner	1	0.2	1.0
1/5/75	1A	Outer	1		
	1B	Outer	1	0.5	2.3
1/8/75	1A	Inner	1	0.2	1.0
1/30/75	1B	Inner	1	0.1	0.5
2/5/75	1A	Inner	1	0.2	0.75
2/19/75	1A	Outer	3	0.1	0.50
2/22/75	1A	Inner	1	0.2	1.0
3/8/75	1A	Inner	1	0.1	0.5
3/18/75	1A	Inner	1		?

In the Spring of 1975 it was determined that the main mode of condenser tube failure was whippage. As a result the condensers on both units were staked to shorten the unsupported tube length. Since that time there have been only two condenser leaks, one in October, 1976 on Unit 2 of 0.4 gpm which was repaired by plugging three tubes and one in February, 1980 on Unit 1 of 0.03 gpm which was repaired by plugging one tube.

Since Prairie Island has not suffered extensive disc cracking, and has not operated for very long with significant water chemistry perturbations, no correlation between water chemistry and disc cracks can be drawn.

IV. Unit 1 LP rotors will be inspected by September 1, 1980, or replaced by rotors that have been inspected. Since the A/A_{cr} ratios are well below 1.0, the inspection schedule is adequate.

V. Not inspected.

VI. Turbine missile analysis was performed for the Prairie Island Plant as a part of the licensing basis. The effects of turbine missiles and the results of the analyses are discussed in the Prairie Island FSAR, Appendix B, Section B.9, pages B.9-1 through B.9-5. The NRC staff evaluation is contained in the NRC Safety Evaluation Report, Section 3.5, page 3-6. Upon receipt from Westinghouse of reanalysis for Prairie Island Units 1 and 2 of missile energies, velocities, and degree of containment within the turbine shell, NSP will have the Architect/ Engineer re-run the licensing basis missile analysis, utilizing the new parameters.

APPENDIX B

PAGES B1-B24

UNIT NO. 1

NON-PROPRIETARY

B-1

ID # : DD80101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TN1253

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI) [ ]b,c,e
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))
[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,f [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,f

E. BORE STRESS

SPEED (RPM)	STRESS
1. 1800	(KSI)
2. 2160 (120%)	(KSI)

[ ]b,c,e

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)
[ ]b,c,e

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4. [ ]bce

ID # : DD80101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK — 80
2. UNIT — PRAIRIE ISLAND #1
3. CUSTOMER: — NOTHERN STATES
4. LP# — 1
5. LOCATION — GOV
6. DISC# — 2
7. TEST NO. — TN1372

B. MATERIAL PROPERTIES (HUB)
1. TYPE — TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: — Bethlehem Steel
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))
[ ]bce,f

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))
[ ]bce,f

D. CHEMISTRY

[C]bce,f	[MN]bce,f	[SI]bce,f	[P]bce,f	[CR]bce,f	[MO]bce,f	[V]bce,f
[NI]bce,f	[AS]bce,f	[SB]bce,f	[SN]bce,f	[AL]bce,f	[CU]bce,f	[S]bce,f

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]bce
2.	2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)
[ ]bce

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bce
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-2

ID # : D0801014O1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TN1372

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Bethlehem Steel
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS
SPEED (RPM) STRESS
1. 1800 (KSI)
2. 2160 (120%) (KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

ID # : D0801014O1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION 60V
6. DISC# 3
7. TEST NO. TN 1336

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Bethlehem Steel
3. Y.S. (KSI, [ ]bce
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI) [ ]b,c,e,
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4. [ ]

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION 60V
6. DISC# 4
7. TEST NO. TO 55584

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI) [ ]b,c,e
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI) [ ]b,c,e
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OD (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OL (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

B-5

ID # : DD80101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION 60V
6. DISC# 5
7. TEST NO. TN 1338

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. (KSI))
2. SUPPLIER: Bethlehem Steel
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,f [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,f

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1500 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4. [ ]

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK BD
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOV
6. DISC# 6
7. TEST NO. TN1256

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI) [ ]bce,
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI) [ ]b,c,e,
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]bce
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]bce
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bce
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

B-1

ID # : D0801014D1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TN1252

B. MATERIAL PROPERTIES (HUB) TB
1. TYPE [ ]b,c,e
(MIN. Y.S. [ ] (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS
SPEED (RPM) STRESS
1. 1800 (KSI)
2. 2160 (120%) (KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

ID # : D0801014O1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 2
7. TEST NO. TN 1334

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI))TB
2. SUPPLIER: Bethlehem Steel
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

D. CHEMISTRY

[C]bce [MN]bce [SI]bce [P]bce [CR]bce [MO]bce [V]bce

[NI]bce [AS]bce [SB]bce [SN]bce [AL]bce [CU]bce [S]bce

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]bce
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]bce
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bce
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D0801014O1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 3
7. TEST NO. TN 1335

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Bethlehem Steel
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [
4.] bce

ID # : 0080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TN 1254

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. (KSI))
2. SUPPLIER: Bethlehem Steel
3. Y.S. (KSI) [ ]bce
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI) [ ]b,c,e
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]bce	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 5
7. TEST NO. TN 1337

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI) [ ]b,c,e
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI) [ ]b,c,e
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT
3. CUSTOMER: NOTHERN STATES PRAIRIE ISLAND #1
4. LP# 1
5. LOCATION GEN
6. DISC# 6
7. TEST NO. TD 26220

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D0801014D1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TO44557

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

D. CHEMISTRY

[C]bce [MN]bce [SI]bce [P]bce [CR]bce [MO]bce [V]bce

[NI]bce [AS]bce [SB]bce [SN]bce [AL]bce [CU]bce [S]bce

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]bce
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]bce
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bce
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TD 5344

B. MATERIAL PROPERTIES (HUB) TB
1. TYPE (MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bc,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bc,e
4.

B-15

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION 60V
6. DISC# 3
7. TEST NO. TO 44563

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F)
2. ESTIMATED MAX DA/DT (IN/HR)

[ ]b,c,e

3.
4.

[ ]bce

ID # : DD8D1D1401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION 60V
6. DISC# 4
7. TEST NO. TD 534B

B. MATERIAL PROPERTIES (HUB) TB
1. TYPE
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))
[ ]bce,f

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))
[ ]b,c,e

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]bce
2.	2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bc,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-17

ID # : D0201014D1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 5
7. TEST NO. TD 44527

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]b,c,e TB
(MIN. Y.S. [ ]b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION

1.	BUILDING BLOCK	80
2.	UNIT	PRAIRIE ISLAND #1
3.	CUSTOMER:	NOTHERN STATES
4.	LP#	2
5.	LOCATION	60V
6.	DISC#	6
7.	TEST NO.	TD 44521

B. MATERIAL PROPERTIES (HUB)

1.	TYPE (MIN. Y.S. [ ]bce (KSI))	TB
2.	SUPPLIER:	MIDVALE HEPPENSTALL
3.	Y.S. (KSI)	[ ]b,c,e
4.	U.T.S. (KSI)	
5.	ELONGATION	
6.	R.A.	
7.	FATT (DEG.F)	
8.	R.T. IMPACT(FT.LB.)	
9.	U.S. IMPACT TEMP. (DEG.F)	
10.	U.S. IMPACT ENG. (FT.LB.)	
11.	U.S. KIC (KSI*SQRT(IN.))	

C. MATERIAL PROPERTIES (RIM)

1.	Y.S. (KSI)	[ ]b,c,e
2.	U.T.S. (KSI)	
3.	ELONGATION	
4.	R.A.	
5.	FATT (DEG.F)	
6.	R.T. IMPACT(FT.LB.)	
7.	U.S. IMPACT TEMP. (DEG.F)	
8.	U.S. IMPACT ENG. (FT.LB.)	
9.	U.S. KIC (KSI*SQRT(IN.))	

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e	[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e
[CU]b,c,e	[S]b,c,e										

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1.	A-CR-OP (1800 RPM) (IN.)	[ ]b,c,e
2.	A-CR-OS (OVERSPEED) (IN.)	

G. SERVICE DATA

1.	OPER. TEMP. METAL TEMP. HUB (DEG.F)	[ ]b,c,e
2.	ESTIMATED MAX DA/DT (IN/HR)	
3.	[ ]b,c,e	
4.		

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TD 55609

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CO]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS
1. 1800	(KSI)
2. 2160 (120%)	(KSI)

[ ]bce

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]bce

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F)
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4. [ ]bce

[ ]bce

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 2
7. TEST NO. TD 5342

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.)	[ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)	

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F)	[ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)	
3. [ ]bce	
4.	

ID # : D0801O1401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 3
7. TEST NO. TD5338

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI) [ ]b,c,e
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))
[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS
1. 1800	(KSI)
2. 2160 (120%)	(KSI) [ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.) [ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D0801014O1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TD5345

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CO]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]bce

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]bce

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F)
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4. [ ]bce

[ ]bce

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 5
7. TEST NO. TD 49528

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

ID # : D080101401

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LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT PRAIRIE ISLAND #1
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 6
7. TEST NO. TO 44522

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL
3. Y.S. (KSI) [ ]bce
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI) [ ]b,c,e
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

Attachment 3

Prairie Island Nuclear Generating Plant

Unit No. 2

Site Specific General Questions

I. A. Turbine Type

Prairie Island 2 consists of one tandem compound four flow, three casing, condensing 1800 RPM turbine utilizing 40 inch last row blades on each LP element. The LP element is designated as a Building Block 80.

B. Number of hours for each LP turbine at time of last inspection:

LP1	19977 hours
LP2	18269 hours

C. LP1 6 overspeeds, 38 trips
LP2 3 overspeeds, 32 trips

An overspeed is any event where the turbine is believed to have gone above 1820 RPM.

D. 1. Material is Ni-Cr-Mo-V alloy similar to ASTM A-471.

Data for items 1 through 11 for question 1.D is not available at this time. Westinghouse has indicated that it will become available in about four weeks. NSP will submit the data at that time.

Since the rotors were inspected and put in service on February 19, 1980, and only one small indication of 19 mils was found, NSP believes that an extension of four weeks to submit the requested data should not result in undue risk to the health and safety of the public. In any case, the data should not be substantially different than that submitted for Unit 1.

II. The Northern States Power Company Unit had a Westinghouse field inspection team at the job site from 12/5/79 to 12/19/79 to ultrasonic inspect the keyways and disc bores of the LP rotors. The rotors inspected were #1 LP-TD44481 and #2 LP-TD1249.

The inspection method employed was to ultrasonic inspect all keyways on Disc 1 thru 5 both ends on each rotor. Also, an ultrasonic 360° scan was made on the inlet and outlet side of each disc.

The inspection results are as follows:

#1 LP	Indication in disc bore of disc #3, Gov End inlet side is result of corrective action taken on disc during manufacture.
#2 LP	.019 deep indication #3 Disc, Gen End Keyway #2

III. See Unit 1 submittal. Response is the same for both units.

IV. The LP rotors have been inspected.

V. An indication was noted on one of the 20 discs inspected. Disc #3 in the generator end of the #2 LP had an indication in one of the three keyways .019 inches in depth.

The present crack growth rate data upon which the estimated life is based includes all Westinghouse experience and 3% Ni, Cr, Mo, V alloy discs from the British experience. It also includes the worst case in regard to material properties from Westinghouse's specification in that the original disc forging supplier is no longer in business and Westinghouse is attempting to get the actual disc material properties.

Based on the upper bound of this combined Westinghouse and British experience, the depth of the indication and the most severe specification material physical properties, it is our opinion that the estimated remaining life of disc #3 is 6.95 years. To account for uncertainties in the predictive process, the theoretical propagation time was divided by 3.

The #3 disc will be reinspected within the next 42 months of operation.

VI. See Unit 1 submittal. Response is the same for both units.

Attachment 3

Prairie Island Nuclear Generating Plant

Spare Rotors

I. A. Turbine Type

The Prairie Island spare rotors are condensing 1800 RPM turbines containing 40 inch last row blades. They are similar to those in Units 1 and 2.

B. Number of hours for each LP turbine at the time of their inspection, 2/80

LP1	24945 hrs
LP2	24945 hrs

C. LP1 2 overspeeds, 19 trips
LP2 2 overspeeds, 19 trips

D. 1. Material is Ni-Cr-Mo-V alloy similar to ASTM A-471. See section B & C of Appendix B for material data.

2. See Section B & C of Appendix B.

3. See Section B & C of Appendix B.

4. See Section G.1 of Appendix B.

5. See Section G.3 of Appendix B.

6. See Section F of Appendix B.

7. See G.4 of Appendix B.

8. See G.2 of Appendix B.

9. See E of Appendix B.

10. See Sections B & C of Appendix B.

11. See Section B of Appendix B.

II. The Northern States Power Company, Prairie Island Spare Rotors, had a Westinghouse Field Inspection Team at the job site from 2/11/80 to 2/22/80 to ultrasonic inspect the L.P. rotors for cracked keyways in the discs. The rotors inspected were #1 LP MPE93813 and #2 LP MPE93814.

The inspection method employed at that time was to ultrasonic inspect all keyways on Disc 1 to 5 both ends on each rotor and an ultrasonic 360° scan on the outlet and inlet side of each disc.

The inspection results are as follows:

#1 L.P. ROTOR -- No indications.

#2 L.P. ROTOR -- No indications.

III. See Unit 1 submittal. Response is the same for spare rotors.

IV. The spare rotors have been inspected.

V. There are no indications.

VI. See Unit 1 submittal. Response is the same for spare rotors.

Note: Due to a computer output error, the data for LP #1, generator end, disc #5 is not available. NSP will submit when Westinghouse makes the data available. In the interim, however, the data for this disc should be very similar to the data submitted for LP #1, governor end, disc #5.

APPENDIX B

PAGES B25-B47

SPARE ROTORS

NON-PROPRIETARY

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TE 18529

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

D. CHEMISTRY

[C]bce [MN]bce [SI]bce [P]bce [CO]bce [MO]bce [V]bce

[NI]bce [AS]bce [SB]bce [SN]bce [AL]bce [CU]bce [S]bce

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]bce

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.) [ ]bce

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bce
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : DD8010140I

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TE 18532

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce L

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

D. CHEMISTRY

[C]bce	[MN]bce	[SI]bce	[P]bce	[CR]bce	[MO]bce	[V]bce
[NI]bce	[AS]bce	[SB]bce	[SN]bce	[AL]bce	[CU]bce	[S]bce

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]bce
2. 2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.) [ ]bce

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bce
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-27

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK — BD
2. UNIT — SPARE ROTORS
3. CUSTOMER: — NORTHERN STATES
4. LP# — 1
5. LOCATION — GOV
6. DISC# — 3
7. TEST NO. — TE 18539

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOU
6. DISC# 4
7. TEST NO. TE18155

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOV
6. DISC# 5
7. TEST NO. TE18545

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce (KSI) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-30

ID # : D020101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GOV
6. DISC# 6
7. TEST NO. TE 18548

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-31

ID # : 0080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TE 18528

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS
SPEED (RPM) STRESS
1. 1800 (KSI)
2. 2160 (120%) (KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F)
2. ESTIMATED MAX DA/DT (IN/HR)

[ ]bc,e

3. [
4.] bcc

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK BD
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 2
7. TEST NO. TE 18533

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS
1. 1800	(KSI)
2. 2160 (120%)	(KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

ID # : D0801014D1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK — BD
2. UNIT — SPARE ROTORS
3. CUSTOMER: — NOTHERN STATES
4. LP# — 1
5. LOCATION — GEN
6. DISC# — 3
7. TEST NO. — TE 18536

B. MATERIAL PROPERTIES (HUB)
1. TYPE — TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: — Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D0201014D1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TE 18541

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.) [ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : DD80101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT SPARE ROTORS
3. CUSTOMER: NORTHERN STATES
4. LP# 1
5. LOCATION GEN
6. DISC# 6
7. TEST NO. TE 18549

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce (MCT) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI) [ ]bce
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT (FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI) [ ]b,c,e
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT (FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CO]b,c,e	[MO]b,c,e	[V]b,c,e	
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e	

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

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ID # : 00801101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK BD
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TE 18530

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

D. CHEMISTRY

[C]bce [MN]bce [SI]bce [P]bce [CR]bce [MO]bce [V]bce

[NI]bce [AS]bce [SB]bce [SN]bce [AL]bce [CU]bce [S]bce

E. BORE STRESS
SPEED (RPM) STRESS
1. 1800 (KSI)
2. 2160 (120%) (KSI)

[ ]bce

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]bce

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F)
2. ESTIMATED MAX. DA/DT (IN/HR)

[ ]bce

3. [ ]bce
4.

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ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK BD
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TE 18534

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]b,c,e

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.) [ ]b,c,e

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4. [ ]

ID # : DD801014D1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 3
7. TEST NO. TE 18537

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]bce

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bc,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-30

ID # : D0801D1401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK — BD
2. UNIT — SPARE ROTORS
3. CUSTOMER: — NOTHERN STATES
4. LP# — 2
5. LOCATION — GOV
6. DISC# — 4
7. TEST NO. — TE 18542

B. MATERIAL PROPERTIES (HUB)
1. TYPE — TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: — Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F)
2. ESTIMATED MAX DA/DT (IN/HR)

[ ]bce

[ ]bce

B-40

ID # : D020101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 5
7. TEST NO. TE 18547

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]bce [MN]bce [SI]bce [P]bce [CR]bce [MO]bce [V]bce

[NI]bce [AS]bce [SB]bce [SN]bce [AL]bce [CU]bce [S]bce

E. BORE STRESS
SPEED (PPM) STRESS
1. 1800 (KSI)
2. 2160 (120%) (KSI) [ ]bce

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.) [ ]bce

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]bce
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-41

ID # : D080101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GOV
6. DISC# 6
7. TEST NO. TE 18550

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]b,c,e TB
(MIN. Y.S. (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS	
1.	1800	(KSI)	[ ]b,c,e
2.	2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

B-42

ID # : D020101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TE18351

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

	SPEED (RPM)	STRESS
1.	1800	(KSI)
2.	2160 (120%)	(KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F)
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

[ ]b,c,e

B-43

ID # : D0801014D1

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 2
7. TEST NO. TE 18535

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e	
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e	

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.)	[ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)	

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]a,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]b,c,e
4.

B-44

ID # : DD8D101401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 3
7. TEST NO. TE 18538

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ]bce TB
(MIN. Y.S. (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.)

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-45

ID # : D0801D1401

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 8D
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TE 18543

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI) [ ]bce
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))
[ ]b,c,e

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e

E. BORE STRESS

SPEED (PPM)	STRESS
1. 1800	(KSI)
2. 2160 (120%)	(KSI) [ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.) [ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

ID # : D080101401

B46

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK BD
2. UNIT SPARE ROTORS
3. CUSTOMER: NOTHERN STATES
4. LP# 2
5. LOCATION GEN
6. DISC# 5
7. TEST NO. TE 18546

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [ ]bce (KSI))
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e [MN]b,c,e [SI]b,c,e [P]b,c,e [CR]b,c,e [MO]b,c,e [V]b,c,e

[NI]b,c,e [AS]b,c,e [SB]b,c,e [SN]b,c,e [AL]b,c,e [CU]b,c,e [S]b,c,e

E. BORE STRESS
SPEED (RPM) STRESS
1. 1800 (KSI)
2. 2160 (120%) (KSI)

[ ]b,c,e

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.)
2. A-CR-OS (OVERSPEED) (IN.)

[ ]b,c,e

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]b,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3. [ ]bce
4.

B-47

ID # : D08010140I

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK — BD
2. UNIT — SPARE ROTORS
3. CUSTOMER: — NOTHERN STATES
4. LP# — 2
5. LOCATION — GEN
6. DISC# — 6
7. TEST NO. — TE 18551

B. MATERIAL PROPERTIES (HUB)
1. TYPE (MIN. Y.S. [ ]bce (KSI)) TB L
2. SUPPLIER: Mitsubishi
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.)
9. U.S. IMPACT TEMP. (DEG.F)
10. U.S. IMPACT ENG. (FT.LB.)
11. U.S. KIC (KSI*SQRT(IN.))

[ ]bce

C. MATERIAL PROPERTIES (RIM)
1. Y.S. (KSI)
2. U.T.S. (KSI)
3. ELONGATION
4. R.A.
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.)
7. U.S. IMPACT TEMP. (DEG.F)
8. U.S. IMPACT ENG. (FT.LB.)
9. U.S. KIC (KSI*SQRT(IN.))

[ ]b,c,e

D. CHEMISTRY

[C]b,c,e	[MN]b,c,e	[SI]b,c,e	[P]b,c,e	[CR]b,c,e	[MO]b,c,e	[V]b,c,e	
[NI]b,c,e	[AS]b,c,e	[SB]b,c,e	[SN]b,c,e	[AL]b,c,e	[CU]b,c,e	[S]b,c,e	

E. BORE STRESS

SPEED (RPM)	STRESS	
1. 1800	(KSI)	[ ]b,c,e
2. 2160 (120%)	(KSI)	

F. CRACK DATA
1. A-CR-OP (1800 RPM) (IN.) [ ]b,c,e
2. A-CR-OS (OVERSPEED) (IN.)

G. SERVICE DATA
1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [ ]a,c,e
2. ESTIMATED MAX DA/DT (IN/HR)
3.
4.