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AUTH.NAME AUTHOR AFFILIATION
MATHEWS,E.R. Wisconsin Public Service Corp.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Operating Reactors

SUBJECT: Forwards proprietary & nonproprietary versions of responses to site-specific questions in NRC 800225 request for info re turbine disc integrity in Westinghouse reactors. Proprietary version withheld (ref 10CFR2.790).

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| | 14 ENGR BR | 1 | 1 | 15 REAG SFTY BR | 1 | 1 |
| | 16 PLANT SYS BR | 1 | 1 | 17 EEB | 1 | 1 |
| | 18 EFFL TRT SYS | 1 | 1 | NRC PDR | 1 | ~~0~~ NP |
| | OELD | 1 | 0 | STS GROUP LEADR | 1 | 0 |
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| | NSIC | 1 | ~~0~~ NP | SMITH,H. W/AFF | 1 | 0 |

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MAR 27 1980

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MEMORANDUM FOR: TERA Corp.

FROM: US NRC/TIDC/Distribution Services Branch

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- ☐ Other: (specify)

Mike

cc: DSB Files

TIDC/DSB Authorized Signature

**WISCONSIN PUBLIC SERVICE CORPORATION**

*P.O. Box 1200, Green Bay, Wisconsin 54305*

March 18, 1980

Mr. Darrell G. Eisenhut
Division of Operating Reactors
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Eisenhut:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Cracking in Low Pressure Turbine Discs

Enclosed are:

1. One (1) copy - responses to the February 25, 1980 request for information on turbine disc integrity, including one (1) copy - Application for Withholding and one (1) copy - Affidavit AW-80-9.

2. One (1) copy - Appendix A (proprietary) - Responses to Question 1-d

3. One (1) copy - Appendix A (non-proprietary) - Responses to Question 1-d

The purpose of this letter is to respond to your request for information of February 25, 1980, relative to turbine disc integrity in operating Westinghouse nuclear low pressure turbines. Per your request in the subject letter, responses to the generic questions have been coordinated through a task force whose representation includes all owners of Westinghouse nuclear low pressure turbines and is chaired by Mr. Wayne Stiede of Commonwealth Edison. The consensus responses to the generic questions have been submitted to you by Westinghouse at the request of the task force. Where we agree with the responses, we have referenced that transmittal in our attached responses.

The site specific responses contain proprietary information of the Westinghouse Electric Corporation. In conformance with the requirements of 10 CFR Section 2.790, as amended, of the Commission's regulations, we are enclosing with the submittal an application for withholding from public disclosure and an affidavit. The affidavit sets forth the basis on which the information may be withheld from public disclosure by the Commission.

PA 0'S.
CHANGE: LE PROP ENCL TO:
NRC PDR, NP FILES
LPDR, NP W ROSS
NSIC, NP ENG BR
BC (2)

8003250449

Correspondence with respect to the affidavit or application for withholding should reference AW-80-9 and should be addressed to Mr. R. Williamson, Manager, Customer Order Engineering, Westinghouse Electric Corporation, Steam Turbine Divisions Lester Branch Box 9175, Philadelphia, PA 19113.

Very truly yours,

E.R. Mathews

E. R. Mathews, Vice President
Power Supply & Engineering

ERM:ljh

Subscribed and sworn to before me
this eighteenth day of March, 1980.

Jeanne O Lewa

Notary Public of Brown County in
the State of Wisconsin

My Commission Expires 2-6-83.

DOCKET NO. 50-305

DATE: 80/03/27

NOTE TO NRC AND/OR LOCAL PUBLIC DOCUMENT ROOMS

The following item submitted with letter dated 80/03/18 from Wisconsin Public Serv Corp. is being withheld from public disclosure in accordance with Section 2.790.

PROPRIETARY INFORMATION

Forwards Prop. & Nonprop. responses to site-specific questions

Sharon Hunt
M/S - 016

Distribution Service's Branch

AW-80-9

March 14, 1980

Darrell G. Eisenhut
Division of Operating Reactors
Office of Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington DC 20555

APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE

Subject: Kewaunee Docket #50-305
Information in Response to NRC Request for Information of February 25, 1980, Relative to Low Pressure Turbine Disc Integrity.

Reference: Appendix A letter from E. R. Mathews to Eisenhut, dated 3/17/80

Dear Mr. Eisenhut:

This application for withholding is submitted by Westinghouse Electric Corporation ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. Withholding from public disclosure is requested with respect to the subject information which is further identified in the affidavit accompanying this application.

The undersigned has reviewed the information sought to be withheld and is authorized to apply for its withholding on behalf of Westinghouse, STG-TOD.

The affidavit accompanying this application sets forth the basis on which the information may be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of Section 2.790 of the Commission's regulations.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse and which is further identified in the affidavit be withheld from public disclosure in accordance with 10CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should be addressed to the undersigned.

Very truly yours,

Robert Williamson

R. Williamson, Manager
Customer Order Engineering
Westinghouse Electric Corporation

Ref: AW-80-9

# AFFIDAVIT

COMMONWEALTH OF PENNSYLVANIA
COUNTY OF DELAWARE:

Before me, the undersigned authority, personally appeared Robert Williamson, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Corporation ("Westinghouse") and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief:

Robert B. Williamson

Robert Williamson, Manager
Customer Order Engineering

Sworn to and subscribed before me
this 15 day of June 1980.

Henry E. Squillace

HENRY E. SQUILLACE
Notary Public, Marple Twp., Delaware Co.
My Commission Expires Oct. 18, 1980

(1) I am Manager, Customer Order Engineering in the Steam Turbine Generator Technical Operations Division of Westinghouse Electric Corporation and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing, and am authorized to apply for its withholding on behalf of the Westinghouse Power Generation Divisions.

(2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.

(3) I have personal knowledge of the criteria and procedures utilized by Westinghouse Power Generation Divisions in designating information as a trade secret, privileged or as confidential commercial or financial information.

(4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

(i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.

(ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

(a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.

(b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.

(c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.

(d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.

(e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.

(f) It contains patentable ideas, for which patent protection may be desirable.

(g) It is not the property of Westinghouse, but must be treated as proprietary by Westinghouse according to agreements with the owner.

(h) Public disclosure of this information would allow unfair and untruthful judgments on the performance and reliability of Westinghouse equipment components and improper comparison with similar components made by competitors.

There are sound policy reasons behind the Westinghouse system which include the following:

(a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.

(b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

(c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.

(d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.

(e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition in those countries.

(f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.

(iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.790, it is to be received in confidence by the Commission.

(iv) The information is not available in public sources to the best of our knowledge and belief.

(v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in Appendix A to letter from E. R. Mathews to Eisenhut, dated March 17, 1980 concerning information in response to NRC request for information of February 25, 1980, relative to low pressure turbine disc integrity.

The information enables Westinghouse to:

(a) Develop test inputs and procedures to satisfactorily verify the design of Westinghouse supplied equipment.

(b) Assist its customers to obtain licenses.

Further, the information has substantial commercial value as follows.

(a) Westinghouse can sell the use of this information to customers.

(b) Westinghouse uses the information to verify the design of equipment which is sold to customers.

(c) Westinghouse can sell services based upon the experience gained and the test equipment and methods developed.

Public disclosure of this information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to design, manufacture, verify, and sell electrical equipment for commercial turbine-generators without commensurate expenses. Also, public disclosure of the information would enable others having the same or similar equipment to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the equipment described in part by the information is the result of many years of development by Westinghouse and the expenditure of a considerable sum of money.

This could only be duplicated by a competitor if he were to invest similar sums of money and provided he had the appropriate talent available and could somehow obtain the requisite experience.

Further the deponent sayeth not.

ANSWERS TO SITE SPECIFIC GENERAL QUESTIONS

I. Provide the following information for each LP turbine:

A. Turbine type

The Wisconsin Public Service, Kewaunee #1 unit consists of one tandem compound four flow, three-casings, condensing, 1800 RPM turbine utilizing 40 in. last row blades in each low pressure element. The low pressure element is designated as a Building Block 80.

B. Number of hours of operation for each LP turbine at time of last turbine inspection or if not inspected, postulated to inspection.

Operating hours to May 9, 1980 = 41152 + 1696 = 42,848 hours. May 9, 1980 is the scheduled shutdown for refueling at which time disc inspection will be conducted.

C. Number of turbine trips and overspeeds.

There have been 57 turbine trips at Kewaunee, none of these trips resulted in overspeed.

There has been 6 overspeeds at Kewaunee for testing under controlled conditions.

D. For each disc:

1. Type of material including material specifications.

The disc material is Ni-Cr-Mo-V alloy steel similar to ASTM A-471. The minimum yield strength specified for each disc is given in Appendix A, Section B.

2. Tensile properties data.

Tensile property data of tests taken from the disc hub and rim are presented in Appendix A, Section B and C, respectively.

3. Toughness property data including Fracture Appearance Transition Temperature and upper energy and temperature.

Toughness property data of tests taken from the disc hub and rim are also presented in Appendix A, Section B and C, respectively. Upper shelf energy is not presented when it is the same as the room temperature energy.

4. Keyway Temperatures.

The keyway temperature is presented in Appendix A, Section G.1. This is the calculated temperature two (2) inches from the exhaust face of the disc at the bore during full load operation with all moisture separator reheaters functioning.

5. Calculated keyway crack size for turbine time specified in "B" above.

The calculated keyway crack size for each disc is presented in Appendix A, G.3. The crack size for discs 1 and 6 are zero because the crack growth rates are assumed to be zero as explained in 8 below.

6. Critical Crack Size

The critical crack size at 1800 rpm and at design overspeed is presented in Appendix A, section F. It is calculated using the Westinghouse proprietary relationship which is given on page 25 of Appendix A.

7. Ratio of Calculated Crack to Critical Crack Size.

The ratio of calculated maximum crack size (G3) to critical crack size at overspeed (F2) is presented in Appendix A, section G.4.

8. Crack growth rate.

The crack growth rate is presented in Appendix A, Section G.2. The crack growth rates the maximum expected rates based upon known cracks to date. The crack growth rate for discs 1 and 6 are assumed to be zero because these discs operate dry.

9. Calculated bore and keyway stress at operating design overspeed.

The bore tangential stress at 1800 rpm and at design overspeed, 120%, are presented in Appendix A, Section E. The value presented include the stresses due to shrink fit and centrifugal force loads only. Additional analyses to include thermal stresses and pressure stresses are being conducted by Westinghouse.

10. Calculated $K_{IC}$ data.

The fracture toughness data, $K_{IC}$, of each disc was calculated from Charpy V - notch and tensile data and are presented in Appendix A, Section B and C. These values were calculated at the upper shelf temperature or room temperature, whichever gave the lower result.

11. Minimum yield strength specified for each disc.

The minimum yield strength specified for each disc is presented in Appendix A, Section B.

II. Provide details of the results of any completed inservice inspection of LP turbine rotors, including areas examined, since issuance of an operating license. For each indication detected, provide details of the location of the crack, its orientation, and size.

The LP turbine rotors at Kewaunee have not been examined to date.

III. Provide the nominal water chemistry conditions for each LP turbine and describe any condenser inleakages or other significant changes in secondary water chemistry to this point in its operating life. Discuss the occurrence of cracks in any given turbine as related to history of secondary water chemistry in the unit.

The nominal water chemistry conditions for the LP turbines can be described as follows:

During plant start up (3/74) and initial operation the secondary side was on coordinated phosphate control as designated by the Westinghouse specifications for the unit. Coordinated phosphate control lasted for 6 months (9/74) at which time the secondary system was converted to all volatile treatment using only hydrazine for both oxygen scavenging and pH control.

During plant startup and operation air inleakage and water seapage problems have occurred intermittantly over the life of the plant. Leaking tubes are plugged and plastic inserts (Alkaserts) have been installed to prevent tube throat erosion.

Secondary water chemistry has always been maintained within strict limitations at Kewaunee Nuclear Power Plant, as evidenced by the small amount of sludge discharges found during annual sludge lancing operations. We are not aware of any correlation between secondary chemistry and cracks in the turbine, and have not detected any turbine cracks at our unit. If any turbine cracks are found and there is reason to believe that they may be related to secondary chemistry, we will evaluate that possibility.

IV. If your plant has not been inspected, describe your proposed schedule and approach to ensure that turbine cracking does not exist in your turbine.

The LP turbine rotors will be inspected during the 1980 refueling outage starting May 9, 1980.

The ratio of maximum calculated crack size to critical crack size for overspeed conditions was calculated in I.D.7 above. This analysis showed that $A/Acr \leq .28$ for all discs for projected operating hours to

May 9, 1980. Therefore, the maximum expected crack size is sufficiently less than the critical crack size at the scheduled inspection time and demonstrates the safety of the unit.

V. If your plant has been inspected and plans to return or has returned to power with cracks, provide your proposed schedule for the next turbine inspection and the basis for this inspection schedule.

Not applicable.

VI. Indicate whether an analysis and evaluation regarding turbine missiles have been performed for your plant and provided to the staff. If such an analysis and evaluation has been performed and reported, please provide appropriate references to the available documentation. In the event that such studies have not been made, consideration should be given to scheduling such an action.

An analysis regarding turbine missiles has been performed for the Kewaunee Plant and is reported in Appendix B of the Kewaunee FSAR. A review of this analysis was conducted in the latter part of 1979 in light of the concerns which have arisen. Further reviews of our analysis will be performed upon receipt of more data from Westinghouse. This data is expected to be available by June of 1980. The reviews performed to date have indicated that sufficient margin exists in the design of the structures at Kewaunee to give adequate protection of the plant against any expected turbine missiles.

ANSWERS TO GENERIC QUESTIONS

We agree with the consensus positions developed by the Westinghouse Turbine Disc Integrity Task Force which were transmitted to you by Westinghouse Steam Turbine Division letter, dated March 14, 1980 from J. Schmerling, Westinghouse to D. Eisenhut, NRC. Please refer to that letter for our response.

APPENDIX A

RESPONSES TO SITE SPECIFIC QUESTION I.D

(NON-PROPRIETARY VERSION)

ID # : D080101104

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 6
7. TEST NO. TD44523

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TA
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D080101104

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 5
7. TEST NO. TD55596

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, $A = DA/DT \times$ OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : DD80101104

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TD55585

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
(MIN. Y.S. [ ]b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ]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 | SR [ ]b,c,e | SN [ ]b,c,e | AL [ ]b,c,e | CU [ ]b,c,e | S [ ]b,c,e |

**E. BOPE 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)

[ ]b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [ ]b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ]b,c,e

ID # : D080101104

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 3
7. TEST NO. TD5555I

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ]b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ]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)

[ ]b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [ ]b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{cr}$ = [ ]b,c,e

ID # : 0080101104

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 2
7. TEST NO. TD30663

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE [ ]b,c,e TE
   (MIN. Y.S. (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ]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)

[ ]b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [ ]b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{cr}$ = [ ]b,c,e

ID # : D080101104

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TD55611

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ] 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D080101103

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 6
7. TEST NO. TD26221

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D080101103

## LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 5
7. TEST NO. TD55586

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ] b,c,e
(MIN. Y.S. (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ] 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D08D101103

# LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 4
7. TEST NO. TD55582

B. MATERIAL PROPERTIES (HUB)
1. TYPE 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) |
| 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)

[ ]b,c,e

3. ESTIMATED MAX. CRACK SIZE, $A = DA/DT \times$ OPERATING HRS. (IN.) = [ ]b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{cr}$ = [ ]b,c,e

ID # : DG8D101103

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 3
7. TEST NO. TD55550

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ]b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ]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)

[ ]b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [ ]b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Acr = [ ]b,c,e

ID # : D080101103

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TD55610

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE [ ] b,c,e TE
   (MIN. Y.S. (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)**

b,c,e

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) |
| 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D08D101103

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TD44560

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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 [ST] 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, $A = DA/DT \times$ OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D080101102

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 6
7. TEST NO. TD5356

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/ACR = [ ] b,c,e

ID # : DC80101102

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# I
5. LOCATION GEN
6. DISC# 5
7. TEST NO. TD5326

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI)
4. U.T.S. (KSI)
5. ELONGATION
6. R.A.
7. FATT (DEG.F)
8. P.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. P.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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D06D101102

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TD55583

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ]b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ]b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. (IN.) = [ ]b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ]b,c,e

ID # : D0801011D2

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 3
7. TEST NO. TD60823

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Ac = [ ] b,c,e

ID # : D0801D11D2

## LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 2
7. TEST NO. TD55409

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ] b,c,e TS (MIN. Y.S. (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ] 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D080101102

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TD44559

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
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)
2. ESTIMATED MAX DA/DT (IN/HR)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D080101101

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 6
7. TEST NO. TD55599

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TA
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Ac = [ ] b,c,e

ID # : D080101101

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 3
7. TEST NO. T060825

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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) |
| 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, $A = DA/DT \times$ OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : DD80101101

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #I
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 3
7. TEST NO. TD60825

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ] 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D080101101

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 5
7. TEST NO. TN1404

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ] 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Acr = [ ] b,c,e

ID # : D080101101

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 4
7. TEST NO. TD60804

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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) |
| 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [ ] b,c,e

ID # : D0801011D1

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TD44558

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [ ] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Acr = [ ] b,c,e

ID # : D080101101

## LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT KE-AUNEE #1
3. CUSTOMER: -ISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TD55410

B. MATERIAL PROPERTIES (HUB)
1. TYPE [ ] b,c,e TS
(MIN. Y.S. (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
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.))

[ ] 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)

[ ] b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [ ] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Ac = [ ] b,c,e

Critical crack size.

The critical crack size at 1800 rpm and at design overspeed is presented in Appendix A, Section F. It is calculated using the following relationship:

[ ] b,c,e

## NOTICE

THE ATTACHED DOCUMENT CONTAINS "PROPRIETARY INFORMATION" AND SHOULD BE HANDLED AS NRC "OFFICIAL USE ONLY" INFORMATION. IT SHOULD NOT BE DISCUSSED OR MADE AVAILABLE TO ANY PERSON NOT REQUIRING SUCH INFORMATION IN THE CONDUCT OF OFFICIAL BUSINESS AND SHOULD BE STORED, TRANSFERRED, AND DISPOSED OF BY EACH RECIPIENT IN A MANNER WHICH WILL ASSURE THAT ITS CONTENTS ARE NOT MADE AVAILABLE TO UNAUTHORIZED PERSONS.

COPY NO. 1

DOCKET NO. _____

CONTROL NO. _____

REPORT NO. _____

REC'D W/LTR DTD. _____

NRC Form 190
(4-78)

APPENDIX A

RESPONSES TO SITE SPECIFIC QUESTION I.D

(WESTINGHOUSE PROPRIETARY)

PROPRIETARY

ID # : D0801011D1

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TD44558

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 109.000
4. U.T.S. (KSI) 119.500
5. ELONGATION 24.0
6. R.A. 68.5
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 90.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 90.0
11. U.S. KIC (KSI*SQRT(IN.)) 214.66

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 105.000
2. U.T.S. (KSI) 118.500
3. ELONGATION 25.0
4. R.A. 65.0
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 90.0
7. U.S. IMPACT TEMP. (DEG.F) 0.0
8. U.S. IMPACT ENG. (FT.LB.) 90.0
9. U.S. KIC (KSI*SQRT(IN.)) 210.94

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.27] | [.27] | [.01] | [.009] | [1.72] | [.33] | [.13] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.58] | [-] | [.0023] | [.016] | [-] | [-] | [.009] |

b,c,e

**E. BORE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [50.000] |
| 2. 2160 (120%) | (KSI) | [56.300] |

b,c,e

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [6.17]
2. A-CR-OS (OVERSPEED) (IN.) [4.78]

b,c,e

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [377]
2. ESTIMATED MAX DA/DT (IN/HR) [0]

b,c,e

3. ESTIMATED MAX.CRACK SIZE, A= DA/DT X OPERATING HRS. =[0] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Acr =[0] b,c,e

ID # : D080101101

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 3
7. TEST NO. TD60825

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 99.000
4. U.T.S. (KSI) 113.500
5. ELONGATION 25.0
6. R.A. 64.3
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 98.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 98.5
11. U.S. KIC (KSI*SQRT(IN.)) 215.19

**C. MATERIAL PROPERTIES (RIM)**

1. Y.S. (KSI) 99.500
2. U.T.S. (KSI) 113.000
3. ELONGATION 25.2
4. R.A. 70.9
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 69.5
7. U.S. IMPACT TEMP. (DEG.F) -75.0
8. U.S. IMPACT ENG. (FT.LB.) 69.5
9. U.S. KIC (KSI*SQRT(IN.)) 179.17

b,c,e

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| .26 | .28 | .01 | .010 | 1.80 | .38 | .14 |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| 3.44 | - | .0024 | - | - | - | .010 |

b,c,e

**E. BORE STRESS**

| SPEED (RPM) | | STRESS |
|---|---|---|
| 1. 1800 | (KSI) | 52.400 |
| 2. 2160 (120%) | (KSI) | 59.700 |

b,c,e

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) 5.61
2. A-CR-OS (OVERSPEED) (IN.) 4.23

b,c,e

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 233
2. ESTIMATED MAX DA/DT (IN/HR) $.836 \times 10^{-5}$

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [.358] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.08] b,c,e

PROPRIETARY

ID # : 0080101101

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 4
7. TEST NO. TD60804

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 94.500
4. U.T.S. (KSI) 113.000
5. ELONGATION 22.5
6. R.A. 64.0
7. FATT (DEG.F) -118.0
8. R.T. IMPACT(FT.LB.) 78.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 78.5
11. U.S. KIC (KSI*SQRT(IN.)) 186.70

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 98.000
2. U.T.S. (KSI) 115.500
3. ELONGATION 25.0
4. R.A. 72.9
5. FATT (DEG.F) -118.0
6. R.T. IMPACT(FT.LB.) 94.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 94.0
9. U.S. KIC (KSI*SQRT(IN.)) 208.95

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.26] | [.27] | [.02] | [.012] | [1.84] | [.45] | [.12] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.45] | [-] | [-] | [.018] | [-] | [-] | [.010] |

b,c,e

**E. BORE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [49.600] |
| 2. 2160 (120%) | (KSI) | [58.200] |

b,c,e

**F. CRACK DATA**

| | |
|---|---|
| 1. A-CR-OP (1800 RPM) (IN.) | [4.65] |
| 2. A-CR-OS (OVERSPEED) (IN.) | [3.27] |

b,c,e

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [195]
2. ESTIMATED MAX DA/DT (IN/HR) [$.356 \times 10^{-5}$] b,c,e
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [.152] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.05] b,c,e

ID # : D080101101

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 5
7. TEST NO. TN1404

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 99.000
4. U.T.S. (KSI) 117.000
5. ELONGATION 23.7
6. R.A. 65.6
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 103.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 103.0
11. U.S. KIC (KSI*SQRT(IN.)) 220.31

**C. MATERIAL PROPERTIES (RIM)**

1. Y.S. (KSI) 99.500
2. U.T.S. (KSI) 116.500
3. ELONGATION 25.6
4. R.A. 72.2
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 107.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 107.0
9. U.S. KIC (KSI*SQRT(IN.)) 225.29

b,c,e

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| .25 | .33 | .02 | .009 | 1.77 | .39 | .12 |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| 3.64 | – | – | – | – | – | .010 |

b,c,e

**E. BORE STRESS**

| SPEED (RPM) | | STRESS |
|---|---|---|
| 1. 1800 | (KSI) | 50.500 |
| 2. 2160 (120%) | (KSI) | 58.400 |

b,c,e

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) 6.38
2. A-CR-OS (OVERSPEED) (IN.) 4.67

b,c,e

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 177
2. ESTIMATED MAX DA/DT (IN/HR) $.228 \times 10^{-5}$

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [.098] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Acr = [.02] b,c,e

PROPRIETARY

ID # : D080101101

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 6
7. TEST NO. TD55599

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TA
   (MIN. Y.S. [80.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 99.000
4. U.T.S. (KSI) 117.000
5. ELONGATION 23.6
6. R.A. 64.7
7. FATT (DEG.F) 0.0
8. R.T. IMPACT(FT.LB.) 84.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 84.0
11. U.S. KIC (KSI*SQRT(IN.)) 197.81

### C. MATERIAL PROPERTIES (RIM)

1. Y.S. (KSI) 99.500
2. U.T.S. (KSI) 117.000
3. ELONGATION 24.5
4. R.A. 71.3
5. FATT (DEG.F) 0.0
6. R.T. IMPACT(FT.LB.) 92.5
7. U.S. IMPACT TEMP. (DEG.F) 0.0
8. U.S. IMPACT ENG. (FT.LB.) 92.5
9. U.S. KIC (KSI*SQRT(IN.)) 208.67

b,c,e

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.25] | [.24] | [.01] | [.009] | [1.61] | [.43] | [.09] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.46] | [-] | [-] | [-] | [-] | [-] | [.009] |

b,c,e

### E. BORE STRESS

| | SPEED (RPM) | STRESS | |
|---|---|---|---|
| 1. | 1800 | (KSI) | [43.500] |
| 2. | 2160 (120%) | (KSI) | [49.500] |

b,c,e

### F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) [6.96]
2. A-CR-OS (OVERSPEED) (IN.) [5.29]

b,c,e

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [198]
2. ESTIMATED MAX DA/DT (IN/HR) [0]

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [0] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Ac = [0] b,c,e

ID # : D080101102

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TD44559

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 103.000
4. U.T.S. (KSI) 118.000
5. ELONGATION 25.7
6. R.A. 69.3
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 96.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 96.0
11. U.S. KIC (KSI*SQRT(IN.)) 216.30

### C. MATERIAL PROPERTIES (RIM)

b,c,e

1. Y.S. (KSI) 104.000
2. U.T.S. (KSI) 119.000
3. ELONGATION 26.0
4. R.A. 70.5
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 86.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 96.0
9. U.S. KIC (KSI*SQRT(IN.)) 204.98

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.27] | [.27] | [.01] | [.009] | [1.72] | [.33] | [.13] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.58] | [-] | [.0023] | [.016] | [ ] | [ ] | [.009] |

b,c,e

### E. BORE STRESS

| SPEED (RPM) | STRESS |
|---|---|
| 1. 1800 | (KSI) 50.000 |
| 2. 2160 (120%) | (KSI) 56.300 |

b,c,e

### F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) 6.27
2. A-CR-OS (OVERSPEED) (IN.) 4.86

b,c,e

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 377
2. ESTIMATED MAX DA/DT (IN/HR) 0

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [0] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [0] b,c,e

ID # : D080101102

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# I
5. LOCATION GEN
6. DISC# 2
7. TEST NO. TD55409

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE (MIN. Y.S. ~~120.0~~ (KSI)) [90.0] b,c,e TB
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 100.500
4. U.T.S. (KSI) 113.500
5. ELONGATION 24.5
6. R.A. 70.7
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 110.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 110.0
11. U.S. KIC (KSI*SQRT(IN.)) 229.67

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 102.500
2. U.T.S. (KSI) 116.000
3. ELONGATION 24.5
4. R.A. 71.3
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 126.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 126.0
9. U.S. KIC (KSI*SQRT(IN.)) 248.89

**D. CHEMISTRY**

C [.24] b,c,e MN [.26] b,c,e SI [.01] b,c,e P [.008] b,c,e CR [1.71] b,c,e MO [.39] b,c,e V [.12] b,c,e

NI [3.33] b,c,e AS [-] b,c,e SB [.0020] b,c,e SN [.017] b,c,e AL [-] b,c,e CU [.14] b,c,e S [.010] b,c,e

**E. BORE STRESS**

| SPEED (RPM) | | STRESS |
|---|---|---|
| 1. 1800 | (KSI) | 52.900 |
| 2. 2160 (120%) | (KSI) | 60.000 |

b,c,e

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) 6.31
2. A-CR-OS (OVERSPEED) (IN.) 4.82

b,c,e

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 285
2. ESTIMATED MAX DA/DT (IN/HR) $.234 \times 10^{-4}$

b,c,e

3. ESTIMATED MAX. CRACK SIZE, $A = DA/DT \times$ OPERATING HRS. (IN.) = [1.00] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.21] b,c,e

ID # : D080101102

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 3
7. TEST NO. TD60823

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 99.000
4. U.T.S. (KSI) 116.500
5. ELONGATION 22.5
6. R.A. 69.9
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 82.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 82.5
11. U.S. KIC (KSI*SQRT(IN.)) 195.93

### C. MATERIAL PROPERTIES (RIM)

1. Y.S. (KSI) 105.000
2. U.T.S. (KSI) 121.000
3. ELONGATION 24.5
4. R.A. 71.3
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 112.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 112.0
9. U.S. KIC (KSI*SQRT(IN.)) 236.74

b,c,e

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.26] | [.27] | [.01] | [.010] | [1.68] | [.38] | [.12] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.40] | [-] | [-] | [-] | [-] | [-] | [.010] |

b,c,e

### E. BORE STRESS

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | 52.400 |
| 2. 2160 (120%) | (KSI) | 59.700 |

b,c,e

### F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) 4.59
2. A-CR-OS (OVERSPEED) (IN.) 3.45

b,c,e

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 233
2. ESTIMATED MAX DA/DT (IN/HR) $.836 \times 10^{-5}$

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [.358] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Ac = [.10] b,c,e

ID # : D060101102

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TD55583

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 107.000
4. U.T.S. (KSI) 118.500
5. ELONGATION 22.7
6. R.A. 68.2
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 109.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 109.5
11. U.S. KIC (KSI*SQRT(IN.)) 236.05

### C. MATERIAL PROPERTIES (RIM)

1. Y.S. (KSI) 107.500
2. U.T.S. (KSI) 118.500
3. ELONGATION 24.0
4. R.A. 72.3
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 107.5
7. U.S. IMPACT TEMP. (DEG.F) -100.0
8. U.S. IMPACT ENG. (FT.LB.) 107.5
9. U.S. KIC (KSI*SQRT(IN.)) 234.29

b,c,e

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.26] | [.25] | [.01] | [.008] | [1.62] | [.38] | [.12] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.38] | [-] | [.0022] | [.017] | [-] | [-] | [.007] |

b,c,e

### E. BORE STRESS

| SPEED (RPM) | STRESS |
|---|---|
| 1. 1800 | (KSI) 49.600 |
| 2. 2160 (120%) | (KSI) 58.200 |

b,c,e

### F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) 7.66
2. A-CR-OS (OVERSPEED) (IN.) 5.46

b,c,e

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 195
2. ESTIMATED MAX DA/DT (IN/HR) $.356 \times 10^{-5}$

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. (IN.) = [.152] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.03] b,c,e

ID # : DC80101102

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 5
7. TEST NO. TD5326

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 98.000
4. U.T.S. (KSI) 115.500
5. ELONGATION 21.4
6. R.A. 62.3
7. FATT (DEG.F) -112.5
8. P.T. IMPACT(FT.LB.) 98.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 98.0
11. U.S. KIC (KSI*SQRT(IN.)) 213.59

### C. MATERIAL PROPERTIES (RIM)

b,c,e

1. Y.S. (KSI) 95.500
2. U.T.S. (KSI) 115.000
3. ELONGATION 23.8
4. R.A. 70.3
5. FATT (DEG.F) -112.5
6. P.T. IMPACT(FT.LB.) 98.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 98.0
9. U.S. KIC (KSI*SQRT(IN.)) 210.99

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| .25 | .28 | .26 | .008 | 1.75 | .49 | .13 |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| 3.47 | - | - | - | - | - | .007 |

b,c,e

### E. BORE STRESS

| SPEED (RPM) | | STRESS |
|---|---|---|
| 1. 1800 | (KSI) | 50.500 |
| 2. 2160 (120%) | (KSI) | 58.400 |

b,c,e

### F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) 5.97
2. A-CR-OS (OVERSPEED) (IN.) 4.37

b,c,e

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 177
2. ESTIMATED MAX DA/DT (IN/HR) $2.28 \times 10^{-5}$

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. (IN.) = .098 b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = .02 b,c,e

ID # : D080101102

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 1
5. LOCATION GEN
6. DISC# 6
7. TEST NO. TD5356

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 94.000
4. U.T.S. (KSI) 109.000
5. ELONGATION 24.0
6. R.A. 71.1
7. FATT (DEG.F)
8. R.T. IMPACT(FT.LB.) 109.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 109.5
11. U.S. KIC (KSI*SQRT(IN.)) 221.94

### C. MATERIAL PROPERTIES (RIM)

1. Y.S. (KSI) 92.500
2. U.T.S. (KSI) 107.500
3. ELONGATION 24.6
4. R.A. 71.3
5. FATT (DEG.F)
6. R.T. IMPACT(FT.LB.) 129.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 129.0
9. U.S. KIC (KSI*SQRT(IN.)) 239.84

b,c,e

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.27] | [.34] | [.21] | [.008] | [1.76] | [.45] | [.14] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.40] | [-] | [-] | [-] | [-] | [-] | [.007] |

b,c,e

### E. BORE STRESS

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | 43.500 |
| 2. 2160 (120%) | (KSI) | 49.500 |

b,c,e

### F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) 8.86
2. A-CR-OS (OVERSPEED) (IN.) 6.76

b,c,e

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 198
2. ESTIMATED MAX DA/DT (IN/HR) 0

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. = [0] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [0] b,c,e

ID # : D0801D1103

PROPRIETARY

# LP TURBINE DISC INFORMATION

## A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 1
7. TEST NO. TD44560

## B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 96.000
4. U.T.S. (KSI) 114.500
5. ELONGATION 24.2
6. R.A. 67.9
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 90.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 90.0
11. U.S. KIC (KSI*SQRT(IN.)) 202.23

## C. MATERIAL PROPERTIES (RIM)

1. Y.S. (KSI) 99.000 b,c,e
2. U.T.S. (KSI) 114.500
3. ELONGATION 24.0
4. R.A. 69.9
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 96.0
7. U.S. IMPACT TEMP. (DEG.F) -75.0
8. U.S. IMPACT ENG. (FT.LB.) 96.0
9. U.S. KIC (KSI*SQRT(IN.)) 212.30

## D. CHEMISTRY

C [.27] b,c,e — MN [.27] b,c,e — SI [.01] b,c,e — P [.009] b,c,e — CR [1.72] b,c,e — MO [.33] b,c,e — V [.13] b,c,e

NI [3.58] b,c,e — AS [-] b,c,e — SB [.0023] b,c,e — SN [.016] b,c,e — AL [-] b,c,e — CU [-] b,c,e — S [.009] b,c,e

## E. BORE STRESS

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | 50.000 b,c,e |
| 2. 2160 (120%) | (KSI) | 56.300 |

## F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) 5.43 b,c,e
2. A-CR-OS (OVERSPEED) (IN.) 4.20

## G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 377 b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) 0
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. = [0] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [0] b,c,e

ID # : D080101103

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TD55610

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE (MIN. Y.S. [120.0] b,c,e ~~70.0~~ (KSI)) TE
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e

| | |
|---|---|
| 3. Y.S. (KSI) | 131.000 |
| 4. U.T.S. (KSI) | 140.500 |
| 5. ELONGATION | 22.0 |
| 6. R.A. | 65.4 |
| 7. FATT (DEG.F) | -120.0 |
| 8. R.T. IMPACT(FT.LB.) | 72.5 |
| 9. U.S. IMPACT TEMP. (DEG.F) | 75.0 |
| 10. U.S. IMPACT ENG. (FT.LB.) | 72.5 |
| 11. U.S. KIC (KSI*SQRT(IN.)) | 207.84 |

**C. MATERIAL PROPERTIES (RIM)** b,c,e

| | |
|---|---|
| 1. Y.S. (KSI) | 135.000 |
| 2. U.T.S. (KSI) | 146.500 |
| 3. ELONGATION | 20.7 |
| 4. R.A. | 65.9 |
| 5. FATT (DEG.F) | -120.0 |
| 6. R.T. IMPACT(FT.LB.) | 72.5 |
| 7. U.S. IMPACT TEMP. (DEG.F) | -75.0 |
| 8. U.S. IMPACT ENG. (FT.LB.) | 72.5 |
| 9. U.S. KIC (KSI*SQRT(IN.)) | 210.67 |

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.26] b,c,e | [.25] b,c,e | [.01] b,c,e | [.010] b,c,e | [1.65] b,c,e | [.41] b,c,e | [.13] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.57] b,c,e | [-] b,c,e | [.0025] b,c,e | [.017] b,c,e | [-] b,c,e | [-] b,c,e | [.008] b,c,e |

**E. BORE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [52.900] b,c,e |
| 2. 2160 (120%) | (KSI) | [60.000] |

**F. CRACK DATA**

| | |
|---|---|
| 1. A-CR-OP (1800 RPM) (IN.) | [5.10] b,c,e |
| 2. A-CR-OS (OVERSPEED) (IN.) | [3.88] |

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [285] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [$.234 \times 10^{-4}$]
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. (IN.) = [1.00] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.26] b,c,e

ID # : D080101103

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 3
7. TEST NO. TD55550

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e

| | |
|---|---|
| 3. Y.S. (KSI) | 103.000 |
| 4. U.T.S. (KSI) | 115.000 |
| 5. ELONGATION | 24.0 |
| 6. R.A. | 68.8 |
| 7. FATT (DEG.F) | -100.0 |
| 8. R.T. IMPACT(FT.LB.) | 100.5 |
| 9. U.S. IMPACT TEMP. (DEG.F) | 75.0 |
| 10. U.S. IMPACT ENG. (FT.LB.) | 100.5 |
| 11. U.S. KIC (KSI*SQRT(IN.)) | 221.60 |

### C. MATERIAL PROPERTIES (RIM)

b,c,e

| | |
|---|---|
| 1. Y.S. (KSI) | 103.500 |
| 2. U.T.S. (KSI) | 117.000 |
| 3. ELONGATION | 25.5 |
| 4. R.A. | 71.1 |
| 5. FATT (DEG.F) | -100.0 |
| 6. R.T. IMPACT(FT.LB.) | 100.5 |
| 7. U.S. IMPACT TEMP. (DEG.F) | -50.0 |
| 8. U.S. IMPACT ENG. (FT.LB.) | 100.5 |
| 9. U.S. KIC (KSI*SQRT(IN.)) | 222.11 |

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.24] b,c,e | [.26] b,c,e | [.01] b,c,e | [.008] b,c,e | [1.71] b,c,e | [3.90] b,c,e | [.12] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.33] b,c,e | [-] b,c,e | [.0020] b,c,e | [.017] b,c,e | [-] b,c,e | [.14] b,c,e | [.010] b,c,e |

### E. BORE STRESS

| | SPEED (RPM) | STRESS | |
|---|---|---|---|
| 1. | 1800 | (KSI) | [52.400] b,c,e |
| 2. | 2160 (120%) | (KSI) | [59.700] |

### F. CRACK DATA

| | |
|---|---|
| 1. A-CR-OP (1800 RPM) (IN.) | [5.97] b,c,e |
| 2. A-CR-OS (OVERSPEED) (IN.) | [4.51] |

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [233] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [$.836 \times 10^{-5}$]
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. (IN.) = [.358] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Acr = [.08] b,c,e

ID # : D080101103

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 4
7. TEST NO. TD55582

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 107.500
4. U.T.S. (KSI) 122.000
5. ELONGATION 23.7
6. R.A. 68.8
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 102.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 102.0
11. U.S. KIC (KSI*SQRT(IN.)) 227.89

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 107.000
2. U.T.S. (KSI) 119.500
3. ELONGATION 24.5
4. R.A. 71.9
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 113.5
7. U.S. IMPACT TEMP. (DEG.F) -100.0
8. U.S. IMPACT ENG. (FT.LB.) 113.5
9. U.S. KIC (KSI*SQRT(IN.)) 240.54

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.26] | [.25] | [.01] | [.008] | [1.62] | [.38] | [.12] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.38] | [-] | [.0022] | [.017] | [-] | [-] | [.007] |

b,c,e

**E. BORE STRESS**

| SPEED (RPM) | | STRESS |
|---|---|---|
| 1. 1800 | (KSI) | 49.600 |
| 2. 2160 (120%) | (KSI) | 58.200 |

b,c,e

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [7.12]
2. A-CR-OS (OVERSPEED) (IN.) [5.07]

b,c,e

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 195
2. ESTIMATED MAX DA/DT (IN/HR) $.356 \times 10^{-5}$

b,c,e

3. ESTIMATED MAX. CRACK SIZE, $A = DA/DT \times$ OPERATING HRS. (IN.) = [.152] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.03] b,c,e

PROPRIETARY

ID # : D080101103

PROPRIETARY

# LP TURBINE DISC INFORMATION

## A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 5
7. TEST NO. TD55586

## B. MATERIAL PROPERTIES (HUB)

1. TYPE (MIN. Y.S. [120.0] (KSI)) b,c,e TE
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e

| | |
|---|---|
| 3. Y.S. (KSI) | 133.500 |
| 4. U.T.S. (KSI) | 139.500 |
| 5. ELONGATION | 19.5 |
| 6. R.A. | 60.1 |
| 7. FATT (DEG.F) | -120.0 |
| 8. R.T. IMPACT(FT.LB.) | 70.5 |
| 9. U.S. IMPACT TEMP. (DEG.F) | 75.0 |
| 10. U.S. IMPACT ENG. (FT.LB.) | 70.5 |
| 11. U.S. KIC (KSI*SQRT(IN.)) | 206.41 |

## C. MATERIAL PROPERTIES (RIM)

b,c,e

| | |
|---|---|
| 1. Y.S. (KSI) | 127.500 |
| 2. U.T.S. (KSI) | 137.000 |
| 3. ELONGATION | 23.5 |
| 4. R.A. | 67.9 |
| 5. FATT (DEG.F) | -120.0 |
| 6. R.T. IMPACT(FT.LB.) | 76.5 |
| 7. U.S. IMPACT TEMP. (DEG.F) | -75.0 |
| 8. U.S. IMPACT ENG. (FT.LB.) | 76.5 |
| 9. U.S. KIC (KSI*SQRT(IN.)) | 211.43 |

## D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.26] b,c,e | [.25] b,c,e | [.01] b,c,e | [.010] b,c,e | [1.65] b,c,e | [.41] b,c,e | [.13] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.53] b,c,e | [-] b,c,e | [.0024] b,c,e | [.017] b,c,e | [-] b,c,e | [-] b,c,e | [.008] b,c,e |

## E. BORE STRESS

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [50.500] b,c,e |
| 2. 2160 (120%) | (KSI) | [58.400] |

## F. CRACK DATA

| | |
|---|---|
| 1. A-CR-OP (1800 RPM) (IN.) | [5.55] b,c,e |
| 2. A-CR-OS (OVERSPEED) (IN.) | [4.06] |

## G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [177] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [$.228 \times 10^{-5}$]
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. (IN.) = [.098] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.02] b,c,e

ID # : 0080101103

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GOV
6. DISC# 6
7. TEST NO. TD26221

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 95.500
4. U.T.S. (KSI) 111.500
5. ELONGATION 23.7
6. R.A. 64.7
7. FATT (DEG.F) -65.0
8. R.T. IMPACT(FT.LB.) 92.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 92.0
11. U.S. KIC (KSI*SQRT(IN.)) 204.08

**C. MATERIAL PROPERTIES (RIM)**

1. Y.S. (KSI) 98.000
2. U.T.S. (KSI) 114.000
3. ELONGATION 24.1
4. R.A. 70.1
5. FATT (DEG.F) -65.0
6. R.T. IMPACT(FT.LB.) 92.0
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 92.0
9. U.S. KIC (KSI*SQRT(IN.)) 206.59

b,c,e

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.29] | [.29] | [.10] | [.008] | [1.66] | [.44] | [.12] |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.23] | [-] | [-] | [-] | [-] | [-] | [.008] |

b,c,e

**E. BORE STRESS**

| SPEED (RPM) | STRESS |
|---|---|
| 1. 1800 (KSI) | 43.500 |
| 2. 2160 (120%) (KSI) | 49.500 |

b,c,e

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [7.44]
2. A-CR-OS (OVERSPEED) (IN.) [5.66]

b,c,e

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 198
2. ESTIMATED MAX DA/DT (IN/HR) 0

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. = [0] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Acr = [0] b,c,e

ID # : D080101104

PROPRIETARY

## LP TURBINE DISC INFORMATION

### A. UNIT IDENTIFICATION

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 1
7. TEST NO. TD55611

### B. MATERIAL PROPERTIES (HUB)

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 105.000
4. U.T.S. (KSI) 120.000
5. ELONGATION 24.5
6. R.A. 71.9
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 119.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 119.5
11. U.S. KIC (KSI*SQRT(IN.)) 244.91

### C. MATERIAL PROPERTIES (RIM)

b,c,e

1. Y.S. (KSI) 107.000
2. U.T.S. (KSI) 121.000
3. ELONGATION 24.7
4. R.A. 72.9
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 129.0
7. U.S. IMPACT TEMP. (DEG.F) -75.0
8. U.S. IMPACT ENG. (FT.LB.) 129.5
9. U.S. KIC (KSI*SQRT(IN.)) 257.20

### D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| .25 | .25 | .01 | .010 | 1.57 | .35 | .14 |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| 3.38 | - | .0018 | - | - | - | .006 |

b,c,e

### E. BORE STRESS

| SPEED (RPM) | | STRESS |
|---|---|---|
| 1. 1800 | (KSI) | 50.000 |
| 2. 2160 (120%) | (KSI) | 56.300 |

b,c,e

### F. CRACK DATA

1. A-CR-OP (1800 RPM) (IN.) 8.14
2. A-CR-OS (OVERSPEED) (IN.) 6.34

b,c,e

### G. SERVICE DATA

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 377
2. ESTIMATED MAX DA/DT (IN/HR) 0

b,c,e

3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. = 0 b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = 0 b,c,e

ID # : D080101104

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 2
7. TEST NO. T030663

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TE
   (MIN. Y.S. [120.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 125.000
4. U.T.S. (KSI) 139.500
5. ELONGATION 18.7
6. R.A. 49.7
7. FATT (DEG.F) -85.0
8. R.T. IMPACT(FT.LB.) 70.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 70.5
11. U.S. KIC (KSI*SQRT(IN.)) 200.39

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 123.000
2. U.T.S. (KSI) 136.000
3. ELONGATION 22.0
4. R.A. 66.6
5. FATT (DEG.F) -85.0
6. R.T. IMPACT(FT.LB.) 94.0
7. U.S. IMPACT TEMP. (DEG.F) 0.0
8. U.S. IMPACT ENG. (FT.LB.) 94.0
9. U.S. KIC (KSI*SQRT(IN.)) 232.44

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.27] b,c,e | [.20] b,c,e | [.26] b,c,e | [.008] b,c,e | [1.54] b,c,e | [.39] b,c,e | [4.12] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.35] b,c,e | [-] b,c,e | [-] b,c,e | [-] b,c,e | [-] b,c,e | [-] b,c,e | [.007] b,c,e |

**E. BORE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [52.900] b,c,e |
| 2. 2160 (120%) | (KSI) | [60.000] |

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [4.72] b,c,e
2. A-CR-OS (OVERSPEED) (IN.) [3.58]

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [285] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [$.234 \times 10^{-4}$]
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT x OPERATING HRS. (IN.) = [1.00] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{cr}$ = [.28] b,c,e

PROPRIETARY

ID # : D080101104

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 3
7. TEST NO. TD55551

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 99.000
4. U.T.S. (KSI) 113.500
5. ELONGATION 24.5
6. R.A. 71.3
7. FATT (DEG.F) -100.0
8. R.T. IMPACT(FT.LB.) 104.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 104.0
11. U.S. KIC (KSI*SQRT(IN.)) 221.43

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 99.500
2. U.T.S. (KSI) 115.000
3. ELONGATION 24.0
4. R.A. 70.5
5. FATT (DEG.F) -100.0
6. R.T. IMPACT(FT.LB.) 114.0
7. U.S. IMPACT TEMP. (DEG.F) 0.0
8. U.S. IMPACT ENG. (FT.LB.) 114.0
9. U.S. KIC (KSI*SQRT(IN.)) 232.89

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.24] b,c,e | [.26] b,c,e | [.01] b,c,e | [.008] b,c,e | [1.71] b,c,e | [.39] b,c,e | [.12] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.39] b,c,e | [-] b,c,e | [.0020] b,c,e | [-] b,c,e | [-] b,c,e | [-] b,c,e | [.010] b,c,e |

**E. BORE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | 52.400 |
| 2. 2160 (120%) | (KSI) | 59.700 |

b,c,e

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [5.96] b,c,e
2. A-CR-OS (OVERSPEED) (IN.) [4.51]

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [233] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [$.836 \times 10^{-5}$]
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [.358] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{cr}$ = [.08] b,c,e

ID # : D080101104

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 4
7. TEST NO. TD55585

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 103.500
4. U.T.S. (KSI) 113.000
5. ELONGATION 24.0
6. R.A. 67.0
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 100.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 100.5
11. U.S. KIC (KSI*SQRT(IN.)) 222.11

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 104.500
2. U.T.S. (KSI) 112.500
3. ELONGATION 24.0
4. R.A. 71.3
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 108.0
7. U.S. IMPACT TEMP. (DEG.F) -100.0
8. U.S. IMPACT ENG. (FT.LB.) 108.0
9. U.S. KIC (KSI*SQRT(IN.)) 231.73

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.26] b,c,e | [.25] b,c,e | [.01] b,c,e | [.008] b,c,e | [1.62] b,c,e | [.38] b,c,e | [.12] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.38] b,c,e | [-] b,c,e | [.0022] b,c,e | [.017] b,c,e | [-] b,c,e | [-] b,c,e | [.007] b,c,e |

**E. BOPE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [49.600] b,c,e |
| 2. 2160 (120%) | (KSI) | [58.200] |

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [6.74] b,c,e
2. A-CR-OS (OVERSPEED) (IN.) [4.79]

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [195] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [$.356 \times 10^{-5}$]
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = [.152] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{cr}$ = [.03] b,c,e

ID # : D080101104

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 5
7. TEST NO. TD55596

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TB
   (MIN. Y.S. [90.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 97.500
4. U.T.S. (KSI) 111.500
5. ELONGATION 24.7
6. R.A. 69.5
7. FATT (DEG.F) -110.0
8. R.T. IMPACT(FT.LB.) 94.0
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 94.0
11. U.S. KIC (KSI*SQRT(IN.)) 208.44

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 99.500
2. U.T.S. (KSI) 113.500
3. ELONGATION 25.0
4. R.A. 74.5
5. FATT (DEG.F) -110.0
6. R.T. IMPACT(FT.LB.) 98.0
7. U.S. IMPACT TEMP. (DEG.F) 0.0
8. U.S. IMPACT ENG. (FT.LB.) 96.0
9. U.S. KIC (KSI*SQRT(IN.)) 215.13

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.28] b,c,e | [.27] b,c,e | [.02] b,c,e | [.009] b,c,e | [1.70] b,c,e | [.48] b,c,e | [.13] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.64] b,c,e | [-] b,c,e | [.0028] b,c,e | [.018] b,c,e | [-] b,c,e | [-] b,c,e | [.005] b,c,e |

**E. BORE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [50.500] b,c,e |
| 2. 2160 (120%) | (KSI) | [58.400] |

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [5.67] b,c,e
2. A-CR-OS (OVERSPEED) (IN.) [4.14]

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [177] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [$.228 \times 10^{-5}$]
3. ESTIMATED MAX. CRACK SIZE, $A = DA/DT \times$ OPERATING HRS. (IN.) = [.098] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [.02] b,c,e

ID # : D080101104

PROPRIETARY

## LP TURBINE DISC INFORMATION

**A. UNIT IDENTIFICATION**

1. BUILDING BLOCK 80
2. UNIT KEWAUNEE #1
3. CUSTOMER: WISC. P.S.
4. LP# 2
5. LOCATION GEN
6. DISC# 6
7. TEST NO. TD44523

**B. MATERIAL PROPERTIES (HUB)**

1. TYPE TA
   (MIN. Y.S. [80.0] (KSI)) b,c,e
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 98.000
4. U.T.S. (KSI) 109.000
5. ELONGATION 24.0
6. R.A. 70.1
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 98.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 98.5
11. U.S. KIC (KSI*SQRT(IN.)) 214.16

**C. MATERIAL PROPERTIES (RIM)** b,c,e

1. Y.S. (KSI) 96.000
2. U.T.S. (KSI) 108.500
3. ELONGATION 25.7
4. R.A. 70.5
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 98.5
7. U.S. IMPACT TEMP. (DEG.F) -50.0
8. U.S. IMPACT ENG. (FT.LB.) 98.5
9. U.S. KIC (KSI*SQRT(IN.)) 212.08

**D. CHEMISTRY**

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| [.27] b,c,e | [.29] b,c,e | [.07] b,c,e | [.009] b,c,e | [1.68] b,c,e | [.41] b,c,e | [.14] b,c,e |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| [3.48] b,c,e | [-] b,c,e | [.0018] b,c,e | [.018] b,c,e | [-] b,c,e | [.13] b,c,e | [.009] b,c,e |

**E. BORE STRESS**

| SPEED (RPM) | STRESS | |
|---|---|---|
| 1. 1800 | (KSI) | [43.500] b,c,e |
| 2. 2160 (120%) | (KSI) | [49.500] |

**F. CRACK DATA**

1. A-CR-OP (1800 RPM) (IN.) [8.23] b,c,e
2. A-CR-OS (OVERSPEED) (IN.) [6.27]

**G. SERVICE DATA**

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) [198] b,c,e
2. ESTIMATED MAX DA/DT (IN/HR) [0]
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT × OPERATING HRS. = [0] b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, $A/A_{CR}$ = [0] b,c,e

ID # : D080101101

LP TURBINE DISC INFORMATION

A. UNIT IDENTIFICATION
1. BUILDING BLOCK 80
2. UNIT KE.AUNEE #1
3. CUSTOMER: .ISC. P.S.
4. LP# 1
5. LOCATION GOV
6. DISC# 2
7. TEST NO. TD55410

B. MATERIAL PROPERTIES (HUB)
1. TYPE TB
(MIN. Y.S. [90.0] b,c,e (KSI))
2. SUPPLIER: MIDVALE HEPPENSTALL b,c,e
3. Y.S. (KSI) 102.000
4. U.T.S. (KSI) 115.000
5. ELONGATION 24.0
6. R.A. 71.9
7. FATT (DEG.F) -120.0
8. R.T. IMPACT(FT.LB.) 98.5
9. U.S. IMPACT TEMP. (DEG.F) 75.0
10. U.S. IMPACT ENG. (FT.LB.) 98.5
11. U.S. KIC (KSI*SQRT(IN.)) 218.25

C. MATERIAL PROPERTIES (RIM) b,c,e
1. Y.S. (KSI) 99.000
2. U.T.S. (KSI) 115.000
3. ELONGATION 24.5
4. R.A. 72.1
5. FATT (DEG.F) -120.0
6. R.T. IMPACT(FT.LB.) 73.0
7. U.S. IMPACT TEMP. (DEG.F) -75.0
8. U.S. IMPACT ENG. (FT.LB.) 73.0
9. U.S. KIC (KSI*SQRT(IN.)) 183.53

D. CHEMISTRY

| C | MN | SI | P | CR | MO | V |
|---|---|---|---|---|---|---|
| .24 | .20 | .01 | .008 | 1.76 | .39 | .12 |

| NI | AS | SB | SN | AL | CU | S |
|---|---|---|---|---|---|---|
| 3.33 | - | .0020 | .017 | - | .14 | .010 |

b,c,e

E. BORE STRESS b,c,e

| SPEED (RPM) | STRESS |
|---|---|
| 1. 1800 (KSI) | 52.900 |
| 2. 2160 (120%) (KSI) | 60.000 |

F. CRACK DATA b,c,e

1. A-CR-OP (1800 RPM) (IN.) 5.67
2. A-CR-OS (OVERSPEED) (IN.) 4.32

G. SERVICE DATA b,c,e

1. OPER. TEMP. METAL TEMP. HUB (DEG.F) 285
2. ESTIMATED MAX DA/DT (IN/HR) $.234 \times 10^{-4}$
3. ESTIMATED MAX. CRACK SIZE, A = DA/DT X OPERATING HRS. (IN.) = 1.00 b,c,e
4. RATIO OF CALCULATED CRACK SIZE TO CRITICAL CRACK SIZE, A/Ac = .23 b,c,e

PROPRIETARY

Critical crack size.

The critical crack size at 1800 rpm and at design overspeed is presented in Appendix 1, Section F. It is calculated using the following relationship:

b,c,e

$$A_{cr}\ (eff) = \frac{Q}{1.21\pi} \left(\frac{K_{IC}}{T_{Bore}}\right)^2 - R$$

Where: $K_{IC}$ is the lower of either the room temperature or upper shelf facture toughness. $T_{Bore}$ is the bore stress given in answer to I.D.9.

Q = 1.35 and is the shape factor based upon an a:2c ratio of 1:4. The 1:4 ratio is supported by Westinghouse observed keyway crack geometries. R = .375 inches and is the radius of the keyway.

WESTINGHOUSE PROPRIETARY

PROPRIETARY