

SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

VALVES

Component	Item	Method			
		MT	PT	VT	UT
<b>MAIN STOP VALVES</b>					
<b>#1 Stop Valve</b>					
	Seat		NAD	NAD	
	Bolts (16)				NAD
	Cover	NAD		NAD	
	Body (TIL 943)	NAD		NAD	
<b>#2 Stop Valve</b>					
	Seat		NAD	NAD	
	Bolts (16)				NAD
	Cover	NAD		NAD	
	Body (TIL 943)	NAD		NAD	
<b>#3 Stop Valve</b>					
	Seat		NAD	NAD	
	Bolts (16)				NAD
	Cover	NAD		NAD	
	Body (TIL 943)	NAD		NAD	

**SHERCO UNIT 3 OUTAGE  
SUMMARY LISITING**

**VALVES**

Component	Item	Method			
		MT	PT	VT	UT
<b>Equalizer Valve</b>					
	Stem	NAD		NAD	NAD
	Body Seat		NAD	NAD	
	Disc Seat		NAD	NAD	
	Disc		NAD	NAD	
<b>Control Reheat Valve CRV</b>					
	Body Seat		NAD	NAD	
	Screen	cracks at the corner welds		under cutting of welds	
	Bolts (72)				NAD
<b>Ventilation Valve</b>					
	Studs (18)				NAD

**SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING**

GENERATOR					
Component	Item	Method			
		MT	PT	VT	UT
	D Coupling	GE		GE	
Rotor					
	#9 Journal	GE		GE	
H2 Fan Buckets (60)					
	Turbine End		NAD	NAD	
	Generator End		NAD	NAD	
	Gas Gap Baffle Studs		NAD	NAD	
	Main Lead Wedges (6)	NAD		NAD	
Exciter End	E Coupling	GE		GE	
Generator End	Retaining Ring ID		NAD	NAD	
Generator End	Retaining Ring		NAD	NAD	
Turbine End	Retaining Ring ID		NAD	NAD	
Turbine End	Retaining Ring		10 spots Removed with scotchbrite and rePT'd ok	NAD	

GE performed MT on Rotor assembly after disassembly

**SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING**

GENERATOR					
Component	Item	Method			
		MT	PT	VT	UT
Slot Wedges					
Slot 1	Wedges 1 – 42		NAD	NAD	
Slot 2	Wedges 1 – 42		NAD	NAD	
Slot 3	Wedges 1 – 42		NAD	NAD	
Slot 4	Wedges 1 – 42		NAD	NAD	
Slot 5	Wedges 1 – 42		NAD	NAD	
Slot 6	Wedges 1 – 42		NAD	NAD	
Slot 7	Wedges 1 – 42		NAD	NAD	
Slot 8	Wedges 1 – 42		NAD	NAD	
Slot 9	Wedges 1 – 42		NAD	NAD	
Slot 10	Wedges 1 – 42		NAD	NAD	
Slot 11	Wedges 1 – 42		NAD	NAD	
Slot 12	Wedges 1 – 42		NAD	NAD	
Slot 13	Wedges 1 – 42		NAD	NAD	
Slot 14	Wedges 1 – 42		NAD	NAD	
Slot 15	Wedges 1 – 42		NAD	NAD	
Slot 16	Wedges 1 – 42		NAD	NAD	
Slot 17	Wedges 1 – 42		NAD	NAD	
Slot 18	Wedges 1 – 42		NAD	NAD	
Slot 19	Wedges 1 – 42		NAD	NAD	
Slot 20	Wedges 1 – 42		NAD	NAD	
Slot 21	Wedges 1 – 42		NAD	NAD	
Slot 22	Wedges 1 – 42		NAD	NAD	
Slot 23	Wedges 1 – 42		NAD	NAD	
Slot 24	Wedges 1 – 42		NAD	NAD	
Slot 25	Wedges 1 – 42		NAD	NAD	
Slot 26	Wedges 1 – 42		NAD	NAD	
Slot 27	Wedges 1 – 42		NAD	NAD	
Slot 28	Wedges 1 – 42		NAD	NAD	
Slot 29	Wedges 1 – 42		NAD	NAD	
Slot 30	Wedges 1 – 42		NAD	NAD	
Slot 31	Wedges 1 – 42		NAD	NAD	
Slot 32	Wedges 1 – 42		NAD	NAD	

SHERCO UNIT 3 OUTAGE  
SUMMARY LISITING

GENERATOR

Component	Item	Method			
		MT	PT	VT	UT
Slot Wedges					
Slot 1 pole	Wedges 1 – 48		NAD	NAD	
Slot 2 pole	Wedges 1 – 48		NAD	NAD	
Slot 4 pole	Wedges 1 – 48		NAD	NAD	
Slot 5 pole	Wedges 1 – 48		NAD	NAD	
Slot 6 pole	Wedges 1 – 48		NAD	NAD	
Slot 7 pole	Wedges 1 – 48		NAD	NAD	
Slot 9 pole	Wedges 1 – 48		NAD	NAD	
Slot 10 pole	Wedges 1 – 48		NAD	NAD	

**SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING**

<b>EXCITER</b>					
Component	Item	Method			
		MT	PT	VT	UT
	E Coupling	NAD		NAD	
	#11 Journal	NAD		NAD	
	#12 Journal	NAD		NAD	
	#11 Bearing UH		crack 7/16"L, 4-3/8" from left horiz. and 1 1/2" from inboard side; crack 3/8"L, 1/16" from RS horiz 3/4" from inboard side; 3/8"L, 7/8" from right horiz at outboard side	Light sporadic debond along edges	NAD
	#11 Bearing LH		NAD	Light sporadic debond along edges	NAD
	#12 Bearing UH		1/4" crack on the bottom at the inboard side	Excess rubbing	NAD
	#12 Bearing LH		NAD	Excess rubbing	NAD
Generator End	Retaining Ring		NAD	NAD	
Turbine End	Retaining Ring		NAD	NAD	



**SHERCO UNIT 3 OUTAGE  
SUMMARY LISITING**

**PROCEDURES, PERSONNEL & EQUIPMENT**

**Procedures:**

Number	Rev.	Title
27.D.300	0	Section 4, Magnetic Particle
		Section 9, Liquid Penetrant
		Section 7, Ultrasonics
		Section 8, Ultrasonics
		Section 10, Fluorescent Penetrant
		All Sections, Visual

**Magnetic Particle**

Portable Inspection Unit	Magnaflux M-500 (MQS)	S/N: 78108
AC Yoke	Magnaflux Y-6	S/N 6007
Magnetic Field Indicator	(Pie Gauge)	
Dry Magnetic Particles	Magnaflux 1 Grey	Batch: 91F050
Dry Magnetic Particles	Magnaflux 8A Red	Batch: 95D009
Wet Fluorescent Magnetic	Magnaflux 14A	Batch: 98C074
Wet Fluorescent Magnetic	Magnaflux 14AM	Batch: 97F09K
Black Lights		

**Penetrant**

		Type	Batch No.
Penetrant	Fluorescent	ZL-60D	98L108
Penetrant	Visible, Red	SKL-SP	98M02K
Cleaner		SKC-S	98L08K
Developer		SKD-S2	98B04K

**Ultrasonic**

Krautkramer	USK-7B		S/N: 2732
Panametrics	5.0 MHz	.25" Dia.	S/N: 191046
	2.25MHz	.50" Dia.	S/N: 126536
IIW Block			S/N: A01515
Babbitt Std			S/N: GTM-31
Aqua-Sonic	100		Batch: H-386

**Personnel:**

Name	Company	MT Level	PT Level	UT Level	VT Level
Christensen, M	MQS	II	II	II	II
Gertner, D	MQS	II	II	II	II
Loredo, Q	LMT	II	II	II	II
Schanen, J	NSP	II	II	II	III
Dahlman, L	NSP	III	III	---	III



**COPY**

*Still  
12/20/50*

Form No: 27.300

**MOS INSPECTION, INC.**

**TURBINE INSPECTION REPORT**

OWNER: Northern States Power CLIENT: Northern States Power

LOCATION: Sherco Plant CONTACT: Lanny Dahlman  
Becker, MN

**TURBINE:**

Manufacturer: General Electric Serial Number: 170X819

Unit Number: 3 Rating: 850 MW RPM: 3600

**INSPECTION:**

Date Inspected: 3-4-99 thru 3-18-99 Technician: Mike Christensen

Technician: Doug Gertner

P.O. #: PN4205MT

W/O#: 07F3389

Report Date: 3-15-99

(X) Complete ( ) Partial Inspection

Auxl. Comp. Inspected:

This report details the conditions noted during our inspection of the above unit. The disposition of all deficiencies noted shall be the responsibility of the owner.

**TRIAL EXHIBIT**  
**0075**  
exhibitsticker.com

NSP, et al v GE  
EX 276  
Date: 11-24-15  
Richard G. Stirewalt  
Stirewalt & Associates

XCEL\_Sherco\_05\_0122482

MQS INSPECTION, INC.

Form: 27.302

Turbine #: 170X819

Work Order #: 07F3389

**HIGH PRESSURE (H.P.) SECTIONS**

Component	Insp. Req'd		Method Cleaned	Deficiency Noted							
	Yes	No		MT	UT	PT	VT	ET	RT	Yes	No
<b>Outer Shell/Cylinders</b>											
Inlet Sleeve Trepan Westinghouse	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )
Positioning Grooves	(✓)	( )	sandblast	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Horizontal Joint	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Studs/Bolts	(✓)	( )	NA	( )	(✓)	( )	(✓)	( )	( )	( )	(✓)
Inlet Steam Flanges	(✓)	( )	sandblast	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Bell Seals (Westinghouse)	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )
<b>Steam Chest</b>											
Steam Flange Bolts	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )
Chest Seats	(✓)	( )	solvent	( )	( )	(✓)	(✓)	( )	( )	( )	(✓)
Studs	(✓)	( )	stoned	( )	(✓)	( )	(✓)	( )	( )	( )	(✓)
Covers	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )
Cover Studs	( )	(✓)	"	( )	( )	( )	( )	( )	( )	( )	( )
Body	(✓)	( )	"	( )	( )	( )	(✓)	( )	( )	( )	(✓)
<b>Rotor/Spindle</b>											
Shaft	(✓)	( )	sandblasted	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Buckets/Blades	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Covers/Shroud Bands	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Wheels/Disks	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Coupling	(✓)	( )	solvent	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Coupling Bolts	(✓)	( )	NA	( )	(✓)	( )	(✓)	( )	( )	( )	(✓)
Thrust Collar (IP rotor)	(✓)	( )	solvent	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Bearing Journal	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Babbitt Bearing Bond	(✓)	( )	"	( )	(✓)	( )	(✓)	( )	( )	( )	(✓)
Thrust bearing Bond (Babbitt)	(✓)	( )	"	( )	(✓)	( )	(✓)	( )	( )	( )	(✓)
<b>Diaphragms/Stationary Blade Rings</b>											
Partitions/Blades	(✓)	( )	sandblasted	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
I.D. Rings/Sets	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
O.D. Rings/Sets	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
<b>Inner Shells/Cylinders</b>											
Nozzle Block	(✓)	( )	sandblasted	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Port Way	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )
Nozzle Row (Row of Partitions)	(✓)	( )	sandblasted	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Steam Shield/Steam Deflector	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )
Horizontal Joints	(✓)	( )	sandblasted	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Positioning Grooves	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)
Studs/Bolts	(✓)	( )	stoned	( )	(✓)	( )	(✓)	( )	( )	( )	(✓)
<b>Other Components</b>											
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )

MQS INSPECTION, INC.

Form: 27.304

Turbine #: 170X819 Work Order #: 07F3389

**INTERMEDIATE PRESSURE (L.P.) SECTIONS**

Component	Insp. Req'd		Method Cleaned	D efficiency Noted								
	Yes	No		MT	UT	PT	VT	ET	RT	Yes	No	
<b>Outer Shell/Cylinders</b>												
Positioning Grooves.....	(✓)	( )	<u>sandblasted</u>	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)	( )
Horizontal Joint.....	(✓)	( )	<u>"</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Studs/Bolts.....	(✓)	( )	<u>NA</u>	( )	(✓)	( )	(✓)	( )	( )	( )	( )	(✓)
Inlet Steam Flanges.....	( )	(✓)	<u>"</u>	( )	( )	( )	( )	( )	( )	( )	( )	(✓)
<b>Rotor/Spindle</b>												
Shaft.....	(✓)	( )	<u>sandblasted</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Buckets/Blades.....	(✓)	( )	<u>"</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Covers/Shroud Bands.....	(✓)	( )	<u>"</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Wheels/Discs.....	(✓)	( )	<u>"</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Couplings.....	(✓)	( )	<u>solvent</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Bearing Journal.....	(✓)	( )	<u>"</u>	( )	(✓)	(✓)	(✓)	( )	( )	( )	( )	(✓)
Babbitt Bearing Bond.....	(✓)	( )	<u>"</u>	( )	(✓)	(✓)	(✓)	( )	( )	( )	( )	(✓)
<b>Diaphragms/Stationary Blade Rings</b>												
Partitions/Blades.....	(✓)	( )	<u>sandblasted</u>	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)	( )
I.D. rings/Sets .....	(✓)	( )	<u>"</u>	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)	( )
O.D. Rings/Sets.....	(✓)	( )	<u>NA</u>	(✓)	( )	( )	(✓)	( )	( )	( )	(✓)	( )
<b>Inner Shells/Cylinders</b>												
Horizontal Joints.....	(✓)	( )	<u>_____</u>	( )	( )	( )	( )	( )	( )	( )	(✓)	( )
Positioning Grooves.....	(✓)	( )	<u>_____</u>	( )	( )	( )	( )	( )	( )	( )	( )	(✓)
Studs/Bolts.....	( )	( )	<u>_____</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
<b>Other Components</b>												
<u>_____</u>	( )	( )	<u>_____</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
<u>_____</u>	( )	( )	<u>_____</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
<u>_____</u>	( )	( )	<u>_____</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
<u>_____</u>	( )	( )	<u>_____</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )

MQS INSPECTION, INC.

27.303

Turbine #: 170X819

Work Order #: 07F3389

LOW PRESSURE (L.P.) SECTIONS

Component	Insp. Req'd		Method Cleaned	Deficiency Noted								
	Yes	No		MT	UT	PT	VT	ET	RT	Yes	No	
<b>Rotor/Spindle</b>												
Buckets/Blades.....	(✓)	( )	<u>sandblasted</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Covers/Shroud Bands.....	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Wheels/Disc.....	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Shaft.....	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Bearing Journal.....	(✓)	( )	<u>solvent</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Tie Wires/Lashing Wire Lugs.....	( )	( )	<u>NA</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
Couplings.....	(✓)	( )	<u>solvent</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Bucket Pins/Steeple.....	(✓)	( )	<u>sandblasted</u>	( )	(✓)	( )	( )	( )	( )	( )	( )	(✓)
Erosion Strips/Stellite Strips.....	(✓)	( )	"	( )	( )	(✓)	(✓)	( )	( )	( )	( )	(✓)
Babbitt Bearing Bond.....	(✓)	( )	<u>solvent</u>	( )	(✓)	(✓)	(✓)	( )	( )	( )	( )	(✓)
<b>Shells/Cylinders</b>												
Positioning Grooves.....	(✓)	( )	<u>sandblasted</u>	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Horizontal Joint.....	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Support Tube Welds.....	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Bridge Supports.....	(✓)	( )	"	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Studs/Bolts.....	( )	(✓)	<u>NA</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
<b>Crossover Pipe System</b>												
Crossover Studs and Bolts.....	( )	(✓)	<u>NA</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
Crossover Diaphragm.....	( )	(✓)	<u>NA</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
Expansion Diaphragm.....	( )	(✓)	<u>NA</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
Steam Deflectors.....	( )	(✓)	<u>NA</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
Support Welds.....	( )	(✓)	<u>NA</u>	( )	( )	( )	( )	( )	( )	( )	( )	( )
<b>Other Components</b>												
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )	( )
_____	( )	( )	_____	( )	( )	( )	( )	( )	( )	( )	( )	( )



MQS INSPECTION, INC.

27.301

Turbine #: 170X819

Work Order #: 07F3389

VALVES

Component	Insp. Req'd		Method Cleaned	D efficiency Noted								
	Yes	No		MT	UT	PT	VT	ET	RT	Yes	No	
<b>Stop Valves</b>												
H.P. Seal Head.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Bonnet.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
H.P. Seal Head Seat.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Disc/Plug.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Anti-Rotation Pins.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Screen/Strainer.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Valve Body.....	(✓)	( )	NA	( )	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Valve Body Seat.....	(✓)	( )	solvent	( )	( )	(✓)	(✓)	( )	( )	( )	( )	(✓)
Head.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Support Yoke.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Studs.....	(✓)	( )	wire brush	( )	(✓)	( )	(✓)	( )	( )	( )	( )	(✓)
Disc Seat/Plug Seat.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Studs.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
<b>Control Valve/Governing Valves</b>												
Stem.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Bonnet.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Disc/Plug.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Disc Seat/Plug Seat.....	( )	(✓)	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Valve Body.....	(✓)	( )	NA	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Valve Body Seat.....	(✓)	( )	solvent	( )	( )	(✓)	(✓)	( )	( )	( )	( )	(✓)
Studs.....	(✓)	( )	wire brush	( )	(✓)	( )	(✓)	( )	( )	( )	( )	(✓)
<b>Intercept Valves or Combination Intercept/Reheat Valves</b>												
Stems.....	( )	( )	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Discs/Plugs.....	( )	( )	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Disc Seat/Plug Seat.....	( )	( )	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Screen.....	( )	( )	NA	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Valve Body...& seat.....	( )	( )	NA	( )	( )	(✓)	(✓)	( )	( )	( )	( )	(✓)
H.P. Seal Head.....	( )	( )	solvent	( )	( )	( )	( )	( )	( )	( )	( )	( )
Studs.....	( )	( )	wire brush	( )	(✓)	( )	(✓)	( )	( )	( )	( )	(✓)
<b>Equalizer Valve</b>												
Stem.....	( )	( )	solvent	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Disc.....	( )	( )	solvent	(✓)	( )	( )	(✓)	( )	( )	( )	( )	(✓)
Disc Seat.....	( )	( )	solvent	( )	( )	(✓)	(✓)	( )	( )	( )	( )	(✓)
Valve Body.....	( )	( )	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )
Valve Body Seat.....	( )	( )	solvent	( )	( )	(✓)	(✓)	( )	( )	( )	( )	(✓)
Studs.....	( )	( )	NA	( )	( )	( )	( )	( )	( )	( )	( )	( )











# MQS Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

## IDENTIFICATION OF DIAPHRAGM BLADING DEFECTS

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

NB= Nozzle Block  
 FOD = Foreign object damage

Since the defects are found in about the same location  
 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Gen	Total # of Blades	# of Defects	Inspect Method	Blade	From (O) Side	From (I) Side	Discharge Side	Length of Defect	Type Defect
Gen	84		Vt/mt	All			X	X	Light FOD severe erosion
"	"	9	"	--	X			X	1-4, 41, 44, 81-83 missing part of blade due to erosion
"	"	2	"	--	X			X	29, 64 have cracks
"	"	25	"	--		X		X	5, 7, 8, 15, 16, 18, 19, 22, 24, 26-28, 31, 35, 39, 42, 48, 50, 69, 73, 75-77, 80, 81 have cracks
Gen.									
NB-B	84		Vt/mt	All			X	X	Light FOD, severe erosion
"	"	8	"	--	X			X	2-4, 44, 80-83 are missing part of blade due to erosion
"	"	4	"	--		X		X	4, 6, 14, 15, 17, 26, 29, 46, 56, 60 have cracks
Turb									
NB-T	84		Vt/mt	All			X	X	Light FOD severe erosion
"	"	12	"	--	X			X	1-5, 40-42, 44, 81-83 are missing part of blade due to erosion
"	"	21	"	--		X		X	1, 3, 4, 6, 13, 14, 19, 21, 39, 41, 42, 44, 48, 51, 53, 55, 56, 60, 65, 71, 79 have cracks
Turb									
NB-B	84		Vt/mt	All			X	X	Light FOD severe erosion
"	"	10	"	--	X			X	1-4, 44, 78, 80-84 are missing part of blade due to erosion
"	"	2	"	--	X			X	59, 77 have cracks
"	"	11	"	--		X		X	1, 38, 39, 45, 47, 71, 72, 74, 81-83 have cracks
2-T	36		"	All			X	X	Heavy FOD light erosion
"	"	1	"	5	X			X	Has tear

XCEL\_Sherco\_05\_0122492

TR.EX.NSP0075.011

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

**IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS**

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

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 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	Blade #	From FOD Ring	From Nozzle Block	Inlet Side	Discharge Side	Length of defect	Type Defects
2-T	36	1	V/mt	11	X			X		Has hole
"	"	1	"	21	X			X		Has crack
"	"	1	"	22		X		X		Has crack
2B	36		"	All			X	X		FOD and light erosion
"	"	4	"	--	X	X		X		Previous weld repair area cracked on 1,4,19,20
"	"	1	"	18	X			X		Has crack
3-T	60		"	All			X	X		Light FOD light erosion
"	"		"	--		X	X			Weld cracked on brace between blades 59 and 60
"	"	4	"	--		X		X		47,53,57,58 have cracks
"	"	1	"	49	X			X		Has crack
3-B	60		"	All			X	X		Light erosion FOD
"	"	8	"	--	X			X		3-5,8,9,14,52,60 have cracks
"	"	4	"	--	X			X		33,48,55,57 are missing piece of blade due to FOD
4-T	50		"	All			X	X		Light erosion light FOD
"	"	2	"	--		X		X		3, 25 have cracks
4-B	50		"	All			X	X		Light FOD erosion
"	"	1	"	--		X	X			Crack on brace which is between blades 49 and 50
"	"	2	"	--	X			X		11, 13 have cracks
"	"	1	"	--		X		X		23 has crack
5-T	47		"	All			X	X		Light erosion
"	"	2	"	--	X		X			8, 27 have cracks

TR.EX.NSP0075.012

XCEL\_Sherco\_05\_0122493

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

**IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS**

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

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 FOD = Foreign object damage

Since the defects are found in about the same location  
 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Blade #	Total # of Blades	# of Defects	Inspection Method	Blades	From OD Ring	From ID Ring	Inlet Side	Discharge Side	Length of defect	Type Defects
5-T	47	1	Vt/mt	--	X			X		24 has crack
"	"	1	"	--		X		X		35 is separating in the weld repair area
"	"	3	"	--		X		X		39, 44, 46 have cracks
5-B	47		"	All			X	X		Light erosion
"	"	1	"	--		X		X		44 has crack
6-T	57		"	All			X	X		Light erosion
"	"	1	"	--	X	X		X		57 has crack
"	"	2	"	--		X		X		11, 13 have cracks
6-B	57		"	All			X	X		Light erosion
"	"	10	"	--		X		X		2,12,32,33,39,41,47,50,51,53 have cracks
"	"	3	"	--	X			X		9,11,13 have cracks
7-T	39	4	"	--	X			X		13, 16, 18, 26 have cracks
"	"	2	"	--	X	X	X			Weld cracked on braces which are between blades 38 and 39
7-B	39	1	"	--	X			X		#1 has crack
Gen										
8-T	61		Vt/mt	All			X	X		Severe erosion, FOD
"	"	14	"	--		X		X		1,14,19,21,22,24,28,31-33,46,48,50,52 have cracks
"	"	1	"	--		X	X			Weld cracks on brace which is between blades 60 and 61

XCEL\_Sherco\_05\_0122494  
 TR.EX.NSP0075.013

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

**IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS**

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

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 FOD = Foreign Object Damage

Since the defects are found in about the same location  
 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	Blade	From OD Bling	From ID Bling	Inlet Side	Discharge Side	Length of defect	
Gen	61		Vt/mt	All			X	X		Erosion FOD
"	"	12	"	--		X		X		2,6,13,15,23,27,28,32,39,40,47,50 have cracks
"	"	1	"	--	X		X			Weld cracked on brace which is between blading 60 and 61
Turb.										
8-T	61		"	All			X	X		Heavy FOD, severe erosion
"	"	3	"	--	X			X		3,8,15 are missing part of blade due to erosion
"	"	20	"	--		X		X		6,8,11,14,17,19,20,24-29,36,49-53,55 have cracks
"	"	3	"	--	X			X		30,31,58 have cracks
Turb										
8-B	61		"	All			X	X		Erosion FOD
"	"	23	"	--		X		X		1-5,8,10,11,13,27,28,30-34,36,39,40,57-60 have cracks
"	"	1	"	--	X			X		46 has crack
Gen										
9-T	43		"	All			X	X		FOD erosion
"	"	2	"	--	X		X			5,38 have cracks
"	"	1	"	--		X	X			32 has crack
"	"	3	"	--		X		X		3,19,27 have tears
"	"	4	"	--		X		X		5,11,36,40 have cracks
"	"	2	"	--	X			X		9,12 have cracks

XCCL\_Sherco\_05\_0122495

TR.EX.NSP0075.014

# MQS Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

## IDENTIFICATION OF DIAPHRAGM BLADING DEFECTS

Sketch is looking at steam inlet side of diaphragm.  
First blade on left side would be No. 1-T on top half and  
No. 1-B on bottom half. Also, show total number of  
blades as their total number in either top or bottom,  
not total number in top and bottom.

NB= Nozzle Block  
FOD = Foreign object damage

Since the defects are found in about the same location  
on either the inside diameter or outside diameter, and  
usually on the discharge side we only need to indicate  
with "X" where the crack or defect occurred, in proper  
column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Gen./Turb.	Total # of Blades	Inspection Method	Blade	From OD Ring	From ID Ring	Angle Side	Discharge Side	Length of defect	Type Defects
Gen.									
9-B	43	Vt/int	All			X	X		FOD erosion
"	"	4	--	X			X		4,11,12,25 have cracks
"	"	1	--		X		X		15 has crack
"	"	1	--		X	X			Web cracked in previous weld repair area at blade #32
Turb.									
9-T	43	"	All			X	X		Light erosion, FOD
"	"	2	--	X			X		19, 21 have holes
"	"	7	--		X		X		2,5,17,25,34,33,38 have cracks
"	"	6	--	X			X		13,19,29,33,40,42 have cracks
"	"	2	--	X	X	X			Welds cracked on braces between blades 42 and 43
Turb.									
9-B	43	"	All			X	X		Erosion FOD
"	"	1	--		X		X		14 has crack
"	"	1	--	X			X		36 has crack
"	"	3	--				X		7,9,13,22 previous repair areas cracked
"	"	1	--			X			Inner web cracking between blades
Gen.									
10-T	37	"	All			X	X		Light FOD
"	"	1	--	X		X			Weld on brace has severe erosion between blades 36,37

XCEL\_Sherco\_05\_0122496

TR.EX.NSP0075.015

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

NB = Nozzle Block  
 FOD = Foreign Object Damage

Since the defects are found in about the same location  
 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	Blade Type	From FOD Ring	From MID Ring	Inlet Side	Dis- charge Side	Length of defect	
Gen.										
10-B	37		Vt/mt	All			X	X		Light FOD
"	"	6	"	--		X		X		3,28,30,31,34,36 have cracks
Turb.										
10-T	37		"	All			X	X		Erosion light FOD
"	"	2	"	--		X		X		1, 16 have holes
Turb.										
10-B	37		"	All			X	X		FOD
"	"	1	"	--		X		X		1 has crack
"	"	2	"	--				X		11, 35 have holes in blade
Gen.										
11-T	63		"	All			X	X		Light erosion
"	"	2	"	--	X	X		X		63 has cracks
Gen.										
11-B	63		"	All			X	X		Light erosion
"	"	1	"	--	X			X		5 has crack
"	"	1	"	--		X		X		11 has crack
Turb.										
11-T	63		"	All			X	X		Light erosion, FOD
"	"	1	"	--	X			X		#52 has crack

XCEL\_Sherco\_05\_0122497

TR.EX.NSP0075.016



**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

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 FOD = Foreign Object Damage

Since the defects are found in about the same location  
 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	# Blades	From ODH Ring	From STD Ring	Inlet Side	Discharge Side	Length of defect	Defect Description
Turb.										
11-T	63	1	Vt/mt	--			X			63 weld is separating from brace
11-B	63			All			X	X		FOD light erosion
"	"	2	"	--				X		1, 63 have holes in blade
Gen.										
12-T	52		"	All			X	X		Light erosion
12-B	"	1	"	--	X			X		23 has holes
"	"	1	"	--		X		X		42 has crack
Turb.										
12-T	52		"	All			X	X		Light erosion
"	"	1	"	--		X		X		1 has hole
12-B	52		"	All			X	X		Light erosion
"	"	2	"	--				X		16, 40 have holes
"	"	1	"	--	X			X		42 has crack
Gen.										
13-T	60		"	All						Good
13-B	"	2	"	--	X			X		5,7 have cracks
"	"	1	"	--						Outer web cracked at blade #41
Turb.										
13-T	60		"	All			X	X		Light erosion, light FOD
13-B	"	1	"	--		X		X		26 has crack

XCEL\_Sherco\_05\_0122498

TR.EX.NSP0075.017

# MQS Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

## IDENTIFICATION OF DIAPHRAGM BLADING DEFECTS

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and No. 1-B on bottom half. Also, show total number of blades as their total number in either top or bottom, not total number in top and bottom.

NB= Nozzle Block  
 FOD = Foreign object damage

Since the defects are found in about the same location on either the inside diameter or outside diameter, and usually on the discharge side we only need to indicate with "X" where the crack or defect occurred, in proper column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Turb.	Total # of Blades	# of Defects	Inspect Method	Blade #	From ID Ring	From OD Ring	Inlet Side	Discharge Side	Length of Defect	Type Defects
13-B	60	1	Vt/mt	All	X			X		Web cracked at #3 blade
LPA	GEN									
14-T	71		"	All			X	X		Light erosion
14-B	71		"	"			X	X		Light erosion
LPA	TURB									
14-T	71		"	All			X	X		Light erosion
"	71	1	"	--	X			X		17 has tear
"	"	1	"	--	X			X		18 has crack
LPA	TURB									
14-B	71		"	All			X	X		Light erosion
"	"	1	"	--		X	X			71 has crack
"	"	1	"	--	X			X		70 has crack
LPA	GEN									
15-T	79	2	"	--	X			X		68, 79 have cracks
15-B	"	1	"	--		X		X		19 has crack
"	"	1	"	--	X			X		44 has crack
LPA	TURB									
15-T	79		"	All			X	X		FOD
"	"	1	"	--	X			X		79 has tear

XCEL\_Sherco\_05\_0122499

TR.EX.NSP0075.018

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

**IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS**

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

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 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	Blade %	From O.D. Ring	From I.D. Ring	Inside Slot	Discharge Side	Length of defect	Remarks
LPA	TURB									
15-B	79		Vt/mt	All			X	X		FOD
"	"	5	"	--	X			X		Previous weld repair area cracked
LPA	GEN									
16-T	36		"	All			X	X		Light pitting
"	"	1	"	--	X			X		36 has crack
LPA	GEN									
16-B	36		"	All			X	X		Light pitting
LPA	TURB									
16-T	36		"	All			X	X		Light pitting
16-B	36		"	--		X		X		Light pitting
"	"	1	"	--		X		X		29 has crack
LPA	GEN									
17-T	40		"	"	All					Good
17-B	40	1	"	--		X		X		14 has crack
"	"	1	"	--	X			X		22 has crack
LPA	TURB									
17-T	40	1	"	--	X			X		1 has crack
"	"	4	"	--		X		X		24,25,26,27 have cracks
17-B	40		"	--		X		X		Good

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

**IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS**

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 First blade on left side would be No. 1-T on top half and  
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 blades as their total number in either top or bottom,  
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 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	Blade	From OD Ring	From ID Ring	Inner Side	Discharge Side	Length of Defect	Type Defects
LPA	GEN									
18-T	40	1	Vt/mt	--		X		X		22 has crack
"	"	1	"	--	X			X		32 has crack
"	"	1	"	--	X					Right side horizontal joint cracked in weld area
18-B	40	1	"	--	X			X		37 previous repair area separating
"	"	1	"	--	X					Left side horizontal joint cracked in weld area
LPA	TURB									
18-T	40	1	"	--	X			X		Web cracked at blade #40
"	"	1	"	--	X					Right side horizontal joint cracked in weld area
18-B	40	1	"	--	X			X		18 has crack
"	"	1	"	--		X		X		35 has crack
"	"	1	"	--	X					Left side horizontal joint cracked in weld area
"	"	1	"	--		X				Left side fit key racked
LPA	GEN									
19-T	30	7	"	--		X	X			16,17,19,20,23-25 welds cracked
"	"	3	"	--	X		X			6,7,29 welds cracked
19-B	30	1	"	--	X			X		1 weld cracked
"	30	4	"	--		X		X		23-25, 27 welds cracked
LPA	TURB									
19-T	30	2	"	--		X		X		17,24 welds cracked
"	"	2	"	--	X			X		19,2 23 welds cracked

XCEL\_Sherco\_05\_0122501

TR.EX.NSP0075.020

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

IDENTIFICATION OF DIAPHRAGM BLADING DEFECTS

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and No. 1-B on bottom half. Also, show total number of blades as their total number in either top or bottom, not total number in top and bottom.

NB = Nozzle Block  
 FOD = Foreign Object Damage

Since the defects are found in about the same location on either the inside diameter or outside diameter, and usually on the discharge side we only need to indicate with "X" where the crack or defect occurred, in proper column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspect. Method	Blade	From FOD Ring	From Inlet Ring	Inlet Side	Discharge Side	Length of defect	
LPA	TURB									
19-T	30	4	Vt/mt	--	X		X			10,14,22,25 welds cracked
19-B	30	3	"	--	X			X		2,3,5 welds cracked
LPB	GEN									
14-T	71		"	All			X	X		Light erosion, light FOD
14-B	71		"	All			X	X		Light erosion, light FOD
"	"	1	"	--	X			X		Previous weld repair separately at 57
LPB	TURB									
14-T	71		"	All			X	X		Light erosion, light FOD
"	"	1	"	--	X			X		63 has crack
14-B	71		"	All			X	X		Light FOD light erosion
LPB	GEN									
15-T	79		"	All			X	X		FOD erosion
"	79		"	--				X		Previous weld repair areas bending and rolling over
15-B	79	2	"	--				X		2, 76 have holes
"	"	1	"	--	X			X		74 has crack
"	"	1	"	--		X		X		52 has crack
LPB	TURB									
15-T	79		"	--						Good
15-B	79		"	--						Good

XCEL\_Sherco\_05\_0122502

TR.EX.NSP0075.021

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

**IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS**

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

NB= Nozzle Block  
 FOD = Foreign object damage

Since the defects are found in about the same location  
 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	Blades	From OD Ring	From ID Ring	Inlet Side	Discharge Side	Length of defect	Type Defects
LPB	GEN									
16-T	36		Vt/mt	All			X	X		Light pitting
16-B	36		"	"			X	X		Light pitting
LPB	TURB									
16-T	36		"	All			X	X		Light pitting
16-B	36		"	All			X	X		Light pitting
17-T	40		"	--						Good
17-B	40	1	"	--	X					Lift side horizontal joint cracked in weld area
"	"	1	"	--	X		X			Web cracked at blade #13
LPB	TURB									
17-T	40	1	"	--	X			X		33 has crack
17-B	40	1	"	--	X			X		10 has crack
LPB	GEN									
18-T	40	1	"	--	X					Right side horizontal joint cracked in weld area
18-B	40	1	"	--	X					Left side horizontal joint cracked in weld area
"	"	1	"	--		X		X		Repair area separating at Blade #1
LPB	TURB									
18-T	40	1	"	--	X					Right side horizontal joint cracked in weld area
18-B	40	1	"	--	X					Left side horizontal joint cracked in weld area

XCEL\_Sherco\_05\_0122503

TR.EX.NSP0075.022

**MQS** Inspection, Inc. 1920 Oakcrest Avenue, Roseville, MN 55113

Form 27.309

**IDENTIFICATION OF  
 DIAPHRAGM BLADING DEFECTS**

Sketch is looking at steam inlet side of diaphragm.  
 First blade on left side would be No. 1-T on top half and  
 No. 1-B on bottom half. Also, show total number of  
 blades as their total number in either top or bottom,  
 not total number in top and bottom.

NB = Nozzle Block  
 FOD = Foreign Object Damage

Since the defects are found in about the same location  
 on either the inside diameter or outside diameter, and  
 usually on the discharge side we only need to indicate  
 with "X" where the crack or defect occurred, in proper  
 column and the length of the defect.

Date: 3-15-99 Station: Sherco WO# 07-F3389

Turbine #: 170X819 Unit No. 3 Technician: Michael T. Christensen, Level II, Doug Gertner, Level II

Stage	Total # of Blades	# of Defects	Inspection Method	Blade #	From FOD Ring	From ID Ring	Inlet Side	Discharge Side	Length of defect	
LPA	GEN									
19-T	30	1	Vt/mt	--	X			X		2 weld cracked
"	"	8	"	--	X		X			3,8,11,12,14,26-28 welds cracked
"	"	5	"	--		X	X			3,21,8,24,26 welds cracked
19-B	30	2	"	--	X			X		25,27 have cracks
"	"	1	"	--		X		X		26 weld cracked
"	"	20	"	--	X		X			1,2,4-7,9-11,14,16-18,21,22,26-30 welds cracked
"	"	8	"	--		X	X			6,8-11,23,24,29 welds cracked
LPB	TURB									
19-T	30	9	"	--	X		X			1,6,10,16,18,20,21,27,28 welds cracked
"	"	1	"	--		X	X			11 weld cracked
19-B	30	5	"	--	X	X	X			4,9,21,26,29 welds cracked
"	"	8	"	--	X		X			1,2,10,11,16,19,27,30 welds cracked
"	"	1	"	--		X	X			24 weld cracked
"	"	5	"	--		X		X		10,11,19,20,30 welds cracked
"	"	11	"	--	X			X		3,5,13,14,16,17,22-24, 26,28 welds cracked
"	"	4	"	--	X	X		X		9,12,15,19 welds cracked

XCEL\_Sherco\_05\_0122504

TR.EX.NSP0075.023





MQS Inspection, Inc.

Form: 27.311

**TURBINE COMPONENT REPORT**

Client: NSP Turbine # 170X819 Unit #: 3 Item: Casings  
 Station: Sherco Date: 3-15-99 Technician: Michael T. Christensen, Level II

Description of Area	MT	ML	RT	RL	Damage	Location/Comments
H.P. Outer casing	X	X				Upper & lower casing halves revealed no recordable indications.
I.P. outer casing	X	X				Lower casing half revealed no recordable indications, upper half #2 Fit on gen. End has a 2-1/8" long crack at 61" from right side horz. Joint
L.P.-A casings	X	X				Diaphragm fits show physical damage (rubbing)
L.P.-B casings	X	X				Diaphragm fits show physical damage. (rubbing) inner (upper half) #2 access cover weld is cracked in base metal. 5.25" on the turbine End, 13.5" long crack at 61" from access cover described previously, Crack is in base metal on the turbine end. Lower half revealed no Indications
H.P. Inner casing	X	X	X			No recordable indications noted.
I.P. #1 Inner casing	X	X				Lower halves for the turbine and generator ends revealed no recordable Indications. Upper halves for the turbine and generator ends have Cracking on the left and right hand horizontal joints.
I.P. #2 Inner casing	X	X				Lower halves for the turbine & generator ends revealed no recordable Indications Upper half generator end revealed cracking on the left And right hand side horizontal joints, upper half turbine end revealed No recordable indications.

XCEL\_Sherco\_05\_0122506  
 TR.EX.NSP0075.025





MQS Inspection, Inc.

Form: 27.311

**TURBINE COMPONENT REPORT**

Client: NSP Turbine # 170X819 Unit #: 3 Item: Exciter  
 Station: Sherco Date: 3-15-99 Technician: Michael T. Christensen, Level II

Description of Area	INT	MT	BT	WT	Damage	Location/Comments
Exciter retaining rings	X		X			O.D. of rings examined, no defects noted.
Bearing	X		X	X		Collector end (lwr.) – excessive rubbing.
	X		X	X		Collector end (upper) – excessive rubbing with a 1/4" long crack on the Bottom of the inboard side.
"	X		X	X		Turbine end (lwr.) – light sporadic disbond around edges.
						Turbine end (upper) – light sporadic disbond around edges, with a crack 7/16" long, 4-3/8" from left horizontal joint and 1-1/4" from inboard Side, another crack 3/8" long, 1/16" from right side horizontal joint 1/4" From inboard side and a 3/8" long crack, 7/8" from right horizontal Joint at the outboard side.
Seal assemblies (4) (boiler feed pump port)	X	X				3 assemblies NDE'd acceptable, #33 inboard has a 2-3/4" long crack In the webbing.
Rings (4) (boiler feed pump port)	X	X				NDE acceptable
Exciter shaft	X	X				No defects noted on excisable shaft, journals & coupling

XCEL\_Sherco\_05\_0122509

TR.EX.NSP0075.028

MQS Inspection, Inc.

Form: 27.311

**TURBINE COMPONENT REPORT**

Client: NSP Turbine # 170X819 Unit #: 3 Item: Bearings  
 Station: Sherco Date: 3-15-99 Technician: Michael T. Christensen, Level II

Description or Area	VID	MIT	FIN	TDI	Damage	Location/Comments
Thrust Bearings	X		X	X		Light sporadic disbond around edges of bearings, light pitting.
#1 Bearing	X		X	X		Upper half bearing has randomly isolated 1/8" diameter areas of disbond #4 pad one area and #5 pad twelve areas.
"	X		X	X		Lower half bearing has light sporadic disbond around edges of bearing Pad #6I has a 1.5" diameter area of disbond and pads 7 and 6R have Cracks in babbit, see attached sketch for locations.
#2 Bearing	X		X	X		Upper half bearing has light sporadic disbond around edges of bearing Pads. Pads #3, #4 and #5 have disbond see attached sketch for Locations. #3 and #4 pads have cuts in babbit near the governor end
"	X		X	X		Lower half bearing has light sporadic disbond around edges of bearing Pads. Pads #6L, #7 and #6R have disbond. See attached sketch.
#3 Bearing	X		X	X		Upper half bearing #3 pad missing a 1/2"X1/4" piece of material on the Generator end.
"	X		X	X		Lower half bearing #6L pad and #7 pad have light sporadic disbond Around edges

XCEL\_Sherco\_05\_0122510  
 TR.EX.NSP0075.029





# IVIQO Turbine Inspection Program

## Turbine Component Report

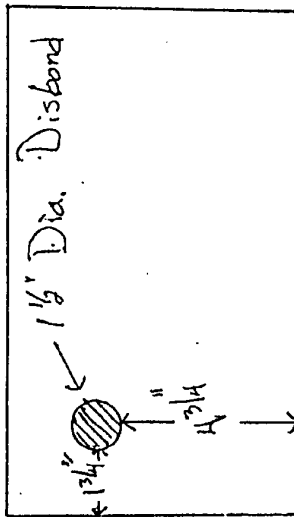
Client: NSP  
Station: Sherco

Unit: 3

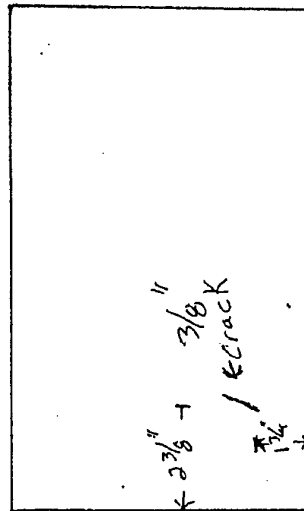
MQS Work Order No. 07F3389

Sheet 1 of 10  
Date: 3-15-99

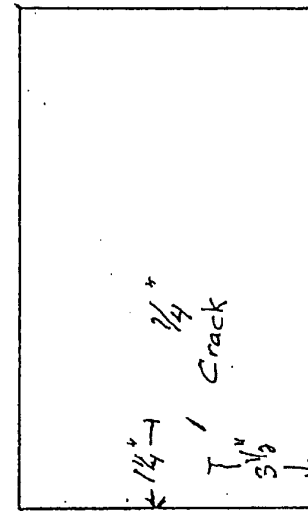
### #1 Bearing Pads (Lower)



6L



7



6R

Technician: M. T. Chin Level I Date: 3-15-99  
 Technician: Doug Carter Level II Date: 3-15-99



# VIWO Turbine Inspection Program

Form 27.319.0, Rev.0

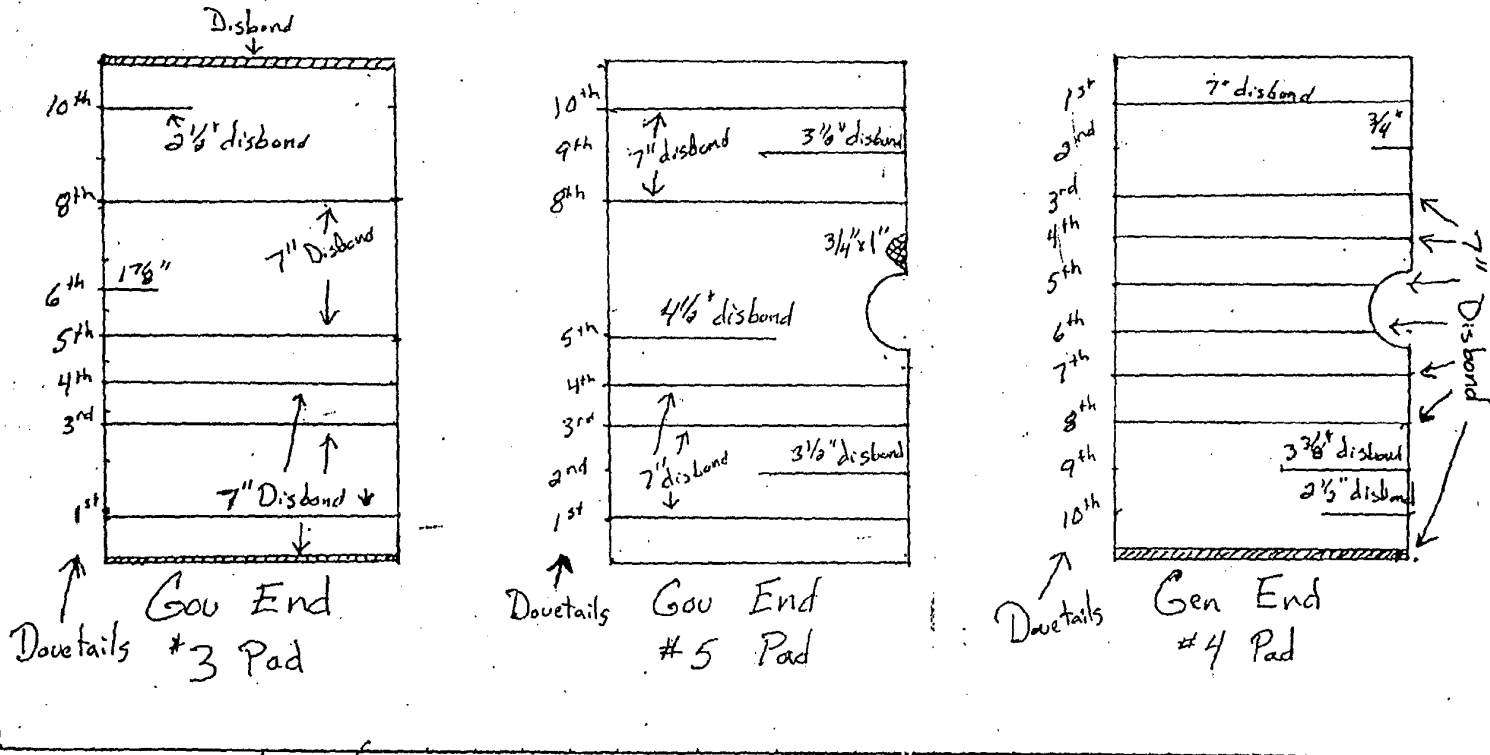
## Turbine Component Report

Client: NSP  
Station: Sherco

Unit: 3  
MQS Work Order No. 07F3389

Sheet 2 of 10  
Date: 3-15-99

### #2 Bearing Pads (Upper)



Technician: M. J. Christ  
Technician: Doug Gaitner

Level II Date: 3-15-99  
Level II Date: 3-15-99

XCEL\_Sherco\_05\_0122514

TR.EX.NSP0075.033

# VIWO Turbine Inspection Program

## Turbine Component Report

Client: NSP  
Station: Sherco

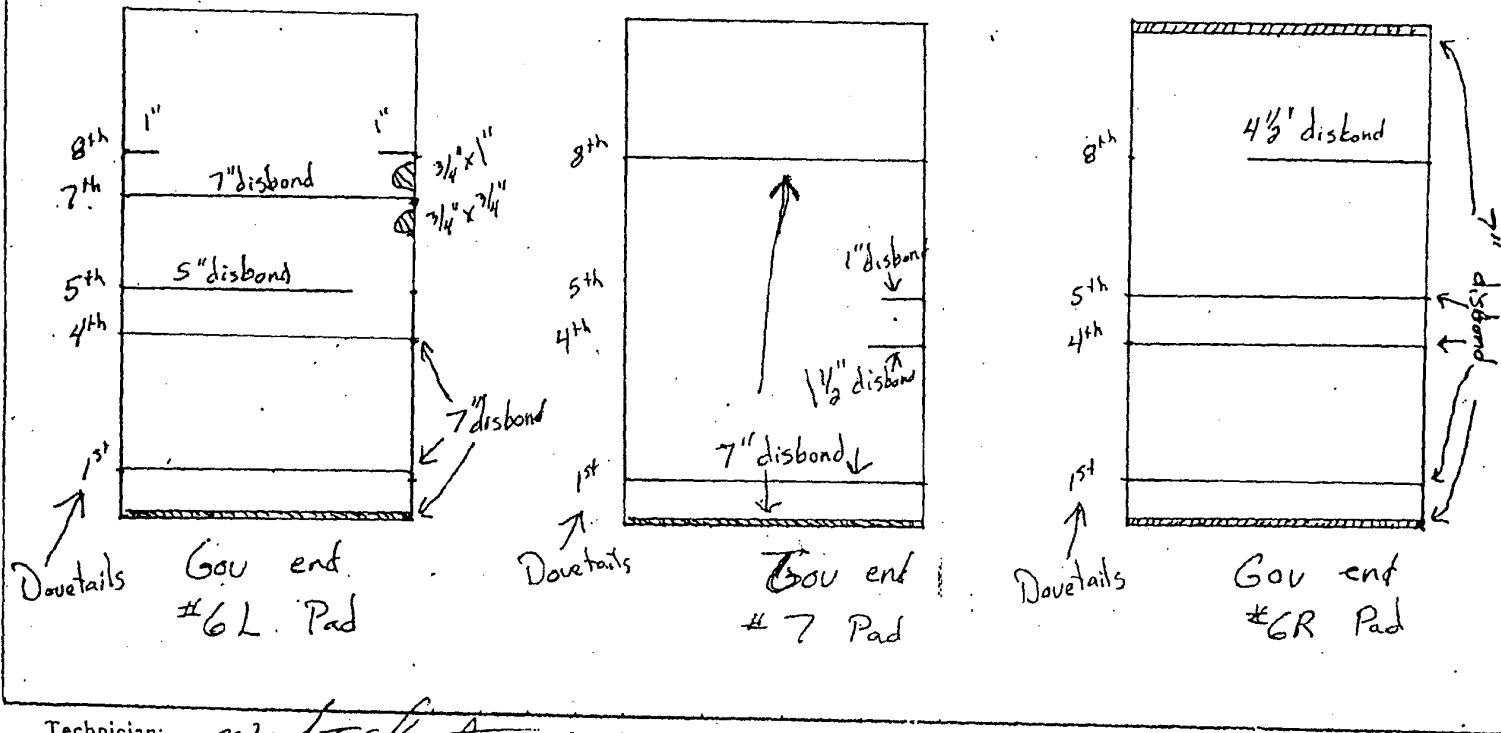
Unit: 3

MQS Work Order No. 07F3389

Sheet 3 of 10

Date: 3-15-99

### #2 Bearing Pads (Lower)



Technician: [Signature]  
Technician: [Signature]

Level II Date: 3-15-99  
Level II Date: 3-15-99

XCEL\_Sherco\_05\_0122515

TR.EX.NSP0075.034

# MQS Turbine Inspection Program

Form 27.319.0, Rev.0

## Turbine Component Report

Client: NSP

MQS Work Order No. 07F3389

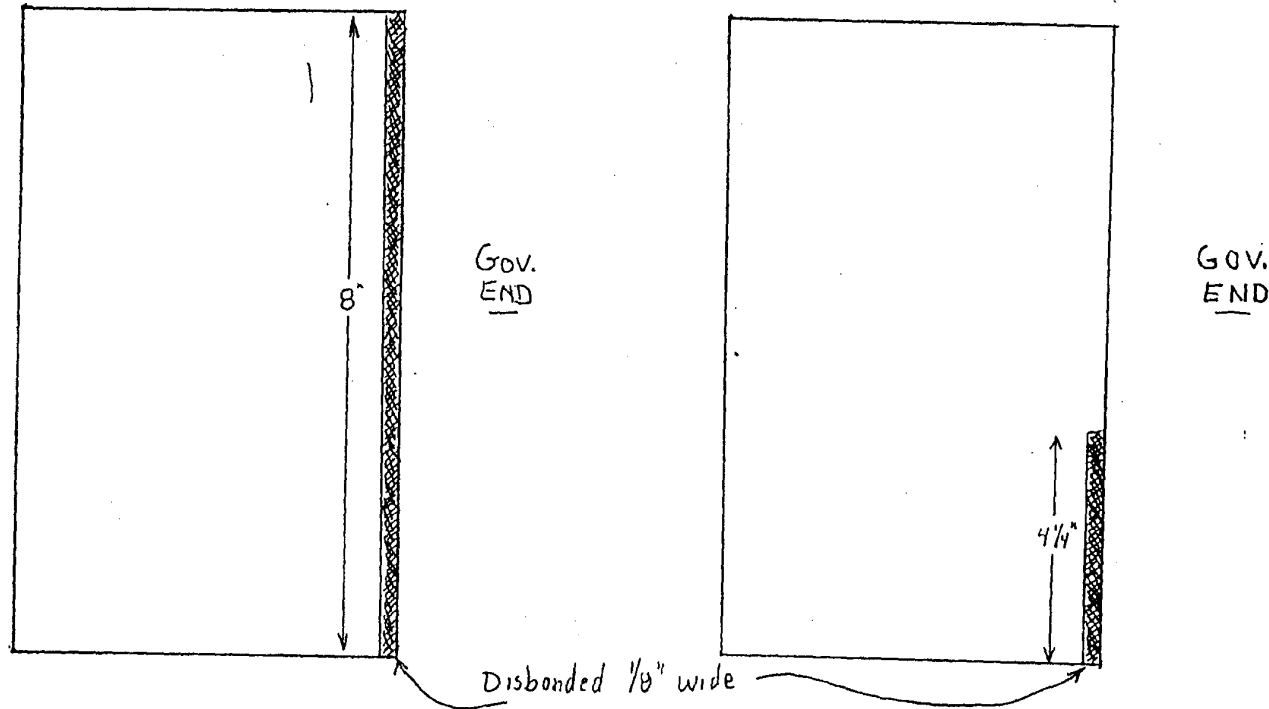
Sheet 4 of 10

Station: Sherco

Unit: 3

Date: 3-15-99

# 4 LOWER



Technician: Neil T. Gagnier

Level II Date: 3-15-99

Technician: Doug Oetzel

Level I Date: 3-15-99

XCCEL\_Sherco\_05\_0122516

TR.EX.NSP0075.035

# MQS Turbine Inspection Program

Form 27.319.0, Rev.0

## Turbine Component Report

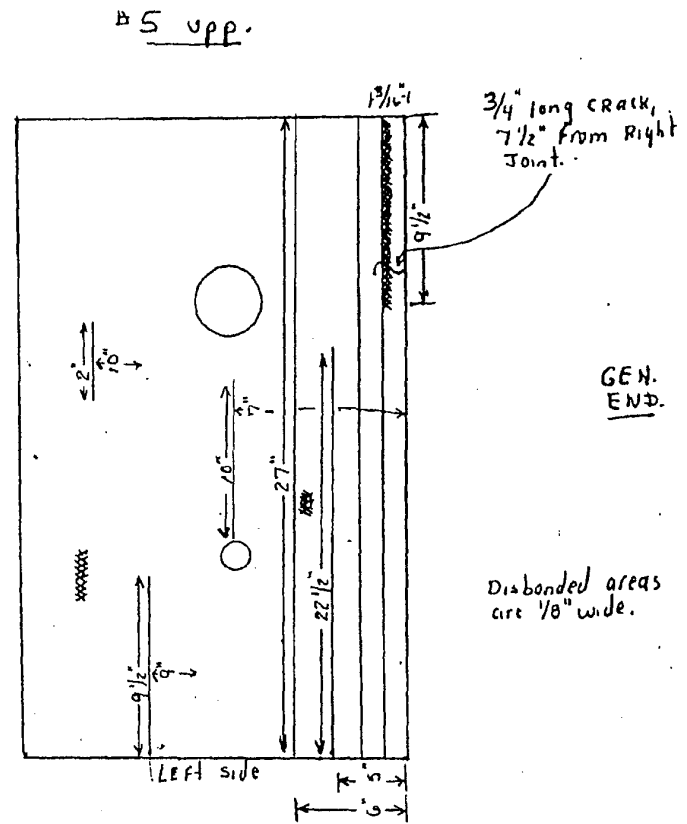
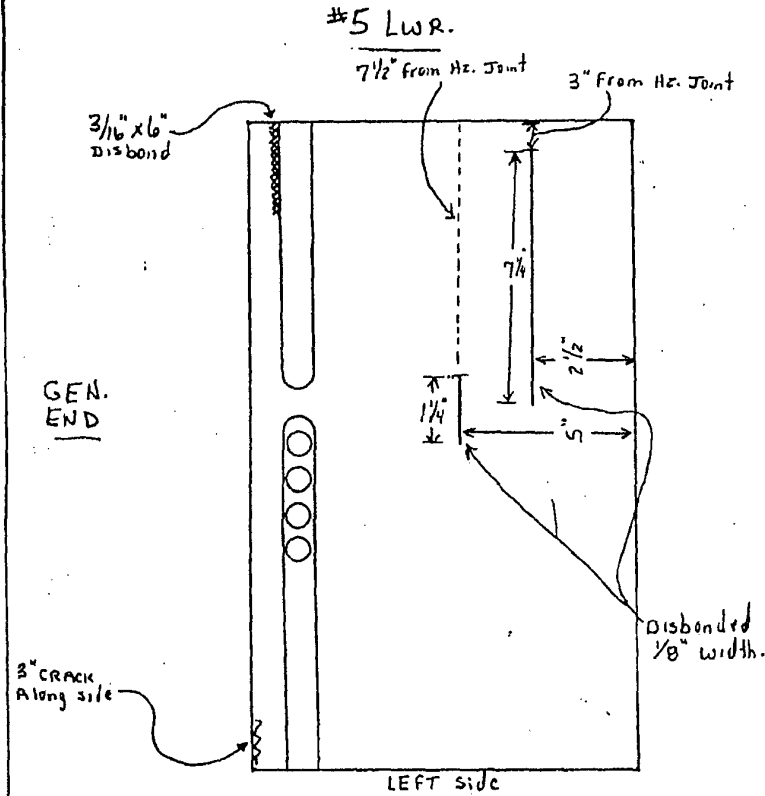
Client: NSP  
Station: Sherco

Unit: 3

MQS Work Order No. 07F3389

Sheet 5 of 10

Date: 3-15-99



Technician: [Signature]  
Technician: [Signature]

Level II Date: 3-15-99  
Level II Date: 3-15-99

Disbonded areas are 1/8\"/>

xxxx - Represents heavily pitted areas.

XCEL Sherco 05\_0122517

TR.EX.NSP0075.036

# MIQO Turbine Inspection Program

Form 27.319.0, Rev.0

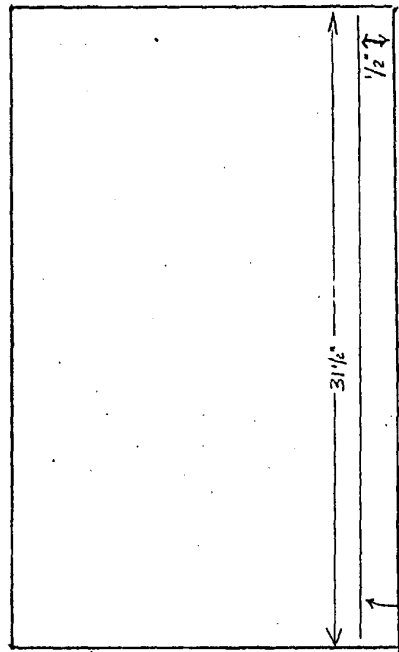
## Turbine Component Report

Client: NSP  
Station: Sherco

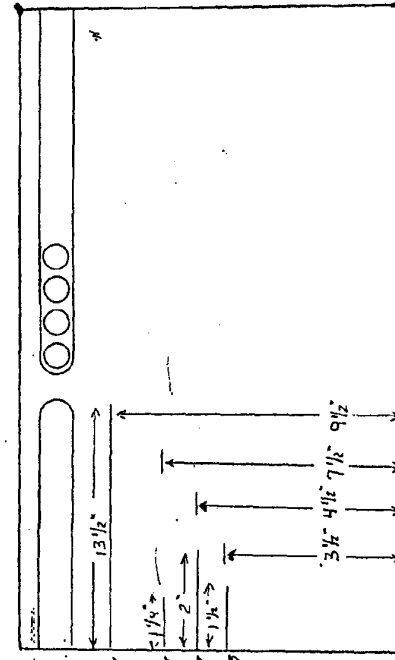
MQS Work Order No. 07F3389

Sheet 6 of 10  
Date: 3-15-99

Unit: 3



#6 upper



#6 Lower

Technician: Mark F. Christ Level II Date: 3-15-99  
 Technician: Doug Beckler Level II Date: 3-15-99

# VIQO Turbine Inspection Program

## Turbine Component Report

Client: NSP  
Station: Sherco

MQS Work Order No. 07F3389

Sheet 7 of 10  
Date: 3-15-99

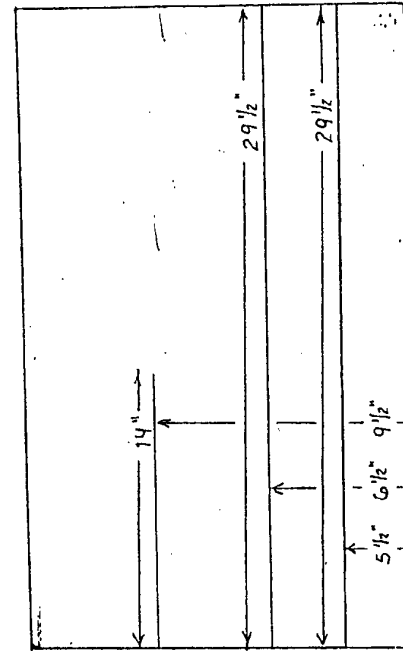
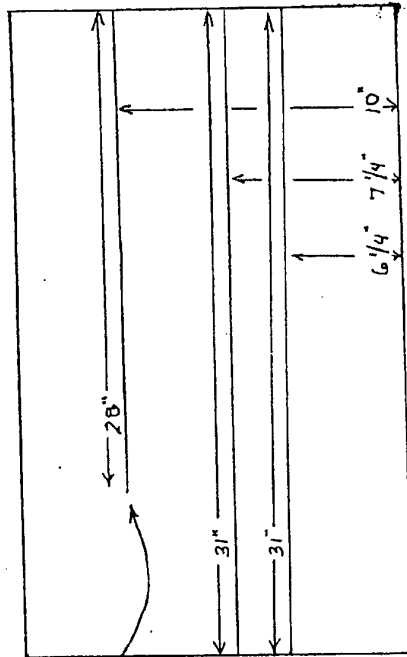
Unit: 3

Left side

Left side

GEN.  
END

GEN.  
END



Disbonded 18" wide

Disbonded 18" wide

#7 upper

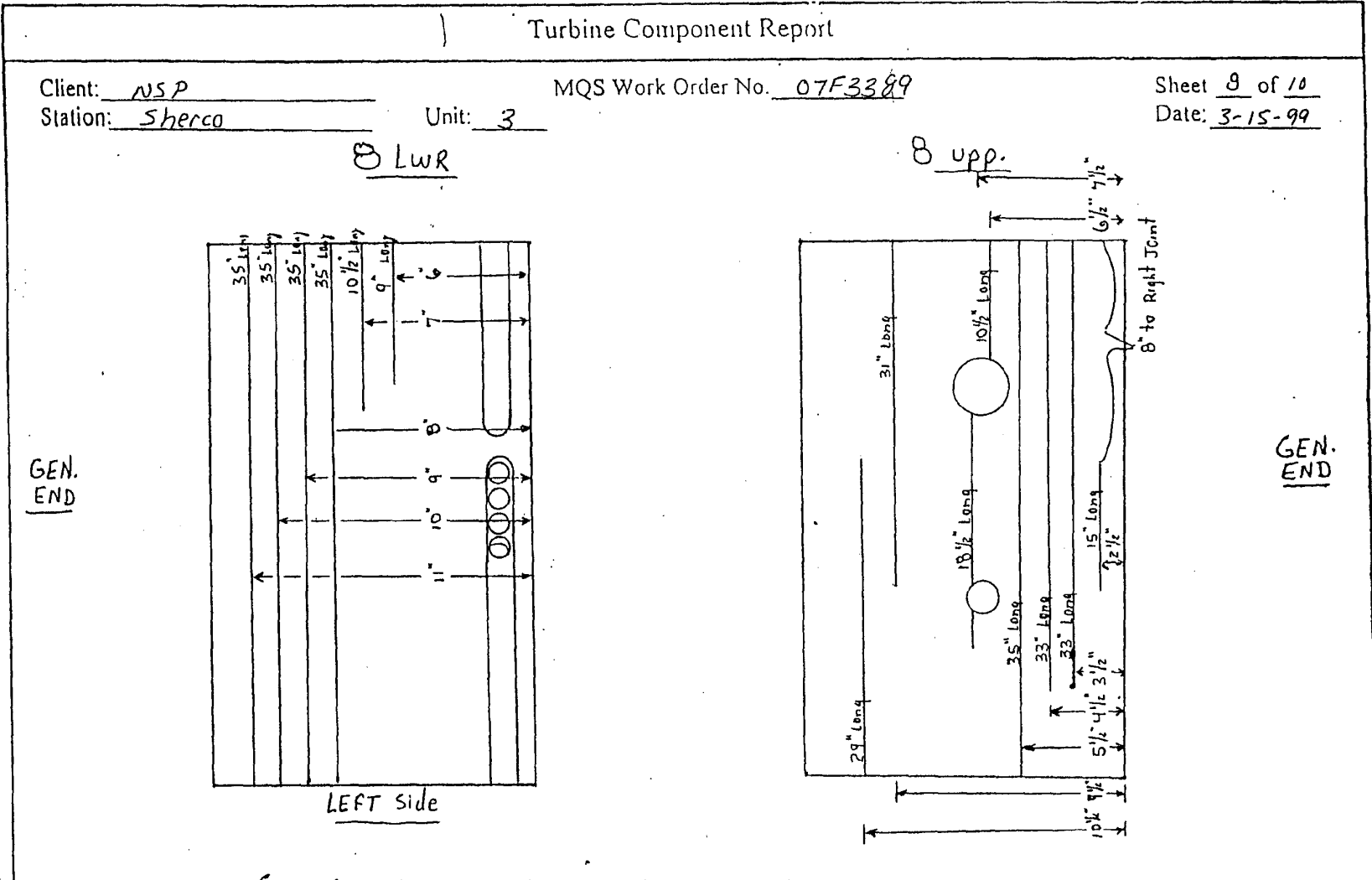
#7 Lower

Technician: [Signature] Level II Date: 3-15-99

Technician: [Signature] Level II Date: 3-15-99

# MQS Turbine Inspection Program

Form 27.319.0, Rev.0



Technician: [Signature] Level II Date: 3-15-99  
 Technician: [Signature] Level II Date: 3-15-99

XCBL\_Sherco\_05\_0122520

TR.EX.NSP0075.039

# MQS Turbine Inspection Program

Form 27.319.0, Rev.0

## Turbine Component Report

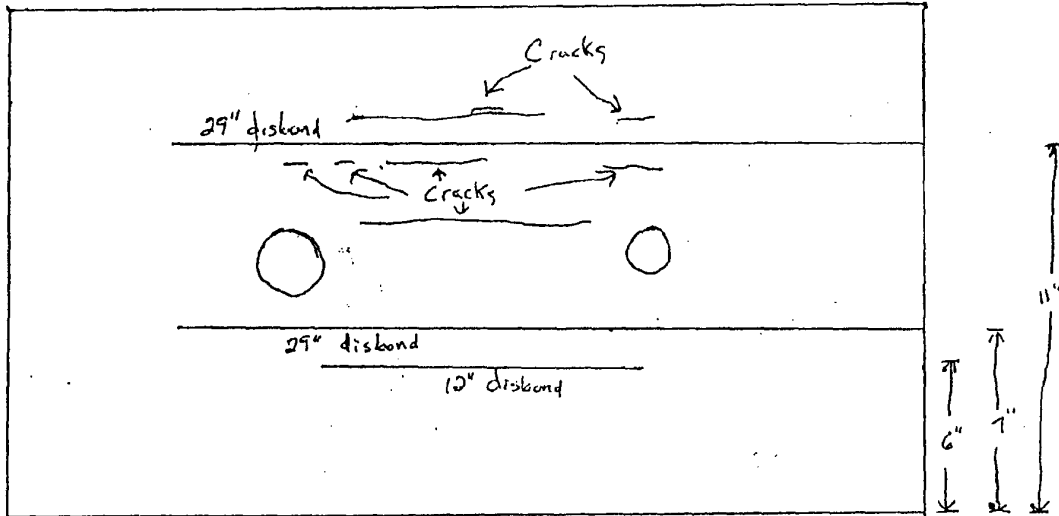
Client: NSP  
Station: Sherco

Unit: 3

MQS Work Order No. 07F3389

Sheet 9 of 10  
Date: 3-15-99

### #9 Bearing (Top)



Gov End

Technician: Mick Chrus

Level II Date: 3-15-99

Technician: Doug Beckner

Level I Date: 3-15-99



# IVIS Turbine Inspection Program

Form 27.319.0, Rev.0

**Turbine Component Report**

Client: ISP Station: Shuca Unit: 3 MQS Work Order No. 07F3389 Sheet 10 of 10  
 Date: 3-15-99

#10 Bearing (bottom)

Gov End

Technician: Mark Christ Level 7D Date: 3-15-99  
 Technician: Doug Coates Level II Date: 3-15-99



<b>MQS</b>		<b>INSPECTION, INC.</b>	<b>TURBINE INSPECTION PROGRAM</b>
NDE TECHNIQUE RECORD / MAGNETIC PARTICLE		Form: 21.07A Rev. Org.	
DATE:	<u>3-15-99</u>	PAGE	of
CLIENT:	<u>Northern States Power</u>	WORK ORDER No	<u>07F3389</u>
STATION:	<u>Sherco</u>	UNIT	<u>3</u>
TURBINE No <u>170X819</u>			
SPECIFICATION:		<u>MQS INSPECTION, INC.</u>	PROCEDURE: <u>27.D.300 Rev.0 - Section 4</u>
<b>PRECLEAN:</b>			
MATERIAL:	<u>NA</u>	METHOD	<u>NA</u> BATCH No: <u>NA</u>
<b>EQUIPMENT:</b>			
	<b>MAGNAFLUX</b>	<u>M500</u> P500	S/N: <u>78108</u>
		(CIRCLE ONE)	
<b>AMPS:</b>			
	CURRENT:		
	Head Shot	<u>NA</u>	Coil Shot: <u>1500 amps</u> Other Info: _____
	Contact Material:	<u>COPPER</u>	4/0 Cable
	RATED MAXIMUM AMPERAGE:	<u>4,000</u>	METHOD: <u>CONTINUOUS</u>
	YOKE:	<u>PARKER</u> / <u>MAGNAFLUX</u>	S/N: <u>6007-Y9</u>
	CURRENT:	<u>AC</u> <u>DC</u>	<u>FIXED AMPERAGE</u>
MAGNETIC FIELDS ARE VERIFIED WITH A MAGNETIC FIELD INDICATOR (PIE GAUGE)			
<b>MATERIAL:</b>			
	<b>MAGNAFLUX 14A</b>	BATCH No: <u>98C074</u>	APPLICATION: <u>Spray</u>
	(Redi-Bath)		
	<b>CARRIER II</b>	BATCH No: <u>NA</u>	
	<b>14AM</b>	BATCH No: <u>97F09K</u>	
	<b>GREY DRY POWDER:</b>	TYPE: <u>#1 Grey</u>	BATCH No: <u>91F050</u>
	<b>RED DRY POWDER:</b>	TYPE: <u>8A Red</u>	BATCH No: <u>95D009</u>
<b>DEMAG:</b>			
	METHOD:	<u>AUTOMATIC REOSTAT DEMAG with INFINITE CONTROL</u>	RESIDUAL: <u>+/- 2 GAUS</u>
	METHOD:	<u>Withdrawal</u>	RESIDUAL: <u>+/- 2 GAUSS</u>
<b>POSTCLEAN:</b>			
MATERIAL:	<u>NA</u>	METHOD	<u>NA</u> BATCH No: <u>NA</u>
NOTE: If any of the above parameters change make note of them below.			
Record results on appropriate Turbine Inspection form.		Attach sketches or additional information as applicable.	
LEVEL III APPROVAL:	TECHNICIAN / Level:	DATE:	
<u>Kenneth J. Olson</u>	<u>Michael T. Christensen, Doug Gertner</u>	<u>3-15-99</u>	

<b>MQS</b> INSPECTION, INC.		<b>TURBINE INSPECTION PROGRAM</b>	
NDE TECHNIQUE RECORD/LIQUID PENETRANT		Form: 23.08A Rev. Org.	
DATE:	<u>3-15-99</u>	PAGE	of
CLIENT:	<u>Northern States Power</u>	WORK ORDER No:	<u>07F3389</u>
STATION:	<u>Sherco</u>	UNIT	<u>3</u>
TURBINE No	<u>170X819</u>		
SPECIFICATION:	<u>MQS INSPECTION</u>	PROCEDURE:	<u>27.D.300 Rev.0 - Section 9</u>
<b>PRECLEAN:</b>			
MATERIAL:	<u>NA</u>	METHOD	<u>NA</u>
		BATCH No:	<u>NA</u>
		DRYING TIME:	<u>NA</u>
<b>PENETRANT:</b>			
MATERIAL:	<u>SKL-SP</u>	BATCH No:	<u>98M02K</u>
		APPLIED BY:	<u>Spray/brush</u>
		DWELL:	<u>          </u>
MATERIAL:	<u>ZL-60D</u>	BATCH No:	<u>98L108</u>
		APPLIED BY:	<u>Spray</u>
		DWELL:	<u>30 min.</u>
<b>EXCESS PENETRANT REMOVAL:</b>			
MATERIAL:	<u>SKC-S</u>	METHOD:	<u>Wipe</u>
		BATCH No:	<u>98L08K</u>
		DRYING TIME:	<u>5 min.</u>
	<u>Denatured</u>		
MATERIAL:	<u>Alcohol</u>	METHOD:	<u>wipe</u>
		BATCH No:	<u>NA</u>
		DRYING TIME:	<u>5 min.</u>
<b>DEVELOPER:</b>			
MATERIAL:	<u>SKD-S2</u>	BATCH No:	<u>98B04K</u>
		APPLIED BY:	<u>Spray</u>
		DEV. TIME	<u>10 min.</u>
<b>POSTCLEAN:</b>			
MATERIAL:	<u>NA</u>	METHOD	<u>          </u>
		BATCH No:	<u>          </u>
NOTE: If any of the above parameters change make note of them below.			
Record results on appropriate Turbine Inspection form.		Attach sketches or additional information as applicable.	
LEVEL III APPROVAL:	TECHNICIAN / Level:	DATE:	
Kenenth J. Olson	Michael T. Christensen, Doug Gertner	3-15-99	

<b>MQS</b> INSPECTION, INC.		<b>TURBINE INSPECTION PROGRAM</b>	
NDE TECHNIQUE RECORD / ULTRASONIC		Form: 22.15A Rev. Org.	
DATE:	<u>3-15-99</u>	PAGE	of
CLIENT:	<u>Northern States Power</u>	WORK ORDER No:	<u>07-F3389</u>
STATION:	<u>Sherco</u>	UNIT:	<u>3</u>
TURBINE No <u>170X819</u>			
SPECIFICATION:			
<b>BABBIT BEARINGS</b>	MQS INSPECTION, INC.	PROCEDURE:	<u>27.D.300 Rev.0 - Section 7</u>
<b>STUDS / BOLTING</b>	MQS INSPECTION, INC.	PROCEDURE:	<u>27.D.300 Rev.0 - Section 8</u>
EQUIPMENT			
Unit Mfg.:	<u>Krautkramer</u>	Model:	<u>USK-7B</u> S/N: <u>2732</u>
Transducer Mfg.:	<u>Panametrics</u>	Model:	<u>contact</u> S/N: <u>191046</u>
Frequency:	<u>5.0 mhz</u>	Angle:	<u>0 degrees</u> Size: <u>.25" dia.</u> Type: <u>contact</u>
Transducer Mfg.:	<u>Panametrics</u>	Model:	<u>contact</u> S/N: <u>126536</u>
Frequency:	<u>2.25 mhz</u>	Angle:	<u>0 degrees</u> Size: <u>.50" dia.</u> Type: <u>contact</u>
CABLE:	LENGTH: <u>6 ft</u>	TYPE:	<u>BNC / BNC</u> <u>BNC / MD</u> * (CIRCLE ONE)
Calibration Block:	<u>IIW Block</u>	S/N:	<u>A01515</u>
	<u>Babbit bearing cal. Std.</u>	S/N:	<u>GTM-31</u>
Couplant:	<u>Aquasonic 100</u>	Batch No.:	<u>H-386</u>
	<u>Turbine Oil</u>	Batch No.:	<u>NA</u>
PROCESS			
Method:	<u>CONTACT</u>	Scanning:	<u>MANUAL</u> Inches / Second: <u>&lt; 6"/sec.</u> Overlap <u>25%</u>
Special Instructions:			
Record results on appropriate Turbine Inspection form. Attach sketches or additional information as applicable.			
LEVEL III APPROVAL:		TECHNICIAN / Level:	DATE:
<u>Patrick J. Haggenmiller</u>		<u>Doug Gertner, Lv II</u> <u>Michael T. Christensen, Level II</u>	<u>3-15-99</u>





MQS Inspection, Inc.

1920 Oakcrest Avenue  
Roseville, MN 55113

Phone (612)633-7616  
Fax (612)633-4928

CERTIFICATION OF INSPECTION

Northern States Power  
ATTN: Accounts Payable  
P.O. Box 9366  
Minneapolis, MN 55440

(612) 520-5896

CERTIFICATION # 07-F3389  
Customer # 073310  
Lab # ..... 07  
Customer Job#  
Shipping Doc #  
Customer PO #  
Date Completed 03/19/99

Description of Parts:

Their Our

Count Count Part Number Description

Count	Count	Part Number	Description
1	1	FWO	GENERAL ELECTRIC TURBINE UNIT #3 AT SHERCO STATION, BECKER, MN

Method ..... MAGNETIC PARTICLE, LIQUID PENETRANT

Specification MQS INSPECTION

Procedure .... 27.D.300 REV 0

Acceptance Criteria REPORT ALL FINDINGS TO CLIENT

Remarks:

See report.

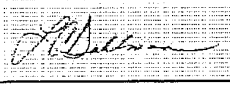
*[Signature]*  
MQS Inspection, Inc.

*[Signature]*  
Title

October 6, 2008 to October 29, 2008

M & MR NDE Inspection Summary

Report Date: 10-29-08

Prepared By:   
L. C. Dahlman  
Sr. NDE Specialist



**NSP, et al v GE**  
EX 281  
Date: 11-24-15  
Richard G. Stirewalt  
Stirewalt & Associates



Sherburne County Generating Station  
Unit 3  
M & MR NDE Inspection Summary

<b>Table of Contents</b>
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ITEM	Repairs Performed	Page(s)
Introduction & Description		2
A Low Pressure Rotor L-0 Blading	None	3
B Low Pressure Rotor L-0 Blading	None	4
Bearings	None	5 - 7
Control Valves & Ventilation Valve	3 new plugs	8
32 Boiler Feed Pump L-0 Blading	Two broken lower casing struts	9
32 BFP Valves	1 new valve seat	10 & 11
33 Boiler Feed Pump L-0 Blading	None	12
33 BFP Valves	2 new valve seats & plugs	13 & 14
Personnel, Procedures, Equipment		15

Sherburne County Generating Station  
Unit 3  
M & SP NDE Inspection Summary

Introduction

DESCRIPTION:

Sherco Unit 3 is a General Electric Turbine consisting of four double-shell sections: a high-pressure section, a double-flow reheat section, and two double-flow low-pressure sections. Operating at 2400 PSIG at 1000F and exhaust pressure of 1.5" HG. ABS. with a rating of 809643 KW at 3600 RPM

Turbine No.	170X819
Generator S/N:	180X819
Exciter S/N:	316X270

SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

LOW PRESSURE ROTOR "A"

Component	Item	Method			
		MT	PT	VT	UT
Generator End					
	L-0 Stellite			*	
	Row (L-0) Buckets			*	
	Row (L-0) Covers			*	
Turbine End					
	L-0 Stellite			*	
	Row (L-0) Buckets			*	
	Row (L-0) Covers			*	

The L-0 blading on both ends show signs of erosion on the Stellite Strips and deposit build up at the blade tips, continuously connected covers, tie knuckles and root radius

The L-0 covers show signs of various degrees of separation between the cover and blade on the discharge side of the leading edge connection (See picture)



All blading has deposit buildup at the tie knuckles, there is no distinct pattern

SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

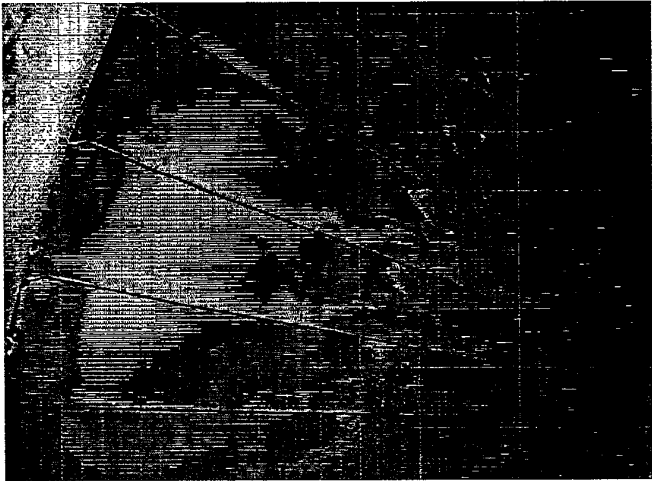
LOW PRESSURE ROTOR "B"

Component	Item	Method			
		MT	PT	VT	UT
Generator End					
	L-0 Stellite			*	
	Row (L-0) Buckets			*	
	Row (L-0) Covers			*	
Turbine End					
	L-0 Stellite			*	
	Row (L-0) Buckets			*	
	Row (L-0) Covers			*	

The L-0 blading on both ends show signs of erosion on the Stellite Strips and deposit build up at the blade tips, continuously connected covers, tie knuckles and root radius

The L-0 covers show signs of various degrees of separation between the cover and blade on the discharge side of the leading edge connection

All blading has deposit buildup at the tie knuckles, there is no distinct pattern.

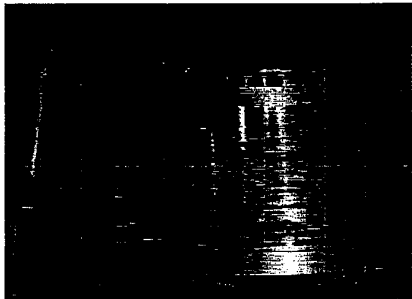


Typical blade build-up at tie knuckles

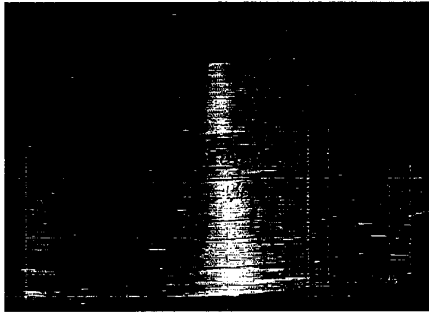
SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

LOW PRESSURE STATIONARY "A" GENERATOR END

Component	Item	Method			
		MT	PT	VT	UT
Bearings					
	#6 Lower Half		Micro-electrolysis bands(2) at 6½" to 8½"from edge and 9" to 15½" from horiz.	Wipe at center	Less than 5% Debond
	#6 Upper Half		NAD	Wiped at center 4-5/8" to 7¼" from edge and 7 to 20 " from horiz. small hole to large hole	Less than 5% Debond



Lower Half

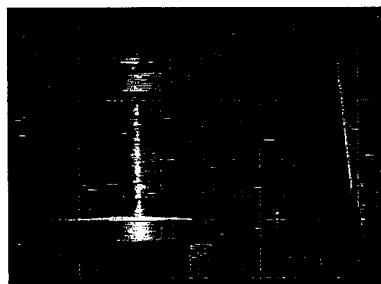


Upper Half

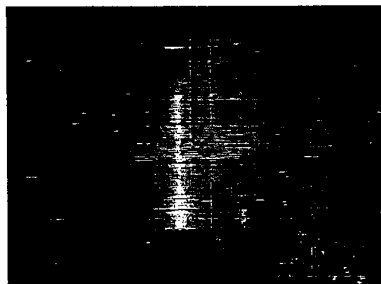
SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

LOW PRESSURE STATIONARY "B" TURBINE END

Component	Item	Method			
		MT	PT	VT	UT
Bearings					
	#7 Lower Half		Micro-electrolysis band at 5 to 6½" from edge and 9½" to 16" from horiz.; Minor debond along edges less than ¼" L	Wiped at center	Less than 5% Debond
	#7 Upper Half		Minor porosity along outer edge	Wiped at center 4-5/8" to 7½" from edge and 7 to 20" from horiz. small hole to large hole	Less than 5% Debond



Lower Half

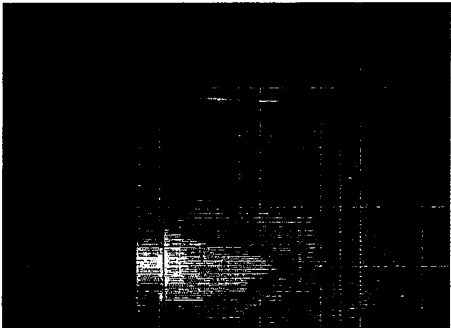


Upper Half

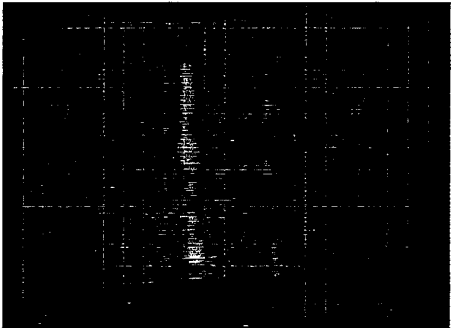
SHERCO UNIT 3 OUTAGE  
SUMMARY LISITING

GENERATOR - GENERATOR END

Component	Item	Method			
		MT	PT	VT	UT
Bearings					
	#9 Lower Half		Minor Porosity on corner	NAD	Less than 5% Debond
	#9 Upper Half		NAD	NAD	Less than 5% Debond



Lower Half



Upper Half

SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

VALVES

Component	Item	Method			
		MT	PT	VT	UT
<b>#1 CONTROL VALVE</b>					
	Stem Threads		NAD	NAD	
	Plug Seat		Sent out		
	Valve Seat		NAD	NAD	
	Bonnet	NAD		NAD	
	Nuts (12)	NAD		NAD	
	Studs (11)			NAD	NAD
<b>#2 CONTROL VALVE</b>					
	Stem Threads		NAD	NAD	
	Plug Seat		Sent out		
	Valve Seat		NAD	NAD	
	Bonnet	NAD		NAD	
	Nuts (12)	NAD		NAD	
	Studs (11)			NAD	NAD
<b>#3 CONTROL VALVE</b>					
	Stem Threads		NAD	NAD	
	Plug Seat		Sent out		
	Valve Seat		NAD	NAD	
	Bonnet	NAD		NAD	
	Nuts (12)	NAD		NAD	
	Studs (12)			NAD	NAD
<b>#4 CONTROL VALVE</b>					
	Stem Threads		NAD	NAD	
	Plug Seat		Sent out		
	Valve Seat		NAD	NAD	
	Bonnet	NAD		NAD	
	Nuts (12)	NAD		NAD	
	Studs (12)			NAD	NAD
<b>VENTILATOR VALVE</b>					
	Plug Seat		NAD	NAD	
	Valve Seat		NAD	NAD	
	Studs (9 @ 1-7/8 x 11.70)			NAD	NAD

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TR.EX.NSP0077.009



**SHERCO UNIT 3 OUTAGE  
SUMMARY LISITING**

<b>32 BOILER FEED PUMP</b>
----------------------------

Component	Item	Method
		VT
	Turbine End	
	Row (L-0) Buckets	Deposit build up on trailing edge of blade full length; build up at roots; build up on trailing edge of stationary blading 1/4" width 3/4 length of blade.
	Row (L-0) Covers	Minor erosion on tenons
	Struts	Bottom half south side bottom strut on NW weld cracked, not noticeable until pressure applied: northeast corner of north side appears cracked.
	Struts	Above conditions corrected by welding



Build up on blades

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XCEL\_Sherco\_05\_0128830

**TR.EX.NSP0077.010**

SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

32 BOILER FEED PUMP VALVES

Component	Item	Method			
		MT	PT	VT	UT
<b>#7 High Pressure Control</b>					
	Valve Seat		NAD	NAD	
	Plug		NAD	NAD	
	Studs (7 @ 3/4 x 6)			NAD	NAD
<b>High Pressure Stop</b>					
	Valve Seat		NAD	NAD	
	Plug		Sent out		
	Strainer	NAD		NAD	
	Studs (10 @ 3/4 x 6.3)			NAD	NAD
<b>Low Pressure Stop</b>					
	Valve Seat		NAD	NAD	
	Plug Seat		NAD	NAD	
	Pzr Seal Head Back Seat		NAD	NAD	
	Stem Back Seat		NAD	NAD	
	Back Seat		NAD	NAD	
	Back Seat Plug Seat		NAD	NAD	
	Strainer	NAD		NAD	
	Studs (24 @ 1/4 x 8.45)			NAD	NAD

**SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING**

<b>32 BOILER FEED PUMP VALVES</b>
-----------------------------------

Component	Item	Method			
		MT	PT	VT	UT
Casing Studs (34 @ 1¼ x 6.25)				NAD	NAD
#1 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		Replaced		
#2 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		NAD	NAD	
#3 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		NAD	NAD	
#4 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		NAD	NAD	
#5 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		1 pore outside sealing band - Acceptable	NAD	

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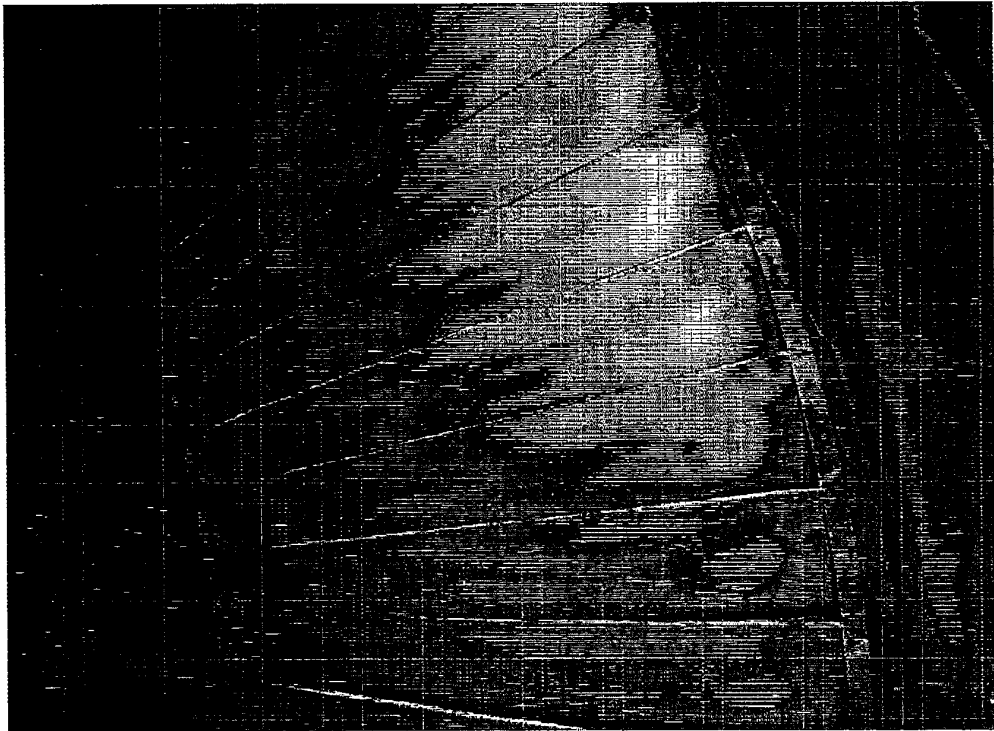
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**TR.EX.NSP0077.012**

SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

33 BOILER FEED PUMP

Component	Item	Method
		VT
	Turbine End	
	Row (L-0) Buckets	Deposit build up on trailing edge of blade full length; build up at roots; build up on trailing edge of stationary blading 1/4" width 3/4 length of blade.
	Row (L-0) Covers	Minor erosion on tenons
	Struts	NAD



Build up on blades

**SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING**

<b>33 BOILER FEED PUMP VALVES</b>
-----------------------------------

Component	Item	Method			
		MT	PT	VT	UT
<b>#7 High Pressure Control</b>					
	Valve Seat		NAD	NAD	
	Plug		NAD	NAD	
	Studs (11 @ ¼ x 6)			NAD	NAD
<b>#7 High Pressure Stop</b>					
	Valve Seat		NAD	Linear lines from slag removal - Acceptable	
	Plug		Sent out		
	Strainer	NAD		NAD	
	Studs (12 @ ¼ x 6.3)			NAD	NAD
<b>Low Pressure Stop</b>					
	Valve Seat		NAD	NAD	
	Plug Seat		NAD	NAD	
	Pzr Seal Head Back Seat		NAD	NAD	
	Stem Back Seat		NAD	NAD	
	Back Seat		NAD	NAD	
	Back Seat Plug Seat		NAD	NAD	
	Strainer	NAD		NAD	
	Studs (24 @ 1¼ x 8.45)			NAD	NAD

SHERCO UNIT 3 OUTAGE  
SUMMARY LISITING

33 BOILER FEED PUMP VALVES

Component	Item	Method			
		MT	PT	VT	UT
Casing Studs (33 @ 1¼ x 6.25)				NAD	NAD
#1 Low Pressure Control					
	Plug Seat		Replaced		
	Seat		Replaced		
#2 Low Pressure Control					
	Plug Seat		Replaced		
	Seat		Replaced		
#3 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		NAD	NAD	
#4 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		NAD	NAD	
#5 Low Pressure Control					
	Plug Seat		NAD	NAD	
	Seat		NAD	NAD	

SHERCO UNIT 3 OUTAGE  
SUMMARY LISTING

**PROCEDURES, PERSONNEL & EQUIPMENT**

Procedures

- STD-MT-6 Rev. 1 Wet Fluorescent Magnetic Particle Examinations With a Cable Wrap
- STD-PT-1 Rev. 1 Visible Solvent Removable Liquid Penetrant Examination
- STD-UT-2 Rev. 1 Ultrasonic Examinations Of Babbitted Bearings
- STD-UT-1 Rev. 2 Ultrasonic Examinations of Shafts, Studs, Pins and Bolts
- STD-VT-1 Rev. 0 General Visual Examination

Magnetic Particle:

- Magnetic Field Indicator (Pie Gauge)
- Wet Fluorescent Magnetic Magnaglo 20B Batch #88G067
- Portable Inspection Unit Magnafulx KCH-3D S/N: 661001
- Black Lights Labino

Liquid Penetrant

- Penetrant - Visible solvent SKL-HF/S Batch #88JO46
- removable
- Cleaner SKC-S Batch #00M01K
- Developer SKD-S2 Batch #95D07K

Ultrasonic

- Panametrics Epoch III S/N: 95061707
- Harisonics 5 MHZ/.25" Dia. S/N: A3868
- Sonotrace Ultrasonic Couplant Batch #: 96143

Personnel

	MT	PT	UT	VT
Dahlman, L. C.	III	III	-	III



**GE Energy Services**

April 2, 1999

*Niche Inspection & Repair Services  
General Electric International, Inc.*

**SUBJECT: IN-SERVICE TURBINE ROTOR INSPECTION**

**NORTHERN STATES POWER COMPANY  
SHERBURNE COUNTY #3  
TURBINE #170X819  
LP-B ROTOR, SERIAL #3567V1**

**INSPECTION HISTORY AND COMPARISON OF RESULTS**

This is the first in-service NDT inspection performed by GE Company on the subject rotor. A comparison of the original acceptance ultrasonic tests with the current tests shows the results to be within GE Company's repeatability limits and implies that no internal change has occurred in this rotor between tests.

**CURRENT RECOMMENDATIONS**

The recent evaluation of the structural integrity of this rotor included the original and the current NDT results, material properties, and the temperature and stress exposures. The evaluation also included an analysis of an assumed crack on the bore surface under each stage. The results of this evaluation were reviewed at a meeting on March 22, 1999. The resulting recommendations for this rotor are:

Continue service in accordance with current GE Company prewarming, starting, and loading recommendations. The rotor should be completely reinspected after not more than ten (10) additional years of service. The primary purpose of the reinspection is to reduce the probability of a catastrophic failure by detecting the initiation or propagation of crack-like discontinuities near the bore and performing corrective action before critical conditions are reached. The probability of failure from other degradation such as periphery or dovetail cracking is also reduced by early detection and appropriate action. In addition, routine inspections provide periodic reevaluations of the rotor integrity with the latest techniques that may permit the identification of conditions not previously recognized.

**NON-DESTRUCTIVE TESTS PERFORMED**

The standard tests performed on this rotor during the recent inspection are listed below. A description of each of these tests is provided in the attached appendix.

- Bore visual examination
- Bore magnetic particle test
- Radial beam boresonic test
- Angle beam boresonic test
- Periphery ultrasonic test
- Axial ultrasonic test
- Rotor dovetail ultrasonic test
- Bucket to rotor gap measurements
- Periphery magnetic particle test



GE-NSP00244099

**TR.EX.NSP0300.001**



**NORTHERN STATES POWER COMPANY  
SHERBURNE COUNTY #3  
TURBINE #170X819  
LP-B ROTOR, SERIAL #3567V1**

#### **BORE SURFACE EXAMINATION**

The bore surface of this rotor was prepared for testing by light honing immediately prior to the recent inspection. The visual inspection and subsequent magnetic particle test of the bore surface disclosed no indications.

#### **RADIAL BEAM BORESONIC AND PERIPHERY ULTRASONIC TEST**

The radial beam boresonic and the periphery ultrasonic tests revealed only one indication. The size and coordinates of this indication are provided on an attached tabulation. Graphic displays of the indication are provided on an attached layout that shows the location of the indication relative to the rotor geometry. The layout includes an axial-radial outline of the rotor with the indication plotted at its proper location. The circumferential location of the indication is displayed with an axial-circumferential view.

#### **ANGLE BEAM BORESONIC TEST**

The angle beam boresonic test performed on this rotor revealed no radial-axial type patterns of indications that fulfill the established crack-like criteria.

The purpose of the angle beam boresonic test is to identify radial-axial patterns of indications that could represent crack-like discontinuities near the bore of the rotor. The test operates at or near the acoustic and electronic noise thresholds of the inspection and consequently detects many reflectors that may include material structure as well as inclusions or real cracks. The indications detected are scanned by applying an algorithm that identifies radial-axial patterns and lists those with sufficient point density to qualify as a potential crack. In addition, a visual study of all the test data combined with experienced judgment is required to ensure the proper conclusions concerning the presence, nature, and overall size of any significant discontinuities.

#### **AXIAL ULTRASONIC TEST**

The straight beam axial ultrasonic test performed from the ends of the rotor revealed no indications.

#### **ROTOR DOVETAIL ULTRASONIC TESTS**

An ultrasonic test of the accessible wheel dovetail hooks was performed on stages L-2 and L-3 of both the turbine and generator ends of this rotor. Point source type indications, some of which were reported as levels, were detected in both L-2 stages. None of the indications showed evidence of continuity in the circumferential direction and there was no loss of the reference reflections. These indications did not warrant bucket removal for further investigation.

It should be noted that the dovetail test is a detection test only and does not size the indications. In addition, there have been cases where cracks existed in locations where no wheel dovetail ultrasonic indications were revealed. As a result, there may be conditions that were not revealed or evaluated that could limit the serviceability of the wheels.

**NORTHERN STATES POWER COMPANY  
SHERBURNE COUNTY #3  
TURBINE #170X819  
LP-B ROTOR, SERIAL #3567V1**

**BUCKET TO ROTOR GAP MEASUREMENTS**

The gap between the bucket and wheel tangs was measured around the entire circumference on both the admission and discharge sides of stages L-2 and L-3 on both the turbine and generator ends of this rotor. A measurable gap was reported at the notch closure on all four of these stages. The maximum values ranged from 0.007" to 0.016". There were no measurable gaps at the regular buckets on any of the stages examined and further action due to the above reported values is not warranted at this time.

**PERIPHERY MAGNETIC PARTICLE TEST**

It has been reported that a magnetic particle test of the external surfaces of this rotor revealed no indications. This test was not performed by GE Life Extension Services.

**ROTOR OUTLINE**

A 1/5 scale outline of the rotor is provided with this report. The outline serves as a model for stress calculations and also shows the location of any reported bore surface and internal indications relative to the rotor geometry.

**MATERIAL PROPERTIES**

The material properties of this rotor are listed on an attached table. At the time of manufacture, the FATT measured from the transverse core samples was -60°F. An embrittlement of 65°F is estimated for the first stage region and 15°F for the second stage region of this rotor due to service conditions which raises the FATT of those portions to 5°F and -45°F respectively. No embrittlement is predicted for the remainder of the rotor.

**NORTHERN STATES POWER COMPANY  
SHERBURNE COUNTY #3  
TURBINE #170X819  
LP-B ROTOR, SERIAL #3567V1**

The recommendations provided in this report represent our best judgment in light of the information available to us. In evaluating the above recommendations, the owner should recognize that there are many operating practices and conditions including, but not limited to, those mentioned above which affect continued satisfactory operation of which GE has no control. It is the owner's responsibility to determine whether or not the rotor should continue to be used in light of the information furnished above and his own operating practices and conditions. No warranty, either expressly or by implication, is being made in regards to these recommendations, and GE expressly disclaims any liability for any damages allegedly incurred as a result or consequence of their application whether it is claimed that these recommendations resulted from GE's negligence or that it is strictly responsible for the damages claimed to have been sustained. GE's responsibility in connection with furnishing this report is as set forth in the contract under which this report is furnished.

Prepared by

 4/2/99

G.S. Bullock, Senior Engineer  
Life Extension Services  
GE International Inc.  
Schenectady, New York 12345

**NORTHERN STATES POWER COMPANY  
SHERBURNE COUNTY #3  
TURBINE #170X819  
LP-B ROTOR, SERIAL #3567V1**

**MATERIAL PROPERTIES**

**SIMILAR TO ASTM**

A 470 Class 7

**TENSILE PROPERTIES**

Tensile Strength	128.8 - 135.3	ksi
0.02% Yield Strength	106.1 - 114.8	ksi
Elongation	18.0 - 22.0	%
Reduction of Area	61.0 - 70.0	%

**IMPACT ENERGY**

Charpy V-notch @ R.T. 50 - 100 ft. lb.

**50% FRACTURE APPEARANCE TRANSITION TEMPERATURE (FATT)**

*As Received	-60°F
*Embrittled	5°F

\* See text for further description.

**CRACK GROWTH**

da/dn vs.  $\Delta K$  see appendix

**TOUGHNESS**

$K_{Ic}$  vs.  $T_e$  see appendix

**Bullock, Gil S (PS, PSD)**

---

**From:** Bullock, Gil S (PS, PSD)  
**Sent:** Monday, March 22, 1999 4:36 PM  
**To:** Peterson, Mark A (PS, PGS)  
**Cc:** Murphy, Keith E (PS, LES)  
**Subject:** Rotor Inspection 170X819 LP-B

NORTHERN STATES POWER COMPANY  
SHERBURNE COUNTY #3  
TURBINE #170X819  
LP-B ROTOR, SERIAL #3567V1

This confirms my voice-mail communication of 3/22/99.

The recent evaluation of the structural integrity of the above rotor included the original and the current NDT results, material properties, and the temperature and stress exposures. In addition, the evaluation included an analysis of an assumed crack on the bore surface under each stage. The results of this evaluation were reviewed at a meeting on March 22, 1999. The resulting recommendations for this rotor are:

Continue service in accordance with current GE Company prewarming, starting, and loading recommendations. The rotor should be completely reinspected after not more than ten (10) additional years of service. The primary purpose of the reinspection is to reduce the probability of a catastrophic failure by detecting the initiation or propagation of crack-like discontinuities near the bore and performing corrective action before critical conditions are reached. The probability of failure from other degradation such as periphery or dovetail cracking is also reduced by early detection and appropriate action. In addition, routine inspections provide periodic reevaluations of the rotor integrity with the latest techniques that may permit the identification of conditions not previously recognized.

The final report will follow.

GS Bullock, Senior Engineer  
GE Life Extension Services  
8\*235-5545

IN-SERVICE TURBINE ROTOR INSPECTION

===GENERAL===

NORTHERN STATES POWER COMPANY Turbine #170X819
SHERBURNE COUNTY #3
Serv Date 07/87 Rating 810 MW Tb Code G3 # Stgs 18 LSB 33.5
Initial Temp 1000 RH Temp 1000 X/O Temp 714 Bore Dia 6.04

===FORGING===

Rotor Type LPB Matl B50A373B9 NiCrMoV Serial #3567V1
Vendor U.S. STEEL
Orig T.S. 135 KSI ARFATT: Measured -60 (Transverse) Assumed -60
% P 0.006 ASFATT: Assumed 5

===INSPECTION STATUS===

DATE Repeatable YES
RECOM

===NDT RESULTS===

Std Ultrasonics Axial Angle Beam Bore Visual Bore Mag Periph Mag
1 Inds NO Inds NO Inds NO Inds NO Inds NO Inds
0 Levels
0 Areas
0 Holding
0 Oriented
0 Radial/Axial
0 Inds with Comments
<.03 - <.03 EFBH

Table with 5 columns: Stg, Ind/Ext, LOE, Notch, Other. Includes rows for 3G, 3T, 4G, 4T and a 'NO ACTION' note.

===EVALUATION===

Limiting Conditions (Off Hold) Critical Crack Size
Indication 1/8" Semi-Cir Initial Sz Aft
Stg 6 Sz LCF O/S
O/S 89 Crit 1.167 1.498 15
(Stg 6) 0.826 0.925 30

===REVIEW MEETING===

GS Bullock DR Nichols

Recommendation: Reinspect After 10 6 3 Yrs Other

By: DRN Date: 03/22/99

MARK PETERSON 87669-2332
V-MAIL 3/22/99
E-MAIL 3/22/99

**Bullock, Gil S (PS, PSD)**

---

**From:** clarify@schdba16.sch.ge.com[SMTP:clarify@schdba16.sch.ge.com]  
**Sent:** Monday, March 22, 1999 4:37 PM  
**To:** bullocgi@pssch.ps.ge.com; jim.force@ps.ge.com; mark.peterson@ps.ge.com;  
nicholsdo@pssch.ps.ge.com; tom.wells@ps.ge.com  
**Subject:** 170X819 # 19990319-0040 Resolution "stm-amer-170X819,LPB,3567V1 Wheel Dovetail Sonic Test" for NORTHERN STATES PWR CO - SHERBURNE - 003

Case ID.....19990319-0040  
ICN No.....  
Turbine ID.....170X819  
Site ID.....T170X819

Case Title.....stm-amer-170X819,LPB,3567V1 Wheel Dovetail Sonic Test

Case Creation Date.....03/19/99 10:49:56  
RCT/Customer Want Date....03/26/99 23:58:34

Contact or MES Name..... MARK PETERSON  
Submitter (if other than above) ..... THOMAS WELLS  
Current PAC Case Owner.....John Emerich

Case Type.....In Svc.- Post Warr.- Tech. Assist.  
Priority.....Respond as Necessary

Case History - \*\*\* EMAIL IN 03/19/99 10:50:00 tom.wells@ps.ge.com  
Review and disposition the wheel dovetail test results.  
Please assign the case to Eloy Emeterio  
Add the following individuals to cc list 2 Gil Bullock and Don Nichols  
bullocgi@pssch.ps.ge.com  
nicholsdo@pssch.ps.ge.com

\*\*\* SUBCASE 19990319-0040-1 CREATED 03/19/99 12:47:00 PM emericj2  
\*\*\* EMAIL IN 03/19/99 10:50:00 tom.wells@ps.ge.com  
Review and disposition the wheel dovetail test results.  
Please assign the case to Eloy Emeterio  
Add the following individuals to cc list 2 Gil Bullock and Don Nichols  
bullocgi@pssch.ps.ge.com  
nicholsdo@pssch.ps.ge.com

\*\*\* SUBCASE 19990319-0040-1 - NOTES 03/22/99 04:26:02 PM emeterel Action Type: Support Comments

[!<For Internal Use Only  
Noted, no action recommended at the current outage >.]

\*\*\* SUBCASE 19990319-0040-1 CLOSED 03/22/99 04:26:50 PM emeterel  
Necessary info to LES for final report.



**GE Energy Services**

**Keith E. Murphy**  
Team Leader NDT Evaluation

Life Extension Services  
General Electric International, Inc.  
1 River Road Schenectady, NY 12345  
Phone: 518-385-4642, 8\*235-4642  
Fax: 518-385-3178, 8\*235-3178  
Email: keith.murphy@geps.ge.com

cc: G. Bullock 37-3C  
Folder

Date: March 21, 1999

**SUBJECT: COMPARISON OF ULTRASONIC TESTS ON  
AN IN-SERVICE LPB TURBINE ROTOR**

**Serial No: 3567V1**  
**Turbine No: 170X819**  
**Customer: Northern States Power Co.**  
**Station: Sherburne County # 3**

Boresonic and periphery inspections have been performed on the following dates:

**BORESONIC TESTS:**

5/18/78  
3/18/99

**PERIPHERY  
TESTS:**

5/25/78  
3/18/99

A complete radial periphery ultrasonic test performed per BB Project B713.1. When a comparison of periphery tests is made, the results are within the limits of repeatability.

When a comparison of the boresonic tests is made, the results are within the limits of repeatability.

In conclusion, it is the opinion of Life Extension Services that the comparisons of the boresonic and periphery tests indicate that no change has occurred in this rotor between tests.

K.E. Murphy,  
Team Leader NDT Evaluation  
GE Life Extension Services



3567V1

\*\*\*\*\*  
C O M P O S I T E  
\*\*\*\*\*

CUSTOMER: NORTHERN STATES POWER COMPANY  
STATION: SHERBURNE COUNTY #3  
ROTOR TYPE: LPB

TURBINE #170X819  
SERIAL #3567V1

-----  
AXIAL REF: GENERATOR END

CIRCUMFERENTIAL REF: Cal Hole at 180 degrees.

RADIAL REF: BORE DIA.	FROM	TO
6.53	0.00	4.69
6.04	5.00	337.31

-----  
 COMPOSITE SUMMARY:      1 INDIVIDUAL INDICATIONS  
                                     1 BORESONIC  
                                     0 PERIPHERY  
                                     0 ANGLE BEAM  
 0 LEVELS OF INDICATIONS  
 0 AREAS OF INDICATIONS  
 0 HOLDING INDICATIONS  
 0 ORIENTED INDICATIONS  
 0 RADIAL/AXIAL INDICATIONS  
 0 INDICATIONS WITH COMMENTS  
 -----

SUMMARY OF TESTS:

CODE	TYPE	DATE	RADIAL RANGE	EFBH RANGE
13.01	BORESONIC	03/18/99	1.26- 1.26	<.03-<.03
13.01	ANGLEBEAM	03/18/99		

-----  
REMARKS: NONE

COMPILED BY TC Murphy

DATE: 03/21/99

3567V1  
PAGE 1

TABLE 1

ULTRASONIC TEST COMPOSITE										
COMP		LOCATION			EFBH	AXIAL	RADL			TEST
IND	COM	AXIAL	RADL	ANGLE	SIZE	HOLD	EXTN	AMP	TEST	IND
NO.	NO.	(IN)	(IN)	(DEG)	(IN)	(IN)	(IN)	(%)	CODE	NO.
1		216.94	1.26	164	<.03			2	13.01	1

\*\*\* END OF COMPOSITE

LIFE EXTENSION SERVICES
IN-SERVICE N.D.T. INSPECTION

\*\*\*\*\*

ROTOR SERIAL: 3567V1 TYPE: LPB
TURBINE #: 170X819 DWG.: 881E393
TESTED BY: E.DONLON J.BLAIR B.BARTHOLOMEW ON 3/13/99 TO 3/15/99
CUSTOMER: NORTHERN STATES POWER COMPANY STATION: SHERBURNE COUNTY #3
FSR #: 583B0344
RELEASE DATE: 3/18/99

\*\*\*\*\*

BORE EXAMINATIONS

Bore Visual Test
Date tested: 3/18/99 Results: NO INDS. NOTED
See Attached 1 Sheets.
Bore Magnetic Particle Test
Date tested: 3/18/99 Results: NO INDS. NOTED
See Attached 1 Sheets.
Ultrasonic Straight Beam Test
Date tested: 3/18/99 Results: INDS. NOTED
See Attached 3 Sheets.
Ultrasonic Anglebeam Test
Date tested: 3/14/99 Results: NO INDS. NOTED
See Attached 1 Sheets.
Bore Eccentricity
Date tested: NR Results: NA
See Attached NA Sheets.
Bore Measurement
Date tested: NR Results: NA
See Attached NA Sheets.

\*\*\*\*\*

PERIPHERY EXAMINATIONS

Ultrasonic Periphery Test
Date tested: 3/18/99 Results: NO INDS. NOTED
See Attached NA Sheets.
Ultrasonic Axial Test
Date tested: 3/18/99 Results: NO INDS. NOTED
See Attached NA Sheets.
OD Magnetic Particle Test
Date tested: 3/99 Results: NO INDS. NOTED
See Attached 1 Sheets.

\*\*\*\*\*

DOVETAIL EXAMINATIONS

Ultrasonic Dovetail Test
Date tested: 3/18/99 Results: INDS. NOTED
See Attached 4 Sheets.
Dovetail Lifting Test
Date tested: 3/18/99 Results: LIFTING NOTED
See Attached 1 Sheets.

\*\*\*\*\*

Comments: OD MAG PARTICLE TEST, COIL WRAP ONLY, WAS PERFORMED BY MQS.

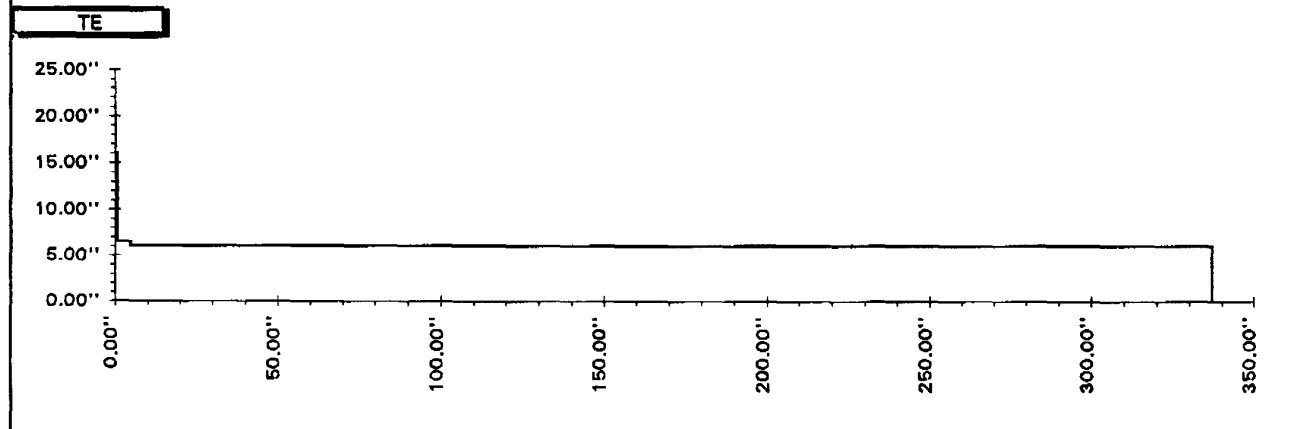
Prepared By: K. Murphy
DATE: 3/21/99



**GE Energy Services**

**BORE VISUAL**

PROCEDURE <u>A0004</u>		Rev.: _____	
		Sheet <u>1</u>	of <u>1</u>
Rotor Serial #: <u>3587V1</u>	Type: <u>LPB</u>	S.O./T.B.#: <u>170X819</u>	
Test Location: <u>Sherburne #3</u>	Customer: <u>NSP</u>		
Tested By: <u>E Donlon</u>	Date: <u>18MAR99</u>		
Reference End: (GE, TE, CE) <u>TE</u>	Excess Stock: (GE, TE) <u>0</u>		
0 Degrees is: <u>Calibration hole at 180 degrees</u>	"A" Point is: <u>0</u>		



Bore Visual Indications Noted - No / Yes - See Attached Sheet(s) No

Bore Length Tested: From <u>0.62"</u> to <u>337.00"</u>	
Bore #1 Dia. =:	<u>23.50"</u> Start: <u>0.00"</u> Stop: <u>0.06"</u> F.O.V.
Bore #2 Dia. =:	<u>16.00"</u> Start: <u>0.06"</u> Stop: <u>0.62"</u> F.O.V.
Bore #3 Dia. =:	<u>6.53"</u> Start: <u>0.62"</u> Stop: <u>4.69"</u> F.O.V.
Bore #4 Dia. =:	<u>6.04"</u> Start: <u>4.69"</u> Stop: <u>337.00"</u> F.O.V. <u>3.38"</u>

**Comments:**  
 The axial measurements are from the turbine end, and the circumferential locations are reference from the generator end.  
 The bore was honed by L. E. S.

- 1) There is a small gouge in the plug bore from 2.88" - 4.25" at 205 degrees.
- 2) Raised metal smear at 121.50" at 105 degrees.
- 3) Pitting from 166.75" - 172.88" from 300 - 120 degrees, up to 0.03" in diameter. 1-3 in the FOV.
- 4) Pitting 325.75" - 337.00" at 120 degrees, up to 0.03" in diameter. 1 - 2 in the FOV.

The bore appears suitable for boresonic and magnetic particle inspections.

W0002\_01

GE-NSP00244111

TR.EX.NSP0300.013



### GE Energy Services

#### BORE MAGNETIC PARTICLE TEST PARAMETER SHEET

PROCEDURE <u>A0005</u>	Rev.: _____	Sheet <u>1</u>	of <u>1</u>	
***** Bore M.P. Indications Noted: Yes or No <u>No</u> *****				
Rotor Serial#: <u>3567V1</u>	S.O./T.B No.: <u>170X819</u>			
Rotor Type: <u>LPB</u>	0 Degrees is: <u>Calibration hole at 180 degrees</u>			
Axial Measurement From: ( <u>TE, GE, CE</u> ) <u>TE</u>	Test Location: <u>Sherburne #3</u>			
Tested By: <u>E Donlon</u>	Date: <u>18MAR99</u>			
P.O.: <u>N/A</u>	QCR No.: <u>N/A</u>			
Current Source: <u>DC welder</u> (Mag Unit I.D.-include "Q") <u>N/A</u>	Excess Stock: (GE/TE) <u>0</u>			
Last Cal. Date: <u>5NOV98</u>	<u>50</u> ML Sample = <u>0.85</u>			
1st M.P. Shot <u>0</u> degrees up /	2nd M.P. Shot <u>90</u> degrees up			
Bore Dia. #1: <u>23.50</u> F.O.V. <u>0.00</u> Amps: _____				
Bore Dia. #2: <u>16.00</u> F.O.V. <u>0.00</u> Amps: _____				
Bore Dia. #3: <u>6.53</u> F.O.V. <u>0.00</u> Amps: <u>605</u>				
Bore Dia. #4: <u>6.04</u> F.O.V. <u>3.38</u> Amps: <u>605</u>				
Indicate Condition of bore at time of test as Before Hone (BH), After Hone (AH), After Grinding (AG), or After Boring (AB). (If After Grinding-Indicate Depth of Grind Area.)				
Condition BH / AH / AG: <u>After Hone</u>		Depth of Grind Area: _____		
Comments:				

**Boresonic Test**

Test Date: Thu Mar 18 09:33:39 1999 Report Date: Thu Mar 18 19:59:15 EST 1999

Serial No.:3567V1

Page: 1

TEST DATE Thu Mar 18 09:33:39 1999  
SERIAL NO. 3567V1  
SHOP ORDER 170X819  
FORGING DRAWING NO. NA  
TYPE LPB

BORE DIAMETER	START OF BORE (AXIAL LOCATION)	HEAD DIAMETER	NUMBER FOR V/U RATIO
6.04	5.00	5.00	11

ALL EFBH SIZES ARE MULTIPLIED BY THESE FACTORS

0 - 1/16	1.00
1/16 - 1/8	1.00
1/8 - 1/4	1.00
1/4 - 1/2	1.00
1/2 - UP	1.00

Boresonic Test

Test Date: Thu Mar 18 09:33:39 1999 Report Date: Thu Mar 18 19:59:16 EST 1999

Serial No.:3567V1

Page: 2

Ultrasonic Indication Distribution  
Single Indication

Flaw Ref End	No. Opp End	Holding Calc.	Location Axial In Z	Est.Min. EFBHS (inches)	Angular Location degrees	Level Percent	Radial Location
1	X		216.94	0.00	164.0	2	1.26

**Boresonic Test**

Test Date: Thu Mar 18 09:33:39 1999 Report Date: Thu Mar 18 19:59:16 EST 1999

Serial No.:3567V1

Page: 3

Comment                    Comments  
Number

Factor 5.000 NO CLUSTERS FOUND!

Factor 2.000 NO CLUSTERS FOUND!

Section End	No. Inds.	Axial		Radial		EFBHS	
		Min.	Max.	Min.	Max.	Min.	Max.
REFERENCE	0	93.19	0.00	0.00	0.00	0.00	0.00
BODY	1	216.94	216.94	1.26	1.26	0.00	0.00
OPPOSITE	0	0.00	0.00	0.00	0.00	0.00	0.00









**GE Energy Services**

**Rotor Serial Number:** 3567V1  
**Turbine Number:** 170X819  
**Customer:** NSP  
**Tested By:** BARTHOLOMEW(T), BLAIR  
**Type of Test:** MANUAL DOVETAILS

**Rotor Type:** LPB  
**Date:** 3/18/99  
**Station:** Sherburne County #3  
**UT Unit Number:** AMPUT #29  
**Procedure:** A0002

**Table II Summary Table**

Stage	Adm/ Disch	L,M,U		Angle	Freq.	Design #	Transducer		Comments
		Of	1,2,3				Check	Indications	
3G	ADM	L	of 3	45	5.00	W-65	OK	N	
3G	ADM	M	of 3	45	2.25	W-65	OK	N	
3G	ADM	U	of 3	60	5.00	W-65	OK	N	
3G	Disch	L	of 3	45	5.00	W-65	OK	N	
3G	Disch	M	of 3	45	2.25	W-65	OK	N	
3G	Disch	U	of 3	60	5.00	W-65	OK	N	
4G	ADM	L	of 3	45	5.00	W-84	OK	Y	
4G	ADM	M	of 3	45	5.00	W-84	OK	Y	
4G	ADM	U	of 3	55	5.00	W-84	OK	N	
4G	Disch	L	of 3	45	5.00	W-84	OK	Y	
4G	Disch	M	of 3	45	5.00	W-84	OK	N	
4G	Disch	U	of 3	55	5.00	W-84	OK	N	
3T	ADM	L	of 3	45	5.00	W-65	OK	N	
3T	ADM	M	of 3	45	2.25	W-65	OK	N	
3T	ADM	U	of 3	60	5.00	W-65	OK	N	
3T	Disch	L	of 3	45	5.00	W-65	OK	N	
3T	Disch	M	of 3	45	2.25	W-65	OK	N	
3T	Disch	U	of 3	60	5.00	W-65	OK	N	
4T	ADM	L	of 3	45	5.00	W-84	OK	Y	
4T	ADM	M	of 3	45	5.00	W-84	OK	Y	
4T	ADM	U	of 3	55	5.00	W-84	OK	N	
4T	Disch	L	of 3	45	5.00	W-84	OK	Y	
4T	Disch	M	of 3	45	5.00	W-84	OK	Y	
4T	Disch	U	of 3	55	5.00	W-84	OK	N	

GE-NSP00244118



**GE Energy Services**

**Rotor Serial Number:** 3567V1  
**Turbine Number:** 170X819  
**Customer:** NSP  
**Tested By:** BARTHOLOMEW(T), BLAIR  
**Type of Test:** MANUAL DOVETAILS

**Rotor Type:** LPB  
**Date:** 3/18/99  
**Station:** PS Sherburne County #3  
**UT Unit Number:** AMPUT #29  
**Procedure:** A0002

**Table III Details of Indicators**

Ind #	Stage	Adm/ Disch	L,M,U OF 1,2,3	Angle	Freq.	CW CCW	Start		Stop		Amp.	L.O.E.	Circ. Extent	Verified	Comments
							Deg	Bckt	Deg	Bckt					
1	4G	ADM	L of 3	45	5.00	CW	4	1.00	360	94.00	5-20	0	PS	N/A	LEVEL OF INDICATIONS
2	4G	ADM	L of 3	45	5.00	CW	4	1	0		5-10	0	PS	N/A	DETAIL OF LEVEL
3	4G	ADM	L of 3	45	5.00	CW	8	2	0		5-10	0	PS	N/A	DETAIL OF LEVEL
4	4G	ADM	L of 3	45	5.00	CW	11	3	0		5-10	0	PS	N/A	DETAIL OF LEVEL
5	4G	ADM	L of 3	45	5.00	CW	15	4	0		5-10	0	PS	N/A	DETAIL OF LEVEL
6	4G	ADM	L of 3	45	5.00	CCW	4	1	0		5-15	0	PS	N/A	DETAIL OF LEVEL
7	4G	ADM	L of 3	45	5.00	CCW	8	2	0		5-10	0	PS	N/A	DETAIL OF LEVEL
8	4G	ADM	L of 3	45	5.00	CCW	11	3	0		5-10	0	PS	N/A	DETAIL OF LEVEL
9	4G	ADM	L of 3	45	5.00	CCW	15	4	0		5-10	0	PS	N/A	DETAIL OF LEVEL
10	4G	ADM	L of 3	45	5.00	CW	57	15	0		35	0	PS	N/A	
11	4G	ADM	L of 3	45	5.00	CW	61	16	0		30	0	PS	N/A	
12	4G	ADM	M of 3	45	5.00	CW	4	1.00	0		25	0	PS	N/A	
13	4G	ADM	M of 3	45	5.00	CW	57	15	0		15	0	PS	N/A	
14	4G	ADM	M of 3	45	5.00	CW	65	17	0		15	0	PS	N/A	
15	4G	ADM	M of 3	45	5.00	CW	80	21	0		15	0	PS	N/A	
16	4G	ADM	M of 3	45	5.00	CW	257	67	0		15	0	PS	N/A	
17	4G	ADM	M of 3	45	5.00	CW	264	69	0		15	0	PS	N/A	
18	4G	ADM	M of 3	45	5.00	CW	287	75	0		15	0	PS	N/A	
19	4G	ADM	M of 3	45	5.00	CW	303	79	0		15	0	PS	N/A	
20	4G	ADM	M of 3	45	5.00	CW	303	79	0		20	0	PS	N/A	
21	4G	ADM	M of 3	45	5.00	CW	306	80	0		15	0	PS	N/A	
22	4G	ADM	M of 3	45	5.00	CW	306	80	0		25	0	PS	N/A	
23	4G	ADM	M of 3	45	5.00	CW	310	81	0		15	0	PS	N/A	
24	4G	ADM	M of 3	45	5.00	CW	310	81	0		25	0	PS	N/A	
25	4G	ADM	M of 3	45	5.00	CW	310	81	0		30	0	PS	N/A	
26	4G	ADM	M of 3	45	5.00	CW	314	82	0		20	0	PS	N/A	

GE-NSP00244119



**GE Energy Services**

**Rotor Serial Number:** 3567V1  
**Turbine Number:** 170X819  
**Customer:** NSP  
**Tested By:** BARTHOLOMEW(T), BLAIR  
**Type of Test:** MANUAL DOVETAILS

**Rotor Type:** LPB  
**Date:** 3/18/99  
**Station:** PS Sherburne County #3  
**UT Unit Number:** AMPUT #29  
**Procedure:** A0002

**Table III Details of Indicators**

Ind #	Stage	Adm/ Disch	L,M,U OF 1,2,3	Angle	Freq.	CW CCW	Start		Stop		Amp.	L.O.E.	Circ. Extent	Verified	Comments
							Deg	Bckt	Deg	Bckt					
27	4G	ADM	M of 3	45	5.00	CW	318	83	0		20	0	PS	N/A	
28	4G	ADM	M of 3	45	5.00	CW	318	83	0		20	0	PS	N/A	
29	4G	ADM	M of 3	45	5.00	CW	322	84	0		15	0	PS	N/A	
30	4G	ADM	M of 3	45	5.00	CW	322	84	0		15	0	PS	N/A	
31	4G	ADM	M of 3	45	5.00	CW	326	85	0		15	0	PS	N/A	
32	4G	ADM	M of 3	45	5.00	CW	352	92	0		15	0	PS	N/A	
33	4G	ADM	M of 3	45	5.00	CCW	8	2	0		15	0	PS	N/A	
34	4G	Disch	L of 3	45	5.00	CW	4	1.00	360	94.00	5-25	0	PS	N/A	LEVEL OF INDICATIONS
35	4G	Disch	L of 3	45	5.00	CW	4	1	0		5-10	0	PS	N/A	DETAIL OF LEVEL
36	4G	Disch	L of 3	45	5.00	CW	8	2	0		5-10	0	PS	N/A	DETAIL OF LEVEL
37	4G	Disch	L of 3	45	5.00	CW	11	3	0		5-10	0	PS	N/A	DETAIL OF LEVEL
38	4G	Disch	L of 3	45	5.00	CW	15	4	0		5-10	0	PS	N/A	DETAIL OF LEVEL
39	4G	Disch	L of 3	45	5.00	CCW	4	1	0		5-10	0	PS	N/A	DETAIL OF LEVEL
40	4G	Disch	L of 3	45	5.00	CCW	8	2	0		5-10	0	PS	N/A	DETAIL OF LEVEL
41	4G	Disch	L of 3	45	5.00	CCW	11	3	0		5-10	0	PS	N/A	DETAIL OF LEVEL
42	4G	Disch	L of 3	45	5.00	CCW	15	4	0		5-15	0	PS	N/A	DETAIL OF LEVEL
43	4T	ADM	L of 3	45	5.00	CW	4	1.00	360	94.00	5-25	0	PS	N/A	LEVEL OF INDICATIONS
44	4T	ADM	L of 3	45	5.00	CW	4	1	0		5-15	0	PS	N/A	DETAIL OF LEVEL
45	4T	ADM	L of 3	45	5.00	CW	8	2	0		5-20	0	PS	N/A	DETAIL OF LEVEL
46	4T	ADM	L of 3	45	5.00	CW	11	3	0		5-10	0	PS	N/A	DETAIL OF LEVEL
47	4T	ADM	L of 3	45	5.00	CW	15	4	0		5-10	0	PS	N/A	DETAIL OF LEVEL
48	4T	ADM	L of 3	45	5.00	CCW	4	1	0		5-30	0	PS	N/A	DETAIL OF LEVEL
49	4T	ADM	L of 3	45	5.00	CCW	8	2	0		5-10	0	PS	N/A	DETAIL OF LEVEL
50	4T	ADM	L of 3	45	5.00	CCW	11	3	0		5-10	0	PS	N/A	DETAIL OF LEVEL
51	4T	ADM	L of 3	45	5.00	CCW	15	4	0		5-10	0	PS	N/A	DETAIL OF LEVEL
52	4T	ADM	L of 3	45	5.00	CW	92	24	0		40	0	PS	N/A	

GE-NSP00244120



**GE Energy Services**

**Rotor Serial Number:** 3567V1  
**Turbine Number:** 170X819  
**Customer:** NSP  
**Tested By:** BARTHOLOMEW(T), BLAIR  
**Type of Test:** MANUAL DOVETAILS

**Rotor Type:** LPB  
**Date:** 3/18/99  
**Station<sub>PS</sub>:** Sherburne County #3  
**UT Unit Number:** AMPUT #29  
**Procedure:** A0002

**Table III Details of Indicators**

Ind #	Stage	Adm/ Disch	L,M,U		Angle	Freq.	CW	Start		Stop		Amp.	L.O.E.	Circ. Extent	Verified	Comments
			OF	1,2,3				Deg	Bckt	Deg	Bckt					
53	4T	ADM	M	of 3	45	5.00	CW	46	12.00	0		15	0	PS	N/A	
54	4T	ADM	M	of 3	45	5.00	CW	107	28	0		15	0	PS	N/A	
55	4T	ADM	M	of 3	45	5.00	CW	107	28	0		25	0	PS	N/A	
56	4T	ADM	M	of 3	45	5.00	CW	203	53	0		20	0	PS	N/A	
57	4T	ADM	M	of 3	45	5.00	CW	226	59	0		10	0	PS	N/A	
58	4T	ADM	M	of 3	45	5.00	CW	276	72	0		25	0	PS	N/A	
59	4T	ADM	M	of 3	45	5.00	CCW	54	14	0		15	0	PS	N/A	
60	4T	Disch	L	of 3	45	5.00	CW	4	1.00	360	94.00	5-25	0	PS	N/A	LEVEL OF INDICATIONS
61	4T	Disch	L	of 3	45	5.00	CW	4	1	0		5-10	0	PS	N/A	DETAIL OF LEVEL
62	4T	Disch	L	of 3	45	5.00	CW	8	2	0		5-15	0	PS	N/A	DETAIL OF LEVEL
63	4T	Disch	L	of 3	45	5.00	CW	11	3	0		5-20	0	PS	N/A	DETAIL OF LEVEL
64	4T	Disch	L	of 3	45	5.00	CW	15	4	0		5-15	0	PS	N/A	DETAIL OF LEVEL
65	4T	Disch	L	of 3	45	5.00	CCW	4	1	0		5-15	0	PS	N/A	DETAIL OF LEVEL
66	4T	Disch	L	of 3	45	5.00	CCW	8	2	0		5-15	0	PS	N/A	DETAIL OF LEVEL
67	4T	Disch	L	of 3	45	5.00	CCW	11	3	0		5-25	0	PS	N/A	DETAIL OF LEVEL
68	4T	Disch	L	of 3	45	5.00	CCW	15	4	0		5-15	0	PS	N/A	DETAIL OF LEVEL
69	4T	Disch	L	of 3	45	5.00	CW	111	29	0		45	0	PS	N/A	
70	4T	Disch	L	of 3	45	5.00	CW	176	46	0		35	0	PS	N/A	
71	4T	Disch	M	of 3	45	5.00	CW	188	49.00	0		20	0	PS	N/A	
72	4T	Disch	M	of 3	45	5.00	CW	207	54	0		15	0	PS	N/A	
73	4T	Disch	M	of 3	45	5.00	CW	230	60	0		15	0	PS	N/A	
74	4T	Disch	M	of 3	45	5.00	CW	237	62	0		25	0	PS	N/A	
75	4T	Disch	M	of 3	45	5.00	CW	249	65	0		10	0	PS	N/A	
76	4T	Disch	M	of 3	45	5.00	CW	268	70	0		15	0	PS	N/A	

GE-NSP00244121



### GE Power Systems

#### IN-SERVICE ROTOR INSPECTION PERIPHERY MAGNETIC PARTICLE TEST RESULTS

Turbine #:	0 170K819	Date:	3/19/99
Customer:	NSP	Station:	Sherburne County #3
Rotor Type:	0 LPB	Type Unit:	STEAM
Serial #:	0 390741	Month/Year Tested:	3/99
Test Performed By:	M. J. Chummas mas		

Results of the peripheral magnetic particle test are used in conjunction with the results of boresonic, bore magnetic particle, and peripheral sonic testing to formally evaluate rotors.

Recommendations concerning future usage and inspection intervals cannot be issued until this information is received.

Include only rotor indications on this sheet. Do not include bucket and cover indications. Include an accurate description of location, length, and depth of defects, along with a sketch if necessary.

	Yes	No
Indications Noted:		
Wheel Dovetail Indications:	_____	_____
Wheel Indications:	_____	_____
Wheel Fillet Indications:	_____	_____
Packing and Heat Groove Indications:	_____	_____ X Coil wraps
Other:	_____	_____

Comments:

SEND IMMEDIATELY TO:

Life Extension Services  
 General Electric Company  
 One River Road  
 Building 55, Room 263  
 Schenectady, NY 12345

Panafax: (518) 385-3178 (dial comm: 8\*235-3178)

\*/RIP/PINSPECT

ENTER SERIAL NUMBER 3567V1

ENTER NUMBER OF STAGES ON ROTOR WITH BOTTLEBORE OR OVERBORE Kt EFFECT  
(ENTER 0 IF NONE) 0

FATT SELECTION LIST

MATERIAL : B50A373B9 - NiCrMoV  
TEMPERATURE RANGE : 182 - 616F  
FATT IMBRITTEMENT RANGE : 0 - 65F

CHOICE ARFATT MAX ASFATT SOURCE  
1 -60 5 TRANSVERSE CORE - MEASURED FATT = -60F

ENTER CHOICE NO. (ENTER 0 FOR USER DEFINED) 1

MACHINE TYPE?

1-WATER SEALS  
2-STEAM SEALS  
3-NUCLEAR

ENTER CHOICE 2

ENTER YOUR NAME (LASTNAME-INITIALS) NICHOLS-DR  
SNUMB 6223T

\*JMON \*

6223T -01 EXECUTING @ 14.487  
6223T - REMOTE OUTPUT WAITING @ 14.489  
normal termination

\*JOUT \*  
FUNCTION?RELE  
\*



SUMMARY OF "INSPECT" CALCULATIONS FOR SERIAL #3567V1

STANDARD 1/8" INITIAL CRACK SIZE

STG	TEMP	BORE STRS	AFT	FINAL	15% CASE		30% CASE		70% CASE	
			SERV FATT	CRACK SIZE	INIT TEMP	O/S CAP	INIT TEMP	O/S CAP	INIT TEMP	O/S CAP
1	616	41.9	5	0.133	75	120	75	119	75	117
2	574	49.4	-44	0.135	68	104	68	103	68	101
3	469	49.0	-60	0.133	61	109	61	108	61	106
4	361	50.8	-60	0.132	54	107	54	107	54	105
5	251	54.7	-60	0.131	47	102	47	102	47	101
6	182	63.6	-60	0.132	40	89	40	89	40	89

CRITICAL SEMI-CIRCULAR SURFACE CRACK

----- CRITICAL CRACK SIZE -----

STG	15% O/S		30% O/S		70% O/S	
	INIT	FINAL	INIT	FINAL	INIT	FINAL
1	1.201	2.227	1.089	1.443	0.486	0.538
2	0.957	2.233	0.910	1.432	0.461	0.525
3	1.194	2.541	1.113	1.610	0.520	0.579
4	1.406	2.369	1.216	1.486	0.484	0.527
5	1.507	2.064	1.156	1.280	0.416	0.446
6	1.167	1.498	0.826	0.925	0.296	0.319

CONTENTS OF ROTOR DATA FILE FOR ROTOR SERIAL #3567V1  
 COMPILED 03/99

TURBINE #170X819  
 ROTOR TYPE: LPB MATERIAL: B50A373B9 SERVICE DATE: 07/87  
 TURBINE CODE: G3 LSB LENGTH: 33.5 IN RPM: 3600  
 SV50 BUCKETS: YES WET OR DRY BOWL: DRY

HP RH X/O  
 TEMP (DEG F) : 1000 1000 714  
 PACK DIA (IN): 26.50 24.00  
 KT FOR S&L :

MATERIAL PROPERTIES

CODES	TS	YS	ELONG	RA	TEST NOTE
C1 C2	(KSI)	(KSI)	(%)	(%)	DATE NUMB
1 1	134.8	114.8	20.0	61.0	06/77

CODES	CHEMISTRY (%)										TEST NOTE
C1 C2	C	MN	P	S	SI	NI	CR	MO	V	DATE NUMB	
1 4	0.24	0.31	0.006	0.009	0.08	3.49	1.76	0.35	0.15	06/77	

CODES	FATT	TEST NOTE
C1 C2	(DEG F)	DATE NUMB
1 1	-60	06/77

C1=SERVICE CODE C2=TEST SAMPLE CODE  
 1=ORIGINAL VENDOR TESTS 1=TRANSVERSE CORE  
 4=LADLE

STAGE DATA (UNITS: IN, LBS, KSI, DEG F)

STG	TEMP	DIAMETERS		WHEEL			LOAD # OF /BUCK BUCK	STRESS		
		PACK	WHEEL	BORE	WIDTH	SPACE		BORE	ABS	SC
1	574	33.96	55.00	6.00	2.20	11.63		39.95	20.21	1
2	469	33.96	55.00	6.00	2.20	5.53		47.07	24.29	1
3	361	31.96	55.00	6.00	3.13	6.07		46.70	24.66	1
4	251	31.96	54.75	6.00	4.69	7.83		48.39	25.91	1
5	182	29.96	55.00	6.00	5.13	10.99		52.10	28.24	1
6	100	29.96	55.13	6.00	11.00	12.09		60.53	34.37	1

SC=STRESS CALCULATION CODE  
 1=STRESS SUMMARY SHEET

INSPECTION DATA

BORE TYPE: ???? 1/5 DWG #

**Bullock, Gil S (PS, PSD)**

---

**From:** Wells, Tom F (PS, LES)  
**Sent:** Friday, March 19, 1999 10:26 AM  
**To:** Perkins, Thomas G (PS, GI&FS)  
**Cc:** Peterson, Mark A (PS, PGS); Bullock, Gil S (PS, PSD)  
**Subject:** IN-SERVICE ROTOR DISPOSITION

**CUSTOMER:** NORTHERN STATES POWER COMPANY  
**STATION:** SHERBURNE COUNTY #3  
**UNIT #:** 170X819  
**ROTOR:** LP B  
**ROTOR #:** 3567V1

ATTEN: Dick Sowers

**PRELIMINARY REPORT**

A review of the results of the inspection just completed on the subject rotor shows that the data is valid and complete. No further testing will be required at this time. There is no evidence of conditions that need to be removed by enlarging the bore. Further access to the bore is not required and reassembly of the bore plug may proceed.

An in-depth analysis of the integrity of the rotor relative to the NDE test data just acquired is being performed. Recommendations regarding continued service and re-inspect interval will be forwarded within five working days. A formal report containing these recommendations, the NDE test data, and sufficient information for an independent evaluation will be forwarded to you within three weeks.

If there are any questions regarding this preliminary report, please feel free to contact your Manager of Engineering Services who will direct your questions to the correct GE organization.

Thomas F. Wells  
Evaluation Specialist  
GE Life Extension Services

3567-V1

PAPERS BELOW THIS SHEET ARE

**MICROFILMED**

5/31/79

DATE:

*Dataflow Inc.*

338 STATE ST.  
SCHENECTADY, N.Y. 12305  
(518) 370-0079

SUBJECT /ROTOR/ SHAFT/ FORGING FOLDER

**DO NOT REMOVE THIS SHEET !**

**ALWAYS PILE PAPERS ON TOP OF IT.**

*D.S. Deaton 5/1/79*

GE-NSP00244127

TR.EX.NSP0300.029

• 14-7072 •

2/3/12

LST-G Department  
Schenectady, NY

CS Bullock  
W. Leach  
RE Weakley

Page 219 of 248  
~~41-303~~  
55-209  
273-238 (2X)

Date: June 23, 1978

TURBINE FORGING EVALUATION AND DISPOSITION REPORT

Shop Order/Type: 170X819 L.P. "B" FORG. FILE NO. 072789PP  
Serial: 3567-V1 Spec.: B50A373B9 Drwg: 169C4276  
Customer: NORTHERN STATES IMS: 7851

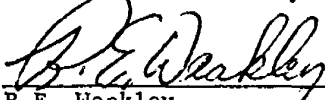
DISCUSSION:


1. Attached is a summary of tests completed, properties reported and engineering releases issued to date for the subject rotor forging. All test results and materials properties received to date have been reviewed. The results of all tests conducted to date are acceptable based on specification and acceptance requirements.
2. Surface radial body tensile check tests were done by General Electric on a trepan extracted from each end of the body of this rotor forging. Strength levels for these two specimens were 7200 to 8500 P.S.I. lower than those measured by the steel mill. This indicated either circumferential non-uniformity of strength or a testing variance.


To resolve this question, both a tensile test and Brinell hardness test survey were conducted for both last stage wheels. The results of both the hardness and tensile test surveys show no evidence of significant circumferential non-uniformity. Furthermore, these tests indicate that the results of the original General Electric surface radial tests are invalid. The more extensive tensile retests conducted confirm, in fact, that the higher tensile strength levels (129.3/132.3 K.S.I.) reported by the steel mill are correct.


DISCISIONS

1. A review of all steel mill and General Electric mechanical tests indicate a satisfactory and uniform level of strength for this forging and that the original two GE check tensile tests produced invalid and inaccurate results. This forging's properties were judged satisfactory to meet the turbine rotor's requirements for serviceability and reliability. Furthermore, even if it were conservatively assumed that the lower tensile results for the original General Electric surface radial tensile tests were valid, they would be acceptable. The level of strength and the uniformity that would result would be fully acceptable.

  
R.E. Weakley  
TURBINE MATERIALS ENGR.  
Bldg. 273, Rm. 238, Ext: 5-5032

  
R.M. Curran, Manager  
TURBINE MATERIALS ENGR.

 7/6/78  
R.J. Placek, Manager  
MECHANICS & ROTOR DEVELOPMENT ENGR.

 7-2-78  
D.P. Timó, Manager  
STRUCTURAL DEVELOPMENT ENGINEERING

Attachments

REW/ev

GE-NSP00244129

TR.EX.NSP0300.031

P/O- 08546 PP072789-ETC Mill Order No.- 3567 Mill Ser.- 3567-11  
 E Serial- 136332 Order Date- 7/10/78 IMS- 7851 Forging Dwg.- 169C-1276  
 Type- LPB Turbine Code- G-3 Rotor Wt.- 114930 Rotor Dia.- 25 3/8"  
 Core Dia.- 6" Spec.- B50A373B9 Finish Machine Drawing-  
 Customer- Northrup S.O.- 170X819 Turbine No.- 170X819  
MW 809 rpm 36 LSB 33.5

**Vendor Supplies: Date Rec'd/Approv. By**

Preliminary Core Props. - 1/30/78 RSW  
 2.25 MHZ HSP Sonic - 1/30/78 RSW  
 Bored X Solid X - " "  
 1.0 MHZ Per.Sonic (Bored) - " "  
 Bore Mag.Part. Test - " "  
 Journal Brinell Hdness. (B50A680M9) - " "  
 Heat Indication Test - (B50A373B) 1/30/78 RSW  
 Test Certificate Inc.:  
 Ingot Size & Wt. - 1/30/78 RSW  
 Ingot Orientation - " "  
 Ingot Discard Data (opt.) - " "  
 Forge Work Data (opt.) - " "  
 Chemistry-Heat Analyses - " "  
 Core Analyses - " "  
 Product Analyses - " "  
 Tens.Props.-Radial Body - 1/30/78 RSW  
 Long. Prol. - " "  
 Core-Body - 1/30/78 RSW  
 -Journal (B50A680M9) - 1/30/78 RSW  
 -Coupling - 1/30/78 RSW  
 Heat Treat.-Quench & Temper(s)- 1/30/78 RSW  
 Stress Relief - 1/30/78 RSW  
 Impact Props-Radial Body - 1/30/78 RSW  
 Core-Body - 1/30/78 RSW  
 -Journal (B50A680M9) - 1/30/78 RSW  
 -Coupling - 1/30/78 RSW  
 Micros-Radial Body - " "  
 Core Body - " "  
 Material Including:  
 Trans. Test Sections - 6/23/77  
 Excess Core Mat'l. - 7/22/77  
 C.T. To-Lab- 1/30/78 M&R Eng.- 1/30/78  
 Forging Rec'd - 1/11/78  
 1st Release Issued - 1/27/78 RSW

**General Elec. Tests: Date Rec'd/Approv By**

Plug Bore(s) Mag.Part. - 5/26/78 RSW  
 QCR # \_\_\_\_\_ T.E. G.E. - \_\_\_\_\_  
 Boresonic - 5/26/78 RSW  
 Plug Bore Boresonic - 5/26/78 RSW  
 QCR # \_\_\_\_\_ T.E. G.E. - \_\_\_\_\_  
 Hl.-Sens Per.Sonic - 5/26/78 RSW  
 Eccentricity (Bore) - 5/26/78 RSW  
 Stress Analysis to M&R Dev. - \_\_\_\_\_  
 By \_\_\_\_\_ Date Ret'd - \_\_\_\_\_  
 Eng. Sonic Release - \_\_\_\_\_  
 Rad. Tensile-To Lab- 5/16/78 Comp. 5/27/78  
RESISTS COMP. 6/6/78  
 SPECIAL BHN SURVEY - 5/30/78  
 2nd Release Issued - 6/15/78 RSW  
 Rad. Body Micro Report - 5/28/78  
 Mag. Part. Prior Heat Test - \_\_\_\_\_  
 Heat Indication Test - \_\_\_\_\_  
 Runout After Heat Test - \_\_\_\_\_  
 3rd Release Issued - 6/15/78 RSW  
 Disp. of Turb. Forging Engr. Eval(s) \_\_\_\_\_  
 Comp. Surf. Mag.Part. - \_\_\_\_\_  
 Final Runout - \_\_\_\_\_  
 After Overspeed Bore Mag.Part. - \_\_\_\_\_  
 Aft. Overspeed Plug Bore Mag.Part. - \_\_\_\_\_  
 QCR # \_\_\_\_\_ T.E. G.E. - \_\_\_\_\_  
 After Overspeed Boresonic - \_\_\_\_\_  
 Aft. Overspeed Plug Bore Boresonic - \_\_\_\_\_  
 QCR # \_\_\_\_\_ T.E. G.E. - \_\_\_\_\_  
 After Overspeed Sonic Release - \_\_\_\_\_  
 4th Release Issued - \_\_\_\_\_

**General Elec. Tests: Date Rec'd/Approv. By**

Trans. Tests - 7/11/77  
 Body Journal (B50A680M9) - 7/11/77  
 Core Disk Exams Report 7/11/77 Photos - \_\_\_\_\_  
 Core Sonic Tests-To Lab- \_\_\_\_\_ Comp.- \_\_\_\_\_  
 Bore Visual Exam - 5/27/78 RSW  
 Normal Bore Mag.Part [Main Bore(s)] - " "

**REMARKS:**

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

ROTOR/SHAFT PROPERTIES SHEET

S.O/TYPE: 170X819 L.P."B" P/O 72789

SERIAL: 7567-VI

SPEC: B5CA373B9

GEN. END IS BOTTOM

MILL PROPS.		T.S. (KSI)	.02%Y.S. (KSI)	FT. LBS. R.T. IMPACT	HIGH TEMP. IMPACT (FT. LBS) @ °F	FATT (°F.)		
LONGITUDINAL PROLONG	T.E.							
	G.E.							
SURF. TANG (SHAFTS)								
SURFACE RADIAL BODY	T.E.	130.3/131.1	106.3/111.3	87/87		<-100		
	S.E.	129.3/130.3	108.3/112.3	76/82		<-100		
	G.E.	130.3/131.3	110.8/112.8	83/85		<-100		
CORE LONGIT.	T.E. CPLG.	129.9/130.3	106.1/106.5	85				
	T.E. JOURN.							
	T.E. BODY	134.8/135.3	106.5/114.8					
	S.E. BODY	132.8/132.8	111.1/112.8					
	G.E. BODY	129.3/129.8	111.1/111.7					
	G.E. JOURN.							
	G.E. CPLG.	128.8/130.3	110.3/110.3					
CORE TRANS.	T.E. CPLG.			85/94				
	T.E. JOURN.							
	T.E. BODY			50/65		<-100		
	S.E. BODY			67/68		-60°F		
	G.E. BODY			92/100		<-100		
	G.E. JOURN.							
BRINELL HARDNESS		T.E.	T.E. JOURN	T.E. BODY	G.E. BODY	G.E. JOURN	G.E.	
G.E. PROPS SURFACE RADIAL	T.E.	123.1 *		103.8 *				
	S.E.							
	G.E.	122.8 *		105.5 *				
CORE TRANS	T.E. CPLG.	* See report also						
	T.E. JOURN.							
	T.E. BODY	135/135	108/109.5	57		-70		
	S.E. BODY	134/134	109/112	69		+10		
	G.E. BODY	132/132	110/110	87		-20		
	G.E. JOURN.							
BRINELL		T.E.	T.E. BODY	G.E. BODY	G.E.	RING @ S.E.		
RUPTURE PROPERTIES	TYPE OF TEST	LIFE @ 950°F	LIFE @ 1000°F	LIFE @ 1100°F	LIFE @ 1125°F	LIFE @ 1200°F	10 <sup>5</sup> HR RUPT. ST (kst)	RUPT. DUCT. (%)
	RADIAL							
	AXIAL							
	TRANS							
CORE RING TESTS	LOCATION (G.E.)							
	% R.A.							
	LOCATION (G.E.)							
	% R.A.							

GE-NSP00244131

TR.EX.NSP0300.033



## MANUFACTURING INSTRUCTIONS

<b>Cost Est.</b>	<b>Req.</b>	<b>M.P.L.</b>	<b>Serial No.</b> 2552
			<b>Turbine No.</b> 170X819
<b>ARMATURE No.</b>	<b>FIELD No.</b>		<b>S.O.</b> 170X819
<b>CUSTOMER</b> Northern States			<b>DATE:</b> May 31, 1978
<b>RATING</b>			

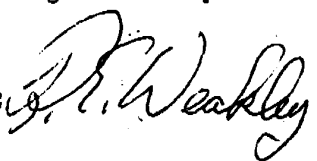
**SUBJECT** 809.6 MW  
 L.P. "B" Turbine Rotor  
 Forg. File No. - 072789PP  
 Serial - 3567-V1  
 Spec. - B50A373B9  
 Drwg. - 169C4276

General Electric surface radial check tensile testing has resulted in unusually low results by comparison to reported values from the steel mill. This could reflect an unidentified testing problem or a non-uniformity of material strength about the rotor circumference.

Consequently, further surface radial tensile testing and special Brinell hardness surveys are required. Four additional surface radial trepans from the 0°, 90°, 180° and 270° locations are to be taken from both end body test bands for a total of eight additional trepans for the rotor. Trepans are to be stamped to show rotor forging serial number, axial location (ie. -"TE" for turbine end and "GE" for generator end) and angular location (ie. -0°, 90°, 180° or 270°). All samples are to be forwarded to J. Barkley for room temperature tensile testing. Test specimens are to be prepared per drawing 222A9095, Pt. 1. No micro exams are required. Brinell hardness surveys are to be conducted with the King Portable Brinell testing machine. "Hardness spots" must be prepared at 22 1/2° intervals on the outer axial face of both last stage wheels for a total of 16 spots per wheel or 32 spots per rotor.

All results should be reported to Materials Engineering as soon as available. In the interim no further processing is to be performed on this rotor.

R.E. Weakley  
 TURBINE MATERIALS ENGINEERING  
 Bldg. 273, Room. 238  
 Ext: 5-5032



REW/ev

DISTR. KEY				
MANAGER: PRODUCT COST	RM CURRAN	273-238	P. MITCHELL	273-1118
MANAGER: QUALITY CONTROL	D. FALSO	273-1118	A. MORSON	273-360
CHARLESTON PLANT (C.L. MEAD ENGRG. 3)	GS Bullock	41-303	JC NEWMAN	273-238
	J. GORMAN	273-2195	DP TIMO	41-301
	P. Huléctt	273-1118	JJ. Lacagnina	28-200
	NF HOPSON	273-238	AK Schmieder	28-204
	VD LUCIER	273-2195	J. Barkley	59-122
	RC MALLINSON	273-2195	J. Chaberek	59-122
	D. MILNE	273-1118	RJ Placek	41-303

PHOTO OFFSET - STEP 0  
 10-99 (6-74) REV.

28

GE-NSP00244132

General Electric Company, Schenectady, N. Y.

SUMMARY SHEET

L.P. 'B' Rotor, Ultrasonic Examination Per:

PERIPHERY SONIC P3CAL2144 REV5

Serial No.: 3567VI S.O.: 170X819 T.G.S.: 08548PA072789

Forg. Dwg. 169C4270 Mach. Dwg. 881E393-1 Vendor: U.S. Steel

Rotor Condition: As Rec'd. 12:00 Is: cal. hole w/A Stamp Stamped Sonic Tested

Transducer Freq.: 2.25 MHz Size: 1/4" X 1" Type: Zr.

Bore Dia.: 6" Head Dia.: — Sq. Ft.: 280

Axial Feed 1/2" Per Rev. Max. Surface Speed 6" Per Sec.

Sensitivity Calibration: set sens. on each dia. per mul. factors

Axial Test @ 2.25 MHz No Inds in P3C-AL-2144

Type of Indication	Gen		Body		Turb.	
	Number	End EFBH φ	Number	End EFBH φ	Number	End EFBH φ
Normal	<u>None</u>		<u>None</u>		<u>None</u>	
Orientated						
Holding						
Area/Level						
Whipping						
L.O.E.	∨		∨		∨	
Radial Loc.		To		To		To
Axial Loc.		To		To		To
Circum Loc.		To		To		To

Total Individual Indications None Total Areas and Levels None

Extent of all Indications: Axial — " Radial — " Circum — " EFBH φ —

Remarks:

Blackball

Tested by: Wallaitis / Tino / Fabozzi / Liefving

Date: 5/25/78

GE-NSP00244134

5.0 MC ABSORPTION TEST

SERIAL 3567V1  
 S.O. 170X819  
 DWG. 169C4276  
GEN. END

L.P.B.

TECHNICIAN Jim Williams  
 DATE 5/23/78  
 TOP OF INGOT \_\_\_\_\_ END  
TURB. END

POSITION	1	2	3	4	5	6	L 7 27%	L 8	9
AXIAL DISTANCE FROM <u>GEN</u> END	22"	60 1/4"	75"	100"	158"	243"	260"	282"	302"
SECOND ORDER	60	50	50	30			38/100	49	55
THIRD ORDER	39	29	39	15			18/31	27	30
FOURTH ORDER	22	19	18	9			10/20	18	20
FIFTH ORDER	18	12	11	5			6/12	11	15
DISTANCE TO BORE OR BORE DIAMETER							6"		
BORING DIAMETER	22 1/4"	22 1/4"	26 1/4"	55 3/8"	54 1/4"	55 3/8"	26 1/4"	20 1/4"	20 1/4"

Noise Level Reading Taken at Position # 7. Inches to Bore or Inches to Centerline ÷ 4 = 2.53"

2nd Order 38 %, Increased to 100 % Noise Level Reading 2 % of 1 1/2" Sweep to Peak

Corrected Noise Level 76 % of the Back Reflection Pos.<sup>n</sup> 4, 5, 6

Remarks:

2.25MHZ 1"ØZR #8553.  
 40      50      45  
 21      28      25  
 16      19      16  
 12      12      10

*Readings at positions # 1, 2, 4 & 9 are normal  
 " " " # 3 are higher than normal  
 " " " # 7 & 8 are lower than normal  
 JGL*

General Electric Company, Schenectady, N. Y.

SUMMARY SHEET

LRB Rotor, Ultrasonic Examination Per:

BORESONIC P3CAL2127 REV 5

Serial No.: 356701 S.O.: 170x819 T.G.S.: 0854900072789

Forg. Dwg. 169C4276-1 Mach. Dwg.: 881E393-1 Vendor: U.S. STEEL

Rotor Condition: As Rec'd 12:00 Is: Calc Hole Stamped Sonic TESTED

Transducer Freq.: 2 1/4 MHz size: 1/4 x 1" Type: Powbles

Bore Dia.: 6" Head Dia.: 5" Sq. Ft.: 300

Axial Feed 1/8" Per Rev. Max. Surface Speed 10 RPM Per Sec.

Sensitivity Calibration: SBR S-9 = 100% = 220 Count from 3/8" Calc Hole w/

Axial Test @ 2.25 MHz 0 Inds DATAC<sup>TM</sup> System

Type of Indication	GEN		Body		TUB	
	Number	End EFBH φ	Number	End EFBH φ	Number	End EFBH φ
Normal	<u>NONE</u>		<u>NONE</u>		<u>NONE</u>	
Orientated	↓		↓		↓	
Holding						
Area/Level						
Whipping						
L.O.E.	↓		↓		↓	
Radial Loc.		To		To		To
Axial Loc.		To		To		To
Circum Loc.		To		To		To

Total Individual Indications NONE Total Areas and Levels NONE

Extent of all Indications: Axial \_\_\_\_\_ " Radial \_\_\_\_\_ " Circum \_\_\_\_\_ " EFBH φ \_\_\_\_\_

Remarks:

Tested by: WALLACE, FROZZI

Date: 5/15/78

HX-30574

UNITED STATES STEEL CORPORATION  
HOMESTEAD DISTRICT WORKS

NONDESTRUCTIVE TEST REPORT

TYPE FORGING LPB Rotor SERIAL 3567-V-1

HEAT NUMBER 2P7935; 3P7727; 4P8121 GRADE B50A373-S15, Gr. B9

CUSTOMER General Electric Company MILL ORDER NO. EA-39425

CUSTOMER ORDER NUMBER 08548-PP072789-ETQ-3

ULTRASONIC RESULTS

TYPE OF REFLECTOSCOPE Sperry UM 715 #2 Hi Sensitivity Sonic

TYPE OF CRYSTAL Aerotech 2.25 MHz, 1" diameter

DIRECTION OF SCANNING Radial

THE ABOVE FORGING HAS BEEN TESTED IN ACCORDANCE WITH U. S. STEEL PROCEDURE

\_\_\_\_\_ DATED \_\_\_\_\_

AND CUSTOMER SPECIFICATION P3C-AL-2150

RESULTS - See attached sheet

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

LEVEL I OPERATOR R. E. Oehling

DATE April 14, 1977 LEVEL II SUPERVISOR F. W. Ward

MAGNETIC PARTICLE OR DYE PENETRANT RESULTS (CHECK APPLICABLE TEST)

THE ABOVE FORGING HAS BEEN MAGNETIC PARTICLE TESTED  OR DYE PENETRANT

TESTED IN ACCORDANCE WITH U. S. STEEL PROCEDURE \_\_\_\_\_

DATED \_\_\_\_\_ AND CUSTOMER SPECIFICATION \_\_\_\_\_

RESULTS - \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

LEVEL I OPERATOR \_\_\_\_\_

DATE \_\_\_\_\_ LEVEL II SUPERVISOR \_\_\_\_\_

GE-NSP00244136

TR.EX.NSP0300.038

HX-26905A

HI SENSITIVITY SONIC REPORT - P3C-AL- 2150

Serial No. 3567-V-1 Customer General Electric Company Order No. EA-39425

Check Appropriate  
Boxes:

<input type="checkbox"/>
<input checked="" type="checkbox"/>

Preliminary Sonic  
Sonic After Grain Refine

<input checked="" type="checkbox"/>
<input type="checkbox"/>

Solid  
Bored

1) Sonic Attenuation Check		<u>Top End Body</u>	<u>Mid Body</u>	<u>Bot. End Body</u>
Sonic Decay Pattern	2 1/4 MHz	<u>100-40-20</u>	<u>100-50-25</u>	<u>100-50-25</u>
	5 MHz	<u>100-20-5</u>	<u>100-25-10</u>	<u>100-30-15</u>
	Diameter	<u>57-5/8</u>	<u>57-5/8</u>	<u>57-5/8</u>

2) Hi-Sensitivity Inspection

Dia. No.	Dia.	Mult. Factor	P.P. B.R.	Indications	Dist. From CL or Bore	Dist. From End of Job	Clock Location	Remarks
1	38-3/4	7.8	23.4	None				
2	25-1/2	5.1	15.3	"				
3	28-3/8	5.8	17.4	"				
4	57-5/8	11.5	34.5	"				
5	Radius	- no test						
6	57-5/8	11.5	34.5	None				
7	Radius	- no test						
8	57-5/8	11.5	34.5	None				
9	Radius	- no test						
10	57-5/8	11.5	34.5	None				
11	Radius	- no test						
12	57-5/8	11.5	34.5	None				
13	Radius	- no test						
14	57-5/8	11.5	34.5	None				
15	28-5/8	5.7	17.1	"				
16	30-5/16	6.1	18.3	"				
17	26-5/8	5.3	15.6	"				
18	40.0	8.0	24.0	"				

9/16/76

GE-NSP00244137

TR.EX.NSP0300.039

HX-30570

Sheet 1 of 1

UNITED STATES STEEL CORPORATION  
HOMESTEAD DISTRICT WORKS

ROTOR BORE INSPECTION

Serial No.: 3567-V-1 Customer: General Electric Company  
 Specification: B50A373-S15, Gr. B9 Drawing No.: 169C4276 Rev. 0  
 Bore Diameter: 6.036" Tested By: J. Nugent Date: July 20, 1977

Test	Axial Location	Clock Position	Length of Indication	Number in Field of view
Visual Inspection		Bore acceptable		
Magnetic Particle Inspection		No indications		
Amperes:  <u>620</u>				

GE-NSP00244138

TR.EX.NSP0300.040

HX-30574

UNITED STATES STEEL CORPORATION  
HOMESTEAD DISTRICT WORKS

NONDESTRUCTIVE TEST REPORT

TYPE FORGING Turbine Rotor SERIAL 3567-V-1  
HEAT NUMBER 2P7935; 3P7727; 4P8121 GRADE B50A373-S15, Gr. B9  
CUSTOMER General Electric Company MILL ORDER NO. EA-39425  
CUSTOMER ORDER NUMBER 08548-PP072789-ETQ-3

ULTRASONIC RESULTS

TYPE OF REFLECTOSCOPE Sperry 715 UM and 775 UM  
TYPE OF CRYSTAL Aerotech 2.25 MHz, 1" diameter  
DIRECTION OF SCANNING \_\_\_\_\_

THE ABOVE FORGING HAS BEEN TESTED IN ACCORDANCE WITH U. S. STEEL PROCEDURE \_\_\_\_\_

\_\_\_\_\_ DATED \_\_\_\_\_  
AND CUSTOMER SPECIFICATION P3C-AL-2144

RESULTS - No indications noted

DATE July 22, 1977 LEVEL I OPERATOR A. Zak  
LEVEL II SUPERVISOR J. J. Devine

MAGNETIC PARTICLE OR DYE PENETRANT RESULTS (CHECK APPLICABLE TEST)

THE ABOVE FORGING HAS BEEN MAGNETIC PARTICLE TESTED  OR DYE PENETRANT   
TESTED IN ACCORDANCE WITH U. S. STEEL PROCEDURE \_\_\_\_\_

DATED \_\_\_\_\_ AND CUSTOMER SPECIFICATION \_\_\_\_\_

RESULTS - \_\_\_\_\_

LEVEL I OPERATOR \_\_\_\_\_  
DATE \_\_\_\_\_ LEVEL II SUPERVISOR \_\_\_\_\_



44-269054

**SENSITIVITY SONIC REPORT - P3C-AL-2144**

#1

Serial No. 3567-V-1 Customer General Electric Company Order No. EA-39425

Check Appropriate  
Boxes:

<input type="checkbox"/>
<input checked="" type="checkbox"/>

Preliminary Sonic

Sonic After Grain Refine

Final

<input type="checkbox"/>
<input checked="" type="checkbox"/>

Solid

Bored

		Top End Body	Mid Body	Bot. End Body
1) Sonic Attenuation Check				
Sonic Decay Pattern	2 1/4 MHz	100-40-30	100-40-30	100-40-30
	5 MHz	100-40-30	100-35-25	100-40-20
	Diameter	55-3/8	55-1/4	55-3/8

2) Hi-Sensitivity Inspection

Dia. No.	Dia.	Mult. Factor	P.P. B.R.	Indications	Dist. From CL or Bore	Dist. From End of Job	Clock Location	Remarks
1	37-5/8	10.7	32.1	None				
2	22-1/4	6.2	18.6	"				
3	28-1/4	8.0	24.0	"				
4	22-1/4	6.2	18.6	"				
5	26-1/4	7.4	22.2	"				
6	40-1/4	11.6	34.8	Radius - no test				
7	55-3/8	16.3	48.9	None				
8	31-1/4	9.0	27.0	Radius - no test				
9	55-1/4	16.3	48.9	None				
10	35	10.0	30.0	Radius - no test				
11	55-1/4	16.3	48.9	None				
12	38-1/4	11.0	33.0	Radius - no test				
13	55-1/4	16.3	48.9	None				
14	35	10.0	30.0	Radius-no test				
15	55-1/4	16.3	48.9	None				
16	31-1/4	9.0	27.0	Radius - no test				
17	55-3/8	16.3	48.9	None				
18	40-1/4	11.6	34.8	Radius - no test				
19	26-1/4	7.4	22.2	None				
20	22-1/4	6.2	18.6	"				

9/16/16

GE-NSP00244140

TR.EX.NSP0300.042



**ULTRASONIC EXAMINATION**  
 Turbine ROTOR FORGING  
**U.S. STEEL CORP. - HOMESTEAD WORKS**

Serial: 3567-V-1  
 Heats: 2P7935; 3P7727; 4P8121  
 Chemistry: Ni-Cr-Mo-V  
 Ingot Dia: 110" Dia., Cut 1-A  
 Customer: General Electric Company  
 Mill Order: EA-39425  
 Cust. Order: 08548-PP072789-EI0-3  
 B/P: 169C4276 Rev. 0  
 Couplant: No. 20 Oil  
 Standard: 3" peak-to-peak  
 Freq: 1.00 MHz Size: 1"  
 Single: X Double:  
 Rotating: No RPM:

0 -Normal Ind.@ %  
 -Normal Ind.@ %  
 -Normal Ind.@ %  
 0 -Travel Ind.@ %  
 -Travel Ind.@ %  
 -Travel Ind.@ %  
 Whipping:  
 Radial Distr:  
 Axial Distr:  
 Circum.Distr:  
 Finish: Adequate

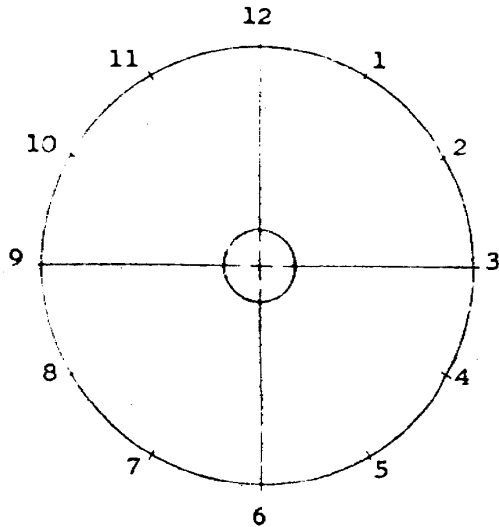
0 -Normal Ind.@ %  
 -Normal Ind.@ %  
 -Normal Ind.@ %  
 0 -Travel Ind.@ %  
 -Travel Ind.@ %  
 -Travel Ind.@ %  
 Whipping:  
 Radial Distr:  
 Axial Distr:  
 Circum.Distr:  
 Finish: Adequate

0 -Normal Ind.@ %  
 -Normal Ind.@ %  
 -Normal Ind.@ %  
 0 -Travel Ind.@ %  
 -Travel Ind.@ %  
 -Travel Ind.@ %  
 Whipping:  
 Radial Distr:  
 Axial Distr:  
 Circum.Distr:  
 Finish: Adequate

Circumferential location of major indications (12:00 o'clock serial number or "A" looking at turbine end).

Tot.Ind. 0 Gen.Rad.Distr. Gen.Circum.Distr Magnitude

REMARKS: No indications.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



Operator A. Zak  
 Foreman J. J. Devine  
 Date July 22, 1977

GE-NSP00244142



**STABILITY TEST RECORD**

3567-VI                      700°F                      100° PER HR                      - MINUS  
 Serial No.                      Test Temperature                      TO 700°F                      Maintain Time                      Read  
GENERAL ELECTRIC                      08548-PP072789-ETQ3                      NOTIFY INSPECTION BEFORE START-UP  
 Customer                      Order                      Blueprint No.                      OR SHUTTING OFF                      Special Instructions

DATE	TIME	AIR TEMP	A	B	C	D	TEMP	A	B	C	D	TEMP	A	B	C	D	TEMP	A	B	C	D	TEMP	A	B	C	D
8-14-77	4 <sup>30</sup> PM	ROOM	1/2	1	1/2	0	ROOM	1/2	1/2	0	0	ROOM	1/2	1/2	1/2	0	ROOM	0	1/2	0	0	ROOM	1/2	1/2	0	1/2
	5 <sup>30</sup>	ROOM	1/2	1	1/2	0	ROOM	1/2	1/2	0	0	ROOM	1/2	1/2	1/2	0	ROOM	0	1/2	0	0	ROOM	1/2	1/2	0	
	6 <sup>30</sup>	ROOM	1/2	1	1/2	0	ROOM	1/2	1/2	0	0	ROOM	1/2	1/2	1/2	0	ROOM	0	1/2	0	0	ROOM	1/2	1/2	0	1/2
	7 <sup>30</sup>	170	1/2	1	1/2	0	170	1/2	1/2	0	0	170	1/2	1/2	1/2	0	170	1/2	1/2	0	0		1/2	1/2	0	1/2
	8 <sup>30</sup>	270	1/2	1	1/2	0	270	1/2	1/2	1/2	0	270	1/2	1	1/2	0	270	1/2	1	0	0		1/2	1/2	0	0
	9 <sup>30</sup>	370	1/2	1	1/2	0	370	1/2	1	1/2	0	370	1	1 1/2	1/2	0	370	1	1	0	0		1/2	1/2	0	0
	10 <sup>30</sup>	470	1/2	1	1/2	0	470	1/2	1	1/2	0	470	1	1 1/2	1/2	0	470	1	1	0	0		1/2	1/2	0	0
	11 <sup>30</sup>	570	1/2	1	1/2	0	570	1/2	1 1/2	1/2	0	570	1 1/2	1 1/2	0	0	570	1 1/2	1 1/2	0	0		1/2	1/2	0	
8-15-77	12 <sup>30</sup> AM	670	1/2	1	1/2	0	670	1	1 1/2	1/2	0	650	1 1/2	1 1/2	0	0	670	1 1/2	1 1/2	0	0		1/2	1/2	0	0
	1 <sup>30</sup>	700	1/2	1	1/2	0	700	1	1 1/2	1/2	0	680	1 1/2	1 1/2	0	0	700	1 1/2	1 1/2	0	0		1/2	1/2	0	0
	2 <sup>30</sup>	700	1/2	1	1/2	0	700	1	1 1/2	1/2	0	690	1 1/2	1 1/2	0	0	700	1 1/2	1	0	0		1/2	1/2	0	0
	3 <sup>30</sup>	700	1/2	1	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1 1/2	1 1/2	0	0	700	1 1/2	1	0	0		1/2	1/2	0	0
	4 <sup>30</sup>	700	1/2	1	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1 1/2	1 1/2	0	0	700	1 1/2	1	0	0		1/2	1/2	0	
	5 <sup>30</sup>	700	1/2	1	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1	1	0	0		1/2	1/2	0	0
	6 <sup>30</sup>	700	1/2	1	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1	1	0	0		1/2	1/2	0	0
	7 <sup>30</sup>	700	1/2	1	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1	1	0	0		1/2	1/2	0	0
	8 <sup>30</sup>	700	1/2	1	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1	1	0	0		1/2	1/2	0	0
	9 <sup>30</sup>	700	1/2	1	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1 1/2	1 1/2	1/2	0	700	1	1	0	0		1/2	1/2	0	0
	10 <sup>30</sup>	cccc DOWN	1/2	1	1/2	0	570	1	1 1/2	1/2	0	620	1 1/2	1 1/2	1/2	0	600	1	1	0	0		1/2	1/2	0	0
	11 <sup>30</sup>		1/2	1	1/2	0	520	1	1 1/2	1/2	0	550	1 1/2	1 1/2	1/2	0	560	1	1	0	0		1/2	1/2	0	0
	12 <sup>30</sup> PM		1/2	1	1/2	0	500	1	1 1/2	1/2	0	530	1	1 1/2	1/2	0	540	1	1	0	0		1/2	1/2	0	0
	1 <sup>30</sup>		1/2	1	1/2	0	490	1	1 1/2	1/2	0	520	1	1 1/2	1/2	0	530	1	1	1/2	0		1/2	1/2	0	0
	2 <sup>30</sup>		1/2	1	1/2	0	480	1	1	1/2	0	510	1	1	1	0	520	1	1	1/2	0		1/2	1/2	0	0

GE-NSP00244144

**STABILITY TEST RECORD**

SHEET 2

3567-VI      700 °F  
 Serial No.      Test Temperature      Heating Rate      Maintain Time      Read

Customer      Order      Blueprint No.      Special Instructions

D. TR	TIME	AIR TEMP	A	B	C	D	TEMP	A	B	C	D	TEMP	A	B	C	D	TEMP	A	B	C	D	TEMP	A	B	C	D	
8-15-77	3:30 PM		1/2	1	1/2	0	470	1	1	1/2	0	500	1	1	1/2	0	510	1/2	1	1/2	0		1/2	1/2	0	0	
			FINAL COLD READINGS																								
8-17-77	2:30 PM		1/2	1	1/2	0		1/2	1/2	0	0		1/2	1/2	0	0		0	0	0	0		1/2	1/2	0	0	
	3:00		1/2	1	1/2	0		1/2	1/2	0	0		1/2	1/2	0	0		0	0	0	0		1/2	1/2	0	0	
	3:30		1/2	1	1/2	0		1/2	1/2	0	0		1/2	1/2	0	0		0	0	0	0		1/2	1/2	0	0	

GE-NSP00244145



# United States Steel Corporation

01.000.0772

## Metallurgical Test Report

*John A. Ryan*

REQ., JOB, CONTRACT NO.

P. O. DATE

PURCHASE ORDER NO.

4/6/74

00940-99071700-470-3

SERIAL

3067-V-1

MILL ORDER NO.

EA-39425

INVOICE NO.

VEHICLE IDENTITY

BEING DULY SWORN ACCORDING TO LAW, DEPOSES AND SAYS THAT THE CHEMICAL ANALYSES AND/OR TEST RESULTS SHOWN IN THIS REPORT ARE CORRECT AS CONTAINED IN THE RECORDS OF THE COMPANY.

SOLD TO

General Electric Company  
Schenectady, New York

General Electric Company  
Schenectady, New York

SHIP TO

SIGNATURE **M.W. MAXSON, CH. MET.**

DATE **August 6, 1977**

SPEC. & INSP.

General Electric Specification 990A373-015 dated 9/13/74 plus our metallurgical comments dated 12/21/74 to apply; Grade 990A37300

STATE OF PENNSYLVANIA  
COUNTY OF ALLEGHENY  
SUBSCRIBED AND SWORN TO BEFORE ME  
THIS 6th DAY OF August 1977

*Dorothy*  
DOROTHY M. ... NOTARIAL PUBLIC  
HOMESTEAD BORD. ALLEGHENY COUNTY  
MY COMMISSION EXPIRES JAN. 29, 1979  
Member, Pennsylvania Association of Notaries

ITEM NO.	MATERIAL DESCRIPTION			QUAN-TITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD ST. TENSILE STR.	ELONGATION %		% RED. OF AREA	BEND
	THICKNESS OR SECTION	WIDTH DIA. OR FT. WT.	LENGTH						IN 8"	IN 2"		
01					114,930	27735 27727 40121	Radial A 90° 180° 270° 180° 90° 180° 270°	111300 107400 104000 106300 100300 113300 111300 114400 110000 112000	121100 120300 120200 120500 120300 122900 120300 120200 120300 121300	22 20 20 20 20 20 20 20 21 20	67 65 67 65 65 64 67 68 67 67	

General Electric Serial #306732  
Customer Drawing #162C4276 Rev. 0

110" Diameter Ingot - Out 1-A  
Ingot Weight - 411,945 lbs.  
Forge Weight - 179,917 lbs.

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO	Sp	As
27735		24	31	006	009	08	05	0	49	1.76	35	001	005	15						
27727		23	35	007	008	10	05	0	46	1.75	35	001	004	14					.000	.007
40121		23	28	006	010	04	06	0	46	1.79	38	001	004	11					.000	.008
Weighted Average		25	31	006	009	08	06	0	47	1.77	35	001	004	13					.000	.008

GE-NSP00244146





Revised CopyHEAT TREATMENTSerial 3567-V-1PRELIMINARY

Air cool to 400/450°C off press - charge into a 375/425°C furnace - equalize - furnace cool to 200/235°C - place couples - equalize couples and maintain 43 hours at 200/235°C - heat to 950°C - equalize couples and maintain 29 hours - fan cool to 232°C.

Re-charge into a 200/250°C furnace - equalize couples and maintain 29 hours at 200/250°C - heat to 850°C - equalize couples and maintain 29 hours - fan cool to 150°C.

Re-charge into a 150°C furnace - equalize couples and maintain 29 hours at 150°C - heat to 635°C - equalize couples and maintain 38 hours - floor.

GRAIN REFINE

Charge into a 350°C maximum furnace - heat to 842°C - equalize couples and maintain 29 hours - spray quench.

Re-charge into a 215/245°C furnace - equalize couples and maintain 20 hours - heat to 590°C - equalize couples and maintain 58 hours - furnace cool to 250°C - floor.

2ND TEMPER

Charge into a 350°C maximum furnace - heat to 842°C - equalize couples and maintain 29 hours - spray quench.

Re-charge into a 215/245°C furnace - equalize couples and maintain 20 hours - heat to 590°C - equalize couples and maintain 58 hours - furnace cool to 250°C - heat to 570°C - equalize couples and maintain 58 hours - furnace cool to 250°C - floor.

M. W. Maxson, Chief Metallurgist/dmm

United States Steel Corporation  
Homestead District Works

GE-NSP00244148

TR.EX.NSP0300.050

HEAT TREATMENTSerial 3567--1PRELIMINARY

Air cool to 400/450°C off press - charge in to a 375/425°C furnace - equalize - furnace cool to 200/235°C - place couples - equalize couples and maintain 43 hours at 200/235°C - heat to 950°C - equalize couples and maintain 29 hours - fan cool to 232°C.

Re-charge into a 200/250°C furnace - equalize couples and maintain 29 hours at 200/250°C - heat to 850°C - equalize couples and maintain 29 hours - fan cool to 150°C.

Re-charge into a 150°C furnace - equalize couples and maintain 29 hours at 150°C - heat to 625°C - equalize couples and maintain 38 hours - floor.

GRAIN REFINE

Charge into a 350°C maximum furnace - heat to 842°C - equalize couples and maintain 29 hours - spray quench.

Re-charge into a 215/245°C - equalize couples and maintain 20 hours - heat to 590°C - equalize couples and maintain 58 hours - furnace cool to 250°C - heat to 570°C - equalize couples and maintain 58 hours - furnace cool to 250°C - floor.

M. W. Maxson, Chief Metallurgist/dmm

*M. W. Maxson/dmm*

United States Steel Corporation  
Homestead District Works

HEAT TREATMENTSerial 3567-V-1PRELIMINARY

Air cool to 400/450°C off press - charge into a 375/425°C furnace - equalize - furnace cool to 200/235°C - place couples - equalize couples and maintain 43 hours at 200/235°C - heat to 950°C - equalize couples and maintain 29 hours - fan cool to 232°C.

Re-charge into a 200/250°C furnace - equalize couples and maintain 29 hours at 200/250°C - heat to 850°C - equalize couples and maintain 29 hours - fan cool to 150°C.

Re-charge into a 150°C furnace - equalize couples and maintain 29 hours at 150°C - heat to 635°C - equalize couples and maintain 38 hours - floor.

GRAIN REFINE

Charge into a 350°C maximum furnace - heat to 842°C - equalize couples and maintain 29 hours - spray quench.

Re-charge into a 215/245°C - equalize couples and maintain 20 hours - heat to 590°C - equalize couples and maintain 58 hours - furnace cool to 250°C - floor.

M. W. Maxson, Chief Metallurgist/dmm

*M. W. Maxson*  
United States Steel Corporation  
Homestead District Works

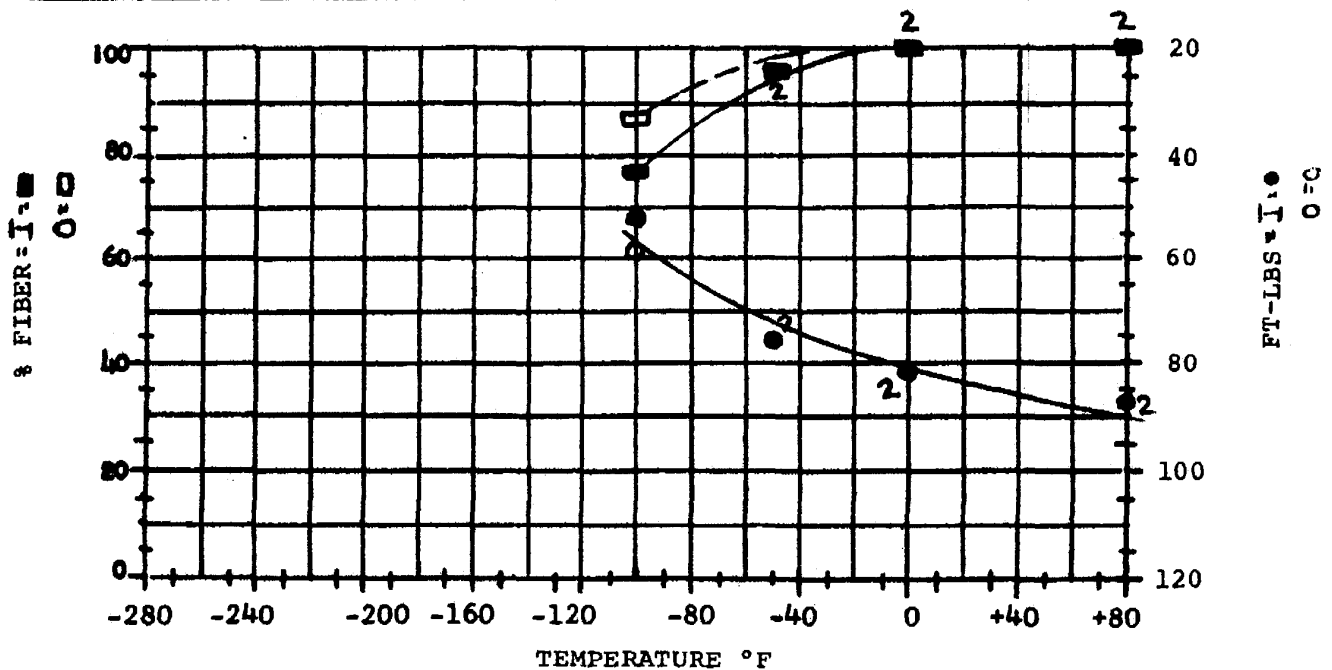
**UNITED STATES STEEL CORPORATION  
HOMESTEAD DISTRICT WORKS  
METALLURGICAL DIVISION  
TRANSITION IMPACT DATA**

OFF

CUSTOMER	CHEM	TYPE	DATE	50% FATT	SERIAL
GES	NICRMOV	R	5-4-77	Below -100°F	3567-V1

NO	LOCATION	TEMP °F	FT-LBS	% FIBER	REMARKS
1	RADA RA	+80	87	100	I
2	RB	+80	87	100	0
3	RC	0	82	100	I
4	RD	0	81	99	0
5	RE	-50	75	95	I
6	RF	-50	77	97	0
7	RG	-100	52	77	I
8	V RH	-100	59	87	0
9					
10					
11					
12					



GE-NSP00244151

TR.EX.NSP0300.053

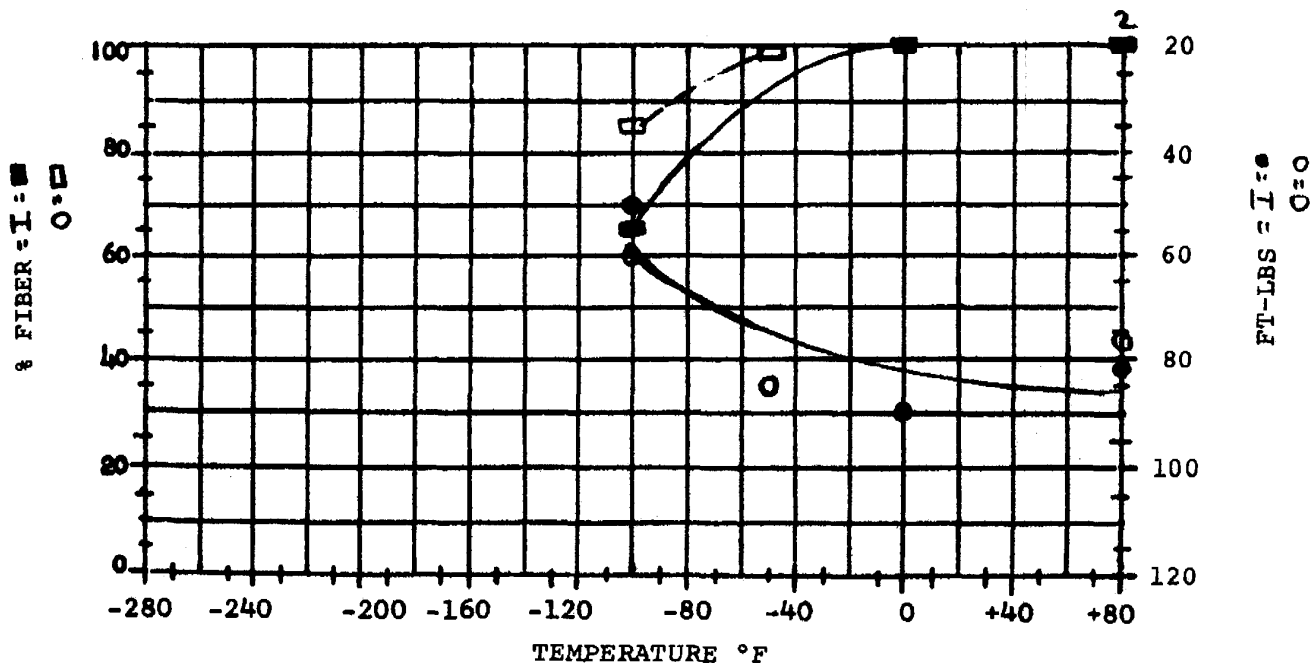
UNITED STATES STEEL CORPORATION  
 HOMESTEAD DISTRICT WORKS  
 METALLURGICAL DIVISION  
 TRANSITION IMPACT DATA

OFF

CUSTOMER	CHEM	TYPE	DATE	50% FATT	SERIAL
GES	NICRMOV	R	5-4-77	Below -100°F	3567-VI

NO	LOCATION	TEMP °F	FT-LBS	% FIBER	REMARKS
1	RADB RA	+80	82	100	I
2	RB	+80	76	99	O
3	RC	0	90	100	I
4	RD	-50	85	99	O
5	RE	-100	50	65	I
6	RF	-100	60	85	O
7					
8					
9					
10					
11					
12					



GE-NSP00244152

TR.EX.NSP0300.054

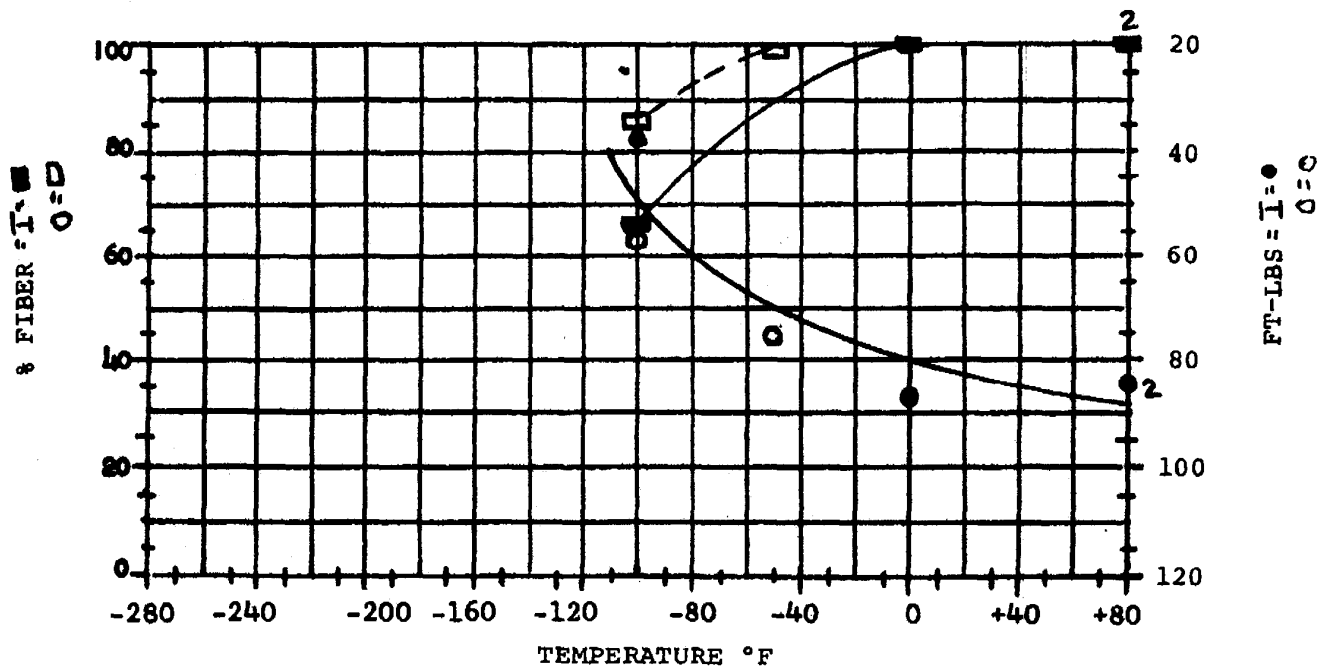
UNITED STATES STEEL CORPORATION  
 HOMESTEAD DISTRICT WORKS  
 METALLURGICAL DIVISION  
 TRANSITION IMPACT DATA

OFF

CUSTOMER	CHEM	TYPE	DATE	50% FATT	SERIAL
GES	NICRMOV	R	5-4-77	Below -100°F	3567-VI

NO	LOCATION	TEMP °F	FT-LBS	% FIBER	REMARKS
1	RADCRA	+80	85	100	I
2	RB	+80	83	100	O
3	RC	0	88	100	I
4	RD	-50	75	99	O
5	RE	-100	38	65	I
6	V RF	-100	58	85	O
7					
8					
9					
10					
11					
12					



GE-NSP00244153

TR.EX.NSP0300.055

Revised Copy

Sheet 1 of 2

U. S. STEEL CORPORATION - BORE CORE TEST DATA

SERIAL NO. 3567-V-1 CUSTOMER General Electric SPECIFICATION B50A373-S15, Gr. 89 TYPE Turbine

MILL ORDER NO. EA-39425 CUSTOMER NO. 08548-PP072789-ETQ-3 DRAWING NO. 169C4276 Rev. 0

Ingot Sizes: Ingot Dia. 110 in. Total Ingot Weight 411,945 lbs. Method Cast V-C-D  
 Forge Reduction: 2.1:1 straight down before 50% upset Top Dia. 111-1/8 in. Forgings per Ingot 1 Ingot Shape Round  
 Bottom Dia. 106-7/8 in. Discard: Top 35.0 End of Forging Toward Turbine  
 Body Length 112 in. Bottom 21.3 of Ingot

LADLE CHEMISTRY

BORE CORE CHEMISTRY

Heat Number	LADLE CHEMISTRY										BORE CORE CHEMISTRY								
	C	Mn	P	S	Si	Ni	Cr	Mo	V		Location	C	Mn	P	S	Si	Ni	Cr	Mo
2P7935	.24	.31	.006	.009	.08	3.49	1.76	.35	.15		A	.29	.35	.012	.012	.11	3.60	1.77	.41
3P7727	.25	.35	.007	.008	.10	3.46	1.76	.35	.14		B	.25	.35	.010	.011	.10	3.55	1.73	.37
4P8121	.25	.28	.006	.010	.06	3.46	1.79	.36	.11		C	.24	.31	.010	.013	.10	3.53	1.69	.35
											A	<u>Sn</u> .005	<u>As</u> .010	<u>Sb</u> .0012					
											B	.006	.010	.0014					
											C	.005	.011	.0014					

BORE CORE PHYSICAL RESULTS

Location	Yield Strength	Tensile Strength	% El.	% R.A.	Impacts *		Location	Yield Strength	Tensile Strength	% El.	% R.A.	Impact	
					R.T.	F.T.						R.T.	F
A	.02 114800	134800	20	61	50	below -100°F	B	.02 111100	134800	19	65	68	
	.2												
A	.02 106500	135300	19	65	65		C	.02 111100	129800	20	67	100	bel
	.2							-10					
B	.02 112800	132800	18	61	67	-60°F	C	.02 111700	129300	20	67	92	
	.2												

\* - Transverse

APPROVED: 0261480

GE-NSP00244154

**U. S. STEEL CORPORATION - BORE CORE TEST DATA**

SERIAL NO. 3567-V-1 CUSTOMER General Electric SPECIFICATION B50A373-S15 Gr B9 TYPE Turbine

MILL ORDER NO. \_\_\_\_\_ CUSTOMER NO. \_\_\_\_\_ DRAWING NO. \_\_\_\_\_

Ingot Sizes: Ingot Dia. \_\_\_\_\_ in. Total Ingot Weight \_\_\_\_\_ lbs. Method Cast \_\_\_\_\_  
 Top Dia. \_\_\_\_\_ in. Forgings per Ingot \_\_\_\_\_ Ingot Shape \_\_\_\_\_  
 Bottom Dia. \_\_\_\_\_ in. Discard: Top \_\_\_\_\_ End of Forging Toward \_\_\_\_\_  
 Body Length \_\_\_\_\_ in. Bottom \_\_\_\_\_ of Ingot \_\_\_\_\_

LADLE CHEMISTRY

BORE CORE CHEMISTRY

Heat Number	LADLE CHEMISTRY										BORE CORE CHEMISTRY								
	C	Mn	P	S	Si	Ni	Cr	Mo	V		Location	C	Mn	P	S	Si	Ni	Cr	Mo

BORE CORE PHYSICAL RESULTS

Location	Yield Strength	Tensile Strength	% El.	% R.A.	Impacts*		Location	Yield Strength	Tensile Strength	% El.	% R.A.	* Impacts	
					R.T.	F.T.T.						R.T.	F.T.T.
TE	.02 106500	130300	21	67	85		GE	.02 110300	128800	20	70	55	
	.2												
TE	.02 106100	129900	20	61	94			.02					
	.2												
GE	.02 110300	130300	20	70	62			.02					
	.2												

\* - Transverse

APPROVED: *ab. H. D. G.*

GE-NSP00244155

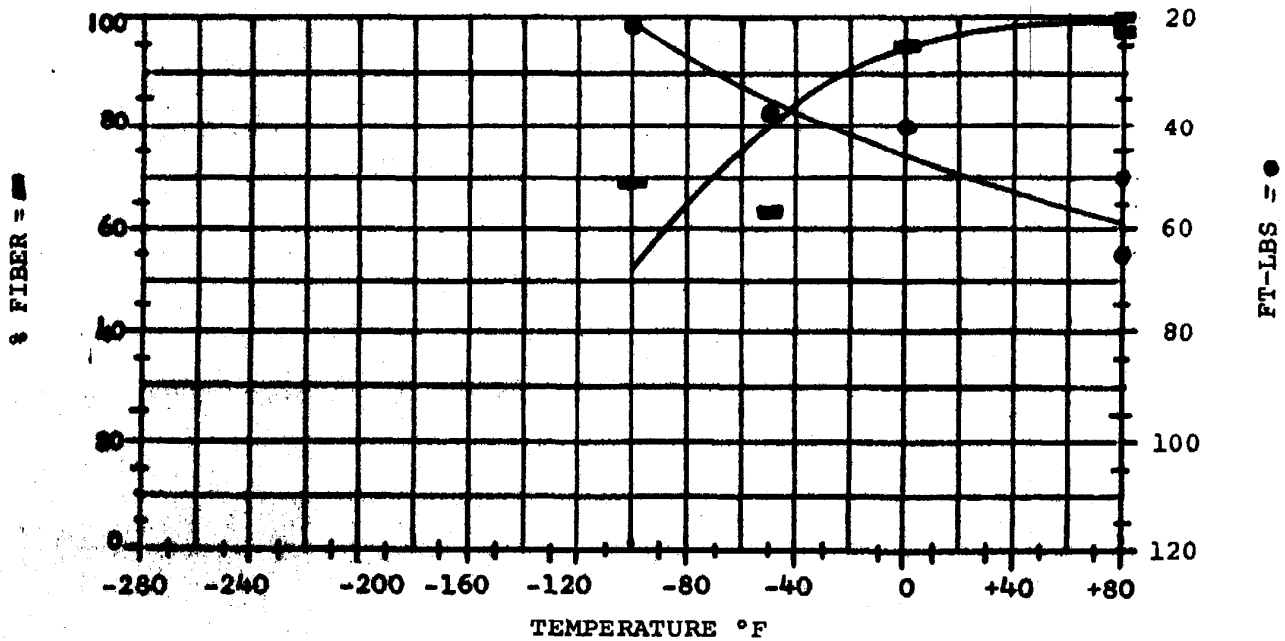


UNITED STATES STEEL CORPORATION  
 HOMESTEAD DISTRICT WORKS  
 METALLURGICAL DIVISION  
 OFF B. CORE  
 TRANSITION IMPACT DATA

CUSTOMER	CHEM	TYPE	DATE	50% FATT	SERIAL
GES	NI CR NO V	R	6-17-77	below -100°F	3567-V1

NO	LOCATION	TEMP °F	FT-LBS	% FIBER	REMARKS
1	ABC LG A	+80°	50	97	
2	B	+80°	65	100	
3	C	0°	40	95	
4	D	-50°	38	63	
5	E	-100°	21	69	
6					
7	GE BCL A	+80°	62	100	
8	V B	+80°	55	100	
9	TE BCL A	+80°	85	100	
10	V B	+80°	94	100	
11					
12					

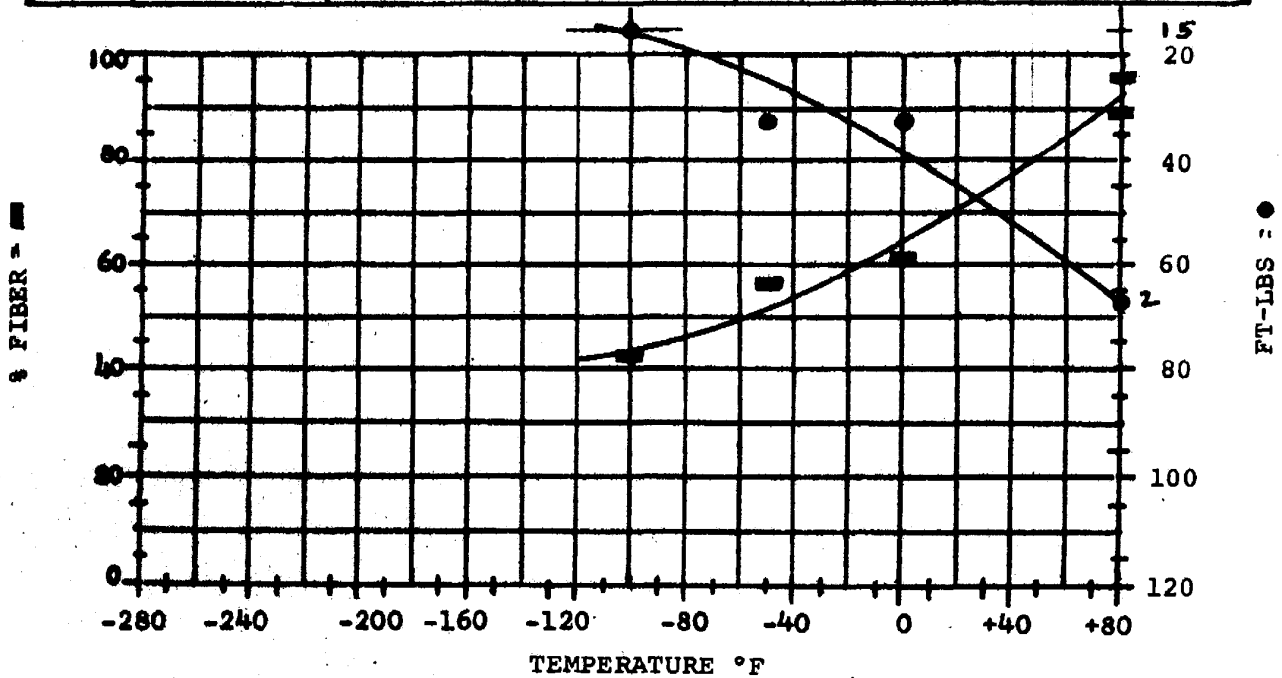


UNITED STATES STEEL CORPORATION  
 HOMESTEAD DISTRICT WORKS  
 METALLURGICAL DIVISION

OFF B. CORE TRANSITION IMPACT DATA

CUSTOMER	CHEM	TYPE	DATE	50% FATT	SERIAL
GES	MICRON V	R	6-17-77	-60°F	3567-V1

NO	LOCATION	TEMP °F	FT-LBS	% FIBER	REMARKS
1	BBC16A	+80°	67	96	
2	B	+80°	68	89	
3	C	0°	32	61	
4	D	-50°	32	56	
5	E	-100°	15	42	
6					
7					
8					
9					
10					
11					
12					



GE-NSP00244157

TR.EX.NSP0300.059

UNITED STATES STEEL CORPORATION  
 HOMESTEAD DISTRICT WORKS  
 METALLURGICAL DIVISION

OFF B. CORE TRANSITION IMPACT DATA

CUSTOMER	CHEM	TYPE	DATE	50% FATT	SERIAL
GES	NI CR HV 1	R	6-17-77	below -100°F	3567-V1

NO	LOCATION	TEMP °F	FT-LBS	% FIBER	REMARKS
1	CBC LRA	+80°	100	100	
2	B	+80°	92	100	
3	C	0°	80	96	
4	D	-50°	50	89	
5	E	-100°	37	72	
6					
7					
8					
9					
10					
11					
12					

