GEC Turbine Generators Limited

METALLURGY DEPARTMENT

Inspection of San Onofre Unit 3 L.P. Rotors

for Stress Corrosion cracking, October 1985

RM 752

20th December 1985.

INSPECTION OF SAN ONOFRE UNIT 3 L.P. ROTORS FOR STRESS-CORROSION CRACKING

1. SUMMARY

This report documents the ultrasonic inspection carried out on the LP2 and LP3 turbine rotors of Unit 3 during a refuelling outage in October 1985 for possible stress-corrosion cracking in the disc bore region and the dowel holes.

A number of small indications were detected in the hub and bore regions of several discs, and also at the LP3 Stage 7 (steam end) dowel hole region. These indications were attributed to original non-metallic inclusions in the disc forgings, and to surface irregularities on the bore caused during the fitting of the discs on to the shaft.

No evidence of stress-corrosion cracking was found on or adjacent to either the disc bores or the dowel holes.

2. TEST EQUIPMENT

The ultrasonic flaw detectors and probes used for the various scans were compatible and were as specified in procedural Sections 4 and 5, appendix A.

3. EQUIPMENT CALIBRATION

3.1 Bore Region Inspection

Calibration was carried out in accordance with the procedure, section 4.2, appendix A. Calibration data were tabulated on U.T. form 1, appendix B.

3.2 Dowel Hole Inspection

Calibration was carried out in accordance with the procedure, section 5.2, appendix A. Calibration data were recorded on U.T. form 4, appendix B.

3.3 Equipment Calibration Results

The calibration data recorded on U.T. form 1 and U.T. form 4, appendix B, illustrate that the requirements of the procedure, section 4, were achieved, and maintained throughout the entire inspection.

4. INITIAL SCANNING CALIBRATION : DISC BORE

This was carried out in accordance with the procedure, section 4.3, appendix A. Data were recorded on U.T. form 2, appendix B.

5. PROCEDURE FOR INSPECTION

5.1 Disc bore scan

The disc bore scan was similar to that satisfactorily employed on the SAN ONOFRE Unit 2 L.P. rotors, and in accordance with the approved procedure, section 5, appendix A.

5.2 Dowel hole scan

The dowel hole scan was similar to that satisfactorily employed on the SAN ONOFRE Unit 2 L.P. rotors, and in accordance with the approved procedure, section 5, appendix A.

6. RECORDING OF INDICATIONS

6.1 Disc bore scan

All relevant indications were recorded on U.T. form 3, appendix B, in accordance with the procedure, section 4.7.

6.2 Dowel hole scan

All relevant indications were recorded on U.T. form 5, appendix B, in accordance with the procedure, section 5.4.

6.3 Condition Monitoring

During future refuelling outage ultrasonic inspections for stress-corrosion cracking, the data recorded in this report (indication co-ordinates, prove movements, gain settings etc.) should be referred to. In this way it should be possible to detect whether any discontinuity propagation has occurred during service.

CONCLUSION

1. No evidence of stress-corrosion cracking was found in any of the disc bore or dowel hole regions on either rotor.

2. Indications in the hub region of the discs were generally 'point-types' and attributed to the presence of isolated non-metallic inclusions. Indications on the bore were attributed to surface irregularities arising during the fitting of the discs to the shaft.

3. The indication recorded in the dowel hole region of LP3, Stage 7 (steam end) was attributed to the presence of isolated non-metallic inclusions.

T. RICKETS

APPENDIX A

SAN ONOFRE UNIT 3 LP ROTORS

Procedure for ultrasonic inspection of disc bores and disc dowel holes.

GENERAL

This procedure prescribes the ultrasonic technique to be applied to search the bore and dowel hole regions of all discs on LP rotors 1, 2 and 3 for detection of stress corrosion cracking.

1. SURFACE CONDITION

   The scanning surface shall be free from dirt, scale or residue that could affect the examination.

2. COUPLANT

   The couplant between test probe and the forging shall be 'Ultragel'.

3. ULTRASONIC FLAW DETECTORS

   Krautkramer type USIP 11.

4. INSPECTION OF BORE REGION

   4.1 Test Probes

   Angle probes - single crystal.

   Frequency - 2MHz.

   Crystal dimensions - 10mm diameter or 20 x 22mm.

   Manufacturer - Mateval or Wells Krautkramer.

   Type LCA2/30 - 30° compression wave

   " LSA2/38 - 38° shear wave

   " LSA2/45 - 45° " "

   " AP65 - 65° " "

   " AP70 - 70° " "

   " AP75 - 75° " "

   " AP80 - 80° " "

4.2 Equipment Calibration

Calibration of equipment shall be carried out:-

(a) prior to commencement of inspection

(b) at any change of test probe

or

(c) every four hours whichever is the more frequent.

A signed record of these calibrations shall be kept and made available with the final report. (UT Form 1).

The characteristics to be covered are:-

1. Time base and Gain Linearity
2. Sensitivity calibration.

4.2.1 Time base and Gain Linearity

These calibrations shall be carried out in accordance with BS 4331 Part 1 Clause 5 and 7 using the A2 reference block described in BS 2704.

4.2.2 Sensitivity calibration

Calibration checks for sensitivity shall be carried out using the 100mm radius on the A2 reference block as a standard. For each test probe the amplitude of the signal shall be adjusted to 80% full screen height and the calibrated gain control reading (in dB) recorded. This operation shall be carried out with the uncalibrated gain control set to maximum and the pulse energy on setting 3.

4.2.3 At the end of each probe use, a final check of the time base calibration and the amplitude of the echo from the artificial reflector shall be carried out on the disc bore calibration block. The values obtained shall be recorded on UT form 1. The procedure for the amplitude measurement shall be identical to that for scanning calibration in clause 4.3. The echo amplitude from the reflector shall be expressed as a percentage of the full screen height. Any fall in amplitude greater than two dBs, compared with the previously reported signal shall be noted and recorded for correction purposes against the disc under inspection.

4.3 Scanning calibration

Using the disc bore calibration block, shown in Fig. 1:-

1. Place the test probe on the appropriate scanning face of the calibration block with the beam axis directed tangentially to the simulated bore surface.
2. Adjust the probe position to give maximum indications from the artificial reflector.
3. Adjust the uncalibrated gain to maximum and the pulse energy to 3.
4. Adjust the calibrated gain control to 80% FSH or maximum amplitude obtainable.
5. Record the echo amplitude as a percentage of full screen height.
6. Record the beam path distance.
7. Record the probe and flaw detector identification. This calibration shall be recorded on UT Form 2.

4.4 Sensitivity monitoring

Monitoring of sensitivity during the testing period shall be performed in accordance with 4.2.2 and recorded on UT Form 1. Any fall in signal amplitude greater than 2dB compared with the initial recorded signal shall necessitate recalibration against the disc bore calibration block and repeat of the inspection performed since the previous calibration.

4.5 Scanning

Each disc shall be scanned over the hub and appropriate panel surfaces using the test probes designated in the scanning plan. See Table 1 and Figs. 2 - 8.

Scanning jigs made for each disc configuration shall be used when scanning from disc panels. The test probe shall be moved forward and backward along the guide at a speed not greater than 150mm per second. The progressive circumferential movement of the probe jig between scans shall not exceed 100mm.

When testing from the hub surface the scan shall cover the whole of the periphery with a probe overlap of at least 15% with each pass.

4.6 Scanning Sensitivity

Scanning sensitivity to be used on both the test block and forgings shall be the maximum.

Equipment calibration shall be:

Uncalibrated gain control - full

Calibrated gain control - To obtain 80% FSH or maximum amplitude

Pulse energy - 3

Suppression - Nil

4.7 Recording of Indications

All indications ≥ grass level +6dB (i.e. twice grass level) shall be recorded on UT Form 3.

The information shall include:

1. Stage and flow indentification.
2. Scanning face - inlet or exhaust.
3. Circumferential position - hub datum to jig scanning edge.
4. Scanning direction - clockwise or counter clockwise.
5. Flaw detector/probe combination identification.
6. Probe angle used.
7. Echo amplitude as a percentage of full screen height.
8. Grass level in percentage FSH.
9. Beam path distance.
10. Distance from hub to index point of probe.
11. Distance form indication to bore surface.
12. Distance of indication from hub end of bore.

5. INSPECTION OF DOWEL HOLE REGION

5.1 Test Probes

Wells Krautkramer 5MHz combined double compression probe type CD 15/5 (15mm diameter crystals).

Wells Krautkramer 2MHz single crystal shear wave probe MAP 60°.

5.2 Calibration

Calibration shall be carried out:-

(a) prior to commencement of inspection.

(b) at any change of test probe.

(c) at end of any scan.

The dowel hole calibration block Fig. 9 shall be used. Data shall be recorded on UT Form 4.

5.2.1 Time base

For shear wave examination the time base shall be calibrated in turn to accommodate the near (12 o'clock) and distant (6 o'clock) artificial reflectors associated with the simulated dowel hole in the dowel hole test block. The single artificial reflector located at the 3 o'clock position will be used for calibration for compression wave examination.

5.2.2 Scanning sensitivity

For shear wave examination the amplitude of the echo from the 6 x 2mm artificial reflector in the simulated dowel hole shall be set to 80% full screen height and increased to 2mm grass level. If this condition is unattainable using the 2MHz 60° shear wave probe at the 6 o'clock position, owing to high grass level, the gain shall be reduced to give a 2mm grass level and the amplitude of the echo from the artificial reflector recorded in terms of percentage screen height. Scanning shall then be carried out at this level.

5.2.3 For the compression wave examination the amplitude of the echo from the artificial reflector in the simulated dowel hole at the 3 o'clock position shall be set to 80% full screen height and increased to 5% FSH grass level.

5.3. Scanning

Scanning shall be carried out from the circumferential surface of the hub as shown in Fig. 10.

The 12 o'clock position shall be scanned using the 2MHz MAP 60^{o} shear wave probe.

The 6 o'clock position shall be scanned using the 2MHz MAP 60^{o} shear wave probe.

The 3 and 9 o'clock positions shall be scanned using the 5MHz combined double crystal compression wave probe.

5.4 Recording of Indications

All indications $\geqslant$ grass level + 6dB shall be recorded on UT Form 5.

The amplitude of isolated indications shall be reported at the gain reading necessary to obtain 80% full screen height from the appropriate artificial reflector.

All multiple (clouds, groups, etc.) indications shall be recorded giving the maximum and average height and the beam path limits.

These shall be reported relative to 80% full screen height gain setting except in the case of the 6 O'clock position where the gain setting in para. 5.2.2 shall be reported.

TABLE 1

SCANNING PLAN - See sketches

Stages 1 - 2

1. 30° angled compression wave scan.
2. 45° shear wave scan from hub.
   a) normal to axis of bore.
   b) angled to give coverage of bore below radius.
3. 80° shear wave scan from disc panel.

Stages 3 - 4

As Stage 1 - 2 with no restriction from balancing slot.

Stage 5

1. 45° shear wave scan from hub.
   a) normal to axis of bore.
   b) angled to give coverage of bore below radius.
2. 75° shear wave scan from disc panel.
3. 80° shear wave scan from disc panel.

Stage 6

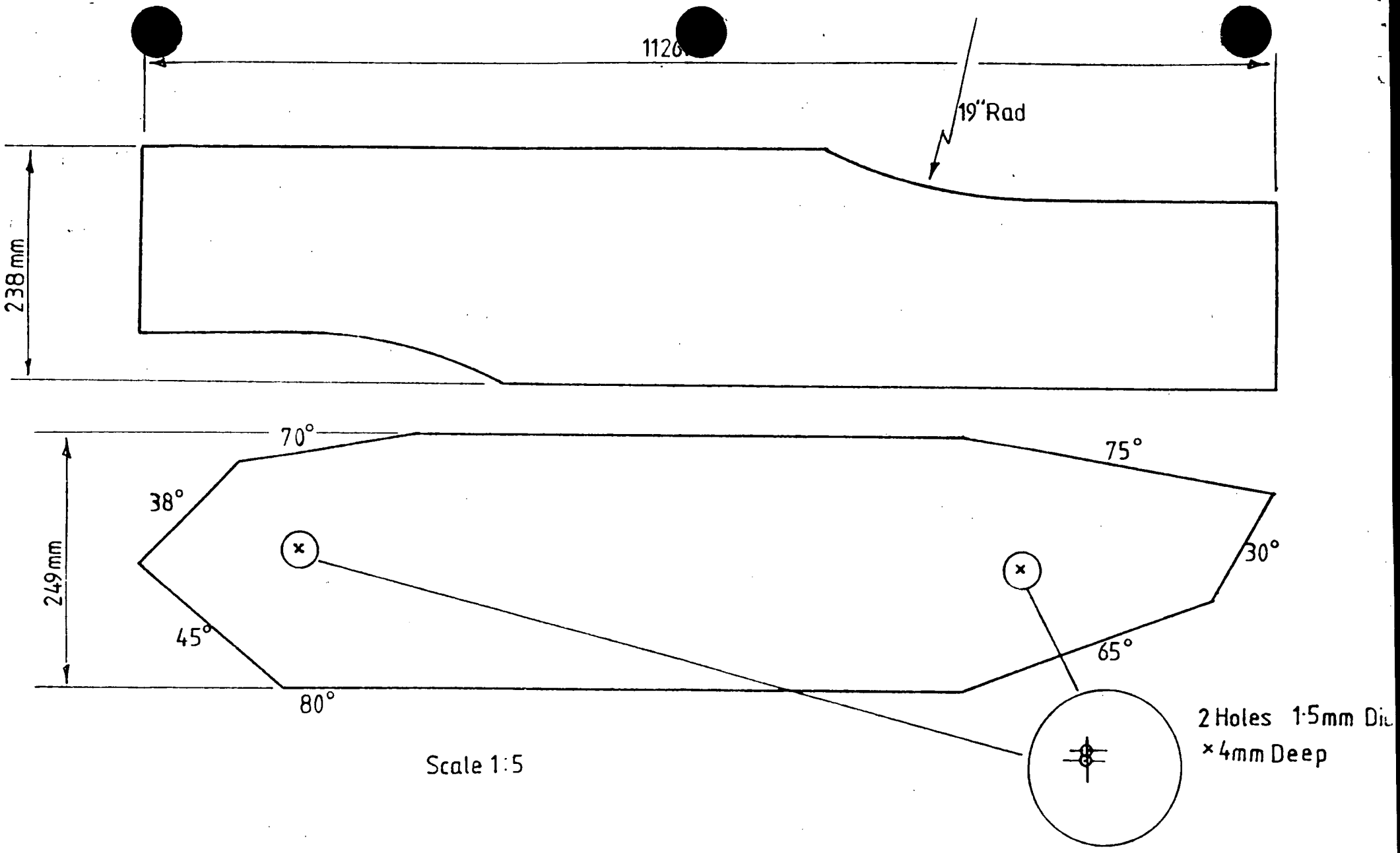
1. 38° shear wave scan from hub.
   a) normal to axis of bore.
   b) angled to give coverage of bore below radius.
2. 75° shear wave scan from disc panel.
3. 80° shear wave scan from disc panel.

Stage 7

1. 38° shear wave scan from hub.
   a) normal to axis of bore
   b) angled to give coverage of bore below radius,
2. 70° shear wave scan from disc panel.
3. 75° shear wave scan from disc panel.
4. 80° shear wave scan from disc panel.

Stage 8

1. 38° shear wave scan from hub.
   a) normal to axis of bore.
   b) angled to give coverage of bore below radius.
2. 65° shear wave scan from disc panel.
3. 70° shear wave scan from disc panel.
4. 75° shear wave scan from disc panel.
5. 80° shear wave scan from disc panel.



Disc Bore Calibration Block

Fig 1

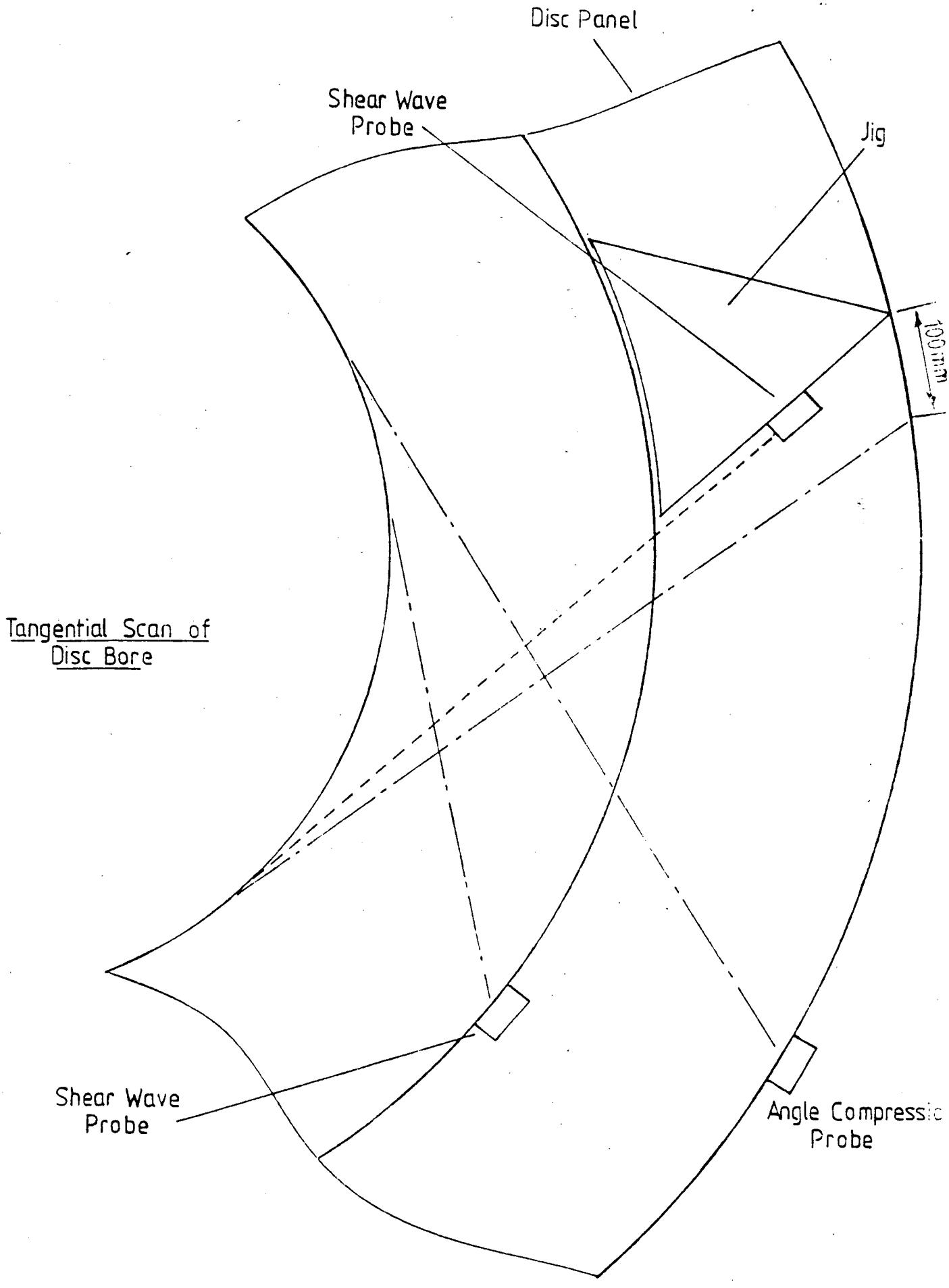

Disc Panel
Shear Wave Probe
Jig
100mm
Tangential Scan of Disc Bore
Shear Wave Probe
Angle Compressic Probe

Fig 2

STAGE 1-2

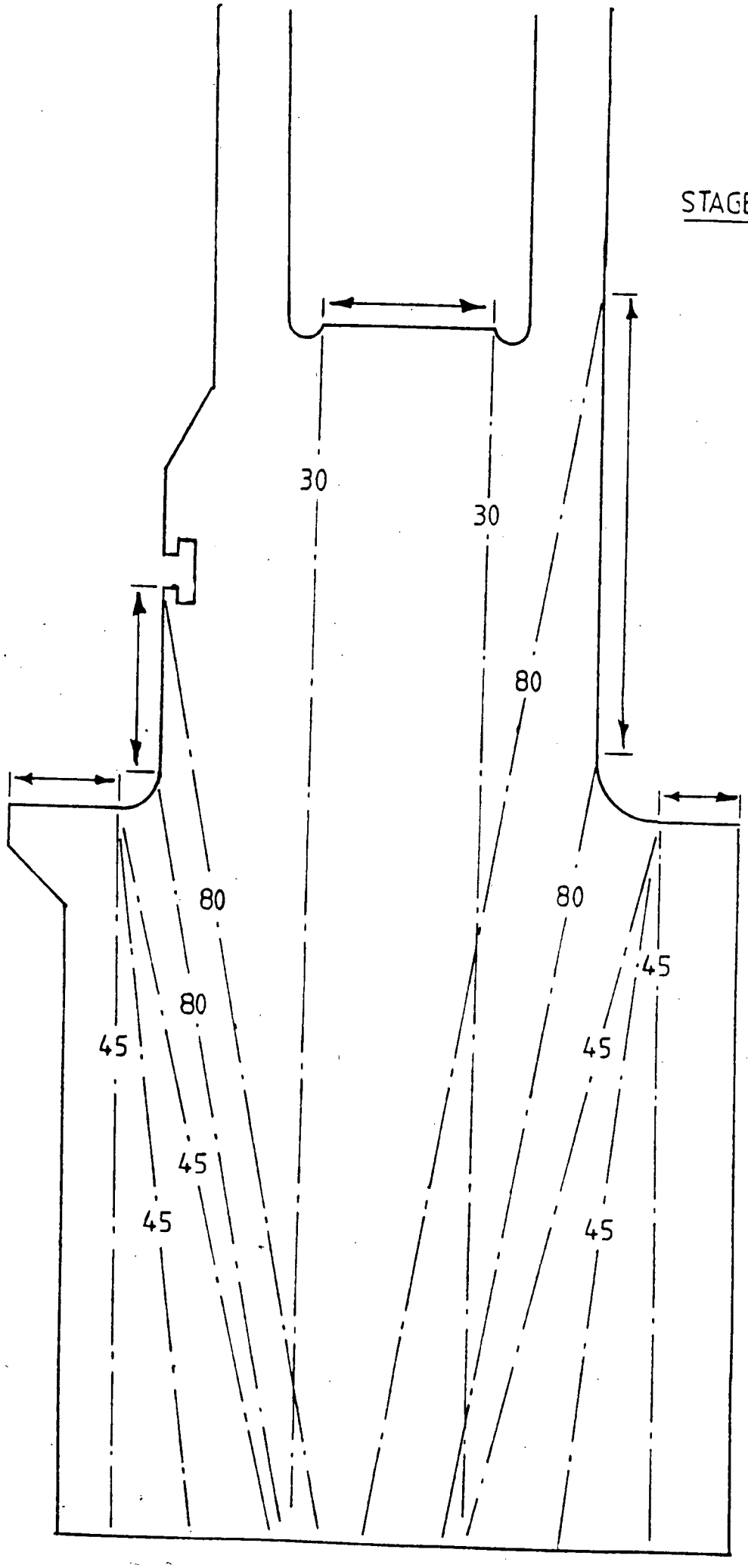


Fig 3

STAGE 3-4

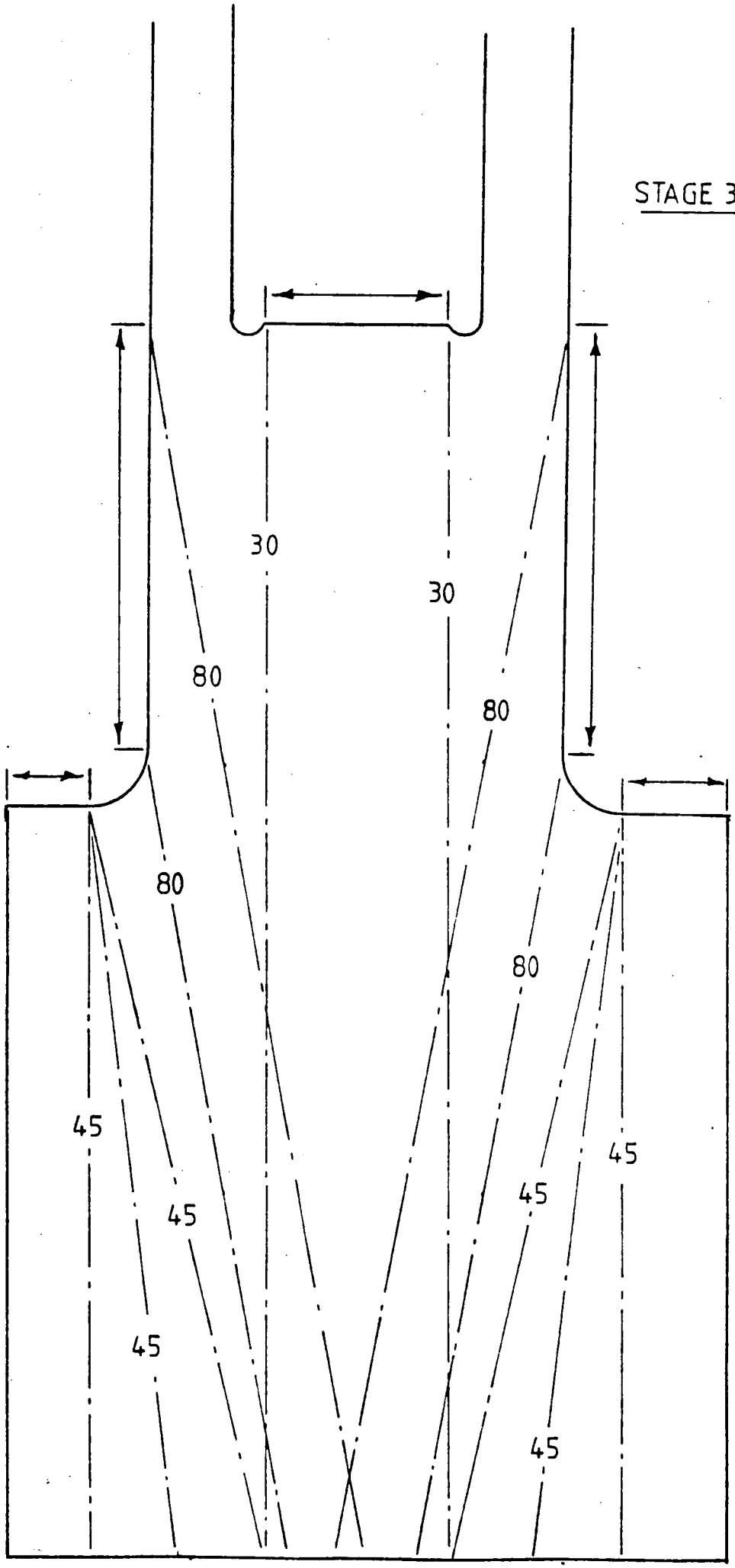


Fig 4

STAGE 5

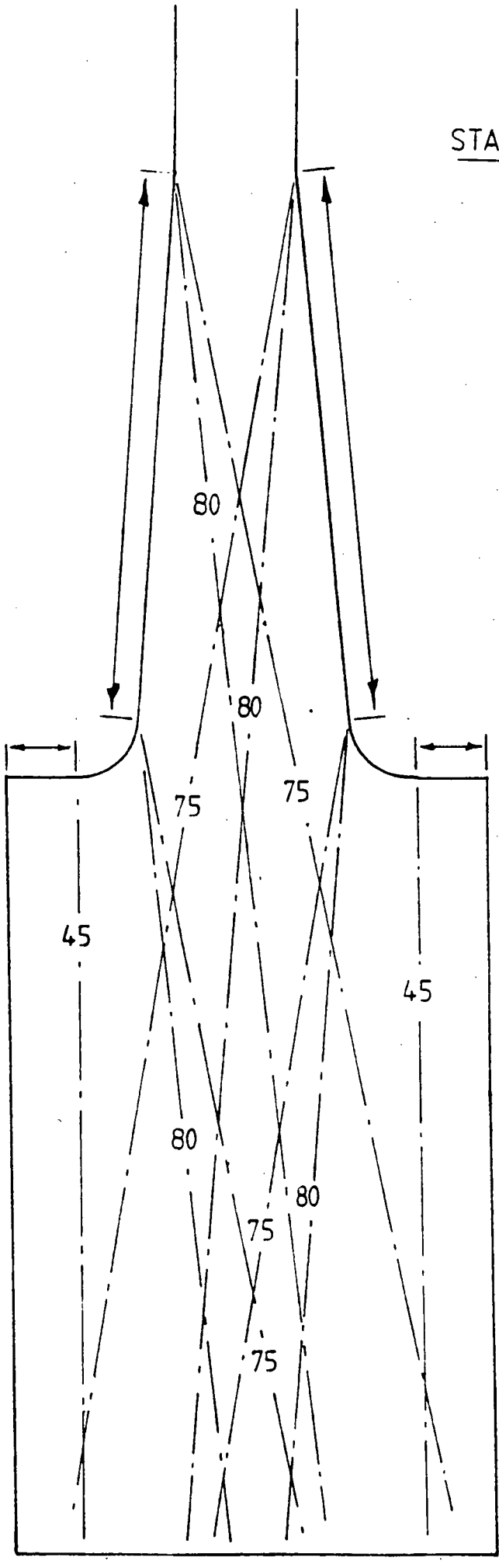


Fig 5

STAGE 6

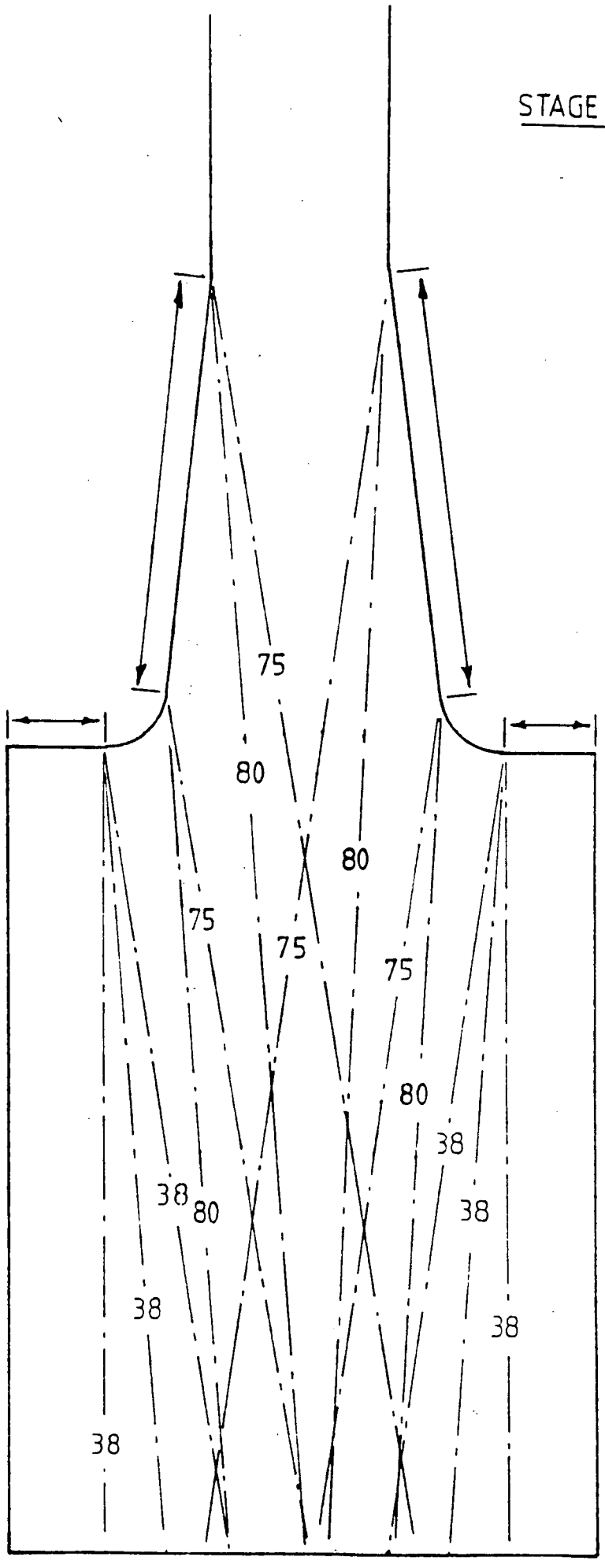


Fig 6

STAGE 7

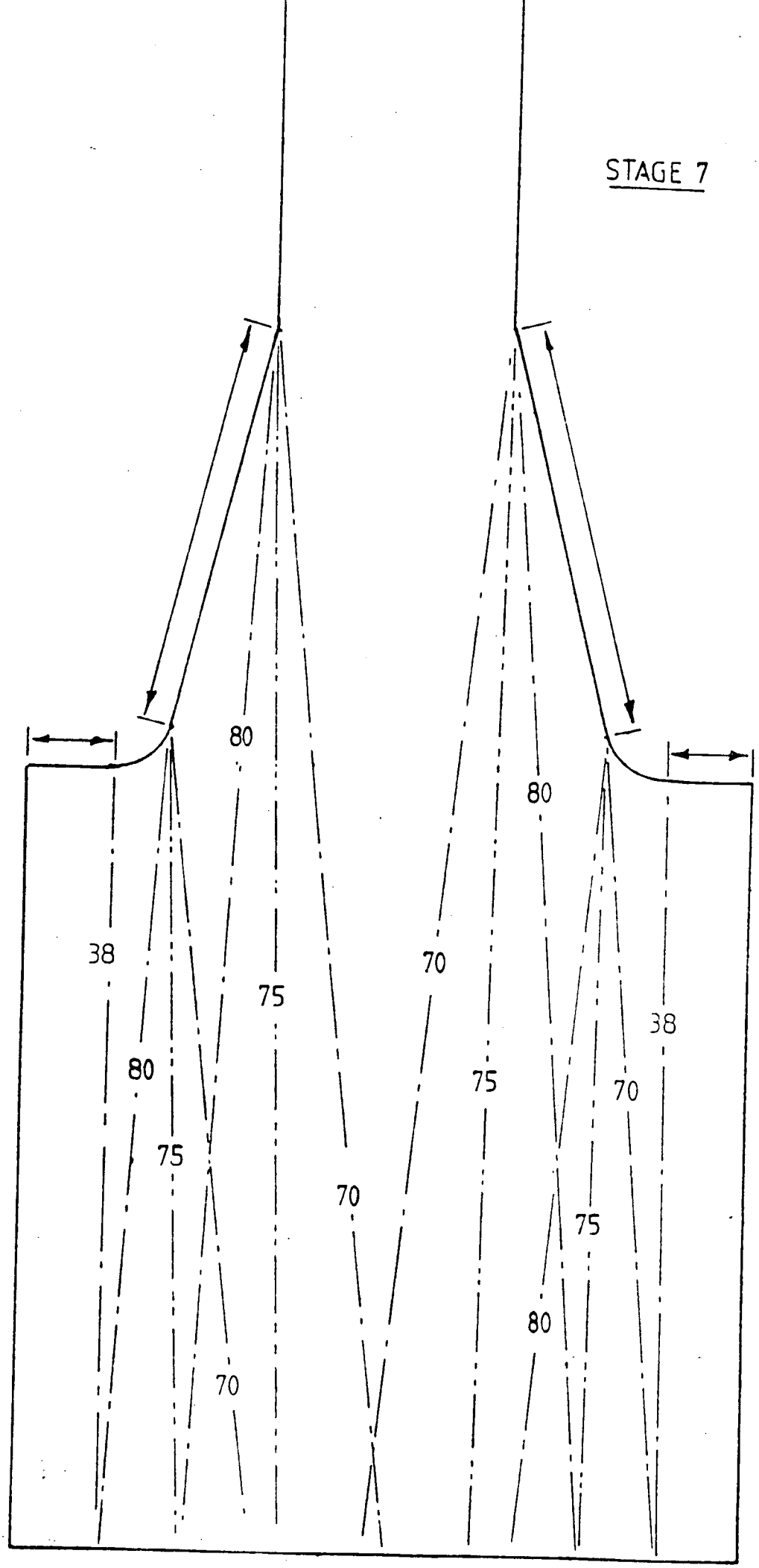


Fig 7

STAGE 8

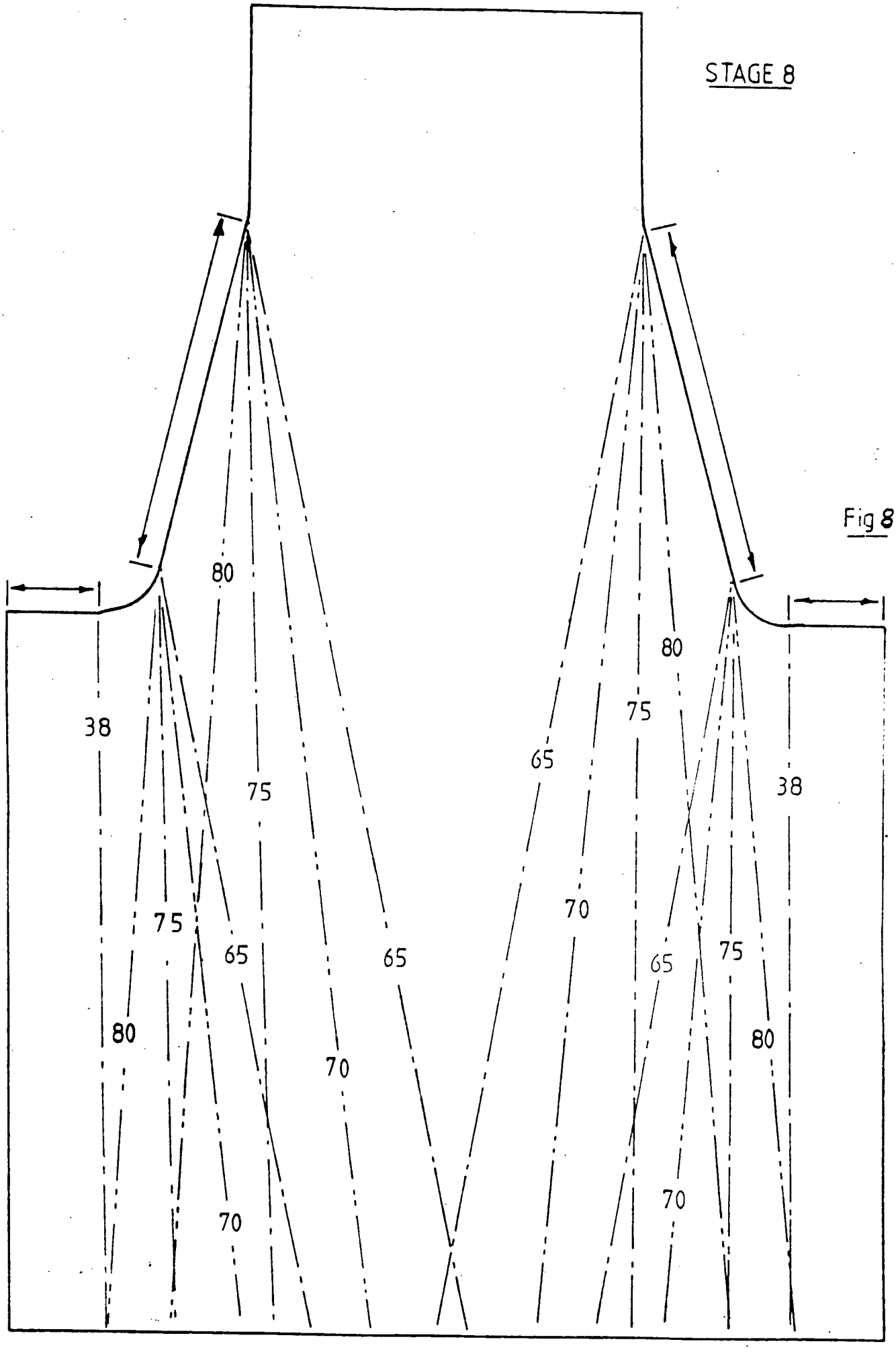
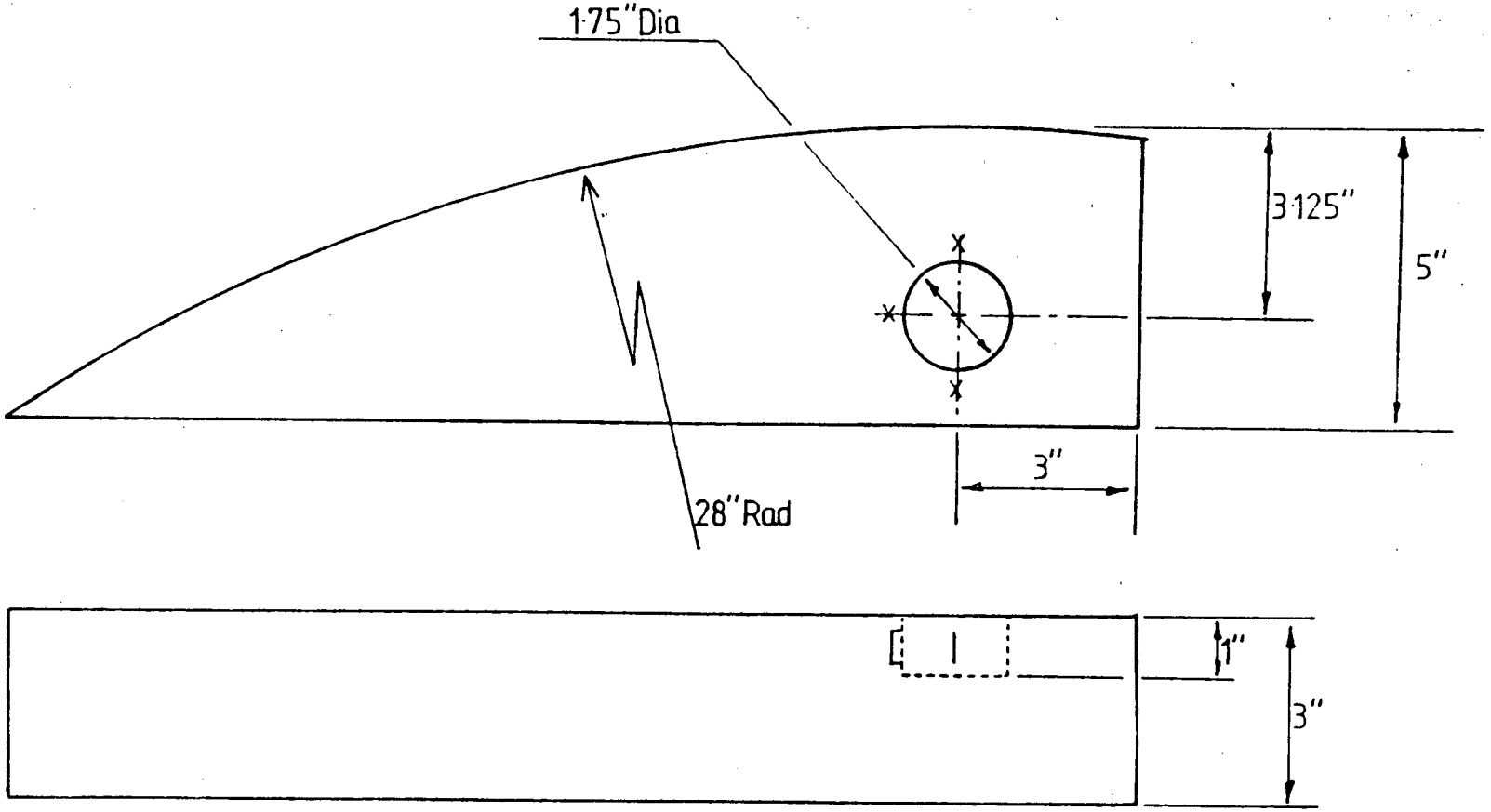


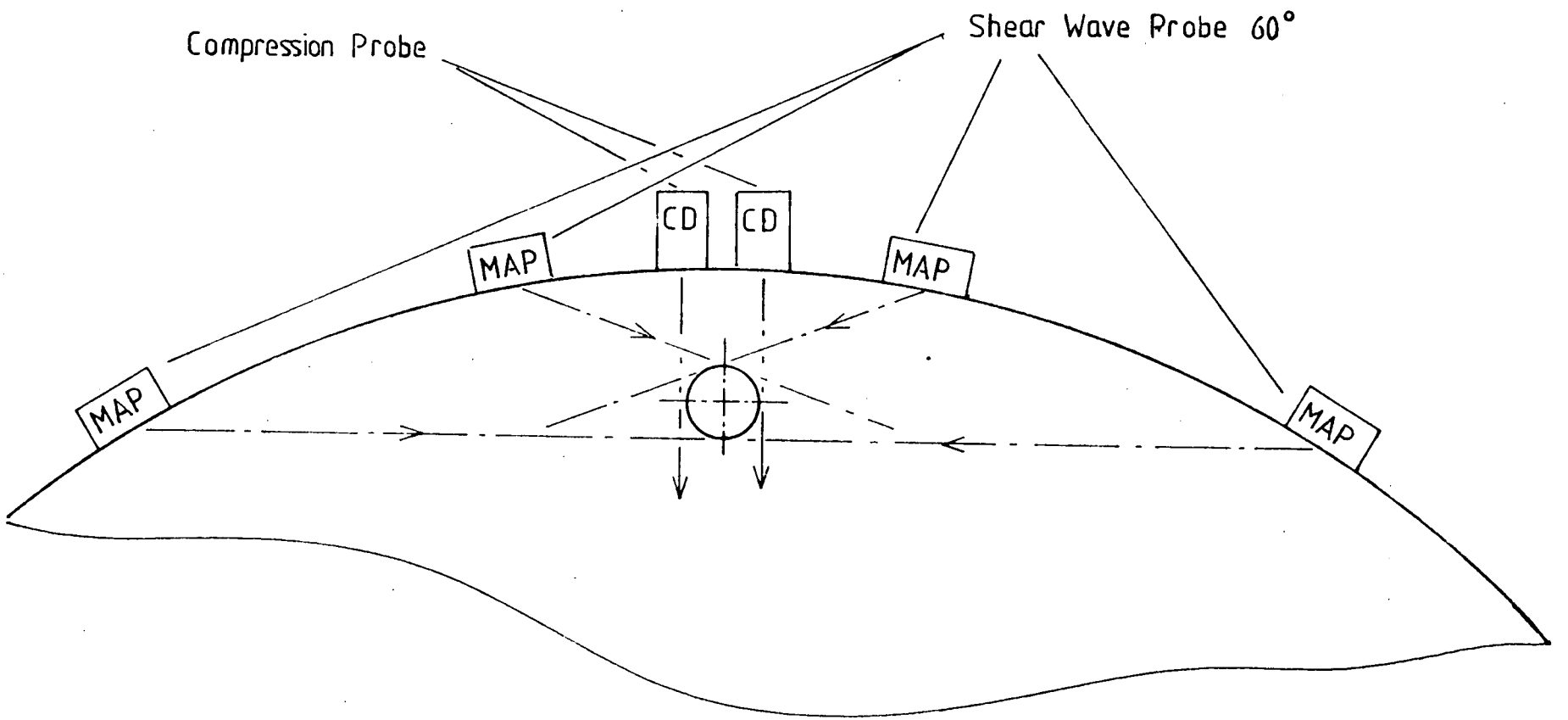
Fig 8



x-Position of 6mm×2mm×·01"Artificial slots

Dowel Hole Calibration Block

Fig 9



Scanning Plan for Dowel Holes

FIG. 10.

APPENDIX B

RESULTS OF INSPECTION

Results are tabulated first for Unit 2 and second for Unit 3. Results are tabulated for each of 4 operators in turn; forms are in numerical order: UT form 1, UT form 2 etc.

No form is included where a particular operator has not been involved in a particular calibration or inspection.

MIKE DOWNS

DISC BORE INSPECTION

EQUIPMENT CALIBRATION CHECK - para. 4.2

IIW A2 Block

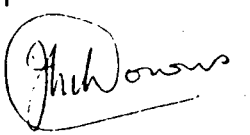
TURBINE ROTOR No. LP-2 UNIT #3
PF-146157

Equipment Serial No. 5959

Initials	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm @ (dBs)	100mm	Final Calibration including Form UT2 Column #7
MD	4/10/85	1115	45°	451	✓	✓	✓	✓	✓	36db	18db	
	4/10/85	1520	45°	451	✓	✓	✓	✓	✓	36db	18db	1745
	5/10/85	0730	45°	451	✓	✓	✓	✓	✓	36db	18db	0840
	5/10/85	0825	80°	801	✓	✓	✓	✓	✓	46db	20db	
	5/10/85	1130	80°	801	✓	✓	✓	✓	✓	48db	20db	1530
	5/10/85	1530	75°	751	✓	✓	✓	✓	✓	50db	30db	1800
	6/10/85	0700	70°	703	✓	✓	✓	✓	✓	38db	18db	0800
	6/10/85	1200	45°	451	✓	✓	✓	✓	✓	38db	18db	1345
	6/10/85	1400	38°	381	✓	✓	✓	✓	✓	42db	22db	1500
	6/10/85	1600	80°	801	✓	✓	✓	✓	✓	52db	20db	1745
	7/10/85	0650	75°	751	✓	✓	✓	✓	✓	46db	22db	0900
	7/10/85	0900	75°	751	✓ RECALIBRATE DUE TO POWER FAILURE			✓	✓	46db	22db	1100
	7/10/85	1320	75°	751	✓	✓	✓	✓	✓	46db	24db	1700
	7/10/85	1700	80°	801	✓	✓	✓	✓	✓	46db	20db	1800
	8/10/85	0800	45°	451	✓	✓	✓	✓	✓	38db	18db	0900
	8/10/85	0900	38°	381	✓	✓	✓	✓	✓	36db	22db	1010
	8/10/85	1400	80°	801	✓	✓	✓	✓	✓	44db	18db	1620
	8/10/85	1625	38°	381	✓	✓	✓	✓	✓	40db	22db	1730

* Tick to indicate satisfactorily completed

Operator Signature
UT Form 1



MIKE DOWNS

DISC BORE INSPECTION

EQUIPMENT No. 5959

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe		Equipment Serial		Beam Path	Echo Amplitude		Grass
	Angle	Ident	5233	5959	Distance (mm)	MAX % F.S.H. HEIGHT @ 80%	dB @ 80%	Level (%)
4/10/85	45°	451			820	80%	76	20
5/10/85	45°	451			820	80%	76	20
5/10/85	80°	801			680	50%	80	15
5/10/85	75°	752			870	60%	80	15
6/10/85	70°	703			720	80%	72	15
6/10/85	45°	451			820	80%	76	20
6/10/85	38°	381			820	80%	74	15
6/10/85	80°	801			680	50%	80	20
6/10/85	75°	751			870	45%	80	20
4/10/85	75°	751			870	50%	80	20
7/10/85	80°	801			680	50%	80	15
8/10/85	45°	451			820	80%	80	15
8/10/85	38°	381			820	80%	80	15
8/10/85	80°	801			680	50%	80	15
8/10/85	38°	381			820	80%	80	15

Operator Signature

UT Form 2

John Downs

MIKE DOWNS

DISC BORE INSPECTION

INDICATION RECORD - para. 4.7

SET: UNIT #3

ROTOR & IDENT: LP-2 PF-146157

I = INLET
D = DISCHARGE
F = FRONT/STEAM END
R = REAR/GENERATOR END

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore mm	Distance from Inlet mm	Distance from Exh. mm	MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR
2	R	D	122°	CCW	5959	80°	801	80%	35	310	212	5	—	266	319	152	180° + 530MM
3	R	I	218°	CCW		80°	801	100%	15	530	135	75	10	0	180	315	270° - 560MM
6	F	I	317°	CCW		75°	751	45%	20	500	160	10	15	73	197	190	0° - 550MM
6	R	D	248°	CCW		75°	751	100%	10	490	120	—	—	52	200	187	0° - 120MM
8	R	D	54°	CCW		75°	751	100%	15	670	124	—	20	mok	in	bore	0° - 158MM
6	R	D	236°	CW		80°	801	55%	30	530	130	50	20	8	151	234	270° - 435MM

Operator Signature J. M. Downs
UT Form 3

MIKE DOWNS

DOWEL HOLE INSPECTION

EQUIPMENT AND SCANNING CALIBRATION - para. 5.2

SET: UNIT #3

ROTOR & IDENT: LP-2 PF-146157

Dowel Hole Calibration Block
F = FRONT / STEAM END
R = REAR / GENERATOR END
I = INLET
D = DISCHARGE

Date	Time	Rotor Datum	Dowel Hole Ident Stage	Flow	Face	Equipt Serial	Probe Angle	Probe Ident	Probe Beam ° *	Probe Index Pt *	Time Base Calibration *	Scanning Calibration % FSH/dBs 12 O'clock	Scanning Calibration % FSH/dBs 6 O'clock	Grass Level (%) 12	Grass Level (%) 6	Beam Path (mm) 12	Beam Path (mm) 6	Final Cal. Check
6/10/85	0800	180°	7-8	F	I&D	5959	60°	115227	✓	✓	✓	80%/44dB	80%/44dB	8	10	140	446	0935
			5-6	F	I&D													
			2-3	F	I&D													
			Re-1	R	-&I													
			4-5	R	D&I													
			6-7	R	D&I													
8/10/85	1015	0°	7-6	F	I&D	5959	60°	115227	✓	✓	✓	80%/44dB	80%/70dB	10	15	140	446	1350
			5-4	F	I&D													
			1-Re	F	-&I													
			2-3	R	D&I													
			5-6	R	D&I													
			7-8	R	D&I													

* Tick to indicate satisfactorily completed
+ Check daily before use

Operator Signature
UT Form 4

DOWEL HOLE INSPECTION

INDICATION RECORD - para. 5.4

SET:

ROTOR & IDENT:

Dowel Stage	Hole Ident Flow	Face	Scan CW or CCW	Probe Angle	mHz	Index Pt to CL of Hole	Beam Path	Amplitude % FSH	Probe Movement (max amplitude) X axis	Y axis	Grass Level	Calibrated Gain Reading

Operator Signature

Date

UT Form 5

MIKE FRATT

DISC BORE INSPECTION

TURBINE ROTOR No. LP No 2 UNIT # 3

PF 146157

Equipment Serial No. 20160-5959

EQUIPMENT CALIBRATION CHECK - para. 4.2

IIW A2 Block

INITIALS	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm@(dBs) noise		FINAL CALIBRATION INCLUDING FORM UT2 COLUMN 47
	4 OCT BS	20:00	38°	381	✓	✓	✓	✓	✓	46	22dB	23:30
	"	24:00	60°	601	✓	✓	✓	✓	✓	46	18dB	03:30
	5 OCT BS	04:00	60°	601	✓	✓	✓	✓	✓	46	18dB	05:40
	"	20:00	30°	301	✓	✓	✓	✓	✓	28	10dB	23:45
	6 OCT BS	01:00	65°	651	✓	✓	✓	✓	✓	36	16dB	
	"	04:25	65°	651	✓	✓	✓	✓	✓	36	16dB	05:30
	"	18:30	30°	301	✓	✓	✓	✓	✓	28	10dB	
	"	22:06	30°	301	✓	✓	✓	✓	✓	28	10dB	23:45
	7 OCT BS	00:12	65°	651	✓	✓	✓	✓	✓	36	16dB	
	"	03:41	65°	651	✓	✓	✓	✓	✓	36	16dB	05:42
	8 OCT BS	00:35	30°	301	✓	✓	✓	✓	✓	28	10dB	
	"	04:00	30°	301	✓	✓	✓	✓	✓	28	10dB	06:28
	"	18:45	30°	301	✓	✓	✓	✓	✓	28dB	10dB	20:49
	"	21:00	65°	651	✓	✓	✓	✓	✓	34dB	16dB	24:00
	9 OCT BS	01:30	30°	301	✓	✓	✓	✓	✓	28dB	16dB	03:10
				–								

* Tick to indicate satisfactorily completed

Operator Signature M R Fratt

UT Form 1

DISC BORE INSPECTION

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe Angle	Probe Ident	Equipment Serial 5233	Equipment Serial 5959	Beam Path Distance (mm)	Echo Amplitude % F.S.H. MAX HEIGHT @ 80dB	Echo Amplitude dB @ 80%	Grass Level ( )
4 OCT 85	38°	381		✓	820	80%	80dB	20%
	80°	801		✓	680	65%	80dB	15%
5 OCT 85	80°	801		✓	680	65%	80dB	15%
	30°	301		✓	930	60%	80dB	20%
6 OCT 85	65°	651		✓	780	80%	74dB	15% @ 80dB
	30°	301		✓	930	60%	80dB	20%
7 OCT 85	65	651		✓	780	80%	74dB	15% @ 80dB
8 OCT 85	30°	301		✓	930	60%	80dB	20%
	65°	651		✓	780	80%	74dB	15% @ 80dB
9 OCT 85	30°	30°		✓	930	65%	80dB	20%

Operator Signature [signature]

UT Form 2

DISC BORE INSPECTION

SET: UNIT #3

ROTOR & IDENT: LP-2 PF-146157

INDICATION RECORD - para. 4.7

I = INLET
D = DISCHARGE
F = FRONT/STEAM END
R = REAR/GENERATOR END

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore	Distance from Inlet	Distance from Exh.	MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR
8	F	O	220°	CCW	5959	65°	651	45%	15%	390	90	15	25	192	460	240	
8	F	I	210°	CW	5959	65°	651	50%	15%	440	110	10	20	171	218	447	
8	F	O	312°	CCW	5959	65°	651	45%	15%	480	125	15	25	220	210	460	
8	F	O	250°	CW	5959	65°	651	40%	15%	390	170	10	15	274	450	220	
3-4	R	NA	356°	CCW	5959	30°	301	60% +4	10%	290	NA	25	130	PLOTS	IN	WEB	
3-4	R	NA	355°	CW	5959	30°	301	60% +2	10%	500	NA	25	130	260	255	223	
3-4	R	NA	MULTIPLE	ECHOS	SEE	ATTACHMENT	#1										

Operator Signature [signature]
UT Form 3

RON HARRS

DISC BORE INSPECTION

EQUIPMENT CALIBRATION CHECK - para. 4.2

IIW A2 Block

TURBINE ROTOR No. LP-2 UNIT #3
PF-146157

Equipment Serial No. 5233

Initials	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm @ (dBs) 100mm		FINAL CALIBRATION INCLUDING FORM UT2 COLUMN #7
RM	4/10/85	1140	45°	452						46db	24db	
	4/10/85	1530	45°	452						44db	24db	1745
	5/10/85	0730	80°	803						50db	26db	
	5/10/85	1130	80°	803						50db	26db	1600
	5/10/85	1615	75°	752						48db	18db	1800
	6/10/85	0700	70°	702						38db	18db	0800
	6/10/85	1200	45°	452						46db	24db	1400
	6/10/85	1400	38°	382						46db	20db	1500
	6/10/85	1600	80°	803						50db	26db	1745 (+2db)
	7/10/85	0615	70°	702						38db	20db	
	7/10/85	0815	70°	702	RECALIBRATE DUE TO POWER FAILURE					38db	20db	
	7/10/85	0840	70°	702	"		" "	"	"	38db	20db	0925
	7/10/85	1430	80°	803						48db	24db	1730
	8/10/85	0700	70°	702						38db	20db	0940
	8/10/85	0950	65°	652						36db	18db	1040
	8/10/85	1335	80°	803						48db	22db	1600
	8/10/85	1600	70°	702						38db	18db	1735

* Tick to indicate satisfactorily completed

Operator Signature
UT Form 1

DISC BORE INSPECTION

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe		Equipment Serial		Beam Path Distance (mm)	Echo Amplitude % F.S.H.		Grass Level (%)
	Angle	Ident	5233	5959		MAX HEIGHT @ BOAM	dB @ 80%	
4/10/85	45°	452	✓		820	80%	80db	15
4/10/85	45°	452			820	80%	80db	15
5/10/85	80°	803			680	55%	80db	15
5/10/85	75°	751			870	45%	80db	15
6/10/85	70°	702			720	80%	76db	15
6/10/85	45°	452			820	80%	80db	15
6/10/85	38°	382			820	80%	76db	15
6/10/85	80°	803			680	55%	80db	15
7/10/85	70°	702			720	80%	74db	20
7/10/85	80°	803			680	55%	80db	15
8/10/85	65°	652			740	50%	80db	20
8/10/85	80°	803			680	55%	80db	20
8/10/85	70°	702			720	80%	74db	15

R. B. Mark

Operator Signature

UT Form 2

DISC BORE INSPECTION

INDICATION RECORD - para. 4.7

I = INLET
D = DISCHARGE
F = FRONT/STEAM END
R = REAR/GENERATOR END

SET: UNIT #3

ROTOR & IDENT: LP- PF-

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore	Distance from Inlet	Distance from Exh.	MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR
1	R	I	230°	CCW	5233	80°	803	80%	20	400	85	20	150	53	140	316	270°-820MM
1	R	I	240°	CCW		80°	803	80%	20	400	85	20	150	53	140	316	270°-690MM
4	R	D	140°	CW		80°	803	85%-80%	15	310	165	10	20	219	323	169	180°-450MM (2 SIGNALS)
8	R	D	157°	CW		75°	752	60%	20	580	175	25	10	78	511	159	180°-230MM
3	R	I	262°	CCW		80°	803	60%	20	320	240	45	30	362	139	349	270°-78MM
6	R	D	328°	CW		80°	803	100%	25	450	135	15	10	45	240	143	270°+225MM
6	R	D	342°	CW		80°	803	100%	15	450	140	25	40	45	240	143	270°+430MM

Operator Signature
UT Form 3

DOWEL HOLE INSPECTION

SET: UNIT #3

ROTOR & IDENT: LP-2 PF-146157

EQUIPMENT AND SCANNING CALIBRATION - para. 5.2

Dowel Hole Calibration Block

F = FRONT/STEAM END
R = REAR/GENERATOR END
I = INLET
D = DISCHARGE

Date	TIME	ROTOR DETAIL	Dowel Hole Ident Stage	Flow	Face	Equipt Serial	Probe Angle	Ident	Beam * +	Index Pt * +	Time Base Calibration *	Scanning Calibration % FSH/dBs	Grass Level (%)	BEAM PATH (MM)	FINAL CAL. CHECK
												tx rx	tx rx	tx rx	
6/10/85	0800	180°	7-8	F	I&D	5233	0°	CD1	0°	N/A	100MM	80% @ 54db	5% @	66db	0940
			5-6	F	I&D										
			2-3	F	I&D										
			R6-1	R	-&I										
			4-5	R	D&I										
			6-7	R	D&I										
8/10/85	1200	0°	7-6	F	I&D	5233	0°	CD1	0°	NA	100MM	80% @ 70db	8% @	74db	1225
			5-4	F	I&D										
			1-R6	F	-&I										
			2-3	R	D&I										
			5-6	R	D&I										
			7-8	R	D&I										

* Tick to indicate satisfactorily completed
+ Check daily before use

Operator Signature

UT Form 4

DOWEL HOLE INSPECTION

INDICATION RECORD - para. 5.4

SET:

ROTOR & IDENT:

Dowel Stage	Hole Ident Flow	Face	Scan CW or CCW	Probe Angle	mHz	Index Pt to CL of Hole	Beam Path	Amplitude % FSH	Probe Movement (max amplitude) X axis	Y axis	Grass Level	Calibrated Gain Reading

Operator Signature

Date

UI Form 5

NORCROSS

DISC BORE INSPECTION

EQUIPMENT CALIBRATION CHECK - para. 4.2

TURBINE ROTOR No. LP 2 UNIT 3
PT 146157

IIW A2 Block

Equipment Serial No. 20180 - 5233

INITIALS	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm Ø (dBs)	100mm	FINAL CALIBRATION INCLUDING FORM UT2 COLUMN #7
	4 Oct 85	20.00	38°	382	✓	✓	✓	✓	✓	38	18	22.15
	4 Oct 85	24.00	80°	803	✓	✓	✓	✓	✓	50	26	
	5 Oct 85	04.00	80°	803	✓	✓	✓	✓	✓	50	26	06.00
	5 Oct 85	20.00	75°	751	✓	✓	✓	✓	✓	46	22	
	5 Oct 85	24.00	75°	751	✓	✓	✓	✓	✓	44	20	02.45
	6 Oct 85	03.00	70°	702	✓	✓	✓	✓	✓	40	18	05.30
	6 Oct 85	18.00	80°	803	✓	✓	✓	✓	✓	48	24	
	6 Oct 85	22.00	80°	803	✓	✓	✓	✓	✓	48	24	01.45
	7 Oct 85	02.15	70°	702	✓	✓	✓	✓	✓	38	18	05.30
	7 Oct 85	19.30	80°	803	✓	✓	✓	✓	✓	46	22	
	7 Oct 85	23.30	80°	803	✓	✓	✓	✓	✓	46	22	03.00
	8 Oct 85	03.30	70°	702	✓	✓	✓	✓	✓	36	16	NOT USED
	8 Oct 85	18.15	75°	751	✓	✓	✓	✓	✓	44	20	
	8 Oct 85	21.30	75°	751	✓	✓	✓	✓	✓	44	20	23.30
	8 Oct 85	23 30	45°	452	✓	✓	✓	✓	✓	42	24	00.30
				—								

* Tick to indicate satisfactorily completed

P. Norcross
Operator Signature
UT Form 1

DISC BORE INSPECTION

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe		Equipment Serial		Beam Path Distance (mm)	Echo Amplitude % F.S.H.		Grass Level ( )
	Angle	Ident	5233	5959		MAX HEIGHT @ BOLT	dB @ 80%	
4 OCT 85	38°	382	✓		820	80%	80 dBs	20%
4 OCT 85	80°	803	✓		680	55%	80 dBs	15%
5 OCT 85	80°	803	✓		680	55%	80 dBs	15%
5 OCT 85	75°	751	✓		860	45%	80 dBs	15%
6 OCT 85	70°	702	✓		720	80%	74 dBs	15%
6 OCT 85	80°	803	✓		680	60%	80 dBs	15%
7 OCT 85	70°	702	✓		720	80%	74 dBs	15%
7 OCT 85	80°	803	✓		680	60%	80 dBs	15%
8 OCT 85	70°	702	✓		720	80%	76 dBs	15%
8 OCT 85	75°	751	✓		860	80%	76 dBs	15%
8 OCT 85	45°	452	✓		820	80%	80 dBs	15%

T. J. Norcross

Operator Signature

UT Form 2

DISC BORE INSPECTION

SET: UNIT #3

ROTOR & IDENT: LP-2 PF-146157

INDICATION RECORD - para. 4.7

I = INLET
D = DISCHARGE
F = FRONT/STEAM END
R = REAR/GENERATOR END

MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore	Distance from Inlet	Distance from Exh.
5	F	I	176°	CW	5233	75°	751	60%	20%	615	285	5	10	109	165	152
8	F	D	160°	CCW	"	75°	751	40% 3 PEAKS	10%	565	125	10	20	47	522	148
5	F	I	215°	CW	"	80°	803	50%	20%	520	340	15	35	260	161	155
7	F	I	256°	CW	"	80°	803	45%	15%	545	205	6	15	122	109	392
8	F	I	276°	CW	"	80°	803	40%	10%	730	170	10	15	plots	into	disc
8	F	I	271°	CW	"	70°	702	80% +10	30%	300	200	10	5	384	185	472
1	R	I	0°	CCW	"	80°	803	80% + 2dB	20%	655	100	6	30	plots	into	disc
1	R	I	14°	CW	"	80°	803	80% + 2dB	20%	620	130	5	10	plots	into	disc
3	R	I	12°	CW	"	80°	803	40% GROUP	20%	550	205	5	5	24	192	298
4	R	D	12°	CW	"	80°	803	40% 2 PEAKS	15%	695	180	10	20	plots	into	disc
5	R	I	356°	CW	"	80°	803	40%	10%	815	315	10	15	plots	into	disc
* 6	R	D	70°	CCW	"	80°	803	80%	15%	519-540	155	5	20	68/47	145	233
6	R	D	100°	CCW	"	80°	803	80% + 4dB	15%	560	200	25	40	47	155	222

* multiple echoes

DATUM 0° IS HOLE No 0 ON CPC (STAMPED)
0-360° IN DIRECTION OF [illegible]

[signature]

Operator Signature
UT Form 3

DISC BORE INSPECTION

TURBINE ROTOR No. LP-3 (UNIT #3)

EQUIPMENT CALIBRATION CHECK - para. 4.2

IIW A2 Block

DOWNS

Equipment Serial No. 5959 PF 146 158

INITIALS	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm @ (dBs) 100mm		FINAL CALIBRATION INCLUDING FORM UT2 COLUMN #7
HD	9/10/85	1500	80°	801	✓	✓	✓	✓	✓	40db	18db	1755
	10/10/85	0615	75°	751	✓	✓	✓	✓	✓	46db	20db	
	9/10/85	1000	75°	751	✓	✓	✓	✓	✓	46db	20db	1140
	11/10/85	0700	75°	751	✓	✓	✓	✓	✓	42db	20db	0845
	11/10/85	0850	45°	451	✓	✓	✓	✓	✓	38db	18db	0950
	11/10/85	1330	80°	801	✓	✓	✓	✓	✓	40db	18db	1555
	11/10/85	1700	70°	703	✓	✓	✓	✓	✓	36db	16db	1745
	12/10/85	0730	38°	381	✓	✓	✓	✓	✓	40db	20db	0850
	12/10/85	1430	80°	801	✓	✓	✓	✓	✓	40db	18db	1735
	13/10/85	0740	45°	451	✓	✓	✓	✓	✓	40db	18db	0945
	13/10/85	1035	38°	381	✓	✓	✓	✓	✓	40db	20db	1215
				—								

* Tick to indicate satisfactorily completed

Operator Signature
UT Form 1

J. McDowns

DISC BORE INSPECTION

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe		Equipment Serial		Beam Path	Echo Amplitude		Grass
	Angle	Ident	5233	5959	Distance (mm)	MAX % F.S.H. HEIGHT @ 80%	dB @ 80%	Level (%)
9/10/85	80°	801		✓	680	50%	80db	18%
10/10/85	75°	751		✓	870	50%	80db	15%
11/10/85	75°	751		✓	870	60%	80db	11%
11/10/85	45°	451		✓	820	80%	80db	15%
11/10/85	80°	801		✓	680	50%	80db	15%
11/10/85	70°	703		✓	720	80%	74db	10%
12/10/85	38°	381		✓	820	55%	80db	15%
12/10/85	80°	801		✓	680	50%	80db	15%
13/10/85	45°	451		✓	830	80%	78db	15%
13/10/85	38°	381		✓	820	80%	80db	10%

Operator Signature

UT Form 2

DISC BORE INSPECTION

SET: UNIT #3

ROTOR & IDENT: LP- DF-

INDICATION RECORD - para. 4.7

I = INLET
D = DISCHARGE
F = FRONT/STEAM END
R = REAR/GENERATOR END

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore	Distance from Inlet	Distance from Exh.	MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR

Operator Signature

UT Form 3

DOWEL HOLE INSPECTION

EQUIPMENT AND SCANNING CALIBRATION - para. 5.2

SET: UNIT #3

ROTOR & IDENT: LP-3

Dowel Hole Calibration Block
F = FRONT / STEAM END
R = REAR / GENERATOR END
D = DISCHARGE
I = INLET

Date	Time	Rotor Rotation	Dowel Hole Ident Stage	Flow	Face	Equipt Serial	Probe Angle	Probe Ident	Probe Beam *	Probe Index Pt * +	Time Base Calibration *	Scanning Calibration % FSH/dBs 12	Scanning Calibration % FSH/dBs 6	Grass Level (%) 12	Grass Level (%) 6	Beam Path (mm) 12	Beam Path (mm) 6	Final Cal. Check	
10/10/85	1245	0°	7-8	F	D-I	5959	60°	115227	✓	✓	✓	80%/44db	80%/44db	5%	10%	140	446	1600	(CRANE NOT OPERATIONAL SINCE 1300)
			5-6	F	D-I														
			2-3	F	D-I														
			Re-1	R	--I														
			4-5	R	I-D														
			6-7	R	I-D														
12/10/85	0900	180°	6-7	F	D-I	5959	60°	115227	✓	✓	✓	80%/44db	80%/44db	5%	15%	140	446		
			4-5	F	D-I														
			Re-1	F	--I							80%/44db	80%/44db	5%	15%	140	446	1425	(WAITING CRANE RECALIBRATE @ 1300)
			2-3	R	I-D														
			5-6	R	I-D														
			7-8	R	I-D														

* Tick to indicate satisfactorily completed
+ Check daily before use

Operator Signature
UT Form 4

DOWEL HOLE INSPECTION

INDICATION RECORD - para. 5.4

SET: UNIT #3

ROTOR & IDENT: LP-3

Dowel Stage	Hole Ident Flow	Hole Ident Face	Scan CW or CCW	Probe Angle	Probe mHz	Index Pt to CL of Hole	Beam Path	Amplitude % FSH	Probe Movement (max amplitude) X axis	Probe Movement (max amplitude) Y axis	Grass Level	Calibrated Gain Reading

Operator Signature

Date

UI Form 5

DISC BORE INSPECTION

TURBINE ROTOR No. LP 3 - UNIT #3

EQUIPMENT CALIBRATION CHECK - para. 4.2 PRATT

IIW A2 Block

Equipment Serial No. 5959 PF 146158

INITIALS	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm B (dBs)	100mm	FINAL CALIBRATION INCLUDING FORM UT2 COLUMN #7
	9OCTBS	22.31	30°	301	✓	✓	✓	✓	✓	28dB	10dB	
	11	23:20	30°	301	✓	✓	✓	✓	✓	28dB	10dB	01:42
	10OCTBS	02:00	65°	651	✓	✓	✓	✓	✓	36dB	16dB	
	11	04:01	65°	651	✓	✓	✓	✓	✓	36dB	16dB	CABLE CHANGE/05:38
	11	21:20	30°	301	✓	✓	✓	✓	✓	26dB	10dB	
	11	23:00	30°	301	✓	✓	✓	✓	✓	28dB	10dB	00:35
	11OCTBS	01:20	65°	651	✓	✓	✓	✓	✓	36dB	16dB	
	11	04:17	65°	651	✓	✓	✓	✓	✓	36dB	16dB	05:38
	11	18:50	30°	301	✓	✓	✓	✓	✓	26dB	10dB	
	11	22:53	30°	301	✓	✓	✓	✓	✓	26dB	10dB	00:39
	12OCTBS	00:45	65°	651	✓	✓	✓	✓	✓	36dB	16dB	
	11	02:50	65°	651	✓	✓	✓	✓	✓	36dB	16dB	04:32
	11	04:50	38°	381	✓	✓	✓	✓	✓	42dB	22dB	05:56
	11	18:50	30°	301	✓	✓	✓	✓	✓	28dB	12dB	21:01
	11	22:00	65°	651	✓	✓	✓	✓	✓	36dB	16dB	02:00
				—								

* Tick to indicate satisfactorily completed

Operator Signature
UT Form 1

DISC BORE INSPECTION

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe Angle	Probe Ident	Equipment Serial 5233	Equipment Serial 5959	Beam Path Distance (mm)	Echo Amplitude MAX HEIGHT @ BORE % F.S.H.	Echo Amplitude dB @ 80%	Grass Level (.)
9 OCT 85	30° *	301		✓	930	65%	8dB	20%
10 OCT 85	65°	651		✓	780	80%	14dB	10%
"	65°	651		✓	780	80%	14dB	15% CABLE CHANGE
"	30° *	301		✓	930	65%	8dB	20%
"	65°	651		✓	780	80%	14dB	15%
11 OCT 85	30° *	301		✓	930	60%	8dB	20%
12 OCT 85	65°	651		✓	780	60%	14dB	15%
"	38°	381		✓	820	80%	16dB	15%
"	30° *	301		✓	930	65%	8dB	20%
"	65°	651		✓	780	80%	14dB	10%

-*- 1-2 FRCAT 5 SCANNED AT -6dB (14dB) DC TC
3-4 REAR 5 HIGH NOISE LEVEL ATTRIBUTED TO GRAIN STRUCTURE

Operator Signature
UT Form 2 [signature]

DISC BORE INSPECTION

INDICATION RECORD - para. 4.7

I = INLET
D = DISCHARGE
F = FRONT/STEAM END
R = REAR/GENERATOR END

SET: UNIT #3

ROTOR & IDENT: LP-3 DF-

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore	Distance from Inlet	Distance from Exh.	MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR
1-2	R	NA	17°	CW	5959	36°	361	90%	20%	590	NA	25	75	169	223	234	C° + 405 MM
B	R	I	330°	CW	5959	65°	651	70%	10%	400	120	10	10	213	214	456	270° + 730 MM
7	F	D	215°	CCW	5959	36°	381	60% +6dB	30%	410	NA	20	65	12	460	46	180° + 460 MM

Operator Signature
UT Form 3 [signature]

DISC BORE INSPECTION

TURBINE ROTOR No. LP-3 (UNIT #3)

EQUIPMENT CALIBRATION CHECK - para. 4.2 MARKS

IIW A2 Block

Equipment Serial No. 5233 PF146158

INITIALS	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm B (dBs)		FINAL CALIBRATION INCLUDING FORM UT2 COLUMN #7
KBM	9/10/85	1500	80°	803	✓	✓	✓	✓	✓	48db	22db	1735
	10/10/85	0615	38°	382	✓	✓	✓	✓	✓	40db	22db	0752
	10/10/85	0800	45°	452	✓	✓	✓	✓	✓	40db	24db	1015
	11/10/85	0650	80°	803	✓	✓	✓	✓	✓	48db	22db	0745
	11/10/85	0750	70°	702	✓	✓	✓	✓	✓	38db	20db	0915 +2db
	11/10/85	0925	38°	382	✓	✓	✓	✓	✓	40db	22db	1015
	11/10/85	1300	80°	803	✓	✓	✓	✓	✓	46db	22db	1605
	11/10/85	1700	70°	702	✓	✓	✓	✓	✓	38db	20db	1750
	12/10/85	1400	80°	803	✓	✓	✓	✓	✓	46db	24db	1740
	13/10/85	0730	75°	751	✓	✓	✓	✓	✓	44db	20db	1045 +2db
	13/10/85	1100	38°	382	✓	✓	✓	✓	✓	42db	20db	1200

* Tick to indicate satisfactorily completed

P J Brooks
Operator Signature
UT Form 1

DISC BORE INSPECTION

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe Angle	Probe Ident	Equipment Serial 5233	Equipment Serial 5959	Beam Path Distance (mm)	Echo Amplitude MAX % F.S.H. HEIGHT @ BOM	Echo Amplitude dB @ 80%	Grass Level (%)
9/10/85	80°	803	✓		680	55%	80db	15%
10/10/85	38°	382	✓		820	50%	80db	20%
10/10/85	45°	452	✓		820	60%	80db	10%
11/10/85	80°	803	✓		680	50%	80db	10%
11/10/85	70°	702	✓		720	80%	76db	10%
11/10/85	38°	382	✓		820	80%	80db	15%
11/10/85	80°	803	✓		680	55%	80db	10%
11/10/85	70°	702	✓		720	80%	76db	10%
12/10/85	80°	803	✓		680	55%	80db	10%
13/10/85	75°	751	✓		870	80%	80db	15%
13/10/85	38°	382	✓		820	80%	80db	10%

Operator Signature

UT Form 2

DISC BORE INSPECTION

SET: UNIT #3

ROTOR & IDENT: LP. DF-

INDICATION RECORD - para. 4.7

I = INLET
D = DISCHARGE
F = FAUST/STEAM END
R = REAR/GENERATOR END

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore	Distance from Inlet	Distance from Exh.	MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR
5	F	I	11°	CCW	5233	80°	803	100%	15%	360	260	30MM	20MM	337	180	137	0° + 195MM

Operator Signature
UT Form 3

DOWEL HOLE INSPECTION

EQUIPMENT AND SCANNING CALIBRATION - para. 5.2

SET: UNIT #3

ROTOR & IDENT: LP-3

Dowel Hole Calibration Block
F = FRONT / STEAM END
R = REAR / GENERATOR END
D = DISCHARGE
I = INLET
Re = ROTOR

Date	Time	Rotor Datum	Dowel Hole Stage	Flow	Ident Face	Equipt Serial	Angle	Probe Ident	Probe Beam *	Probe Index Pt *	Time Base Calibration *	30 O'clock Position Scanning Calibration % FSH/dBs		30 O'clock Position Grass Level (%)		Beam Path (mm)		Final Cal. Check
												12	6	12	6	12	6	
12/10/85	1030	0°	7-8	F	D-I	5233	0°	CD-1	NA	—	100MM	80%/74db		5%	—	—	—	1145
			5-6	F	D-I													
			2-3	F	D-I													
			Re-1	R	--I													
			4-5	R	I-D													
			6-7	R	I-D													
												80%/64db		10%/74db		—	—	0945
12/10/85	0745	180°	6-7	F	D-I	5233	180°	CD-1	NA	—	100MM							
			4-5	F	D-I													
			Re-1	F	--I													
			2-3	R	I-D													
			5-6	R	I-D													
			7-8	R	I-D													

* Tick to indicate satisfactorily completed
+ Check daily before use

F. J. Mackie
Operator Signature
UT Form 4

DOWEL HOLE INSPECTION

SET: UNIT #3

ROTOR & IDENT: LP-3

INDICATION RECORD - para. 5.4

F = FRONT/STEAM END

D = DISCHARGE

Dowel Stage	Hole Ident Flow	Face	Scan CW or CCW	Probe Angle	mHz	Index Pt to CL of Hole	Beam Path (MM)	Amplitude % FSH	Probe Movement (max amplitude) X axis	Y axis	Grass Level	Calibrated Gain Reading
7	F	D	NA	0°	5	12 MM	77MM	80% +6db	0	20MM	5%	68 (74 @ 100% FSH)

Operator Signature

Date

UI Form 5

DISC BORE INSPECTION

TURBINE ROTOR No. LP3 UNIT 3

Equipment Serial No. 5233

EQUIPMENT CALIBRATION CHECK - para. 4.2 NORCROSS

IIW A2 Block

PF 146158

INITIALS	Date	Time	Probe Angle	Probe Ident	Beam Angle *	Index Point *	Time Base Linearity *	Time Base Calibration *	Amplifier Linearity *	Calibrated Gain Control Reading 1.5mm Ø (dBs) 100mm		FINAL CALIBRATION INCLUDING FORM UT2 COLUMN 4.7
	9 Oct 85	22 00	80°	803	✓	✓	✓	✓	✓	46dB	22dB	01·56
	10 Oct 85	02·30	70°	702	✓	✓	✓	✓	✓	38dB	18dB	05·40
	10 Oct 85	20·30	80°	803	✓	✓	✓	✓	✓	46dB	22dB	
	11 Oct 85	00·30	80°	803	✓	✓	✓	✓	✓	46dB	22dB	
	11 Oct 85	03 30	80°	803	✓	✓	✓	✓	✓	46dB	22dB	05·40
	11 Oct 85	19·00	75°	751	✓	✓	✓	✓	✓	46dB	20dB	
	11 Oct 85	22·30	75°	751	✓	✓	✓	✓	✓	46dB	20dB	02·00
	12 Oct 85	03·00	45°	451	✓	✓	✓	✓	✓	40dB	20dB	05·00
	12 Oct 85	18·30	70°	702	✓	✓	✓	✓	✓	36dB	18dB	22·30
	12 Oct 85	23·00	75°	751	✓	✓	✓	✓	✓	44dB	20dB	03·00
				–								

* Tick to indicate satisfactorily completed

P Norcross

Operator Signature

UT Form 1

DISC BORE INSPECTION

INITIAL SCANNING CALIBRATION - para. 4.3

Disc Bore Calibration Block

Date	Probe Angle	Probe Ident	Equipment Serial 5233	Equipment Serial 5959	Beam Path Distance (mm)	Echo Amplitude % F.S.H. Max Height Bore	Echo Amplitude % F.S.H. dB @ 80%	Grass Level (...)
9/10/85	80°	803	✓		680	55%	80dB	15%
10/10/85	70°	702	✓		720	80%	76dB	15%
10/10/85	80°	803	✓		680	60%	80dB	15%
11/10/85	75°	751	✓		860	60%	80dB	15%
11/10/85	45°	452	✓		820	60%	80dB	15%
12/10/85	70°	702	✓		720	80%	76dB	15%

Operator Signature

UT Form 2

DISC BORE INSPECTION

SET: UNIT #3

ROTOR & IDENT: LP-3 PF-

INDICATION RECORD - para. 4.7

I = INLET
D = DISCHARGE
F = FRONT/STEAM END
R = REAR/GENERATOR END

Stage	Flow	Face	Circumfl Position	Scan CW/CCW	Equipt Serial	Probe Angle	Probe Ident	Amplitude % F.S.H.	Grass Level (%)	Beam Path (MM)	Hub to Index Pt. (MM)	Probe Movement (MM) (max amp) X axis	Probe Movement (MM) (max amp) Y axis	Distance from Bore	Distance from Inlet	Distance from Exh.
7	R	D	25°	CCW	5233	80°	803	80%	20%	530	145	8	10	59	392	103
7	R	I	25°	CW	5233	80°	803	100%	20%	625	195	20	20	11	108	407
8	F	D	78°	CW	5233	70°	702	40%	15%	710	205	5	5	0	444	226
5	F	I	325°	CCW	5233	80°	803	60%	20%	650	230	5	8	19	160	160
* 8	F	I	313°	CCW	5233	80°	803	80%+4dB	10%	500	190	15	10	172	225	540
* 1-2	R	D	295°	CW	5233	80°	803	80%+1dB	15%	470	250	5	5	148	276	194
8	R	D	212°	CCW	5233	75°	751	80%+1dB	20%	500	140	10	20	125	520	150

MEASUREMENTS IN MM FROM QUADRANT DEGREE MARKS ON ROTOR

* MULTIPLE INDICATIONS

Operator Signature
UT Form 3

DOWEL HOLE INSPECTION

EQUIPMENT AND SCANNING CALIBRATION - para. 5.2

Dowel Hole Calibration Block

SET: UNIT 3

ROTOR & IDENT: LP3

Date	Time	Rotor Datum	Dowel Hole Ident Stage	Flow	Face	Equipt Serial	Angle	Probe Ident	Probe Beam *	Probe Index Pt *	Time Base Calibration *	Scanning Calibration % FSH/dBs	Grass Level (%)	Beam Path (mm)	Final Cal. Check
												12 6	12 6	12 6	
10/10/85	19.00	0	7-8	F	D+I	5959	60°	115227	✓	✓	✓	88 46	10	450	19.30
			5-6	F	D+I										
			2-3	F	D+I										
			1	R	I										
			4-5	R	I+D										
			6-7	R	I+D										

* Tick to indicate satisfactorily completed
• Check daily before use

Operator Signature

UT Form 4

DOWEL HOLE INSPECTION

INDICATION RECORD - para. 5.4

SET:

ROTOR & IDENT:

Dowel Stage	Hole Ident Flow	Face	Scan CW or CCW	Probe Angle	mHz	Index Pt to CL of Hole	Beam Path	Amplitude % FSH	Probe Movement (max amplitude) X axis	Y axis	Grass Level	Calibrated Gain Reading

Operator Signature

Date

UT Form 5