WNP-2 PRESERVICE INSPECTION PROGRAM PLAN

PROCEDURES

Volume 3

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Washington Public Power Supply System
Richland, Washington 99352

Date 1/8/79
Revision 0

WNP-2 PSI PROGRAM PLAN

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WNP-2 PSI PROGRAM PLAN

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Lambert • MacGill • Thomas, Inc. Testing • Engineering • Service • Training 771 East Brokaw Road San Jose, Ca. 95112 408-297-8766	PROC. UTP-40 PAGE 1 FOLLOWING PAGES 2 REVISION 0 DATE 12/23/80

TITLE: REMOTE ULTRASONIC EXAMINATION OF REACTOR PRESSURE VESSEL BOTTOM HEAD WELDS

I. PURPOSE AND SCOPE

A. Purpose

1. This procedure provides instructions for the assembly, checkout, and general operation of the ultrasonic system for conducting remote ultrasonic examinations of the Reactor Pressure Vessel Longitudinal and Circumferential Welds.

2. The instructions provided implement the requirements of Section XI, ASME Boiler and Pressure Vessel Code, 1974 edition, Summer 1975 addenda.

B. Scope

1. This procedure is applicable to the ultrasonic system used with the remotely operated mechanical examination device to conduct the longitudinal and circumferential weld examinations.

2. Assembly and operating instructions for the remotely operated device are contained in Procedure UTP-47, "Pole Guided Examination Device Assembly and Operating Procedure."

QUALIFICATION:

Approved for use J. J. Lambert 1/2/81

D B MacGill Level III 1-2-81

I. B. 3. Instructions for the assembly and operation of the remote automatic ultrasonic data recording system are contained in Procedure UTP-42, "Remote Automatic Ultrasonic Data Recording."

4. Volumetric examinations shall be performed using ultrasonic angle and straight beam techniques, as follows:

a) Base metal through which sound will pass shall receive a 0° longitudinal beam examination to detect reflectors which may interfere with the angle beam examinations;

b) All welds and one-half t of the base metal beyond each edge of the weld shall receive a 45° and 60° angle beam exanination, and a 0° straight beam examination;

c) Other angles may be used where wall thickness or geometric configuration impedes effective use of 45° and 60° angle beam examination.

d) The extent of straight and angle beam scanning is defined in the Scan Plan sections appropriate to the specific area to be examined.

II. REFERENCES

A. Applicable Code Editions

1. This procedure complies with the requirements of the 1974 edition of ASME Boiler and Pressure Vessel Code, Section XI, Summer 1975 addenda.

B. Supplemental References

1. SNT-TC-1A (June 1975), "Recommended Practice for the Establishment of Personnel Qualification and Certification Programs."
2. LMT, Inc. Procedure QA-6, "Qualification and Certification of NDE Personnel."
3. LMT, Inc. Operating and Quality Assurance Manual, Revision 12, approved for the WNP-2 Preservice Inspection by WPPSS.

III. DEFINITIONS

Beam Direction:	Orientation of ultrasonic beam relative to vessel axis, independent of scan direction.
Controller:	Electronic device controlling mechanical system motor direction and/or speed. May indicate relative position via multi-digit readout.
Index Movement: (Increment)	Module movement (distance moved) between scans.

III.	Module, Search Unit:	Search unit cluster including shoes, wedges, holding framework, couplant supply manifold.
	Scan Direction:	Motion of search unit module relative to vessel axis, independent of beam direction.
	X-axis:	Circumferential axis of head.
	Y-axis:	Meridional axis of head.
	T:	Calibration block thickness.
	t:	Weld thickness.

IV. RESPONSIBILITY

A. The Technical Manager, LMT, Inc. is responsible for the generation and control of this procedure and shall so indicate by a dated signature on the procedure cover sheet.

B. The responsible Level III Field Supervisor, LMT, or his designated Level III alternate, LMT, shall qualify the procedure for a particular examination.

V. PROCEDURE QUALIFICATION

This procedure shall be qualified for specific examinations, personnel, and equipment by performing and documenting a successful calibration.

VI. PERSONNEL REQUIREMENTS

A. Examiners using this procedure shall have levels of qualifications as per the Procedure Qualification.

B. Personnel operating the Pole Guided Device device shall be qualified on the equipment and so certified by an authorized LMT Level III examiner.

1. For each shift of operation, the examination team shall consist of at least the following personnel:

a) Coordinator/supervisor: Coordinate efforts of individual team members and efforts of the examination team with the owner and appropriate on-site crafts.

b) Console operator: Operate controllers, record necessary data for completion of scan data sheets. Conduct and verify functional checks of mechanical system.

c) Observer: Stationed at device location to observe operation of device, warn of pending obstruction, malfunction, etc.

d) Ultrasonic operator: Perform examination calibration, enter appropriate information on strip chart recordings, verify proper operation of ultrasonic system. Certified to at least Level II Ultrasonic.

VI. B. 2. Team personnel may perform the above duties on a rotational basis, provided adequate cross training and certification levels are existent.

VII. EQUIPMENT AND MATERIALS

A. System Description

1. The Ultrasonic and Data Acquisition System consists of three (3) Nortec NDT-131D ultrascopes, a digital-to-analog converter, and an eight (8) channel direct writing strip chart recorder.

2. The ultrascopes have been modified for rack mounting and remote "slave" display of each instruments' CRT presentation.

3. The BCD data output from the mechanical system controllers is converted to analog form by the digital-to-analog converter and input to the strip chart recorder.

4. The eight channel strip chart recorder provides a permanent record of range and amplitude data of received ultrasonic signals (channels 1-6) and the X and Y axis location of the device during each scan (channels 7 and 8).

B. Instrumentation Requirements

1. The NDT-131D ultrascopes shall meet the following performance criteria:

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VII. B. 1. a) Vertical linearity (screen height) within ±5% of full screen, for at least 80% of the total screen height.

b) Amplitude control accurate over its useful range to ±20% of the nominal amplitude ratio.

2. The NDT-131D ultrascopes shall have their internal alignment and calibration verified within 90 days prior to use.

a) Records of internal alignment and calibration verification shall be available at the jobsite for WPPSS audit.

3. The digital-to-analog converter shall meet the following performance criteria:

a) Repeat SwRI controller readout (last four digits) 0000 through 9999, ±0 counts.

b) Analog voltage output proportional to BCD input at the rate of 100 counts/volt, ±0.01 v and 1000 counts/volt, ±0.01 v, switch selectable.

4. The direct writing analog strip chart recorder shall meet the following performance criteria:

a) Frequency response at 40 mm - dc to 60 Hz, ±1 division.

b) Frequency response at 10 divisions amplitude - dc to 125 Hz, ±1 division.

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VII. B. 4. c) Non linearity may not exceed 0.35% of full scale.

5. The strip chart recorder shall have its internal alignment and calibration verified within 180 days prior to use.

   a) Records of internal alignment and calibration verification shall be available at the jobsite for WPPSS audit.

C. <u>Search Unit and Wedge Requirements</u>

1. Search unit essential properties shall be certified by the manufacturer, including bandwidth, damping, center frequency within 10% of nominal, and relative gain.

   a) A record of search unit properties shall be available at the jobsite for WPPSS audit.

2. Wedges shall yield refracted angles of 45°, ±2°, and 60°, ±3°, to be acceptable for use.

   a) Refracted angles shall be determined in the calibration block daily, prior to use, as instructed Procedure in UTP-14.

   b) Other angles may be used for evaluation and shall be within ±3° of the nominal wedge angle.

3. The results of examinations performed with angle beam search units which meet the above requirements are acceptable provided the search unit beam angle on subsequent checking is within ±3° of nominal.

VII. C. 3. Should this tolerance not be met on subsequent checking, determination of the need for re-examination shall be made and the basis for the decision documented.

4. Search units shall be 0.75 inch diameter with a central frequency of 2.25 MHz, ±10%.

   a) Search units of other sizes and/or frequencies may be used for evaluation and/or in unusual circumstances. Such use shall be documented by an approved Field Change to this procedure in accordance with the requirements of LMT Procedure QA-5.

D. Couplant

1. Couplant used to conduct examinations governed by this procedure shall be "reactor grade" deionized water.

2. Wetting agents such as Kodak "Photo-flo" may be added to improve coupling efficiency.

E. Calibration Blocks

1. Calibration blocks shall be of the form and dimensions of Figures 1a) through 1 d).

2. Select the appropriate calibration block for a specific longitudinal or circumferential weld examination according to Table 1.

VII. E. 2. CALIBRATION BLOCKS

WELD	DESCRIPTION	CAL BLOCK
AA	Bottom Head to No. 1 Shell Course Circ. (from Bottom Head Side)	UT-118
AA	Bottom Head to No. 1 Shell Course Circ. (from No. 1 Shell Course Side)	UT-119
AB	No. 1 to No. 2 Shell Course Circ (from No. 1 Shell Course Side)	UT-119
AB	No. 1 to No. 2 Shell Course Circ. (from No. 2 Shell Course Side)	UT-120
AC	No. 2 to No. 3 Shell Course Circ.	UT-120
AD	No. 3 to No. 4 Shell Course Circ. (from No. 3 Shell Course Side)	UT-120
BA	No. 1 Shell Vertical 45°	UT-119
BB	No. 1 Shell Vertical 135°	UT-119
BC	No. 1 Shell Vertical 225°	UT-119
BD	No. 1 Shell Vertical 315°	UT-119
BE	No. 2 Shell Vertical 10°	UT-120
BF	No. 3 Shell Vertical 100°	UT-120
BG	No. 2 Shell Vertical 190°	UT-120
BH	No. 2 Shell Vertical 280°	UT-120
BJ	No. 3 Shell Vertical 50°	UT-120
BK	No. 3 Shell Vertical 170°	UT-120
BM	No. 3 Shell Vertical 290°	UT-120
BP	No. 4 Shell Vertical 90°	UT-121
BR	No. 4 Shell Vertical 210°	UT-121
BN	No. 4 Shell Vertical 330°	UT-121

Table 1

VIII. PREPARATIONS

A. Documentation

1. The following documentation shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before beginning any examination program:
   a) Procedure and Qualification
   b) Calibration Reports
   c) Examination Reports
   d) Material and Equipment Certifications
   e) Personnel Certifications
   f) Status Indicators (Hold tags)

B. Physical

1. The following physical preparation requirements shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before specific examinations are performed:
   a) Insulation removal
   b) OSHA requirements (ladders, lighting, fresh air, etc.)
   c) Cleanup requirements
   d) Safety precautions
   e) Electrical outlets - 110-120v AC, 30 amp, single phase, minimum of two (2) required.
   f) Air or nitrogen supply.

VIII. C. Surface Preparation

1. Examination surfaces shall be free from weld spatter or any other surface condition which will impede free movement of the search unit module.
2. Examination surfaces shall be free from extraneous materials or other conditions which, in the opinion of the examiner, will impair the performance of a meaningful examination.

IX. LIMITATIONS

This procedure is limited to remotely operated ultrasonic examinations of longitudinal and circumferential welds in the reactor pressure vessel, using contact methods, conducted from the vessel OD surface.

X. ULTRASONIC SYSTEM INTERCONNECTS AND CALIBRATION

A. System Interconnects

1. Refer to the appropriate section of the Scan Plan; connect the search unit cables as directed.
2. Perform the following instrumentation interconnects:

X. A. 2.

Instrument/Output	Cable	Instrument/Input
No. 1 131D/AMP	BNC/Gould No. 1	Strip Chart/Ch 1
No. 1 131D/RANGE	BNC/Gould No. 2	Strip Chart/Ch 2
No. 2 131D/AMP	BNC/Gould No. 3	Strip Chart/Ch 3
No. 2 131D/RANGE	BNC/Gould No. 4	Strip Chart/Ch 4
No. 3 131D/AMP	BNC/Gould No. 5	Strip Chart/Ch 5
No. 3 131D/RANGE	BNC/Gould No. 6	Strip Chart/Ch 6
CONVERTER/X-OUT	BNC/Gould No. 7	Strip Chart/Ch 7
CONVERTER/Y-Z OUT	BNC/Gould No. 8	Strip Chart/Ch 8
220/BCD OUT	MIL/MIL No. 1	CONVERTER/X IN
82100/BCD OUT	MIL/MIL No. 2	CONVERTER/Y-Z IN

B. Calibration, General Requirements

1. Calibration shall be performed on a complete system.

   a) Changes in ultrasonic instrumentation, cables, or search units requires recalibration.

   b) An extension of up to six feet may be added to the search unit cables for calibration purposes, and removed prior to conducting the examination.

      (1) When such extension is used, ultrasonic responses obtained with and without the

X. B. 1. b) (1) extension shall be compared during the first calibration and so noted on the "Report of Ultrasonic Calibration."

c) A change in qualified personnel or recording instrumentation shall require calibration verification.

d) Instrument vertical linearity and amplitude control verifications need not be made with the search unit used for examination.

e) Calibration checks shall be performed before and after each examination and at intervals not to exceed 12 hours.

2. Verify instrument vertical linearity as follows:

a) Position an angle beam search unit on the calibration block to obtain echoes from the T/2 and 3T/4 holes in a 2:1 amplitude ratio.

b) Adjust the amplitude control to position the larger indication at 100% of calibrated scale and note the amplitude of the smaller on the calibration form as estimated to the nearest 1% of screen height.

c) Vary the amplitude control so that the response of the larger signal is successively lowered in 10% increments to 10% of full calibrated scale. At each incremental setting note the response of both indications.

X. B. 2. d) Acceptable instrument alignment is verified when the ratio of the two responses remains two-to-one over the range of amplitude adjustment within 5% of calibrated full scale.

3. Verify the amplitude control accuracy as follows:

a.) Position an angle beam search unit on the calibration block to obtain a peaked echo from the T/2 hole at 80% of full calibrated scale.

b) Adjust the amplitude control to decrease the gain by 6 dB and 12 dB. Note the echo amplitude at each setting. Estimate the amplitude to 1% of full calibrated scale.

c) Adjust the amplitude control to position the T/2 response to 20% of full calibrated scale. Then adjust the amplitude control to increase the gain 12 dB. Record the response as estimated to 1% of full calibrated scale.

d) Adjust the amplitude control to position the T/2 response to 40% of full calibrated scale. Then adjust the amplitude control to increase the gain 6 dB. Note the response as estimated to 1% of full scale.

X. B. 3. e) Acceptable instrument alignment is verified when the responses noted are within the tolerances of Table 2.

Indication Set	Gain Change	Indication Tolerance Limits
80%	-6 dB	32% to 48%
80%	-12 dB	16% to 24%
40%	+6 dB	64% to 96%
20%	+12 dB	64% to 96%

Table 2

f) Instrument alignment shall be verified at the beginning of each day's examinations. Performance of the verification shall be recorded on the Ultrasonic Calibration Record (Figure 2).

4. Calibration shall be performed with the calibration block temperature within 25°F of the component to be examined.

C. <u>Straight Beam Calibration, using Staggered Side Drilled Holes</u>

1. Sweep Range Calibration

a) Measure the distance from the unclad surface of the appropriate calibration block to the edge of the T/4 hole and the thickness of the block. (These dimensions may be obtained from the WPPSS as-built calibration block drawings, Figures 1a), 1b), 1c), and 1d).)

X. C. 1. b) Position the search unit on the calibration block to obtain a signal from the T/4 hole.

c) Adjust the delay control to set the left edge of the signal to the number of divisions equivalent to the distance to the T/4 hole measured in a).

d) Position the search unit on the calibration block to obtain a first back surface reflection.

e) Adjust the range control to set the left edge of the first back reflection to the number of divisions equivalent to the thickness of the block measured in a).

f) Repeat steps b), c), d), and e) until the signal from the T/4 hole and the first back reflection appears at the number of sweep divisions equivalent to the distances obtained in a).

g) At this sweep range calibration each major division of sweep represents one inch of metal path.

2. Sensitivity Calibration

a) Position the 0° search unit for maximum response from the SDH in the appropriate calibration block exhibiting the largest amplitude. See the WNP-2 Program Plan and Figures 1a), 1b), 1c), and 1d) for block selection.

X. C. 2. b) Adjust the amplitude control to set the response amplitude to 80% of FSH.

c) Mark the location of the amplitude peak on the CRT screen.

d) Without further sensitivity adjustment, obtain and mark on the CRT screen the amplitude peak of the remaining staggered side drilled holes.

e) Connect the amplitude peak marks with a smooth curve, extended to cover the examination thickness.

(1) This is the Primary Reference Response (PRR) or Distance Amplitude Correction (DAC) Curve.

(2) The PRR shall terminate when the signal-to-noise ratio becomes less than four.

f) Position the search unit for maximum response from a convenient reflector in a reference standard (Rompas, IIW, etc.). Mark the position on the CRT screen.

g) Transcribe the PRR curve points and the position of the reflector from the reference standard to the Report of Ultrasonic Calibration form, Figure 2, and complete all pertinent data.

X. D. Angle Beam Calibration using In-line Side Drilled Holes

1. Sweep Range Calibration

   a) Position the angle beam search unit for maximum amplitude response from the T/4 SDH in the appropriate calibration block.

   b) Adjust the DELAY control to set the left edge of the T/4 SDH signal to 2.0 sweep divisions.

   c) Position the angle beam search unit for maximum amplitude response from the 3T/4 SDH.

   d) Adjust the RANGE control to set the left edge of the 3T/4 SDH signal to 6.0 sweep divisions.

   e) Repeat steps a) through d), in sequence, as required, until the T/4 and 3T/4 SDH signals appear at 2.0 and 6.0 sweep divisions.

2. Sensitivity Calibration

   a) Position the angle beam search unit on the CLAD SIDE of the block; determine the amplitude difference in dB between the 3T/4 and 5T/4 SDH responses. Record this number for use in step X.D.2.f)(1).

   b) Position the angle beam search unit on the UNCLAD SIDE for maximum response from the SDH exhibiting the largest amplitude.

   c) Adjust the amplitude control to set the response amplitude to 80% of FSH.

X. D. 2. d) Mark the location of the amplitude peak on the CRT screen.

e) Without further sensitivity adjustment, obtain and mark on the CRT screen the amplitude peak of the remaining SDH, except the 5T/4 position.

f) To obtain the amplitude of the 5T/4 SDH, position the angle beam search unit for maximum response amplitude from the 3T/4 SDH.

(1) Decrease the sensitivity control by the dB value obtained in a) above.

(2) Mark this amplitude peak at 10.0 sweep divisions.

(3) Return the amplitude control to the value of 2.c) above.

g) Connect the amplitude peak marks with a smooth curve.

(1) This is the Primary Reference Response (PRR) or Distance Amplitude Correction (DAC) Curve.

(2) The PRR curve shall terminate when the signal-to-noise ratio becomes less than four.

X. D. 2. h) Position the search unit for maximum response from a convenient reflector in a reference standard (Rompas, IIW, etc.). Mark the amplitude peak on the CRT screen.

i) Position the search unit for maximum amplitude response from the far (clad) side square notch.

j) Mark the square notch amplitude peak on the CRT screen.

(1) The square notch signal is to be considered when evaluating planar reflectors perpendicular to the examination surface, at or near the far surface.

k) Transcribe the PRR curve points and the position of the reflector from the reference standard to the Report of Calibration form, Figure 2, and complete all pertinent data.

E. <u>Beam Spread Determination</u>

Perform beam spread determinations according to Procedure UTP-14.

F. <u>Digital Calibrations</u>

1. Straight (0°) Beam

a) Measure the distance from the block surface to the near edge of the T/4 SDH. (This information may be obtained from the WPPSS as-built UT calibration block drawings.)

X. F. 1. b) Measure the block thickness.

c) Depress 1st, 20, SINGLE, SOUNDPATH pushbuttons.

d) Position the 0° search unit for maximum response amplitude from the T/4 hole.

e) Depress and hold the D-1 pushbutton; adjust the D-1 control such that the range gate triggers on the T/4 SDH signal.

f) Adjust the ZERO control to set the digital readout to the distance value obtained in a) above.

g) Position the 0° search unit for maximum response amplitude from the far surface of the block.

h) Adjust the D-1 control such that the RANGE gate triggers on the back surface signal (the far surface of the block).

i) Adjust the CAL control to set the digital readout to the block thickness.

j) Repeat steps d) through i), as required, until the digital readout is correct for each metal path ±0.01 inch.

2. Angle Beam

a) Determine refracted beam angle (θ) according to Procedure UTP-14.

X. F. 2. b) Measure the distance (depth) of the T/4 SDH from the block surface to the hole centerline. (This information may be obtained from the WPPSS as-built UT calibration block drawings.)

c) Measure the block thickness. (This information may be obtained from the WPPSS as-built UT calibration block drawings.)

d) Adjust the OFFSET control to set the "step" in the baseline to sweep division "0".

e) Circulate the metal path to the T/4 SDH and the far notch as follows:

$$\text{Metal path} = \frac{\text{depth}}{\cos\theta}$$

f) Depress 1st, 20, SINGLE, SOUNDPATH, and 45 or 60 pushbuttons, as appropriate.

g) Position the angle beam search unit for maximum response amplitude from the T/4 SDH.

h) Adjust the D-1 control such that the RANGE gate triggers on the T/4 SDH.

i) Adjust the ZERO control to set the digital readout to the calculated metal path value of e) above.

j) Position the angle beam search unit to obtain maximum response amplitude from the far notch.

X. F. 2. k) Adjust the D-1 control such that the RANGE gate triggers on the notch signal.

l) Adjust the CAL control to set the digital readout to the calculated metal path of e) above.

m) Repeat steps g) through l) until the digital readout is correct for each metal path, ±0.01 inch.

G. Strip Chart Recorder Calibration

Calibrate each strip chart recorder channel to the appropriate 131D and digital-to-analog converter output according to Procedure UTP-42.

XI. PERFORMANCE

A. Calibration Verification

1. Calibration shall be performed using the responses of the basic calibration block at the beginning of each day's examination, with any change in test personnel, and at intervals not to exceed 12 hours.
2. Calibration checks shall be performed using the responses of either the basic calibration block or the reference standard before and after each examination, or at intervals not to exceed four (4) hours.
3. Response within 2 dB and 5% of the original amplitude and sweep range values respectively shall be considered proof of calibration. An unacceptable

I. A. 3. calibration check shall be cause for full examination of the test system to determine the reason for the calibration change. Typical causes for calibration change are ambient temperature effects on search units and electronics, control settings inadvertently changed, and loss of couplant between the search unit and wedge. If, in the judgment of the examiner, the cause of the calibration change has been corrected or may be compensated for by a change in control settings, calibration may be restored using the calibration check response. Any examination that has been performed in a noncalibrated condition shall be repeated.

4. Record the time(s) at which verification is performed on the Calibration Report form.

B. Sensitivity

1. Scanning sensitivity shall be two (2) times that of the Primary Reference Response.

2. Penetration of straight beam energy shall be verified by a back surface echo.

C. Coverage (per appropriate Scan Plan)

1. The weld and adjacent base metal for at least t/2 on both sides of the weld shall be scanned with a calibrated straight (0°) beam, from an accessible surface.

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XI. C. 2. The weld and adjacent base metal for at least t/2 on both sides of the weld shall be scanned by 45° and 60° (nominal) angle beams (see Figure 3 and Table 3).

EXAMINATION COVERAGE

Circumferential Welds:

Weld	Thickness	Beam Direction	Distance from Weld Edge: Examination from Bottom Side 45°	Distance from Weld Edge: Examination from Bottom Side 60°	Distance from Weld Edge: Examination from Top Side 45°	Distance from Weld Edge: Examination from Top Side 60°
AA	6.75/9.75	Axial	10.70	16.45	14.63	21.76
		Circ.	3.38	3.38	4.88	4.88
AB	9.75/6.44	Axial	14.63	21.76	9.66	14.37
		Circ.	4.88	4.88	3.22	3.22
AC	6.44/6.56	Axial	9.66	14.37	9.84	14.64
		Circ.	3.22	3.22	3.28	3.28
AD	6.56/7.25	Axial	9.84	14.64	10.88	16.18
		Circ.	3.28	3.28	3.63	3.63

Longitudinal Welds:

Shell Course	Thickness	Beam Direction	Distance from Weld Edge 45°	Distance from Weld Edge 60°
1	9.75	Axial	4.88	4.88
		Circ.	16.8	26.0
2	6.44	Axial	3.22	3.22
		Circ.	10.2	16.0
3	6.56	Axial	3.28	3.28
		Axial Circ.	10.4	16.4
4	7.25	Axial	3.63	3.63
		Circ.	11.5	18.33

Table 3

XI. C. 3. The material through which angle beams pass shall be scanned with a straight beam maintaining a 50% to 80% FSH back reflection amplitude, where practicable.

4. Index movement between scans shall not exceed 75% of the search unit dimension measured perpendicular to the scan direction.

D. Scanning Directions

The angle beams shall be directed perpendicular to the weld in two directions, and in two directions parallel to the weld (CW, CCW).

E. Scan Speed

1. Scan speed shall not exceed four (4) inches per second.

2. Scan speed shall be as specified in Procedure UTP-47.

F. Limitations

Physical and/or other limitations, obstructions, etc., preventing full compliance with XI.C. above shall be recorded on the Examination Report form (Figure 4).

XII. EVALUATION

A. Recordable Indications

1. Any non-geometric indication with an amplitude 20% or greater of the Primary Reference Response level shall be recorded.

XII. A. 1. a) Geometric reflectors greater than 50% of DAC shall be identified and noted on the examination report and strip chart recording.

2. Clad interface and back wall reflections shall not be recorded unless, in the opinion of the examiner, an unusual condition is observed.

3. The extent and location of laminar reflectors found by straight beam scanning (XI.C.3) which may interfere with angle beam examination shall be recorded.

4. Any planar indication exceeding the amplitude of the calibration planar notch shall be recorded.

B. Indication recording is based on the scheme of reference points shown in Figure 5.

1. Depth data shall be obtained from successive scans perpendicular to the indication with a minimum 25% effective transducer width overlap, and data taken between the 20% DAC points.

2. Length data shall be taken between 20% DAC points.

3. Record the following data for each scan perpendicular to the indication:

a) Maximum amplitude, with associated metal path, search unit position and sweep location.

XII. B. 3. b) Twenty percent of DAC points, with associated metal path, search unit position, and sweep locations.

4. Enter the above data on the "Remote Ultrasonic Indication Data Tabulation" form, Figure 6.

C. Evaluation Criteria

1. Any indication exceeding 20% of the Primary Reference Distance Amplitude Curve shall be evaluated by the examiner to determine the extent, size, location and shape of the reflector. These parameters shall be included on the "Notification of Reportable Indication" form, Figure 7, and on the "Ultrasonic Indication Data Tabulation" form, Figure 6.

D. Acceptance Criteria

1. Acceptance criteria contained in paragraph 3410 and 3510 of ASME Section XI, 1974 edition, addenda through Summer 1975, are summarized in the tables drawn in Figures 8 and 9.

XIII. RECORDS

A. A Report of Mechanized Ultrasonic Examination form shall be prepared for each item examined, and each examination report shall be related to the appropriate Report of Ultrasonic Calibration. Typical forms are attached in Figures 2 and 4.

XIII. B. Oscillograph chart records shall be made of all examinations.

1. Chart records shall include pre and post test calibration checks made at the same scanning speed as the examination.
2. Location and pertinent information shall be written on each chart.
   a) Pertinent information includes, but is not limited to, item, date, and start and completion times.

C. Recording Conventions

1. Ultrasonic scans and the location of indications shall be recorded according to the conventions established in Figure 5.

D. Other types of recording devices, such as event or alarm monitoring may be used to aid the examiner where feasible.

XIV. REVIEW

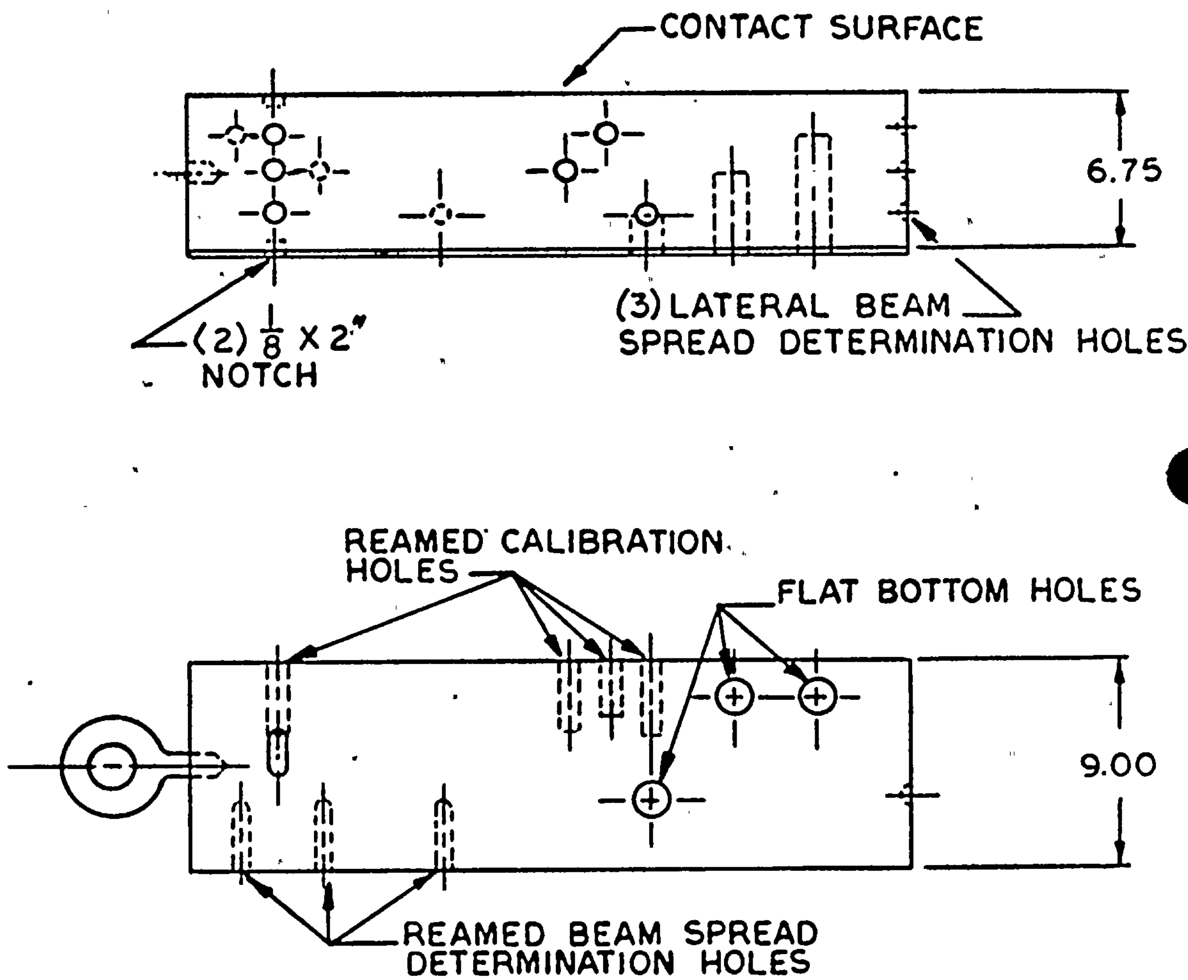
A. Examination reports shall be subject to review by an assigned LMT Level III examiner for conformity to the requirements of this procedure.

1. Following the final LMT review, the reports will be transmitted to the WPPSS ISI Field Coordinator for review by WPPSS and the Authorized Nuclear Inspector.

XV. DOCUMENTATION STORAGE AND DISTRIBUTION

A. Original examination documentation shall become the property of WPPSS upon sign-off by the ISI Field Coordinator. Additional reports which may include examination documentation as reference material shall be generated from copies.

B. Field storage facilities shall provide a safe storage area and access to files shall be limited to the LMT Field Supervisor, his designated representatives, WPPSS representatives, and the Authorized Nuclear Inspector.



UT CALIBRATION BLOCK, UT-118
RPV BOTTOM HD. RADIAL PLATES
(REF DWG: WPPSS-UTCB-206 REV 1)

Figure 1 (a)

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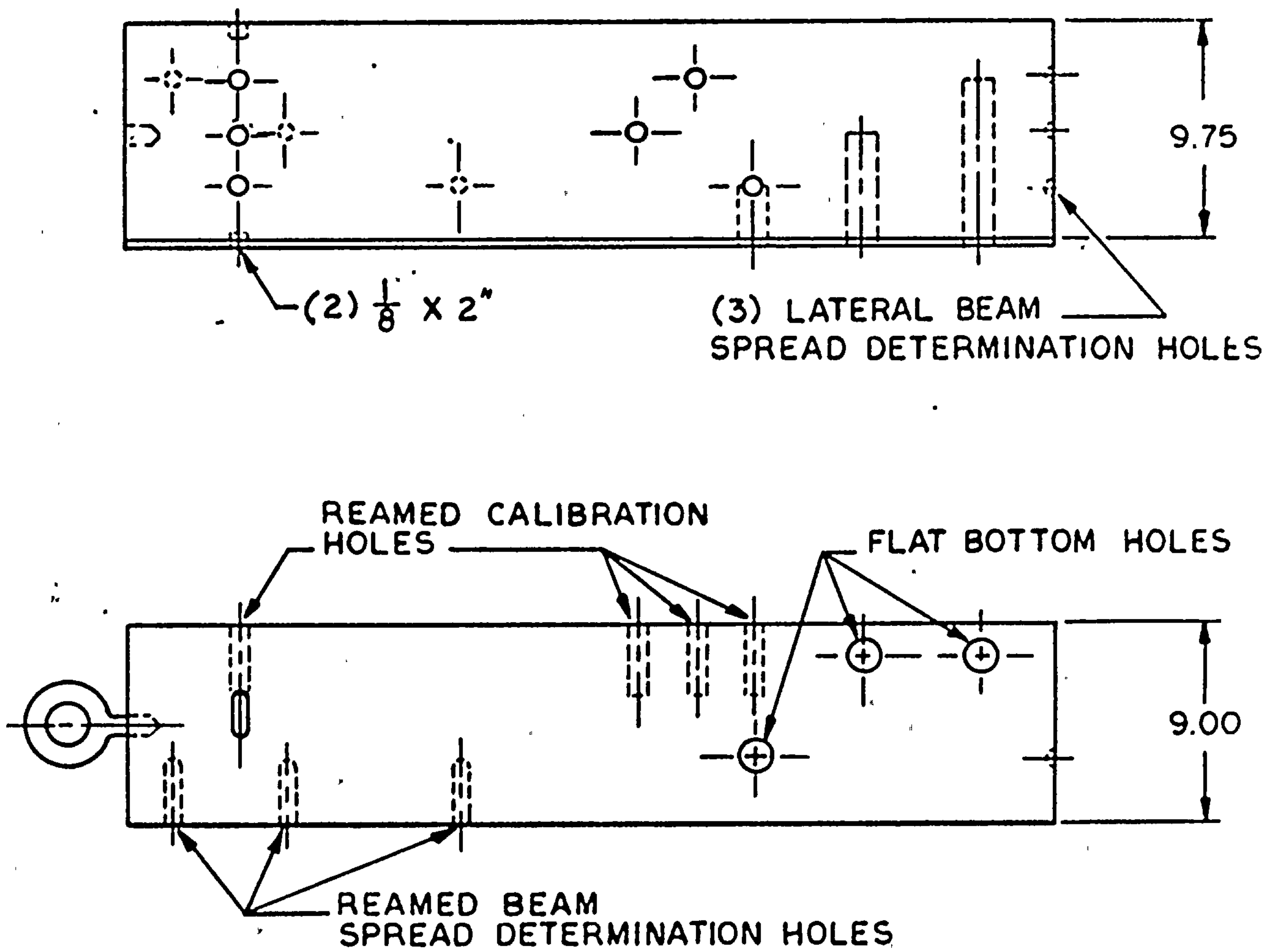

UT CALIBRATION BLOCK, UT-119
RPV #1 SHELL RING
(REF DWG: WPPSS - UTCB-207, REV 1)

Figure 1 (b)

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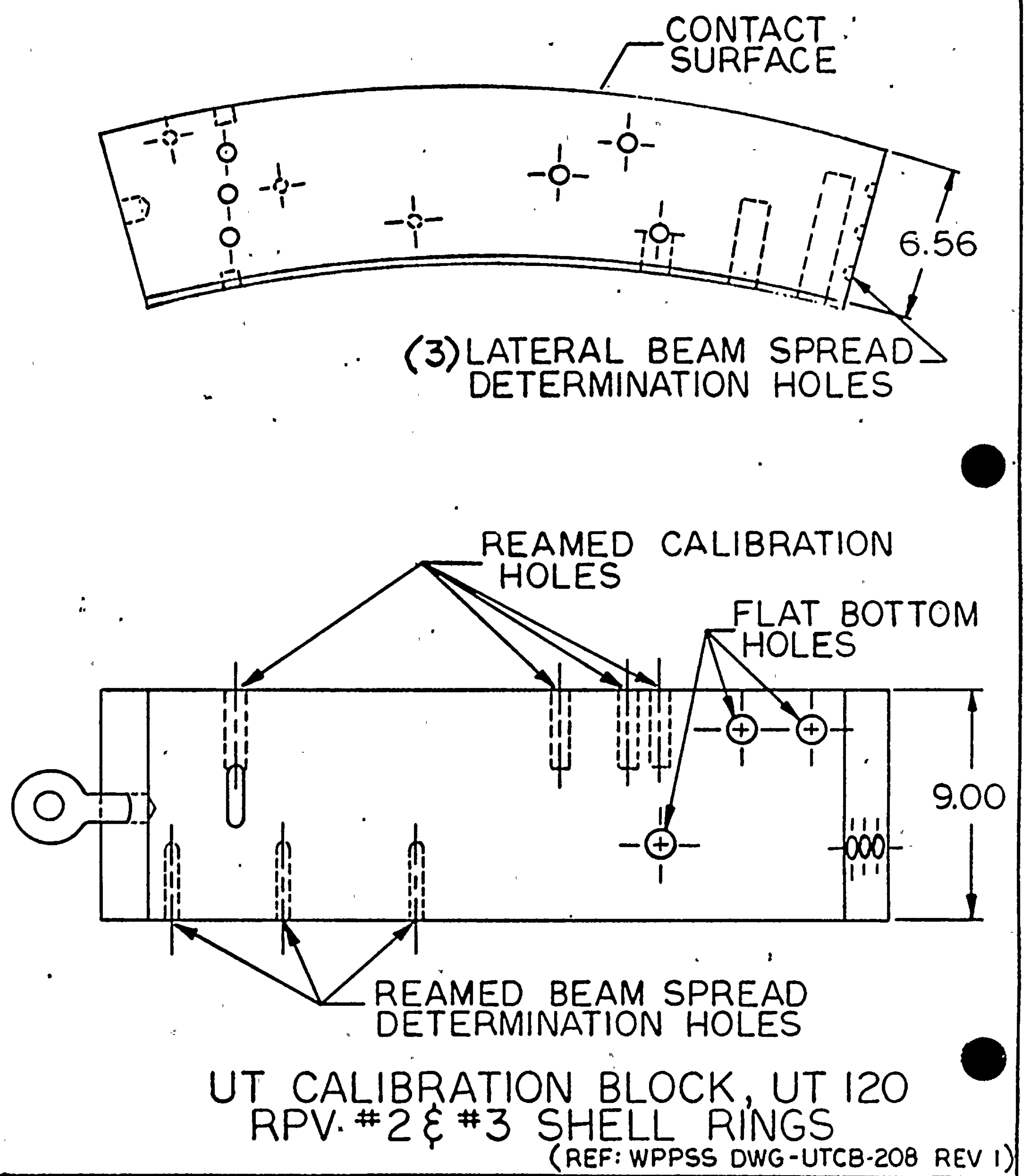
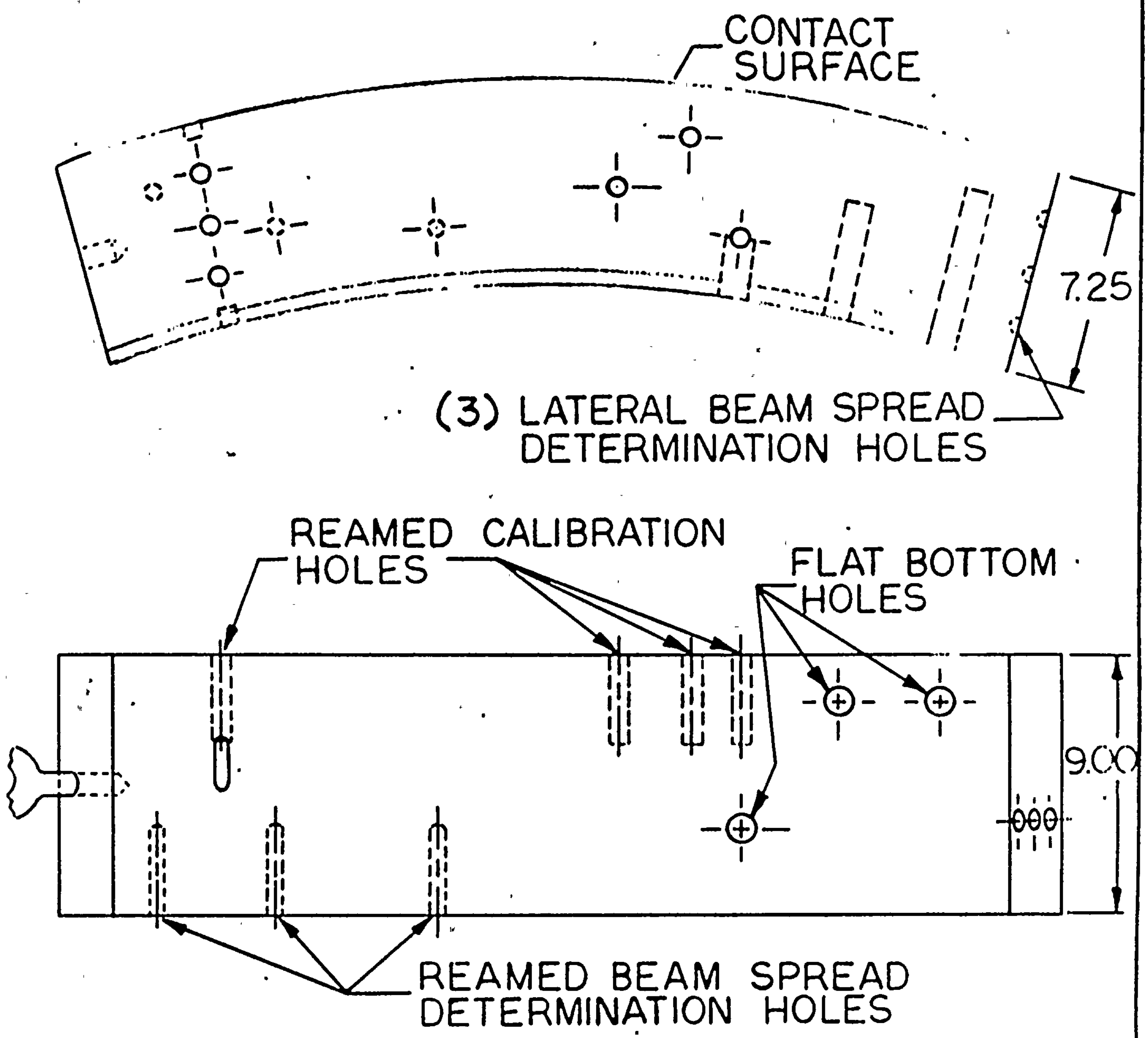


Figure 1 (c)



UT CALIBRATION BLOCK, UT 121
RPV #4 SHELL RING

(REF: WPPSS DWG-UTCB-209 REV 1)

Figure 1 (d)

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Cal. No.________ Time________
Job No.________
Date:________
Page________ of________

REPORT OF ULTRASONIC CALIBRATION

SIGN

Examiner/Level________ Examiner/Level________ Examiner/Level________
Authorized Inspector________ Customer________

EQUIPMENT

Instrument	S/N	Recal Due

Cable________ S/N________
Couplant________
Mech. Device Descr.________

Vertical Linearity Check — Check Completed________

Ref	Signal 1	100	90	80	70	60	50	40	30	20	10
Ch 1	Signal 2										
Ch 2	Signal 2										
Ch 3	Signal 2										

Attenuator Linearity Check — Check Completed________

Ref	Tester Gain	Set	-6	-12	Set	+12	Set	+6
	Signal Amp.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96
Ch 1	Actual Value	80%			20%		40%	
Ch 2	Actual Value	80%			20%		40%	
Ch 3	Actual Value	80%			20%		40%	

Search Units

S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________
S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________
S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________
S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________

PROC

Procedure________ Revision________ Date________

CALIBRATION

Calibration Block Type________ Size________ S/N________ Temp________
Reference Block Type________ S/N________ Temp________

Calibration Check Times:

________(Initial)________ ________ ________ ________ ________ ________(Final)

Figure 2

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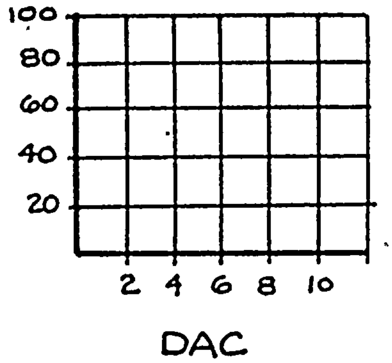
Cal No. ________
Page ____ of ____

REPORT OF ULTRASONIC CALIBRATION (continuation sheet)

Channel 1

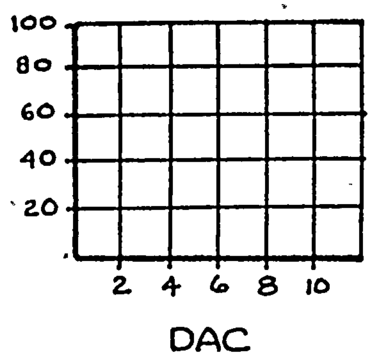
		Refl'r.	Sweep	M.P.	Amp.
Angle	____				
Sens.	____	____	____	____	____
Sweep	____	____	____	____	____
Delay	____	____	____	____	____
Reject	____	____	____	____	____
Damp.	____	____	____	____	____
Freq.	____	____	____	____	____
Filter	____	____	____	____	____
RepRate	____				



STRIP CHART:
Channels ____ ____ Sens. ____ ____
Range Amp. Range Amp.

Channel 2

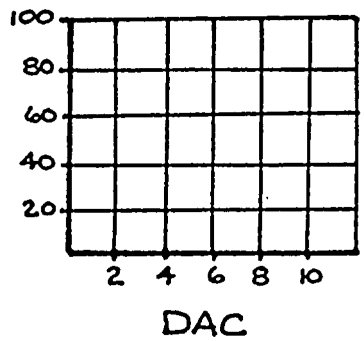
		Refl'r.	Sweep	M.P.	Amp.
Angle	____				
Sens.	____	____	____	____	____
Sweep	____	____	____	____	____
Delay	____	____	____	____	____
Reject	____	____	____	____	____
Damp.	____	____	____	____	____
Freq.	____	____	____	____	____
Filter	____	____	____	____	____
RepRate	____				



STRIP CHART
Channels ____ ____ Sens. ____ ____
Range Amp. Range Amp.

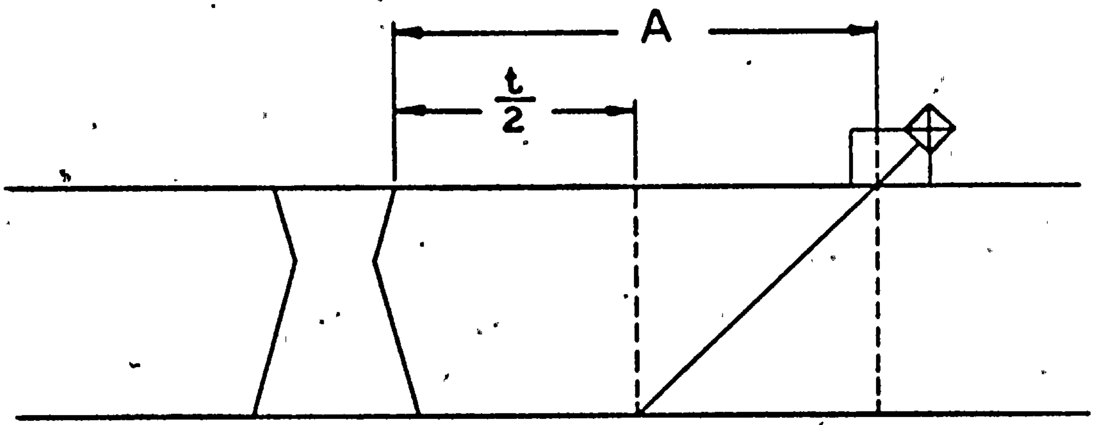
Channel 3

		Refl'r.	Sweep	M.P.	Amp.
Angle	____				
Sens.	____	____	____	____	____
Sweep	____	____	____	____	____
Delay	____	____	____	____	____
Reject	____	____	____	____	____
Damp.	____	____	____	____	____
Freq.	____	____	____	____	____
Filter	____	____	____	____	____
RepRate	____				



STRIP CHART:
Channels ____ ____ Sens. ____ ____
Range Amp. Range Amp.

Figure 2 (con't.)



WELD COVERAGE

Figure 3

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DWG. NO. ______
Report No. ______
Cal.No. ______
Job. No. ______
Date ______
Page ______ of ______

REPORT OF MECHANIZED ULTRASONIC EXAMINATION

ITEM

ISI No. ______ Size ______ Material ______ S/N(s) ______
Description ______
Location ______ Preparation ______ Temp. ______

SIGN

Examiner/Level ______ Examiner/Level ______ Review/Level ______
Authorized Inspector ______ Customer ______

PROC

Calibration Procedure ______ Rev. ______
Examination Procedure ______ Rev. ______
Recording Procedure ______ Rev. ______

EXAMINATION

Sensitivity:	Ref;	Scan
Ch. 1	______dBG	______dBG
Ch. 2	______dBG	______dBG
Ch. 3	______dBG	______dBG

TIME

______ START ______ STOP

Direction	Scan Description	Results*
00	0° Base Metal	
0	0° Weld & HAZ	
1-45	Axial, 45°↑	
1-60	Axial, 60°↑	
2-45	Axial, 45°↓	
2-60	Axial, 60°↓	
3-45	Circ., 45° CW	
3-60	Circ., 60° CW	
4-45	Circ., 45° CCW	
4-60	Circ., 60° CCW	

*NAD = No apparent discontinuities
G = Geometry
L = Linear
S = Spot
LM = Laminar
M = Multiple

Description of Indications

Scan Dir. & No.	Description

Obstructions/Limitations

Scan Dir. & No.	Description

Figure 4

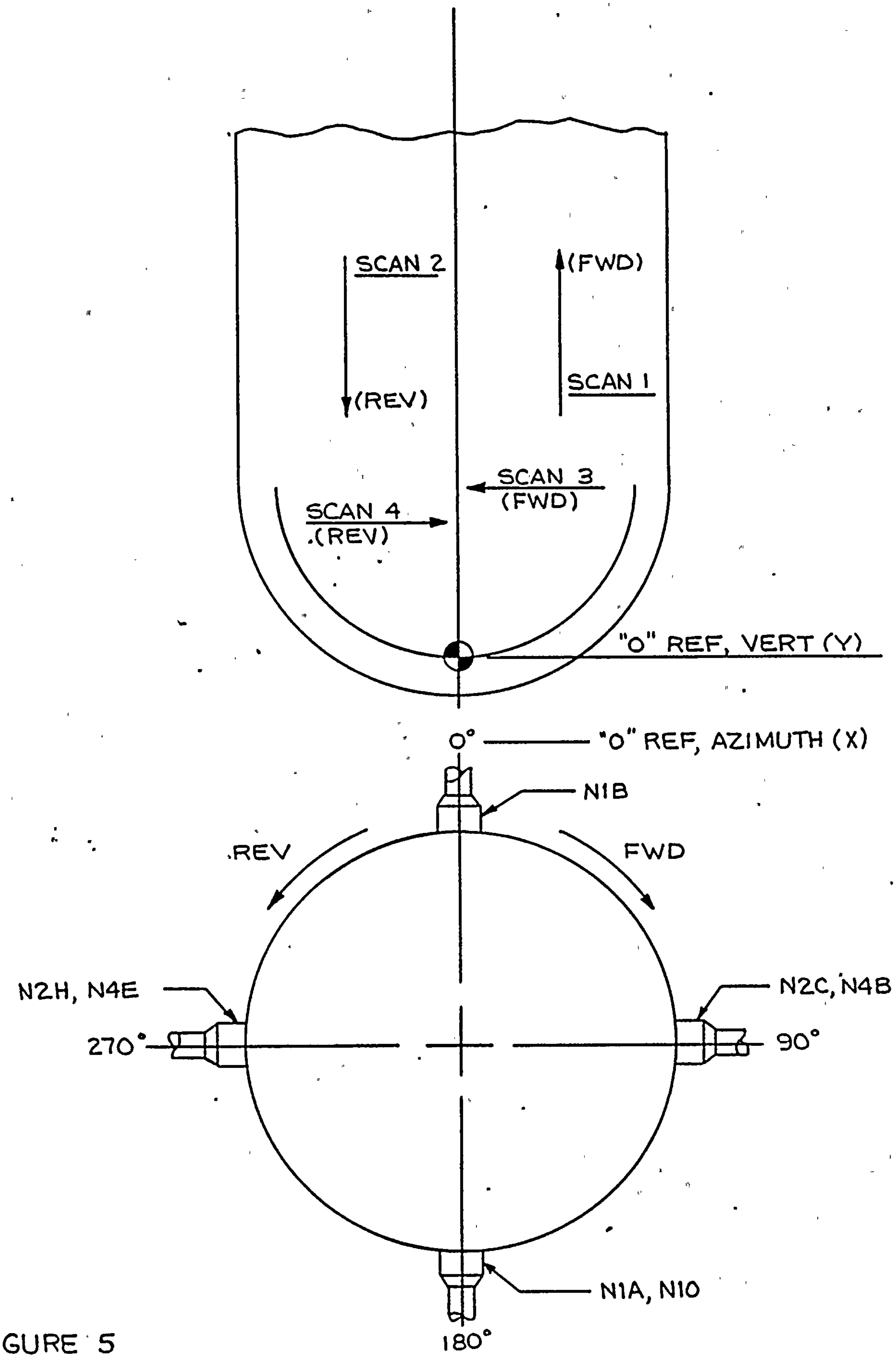

FIGURE 5
X & Y "O" REF, SCAN DIRECTIONS

REMOTE ULTRASONIC INDICATION DATA TABULATION

MAXIMUM		SWP RDG	MTL PATH	POSITION		LOCATION		20% DAC								% OF t		REMARKS
% FSH	% DAC			IN	CTS	IN	CTS	MINIMUM				MAXIMUM				DPTH	DIST FROM SURF	
								SWP RDG	MTL PATH	POSITION IN	POSITION CTS	SWP RDG	MTL PATH	POSITION IN	POSITION CTS			

Figure 6

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Job Location ____________

Report No ____________

Exam Date ____________

NOTIFICATION OF REPORTABLE INDICATION

Part I - LMT Findings

LMT Job No. ____________ I.D.# ____________ ISO No. ____________

NDT Method: UT ______ PT ______ MT ______ ET ______ VT ______

Description of Indication: (Sketch/photograph attached Yes __ No __)

Examination Reference:

Signature of Examiner/Certif. Level Date:

Signature of LMT Field Supervisor Date:

Notification Acknowledged by
Client Representative: Date:

Part II - Re-examination

Findings: (Sketch/photograph attached Yes __ No __)

Re-examination Reference:

Signature of Examiner/Certif. Level Date:

Signature of LMT Supervisor Date:

Closed
Client Representative Date:

Figure 7

TABLE IWB-3511.1
ALLOWABLE PLANAR INDICATIONS

Material: Ferritic steels that meet the requirements of NB-2331 and have specified minimum yield strength of 50 ksi or less at room temperature
Thickness Range: 4 in. and greater

Aspect Ratio, a/ℓ[1]	Surface Indications, a/t,%[2]	Subsurface Indications, a/t,%[2,3]
0.	2.0	2.6
0.05	2.1	2.8
0.10	2.3	2.9
0.15	2.6	3.2
0.20	2.9	3.6
0.25	3.2	4.1
0.30	3.7	4.6
0.35	3.7	5.2
0.40	3.7	5.8
0.45	3.7	6.5
0.50	3.7	7.2

NOTES:
(1) Dimensions a and ℓ are defined in the figures referenced in IWB-3511.1. For intermediate flaw-aspect ratios, a/ℓ, linear interpolation is permissible.
(2) Component thickness t is measured normal to the pressure-retaining surface of the component. Where the section thickness varies, the average thickness over the length of the planar indication is the component thickness.
(3) The total depth of an allowable subsurface indication is twice the listed value.

TABLE IWB-3511.3
ALLOWABLE LAMINAR INDICATIONS

Component Thickness, t in.[1,2]	Laminar Area,[3] sq in.
4	12
6	18
8	24
10	30
12	36
14	42
16	48

NOTES:
(1) Component thickness t is measured normal to the pressure-retaining surface of the component. Where the section thickness varies, the average thickness over the area of the laminar indication is the component thickness.
(2) For intermediate thicknesses, linear interpolation of area is permissible.
(3) The area of a laminar flaw is defined in IWB-3360.

Figure 8

TABLE IWB-3510
ALLOWABLE INDICATIONS
FOR MATERIALS SA-533, SA-508

a/ℓ[1]	Surface Indications Percent a/t	Subsurface Indications Percent a/t
0	1.88	2.32
0.05	2.00	2.42
0.10	2.18	2.61
0.15	2.42	2.91
0.20	2.71	3.25
0.25	3.08	3.68
0.30	3.48	4.13
0.35	3.48	4.63
0.40	3.48	5.24
0.45	3.48	5.86
0.50	3.48	6.51

[1] For intermediate ratios, linear interpolation is permitted.

Figure 9

Date 1/8/79

Revision 0

WNP-2 PSI PROGRAM PLAN

N O T U S E D

(Purposely left blank)

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WNP-2 PROCEDURE COVER SHEET AND QUALIFICATION RECORD

Procedure No. UTP-41 Revision No. 1

Procedure Title REMOTE ULTRASONIC EXAMINATION OF REACTOR PRESSURE VESSEL NOZZLE-TO-SHELL WELDS

LMT, Inc. QA Review and Approval DB MacGill Level III 5-8-81
(Quality Assurance Officer)

Client Approval D Ramey ISI Engineer 6-1-81

Authorized Nuclear Inspector ~~Approval~~ REVIEW S.M. Foster 6-2-81

Specific Qualification Record

Component	Examiners	Date

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

REVIEW OF CONTRACTOR SUBMITTALS

WNP- 02	ISI ENGINEER D P Ramey	DATE 5/8/81
CONTRACT NO. C-14402	TITLE PSI Services for NSSS & Associated Nuclear Piping	
CONTRACTOR LMT, Inc		

DOCUMENT TITLE	REV.
UTP-41 " Remote UT Examination of Reactor Pressure Vessel Nozzle-To-shell Welds	1

PREVIOUSLY REVIEWED [X] YES [ ] NO (DATE IF YES) 12/24/80

PREVIOUSLY APPROVED [ ] YES [X] NO (DATE IF YES)

REASONS FOR RE-SUBMITTAL (IF PREVIOUSLY APPROVED)

REVIEWER	APPROVED	APPROVED AS NOTED	DISAPPROVED	COMMENTS ATTACHED
D.W. Porter 5/8/81 — SUPERVISOR, ISI AND OPERATIONS SUPPORT ENGINEER	X			
N/A — PROJECT ENGINEERING MANAGER/PLANT TECHNICAL SUPERVISOR				
5/8/81 [signature] — SUPERVISOR, ISI/NDE, GENERATION SERVICES	X			
[signature] 5/18/81 — MANAGER, ~~QUALITY SERVICES~~ operational QA and Services	X			

NOTES/COMMENTS:
ANI-I REVIEW [signature] 5/21/81

WP-702 EDP 9.0

TITLE: REMOTE ULTRASONIC EXAMINATION OF REACTOR PRESSURE VESSEL NOZZLE-TO-SHELL WELDS

I. PURPOSE AND SCOPE

A. Purpose

1. This procedure provides instructions for the assembly, checkout, and general operation of the ultrasonic system for conducting remote ultrasonic examinations of the Reactor Pressure Vessel Nozzle-to-Shell welds.
2. The instructions provided implement the requirements of Section XI, ASME Boiler and Pressure Vessel Code, 1974 edition, Summer 1975 addenda.

B. Scope

1. This procedure is applicable to the ultrasonic system used with the remotely operated mechanical examination device to conduct the nozzle-to-shell weld examinations.
2. Assembly and operating instructions for the remotely operated device are contained in Procedure UTP-44, "Nozzle-to-Shell Device Assembly and Operating Procedure."

QUALIFICATION:

Approved for use F. H. Lambert 2/13/81
D. B. MacGill Level III 2-17-81

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I. B. 3. Instructions for the assembly and operation of the remote automatic ultrasonic data recording system are contained in Procedure UTP-42, "Remote System Automatic Ultrasonic Data Recording."

4. Volumetric examinations shall be performed using ultrasonic angle and straight beam techniques, as follows:

a) Base metal through which sound will pass shall receive a 0° longitudinal beam examination to detect reflectors which may interfere with the angle beam examinations;

b) All welds and one-half t of the base metal on the vessel side of the weld shall receive a 45° and 60° angle beam exanination, and a 0° straight beam examination;

c) Other angles may be used where wall thickness or geometric configuration impedes effective use of 45° and 60° angle beam examination.

d) The extent of straight and angle beam scanning is defined in the Scan Plan sections appropriate to the specific area to be examined.

II. REFERENCES

A. Applicable Code Editions

1. This procedure complies with the requirements of the 1974 edition of ASME Boiler and Pressure Vessel Code, Section XI, Summer 1975 addenda.

B. Supplemental References

1. SNT-TC-1A (June 1975), "Recommended Practice for the Establishment of Personnel Qualification and Certification Programs."
2. LMT, Inc. Procedure QA-6, "Qualification and Certification of NDE Personnel."
3. LMT, Inc. Operating and Quality Assurance Manual, Revision 12, approved for the WNP-2 Preservice Inspection by WPPSS.

III. DEFINITIONS

Beam Direction:	Orientation of ultrasonic beam relative to vessel axis, independent of scan direction.
Controller:	Electronic device controlling mechanical system motor direction and/or speed. May indicate relative position via multi-digit readout.
Index Movement: (Increment)	Module movement (distance moved) between scans.

III. Module, Search Unit: Search unit cluster including shoes, wedges, holding framework, couplant supply manifold.

Scan Direction: Motion of search unit module relative to vessel axis, independent of beam direction.

X-axis: Circumferential axis of head.

Y-axis: Longitudinal axis of nozzle (radial to vessel).

Z-axis: Radial axis of nozzle.

T: Calibration block thickness.

t: Weld thickness.

IV. RESPONSIBILITY

A. The Technical Manager, LMT, Inc. is responsible for the generation and control of this procedure and shall so indicate by a dated signature on the procedure cover sheet.

B. The responsible Level III Field Supervisor, LMT, or his designated Level III alternate, LMT, shall qualify the procedure for a particular examination.

V. PROCEDURE QUALIFICATION

This procedure shall be qualified for specific examinations, personnel, and equipment by performing and documenting a successful calibration.

VI. PERSONNEL REQUIREMENTS

A. Examiners using this procedure shall have levels of qualifications as per the Procedure Qualification.

B. Personnel operating the nozzle-to-shell examination device shall be qualified on the equipment and so certified by an authorized LMT Level III examiner.

1. For each shift of operation, the examination team shall consist of at least the following personnel:

a) Coordinator/supervisor: Coordinate efforts of individual team members and efforts of the examination team with the owner and appropriate on-site crafts.

b) Console operator: Operate controllers, record necessary data for completion of scan data sheets. Conduct and verify functional checks of mechanical system.

c) Observer: Stationed at device location to observe operation of device, warn of pending obstruction, malfunction, etc.

d) Ultrasonic operator: Perform examination calibration, enter appropriate information on strip chart recordings, verify proper operation of ultrasonic system. Certified to at least Level II Ultrasonic.

VI. B. 2. Team personnel may perform the above duties on a rotational basis, provided adequate cross training and certification levels are existent.

VII. EQUIPMENT AND MATERIALS

A. System Description

1. The Ultrasonic and Data Acquisition System consists of three (3) Nortec NDT-131D ultrascopes, a digital-to-analog converter, and an eight (8) channel direct writing strip chart recorder.

2. The ultrascopes have been modified for rack mounting and remote "slave" display of each instruments' CRT presentation.

3. The BCD data output from the mechanical system controllers is converted to analog form by the digital-to-analog converter and input to the strip chart recorder.

4. The eight channel strip chart recorder provides a permanent record of range and amplitude data of received ultrasonic signals (channels 1-6) and the X and Z axis location of the device during each scan (channels 7 and 8).

B. Instrumentation Requirements

1. The NDT-131D ultrascopes shall meet the following performance criteria:

VII. B. 1. a) Vertical linearity (screen height) within ±5% of full screen, for at least 80% of the total screen height.

b) Amplitude control accurate over its useful range to ±20% of the nominal amplitude ratio.

2. The NDT-131D ultrascopes shall have their internal alignment and calibration verified within 90 days prior to use.

a) Records of internal alignment and calibration verification shall be available at the jobsite for WPPSS audit.

3. The digital-to-analog converter shall meet the following performance criteria:

a) Repeat SwRI controller readout (last four digits) 0000 through 9999, ±0 counts.

b) Analog voltage output proportional to BCD input at the rate of 100 counts/volt, ±0.01 v and 1000 counts/volt, ±0.01 v, switch selectable.

4. The direct writing analog strip chart recorder shall meet the following performance criteria:

a) Frequency response at 40 mm - dc to 60 Hz, ±1 division.

b) Frequency response at 10 divisions amplitude - dc to 125 Hz, ±1 division.

V. B. 4. c) Non linearity may not exceed 0.35% of full scale.

5. The strip chart recorder shall have its internal alignment and calibration verified within 180 days prior to use.

a) Records of internal alignment and calibration verification shall be available at the jobsite for WPPSS audit.

C. <u>Search Unit and Wedge Requirements</u>

1. Search unit essential properties shall be certified by the manufacturer including bandwidth, damping, center frequency within 10% of nominal, and relative gain.

a) A record of search unit properties shall be available at the jobsite for WPPSS audit.

2. Wedges shall yield refracted angles of 45°, ±2°, and 60°, ±3°, to be acceptable for use.

a) Refracted angles shall be determined in the calibration block daily, prior to use, as instructed Procedure in UTP-14, "Beam Spread and Refracted Angle Determination."

b) Other angles may be used for evaluation and shall be within ±3° of the nominal wedge angle.

3. The results of examinations performed with angle beam search units which meet the above requirements are acceptable provided the search unit beam angle on subsequent checking is within ±3° of nominal.

VII. C. 3. Should this tolerance not be met on subsequent checking, determination of the need for re-examination shall be made and the basis for the decision documented.

4. Search units shall be 0.75 inch diameter with a central frequency of 2.25 MHz., ±10%.

a) Search units of other sizes and/or frequencies may be used for evaluation and/or in unusual circumstances. Such use shall be documented by an approved Field Change to this procedure in accordance with the requirements of LMT Procedure QA-5.

D. <u>Couplant</u>

1. Couplant used to conduct examinations governed by this procedure shall be "reactor grade" deionized water.

2. Wetting agents such as Kodak "Photo-flo" may be added to the couplant water to aid in coupling efficiency.

E. <u>Calibration Blocks</u>

1. Calibration blocks shall be of the form and dimensions of Figures 1a), 1b) or 1c).

2. Select the appropriate calibration block for a specific nozzle-to-shell weld examination according to the following:

VII. E. 2.

Nozzle	Block No.
N1	UT-119
N2	UT-119
N3	UT-121
N4	UT-120
N5	UT-120
N6	UT-120
N16	UT-120

VIII. PREPARATIONS

A. Documentation

1. The following documentation shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before beginning any examination program:

a) Procedure and Qualification;

b) Calibration Reports;

c) Examination Reports;

d) Material and Equipment Certifications;

e) Personnel Certifications;

f) Status Indicators (Hold tags);

B. Physical

1. The following physical preparation requirements shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before specific examinations are performed:

VII. B. 1. a) Insulation removal;

b) OSHA requirements (ladders, lighting, fresh air, etc.);

c) Cleanup requirements;

d) Safety precautions;

e) Electrical outlets - 110-120v AC, 30 amp, single phase, minimum of two (2) required;

f) Air or nitrogen supply.

C. Surface Preparation

1. Examination surfaces shall be free from weld spatter or any other surface condition which will impede free movement of the search unit module.

2. Examination surfaces shall be free from extraneous materials or other conditions which, in the opinion of the examiner, will impair the performance of a meaningful examination.

IX. LIMITATIONS

This procedure is limited to remotely operated ultrasonic examinations of nozzle-to-shell welds in the reactor pressure vessel, using contact methods, conducted from the vessel OD surface.

X. ULTRASONIC SYSTEM INTERCONNECTS AND CALIBRATION

A. System Interconnects

1. Refer to the appropriate section of the Scan Plan; connect the search unit cables as directed.

2. Perform the following instrumentation interconnects:

Instrument/Output	Cable	Instrument/Input
No. 1 131D/AMP	BNC/Gould No. 1	Strip Chart/Ch 1
No. 1 131D/RANGE	BNC/Gould No. 2	Strip Chart/Ch 2
No. 2 131D/AMP	BNC/Gould No. 3	Strip Chart/Ch 3
No. 2 131D/RANGE	BNC/Gould No. 4	Strip Chart/Ch 4
No. 3 131D/AMP	BNC/Gould No. 5	Strip Chart/Ch 5
No. 3 131D/RANGE	BNC/Gould No. 6	Strip Chart/Ch 6
CONVERTER/X-OUT	BNC/Gould No. 7	Strip Chart/Ch 7
CONVERTER/Y-Z OUT	BNC/Gould No. 8	Strip Chart/Ch 8
220/BCD OUT	MIL/MIL No. 1	CONVERTER/X IN
700/BCD OUT	MIL/MIL No. 2	CONVERTER/Y-Z IN

B. Calibration, General Requirements

1. Calibration shall be performed on a complete system.

   a) Changes in ultrasonic instrumentation, cables, or search units require recalibration.

X. B. 1. b) An extension of up to six feet may be added to the search unit cables for calibration purposes, and removed prior to conducting the examination.

(1) When such extension is used, ultrasonic responses obtained with and without the extension shall be compared during the first calibration and so noted on the "Report of Ultrasonic Calibration."

c) A change in qualified personnel or recording instrumentation shall require calibration verification.

d) Instrument vertical linearity and amplitude control verifications need not be made with the search unit used for examination.

e) Calibration checks shall be performed before and after each examination and at intervals not to exceed 12 hours.

2. Verify instrument vertical linearity as follows:

a) Position an angle beam search unit on the calibration block to obtain echoes from the T/2 and 3T/4 holes in a 2:1 amplitude ratio.

b) Adjust the amplitude control to position the larger indication at 100% of calibrated scale

X. B. 2. b) and note the amplitude of the smaller on the calibration form as estimated to the nearest 1% of calibrated screen height.

c) Vary the amplitude control so that the response of the larger signal is successively lowered in 10% increments to 10% of full calibrated scale. At each incremental setting note the response of both indications.

d) Acceptable instrument alignment is verified when the ratio of the two responses remains two-to-one over the range of amplitude adjustment within 5% of calibrated full scale.

3. Verify the amplitude control accuracy as follows:

a) Position an angle beam search unit on the basic calibration block to obtain a peaked echo from the T/2 hole at 80% of full calibrated scale.

b) Adjust the amplitude control to decrease the gain by 6 dB and 12 dB. Note the echo amplitude at each setting. Estimate the amplitude to 1% of full calibrated scale.

c) Adjust the amplitude control to position the T/2 response to 20% of full calibrated scale. Then adjust the amplitude control to increase the gain 12 dB. Record the response as estimated to 1% of full calibrated scale.

X. B. 3. d) Adjust the amplitude control to position the T/2 response to 40% of full calibrated scale. Then adjust the amplitude control to increase the gain 6 dB. Note the response as estimated to 1% of full scale.

e) Acceptable instrument alignment is verified when the responses noted are within the tolerances of Table 1.

Indication Set	Gain Change	Indication Tolerance Limits
80%	-6 dB	32% to 48%
80%	-12 dB	16% to 24%
40%	+6 dB	64% to 96%
20%	+12 dB	64% to 96%

Table 1

f) Instrument alignment shall be verified at the beginning of each day's examinations. Performance of the verification shall be recorded on the Ultrasonic Calibration Record (Figure 2).

4. Calibration shall be performed with the calibration block temperature within 25°F of the component to be examined.

C. Straight Beam Calibration, using Staggered Side Drilled Holes

1. Sweep Range Calibration

X. C. 1. a) Position the search unit on a Rompas, IIW, or other carbon steel reference standard of one (1) inch thickness.

b) Adjust the amplitude and sweep controls to display ten (10) back reflections.

c) Adjust the DELAY control to set the left edge of the first back reflection to one (1) major sweep division.

d) Adjust the RANGE control to set the left edge of the tenth back reflection to ten (10) major sweep divisions.

e) Repeat steps b), c), and d), above, until the first and tenth back reflections appear at sweep divisions 1.0 and 10.0, respectively.

f) At this sweep range calibration, each major division of sweep represents one (1) inch of metal path.

2. Sensitivity Calibration

a) Position the 0° search unit for maximum response from the SDH in the appropriate calibration block exhibiting the largest amplitude. See the WNP-2 Program Plan and Figures 1a), 1b), and 1c) for block selection.

X. C. 2. b) Adjust the amplitude control to set the response amplitude to 80% of FSH.

c) Mark the location of the amplitude peak on the CRT screen.

d) Without further sensitivity adjustment, obtain and mark on the CRT screen the amplitude peak of the remaining staggered side drilled holes.

e) Connect the amplitude peak marks with a smooth curve, extended to cover the examination thickness.

(1) This is the Primary Reference Response (PRR) or Distance Amplitude Correction (DAC) Curve.

(2) The PRR curve shall terminate when the signal-to-noise ratio becomes less than four.

f) Position the search unit for maximum response from a convenient reflector in a reference standard (Rompas, IIW, etc.). Mark the amplitude peak on the CRT screen.

g) Transcribe the PRR curve and the reference standard points to the Report of Ultrasonic Calibration form, Figure 2, and complete all pertinent data.

X. D. <u>Angle Beam Calibration using In-line Side Drilled Holes</u>

1. Sweep Range Calibration

   a) Position the angle beam search unit for maximum amplitude response from the T/4 SDH in the appropriate calibration block.

   b) Adjust the DELAY control to set the left edge of the T/4 SDH signal to 2.0 sweep divisions.

   c) Position the angle beam search unit for maximum amplitude response from the 3T/4 SDH.

   d) Adjust the RANGE control to set the left edge of the 3T/4 SDH signal to 6.0 sweep divisions.

   e) Repeat steps a) through d), in sequence, as required, until the T/4 and 3T/4 SDH signals appear at 2.0 and 6.0 sweep divisions.

2. Sensitivity Calibration

   a) Position the angle beam search unit on the CLAD SIDE of the block; determine the amplitude difference in dB between the 3T/4 and 5T/4 SDH responses. Record this number for use in step X.D.2.f)(1).

   b) Position the angle beam search unit on the UNCLAD SIDE for maximum response from the SDH exhibiting the largest amplitude.

   c) Adjust the amplitude control to set the response amplitude to 80% of FSH.

X. D. 2. d) Mark the location of the amplitude peak on the CRT screen.

e) Without further sensitivity adjustment, obtain and mark on the CRT screen the amplitude peak of the remaining SDH, except the 5T/4 position.

f) To obtain the amplitude of the 5T/4 SDH, position the angle beam search unit for maximum response amplitude from the 3T/4 SDH.

(1) Decrease the sensitivity control by the dB value obtained in a) above.

(2) Mark this amplitude peak at 10.0 sweep divisions.

(3) Return the amplitude control to the value of 2.c) above.

g) Connect the amplitude peak marks with a smooth curve.

(1) This is the Primary Reference Response (PRR) or Distance Amplitude Correction (DAC) Curve.

(2) The PRR curve shall terminate when the signal-to-noise ratio becomes less than four.

X. D. 2. h) Position the search unit for maximum amplitude response from a convenient reflector in a reference standard (Rompas, IIW, etc.). Mark the amplitude peak on the CRT screen.

i) Position the search unit for maximum amplitude response from the far (clad) side square notch.

j) Mark the square notch amplitude peak on the CRT screen.

(1) The square notch signal is to be considered when evaluating planar reflectors perpendicular to the examination surface, at or near the far surface.

k) Transcribe the PRR curve and the reference standard points to the Report of Calibration form, Figure 2, and complete all pertinent data.

E. Beam Spread Determination

Perform beam spread determinations according to Procedure UTP-14.

F. Digital Calibrations

1. Straight (0°) Beam

a) Measure the distance from the block surface to the near edge of the T/4 SDH. (This information may be obtained from the WPPSS as-built UT calibration block drawings UTCB-207, 208 and 209.)

X. F. 1. b) Measure the block thickness. (This information may be obtained from the above calibration block drawings.)

c) Depress 1st, 20, SINGLE, SOUNDPATH pushbuttons.

d) Position the 0° search unit for maximum response amplitude from the T/4 hole.

e) Adjust the D-1 control such that the RANGE gate triggers on the T/4 SDH signal.

f) Adjust the ZERO control to set the digital readout to the distance value obtained in a) above.

g) Position the 0° search unit for maximum response amplitude from the far surface of the block.

h) Adjust the D-1 control such that the RANGE gate triggers on the back surface signal (the far surface of the block).

i) Adjust the CAL control to set the digital readout to the block thickness.

j) Repeat steps d) through i), as required, until the digital readout is correct for each metal path ±0.01 inch.

2. Angle Beam

a) Determine refracted beam angle (θ) according to Procedure UTP-14.

X. F. 2. b) Measure the distance (depth) of the T/4 SDH from the block surface to the hole centerline. (This information may be obtained from the WPPSS as-built UT calibration block drawings.)

c) Measure the block thickness. (This information may be obtained from the WPPSS as-built UT calibration block drawings.)

d) Adjust the OFFSET control to set the "step" in the baseline to sweep division "0".

e) Calculate the metal path to the T/4 SDH and the far notch as follows:

$$\text{Metal path} = \frac{\text{depth}}{\cos\,\theta}$$

f) Depress 1st, 20, SINGLE, SOUNDPATH, and 45 or 60 pushbuttons, as appropriate.

g) Position the angle beam search unit for maximum response amplitude from the T/4 SDH.

h) Adjust the D-1 control such that the RANGE gate triggers on the T/4 SDH.

i) Adjust the ZERO control to set the digital readout to the calculated metal path value of e) above.

j) Position the angle beam search unit to obtain maximum response amplitude from the far notch.

X. F. 2. k) Adjust the D-1 control such that the RANGE gate triggers on the notch signal.

l) Adjust the CAL control to set the digital readout to the calculated metal path of e) above.

m) Repeat steps g) through l) until the digital readout is correct for each metal path, ±0.01 inch.

G. Strip Chart Recorder Calibration

Calibrate each strip chart recorder channel to the appropriate 131D and digital-to-analog converter output according to Procedure UTP-42.

XI. PERFORMANCE

A. Calibration Verification

1. Calibration shall be performed using the responses of the basic calibration block at the beginning of each day's examination, with any change in test personnel, and at intervals not to exceed 12 hours.

2. Calibration checks shall be performed using the responses of either the basic calibration block or the reference standard before and after each examination, or at intervals not to exceed four (4) hours.

3. Response within 2 dB and 5% of the original amplitude and sweep range values respectively shall be considered proof of calibration. An unacceptable

XI. A. 3. calibration check shall be cause for full examination of the test system to determine the reason for the calibration change. Typical causes for calibration change are ambient temperature effects on search units and electronics, control settings inadvertently changed, and loss of couplant between the search unit and wedge. If, in the judgment of the examiner, the cause of the calibration change has been corrected or may be compensated for by a change in control settings, calibration may be restored using the calibration check response. Any examination that has been performed in a noncalibrated condition shall be repeated.

4. Record the time(s) at which verification is performed on the Calibration Report form.

B. Sensitivity

1. Scanning sensitivity shall be two (2) times that of the Primary Reference Response.

2. Penetration of straight beam energy shall be verified by a back surface echo.

C. Coverage (per appropriate Scan Plan)

1. The weld and adjacent base metal for at least t/2 on both sides of the weld shall be scanned with a calibrated straight (0°) beam, from an accessible surface.

XI. C. 2. The weld and adjacent base metal for at least t/2 on the vessel side of the weld shall be scanned by 45° and 60° (nominal) angle beams.

3. The material through which angle beams pass shall be scanned with a straight beam maintaining a 50% to 80% FSH back reflection amplitude, where practicable.

4. Index movement between scans shall not exceed 75% of the search unit dimension measured perpendicular to the scan direction.

D. <u>Scanning Directions</u>

The angle beams shall be directed perpendicular to the weld from the vessel shell, and in two directions parallel to the weld (CW, CCW).

E. <u>Scan Speed</u>

1. Scan speed shall not exceed four (4) inches per second.

2. Scan speed shall be as specified in Procedure UTP-44.

F. <u>Limitations</u>

Physical and/or other limitations, obstructions, etc., preventing full compliance with XI.C. above shall be documented on the examination report.

XII. <u>EVALUATION</u>

A. <u>Recordable Indications</u>

1. Any non-geometric indication with an amplitude 20% or greater of the Primary Reference Response level shall be recorded.

XII. A. 1. a) Geometric reflectors greater than 50% of DAC shall be identified and noted on the examination report and strip chart recording.

2. Clad interface and back wall reflections shall not be recorded unless, in the opinion of the examiner, an unusual condition is observed.

3. The extent and location of laminar reflectors found by straight beam scanning (XI.C.3) which may interfere with angle beam examination shall be recorded.

4. Any planar indication exceeding the amplitude of the calibration planar notch shall be recorded.

B. Indication recording is based on the scheme of reference points shown in Figure 3.

1. Depth data shall be obtained from successive scans perpendicular to the indication with a minimum 25% effective transducer width overlap, and data taken between the 20% DAC points.

2. Length data shall be taken between 20% DAC points.

3. Record the following data for each scan perpendicular to the indication:

a) Maximum amplitude, with associated metal path, search unit position and sweep location.

XII. B. 3. b) Fifty percent of DAC points, with associated metal path, search unit position, and sweep locations.

4. Enter the above data on the "Remote Ultrasonic Indication Data Tabulation" form, Figure 4.

C. Evaluation Criteria

1. Any indication exceeding 20% of the Primary Reference Distance Amplitude Curve shall be evaluated by the examiner to determine the extent, size, location and shape of the reflector. These parameters shall be included on the "Notification of Reportable Indication" form, Figure 5, and on the "Ultrasonic Indication Data Tabulation" form, Figure 4.

D. Acceptance Criteria

1. Acceptance criteria contained in paragraph 3512 of ASME Section XI, 1974 edition, addenda through Summer 1975, are summarized in the tables drawn in Figures 6 and 8.

XIII. RECORDS

A. A Report of Mechanized Ultrasonic Examination form shall be prepared for each item examined, and each examination report shall be related to the appropriate Report of Ultrasonic Calibration. Typical forms are attached in Figures 2 and 8.

XIII. B. Oscillograph chart records shall be made of all examinations.

1. Chart records shall include pre and post test calibration checks made at the same scanning speed as the examination.
2. Location and other pertinent information shall be written on each chart.
   a) Pertinent information includes, but is not limited to, item, date, and start and completion times.

C. Recording Conventions

1. Ultrasonic scans and the location of indications shall be recorded according to the conventions established in Figure 3.

D. Other types of recording devices, such as event or alarm monitoring may be used to aid the examiner where feasible.

XIV. REVIEW

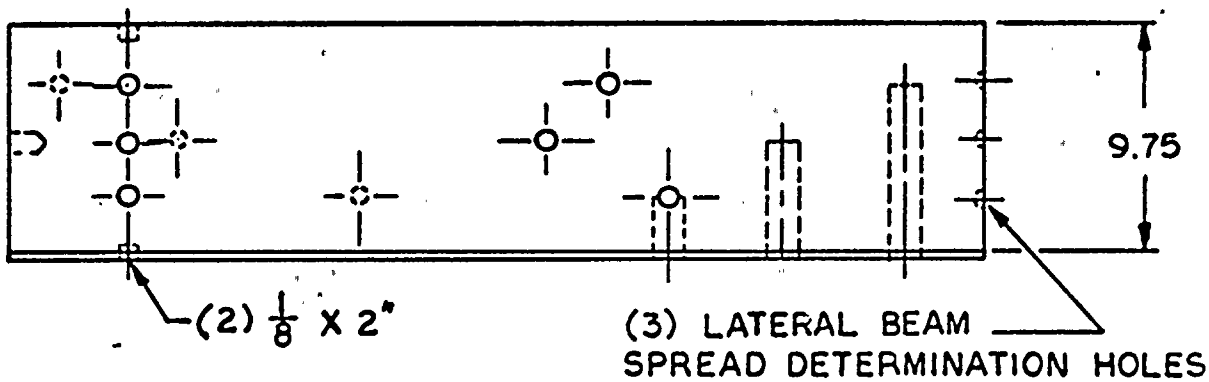
A. Examination reports shall be subject to review by an assigned LMT Level III examiner for conformity to the requirements of this procedure.

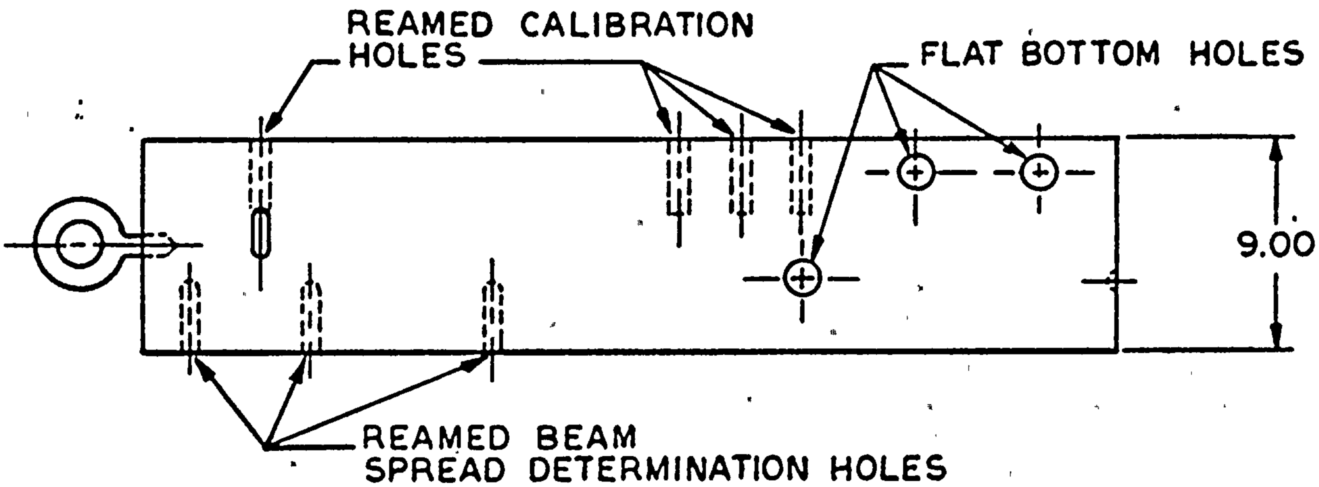
1. Following the final LMT review, the reports will be transmitted to the WPPSS ISI Field Coordinator for review by WPPSS and the Authorized Nuclear Inspector.

XV. DOCUMENTATION STORAGE AND DISTRIBUTION

A. Original examination documentation shall become the property of WPPSS upon sign-off by the ISI Field Coordinator. Additional reports which may include examination documentation as reference material shall be generated from copies.

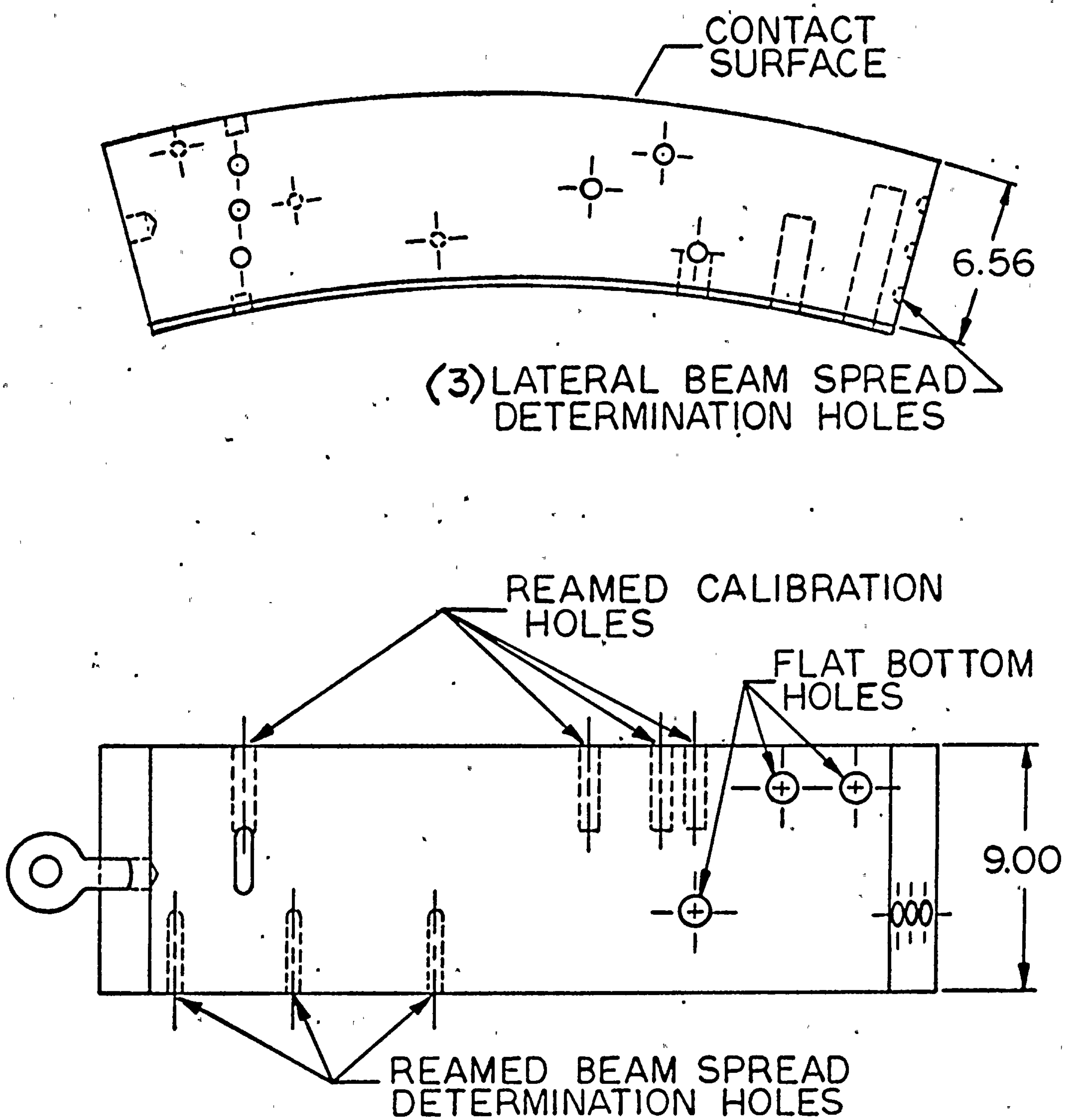
B. Field storage facilities shall provide a safe storage area and access to files shall be limited to the LMT Field Supervisor, his designated representatives, WPPSS representatives, and the Authorized Nuclear Inspector.





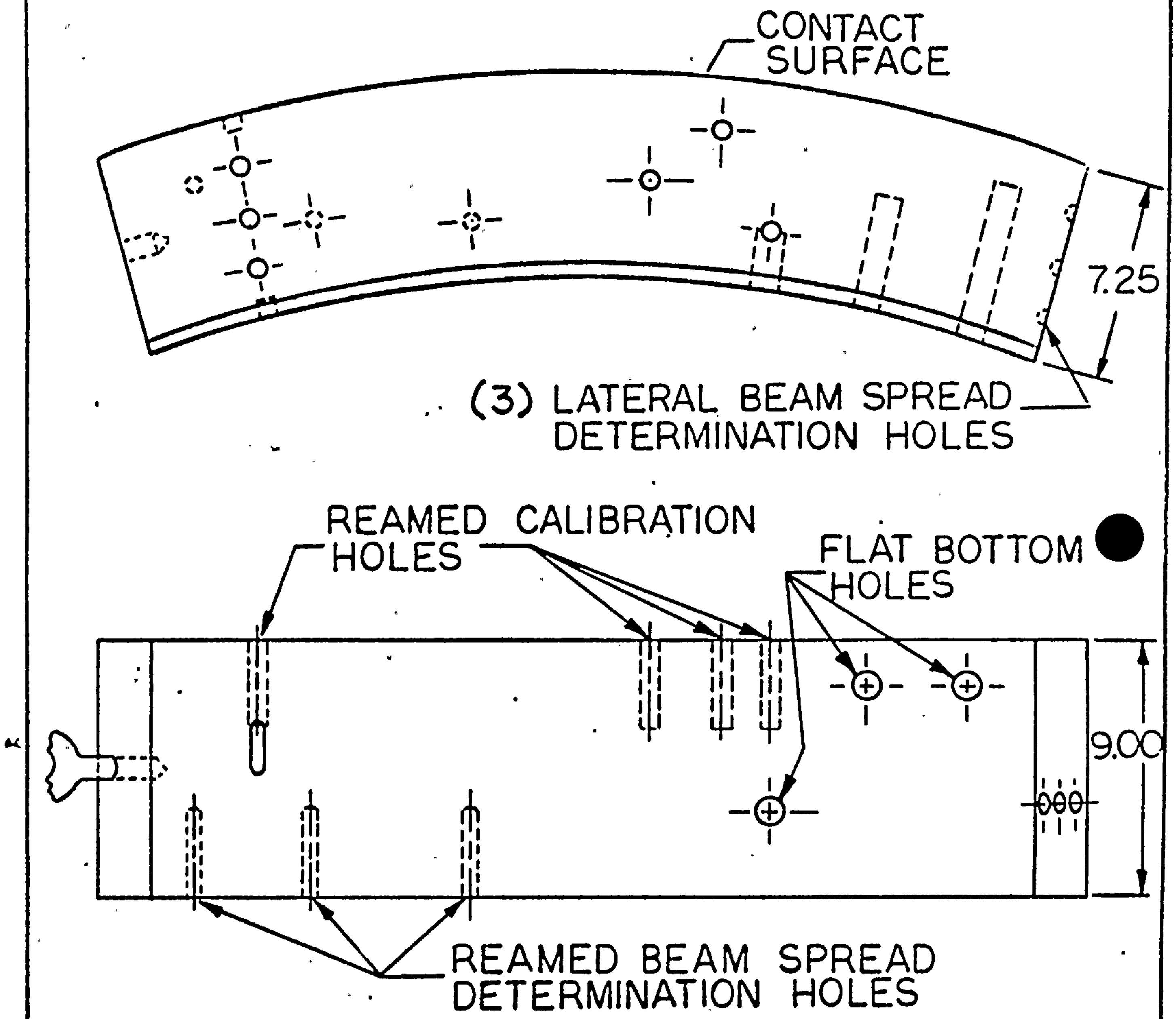
UT CALIBRATION BLOCK, UT-119
RPV #1 SHELL RING
(REF DWG: WPPSS - UTCB-207, REV 1)

Figure 1 a



UT CALIBRATION BLOCK, UT 120
RPV #2 & #3 SHELL RINGS

Figure 1b (REF: WPPSS DWG-UTCB-208 REV 1)



UT CALIBRATION BLOCK, UT 121
RPV #4 SHELL RING

Figure 1c (REF: WPPSS DWG-UTCB-209 REV 1)

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Job No.________
Date:________
Page________ of________

REPORT OF ULTRASONIC CALIBRATION

SIGN

Examiner/Level________ Examiner/Level________ Examiner/Level________
Authorized Inspector________ Customer________

EQUIPMENT

Instrument	S/N	Recal Due

Cable________ S/N________
Couplant________
Mech. Device Descr.________

Vertical Linearity Check Check Completed________

Ref	Signal 1	100	90	80	70	60	50	40	30	20	10
Ch 1	Signal 2										
Ch 2	Signal 2										
Ch 3	Signal 2										

Attenuator Linearity Check Check Completed________

Ref	Tester Gain	Set	-6	-12	Set	+12	Set	+6
	Signal Amp.	80%	32 to 48	16 to 24	20%	64 to 96	40%	64 to 96
Ch 1	Actual Value	80%			20%		40%	
Ch 2	Actual Value	80%			20%		40%	
Ch 3	Actual Value	80%			20%		40%	

Search Units

S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________
S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________
S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________
S/N________ Mfg.________ Type________ Size________ Freq.________ Index________ Angle________

PROC

Procedure________ Revision________ Date________

CALIBRATION

Calibration Block Type________ Size________ S/N________ Temp________
Reference Block Type________ S/N________ Temp________

Calibration Check Times:

________(Initial)________ ________ ________ ________ ________ ________(Final)

Figure 2

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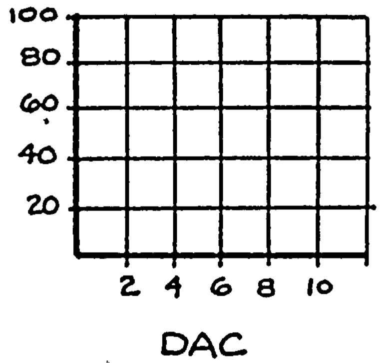
Cal No. ______
Page ____ of ____

REPORT OF ULTRASONIC CALIBRATION (continuation sheet)

Channel 1

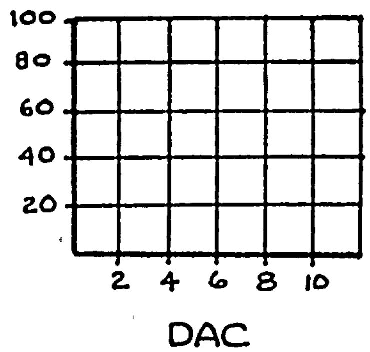
		Refl'r.	Sweep	M.P.	Amp.
Angle					
Sens.					
Sweep					
Delay					
Reject					
Damp.					
Freq.					
Filter					
RepRate					



STRIP CHART:
Channels ______ ______ Sens. ______ ______
Range Amp. Range Amp.

Channel 2

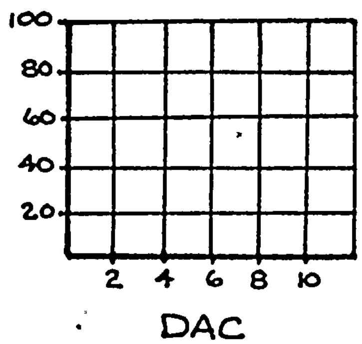
		Refl'r.	Sweep	M.P.	Amp.
Angle					
Sens.					
Sweep					
Delay					
Reject					
Damp.					
Freq.					
Filter					
RepRate					



STRIP CHART
Channels ______ ______ Sens. ______ ______
Range Amp. Range Amp.

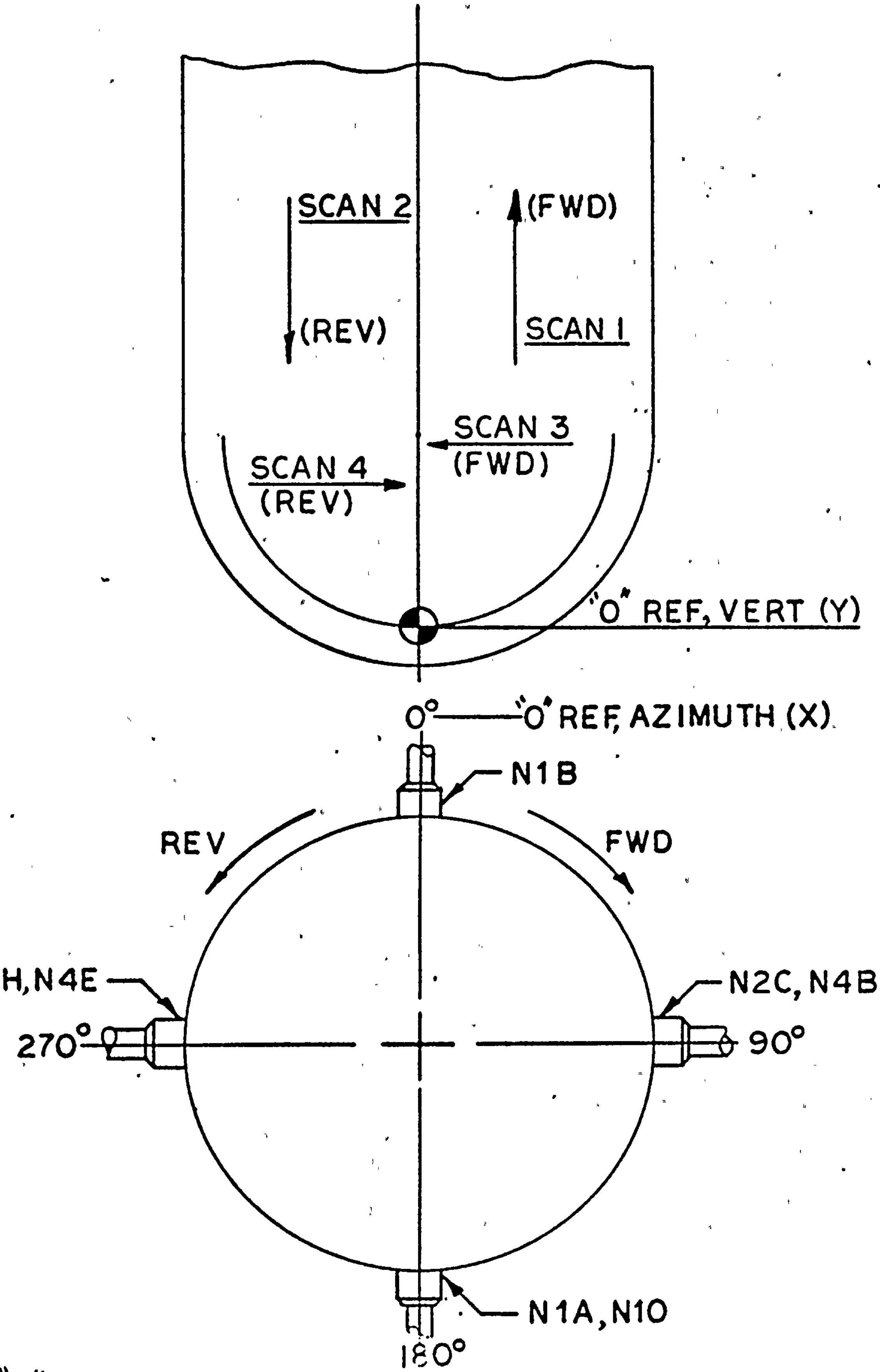
Channel 3

		Refl'r.	Sweep	M.P.	Amp.
Angle					
Sens.					
Sweep					
Delay					
Reject					
Damp.					
Freq.					
Filter					
RepRate					



STRIP CHART:
Channels ______ ______ Sens. ______ ______
Range Amp. Range Amp.

Figure 2 (Cont.)



X&Y "O" REF, SCAN DIRECTIONS Figure 3

REMOTE ULTRASONIC INDICATION DATA TABULATION

MAXIMUM		SWP RDG	MTL PATH	POSITION		LOCATION		20% DAC								% OF t		REMARKS
								MINIMUM				MAXIMUM						
% FSH	% DAC			IN	CTS	IN	CTS	SWP RDG	MTL PATH	POSITION IN	POSITION CTS	SWP RDG	MTL PATH	POSITION IN	POSITION CTS	DPTH	DIST FROM SURF	

Figu[illegible] 4

PROC. NO. UTP-41, PAGE 36, FOLLOWING PAGE 37

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Job Location ____________
____
Report No ____________
____
Exam Date ____________

NOTIFICATION OF REPORTABLE INDICATION

Part I - LMT Findings

LMT Job No. ____________ I.D.# ____________ ISO No. ____________

NDT Method: UT _____ PT _____ MT _____ ET _____ VT _____

Description of Indication: (Sketch/photograph attached Yes __ No __)

Examination Reference:

Signature of Examiner/Certif. Level — Date:

Signature of LMT Field Supervisor — Date:

Notification Acknowledged by Client Representative: — Date:

Part II - Re-examination

Findings: (Sketch/photograph attached Yes __ No __)

Re-examination Reference:

Signature of Examiner/Certif. Level — Date:

Signature of LMT Supervisor — Date:

Closed Client Representative — Date:

Figure 5

TABLE IWB-3511.1
ALLOWABLE PLANAR INDICATIONS

S74

Material: Ferritic steels that meet the requirements of NB-2331 and have specified minimum yield strength of 50 ksi or less at room temperature
Thickness Range: 4 in. and greater

Aspect Ratio, a/ℓ [1]	Surface Indications, a/t,% [2]	Subsurface Indications, a/t,% [2,3]
0.	2.0	2.6
0.05	2.1	2.8
0.10	2.3	2.9
0.15	2.6	3.2
0.20	2.9	3.6
0.25	3.2	4.1
0.30	3.7	4.6
0.35	3.7	5.2
0.40	3.7	5.8
0.45	3.7	6.5
0.50	3.7	7.2

NOTES:
(1) Dimensions a and ℓ are defined in the figures referenced in IWB-3511.1. For intermediate flaw-aspect ratios, a/ℓ, linear interpolation is permissible.
(2) Component thickness t is measured normal to the pressure-retaining surface of the component. Where the section thickness varies, the average thickness over the length of the planar indication is the component thickness.
(3) The total depth of an allowable subsurface indication is twice the listed value.

TABLE IWB-3511.3
ALLOWABLE LAMINAR INDICATIONS

S74

Component Thickness, t in. [1,2]	Laminar Area, [3] sq in.
4	12
6	18
8	24
10	30
12	36
14	42
16	48

NOTES:
(1) Component thickness t is measured normal to the pressure-retaining surface of the component. Where the section thickness varies, the average thickness over the area of the laminar indication is the component thickness.
(2) For intermediate thicknesses, linear interpolation of area is permissible.
(3) The area of a laminar flaw is defined in IWB-3360.

Figure 6

S75

TABLE IWB-3512.1
ALLOWABLE PLANAR INDICATIONS[1]

Material: SA-508 Class 2 and 3 Forgings that meet the requirements of NB-2331 and have specified minimum yield strengths of 50 ksi or less

Thickness Range, t: 3 in. and greater

Aspect Ratio, a/ℓ [1]	Surface Indications, a/t,% [2]	Subsurface Indications, a/t,% [2,3]
0.	1.9	2.3
0.05	2.0	2.4
0.10	2.2	2.6
0.15	2.4	2.9
0.20	2.7	3.3
0.25	3.1	3.7
0.30	3.5	4.1
0.35	3.5	4.6
0.40	3.5	5.2
0.45	3.5	5.9
0.50	3.5	6.5
Inside Corner Radius	2.5	Not Applicable

NOTES:

(1) Dimensions a and ℓ are defined in Fig. IWB-3512.1(a). For intermediate flaw-aspect ratios, a/ℓ, linear interpolation is permissible.

(2) The component thickness, t, is determined as follows for the applicable typical flaws shown in Fig. IWB-3512.1(a):

Flaw #1 and #2	$t = (t_{n_1} + t_{n_2})/2$
Flaw #3	$t = t_s$
Flaw #4	$t = t_{n_1}$
Flaw #5	t = lesser of t_{n_2} or t_s for any aspect ratios applicable to this flaw geometry

(3) The total depth of an allowable subsurface indication is twice the listed value.

Figure 7

WPS-UTXR-1 6/80

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Report No. ______
Cal. No. ______
Job. No. ______
Date ______
Page ______ of ______

REPORT OF MECHANIZED ULTRASONIC EXAMINATION

ITEM

ISI No. ______ Size ______ Material ______ S/N(s) ______

Description ______

Location ______ Preparation ______ Temp. ______

SIGN

Examiner/Level ______ Examiner/Level ______ Review/Level ______

Authorized Inspector ______ Customer ______

PROC

Calibration Procedure ______ Rev. ______

Examination Procedure ______ Rev. ______

Recording Procedure ______ Rev. ______

EXAMINATION

Sensitivity:	Ref;	Scan
Ch. 1	______dBG	______dBG
Ch. 2	______dBG	______dBG
Ch. 3	______dBG	______dBG

TIME

______ START ______ STOP

Direction	Scan Description	Results*
00	0° Base Metal	
0	0° Weld & HAZ	
1-45	Axial, 45°↑	
1-60	Axial, 60°↑	
2-45	Axial, 45°↓	
2-60	Axial, 60°↓	
3-45	Circ., 45° CW	
3-60	Circ., 60° CW	
4-45	Circ., 45° CCW	
4-60	Circ., 60° CCW	

*NAD = No apparent discontinuities
G = Geometry
L = Linear
S = Spot
LM = Laminar
M = Multiple

Description of Indications

Scan Dir. & No.	Description

Obstructions/Limitations

Scan Dir. & No.	Description

Figure 8

Date 1/8/79

Revision 0

WNP-2 PSI PROGRAM PLAN

N O T U S E D

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WNP-2 PROCEDURE COVER SHEET AND QUALIFICATION RECORD

Procedure No. UTP-42 Revision No. 0

Procedure Title REMOTE SYSTEM AUTOMATIC ULTRASONIC DATA RECORDING

LMT, Inc. QA Review and Approval E B MacGill Level III 12-19-80
(Quality Assurance Officer)

Client Approval D P Ramey, TSI Engineer 3/16/81

Authorized Nuclear Inspector ~~Approval~~ concurrence 3/16/81 K. Collins

Specific Qualification Record

Component	Examiners	Date

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

REVIEW OF CONTRACTOR SUBMITTALS

WNP- 02	ISI ENGINEER D.P. Ramey	DATE 12-24-80
CONTRACT NO. C-14402	TITLE PSI Services for NSSS & Associated Nuclear Piping	
CONTRACTOR LMT, Inc.		

DOCUMENT TITLE	REV.
UTP-42 Remote System Automatic Ultrasonic Data Recording	0

PREVIOUSLY REVIEWED ☒ YES ☐ NO (DATE IF YES) Dec. 15, 1980 (WPCM-2-80-34)

PREVIOUSLY APPROVED ☐ YES ☒ NO (DATE IF YES)

REASONS FOR RE-SUBMITTAL (IF PREVIOUSLY APPROVED)

REVIEWER	APPROVED	APPROVED AS NOTED	DISAPPROVED	COMMENTS ATTACHED
TCP D.W. Porter 12/24/80 SUPERVISOR, ISI AND OPERATIONS SUPPORT ENGINEER	X			
[illegible] 12/24/80 JDR PROJECT ENGINEERING MANAGER/PLANT TECHNICAL SUPERVISOR 1/6/81	X			
SUPERVISOR, ISI AND GENERATION SERVICES				
12/29/80 [illegible] 12/29/80 MANAGER, QUALITY SERVICES	X			

NOTES/COMMENTS:
ANI(I) CONCURRANCE [illegible] 1-6-81

WP-702 EDP 9.0

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TITLE: REMOTE SYSTEM AUTOMATIC ULTRASONIC DATA RECORDING

I. PURPOSE AND SCOPE

This procedure provides direction for automatic recording of test data generated in remote ultrasonic examinations performed under other LMT, Inc. procedures.

II. REFERENCES

A. Applicable Code Editions

Automatic data recording is not directly covered by any ASME Code.

B. Applicable Code Cases

None.

C. Supplemental References

1. Manufacturer's Manual, Nortec 131D.
2. Applicable LMT Remote, Mechanized Equipment and Remote Ultrasonic Test Procedures.
3. LMT Operating and Quality Assurance Manual, Revision 12, approved for the WNP-2 Preservice Inspection by WPPSS.

QUALIFICATION:

Approved for use [signature]

[signature] Level III
12-19-80

III. DEFINITIONS

System: Combination of remotely operated examination device, ultrasonic and data acquisition instrumentation, including search units and wedges.

IV. RESPONSIBILITY

A. The Technical Manager, LMT, Inc., is responsible for the generation and control of this procedure and shall so indicate by a dated signature on the procedure cover sheet.

B. The responsible Level III Field Supervisor, LMT, shall qualify the procedure for a particular examination. When the Field Supervisor is not Level III in the discipline, both his signature and that of a qualified LMT Level III are required.

V. PROCEDURE QUALIFICATION

This procedure shall be qualified in conjunction with the first remote examination system procedures. Such qualification shall be acceptable for use with all remote examination system procedures.

VI. PERSONNEL REQUIREMENTS

A. Examiners using this procedure shall have levels of qualification, as specified by the approved procedure qualification, and associated approved calibration records.

B. Personnel shall be qualified and certified according to the requirements of ASME Sections V and XI, SNT-TC-1A, and LMT Procedure QA-6, "Qualification and Certification of NDE Personnel."

VII. EQUIPMENT AND MATERIAL REQUIREMENTS

A Nortec 131D, or equivalent instrumentation, modified to provide analog metal path and echo amplitude voltage outputs.

B. Digital-to-analog converter.

C. Gould 2800 eight-channel strip chart recorder, or equivalent, using chart materials as recommended by the manufacturer.

D. Equipment shall meet the calibration requirements as stated in the examination procedure.

VIII. PREPARATION

A. Documentation

Documentation requirements shall be as stated in the examination procedure.

VIII. B. Physical

An uncontaminated area with work table and electrical power is required for the data recording station.

1. Electrical outlets shall be 30A, 110/120Vac, single phase. At least two (2) separate outlets are required.

IX. LIMITATIONS

This procedure is applicable to automated data recording used in conjunction with remote ultrasonic examinations, and is not adaptable to other methods without modification.

X. CALIBRATION

A. Calibration is performed on a complete system. A change in ultrasonic tester, position encoder, or recording instrumentation requires recalibration of the system.

B. The Ultrasonic Tester

Calibrate the digital readout section of each ultrasonic instrument in accordance with the examination procedure instructions to display vertical and horizontal signal indications in percent of scale and inches or sweep divisions respectively.

C. Strip Chart Recorder

1. Refer to Figure 1; connect the 131D and digital-to-analog converter outputs to the strip chart recorder inputs.

X. C. 2. Calibrate <u>each</u> AMPLITUDE channel as follows:

a) Obtain a calibration or reference block signal; adjust the instrument sensitivity to set the amplitude to 100% FSH.

b) Adjust the strip chart ATTENUATOR and SENSITIVITY controls to set the pen deflection to ten major divisions.

c) Adjust the instrument sensitivity to set the signal amplitude to 20% FSH.

d) Adjust the strip chart recorder POSITION control to set the pen to two major divisions.

e) Repeat steps a) through d), until the strip chart recorder pen faithfully tracks the signal amplitude displayed on the instrument.

3. Calibrate <u>each</u> RANGE channel as follows:

a) Obtain a calibration or reference block signal at sweep location ten.

b) Adjust D-1 such that the range gate triggers on the signal.

c) Adjust the strip chart recorder ATTENUATOR and SENSITIVITY controls to set the pen deflection to ten major divisions.

d) Obtain a calibration or reference block signal at sweep location one.

X. C. 3. e) Adjust D-1 such that the range gate triggers on the signal.

f) Adjust the strip chart recorder POSITION control to set the pen to one major division.

g) Repeat steps a) through f) until the recorder pen faithfully tracks the range gate.

4. Calibrate the digital-to-analog converter channels as follows:

a) Set the counts/volt output switch to:

(1) 100 when total axis movement is $\leq$ 1000 counts.

(2) 1000 when total axis movement is > 1000 counts.

b) Set DC amplitude sensitivity control full CW.

c) Set the VOLTS FULL SCALE control such that each major division of pen deflection is a convenient fraction of the maximum number of counts displayed on the strip chart (i.e., when VOLTS FULL SCALE is set to 10, and the digital-to-analog converter output switch is at 100, each major division of pen travel represent 100 counts.)

SCAN DATA SHEET: NOZZLE/VESSEL WELDS & NOZZLE INNER RADIUS SECTION

Date:__________ Noz.__________ Rpt. No.__________ Cal. No.__________ Page____ of____

Start Time:__________ Completion Time:__________

Increment No.	Index Z Axis		Scan X Axis				Comments
			Start		Stop		
	700 Counts	Inches from Weld ℄	X-220 Counts	Deg.	X-220 Counts	Deg.	

Figure 1

Nozzle to Shell Device Zero and Travel Linearity Verification

Date:______________ Job No.:______________

Nozzle________________

A. X-Axis Zero and Travel Linearity

Instruction	Verification*
1. Drive to TDC (bubble level)	________
a) Null meter reads "0" ± 1 div.	________
b) X-220 R/O=00000	________
2. Drive FWD 360° (bubble level)	________
a) Null meter reads "0" ± 1 div.	________
b) X-220 R/O=(10 x dash no.) ± 1 count.	________
3. Drive REV 360° (bubble level)	________
a) Null meter reads "0" ± 1 div.	________
b) X-220 R/O=00000 ± 1 count.	________

4. Scan Speed at Maximum Controller setting:______________ins./sec.

*Verification denotes acceptability.

B. Y-Axis Repeatability

Instruction	Verification*
1. Set Stop = 2" from switch arm	________
2. 82300 AUTO	________
3. WALL FOLLOWER to stop	________
4. Measure "B"	________
5. Depress SWITCH ARM, drive ≈ 1"	________
6. Release SWITCH ARM	________
7. WALL FOLLOWER to stop	________
8. Measure "B",	
a) "B", step 4="B" step 8 ± 1/16"	________

C. Z-Axis Zero and Travel Linearity

Instruction	Verification*
1. Set "A" to 5/16" ± 1/32"	________
a) 700 R/O=00000	________
2. Drive FWD to A=15 5/16" ± 1/32"	________
a) 700 R/O=01500±5 counts	________
3. Drive REV to A=5/16"± 1/32"	________
a) 700 R/O=00000±5 counts	________

4. Scan Speed at Maximum Controller setting:______________ins./sec.

Figure 2

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Nozzle-to-Shell Device Checklist: System Preliminary Checkout

Job No.__________ Examination No.__________ sheet 1 of 6

Date:__________

Instruction	Accomplished By
1. Turn the X-220 Controller ON.	________
a) Depress RESET.	________
b) Set to FWD.	________
c) Set Lower Limit to 00000.	________
d) Set Upper Limit to 00300.	________
e) Depress and release START.	________
(1) Determine x-axis sprocket rotation is correct for forward movement of drive car (CW when facing vessel).	________
(2) Observe that 220 digital display is INCREASING. NOTE: If count is decreasing, reposition toggle switch located between the two multiple conductor panel connectors on the rear of the 220 Controller.	________
f) Continue "running forward" until 5 digit display is 00300. Drive car motor should shut off and direction should automatically change to REV.	________

Figure 3

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Instruction	Accomplished By
1. g) Depress and release START.	__________
(1) Determine drive sprocket rotation is opposite to that of e)(1), above, and that 220 readout is DECREASING.	__________
h) When 220 display reaches 00000, drive motor will stop; direction will change to FWD.	__________
i) Depress and release STOP.	__________
2. Turn the 700 Controller ON.	__________
a) Depress RESET.	__________
b) Set direction to FORWARD.	__________
c) Depress small button next to MODULE DRIVE LED; observe illumination of LED.	__________
d) Set Lower Limit to 00000, Upper Limit to 2438.	__________
e) Observe MODULE RETRACT and SLIDE RETRACT LED'S are illuminated.	__________
f) Depress and release START.	__________

Figure 3 (Cont.)

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Instruction	Accomplished By
2. f) (1) Observe module drive is moving away from inspection arm hinge point and that MODULE RETRACT LED extinguishes, and that the digital readout is INCREASING.	______
(2) At approximately 1236 counts, the MODULE DRIVE will stop, the LED will extinguish, and the MODULE EXT LED will illuminate.	______
(3) After a 2-3 second pause, the SLIDE DRIVE LED will illuminate, the slide will begin extension, and the slide RETRACT LED will extinguish.	______
(4) At approximately 2438 counts, the slide extension will stop, the SLIDE EXTEND LED will illuminate and the direction control will change to REV.	______

Figure 3 (Cont.)

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Instruction	Accomplished By
3. Turn the 82300 Controller ON; set to MAN.	________
a) Set direction to FWD.	________
b) Depress the JOG control.	
(1) Observe inspection arm moves toward vessel, panel galvonometer indicates FORWARD.	________
(2) Release JOG.	________
c) Set direction to REVERSE	________
d) Depress JOG control.	________
(1) Observe inspection arm moves away from vessel, panel meter indicates REVERSE.	________
e) Set the Controller to AUTO.	________
(1) Depress the WALL FOLLOWER switch actuating arm roller - observe the inspection arm moves away from the vessel, and the panel meter indicates REVERSE.	________
(2) Release the actuating arm rollers; observe the inspection arm moves toward the vessel, and the panel meter indicates FORWARD.	________

Figure 3 (Cont.)

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Instruction	Accomplished By
3. f) Set the Controller to MANUAL.	______
4. Set the W.L. (wheel lock) regulator (No. 1 402) to 40 psi.	______
a) Toggle W.L. to ON - observe the wheel lock cylinder extends and the wheels swing inboard.	______
b) Toggle W.L. to OFF - observe retraction of air cylinder and that wheels swing outboard.	______
5. Set the ARM regulator (No. 2 402) to 55 psi.	______
a) Toggle ARM RETRACT - observe retraction of air cylinders, elevation of arm.	______
b) Toggle ARM EXTEND - observe extension of air cylinders, decreasing elevation of arm.	______
6. Set TAIL WHEEL regulator (No. 2 402) to 40 psi.	______
a) Toggle TAIL WHEEL EXTEND - observe extension of air cylinder and tail wheel.	______
b) Toggle TAIL WHEEL RETRACT - observe extension of air cylinder and tail wheel.	______

Figure 3 (Cont.)

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sheet 6 of 6

Instruction	Accomplished By
7. Set MODULE SUPPORT WHEEL regulator (No. 3 402) to 70 psi.	______
a) Toggle MOD SPT WHL to Z - observe rotary movement of wheels to align with radial scan motion.	______
b) Toggle MOD SPT WHL to X - observe rotary motion of wheels to align with circumferential scan movement.	______
8. Set PURGE regulator (No. 3 402) to 5 psi.	______
a) Toggle ON.	______
9. Set COUPLANT PRS. regulator (No. 1 402 to 15 psi.	______
a) Toggle ON.	______
b) Open couplant flow control valve; set flow meter to approximately 200 cc/min.	______
c) Observe couplant flow through clear supply lines and out through wedges and shoes.	______
d) Close valve; toggle OFF.	______

END OF CHECKLIST

Figure 3 (Cont.)

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NOZZLE-TO-SHELL DEVICE CHECKLIST: SYSTEM ADJUSTMENTS AND FINAL CHECKOUT

Job No.________________ Examination No.__________________

Date:________________

Instruction | Accomplished By

1. Prior to installing the device on a nozzle mock-up or nozzle, perform the following preliminary adjustments: (refer to D555032 for item identification).

   a) Set the NOSE WHEELS (item 9) 1/8 inch closer to the EXAMINATION ARM than the MODULE SUPPORT WHEELS (item 11). ____________

   b) Adjust the position of the WALL FOLLOWER SWITCH ARM (item 7) such that the "no activate" position is 1.5 inches above the hinge point and record the "C" dimension from the EXAMINATION ARM hinge centerline. ____________

   NOTE: The "C" dimension varies for each nozzle. It is determined by the nozzle-to-shell blend radius and the device configuration for a specific nozzle. An average value of "C" is 1.125 inches. See 2d)(9) for the final adjustment of "C". ____________

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Instruction	Accomplished By
1. c) Set the TAIL WHEEL (item 4) near the end of the TRAILING ARM (item 3).	________
2. Mount the device on a nozzle mock-up or nozzle, and perform the following final adjustments:	
a) X-axis motor drive	
(1) Place the drive car on the track, swing the manually set wheels inboard, lock in place.	________
(2) Toggle W.L. (wheel lock) ON.	________
(3) Toggle MOD SPT WHLS "X".	________
(4) Refer to the figure below for adjustment screw identification.	________

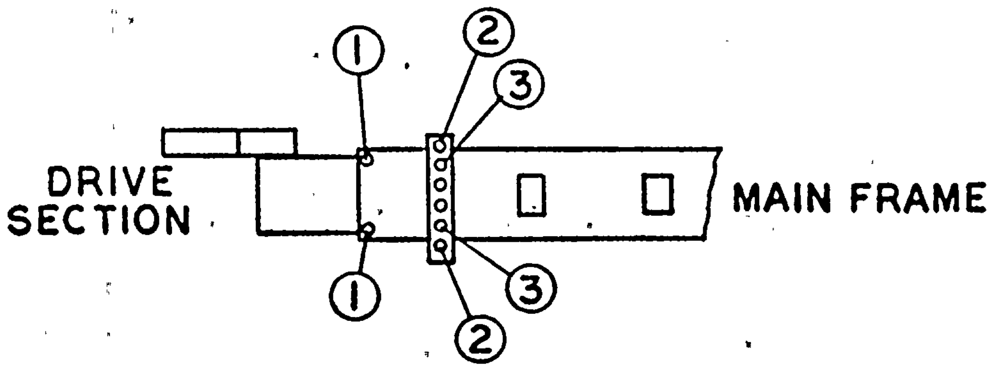

Figure 4 (Cont.)

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Instruction	Accomplished By
2. a) (5) Loosen set screws 1,2, & 3.	______
(6) Hold the drive section down, in contact with the track chain. Drive the car slowly in either direction, tighten screws 2 until the drive section no longer moves up and down as the drive sprocket teeth engage the chain.	______
b) Boss Wheel Bracket Adjustment	
(1) Drive the device to the nozzle TDC (null meter reads "0").	______
(2) Set the 82300 Controller to the MAN STOP mode, with the WALL FOLLOWER DRIVE retracted such that the WALL FOLLOWER SWITCH ARM does not contact the vessel.	______
(3) The NOSE WHEEL end of the EXAMINATION ARM should lightly contact the vessel wall.	______

Figure 4 (Cont.)

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Instruction	Accomplished By
2. b) (4) Reset (zero) the 220 readout	____________
(5) Adjust the BOSS WHEEL BRACKET as required to set the WALL FOLLOWER DRIVE ASS'Y parallel to the nozzle boss.	____________
(6) Record the final distance between the nozzle boss and the bottom of the WALL FOLLOWER DRIVE ASSEMBLY.	____________
c) Tail Wheel Adjustment	
(1) Position the TAIL WHEEL on the TRAILING ARM as indicated in the appropriate drawing (D5570-011 through 015).	____________
(2) Adjust the height of the TAIL WHEEL such that it contacts the pipe, within its working range (≈ 1 inch) at all points around the track.	____________
(3) Set the TAIL WHEEL regulator to 40 psi.	____________
d) Wall Follower	
(1) Drive the device to nozzle TDC (X-220 R/O = 00000).	____________

Figure 4 (Cont.)

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Instruction	Accomplished By
2. d) (2) Toggle ARM EXT; reduce regulator setting to approximately 10 psi.	________
(3) Toggle MOD SPT WHLS "Z"; set 700 Controller to MODULE DRIVE, REV.	________
(4) Depress and hold JOG; drive module to set "A" to 5/16 inch ± 1/32 inch (Drawing 55032); release JOG.	________
(5) Set the 82300 Controller to AUTO, activating the WALL FOLLOWER DRIVE. The WALL FOLLOWER SWITCH ARM will contact the vessel wall and shut off the WALL FOLLOWER DRIVE.	________
(6) Set the 700 Controller to MODULE DRIVE, FWD. Depress JOG; drive the MODULE SUPPORT WHEELS to the tangent point between the nozzle blend radius and vessel wall.	________
(7) Adjust the WALL FOLLOWER SWITCH ARM such that the module is firmly seated on the vessel surface, with approximately ¼ inch gap between the MODULE SUPPORT WHEELS and the vessel surface.	________

Figure 4 (Cont.)

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Instruction	Accomplished By
2. d) (8) Drive the module to Z = 0.0000; assure the MODULE SUPPORT WHEELS do not touch the vessel surface.	________
(9) Should the MODULE SUPPORT WHEELS contact the vessel wall, adjust the BOSS WHEEL BRACKETS to obtain a slight clearance between the MODULE SUPPORT WHEELS and the vessel surface; re-record dimension "C".	________
(10) Set the exam arm regulator to 35 psi.	________

END OF CHECKLIST

Figure 4 (Cont.)

Date 1/8/79
Revision 0

WNP-2 PSI PROGRAM PLAN

NOT USED

(Purposely left blank)

X. C. 4. d) With the appropriate controller readout at zero (or the readout representing the start position), adjust the POSITION control to set the pen to zero.

e) Drive the device along one axis to a count value representing full chart pen travel.

f) Adjust the SENSITIVITY control (as required) to set the pen to ten (10) major divisions.

g) Drive the device (along the same axis) to the start position, d).

h) Adjust the POSITION control to set the pen to "0" division.

i) Repeat steps e), f), g), and h) until the pen faithfully tracks the display value.

XI. PERFORMANCE

A. Chart records shall contain written notes fully identifying the record as directed in the examination procedure.

B. Calibration checks shall be recorded on each chart as directed by the examination procedure.

XII. <u>EVALUATION</u>

A. Recordable and reportable indications shall be as defined in the referencing ultrasonic procedure.

B. Recordable indications shall be evaluated in accordance with the referencing ultrasonic procedure.

XIII. <u>RECORDS</u>

Chart records shall be reviewed by an assigned LMT Level III examiner for conformity to the requirements of the procedure.

XV. <u>STORAGE AND DISTRIBUTION</u>

Storage and distribution shall be governed by the examination procedure which this procedure supplements.

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(408) 297-8766

JOB

SHEET NO OF

CALCULATED BY DATE

CHECKED BY DATE

SCALE

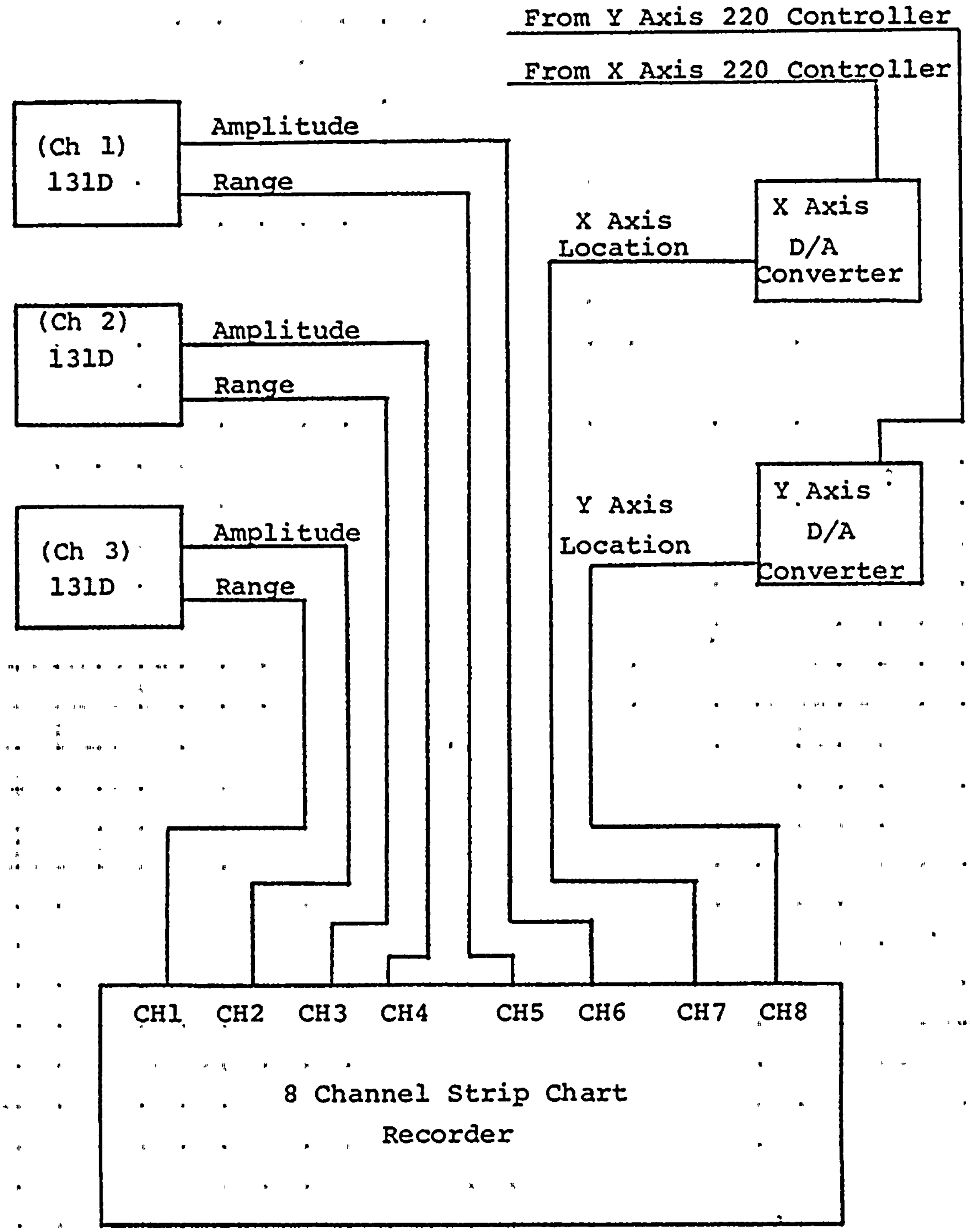

Figure 1

Date 1/8/79
Revision 0

WNP-2 PSI PROGRAM PLAN

N O T   U S E D

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WNP-2 PROCEDURE COVER SHEET AND QUALIFICATION RECORD

Procedure No. UTP-44 Revision No. 1

Procedure Title NOZZLE-TO-SHELL DEVICE ASSEMBLY AND OPERATING PROCEDURE

LMT, Inc. QA Review and Approval D.S. MacGill Level III 2-17-81
(Quality Assurance Officer)

Client Approval D.R. Ramey ISI Engineer WNP-2 5/21/81

Authorized Nuclear Inpsector REVIEW ~~Approval~~ H.M. [illegible] 6/2/81

Specific Qualification Record

Component	Examiners	Date

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

REVIEW OF CONTRACTOR SUBMITTALS

WNP- 02	ISI ENGINEER D P Ramey	DATE 4/20/81
CONTRACT NO. C-14402	TITLE PSI Services for NSSS & Associated Nuclear Piping	
CONTRACTOR LMT, Inc.		

DOCUMENT TITLE	REV.
UTP-44 Nozzle-to-shell Device Assembly and Operating Procedure	1

PREVIOUSLY REVIEWED [X] YES [ ] NO (DATE IF YES) 12/24/80

PREVIOUSLY APPROVED [ ] YES [X] NO (DATE IF YES)

REASONS FOR RE-SUBMITTAL (IF PREVIOUSLY APPROVED)

REVIEWER	APPROVED	APPROVED AS NOTED	DISAPPROVED	COMMENTS ATTACHED
TFK D. W. [signature] 4-22-81 — SUPERVISOR, ISI AND OPERATIONS SUPPORT ENGINEER		X		
N/A — PROJECT ENGINEERING MANAGER/PLANT TECHNICAL SUPERVISOR				
SDS K. Hammond 4-23-81 — SUPERVISOR, ISI/NDE/GENERATION SERVICES		X		
4/28/81 [signature] — MANAGER, ~~QUALITY SERVICES~~ Operational and QA Services		X		

NOTES/COMMENTS:

Change step X.1.A.6 to step X.1.A.8 DPR

add step X.1.A.6 "Perform The requirements of The remote system automatic UT data recording procedure UTP-42" This step was left out from Revision 0.

Page-5. VI. B. How do you certify equipment operators and why? SDS

ANI-I REVIEW - H.M. [illegible] 5-5-81

WP-702 EDP 9.0

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TITLE: NOZZLE-TO-SHELL DEVICE
ASSEMBLY AND OPERATING PROCEDURE

I. <u>PURPOSE AND SCOPE</u>

A. <u>Purpose</u>

1. This procedure provides instructions for the assembly, checkout, and general operation of the remotely operated Nozzle-to-Shell Examination Device.

B. <u>Scope</u>

1. This procedure is applicable only to the remotely operated mechanical device and associated control modules.

2. Instructions for the assembly and operation of the ultrasonic portion of the complete examination system are contained in Procedures UTP-36, "Remote Ultrasonic Examination of Nozzle Forgings Inner Radius Sections", and UTP-41, "Remote Ultrasonic Examination of Reactor Pressure Vessel Nozzle-to-Shell Welds", as applicable.

3. Instructions for the assembly and operation of the remote automatic data recording system are contained in Procedure UTP-42, "Remote System Automatic Ultrasonic Data Recording."

II. <u>REFERENCES</u>

A. This procedure is based on the recommendations and

QUALIFICATION:

Approved for use FG Lambert 2/13/81
EBMacGill Level III 2-17-81

II. A. instructions of the manufacturer, Southwest Research Institute.

1. Complete operating details are contained in the following SwRI Operating Manuals:
   a) Operating Instruction Manual 5583011, "Nozzle-to-shell Inspection Device";
   b) Operating Instruction Manual 5583008, "Butt Weld Inspection Device";
   c) Operating Manual 80220, "Model 220 Controller";
   d) Operating Guide 82300, "Model 82300 Controller";
   e) Operating Manual 80402, "Model 402 Controller";
   f) Operating Guide 82700, "Model 82700 Controller";
2. The following drawings are references in this procedure:
   a) LMT Drawing D555032;
   b) SwRI Drawings D5570-011, -012, -013, -014, -015.

III. <u>DEFINITIONS</u>

Beam Direction:	Orientation of ultrasonic beam relative to vessel axis, independent of scan direction.
Controller:	Electronic device controlling mechanical system motor direction and/or speed. May indicate relative position via multi-digit readout.

III. Index Movement: (Increment)	Module movement (distance moved) between scans.
Module, Search Unit:	Search unit cluster including shoes, wedges, holding framework, couplant supply manifold.
Scan Direction:	Motion of search unit module relative to nozzle axis, independent of beam direction.
X-axis:	Circumferential axis of vessel.
Y-axis:	Longitudinal axis of nozzle (radial-to-vessel).
Z-axis:	Radial axis of nozzle.

IV. <u>RESPONSIBILITY</u>

A. The Technical Manager, LMT, Inc. is responsible for the generation and control of this procedure and shall so indicate by a dated signature on the procedure cover sheet.

B. The responsible Level III Field Supervisor, LMT, or his designated Level III alternate, LMT, shall qualify the procedure for a particular examination.

V. <u>PROCEDURE QUALIFICATION</u>

This procedure shall be qualified by performing and documenting successful checkout and position verification and repeatability as instructed in X.D. below.

VI. <u>PERSONNEL REQUIREMENTS</u>

A. Examiners using this procedure shall have levels of qualifications as per the Procedure Qualification.

B. Personnel operating the nozzle-to-shell examination device shall be qualified on the equipment and so certified by an authorized LMT Level III examiner.

1. For each shift of operation, the examination team shall consist of at least the following personnel:

a) Coordinator/supervisor: Coordinate efforts of individual team members and efforts of the examination team with the owner and appropriate on-site crafts.

b) Console operator: Operate controllers, record necessary data for completion of scan data sheets. Conduct and verify functional checks of mechanical system.

c) Observer: Stationed at device location to observe operation of device, warn of pending obstruction, malfunction, etc.

VI. B. 1. d) Ultrasonic operator: Perform examination calibration, enter appropriate information on strip chart recordings, verify proper operation of ultrasonic system. Certified to at least Level II Ultrasonic.

2. Team personnel may perform the above duties on a rotational basis, provided adequate cross training and certification levels are existent.

VII. <u>EQUIPMENT AND MATERIALS</u>

A. <u>System Description</u>

1. The mechanical system has been designed to remotely scan nozzle-to-vessel welds and nozzle inner radius sections.

2. The device operates from tracks which encircle the "necked-down" portion of the nozzle forging. The <u>drive car</u> (pipe bug) mounts on the track, providing circumferential movement around the nozzle. The <u>inspection arm assembly</u>, attached to the pipe bug by an adapter arm, positions the search unit module radially on the vessel wall, and provides a wall following motion of the arm assembly, which has been designed to ensure a constant radial location of the search unit module.

VII. A. 2. The <u>82300 Controller</u> governs the wall following motion of the inspection arm assembly. A switch and actuator assembly mounted at the hinge point of the inspection arm/linear drive junction contacts the vessel wall. As the device progresses around the nozzle forging, the switch actuator arm position changes, causing the inspection arm assembly to move as required to maintain approximate parallelism between the arm and vessel wall.

The 82300 Controller may be set to either AUTO or MANUAL to control the wall following function. When in the AUTO mode, the position of the switch arm determines the direction the arm assembly will move.

In the MANUAL mode, the proximity switch assembly is disabled and the wall following motions are controlled by the JOG control - a front panel galvanometer indicates direction of travel in both AUTO and MANUAL modes.

The <u>82700 Controller</u> governs radial movement of the search unit array along the vessel wall. Radial position is indicated on a five digit display,

VII. A. 2. mounted on the controller front panel. Upper and lower limit switches are set to control the extent of search unit movement, within the physical limits of the inspection arm assembly.

The <u>220 Controller</u> regulates rotational speed and direction and, via a five digit display, indicates circumferential location of the device along the nozzle track. Upper and lower limit control switches may be set to allow complete, 360°, rotation around the nozzle, or limited movement between selectable limits. Air and/or nitrogen supply and couplant water flow rates are regulated by the <u>402 Controller</u>.

VIII. <u>PREPARATION</u>

A. <u>Documentation</u>

1. The following preliminary documentation requirements shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before beginning any examination program:
   a) Procedure and Qualification
   b) Calibration Reports
   c) Examination Reports
   d) Material and Equipment Certifications

X. A. 1. e) Personnel Certifications

f) Status Indicators (Hold tags)

B. Physical

1. The following physical preparation requirements shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before specific examinations are performed:

   a) Insulation removal;

   b) OSHA requirements (ladders, lighting, fresh air, scaffolding, etc.);

   c) Cleanup requirements;

   d) Safety precautions (other work in area, etc.);

   e) Electrical outlets - 110-120v AC, 30 amp, single phase, minimum of two (2) required;

   f) Air or nitrogen supply.

C. Surface Preparation

1. Examination surfaces shall be free from weld spatter or any other surface condition which will impede free movement of the search unit array.

2. Examination surfaces shall be free from extraneous materials or other conditions which, in the opinion of the examiner, will impair the performance of a meaningful examination.

IX. LIMITATIONS

This procedure is limited to remotely operated ultrasonic examinations of nozzle-to-vessel welds and nozzle inner radiused sections conducted from the vessel OD surface, using contact methods.

X. SYSTEM ASSEMBLY AND FUNCTIONAL CHECKOUT

A. System Assembly

1. The nozzle-to-shell device attaches to drive car D13165, or D13167, depending upon nozzle diameter. Select the appropriate components according to the following (refer to Drawing D555032):

NOZZLE	COMPONENTS
N1	Drive Car: D13165
	Boss Wheel Brackets: B-14164
	Adapter Arm: C14165
	Trailing Arm: C13316 (-101)
	Hinge Adapter: B-13912
N2	Drive Car: D13167
	Boss Wheel Brackets: B14164
	Adapter Arm: C14165
	Trailing Arm: C13316 (-101)

X. A. 1.

NOZZLE	COMPONENTS
N2	Hinge Adapter: B 13912
N3	Drive Car: D13165
	Boss Wheel Brackets: B10781F (-2)
	Adapter Arm: D13015
	Trailing Arm: C13316 (-101)
	Hinge Adapter: B 13912
N4, N5, N6, N16	Drive Car: D13167
	Boss Wheel Brackets: B-13803-1, -2
	Adapter Arm: D 13802
	Hinge Adapter: B 13912

2. Assemble the device according to the following general instructions:

a) Position the HINGE ADAPTER on the appropriate DRIVE CAR; attach with four (4) 5/16-18 x 7/8" SS socket head cap screws.

b) Select the appropriate ADAPTER ARM; position on the HINGE ADAPTER (refer to D555032 for orientation); attach with four (4) 5/16-18 x 7/8" SS socket head cap screws.

c) Select the appropriate BOSS WHEEL BRACKETS (D555032); attach to WALL FOLLOWER DRIVE ASSEMBLY.

X. A. 2. d) Referring to D555032, position the EXAMINATION ARM on the ADAPTER ARM; attach with four (4) 1/4-20 x 5/8" SS socket head cap screws.

e) Position the TRAILING ARM assembly as indicated by D555032; attach to ADAPTER ARM with two (2) 5/16-18 x 3/4" SS socket head cap screws.

3. Device/cable/controller interconnects.

a) Connect cable D 5583-801 to the device and controllers as follows:

CABLE Pneumatic Number/Color		DEVICE	CONTROLLER/CONNECTOR
1	Yellow	Match Number	No. 1 402/4
2	Blue	Match Number	No. 2 402/2
3	Green	Match Number	No. 1 402/3
4	Red	Match Number	No. 3 402/1
5	Gray	SPARE	N/A
6	Orange	Match Number	No. 1 402/3
7	Orange	Match Number	No. 2 402/3
8	Green	SPARE	N/A
9	Red	Match Number	No. 2 402/1
10	Yellow	SPARE	N/A

X. A. 3.

CABLE		DEVICE	CONTROLLER/CONNECTOR
Pneumatic			
Number/Color			
11	Blue	Match Number	No. 3 402/2
12	Gray	SPARE	N/A
	Clear	Clear	No. 3 402/WATER OUT

Electrical/Electronic

CABLE	DEVICE	CABLE	CONTROLLER/CONNECTOR
1 (lemo)	NOT USED	110	NOT USED
2 (lemo)	2 (Pipe Bug)	220	220/INPUT
3 (lemo)	3 (Line Conn)	300 or 500	82300/INPUT
4 (lemo)	4 (Line Conn)	700	82700/INPUT
5 (lemo)	5 (Line Conn)	--	---------

Ultrasonic (Coax Cables)

Attach BNC connectors to search units as directed by Scan Plan.

Digital/Analog Converter

Controller/Connector	D/A Converter
220/BCD OUT	X-IN
82700 BCD OUT	Y/Z-IN

Controller Power Cables

Connect the 220, 82300, and 82700 power cables to a 115v AC regulated power supply.

X. A. 4. Air or Nitrogen Supply.

a) Connect the rotary manifold to the air or nitrogen supply source, using adapters as required;

b) Rotate all regulators full CCW;

c) Connect the braided air lines to the rotary manifold and the AIR connector on the rear panel of each 402 controller;

6. Couplant Supply.

a) Connect a 1/8" air line to the couplant supply can and the No. 3 outlet on the No. 3 402 controller;

b) Connect the water line from the couplant supply can to WATER IN on the No. 3 402 controller.

7. Search Unit Array.

a) Select the appropriate search unit array as directed by the Scan Plan; attach to the support assembly with shoulder screws.

B. <u>Mechanical System Checkout</u>.

1. Turn X 220 controller ON.

a) Depress RESET;

b) Set to FWD;

c) Set lower limit to 0000;

d) Set upper limit to 00300;

e) Depress START;

X. B. 1. e) (1) Determine X-axis drive sprocket rotation is correct for FORWARD movement of drive car (CW when facing vessel).

(2) Observe that 220 digital display in INCREASING. NOTE: <u>If count is decreasing, reposition toggle switch located between the two multiple conductor panel connectors on the rear of the 220 controller.</u>

f) Continue "running forward" until five digit display is 00300. Drive car motor should shut off and direction should automatically change to REV.

g) Depress and release start.

(1) Determine drive sprocket rotation is opposite to that of e) (1) above, and that 220 readout is DECREASING.

h) When 220 display reaches 00000, drive motor will stop; direction will change to FWD.

i) Depress and release STOP.

2. Turn the 700 controller ON.

a) Depress RESET;

b) Set direction to FORWARD;

c) Depress small button next to MODULE DRIVE LED; observe illumination of LED.

X. B. 2. d) Set lower limit to 00000, upper limit to <u>2438</u>.

e) Observe MODULE RETRACT and SLIDE RETRACT LED's are illuminated.

f) Depress and release START.

(1) Observe module drive is moving <u>away</u> from inspection arm hinge point, that MODULE RETRACT LED estinguishes, and that the digital readout is INCREASING.

(2) At approximately 1236 counts, the MODULE DRIVE will stop, the LED will extinguish, and the MODULE EXT LED will illuminate.

(3) After a 2-3 second pause, the SLIDE DRIVE LED will illuminate, the slide will begin extension, and the SLIDE RETRACT LED will extinguish.

(4) At approximately 2438 counts, the slide extension will stop, the SLIDE EXTEND LED will illuminate and the direction control will change to REV.

3. Turn the 82300 controller ON; set to MAN.

a) Set direction to FWD.

b) Depress the JOG control.

(1) Observe inspection arm moves <u>toward</u> vessel and panel galvonometer indicates FORWARD.

X. B. 3. b) (2) Release JOG.

c) Set direction to PEVERSE.

d) Depress JOG control.

(1) Observe inspection arm moves <u>away</u> from vessel and panel meter indicates REVERSE.

e) Set the controller to AUTO.

(1) Depress the wall follower switch actuating arm roller; observe the inspection arm moves <u>away</u> from the vessel and the panel meter indicates REVERSE.

(2) Release the actuating arm rollers; observe the inspection arm moves <u>toward</u> the vessel and the panel meter indicates FORWARD.

f) Set the controller to MANUAL.

4. Set the W.L. (wheel lock) regulator (No. 1 402) to 40 psi.

a) Toggle W.L. to ON; observe the wheel lock air cylinder extends and the wheels swing inboard.

b) Toggle W.L. to OFF; observe retraction of air cylinder and that wheels swing outboard.

5. Set the ARM regulator (No. 2 402) to 55 psi.

a) Toggle ARM RETRACT; observe retraction of air cylinders and elevation of arm.

X. B. 5. b) Toggle ARM EXTEND; observe extension of air cylinders and decreasing elevation of arm.

6. Set TAIL WHEEL regulator (No. 2 402) to 40 psi.
   a) Toggle TAIL WHEEL EXTEND; observe extension of air cylinder and TAIL WHEEL.

7. Set MODULE SUPPORT WHEEL regulator (No. 3 402) to 70 psi.
   a) Toggle MOD SPT WHL to Z; observe rotary movement of wheels to align with radial scan motion.
   b) Toggle MOD SPT WHL to X; observe rotary motion of wheels to align with circumferential scan movement.

8. Set PURGE regulator (No. 3 402) to 5 psi.
   a) Toggle ON.

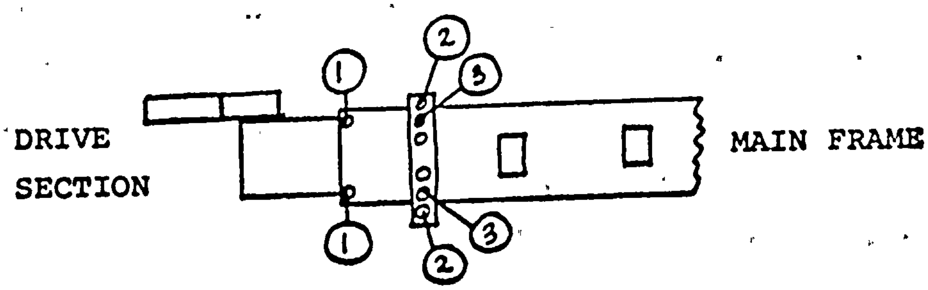
9. Set COUPLANT PRS. regulator (No. 1 402) to 15 psi.
   a) Toggle ON.
   b) Open couplant flow control valve; set flow meter to approximately 200 cc/min.
   c) Observe couplant flow through clear supply lines and out through wedges and shoes.
   d) Close valve; toggle OFF.

X. C. 2. a) (1) manually set wheels inboard; lock in place.

(2) Toggle W.L. (wheel lock) ON.

(3) Toggle MOD SPT WHLS "X".

(4) Refer to the figure below for adjustment screw identification.



(5) Loosen set screws 1, 2, and 3.

(6) Hold the drive section down in contact with the track chain. Drive the car slowly in either direction, tighten screws (2) until the drive section no longer moves up and down as the drive sprocket teeth engage the chain.

(7) Stop the car and tighten the screws (1) moderately until the springs are almost fully compressed. This loads the drive motor hold-down springs so that the drive section will

X. C. 2. a) (7) stay in contact with the chain at the adjusted height that was established in (6).

(8) Tighten the screws (3) to lock the adjustment of (1). This action also allows a small amount of movement, heavily spring-loaded, for the drive section to rise out of engagement with the chain in the event that some obstruction in the chain is encountered.

b) Boss Wheel Bracket Adjustment

(1) Drive the device to the nozzle TDC (null meter reads "0").

(2) Set the 82300 controller to the MAN STOP mode, with the WALL FOLLOWER DRIVE retracted such that the WALL FOLLOWER SWITCH.ARM does <u>not</u> contact the vessel.

(3) The NOSE WHEEL end of the EXAMINATION ARM should lightly contact the vessel wall.

(4) Reset (zero) the 220 readout.

(5) Adjust the BOSS WHEEL BRACKET as required to set the WALL FOLLOWER DRIVE ASS'Y parallel to the nozzle boss.

(6) Record the final distance between the nozzle boss and the bottom of the WALL FOLLOWER DRIVE ASSEMBLY.

c) Tail Wheel Adjustment

X. C. 2. c) (1) Position the TAIL WHEEL on the TRAILING ARM as indicated in the appropriate drawing (DD5570-011 through -015).

(2) Adjust the height of the TAIL WHEEL such that it contacts the pipe, within its working range (approx. one inch) at all points around the track.

(3) Set the TAIL WHEEL regulator to 40 psi.

d) Wall Follower.

(1) Drive the device to nozzle TDC (X-220 R/O = 00000).

(2) Toggle ARM EXT; reduce regulator setting to approximately 10 psi.

(3) Toggle MOD SPT WHLS "Z"; set 700 controller to MODULE DRIVE, REV.

(4) Depress and hold JOG; drive module to set "A" to 5/16 inch ± 1/32 inch (Drawing D555032); release JOG.

(5) Set the 82300 Controller to AUTO, acitivating the WALL FOLLOWER DRIVE. The WALL FOLLOWER SWITCH ARM will contact the vessel wall and shut off the WALL FOLLOWER DRIVE.

(6) Set the 700 controller to MODULE DRIVE, FWD. Depress JOG; drive the MODULE SUPPORT WHEELS

X. C. 2. d) (6) to the tangent point between the nozzle blend radius and vessel wall.

(7) Adjust the WALL FOLLOWER SWITCH ARM such that the module is firmly seated on the vessel surface, with approximately 1/4 inch gap between the MODULE SUPPORT WHEELS and the vessel drive.

(8) Drive the module to Z = 00000; assure the MODULE SUPPORT WHEELS do not touch the vessel surface.

(9) Should the MODULE SUPPORT WHEELS contact the vessel wall, adjust the BOSS WHEEL BRACKETS to obtain a slight clearance between the MODULE SUPPORT WHEELS and the vessel surface; re-record dimension "C".

(10) Set the EXAM ARM regulator to 35 psi.

D. <u>Verification</u>

1. Prior to commencing examination, verify the accuracy of the calibrated mechanical movement.

a) X-axis Zero Position (Level).

(1) Place the drive car on a stable surface and place shims under the appropriate end of the long axis of the car until a bubble level placed on the frame of the car confirms that it is level. (A suitable level is a Stanley

X. D. 1. a). (1) 43-364). The bubble of the level must be less than 1/16 inch (1.6mm) off center. (In the vicinity of null zero, the electronic level sensor has a sensitivity of approximately one minute of arc/division.)

(2) Adjust the mounting bracket of the rotatable level sensor such that the null meter of the controller reads zero.

(3) Tilt the drive car off level and return it to null meter reading of 0. The bubble level must read the same as described in (1).

b) X-axis zero position (alternate).

(1) Place the drive car on the track; lock wheels.

(2) Place a bubble level on the car body; drive the car until a level condition is indicated.

(3) Perform any necessary adjustments as in X.D.1.a) (2) and (3) above.

c) X-axis travel.

(1) Install the drive car on any suitable section pipe track (a track standard is suitable).

(2) Place a reference mark on the roller chain at some convenient point, and attach a pointer to the body of the drive car so that the end

X. D. 1. c) (2) of the pointer is as close as practical to the reference mark.

(3) Count 20 links of chain from the reference and make a second mark on the chain at the same position on the chain link as the first mark.

(4) Zero the display on the Model 220 controller.

(5) Drive the car along the track until the pointer exactly aligns with the second mark The display must read 00200 ±1 count (all mechanical system slack must be eliminated to obtain this accuracy).

(6) Drive the car in the opposite direction until the pointer exactly aligns with the first mark. The display must read 00000 ±1 count.

(7) There is no adjustment for this calibration. If the proper accuracy cannot be achieved, replace the encoder or readout as necessary.

d) Z-axis zero.

(1) Using the Model 82700 controller, operate in the REVERSE direction until the transducer module is fully retracted and has been stopped by the limit switches on the slide assem-

X. D. 2. d) (1) bly. This operation should be performed with the speed control set at six (6).

1.

(2) Measure the "A" dimension (D555032) to assure that the module is fully retracted. "A" must be 5/16 ± 1/32 inch (7.9 ± 0.8mm). In this position the transducer centerline is 1-7/8 inches (73mm) from the hinge point.

(3) Zero the 700 readout.

(4) Operate the controller in the FORWARD direction for approximately 500 counts and return to the "A" dimension of 5/16 ±1/32 inch.

e) Z travel verification (see D555032)

(1) Operate the controller in REVERSE to the zero position described in D.1.d) (1).

(2) Operate the controller in the FORWARD direction until "A" = 15-5/16 ± 1/32 inch. The meter must read 01500 ± 5 counts.

(3) Return to "A" + 5/16 ± 1/32 and verify that the meter reads 00000 ± 5 counts.

(4) The readout is 100 counts per inch.

f) Wall follower drive (Y-axis) repeatability.

(1) Place the device in a stable position and raise the EXAMINATION ARM such that the WALL FOLLOWER SWITCH ARM is accessible.

X. D. 1. f) (2) Place a <u>firm</u> stop in a position such that 1 to 2 inches of FORWARD movement of the WALL FOLLOWER DRIVE will cause the WALL FOLLOWER SWITCH ARM to contact the stop, shutting off the drive.

(3) Set the 82300 controller to AUTO. The WALL FOLLOWER DRIVE ASS'Y will move forward until the WALL FOLLOWER SWITCH ARM contact's the stop.

(4) Measure dimension "B" (D55032).

(5) Depress the WALL FOLLOWER SWITCH ARM and allow the WALL FOLLOWER DRIVE ASS'Y to travel approximately one inch <u>away</u> from the stop.

(6) Release the WALL FOLLOWER SWITCH ARM, allowing the WALL FOLLOWER DRIVE ASS'Y to return the SWITCH ARM to the stop.

(7) Measure dimension "B"; compare to the value obtained in step (4) above. The values must be the same, ±1/16 inch.

2. Complete the Zero and Travel Linearity Verification form, Figure 1.

E. <u>Installation</u>

1. Prior to installing the device on the track, perform the following:

X. E. 1. a) Assure all device movements are operational (X.B. and C.) and within allowable tolerances (X.D.).

b) Assure the search unit calibration is current.

c) Assure adequate water, air, and electrical supplies.

d) Assure the appropriate search unit array has been properly installed (reference Scan Plan).

e) Secure the main cable to the adapter in a manner which will remove strain from all connectors.

f) Assure the nozzle examination area has been cleared of obstructions, adequate lighting is provided, the examination surface is properly cleaned, and that the track has been properly positioned and tightly mounted.

g) Select cable routing to avoid abrupt bends, sharp edges, and possible damage from other drywell activities.

h) Place the device in the following condition:

(1) Water - OFF.

(2) Tail Wheel - Toggle OFF.

(3) Wheel Lock - Toggle OFF.

(4) Manually set wheels - OUTBOARD.

(5) Arm - Toggle EXTEND; regulator at 40 psi.

(6) Module Support Wheels - Toggle X.

(7) Switch Box Purge - Toggle OFF.

X. E. 1. h) (8) 82300 - MANUAL, STOP.

(9) X-220 - STOP.

(10) 700 - STOP.

2. Move to examination area.

a) <u>Exercise extreme care to prevent damage to both the device and the cable during the move.</u> Ensure sufficient excess cable (approximately 15 feet) is readily available in the examination area.

3. Prepare for device installation.

a) Set EXAMINATION ARM regulator to 0 psi; toggle EXTEND.

b) Concurrently locate the device on the track and carefully insert the EXAMINATION ARM into the space between the vessel surface and the insulation.

c) Swing the manually set wheels inboard; lock in place with the thumb screws.

d) Toggle W.L. ON.

e) Set ARM regulator to 35 psi.

f) Toggle ARM EXTEND.

g) Check the final adjustments of X.C.2; refine as necessary.

X. E. 3. g) NOTE: The final adjustments may require "refining" on each nozzle due to minor variations in nozzle dimensions.

4. Preliminary scan.

a) Perform the preliminary scan to determine scanning limits which may be imposed on any specific nozzle by variation in clearance due to penetrations, insulation, thermocouple pads, etc.

b) Set the system to the following conditions:

(1) Toggle W.L. ON.

(2) Toggle TAIL WHEEL EXT.

(3) Toggle EXAMINATION ARM EXT.

(4) Toggle COUPLANT OFF; valve CLOSED.

(5) Toggle MODULE SUPPORT WHEELS Z.

(6) Toggle WALL FOLLOWER SWITCH box purge ON.

(7) 82300 Controller - MANUAL STOP.

(8) 220 Controller - STOP.

(9) 700 Controller - STOP, MANUAL DRIVE.

c) Station an observer at the device, communicating with the console operator via a comm set.

d) Set 700 to REVERSE: depress START.

(1) Module will drive to 00000, stop.

e) Set the 82300 controller to AUTO.

f) Toggle MODULE SUPPORT WHEELS to X.

X. E. 4. g) JOG the device to nozzle TDC; reset the 220 controller; set lower limit to 00000.

h) Set the 220 controller to FORWARD; depress JOG, driving the device <u>slowly</u> 360° while the observer checks for:

(1) MODULE contact;

(2) TAIL WHEEL contact;

(3) Smooth, regular progression of the device around the nozzle;

(4) NOSE WHEEL contact with the vessel wall;

(5) Accurate WALL FOLLOWER function;

(6) Note and record <u>all</u> obstructions and interferences.

i) When the device reaches nozzle TDC (null meter indicates "0") release the JOG control. Note the 220 readout; add 20 counts and set value as upper limit.

j) Set 220 Controller to REV, STOP.

k) Toggle MODULE SUPPORT WHEELS Z.

l) Set the 700 Controller to MODULE DRIVE, FWD.

m) Refer to the Scan Plan; determine the maximum Z-axis extension required and set as upper limit.

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X. E. 4. n) Depress and release START; drive the module to the upper limit.

o) Toggle MODULE SUPPORT WHEELS X.

p) Slowly drive the device CCW to X = 00000 while the observer checks for the same conditions itemized in X.E.4.h), above.

q) Note and record all obstructions and interferences.

r) When the device returns to X = 00000, verify the null meter equals "0", then drive the MODULE REV to Z = 00000.

s) Arrange the cable such that minimal attention is required by routing along the pipe and attaching with a rope, strap, etc., leaving sufficient slack for a complete circumferential scan, avoiding sharp bends or kinks, sharp edges, projections, etc.

XI. PERFORMANCE

A. Preparation for Scanning

1. Refer to the appropriate section of the Scan Plan; determine the correct search unit module.

2. Refer to Procedure UTP-41 for nozzle-to-vessel welds, or Procedure UTP-36 for nozzle inner radius examinations. Assure that the ultrasonic system has been calibrated in accordance with the procedure require-

XI. A. 2. ments. Perform the requirements of the "Remote System Automatic Ultrasonic Data Recording" procedure, UTP-42.

3. Refer to the Scan Plan; attach the module in the indicated orientation to the module support assembly; connect the coaxial search unit cables and attach the couplant supply line to the module mounted manifold.

4. Set the Z-axis drive to the start point indicated by the Scan Plan.

5. Set the controllers to the following conditions:

a) Toggle WL ON; regulator to 40 psi.

b) Toggle TAIL WHEEL EXTEND; regulator to 40 psi.

c) Toggle MODULE SUPPORT WHEELS X; regulator to 70 psi.

d) Toggle WALL FOLLOWER SWITCH box ON; regulator to 5 psi.

e) Toggle EXAMINATION ARM EXTEND: regulator to 45 psi for Z $\leq$ 1250 counts and 55-65 psi for Z $\geq$ 1250 counts.

f) 82300 to AUTO.

g) X-220 to FWD, STOP; X-220 R/O = 00000, speed to 6.

h) 700 to FWD, STOP, MODULE DRIVE; 700 R/O = start point from XI.A.4.

XI. A. 5. i) Set couplant regulator to 10 psi; toggle COUPLANT ON. Open valve and set flow rate to 200 cc/min.

6. Verify the performance of the complete system, including ultrasonics, under remote scanning conditions.

B. <u>Scanning</u>

1. Depress and release X-220 FWD, START.

   a) When X-220 approximates 1/2 of upper limit, increase speed to 10.

   b) Record all appropriate information on Scan Data Sheet.

   c) Depress and release X-220 STOP, REV; set speed to 6.

2. Upon completion of scan, perform the following:

   a) Toggle MODULE SUPPORT WHEELS to Z.

   b) Index MODULE according to the Scan Plan.

   c) Upon completion of index movement, toggle MODULE SUPPORT WHEELS to X.

   d) Record appropriate information on Scan Data Sheet.

3. Depress and release X-220 START.

   a) When X-220 approximates 1/2 of lower limit, increase speed to 10.

   b) Depress and release X-220 STOP, REV; set speed to 6.

XI. B. 4. Upon completion of scan, perform the following:

a) Toggle MODULE SUPPORT WHEELS Z.

b) Index MODULE according to Scan Plan.

c) Upon completion of index movement, toggle MODULE SUPPORT WHEELS to X.

d) Record appropriate information on Scan Data Sheet.

5. Repeat steps 1 through 4 above until examination is complete.

6. Re-verify the "0" position per X.D. at the conclusion of scanning, prior to removing the device from the track.

XII. EVALUATION

A. All recordable and/or reportable indications shall be evaluated in accordance with the appropriate ultrasonic examination procedures and applicable portions of the Scan Plan.

XIII. RECORDS

A. A Scan Data Sheet (Figure 1) shall be completed for each examination and shall be related to the Ultrasonic Calibration and Examination Reports and those portions of the Scan Plan which apply to that examination.

B. A Zero and Travel Linearity Verification form shall be completed daily, prior to use (Figure 2).

XIII. C. Each time the nozzle-to-shell device is assembled as a system, complete the appropriate Nozzle-to-Shell Device Checklist (Figures 3 and 4).

XIV. REVIEW

A. All Scan Data Sheets are subject to review by an assigned LMT Level III for completeness and accuracy of entered date.

XIV. B. Following the LMT review, the Scan Data Sheets shall be transmitted to the WPPSS ISI Field Coordinator for review by WPPSS and the Authorized Nuclear Inspector.

XV. DOCUMENTATION STORAGE AND DISTRIBUTION

A. Original examination documentation shall become the property of WPPSS upon sign-off by the ISI Field Coordinator. Additional reports which may include examination documentation as reference material shall be generated from copies.

B. Field storage facilities shall provide a safe storage area, and access to files shall be limited to the LMT Field Supervisor, his designated representatives, WPPSS representatives, and the Authorized Nuclear Inspector.

Date 1/8/79
Revision 0

WNP-2 PSI PROGRAM PLAN

NOT USED

(Purposely left blank)

Date 1/8/79

Revision 0

WNP-2 PSI PROGRAM PLAN

N O T   U S E D

(Purposely left blank)

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WNP-2 PROCEDURE COVER SHEET AND QUALIFICATION RECORD

Procedure No. UTP-47 Revision No. 0

Procedure Title POLE GUIDED EXAMINATION DEVICE ASSEMBLY AND OPERATING PROCEDURE

LMT, Inc. QA Review and Approval D.B. MacGill Level III 1-2-81
(Quality Assurance Officer)

Client Approval D.P. Ramey, ISI Engineer 3/6/81

Authorized Nuclear Inspector Approval S.M. Foster 2-9-81

Specific Qualification Record

Component	Examiners	Date

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

REVIEW OF CONTRACTOR SUBMITTALS

5463

WNP- 02	ISI ENGINEER DP Ramey	DATE 3/2/81
CONTRACT NO. C-14402	TITLE PSI Services for NSSS & Associated Nuclear Piping	
CONTRACTOR LMT, Inc.		

DOCUMENT TITLE	REV.
UTP-47 " Pole Guided Examination Device Assembly and Operating Procedure	0

PREVIOUSLY REVIEWED [X] YES [ ] NO (DATE IF YES) 12/24/80

PREVIOUSLY APPROVED [ ] YES [X] NO (DATE IF YES)

REASONS FOR RE-SUBMITTAL (IF PREVIOUSLY APPROVED)

REVIEWER	APPROVED	APPROVED AS NOTED	DISAPPROVED	COMMENTS ATTACHED
D. W. Porter 3/2/81 SUPERVISOR, ISI AND OPERATIONS SUPPORT ENGINEER		X		
N/A PROJECT ENGINEERING MANAGER/PLANT TECHNICAL SUPERVISOR				
Ken [illegible] 3/2/81 SUPERVISOR, ISI/NDE/GENERATION SERVICES		X		
[illegible] ~~Assurance~~ 3/6/81 MANAGER, QUALITY SERVICES		X		

[illegible] 3/5/81

NOTES/COMMENTS:

- Typo page 15 remove "are" from paragraph X.C.2.c).
- Typo page 24 change "OFF" to "ON" in paragraph X.D.1.d).1).(g).

ANI(I) Concurrance [illegible] 3-9-81

WP-702 EDP 9 0

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TITLE: POLE GUIDED EXAMINATION DEVICE ASSEMBLY AND OPERATING PROCEDURE

I. PURPOSE AND SCOPE

A. Purpose

1. This procedure provides instructions for the assembly, checkout, and general operation of the remotely operated Pole Guided Examination Device.

B. Scope

1. This procedure is applicable to the remotely operated mechanical device and associated control modules.

2. Instructions for the assembly and operation of the ultrasonic portion of the complete examination system are contained in Procedure UTP-40, "Remote Ultrasonic Examination of Reactor Vessel Circumferential and Longitudinal Butt Welds."

3. Instructions for the assembly and operation of the remote automatic ultrasonic data recording system are contained in Procedure UTP-42, "Remote System Automatic Ultrasonic Data Recording."

II. REFERENCES

A. This procedure is based on the recommendations and instructions of the manufacturer, Southwest Research Institute.

QUALIFICATION:

Approved for use: J. Lambert Level III 1/5/81
D.B. MacGill Level III 1-2-81

II. A.1. Complete operating details are contained in the following SwRI Operating Manuals:

a) Operating Manual 80110, "Model 110 Controller"
b) Operating Manual 80220, "Model 220 Controller"
c) Operating Manual 80402, "Model 402 Controller"
d) Operating Manual 82100, "Model 82100 Controller"
e) Operating Manual 5583006, "Pole Guided Inspection Device"

2. The following drawings are referenced in this procedure:

a) SwRI Drawing D-10094
b) SwRI Drawing D-10490
c) SwRI Drawing C-13577
d) SwRI Drawing D-10520

III. DEFINITIONS

Beam Direction: Orientation of ultrasonic beam relative to vessel axis, independent of scan direction.

Controller: Electronic device controlling mechanical system motor direction and/or speed. May indicate relative position via multi-digit readout.

III. Index Movement: (Increment)	Module movement (distance moved) between scans.
Module, Search Unit:	Search unit cluster including shoes, wedges, holding framework, couplant supply manifold.
Scan Direction:	Motion of search unit module relative to vessel axis, independent of beam direction.
X-axis:	Circumferential axis of vessel.
Y-axis:	Longitudinal axis of vessel.
T:	Calibration block thickness.
t:	Weld thickness.

IV. RESPONSIBILITY

A. The Technical Manager, LMT, Inc. is responsible for the generation and control of this procedure and shall so indicate by a dated signature on the procedure cover sheet.

B. The responsible Level III Field Supervisor, LMT, or his designated Level III alternate, LMT, shall qualify the procedure for a particular examination.

V. PROCEDURE QUALIFICATION

This procedure shall be qualified by performing and documenting successful checkout and position verification and repeatability as instructed in X.D. below.

VI. PERSONNEL REQUIREMENTS

A. Examiners using this procedure shall have levels of qualifications as per the Procedure Qualification.

B. Personnel operating the pole guided examination device shall be qualified on the equipment and so certified by an authorized LMT Level III examiner.

1. For each shift of operation, the examination team shall consist of at least the following personnel:

a) Coordinator/supervisor: Coordinate efforts of individual team members and efforts of the examination team with the owner and appropriate onsite crafts.

b) Console operator: Operate controllers, record necessary data for completion of scan data sheets. Conduct and verify functional checks of mechanical system.

c) Observer: Stationed at device location to observe operation of device, warn of pending obstruction, malfunction, etc.

VI. B. 1. d) Ultrasonic operator: Perform examination calibration, enter appropriate information on strip chart recordings, verify proper operation of ultrasonic system. Certified to at least Level II Ultrasonic.

2. Team personnel may perform the above duties on a rotational basis, provided adequate cross training and certification levels are existent.

VII. EQUIPMENT AND MATERIALS

A. System Description

1. The pole guided device has been designed to remotely scan reactor pressure vessel longitudinal and circumferential welds.

2. Vertical device movement is along permanently installed Pole Tracks which have been placed at known elevations and azimuth locations around the vessel.

3. Horizontal search unit movement is accomplished by means of a transverse arm, which may be extended up to 21.69 inches either side of the device centerline.

4. Search units are mounted in a modular configuration on an assembly which may be remotely rotated up to 300°. The remote rotation feature allows for changing the direction of the ultrasonic beam relative to the vessel long axis, without removing the search

VII. A. 4. unit module from the device.

5. Vertical and circumferential (X- and Y- axis) movements are governed by the Model 220 Controllers. Front panel controls regulate scan speed, direction and limits. Module location, relative to a known ZERO reference, is indicated by a digital display.

6. The transverse arm is mounted to the vertical axis drive car in a manner allowing the arm assembly to be extended outward, toward the vessel, or retracted back to the drive car. The extending/retracting motion describes an arc. When the transverse arm is extended, the search unit module location, relative to the drive car reference switch, changes. A "sine pot", attached to the transverse arm hinge point, "reads" the degree of transverse arm movement, and is input to the 82100 controller. The 82100 has two (2) digital displays. The first is a three digit display of the sine pot input. The second (five digit) display is the algebraic sum of the Y-axis 220 display and the sine pot input.

7. Search unit module rotation is regulated by the Model 110 controller. Front panel controls govern rotational speed and direction. Module orientation is indicated by a front panel digital display.

VII. A. 8. <u>Model 402 Controllers</u> regulate couplant flow, couplant supply pressurization, transverse arm extension/retraction, and drive car wheel lock functions.

VIII. <u>PREPARATIONS</u>

A. <u>Documentation</u>

1. The following preliminary documentation requirements shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before beginning any examination program:

   a) Procedure and Qualification
   b) Calibration Reports
   c) Examination Reports
   d) Material and Equipment Certifications
   e) Personnel Certifications
   f) Status Indicators (Hold tags)

B. <u>Physical</u>

1. The following physical preparation requirements shall be reviewed by the examiner with the WPPSS ISI Field Coordinator before specific examinations are performed:

   a) Insulation removal
   b) OSHA requirements (ladders, lighting, fresh air, scaffolding, etc.)

VIII. B. 1. c) Cleanup requirements

d) Safety precautions (other work in area, etc.)

e) Electrical outlets - 110-120v AC, 30 amp, single phase, minimum of two (2) required.

f) Air or nitrogen supply.

C. Surface Preparation

1. Examination surfaces shall be free from weld spatter or any other surface condition which will impede free movement of the search unit module.

2. Examination surfaces shall be free from extraneous materials or other conditions which, in the opinion of the examiner, will impair the performance of a meaningful examination.

IX. LIMITATIONS

This procedure is limited to remotely operated ultrasonic examinations of longitudinal and circumferential welds of the reactor vessel conducted from the vessel OD surface, using contact methods.

X. SYSTEM ASSEMBLY AND FUNCTIONAL CHECKOUT

A. System Assmebly

1. Device/Cable/Controller interconnects

a) Using cable 82041, interconnect the device and controllers as follows:

X. A. 1.

Pneumatic

Cable	Device	Controller/Connector
B (red)	B	No. 1-402/1 (brake)
WL (yellow)	WL	No. 1-402/3 (wheel lock)
C1 (blue)	C1	No. 2-402/1 (arm ext.)
C2 (black)	C2	No. 2-402/2 (arm ret.)
W (clear)	W	No. 3-402/WTR OUT (couplant)

a) Electrical/Electronic

Cable	Device	Controller/Connector
Multiple	Multiple	220-X X-220/input
Cond.	Cond.	220-Y Y-220/input

Ultrasonic (Coax) Cables

2. Attach the coax cables as directed by the Scan Plan.
3. Using cable 8207-C, interconnect the Y-220 and 82100 controllers.
   a) Connect one end to Y-220 BCD OUT
   b) Connect remaining end to 82100 BCD IN
4. Digital-to-analog converter to controller interconnects.

X. A. 4. D/A Converter — Controller/Connector

D/A Converter	Controller/Connector
X-IN	X-220/BCD OUT
Y-IN	82100/BCD OUT

5. Controller Power Cables

   a) Connect the 220, 82100, and 110 controller power cables to a 115 vac regulated power supply.

   b) Rotate all regulator controls full CCW.

   c) Connect the braided air lines to the rotary manifold and the AIR connector on the rear panel of each 402 controller.

6. Couplant Supply

   a) Connect a 1/8" air line to the couplant supply can and the No. 3 outlet on the No. 3 402 controller.

   b) Connect the water line from the couplant supply can to WATER IN on the No. 3 402 controller.

7. Search Unit Array

   a) Select the appropriate search unit array as directed by the Scan Plan; attach to the support assembly with shoulder screws.

B. Mechanical System Checkout

1. Turn Y 220 on.

   a) Set direction to FORWARD

   b) Set lower limit to 20000

X. B. 1. c) Set upper limit to 90000

d) Depress and release START

1) Determine drive gear rotation is proper to move "bug" in forward direction (CW when viewing from track side, cables at bottom), and that the five digit display is INCREASING.

NOTE: <u>If count is decreasing, reposition toggle switch located between the two multiple conductor connectors on the rear of the 220 controller.</u>

2) Depress STOP

2. Set No. 2 402 controller ARM regulator to 40 psig.

a) Set ARM toggle to EXT.

b) As ARM extends, observe that the 82100 five digit display decreases as the three digit display increases.

NOTE: <u>The 82100 five digit display, plus the three digit display, should equal the Y-220 controller five digit display.</u>

3. Turn X-220 ON

a) Set direction to FORWARD

b) Set lower limit to 20000

c) Set upper limit to 90000

d) Depress and release START

X. B. 3. e) Observe that the transverse arm is moving in proper direction (right to left, when looking from the "bug" toward the vessel), and that the five digit display is INCREASING.

f) Depress STOP.

g) Set direction to REVERSE.

h) Depress and release START.

i) Observe that the arm is moving left to right (viewing from "bug" to vessel), and that the five digit display is DECREASING.

j) Drive arm to full reverse position.

k) Depress STOP.

l) Set X-220 readout to 00000.

m) Set direction FORWARD.

n) Drive to full forward position.

o) X-220 readout at limit of FORWARD travel should be 00469 ±5 counts.

p) Set lower limit to 00235.

q) Set direction to REVERSE.

r) Depress and release START.

s) When X display reads 00235, arm will stop.

4. Set ARM toggle to RET.

5. Set WL (wheel lock) regulator to 80 psig.

X. B. 5. a) Set WL toggle to ON; observe extension of air cylinder and that the air-loaded wheels move toward the "Manually Set" wheels.

b) Set WL toggle to OFF; observe that air cylinder and attached wheels retract.

6. Set BRK (brake) regulator to 100 psig.

a) Set BRK toggle to ON; observe extension of brake air cylinder and movement of lever.

b) Set BRK toggle to OFF; observe retraction of air cylinder.

7. Depress REFERENCE SWITCH; observe that REFERENCE LAMP on Y-220 controller is illuminated.

8. Turn 110 controller ON.

a) <u>Ensure that module rotator is not against stop.</u>

b) Set direction to FORWARD.

c) Depress JOG control; observe that rotation of search unit array is CCW when viewed from vessel side of arm, and that digital display is INCREASING.

d) Release JOG control.

e) Set direction to REVERSE.

f) Depress and hold the JOG control; observe that rotation of the search unit array is CW when viewed from the vessel side of the arm, and that the digital display is DECREASING.

X. C. System Adjustments and Final Checkout

1. Trailer Position (Reference SwRI Drawings D-10094 and D-10490).

   a) Attach the device to a straight section of track. Place the track on a flat surface (horizontal).

   b) Remove all air pressure from the arm cylinders and toggle WL ON.

   c) Extend the trailer tilt stop screws (item 45 of D-10094) until the trailer base (item 15 of D-10094) is parallel to the yoke (item 19 of D-10490) and locked in position.

   d) Adjust the arm cylinder rods (turn the cylinder rod in or out of the rod clevis) until the rear of the trailer base rests evenly on the supports extending from the front of the car body assembly (items 5 and 6 of D-10490).

   e) Adjust the tilt (forward and backward) of the trailer base until it is parallel with the body (item 2 of D-11663) of the drive car assembly. This adjustment is made by turning the arm adjusting rod (item 18 of D-10490).

2. Trailer Tilt Stop Adjustment

   The two screws (item 45 of D-10094), serve to restrict the side-to-side tilt of the trailer assembly. The tilt capability is required to allow the trans-

X. C. 2. verse arm to accomodate to the vessel surface in the event that the width of the pole track is not exactly parallel to a tangent to the vessel surface.

Adjustment of the stops is accomplished as follows:

a) Retract the lift cylinders completely.

b) Loosen the lock nuts (item 45 of D-10094).

c) Adjust the height of the screws (item 45 of D-10094) until the heads of the screws are clear the yoke (item 19 of D-10490) by about 3/16 inch.

d) Tighten the lock nuts.

3. Transverse Arm Limit Switches

There are two limit switches (item 23 of D-10094) on the trailer assembly that automatically limit the travel of the transverse arm. These switches may need adjustment when the transverse arm is changed.

To adjust, proceed as follows:

a) Drive the transverse arm slowly to the left until the cam is opposite the roller of the right hand microswitch.

b) Loosen the two screws holding the microswitch and move the switch toward the rack until the switch actuates. Tighten the screws.

X. C. 3. c) Drive the transverse arm slowly to the right and repeat the adjustment with the other switch.

d) Drive the arm in each direction and readjust if necessary.

4. Track Reference Switch (Level and Switch Assembly, SwRI Drawing C-13577).

The limit switch (item 10) and its actuator (items 2 and 6) are used to establish the primary reference position of the pole guided device on the track. Each pole track has a reference button attached to the back side of the gear rack, at some preselected point. As the drive car passes the reference position, the switch is activated momentarily and lights the reference lamp on the controller. Adjust the reference switch as follows:

a) Install the device on the track. Determine that the roller of the actuator (item 6) is just barely in contact with the back of the rack on the track. (Adjust using screw, item 24).

b) Slowly drive the device past the reference position and readjust item 3 as necessary to light the reference light on the panel.

X. C. 4. c) Drive the device past the reference position in the other direction. The light should light in both directions as the reference position is passed and not be lighted at other locations.

d) If there is insufficient adjustment in item 3, adjust item 18 until item 3 is within its range.

NOTE: The distance from the reference SWITCH position to the centerline of the transducer modules on the transverse arm is approximately 255 counts with the trailer fully retracted.

5. Search Unit Module Offset (along track)

The positional readout of the pole device (along the track) is relative to the track reference. With the search unit support (trailer) fully retracted, the position of the module is a fixed and known number of counts away from the reference switch. However, this is not a useful operating condition. The search units must be extended to contact the examination surface. As the search units are extended to the surface, due to the mechanical configuration of the device, the distance between the module and the reference switch and drive assembly becomes less. The difference in position is a sine function of the amount of extension necessary to reach the surface.

X. C. 5. This condition is easily seen on SwRI Drawing D-10520. A sine potentiometer and Model 82100 Controller are used to compensate for this change in position of the search unit.. The 82100 controller monitors the rotation of the sine potentiometer, subtracts an appropriate number of counts from the position displayed on the Model 220 Controller, and displays the corrected position on the five digit display as well as the "OFFSET" on the 3-1/2 digit display.

Adjustment of the potentiometer (item 6 of D-10490) is critical and should be accomplished in the following manner after the sine pot has been replaced. No adjustment should be required in normal operation.

a) Remove the sine pot connector from the back of the 82100 controller and short pins B and K of the controller receptacle.

b) Remove the plastic front cover from the 3-1/2 digit analogic panel meter and turn the ZERO adjustment screw until the offset meter reads 000. The ZERO adjust screw is located between

X C. 5. b) the second and third NIXIE tubes from the right. It is the left hand adjustment. DO NOT ADJUST THE SCREW ON THE RIGHT.

c) Remove the short between pins B and K and reconnect the sine pot cable connector.

d) With the cover (item 14 of D-10490) removed and the trailer in the full down position, loosen the set screw which holds the gear (item 59) on the 1/4 inch shaft (item 57).

e) Rotate the gear (item 59) and sine pot shaft until the offset meter reads 000 and lightly tighten the set screw.

f) Raise the trailer to its maximum height. The offset meter should increase smoothly and stop at approximately 76.

(1) If the readout does not stop near 76 or does not increase smoothly, the pot has been set at the wrong ZERO.

(2) Lower the trailer back to the mechanical zero position and loosen the set screw on item 59.

(3) Slowly rotate the gear and sign pot shaft (about 90° rotation of the pot) until the meter again reads 000. Lightly tighten the set screw.

X. C. 5. f) (4) Repeat 5.f).

g) Lower the trailer to the mechanical zero position and loosen the set screw on item 59..

h) Slowly rotate the gear and pot shaft until the meter reads +004 and tighten the set screw.

i) Adjust the zero screw on the meter until the readout is 000.

j) Replace the meter cover and the sine pot cover (item 14).

k) Select a convenient horizontal reference point on the trailer assembly and on the drive car. Measure and record the horizontal distance between these two points.

l) Raise the trailer assembly so that the horizontal distance between these two reference points is reduced by 4.36 inches.

m) Adjust the range of the offset meter so that the meter reads 76. (The adjustment screw is located in the middle of the rear end of the chassis of the Model 82100 Controller.)

n) Check the reading at the following positions:

X. C. 5. n)

Reduced Distance	Offset Meter
0	0 ± 1
1.16 ± .03 (29.5 mm)	20 ± 1
2.74 ± .03 (64.7 mm)	48 ± 1
4.36 ± .03 (111 mm)	76 ± 1

NOTE: <u>This calibration may also be conducted with the setup shown in Figure 1, in which case "X" is the reduced distance.</u>

D. <u>Verification</u>

1. Prior to commencing examination, verify the accuracy of the calibrated mechanical movements.

   a) Y-Axis Linearity

      1) Position the drive car such that the drive gear is readily accessible. Make a mark on the drive gear and position a pointer on the base of the drive car so that it just clears the mark on the drive car.

      2) Zero the display on the controller.

      3) Run the drive motor FORWARD in 48-count increments until 00480 counts are displayed within ±1 count. The mark on the drive gear must coincide with the pointer after each 48-count increment, ±1 count.

X. D. 1. a) 4) Repeat 1.a)(3) in the REVERSE direction (00480 to 00000).

5) There is no adjustment for this calibration. If an error is noted, the encoder is malfunctioning, the controller is malfunctioning, or the encoder coupling is not tight.

b) Y-Axis Travel

1) Obtain a 3 to 4 foot length of track which has a reference button. The button should be mounted near the end of the track from which the device will start traveling in an increasing direction.

2) Place the device at one end of the track.

3) Place matched marks on the device and track.

4) Zero the Model 220 Controller display.

5) Drive the device toward the opposite end of the track (FORWARD) until the controller displays 00419 counts.

6) Measure the distance from the reference mark on the device back to the mark on the track. This distance should be 24.00 ± .06 inches.

X. D. 1. b) 7) Operate the device in the opposite direction until the Model 220 Controller displays 00000. The two matched marks should align with each other within ±.06 inches.

8) There is no adjustment for this calibration (see 1.a)(5).

c) Reference Light Check

1) Place the device on the test track and drive in REVERSE until the reference light is ON.

2) Mark the track at the rear edge of the drive car.

3) Zero the readout on the Model 220 controller.

4) Drive the device FORWARD approximately 50 counts and return to the light ON position.

5) The 00000 position for a particular examination can be directly related to the position of the track reference button. It is the reference button which actuates the reference light.

d) Module "Y" Offset

1) It is necessary that the distance between the reference switch actuation position and the module centerline be known if the true search

X. D. 1. d) 1) unit position is to be determined. To determine this distance, proceed as follows:

(a) Mount the device on a section of track containing a reference button (either a test section or the actual pole track) and retract the trailer fully.

(b) Drive the device in REVERSE past the reference button. The reference light on the controller will turn ON then OFF. Drive in REVERSE approximately 10 counts past the OFF position.

(c) Zero the controller readout.

(d) Drive FORWARD slowly and note the readout when the light turns ON.

(e) Continue FORWARD until the light turns OFF and note the reading.

(f) Continue FORWARD for approximately 10 counts.

(g) Drive REVERSE until the light turns OFF and note the reading.

(h) Continue REVERSE until the light turns OFF and note the reading.

X. D. 1. d) 1) (i) Average the four readings of (d), (e), (g), and (h).

(j) Drive FORWARD to the average reading obtained in (i).

(k) Mark the track at the rear end of the drive car and then carefully measure the distance from the mark to the center of the reference button.

(l) Carefully measure the distance from the rear of the drive car to the rear edge of the transverse arm.

(m) Subtract the dimension of (k) from the dimension of (l).

(n) Add 2.0 inches to (m).

(o) Convert (n) to counts by multiplying 17.4616.

(p) Subtract the reading of (i) from the reading of (g).

(q) Add the number of counts of (p) to the number of counts of (o). This number is the actual number of counts from the reference light ON position to the module centerline when the trailer is fully retracted.

X. D. 1. e) Transducer Offset

Sine pot correction of the "Y." offset due to the raising of the trailer and the calibration of this movement is discussed in X.C.5.

f) "X" Movement (Transverse Arm Position)

1) Linearity

(a) Place the device in the position such that the rack on the back of the transverse arm is accessible.

(b) Drive the arm in the REVERSE direction to a position close to the mechanical limit but not past the microswitch cutoff. Zero the Model 220 Controller.

(c) Attach a pointer to some stationary part of the trailer assembly so the pointer just clears the teeth of the rack at the tip of the pointer.

(d) Place five marks on the rack at intervals of exactly fourteen (14) teeth from the starting point.

(e) Operate the arm in the FORWARD direction and stop as each of the five marks are exactly aligned with the pointer. Note the number of counts that the readout

X. D. 1. f) 1) (e) has increased since the previous mark was aligned with the pointer.

(f) The count increase must be multiples of 48 ± 1.

(g) Repeat (e) and (f) in the REVERSE direction.

(h) There is no adjustment for this calibration. The cause of any problems will be in the encoder, encoder drive gears, cable or controller.

2) Arm Travel

(a) Drive the arm in the direction specified in the Mechanized Scan Plan to reach "0" until the arm approaches the limit stop.

(b) Place match marks on the rack of the arm assembly and a stationary part of the device.

(c) Zero the Model 220 Controller display.

(d) Operate the arm in the increasig direction until the controller readout displays 00244 counts.

X. D. 1. f) 2) (e) Measure the distance along the rack between the two match marks. This distance should be <u>14</u> ± <u>.06</u> inches.

(f) Operate the arm in the decreasing direction until the controller readout displays <u>00000</u>.

(g) Verify that the matched marks are aligned within ±.06 inches.

3) "0" Position

(a) Operate the arm in the decreasing count direction as required by the Scan Plan until the arm lower limit stop is reached. The limit should be approached slowly to minimize overshoot.

(b) Zero the display on the controller.

(c) Drive the arm in the increasing count direction until upper limit stop is reached. Again, the limit should be approached slowly.

(d) Note the total count.

(e) Divide the total count by two and drive in decreasing direction to this number. The arm should be in its center position.

X. D. 1. f) 3) (f) Make a reference mark on the centerline of the trailer assembly and a matching mark on the arm. The position of the transducer module on the arm will be referenced to this mark.

(g) Drive the arm to the lower limit stop (the counter will read 00000).

(h) Make a mark on the arm which aligns with centerline reference mark on the trailer. (This is the arm zero mark.)

(i) Operate the arm in the increasing direction for approximately 100 counts and return to 00000.

(j) The trailer centerline reference mark and the arm zero mark must align within ±.06 inches.

4) Search Unit Module Rotation

(a) Identify the mechanical limit stops of the rotator.

(1) Inspect the underside of the worm wheel and locate the aluminum projection which serves as the mechanical limit stop.

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X. D. 1. f) 4) (a) (2) There is a screw head projecting from the base of the rotator just to the left of the motor under the worm wheel which serves as the rotating member of the mechanical stop.

(3) The mechanical stop allows approximately 300 degrees of rotation.

(4) The stop is used to prevent damage to the potentiometer but may damage the motor if it is contacted at a speed other than very slow.

(b) Remove the module and drive the rotator (using the Model 110 Controller) slowly in REVERSE (clockwise) toward the stop until side "1" of the rotator is parallel with side "A" of the transverse arm (see Figure 2).

(c) Install the module looking in the direction required by the Scan Plan. (For this discussion, the module looks to the rear at 0°.)

X. D. 1. f) 4) (d) Adjust the "Z" adjustment so that readout is 000.

(e) Rotate the module FORWARD (CCW) 270 degrees such that side "1" of the module is perpendicular to side "A" of the arm (Figure 2).

(f) Adjust the "R" control to set the display at 270.

(g) Return the module to the original zero position defined in (b). Re-zero the meter if necessary.

(h) Return the module to the 270 degree position defined in (e). Reset the meter to 270 if necessary.

(i) Repeat (g) and (h) until no change is noted.

(j) Rotate the module counterclockwise such that side "1" of the module is perpendicular to side "A" of the arm. The controller must display 090 ± 1, Figure 2.

(k) Rotate the module counterclockwise such that side "1" of the module is parallel to side "A" of the arm. The controller must display 180 ± 1, Figure 2.

X. D. 1. f) 4) (1) Some slight modification of the "R" and "Z" adjustments are possible to make the 090 and 180 positions proper.

E. <u>Installation</u>

1. Prior to installing the device on the track, perform the following:

   a) Assure all device movements are operational (X.B. and C.) and within allowable tolerances (X.D.).

   b) Assure the search unit calibration is current.

   c) Assure adequate water, air, and electrical supplies.

   d) Assure the appropriate search unit array has been properly installed (reference Scan Plan).

   e) Secure the main cable to the device in a manner which will remove strain from all connectors.

   f) Assure the examination area has been cleared of obstructions, adequate lighting is provided, the examination surface is properly cleaned, and that the track has been properly positioned and tightly mounted.

   g) Select cable routing to avoid abrupt bends, sharp edges, and possible damage from other drywell activities.

X. E. 1. h) Place the device in the following condition:

1) Water - OFF.

2) Wheel Lock - Toggle OFF.

3) Manually set wheels - OUTBOARD.

4) Arm - Toggle RETRACK; regulator at 40 psi.

5) 110 - STOP.

6) X-220 - STOP.

7) Y-220 - STOP.

2. Move to examination area.

a) Exercise extreme care to prevent damage to both the device and the cable during the move.

b) Ensure sufficient excess cable is readily available in the examination area.

3. Prepare for device installation.

a) Toggle WL and BRAKE OFF.

b) Toggle ARM RET.

c) Retract MANUALLY SET WHEELS.

d) Engage the remotely set wheels in the track groove (refer to Scan Plan for device orientation); engage drive gear with rack.

e) Adjust device alignment to allow wheel engagement with track groove.

f) Swing MANUALLY SET WHEELS inboard; ensure detents lock in place.

g) Toggle WL ON.

X. E. 4. Preliminary Scan

a) Perform the preliminary scan to determine scanning limits which may be imposed by local variations in clearance due to penetrations, insulation, thermocouple pads, etc.

b) Set the device to the following conditions:

1) Toggle WL ON.
2) Toggle ARM EXT.
3) Toggle COUP. PRS. OFF; close valve.
4) 110 controller STOP.
5) X-220 controller STOP.
6) Y-220 controller STOP.

c) Station an observer at the device, communicating with the console operator via a com set.

d) Drive Y to REF. BUTTON (front panel pilot lamp will illuminate).

e) Reset Y-220 display (00000).

f) Drive X full CCW.

g) Reset X-220 display (00000).

h) Toggle ARM EXT.

i) Set Y upper limit to maximum value for specific track (refer to Scan Plan).

j) Set Y-220 speed control to 6; direction FWD.

X. E. 4. k) Depress and release START.

l) During scan motion, observer to watch for smooth progression of device along track, obstructions, module contact with vessel surface.

m) Upon completion of scan, reverse motion of device, scan to lower limit (reference button).

n) Observer action same as l).

o) Refer to Scan Plan for X upper limit; set X-220 upper limit switches.

p) Set X-220 FWD; speed at six.

q) Depress and release START.

r) Observer to watch for smooth travel of arm, obstructions, module contact with vessel surface.

s) Record all obstructions on the examination report form.

t) Arrange cable to require minimal attention during device operation.

XI. PERFORMANCE

A. Preparation for Scanning

1. Refer to the appropriate section of the Scan Plan; determine the correct search unit module.

XI. A. 2. Refer to Procedure UTP-40. Assure that the Ultrasonic System has been calibrated in accordance with the procedure requirements.

3. Perform the requirements of the "Remote System Automatic Ultrasonic Data Recording" procedure, UTP-42.

4. Refer to the Scan Plan; attach the module in the indicated orientation to the module support assembly; connect the coaxial search unit cables and attach the couplant supply line to the module mounted manifold.

5. Set the Y-axis drive to the start point indicated by the Scan Plan.

6. Set the controllers to the following conditions:
   a) Toggle WL ON; regulator to 40 psi.
   b) X-220 to FWD, STOP; X-220 R/O to start point from Scan Plan; speed to six.
   c) Y-220 to FWD, STOP, MODULE DRIVE, R/O to start point from Scan Plan.

7. Verify performance of the complete system, including ultrasonics, under remote scanning conditions.

B. <u>Scanning</u>

1. Refer to Scan Plan; identify scan axis, increment (index) axis.

XI. B. 2. Verify module is positioned according to Scan Plan start points.

3. Verify X and Y controllers upper and lower limits are set according to Scan Plan.

4. Toggle COUP. PRS. ON; regulator to 15 psi; open valve and set flow to 200 cc/min.

5. Depress and release appropriate axis controller START.

6. Upon completion of scan, depress and release STOP, REV, and index module according to Scan Plan.

7. Enter all appropriate information on Scan Data Sheet.

8. Repeat steps 5, 6, and 7 until examination is complete.

9. Upon completion of scanning and prior to removing the device from the track, re-verify the X and Y axis "0" positions.

XII. EVALUATION

A. All recordable and/or reportable indications shall be evaluated in accordance with the appropriate ultrasonic examination procedures and applicable portions of the Scan Plan.

XIII. RECORDS

A. A Scan Data Sheet (Figure 3) shall be completed for each examination and shall be related to the Ultrasonic Calibration and Examination reports and those portions of the Scan Plan which apply to that examination.

B. A "Pole Guided Device Zero and Travel Linearity Verification" form shall be completed daily, prior to commencing examination (Figure 4).

C. Each time the pole guided examination device is assembled as a system, complete the checklists (Figures 5 and 6).

XIV. REVIEW

A. All Scan Data Sheets are subject to review by an assigned LMT Level III for completeness and accuracy of entered data.

B. Following the LMT review, the Scan Data Sheets shall be transmitted to the WPPSS ISI Field Coordinator for review by WPPSS and the Authorized Nuclear Inspector.

XIV. DOCUMENTATION STORAGE AND DISTRIBUTION

A. Original examination documentation shall become the property of WPPSS upon sign-off by the ISI Field Coordinator. Additional reports which may include examination documen-

XIV.. A. tation as reference material shall be generated from copies.

B. Field storage facilities shall provide a safe storage area, and access to files shall be limited to the LMT Field Supervisor, his designated representatives, WPPSS representative and the Authorized Nuclear Inspector.

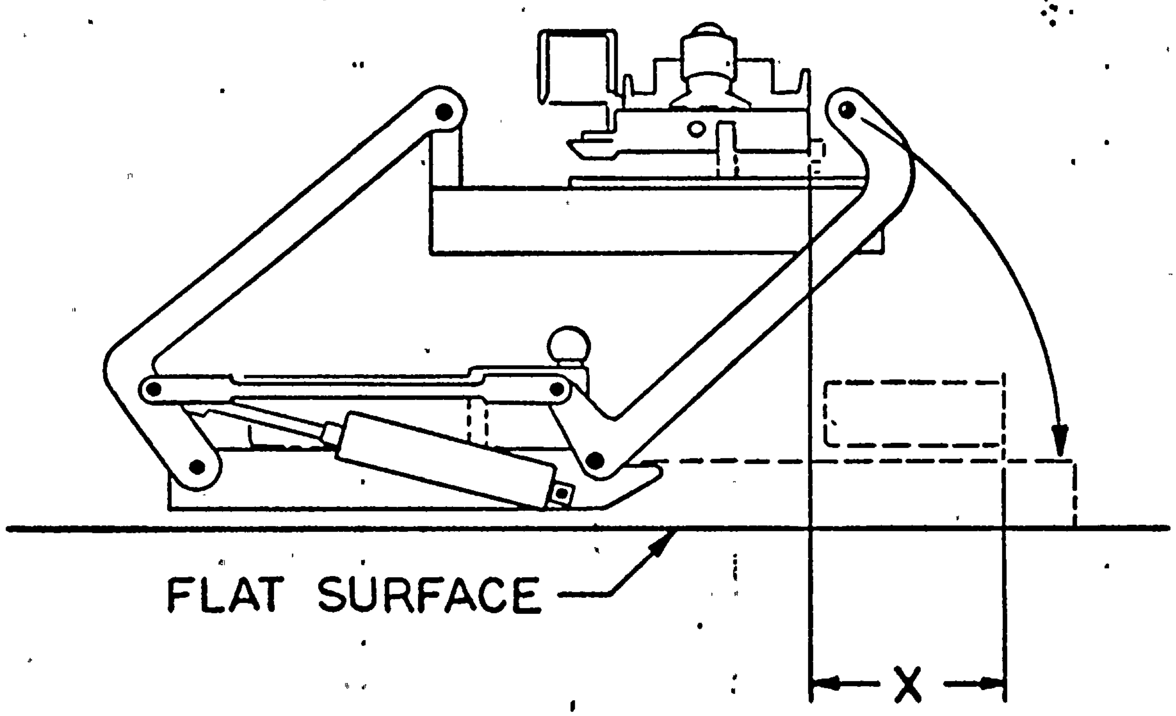

FIGURE 1

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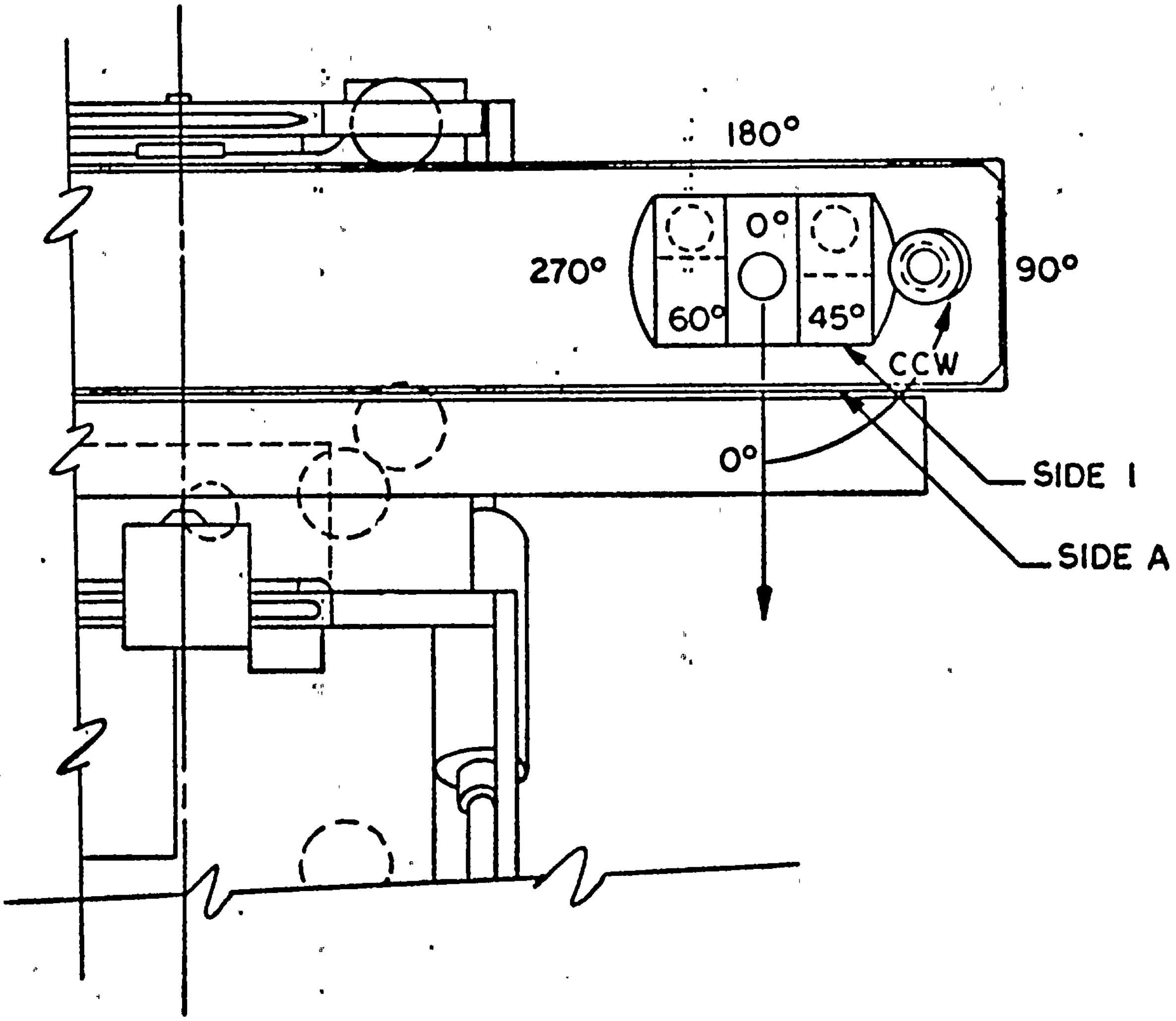

FIGURE 2

Exam. No.: ____________

SCAN DATA SHEET: CIRCUMFERENTIAL AND LONGITUDINAL WELDS: RPV SHELL, LOWER HEAD

Date ________ Weld No. ________ Report No. ________ Cal. No. ________________ Pg ____ of ____
Start Time ________________ Completion Time ________________

	INDEX __ AXIS			SCAN __ AXIS						
				START			STOP			
Increment No.	__-220 counts	Inches from Track Ref.	Inches from Vessel Ref.	__-220 counts	Inches from Track Ref.	Inches from Vessel Ref.	__-220 counts	Inches from Track Ref.	Inches from Vessel Ref.	Comments

PROC. UTP-47 PAGE 42 FOLLOWING 43

Figure 3

Pole Guided Device Zero and Travel Linearity Verification

X-Axis Zero and Travel Linearity

INSTRUCTION	VERIFICATION
1. Drive ARM full Rev, Set Controller FWD	
a) 5 marks on rack @ 14 tooth intervals	
b) Drive FWD to each mark.	
c) Record count at each mark. 1___; 2___; 3___; 4___; 5___	
d) Count increase ea. mark = 48 counts ±1.	
e) Set Controller FWD	
f) Set lower limit to 00000	
g) Drive to 1st mark ± 1/16"	
h) 220 R/O = 00000 ±1 count.	

Y-Axis Zero and Travel Linearity

INSTRUCTION	VERIFICATION
1. Drive to REF. BUTTON	
a) Y-220 R/O = 00000	
b) Drive RWD 10 inches	
c) Y-220 R/O = 00175 ±1 count	
2. Drive REV to REF BUTTON	
a) Y-220 R/O = 00000	

Module Zero and Linearity

INSTRUCTION

1. Drive Module to 0° Orientation
   - a) 110 R/O = 00000
   - b) Drive FWD to 270 location
   - c) 110 R/O = 00270±1
   - d) Drive FWD to orientation
   - e) 110 R/O = 00000

PROC. NO. UTP-47
PAGE 43
FOLLOWING PAGE 44

Figure 4

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Pole Guided Device Checklist: System Preliminary Checkout

Job No.________________ Examination No.____________ Sheet 1 of 4

Date:__________________

Instruction:	Accomplished by:
1. Turn Y 220 on.	
a) Set direction to FORWARD	__________
b) Set lower limit to 20000	__________
c) Set upper limit to 90000	__________
d) Depress and release START	__________
1) Determine drive gear rotation is proper to move "bug" in forward direction (CW when viewing from track side, cables at bottom), and that the five digit display is INCREASING.	__________
NOTE: <u>If count is decreasing, reposition toggle switch located between the two multiple conductor connectors on the rear of the 220 controller.</u>	__________
2) Depress STOP	__________
2. Set No. 2 402 controller ARM regulator to 40 psig.	__________
	__________
a) Set ARM toggle to EXT.	
b) As ARM extends, observe that the 82100 five digit display decreases as the three digit display increases.	__________
NOTE: <u>The 82100 five digit display, plus the three digit display, should equal the Y-220 controller five digit display.</u>	

Figure 5

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Instruction:	Accomplished by:
3. Turn X-220 ON	
a) Set direction to FORWARD	________
b) Set lower limit to 20000	________
c) Set upper limit to 90000	________
d) Depress and release START	________
e) Observe that the transverse arm is moving in proper direction (right to left, when looking from the "bug" toward the vessel), and that the five digit display is INCREASING.	________
f) Depress STOP.	________
g) Set direction to REVERSE.	________
h) Depress and release START.	________
i) Observe that the arm is moving left to right (viewing from "bug" to vessel), and that the five digit display is DECREASING.	________
j) Drive arm to full reverse position.	________
k) Depress STOP.	________
l) Set Y-220 readout to 00000.	________
m) Set direction FORWARD.	________
n) Drive to full forward position.	________
o) Y-220 readout at limit of FORWARD travel should be 00469.	

Figure 5 (cont.)

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Instruction:	Accomplished by:
3. p) Set lower limit to 00235.	______
q) Set direction to REVERSE.	______
r) Depress and release START.	______
s) When Y display reads 00235, arm will stop.	______
4. Set ARM toggle to RET.	______
5. Set WL (wheel lock) regulator to 80 psig.	______
a) Set WL toggle to ON; observe extension of air cylinder and that the air-loaded wheels move toward the "Manually Set" wheels.	______
b) Set WL toggle to OFF; observe that air cylinder and attached wheels retract.	______
6. Set BRK (brake) regulator to 100 psig.	______
a) Set BRK toggle to ON; observe extension of brake air cylinder and movement of lever.	______
b) Set BRK toggle to OFF; observe retraction of air cylinder.	______
7. Depress REFERENCE SWITCH; observe that REFERENCE LAMP on X-220 controller is illuminated.	
8. Turn 110 controller ON.	______
a) Ensure that module rotator is not against stop.	______
b) Set direction to FORWARD.	______
	______

Figure 5 (cont.)

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Instruction:	Accomplished by:
8. c) Depress JOG control; observe that rotation of search of search unit is CCW when viewed from vessel side of arm, and that digital display is INCREASING.	________
d) Release JOG control.	________
e) Set direction to REVERSE.	________
f) Depress and hold the JOG control; observe that rotation of the search unit array is CW when viewed from the vessel side of the arm, and that the digital display is DECREASING.	________

END OF CHECKLIST

Figure 5 (cont.)

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Pole Guided Device Checklist: System Adjustments and Final Checkout

Job No.________________ Examination No.____________ Sheet 1 of 7
Date:________________

Instruction: Accomplished by:

1. Trailer Position (Reference SwRI Drawings D-10094 and D-10490).
   a) Attach the device to a straight section of track. Place the track on a flat surface (horizontal). ____________
   b) Remove all air pressure from the arm cylinders and toggle WL ON. ____________
   c) Extend the trailer tilt stop screws (item 45 of D-10094) until the trailer base (item 15 of D-10094) is parallel to the yoke (item 19 of D-10490) and locked in position. ____________
   d) Adjust the arm cylinder rods (turn the cylinder rod in or out of the rod clevis) until the rear of the trailer base rests evenly on the supports extending from the front of the car body assembly (items 5 and 6 of D-10490). ____________
   e) Adjust the tilt (forward and backward) of the trailer base until it is parallel with the body (item 2 of D-11663) of the drive car assembly. This adjustment is made by turning the arm adjusting rod (item 18 of D-10490). ____________
2. Trailer Tilt Stop Adjustment
   The two screws (item 45 of D-10094), serve to restrict the side-to-side tilt of the trailer assembly. The tilt capability is required to allow the transverse arm to accommodate to the

Figure 6

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Instruction:	Accomplished by:
2. vessel surface in the event that the width of the pole track is not exactly parallel to a tangent to the vessel surface. Adjustment of the stops is accomplished as follows:	
a) Retract the lift cylinders completely.	________
b) Loosen the lock nuts (item 45 of D-10094).	________
c) Adjust the height of the screws (item 45 of D-10094) until the heads of the screws are clear the yoke (item 19 of D-10490) by about 3/16 inch.	________
d) Tighten the lock nuts.	________
3. Transverse Arm Limit Switches There are two limit switches (item 23 of D-10094) on the trailer assembly that automatically limit the travel of the transverse arm. These switches may need adjustment when the transverse arm is changed. To adjust, proceed as follows:	
a) Drive the transverse arm slowly to the left until the cam is opposite the roller of the right hand microswitch.	________
b) Loosen the two screws holding the microswitch and move the switch toward the rack until the switch actuates. Tighten the screws.	________

Figure 6 (cont.)

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Instruction:	Accomplished by:
3. c) Drive the transverse arm slowly to the right and repeat the adjustment with the other switch.	____________
d) Drive the arm in each direction and readjust if necessary.	____________
4. Track Reference Switch (Level and Switch Assembly, SwRI Drawing C-13577). The limit switch (item 10) and its actuator (items 2 and 6) are used to establish the primary reference position of the pole guided device on the track. Each pole track has a reference button attached to the back side of the gear rack, at some preselected point. As the drive car passes the reference position, the switch is activated momentarily and lights the reference lamp on the controller. Adjust the reference switch as follows:	
a) Install the device on the track. Determine that the roller of the actuator (item 6) is just barely in contact with the back of the rack on the track. (Adjust using screw, item 24).	____________
b) Slowly drive the device past the reference position and readjust item 3 as necessary to light the reference light on the panel.	____________

Figure 6 (cont.)

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<u>Instruction:</u> <u>Accomplished by:</u>

4. c) Drive the device past the reference position in the other direction. The light should light in both directions as the reference position is passed and not be lighted at other locations. __________

   d) If there is insufficient adjustment in item 3, adjust item 18 until item 3 is within its range. __________

   NOTE: <u>The distance from the reference SWITCH position to the centerline of the trans- ducer modules on the transverse arm is approximately 255 counts with the trailer fully retracted.</u>

5. Search Unit Module Offset (along track)
   The positional readout of the pole device (along the track) is relative to the track reference. With the search unit support (trailer) fully retracted, the position of the module is a fixed and known number of counts away from the reference switch. However, this is not a useful operating condition. The search units must be extended to contact the examination surface. As the search units are extended to the surface, due to the mechanical configuration of the device, the distance between the module and the reference switch and drive assembly becomes less. The difference in position is a sine function of the amount of extension necessary to reach the surface.

Figure 6 (cont.)

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Instruction:	Accomplished by:
5. This condition is easily seen on SwRI Drawing D-10520. A sine potentiometer and Model 82100 Controller are used to compensate for this change in position of the search unit. The 82100 controller monitors the rotation of the sine potentiometer, subtracts an appropriate number of counts from the position displayed on the Model 220 Controller, and displays the corrected position on the five digit display as well as the "OFFSET" on the 3-1/2 digit display.	
Adjustment of the potentiometer (item 6 of D-10490) is critical and should be accomplished in the following manner after the sine pot has been replaced. No adjustment should be required in normal operation.	
a) Remove the sine pot connector from the back of the 82100 controller and short pins B and K of the controller receptacle.	______________
b) Remove the plastic front cover from the 3-1/2 digit analogic panel meter and turn the ZERO adjustment screw until the offset meter reads 000. The ZERO adjust screw is located between the second and third NIXIE	

Figure 6 (cont.)

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Instruction:	Accomplished by:
5. b) tubes from the right. It is the left hand adjustment. DO NOT ADJUST THE SCREW ON THE RIGHT.	____________
c) Remove the short between pins B and K and reconnect the sine pot cable connector.	____________
d) With the cover (item 14 of D-10490) removed and the trailer in the full down position, loosen the set screw which holds the gear (item 59) on the 1/4 inch shaft (item 57).	____________
e) Rotate the gear (item 59) and sine pot shaft until the offset meter reads 000 and lightly tighten the set screw.	____________
f) Raise the trailer to its maximum height. The offset meter should increase smoothly and stop at approximately 76.	____________
(1) If the readout does not stop near 76 or does not increase smoothly, the pot has been set at the wrong ZERO.	
(2) Lower the trailer back to the mechanical zero position and loosen the set screw on item 59.	
(3) Slowly rotate the gear and sine pot shaft (about 90° rotation of the pot) until the meter again reads 000. Lightly tighten the set screw.	____________

Figure 6 (cont.)

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Instruction:	Accomplished by:
5. f) (4) Repeat 5.f).	______
g) Lower the trailer to the mechanical zero position and loosen the set screw on item 59.	______
h) Slowly rotate the gear and pot shaft until the meter reads +004 and tighten the set screw.	______
i) Adjust the zero screw on the meter until the readout is 000.	______
j) Replace the meter cover and the sine pot cover (item 14).	______
k) Select a convenient horizontal reference point on the trailer assembly and on the drive car. Measure and record the horizontal distance between these two points.	______
l) Raise the trailer assembly so that the horizontal distance between these two reference points is reduced by 4.36 inches.	______
m) Adjust the range of the offset meter so that the meter reads 76. (The adjustment screw is located in the middle of the rear end of the chassis of the Model 82100 Controller.)	______

END OF CHECKLIST

Figure 6 (cont.)

Date 1/8/79

Revision 0

WNP-2 PSI PROGRAM PLAN

N O T   U S E D

(Purposely left blank)

Date 1/8/79
Revision 0

WNP-2 PSI PROGRAM PLAN

NOT USED

(Purposely left blank)

Date 1/8/79

Revision 0

WNP-2 PSI PROGRAM PLAN

N O T   U S E D

(Purposely left blank)

11.0--ULTRASONIC CALIBRATION STANDARDS

This section of the WNP-2 PSI Program Plan provides a description of the design and identifies the applicability of each ultrasonic calibration block which will be used to complete the ultrasonic examinations identified in this Program Plan. This section is divided into two subsections. Subsection 11.1 presents the UT calibration blocks which will be used in completing examinations of the RPV, including top and bottom heads, nozzle-to-shell welds and inner radii, and nozzle safe end weld examinations. Subsection 11.2 presents those calibration blocks which will be used in completing examinations of the piping systems. The RPV safe-end UT blocks were designed and fabricated by the NSSS supplier, as were the vessel blocks, with the exception of the calibration blocks for the feedwater nozzle inner radius and flange-to-shell weld. The feedwater nozzle block is an actual BWR feedwater nozzle with attached shell plate material. This mock-up, including the notches which simulate flaws, was designed and fabricated by the Supply System. The flange-to-shell weld block is an actual BWR flange with attached shell plate material. This block was designed and fabricated by the Supply System. The balance of the piping weld blocks were designed and fabricated by the Supply System as detailed in 11.2.

Date 1/8/79
Revision 0

11.1 VESSEL STANDARDS

The design drawings on the following pages illustrate the ultrasonic calibration blocks which will be used to perform ultrasonic examinations of the RPV, including top and bottom heads, the nozzle-to-shell welds and inner radii, and the nozzle safe end welds. Table 11-1 lists those UT blocks, including the block identification number which will be used exclusively whenever referencing the calibration block on data sheets or other records, and the corresponding design drawing number. The block identification number is the same number referenced from the Program Plan and Schedule Tables and the Weld and Component Identification Diagrams found in Section 8.0, "WELD ID DIAGRAMS".

TABLE 11-1

RPV ULTRASONIC CALIBRATION BLOCKS

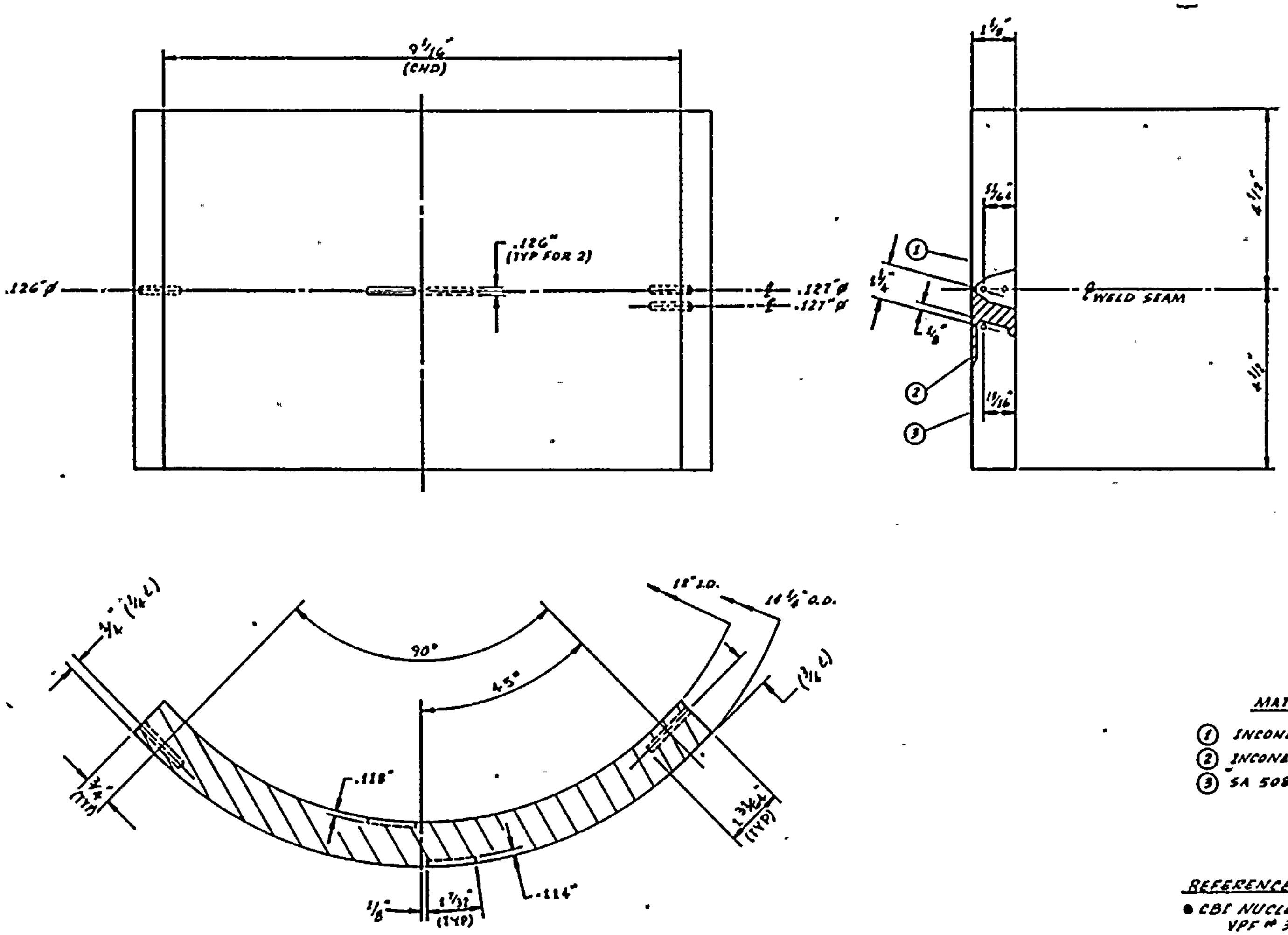
BLOCK ID NO.	DETAIL DWG. NO.	APPLICABLE TO	MATERIAL	NOMINAL DIAMETER	NOMINAL THICKNESS	MATERIAL SPECIFICATION
UT-101	UTCB-101	NOZZLE TO SAFE-END, N1	CS-SS	22"	1 29/32"	SA-508, SA-336
UT-102	UTCB-102	NOZZLE TO SAFE-END, N4, N5, N6, N16	CS-INCO	12"	1 1/8" 1 5/16"	SA-508, SB-166
UT-104	UTCB-104	NOZZLE TO SAFE-END, N3	CS-CS	24"	1 5/8"	SA-508, Gr. B
UT-105	UTCB-105	SAFE-END TO STUB, N4	INCO-INCO	12"	15/16"	SB-166-70
UT-106	UTCB-106	SAFE-END OR STUB TO SAFE-END EXTENSION, N4, N5, N6, N16	INCO-CS	10/12"	13/16"	SB-166, SA-508
UT-107	UTCB-107	NOZZLE TO FLANGE, N7, N18	CS-CS	6"	1 3/4"	SA-508
UT-108	UTCB-108	NOZZLE TO FLANGE, N8	CS-CS	4"	1 1/4"	SA-508
UT-109	UTCB-109	NOZZLE TO SAFE-END, N9	CS-SS	4"	3/4"	SA-508, SA-336
UT-110	UTCB-110	NOZZLE TO SAFE-END, N10	CS-CS	5"	3/4"	SA-508
UT-111	UTCB-111	NOZZLE TO SAFE-END, N2	CS-SS	12"	1 1/4"	SA-508, SA-182, F 316L
UT-115	UTCB-203	TOP HEAD DOLLAR PLATES	CS	N/A	3 5/8"	SA-533, Gr. B
UT-116	UTCB-204	TOP HEAD RADIAL PLATES	CS	N/A	5 1/8"	SA-533, Gr. B
UT-117	UTCB-205	BOTTOM HEAD DOLLAR PLATES	CS	N/A	8"	SA-533, Gr. B
UT-118	UTCB-206	BOTTOM HEAD RADIAL PLATES	CS	N/A	6 3/4"	SA-533, Gr. B

TABLE 11-1

Date 12/14/8
Revision 3

RPV ULTRASONIC CALIBRATION BLOCKS

BLOCK ID NO.	DETAIL DWG. NO.	APPLICABLE TO	MATERIAL	NOMINAL DIAMETER	NOMINAL THICKNESS	MATERIAL SPECIFICATION
UT-119	UTCB-207	SHELL COURSE #1	CS	N/A	9 3/4"	SA-533, Gr. B
UT-120	UTCB-208	SHELL COURSE #2 & #3	CS	N/A	6 9/16"	SA-533, Gr. B
UT-121	UTCB-209	SHELL COURSE #4	CS	N/A	7 1/4"	SA-533, Gr. B
UT-122	UTCB-250	N-4 NOZZLE INNER RADIUS & BORE	CS	N/A	LATER	SA-533, Gr. B, SA-508
UT-123	UTCB-251	RPV FLG. TO SHELL COURSE #	CS	N/A	N/A	SA-508
UT-130	UTCB-210	RPV STUDS	CS	6"	N/A	SA-540, Gr. 23
UT-132	UTCB-211	RPV NUTS	CS	6"	N/A	SA-540, Gr. 23



MATERIAL

1. INCONEL SB 166 HEAT Nº NX 7733
2. INCONEL 82
3. SA 508 CL II CS HEAT Nº 522308

REFERENCES

- CBI NUCLEAR CO.
  VPF # 3613-649 REV 0
- ISI DRAWINGS
  RPV- 108 REV 0
  RPV- 109 REV 0
  RPV- 110 REV 0

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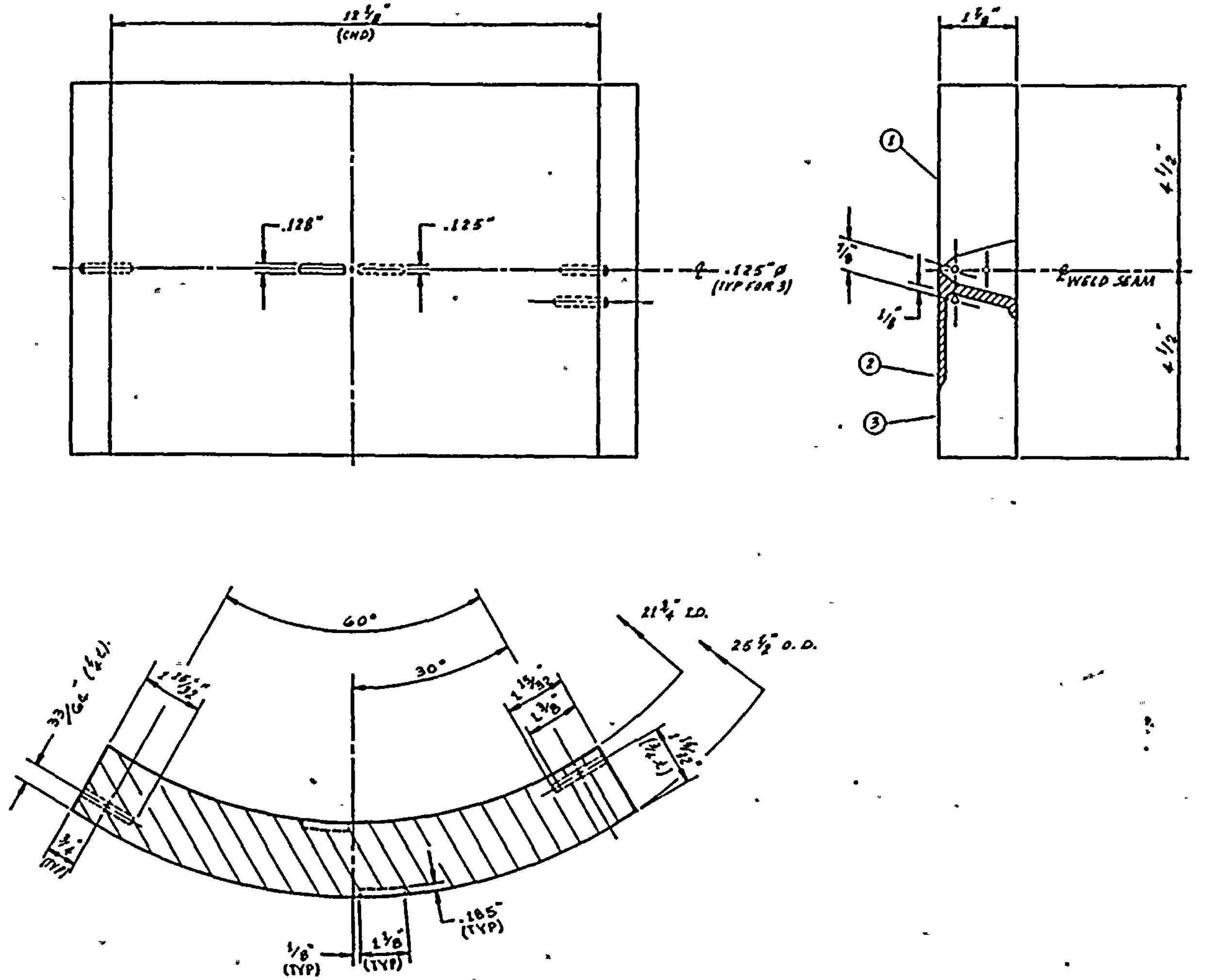
RICHLAND, WASHINGTON 99352

WNP-2

NOZZLE TO SAFE-END, N4, N5, N6 & N16
UT CALIBRATION BLOCK, UT-102

NO	DATE	REVISION	BY	CHKD	APPVD
1	12-2-81	ADDED HEAT Nº	[illegible]	[illegible]	[illegible]
0	5-31-79	ISSUED FOR USE, AS BUILT	[illegible]	[illegible]	[illegible]

ENGINEER T HOYLE
DRAWN K McANDREW
DATE 5-31-79
DWG NO UTCB-102
REV 1



MATERIAL

1. SA 336 CL F8 SS HEAT NO 656511
2. INCONEL 82
3. SA 508 CL II CS HEAT NO 719453

REFERENCES:

- CBI NUCLEAR CO. VPF # 3139.519 REV 1
- ISI DRAWING RPV-105 REV 0

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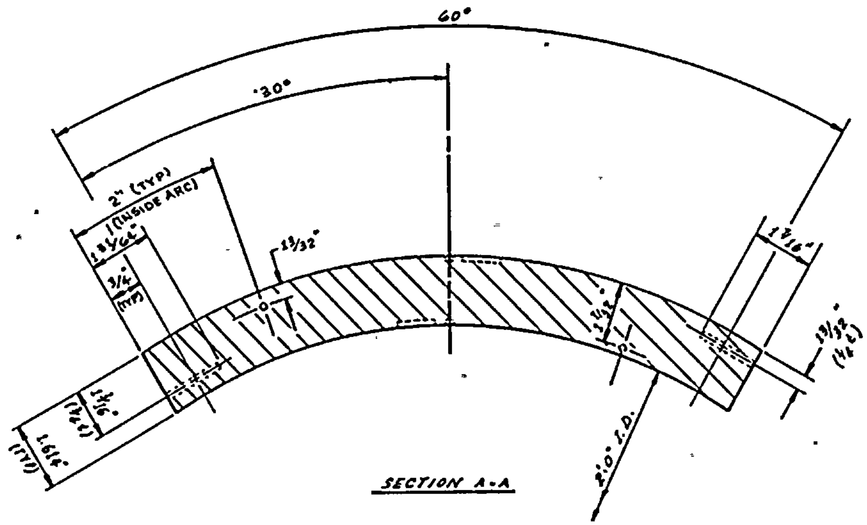
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

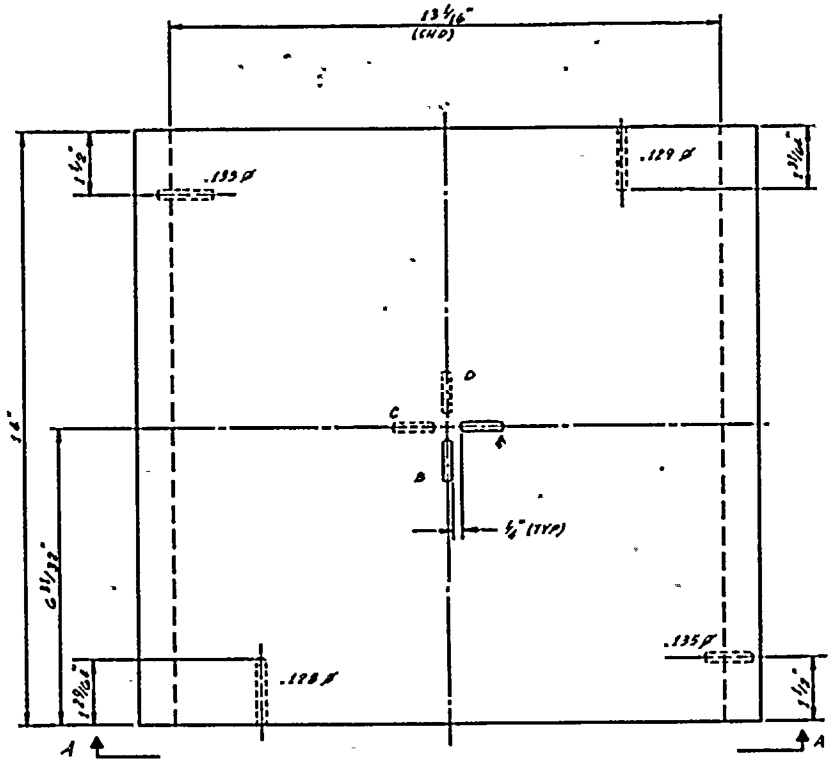
WNP-2
NOZZLE TO SAFE-END, N1
UT CALIBRATION BLOCK, UT-101

NO	DATE	REVISION	BY	CHKD	APPVD
1	10-8-81	ADDED HEAT NO 5	KMcA	[illegible]	TKG
0	7-31-79	ISSUED FOR USE, AS BUILT	KMcA	[illegible]	[illegible]

ENGINEER	T HOYLE
DRAWN	K. McANDREW
DATE	5-30-79
DWG NO	UTCB-101
REV	1



SECTION A-A



NOTCH	LENGTH	WIDTH	DEPTH
A	61/64"	.133"	.134"
B	59/64"	.136"	.140"
C	59/64"	.127"	.142"
D	15/16"	.125"	.144"

MATERIAL

SA508 CL I HEAT NO 223641

REFERENCES:

- CBI NUCLEAR CO. VPF # 3139-520 REV 0
- ISI DRAWING RPV-107 REV 0

NO	DATE	REVISION	BY	CHKD	APPVD
1	12-281	ADDED HEAT NO & I.D. DIM			TK
0	7-3-79	ISSUED FOR USE, AS BUILT	KMA		

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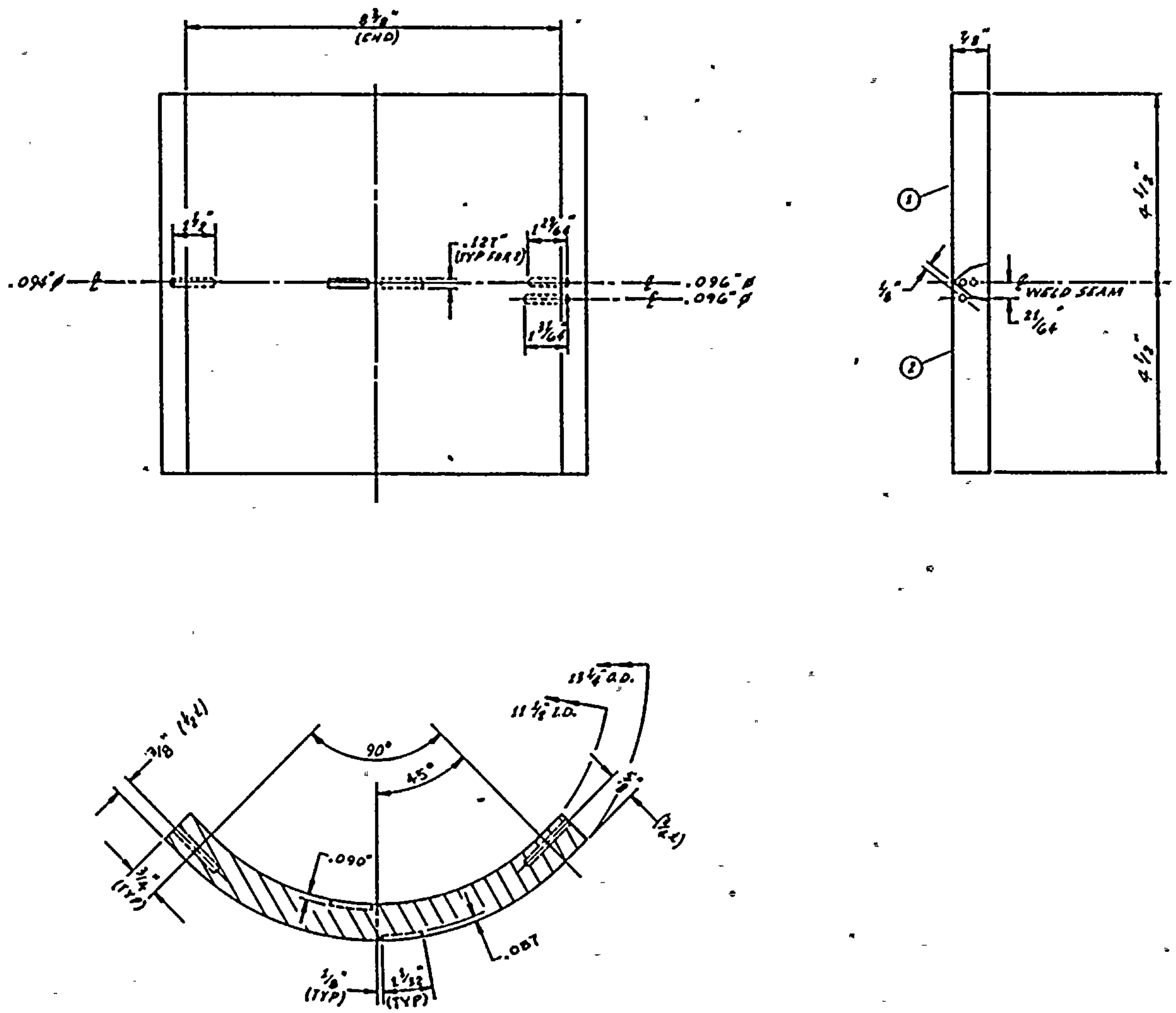
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND WASHINGTON 99352

ENGINEER T HOYLE
DRAWN K. McANDREW
DATE 6-11-79

WNP-2
NOZZLE TO SAFE-END N3 UT CALIBRATION BLOCK, UT-104

DWG NO UTCB-104 REV 1



MATERIAL

1. INCONEL SB 166 HEAT Nº NX 7733
2. INCONEL SB 166 HEAT Nº NX 7733

REFERENCES:

- CBI NUCLEAR CO. VPF # 3133-519 REV 1
- ISI DRAWING RPV-108 REV 0

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

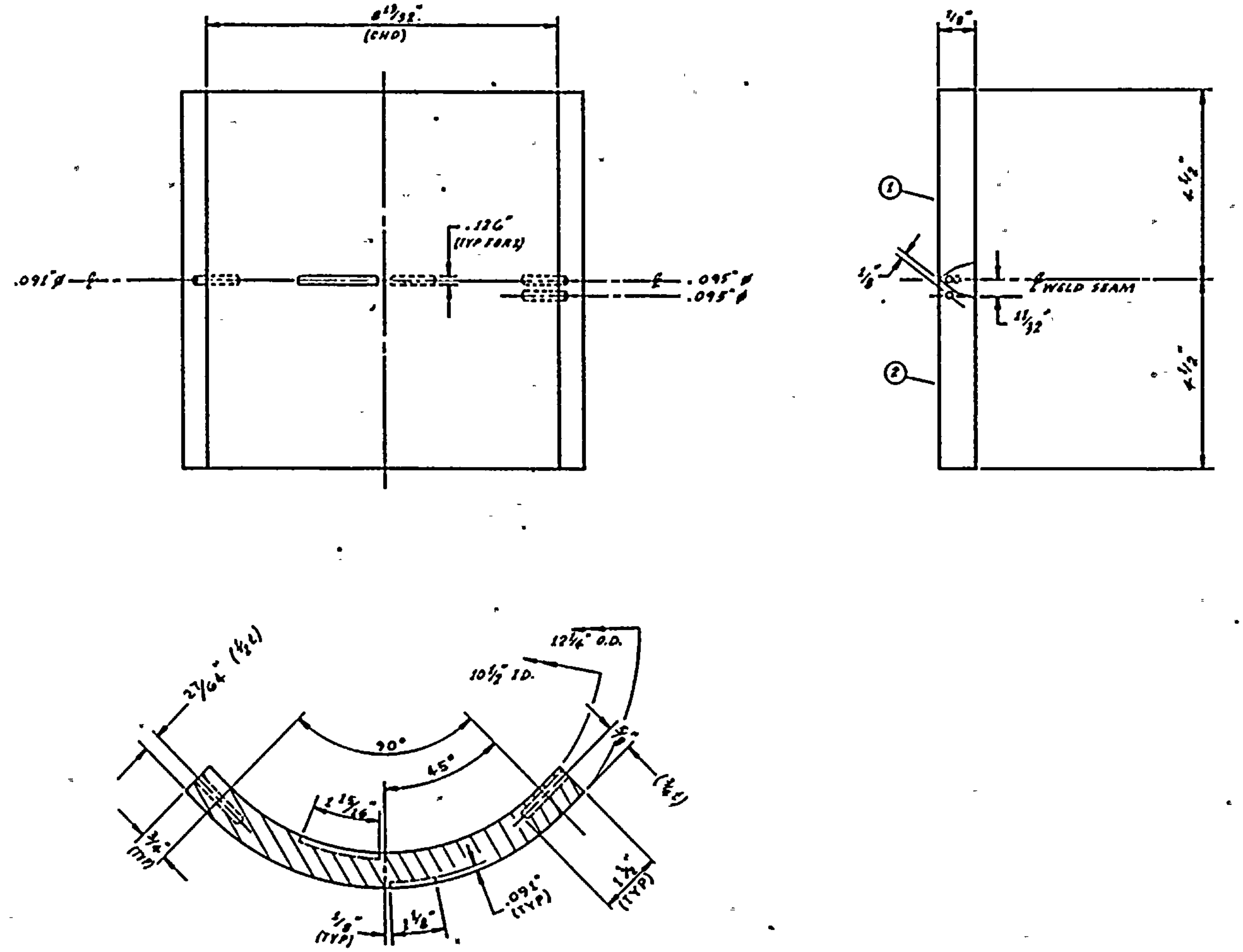
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON

WNP-2

SAFE-END TO SAFE-END STUB, N4 UT CALIBRATION BLOCK, UT-105

NO	DATE	REVISION	BY	CHKD	APPVD
1		ADDED HEAT NOS			
0		ISSUED FOR USE			

ENGINEER T HOYLE
DRAWN K McANDREW
DATE 5-30-79
DWG NO UTCB-105
REV 1



*MATERIAL

1. SA 508 CL I CS HEAT Nº 718419
2. INCONEL SB 166 HEAT Nº NX 7785

REFERENCES:

- CBI NUCLEAR CO.
  VPF # 3613-650 REV 0
- ISI DRAWINGS
  RPV-108 REV 0
  RPV-109 REV 0
  RPV-110 REV 0

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

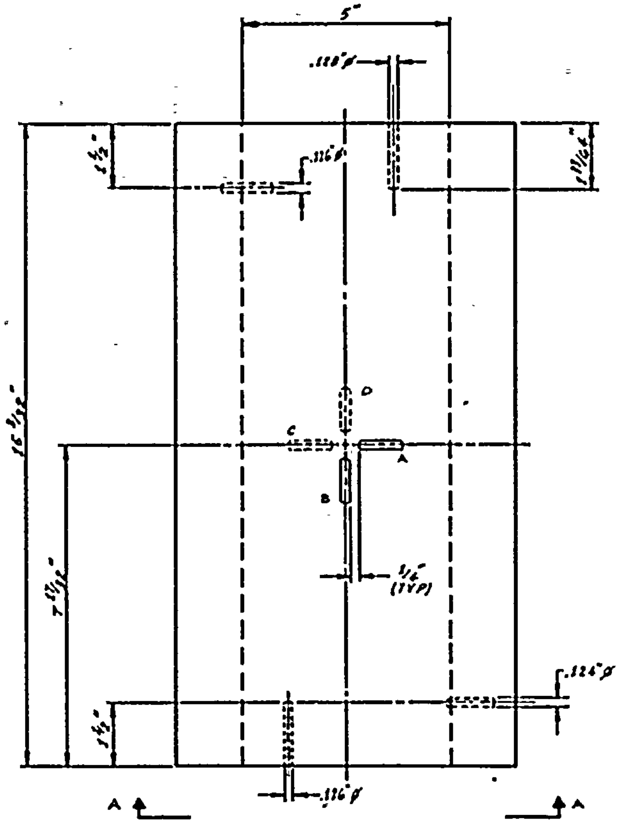
NO	DATE	REVISION	BY	CHKD	APPVD
1	[illegible]	ADDED HEAT NOS	[illegible]	[illegible]	[illegible]
0	[illegible]	ISSUED FOR USE, AS BUILT	[illegible]	[illegible]	[illegible]

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

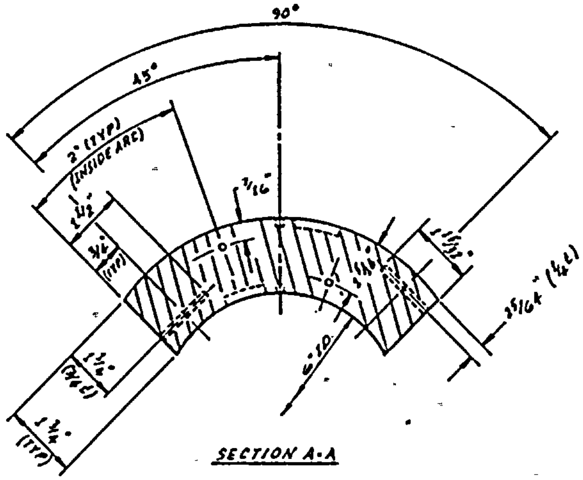
ENGINEER	T HOYLE
DRAWN	K McANDREW
DATE	5-31-79

WNP-2
SAFE-END TO SAFE-END EXTENSION, N4, N5, N6 & N16
UT CALIBRATION BLOCK, UT-106

DWG NO UTCB-106 REV 1



NOTCH	LENGTH	WIDTH	DEPTH
A	1 1/32"	.125"	.155"
B	1 1/32"	.125"	.156"
C	1 1/32"	.127"	.154"
D	1"	.127"	.160"



SECTION A-A

MATERIAL

SA 508 CL II HEAT No 181 T 116

REFERENCES:

- CBI NUCLEAR CO. VPF # 3138-521 REV 0
- ISI DRAWING RPY-111 REV 0

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

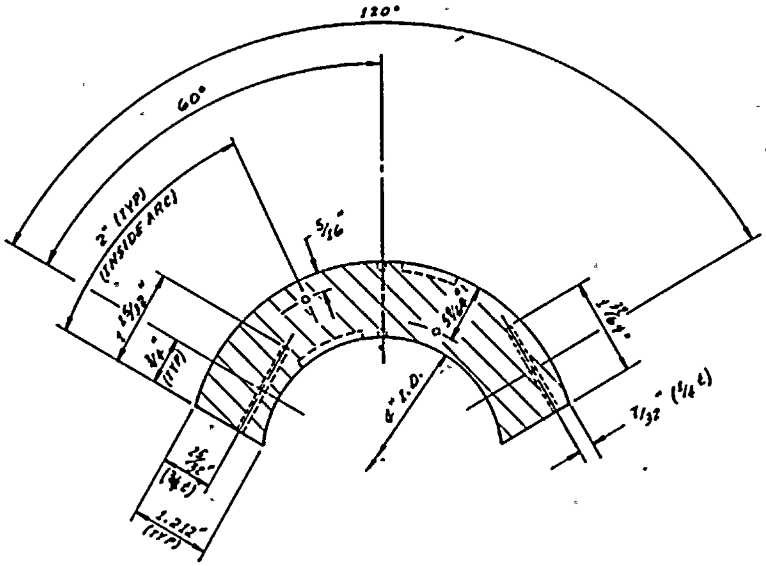
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

NO	DATE	REVISION	BY	CHKD	APPVD
1	12-3-82	ADDED HEAT No & I.D. DIM.			
0	7-31-79	ISSUED FOR USE, AS BUILT			

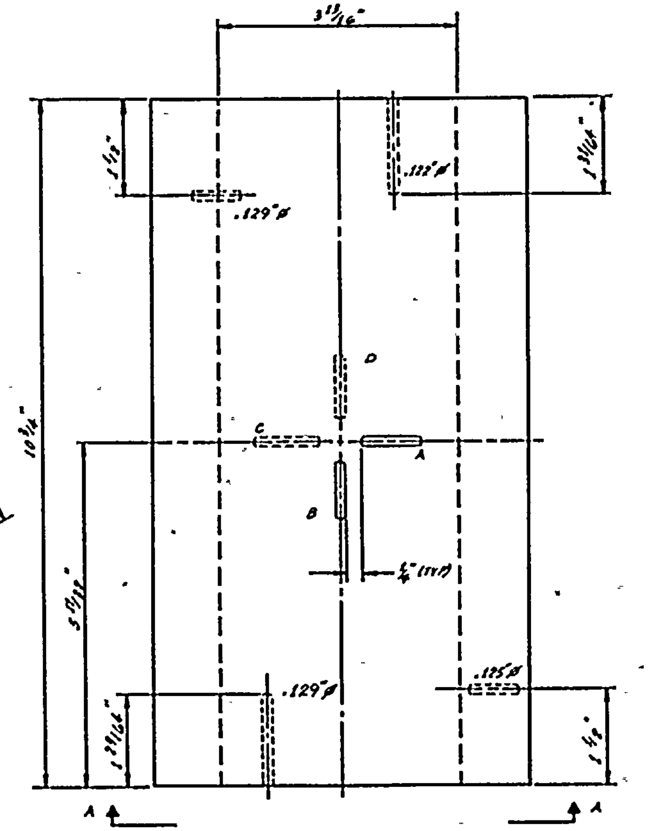
ENGINEER T HOYLE
DRAWN K McANDREW
DATE 6-6-79

WNP-2
NOZZLE TO FLANGE, N7, N18
UT CALIBRATION BLOCK, UT-107

DWG NO UTCB-107
REV 1



SECTION A-A



NOTCH	LENGTH	WIDTH	DEPTH
A	29/32"	.127"	.112"
B	61/64"	.126"	.114"
C	1 1/32"	.125"	.103"
D	1 1/32"	.125"	.113"

MATERIAL

SA 508 CL II HEAT Nº 223603

REFERENCES

- CBI NUCLEAR CO VPF # 3133-520 REV 0
- ISI DRAWING RPV-112 REV 0

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON

WNP-2

NOZZLE TO FLANGE, N8 UT CALIBRATION BLOCK, UT-108

NO	DATE	REVISION	BY	CHKD	APPVD
1	12/2/81	ADDED HEAT Nº & I.D. DIM.	[illegible]	[illegible]	TFK
0	7/31/79	ISSUED FOR USE, AS BUILT	[illegible]	[illegible]	[illegible]

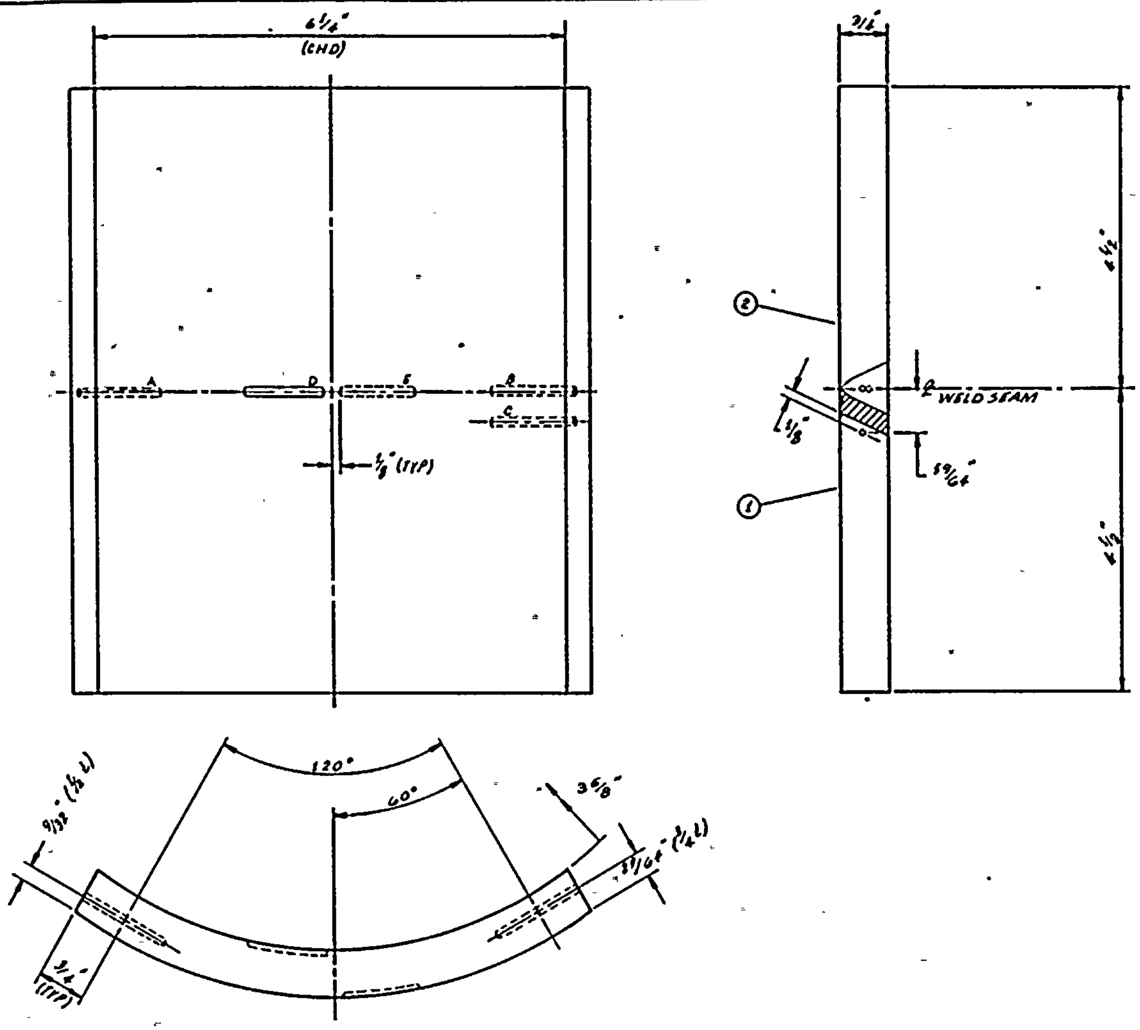
ENGINEER T. HOYLE

DRAWN K. McANDREW

DATE 6-13-79

DWG NO UTCB-108

REV 1



HOLE	DIAMETER	DEPTH
A	.095"	1 7/16"
B	.095"	1 9/16"
C	.095"	1 11/32"

NOTCH	LENGTH	WIDTH	DEPTH
D	1 5/32"	.126"	.078"
E	1 3/16"	.126"	.076"

MATERIAL

1. SA 508 CL II HEAT Nº 5977
2. SA 336 CL F8 HEAT Nº 119382

REFERENCES

CBI NUCLEAR CO.
VPF #3613-652 REV 0

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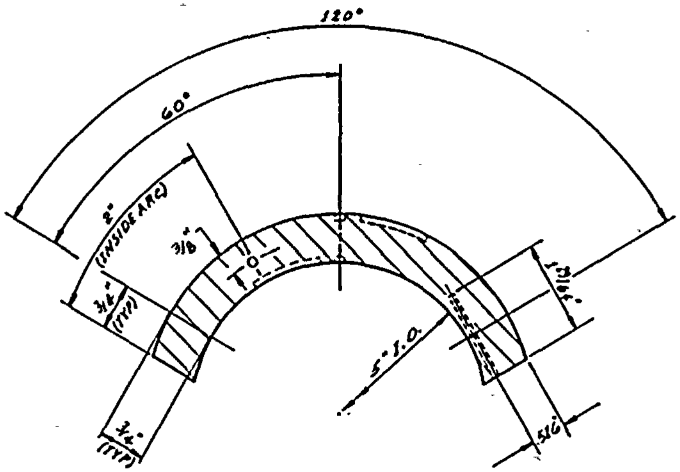
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP-2

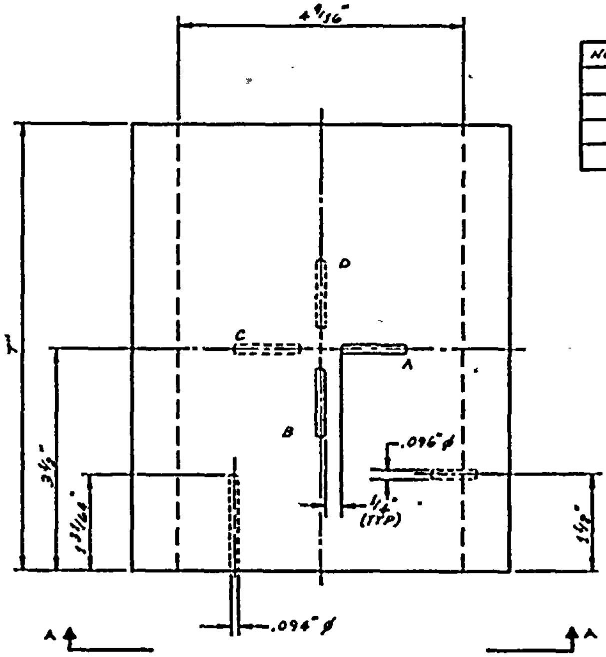
JET PUMP INSTRUMENTATION, N9
UT CALIBRATION BLOCK, UT-109

NO	DATE	REVISION	BY	CHKD	APPVD
1	12-2-81	ADDED HEAT NOS	[illegible]	[illegible]	TFH
0	9-13-79	ISSUED FOR USE, AS BUILT	[illegible]	[illegible]	[illegible]

ENGINEER T HOYLE
DRAWN K McANDREW
DATE 7-12-79
DWG NO UTCB-109
REV 1



SECTION A-A



NOTCH	LENGTH	WIDTH	DEPTH
A	1 1/16"	.126"	.076"
B	1 1/16"	.125"	.077"
C	1 1/16"	.126"	.077"
D	1 1/32"	.126"	.071"

MATERIAL:
SA 508 CL I HEAT Nº 214640

REFERENCES:
CBI NUCLEAR CO.
VPF # 3133-521 REV 0
ISI DRAWING
RPV-113 REV 0

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

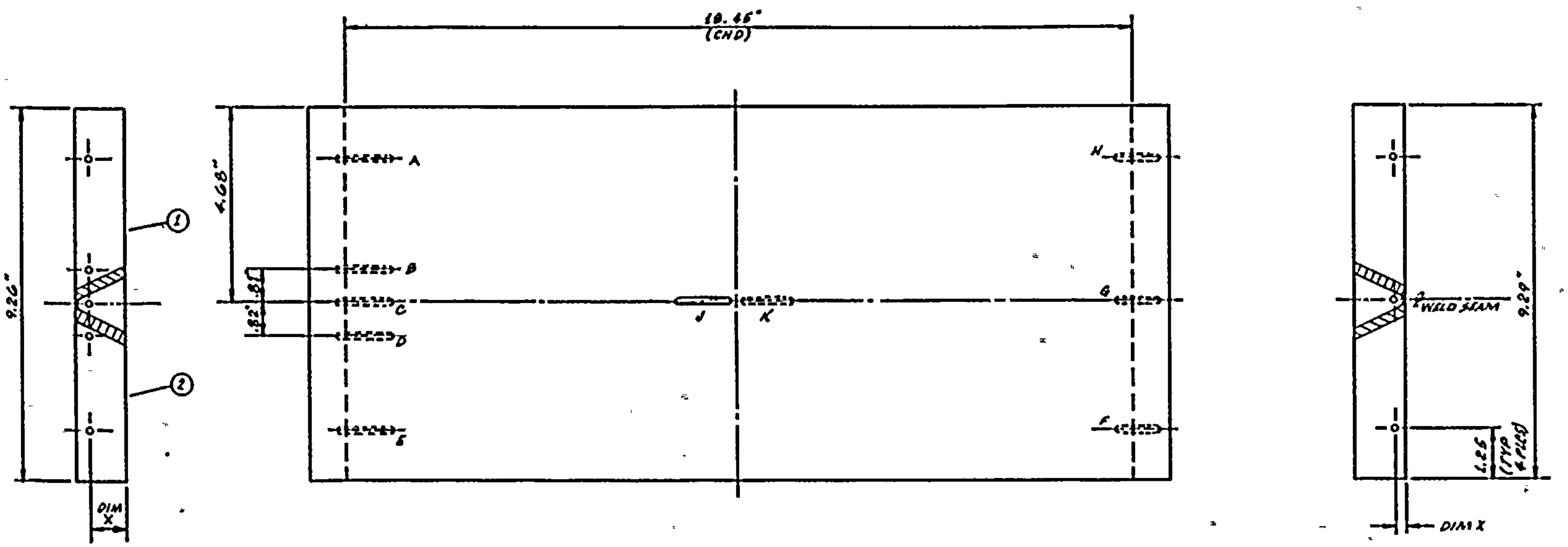
NO	DATE	REVISION	BY	CHKD	APPVD
1	1-2-81	ADDED HEAT Nº & I.D. DIM.	KMcA		
0	5-11-79	ISSUED FOR USE, AS BUILT	KMcA		

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

ENGINEER F HOYLE
DRAWN K. McANDREW
DATE 6-7-79

WNP-2
NOZZLE TO SAFE-END, N10
UT CALIBRATION BLOCK, UT-110

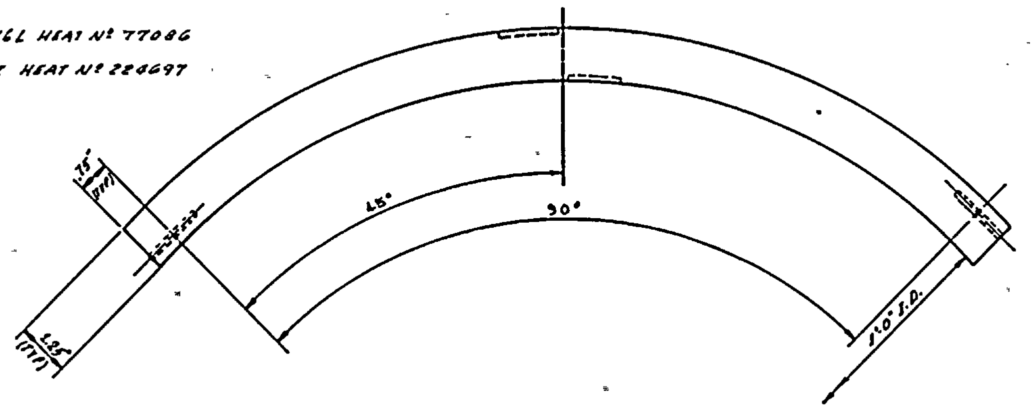
DWG NO UTCB-110
REV 1



MATERIAL

1. SA 182 F316L HEAT N° 77086

2. SA 508 CL I HEAT N° 224697



NOTCH	LENGTH	WIDTH	DEPTH
J	1.234"	.133"	.116-.126"
K	1.171"	.126"	.104"-.108"

HOLE	DIAMETER	DEPTH	DIM X
A	.125"	.151"	.90"
B	.126"	1.53"	.90"
C	.125"	1.46"	.91"
D	.126"	1.50"	.88"
E	.126"	1.50"	.89"
F	.125"	1.50"	.28"
G	.125"	1.57"	.29"
H	.126"	1.54"	.27"

REFERENCES:

AP&E/GE ORDER # F-20166A
SHOP SHEET 1 REV 3

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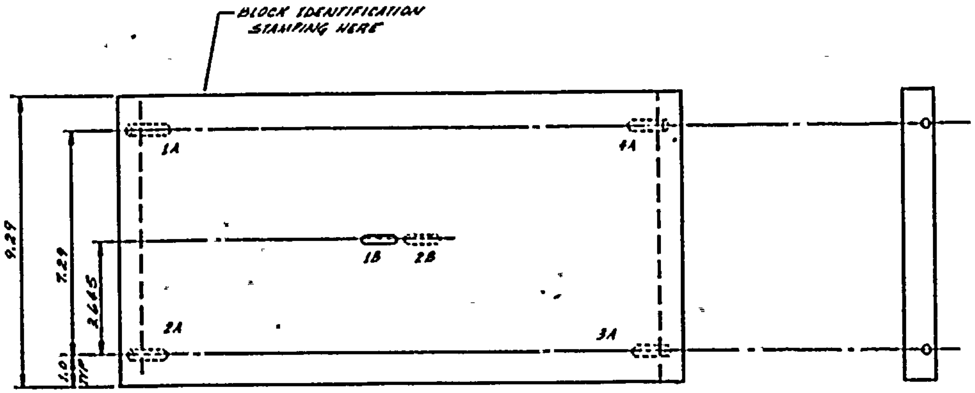
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

NO	DATE	REVISION	BY	CHKD	APPVD
1	[illegible]	ADDED HEAT N°s & I.D. DIM	[illegible]	[illegible]	[illegible]
0	[illegible]	ISSUED FOR USE, AS BUILT	[illegible]	[illegible]	[illegible]

ENGINEER T HOYLE
DRAWN K McANDREW
DATE 6-27-79

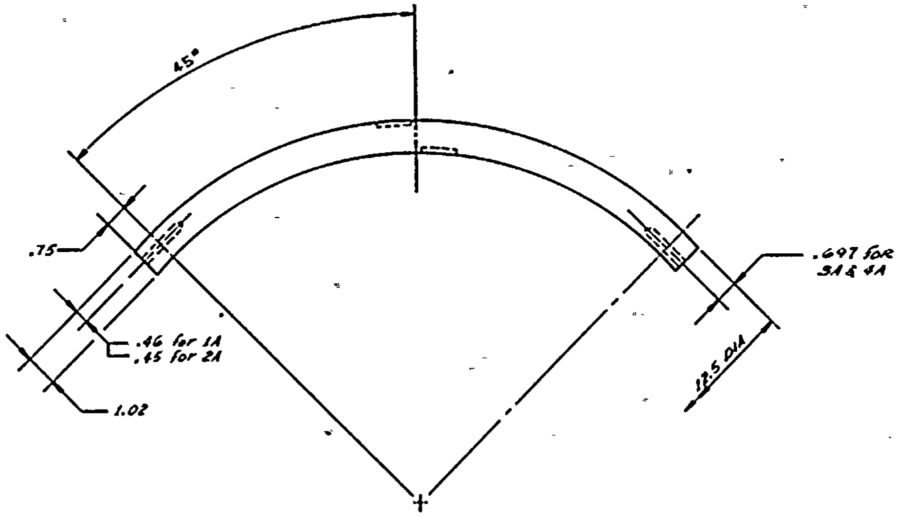
WNP-2
NOZZLE TO SAFE-END N2
UT CALIBRATION BLOCK, UT-111

DWG NO UTCB-111 REV 1



HOLES	DIAMETER	LENGTH
1A	0.093	1.59
2A	0.092	1.53
3A	0.093	1.56
4A	0.092	1.56

NOTCH	LENGTH	WIDTH	DEPTH
1B	1.16	0.16	0.12/0.11
2B	1.16	0.16	0.12



NOTES:

1. BLOCK STAMPED WITH 1/8" HIGH STEEL STAMP WITH MATERIAL SPEC, HEAT No, CAL BLOCK No & WNP-2.
2. ALL DIMENTIONS ARE IN INCHES.

MATERIAL

SA 182 GR F316L

HEAT No

78158

REFERENCE:

SEE DOCUMENT PKG FOR UT-112

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP-2

N2 SAFE-END FORGING UT CALIBRATION BLOCK UT-112

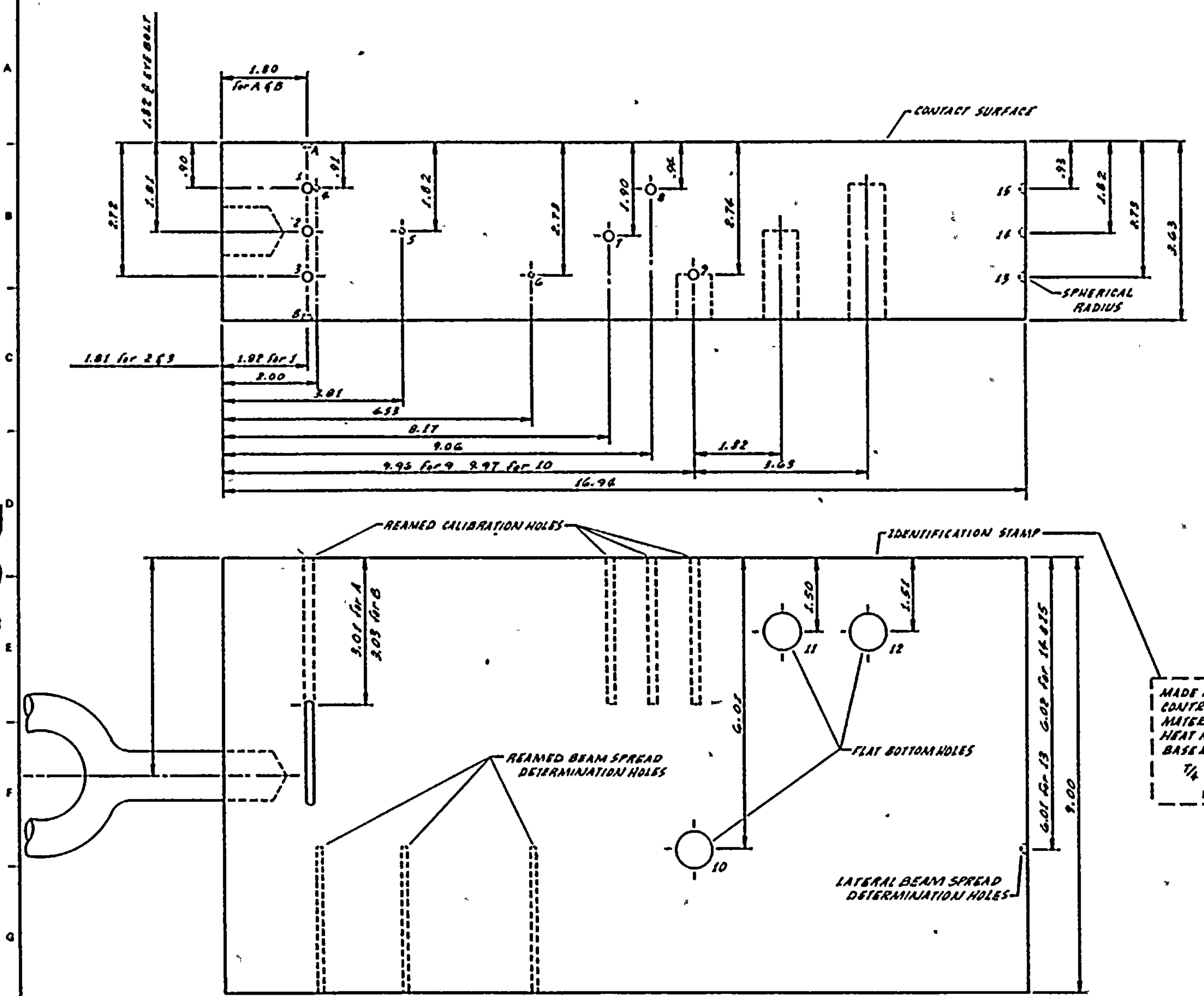
ENGINEER T HOYLE

DRAWN K McANDREW

DATE 12-30-80

DWG NO UTCB-112 REV 0

NO	DATE	REVISION	BY	CHKD	APPVD
0	1/8/81	AS BUILT	[illegible]	WR	JTH



HOLES	ϕ	DEPTH
1	.190	3.00
2	.190	3.01
3	.190	3.01
4	.188	3.03
5	.189	3.03
6	.188	3.02
7	.190	3.01
8	.190	3.01
9	.190	3.02
10	.77	.95
11	.76	1.86
12	.76	2.79
13	.194	—
14	.196	—
15	.196	—

NOTCHES	A	B
LENGTH	2.00	1.99
WIDTH	.126	.130
DEPTH	.070	.073

NOTES:

1. GE DESIGNED & CBIN FABRICATED CALIBRATION BLOCK. (SEE REF DWGS FOR FABRICATION NOTES, REQUIREMENTS, PIECE Nº & CUTTING SKETCH)
2. DUE TO VESSEL CURVATURE, METAL PATH DISTANCE WILL BE LONGER ON THE VESSEL THAN THIS BLOCK.
3. ALL DIMENSIONS ARE IN INCHES.

MADE FROM: TOP HD DOL ℞
CONTRACT Nº: 78-2647
MATERIAL SPEC: SA 533 GR B CL 1
HEAT Nº: C 1256-3
BASE METAL THK: 3 5/8
T/4 = .91 T/2 = 1.81 3T/4 = 2.72
WNP-2 UT-116

REFERENCE
CBI NUCLEAR CO.
205 AE 023 SH 116 REV 3

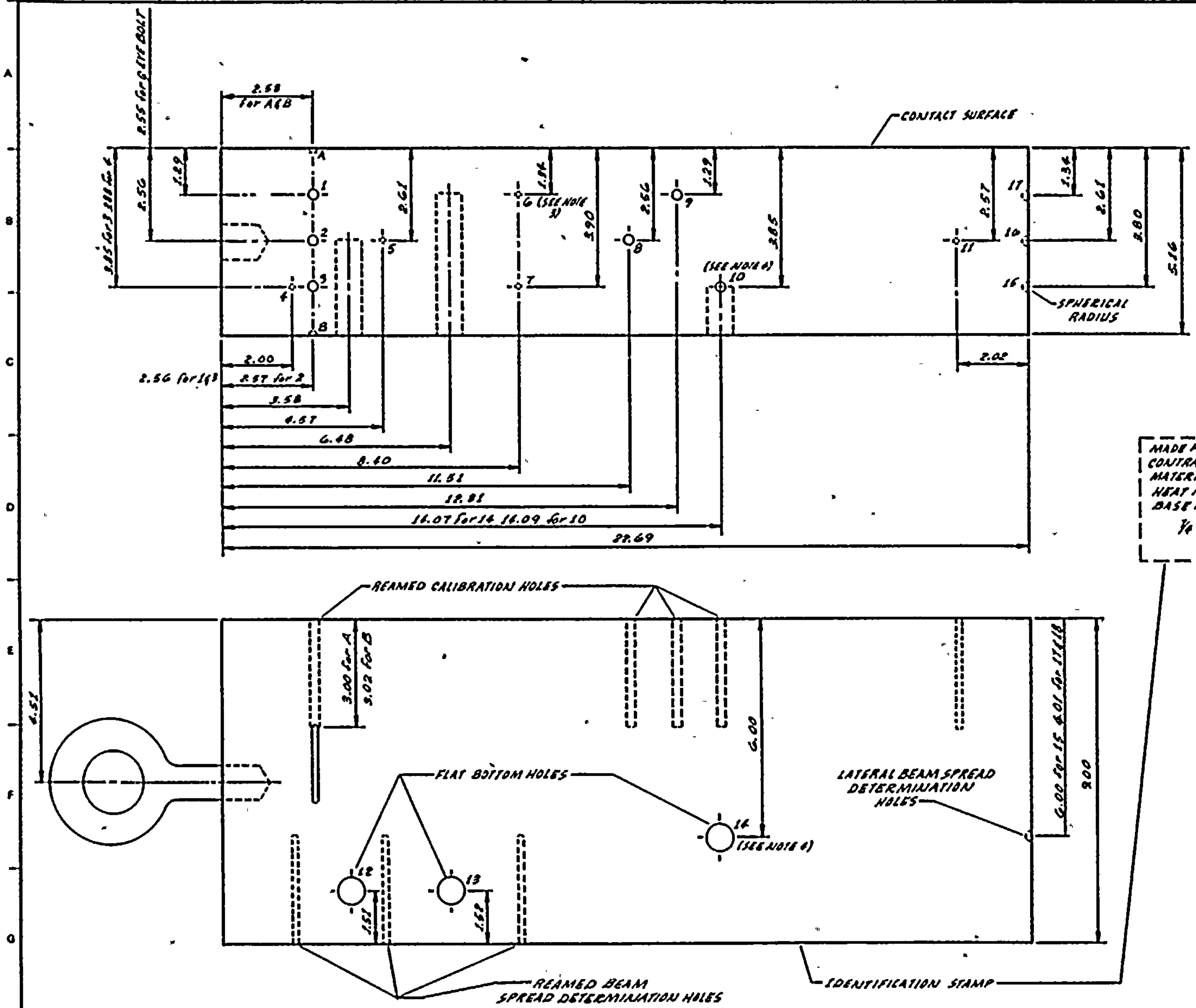
THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP-2
UT CALIBRATION BLOCK, UT-116, RPV TOP HEAD DOLLAR PLATE STANDARD

ENGINEER T HOYLE
DRAWN K. McANDREW
DATE 1-10-80
DWG NO UTCB-203
REV 1

NO	DATE	REVISION	BY	CHKD	APPVD	NO	DATE	REVISION	BY	CHKD	APPVD
						1	6-10-80	AS BUILT	KMcA	TFH	DWF



HOLES	∅	DEPTH
1	.251	3.05
2	.251	3.04
3	.251	3.05
4	.126	3.00
5	.126	3.00
6	.132	3.00
7	.125	2.99
8	.252	3.01
9	.252	3.00
10	.252	3.04
11	.132	3.03
12	.76	2.63
13	.76	3.87
14	.76	1.35
15	.257	——
16	.257	——
17	.256	——

NOTCHES	A	B
LENGTH	2.00	2.01
WIDTH	.125	.119
DEPTH	.104	.111

MADE FROM:	TOP HD RAD ℄
CONTRACT Nº:	72-2647
MATERIAL SPEC:	SA 533 GR B CL 1
HEAT Nº:	A 0803-1
BASE METAL THK:	5 1/8

1/4 = 1.25, 1/2 = 2.56, 3/4 = 3.84

WNP-2 UT-116

NOTES:

1. GE DESIGNED & CBIN FABRICATED CALIBRATION BLOCK. (SEE REF DWGS FOR FABRICATION NOTES, REQUIREMENTS, PIECE Nº & CUTTING SKETCH.)
2. DUE TO VESSEL CURVATURE, METAL PATH DISTANCES WILL BE LONGER ON THE VESSEL THAN THIS BLOCK.
3. THE 1/4 t BEAM SPREAD DETERMINATION HOLE (6) IS LOCATED FARTHER FROM THE CONTACT SURFACE THAN 1/4 t. USE AS BUILT DIMENSION.
4. THE 1/2 t (12) & 3/4 t (10) HOLES ARE LOCATED CLOSER TO THE CONTACT SURFACE THAN 1/2 t & 3/4 t RESPECTIVELY. USE AS BUILT DIM.
5. ALL DIMENSIONS ARE IN INCHES.

REFERENCE

CBI NUCLEAR CO.
- 205 AE 023 SH 116 REV 4

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

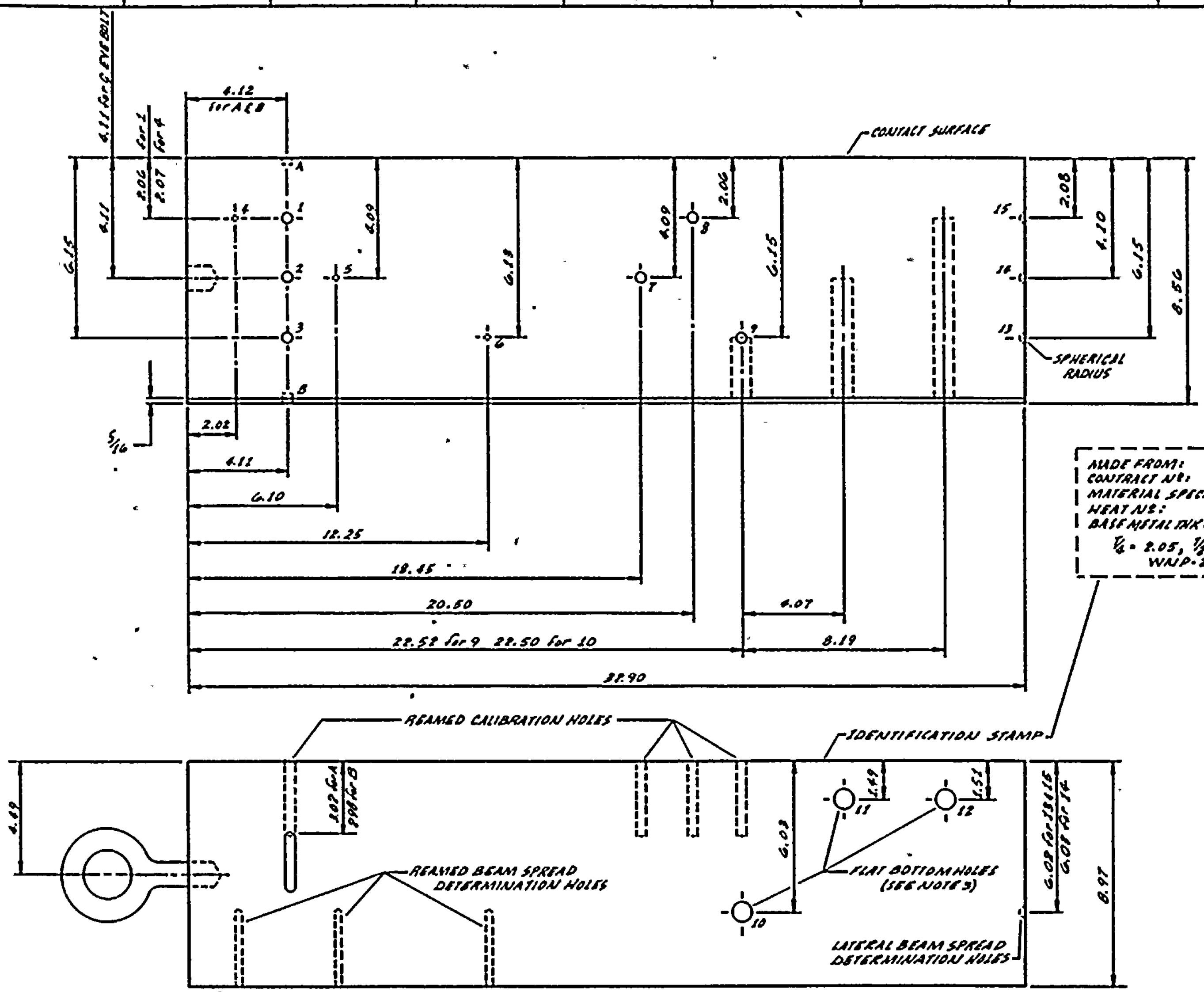
WNP-2

UT CALIBRATION BLOCK, UT-116
RPV TOP HEAD RADIAL PLATES

ENGINEER T HOYLE
DRAWN K. McANDREW
DATE 1-11-80
DWG NO UTCB-204
REV 1

NO	DATE	REVISION	BY	CHKD	APPVD
1	6-10-80	AS BUILT	[illegible]	TF	[illegible]

POOR ORIGINAL



HOLES	Ø	DEPTH
1	.376	2.14
2	.374	3.09
3	.372	3.09
4	.132	2.00
5	.130	2.05
6	.130	3.10
7	.377	3.16
8	.378	3.12
9	.378	3.09
10	.75	2.16
11	.75	4.25
12	.75	6.27
13	.376	——
14	.376	——
15	.376	——

NOTCHES	A	B
LENGTH	2.00	2.06
WIDTH	.125	.132
DEPTH	.192	.440

MADE FROM: BOT HD DOL R
CONTRACT NO: 78-2647
MATERIAL SPEC: SA 533 GR B CL 1
HEAT NO: B 5130-1
BASE METAL THK: 8
T/4 = 2.05, T/2 = 4.09, 3T/4 = 6.14
WNP-2 UT-117

NOTES:

1. GE DESIGNED & CBIN FABRICATED CALIBRATION BLOCK. (SEE REF DWG FOR FABRICATION NOTES, REQUIREMENTS, PIECE NO & CUTTING SKETCH)
2. DUE TO VESSEL CURVATURE, METAL PATH DISTANCES WILL BE LONGER ON THE VESSEL THAN THIS BLOCK.
3. THE FLAT BOTTOM HOLES (10, 11 & 12) ARE CLOSER TO THE CONTACT SURFACE THAN 1/4 t, 1/2 t & 3/4 t. USE AS BUILT DIMENSIONS.
4. ALL DIMENSIONS ARE IN INCHES.

REFERENCE
CBI NUCLEAR CO.
205 AE 023 SHEET 117 REV 3

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

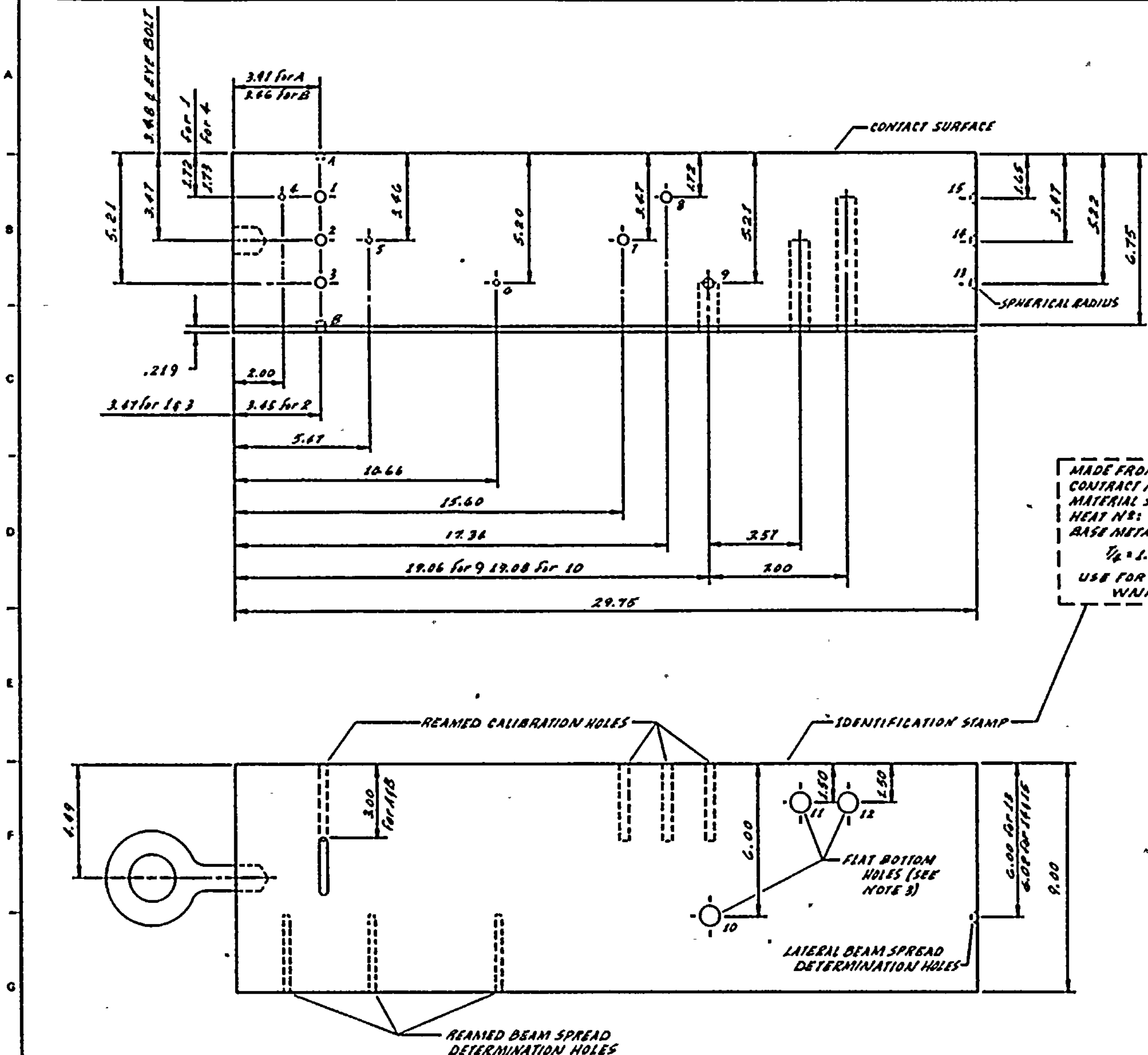
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

ENGINEER T HOYLE
DRAWN K-McANDREW
DATE 1-11-80

WNP-
UT CALIBRATION BLOCK, UT 117
RPV BOTTOM HEAD DOLLAR PLATES

DWG NO UTCB-205
REV 1

NO	DATE	REVISION	BY	CHKD	APPVD
1	6-10-80	AS BUILT	[illegible]	[illegible]	[illegible]



HOLES	⌀	DEPTH
1	.316	3.10
2	.316	3.11
3	.316	2.94
4	.132	3.09
5	.130	3.06
6	.130	3.06
7	.316	3.10
8	.316	2.74
9	.316	3.15
10	.77	1.81
11	.76	3.56
12	.77	5.24
13	.320	——
14	.312	——
15	.320	——

NOTCHES	A	B
LENGTH	2.00	2.00
WIDTH	.115	.128
DEPTH	.171	.452

MADE FROM: BOT HD DOL Q
CONTRACT Nº: 72-2647
MATERIAL SPEC: SA 533 GR B CL 1
HEAT Nº: B 5130-1
BASE METAL THK: 6 3/4

$T/4 = 1.73$, $T/2 = 3.47$ $3T/4 = 5.20$

USE FOR BOTTOM HEAD RAD. PLATE
WNP-2 UT-118

NOTES:

1. GE DESIGNED & CBIN FABRICATED CALIBRATION BLOCK. (SEE REF DWG FOR FABRICATION NOTES, REQUIREMENTS, PIECE Nº, & CUTTING SKETCH)
2. DUE TO VESSEL CURVATURE METAL PATH DISTANCES WILL BE LONGER ON THE VESSEL THAN THIS BLOCK.
3. THE 1/2 t (11) & 3/4 t (10) FLAT BOTTOM HOLES ARE LOCATED CLOSER TO THE CONTACT SURFACE THAN 1/2 t & 3/4 t RESPECTIVELY. USE AS BUILT DIMENSIONS.
4. ALL DIMENSIONS ARE IN INCHES.
5. WHEN USING NOTCHES FOR EVALUATION, USE AS BUILT DIMENSIONS - THEY ARE NOT 2% NOTCHES.

REFERENCE

CBI NUCLEAR CO.
205 AE 023 SH 118 REV 3

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

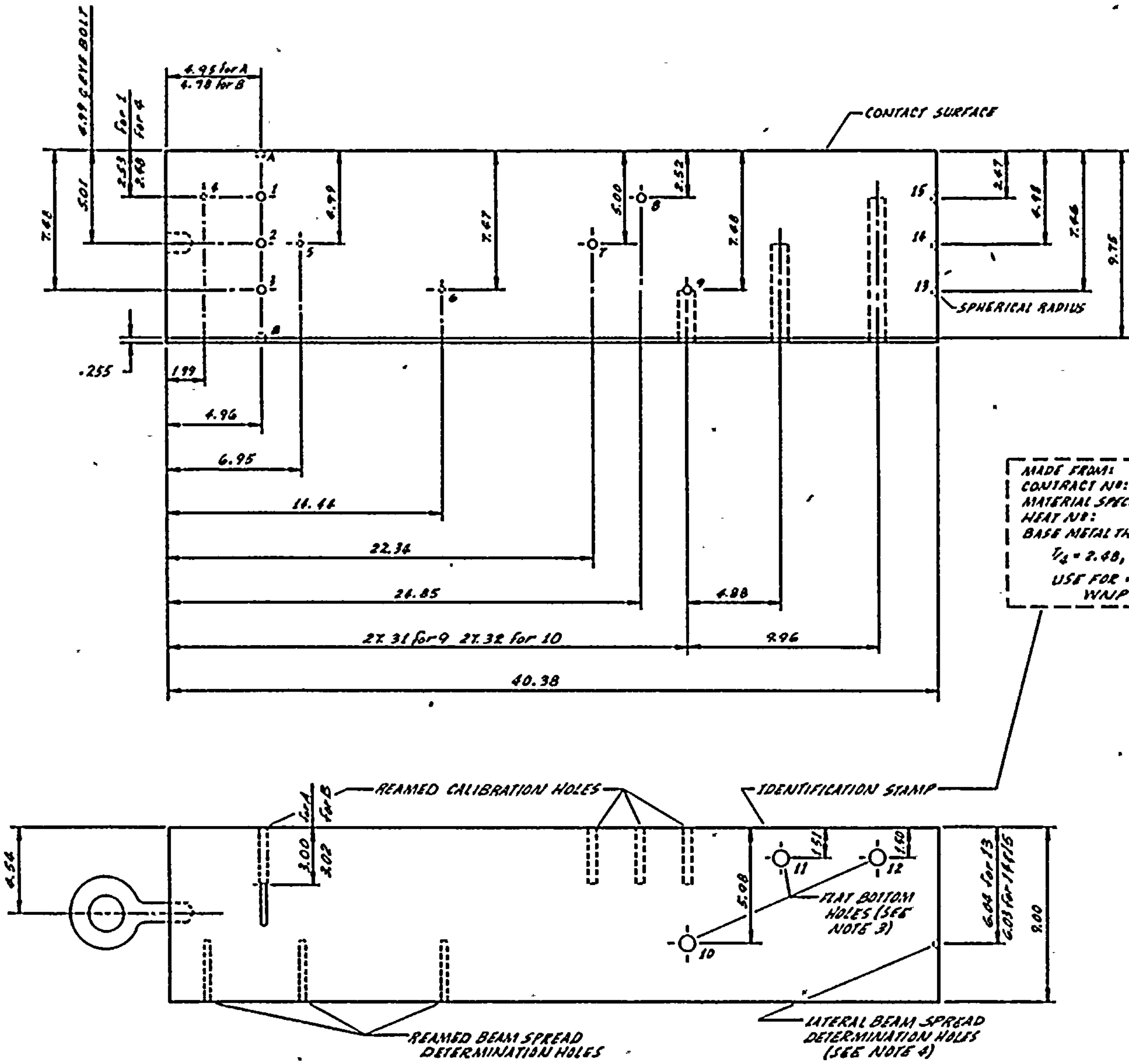
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

ENGINEER T HOYLE
DRAWN K McANDREW
DATE 1-14-80

WNP-2
UT CALIBRATION BLOCK, UT 118
RPV BOTTOM HEAD RADIAL PLATES

DWG NO UTCB-206 REV 1

NO	DATE	REVISION	BY	CHKD	APPVD
1	6-16-80	AS BUILT	[illegible]	[illegible]	[illegible]



HOLES	∅	DEPTH
1	.378	3.13
2	.378	3.13
3	.378	3.12
4	.127	3.00
5	.132	3.02
6	.132	3.00
7	.377	3.13
8	.378	3.13
9	.378	3.13
10	.76	2.53
11	.76	5.03
12	.76	7.52
13	.382	—
14	.380	—
15	.381	—

NOTCHES	A	B
LENGTH	2.00	2.00
WIDTH	.125	.130
DEPTH	.202	.431

MADE FROM: SHROUD LEG MATERIAL
CONTRACT NO: 72-2647
MATERIAL SPEC: SA 533 GR B CL 1
HEAT NO: A 0093-1
BASE METAL THK: 9.75.
$T/4 = 2.48$, $T/2 = 4.97$, $3T/4 = 7.45$
USE FOR #1 SHELL RING
WNP-2 UT-119

NOTES:

1. GE DESIGNED & CBIN FABRICATED CALIBRATION BLOCK. (SEE REF. DWG. FOR FABRICATION NOTES, REQUIREMENTS, & PIECE NO.)
2. DUE TO VESSEL CURVATURE, METAL PATH DISTANCES WILL BE LONGER ON THE VESSEL THAN THIS BLOCK.
3. THE FLAT BOTTOM HOLES (10, 11, 12) ARE LOCATED CLOSER TO THE CONTACT SURFACE THAN 1/4 t, 1/2 t & 3/4 t. USE AS BUILT DIM.
4. THE 3/4 t (13) LATERAL BEAM SPREAD DETERMINATION HOLE IS LOCATED SLIGHTLY OFF CENTER. USE AS BUILT DIM.
5. ALL DIMENSIONS ARE IN INCHES.

REFERENCE
CBI NUCLEAR CO.
205 AE 023 SH 119 REV 3

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON

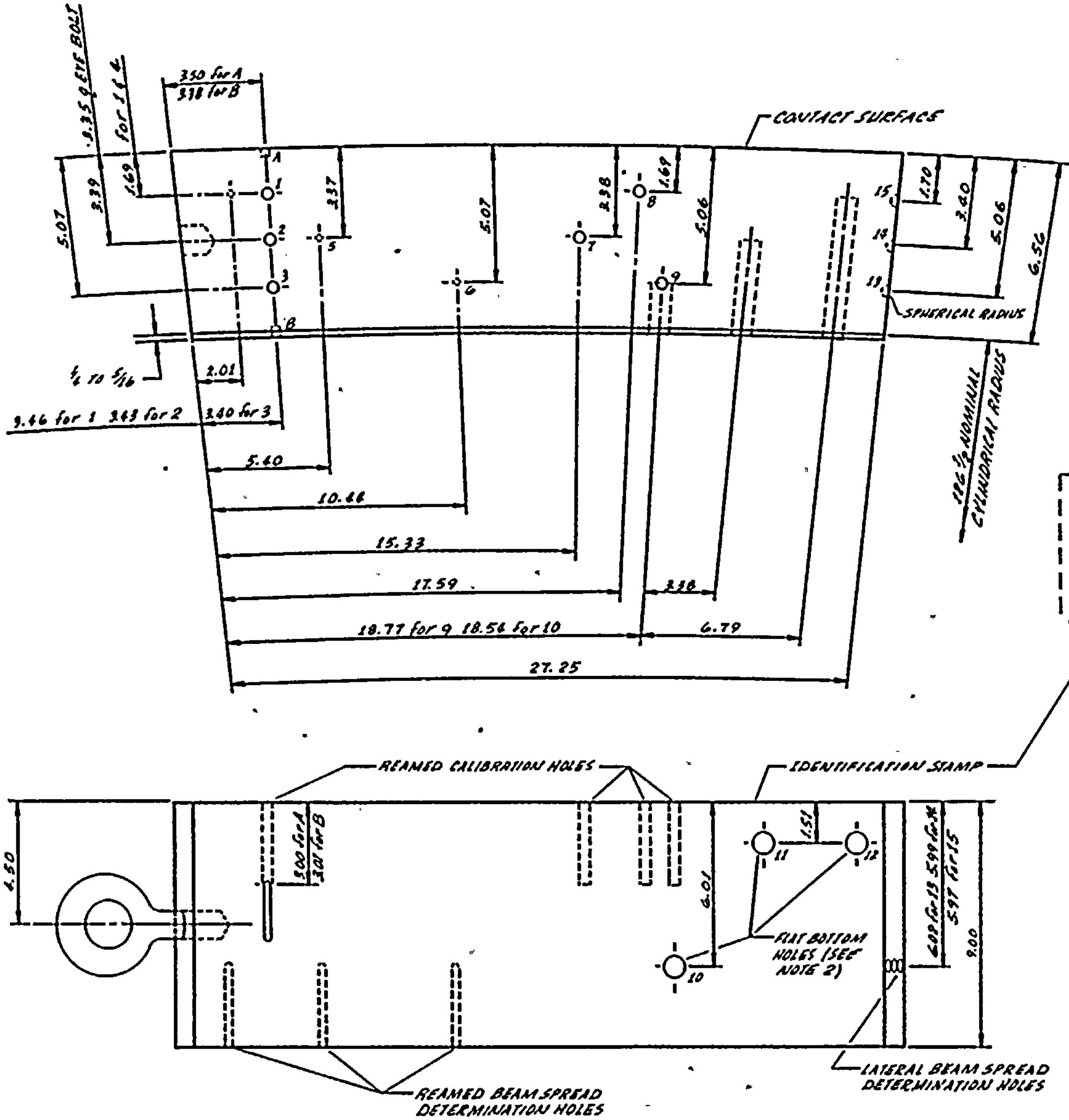
WNP-2

UT CALIBRATION BLOCK, UT 119
RPV #1 SHELL RING

ENGINEER T HOYLE
DRAWN K McANDREW
DATE 1-14-80
DWG NO UTCB-207
REV 1

NO	DATE	REVISION	BY	CHKD	APPVD	NO	DATE	REVISION	BY	CHKD	APPVD
						1	6-12-80		[illegible]	TFB	[illegible]

POOR ORIGINAL



HOLES	ø	DEPTH
1	.313	3.00
2	.313	3.02
3	.313	3.02
4	.130	3.04
5	.189	3.01
6	.129	3.01
7	.313	3.03
8	.313	3.03
9	.314	3.01
10	.76	1.82
11	.76	3.47
12	.76	5.17
13	.319	—
14	.319	—
15	.319	—

NOTCHES	A	B
LENGTH	2.00	2.00
WIDTH	.127	.128
DEPTH	.130	.415

MADE FROM: #3 SHELL RING
CONTRACT No: 72-2667
MATERIAL SPEC: SA 533 GR B CL 1
HEAT No: C 1508-1
BASE METAL THK: 6 9/16.
1/4 = 1.69, 1/2 = 3.38 3/4 = 5.06
WNP-2 UT-120

NOTES:

1. GE DESIGNED & CBIN FABRICATED CURVED CALIBRATION BLOCK. (SEE REF. DWG. FOR FABRICATION NOTES, REQUIREMENTS, PIECE No & CUTTING SKETCH.)
2. THE 3/4 t (10) FLAT BOTTOM HOLE IS CLOSER TO THE CONTACT SURFACE THAN 3/4 t. USE AS BUILT DIM.
3. ALL DIMENSIONS ARE IN INCHES.

REFERENCE

CBI NUCLEAR CO.
205 AE 023 SH 120 REV 3

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352
WNP-2

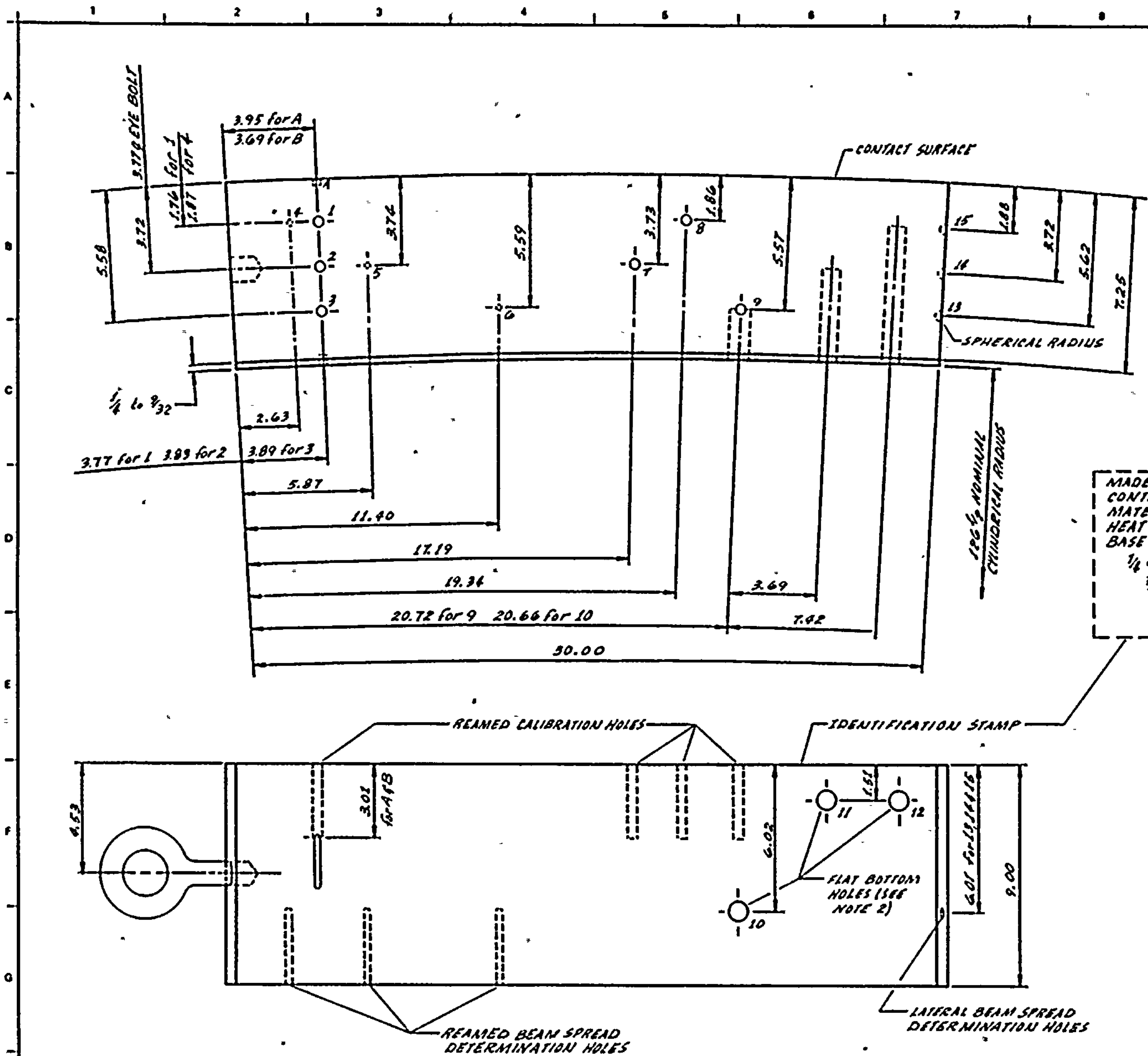
ENGINEER T HOYLE
DRAWN K. McANDREW
DATE 1-15-80

UT CALIBRATION BLOCK, UT 120 RPV #2 & #3 SHELL RINGS

DWG NO UTCB-208 REV 1

NO	DATE	REVISION	BY	CHKD	APPVD
1	6-10-81	AS BUILT	[illegible]	JFB	[illegible]

NO	DATE	REVISION	BY	CHKD	APPVD



HOLES	ϕ	DEPTH
1	.314	3.06
2	.314	3.06
3	.312	3.03
4	.128	2.97
5	.129	2.98
6	.130	2.99
7	.313	3.04
8	.311	3.05
9	.311	3.04
10	.75	2.00
11	.75	3.96
12	.75	5.85
13	.312	—
14	.312	—
15	.312	—

NOTCHES	A	B
LENGTH	1.99	1.98
WIDTH	.125	.126
DEPTH	.182	.405

MADE FROM: #4 SHELL RING
CONTRACT NO: 72-2647
MATERIAL SPEC: SA 533 GR B CL 1
HEAT NO: C 1873
BASE METAL THK: 7 1/4
1/4 = 1.86, 1/2 = 3.72, 3/4 = 5.58
3/4 DIA HOLES
1/4 = 1.78 1/2 = 3.67
WNP-2 UT-121

NOTES:

1. GE DESIGNED & CBIN FABRICATED CURVED CALIBRATION BLOCK. (SEE REF. DWG. FOR FABRICATION NOTES, REQUIREMENTS, PIECE NO & CUTTING SKETCH)
2. THE 1/4 t (12) & 1/2 t (11) FLAT BOTTOM HOLES ARE CLOSER TO THE CONTACT SURFACE THAN 1/4 & 1/2 t RESPECTIVELY. USE AS BUILT DIM.
3. ALL DIMENSIONS ARE IN INCHES.

REFERENCE

CBI NUCLEAR CO.
205 AE 023 SH 121 REV 3

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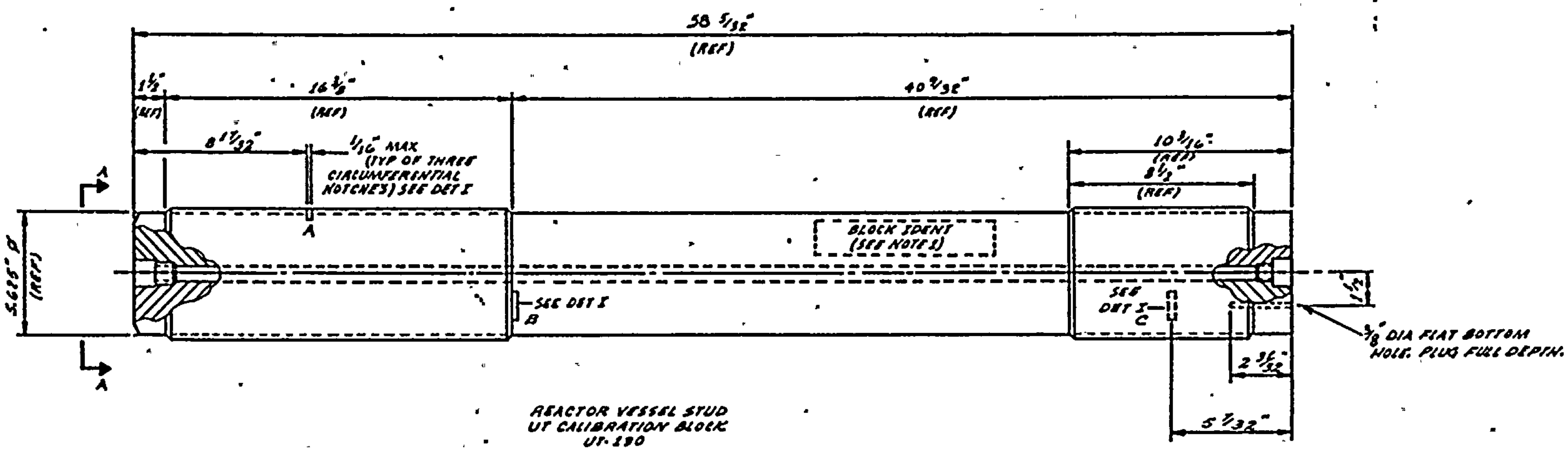
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP-2
UT CALIBRATION BLOCK, UT 121
RPV #4 SHELL RING

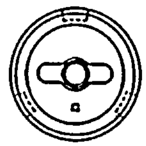
ENGINEER T HOYLE
DRAWN K McANDREW
DATE 1-15-80
DWG NO UTCB-209
REV 1

NO	DATE	REVISION	BY	CHKD	APPVD
1	5.12.80	AS BUILT	KMA	1FR	RWL

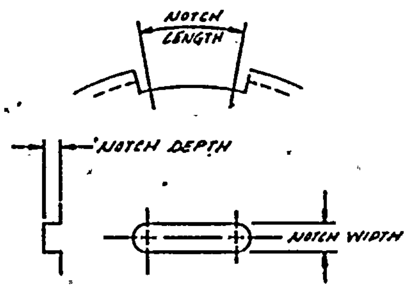


REACTOR VESSEL STUD
UT CALIBRATION BLOCK
UT-130
(MAKE FROM SPARE STUD)

NOTCHES	A	B	C
LENGTH	0.379	0.379	0.372
WIDTH	0.0625	0.0526	0.0526
DEPTH	0.164	0.149	0.157



SECTION A-A



DETAIL I
SEE NOTE 3

NOTES:

1. STUD STAMPED ON SHANK WITH 1/8" HIGH STEEL STAMP WITH CAL BLOCK Nº "UT-130".
2. 1/32 INCH MACHINING TOLERANCES ARE APPLICABLE UNLESS OTHERWISE NOTED.
3. LOCATE NOTCHES 120° APART AS SHOWN IN SECTION A-A.

REFERENCES:

CBI NUCLEAR CO.
205 AE 023 SHT. 35 REV 1

Daniel W. Porter

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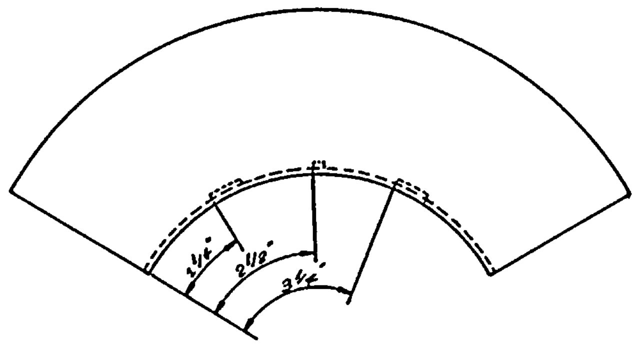
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

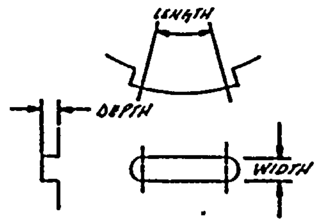
NO	DATE	REVISION	BY	CHKD	APPVD
3	10-23-81	AS BUILT	[illegible]	[illegible]	TSH
2	4-9-81	CHANGED NOTCH DET. IN F-6	KMcA	TSH	[illegible]
1	2-26-79	REDRAWN, CALIBRATION DESIGN CHANGE TO FULL LENGTH STANDARD CALIBRATION.	KMcA	[illegible]	[illegible]
0	7-27-78	ISSUED FOR CONSTRUCTION	KMcA	NCH	[illegible]

ENGINEER NC HALLAS
DRAWN K. McANDREW
DATE 7-12-78

WNP-2
RPV STUD
UT CALIBRATION BLOCK

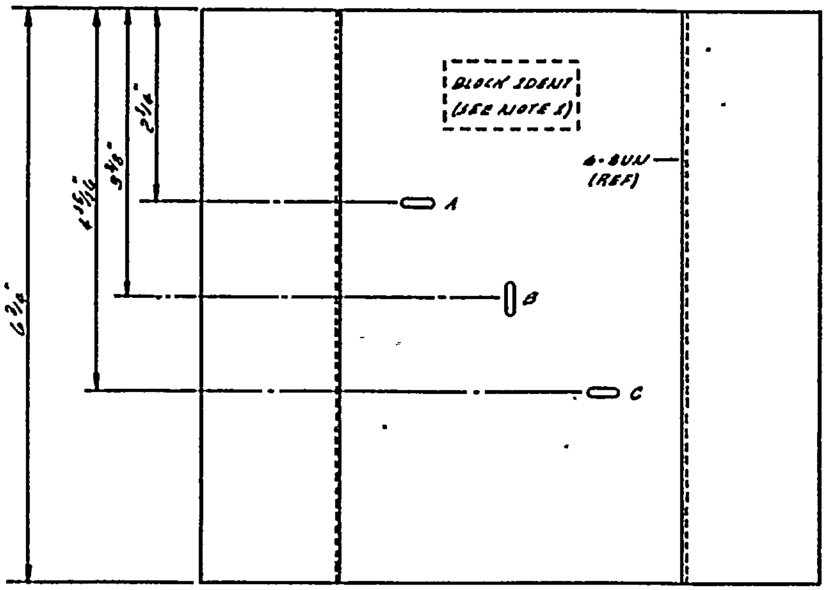
DWG NO UTCB-130
REV 3





NOTCH DETAIL

NOTCH	LENGTH	WIDTH	DEPTH
A	0.374	0.156	0.0686
B	0.373	0.150	0.0685
C	0.371	0.145	0.0685



NOTES:

1. BLOCK STAMPED WITH ⅛" HIGH STEEL STAMP WITH CAL BLOCK № UT-132 & WNP-2.
2. MADE FROM SPARE NUT.

REFERENCES:

CBI NUCLEAR CO
205 AE 023 SH 36 REV 5

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

NO	DATE	REVISION	BY	CHKD	APPVD
3	12-1-81	AS BUILT, REDRAWN (PIECE WAS SECTIONED)	KHA	JR	TFH
2	6-8-81	REVISED AS NOTED	KHA	TFH	DWP
1	7-31-79	REVISED NOTCHES AS NOTED	KHA	DWP	LFB
0	7-13-78	ISSUED FOR CONSTRUCTION	KHA	DWP AKH	[illegible]

ENGINEER N C HALLS
DRAWN K-A/C ANDREW
DATE 7-12-78

WNP-2
RPV NUT
UT CALIBRATION BLOCK, UT-132

DWG NO UTCB-211 REV 3

Date 1/8/79
Revision 0

11.2 PIPING SYSTEM STANDARDS

The design drawings on the following pages illustrate the ultrasonic calibration blocks which will be used to perform ultrasonic examinations of the nuclear Class 1 and 2 piping systems. Table 11-2 lists those UT blocks, including the block identification number which will be used exclusively whenever referencing the calibration block on data sheets or other records, and the corresponding design drawing number. The block identification number is the same number referenced from the Program Plan and Schedule Tables and the Weld and Component Identification Diagrams found in Section 8.0, "WELD ID DIAGRAMS".

The following notes apply to Table 11-2:

NOTE 1: This block is for use on 20" RHR(2)-4S which is of material specification SA-312 rather than SA-358. This is acceptable based on the acoustic similarity of the two materials.

NOTE 2: For these piping systems, the UT calibration block is for use on the schedule 100 elbows only.

NOTE 3: This block is for use on 12" RHR(1)-4S which is of material specification SA-312 rather than SA-358. This is acceptable based on the acoustic similarity of the two materials.

NOTE 4: See detail for special 5" thermal sleeve on RFW-101-1 in Section 8.0, "WELD ID DIAGRAMS".

NOTE 5: See detail for flued head fitting on MS-101-3. This block is intended for use along with pipe block UT-3.

TABLE 11-2

RPV ULTRASONIC CALIBRATION BLOCKS

Date 11/14/80

Revision 1

See Section 11.2 for notes

BLOCK ID NO.	DETAIL DWG. NO.	APPLICABLE TO	MATERIAL	NOMINAL DIAMETER	NOMINAL THICKNESS	MATERIAL SPECIFICATION
UT-1	UTCB-220	30" MS(1)-4	CS	30"	1.250"	SA 155 KCF-70
UT-2	UTCB-220	28" MS(1)-4	CS	28"	1.420"	SA 155 KCF-70
UT-3	UTCB-220	26" MS(1)-4	CS	26"	1.125"	SA 155 KCF-70
UT-4	UTCB-224	26" MS(1)-4	CS	26"	1.125"	SA-106 Gr. B
UT-5	UTCB-220	24" RFW(1)-4	CS	24"	1.812"	SA-106 Gr. B
UT-6	UTCB-220	24" MS(1)-4	CS	24"	1.218"	SA-106 Gr. B
UT-7	UTCB-220	24" RRC(1)-4S	SS	24"	1.140"	SA-358 Gr. 304
		24" RRC(2)-4S				
UT-8	NOT USED					
UT-9	UTCB-220	20" RRC(6)-4S	SS	20"	1.031"	SA-358 Gr. 304 (NOTE 1)
		20" RHR(2)-4S				
UT-10	UTCB-220	20" RHR(2)-4	CS	20"	1.031"	SA-106 Gr. B
UT-11	UTCB-220	18" RFW(1)-4	CS	18"	1.375"	SA-106 Gr. B
UT-12	UTCB-220	18" MS(1)-4	CS	18"	0.938"	SA-106 Gr. B
UT-13	UTCB-220	16" RRC(1)-4S	SS	16"	0.758"	SA-358 Gr. 304

TABLE 11-2

Date 11/14/80
Revision 2

PIPING SYSTEM ULTRASONIC CALIBRATION BLOCKS

See Section 11.2 for Notes

BLOCK ID NO.	DETAIL DWG. NO.	APPLICABLE TO	MATERIAL	NOMINAL DIAMETER	NOMINAL THICKNESS	MATERIAL SPECIFICATION
UT-14	UTCB-221	14" RHR(1)-4	CS	14"	0.750"	SA-106 Gr. B
UT-15	UTCB-221	12" RFW(1)-4	CS	12"	1.000"	SA-106 Gr. B
UT-16	UTCB-221	12" RHR(1)-4	CS	12"	0.844"	SA-106 Gr. B
		12" HPCS(1)-4				(NOTE 2)
		12" LPCS(1)-4				(NOTE 2)
UT-17	UTCB-221	12" HPCS(1)-4	CS	12"	0.688"	SA-106 Gr. B
		12" LPCS(1)-4				
UT-18	NOT USED					
UT-19	UTCB-221	12" RRC(7)-4S	SS	12"	0.688"	SA-358 Gr. 304 (NOTE 3)
		12" RHR(1)-4S				
		12" RRC(1)-4S				
UT-20	NOT USED					
UT-21	UTCB-221	10" RCIC(12)-4	CS	10"	0.719"	SA-106 Gr. B
UT-22	UTCB-221	10" HPCS(1)-4	CS	10"	0.594"	SA-106 Gr. B
		10" RCIC(12)-4				
		10" LPCS(1)-4				
UT-23	UTCB-221	10" RCIC(12)-4	CS	10"	0.844"	SA-106 Gr. B

TABLE 11-2

Date 11/14/80
Revision 1

PIPING SYSTEM ULTRASONIC CALIBRATION BLOCKS

See Section 11.2 for Notes

BLOCK ID NO.	DETAIL DWG. NO.	APPLICABLE TO	MATERIAL	NOMINAL DIAMETER	NOMINAL THICKNESS	MATERIAL SPECIFICATION
UT-24	UTCB-221	8" MS(1)-4	CS	8"	0.906"	SA-106 Br. B
UT-25	UTCB-221	8" RCIC(12)-4	CS	8"	0.594"	SA-106 Gr. B
		8" RHR(20)-4				
UT-26	UTCB-221	8" RRC(1)-4S	SS	8"	0.500"	SA-376 Tp. 304
UT-27	UTCB-221	6" RCIC(1)-4	CS	6"	0.562"	SA-106 Gr. B
		6" RCIC(6)-4				
UT-28	UTCB-221	6" RCIC(1)-4	CS	6"	0.432"	SA-106 Gr. B
		6" RHR(10)-4				
		6" RWCU(3)-4				
		6" RWCU(4)-4				
		6" RFW(11)-4				
UT-29	UTCB-221	4" RRC(4)-4S	SS	4"	0.337"	SA 312 Tp. 304
		JET PUMP INST. NOZZLE				
UT-30	UTCB-221	4" RCIC(10)-4	CS	4"	0.337"	SA-106 Gr. B
		4" RCIC(13)-4				
		4" RWCU(3)-4				
		4" RWCU(4)				

TABLE 11.2

PIPING SYSTEM ULTRASONIC CALIBRATION BLOCKS

Date 1/18/85
Revision 2

See Section 11.2 for Notes

BLOCK ID NO.	DETAIL DWG. NO.	APPLICABLE TO	MATERIAL	NOMINAL DIAMETER	NOMINAL THICKNESS	MATERIAL SPECIFICATION
		4" HPCS(4)				
		4" RRC(51)-4				
		4" HPCS(1)-4				
		4" LPCS(1)-4				
		4" MS(12)-4				
		4" RFW(11)-4				
UT-31	UTCB-221	4" RRC(8)-4S	SS	4"	0.237"	SA-376 Tp. 304
UT-32	UTCB-221	5" RFW(11)-4	CS	5"	0.500"	SA-106 Gr. B (NOTE 4)
UT-33	UTCB-220	24" RFW(1)-4	CS	24"	2.343"	SA-106 Gr. B
UT-34	UTCB-230	CRD SCRAM DISCHARGE VOLUME	CS	12"	0.688"	SA-333 Gr. 6
UT-35	UTCB-231	CRD SCRAM DISCHARGE	CS	8"	0.500"	SA-106 Gr. B
UT-36	UTCB-231	CRD SCRAM DISCHARGE	CS	6"	0.432"	SA-106 Gr. B
UT-37	NOT USED					
UT-38	NOT USED					
UT-39	NOT USED					
UT-40	UTCB-222	MS FLUID HEAD	CS	FLAT	5.000"	SA-105 (NOTE 5)

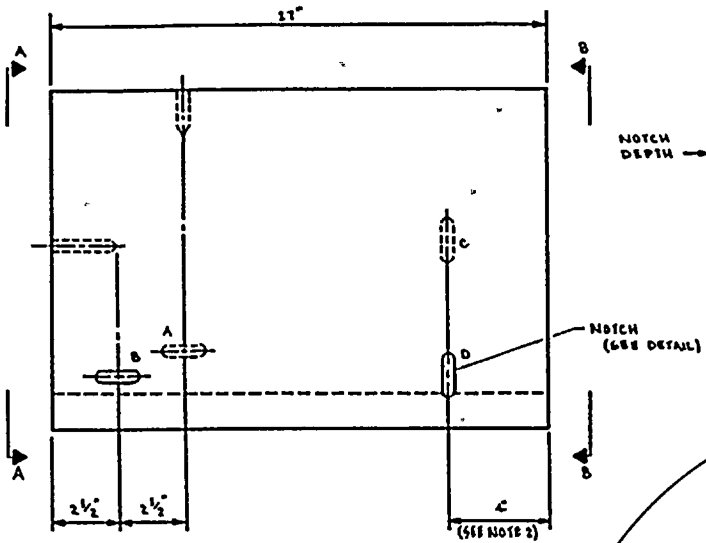
TABLE 11.2

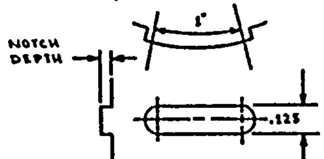
PIPING SYSTEM ULTRASONIC CALIBRATION BLOCKS

Date 1/18/85
Revision 0

See Section 11.2 for Notes

BLOCK ID NO.	DETAIL DWG. NO.	APPLICABLE TO	MATERIAL	NOMINAL DIAMETER	NOMINAL THICKNESS	MATERIAL SPECIFICATION
UT-41	UTCB-223	REACTOR RECIRC. PUMP STUDS	CS	3-1/4"	N/A	SA-193 Gr. 7
UT-42	UTCB-225	RHR HEAT EXCHANGER SHELL TO HEAD AND SHELL TO FLANGE WELDS RHR HEAT EXCHANGER NOZZLE TO SHELL WELDS (N3, N4)	CS	FLAT	1.00"	SA-516 Gr. 70
UT-43	UTCB-226	RRC FLOW CONTROL VALVE	CS	2-3/4"	14-1/4"	SA-193 Gr. B7
UT-44	UTCB-229	3" MS(20)-4	CS	3"		SA-106 Gr. B
UT-45	NOT USED					
UT-46	UTCB-227	CARBON STEEL LUGS	CS	FLAT	0.500"	SA-516 Gr. 70
UT-47	UTCB-228	STAINLESS STEEL LUGS	SS	FLAT	0.500"	SA-240 Tp 304 CL 1





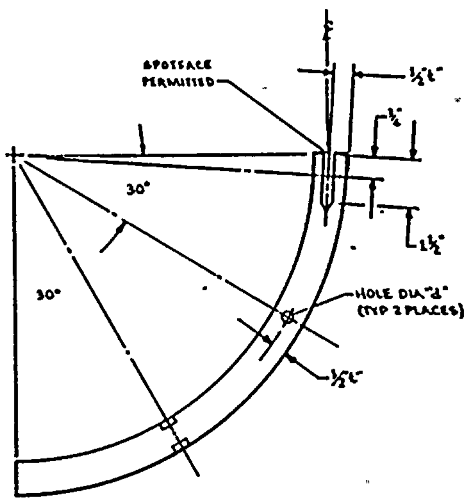
DETAIL

TYPICAL 4 PLACES EXCEPT FOR CURVATURE. SEE NOTE 6

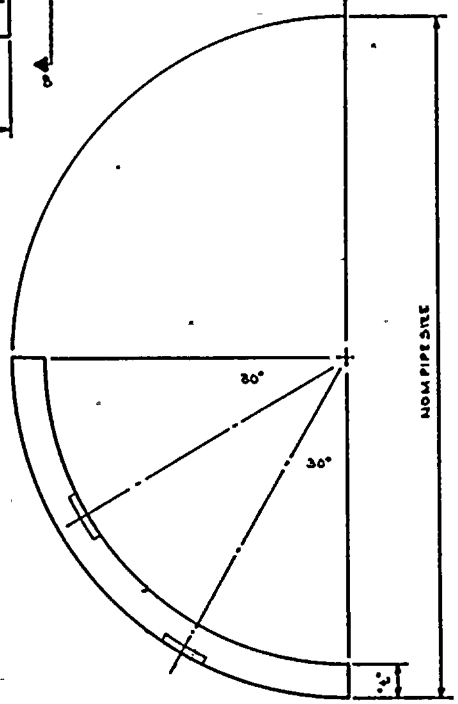
CAL BLOCK Nº	NOM PIPE SIZE	NOM WALL THK "t"	MATERIAL SPECIFICATION	* NOTCH DEPTH	HOLE DIA "d"	HEAT Nº
UT-1	30	1.250	SA 155 KCF-70	.123 .122 .116 .110	1/8"	W 10234
UT-2	28	1.420	SA 155 KCF-70	.127 .125 .130 .111	1/8"	14368
UT-3	26	1.125	SA155 KCF-70	.109 .113 .108 .109	1/8"	M01466
UT-4	SEE UTCB-224					
UT-5	24	1.812	SA 106 GRB	.152 .151 .155 .154	1/8"	L2308
UT-6	24	1.218	SA 106 GRB	.113 .130 .110 .115	1/8"	L85730
UT-7	24	1.140	SA 358 GR304	.109 .109 .110 .109	1/8"	19068
UT-8	NOT USED					
UT-9	20	1.031	SA 358 GR304	.105 .106 .109 .104	1/8"	25890
UT-10	20	1.031	SA 106 GRB	.105 .099 .099 .106	1/8"	L86486
UT-11	18	1.375	SA 106 GRB	.124 .120 .126 .125	1/8"	N10166
UT-12	18	0.938	SA 106 GRB	.093 .095 .092 .092	3/32"	L00193
UT-13	16	0.758	SA 358 GR304	.075 .075 .077 .078	3/32"	57060
UT-33	24	2.343	SA 106 GRB	.186 .186 .198 .182	3/16"	443549

NOTCH DEPTH	
A	C
B	D

* KEY



SECTION A-A



SECTION B-B

NOTES:

1. BLOCKS STAMPED WITH 1/8" HIGH STEEL STAMP ON ENDS WITH NOM PIPE SIZE, SCH OR WALL THK, MATL SPEC, HEAT Nº & CAL BLOCK Nº.
2. DIMENSION 2½" FOR UT-1.
3. DELETED
4. DELETED
5. ALL DIMENSIONS ARE IN INCHES.
6. NOTCH BOTTOM CURVATURE CONFORMS TO PIPE WALL CURVATURE.

DANIEL W. PORTER — PROFESSIONAL ENGINEER

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND WASHINGTON 99352

WNP-2

UT CALIBRATION BLOCKS

NO	DATE	REVISION	BY	CHKD	APPVD	NO	DATE	REVISION	BY	CHKD	APPVD
5	2-2-81	CORRECTED HEAT Nº FOR UT-9	KMcA			2	2-2-79	CORRECTED 2 DIMENSIONS, DELETED UT-4	KMcA		
4	1-11-80	AS BUILT, UT-2, 7, 9, 13 & 33	KMcA			1	1-2-79	TABLE REVISED, HOLE DEPTH CHANGED	KMcA		
3	9-5-79	AS BUILT, UT-1, 3, 5, 6, 10, 11 & 12	KMcA			0	7-28-78	ISSUED FOR CONSTRUCTION	KMcA		

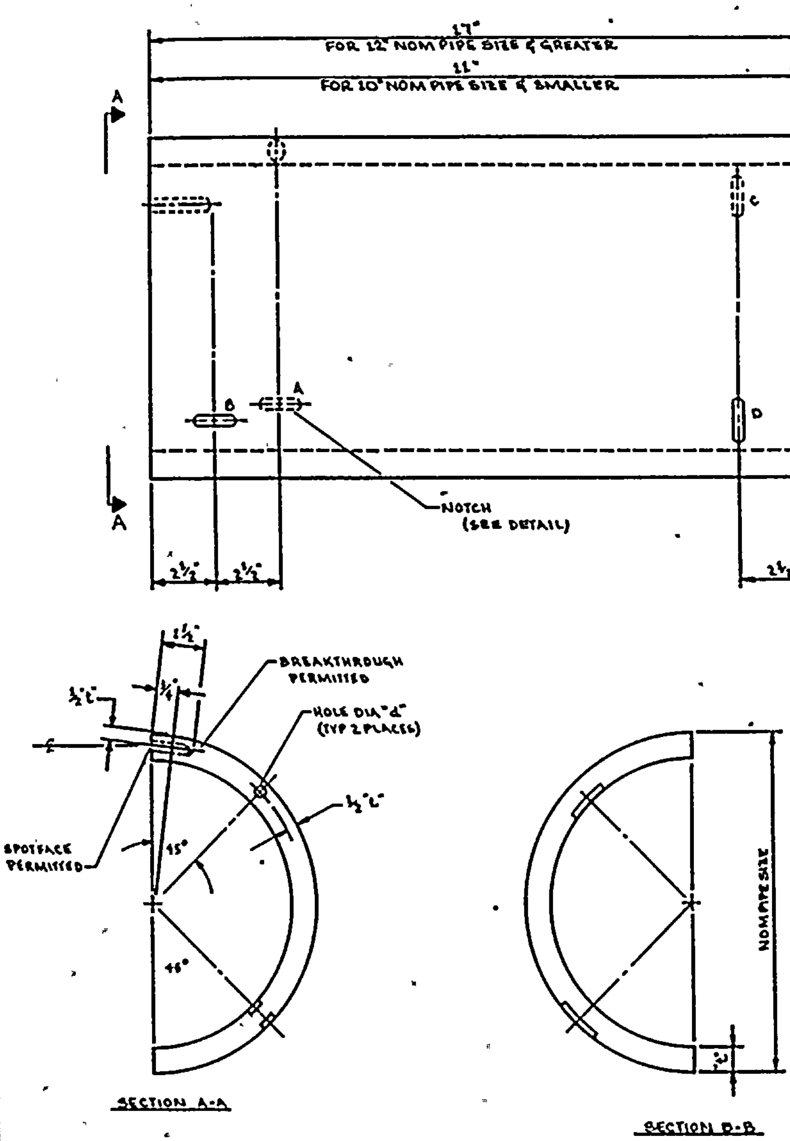
ENGINEER MC HALLAS

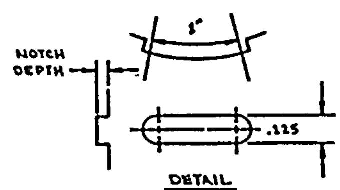
DRAWN K. McANDREW

DATE 7-28-78

DWG NO UTCB-220

REV 5





CAL BLOCK Nº	NOM PIPE SIZE	NOM WALL THK "t"	MATERIAL SPECIFICATION	* NOTCH DEPTH	HOLE DIA "d"	HEAT Nº
UT-14	14	.750	SA 106 GR B	.075 .076 .075 .076	3/32"	N10630
UT-15	12	1.000	SA 106 GR B	.091 .098 .097 .097	3/32"	L45845
UT-16	12	.844	SA 106 GRB	.081 .088 .082 .083	3/32"	64975
UT-17	12	.688	SA 106 GR B	.073 .067 .068 .070	3/32"	105057
UT-18	NOT USED					
UT-19	12	.688	SA 358 GR 304	.066 .069 .070 .071	3/32"	2P7134
UT-20	NOT USED					
UT-21	10	.719	SA 106 GRB	.071 .072 .071 .073	3/32"	152177
UT-22	10	.594	SA 106 GRB	.058 .058 .057 .057	3/32"	N93495
UT-23	10	.844	SA 106 GRB	.081 .081 .081 .081	3/32"	N38495
UT-24	8	.906	SA 106 GRB	.090 .092 .079 .086	3/32"	N54295
UT-25	8	.594	SA 106 GRB	.060 .061 .060 .060	3/32"	45037
UT-26	8	.500	SA 376 TP 304	.047 .054 .053 .051	3/32"	M1386
UT-27	6	.562	SA 106 GR B	.054 .061 .056 .058	3/32"	N10088
UT-28	6	.432	SA 106 GR B	.046 .045 .042 .044	3/32"	LB4413
UT-29	4	.337	SA 312 TP 304	.036 .037 .032 .032	3/32"	F50309
UT-30	4	.337	SA 106 GRB	.030 .036 .035 .033	3/32"	N94874
UT-31	4	.237	SA 376 TP 304	.027 .024 .020 .026	3/32"	01480
UT-32	5	.500	SA 106 GRB	.086 .055 .050 .053	3/32"	L44776

NOTES:

1. BLOCKS STAMPED WITH ⅛" HIGH STEEL STAMP ON ENDS WITH NOM PIPE SIZE, SCH OR WALL THK, MATL SPEC, HEAT Nº & CAL BLOCK Nº.
2. DELETED
3. DELETED
4. DELETED
5. ALL DIMENSIONS ARE IN INCHES.
6. NOTCH BOTTOM CURVATURE CONFORMS TO PIPE WALL CURVATURE.

DANIEL W. PORTER — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

Daniel W. Porter

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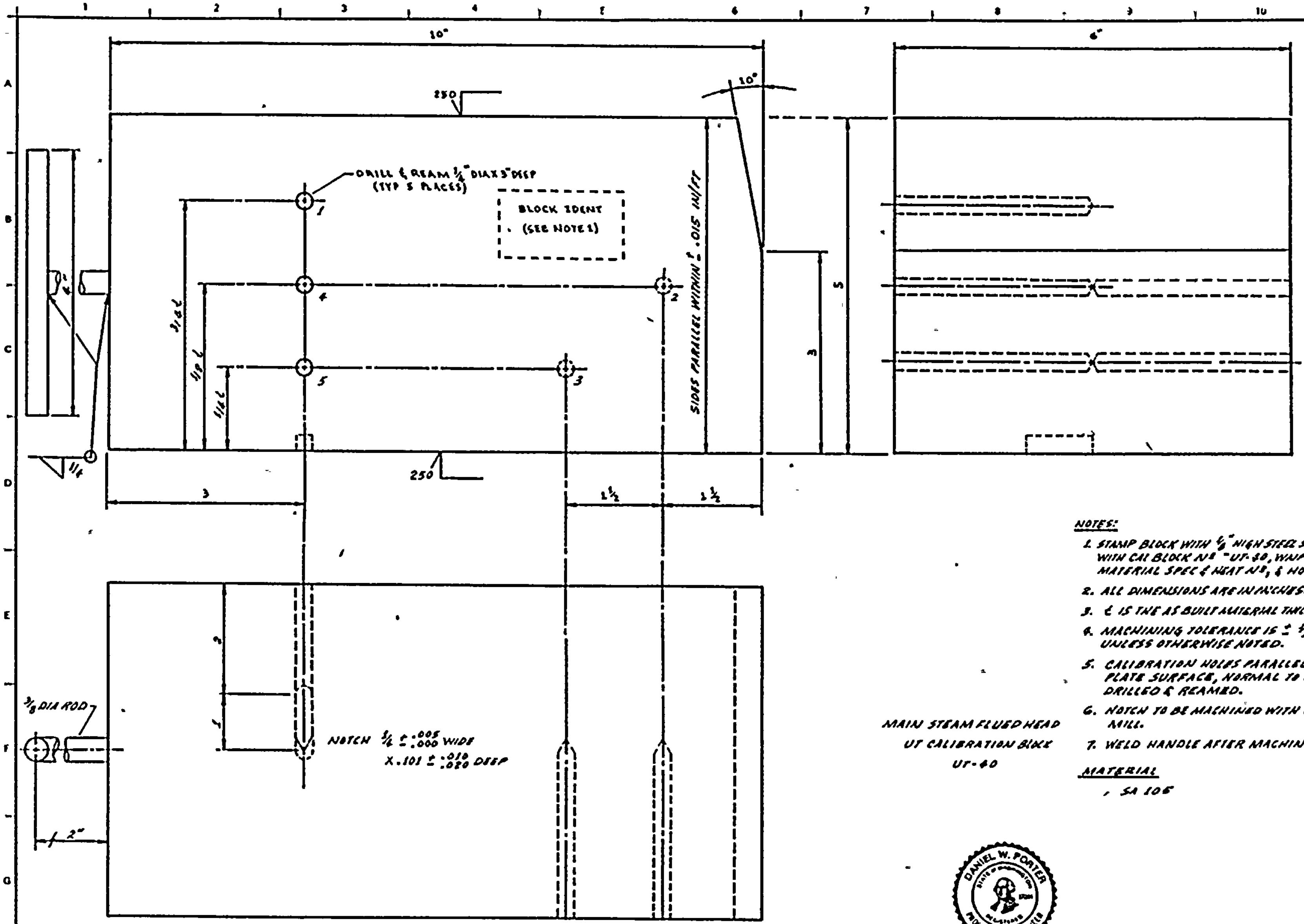
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP 2

UT CALIBRATION BLOCKS

NO	DATE	REVISION	BY	CHKD	APPVD	NO	DATE	REVISION	BY	CHKD	APPVD
5	3-28-81	CORRECTED HEAT Nº FOR UT-31.	KMcA			2	2-2-79	CORRECTED Z DIMENSION FOR UT-31.	KMcA		
4	7-13-79	AS BUILT, UT-32	KMcA			1	1-2-79	TABLE REVISED, HOLE DEPTH CHANGED	KMcA		
3	3-16-79	AS BUILT, UT-14 thru 31	KMcA			0	7-11-78	ISSUED FOR CONSTRUCTION	KMcA		

ENGINEER N.C. HALLAS
DRAWN KMcANDREW
DATE 7-11-78
DWG NO UTCB-221
REV 5



MAIN STEAM FLUED HEAD
UT CALIBRATION BLOCK
UT-40

NOTES:

1. STAMP BLOCK WITH 1/8" HIGH STEEL STAMP WITH CAL BLOCK Nº "UT-40, WNP-2", MATERIAL SPEC & HEAT Nº, & HOLE NOS.
2. ALL DIMENSIONS ARE IN INCHES.
3. t IS THE AS BUILT MATERIAL THICKNESS.
4. MACHINING TOLERANCE IS ± 1/32 UNLESS OTHERWISE NOTED.
5. CALIBRATION HOLES PARALLEL TO PLATE SURFACE, NORMAL TO EDGE, DRILLED & REAMED.
6. NOTCH TO BE MACHINED WITH 1/8" END MILL.
7. WELD HANDLE AFTER MACHINING.

MATERIAL

, SA 106

DANIEL W. PORTER — PROFESSIONAL ENGINEER

Daniel W. Porter

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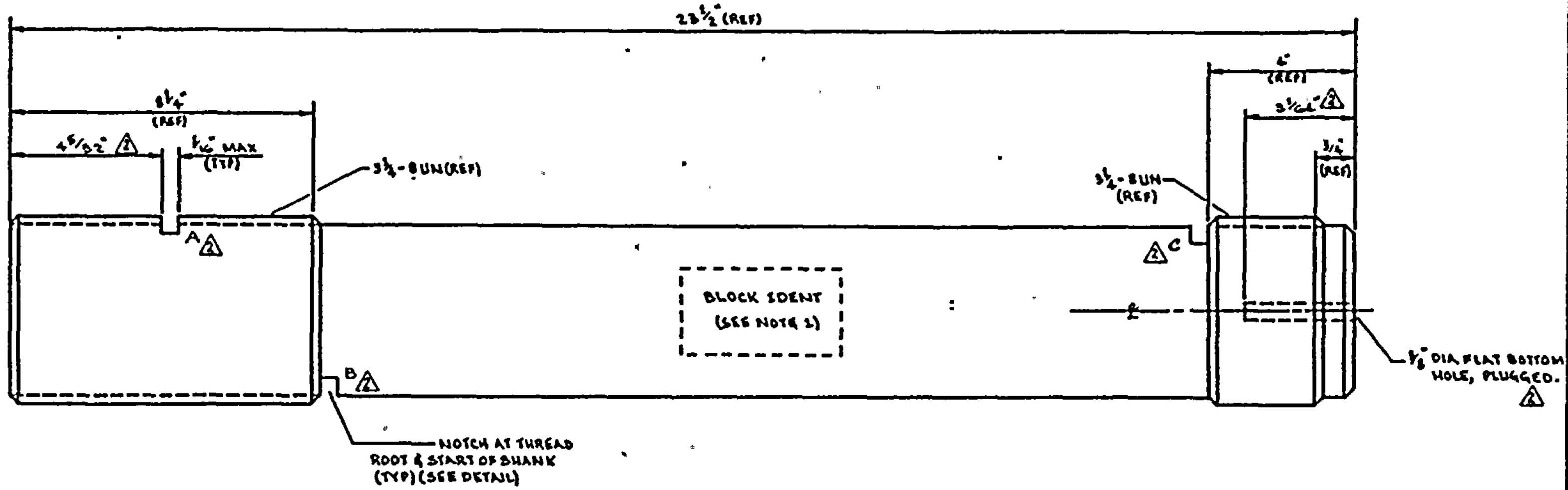
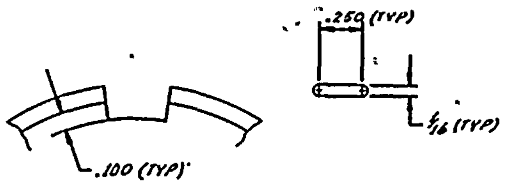
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND WASHINGTON 99352

NO	DATE	REVISION	BY	CHKD	APPVD
1	[illegible]	REVISED TO AS-BUILT STATUS	[illegible]	[illegible]	DWP
0	[illegible]	ISSUED FOR CONSTRUCTION	KMcA	[illegible]	[illegible]

ENGINEER N.C. HALLAS	WNP-2 UT CALIBRATION BLOCK
DRAWN K. McANDREW	
DATE 7-11-78	DWG NO UTCB-222 — REV 1



NOTCH	LENGTH	WIDTH	DEPTH
A	.252	1/16"	.101
B	.248	1/16"	.100
C	.253	1/16"	.100



NOTCH DETAIL

RECIRC PUMP STUD
UT CALIBRATION BLOCK
UT-41
(MAKE FROM SPARE STUD)

NOTES:

1. STUD SHANK STAMPED WITH 1/8" HIGH STEEL STAMP WITH CAL BLOCK NO, UT-41 & WNP-2.
2. DELETED.
3. NOTCHES LOCATED 120° APART.
4. NOTCHES ARE PERPENDICULAR TO THE AXIS OF THE STUD.

DANIEL W. PORTER — STATE OF WASHINGTON — REGISTERED PROFESSIONAL ENGINEER

Daniel W. Porter

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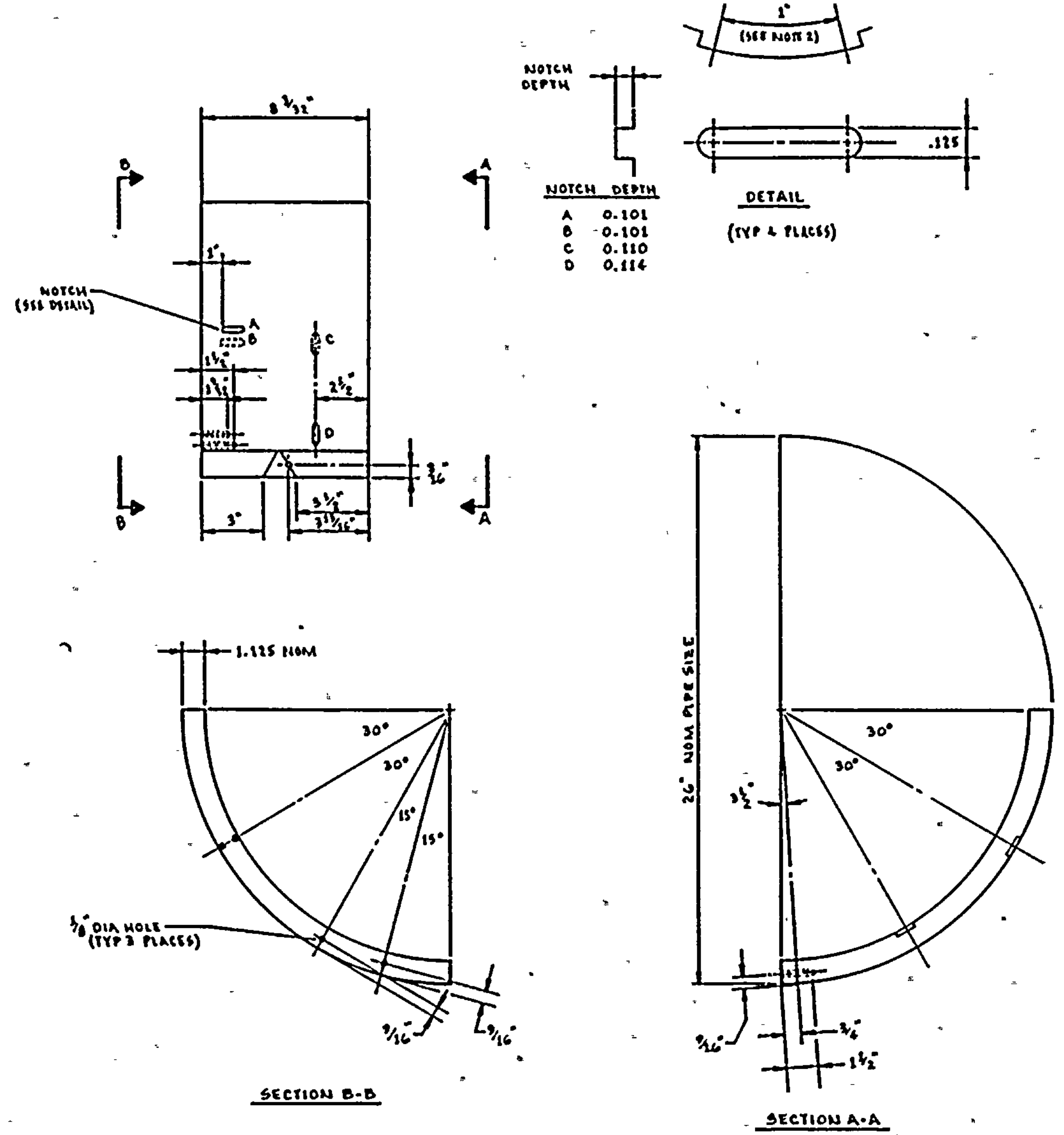
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

NO	DATE	REVISION	BY	CHKD	APPVD
2	6-7-83	AS BUILT REVISED AS NOTED			
1	6-2-82	CORRECTED NOTCH DETAIL			
0	7-13-78	ISSUED FOR CONSTRUCTION			

ENGINEER N.C. HALLAS
DRAWN K. McANDREW
DATE 7-11-78

WNP-2
RECIRC PUMP STUD UT-41
UT CALIBRATION BLOCK

DWG NO UTCB-223 — REV 2



NOTES:

1. BLOCKS STAMPED WITH 3/8" HIGH STEEL STAMP ON ENDS WITH NOM PIPE SIZE, SCH OR WALL THK, MATL SPEC, HEAT Nº & CAL BLOCK NO.
2. NOTCH C IS 1 1/8" IN LENGTH. ALL OTHER NOTCHES ARE 1" IN LENGTH.
3. DELETED
4. ALL DIMENSIONS ARE IN INCHES.
5. NOTCH BOTTOM CURVATURE CONFORMS TO PIPE WALL CURVATURE.

MATERIAL

SA 106 GR B
HEAT Nº J4384

D.W. Porter

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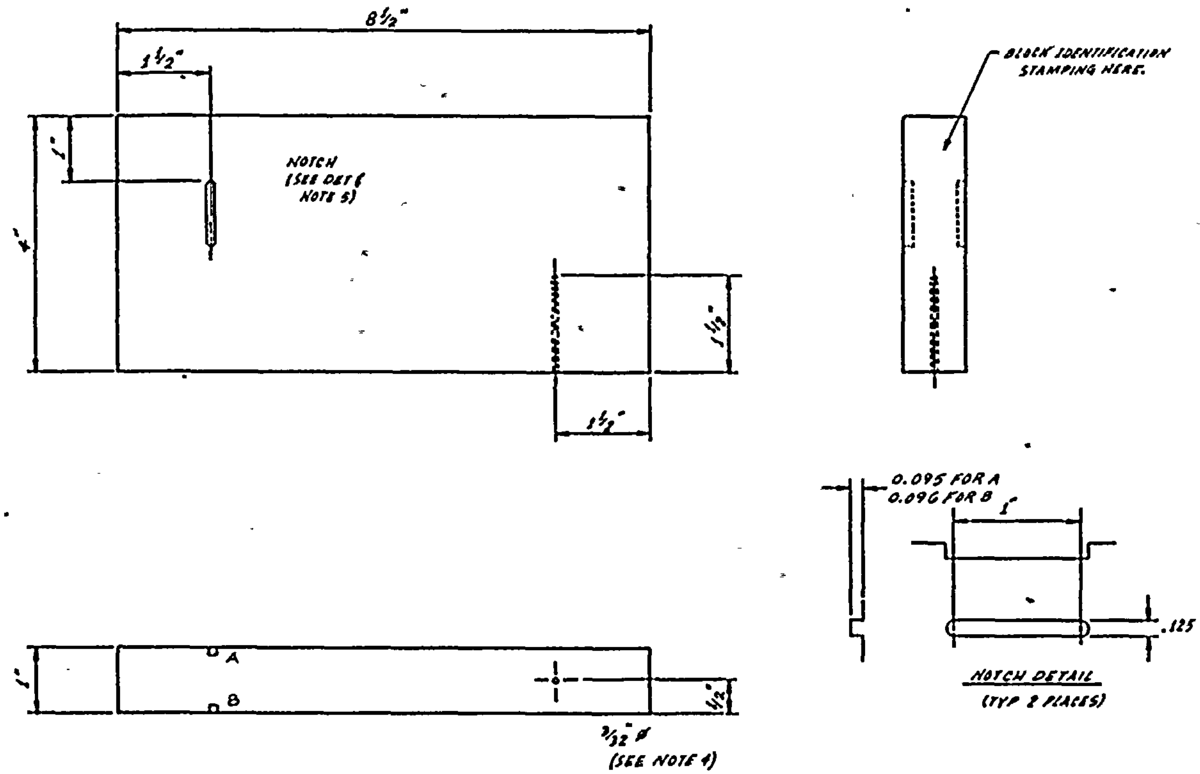
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP-2

UT-4 CALIBRATION BLOCK

ENGINEER NC HALLAS
DRAWN K. McANDREW
DATE 2-16-79
DWG NO UTCB-224
REV 2

NO	DATE	REVISION	BY	CHKD	APPVD
2	12-2-81	ADDED MATERIAL & HEAT Nº	K.McA	JPV	TFF
1	4-3-79	AS BUILT	KMcA		
0	2-16-79	ISSUED FOR CONSTRUCTION	KMcA		



NOTES:

1. BLOCK STAMPED WITH 1/8" HIGH STEEL STAMP WITH MATERIAL SPEC, HEAT NO., CAL BLOCK NO. & "WNP-2, RHR-HT-EXCH."
2. ALL DIMENSIONS ARE IN INCHES.
3. MACHINING TOLERANCE IS ± 1/32 INCH UNLESS OTHERWISE NOTED.
4. CALIBRATION HOLE PARALLEL TO PLATE SURFACE, NORMAL TO EDGE, DRILLED & REAMED.
5. NOTCHES TO BE MACHINED WITH .125 DIA FLAT END MILL.

MATERIAL

SA 516 GR 70
HEAT NO 71071

DANIEL W. PORTER — PROFESSIONAL ENGINEER

Daniel W. Porter

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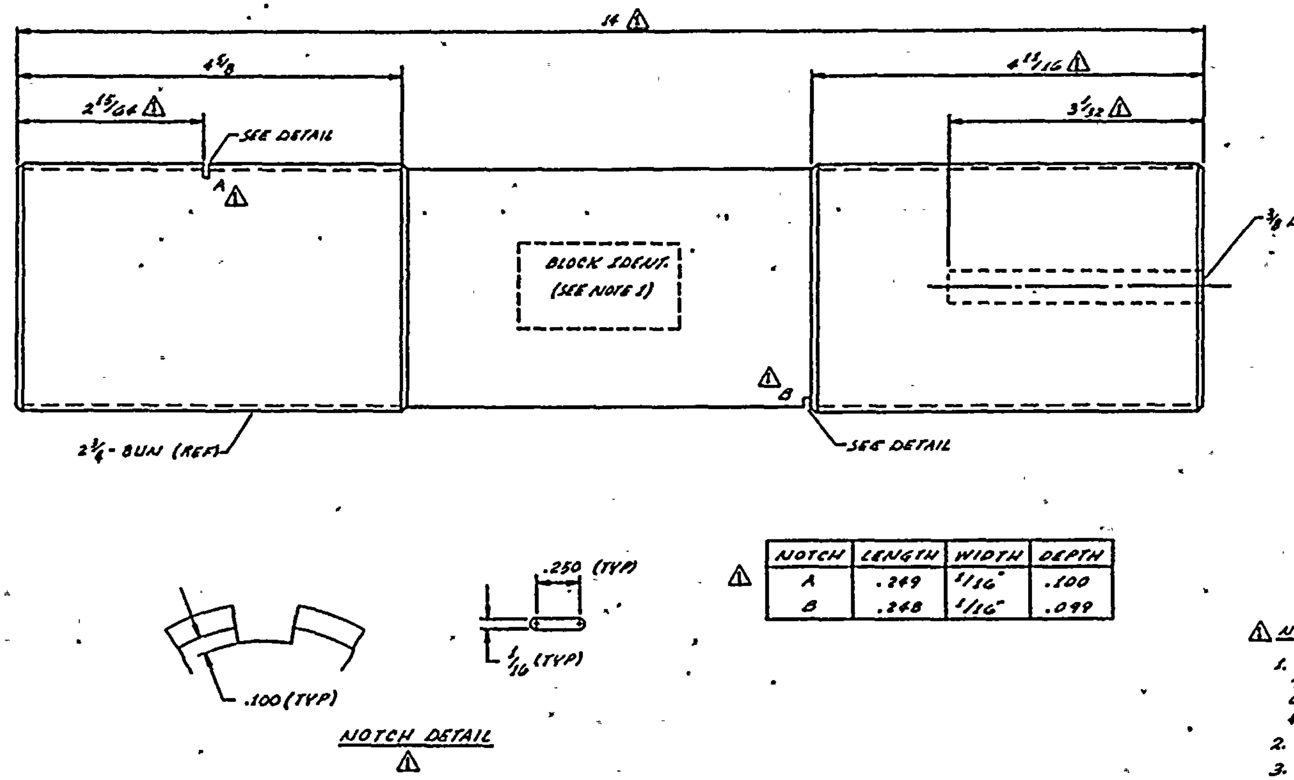
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP-2

RHR HEAT EXCHANGER CALIBRATION BLOCK UT-42

NO	DATE	REVISION	BY	CHKD	APPVD
1	12-2-81	ADDED PROF. ENGR. STAMP AS BUILT	[illegible]	[illegible]	[illegible]
0	7-31-79	ISSUED FOR CONSTRUCTION	[illegible]	[illegible]	[illegible]

ENGINEER T. HOYLE
DRAWN K. McANDREW
DATE 6-14-79
DWG NO UTCB-885
REV 1



NOTCH	LENGTH	WIDTH	DEPTH
A	.249	1/16"	.100
B	.248	1/16"	.099

NOTES:

1. STUD SHANK STAMPED WITH 1/8" HIGH STEEL STAMP WITH CAL BLOCK Nº UT-43, WNP-2, & SA 193 GR B7.
2. DELETED.
3. NOTCHES ARE PERPENDICULAR TO THE AXIS OF THE STUD.
4. DIMENSIONS ARE IN INCHES.

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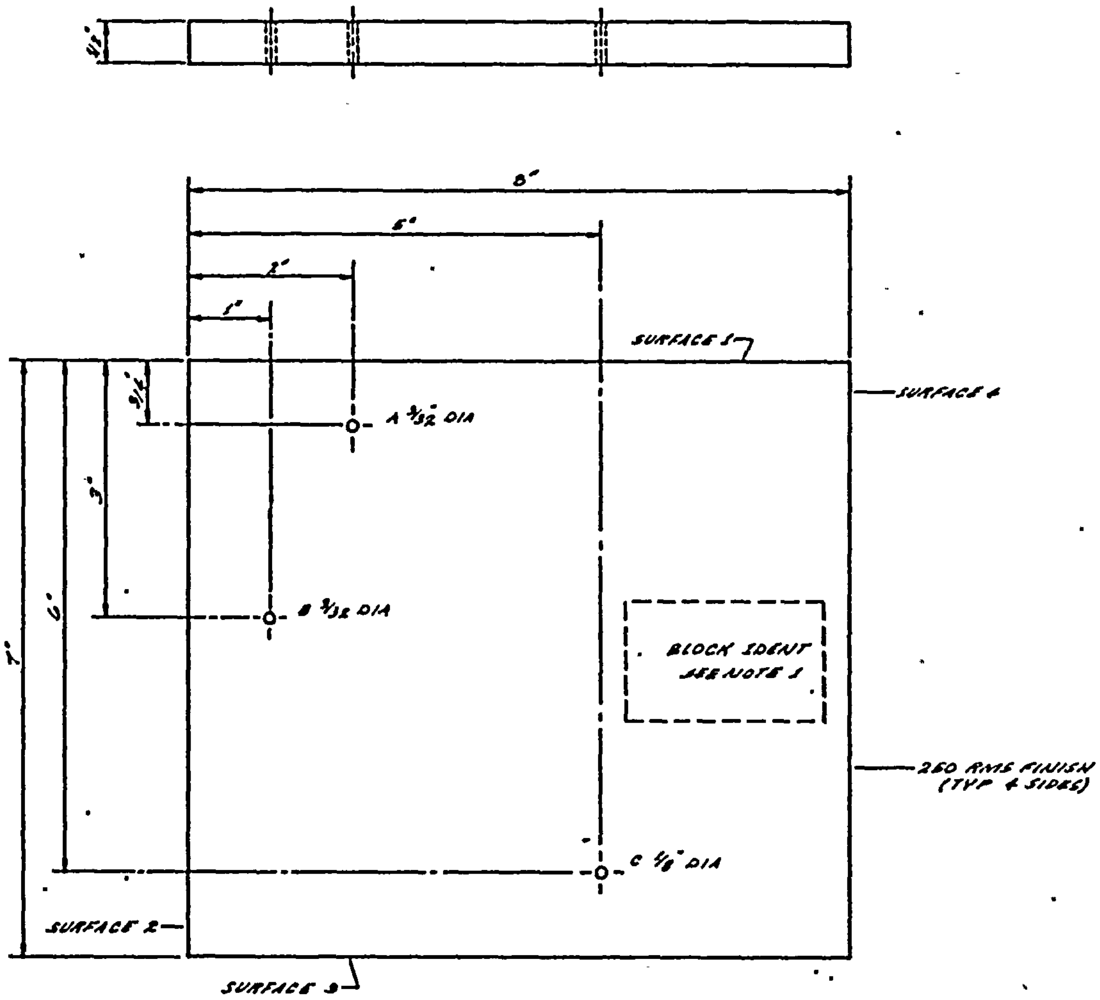
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

WNP-2

RECIRC FLOW CONTROL VALVE
UT CALIBRATION BLOCK UT-43

ENGINEER T F HOYLE
DRAWN K McANDREW
DATE 6-4-80
DWG NO UTCB-226
REV 1

NO	DATE	REVISION	BY	CHKD	APPVD
1	6-7-81	AS BUILT REVISED AS NOTED	KMcA	LFC	TFP
0	6-24-80	ISSUED FOR CONSTRUCTION	KMcA	TFF	[illegible]



LUG THICKNESS (t)	METAL PATH	HOLE	SURFACE
t ≤ 1"	3/4"	A	1
	1	B	2
	2	A	3
	3	B	1
	4	B	3
	6	A	4
	7	B	4
1 < t ≤ 2"	1	C	3
	3	C	4
	5	C	2
	6	C	1

NOTES:

1. STAMP LUG WITH 1/8" HIGH STEEL STAMP WITH CAL BLOCK Nº UT-46, WNP-2, MATERIAL: SA 516 GR 70 HEAT Nº:
2. MACHINING TOLERANCE IS ± 1/32" UNLESS OTHERWISE NOTED.

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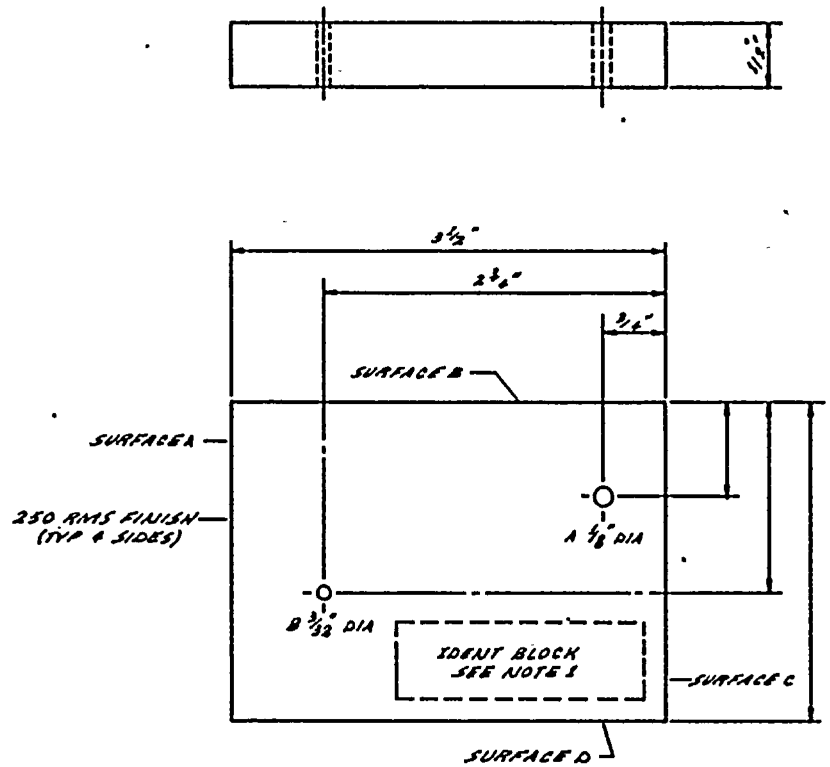
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON

WNP-2

UT CALIBRATION BLOCK UT-46
CARBON STEEL LUG

ENGINEER DA MURDOCH
DRAWN [signature]
DATE 9-29-81
DWG NO UTCB-227
REV 0

NO	DATE	REVISION	BY	CHKD	APPVD
0	1/29/81	ISSUED FOR CONSTRUCTION	[signature]	[signature]	TFH



LUG THICKNESS (t)	METAL PATH	HOLE	SURFACE
t ≤ 1"	3/4"	3/32" DIA	A
	1"		D
	1 1/2"		B
	2 1/4"		C
1" < t ≤ 2"	1/2"	1/8" DIA	C
	3/4"		B
	1 1/4"		D
	3"		A

NOTES:

1. STAMP LUG WITH 1/8" HIGH STEEL STAMP WITH CAL BLOCK NO UT-47, WNP-2, MATERIAL: SA 240 TP 304 CL 1 HEAT NO:
2. MACHINING TOLERENCE IS ± 1/32" UNLESS OTHERWISE NOTED.

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON

WNP-2

UT CALIBRATION BLOCK UT-47 STAINLESS STEEL LUG

ENGINEER DA MURDOCK

DRAWN K. McANDREW

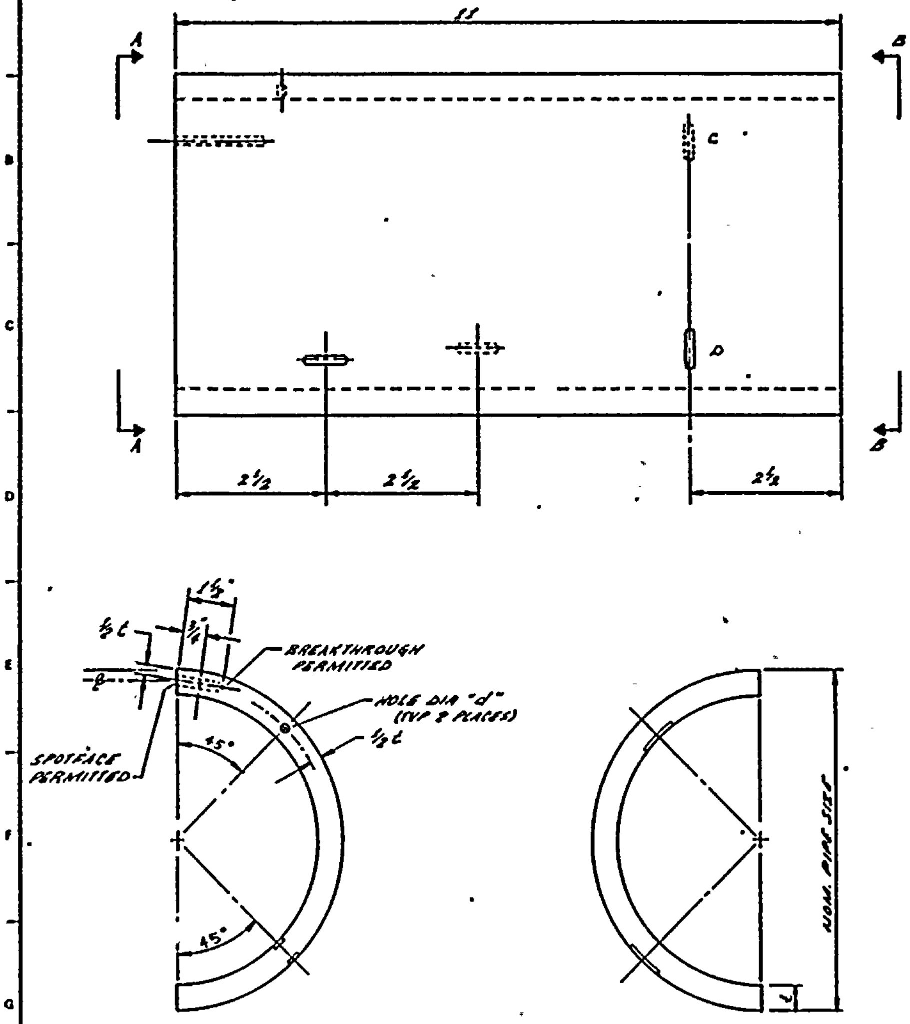
DATE 9-29-81

DWG NO UTCB-228

REV 0

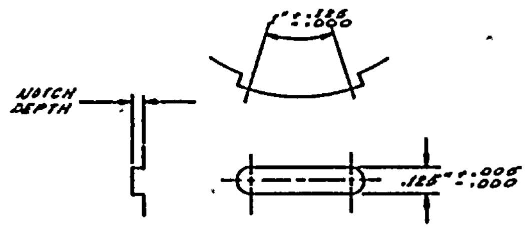
NO	DATE	REVISION	BY	CHKD	APPVD
0	[illegible]	ISSUED FOR CONSTRUCTION	KAA	[illegible]	TFH

CAL BLOCK No	NOM. PIPE SIZE	NOM. WALL THK "t"	MATERIAL SPECIFICATION	NOTCH DEPTH	HOLE DIA. "d"
UT-66	3	0.437	SA 106 GR B	.044 +.004 −.008	3/32"



SECTION A-A

SECTION B-B



DETAIL

TYPICAL 4 PLACES EXCEPT FOR CURVATURE. SEE NOTE 2.

NOTES:

1. STAMP BLOCK WITH ⅛" HIGH STEEL STAMP ON ENDS WITH NOM. PIPE SIZE, SCH OR WALL THK, MATL. SPEC., HEAT No & CAL BLOCK No.
2. NOTCH BOTTOM CURVATURE CONFORMS TO PIPE WALL CURVATURE.
3. STANDARD MACHINING TOLERANCES ARE APPLICABLE UNLESS OTHERWISE NOTED.
4. ALL DIMENSIONS ARE IN INCHES.
5. AXIAL HOLE PARALLEL TO AXIAL SURFACE WITHIN ± 0.010.
6. HOLES ARE TO BE DRILLED & REAMED

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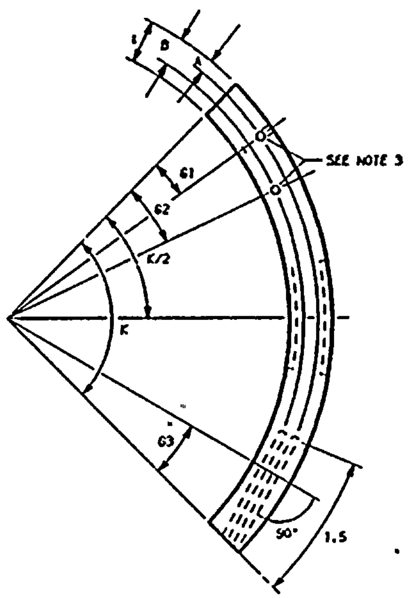
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

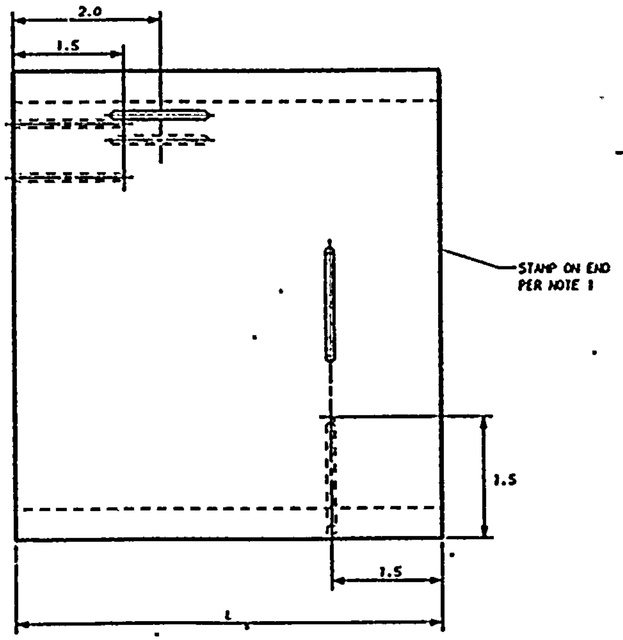
WNP-2
INSERVICE INSPECTION BOUNDARY DIAGRAM
UT CALIBRATION BLOCKS UT-66

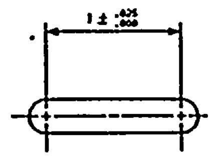
NO	DATE	REVISION	BY	CHKD	APPVD
0	9-2-82	ISSUED FOR CONSTRUCTION			

ENGINEER D RAMEY
DRAWN K McANDREW
DATE 2-8-82
DWG NO UTCB-229
REV 0

t >1/2														
CAL BLOCK NUMBER	NOMINAL PIPE SIZE	SCHEDULE	WALL THICKNESS	K±1°	L±.100	θ1±.25°	θ2±.25°	θ3±.25°	NOTCH DEPTH $\pm^{0.005}_{0.010}$	A ± 0.010	B ± 0.010	HOLE DIAMETER ± 0.010	HEAT NUMBER	MATERIAL SPEC
UT-34	12	60	0.688	57.5	7.25	14.3	21.5	7.2	.067	.172	.516	3/32"	XXXX	SA 333 GR 6







NOTCH DETAIL

NOTES

1. STAMP BLOCKS WITH 1/8" HIGH STEEL STAMP WITH WNP-2, CAL BLOCK NUMBER, NOM PIPE SIZE, MATERIAL, AND HEAT NUMBER.
2. NOTCH BOTTOM CURVATURE CONFORMS TO PIPE WALL CURVATURE.
3. HOLE PARALLEL TO AXIAL SURFACE WITHIN ± .010.
4. HOLES ARE TO BE DRILLED AND REAMED.
5. NOTCH SIDES PERPENDICULAR TO THE SURFACE WITHIN ± 5°.
6. NOTCH WIDTH .250 MAX.
7. ALL DIMENSIONS ARE IN INCHES.
8. MACHINED SURFACE TO BE 250 RMS MAX.

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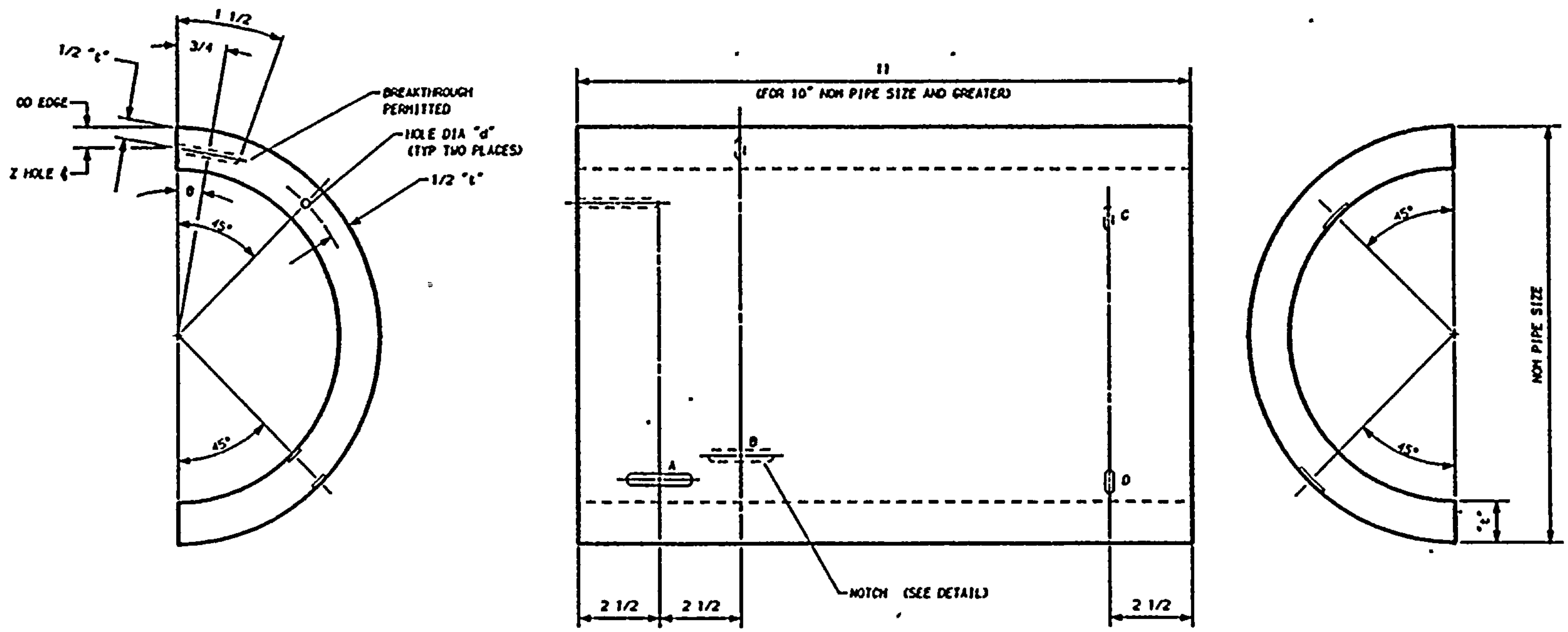
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

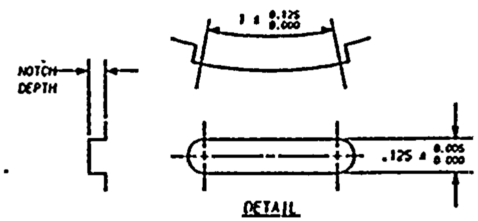
					0		ISSUED FOR CONSTRUCTION				ENGINEER DP RAMEY
											DRAWN K-McANDREW
NO	DATE	REVISION	BY	CHKD	APVD	NO	DATE	REVISION	BY	CHKD	APVD	DATE 6-27-83

WNP-2

UT CALIBRATION BLOCK

DWG NO UTCB-230 | REV 0





DETAIL

(TYPICAL FOUR PLACES EXCEPT FOR CURVATURE. SEE NOTE 6.)

CAL BLOCK NUMBER	NOM. PIPE SIZE	NOM. WALL THK "t"	MATERIAL SPEC	NOTCH DEPTH	HOLE DIA "d"	θ	Z
UT-35	8	0.500	SA 106 GR B	0.050 ± [illegible]	3/32	10.5°	0.228
UT-36	6	0.432	SA 106 GR B	0.043 ± [illegible]	3/32	13.5°	0.126

NOTES

1. STAMP BLOCKS WITH 1/8" HIGH STEEL STAMP ON ENDS WITH WNP-2, CAL BLOCK NUMBER, NOM PIPE SIZE, SCH OR WALL THK, MATL SPEC, AND HEAT NUMBER.
2. TOLERANCE FOR θ IS ± 1/4°.
3. TOLERANCE FOR Z IS ± 0.005.
4. STANDARD MACHINE TOLERANCES ARE APPLICABLE UNLESS OTHERWISE NOTED.
5. ALL DIMENSIONS ARE IN INCHES.
6. NOTCH BOTTOM CURVATURE CONFORMS TO PIPE WALL CURVATURE.

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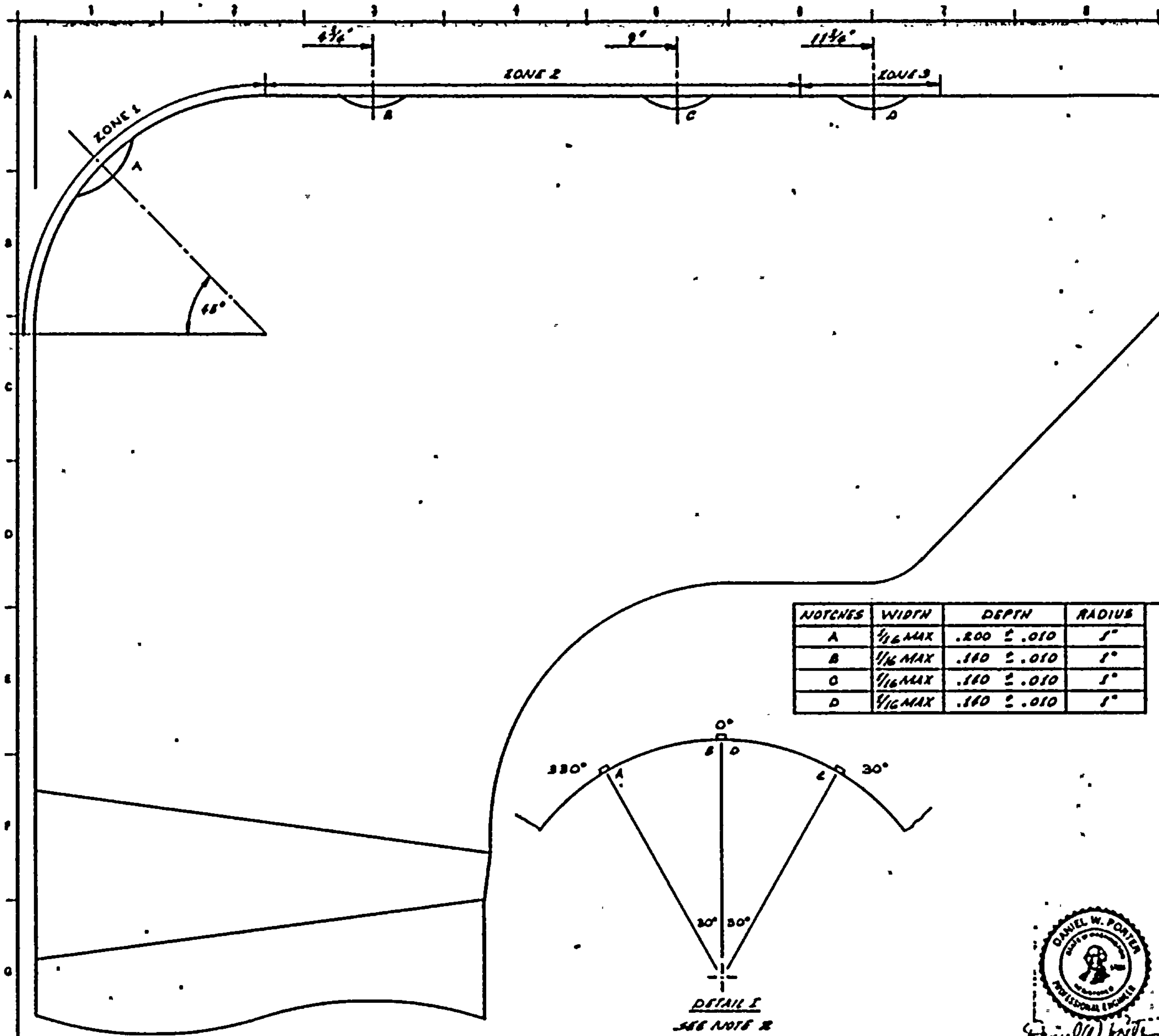
WASHINGTON PUBLIC POWER
SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

ENGINEER DP RAMEY
DRAWN K-McANDREW
DATE 6-17-83

WNP-2
UT CALIBRATION BLOCK

DWG NO. UTCB-231 | REV 0

NO	DATE	REVISION	BY	CHKD	APVD
0	1-24-85	ISSUED FOR CONSTRUCTION			



NOTCHES	WIDTH	DEPTH	RADIUS
A	1/16 MAX	.200 ± .010	1"
B	1/16 MAX	.160 ± .010	1"
C	1/16 MAX	.160 ± .010	1"
D	1/16 MAX	.160 ± .010	1"

NOTES:

1. NOTCHES TO BE CUT WITH A MAX. NOMINAL 1/16" THK 2"Ø GRINDING WHEEL. WIDTH OF NOTCH SHALL BE THAT OBTAINED BY MOVING WHEEL INTO METAL IN ONE PASS - NOMINAL THK OF WHEEL. RADIUS IS NOMINAL 1". DUE TO WEARING OF ABRASIVE RADIUS MAY BE SMALLER THAN 1/8".
2. NOTCHES SHALL BE LOCATED AS SHOWN IN DETAIL I WHEN VIEWING NOZZLE FROM THE VESSEL INTERIOR.
3. NOTCH LOCATION SHALL BE ± 1/8".
4. NOTCHES SHALL BE 90° ± 2° TO THE BORE.
5. NAME PLATE (ATTACHED TO O.D.)

   WNP-2 FEEDWATER NOZZLE MOCKUP UT-122

   MADE FROM:
   DOUGLAS POINT UNIT I RPV

   MATERIAL:

   PLATE SA 533
   HT. NO.

   NOZZLE SA 508
   HT. NO. K-1231,0006

REFERENCES:

CBIN NUCLEAR CO.

1. 72-2647 SHT 56, 59
   (VPF-3153-65, 68)
2.
   (VPF-3615-490)
   (VPF-3613-712)

DANIEL W. PORTER
PROFESSIONAL ENGINEER

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RICHLAND, WASHINGTON 99352

NO	DATE	REVISION	BY	CHKD	APPVD
0	10-1-81	ISSUED FOR CONSTRUCTION			

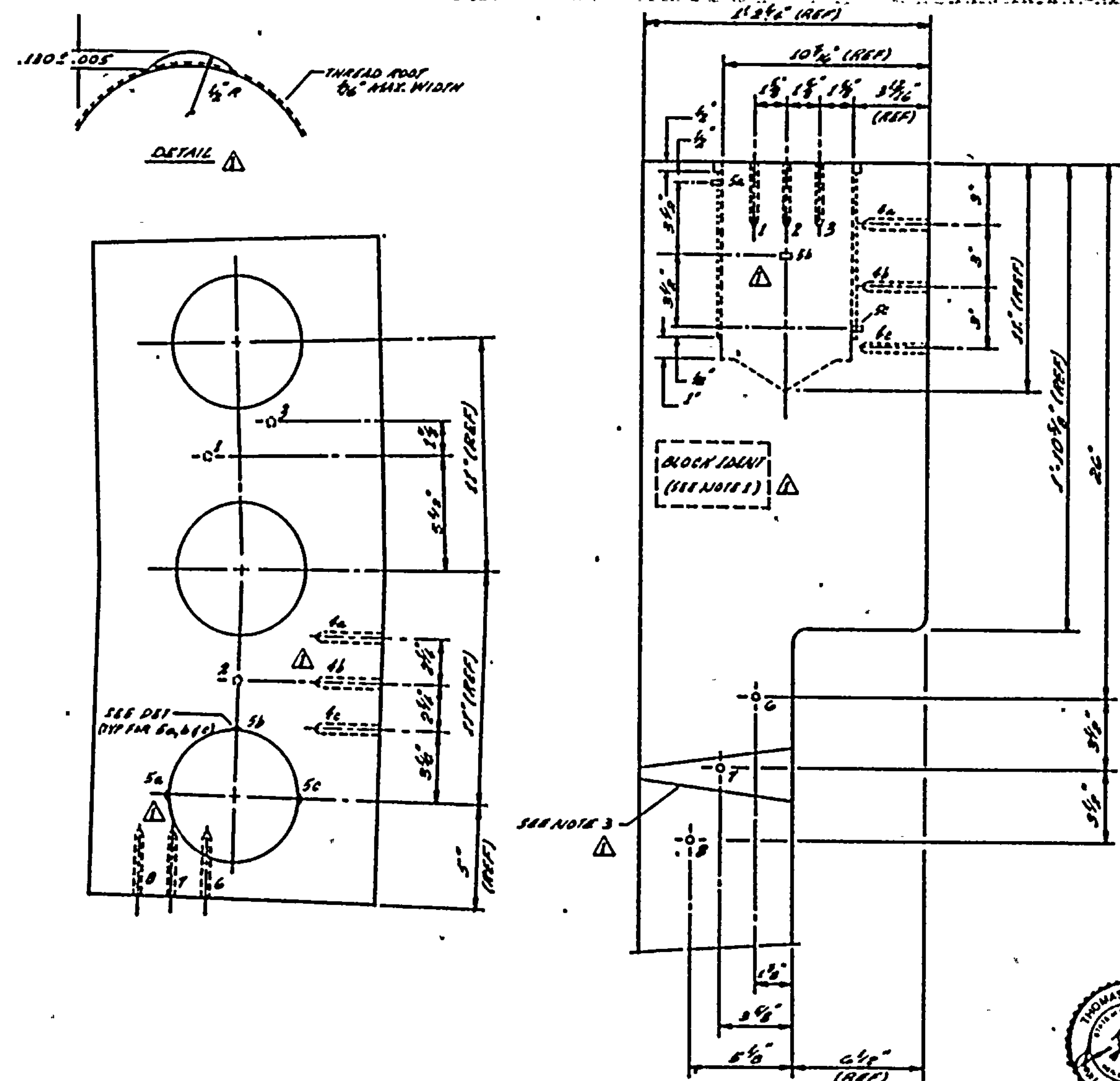
ENGINEER TF HOYLE
DRAWN K. McAndrew
DATE 6-21-81

WNP-2
WNP-2 FW NOZZLE MOCK-UP, UT-122

DWG NO UTCB-250 SH 2 of 2 REV 0

[illegible]

[illegible]



NOTES:

1. STAMP BLOCK WITH MIN 3/16" HIGH STEEL STAMP WITH:
   - WNP-2
   - CAL BLOCK Nº 123
   - MATL SA 508 CL 2
   - HEAT Nº 49D165-1-1
   - MADE FROM SCRAPPED DOUGLAS PT UNIT 1 RPV
2. 1/32 INCH MACHINE TOLERANCES ARE APPLICABLE UNLESS OTHERWISE NOTED.
3. REPRESENTS WELD IN WNP-2 RPV FLANGE

HOLE	DIA ±.005	DEPTH	UT TECHNIQUE
1 2 3	0.375 0.375 0.375	3.00 3.00 3.00	LIGAMENTS: L-WAVE FROM FLANGE SIDE
4a 4b 4c	0.4375 0.4375 0.4375	3.00 3.00 3.00	LIGAMENTS: L-WAVE FROM MATING SURFACE
5a 5b 5c	1.000 1.000 1.000	0.150 0.150 0.150	FLANGE THREADS: L-WAVE FROM MATING SURFACE
6 7 8	0.3125 0.3125 0.3125	3.00 3.00 3.00	WELD: L-WAVE FROM MATING SURFACE

REFERENCES:

C B I NUCLEAR CO.
VFP 3133-35
VFP 3133-36

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND, WASHINGTON 99352

NO	DATE	REVISION	BY	CHKD	APPVD
1	11-19-81	REVISED AS NOTED	[illegible]	[illegible]	[illegible]
0	9-8-81	ISSUED FOR CONSTRUCTION	[illegible]	[illegible]	[illegible]

ENGINEER D P RANEY
DRAWN W. McANDREW
DATE 9-8-81
WNP-2
RPV FLANGE UT CAL BLOCK, UT-123
DWG NO UTCB-251 SH 2 of 2
REV 1

Date 12/14/81
Revision 1

12.0--MANAGEMENT PLAN

12.1 INTRODUCTION

This management plan describes the interfaces between the various persons involved in performance of the PSI examinations. These interfaces are described for the Supply System, Bechtel construction management and PSI Contractor (Lambert-MacGill-Thomas [LMT)] personnel. The LMT Management Plan, QA-26, which describes the LMT site and home office organization, and the Supply System/LMT interfaces, is incorporated herein by reference, with the actual document located at the end of this section.

This management plan is divided into sections based on activities as follows:

- 12.2 Site Organization
- 12.3 Planning and Scheduling
- 12.4 PSI Program Plan Revisions
- 12.5 Field Support Services
- 12.6 Reporting and Disposition of Indications
- 12.7 Technical Surveillance

Each of the above listed sections consists of a description of the responsibilities and interfaces for that activity, and a corresponding organization chart to illustrate the lines of responsibility and flow of information.

12.2 Site Organization

The LMT site organization is described in the LMT Management Plan, Section X, Page 5. This organization is applicable to the volumetric and surface examinations.

Visual examinations of piping and component supports will be conducted in conjunction with the Test and Startup Program as described in Section 9.0, "Visual Program". The Supply System ISI Engineer will work with the Test and Startup personnel to ensure that the personnel involved in these examinations are properly trained and the procedures and records generated satisfy the preservice inspection requirements of ASME Section XI, Subsection IWF from the Summer 1978 Addenda insofaras practacal.

Visual examinations for evidence of leakage during hydrostatic tests will be conducted as part of the ASME Section III hydrostatic test program as allowed by Section XI.

Visual examinations of Class 1 pump, Valve bodies, and the RPV interior will be or have been completed and documented by Supply System personnel.

The WPPSS ISI Engineer is responsible for the overall completion of the Preservice Inspections as designated in Engineering Division Procedure EDP-9.3, "Conduct of Preservice Inspections" (see Section 10.0, "Procedures). The Supply System ISI Field Coordinator is, in turn, responsible for the implementation of the PSI Program Plan, i.e., for coordinating the field examination activities. The Supply System ISI Field Coordinator provides day-to-day technical direction to LMT. The LMT Site Supervisor, in turn, directs the activities of his examination teams and the data control personnel. Bechtel Construction Management is responsible for the scheduling of day-to-day work and for getting any needed support services from the other crafts.

Date 11/14/80

Revision 2

WNP-2 PSI PROGRAM PLAN

NOT USED

(Purposely left blank)

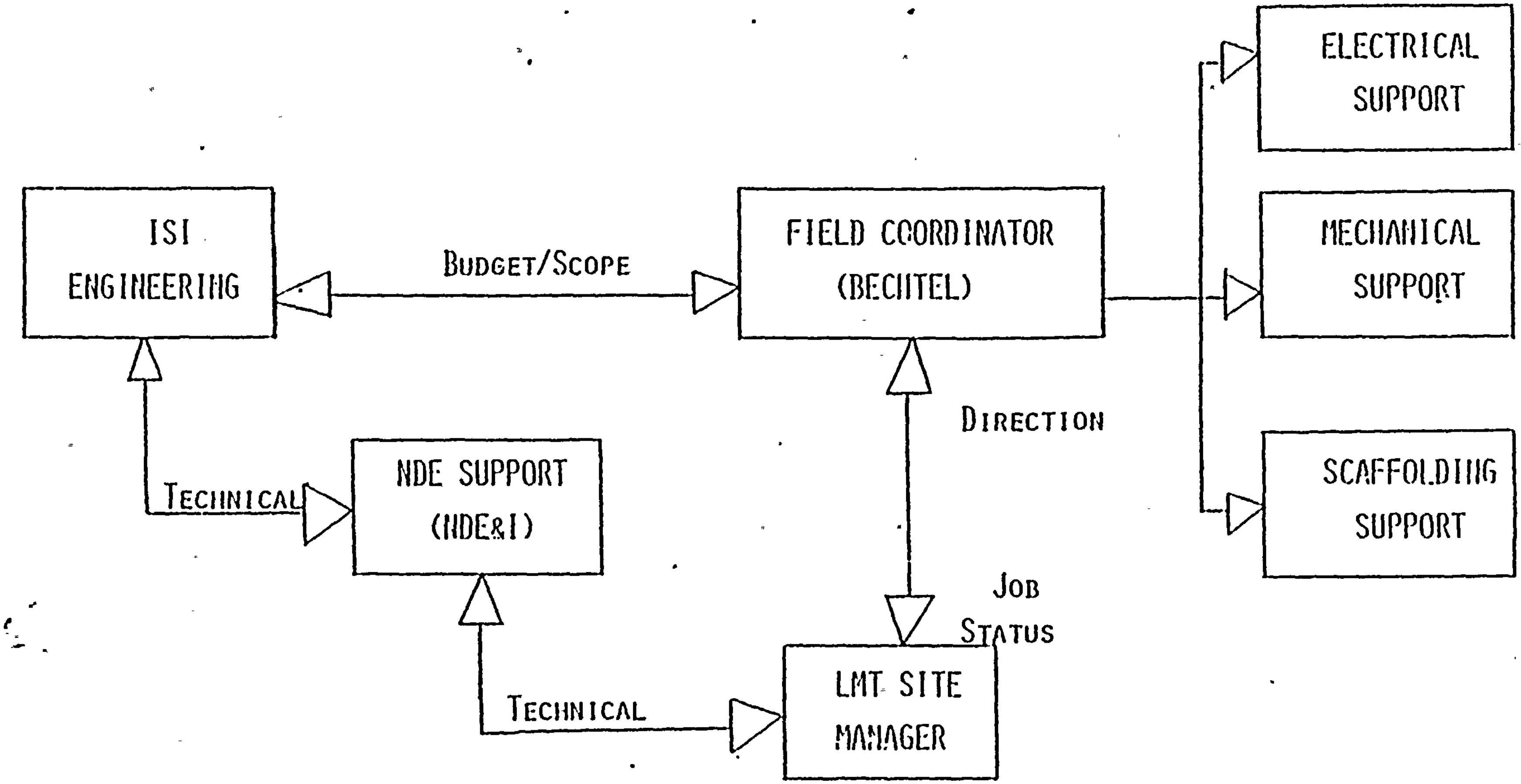
12.3 Planning and Scheduling

The planning and scheduling of the PSI examinations will be conducted as follows. The organization of personnel involved in planning and scheduling is illustrated on Figure 12.3-1 below. Their primary source of scheduling information is the Supply System ISI Field Coordinator. The Bechtel Construction Management Field Coordinator receives input from the Supply System Project Engineer, Bechtel Planning and Scheduling, the Supply System ISI Engineering, and Supply System ISI Field Coordinator. Weekly scheduling meetings, with greater or less frequencies as needed, will be the primary source of input to the ISI Field Coordinator, LMT Field Supervisor, and Bechtel Construction Management Field Coordinator.

The Supply System has developed a computerized ISI Data Management System which will ensure the completion of all examinations committed to in this Program Plan. This software will allow tracking of progress and aid in scheduling the remaining examinations through to completion. The system is such that all committed examinations are entered into the data bases as open items. The data records for each examinations are then entered as they are performed, closing out the individual examinations commitments one at a time. Surveys of the data base can be quickly run to determine remaining examinations as often as needed to assist in planning and scheduling.

Figure 12.3-1

WNP-2 PSI MANAGEMENT INTERFACES

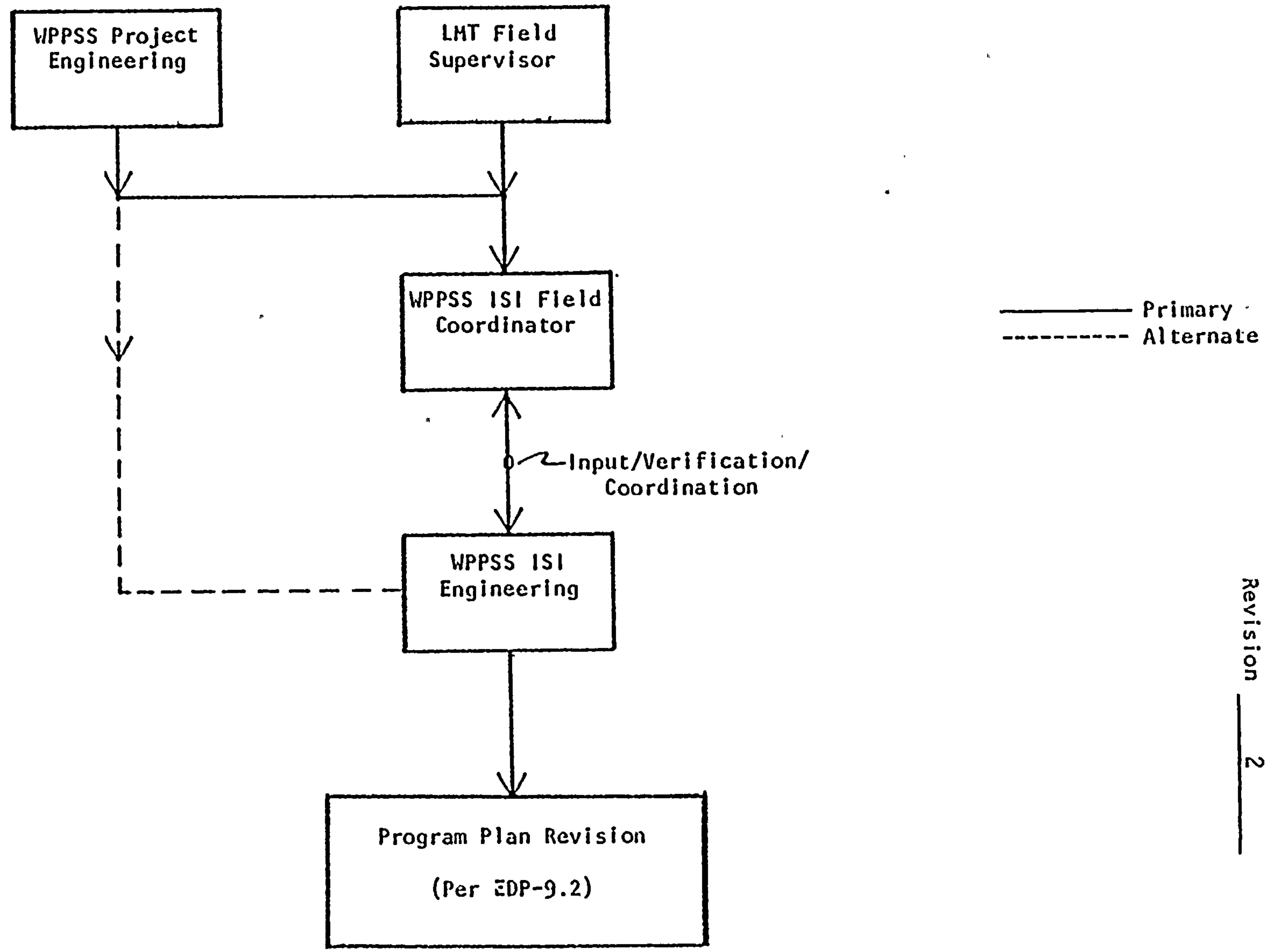


12.4 PSI Program Plan Revisions

WPPSS ISI Engineering is responsible for the maintenance of the PSI Program Plan, and will make changes to the plan as authorized in Engineering Division Procedure EDP-9.2, "Preparation of PSI Plan". The primary source of notification of need for Program Plan revision is the WPPSS ISI Field Coordinator, who in turn receives input from WPPSS Project Engineering, or the LMT Field Supervisor. Alternative examination techniques or methods may also be proposed by the ISI Field Coordinator. The responsible ISI Engineer will verify need for any Program Plan change and coordinate the actual change with the ISI Field Coordinator. Any unexaminable areas discovered in the above process will be documented in the PSI Final Report by the ISI Engineer with appropriate justification which will constitute the basis for request for relief from code requirements as required by the NRC. Figure 12.4-1 illustrates the above described interfaces.

Figure 12.4-1

ALL EXAMINATIONS
PSI PROGRAM PLAN REVISIONS



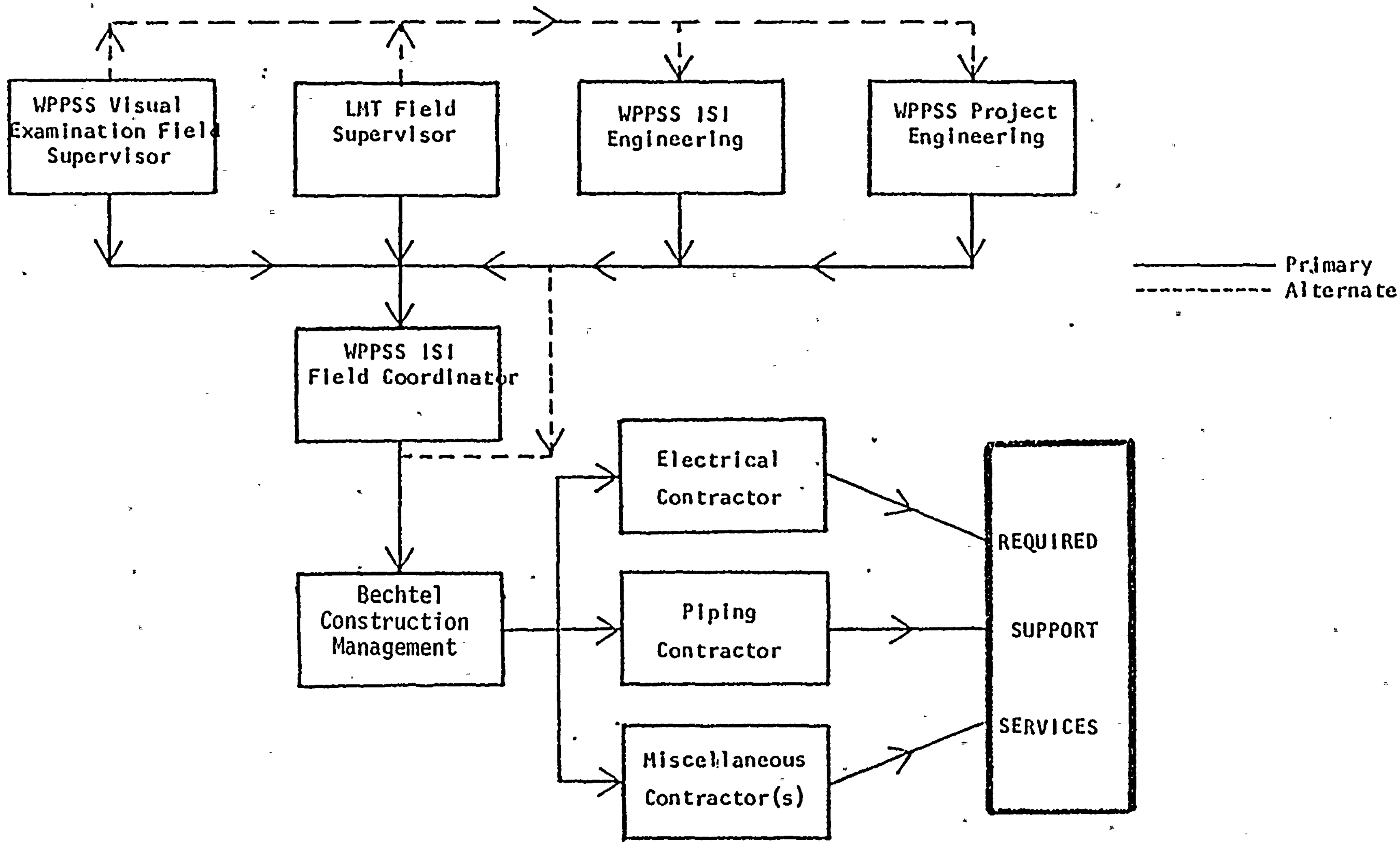
12.5 Field Support Services

The Bechtel Construction Management organization (BCM) is responsible for arranging field support services through the individual field contractors as shown on Figure 12.5-1. The primary source of requests for support services comes from the LMT Field Supervisor/Foreman. As an alternative, the LMT Field Supervisor may notify the Supply System ISI Field Coordinator.

Field support services include such things as scaffolding, electric power hookup, water, compressed air or nitrogen, ladders, support or insulation removal, cosmetic grinding, etc.

Figure 12.5-1

ALL EXAMINATIONS
FIELD SUPPORT SERVICES



12.6 Reporting and Disposition of Indications

The LMT Field Supervisor is responsible for reporting all indications to the Supply System ISI Field Coordinator in accordance with his respective NDE procedures, and/or the contract with the Supply System. The Field Coordinator will then verify the existence and status (reportable/not reportable) of the indication, and report the indication to the Supply System ISI Engineer as required. The Field Coordinator will notify ISI Engineering of any significant non-geometric indication such that ISI Engineering will have the opportunity to witness the verification of the existence and status of the indication. The Supply System ISI Field Coordinator will keep a continuous written inventory of reportable indications, and will forward copies of the inventory sheets to the ISI Engineer on a weekly basis during the conduct of Preservice Inspections.

Any reported indication which cannot be routinely dispositioned by the Supply System ISI Engineering or the ISI Field Coodinator, will be presented by the ISI Engineer to the Supply System Evaluation Review Team for action. Disposition of all indications reported to the Evaluation Review Team will be documented on Evaluation Review Team Reports per EDP-9-3, "Conduct of Preservice Examinations".

NOTE: A portion of the preservice examinations of piping systems will be performed prior to final release of those systems by the installation contractor to the owner. During that time period, unacceptable surface conditions which are likely to be easily removed by cosmetic grinding will not be subject to Evaluation Review Team scrutiny.

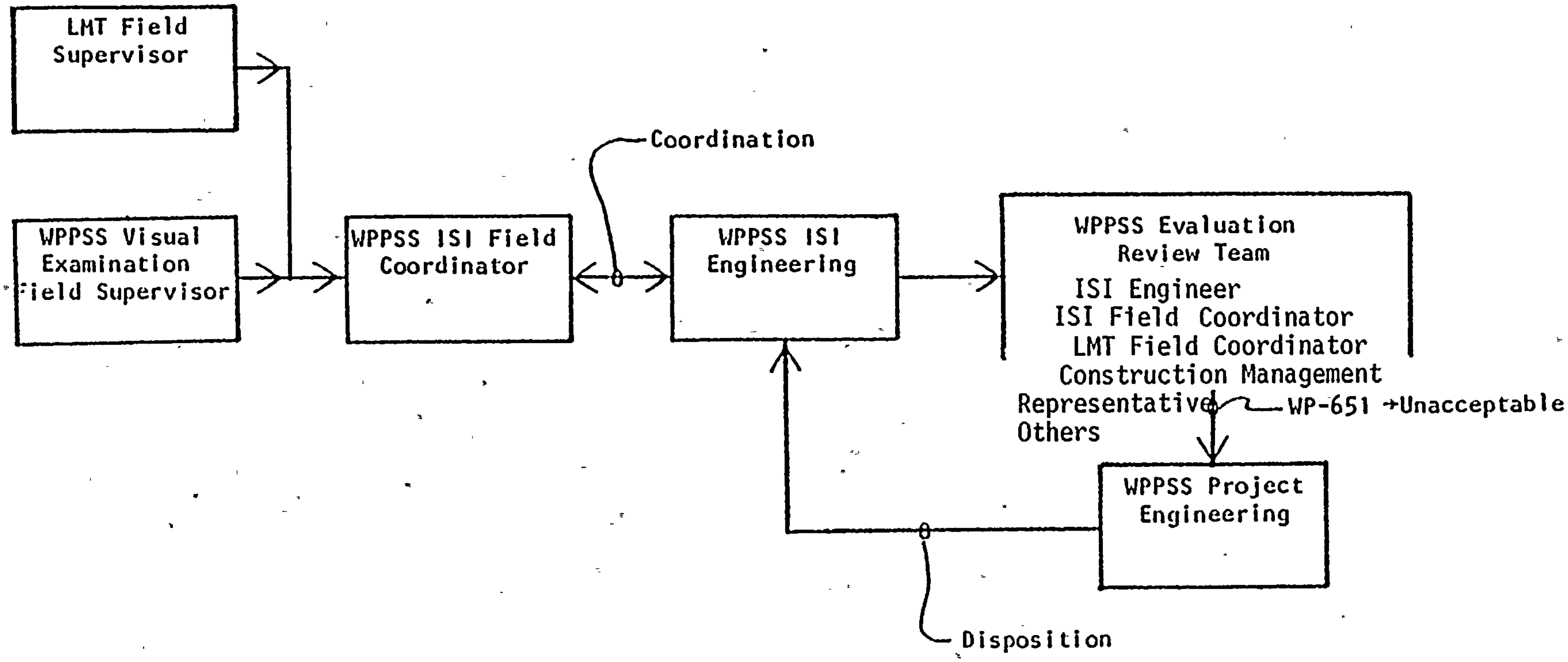
The ISI Field Coordinator will resolve unacceptable surface indications detected by liquid penetrant, magnetic particle, or visual examination methods by giving Construction Management a detailed description of the unacceptable condition. Construction Management transmits this

information to the appropriate installation contractor who will repair or rework the component or weld as necessary. If it is deemed appropriate to do so, a non-conformance report (NCR) will be initiated by Construction Management using their established NCR system.

Figure 12.6-1

ALL EXAMINATIONS
REPORTING AND DISPOSITION OF INDICATIONS

(Reference EDP-9.3)



Date 11/14/80
Revision 2

12.7 Technical Surveillance

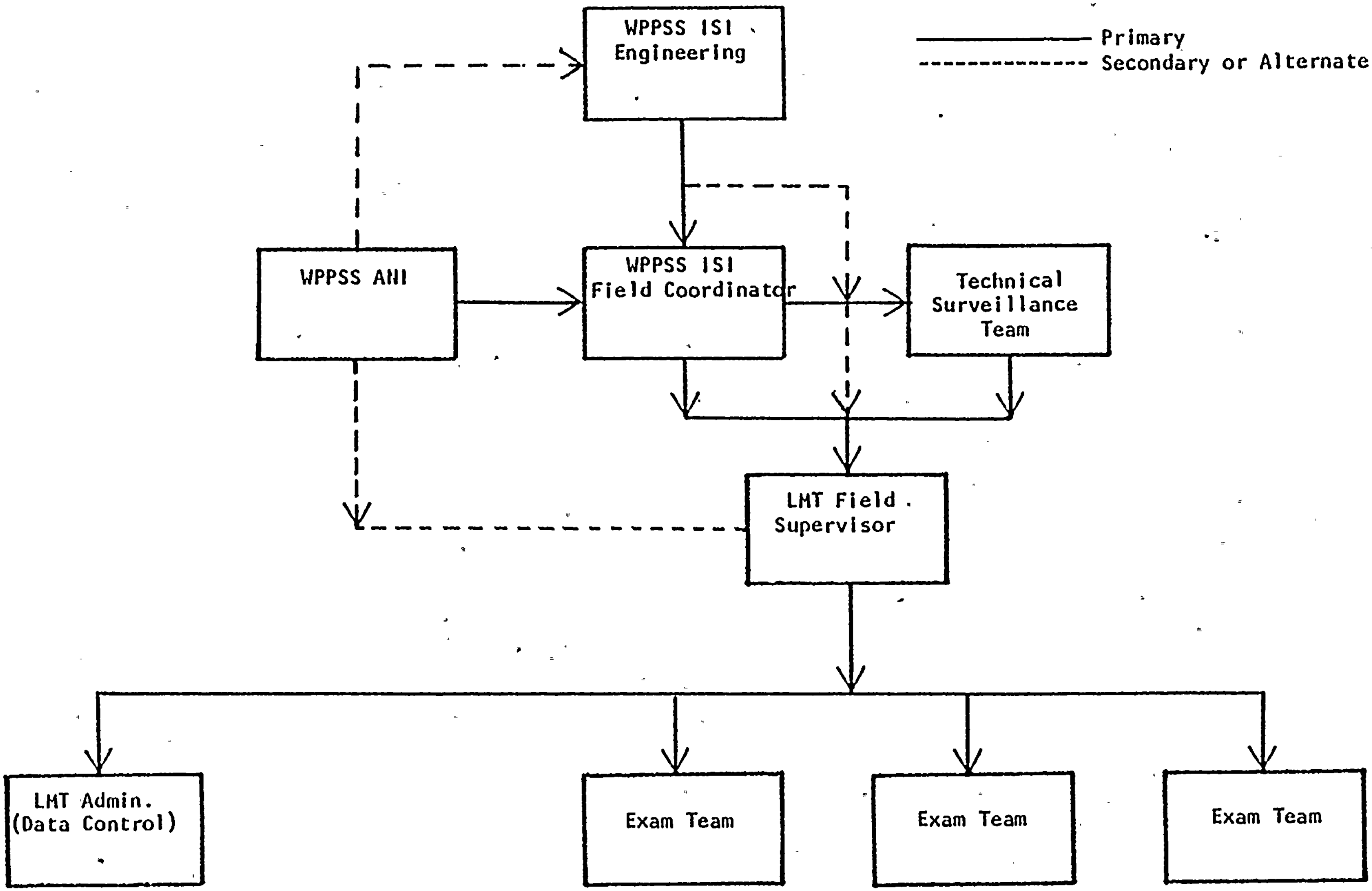
The Supply System ISI Engineering is responsible for technical surveillance of the overall PSI examination effort to ensure compliance with the requirements of the PSI Program Plan. Technical surveillance of the volumetric and surface NDE activities on a day-to-day basis will be accomplished by the ISI Field Coordinator with the aid of a Technical Surveillance Team as required depending on the number of examination teams present on-site and other such factors. The Technical Surveillance Team will be under the direction of the Field Coordinator, and may consist of personnel from either the ISI Engineering or Generation Services organizations. Figure 12.7-1 illustrates the above interfaces for volumetric and surface examinations performed by LMT.

The Technical Surveillance Personnel will complete Daily Log Sheets to document their surveillance. Figure 12.7-3 is a typical Daily Log Sheet. The Log sheets will be returned to the Field Coordinator, who will maintain them in a chronological file on a system basis. The Field Coordinator is responsible for assuring that any follow-up action noted on the log sheets is taken, and will confirm that action by signing and dating the log sheet.

Figures 12.7-1 also illustrates the technical surveillance performed by the WPPSS Authorized Nuclear Inspector.

Figure 12.7-1

VOLUMETRIC AND SURFACE EXAMINATIONS
TECHNICAL SURVEILLANCE



Date 11/14/80
Revision 2

Date 12/14/81
Revision 1

NOT USED

(Purposely Left Blank)

Figure 12.7-3

Date 7/27/79

Revision 1

WNP- 2

Surveillance Log Sheet

o Name________________ Date__________

o ISI Drawing No.______________

o Surveillance Record

o Key: AC - Access ST - Stamping Vis - Visual LT - Leak Test
NDE Methods: PT, MT, UT, RT, ET

System or Component	Weld I.D.#	Examiner Name(s)	Equipment - Cal Std - Materials
			Surveyed AC ST Vis LT PT MT UT RT ET
			Surveyed AC ST Vis LT PT MT UT RT ET
			Surveyed AC ST Vis LT PT MT UT RT ET

Corrective Action Required Yes_______No_______

Notes - Comments - Corrective Action Taken

WPPSS ISI Field Coordinator____________________ Date__________

Page_____of_______

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WNP-2 PROCEDURE COVER SHEET AND QUALIFICATION RECORD

Procedure No. QA-26 Revision No. 1

Procedure Title WNP-2 Management Plan

LMT, Inc. QA Review and Approval [signature] 2-20-79 Level III
(Quality Assurance Officer)

Client Approval Daniel W. Porter 2/28/79

Authorized Nuclear Inpsector Approval [signature] 2/28/79

Specific Qualification Record

Component	Examiners	Date

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

REVIEW OF CONTRACTOR SUBMITTALS

2	ISI ENGINEER Thomas F Hoyle	DATE 2/28/79
CONTRACT NO. C-14402	TITLE PSI Services for NSSS and Associated Nuclear Piping	
CONTRACTOR LMT, INC		

DOCUMENT TITLE	REV.
WNP-2 Management Plan QA-26	1

PREVIOUSLY REVIEWED [X] YES [ ] NO (DATE IF YES) 1/25/79

PREVIOUSLY APPROVED [ ] YES [X] NO (DATE IF YES)

REASONS FOR RE-SUBMITTAL (IF PREVIOUSLY APPROVED)

REVIEWER	APPROVED	APPROVED AS NOTED	DISPOSITION: DISAPPROVED	COMMENTS ATTACHED
[signature] 2/28/79 [signature] 2-28-79 SUPERVISOR, ISI AND OPERATIONS SUPPORT ENGINEER	X			
N/A PROJECT ENGINEERING MANAGER/PLANT TECHNICAL SUPERVISOR				
Ken J. Hannah 2-28-79 SUPERVISOR, ISI/NDE, GENERATION SERVICES	X			
[initials] 2/28/79 M. L. Dreher 2/28/79 MANAGER, QUALITY SERVICES	X			

NOTES/COMMENTS:

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PROC. NO. QA-26
PAGE 1
FOLLOWING PAGE 2
REVISION 1
DATE 2/16/79

TITLE: WNP-2 MANAGEMENT PLAN

I. PURPOSE AND SCOPE

A. Purpose

It is the purpose of this management plan to define the management responsibilities and interfaces between LMT and Washington Public Power Supply System (WPPSS) to meet the requirements of the ASME Boiler and Pressure Vessel Code, Section XI.

B. Scope

The scope of this plan is the performance of the manual and mechanized preservice examinations of the vessel and piping system of the WNP-2 plant as described by the PSI Program Plan.

II. REFERENCES

A. This procedure is in compliance with applicable portions of the following referenced documents:

1. LMT Operating and Quality Assurance Manual, Addendum to Revision 10, approved for the WNP-2 PSI by WPPSS.

QUALIFICATION:

Approved for use
D. MacGill 2-20-79 Level III
[illegible] Lambert Level III 2/20/79

II. A. 2. WNP-2 PSI Program Plan

3. ASME Boiler and Pressure Vessel Code, Section XI, 1974 edition, addenda through Summer 1975.

III. DEFINITIONS

None

IV. RESPONSIBILITY

The Technical Manager, LMT, Inc., is responsible for the generation and control of this procedure and shall so indicate by a dated signature on the procedure cover sheet.

V. PROCEDURE QUALIFICATION

The management plan shall be considered qualified upon acceptance by WPPSS.

VI. PERSONNEL REQUIREMENTS

The management plan sets forth the organizational responsibilities and interfaces for LMT. It shall be observed by all LMT personnel.

VII. EQUIPMENT REQUIREMENTS

There shall be appropriate office space, and equipment and storage space for the implementation of this procedure.

A. Office space shall be located in a trailer or similar facility in or adjacent to plant buildings and shall be provided with desks, chairs and outside and plant telephone system connections.

B. A wire-enclosed secure area adjacent to the office space shall be provided for the storage of equipment and materials to be used in the examinations.

VIII. PREPARATION

A. Documentation

The following documentation shall be submitted to WPPSS for review and approval before beginning examinations:

1. NDE Procedures
2. LMT Forms
3. LMT QA Manual (controlled copies upon approval by WPPSS)
4. LMT Weld Marking Procedure
5. LMT Document Control Procedure

VIII. B. Physical Preparation

The following physical preparation requirements shall be reviewed by WPPSS before beginning examinations:

1. OSHA requirements
2. Material preparation
3. Services

IX. LIMITATIONS

This management plan has been prepared for the PSI of the WNP-2 plant of WPPSS and is not necessarily applicable to other situations.

X. LMT ORGANIZATION

A. Internal LMT Organization

See Figure 1.

B. LMT Site Organization

1. See Figure 2.

2. It is the intention of this plan that the position of LMT Field Supervisor be occupied by a Company

X. B. 2. Officer, particularly at points in the job where levels of effort may be changing and during the performance of the mechanized examinations.

a) During periods of low and stable job effort during the manual examination, requiring no more than two ultrasonic teams, plus helpers, the Field Supervisor, with the concurrence of the WPPSS ISI Field Coordinator, may leave the site after designating an LMT acting supervisor.

XI. INTERFACES

A. LMT/WPPSS Preservice Inspection interfaces will be as shown in Figure 3.

B. Transmittals will be addressed to Mr. A. D. Kohler and will consist of two copies, with attachments, for Mr. Kohler and four copies, with attachments, for Mr. T. F. Hoyle.

1. LMT letters shall be identified according to the following scheme:

a) LMWP-2-78 (year)-XXX (sequence number, beginning with -001)

XI. B. 2. WPPSS letters will be identified WPLM-2-78 (year) - XXX (sequence number, beginning with -001).

C. LMT's billing will be submitted to Mr. A. D. Kohler and marked for attention to Mr. R. L. Winters/M. E. Reed.

1. Billing will include LMT invoices and backup documentation such as Purchase Orders, Expense Accounts, etc.

2. Each billing will include WPPSS "Contractor's Request for Payment" forms (Figures 4 and 5).

XII. <u>CONTROLS</u>

A. Quality Assurance shall be according to that revision of the controlled LMT Operating and Quality Assurance Manual approved by WPPSS.

B. Personnel policy shall be controlled according to the LMT Company Policy (Attachment 1).

XIII. <u>RECORDS</u>

Job related documentation will be maintained at the site in a satellite job file organized according to LMT Procedure QA-28, "Document Control for the WNP-2 Preservice Inspection."

XIV. REVIEW

1. The WPPSS ISI Field Coordinator and the Authorized Nuclear Inspector shall have full access to examination data.

2. The LMT Site Supervisor will prepare a weekly report of job activities as directed by WPPSS, which shall include as a minimum:
   a) Manhours expended
   b) Manhours estimated
   c) Examinations completed
   d) Examinations remaining
   e) Schedule analysis
   f) Summary of indications
   g) Accessibility problems

XV. STORAGE AND DISTRIBUTION

A. Field storage facilities shall provide a safe storage area. Access to the files shall be limited to the LMT Field Supervisor, his designated representatives, the WPPSS ISI Field Coordinator, and the Authorized Nuclear Inspector.

B. Examination documentation shall become the property of WPPSS upon sign-off by the WPPSS ISI Field Coordinator.

ORGANIZATION

A. Permanent Organization Chart

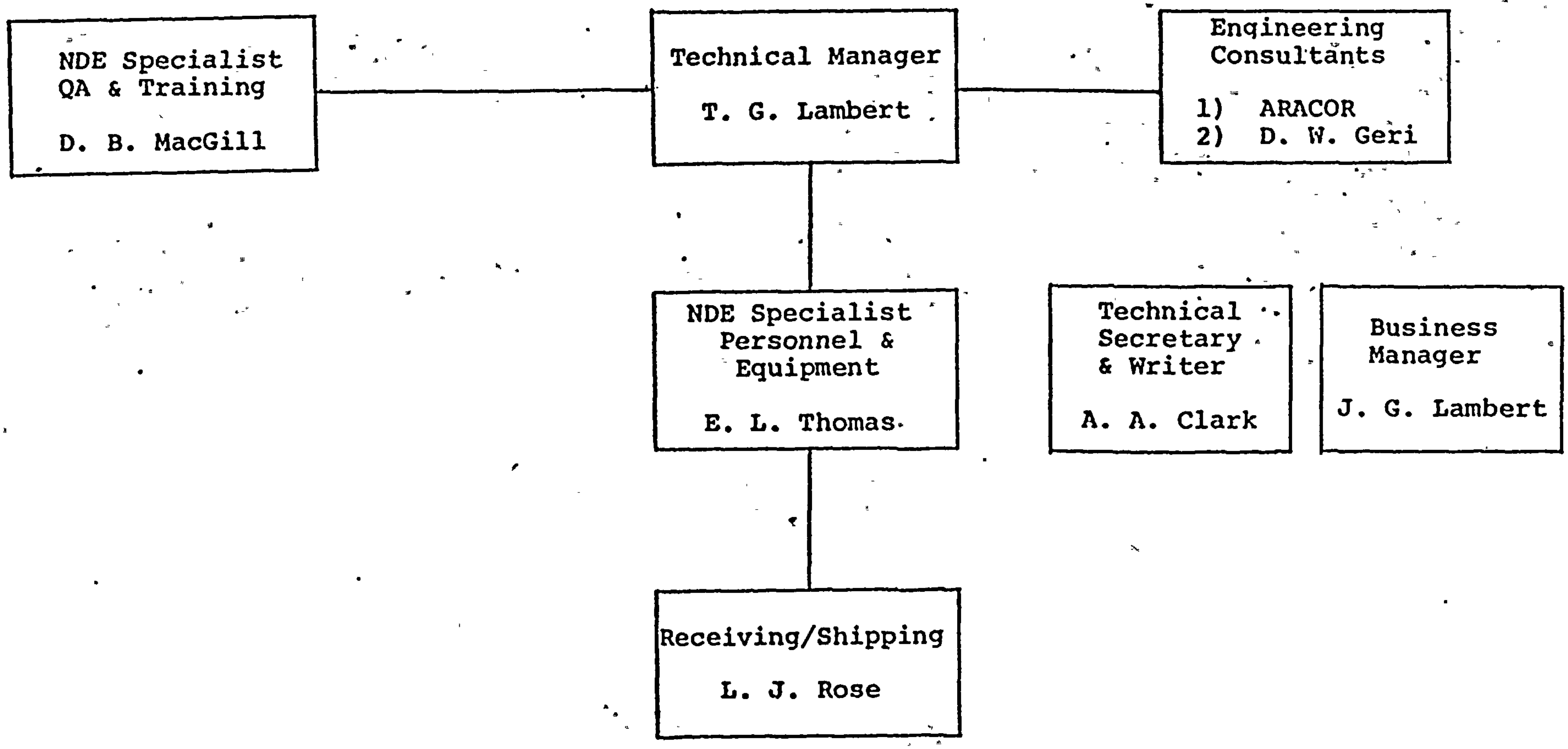

Figure 1

LMT SITE ORGANIZATION

MANAGEMENT PLAN OUTLINE

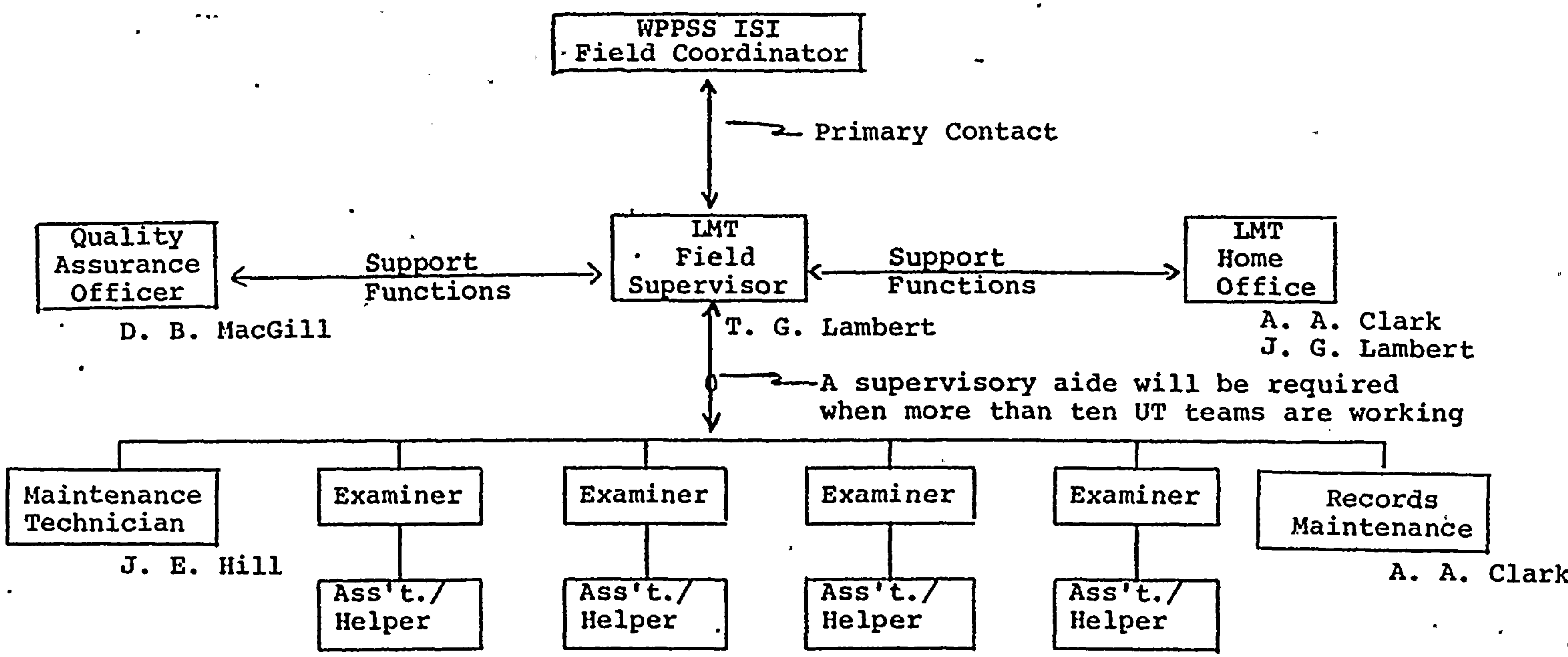

Figure 2

WNP-2 PSI INTERFACE WPPSS/LMT, INC.

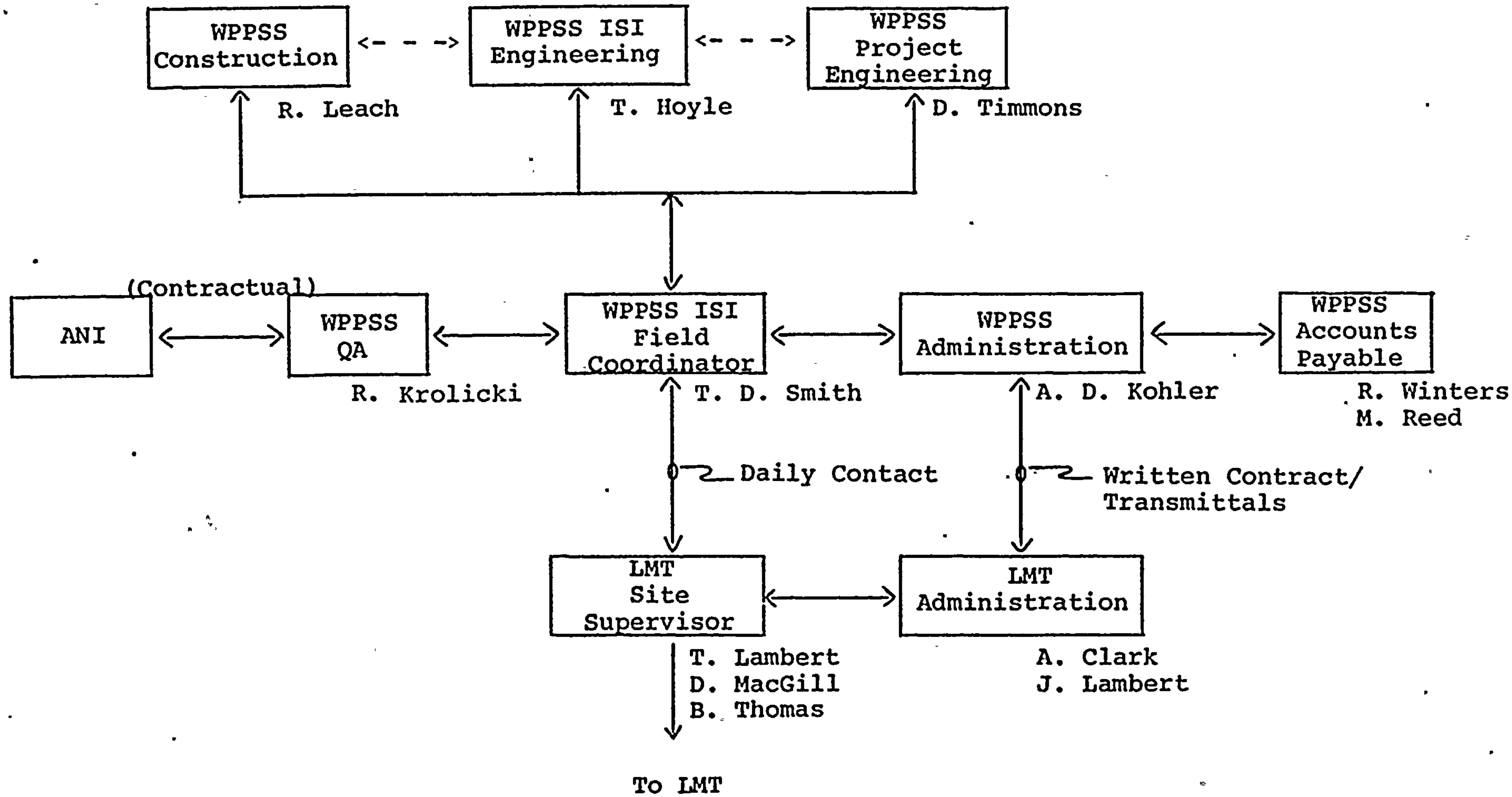

Figure 3

BRWP 50110 A

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
NUCLEAR PROJECT NO. 2
CONTRACTOR'S REQUEST FOR PAYMENT

B&R W.O.. 2808

Payment Request No.____

Contractor

Period from__________ to__________

Description of work and/or equipment:

Contract No.:

Page of

Current Contract Amount	Previously Approved Gross Amount	Gross Amount This Request	Total to Date
LESS RETAINED AMOUNT			
LESS PREVIOUS NET PAYMENTS REQUESTED			
SALES TAX @ 5.1% ** (On Gross Amount)			
NET PAYMENT REQUEST			

RETAINED AMOUNT DETAIL

	This Request	Total to Date
First $100,000 @ 10%		
Over $100,000 @ 5 %		
TOTAL RETENTION		

We hereby represent that the above is a true statement of account of the above contract to date and hereby release the Owner from any claims for materials or labor furnished or expense incurred to date which is not included in requests for Payment to Date, except for integrated units of construction partially completed for which no Request for Payment has been made. We further represent that prevailing wages have been paid by us and by our sub-contractors in accordance with Statements of Intent on file with the Washington State Department of Labor & Industries and approved by the Industrial Statistician.

CONTRACTOR:__________

DATE:________ BY:________ TITLE:________

QUANTITIES VERIFIED:

____
Construction Engineer

ACCOUNTS VERIFIED:

____
Office Manager

REQUEST VERIFIED:

____
Sr. Construction Engineer

DATE:________

Recommended for Payment:
BURNS AND ROE, INC.

____
Resident Construction Manager

(For Owners Use)

Figure 4

(REV 0,JUN 13,1975)

CONTRACTOR'S REQUEST FOR PAYMENT
DISTRIBUTION DETAIL

Owner Washington Public Power Supply System

Project: Hanford No. 2 B&R, W.O.: 2808

Contractor: Contract No: Period: From To Page of No.:

BID ITEM NO	F.P.C. ACCT. NO.	DESCRIPTION	ESTIMATED CONTRACT DOLLARS			PREVIOUSLY APPROVED DOLLARS			THIS REQUEST DOLLARS			TOTAL TO DATE DOLLARS		
			QTY. %	LABOR	MATERIAL	QTY. %	LABOR	MATERIAL	QTY. %	LABOR	MATERIAL	QTY %	LABOR	MATERIAL

Figure 5

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Saratoga, Ca. 95070
408-867-4109

COMPANY POLICY

Issued: 2/22/78 By: T. G. Lambert TGL

1.0 PURPOSE

This policy establishes guidelines and requirements of personnel engaged in full or part-time employment for Lambert, Mac Gill, Thomas, Inc. (LMT).

2.0 AIR TRAVEL

1. Employees required to travel on company business will be provided with coach class airline tickets.

2. All air travel is required to be coach class. First class travel is allowable only if it is the only class available.

3. A maximum of eight hours travel time per day is chargeable for domestic trips.

4. Under normal circumstances, employees are expected to allow sufficient time for travel connections. Failure to make connections may result in the employee bearing any additional airline costs incurred.

3.0 CASH ADVANCES

Cash advances will be provided to employees prior to company required travel.

LMT may not be held responsible for loss or theft of monies advanced to an employee.

4.0 TIME CARDS

1. Time cards are to be submitted on a weekly basis (see sample attached).

2. For time keeping purposes, time shall be submitted from Monday through Saturday of each week.

3. For employees working on field assignment, all time cards must have the approval of the responsible LMT Field Supervisor.

5.0 EXPENSE ACCOUNTS

1. Expense accounts shall be submitted upon completion of a job or assigned task. In the event of job is of longer duration than one week, expense accounts shall be submitted on a weekly basis, in conjunction with time cards.

2. Complete receipts must accompany all expense accounts including airline tickets, gasoline, job supplies, entertainment, motel, phone, and laundry.

3. In the event an employee incurs any entertainment expense, receipts must accompany the expense account for each occasion. Receipts shall reflect what expense covered, where expense was incurred, names of attendees, and the amount of expense. If entertainment expense includes

employee meals employee shall note difference in the total day's meal expense.

4. For field assignments, all expense accounts must have the signed approval of the responsible LMT Field Supervisor.

6.0 TRAVEL EXPENSES

A. Meals

1. Maximum allowable charges for meals shall be $18.00 per day (on overnight trips, where employee is unable to return home).

2. Meals shall not be reimbursable when employees can return home at night without inconvenience.

B. Lodging

1. Lodging in most cases will be prearranged by LMT management.

2. Accomodations in excess of $20.00 per day must have prior approval of LMT management.

3. Lodging expenses shall be limited to room, telephone expense, and laundry (when applicable).

C. Telephone

1. Telephone charges to employee's home will be reimbursed equivalent to one three-minute station-to-station

operator assisted call per day. Evidence of expense must accompany expense account.

2. All company calls to the LMT Cupertino office shall be collect (include charge number when applicable).

D. <u>Laundry</u>

1. Laundry charges shall not be paid by LMT for trips less than four days duration.

2. For trips in excess of four days duration, a $10.00 maximum laundry charge per week will be reimbursed by LMT.

E. <u>Automobiles</u>

1. A .15¢ per mile rate shall be paid by LMT for business trips in personal cars, when company vehicles are not available and on prior approval by LMT management.

2. In the event an employee elects to drive a personal car to a job site rather than fly, reimbursement will be made on the basis of airfare or mileage, whichever is less. Travel time will be paid on the basis of total air travel time required.

3. A valid driver's license shall be required for any employee operating a company vehicle. LMT is not responsible for moving violations an employee receives while operating a company vehicle.

4. Company vehicles are not to be loaned to anyone other than employees of LMT, Inc.

5. For field assignments, rental cars will in most cases be prearranged by LMT management.

6. LMT employees are instructed to decline insurance on all rental car agreements. In the event an employee elects to retain additional insurance, it shall be at the employee's expense.

7.0 PAY PERIODS

1. Payroll checks will be issued on the last working day of each month.

2. Time cards and expense accounts covering each job are required prior to paycheck issuance.

3. All hours worked will be submitted on a weekly basis by the LMT Field Supervisor. It is the responsibility of the individual employee to submit time cards and expense accounts to the Supervisor for submission to the Business Manager.

4. When a field assignment prevents submittal of expense accounts and time cards to the home office by the last working day of the month, the responsible Field Supervisor shall "call-in" time and expenses to the Business Manager.

Such call-in shall be made in sufficient time that payroll checks may be issued.

8.0 VISION EXAMINATIONS

Reimbursement for industrial vision examinations will be made by LMT via expense account up to $15.00 maximum.

9.0 GENERAL

Employees may be held responsible for loss or damage to equipment or tools borrowed from a client.

10.0 TERMINATIONS

Any employee reporting for work under the influence of alcohol or drugs shall be cause for either suspension without pay for that day or termination, at the discretion of LMT management.

Employees terminated in the field by LMT will be returned to their home base to LMT expense. Employees who terminate without LMT authorization will be required to pay their own travel and living expenses from the time of termination.

11.0 EXCEPTIONS

Any exceptions to the foregoing guidelines and requirements shall be written or verbal approval of the LMT Technical Manager.

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COMPANY POLICY

WEEKLY TIME CARD

EMPLOYEES NAME ______ NO. ______ WEEK ENDING ______ 19__

JOB NAME OR NO.	KIND OF WORK DONE	S	M	T	W	T	F	S	HRS.	RATE	AMOUNT
	TOTALS										

SAMPLE

APPROVED ______

DEDUCTIONS:				TOTAL	
	ST. U. INS.	FED. O. A.	OTHERS	NET PAY	

DATE PAID ______ CHECK NO. ______

ACO-UTILITY Line Form No. 10-214

EXPENSE REPORT FOR RECORDING I.R.S. DATA

NAME

TERR. OR DEPT.

DATE OF REPORT / /

PURPOSE OF TRIP

DATE OF TRIP FROM / / TO / /

SAMPLE

		SUN. / /	MON. / /	TUES. / /	WED. / /	THUR. / /	FRI. / /	SAT / /	
• 1	TRANSPORTATION ($25 OR OVER ATT RECEIPT)								
• 2	TAXI-LIMOUSINE-CARFARE								
3	HOTEL (ATTACH RECEIPT)								
4	MEALS (PERSONAL USE ONLY NO 11 FOR OTHER)								
5	TELEPHONE - TELEGRAM								
6	LAUNDRY - VALET SERVICE								
• 7	OTHER AUTO • PARKING TOLLS SERVICE REPAIRS								
8	TIPS - CHECKING - OTHER								
9	POSTAGE								
• 10	MISCELLANEOUS & GIFTS								
• 11	ENTERTAINMENT								
	DAILY TOTALS →								

NON-REIMBURSED EXPENDITURES (PERSONAL RECORD) — ACCOUNTING

SUN			REMARKS:	AMT ADVANCE
MON.				$
TUES.				EXP ABOVE
WED.				
THU				$
FRI.			CHECKED BY:	DIFFERENCE
SAT			APPROVED BY:	
TOTAL			DATE:	$

EXPLAIN BELOW IN DETAIL

ITEM		SUN.	MON.	TUE	WED.	THUR	FRI	SAT
1	FROM							
	TO							
	TO							
	TO							
	AUTO MILEAGE							
2	FROM							
	TO							
	FROM							
	TO							
	FROM							
	TO							

7			11	
10	MISC - SHOW NAME, COST, PURPOSE $25 OR OVER ATT RECEIPT			

SIGNED X

APPROVED BY X DATE / /

PART 1 WITH RECEIPTS ATTACHED TO APPROPRIATE OFFICE Rediform® 95976

PART 2 RETAINED AS YOUR RECORD OF EXPENSE

Date 7/27/79

Revision 1

13.0--QUALITY ASSURANCE

The WNP-2 Preservice Inspection Program activities will be conducted in accordance with the WPPSS Topical Report WPPSS-QA-004, the WPPSS Operational Quality Assurance Program description. The Quality Assurance Program governing the activities of Lambert, MacGill and Thomas, Inc., has been reviewed by WPPSS and found to be in compliance with the WPPSS commitments in the above referenced Topical Report. The specific procedures covering the Preservice Inspection Program activities are listed in Section 10.0, "PROCEDURES". The management plan is located in Section 12.0. The management plan and the procedures have been prepared and/or reviewed and approved by WPPSS and confirmed to be in compliance with the WPPSS commitments in the above referenced Topical Report.

14.0--EXAMINATION EQUIPMENT

The remote ultrasonic examination equipment to be used in completing the preservice examinations of the reactor pressure vessel consists primarily of: 1) permanently installed pole and bottom head tracks and temporary nozzle tracks; and 2) the remote examination system. This section is divided into those two categories accordingly.

14.1 RPV POLE, BOTTOM HEAD, AND NOZZLE TRACKS

The Supply System has installed permanent pole and bottom head tracks at WNP-2. Those tracks are mounted on the metallic reflective insulation in the annulus between the RPV and the sacrificial shield wall on the skirt insulation beneath the RPV (located on the skirt inside surface), respectively. Drawings showing details of the track designs and locations are included in Appendix 14A to this section. Generally, the remote examination devices described in 14.2 below are loaded onto the pole tracks through sacrificial shield nozzle penetrations using temporary track extensions or through the skirt openings in the shield wall and RPV skirt for the bottom head tracks. The lower pole tracks in the skirt area are loaded from the skirt annulus area after removing the insulation at the bottom of the annulus. Hinged swing-out sacrificial shield doors provide access through the nozzle penetrations.

The RPV nozzle scanning tracks are removable roller chain tracks with leaf spring tensioners between the pipes and nozzles and the track itself. The tracks are designed to be quickly installed and removed to minimize residence time in a radiation environment during inservice inspections. Nozzle track removal is required during plant service to allow clearance for closure of the sacrificial shield doors. The nozzle-to-shell welds, nozzle inner radii, and nozzle safe end and extension welds are all accessible to the nozzle examination devices using these tracks. A procedure for ensuring repeatability of location of these tracks on subsequent installation is included in the mechanized equipment procedures in Section 10.0, "PROCEDURES".

14.2 REMOTE EXAMINATION SYSTEM

The Remote Examination System consists of a Data Acquisition system coupled to various remotely operated examination devices. The examination system is described in Appendix 14B of this section. The Appendix contains a system description, device and controller functional descriptions and device assembly drawings. Following is a list of components which make up this system.

a. RPV Longitudinal and Circumferential Pole Guided Inspection Device

b. Nozzle-to-Vessel/Inner Radius Weld Inspection Device

c. Nozzle Butt Weld Inspection Device

d. Lower Head Inspection Device

e. Control Equipment

f. Digital-to-Analog Converter

g. Eight Channel Strip Chart Recorder

h. Multiple Trace Oscilloscope

i. TV Camera, Recorder and Monitor

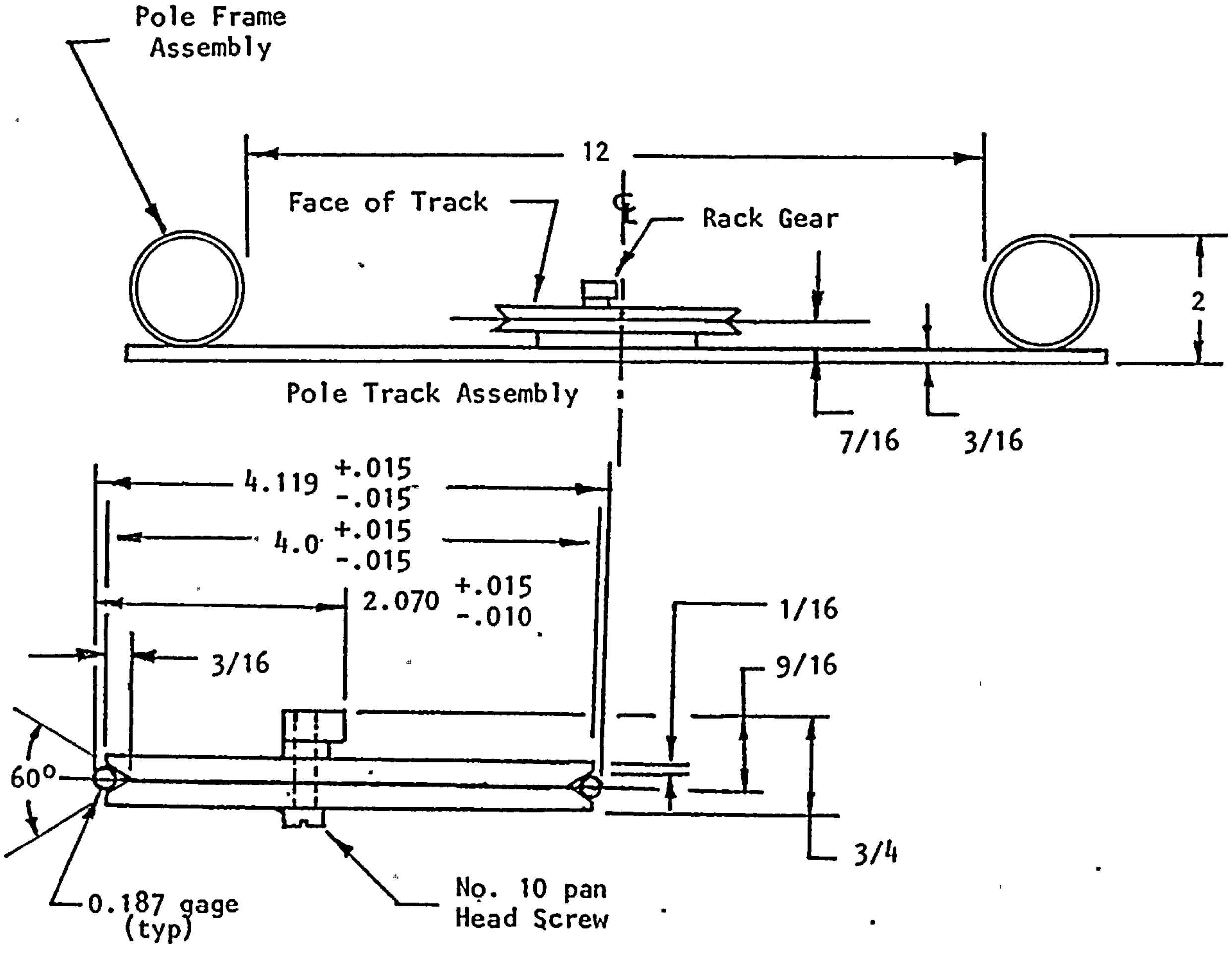
Date 1/8/79

Revision 0

APPENDIX 14A

RPV POLE AND NOZZLE INSPECTION TRACKS

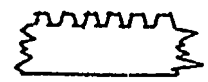
- DESIGN DETAILS
- LOCATIONS



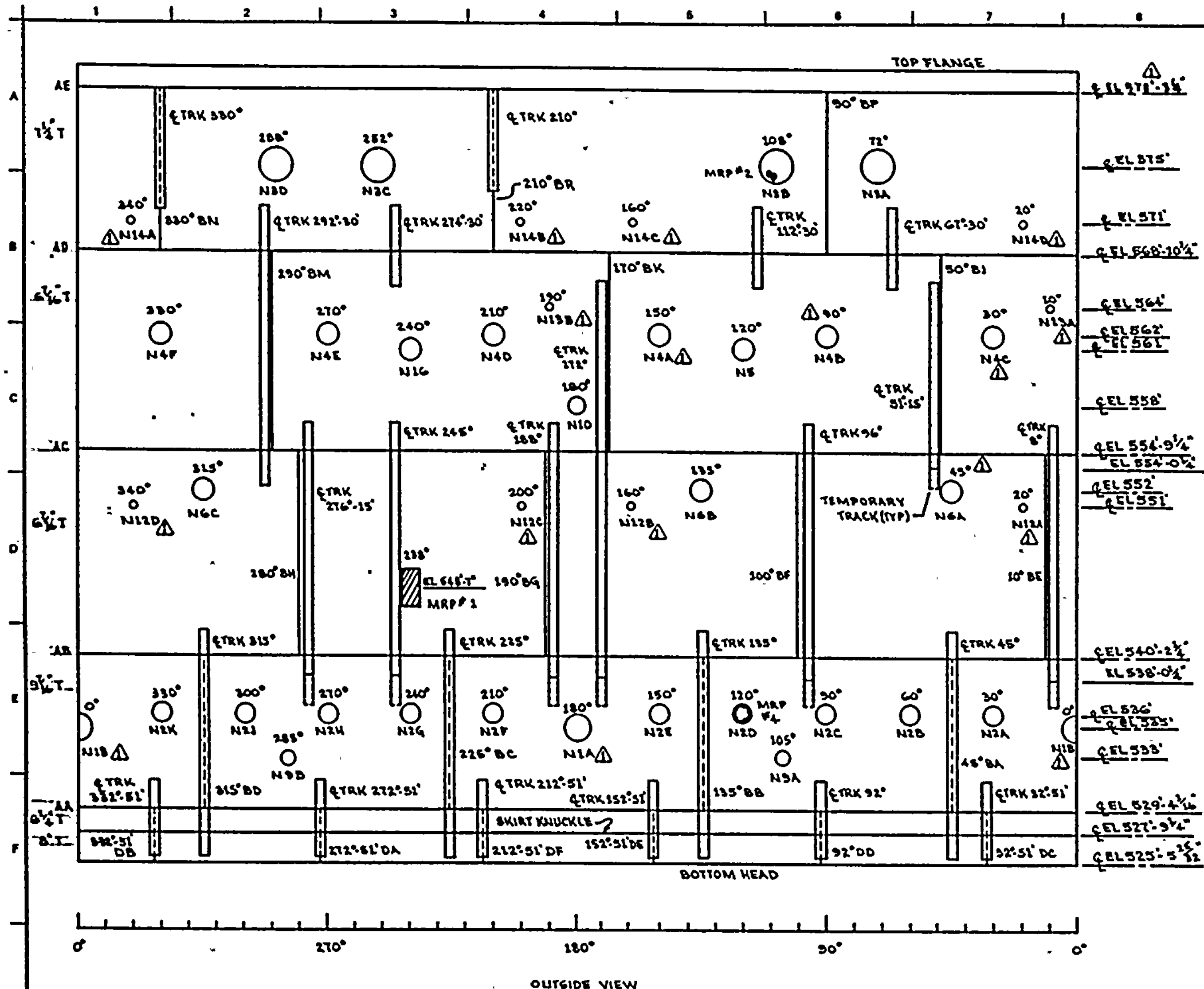
Permanent Track Detail Stainless Steel

NOTES:

1) All dimensions in inches
2) Track detail typical for pole and bottom head tracks
3) Tracks fabricated by Southwest Research Institute, San Antonio, Texas


Rack Gear Detail
16 D.P., 14½° pressure angle

Washington Public Power Supply System WNP-2	
RPV POLE TRACK DETAIL DRAWING	
No Scale	Rev. A



NOTES:

REFERENCES:

BURNS & ROE DRAWING M 886 REV 1

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY.

PIPING SYSTEM	NOM DIA (IN)	SCH	NOM WALL THK	MATERIAL SPECIFICATION	MATL TYPE	CAL BLOCK NO

NO	DATE	REVISION	BY	CHKD	APPVD
1	2-17-79	REVISED NOZZLE LETTERING, PER AS BUILT	KMcA		
0		ISSUED FOR USE	KMcA		
A	5-11-78	ISSUED FOR INFORMATION ONLY	KMcA	DJP	DJP

QUALITY CLASS: 1 | ASME CODE CLASS: N/A

ENGR: D PORTER | DRAWN: K McA | DATE: 2-24-78

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

RICHLAND, WASHINGTON 99352

WNP-2

WELD & COMPONENT IDENTIFICATION DIAGRAM

TITLE:

REACTOR PRESSURE VESSEL POLE TRACK LOCATION

DWG NO: RPV-105 | REV 1

[illegible]

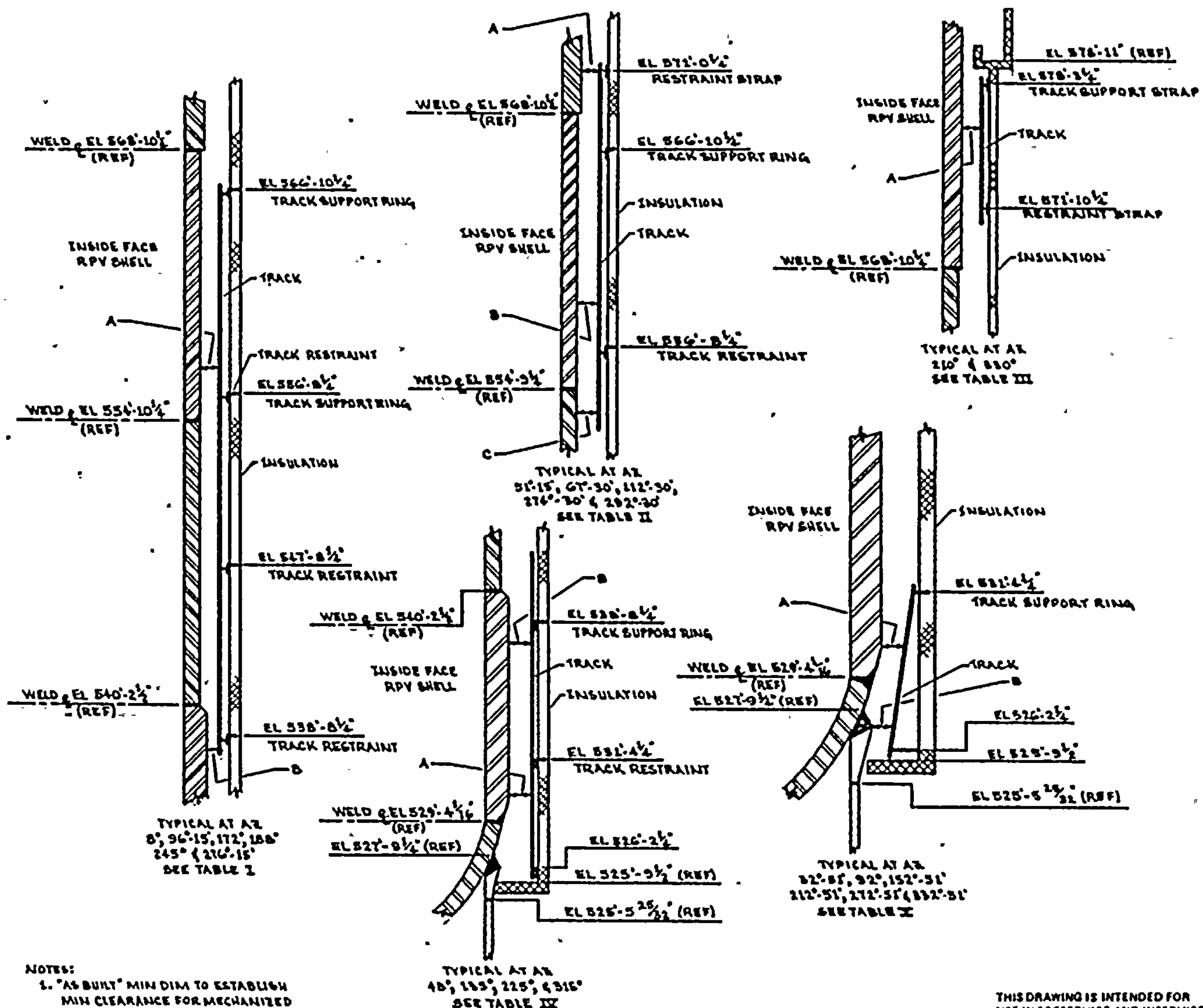


TABLE I	A	B	* LEFT POLE AT B	* RIGHT POLE AT B	LEFT POLE AT A	RIGHT POLE AT A
8°	X	7 1/2	6			
96°-15'	X	6 1/4	6	6		
172°	10	7	6 1/2	6 5/8	9 1/4	9 1/2
188°		6 1/2	6 1/2	5 1/2		
245°	X	7 1/4	6 1/2	6 7/8		
276°-15'	X	IN ACCESSIBLE				

TABLE II	A	B	C	LEFT POLE AT A	RIGHT POLE AT A
51°-15'	X	X	10	9 1/2	
67°-30'		X	X		
112°-30'		X	X		
274°-30'		X	X		
292°-30'	9 1/8	X	10 1/4	9 1/2	

TABLE III	A	B
210°	X	X
330°	X	X

TABLE IV	A	B	* LEFT POLE AT B	* RIGHT POLE AT B
45°	6 7/8	7 1/2	6 1/2	6 5/8
135°	6 7/8	7 1/4	6 1/2	6 1/4
225°	6 1/4	7	6 1/2	6 1/2
315°	6 1/4	7	6 5/8	6 1/8

TABLE V	A	B
32°-51'	6 1/4	6 3/4
92°	6 1/4	6 3/4
152°-51'	6 1/4	6 5/8
212°-51'	6 1/4	7 1/8
272°-51'	6 1/4	7 1/8
332°-51'	6	7 1/8

NOTES:
1. "AS BUILT" MIN DIM TO ESTABLISH MIN CLEARANCE FOR MECHANIZED CRAWLER-TO GEAR RACK OR POLE.
2. "*" INDICATES, FACING VESSEL

THIS DRAWING IS INTENDED FOR USE IN PRESERVICE AND INSERVICE INSPECTION PROGRAMS ONLY.

PIPING SYSTEM	NOM DIA (IN)	SCH	NOM WALL THK	MATERIAL SPECIFICATION	MATL TYPE	CAL BLOCK NO

QUALITY CLASS: 1 | ASME CODE CLASS: 1

ENGR: D PORTER | DRAWN: K. McA. | DATE: 2-24-78

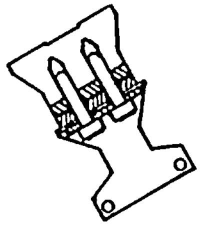
WASHINGTON PUBLIC POWER SUPPLY SYSTEM
RICHLAND WASHINGTON 99352

WNP-2
WELD & COMPONENT IDENTIFICATION DIAGRAM

TITLE:
RPV POLE TRACKS
SECTION VIEWS & AS-BUILT CLEARANCES

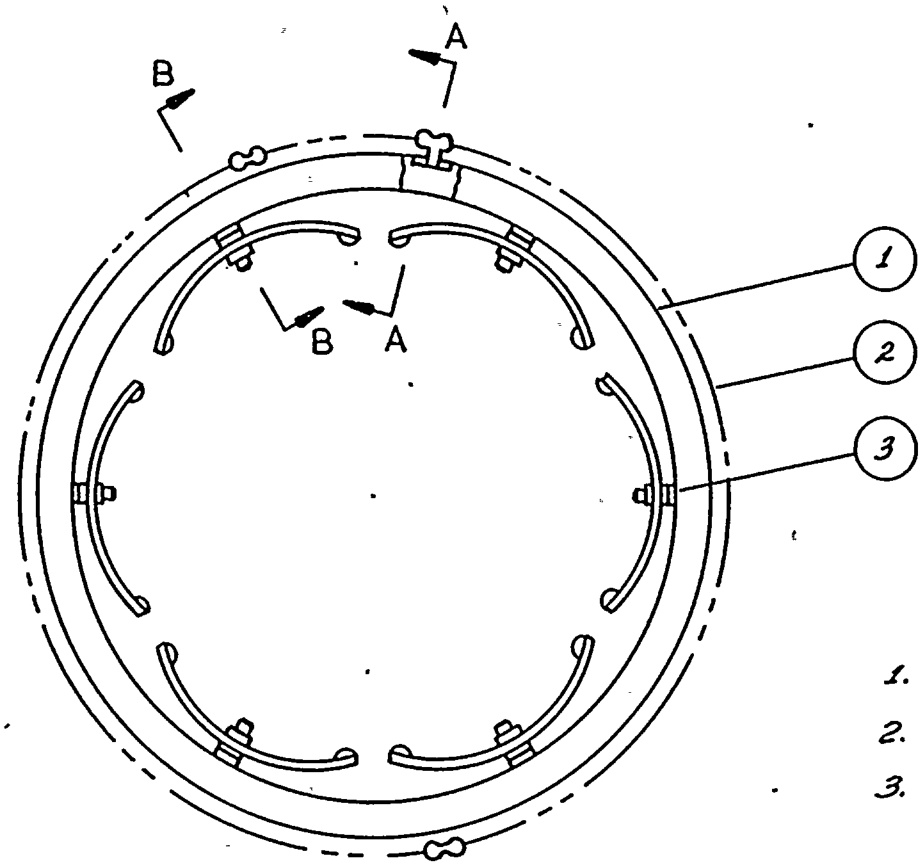
DWG NO: RPV-104 | REV A

NO	DATE	REVISION	BY	CHKD	APPVD
A	5-17-78	ISSUED FOR INFORMATION ONLY	KMcA	DLP	RAL



SECTION B-B

SECTION A-A



1. SUB ASSY
2. CHAIN
3. SPACER

WNP-2
COMPLETE ASSY PIPE TRACK
IDA-201 REV 0

Date 11/14/80
Revision 1

APPENDIX 14B

REMOTE EXAMINATION SYSTEM

- o SYSTEM DESCRIPTION
- o EXAMINATION DEVICE FUNCTIONAL DESCRIPTIONS
- o CONTROLLER FUNCTIONAL DESCRIPTIONS
- o EXAMINATION DEVICE PERFORANCE SPECIFICATIONS
- o ASSEMBLY DRAWINGS

M

Date 11/14/80
Revision 0

REMOTE EXAMINATION SYSTEM DESCRIPTION

The inspection of the WNP-2 Reactor Pressure Vessel is remotely performed using a series of Southwest Research Institute devices. The vessel longitudinal and girth weld seams are examined by a device called a "Pole Bug" which travels between the vessel and the insulation on permanently mounted vertical tracks. The attachment welds and inner radius zones of the larger nozzles are examined by a radially scanning nozzle to shell weld examination device and the safe ends are examined using a butt weld inspection device. Both of these travel on tracks mounted circumferentially on the safe end or pipe. Finally, the bottom head welds are examined using a device which travels around a track inside the vessel support skirt. All remote devices were designed and manufactured by Southwest Reseach Institute (SWRI)

Each of these devices include an ultrasonic transducermodule, motors, and the electrical encoders which convert the motion of the device into electrical signals. The motion signals are transmitted to controllers which display position and provide control functions.

The device controllers contain the circuitry necessary to position the transducers to perform the required examinations, and to display the transducer position. The transducers themselves are driven by a maximum of three ultrasonic testers, one per transducer.

These instruments perform the examination, display examination data, and provide analog voltage outputs for recording on an eight channel strip chart recorder. The analog voltage outputs from the controller via digital to analog converters represent the two co-ordinates of the device's position. Signal range and amplitude data output are recorded for each ultrasonic tester (up to three tester's may be operated simultaneously for each scan, each examining at a different angle).

The examination instrumentation and control functions are divided into two categories; device operation and examination performance. The instrumentation necessary for each function is mounted in a separate console designed to be

monitored by a technician performing a single function. The device controllers are mounted in a Desk Console (Figure 1) and the ultrasonic testers and associated instrumentation are mounted in a standing console rack (Figure 2).

The performance of the separate functions is improved by providing.crossover information between technicians. That is, providing the examiner at the test console with position readout, and the device operator with examination readout. This is done by displaying the position data on a slave panel in the Tester Console, and by a multiple trace oscilloscope display and closed circuit TV System with monitor at the device operators desk. A cassette TV recorder provides a permanent record of the examination.

DISCUSSION

MECHANICAL SYSTEM CONTROL INSTRUMENTATION

Block diagrams of the remote device control systems are shown in Figure 3. The actual number of SWRI System Controllers in use at any given time depends on the examination being performed. All controllers will be physically in place throughout the entire examination program, however. The selection of controllers for each examination is shown in Table 1.

In addition to the controls and readouts, the TV monitor showing ultrasonic test data will be located at the operator's desk. This display gives the Device Operator confirmation that his system is performing as required, and that the recording system is functional.

TESTING INSTRUMENTATION

The ultrasonic test instruments are mounted in a standing console rack. There are three Nortec NDT 131D portable ultrasonic testers connected to operate in synchronization. Each tester provides two analog voltage outputs, one of which is proportional to the amplitude of the largest indication in the displayed gated sweep; the other is proportional to the metal path distance to

the leading edge of the first indication which has amplitude exceeding a preset threshold level. By this selection of parameters, complex waveforms are most consistently recorded for evaluation.

Each tester displays data conventionally on a individual CRT, and the analog outputs are routed to a Brush eight-channel oscillograph recorder. The recorder provides continuous monitoring of the amplitude and range outputs of each tester, using six of the available eight channels for this purpose.

The remaining two channels of the Brush recorder are reserved for analog voltages representing the position co-ordinates of the transducer module. Each SWRI device is located by a two-dimensional digital encoder readout. The readout may be proportional to X-Y position coordinates, as in the examination of a plate repair area, or the readout may indicate R-O position co-ordinates during the examination of a nozzles-to-vessel weld. In either case the output of the encoder is digital pulse.

The encoder output and display represent Binary Coded Decimal information. The Brush recorder can only accommodate analog inputs. Conversion of the Binary Coded Decimal output of the SWRI controllers to analog voltage is the function of the LMT Digital to Analog Converter, Model 1 (DAC 1). This unit allows conversion of the three most-significant or the three least-significant digits to analog voltage, in this way providing an expandable scale for precise recording of flaw locations. The DAC 1 also repeats visually the digital outputs of the SWRI controllers on LED readouts on the front panel.

The remaining test instrumentation panel component is a Tektronix 5110 Oscilloscope with a 5B12N dual time base, and two 5A18N dual amplifiers. So equipped, this scope displays four signals simutaneously on two separate time bases. The 45° and 60° shear wave and the 0° longitudinal wave traces will be displayed on a time base proportional to the longitudinal wave velocity of ultrasound.

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Revision 0

VIDEO RECORDING INSTRUMENTATION

Essential readouts are closely grouped on the test instrumentation console so that the data can be recorded on video tape for a permanent visual record of the test.

The video recording system consists of an RCA TC1005 Black and White closed-circuit TV camera, an RCA TC1210 monitor and a Sony VO2610 3/4" Video Cassette Tape Recorder.

The camera is mounted in a fixed position in front of the test equipment cabinet and is focused on the oscilloscope and digital position displays. The camera is activited by the main power switch of the test equipment console.

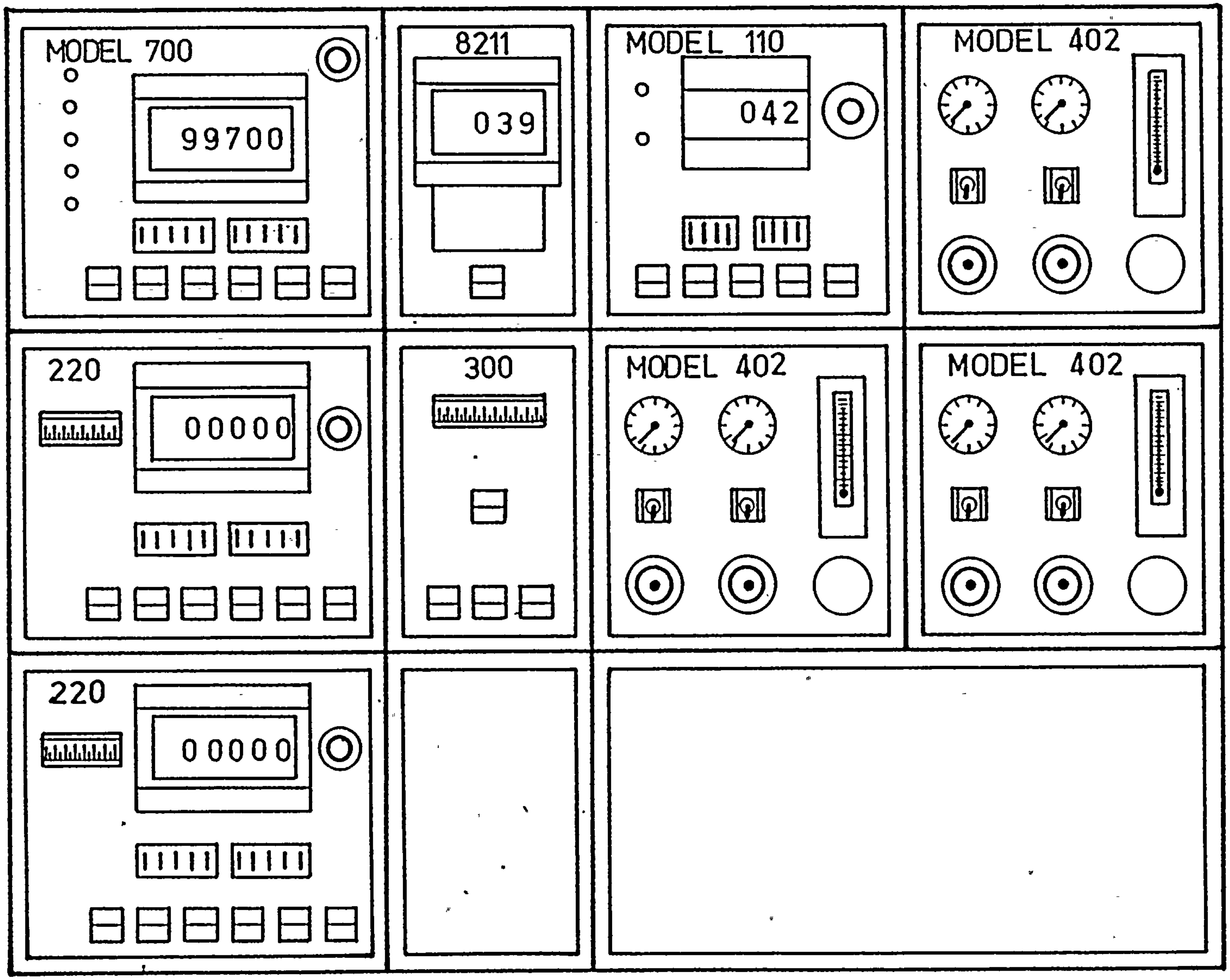


FIGURE 1

DATE 11/14/80
REVISION 0

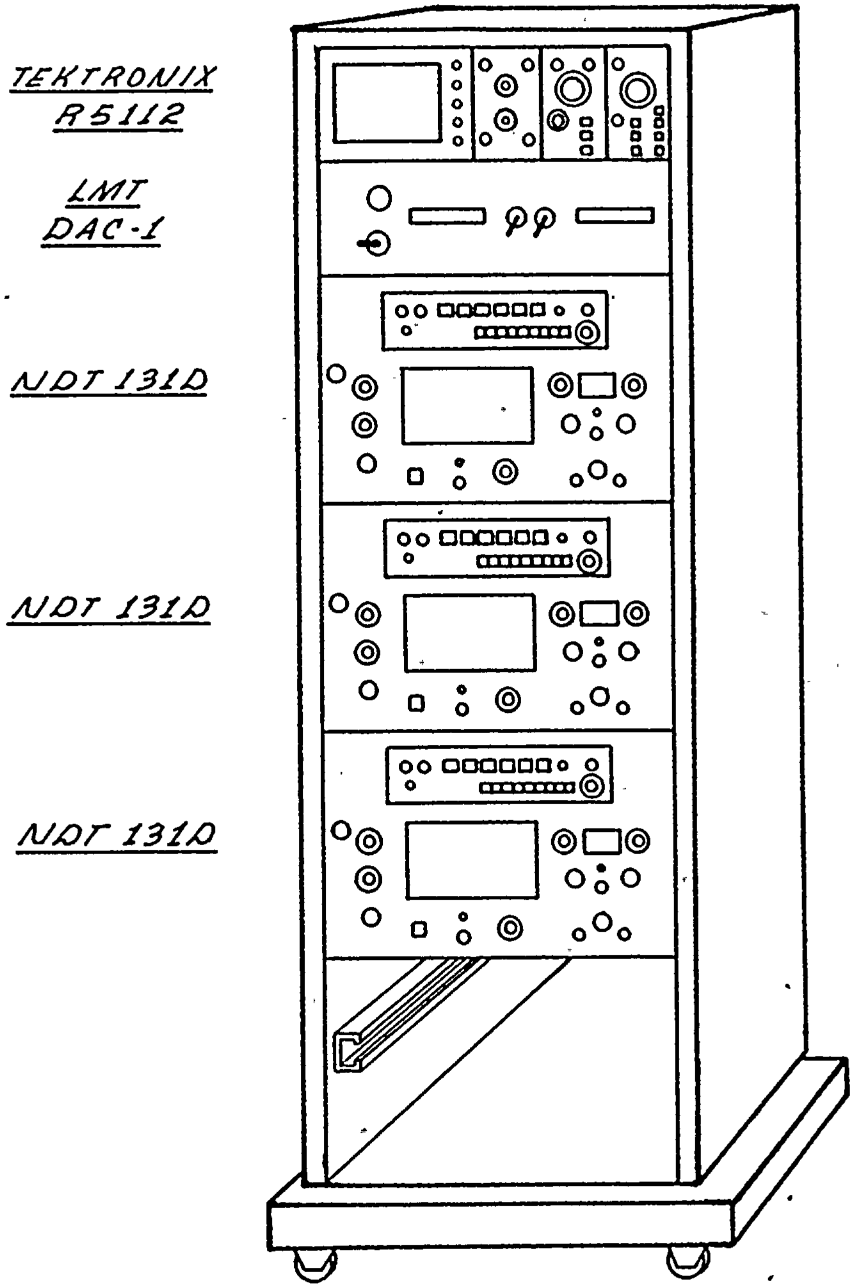
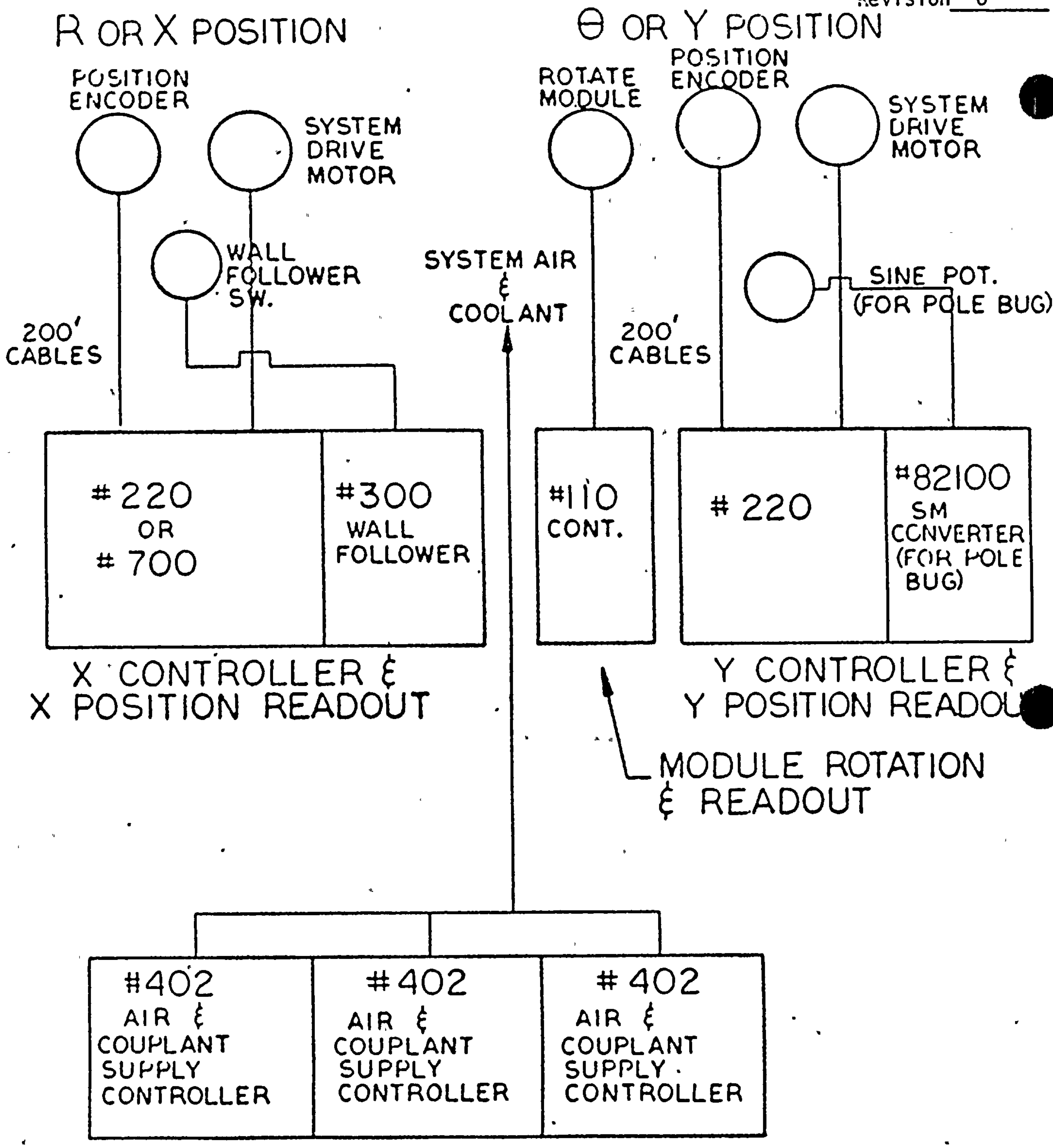


FIGURE 2

WNP-2

ULTRASONIC INSTRUMENT RACK WITH MONITOR

DATE 11/14/80
REVISION 0



NOTE:
THE VARIOUS CONTROLLERS ARE SELECTED ACCORDING TO THE EXAMINATIONS TO BE PERFORMED.

CONTROL SYSTEM BLOCK DIAGRAM

FIG. 3

Examination	Scan	Transducers	Device	Controllers	Aux Equipment	Pneumatic Cont.
Vessel Plate Welds	⊥ to weld	45° 60° 0°	Pole Bug	220 220 110	82100 Sine Pot Converter	2 No. 402
	‖ weld	45° 60°	Pole Bug	220 220	82100 Sine Pot Converter	2 No 402
N/V Welds	⊥ weld	45° 60° 0°	N/V Weld Device	220 700	300 Wall Follower Controller	3 No 402
	‖ weld	45° 60°	N/V Weld Device	220 700	300 Wall Follower Controller	3 No 402
N/V Inner Radius	Tangent to I.R. from Plate	∼66°, ∼66°	N/V Weld Device	220 700	300 Wall Follower Controller	2 No 402
N/SE	⊥ weld	45° 60° 0°	BWID	220 220		2 No 402
	‖ weld	45° 60°	BWID	220 220		2 No 402
Bottom Head	⊥ weld	45° 60° 0°	Bottom Head Device	220 220		2 No 402

Table 1

EXAMINATION DEVICE FUNCTIONAL DESCRIPTIONS

Date 11/14/80
Revision 0

BUTT WELD INSPECTION DEVICE

DESCRIPTION

The Butt Weld Inspection Device is designed to inspect butt welds in the area of nozzle-to-safe end, safe end-to-pipe and pipe-to-pipe. The device operates from pipe tracks that are installed on the outside of the pipe. The design is applicable to almost any pipe in the size range of 12 to 60 inches (325 to 1520 mm) in diameter.

The principle components of the device include a drive car assembly, module drive assembly, transducer module assembly and a trailing arm assembly. The drive car provides circumferential (X-direction) movement around the pipe while the module drive provides axial (Y-direction) movement of the transducer module. The device configuration is basically the same for all pipes, only requiring a change in the drive car and transducer module as the pipe diameters change. The trailing arm assembly is used to bring the transducer module in close to the edge of the pipe track, an area that is not accessible with the standard module drive.

Controller Operation

Circumferential Position "X"

The Model 220 Controller provides control and positional readout for the circumferential movement of this device. Controller operation is described in Operating Manual 80220.

Transducer Module Position "Y"

The Model 210 Controller provides control and positional readout for the Module Y-Drive Assembly which supports and moves the module axially on the device side arm. Controller operation is described in Operating Manual 80210.

Date 11/14/80
Revision 0

Air Pressure and Water

Two Model 402 Controllers provide control of the air and water for this device.

(a) The first Model 402 Controller provides air control for the drive car WHEEL LOCK and the TRANSDUCER MODULE load cylinders.

(b) The second Model 402 Controller provides air to pressurize the water supply container and control of the water to the Transducer Module assembly.

(c) Controller operation is described in Operating Manual 80402.

LOWER HEAD INSPECTION DEVICE

Description

The Lower Head Inspection Device is designed to inspect the meridional and circular welds of the lower head of the pressure vessel. The device operates from a four-inch (101.6 mm) wide circumferential track installed on or near the inside of the vessel support skirt.

The principal components of the device include a drive car assembly, module drive side-arm assembly and a transducer module assembly with rotator. The drive car provides circumferential (X-direction) movement around the vessel while the module drive provides meridional (Y-direction) movement of the transducer module. The transducer module can be remotely rotated up to 320 degrees. The device can be assembled into three basic configurations (A, B, and C) to extend inspection coverage in the Y-direction.

Controller Operation

Circumferential Position "X"

The Model 220 Controller is used to provide control and positional readout for the circumferential movement of this device. Controller operation is described in Operating Manual 80220.

Transducer Module Position "Y"

The Model 210 Controller provides control and positional readout for the Y-drive assembly which supports and moves the module on the side arm. Controller operation is described in Operating Manual 80210.

Transducer Module Rotation

The Model 110 Controller provides control and positional readout of the rotation of the transducer module. Controller operation is described in Operating Manual 80110.

Date 11/14/80
Revision 0

Air Pressure and Water

Two Model 402 Controllers provide control of the air and water for this device.

(a) The first Model 402 Controller provides air control for the drive car WHEEL LOCK and the Y-DRIVE SIDE ARM cylinder.

(b) The second Model 402 Controller provides air control for the TRANSDUCER MODULE load cylinder, air to pressurize the water supply container, and control of the water to the transducer Module Assembly.

(c) Controller operation is described in Operating Manual 80402.

Date 11/14/80
Revision 0

POLE GUIDED INSPECTION DEVICE

Description

The Pole Guided Device is used to inspect vertical and circumferential welds in reactor pressure vessels from the outside surface. The device operates on a four-inch (101.6 mm) wide track and is supported by a pole assembly that is parallel to the surface of the vessel. Tracks are located at various places around the vessel in the vertical direction. A curved arm that matches the vessel radius is used to index the transducer package to new scanning positions.

The device carries a maximum of six transducers which are mounted on the transverse arm in two groups of three transducers each. The arm can be remotely extended up to 21.69 inches (552 mm) on either side of the track centerline to align the transducer with the welds being examined. Each transducer group, or module, is supported on a rotatable assembly which can be remotely rotated up to 300 degrees. Thus, the transducer may be directed to either side, up, down, or at any chosen angle in between. Examination of the welds is accomplished by positioning the transducers at a chosen distance from the track centerline and, then, driving the device up or down the pole for vertical welds and horizontally right or left for circumferential welds.

Controller Operation

X Position (Along the Track)

(a) The Model 220 Controller provides control and positional readout of the device along the track. This controller includes a signal light to indicate when the device is at the reference point (reference button) of the track. Controller operating function is described in Operating Manual 80220.

(b) The Model 82100 Controller provides the "corrected" X position of the transducer in relation to the track. Due to the swing action of

the arms that support the trailer and transducer assemblies, the actual transducer position changes as a function of the distance between the pole track and the vessel surface. The "corrected" position is the true distance "along the track" of the transducer and the track reference point. Controller operating function is described in Operating Manual 82100.

Y Position (Perpendicular to the Track)

The Model 210 Controller provides control and positional readout of the transverse arm which supports and moves the transducers in the "Y" direction. Controller operating function is described in Operating Manual 80210.

Transducer Module Rotation

The Model 110 Controller provides control and positional readout of the rotation of the transducer module. There are two identical transducer modules located at each end of the transverse arm. Only one module can be operated at one time. Operational function of the Model 110 Controller is described in Operating Manual 80110.

Air and Water Control

(a) The first Model 402 Controller provides control of the WHEEL LOCK and BRAKE on the drive car.

(b) The second Model 402 Controller provides control of the ARM on the trailer assembly and WATER for the transducer.

(c) Operational function of the Model 402 Controller is described in Operating Manual 80402.

Date 11/14/80
Revision 0

Transducer Module C-10680

This module includes three transducer/shoe assemblies providing a scan capability of 0^o longitudinal beam and 45^0 and 60^o shear beams. The module is supported on a rotatable assembly and can be remotely rotated through 300 degrees (see C-12408). The transducer has a 3/4-inch (19.05 mm) diameter crystal and operates at 2.25 MHz.

Date 11/14/80
Revision 0

NOZZLE-TO-SHELL/NOZZLE INNER RADIUS INSPECTION DEVICE

Description

The nozzle-to-shell inspection device has been designed to inspect the nozzle-to-shell welds of nozzles in the size range of 10 to 42 inches (254 to 1100 mm) in diameter. The inspection device assembly consists of the Inspection Arm (12100) and the Drive Car (13165 or 13167) as primary components. The Inspection Arm is the same for all nozzles. Drive Car 13167 is used for nozzles from 10 to 20 inches (254 to 508 mm) in diameter and Drive Car 13165 is used for nozzles from 20 to 42 inches (508 to 1100 mm) in diameter.

The device operates from pipe tracks that are installed on the necked-down portion of the nozzle forging. The Drive Car provides circumferential movement (X direction) around the track and the Inspection Arm Assembly provides both radial movement of the transducer (Y direction) and a wall following feature which assures a constant radial position.

Due to the differences in nozzle shapes, a specific configuration of the primary components must be designed for each type of nozzle, although the basic function and operation of the primary components is the same for all configurations.

Controller Operation

Circumferential Position "X"

The Model 220 Controller is used to provide control and positional readout for the circumferential movement of this device. Controller operation is described in Operating Manual 80220.

The nozzle inner radius function of the nozzle-to-shell device is accomplished by changing the transducer module assembly.

Date 11/14/80
Revision 0

Transducer Module Position "Y"

The Model 700 Controller provides control and positional readout for the Transducer Module movement on the INSPECTION ARM ASSEMBLY of the device. This provides a movement and readout capability which is radial with respect to the nozzle centerline. Due to the mechanical configuration of the device, the position of the inspection arm is influenced by the pipe track position and the configuration of the nozzle. If the device adjustment is maintained according to the configuration drawings, module position will be repeatable. Controller operation is described in Operating Manual 82700.

Wall Follower

The Model 300 Controller provides control of the WALL FOLLOWER DRIVE ASSEMBLY. Wall sensor switches mounted on the HINGE ARM ASSEMBLY contact the pressure vessel causing the Controller to move the wall follower drive assembly as necessary so that the arm assembly remains approximately parallel to the vessel wall. Controller operation is described in Operating Manual 82300.

Air Pressure and Water

Three Model 402 Controllers provide control of the air and water for this device.

(a) The first Model 402 Controller provides control for the TAIL WHEEL and the Drive Car WHEEL LOCK.

(b) The second Model 402 Controller provides control for the INSPECTION ARM ASSEMBLY tilt cylinders and the MODULE WHEEL cylinder.

(c) The third Model 402 Controller provides air to purge the wall sensor switch case, air to pressurize the water supply container and control of the water to the Transducer Module Assembly.

(d) Controller operation is described in Operating Manual 80402.

Date 11/14/80
Revision 0

CONTROLLER FUNCTIONAL DESCRIPTIONS

MODEL 82100 CONTROLLER

The Model 82100 Controller is an electronic compensation unit designed for use with the Pole Guided Inspection Device. The controller consists of a motorized propulsion unit containing a position encoder that measures the location of the propulsion unit along its track. Attached to the propulsion unit is a hinged arm carrying the ultrasonic transducers. The arm is designed to swing out and away from the track in order to position the transducers onto the surface to be inspected.

The angular motion of this arm results in a change of the vertical position of the transducer as measured from some reference point on the device. This means then, that the encoder on the propulsion unit cannot measure the exact location of the transducers. In order to provide a means of determining the exact transducer location, the controller has been designed to measure the deflection angle of the hinged arm, calculate the change in vertical position of the transducers as a result of the deflection (this distance is defined as "offset"), and subtract this amount from the position of the propulsion unit.

Date 11/14/80
Revision 0

MODEL 82700 CONTROLLER

The Model 82700 controller is a reversible variable voltage DC controller with a 5-digit Nixie R tube readout which has been designed for use with SWRI inspection equipment. Additional features include BCD output corresponding to the digital readout, zero set, and settable limit stops.

The 5-digit Nixie R tube position readout accepts pulses from an incremental encoder, processes the pulses through a quadrature circuit to determine direction of travel, and displays the results on a 5-digit up-down counter. BCD information of the counter indication is available at the output connector at the rear of the unit for parallel remote display.

Two 5-digit Thumbwheel Limit switches provide settable upper and lower limits for travel of the device. These switches are located below the digital readout.

MODEL 82300 CONTROLLER

The Model 82300 Controller provides the power and control for the Linear Drive Assembly of either of the Nozzle-to-Shell/Nozzle Radius Area Inspection Devices. This assembly functions in conjunction with the wall sensor switch to maintain the arm pivot point at a constant distance from the vessel with the result that the module assembly movement approximates a circular path on the vessel wall. As the device moves around the pipe tracks, the distance from the track to the wall changes because of vessel curvature and it is necessary to correct for these changes. As the distance increases, the sensor switch activates the controller to move the arm pivot point toward the wall in a path parrallel to the nozzle axis. Movement will stop when the initially set pivot point-to-wall distance is reached. In like manner, the arm pivot point will reverse direction when too near the vessel wall.

The Model 82300 Controller provides.both manual and automatic modes. MANUAL is used in the installation, removal, and adjustment of the device; AUTOMATIC is used for all scanning.

Date 11/14/80
Revision 0

MODEL 220 CONTROLLER

The Model 220 Controller is a reversible variable voltage DC controller with a 5-digit Nixie R tube readout which has been designed for use with SWRI inspection equipment. Additional features include level indication, position light, BCD output corresponding to the digital readout, zero set, counter reversal, and settable limit stops.

The 5-digit X-positive Nixie R tube readout accepts pulses from an incremental encoder, processes the pulses through a quadrature circuit to determine direction of travel, and displays the result on the 5-digit up-down counter. BCD information of the counter indication is available at the output plug at the rear of the unit for parallel remote display.

A level indicator is provided to operate in conjunction with a 7606 Fredericks level sensor to provide a primary level indication. The indicator is a 100-0-100 zero center micrometer. Full scale is approximately one degree. The meter is located at the upper left corner of the front panel.

Two 5-digit thumbwheel limit switches provide settable upper and lower limits for travel of the device. These switches are located below the digital readout

A position REFERENCE light is provided at the middle left side of the front panel. This light operates in conjunction with a position reference switch attached to the scanning device.

Date 11/14/80
Revision 0

MODEL 110 CONTROLLER

The Model 110 Controller is a reversible variable-voltage DC controller with a 3-1/2 digit Nixie tube readout which has been designed for use with SwRI inspection equipment. Additional features include BCD output corresponding to the digital readout, zero set, counter reversal and settable limit stops.

The 3-1/2 digit X-positive Nixie tube readout accepts analog information from a potentiometer, performs an analog-to-digital conversion, and displays the result on the 3-1/2 digit up-down counter. BCD information of the counter indication is available at the output plug at the rear of the unit for parallel remote display.

Two 4-digit thumbwheel limit switches provide settable upper and lower limits for travel of the device. These switches are located below the digital readout.

Date 11/14/80
Revision 0

MODEL 402 CONTROLLER

The Model 402 Controller is a dual, regulated, filtered pneumatic supply in combination with a single, flow-regulated fluid supply which has been designed for use with SwRI inspection equipment. Each pneumatic system includes a regulated pressure gauge, 4-way valve suitable for operation of double-acting cylinders and a bezel locking regulator. The fluid system includes a needle valve for flow regulation and a flow meter for easy repeatability of flow setting.

Date 11/14/80
Revision 0

EXAMINATION DEVICE PERFORMANCE SPECIFICATIONS

Date 11/14/80
Revision 0

BUTT WELD INSPECTION DEVICE

1. Scanner Motion

Circumferential	
Axial	

2. Extent of Travel (2 Arms)

Circumferential	360^{o}+
Axial	7 in, 16 in

3. Speed, Maximum

Circumferential	1-5/8 in/sec
Axial	1 in/sec

4. Position Repeatability

Circumferential	$\pm$ 1/8 in
Axial	$\pm$ 1/10 in

5. Accuracy

Circumferential	$\pm$ .020 in (1 count)
Axial	$\pm$ .010 in

6. Readout Sensitivity

Circumferential	10 counts/link of chain	reads to 1 count
Axial	100 counts/in	

7. Scan Index Increment

Circumferential	1 count
Axial	1 count (.010 in)

8. Device Weight

   20 lbs.

9. Cable Weight

   2 lbs/ft

10. Maximum Cable Length

   200 ft

Date 11/14/80
Revision 0

LOWER HEAD INSPECTION DEVICE

1. Scanner Motion

Circumferential	
Meridional	

2. Extent of Travel

Circumferential	360^o + (Length of Track)
Meridional	20 in

3. Speed, Maximum

Circumferential	3 in/sec
Meridional	1 in/sec

4. Position Repeatability

Circumferential	$\pm$ 1/4 in
Meridional	$\pm$ 1/8 in

5. Accuracy

Circumferential	.057 in (1 count)
Meridional	.010 in (1 count)

6. Readout Sensitivity

Circumferential	17.5 counts/in	Reads to 1 count
Meridional	100 counts/in	

7 Scan Index Increment

Circumferential	1 count (.057 in)
Meridional	1 count (.010 in)

8. Device Weight

20 lbs

9. Cable Weight

2 lb/ft

10. Maximum Cable Length

200 ft

Date 11/14/80
Revision 0

POLE GUIDED INSPECTION DEVICE

1. Scanner Motion

    Circumferential
    Vertical

2. Extent of Travel

Circumferential	28.75 in
Vertical	Length of pole track

3. Speed, Maximum

Circumferential	3 in/sec
Vertical	3 in/sec

4. Position Repeatability

Circumferential	$\pm$ 1/8 in
Vertical	$\pm$ 1/8 in

5. Accuracy

Circumferential	.057 in (1 count)
Vertical	.057 in (1 count)

6. Readout Sensitivity

Circumferential	18.00 counts/in - Extended	
	17.46 counts/in - Retracted	reads to 1 count
Vertical	17.46 counts/in	

7. Scan Index Increment

Circumferential	1 count (.057 in)
Vertical	1 count (.057 in)

8. Device Weight

40 lbs

9. Cable Weight

2 lbs/ft

10. Maximum Cable Length

200 ft

Date 11/14/80

Revision 0

NOZZLE-TO-SHELL/NOZZLE INNER RADIUS INSPECTION DEVICE

1. Scanner Motion

   Circumferential
   Radial
   Axial (Wall Following)

2. Extent of Travel

Circumferential	360^{o}+
Radial	25 in
Axial	5-1/2 in

3. Speed, Maximum

Circumferential	1-5/8 in/sec
Radial	1 in/sec
Axial	1-1/2 in/sec

4. Position Repeatability

   Less than 1/8 in for all 3 Axes

5. Accuracy

Circumferential	~.010 in (1 count)
Radial	~.010 in (1 count)
Axial	~.100 in (1 count)

6. Read Out Sensitivity

Circumferential	10 counts/link of track	Reads to 1 count
Radial	100 counts/in	
Axial	No Readout	

Date 11/14/80
Revision 0

7. Scan Index Increment

Circumferential	1 count
Radial	1 count (.010 in)
Axial	N/A

8. Device Weight

42 lbs

9. Cable Weight

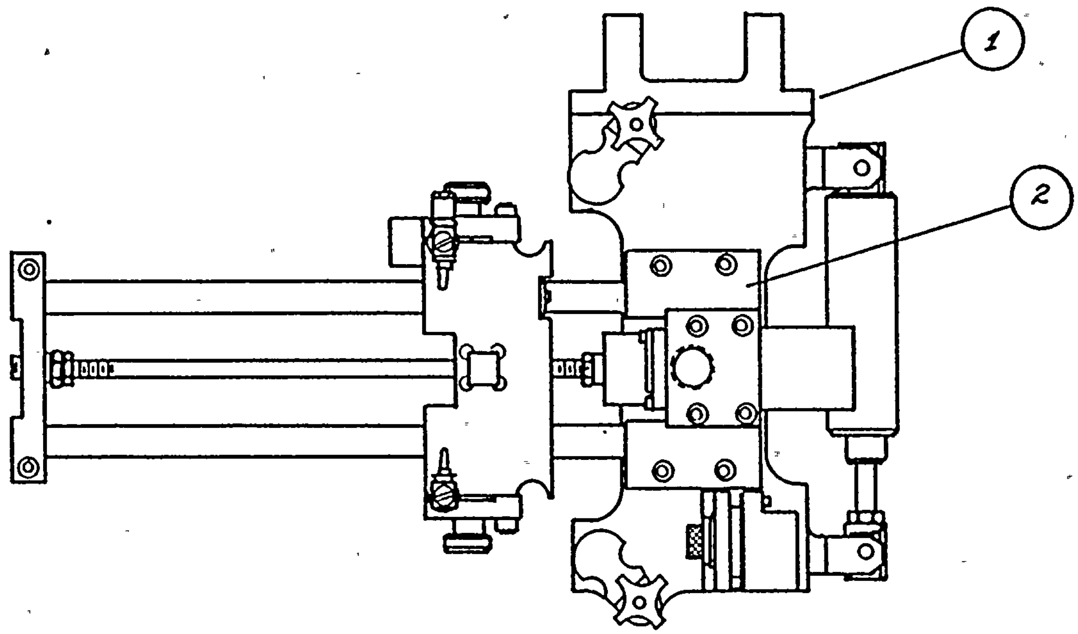
2 lbs/ft

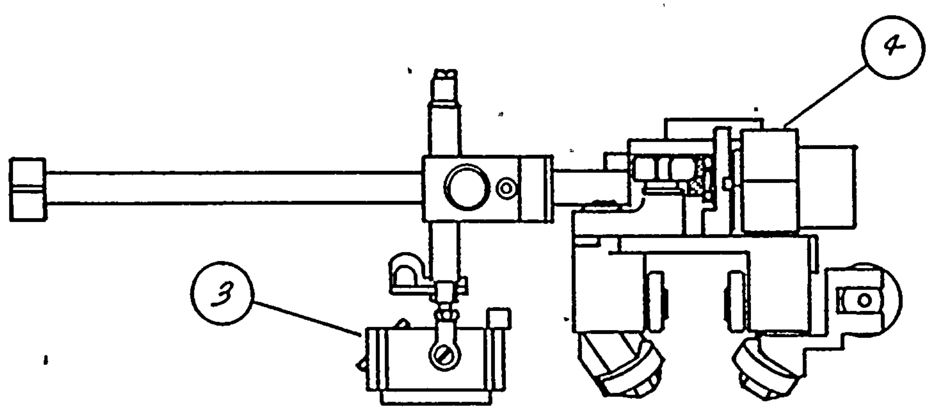
10. Maximum Cable Length

200 ft

Date 11/14/80
Revision 0

ASSEMBLY DRAWINGS





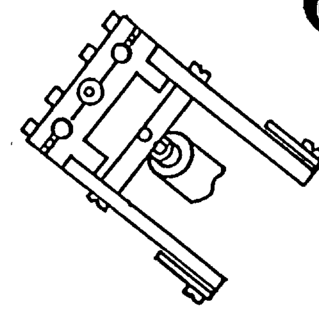
1. CAR ASSY
2. MODULE 'Y' DRIVE ASSY
3. TRANSDUCER MODULE ASSY
4. LEVEL ASSY

WNP-2

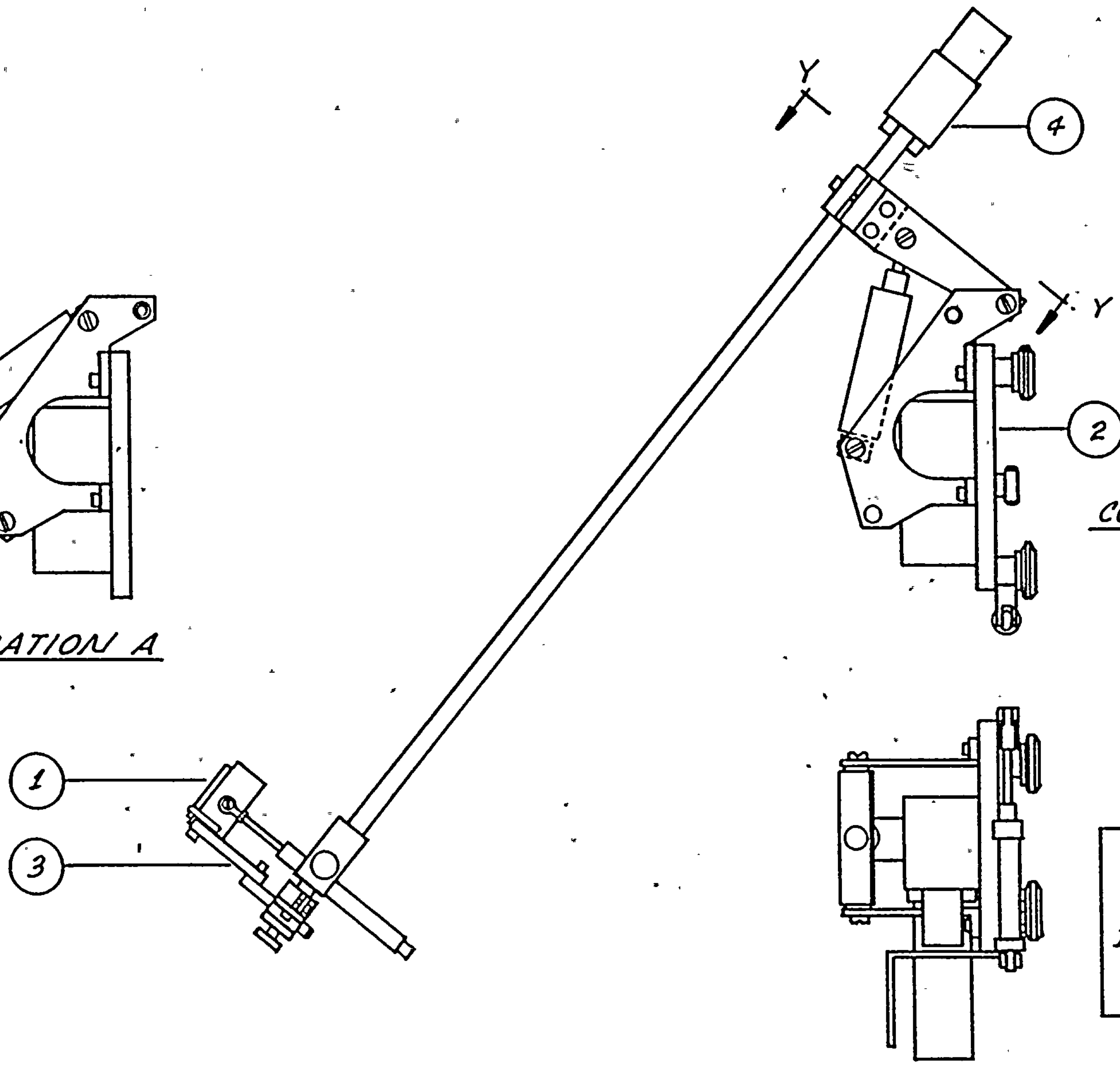
BUTT WELD INSPECTION DEVICE ASS'Y

IDA-101 REV 0

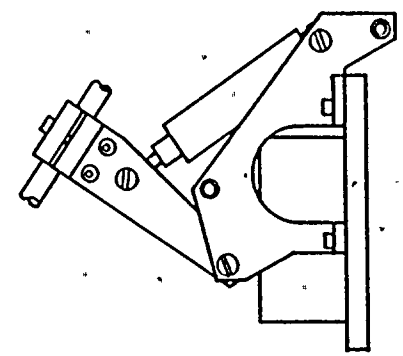
1. TRANSDUCER MODULE ASSY
2. L-2 DRIVE CAR ASSY
3. OUTRIGGER ASSY
4. 'Y' DRIVE ASSY



VIEW Y-Y



CONFIGURATION B



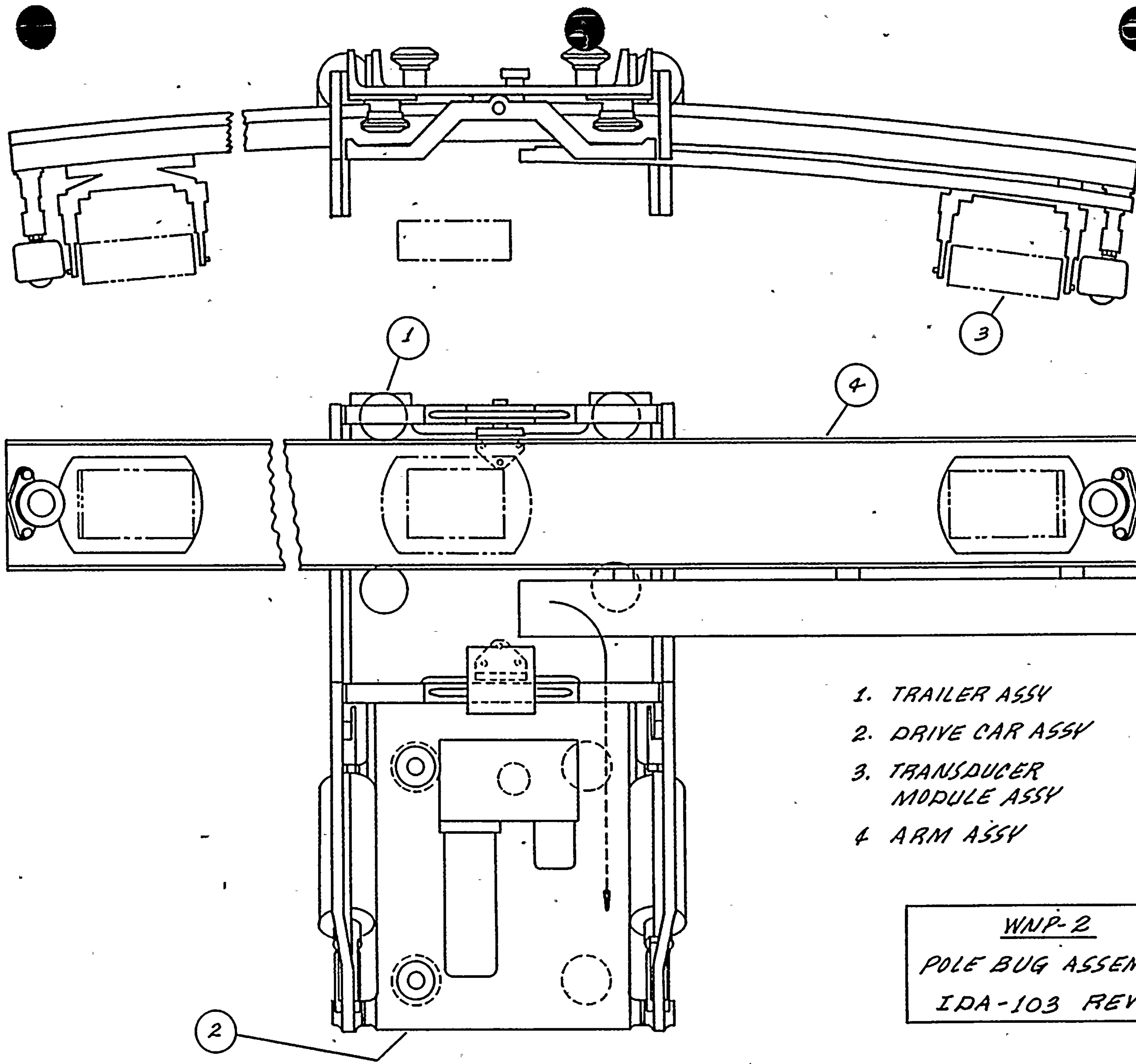
CONFIGURATION A

14B-39

WNP-2

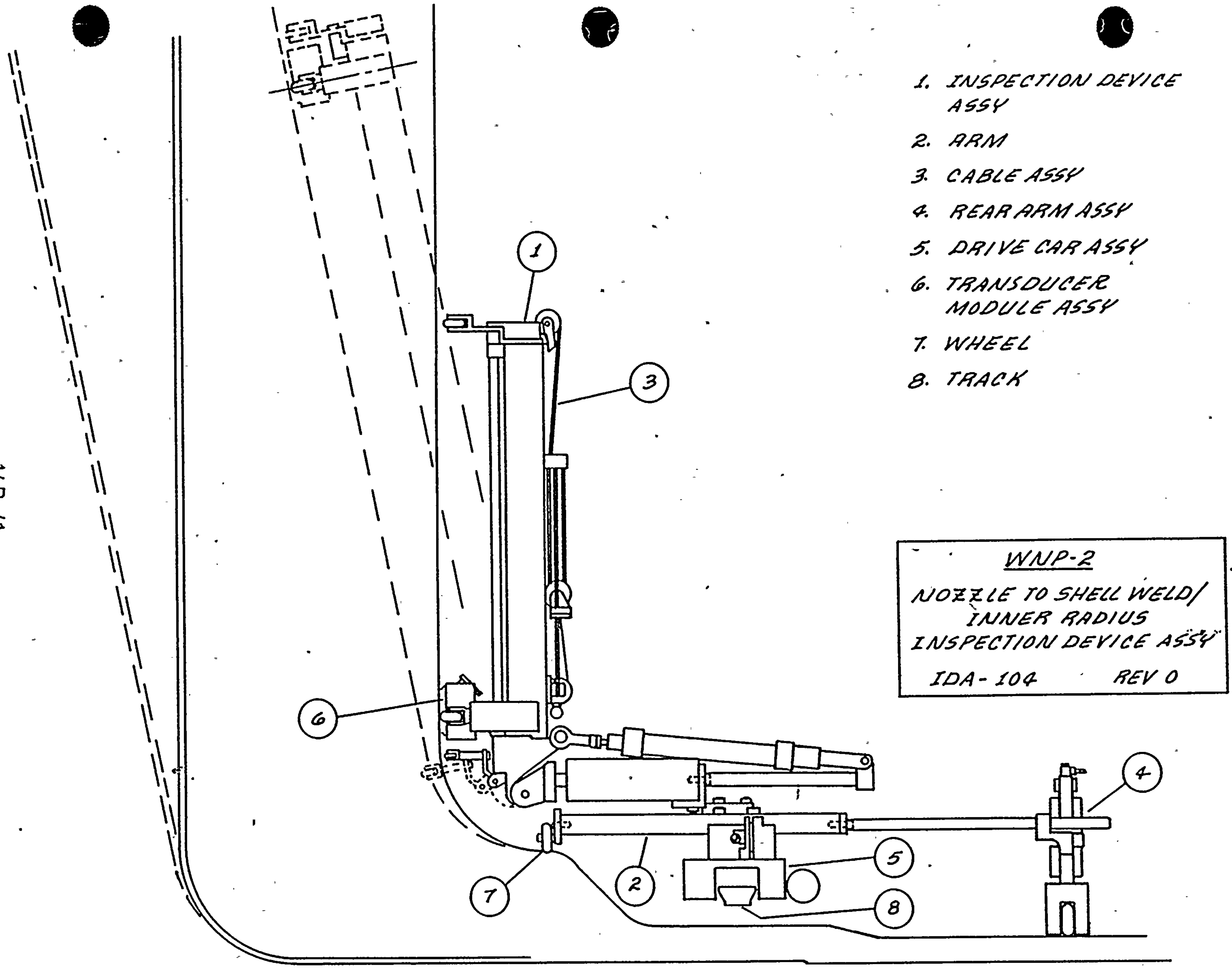
LOWER HEAD
INSPECTION DEVICE ASSY

IDA-102 REV 0



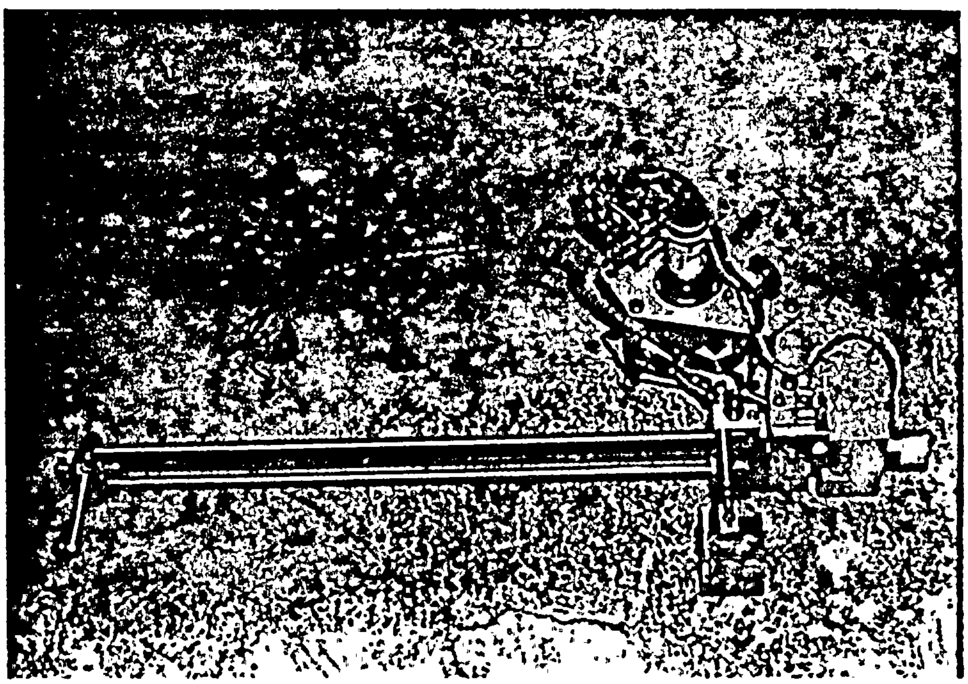
1. TRAILER ASSY
2. DRIVE CAR ASSY
3. TRANSDUCER MODULE ASSY
4 ARM ASSY

WNP-2
POLE BUG ASSEMBLY
IDA-103 REV 0


1. INSPECTION DEVICE ASSY
2. ARM
3. CABLE ASSY
4. REAR ARM ASSY
5. DRIVE CAR ASSY
6. TRANSDUCER MODULE ASSY
7. WHEEL
8. TRACK
WNP-2
NOZZLE TO SHELL WELD/ INNER RADIUS INSPECTION DEVICE ASSY
IDA-104
REV 0

Date 11/14/80
Revision 0

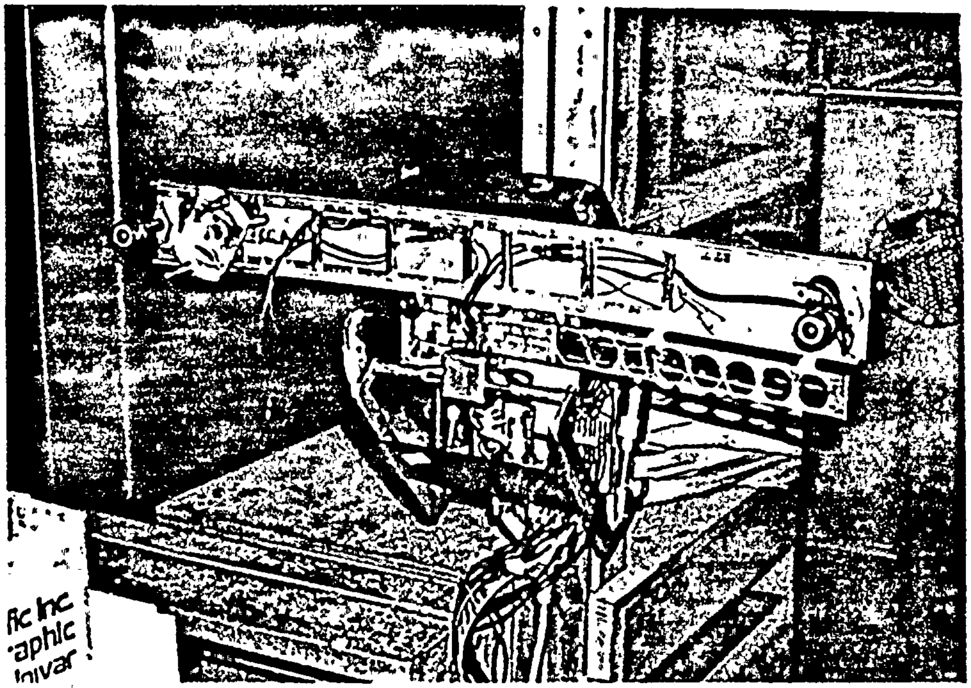
BUTT WELD INSPECTION DEVICE



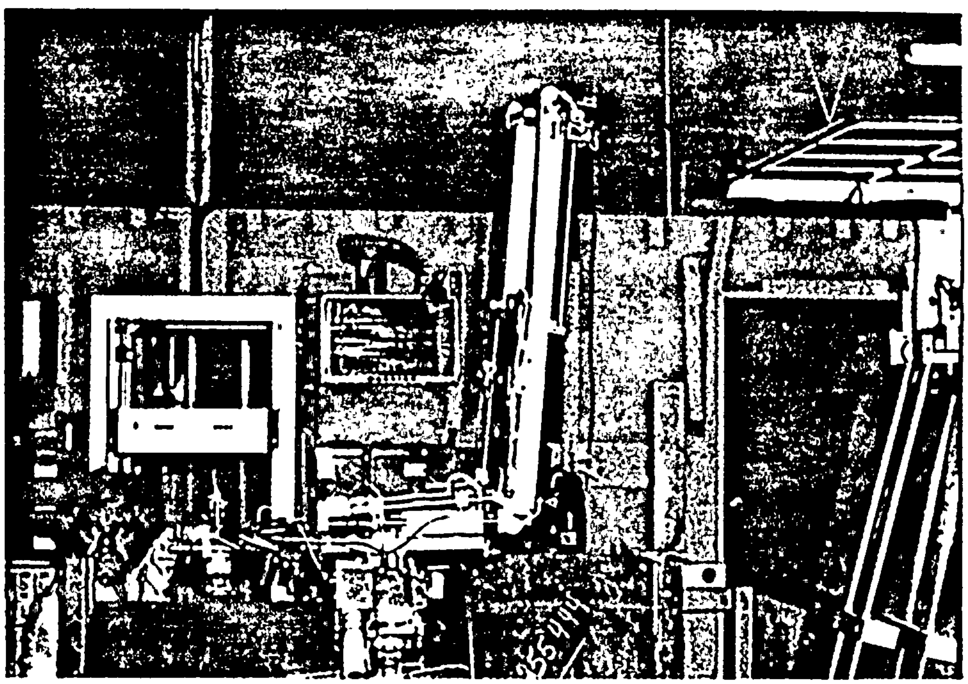
LOWER HEAT INSPECTION DEVICE

Date 11/14/80

Revision 0



POLE GUIDED INSPECTION DEVICE



NOZZLE TO SHELL WELD/INNER RADIUS
INSPECTION DEVICE

Date 11/14/80
Revision 1

15.0--PSI REPORT SUBMITTAL

Following the completion of the WNP-2 Preservice Inspection, a Preservice Inspection Report will be prepared by the Supply System and filed with the enforcement and regulatory authorities having jurisdiction at the plant site. The report will satisfy the reporting requirements of the reference ASME Section XI Code, Article IWA-6000, "RECORDS AND REPORTS".

The WNP-2 Preservice Inspection Report will include, but not be limited to, the following information:

1. Abstract, including form NIS-1.

2. Authorized Inspector approval.

3. Summary of examinations and results, including disposition of significant indications.

4. Procedures used during the PSI effort.

5. Equipment, personnel, and material certifications.

6. Report supplement itemizing the examinations performed, procedures used, data sheet references, and results of each examination. This supplement will consist of the following:

   a. For piping systems involving volumetric and surface examinations, including the RPV and appurtenances, the supplement will include weld and component identification diagrams which reflect as-built, as-examined conditions, and non-destructive examination summary tables which list the examination results for each examination item.

   b. For piping systems involving only visual examinations, the supplement will include the ISI boundary diagrams which reflect as-built, as-examined conditions, and a summary of examination results for each system.

The format for the non-destructive examination summary tables is shown on the following pages, including sample completed tables with typical entries.

At the time of issuance of this document, the filing of the PSI final report is anticipated to occur in September 1981 amendment.

LIST OF ABBREVIATIONS
USED ON NDE SUMMARY TABLE

1) @ = At
2) CL = Centerline
3) Hgr = Hanger
4) I D = Inside Diameter
5) O D = Outside Diameter
6) Geo = Geometry
7) In or " = Inch(s)
8) Ind = Indication(s)
9) DAC = Distance Amplitude Curve
10) - = Minus
11) + = Plus
12) % = Percentage
13) Obst = Obstruction
14) IWC = Index (transducer) to Weld Centerline Distance
15) Sc = Scan
16) Ext = Extent
17) MP = Metal Path
18) Int = Intermittent
19) FD = Finger Damps
20) PWR = Pipe Whip Restraint
21) DEG = Degree
22) LTD = Limited
23) WRG = Weld Root Geo.

Date 12/14/81

Revision 0

24) RESP = Response

25) N = Node

26) NR = Node Response

27) MR = Mechanical Reflector

28) CB = Counterbore

29) T = Tee

30) IR = Inner Radius

31) SWL = Sweep-O-Let

32) WOL = Weld-O-Let

33) CW = Clockwise

34) CCW = Counterclockwise

35) DIMS = Dimension

36) PWS = Pipe Whip Support

37) DIV = Division

38) LD = Long Weld Down Stream

39) LDI = Long Weld Down Stream Inside (elbows)

40) LDO = Long Weld Down Stream Outside (elbows)

41) LU = Long Weld Upstream

42) LUI = Long Weld Upstream Inside (elbows)

43) LUO = Long Weld Upstream Outside (elbows)

44) ALD = Long Weld Downstream (Nozzles)

45) ALU = Long Weld Upstream (Nozzles)

46) PVC = Polyvinyl Chloride

47) PR = Pipe Restraint

Date 12/14/81

Revision 0

48) BDY = Body

49) BLT = Bolting (valve)

50) BD = Flange Bolting

51) LOC = Leak Off Connection

52) LONG = Longitudinal

53) ACC = Accept

54) SE = Safe End

WNP-02
INTERVAL: PSI
PERIOD: NA
OUTAGE:
DRAWING NO. RRC-102

WASHINGTON PUBLIC POWER SUPPLY SYSTEM
NON-DESTRUCTIVE EXAMINATION SUMMARY TABLE
SYSTEM OR COMPONENT RRC(2)-4S
DESCRIPTION: REACTOR RECIR LOOP B

DATE 25/11/81

IDENT. NO.	EXAM. MTH.	EXAM. DATA SHEET NO.	EXAMINATION RESULTS NO INDIC.	INSIGNIF INDIC.	SIGNIFICANT GEOMETRY	OTHER	REMARKS
24RRC(2)B-1	VOL						
	SUR	RRP-023	ACC				
24RRC(2)B-2	VOL	RRU-209	0,45				
	SUR	RRP-070	ACC				
24RRC(2)B-2LD	VOL	RRU-210	0,45				
	SUR	RRP-070	ACC				
24RRC(2)B-3LU	VOL	RRU-211	0,45				
	SUR	RRP-070	ACC				
24RRC(2)B-3	VOL	RRU-202	0	45			SC 3 50% DAC OD, EXT 360 INT. IWC=2 1/4 MP=4.43. FD. SC 4 75% DAC ID, EXT 360. IWC=1 1/4 MP=1.8. 1 1/2 NODE RETURN 90% DAC; @ 75% DAC IND, EXT 360. IWC=2 1/4 MP=3.88
	SUR	RRP-070	ACC				
24RRC(2)B-3LDO	VOL	RRU-205		45			SC 11 55% DAC IND, EXT IWC=2 1/2 MP=3.61
	SUR	RRP-070	ACC				
24RRC(2)B-3LDI	VOL	RRU-203		45			SC 12 80% DAC IND, EXT IWC=2 1/4 MP=3.66
	SUR	RRP-070	ACC				

Date 12/14/81
Revision 1

Date [illegible]
Written [illegible]

LIST OF ABBREVIATIONS USED

IN ECT RESULT SUMMARY SHEETS

ACC = Acceptable
ADJ = Adjacent
ALD = Long Weld Downstream (Nozzles)
ALU = Long Weld Upstream (Nozzles)
AMP = Amperage
APP = Approximately
AVG = Average
AUGMT = Augmented

B [illegible] = Large Bolting
BDY = Body
BLT = Bolting (Valves)
BDRY = Boundary
BTM = Bottom

CAL = Calibration
CB = Counterbore
CCW = Counter Clockwise
CIRC or CIRC = Circumferential
CL = Centerline
CONF = Configuration
CONT'D = Continued
CRD = Control Rod Drive
CW = Clockwise
CS = Carbon Steel
CAT = Category

DAC = Distance Amplitude Curve
DEG = Degree(s)
DIA = Diameter
DIM = Dimension(s)
DIV = Division(s)
D [illegible] = Dollar
DS = Downstream

ELL = Elbow
ELS = Elbow Side
EVAL = Evaluation
EXT = Extend or Extent
EXAM = Examination
EA = Each

FD = Flange Damage
F [illegible] = Flange
FWE = Free Weld Edge, Flange [illegible]
FW = Feedwater

GRTR = Greater or Greater Than
= Greater Than

HD = Head
HGR = Hanger
HPCS = High Pressure Core Spray

IN = Inches
ID = Inside Diameter
INACC = Inaccessible
IND = Indication(s)
INF = Information
IR = Inner Radius
[illegible]
INIT = Initial
INSTR = Instrument
INT = Intermittent
ING = [illegible]
INT = Internal

[illegible]

LTRL = Lateral

LAM = Lamination
LCR = Log Chart Reflector
L [illegible] = Long Weld Downstream
LDI = Long Weld Downstream Inside
LDO = Long Weld Downstream Outside
LKN = Leakage
LK = Leak
LOC = [illegible]
LONG = Longitudinal
LTD = Limited
LU = Long Weld Upstream
LUI = Long Weld Upstream Inside
LUO = Long Weld Upstream Outside
LK or LWR = [illegible]
< = Less Than
L [illegible] = Low [illegible]

Date 1/18/85
Revision 0

LIST OF ABBREVIATIONS USED ON NDE RESULT SUMMARY TABLE

@ = At
ACC = Accept(ed)
ADJ = Adjacent
ALD = Long Weld Downstream (Nozzles)
ALU = Long Weld Upstream (Nozzles)
AMP = Amperage
APP = Approximately
AVE = Average
AUGMT = Augmented

BD = Flange Bolting
BDY = Body
BLT = Bolting (Valve)
BNDRY = Boundary
BTM = Bottom

CAL = Calibration
CB = Counterbore
CCW = Counter Clockwise
CIR or CIRC = Circumferential
CL = Centerline
CONF = Configuration
CONT'D = Continued
CRD = Control Rod Drive
CW = Clockwise
CS Carbon Steel
CAT = Category

DAC = Distance Amplitude Curve
DEG = Degree(s)
DIA = Diameter
DIMS = Dimension(s)
DIV = Division(s)
DOL = Dollar
DS = Downstream

ELL = Elbow
E.S. = Elbow Side
EVAL = Evaluation
EXT = Extend or Extent
EXAM = Examination
EA = Each

FD = Finger Damps
FL or FLG = Flange
FRE = From Ref. Edge, Ext. 360°
FW = Feedwater

GEO = Geometry or Geometric
= Greater Than

HD = Head
HGR = Hanger
HPCS = High Pressure Core Spray

" = Inches
ID = Inside Diameter
INACC = Inaccessible
IND = Indication(s)
INFO = Information
IR = Inner Radius
INSIGN = Insignificant
INSTL = Installed
INSTR = Instrument
INT = Intermittent
IWC = Index (Transducer) to Weld Centerline Distance
INC = Inconel

JP = Jet Pump

KNKL = Knuckle

LAM = Lamination
LCR = Lug Corner Reflector
LD = Long Weld Downstream
LDI = Long Weld Downstream Inside
LDO = Long Weld Downstream Outside
LIN = Linear
LK = Leak
LOC = Leak Off Connection
LONG = Longitudinal
LTD = Limited
LU = Long Weld Upstream
LUI = Long Weld Upstream Inside
LUO = Long Weld Upstream Outside
LW or L-WAVE = Longitudinal Wave
= Less Than
LPCS = Low Pressure Core Spray

Date 1/18/85
Revision 0

LIST OF ABBREVIATIONS USED ON NDE RESULT SUMMARY TABLE

- = Minus or To
MAX = Maximum
MP = Metal Path
MR = Mechanical Reflector
MRD = Meridian
MULT = Multiple(s)
MS = Main Steam
MRP = Major Repair Area

N = Node (in RSLT Remark)
NES = Nuclear Energy Services
NR = Node Response
N or NZ = Nozzle(s)

OPP = Opposite

+ = PLUS
% = Percentage
PDS = Pipe Downstream
PENT, PEN, PENE, or PN = Penetration
PR = Pipe Restraint
PREP = Preparation
PRESS = Pressure
P.S. = Pipe Side
PVC = Polyvinyl Chloride
PWR = Pipe Whip Restraint
PWS = Pipe Whip Support
PB = Pressure Boundary

RED = Reducer
REDIRECT = Redirection
REF = Reference
REQ'D = Required
RESP = Response
REV = Required Examination Volume
RPT(s) = Report(s)
R.S. = Reducer Side
RSLT = Result(s)
RPV = Reactor Pressure Vessel
RRC = Reactor Recirculation

SC = Scan(s) or Shell Course
SCH = Schedule
SE = Safe End
SEG = Segregate(s)
SIGN = Significant
SIMUL = Simultaneous
SKRT = Skirt
SLC = Stand-by Liquid Control
SN = Snubbers
SOL = Sock-O-Let
SP = Spare
SPG = Spring
STD = Standard
STM = Steam
SUC = Suction
SUP = Support
SWL = Sweep-O-Let
SS = Stainless Steel
SUR = Surface

- = To or Minus
T = Tee
"T" = Thickness
TC = Thermocouple(s)
T.S. = Tee Side
TYP = Typical(ly)
T-MATL = Test Material

US = Upstream
UTCB = Ultrasonic Calibration Block
UT = Ultrasonic Test
UTP = Ultrasonic Test Procedure

V, VES, or VESS = Vessel
VLV = Valve
VN = Vent
VRT = Vertical
V.S. = Valve Side
VT = Visual
VOL. Volumetric

Date 1/18/85
Revision 0

LIST OF ABBREVIATIONS USED
ON NDE RESULT SUMMARY TABLE

W = Weld
WCG = Weld Crown Geo
WD = Weld
WOL = Weld-O-Let
WPG = Weld Prep Geometry
WRG = Weld Root Geometry
WRR = Weld Radius Reflector
WC = Weld Crown
WCL = Weld Centerline

XDUCER = Transducer

Date 1/18/85
Revision 0

NOTES TO NDE RESULT SUMMARY TABLE

NOTE 1: This weld did not receive full coverage from both sides. It did receive full coverage from one side and meets code requirements.

NOTE 2: This weld did not receive full Section XI Code exam.