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50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana & 05000316
AUTH.NAME AUTHOR AFFILIATION
HUNTER,R.S. American Electric Power Co., Inc.
RECIP.NAME RECIPIENT AFFILIATION
JORDAN,E. Division of Reactor Operations Inspections

SUBJECT: Responds to NRC 790611 request for info re feedwater line cracks, forwards 10CFR50.59 evaluation & special procedure guide for feedwater line data collection. Makes commitment for periodic repts, testing & surveillance programs.

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JUN 27 1979

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AMERICAN ELECTRIC POWER *Service Corporation*

AEP

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REGULATORY DOCKET FILE COPY

June 15, 1979
AEP:NRC:00221

Donald C. Cook Nuclear Plant Units 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74

Mr. E. Jordan
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Jordan:

On June 11, 1979 we met with the Commission to discuss the matter of the cracks found in the feedwater line elbows of the Donald C. Cook Nuclear Plant. Our letters of May 26, 1979 and June 7, 1979 (AEP:NRC:00216) reported the circumstances surrounding this problem and the corrective actions taken. At the conclusion of the June 11 meeting, you requested that we submit this additional information for your review:

1. A 10 CFR 50.59 evaluation.

   This is attached.

2. The feedwater line data collection procedure including acceptance criteria.

   Attached is Special Procedure Guide for feedwater line data collection.

3. A commitment to provide periodic reports on the results of our ongoing investigation.

   We will provide you with a monthly periodic report of our data collection program and our other evaluations beginning one month from the time of Unit 2 criticality.

4. The baseline non-destructive examination data.

   We will do an ultrasonic examination of the nozzle-to-elbow weld areas which, with the associated radiographs, will serve as the baseline for future inspections. This will be available at the plant for your inspection.

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5. A commitment that we will perform surveillance of the nozzle-to-feedwater elbow weld at the next refueling outage for Unit 2.

   We agree with this commitment.

6. A copy of the metallurgical evaluations and stress analyses.

   This will be provided to you as soon as available.

Your staff also recommended that we radiograph the weld at the other anchor point at the containment wall. We radiographed two of the feedwater pipe-to-penetration welds and found no indications.

Very truly yours,

R. S. Hunter
Senior Vice President - Construction
American Electric Power Service Corporation

RSH/emc
Attachment

cc: R. C. Callen
G. Charnoff
R. W. Jurgensen
D. V. Shaller - Bridgman
J. G. Davis - NRC
J. E. Dolan

DONALD C. COOK NUCLEAR PLANT

Safety Evaluation of the Modified Feedwater Elbow Design and Installation of the Data Collection Instrumentation

Subsection 59 of 10 CFR Part 50 requires that each design change and/or test program be reviewed to determine whether or not the proposed change or test involves an unreviewed safety question. The safety review of the elbow design modifications and the instrumentation installation are discussed below.

The results of our review of the modifications/data collection instrumentation installation verify the acceptability of the Donald C. Cook Plant for continued safe operation in that they do not represent a potential safety hazard. The design change/data collection program, as described in our AEP:NRC:00216 submittal, will have no adverse effect on the health and safety of the general public.

The new 16 inch feedwater elbows are made from the same materials as the original elbows, that is, A234WPB carbon steel.

The feedwater elbow design has been improved by eliminating the sharp discontinuities inside the elbow caused by counterboring the original Schedule 80 elbow to match the Schedule 60 steam generator nozzle. In addition, the new elbow has been built up to a Schedule 80 thickness near the elbow to nozzle weld. These modifications reduce the stresses in the area adjacent to the elbow to nozzle weld and as such will not increase either the probability or the consequences of a design basis event. The modified elbow design will not lead to the malfunction of any equipment important to safety nor will it create the possibility for an accident of a different type than any evaluated in the safety analysis. The modified elbow design does not result in the reduction of the margin to any safety analysis limit.

Two feedwater lines in Unit No. 2 will be instrumented as part of our data collection/evaluation program. The objective of this program is to gather, and subsequently evaluate, information on steady state and transient conditions during normal operation from cold shutdown to 100% power. Evaluation of the data collected can aid in determining the cause of cracking in the feedwater elbows and verify the adequacy of the new elbow design. Any changes in power level made for the data collection program will be within the applicable Technical Specification limits.

The appropriate cable separation criteria and containment penetration provisions are met for the instrument cables used for this program.

A review of the Post Accident Combustible Gas Control Analysis for Unit No. 2, FSAR Section 14.3.6, indicates that the aluminum content of the data collection instrumentation, when added to the existing aluminum inventory inside containment, does not result in an aluminum inventory in excess of the analysis assumption.

DONALD C. COOK NUCLEAR PLANT

SPECIAL PROCEDURE GUIDE

FOR

FEEDWATER LINE DATA COLLECTION

1. Purpose

Information regarding displacement, pressure, temperature and strain will be collected during the performance of the sequence of events as outlined in section 8. The purpose of this program is to determine the amplitude and frequency of cyclic stresses on the feedwater lines. The feedwater lines to steam generators 2-1 and 2-3 are to be instrumented as outlined in section 3.2. The same locations on both lines are chosen to be instrumented in order to assure duplication of information. The results of this test will be applicable to both units.

2. Remarks

2.1 Personnel Categories

2.1.1 Test Coordinator - will be an I & M Power D.C. Cook Plant Performance Engineer

2.1.2 Test Consultant - will be a Brewer Engineering Laboratory person and/or AEPSC person.

3.0 Test Equipment

3.1 List of Test Instrumentation

3.1.1 Linear Accelerometers

Statham Instruments Inc.

3.1.1.1 Model A5-10-350

Range ± 10 g

Natural frequency 250 cps

Damping .7 ± .1 of critical

Direction of Sensitivity - perpendicular to base

Non-linearity & Hysteresis ± 1% of full scale

3.1.1.2 Model A6-15-350

Range ± 15g

Natural frequency 150 cps

Damping .7 ± .1 of critical

Direction of Sensitivity - perpendicular to long axis of accelerometer

Non-linearity & Hysteresis ± 1 % of full scale

3.1.2 Weldable Strain Gages

BLH Electronics

SR-4 gages

3.1.2.1 FNW Type

3.1.2.2 FNWFB Type

3.1.3 Thermocouple Compensators

Omega Engineering, Inc.

Type MCJ

Sensitivity ± 1.8°F (± 1°C)

Battery Type - Silver Oxide

3.1.4 Thermocouples

Chromel/Alumel Wire (Type K)

3.1.5 Pressure & Differential Pressure Transducers

3.1.5.1 Differential Pressure Transducers
BLH Electronics

Type	HMD	DHF
Range	± 100 psid	0 to 1000 psig
Line	5000 psig	5000 psig

Nonlinearity 0.25% of Rated Output
Repeatability 0.1% of Rated Output
Hysteresis 0.15% of Rated Output

3.1.5.2 Pressure Transducers
CEC 4-317 & 4-317-0001

Range 0 to 4000 psig; Line 5000 psig

3.1.6 Direct Current Differential Transformers

Trans-Teck

Model 354-000

Range ± 1 inch

3.2 Location of Instruments

For orientation and location of test instruments see attached sketches 2-Temp-07 (1 thru 12)

4.0 Prerequisites

4.1 Test Instrumentation is located per Section 3.2 and installed per existing state of the art techniques described by procedure 02-Temp-07.4.1.

4.2 Test instrumentation is calibrated per attached state of the art techniques(see 02-Temp-07.4.2).

4.3 The following system instrumentation shall be installed and checked as operational. (For manufacturer and model see section 3.0):

4.3.1 Twenty three thermocouples on each of feedwater loops 1 and 3 at positions shown on drawing 2-Temp-07 sheets 7 and 8.

4.3.2 One, or if possible, two thermocouples attached to pipe radiograph plug on each of feedwater line elbows

as shown on drawing 2-Temp-07 sheet 12.

4.3.3 Twelve temperature compensated FNWFB type weldable strain gages on feedwater line elbow and nozzle for each loop as shown in drawing 2-Temp-07 sheets 5 and 6. Two type FNW strain gages, assembled in a bridge to compensate for temperature, may be substituted for a single type FNWFB strain gage.

4.3.4 Three type FNW strain gages, one on one of the snubber rods at each snubber location at feedwater loop 1.

4.3.5 Thirteen accelerometers per loop on both loop 1 and 3 at the following locations and orientation (refer to drawing 2-Temp-07 sheet 4).

4.3.5.1 Nine accelerometers, one in each of the x, y & z axis at the steam generator elbow, the lower vertical elbow and the wide flange of the snubber on the horizontal pipe run. Two accelerometers, one each on the y & z axis at the lower horizontal elbow and two accelerometers, one each on the x & y axis midway between the two restraints on the vertical riser.

4.3.6 Ten Direct Current Differential Transformers (DCDT), two each, to measure pipe movement in the direction perpendicular to the pipe, at the four piping rupture restraints and the crane wall sleeve on both line 2-1 and 2-3.

4.3.7 Pressure Transducers at the following test connections FPI 210, FPI 230, FFI 210 and FFI 230 to measure any pressure surges in both auxiliary and main feedwater lines, and one at pressure tap on both loops 1 and 3 as shown in drawing 2-Temp-07 sheet 11.

4.3.8 Differential Pressure Transducers. at the following locations FFI-210, FFI-230 and FFC-230 or 231 as shown in drawing 2-Temp-07 sheet 10.

4.4 Oscillographs and magnetic tape decks are in place and operational.

4.5 Test Instrumentation is protected as shown by sketch No. 02-Temp-07.4.5.1 and installation procedure No. 02-Temp-07.4.5.2

4.6 Feedwater line has been reinsulated under direct supervision of Brewer Engineering Labs personnel.

4.7 Verification has been performed on sequence of connection of the test instrumentation to their proper recording channel.

4.8 Power circuits labeled Trans.21CMC, ABC 21-CMC-7,MCC2EZC-CS and MCC-2-CT-CS have been tagged to SOE to prevent de-energizing.

4.9 All testing personnel have been thoroughly briefed on performance of the test, and acknowledge that instructions are understood. See signoff sheet

4.10 SOE has notified test consultant that the Unit is ready to return to service.

4.11 Communications to the recording equipment area has been established with the control room.

4.12 Time Code generator is to be synchronized with control room clock.

4.13 Test coordinator is stationed in the control room throughout the test period with suitable communication with the recording equipment area.

4.14 Verify by sample that temperature compensator electronics are modified to accept silver oxide battery source.

4.15 DCDT's are reset sometime following step 8.? but before step 8.6.

4.16 The cold portion of the main feedwater system interference walk-down test as specified by AEPSC Piping and Valves Section letter to D.V. Shaller dated 6/11/79 has been completed.

4.17 Feedwater piping should be filled with water prior to step 8.1.

5.0 Precautions

5.1 SOE or unit forman shall notify test coordinator a minumum of 3 minutes prior to start of all transients. Test coordinator will immediately notify recording personnel. If plant evolutions are such that immediate operator response is necessary for an observed plant condition, no notification to test coordinator is necessary prior to the operator response. The test coordinator should endeavor to obtain as much data as possible from an unannounced transient which corresponds to one of the below listed events.

6.0 Acceptance Criteria

6.1 The data collection as outlined in section 7 will be considered acceptable if sufficient data is collected during the times specified in section 8. Instrumentation readings from any one of loops 1 or 3 or any combination will be considered sufficient with the approval of the test consultant.

6.2 Analyze the strain gage data to determine the magnitude and frequency of cyclic stresses due to pipe motion and temperature changes. Resulting cyclic stresses must be within the design allowable per ASME Section III Division I Figure I-9.1 (S/N) curves.

7.0 Data Collection

7.1 Record data during periods as specified in section 8 on both oscillograph and magnetic tape recorders.

7.2 Test instrumentation readings as recorded by either oscillograph (strip chart) or magnetic tape will be considered acceptable.

7.3 Data collected during steps 8.4 and 8.5 need not be recorded in any specific sequence.

7.4 Strain gage readings on snubbers need only be obtained at test consultants request.

7.5 DCDT readings will be recorded on data sheets or strip charts.

7.6 Tape Recorder Log Sheets are to be used to record sequence of events and each tape as well as each reel permanently identified.

7.7 RCS temperature for hot and cold legs shall be recorded from station instrumentation at each test sequence.

7.8 During performance of steps 8.6 and the following steps record main feedwater pump turbine speed using station instruments.

8.0 Sequence of Events

Data collection will take place during the following events in accordance with Acceptance Criteria specified in section 6.

8.1 Feedwater Line Displacement Test.

8.1.1 Displace feedwater pipe to some value slightly greatly than 1/4 inch perpendicular to horizontal run, in the horizontal direction, at lower horizontal elbow on either feedwater line 1 or 3 and record strain gage and accelerometer readings for 30 seconds.

8.1.2 Suddenly release the pipe and continue recording until stable conditions have been reached according to the judgment of the test consultant.

8.2 Record strain gage, accelerometer and DCDT readings for 1 minute prior to startup of each reactor coolant pump and continue recording after pump has started until readings have stabilized as determined by the test consultant.

8.3 Thermocouple, strain gage, accelerometer, pressure transducer and DCDT readings will be recorded for a period of 3 minutes during heat-up when the Reactor Coolant Temperatures are at the following values:

8.3.1 200°F ± 25°F

8.3.2 300°F ± 25°F

8.3.3 400 F ± 25°F

8.3.4 500°F ± 25°F

8.3.5 Hot Standby Conditions

8.4 In the event that steam generator 1 or 3 is fed with auxiliary feedwater during heat-up, the test consultant may, at his own judgement, record thermocouple, strain gage, pressure and accelerometer readings 1 minute prior to auxiliary feedpump start up and continue to record until stable conditions are reached according judgement of test consultant.

8.5 When the unit is at hot standby, record pressure transducer, thermocouple, strain gage, DCDT and accelerometer readings during at least two events of startup of auxiliary feedpumps to either steam generator 1 or 3 and continue to record until at least five minutes after stop of flow.

8.6 When unit is at hot stand-by, and when steam generator 3 is expected to receive a fairly constant rate of auxiliary feedwater flow for an extended period, pressure transducer, thermocouple, strain gage, DCDT and accelerometer readings will be recorded for a period of three minutes at least twice.

8.7 Hi Aux FW flow check. Let SG No. 1 or 3 level decrease to Low alarm point. Immediately start AFW pump on associated steam generators, and rapidly open associated FMO valve until AFW flow of 150 gpm is reached. When SG level returns to normal level, close associated FMO valve. Secure running AFW pump if necessary. Start data recording equipment just before reaching low level alarm point and record data for 3 minutes after FMO associated valve is closed again.

8.8 Pressure transducer, thermocouple, DCDT, strain gage and accelerometer readings will also be recorded under the following conditions:

8.8.1 One minute prior to startup of first main feedwater pump continuing until both steam generator 1 and 3 are on main feedwater and the flow has stabilized according to judgment of test consultant.

8.8.2 During power ascension, every 10% ± 2% of power level up until startup of second feedwater pump, for at least three minutes at each level.

8.8.3 From one minute prior to startup of the second feedwater pump until stable conditions are met after pump start, according to judgement of test consultant.

8.8.4 During continuation of power ascension every 10% ± 2% power level until full power, for at least three minutes.

8.8.5 From one minute prior to turbine valve sequence test for main stop valves until stable conditions are met according to judgement of test consultant.

8.8.6 For three minutes every hour at full load or during any one hour period that the system is maintained at steady state. Full load will be considered as any load anywhere above 3200 MW_{th}.

8.9 Trip reactor according to plant procedures. Record pressure transducer, thermocouple, DCDT, strain gage and accelerometer readings one minute prior to reactor trip and continue until readings have stabilized according to judgement of test consultant .

8.10 The test consultant may decide, at his own discretion, to record instrumentation readings at any time during the test period.

STEAM GENERATOR NOZZLE AND ELBOW STRAIN GAGE AND THERMOCOUPLE INSTALLATION PROCEDURE

02-TEMP-07.4.1

1. Layout the strain gage and thermocouple locations in accordance with the AEP sketches. Mark the locations centerlines using a magic marker.

2. Smooth and polish the surface at each location using an 80-100 grit disc grinder with a rubber backing disc. An area approximately 4 inches in diameter is required for each strain gage. An area approximately 1 inch in diameter is required for the thermocouples.

3. Layout the locations again and mark the centerlines with a pencil.

4. Clean the metal surface using a tissue wet with an industrial cleaner. (Solvent)

5. Set up the resistance spot welder for an energy level of 10-12 Watt seconds. Test the welder by making one spot at the corner of a test sample provided with the strain gages. Remove the test sample by pulling with pliers. A clean hole approximately .020 inches in diameter should be observed in the test sample.

6. Position the strain gage over the centerlines and align the strain gage.

7. Tack the strain gage to the surface using one spot weld at one end of the strain gage. Check the gage alignment and adjust if necessary. Continue the spot welding until completed, in accordance with the manufacturers' recommendations.

8. Align and spot weld ceramic terminals at each end of the strain gages.

9. Connect the nichrome foil strain gage leads to the terminals and check the strain gage for continuity and leakage.

10. Complete the Wheatstone bridge circuit wiring and again check continuity and leakage.

11. Attach the cable leads to the terminals and make the final continuity and leakage check.

Thermocouple Installation Following Step 5:

12. Strip the thermocouple leads for a length of ½ inch and spread the leads apart from each other.

13. Using the flat face of a small ball peen hammer flatten the leads to a thickness of approximately .015 inches.

14. Position the two thermocouples leads each side of the location and at 1/16 inch spacing and spot weld the leads to the surface using several spots.

15. Check the thermocouple operation using a potentiometer.

02-TEMP-07.4.2
CALIBRATION PROCEDURE

Electrical Shunt Calibration for strain gages:

$$\text{Microinch/inch} = \frac{R \times 10^6}{(G.F.)\ (B.F.)\ (R + Rsh)}$$

R: gage resistance
G.F.: gage factor
B.F.: Bridge factor
Rsh: Shunt resistor

A resistor is used to shunt one arm of the wheatstone bridge to simulate the strain. The value is calculated by using the above stated formula. Typical values for the shunt resistors are 121K, 243K, 499K etc. When one arm of the strain gage bridge is shunted, a step function is observed on the oscillograph. By measuring the deflection, calibration value in terms of microinches/inch per inch of deflection is determined. strain is converted in to stress by using appropriate modulus of elasticity.

D.C.D.T. Calibration

Using holding jig equipped with micrometer-

Adjust DCDT in the fixture so that Digital Volt Meter (DVM) reads 0 volts.

Move micrometer ±1" in steps of 0.25" and note down the DVM reading.

Use linear regression to determine the calibration value in inches per volt.

Pressure Cells Calibration:

All pressure cells will be calibrated in the laboratory using dead weight pressure tester. Only electrical calibration will be performed prior to testing. Procedure will be the same as that of strain gage calibration.

Accelerometer Calibration:

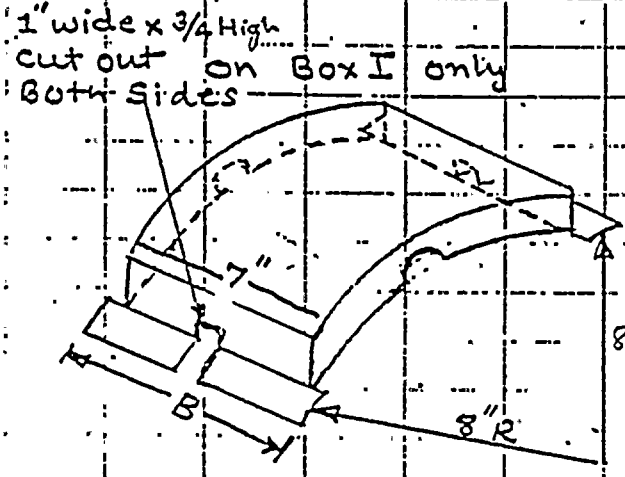
Accelerometers will be calibrated by placing the accelerometer such that its sensitive axis is vertical. Note down the reading. Turn the accelerometer upside down and note down the reading. Determine the calibration in terms of microinches/inch per "g". Electrical calibration will be performed prior to testing same as that of strain gages.

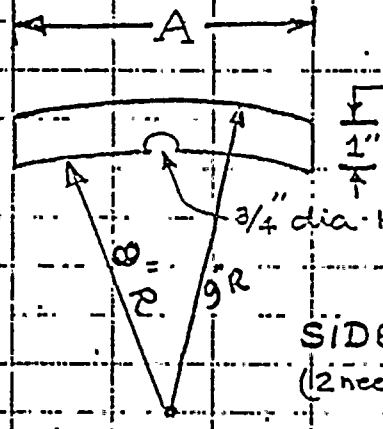
6/11/79

02-TEMP-07.4.5.1

PROTECTIVE COVERS FOR STRAIN GAGES

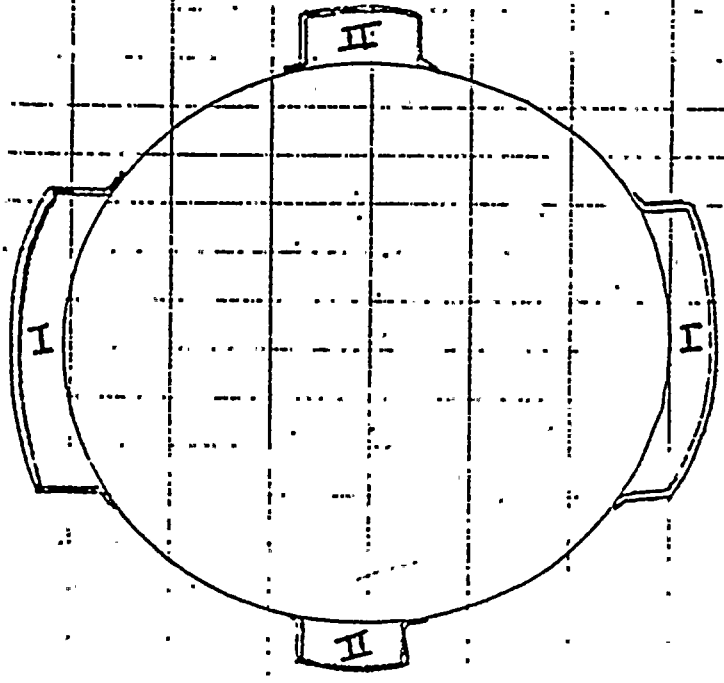
BOX	Dim. A	Dim B	QTY
I	6"	8"	4
II	2"	8"	4





SIDE PANEL
(2 needed per box)

material: 0.020 sheet metal



02-TEMP-07.4.5.2
INSTALLATION PROCEDURE FOR PROTECTIVE COVERS

After completion of the strain gage installation & cable hook up, clean the surrounding area of the size of a protective cover with an approved cleaner.

Place the cover over installation so that the cables from strain gages come out thru the side hole and then cement it down with a high temperature epoxy cement.

Tack weld small strips of shim stock (0.003") to the cover and pipe (use same spot welder as for gages).

Band the covers on to the pipe during epoxy cure if necessary.

A.E.P.S.C. - M.E.D.

INSTRUMENTATION AND CONTROLS SECTION

ADMINISTRATIVE INSTRUCTION AND DESIGN PROCEDURE

ENGINEERING CONTROL PROCEDURE

DRAWING REVISION NO.	CONTROLLED DISTRIBUTION FOR E.C.P. PACKAGE REVISION DESCRIPTION AND AUTHORIZING DOCUMENT I.D.	I = INITIAL ISSUE ✓ = REVISED THIS ISSUE DIGITAL	ANALOG	LOGIC DIAGRAM	SCHEMATIC DIAGRAM	CALIBRATION DATA	CALCULATIONS		REVISION BY	APPROVED BY DATE ISSUED
0	ISSUED AS PER RFC-DC-02-2394				I				LJH 6-4-75	[signature] 6-14-75

A.I.D. E.C.P. 1
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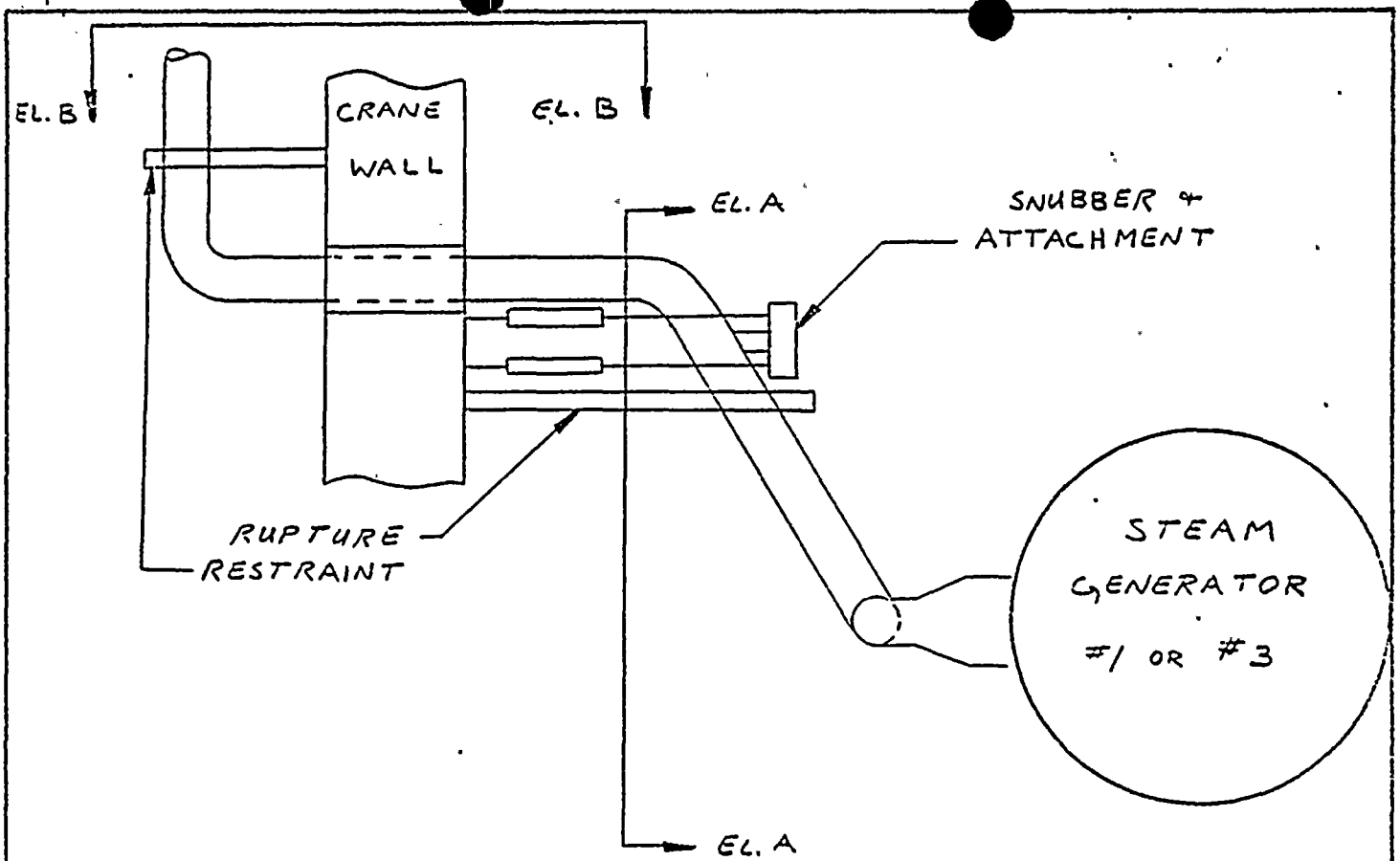
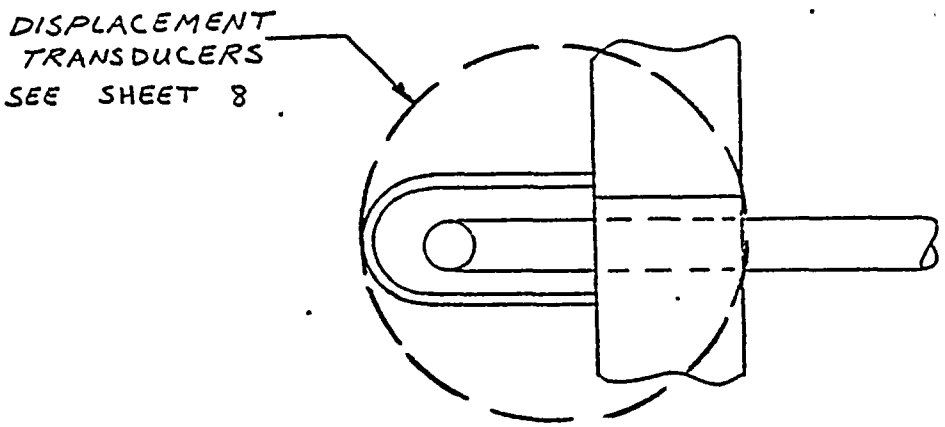
PLANT D.C. COOK
E.C.P. PACKAGE REVISION RECORD

STEAM GENERATOR — FEEDWATER ELBOW TEST

DWG. 2-TEMP-07
SHEET 1 OF 12



PLAN



EL. B-B

AMERICAN ELECTRIC POWER SERVICE CORPORATION			INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R.L. SHOBERG DR L.J. HOLLAND CH R.L.S. DATE 5-31-79	APPROVED BY	INST. & CONTROLS SECTION 6/14/79	PLANT D.C. COOK STEAM GENERATOR - FEEDWATER ELBOW TEST F.W. TEST INSTRUMENTATION
			DWG. 2-TEMP-07 REV. 0 SHEET 2 OF 12

A.I.D. E.C.P. 2a
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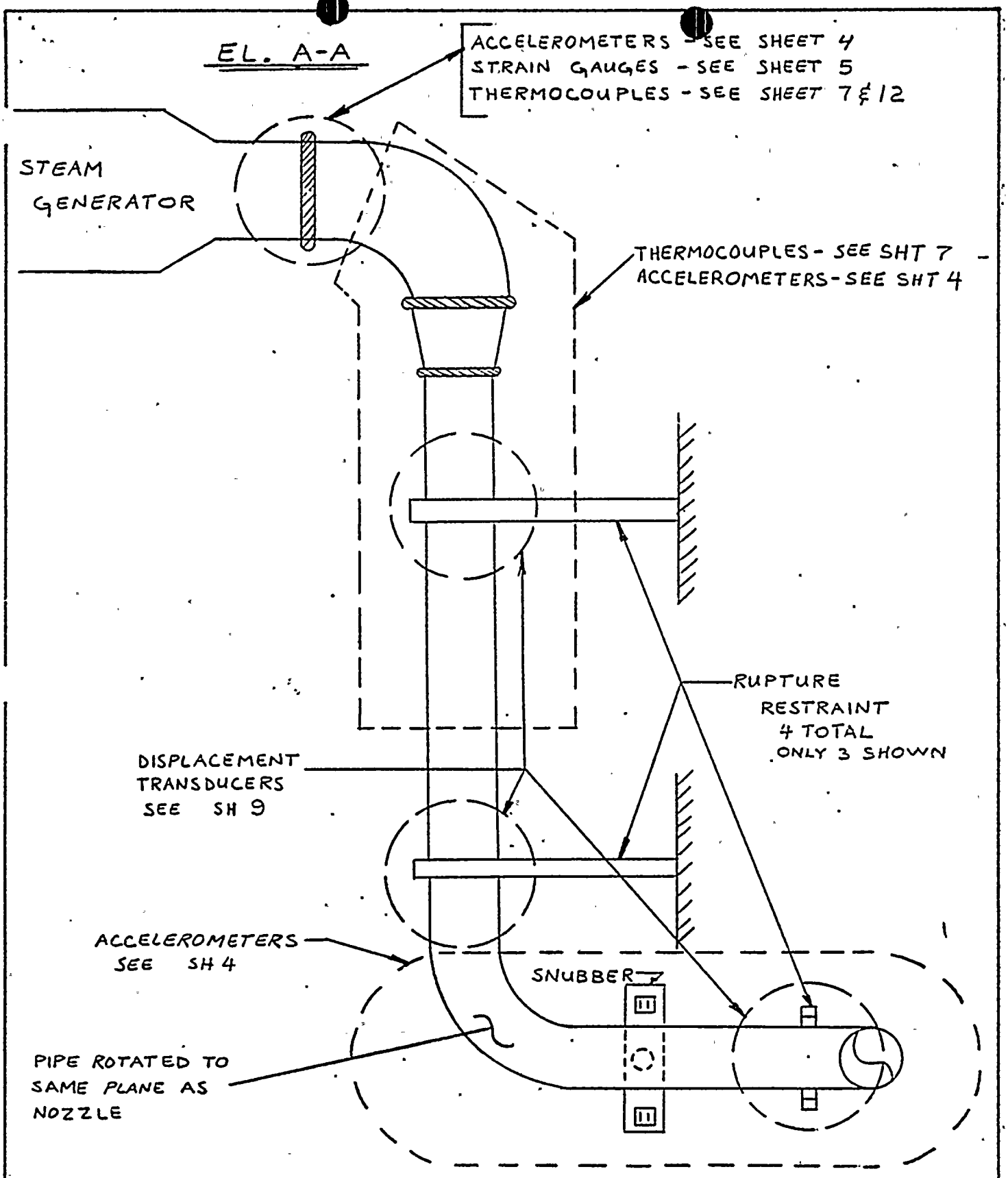
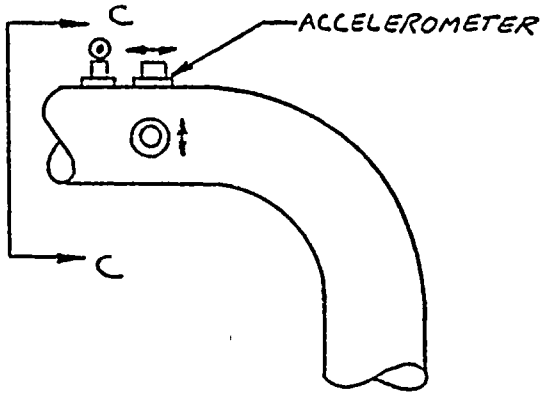
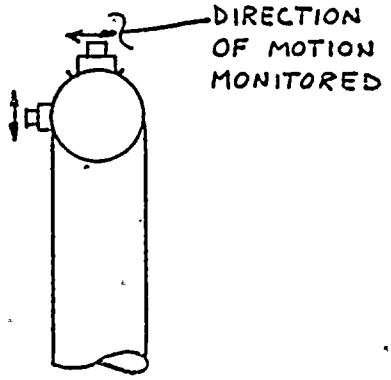


AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R.L. SHOBERG DR L. J. HOLLAND CH R.S.S. DATE 5-31-79	APPROVED BY INST. & CONTROLS SECTION 6/19/79	PLANT D.C. COOK STEAM GENERATOR - FEEDWATER ELBOW TEST F.W. TEST INSTRUMENTATION
		DWG. 2-TEMP-07 REV. 0 SHEET 3 OF 12

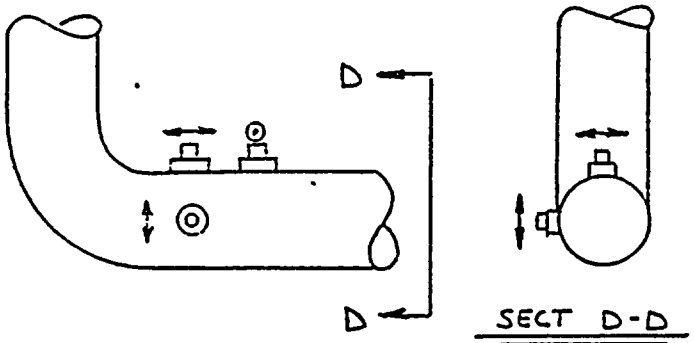
A.I.D. E.C.P. 2a
052378



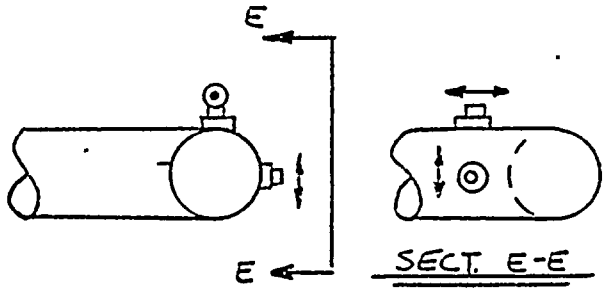
STEAM GENERATOR
ELBOW #1



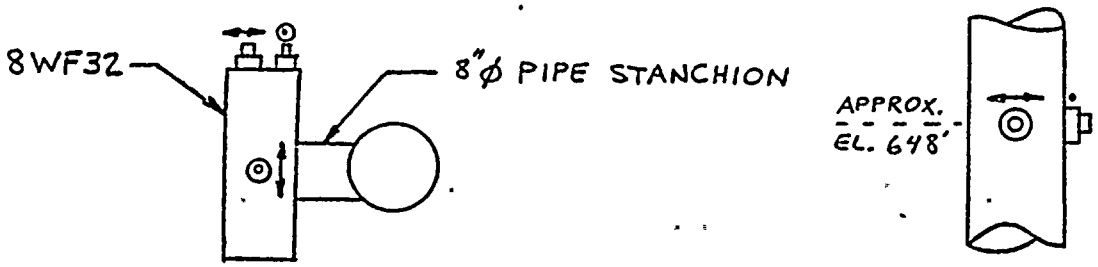
SECT. C-C



LOWER VERTICAL
ELBOW #2



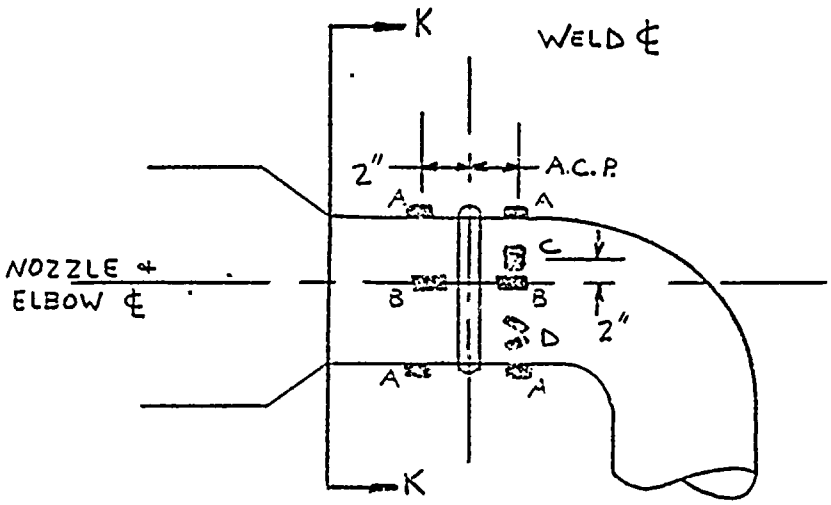
LOWER HORIZONTAL
ELBOW #3

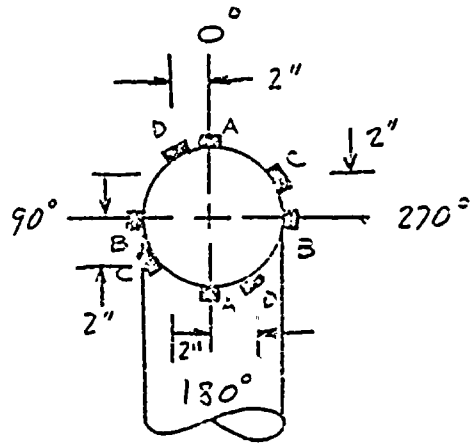


SNUBBER ATTACHMENT

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R.L. SHOBERG DR L. J. HOLLAND CH R.L.S. DATE 5-31-79	APPROVED BY INST. & CONTROLS SECTION C6T#79	PLANT D. C. COOK
		STEAM GENERATOR - FEEDWATER ELBOW TEST ACCELEROMETERS
		DWG. 2-TEMP-07 REV. 0 SHEET 4 OF 12

A.I.D. E.C.P. 2a
052378





SECTION K-K

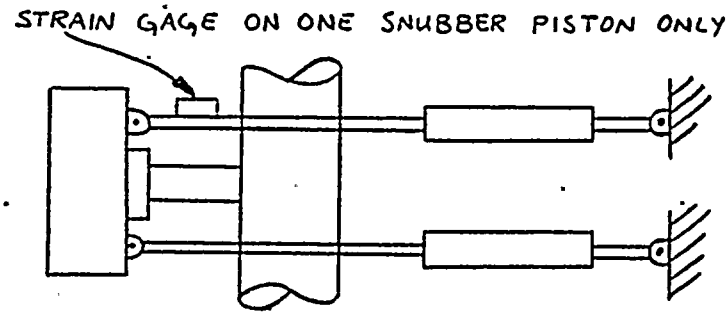
A - VERTICAL BENDING

B - HORIZONTAL BENDING

C - AXIAL

D - TORSION

A.C.P. = AS CLOSE AS POSSIBLE



TYPICAL

OTHER SNUBBERS ARE SINGLE PISTON

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R.L. SHOBERG DR L. J. HOLLAND CH R.P.S. DATE 6-1-79	APPROVED BY INST. & CONTROLS SECTION CS1479	PLANT D.C. COOK STEAM GENERATOR – FEEDWATER ELBOW TEST STRAIN GAUGES
		DWG. 2-TEMP-07 REV. 0 SHEET 5 OF 12

A.I.D. E.C.P. 2a
052378

A.I.D. E.C.P. 2a
052378

AMERICAN ELECTRIC POWER SERVICE CORPORATION

INSTRUMENTATION & CONTROL E. C. P. SKETCH

LD ENG M. PERLMAN
DR L. J. HOLLAND
CH R. D. S.
DATE 6-13-79

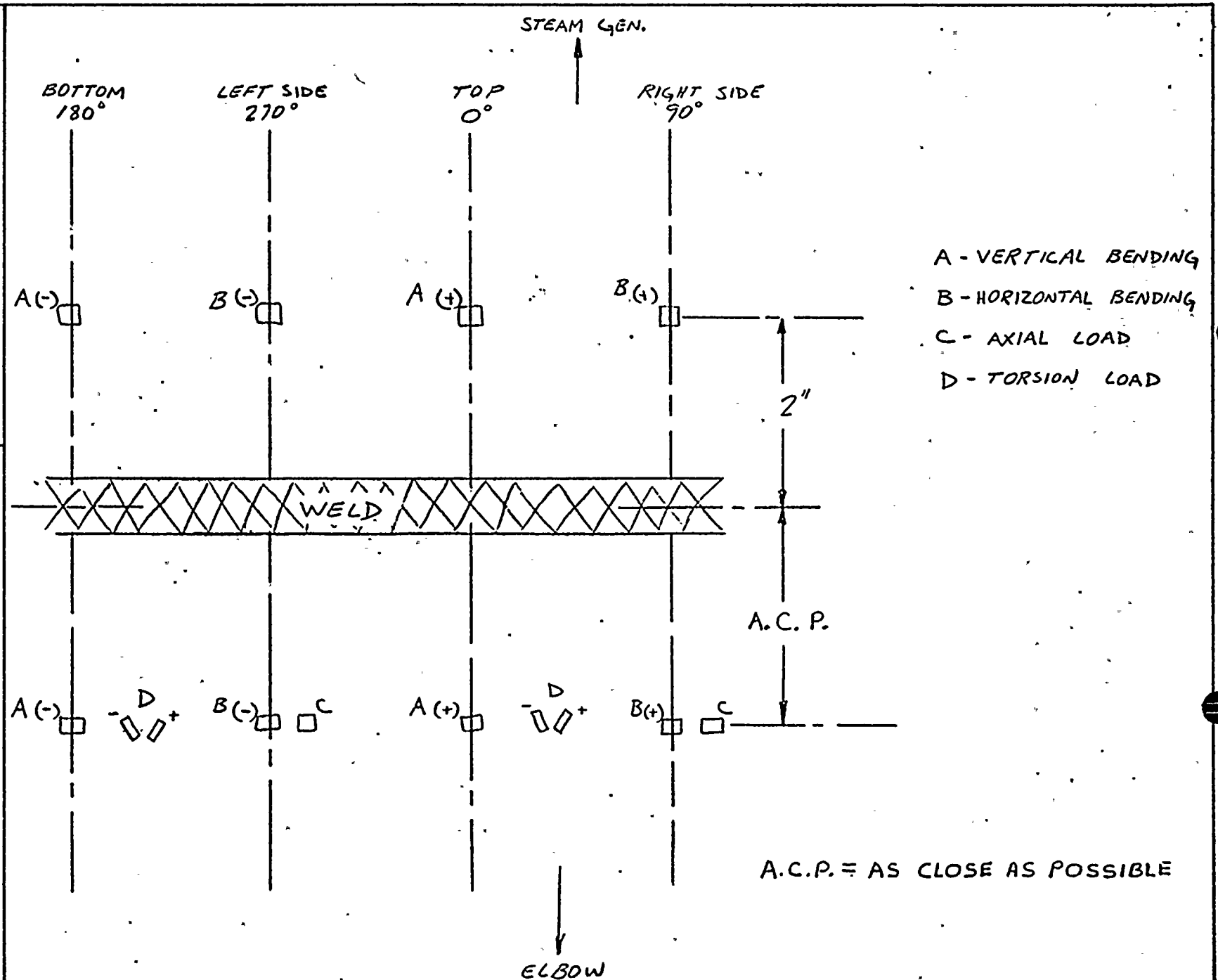
APPROVED BY INST. & CONTROLS SECTION

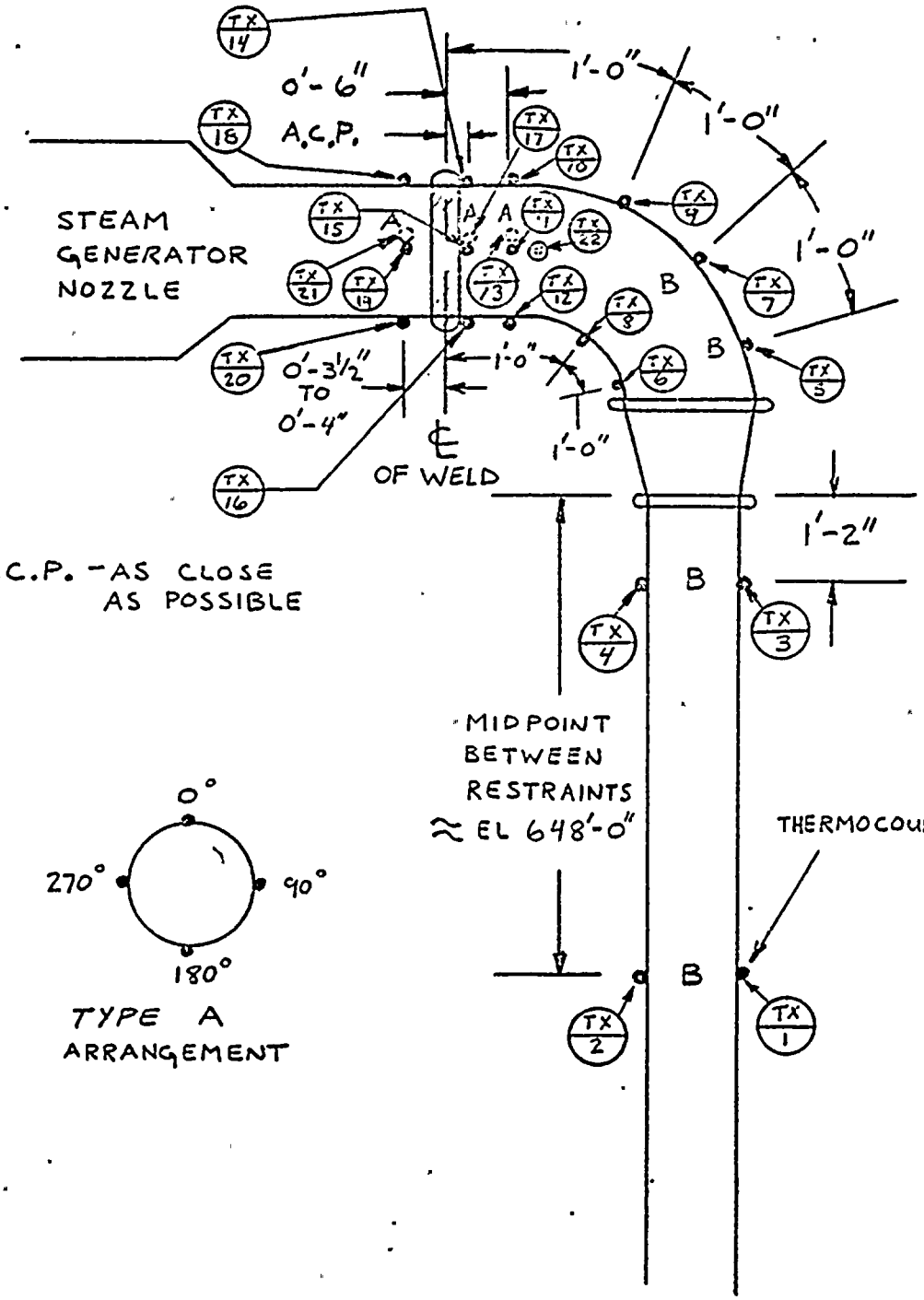
06/479

PLANT D.C. COOK

STEAM GENERATOR - FEEDWATER ELBOW TEST
STRAIN GAUGES LAYOUT & NUMBERING

DWG. 2-TEMP-07 REV. 0 SHEET 6 OF 12



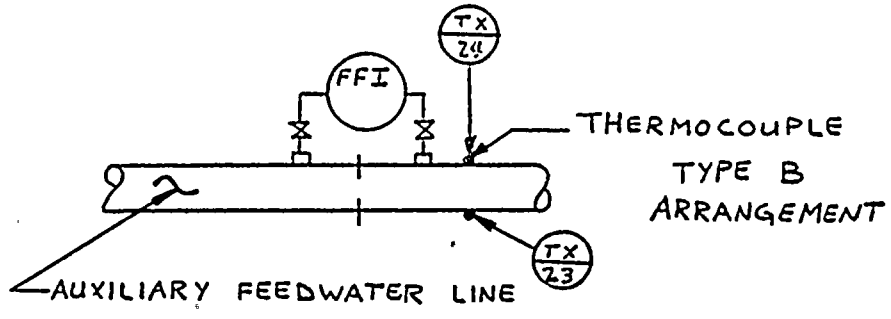


0° IS LONG RADIUS SIDE OF ELBOW

180° IS SHORT RADIUS SIDE OF ELBOW

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R. L. SHOBERG DR L. J. HOLLAND CH R. L. S. DATE 6-1-79	APPROVED BY INST. & CONTROLS SECTION C67479	PLANT D.C. COOK STEAM GENERATOR - FEEDWATER ELBOW TEST THERMOCOUPLES
		DWG. 2-TEMP-07 REV. 0 SHEET 7 OF 12

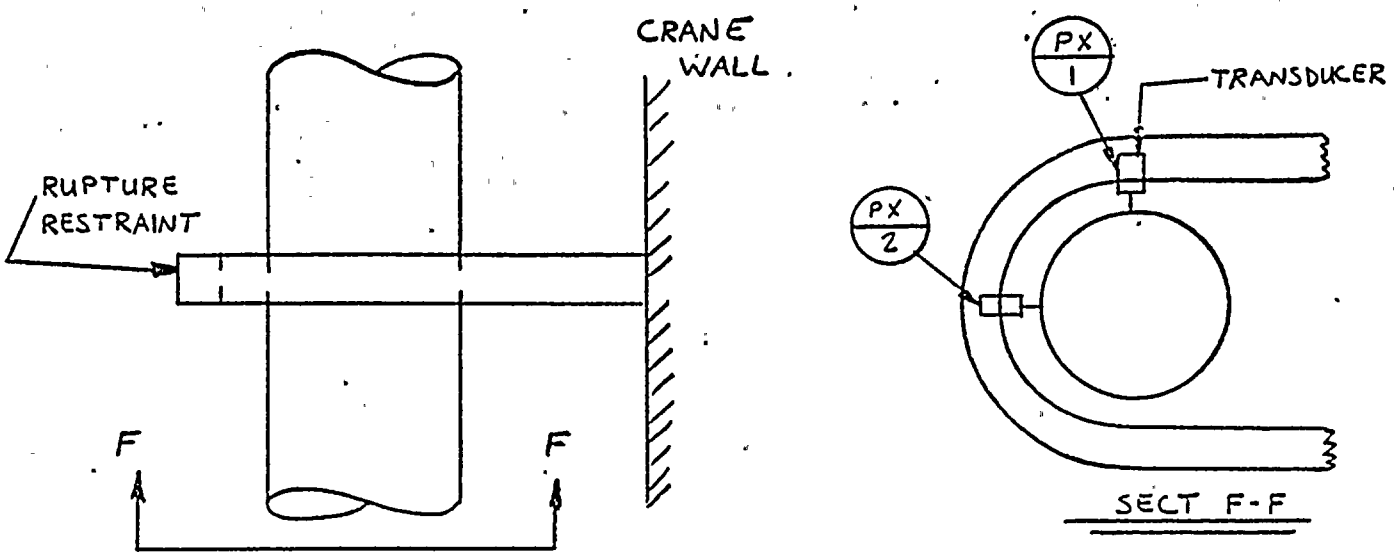
A.I.D. E.C.P. 7a
052378



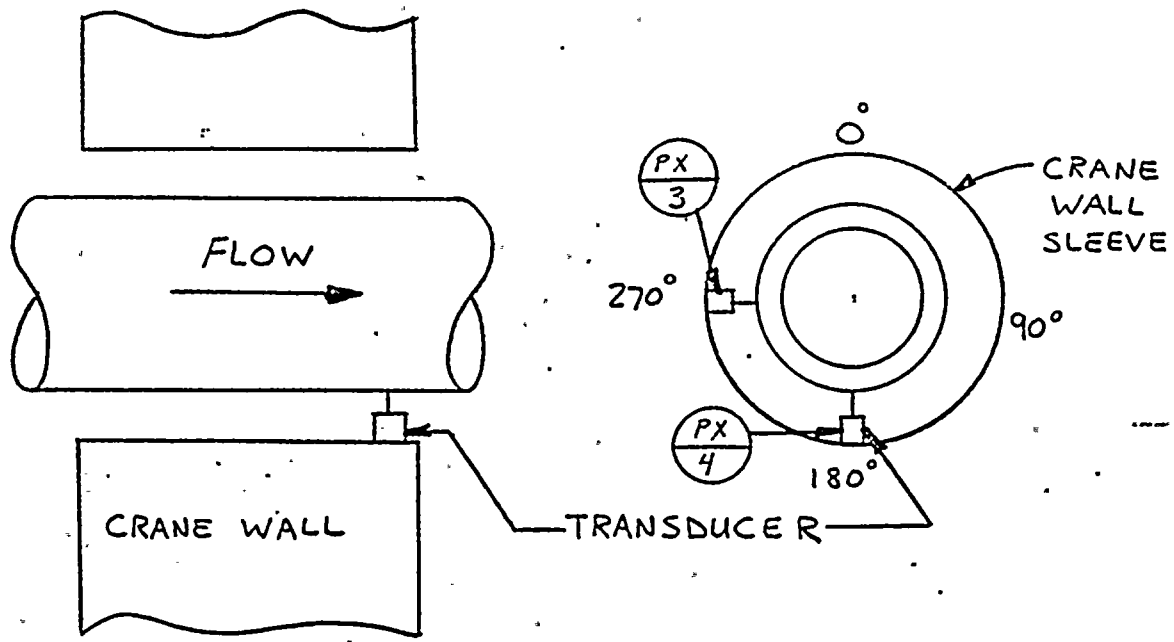
ARRANEMENT ADJACENT TO
FFI-210 & FFI-230

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R.L. SHOBERG DR L. J. HOLLAND CH R.L.S. DATE 6-1-79	APPROVED BY INST. & CONTROLS SECTION 06/4/79	PLANT D.C. COOK STEAM GENERATOR — FEEDWATER ELBOW TEST THERMOCOUPLES
		DWG. 2-TEMP-07 REV. 0 SHEET 8 OF 12

A.I.D. E.C.P. 2a
052378



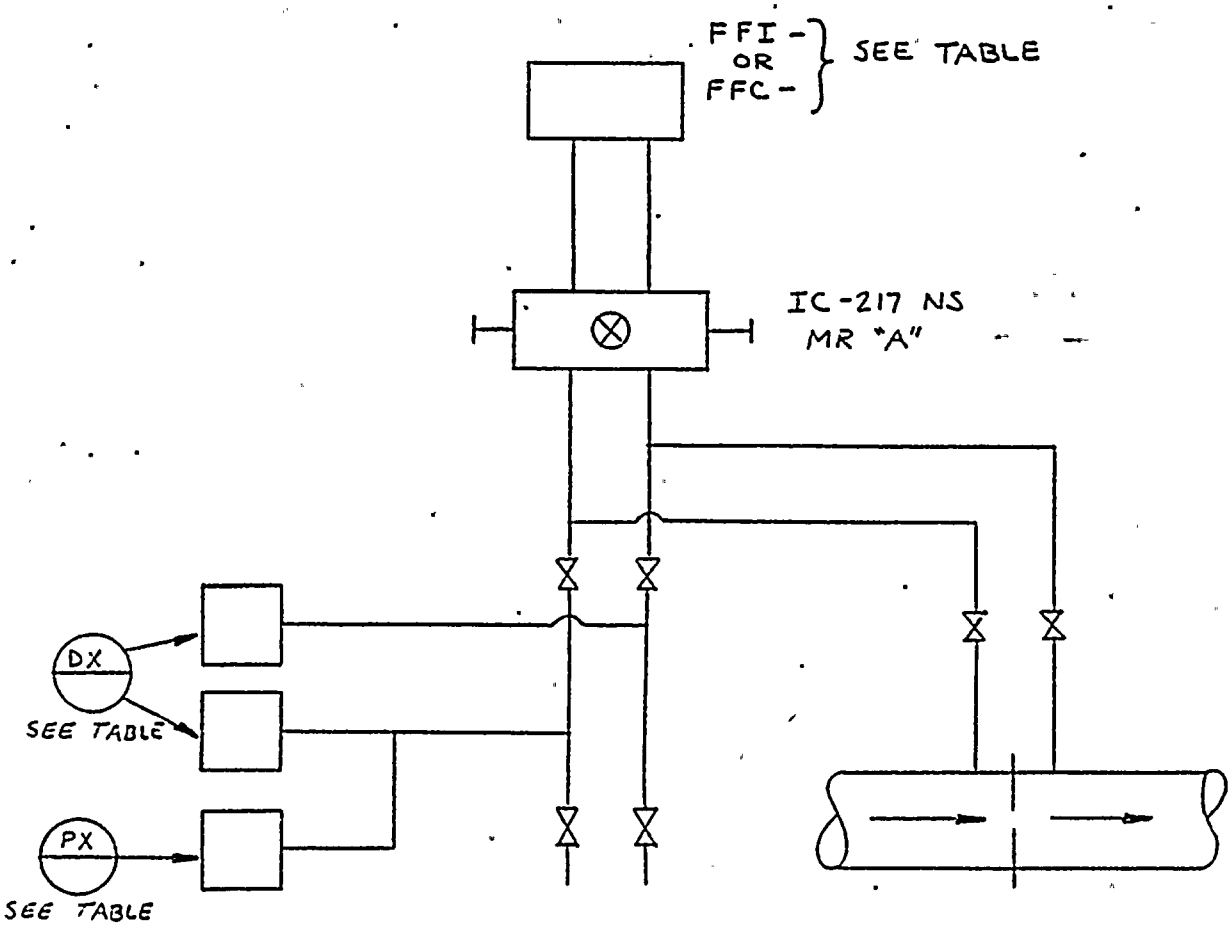
ALL TRANSDUCERS MOUNTED IN PLANE OF RUPTURE RESTRAINT



ALL DCDTs TO BE MOUNTED ON OPPOSITE SIDE OF DIRECTION OF PIPE MOTION

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R.L. SHOBERG JR L.J. HOLLAND CH R.P.S. DATE 6-1-79	APPROVED BY INST. & CONTROLS SECTION 061479	PLANT D.C. COOK STEAM GENERATOR – FEEDWATER ELBOW TEST DISPLACEMENT TRANSDUCERS
		DWG. 2-TEMP-07 REV. 0 SHEET 9 OF 12

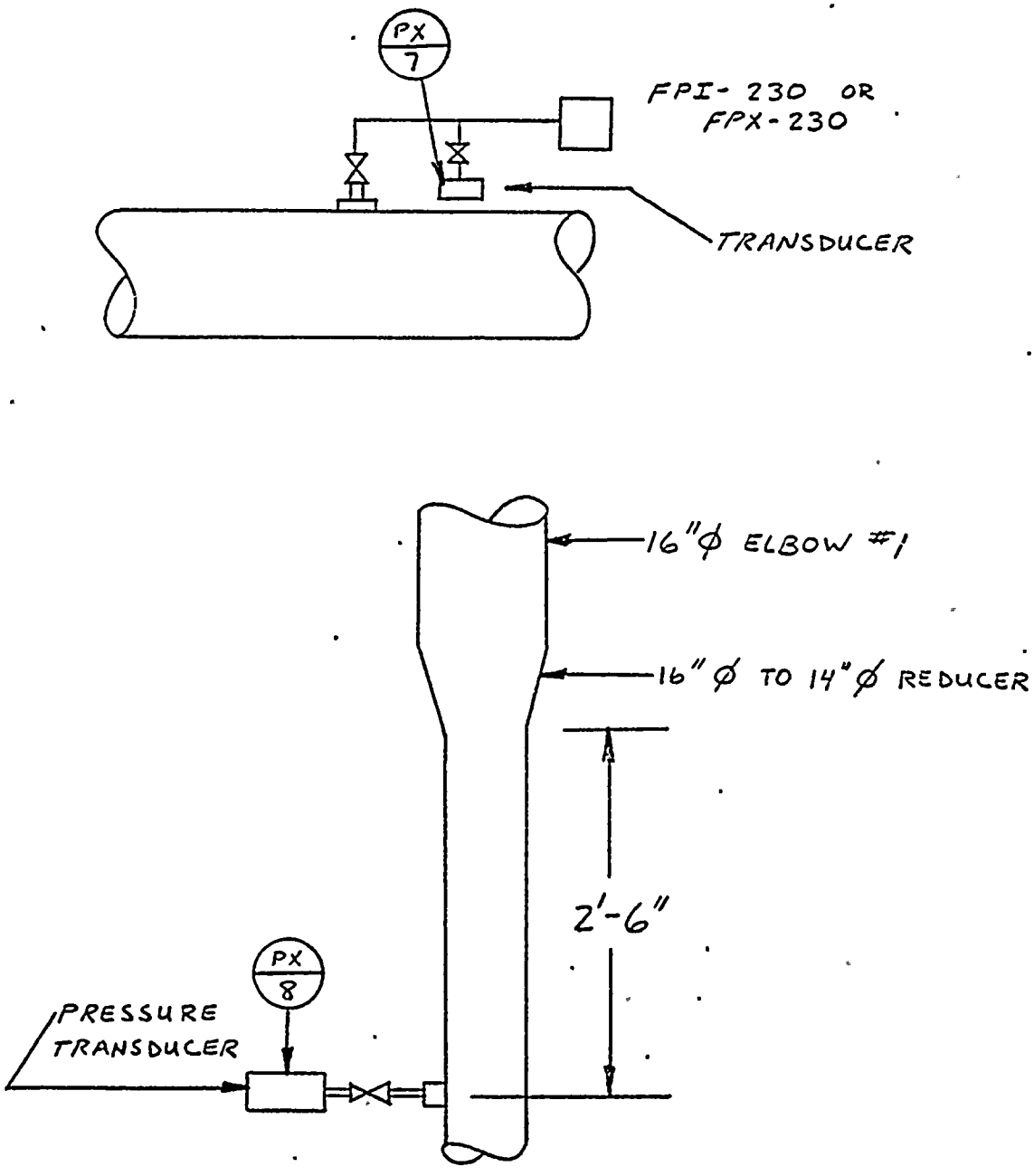
A.I.D. E.C.P. 2a
052378



TAG	PX	DX	DESCRIPTION
FFI-210	5	1	AUXILIARY FEEDWATER TO STEAM GENERATOR 1
FFI-230	6	2	AUXILIARY. FEEDWATER TO STEAM GENERATOR 3
FFC-230 OR FFC-231.	—	3	MAIN FEEDWATER TO STEAM GENERATOR 3

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG M. PERLMAN R L. J. HOLLAND CH R. E. S. DATE 6-1-79	APPROVED BY INST. & CONTROLS SECTION 06/479	PLANT D.C. COOK STEAM GENERATOR - FEEDWATER ELBOW TEST PRESSURE TRANSDUCERS
		DWG. 2-TEMP-07 REV. 0 SHEET 10 OF 12

A.I.D. E.C.P. 2a
052378

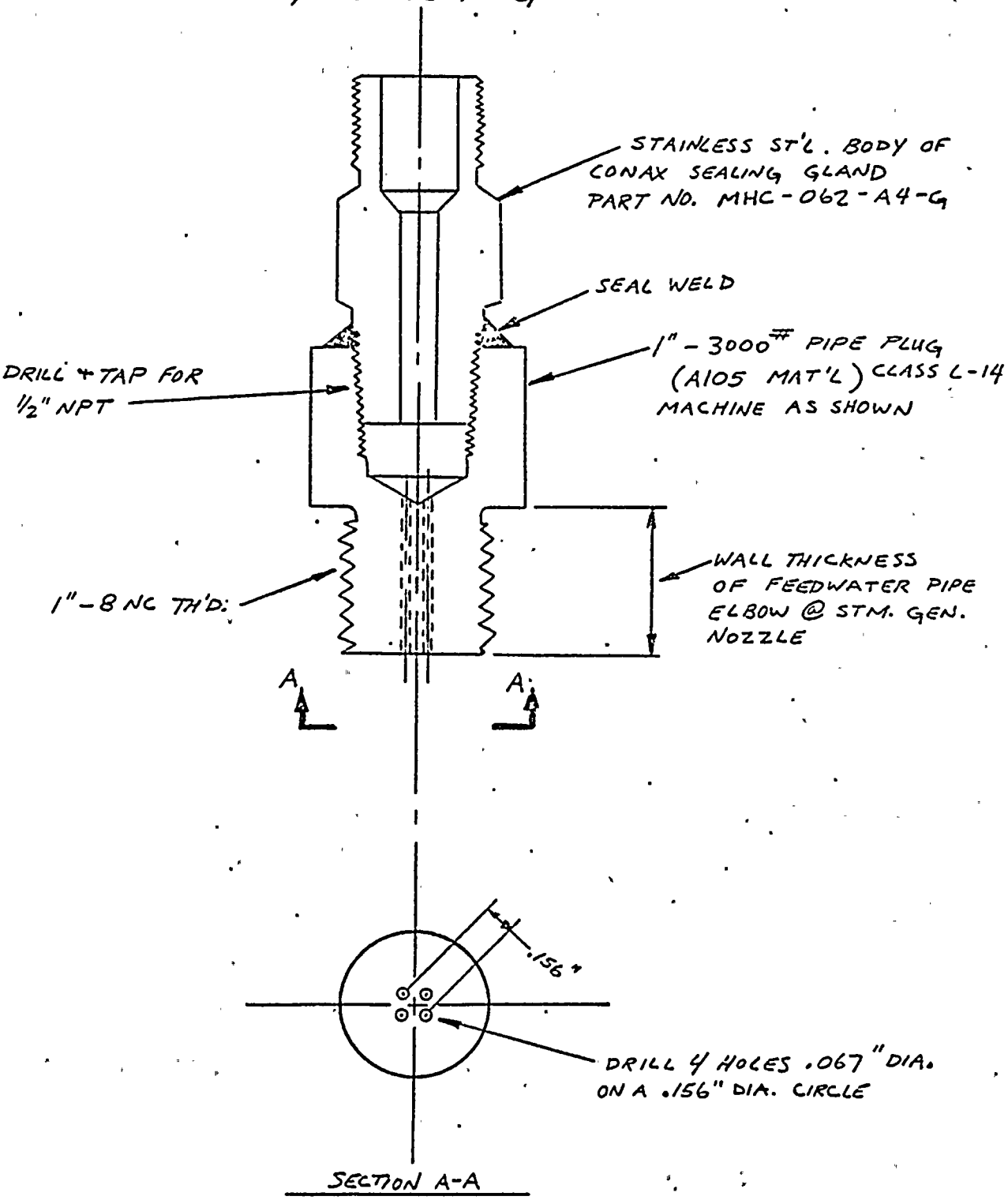


MAIN FEEDWATER PRESSURE

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG R. L. SHOBERG DR L. J. HOLLAND CH R. P. B. DATE 6-1-'79	APPROVED BY INST. & CONTROLS SECTION 6-14-79	PLANT D. C. COOK STEAM GENERATOR – FEEDWATER ELBOW TEST PRESSURE TRANSDUCERS
		DWG. 2-TEMP-07 REV. 0 SHEET 11 OF 12

A.I.D. E.C.P. 2a
052378

1. MACHINE 1" PIPE PLUG AS SHOWN
2. CAREFULLY REMOVE INTERNALS OF SEALING GLAND
3. SCREW GLAND BODY INTO PIPE PLUG
4. SEAL WELD GLAND BODY TO PIPE PLUG



SECTION A-A

AMERICAN ELECTRIC POWER SERVICE CORPORATION		INSTRUMENTATION & CONTROL E. C. P. SKETCH
LD ENG M. PERLMAN DR L. J. HOLLAND CH R.L.S. DATE 6-13-79	APPROVED BY: INST. & CONTROLS SECTION 6/19/79	PLANT D.C. COOK STEAM GENERATOR - FEEDWATER ELBOW TEST ASSEMBLY OF RADIOGRAPH PLUG & CONAX SEALING GLAND FOR TX-22 THERMOCOUPLE DWG. 2-TEMP-07 REV. 0 SHEET 12 OF 12

A.I.D. E.C.P. 2a
052378