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SUBJECT: Forwards preliminary SG info, consisting of data from SG
 tube rupture investigation.

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102-02533-TRB/JRP

June 14, 1993

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 2
Docket No. STN 50-529
Preliminary Steam Generator Information
File: 93-056-026

The purpose of this letter is to provide you data from the PVNGS Unit 2 Steam Generator tube rupture investigation. Please note that this information is in preliminary form and has been marked as such. A summary list is also enclosed for your information.

Should you have any questions, please contact J. R. Provasoli at (602) 393-5730.

Sincerely,

Richard G. Bradish for

Thomas R. Bradish, Manager
Nuclear Regulatory Affairs

TRB/JRP/ap

Enclosure

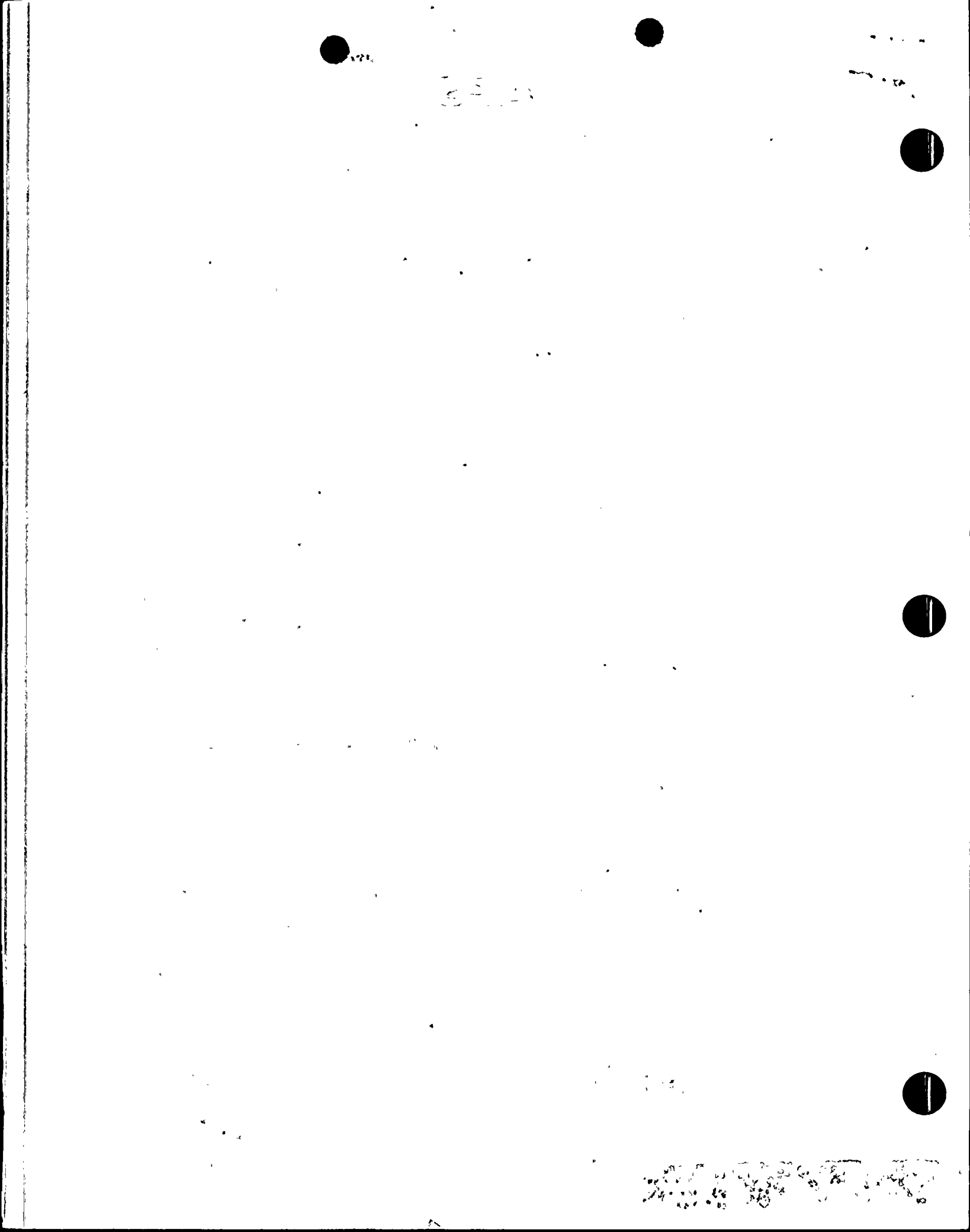
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K. E. Perkins
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160063

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Aool
11



SUMMARY LIST

June 14, 1993

Revision A

IV. SUBSEQUENT ACTIVITIES

A. ORIGINAL SCOPE OF ECT FOR UNIT 2

B. ECT INITIAL RESULTS

MISCELLANEOUS

PRELIMINARY LAB RESULTS

TUBE NO.	R 117 C	40
	R 116 C	41
	R 29 C	24
	R 22 C	13
	R 103 C	156
	R 105 C	156
	R 117 C	144
	R 127 C	140

9306180024

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IV. SUBSEQUENT ACTIVITIES

A. ORIGINAL SCOPE OF ECT FOR UNIT 2

Original Scope of eddy current testing for Unit 2's 4th refueling outage was developed based on: Technical Specification Surveillance requirements, EPRI recommendations, and consideration of the type and location of previously identified flaws and/or indications.

Previous tubing indications that had been identified in Palo Verde's SGs included:

- Axial cracking found at the top of the tubesheet in Unit 1.
- Axial cracking found at the 01H flow distribution ^{plate} baffle in Unit 2.
- Axial cracking found above the 09H free span in Unit 2.
- Wear at the cold leg corners, batwings, ^{edge} and vertical straps.
- Loose parts with and without associated wear.

Problems identified by other utilities, vendors, and the NRC have included:

- Circumferential and axial cracking at the tubesheet and/or tube supports.
- Denting and cracking next to the stay rods.
- Cracking in short radius bends.
- Crevice cracking or attack in non-expanded tubes.



IV. SUBSEQUENT ACTIVITIES (cont.)

A. ORIGINAL SCOPE OF ECT FOR UNIT 2 (cont.)

The original scope included bobbin coil examinations on 100% of the tubes in each Unit 2 SG. Inspection was planned using the motorized rotating pancake coil (MRPC) for a minimum of 10% of the tubes at the expansion transition and first support locations on the hot leg side.



IV. SUBSEQUENT ACTIVITIES (cont.)

B. ECT INITIAL RESULTS

The fourth refueling outage for Palo Verde Unit 2 began on March 14, 1993, due to a steam generator tube rupture. The original outage was scheduled to begin on March 20, 1993. The initial examination plan for both steam generators was a 100% full length bobbin examination with approximately 10% of the tubes to be tested using MRPC for the 01H and TSH intersections. The tubes were to be examined full length with the exception of some row 1, 2 and 3 tubes which were to be examined through the U-bend from both the hot and cold legs.

After the manways were removed, the secondary side of steam generator 22 was filled until the leaking tube could be identified. Visual examination confirmed that row 117 line 144 was the leaking tube. Eddy current probes and a Welch Allyn video probe were used to characterize the tube leak. Based on the information provided by the probes, an approximately 8-inch long mid-span axial indication located 34 inches above the 08H support was identified. A 2-inch long "fishmouth" rupture was found in this tube starting one inch above the start of the 8-inch axial indication.

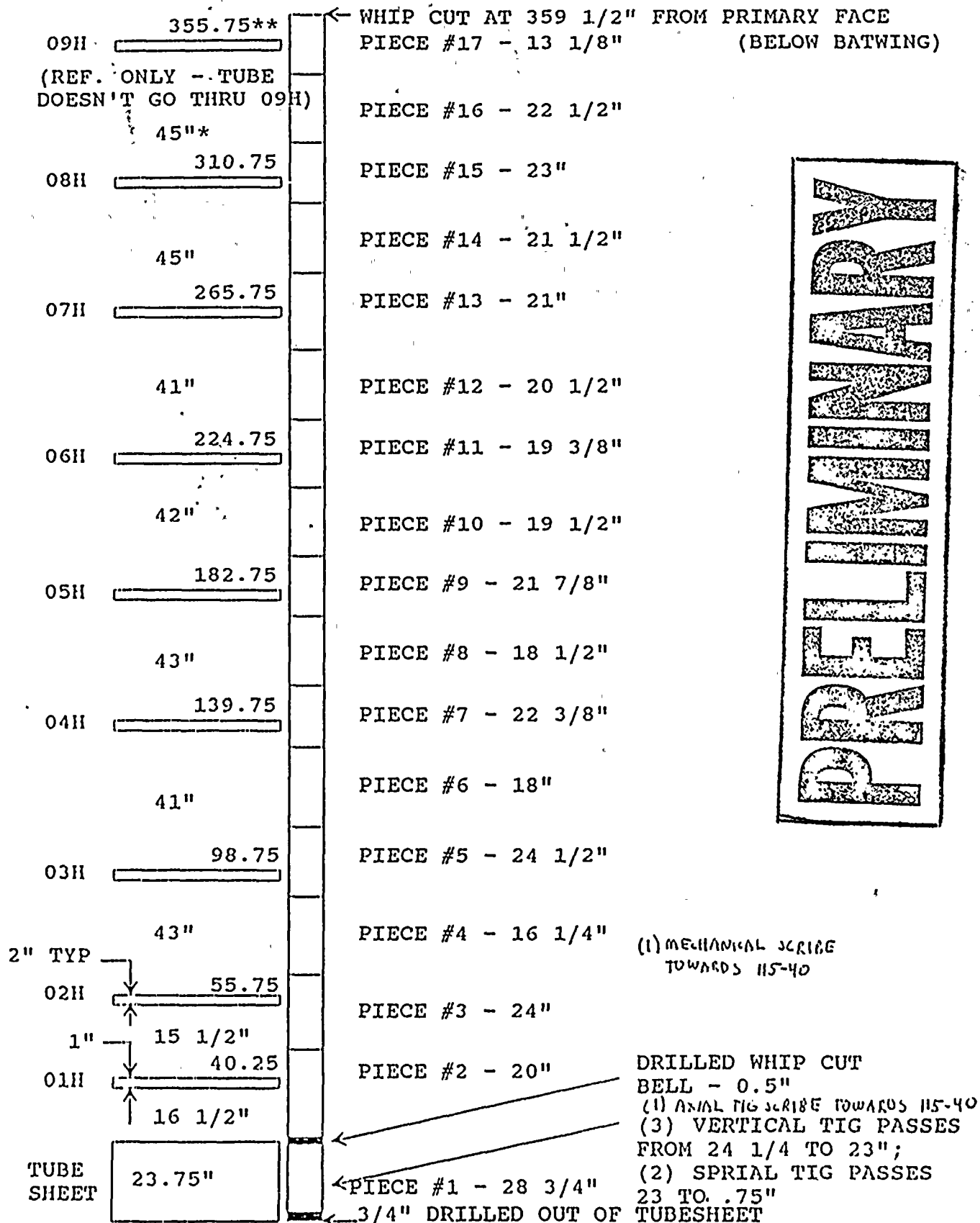
The eddy current testing program planned for the outage was begun on 4/11/93. Initial testing results identified a number of tubes with indications of axial cracking, the majority of which were located in the upper area of the hot leg in SG #2. The location and impact of the indications are addressed later in this report.

IV. SUBSEQUENT ACTIVITIES (cont.)

B. ECT INITIAL RESULTS (cont.)

As a result of the initial testing, the scope of testing in both generators was expanded. The ECT scope was systematically increased as additional flaws were detected in both generators. The details of the ECT program expansion, results, and level of detectability are discussed in Sections VI and VII of this report.

TUBE 117-40

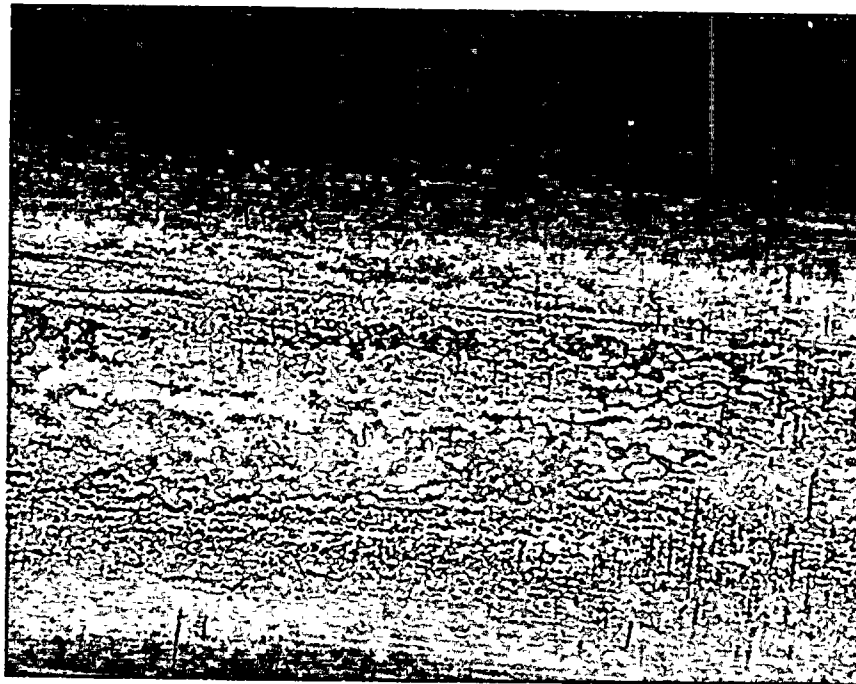


* DISTANCES BETWEEN CENTERLINE OF TSP's (01H IS A 1" THICK BAFFLE PLATE AND ALL OTHERS ARE 2" THICK EGGCRATES)

** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF TSP

NOTES: NOTCH IN TUBE SAMPLE IS ON TOP END (OPPOSITE TS)

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117-40 PC 15-16A
7.5X

AN AREA OF SHALLOW IGA ON TUBE O.D. - THE MAXIMUM DEPTH WAS ABOUT 5% OF WALL.



PRELIMINARY

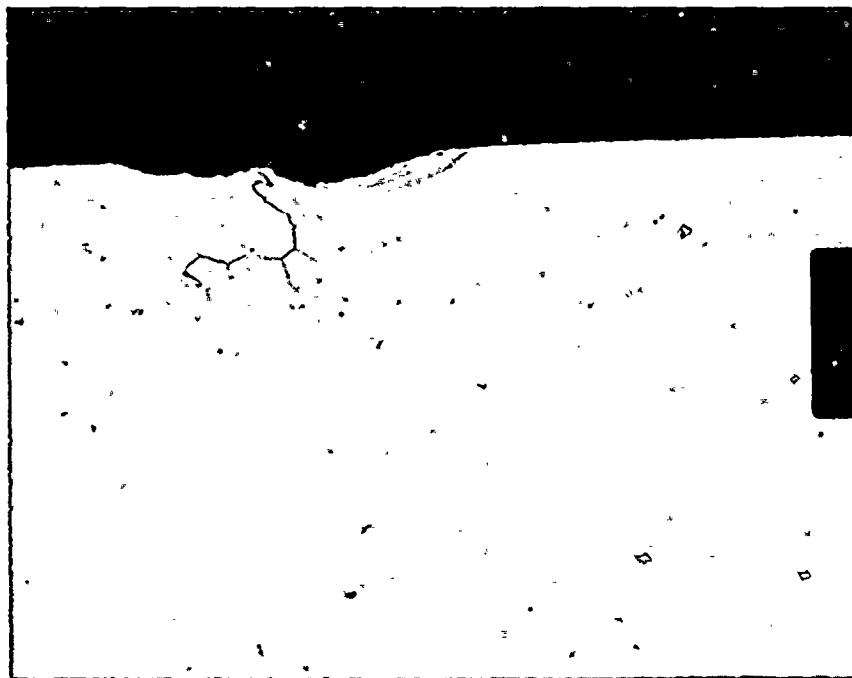


F725
250x
PV 117-40-17B
@ ~ 180°

GREY AREA IS "RIDGE" DEPOSIT BETWEEN TUBES 117-40 AND 115-40. THIS PHOTO WAS TAKEN AT THE THICKEST PORTION OF THE DEPOSIT, WHICH MEASURED 2.5 MILS.



PRELIMINARY



F727 PV 117-40-16 ±2
250X 311°

PHOTO OF IGA/IGSCC UNDER 0.6 MIL SCRATCH.



PRELIMINARY



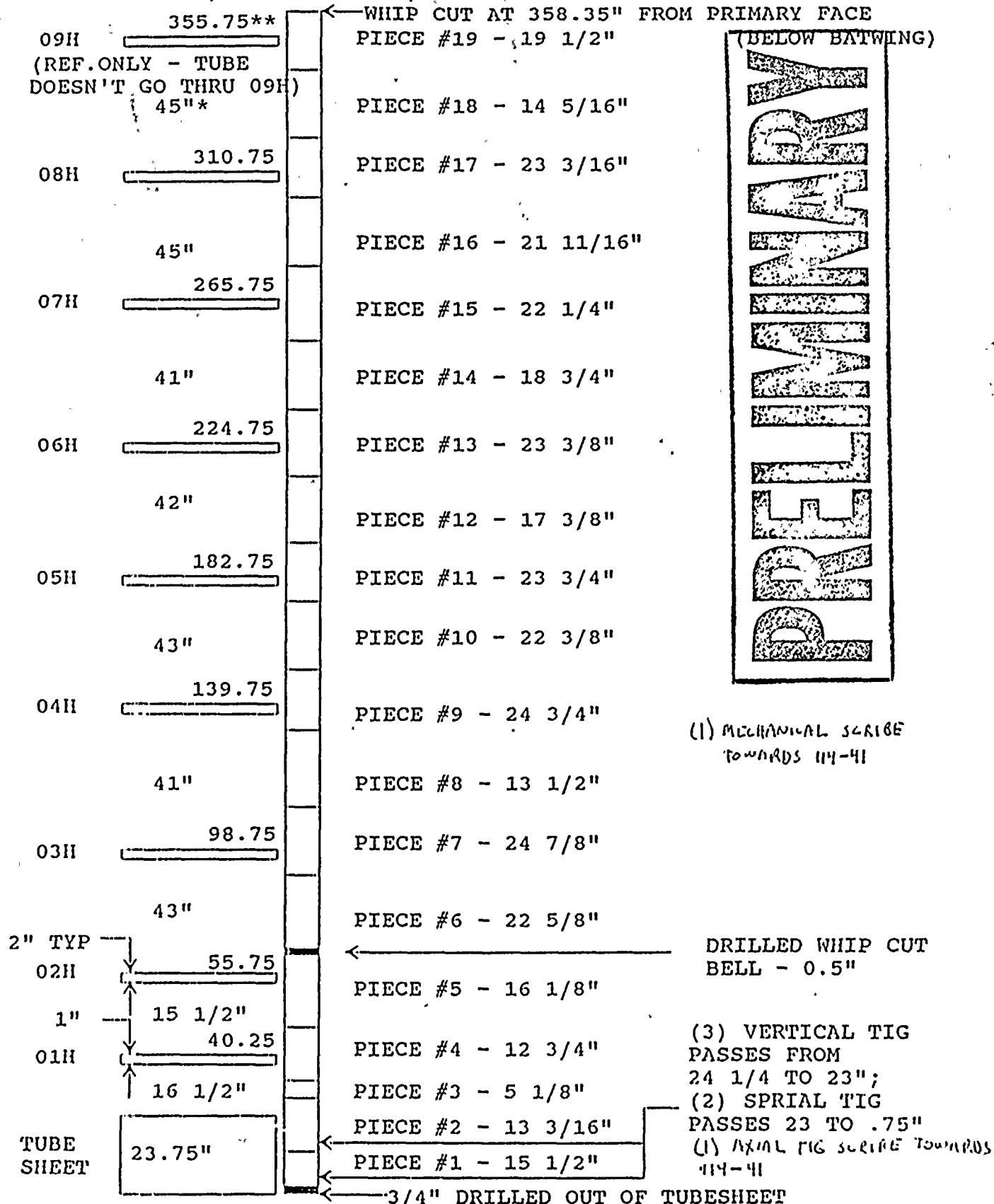
CRACK IN 117-40-16-5
GRADE 50 3-28 FROM DE F733

LONG, SHALLOW SCRATCH WITH IGA/IGSCC AT BOTTOM. THE SCRATCH WAS APPROXIMATELY 0.6 MILS DEEP, WITH A FEW MILS ATTACK AT BOTTOM.



TUBE 116-41

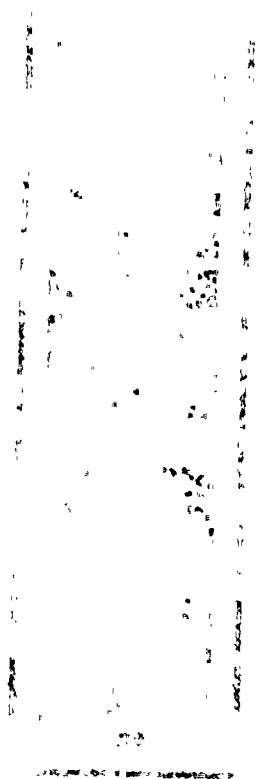
REVISION 2



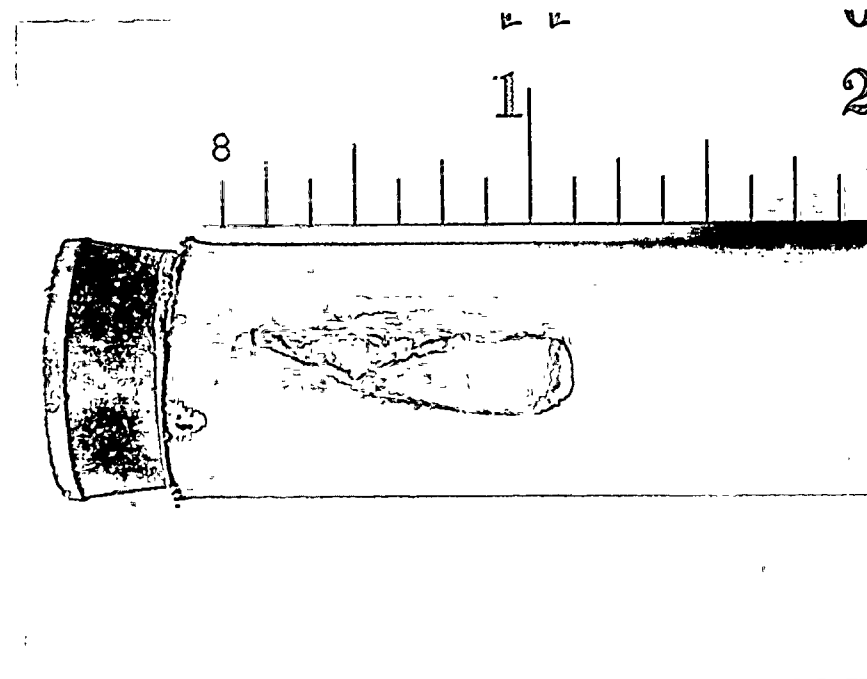
* DISTANCES BETWEEN CENTERLINE OF TSP'S (01H IS A 1" THICK BAFFLE PLATE AND ALL OTHERS ARE 2" THICK EGGRATES)

** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF TSP

NOTES: NOTCH IN TUBE SAMPLE IS ON TOP END (OPPOSITE TS)



PRELIMINARY



116-41 Pe. 19 0° F687

WHIP CUT END OF TUBE 116-41, SECTION 19. SHOWING WEAR MARK CAUSED BY CONTACT WITH UPPER SCALLOP BAR. MAXIMUM WALL PENETRATION WAS APPROXIMATELY 50%.



SUMMARY OF PRELIMINARY DYE PENETRANT RESULTS AFTER DESCALING/SWELLING

As of: 6/5/93

JUN-7-93 MON 14:45

LYNTECHCENTER

FAX NO. 8045226860

P.02

Tube No.	Section No.	Results				Remarks
		Crack Indications	Other Indications	Scratches Present		
117-40	17	Yes (50%)* (27%)*	Yes	Yes		Mixed IGA and IGSCC under axial deposit ridge over about 12 inches Multiple partial axial scratches with associated consistent cracking and/or IGA
	16	Yes (15%)* (10%)*	Yes	Yes		Three axial scratches (one partial length) – most with intermittent cracking; general light IGA Deeper IGA at spalled deposit regions
	15	Yes (10%)* (15%)*	Yes	Yes		Three axial scratches (one partial length) – most with intermittent cracking; general light IGA Deeper IGA at eggcrate wear marks; specimen to be incrementally ground
	14	Yes (5%)*	Yes	Yes		Multiple axial scratches – most with intermittent cracking; general light IGA
	13	Yes	No	Yes		Multiple axial scratches – one with intermittent cracking
	12	No	No	Yes		Multiple axial scratches; some possible minor wastage
	11	No	No	Yes		Multiple axial scratches; several minor wear marks
	10	N/A	N/A	N/A		Not tested; used for base metal characterization
	9	No	No	Yes		Multiple axial scratches
	8	Yes	No	Yes		Multiple axial scratches – one with a short crack; some possible minor wastage
	7	No	No	Yes		Multiple axial scratches; some possible wastage
	6	Yes	No	Yes		Multiple axial scratches – one with a short crack
	5	No	No	Yes		Multiple axial scratches; one minor wear mark
	4	No	No	Yes		Multiple axial scratches
	3	Yes	Yes	Yes		Multiple axial scratches – two with occasional minor cracking and/or IGA
	2	No	No	Yes		Two full length scratches – one intermittent; one partial length axial scratch
	1	N/A	N/A	N/A		Not tested
116-41	19	Yes (12%)*	Yes	Yes		Two partial length axial scratches with associated intermittent cracking and some minor IGA
	18	Yes (5%)*	Yes	Yes		One full length intermittent axial scratch with associated intermittent cracking and minor IGA
	17	Yes (5%)*	Yes	Yes		Two axial scratches with associated intermittent cracking and some minor IGA
	16	Yes	Yes	Yes		Minor cracks and IGA (more prominent near top end) associated with axial scratches
	15	No	Yes	Yes		Possible minor IGA at eggcrate gen. associated with wear marks; multiple axial scratches
	14	No	No	Yes		Tear-drop shaped patterns in circumferential band; one full length axial scratch
	13	Yes	No	Yes		Very minor crack just outside scratch; two full length axial scratches – one intermittent
	12	No	No	Yes		Two full and one partial length axial scratches – one intermittent
	11	No	Yes	Yes		Spiralling axial minor IGA patterns near top; three minor wear marks; one axial scratch
	10	No	No	Yes		One full & one partial length intermittent axial scratches
	9	No	No	Yes		One full & one partial length intermittent axial scratches
	8	No	No	Yes		Two full & two partial length axial scratches
	7	No	No	Yes		Rough surface over bottom half; one full & one partial length axial scratch
	6					
	5	No	No	Yes		Significant wear mark; rippled OD surface at one location; one full length axial scratch
	4	No	No	Yes		Minor wear marks; three intermittent axial scratches
	3	No	No	Yes		Two full length axial scratches
	2	N/A	N/A	N/A		Not tested
	1	N/A	N/A	N/A		Not tested

* Percentage in parentheses is maximum crack or IGA depth; revised maps will be sent Monday

PRELIMINARY



PALO VERDE STEAM GENERATOR TUBE DEPOSIT ANALYSES FLOWCHART

117-40-15 FS
117-40-15 08H
117-40-9 FS
117-40-9 05H
117-40-2 FS (Leach)
117-40-15 FS (Non-Leach)
117-40-2 01H FDB
116-41-19A FS
22-13-2B2 FS
22-13-2B2 01H FDB

20 mg Samples

Balance

ARC

• XRD
• Emission Spec.
• Total Carbon

• Semi-quantitative

LTC

117-40-9 FS
117-40-9 05H
117-40-15 FS (Non-Leach)
116-41-19A FS

• ICP (Al, B, Ca, Cr, Cu, Fe)
(Pb, Mg, Mn, Ni, Ti)
(Zn, Si, Mo, Sn & P)

•• ISE (Cl & F)
FAA (Na & K)
Total Sulfur (per ARC)

• Elements to be quantified
were established by prior
semi-quantitative analysis.

•• Cl may be analyzed by IC
F electrode may be attained
on project.

117-40-15 FS
117-40-15 08H
117-40-2 FS (Leach)
117-40-2 01H FDB
22-13-2B2 FS
22-13-2B2 01H FDB

LEACH TEST (per ARC)

LEACHATE

• pH & Cond.
ISE (Cl & F)
FAA (Na & K)
IC (SO_4^{2-} , PO_4^{3-} , CO_3^{2-}
 NO_3^- , NO_2^-)
ICP (same elements
as non-leached
samples)

LEACHATE RESIDUE

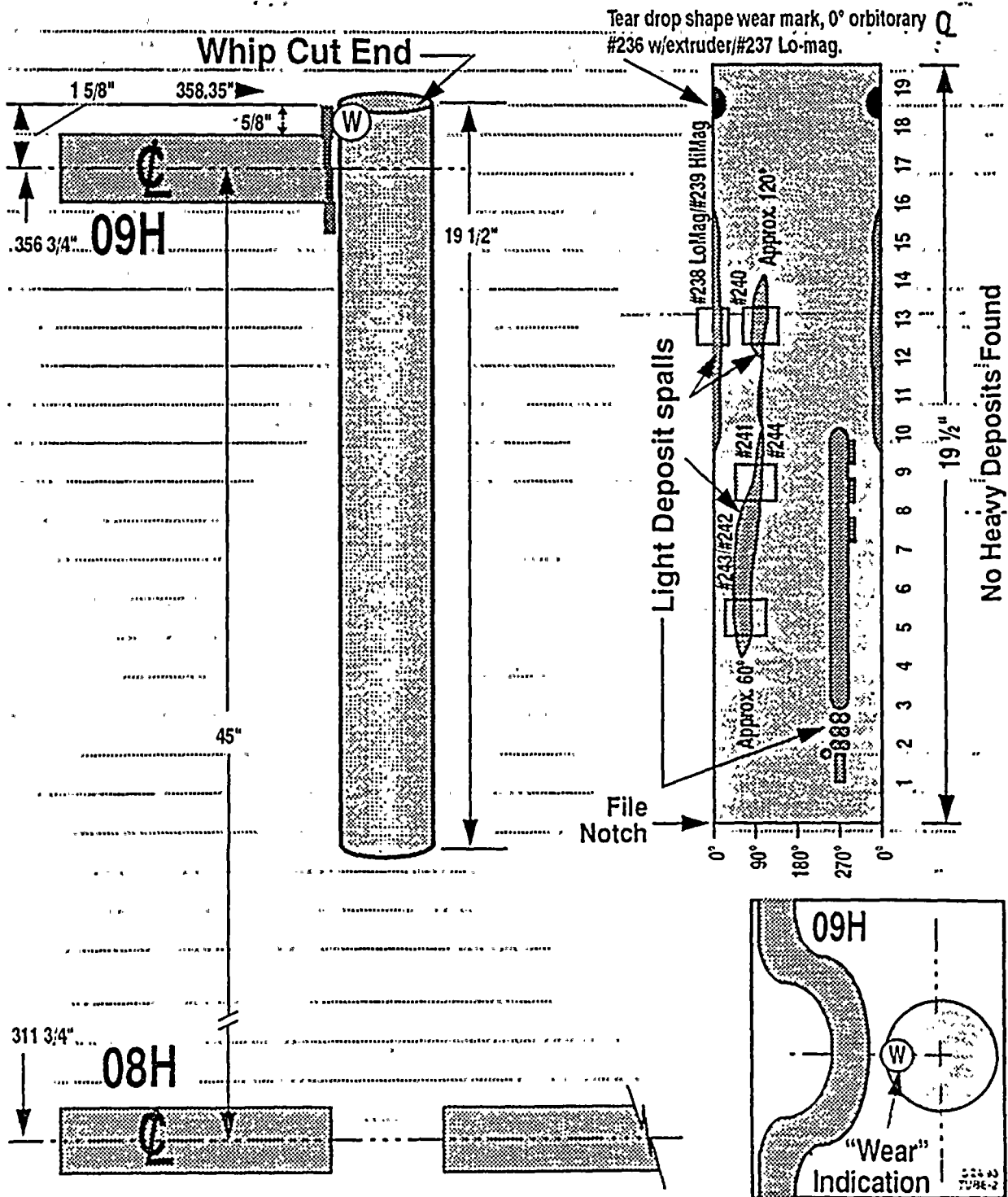
ICP (same elements
as non-leached
samples)
Total Sulfur
(per ARC)

• Under cover gas.

PRELIMINARY

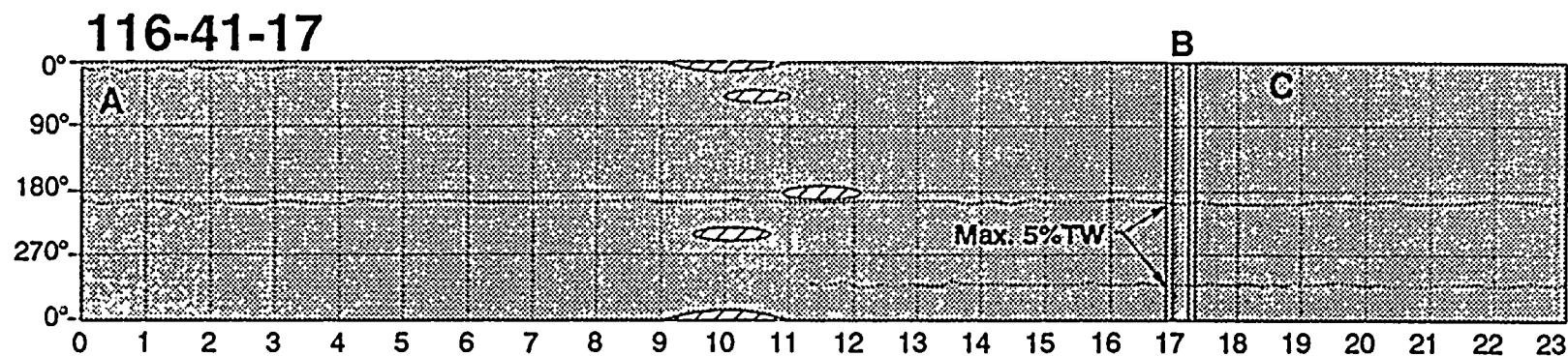
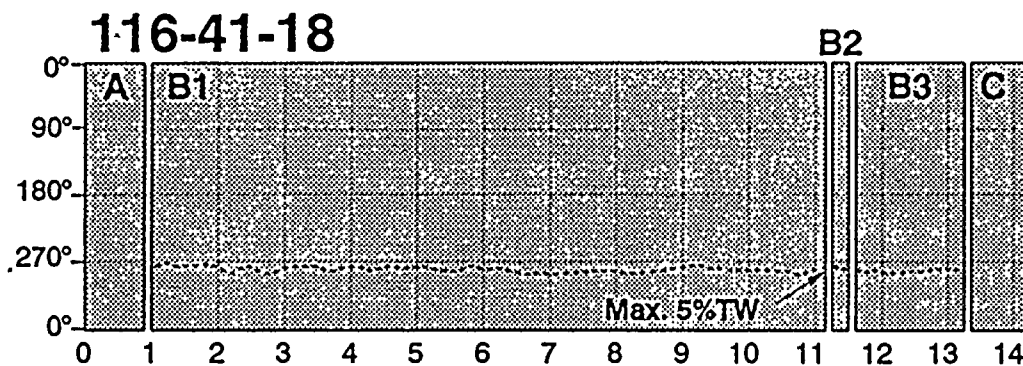
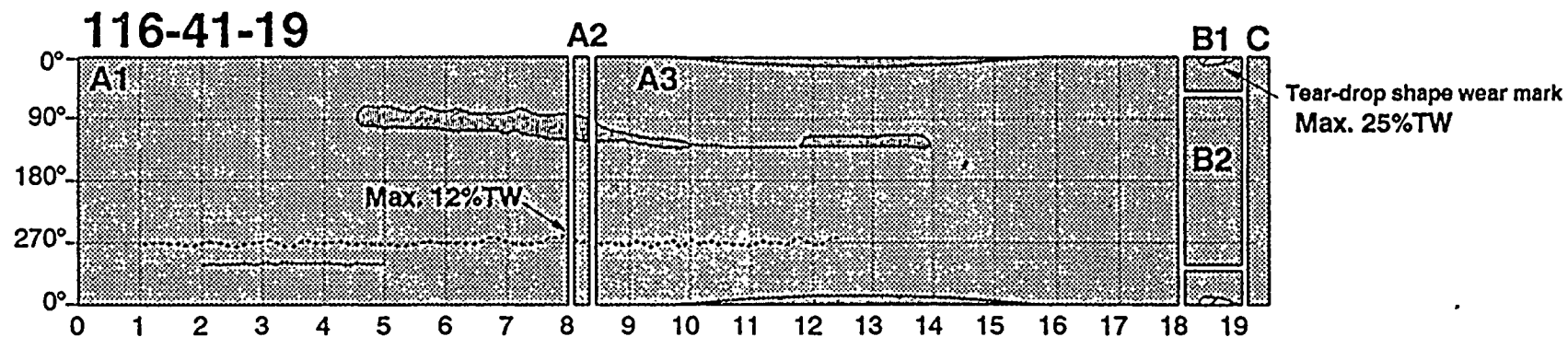


Palo Verde Unit 2 Steam Generator 22 (B&W) Tube 116 - 41 Tube Section #19



PRELIMINARY

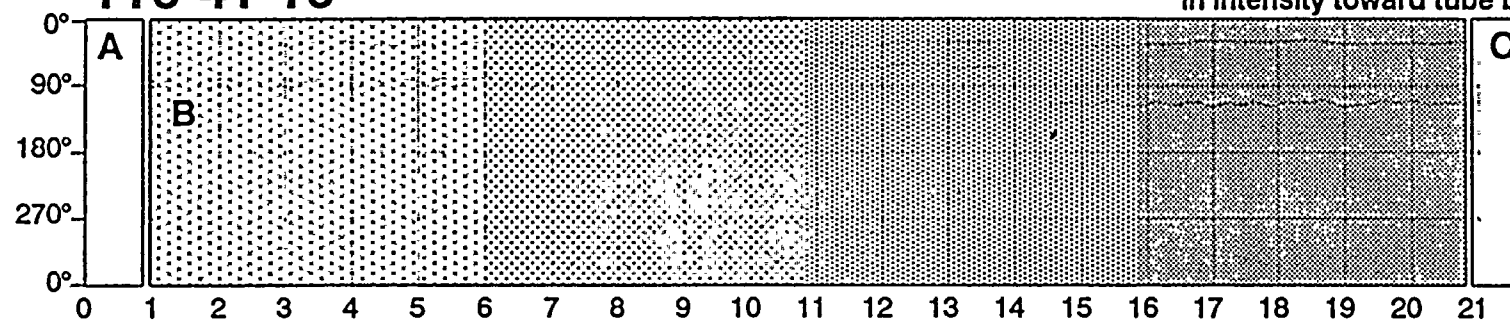




PRELIMINARY

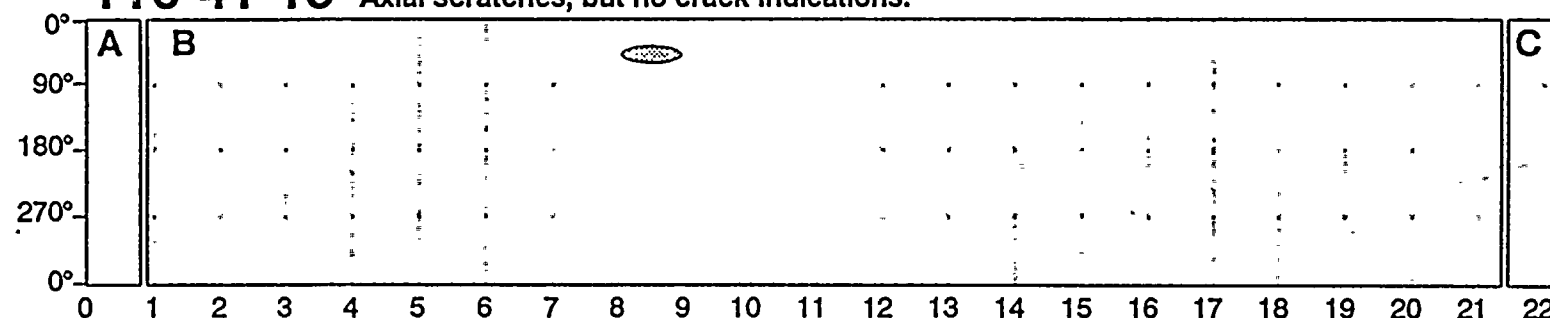
116-41-16

All IGA < 5% gradually diminishing
in intensity toward tube bottom end.



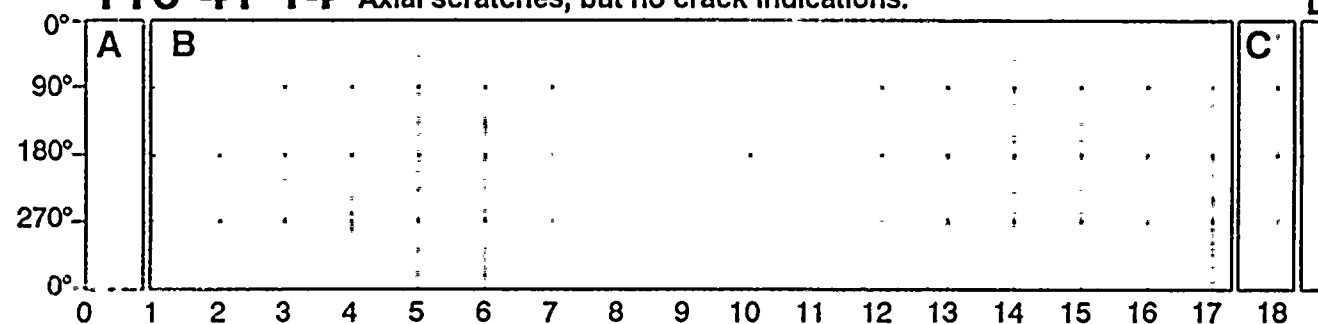
116-41-15

Axial scratches, but no crack indications.



116-41-14

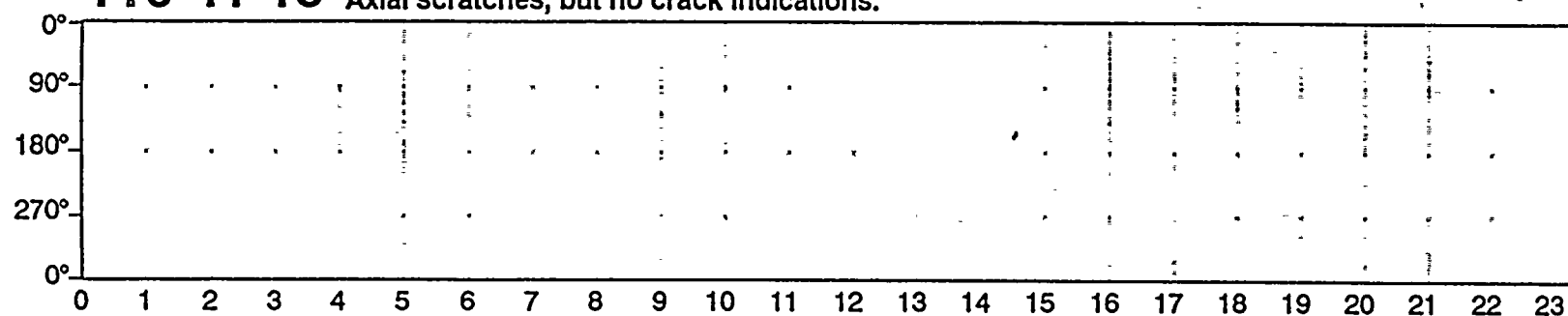
Axial scratches, but no crack indications.



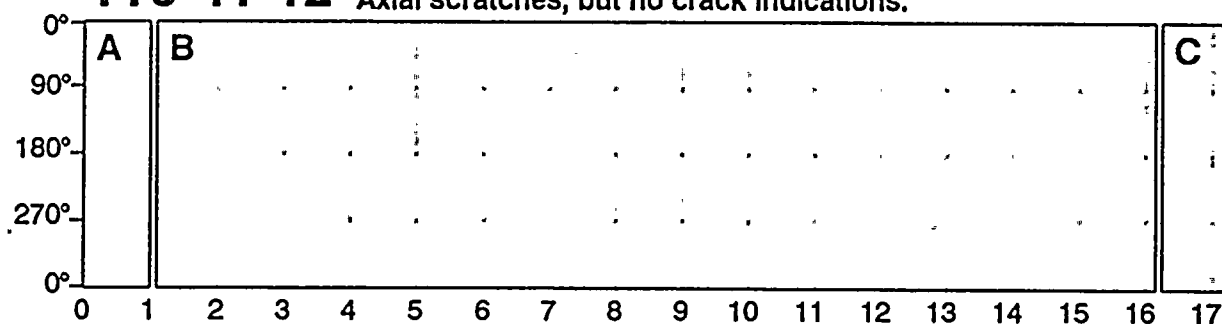
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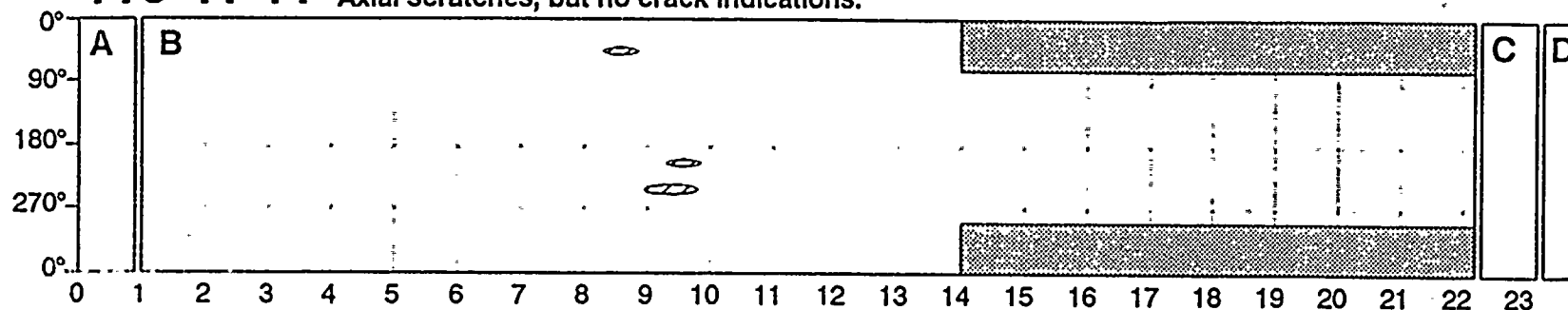
116-41-13 Axial scratches, but no crack indications.



116-41-12 Axial scratches, but no crack indications.

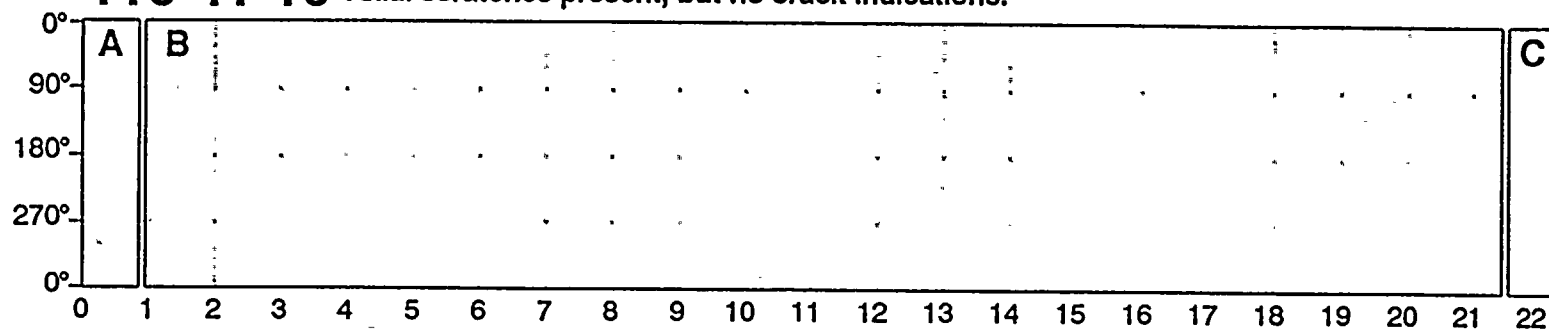


116-41-11 Axial scratches, but no crack indications.

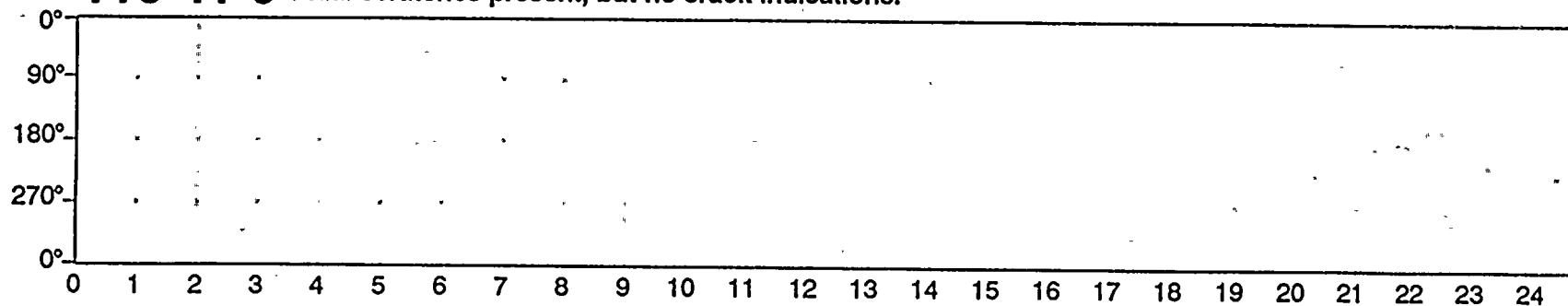




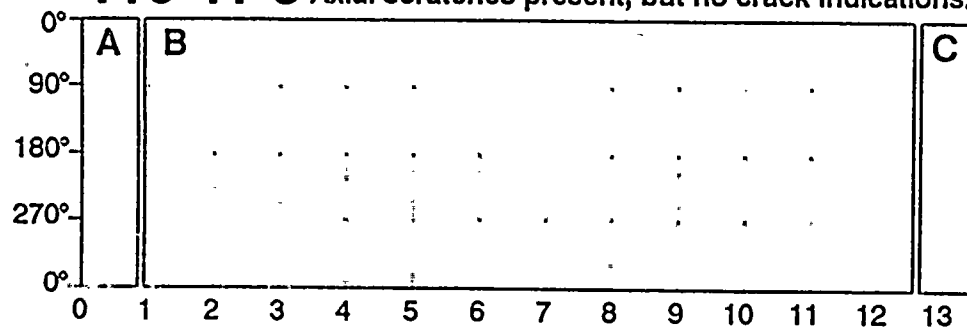
116-41-10 Axial scratches present, but no crack indications.



116-41-9 Axial scratches present, but no crack indications.



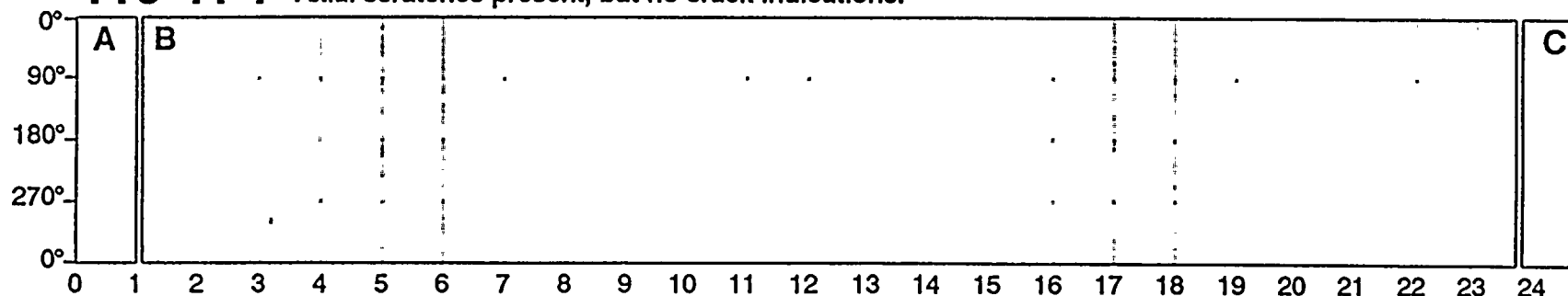
116-41-8 Axial scratches present, but no crack indications.



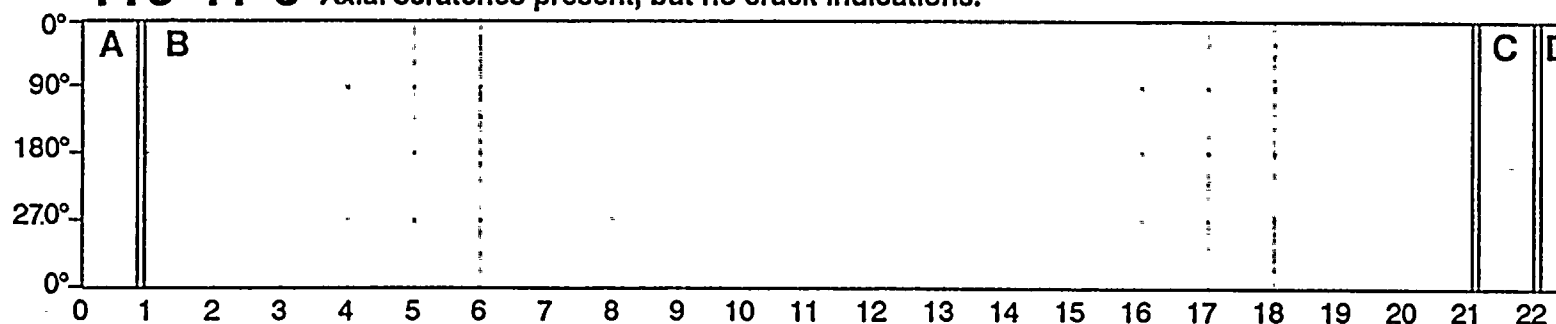
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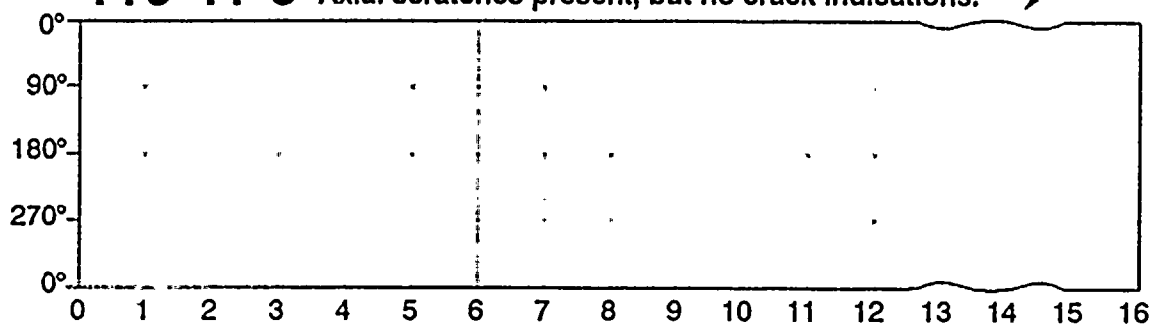
116-41-7 Axial scratches present, but no crack indications.



116-41-6 Axial scratches present, but no crack indications.



116-41-5 Axial scratches present, but no crack indications.

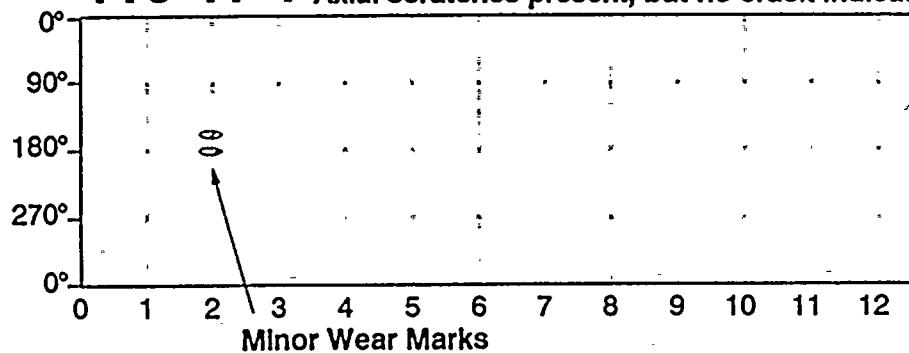


Area where tube OD was rippled.

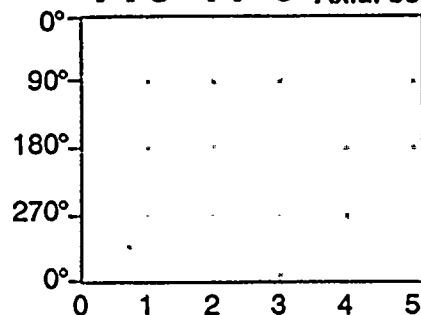
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116-41-4 Axial scratches present, but no crack indications.

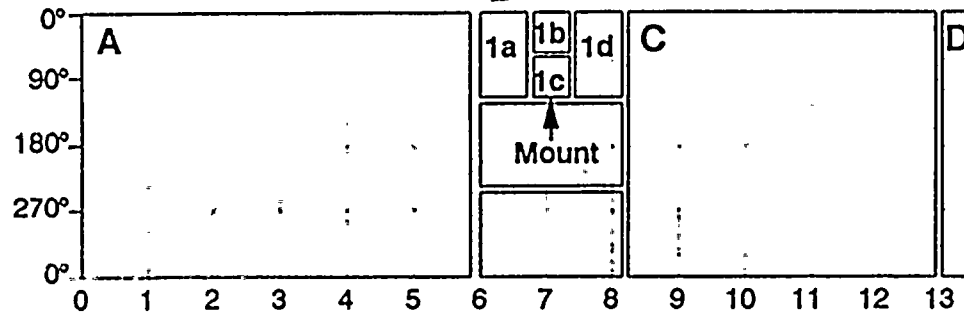


116-41-3 Axial scratches present, but no crack indications.



Axial scratches present, but no crack indications.

116-41-2



PRELIMINARY



10-Jun-93

TUBE SECTION 116-41

PRELIMINARY

EXAMINATION METHOD	PIECE NO.																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	Establish Tube Orientation	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Visual Inspections	Visual Examination		D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	Macrophotography		D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Dimensional Inspections	OD Measurements		D		D	D									D	D	D	D	D
	ID Measurements		D		D	D									D	D	D	D	D
Eddy Current Inspections	Bobbin Coil ECT		D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	MRPC ECT		D		D	D													D
	Rotating Field Probe ECT		D		D	D													D
X-Ray Radiography			D																D
Helium Leak Test																			

Destructive Examinations:

Deposit Collection	Tube Swelling		D		D	D				D				D				D		D
	Scrape Deposits		D		D	D				D				D				D		D
Fluorescent Liquid Penetrant Inspections	Descale		D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
	Initial Fluorescent PT		D*																	
	Post Decscale Swell			N/A			D	D	D		D	D	D		D	D	D		D	D
	Post Swell Fluorescent PT		D*	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
SEM/EDS																				D
Metallography			D																	D
Microhardness																				D
SAM/XPS																				

Deposit Analyses	XRD																			1
	Emission Spec. (Semi-quant)																			1
	Perkin Elmer (Total C)																			1
	ISE (Cl & F)																			1
	ICP (Pb, S, et. al.)																			1
	Flame AA (Na)																			1
	Total S																			1
	Leachate																			

Tube Material Characterization	Bulk Chemistry																			
	Tensile Test																			
	Dual Etch		D																	
	Microhardness																			
	Modified Huey Test																			



EXAMINATION METHOD

TUBE SECTION 116-41-1

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
Visual Inspections	Establish Tube Orientation	DONE
Dimensional Inspections	Visual Examination	NOT TO BE DONE
Eddy Current Inspections	Macrophotography	NOT TO BE DONE
	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
	Bobbin Coil ECT	NOT TO BE DONE
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Descale	NOT TO BE DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	NOT TO BE DONE
	Post Swell Fluorescent PT	NOT TO BE DONE
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE



EXAMINATION METHOD

TUBE SECTION 116-41-2

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	DONE
Inspections	ID Measurements	DONE
Eddy Current	Bobbin Coil ECT	DONE, NDD
Inspections	MRPC ECT	DONE, NDD
	Rotating Field Probe ECT	DONE, NDD
X-Ray Radiography		DONE, NO DEFECTS NOTED
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	R/T ISOLATED BEFORE SWELL, UPPER SECTION ONLY SWELLED(BURST)
Collection	Scrape Deposits	DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	DONE ON ID AFTER CLAM SHELL SECTION, NO DEFECTS
Inspections	Post Decscale Swell	NOT TO BE DONE
	Post Swell Fluorescent PT	DONE ON FLATTENED CLAM SHELL & BURST SECTIONS, NO DEFECTS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		SECTION B2-1A FROM R/T, NO DEFECTS
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	DONE, NORMAL MICROSTRUCTURE, NOT SENSITIZED
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE



EXAMINATION METHOD

TUBE SECTION 116-41-3

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	N/A - TOO SHORT TO SWELL
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

EXAMINATION METHOD

TUBE SECTION 116-41-4

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
Visual Inspections	Establish Tube Orientation	DONE
Dimensional Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
	OD Measurements	DONE
	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	DONE, NDD
	Rotating Field Probe ECT	DONE, NDD
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	DONE
	Scrape Deposits	DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	N/A
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE



EXAMINATION METHOD

TUBE SECTION 116-41-5

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	BADLY BOWED, BENT, HAS A SEVERE SCRAPE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	SCRAPE DETECTED, WALL THICKNESS VARIATIONS NOTED AT UPPER END
Inspections	ID Measurements	DONE
Eddy Current	Bobbin Coil ECT	DONE, NDD
Inspections	MRPC ECT	DONE, NDD
	Rotating Field Probe ECT	DONE, NDD
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	DONE, WALL THICKNESS VARIATIONS LEAD TO "BULGES" TOP END
Collection	Scrape Deposits	DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	NOT TO BE DONE
Inspections	Post Decscale Swell	N/A
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

EXAMINATION METHOD

TUBE SECTION 116-41-6

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	NOT TO BE DONE
Inspections	ID Measurements	NOT TO BE DONE
Eddy Current	Bobbin Coil ECT	DONE, NDD
Inspections	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	NOT TO BE DONE
Collection	Scrape Deposits	NOT TO BE DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	NOT TO BE DONE
Inspections	Post Decscale Swell	DONE
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

EXAMINATION METHOD

TUBE SECTION 116-41-7

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
Visual Inspections	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
Dimensional Inspections	Macrophotography	DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
Dimensional Inspections	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
Eddy Current Inspections	MRPC ECT	NOT TO BE DONE
Eddy Current Inspections	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	NOT TO BE DONE
Deposit Collection	Scrape Deposits	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
Fluorescent Liquid Penetrant Inspections	Initial Fluorescent PT	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Post Decscale Swell	DONE
Fluorescent Liquid Penetrant Inspections	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
Deposit Analyses		NOT TO BE DONE
Deposit Analyses	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
Tube Material Characterization	Tensile Test	NOT TO BE DONE
Tube Material Characterization	Dual Etch	NOT TO BE DONE
Tube Material Characterization	Microhardness	NOT TO BE DONE
Tube Material Characterization	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 116-41-8

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	DONE
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY



EXAMINATION METHOD

TUBE SECTION 116-41-9

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
Visual Inspections	Establish Tube Orientation	DONE
	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	DONE
	Scrape Deposits	DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	N/A
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY



EXAMINATION METHOD

TUBE SECTION 116-41-10

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	DONE
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY



EXAMINATION METHOD

TUBE SECTION 116-41-11

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	DONE
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 116-41-12

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	DONE
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 116-41-13

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macro photography	DONE
Dimensional	OD Measurements	NOT TO BE DONE
Inspections	ID Measurements	NOT TO BE DONE
Eddy Current	Bobbins Coil ECT	DONE, NDD
Inspections	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	DONE
Collection	Scrape Deposits	DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	NOT TO BE DONE
Inspections	Post Descale Swell	N/A
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 116-41-14

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	NOT TO BE DONE
Inspections	ID Measurements	NOT TO BE DONE
Eddy Current	Bobbin Coil ECT	DONE, NDD
Inspections	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	NOT TO BE DONE
Collection	Scrape Deposits	NOT TO BE DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	NOT TO BE DONE
Inspections	Post Decscale Swell	DONE
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY



EXAMINATION METHOD

TUBE SECTION 116-41-15

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	DONE
Inspections	ID Measurements	DONE
Eddy Current	Bobbin Coil ECT	DONE, NDD
Inspections	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	NOT TO BE DONE
Collection	Scrape Deposits	NOT TO BE DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	NOT TO BE DONE
Inspections	Post Descale Swell	DONE
	Post Swell Fluorescent PT	DONE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 116-41-16

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	DONE
Inspections	ID Measurements	DONE
Eddy Current	Bobbin Coil ECT	DONE, NDD
Inspections	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	NOT TO BE DONE
Collection	Scrape Deposits	NOT TO BE DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	NOT TO BE DONE
Inspections	Post Descale Swell	DONE
	Post Swell Fluorescent PT	LIGHT IGA AT UPPER END, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

EXAMINATION METHOD

TUBE SECTION 116-41-17

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	DONE
	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	DONE
	Scrape Deposits	DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
	Initial Fluorescent PT	NOT TO BE DONE
	Post Decscale Swell	N/A
	Post Swell Fluorescent PT	LIGHT IGA ALONG WHOLE TUBE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		SECTION B - DEEPEST IGP = 2 MILS = 5%TW
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 116-41-18

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	DONE
Inspections	ID Measurements	DONE
Eddy Current	Bobbin Coil ECT	DONE, NDD
Inspections	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit	Tube Swelling	NOT TO BE DONE
Collection	Scrape Deposits	NOT TO BE DONE
Fluorescent	Descale	DONE
Liquid Penetrant	Initial Fluorescent PT	NOT TO BE DONE
Inspections	Post Descale Swell	DONE
	Post Swell Fluorescent PT	LIGHT IGA ALONG WHOLE TUBE, SEE CRACK MAPS
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		SECTION B2 - 2 MIL DEEP (5%WT) IGP WHOLE CIRCUMFERENCE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit	Anal. of Non Leached Deposit	NOT TO BE DONE
Analyses		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material	Bulk Chemistry	NOT TO BE DONE
Characterization	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY



EXAMINATION METHOD

TUBE SECTION 116-41-19

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
Visual Inspections	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	TEAR-SHAPED, DEEP WEAR MARK AT TOP END, SEE CRACK MAPS
Dimensional Inspections	Macrophotography	DONE
Dimensional Inspections	OD Measurements	WEAR MARK = 16 MILS DEEP
Dimensional Inspections	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	09H+1.1=INA/27%
Eddy Current Inspections	MRPC ECT	09H+1.1= 0.6/0.3/VOL
Eddy Current Inspections	Rotating Field Probe ECT	DONE
X-Ray Radiography		DONE, ONLY WEAR MARK SEEN
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Deposit Collection	Tube Swelling	DONE
Fluorescent Liquid Penetrant Inspections	Scrape Deposits	DONE
Fluorescent Liquid Penetrant Inspections	Descale	DONE
Fluorescent Liquid Penetrant Inspections	Initial Fluorescent PT	NOT TO BE DONE
Fluorescent Liquid Penetrant Inspections	Post Descale Swell	DONE
Fluorescent Liquid Penetrant Inspections	Post Swell Fluorescent PT	DEEPER IGA PATCHES, LIGHT IGA ON WHOLE TUBE, SEE CRACK MAPS
SEM/EDS		DONE, WEAR MARK APPEARS TO BE MECHANICAL
Metallography		SECTION B-1A, NO EVIDENCE OF COLD WORK AT WEAR MARK
Metallography		SECTION A2 - DEEPEST IGP = 2 MILS = 5%TW
Metallography		NOT TO BE DONE
Metallography		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		SECTION B-1A, NO HIGHER HARDNESSES NEXT TO WEAR MARK
SAM/XPS		NOT TO BE DONE

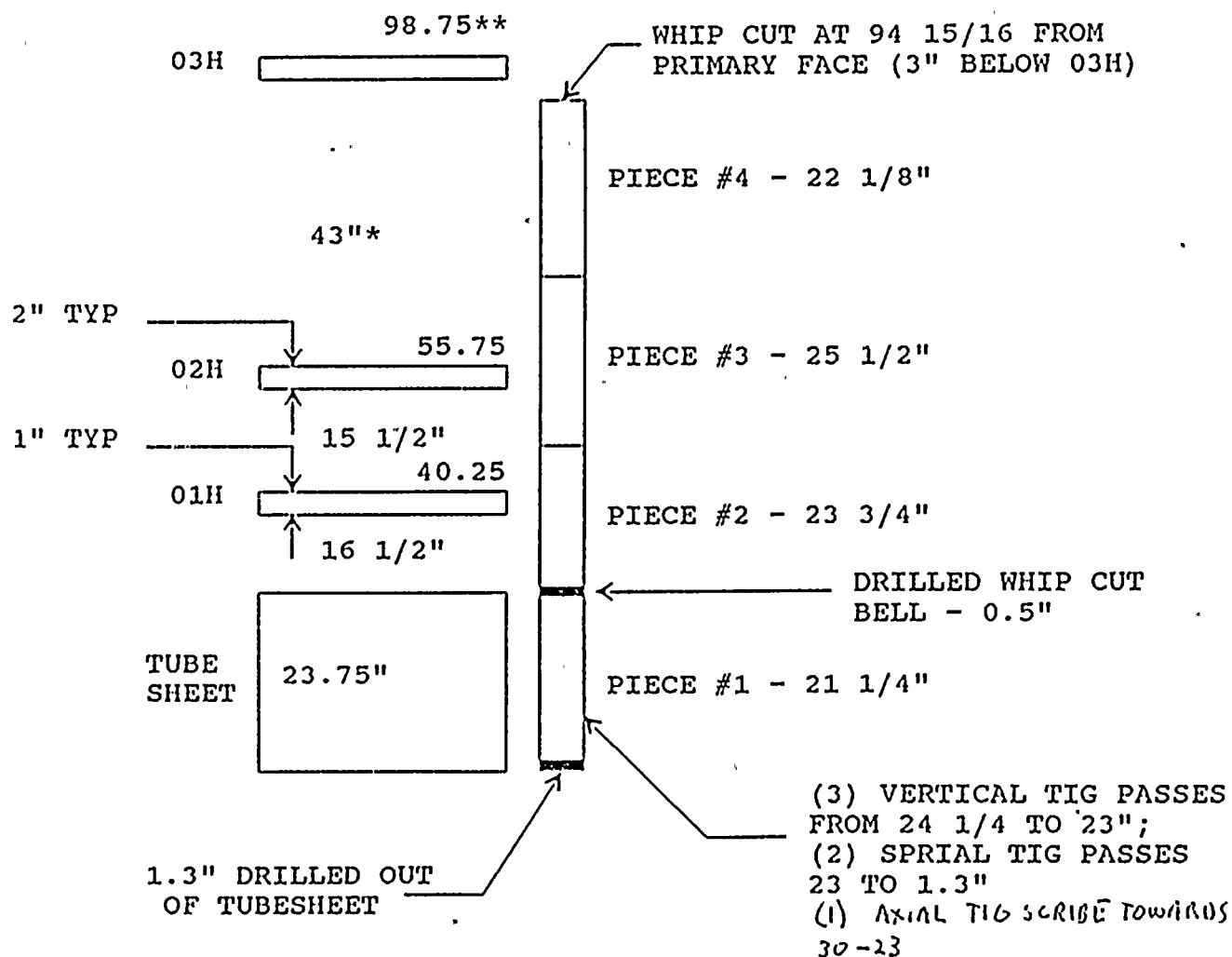
Deposit Analyses	Anal. of Non Leached Deposit	PENDING, FREE SPAN DEPOSIT
Deposit Analyses		NOT TO BE DONE
Deposit Analyses	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
Tube Material Characterization	Tensile Test	NOT TO BE DONE
Tube Material Characterization	Dual Etch	NOT TO BE DONE
Tube Material Characterization	Microhardness	NOT TO BE DONE
Tube Material Characterization	Modified Huey Test	NOT TO BE DONE

PRELIMINARY



TUBE 29-24



* DISTANCES BETWEEN CENTERLINE OF TSP'S (01H IS A 1" THICK BAFFLE PLATE AND ALL OTHERS ARE 2" THICK EGGRATES)

** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF TSP

NOTES: NOTCH IN TUBE SAMPLE IS ON TOP END—(OPPOSITE TS)

PRELIMINARY



Page 1 of 1

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10-Jun-93

TUBE SECTION 22-13

TUBE SECTION 29-24

EXAMINATION METHOD

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys
Visual Inspections	Establish Tube Orientation
Dimensional Inspections	Visual Examination
Eddy Current Inspections	Macrophotography
	OD Measurements
	ID Measurements
	Bobbin Coil ECT
	MRPC ECT
	Rotating Field Probe ECT
X-Ray Radiography	
Helium Leak Test	

Destructive Examinations:

Burst Testing	Tube Burst Testing
	Stereovisual Inspection
	Photography
	Scrape Deposits
SEM/EDS	
Metallography	
Microhardness	
SAM/XPS	

Deposit Analyses	XRD
	Emission Spec. (Semi-quant)
	Perkin Elmer (Total C)
	ISE (Cl & F)
	ICP (Pb, S, et. al.)
	Flame AA (Na)
	Total S
	Leachate

Tube Material Characterization	Bulk Chemistry
	Tensile Test
	Dual Etch
	Microhardness
	Modified Huey Test

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PRELIMINARY

* To be taken from non-swelled ring adjacent to burst section.



EXAMINATION METHOD

TUBE SECTION 29-24-1

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	NOT TO BE DONE
	Macrophotography	NOT TO BE DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	NOT TO BE DONE
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Burst Testing	Tube Burst Testing	NOT TO BE DONE
	Stereovisual Inspection	NOT TO BE DONE
	Photography	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 29-24-2

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	DONE
	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	01H+0.05 = 0.6/ <98%
	MRPC ECT	01H+0.05 = NDD
	Rotating Field Probe ECT	DONE
X-Ray Radiography		DONE, NO DEFECTS NOTED
Helium Leak Test		DONE, NO LEAKS

Destructive Examinations:

Burst Testing	Tube Burst Testing	DONE, BURST PRESSURE = 9,662 PSI
	Stereovisual Inspection	DONE, SHORT AXIAL IGA CRACKS NEIGHBOR THE FRACTURE
	Photography	DONE
	Scrape Deposits	DONE
SEM/EDS		CRACK PROFILE PENDING
		EDS PENDING
Metallography		SECTION XXXX, PENDING
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 29-24-3

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	DONE
	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	DONE, NDD
	Rotating Field Probe ECT	DONE, NDD
X-Ray Radiography		DONE, NO DEFECTS NOTED
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Burst Testing	Tube Burst Testing	NOT TO BE DONE
	Stereovisual Inspection	NOT TO BE DONE
	Photography	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

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EXAMINATION METHOD

TUBE SECTION 29-24-4

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	DONE
	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

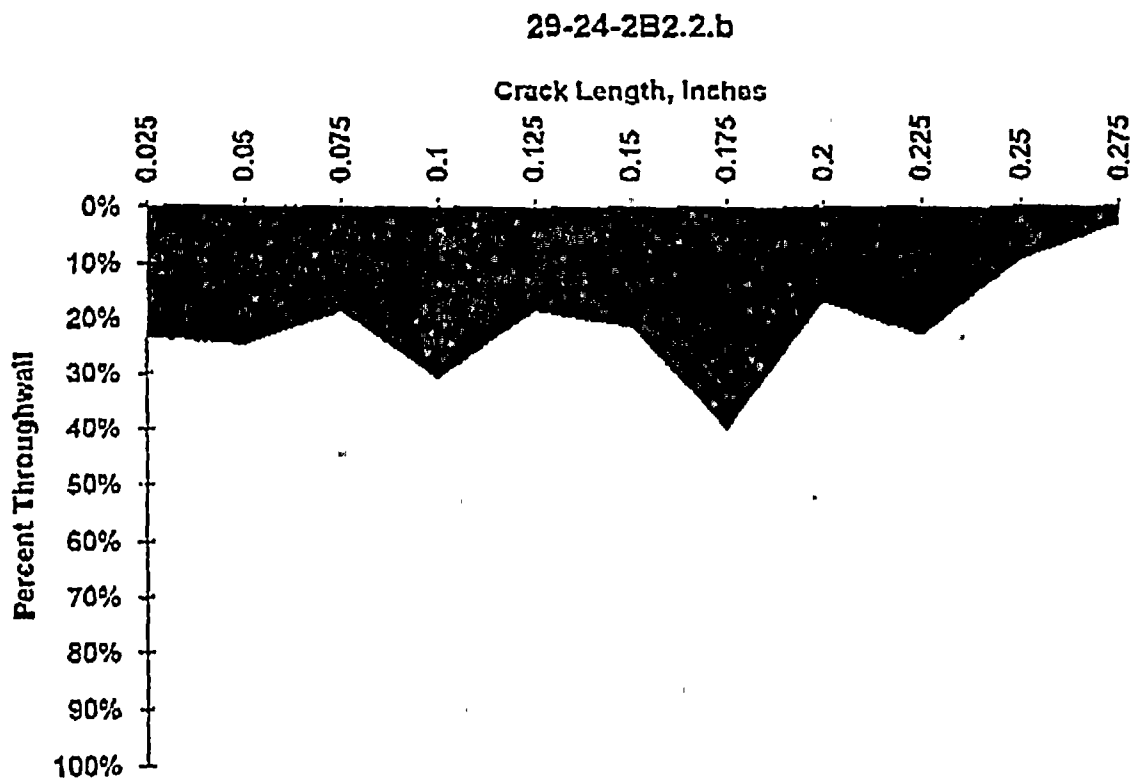
Burst Testing	Tube Burst Testing	NOT TO BE DONE
	Stereovisual Inspection	NOT TO BE DONE
	Photography	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

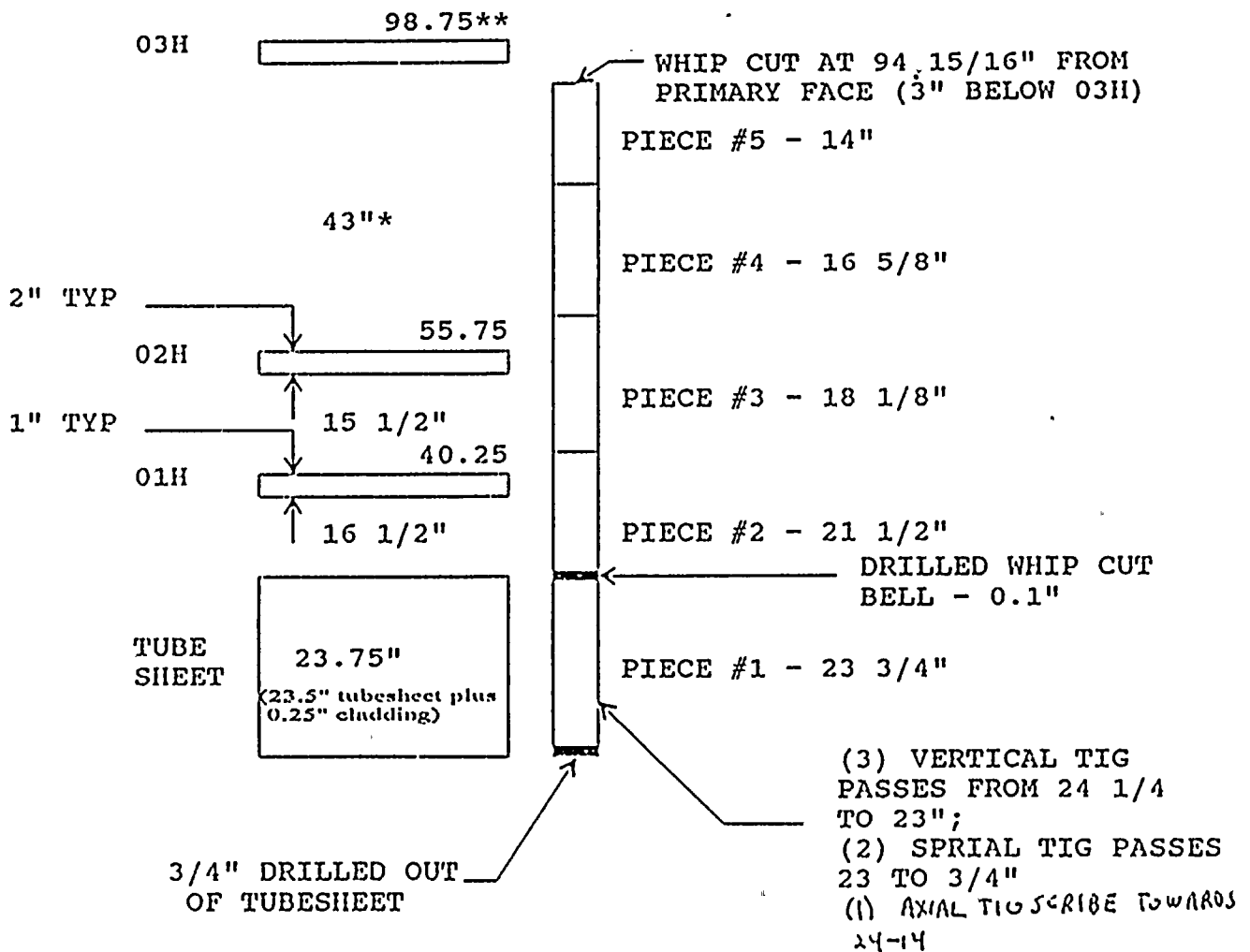
Crack Depth Data 29-24-2B.2.2.b				\\latm\paloverd\crack\2b22b.xls	
				6/10/93	
axial	%throughwall (assuming 43 mills)	depth, mil			
0.025	23%	0.8375	10		
0.05	25%	1	11	AVG: 21%	
0.075	19%	0.75	8	MAX: 40%	
0.1	31%	1.25	13		
0.125	19%	0.75	8		
0.15	22%	0.875	9		
0.175	40%	1.625	17		
0.2	17%	0.6875	7		
0.225	23%	0.9375	10		
0.25	9%	0.375	4		
0.275	3%	0.125	1		



PRELIMINARY



TUBE 22-13



* DISTANCES BETWEEN CENTERLINE OF TSP's (01H IS A 1" THICK BAFFLE PLATE AND ALL OTHERS ARE 2" THICK EGGRATES)

** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF TSP

NOTES: NOTCH IN TUBE SAMPLE IS ON TOP END (OPPOSITE TS)

PRELIMINARY



PALO VERDE STEAM GENERATOR TUBE DEPOSIT ANALYSES FLOWCHART

PRELIMINARY

117-40-15 FS
117-40-15 08H
117-40-9 FS
117-40-9 05H
117-40-2 FS (Leach)
117-40-15 FS (Non-Leach)
117-40-2 01H FDB
116-41-19A FS
22-13-2B2 FS
22-13-2B2 01H FDB

20 mg Samples

Balance

ARC

XRD
Emission Spec.
Total Carbon
Semi-quantitative

LTC

117-40-9 FS
117-40-9 05H
117-40-15 FS (Non-Leach)
116-41-19A FS

* ICP (Al, B, Ca, Cr, Cu, Fe)
(Pb, Mg, Mn, Ni, Ti)
(Zn, Si, Mo, Sn & P)

** ISE (Cl & F)
FAA (Na & K)
Total Sulfur (per ARC)

* Elements to be quantified
were established by prior
semi-quantitative analysis.

** Cl may be analyzed by IC
F electrode may be attained
on project.

117-40-15 FS
117-40-15 08H
117-40-2 FS (Leach)
117-40-2 01H FDB
22-13-2B2 FS
22-13-2B2 01H FDB

LEACH TEST (per ARC)

LEACHATE

* pH & Cond.
ISE (Cl & F)
FAA (Na & K)
IC (SO_4^{2-} , PO_4^{3-} , CO_3^{2-}
 NO_3^- , NO_2^-)
ICP (same elements
as non-leached
samples)

LEACHATE RESIDUE

ICP (same elements
as non-leached
samples)
Total Sulfur
(per ARC)

* Under cover gas.



EXAMINATION METHOD

TUBE SECTION 22-13-1

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	NOT TO BE DONE
	Macrophotography	NOT TO BE DONE
Dimensional Inspections	OD Measurements	NOT TO BE DONE
	ID Measurements	NOT TO BE DONE
Eddy Current Inspections	Bobbin Coil ECT	NOT TO BE DONE
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	NOT TO BE DONE
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Burst Testing	Tube Burst Testing	NOT TO BE DONE
	Stereovisual Inspection	NOT TO BE DONE
	Photography	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
SEM/EDS		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 22-13-2

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	DONE
	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	O1H-0.1 = 1.1/NA/43%
	MRPC ECT	O1H-0.1 = 0.3/0.3/SAI
	Rotating Field Probe ECT	DONE
X-Ray Radiography		DONE, NO DEFECTS NOTED
Helium Leak Test		DONE, NO LEAKS

Destructive Examinations:

Burst Testing	Tube Burst Testing	DONE, BURST PRESSURE = 8,948 PSI
	Stereovisual Inspection	DONE, SHORT AXIAL IGA CRACKS NEIGHBOR THE FRACTURE
	Photography	DONE
	Scrape Deposits	DONE
SEM/EDS		CRACK PROFILE DONE (AVG = 31%TW, MAX = 56%TW)
		EDS PENDING
Metallography		PENDING
Microhardness		NOT TO BE DONE
SAM/XPS		PENDING

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
	Leachate & Residue	PENDING, TSP AND NON-TSP REGIONS

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	PENDING
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

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EXAMINATION METHOD

TUBE SECTION 22-13-3

Nondestructive Examinations:

Receipt	Radiation Surveys	DONE
Inspections	Establish Tube Orientation	DONE
Visual	Visual Examination	DONE, SEE CRACK MAPS
Inspections	Macrophotography	DONE
Dimensional	OD Measurements	DONE
Inspections	ID Measurements	DONE
Eddy Current	Bobbin Coil ECT	02H+.75 = NDD
Inspections	MRPC ECT	02H+.75 = VOL(ID)
	Rotating Field Probe ECT	DONE
X-Ray Radiography		DONE, NO DEFECTS NOTED
Helium Leak Test		DONE, NO LEAKS

Destructive Examinations:

Burst Testing	Tube Burst Testing	DONE, BURST PRESSURE = 10,396 PSI
	Stereovisual Inspection	DONE, BURST FRACTURE WAS 100% DUCTILE
	Photography	DONE
	Scrape Deposits	DONE
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE
Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE
Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

EXAMINATION METHOD

TUBE SECTION 22-13-4

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
Visual Inspections	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
Dimensional Inspections	Macrophotography	DONE
Dimensional Inspections	OD Measurements	DONE
Dimensional Inspections	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
Eddy Current Inspections	MRPC ECT	NOT TO BE DONE
Eddy Current Inspections	Rotating Field Probe ECT	DONE, NDD
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Burst Testing	Tube Burst Testing	NOT TO BE DONE
	Stereovisual Inspection	NOT TO BE DONE
	Photography	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

(23)



EXAMINATION METHOD

TUBE SECTION 22-13-5

Nondestructive Examinations:

Receipt Inspections	Radiation Surveys	DONE
	Establish Tube Orientation	DONE
Visual Inspections	Visual Examination	DONE, SEE CRACK MAPS
	Macrophotography	DONE
Dimensional Inspections	OD Measurements	DONE
	ID Measurements	DONE
Eddy Current Inspections	Bobbin Coil ECT	DONE, NDD
	MRPC ECT	NOT TO BE DONE
	Rotating Field Probe ECT	DONE, NDD
X-Ray Radiography		NOT TO BE DONE
Helium Leak Test		NOT TO BE DONE

Destructive Examinations:

Burst Testing	Tube Burst Testing	NOT TO BE DONE
	Stereovisual Inspection	NOT TO BE DONE
	Photography	NOT TO BE DONE
	Scrape Deposits	NOT TO BE DONE
SEM/EDS		NOT TO BE DONE
		NOT TO BE DONE
Metallography		NOT TO BE DONE
Microhardness		NOT TO BE DONE
SAM/XPS		NOT TO BE DONE

Deposit Analyses	Anal. of Non Leached Deposit	NOT TO BE DONE
		NOT TO BE DONE
	Leachate & Residue	NOT TO BE DONE

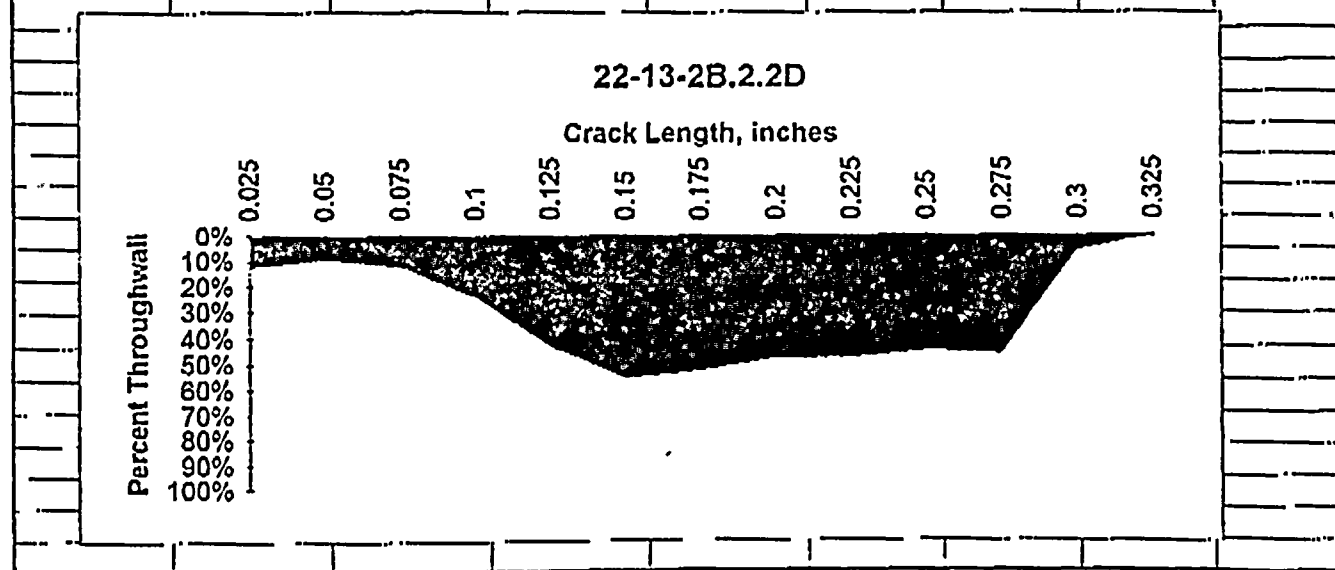
Tube Material Characterization	Bulk Chemistry	NOT TO BE DONE
	Tensile Test	NOT TO BE DONE
	Dual Etch	NOT TO BE DONE
	Microhardness	NOT TO BE DONE
	Modified Huey Test	NOT TO BE DONE

PRELIMINARY

Crack Depth Data-22-13-2B.2.2.d				j:\alm\paloverd\crack\13b22d.xls	
				6/8/93	
axial	%throughwall (assuming 43 mills)		depth		
0.025	12%	0.5	5		
0.05	9%	0.375	4		
0.075	12%	0.5	5		
0.1	25%	1	11		
0.125	44%	1.75	19		
0.15	56%	2.25	24		
0.175	53%	2.125	23		
0.2	48%	1.9375	21		
0.225	48%	1.9375	21		
0.25	45%	1.8125	19		
0.275	47%	1.875	20		
0.3	6%	0.25	3		
0.325	0%	0	0		

AVG : 31%

MAX : 56%



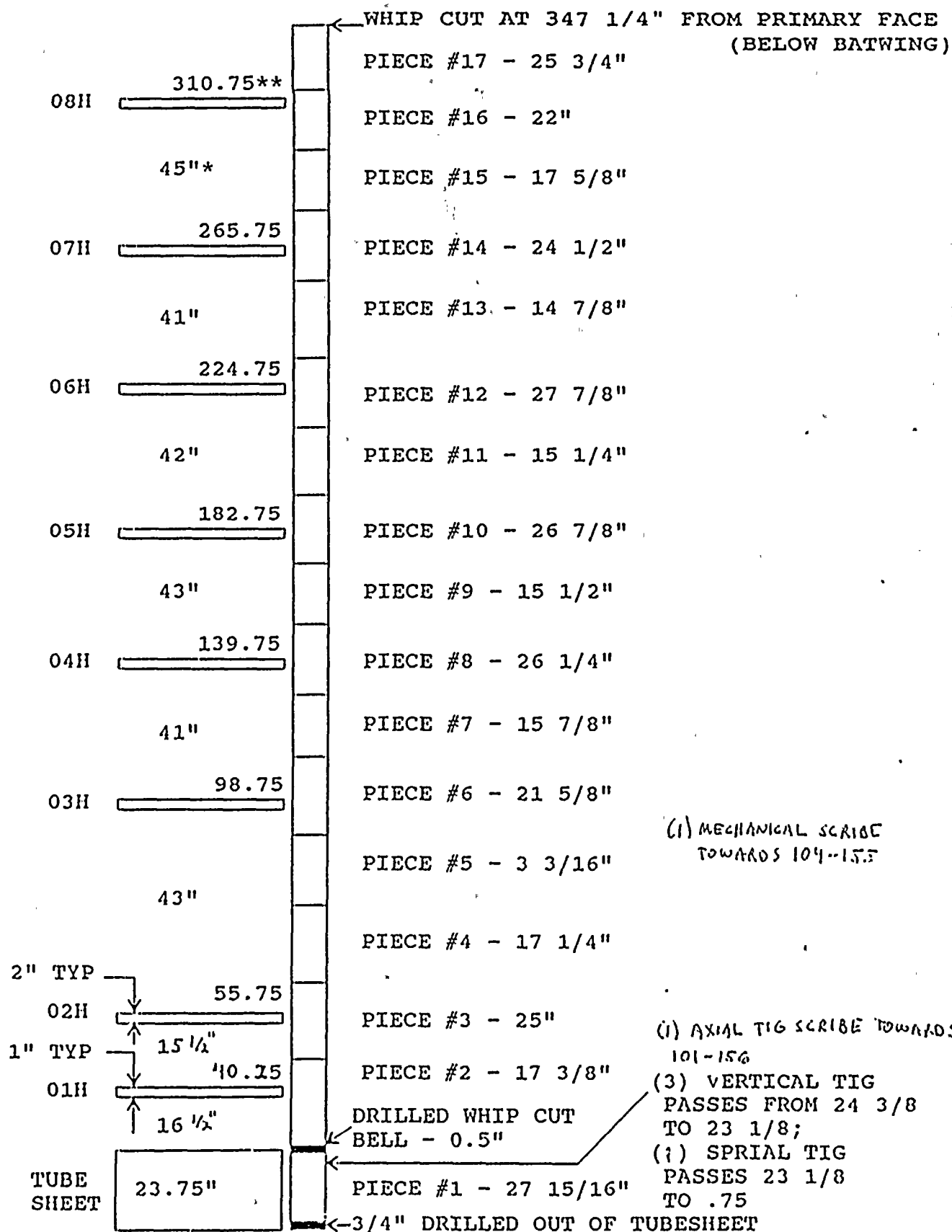
PRELIMINARY

1. 1950年10月1日，中华人民共和国成立，标志着中国历史进入了一个新的纪元。这一天，毛泽东主席在天安门城楼上向全国人民宣告了这一伟大的时刻。从此，中国结束了长达百年的半殖民地半封建社会，真正实现了民族独立和人民解放。

2. 在随后的日子里，新中国政府采取了一系列重大措施，包括土地改革、镇压反革命运动以及抗美援朝战争等，进一步巩固了新生政权，并为国家的工业化建设奠定了基础。

3. 1956年，中国完成了对农业、手工业和资本主义工商业的社会主义改造，实现了生产资料的公有制，正式确立了社会主义制度。这一历史性的转变，为中国后来的发展道路指明了方向。

4. 进入20世纪60年代，中国面临着复杂的国际形势和国内经济挑战。尽管如此，中国人民在党的领导下，坚持自力更生、艰苦奋斗，在科技、工业和国防等领域取得了显著成就，为国家的繁荣富强奠定了坚实基础。



* DISTANCES BETWEEN CENTERLINE OF TSP'S (01H IS A 1" THICK BAFLE PLATE, ALL OTHERS ARE 2" THICK EGGRATES)

** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF EGGRATE

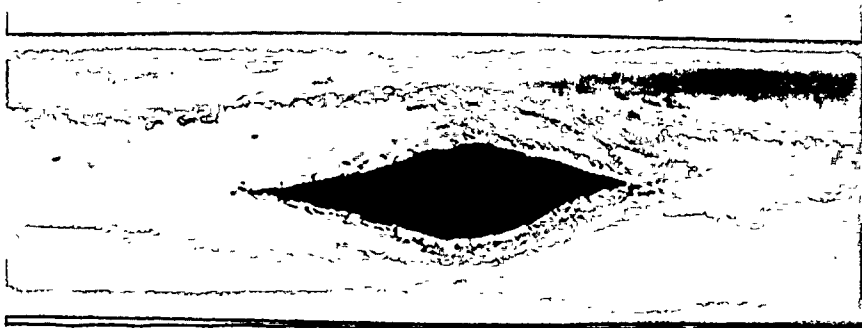
NOTE: NOTCH EACH IN TUBE SAMPLE IS ON TOP END (OPPOSITE TS)

PRELIMINARY



RELIMINARY

TOP



SHOWS LABORATORY BURST TEST.

7

103/152 H17 FERENCE

2X

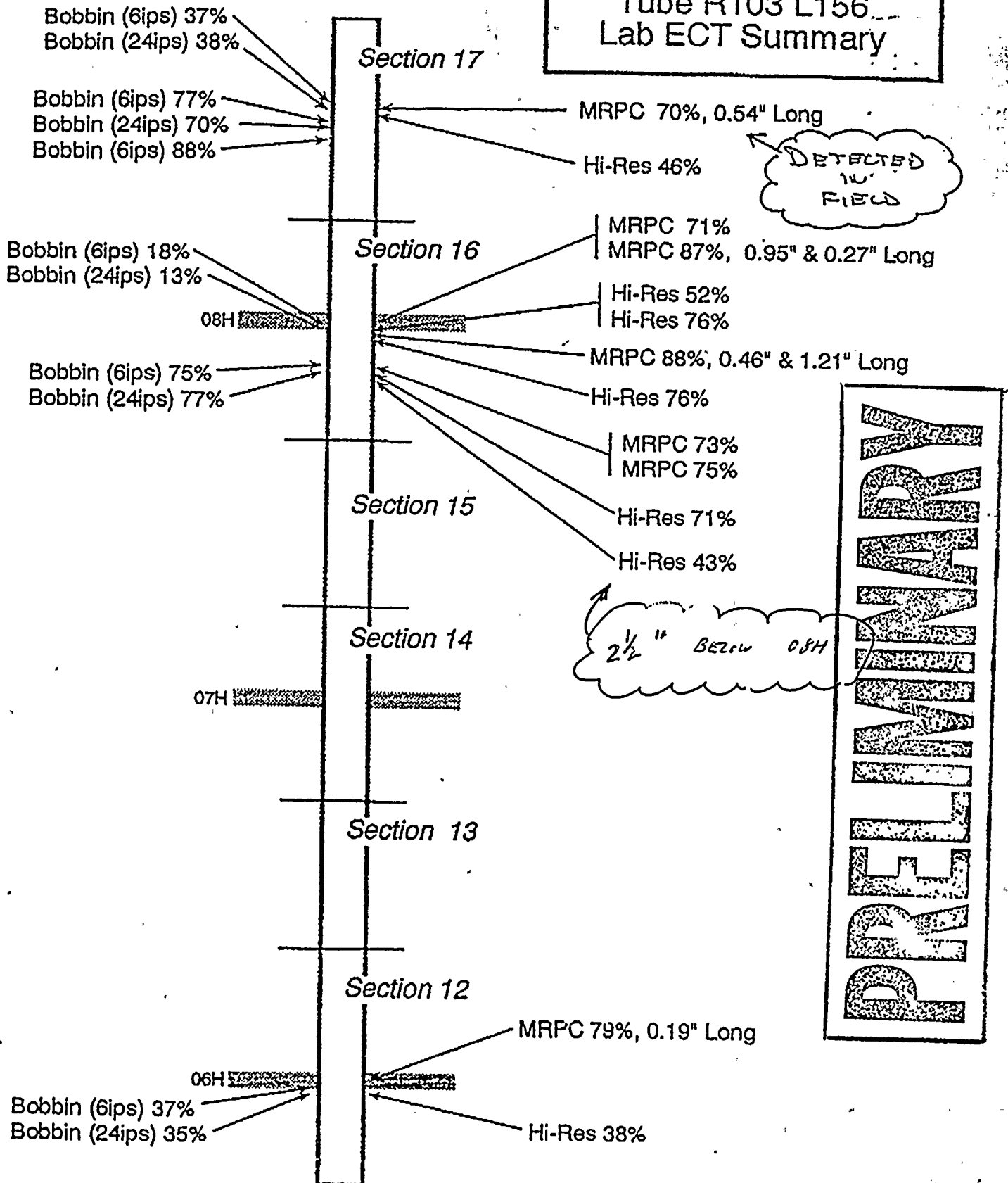


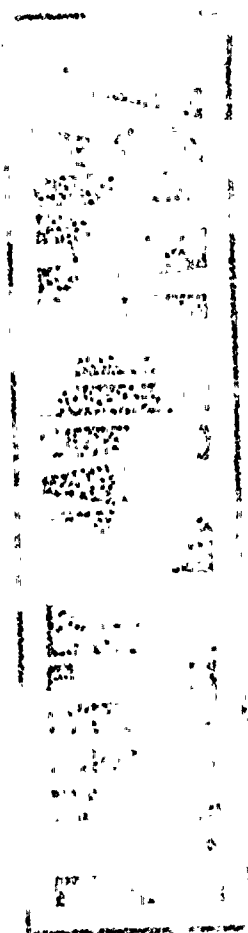
	6 in/sec percent thru wall	Bobbin location from end	24 in/sec Bobbin	Hi Resolution	MRPC	LXW
08H+	88% 77% 36%	7.86 8.11 9.54	38% 70%	9.37 8.59	46% 9.10	70% 10.37 0.54 X 0.10
Seen by all coils 2 different locations Coil						
08H	75% 18%	10.34 12.15	77% 13%	10.08 (9) 11.54 (10) (11) 76% (12) 71%	19% 10.08 48% 12.28 76% 12.24 71% 10.15	88% 10.32 0.27 X 0.17 89% 13.91 0.95 X 0.19
07H	DNT	13.02	DNT	12.75	NDD	NDD
06H	37%	10.80	35%	10.67	38% 10.56	79% 11.00 0.23 X 0.16
TSH	NDD		NDD		NDD	NDD

PRELIMINARY



Steam Generator 22
Tube R103 L156
Lab ECT Summary





TUBE PULL CANDIDATES

TUBE NO. R 103-L 156

LOCATION OF FLAWS	AXIAL EXTENT	CIRC. EXTENT	EST % TW
TSH-0.14"	TSH-0.16" -- TSH-0.13"	1.3"	? SCI
06H+0.83"	06H+0.78" -- 06H+0.88"	0.2"	16
07H+1.0"to+36"	07H+1.0" -- 07H+36"	0.25"	PDP
07H+21"to+35"	07H+21" -- 07H+35"	0.25"	PLP
07H+1.0"to+36"	07H+1.0" -- 07H+36"	0.78"	DNTS
08H-0.95"	MULTIPLE WEAR 90 DEG. APART 08H-1.00" -- 08H-0.80"	0.25" EACH	22
08H+0.72"	08H+0.4" -- 08H+1.04"	0.2"	29
08H+14.38"to+25.50"	08H+14.38" -- 08H+25.5"	0.3"	PDP
08H+15.00"to+18.51"	08H+15" -- 08H+18.51"	0.2"	MAI
BW1+1.77"	BW1+1.55" -- BW1+2.01"	0.2"	17
BW1-1.76"	BW1-2.0" -- BW1-1.40"	0.2"	20

DIAMETER CHANGES:

06H+ 30.07 - POSSIBLE BULGE

TOP OF TUBESHEET SIGNAL = 48.77 VOLTS

BULGE SIGNAL = 3.75 VOLTS

% OF TUBE SHEET SIGNAL = 7.7%

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CUMULATIVE REPORT
04/93, ARIZONA PUBLIC SERVICE, PALO VERDE, UNIT 2

STEAM GENERATOR: 22
LOCATION: ALL
ITERIA: ROW 103 COL 156

PAGE: 1 OF 2
DATE: 04/30/93
TIME: 14:49:30

ROW	COL	DATE	LEG	EXAM EXTENT		REM	CAL	PROBE	LOCATION	CURRENT				
				PROGRAM	ACTUAL					VOLTS	MIL	DEG	%	CH
103	156		H	01H-01H	01H-01H		00067	610RP					NDD	
			H	TSH-TSH	TSH-TSH		00067	610RP					NDD	
			H	TEH-TEC	-		99999	610UL					TPC	
			H	01H-02H	01H-02H		00109	610RC					NDD	
			H	05H-06H	05H-06H		00109	610RC					NDD	
			H	04H-05H	04H-05H		00109	610RC					NDD	
			H	03H-04H	03H-04H		00109	610RC					NDD	
			H	02H-03H	02H-03H		00109	610RC					NDD	
			H	TEH-TSH	TEH-TSH	RPI	00109	610RC	TSH- 0.14	2.46		3	SCI	1
			H	TSH-01H	TSH-01H	RPI	00109	610RC	TSH- 0.14	2.46		3	SCI	1
			H	TEH-TEC	TEH-TEC		00029	610UL	06H+ 0.83	0.66		0	16	P 2
			H	06H-07H	06H-07H		00109	610RC	06H+ 0.86	0.45		32	WAR	P 1
			H	TEH-TEC	TEH-TEC		00106	11412	06H+ 0.89	0.77		0	21	P 2
			H	TEH-TEC	TEH-TEC		00105	11812	06H+ 0.92	1.00		0	21	P 2
			H	06H-06H	06H-06H		00067	610RP	06H+ 0.99	0.75		0	WAR	P 1
			H	07H-08H	07H-08H		00109	610RC	07H+ 1.00TO+ 36.00	0.71		26	DNT	1
			H	07H-08H	07H-08H		00109	610RC	07H+ 1.00TO+ 36.00	1.09		86	PDP	11
			H	TEH-BW1	TEH-VS2		00103	630UC	07H+ 18.80to+ 22.2	1.58		170	NQI	P 1
			H	07H-08H	07H-08H		00109	610RC	07H+ 21.00TO+ 35.00	1.09		86	PLP	6
			H	TEH-TEC	TEH-TEC		00105	11812	08H- 0.95	0.76		0	17	P 2
			H	08H-BW1	08H-BW1		00109	610RC	08H- 0.95	0.70		165	WAR	P 1
			H	TEH-TEC	TEH-TEC		00106	11412	08H- 0.92	0.87		0	22	P 2
			H	08H-BW1	08H-BW1		00109	610RC	08H- 0.84	1.03		146	WAR	P 1
			H	TEH-TEC	TEH-TEC		00106	11412	08H+ 0.43	0.79		0	21	P 2
			H	TEH-TEC	TEH-TEC		00105	11812	08H+ 0.72	0.70		0	16	P 2
			H	07H-08H	07H-08H		00109	610RC	08H+ 0.79	0.31		0	WAR	P 1
			H	08H-BW1	08H-BW1		00109	610RC	08H+ 0.80	1.01		134	WAR	P 1
			H	07H-08H	07H-08H		00109	610RC	08H+ 0.80	0.80		0	WAR	P 1
			H	TEH-BW1	TEH-VS2		00103	630UC	08H+ 0.81	1.05		0	29	P 2
			H	08H-BW1	08H-BW1		00109	610RC	08H+ 0.81	1.04		164	WAR	P 1
			H	08H-BW1	08H-BW1		00067	610RP	08H+ 0.85	1.48		0	WAR	P 1
			H	08H-BW1	08H-BW1		00109	610RC	08H+ 14.38TO+ 25.50	0.89		81	PDP	11
			H	08H-BW1	08H-BW1	RPI	00109	610RC	08H+ 15.00TO+ 18.51	1.80		163	MAI	1
			H	08H-BW1	08H-BW1	RPI	00067	610RP	08H+ 16.39TO+ 19.22	0.57		129	SAI	P 1
			H	08H-BW1	08H-BW1		00067	610RP	08H+ 16.56to+ 28.9	1.46		0	PDP	11
			H	TEH-TEC	TEH-TEC		00105	812	08H+ 19.64	1.08		12	NBI	1
			H	TEH-TEC	TEH-TEC		00029	610UL	08H+ 20.36	0.22		151	NBI	1
			H	TEH-TEC	TEH-TEC		00106	412	08H+ 20.59	1.45		16	NBI	1
			H	08H-BW1	08H-BW1		00067	610RP	BW1- 2.15	1.44		0	WAR	P 1
			H	08H-BW1	08H-BW1		00109	610RC	BW1- 1.80	1.18		155	WAR	P 1
			H	TEH-TEC	TEH-TEC		00029	610UL	BW1- 1.76	0.72		0	17	P 2
			H	TEH-TEC	TEH-TEC		00105	11812	BW1- 1.74	0.47		0	11	P 2
			H	TEH-TEC	TEH-TEC		00106	11412	BW1- 1.70	0.20		0	17	P 2
			H	TEH-BW1	TEH-VS2		00103	630UC	BW1- 1.55	0.67		0	27	P 2
			H	08H-BW1	08H-BW1		00067	610RP	BW1+ 1.77	1.27	17	0	17	P 1

PRELIMINARY

CONAM NUCLEAR, INC.

(80)



CUMULATIVE REPORT
04/93, ARIZONA PUBLIC SERVICE, PALO VERDE, UNIT 2

STEAM GENERATOR: 22
LOCATION: ALL
CRITERIA: ROW 103 COL 156

PAGE: 2 OF 2
DATE: 04/30/93
TIME: 14:49:30

ROW	COL	DATE	LEG	EXAM EXTENT		REM	CAL	PROBE	LOCATION	CURRENT				
				PROGRAM	ACTUAL					VOLTS	MIL	DEG	%	CH
103	156		H	08H-BW1	08H-BW1		00109	610RC	BW1+ 1.92	8.04		172	WAR	P 1

NUMBER OF TUBES SELECTED FROM CURRENT OUTAGE: 1
NUMBER OF DATA RECORDS SELECTED FROM CURRENT OUTAGE: 46

NO TREND ANALYSIS REQUESTED

REPORT OPTIONS:
Only examination results matching criteria are included

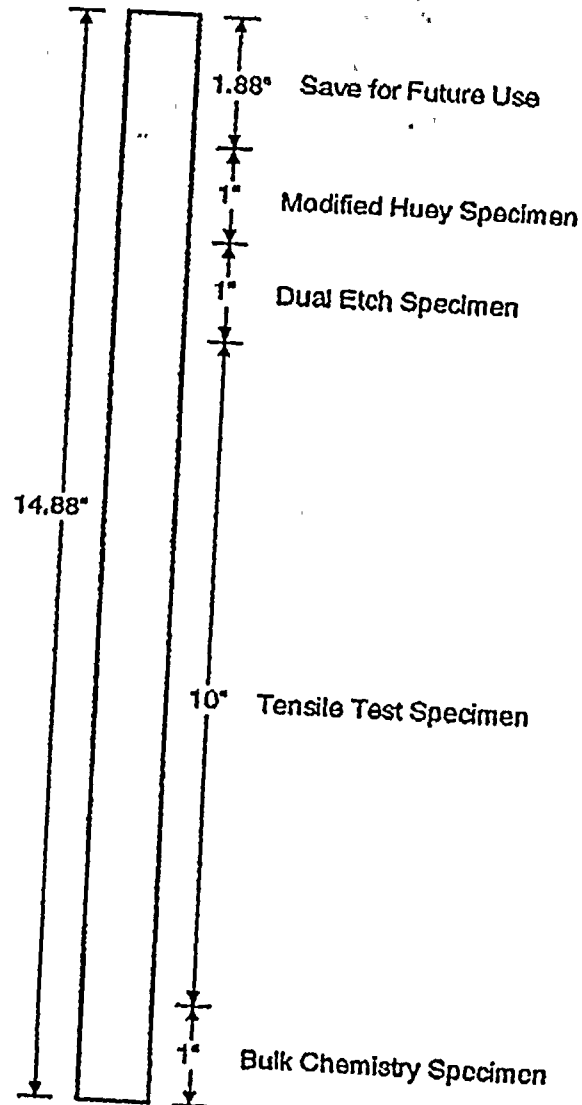
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CONAM NUCLEAR, INC.



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Steam Generator 22 Tube R103 L156 Section 13

DRAFT

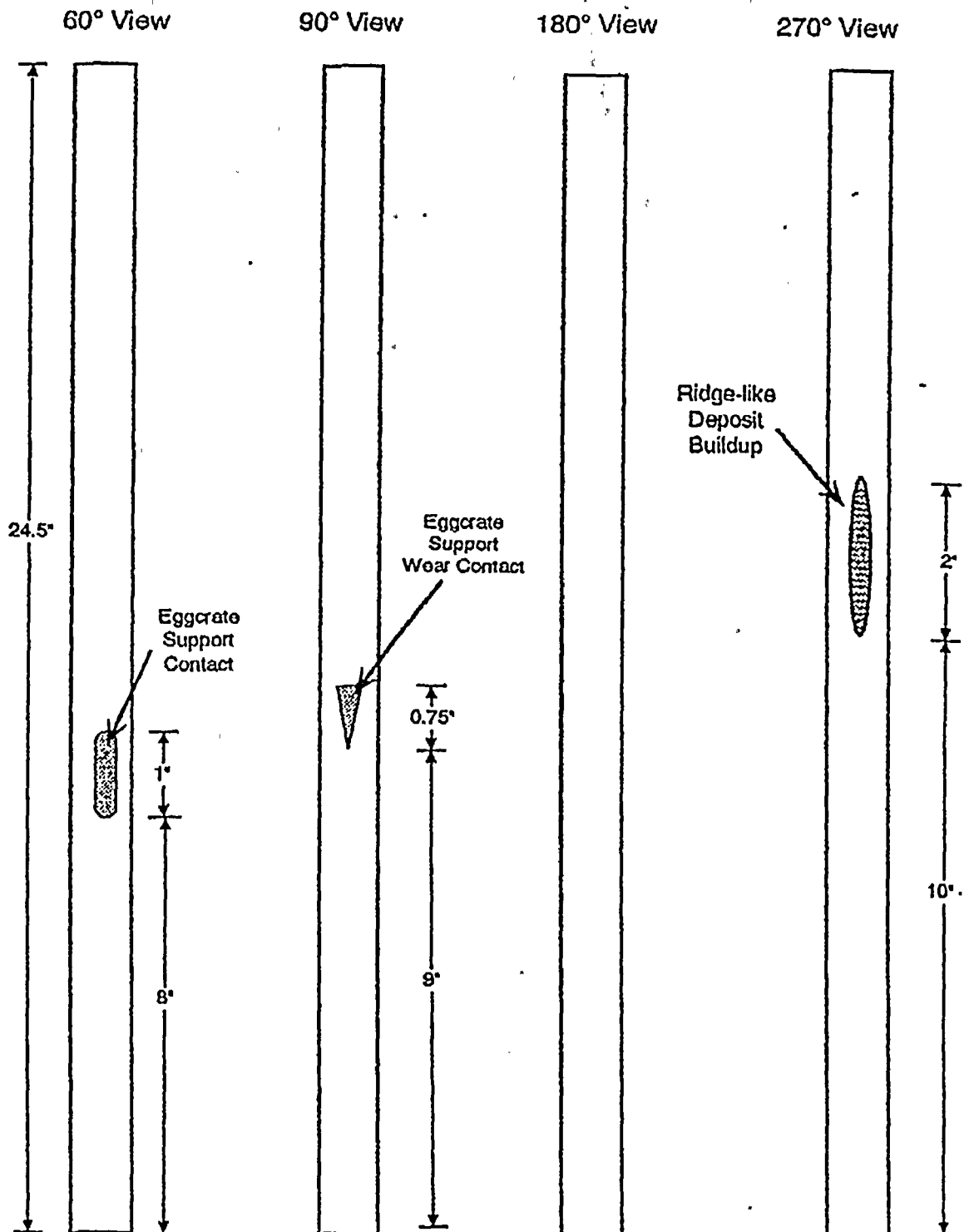


PRELIMINARY



Steam Generator 22 Tube R103 L156 Section 14

DRAFT



PRELIMINARY



Steam Generator 22 Tube R103 L156 Section 16

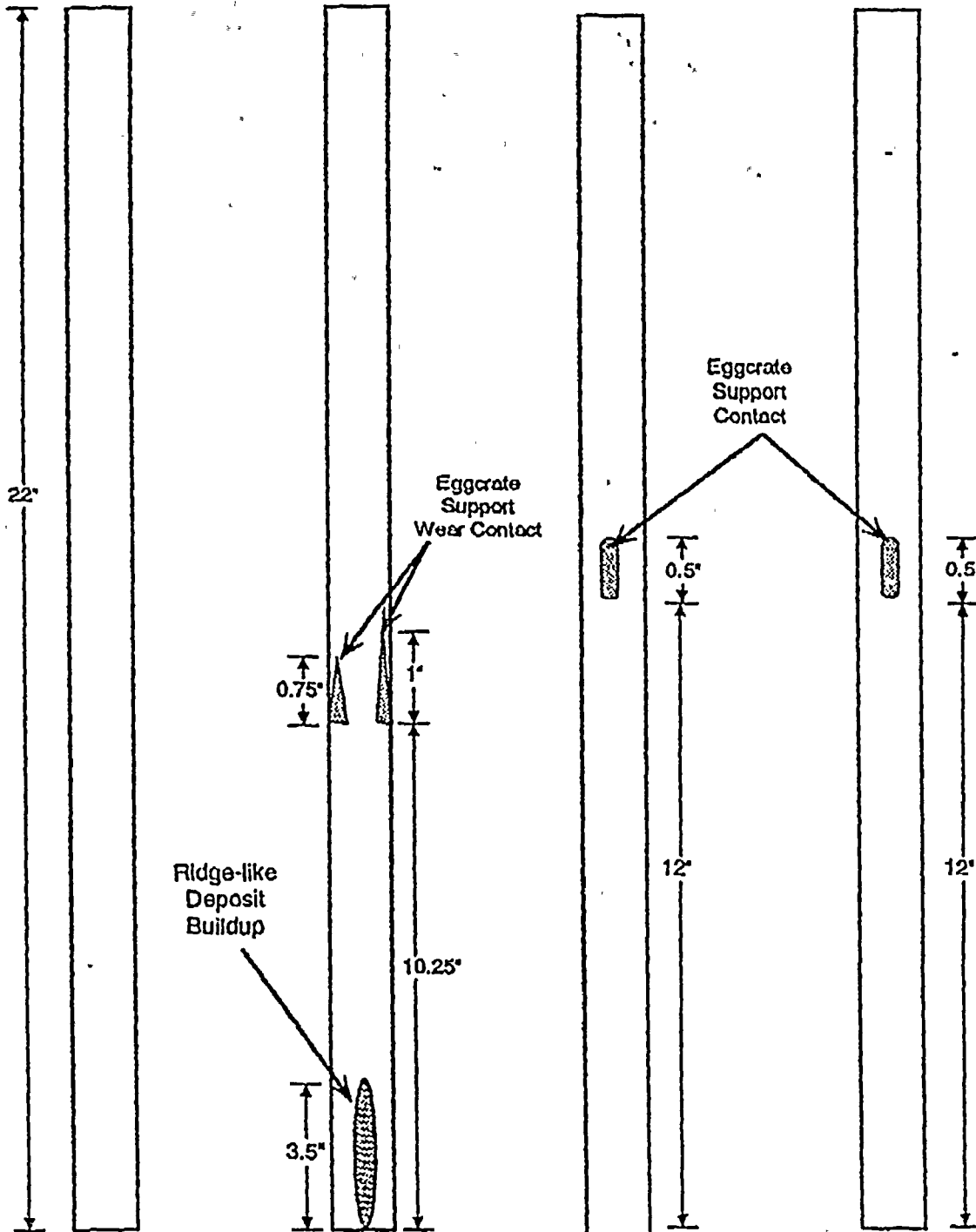
DRAFT

0° View

90° View

245° View

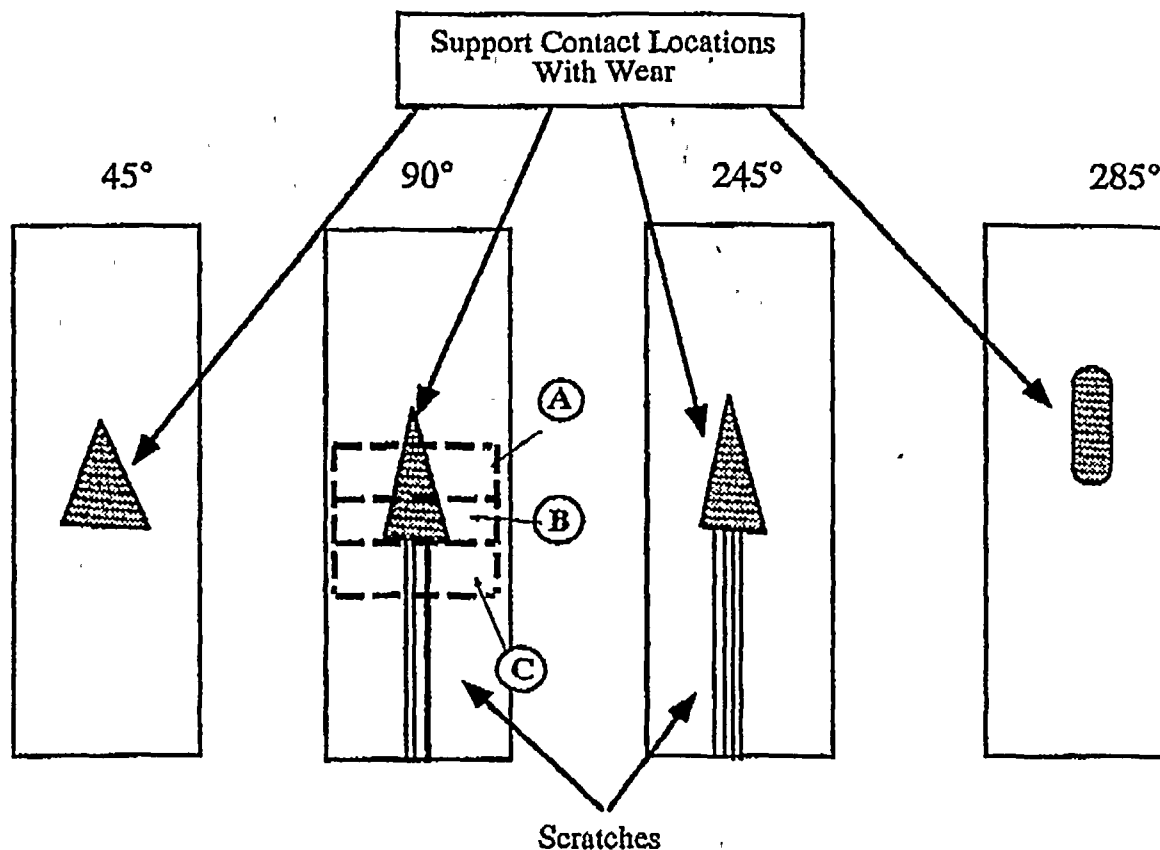
285° View



PRELIMINARY



103/156 08H Support Descaled



- A- Transverse mount for SEM surface examination
B- Transverse mount for wear depth, corrosion, and hardness, to be Ni plated
C- Transverse mount for scratch depth and hardness section to be Ni plated

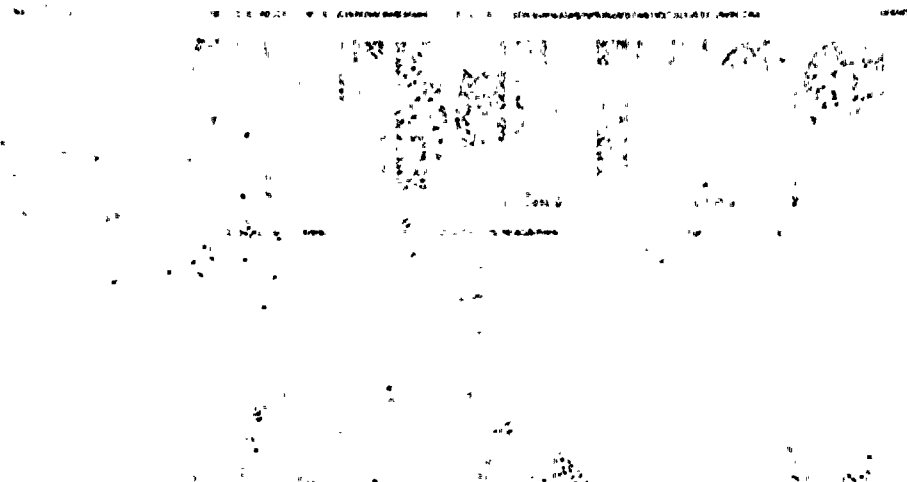
OBSERVATIONS:

- Scratches extend below the support location and not above the support
- Deepest scratch about 1 mil deep
- Wear locations 6 mils deep

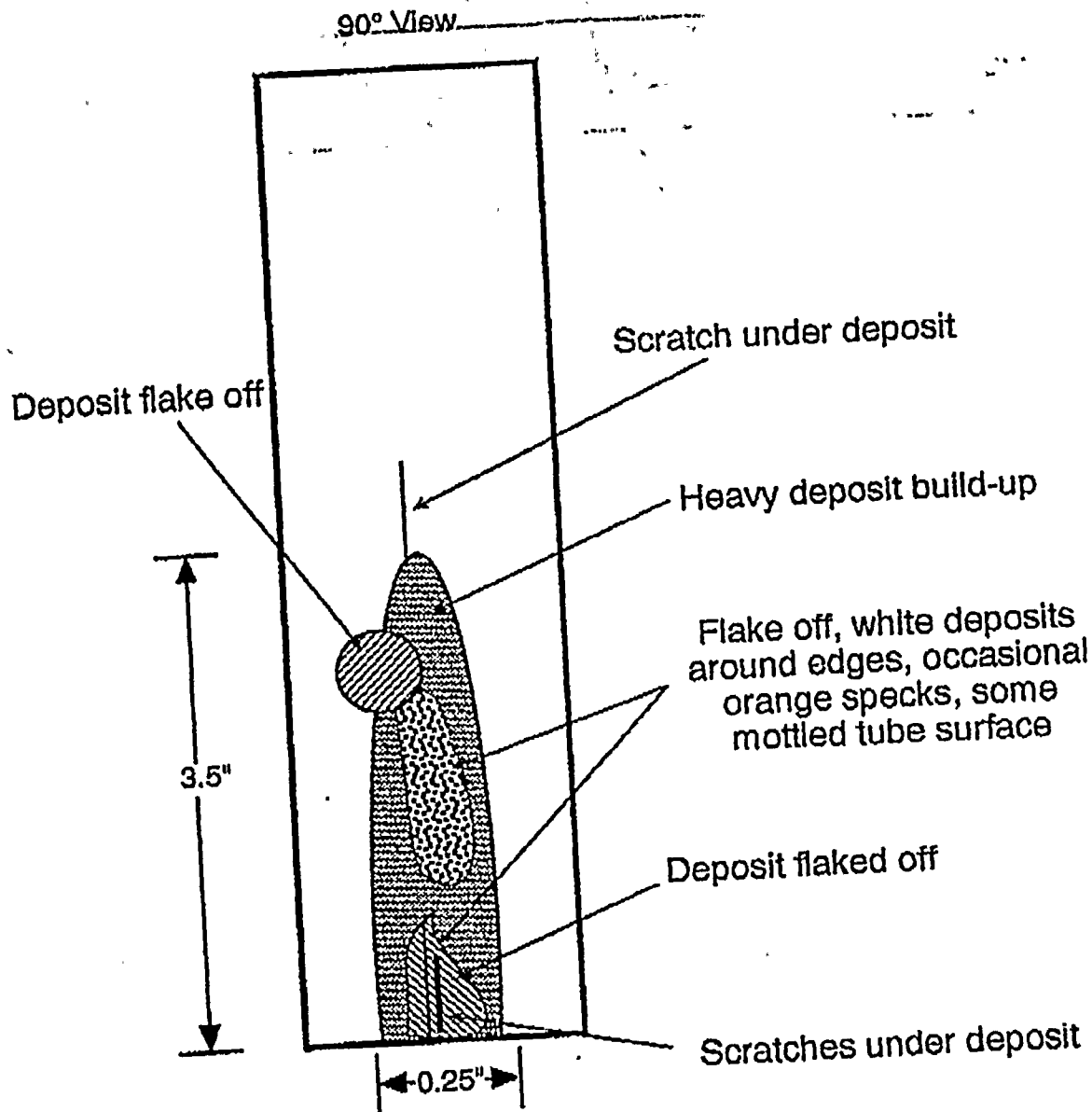
WORK IN PROGRESS

- Part A prepared for SEM surface examination
- Parts B and C cut and ready for Ni plating

PRELIMINARY



3
106/156 Section 16 (Lower Part)



PRELIMINARY

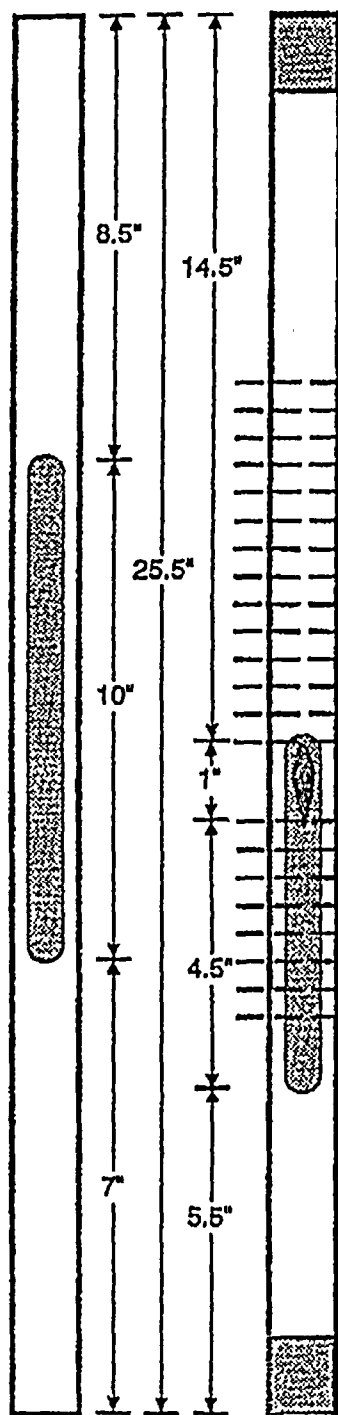


DRAFT

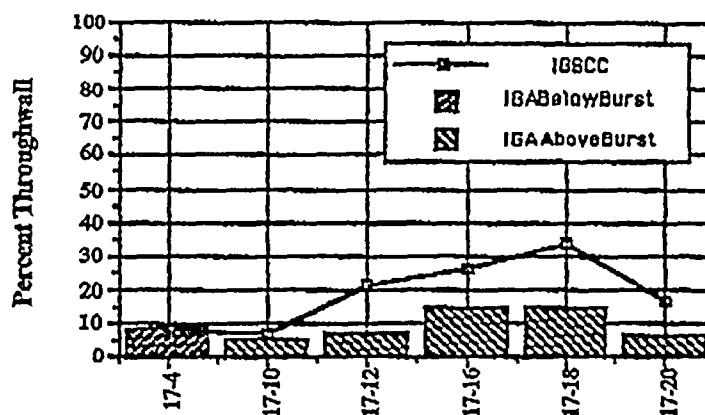
Steam Generator 22 Tube R103 L156 Section 17

180° View

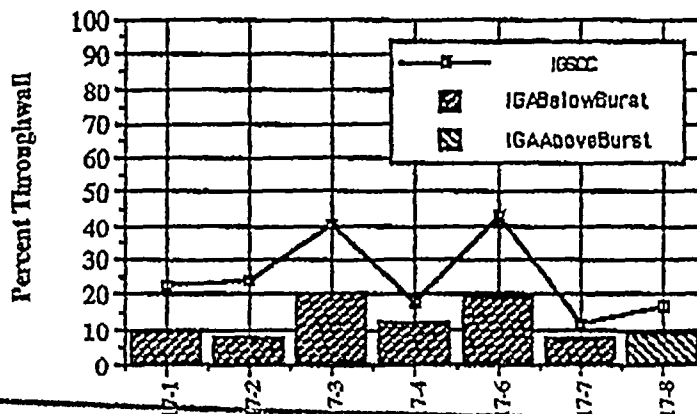
300° View



Section 17 (180°)



Section 17 (270°-300°)



PRELIMINARY

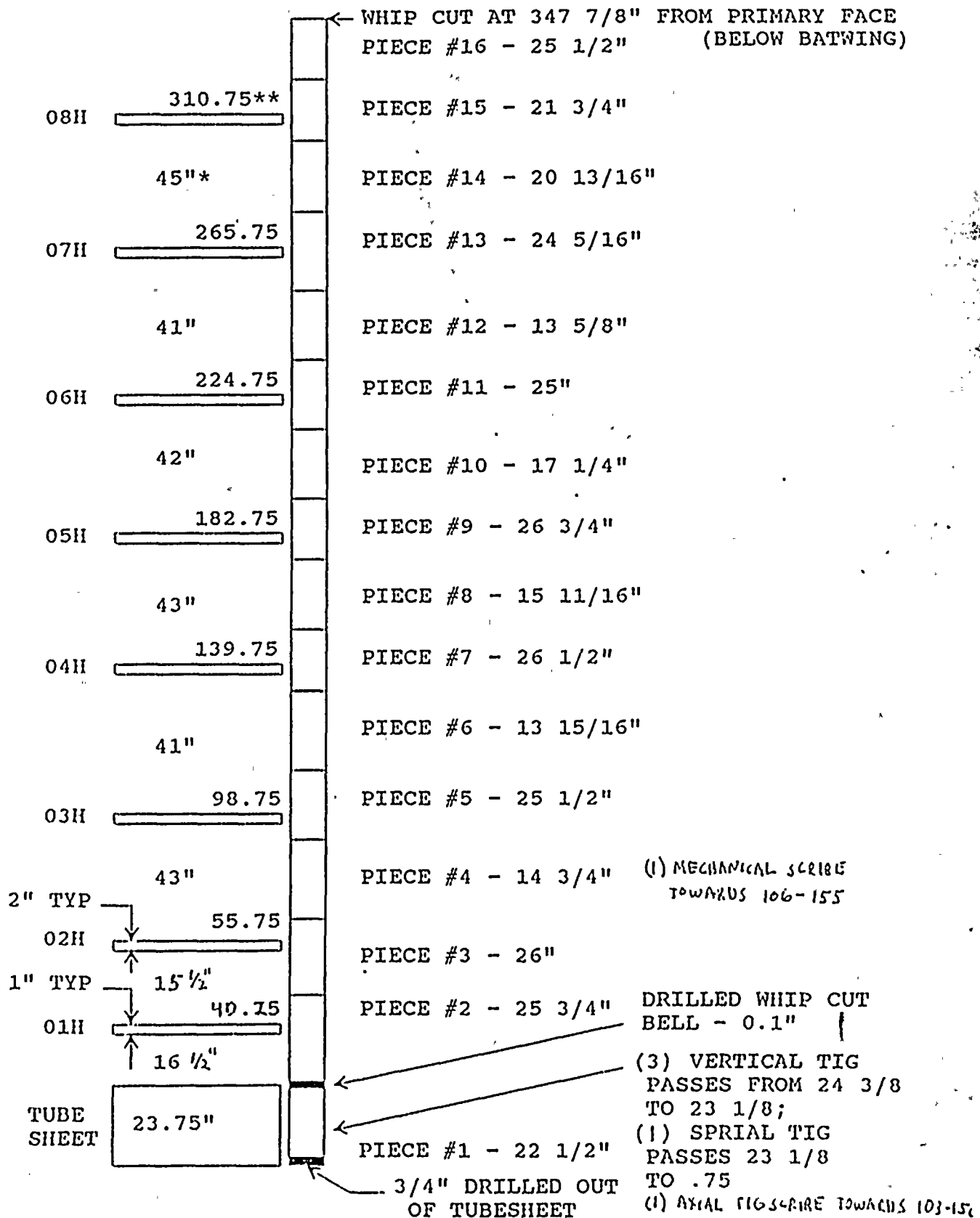
Deposit
Burst Fitting



12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

TUBE 105-156

REVISION 2



* DISTANCES BETWEEN CENTERLINE OF TSP'S (01H IS A 1" THICK

BAFFLE PLATE, ALL OTHERS ARE 2" THICK EGGCRATES)

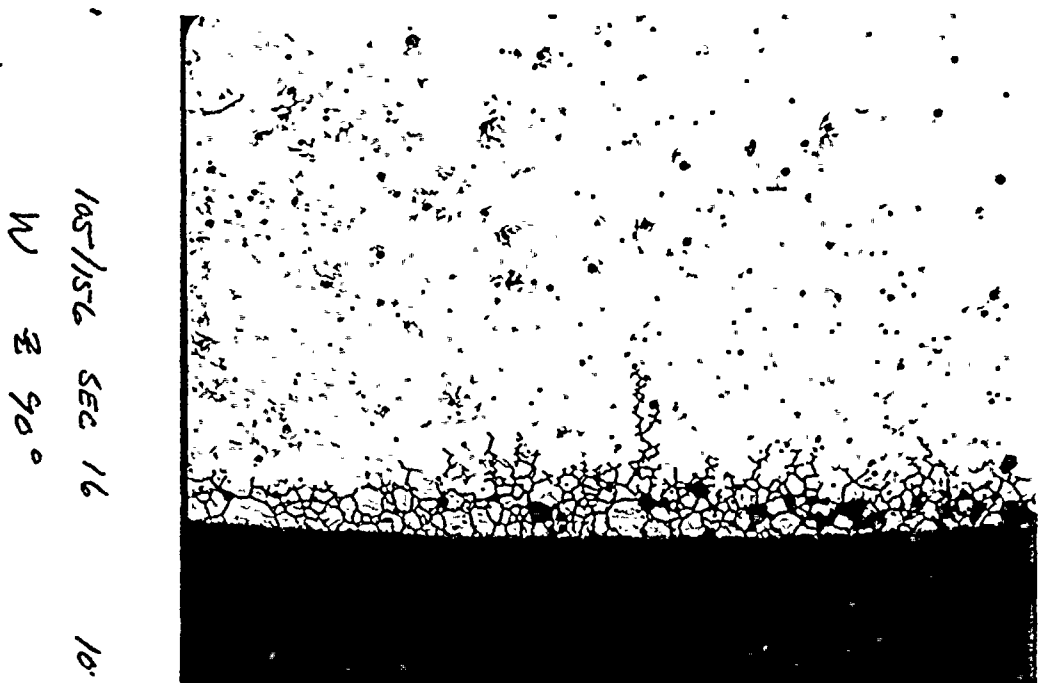
** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF EGGCRATE

NOTE: NOTCH EACH IN TUBE SAMPLE IS ON TOP END (OPPOSITE TS)

PRELIMINARY



VIEW OF TUBE O.D. SHOWING BOTH IGA AND SHALLOW IGSCC. PVNGS U2 - SG
#22 TUBE NO. 105/156 - SECTION 16. - W - 90 DEGREE.



PRELIMINARY



TUBE PULL CANDIDATES

TUBE NO. R 105-L 156

LOCATION OF FLAWS	AXIAL EXTENT	CIRC. EXTENT	EST % TW
08H+0.72"	08H+0.70" -- 08H+1.0"	0.15"	11
08H+13.87"to+31.0"	08H+13"-- 08H+37.0"	0.25"	PDP
08H+21.54"to+25.62"	08H+21.5" -- 25.0"	0.25"	0-96% MAI

DIAMETER CHANGES:

NONE ABOVE TSH

PRELIMINARY



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CUMULATIVE REPORT
04/93, ARIZONA PUBLIC SERVICE, PALO VERDE, UNIT 2

STEAM GENERATOR: 22
LOCATION: ALL
ITERIA: ROW 105 COL 156

PAGE: 1 OF 1
DATE: 04/30/93
TIME: 14:49:08

ROW	COL	DATE	LEG	EXAM EXTENT		REM	CAL	PROBE	LOCATION	CURRENT				
				PROGRAM	ACTUAL					VOLTS	MIL	DEG	%	CH
105	156		H	TEH-TEC	-		99999	610UL						TPC
			H	06H-07H	06H-07H		00108	610RC						NDD
			H	05H-06H	05H-06H		00108	610RC						NDD
			H	04H-05H	04H-05H		00108	610RC						NDD
			H	03H-04H	03H-04H		00108	610RC						NDD
			H	02H-03H	02H-03H		00108	610RC						NDD
			H	01H-02H	01H-02H		00108	610RC						NDD
			H	TSH-01H	TSH-01H		00108	610RC						NDD
			H	TEH-TSH	TEH-TSH		00108	610RC						NDD
			H	TEH-BW1	TEH-VS2		00103	630UC	08H+ 0.72	0.34		0	11	P 2
			H	08H-LB1	08H-LB1		00108	610RC	08H+ 0.76	2.50		138	WAR	P 1
			H	07H-08H	07H-08H		00108	610RC	08H+ 0.76	0.87		135	WAR	P 1
			H	08H-BW1	08H-LB1		00108	610RC	08H+ 13.87TO+ 31.41	2.68		76	PDP	11
			H	08H-BW1	08H-BW1		00031	610RP	08H+ 16.74to+ 37.3	0.06		0	PDP	11
			H	08H-LB1	08H-LB1	RPI	00108	610RC	08H+ 21.54TO+ 25.62	13.94		42	MAI	P 1
			H	TEH-TEC	TEH-TEC	RPI	00029	610UL	08H+ 24.28	4.14		67	84	1
			H	TEH-BW1	TEH-VS2	RPI	00103	630UC	08H+ 24.50	4.32		68	87	1
			C	09H-TEH	TEC-TEH		00097	610UL	08H+ 24.60	4.53		73	PID	1
			H	TEH-TEC	TEH-TEC	RPI	00029	610UL	08H+ 25.28	3.67		83	74	1
			H	TEH-BW1	TEH-VS2	RPI	00103	610UC	08H+ 25.51	3.26		78	81	1
			H	TEH-TEC	TEH-TEC	RPI	00029	610UL	08H+ 25.78	4.80		73	80	1
			H	TEH-BW1	TEH-VS2	RPI	00103	610UC	08H+ 25.85	4.64		59	91	1
			H	08H-BW1	08H-BW1	RPI	00031	610RP	08H+ 26.26to+ 30.6	3.49		46	SAI	1
			H	TEH-TEC	TEH-TEC	RPI	00029	610UL	08H+ 26.49	1.80		66	85	1
			H	TEH-BW1	TEH-VS5	RPI	00103	610UC	08H+ 26.58	2.00		49	96	1
			H	TEH-TEC	TEH-TEC	RPI	00029	610UL	08H+ 27.81	0.74		120	46	1
			H	TEH-TEC	TEH-TEC		00093	610UL	08H+ 27.81	4.91		71	PID	1
			H	TEH-BW1	TEH-VS2	RPI	00103	610UC	08H+ 27.88	0.78		117	51	1

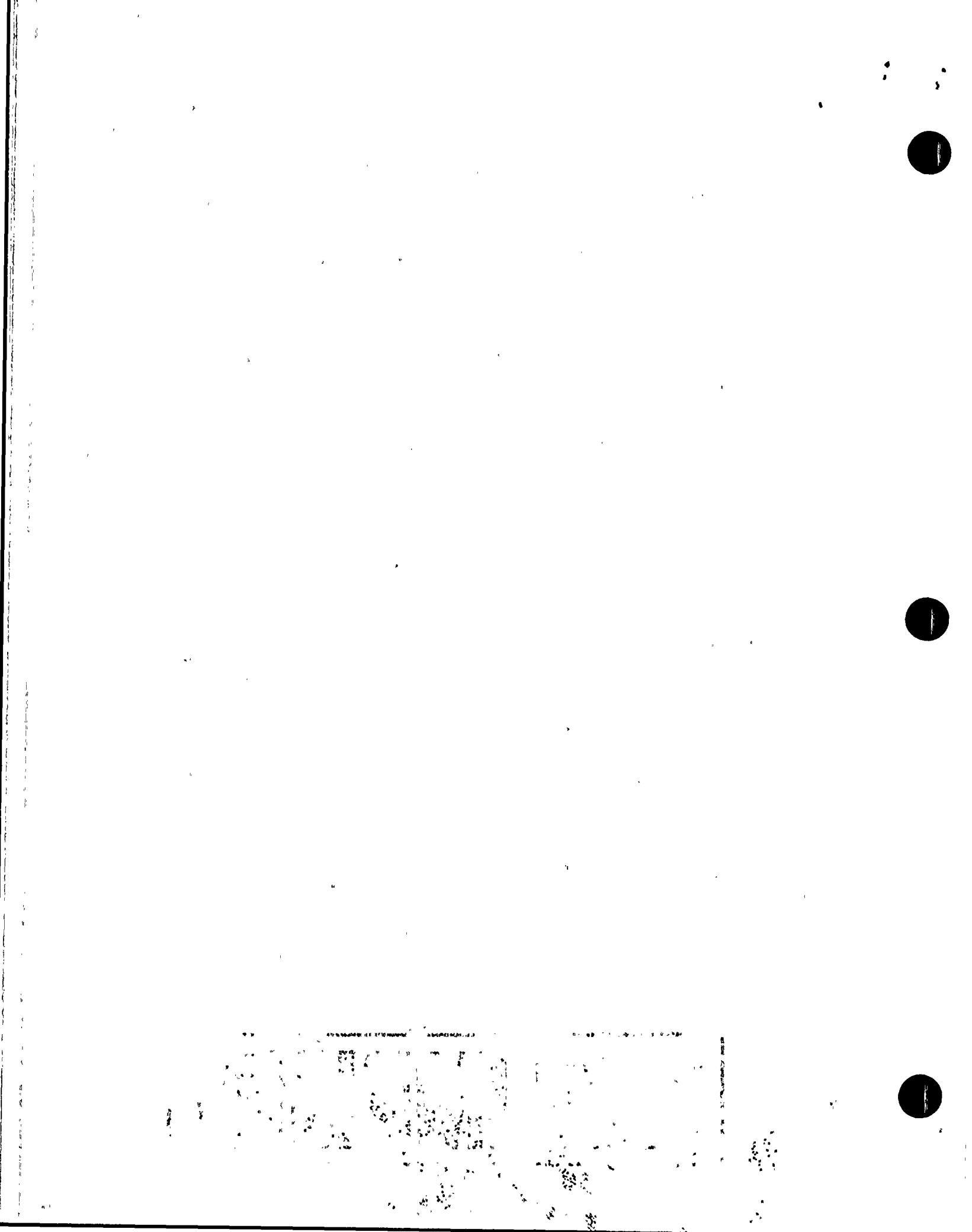
NUMBER OF TUBES SELECTED FROM CURRENT OUTAGE: 1
NUMBER OF DATA RECORDS SELECTED FROM CURRENT OUTAGE: 28

NO TREND ANALYSIS REQUESTED

REPORT OPTIONS:

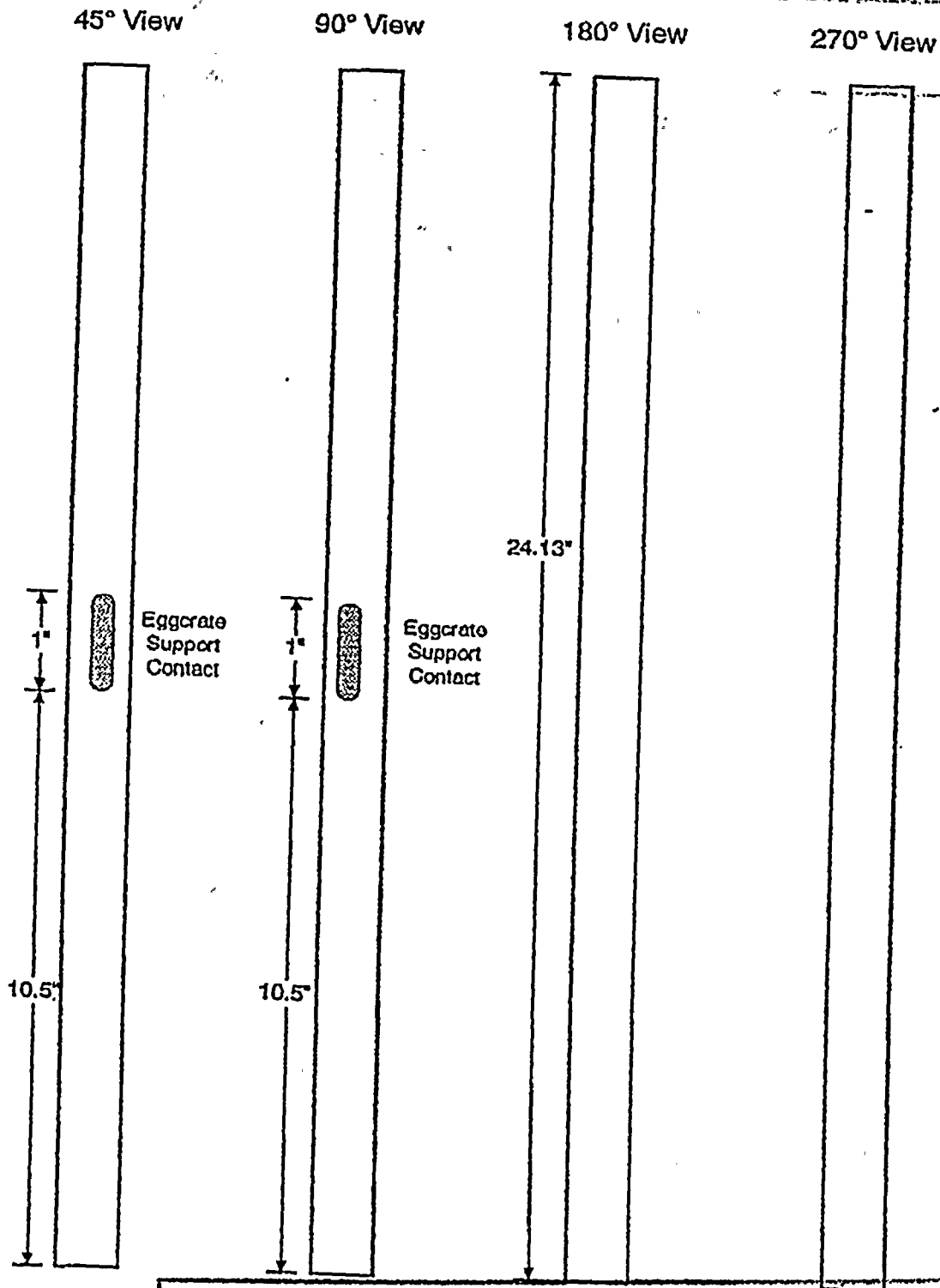
Only examination results matching criteria are included

PRELIMINARY
CONAM NUCLEAR INC.



Steam Generator 22 Tube R105 L156 Section 13

DRAFT



PRELIMINARY



1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in financial reporting.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It includes a detailed description of the experimental procedures and the statistical analysis performed.

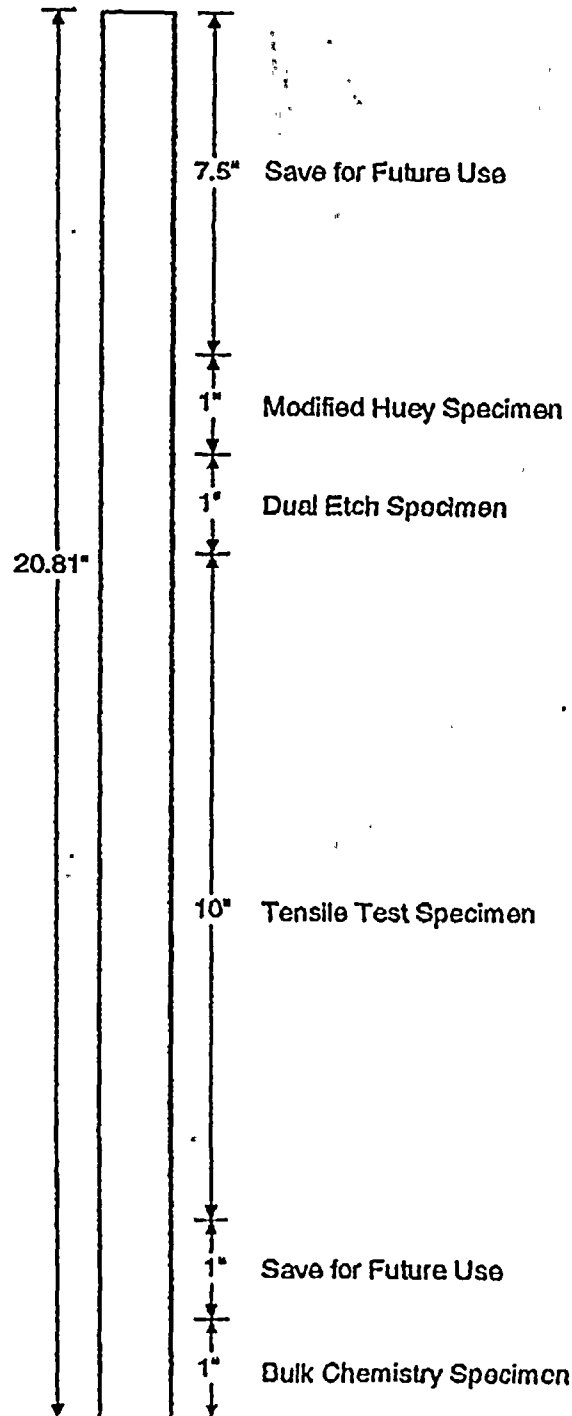
3. The third part of the document presents the results of the study, showing the trends and patterns observed in the data. It includes several graphs and tables to illustrate the findings.

4. The fourth part of the document discusses the implications of the results and the potential applications of the findings. It highlights the need for further research and the importance of sharing the results with the relevant stakeholders.

5. The fifth part of the document provides a conclusion and a summary of the key findings. It also includes a list of references and a bibliography of the sources used in the study.

Steam Generator 22 Tube R105 L156 Section 14

DRAFT

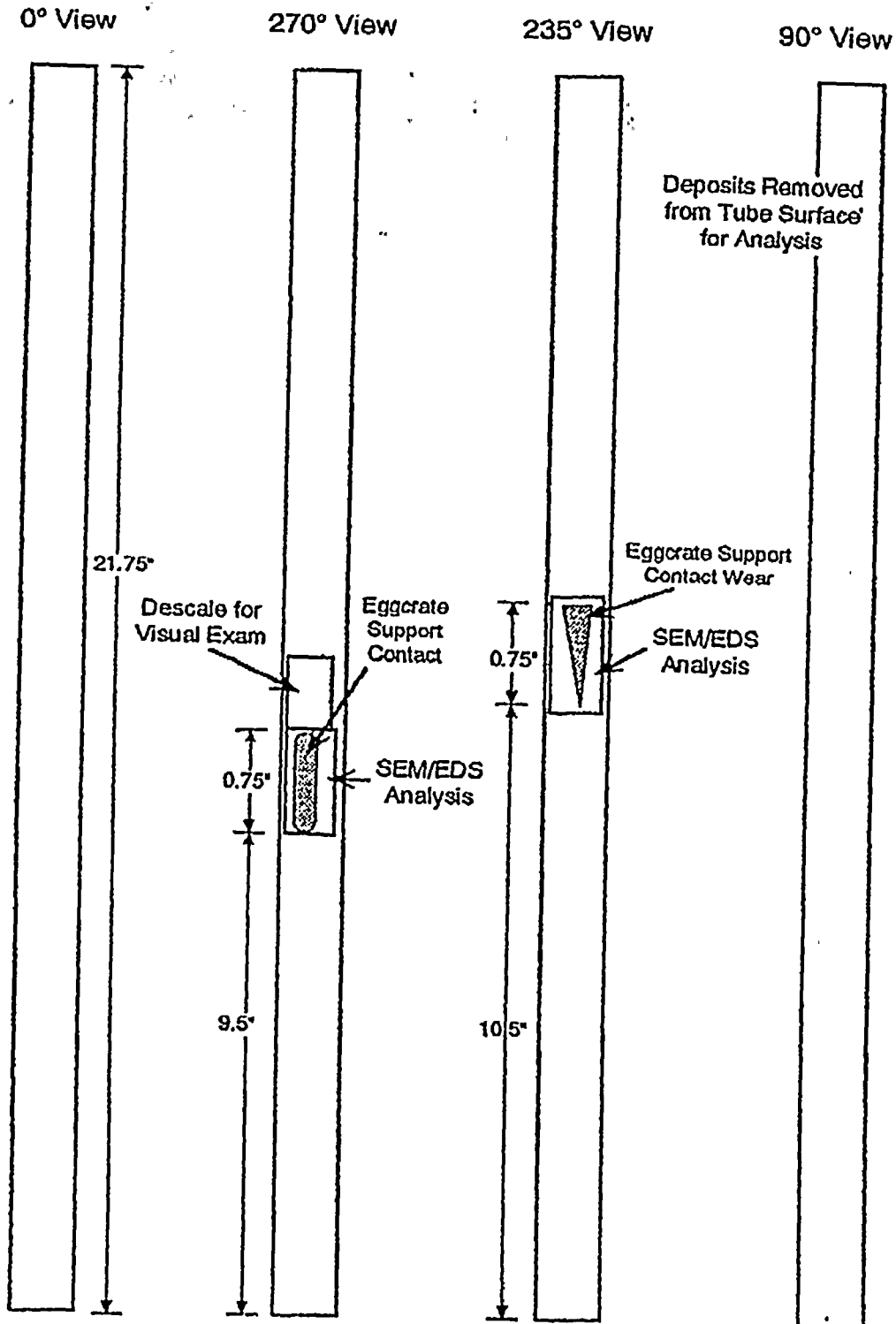


PRELIMINARY



Steam Generator 22 Tube R105 L156 Section 15

DRAFT



PRELIMINARY

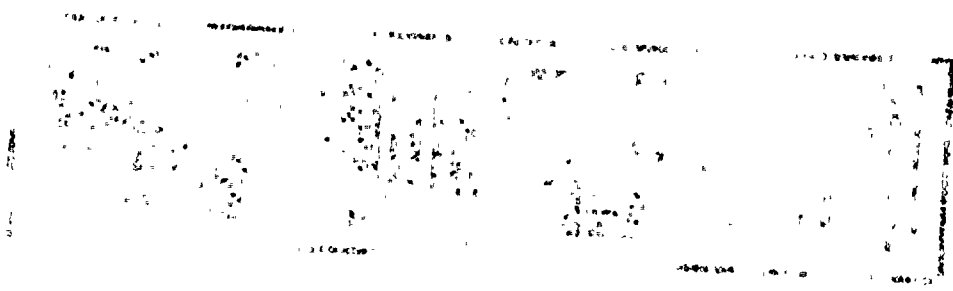


XRF/XRD Data

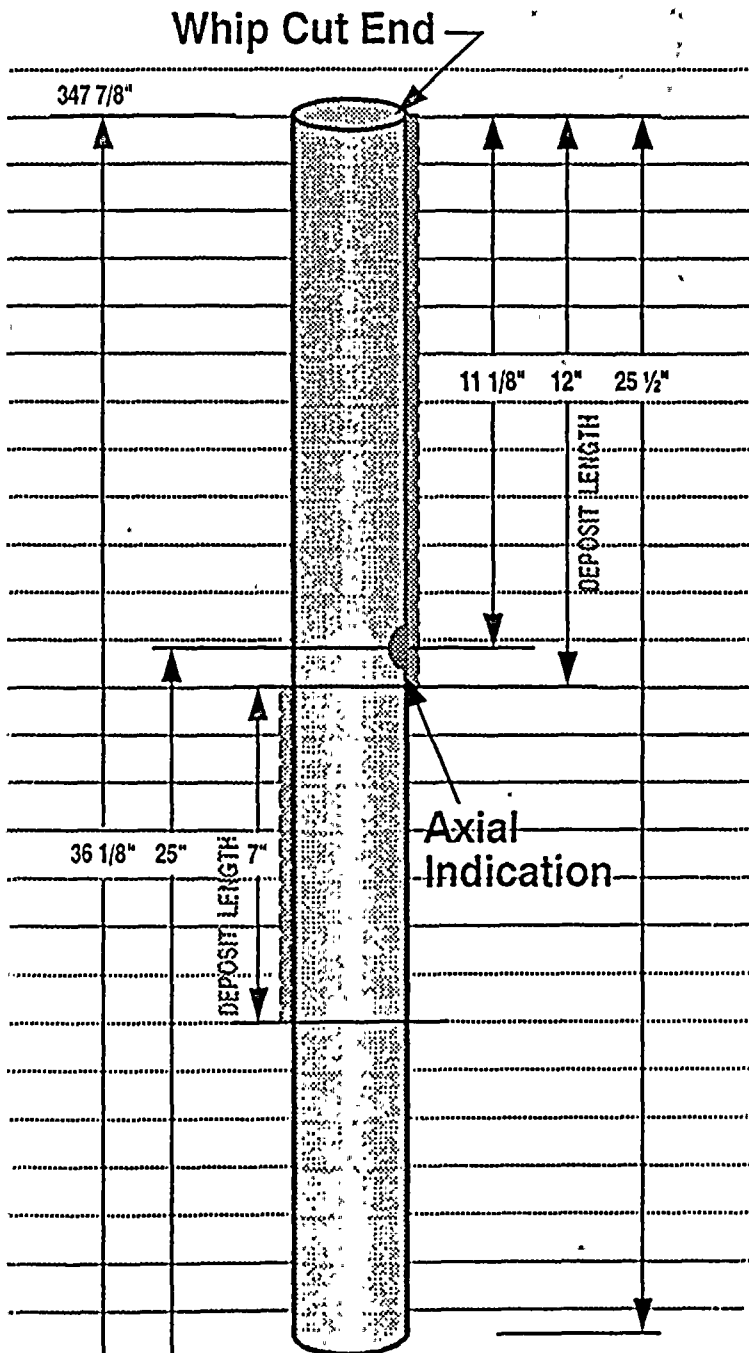
X-Ray Fluorescence Tube 105/156 (Surface Scrapings)

Section 15	wt.%
Fe3O4	88.07
Cu	2.52
NiO	0.75
ZnO	0.26
MnO	6.68
Cr2O3	0.13
MoO3	0.07
TiO	0.20
PbO	0.12
SnO2	0.08
SiO2	0.35
Al2O3	0.22
P2O5	0.03
SO3	0.17
Cl	0.10
K2O	0.05
CaO	0.08
MgO	0.17

PRELIMINARY



Palo Verde Unit 2
Steam Generator 22
Tube 105 - 156
Tube Section #16



Midspan Above 08H
X = Axial Flaw w/ Deposit
D = Deposit Only

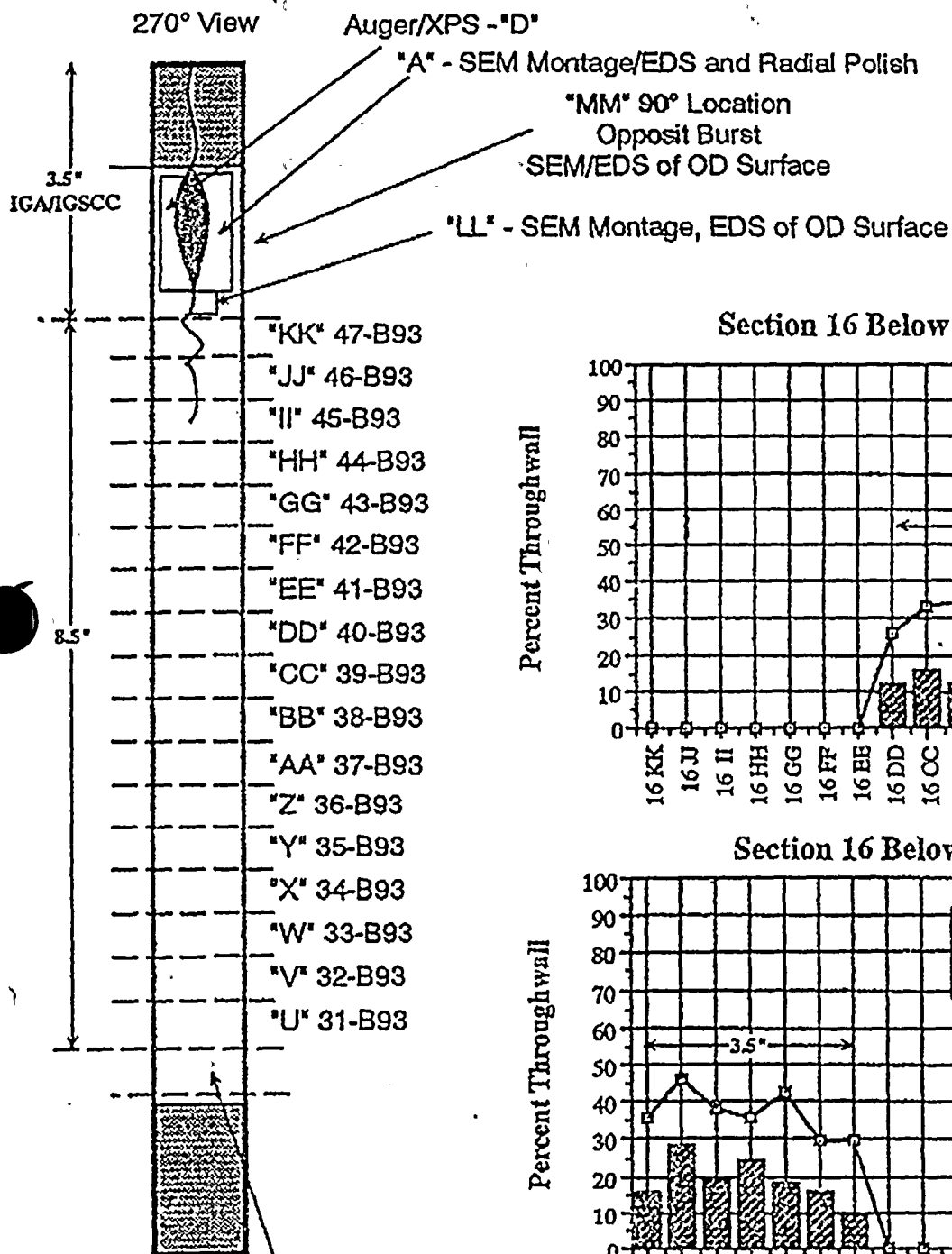
	COLUMN		
	155	156	157
ROW			
107		107-156	
106	106-155	X	106-157
105		105-156	
104	104-155	D	X 104-157
103		103-156	
102	102-155	D	102-157
101		101-156	

PRELIMINARY

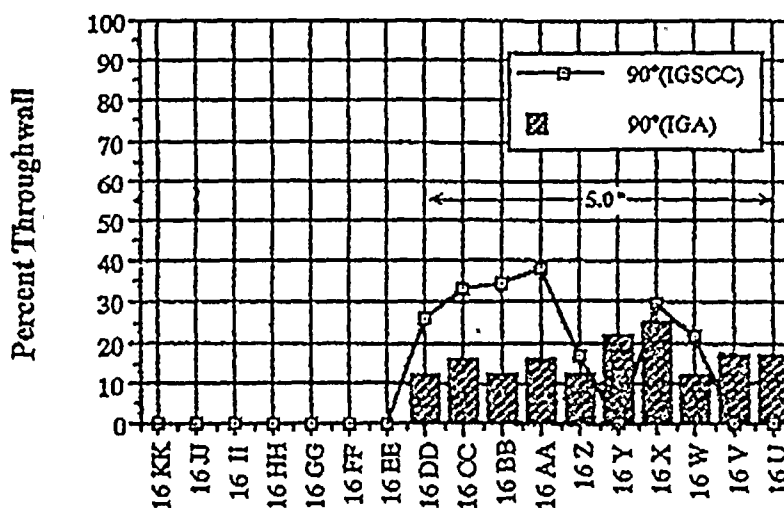
5-27-93
JF-1C



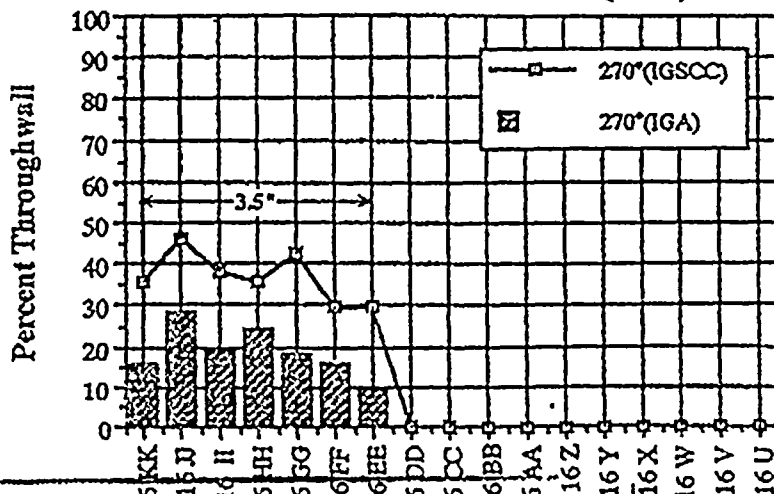
Steam Generator 22 Tube R105 L156 Section 16 Burst Test Part



Section 16 Below Burst (90°)



Section 16 Below Burst (270°)



B* SEM/EDS of Deposits on 90° OD Surface
and Transverse Met Mount

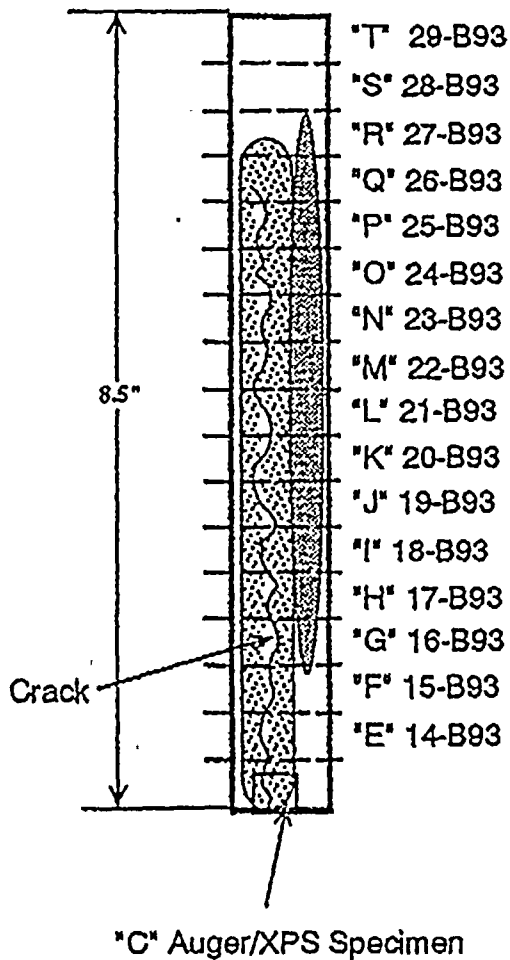
Descalced Surface for Burst Fittings

PRELIMINARY

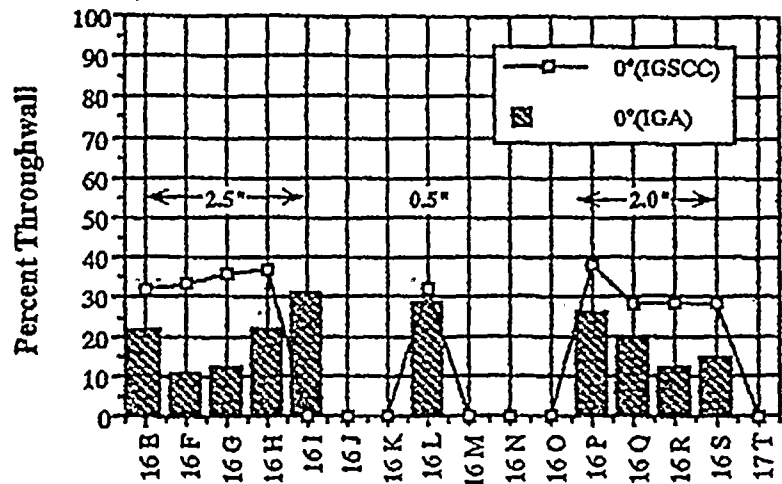


Steam Generator 22 Tube R105 L156 Section 16 Upper Part

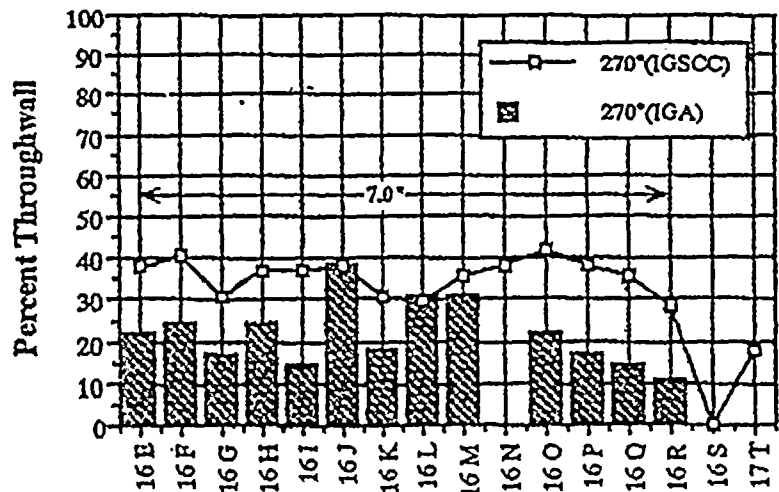
270° View



Section 16 Above Burst (0°)



Section 16 Above Burst (270°)



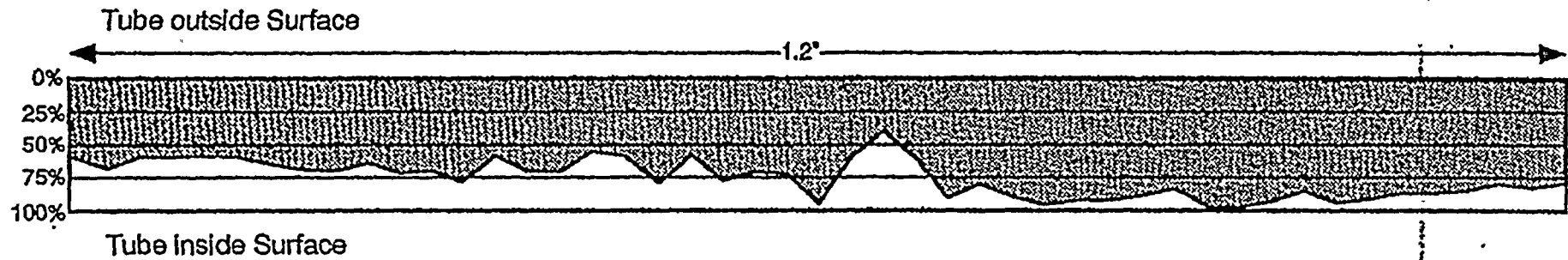
Area of Deposits
Area of IGA/MAI

PRELIMINARY



THE UNIVERSITY OF CHICAGO
LIBRARY
540 EAST 58TH STREET
CHICAGO, ILL. 60637
TEL: 773-936-3000
FAX: 773-936-3000
WWW.CHICAGO.EDU

Steam Generator 22
 Tube R105 L156
 Section 16 Burst Face Crack Depth Diagram

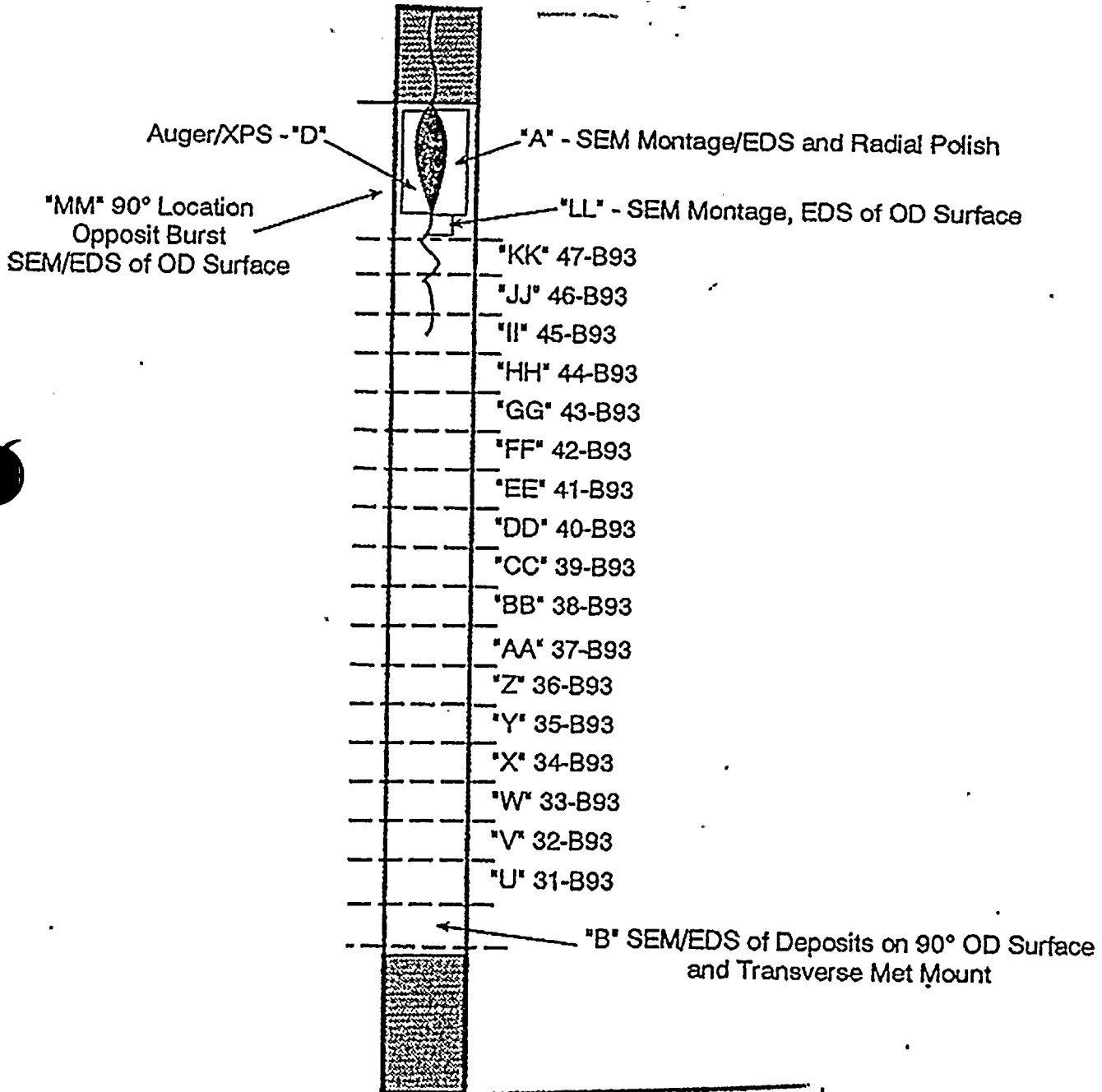


IGA/IGSCC
 Ductile
 Average Depth 77.2%
 Max. Depth 98.2%

PRELIMINARY

**Steam Generator 22
Tube R105 L156
Section 16 Burst Test Part**

270° View



Descaled Surface for Burst Fittings

PRELIMINARY



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Depth 105/156-16

Tube: 105/156

Section: 16 Below the Burst

Mount No.	Location	Measurement (in)	Mils	% Throughwall	Comments
16KK 47-B93	270°	0.65	6.5	15.5	IGA
	270°	1.50	15.0	35.7	IGSCC
16JJ 46-B93	270°	1.20	12.0	28.6	IGA
	270°	1.95	19.5	46.4	IGSCC
16II 45-B93	270°	0.80	8.0	19.0	IGA
	270°	1.60	16.0	38.1	IGSCC
16HH 44-B93	270°	1.00	10.0	23.8	IGA
	270°	1.50	15.0	35.7	IGSCC
16GG 43-B93	270°	0.75	7.5	17.9	IGA
	270°	1.80	18.0	42.9	IGSCC
	0°	0.75	7.5	17.9	IGA
16FF 42-B93	270°	0.65	6.5	15.5	IGA
	270°	1.25	12.5	29.8	IGSCC
16EE 41-B93	270°	0.40	4.0	9.5	IGA
	270°	1.25	12.5	29.8	IGSCC
16DD 40-B93	90°	0.50	5.0	11.9	IGA
	90°	1.10	11.0	26.2	IGSCC
16CC 39-B93	90°	0.65	6.5	15.5	IGA
	90°	1.40	14.0	33.3	IGSCC
	110°	1.10	11.0	26.2	IGA
16BB 38-B93	90°	0.50	5.0	11.9	IGA
	90°	1.45	14.5	34.5	IGSCC
16AA 37-B93	90°	0.65	6.5	15.5	IGA
	90°	1.60	16.0	38.1	IGSCC
19Z 36-B93	90°	0.50	5.0	11.9	IGA
	90°	0.70	7.0	16.7	IGSCC
	115°	0.60	6.0	14.3	IGA
	115°	1.15	11.5	27.4	IGSCC
16Y 35-B93	90°	0.90	9.0	21.4	IGA
16X 34-B93	90°	1.05	10.5	25.0	IGA
	90°	1.25	12.5	29.8	IGSCC
16W 33-B93	90°	0.50	5.0	11.9	IGA
	90°	0.90	9.0	21.4	IGSCC
16V 32-B93	90°	0.70	7.0	16.7	IGA
	45°	0.45	4.5	10.7	IGA
16U 31-B93	90°	0.70	7.0	16.7	IGA

PRELIMINARY



Depth 105/156-16

Tube: 105/156

Section: 16 Above the Burst

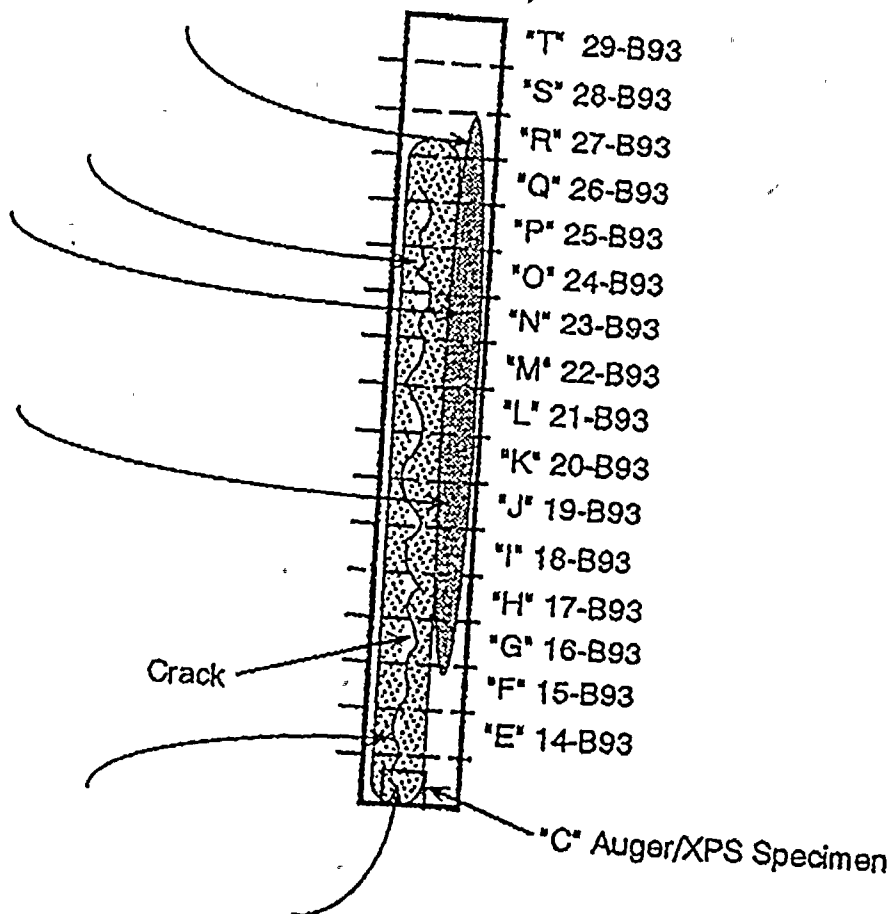
Mount No.	Location	Measurement (in)	Mils	% Throughwall	Comments
16E 14-B93	0°	0.45	4.5	10.7	IGA
	0°	1.40	14.0	33.3	IGSCC
	270°	1.00	10.0	23.8	IGA
	270°	1.70	17.0	40.5	IGSCC
16G 15-B93	0°	0.50	5.0	11.9	IGA
	0°	1.50	15.0	35.7	IGSCC
	270°	0.70	7.0	16.7	IGA
	270°	1.30	13.0	31.0	IGSCC
16H 17-B93	0°	0.90	9.0	21.4	IGA
	0°	1.55	15.5	36.9	IGSCC
	270°	1.00	10.0	23.8	IGA
	270°	1.55	15.5	36.9	IGSCC
16I 18-B93	0°	1.30	13.0	31.0	IGA
	250°	0.60	6.0	14.3	IGA
	250°	1.55	15.5	36.9	IGSCC
	300°	0.60	6.0	14.3	IGA
	300°	1.10	11.0	26.2	IGSCC
16J 19-B93	300°	1.20	12.0	28.6	IGSCC
	340°	1.60	16.0	38.1	IGA/IGSCC
	315°	1.10	11.0	26.2	IGA
16K 20-B93	315°	1.50	15.0	35.7	IGSCC
	280°	0.75	7.5	17.9	IGA
	280°	1.30	13.0	31.0	IGSCC
	225°	0.50	5.0	11.9	IGA
	225°	1.60	16.0	38.1	IGSCC
	0°	1.20	12.0	28.6	IGA
16L 21-B93	0°	1.35	13.5	32.1	IGSCC
	270°	1.25	12.5	29.8	IGSCC
	250°	0.90	9.0	21.4	IGA
	250°	1.30	13.0	31.0	IGSCC
	315°	1.30	13.0	31.0	IGA
16M 22-B93	270°	0.45	4.5	10.7	IGSCC
	225°	1.50	15.0	35.7	IGSCC
	200°	1.10	11.0	26.2	IGSCC

PRELIMINARY



Steam Generator 22
Tube R105 L156
Section 16 Upper Part

270° View



Area of Deposits
Area of IGA/MAI

PRELIMINARY



Depth 105/156-16

Tube: 105/156

Section: 16 Above the Burst

Mount No.	Location	Measurement (in)	Mils	% Throughwall	Comments
16N 23-B93	270°	1.50	15.0	35.7	IGSCC
	225°	1.60	16.0	38.1	IGSCC
16O 24-B93	270°	1.75	17.5	41.7	IGSCC
	270°	0.90	9.0	21.4	IGA
16P 25-B93	0°	1.10	11.0	26.2	IGA
	0°	1.60	16.0	38.1	IGSCC
	270°	0.70	7.0	16.7	IGA
	270°	1.60	16.0	38.1	IGSCC
16Q 26-B93			0.0	0.0	
16R 27-B93	0°	0.50	5.0	11.9	IGA
	0°	1.20	12.0	28.6	IGSCC
	270°	0.45	4.5	10.7	IGA
	270°	1.20	12.0	28.6	IGSCC
16S 28-B93	0°	0.60	6.0	14.3	IGA
	0°	1.20	12.0	28.6	IGSCC
16T 29-B93	270°	0.75	7.5	17.9	IGSCC

PRELIMINARY



THE
FEDERAL BUREAU OF INVESTIGATION
UNITED STATES DEPARTMENT OF JUSTICE
WASHINGTON, D. C. 20535

MEMORANDUM FOR THE DIRECTOR

SUBJECT: [Illegible]

DATE: [Illegible]

BY: [Illegible]

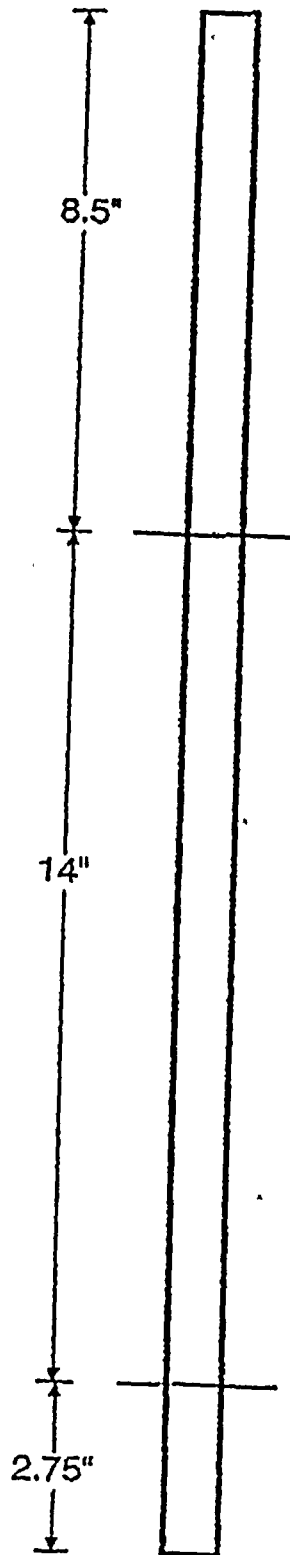
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Steam Generator 22
Tube R105 L156
Section 16

DRAFT

Upper Part of Section 16

Lower Part of Section 16
Used for Burst Test



PRELIMINARY



X-Ray Fluorescence Tube 105/156/Surface
Scrapings

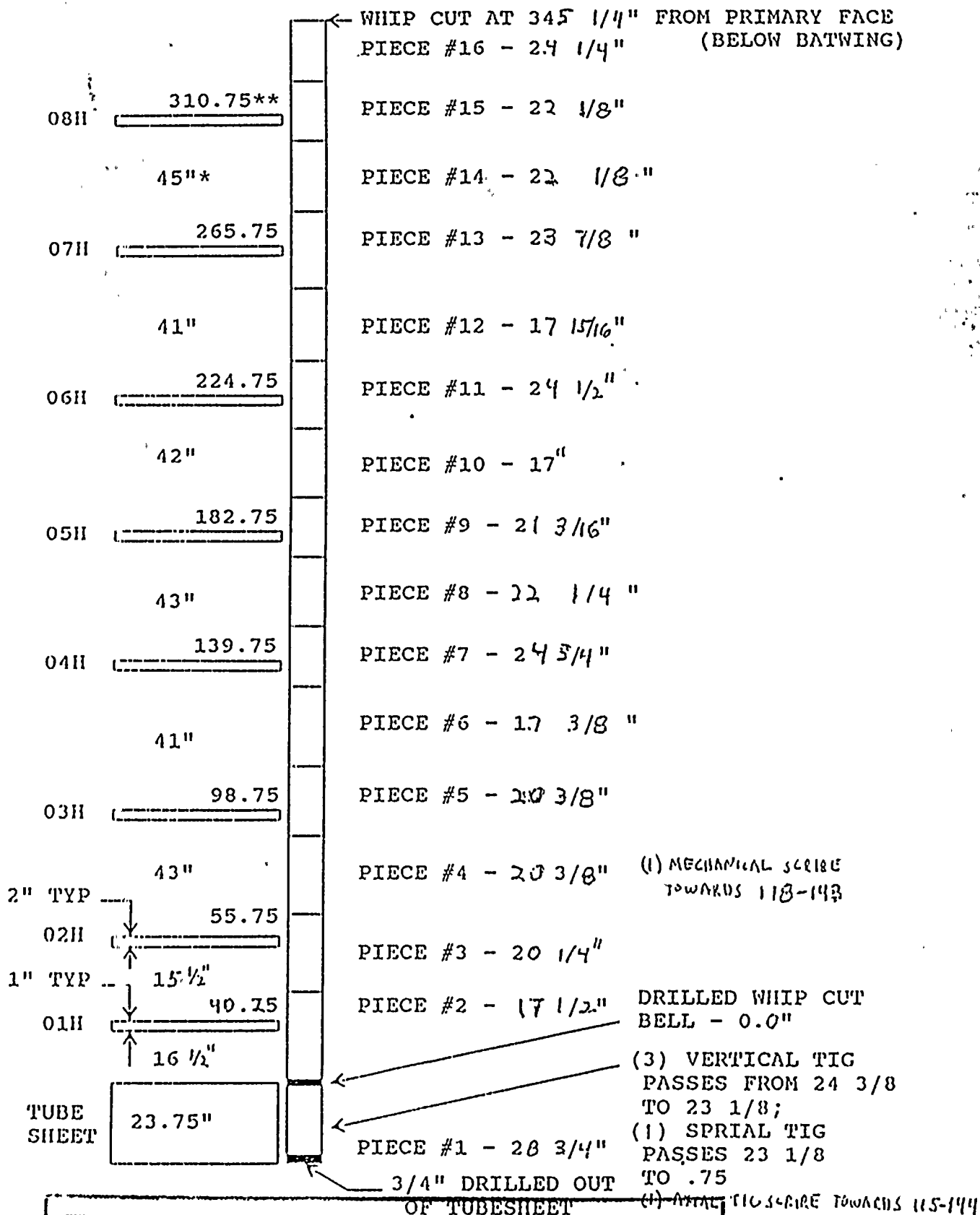
Section 16	wt. %
Fe3O4	61.26
Cu	4.1
NiO	2.46
ZnO	1.54
MnO	13.79
Cr2O3	0.26
MoO3	0.1
TiO	0.7
PbO	0.18
SnO2	0.13
SiO2	10.13
Al2O3	0.76
P2O5	1.24
SO3	0.16
Cl	0.12
K2O	0.36
CaO	1.17
MgO	1.53

PRELIMINARY



TUBE 117-144

REVISION 2



* DISTANCES BETWEEN CENTERLINE OF TSP'S (0.0119" / 1" THICK BAELE PLATE, ALL OTHERS ARE 2" THICK EGGRATES)

** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF EGGRATE

NOTE: NOTICE EACH IN-TUBE SAMPLE IS ON TOP END (OPPOSITE TS)



6 in/sec Bobbin
percent location
thru wall from end

24 in/sec Bobbin

Hi Resolution MRPC

LXW

#16	91%	25.92	52%	25.87	46%	24.10	52%	28.72	2.56 X 0.18
	36%	24.58	16%	24.89	79%	24.28	78%	28.32	

PRELIMINARY



THE
FEDERAL
BUREAU OF
INVESTIGATION
OF THE
DEPARTMENT OF JUSTICE
WASHINGTON, D. C. 20535

MEMORANDUM FOR THE DIRECTOR, FBI

SUBJECT: [Illegible]

DATE: [Illegible]

BY: [Illegible]

1

CUMULATIVE REPORT
04/93, ARIZONA PUBLIC SERVICE, PALO VERDE, UNIT 2

TEAM GENERATOR: 22
LOCATION: ALL
CRITERIA: ROW 117 COL 144

PAGE: 1 OF 1
DATE: 04/30/93
TIME: 14:48:27

ROW	COL	DATE	LEG	EXAM EXTENT		REM	CAL	PROBE	LOCATION	VOLTS	CURRENT			
				PROGRAM	ACTUAL						MIL	DEG	%	CH
117	144		H	07H-08H	07H-08H		00107	610RC					NDD	1
			H	06H-07H	06H-07H		00107	610RC					NDD	
			H	05H-06H	05H-06H		00107	610RC					NDD	
			H	04H-05H	04H-05H		00107	610RC					NDD	
			H	03H-04H	03H-04H		00107	610RC					NDD	
			H	02H-03H	02H-03H		00107	610RC					NDD	
			H	01H-02H	01H-02H		00107	610RC					NDD	
			H	TSH-01H	TSH-01H		00107	610RC					NDD	
			H	TEH-TSH	TEH-TSH		00107	610RC					NDD	
			H	-	-		99999	610UL					TPC	
			H	08H-BW1	08H-BW1		00018	610RP	08H+ 28.53to+ 43.4	0.08		0	PDP	11
			H	09H-BW1	08H-BW1	RPI	00107	610RC	08H+ 32.21TO+ 43.55	89.91		17	MAI	P 1
			H	TEH-09C	TEH-09C	RPI	00000	610UL	08H+ 33.17	1.49		106	58	1
			H	TEH-09C	TEH-09C	RPI	00000	610UL	08H+ 34.07	7.02		37	93	1
			H	08H-BW1	08H-BW1	RPI	00018	610RP	08H+ 34.54to+ 43.7	44.85		14	SAI	1
			H	TEH-BW1	TEH-BW1	RPI	00103	630UC	08H+ 35.80to+ 39.4	252.8		20	100	P 1
			H	TEH-09C	TEH-09C	RPI	00000	610UL	08H+ 36.32	321.1		17	100	1
			H	09C-TEC	TEH-TEC		00003	610UL	08H+ 37.39	313.0		17	PID	P 1
			H	TEH-09C	TEH-09C	RPI	00000	610UL	08H+ 39.00	1.12		72	81	1
			H	08H-BW1	08H-BW1		00018	610RP	08H+ 43.09	11.37		9	DNT	P 1
			H	08H-BW1	08H-BW1	RPI	00018	610RP	08H+ 43.92	1.45		76	MAI	P 1
			H	TEH-09C	TEH-09C	RPI	00000	610UL	09H- 0.79	3.24		84	62	P 1
			H	08H-09H	08H-BW1	RPI	00107	610RC	09H- 0.26	0.66		0	MAI	1
			H	TEH-BW1	TEH-BW1	RPI	00103	630UC	09H+ 0.29to+ 13.9	3.75		52	91	P 1
			H	09H-BW1	08H-BW1	RPI	00107	610RC	BW1- 1.66	1.31		149	SAI	P 1
			H	TEH-09C	TEH-09C	RPI	00000	610UL	BW1+ 0.37	3.83		40	96	P 1
			H	09H-BW1	08H-BW1	RPI	00107	610RC	BW1+ 0.49	4.37		77	MAI	P 1
			H	08H-BW1	08H-BW1	RPI	00018	610RP	BW1+ 0.62	1.79		88	SAI	P 1
			H	TEH-BW1	TEH-BW1	RPI	00103	630UC	BW1+ 0.66	4.54		32	97	P 1

NUMBER OF TUBES SELECTED FROM CURRENT OUTAGE: 1
NUMBER OF DATA RECORDS SELECTED FROM CURRENT OUTAGE: 29

NO TREND ANALYSIS REQUESTED

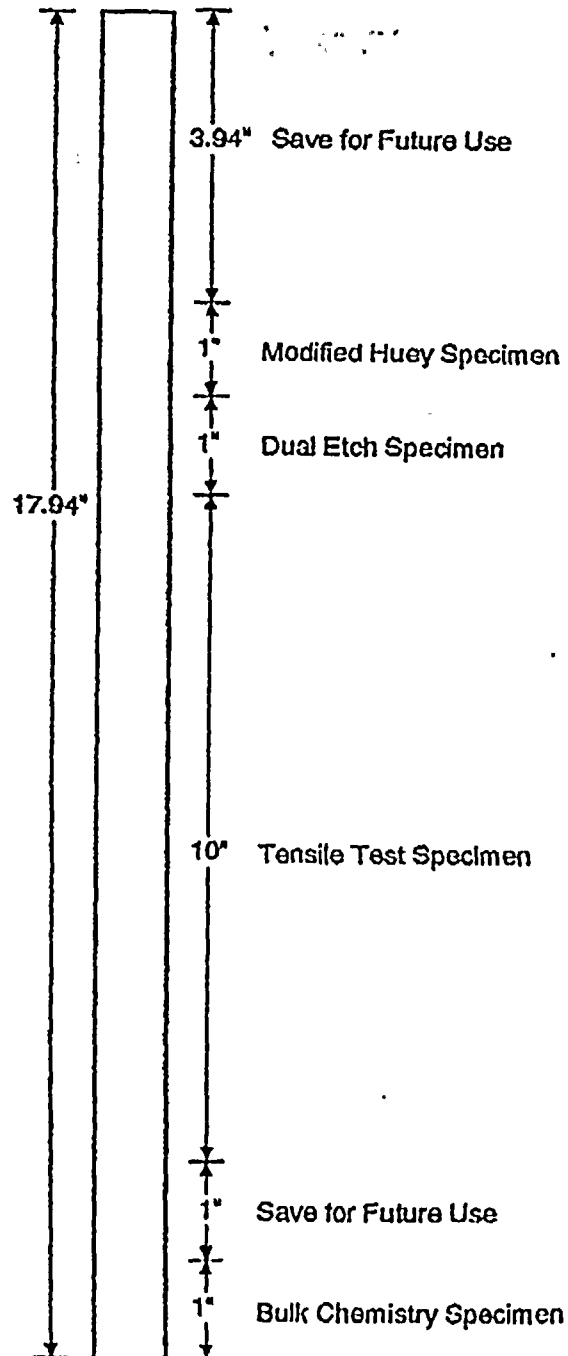
REPORT OPTIONS:

Only examination results matching criteria are included

PRELIMINARY



Steam Generator 22 Tube R117 L144 Section 12

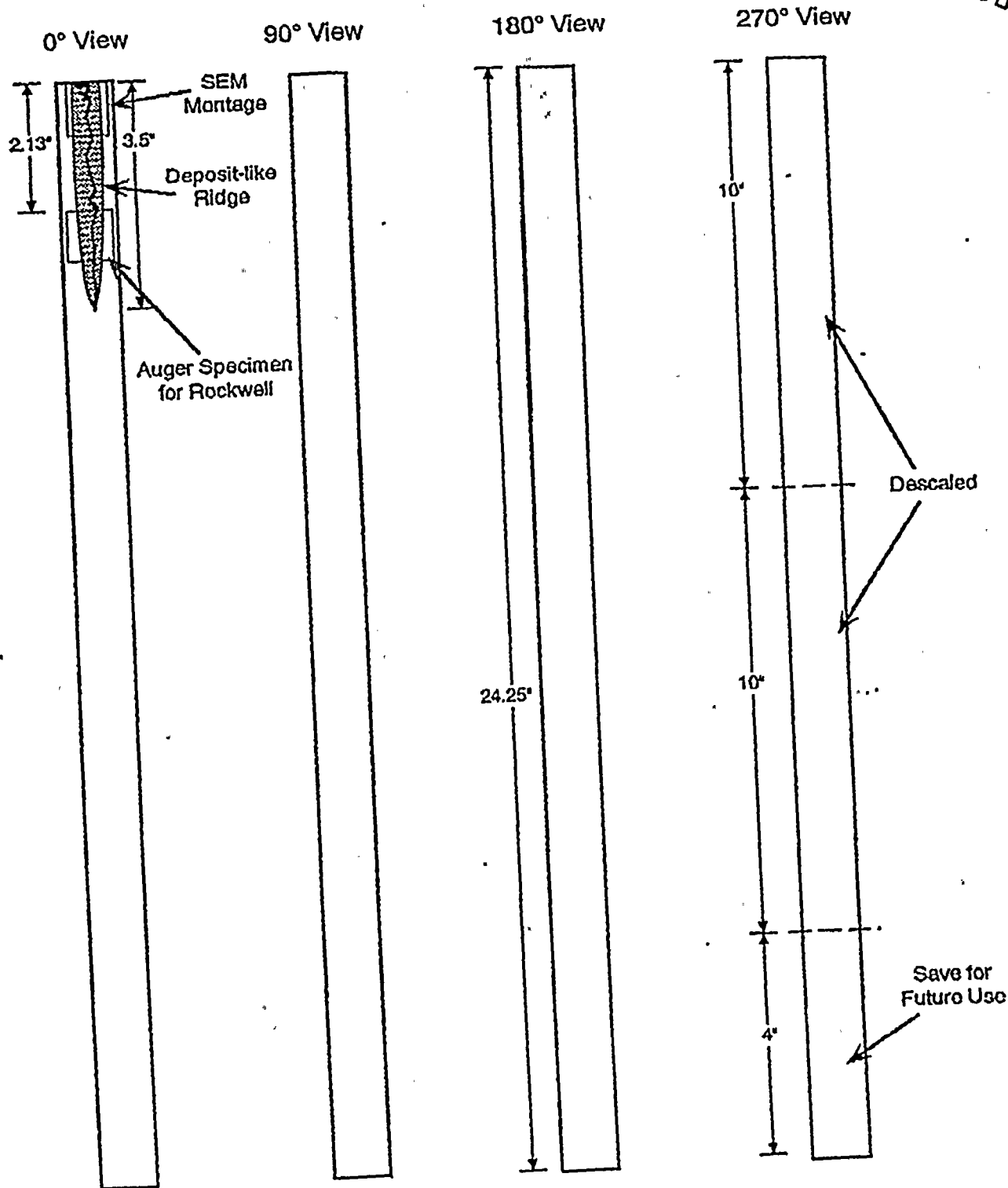
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WASHINGTON, D.C.

Steam Generator 22 Tube R117 L144 Section 16

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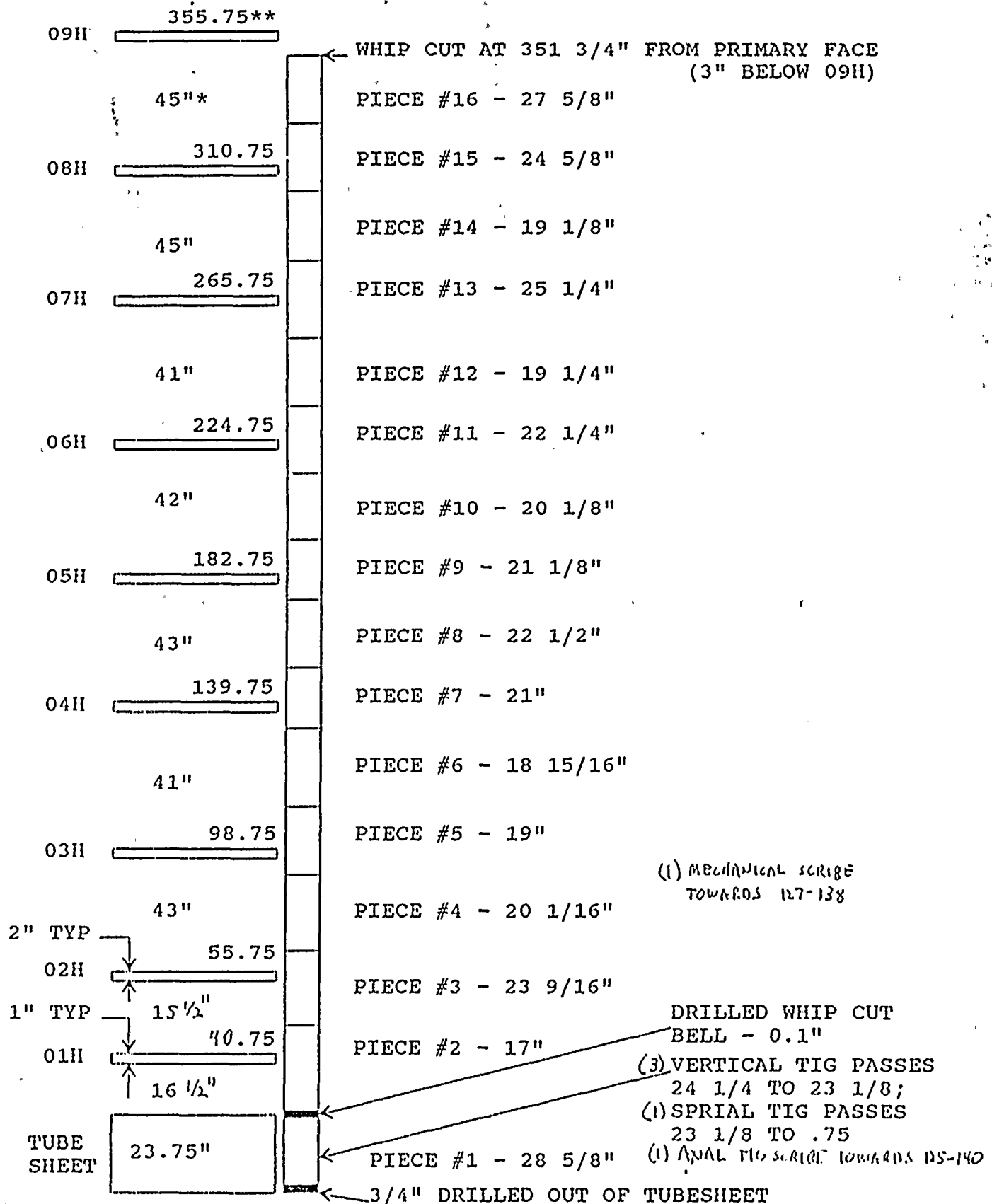


PRELIMINARY



TUBE 127-140

REVISION 2



* DISTANCES BETWEEN CENTERLINE OF TSP'S (01H IS A 1" THICK BATTLE PLATE, ALL OTHERS ARE 2" THICK EGGCRATES)

** DISTANCE FROM PRIMARY FACE TO CENTERLINE OF EGGCRATE

NOTE: NOTCH EACH IN TUBE SAMPLE IS ON TOP END (OPPOSITE TS)



THE UNIVERSITY OF CHICAGO
LIBRARY
540 EAST 57TH STREET
CHICAGO, ILL. 60637
TEL: 773-936-3000
FAX: 773-936-3000
WWW.CHICAGO.EDU

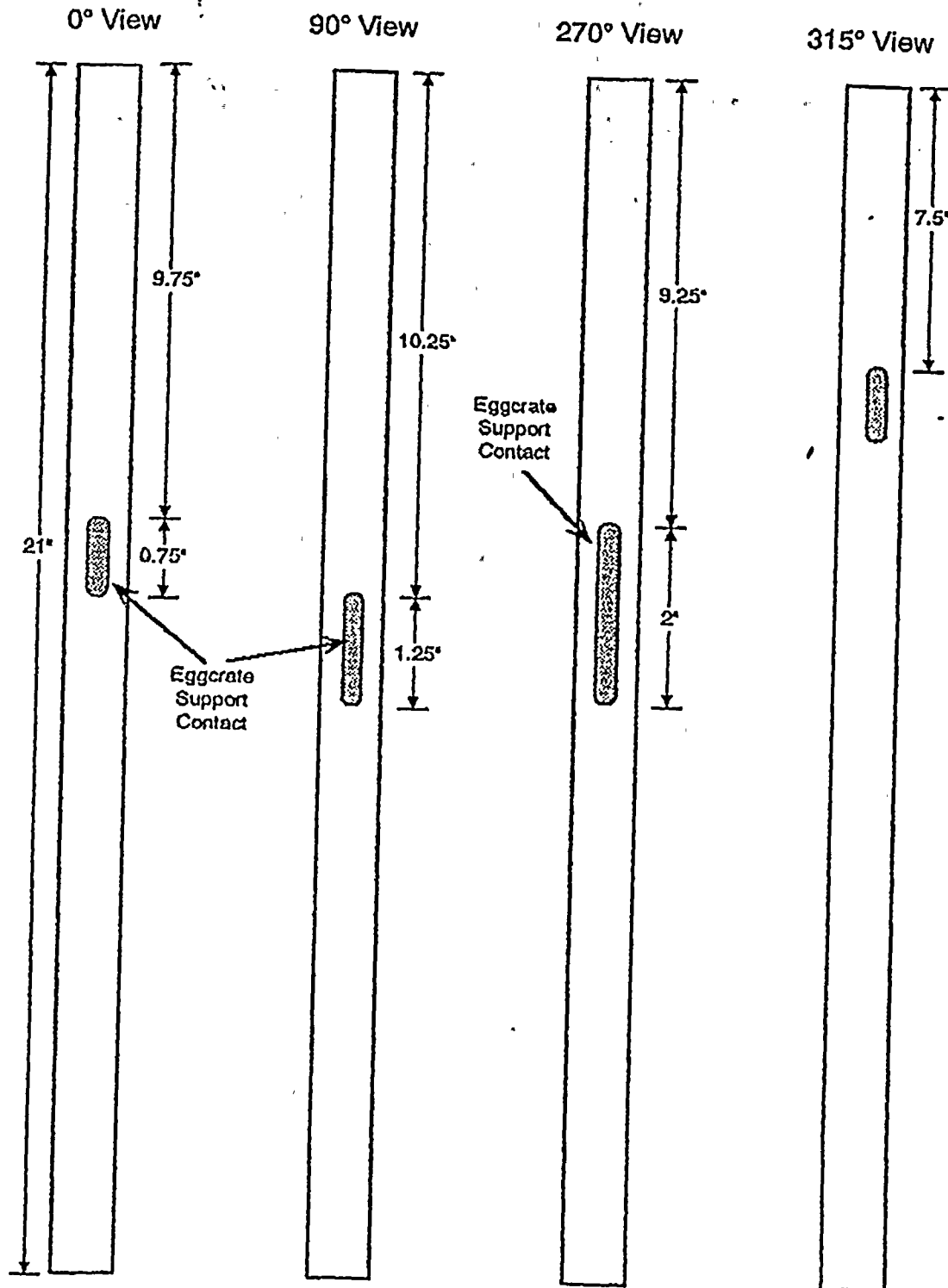
	6 in/sec percent thru wall	Bobbin location from end	24 in/sec	Bobbin	Hi Resolution	MRPC	LXW
08H	61%	12.28	61%	12.52	70% 12.30	89% 12.02	0.38 X 0.18
07H	68%	12.81	69%	11.22	64% 12.58	85% 11.65	0.25 X 0.14
06H	NDD		NDD		NDD	NDD	
05H	NDD		NDD		NDD	NDD	

PRELIMINARY

[illegible]

Steam Generator 22 Tube R127 L140 Section 9

DRAFT



PRELIMINARY

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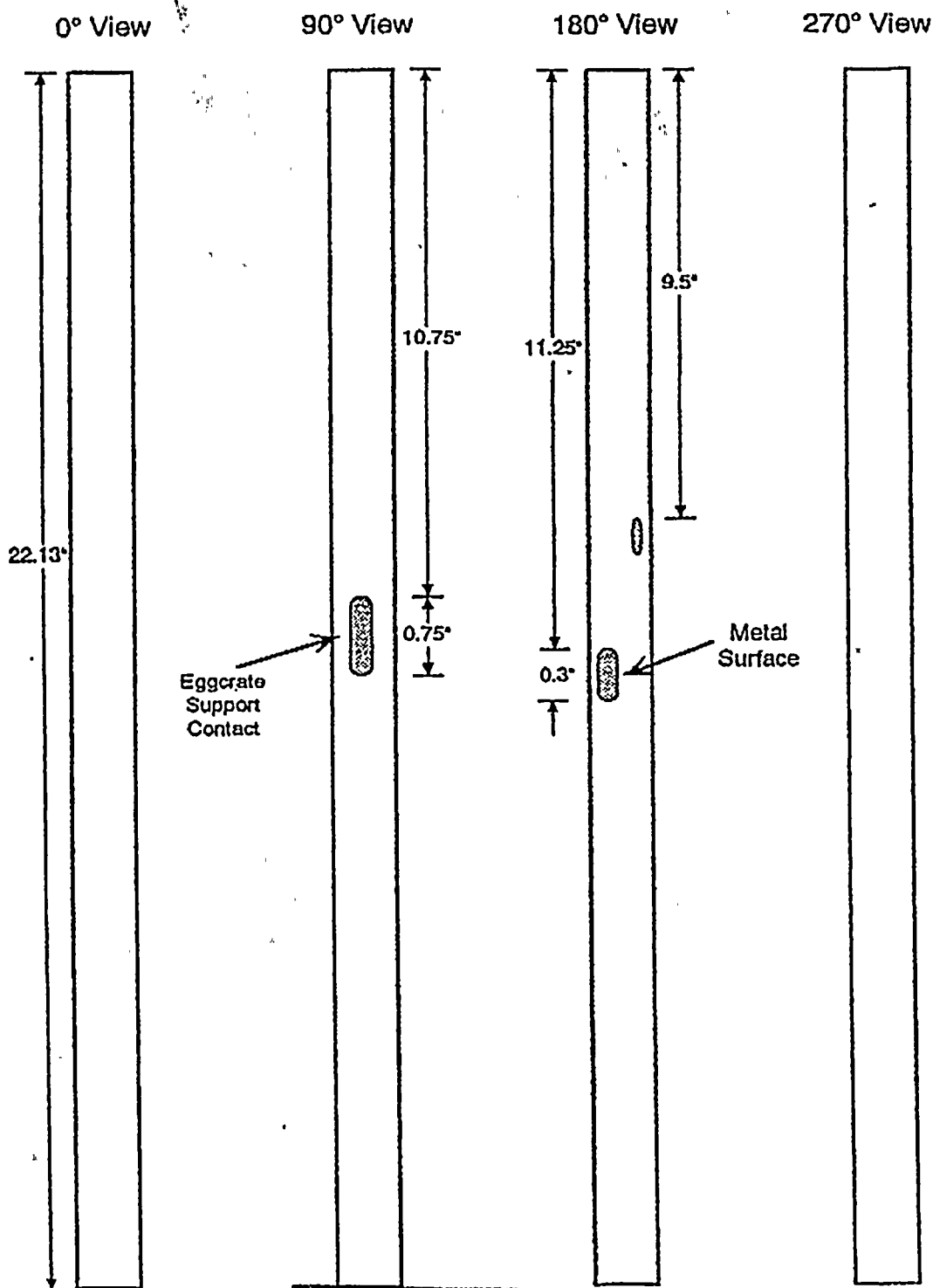


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Steam Generator 22 Tube R127 L140 Section 11

DRAFT



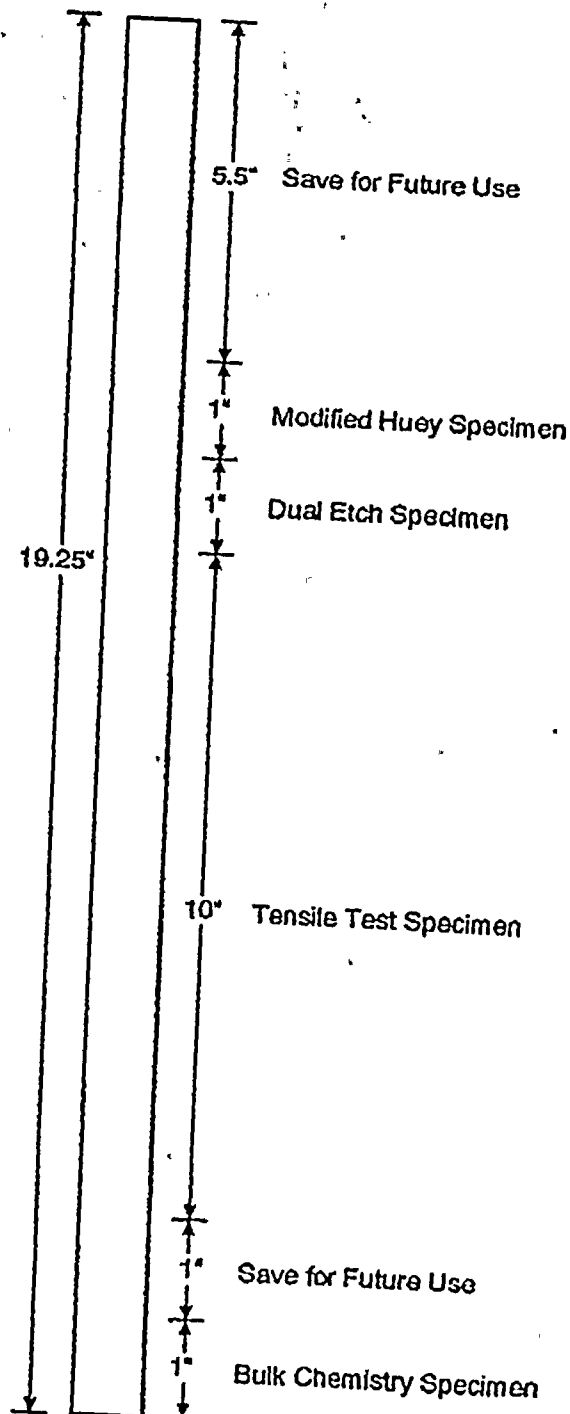
PRELIMINARY

114

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY
530 SOUTH EAST ASIAN AVENUE
CHICAGO, ILLINOIS 60607
TEL: 773-936-5000
FAX: 773-936-5000
WWW: WWW.CHEM.UCHICAGO.EDU

Steam Generator 22 Tube R127 L140 Section 12

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PRELIMINARY



TABLE 1. SUMMARY OF DATA FOR THE
PERIOD 1960-1969. The data are
presented in the following order:
1. Total number of cases
2. Number of cases by age group
3. Number of cases by sex
4. Number of cases by race
5. Number of cases by occupation
6. Number of cases by education
7. Number of cases by marital status
8. Number of cases by place of birth
9. Number of cases by duration of residence
10. Number of cases by date of onset
11. Number of cases by date of diagnosis
12. Number of cases by date of death
13. Number of cases by date of last contact
14. Number of cases by date of last follow-up
15. Number of cases by date of last examination
16. Number of cases by date of last interview
17. Number of cases by date of last contact
18. Number of cases by date of last follow-up
19. Number of cases by date of last examination
20. Number of cases by date of last interview

PRELIMINARY



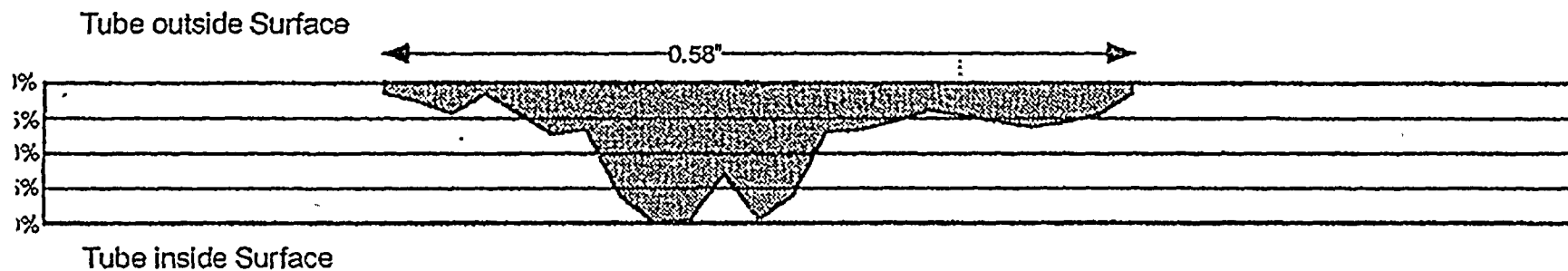
127/140 #13 Burst
①

40X

SCANNING ELECTRON MICROSCOPE PHOTO OF LABORATORY BURST TEST FRACTURE
SURFACE AREA ABOVE ARROWS IS IGSCC



Steam Generator 22
 Tube R127 L140
 Section 13 Burst Face Crack Depth Diagram



IGA/IGSCC
 Ductile
 Average Depth 39.9%
 Max. Depth 100%

PRELIMINARY



100-100000

100-100000

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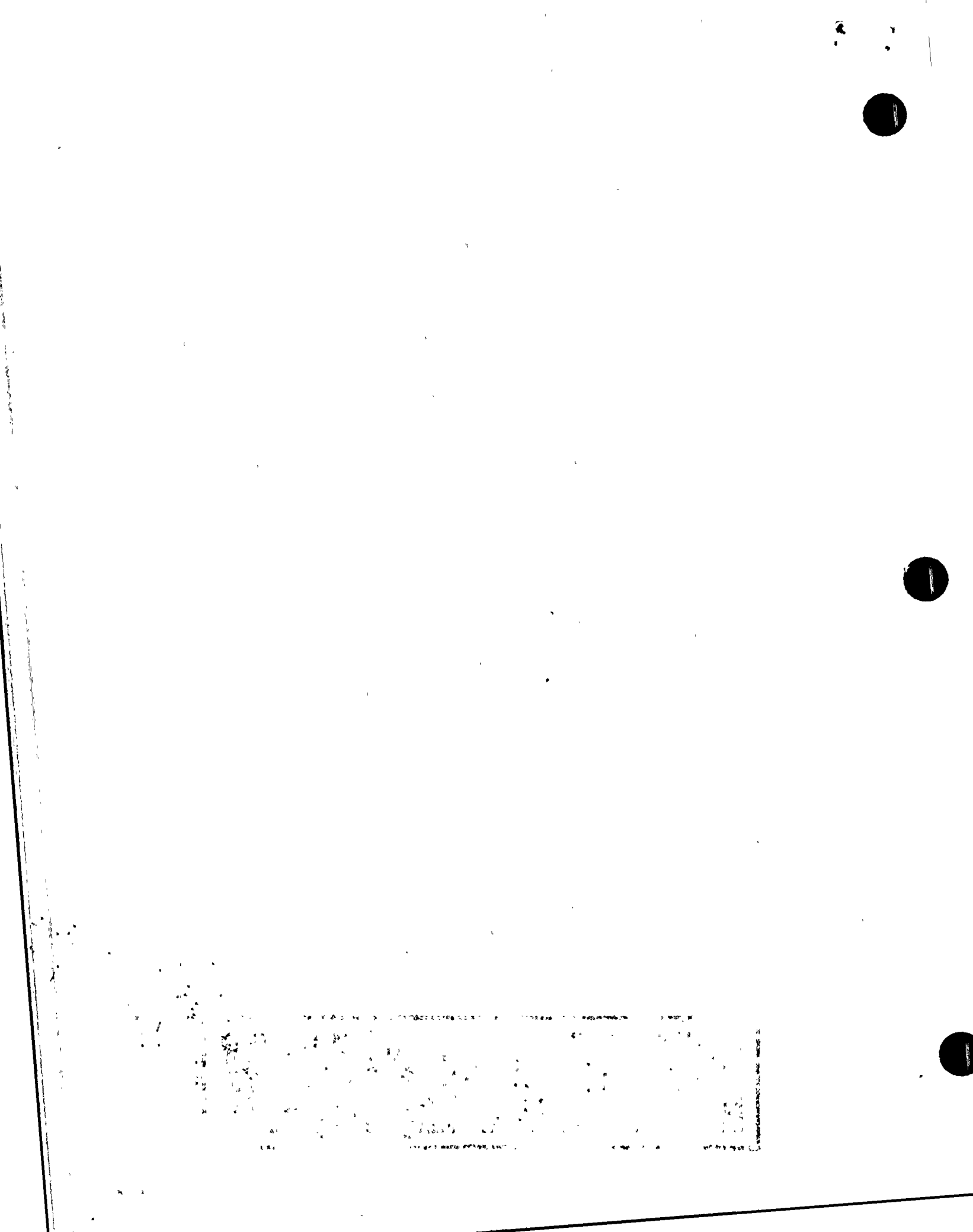
Depth Measurements

Tube: R127 L140

Section: 13 Burst (07H)

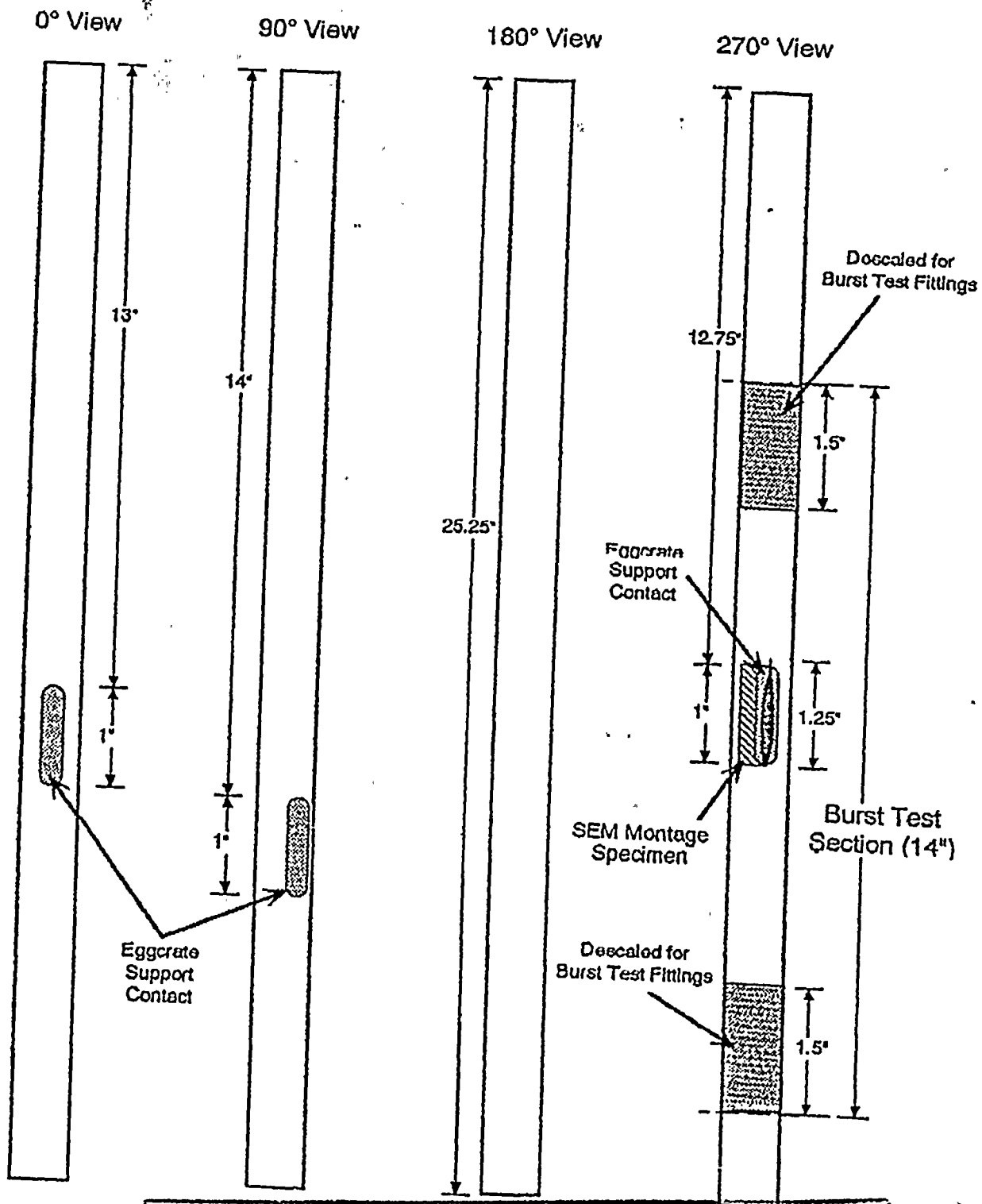
Location	Measurement (in)	Mils	% Throughwall
1	0.10	2.5	6.0
2	0.20	5.0	11.9
3	0.35	8.8	20.8
4	0.15	3.8	8.9
5	0.35	8.8	20.8
6	0.65	16.3	38.7
7	0.60	15.0	35.7
8	1.35	33.8	80.4
9	1.68	42.0	100.0
10	1.66	41.5	98.8
11	1.10	27.5	65.5
12	1.60	40.0	95.2
13	1.35	33.8	80.4
14	0.60	15.0	35.7
15	0.60	15.0	35.7
16	0.45	11.3	26.8
17	0.30	7.5	17.9
18	0.35	8.8	20.8
19	0.45	11.3	26.8
20	0.52	13.0	31.0
21	0.45	11.3	26.8
22	0.40	10.0	23.8
23	0.15	3.8	8.9
Average Depth		16.8	39.9

PRELIMINARY



Steam Generator 22 Tube R127 L140 Section 13

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PRELIMINARY



THE
FEDERAL
BUREAU OF
INVESTIGATION
OF THE
DEPARTMENT OF JUSTICE
WASHINGTON, D. C. 20535

MEMORANDUM FOR THE DIRECTOR

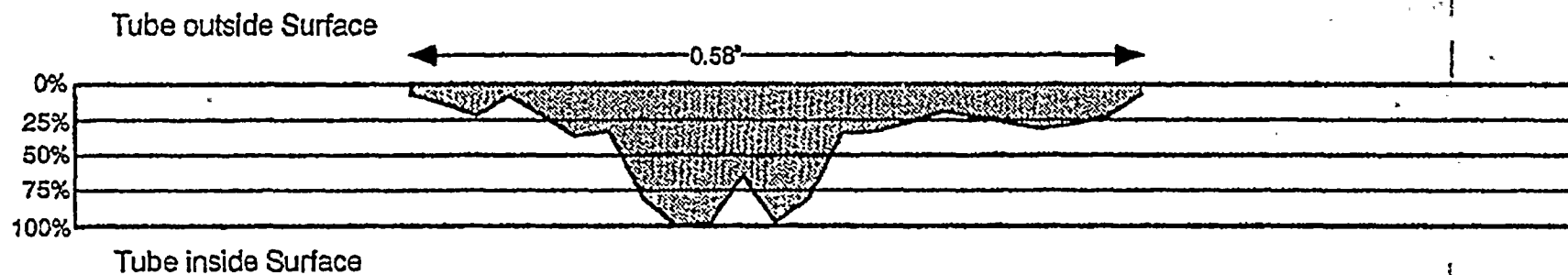
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BY: [Illegible]

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Steam Generator 22
Tube R127 L140
Section 13 Burst Face Crack Depth Diagram



IGA/IGSCC
Ductile

Average Depth 39.9%
Max. Depth 100%

RELIMINARY

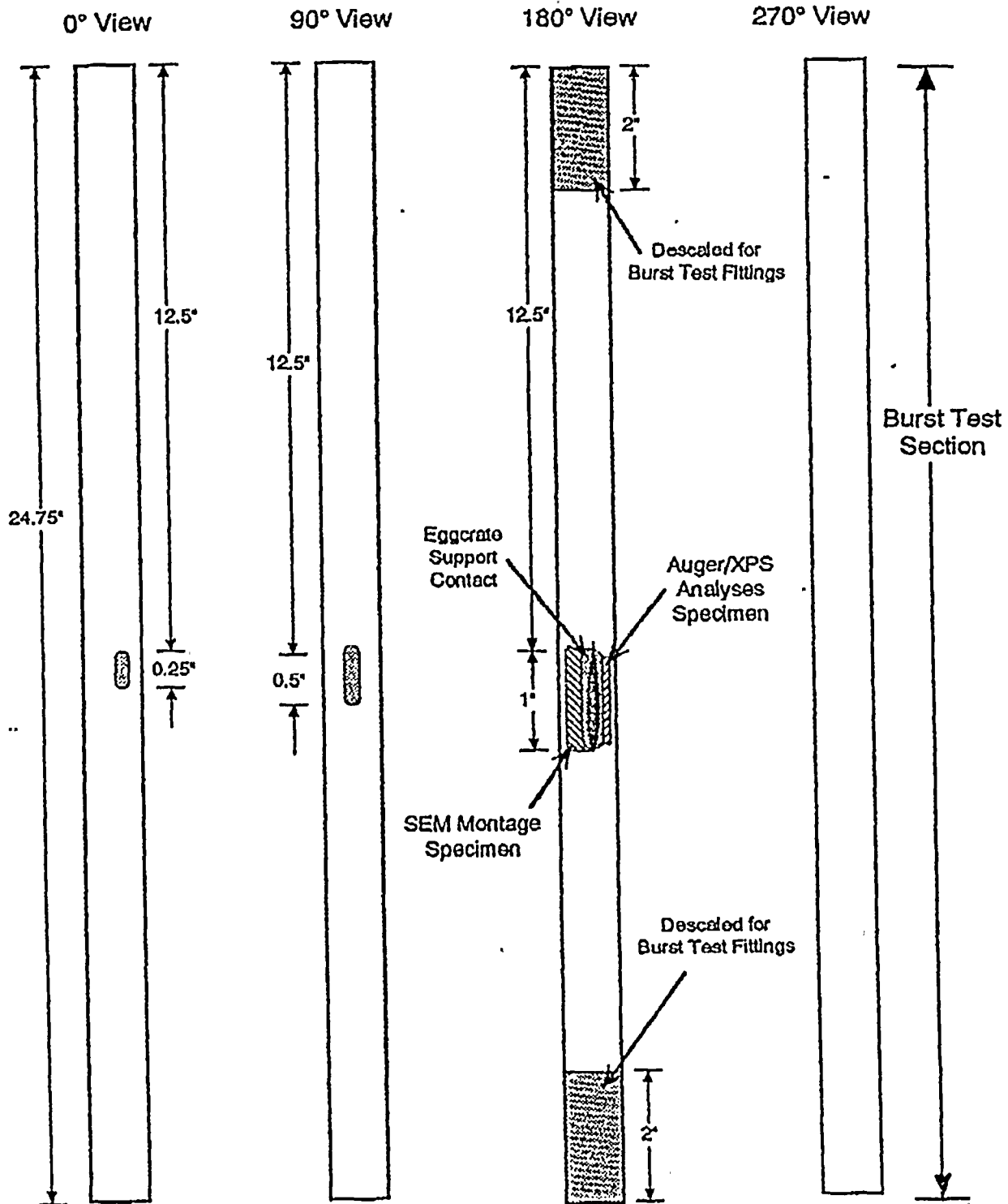
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The map shows the northern Adriatic coastline from Trieste in the north to the Gulf of Genoa in the south. Sampling stations are indicated by numbers 1 through 14. Station 1 is near Trieste, station 2 is further south, and stations 3 through 14 are distributed along the coast and in the open sea. The map includes latitude lines (45° 30' N, 45° 00' N, 44° 30' N) and longitude lines (13° 30' E, 13° 00' E, 12° 30' E). A scale bar at the bottom indicates distances from 0 to 100 km.

Steam Generator 22 Tube R127 L140 Section 15

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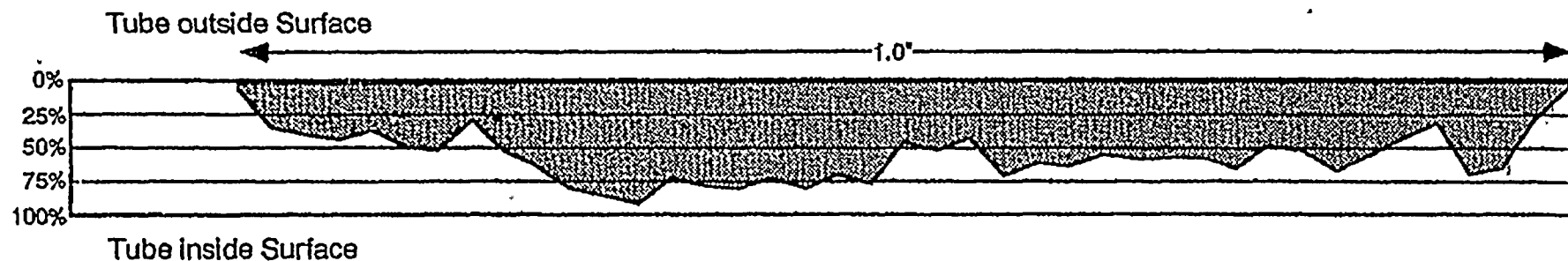
PRELIMINARY



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Steam Generator 22
Tube R127 L140
Section 15 Burst Face Crack Depth Diagram



IGA/IGSCC
Ductile
Average Depth 58%
Max. Depth 89.3%

PRELIMINARY

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