1120

PROGRESS REVIEW MEETING NO. 3

FEBRUARY 13-14, 1980

ALTERNATE CENTRAL RECEIVER POWER SYSTEM PROGRAM PHASE II

PREPARED FOR

UNITED STATES DEPARTMENT OF ENERGY

(CONTRACT NO. DE-AC03-79SF10535)

GENERAL ELECTRIC COMPANY
ENERGY SYSTEMS PROGRAMS DEPARTMENT
SCHENECTADY, NEW YORK

GENERAL ELECTRIC

GE Progress Review #3

February 13, 1980

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F. Witt	415/494-7693	GE-Field Sales
Cy Hussey	518/385-9391	GE-ESPD
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AGENDA

WEDNESDAY, FEBRUARY 13, 1980

0800	INTRODUCTION	J. ELSNER
0830	TEST RECEIVER DESIGN REQUIREMENTS	A. CURINGA
0845	TEST RECEIVER OVERALL DESIGN/LAYOUT	E. OLICH
0920	TEST RECEIVER STRUCTURE	E. MESERVE
1000	BREAK	
1015	ABSORBER PANEL DESIGN & ANALYSIS	C. HUSSEY
1145	LUNCH	
1230	ABSORBER PANEL FABRICATION	C. HUSSEY
1330	SODIUM PIPING DESIGN	E. OLICH
1350	SODIUM COMPONENTS	E. OLICH/D. DRENDEL
1500	ELECTRICAL, CONTROLS & INSTRUMENTATION	P. SWARTZ
1530	ASSEMBLY PLAN/STATUS	E. GERRELS
1600	ADJOURN	

AGENDA (CONTINUED)

THURSDAY, FEBRUARY 14, 1980

0800	TEST RECEIVER INSTALLATION & CHECKOUT	J. AMOS
0900	MAINTENANCE & TRAINING	J. AMOS
0930	DECOMMISSIONING & REMOVAL	J. AMOS
0945	PRINCIPAL TESTS	A. CURINGA
1030	BREAK	
1045	PRELIMINARY TEST PLAN	A. CURINGA
1145	CONCLUSIONS	J. ELSNER
1150	ACTION ITEMS	ALL
1200	ADJOURN	

INTRODUCTION

- PROGRAM OVERVIEW
- BASELINE TEST PANEL DESIGN
- TEST PANEL DEVELOPMENTS
- SCHEDULE IMPACT
- COST GROWTH
- ACTION PLAN

PROGRAM OBJECTIVE

SUPPORT THE NEAR TERM APPLICATION OF SODIUM SOLAR CENTRAL RECEIVERS FOR LOW COST ELECTRIC POWER GENERATION, BY:

- PERFORMANCE OF A RECEIVER PANEL TEST AT THE CENTRAL RECEIVER TEST FACILITY (CRTF)
- PERFORMANCE OF MATERIALS EXPERIMENTS AND PANEL FABRICATION DEVELOPMENT
- COMMERCIAL PLANT DESIGN UPDATES
- DEVELOPMENT PLANNING

CONTRACTING ORGANIZATION

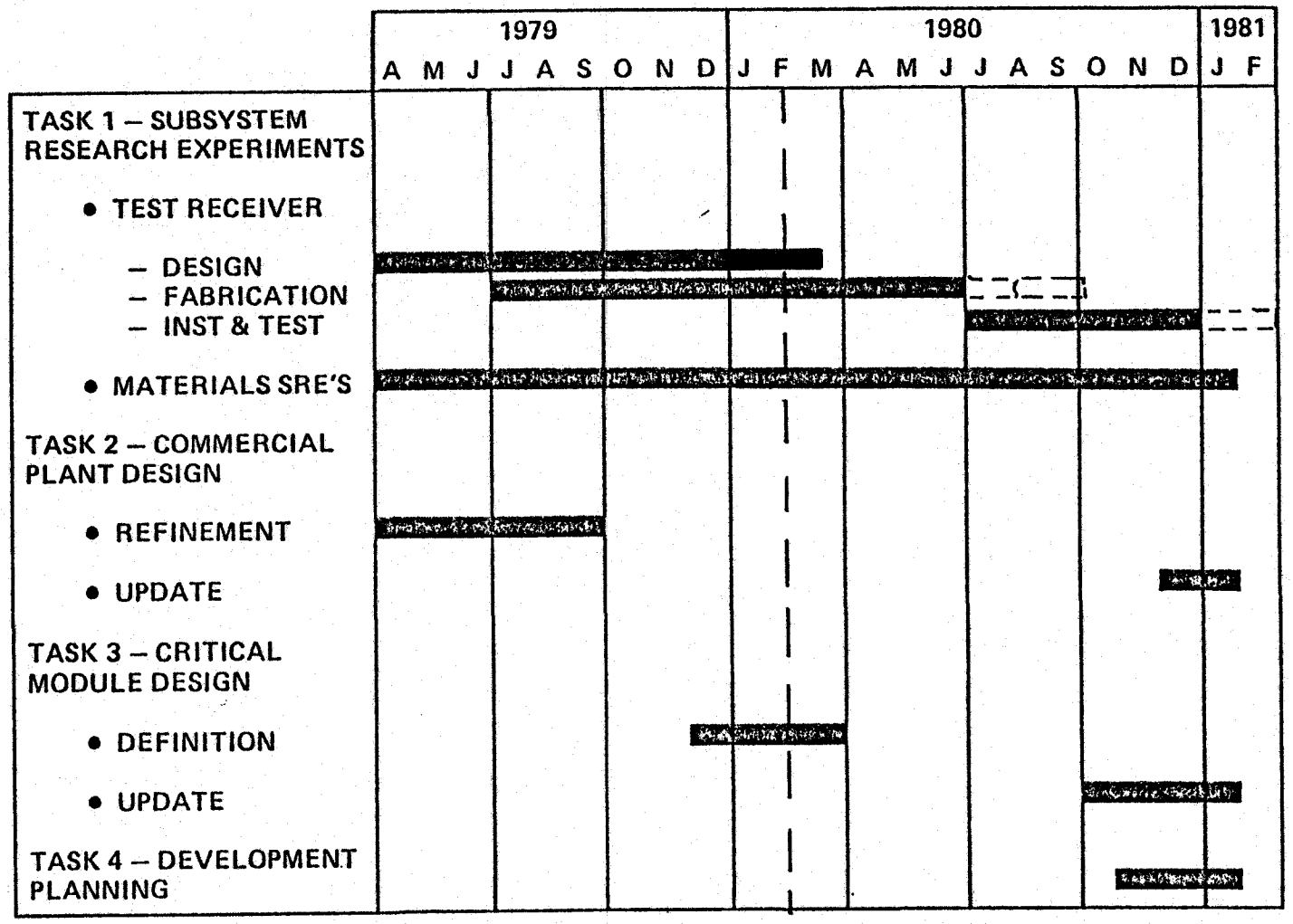
- GENERAL ELECTRIC COMPANY
  - ENERGY SYSTEMS PROGRAMS DEPARTMENT (ESPD)

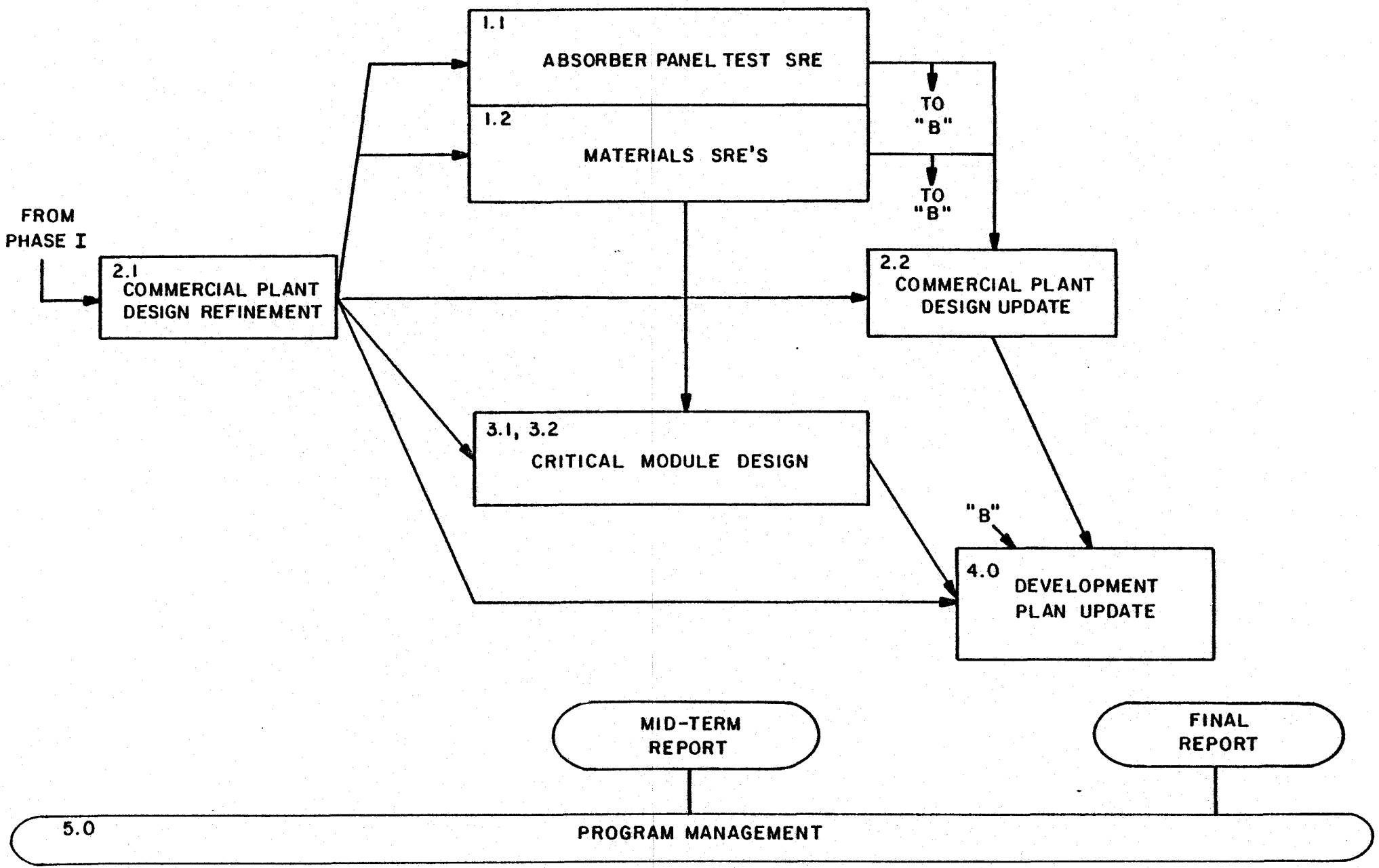
    PROGRAM MANAGEMENT
    SYSTEMS ENGINEERING
    PLANT INTEGRATION
  - ADVANCED REACTOR SYSTEMS DEPARTMENT (ARSD)

    LIQUID METAL ENGINEERING
    SODIUM COMPONENTS
  - CORPORATE RESEARCH AND DEVELOPMENT (CRD)

    PHASE I CONTINUITY
    PLANT IMPROVEMENTS
- FOSTER WHEELER DEVELOPMENT CORPORATION (FWDC)
  - ABSORBER TEST PANEL FABRICATION
- KAISER ENGINEERS, INC.
  - STORAGE SYSTEM DESIGN IMPROVEMENT

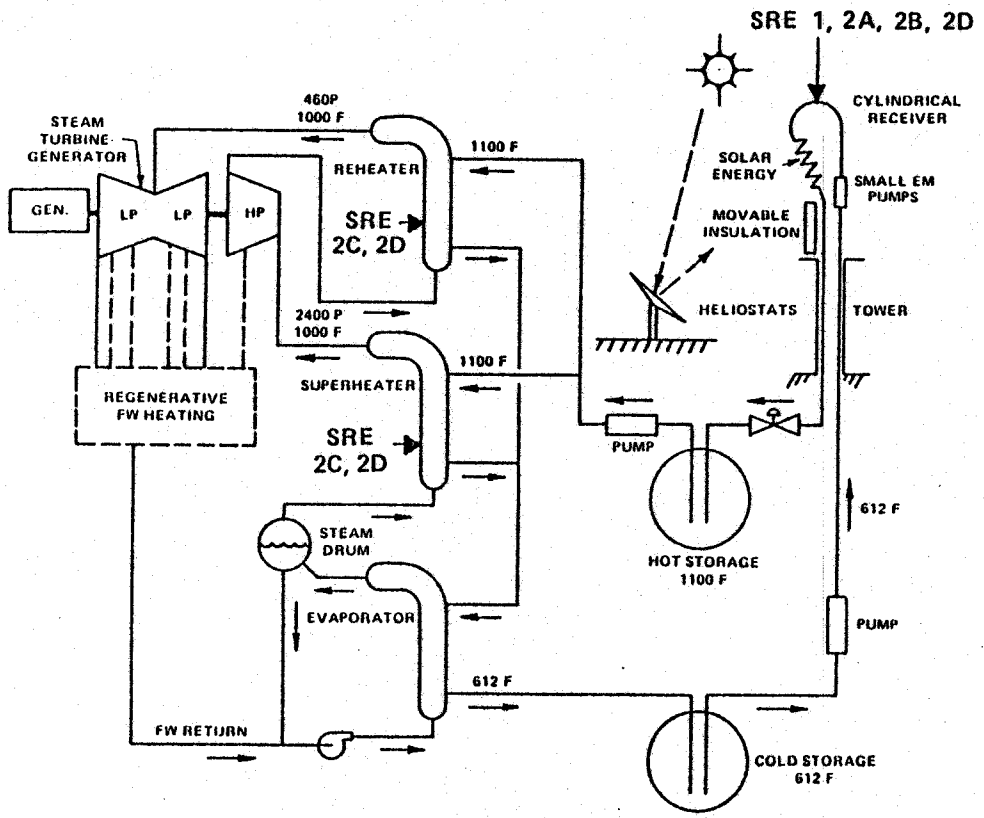
ALTERNATE CENTRAL RECEIVER POWER SYSTEM
PROGRAM SCHEDULE




1.1
ABSORBER PANEL TEST SRE
1.2
MATERIALS SRE'S
TO "B"
TO "B"
FROM PHASE I
2.1
COMMERCIAL PLANT DESIGN REFINEMENT
2.2
COMMERCIAL PLANT DESIGN UPDATE
3.1, 3.2
CRITICAL MODULE DESIGN
"B"
4.0
DEVELOPMENT PLAN UPDATE
MID-TERM REPORT
FINAL REPORT
5.0
PROGRAM MANAGEMENT

ALTERNATE CENTRAL RECEIVER PROGRAM
MAJOR PHASE II ACTIVITIES

SYSTEM ENGINEERING AND ANALYSIS



SUBSYSTEM RESEARCH EXPERIMENTS (SRE'S)

• SRE 1	ABSORBER PANEL TEST
• SRE 2	MATERIALS SRE'S
SRE 2A	PANEL FABRICATION DEVELOPMENT
SRE 2B	PANEL INSPECTION AND EVALUATION
SRE 2C	STRESS CORROSION AND FATIGUE
SRE 2D	FATIGUE CRACK GROWTH AND FRACTURE TOUGHNESS

ABSORBER PANEL TEST SRE

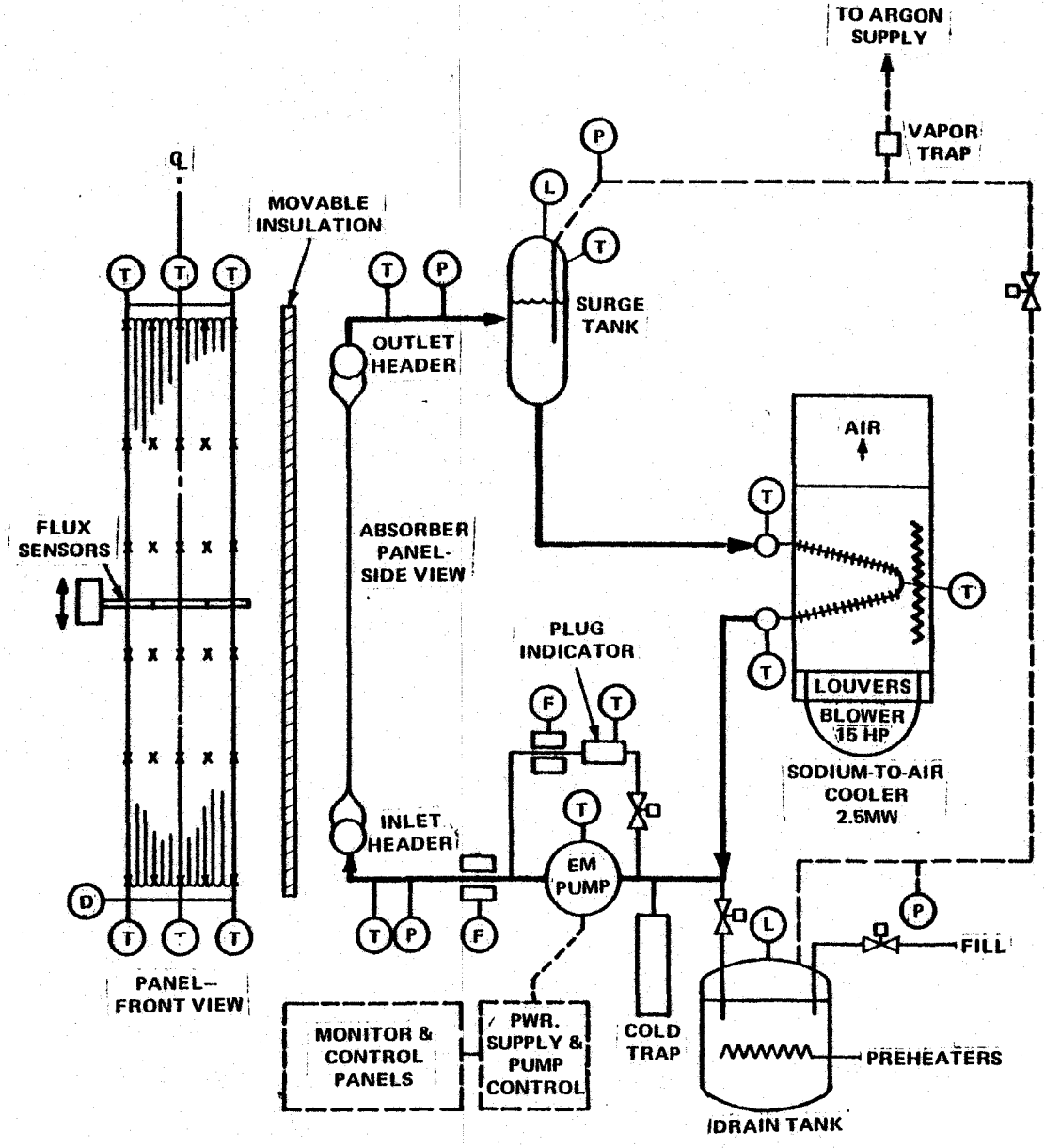
OBJECTIVES

- MANUFACTURABILITY OF A THIN-WALLED, BRAZED PANEL
- STRUCTURAL INTEGRITY OF THE AS-BUILT PROTOTYPE PANEL
- CONTROL STABILITY
- RELIABILITY/SAFETY OF SODIUM SYSTEMS
- HIGH FLUX PANEL OPERATION
- ACTUAL ABSORBER PANEL COST DATA

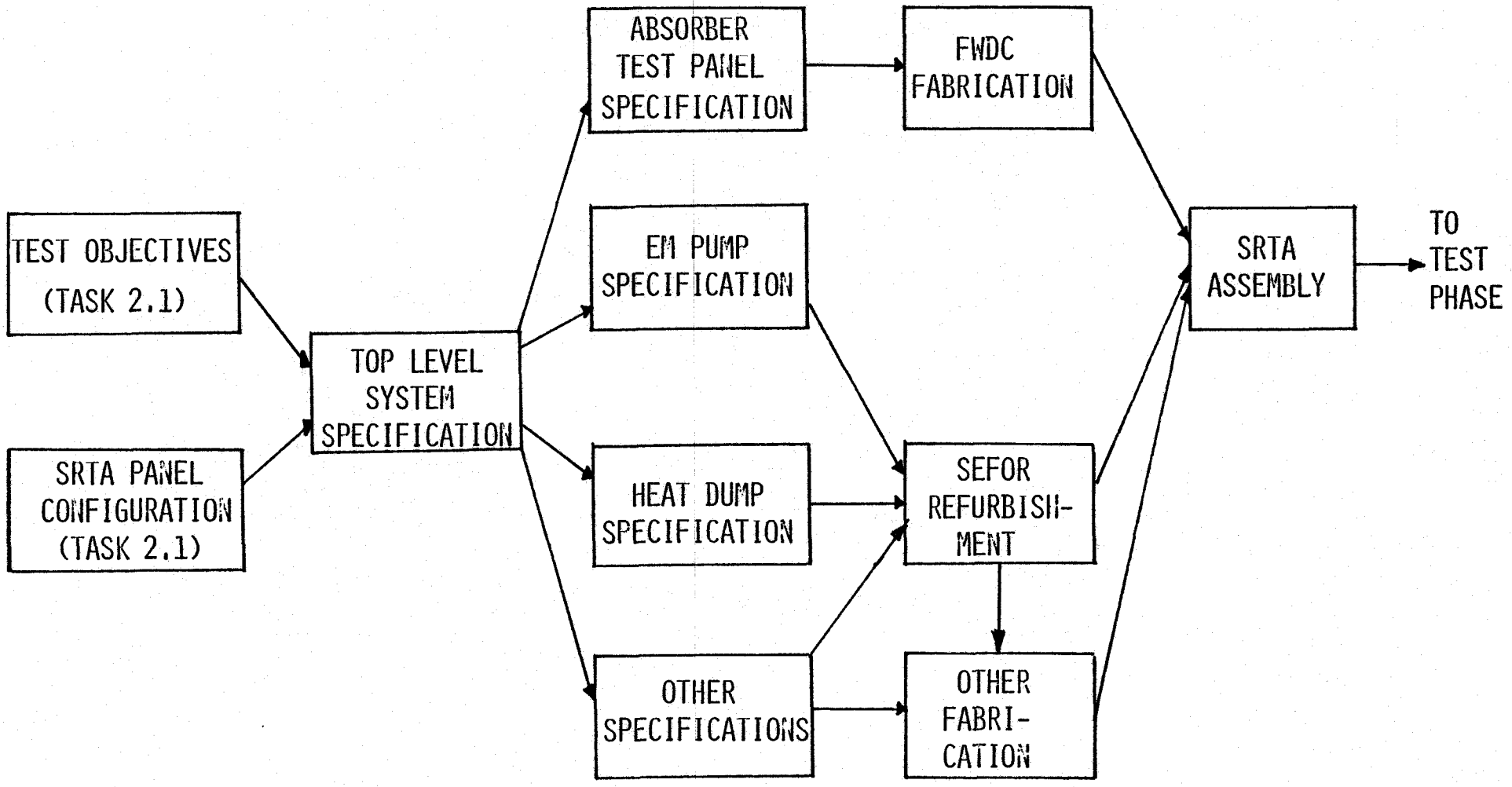
SODIUM RECEIVER TEST ASSEMBLY (SRTA)

- ABSORBER TEST PANEL PLUS NECESSARY SUPPORT EQUIPMENT
- 2.5 MW RATED POWER
- TO BE TESTED AT THE CENTRAL RECEIVER TEST FACILITY (CRTF) IN FALL 1980
- MAJOR SUPPORT EQUIPMENT PURCHASED FROM SOUTHWEST EXPERIMENTAL FAST OXIDE REACTOR (SEFOR) NEAR FAYETTEVILLE, ARKANSAS

SIMPLIFIED SRTA SCHEMATIC



SRTA (TASK 1.1) SUMMARY WORK FLOW



BASELINE TEST PANEL DESIGN

- PHASE II PROPOSAL (12/78) BASED ON:
  - VERTICAL BRAZE OF 2 HALF LENGTH PANELS FOR 3 HEADER CONFIGURATION
  - TANGENT TO TANGENT TUBE BRAZE
  - UNIFORM FLUX AND THEREFORE UNIFORM TRANSVERSE TEST PANEL CENTER TO EDGE TEMPERATURE GRADIENT (BASED ON 11/78 CRTF MEETING)

REVISED TEST PANEL DESIGN

- AS THE RESULT OF PHASE II BRAZE DEVELOPMENT PROGRAM:
  - HORIZONTAL BRAZE ORIENTATION
  - NICKEL PLATED I800
  - BRAZING INSERTS BETWEEN TUBES

- AS THE RESULT OF SHIFT TO 2 HEADER PANEL
  - FULL LENGTH PANEL BRAZE
  - NO ACCEPTABLE FURNACE AVAILABLE, NECESSITATING FABRICATION OF TEMPORARY FURNACE

- AS THE RESULT OF UNEXPECTED NON-UNIFORM CRTF FLUX PROFILE
  - LARGE ($126^{o}F$) CENTER-TO-EDGE TEMPERATURE GRADIENT
  - MUCH MORE COMPLEX TEST PANEL DESIGN AND FABRICATION

DESIGN PROGRESS

- TO BRAZE THE LONG TEST PANEL (20') IN A HORIZONTAL CONFIGURATION A TEMPORARY FURNACE HAD TO BE BUILT (11/79).

- TO REDUCE FURNACE COST AND RISK, PART WIDTH SEGMENTS WERE SELECTED AS BRAZE APPROACH (11/79).

- SMALL FURNACE CONTRACT IN PLACE (1/80).

- FOSTER WHEELER FABRICATION DEVELOPMENT AND ANALYSIS SHOWED FULL WIDTH BRAZE TO BE LOWER COST AND RISK. (GE ADOPTED APPROACH - 1/80)

- FULL WIDTH FURNACE REQUIRED (2/80): AMENDMENT TO PYROMET CONTRACT BEING PREPARED.

14 WEEK SCHEDULE SLIP PROJECTED

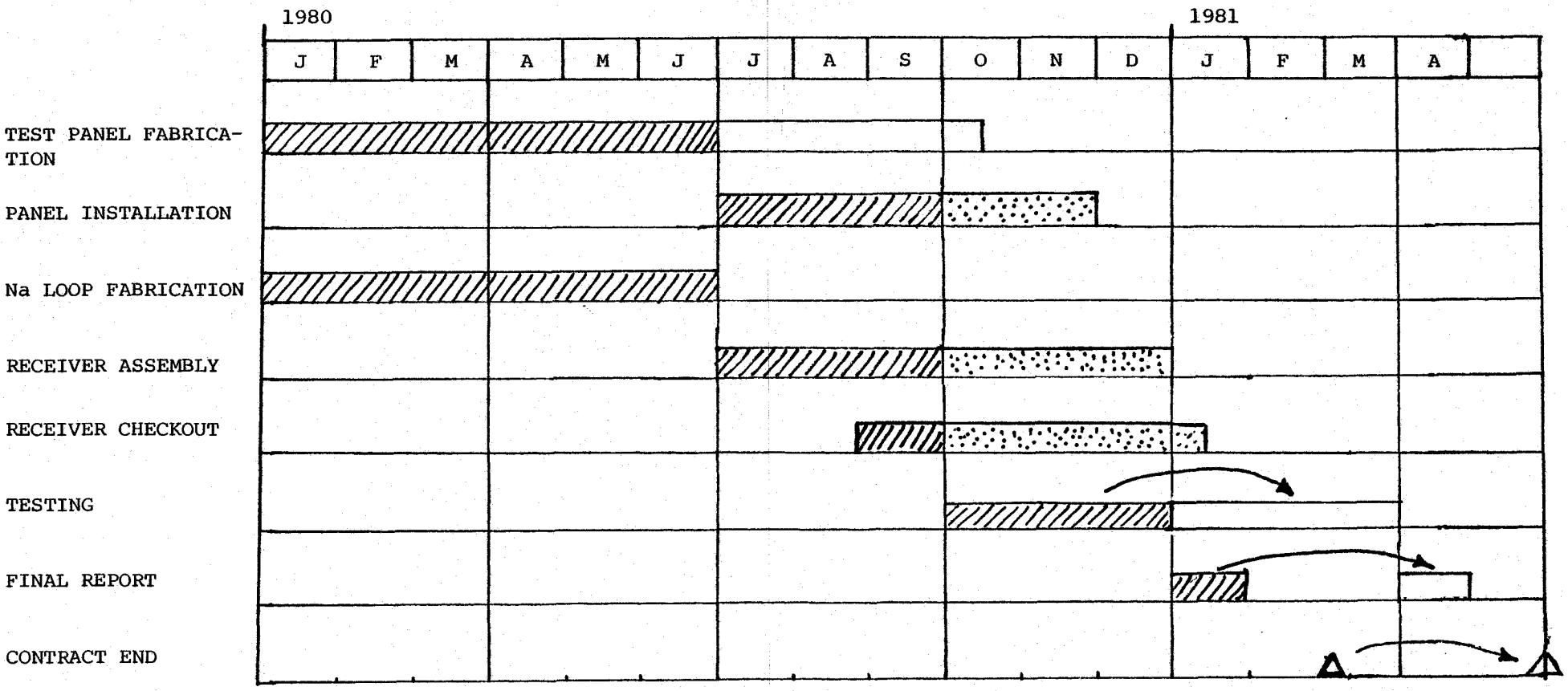
- LARGE FURNACE DELIVERY IS CRITICAL PATH ITEM

- FOSTER WHEELER SUPPLIERS CLOSE TO CRITICAL PATH
  - TUBING (PATCO IN L.A.)
  - SPACERS (TECHALLOY IN PA.)

- POTENTIAL FUTURE PROBLEMS
  - FIT UP AND WELDING AT FOSTER WHEELER
  - SLIP AT FOSTER WHEELER SUPPLIERS
  - HELIUM LEAK TEST AT FOSTER WHEELER

- AGGRESSIVE EXPEDITING WILL BE APPLIED TO HOLD NEW SCHEDULE

ALTERNATE CENTRAL RECEIVER PROGRAM
REVISED SCHEDULE
(PRELIMINARY)



ORIGINAL SCHEDULE ////////// SLIP ▭ STRETCH OUT ⁘⁘⁘

1/29/80

COST INCREASES

- TEMPORARY BRAZING FURNACE
- FOSTER WHEELER COST GROWTH
  - BRAZING INSERTS
  - NICKEL PLATING
  - TRACE HEATING
  - INCREASED COMPLEXITY
- PROGRAM STRETCH OUT

PROGRAM SOURCES OF FUNDS

- DOWNSCOPING OF NON-CRITICAL TASKS

  #1.2.2 NON-DESTRUCT TEST

  #2.2 COM'L PLANT UPDATE

  #3 CRITICAL MODULE

  #4 DEVELOPMENT PLAN

ACTION PLAN

- GE PREPARING A LETTER OUTLINING:
  - NEW SCHEDULE & CONTRACT END DATE
  - FORM 60 AND BACK-UPS FOR TASK #1 COST GROWTH (EXPLAINING REASONS FOR GROWTH)
  - SUGGESTED DOWNSCOPING OF OTHER TASKS WITH PRIORITY SO THAT DOE CAN DECIDE WHETHER TO FUND PARTIALLY

PROGRAM STATUS

- COMMERCIAL PLANT DESIGN REVISION COMPLETED - 10/79
- FULL WIDTH TEST PANEL BRAZE SELECTED
- SRTA DESIGN NEARING COMPLETION
- SRTA FACTORY ASSEMBLY UNDERWAY
- DRAFT TEST PLAN TO BE COMPLETED BY 3/1/80

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	1600	ADJOURN	

SRTA DESIGN REQUIREMENTS

INCIDENT SOLAR BEAM ACCEPTANCE

THE SRTA SHALL ACCEPT A MAXIMUM STEADY STATE INCIDENT SOLAR POWER OF 2.5 MW ON THE ABSORBER PANEL ACTIVE HEAT EXCHANGER SURFACE. THE PANEL SHALL BE ABLE TO ACCEPT THIS POWER LEVEL IN ANY DISTRIBUTION WHICH IS SYMMETRIC ABOUT THE VERTICAL CENTERLINE OF THE PANEL, BETWEEN THE EXTREMES OF UNIFORM FLUX AND SINGLE POINT AIMING FLUX. THE SRTA SHALL BE DESIGNED TO ACCEPT TRANSIENTS IN THE SOLAR POWER LEVEL OF UP TO 1 MW/MINUTE AND HOLD TIMES AT FULL POWER (2.5 MW INCIDENT) OF UP TO 10 HOURS.

ABSORBER PANEL INLET TEMPERATURE

THE ABSORBER PANEL INLET TEMPERATURE SHALL BE MAINTAINED AT A SET POINT BETWEEN 500^{o}F AND 700^{o}F ($\pm$ 5^{o}F) UNDER ALL INCIDENT SOLAR POWER LEVELS BETWEEN 0.25 MW AND 2.5 MW INCLUDING TRANSIENT AS WELL AS STEADY STATE CONDITION.

ABSORBER PANEL OUTLET TEMPERATURE

THE ABSORBER PANEL OUTLET TEMPERATURE SHALL BE MAINTAINED AT 1100^{o}F $\pm$ 5^{o}F UNDER ALL STEADY STATE AND TRANSIENT INSOLATION CONDITIONS FROM 0.25 MW TO 2.5 INCIDENT POWER.

DESIGN LIFE REQUIREMENTS

THE SRTA EQUIPMENT SHALL BE DESIGNED TO OPERATE FOR AT LEAST 5000 HOURS WITHOUT SIGNIFICANT DETERIORATION IN PERFORMANCE OR PLANNED REPLACEMENT OF MAJOR COMPONENTS. IN ADDITION THE ABSORBER PANEL SHALL BE DESIGNED TO PROVIDE 30 YEAR LIFE WITH RESPECT TO CORROSION AND THERMAL CYCLING DAMAGE OF THE METALLIC PARTS. FOR CORROSION, 30 YEAR LIFE SHALL BE DEFINED AS 131,000 HOURS OF EXPOSURE TO FULL LOAD OPERATING TEMPERATURES AND ENVIRONMENTS.

SRTA DESIGN REQUIREMENTS (CONTINUED)

OPERATING MODES

- OPERATION - THE SODIUM PUMP AND THE HEAT DUMP ARE UNDER AN AUTOMATIC CONTROL WHICH RESPONDS TO VARIATIONS IN THE SOLAR HEAT INPUT TO MAINTAIN THE ABSORBER PANEL INLET/OUTLET TEMPERATURES AT APPROXIMATELY 600°F/1100°F RESPECTIVELY.
- HOT HOLD - HOT SHUTDOWN CONDITION IN WHICH THE PANEL MOVEABLE INSULATION IS CLOSED AND THE TRACE HEATERS MAINTAIN THE LOOP TEMPERATURE AT APPROXIMATELY 600°F.
- PREHEAT - TRANSITION FROM A COLD AMBIENT TEMPERATURE CONDITION TO HOT HOLD.
- STARTUP - TRANSITION FROM HOT HOLD TO OPERATION.
- SHUTDOWN - TRANSITION FROM OPERATION TO HOT HOLD.
- EMERGENCY DUMP - ALL OF THE SODIUM IS DRAINED RAPIDLY OUT OF THE LOOP INTO THE DUMP TANK AND THE LOOP IS FILLED WITH INERT GAS.
- CALIBRATION MANEUVERS - CALIBRATION MODES SHALL BE PROVIDED AS REQUIRED FOR INSTANCE THE SODIUM FLOWMETER CALIBRATION USING THE SURGE TANK LEVEL GAGES. T/C CALIBRATION RUN OVER A RANGE OF ISOTHERMAL TEMPERATURES FROM 600°F TO 1100°F.

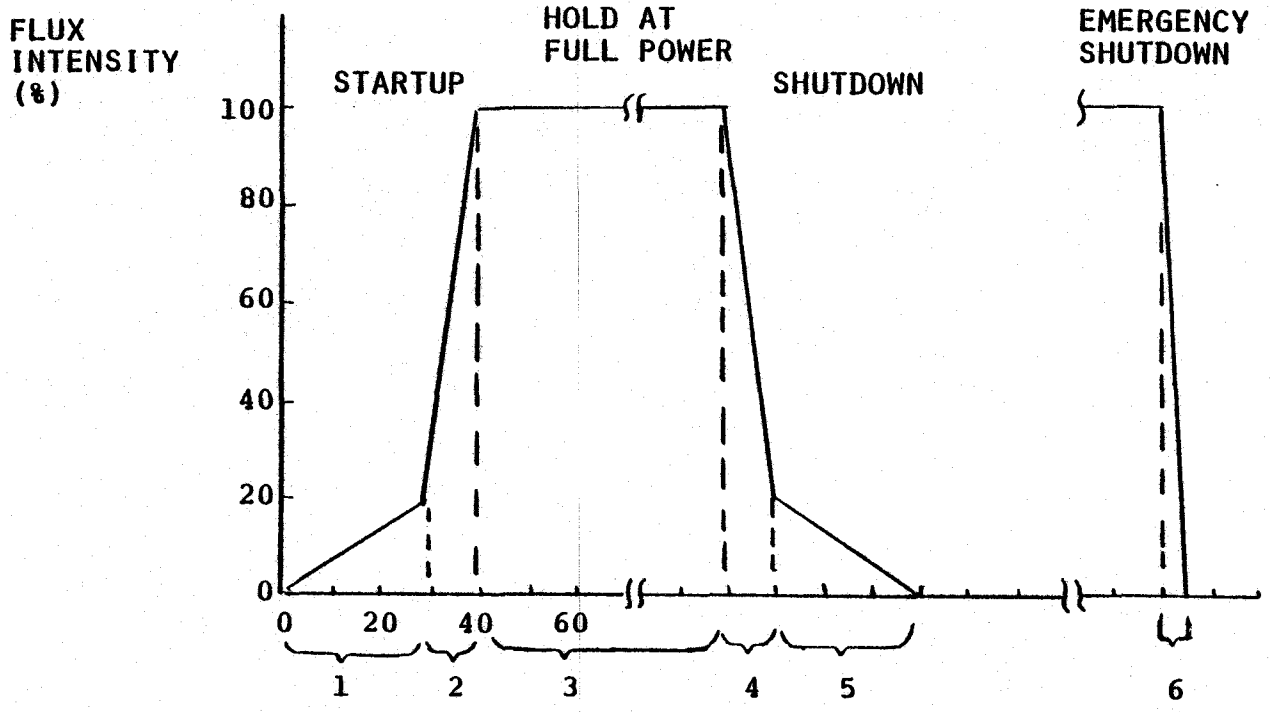
SRTA DESIGN REQUIREMENTS (CONTINUED)

OPERATING REQUIREMENTS

TEMPERATURE (DRY BULB):	-20 TO 120°F
WIND SPEED:	0 TO 14 M/S (30 MPH)

SURVIVAL REQUIREMENTS

WIND SPEED:	45 M/S GUSTS FROM ANY DIRECTION (100 MPH)
SNOW:	5 LB/FT^2 SNOW DEPOSITION
LIGHTNING:	DIRECT HIT
RAIN:	3 INCHES IN 24 HOURS
ICE:	2 INCH THICK DEPOSIT
EARTHQUAKE: (AT TOP OF TOWER)	.5G LATERAL AT CONSTANT ACCELERATION
HAIL:	1 INCH DIAMETER 0.9 SPECIFIC GRAVITY 75 FPS



	TYPE OF CYCLE	NUMBER OF CYCLES	DURATION (MINUTES)
1.	RAMP TO FULL TEMPERATURE	18,000	30
2.	RAMP TO FULL FLUX	18,000	10
3.	HOLD AT FULL FLUX		
	CLEAR DAYS	7,000	600
	HALF CLOUDY DAYS	2,500	300
	PARTLY CLOUDY DAYS	8,500	60
4.	RAMP TO MINIMUM FLOW	9,500	10
5.	RAMP TO UNIFORM TEMPERATURE	9,500	30
6.	EMERGENCY SHUTDOWN	8,500	5 SECONDS

ABSROBER PANEL THERMAL CYCLING HISTOGRAM (30 YEARS)

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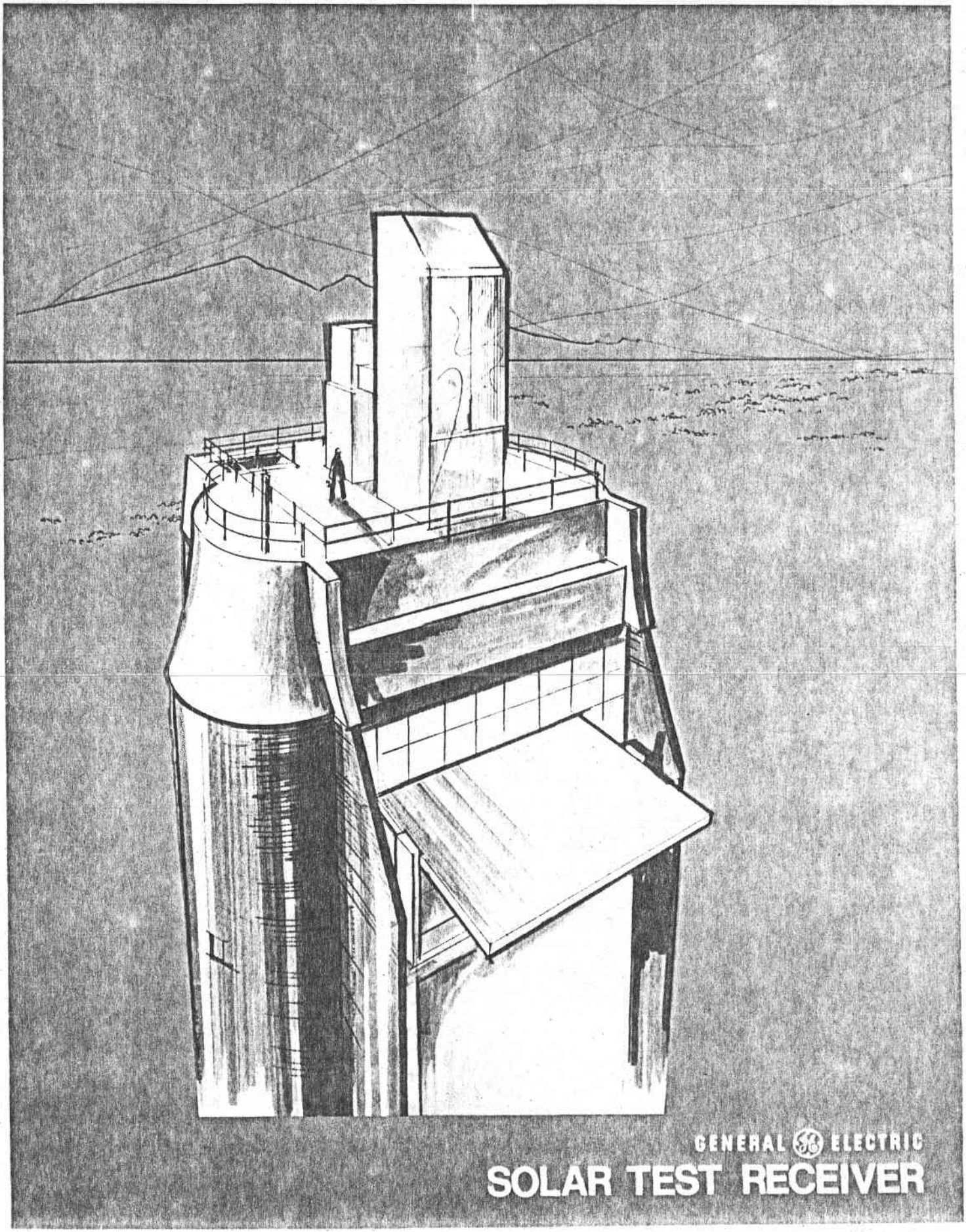
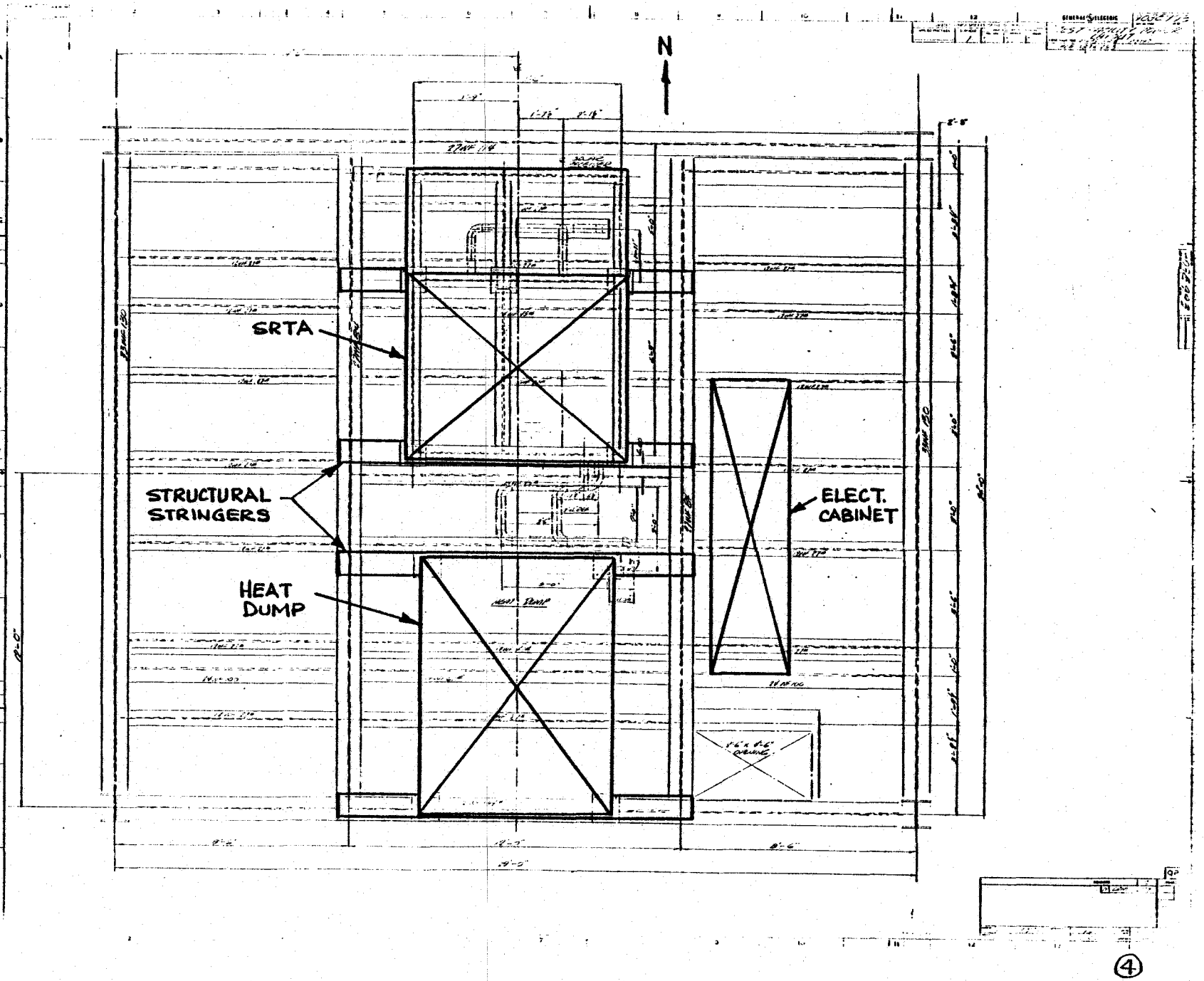
OVERALL DESIGN/LAYOUT DRAWINGS

(1)	Piping and Instrumentation Diagram		908E992
(2)	Sodium Receiver Test Assembly	Sheet 1	908E982
(3)	Sodium Receiver Test Assembly	Sheet 2	908E982
(4)	Test Facility Tower Layout		908E993


GENERAL ELECTRIC
SOLAR TEST RECEIVER


N
SRTA
STRUCTURAL STRINGERS
HEAT DUMP
ELECT. CABINET

SRTA MAJOR COMPONENTS

	SOURCE
SUPPORT STRUCTURE	NEW
EM PUMP	SEFOR
VALVES	SEFOR
SOLAR SHIELD	NEW
SURGE TANK	SEFOR
DRAIN TANK	SEFOR
HEAT DUMP	SEFOR
SOLAR TEST PANEL	NEW
INSTRUMENTATION	NEW

STATUS

DESIGN	COMPLETED
PRELIMINARY DESIGN REVIEW	SEPTEMBER 25, 1979
DESIGN REVIEW BY ESPD REVIEW TEAM	NOVEMBER 12, 1979
FINAL DESIGN REVIEW	JANUARY 10, 1980
PIPING DESIGN & SUPPORTS	IN PROCESS
SOLAR SHIELD	IN PROCESS
SRTA DOOR	IN PROCESS
INSTRUMENTATION	IN PROCESS
FABRICATION	
STRUCTURAL SUPPORT	DELIVERED 1/18/80
PIPE SPOOLS, SOLD TRAP, VAPOR TRAP	IN PROCESS
SEFOR EQUIPMENT REFURBISHMENT	
EM PUMP	OCTOBER 16, 1979
SODIUM VALVES	JANUARY 4, 1980
SURGE TANK	IN PROCESS
DRAIN TANK	IN PROCESS
HEAT DUMP	IN PROCESS

OFF-PANEL SOLAR INCIDENCE FLUX

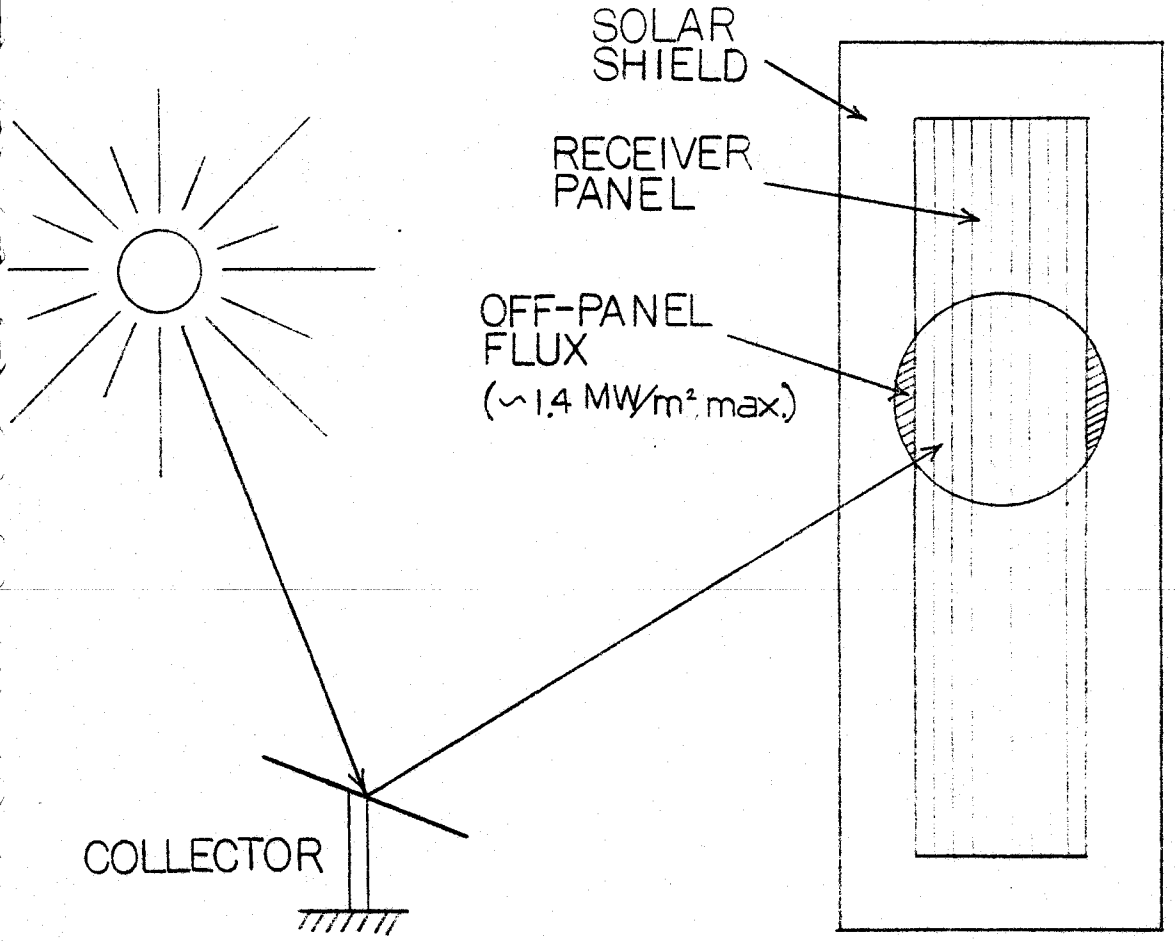


FIG. 1

KLLee
9-25-79

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TEST RECEIVER STRUCTURAL DRAWINGS

(5)	Test Support Structure	Sheet 1	908E983
(6)	Test Support Structure	Sheet 2	908E983
(7)	Test Support Structure	Sheet 3	908E983
(8)	Test Support Structure	Sheet 4	908E983

SRTA STRUCTURAL ANALYSIS

LOADS

WIND	40PSF, GUSTING
SEISMIC	RESPONSE SPECTRA ANALYSIS
VERTICAL DL + LL	NEGL.
THERMAL	UNDER STUDY
SHIPPING	3G LAT., 5G AXIAL

MATERIALS

ASTM A36 STEEL BEAMS, BRACES ASTM A500
STEEL TUBES A307 BOLTED CONNECTIONS

GUSTING OF WIND

GUSTING, IN ORDER TO HAVE FULL EFFECT ON A STRUCTURE, NEEDS TO HAVE AN ALONGWIND EXTENT OF 4 TIMES THE ALONGWIND DIMENSION, AND THE GUSTING MUST AT LEAST BE AT THE MINIMUM FREQUENCY OF THE STRUCTURE (6.0 H_Z IN THIS CASE)

V_{MIN} = 4(6.25 FT) (6.0 CYCLES/SEC) = 150 FT/SEC = 102 MPH.

HOWEVER THIS CORRESPONDS TO A WAVE LENGTH OF ONLY 25 FT. AND THE GUST SPECTRAL DENSITY VARIATION IS ONLY ABOUT 1/10 THE VALUE OF THE MORE PROMINENT (300+ FT/SEC) WAVE LENGTHS, AND THUS GUSTING WILL NOT POSE A PROBLEM

REFERENCE: VELLOZZI, J. AND COHEN, E., "GUST RESPONSE FACTORS" JOURNAL OF THE STRUCTURAL DIVISION, ASCE, VOL. 94, NO. ST6, PROC. PAPER 5980, JUNE 1968, PP 1295-1313.

WIND FLUTTER

IN ORDER TO PRODUCE SHEDDING OF VORTICES AT THE RIGHT FREQUENCY THE WIND SPEED MUST BE:

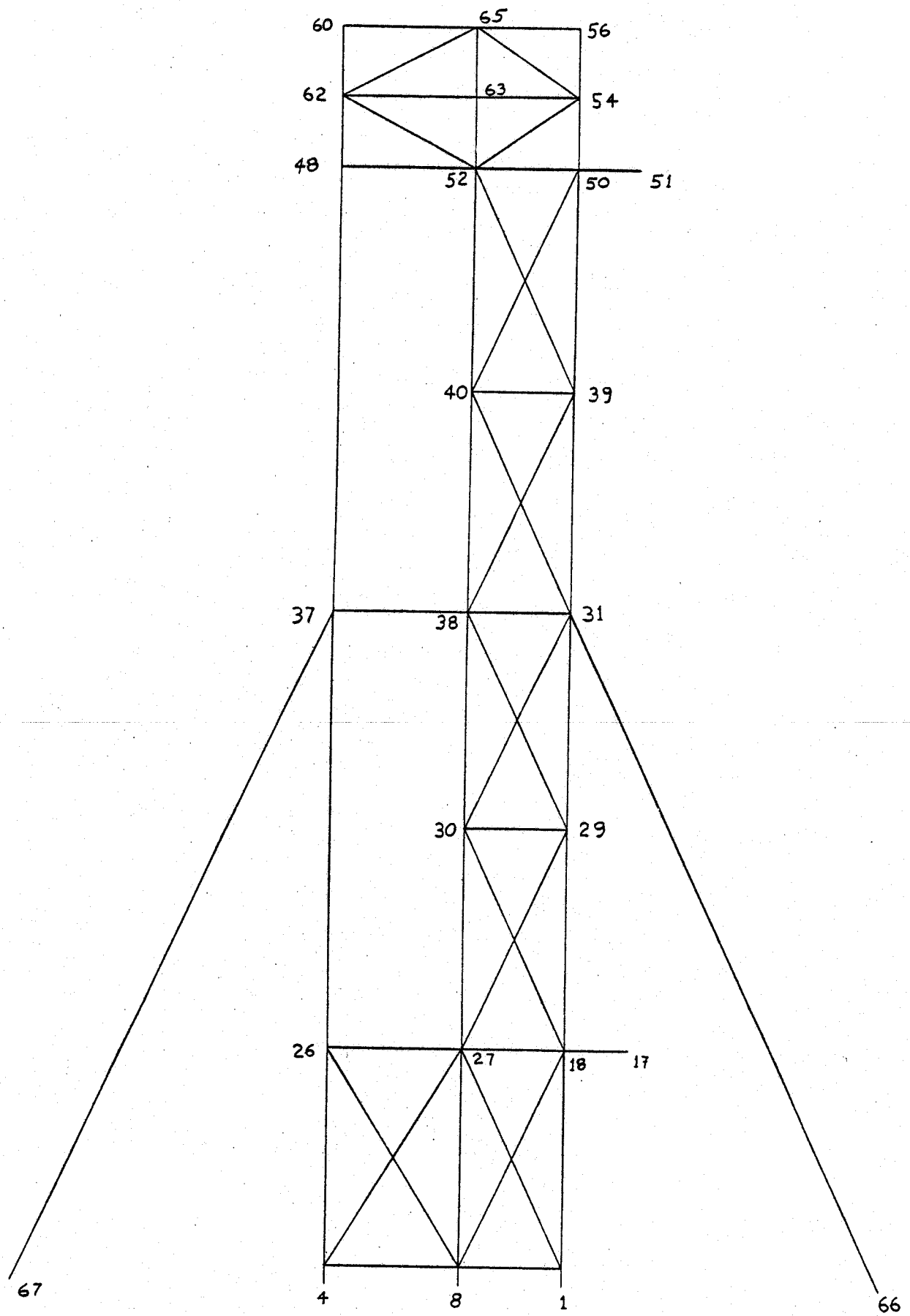
$$V = \frac{FD}{.198} = \frac{(6.0 \text{ CYCLES/SEC})(6.25 \text{ FT})}{.198} = 189 \text{ FT/SEC} = 129 \text{ MPH}$$

AT THIS SPEED THE REYNOLDS NUMBER IS:

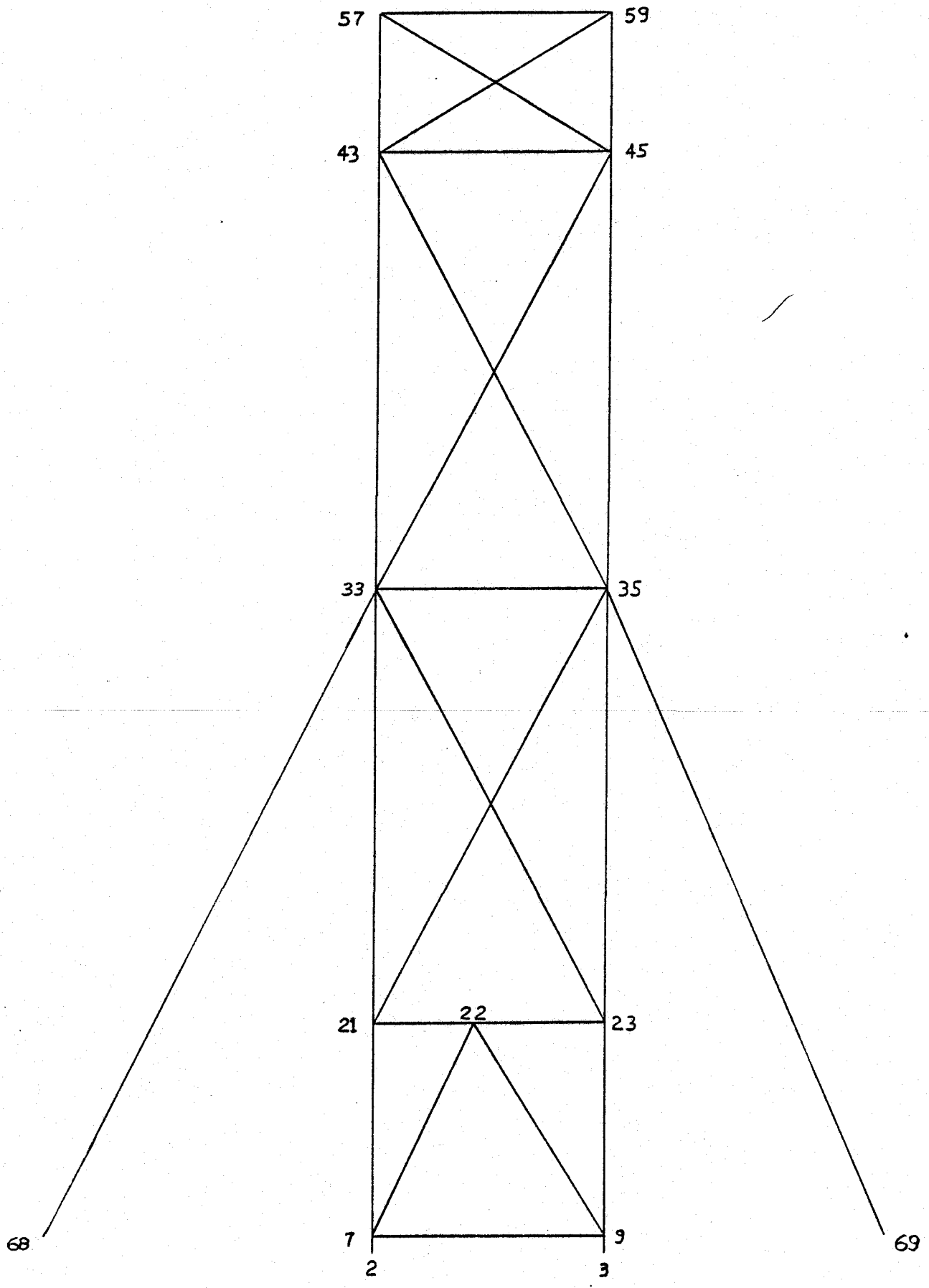
$$RE = \frac{VD}{\nu} = \frac{(189 \text{ FT/SEC})(6.25 \text{ FT})}{1.7 \times 10^{-4} \text{ FT}^2/\text{SEC}} = 6.9 \times 10^6$$

HOWEVER VORTICES TEND TO DISINTEGRATE INTO RANDOM TURBULENCE AT REYNOLDS NUMBERS HIGHER THAN 2×10^4, WHICH IS ONLY .54 FT/SEC FOR THE TOWER

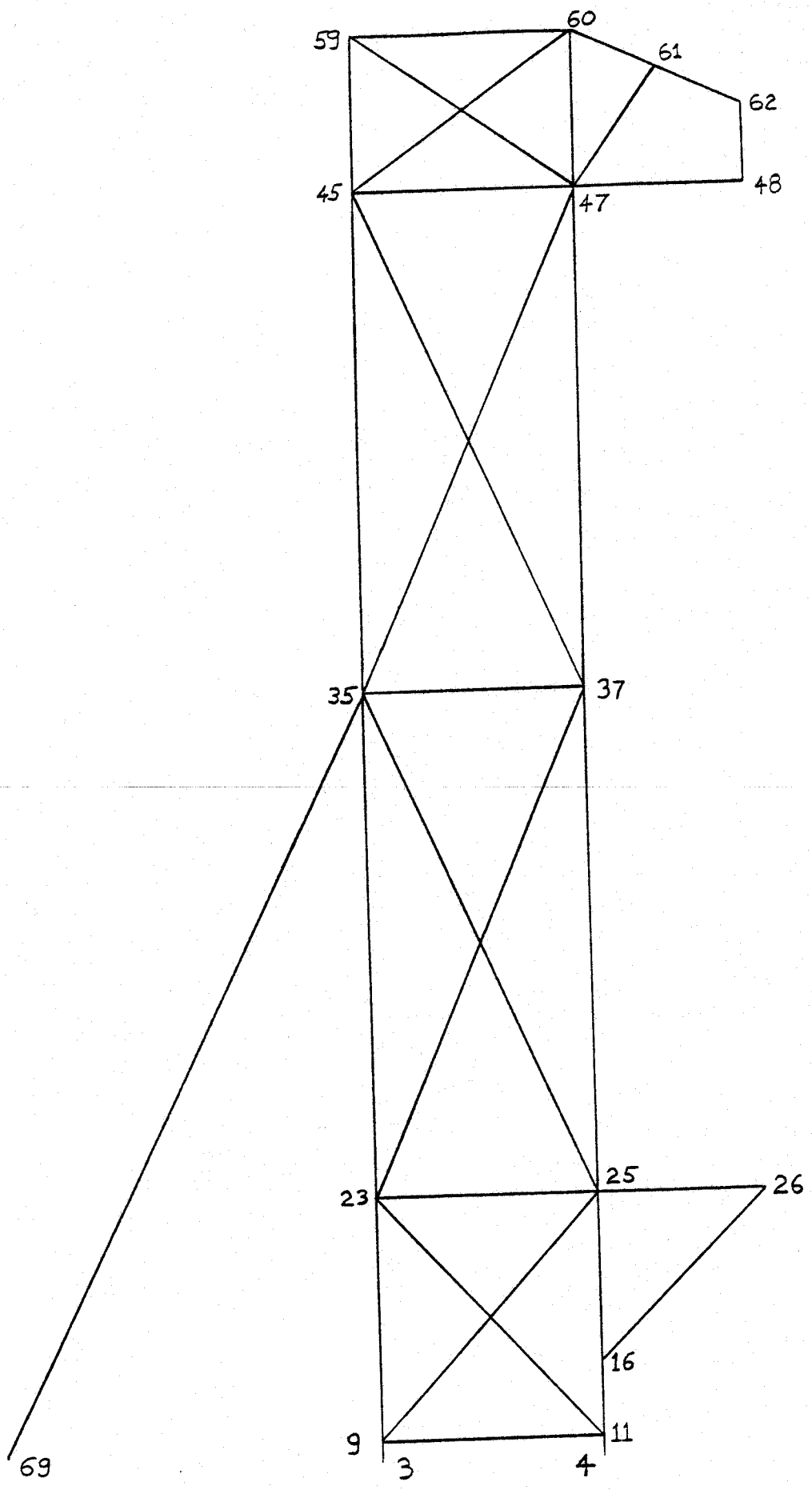
REFERENCE: DUAGHERTY, R. AND INGERSOLL, A. FLUID MECHANICS WITH ENGINEERING APPLICATIONS, MCGRAW HILL BOOK COMPANY INC. 1954



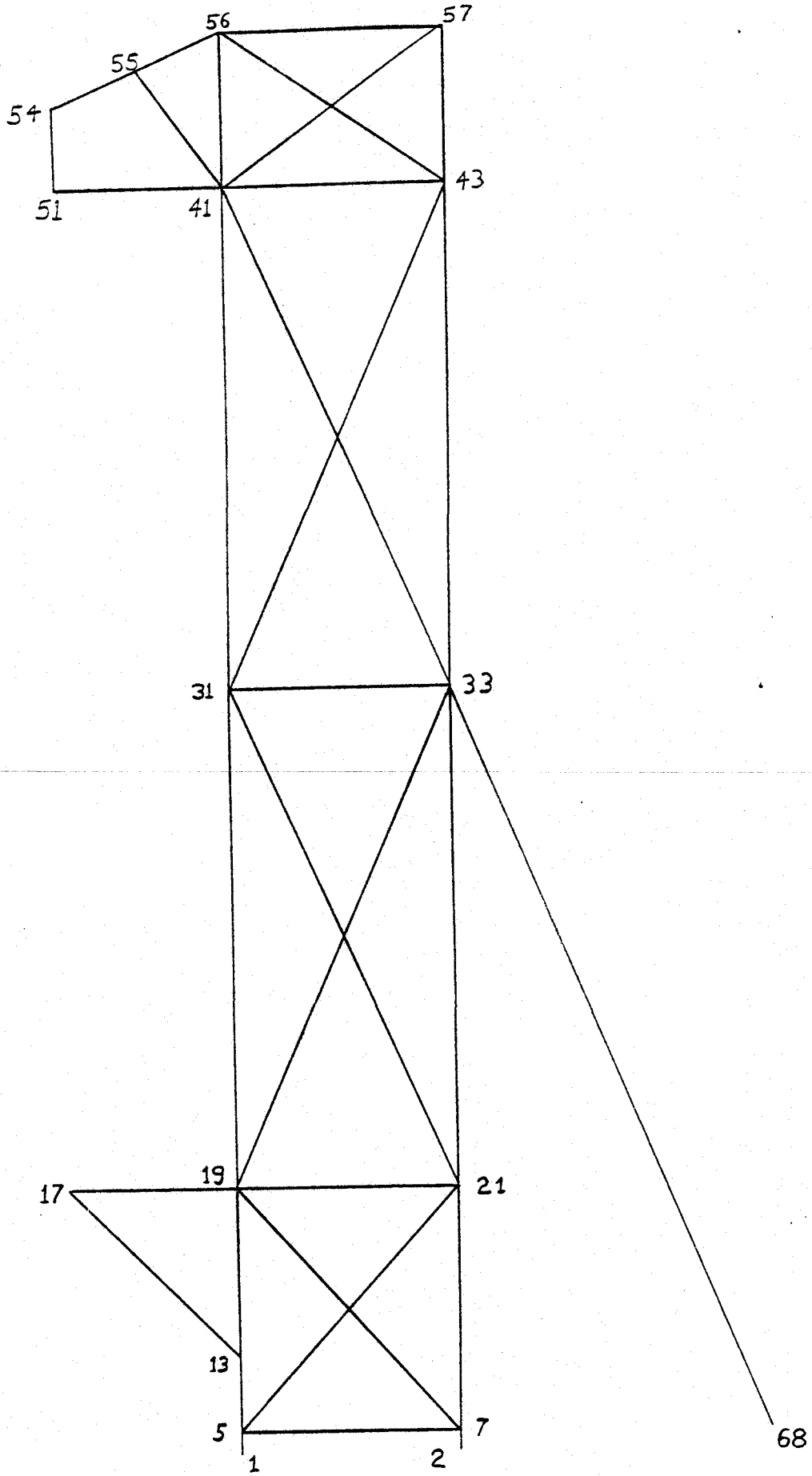
NORTH FACE



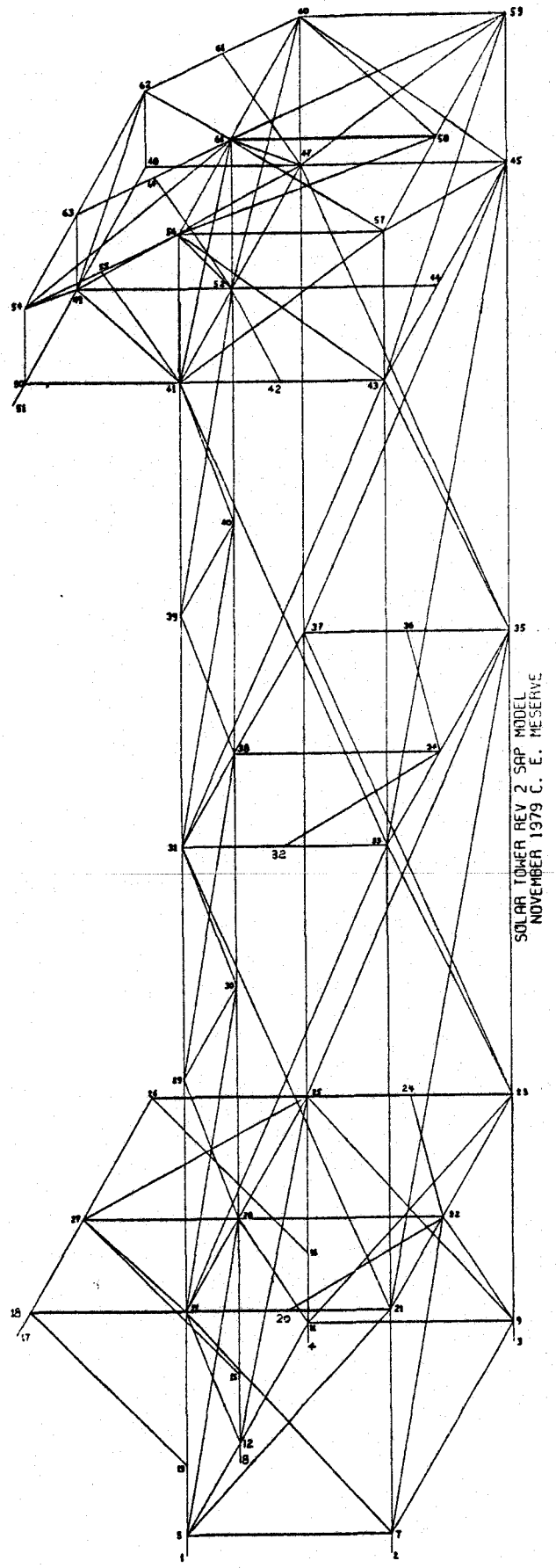
SOUTH FACE



EAST FACE

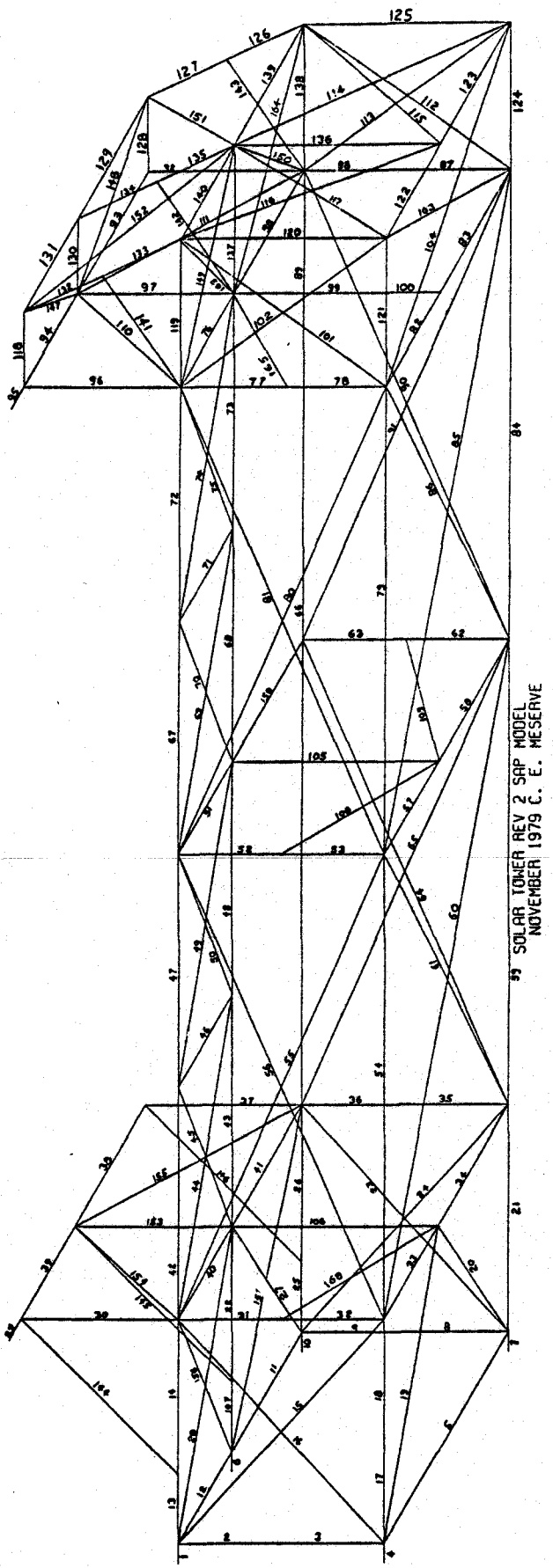


WEST FACE



NODES

SAP MODEL (NO OUTRIGGERS)



ELEMENTS

SAP MODEL (NO OUTRIGGERS)

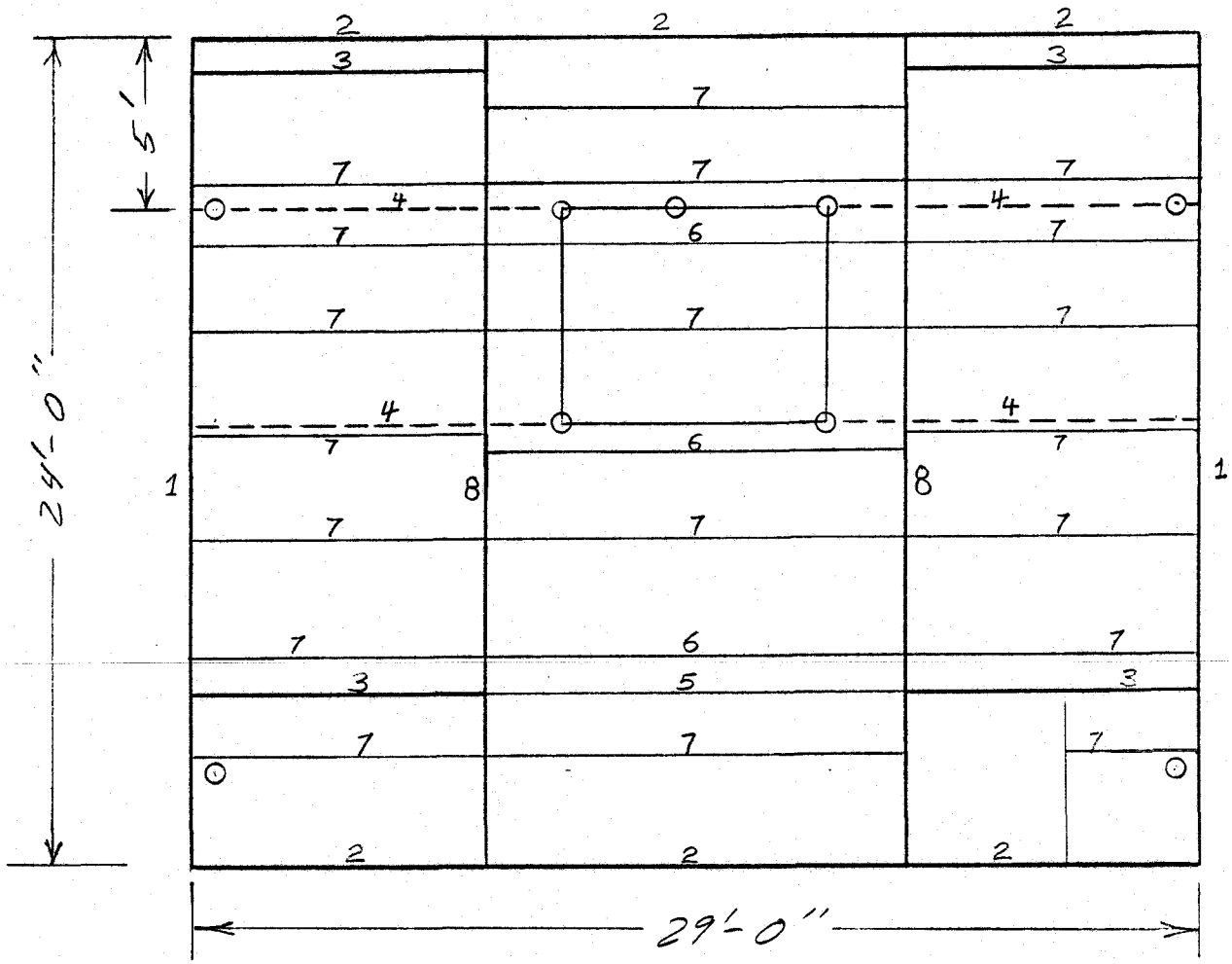
COMPARISON OF DIFFERENT CONFIGURATIONS
OF SRTA DURING SEISMIC EVENT

CONFIGURATION	MAXIMUM DEFLECTION IN INCHES		MAXIMUM STRESS IN KSI	MAXIMUM BASE LOADS NS OR E-W IN KIPS	
	N-S	E-W		AXIAL	SHEAR
157 ELEMENTS	1.4	3.1	30.3	114.0	10.6
158 ELEMENTS + 2 1.5D ROD STRUTS IN THE E-W PLANE	1.4	1.2	21.3	114.0	10.6
158 ELEMENTS + 2 2.0D ROD STRUTS IN THE E-W PLANE	1.4	1.3	24.9	137.0	13.0
158 ELEMENTS + 4 1.5D ROD STRUTS IN THE E-W PLANE	1.5	1.0	25.6	133.0	14.7
158 ELEMENTS + 4 6X¢X1/4 ST STRUTS IN THE E-W PLANE	1.6	.85	28.9	142.0	19.4
164 ELEMENTS + 4 6X6X1/4 ST STRUTS IN THE E-W PLANE	1.3	.80	18.2	105.0	13.1
164 ELEMENTS + 4 6X6X1/4 ST STRUTS NORTH 2 - E-W PLANE SOUTH 2 - 45° TO E-W PLANE	.63	.65	10.9	45.7	8.4
AS ABOVE BUT WITH 2 W21X101 I BEAMS TO CONNECT WITH ELEVATOR	.84	.49	18.5 (BASE BEAM STRESS)	55.0	7.8

COMPARISON OF DIFFERENT CONFIGURATIONS OF SRTA DURING SEISMIC EVENT

CONFIGURATION	MAXIMUM DEFLECTION IN INCHES		MAXIMUM STRESS IN KSI	MAXIMUM BASE LOADS NS OR E-W IN KIPS	
	N-S	E-W		AXIAL	SHEAR
AS BUILT NO STRUTS 3/8 G FACTOR	1.21	.98	14.2	49.2	11.0
AS BUILT NO STRUTS .5 G LOADS	.63	.76	7.9	29.9	7.6

PLAN VIEW OF TOWER ON ELEVATOR ROOF



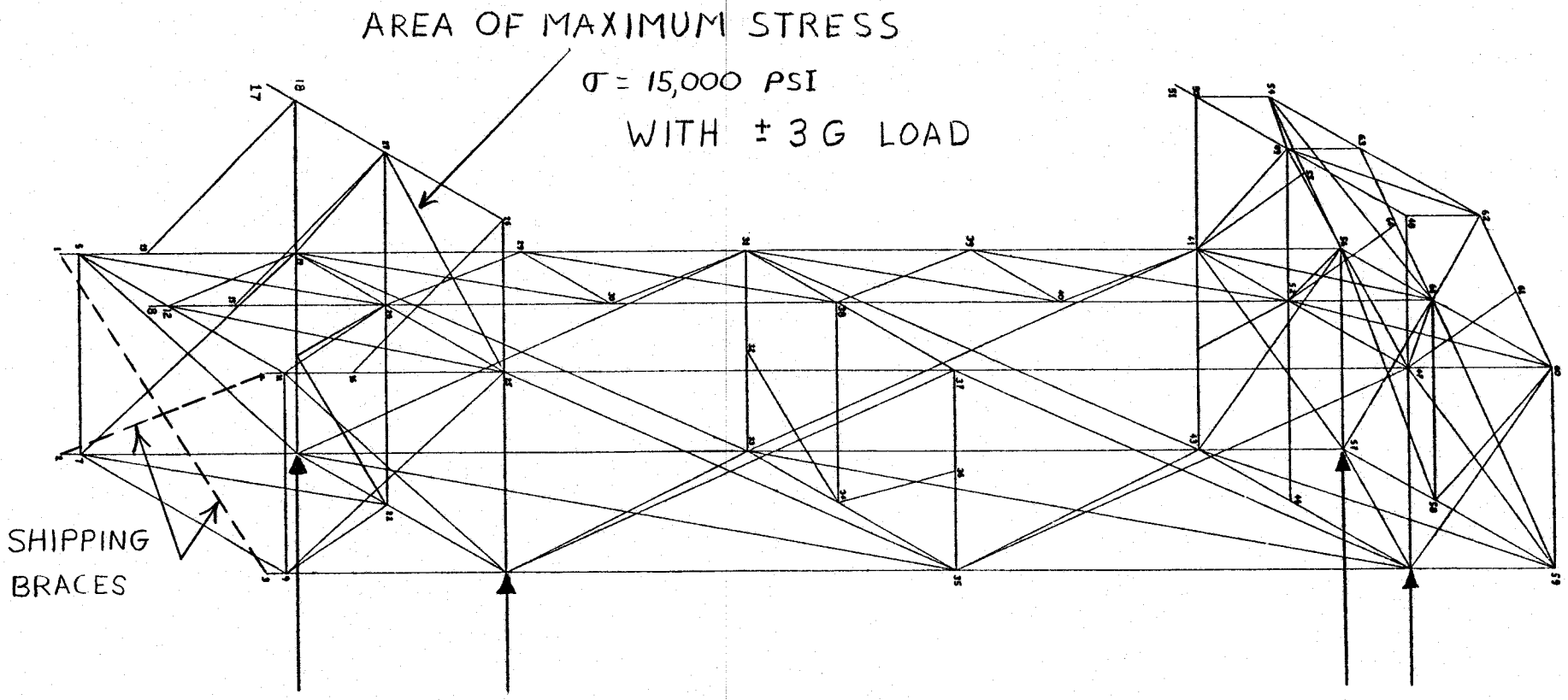
1. W 33 x 130
2. W 27 x 114
3. W 24 x 100
4. W 21 x 101
5. W 14 x 61
6. W 14 x 43
7. W 12 x 27
8. W 24 x 84

NORTH

DEFLECTIONS OF THE SRTA

HEIGHT ABOVE THE ELEVATOR ROOF IN INCHES	DEFLECTION IN INCHES			
	SEISMIC		WIND	
	N-S	E-W	N-S	E-W
90	.25	.13	.13	.08
259	.66	.46	.41	.34
428	1.1	.96	.62	.67
481	1.2	.99	.68	.68

PLACEMENT OF SUPPORTS FOR TRANSPORTATION



WITHOUT BRACES σ_{MAX} = 26,000 PSI

CONCLUSIONS

TEST TOWER IN STRUCTURALLY ADEQUATE WITH REDUCED SEISMIC LOADS

AGENDA

WEDNESDAY, FEBRUARY 13, 1980

0800	INTRODUCTION	J. ELSNER
0830	TEST RECEIVER DESIGN REQUIREMENTS	A. CURINGA
0845	TEST RECEIVER OVERALL DESIGN/LAYOUT	E. OLICH
0920	TEST RECEIVER STRUCTURE	E. MESERVE
1000	BREAK	
→ 1015	ABSORBER PANEL DESIGN & ANALYSIS	C. HUSSEY
1145	LUNCH	
1230	ABSORBER PANEL FABRICATION	C. HUSSEY
1330	SODIUM PIPING DESIGN	E. OLICH
1350	SODIUM COMPONENTS	E. OLICH/D. DRENDEL
1500	ELECTRICAL, CONTROLS & INSTRUMENTATION	P. SWARTZ
1530	ASSEMBLY PLAN/STATUS	E. GERRELS
1600	ADJOURN	

ABSORBER PANEL DESIGN DRAWINGS

(9)	Absorber Panel Interface Control Drawing	E-017
(10)	Solar Absorber Test Panel - Details	67-3481-5-30

TEST PANEL DESIGN & MANUFACTURE

- PERFORMANCE AND DESIGN REQUIREMENTS
- FLUX AND TEMPERATURE DISTRIBUTION
- TEST/COMMERCIAL PANEL COMPARISON
- PANEL & STRUCTURE ARRANGEMENT
- MECHANICAL ALTERNATIVES
- EXPANSION ALLOWANCE
- FINITE ELEMENT ANALYSIS (GE)
- FINITE ELEMENT ANALYSIS (FW)
- MANUFACTURING EFFORT

ABSORBER TEST PANEL REQUIREMENTS

PERFORMANCE

- 2.5 MW TOTAL INCIDENT POWER WITH "UNIFORM" FLUX $\sim .5\ MW/M^2$, PEAK FLUX $\sim 1.5\ MW/M^2$
- INLET TEMPERATURE $500^{o}F$-$700^{o}F$
- CONSTANT OUTLET TEMPERATURE $1100^{o}F$
- 30 YEAR CYCLIC DESIGN LIFE
- OPERATING MODES
- OPERATING/SURVIVAL REQUIREMENTS
- TRUCK TRANSPORTATION
- MINIMUM FIELD LABOR/WELDING
- CLEANLINESS

DESIGN AND CONSTRUCTION

- ASME SECTION VIII DIVISION 1 BOILER & PRESSURE VESSEL
- AISC STRUCTURE
- HANDLING LOADS 5G
- SHIPPING LOADS 2G VERTICAL, 5G DIRECTION OF TRAVEL
- INCOLOY 800 PER ASME

ABSORBER TEST PANEL REQUIREMENTS (CONT'D)

DESIGN DOCUMENTATION

TESTING

- HYDROSTATIC OR PNEUMATIC PRESSURE
- HELIUM LEAK TEST

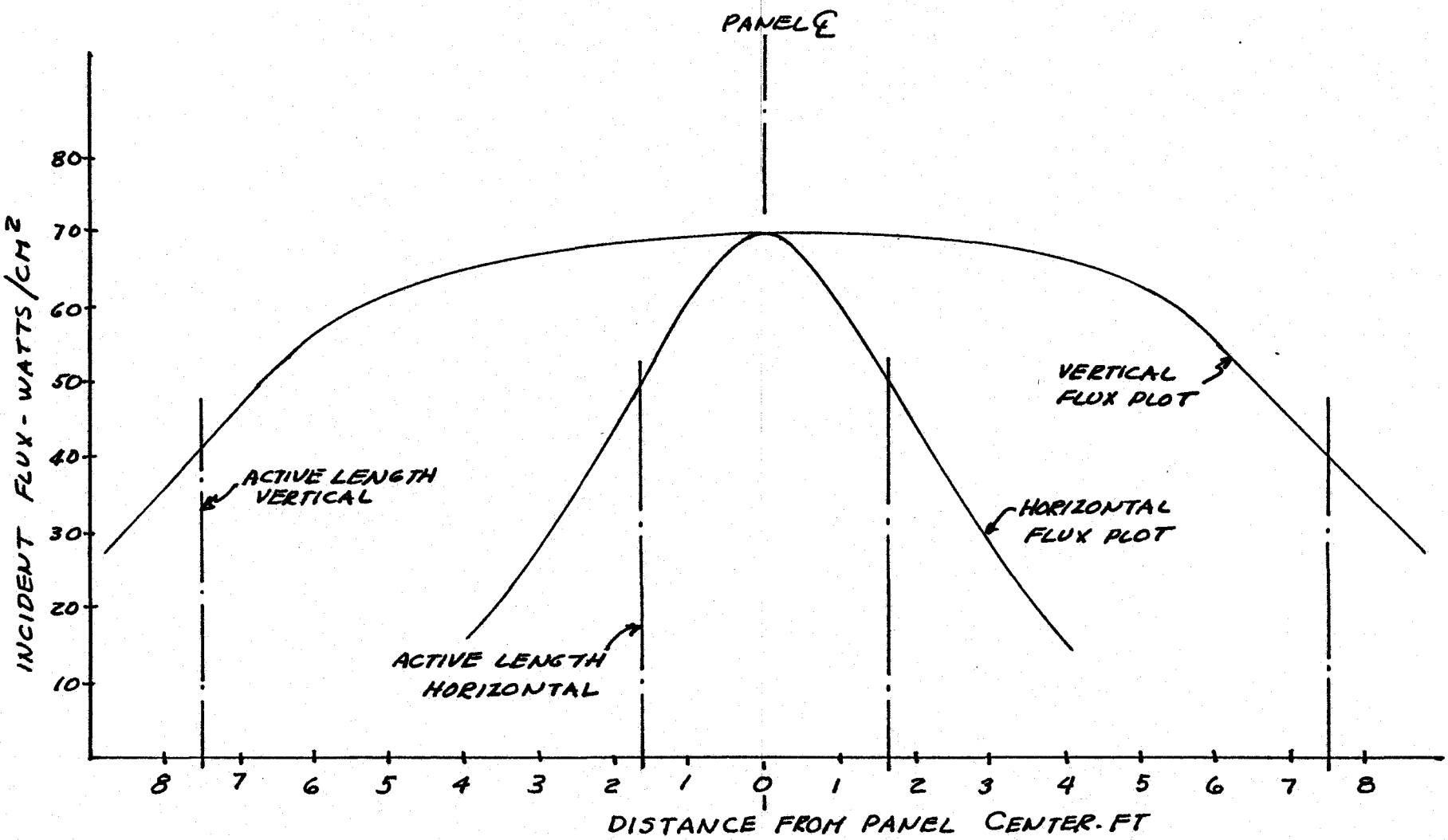
INSULATION/TRACE HEATING

QUALITY ASSURANCE

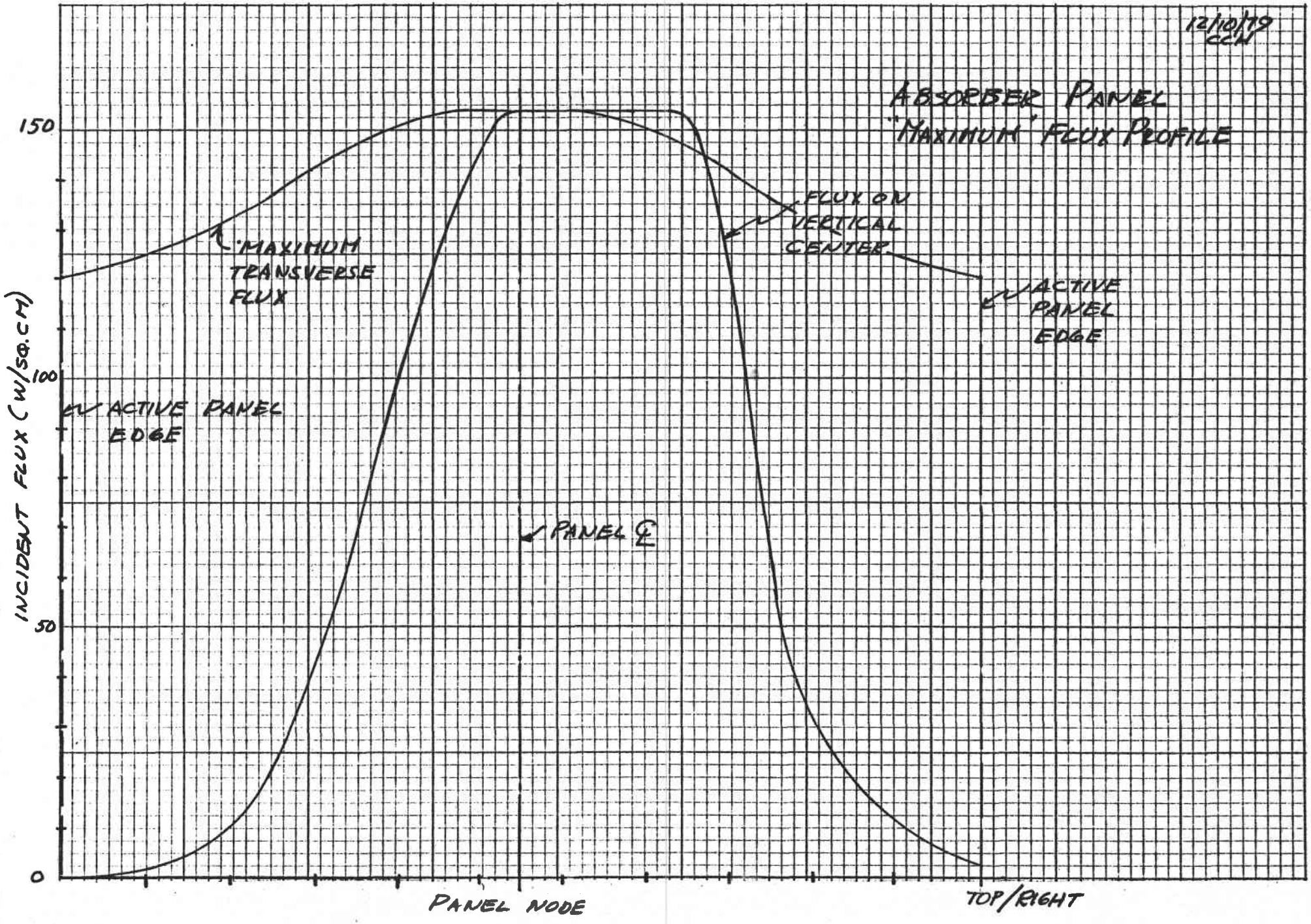
SHIPPING

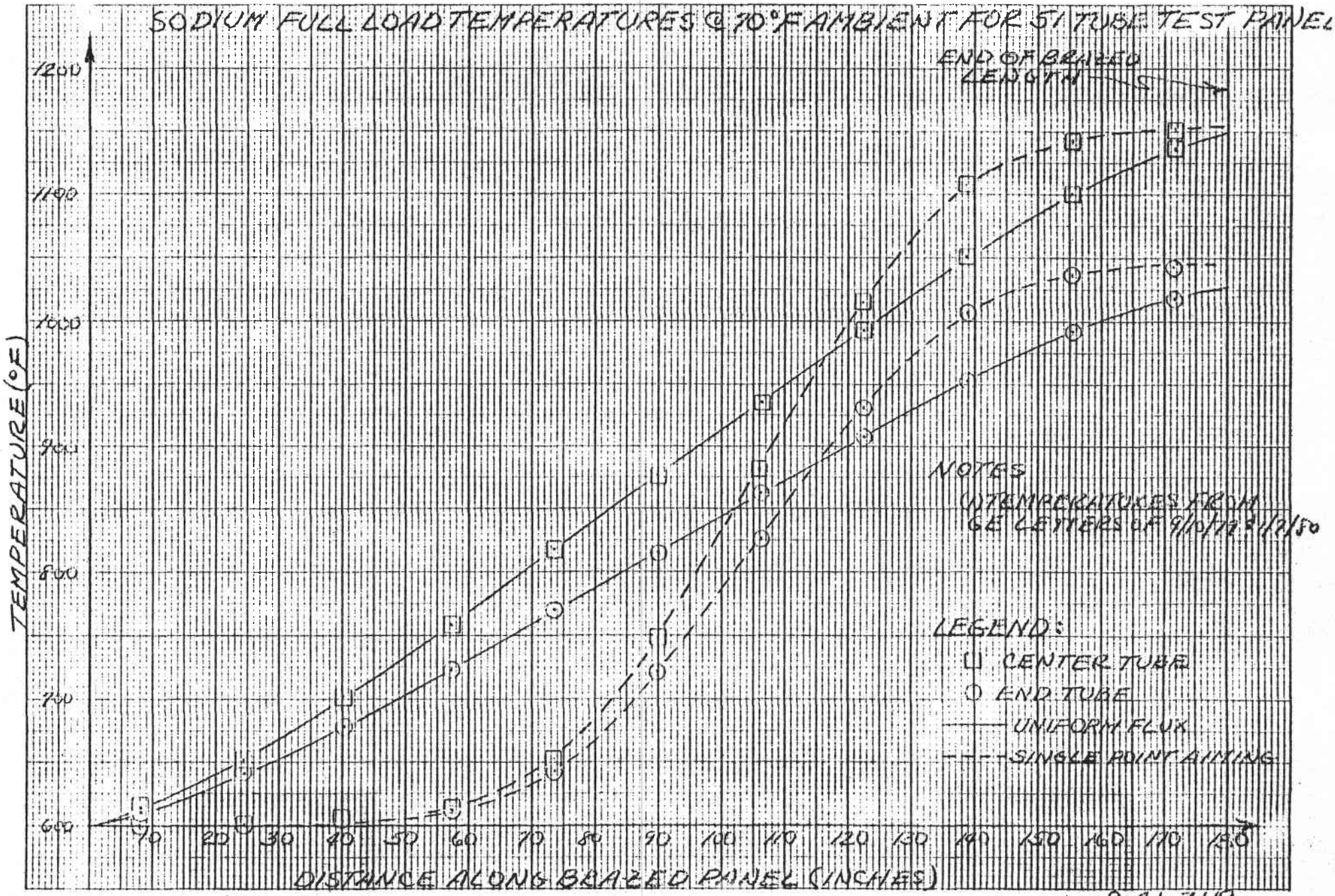
- PURGED

FLUX PLOT FOR "UNIFORM" PANEL DISTRIBUTION

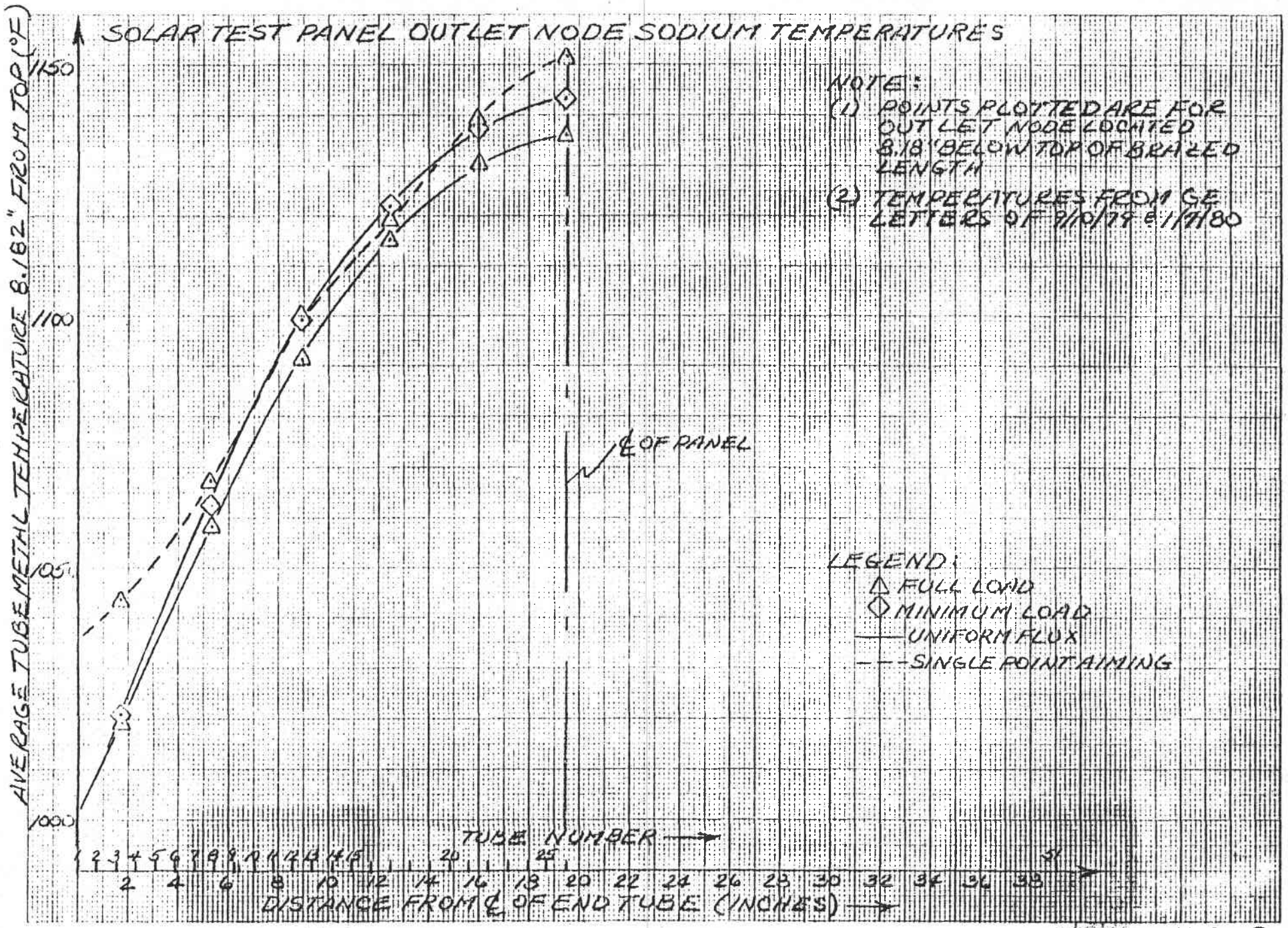


9/29/19
CH

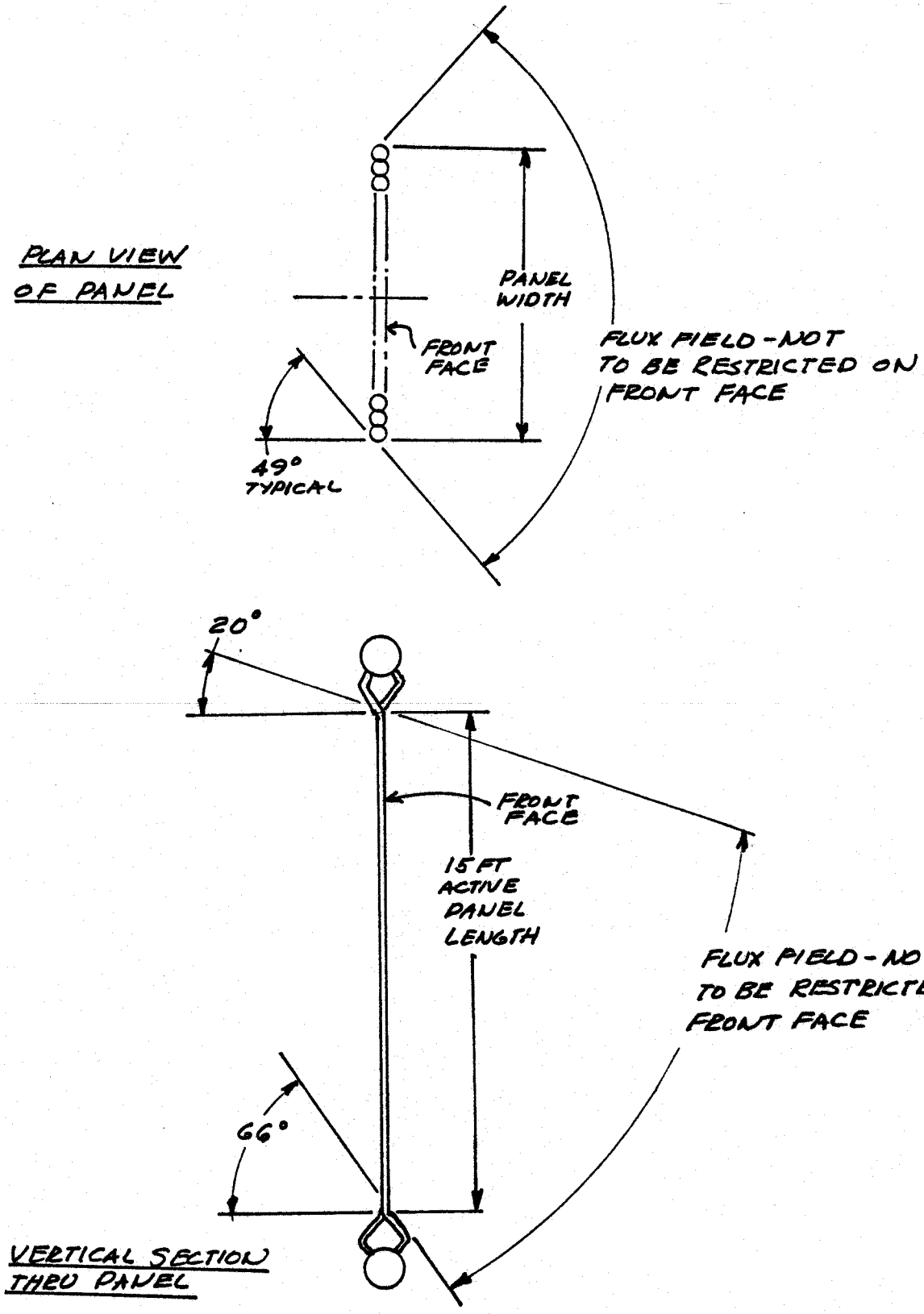

12/10/79
CCN
ABSORBER PANEL
"MAXIMUM" FLUX PROFILE
150
100
50
0
INCIDENT FLUX (W/SQ.CM)
MAXIMUM
TRANSVERSE
FLUX
FLUX ON
VERTICAL
CENTER
ACTIVE
PANEL
EDGE
ACTIVE PANEL
EDGE
PANEL ℄
PANEL NODE
TOP/RIGHT



9-41-3119
AR 1/15/80



9-41-3119



PANEL FLUX FIELD RESTRICTIONS

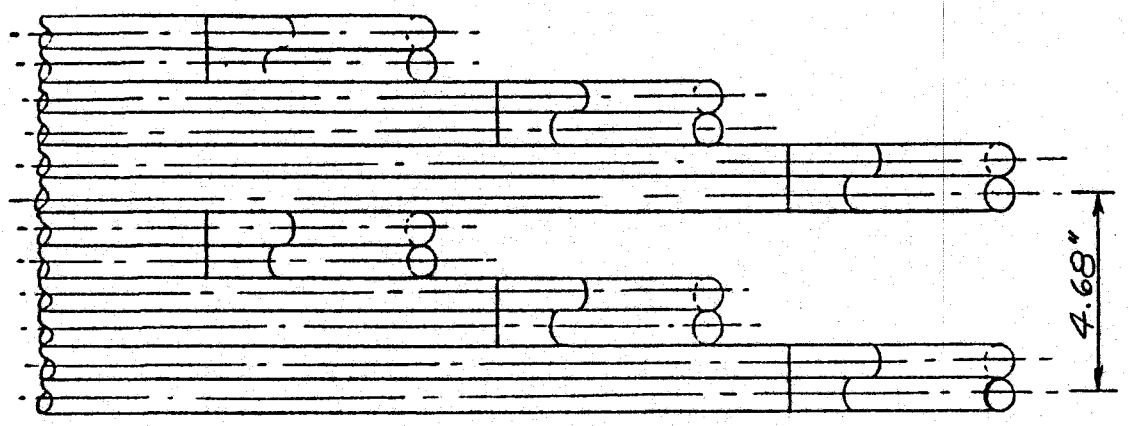
9/29/79
CH

SRTA/COMMERCIAL PANEL COMPARISON

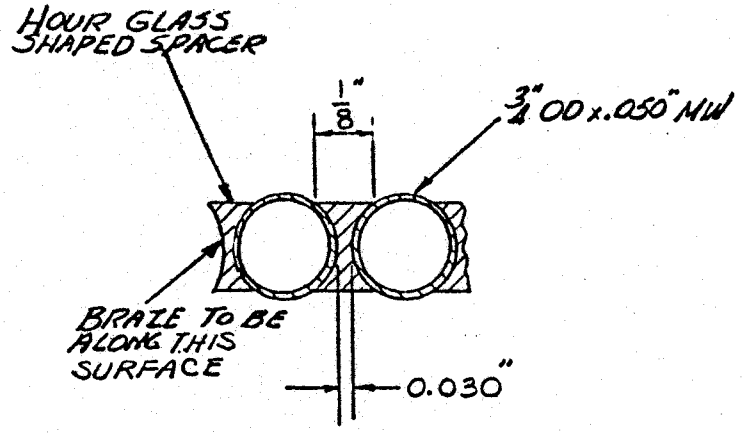
PARAMETER PHYSCIAL CHARACTERISTICS	SRTA		COMMERCIAL (100 MWE)	REPOWERING (60 MWE)
WIDTH, M (FT)	1	(3.31)	2.09 (6.87)	1.52 (5.0)
LENGTH, M (FT)	4.57	(15.0)	16 (52.48)	12 (39.37)
TUBE DIAM. CM (IN.)	1.905	(.75)	1.905 (.75)	1.905 (.75)
TUBE WALL, CM (IN.)	.127	(.05)	.127 (.05)	.127 (.05)
NUMBER OF TUBES	51		108	80
MATERIAL	I800		I800	I800
FLOW DRIVER	EM PUMP		EM PUMP	EM PUMP
TUBE-TO-TUBE JOINTS	BRAZED		BRAZED	BRAZED
TUBE-TO-HEADER JOINTS	WELDED		WELDED	WELDED
PERFORMANCE CHARACTERISTICS				
PEAK FLUX, (MW/M^2)	0.64	1.55	1.2	1.13
INLET TEMP., ^oC (^oF)	323 (613)	323 (613)	323 (613)	293 (560)
OUTLET TEMP., ^oC (^oF)	593 (1100)	593 (1100)	593 (1100)	593 (1100)
SODIUM VELOCITY (MAX) M/SEC (FT/SEC)	.70 (2.3)	.70 (2.3)	3.1 (10.2)	1.9 (6.4)
MAX. WALL TEMPERATURE RISE ^oC (^oF)	52 (90.5)	105 (189)	86 (155)	78 (141)

MECHANICAL DESIGN REQUIREMENTS

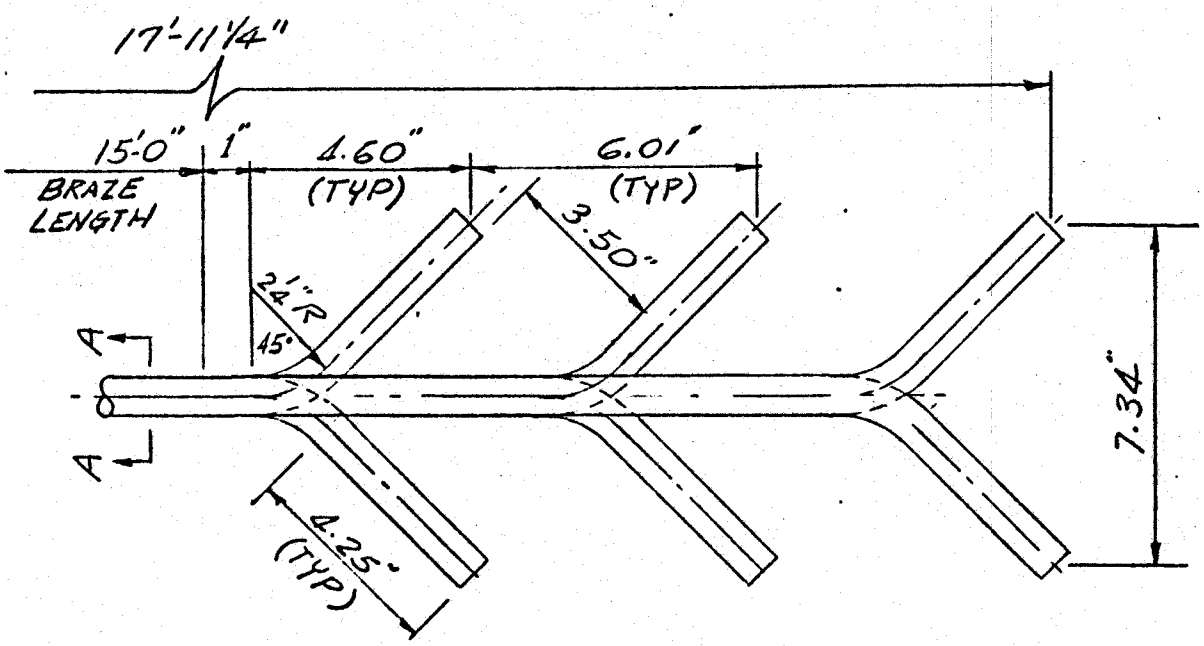
- PANEL TO BE TOP SUPPORTED AND GUIDED TO GROW DOWNWARD
- PANEL MUST OPERATE WITH A 126°F TUBE-TO-TUBE TEMPERATURE DIFFERENTIAL
- 1100°F ISOTHERMAL OPERATION IMPOSES LARGEST THERMAL GROWTHS
- TUBES AND HEADERS EXPAND APPROXIMATELY 2-1/2" AND 1/2" RESPECTIVELY
- SURFACES NOT EXPOSED TO MAIN FLUX MUST BE INSULATED
- BACK SIDE OF BRAZE SECTION MUST BE ACCESSIBLE TO A DEPTH OF 28"
- HEAT TRACING MUST BE PROVIDED ON PANEL AND HEADERS



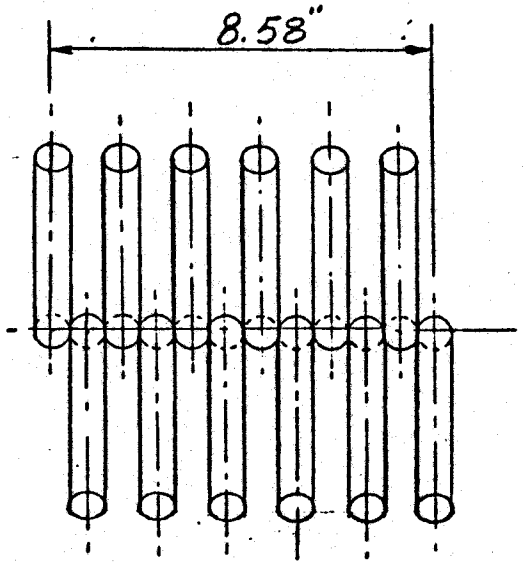
PLAN



SECTION AA



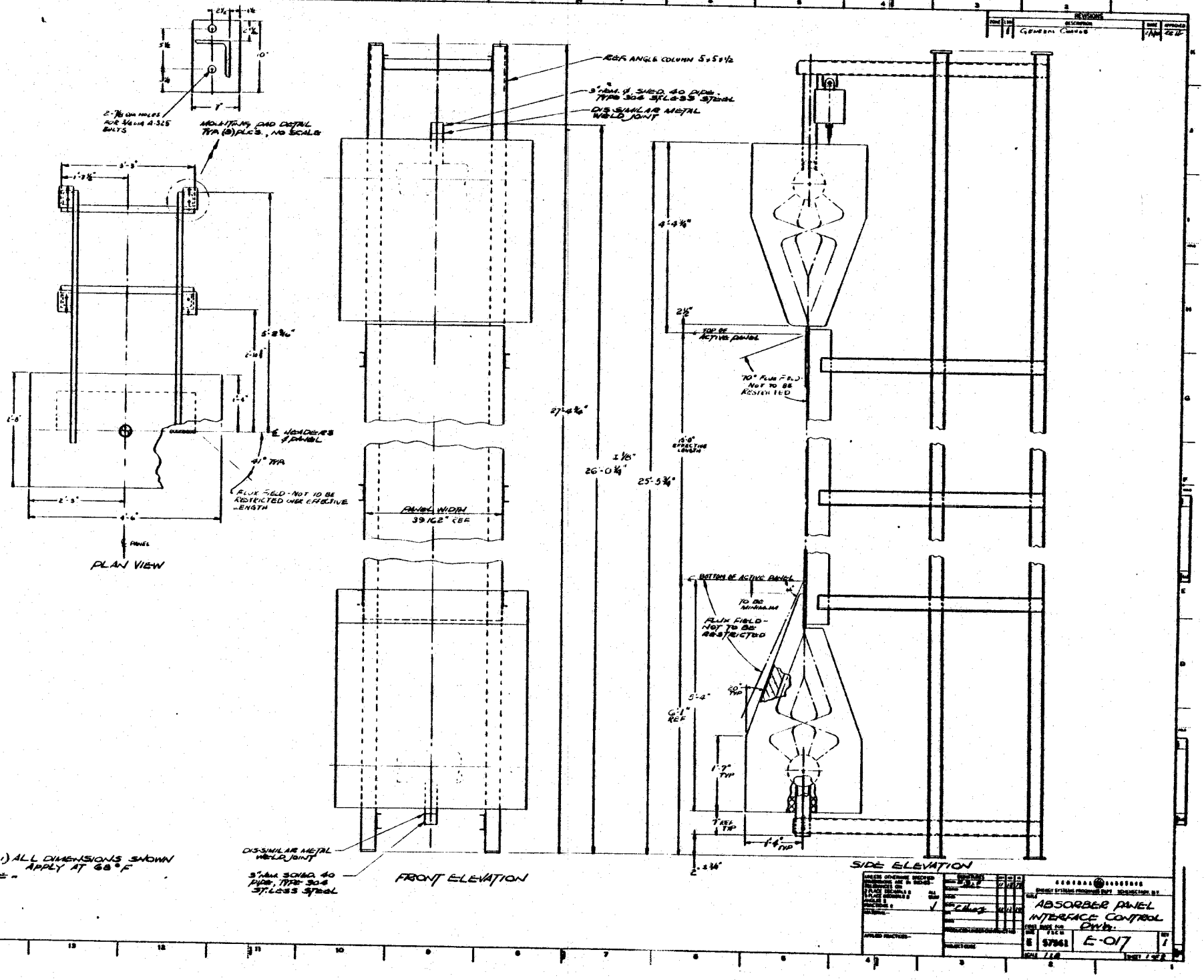
ELEVATION

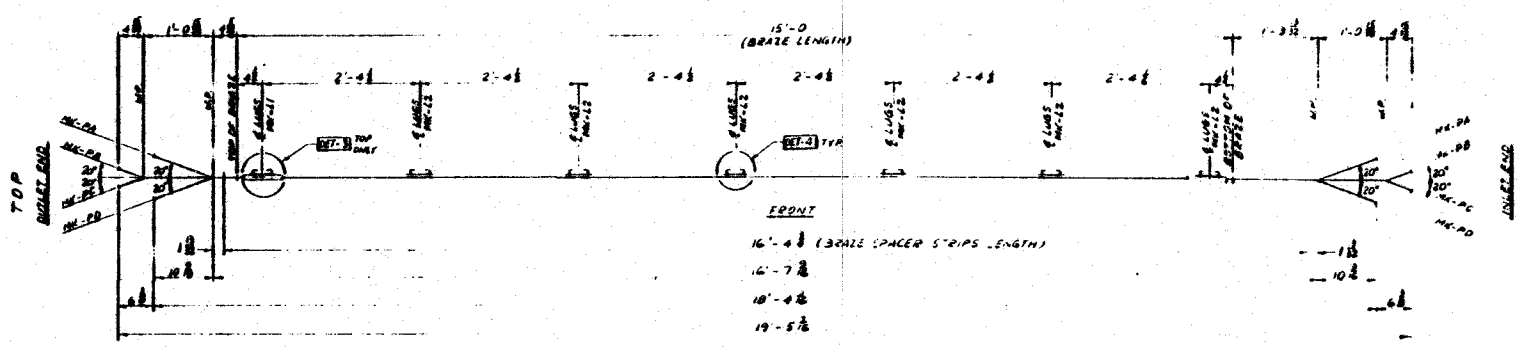


END

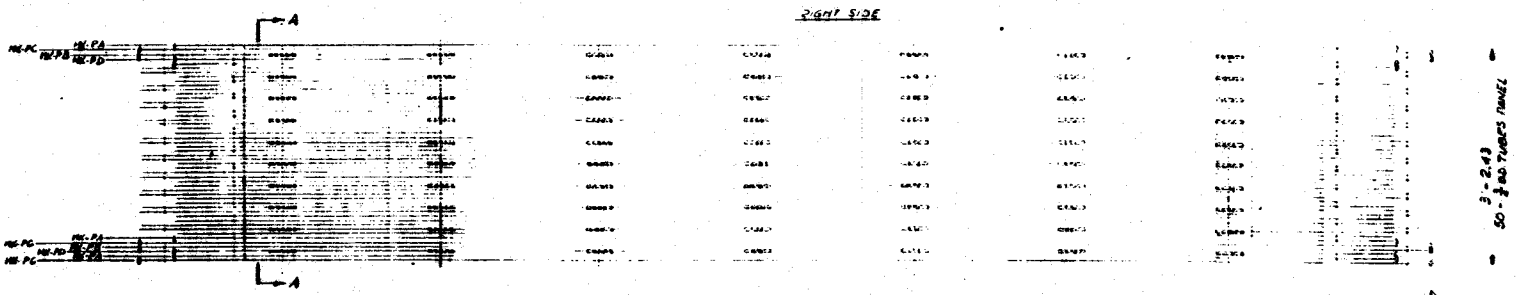
TYPICAL 12 TUBE INCOLOY 800 TUBE PANEL

9-41-3119
AR 8/23/71

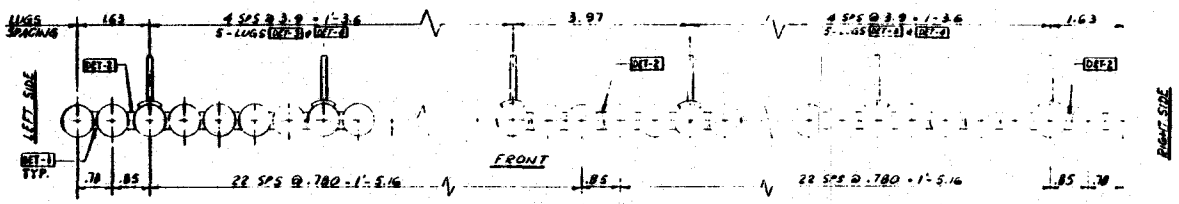

2-7/16 DIA HOLES FOR 3/4 DIA A-325 BOLTS
MOUNTING PAD DETAIL TYP (8) PLCS., NO SCALE
PLAN VIEW
REAR ANGLE COLUMN 5 x 5 x 1/2
3" NOM. Ø SCHED. 40 PIPE, TYPE 304 STAINLESS STEEL
DISSIMILAR METAL WELD JOINT
PANEL WIDTH 39.162" REF
DISSIMILAR METAL WELD JOINT
3" NOM. SCHED. 40 PIPE, TYPE 304 ST. LESS STEEL
FRONT ELEVATION
FLUX FIELD - NOT TO BE RESTRICTED
BOTTOM OF ACTIVE PANEL
TO BE MINIMUM
FLUX FIELD - NOT TO BE RESTRICTED
SIDE ELEVATION
NOTE -
1) ALL DIMENSIONS SHOWN APPLY AT 68°F
GENERAL DYNAMICS
ABSORBER PANEL INTERFACE CONTROL DWG.
E-017



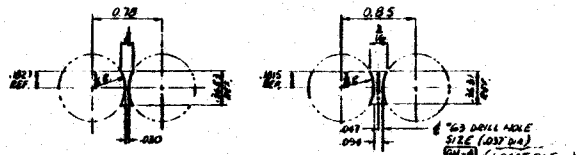
SIDE ELEVATION



FRONT ELEVATION

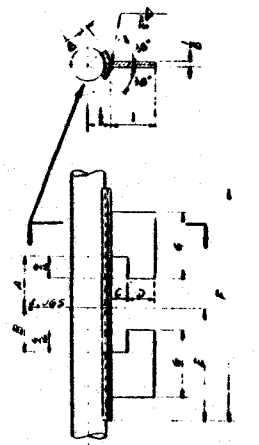


SECTION "A-A"
(SCALE FULL SIZE)



DETAIL - 1 (MK-BS1)
46 - REQ'D
BRAZE SPACER STRIP
FOR NORMAL TUBE SPACING
(SCALE DOUBLE SIZE)

DETAIL - 2 (MK-BS2)
3 - REQ'D
BRAZE SPACER STRIP
FOR INSTRUMENTATION
(SCALE DOUBLE SIZE)



DETAIL - 3 & 4 (FULL SIZE)
(AS SHOWN AND NOTED)

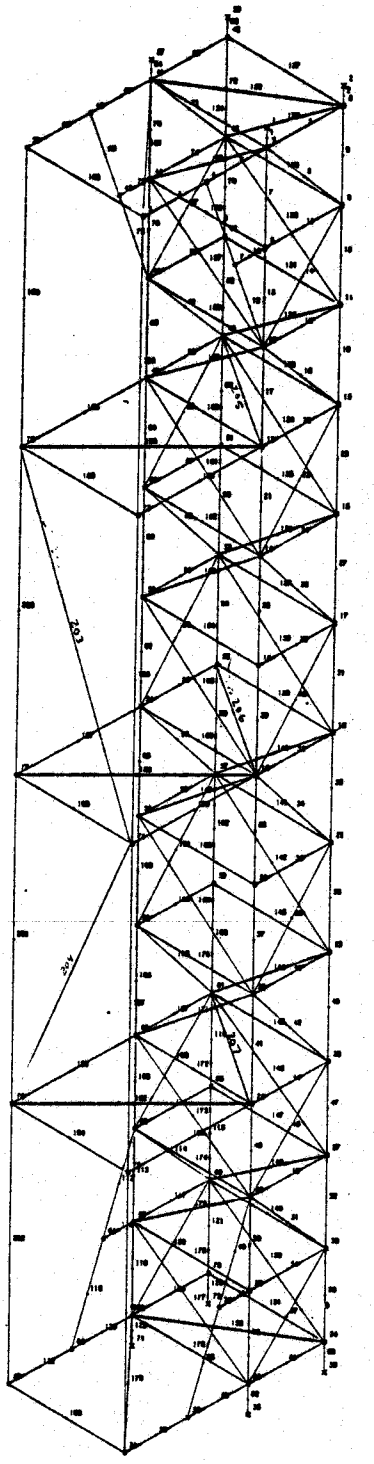
TABULATION OF LUG DATAS

MK-	NO REQ'D	DETAIL	A	B	C	D	E	F	G
L1	10	3	2	2 1/2	1/2	1	5 1/2	10	3
L2	60	4	1 1/4	1	1/2	1/2	2 1/2	5	1 1/2

NOTES

1. DO NOT SCALE THIS DRAWING USE FIGURE DIMENSIONS ONLY
2. ABBREVIATIONS USED ON THIS DRAWING ARE IN ACCORDANCE WITH AMERICAN STANDARD ABBREVIATIONS FOR USE ON DRAWINGS
3. ALL MATERIALS TO BE 1100-0 ALCLAD UNLESS OTHERWISE NOTED.
4. BRAZER MUST KEEP HOLES OPEN BY PLUGGING OR OTHER MEANS.

SOLAR ABSORBER TEST PANEL
PANEL DETAILS
PRELIMINARY 2/5/80
67-3581-5-30



SØLAR CØLLECT SPRT TØWER, #3581PITUCH

SHIELDS FOR FLUX SPILLAGE

SPILLAGE FLUXES RECEIVED FROM GE 9/13/79

MAXIMUM SPILLAGE FLUX IS 42 W/CM^2 (133140 $BTU/H \cdot FT^2$)

SHIELDS ASSUMED TO BE PAINTED WHITE TO YIELD ABSORPTIVITY OF 0.3

FREE CONVECTION INADEQUATE FOR COOLING HEADER BOX SHIELDS

DEAN PANEL WITH AIR BLOWN THROUGH AT 220 FPS PROVIDES ADEQUATE COOLING

AIR INSIDE HEAT TRANSFER COEFFICIENT IS 45 $BTU/H \cdot FT^2$ AND $\Delta P = 8$ PSI

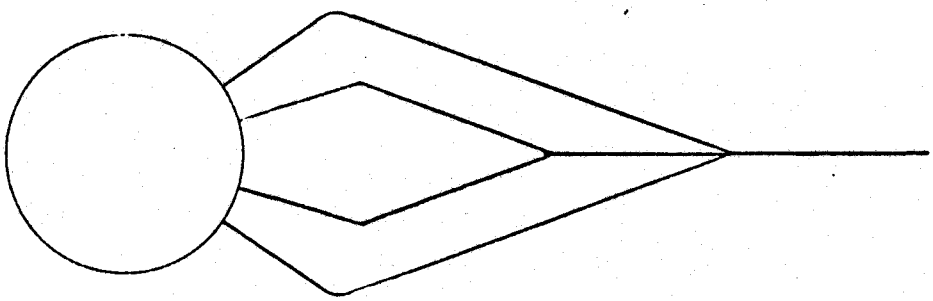
75 HP BLOWER REQUIRED FOR 2 PANELS AT COST OF $15,300

EACH DEAN PANEL WILL COST $1,200 IN C.S. AND $7,000 IN S.S.

GE ASSUMES RESPONSIBILITY FOR ALL FLUX SPILLAGE SHIELDS

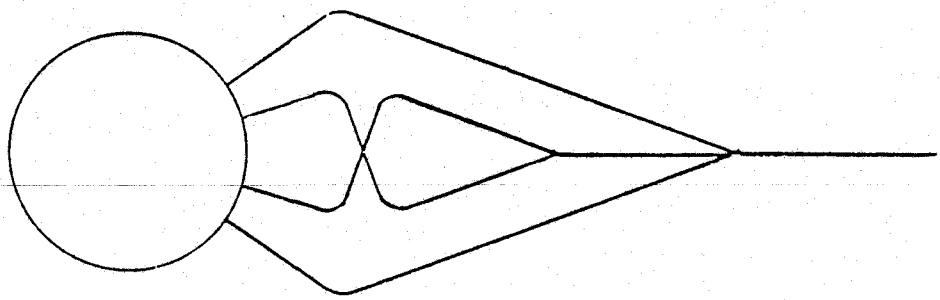
METHOD OF ACCOMODATING TUBE TO TUBE $\triangle T$

PROVIDE FLEXIBILITY LOOP AT HEADER WHILE MINIMIZING SHADOW



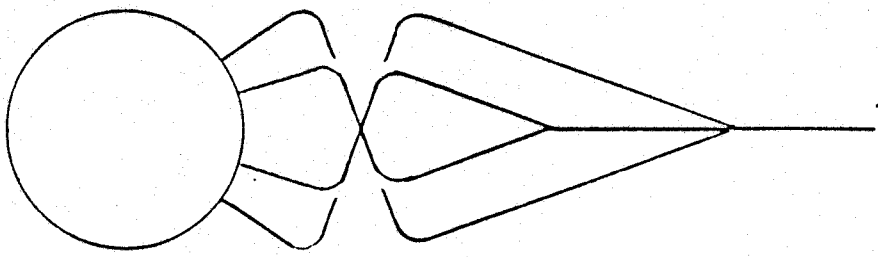
STRESS TOO HIGH IN INNER LOOP

SIMPLE LOOP



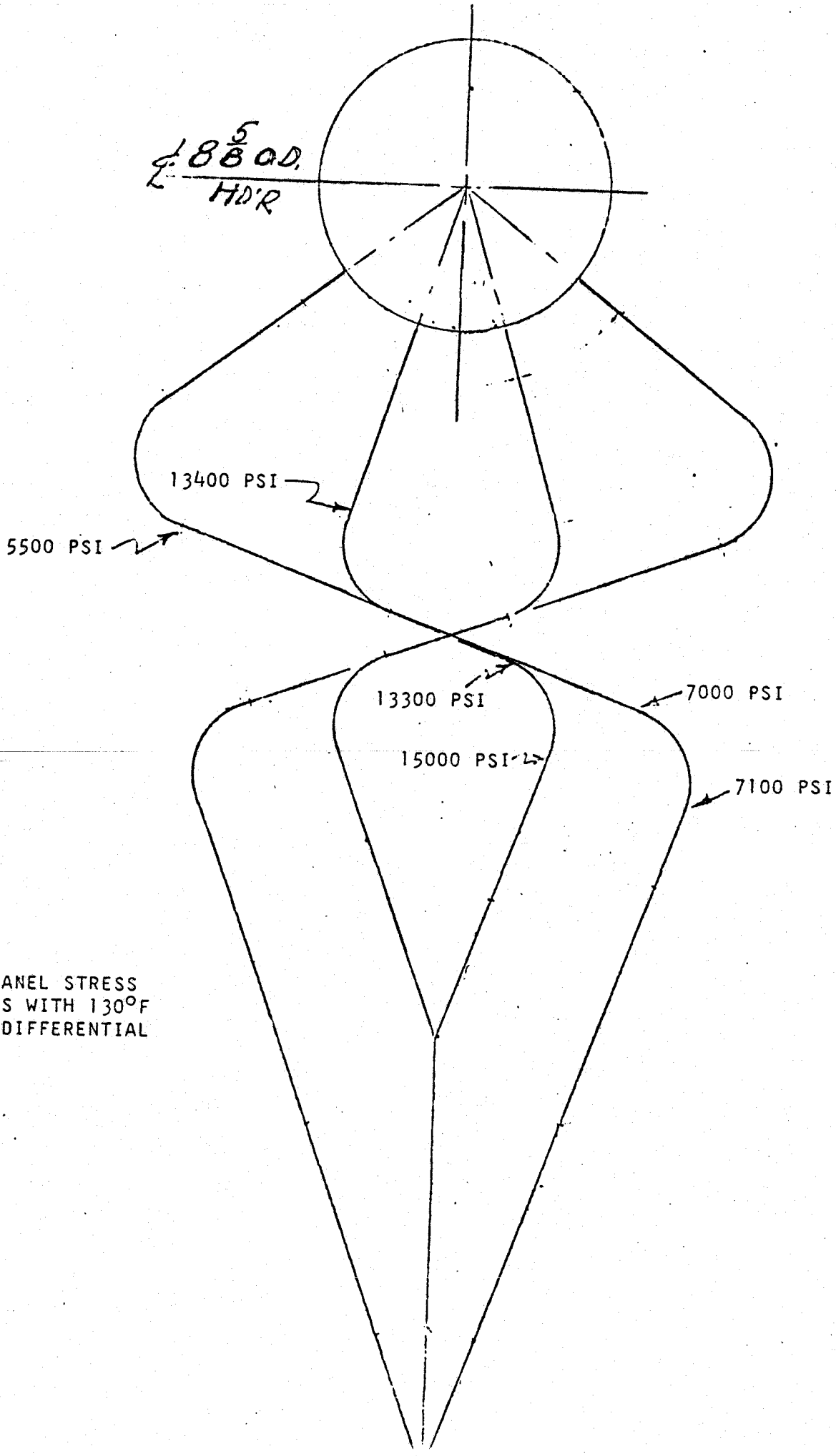
STRESS TOO HIGH IN OUTER LOOP

INNER LOOPS CROSS



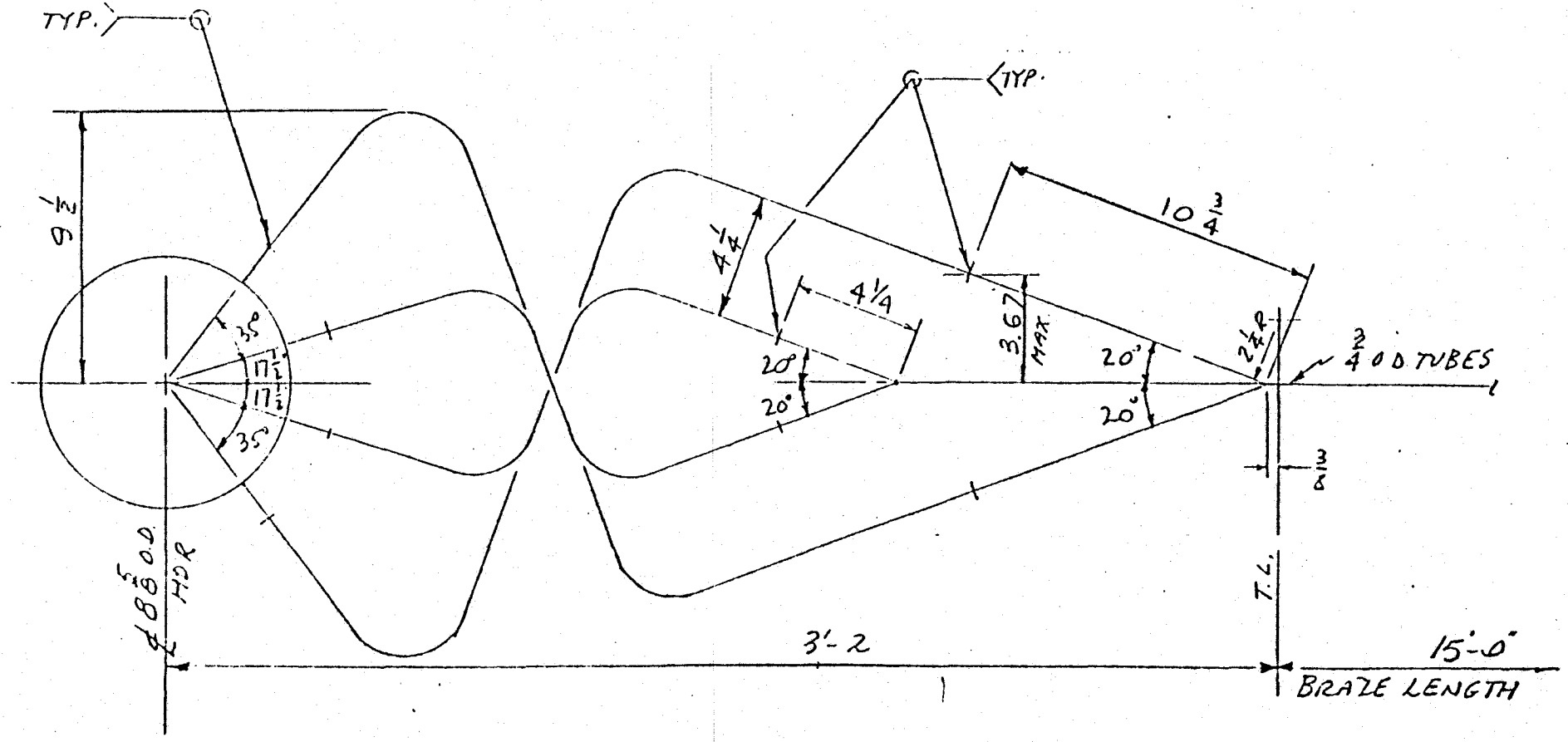
STRESSES ACCEPTABLE

BOTH LOOPS CROSS

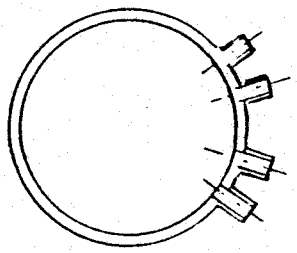
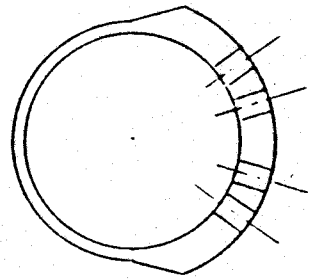
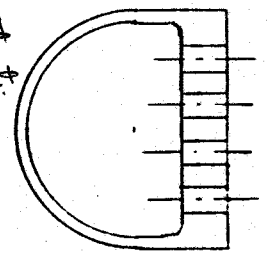
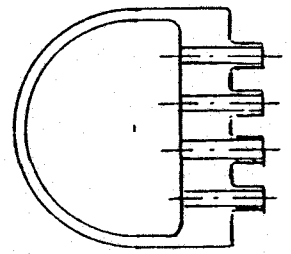


SOLAR TEST PANEL STRESS
IN TUBE STUBS WITH 130°F
TEMPERATURE DIFFERENTIAL

JUMPER TUBE ARRANGEMENT

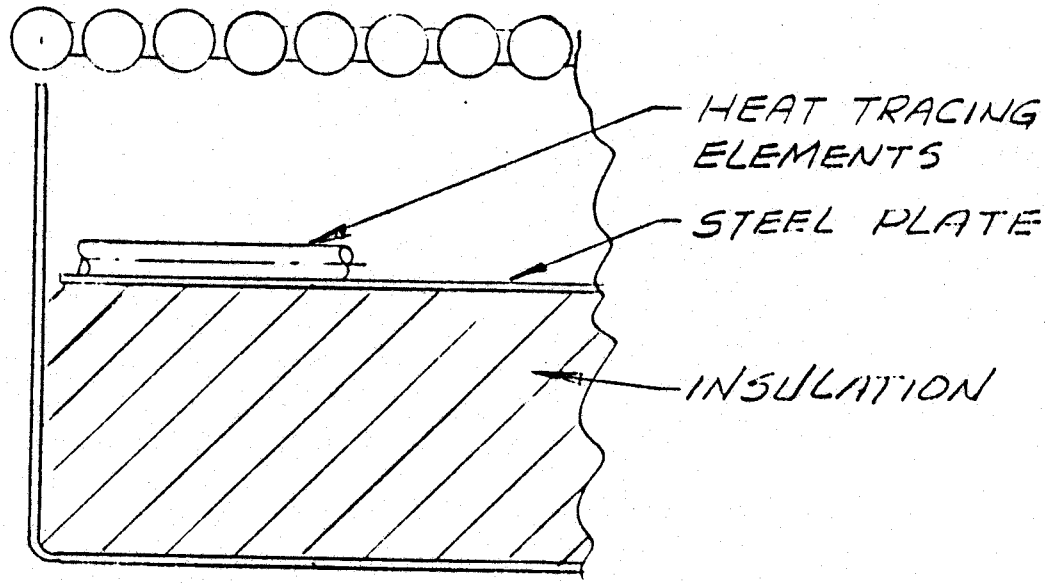


POSSIBLE HEADER/TUBESHEET ARRANGEMENTS

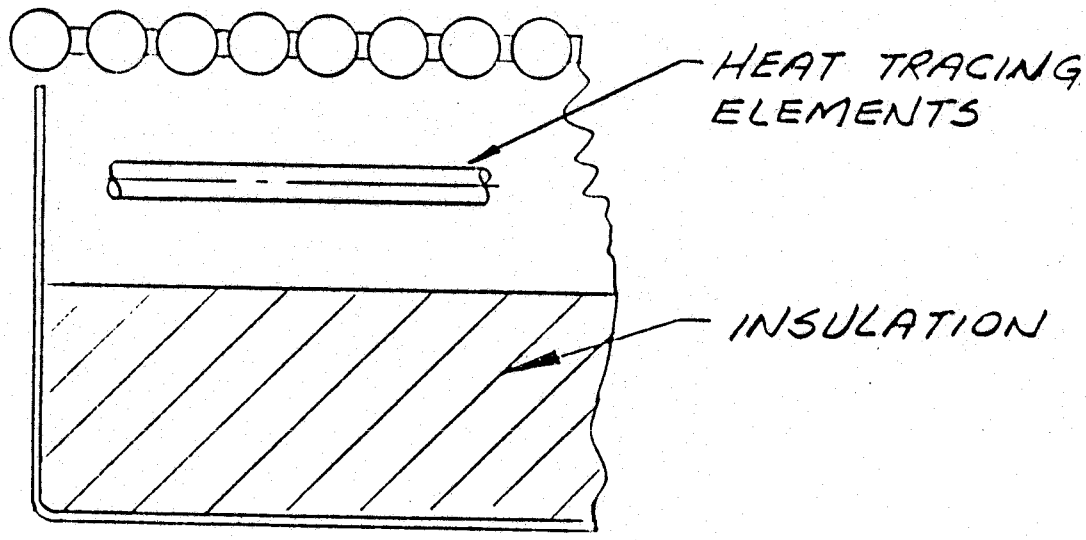
	ARRANGEMENT	METHOD OF TUBE ATTACHMENT	COMMENTS
	PIPE WITH STUBS * *(SELECTED)	TUBES ORBITAL WELDED TO STUBS	TUBE WELD CANBE RT'ED, BUT STUB CANNOT
	COMBINATION THICK AND THIN WALL HEADER	TUBES FILLET WELDED AND ROLLED INTO 1" THICK SECTION	TUBE WELD CANNOT BE RT'ED, BUT FITUP SIMPLIFIED (.070 MIN WALL REQ'D)
	FLAT TUBESHEET	TUBES FILLET WELDED & ROLLED INTO 1" THK TUBESHEET	TUBE WELD CANNOT BE RT'ED, BUT FITUP SIMPLIFIED (.070 MW FOR HORIZ WELDS .050 MW FOR VERT WELDS)
	FLAT TUBESHEET WITH SPIGOTS	TUBES ORBITAL OR IB WELDED TO SPIGOTS	TUBE WELD CANBE RT'ED.

× want full-penetration weld *
as N.G.

METHODS OF PANEL HEAT TRACING STUDIED



HEAT TRACING ELEMENTS ATTACHED TO STEEL PLATE BEHIND PANEL (SELECTED)



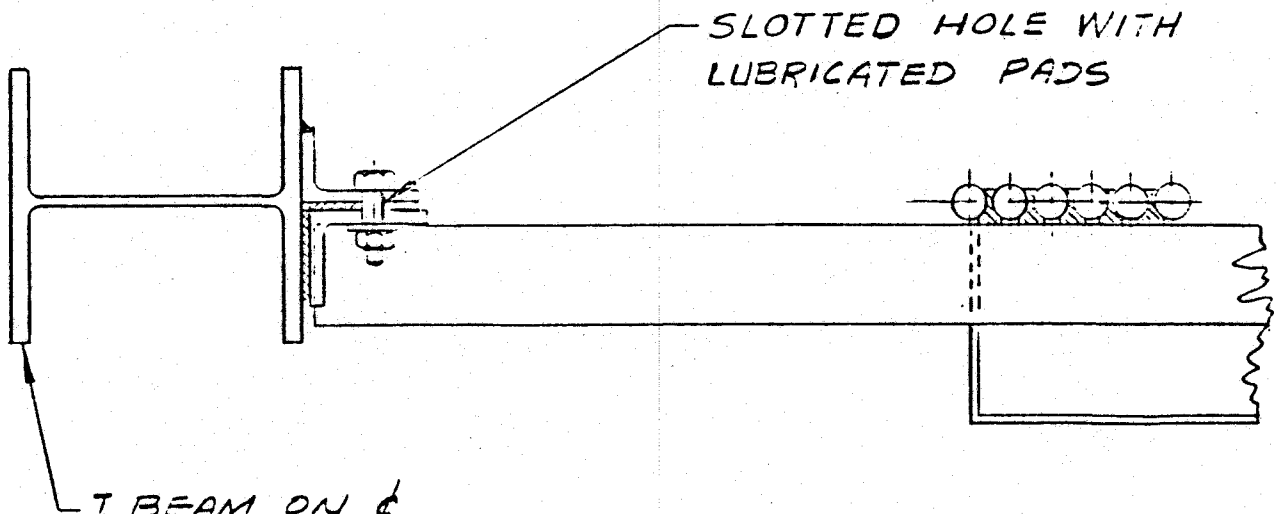
HEAT TRACING ELEMENTS SUSPENDED IN AIR GAP BEHIND PANEL

METHODS OF ACCOMMODATING THERMAL EXPANSION CONSIDERED

SLIP JOINTS

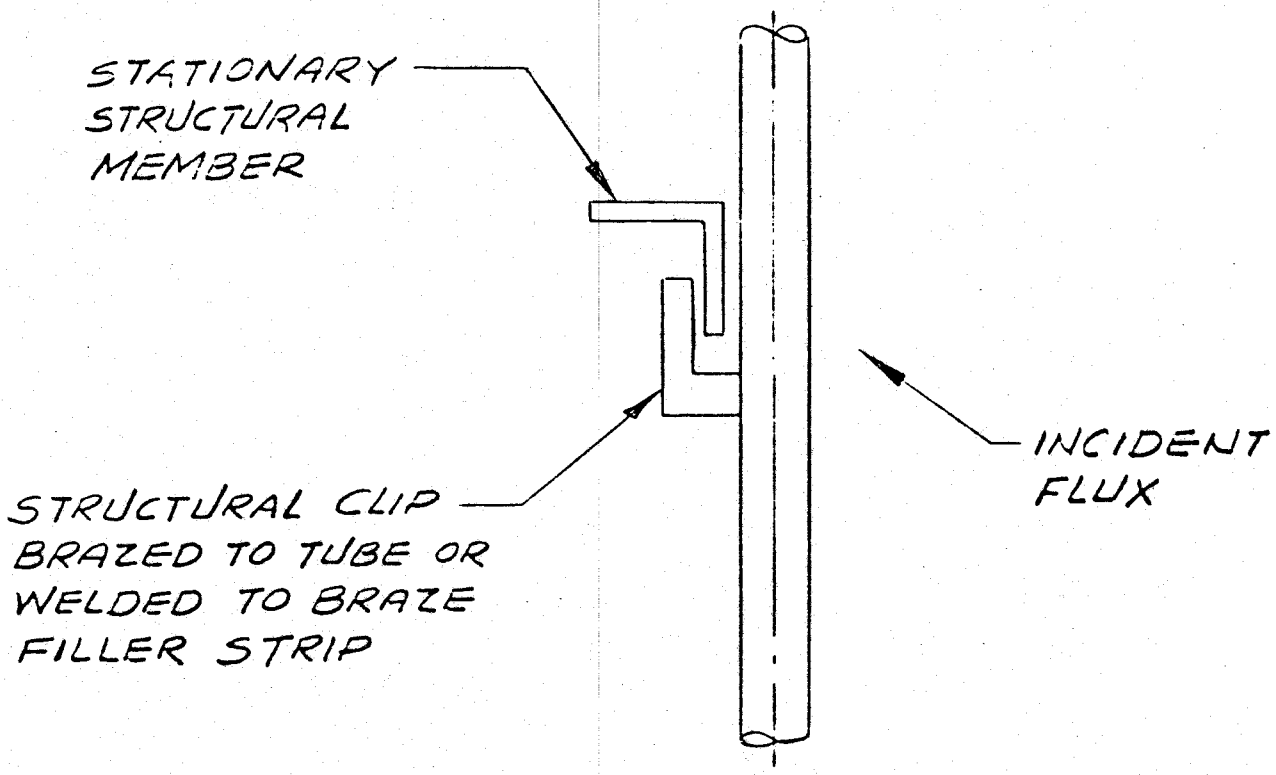
BALL AND ROLLER SLIDES

LINKAGES

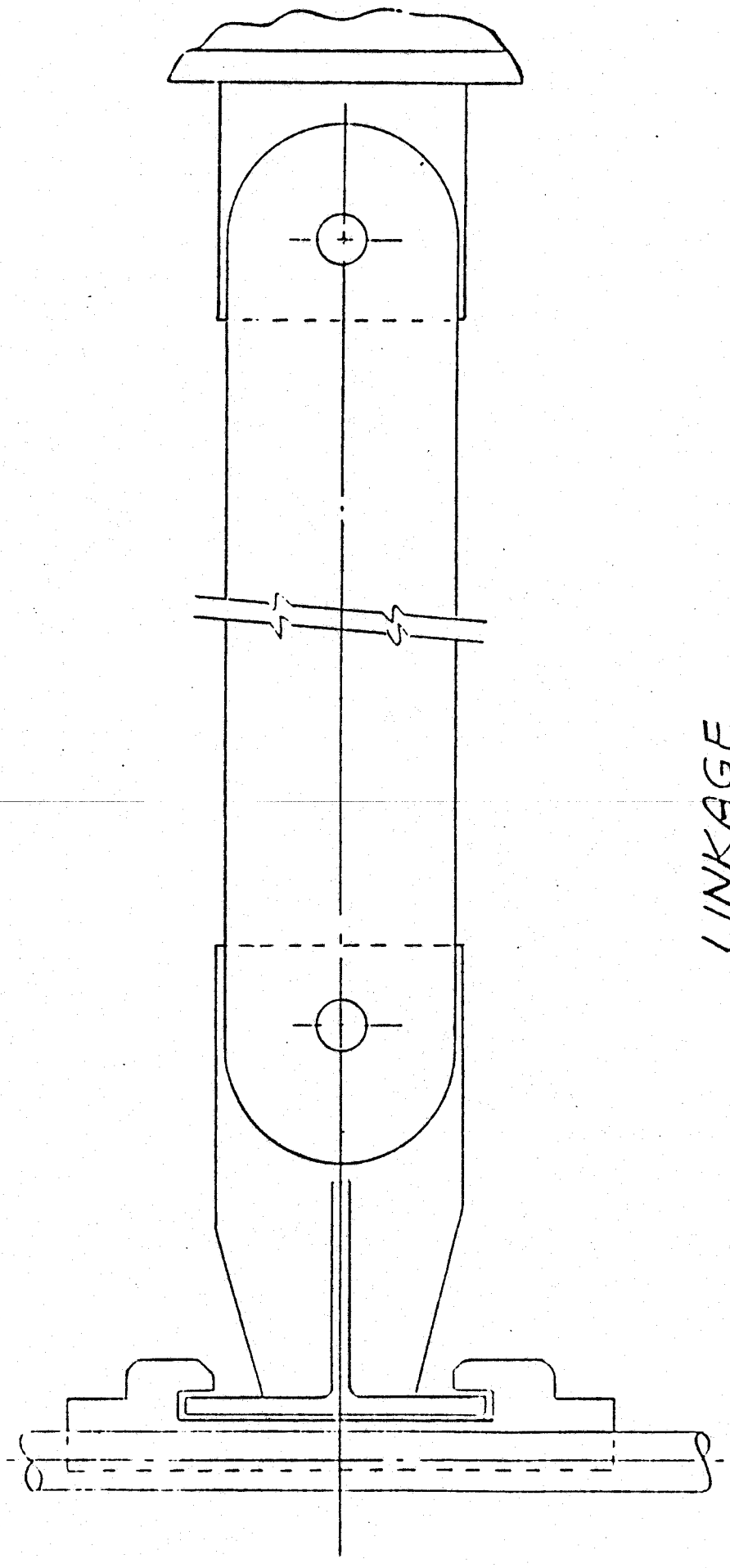


PLAN VIEW

SLIP JOINT OPERATING AT AMBIENT CONDITIONS

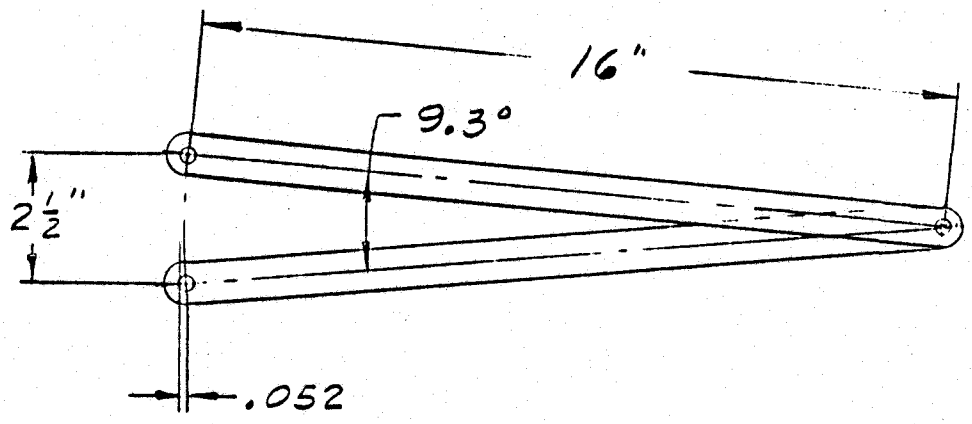


SLIP JOINT OPERATING AT
PANEL TEMPERATURE

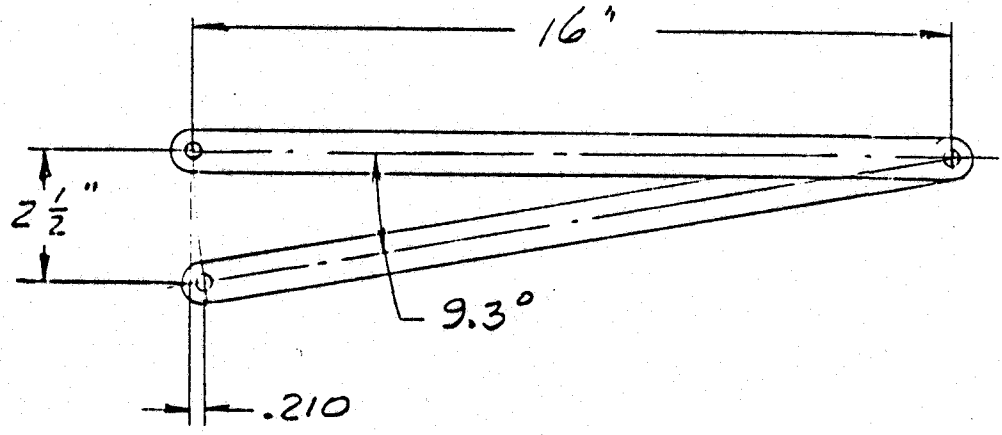


LINKAGE

LATERAL MOVEMENT OF PROPOSED LINKAGE

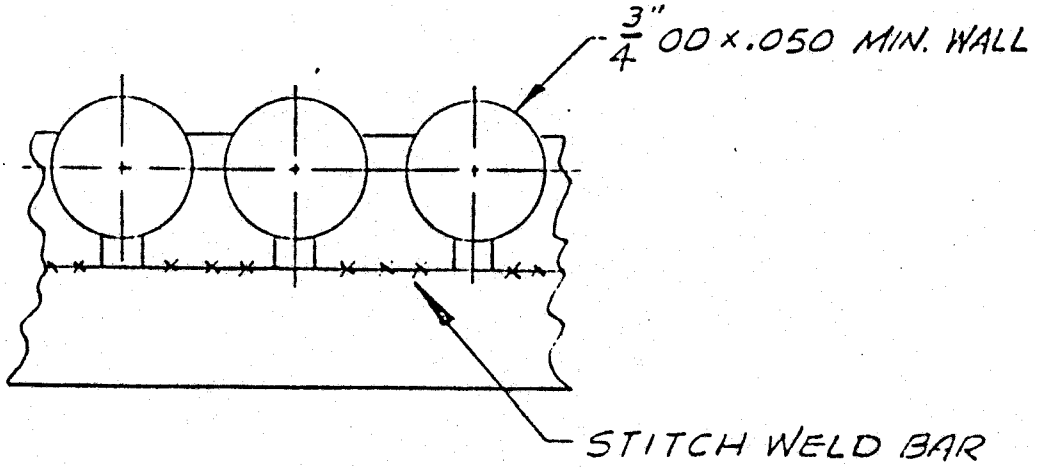


NOMINAL

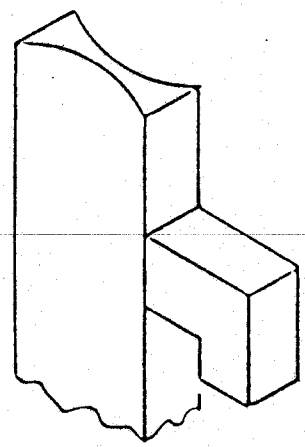


WORST CASE

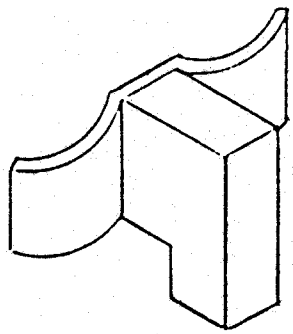
METHODS OF ATTACHING WINDBRACES TO PANEL



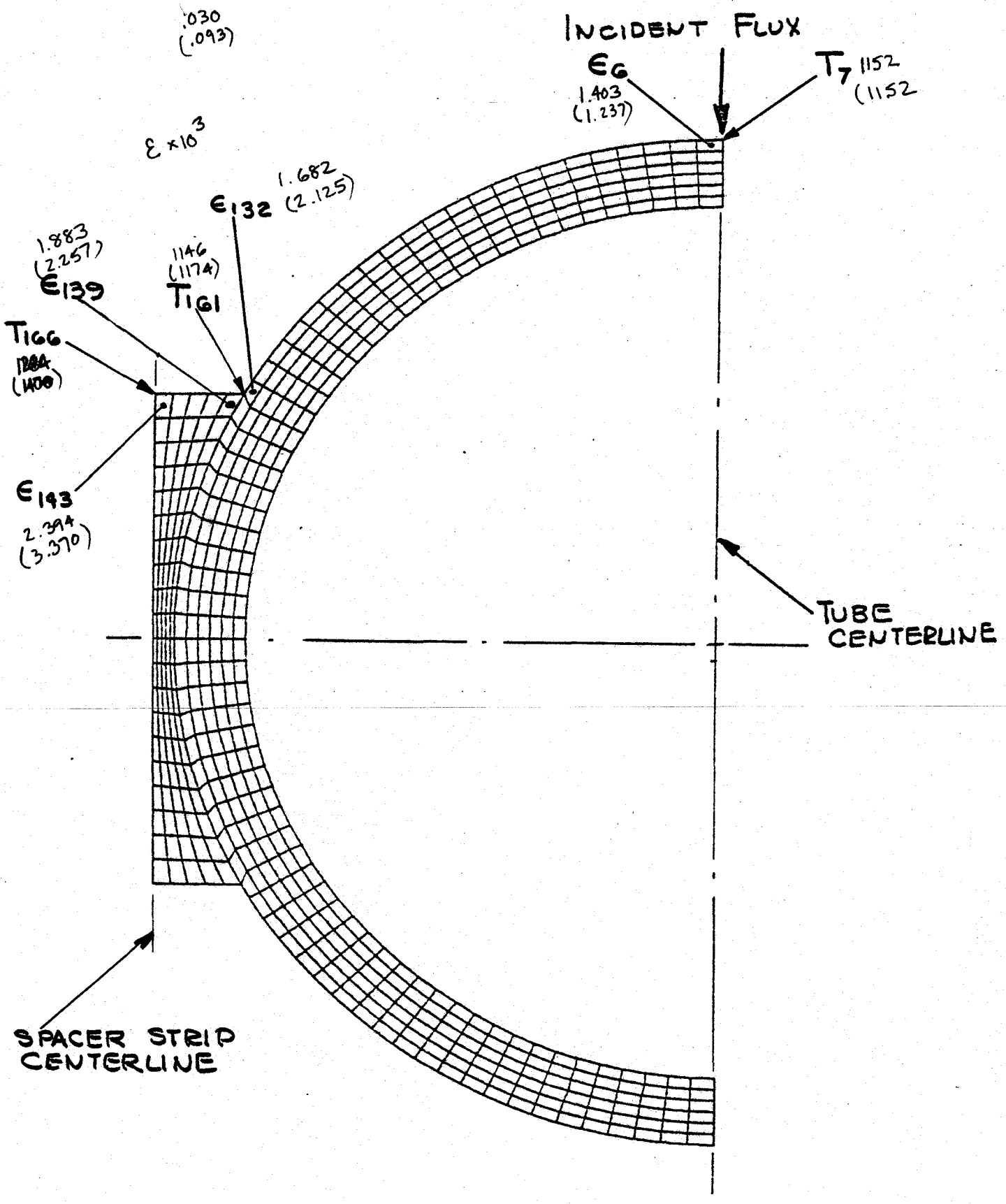
AXISYMMETRIC BRAZE STRIPS WELDED TO BASE



STRUCTURAL CLIP WELDED TO BRAZE STRIP

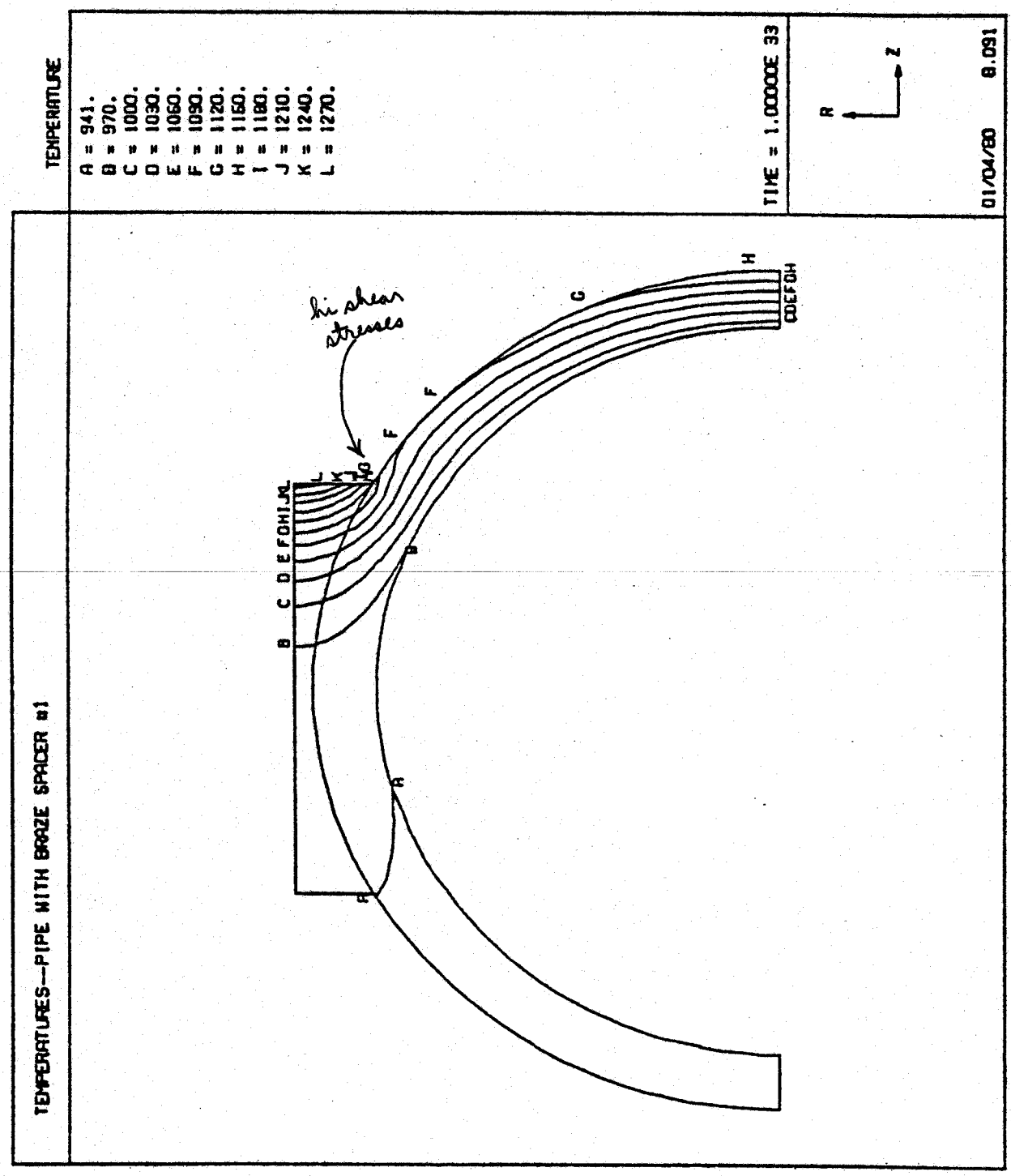


STRUCTURAL CLIP BRAZED TO TUBES

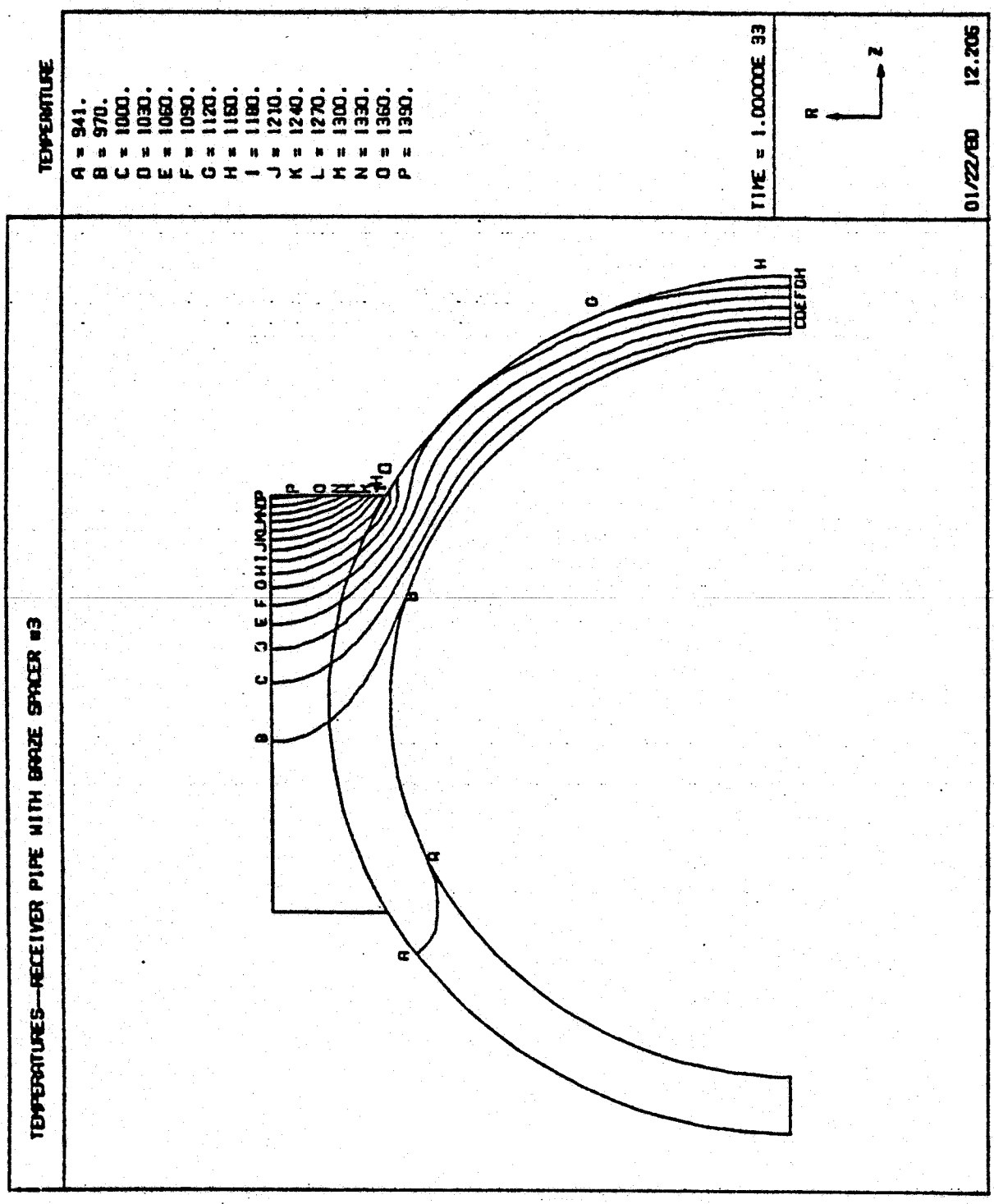


PANEL MODEL WITH NARROW SPACER STRIP

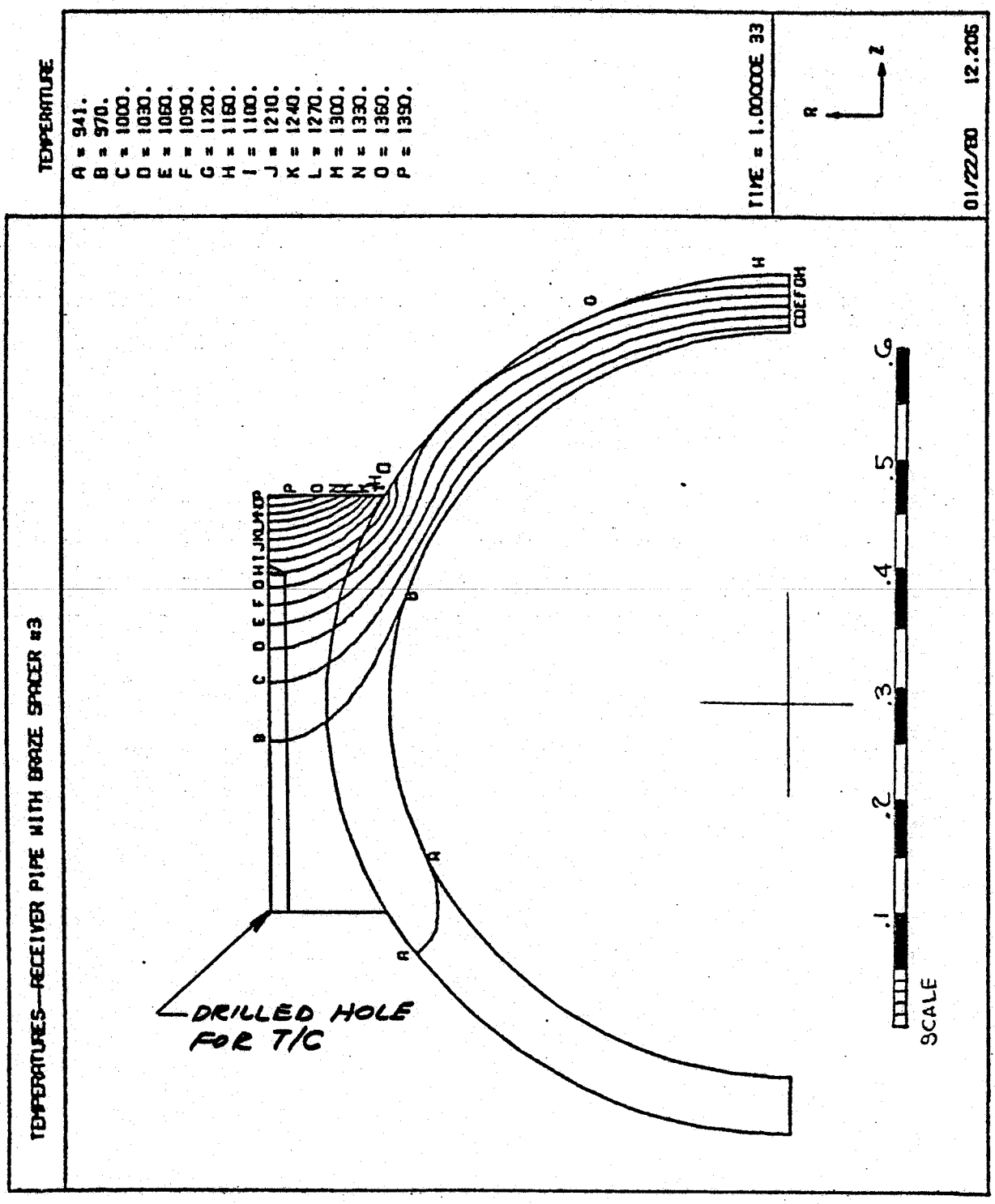
1.2 MW/m²



ISOTHERMS FOR .03 IN SPACER (GE)

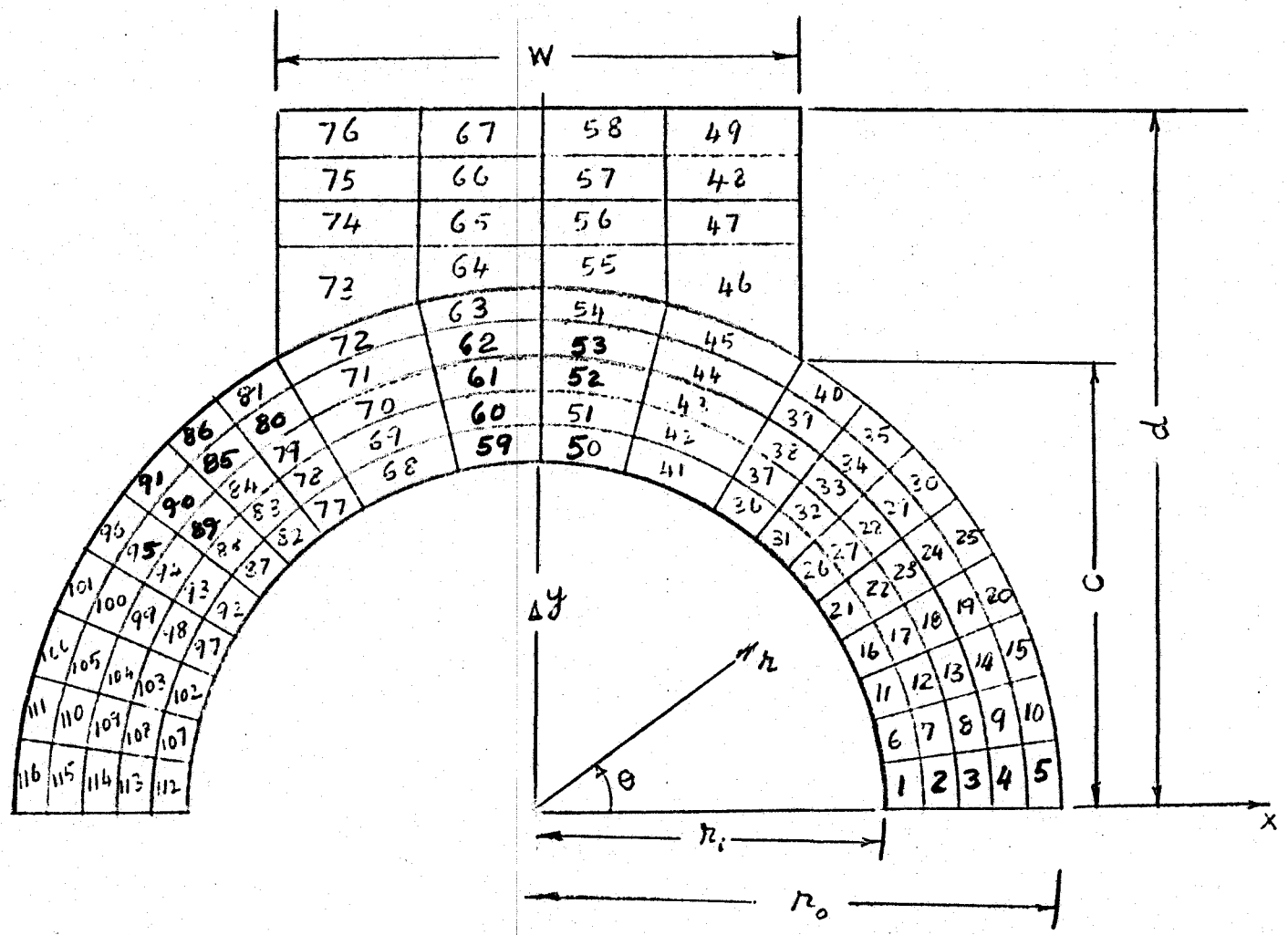


ISOTHERMS FOR .093 IN. SPACER (GE)
(thermocouple strip)



THERMOCOUPLE LOCATIONS

FOSTER WHEELER FINITE ELEMENT MODEL

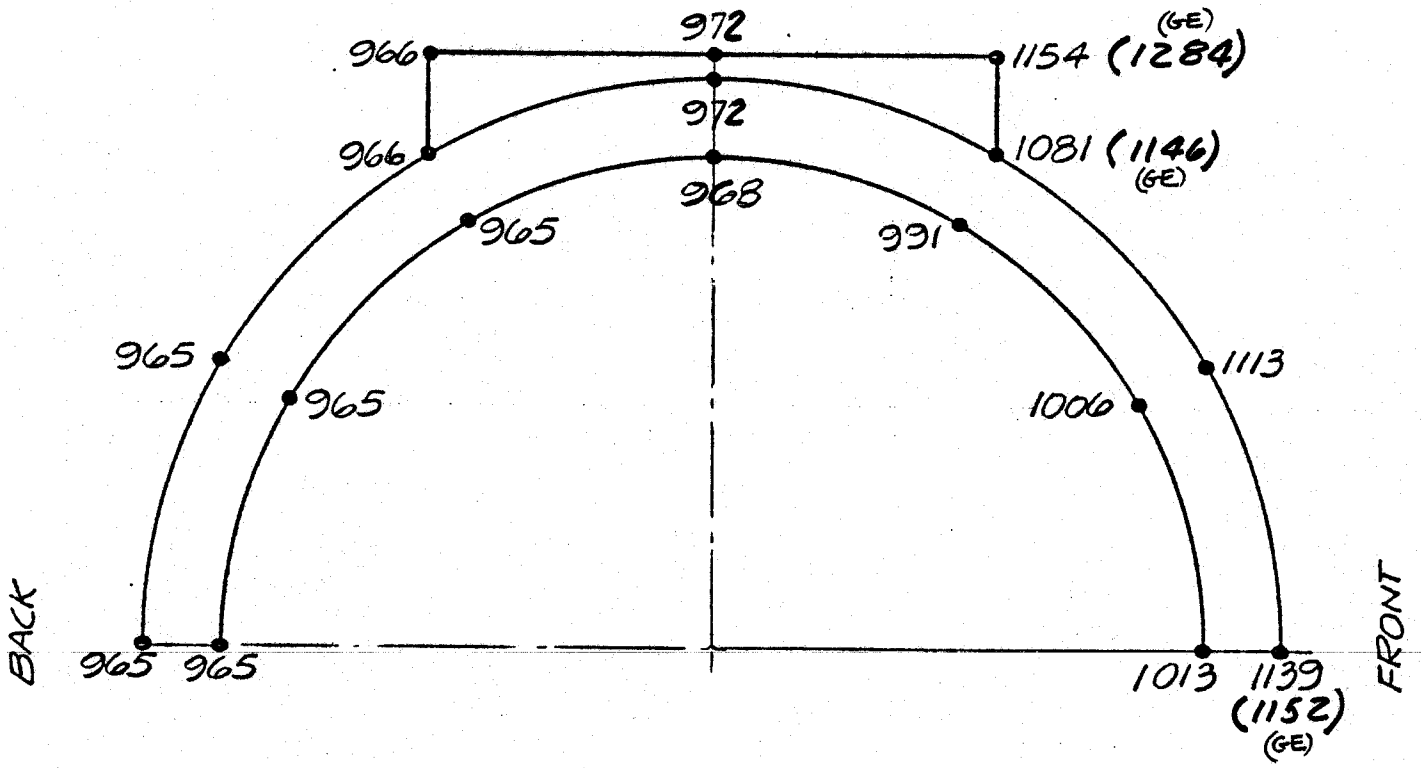


NOTE: (1) ELEMENT NUMBERS ARE SHOWN
(2) NOT TO SCALE

SUMMARY OF GE PANEL ANALYSIS

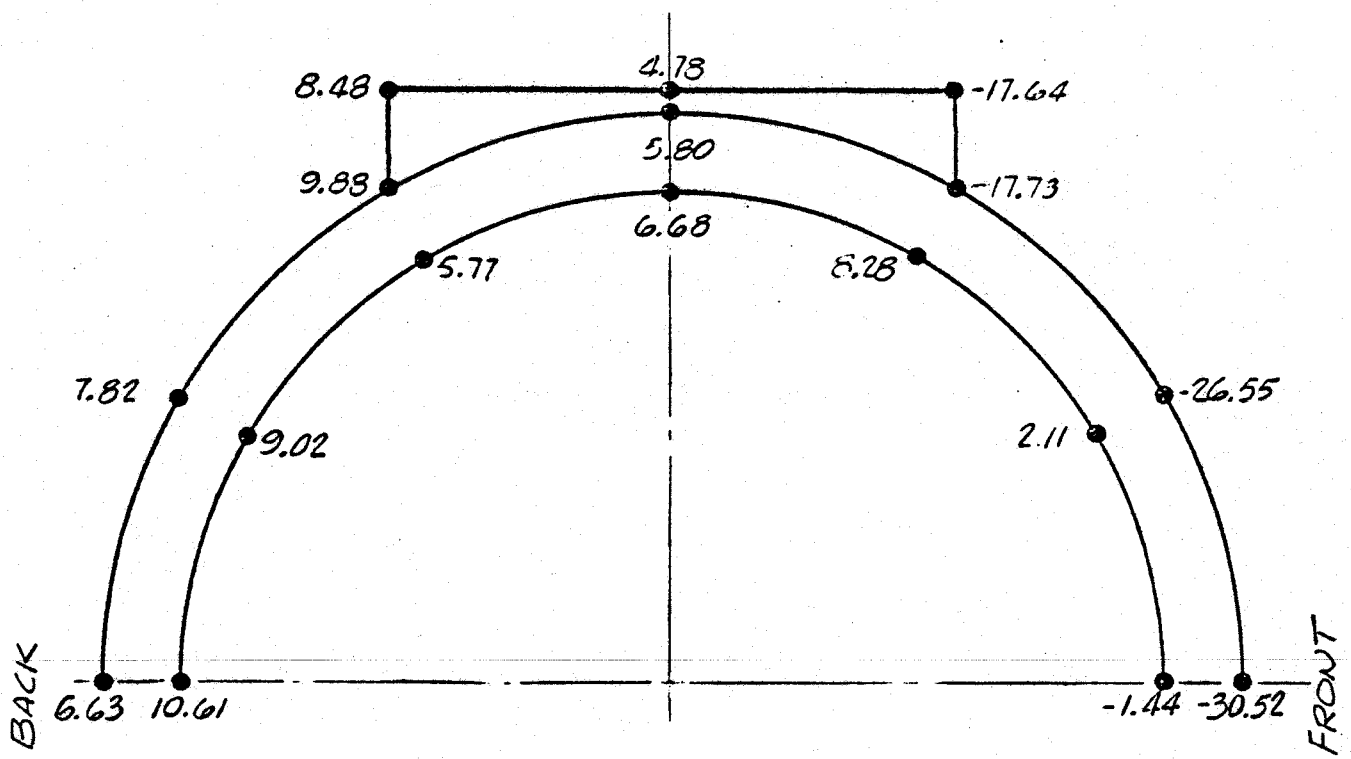
ABSORBED FLUX = 1.1 MW/M^2

	0.030 SPACER	0.093 SPACER
T_7, °F	1152	1152
T_{161}, °F	1146	1174
T_{166}, °F	1284	1400
$\Delta\varepsilon 6$, IN/IN	1.403×10^{-3}	1.237×10^{-3}
$\Delta\varepsilon 132$, IN/IN	1.682×10^{-3}	2.125×10^{-3}
$\Delta\varepsilon 139$, IN/IN	1.883×10^{-3}	2.257×10^{-3}
$\Delta\varepsilon 143$, IN/IN	2.394×10^{-3}	3.370×10^{-3}
ALLOWABLE CYCLES:		
FOR 620 MIN. HOLD	350	< 140
80 MIN. HOLD	700	< 250
0 MIN. HOLD	9000	< 1600



OPERATING CONDITIONS:
STEADY STATE FULL LOAD SODIUM FLOW
1.0 MW/m² ABSORBED FLUX

COMMERCIAL PANEL FRONT TO BACK
TEMPERATURE DISTRIBUTION (°F)
6 METERS BELOW TOP OF PANEL



OPERATING CONDITIONS:
STEADY STATE FULL LOAD SODIUM FLOW
1.0 MW/m^2 ABSORBED FLUX

COMMERCIAL PANEL FRONT TO BACK
AXIAL STRESS DISTRIBUTION (KSI)
6 METERS BELOW TOP OF PANEL

AGENDA

WEDNESDAY, FEBRUARY 13, 1980

0800	INTRODUCTION	J. ELSNER
0830	TEST RECEIVER DESIGN REQUIREMENTS	A. CURINGA
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1600	ADJOURN	

PROPOSED MANUFACTURING PLAN

- RECEIPT AND INSPECTION OF MATERIALS
- HEADER FABRICATION
  - END CLOSURE FABRICATION
  - SHELL FABRICATION, ASSEMBLY AND NDE
- STRUCTURAL PARTS FABRICATION
  - STRUCTURAL SUPPORT
  - WIND BRACES AND ATTACHMENTS
  - INSULATION ENCLOSURES
- PANEL FABRICATION
  - FIELD AND RECEIVING INPSECTION
    - TUBES - REDRAWING, NICKEL PLATING, BENDING & BRAZING
    - PANEL PREPARATION AND JUMPER TUBE FABRICATION
- TUBE BUNDLE ASSEMBLY AND TESTING
  - CHECK AND MAINTAIN CLEANLINESS
  - ASSEMBLY - WELDING AND NDE OF JUMPER TUBES
  - * HYDROTEST THE ASSEMBLY AND DRYING
  - * HELIUM LEAK TEST
- FINAL ASSEMBLY, PACKAGE AND SHIP
  - ASSEMBLY HEAT TRACING WIRING
  - ASSEMBLE INSULATION

* CUSTOMER NOTIFICATION POINTS

PROPOSED MANUFACTURING PLAN

(CONTINUED)

- FINAL ASSEMBLY, PACKAGE AND SHIP (CONT'D)
  - ASSEMBLE SUPPORT STRUCTURE
  - PAINT WITH PYROMARK 2500 BLACK
  - PRESSURIZE THE PANEL WITH NITROGEN
  - FINALIZE DATA PACKAGE
  - PREPARE TO SHIP
  - LOAD AND SHIP

SUMMARY OF PROPOSED SHOP TESTS (FW)

- TUBING - from Hunt. Alloys, redrawn by ....
  - EDDY CURRENT TEST
  - ULTRASONIC TEST FOR THICKNESS
  - PRESSURE TEST
- HEADER FABRICATION
  - PENETRATION TEST THE BACK GOUGE AND FINAL ACCESSIBLE SURFACES OF ALL HEADER FITTING AND STUB TO HEADER WELDS AND ALL CRITICAL ATTACHMENT WELDS
  - R.T. ALL BUTT WELDS
    - A) END CLOSURES TO HEADERS
    - B) STAINLESS TO INCOLOY TRANSITION WELD

stub tube orbital welded to header

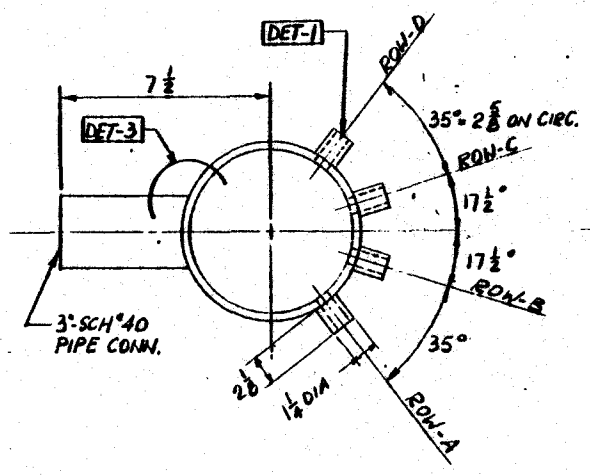
- TUBE BUNDLE ASSEMBLY AND TESTING
  - TUBE TO TUBE WELDS
    - A) R.T.
    - B) PENETRANT EXAMINATION
  - TUBE TO STUB WELDS
    - A) R.T.
    - B) PENETRANT EXAMINATION
- IN PROCESS AIR TEST OF TUBE WELDS - (FWEC INFORMATION)
- HYDROTEST OF THE PANEL ASSEMBLY
- HELIUM LEAK TEST

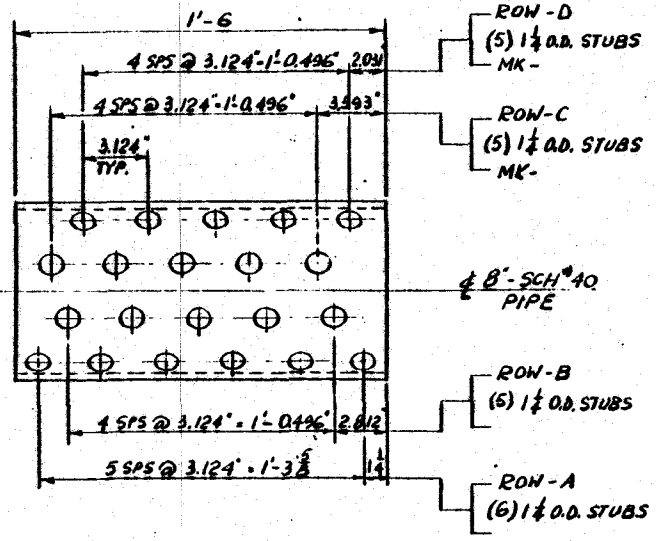
Plating of tubes costs ≈ $33,000

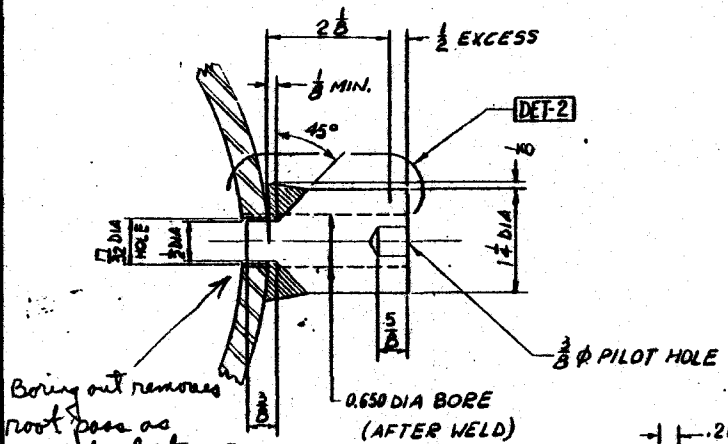
LIST OF EXPECTED FABRICATION PROCEDURES

* 1. BRAZED TUBE PANEL RECEIVING INSPECTION
* 2. CLEANING
* 3. PREPARATION FOR SHIPMENT AND PACKAGING
* 4. UNPACKING AND SPECIAL FIELD HANDLING
* 5. BRAZING
6. HYDROTEST AND DRYING
7. HELIUM LEAK TEST - HOOD METHOD
8. PENETRANT TESTING
* 9. TUBE TO TUBE AND TUBE TO STUB WELDING
10. STUB TO HEADER WELDING
11. HEADER PRESSURE BOUNDARY WELDING
12. WELDING OF CARBON STEEL PARTS
13. STAINLESS TO INCOLOY TRANSITION WELDING

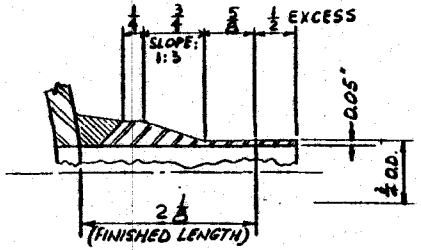
* DESIGNATES PROCEDURES REQUIRING GE APPROVAL.



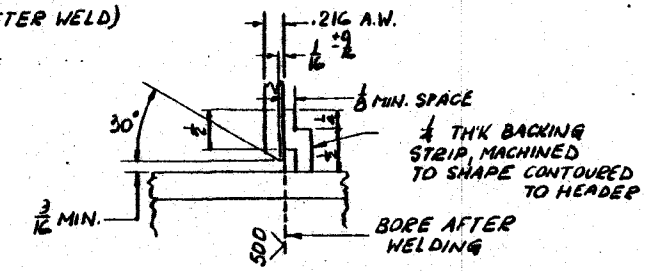




DETAIL-1



DETAIL-2



DETAIL-3

NOTES

1. HEADER AND STUB MATERIAL: INCOLOY 800

REV.	DATE	BY	DESCRIPTION
A	12-21-79	DLK	FIRST ISSUE

REVISIONS

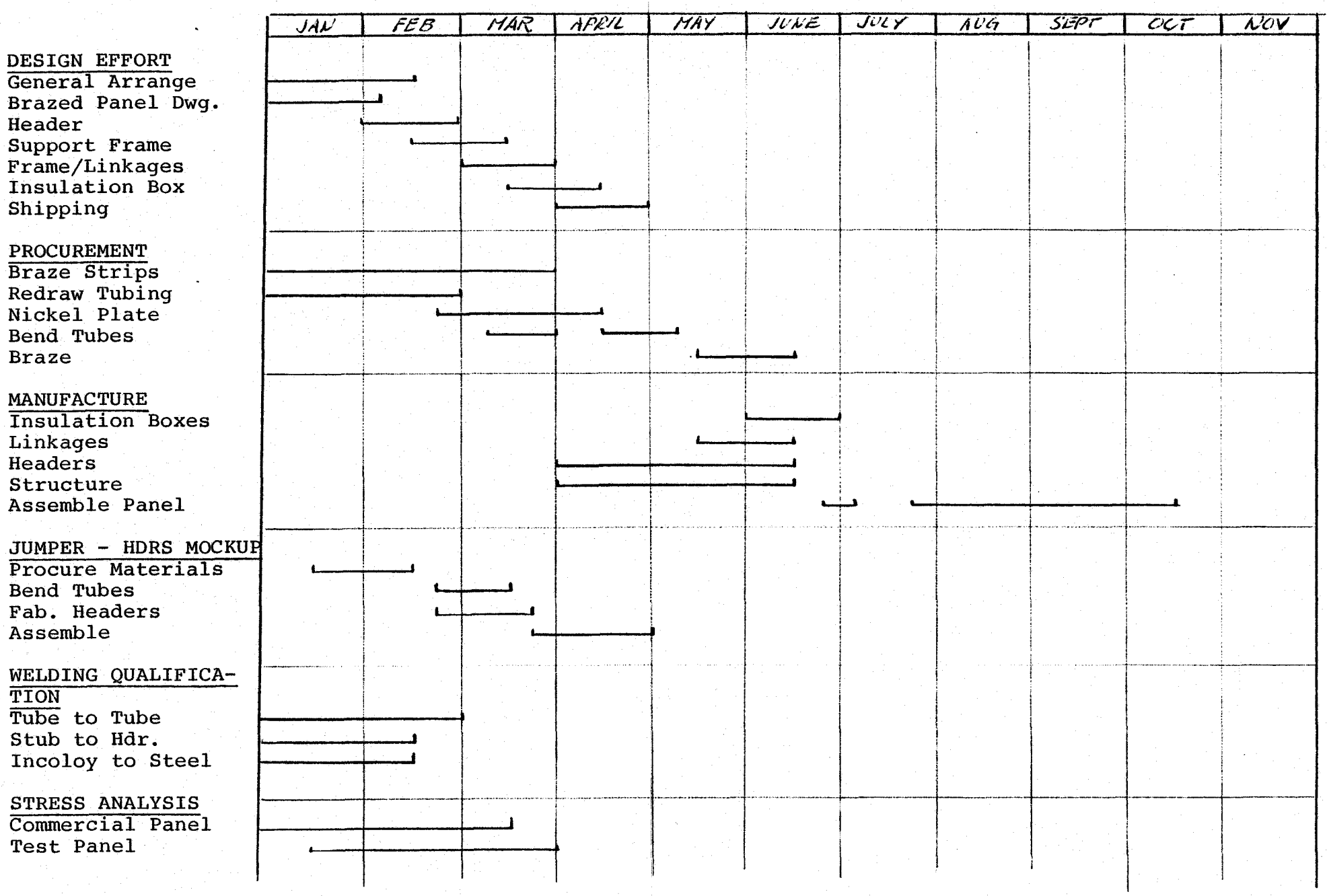
SOLAR TEST PANEL HEADER MOCK-UP

DRAWING NUMBER	SCALE 3, 12		SIZE D
67-3581-3-1416			REVISION A
DRAWN BY	DLK	12-6-79	B-67-3581
CHECKED BY			
APPROVED BY			

PROPOSED CLEANING CRITERIA

1. Cleanliness Inspection Criteria
2. Cleaning Methods and Materials
3. In Process Cleanliness

PANEL MANUFACTURING SCHEDULE



MANUFACTURING RISK

- HEADER FABRICATION
  - STUB TO HEADER WELDS
    - PT DEFECT REPAIRS
      - A) MINOR REPAIRS
      - B) MAJOR REPARIS
- PANEL ASSEMBLY AND TESTING
  - TUBE TO TUBE AND TUBE TO STUB WELDS
    - CUT TO SUIT FIT-UP AND INSPECTION
    - PT AND RT DEFECT REPAIRS
      - A) REPREPING OF ENDS
      - B) REWELDING

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1600	ADJOURN	

SODIUM PIPING DESIGN DRAWINGS

(11)	Sodium Receiver Test Loop Isometric	909E050
(12)	Surge Tank Inlet Loop	145D6376
(13)	Primary Return Loop	145D6374
(14)	Primary Inlet Loop	145D6373
(15)	Pump Outlet Loop	145D6375

PIPING ANALYSIS

MATERIAL

PIPE - ASTM A312 TYP 304 SEAMLESS

FITTINGS - ASTM A403 GRADE WP - TYP 304 SEAMLESS

VALVE FORGING - ASTM A182 TYP 304

INSULATION - CALCIUM SILICATE - 3" WITH 8 OZ CANVAS JACKET

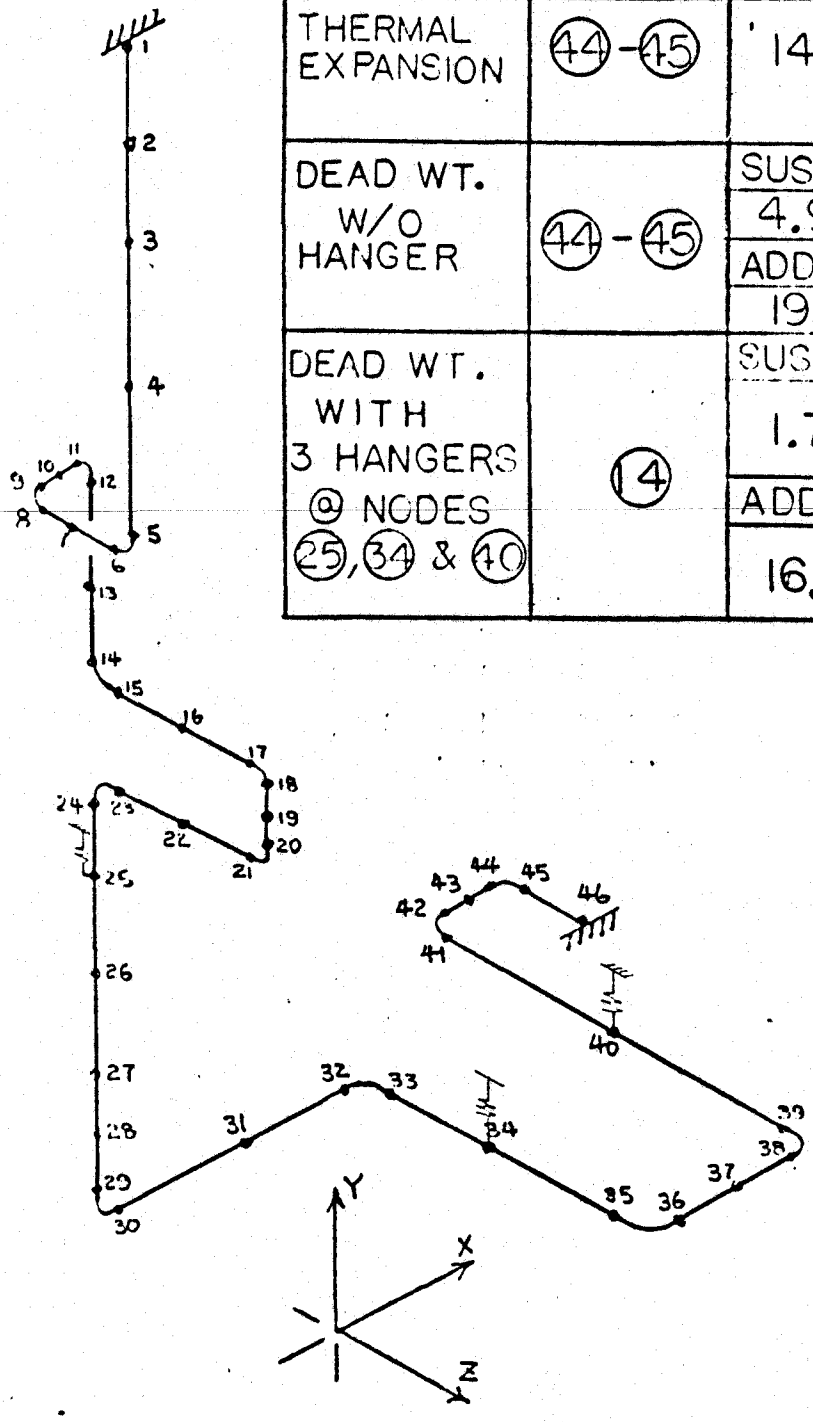
SERVICE	DESIGN	OPERATING
PRESSURE PSI	75	50
TEMPERATURE °F	1150	1100
EARTHQUAKE G (HORIZ)	.5	0

ANALYSIS METHODS

- FLEXIBILITY ANALYSIS - M. W. KELLOGG CO.
- STATIC & DYNAMIC ANALYSIS OF MECHANICAL & PIPING COMPONENTS BY FINITE ELEMENT METHOD - (SAP 4)
- POWER PIPING CODE FOR PRESSURE PIPING - ANSI B31.1

SRTA PIPING
SURGE TANK TO HEAT DUMP

	MAX. STRESS LOCATION	MAX. STRESS (KSI)	ALLOWABLE STRESS (KSI)	MAX. DISP. (IN.)
THERMAL EXPANSION	(44) - (45)	14.7	21.5	1.7" VERT. @ NODE (29)
DEAD WT. W/O HANGER	(44) - (45)	SUSTAINED LOAD		.59" VERT. @ NODE (28)
		4.95	6.5	
		ADDITIVE LOAD		
		19.5	28.0	
DEAD WT. WITH 3 HANGERS @ NODES (25), (34) & (40)	(14)	SUSTAINED LOAD		.13" VERT. @ NODE (19)
		1.72	6.5	
		ADDITIVE LOAD		
		16.32	28.0	



K.L.L.
FEB/80

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SODIUM COMPONENT DRAWINGS

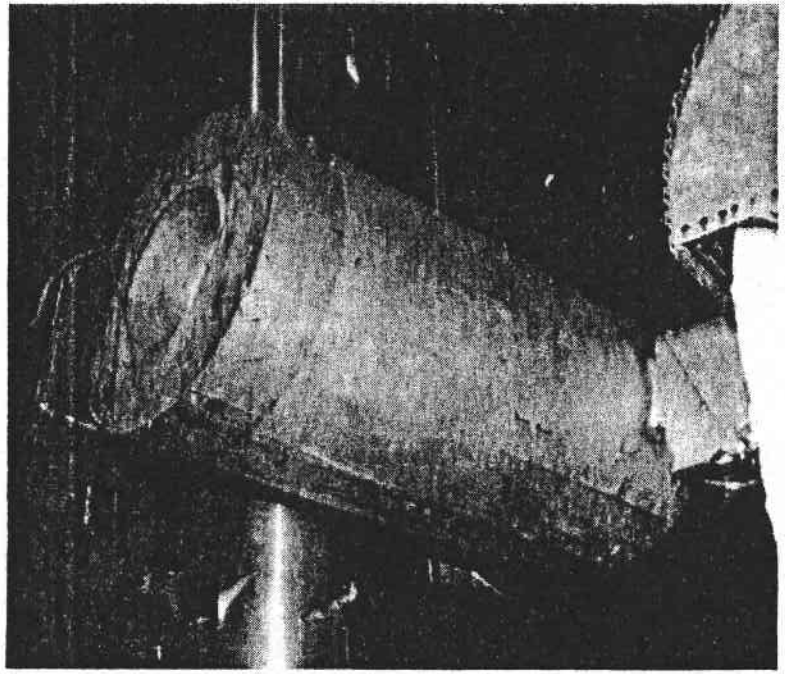
(16)	EM Pump	134D1856
(17)	Sodium Control Valve (Motor Oper.)	179C5264
(18)	Sodium Control Valve (Pneu. Oper.)	179C5262
(19)	Sodium Globe Valve (Manual)	179C5263
(20)	Vapor Trap	179C5261
(21)	4" Cold Trap	145D6361
(22)	Heat Dump Sheet 1	179C5260
(23)	Heat Dump (Coil) Sheet 2	179C5260

→ mostly from SEFOR

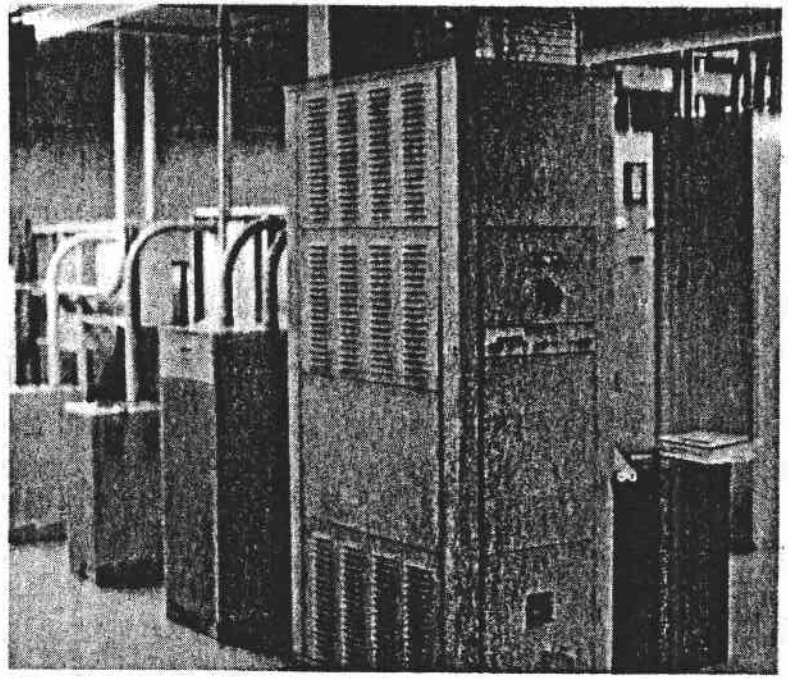
SODIUM COMPONENTS

- EM PUMP
- VALVES
- TANKS
- HEAT DUMP
- LOOP ANALYSIS
- DRAWINGS
  - EM PUMP 134D1856
  - CONTROL VALVE 179C5264
  - CONTROL VALVE 179C5262
  - GLOBE VALVE 179C5263

EM PUMP



- 250 gpm HELICAL PUMP
- 30 psi HEAD



CONTROLS

DESIGN SPECIFICATION
23A2623

pump comes from SEFOR

DESIGN CONDITIONS	SRTA	SEFOR
DESIGN FLOW RATE, GPM	175	250
DESIGN HEAD REQUIRED, PSI	30	30
DESIGN SODIUM TEMPERATURE, °F	700	550
SUCTION PRESSURE, PSIA	5	5

	SRTA	
OPERATING CONDITIONS	RANGE	NORMAL
OPERATING FLOW RATE, GPM	10-175	15
OPERATING HEAD, PSI	1-30	20
OPERATING TEMPERATURE, °F	300-1100	612
OPERATING SUCTION PRESSURE, PSIA	3-10	5

SODIUM PRESSURE - RETAINING BOUNDARY	SRTA	SEFOR
DESIGN PRESSURE, PSI	75	100
DESIGN TEMPERATURE, °F	1150	1050

CALCULATED PERFORMANCE

5KY416PN1 STATOR
5KY416PG1 DUCT

DESIGN POINT	SEFOR (avail. pump)	SRTA (max. requirements)	POTENTIAL OPERATION (normal requirements)
FLOW RATE (GPM)	250	175	175
DEVELOPED PRESSURE (PSI)	30	30	10
CALCULATED PERFORMANCE			
POWER OUTPUT, KW	3.3	2.3	.8
POWER INPUT, KW	19	33.6	13.37
LINE VOLTAGE, VOLTS	385	475	295
LINE CURRENT, AMPERES	95	125	78
POWER FACTOR, %	23.9	32.7	34.8
EFFICIENCY, %	17.1	6.8	5.5
WINDING CURRENT DENSITY, AMPERES/INCH^2	1936	2546	1595

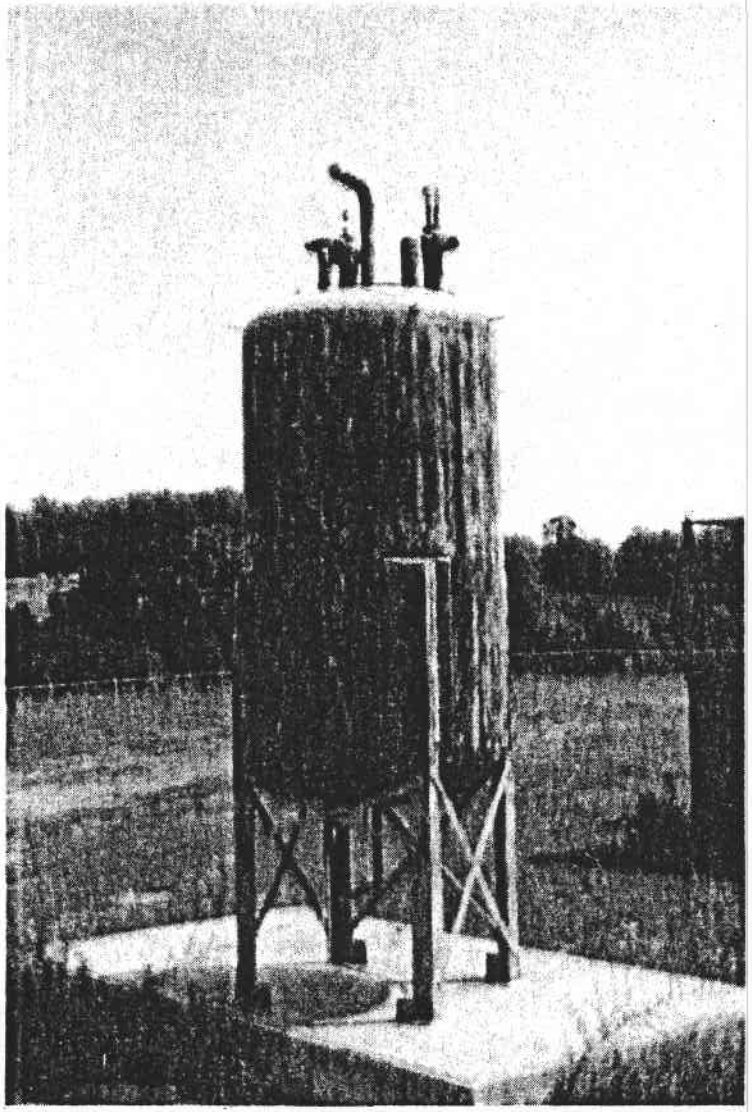
SRTA TANKS

- MODIFIED SODIUM EXPANSION TANKS FROM SEFOR
- SECTION VIII, DIVISION 1, ASME CODE
- BUTT WELDS 100 PERCENT RADIOGRAPHED
- 304 STAINLESS STEEL
- DESIGN PRESSURE: 100 PSIG AT 1000°F - SEFOR
  50 PSIG AT 1150°F - SRTA
- HYDROTESTED JULY 1979

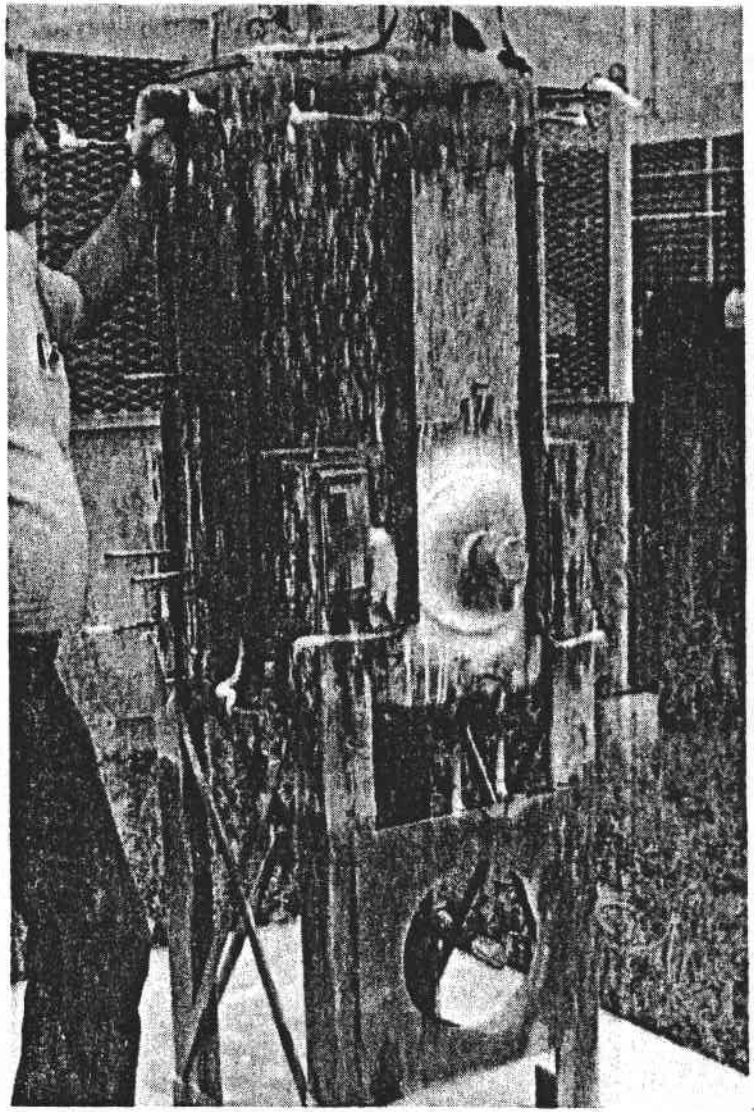
DBD
2/80

SODIUM TANKS

- LEVEL PROBES
- 304 SS



450 gallons



75 gallons

TANK MODIFICATIONS FOR SRTA

- 450 GAL CUT DOWN TO 240 GAL FOR DUMP TANK
- NOZZLES AND SUPPORT LEGS
- SECTION VIII, DIVISION 1, EXCEPT FOR A.I. AND U STAMP
- BUTT WELDS RADIOGRAPHED
- LIQUID PENETRANT ORIGINAL AND MODIFICATION WELDS (INSIDE AND OUTSIDE)
- HYDROTEST AND HELIUM LEAK TEST
- CODE CALCULATIONS FOR DESIGN PRESSURE 50 PSIG AT 1150°F
- QUALITY RECORDS

DBD
2/80

REQUIRED DUMP TANK VOLUME

HEAT DUMP	32 GAL
SOLAR PANEL	42
PIPING	37
SURGE TANK (N_A)	60
	171 GAL
20% MISCELLANEOUS COMPONENTS OR OVERFILL OF SURGE TANK	+34
	205

ALLOW 10% FOR FREE ARGON AND HEEL RESULTS IN A REQUIRED DUMP TANK VOLUME OF 226 GAL.

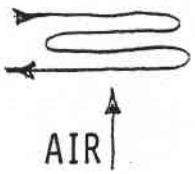
(actually make 240 gal.)

DBD
2/80

HEAT DUMP

USE SEFOR AUX AIR BLAST COOLER

- o BUILT IN 1966
- o SECTION VIII ASME CODE
- o STRUCTURAL SUPPORT A.I.S.C.
- o 23 TYPE 304 TUBES
  embedded carbon steel fins



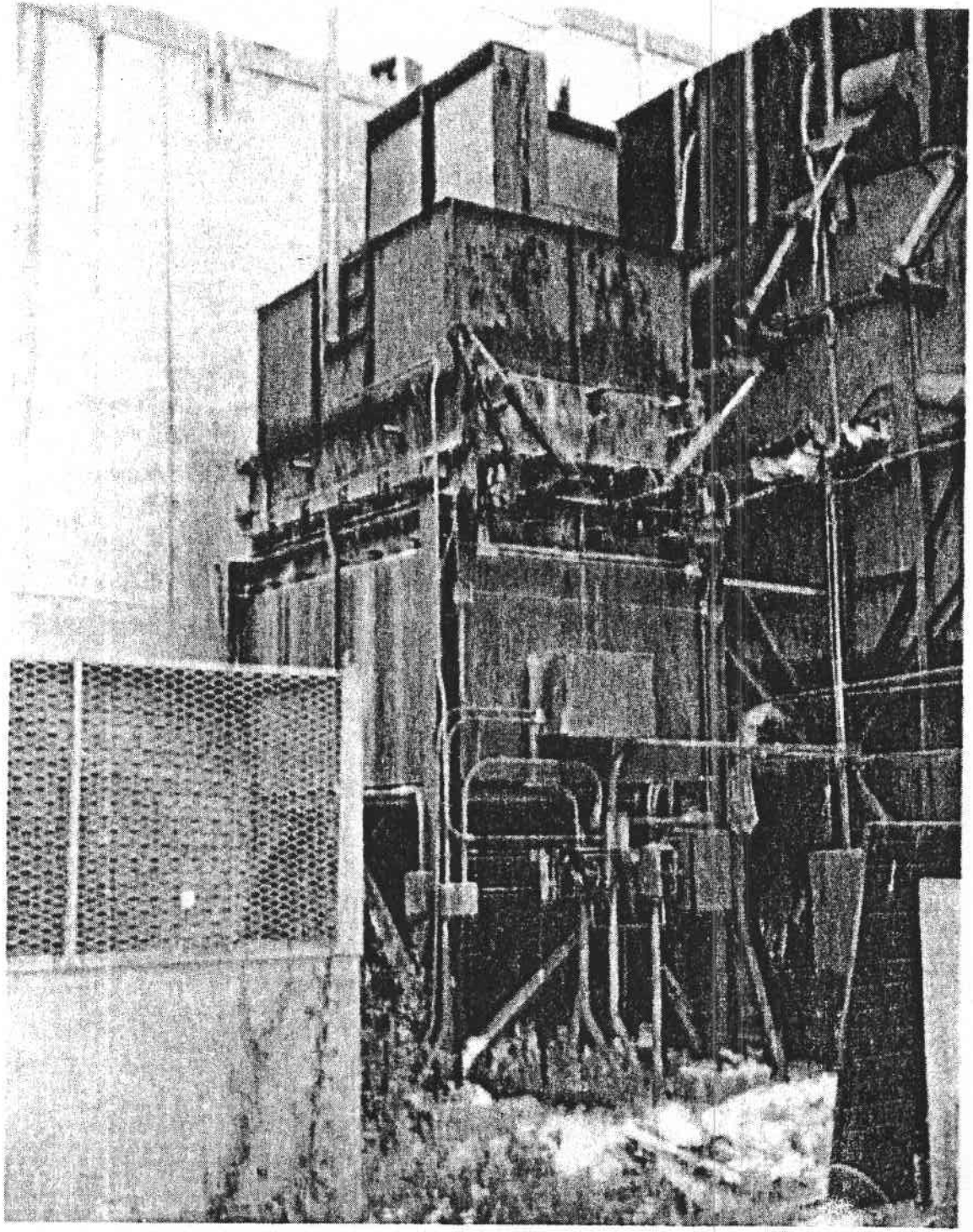
- o BEING REFURBISHED
- o COMPARISON OF SRTA DUTY TO SEFOR DUTY

  HEAT TRANSFER

  CODE CALCULATIONS

  STRUCTURAL

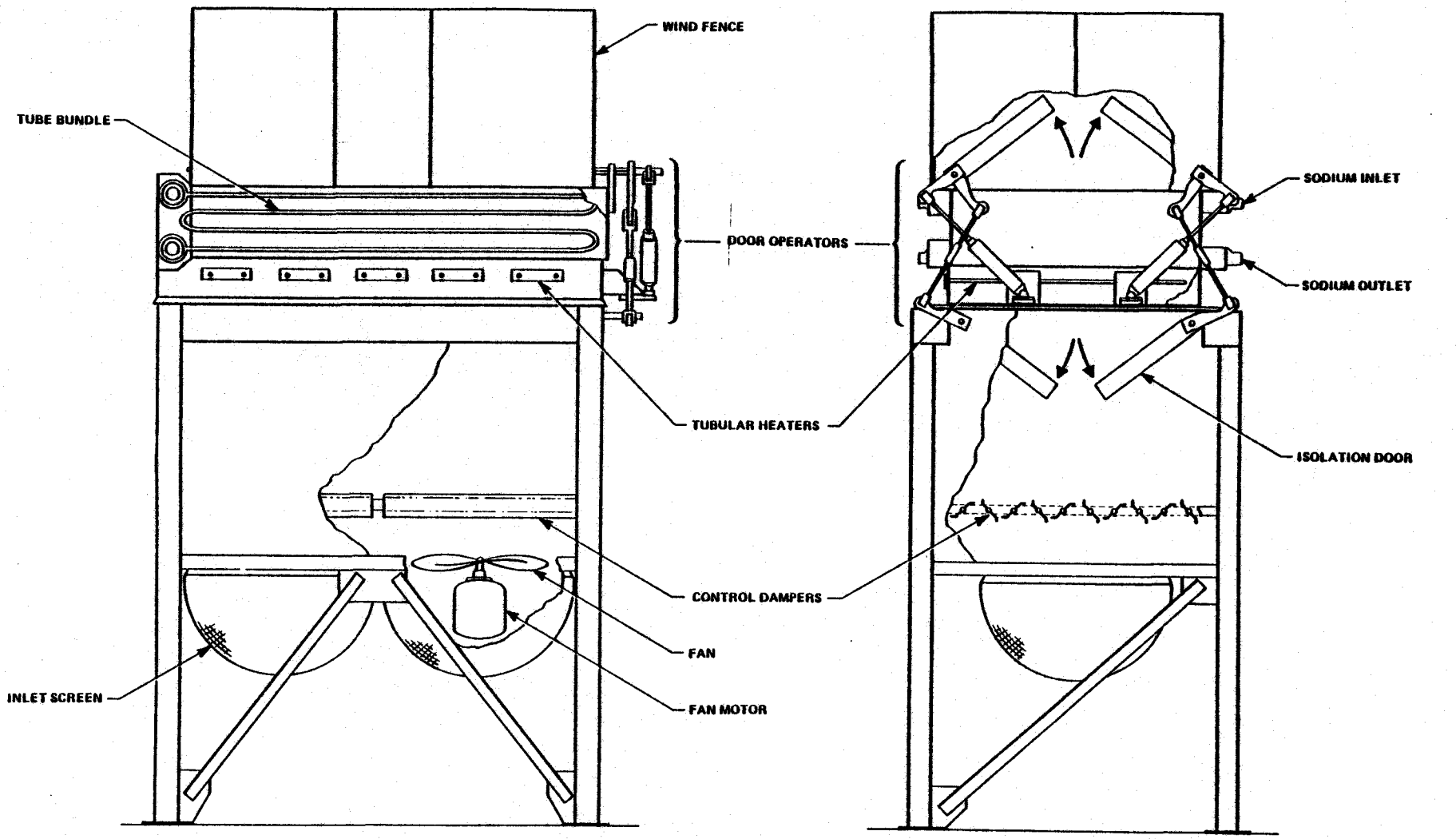
DBD
2/80



SODIUM/AIR HEAT DUMP

- 2.5 MWt
- 304 SS COIL
- CONTROL FROM 0.25 TO 2.5 MWt

79-550-11



HEAT DUMP

80-099-01

HEAT DUMP REFURBISHMENT

- TUBE BUNDLE SECTION
  - INERTED SINCE SEFOR SHUTDOWN
  - HYDROTESTED JULY 1979
  - REPAIRED SEVERAL SMALL MANIFOLD LEAKS
  - HELIUM LEAK TEST ($<2X10^{-8}$ cc/sec)
  - REPLACING THERMOCOUPLES
  - INSULATING MANIFOLD AND U BEND ENCLOSURES
  - QUALITY RECORDS
- ISOLATION DOORS
  - REPLACE RUSTED SHEETMETAL AND DAMAGED INSULATION
  - REBUILDING AIR CYLINDERS
- NEW HIGHER RATED CALROD HEATERS
- LOUVER OPERATING MOTOR TO BE REPLACED
- FAN MOTORS REBUILT/REPLACED
- DESIGNING A CATCH PAN
- INSULATE OUTSIDE

DBD
2/80

COMPARISON OF SRTA AND SEFOR THERMAL DUTY:

- HEAT TRANSFER RATE UNCHANGED

$$2.5\ MW = 8.5 \times 10^6 \frac{BTU}{HR}$$

- SODIUM SIDE

	SEFOR	SRTA
INLET TEMP	850°F	1100°F
OUTLET TEMP	550°F	500-700°F
FLOW	92000 $\frac{LB}{HR}$	47000 $\frac{LB}{HR}$

- AIR SIDE

INLET TEMP	90°F	120°F

DBD
2/80

AFFECT OF SRTA CONDITIONS ON BLH HEAT TRANSFER CALCULATIONS:

- "H_T" CONVECTION INSIDE TUBES DROPS

  $4500 \frac{BTU}{HR\ FT^2\ °F} \rightarrow 3300$

- "LMTD" INCREASES

  $430°F \rightarrow 500$

- REQUIRED SURFACE AREA DROPS

  $2560\ FT^2 \rightarrow 2250$

  (AVAILABLE AREA = $2730\ FT^2$)

CONCLUSION: ACCEPTABLE FOR SRTA, HOWEVER CONSIDERATION OF CONTACT RESISTANCE BETWEEN IMBEDDED CARBON STEEL FIN AND STAINLESS TUBE LED TO RECOMMENDATION TO REPLACE WITH A NEW BRAZED FIN TUBE BUNDLE.

DBD
2/80

CODE CALCULATIONS:

	SEFOR	SRTA
DESIGN TEMPERATURE	1000°F	1150°F
DESIGN PRESSURE	50 PSIG	50 PSIG

FATIGUE:

SEFOR - MULTIPLE CYCLES TO 14°F/SEC

SRTA - 100 CYCLES TO 1°F/SEC

STRUCTURAL:

	SEFOR	SRTA
WIND	300 MPH	100 MPH
SEISMIC	0.5 G HORZ 0.33 G VERT	1.5 G @ 10 Hz* -

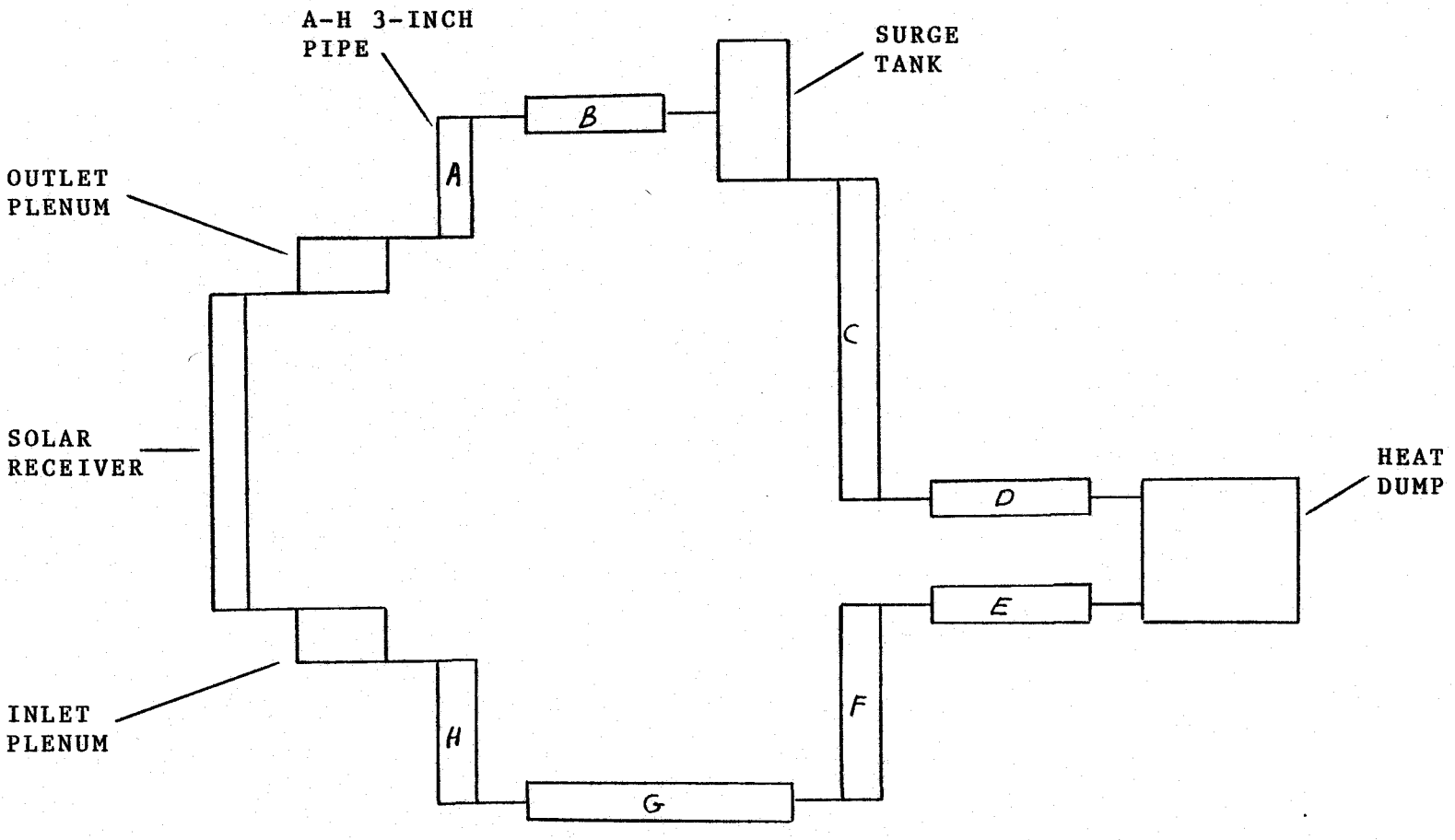
* BEING CHANGED TO 0.5G STATIC

DBD
2/80

SEISMIC ANALYSIS

- o "SAP" FINITE ELEMENT MODEL
- o RESPONSE SPECTRUM
- o DISPLACEMENT COMBINATION BY SRSS
- o FIRST SIGNIFICANT MODE 19 Hz
- o MAXIMUM DISPLACEMENT 0.042 IN.
- o MAX LOAD AT LEG BASE = 13700 LB/LEG COMPARE TO 21000 LB/LEG BY BLH FOR 300 MPH WIND
- o RESPONSE INDICATES LITTLE OR NO DYNAMIC AMPLIFICATION

DBD
2/80

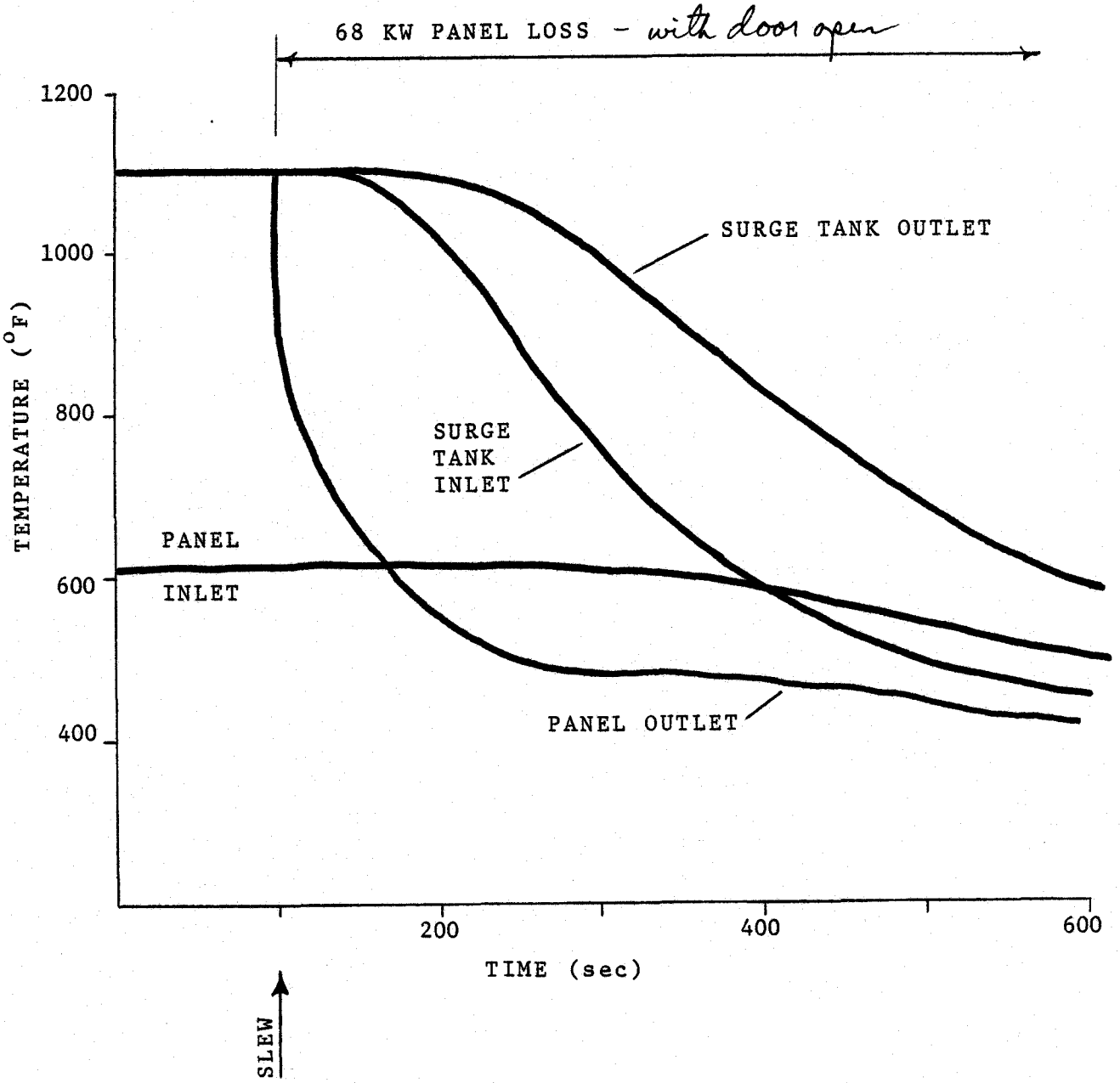


ANALYTICAL MODEL OF SRTA LOOP

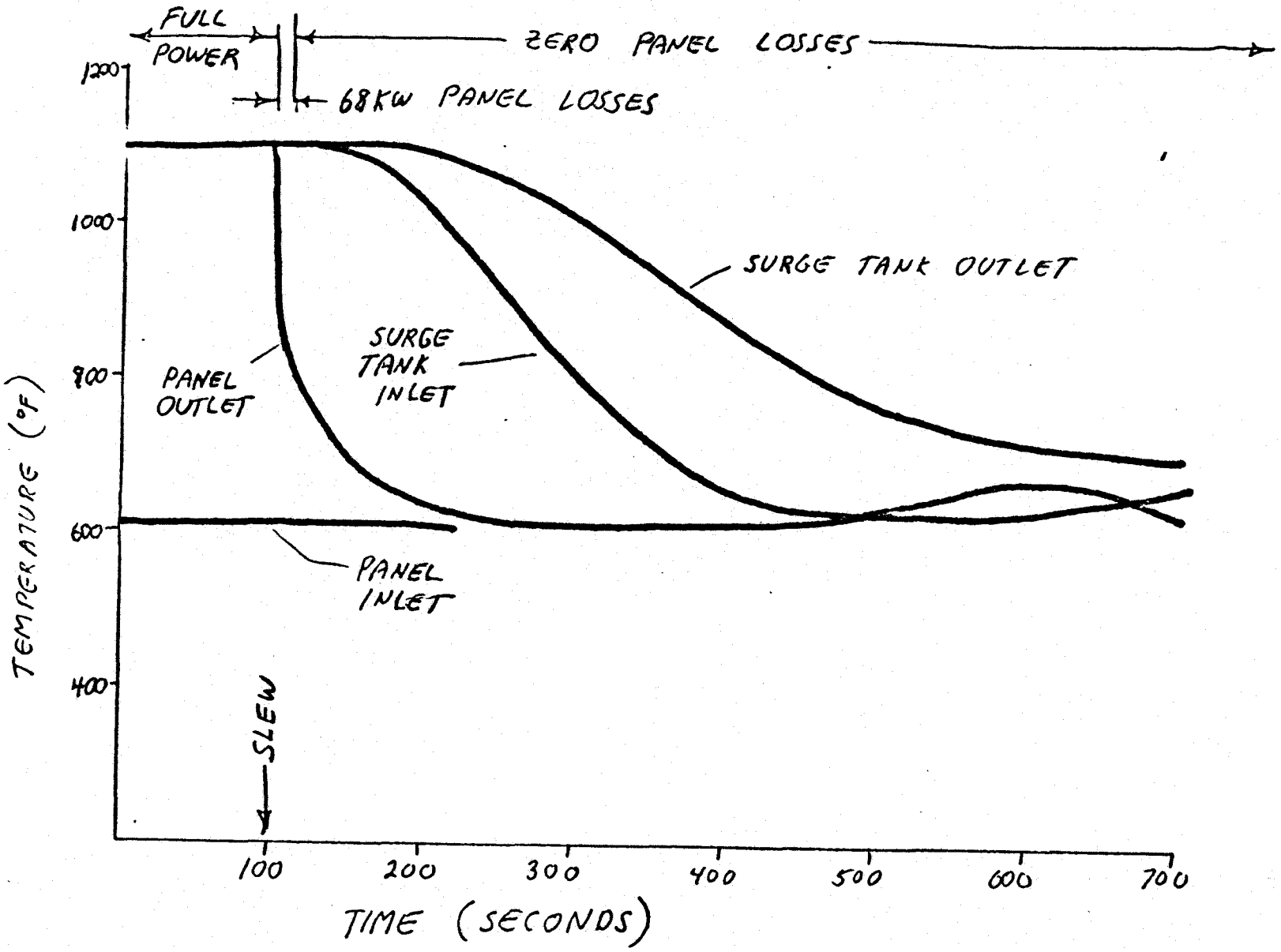
Temp. Transients:

EXAMPLE SLEW - SODIUM AND AIR FLOW RUN DOWN
TO 10% IN 15 SEC FOLLOWING SLEW

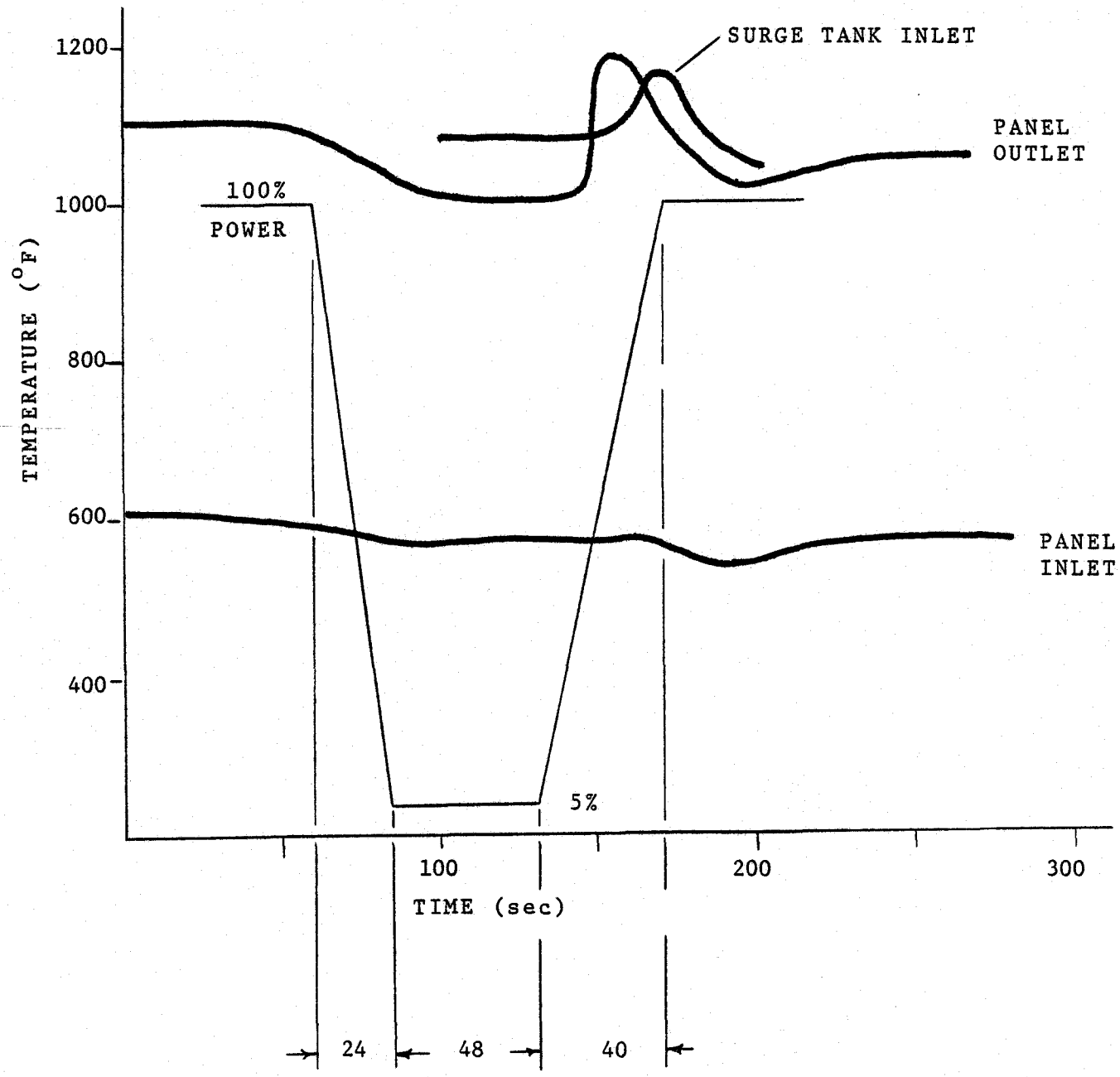
Door not closed



SLEW – Na AND AIR RUN DOWN TO 10% IN 15 SEC.
DOOR CLOSED AT 10 SEC



EXAMPLE CLOUD TRANSIENT - SODIUM AND AIR FLOW
VARIED IN PHASE WITH POWER



AGENDA

WEDNESDAY, FEBRUARY 13, 1980

0800	INTRODUCTION	J. ELSNER
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1230	ABSORBER PANEL FABRICATION	C. HUSSEY
1330	SODIUM PIPING DESIGN	E. OLICH
1350	SODIUM COMPONENTS	E. OLICH/D. DRENDEL
→ 1500	ELECTRICAL, CONTROLS & INSTRUMENTATION	Paul SWARTZ
1530	ASSEMBLY PLAN/STATUS	E. GERRELS
1600	ADJOURN	

ELECTRICAL, CONTROLS AND INSTRUMENTATION DRAWINGS

(24)	SRTA Instrumentation & Electrical Diagram Sheet 1	909E024
(25)	SRTA Instrumentation & Electrical Diagram Sheet 2	909E024
(26)	SRTA One Line Diagram	145D6359
(27)	SRTA Control Center Sheet 1	909E040
(28)	SRTA Control Center Sheet 2	909E040
(29)	Vertical Flowmeter 3"	134D1875
(30)	Sodium Pressure Element	145D6380

INSTRUMENTATION

SODIUM LOOP FLOW

MAIN & BYPASS

SODIUM TEMPERATURE

RTDs AND TYPE K THERMOCOUPLES

SODIUM LOOP PRESSURES

PUMP AND PANEL INLET & OUTLET

SODIUM TANKS COVER GAS PRESSURE

DUMP TANK AND SURGE TANK

SODIUM TANKS LEVEL

ANALOG AND DISCRETE POINT

STRAIN GAUGES

15 POINTS

DISPLACEMENT

PANEL EXPANSION

INSTRUMENTATION

SODIUM LOOP FLOW

MAIN LOOP - 3 INCH - FULL FLOW RANGE - cold leg

BY-PASS LOOP - 1 INCH - LOW FLOW RANGE - " "

PERMANENT MAGNET TYPE

MAIN LOOP CALIBRATION IN PLACE

ACCURACY ± 1.0 TO 1.5%

SODIUM TEMPERATURE

PANEL INLET & OUTLET - PLATINUM RTDs

HEAT DUMP INLET AND OUTLET - CHROMEL-ALUMEL THERMOCOUPLE

PANEL BACK TEMPERATURES - CHROMEL-ALUMEL THERMOCOUPLE

TRACE HEATING TEMPERATURES - CHROMEL-ALUMEL THERMOCOUPLE

RTD ACCURACY ± 0.1%

CHROMEL-ALUMEL T/C ACCURACY - FOR ± 4°F IS A SPECIAL OTHERS ARE STND

LOOP RTDs & T/Cs FOR CONTROL IN THERMOWELLS

INSTRUMENTATION

SODIUM LOOP PRESSURES

PUMP SUCTION AND DISCHARGE

PANEL INLET AND OUTLET

Na-to-NaK-to-SILICON OIL PRESSURE TRANSFER
THROUGH STAINLESS STEEL SLACK DIAPHRAGMS
STANDARD PRESSURE TRANSMITTER

ACCURACY $\pm$ 1 PSIG

SODIUM TANKS COVER GAS PRESSURES

STANDARD TRANSMITTER IN COLD SIDE OF VAPOR
TRAP PIPING

SODIUM TANKS LEVEL

RESISTANCE TYPE PROBES (SEFOR DESIGN)

BASED ON RESISTANCE OF STAINLESS STEEL SHEATH.
PASS DC CURRENT THROUGH SHEATH AND MEASURE
MILLIVOLT DROP ACROSS LENGTH OF PROBE.

"J" STYLE PROBE - ANALOG

"I" STYLE PROBE - POINT

INSTRUMENTATION

STRAIN GAUGES

MOUNTED ON BACK OF PANEL IN 15 LOCATIONS

BLH HIGH TEMPERATURE TYPE TO 1200°F

DISPLACEMENT SENSOR

MEASURES PANEL EXPANSION IN THE DOWNWARD DIRECTION

3 INCHES OF PANEL EXPANSION FROM ROOM TEMPERATURE TO 1100°F ARE MEASURED WITH AN LVDT (LINEAR VARIABLE DIFFERENTIAL TRANSFORMER)

ACCURACY $\pm$ 0.05 INCH

CONTROL

ABSORBER PANEL OUTLET TEMPERATURE

1100°F ± 5°F FROM 0.25 TO 2.5 MW

LOOP FLOW CONTROLLED -

FEED FORWARD (PROMPT) - SOLAR FLUX

TRIM (CONTROLLED RATE) - PANEL OUTLET TEMPERATURE

ABSORBER PANEL INLET TEMPERATURE

SET FROM 500°F TO 700°F ± 5 F

HEAT DUMP CONTROLLED -

FAN SPEED LOGIC FROM PANEL POWER

TRIM BY ADJUSTING LOUVRE TO HEAT DUMP OUTLET TEMPERATURE

MANUAL FOR STARTUP AND SHUTDOWN

TRACE HEATING

CONTROL

MANUAL BY OPERATOR FROM PANEL

TRIAC FOR LIGHT LOADS (120 & 240 VOLTS)

VARIABLE AUTOTRANSFORMER FOR HEAVY LOADS (480 VOLTS)

BANKED SHUTOFF CONTROL

- ABSORBER PANEL
- HEAT DUMP
- DRAIN TANK
- LOOP PIPING AND SURGE TANK
- OTHERS

GROUND FAULT INTERRUPTION (GFI)

MOST HEATERS - CALROD TUBULAR

DESIGN STATUS

DRAWINGS

IED - SETS THE C&I&E SCOPE BY FUNCTION

REVIEWED AND READY FOR ISSUE

CONTROL PANEL - HOUSES MOST TRANSDUCERS, INDICATORS AND CONTROLS

90% COMPLETE, ABOUT READY FOR ENGINEERING REVIEW

SYSTEM PARTS LIST - IDENTIFIES ALL COMPONENTS

75% COMPLETE, WILL BE SENT OUT FOR REVIEW WITH PANEL DRAWINGS

MATERIAL

IN PROCESS OF ORDERING IDENTIFIED LONG LEAD ITEMS

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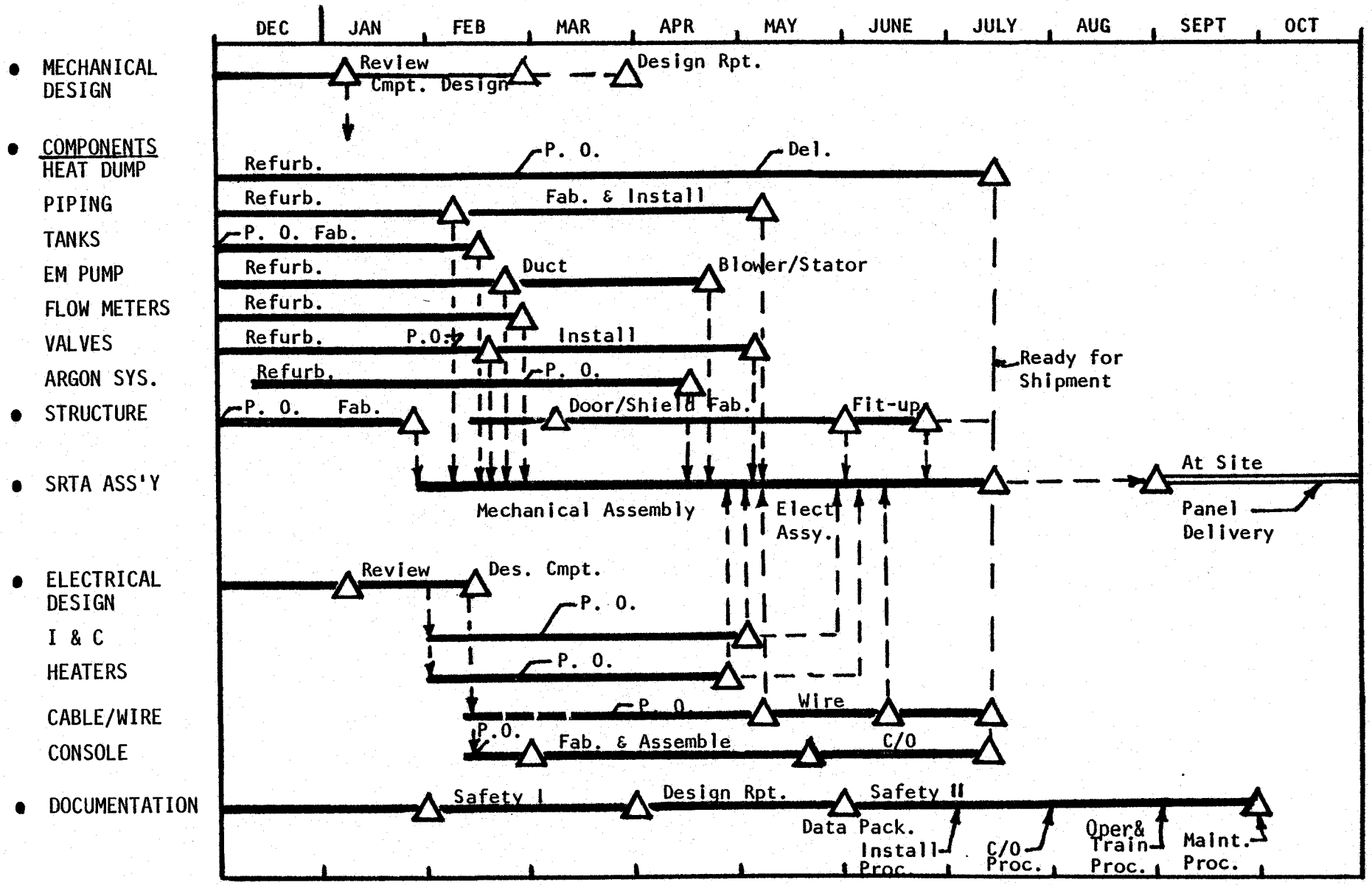
SRTA ASSEMBLY



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THURSDAY, FEBRUARY 14, 1980

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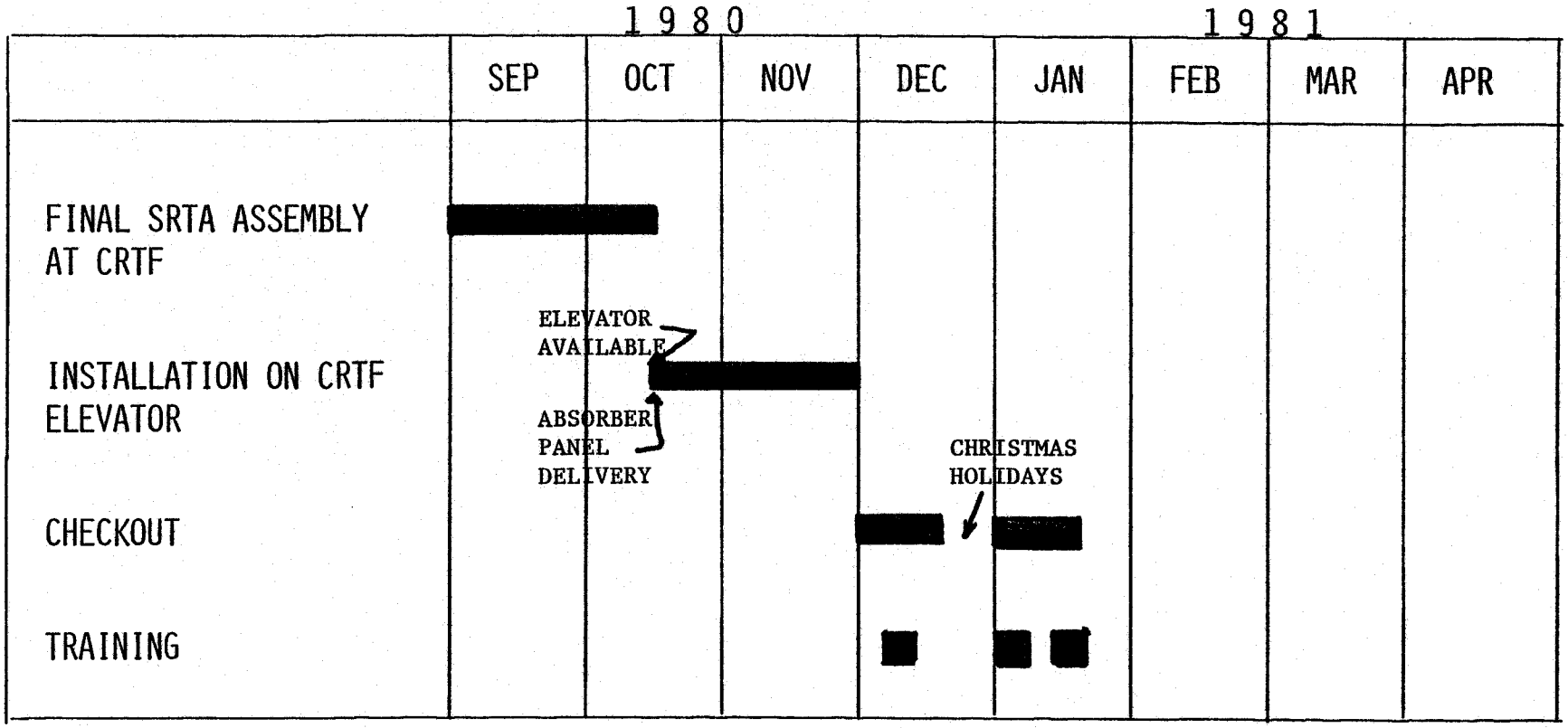
	1150	ACTION ITEMS	ALL
	1200	ADJOURN	

SCHEDULE

SRTA INSTALLATION, CHECKOUT, AND TRAINING AT CRTF



ACTIVITIES

SRTA FINAL ASSEMBLY AT CRTF

- UNLOAD AND INSPECT SRTA SUBASSEMBLIES INSIDE CRTF AT GROUND LEVEL ON CRTF LIFT PLATFORM
- MOUNT LOWER SRTA ASSEMBLY ON SLEEPER BEAMS AND ATTACH UPPER SRTA ASSEMBLY
- APPLY INSULATION BOARD TO SOLAR SHIELD FRAME (PERFORMED BY CRTF PERSONNEL)
- INSTALL PIPE HANGERS
- INSTALL PUMP STATOR, BLOWER, CAPACITOR, AND SNUBBERS
- CONNECT PUMP POWER CABLING
- MOVE SRTA ASSEMBLY OUT OF TOWER

ACTIVITIES

SRTA INSTALLATION ON CRTF ELEVATOR

- MOVE SRTA ASSEMBLY AND DRIP PANS INTO TOWER AND ATTACH SLEEPER BEAMS TO ELEVATOR TOP
- ASSEMBLE HEAT DUMP ON ELEVATOR
- INSTALL CONTROL PANEL ON COMPUTER LEVEL
- INSTALL ELECTRICAL POWER SUPPLY ON ELEVATOR TOP
- RECEIVE AND INSPECT ABSORBER PANEL
- INSTRUMENT ABSORBER PANEL
- INSTALL ABSORBER PANEL IN SRTA
- WELD AND INSPECT Na PIPE SPOOLS TO CONNECT ABORBER PANEL AND HEAT DUMP TO SRTA LOOP
- INSTALL PREHEATERS & INSULATE SPOOLS
- INSTALL SOLAR SHIELD
- INSTALL INSULATING DOOR
- INSTALL CABLE CONNECTIONS AND ROUTE CABLES
- INSTALL SRTA SIDING

ACTIVITIES
SRTA CHECKOUT

GROUND LEVEL (NON-SOLAR)

- o ELECTRICAL AND INSTRUMENTATION FUNCTIONAL CHECKOUT
- o SYSTEM LEAK CHECK
- o PREHEAT DRAIN TANK AND TRANSFER SODIUM
- o PREHEAT SYSTEM, DEMONSTRATE FILL AND DRAIN OPERATIONS. PERFORM T/C AND FLOWMETER CALIBRATIONS, DEMONSTRATE SAFETY INTERLOCKS AND SYSTEM SHUTDOWN.
- o DISCONNECT POWER CABLES AND MOVE ELEVATOR TO TOWER TOP AND RECONNECT POWER CABLES

TOWER TOP CHECKOUT

- o PREHEAT, FILL AND DEMONSTRATE SOLAR STARTUP, AUTOMATIC CONTROLS, AND SAFETY CIRCUITS

AGENDA (CONTINUED)

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SRTA MAINTENANCE

- SRTA DESIGNED FOR MINIMUM MAINTENANCE
- ACCESS PROVIDED FOR INSTRUMENTATION AND TRACE HEATER REPLACEMENT IF REQUIRED
- SPARE INSTRUMENTATION AND ELECTRICAL REPLACEMENT PARTS TO BE PROVIDED
- EXTRA SEFOR VALVES AVAILABLE IF VALVE REPLACEMENT SHOULD BE REQUIRED
- MAINTENANCE OPERATIONS WILL BE PERFORMED ON OFF SHIFTS AS FAR AS POSSIBLE TO MINIMIZE LOSS OF SOLAR TEST TIME
- OPERATING PROCEDURES WILL INCLUDE DAILY EQUIPMENT INSPECTION AND PREVENTIVE MAINTENANCE TASKS

TRAINING

FIRST WEEK OF CHECKOUT

5 - 1 HR CLASSES - PROCEDURE REVIEW AND DISCUSSION

THIRD AND FIFTH WEEK OF CHECKOUT

ON-THE-JOB TRAINING DURING HOT CHECKOUT AND CALIBRATION OPERATIONS

AGENDA (CONTINUED)

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SRTA REMOVAL & DECOMMISSIONING

- SHUT DOWN SYSTEM AND DISCONNECT POWER CABLES

- MOVE ELEVATOR TO GROUND LEVEL

* o CUT ABSORBER PANEL OUT. MAINTAIN INERT GAS IN PANEL AND LOOP. SEAL NOZZLES AND SRTA PIPES. REMOVE FROM SRTA AND TRANSPORT TO DESIGNATED LOCATION FOR POST-TEST INSPECTION. ANY FURTHER CLEANING WOULD BE PART OF POST-TEST INSPECTION ACTIVITY.

- CUT HEAT DUMP INLET AND OUTLET PIPES, SEAL WITH WELD CAPS. MAINTAIN INERT GAS IN LOOP AND HEAT DUMP FROM BOTTLE SUPPLY. MOVE SRTA AND HEAT DUMP TO DESIGNATED STORAGE AREA. COVER GAS PRESSURE OF 1-2 PSIG IS ADEQUATE BUT A METHOD OF MONITORING THIS PRESSURE SHOULD BE PROVIDED (ROUTINE INSPECTION OR LOW PRESSURE ALARM).

- MOVE AUXILIARY EQUIPMENT (CONTROL PANEL, ELECTRICAL EQUIPMENT, AND OTHERS) TO A DESIGNATED STORAGE AREA. INDOOR STORAGE IS DESIRABLE FOR THESE ITEMS.

* NOT INCLUDED IN PRESENT SCOPE

AGENDA (CONTINUED)

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OBJECTIVES

DEMONSTRATE

- AVAILABILITY OF SODIUM COMPONENTS
- MANUFACTURABILITY OF PANEL
- SAFETY AND RELIABILITY OF SODIUM SYSTEMS

VERIFY

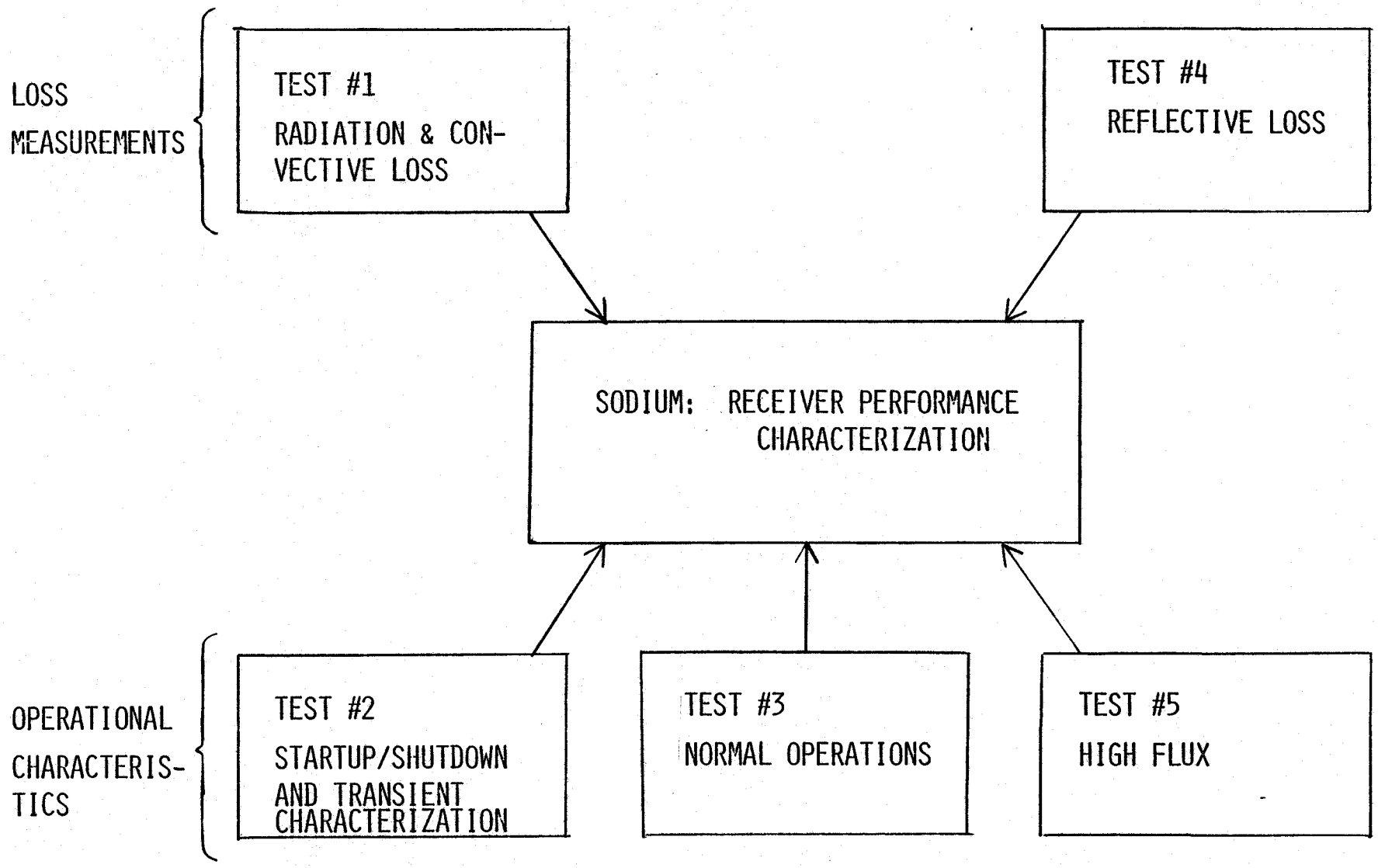
- SRTA COMPLIANCE WITH DEVELOPMENT SPECIFICATION

MEASURE

- PANEL EFFICIENCY
- RADIATION AND CONVECTIVE LOSSES
- REFLECTIVE LOSSES
- THERMALLY INDUCED STRAINS

OVERVIEW

CRTF TESTING



TEST DESCRIPTION

#1 RADIATION AND CONVECTIVE LOSSES:

OBJECTIVE

MEASURE THE RADIATION AND CONVECTION LOSSES FROM THE PANEL

PROCEDURE

CIRCULATE SODIUM WITHOUT ANY SOLAR FLUX AND MEASURE ΔT ACROSS PANEL TO DEDUCE LOSSES. CONDUCT THIS TEST AT FIVE DIFFERENT PANEL INLET TEMPERATURES 350, 450, 600, 850 AND 1100^{o}F AND ACCURATELY MEASURE MASS OF SODIUM FLOW THROUGH THE PANEL. TEST WILL RUN 10 MINUTES AT EACH TEMPERATURE.

#2 STARTUP/SHUTDOWN AND TRANSIENT CHARACTERIZATION:

OBJECTIVE

TO DETERMINE THE STARTUP/SHUTDOWN FLUX RAMP AND FLOW CONDITIONS, AND THE SRTA TRANSIENT TOLERANCE

PROCEDURE

FOR CONSTANT FLUX DISTRIBUTIONS AND RAMP CONDITIONS THE INITIAL FLOW RATE WILL BE HELD AT 40, 30, 20, AND 10 PERCENT OF NORMAL FLOW UNTIL THE 1100°F OUTLET TEMPERATURE IS REACHED. THIS WILL BE REPEATED FOR TWO ADDITIONAL FLUX RAMPS. ANALYSIS OF THE DATA WILL BE USED TO DETERMINE STARTUP AND SHUTDOWN SCENARIOS.

STARTING FROM NORMAL OPERATING CONDITIONS THREE DIFFERENT RAMPS WILL BE USED TO VARY THE FLUX 100 TO 0 PERCENT, THE RAMPS WILL BE REPEATED VARYING THE FLUX FROM 100 TO 50 PERCENT. THE DATA WILL BE ANALYZED TO DETERMINE OPERATIONAL LIMITS AS A FUNCTION OF TRANSIENT CONDITIONS.

#3 NORMAL OPERATIONS:

OBJECTIVE	PROCEDURE
TO MEASURE PANEL EFFICIENCY AT FULL POWER AND CORRELATE THIS WITH THE RESULTS OF TEST #1 AND #4 (RADIATION, CONVECTION, & REFLECTION LOSSES)	OPERATE THE PANEL WITH 1.5:1 PEAK TO AVERAGE FLUX DISTRIBUTION. SET INLET/OUTLET TEMPERATURES AT 600°F/1100°F RESPECTIVELY. REPEAT FOR 60 AND 20 PERCENT OF FLUX LEVELS. OPERATE PANEL WITH 1.2 MW/M^2 PEAK FLUX, SET INLET/OUTLET TEMPERATURES AT 600°F/1100°F RESPECTIVELY.

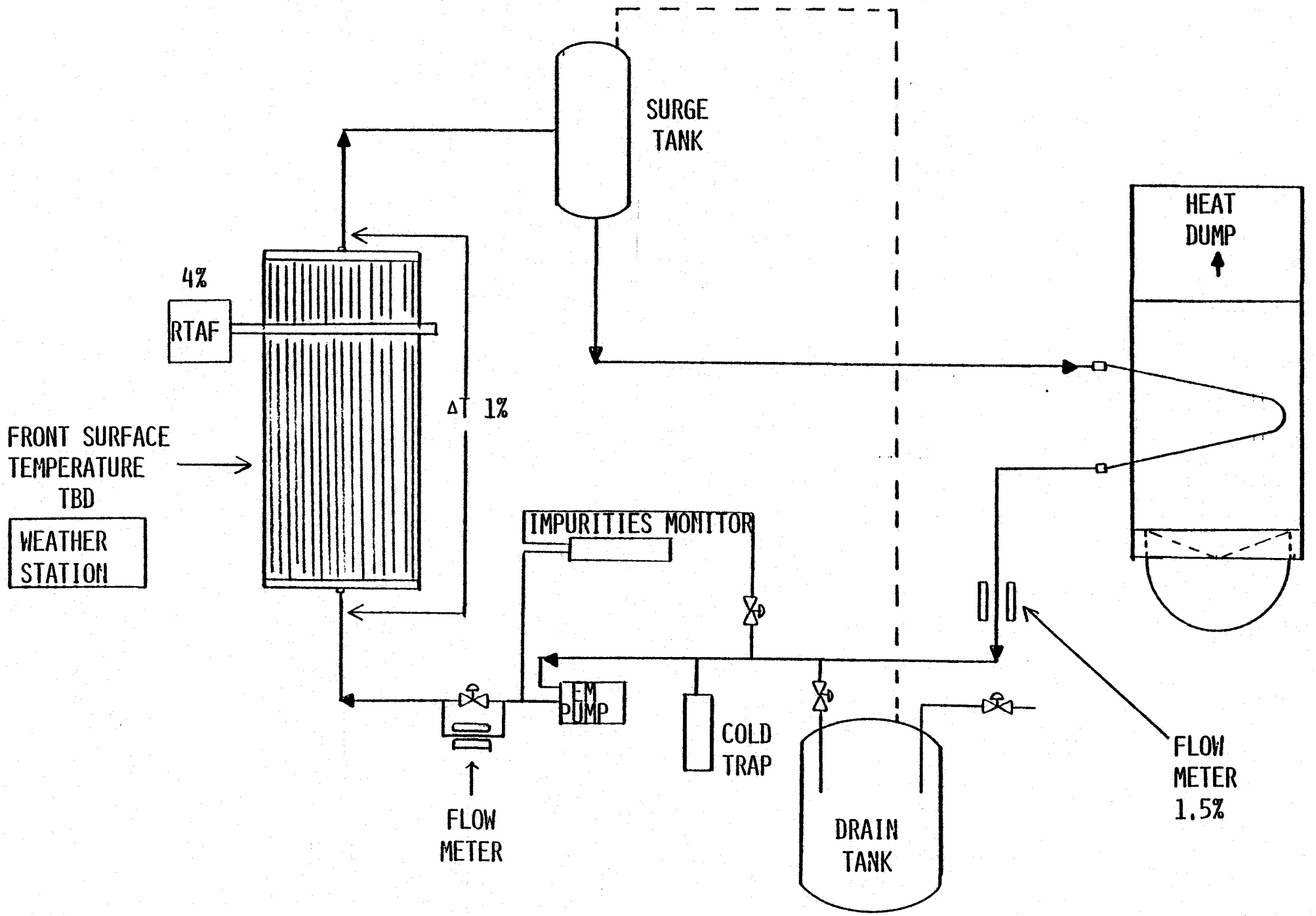
#4 REFLECTION LOSS TEST:

OBJECTIVE	PROCEDURE
TO MEASURE THE EFFECTIVE SOLAR ABSROPTIVITY OF THE PANEL COATING	OPERATE PANEL WITH ~ 1.5 MW PEAK INCIDENT POWER. SET FLOW TO MAINTAIN ΔT OF 150°F FROM INLET 300°F.

#5 HIGH FLUX TEST:

OBJECTIVE	PROCEDURE
DEMONSTRATE ABILITY OF PANEL TO TOLERATE HIGH FLUX.	OPERATE PANEL WITH ~ 1.5 MW PEAK INCIDENT FLUX AT NORMAL INLET/OUTLET TEMPERATURES - 600°F/1100°F.

SIMPLIFIED LOOP DIAGRAM



DATA ACQUISITION

PARAMETER	DEVICE	ACCURACY
INCIDENT FLUX	RTAF	4%
FRONT SURFACE PANEL TEMPERATURE	T/C	TBD
BACK SURFACE PANEL TEMPERATURE	T/C	1%
SODIUM ΔT	PLATNIUM RTD	1%
SODIUM FLOW	FLOW METER	1.5%
PANEL STRAIN	BLH STRAIN GAUGE	TBD
PANEL EXPANSION	LINEAR VARIABLE DIFFERENTIAL TRANSFORMER	2%
AMBIENT TEMPERATURES	CRTF WEATHER STATION	1%
WIND SPEED	CRTF WEATHER STATION	2%

ABSORBER LOSS PROGRAM

INPUT VARIABLE

RECEIVER

ABSORPTIVITY
EMISSIVITY
HEAT FLUX FACTOR
LENGTH
TUBE I.D.
TUBE O.D.
TUBES (QUANTITY)
WIDTH

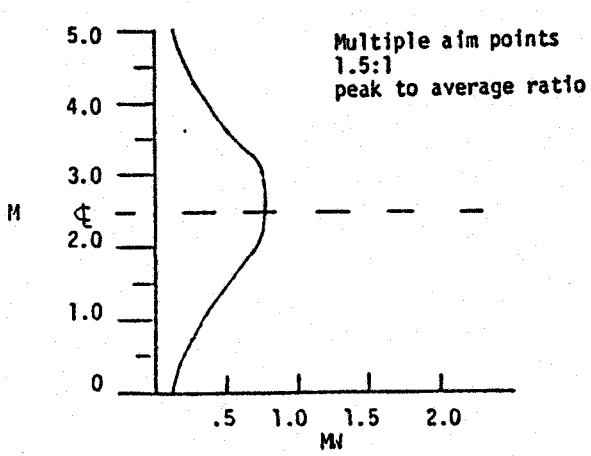
OPERATING CONDITIONS

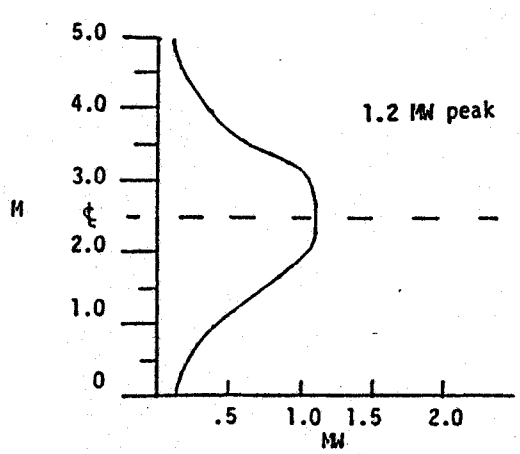
AMBIENT AIR TEMPERATURE
AIR SIDE CONVECTION COEFFICIENT
INCIDENT FLUX
SODIUM INLET TEMPERATURE
SODIUM OUTLET TEMPERATURE
SPECIFIC HEAT OF SODIUM

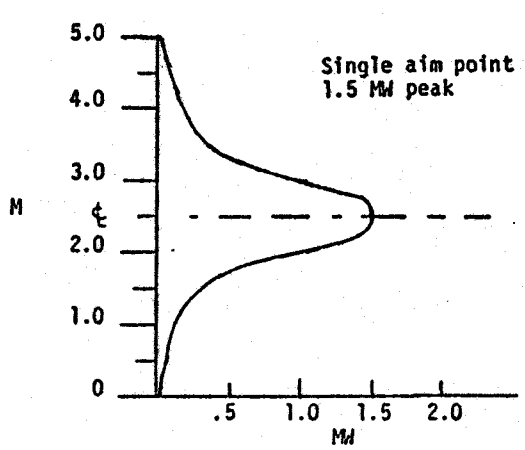
OUTPUT

FLOW
RADIATION LOSS
CONVECTIVE LOSS
REFLECTIVE LOSS
EFFICIENCY
OUTSIDE TUBE TEMPERATURE
SODIUM TEMPERATURE
SODIUM HEAT TRANSFER COEFFICIENT
TUBE CONDUCTANCE
TUBE WALL CONDUCTIVITY
PEAK TUBE TEMPERATURE

FLUX DISTRIBUTIONS







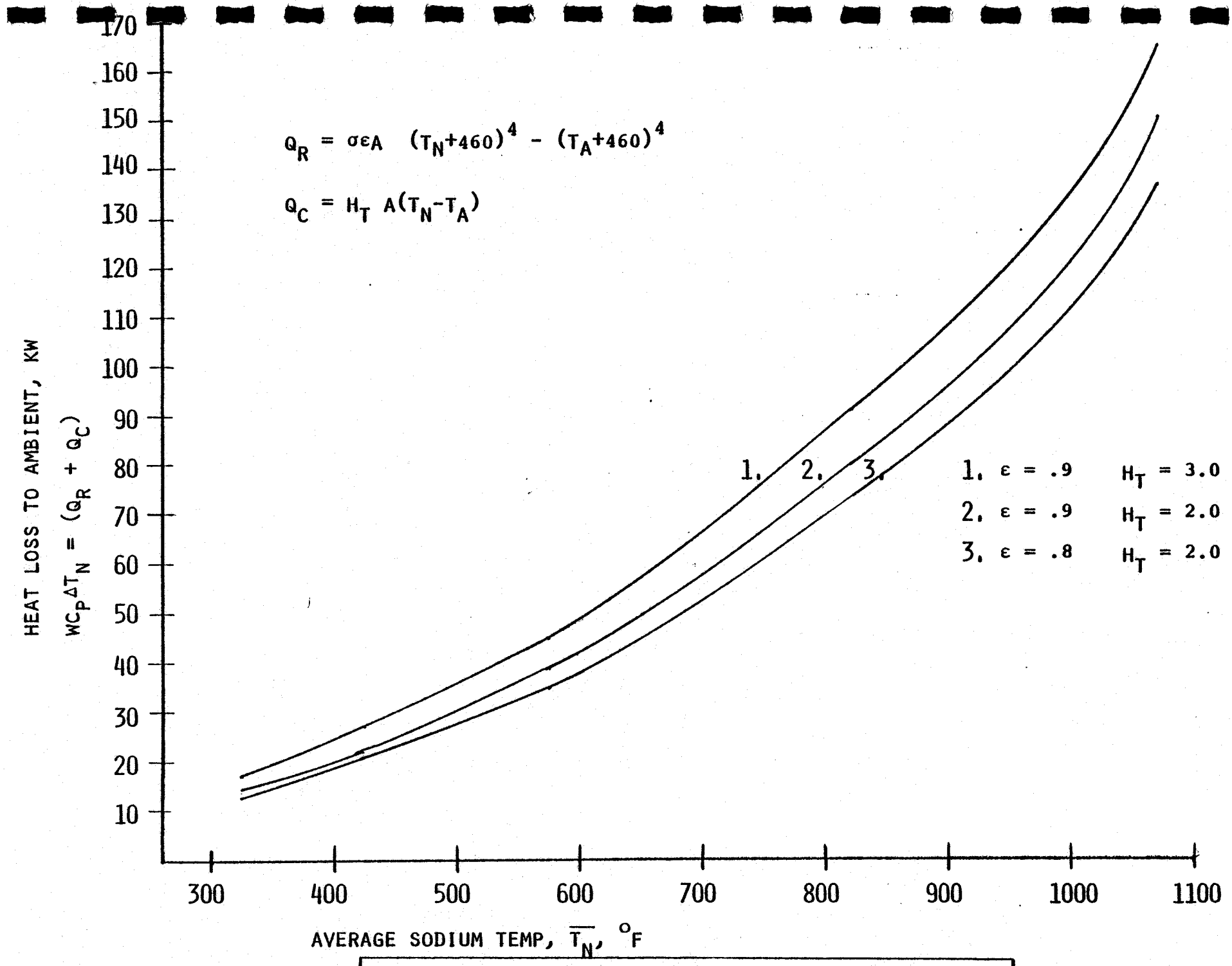
TEST #1 RADIATION AND CONVECTIVE LOSS

TEST CONDITIONS

RUN #	TOTAL TIME	FLUX DISTRIBUTION	FLUX RAMP	% HELIOSTATS	INLET TEMP °F	OUTLET TEMP °F	% FLOW	WIND SPEED	AIR TEMP
1.1	4	0	0	0	350	300	As Rqd.	Note 1	Note 1
1.2	4	0	0	0	450	400	As Rqd.	Note 1	Note 1
1.3	4	0	0	0	600	550	As Rqd.	Note 1	Note 1
1.4	4	0	0	0	850	800	As Rqd.	Note 1	Note 1
1.5	4	0	0	0	1100	1050	As Rqd.	Note 1	Note 1

DATA

RUN #	DATA INTERVAL	FLOW	ΔT	PANEL T/C	STRAIN GUAGE	RTAF	WIND SPEED	AIR TEMP.
1.1	10 min.	20 sec.	20 sec.	20 sec.	NA	NA	20 sec.	20 sec
1.2	"	"	"	"	"	"	"	"
1.3	"	"	"	"	"	"	"	"
1.4	"	"	"	"	"	"	"	"
1.5	"	"	"	"	"	"	"	"



CURVE FIT DETERMINATION OF ε + H_T FOR G.E. RECEIVER

TEST #2 STARTUP/SHUTDOWN AND TRANSIENT CHARACTERIZATION

TEST CONDITIONS

RUN #	TOTAL TIME	FLUX DISTRIBUTION	FLUX RAMP	# HELIOSTATS	INLET TEMP °F	OUTLET TEMP °F	# FLOW	WIND SPEED	AIR TEMP
2.1	6	1	1	0-100-0	600	600-1100-600	Initial 40	Note 2	Note 2
2.2	6	1	1	0-100-0			Initial 30		
2.3	6	1	1	0-100-0			Initial 20		
2.4	6	1	1	0-100-0			Initial 10		
2.5	6	1	2	0-100-0			Initial 40		
2.6	6	1	2	0-100-0			Initial 30		
2.7	6	1	2	0-100-0			Initial 20		
2.8	6	1	2	0-100-0			Initial 10		
2.9	6	1	3	0-100-0			Initial 40		
2.10	6	1	3	0-100-0			Initial 30		
2.11	6	1	3	0-100-0			Initial 20		
2.12	6	1	3	0-100-0		600-1100-600	Initial 10		
2.13	4	1	4	100-0		1100-600	As Rqd.		
2.14	4	1	5	100-0		1100-600	As Rqd.		
2.15	4	1	6	100-0		1100-600	As Rqd.		
2.16	4	1	7	100-50		1100-	As Rqd.		
2.17	4	1	8	100-50		1100-	As Rqd.		
2.18	4	1	9	100-50	600	1100-	As Rqd.	Note 2	Note 2

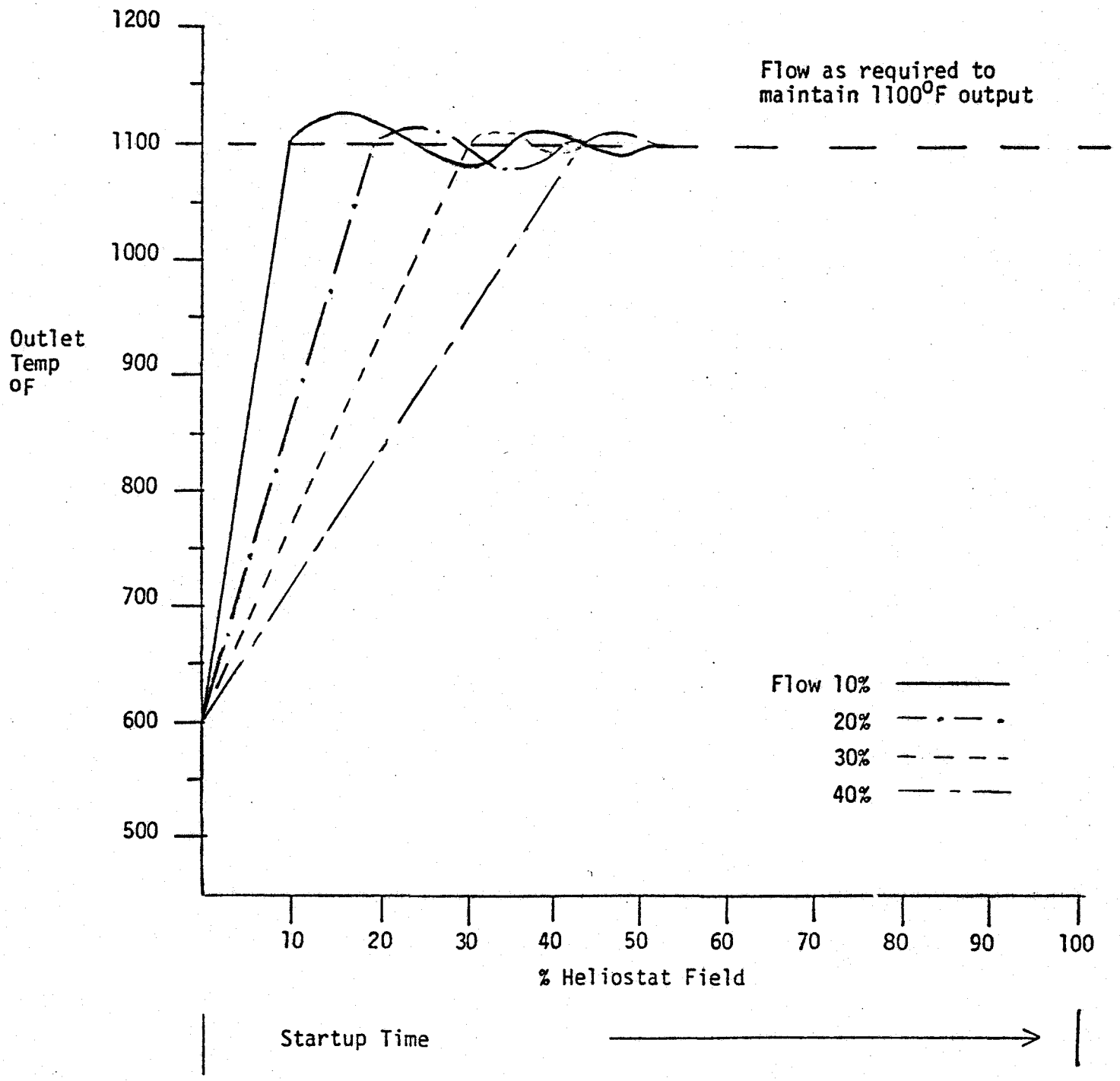
TEST #2 STARTUP/SHUTDOWN AND TRANSIENT CHARACTERIZATION (CONTINUED)

DATA

RUN #	DATA INTERVAL	FLOW	ΔT	PANEL T/C	STRAIN GUAGE	RTAF	WIND SPEED	AIR TEMP
2.1	2 hours	20 sec.	20 sec.	T/C on center & edge tubes and those associated with strain gauges every sec	20 sec.	10 min.	5 min.	5 min
2.2	2 hours							
2.3	2 hours							
2.4	2 hours							
2.5	1½ hours							
2.6	1½ hours							
2.7	1½ hours							
2.8	1½ hours							
2.9	1 hour, 10 min.							
2.10	1 hour, 10 min.							
2.11	1 hour, 10 min.							
2.12	1 hour, 10 min.					10 min.	5 min.	5 min
2.13	3 min.					1 min.	Start & end of data interval	
2.14	3 min.							
2.15	3 min.							
2.16	3 min.			T/C on center & edge tubes and those associated with strain gauges every 20 sec.				
2.17	3 min.							
2.18	3 min.	20 sec.	20 sec.		20 sec.	1 min.	Start & end of data interval	

100% Flow is That Required to Maintain

1100°F at Full Flux



OUTPUT DATA PLOT
TEST #2 RUNS 2.1 THRU 2.12

TEST #3 NORMAL OPERATION

TEST CONDITIONS

RUN #	TOTAL TIME	FLUX DISTRIBUTION	FLUX RAMP	# HELIOSTATS	INLET TEMP °F	OUTLET TEMP °F	# FLOW	WIND SPEED	AIR TEMP
3.1	6 hrs.	1	Note 3	100	600	1100	As Rqd.	Note 2	Note 2
3.2	6 hrs.	1		100					
3.3	6 hrs.	1		100					
3.4	4 hrs.	2		100					
3.5	4 hrs.	2		100					
3.6	4 hrs.	2		100					
3.7	4 hrs.	1		60					
3.8	4 hrs.	1		60					
3.9	4 hrs.	1		20					
3.10	4 hrs.	1	Note 3	20	600	1100	As Rqd.	Note 2	Note 2

DATA

RUN #	DATA INTERVAL	FLOW	ΔT	PANEL T/C	STRAIN GUAGE	RTAF	WIND SPEED	AIR TEMP
3.1	∿ 5 hrs.	20 sec.	12 continuous samples every 20 seconds at 15 minute intervals	15 minutes	15 minutes	12 continuous samples every 20 seconds at 15 min. intervals	15 min.	15 min
3.2	∿ 5 hrs.							
3.3	∿ 5 hrs.							
3.4	∿ 2 hrs.							
3.5	∿ 2 hrs.							
3.6	∿ 2 hrs.							
3.7	∿ 2 hrs.							
3.8	∿ 2 hrs.							
3.9	∿ 2 hrs.							
3.10	∿ 2 hrs.			15 minutes	15 minutes		15 min.	15 min

TEST #4 REFLECTION LOSS

TEST CONDITIONS

RUN #	TOTAL TIME	FLUX DISTRIBUTION	FLUX RAMP	% HELIOSTATS	INLET TEMP °F	OUTLET TEMP °F	% FLOW	WIND SPEED	AIR TEMP
4.1	6 hrs.	3	Note 3	As Rqd.	300	450	As Rqd.	< 10 mph Note 1	Note 1
4.2	6 hrs.	3	Note 3	As Rqd.	300	450	As Rqd.		"
4.3	6 hrs.	3	Note 3	As Rqd.	300	450	As Rqd.		"

DATA

RUN #	DATA INTERVAL	FLOW	ΔT	PANEL T/C	STRAIN GUAGE	RTAP	WIND SPEED	AIR TEMP
4.1	15 minutes	20 seconds	20 seconds	20 seconds	1 minute	3 minutes	20 seconds	20 sec.
4.2	15 minutes	20 seconds	20 seconds	20 seconds	1 minute	3 minutes	20 seconds	20 sec.
4.3	15 minutes	20 seconds	20 seconds	20 seconds	1 minute	3 minutes	20 seconds	20 sec.

TEST #5 HIGH FLUX TEST

TEST CONDITIONS

RUN #	TOTAL TIME	FLUX DISTRIBUTION	FLUX RAMP	# HELIOSTATS	INLET TEMP °F	OUTLET TEMP °F	# FLOW	WIND SPEED	AIR TEMP
5.1	6 hrs.	3	Note 3	As Rqd.	600	1100	As Rqd.	Note 2	Note 2
5.2	6 hrs.	3	Note 3	As Rqd.	600	1100	As Rqd.	Note 2	Note 2
5.3	6 hrs.	3	Note 3	As Rqd.	600	1100	As Rqd.	Note 2	Note 2

DATA

RUN #	DATA INTERVAL	FLOW	ΔT	PANEL T/C	STRAIN GUAGE	RTAF	WIND SPEED	AIR TEMP
5.1	15 minutes	20 seconds	20 seconds	20 seconds	20 seconds	3 minutes	1 min.	1 min.
5.2	15 minutes	20 seconds	20 seconds	20 seconds	20 seconds	3 minutes	1 min.	1 min.
5.3	15 minutes	20 seconds	20 seconds	20 seconds	20 seconds	3 minutes	1 min.	1 min.

AGENDA (CONTINUED)

THURSDAY, FEBRUARY 14, 1980

0800	TEST RECEIVER INSTALLATION & CHECKOUT	J. AMOS
0900	MAINTENANCE & TRAINING	J. AMOS
0930	DECOMMISSIONING & REMOVAL	J. AMOS
0945	PRINCIPAL TESTS	A. CURINGA
1030	BREAK	
1045	PRELIMINARY TEST PLAN	A. CURINGA
1145	CONCLUSIONS	J. ELSNER
1150	ACTION ITEMS	ALL
1200	ADJOURN	

TEST PLAN

1.0 SCOPE

2.0 OBJECTIVES

3.0 ORGANIZATION

4.0 SCHEDULE

5.0 TEST

6.0 DATA SYSTEMS REQUIREMENTS

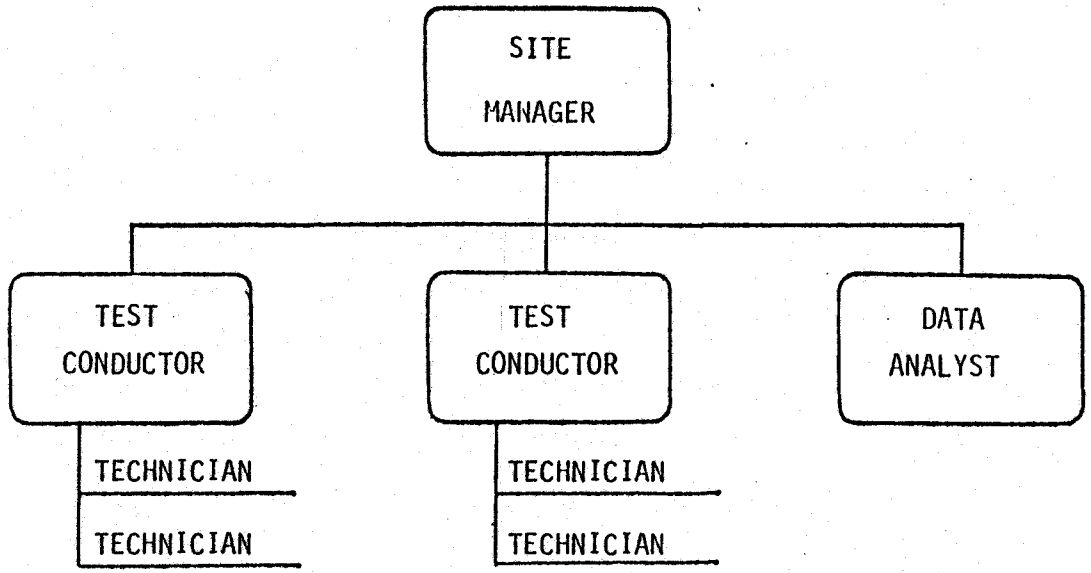
7.0 CRTF SUPPORT

8.0 DEVELOPMENT FOR SPECIFICATION FOR SRTA

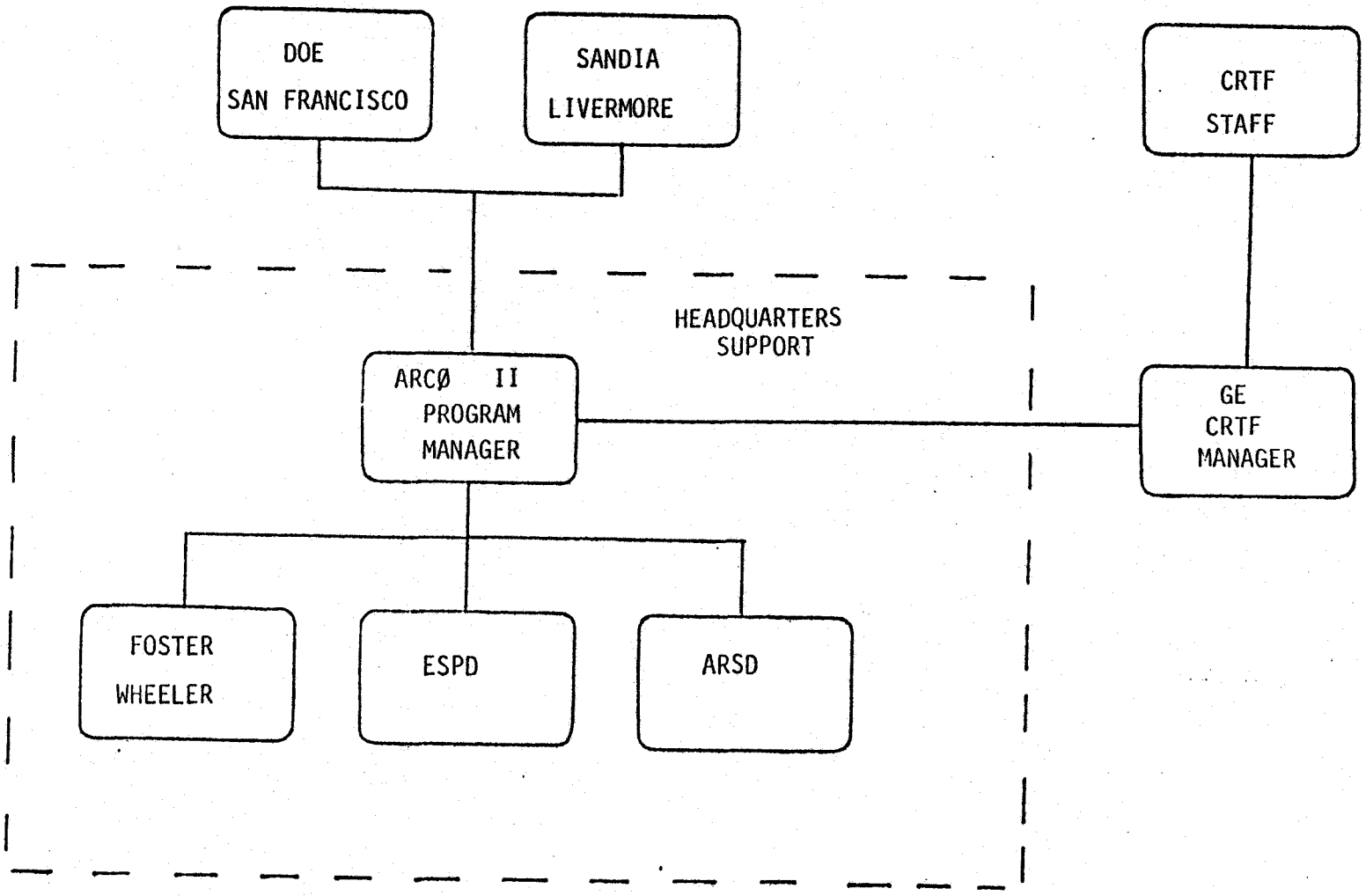
SCOPE

- THE OBJECTIVES OF THE CRTF TESTING.
- THE ORGANIZATIONAL STRUCTURE THE GENERAL ELECTRIC TEST TEAM.
- A SCHEDULE OF THE ON-SITE INSTALLATION, CHECKOUT AND TEST OF THE SRTA.
- TRACEABILITY OF TESTS TO THE SRTA DEVELOPMENT SPECIFICATION.
- A DESCRIPTION OF THE TEST CONDITIONS AND DATA REQUIREMENTS FOR EACH TEST.
- A LISTING OF THE DATA SYSTEM SUPPORT TO BE PROVIDED BY CRTF.
- A LISTING OF SPECIAL TEST EQUIPMENT AND FACILITIES TO BE PROVIDED BY CRTF.

ORGANIZATION - ON-SITE



ORGANIZATION - EXTERNAL INTERFACES



DATA SYSTEMS REQUIREMENTS

DISPLAY FORMATS

- CONTROL CONSOLE
- MONITORS

ON-LINE CONVERSION & ANALYSIS

DATA RECORDING

- HARD COPY
- MAGNETIC TAPE

ALARMS & INTERRUPTS

CRTF SUPPORT

- RTAF
- SOLAR SHIELD INSULATION
- FACILITIES
- DATA SYSTEM
- IRSS

AGENDA (CONTINUED)

THURSDAY, FEBRUARY 14, 1980

0800	TEST RECEIVER INSTALLATION & CHECKOUT	J. AMOS
0900	MAINTENANCE & TRAINING	J. AMOS
0930	DECOMMISSIONING & REMOVAL	J. AMOS
0945	PRINCIPAL TESTS	A. CURINGA
1030	BREAK	
1045	PRELIMINARY TEST PLAN	A. CURINGA
→ 1145	CONCLUSIONS	J. ELSNER
1150	ACTION ITEMS	ALL
1200	ADJOURN	

APPENDIX

DRAWINGS

(1)	Piping and Instrumentation Diagram	908E992
(2)	Sodium Receiver Test Assembly Sheet 1	908E982
(3)	Sodium Receiver Test Assembly Sheet 2	908E982
(4)	Test Facility Tower Layout	908E993
(5)	Test Support Structure Sheet 1	908E983
(6)	Test Support Structure Sheet 2	908E983
(7)	Test Support Structure Sheet 3	908E983
(8)	Test Support Structure Sheet 4	908E983
(9)	Absorber Panel Interface Control Drawing	E-017
(10)	Solar Absorber Test Panel - Details	67-3481-5-30
(11)	Sodium Receiver Test Loop Isometric	909E050
(12)	Surge Tank Inlet Loop	145D6376
(13)	Primary Return Loop	145D6374
(14)	Primary Inlet Loop	145D6373
(15)	Pump Outlet Loop	145D6375
(16)	EM Pump	134D1856
(17)	Sodium Control Valve (Motor Oper.)	179C5264
(18)	Sodium Control Valve (Pneu. Oper.)	179C5262
(19)	Sodium Globe Valve (Manual)	179C5263
(20)	Vapor Trap	179C5261
(21)	4" Cold Trap	145D6361
(22)	Heat Dump Sheet 1	179C5260
(23)	Heat Dump (Coil) Sheet 2	179C5260

DRAWINGS (continued)

(24)	SRTA Instrumentation & Electrical Diagram Sheet 1	909E024
(25)	SRTA Instrumentation & Electrical Diagram Sheet 2	909E024
(26)	SRTA One Line Diagram	145D6359
(27)	SRTA Control Center Sheet 1	909E040
(28)	SRTA Control Center Sheet 2	909E040
(29)	Vertical Flowmeter 3"	134D1875
(30)	Sodium Pressure Element	145D6380

GENERAL ELECTRIC 908E992

TITLE P&ID SODIUM RECEIVER TEST ASSEMBLY

FIRST MADE FOR ACRPS PH II P2797

FCF 387×253

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:— APPLIED PRACTICES 265A4100

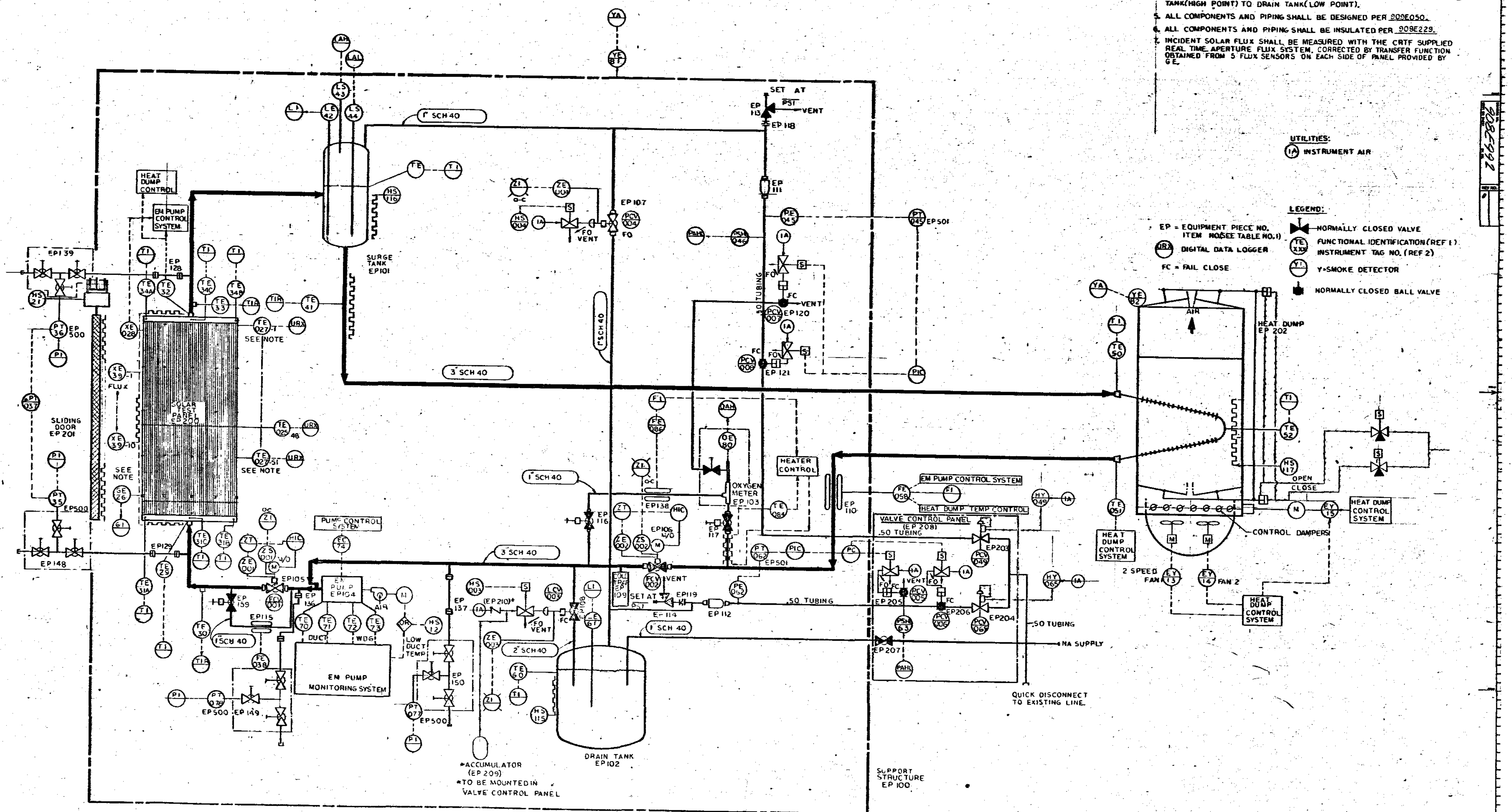
REFERENCE DRAWINGS

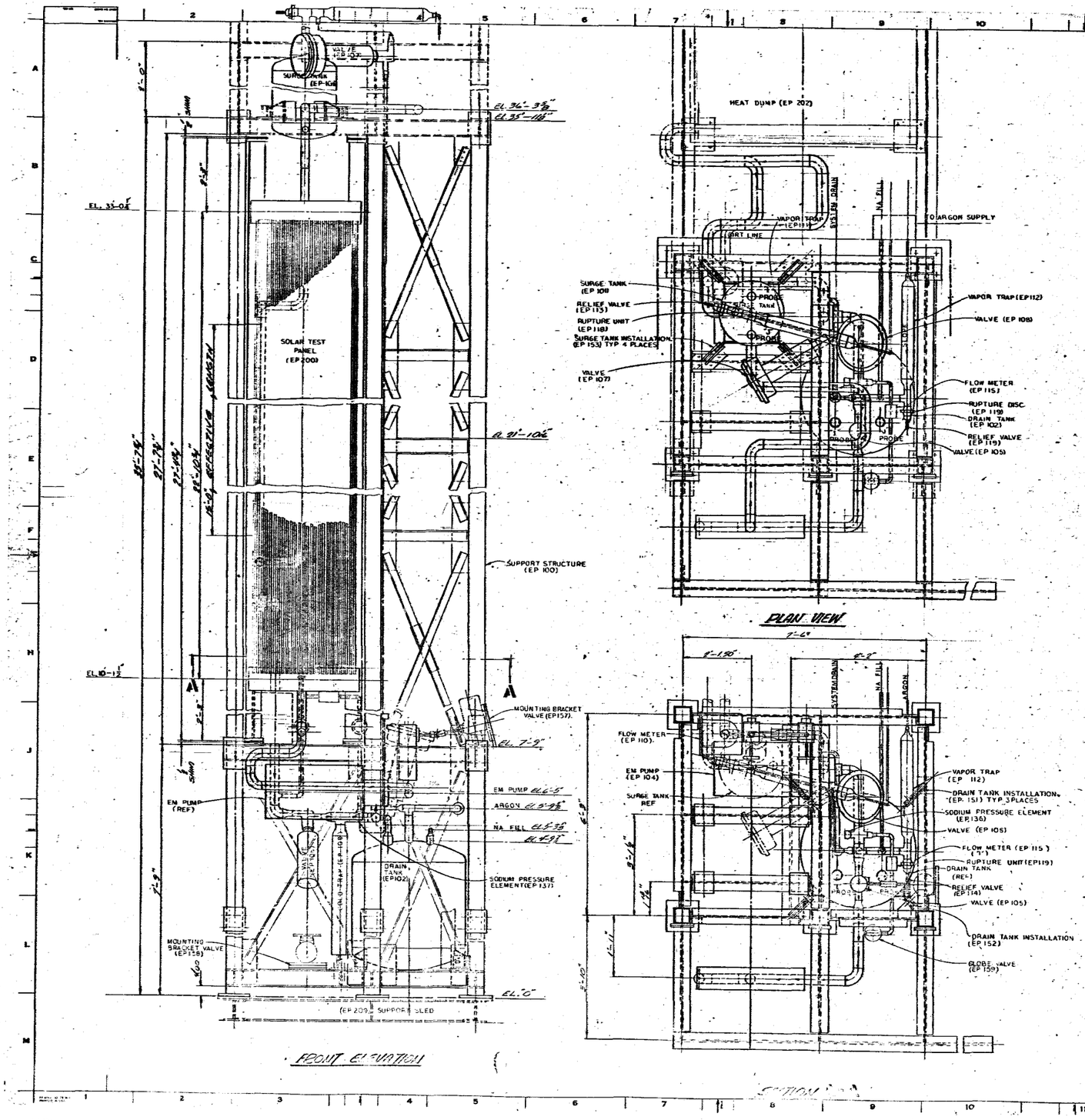
1. PIPING AND INSTRUMENT SYMBOLS - 816E200
2. IED SOLAR PANEL TEST - 909E024

ITEM NO	PARTS LIST
1-399	387 X 253
400 600	387 X 265

NOTES:

1. INSTRUMENTATION SHOWN ON THIS DWG IS SHOWN IN SUMMARY FORM, FOR DETAILS SEE I.E.D (REF SHT 2)
2. ALL SODIUM PIPES AND FITTINGS ARE 316 SS OR 304 SS.
3. ALL PIPING AND COMPONENTS ARE TRACE HEATED PER 908E229.
4. ALL PIPING SLOPED 3° MINIMUM FOR COMPLETE DRAINAGE FROM SURGE TANK (HIGH POINT) TO DRAIN TANK (LOW POINT).
5. ALL COMPONENTS AND PIPING SHALL BE DESIGNED PER 909E050.
6. ALL COMPONENTS AND PIPING SHALL BE INSULATED PER 908E229.
7. INCIDENT SOLAR FLUX SHALL BE MEASURED WITH THE CRTF SUPPLIED REAL TIME APERTURE FLUX SYSTEM, CORRECTED BY TRANSFER FUNCTION OBTAINED FROM 5 FLUX SENSORS ON EACH SIDE OF PANEL PROVIDED BY G.E.





NOTES:

1. ALL SODIUM PIPES AND FITTINGS ARE 316SS OR 304SS
2. ALL PIPING AND COMPONENTS ARE TRACE HEATED PER 908E229.
3. ALL PIPING SLOPED 3% MINIMUM FOR COMPLETE DRAINAGE FROM SURGE TANK (HIGH POINT) TO DRAIN TANK (LOW POINT).
5. ALL COMPONENTS AND PIPING SHALL BE DESIGNED PER 909E050.
6. ALL COMPONENTS AND PIPING SHALL BE INSULATED PER 908E229.

REFERENCE DRGS

SODIUM RECEIVER TEST ASSEMBLY P&ID	908E992
TEST SUPPORT STRUCTURE - STRUCTURAL	908E983
TEST SUPPORT STRUCTURE FRAMING	908E984
TEST FACILITY TOWER - LAYOUT	908E993
SODIUM RECEIVER TEST LOOP	909E050

REFERENCE PARTS LIST FOR COMPONENTS IN STRUCTURE

E.P. NO	DESCRIPTION	DRWG. NO.
100	SUPPORT STRUCTURE	908E983
101	SURGE TANK	908E999
102	DRAIN TANK	134D1931
103	ELECTRO CHEMICAL OXYGEN METER	GE MODEL NO.18 EMEI1A01X
104	EM PUMP	134D1856
105	VALVE (2") MOTOR OPERATED	179C5264 PT 2
106	VALVE (2") MOTOR OPERATED	179C5262 PT 1
107	VALVE (2")	179C5262 PT 1
108	VALVE (2")	179C5264 PT 2
109	COLD TRAP	145D6361
110	FLOW METER (3" VERTICAL)	134D1875
111	VAPOR TRAP	179C5261
112	VAPOR TRAP	112C2427
113	VALVE RELIEF	PI-789-1 CIRCLE SEAL
114	VALVE RELIEF	PI-789-1 CIRCLE SEAL
115	FLOW METER (1")	LATER
116	GLOBE VALVE (2" MANNUAL)	179C5263 PT
117	GLOBE VALVE (2" MANNUAL)	179C5263 PT
118	RUPTURE UNIT	179C5259
119	RUPTURE UNIT	179C5259
120	BALL VALVE WORCHESTER CONTROLS	B36SHM224DS MARK III PNEUMATIC 2.5-416 NSWO ACTUATOR
121	BALL VALVE WORCHESTER CONTROLS	B36SHM224DS MARK III PNEUMATIC 150-416 NSWO ACTUATOR
★122	PRIMARY RETURN LOOP	145D6374 G1
★123	" " " " " "	" " " 62
★124	" " " " " "	" " " 63
★125	PRIMARY INLET LOOP	145D6373 G1
★126	" " " "	" " " 62
★127	" " " "	" " " 63
128	SODIUM PRESSURE ELEMENT	145D6380
129	SODIUM PRESSURE ELEMENT	145D6380
★130	PRIMARY INLET LOOP	145D6373 G4
★131	" " "	" " " 65
★132	" " "	" " " 66
★133	" " "	" " " 67
★134	" " "	" " " 68
★135	PRIMARY INLET LOOP	145D6373 G9
136	SODIUM PRESSURE ELEMENT	145D6380
137	SODIUM PRESSURE ELEMENT	145D6380
138	FLOW METER (1")	LATER
139	VALVE PANEL	134D1932G1
★140	PUMP OUTLET LOOP	145D6375 G1
★141	" " "	" " " 62
★142	" " "	" " " 63
★143	PUMP OUTLET LOOP	145D6375 G4
★144	SURGE TANK INLET LOOP	145D6375 G1
★145	" " " "	" " " 62
★146	" " " "	" " " 63
★147	SURGE TANK INLET LOOP	145D6375 G4
148	VALVE PANEL	134D1932G1
149	VALVE PANEL	134D1932G1
150	VALVE PANEL	134D1932 G1

★ SEE SODIUM RECEIVER TEST LOOP 909E050 (ISOMETRIC)

GENERAL ELECTRIC — 908E992 — SODIUM RECEIVER TEST ASSEMBLY — APPLIED ENGINEERING 7534100

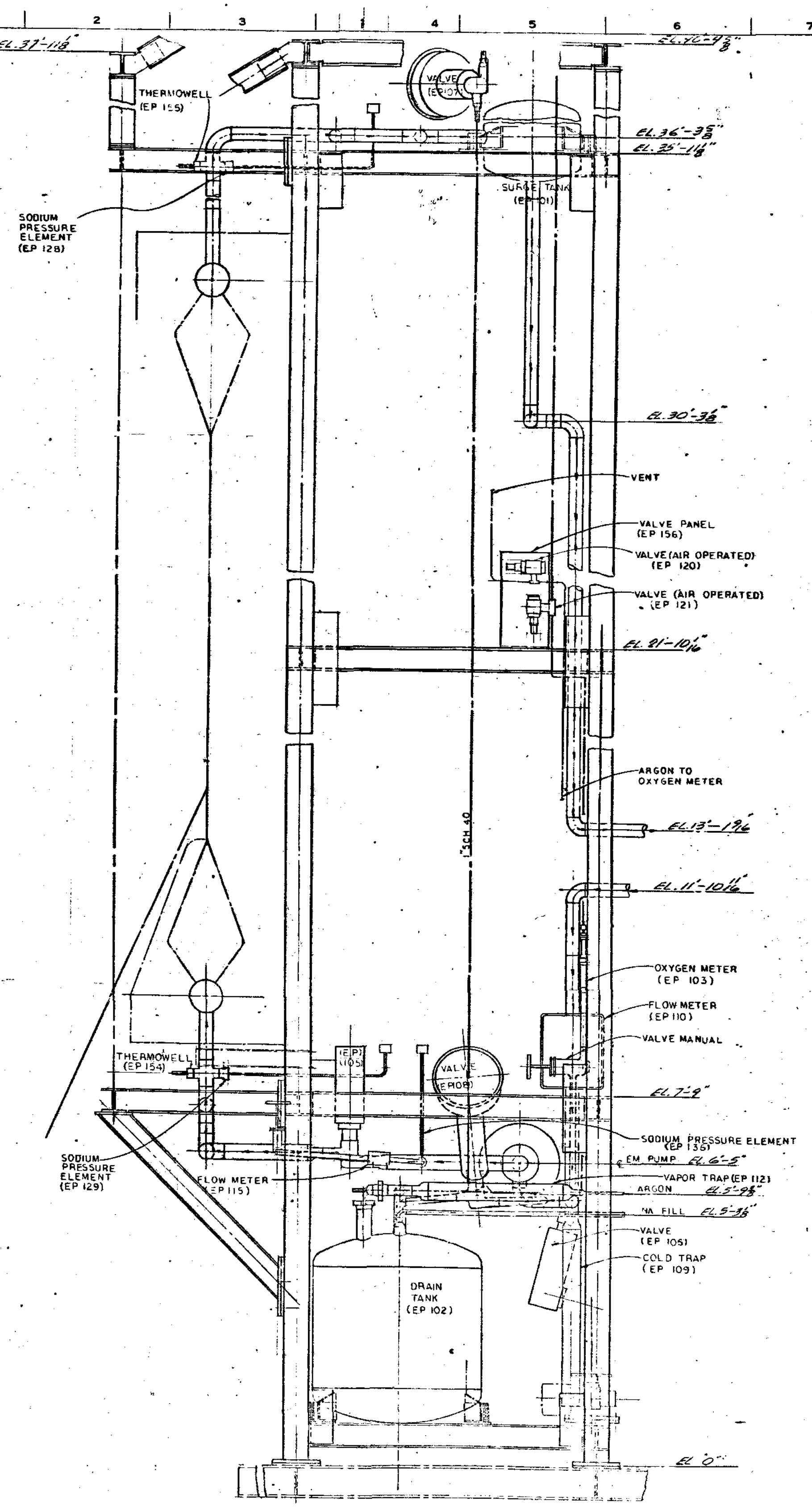
GENERAL ELECTRIC

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:–

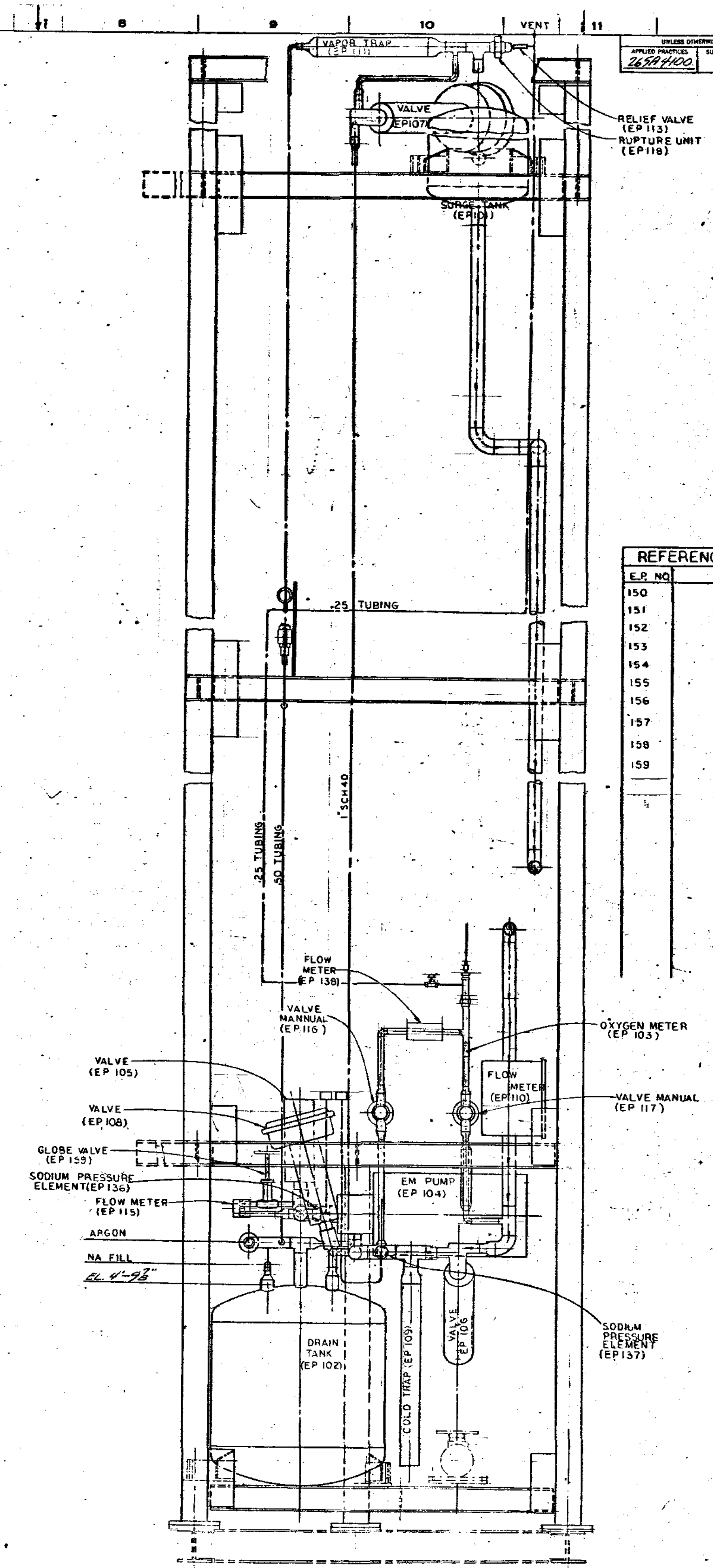
APPLIED PRACTICES	SURFACES
265A4100	✓

TITLE SODIUM RECEIVER TEST ASSEMBLY

FIRST MADE FOR ALRPS PH II



SIDE ELEVATION



REAR ELEVATION

REFERENCE PARTS LIST FOR COMPONENTS IN STRUCTURE

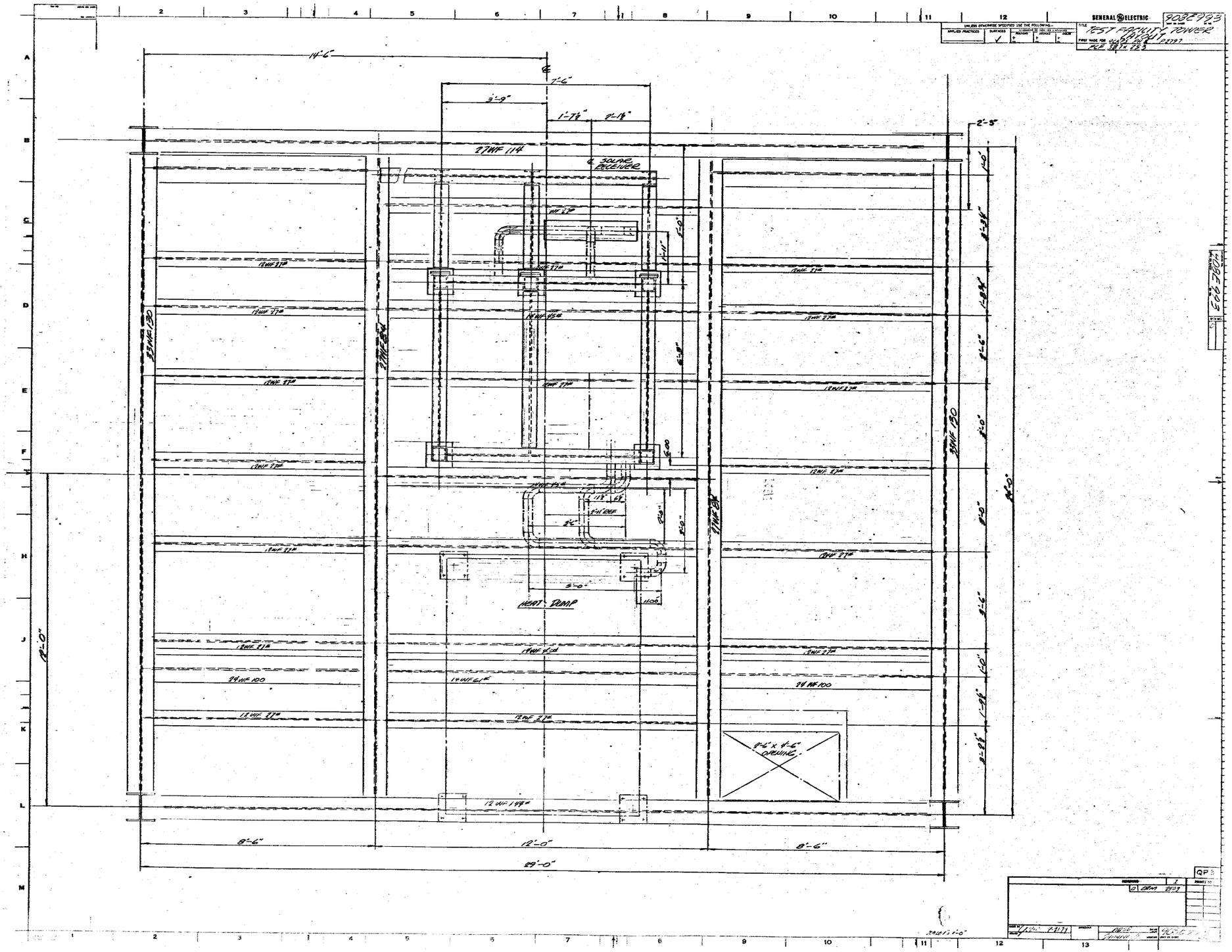
E.P. NO	DESCRIPTION	DRWG NO.
150	VALVE PANEL	134D1932 G1
151	DRAIN TANK INSTALLATION	145D6381 G1
152	" " "	145D6381 G2
153	SURGE TANK INSTALLATION	145D6361 G1
154	THERMOWELL	179C5377
155	THERMOWELL	179C5377
156	VALVE PANEL-MOUNTING	179C5378
157	MOUNTING BRACKET-VALVE	179C5379
158	MOUNTING BRACKET-VALVE	179C5380
159	GLOBE VALVE-BELLOWS SEALED (1)	1804-18-BS (TYPE 304) ALLOY STEEL PRODUCTS

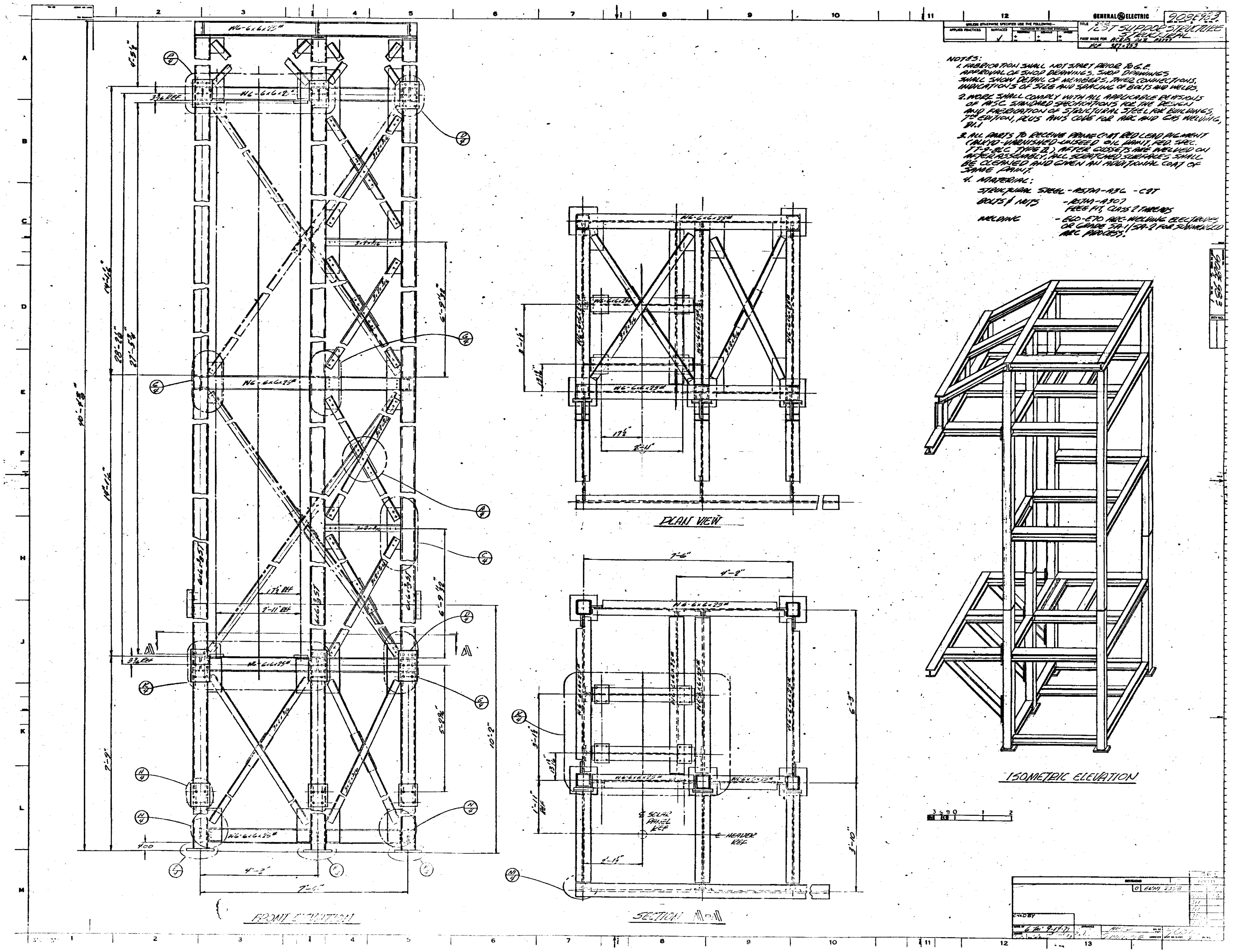
REVISIONS

FOR NOTES & REVISION SEE SHEET 1

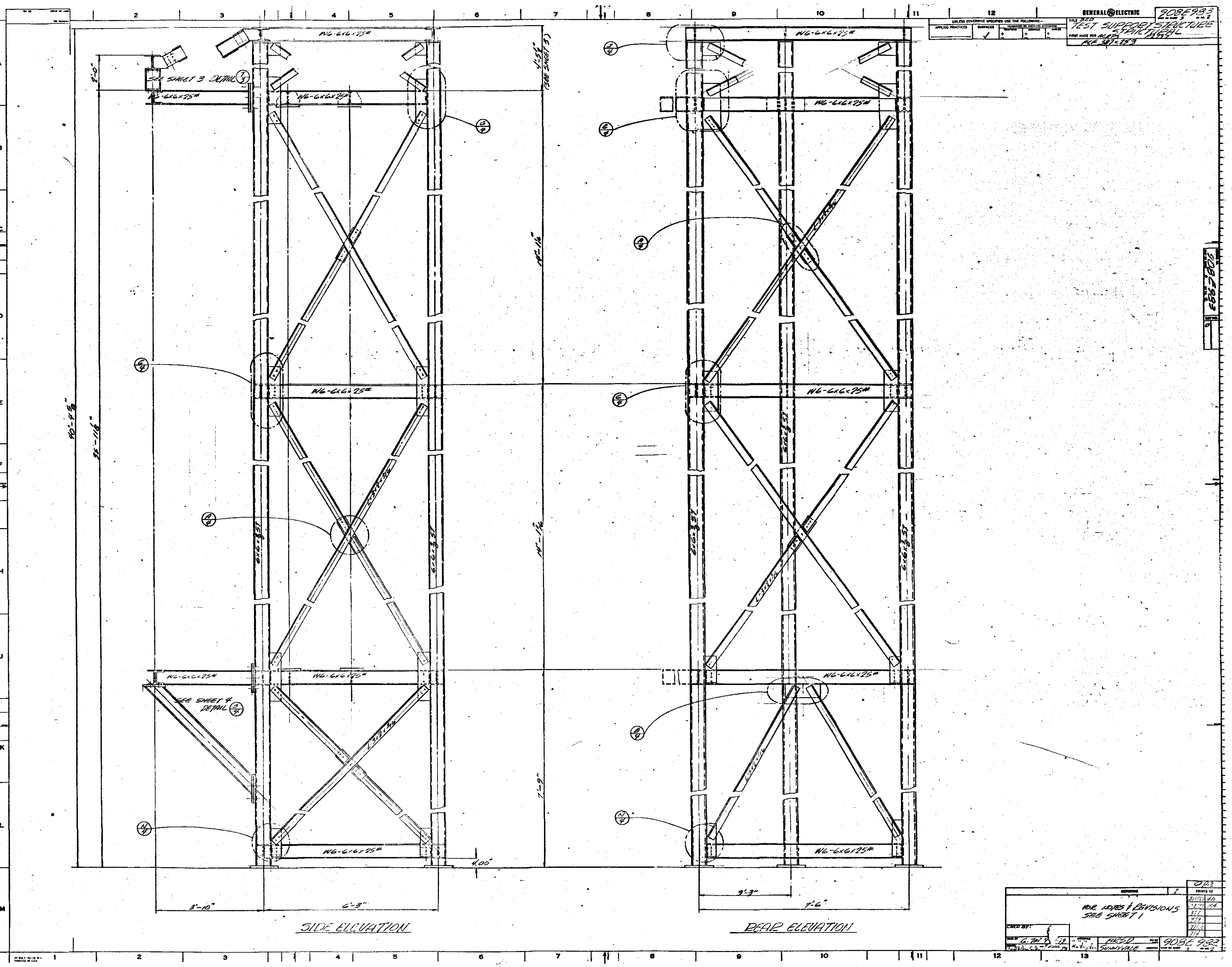
GENERAL ELECTRIC

TEST FACILITY LAYOUT POWER

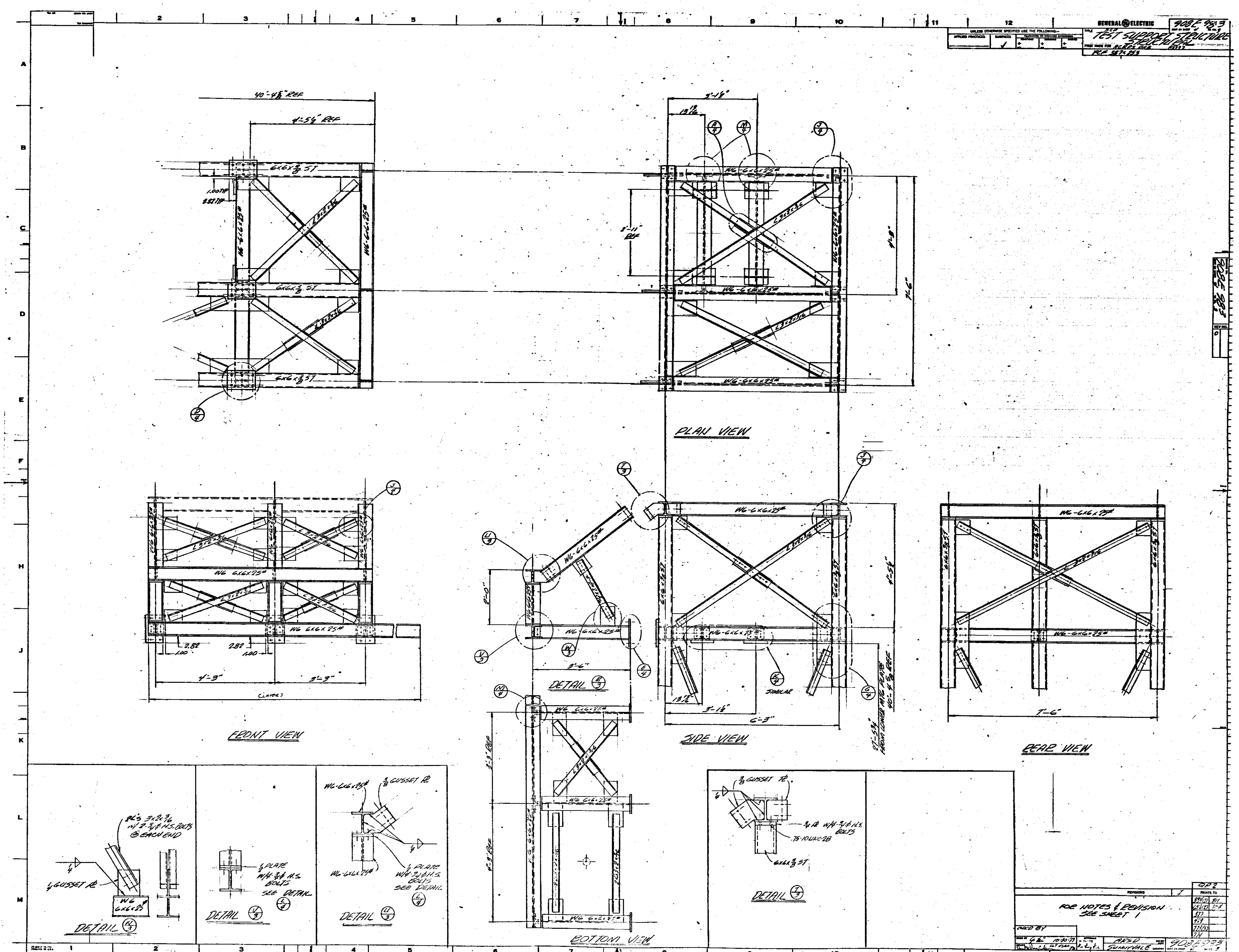


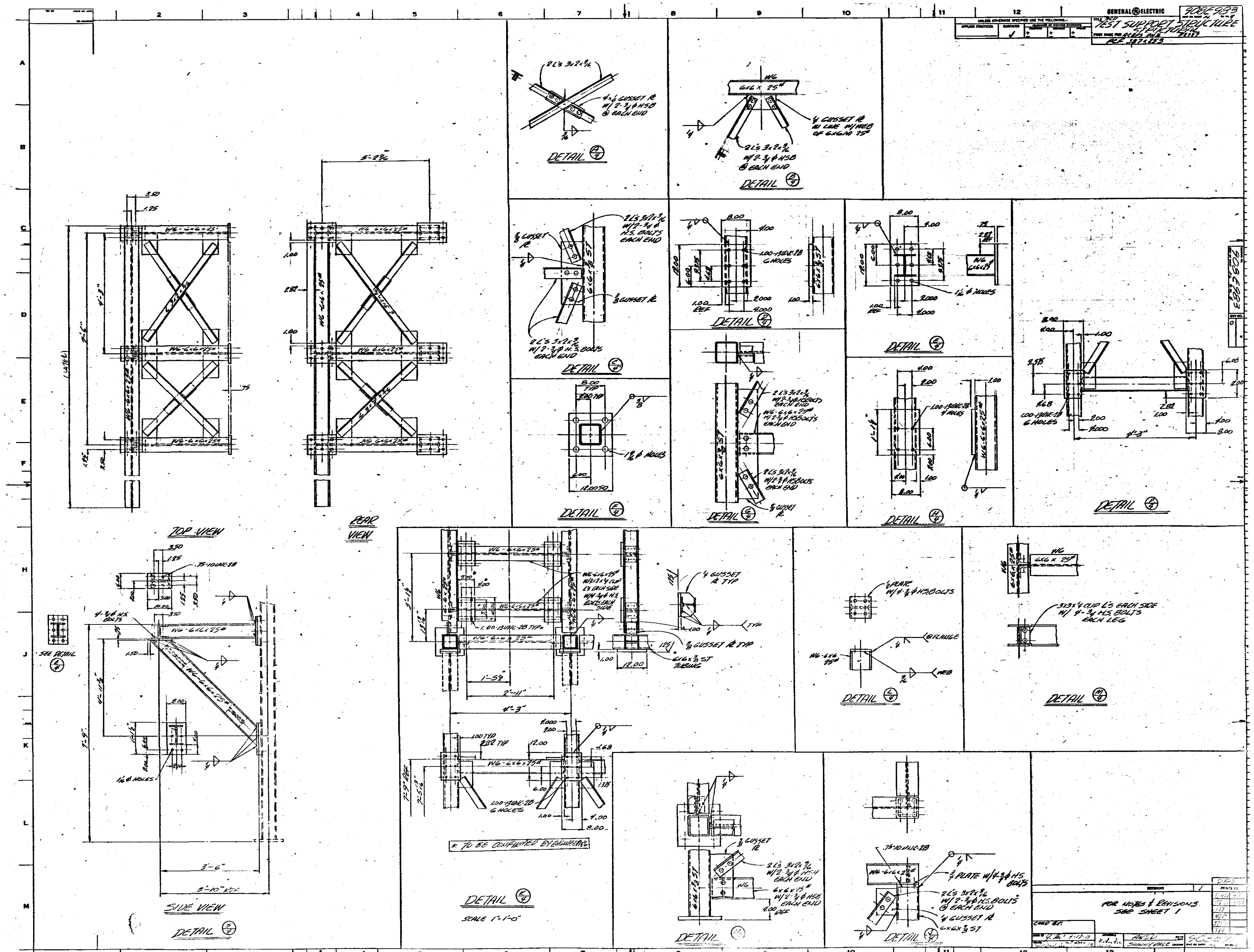

GENERAL ELECTRIC
908E983
TITLE TEST SUPPORT STRUCTURE STRUCTURAL
FIRST MADE FOR ACRS PH II
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—
APPLIED PRACTICES
SURFACES
NOTES:
1. FABRICATION SHALL NOT START PRIOR TO G.E. APPROVAL OF SHOP DRAWINGS. SHOP DRAWINGS SHALL SHOW DETAIL OF MEMBERS, THIER CONNECTIONS, INDICATIONS OF SIZE AND SPACING OF BOLTS AND WELDS.
2. WORK SHALL COMPLY WITH ALL APPLICABLE REVISIONS OF AISC STANDARD SPECIFICATIONS FOR THE DESIGN AND FABRICATION OF STRUCTURAL STEEL FOR BUILDINGS, 7TH EDITION, PLUS AWS CODE FOR ARC AND GAS WELDING, D1.1
3. ALL PARTS TO RECEIVE PRIME COAT RED LEAD PIGMENT (ALKYD-VARNISHED-LINSEED OIL PAINT, FED. SPEC. TT-P-86C TYPE II), AFTER GUSSETS ARE WELDED ON AFTER ASSEMBLY, ALL SCRATCHED SURFACES SHALL BE CLEANED AND GIVEN AN ADDITIONAL COAT OF SAME PAINT.
4. MATERIAL:
STRUCTURAL STEEL - ASTM-A36 - C&T
BOLTS & NUTS - ASTM-A307 FREE FIT, CLASS 2 THREADS
WELDING - E60-E70 ARC-WELDING ELECTRODES OR GRADE SA-1/SA-2 FOR SUBMERGED ARC PROCESS.
FRONT ELEVATION
PLAN VIEW
SECTION A-A
ISOMETRIC ELEVATION
W6-6x6x25#
40'-4 3/4"
28'-8 1/2"
27'-5 3/4"
14'-1 1/2"
7'-9"
10'-2"
6'-9 1/2"
7'-6"
4'-3"
4'-8"
6'-3"
3'-10"

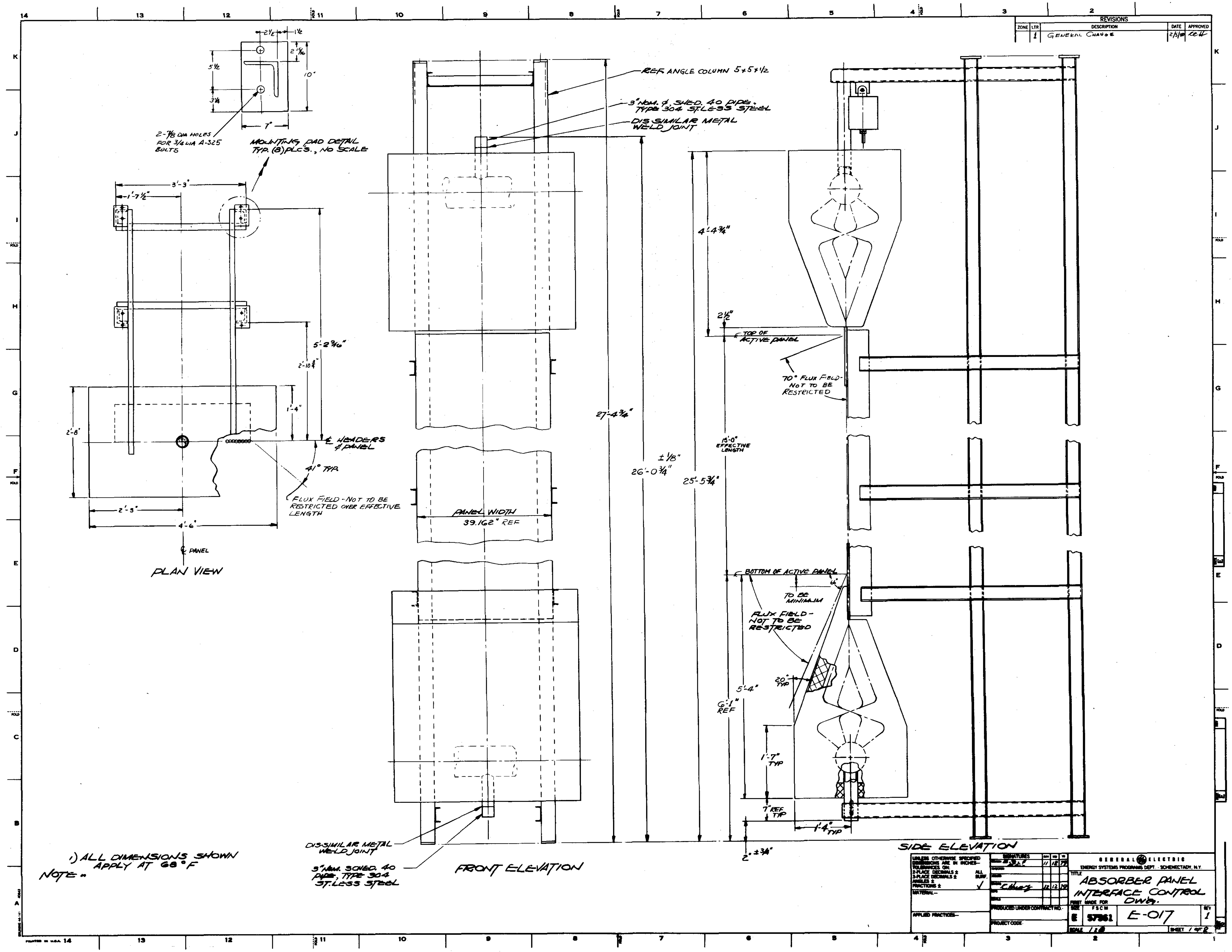
5


GENERAL ELECTRIC
908E983
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—
APPLIED PRACTICES
SURFACES
TITLE
TEST SUPPORT STRUCTURE
STRUCTURAL
FIRST MADE FOR
W6-6x6x25#
W6-6x6x25#
SEE SHEET 3 DETAIL
SIDE ELEVATION
REAR ELEVATION
3'-10"
6'-3"
3'-3"
7'-6"
40'-9 5/8"
35'-11 1/8"
4.00"
REVISIONS
FOR NOTES & REVISIONS SEE SHEET 1
CHKD BY:
PRINTS TO
ARSD
SUNNYVALE
908E983

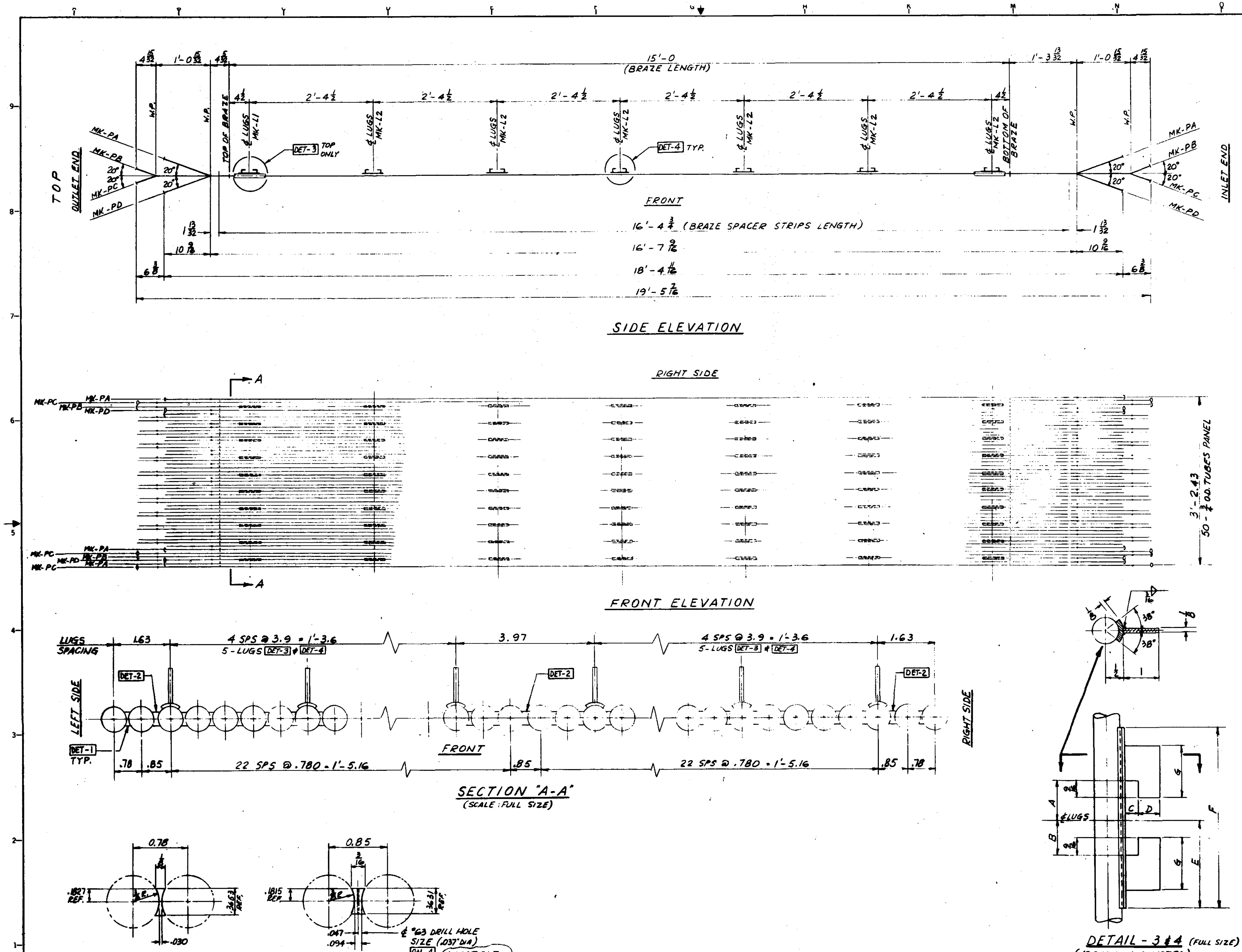
6


GENERAL ELECTRIC
908E 983
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—
APPLIED PRACTICES
SURFACES
TITLE
TEST SUPPORT STRUCTURE
STRUCTURAL
FIRST MADE FOR
PLAN VIEW
FRONT VIEW
SIDE VIEW
REAR VIEW
BOTTOM VIEW
W6-6x6x25#
6x6x3/8 57
40'-4 5/8" REF
4'-5 3/4" REF
4'-9"
7'-6"
4'-5 3/4"
4'-3"
5'-3"
6'-3"
SIMILAR
1/4 GUSSET PL
3/8 GUSSET PL
1/2 PLATE W/4-3/4 H.S. BOLTS SEE DETAIL
1/4 PLATE W/4-3/4 H.S. BOLTS SEE DETAIL
DETAIL
FOR NOTES & REVISION SEE SHEET 1
SUNNYVALE
1


GENERAL ELECTRIC
TEST SUPPORT STRUCTURE
TOP VIEW
REAR VIEW
SIDE VIEW
DETAIL
* TO BE CONFIRMED BY ENGINEERING
SCALE 1"=1'-0"
FOR NOTES & REVISIONS SEE SHEET 1


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
1 | GENERAL CHANGE
2-7/8 DIA HOLES FOR 3/4 DIA A-325 BOLTS
MOUNTING PAD DETAIL TYP. (8) PLC'S., NO SCALE
PLAN VIEW
¢ HEADERS & PANEL
41° TYP.
FLUX FIELD - NOT TO BE RESTRICTED OVER EFFECTIVE LENGTH
¢ PANEL
REF. ANGLE COLUMN 5×5×1/2
3" NOM. ø, SHED. 40 PIPE. TYPE 304 STLESS STEEL
DISSIMILAR METAL WELD JOINT
PANEL WIDTH 39.162" REF
FRONT ELEVATION
DISSIMILAR METAL WELD JOINT
3" NOM. SCHED. 40 PIPE, TYPE 304 ST. LESS STEEL
27'-4 3/4"
26'-0 3/4"
±1/8"
25'-5 3/4"
15'-0" EFFECTIVE LENGTH
4'-4 3/4"
TOP OF ACTIVE PANEL
70° FLUX FIELD - NOT TO BE RESTRICTED
BOTTOM OF ACTIVE PANEL
TO BE MINIMUM
FLUX FIELD - NOT TO BE RESTRICTED
20° TYP
5'-4"
6'-1" REF
1'-7" TYP
7" REF TYP
1'-4" TYP
2" ±3/4"
SIDE ELEVATION
1) ALL DIMENSIONS SHOWN APPLY AT 68°F
NOTE:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES—
TOLERANCES ON:
2-PLACE DECIMALS ±
3-PLACE DECIMALS ±
ANGLES ±
FRACTIONS ±
ALL SURF.
MATERIAL—
APPLIED PRACTICES—
SIGNATURES
PRODUCED UNDER CONTRACT NO.
PROJECT CODE
GENERAL ELECTRIC
ENERGY SYSTEMS PROGRAMS DEPT. · SCHENECTADY, N.Y.
TITLE ABSORBER PANEL INTERFACE CONTROL DWG.
FIRST MADE FOR
SIZE E
FSCM 57961
E-017
REV 1
SCALE
SHEET 1 OF 2

9



TABULATION OF LUG DATAS

MK-	NO. REQ'D	DETAIL-	A	B	C	D	E	F	G	
L1	10	3	2	2 1/8	1/2	1/2	5 1/8	10 1/8	3	
L2	60	4	1 1/8	1	3/8	5/8	2 1/4	5 1/8	1 1/2	

NOTES

1. DO NOT SCALE THIS DRAWING. USE FIGURE DIMENSIONS ONLY.
2. ABBREVIATIONS USED ON THIS DRAWING ARE IN ACCORDANCE WITH AMERICAN STANDARD "ABBREVIATIONS FOR USE ON DRAWINGS".
3. ALL MATERIALS TO BE INCOLOY 800 UNLESS OTHERWISE NOTED.
4. BRAZER MUST KEEP HOLES OPEN BY PLUGGING OR OTHER MEANS.

REV	DATE	DR INIT	DESCRIPTION

REVISIONS

SOLAR ABSORBER TEST PANEL

PANEL DETAILS

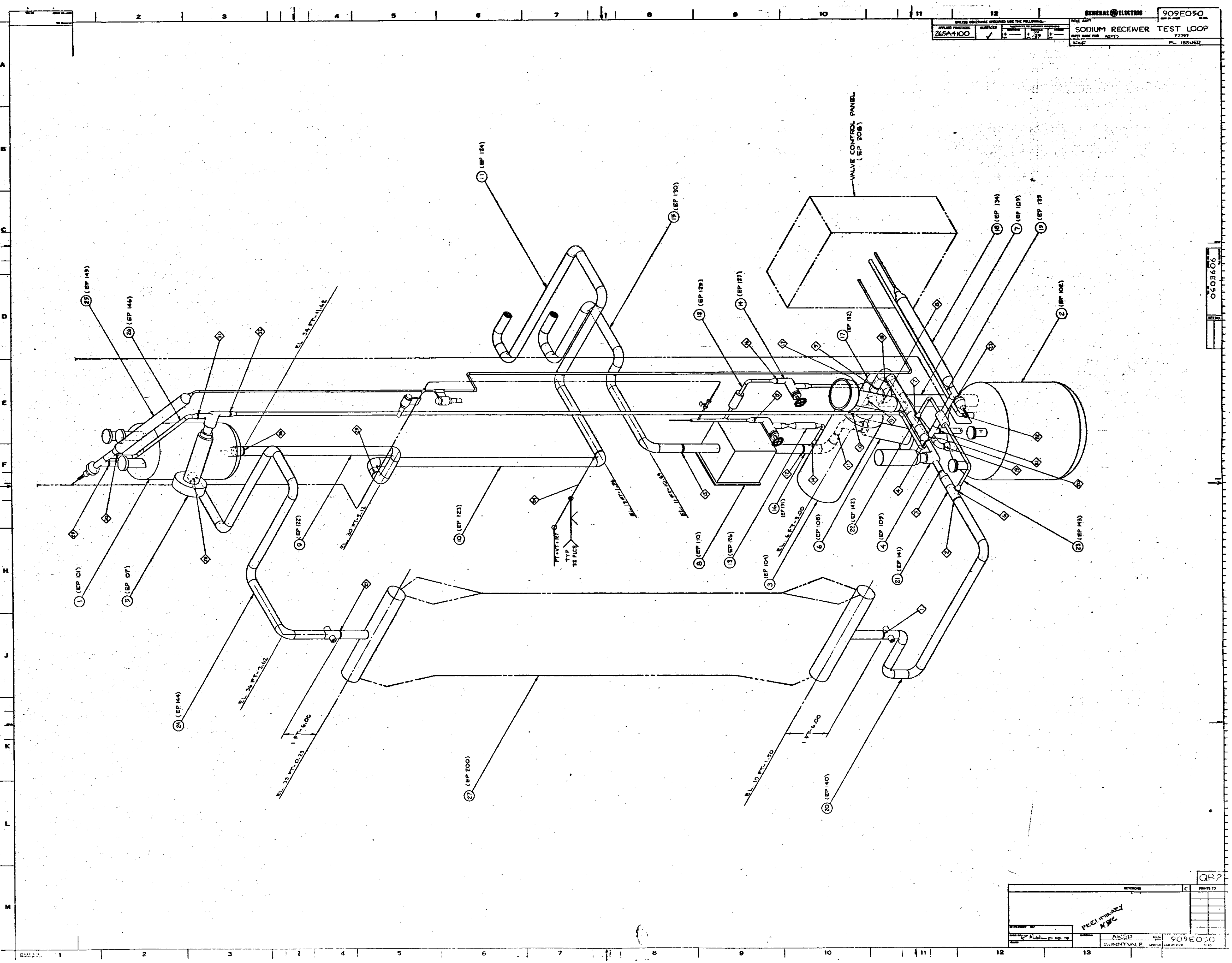
PRELIMINARY 2/5/80

DRAWING NUMBER: 67-3581-5-30 — SCALE 1½" = 1'-0" — REVISION

DRAWN BY: ZLK 2-1-80 CONT. NO. 867-3581

CHECKED BY:

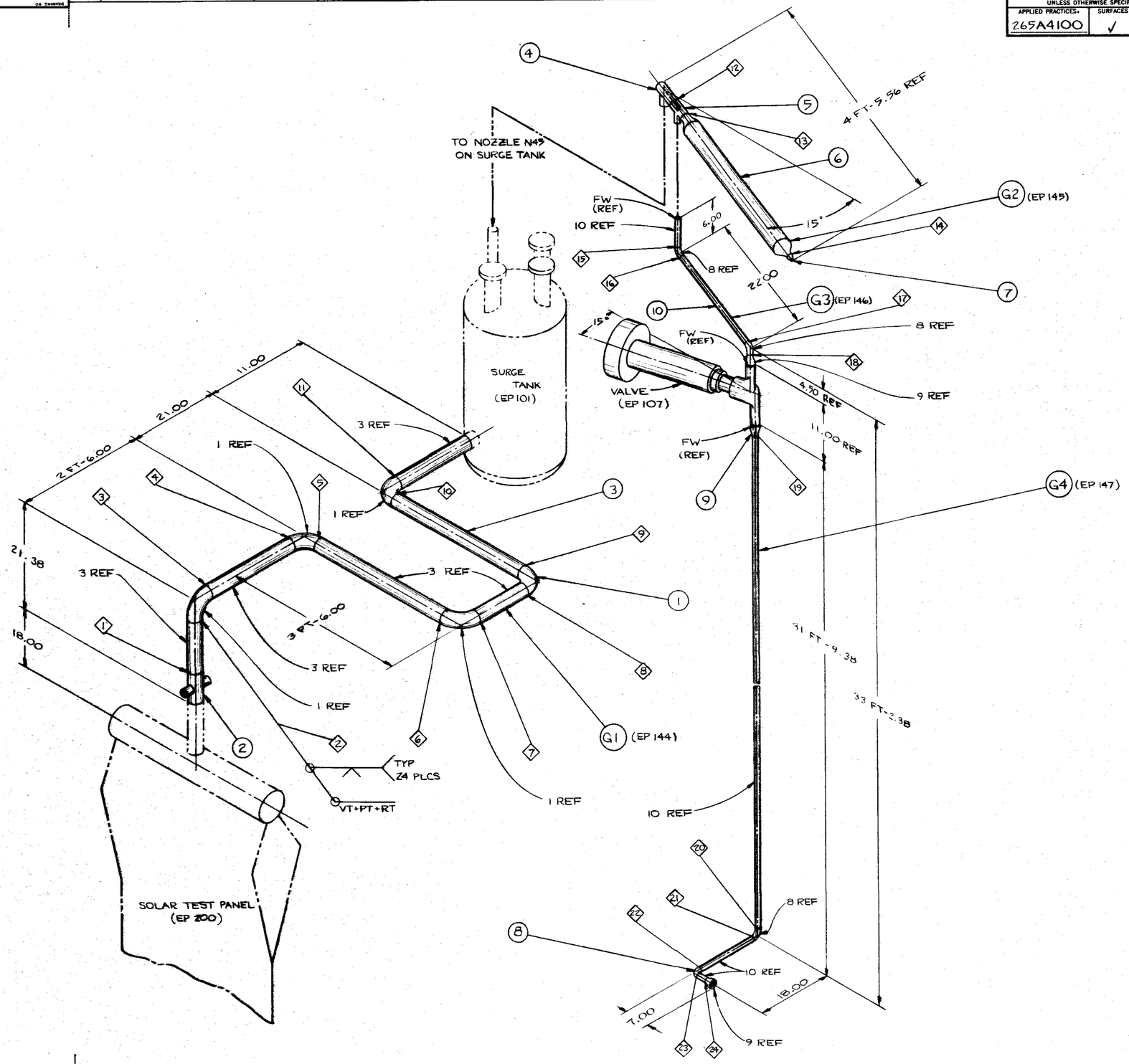
APPROVED BY:


GENERAL ELECTRIC
909E050
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—
APPLIED PRACTICES
265A4100
SURFACES
TITLE ASM
SODIUM RECEIVER TEST LOOP
FIRST MADE FOR ACRPS
PZ797
PL ISSUED
VALVE CONTROL PANEL
(EP 208)
REVISIONS
PRINTS TO
QP-2
PRELIMINARY
CHECKED BY
ARSD
SUNNYVALE
909E050

GENERAL ELECTRIC

145D6376 CONT ON SHEET SH NO.

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—					REV NO.	TITLE
APPLIED PRACTICES: 265A4100	SURFACES: ✓	TOLERANCES ON MACHINED DIMENSIONS: FRACTIONS ± —; DECIMALS ± .25; ANGLES ± 2°			145D6376 CONT ON SHEET SH NO.	SURGE TANK INLET LOOP
						FIRST MADE FOR ACEPS P2797
						REF PL ISSUED



NOTES:

1. FABRICATE PER G.E. SPEC.
2. ◇ IDENTIFIES WELD NUMBERS FOR TRACEABILITY OF QUALITY CONTROL RECORDS. ALL NONDESTRUCTIVE EXAMINATIONS TO BE REFERENCED TO DRAWING AND WELD NUMBERS.
3. NONDESTRUCTIVE EXAMINATION SHALL BE PERFORMED IN ACCORDANCE WITH PARAGRAPH 136.4 OF ANSI B31.1.
4. ALL PARTS CLEANED IN ACCORDANCE WITH 22A3515.

QP-2

REVISIONS	C	PRINTS TO
PRELIMINARY ABCD		

DRAWN BY	APPROVALS	DIV OR DEPT	145D6376
ISSUED E Mokle 23 JAN 80		ARSD SUNNYVALE LOCATION	CONT ON SHEET SH NO.

77-602 F 10-76 PRINTED IN U.S.A.

12

GENERAL ELECTRIC

145D6374

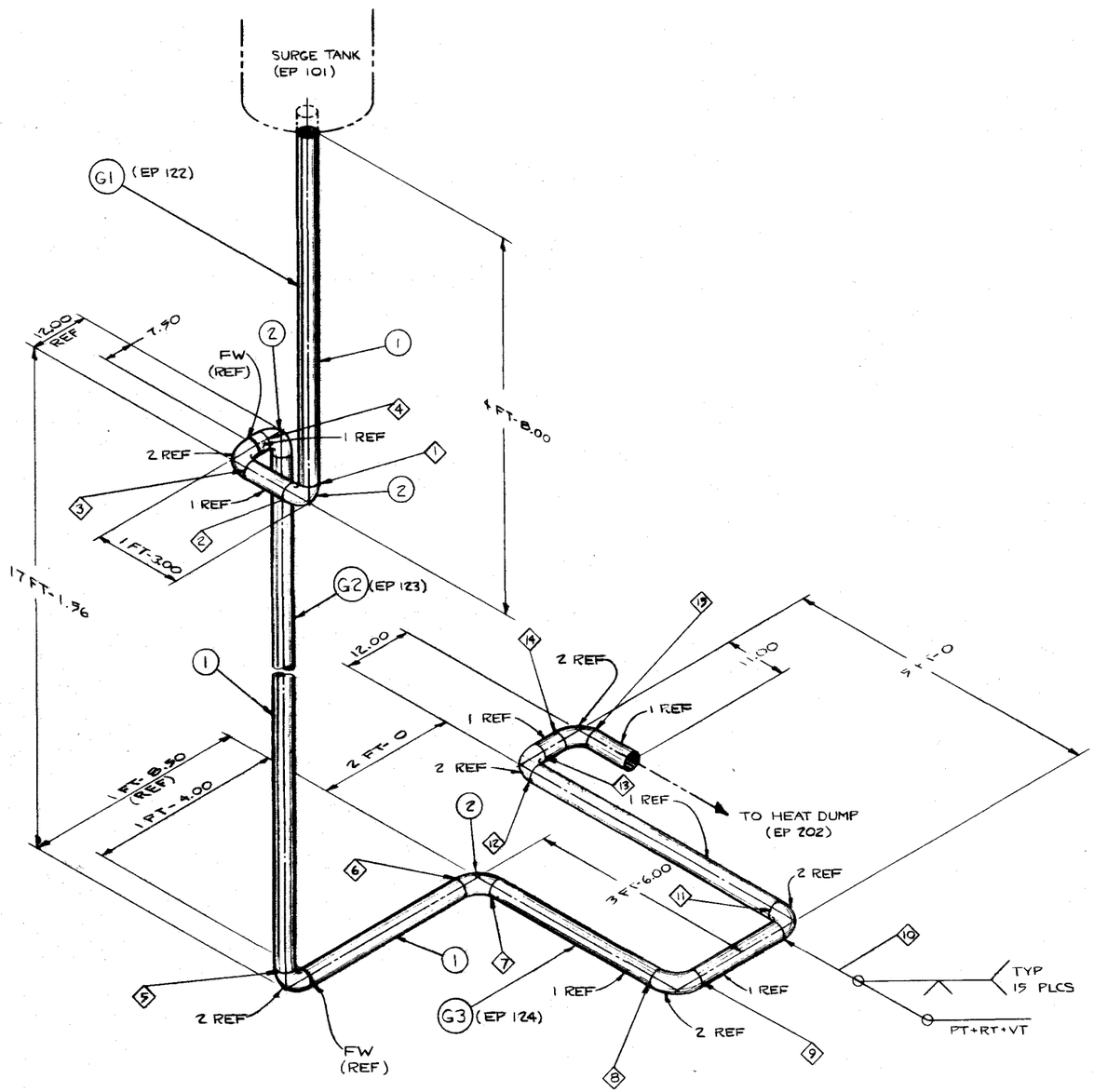
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—
APPLIED PRACTICES: 26ŸA4100 | SURFACES: ✓ | TOLERANCES ON MACHINED DIMENSIONS: FRACTIONS ± —— | DECIMALS ± .25 | ANGLES ± ——

145D6374

TITLE: PRIMARY RETURN LOOP
FIRST MADE FOR ACEPS P2797
FCF PL ISSUED

NOTES:

1. FABRICATE PER G.E. SPEC.
2. ◇ IDENTIFIES WELD NUMBERS FOR TRACEABILITY OF QUALITY CONTROL RECORDS. ALL NONDESTRUCTIVE EXAMINATIONS TO BE REFERENCED TO DRAWING AND WELD NUMBERS.
3. NONDESTRUCTIVE EXAMINATION SHALL BE PERFORMED IN ACCORDANCE WITH PARAGRAPH 136.4 OF ANSI B31.1.
4. ALL PARTS CLEANED IN ACCORDANCE WITH 22A3515.



QP-2

REVISIONS | C | PRINTS TO

PRELIMINARY
ABC

CHECKED BY
DRAWN E.Mohr 21 JAN 80
APPROVED
DIV OR DEPT ARSD
LOCATION SUNNYVALE
145D6374 CONT OR SHEET DR NO.

FF-602-F (7-73) PRINTED IN U.S.A.

13

GENERAL ELECTRIC | 145D6373

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:— APPLIED PRACTICES: 265A4100 | SURFACES: ✓ | TOLERANCES ON REQUIRED DIMENSIONS: FRACTIONS ± —— | DECIMALS ± .XX .25 | ANGULAR ± 2°

145D6373

TITLE ASM

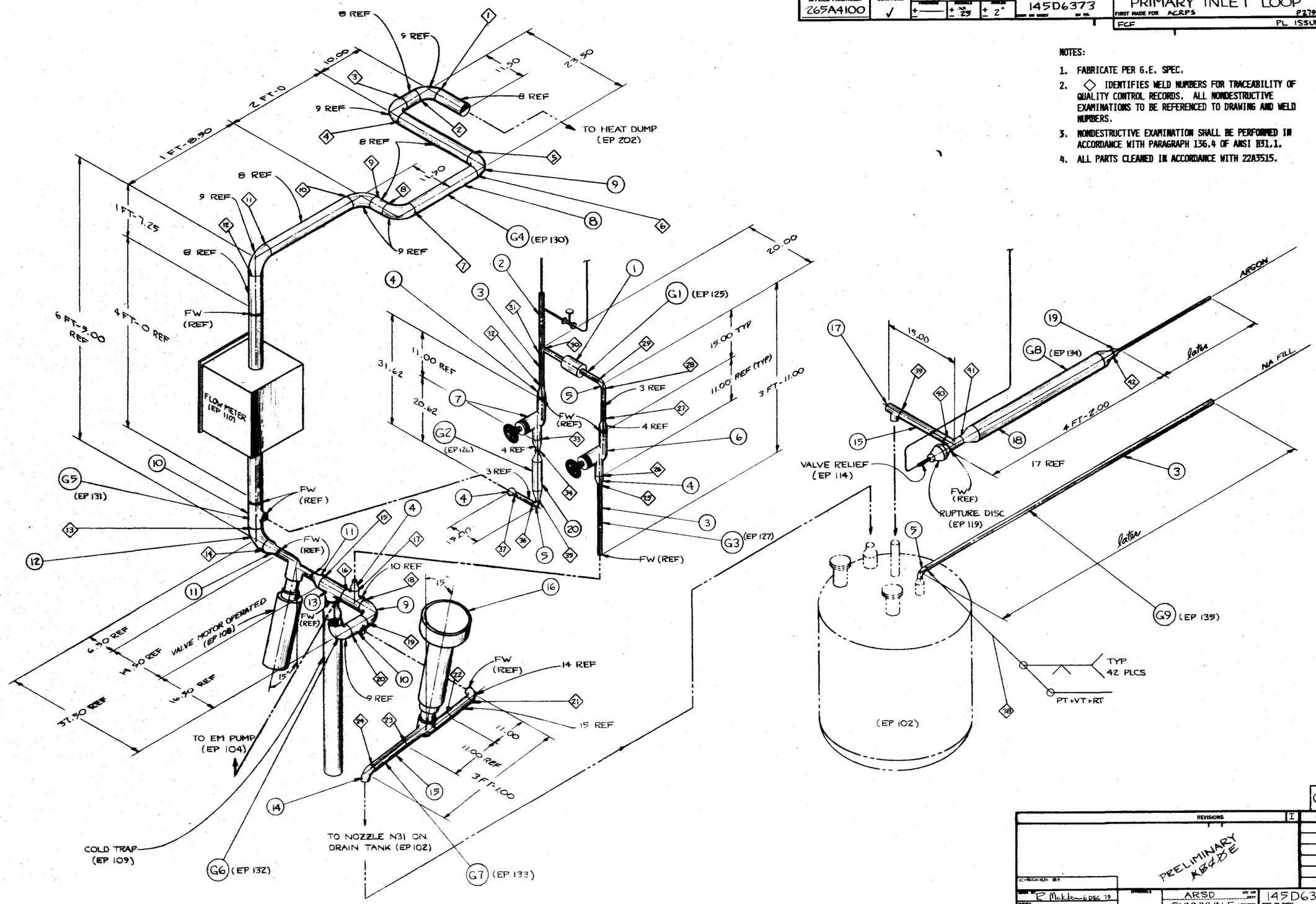
PRIMARY INLET LOOP

FIRST MADE FOR ACRPS P2797

FCF PL ISSUED

NOTES:

1. FABRICATE PER G.E. SPEC.
2. ◇ IDENTIFIES WELD NUMBERS FOR TRACEABILITY OF QUALITY CONTROL RECORDS. ALL NONDESTRUCTIVE EXAMINATIONS TO BE REFERENCED TO DRAWING AND WELD NUMBERS.
3. NONDESTRUCTIVE EXAMINATION SHALL BE PERFORMED IN ACCORDANCE WITH PARAGRAPH 136.4 OF ANSI B31.1.
4. ALL PARTS CLEANED IN ACCORDANCE WITH 22A3515.



QP-2

REVISIONS | I | PRINTS TO

PRELIMINARY

CHECKED BY

DRAWN R Mckle 6 DEC 79

APPROVALS

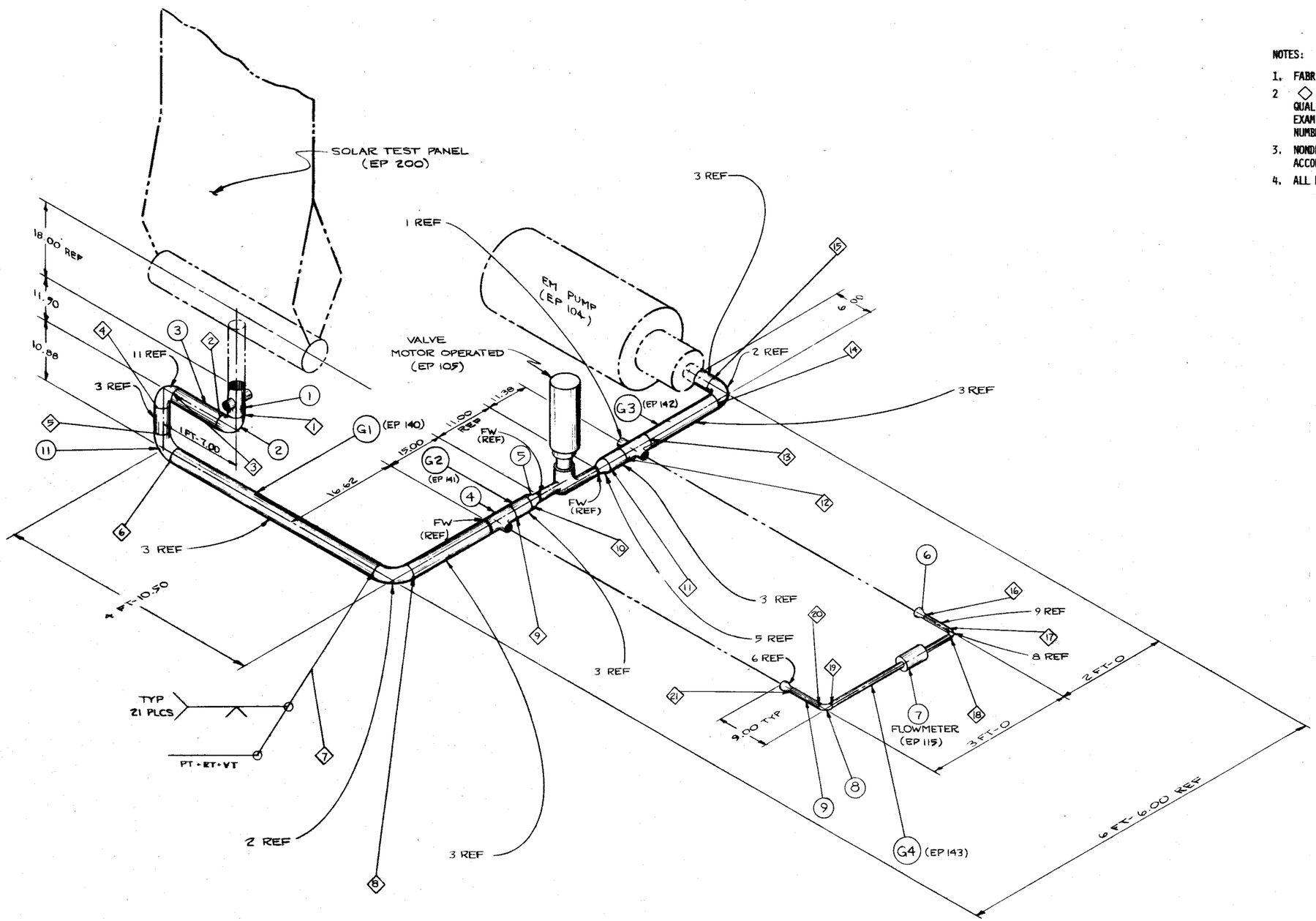
ARSD SUNNYVALE

145D6373

FY-852-F (7-78) PRINTED IN U.S.A.

GENERAL ELECTRIC | 145D6375 CONT ON SHEET SH NO.

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING: — APPLIED PRACTICES: Z65A4100 | SURFACES: √ | TOLERANCES ON MACHINED DIMENSIONS: FRACTIONS ± —— | DECIMALS ± .XX .25 | ANGLES ± —— | DRAWING NO. 145D6375 | REV NO. | TITLE: PUMP OUTLET LOOP | FIRST MADE FOR ACRPS P2797 | FCF | PL ISSUED



NOTES:

1. FABRICATE PER G.E. SPEC.
2. ◇ IDENTIFIES WELD NUMBERS FOR TRACEABILITY OF QUALITY CONTROL RECORDS. ALL NONDESTRUCTIVE EXAMINATIONS TO BE REFERENCED TO DRAWING AND WELD NUMBERS.
3. NONDESTRUCTIVE EXAMINATION SHALL BE PERFORMED IN ACCORDANCE WITH PARAGRAPH 136.4 OF ANSI B31.1.
4. ALL PARTS CLEANED IN ACCORDANCE WITH 22A3515.

QP-2

REVISIONS	C	PRINTS TO
PRELIMINARY A B C D		

CHECKED BY

DRAWN R. M. Ide 18 JAN 80

APPROVED

ARSD DIV OR DEPT | SUNNYVALE LOCATION | 145D6375 CONT ON SHEET SH NO.

PF-652-F (7-72) PRINTED IN U.S.A.

15

GENERAL ELECTRIC — 134D1856

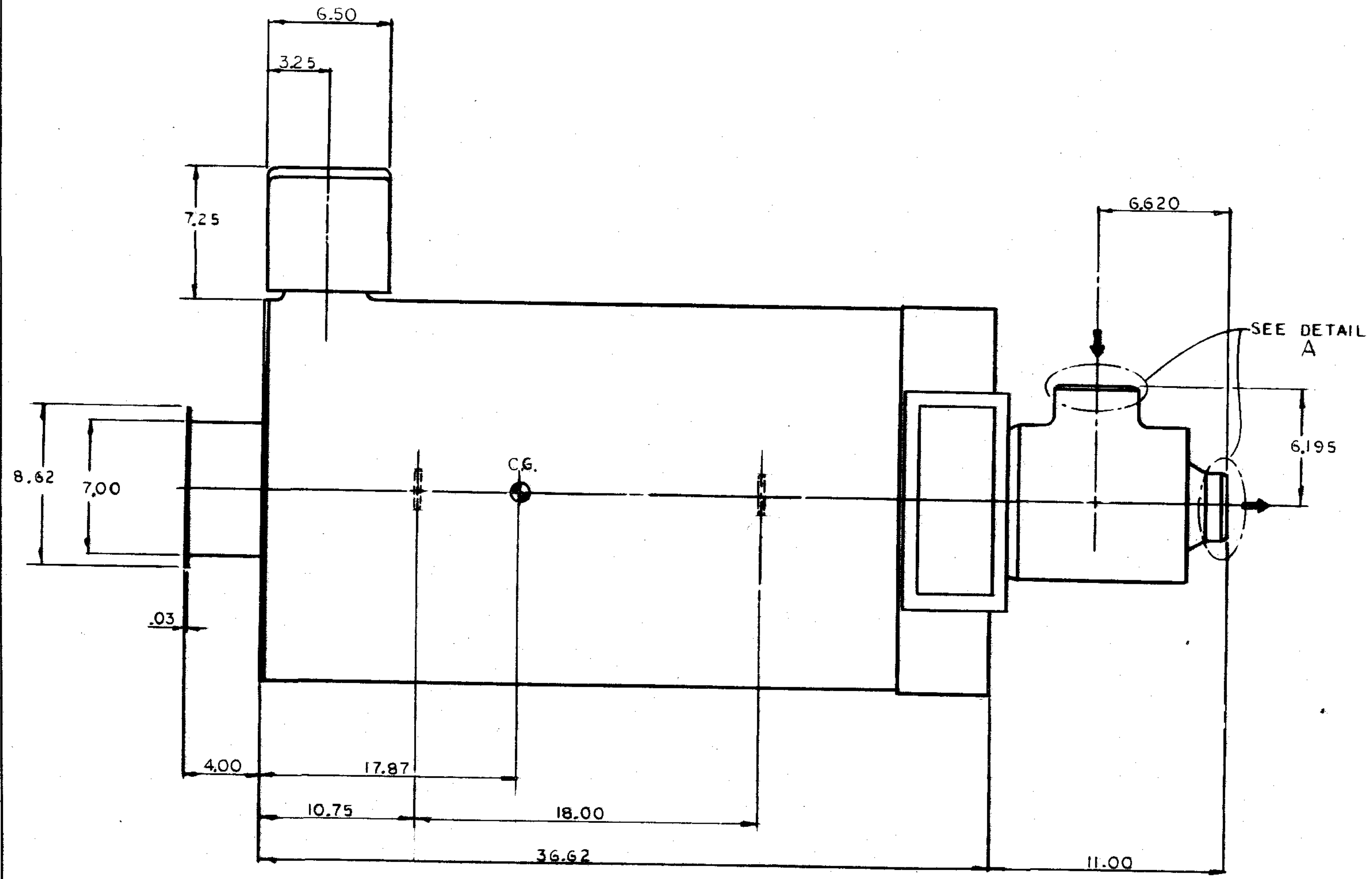
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING — APPLIED PRACTICES: 265A4100 — SURFACE: √

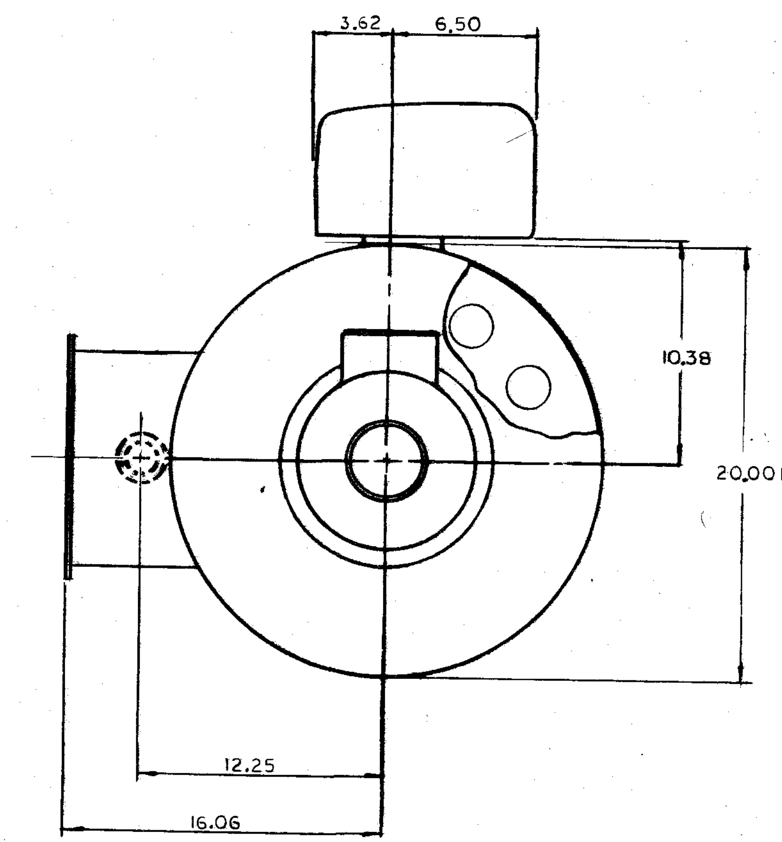
134D186

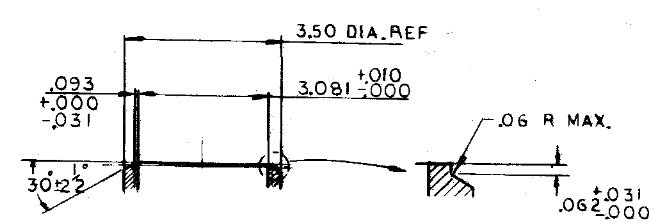
TITLE: EM PUMP REFURBISMENT

FIRST MADE FOR ACRPS PH II

FCF 387x253







DETAIL A

SEFOR REFERENCE DOCUMENT

VPF S-1289-1 TO -122

VPF S-1289-123 DRWG 528D215
OUTLINE AUX. SECONDARY
EM PUMP

NOTES:

1. FOR SPECIFICATION SEE

2. WELD INSPECTION ON SODIUM CONTAINTMENT WELDS PER SPECS

3. ULTRASONIC INSPECTION PER N324.3 SECTION III OF NUCLEAR PRESSURE VESSEL CODE.

4. CLEAN ALL PARTS PER 22A3515.

REVISIONS	
0	ERM 2059

QP-2 — PRINTS TO

MADE BY 9.Tai 8-27-79 — APPROVALS ARSD SUNNYVALE — 134D1856

FF-812-F (12-78) PRINTED IN U.S.A.

16

GENERAL ELECTRIC — 179C5264 — CONT ON SHEET 2 — SH NO. 1

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—

APPLIED PRACTICES	SURFACES	TOLERANCES ON MACHINED DIMENSIONS: FRACTIONS ±	DECIMALS ±	ANGLES ±
26A4100	✓			

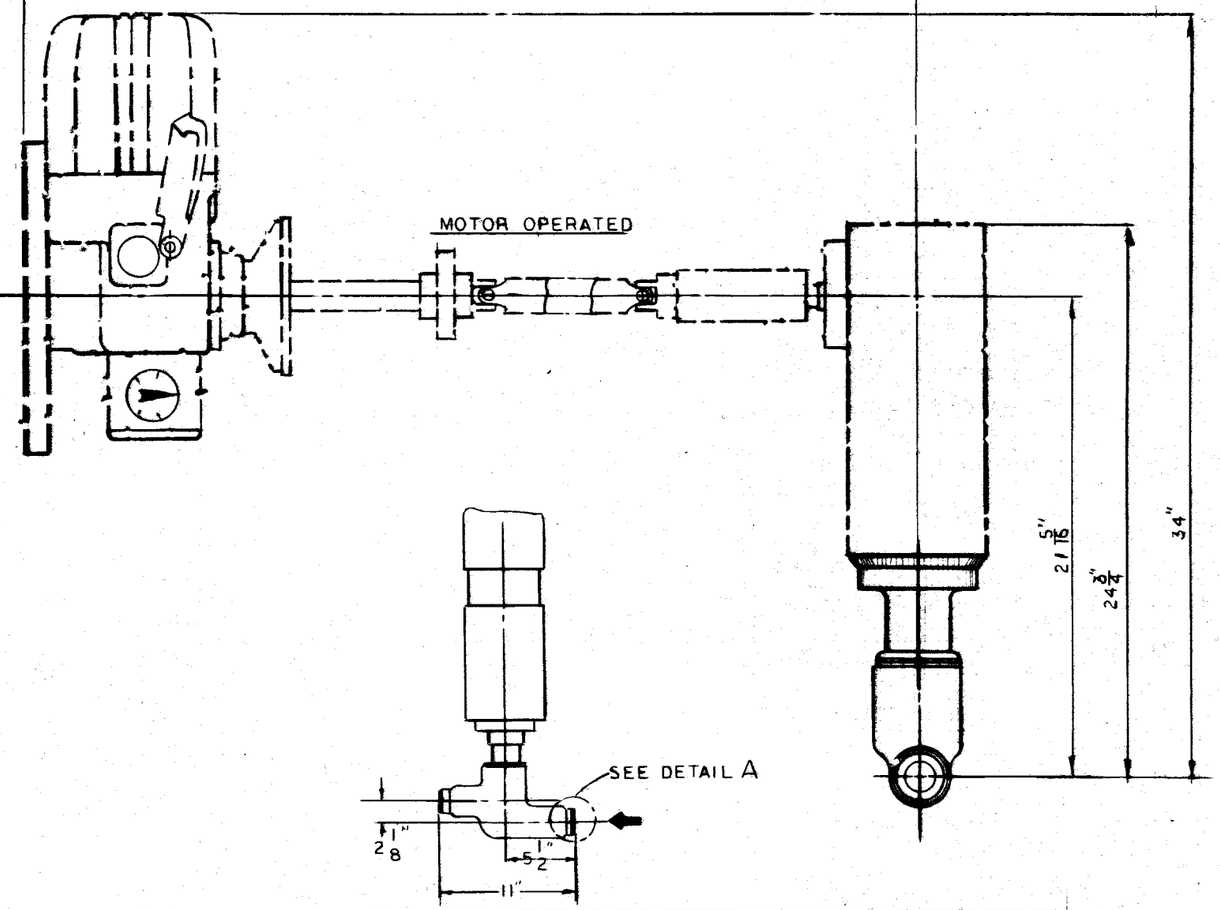
TITLE: CONTROL VALVE (MOTOR OPERATED) REFURBISHMENT

FIRST MADE FOR PGE&S PM# P2797

REF 387x753

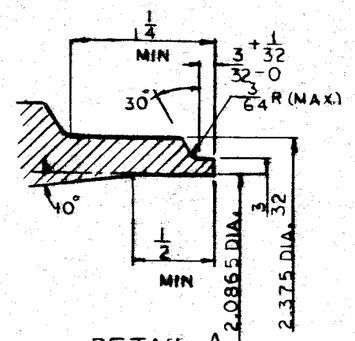
$3'-5\frac{3}{16}"$ (393-7)

$3'-3\frac{15}{16}"$ (393-8)



NOTES:

1. FOR SPECIFICATION SEE
2. WELD INSPECTION ON SODIUM CONTAINMENT WELDS PER SPECS
3. ULTRASONIC INSPECTION PER N324.3 SECTION III OF NUCLEAR PRESSURE VESSEL CODE.
4. CLEAN ALL PARTS PER 22A3515.



DETAIL A
BOTH ENDS

PART NO.	Valve Ident No. E.P. No.	Valve Size	Valve Type	Valve Location	Sefor Reference Document	Remarks	Sefor Ref E.P. No.
179C5264-1	106	2"	GLOBE ELEC. M.O.	PUMP INLET LOOP	Sargent – Lundy Specs Y-2018	Throttle Service	393-7
179C5264-2	105	2"	GLOBE ELEC. M.O.	PUMP OUTLET LOOP	" " "	Throttle Service	393-8

REF MFR: COPES-VULCAN—MODIFIED TYPE O-100 PER BULLETIN-1087
DRG NO. X-1-98221

REVISIONS: 0 ECN

PRINTS TO: QP-2

MADE BY: G.T.° 8-30-79 — ISSUED

APPROVALS

MESD — BU OR DEPT — SUNNYVALE — LOCATION

179C5264 — CONT ON SHEET 2 — SH NO. 1

REV NO. D

FF-600-F (9-76) PRINTED IN U.S.A.

GENERAL ELECTRIC

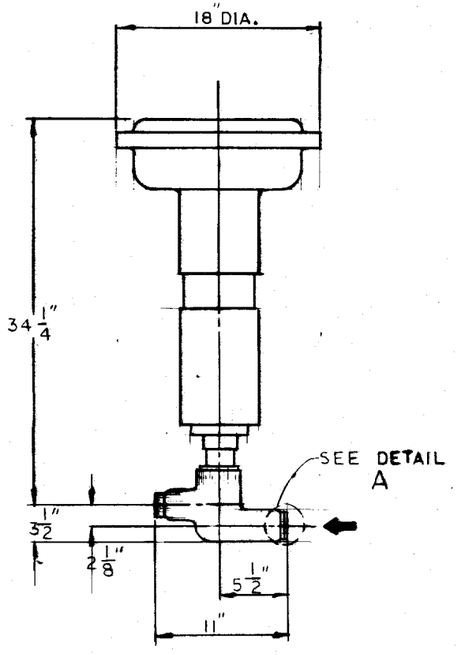
179C5262
CONT ON SHEET | SH NO.

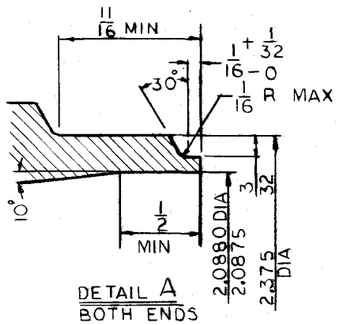
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:–				
APPLIED PRACTICES	SURFACES	TOLERANCES ON MACHINED DIMENSIONS: FRACTIONS	DECIMALS	ANGLES
26A4100	✓	±	±	±

TITLE: CONTROL VALVE REFURBISMENT

FIRST MADE FOR ACRPS PH II P4797

FCF 387 × 253





DETAIL A
BOTH ENDS

NOTES:

1. FOR SPECIFICATION SEE

2. WELD INSPECTION ON SODIUM CONTAINMENT WELDS PER SPECS

3. ULTRASONIC INSPECTION PER N324,3 SECTION III OF NUCLEAR PRESSURE VESSEL CODE.

4. CLEAN ALL PARTS PER 22A3515

5 VALVE PI SHOWN IS ARRANGED FOR "FAILED CLOSED" DESIGN. CONVERT TO "FAIL OPEN" DESIGN PER BULLETIN 1087, COPES-VULCAN.

CONTROL VALVES

PART NO.	Valve Ident No E.P. No.	Valve Size	Valve Type	Valve Location	Sefor Reference Document	Remarks	Sefor Ref E.P. No.	
179C5262-1	107	2"	GLOBE Solenoid	PUMP INLET	Sargent – Lundy Specs Y 2018	Shut-off Service	393-12	SEE NOTE 5
179C5262-2	108	2"	GLOBE Solenoid	DRAIN LINE	" " "	Shut-off Service	393-14	

REF MFR: COPES-VULCAN-MODIFIED TYPE O-100 PER BULLETIN 1087
DRG NO. X-1-98221

REVISIONS		I
0	ERM 2509	

PRINTS TO: APP 2

DRAWING NO. 179C5262 | CONT ON SHEET | SH NO.

REV NO. 0

MADE BY / ISSUED: G. Tai 8-31-79 | APPROVALS | ARSD DIV OR DEPT | SUNNYVALE LOCATION | CONT ON SHEET 179C5262 SH NO.

FF-309-F (9-76) PRINTED IN U.S.A.

GENERAL ELECTRIC

179C5263 CONT ON SHEET SH NO.

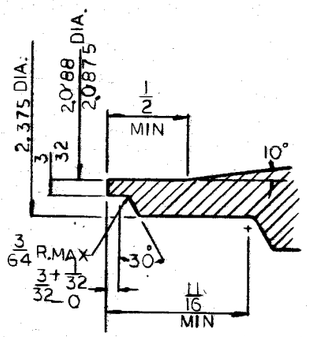
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—

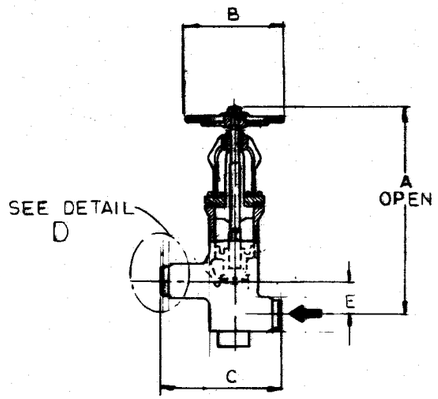
APPLIED PRACTICES	SURFACES	TOLERANCES ON MACHINED DIMENSIONS FRACTIONS	DECIMALS	ANGLES
26A4400	✓	±	±	±

TITLE GLOBE VALVE-MANUAL REFURBISHMENT PH II

FIRST MADE FOR ACRS

FCF 387 x 253





DETAIL D
TYP BOTH ENDS

NOTES:

1. FOR SPECIFICATION SEE

2. WELD INSPECTION ON SODIUM CONTAINMENT WELDS PER SPECS

3. ULTRASONIC INSPECTION PER N324.3 SECTION III OF NUCLEAR PRESSURE VESSEL CODE.

4. CLEAN ALL PARTS PER 22A3515.

MANUALLY OPERATED GLOBE VALVES

PART NO.	Valve Ident No. (E.P. No.)	Valve Size	Valve Type	Valve Location	Sefor Reference Document	Remarks	Sefor Ref EP No.	Valve Dimensions A	B	C		
179C5263-1	207	2"	GLOBE	NA FILL	Sargent – Lundy Specs Y-2018	Shut-off service w/lock	394-4					
179C5263-2	116	2"	GLOBE	OXYGEN METER LOOP	" " "	Shut-off service	394-8					
179C5263-3	117	2"	GLOBE	OXYGEN METER LOOP	" " "	" " "	394-2					

REF MFR: POWELL VALVE-SIMILAR TO DWG C 43647

DRAWING NO. 179C5263 SH NO. REV NO. 0

QP-2

REVISIONS	I	PRINTS TO
0 ERM 2509		

MADE BY / ISSUED 8-30-79 | APPROVALS | DIV OR DEPT ARSD | LOCATION SUNNYVALE | CONT ON SHEET | SH NO. 179C5263

PF-809-F (8-76) PRINTED IN U.S.A.

GENERAL ELECTRIC

179C5261

TITLE VAPOR TRAP (4") REFURBISMENT

FIRST MADE FOR ACRPS PH II 22797

FCF 387×253

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—				
APPLIED PRACTICES	SURFACES	TOLERANCES ON MACHINED DIMENSIONS: FRACTIONS	DECIMALS	ANGLES
265A4100	✓	±	±	±

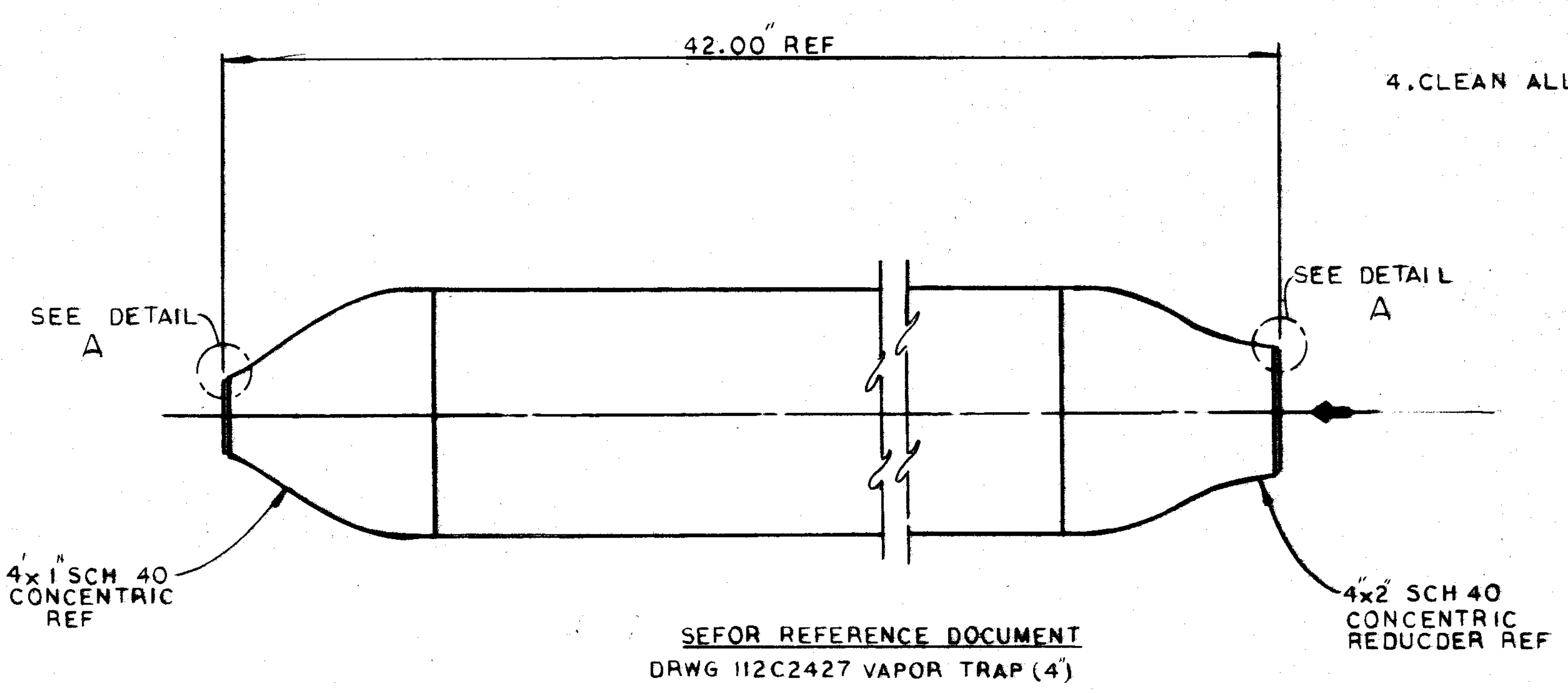
NOTES:

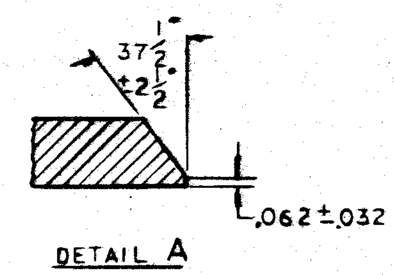
1. FOR SPECIFICATION SEE

2. WELD INSPECTION ON SODIUN CONTAINMENT WELDS PER SPECS

3. ULTRASONIC INSPECTION PER N324.3 SECTION III OF NUCLEAR PRESSURE VESSEL CODE.

4. CLEAN ALL PARTS PER 22A3515.





DETAIL A

SEFOR REFERENCE DOCUMENT

DRWG 112C2427 VAPOR TRAP (4")

QP-3

REVISIONS	I
0	ERM 2509

PRINTS TO

MADE BY G. Hu 8-29-79 APPROVALS ARSD SUNNYVALE

179C5261

REV NO. 0

FF-809-F (9-76) PRINTED IN U.S.A.

20

GENERAL ELECTRIC 145D6361

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—

APPLIED PRACTICES	SURFACES	FRACTIONS	DECIMALS	ANGLES
265A4100	125	±	±.06	± 2°

REV NO. 0 — 145D6361

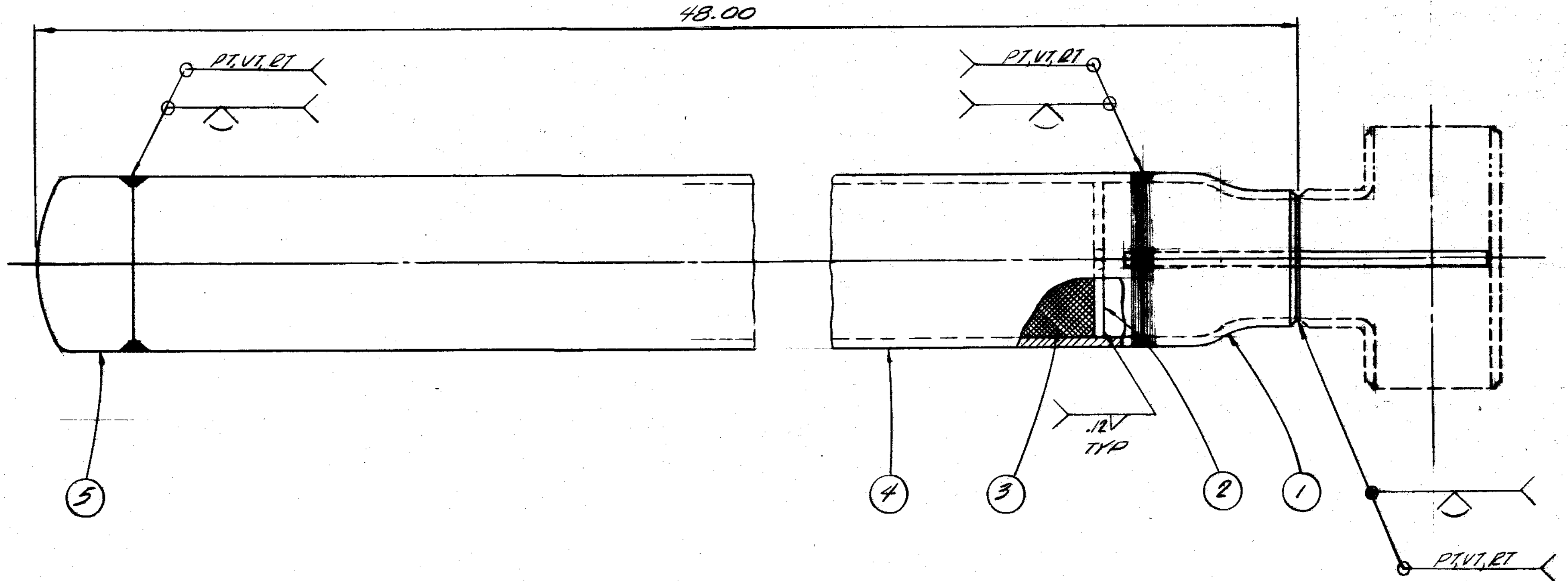
TITLE: 4" COLD TRAP

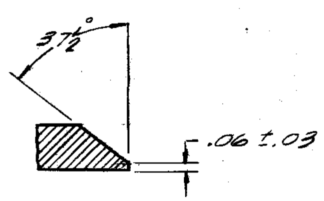
FIRST MADE FOR ACRPS PH II P2797

FCF 387 x 253 P/L ISSUED

NOTES:

1. UNLESS OTHERWISE NOTED ALL WELD PREPARATION WILL BE PER DETAIL A.
2. DESIGN, FABRICATION, INSPECTION AND TESTING IN ACCORDANCE WITH
3. DESIGN TEMP. DESIGN PRESS.





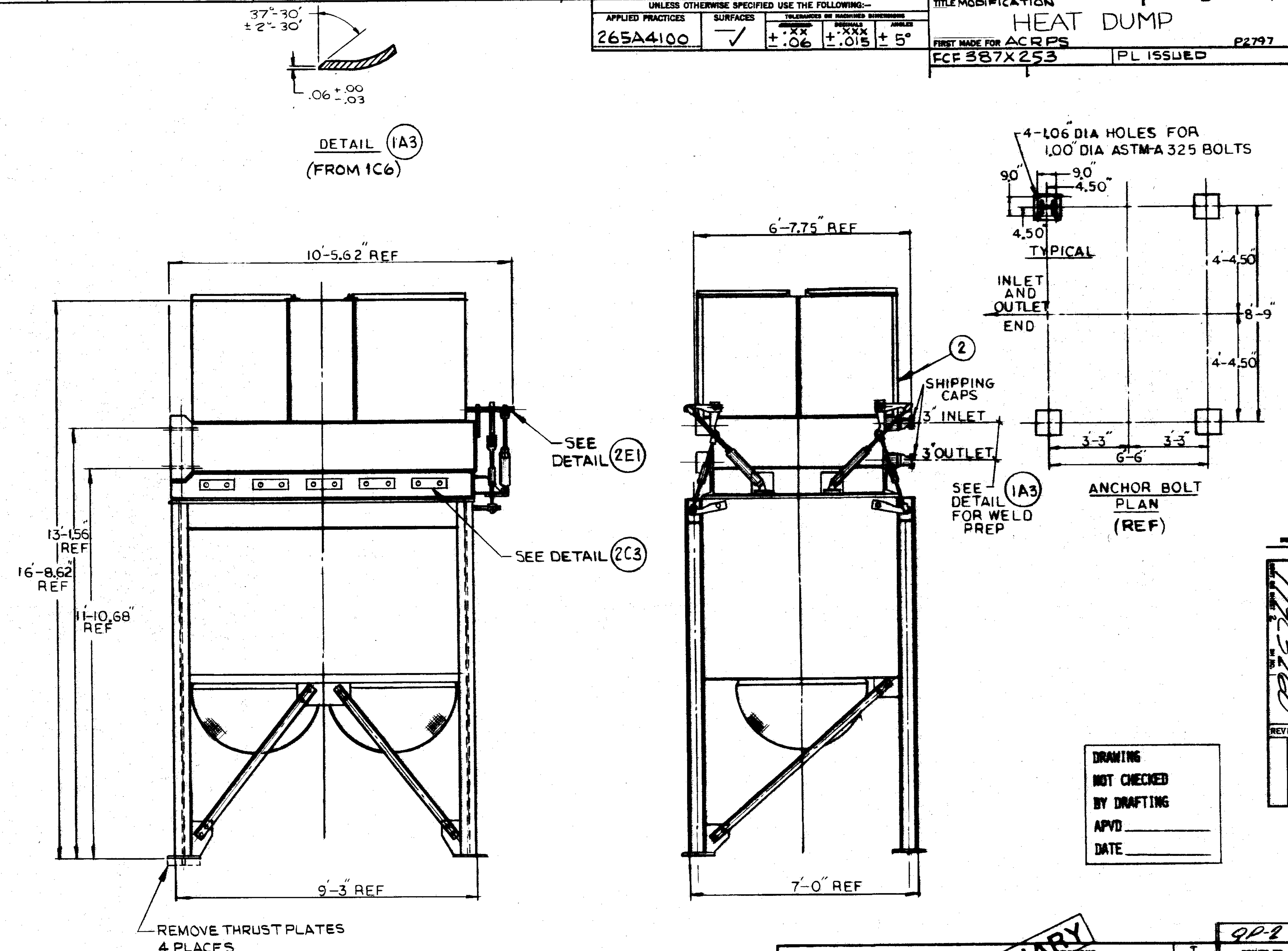
DETAIL A

(61)

QP-2

REVISIONS	I	PRINTS TO
0	EBM 2059	

MADE BY: 9 Tai 1-22-80 — ARSD DIV OR DEPT — SUNNYVALE LOCATION — 145D6361



GENERAL ELECTRIC — 179C5260 — CONT ON SHEET 2 — SH NO. 1

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—

APPLIED PRACTICES	SURFACES	TOLERANCES ON MACHINED DIMENSIONS		
265A4100	√	±.XX ±.06	±.XXX ±.015	±5°

TITLE MODIFICATION
HEAT DUMP
FIRST MADE FOR ACRPS — P2797
FCF 387X253 — PL ISSUED

SEFOR REFERENCE DOCUMENT
VPF S-892-1 TO -37
VPF S-892-1 DRWG 360-5-00005
ERECTION PLAN
AUXILIARY AIR BLAST
COOLER

(G1)

DRAWING
NOT CHECKED
BY DRAFTING
APVD ______
DATE ______

PRELIMINARY

REVISIONS I — ERM 2383 — B

PRINTS TO 9P-2: 315, 334

CHKD BY:
MADE BY G. [illegible] 8-24-79
APPROVALS ARSD
Sunnyvale
179C5260 — CONT ON SHEET 2 — SH NO. 1

FF 909-F (9-75) PRINTED IN U.S.A.

GENERAL ELECTRIC

179C5260 CONT ON SHEET FL SH NO. 2

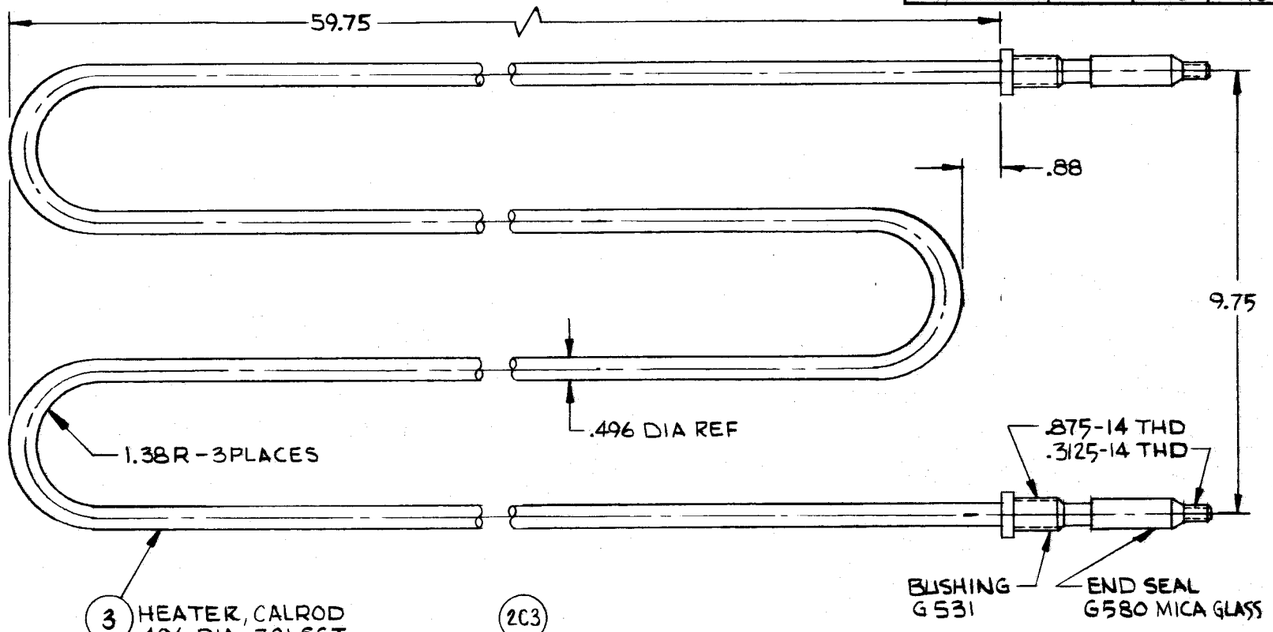
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:–				
APPLIED PRACTICES	SURFACES	TOLERANCES ON MACHINED DIMENSIONS		
		PRECISION	REGULAR	ANGLES
265A4100	√	± .XX .06	± .XXX .015	± 5°

TITLE MODIFICATION

HEAT DUMP

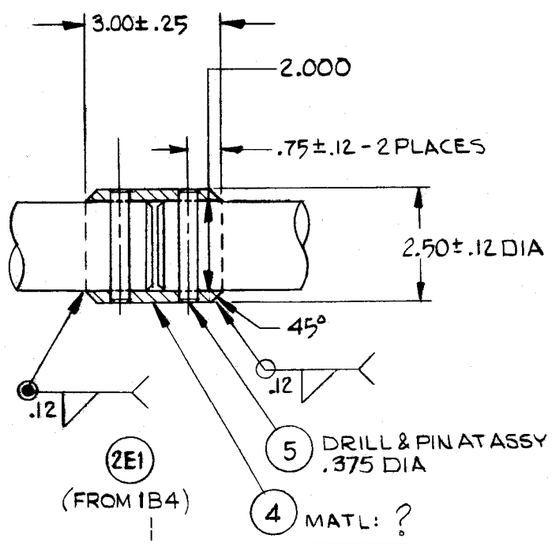
FIRST MADE FOR ACRPS

P2797



(3) HEATER, CALROD
.496 DIA, 321 SST
8KW, 480V, 3PHASE
246.5 SHEATH LENGTH
5.25 COLD LGTH EACH END

(2C3) (FROM 1C4)
INSTALL IN ASSY USING EXISTING HEATER MOUNTING PLATES



(2E1) (FROM 1B4)

(5) DRILL & PIN AT ASSY .375 DIA

(4) MATL: ?

DRAWING NOT CHECKED BY DRAFTING
APVD _____
DATE _____

PRELIMINARY

QP-2

REVISIONS	I	PRINTS TO
FOR REVISIONS SEE SHEET 1		

CHKD BY:

MADE BY: [signature] 7 DEC 79 ISSUED

APPROVALS

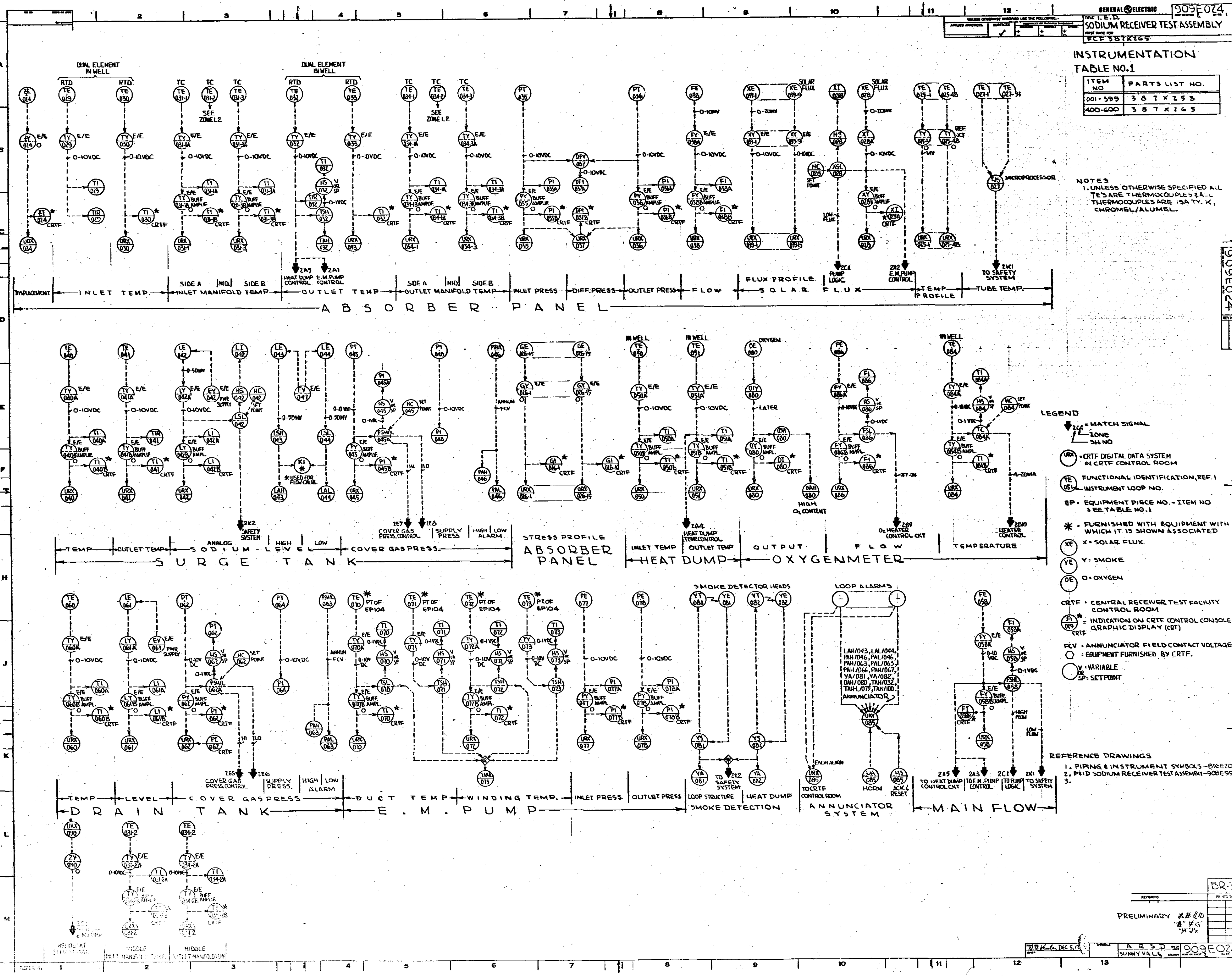
ARSD DIV OR DEPT
SUNNYVALE LOCATION

179C5260 CONT ON SHEET FL SH NO. 2

DRAWING NO. 179C5260 CONT ON SHEET FL SH NO. 2

REV NO.

FF-809-F (9-76) PRINTED IN U.S.A.



GENERAL ELECTRIC
909E024
TITLE I.E.D.
SODIUM RECEIVER TEST ASSEMBLY
FIRST MADE FOR
FCF 387X265
INSTRUMENTATION
TABLE NO.1
ITEM NO | PARTS LIST NO.
001-399 | 387X253
400-600 | 387X265
NOTES
1. UNLESS OTHERWISE SPECIFIED ALL TE'S ARE THERMOCOUPLES & ALL THERMOCOUPLES ARE ISA TY. K, CHROMEL/ALUMEL.
ABSORBER PANEL
DISPLACEMENT
INLET TEMP.
SIDE A | MID | SIDE B
INLET MANIFOLD TEMP.
OUTLET TEMP.
OUTLET MANIFOLD TEMP.
INLET PRESS.
DIFF. PRESS.
OUTLET PRESS.
FLOW
FLUX PROFILE
SOLAR FLUX
TEMP. PROFILE
TUBE TEMP.
SURGE TANK
TEMP.
OUTLET TEMP.
ANALOG
SODIUM LEVEL
HIGH
LOW
COVER GAS PRESS.
STRESS PROFILE
ABSORBER PANEL
HEAT DUMP
INLET TEMP
OUTLET TEMP
OXYGENMETER
OUTPUT
FLOW
TEMPERATURE
LEGEND
= MATCH SIGNAL
ZONE
SH. NO
= CRTF DIGITAL DATA SYSTEM IN CRTF CONTROL ROOM
FUNCTIONAL IDENTIFICATION, REF. 1
INSTRUMENT LOOP NO.
EP = EQUIPMENT PIECE NO. = ITEM NO SEE TABLE NO. 1
✱ = FURNISHED WITH EQUIPMENT WITH WHICH IT IS SHOWN ASSOCIATED
X = SOLAR FLUX.
Y = SMOKE
O = OXYGEN
CRTF = CENTRAL RECEIVER TEST FACILITY CONTROL ROOM
= INDICATION ON CRTF CONTROL CONSOLE GRAPHIC DISPLAY (CRT)
FCV = ANNUNCIATOR FIELD CONTACT VOLTAGE
= EQUIPMENT FURNISHED BY CRTF.
V = VARIABLE
OR
SP = SETPOINT
DRAIN TANK
TEMP
LEVEL
COVER GAS PRESS
E.M. PUMP
DUCT TEMP
WINDING TEMP.
INLET PRESS.
OUTLET PRESS
SMOKE DETECTOR HEADS
SMOKE DETECTION
LOOP STRUCTURE
HEAT DUMP
LOOP ALARMS
ANNUNCIATOR SYSTEM
MAIN FLOW
REFERENCE DRAWINGS
1. PIPING & INSTRUMENT SYMBOLS—816E200
2. P&ID SODIUM RECEIVER TEST ASSEMBLY—908E992
3.
BR-3
PRELIMINARY
A R S D
SUNNYVALE
909E024

GENERAL ELECTRIC — 909E024

SODIUM RECEIVER TEST ASSEMBLY — SOLAR TEST PROGRAM

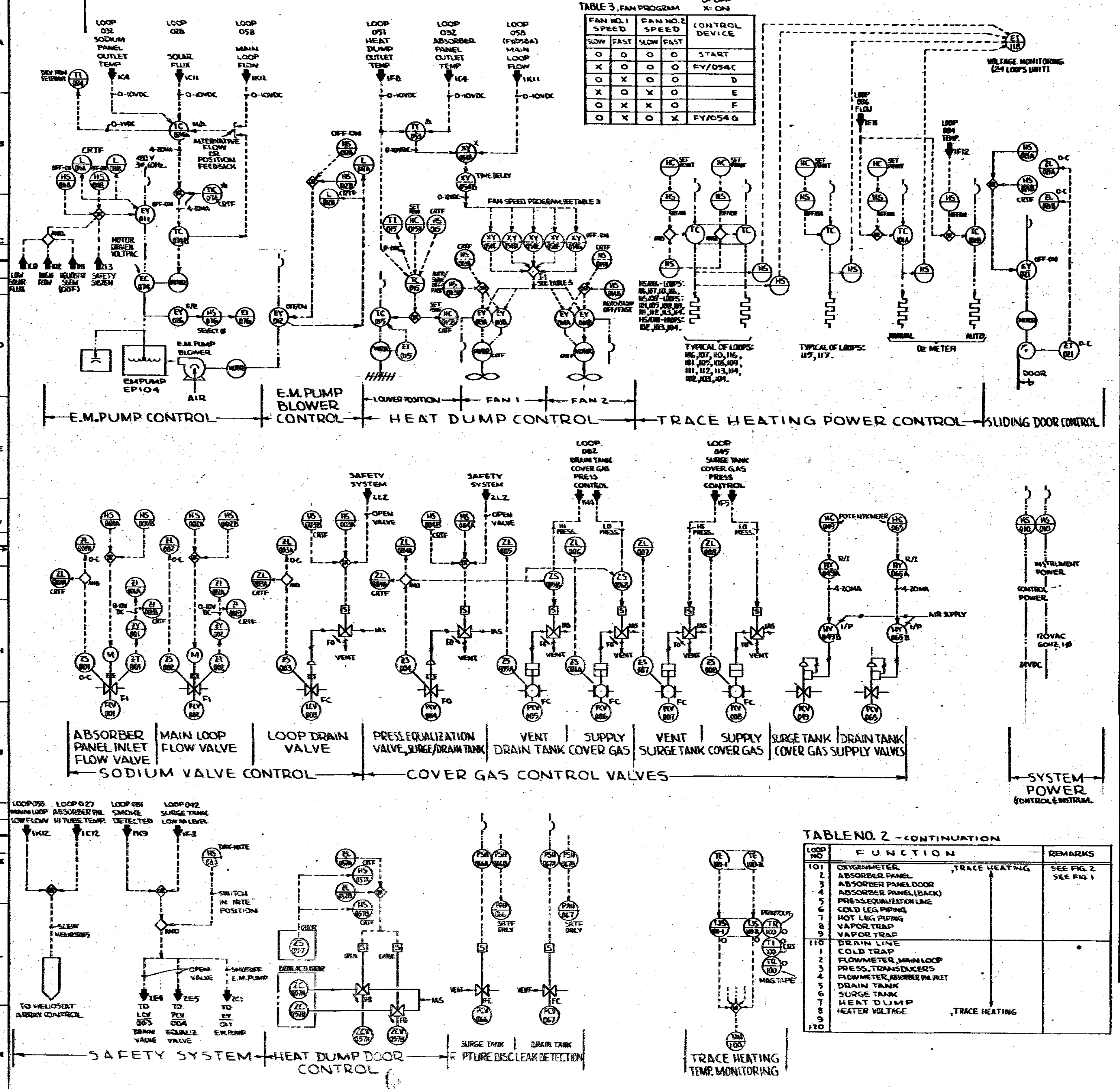


TABLE 3, FAN PROGRAM

O = OFF
X = ON

FAN NO. 1 SPEED		FAN NO. 2 SPEED		CONTROL DEVICE
SLOW	FAST	SLOW	FAST	
O	O	O	O	START
X	O	O	O	FY/054C
O	X	O	O	D
X	O	X	O	E
O	X	X	O	F
O	X	O	X	FY/054G

TABLE NO. 2

LOOP NO.	FUNCTION	REMARKS
001	FLOW CONTROL VALVE, ABSORBER PANEL INLET	
2	FLOW CONTROL VALVE, MAIN LOOP FLOW	
3	LOOP DRAIN VALVE	
4	PRESS. EQUALIZATION VALVE, SURGE/DRAIN TANK	
5	VENT VALVE } DRAIN TANK COVER GAS	
6	SUPPLY VALVE } DRAIN TANK COVER GAS	
7	VENT VALVE } SURGE TANK COVER GAS	
8	SUPPLY VALVE } SURGE TANK COVER GAS	
009		
010	CONTROL & INSTRUMENT POWER, HANDSWITCH	
11	EM PUMP POWER	
12	EM PUMP BLOWER MOTOR POWER	
13	HEAT DUMP FAN #1 MOTOR POWER	
14	HEAT DUMP FAN #2 MOTOR POWER	
15	HEAT DUMP LOUVER MOTOR POWER	
16	TRACE HEATING POWER CONTROL, LOOP PIPING	
17	, [illegible]	
18	, ABSORBER PANEL	
019	, SODIUM COOLER	
020	TRACE HEATING POWER CONTROL, DRAIN TANK	
1	ABSORBER PANEL DOOR CONTROL	
2		
3		
4	ABSORBER PANEL DISPLACEMENT	
5	ABSORBER PANEL TEMP PROFILE	
6	ABSORBER PANEL STRESS	
7	ABSORBER PANEL TUBE TEMP.	
8	SOLAR FLUX ABSORBER PANEL	
9	INLET TEMP.	
030	INLET TEMP.	
1	INLET MANIFOLD TEMP	
2	OUTLET TEMP.	
3	OUTLET TEMP.	
4	OUTLET MANIFOLD TEMP.	
5	INLET PRESS.	
6	OUTLET PRESS.	
7	DIFFERENTIAL PRESS.	
8	INLET FLOW	
9	SOLAR FLUX PROFILE, ABSORBER PANEL	
040	TEMPERATURE, HTR CONTROL, SURGE TANK	
1	OUTLET TEMP.	
2	SODIUM LEVEL, ANALOG	
3	SODIUM LEVEL, HIGH	
4	SODIUM LEVEL, LOW	
5	COVER GAS PRESS., CONTROL	
6	COVER GAS PRESS., ALARM	
7	LEVEL PROBE POWER SUPPLY,	
8	COVER GAS SUPPLY PRESS,	
9	COVER GAS SUPPLY PRESS. CONTROL, SURGE TANK	
050	INLET TEMP, HEAT DUMP	
1	OUTLET TEMP	
2	CONTROL TEMP.	
3	COOLER/SOLAR PANEL TEMP. &	
4	TEMP./FLOW MULTIPLIER	
5	TEMP. INDICATOR CONTROLLER	
6		
7	DOOR CONTROL, HEAT DUMP	
8	MAIN LOOP FLOW	
9		
060	TEMP. (CONTROL TEMP), DRAIN TANK	
1	SODIUM LEVEL	
2	COVER GAS PRESS. (CONTROL)	
3	COVER GAS PRESS. (ALARM),	
4	COVER GAS SUPPLY PRESS.	
5	COVER GAS SUPPLY PRESS. CONTROL, DRAIN TANK	
6	RUPTURE DISC LEAK DETECTION, SURGE TANK	
7	RUPTURE DISC LEAK DETECTION, DRAIN TANK	
8		
9		
070	DUCT TEMP., E.M. PUMP	
1	DUCT TEMP.	
2	WINDING TEMP.	
3	WINDING TEMP.	
4	CONTROL SYSTEM	
5	TEMP. OFF NORMAL (ALARM)	
6	VOLTAGE MONITORING	
7	INLET PRESSURE	
8	OUTLET PRESSURE, E.M. PUMP	
9		
080	OXYGENMETER OUTPUT	
1	SMOKE DETECTION, LOOP STRUCTURE	
2	SMOKE DETECTION, SODIUM COOLER	
3	DAY-NITE CONTROL SWITCH	
4	OXYGENMETER TEMP.	
5	ANNUNCIATOR SYS.	
6	OXYGENMETER FLOW	
7		
8		
9		
090	HELIOSTAT SLEW SIGNAL	
1		
2		
3		
4		
5		
6		
7		
8		
9		
100	TRACE HEATING TEMP. MONITORING	

SEE CONTINUATION

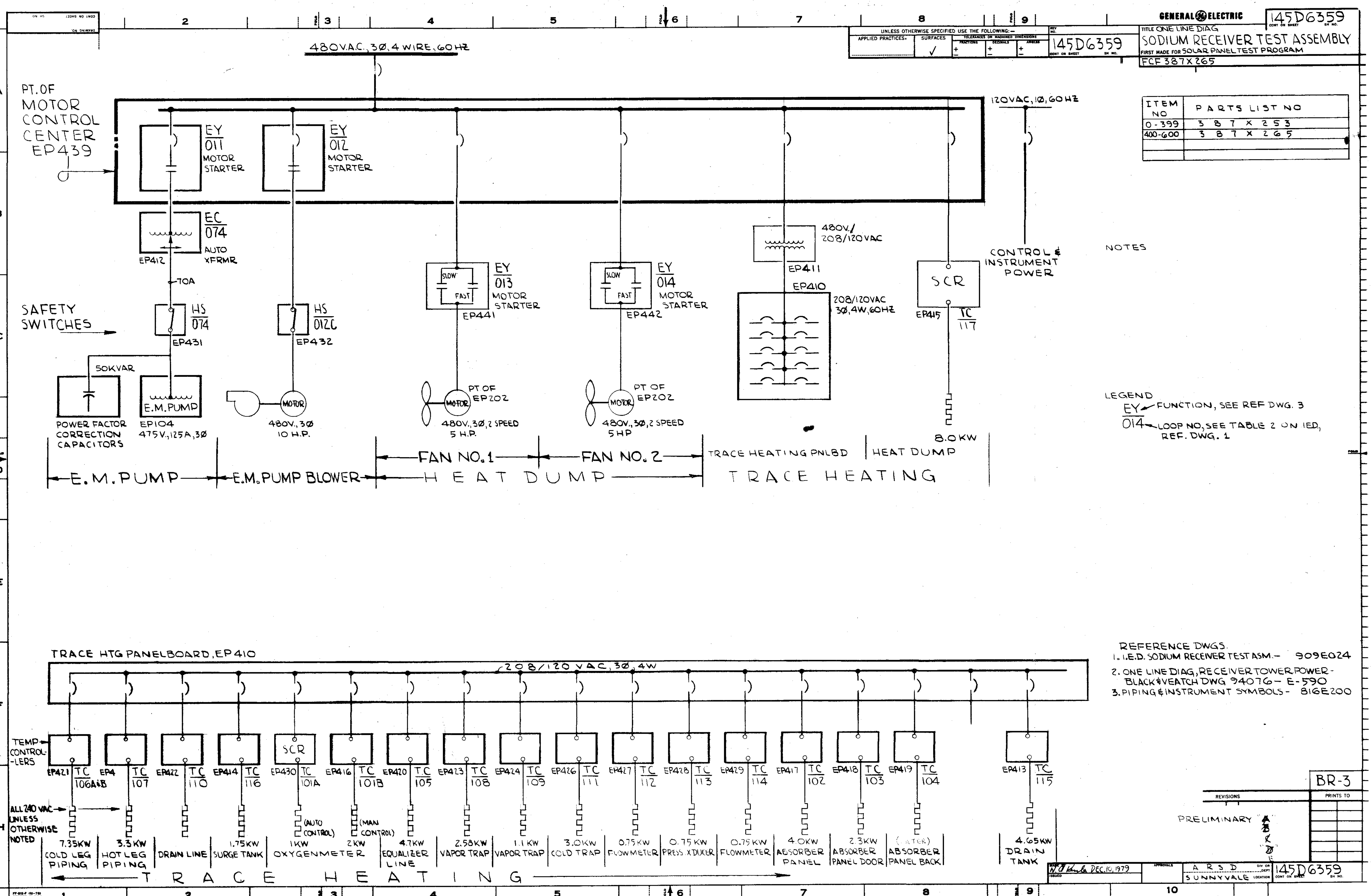
TABLE NO. 2 - CONTINUATION

LOOP NO	FUNCTION	REMARKS
101	OXYGENMETER, TRACE HEATING	SEE FIG. 2
2	ABSORBER PANEL	SEE FIG. 1
3	ABSORBER PANEL DOOR	
4	ABSORBER PANEL (BACK)	
5	PRESS. EQUALIZATION LINE	
6	COLD LEG PIPING	
7	HOT LEG PIPING	
8	VAPOR TRAP	
9	VAPOR TRAP	
110	DRAIN LINE	
1	COLD TRAP	
2	FLOWMETER, MAIN LOOP	
3	PRESS. TRANSDUCERS	
4	FLOWMETER, ABSORBER PNL. INLET	
5	DRAIN TANK	
6	SURGE TANK	
7	HEAT DUMP	
8	HEATER VOLTAGE, TRACE HEATING	
9		
120		

BR-3

FOR REVISIONS SEE SHEET 1

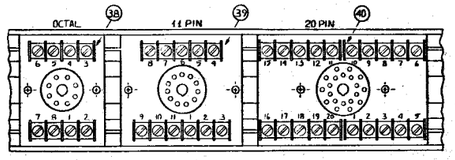
ARSD SUNNYVALE 909E024


GENERAL ELECTRIC
145D6359
UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:
APPLIED PRACTICES
SURFACES
TOLERANCES ON MACHINED DIMENSIONS
FRACTIONS
DECIMALS
ANGLES
145D6359
TITLE ONE LINE DIAG
SODIUM RECEIVER TEST ASSEMBLY
FIRST MADE FOR SOLAR PANEL TEST PROGRAM
FCF 387X265
480V.A.C., 3Ø, 4 WIRE, 60 HZ
PT. OF MOTOR CONTROL CENTER EP439
EY 011 MOTOR STARTER
EY 012 MOTOR STARTER
EC 074 AUTO XFRMR
EP412
70A
SAFETY SWITCHES
HS 074
EP431
HS 012C
EP432
50KVAR
POWER FACTOR CORRECTION CAPACITORS
E.M. PUMP
EP104
475V., 125A, 3Ø
MOTOR
480V., 3Ø
10 H.P.
SLOW
FAST
EY 013 MOTOR STARTER
EP441
PT OF EP202
480V., 3Ø, 2 SPEED
5 H.P.
EY 014 MOTOR STARTER
EP442
PT OF EP202
480V., 3Ø, 2 SPEED
5 HP
480V./208/120VAC
EP411
EP410
208/120VAC
3Ø, 4W, 60HZ
SCR
EP415
TC 117
8.0KW
120VAC, 1Ø, 60 HZ
CONTROL & INSTRUMENT POWER
E.M. PUMP
E.M. PUMP BLOWER
FAN NO. 1
FAN NO. 2
HEAT DUMP
TRACE HEATING PNLBD
HEAT DUMP
TRACE HEATING
ITEM NO | PARTS LIST NO
0-399 | 387X253
400-600 | 387X265
NOTES
LEGEND
EY — FUNCTION, SEE REF DWG. 3
014 — LOOP NO, SEE TABLE 2 ON IED, REF. DWG. 1
TRACE HTG PANELBOARD, EP410
208/120 VAC, 3Ø, 4W
TEMP CONTROLLERS
SCR
EP421 TC 106A&B
EP4 TC 107
EP422 TC 110
EP414 TC 116
EP430 TC 101A
EP416 TC 101B
EP420 TC 105
EP423 TC 108
EP424 TC 109
EP426 TC 111
EP427 TC 112
EP428 TC 113
EP429 TC 114
EP417 TC 102
EP418 TC 103
EP419 TC 104
EP413 TC 115
ALL 240 VAC UNLESS OTHERWISE NOTED
(AUTO CONTROL)
(MAN CONTROL)
7.35KW COLD LEG PIPING
3.3KW HOT LEG PIPING
DRAIN LINE
1.75KW SURGE TANK
1KW OXYGENMETER
2KW
4.7KW EQUALIZER LINE
2.58KW VAPOR TRAP
1.1KW VAPOR TRAP
3.0KW COLD TRAP
0.75KW FLOWMETER
0.75KW PRESS. XDUCER
0.75KW FLOWMETER
4.0KW ABSORBER PANEL
2.3KW ABSORBER PANEL DOOR
(LATER) ABSORBER PANEL BACK
4.65KW DRAIN TANK
TRACE HEATING
REFERENCE DWGS.
1. I.E.D. SODIUM RECEIVER TEST ASM. - 909E024
2. ONE LINE DIAG, RECEIVER TOWER POWER - BLACK & VEATCH DWG 94076 - E-590
3. PIPING & INSTRUMENT SYMBOLS - 816E200
BR-3
REVISIONS
PRINTS TO
PRELIMINARY
DEC. 10, 1979
ISSUED
APPROVALS
A R S D
SUNNYVALE
145D6359

GENERAL ELECTRIC 909E040

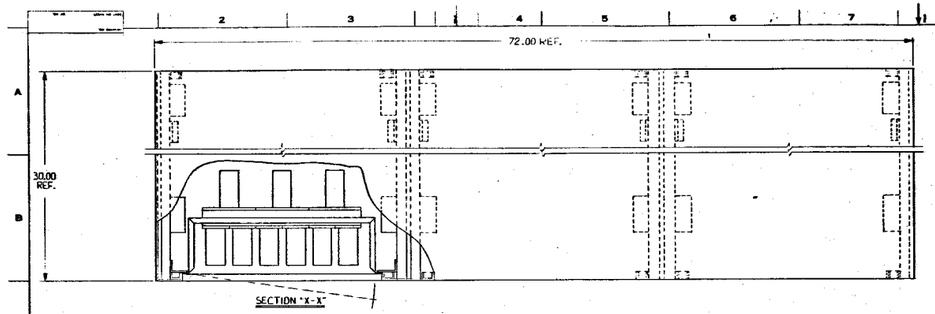
TITLE ASSEMBLY
CONTROL CENTER
FOR USE ON 500MW RECEIVER TEST ASSEMBLY
ECF 387X265 PL ISSUED

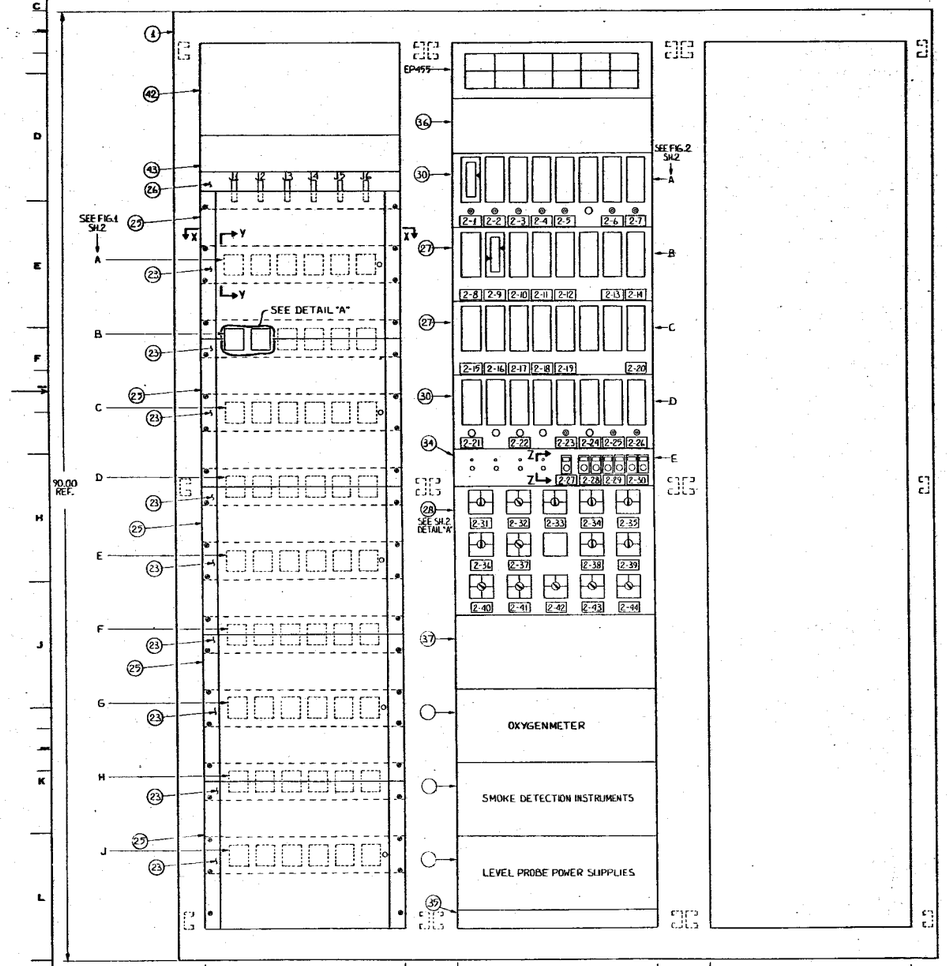
PT. NO.	PARTS LIST
400-600	387X265



DETAIL "A"
SHOWING TYPICAL ORIENTATION OF THREE TYPES OF SOCKETS USED.

NOTES:
1. ELECTRICAL DEVICE DESIGNATIONS SHALL BE MARKED ON WIRING SIDE OF PANEL ADJACENT TO DEVICE USING ADHESIVE BACKED, BLACK PLASTIC EMBOSSING TAPE.
2. DEVICES NO. PSHL/045A, PSHL/062A & FISHL/038 REQUIRE RETAINING CLIP PT. NO. 42.
3. PARTS HAVING PREFIX 2 (ie. 2-31) ARE MARKER PLATES AND WILL BE FOUND ON PARTS LIST 387X272 G001.





FRONT VIEW

SIDE VIEW

PRELIMINARY

ASSR SUNNYVALE 909E040

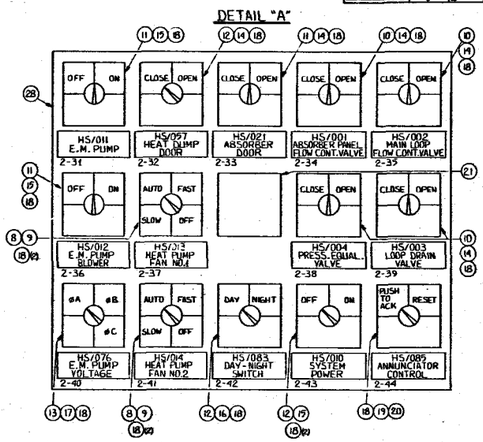
FIG. 1 (COMPONENT LOCATION MATRIX - FRONT PANELS).

	J1	J2	J3	J4	J5	J6
A	TY/031-1A	TY/031-2A	TY/031-3A	TY/034-1A	TY/034-2A	TY/034-3A
	38 EP456	38 EP456	38 EP456	38 EP456	38 EP456	38 EP456
B	DPY/037	FY/038A	TY/040A	TY/041A	LY/042A	FY/086A
	39 EP464	38 EP466	38 EP456	38 EP456	38 EP457	38 EP466
C	TY/050A	TY/051A	TY/084A	TY/060A	LY/061A	SPARE
	38 EP456	38 EP456	38 EP456	38 EP456	38 EP457	38
D	TY/070A	TY/071	TY/072A	TY/073	FY/058A	XY/054A
	38 EP456	38 EP456	38 EP456	38 EP456	38 EP466	38 EP463
E	ZY/001	ZY/002	HY/049A	HY/069A	TY/053	XY/054B
	38 EP458	38	38	38	39	38
F	XY/039-1	XY/039-2	XY/039-3	XY/039-4	XY/039-5	XY/039-6
	38	38	38	38	38	38
G	XY/039-7	XY/039-8	XY/039-9	XY/028	SPARE	SPARE
	38	38	38	38	38	38
H	TY/029	TY/030	TY/032	TY/033	SPARE	SPARE
	38	38	38	38	38	38
J	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
	38	38	38	38	38	38

FIG. 1 (COMPONENT LOCATION MATRIX - REAR OF PANELS).

	J6	J5	J4	J3	J2	J1
A	TSH/032		LSH/043		LSL/044	
	40		39		39	
B	PSHL/045A		TC/084		FSL/086	
	40		40		40	
C	PSHL/062A		TSH/070		TSH/071	
	40		40		40	
D	FISH-L/058		TSH/072		TSH/073	
	40		40		40	
E	LSL/042		XSL/028		TC/074A	
	40 EP460		40 EP460		40	
F	TC/015		XY/054C		XY/054D	
	40		40		40	
G	XY/054E		XY/054F		XY/054G	
	40		40		40	
H	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
	38	38	38	38	38	38
J	SPARE	SPARE	SPARE	SPARE	SPARE	SPARE
	38	38	38	38	38	38

DETAIL "A"



EXAMPLES

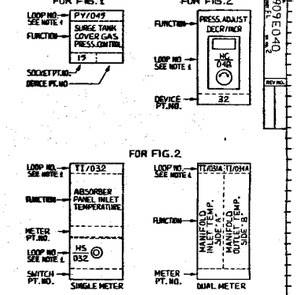
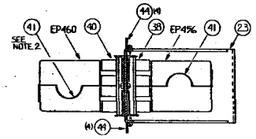


FIG. 2 (INDICATOR LOCATION MATRIX).

	1	2	3	4	5	6	7	8
A	TI/032	TI/070	TI/071	TI/072	TI/073		FI/058	FI/086
	ABSORBER PANEL OUTLET TEMP.	E.M. PUMP DUCT TEMP.	E.M. PUMP DUCT TEMP.	E.M. PUMP WDG. TEMP.	E.M. PUMP WDG. TEMP.		MAIN LOOP FLOW	O_2 METER FLOW
	HS 032	HS 070	HS 071	HS 072	HS 073		HS 098	HS 086
	31	31	31	31	31	48	31	31
B	TI/029A	TI/031-1A TI/031-1A	TI/031-2A TI/031-2A	TI/031-3A TI/031-3A	FI/057A	PI/036A	DPI/037	FI/038A
	ABSORBER PNL INLET TEMP.	ABS. MANIFOLD INLET TEMP. SIDE "A" / ABS. MANIFOLD OUTLET TEMP. SIDE "A"	ABS. MANIFOLD INLET TEMP. MIDDLE / ABS. MANIFOLD OUTLET TEMP. MIDDLE	ABS. MANIFOLD INLET TEMP. SIDE "B" / ABS. MANIFOLD OUTLET TEMP. SIDE "B"	ABS. MANIFOLD INLET PRESS.	ABS. MANIFOLD OUTLET PRESS.	ABSORBER MANIFOLD DIFF. PRESS.	ABSORBER PNL INLET FLOW
C	PI/077A PI/028A	EI/076	LI/061A	TI/040A TI/062A	TI/030A TI/091A			ZI/001 ZI/002
	E.M. PUMP INLET PRESS. / E.M. PUMP OUTLET PRESS.	E.M. PUMP VOLTAGE (0-300VAC)	DRAIN TANK N_a LEVEL	SURGE TANK TEMP. / DRAIN TANK TEMP.	HEAT PUMP INLET TEMP. / HEAT PUMP OUTLET TEMP.			ABSORBER PNL FLOW VALVE POS. / MAIN LOOP FLOW VALVE POS.
D	TI/074	LI/042A	TI/056	XI/028	TI/084	PI/048 PI/064	PI/049A	FI/062
	E.M. PUMP CONTROL DEVIATION FROM SETPOINT	SURGE TANK N_a LEVEL	TEMP. CONTROL (DEVIATION FROM SETPOINT)	ABSORBER PNL SOLAR FLUX	O_2 METER TEMP. (CONTROL INDICATION)	SURGE TANK COVER GAS SUPPLY PRESS. / DRAIN TANK COVER GAS SUPPLY PRESS.	SURGE TANK COVER GAS PRESS. CONTROL SETPOINT	O_2 METER FLOW CONTROL SETPOINT
		HS 042		HS 028	HS 084		HS 045	HS 062
	48	48	48	48	31	48	31	31
E		N_a LEVEL SETPOINT		SOLAR FLUX SETPOINT	TEMPERATURE SETPOINT	PRESS. ADJUST SURGE TANK DECR/INCR	PRESS. ADJUST SURGE TANK LO SETPT. DECR/INCR	PRESS. ADJUST DRAIN TANK SETPT. LO DECR/INCR
	49	42	49	30	32	32	32	32



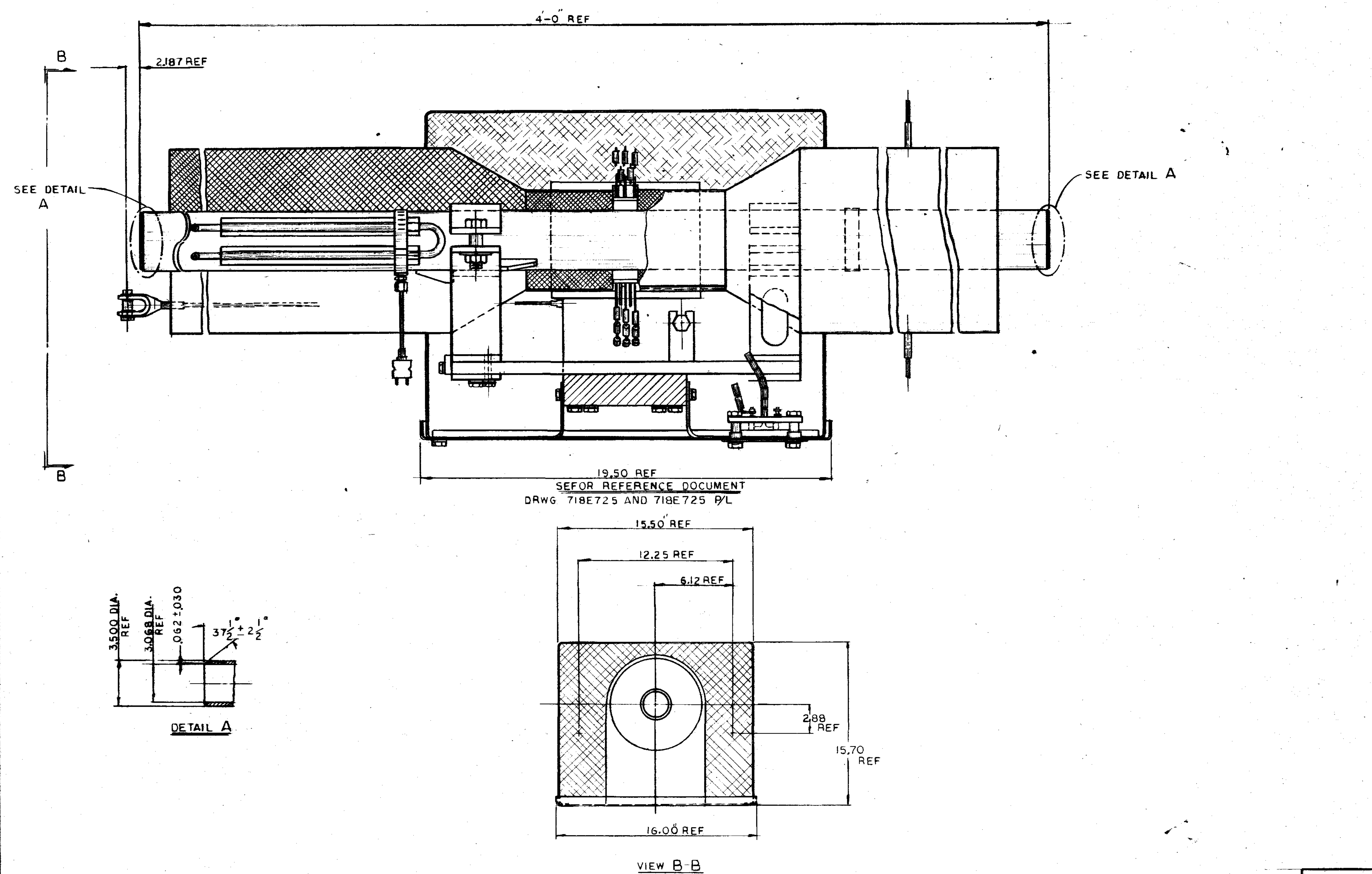
GENERAL ELECTRIC 134D1875

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:			REV NO. 0
APPLIED PRACTICES	SURFACES	TOLERANCES ON MACHINED DIMENSIONS	
265A4100	√	+ −	134D1875

TITLE: VERTICAL FLOWMETER (3") REFURBISMENT

FIRST MADE FOR ACRPS PH8 P2797

FCF 387x253



NOTES:

1. FOR SPECIFICATION SEE
2. WELD INSPECTION ON SODIUM CONTAINMENT WELDS PER SPECS
3. ULTRASONIC INSPECTION PER N324.3 SECTION III OF NUCLEAR PRESSURE VESSEL CODE.
4. CLEAN ALL PARTS PER 22A3515.
5. FILL PIPE WITH NITROGEN OR ARGON GAS BEFORE WELDING.

REFERENCE

SEFOR SPECS 22A1644

REVISIONS: I — 0 ERM 2059

PRINTS TO: QP-3

MADE BY: 8-28-72

APSD SUNNYVALE

134D1875

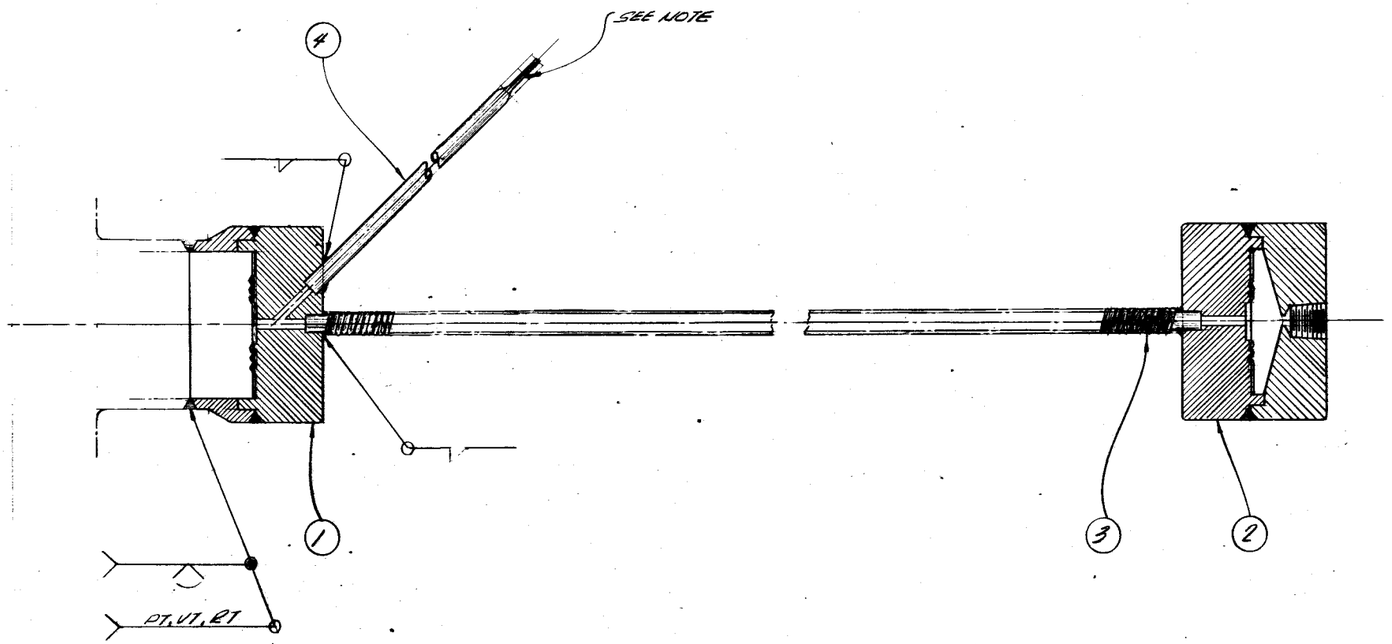
GENERAL ELECTRIC

145063B0 — DWG NO.

UNLESS OTHERWISE SPECIFIED USE THE FOLLOWING:—
APPLIED PRACTICES: 26A4100 | SURFACES: ✓ | TOLERANCES ON DECIMALS DIMENSIONS: FRACTIONS ± — | DECIMALS ± — | ANGLES ± —

REV NO. 0 — 145063B0 — DWG NO. — SH NO. — CONT ON SHEET

TITLE: SODIUM PRESSURE ELEMENT
FIRST MADE FOR ARPS PH 2 PA797
FCF 387 x 253 PIL ISSUED



NOTES:

REVISIONS | LTR
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PRINTS TO

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