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PALISADES NUCLEAR PLANT
HEALTH PHYSICS ISSUES
STEAM GENERATOR REPLACEMENT PROJECT
AGENDA
MAY 2, 1990

I. INTRODUCTION

II. RADIATION SAFETY DEPARTMENT ORGANIZATION

III. RADIATION PROTECTION PROGRAM

- A. Program Parameters
- B. Operational Health Physics
- C. ALARA
- D. Training
- E. Radioactive Waste
- F. Decontamination

IV. CONTAINMENT OPENING - HVAC

V. OLD S.G. REMOVAL, HANDLING, AND TRANSPORT

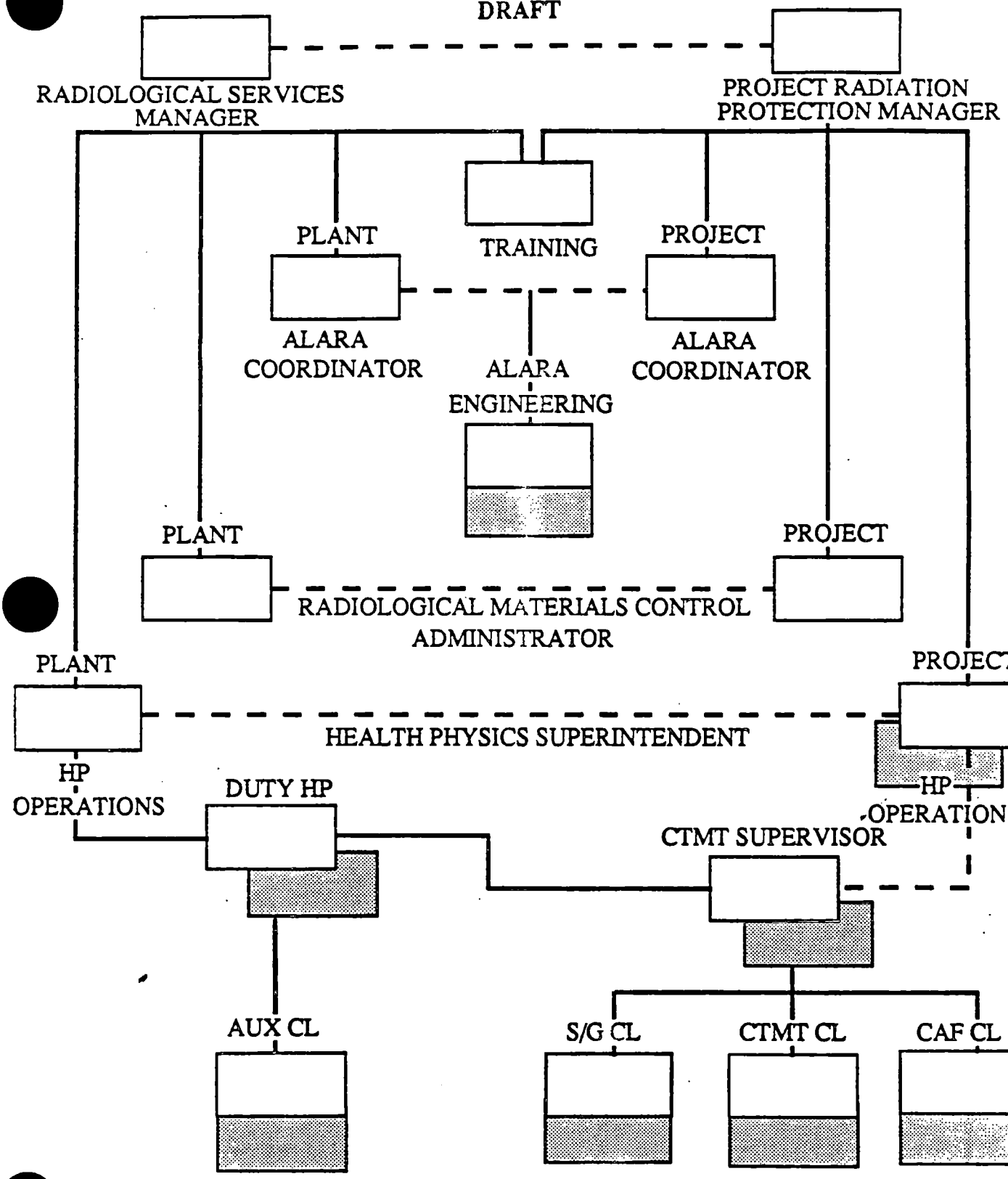
VI. OLD S.G. STORAGE

VII. SELF ASSESSMENT

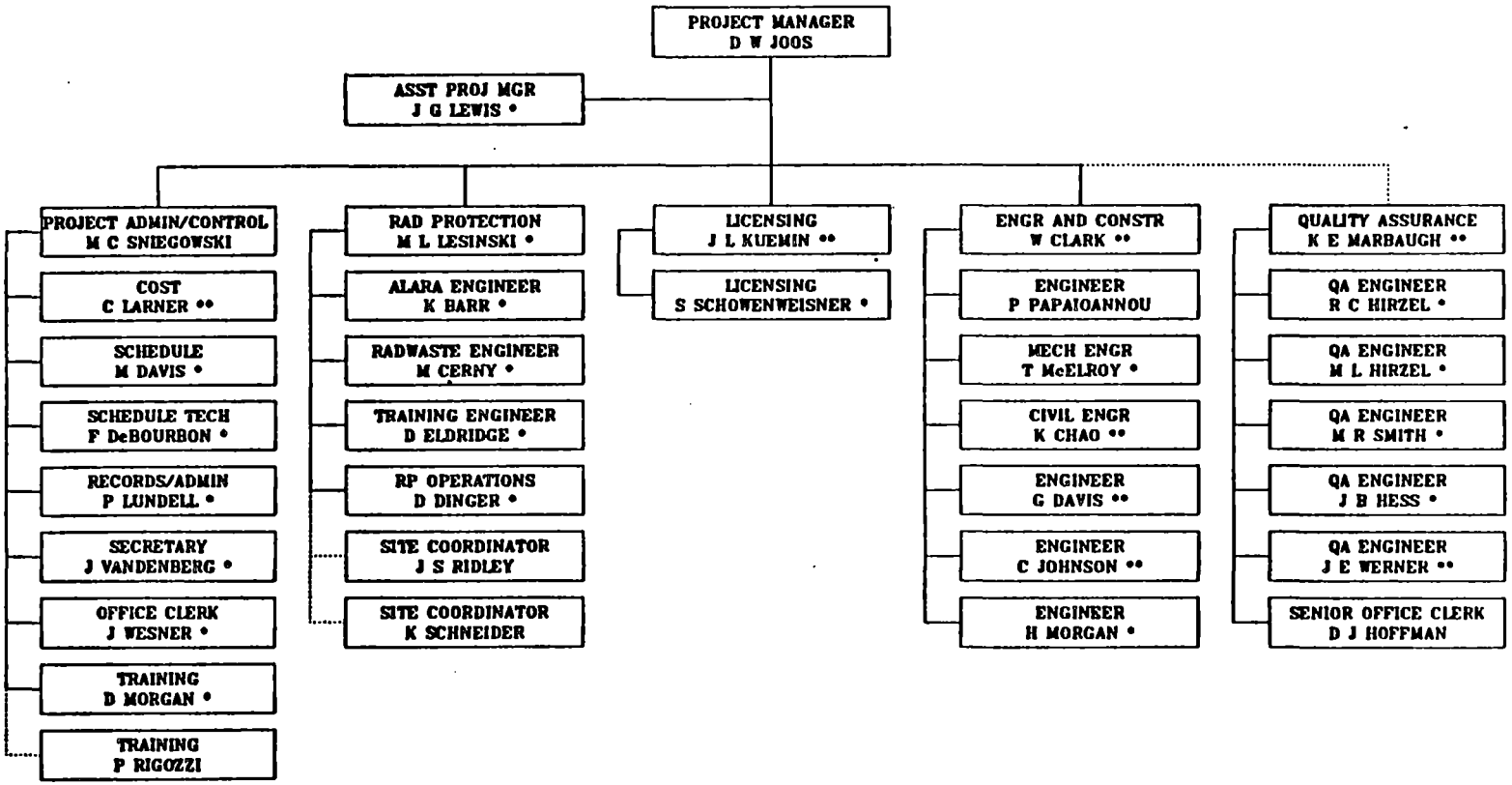
VIII. DRY FUEL STORAGE

SGRP OUTAGE
RADIOLOGICAL SERVICES
ORGANIZATIONAL CHART

DRAFT



PALISADES STEAM GENERATOR REPLACEMENT PROJECT ORGANIZATION

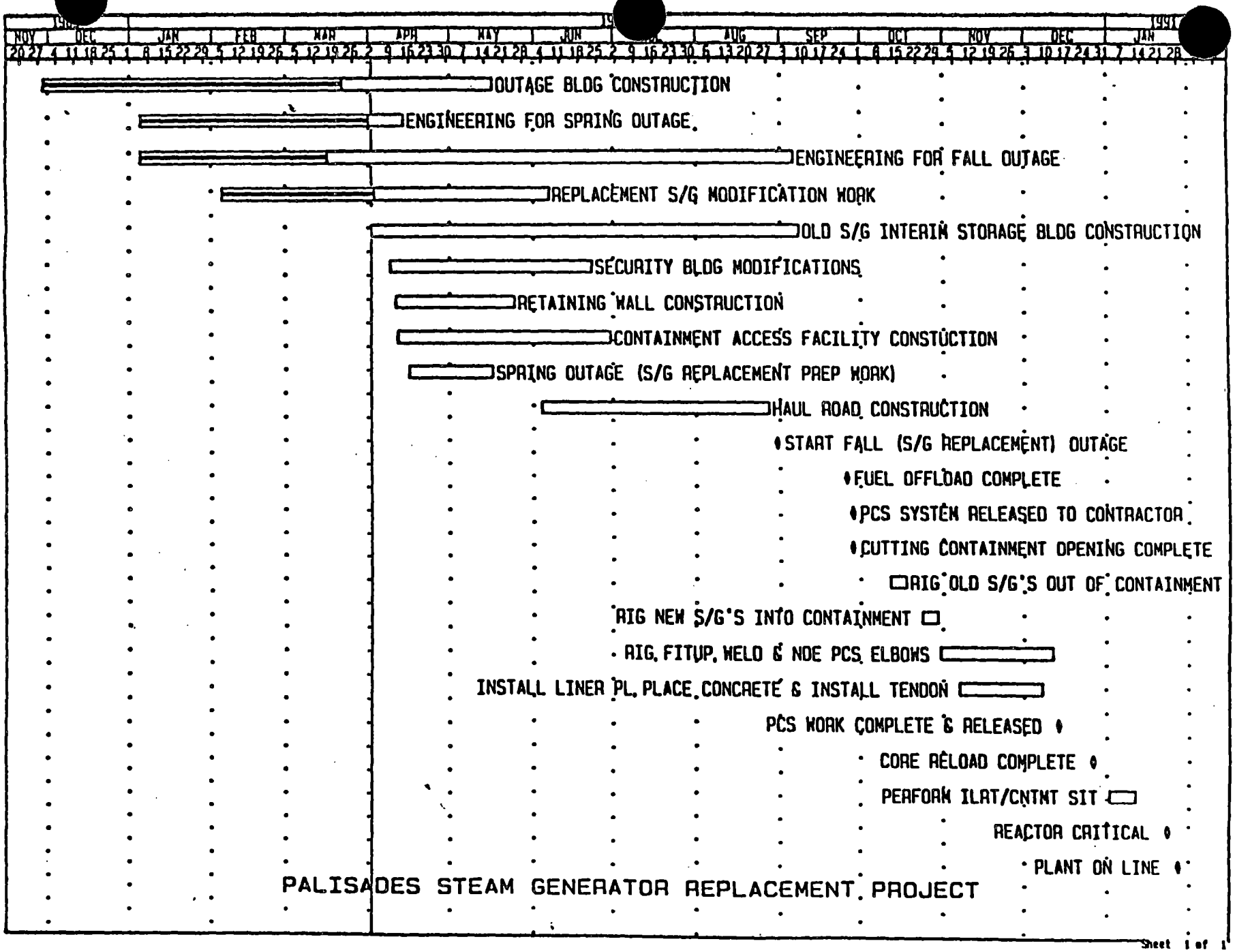


• CONTRACT PERSONNEL
•• PERSONNEL ON LOAN

5/1/90

BECHTEL ALARA LIAISONS

- SHIFTLY COMMUNICATION AND INFORMATION FOR CONSTRUCTION AND RSD
- PERFORM ALARA COORDINATION MEETINGS FOR UNIQUE WORK EVOLUTIONS
- BPCo CRAFT ALARA ORIENTATION
- INITIAL WORK PACKAGE INPUT AND REVIEW
- ENSURE SEQUENCE OF EVENTS INCLUDED IN WORK PACKAGES
- PROVIDE INPUT FOR MAN-REM ESTIMATES AND RWP GENERATION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OUTAGE BLDG CONSTRUCTION
ENGINEERING FOR SPRING OUTAGE
ENGINEERING FOR FALL OUTAGE
REPLACEMENT S/G MODIFICATION WORK
OLD S/G INTERIM STORAGE BLDG CONSTRUCTION
SECURITY BLDG MODIFICATIONS
RETAINING WALL CONSTRUCTION
CONTAINMENT ACCESS FACILITY CONSTUCTION
SPRING OUTAGE (S/G REPLACEMENT PREP WORK)
HAUL ROAD CONSTRUCTION
START FALL (S/G REPLACEMENT) OUTAGE
FUEL OFFLOAD COMPLETE
PCS SYSTEM RELEASED TO CONTRACTOR
CUTTING CONTAINMENT OPENING COMPLETE
RIG OLD S/G'S OUT OF CONTAINMENT
RIG NEW S/G'S INTO CONTAINMENT
RIG, FITUP, WELD & NDE PCS ELBOWS
INSTALL LINER PL, PLACE CONCRETE & INSTALL TENDON
PCS WORK COMPLETE & RELEASED
CORE RELOAD COMPLETE
PERFORM ILRT/CNTMT SIT
REACTOR CRITICAL
PLANT ON LINE
PALISADES STEAM GENERATOR REPLACEMENT PROJECT
Sheet 1 of 1

REPLACEMENT STEAM GENERATOR IMPROVEMENTS

- BETTER BLOWDOWN
  (minimize future sludge lancing)

- BETTER TUBE SUPPORTS
  (minimize denting)
  -Horizontal Grid - Egg Crate
  -Vertical Grid
  -Batwing Strips

- HANDHOLES

  -4, 6" on lower and intermediate shells for inspections

- INSPECTION PORTS

  -2, 2" above tubesheet secondary face

- RECIRCULATION AND CHEMICAL CLEANING NOZZLE

  -For recirculation of secondary water
  -For circulation of chemical cleaning fluid

- BIGGER MANWAYS

  -All 18" inside diameter

- SURFACE PRETREATMENT

STEAM GENERATOR

REPLACEMENT

PROJECT

RADIATION PROTECTION

PROGRAM

STANDARDS

- MEET REQUIREMENTS OF 10CFR20

- FOLLOW GUIDELINES IN NRC REGULATORY GUIDES 8.8 AND 8.10

- FOLLOW GUIDANCE PROVIDED IN:

  -CPCo Radiation Safety Plan

    - Palisades Plant Health Physics procedures

  -Project Plan

    - Project Radiation Safety Plan
    - Project specific procedures and plans

MANAGEMENT GUIDELINES FOR PROGRAM DEVELOPMENT

- MINIMIZE IMPACT ON PLANT MANPOWER AND FACILITIES

- MINIMIZE CHANGES TO THE EXISTING PROGRAMS

- MAXIMIZE COMMUNICATION AND INTEGRATION OF PROJECT, PLANT AND REPAIR CONTRACTOR

- UTILIZE LESSONS LEARNED FROM PLANT OPERATIONS, PAST SGR PROJECTS, AND PAST NRC CONCERNS

- PROVIDE AS A MINIMUM, STANDARD PALISADES RADIOLOGICAL PROTECTION SERVICES

GOALS

- MINIMIZE RADIATION EXPOSURE TO WORKERS AND THE PUBLIC < 699 MREM
- MINIMIZE PERSONNEL CONTAMINATIONS < 215
- MINIMIZE SPREAD OF CONTAMINATION
- MINIMIZE GENERATION OF RADIOACTIVE WASTE
- MINIMIZE SCHEDULE IMPACT DUE TO RADIOLOGICAL CONCERNS
- MAXIMIZE POSITIVE LONG TERM EFFECTS ON PLANT AND PROGRAMS

MEETINGS/INTERFACE

- RSD PLANT AND PROJECT

  -Weekly RSD Staff
  -Daily Shift Turnover
  -Monthly/Weekly Project ALARA Committee
  -Monthly/Bimonthly SGRP Planning
  -Weekly Pre-Outage Readiness
  -Monthly Plant ALARA Committee

- BECHTEL/SGRP

  -Plan of the Day - prior to each shift
  -Weekly Schedule - 4 week look ahead
  -Weekly Action Item
  -Monthly Project Status

- PLANT/SGRP

  -Plant Status - each morning or shift
  -Daily Schedule - each afternoon
  -Outage Management - weekly

SGRP LESSONS LEARNED

•MOCK-UP TRAINING

-Mock-up on more job evolutions
-More aggressive mock-up needed

•CLEANLINESS

-Must be stringently maintained
-Internal piping, cavity, work areas, etc.
-Cleanliness training required

•RADIOGRAPHY

-Radiography plan drafted for control
-Communication between RSD and radiographer

•COMMUNICATIONS

-Wireless headsets
-Closed circuit television
-Portable radios

•DEDICATED TECHNICIAN COVERAGE

-Workers report to Crewleader prior to entry
-Coverage technicians know when workers entering area
-Dedicated technician familiar with area work
-Maximizes coverage efficiency and consistency

COOK VS PALISADES

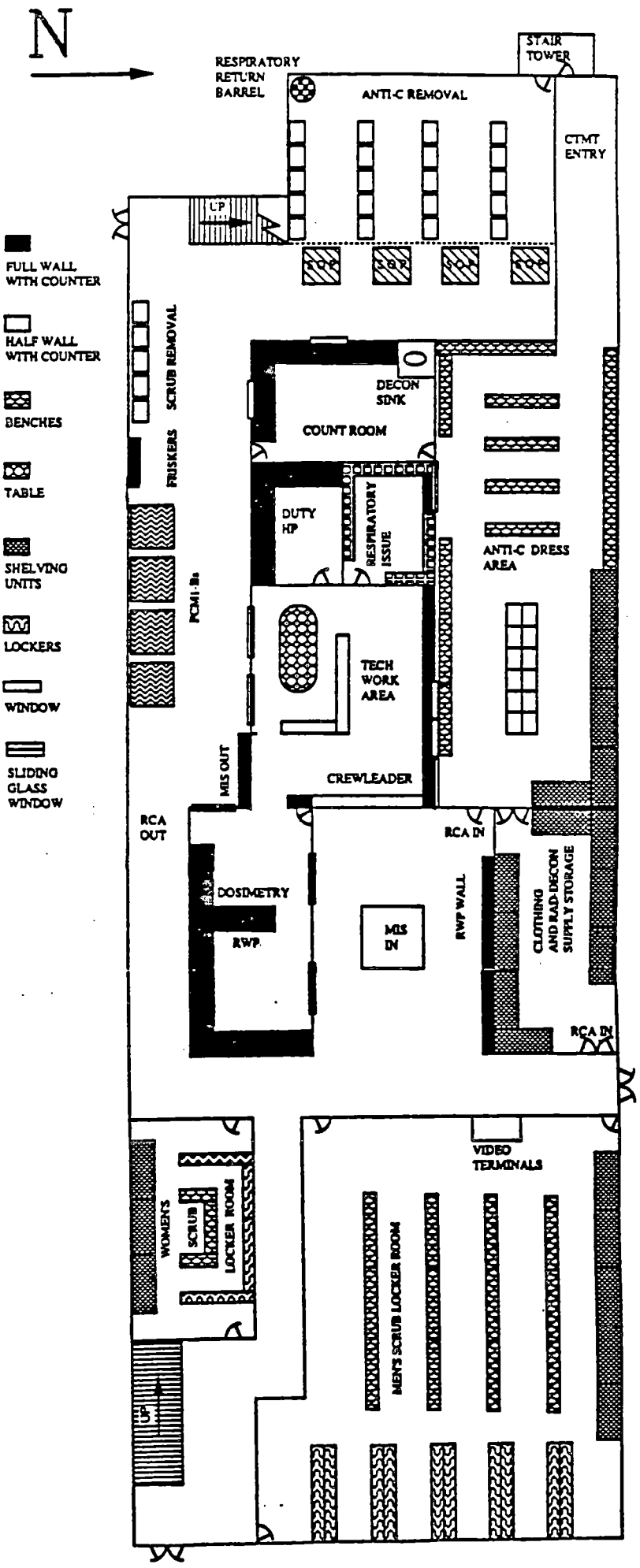
- DUAL UNIT SITE
- PROCEDURE REWRITE
- ONSITE NVLAP ACCREDITATION IN-PROCESS
- RADWASTE FACILITIES NEEDED
- RECENT SWITCH TO OFFSITE LAUNDRY

- SINGLE UNIT SITE
- NO PROCEDURE REWRITE
- ONSITE NVLAP DOSIMETRY AVAILABLE
- RADWASTE HANDLING FACILITIES ADEQUATE
- OFFSITE LAUNDRY ALREADY IN USE

SGRP COMPARISON OF PEAK RADIATION SAFETY STAFFING

		Point Beach	HB Robinson	DC Cook	Palisades* Contractor	House
Health Physics	Foreman & Leads	6	3	10		8
	Seniors	32	70	53	99	7
	Juniors & Access Control	32	33	41	24	
	Totals	70	106	104		138** (103)
Dosimetry	Technicians			15	4	3
	Clerks		36	2	8	
	Totals		36	17		15** (11)
Decon	Foremen		4	2		
	Technicians		52	35	60	
	Totals		56	37		60** (45)

*Projected Numbers
**At peak staffing, 75% will be dedicated to SGRP (#)


N
RESPIRATORY RETURN BARREL
STAIR TOWER
ANTI-C REMOVAL
CTMT ENTRY
UP
SCR
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FULL WALL WITH COUNTER
HALF WALL WITH COUNTER
BENCHES
TABLE
SHELVING UNITS
LOCKERS
WINDOW
SLIDING GLASS WINDOW
SCRUB REMOVAL
FRISKERS
PCM1-Ba
DECON SINK
COUNT ROOM
DUTY HP
RESPIRATORY ISSUE
ANTI-C DRESS AREA
TECH WORK AREA
MIS OUT
CREWLEADER
RCA OUT
RCA IN
DOSIMETRY
RWP
MIS IN
RWP WALL
CLOTHING AND RAD-DECON SUPPLY STORAGE
RCA IN
VIDEO TERMINALS
WOMEN'S LOCKER ROOM
SCRUB
MEN'S SCRUB LOCKER ROOM
UP

SGRP COMPARISONS
HP PORTABLE SURVEY INSTRUMENTS

	Point Beach	DC Cook	Palisades*
Dose Rate Instruments			
RO-2	0	23	25
RO-2A	10	15	12
Teletector	6	10	20
Gamma Survey Instruments	8	10	(15)
Total	24	58	57 (15)
Air Samplers			
High-Vol Grab Samplers	7	15	15
Lo-Vol Continuous Monitors	12	17	12
Total	19	32	27

*Will be used for SGRP and balance of Plant
(emergency use instruments only)

SGRP COMPARISONS
HEALTH PHYSICS INSTRUMENTATION

	Point Beach	DC Cook	Palisades
Contamination Monitors			
PCM-1B	0	5	4
Portable Friskers	20	30	49*
Count Room Instruments			
Gross B-G Counter	3	3	2
Gross I_2 Counter	0	0	2
Alpha Scintillator	3	1	2*
Gamma Spectrograph	1	1	2*
Area Radiation Monitors			
Remote Monitors	1	4	4

*Will be used for SGRP and Balance of Plant

SGRP COMMUNICATIONS

- WIRELESS HEADSETS

  -Radiation Safety Technician use

  -Reliable communication within containment

    - Crewleader to job coverage technicians
    - Between dedicated technicians

  -Inside to outside containment communication

    - Access control to Crewleader
    - Count room to job coverage technicians

- CLOSED CIRCUIT TELEVISION (CCTV)

12 cameras
8 monitors

  -ALARA tool

  -Aids in continuous coverage of high dose jobs

  -Aids in monitoring long term jobs

    - Automatic cutting
    - Automatic welding

- HAND HELD RADIOS

  -Communication between BPCo and RSD

  -Necessary for multi-source radiography

ELECTRONIC DOSIMETRY WITH COMPUTER INTERFACE

- WHAT IS IT?

  -Secondary dosimeter
  -LED displays accumulated dose and dose rate
  -Accumulated dose and dose rate alarms

- WHAT DOES IT DO?

  -Automatically rezeroes
  -Sets dose alarm from computer margins or default setting
  -Sets dose rate alarm from RWP or default setting
  -Instantly updates MIS computer for personnel dose on entry
  -Stores total accumulated dose and highest dose rate seen

- HOW DOES IT WORK?

  -Worker inserts dosimeter into reader
  -Enters SS no. and RWP no.

- WHY USE ELECTRONIC DOSIMETRY?

  -Alarming capabilities
  -More easily read than pocket ion chambers
  -Instant computer updating aids dose tracking and personnel dose reporting
  -Minimizes dosimeter discrepancies

AIRBORNE CONTROL

- DECONTAMINATION
  - -Initial Containment
  - -On-going
  - -Tool/Equipment
- CONTAINMENTS
  - -Pipe Cutting
  - -Pipe End Decon
  - -Filtration/Ventilation
- RESPIRATOR
  - -Fit Test
  - -MPC Tracking
- AIR SAMPLING
  - -CAM
  - -Grab

MAN-REM ESTIMATE METHOD

- CONSTRUCTION MAN-HOURS
- CONSTRUCTION WORK LOCATIONS
- RADIATION SURVEY DATA FOR LOCATIONS
- WEIGHTING FOR OCCUPANCY IN

  -Low Dose
  -General Area Dose
  -High Dose

  For Each Task

- WEIGHTING FOR RCA EFFICIENCY

  -Dress In/Out
  -Respirator
  -Special Dosimetry
  -Tool Checkout

- PLANT HISTORIC DATA
- OTHER SGRPs
- ESTIMATE

SGRP

MAN-REM ESTIMATE

CONSTRUCTION SCOPE:	573.7
CPCo SCOPE:	125.5
TOTAL PROJECT:	699.2

SGRP MAN-REM ESTIMATE
REVISION 1 (4/19/90)

	Task	Man-Rem
1.	Health Physics/Decon	109
2.	Plant Support	16
3.	Construction Opening	5
4.	Rigging and Supports	86
5.	S/G Modifications	12
6.	PCS Piping	171
7.	Insulation	48
8.	New Pipe Systems (BD/Recirc)	41
9.	Secondary Piping	10
10.	Old S/G Storage Facility	1
11.	Instrument Sample System	1
12.	HVAC	8
13.	Scaffold and Tents	81
14.	Temporary Services	17
15.	Project Support (Tours, Inspections, etc.)	58
16.	Testing & Inspection (NDE)	29
17.	Prep Outage 1989	13

STEAM GENERATOR REPLACEMENT DOSE SUMMARY

PLANT	SG	TOTAL DOSE (REM)
SURRY-2	3	2141
SURRY-1	3	1758
TURKEY POINT-3	3	2151
TURKEY POINT-4	3	1305
POINT BEACH-1	2	576
H B ROBINSON-2	3	1206
INDIAN POINT-3	4	541
D C COOK-2	4	561
PALISADES (ESTIMATED)	2	699

TECHNIQUES TO SAVE DOSE

- REDUCE FROM 6 CUT TO 5 CUT METHOD
- PERFORM LOOP CUTS WITHOUT REMOVING MANWAYS
- REMOVE ALL PRIMARY COOLANT SEAL FLUSH FILTERS
- PERFORM CUT PIPE END INTERNAL DECON
- CCTV
- SURROGATE TOUR
- MOCK-UP TRAINING
- RSD HEAD SET COMMUNICATIONS SYSTEM

ALARA REVIEW PROCESS

•WP&IR

-Bechtel ALARA review
-SGRP ALARA review

•FACILITY CHANGE PACKAGE

-CPCo design review
-ALARA checklist
-CPCo ALARA approval

•RWP

-CPCo RWP ALARA review
-CPCo ALARA approval

•PRE-JOB BRIEFING

-Lead technician or crewleader
-Duty HP, RWP technician or ALARA

•IN-PROGRESS AND POST-JOB REVIEWS

-ALARA (SGRP, CPCo)

•LESSONS LEARNED

-ALARA

PROJECT SOURCE TERM REDUCTION

DECEMBER '89	SOURCE IDENTIFICATION/ PRIORITIZATION (34)
JANUARY '90	ACTION PLAN TO IMPLEMENT BEST OPTIONS
FEBRUARY '90	SGRP COST/BENEFIT ANALYSIS ON SHARED CHEMICAL DECON OF LETDOWN, REGEN Hx, LETDOWN Hx LOOP
MARCH '90	SGRP COST/BENEFIT ON CUT/REMOVE OF FIVE SOURCES, THREE QUALIFIED
APRIL '90	WALKDOWNS TO EVALUATE UPGRADED SHIELDING FOR SOURCES NOT QUALIFIED FOR REMOVAL
MAY '90	BECHTEL COST/BENEFIT OF THE THREE LINES IDENTIFIED BY SGRP

PIPE END DECONTAMINATION

- MECHANICAL DECONTAMINATION

  -Grit blast at a 45° angle
  -Glass bead for smoothing
  -Vacuum and pressure equilization
  -Closed circuit TV
  -No damage to base material

- USED SUCCESSFULLY AT:

  -IP-3 SGRP
  -Muhleberg
  -Obrigheim

- WHEN COMBINED WITH SHIELDING, AVERAGE DOSE REDUCTION FACTOR OF ~20

- ESTIMATED WASTE (if 6 cut method)

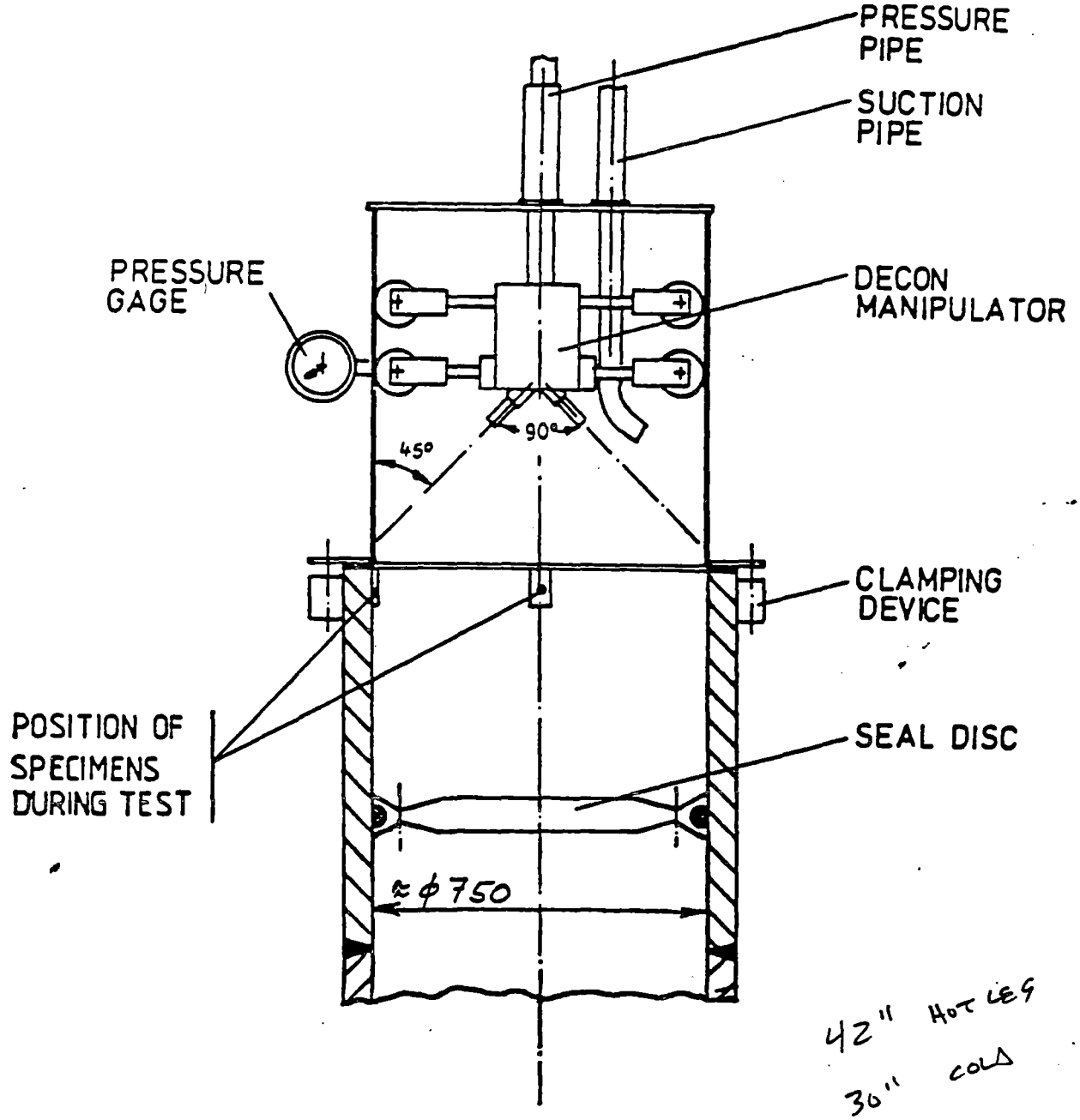
  -6.6 cf coborundum (grit)
  -3.6 cf glass beads
  -6 small dust cans
  -3 RBU filters (1 cf)

- NO MIXED WASTE

- DOSES FROM 5000 mRem/hr TO 250 mRem/hr

- PIPE END MACHINING PERFORMED WITHOUT RESPIRATORS

PCS PIPE END DECONTAMINATION EQUIPMENT



ALUMINUM OXIDE GRIT BLASTING

PROCESS EQUIPMENT

- RECIRCULATING BLAST UNIT
- MANIPULATOR
- FRONT BOX
- SEAL DISC
- ALUMINUM OXIDE/GLASS BEADS
- CCTV

PRIMARY SYSTEM CHEMICAL DECON

- INDEPENDENT STUDY
- ESTIMATED COST: $1,650,000.00
- ESTIMATED MAN-REM COST: 30 MAN-REM
- ESTIMATED MAN-REM SAVINGS: 25 MAN-REM
- SCHEDULE REQUIREMENT: 3-5 CRITICAL PATH DAYS
- ADDITIONAL CONSIDERATIONS

  -PCS Dam Installation
  -Core Support Barrel Removal
  -Disruption of Missle Shield Logistics
  -Loss of Lay Down Areas
  -Manways Will Remain On (No Jumps)
  -Low External Dose Contribution

- RESULTS

  -Negative Cost/Benefit
  -Negative Schedule Impact
  -Negative Logistics

MINIMIZING CHANNEL HEAD RADIATION FIELDS

- INDEPENDENT INDUSTRY SURVEY
- AVERAGE PLANT DOSE RATES:

  13 R/hr TUBESHEET
  10 R/hr GENERAL AREA

- PALISADES OLD STEAM GENERATORS

  5 R/hr TUBESHEET
  3.5-5 R/hr GENERAL AREA

- FACTORS FOUND TO MITIGATE RAD FIELDS:

  MATERIAL
  - -LOW COBALT CONTENT
  - -TUBES BRIGHT ANNEALE

  SURFACE
  - -REDUCED ROUGHNESS
  - -REDUCED PLATEOUT
  - -REDUCED RAD LEVELS

  CHEMISTRY
  - -pH 7.1
  - -LITHIUM 2.2 ppm (MAX)
  - -DISSOLVED O_2 <5ppb
  - -HYDROGEN PEROXIDE INJECTION

S/G SURFACE ENHANCEMENT

OBJECTIVE: PROVIDE A UNIFORM MICROSMOOTH SURFACE

- MECHANICALLY CLEAN AND SMOOTH SURFACE
  - -Brush to remove scale and debris
  - -Flapper wheel and buff to a smoothness of 40 RMS
- ELECTROCHEMICALLY POLISH TO REMOVE MICROROUGHNESS
  - -Conforming cathode
  - -Standard electrolyte and technique
  - -Rinsing with demin water
  - -Final smoothness featureless at 100X scanning electron microscope

SGRP TRAINING

- GENERAL EMPLOYEE TRAINING (GET)
  - -INPO 87-008 "Guidelines for GET"
  - -GET updated as necessary for SGRP
- PROJECT ORIENTATION (GET UPDATE)
  - -SGRP workers currently on-site
  - -Update on Project specifics
    - ○facilities
    - ○plans and procedures
- CONTRACT TECHNICIANS
  - -INPO 87-008, "Guidelines for RPT Training"
  - -Entrance exam for incoming knowledge and skills
  - -Procedure training and exam
  - -OJT
  - -Continuing Training

SGRP TRAINING (CONTINUED)

- SUPERVISOR ALARA SEMINAR
  - -BPCo supervision
  - -Motivational ALARA techniques
  - -Points out ALARA responsibilities
  - -Shows causes of unnecessary exposure
  - -Familiarization with RP paperwork
- MOCK-UP TRAINING
  - -Required prior to RWP sign-in
  - -Pipe-end decon
  - -Machining
  - -Welding
  - -Channel head jumps as necessary

DECONTAMINATION

- INITIAL CONTAINMENT DECON

  -Allows access
  -Reduces respiratory requirements
  -Reduces personnel contaminations

- GENERAL AREA DECON

  -Maximizes contamination control
  -Maximizes productivity
  -Minimizes protective clothing requirements
  -Minimizes use of respirators
  -Minimizes personnel contaminations

- SPECIAL DECON REQUIREMENTS

  -Thermal shield
  -Liner plate
  -Steam generators

- CONTRACTOR DECON SERVICES

  -Tools and equipment
  -Respirators
  -Protective clothing

RADIOACTIVE MATERIALS PROGRAM

•MINIMIZATION OF VOLUME GENERATED

-Prevention of material and equipment from becoming contaminated

-Pre-job planning, material lists

-Decontamination of materials and equipment

-Re-use of equipment which has been contaminated

•MINIMIZATION OF VOLUME BURIED

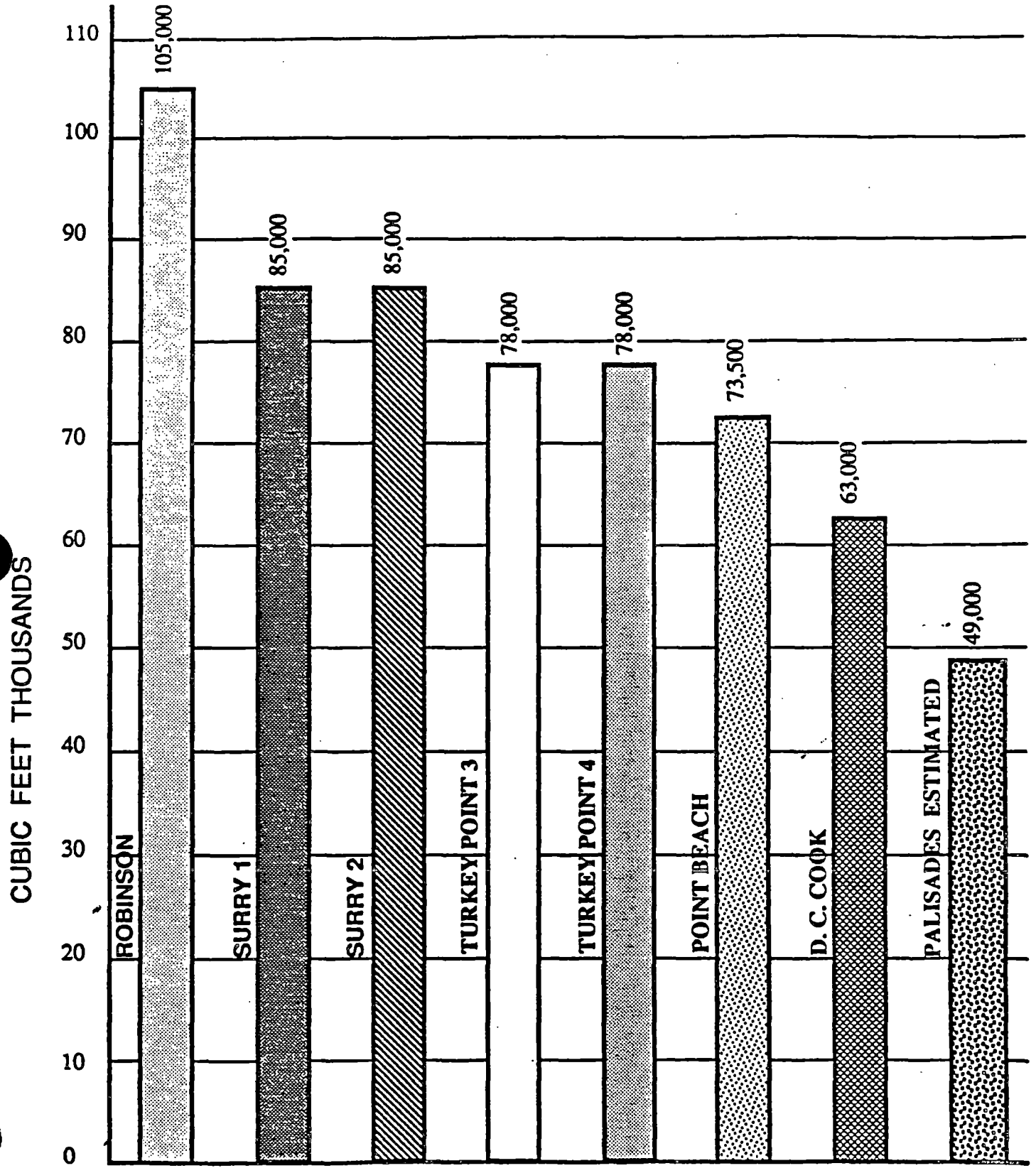
-Segregation of reusable material which inadvertently ends up in the trash

-State of the art supercompactor

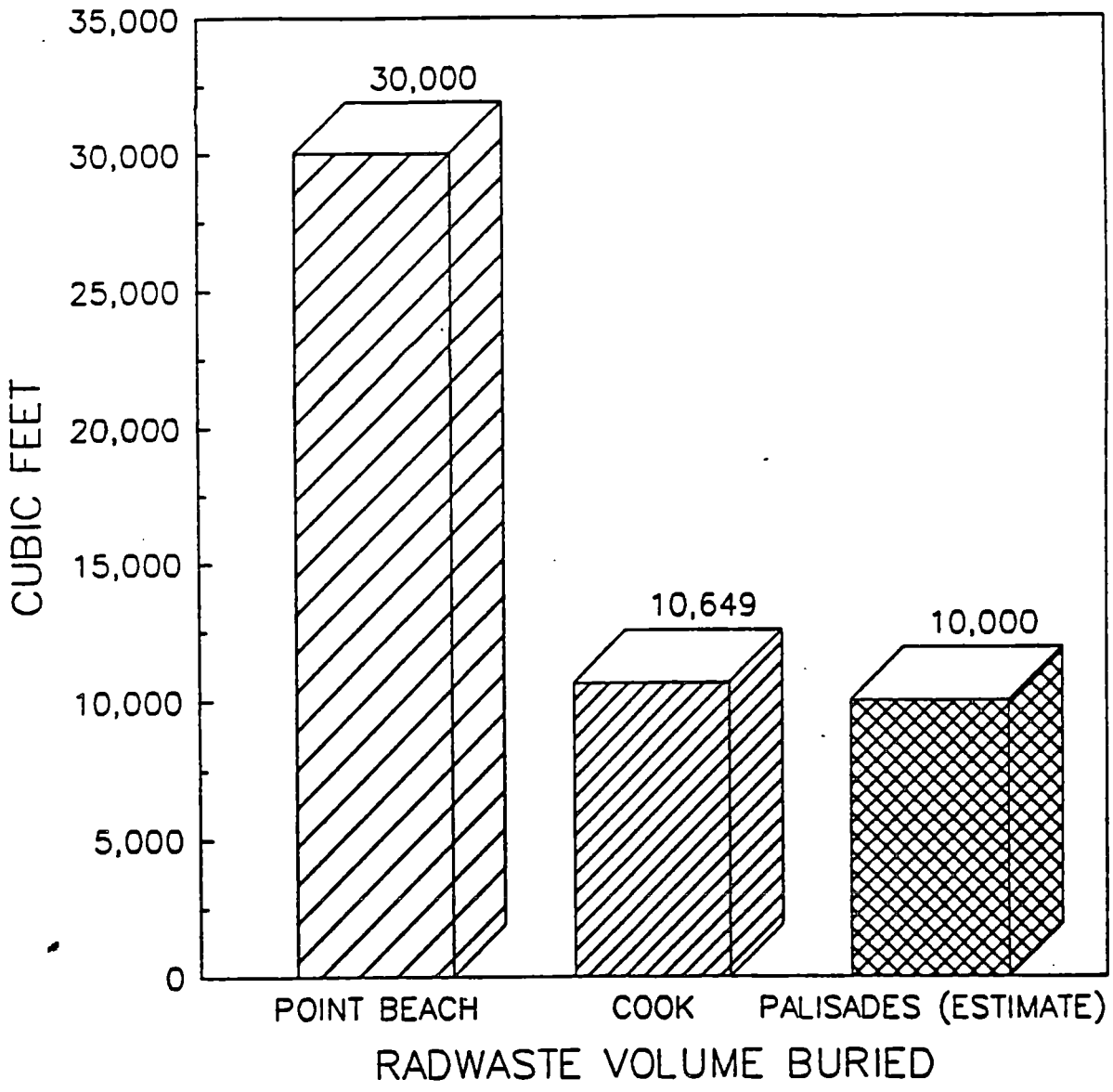
-Vendors available for special requirements

STEAM GENERATOR REPLACEMENT PROJECT
RADWASTE VOLUMES GENERATED
PER UNIT

AVERAGE DENSITY 10 lb/ft^3



STEAM GENERATOR REPAIR PROJECTS
POINT BEACH, COOK AND PALISADES (ESTIMATE)
SGRPs



CONSTRUCTION OPENING

- ORIGINAL CONTAINMENT CONTRUCTION UTILIZED AN OPENING

- OTHER OPERATING FACILITIES EQUIPMENT HATCHES OPEN TO THE ATMOSPHERE

- SIZE AND LOCATION OF OPENING 26' x 28'

- STEEL AND CONCRETE

  -Survey and disposition

- ENGINEERING CONTROLS

  -Temporary enclosure
  -HVAC
  -Local containments and ventilation

- AIR MONITORING

  -Grab samples
  -CAMs
  -HEPA outlet

- WALL REINSTALLATION

- TESTING

REQUIREMENTS FOR OPENING CONTAINMENT DOOR

- HEALTH PHYSICS NOTIFICATION

  -Crewleader stops or limits area jobs with airborne potential

  -CAMs operability and source checked

  -Grab sample taken prior to opening (not mandatory)

  -Grab sampler loaded

  -Inner vicinity floor smeared to ensure < 10K dpm/100cm2

- FUEL HANDLING SUSPENDED

- FUEL HANDLING BUILDING VENTILATION EXHAUST IN OPERATION

- CONTAINMENT PURGE SUPPLY FANS TAGGED OFF

- IODINE REMOVAL UNITS OPERABLE

- PERSONNEL AIR LOCK OPERABLE/DOOR NORMALLY CLOSED

- WEATHER CONDITIONS FACTORED INTO DECISION TO PROCEED

MITIGATION OF RELEASE FROM CONSTRUCTION OPENING

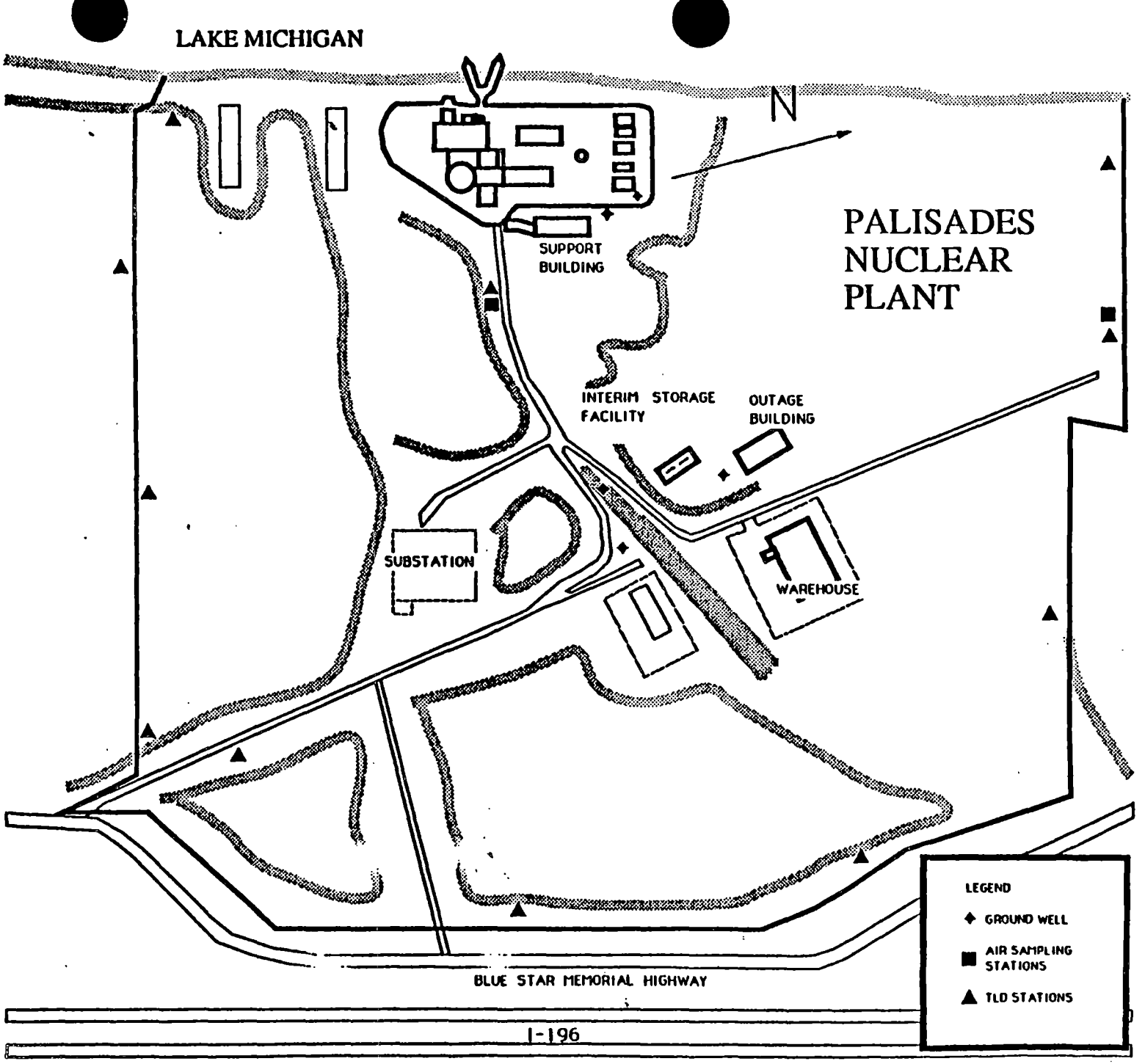
- WHEN REQUIRED
  - -CAM alarm
  - -649' G/A air sample result >25% MPC
- ACTIONS REQUIRED
  - -Commence air sampling immediately
  - -Contain source if known
  - -Activate I_2 removal units if I_2 present
  - -Verify HVAC operability
  - -Verify in-flow
  - -Close temporary door if possible (quantify release if not possible)
- PRIOR TO NEXT OPENING
  - -Investigate cause
  - -Determine future preventive measures

STEAM GENERATOR DESCRIPTION

- TWO UNITS
- 462 TONS EACH
- 60 FEET LONG
- 20 FEET IN DIAMETER
- 1718 CURIE CONTENT EACH
- 40 mRem/Hr MAXIMUM SURFACE DOSE RATE ESTIMATE (DRY)

RIGGING AND TRANSPORT

- RIGGING INSIDE CONTAINMENT
- RETAINING WALL OUTSIDE CONTAINMENT
- RIGGING OUTSIDE CONTAINMENT
- HAUL ROUTES
- EVENT ANALYSIS


LAKE MICHIGAN
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OUTAGE
BUILDING
SUBSTATION
WAREHOUSE
BLUE STAR MEMORIAL HIGHWAY
I-196
LEGEND
GROUND WELL
AIR SAMPLING
STATIONS
TLD STATIONS

EVENT ANALYSIS

•SCENARIO*

-S/G drop outside of containment

-Seal welded nozzle caps come off

•ASSUMPTIONS

-Curie content 1718

-Breathing rate from Section C.2.(C) of Regulatory Guide 1.4

-Dose conversion factors from Tables E.7 to E.10 of Regulatory Guide 1.145

-10% of activity in steam generator is released and 1% of that released goes airborne

* Present design analysis drop scenario shows that no breach of S/G can occur and no release of radioactivity will occur in case of an accidental drop

EVENT ANALYSIS (CONTINUED)

•CALCULATED DOSE COMPARISON TO IP-3

STEAM GENERATOR DROP LOCATION	WHOLE BODY DOSE PALISADES	IP-3	CRITICAL ORGAN (LUNG) DOSE PALISADES	IP-3
CONTAINMENT	0.10 mRem	0.3 mRem	30 mRem	118 mRem
STORAGE FACILITY	0.58 mRem	2.3 mRem	153 mRem	1030 mRem

•10CFR100 GUIDELINE

-300 REM TO THYROID OR CRITICAL ORGAN
- 25 REM TO WHOLE BODY

NOTE: THE PRESENT DESIGN ANALYSIS DROP SCENARIO SHOWS THAT NO BREACH OF THE STEAM GENERATOR CAN OCCUR AND NO RELEASE OF ACTIVITY WILL OCCUR IN THE CASE OF AN ACCIDENTAL DROP.

•SITE EMERGENCY PLAN WOULD COVER THE INCIDENT

TRANSFER FOR RECYCLING

- ADVANTAGES

  -S/Gs would be immediately and ultimately disposed of

  -Burial space would be minimized

- DISADVANTAGES

  -High exposure rate if not deconned

  -Additional time, expense and man-rem if deconned

  -Cost, time and man-rem required for shipment

  -Many shipments required

  -Many potential accident scenarios would need to be addressed

  -Potential objections or additional requirements by states traversed

  -Application of technology to this situation untested

— HANFORD
or
BERKWELL

BARGE AND BURY

•ADVANTAGES

-S/Gs would be immediately and ultimately disposed of

-Future uncertain cost increases would be avoided

DISADVANTAGES

-S/G surface exposure rates would be higher than if delayed

-There would be additional man-rem and expense over interim storage

-Potential problems associated with shielding and loading intact S/Gs

-Many potential accident scenarios would need to be addressed

-Site preparations and rigging/loading could negatively impact schedule

-Project schedule delays could result in storage until spring

-Uncertainty in ability to bury outside of Michigan could drastically alter this approach

ON-SITE STORAGE

- ADVANTAGES

  -No credible accident scenario

  -Handling is simplified and time required for disposition is reduced

  -At the end of plant life, the radiological hazard will be greatly reduced (1/10 original in 24 mo. then T1/2 is 5.2 yrs)

  -Future improvements in technology could be applied

- DISADVANTAGES

  -This is an interim solution, final disposition will occur during decommissioning

  -Uncertainty in future disposal costs

STEAM GENERATOR DISPOSAL OPTION COMPARISON

OPTION	MAN-REM
BARGE AND BURY	10
CUT, TRUCK AND DISPOSE	
-With decon	<100
-Without decon	1500
ON-SITE INTERIM STORAGE	
-Construction	1
-Maintenance	<5
-Future disposal	?

FATE OF OTHER REMOVED STEAM GENERATORS

•SURRY (1 & 2)	1 SHIPPED FOR STUDY 5 ON-SITE STORAGE
•H B ROBINSON 2	3 ON-SITE STORAGE
•POINT BEACH 1	2 ON-SITE STORAGE
•TURKEY POINT 3 & 4	6 ON-SITE STORAGE
•INDIAN POINT 3	4 ON-SITE STORAGE
•D C COOK 2	4 ON-SITE STORAGE

COMPARISON OF STEAM GENERATOR STORAGE FACILITIES

PLANT	WALL THICKNESS	ROOF THICKNESS	EXTERNAL DOSE RATE
PALISADES	2'-6"	1'-6" (MIN)	<0.5 MR/HR
INDIAN PT 3	3'-0"	1'-6" (MIN)	<0.5 MR/HR
D C COOK 2	2'-6"	2'-6"	<1.0 MR/HR
TURKEY PT 3 & 4	2'-0"	1'-0"	<2.5 MR/HR
PT BEACH 1	2'-0"	2'-0"	<2.5 MR/HR
SURRY 1 & 2	3'-0"	NOT AVAILABLE	<0.5 MR/HR
ROBINSON 2	2'-0"	2'-0"	<1.0 MR/HR

DESIGN PARAMETERS OF PALISADES OLD STEAM GENERATORS INTERIM STORAGE FACILITY

- **LOCATION**

  -Approximately 2200ft northeast of the containment

- **DIMENSION**

  -Length 129' 4"
  -Width 29' 0"
  -Height 28' 9 1/4" (maximum)

- **NUMBER OF STEAM GENERATORS**

  -2

- **WALL THICKNESS**

  -2' 6"

- **ROOF THICKNESS**

  -1' 9" to 2' 1"

- **SURFACE RADIATION LEVEL**

  -0.5 mR/hr on exterior

INTERIM STORAGE FACILITY (CONT)

- OFFSITE BOUNDARY

  -Van Buren State Park is the closest offsite boundary at 1200 ft north of the facility

- NEAREST ON-SITE STRUCTURE:

  -Outage Building at 275 ft away

- LOCKED AND POSTED ACCESS DOOR

- SURVEILLANCE PROGRAM RADIATION, CONTAMINATION

- MAXIMUM ALLOWABLE BUILDING WALL SURFACE DOSE RATE 0.5 mR/Hr

- S/Gs COATED TO SEAL SURFACE

- CLOSED SUMP

- SEALED BUILDING

- REMOTE SAMPLING PORTS

ISF OFF-SITE DOSE

•ASSUMPTIONS

-200 mRem/hr S/G dry surface dose rate*

-Right cylinder 930.62" long, 155.5" diameter

-ISF 130' long, 30' high, 30' wide

-1200' to nearest fence (worst case)

-Tourist at fence 100% of the time

-Sky shine included

-Nearest residence 3000 ft, 100% occupancy

•LIMITS

-EPA 40CFR190.10(a) limit = 25 mRem/yr

-ISF dose to fence = 5.0 E-4 mRem/yr

-ISF dose to nearest resident = 1.0 E-5 mRem/yr

*Conservative compared to expected value of 40 mRem/hr

ENVIRONMENTAL SAMPLING PROGRAM

- ONGOING

  - -PRESENT ENVIRONMENTAL MONITORING PROGRAM

    - Direct Radiation
    - Airborne
    - Waterborne
    - Ingestion

- IN ADDITION

  - -DURING S/G TRANSPORTATION [redacted]

    - Direct Radiation
    - Ingestion

  - -AFTER STORAGE

    - Direct Radiation
    - Waterborne

Attachment 3

NRC/CPCo/BPC Meeting

May 3, 1990

Palisades Plant Site

Name	Affiliation
David W. Joos	CPCo/VP Energy Supply Services/SGRP Mgr
R.H. Beck	Bechtel
Mark Rubin	NRR/NRC
John A. Zwolinski	NRR/ADP/DRSP
Brian E. Holian	NRR/PM-Palisades
Bob Pierson	NRR/PDIII-1/DRSP
Keith Wichman	NRR/DET/EMCB
Chen P. Tan	NRR/DET/ESGB
Arnold Lee	NRR/DET/EMEB
A.K. Beckman	Bechtel
Kelly V. Cedarquist	CPCo/ISI
Tom Newton	CPCo/ISI
Mark Caruso	NRC/NRR/SRXB
Jake Wechselberger	NRR
Emmett Murphy	NRR/DET/EMCB
Winston W. Liu	Reactor Inpsector NRC RIII
Tom Tai	Bechtel
Mark L. Lesinsui	CPCo SGRP/RP
Jim Kuemin	CPCo SGRP/Licensing
William Clark	CPCo SGRP/Eng & Const
Cris Hillman	CPCo Palisades/Projects
J.G. Lewis	CPCo/SGRP
Herman M. Esch	CPCo/Palisades/Planning
David P. Hoffman	CPCo/VP Nuclear Operations
Ken Berry	CPCo/Director Nuclear Licensing
Bud Gerling	CPCo/Pal/A&TA Supervisor

Att 4

NRC PRESENTATION and TOUR

DATE: MAY 3, 1990

LOCATION: MANAGERS CONFERENCE ROOM

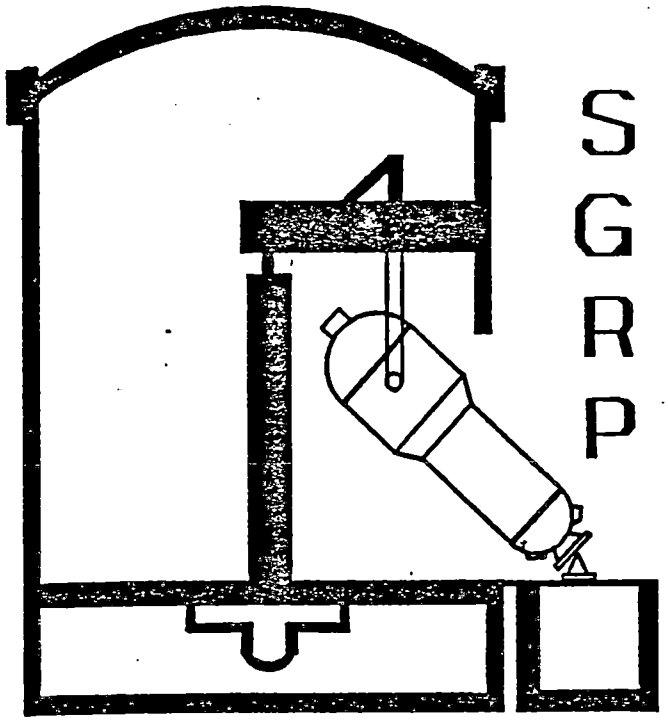
SUBJECT: SGRP, SG IMPROVEMENTS and SECONDARY SYSTEM IMPROVEMENTS

AGENDA:

8:00	INTRODUCTION	D W JOOS
8:15	VIDEO	
8:30	PROJECT PLAN	D W JOOS
9:00	SG & SECONDARY IMPROVEMENTS	C T HILLMAN
10:00	SGRP OUTAGE SCHEDULE	A K BECKMAN
11:30	LUNCH	
12:00	SURROGATE TOUR ON LASER DISK	J S RIDLEY
1:00	PLANT TOUR OUTSIDE CONTAINMENT TURBINE BLDG SFP INSIDE CONTAINMENT SG HAUL ROUTE SG INTERIM STORAGE NEW SGs	J G LEWIS
4:30	CLOSEOUT	D W JOOS

PALISADES
STEAM GENERATOR
REPLACEMENT PROJECT

PALISADES



PROJECT PLAN

1. INTRODUCTION
2. MISSION & GOALS
3. ORGANIZATION
4. SCOPE & RESPONSIBILITIES
5. PROJECT SCHEDULE
6. OUTAGE SCHEDULE
7. BUDGET

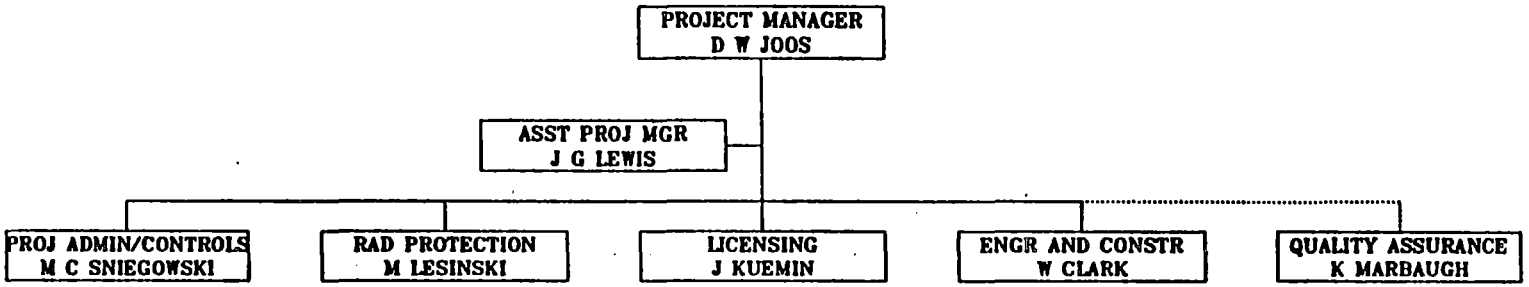
SGRP MISSION

"TO ACCOMPLISH THE STEAM GENERATOR REPLACEMENT WITHIN BUDGET, ON OR AHEAD OF SCHEDULE, AND WITH HIGH QUALITY. IN ADDITION, ALL PROJECT OBJECTIVES SHOULD BE ACCOMPLISHED SAFELY AND WITH RADIATION EXPOSURE AS LOW AS REASONABLY ACHIEVABLE."

SGRP
PROJECT GOALS

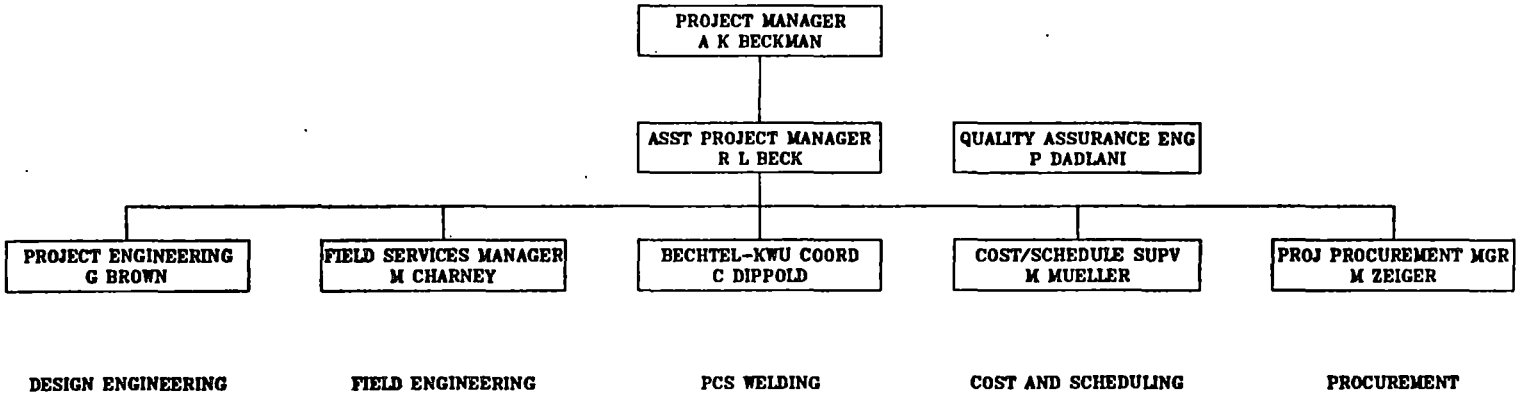
SAFETY	• NO LOST-TIME ACCIDENTS • RADIATION EXPOSURE LESS THAN 679 MAN-REM • NO OVER-EXPOSURES • LESS THAN 215 CONTAMINATIONS • LESS THAN 10,000 CUBIC FEET RADWASTE FOR BURIAL
SCHEDULE	• 21 DAYS SPRING OUTAGE CRITICAL PATH • 75 DAYS REPLACEMENT OUTAGE CRITICAL PATH
COST	• LESS THAN $103 MILLION
COMPLIANCE	• NO NRC CIVIL PENALTIES • LESS THAN 45 NRC NON-COMPLIANCE POINTS • NO ENVIRONMENTAL VIOLATIONS • NO WORKER SAFETY VIOLATIONS
QUALITY	• COMPLIANCE WITH REQUIREMENTS • MINIMIZE REWORK

PALISADES STEAM GENERATOR REPLACEMENT PROJECT ORGANIZATION



PLANNING AND SCHEDULING	RADIATION PROTECTION FACILITIES AND SERVICES	STRATEGY DEVELOPMENT	ENGR AND CONSTRUCTION	AUDIT AND SURVEILLANCE PROGRAM
CONTRACTS	SOURCE-TERM REDUCTION	SUBMITTAL PREPARATION AND DEFENSE	PROCUREMENT	QUALITY PROGRAM DEVELOPMENT AND LICENSING
ADMINISTRATION	DECONTAMINATION	NRC COMMUNICATIONS	TESTING AND INSPECTIONS	
RECORDS MANAGEMENT	RADWASTE			

PALISADES STEAM GENERATOR REPLACEMENT PROJECT
BECHTEL ORGANIZATION



DESIGN ENGINEERING

LICENSING

FIELD ENGINEERING

FIELD PROCUREMENT

FIELD CONSTRUCTION

FIELD COST/SCHEDULING

FIELD ALARA

FIELD SAFETY

FIELD QUALITY CONTROL

PCS WELDING

COST AND SCHEDULING

PROCUREMENT

5/1/90

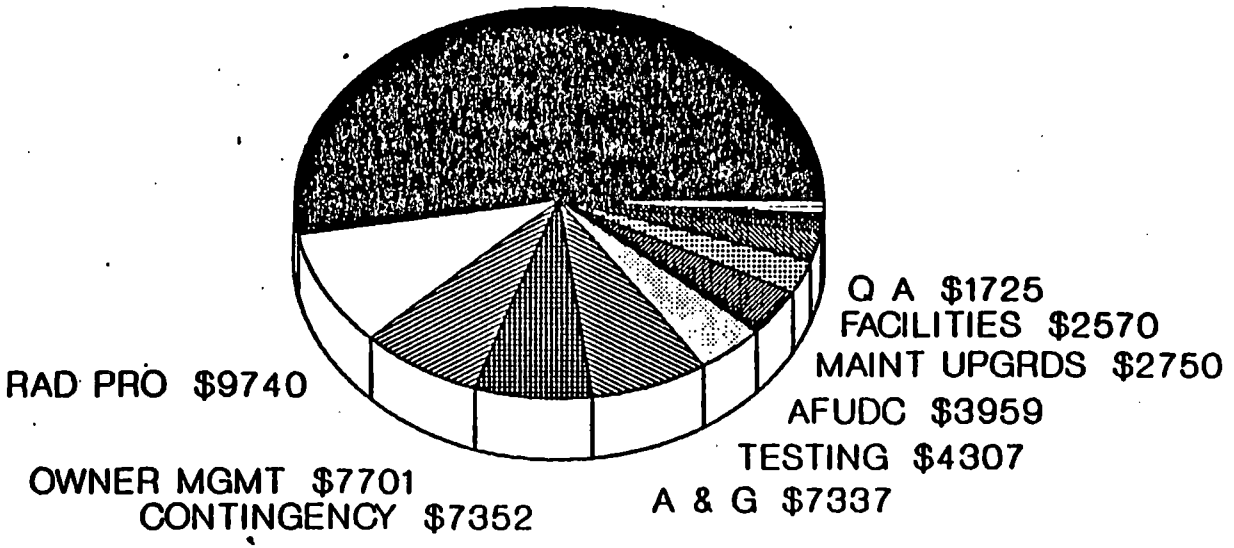
SGRP
SCOPE & RESPONSIBILITIES

- PROJECT MANAGEMENT
- COMPLETION & DELIVERY OF THE STEAM GENERATORS
- ENGINEERING AND CONSTRUCTION
- TESTING & INSPECTION
- FACILITIES
- LICENSING
- RADIATION PROTECTION
- QUALITY ASSURACE/QUALITY CONTROL
- SECURITY

SGRP

TOTAL PROJECT BUDGET

ALL COSTS 000's



Budget Rev: 2A

Desk Reference 4.1.1

NRC MEETING

STEAM GENERATOR STATUS UPDATE

TOPICAL AGENDA

MAY 3, 1990

EXISTING STEAM GENERATORS

* Steam Generator History
  - operation and tube plugging history
  - corrosion mechanisms
* Current Problems and Remedies
  - tube support plate growth
  - denting and cracking
  - IGA/SCC
* Chemistry Performance
  - sludge lancing
  - chemistry with the Reverse Osmosis unit

REPLACEMENT STEAM GENERATORS

* Steam Generator Design Improvements
  - stainless steel eggcrate supports
  - recirculation ring
  - increased blowdown line size
* Secondary Side Improvements
  - copper removal
  - blowdown system enhancements
* Future Plans
  - Steam Generator Reliability Program

SG AND SECONDARY IMPROVEMENTS

- EXISTING STEAM GENERATORS
  - SG HISTORY
  - CURRENT PROBLEMS AND REMEDIES
  - CHEMISTRY PERFORMANCE
- REPLACEMENT STEAM GENERATORS
  - DESIGN IMPROVEMENTS
- SECONDARY SIDE IMPROVEMENTS
- FUTURE PLANS

PALISADES STEAM GENERATOR OPERATING HISTORY

- JAN 1973 — FIRST TUBE FAILURE AFTER ONE YEAR OF OPERATION; WASTAGE ATTACK, PLUGGED FIRST 11 ROWS (1,400 TUBES; 8%)

- AUG 1973 — EXCESSIVE LEAKAGE; PLUGGED ALL TUBES WITH GREATER THAN 60% WASTAGE DEFECTS (340 TUBES)

- MAY 1974 — PLANT WAS STILL OFF LINE FOR RX VESSEL REPAIRS. FAILURE MECHANISM WAS IGA; SYSTEM FLUSHED AND WATER TREATMENT CHANGED TO ALL-VOLATILE TREATMENT (APPROXIMATELY 920 PLUGGED; 16% PLUGGED TOTAL)

- 1975 TO 1982 — WASTAGE ESSENTIALLY ARRESTED; 1085 PLUGGED OVER 8 YEARS (ADDITIONAL 6%) DENTING WAS OCCURRING AT A MINOR RATE; TUBE SUPPORT PLATES BEING LOCKED UP

- MAR 1982 — 2 LEAKING TUBES IN A-SG; DEVELOPMENT BEGUN ON A ECT PROBE CAPABLE OF TRAVERSING THE FULL LENGTH OF THE TUBES FOR BETTER DETECTION OF CIRCUMFERENTIAL CRACKS AND IGA

- AUG 1983 — BEGAN OUTAGE WHICH WAS EXTENDED 11 MONTHS BY REQUIRED QUALIFICATION OF THE RECENTLY DEVELOPED 4C4F ECT PROBE. TESTING REVEALED A SUBSTANTIAL NUMBER OF POSSIBLE IGA INDICATIONS (PLUGGED APPROXIMATELY 280 TUBES)

OPERATING HISTORY - CONTINUED

- NOV 1985 A ROUTINE REFUELING OUTAGE WITH NO ABNORMAL SG INSPECTION RESULTS; DENTING CONTINUING

- DEC 1987 FIRST OUTAGE DUE TO SG LEAKS IN OVER 5 YEARS. CIRCUMFERENTIAL CRACK AT 13TH SUPPORT PLATE OF B-SG; BORIC ACID ADDED TO SECONDARY SIDE TO HELP MITIGATE DENTING, PRECEDED BY SLUDGE LANCING

- AUG 1988 TUBE LEAK IN B-SG; CIRCUMFERENTIAL CRACKS AT 13TH SUPPORT PLATE; 34 TUBES PLUGGED

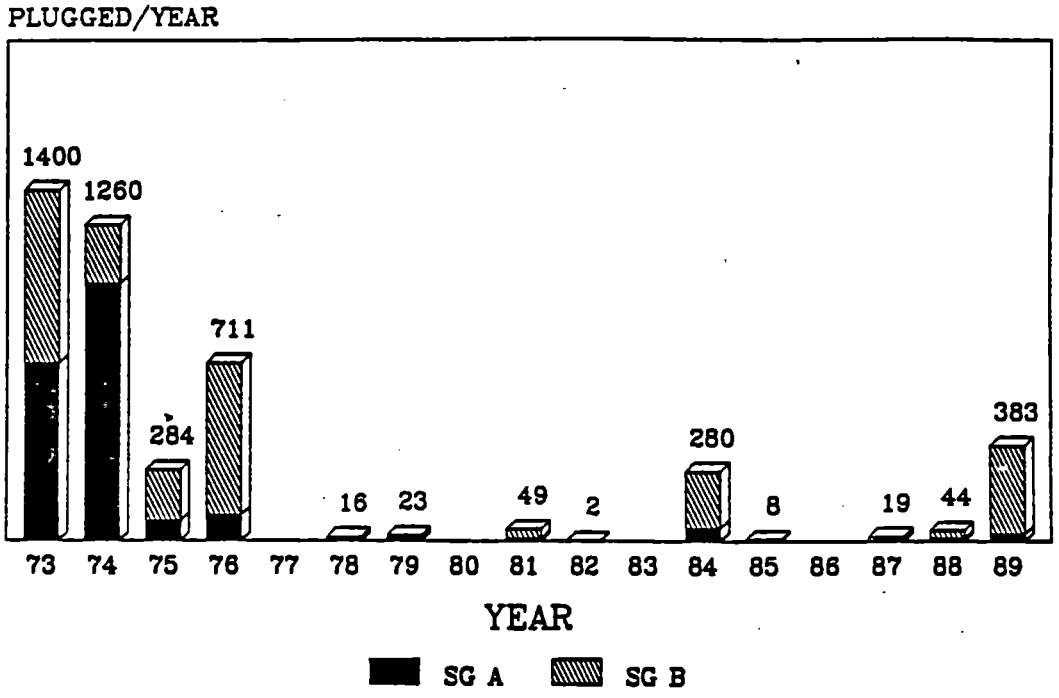
- DEC 1988 WELD DEFECT ON B-SG TUBE PLUG; PREVENTIVE PLUGGING OF 9 TUBES

- JAN 1989 CIRCUMFERENTIAL CRACK AT 3RD SUPPORT PLATE; PREVENTIVE PLUGGING OF 238 TUBES

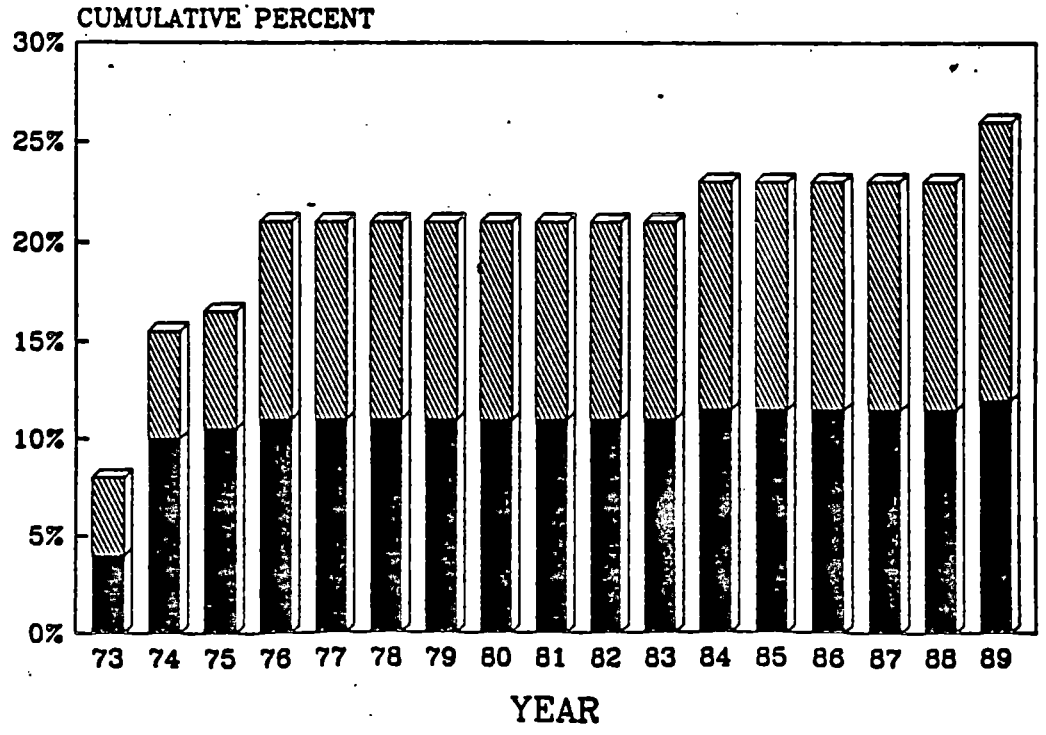
- OCT 1989 ADDITIONAL 145 TUBES PLUGGED DUE TO CRACKING IN HIGH STRESS REGIONS

- TOTAL TUBES PER SG 8519; PRESENTLY A-SG HAS 2044 TUBES PLUGGED (24%) AND B-SG HAS 2442 TUBES PLUGGED (29%)

STEAM GENERATOR TUBE PLUGGING

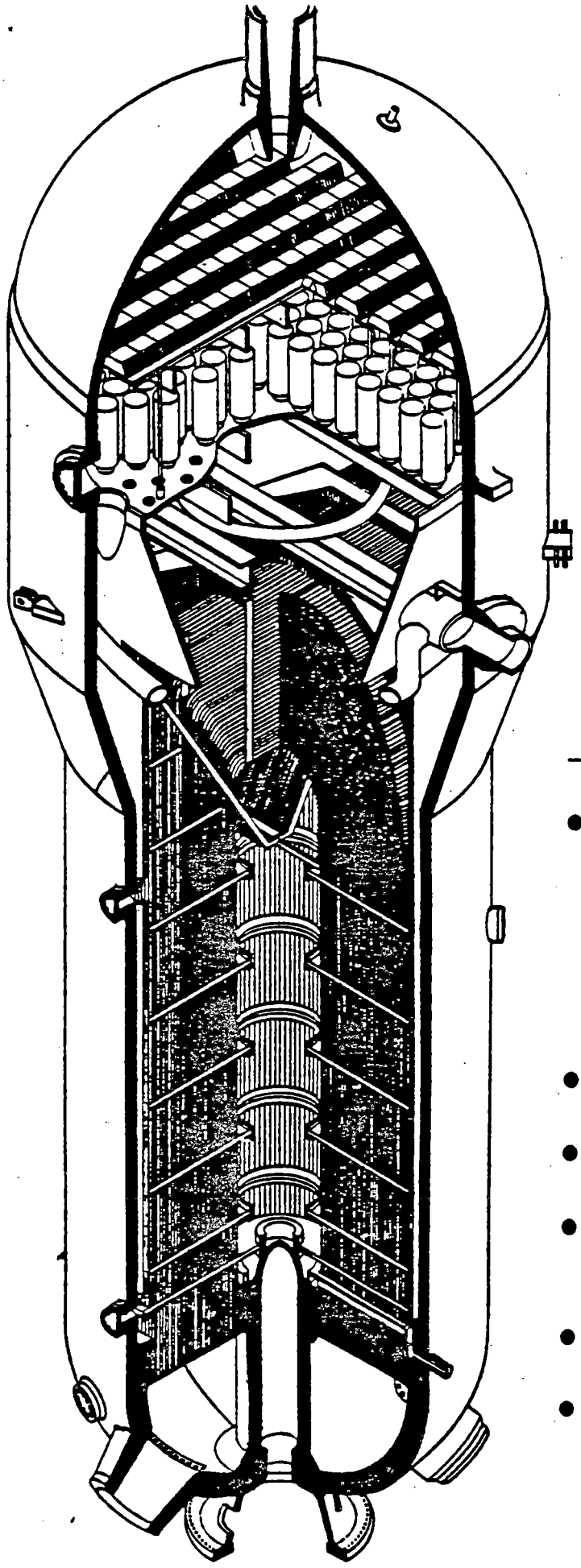


SG FORCED OUTAGES:
73-1, 74-2, 82-1, 87-1, 88-2, 89-1



EXISTING STEAM GENERATORS

- CORROSION MECHANISMS
  - WASTAGE
  - DENTING
  - IGA/SCC
- CURRENT PROBLEMS AND REMEDIES
  - TUBE SUPPORT PLATE GROWTH
  - DENTING AND CRACKING
  - IGA/SCC
- CHEMISTRY PERFORMANCE
  - SLUDGE LANCING
  - CHEMISTRY WITH THE REVERSE OSMOSIS UNIT



IMPROVEMENTS

- STAINLESS STEEL EGGCRATE TUBE SUPPORTS
  - MINIMIZE FLOW STAGNATION
  - REDUCE POTENTIAL FOR DENTING
  - MINIMIZE STEAM BLANKETING
- LARGER MANWAYS
- MODIFIED INSPECTION PORTS
- INTEGRAL MAIN STEAM FLOW RESTRICTOR
- IMPROVED BLOWDOWN CAPABILITY
- ELECTROPOLISH PCS HEADS

SECONDARY SYSTEM IMPROVEMENTS

- COPPER REMOVAL

  MAIN CONDENSER RETUBING

  FEEDWATER HEATER AND DRAIN COOLER REPLACEMENT

- OXYGEN CONTROL

  CONDENSER BOOT REPLACEMENT

- CORROSION PRODUCT REMOVAL

  ORGANIC REMOVAL

  SECONDARY WATER QUALITY

  WATER QUALITY INSTRUMENT UPGRADE

- PHASE II BLOWDOWN SYSTEM ENHANCEMENTS

  INCREASE BLOWDOWN AND RECIRC PIPE SIZE

  INCREASE CAPACITY OF BLOWDOWN HX

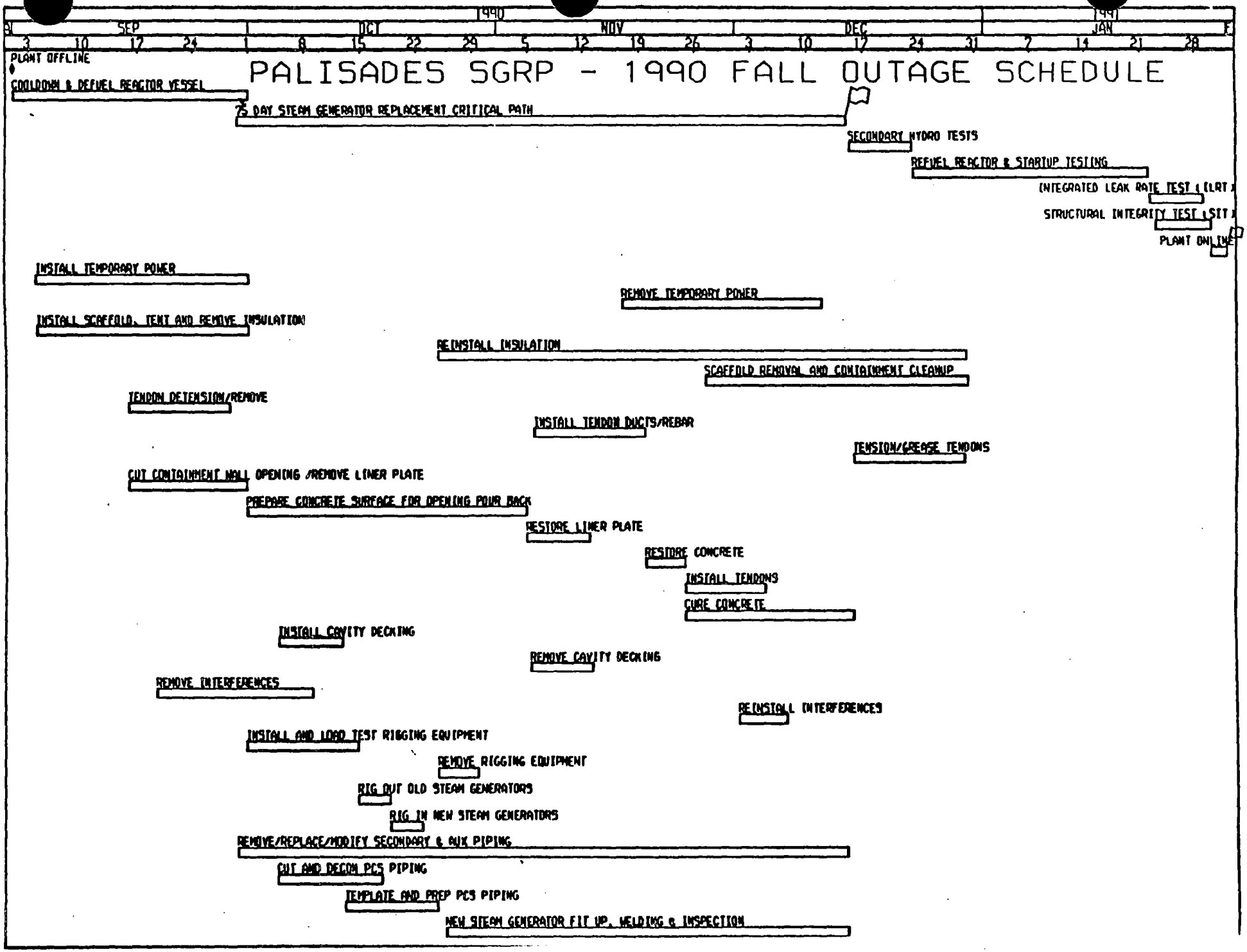
  LARGER FLOW BLOWNDOWN PUMPS

FUTURE PLANS

- STEAM GENERATOR RELIABILITY PROGRAM
  - PROGRAMMATIC ASPECTS
  - OPERATION ENHANCEMENTS
  - MAINTENANCE ENHANCEMENTS

Palisades
SGRP Outage Schedule

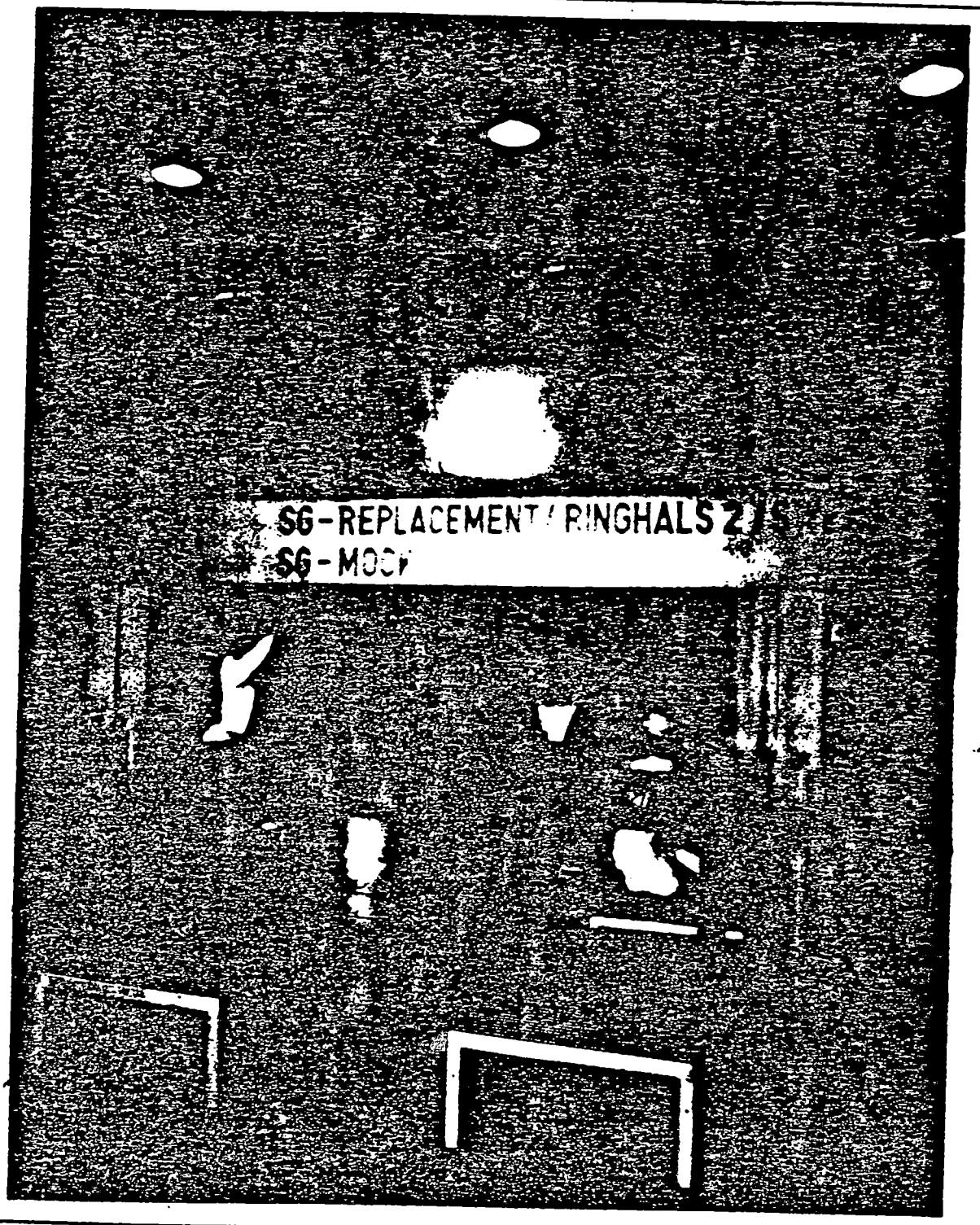
- Pre-Outage SGR Activities
- SGR Activities During Plant Defueling
- 75 Day SGR Critical Path Activities
- SGR Activities During Plant Refueling


1990
SEP
OCT
NOV
DEC
1991
JAN
3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24 31 7 14 21 28
PLANT OFFLINE
PALISADES SGRP - 1990 FALL OUTAGE SCHEDULE
COOLDOWN & DEFUEL REACTOR VESSEL
75 DAY STEAM GENERATOR REPLACEMENT CRITICAL PATH
SECONDARY HYDRO TESTS
REFUEL REACTOR & STARTUP TESTING
INTEGRATED LEAK RATE TEST (ILRT)
STRUCTURAL INTEGRITY TEST (SIT)
PLANT ONLINE
INSTALL TEMPORARY POWER
REMOVE TEMPORARY POWER
INSTALL SCAFFOLD, TENT AND REMOVE INSULATION
REINSTALL INSULATION
SCAFFOLD REMOVAL AND CONTAINMENT CLEANUP
TENDON DETENSION/REMOVE
INSTALL TENDON DUCTS/REBAR
TENSION/GREASE TENDONS
CUT CONTAINMENT WALL OPENING /REMOVE LINER PLATE
PREPARE CONCRETE SURFACE FOR OPENING POUR BACK
RESTORE LINER PLATE
RESTORE CONCRETE
INSTALL TENDONS
CURE CONCRETE
INSTALL CAVITY DECKING
REMOVE CAVITY DECKING
REMOVE INTERFERENCES
REINSTALL INTERFERENCES
INSTALL AND LOAD TEST RIGGING EQUIPMENT
REMOVE RIGGING EQUIPMENT
RIG OUT OLD STEAM GENERATORS
RIG IN NEW STEAM GENERATORS
REMOVE/REPLACE/MODIFY SECONDARY & AUX PIPING
CUT AND DECON PCS PIPING
TEMPLATE AND PREP PCS PIPING
NEW STEAM GENERATOR FIT UP, WELDING & INSPECTION

Palisades
Pre-Outage SGR Activities

- Mock-up Channel head & PCS Piping
  - PCS Cutting and Machining
  - PCS Welding
  - PCS Decontamination
  - PCS Nozzle/Elbow Fit-up
- Old Steam Generator Storage Building
- Training
- Detailed Planning
- Reinforced Earth Wall
- Assemble Platform and Rigging Equipment Outside of Containment Opening

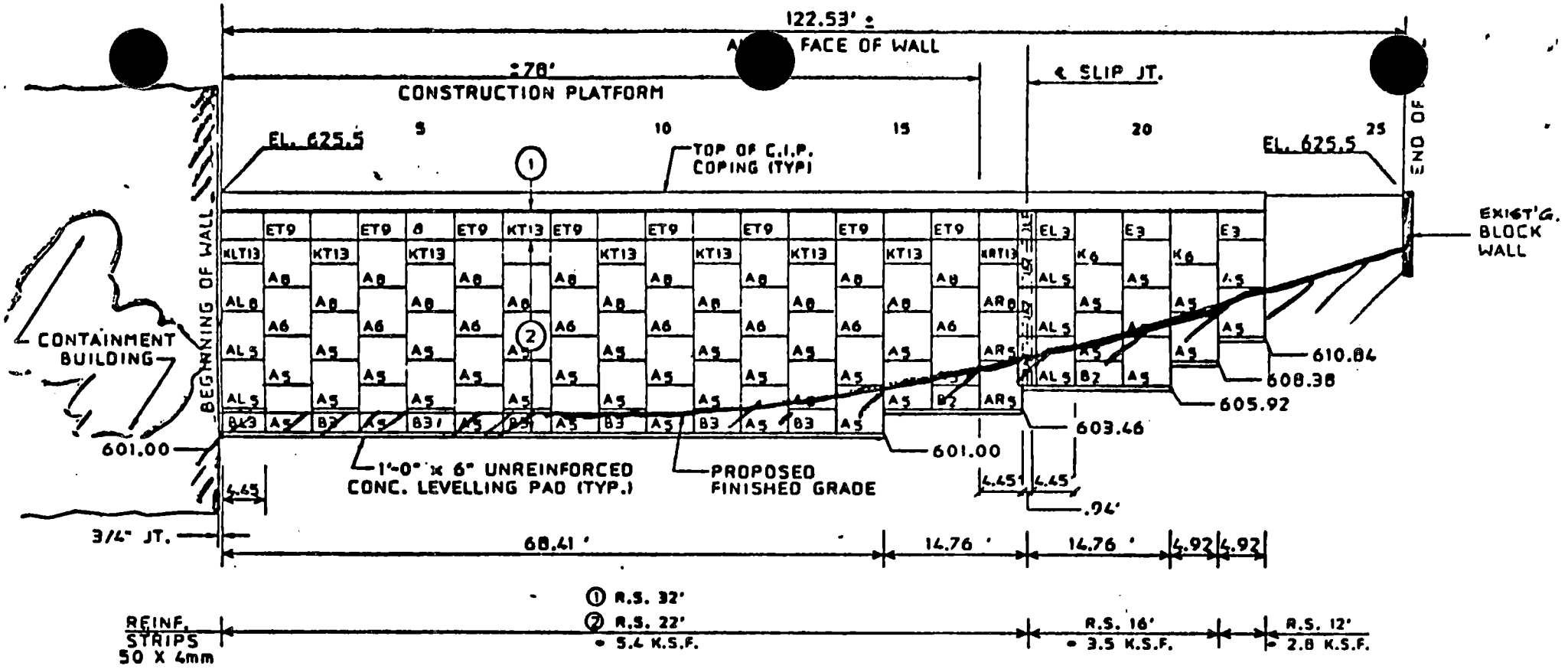
SIEMENS



SG-Mock Up Steam Generator Replacement Ringhals 2/Sweden

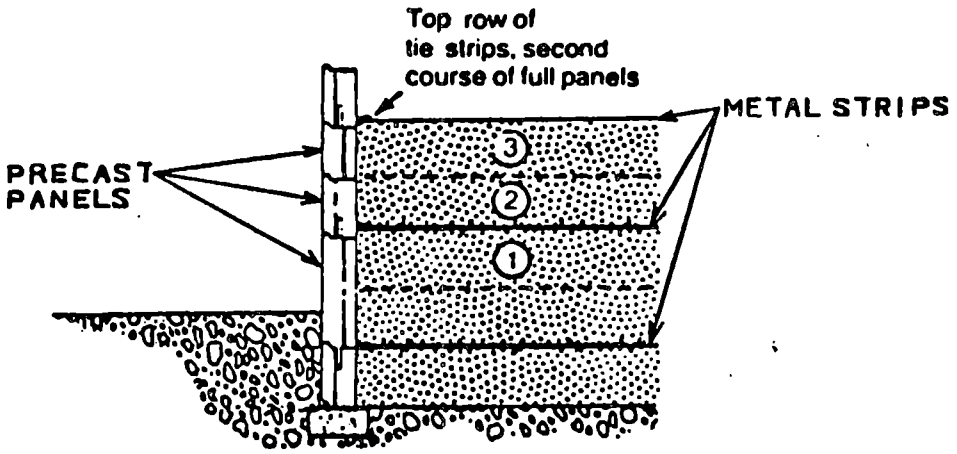
Personnell-, Equipment Training and Qualification

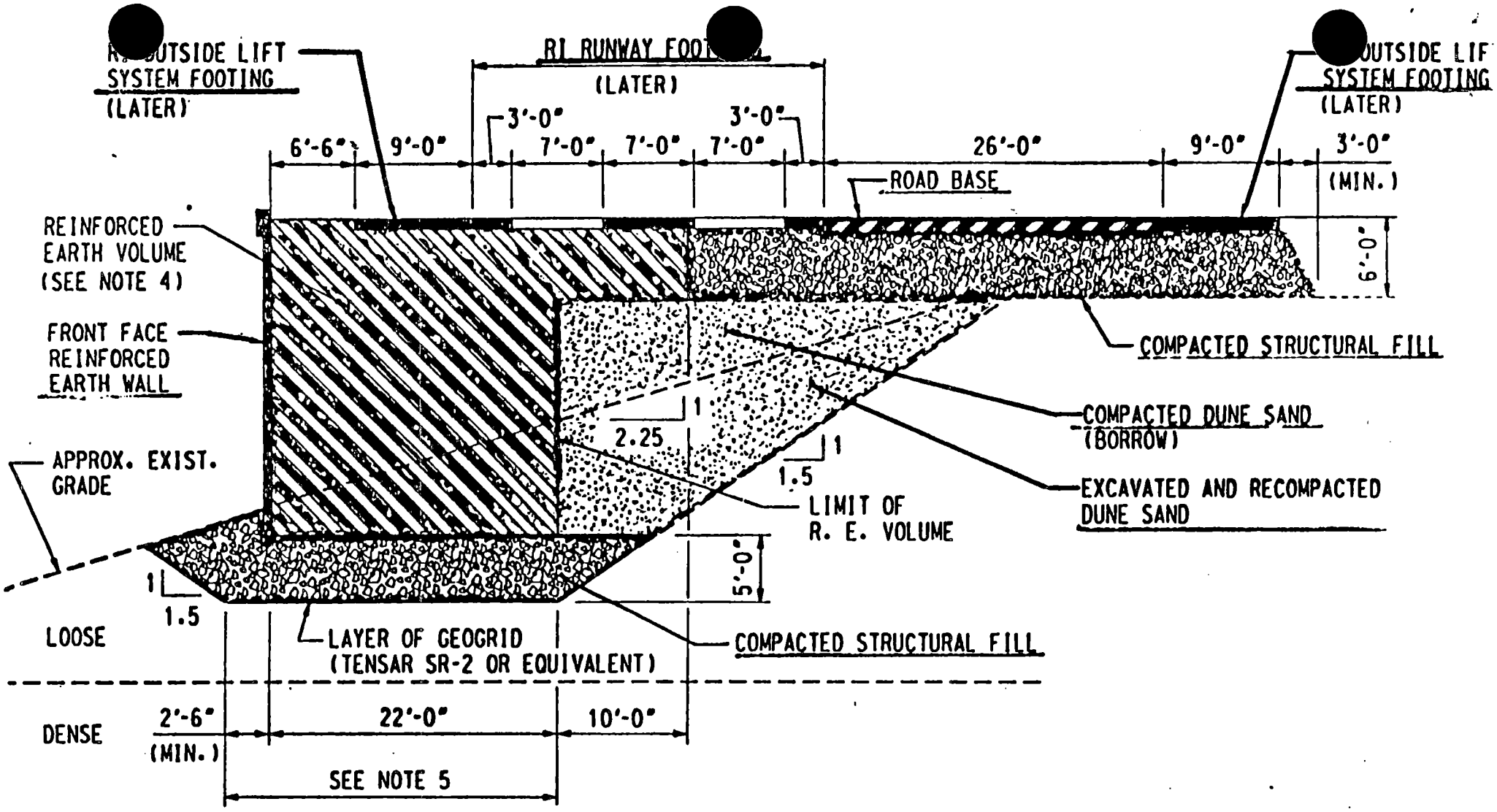
89 PWR 124
UB KWU
U444PT



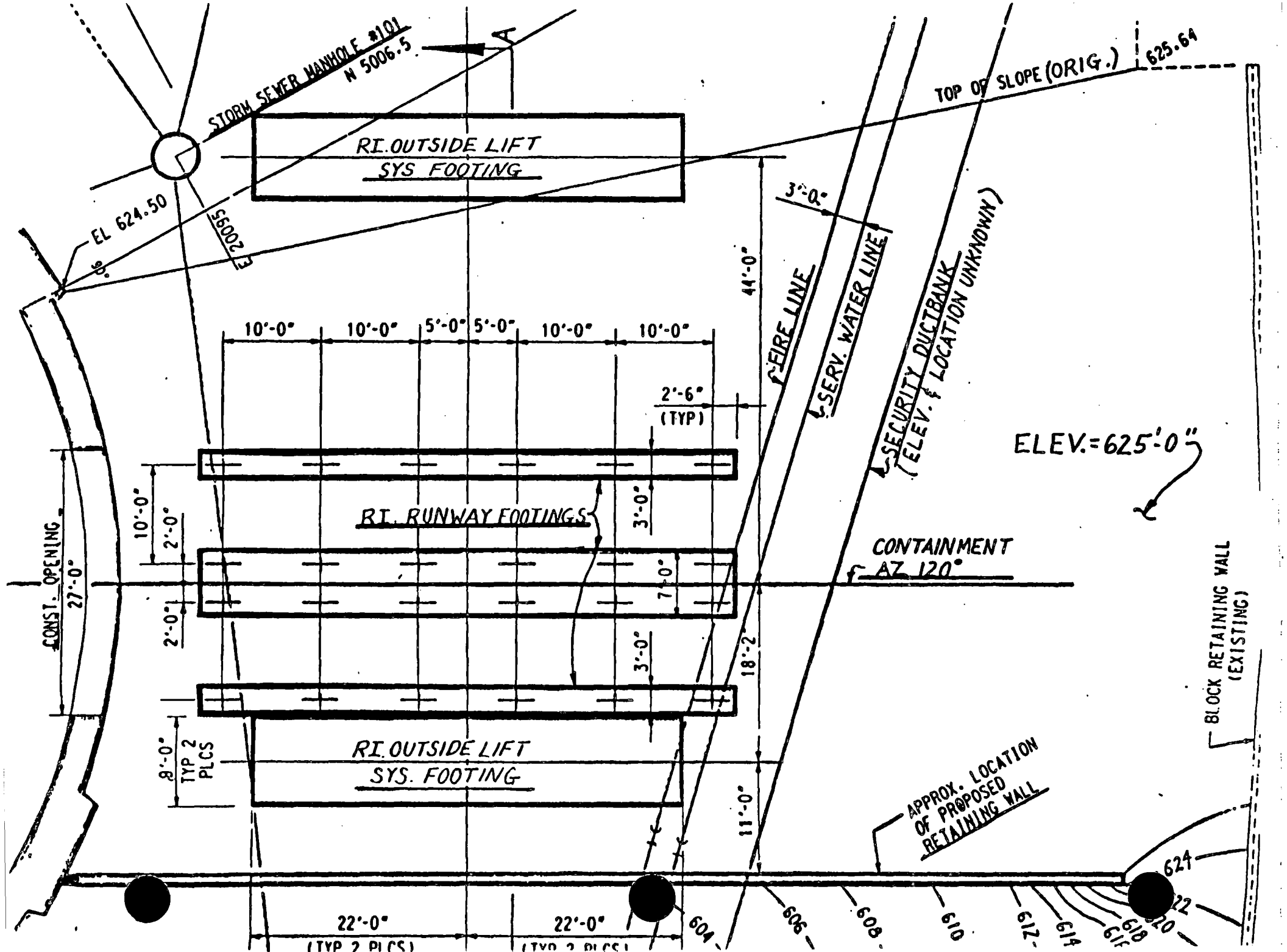
ELEVATION - FRONT FACE

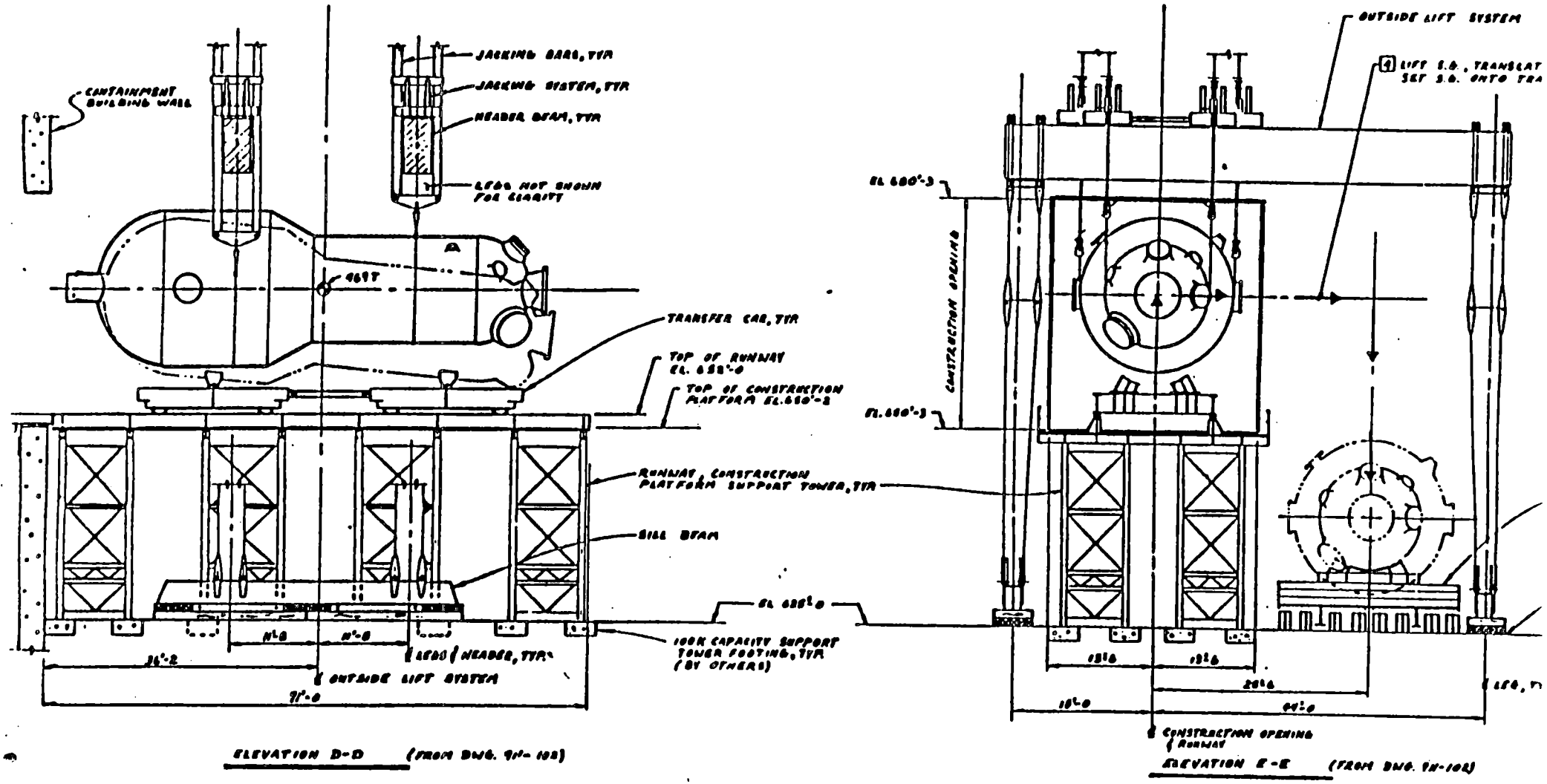
SCALE • 1" = 10'




OUTSIDE LIFT SYSTEM FOOTING (LATER)
RI RUNWAY FOOT
(LATER)
OUTSIDE LIF
SYSTEM FOOTING
(LATER)
6'-6"
9'-0"
3'-0"
7'-0"
7'-0"
7'-0"
3'-0"
26'-0"
9'-0"
3'-0"
(MIN.)
ROAD BASE
REINFORCED EARTH VOLUME (SEE NOTE 4)
FRONT FACE REINFORCED EARTH WALL
6'-0"
COMPACTED STRUCTURAL FILL
COMPACTED DUNE SAND (BORROW)
EXCAVATED AND RECOMPACTED DUNE SAND
APPROX. EXIST. GRADE
1
2.25
1
1.5
LIMIT OF R. E. VOLUME
5'-0"
1
1.5
LOOSE
LAYER OF GEOGRID (TENSAR SR-2 OR EQUIVALENT)
COMPACTED STRUCTURAL FILL
DENSE
2'-6"
(MIN.)
22'-0"
10'-0"
SEE NOTE 5

SECTION A


STORM SEWER MANHOLE #101
N 5006.5
E 2009.5
EL 624.50
TOP OF SLOPE (ORIG.)
625.64
RI. OUTSIDE LIFT SYS FOOTING
3'-0"
44'-0"
℄ FIRE LINE
℄ SERV. WATER LINE
℄ SECURITY DUCTBANK (ELEV. & LOCATION UNKNOWN)
ELEV.=625'-0"
10'-0"
10'-0"
5'-0"
5'-0"
10'-0"
10'-0"
2'-6" (TYP)
RI. RUNWAY FOOTINGS
10'-0"
2'-0"
3'-0"
CONST. OPENING
27'-0"
℄ CONTAINMENT AZ 120°
7'-0"
2'-0"
3'-0"
18'-2"
8'-0" TYP 2 PLCS
RI. OUTSIDE LIFT SYS. FOOTING
11'-0"
APPROX. LOCATION OF PROPOSED RETAINING WALL
BLOCK RETAINING WALL (EXISTING)
624
22
620
618
614
612
610
608
606
604
22'-0" (TYP 2 PLCS)
22'-0" (TYP 2 PLCS)

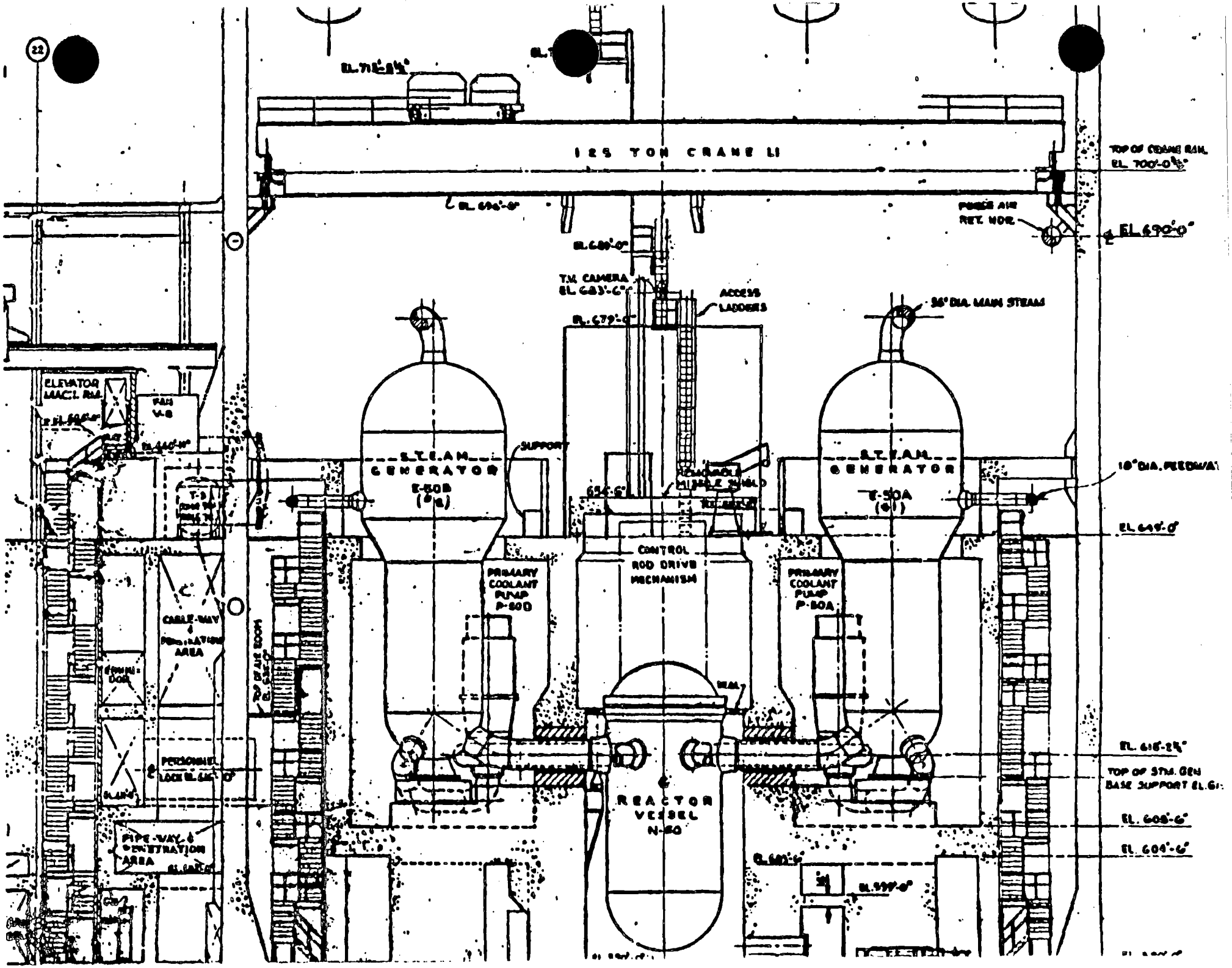


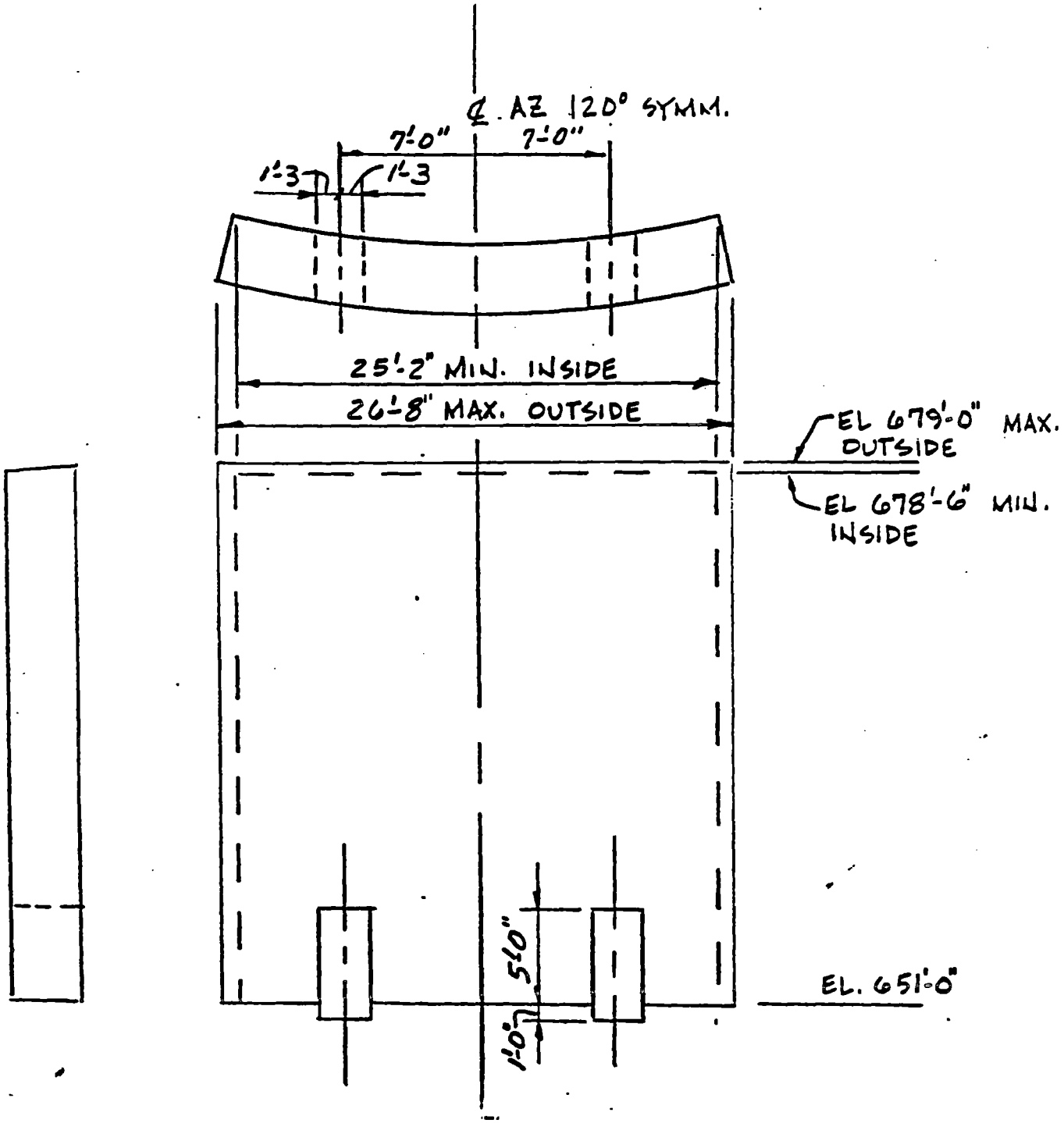
ELEVATION D-D (FROM DWG. 9N-102)

ELEVATION E-E (FROM DWG. 9N-102)

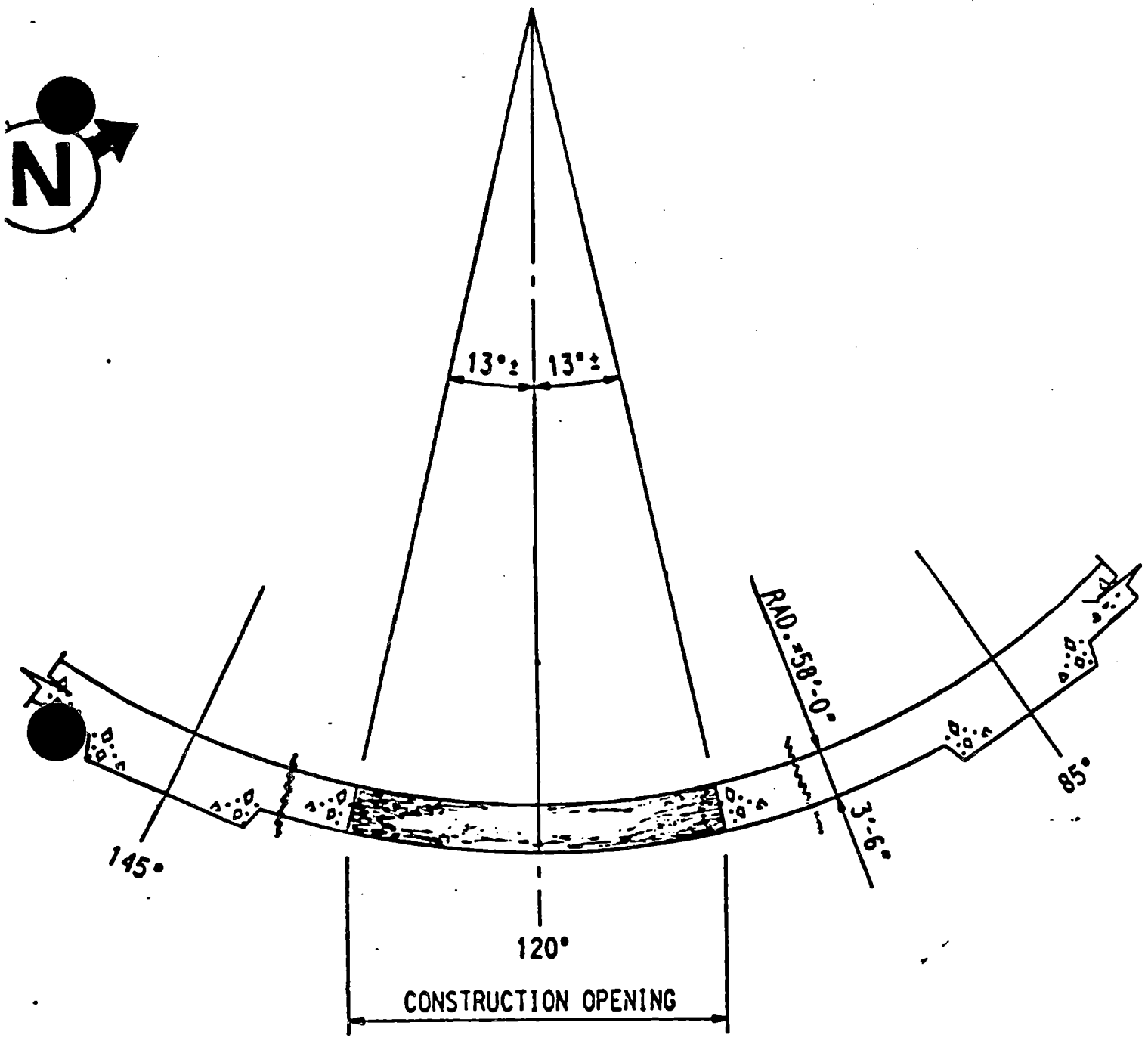
Palisades
SGR Activities
During Plant Defueling

- Install Temporary Power
- Install Scaffolding
- Insulation Removal
- Interference Removal
- Tendon Detentioning and Removal
- Cutting Containment Wall Opening


125 TON CRANE LI
TOP OF CRANE RAIL EL. 700'-0"
EL. 690'-0"
EL. 680'-0"
T.V. CAMERA EL. 683'-6"
EL. 679'-0"
ACCESS LADDERS
36" DIA. MAIN STEAM
POWER AIR RET. HDR.
ELEVATOR MACH. RM.
FAN V-8
STEAM GENERATOR E-50B (0)
SUPPORT
STEAM GENERATOR E-50A (0)
10" DIA. FEEDWATER
EL. 649'-0"
CONTROL ROD DRIVE MECHANISM
PRIMARY COOLANT PUMP P-50D
PRIMARY COOLANT PUMP P-50A
CABLE-WAY PENETRATION AREA
TOP OF AIR DOOR EL. 636'-0"
PERSONNEL LOCK EL. 616'-0"
EL. 616'-2½"
TOP OF STM. GEN BASE SUPPORT EL. 6
REACTOR VESSEL N-50
EL. 608'-6"
EL. 604'-6"
PIPE-WAY PENETRATION AREA
EL. 599'-0"



CONSTRUCTION OPENING CONCRETE BLOCK



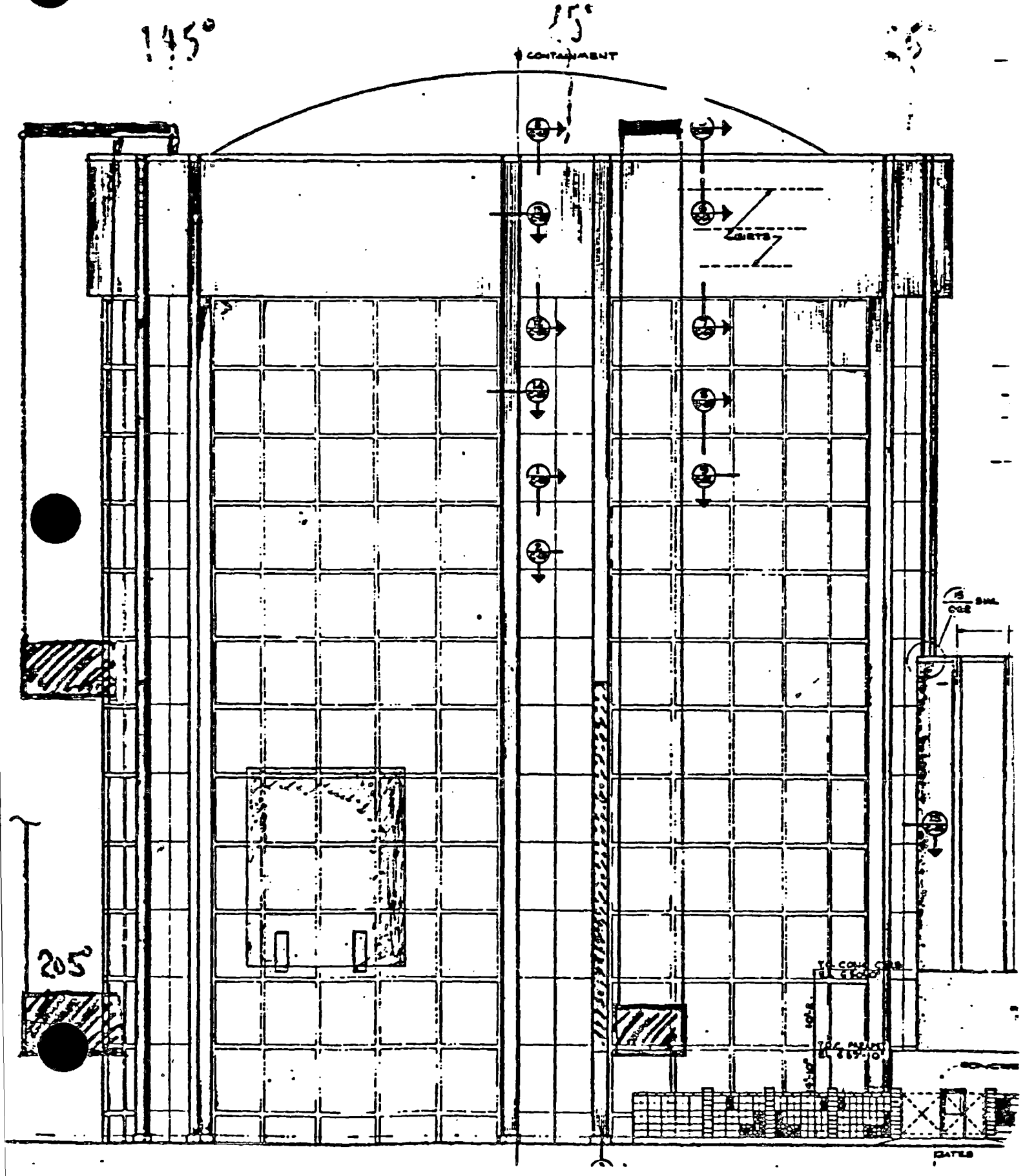
PARTIAL PLAN - CONTAINMENT WALL

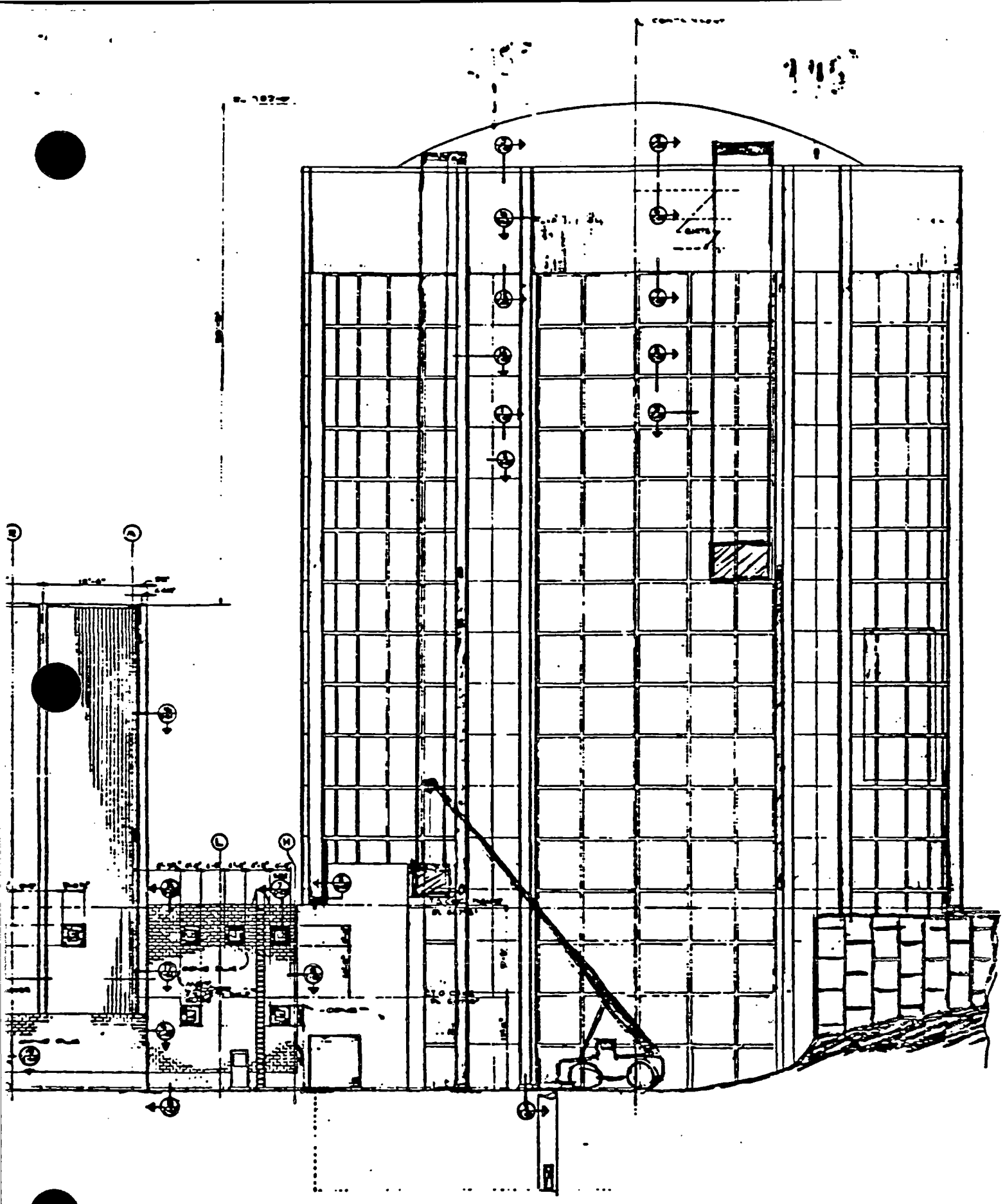
AZ. 85° TO 145°

SCALE: 3/32" = 1'-0"

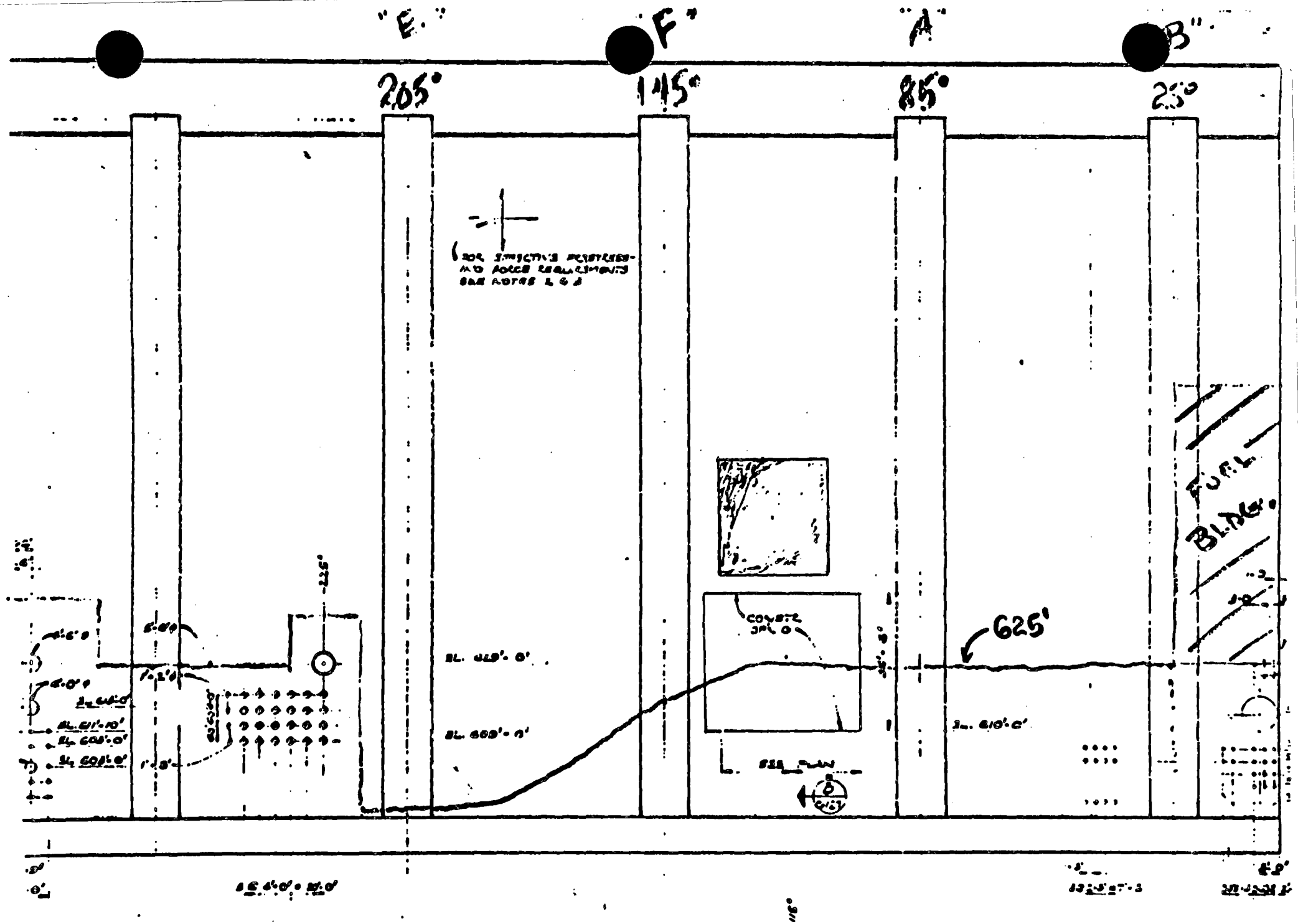
Joints shall be finished smooth and flush. MATCH PANEL COLOR.

CLEAN: - After erection, the panels shall be washed with a mild soap and water solution. Rinse thoroughly with water.

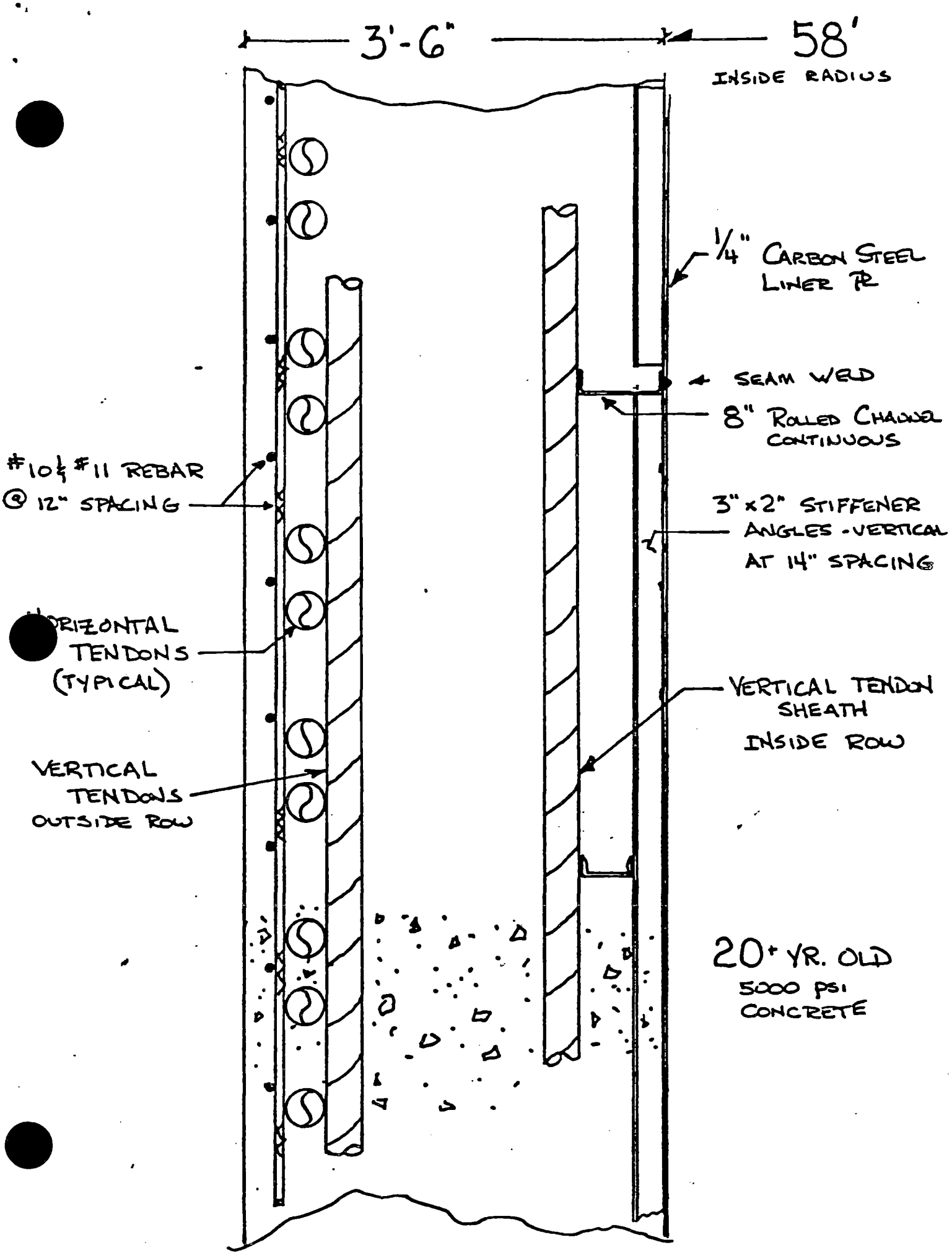




SOUTH ELEVATION

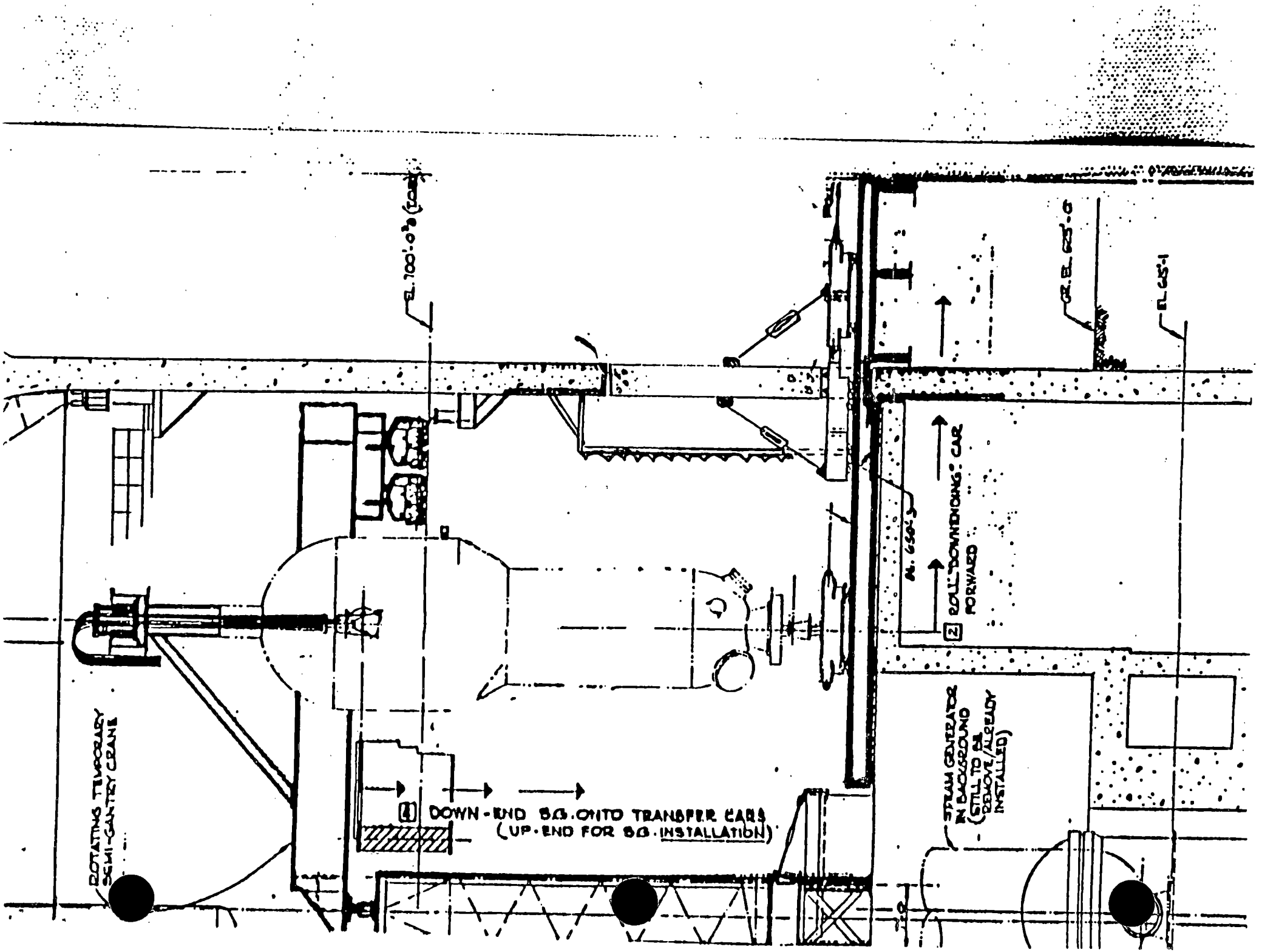


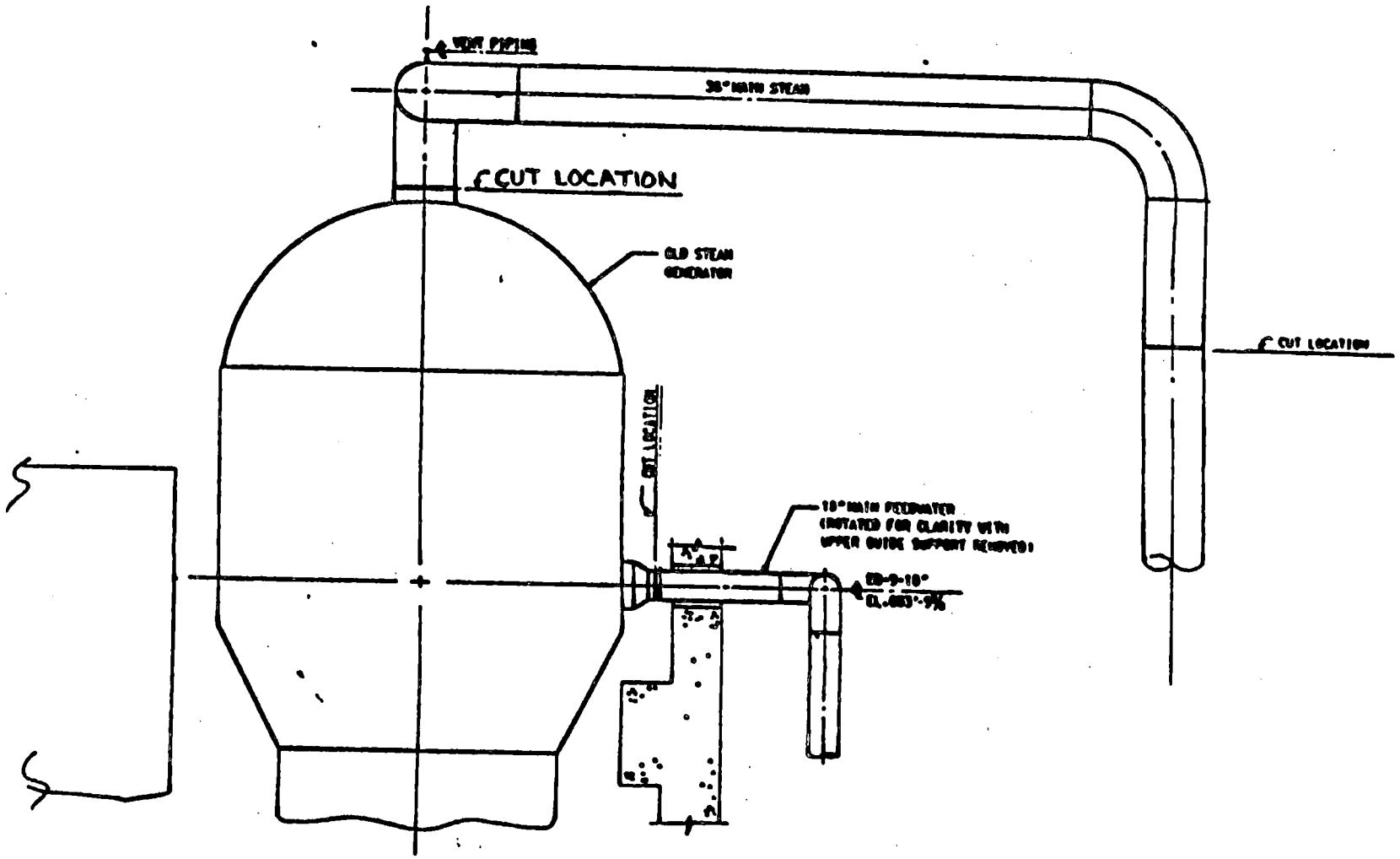
PRESTRESSING FORCE REQUIREMENTS - DEVELOPED ELEVATION

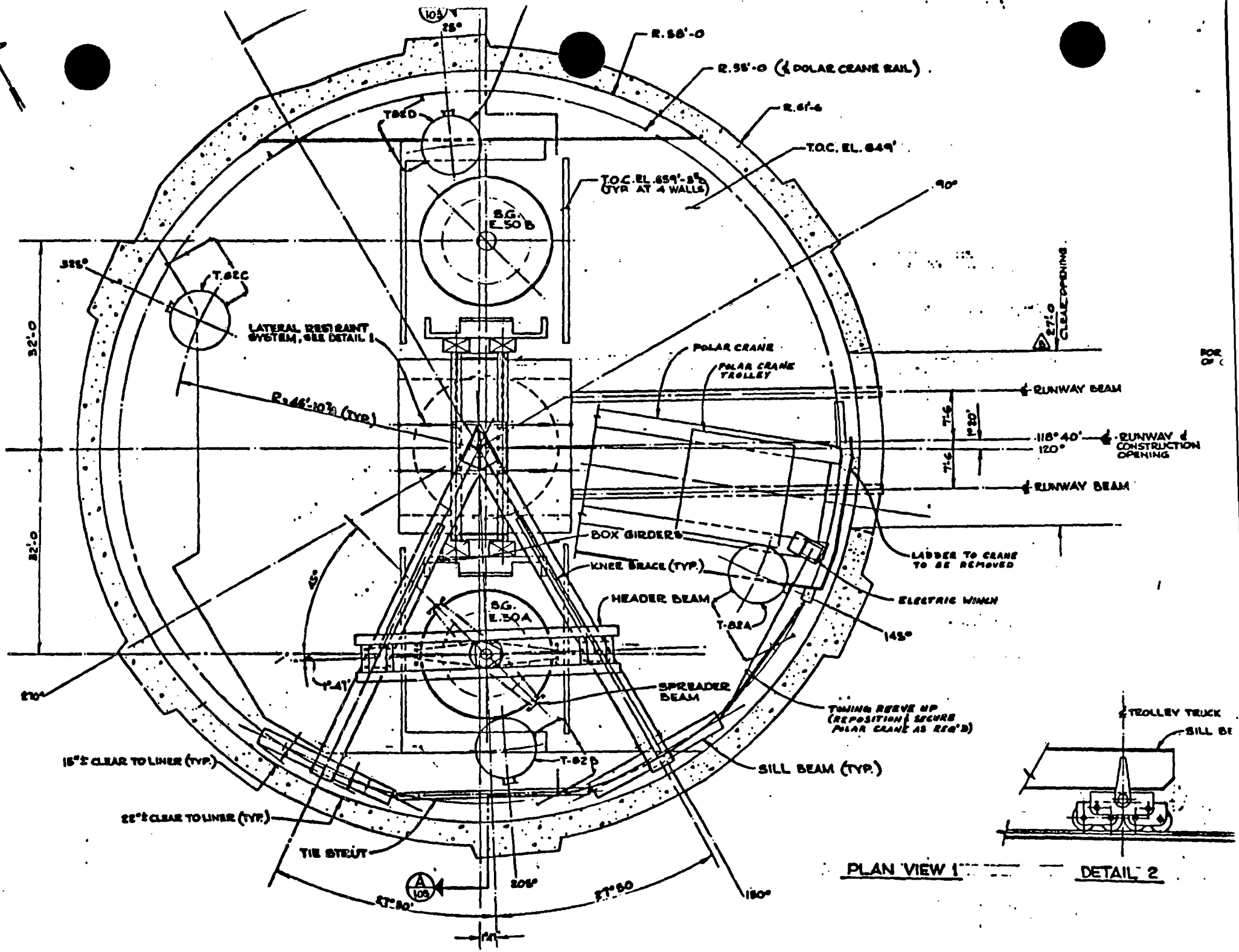

3'-6"
58'
INSIDE RADIUS
1/4" CARBON STEEL LINER PL
SEAM WELD
8" ROLLED CHANNEL CONTINUOUS
#10 & #11 REBAR @ 12" SPACING
3" x 2" STIFFENER ANGLES - VERTICAL AT 14" SPACING
HORIZONTAL TENDONS (TYPICAL)
VERTICAL TENDON SHEATH INSIDE ROW
VERTICAL TENDONS OUTSIDE ROW
20+ YR. OLD 5000 PSI CONCRETE

Palisades
75 Day SGR Critical Path Activities

- Complete Cut and Remove Concrete Block at Containment Opening
- Install and Load Test S/G Rigging Equipment
- Remove M/S and F/W Piping
- Prepare Concrete Surface
- Machine Cut and Decon PCS Piping
- Rig-Out Old S/Gs
- Rig-In New S/Gs
- Remove S/G Rigging Equipment
- Template and Weld Prep PCS Piping
- Fit-Up and Weld PCS Piping
- Install New Liner Plate
- Install Concrete Reinforcing and Tendon Ducts
- Form and Place Concrete at Containment Opening
- Install Tendons
- NDE and PWHT PCS Piping
- Install M/S and F/W Piping
- Hydrotest S/G Secondary Side and Piping

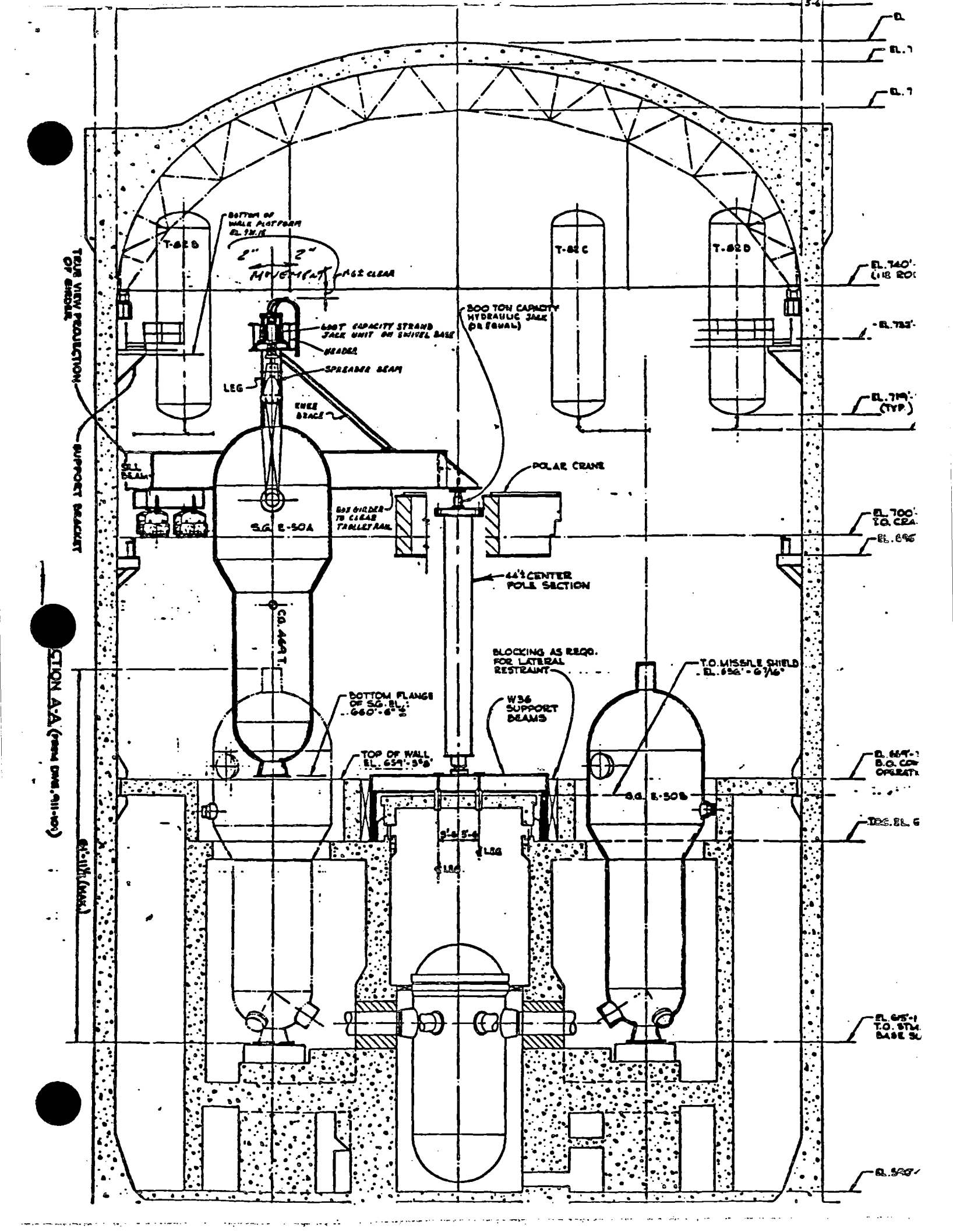

EL. 100'-0" (approx.)
EL. 625'-0
EL. 625'-1
EL. 656'-5
2 ROLL DOWN DOOR CAR FORWARD
ROTATING TEMPORARY SEMI-GANTRY CRANE
1 DOWN-END S.G. ONTO TRANSFER CARS (UP-END FOR S.G. INSTALLATION)
STEAM GENERATOR IN BACKGROUND (STILL TO BE REMOVED/ALREADY INSTALLED)

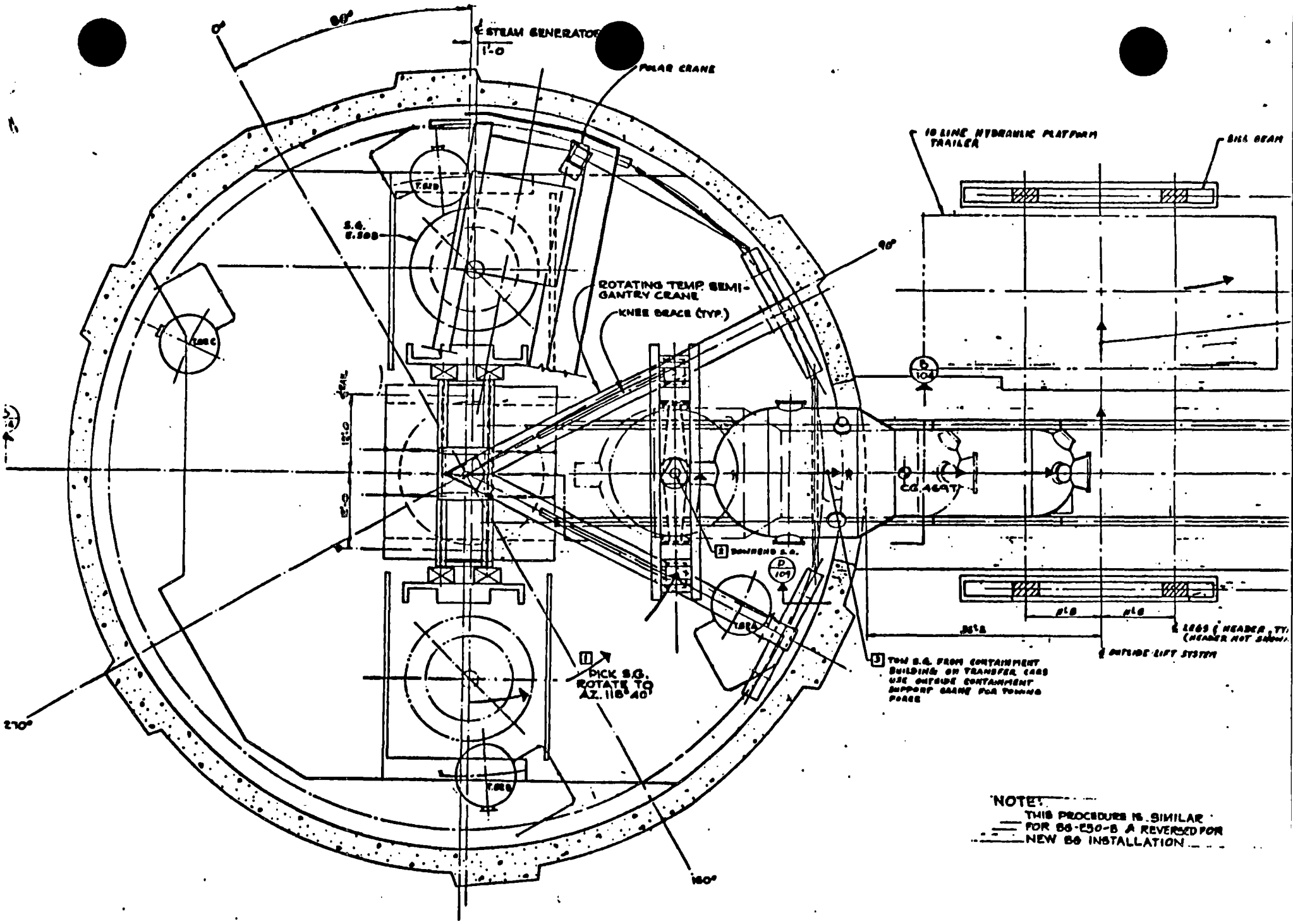

VENT PIPING
36" MAIN STEAM
℄ CUT LOCATION
OLD STEAM GENERATOR
℄ CUT LOCATION
℄ CUT LOCATION



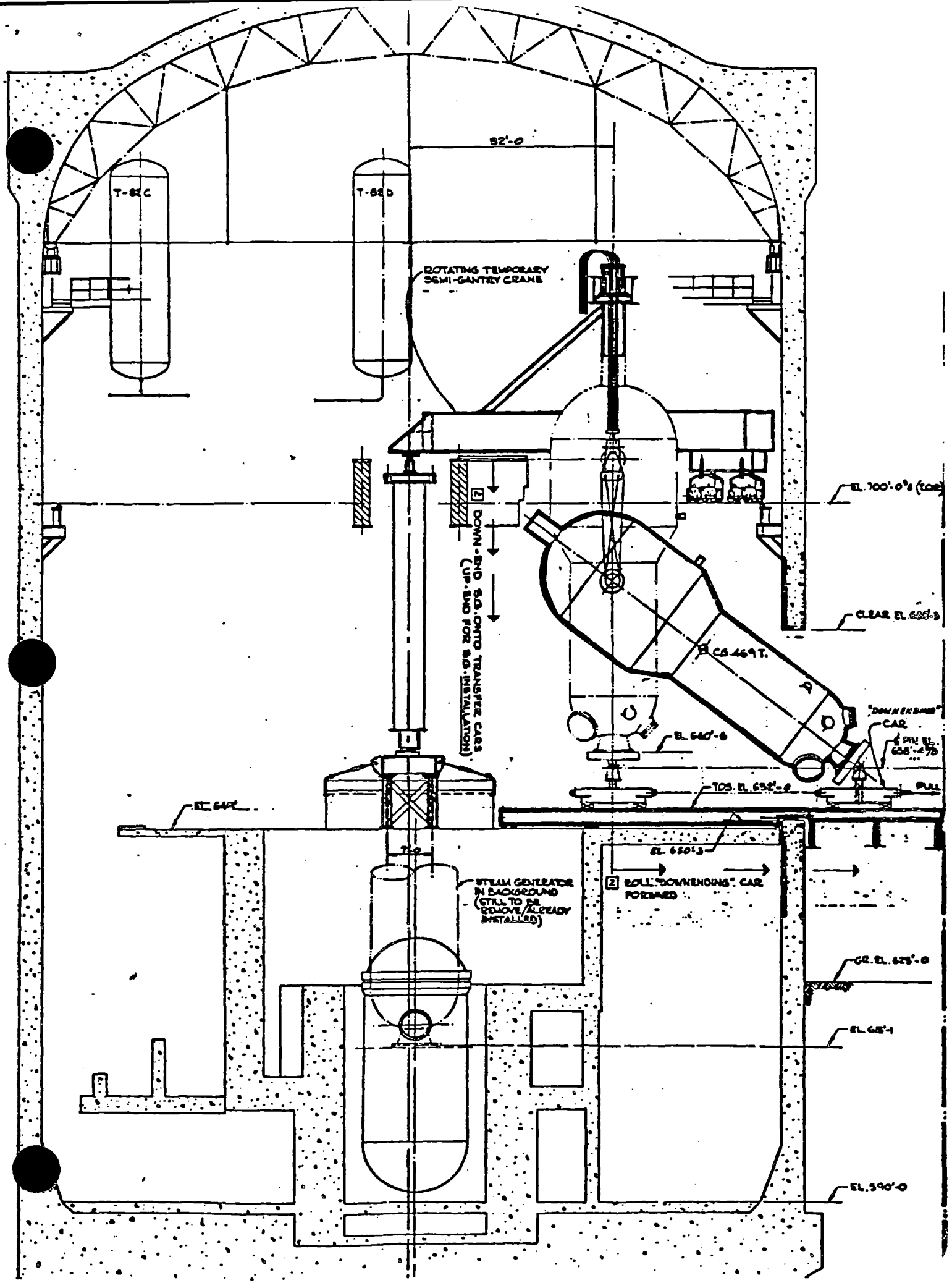
PLAN VIEW 1

DETAIL 2

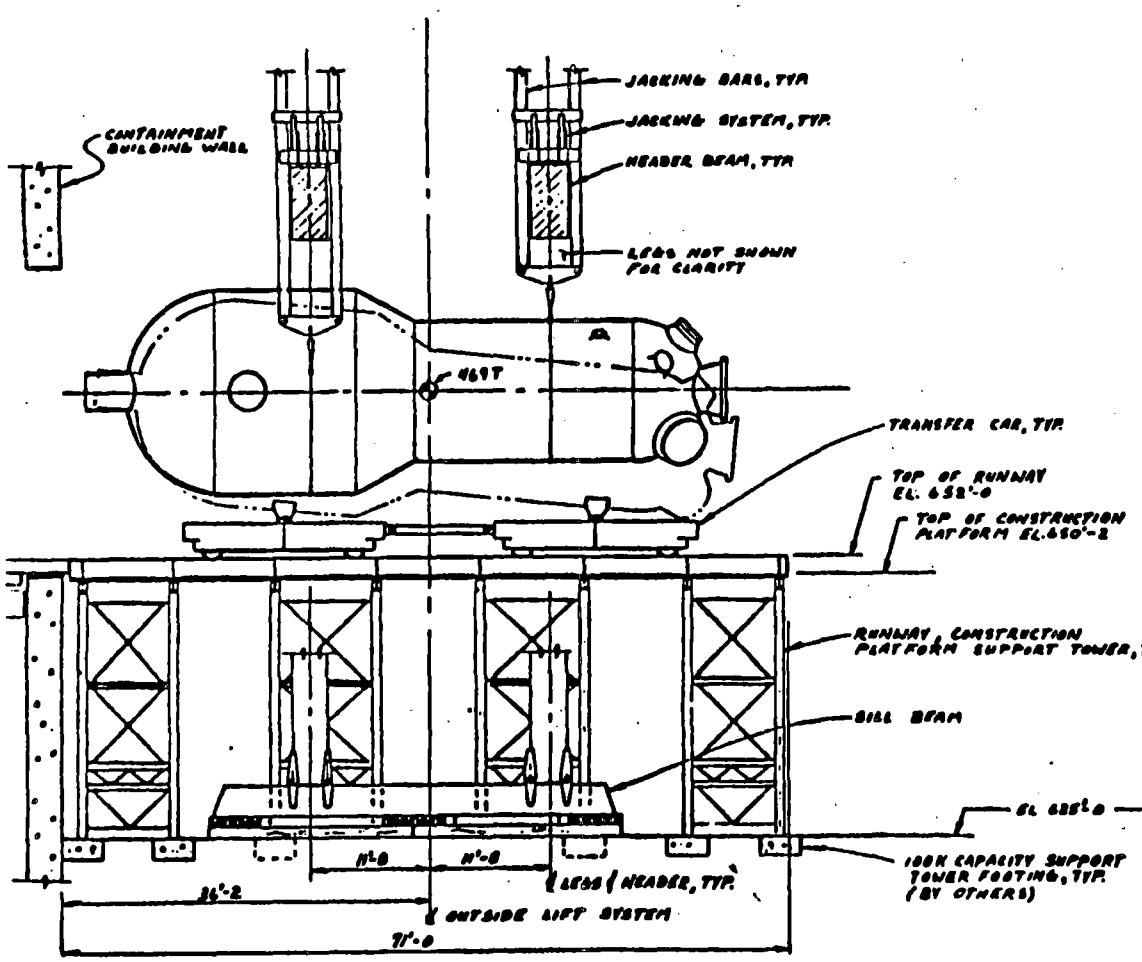

T-82 B
T-82 C
T-82 D
BOTTOM OF WALK PLATFORM EL. 734.15
2"
2"
MIN. CLEAR
600T CAPACITY STRAND JACK UNIT ON SWIVEL BASE
HEADER
SPREADER BEAM
LEG
KNEE BRACE
800 TON CAPACITY HYDRAULIC JACK (OR EQUAL)
EL. 740'-
EL. 733'-
EL. 719'-
(TYP.)
SILL BEAM
POLAR CRANE
S.G. E-50A
EL. 700'-
T.O. CRA
EL. 695'
44'-1 CENTER POLE SECTION
CO. 44 T.
BLOCKING AS REQD. FOR LATERAL RESTRAINT
T.O. MISSILE SHIELD EL. 656'-6 1/16"
BOTTOM FLANGE OF S.G. EL. 660'-8"
W36 SUPPORT BEAMS
TOP OF WALL EL. 654'-5"
EL. 654'-
B.O. CO
OPERATI
S.G. E-50B
TOP. EL. 6
5'-6
5'-4
LEG
EL. 615'-
T.O. STR
BASE SL
EL. 580'-
TRUE VIEW PROJECTION OF ERECTOR
SUPPORT BRACKET
SECTION A-A (FROM DWG. 811-100)


0°
90°
180°
270°
STEAM GENERATOR
POLAR CRANE
ROTATING TEMP. SEMI-GANTRY CRANE
KNEE BRACE (TYP.)
S.G. 8,508
CG 469T
10 LINE HYDRAULIC PLATFORM TRAILER
BIAS BEAM
OUTSIDE LIFT SYSTEM
1 PICK S.G. ROTATE TO AZ. 118° 40'
3 TOW S.G. FROM CONTAINMENT BUILDING OR TRANSFER CASE USE OUTSIDE CONTAINMENT SUPPORT CRANE FOR TOWING FORCE
NOTE:
THIS PROCEDURE IS SIMILAR FOR 86-250-B & REVERSED FOR NEW 86 INSTALLATION

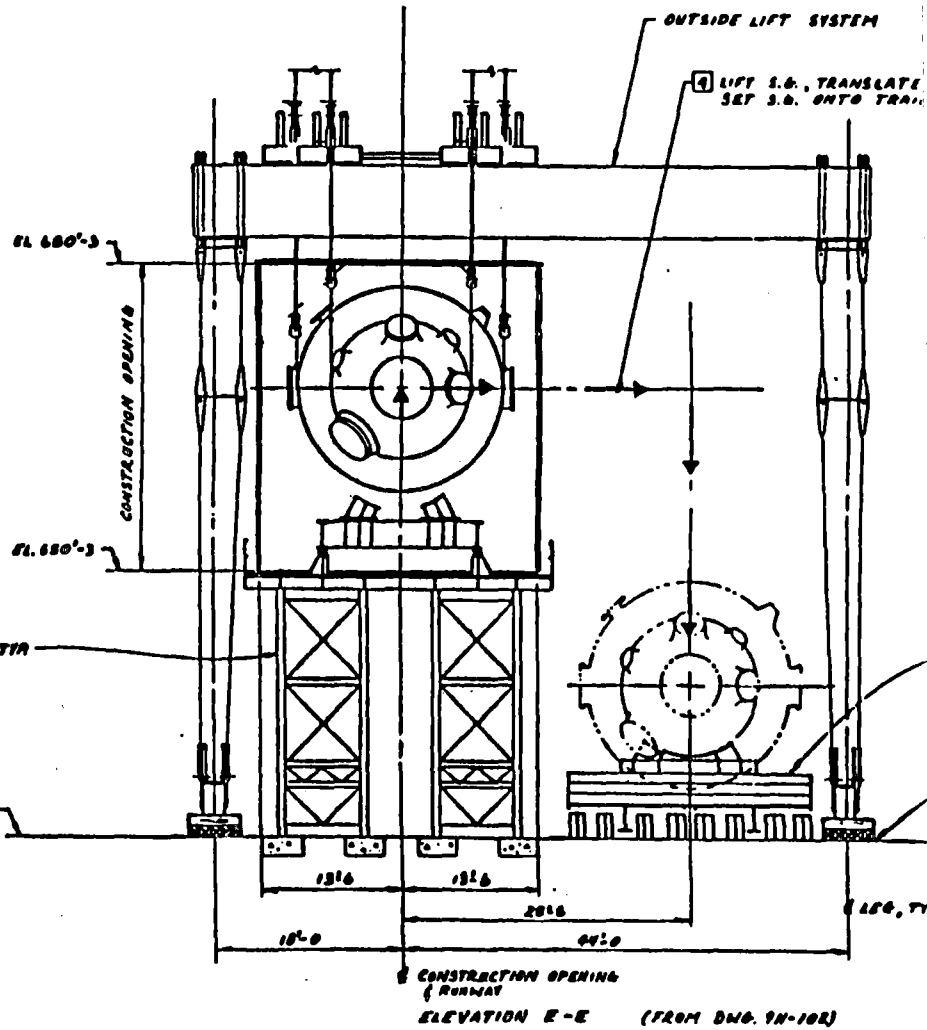
PLAN VIEW 2



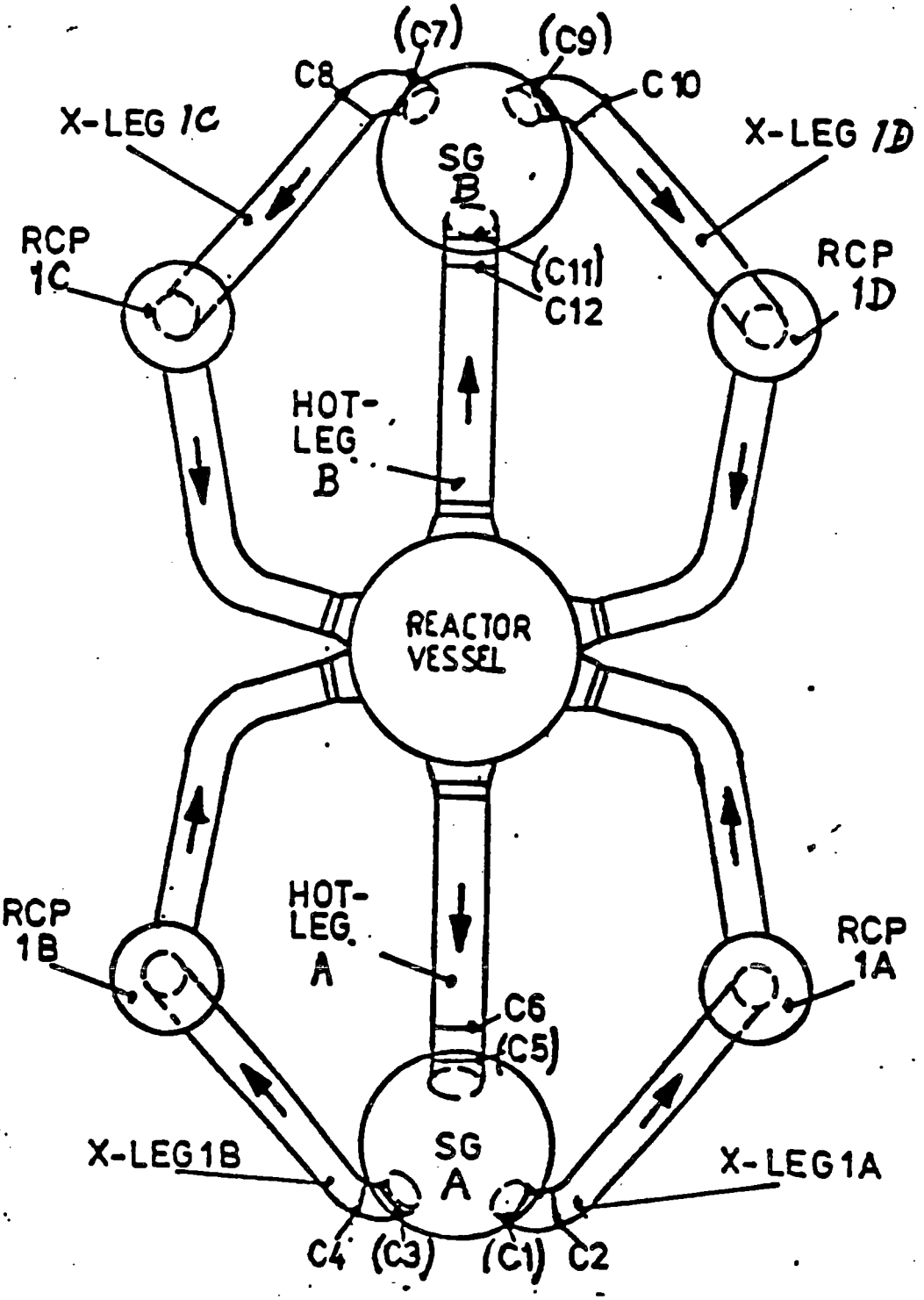
SECTION B-B (FROM DWG. 811-102)

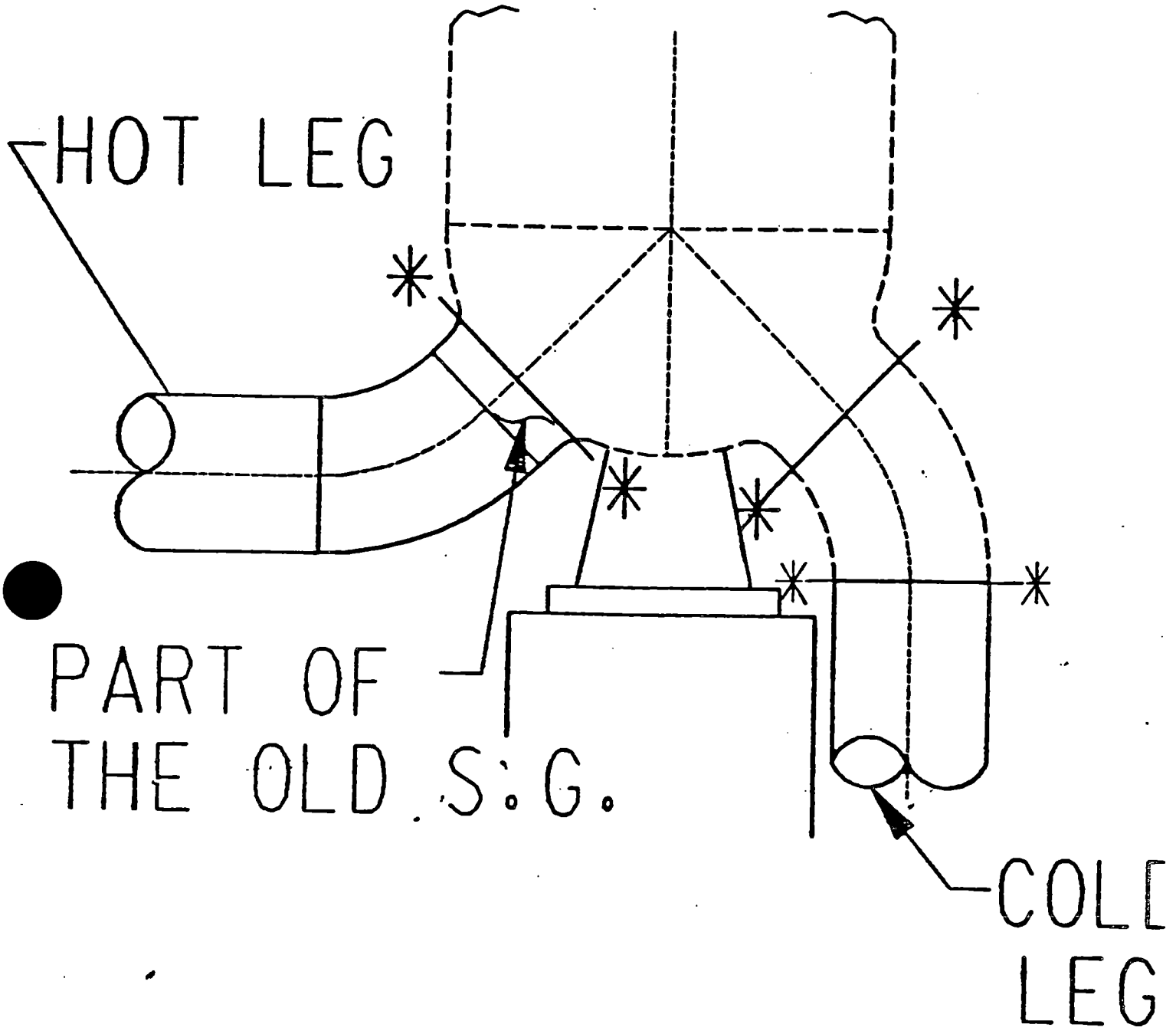


ELEVATION D-D (FROM DWG. 9N-102)



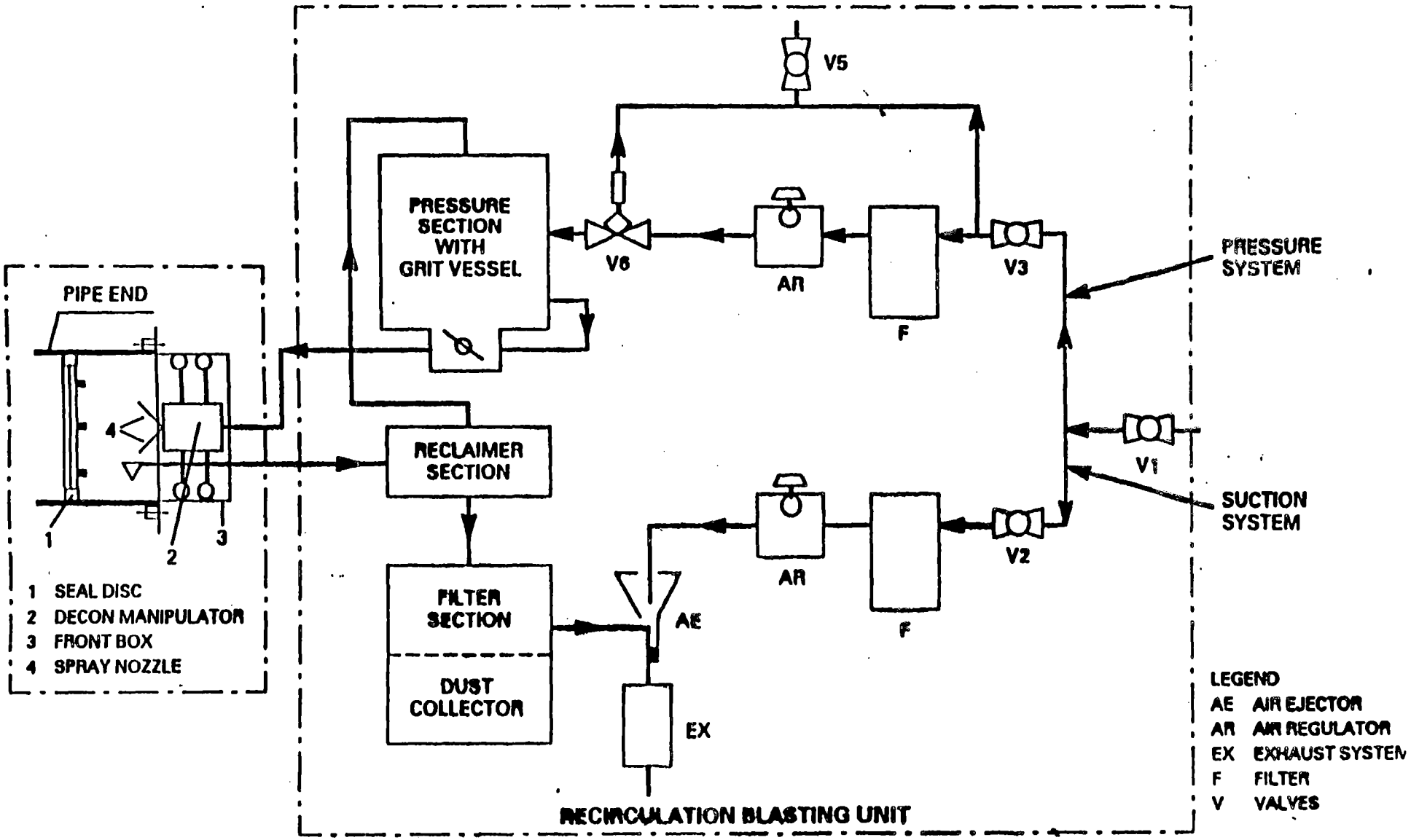
ELEVATION E-E (FROM DWG. 9N-102)


(C7)
(C9)
C8
C10
X-LEG 1C
X-LEG 1D
SG
B
RCP
1C
RCP
1D
(C11)
C12
HOT-
LEG
B
REACTOR
VESSEL
HOT-
LEG
A
RCP
1B
RCP
1A
C6
(C5)
SG
A
X-LEG1B
X-LEG1A
C4
(C3)
(C1)
C2



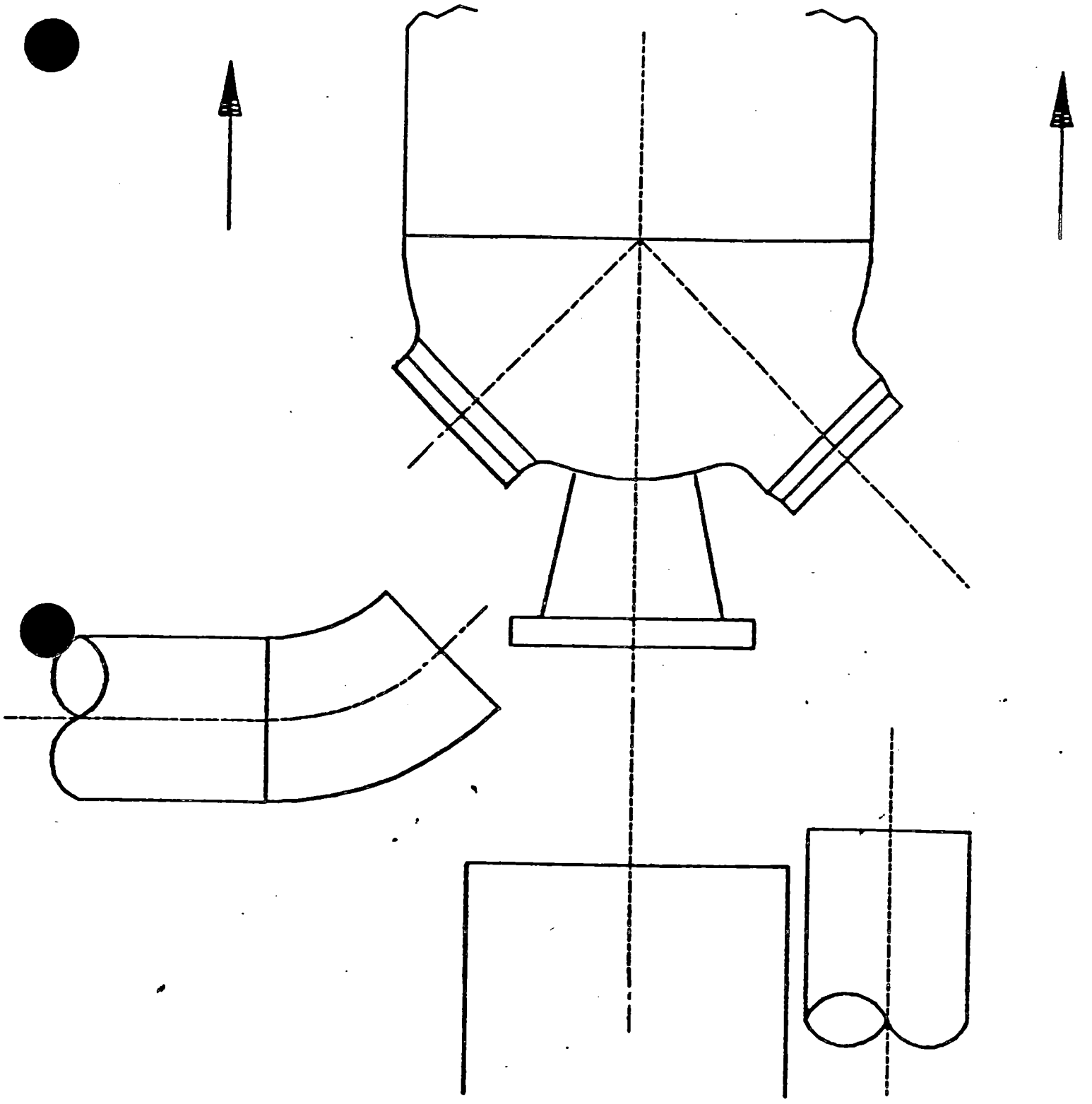
CUTTING COLD LEG ELBOWS

AND HOT LEG

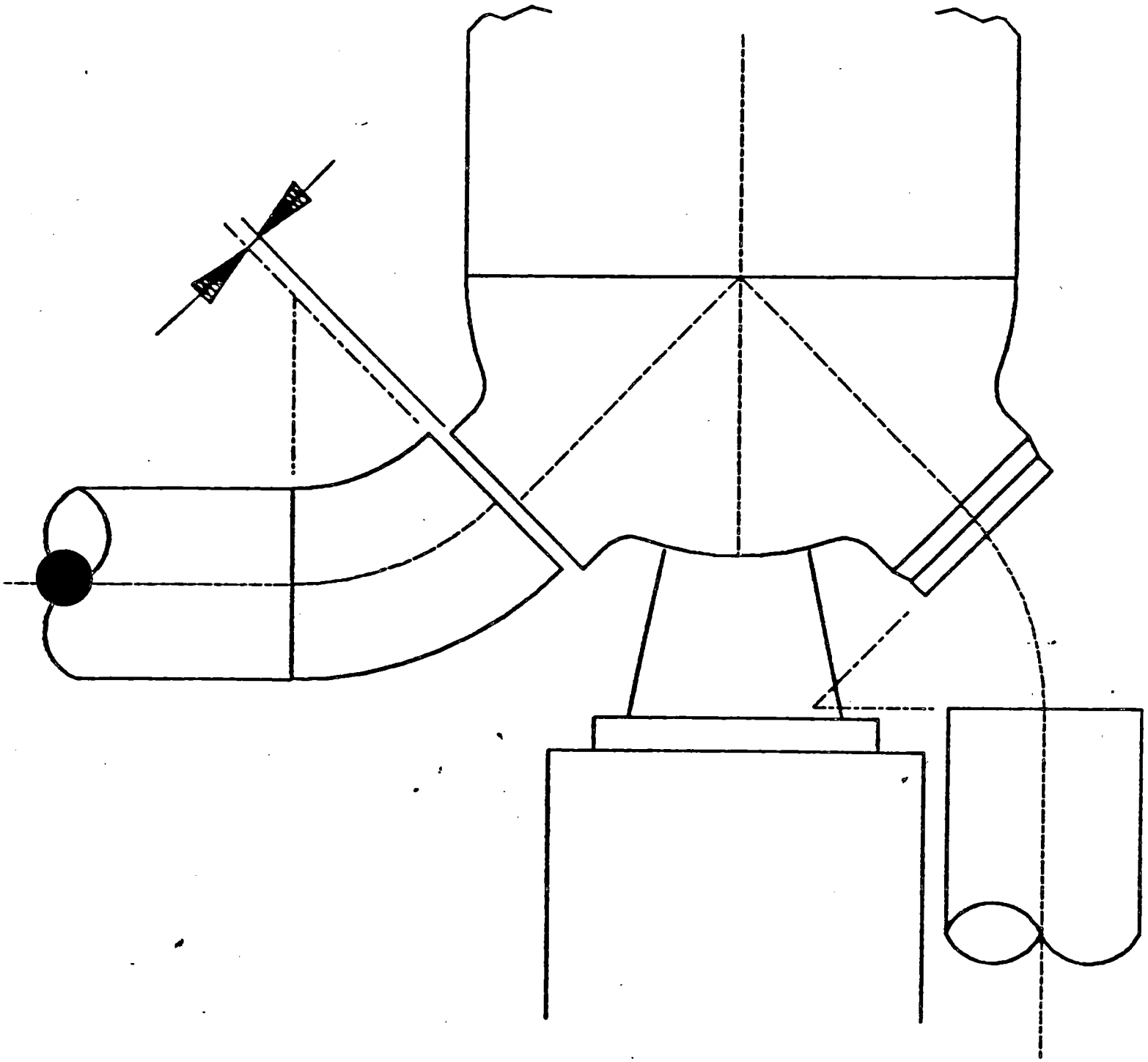


Reactor Coolant Pipe Decontamination System Diagram

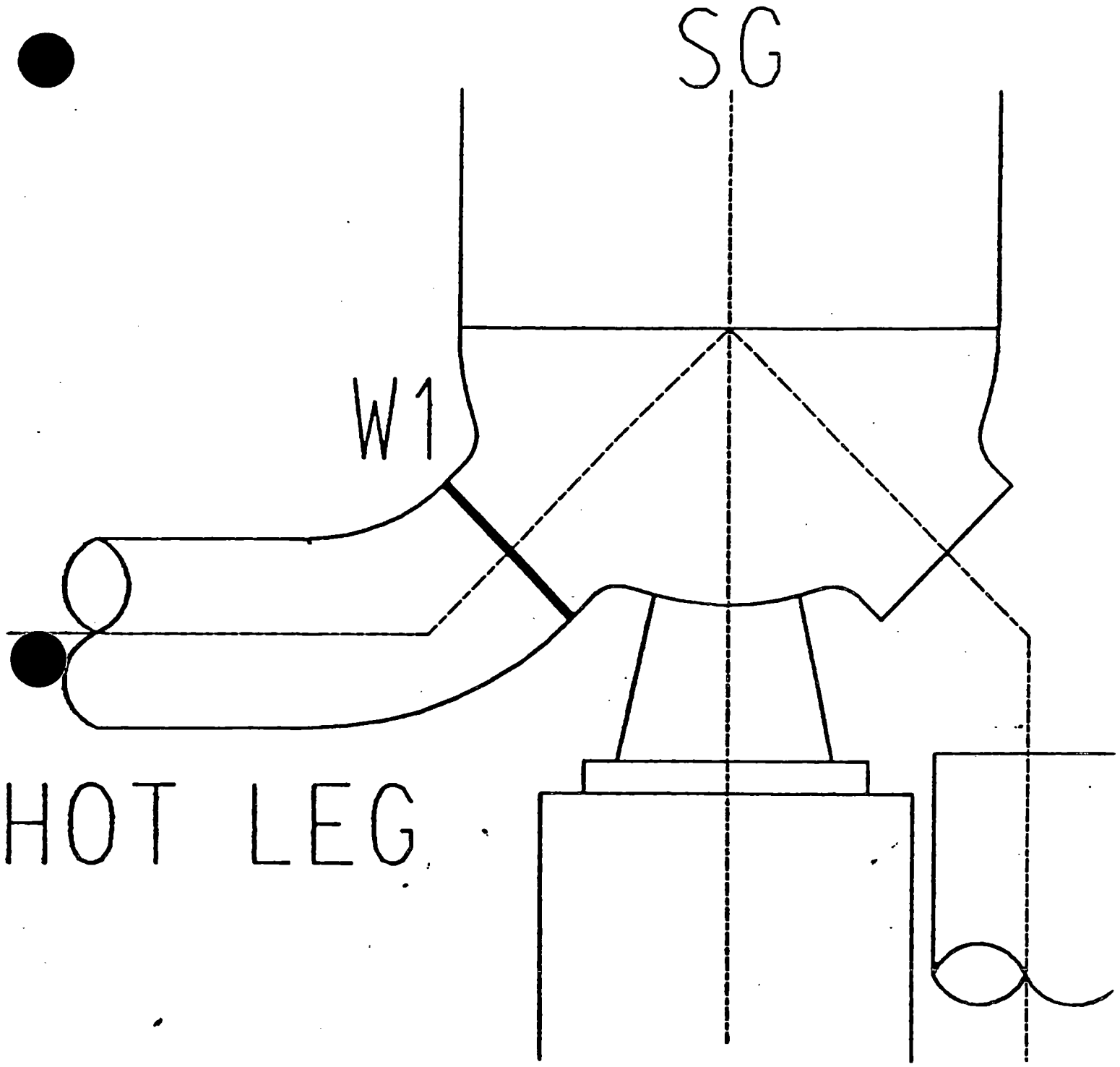
G-3/90-1461-7



STEAM GENERATOR REMOVAL

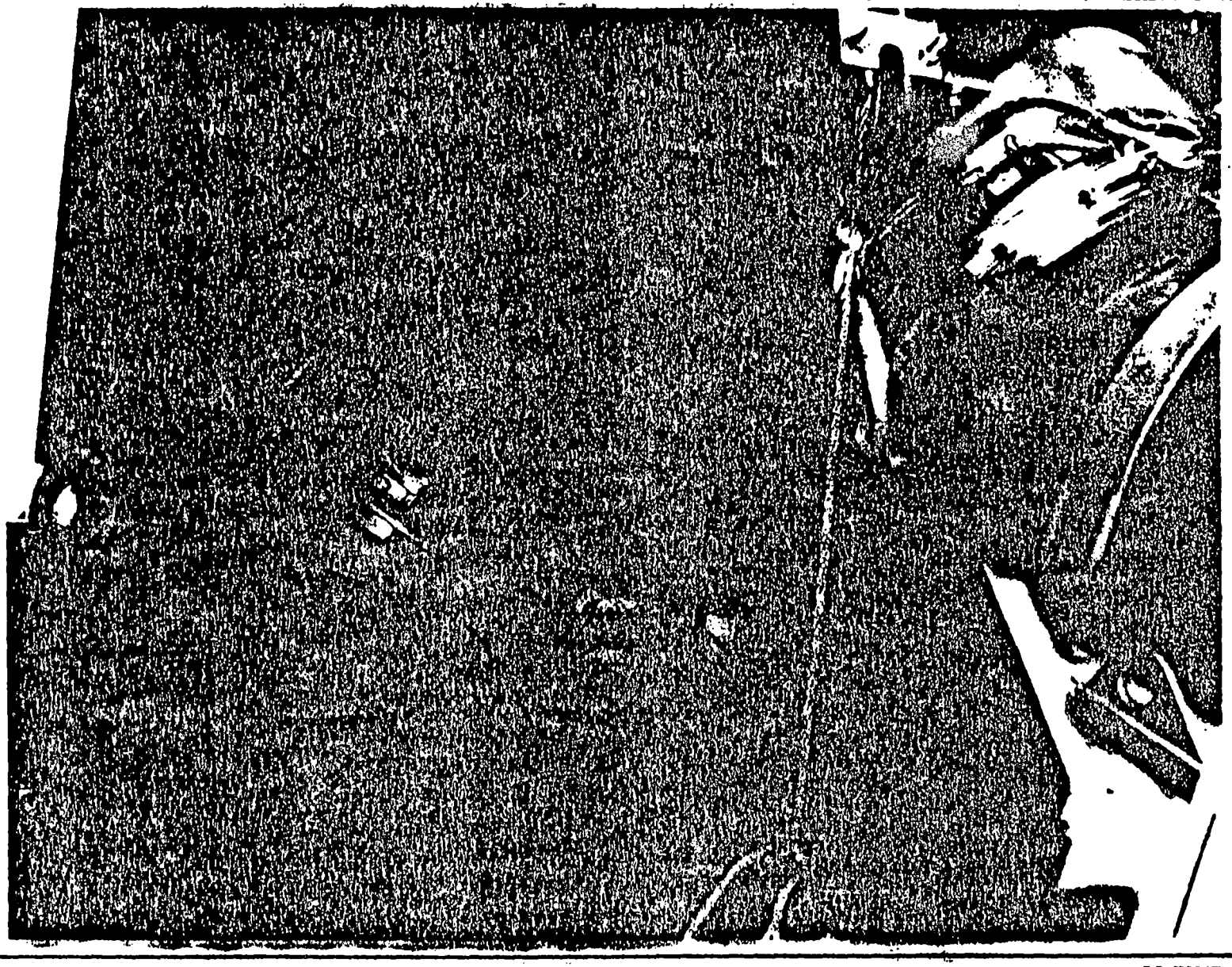


TRIAL FIT OF STEAM GENERATOR



WELD IN HOT LEG

SIEMENS

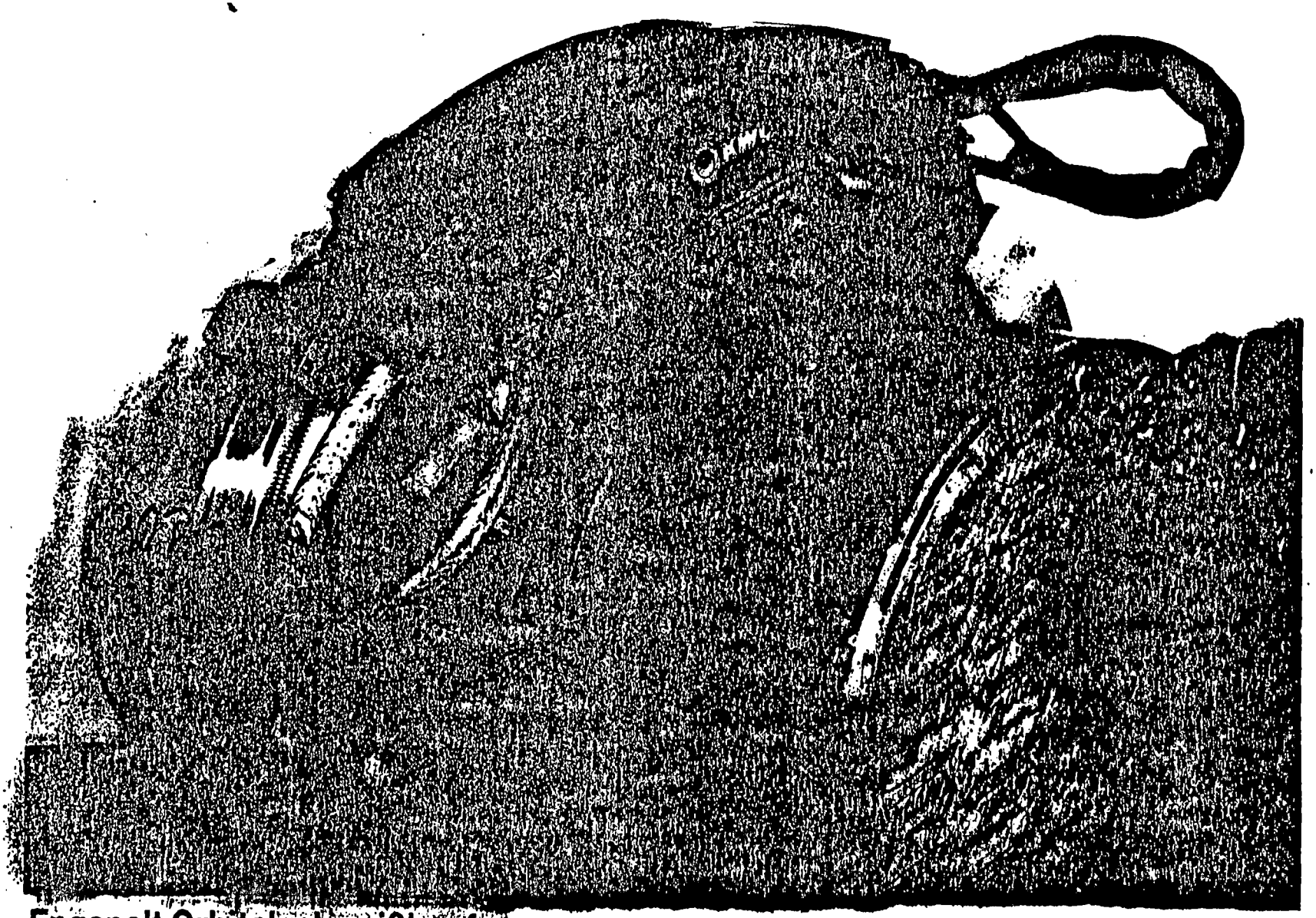


SG-Mock Up Steam Generator Replacement Ringhals 2/Sweden

Personnell-, Equipment Training and Qualification

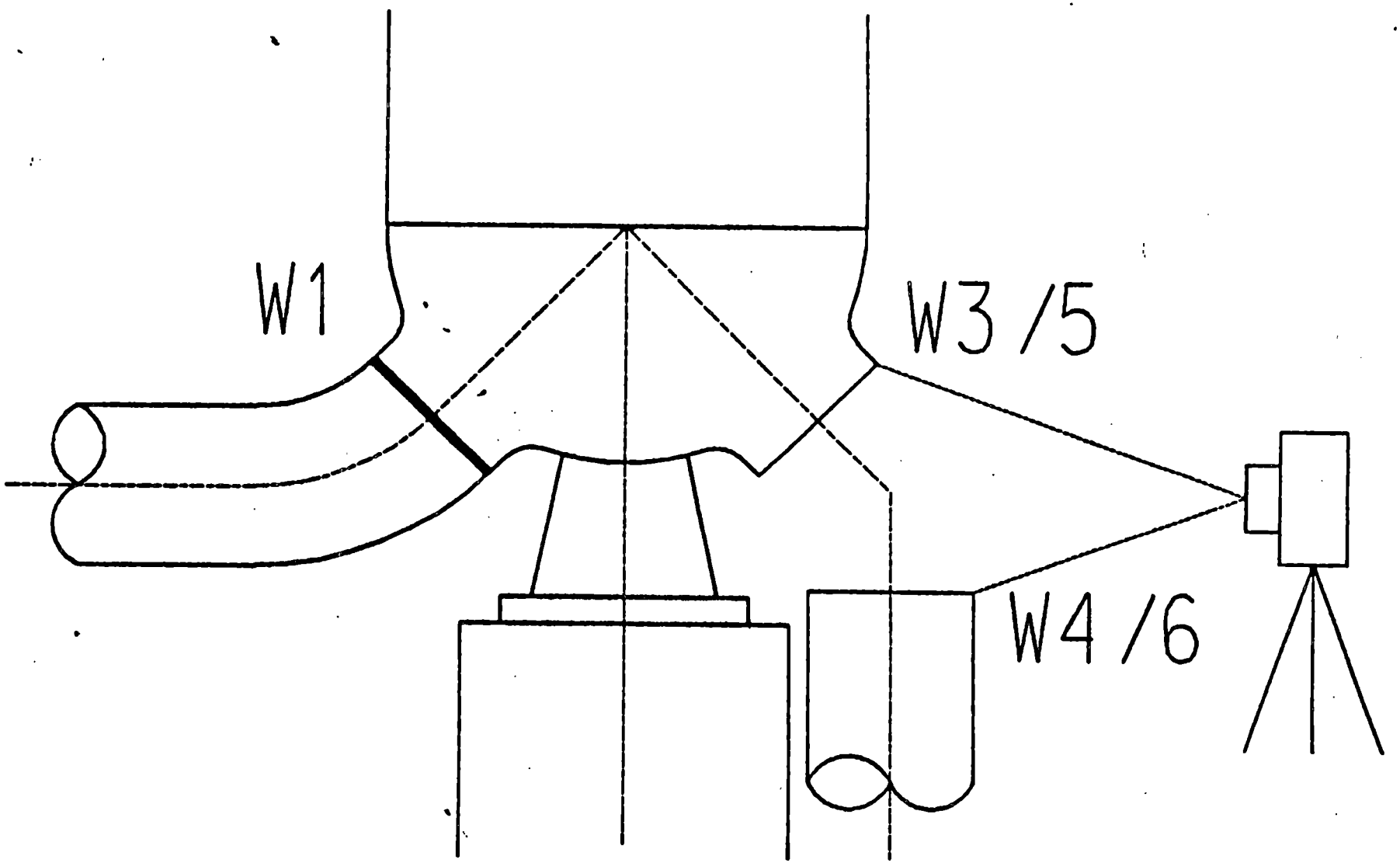
89 PWR 125
UB KWU
U444PT

SIEMENS



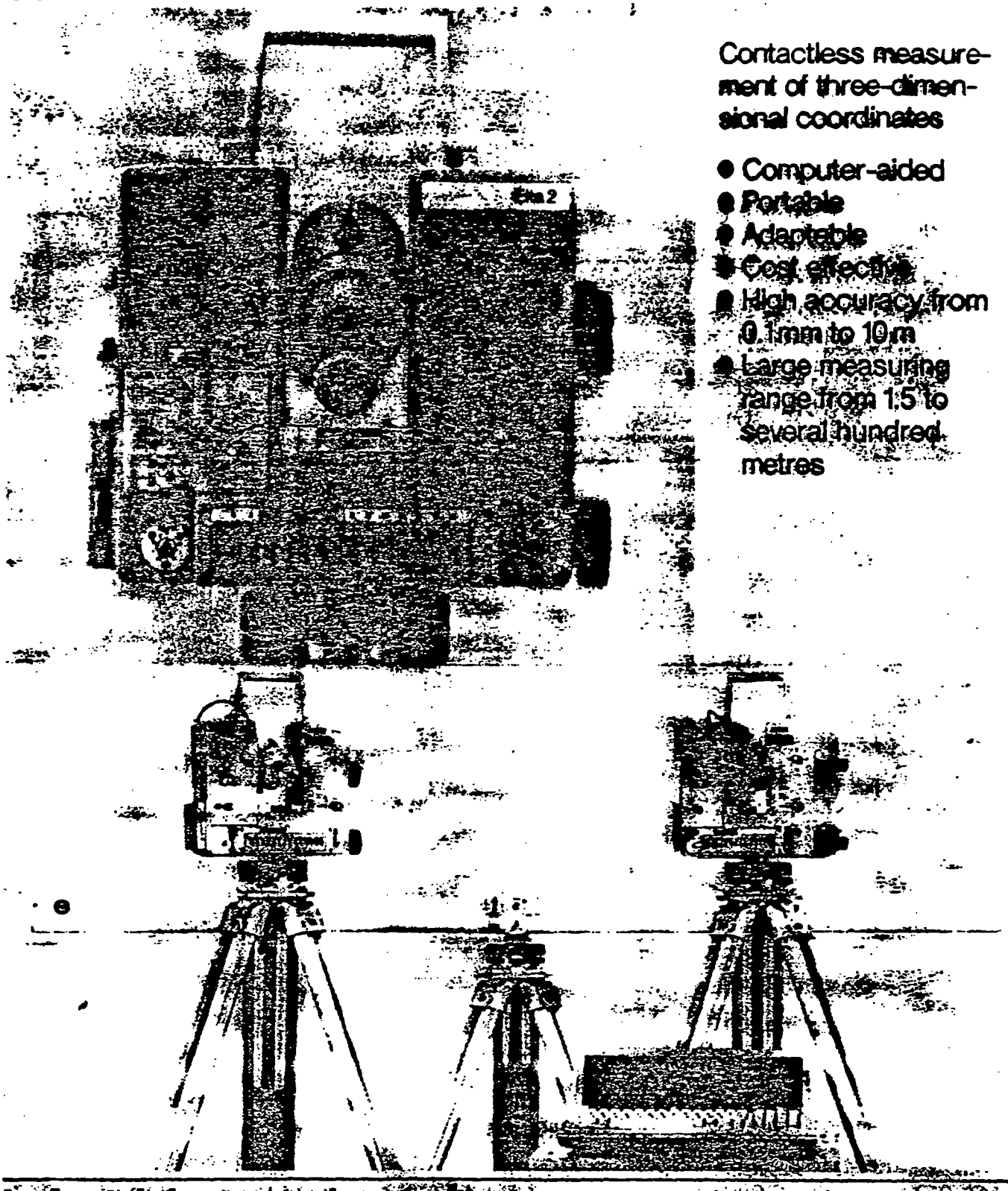
Engspalt Orbitalschweißkopf
Narrow Gap Orbital Welding Head

851460 d/e



PREPARATION OF ELBOWS

SIEMENS



Contactless measurement of three-dimensional coordinates

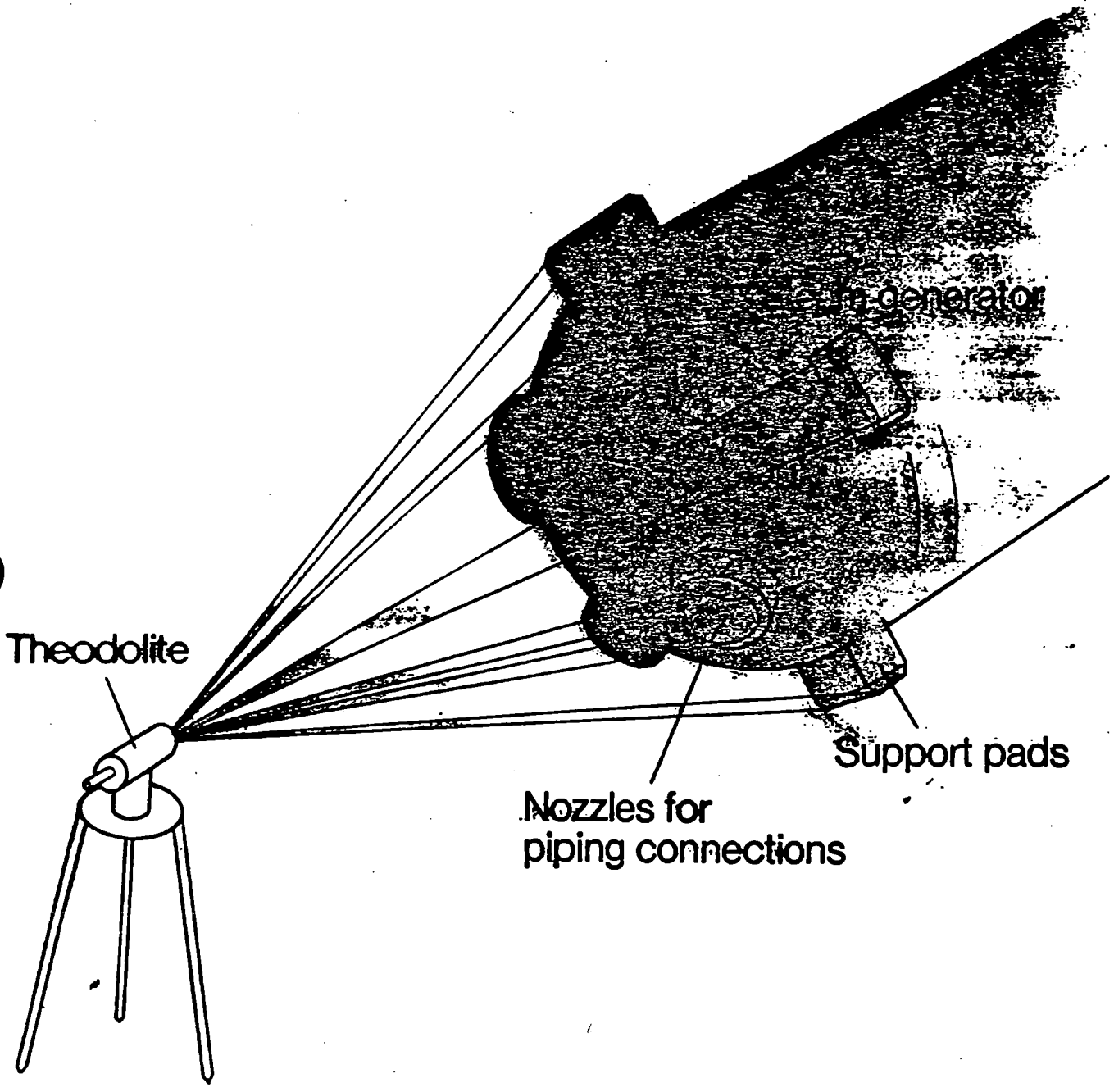
- Computer-aided
- Portable
- Adaptable
- Cost effective
- High accuracy from 0.1 mm to 10 m
- Large measuring range from 1:5 to several hundred metres

Industrial measuring system

Equipment

87 PWR 187e
Fig. 3

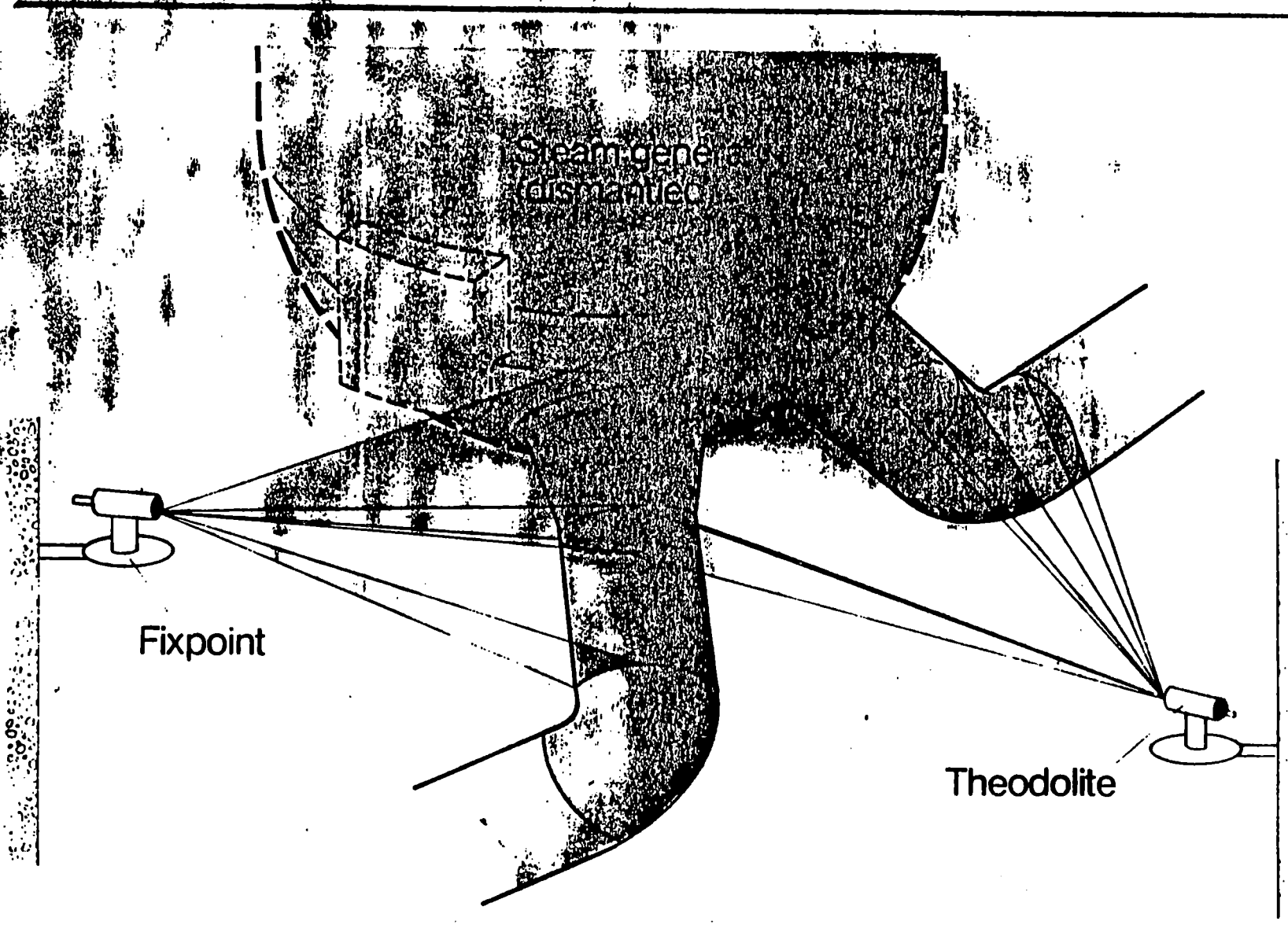
SIEMENS



Industrial measuring system
Recording of new component dimensions (steam generator)

88 PWR 162e
Fig. 8

SIEMENS

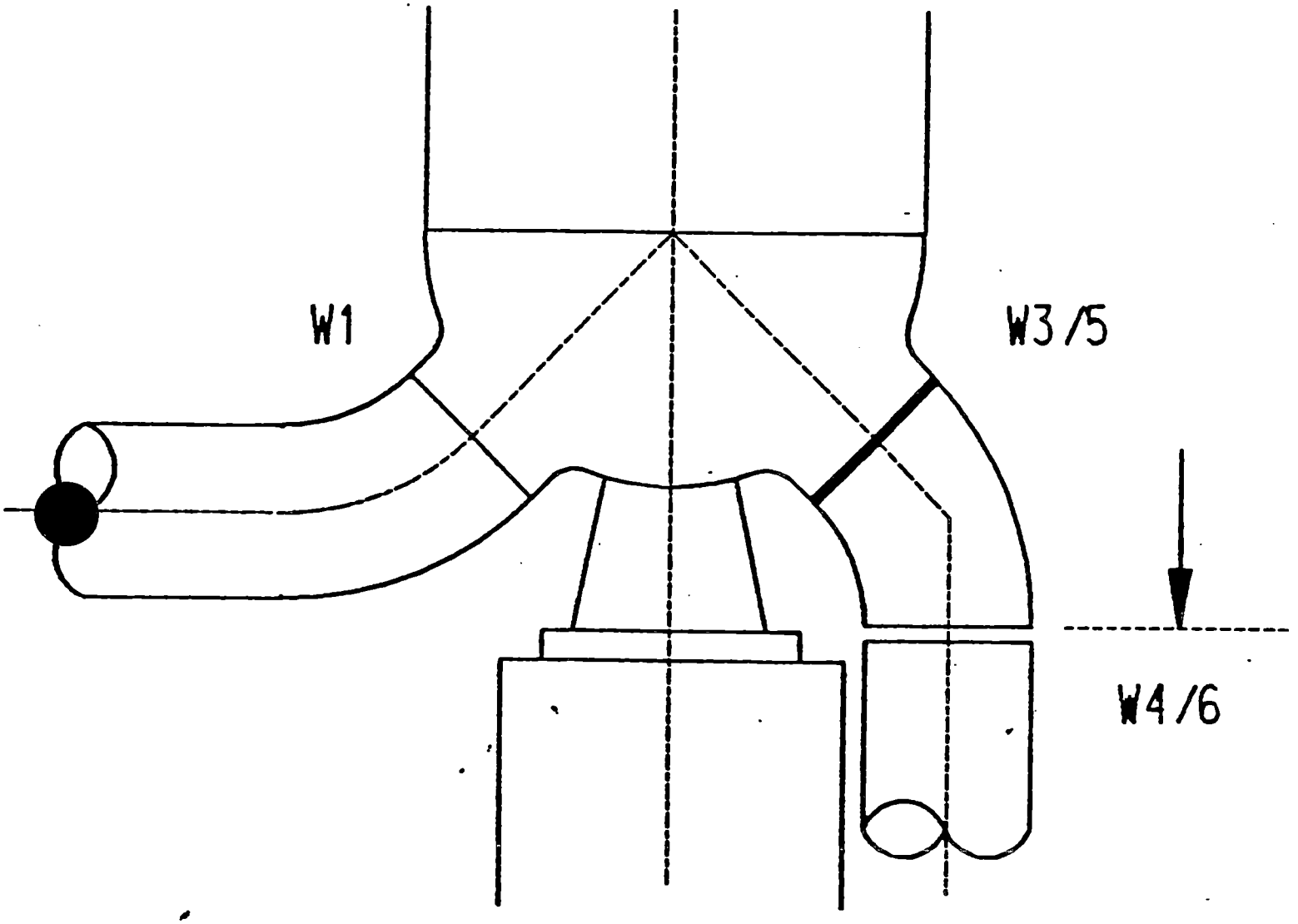


Industrial measuring system

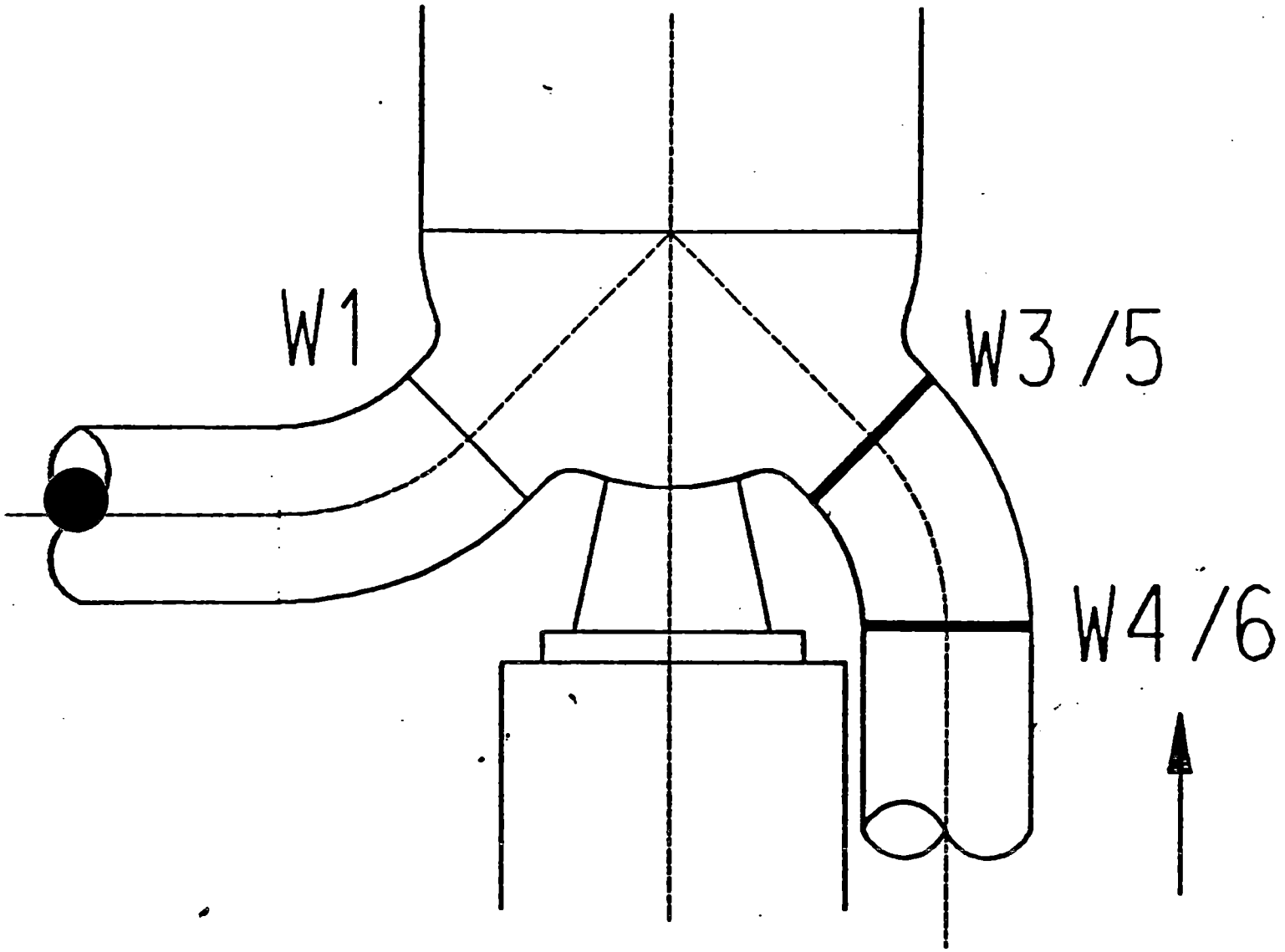
Control measurement of the pipes after dismantling of the steam generator

87 PWR 203

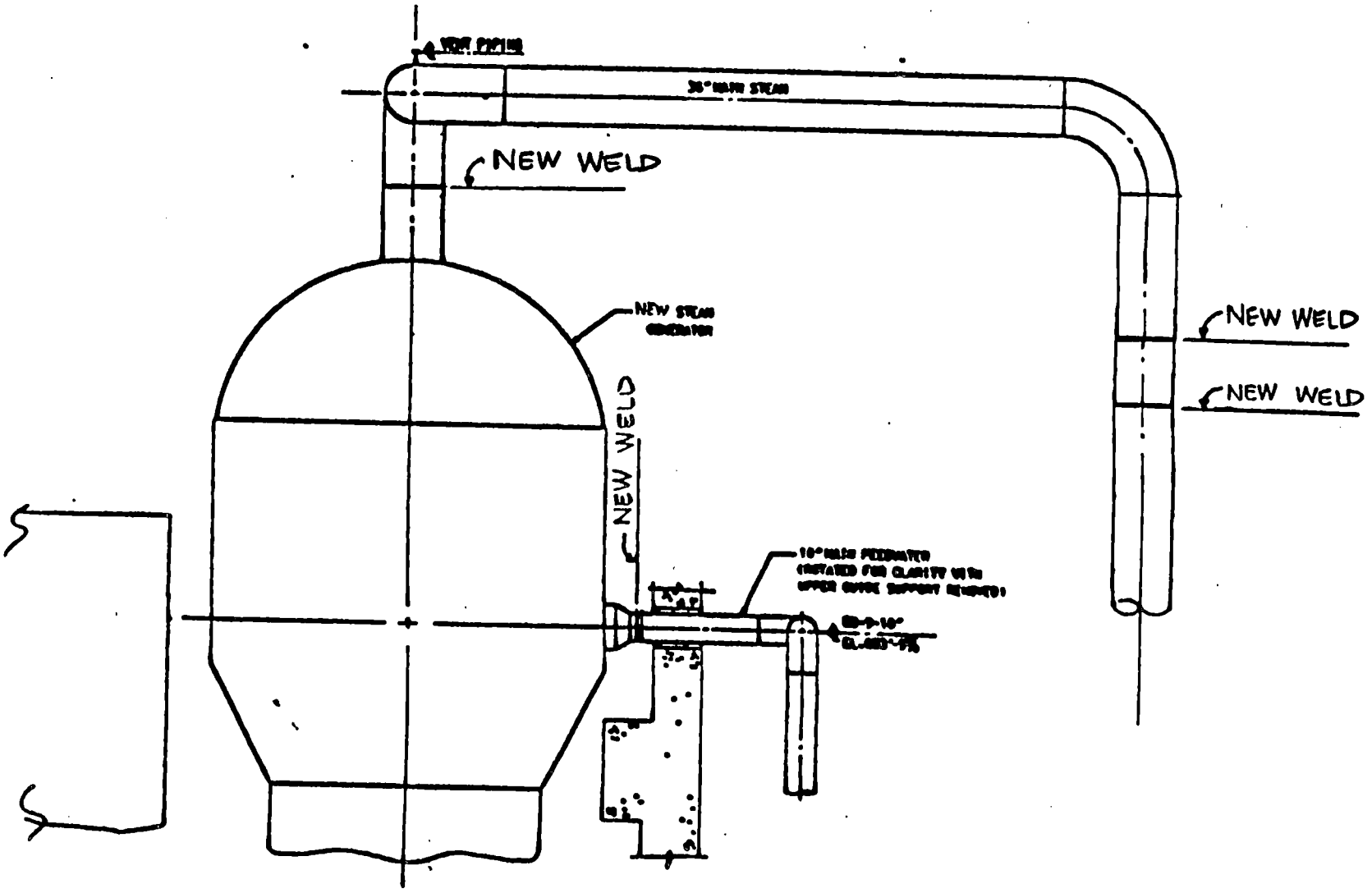
Fig. 13



WELD IN COLD LEG ELBOW



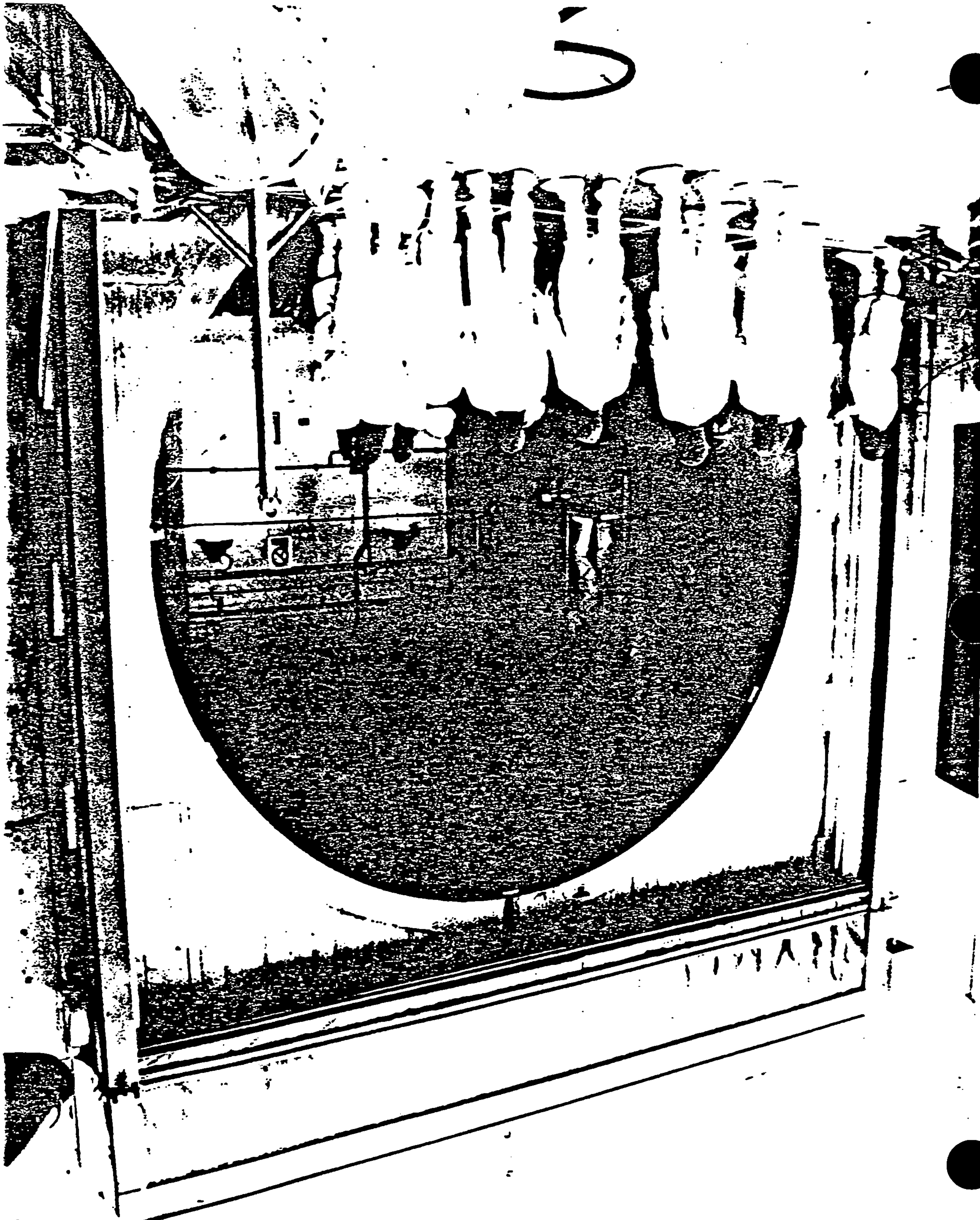
WELD IN COLD LEG


NEW WELD
NEW WELD
NEW WELD
NEW WELD

Palisades
SGR Activities
During Plant Refueling

- Install Removed Interferences
- Install New S/G and Piping Insulation
- Remove Temporary Power
- Tension and Grease Tendons
- Perform Containment SIT

5



PRESENTATIONS

CONTAINMENT CONSTRUCTION OPENING.....APRIL 12

NARROW-GAP WELDING.....APRIL 26

RADIATION PROTECTION.....MAY 2

SG and SECONDARY SIDE IMPROVEMENTS.....MAY 3

PIPE and PIPE SUPPORTS.....

FSAR ANALYSES.....

RIGGING AND HAULING.....

FCP DESCRIPTION	SCHEDULE
Blowdown System Piping - Phase I	Completed
Recirculation System Piping - Phase I	Completed
Wide Range Instrumentation Tubing - Phase I	Completed
Breathing Air Station Relocation - Phase I	Completed
Rigging and Support Installation - Phase I	Completed
Reinforced Earth Retaining Wall	April 13
Aux Bldg Modification for CAF	June 15
Overall SG Replacement Program	June 15
Temporary Commodities	June 15
Old Steam Generator Storage Facility	May 3
Outside Rigging	June 15
Inside Rigging	June 15
CCW Surge Tank Room Tubing Relocation	June 15
CCW Surge Tank Room Roof Slab Removal	June 15
Containment Construction Opening	June 15
PCS Piping Replacement	June 15
Main Steam System Piping Modification	June 15
Emergency FW System Piping Modification	June 1
Blowdown System Piping - Phase II	June 15
Recirc System Piping - Phase II	June 15
Steam Generator Sample System	June 1
Wide Range Level Instrumentation	June 15
Foundation Structure for Rigging Platform	May 21
CVCS Piping/Valve Relocation	June 15
Steam Generator Replacement	June 15
Main Feedwater System Modification	May 15

INTERIM OLD SG STORAGE FACILITY

- Structural Design of Storage Facility
- Seismic Design Considerations
- Other Natural Phenomena
- Flooding
- Fire Protection and Fire Hazards
- Electrical Design Considerations
- Radiological Impact
  (Onsite and Offsite Doses)
- Radiological Consequences of Abnormal Events
- Surveillance Requirements
- Structural Adequacy of SG Supports
- Security Access Controls
- Construction Impact
- Technical Specification Impact
- FSAR Impact

CONTAINMENT CONSTRUCTION OPENING

- o Containment Design Parameters
- o Containment Structural Adequacy
- o Shutdown Cooling System Operation Coordination
- o Impact on Safety-Related Equipment during Construction
- o Temporary HVAC Consideration
- o Missile/Tornado and Depressurization Considerations
- o Containment Access Control and Security Control
- o Replacement Materials (concrete, rebar, sheathing, liner plate) and Construction Details
- o Radiation Protection
- o Temporary Enclosure Consideration
- o Fuel Building/Containment Interface

CONTAINMENT CONSTRUCTION OPENING (cont)

- Liner Plate Protection Considerations
- Protective Coating on Liner Plate
- Procedural Controls
- Waste Disposal
- Removal and Reinstallation of Tendons
- Mockup Training
- Inspection Method/Criteria
- Performance Tests
- Technical Specification Impact
- FSAR Impact

RIGGING INSIDE CONTAINMENT

- o Structural Evaluation of Rigging Loads on Existing Polar Crane Rail, Containment Shell and Reactor Cavity Shield Walls
- o Heavy Load Consideration
- o Load Test of all Lifting Systems and Components
- o Impact on Plant Security System
- o Fire Protection System Considerations
- o Electrical Design Considerations
- o Procedural Controls
- o Consequences of Dropping Old/New SG, Rigging, or Other Equipment
- o Radiation Protection
- o Technical Specification Impact
- o FSAR Impact

HAUL ROUTES AND RIGGING OUTSIDE CONTAINMENT

- Structural Evaluation of Access Roads
- Evaluation of Underground Utilities
- Assessment of Nearby and Overhead Facilities for Interferences
- Load Test of all Lifting Systems and Components
- Structural Evaluation of Rigging Platform, Structural Supports, and Foundation
- Flood Control
- Procedural Controls
- Impact on Fire Protection
- Impact on Plant Security System
- Impact on Electrical Systems

HAUL ROUTES AND RIGGING OUTSIDE CONTAINMENT (cont)

- o Transportation Incidents (loss of transporter control, transporter overturning, etc.)
- o Consequences of Dropping Old/New SG, Rigging, or Other Equipment
- o Technical Specification Impact
- o FSAR Impact

RETAINING WALL OUTSIDE CONTAINMENT

- Structural Adequacy of the Structure
- Evaluation of Underground Utilities
- Assessment of Nearby and Overhead Facilities for Interferences
- Procedural Controls
- Construction Impact
- Separation from Containment
- Impact on Containment/Tendon System
- Impact on Fire Protection
- Impact on Plant Security System
- Impact on Electrical Systems
- Design Life of the Structure
- Technical Specification Impact
- FSAR Impact

PIPING SYSTEMS INSIDE CONTAINMENT

- o Seismic Design Considerations
- o Missile Design Considerations
- o Pipe Support Design Considerations
- o High-Low Pressure Interfaces
- o Interfacing LOCA
- o Pipe Penetrations (LLRT, Heatup, etc)
- o Pipe Breaks (MSLB, HELB, etc.)
- o Single Failure Criteria
- o Environmental Qualification Impact
- o Code Compliance and Reconciliation
- o Containment Heat Load Considerations
- o Containment Heat Sink Considerations
- o Thermal Insulation Removal and Replacement

PIPING SYSTEMS INSIDE CONTAINMENT (cont)

- Heavy Load Considerations
- Protective Coating
- Hydrogen Generation
- Pipe Severance and Reconnection Technique
- Radiological Impact of Pipe Cutting
- Waste Disposal
- Return-to-Service Testing
- Technical Specification Impact
- FSAR Accident Analyses
- FSAR Impact

SG BLOWDOWN AND RECIRCULATION PIPING - SPRING OUTAGE INSTALLATION

- Structural Evaluation of Pipe Support Loads (permanent and temporary) on Containment Interior Structures
- Seismic Design Considerations
- Missile Design Considerations
- Protective Coating
- Impact on Subcompartment Analysis
- Containment Heat Sink Considerations
- Hydrogen Generation
- Heavy Load Considerations
- Technical Specification Impact
- FSAR Accident Analyses
- FSAR Impact

WIDE RANGE LEVEL INSTRUMENTATION

- o Potential Changes to Setpoint
- o Review of FSAR Accident Analyses
- o Review of Set Point Index
- o Environmental Qualification Impact
- o Regulatory Guide 1.97 Compliance
- o Fire Protection Considerations
- o Single Failure Criteria
- o Electrical Power Supply Considerations
- o Structural Evaluation of Instrumentation Support Loads on Containment Interior Structures
- o Seismic Design Considerations
- o Technical Specification Impact
- o FSAR Impact

WIDE RANGE LEVEL INSTRUMENTATION - SPRING OUTAGE INSTALLATION

- Structural Evaluation of Instrumentation Support Loads on Containment Interior Structures
- Seismic Design Considerations
- Impact on Subcompartment Analysis
- Containment Heat Sink Considerations
- Hydrogen Generation
- Technical Specification Impact
- FSAR Accident Analyses
- FSAR Impact

INTERFERENCE REMOVAL AND REINSTALLATION

- Consequences of Load Drop
- Laydown Load Consideration
- Impact on Safety Systems During Removal/Reinstallation
- Impact on Fire Protection System
- Impact on Security System
- Loss of Offsite Power
- Procedural Controls
- Return-to-Service Testing
- Technical Specification Impact
- FSAR Accident Analyses
- FSAR Impact

TEMPORARY RIGGING COMPONENTS INSIDE CONTAINMENT - SPRING OUTAGE INSTALLATION

- Structural Evaluation of Rigging Component Loads on Containment Dome Trusses and Liner Plate
- Seismic Design Considerations
- Impact on Subcompartment Analysis
- Containment Heat Sink Considerations
- Hydrogen Generation
- Protective Coating
- Heavy Load Considerations
- Heavy Load Consideration Not Addressed in Existing Plant Procedures
- Technical Specification Impact
- FSAR Accident Analyses
- FSAR Impact

BREATHING AIR SYSTEM - SPRING OUTAGE INSTALLATION

- Structural Evaluation of Support Loads on Containment Interior Structures
- Pipe Support Design Considerations
- Seismic Design Considerations
- System Interface
- Performance Tests
- Technical Specification Impact
- FSAR Accident Analyses
- FSAR Impact

STEAM GENERATOR REPLACEMENT FC

- Comparison with Existing SG Design
- Code Compliance and Reconciliation
- Structural Adequacy of Existing SG Support System
- Thermal Insulation Removal and Replacement
- Missile Design Considerations
- Seismic Design Considerations
- Containment Heat Load Considerations
- Containment Heat Sink Considerations
- Containment Net Free Volume Considerations
- Procedural Controls
- System Interface
- Equipment Qualification Program Evaluation

STEAM GENERATOR REPLACEMENT FC (cont)

- o PCS Flow
- o Flow-Induced Vibration
- o Temperature Difference between Hot and Cold Legs
- o Pressure Drop Across the Core
- o ALARA Considerations
- o Return-to-Service Testing
- o Technical Specification Impact
- o Evaluation of FSAR Accident Analyses
- o FSAR Impact

OVERALL SG REPLACEMENT PROJECT

- Comparison with Existing SG Design
- Code Compliance and Reconciliation
- Structural Considerations
- Missile Design Considerations
- Seismic Design Considerations
- Procedural Control During Construction
- Operational Procedure Review
- System Interface
- Equipment Qualification Program Review
- PCS Flow
- Flow-Induced Vibration
- Temperature Difference between Hot and Cold Legs

OVERALL SG REPLACEMENT PROJECT (cont)

- Pressure Drop Across the Core
- ALARA Considerations
- Return-to-Service Testing
- Technical Specification Impact
- FSAR Accident Analyses Review
- FSAR Impact

PALISADES STEAM GENERATOR REPLACEMENT PROJECT

BECHTEL TASK MANAGERS

1	PROJECT MANAGER	BECKMAN
	ASST. PROJECT MANAGER	BECK
1A	PROJECT ENGINEERING	BROWN
1B	CONSTRUCTION	CHARNEY
1C	COST/SCHEDULE	MUELLER
1D	QUALITY (H.O./FIELD)	DADLANI / BRYAN
2	LICENSING	TAI
3	OUTAGE BUILDING	L. KELLER
4	CONTAINMENT OPENING	MORRIS
5	RIGGING	BREHM
6	S/G MODIFICATIONS	WRIGHT
7	PCS PIPING	LEONARD
8	INSULATION	GEIGER
9	PCS WELDING TRAINING / TESTING	DIPPOLD
10	NEW PIPING SYSTEM (B/D & RECIRC)	NORBERG
11	SECONDARY PIPING (M/S & F/W)	HEARD
12	OLD S/G STORAGE FACILITY	STEINEM
13	INSTRUMENTATION / SAMPLE SYSTEM	STONER
14	HVAC	GEIGER
15	TEMPORARY FACILITIES	STEELE
16	SCAFFOLDING AND TENTS	STEELE
17	TEMPORARY SERVICES	ALFONE
18	ALARA / HEALTH PHYSICS	MURPHY
21	TESTING & INSPECTION	GRAY

(04/25/90)

FSAR CHAPTER 14 SAFETY ANALYSES

FOR THE REPLACEMENT STEAM GENERATORS

- DISPOSITION OF ALL CHAPTER 14 EVENTS (CPCo, ANF, CE)

- THE DISPOSITION IS BASED ON REPLACEMENT STEAM GENERATOR DESIGN DIFFERENCES AND RESULTING PLANT OPERATING CONDITIONS

- ONLY TWO EVENTS ARE DISPOSITIONED AS REQUIRING REANALYSIS:

  1. FSAR 14.15, STEAM GENERATOR TUBE RUPTURE (SGTR), DUE TO A LARGER TUBE INSIDE DIAMETER

  2. FSAR 14.18.2, MAIN STEAM LINE BREAK (MSLB) CONTAINMENT RESPONSE (INCREASED SECONDARY INVENTORY)

- PRELIMINARY RESULTS TO THE SGTR AND THE MSLB CONTAINMENT EVENTS ARE ACCEPTABLE (ACCEPTANCE CRITERIA BEING MET).

- THE ACCEPTABLE COMPLETION OF THE EVENTS REQUIRED WILL SUPPORT THE REPLACEMENT OF THE STEAM GENERATORS UNDER THE 10CFR50.59 PROCESS