J.O. No. 11600.02

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DESIGN CRITERIA AND DESCRIPTION

TECHNICAL SUPPORT CENTER

SHOREHAM NUCLEAR POWER STATION - UNIT 1
LONG ISLAND LIGHTING COMPANY

8007230462

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1.0 GENERAL CRITERIA AND DESCRIPTION

1.1 General Criteria

A separate Technical Support Center (TSC) shall be provided for use by plant management, technical, and engineering support personnel. In an emergency, this center shall be used for assessment of plant status and potential offsite impact in support of the control room command and control function. The center should also be used in conjunction with implementation of onsite and offsite emergency plans, including communications with an offsite emergency response center. Provide at the onsite Technical Support Center the as-built drawings of general plant arrangements and piping, instrumentation, and electrical systems. Photographs of as-built system layouts and locations are an acceptable method of satisfying some of these needs.

1.2 General Description

The second floor of the security building will be upgraded to serve as the TSC by the addition of filtered ventilation, computer generated system and radiological parameter displays and a backup power supply.

The TSC staffing and activation criteria and interaction with the Emergency Operations Facilities will be specified in the Shoreham Nuclear Power Station - Unit 1 (SNPS-1) Emergency Plan.

The TSC will be operational by fuel load.

2.0 DESIGN CRITERIA AND DESCRIPTION

2.1 Location/Space

2.1.1 Criteria

The TSC shall be located in proximity to but separate from the control room, and within the plant security boundary. The facility shall be of sufficient size to accommodate those operating the TSC, NRC, and vendor representatives as well as the required equipment and technical data.

2.1.2 Description

The existing security building is a separate structure located on the north side of the plant, as shown on the Site Arrangement Plan, Figure 1. The entire second floor of approximately 4,000 sq ft consisting of lecture and classrooms, an office, a library and toilets will be made available as the TSC on a joint basis. The first floor will continue as the security facility although it will be within the protected (habitable) environment provided for the entire building due to the TSC requirements.

The existing floor plan is shown on Figure 2. It will provide ample space for 25 people.

2.2 Structural/Architectural

2.2.1 Criteria

The TSC need not be designed to seismic Category I requirements. It shall be well built in accordance with sound engineering practice, with due consideration to the effects of natural phenomena which may occur at the site.

2.2.2 Description

The existing security building will be modified as necessary to accommodate the functions of a TSC.

2.2.2.1 Existing Structure

The security building superstructure is of steel framed construction supported on reinforced concrete spread footings. The energy efficient curtain wall design utilizes insulated cavity wall construction. The roof deck and intermediate floor slab are of reinforced concrete construction, with the roofing material comprised of insulated, built-up asphalt and gravel.

2.2.2.2 Building Modifications

The existing roof level HVAC penthouse will be expanded to accommodate additional mechanical equipment. This penthouse expansion will be of a similar construction as the existing security building and will complement the existing architectural style.

Additional building modifications will include the architectural sealing of the building to develop the ability to sustain the positive internal pressure required for TSC occupation.

This will be accomplished by providing existing doors and frames with appropriate weather stripping and gaskets. Should such modifications provide inadequate reduction of air leakage, the interior walls will be coated with an impermeable coating system where necessary.

2.3 Habitability

2.3.1 Criteria

The TSC shall be designed to protect personnel from radiological hazards including direct radiation and airborne contaminants in accordance with General Design Criterion 19 and Standard Review Plan 6.4. Limits of 5 rem whole body, 30 rem thyroid, shall not be exceeded for the duration of the accident considering major sources of radiation.

Monitoring shall be provided for both direct radiation and airborne radioactive contaminants. The monitors should provide warning if the radiation levels in the support center are reaching levels approaching the design limits. The licensee should designate action levels to define when protective measures should be taken (such as using breathing apparatus and potassium iodine tablets, or evacuation to the control room).

2.3.2 Description

The security building meets these criteria, as follows:

1. Credit is taken for mixed mode release; see Attachment 1 for justification, and

2. The TSC atmosphere is filtered through a Charcoal-HEPA filter. See Attachment 2 for a discussion of the analysis. This is achieved by upgrading the security building HVAC system as discussed in Section 2.4.

   The 30 day integrated doses calculated based on the above are:

	Total 30 Day Integrated Dose (Rem)		
	Thyroid	Gamma	Beta
Mixed Mode Release & 95 percent Halogen Filter	16	0.348	3.75

These are within the limits of General Design Criterion 19. Local wall-mounted area radiation monitors will be provided to measure radioactivity within the TSC and a ventilation monitor with an iodine cartridge will measure recirculated airborne levels. Action levels to define when protective measures should be taken (including evacuation) will be designated.

2.4 Heating, Ventilation, and Air Conditioning

2.4.1 Criteria

Permanent ventilation systems, including particulate and charcoal filters, shall be provided. These systems need not be qualified as ESF systems. However, the design and testing guidance of Regulatory Guide 1.52 shall be followed except that the systems need not be redundant, seismic, instrumented in the control room, or automatically activated. In addition, HEPA charcoal filters need not be tested as specified in Regulatory Guide 1.52 nor meet the QA requirements of 10CFR50 Appendix B. Spare parts shall be readily available.

2.4.2 Description

To pressurize the security building atmosphere, 2,000 to 3,000 cfm of filtered outside air will be supplied to the building. Provision has been made in the system design for 3,000 cfm maximum outside air, with recirculation capability of up to 1,000 cfm.

A 3,000 cfm capacity Charcoal-HEPA filter train with booster fan will be installed on the roof of the security building inside an extension of the existing equipment room. This filter train will remove, with 95 percent efficiency, the gaseous iodine, methyl iodine, and any particulates from the outside air, reducing concentrations to within acceptable limits.

In order to use the outside air of 2,000 to 3,000 cfm for pressurization only, exhaust from the second floor lecture hall, toilets, and locker area will be eliminated by shutting down roof fans and securely closing dampers. In addition, the main exhaust damper will be closed securely. Procedures shall be provided to ensure all necessary actions are completed upon manning the TSC.

Existing system controls will be modified to suit the new design requirements and to maintain positive pressure following a DBA. A central control center will be provided for remote manual operation of the HVAC system during an accident. This will include push buttons for all the manual-controlled, power operated dampers, startup of the filter booster fan, and direct expansion air conditioning.

A conceptual study sketch (Figure 3) showing a schematic of the existing security building HVAC system and proposed modifications is attached.

Provisions for a direct expansion (DX) refrigeration system have been made to meet the requirements of heat gains due to equipment, outside air, lights and power, and personnel occupany, and loss of office and service building chilled water supply. During an accident, the TSC HVAC will be self contained and its power source will be from a backup power supply as discussed in Section 2.6.

Regulatory Guide 1.52, Design Testing and Maintenance Criteria for Atmospheric Cleanup System Air Filtration and Adsorption Units, will be followed as required to meet the criteria as stated in Section 2.4.1. Spare parts will be readily available as will procedures for replacing failed components.

2.5 Instrumentation

2.5.1 Criteria

The TSC shall have the capability to display plant parameters and equipment status to technical and management personnel responsible for engineering and support of reactor operations (control room activities) following an accident. The TSC capability to assess plant parameters shall be independent from actions in the control room. The TSC equipment is not required to be safety grade or redundant.

The data between the beginning of the accident (t=0 defined as initial event, e.g., reactor scram or turbine trip) and the time of activation of the TSC shall not be lost and shall be available at the TSC.

The instrumentation in the TSC shall not degrade plant installed safety-grade instrumentation and equipment.

2.5.2 Description

The TSC data display will be entirely computer based and will be provided by way of an enhancement of the existing process computer (PCS) and digital radiation monitoring computer (RMS) systems. Refer to FSAR Sections 7.5.1.6 and 7.5.2.7 on the process computer system and to Sections 11.4 and 12.3.4 on the digital radiation monitoring system.

The selection of parameters will be based on capabilities to:

1. Diagnose initial event/accident,

2. Evaluate performance of safety related systems,

3. Ensure that the plant is in a stable shutdown condition following an accident,

4. Monitor offsite (portable) and onsite radiological data, and

5. Monitor meteorological data.

2.5.2.1 In-plant System Parameters

Presentation of in-plant system parameters will be provided at the TSC by the process computer system. Data will be presented by a color graphics CRT display with keyboard access. Three high speed typers will be provided for hard copy record. One typer, a KSR (Input/Output) type, will provide user demand request capabilities and will receive outputs from existing NSSS and BOP post-trip logs as well as significant in-plant system alarms. The other two typers will be of the RO (Receive Only) type: one will provide the same alarms being presented on the main control room alarm typer and the other will provide output of the process computer TSC data log (Section 2.5.2.3).

The entire process computer system data base will thus be available, on demand, for TSC display. Attachment 3 provides a listing of specific data points which will be available at the TSC as part of the PCS TSC historical data file and log (Section 2.5.2.3).

Additional data will be provided to the process computer to ensure plant safety parameter availability at the TSC. All Class 1E signals required at the TSC will be isolated prior to input to the process computer to ensure that these signals are not jeopardized or degraded by the operation of, or failure of, the process computer system. Qualified isolation devices will, in these cases, be inserted into those required Class 1E circuits to provide this assurance. A new TSC termination cabinet will be located in the relay room and will be designed as a central gathering point for all required additional data prior to process computer system input.

2.5.2.2 Radiological Data

Presentation of in-plant radiological parameters and meteorological data will be provided at the TSC by the digital radiation monitoring computer system. Data will be presented by a color graphics CRT display with keyboard access. One high speed typer, a KSR (input/output) type will be provided for hard copy records by way of user demand requests and outputs from the RMS TSC data log and historical file (Section 2.5.2.3).

The entire RMS computer system data base, including off-site dose calcuations, will be available, on demand, for TSC display. Attachment 4 provides a listing of specific data points which will be avilable at the TSC as part of the RMS TSC historical data file and log (Section 2.5.2.3).

Additional data, including wide ranges on effluent process monitors, will be provided to the radiation monitoring computer to ensure radiological and meteorological parameter availability at the TSC.

2.5.2.3 TSC Logs and Historical Data Files

Two logs and historical data files will be provided, one by way of the process computer system (PCS) and the other by way of the radiation monitoring system (RMS) computer. Pre-event historical data files and post-event logging of data will provide TSC personnel with the capability to diagnose the initiating event and its radiological consequences, as well as provide an immediate evaluation of safety systems performance and plant status.

2.5.2.3.1 TSC Log/Historical File - In-plant System Parameters

The process computer TSC historical data log will initiate upon receipt of an external event signal (t=0) a printout, on a TSC typer, of those in-plant system parameters assigned to this log (Attachment 3). The log will continue printing out data (the frequency of a data point printout will depend on its assigned scan rate) until manually terminated. A 5 minute pre-event data file (i.e., history) of these selected TSC log parameters will be stored by the process computer to be recalled to the TSC, on demand, using the TSC KSR typer.

2.5.2.3.2 TSC Log/Historical File - Radiological/Meteorological Parameters

The RMS computer log and historical files provided will be similar to the process computer TSC log and data file (Section 2.5.2.3.1) thus providing both pre- and post-event radiological/meteorological data record.

2.6 Electrical Power Supply

2.6.1 Criteria

An emergency power supply shall be provided for the permanent ventilation system of the TSC. The power supply to the TSC instrumentation need not meet safety grade requirements, but shall be reliable and of a quality compatible with the TSC instrumentation requirements. The power supply for instrumentation shall be continuous once the TSC is activated.

2.6.2 Description

The security building facilities are presently supplied from a 300 kVA 480-120/208 V transformer through an automatic transfer switch which receives power from buses 11C and 12C. Black power from an on-site diesel will be connected to the alternate side of the automatic transfer switch instead of the feed from bus 12C. The normal supply to the transfer switch still has access to both sources of offsite power by virtue of the transfer scheme on the 4 kV switchgear and manually through the tie-breaker in the 480 V double-ended load center. This arrangement allows access to two sources of offsite power and a diesel generator and will carry existing and added HVAC, lighting and other necessary loads.

The power requirements for the added computer points and the peripheral equipment in the TSC will be supplied from the existing computer inverter which is connected to the safety diesels. The inverter serves as an isolation device so that the computer does not have to be tripped on a LOCA signal. Power for power supplies associated with isolation devices for added instrumentation will be fed from the appropriate safety related buses.

2.7 Communications

2.7.1 Criteria

Communication links shall be established with the control room, the onsite Operational Support Center, the offsite Emergency Operations Facility, and the NRC.

2.7.2 Description

Bell System phone lines will be used for communication with the NRC, the onsite Operational Support Center, and the offsite Emergency Operations Facility, with optional lines to the Nuclear Steam Supplier and the Architect Engineer. An existing line to NAWAS will be available.

Communication to the control room will be by page/party, and the plant pbx phone systems.

2.8 Records

2.8.1 Criteria

A complete set of as-built drawings and other records, as described in ANSI N45.2.9-1974, shall be properly stored and filed at the site and accessible to the TSC under emergency conditions. These documents shall include, but not be limited to, general arrangement drawings, P&IDs, piping system isometrics, electrical schematics, and photographs of components installed without layout specifications (e.g., field-run piping and instrument tubing).

2.8.2 Description

Critical documents such as Emergency Procedures, System Descriptions, and General Arrangement, Flow, Logic and Elementary Schematic Drawings will be available in the TSC and the balance will be available in the plant Records Center.

ATTACHMENT 1

SECURITY BUILDING

TSC X/Q CALCULATIONAL TECHNIQUE

Murphy and Campe identifies the technique that is to be utilized to evaluate X/Q values to be used in plant habitability calculations (see Standard Review Plan 6.4). The technique identified applies to a Design Basis Accident (DBA) release emanating from some wall of the containment structure. Historically, DBA X/Q calculational techniques have been conservatively limited to ground level release criteria except for releases from stacks 2 1/2 times the height of the nearest adjacent building (see Regulatory Guide (RG) 1.145).

The release from the Shoreham DBA is unique in that the reactor building standby ventilation vent fulfills all seismic criteria. Instead of the release leaking through portions of the primary and secondary containments, it is confined to exit through the vertical vent atop the secondary containment structure. This vent is higher than any adjacent building in the plant. Thus, a more appropriate approach to consider X/Q calculation would be to utilize the mixed-mode release concept identified in RG 1.111, Revision 1, Position C2b. To this end, the governing Murphy and Campe equation can be married with the RG 1.111 Position C2b concept (which was developed from atmospheric tracer tests sponsored by the Atomic Industrial Forum at Millstone) to produce the following working equation:

$$\chi/Q = \frac{E_T}{\bar{u}\,(\pi\sigma_y\sigma_z + \frac{A}{K+2})} + \frac{(1-E_T)\,\mathrm{Exp}\,-\frac{1}{2}\left(\frac{h_e}{\sigma_z}\right)^2}{\bar{u}\pi\sigma_y\sigma_z}.$$

Where:

E_T = entrainment coefficient

$E_T = 1$ for $W_{o\bar{u}} \leq 1$

$E_T = 2.58 - 1.58\,(W_{o\bar{u}})$ for $1 < W_{o\bar{u}} \leq 1.5$

E_T = $0.3-0.06\ (W_{o\bar{u}}\ )$ for $1.5 < W_{o\bar{u}} \leq 5.0$

E_T = 0 for $W_{o\bar{u}} > 5.0$

$\bar{u}$ = wind speed at 10-m level (m/sec)

σ_y = horizontal dispersion coefficient (m)

σ_z = vertical dispersion coefficient (m)

A = containment building area (m^2)

$$K = \frac{3}{(S/d)^{1.4}}$$

where:

S = source to receptor distance (m)

d = containment diameter (m)

h_e = effective stack height (m)

where:

$h_e = h_s + h_{pr} - h_t$

h_s = height of vent release (m)

h_{pr} = nonbuoyant plume rise (m)

h_t = height of TSC roof above plant grade (m)

W_o = stack exit velocity (m/sec)

It is conservatively assumed that the 10-m wind speed applies to the elevated portion of the release.

RG 1.145 also identifies a fumigation condition as limiting for elevated (or partially elevated) releases during accident conditions. Seabreeze fumigation occurs only when the winds are blowing onshore. Examination of the relative locations of the shoreline, containment structure, and TSC, clearly shows the fumigation from the containment can only occur in the opposite direction from the TSC. Thus, this condition yields a zero X/Q at the TSC.

The final consideration is to identify a 5 percent worst condition for this type of release. In order to introduce more conservatism into the calculational techniue, the meteorological condition producing the highest (worst) X/Q value (i.e. 0.01 percent) was assumed to occur for the first 8 hr of the accident (0-8 hr period). An additional conservatism, nonbuoyant plume rise, due to the momentum of the release, was presumed to be zero, even though RG 1.111, Revision 1 recommends its consideration.

The X/Q's shown below were determined as being the highest (worst) values for the TSC. For the mixed-mode release, the 0-8-hr X/Q value maximized during Pasquill stability Class D (neutral) with a wind speed of 10.73 m/sec. For the ground release scenario, the 5 percent X/Q resulted from a Pasquill stability Class F (stable) and a wind speed of 1 m/sec.

Security Building*	0-8 Hr	8-24 Hr	1-4 Day	4-30 Day
Mixed Mode Release X/Q (sec/m³)	8.58×10^{-5}	5.32×10^{-5}	1.89×10^{-5}	3.43×10^{-6}
Ground Release X/Q (sec/m³)	1.02×10^{-3}	6.32×10^{-4}	2.24×10^{-4}	4.08×10^{-5}

*Distance 107 m from source to receptor

ATTACHMENT 2

SECURITY BUILDING

TSC INTEGRATED DOSE CALCULATION

Regulatory Guide 1.3 identifies the technique that is to be utilized to evaluate the integrated dose. The TSC integrated dose analysis was done based on a LOCA release from the primary containment at a rate of .5 percent volume per day, 10 gph ECCS leakage into the secondary containment, and MSIV leakage corresponding to a Technical Specification value of 11.5 scfh per valve. All releases are discharged via the RBSVS System.

The thyroid doses are computed using the conversion factors given in TID 14844 and a breathing rate of 3.47×10^{-4} m^3/sec (1.25 m^3/hr). The gamma doses are computed based on a finite cloud model in the TSC plus a semi-infinite cloud surrounding the building which has an equivalent 4 inch concrete structure. The beta doses are based on the simi-infinite cloud model suggested by the NRC, Regulatory Guide 1.3.

The total 30-day integrated LOCA doses from the airborne activity in the TSC plus gamma penetrating the building are indicated below. The doses are calculated based on mixed-mode releases with atmospheric dispersion factors (X/Q's) as described in Attachment 1 and providing a HEPA-charcoal HVAC system as delineated in Section 2.4.2 of the TSC Design Criteria and Description.

	Total 30-Day Integrated Dose (Rem)		
	Thyroid	Gamma	Beta
Mixed-Mode Release			
95% Halogen Filter	16.	1.73	3.70
No filter	319.	1.74	3.75

ATTACHMENT 3

TSC LOG AND HISTORICAL DATA FILE
IN-PLANT SYSTEM PARAMETERS

1.0 Core Parameters

1. Control Rod Postion (Core map graphic display)
2. Neutron Flux Levels (APRM, TIP)

1.1 Reactor Coolant System Parameters*

1. Reactor pressure
2. Reactor water level
3. Safety and relief valve position

1.2 Power Conversion System Parameters

1. Feedwater flow
2. Feedwater temperature
3. Condensate storage tank level
4. Main condenser pressure
5. Circulating water pumps disch. pressure

1.3 Safety System Parameters*

1. RCIC pump disch. flow
2. RHR system flow
3. RHR HX inlet/outlet temperatures
4. HPCI pump disch. flow
5. Core spray system flow
6. RHR HX - RHR SW outlet temperature
7. RHR HX - RHR SW flow
8. RBCLCW HX outlet temperatures
9. RB flood level

1.4 Containment Parameters*

1. Drywell pressure
2. Drywell temperature
3. Suppression chamber pressure
4. Suppression pool water temperature
5. Suppression pool water level
6. Drywell hydrogen conc.
7. Suppression hydrogen conc.
8. Drywell oxygen conc.
9. Suppression chamber oxygen conc.
10. Reactor Bldg. pressure

1.5 Service Air

1. ADS air header pressure

* Redundant signals in these categories will be provided in this log.

ATTACHMENT 4

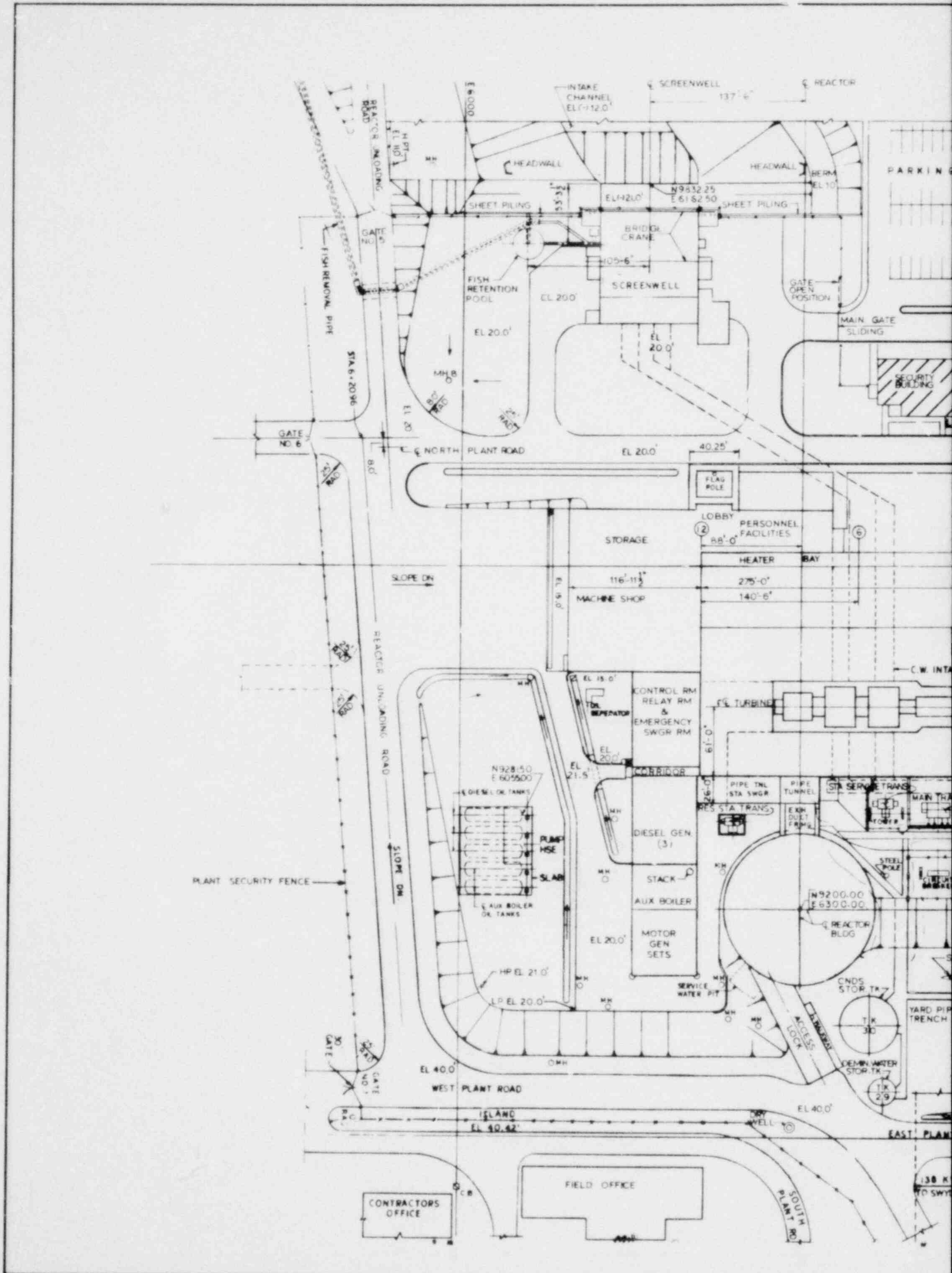
TSC LOG AND HISTORICAL DATA FILE
RADIOLOGICAL/METEOROLOGICAL PARAMETERS

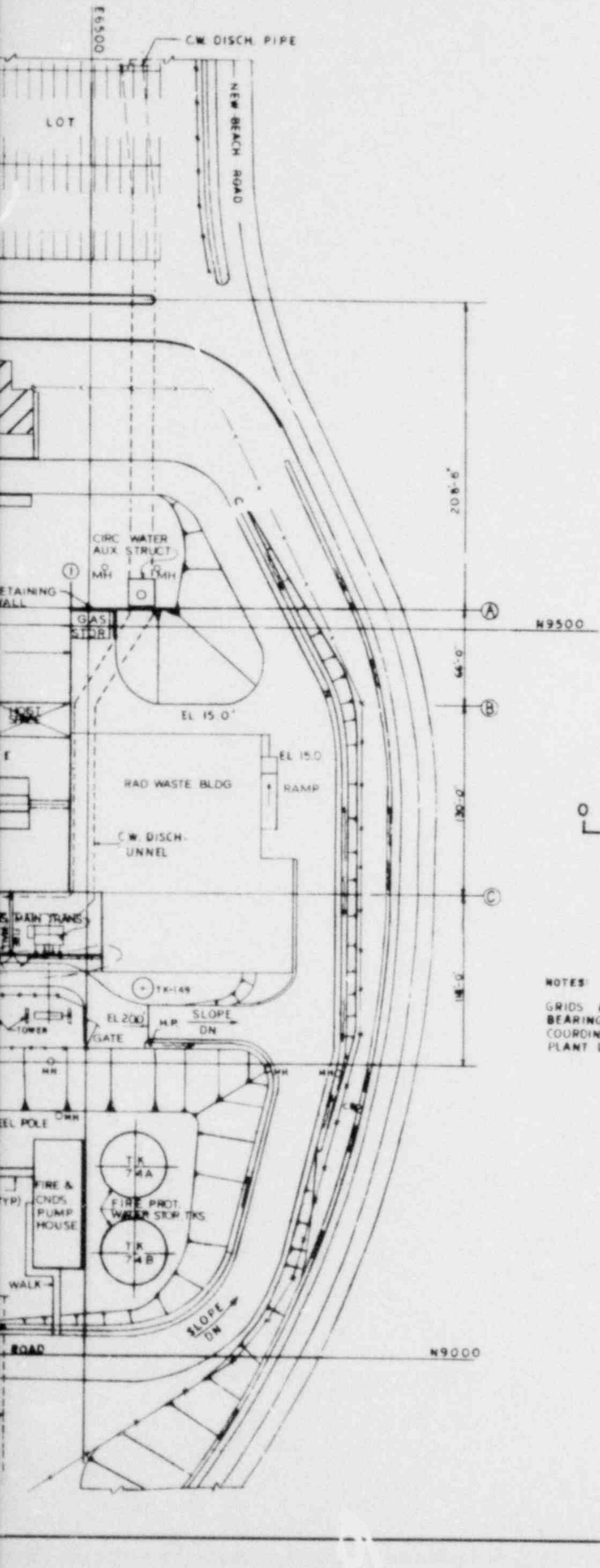
Meteorological Parameters

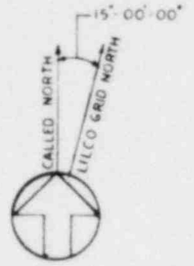
1. Wind direction
2. Wind speed
3. Temperature 10 meters elevation
4. Vertical temp difference between 10 meters and upper levels

Radiological Parameters

1. Main steam line radiation level
2. Containment area radiation high range
3. RHR service water discharge radioactivity
4. RBCLCW system radioactivity level
5. Control room ventilation activity level
6. Radiation levels in essential equipment areas
7. Release paths activity (Station vent exhaust and RBSVS)
8. Gaseous effluent flow rates


INTAKE CHANNEL EL(-)12.0'
℄ SCREENWELL
℄ REACTOR
137'-6"
REACTOR UNLOADING ROAD
HEADWALL
HEADWALL
BERM EL 10'
PARKING
N 9632.25
E 6162.50
SHEET PILING
SHEET PILING
EL(-)12.0'
BRIDGE CRANE
105'-6"
SCREENWELL
GATE NO. 5
FISH REMOVAL PIPE
FISH RETENTION POOL
EL 20.0'
EL 20.0'
EL 20.0'
GATE OPEN POSITION
MAIN GATE SLIDING
SECURITY BUILDING
STA. 6 + 20.96
MH 8
GATE NO. 6
℄ NORTH PLANT ROAD
EL 20.0'
40.25'
FLAG POLE
LOBBY
PERSONNEL FACILITIES
88'-0"
STORAGE
HEATER BAY
SLOPE DN
116'-11½"
275'-0"
140'-6"
MACHINE SHOP
REACTOR UNLOADING ROAD
C.W. INTA
CONTROL RM
RELAY RM
&
EMERGENCY SWGR RM
℄ TURBINE
N 9281.50
E 6055.00
℄ DIESEL OIL TANKS
PUMP HSE
SLAB
CORRIDOR
PIPE TNL STA SWGR
PIPE TUNNEL
STA SERV TRANS
MAIN TRA
RES STA TRANS
DIESEL GEN. (3)
STACK
AUX BOILER
MOTOR GEN SETS
N 9200.00
E 6300.00
℄ REACTOR BLDG
PLANT SECURITY FENCE
SLOPE DN
℄ AUX BOILER OIL TANKS
EL 20.0'
HP EL 21.0'
LP EL 20.0'
SERVICE WATER PIT
CNDS STOR. TK
YARD PIPE TRENCH
ACCESS LOCK
DEMIN WATER STOR. TK
EL 40.0'
WEST PLANT ROAD
ISLAND
EL 40.42'
DRY WELL
EL 40.0'
EAST PLAN
FIELD OFFICE
CONTRACTORS OFFICE
SOUTH PLANT RD
138 K
TO SWY

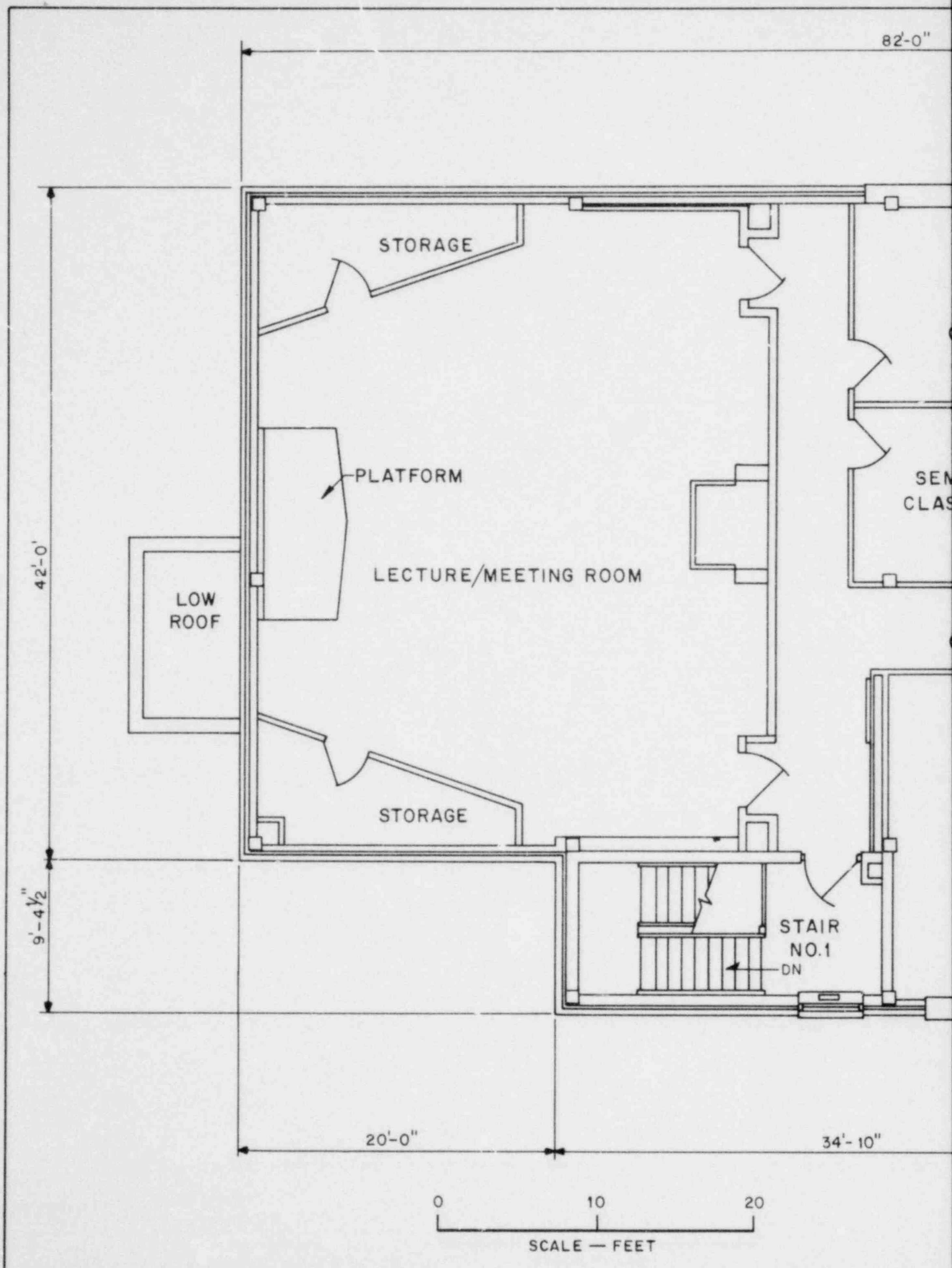




NOTES:

GRIDS & COORDINATES REFER TO PLANT GRID SYSTEM.
BEARINGS ARE RELATED TO LILCO GRID.
COORDINATES ARE BASED ON SHOREHAM PLANT GRID.
PLANT DUE NORTH EQUALS LILCO N15°-00'-00"W.

FIGURE 1
SITE ARRANGEMENT PLAN
SHOREHAM NUCLEAR POWER STATION-UNIT I



82'-0"
STORAGE
PLATFORM
SEM
CLAS
LECTURE/MEETING ROOM
LOW
ROOF
42'-0'
STORAGE
STAIR
NO.1
DN
9'-4½"
20'-0"
34'-10"
0
10
20
SCALE — FEET

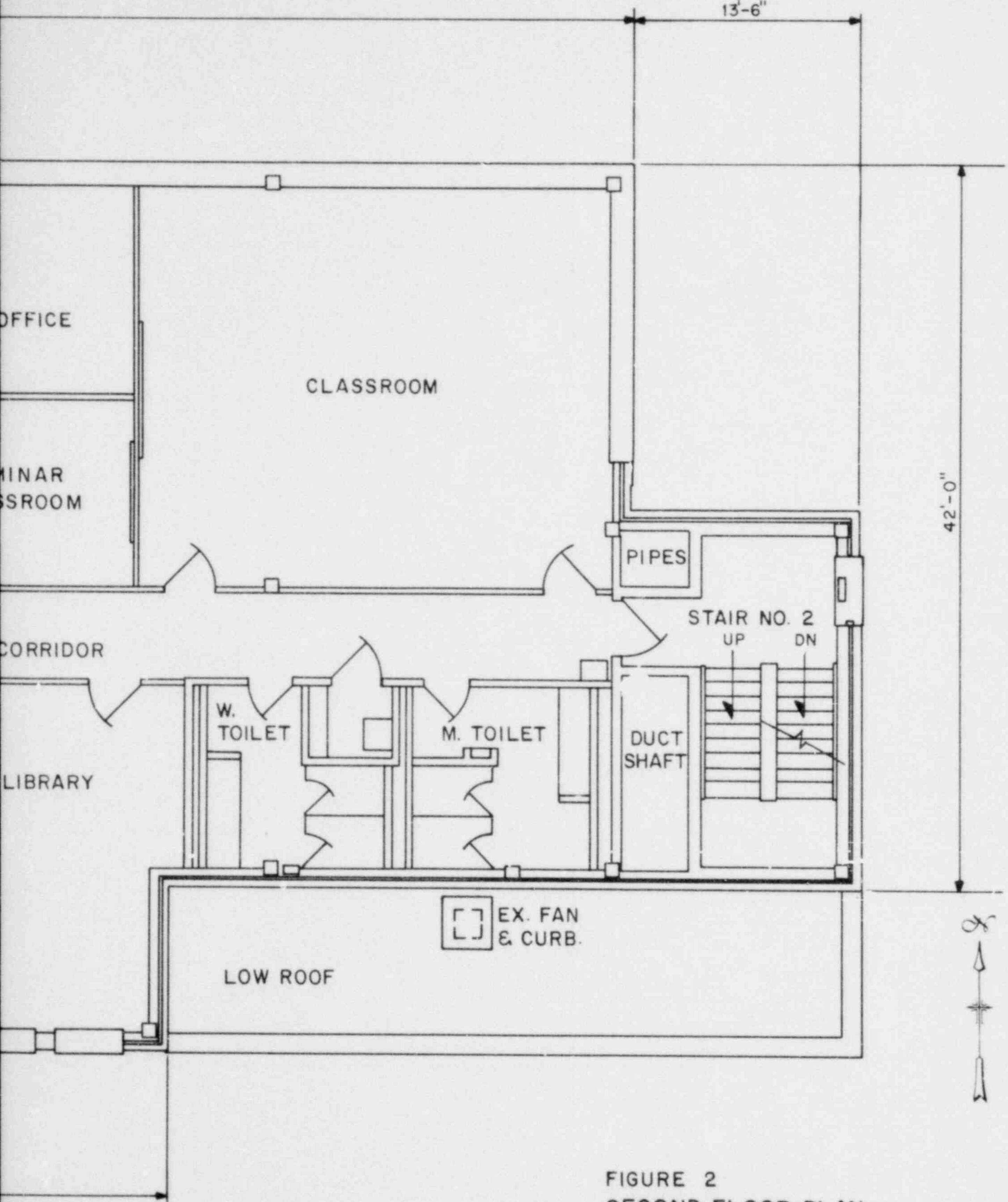
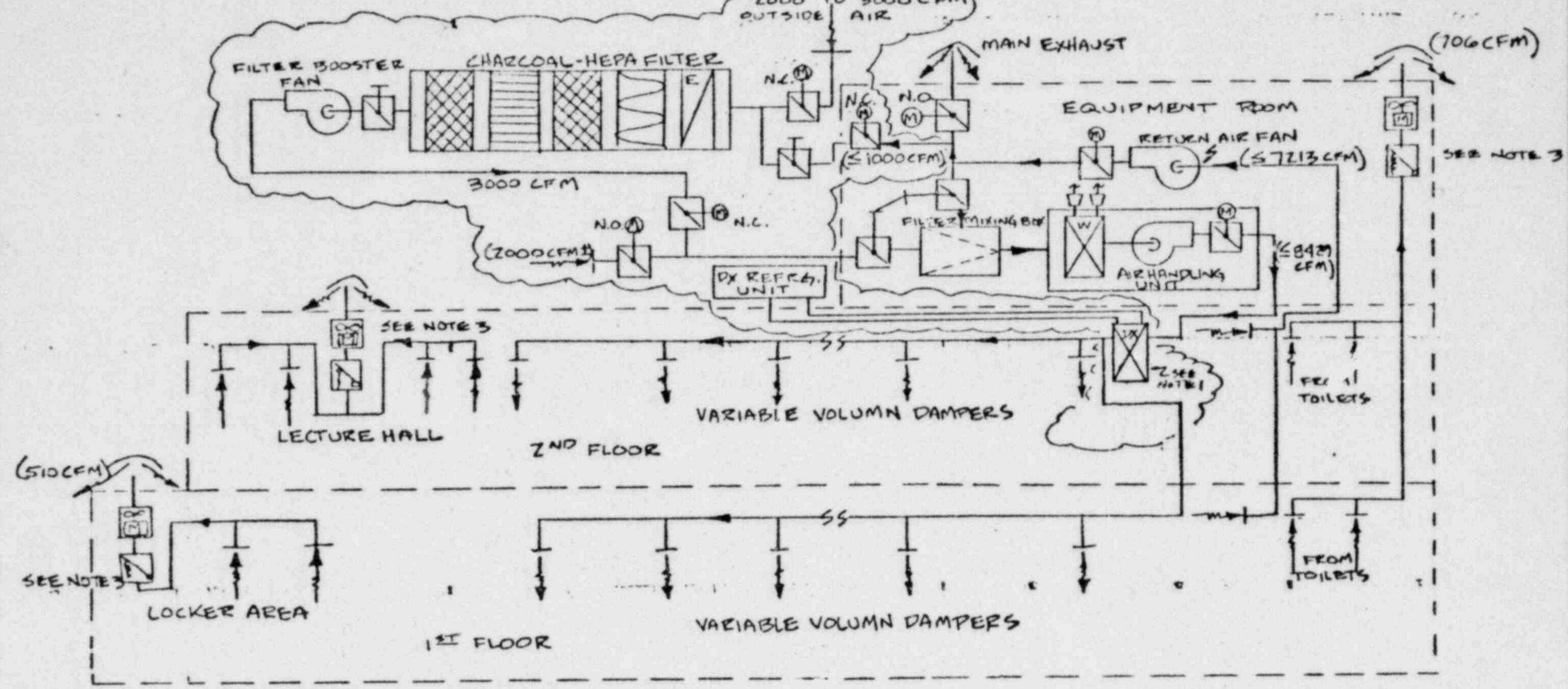


FIGURE 2
SECOND FLOOR PLAN
EXISTING SECURITY BUILDING
SHOREHAM NUCLEAR POWER STATION-UNIT 1



NOTES: 1. ADDITIONAL COOLING CAPACITY FOR TSC HEAT GAIN CAN BE PROVIDED BUT MAY NOT IN FACT BE NEEDED.

2. ALL EQUIPMENT IN [cloud symbol] TO BE ADDED

3. ROOF EXHAUST DAMPERS MAY REQUIRE UPGRADING TO REDUCE LEAKAGE

4. FREE VOLUMN OF SECURITY BUILDING = 105,000
1 AC PER HOUR = 1750 CFM

FIGURE 3
HVAC SCHEMATIC DIAGRAM
TECHNICAL SUPPORT CENTER
SHOREHAM NUCLEAR POWER STATION-UNIT 1