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RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards response to NUREG-0737,Item III.D.3.4 re control room habitability.Control room ventilation sys will be modified to provide necessary make-up flow for pressurization by 830101.

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NEW YORK, N. Y. 10004

February 9, 1981
AEP:NRC:00398C

Donald C. Cook Nuclear Plant Units 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
Post-TMI Requirement (NUREG-0737)
Item III.D.3.4 Control Room Habitability

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Denton:

The attachment to this letter provides our response to the subject item of Enclosure 1 to NUREG-0737 as per our letter No. AEP:NRC:0398 dated January 8, 1981. The information in the attachment to this letter is presented in the format given in NUREG-0737.

Very truly yours,

R. S. Hunter
Vice President

cc: R. C. Callen
G. Charnoff
John E. Dolan
R. W. Jurgensen
D. V. Shaller - Bridgman
NRC Region III Resident Inspector - Bridgman

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ATTACHMENT 1 TO AEP:NRC:00398C

ITEM III.D.3.4 CONTROL ROOM HABITABILITY

In response to the position stated on Pages III.D.3.4-1 through III.D.3.4-3 of NUREG-0737, please be advised that only clarifications (1) and (3) are applicable to our facility. The Donald C. Cook Nuclear Plant received its operating license on the basis of compliance with Proposed AEC General Design Criterion No. 11.

Habitability Under Toxic Gas Releases

In accordance with Clarification (3), a toxic gas analysis based on information compiled since the receipt of NUREG 0737 has been performed for the area within a 5 mile radius of the plant site. Assuming implementation of the modifications listed below, the analysis of both transient and stationary sources indicates that a release of the known sources would not result in levels of toxicity which would impair the operator's capability to isolate the control room, start the filtration system in a recirculation mode and/or put on a self-contained breathing apparatus. The proposed modifications are:

1. Installation of chlorine gas detection equipment to monitor air in the vicinity of the Control Room with alarms in each control room. Operators will respond to an alarm by immediately isolating the control rooms and starting the filter system in the clean-up mode.

2. A reduction of the ventilation supply air to each control room air conditioning unit from 1000 cfm to 570 cfm maximum.

3. Weatherstripping of all doors and hatches to the control room (effectively reducing leakage to 0 cfm).

4. The new emergency plan implementing procedures will require the operators to isolate the control room whenever a toxic or unknown gas is detected in the control room by one or more of the human senses. The procedure will state that the control room shall remain isolated until the source is found or a determination is made that the hazard no longer exists.

5. Providing damper isolation capability inside each control room.

The above modifications will be implemented by January 1, 1983.

Habitability Under Radioactivity Releases

We have performed an analysis of control room operator radiation exposures to direct and airborne radioactive material resulting from a DBA-LOCA containment leakage and ESF leakage contribution outside of containment.

The analysis performed took into consideration submersion dose from radioactive material present inside the control room (whole body dose), ingestion dose from inhalation (thyroid dose) and direct radiation exposure from radioactive material outside the control room (direct shine dose).

1. The doses to Control Room Personnel due to submersion and inhalation were calculated using the Murphy-Campe Methodology(*). The assumptions used in the analysis are:

   1. Reactor Power level - 3391 Mwt
   2. Fuel Burn-up - 650 days
   3. Core inventory - Table A.2-1 of Chapter 14 of the facility FSAR
   4. Containment Activity:

Noble gases	100% Core inventory
Iodine	25% Core inventory

   5. Containment Free Volume -1.25×10^6 ft^3
   6. Leak Rate from Containment:

      0 to 24 hrs - 0.25 volume %/day
      1 to 30 days - 0.125 volume %/day

   7. X/Q at the Control Room Intakes:

      0 to 24 hrs - 8.26×10^{-4} Sec/m^3
      1 to 30 days - 5.51×10^{-4} Sec/m^3

   8. Control Room Volume - 39,600 ft^3 gross
   9. Control Room Design Characteristics:

      a. Isolation with Filtered Recirculation & Pressurization
      b. 100 cfm: make-up flow
      c. 5900 cfm: recirculation flow
      d. no unfiltered in-leakage

(*) K. G. Murphy and K. M. Campe, "Nuclear Power Plant Control Room Ventilation System for Meeting GDC 19", 13th AEC Air Cleaning Conference, August 1974.

10. Iodine Filter Efficiency:

    Inorganic - 99%
    Organic - 90%

11. Occupancy Factors:

    0 to 24 hrs - 1
    1 to 4 days - .6
    4 5o 30 days - .4

The thirty day integrated doses resulting from this analysis are:

1. Whole body dose 0.65 Rads
2. Thyroid dose 27.3 Rads
3. Skin dose 27.7 Rads

The control room ventilation system will be modified to provide the necessary make-up flow for pressurization. This modification will be completed by January 1, 1983.

2. The direct shine doses to control room personnel from the containment and the passing cloud were evaluated using assumptions 1 through 7 in Item 1 above and a minimum control room wall thickness of 18". An integrated whole body dose of less than .1 Rads was obtained.

Thus, with implementation of the proposed modification under Item 1 above the total dose from direct shine, inhalation, and submersion does not exceed the limits established in GDC 19 of Appendix A to 10 CFR Part 50.

III.D.3.4 - Attachment 1, Information Required for Control-Room Habitability Evaluation

1. Control Room mode of operation, i.e. pressurization and filter recirculation for radiological accident isolation or chlorine release.

The control room mode of operation will automatically isolate the control room upon receipt of a high radiation alarm from the control room area monitor, or a SI signal from either DCCNP Unit . The control room filter system will automatically be aligned for the recirculation mode but will require operator action to start.

Upon receipt of a chlorine alarm from the chlorine detection system, the operators will isolate the control rooms and align and start the filter system in the recirculation mode.

2. Control Room Characteristics:

(a) Air Volume 39,600 ft.^{3} gross

(b) With the exception of the computer room, the critical files, control room, kitchen and washroom are all located in a common area which can be isolated from the external environment. Access to the computer room would require putting on self-contained breathing equipment and protective clothing as accident conditions dictate.

(c) Control Room schematic with normal and emergency air flows - see attached Sketch A.

(d) Infiltration leakage rates - Modified leakage rate based on weatherstripped doors and hatches, and control rooms unpressurized:

Unit 1	9.5 cfm
Unit 2	21.5 cfm

(e) HEPA filter and charcoal absorber efficiencies

HEPA (DOP test per ANSI N510)
Tech Spec 99%

Carbon
Halogenated hydrocarbon leak test:
Tech Spec 99%

Radioactive Methyl Iodine Test
Tech Spec 90%

(f) Closest distance between containment and air intake - 85 feet.

(g) Layout of control room, air intakes, containment building and chlorine, or other chemical storage facility with dimensions - See attached Sketch B

(h) Control Room Shielding - See our submittals dated March 10, 1980 (AEP:NRC:00334B - attachment page 6, item 5) and May 15, 1980 (AEP:NRC:00334D - Executive Summary of Shielding Review performed in response to NUREG-0578 Category A Item 2.1.6.B). Note also, the minimum control room wall thickness is 1.5 feet.

(i) Automatic Isolation capability - damper closing time, damper leakage and area.

Damper isolation covered by answer to question (1) above.
Damper closing time = 15 seconds
Damper leakage and area as follows:

ACRDA-1 - (Air Conditioning System Isolation)
leakage = 5 cfm @ 1/8" wg;
area = 1 sq. ft.

ACRDA-2 - (Pressurizer/Cleanup filter isolation)
leakage = 14 cfm @ 1/8" wg:
area = 4 sq. ft.

ACRDA-4 - (Toilet Room damper isolation)
leakage = 4 cfm;
area = 44 sq. ft.

(j) Chlorine detectors or toxic gas - present - chlorine detection at chlorine house; modified - chlorine detection at Control Rooms.

(k) Self contained breathing apparatus - 1 in each control room, and ten additional units immediately outside the control room's doors.

(l) Bottled air supply - 7½ hours (assuming active working conditions).

(m) Emergency food and potable water supply (Days supply for how many people) - None

(n) Control Room personnel capacity

Normal	25-30 people
Emergency	50 people

(o) Potassium iodide drug supply - "1000 thyro-block tablets, 130 mg. Potassium Iodide" with no authority to administer such drugs from any Federal, State or Local Agency.

3. Onsite storage of chlorine and other hazardous chemicals.*

(a)

100-	K size cylinder welding oxygen 244 cu. ft.
30-	Acetylene welding Grade 330 cu. ft.
100-	Argon welding grade T size 330 cu. ft.
60-	Breathing air T cylinder 305 cu. ft.
7-	Hydrogen K size cylinder 191 cu. ft.
15-	P-10 gas K size cylinder 227 cu. ft.
10-	Dry nitrogen T size cylinder 300 cu. ft.
20-	Dry nitrogen Q size cylinder 73 cu. ft.
6-	Liquid nitrogen IS-160 cylinder 3930 cu. ft.
13-	Purified argon T. cylinder 332 cu. ft.
5-	Extra dry nitorgen T. cylinder 301 cu. ft.
5-	Purified acetylene lab size 380 cu. ft.
5-	Purified hydrogen T. cylinder 256 cu. ft.
5-	CO/2 lab grade 65 lb. cylinder
2-	Extra dry oxygen T size 331 cu. ft.
15-	Acetylene welding grade NC size 10 cu. ft.
10-	R-502 freon gas FOC cylinder 125 lb.
15-	Dry Air T cylinder 309 cu. ft.
3-	Oxygen welding grade D size 120 cu. ft.
6-	Nitrogen T size purified extra dry 300 cu. ft.
5-	R-12 freon gas F-C cylinder 145 lb.
5-	R-22 freon gas F-C cylinder 125 lb.
10-	SD size medical oxygen 12.7 cu. ft.

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*Note: This listing is not intended to indicate the exact quantities of materials stored on-site at all times, but rather the kinds and amounts of potentially hazardous materials in general use in the plant on any given occasion.

10- T size cylinder welding oxygen 330 cu. ft.

5- T size cylinder 2650 PSIG medical grade oxygen 330 cu. ft.

10- Argon size S cylinder 150 cu. ft.

10- Medical oxygen D size 122 cu. ft.

2- Helium T size cylinder 300 cu. ft.

5- Mapp Gas cylinder 70 lb.

4- Butane FX inst. grade propane 120 lb.

5- CO_2 inst. grade 60 lb. K size cylinder

4- Propane inst. grade FX size cylinder 100 lb.

10- R size oxygen gas cylinder for outright sale 20 cu. ft.

15- MC size acetylene cyl. for outright sale 10 cu. ft.

5- R size oxygen cyl. 20 cu. ft.

7- 10% methane 90% argon T 306 cu. ft.

(b) Closest distance from control room air intakes:

Chlorine 500 feet

CO_2 53 feet

Remaining gases - 362 feet (when in storage - otherwise a variable)

4. Offsite Manufacturing, Storage or Transportation Facilities of Hazardous Chemicals

(a & b)

C&O Railroad - 1.25 miles
I-94 and Red Arrow Highway - 1 mile
Multiple Coatings Inc. - 4.1 miles
Gast Manufacturing - 2.4 miles
Ad-CO Diecasting - 3.1 miles
Jericho Diecasting - 1.7 miles
Pemco Diecasting - 2.5 miles
Supreme Casting - 1.8 miles
Weldun International - 3.0 miles
Anstay Foundry - 3.6 miles
Manley Sand - 1.2 miles
Lakeshore Custom Cleaners - 4.6 miles
Shoreline Oil Company Inc. - 2.1 miles
Strefling Oil Company - 3.9 miles
Glamour Pools - 3.5 miles
Colonial Die Corp. - 3.5 miles
Link Tool Die & Engineering Co. - 2.2 miles
Martin Marietta Aggregates - 1.5 miles
Bridgman High School - 3.5 miles
Lake Township Water Works - 1.1 miles
Bridgman Water Works - 2.6 miles

(c) Quantity of hazardous chemical in one container:

Acetaldehyde	23,500 gallons
Acetone	25,000 gallons
Acrylonitrile	21,000 gallons
Anhydrous Ammonia	40,000 pounds
Aniline	21,000 gallons
Benzene	21,000 gallons
Butadiene	34,000 gallons
Butenes	34,000 gallons
Carbon dioxide	20,000 gallons
Chlorine	17,000 gallons

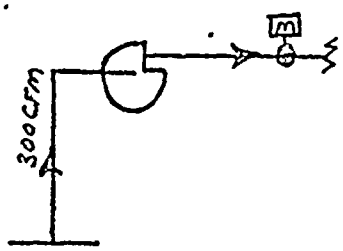
Ethyl Chloride	24,000 gallons
Ethyl Ether	21,000 gallons
Ethylene Dichloride	21,000 gallons
Ethylene Oxide	25,000 gallons
Formaldehyde	21,000 gallons
Hydrogen Sulfide	20,000 gallons
Methanol	30,000 gallons
Sulfur Dioxide	40,000 pounds
Sulfuric Acid	15,000 gallons
Vinyl Chloride	25,200 gallons
Xylene	21,000 gallons
Toluene	55 gallons
Trichloroethane	500 gallons
Lacquer Thinner	55 gallons
Fuel Oil No. 2	80,000 gallons
Chromate solution	55 gallons
Stoddard solvent	55 gallons
Cleaning solvent	55 gallons
Perchloethylene	50 gallons
No. 1 fuel oil	30,000 gallons
Gasoline - Regular	20,000 gallons
Gasoline - Unleaded	15,000 gallons
Granular Chlorine	30 pounds

(d) At least once/week for most chemicals.

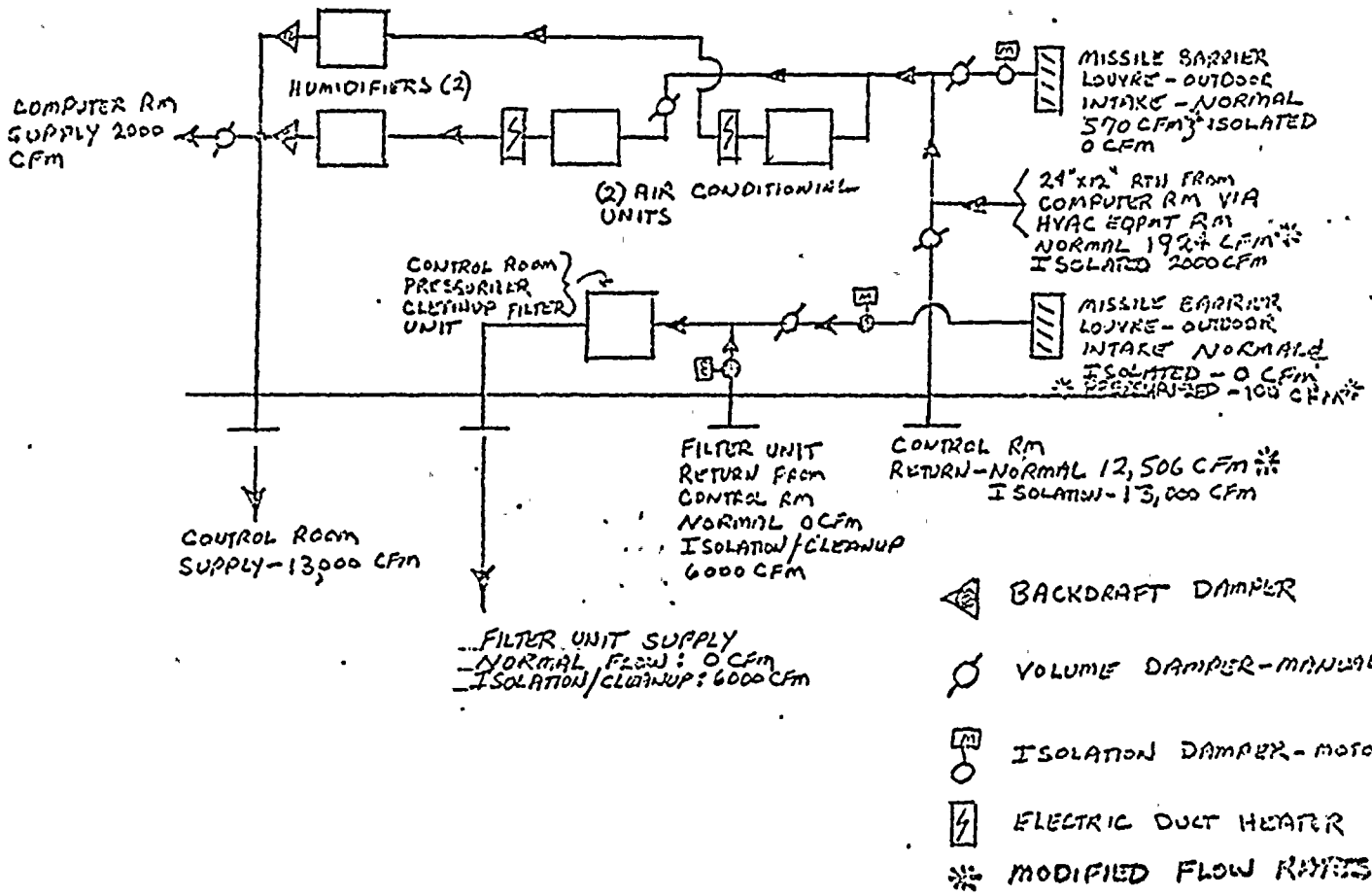
5. Technical Specifications

(a) Chlorine detection system - none

(b) The Cook Plant Technical Specifications address operability and surveillance requirements of the Control Room Emergency Filtration System. Surveillance requirements include periodic filter testing, verification of filter efficiency, verification of flow rearrangement upon the receipt of a SI signal or a containment isolation signal and verification that the system can maintain a positive pressure of $\geq$1/16" w.g. at the design flow rate.



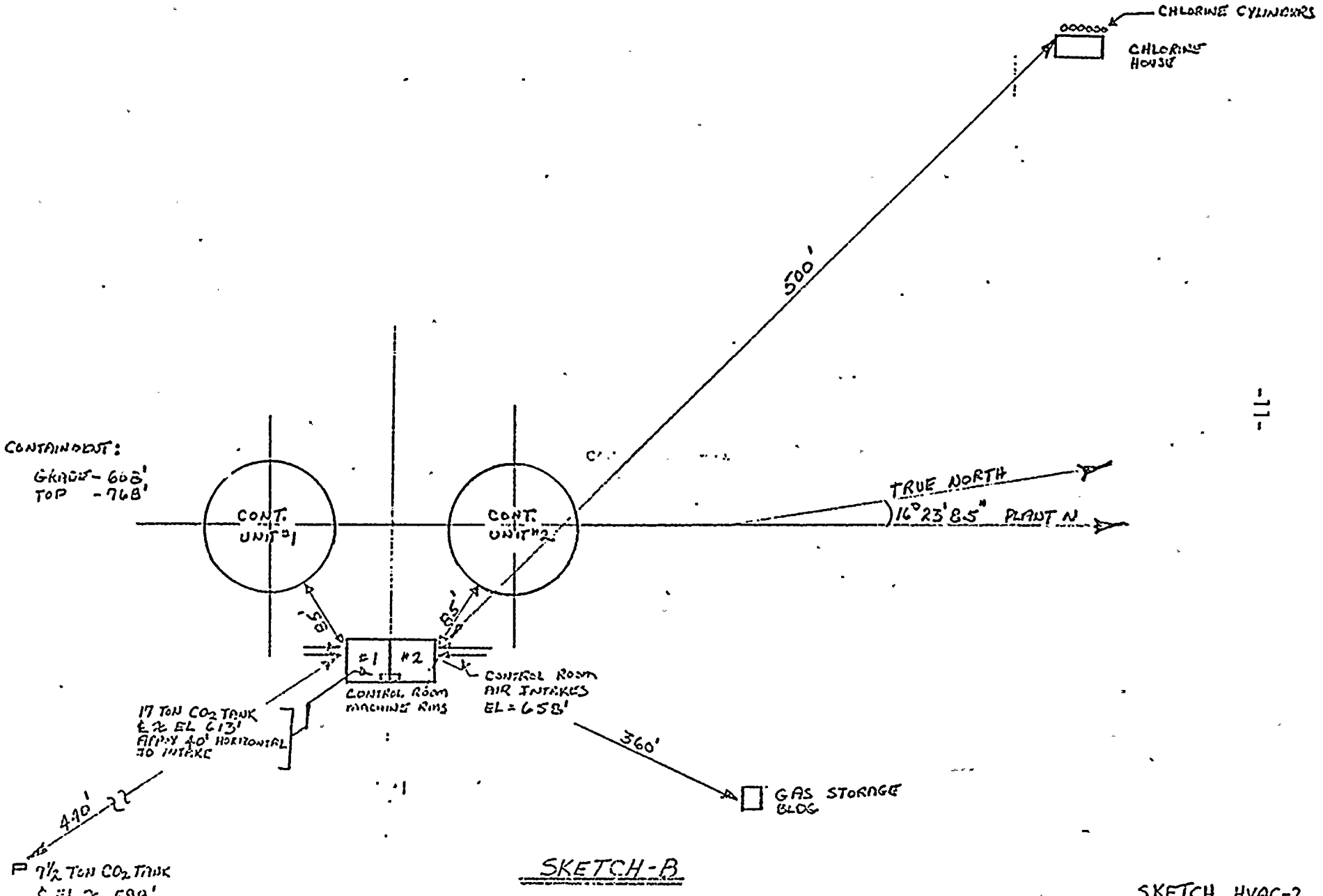
CONTROL ROOM TOILET VENTILATION



CONTROL RM AIR CONDITIONING SCHEMATIC

SKETCH A

SKETCH HVAC-1
RDK 6/5/80



SKETCH-B

SKETCH HVAC-2.
RDK. 12/24/80.