

1st day after lunch

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**NUCLEAR WASTE TECHNICAL REVIEW BOARD
STRUCTURAL GEOLOGY & GEOENGINEERING PANEL MEETING**

**SUBJECT: RAMP SIZING BY VENTILATION
REQUIREMENTS**

PRESENTER: DR. JOHN W. PETERS

**PRESENTER'S TITLE
AND ORGANIZATION: SUBSURFACE PROJECT ENGINEER, ESF DESIGN
M&O/MORRISON-KNUDSEN
LAS VEGAS, NEVADA**

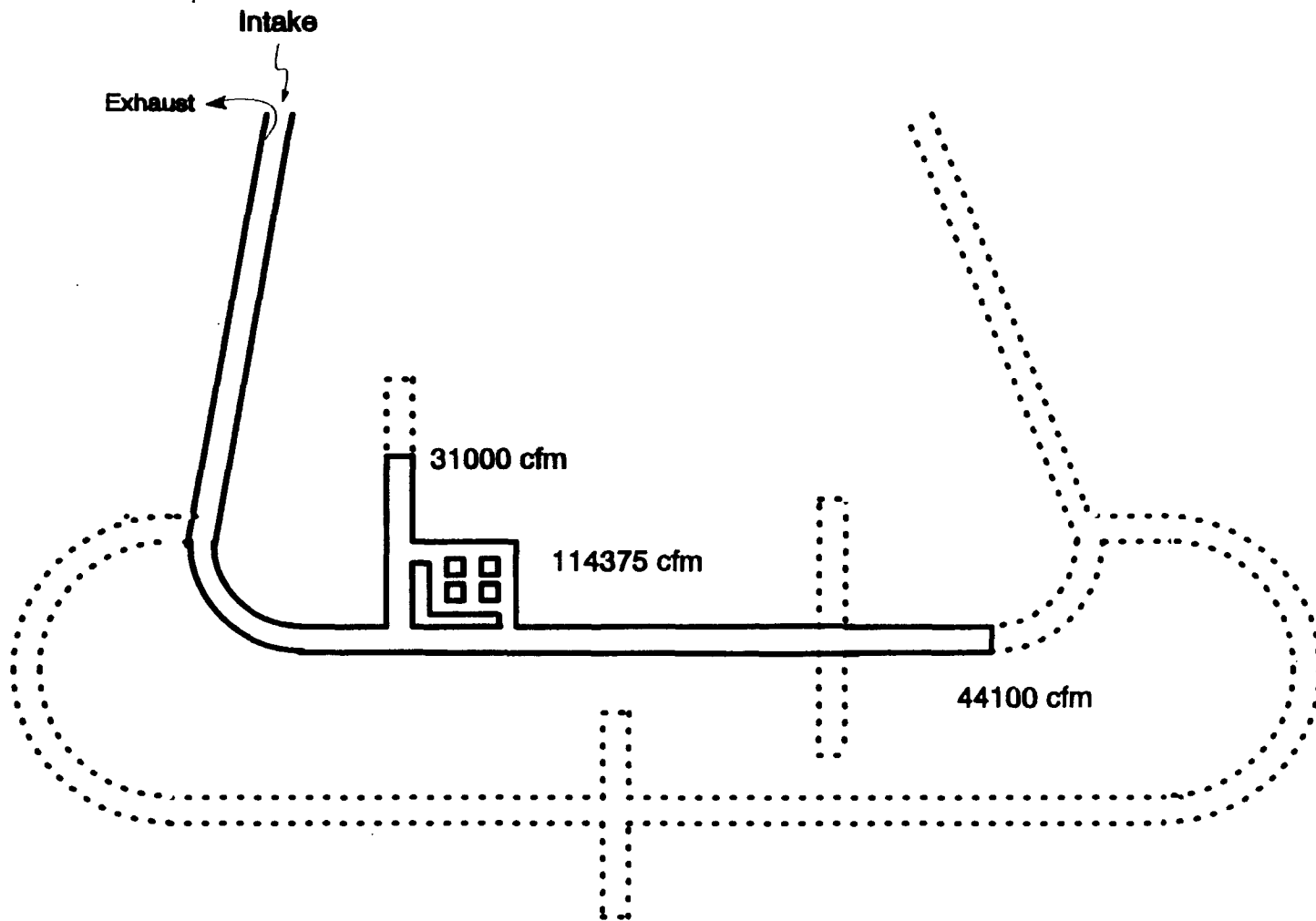
**PRESENTER'S
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**PLAZA-SUITE HOTEL • LAS VEGAS, NEVADA
NOVEMBER 4 - 5, 1992**

Table 1
Ventilating Air Required
At Each Significant Phase of ESF Development

Phase		Activities	Method	Air Required Each Place	Air Required Total
1	A	Topopah Spring Ramps & Main Level Drift	Large TBM	44100	44100
2	A	Topopah Spring Ramps & Main Level Drift	Large TBM	44100	158476
	B	Main Test Level	Drill & Blast	114375	
3	A	Topopah Spring Ramps & Main Level Drift	Large TBM	44100	189475
	B	Main Test Level	Drill & Blast	114375	
	C	Imbricate, East, or West Main Level Drifts	Small TBM	31000	
4	A	Calico Hills Ramps & Main Level	Small TBM	31000	31000
5	A	Calico Hills Ramps & Main Level	Small TBM	31000	62000
	B	Solitario or Ghost Dance Drift	Roadheader	31000	

Maximum Ventilation Requirement Condition



Total air required @ working faces = 31000 + 44100 + 114375 = 189475

Calico Hills Development

With Full Scale Testing On Topopah Spring Level

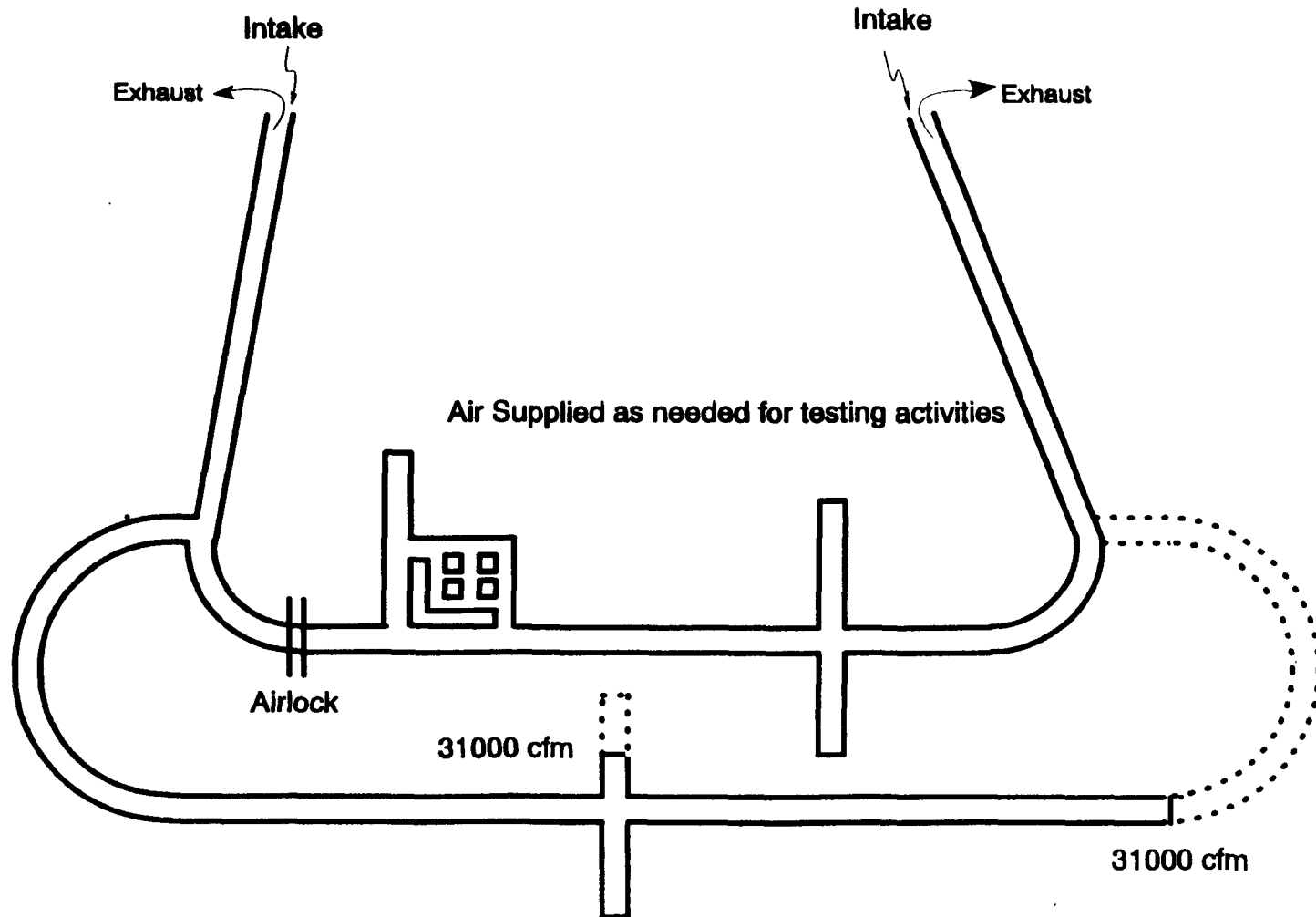


Table 2
Estimated Air Quantities For ESF Development
At Maximum Condition

Equipment Type	Total Diesel Equipment	Brake Horse Power	CFM Required @125 cfm/bhp
5yd LHD's	3	150	56,250
Roof Bolter	1	100	12,500
Drill Jumbo	1	100	12,500
Powder Truck	1	60	7,500
Service Truck	1	100	12,500
Supply Truck	2	100	25,000
Personnel Transport (15-20 persons)	3	100	37,500
Personnel Transport (4 persons)	2	57	14,250
SUB-TOTAL			178,000
Personnel Function	Number of Persons		CFM Required @200 cfm/person
Working Face (3 Working areas)	36		7,200
Support	36		7,200
Testing Personnel	20		4,000
Visitors	10		2,000
SUB-TOTAL	102		20,400
TOTAL			198,400
GRAND TOTAL (Inc. allowance for 25% Leakage)			264,533

Estimated Minimum Topopah Ramp & Main Drift Size Based On Ventilation Requirements Only

Assumptions:

- **Air required for the maximum demand phase (Phase 3, Table 1) will be 264,533 cfm, as defined in Table 2.**
- **Maximum air velocity in drifts with antitropical conveyors 600 fpm.**
- **Deductions in effective tunnel area for invert, return air tubing, conveyor, etc.**
 - **for double lane traffic $\approx 155 \text{ ft}^2$**
 - **for single lane traffic $\approx 80 \text{ ft}^2$**

The required minimum tunnel size was estimated as follows:

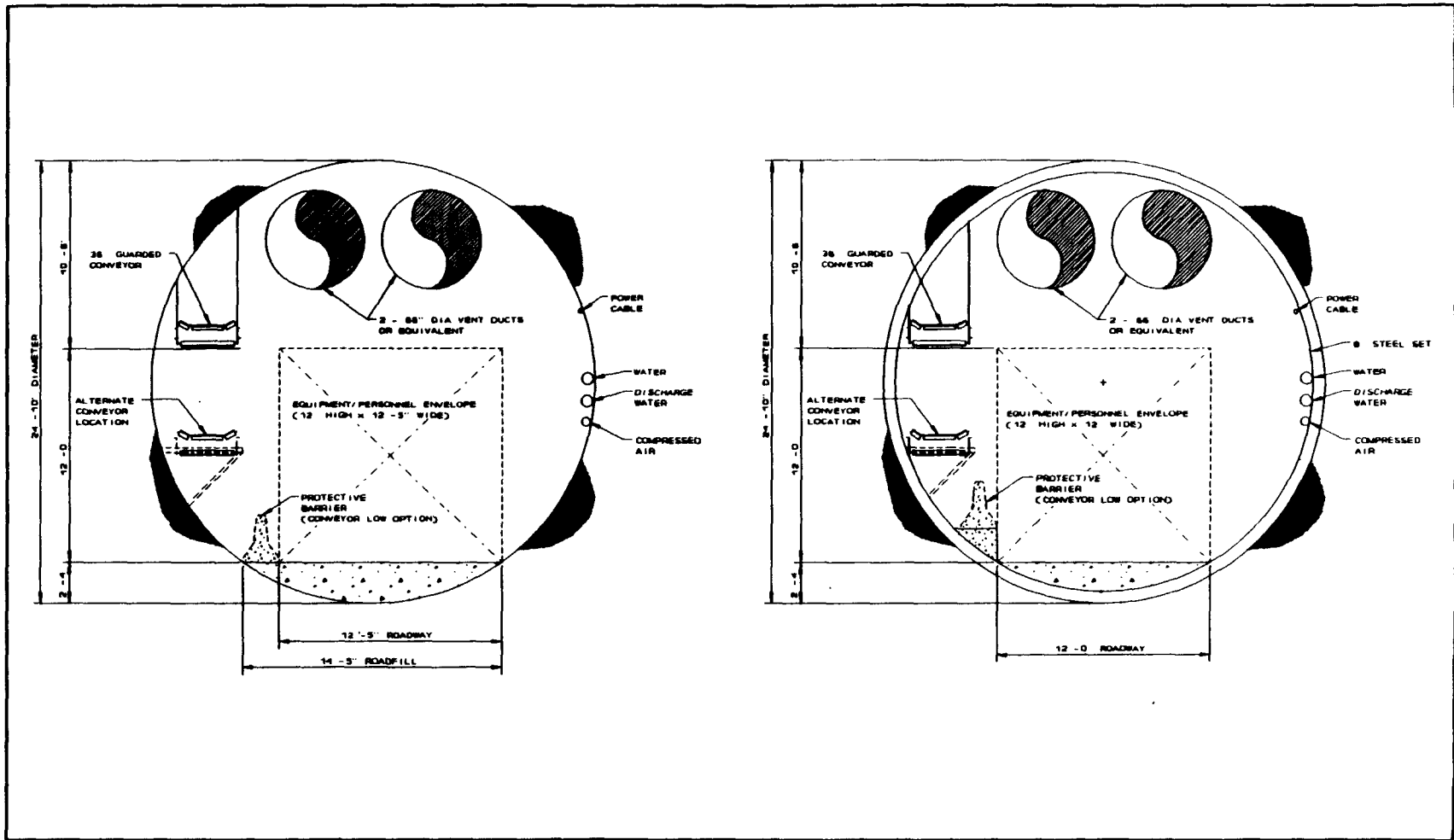
$$\text{Drift Diameter} = ((\text{Air Required}(\text{cfm})/600 \text{ fpm} + \text{Deducts}(\text{ft}^2))/\pi)^{1/2} \times 2$$

For double lane traffic

$$\text{Drift Diameter} = ((264,533 \text{ cfm} / 600 \text{ fpm} + 155 \text{ ft}^2)/\pi)^{1/2} \times 2 = 27.6 \text{ ft.}$$

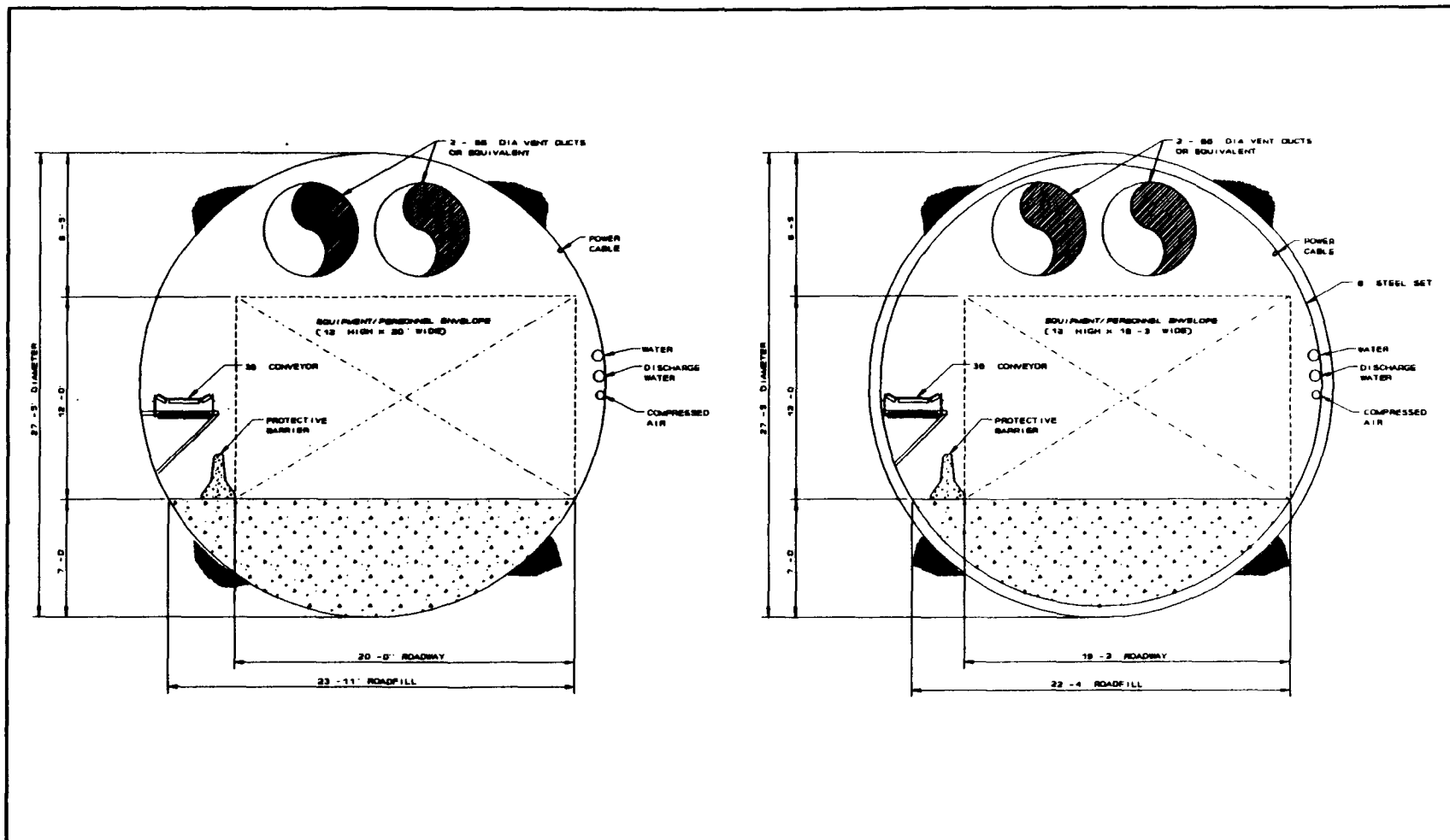
For single lane traffic

$$\text{Drift Diameter} = ((264,533 \text{ cfm} / 600 \text{ fpm} + 80 \text{ ft}^2)/\pi)^{1/2} \times 2 = 25.8 \text{ ft.}$$



**Topopah Spring - Bore & Backfill
 Conveyor High Or Low - Single Lane Traffic
 Nominal Tunnel Diameter = 25 Ft.**

(Shown With & Without Steel Sets)



**Topopah Spring - Bore & Backfill
 Conveyor Low - Double Lane Traffic
 Nominal Tunnel Diameter = 27½ Ft.**

(Shown With & Without Steel Sets)