Mrs. Holloway of Oak Ridge National Laboratory (ORNL) discussed the tornado effects on the plant in terms of modelling efforts and the use of computer codes, TVENT and SOLA-ICE, developed at the Los Alamos Scientific Laboratory (LASL). The viewgraphs presented for this discussion are shown in Attachment 3. Dr. Davis discussed estimates of radioactivity at risk and quantities which could be released during a tornado. The viewgraphs used for this discussion are shown in Attachment 4.

Dr. Coffman indicated that his analysis showed that the head-end ventilation system filters would be protected even during the extreme conditions of the 200 mph tornado (the largest credible).

Dr. Clark presented the results (Attachment 5) of a consequence analysis based on meteorological dispersion factors associated with the tornado. These factors were derived from work done at the Savannah River Laboratory. An assumption in this analysis is that a person stands at the site boundary in the path taken by the tornado after it passes over the plant. As unlikely as this assumption may seem, it is necessary in order to estimate a possible radiological offsite exposure from the tornado event.

Request

Based on the above discussion, NFS was requested to provide some protection by sealing up the manipulator sleeve ports and other similar openings. NFS indicated they would respond to this request within a short period of time.

Supporting Documentation

The reports documenting the above analyses are not all completed. When all of the reports are complete, the NRC staff will issue them along with its evaluation. This process is expected to take about three months.

A. Thomas Clark, Jr.
Advanced Fuel and Spent Fuel
Licensing Branch

Charles J. Haughney
Advanced Fuel and Spent Fuel
Licensing Branch

Enclosures:
Attachments 1, 2, 3, 4 & 5

1792 304

8001230 270

Attachment 1

List of Attendees

Name	Organization
A. T. Clark, Jr	NRC, NMSS, FCAF
T. K. DeBoer	NYSERDA
W. A. Coffman	Engineering Analysis
E. J. Frederick	ORNL
L. J. Holloway	ORNL
W. Davis, Jr.	ORNL
C. J. Haughney	NRC, NMSS, FCAF
N. J. Newman	NFS
J. R. Clark	NFS
R. F. Abbey, Jr.	NRC, RES

Attachment 2

TORNADO EFFECTS AT WEST VALLEY

- PURPOSE OF MEETING
  - Review Analysis
  - Indicate Effects
- STRIKE RISK ANALYSIS
  - Probability
  - Physical Effects
    - Flow Pathways
    - Structural
  - Radiological Effects
- REQUEST FOR MODIFICATION
  - Secure Manipulator Sleeves

ANALYTICAL PROCEDURES

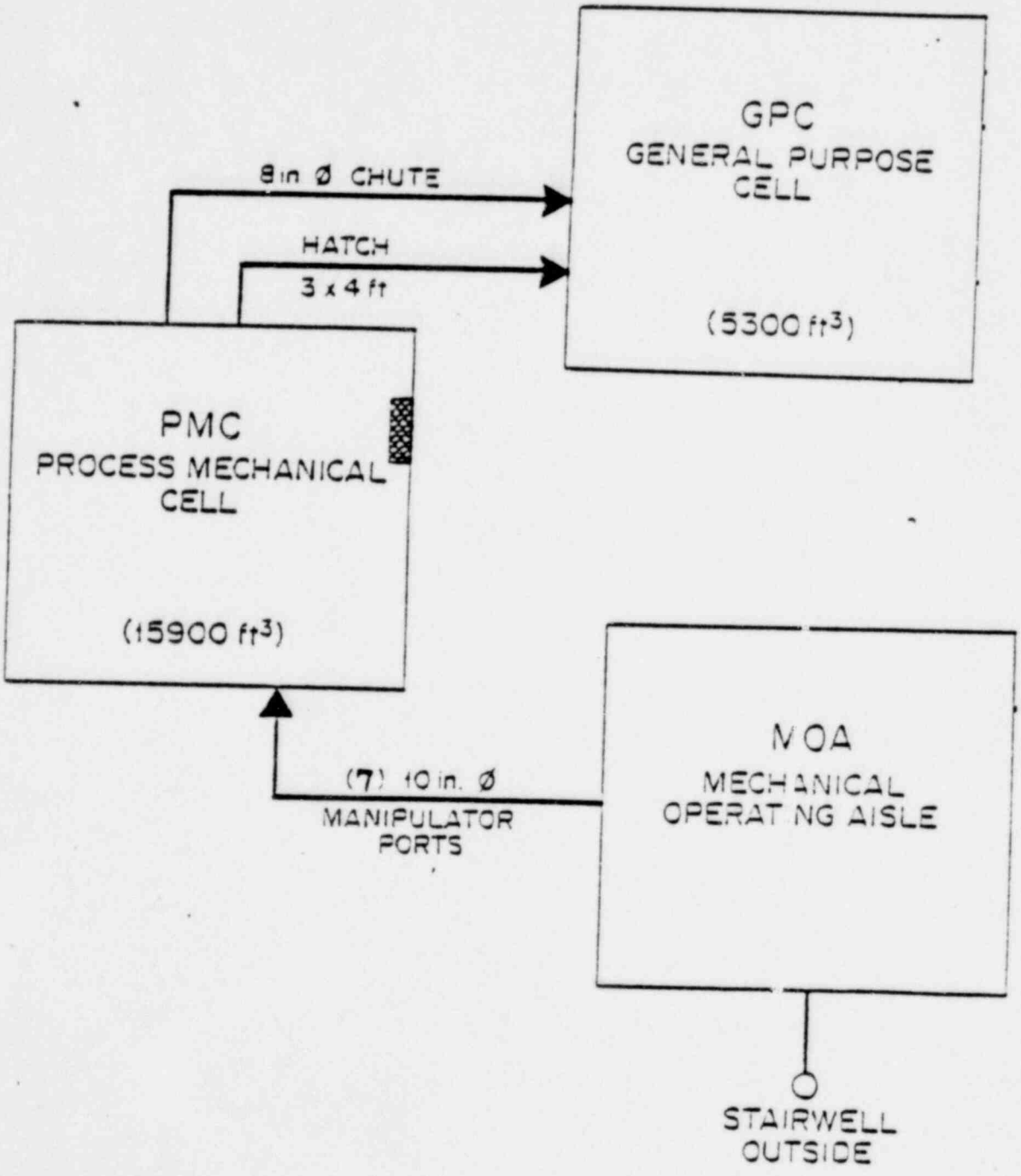
- IDENTIFY VENTILATION PATHWAYS AND OTHER PATHWAYS WITH POTENTIAL FOR RELEASE OF AIR FROM THE CELLS
- DEVELOP SCHEMATIC MODEL OF VENTILATION AND OTHER PATHWAYS
- USING TVENT COMPUTER CODE, DETERMINE TRANSIENT PRESSURES AND FLOWS GENERATED WITHIN MODELED SYSTEM BY TORNADO-INDUCED FORCES
- USING RESULTS OF TVENT ANALYSIS, DETERMINE IF AIR CONTAINING RADIOACTIVE MATERIAL COULD ESCAPE FROM BUILDING
- USING TVENT GENERATED FLOWS, DETERMINE VELOCITY PROFILES WITHIN CELLS USING SOLA-ICE COMPUTER CODE
- DETERMINE AMOUNT OF MATERIAL REENTRAINED AND RELEASED FROM BUILDING DURING TORNADO GENERATED INTERNAL FLOWS
- DETERMINE ATMOSPHERIC DISPERSION OF SOURCE
- CALCULATE AIR CONCENTRATIONS AND POP. DOSAGES

CASES ANALYZED:

- CASE 1 - GPC TO PMC THROUGH MANIPULATOR PORTS TO CORRIDOR AND AMBIENT
- CASE 2 - GPC TO CPC TO EQUIPMENT DECONTAMINATION ROOM (EDR) TO AMBIENT
- CASE 3 - GPC THROUGH COVERED PORTS TO GENERAL OPERATING AISLE (GOA) TO AMBIENT
- CASE 4 - GPC THROUGH EXHAUST DUCT TO MASTER SLAVE MANIPULATOR (MSM) BUILDING TO AMBIENT
- CASE 5 - NORMAL VENTILATION PATHWAYS (ABNORMAL PATHS SEALED) WITHOUT BLOWERS OPERATING

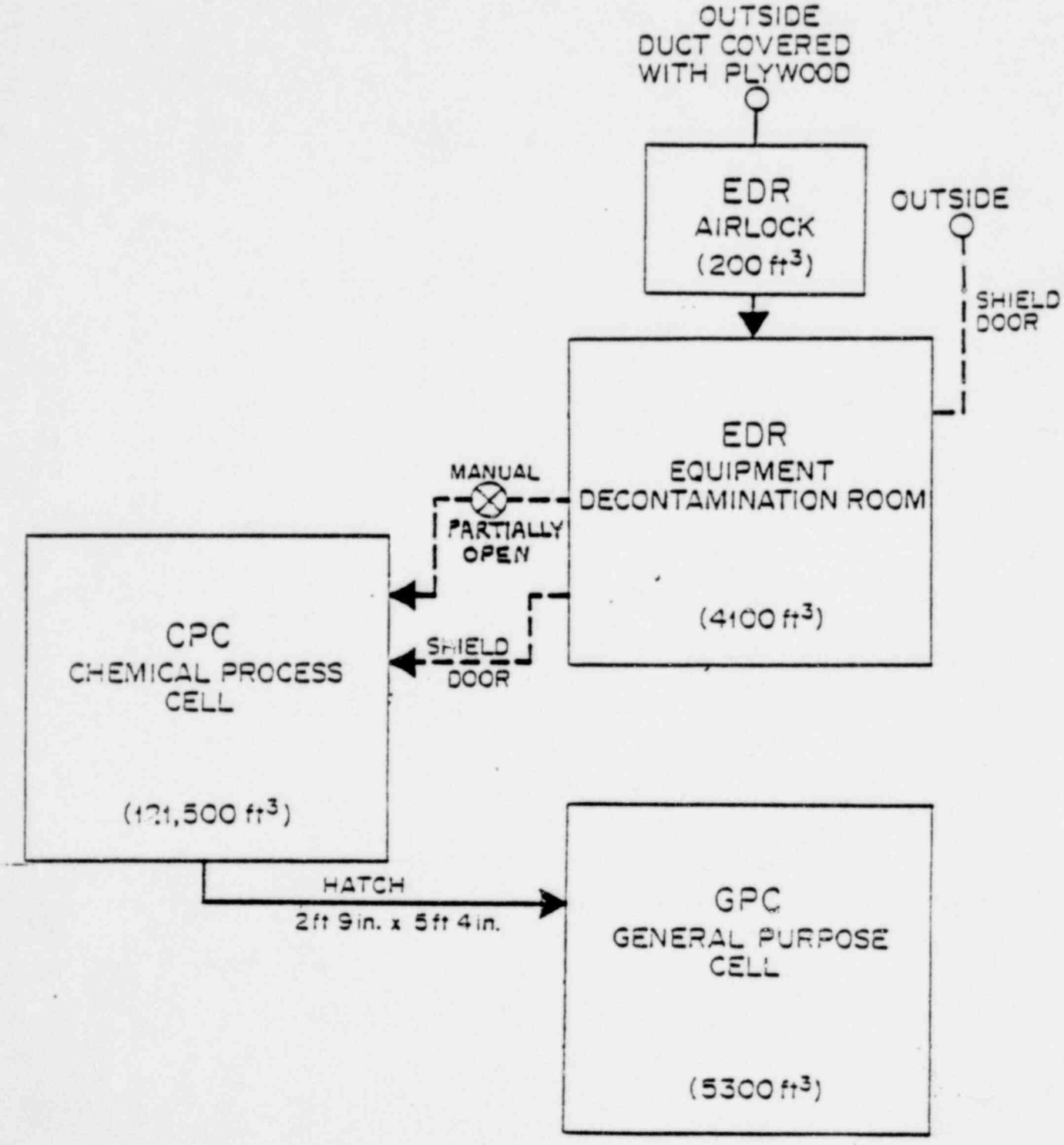
PROCESS MECHANICAL CELL (PMC)

MANIPULATOR PORTS



CHEMICAL PROCESS CELL (CPC) TO

EQUIPMENT DECONTAMINATION ROOM (EDR)



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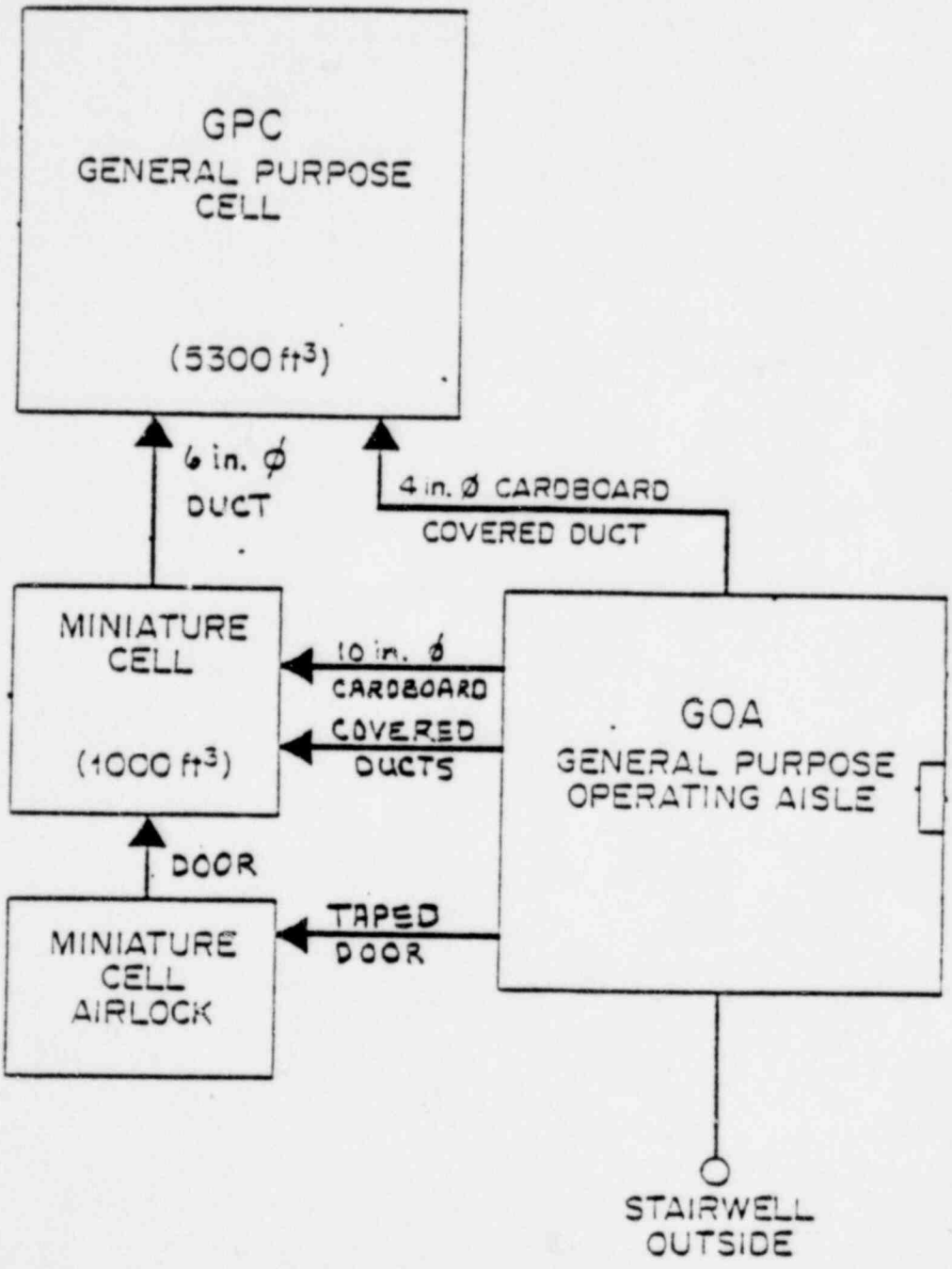
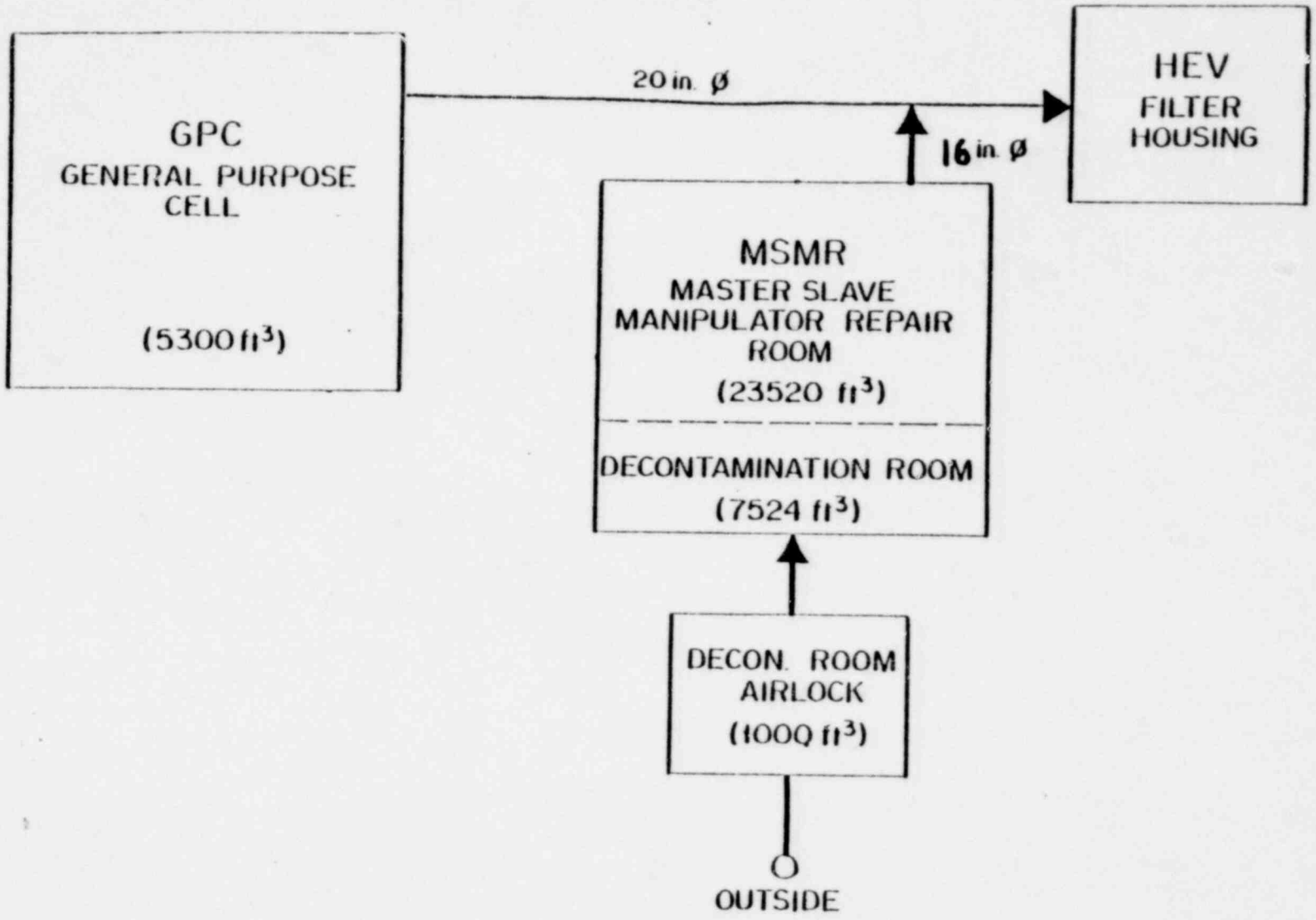
GENERAL PURPOSE CELL (GPC) PORTS

TO GENERAL OPERATING AISLE (GOA)



GPC EXHAUST DUCT TO MASTER SLAVE

MANIPULATOR (MSM) BUILDING



PATHWAYS WITH POTENTIAL FOR RELEASE OF

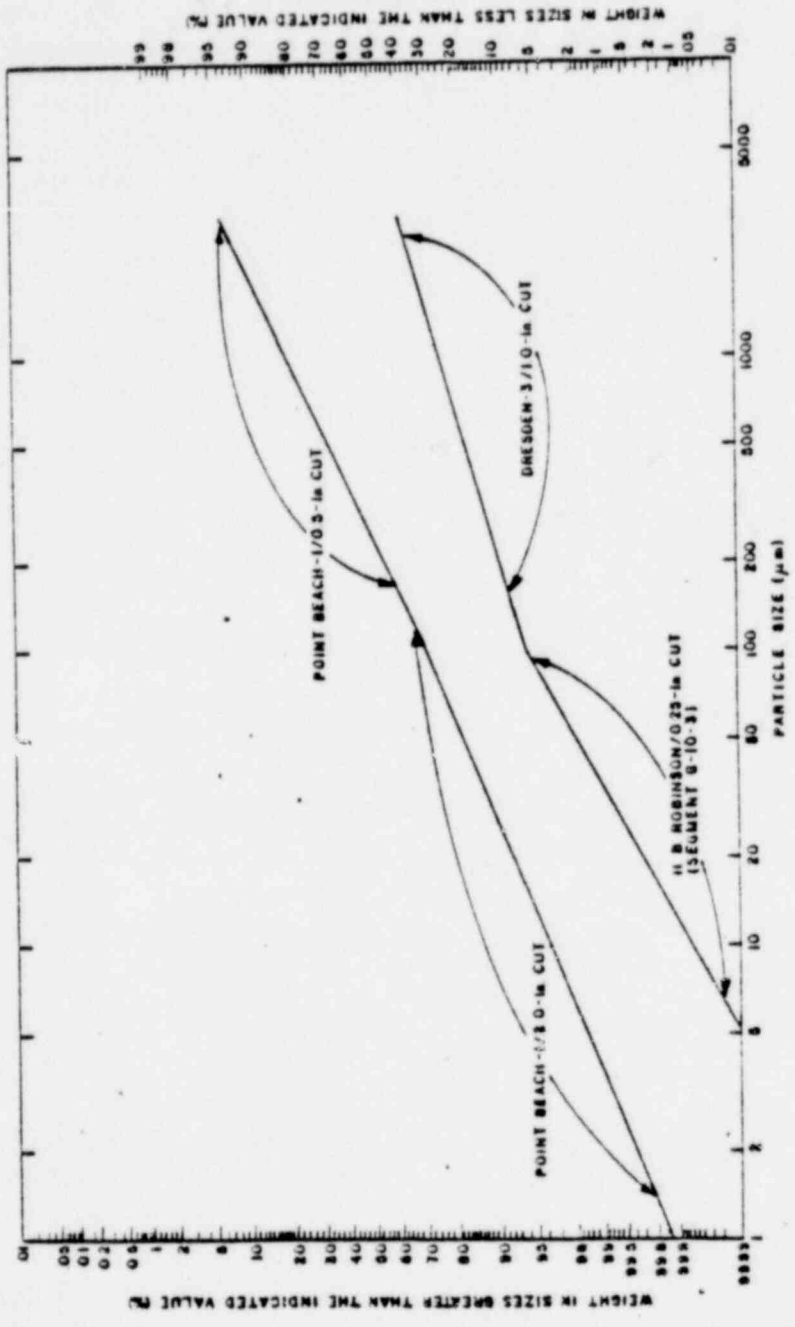
RADIOACTIVELY CONTAMINATED AIR

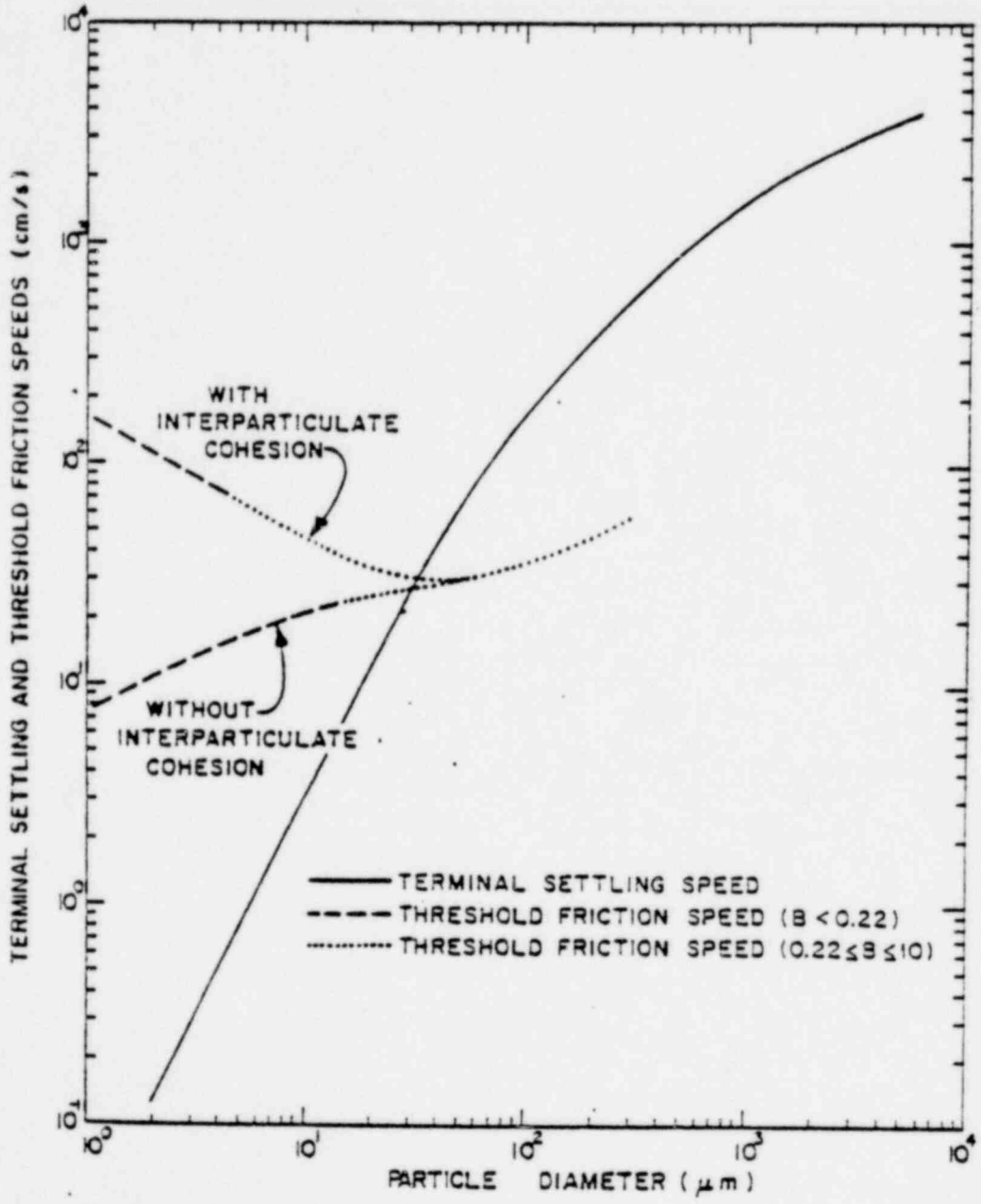
PATHWAY	EXTERIOR WALLS	TORNADO WIND SPEED (MPH)
1 PMC MANIPULATOR PORTS	INTACT	100
		200
		300
1 PMC MANIPULATOR PORTS	REMOVED	100
		200
		300
4 GPC TO MSM BUILDING	REMOVED	300

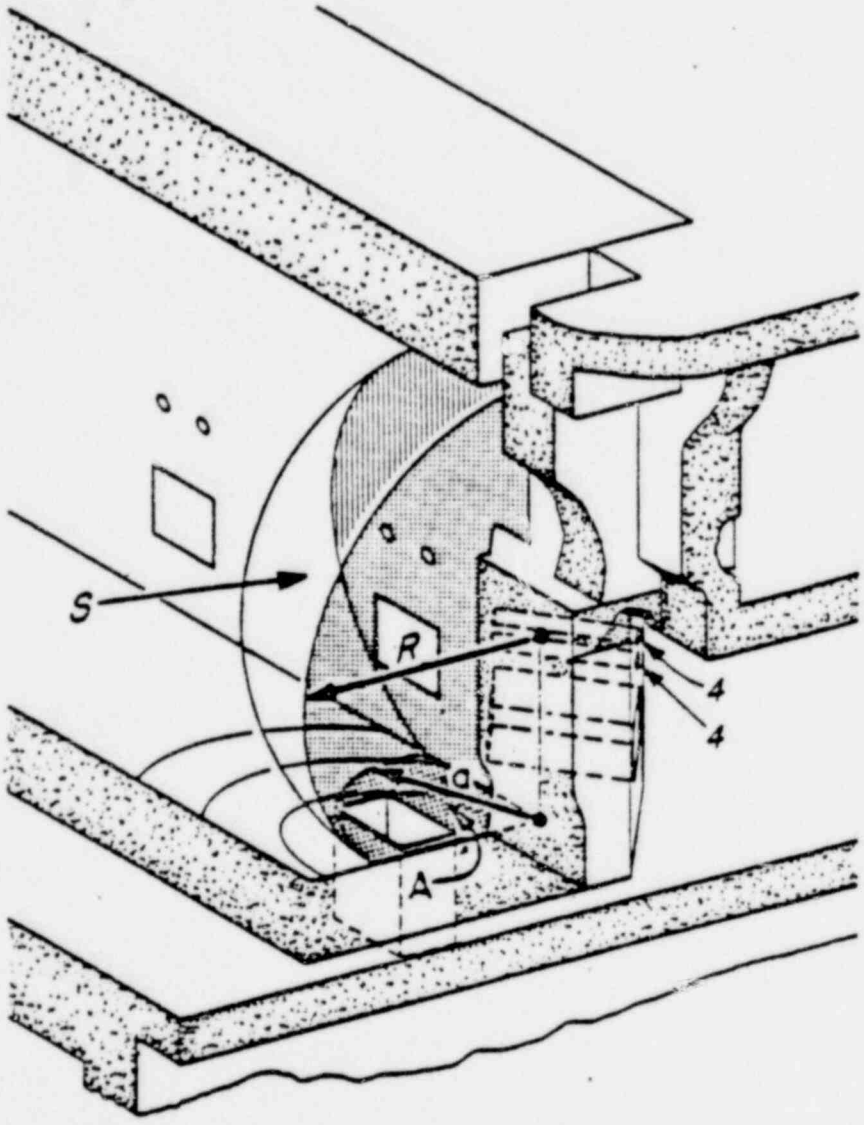
AIR VOLUMES RELEASED FROM CELLS

CASE		VOLUME RELEASED FROM PMC (BRANCH 3) FT^3	VOLUME RELEASED FROM GPC (BRANCH 4) FT^3	TOTAL VOLUME TO AMBIENT (BRANCH 1) FT^3
1A	OUTER WALLS INTACT	362	275	570
1B		1273	1142	2299
1C		1983	1922	3953 (BRANCHES 2 & 3)
1A	OUTER WALLS LOST	484	439	568
1B		1947	2282	2292
1C		3319	4555	5675
4C		0	446	3127

Attachment 4







RESUSPENSION OF FUEL PARTICLES

1. USE PARTICLE SIZE DISTRIBUTION RANGES GIVEN IN NUREG/CR-0866.
2. USE FRACTIONAL DISLODGEMENT INFORMATION FROM NUREG/CR-0866
3. OBTAIN NEAR-FLOOR AIR SPEEDS FROM SOLA-ICE via TVENT.
4. EVALUATE TERMINAL SETTLING AND THRESHOLD FRICTION SPEED EQUATIONS FOR PARTICLES (UO_2) OF DENSITY 10 g/cm^3 AND DIAMETERS 1 TO 5000 μm.
5. GENERATE TABLE OF FRACTIONAL RESUSPENSION OF AVAILABLE PARTICLE WEIGHT vs AIR SPEED FROM 1 AND 4.
6. USE 2, 4, AND 5 TO CALCULATE WEIGHTS OF FUEL REENTRAINED IN PHC AND CPC FOR EACH OF 3 SPECIFIED (100, 200, AND 300 mph) TORNADOS AS INDICATED BY TVENT ANALYSES.

ESTIMATING WEIGHT AND NUCLIDE ACTIVITIES IN PHC AND GPC

1. OBTAIN AVERAGE POWER REACTOR FUEL DECAY AGE FROM SAR (1973) AND Y/OWI/SUB-77/42500 (1977).
   (NPR FUEL CAN BE NEGLECTED.)

2. OBTAIN AVERAGE POWER REACTOR FUEL BURNUP.

3. USE 1 AND 2 IN ORIGEN CODE TO CALCULATE QUANTITIES OF NUCLIDES AT DECAY AGE PLUS γ-RAY SPECTRUM.

4. USE 3 PLUS SHIELDING DESIGN CODE TO CALCULATE DOSE CONVERSION FACTORS [(kg U/m^2)/(R/hr)].

5. USE 4 PLUS IN-CELL DOSE DATA OBTAINED BY NFS PERSONNEL TO CALCULATE SURFACE CONCENTRATIONS OF FUEL (kg U/m^2).

SUMMARY OF CALCULATED DISCHARGES FROM PMC

CASE	WALLS AND DOORS INTACT		WALLS AND DOORS DESTROYED	
	1B	1C	1B	1C
WEIGHT OF FUEL DISCHARGED, g	7.5-225	100-3000	95-2850	390-11,650
ACTIVITY DISCHARGED, Ci				
^{90}Sr	0.24-7.1	3.2-95	3.0-90	12-370
^{90}Y	0.24-7.1	3.2-95	3.0-90	12-370
^{137}Cs	0.30-9.0	4.0-120	3.8-110	16-470
^{137m}Ba	0.29-8.6	3.8-110	3.6-110	15-440
TOTAL FP	1.1-34	15-450	14-430	59-1700
^{241}Pu	0.23-7.0	3.1-93	2.9-88	12-360
TOTAL ACT.	0.24-7.1	3.2-95	3.0-90	12-370

SUMMARY OF CALCULATED DISCHARGES FROM PMC

CASE	WALLS AND DOORS INTACT		WALLS AND DOORS DESTROYED	
	1B	1C	1B	1C
WEIGHT OF FUEL DISCHARGED, g	7.5-225	100-3000	95-2850	390-11,650
ACTIVITY DISCHARGED, Ci				
^{90}Sr	0.24-7.1	3.2-95	3.0-90	12-370
^{90}Y	0.24-7.1	3.2-95	3.0-90	12-370
^{137}Cs	0.30-9.0	4.0-120	3.8-110	16-470
^{137m}Ba	0.29-8.6	3.8-110	3.6-110	15-440
TOTAL FP	1.1-34	15-450	14-430	59-1700
^{241}Pu	0.23-7.0	3.1-93	2.9-88	12-360
TOTAL ACT.	0.24-7.1	3.2-95	3.0-90	12-370

	50-YEAR DOSE, REM	
ORGAN	W/WALLS INTACT	W/O WALLS
WHOLE BODY	.0067 - .021	.088 - 2.7
KIDNEY	.025 - .77	.32 - 10
LIVER	.061 - 1.9	.8 - 24
BONE	.09 - 2.3	1.2 - 36
LUNGS	.0088 - .28	.12 - 3.5
GI-TRACT	3.6×10^{-5} - .0011	4.6×10^{-4} - .015

(200 MPH WINDS)