

new

CRBRP WORKING MEETING

FOR

NUCLEAR REGULATORY COMMISSION

CRBRP PROGRAM OFFICE

CONFINEMENT FILTRATION SYSTEMS

PRESENTED BY

PETER FAZEKAS

MANAGER, AUXILIARY SYSTEMS ENGINEERING

BURNS AND ROE, INC.

CONFINEMENT FILTRATION SYSTEMS

SUMMARY OUTLINE

- DESIGN BASIS
- DESIGN REQUIREMENTS
- SYSTEM DESCRIPTION
- SAFETY EVALUATION

GENERAL OVERVIEW

- THE CONFINEMENT FILTRATION SYSTEMS PROVIDE PRESSURE CONTROL AND RADIOACTIVE MATERIAL FILTRATION FOR THE:
 - REACTOR CONTAINMENT BUILDING (RCB) CONFINEMENT
 - REACTOR SERVICE BUILDING (RSB) CONFINEMENT
- THE CONFINEMENT FILTRATION SYSTEMS ARE DESIGNED TO MAINTAIN .25 IN. W.G. NEGATIVE PRESSURE IN THE DESIGNATED AREAS DURING:
 - NORMAL PLANT OPERATION
 - RADIOACTIVE ACCIDENT CONDITION
- THE CONFINEMENT FILTRATION SYSTEMS ARE DESIGNED TO INCLUDE CAPACITY FOR RECIRCULATION. THE RECIRCULATING OPERATING MODE IS UTILIZED DURING RADIOACTIVE ACCIDENT CONDITIONS

DESIGN BASIS

- GENERAL DESIGN CRITERIA
- SYSTEM CLASSIFICATION

CONFINEMENT FILTRATION SYSTEMS

GENERAL DESIGN CRITERIA

- QUALITY STANDARDS AND RECORDS (CRITERION 1)
- DESIGN BASIS FOR PROTECTION AGAINST NATURAL PHENOMENA (CRITERION 2)
- ENVIRONMENTAL AND MISSILE DESIGN BASIS (CRITERION 5)
- INSTRUMENTATION AND CONTROL (CRITERION 11)
- CONTAINMENT DESIGN (CRITERION 14)
- INSPECTION OF CONTAINMENT ATMOSPHERE CLEAN-UP SYSTEMS (CRITERION 50)
- TESTING OF CONTAINMENT ATMOSPHERE CLEAN-UP SYSTEMS (CRITERION 51)
- FUEL STORAGE AND HANDLING AND RADIOACTIVITY CONTROL (CRITERION 53)
- MONITORING RADIOACTIVITY RELEASES (CRITERION 56)

CONTAINMENT FILTRATION SYSTEMS

SYSTEM CLASSIFICATION

SYSTEM	SAFETY CLASS	QUALITY GROUP	SEISMIC CATEGORY	TORNADO PROTECTION
RCB CONFINEMENT (ANNULUS) FILTRATION SYSTEM	3	C	I	YES
RSB CONFINEMENT FILTRATION SYSTEM	3	C	I	YES

DESIGN REQUIREMENTS

- GENERAL REQUIREMENTS
- PERFORMANCE REQUIREMENTS
- SYSTEM INTERFACES

CONFINEMENT FILTRATION SYSTEMS

GENERAL REQUIREMENTS

- MAINTAIN LESS THAN 0.25 IN. W.G. NEGATIVE PRESSURE IN THE CONFINEMENT AREAS
- EXHAUST AIR FILTRATION FOR ALL CONFINEMENT AREAS DURING NORMAL OPERATION
- FILTRATION FOR THE RCB VENTILATION EXHAUST AIR DURING REFUELING OPERATIONS
- MIXING PROVISION FOR THE RECIRCULATED AIR STREAM
- MISSILE PROTECTION DESIGN
- SHIELDING DESIGN
- CAPABILITY FOR OPERATIONAL TESTING
- ENVIRONMENTAL CONDITIONS

CONFINEMENT FILTRATION SYSTEMS

PERFORMANCE REQUIREMENTS

PARAMETER		RCB CONFINEMENT SYSTEM	RSB CONFINEMENT SYSTEM
MINIMUM NEGATIVE PRESSURE	IN. W.G.	1/4	1/4
MAXIMUM INFILTRATION RATE	CFM	3000	1800
RECIRCULATION RATIO		1:3,5	1:9
MINIMUM PARTICULATE EFFICIENCY	%	99	99
MINIMUM ADSORBENT EFFICIENCY	%	95	95

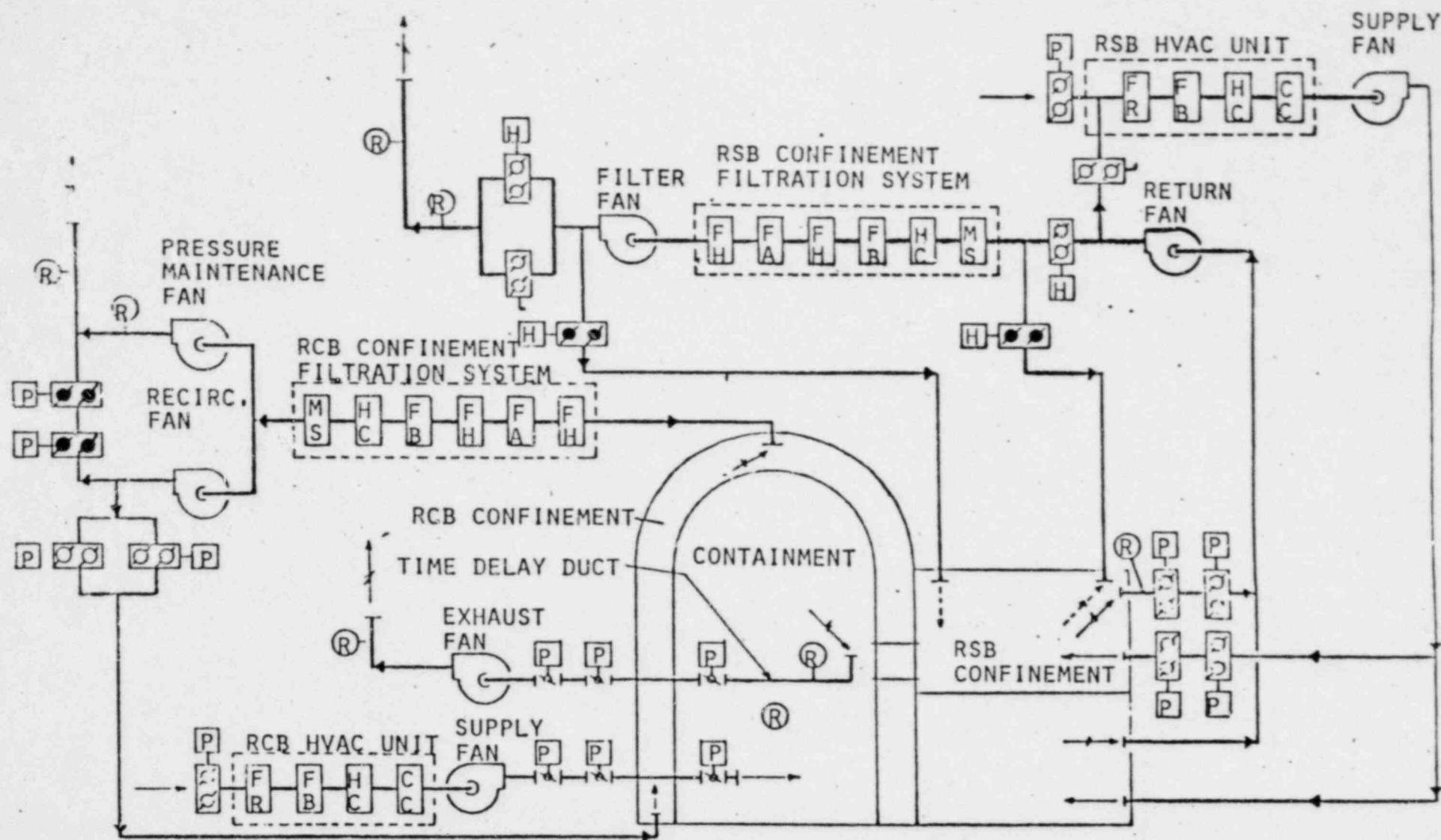
CONFINEMENT FILTRATION SYSTEMS

SYSTEM INTERFACES

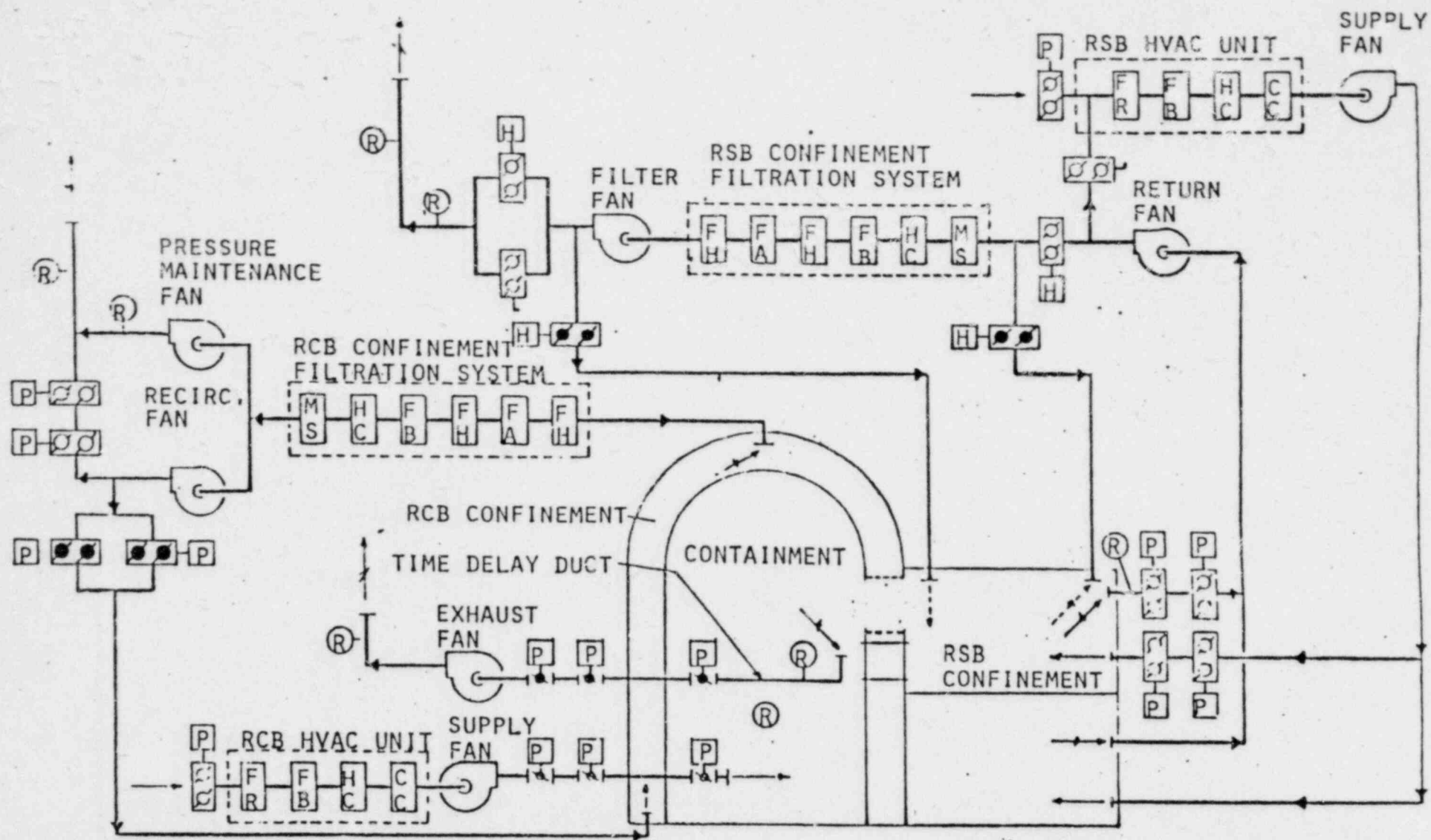
- BUILDING ELECTRICAL POWER SYSTEM - POWER SUPPLY, LIGHTING
- NI BUILDINGS - SPACE, SUPPORT, DRAINAGE,
TORNADO MISSILE PROTECTION,
SHIELDING
- RADIOACTIVE WASTE SYSTEM - SIZE REDUCTION AND DISPOSAL
OF RADIOACTIVE WASTES
- NI HVAC SYSTEM - CONTROL OF SPACE ENVIRONMENT
- MAINTENANCE SYSTEMS - TOOLS, TRANSPORTATION,
BAGGING, MAINTENANCE SHIELDING
- PLANT CONTROL SYSTEM - MAIN CONTROL PANEL ALARMS
- DATA HANDLING & DISPLAY SYSTEM - DATA LOGGING AND DISPLAY

SYSTEM DESCRIPTION

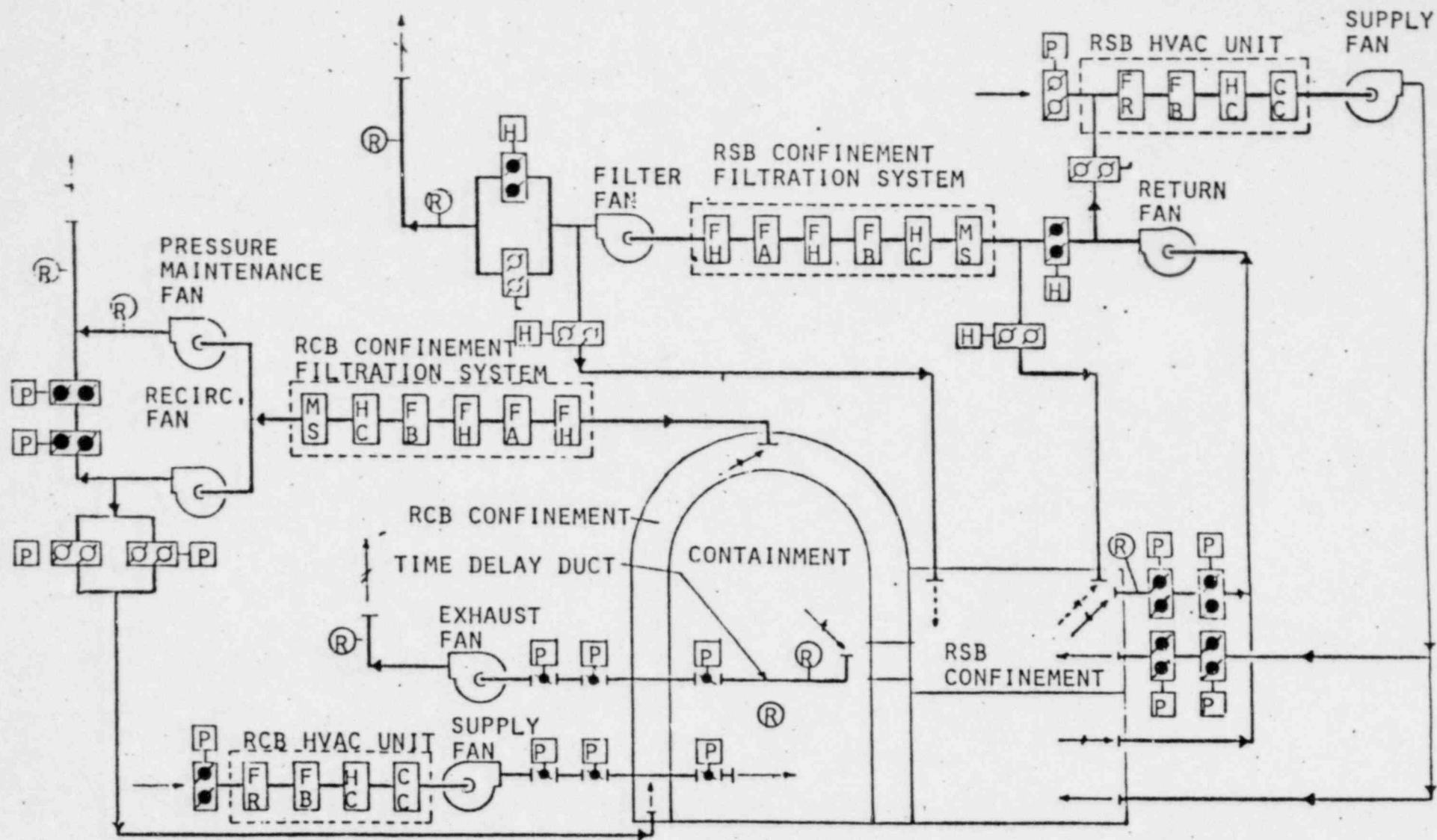
- SYSTEM CONFIGURATION
- SYSTEM PARAMETERS
- SYSTEM COMPONENTS



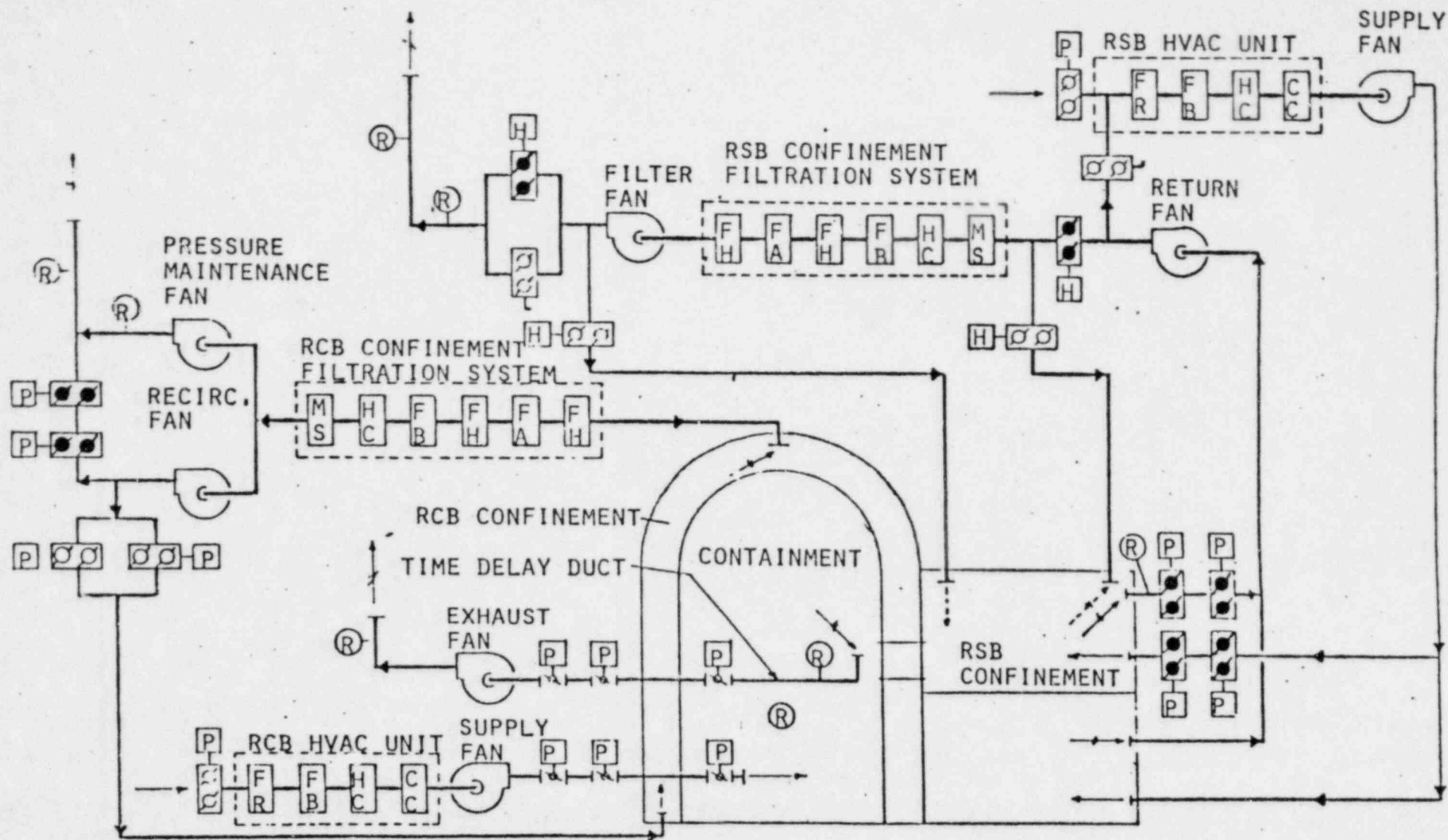
CONFINEMENT FILTRATION SYSTEMS
(NORMAL OPERATION)



CONFINEMENT FILTRATION SYSTEMS
(REFUELING OPERATION)



CONFINEMENT FILTRATION SYSTEMS
(RCB ACCIDENT)



CONFINEMENT FILTRATION SYSTEMS
(RSB ACCIDENT)

CONFINEMENT FILTRATION SYSTEMS

SYSTEM PARAMETERS

		RCB CONFINEMENT FILTRATION SYSTEM	RSB CONFINEMENT FILTRATION SYSTEM
NUMBER OF TRAINS	EA.	2	2
FILTER UNIT DESIGN			
FLOW RATE	CFM	14,000	18,000
FILTER SYSTEM DESIGN			
PRESSURE DROP	IN. W.G.	9	9
FILTER UNIT DESIGN			
FACE VELOCITY	IN. W.G.	250	250
ACCIDENT EXHAUST			
FLOW RATE	CFM	3,000 MAX.	1,700 MAX.
RECIRCULATION			
FLOW RATE	CFM	11,000 CFM	16,300 CFM

SYSTEM COMPONENTS

● FILTER UNITS

- MOISTURE SEPARATOR
- ELECTRIC HEATING COIL
- BAG TYPE PREFILTER
- HEPA FILTER
- CHARCOAL FILTER
- HEPA FILTER

● RCB PRESSURE MAINTENANCE FAN

- CENTRIFUGAL, DIRECT DRIVE
- VORTEX INLET DAMPER, EH ACTUATOR
- 1E POWER SUPPLY

● RCB RECIRCULATING FAN

- CENTRIFUGAL, DIRECT DRIVE
- VORTEX INLET DAMPER, EH ACTUATOR
- 1E POWER SUPPLY

● RSB FILTER FAN

- CENTRIFUGAL, DIRECT DRIVE
- VORTEX INLET DAMPER, EH ACTUATOR
- 1E POWER SUPPLY

● DAMPERS, DUCTWORK

- QUALITY GROUP C DESIGN
- SEISMIC CATEGORY I
- LEAK TIGHT CONSTRUCTION
- MISSILE (INTERNAL, EXTERNAL) PROTECTED

CONFINEMENT FILTRATION SYSTEMS

SAFETY EVALUATION

DESIGN BASIS CRITERIA

- CRITERION 1
QUALITY STANDARDS AND RECORDS
- CRITERION 2
DESIGN BASES FOR PROTECTION
AGAINST NATURAL PHENOMENA
- CRITERION 5
ENVIRONMENTAL AND MISSILE
DESIGN BASES
- CRITERION 11
INSTRUMENTATION AND CONTROL
- CRITERION 14
CONTAINMENT DESIGN
- CRITERION 50
INSPECTION OF CONTAINMENT CLEAN-UP SYSTEMS
- CRITERION 51
TESTING OF CONTAINMENT CLEAN-UP SYSTEMS
- CRITERION 53
FUEL STORAGE AND HANDLING AND
REACTIVITY CONTROL

SYSTEM DESIGN FEATURE

- Q/A PROCEDURES ESTABLISHED FOR CRBR
- SEISMIC CATEGORY I
- TORNADO MISSILE PROTECTION
- SYSTEM AND COMPONENTS DESIGNED TO ACCOMMODATE
ENVIRONMENTAL CONDITIONS
- LOAD COMBINATIONS
- INTERNAL MISSILES WERE EVALUATED
- BYPASS AND INOPERABLE STATUS INDICATION PROVIDED
- REDUNDANT TRAINS SEPARATED
- ALL INSTRUMENTATION QUALIFIED 1E
- THE CONTAINMENT ISOLATION SYSTEM IN CONJUNCTION
WITH THE REACTOR CONTAINMENT PROVIDES AN
ESSENTIALLY LEAK TIGHT BARRIER AGAINST UN-
CONTROLLED RELEASE OF RADIOACTIVITY
- FULL ACCESS PROVIDED FOR INSERVICE INSPECTION
- INSTRUMENTATION PROVIDED FOR CONTINUOUS PERFORMANCE
VERIFICATION
- CAPABILITY PROVIDED FOR LEAK TESTING
- CAPABILITY PROVIDED FOR PERFORMANCE TESTING
- CONTINUOUS OPERABILITY STATUS INDICATION
- PRE-OPERATIONAL AND OPERATIONAL TEST PROGRAM WAS
DEVELOPED
- CONFINEMENT DESIGN FOR RSB FUEL HANDLING AREA
- EXHAUST AIR FILTRATION AND PRESSURE MAINTENANCE
DURING FUEL HANDLING OPERATIONS

SAFETY EVALUATION

DESIGN BASIS CRITERIA

- CRITERION 56
MONITORING RADIOACTIVITY RELEASES

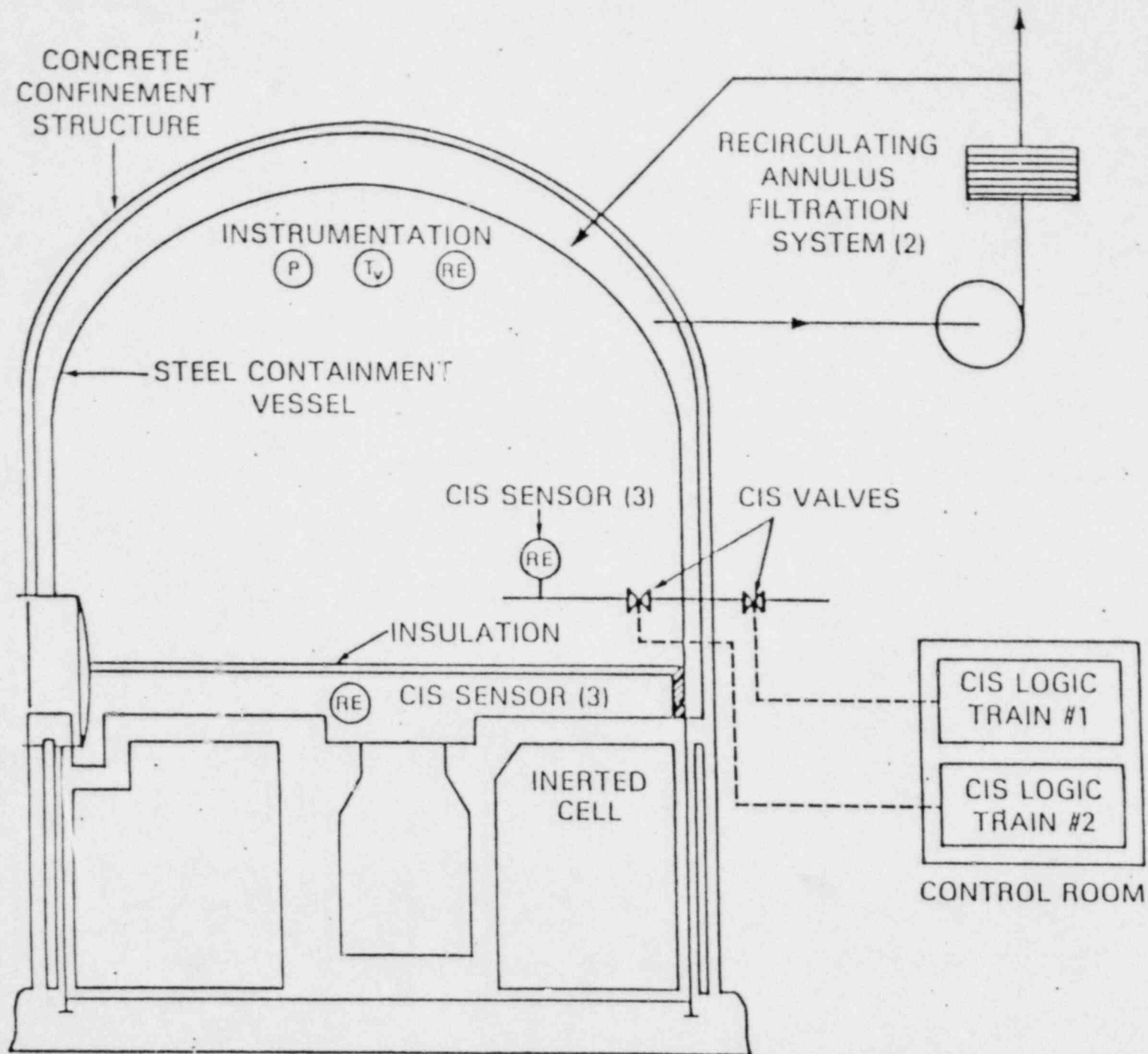
SYSTEM DESIGN FEATURE

- EFFLUENT MONITORING PROVIDED FOR ALL
EXHAUST OPENINGS

CRBRP CONTAINMENT SYSTEM

Gorge Clare

Containment Isolation
Initiating signal



CONTAINMENT ISOLATION SIGNALS

<u>INSTRUMENT</u>	<u>SET POINT</u>
HAA GAMMA DETECTOR	8.5 MR/HR NOMINAL 11.9 MR/HR WORST CASE
EXHAUST DUCT GAMMA DETECTOR	3.4×10^{-7} UCI/CC NOMINAL 4.9×10^{-7} UCI/CC WORST CASE
AUTOMATIC BACKPRESSURE VALVE ACTUATORS	50 PSIG NOMINAL 40 PSIG WORST CASE