

ENCLOSURE 1

December 15, 2009 Public Meeting Presentation on Passive
Filtration & Main Control Room Habitability

MCR Emergency Habitability System (VES)

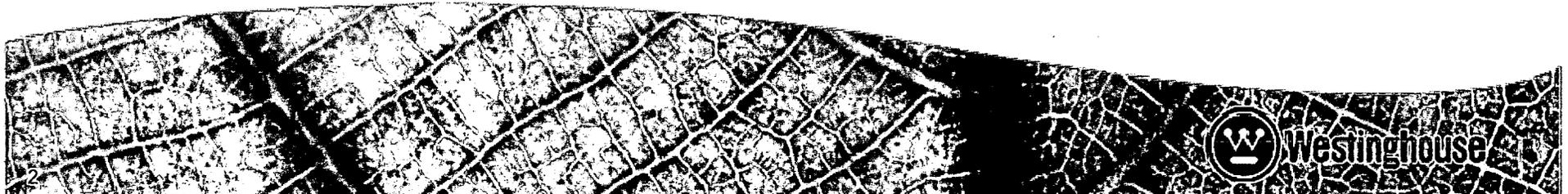
**Passive Filtration & Main
Control Room Habitability**

December 15, 2009

Andy Pfister & Nick Salkeld

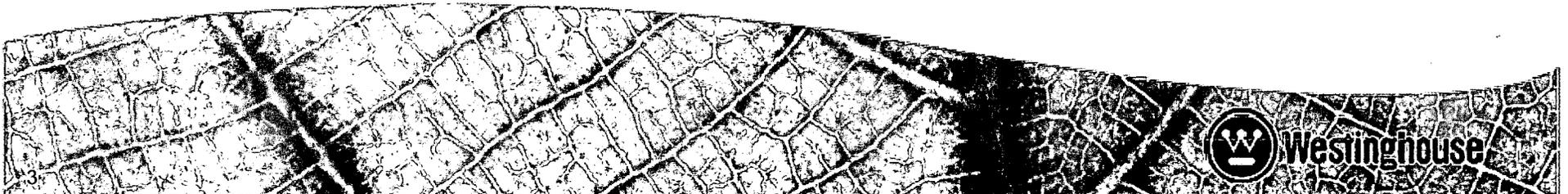
Presentation Overview

- General overview of AP1000 Main Control Room Habitability design changes
- Passive Filtration Testing
- Resolution to outstanding design related open items
 - Operating Experience, Single Failure, & Flow Instrumentation
- Resolution to outstanding open items related to Technical Specifications



Presentation Objectives

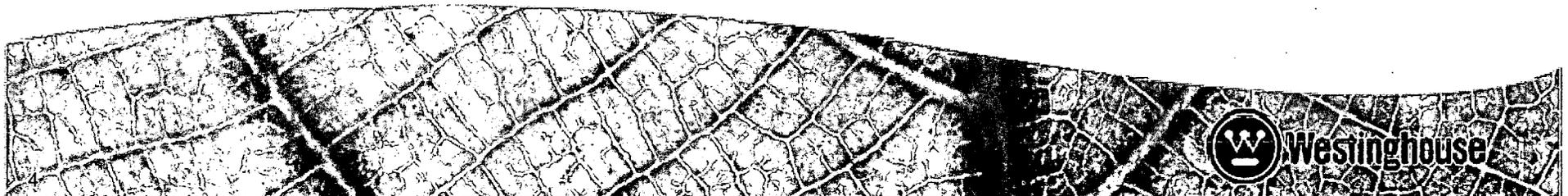
- Understand VES passive filtration
- Understand VES testing conducted by Westinghouse
- Understand eductor operating experience and passive filtration line's susceptibility to a single failure
 - RAI-SRP6.4-SPCV-9, -12, -13
- Understand impact of VES passive filtration relative to Technical Specifications
 - RAI-SRP 6.4-SPCV-10, -11, -14



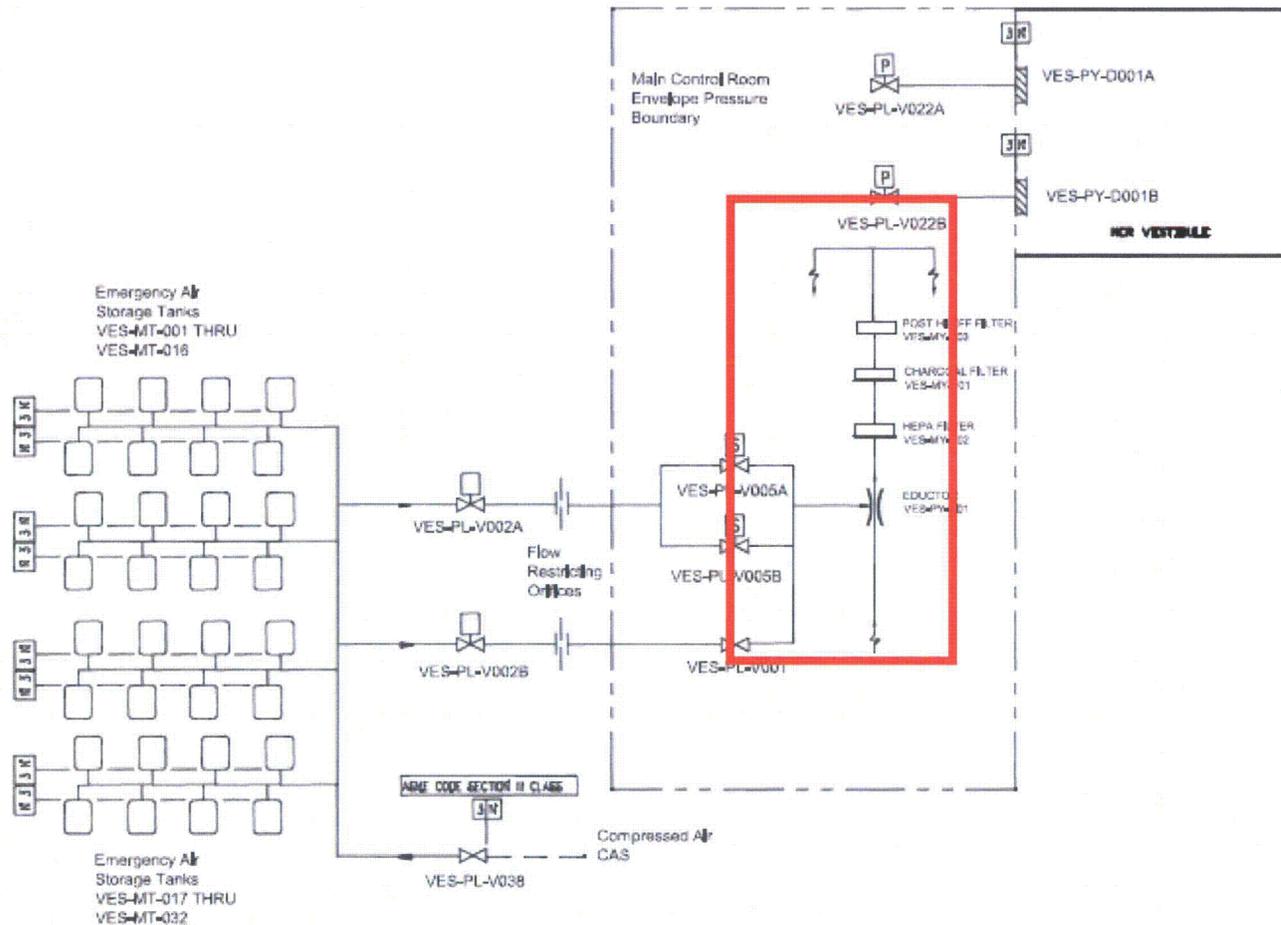


AP1000 Main Control Room Habitability

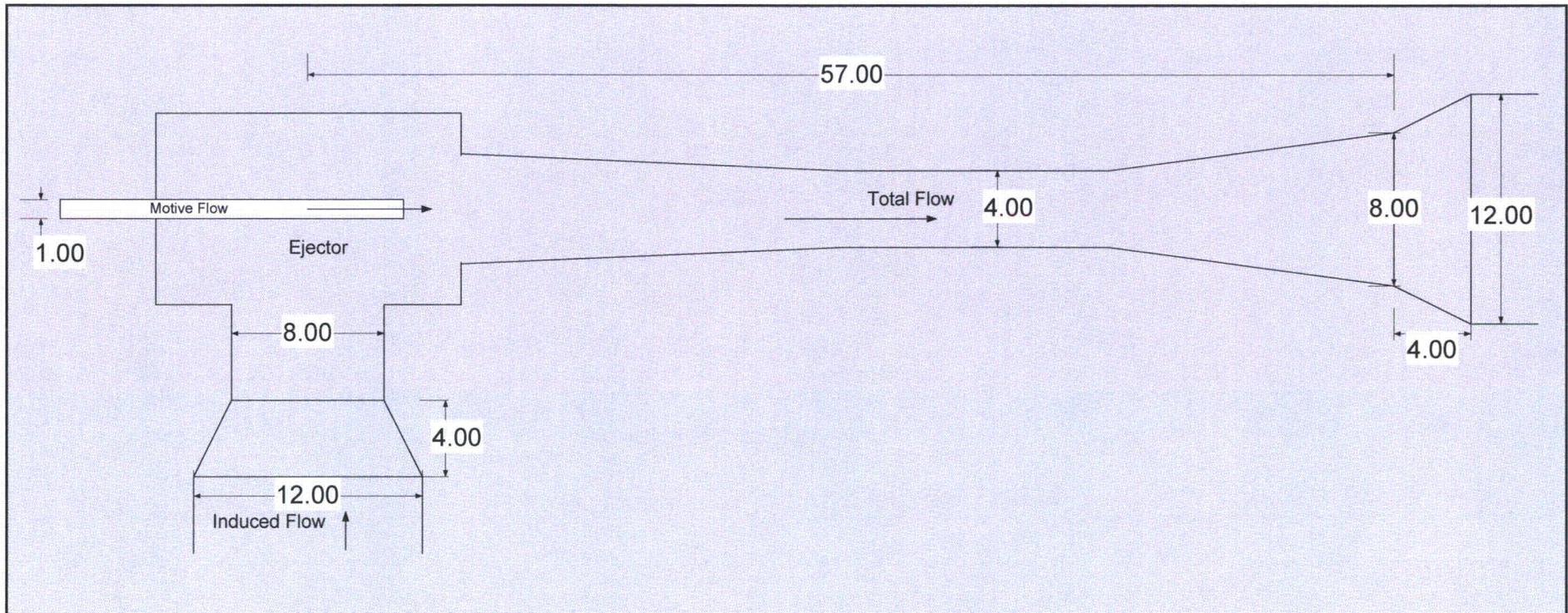
- Chi/Q values for AP1000 changed between DCD Rev. 15 and DCD Rev. 17 to bound potential new sites
- Concerns regarding unfiltered in-leakage into the main control room during VES operation prompted system design changes
- A passive filtration flow path was added to the existing VES design to filter potential unfiltered in-leakage
- An eductor induces passive filtration flow using bottled air from the emergency air storage tanks



VES Design Enhancements



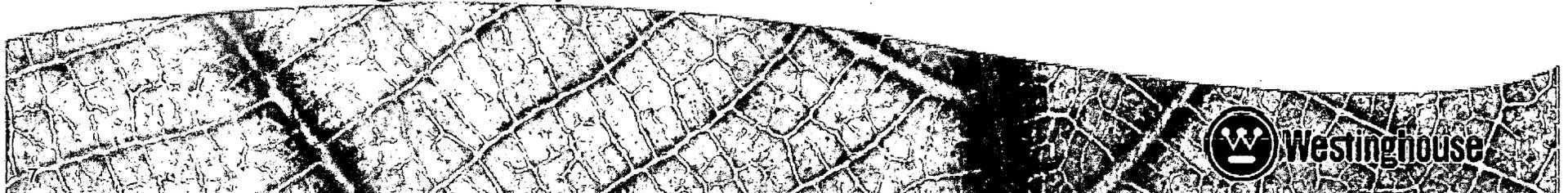
Eductor – Air Ejector



*All dimensions are given in inches

AP1000 VES Passive Air Filtration

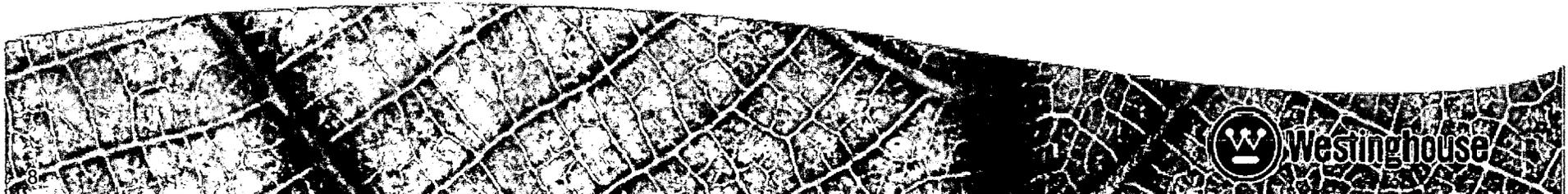
- System performance allows for 15 cfm of unfiltered in-leakage while maintain operator dose below 5 rem TEDE
 - Accept 5 cfm leakage through the vestibule
 - Accepts up to 10 cfm in-leakage from sources other than the vestibule
 - Actual in-leakage is expected to be zero
- Passive filtration eliminates need for VES actuation on low pressurizer pressure
- System configuration is similar to active system designed to meet Regulatory Guide 1.52





AP1000 Passive Filtration DCD Impacts

- Tier 1, Section 2.7.1
- Tier 2
 - Section 1.2, 1.9, & Appendix 1A
 - Section 3.2, 3.9, 3.11, & 3I
 - Section 6.4
 - Section 7.2 & 7.3
 - Section 8.3
 - Section 9.4, 9.5, & Appendix 9A
 - Section 14.2
 - Section 15.6
 - Technical Specifications

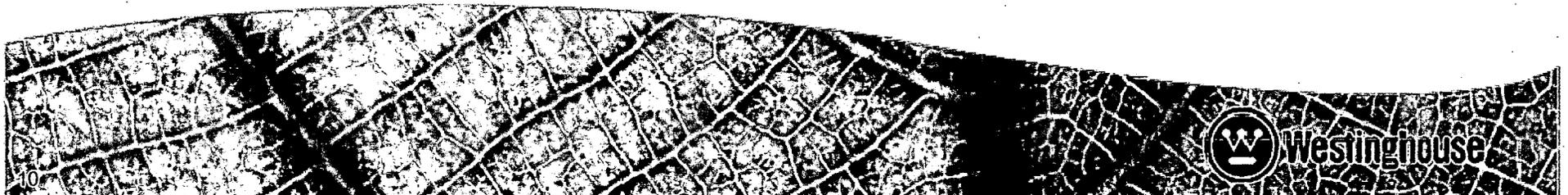


MCR Emergency Habitability System (VES)

Passive Filtration Testing

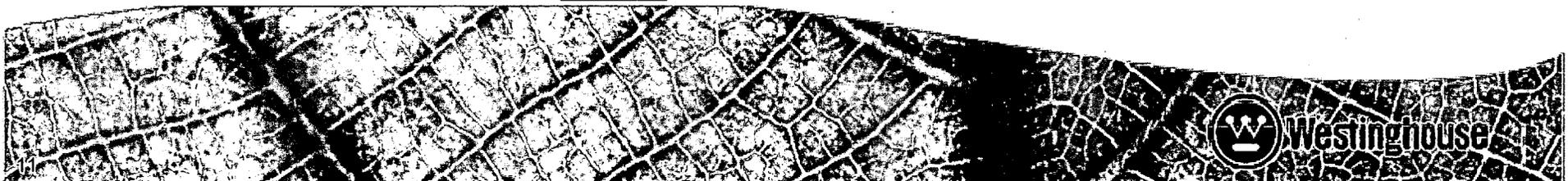
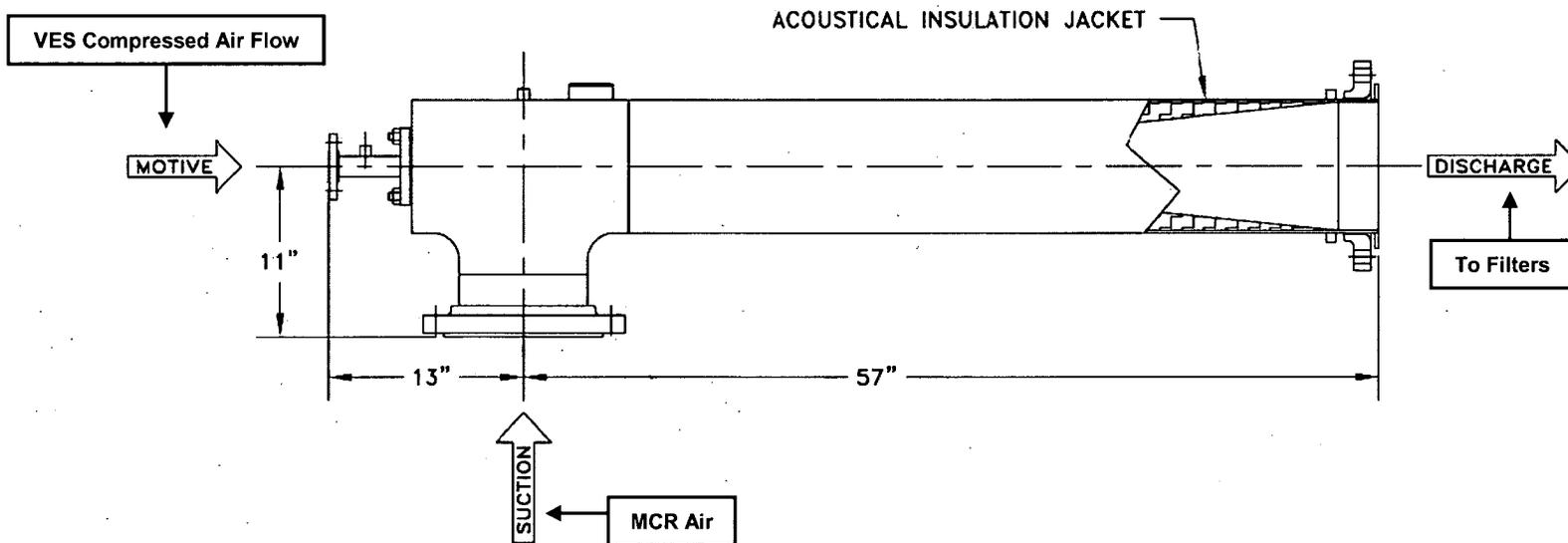
Passive Filtration Testing

- Westinghouse
 - Waltz Mill facility
- Testing to confirm the operability and performance of the passive filtration design

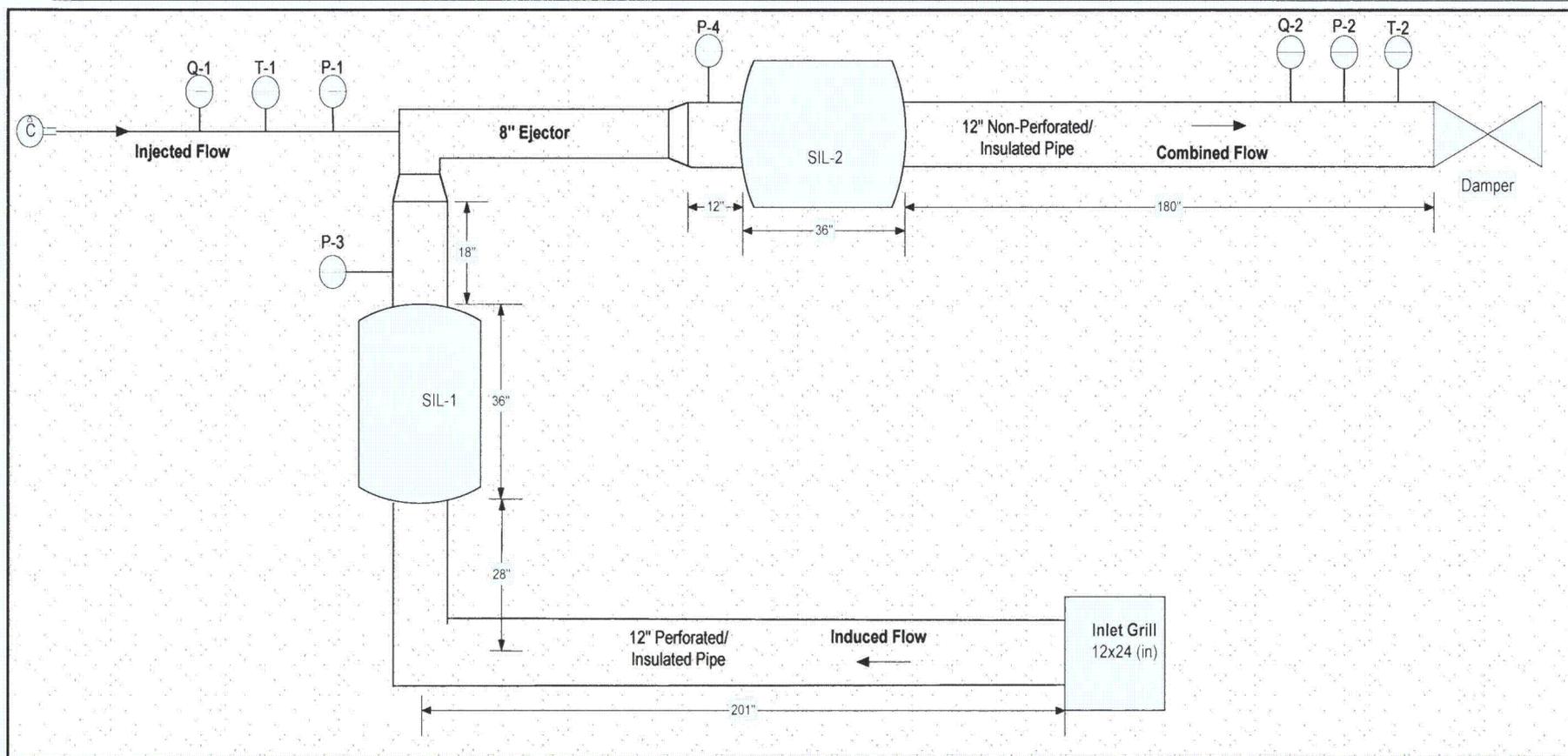


Eductor – Air Ejector

- Venturi device that uses the energy in the compressed air to create a vacuum that entrains the MCR ducting airstream
- Amplification of the 65 ± 5 scfm delivery flow is roughly 10 times at an inlet pressure of 115 ± 5 psig

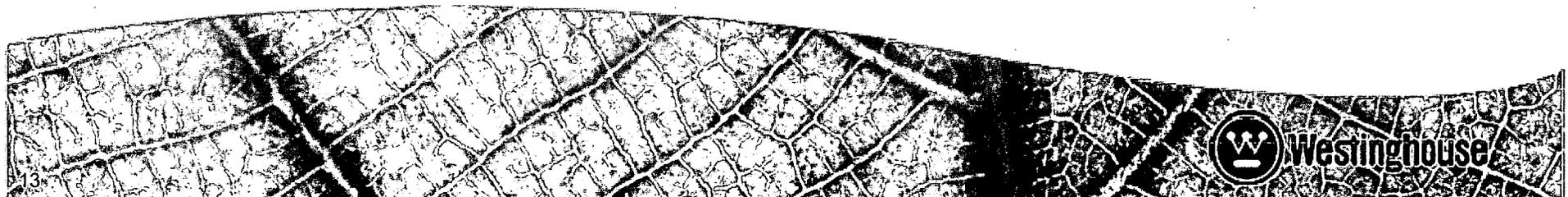


Passive Air Filtration Testing



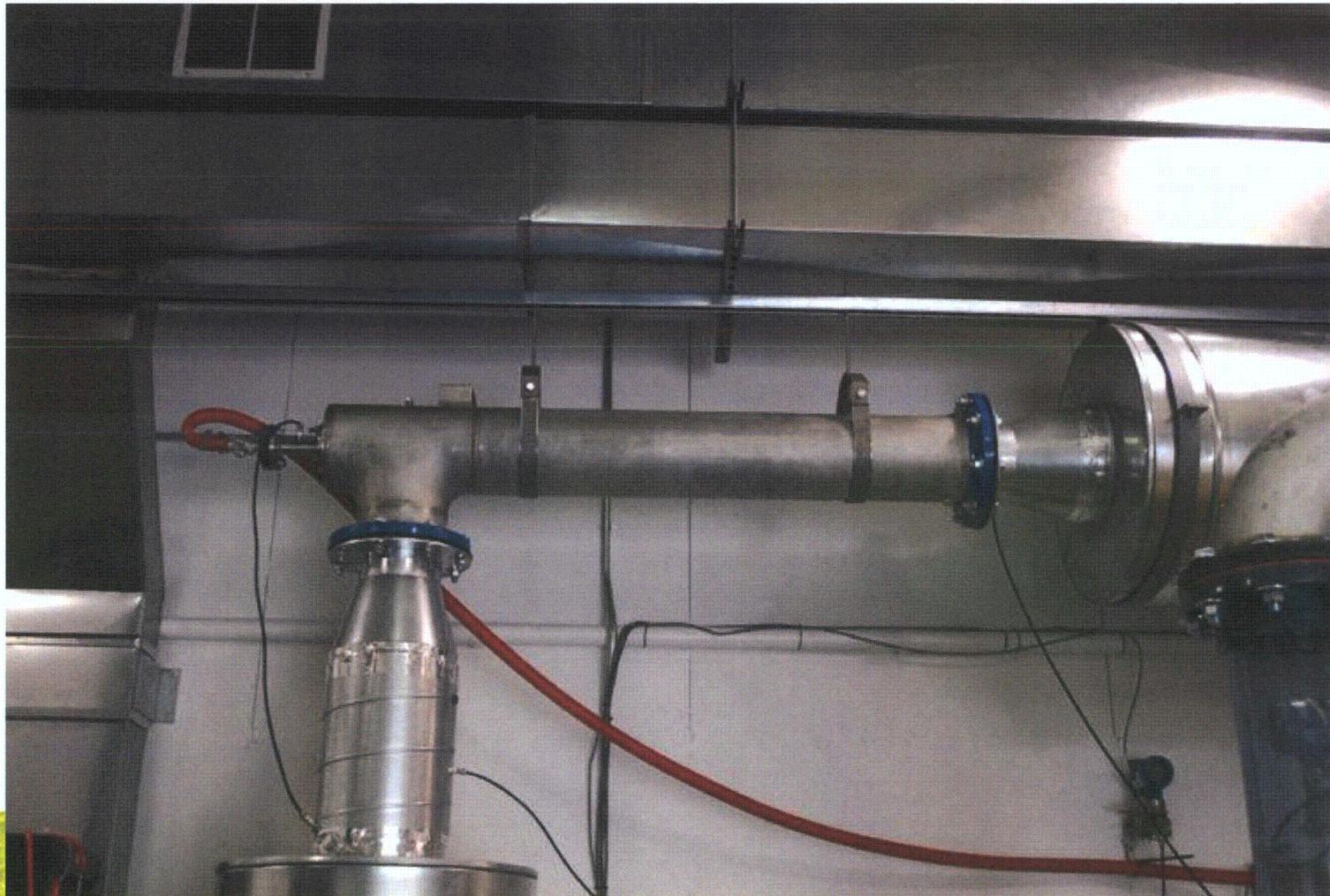
Testing Objectives and Results

- Test the operability and performance of the MCR Passive Air Filtration design addition to VES
 - Determine whether a compressed air flow rate of at least 60 scfm induces a filtration flow of at least 600 scfm with varying backpressure on the eductor
- Can induce required filtration flow with up to 5 inches of back pressure on the eductor
 - Eductor inlet pressure and feed flow from air tanks relate linearly
 - Feed flow and filtration (amplified) flow relate linearly

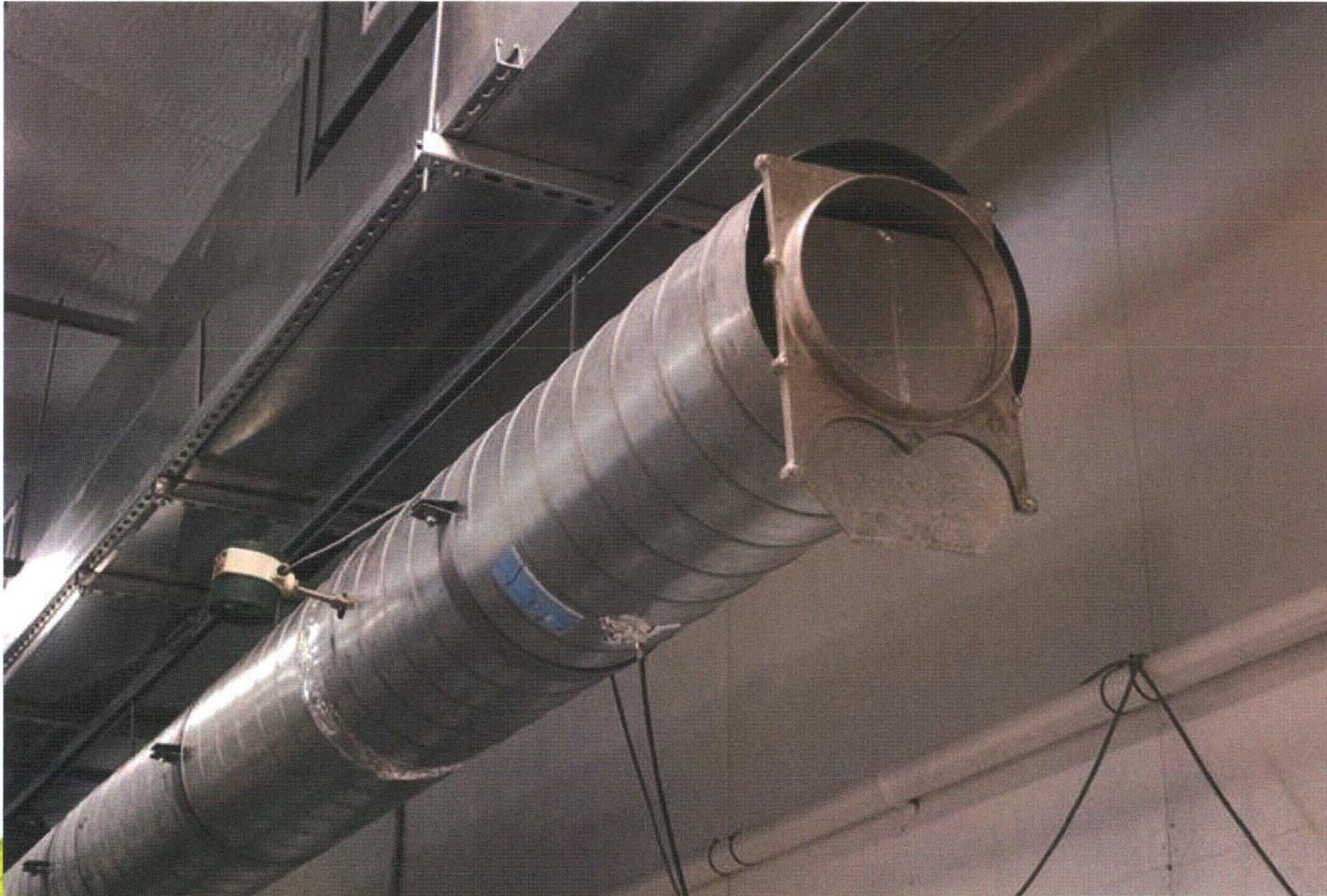




Passive Air Filtration Testing



Passive Air Filtration Testing



AP1000™



 **Westinghouse**

Passive Air Filtration Testing

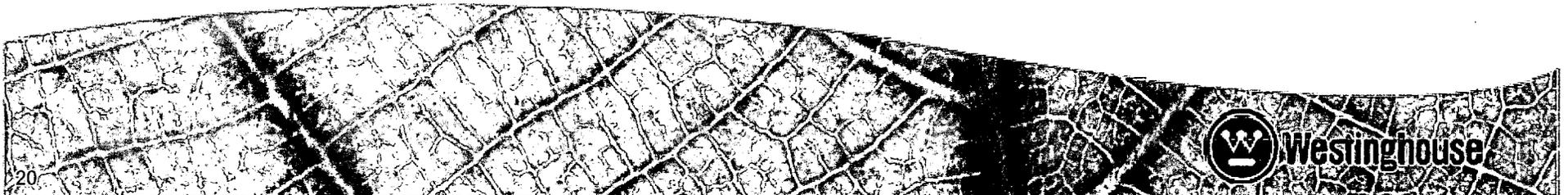


MCR Emergency Habitability System (VES)

Closure of Open Items

Eductor Operating Experience

- RAI-SRP 6.4-SPCV-09
- Eductor is a venturi device that uses energy in the VES compressed air to induce a MCR filtration flow
- Similar eductors have been used to continuously convey abrasive powders for 10 years without a need for maintenance
- AP1000 eductor will not be used to normal plant operation & will be tested at an 18 month surveillance to verify operability



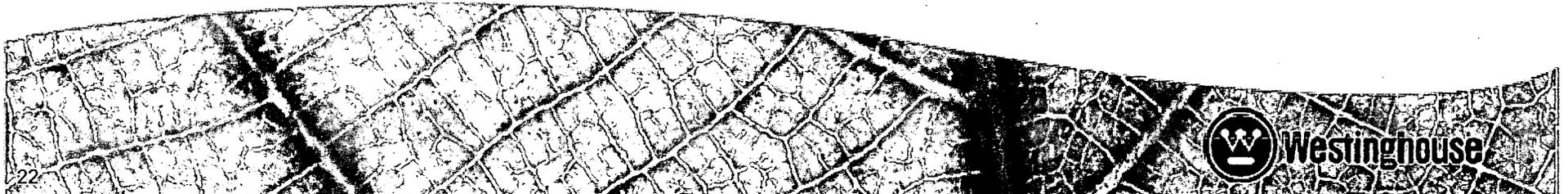
Passive Filtration Line Single Failures

- RAI-SRP 6.4-SPCV-13
- In accordance with SECY-77-439 a passive failure is an event such as line blockage or structural failure that limits a component's effectiveness
- Passive failures are not assumed until 24 hours after initiation of design basis events



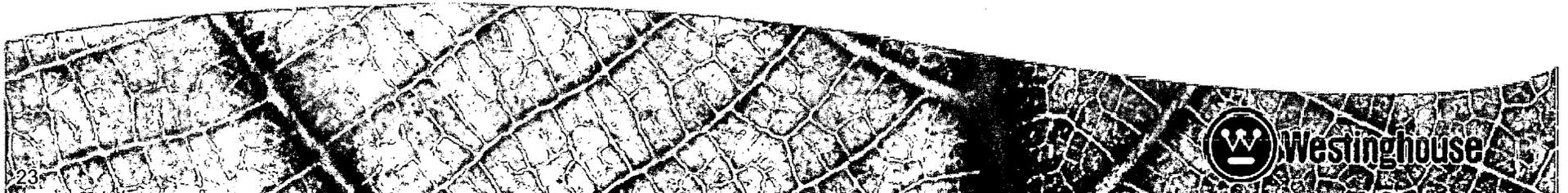
Passive Filtration Line Single Failures

- Dose analysis demonstrates that VES passive filtration is not required 24 hours after accident initiation
- Large break LOCA & steam line breaks were analyzed to demonstrate operator dose rates remain below 5.0 rem TEDE with no passive filtration after 24 hours
- Large break LOCA & steam line break are limiting since they involve a release after 24 hours



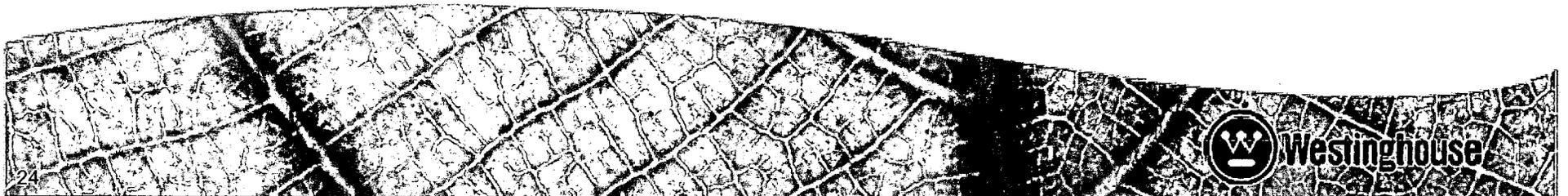
Passive Filtration Line Single Failures

Comparison of Limiting VES Operating Cases		
<i>Scenario</i>	<i>VES Filtration Operating for 72 Hours</i>	<i>VES Filtration Operating for 24 Hours</i>
Large Break LOCA	4.41 rem TEDE	4.41 rem TEDE
Steam Line Break (pre-existing iodine spike)	3.9 rem TEDE	3.91 rem TEDE
Steam Line Break (Accident initiated iodine spike)	4.0 rem TEDE	4.41 rem TEDE



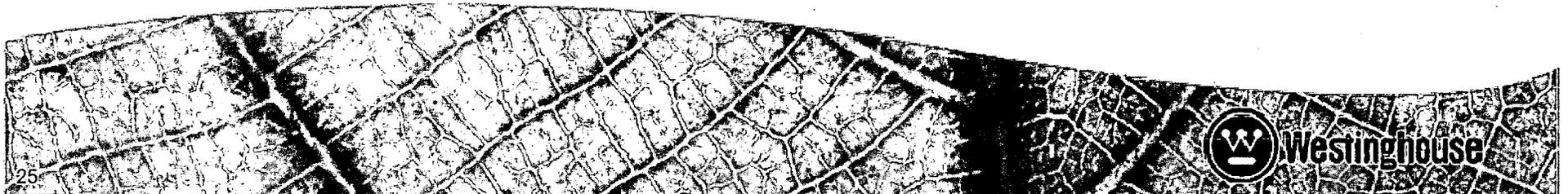
Passive Filtration Line Single Failures

- 65 ± 5 scfm of breathable air from the VES emergency air storage tanks is required after 24 hours
- The configuration of the air delivery system has not changed since Revision 15 of the DCD
- Redundant active components exist in the air delivery flow path that are capable of providing breathable air to the MCR



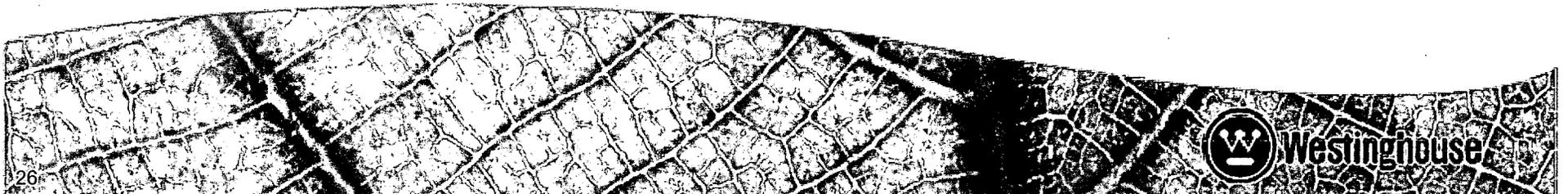
Passive Filtration Line Single Failures

- Air delivery is monitored by a safety related flow instrument
- CAS provides air to the emergency air storage tanks
 - CAS contains a filtration package & air purifier/dryer to maintain breathable air meeting requirements of ANSI/CGA G7.1
- No credible source of line blockage in the VES line from the air bottles to the eductor



Passive Filtration Line Flow Instruments

- RAI-SRP 6.4-SPCV-12
- VES passive filtration flow instrumentation is not required to be safety related since filtration is not required after 24 hours
- Instrumentation is not required to ensure function of safety related components
- Instrumentation provides no automatic actuation or control of safety related equipment
- Instrumentation has been categorized as an E3 PAMs variable

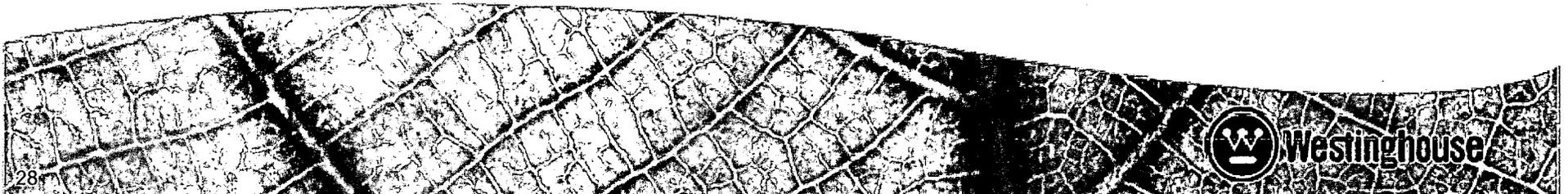


MCR Emergency Habitability System (VES)

**Changes to Technical
Specification 3.7.6**

Changes to Technical Specifications

- Chapter 16 – Tech Spec – 3.7.6 – MCR Habitability Systems (VES)
- LCO 3.7.6 – The MCR Habitability System shall be OPERABLE
- Changes to TS 3.7.6 as a result of NRC RAIs
- Two open items of concern:
 1. LCO 3.7.6, Condition D – “One bank of VES air tanks (8 tanks) inoperable”
 2. TS 5.5.13 – Ventilation Filter Testing Program (VFTP)



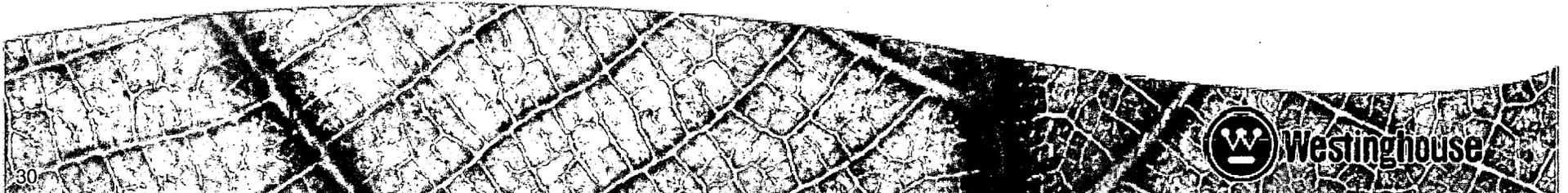
Changes to Technical Specifications

1. LCO 3.7.6, Condition D – “One bank of VES air tanks (8 tanks) inoperable” (RAI-SRP 6.4-SPCV-14)
 - Time limit of 7 days proposed
 - Reliable compensatory measures are available to ensure compliance with GDC 19 dose limits with 54 hours of compressed air
 - VBS fans initiated at 54 hours
 - Standard Tech Specs allow for 7 day completion time for one train MCR HVAC out of service
 - Expected time breakdown (assuming ideal conditions):
 - Vent – 2.5 hours, Maintenance Activities – 24 hours, Refill (using CAS HP compressor)– 24 hours



Changes to Technical Specifications

2. TS 5.5.13 – Ventilation Filter Testing Program (VFTP), (RAI-SRP 6.4-SPCV-10, -11)
 - Editorial error for combined penetration leakage corrected to say less than 0.05% instead of 0.5%
 - Incorporating DP testing across the HEPA filter and adsorber
 - In accordance with Standard Tech Specs
 - The total flow verification of passive filtration line during VFTP remains the same



Conclusions

- Passive Filtration design addition and implementation into DCD
- Passive Filtration testing provided data that confirms system operability and performance
- Resolution to outstanding design related open items
 - Educator operating experience
 - Dose analysis shows no filtration needed after 24 hours
 - Passive Filtration flow instrumentation is non-safety related and a PAMs E3 variable
- Resolution to outstanding open items related to Technical Specifications
 - 7 day completion time for Condition D
 - System remains single failure tolerant and meets GDC 19 requirements with compensatory measures
 - Incorporating DP testing across the filters

