Application of Modular, Rapidly Deployable CBR Filtration and Environmental Conditioning Systems for Building Collective Protection

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Modular / Rapidly Deployable

Why is there a need for modular, rapidly deployable collective protection systems?

✓ Minimal Impact on Mission Critical Facility/Shelter

✓ Reduce Engineering Design and Installation Requirements

✓ Reduce Overall Cost and Lead Times

✓ Logistics Support (Manuals, Spare Parts, Training, etc.)
Topics

- What is a Modular CBR Filtration System?
- Why combine HVAC and ColPro Filtration?
- Why Modular and Rapidly Deployable?
- Schedule and Cost Impact
- System Features and Options
- Modular CBR Filtration System Applications
2x2 Modular CBR Filter System
With Heating / Cooling Coils (4,000 cfm)

OpenAire™ Filter Housings
(2w x 2h shown)

Outlet Plenum

Inlet Plenum

Cooling / Heating Coils
3x3 Modular CBR Filter System
With No Cooling/Heating (9,000 cfm)

CBR Filter Housings
(Navy 3w x 3h shown)

Inlet Plenum

Controls / Monitoring Equipment

Outlet Plenum
Why Combine HVAC and ColPro Filtration?

- ColPro requires significant increases in make-up air and typically the facility HVAC systems can not handle the additional cooling/heating loads.

- Standard HVAC systems are not designed for higher pressures. Systems have significant leaks.

- Elimination of redundant components
  - HVAC blower fan
  - HVAC housing
  - Prefilter housing
  - Concrete pad size, electrical wiring, monitor / controls
Why Modular Construction?

- Uses pre-designed modules
- Reduces NRE engineering and design requirements
- Promotes Product Standardization
  - Maintenance and Repair Parts
  - Manual Creation and Support
  - Standard Monitor/Control Equipment
  - Standard Integration with Building Control Systems
  - Training
  - Testing and Certification
- Allows assembly in confined spaces (Mechanical Rooms, etc.)
Why Rapidly Deployable?

- Minimizes Impact on the Mission Critical Facility / Shelter

- Reduces Installation Cost
  ✓ Requires only electrical power connection, remote signal connections, and outlet duct connection
  ✓ Versatile Placement (pad, ground, parking lot, trailer mount)

- Reduces Installation Schedule
  ✓ Hardware can be installed in 24 – 48 hours

- Shipping Requirements
  ✓ Sized to allow standard truck transport with no oversize limits exceeded.
  ✓ Allows 2 systems per truck
Schedule Impact (Future CBR System)

- Survey – System specification, minimize facility/shelter investigation
- Design – Reduce scope to system configuration options
- Manufacturing
  - Inventory long lead items (fan, housings, VFD, etc.)
  - Eliminate long lead items (design features)
- Procurement Strategy – Quantity buy options
- Testing – Perform testing at the factory & minimize in-field testing
Lower Total Cost and Shorter Time

Traditional ColPro System

Modular, Rapid Deployable System

Relative System Cost

Training/Manuals
Testing
Installation
Hardware
Design
Site Survey

Training/Manuals
Testing
Installation
Hardware
Design
Site Survey
Modular CBR Filtration System Features

- Modular CBR 3x3 Filtration System
  ✓ Air flow capacities 4,000 - 14,400 cfm
    @ 200 cfm per filter

- Modular CBR 2x2 Filtration System
  ✓ Air flow capacities 1,000 - 6,400 cfm
    @ 200 cfm per filter

- Filter Housing Options
  ✓ US Navy CBR Filter Housing to 5 filters deep
  ✓ OpenAire™ Filter Housing to 8 filters deep
Modular CBR Filtration System Features

Overall dimensions and weight

- 3x3 system - 8’ wide x 8’ high x 16’ to 22’ long depending on housing length and options

- 2x2 system - 6’ wide x 6’ high x 16’ to 22’ long depending on housing length and options

- Weight ~ 6,800 lbs - 3x3 system with OpenAire™ filter housings, 5 deep, w/o CBR filters
Application of Modular CBR Filtration Systems
AirePod™ Modular CBR Filter System (8,000 cfm)
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Modular CBR Filtration System Features

- Features
  - 2 ½” double-wall aluminum casing with foam insulation
  - Mostly aluminum construction with acoustic treatments
  - Integrated fan, VFD motor control, lights, and gauges
  - Requires only electrical power connection to fan, remote signal connections, and outlet duct connection
  - Hypalon® roofing with insulation and rain gutters for exterior applications

- Additional Benefits
  - Security - lockable doors
  - Aesthetics
AirePod™ was designed using Computational Fluid Dynamics (CFD) to maximize filter flow uniformity and minimize static pressure losses.
Testing and Industry Specifications

- Housing Leak Test – ASME N510 – Must be $< \frac{1}{2} \%$ leakage

- Gas and Aerosol Testing – ASME N510
  ✓ Allowable HEPA Leakage $< 0.03\%$
  ✓ Allowable Penetration of Gas Filter $< 0.1\%$

- Motor Vibration Test – Must be $< 0.2$ in/sec


- Performance Testing – VFD, Monitors, etc.


Potential Modular CBR Applications

- Guardian Installation Protection Program
- Joint Expeditionary Collection Protection Systems
- Special Events (Olympics, World Trade Organization Meetings, Global Summits, VIP Meetings/Forums, etc.)
- High Priority Commercial Applications (Conferences, Board Meetings)
- High Threat Targets (VIP Offices, R&D facilities, etc.)
- Shipboard Applications
- Future Hospital and Medical Shelter Systems
Benefits of the Modular, Rapidly Deployable CBR System

✓ 40% Reduction in Schedule

✓ 20% Reduction in Cost

✓ Technical Risk Reduction with Standardized Design

✓ Minimizes Design / Installation / Logistics Support

✓ Improves Aesthetics (reduction of ductwork, plenums, etc.)

✓ Redeployable System
Questions