



Project Profile

Custom HEPA Filtered Extraction Enclosure

Project Overview

PROJECT OVERVIEW

A research facility performing rock crushing and grinding for sample preparation was facing significant challenges related to heavy particulate generation and the risk of facility wide contamination. The process created dense airborne particulates that could not be adequately controlled using localized housekeeping measures, and the facility lacked available HVAC capacity to support traditional ducted exhaust solutions.

PCI was engaged to develop a stand alone containment and extraction solution that would effectively capture and filter particulates at the source—without relying on the building's existing HVAC infrastructure.

THE CHALLENGE

The customer required a solution that could:

- Prevent high particle loads from dispersing throughout the facility
- Operate independently of existing HVAC systems
- Support ergonomic access to rock crushing and grinding equipment
- Maintain flexibility for future process adjustments
- Be implemented without major building modifications

Standard containment enclosures and ducted exhaust systems were not viable due to infrastructure limitations and workflow constraints. A custom, engineered approach was required.

THE SOLUTION

PCI developed a custom extraction enclosure from the ground up, incorporating the following design features:

Structural Design

- 80/20 aluminum framing system for modularity and structural rigidity
- Clear acrylic rear panels and roof to maintain visibility and ambient light
- Polyvinyl curtain walls at the front and sides to provide flexible access while maintaining containment

Airflow & Filtration

- Three HEPA filtered Fan Filter Units (FFUs)
- Each FFU operating at 600 CFM, providing a combined extraction capacity of 1,800 CFM
- HEPA filtration designed to capture fine particulates generated during crushing and grinding operations
- Fully recirculating system, eliminating the need for external exhaust or HVAC tie ins

Ergonomics & Workflow

- Open, flexible curtain access allowing operators to safely handle materials and equipment
- Layout designed to minimize awkward reaches and operator fatigue
- Containment performance maintained without restricting productivity

Key Features and Conclusion

RESULTS

Following installation, the customer conducted an initial production run, immediately confirming:

- Effective capture and containment of airborne particulates
- Significant reduction in particulate migration beyond the enclosure
- Improved housekeeping conditions throughout the facility
- No negative impact on workflow or operator access

The customer has since reported continued satisfaction with both the performance and practicality of the solution.

BEFORE



AFTER



KEY TAKEAWAYS

- PCI delivered a fully custom containment solution where standard systems were not feasible
- HEPA filtered FFUs enabled effective extraction without additional HVAC capacity
- The enclosure was engineered to balance containment performance, ergonomics, and flexibility
- The project demonstrates PCI's ability to solve complex containment challenges through process driven design

CONCLUSION

This project highlights PCI's capability to move beyond off the shelf equipment and deliver purpose built containment systems tailored to real world laboratory and research challenges. By understanding the customer's process, constraints, and goals, PCI provided a solution that met performance requirements while remaining practical, adaptable, and operator friendly.

