

PennBarry Fan Guide Specification  
Laboratory Exhaust System: Model vPlume™

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vPlume™ is a commercial lab exhaust fan that ensures a greater margin of safety by effectively dispersing unwanted exhaust, preventing re-entrainment by other ventilation systems. VPlume™ applications are several, including elementary schools and high schools.

The vPlume™ provides a higher level of safety and health by propelling contaminated effluent higher into the air stream where it becomes diluted before contaminants settle back to building envelope or ground level.

The vPlume™ features AMCA type “B” Spark resistant construction and the widest range of available nozzles in the industry. The centrifugal wheels are aluminum, non-overloading, Airfoil, robotically welded, and dynamically balanced.

#### Product Capabilities

- Flow capacity up to 7,100 CFM.

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Note to Specifier: This product specification guide is written in accordance to the Construction Specifications Institute (CSI) Master Format - 2016 Edition.

## BEGIN SECTION 23 34 23

### 1. GENERAL

#### 1.1 SUMMARY

- A. Section covers vPlume™ High Velocity Exhaust System.

#### 1.2 REFERENCE STANDARDS AND CERTIFICATIONS

- A. Air Movement and Control Association International (AMCA)
  1. 99 – Standards Handbook (2003 Edition)
  2. 204 – Standard Balance Quality & Vibration Levels for Fans
  3. 210 – Standard Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
  4. 211 – Product Rating Program – Product Rating Manual for Fan Air Performance
  5. 300 – Reverberant Room Method for Sound Testing of Fans
  6. 301- Methods for Calculating Fan Sound Ratings from Laboratory Test Data

- 7. 311 – Certified Ratings Program Product Rating Manual for Fan Sound Performance
- B. American National Standards Institute (ANSI/AIHA)
  - 1. Z9.5-2003 Laboratory Ventilation
- C. American Society of Heating, Refrigeration and Air Conditioning Engineering (ASHRAE)
  - 1. Laboratory Design Guide (2002 Edition)
- D. Underwriter Laboratories Inc. (UL/cUL)
  - 1. 705 – Standard for Power Ventilators
- E. National Fire Protection Agency (NFPA)
  - 1. NFPA 70 – National Electric Code
- F. Occupation Safety and Health Administration (OSHA)
  - 1. 1910.212 – General Requirements for Machine Guarding
  - 2. 1910.219 – General Requirements for Guarding Safe use of Mechanical Power Transmission Apparatus
- G. National Electric Manufacturer’s Association (NEMA)
  - 1. NEMA MG 1 – Motors and Generators

### 1.3 SUBMITTALS

- A. Submit in accordance with CSI Master Format 01 33 00 Submittal Procedures
- B. Exhaust Assembly Performance
  - 1. Provide air performance curves with flow, static pressure, and power
  - 2. Provide sound performance data with sound power levels in eight octave bands and A-weighted overall sound power levels.
  - 3. Provide all primary and bypass air quantities with all appropriate calculations to justify plume height. All values and calculations must be appropriately labeled and marked on an exhaust assembly diagram to ensure proper understanding of calculations.
  - 4. Provide motor electrical characteristics including current, voltage, phase, cycle, enclosure, nominal speed
  - 5. List all accessories equipped with exhaust assembly.
  - 6. List Standard features of exhaust assembly.
  - 7. Provide Dimensional drawings including weight
  - 8. Provide documentation of AMCA and UL certification

### 1.4 QUALITY ASSURANCE

- A. Exhaust Assembly Performance Certification
  - 1. Exhaust Assembly must be tested in accordance with AMCA Standard 210 and Standard 300.
  - 2. Exhaust Assemblies ratings must conform to AMCA Standards 211 and 311
  - 3. Exhaust Assembly wheels must be dynamically and statically balanced to comply with AMCA 204, fan application category BV-3 (Balance Grade G6.3)
- B. Spark Resistance
  - 1. Exhaust Assembly shall be classified for spark resistant construction in accordance with AMCA 99-0401-86
- C. Electrical
  - 1. Motors must comply with NEMA standards

### 1.5 LOGISTICS AND STARTUPS

- A. Delivery
  - 1. Units must be examined for damage upon delivery.
  - 2. Visual Damage to packaging or product must be noted upon receipt of delivery, as well as must be noted on the BOL or receipt of delivery.

- B. Handling
  - 1. Exhaust Assemblies should be handled in accordance with manufacturer's instructions and follow all relevant safety precautions in accordance with OSHA regulations.
- C. Storage
  - 1. Product must be stored in dry indoor area, protected from potential damage from weather and worksite activities.
  - 2. Long term storage should follow instructions noted in the product's Installation Operation and Maintenance Manual.

## 1.6 WARRANTY

- A. Manufacturer's warranty
  - 1. Warranty period is 12 months from date of shipment.
  - 2. See Manufacturer's warranty for specific terms & conditions.

## 2. PRODUCTS

### 2.1. MANUFACTURER

- A. Basis of Design: PennBarry, 605 Shiloh Road, Plano, TX 75074, (972) 212-4700

### 2.2. LABORATORY EXHAUST SYSTEM – PENNBARRY MODEL vPLUME™

- A. Basis of Design: PennBarry Model vPlume™
- B. General Description: Belt drive, roof-mounted commercial laboratory exhaust fan
  - 1. Flow capacity up to 7,100 CFM.
  - 2. Standard atmospheric conditions shall be used to evaluate fan performance (air density 0.075 lb/ft<sup>3</sup>) (except as otherwise specified).
  - 3. All fans shall be belt drive, AMCA arrangement 9 according to drawings.
  - 4. Each exhaust fan and plenum shall be equipped with integral lifting lugs for ease of rigging. Lifting lugs shall be placed to minimize the potential for damage during rigging.
  - 5. All fasteners exposed to corrosive exhaust shall be type 316 stainless, excluding motor and bearing fasteners.
- C. Wheel:
  - 1. Fan impeller shall be non-overloading high-efficiency centrifugal wheels, with airfoil style blades designed and tested to maximize performance.
  - 2. Fan impeller shall be constructed of aluminum in accordance with AMCA B spark resistant construction.
  - 3. Fan impeller and housing shall be statically and dynamically tested and balanced in accordance with AMCA 204-05, "Balance Quality and Vibration Levels for Fans". Fan application category shall be BV-3/6.3 and adhere to all constraints appropriate for this category.
- D. Motors and Drive:
  - 1. Fan motors shall be rated as premium efficiency, NEMA frame, 900, 1200, 1800 or 3600 rpm with a TEFC rating and a 1.15 service factor unless used with a VFD, which will result in a 1.0 service factor.
  - 2. A factory-mounted NEMA 3R disconnect switch shall be mounted to a bolted clip on the fan housing and wired to fan motor by the exhaust assembly manufacturer.
  - 3. All fans shall be belt drive, AMCA arrangement 9 and shall be sized according to the specified drawings.
  - 4. Drive belts and sheaves shall be sized for 150% of the motor horsepower. Drives shall be either adjustable or constant type.
  - 5. Fan motor shall be isolated from outside the exhaust airstream with all motor ventilation originating from ambient, outside air.
  - 6. Motor cover shall be of welded construction.

E. Fan Housing and Construction

1. Fan housing shall be constructed of heavy gauge steel with continuously welded seams. Fan housings with skip-welded seams or other joining methods are unacceptable.
2. Fan inlet shall utilize an aerodynamically designed high-efficiency inlet.
3. Fan housings fabricated of polypropylene or fiberglass, or are bolted together shall not be acceptable.
4. Fan assembly shall be AMCA B spark resistant construction to minimize the sparking potential within the effluent airstream. Other construction types are not acceptable.
5. Fan motor shall be housed outside the exhaust airstream with all motor ventilation originating from ambient, outside air.
6. Fan housing shall have a splash guard mounted behind the wheel to aid in preventing leakage into the lab.
7. Provide fan housing drain for condensate and rain water removal.
8. Provide extended lubrication lines with grease Zerks for easy motor bearing lubrication from fan assembly exterior. Zerks shall be placed on the outside of the fan housing and mounted on welded clips affixed to the fan housing.
9. A bolted oversized access door shall be supplied in the fan housing allowing for impeller inspection and removal of impeller, shaft and bearings without removal of the fan housing.
10. Fan bearings shall be L10-100k concentric lock type.
11. Fan shaft shall be 304 stainless steel with an optional 316 stainless steel.
12. Finish color is gray.

F. V-Plume High Velocity Nozzle

1. Nozzle shall be constructed of heavy gauge, continuously welded steel. Nozzles with partially welded seams or other joining methods are unacceptable. Nozzles constructed of FRP or PVC are not acceptable.
2. Exhaust nozzle shall provide a consistent minimum exit velocity of 2500 feet per minute (fpm) or greater at operating conditions.

G. Mixing/Bypass Plenum for variable exhaust systems

1. A mixing/bypass plenum shall be provided as shown on drawings. The plenum shall be equipped with a bypass air damper and rain hood with bird screen.
2. The plenum box shall have a minimum of (2) access doors to aid in installation and servicing of the system.
3. For exhaust assembly systems, a mixing/bypass plenum equipped with a bypass damper shall be provided. Mixing/bypass plenum shall be constructed of (heavy gauge steel/single wall panels that are welded together). Bypass/Mixing plenum shall be capable of supporting the fan/nozzle assembly. Bypass dampers shall be protected by a removable rain hood with bird screen constructed of heavy gauge expanded sheet metal.
4. Plenum inlet connections shall be slip fit. Located in the bottom of the plenum assembly per the Pennbarry drawings.
5. Fan isolation damper/s, either gravity backdraft or two position actuated, fabricated of aluminum (if required) shall be located below the fan in the plenum box.
6. All damper actuation and access shall be outside of the contaminated airstream.

3. EXECUTION

3.1. MANUFACTURER'S INSTRUCTION

- A. Follow all manufacturers product usage guidelines and installation instructions

3.2. EXAMINATION

- A. Examine fans upon delivery for visual check of components. Verify no visible external damage. Examine area of fan installation for non-satisfactory conditions that may cause increased maintenance or increased difficulty of installation. Notify Engineer of these conditions and correct as is necessary.
- 3.3. PREPARATION
- A. Verify Roof openings are square and fan dimensions match. Verify fan motor electrical matches building supply power.
- 3.4. INSTALLATION
- A. Follow manufacturer's recommendations as dictated in the Installation, Operations, & Maintenance Manual
- 3.5. SYSTEM STARTUP
- A. Follow manufacturer's recommendations as dictated in the Installation, Operations, & Maintenance Manual
- 3.6. MAINTENANCE
- A. Follow manufacturer's recommended schedule as specified in the Installation, Operations, & Maintenance Manual
  - B. Failure to comply with proper maintenance will void Manufacturer's Warranty

END OF SECTION 23 34 23