Clean Rooms International, Inc. Guide Specification

Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, as described in the Project Delivery Practice Guide, including MasterFormat® and SectionFormat/PageFormat®.

This section must be carefully reviewed and edited by the Architect to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the drawings. Delete all "Specifier Notes" after editing this Section.

Section 23 4133
HIGH-EFFICIENCY PARTICULATE AIR FILTRATION

Specifier Notes: This section covers Clean Rooms International (CRI) air filtration systems. Consult CRI for assistance in editing this section for the specific application.

CRI filtration systems may contribute points toward LEED™ Certification. Consult Clean Rooms International, Inc. for more information. www.cleanroomsint.com

PART 1 GENERAL

1.01 SECTION INCLUDES

Specifier Note: Delete all that do not apply. Follow through with deleting corresponding Article headings and paragraphs related to this Articles edits.

A. High-efficiency particulate air (HEPA) fan filter units.
B. Ultra-low penetration air (ULPA) fan filter units.
C. Pre-filters.
D. Final Filters.
E. Control System.
F. Terminal Diffusers.
G. Gauges.
H. Gypsum Board Ceiling Collars.
I. Duct Collar Adapter.
J. Air Conditioning Box.
K. Grilles.
L. Pilot Light.
M. Room Side Speed Control, Aerosol Port and Static Control.
N. Aerosol Injection Port, Dispersion Tube and Sample Port.
O. Insulation Blanket.
P. Room side Replaceable Motors.
Q. Power Cord.

1.02 RELATED REQUIREMENTS

A. Section 09 5714 - Special Function Ceilings – Cleanroom Gasketed Walkable Grid System.
B. Section 09 5715 - Special Function Ceilings - Cleanroom Gasketed Grid System.
C. Section 10 2219 - Demountable Plastic Partition System – Vinyl Curtain and Strip Door.
D. Section 12 3553 - Specialty Casework – Pass-through Chambers.
E. Section 21 0500 - Common Work Results for Fire Suppression: Fire protection requirements.
F. Section 23 0500 - Common Work Results for HVAC: HVAC connections.
G. Section 26 0500 - Common Works Results for Electrical: Electrical requirements.

1.03 REFERENCE STANDARDS

A. ASHRAE – Design Guide for Clean Rooms
B. IEST - Institute of Environmental Science and Technology

C. NEBB – National Environmental Balancing Bureau, Certified Professional (CP) for Cleanroom Performance Testing (CPT)
D. UL 507 – Standard for Electric Fans
E. UL 900 – Standard for Air Filter Units
F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 DEFINITIONS

A. AC – Alternating Current
B. ASHRAE – American Society of Heating, Refrigerating, and Air-Conditioning Engineers
C. BMS – Building Management System
D. CAT – Category
E. CFM – Cubic Feet per Minute
F. CofC – Certificate of Compliance
G. ECM – Electronically Controlled Motor
H. IEST RP – Institute of Environmental Science and Technology - Recommended Practice
I. FFU – Fan Filter Unit
J. FPM – Feet Per Minute
K. GS – Gel Seal (Filter)
L. HEPA - High Efficiency Particulate Air (Filter)
M. MPPS - Most Penetrating Particle Size
N. NCR – Non-Ceiling Replaceable (Filter)
O. NEBB – National Environmental Balancing Bureau
P. NEMA – The National Electrical Manufactures Association
Q. SS – Stainless Steel
R. UCC – Universal Control Card
S. UL – Underwriters Laboratory
T. ULPA – Ultra-Low Particulate Air (Filter)

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: For each type of product: Include dimensions, operating characteristics, required clearances and access, rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification, manufacturer's manuals, furnished specialties; and accessories for each model indicated.
C. Shop Drawings: For fan filter unit system indicated:
    1. Include plans, elevations, sections, details.
    2. Show filter rack assembly, dimensions, materials.
D. Samples: For each exposed product.
    1. Size: 6 inch (152 mm) by 6 inch (152 mm).
E. Product Test Reports: For each filter, include tests performed by a qualified testing agency.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of filter to include operation and maintenance manuals.
B. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.07 MAINTENANCE MATERIAL SUBMITTALS

A. Provide one complete set of filters for each fan filter unit.
    1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
B. Filters to be stored in a conditioned environment where temperatures will be maintained from 50 to 100 degrees Fahrenheit (10 to 37.77 degrees Celsius) and relative humidity that does

not exceed 95%. It is recommended that filters not be stored for a period of more than five years.

1.08 QUALITY ASSURANCE

A. If requested, the manufacturer to make available their Corporate Quality Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum of five years of documented experience.

C. Manufacturer to make available printed filter performance test results showing Certificate of Compliance.

D. Installer Qualifications: Company approved by manufacturer and trained to perform work in this section.

E. Cleanroom Air Systems: Tested and certified by a NEBB – Certified Professional (CP) for Cleanroom Performance Testing (CPT) specializing in cleanroom certification. Ensure that the certifying agency is in current and active status and in good standing with the IEST.

F. Testing agency to be NEBB certified as a Registered Cleanroom Certification Professional.

G. Standards:

1. Comply with IEST-RP-CC034.
2. Comply with IEST-RP-CC001.
3. Comply with UL 586.
4. Comply with IEST-RP-CC034.

H. Installer Qualifications: Company approved by manufacturer and trained to perform work in this section.

1.09 DELIVERY, STORAGE, AND HANDELING

A. Deliver and store products in a clean, dry environment.

B. Comply with manufacturer’s written rigging and installation instructions for unloading and moving to final installed location.

C. Handle products carefully to prevent damage, breaking, denting and scoring. Do not install damaged products.

D. Protect products from weather, dirt, dust, water, construction debris, and physical damage.

1. Retain factory-applied coverings on equipment to protect finishes during construction and remove prior to operating unit.
2. Cover unit openings before installation to prevent dirt and dust from entering inside of fan filter modules. If required to remove coverings during installation, reapply coverings over openings after unit installation and remove prior to operating unit.
3. Replace installed products damaged during construction.

1.10 WARRANTY

A. See Section 01 7800 – Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Manufacturer agrees to repair or replace Clean Rooms International, Inc. components that fail in materials or workmanship within the warranty period.

1. Warranty Period: One-year limited warranty from date of delivery.
2. Limited warranty does not cover adjacent products, improper installation, or labor.

PART 2 PRODUCTS

1. MANUFACTURERS

A. Fan Filter Units

1. Clean Rooms International, Inc.: 4939 Starr St. SE, Grand Rapids, MI 49546. Toll free: 877-380-1860. Phone: 616-452-8700. Fax: 616-452-2372. Email: sales@cleanroomsint.com

Specifier Note: Select only the Fan Filter Unit required for project.

2. SAM® Variable Speed, MicroSound NCR.
3. SAM® Variable Speed, MicroSound GS.

4. SAM® Variable Speed, MicroSound GS LI.
5. SAM® Special Series, Undersized 24 MicroSound.
6. SAM® Special Series, MicroSound Stainless Steel.
7. SAM® Special Series, Hazardous Location.
8. SAM® Special Series, RSRM.
9. SAM® Special Series, RF Reverse Flow.
10. SAM® 3-Speed, MicroSound NCR.
11. SAM® 3-Speed, MicroSound GS.
12. SAM® ECM, NCR.
13. SAM® ECM, GS.
14. SAM® ECM, GS LI
15. Sam ECM RF
16. SAM 4x4

Specifier Note: Make selection.

17. Substitutions: [Not Permitted] [See Section 01 6000 – Product Requirements]

B. Fan Filter Unit

Specifier Note: Select fan filter unit size.

1. Size: Nominal dimension of [2 foot by 2 foot (609.6mm by 609.6mm).] [2 foot by 3 foot (609.6mm by 914.4mm] [2 foot by 4 foot (609.6 by 1219.2mm).]

Specifier Note: Select stainless steel or steel module body.

2. Body: Manufactured from [20-22 gauge steel epoxy powder coated white.] [304 20-22 gauge stainless steel.]

Specifier Note: Select Prefilter condition.

3. Prefilter/Inlet Condition: [20 inch by 20 inch by 1 inch (508mm by 508mm by 25.4mm), 30 percent ASHRAE MERV 8 prefilter open to plenum.] [Duct collar (omit prefilter) [10 inch diameter collar.] [12 inch diameter collar.] [No prefilter or collar.]

Specifier Note: Select grill option and screw type.

4. Grill: [Polystyrene eggcrate grille.] [Aluminum perforated grille powder coated in white.] [Stainless steel perforated grill with stainless steel frame.] [Stainless steel grille with aluminum frame.]

   Specifier Note: Select zinc coated for aluminum grill and frame or stainless steel for stainless steel grill and frame.

   a. Grill secured with [zinc coated Philips screws.] [stainless steel Philips screws.]

Specifier Note: Delete if specifying SAM 4x4.

5. Support: Equipped with hanging tabs for attachment of seismic restraints for wire hangers at each corner.

Specifier Note: Select impeller/wheel required.

6. Impeller: Provide [variable speed alternating current backward curved impeller/wheel.] [three speed alternating current forward curved impeller/wheel.] [electronically communicated motor with forward curved impeller/wheel.]

Specifier Note: Select motor type required.

7. ECM Motor: [Constant torque (for ducted supply applications)] [Constant airflow (for plenum or open-air applications)] programmed to adjust the airflow by altering the motor RPM.

Specifier Note: Select motor voltage. 208-230V not available on the 3-Speed fan filter unit. Either 208v or 230v must be selected if requesting an ECM in that voltage.

8. Motor voltage: [115V.] [208-230V.] [277V.]

Specifier Note: Select one of the following 2 paragraphs for speed control and network controls required and select options within each paragraph.

9. Local speed control: [Variable speed control for variable speed motor.] [3-speed switch for 3-speed motor.] [Grille mounted speed control for variable speed motor in GS unit only.] [Variable speed controller or 3-speed controller shipped loose for installation by others.] [Local non-network control with digital display for EC motor.] [Local EC motor control without digital display for future network control.]
10. Network control card and CAT5 cables: [Include remote console.] [Gateway/hub for BMS (building management system by others).] [Include remote console with integrated connection gateway/hub for BMS (BACnet IP or BACnet MS/TP).]

Specifier Note: Select filter seal or gasket required and filter type required. Filter is room-side replaceable on GS models only.

11. Seals and Gaskets: Fan filter unit provided with [upstream gel seal [HEPA] [ULPA] filter kept securely in place inside fan filter body with filter retaining clamps.] [non-ceiling replaceable (NCR) [HEPA] [ULPA] filter with integrated upstream gasket.]

C. Filter Frame: Anodized extruded aluminum with sides of frame joined together.

Specifier Note: Select filter seal or gasket required.

D. Filter bypass prevention: Provide [GS upstream gel trough filled with a two-component polyurethane gel to prevent filter bypass at filter housing knife edge.] [NCR gasketed filter mechanically fastened to the fan filter unit plenum.]

E. Filter Media: Micro glass fiber type mini-pleated into closely spaced pleats with glue bead or hot melt separators. Nominal 2 inch (53mm) thick media pack, contained within 3.5 inch (88.9mm) deep frame.

F. Filter Media Pack: Sealed on all sides with a solid UL classified polyurethane sealant to form a leak-proof seal with frame.

Specifier Note: Select filter to be used.

G. Filter Media Testing: Each [HEPA] [ULPA] filter to be tested and certified to have efficiency of not less than [HEPA 99.99 percent at 0.3 um] [ULPA 99.9995 percent at MPPS], per the IEST RP for HEPA and ULPA filters Type J per IEST RP CC034.

1. Each filter to be factory scan tested to a maximum allowable leak rate of 0.01 percent per IEST RP CC034, Section 9.
2. Clean HEPA filter pressure drop to be nominal at published values per CofC. See Article 1.08 QUALITY ASSURANCE.

2.02 PERFORMANCE REQUIREMENTS

A. ASHRAE 62.1: Reference to applicable requirements.

B. Comply with UL 900 – Standard for Air Filters.

C. Comply with UL 507 – Standard for Electric Fans.

D. Filter labels to have the following information: Tested efficiency, tested airflow, initial resistance at tested airflow, serial number, part number, filter type according filter manufacturer.

E. Fan filter unit to operate at Clean Rooms International, Inc. published CFM.

2.03 FINISHES

Specifier Note: Select finish.

A. Fan Filter Unit Finish: [White powder coated steel.] [304 stainless steel.]

2.05 ACCESSORIES

A. Each fan filter unit to include:

Specifier Note: Select one of the following three paragraphs and the size required.

1. Ducted inlet adapter, [10 inch (254mm)] [12 inch (304.8mm)] diameter supplied as scheduled.
2. Side load prefilter frame [10 inch (254mm)] [12 inch (304.8mm)] diameter.
3. Top load adaptor [10 inch (254mm)] [12 inch (304.8mm)] diameter.

Specifier Note: Select integrated or remote.

4. Injection Port: [Integrated aerosol injection port and sample port.] [Remote aerosol injection port and sample port.]

Specifier Note: Select indicator required.

5. GS Style red pilot light, factory mounted in grille frame [to indicate power to motor.] [to indicate power to motor and air flow.]

Specifier Note: Select motor indicator required.

6. Remote mounted NCR style red pilot light, [to indicate power to motor.] [to indicate power to motor and air flow.]
7. SAMLink Control System to control multiple fan filter modules.
8. 1-1/2 inch insulation blanket.
9. NEMA 5-15P 8 foot (2438.4mm) long power cord for 110-120V only.

Specifier Note: GS style only.

10. Room side replaceable motor.
11. Fan Filter Unit to include a gypsum board adaptor if installed in a drywall ceiling.
    a. Finish: [White powder coated.] [Stainless steel.]

Specifier Note: Select grill type required.

12. Grill: [Polystyrene eggcrate grille.] [Powder coated white aluminum perforated grill.] [Stainless steel perforated grill and stainless steel frame.] [Stainless steel grill with aluminum frame.] Note: Zinc coated Phillip screws typical except for all stainless steel grills and frames which require stainless steel screws.

Specifier Note: Select gauge mounting requirements.

13. Magnehelic gauge [flush mounted in fan filter unit plenum.] [shipped loose with port in plenum] [port installed in plenum with no gauge.]

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.
B. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
C. Verify that filed measurements are as shown on the drawings.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF FAN FILTER UNITS

A. Install in accordance with manufacturer's instructions.
B. Reference drawings for size(s) and locations of fan filter units.
C. Position each fan filter unit with clearance for normal service and maintenance. Anchor frames to substrate.
D. Install units in position to prevent passage of unfiltered air.
E. Do not operate systems until filters (temporary or permanent) are in place. Replace temporary filters that were used during construction and testing with new, clean pre filters.
F. Coordinate filter installations with duct and air-handling unit installations.

3.03 INSTALLATION OF CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.
B. Connect control wiring between pressure sensors and Direct Digital Control (DDC) system.
C. Tests and Inspections:
    1. Perform (HEPA or ULPA) filter leak test of the installed and operating system to verify:
        a. Filters have not been damaged.
        b. Filters have been installed properly.
        c. There are no leaks in the fluid-seal to fan filter unit knife edge or gasket.
        d. There are no leaks in the mounting frame or between the mounting frame and the housing, which would compromise the function of the system.

2. With fan filter unit operating, a challenge aerosol (Poly-alpha-olefin PAO) is injected upstream of the (HEPA or ULPA) filters.
   a. To perform and accurate filter leak test, it is necessary that the challenge aerosol concentration be uniform over the entire upstream face of the filter, seals, and supporting structure being tested. It is also necessary that the aerosol concentration remain constant throughout the entire duration of the test. An upstream sample port must be provided in the system that will allow an accurate determination of the challenge concentration.
3. Equipment required:
   a. Aerosol Generator – Device that can aerosolize a thermally (not all are thermal) generated poly-dispersed particle medium for filter integrity testing. Aerosol to have a mass median diameter of approximately 0.3 micrometer.
   b. Aerosol Photometer – Light scattering mass concentration indicator. Instruments of this type must have a threshold sensitivity of at least 10-3 micrograms per liter of 0.3 micrometer diameter particles and capable of measuring concentrations over a range of 105 times the threshold sensitivity. Unit to be furnished with either a logarithmic or linear readout and a sampling flow rate of 0.0 +/- 0.1 CFM (0.0 +/- 0.00283 cubic meter/minute). Calibration to be within one year and in accordance with the manufacturer's specifications.
4. Procedure:
   a. Introduce the challenge aerosol into the air upstream of the HEPA or ULPA filter(s) in a manner that will produce a uniform challenge concentration. Measure the upstream concentration at a point immediately upstream of the filters under test.
   b. With nozzle of probe held not more than 1 inch (25.4mm) from the area being tested, scan the entire downstream side of the HEPA or ULPA filter(s) and the perimeter of each filter pack by passing photometer probe in slightly overlapping strokes at a traverse rate of not more than 2 inches (50.8mm) per second. Separate passes to be made around entire periphery of filter, along bond between filter pack and frame, and around seal between filter and device per IEST RP CC034 or NEBB procedural Standards.

D. Designated leaks are deemed to have occurred where there is a reading greater than 0.0001 (0.10 percent) of the upstream challenge aerosol concentration for scanning HEPA or ULPA filters.
E. Air filter will be considered defective if filter does not pass tests and inspections.
F. Prepare test and inspection reports.
G. Refer to patching requirements per IEST RP CC034 or NEBB procedural Standards.

3.03 CLEANING

A. After completing system installation and testing, adjusting, and balancing air-handling and air distribution systems, clean filter housings and install new pre filter media.

3.04 PROTECTION

A. Protect installed products and accessories from damage during installation, general construction activities, and until turnover of facility at substantial completion.

END OF SECTION