

**SECTION 23 40 00**  
**HVAC AIR CLEANING DEVICES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Air filters for heating, ventilating and air conditioning.
- B. Definitions: Refer to ASHRAE Standard 52.1 for definitions of face velocity, net effective filtering area, media velocity, resistance pressure drop), atmospheric dust spot efficiency and dust-holding capacity. ASHRAE Standard 52.1 measures arrestance, dust spot efficiency and dust holding capacity of filters.
- C. Refer to ASHRAE Standard 52.2 for definitions of MERV (Minimum Efficiency Reporting Value), PSE (Particle Size Efficiency) and particle size ranges for each MERV number. ASHRAE Standard 52.2 measures particle size efficiency (PSE).

**1.2 RELATED WORK**

- A. General mechanical requirements and items, which are common to more than one section of Division 23: Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- B. Filter housing and racks: Section 23 73 00, PACKAGED, OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS.

**1.3 QUALITY ASSURANCE**

- A. Air Filter Performance Report for Extended Surface Filters:
  - 1. Submit a test report for each Grade of filter being offered. The report shall not be more than three (3) years old and prepared by using test equipment, method and duct section as specified by ASHRAE Standards 52.1 and 52.2 for type filter under test and acceptable to Resident Engineer, indicating that filters comply with the requirements of this specification. Test for 150 m/min (500 fpm) will be accepted for lower velocity rated filters provided the test report of an independent testing laboratory complies with all the requirements of this specification.
  - 3. Guarantee Performance: The manufacturer shall supply ASHRAE 52.2 test reports on each filter type submitted. Any filter supplied will be required to maintain the minimum efficiency shown on the ASHRAE Standard 52.2 report throughout the time the filter is in service. Within the first 6-12 weeks of service a filter may be pulled out of service and sent to an independent laboratory for ASHRAE Standard 52.2 testing for initial efficiency only. If this filter fails to meet the minimum level of efficiency shown in the previously submitted reports, the filter manufacturer/distributor shall take

- back all filters and refund the owner all monies paid for the filters, cost of installation, cost of freight and cost of testing.
- B. Filter Warranty for Extended Surface Filters: Guarantee the filters against leakage, blow-outs, and other deficiencies during their normal useful life, up to the time that the filter reaches the final pressure drop. Defective filters shall be replaced at no cost to the Government.
  - C. Comply with UL Standard 586 for flame test.
  - D. Nameplates: Each filter shall bear a label or name plate indicating manufacturer's name, filter size, rated efficiency, and UL classification.

#### 1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
  - 1. Extended surface filters.
  - 2. HEPA filters.
  - 3. Magnehelic gages.
- C. Air Filter performance reports.
- D. Suppliers warranty.

#### 1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.
- B. American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc. (ASHRAE):
  - 52.1-92R.....Gravimetric and Dust-Spot procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
  - 52.2-2007.....Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
- C. American Society of Mechanical Engineers (ASME):
  - NQA-1-2008.....Quality Assurance Requirements for Nuclear Facilities Applications
- D. Underwriters Laboratories, Inc. (UL):
  - 586;Amendment 20 March 2000    High-Efficiency, Particulate, Air Filter Units
  - 900;Revision 15 July 2009     Test Performance of Air Filter Units

**PART 2 - PRODUCTS****2.1 REPLACEMENT FILTER ELEMENTS TO BE FURNISHED**

- A. To allow temporary use of HVAC systems for testing and in accordance with Paragraph, TEMPORARY USE OF MECHANICAL AND ELECTRICAL SYSTEMS in Section 01 00 00, GENERAL REQUIREMENTS, provide one complete set of spare filters to the Resident Engineer.
- B. The Resident Engineer will direct whether these additional filters will either be installed as replacements for dirty units or turned over to VA for future use as replacements.

**2.2 EXTENDED SURFACE AIR FILTERS**

- A. Use factory assembled air filters of the extended surface type with supported or non-supported cartridges for removal of particulate matter in air conditioning, heating and ventilating systems. Filter units shall be of the extended surface type fabricated for disposal when the dust-load limit is reached as indicated by maximum (final) pressure drop.
- B. Filter Classification: UL approved Class 2 conforming to UL Standard 900.
- C. Filter Grades, Percent, Average ASHRAE Efficiency and Controlled Containment:

Table 2.2C

Filter Grades				
MERV Value ASHRAE 52.2	Application	Dust-Spot Efficiency ASHRAE 52.1	Particle Size	Thickness /Type
7	Pre-Filter	25 to 30%	3 to 10 Microns	50 mm (2-inch) Throwaway
11	After-Filter	60 to 65%	1 to 3 Microns	150 mm (6-inch) Rigid Cartridge
14	After-Filter	90 to 95%	0.3 to 1 Micron	300 mm (12-inch) Rigid Cartridge

**D. Filter Media:**

- 1. MERV 11 and 14 Supported (Rigid Pleated) Type: Media shall be composed of high density glass fibers or other suitable fibers. Fastening methods used to maintain pleat shape, (metal backing or aluminum separators) shall be sealed in a proper enclosing frame to insure no air leakage for life of filter. Staples and stays are prohibited.

2. MERV 7 (Pleated) Type: Media shall be composed of synthetic/natural fibers. Media shall maintain uniform pleat shape and stability for proper air flow and maximum dust loading. The media frame shall be constructed of aluminized steel. Bond the pleated media pack on all four edges to insure no air leakage for the life of the filter.

Staples and stays are prohibited.

- E. Filter Efficiency and Arrestance: Efficiency and arrestance of filters shall be determined in accordance with ASHRAE Standard 52.1, and MERV value in accordance with ASHRAE Standard 52.2.
- F. Maximum initial resistance, recommended change over pressure drop, and maximum recommended final resistance, PA (inches of water), for each filter cartridge when operated at 150 m/min (500 feet per minute) face velocity shall be as specified in Table 2.2.F:

Table 2.2.F

<b>Filter Initial and Final Resistance</b>			
	Initial Resistance	Maximum Recommended Change Over Pressure Drop	Maximum Final Resistance
MERV 7 (2-inch deep)	78 (0.31)	156 (0.62)	250 (1.00)
MERV 11 (12-inch deep)	60 (0.24)	120 (0.48)	375 (1.50)
MERV 14 (12-inch deep)	170 (0.68)	340 (1.36)	375 (1.50)

- G. Side Servicing Housings (Inside Packaged Outdoor Central Station Air Handler):
1. Minimum 1.6 mm (16 Gauge) galvanized steel, or aluminum, completely factory assembled with upstream and downstream flanges for connection into the duct system. Furnish housing length sufficient to provide for fully extended operating filter elements.
  2. Access doors: Double wall insulated, located on one side of the housing; with continuous gasketing on the perimeter and positive locking devices. //Provide access doors on both sides only when required as shown on drawings.// Design doors to withstand a minimum positive/negative 1.0 kPa (4 inch WG) static pressure. Furnish access doors that are the full size of the housing.
  3. Filter slide channels: Channels shall incorporate a positive-sealing gasket material to seal the top and bottom of the filter cartridge frames to prevent bypass. Provide factory installed gasketing to prevent leakage between cartridges, and between cartridges and doors.
- H. Equipment Identification: Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

**2.3 INSTRUMENTATION**

- A. Magnehelic Differential Pressure Filter Gages: Nominal 100 mm (four inch) diameter, zero to 500 Pa (zero to two inch water gage), three inch for HEPA) range, //except for MERV 17 HEPA Final Filters, where the range shall be zero to 750 Pa (zero to three inch water gage)// Gauges shall be flush-mounted in aluminum panel board, complete with static tips, copper or aluminum tubing, and accessory items to provide zero adjustment.
- B. DDC static (differential) air pressure measuring station. Refer to Specification Section 23 09 23 DIRECT DIGITAL CONTROL SYSTEM FOR HVAC
- C. Provide one DDC sensor across each extended surface filter. Provide Petcocks for each gauge or sensor.
- D. Provide one common filter gauge for two-stage filter banks with isolation valves to allow differential pressure measurement.

**2.4 HVAC EQUIPMENT FACTORY FILTERS**

- A. Manufacturer standard filters within fabricated packaged equipment shall meet these specifications and shall adhere to industry standard.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Install supports, filters and gages in accordance with manufacturer's instructions.

**3.2 START-UP AND TEMPORARY USE**

- A. Clean and vacuum air handling units and plenums prior to starting air handling systems.
- B. Install or deliver replacement filter units as directed by the Resident Engineer.

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