

# Quiet-Duct Clean-Flow™ Silencers

## Section 15000 Specifications

### 1.01 General

- A. Furnish and install "Clean-Flow" (rectangular) silencers of the types and sizes shown on the plans and/or listed in the schedule. Silencers shall be the product of IAC Acoustics. Any specification change must be submitted in writing and approved by the Architect/Engineer, in writing, at least 10 days prior to the bid due-date.

### 2.01 Materials

- A. Outer casings of rectangular silencers shall be made of 22 gauge type #G-90 lock-former-quality galvanized steel.
- B. Interior partitions for rectangular silencers shall be not less than 26 gauge type #G-90 galvanized lock-former-quality perforated steel.
- C. Filler material shall be inorganic glass fiber of a proper density to obtain the specified acoustic performance and be packed under not less than 5% compression to eliminate voids due to vibration and settling. Material shall be inert, vermin- and moisture-proof. Filler material shall be totally encapsulated and sealed with polymeric film of an appropriate thickness. The encapsulated fill material shall be separated from the interior perforated baffles by means of a noncombustible, erosion resistant, factory-installed, acoustic stand-off. It shall not be acceptable to omit the acoustic stand-off and try to compensate for its absence by means of corrugated baffles.
- D. Combustion ratings for the silencer acoustic fill shall be not greater than the following when tested to ASTM E 84, NFPA Standard 255, or UL No. 723:

Flamespread Classification .....	20
Smoke Development Rating.....	20

### 3.01 Construction

- A. Units shall be constructed in accordance with the ASHRAE Guide recommendations for high pressure duct work. Seams shall be lock formed and mastic filled. Rectangular casing seams shall be in the corners of the silencer shell to provide maximum unit strength and rigidity. Interior partitions shall be fabricated from single-piece, margin-perforated sheets and shall have die-formed entrance and exit shapes so as to provide the maximum aerodynamic efficiency and minimum self-noise characteristics in the sound attenuator. Blunt noses or squared off partitions will not be accepted.
- B. Attachment of the interior partitions to the casing shall be by means of an interlocking track assembly. Tracks shall be solid galvanized steel and shall be welded to the outer casing. Attachment of the interior partitions to the tracks shall be such that a minimum of 4 thicknesses of metal exist at this location. The track assembly shall stiffen the exterior casing, provide a reinforced attachment detail for the interior partitions, and shall maintain a uniform airspace width along

the length of the silencer for consistent aerodynamic and acoustic performance. Interior partitions shall be additionally secured to the outer casing with welded nose clips at both ends of the sound attenuator.

- C. Sound attenuating units shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge from inside to outside the casing. Airtight construction shall be provided by use of a duct sealing compound on the job-site material and labor furnished by the contractor.

### 4.01 Acoustic Performance

- A. All silencer ratings shall be determined in a duct-to-reverberant room test facility which provides for airflow in both directions through the test silencer in accordance with ASTM Specification E477-99. The test facility shall be NVLAP accredited for the ASTM E477-99 test standard. Data from a non-accredited laboratory will not be acceptable. The test set-up and procedure shall be such that all effects due to end reflection, directivity, flanking transmission, standing waves and test chamber sound absorption are eliminated.

Acoustic ratings shall include Dynamic Insertion Loss (DIL) and Self-Noise (SN) Power Levels both for FORWARD FLOW (air and noise in same direction) and REVERSE FLOW (air and noise in opposite directions) with airflow of at least 2000 fpm entering face velocity. Data for rectangular and tubular type silencers shall be presented for tests conducted using silencers no smaller than the following cross-sections:

Rectangular, inch: 24 x 24, 24 x 30, or 24 x 36  
Tubular, inch: 12, 24, 36 and 48

### 5.01 Aerodynamic Performance

- A. Static pressure loss of silencers shall not exceed those listed in the silencer schedule as the airflow indicates. Airflow measurements shall be made in accordance with ASTM specification E477-99 and applicable portions of ASME, AMCA, and ADC airflow test codes. Tests shall be reported on the identical units for which acoustic data is presented.

### 6.01 Certification

- A. With submittals, the manufacturer shall supply certified test data on Dynamic Insertion Loss, Self-Noise Power Levels, and Aerodynamic Performance for Reverse and Forward Flow test conditions. Test data shall be for a standard product. All rating tests shall be conducted in the same facility, shall utilize the same silencer, and shall be open to inspection upon request from the Architect/Engineer.

### 7.01 Duct Transitions

- A. When transitions are required to adapt silencer dimensions to connecting duct work they shall be furnished by the installing contractor.

# Quiet-Duct Clean-Flow™ Silencers

## Type: HLFM

### Forward & Reverse Flow Ratings



The IAC Type HLFM Clean-Flow Quiet-Duct Silencers provide improved low frequency attenuation with medium range pressure loss for air handling systems requiring a high degree of cleanliness and hygiene. The non-erosive, non-pregnable, “Clean Flow” features make these silencers ideal for hospital, laboratory and clean-room type applications.

All HLFM Silencers have been rated with procedures certified in accordance with applicable portions of ASTM E477. All Dynamic Insertion Loss and Self-Noise Acoustic Performance Data were obtained in IAC’s Aero-Acoustic Laboratory using the duct-to-room reverberant test facility **with air flowing through the silencers.**

Type HLFM Silencers provide improved low frequency attenuation for medium velocity HVAC systems. The acoustic fill is totally encapsulated to prevent erosion or entrainment of particulate. A honeycomb acoustic stand-off provides additional protection and performance.

### Designating Silencers

**Model:** 5HLFM 24 x 18

**Type:** HLFM **Length:** 5’ **Width:** 24” **Height:** 18”

**Table I: Dynamic Insertion Loss (DIL) Ratings: Forward (+) / Reverse (-) Flow**

IAC Model	Octave Band	1	2	3	4	5	6	7	8
	Hz	63	125	250	500	1K	2K	4K	8K
	Face Velocity, fpm	Dynamic Insertion Loss, dB							
3HLFM	-2000	6	8	11	15	15	14	13	8
	-1000	6	8	11	15	15	13	12	8
	0	6	7	11	16	15	12	11	8
	1000	4	7	10	15	14	13	11	8
	2000	4	7	10	14	13	12	11	8
5HLFM	-2000	9	14	21	23	22	16	13	10
	-1000	8	13	21	23	23	16	13	10
	0	9	12	22	23	23	16	14	10
	1000	8	12	20	23	22	16	13	10
	2000	7	11	19	22	22	16	13	9
7HLFM	-2000	11	16	23	29	29	19	18	13
	-1000	11	16	24	29	29	19	19	14
	0	11	16	24	29	28	20	19	14
	1000	11	16	23	28	27	19	18	13
	2000	11	15	23	28	27	21	18	14
10HLFM	-2000	14	21	28	31	33	23	22	16
	-1000	14	21	28	31	32	24	23	17
	0	15	21	28	32	31	25	23	17
	1000	15	21	27	30	32	25	23	16
	2000	13	20	27	30	32	25	23	16



(+) Forward Flow / (-) Reverse Flow. Aero-acoustic performance data based on NVLAP accredited laboratory tests conducted in strict accordance with ASTM E477-99. Contact IAC if attenuation in excess of 50 dB is required.

**Table II: Weights & Measures**

Nominal Length	W/In H/In	6	6	6	6	6	6	12	12	12	12	12	12	24	24	24
3'	Wt/lb.	18	21	25	29	31	35	35	42	50	57	61	70	54	64	74
5'		29	35	42	47	52	59	58	70	83	94	104	117	89	104	121
7'		41	49	59	67	75	83	82	98	118	134	150	166	125	146	175
10'		59	70	84	95	N/A	N/A	117	140	167	190	N/A	N/A	178	209	250

  

Nominal Length	W/In H/In	24	24	24	36	36	36	36	36	36	48	48	48	48	48	48
3'	Wt/lb.	82	92	102	89	106	124	139	153	172	108	128	148	164	184	204
5'		136	152	157	147	174	204	230	256	274	178	208	242	272	304	314
7'		196	218	240	207	244	293	330	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10'		280	N/A	N/A	295	349	417	470	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Table III: Aerodynamic Performance**

IAC Model	L/Ft	Static Pressure Drop, i.w.g.															
HLFM	3'	0.05	0.07	0.09	0.12	0.15	0.19	0.23	0.27	0.32	0.37	0.42	0.48	0.55	0.61	0.68	0.76
	5'	0.05	0.07	0.10	0.13	0.16	0.20	0.24	0.29	0.34	0.39	0.45	0.51	0.57	0.64	0.72	0.79
	7'	0.05	0.07	0.10	0.13	0.17	0.21	0.25	0.30	0.35	0.41	0.47	0.53	0.60	0.67	0.75	0.83
	10'	0.06	0.08	0.12	0.15	0.18	0.24	0.29	0.34	0.40	0.46	0.53	0.60	0.68	0.76	0.85	0.94
Silencer Face Velocity, fpm		500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000

**Table IV: Self-Noise Power Levels, dB re: 10-12 Watts**

IAC Model	Octave Band	1	2	3	4	5	6	7	8
	Hz	63	125	250	500	1K	2K	4K	8K
	Silencer Face Velocity, fpm								
HLFM (all sizes)	-3000	64	62	64	66	65	64	66	62
	-2000	53	50	54	56	56	59	58	51
	-1000	42	40	43	45	47	46	37	27
	1000	47	34	36	35	40	37	27	20
	2000	54	52	58	56	51	56	55	50
	3000	68	64	64	63	61	63	66	63

(+) Forward Flow / (-) Reverse Flow. Aero-acoustic performance data based on NVLAP accredited laboratory tests conducted in strict accordance with ASTM E477-99.

**TAKE NOTE!**

- Silencer Face Area is the cross-sectional area at the silencer entrance
- Face Velocity is the CFM of airflow divided by the Face Area (in sq. ft.)
- Pressure Drop for any velocity can be calculated from this equation:  
 $PD = (Actual\ FV/Catalog\ FV)^2 \times (Catalog\ PD)$
- Self Noise values shown are for a four-square-foot face area silencer
- For each doubling of the face area add 3 dB to the self-noise values listed
- For each halving of the face area subtract 3 dB from the self-noise values listed
- Weights and measures are listed for limited number of available sizes