Climate Control Solutions
BARD MANUFACTURING CO., INC.
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THE WALL-MOUNT™ ENERGY RECOVERY VENTILATOR TECHNICAL GUIDE

5 Models
Ventilation Rate — 200 to 450 CFM
Heat Recovery Efficiency Up to 82%

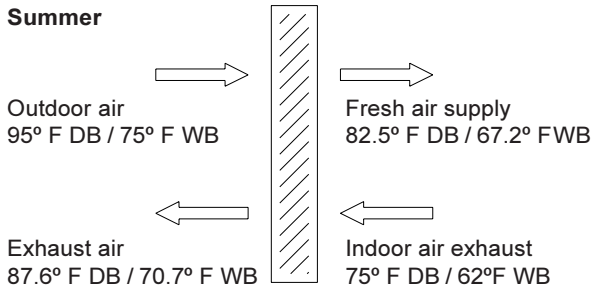
The Wall-Mount Energy Recovery Ventilator is designed to provide treated outside air to individual occupied comfort zones to meet the new American Society of Heating Refrigeration & Air Conditioning Engineers (ASHRAE 62.1) I.A.Q. (Indoor Air Quality) standards. The growing concerns over the quality of indoor air in confined commercial spaces, such as offices, classrooms, manufacturing areas, portable or semipermanent (relocatable) structures has resulted in ASHRAE changing the recommended quantities of fresh air. As an example, classroom requirements have increased from 5 CFM to 15 CFM per student, and laboratories and training shops are 20 CFM.

This increase, results in dramatic changes in indoor air quality levels in most confined spaces. The occupants benefit from a healthier, fresher environment more conducive to creative work or learning. However, the energy impact of three times more ventilation air in locations where there is a significant heating and cooling season, can double operating costs of mechanical heating and cooling equipment. (Example: A portable classroom in Columbia, South Carolina with 22 adults (27 children•) would have an increased heating load from 25,288 BTU to 36,420 BTU per hour loss and a cooling load increase from 34,955 BTU to 45,031 BTU per hour load.)

To reduce the energy impact of this ventilation requirement, the Wall-Mount Energy Recovery Ventilator is used to recover a significant portion of the energy being exhausted with the stale indoor air. (Example: The previous heating load for 15 CFM per person would be reduced to approximately 23,597 BTU per hour and cooling load reduced to 35,499 BTU per hour, resulting in the need for a smaller air conditioner or heat pump. The improved air quality can be achieved with only a small increase in heating and cooling cost since the ventilation provided through the Wall-Mount Energy Recovery Ventilator will recover up to 82% of the waste heat leaving the conditioned space through the exhausted air stream in heating and reject 67% of the sensible and latent heat gain entering the conditioned space through the fresh air stream in cooling. The sensible and high latent removal capability of the Wall-Mount Energy Recovery Ventilator will in some applications allow for the down sizing of a wall-mounted air conditioner or heat pump needed for a specific cooling load.

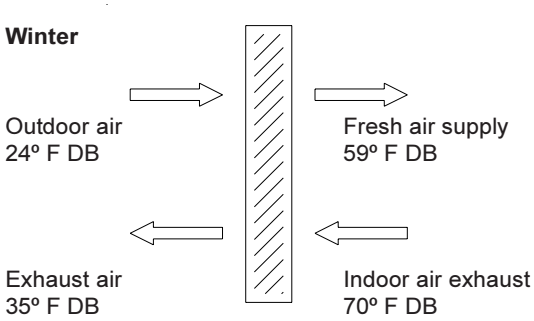
TYPICAL WINTER AND SUMMER LOAD REDUCTIONS

(WERV-A3C and WERV-C3C)



Cooling equipment design size reduction:

1. Total BTUH Cooling =
   4.5 x CFM x (OD enthalpy - ID enthalpy) x WERV eff 9,921 BTUH = 4.5 x 325 x (38.5 - 27.9) x .64
2. BTUH sensible cooling =
   1.08 x CFM x (OD DB temp - ID DB temp) x WERV eff 4,492 BTUH = 1.08 x 325 x (95 - 75) x .64



Heating equipment design size reduction:

BTUH sensible heating =

1.08 x CFM x (ID DB temp - OD DB temp) x WERV eff.

12,271 BTU/Hr = 1.08 x 325 x (70 - 24) x .76

The Wall-Mount Energy Recovery Ventilator will meet the fresh air requirements for any space requiring ventilation rates of 200 to 450 CFM.

The Wall-Mount Energy Recovery Ventilator pulls exhaust air from the conditioned space such as a classroom, office or manufacturing area. Preconditioned outdoor fresh air is then provided directly to the conventional wall-mount air conditioner or heat pump system reducing much of the latent and sensible load on the cooling or heating unit. This preconditioning significantly reduces the cooling and heating operating cost of the HVAC equipment and provides significantly improved humidity control, thus delivering an adequate amount of fresh air to provide significantly improved indoor air quality. It can operate independently of the heating or cooling equipment. See Figure 1 (at the right).

The Wall-Mount Energy Recovery Ventilator is designed as a single package unit, which can be ordered factory installed in a Bard WA or WH Wall-mount unit or it can be ordered separately and field installed in the new series Bard Wall-mount units on site. The package consists of a unique rotary Energy Recovery Cassette that can be easily removed for cleaning and maintenance. It has two heat transfer wheels (except WERV-A2B has one heat transfer wheel) for efficient heat transfer. The heat transfer wheels used are a permanently bonded dry desiccant coating for total heat recovery. Ventilation is accomplished with 2 blower/motor assemblies each consisting of a drive motor and dual blowers for maximum ventilation at low sound levels. Air is exhausted at the same rate that fresh air is brought into the structure thereby not pressuring the building. See Figures 2 and 3. Intake and exhaust airflow rates are independently adjustable (except WERV-A2B) to meet specific building pressurization requirements.

FIGURE 1
AIR FLOW WITH
ENERGY RECOVERY VENTILATOR

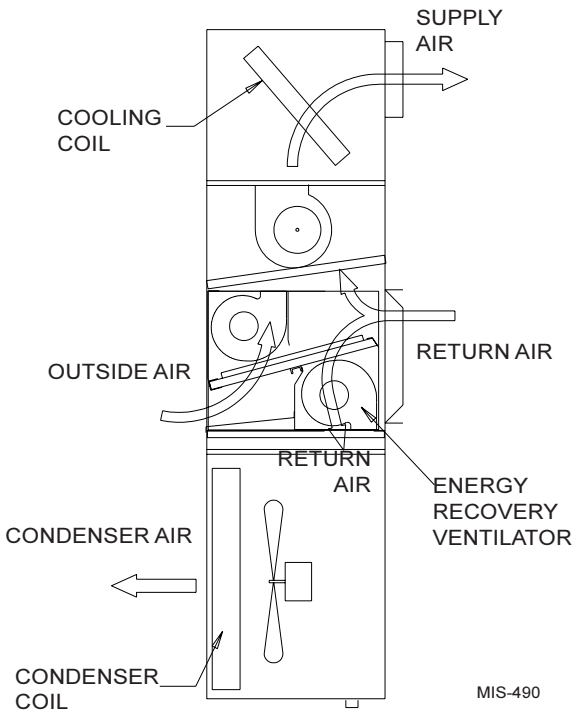


FIGURE 2
ENERGY RECOVERY CASSETTE

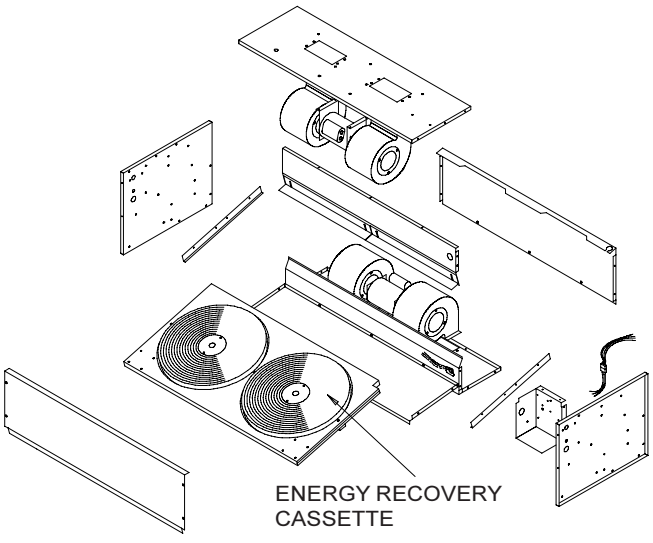
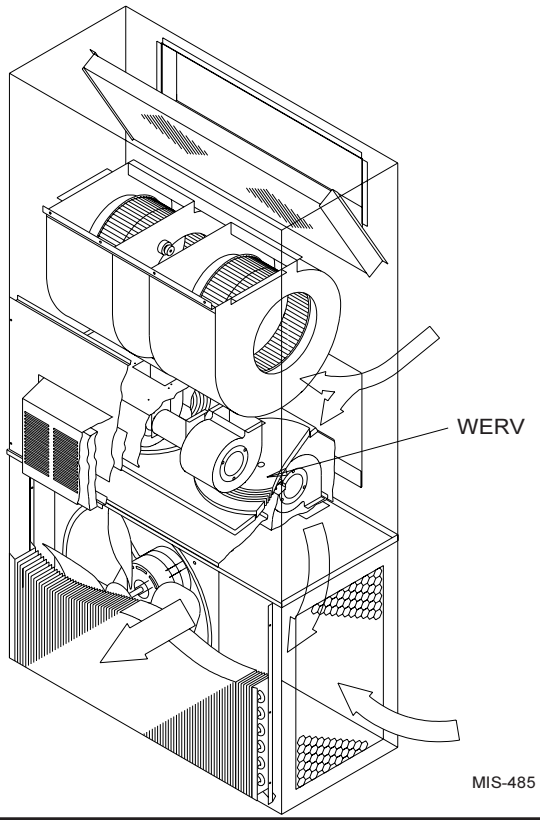


FIGURE 3
TYPICAL WALL-MOUNT WITH WERV INSTALLED



WERV-A2B
ENERGY RECOVERY PERFORMANCE & APPLICATION DATA

SUMMER COOLING PERFORMANCE (Indoor Design Conditions 75° DB / 62° WB)

Ambient O.D.		VENTILATION RATE — 250 CFM 62% EFFICIENCY						VENTILATION RATE — 225 CFM 63% EFFICIENCY						VENTILATION RATE — 200 CFM 64% EFFICIENCY					
DB/ WB	F	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL
	75	11925	8100	1325	7394	5022	822	10727	7287	3441	6758	4591	2168	9540	6480	3060	6010	4082	1928
105	70	8100	8100	0	5022	5022	0	7287	7287	0	4591	4591	0	6480	6480	0	1082	4082	0
	65	8100	8100	0	5022	5022	0	7287	7287	0	4591	4591	0	6480	6480	0	4082	4082	0
	80	17550	6750	10800	10881	4185	6696	15788	6072	9716	9946	3826	6121	14040	5400	8640	8845	3402	5443
	75	11925	6750	5175	7394	4185	3209	10727	6072	4655	6758	3826	2933	9540	5400	4140	6010	3402	2608
100	70	6863	6750	113	4255	4185	70	6173	6072	101	3889	3826	64	5490	5400	90	3458	3402	56
	65	6750	6750	0	4185	4185	0	6072	6072	0	3826	3826	0	5400	5400	0	3402	3402	0
	60	6750	6750	0	4185	4185	0	6072	6072	0	3826	3826	0	5400	5400	0	3402	3402	0
	80	17550	5400	12150	10881	3348	7533	15788	4858	10930	9946	3060	6886	14040	4320	9720	8845	2722	6124
	75	11925	5400	6525	7394	3348	4046	10727	4858	5870	6758	3060	3698	9540	4320	5220	6010	2722	3289
95	70	6863	5400	1463	4255	3348	907	6173	4858	1315	3889	3060	829	5490	4320	1170	3458	2722	737
	65	5400	5400	0	3348	3348	0	4858	4858	0	3060	3060	0	4320	4320	0	2722	2722	0
	60	5400	5400	0	3348	3348	0	4858	4858	0	3060	3060	0	4320	4320	0	2722	2722	0
	80	17550	4050	13500	10881	2511	8370	15788	3643	12145	9946	2295	7651	14040	3240	10800	8845	2041	6804
	75	11925	4050	7875	7394	2511	4883	10727	3643	7084	6758	2295	4463	9540	3240	6300	6010	2041	3969
90	70	6863	4050	2813	4255	2511	1744	6173	3643	2530	3889	2295	1594	5490	3240	2250	3458	2041	1417
	65	4050	4050	0	2511	2511	0	3643	3643	0	2295	2295	0	3240	3240	0	2041	2041	0
	60	4050	4050	0	2511	2511	0	3643	3643	0	2295	2295	0	3240	3240	0	2041	2041	0
	80	17550	2700	14850	10881	1674	9207	15788	2429	13359	9946	1530	8416	14040	2160	11880	8845	1361	7484
	75	11925	2700	9225	7394	1674	5720	10727	2429	8298	6758	1530	5228	9540	2160	7380	6010	1361	4649
85	70	6683	2700	4163	4255	1674	2581	6173	2429	3744	3889	1530	2359	5490	2160	3330	3458	1361	2098
	65	2700	2700	0	1674	1674	0	2429	2429	0	1530	1530	0	2160	2160	0	1361	1361	0
	60	2700	2700	0	1674	1674	0	2429	2429	0	1530	1530	0	2160	2160	0	1361	1361	0
	75	11925	1350	10575	7394	837	6557	10727	1214	9513	6758	765	5993	9540	1080	8460	6010	680	5330
80	70	6863	1350	5513	4255	837	3418	6173	1214	4959	3889	765	3124	5490	1080	4410	3458	680	2778
	65	2363	1350	1013	1465	837	628	2125	1214	911	1339	765	574	1890	1080	810	1190	680	510
	60	1350	1350	0	837	837	0	1214	1214	0	765	765	0	1080	1080	0	680	680	0
	70	6863	0	6863	4255	0	4255	6173	0	6173	3889	0	3889	5490	0	5490	3458	0	3458
75	65	2363	0	2363	1465	0	1465	2125	0	2125	1339	0	1339	1890	0	1890	1190	0	1190
	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

WINTER HEATING PERFORMANCE (Indoor Design Conditions 70°F DB)

Ambient O.D.	VENTILATION RATE					
	250 CFM 74% EFF.		225 CFM 75% EFF.		200 CFM 76% EFF.	
DB F	WVL	WHR	WVL	WHR	WVL	WHR
65	1350	999	1214	911	1080	810
60	270	1998	2429	1822	2160	1620
55	4050	2997	3643	2733	3240	2430
50	5400	3996	4858	3643	4320	3240
45	6750	4995	6072	4554	5400	4050
40	8100	5994	7287	5465	6480	4860
35	9450	6993	8501	6376	7560	5670
30	10800	7992	9716	7287	8640	6480
25	12150	8991	10930	8198	9720	7290
20	13500	9990	12145	9108	10800	8100
15	14850	10989	13359	10019	11880	8910

LEGEND

VLT – Ventilation Load - Total
VLS – Ventilation Load - Sensible
VLL – Ventilation Load - Latent
HRT – Heat Recovery - Total
HRS – Heat Recovery - Sensible
HRL – Heat Recovery - Latent
WVL – Winter Ventilation Load
WHR – Winter Heat Recovery

Note: Sensible performance only is shown for winter application.

WERV-A3C and WERV-C3C
ENERGY RECOVERY PERFORMANCE & APPLICATION DATA

SUMMER COOLING PERFORMANCE (Indoor Design Conditions 75° DB / 62° WB)

Ambient O.D.		VENTILATION RATE 400 CFM 63% EFFICIENCY						VENTILATION RATE 325 CFM 64% EFFICIENCY						VENTILATION RATE 250 CFM 65% EFFICIENCY					
DB/ WB	F	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL
105	75	19080	12960	6120	23030	8164	3855	15502	10530	4972	9921	6739	3182	11925	8100	3825	7751	5265	2486
	70	12960	12960	0	8164	8164	0	10530	10530	0	6739	6739	0	8100	8100	0	5265	5265	0
	65	12960	12960	0	8164	8164	0	10530	10530	0	6739	6739	0	8100	8100	0	5265	5265	0
100	80	28080	10800	17280	17690	6804	10886	22815	8775	14040	14601	5616	8985	17550	6750	10800	11407	4387	7019
	75	19080	10800	8280	12020	6804	5216	15502	8775	6727	9921	5616	4305	11925	6750	5175	7751	4387	3363
	70	10980	10800	180	6917	6804	113	8921	8775	146	5709	5616	93	6862	6750	112	4460	4387	73
	65	10800	10800	0	6804	6804	0	8775	8775	0	5616	5616	0	6750	6750	0	4387	4387	0
	60	10800	10800	0	6804	6804	0	8775	8775	0	5616	5616	0	6750	6750	0	4387	4387	0
95	80	28080	8640	19440	17690	5443	12247	22815	7020	15795	14601	4492	10108	17550	5400	12150	11407	3510	7897
	75	19080	8640	10440	12020	5443	6577	15502	7020	8482	9921	4492	5428	11925	5400	6525	7751	3510	4241
	70	10980	8640	2340	6917	5443	1474	8921	7020	1901	5709	4492	1216	6862	5400	1462	4460	3510	950
	65	8640	8640	0	5443	5443	0	7020	7020	0	4492	4492	0	5400	5400	0	3510	3510	0
	60	8640	8640	0	5443	5443	0	7020	7020	0	4492	4492	0	5400	5400	0	3510	3510	0
90	80	28080	6480	21600	17690	4082	13608	22815	5265	17550	14601	3369	11232	17550	4050	13500	11407	2632	8774
	75	19080	6480	12600	12020	4082	7938	15502	5265	10237	9921	3369	6552	11925	4050	7875	7751	2632	5118
	70	10980	6480	4500	6917	4082	2835	8921	5265	3656	5709	3369	2340	6862	4050	2812	4460	2632	1828
	65	6480	6480	0	4082	4082	0	5265	5265	0	3369	3369	0	4050	4050	0	2632	2632	0
	60	6480	6480	0	4082	4082	0	5265	5265	0	3369	3369	0	4050	4050	0	2632	2632	0
85	80	28080	4320	23760	17690	2721	14968	22815	3510	19305	14601	2246	12335	17550	2700	14850	11407	1755	9652
	75	19080	4320	14760	1202	2721	9298	15502	3510	11992	9921	2246	7675	11925	2700	9225	7751	1755	5996
	70	10980	4320	6660	6917	2721	4195	8921	3510	5411	5709	2246	3463	6862	2700	4162	4460	1755	2705
	65	4320	4320	0	2721	2721	0	3510	3510	0	2246	2246	0	2700	2700	0	1755	1755	0
	60	4320	4320	0	2721	2721	0	3510	3510	0	2246	2246	0	2700	2700	0	1755	1755	0
80	75	19080	2160	16920	12020	1360	10659	15502	1755	13747	9921	1123	8798	11925	1350	10575	7751	877	6873
	70	10980	2160	8820	6917	1360	5556	8921	1755	7166	5709	1123	4586	6862	1350	5512	4460	877	3583
	65	3780	2160	1620	2381	1360	1020	3071	1755	1316	1965	1123	842	2362	1350	1012	1535	877	658
	60	2160	2160	0	1360	1360	0	1755	1755	0	1123	1123	0	1350	1350	0	877	877	0
75	70	10980	0	10980	6917	0	6917	8921	0	8921	5709	0	5709	6862	0	6862	4460	0	4460
	65	3780	0	3780	2381	0	2381	3071	0	3071	1965	0	1965	2362	0	2362	1535	0	1535
	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

WINTER HEATING PERFORMANCE
(Indoor Design Conditions 70°F DB)

Ambient O.D.	VENTILATION RATE					
	400 CFM 75% EFF.		325 CFM 76% EFF.		250 CFM 77% EFF.	
DB F	WVL	WHR	WVL	WHR	WVL	WHR
65	2160	1620	1755	1333	1350	1039
60	4320	3240	3510	2667	2700	2079
55	6480	4860	5265	4001	4050	3118
50	8640	6480	7020	5335	5400	4158
45	10800	8100	8775	6669	6750	5197
40	12960	9720	10530	8002	8100	6237
35	15120	411340	12285	9336	9450	7276
30	17280	12960	14040	10670	1080	8316
25	19440	14580	15795	12004	12150	9355
20	21600	16200	17550	13338	13500	10395
15	23760	17820	19305	14671	14850	11434

LEGEND

VLT – Ventilation Load - Total
VLS – Ventilation Load - Sensible
VLL – Ventilation Load - Latent
HRT – Heat Recovery - Total
HRS – Heat Recovery - Sensible
HRL – Heat Recovery - Latent
WVL – Winter Ventilation Load
WHR – Winter Heat Recovery

Note: Sensible performance only is shown for winter application.

WERV-A5C and WERV-C5C
ENERGY RECOVERY PERFORMANCE & APPLICATION DATA

SUMMER COOLING PERFORMANCE (Indoor Design Conditions 75° DB / 62° WB)

Ambient O.D.		VENTILATION RATE — 450 CFM 65% EFFICIENCY						VENTILATION RATE — 375 CFM 66% EFFICIENCY						VENTILATION RATE — 300 CFM 67% EFFICIENCY					
DB/ WB	F	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL	VLT	VLS	VLL	HRT	HRS	HRL
105	75	21465	14580	6884	13952	9477	4475	17887	12150	5737	11805	8018	3786	14310	9720	4590	9587	6512	3075
	70	14580	14580	0	9477	9477	0	12150	12150	0	8018	8018	0	9720	9720	0	6512	6512	0
	65	14580	14580	0	9477	9477	0	12150	12150	0	8018	8018	0	9720	9720	0	6512	6512	0
100	80	31590	12150	19440	20533	7897	12635	26325	10125	16200	17374	6682	10692	21060	8100	12960	14110	5427	8683
	75	21465	12150	9314	13952	7897	6054	17887	10125	7762	11805	6682	5123	14310	8100	6210	9587	5427	4160
	70	12352	12150	202	8029	7897	131	10293	10125	168	6793	6682	111	8235	8100	135	5517	5427	90
	65	12150	12150	0	7897	7897	0	10125	10125	0	6682	6682	0	8100	8100	0	5427	5427	0
	60	12150	12150	0	7897	7897	0	10125	10125	0	6682	6682	0	8100	8100	0	5427	5427	0
95	80	31590	9720	21870	20533	6318	14215	26325	8100	18225	17374	5345	12028	21060	6480	14580	14110	4341	9768
	75	21465	9720	11744	13952	6318	7634	17887	8100	9787	11805	5345	6459	14310	6480	7830	9587	4341	5246
	70	12352	9720	2632	8029	6318	1711	10293	8100	2193	6793	5345	1447	8235	6480	1755	5517	4341	1175
	65	9720	9720	0	6318	6318	0	8100	8100	0	5345	5345	0	6480	6480	0	4341	4341	0
	60	9720	9720	0	6318	6318	0	8100	8100	0	5345	5345	0	6480	6480	0	4341	4341	0
90	80	31590	7290	24300	20533	4738	15794	26325	6075	20250	17374	4009	13365	21060	4860	16200	1400	3256	10854
	75	21465	7290	14175	13952	4738	9213	17887	6075	11812	11805	4009	7796	14310	4860	9450	9587	3256	6331
	70	12352	7290	5062	8029	4738	3290	10293	6075	4218	6793	4009	2784	8235	4860	3375	5517	3256	2261
	65	7290	7290	0	4738	4738	0	6075	6075	0	4009	4009	0	4860	4860	0	3256	3256	0
	60	7290	7290	0	4738	4738	0	6075	6075	0	4009	4009	0	4860	4860	0	3256	3256	0
85	80	31590	4860	26730	20533	3159	17374	26325	4050	22275	17374	2672	14701	21060	3240	17820	14110	2170	11939
	75	21465	4860	16605	13952	3159	10793	17887	4050	13837	11805	2672	9132	14310	3240	11070	9587	2170	7416
	70	12352	4860	7492	8029	3159	4870	10293	4050	6243	6793	2672	4120	8235	3240	4995	5517	2170	3346
	65	4860	4860	0	3159	3159	0	4050	4050	0	2672	2672	0	3240	3240	0	2170	2170	0
	60	4860	4860	0	3159	3159	0	4050	4050	0	2672	2672	0	3240	3240	0	2170	2170	0
80	75	21465	2430	19035	13952	1579	12372	17887	2025	15862	11805	1336	10469	14310	1620	12690	9587	1085	8502
	70	12352	2430	9922	8029	1579	6449	10293	2025	8268	6793	1336	5457	8235	1620	6615	5517	1085	4432
	65	4252	2430	1822	2764	1579	1184	3543	2025	1518	2338	1336	1002	2835	1620	1215	1899	1085	814
	60	2430	2430	0	1579	1579	0	2025	2025	0	1336	1336	0	1620	1620	0	1085	1085	0
75	70	12352	0	12352	8029	0	8029	10293	0	10293	6793	0	6793	8235	0	8235	5517	0	5517
	65	4252	0	4252	2764	0	2764	3543	0	3543	2338	0	2338	2835	0	2835	1899	0	1899
	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

WINTER HEATING PERFORMANCE (Indoor Design Conditions 70°F DB)

Ambient O.D.	VENTILATION RATE					
	450 CFM 80% EFF.		375 CFM 81% EFF.		300 CFM 82% EFF.	
DB F	WVL	WHR	WVL	WHR	WVL	WHR
65	2430	1944	2025	1640	1620	1328
60	4860	3888	4050	3280	3240	2656
55	7290	5832	6075	4920	4860	3985
50	9720	7776	8100	6561	6480	5313
45	12150	9720	10125	8201	8100	6642
40	14580	11664	12150	9841	9720	7970
35	17010	13608	14175	11481	11340	9298
30	19440	15552	16200	13122	12960	10627
25	21870	17496	18225	14762	14580	11955
20	24300	19440	50250	16402	16200	13284
15	26730	21384	22275	18042	17820	14612

LEGEND

VLT – Ventilation Load - Total
VLS – Ventilation Load - Sensible
VLL – Ventilation Load - Latent
HRT – Heat Recovery - Total
HRS – Heat Recovery - Sensible
HRL – Heat Recovery - Latent
WVL – Winter Ventilation Load
WHR – Winter Heat Recovery

Note: Sensible performance only is shown for winter application.

Product Selection

1. To select a Wall-Mount Energy Recovery Ventilator, the following information about the structure and local design conditions will be needed. (See ASHRAE or ACCA manuals.)

   A. 1. Location: City _____ State____

   2. Description of structure_____

   3. Number of occupants_____

   B. Summer Design Conditions

   1. Outdoor: DB_____ ºF WB _____ ºF

   2. Indoor: DB 75ºF WB 62ºF

   C. Winter Design Conditions

   1. Outdoor: DB____ ºF

   2. Indoor: DB 70ºF

   D. Ventilation Requirements of Structure

   1. Occupants: Number _____ x 15 =_____ CFM

   2. Other ventilation requirements_____CFM

   3. Total ventilation required_____ CFM

2. Calculate the heating and cooling loads in BTUH for the structure and internal gains. It is recommended that one of the following procedures be used. Air Conditioning Contractors of America (ACCA) Manual "N" or "J" or American Society of Heating, Refrigeration and Air Conditioning Engineers Incorporated (ASHRAE). Note: Do not include the ventilation requirements at this time.

   A. Structure Heat Gain (Summer Load)

   1. Sensible heat gain _____ BTUH

   2. Latent heat gain _____ BTUH

   3. Total heat gain _____ BTUH

   B. Structure Heat Loss (Winter Load)

   1. Total heat loss _____BTUH

Example: Of WERV Selection

In this example, a Wall-Mount Energy Recovery Ventilator will be selected for a 24 x 40 foot relocatable classroom in Columbia, South Carolina. The classroom will have 22 occupants and a ventilation requirement of 15 CFM per person.

A. 1. Location: City Columbia State SC

2. Description of structure 20 x 40 ft relocatable classroom

3. Number of occupants 22 people

B. Summer Design Conditions

1. Outdoor: DB 95 ºF WB 75 ºF

2. Indoor: DB 75ºF WB 62ºF

C. Winter Design Conditions

1. Outdoor: DB 24 ºF

2. Indoor: DB 70ºF

D. Ventilation Requirements of Structure

1. Occupants: Number 22 x 15 = 330 CFM

2. Other ventilation requirements 0 CFM

3. Total ventilation required 330 CFM

2. Calculate the heating and cooling loads using Air Conditioning Contractors of America (ACCA) Manual "N" with the appliance load adjusted for lighting and infiltration adjusted for classroom traffic. No ventilation included at this time.

A. Structure Heat Gain (Summer Load)

1. Sensible heat gain 24,140 BTUH

2. Latent heat gain 5,777 BTUH

3. Total heat gain 29,917 BTUH

B. Structure Heat Loss (Winter Load)

1. Total heat loss 19,722 BTUH

3. Using the Wall-Mount Energy Recovery Ventilator Application Data Table, tentatively select an Energy Recovery Ventilator that will meet or exceed the ventilation rate CFM indicated on line 1.D.3 on the preceding page. This will be the amount of ventilation air that will need to be conditioned as it enters the structure. Using the outdoor DB and WB for summer, line 1.B.1, and winter line 1.C.1, design conditions determine the total ventilation loads for the structure and the total heat recovery capability of the Wall-Mount Energy Recovery Ventilator. *NOTE: As you use these tables, interpolation may be required.*

A. Model of WERV selected _____

Ventilation rate selected _____ CFM

B. Ventilation Load (Summer)

1. VLS: Sensible _____ BTUH

2. VLL: Latent _____ BTUH

C. Heat Recovery Ventilator (Summer)

HRS: Sensible _____ BTUH

HRL: Latent _____ BTUH

D. Ventilation Load (Winter)

WVL: Sensible _____ BTUH

E. Heat Recovery Ventilator (Winter)

WHR: Sensible _____ BTUH

4. Determine the total structure load including the ventilation, then select the Bard Wall-Mount unit to be used with the Wall-Mount Energy Recovery Ventilator.

A. Total Structure and Ventilation Heat Gain Load

1. Sensible Load

Structure line 2.A.1 _____ BTUH

Ventilation + line 3.B.1 _____ BTUH

Heat Rejected – line 3.C.1 _____ BTUH

= Total Sensible Cooling _____ BTUH

2. Latent Load

Structure line 2.A.2 _____ BTUH

Ventilation + line 3.B.2 _____ BTUH

Heat Rejected – line 3.C.2 _____ BTUH

= Total Latent Cooling _____ BTUH

3. Using the Wall-Mount Energy Recovery Ventilator Application Data Tables, a WERV-A3C Energy Recovery Ventilator was selected to meet or exceed the ventilation rate of 330 CFM indicated on line 1.D.3 on preceding page. This unit operating on medium speed blower will deliver 325 CFM (99%) of ventilation air that will need to be conditioned as it enters the structure. Using the outdoor DB and WB for summer, line 1.B.1, and winter, line 1.C.1, design conditions, interpolation of the capacity table for the WERV-A3C at 325 CFM was used to determine the total ventilation loads for the structure and the total heat recovery capability of the Wall-Mount Energy Recovery Ventilator.

A. Model of WERV selected WERV-A3C

Ventilation rate selected 325 CFM

B. Ventilation Load (Summer)

1. VLS: Sensible 7,020 BTUH

2. VLL: Latent 8,482 BTUH

C. Heat Recovery Ventilator (Summer)

HRS: Sensible 4,492 BTUH

HRL: Latent 5,428 BTUH

D. Ventilation Load (Winter)

WVL: Sensible 16,146 BTUH

E. Heat Recovery Ventilator (Winter)

WHR: Sensible 12,271 BTUH

4. Determine the total structure load including the ventilation load above, then select the Bard Wall-Mount unit to be used with the Wall-Mount Energy Recovery Ventilator.

A. Total Structure and Ventilation Heat Gain Load

1. Sensible Load

Structure line 2.A.1 24,140 BTUH

Ventilation + line 3.B.1 7,020 BTUH

Heat Rejected – line 3.C.1 4,492 BTUH

= Total Sensible Cooling 26,668 BTUH

2. Latent Load

Structure line 2.A.2 5,777 BTUH

Ventilation + line 3.B.2 8,482 BTUH

Heat Rejected – line 3.C.2 5,428 BTUH

= Total Latent Cooling 8,831 BTUH

3. Total Cooling Heat Gain

Total Sensible line 4.A.(1) 26,668 BTUH

Total Latent + line 4.A.(2) 8,831 BTUH

Unit Capacity

= Total Cooling Load 35,499 BTUH

B. Total Heating Loss

1. Total Structure and Ventilation Heat Loss Load

Structure	line 2.B.1	_____	BTUH
Ventilation	+ line 3.D.1	_____	BTUH
Heat Recovered	– line 3.E.1	_____	BTUH
Unit Capacity = Total Heating Load		_____	BTUH

5. Air conditioning unit selection, use the data in steps 1,3 and 4 above. Use the outdoor DB, and an indoor DB 80°F and WB 67°F (this is the average mixed air temperature entering the evaporator after the WERV) for summer to select an air conditioner or heat pump from the manufacturer's specification sheet. ***Cooling only*** units should be selected so that its sensible capacity is not less that total sensible load, line 4.A.2 on preceding page or not more than 115% of this calculated load (allowing for the standard steps in capacity provided by the manufacturer's product line). In addition, the corresponding latent capacity of the unit should not be less than the calculate latent load, line 4.A.2. In order to take full advantage of the heat pump during the heating season, the heat pump can be oversized for cooling by up to 25% if this practice produces a lower balance point and noticeable reduction in annual operating costs.

   Heat pump units, which provide heating and cooling, shall be sized to provide the lowest possible balance point (when operating in the heating mode) without exceeding the limits of the cooling requirements explained above. Auxiliary heat should be sized to make up for any deficiency in output when the heat pump unit cannot provide full heating at the design condition, line 1.C.1 on preceding page.

   A. Cooling Equipment Summary

   Make: Bard Type_____ SEER_____ HSPF____

   Model Wall-Mount _____

   Sensible Cooling _____ BTUH

   Latent Cooling _____ BTUH

   Total Cooling _____ BTUH

   Unit Indoor Airflow _____ CFM

   Heating Output _____ BTUH

   Auxiliary Heating Output _____ BTUH

   Model WERV *_____ Vent CFM_____

NOTE: If WERV selected in step # above does not match with Wall-Mount unit selected in step 5, repeat steps 3 through 5 with the WERV that does match.

B. Total Heating Loss

1. Total Structure and Ventilation Heat Loss Load

Structure	line 2.B.1	19,722	BTUH
Ventilation	+ line 3.D.1	16,146	BTUH
Heat Recovered	– line 3.E.1	12,271	BTUH
Unit Capacity = Total Heating Load		23,597	BTUH

5. Air conditioning unit selection using the data in steps 1, 3 and 4 above. Use the outdoor DB and an indoor DB 80º F and WB 67º F (this is the average mixed air temperature entering the evaporator after the WERV) for cooling and outdoor DB and a 70º F DB indoors for heating. A heat pump was selected from manufacturer's specification sheet using total cooling sensible load, line 4.A.1., latent load, line 4.A.2. and full heating at the design condition, line 1.C.1. above.

   A. Cooling Equipment Summary

   Make: Bard Type ASHP SEER 10 HSPF 6

   Model Wall-Mount WH361-A10RW4XX0

   Sensible Cooling 26,800 BTUH

   Latent Cooling 8,800 BTUH

   Total Cooling 35,600 BTUH

   Unit Indoor Airflow 1,100 CFM

   Heating Output 20,900 BTUH

   Auxiliary Heating Output 17,065 BTUH

   Model WERV* WERV-A3C Vent CFM 325

Equations

1. Total BTUH Cooling =
   4.5 x CFM x (OD enthalpy – ID enthalpy) x WERV Eff.

2. BTUH Sensible Cooling =
   1.08 x CFM x (OD DB temp – ID DB temp) x WERV Eff.

3. BTUH Sensible Heating =
   1.08 x CFM x (ID DB temp – ID OD temp) x WERV Eff.

Engineered Features

- Meets IAQ needs up to 450 CFM ventilation rates.
- Heat Recovery Efficiencies of up to 82% heating and 67% cooling.
- The internally mounted Energy Recovery Cassette can be factory or field installed.
- The rotating energy wheels provide sensible and latent heat transfer during both summer and winter conditions.
- The moisture is transferred in the vapor phase.
- The Energy Recovery Cassette has a three speed blower to allow the selection of ventilation rates. WERV-3 and WERV-5 models have independent selection of intake and exhaust rates.

Cabinet Construction

- Fully insulated 20 gauge galvanized steel.

Product Benefits

- Meets IAQ needs at a low sound level.
- Allows for smaller equipment sizing to meet heating and cooling loads — better humidity control.
- Lower peak loads.
- Lower equipment maintenance and reduced operational costs.
- No separate ventilation system required.

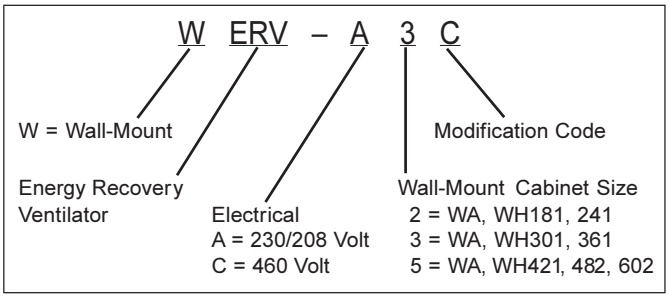
Specifications

1. The Energy Recovery Ventilator shall be designed as an integral part of the air conditioning and heat pump system and shall provide a minimum efficiency of _____% during air conditioning design conditions and_____% efficiency during heating design conditions. The recovery system shall provide total energy recovery (both sensible and latent heat).
2. The ventilation system shall be capable of providing up to _____ CFM of fresh air. The exhaust air rate shall be independently adjustable from the fresh air rate, so building pressure conditions can be regulated according to Engineer's specifications.
3. The Energy Recovery Ventilator shall be ARI Certified to ARI Standard 1060-2005 for Air-to-Air Energy Recovery Ventilators.
4. The energy transfer material shall be polymer with permanently bonded silica jell dry desiccant. The energy transfer media shall be cleanable by washing with detergent and warm water without a measurable degradation of heat transfer performance. The energy transfer wheel shall be provided with a stainless steel rim and spokes.
5. The energy transfer wheel shall be designed to last a minimum of 10 years under normal use in classroom applications.
6. The energy transfer materials must meet the flame and smoke spread rating requirements established by Underwriters Laboratories for air conditioning systems.
7. The energy transfer wheel shall be driven by a 24 pole, synchronous speed motor with permanently lubricated sealed ball bearings. They shall be equipped with a plug-in type connector for ease or removal of the heat transfer cassette for cleaning and servicing.
8. The energy transfer wheel shall be designed with a permanently lubricated, oil filled, bronze bearing and a stainless steel shaft.
9. The energy recovery system shall have a pile type perimeter seal to prevent bypass air flow around the energy transfer wheel and to aid in energy transfer.
10. The Energy Recovery Ventilator System must be designed to be suitable for field retrofit installation and ease of replacement without rendering the air conditioning system inoperable if the energy recovery system is temporarily removed for cleaning or servicing.

Electrical Data

Model	Voltage	Amps	Control Voltage
WERV-A2B	230/208	2.2	24V
WERV-A3C	230/208	2.2	24V
WERV-C2C	460	1.2	24V
WERV-C3C	460	1.2	24V
WERV-A5C	230/208	2.2	24V
WERV-C5C	460	1.2	24V

Nomenclature



Limited Warranty

ENERGY RECOVERY VENTILATOR "WERV" SERIES

Bard Manufacturing Company, Inc. Bryan, Ohio 43506 warrants to you, the original purchaser, that the "Energy Recovery Ventilator" will be free from defects in materials and workmanship when used under normal conditions.

Duration of Warranty
Our warranty and all implied warranties are limited to defects arising during periods shown in the following table:

Items Covered	Length of Warranty
All components excluding those items listed in Item 3 below	5 years
Energy Transfer Wheels	5 years

Proof Of Purchase

You must be able to show us the date on which you purchased this product when you make a claim under this warranty. Your owner's registration card filed with us or your dealer's invoice, bill of sale or similar document is sufficient. If you can not show us the actual date of purchase, the time periods in this warrant will start on the date that we shipped you unit from the factory.

What This Warranty Does Not Cover

1. Alterations not approved by Bard; improper installation, repairs or servicing; or improper parts or accessories not supplied by Bard.
2. Misuse or failure to follow instructions (including failure to perform preventative maintenance) or limitations on the rating plate; operation in a corrosive atmosphere.
3. Parts that must be replaced periodically (such as filters, mist eliminator, belts, pile seals, etc.).
4. Improper electrical supply (such as low voltage, transients and power interruption).
5. Cost of service call at installation sight to diagnose causes of trouble, labor to replace defective component or transportation costs for replacement parts.
6. Consequential damages resulting in any malfunction. Some states do not allow limitations on consequential damages, so the above limitations may not apply to you.

What We Will Do About A Defect

Bard will either repair or replace the defective part only. The warranty for the repaired or replaced part will last only for the remainder of the warranty period for the original part.

Service

If your product requires service, you should contact the contractor who installed the unit. If you don't know who that is, you should contact a competent, qualified contractor.

If your contractor does not repair your product properly, please write us directly. Include all pertinent information including model and service number. Address your letter to:

Technical Service Department
Bard Manufacturing Company, Inc.
P. O. Box 607
Bryan, Ohio 43506

Only Warranty

This is the only warranty we make. There are no other expressed warranties. All implied warranties are limited to the duration of the applicable written warranty made above.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation or exclusion may not apply to you.

Other Rights

This warranty gives you specific legal rights and you may have other rights which vary from state to state.