
Energy Savings Calculations for ECM 14: Infiltration Reductions

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Putnam County, NY
 Energy and Demand Savings Summary
 Measure ID: 14
 Measure Name: Infiltration Reductions
 Measure Location:
 Engineers:

Item	Units	Mail	Cour	Brwn	Court/1812	Mail	Golf	IOC	Gov2	Gov3	Kern	Koehler/Sr	Putnam/Sr	Fam/1808	Hwy1	Hwy2	Hwy3	Hwy4	BOE	Law	Summary	
		Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	Savings	
Electricity																						
Energy On-Peak	kWh	121	96	49	63	22	109	100	109	32	258	-109	52	242	83	-42	121	81	119	-47	2,476	
Energy Off-Peak	kWh																					0
Energy Total	kWh	121	96	49	63	22	109	100	109	32	258	-109	52	242	83	-42	121	81	119	-47	2,476	
Demand On-Peak, Monthly	kW																					0.0
Demand On-Peak, Annual	kW																					0.0
Demand Off-Peak, Monthly	kW																					0.0
Demand Off-Peak, Annual	kW																					0.0
Fossil Fuel																						
Natural Gas (MG)	MG	591	328			565			302		798	630		600					299	216	4,610	
Liquid Propane Gas (LPG)	Gallons																					0
Steam	Mdths																					0
Fuel Oil #2	Gallons			173	280		333	741		67			162		199	133	563	281			2,977	
Fuel Oil #4	Gallons																					0
Fuel Oil #6	Gallons																					0
Solar Value Stack	\$																					0
Water																						
Water Savings	kGallons																					0
Sewer																						
Sewer Savings	kGallons																					0

Putnam County, NY
Sheriff's Department/Correctional Facility
Infiltration Reductions

TABLE 3 Weather Data for Danbury, CT												
Operating Hours												
Month	Avg Temp (deg. F)	M.C. WB (deg. F)	M.C. WB Fluctuation	(1:00-1:00 Hours)	(9:00-10:00 Hours)	(17:00-18:00 Hours)	7000 Hrs	Use One-Peak Hrs.	Use One-Peak Peak Lbs.	Use One-Peak Peak Lbs.	Use One-Peak Peak Hrs.	
Code	A	B	C	D	E	F	G	H	I	J	K	L
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0
75 to 80	77.5	0.0	0.0	0	0	0	0	0	0	0	0	0
70 to 75	72.5	0.0	0.0	0	0	0	0	0	0	0	0	0
65 to 70	67.5	0.0	0.0	0	0	0	0	0	0	0	0	0
60 to 65	62.5	0.0	0.0	0	0	0	0	0	0	0	0	0
Heating												
35 to 60	57.5	48.4	0.0	287	248	295	830	830	0	0	0	0
30 to 35	47.5	41.8	0.0	209	208	211	579	579	0	0	0	0
25 to 30	42.5	35.2	0.0	200	212	237	704	704	0	0	0	0
20 to 25	37.5	28.6	0.0	245	212	237	704	704	0	0	0	0
15 to 20	32.5	22.0	0.0	340	192	244	766	766	0	0	0	0
10 to 15	27.5	15.4	0.0	296	163	248	647	647	0	0	0	0
5 to 10	22.5	8.8	0.0	200	95	132	433	433	0	0	0	0
0 to 5	17.5	2.2	0.0	159	68	79	306	306	0	0	0	0
15 to 20	17.5	17.5	0.0	45	57	48	150	150	0	0	0	0
10 to 15	12.5	12.5	0.0	38	20	21	83	83	0	0	0	0
5 to 10	7.5	7.5	0.0	33	16	17	58	58	0	0	0	0
0 to 5	2.5	2.5	0.0	3	3	3	13	13	0	0	0	0
10 to 15	17.5	17.5	0.0	0	0	0	0	0	0	0	0	0
15 to 20	22.5	22.5	0.0	0	0	0	0	0	0	0	0	0
20 to 25	27.5	27.5	0.0	0	0	0	0	0	0	0	0	0
25 to 30	32.5	32.5	0.0	0	0	0	0	0	0	0	0	0
30 to 35	37.5	37.5	0.0	0	0	0	0	0	0	0	0	0
35 to 40	42.5	42.5	0.0	0	0	0	0	0	0	0	0	0
40 to 45	47.5	47.5	0.0	0	0	0	0	0	0	0	0	0
45 to 50	52.5	52.5	0.0	0	0	0	0	0	0	0	0	0
50 to 55	57.5	57.5	0.0	0	0	0	0	0	0	0	0	0
55 to 60	62.5	62.5	0.0	0	0	0	0	0	0	0	0	0
60 to 65	67.5	67.5	0.0	0	0	0	0	0	0	0	0	0
65 to 70	72.5	72.5	0.0	0	0	0	0	0	0	0	0	0
70 to 75	77.5	77.5	0.0	0	0	0	0	0	0	0	0	0
75 to 80	82.5	82.5	0.0	0	0	0	0	0	0	0	0	0
80 to 85	87.5	87.5	0.0	0	0	0	0	0	0	0	0	0
85 to 90	92.5	92.5	0.0	0	0	0	0	0	0	0	0	0
90 to 95	97.5	97.5	0.0	0	0	0	0	0	0	0	0	0
95 to 100	102.5	102.5	0.0	0	0	0	0	0	0	0	0	0
100 to 105	107.5	107.5	0.0	0	0	0	0	0	0	0	0	0

Savings											
Cell Ref	Value	Unit	CELL Description								
P43	0.00	0.00	Beam Sheriff's Office Door								
P44	1.00	1 (UT)	Beam Sheriff's Office Door								
P45	2.00	2 (UT)	Beam Sheriff's Office Door								
P46	3.00	3 (UT)	Beam Sheriff's Office Door								
P47	0.00	0.00	Side Entrance Doors								
P48	0.00	0.00	Side Entrance Doors								
P49	0.00	0.00	Side Entrance Doors								
P50	0.00	0.00	Side Entrance Doors								
P51	0.00	0.00	Side Entrance Doors								
P52	0.00	0.00	Side Entrance Doors								
P53	0.00	0.00	Side Entrance Doors								
P54	0.00	0.00	Side Entrance Doors								
P55	0.00	0.00	Side Entrance Doors								
P56	0.00	0.00	Side Entrance Doors								
P57	0.00	0.00	Side Entrance Doors								
P58	0.00	0.00	Side Entrance Doors								
P59	0.00	0.00	Side Entrance Doors								
P60	0.00	0.00	Side Entrance Doors								
P61	0.00	0.00	Side Entrance Doors								
P62	0.00	0.00	Side Entrance Doors								
P63	0.00	0.00	Side Entrance Doors								
P64	0.00	0.00	Side Entrance Doors								
P66	0.00	0.00	Combination of all Types								
P67	70.1%	70.1%	Combination of all Types								
P68	3.52 COP	3.52 COP	Combination of all Types								
P69	100.0%	100.0%	Combination of all Types								
P70	100.0%	100.0%	Combination of all Types								
P71	100.0%	100.0%	Combination of all Types								
P72	25.10%	25.10%	Combination of all Types								

Average Space Temperatures - After Implementation of EMS											
Cell Ref	Value	Unit	Description								
Q76	72.0	Heating	average temperature for all mean								
Q77	73.0	Heating	average temperature for all mean								

Putnam County, NY
New Putnam County Courthouse
Infiltration Reduction

TMY-3 Weather Data for Danbury, CT												
Operating Hours												
Amb. Temp Bin deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology	D	E	F	G	H	I	J	K	L
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0
75 to 80	77.5	0.3	0.0	35	216	108	359	359	0	0	0	0
70 to 75	72.5	62.4	0.0	83	267	174	524	524	0	0	0	0
65 to 70	67.5	59.5	0.0	221	316	251	798	798	0	0	0	0
60 to 65	62.5	54.9	0.0	279	289	344	912	912	0	0	0	0
Heating												
55 to 60	57.5	48.4	0.0	257	248	295	830	830	0	0	0	0
50 to 55	52.5	41.8	0.0	288	211	278	778	778	0	0	0	0
45 to 50	47.5	34.1	0.0	201	148	201	550	550	0	0	0	0
40 to 45	42.5	28.6	0.0	245	212	232	704	704	0	0	0	0
35 to 40	37.5	33.3	0.0	330	192	244	766	766	0	0	0	0
30 to 35	32.5	29.6	0.0	236	163	248	647	647	0	0	0	0
25 to 30	27.5	24.1	0.0	206	95	132	433	433	0	0	0	0
20 to 25	22.5	21.6	0.0	159	68	79	306	306	0	0	0	0
15 to 20	17.5	16.9	0.0	67	51	73	191	191	0	0	0	0
10 to 15	12.5	10.5	0.0	45	27	48	150	150	0	0	0	0
5 to 10	7.5	6.4	0.0	23	20	37	119	119	0	0	0	0
0 to 5	2.5	1.0	0.0	8	8	21	63	63	0	0	0	0
10 to 5	7.5	0.0	0.0	3	0	0	23	23	0	0	0	0
5 to 10	7.5	0.0	0.0	3	0	0	23	23	0	0	0	0
0 to 5	2.5	0.0	0.0	0	0	0	0	0	0	0	0	0
20 to 15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0
25 to 20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0

Cell Ref.	Comment:	Value	Unit	CELL	Description
A-1	TMY-3 Weather Data for Danbury, CT				
F-1	Occupied hours as per the RFP data	8,760	hrs		
M	Total Crank Area of windows and doors	1,179 SF			
N	Average wind speed during the cooling and heating seasons	7.0 mph			
O	1 x total M x total N x 0.286 = 69 x FPH				
P	1.08 x total O x 1.5 x (col B) + (col C) + (col D) + (col E) + (col F) + (col G) + (col H) + (col I) + (col J) + (col K) + (col L) + (col M) + (col N) + (col O) + (col P) + (col Q) + (col R) + (col S) + (col T) + (col U) + (col V) + (col W) + (col X) + (col Y) + (col Z) + (col AA) + (col AB) + (col AC) + (col AD) + (col AE) + (col AF) + (col AG) + (col AH) + (col AI) + (col AJ) + (col AK) + (col AL) + (col AM) + (col AN) + (col AO) + (col AP) + (col AQ) + (col AR) + (col AS) + (col AT) + (col AU) + (col AV) + (col AW) + (col AX) + (col AY) + (col AZ) + (col BA) + (col BB) + (col BC) + (col BD) + (col BE) + (col BF) + (col BG) + (col BH) + (col BI) + (col BJ) + (col BK) + (col BL) + (col BM) + (col BN) + (col BO) + (col BP) + (col BQ) + (col BR) + (col BS) + (col BT) + (col BU) + (col BV) + (col BW) + (col BX) + (col BY) + (col BZ) + (col CA) + (col CB) + (col CC) + (col CD) + (col CE) + (col CF) + (col CG) + (col CH) + (col CI) + (col CJ) + (col CK) + (col CL) + (col CM) + (col CN) + (col CO) + (col CP) + (col CQ) + (col CR) + (col CS) + (col CT) + (col CU) + (col CV) + (col CW) + (col CX) + (col CY) + (col CZ) + (col DA) + (col DB) + (col DC) + (col DD) + (col DE) + (col DF) + (col DG) + (col DH) + (col DI) + (col DJ) + (col DK) + (col DL) + (col DM) + (col DN) + (col DO) + (col DP) + (col DQ) + (col DR) + (col DS) + (col DT) + (col DU) + (col DV) + (col DW) + (col DX) + (col DY) + (col DZ) + (col EA) + (col EB) + (col EC) + (col ED) + (col EE) + (col EF) + (col EG) + (col EH) + (col EI) + (col EJ) + (col EK) + (col EL) + (col EM) + (col EN) + (col EO) + (col EP) + (col EQ) + (col ER) + (col ES) + (col ET) + (col EU) + (col EV) + (col EW) + (col EX) + (col EY) + (col EZ) + (col FA) + (col FB) + (col FC) + (col FD) + (col FE) + (col FF) + (col FG) + (col FH) + (col FI) + (col FJ) + (col FK) + (col FL) + (col FM) + (col FN) + (col FO) + (col FP) + (col FQ) + (col FR) + (col FS) + (col FT) + (col FU) + (col FV) + (col FW) + (col FX) + (col FY) + (col FZ) + (col GA) + (col GB) + (col GC) + (col GD) + (col GE) + (col GF) + (col GG) + (col GH) + (col GI) + (col GJ) + (col GK) + (col GL) + (col GM) + (col GN) + (col GO) + (col GP) + (col GQ) + (col GR) + (col GS) + (col GT) + (col GU) + (col GV) + (col GW) + (col GX) + (col GY) + (col GZ) + (col HA) + (col HB) + (col HC) + (col HD) + (col HE) + (col HF) + (col HG) + (col HH) + (col HI) + (col HJ) + (col HK) + (col HL) + (col HM) + (col HN) + (col HO) + (col HP) + (col HQ) + (col HR) + (col HS) + (col HT) + (col HU) + (col HV) + (col HW) + (col HX) + (col HY) + (col HZ) + (col IA) + (col IB) + (col IC) + (col ID) + (col IE) + (col IF) + (col IG) + (col IH) + (col II) + (col IJ) + (col IK) + (col IL) + (col IM) + (col IN) + (col IO) + (col IP) + (col IQ) + (col IR) + (col IS) + (col IT) + (col IU) + (col IV) + (col IW) + (col IX) + (col IY) + (col IZ) + (col JA) + (col JB) + (col JC) + (col JD) + (col JE) + (col JF) + (col JG) + (col JH) + (col JI) + (col JJ) + (col JK) + (col JL) + (col JM) + (col JN) + (col JO) + (col JP) + (col JQ) + (col JR) + (col JS) + (col JT) + (col JU) + (col JV) + (col JW) + (col JX) + (col JY) + (col JZ) + (col KA) + (col KB) + (col KC) + (col KD) + (col KE) + (col KF) + (col KG) + (col KH) + (col KI) + (col KJ) + (col KL) + (col KM) + (col KN) + (col KO) + (col KP) + (col KQ) + (col KR) + (col KS) + (col KT) + (col KU) + (col KV) + (col KW) + (col KX) + (col KY) + (col KZ) + (col LA) + (col LB) + (col LC) + (col LD) + (col LE) + (col LF) + (col LG) + (col LH) + (col LI) + (col LJ) + (col LK) + (col LL) + (col LM) + (col LN) + (col LO) + (col LP) + (col LQ) + (col LR) + (col LS) + (col LT) + (col LU) + (col LV) + (col LW) + (col LX) + (col LY) + (col LZ) + (col MA) + (col MB) + (col MC) + (col MD) + (col ME) + (col MF) + (col MG) + (col MH) + (col MI) + (col MJ) + (col MK) + (col ML) + (col MM) + (col MN) + (col MO) + (col MP) + (col MQ) + (col MR) + (col MS) + (col MT) + (col MU) + (col MV) + (col MW) + (col MX) + (col MY) + (col MZ) + (col NA) + (col NB) + (col NC) + (col ND) + (col NE) + (col NF) + (col NG) + (col NH) + (col NI) + (col NJ) + (col NK) + (col NL) + (col NM) + (col NN) + (col NO) + (col NP) + (col NQ) + (col NR) + (col NS) + (col NT) + (col NU) + (col NV) + (col NW) + (col NX) + (col NY) + (col NZ) + (col OA) + (col OB) + (col OC) + (col OD) + (col OE) + (col OF) + (col OG) + (col OH) + (col OI) + (col OJ) + (col OK) + (col OL) + (col OM) + (col ON) + (col OO) + (col OP) + (col OQ) + (col OR) + (col OS) + (col OT) + (col OU) + (col OV) + (col OW) + (col OX) + (col OY) + (col OZ) + (col PA) + (col PB) + (col PC) + (col PD) + (col PE) + (col PF) + (col PG) + (col PH) + (col PI) + (col PJ) + (col PK) + (col PL) + (col PM) + (col PN) + (col PO) + (col PP) + (col PQ) + (col PR) + (col PS) + (col PT) + (col PU) + (col PV) + (col PW) + (col PX) + (col PY) + (col PZ) + (col QA) + (col QB) + (col QC) + (col QD) + (col QE) + (col QF) + (col QG) + (col QH) + (col QI) + (col QJ) + (col QK) + (col QL) + (col QM) + (col QN) + (col QO) + (col QP) + (col QQ) + (col QR) + (col QS) + (col QT) + (col QU) + (col QV) + (col QW) + (col QX) + (col QY) + (col QZ) + (col RA) + (col RB) + (col RC) + (col RD) + (col RE) + (col RF) + (col RG) + (col RH) + (col RI) + (col RJ) + (col RK) + (col RL) + (col RM) + (col RN) + (col RO) + (col RP) + (col RQ) + (col RR) + (col RS) + (col RT) + (col RU) + (col RV) + (col RW) + (col RX) + (col RY) + (col RZ) + (col SA) + (col SB) + (col SC) + (col SD) + (col SE) + (col SF) + (col SG) + (col SH) + (col SI) + (col SJ) + (col SK) + (col SL) + (col SM) + (col SN) + (col SO) + (col SP) + (col SQ) + (col SR) + (col SS) + (col ST) + (col SU) + (col SV) + (col SW) + (col SX) + (col SY) + (col SZ) + (col TA) + (col TB) + (col TC) + (col TD) + (col TE) + (col TF) + (col TG) + (col TH) + (col TI) + (col TJ) + (col TK) + (col TL) + (col TM) + (col TN) + (col TO) + (col TP) + (col TQ) + (col TR) + (col TS) + (col TT) + (col TU) + (col TV) + (col TW) + (col TX) + (col TY) + (col TZ) + (col UA) + (col UB) + (col UC) + (col UD) + (col UE) + (col UF) + (col UG) + (col UH) + (col UI) + (col UJ) + (col UK) + (col UL) + (col UM) + (col UN) + (col UO) + (col UP) + (col UQ) + (col UR) + (col US) + (col UT) + (col UY) + (col UZ) + (col VA) + (col VB) + (col VC) + (col VD) + (col VE) + (col VF) + (col VG) + (col VH) + (col VI) + (col VJ) + (col VK) + (col VL) + (col VM) + (col VN) + (col VO) + (col VP) + (col VQ) + (col VR) + (col VS) + (col VT) + (col VU) + (col VV) + (col VW) + (col VX) + (col VY) + (col VZ) + (col WA) + (col WB) + (col WC) + (col WD) + (col WE) + (col WF) + (col WG) + (col WH) + (col WI) + (col WJ) + (col WK) + (col WL) + (col WM) + (col WN) + (col WO) + (col WP) + (col WQ) + (col WR) + (col WS) + (col WT) + (col WU) + (col WV) + (col WW) + (col WX) + (col WY) + (col WZ) + (col XA) + (col XB) + (col XC) + (col XD) + (col XE) + (col XF) + (col XG) + (col XH) + (col XI) + (col XJ) + (col XK) + (col XL) + (col XM) + (col XN) + (col XO) + (col XP) + (col XQ) + (col XR) + (col XS) + (col XT) + (col XU) + (col XV) + (col XW) + (col XX) + (col XY) + (col XZ) + (col YA) + (col YB) + (col YC) + (col YD) + (col YE) + (col YF) + (col YG) + (col YH) + (col YI) + (col YJ) + (col YK) + (col YL) + (col YM) + (col YN) + (col YO) + (col YP) + (col YQ) + (col YR) + (col YS) + (col YT) + (col YU) + (col YV) + (col YW) + (col YX) + (col YY) + (col YZ) + (col ZA) + (col ZB) + (col ZC) + (col ZD) + (col ZE) + (col ZF) + (col ZG) + (col ZH) + (col ZI) + (col ZJ) + (col ZK) + (col ZL) + (col ZM) + (col ZN) + (col ZO) + (col ZP) + (col ZQ) + (col ZR) + (col ZS) + (col ZT) + (col ZU) + (col ZV) + (col ZW) + (col ZX) + (col ZY) + (col ZZ)				

Putnam County, NY
121 Main Street
Infiltration Reduction

TMY-3 Weather Data for Danbury, CT												
Operating Hours												
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology Bin Binns	D	E	F	G	H	I	J	K	L
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0
75 to 80	77.5	0.3	0.0	35	216	108	359	359	0	0	0	0
70 to 75	72.5	62.4	0.0	83	267	174	524	524	0	0	0	0
65 to 70	67.5	59.5	0.0	221	316	251	798	798	0	0	0	0
60 to 65	62.5	54.9	0.0	279	289	344	912	912	0	0	0	0
Heating												
35 to 60	47.5	48.4	0.0	257	248	295	830	830	0	0	0	0
30 to 35	42.5	41.8	0.0	288	288	311	778	778	0	0	0	0
25 to 30	37.5	34.1	0.0	291	291	343	704	704	0	0	0	0
20 to 25	32.5	30.6	0.0	245	212	237	704	704	0	0	0	0
15 to 20	27.5	33.3	0.0	330	192	244	766	766	0	0	0	0
10 to 15	22.5	29.6	0.0	236	163	248	647	647	0	0	0	0
5 to 10	17.5	24.1	0.0	206	95	132	433	433	0	0	0	0
0 to 5	12.5	16.9	0.0	159	68	79	306	306	0	0	0	0
5 to 10	7.5	6.3	0.0	45	51	73	191	191	0	0	0	0
0 to 5	2.5	0.5	0.0	20	20	27	48	150	150	0	0	0
5 to 10	7.5	6.3	0.0	33	20	27	48	150	150	0	0	0
0 to 5	2.5	0.5	0.0	18	0	21	33	58	58	0	0	0
5 to 10	7.5	6.3	0.0	3	0	0	3	5	5	0	0	0
0 to 5	2.5	0.5	0.0	0	0	0	0	0	0	0	0	0
15 to 20	17.5	0.0	0.0	0	0	0	0	0	0	0	0	0
20 to 25	22.5	0.0	0.0	0	0	0	0	0	0	0	0	0
25 to 30	27.5	0.0	0.0	0	0	0	0	0	0	0	0	0
30 to 35	32.5	0.0	0.0	0	0	0	0	0	0	0	0	0
35 to 40	37.5	0.0	0.0	0	0	0	0	0	0	0	0	0
40 to 45	42.5	0.0	0.0	0	0	0	0	0	0	0	0	0
45 to 50	47.5	0.0	0.0	0	0	0	0	0	0	0	0	0
50 to 55	52.5	0.0	0.0	0	0	0	0	0	0	0	0	0
55 to 60	57.5	0.0	0.0	0	0	0	0	0	0	0	0	0
60 to 65	62.5	0.0	0.0	0	0	0	0	0	0	0	0	0
65 to 70	67.5	0.0	0.0	0	0	0	0	0	0	0	0	0
70 to 75	72.5	0.0	0.0	0	0	0	0	0	0	0	0	0
75 to 80	77.5	0.0	0.0	0	0	0	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0

Cell Ref.	Comment
A-1	TMY-3 Weather Data for Danbury, CT
I-1	Occupied hours as per the RFP data
M	Total Crank Area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	1 col M [x] col N [x] 5286 = 69 x P70
P	1.08 x col O [x] col J [x] (col B [x] - 0.76) x (col B [x] - 0.60) heating
Q	1.08 x col O [x] col J [x] (col B [x] - 0.77) x (col B [x] - 0.60) cooling, 1.08 x col O [x] col J [x] (col B [x] - 0.60) heating
R	1.08 x col O [x] col J [x] (col B [x] - 0.60) x P69
S	1.08 x col O [x] col J [x] (col B [x] - 0.60) x P69
T	1.08 x col O [x] col J [x] (col B [x] - 0.60) x P69
U	1.08 x col O [x] col J [x] (col B [x] - 0.60) x P69

Assumptions:	Value	Unit	CELL	Description
Single Door - Sides, Top, Sweep (UT)	4 (UT)		P43	Exterior Doors
Single Door - Sweep (UT)	3 (UT)		P44	Exterior Doors
			P45	
			P46	
Block Seal Panel (LF)	275 (LF)		P47	Open Warehouse Area
			P48	
			P49	
			P50	
			P51	
			P52	
			P53	
			P54	
			P55	
			P56	
			P57	
			P58	
			P59	
			P60	
			P61	
			P62	
			P63	
			P64	
Total Crank Area	2,914 SF		P66	Combination of all Types
Existing Boiler Plant Efficiency	90.0%		P67	
Existing Cooling Plant Efficiency	2.93 COP		P68	
Percent Building Cooled	5.0%		P69	
Average Annual Wind Speed	10.0 MPH		P70	
Crack Area Workload Diversity	2.5 (0%)		P72	

Average Space Temperatures - After Implementation of EXR			
Assumed	Cooling	Heating	Description
UnOccupied	72.0	64.8	Q76 average temperature for all areas
UnOccupied	72.0	64.8	Q77

Putnam County, NY
Putnam National Golf Club - Clubhouses
Infiltration Reduction

AMV-3 Weather Data for Danbury, CT		Operating Hours										Savings									
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology Bin Binna	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
					(1-16) Hours	(17-24) Hours	Total Hrs	(Occ. On-Peak Hrs)	(Unacc. On- Peak Hrs)	(Acc. Off-Peak Hrs)	(Unacc. Off- Peak Hrs)	Total Cracks Area (Sq. Ft.)	Average Wind Speed (MPH)	Infiltration (Flow Rate CFM)	Occ. Heating (Cooling Savings) (MMBTU)	Unacc. Heating (Cooling Savings) (MMBTU)	Occ. Cooling (Heating Savings) (MMBTU)	Unacc. Cooling (Heating Savings) (MMBTU)	Unacc. Heating (Cooling Savings) (MMBTU)	Unacc. Cooling (Heating Savings) (MMBTU)	
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	243	9	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	213	8	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	183	7	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	153	6	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	123	5	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	93	4	0	0	0	0	0
75 to 80	77.5	0.3	0.0	35	216	108	359	0	0	0	0	0	1.1	10.0	243	3	0	0	0	0	0
70 to 75	72.5	0.2	0.0	83	267	174	524	0	0	0	0	0	1.1	10.0	243	0	0	0	0	0	0
65 to 70	67.5	0.0	0.0	221	316	201	708	0	0	0	0	0	1.1	10.0	243	0	0	0	0	0	0
60 to 65	62.5	0.0	0.0	279	289	344	912	0	0	0	0	0	1.1	10.0	243	0	0	0	0	0	0
55 to 60	57.5	0.0	0.0	287	248	295	830	0	0	0	0	0	1.1	7.0	170	2	0	0	0	0	0
50 to 55	52.5	0.0	0.0	288	211	278	777	0	0	0	0	0	1.1	7.0	170	3	0	0	0	0	0
45 to 50	47.5	0.0	0.0	290	174	231	704	0	0	0	0	0	1.1	7.0	170	4	0	0	0	0	0
40 to 45	42.5	0.0	0.0	244	137	184	604	0	0	0	0	0	1.1	7.0	170	5	0	0	0	0	0
35 to 40	37.5	0.0	0.0	330	102	244	766	0	0	0	0	0	1.1	7.0	170	6	0	0	0	0	0
30 to 35	32.5	0.0	0.0	236	63	248	647	0	0	0	0	0	1.1	7.0	170	7	0	0	0	0	0
25 to 30	27.5	0.0	0.0	206	05	132	433	0	0	0	0	0	1.1	7.0	170	8	0	0	0	0	0
20 to 25	22.5	0.0	0.0	159	08	79	306	0	0	0	0	0	1.1	7.0	170	9	0	0	0	0	0
15 to 20	17.5	0.0	0.0	67	51	73	191	0	0	0	0	0	1.1	7.0	170	10	0	0	0	0	0
10 to 15	12.5	0.0	0.0	45	27	48	150	0	0	0	0	0	1.1	7.0	170	11	0	0	0	0	0
5 to 10	7.5	0.0	0.0	23	20	23	73	0	0	0	0	0	1.1	7.0	170	12	0	0	0	0	0
0 to 5	2.5	0.0	0.0	8	0	21	33	0	0	0	0	0	1.1	7.0	170	13	0	0	0	0	0
-5 to 0	-2.5	0.0	0.0	3	0	0	3	0	0	0	0	0	1.1	7.0	170	14	0	0	0	0	0
-10 to -5	-7.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	170	15	0	0	0	0	0
-15 to -10	-12.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	170	16	0	0	0	0	0
-20 to -15	-17.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	170	17	0	0	0	0	0
-25 to -20	-22.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	170	17	0	0	0	0	0

Cell Ref.	Comment	Value	Unit	CELL	Description	
A-1	AMV-3 Weather Data for Danbury, CT					
I-1	Occupied hours as per the RTP data	9 (U1)		P43	Exterior Doors	
M	Total Cracks area as per the RTP data	4 (U1)		P44	Exterior Doors	
N	Average wind speed during the cooling and heating seasons	23 (L,F)		P45	Perimeter of Main Entry	
O	1 x col M, 1 x col N, 1 x P286 = 60 x P70	0		P46		
P	1.08 x col O, 1 x col I, 1 x col B, 1 x col Q, 1 x col R, 1 x col S, 1 x col T, 1 x col U, 1 x col V, 1 x col W, 1 x col X, 1 x col Y, 1 x col Z, 1 x col AA, 1 x col AB, 1 x col AC, 1 x col AD, 1 x col AE, 1 x col AF, 1 x col AG, 1 x col AH, 1 x col AI, 1 x col AJ, 1 x col AK, 1 x col AL, 1 x col AM, 1 x col AN, 1 x col AO, 1 x col AP, 1 x col AQ, 1 x col AR, 1 x col AS, 1 x col AT, 1 x col AU, 1 x col AV, 1 x col AW, 1 x col AX, 1 x col AY, 1 x col AZ, 1 x col BA, 1 x col BB, 1 x col BC, 1 x col BD, 1 x col BE, 1 x col BF, 1 x col BG, 1 x col BH, 1 x col BI, 1 x col BJ, 1 x col BK, 1 x col BL, 1 x col BM, 1 x col BN, 1 x col BO, 1 x col BP, 1 x col BQ, 1 x col BR, 1 x col BS, 1 x col BT, 1 x col BU, 1 x col BV, 1 x col BW, 1 x col BX, 1 x col BY, 1 x col BZ, 1 x col CA, 1 x col CB, 1 x col CC, 1 x col CD, 1 x col CE, 1 x col CF, 1 x col CG, 1 x col CH, 1 x col CI, 1 x col CJ, 1 x col CK, 1 x col CL, 1 x col CM, 1 x col CN, 1 x col CO, 1 x col CP, 1 x col CQ, 1 x col CR, 1 x col CS, 1 x col CT, 1 x col CU, 1 x col CV, 1 x col CW, 1 x col CX, 1 x col CY, 1 x col CZ, 1 x col DA, 1 x col DB, 1 x col DC, 1 x col DD, 1 x col DE, 1 x col DF, 1 x col DG, 1 x col DH, 1 x col DI, 1 x col DJ, 1 x col DK, 1 x col DL, 1 x col DM, 1 x col DN, 1 x col DO, 1 x col DP, 1 x col DQ, 1 x col DR, 1 x col DS, 1 x col DT, 1 x col DU, 1 x col DV, 1 x col DW, 1 x col DX, 1 x col DY, 1 x col DZ, 1 x col EA, 1 x col EB, 1 x col EC, 1 x col ED, 1 x col EE, 1 x col EF, 1 x col EG, 1 x col EH, 1 x col EI, 1 x col EJ, 1 x col EK, 1 x col EL, 1 x col EM, 1 x col EN, 1 x col EO, 1 x col EP, 1 x col EQ, 1 x col ER, 1 x col ES, 1 x col ET, 1 x col EU, 1 x col EV, 1 x col EW, 1 x col EX, 1 x col EY, 1 x col EZ, 1 x col FA, 1 x col FB, 1 x col FC, 1 x col FD, 1 x col FE, 1 x col FF, 1 x col FG, 1 x col FH, 1 x col FI, 1 x col FJ, 1 x col FK, 1 x col FL, 1 x col FM, 1 x col FN, 1 x col FO, 1 x col FP, 1 x col FQ, 1 x col FR, 1 x col FS, 1 x col FT, 1 x col FU, 1 x col FV, 1 x col FW, 1 x col FX, 1 x col FY, 1 x col FZ, 1 x col GA, 1 x col GB, 1 x col GC, 1 x col GD, 1 x col GE, 1 x col GF, 1 x col GG, 1 x col GH, 1 x col GI, 1 x col GJ, 1 x col GK, 1 x col GL, 1 x col GM, 1 x col GN, 1 x col GO, 1 x col GP, 1 x col GQ, 1 x col GR, 1 x col GS, 1 x col GT, 1 x col GU, 1 x col GV, 1 x col GW, 1 x col GX, 1 x col GY, 1 x col GZ, 1 x col HA, 1 x col HB, 1 x col HC, 1 x col HD, 1 x col HE, 1 x col HF, 1 x col HG, 1 x col HH, 1 x col HI, 1 x col HJ, 1 x col HK, 1 x col HL, 1 x col HM, 1 x col HN, 1 x col HO, 1 x col HP, 1 x col HQ, 1 x col HR, 1 x col HS, 1 x col HT, 1 x col HU, 1 x col HV, 1 x col HW, 1 x col HX, 1 x col HY, 1 x col HZ, 1 x col IA, 1 x col IB, 1 x col IC, 1 x col ID, 1 x col IE, 1 x col IF, 1 x col IG, 1 x col IH, 1 x col IJ, 1 x col IK, 1 x col IL, 1 x col IM, 1 x col IN, 1 x col IO, 1 x col IP, 1 x col IQ, 1 x col IR, 1 x col IS, 1 x col IT, 1 x col IU, 1 x col IV, 1 x col IW, 1 x col IX, 1 x col IY, 1 x col IZ, 1 x col JA, 1 x col JB, 1 x col JC, 1 x col JD, 1 x col JE, 1 x col JF, 1 x col JG, 1 x col JH, 1 x col JI, 1 x col JJ, 1 x col JK, 1 x col JL, 1 x col JM, 1 x col JN, 1 x col JO, 1 x col JP, 1 x col JQ, 1 x col JR, 1 x col JS, 1 x col JT, 1 x col JU, 1 x col JV, 1 x col JW, 1 x col JX, 1 x col JY, 1 x col JZ, 1 x col KA, 1 x col KB, 1 x col KC, 1 x col KD, 1 x col KE, 1 x col KF, 1 x col KG, 1 x col KH, 1 x col KI, 1 x col KJ, 1 x col KL, 1 x col KM, 1 x col KN, 1 x col KO, 1 x col KP, 1 x col KQ, 1 x col KR, 1 x col KS, 1 x col KT, 1 x col KU, 1 x col KV, 1 x col KW, 1 x col KX, 1 x col KY, 1 x col KZ, 1 x col LA, 1 x col LB, 1 x col LC, 1 x col LD, 1 x col LE, 1 x col LF, 1 x col LG, 1 x col LH, 1 x col LI, 1 x col LJ, 1 x col LK, 1 x col LL, 1 x col LM, 1 x col LN, 1 x col LO, 1 x col LP, 1 x col LQ, 1 x col LR, 1 x col LS, 1 x col LT, 1 x col LU, 1 x col LV, 1 x col LW, 1 x col LX, 1 x col LY, 1 x col LZ, 1 x col MA, 1 x col MB, 1 x col MC, 1 x col MD, 1 x col ME, 1 x col MF, 1 x col MG, 1 x col MH, 1 x col MI, 1 x col MJ, 1 x col MK, 1 x col ML, 1 x col MN, 1 x col MO, 1 x col MP, 1 x col MQ, 1 x col MR, 1 x col MS, 1 x col MT, 1 x col MU, 1 x col MV, 1 x col MW, 1 x col MX, 1 x col MY, 1 x col MZ, 1 x col NA, 1 x col NB, 1 x col NC, 1 x col ND, 1 x col NE, 1 x col NF, 1 x col NG, 1 x col NH, 1 x col NI, 1 x col NJ, 1 x col NK, 1 x col NL, 1 x col NM, 1 x col NO, 1 x col NP, 1 x col NQ, 1 x col NR, 1 x col NS, 1 x col NT, 1 x col NU, 1 x col NV, 1 x col NW, 1 x col NX, 1 x col NY, 1 x col NZ, 1 x col OA, 1 x col OB, 1 x col OC, 1 x col OD, 1 x col OE, 1 x col OF, 1 x col OG, 1 x col OH, 1 x col OI, 1 x col OJ, 1 x col OK, 1 x col OL, 1 x col OM, 1 x col ON, 1 x col OO, 1 x col OP, 1 x col OQ, 1 x col OR, 1 x col OS, 1 x col OT, 1 x col OU, 1 x col OV, 1 x col OW, 1 x col OX, 1 x col OY, 1 x col OZ, 1 x col PA, 1 x col PB, 1 x col PC, 1 x col PD, 1 x col PE, 1 x col PF, 1 x col PG, 1 x col PH, 1 x col PI, 1 x col PJ, 1 x col PK, 1 x col PL, 1 x col PM, 1 x col PN, 1 x col PO, 1 x col PP, 1 x col PQ, 1 x col PR, 1 x col PS, 1 x col PT, 1 x col PU, 1 x col PV, 1 x col PW, 1 x col PX, 1 x col PY, 1 x col PZ, 1 x col QA, 1 x col QB, 1 x col QC, 1 x col QD, 1 x col QE, 1 x col QF, 1 x col QG, 1 x col QH, 1 x col QI, 1 x col QJ, 1 x col QK, 1 x col QL, 1 x col QM, 1 x col QN, 1 x col QO, 1 x col QP, 1 x col QQ, 1 x col QR, 1 x col QS, 1 x col QT, 1 x col QU, 1 x col QV, 1 x col QW, 1 x col QX, 1 x col QY, 1 x col QZ, 1 x col RA, 1 x col RB, 1 x col RC, 1 x col RD, 1 x col RE, 1 x col RF, 1 x col RG, 1 x col RH, 1 x col RI, 1 x col RJ, 1 x col RK, 1 x col RL, 1 x col RM, 1 x col RN, 1 x col RO, 1 x col RP, 1 x col RQ, 1 x col RR, 1 x col RS, 1 x col RT, 1 x col RU, 1 x col RV, 1 x col RW, 1 x col RX, 1 x col RY, 1 x col RZ, 1 x col SA, 1 x col SB, 1 x col SC, 1 x col SD, 1 x col SE, 1 x col SF, 1 x col SG, 1 x col SH, 1 x col SI, 1 x col SJ, 1 x col SK, 1 x col SL, 1 x col SM, 1 x col SN, 1 x col SO, 1 x col SP, 1 x col SQ, 1 x col SR, 1 x col SS, 1 x col ST, 1 x col SU, 1 x col SV, 1 x col SW, 1 x col SX, 1 x col SY, 1 x col SZ, 1 x col TA, 1 x col TB, 1 x col TC, 1 x col TD, 1 x col TE, 1 x col TF, 1 x col TG, 1 x col TH, 1 x col TI, 1 x col TJ, 1 x col TK, 1 x col TL, 1 x col TM, 1 x col TN, 1 x col TO, 1 x col TP, 1 x col TQ, 1 x col TR, 1 x col TS, 1 x col TT, 1 x col TU, 1 x col TV, 1 x col TW, 1 x col TX, 1 x col TY, 1 x col TZ, 1 x col UA, 1 x col UB, 1 x col UC, 1 x col UD, 1 x col UE, 1 x col UF, 1 x col UG, 1 x col UH, 1 x col UI, 1 x col UJ, 1 x col UK, 1 x col UL, 1 x col UM, 1 x col UN, 1 x col UO, 1 x col UP, 1 x col UQ, 1 x col UR, 1 x col US, 1 x col UT, 1 x col UY, 1 x col UZ, 1 x col VA, 1 x col VB, 1 x col VC, 1 x col VD, 1 x col VE, 1 x col VF, 1 x col VG, 1 x col VH, 1 x col VI, 1 x col VJ, 1 x col VK, 1 x col VL, 1 x col VM, 1 x col VN, 1 x col VO, 1 x col VP, 1 x col VQ, 1 x col VR, 1 x col VS, 1 x col VT, 1 x col VU, 1 x col VV, 1 x col VW, 1 x col VX, 1 x col VY, 1 x col VZ, 1 x col WA, 1 x col WB, 1 x col WC, 1 x col WD, 1 x col WE, 1 x col WF, 1 x col WG, 1 x col WH, 1 x col WI, 1 x col WJ, 1 x col WK, 1 x col WL, 1 x col WM, 1 x col WN, 1 x col WO, 1 x col WP, 1 x col WQ, 1 x col WR, 1 x col WS, 1 x col WT, 1 x col WU, 1 x col WV, 1 x col WW, 1 x col WX, 1 x col WY, 1 x col WZ, 1 x col XA, 1 x col XB, 1 x col XC, 1 x col XD, 1 x col XE, 1 x col XF, 1 x col XG, 1 x col XH, 1 x col XI, 1 x col XJ, 1 x col XK, 1 x col XL, 1 x col XM, 1 x col XN, 1 x col XO, 1 x col XP, 1 x col XQ, 1 x col XR, 1 x col XS, 1 x col XT, 1 x col XU, 1 x col XV, 1 x col XW, 1 x col XX, 1 x col XY, 1 x col XZ, 1 x col YA, 1 x col YB, 1 x col YC, 1 x col YD, 1 x col YE, 1 x col YF, 1 x col YG, 1 x col YH, 1 x col YI, 1 x col YJ, 1 x col YK, 1 x col YL, 1 x col YM, 1 x col YN, 1 x col YO, 1 x col YP, 1 x col YQ, 1 x col YR, 1 x col YS, 1 x col YT, 1 x col YU, 1 x col YV, 1 x col YW, 1 x col YX, 1 x col YY, 1 x col YZ, 1 x col ZA, 1 x col ZB, 1 x col ZC, 1 x col ZD, 1 x col ZE, 1 x col ZF, 1 x col ZG, 1 x col ZH, 1 x col ZI, 1 x col ZJ, 1 x col ZK, 1 x col ZL, 1 x col ZM, 1 x col ZN, 1 x col ZO, 1 x col ZP, 1 x col ZQ, 1 x col ZR, 1 x col ZS, 1 x col ZT, 1 x col ZU, 1 x col ZV, 1 x col ZW, 1 x col ZX, 1 x col ZY, 1 x col ZZ					
Average Space Temperatures - After Implementation of EAF						
Occupied	Cooling	72.0	70.0	Q76	Description	
Unoccupied	Heating	72.0	70.0	Q77	average temperature for all areas	

Putnam County, NY
 Donald R. Smith Government Campus - Building 3
 Infiltration Reductions

EMV-3 Weather Data for Danbury, CT

Cooling	Operating Hours										Savings										
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	
30 to 60 deg. F	Avg Temp deg. F	M/C W/B deg. F	M/C Embly Btu/hrs	01-08 Hours	09-16 Hours	17-24 Hours	Total Hrs	Acc One-Peak Hrs	Unk/Occ Peak Hrs	Occ Off-Peak Hrs	Unk/Occ Peak Hrs	Unk/Occ Peak Hrs	Unk/Occ Peak Hrs	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Occ Heating Cooling Savings (MMBTU)	Unk Heating Cooling Savings (MMBTU)	Occ Cooling Savings (MMBTU)	Unk Cooling Savings (MMBTU)	Occ Heating Savings (MMBTU)	Unk Heating Savings (MMBTU)
35 to 60	107.5	60.1	0.0	0	0	0	0	0	0	0	0	0	0	10.0	110	4	3	0	0	0	0
60 to 75	102.5	60.1	0.0	0	0	0	0	0	0	0	0	0	0	10.0	110	4	3	0	0	0	0
75 to 90	97.5	60.1	0.0	0	0	0	0	0	0	0	0	0	0	10.0	110	4	3	0	0	0	0
90 to 105	92.5	60.1	0.0	0	17	0	17	5	14	0	0	0	0	10.0	110	2	2	0	0	0	0
105 to 120	87.5	60.1	0.0	0	30	13	43	25	21	0	0	0	0	10.0	110	2	1	0	0	0	0
120 to 135	82.5	60.1	0.0	8	167	50	225	54	171	0	0	0	0	10.0	110	1	0	0	0	0	0
135 to 150	77.5	65.3	0.0	35	216	108	359	85	274	0	0	0	0	10.0	110	1	0	0	0	0	0
150 to 165	72.5	62.4	0.0	83	267	174	524	125	388	0	0	0	0	10.0	110	0	0	0	0	0	0
165 to 180	67.5	59.5	0.0	221	316	261	798	190	608	0	0	0	0	10.0	110	0	0	0	0	0	0
180 to 195	62.5	54.3	0.0	279	289	344	912	217	693	0	0	0	0	10.0	110	0	0	0	0	0	0
195 to 210	57.5	48.4	0.0	287	248	293	830	198	632	0	0	0	0	7.0	77	1	0	0	0	0	0
210 to 225	52.5	44.4	0.0	299	208	311	819	169	529	0	0	0	0	7.0	77	2	0	0	0	0	0
225 to 240	47.5	40.4	0.0	309	169	342	820	159	529	0	0	0	0	7.0	77	2	0	0	0	0	0
240 to 255	42.5	36.4	0.0	315	130	373	818	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
255 to 270	37.5	32.4	0.0	318	91	404	813	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
270 to 285	32.5	28.4	0.0	319	52	435	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
285 to 300	27.5	24.4	0.0	319	13	466	801	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
300 to 315	22.5	20.4	0.0	319	0	497	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
315 to 330	17.5	16.4	0.0	319	0	528	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
330 to 345	12.5	10.4	0.0	319	0	559	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
345 to 360	7.5	6.4	0.0	319	0	590	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
360 to 375	2.5	1.4	0.0	319	0	621	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
375 to 390	-2.5	0.4	0.0	319	0	652	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
390 to 405	-7.5	-1.4	0.0	319	0	683	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
405 to 420	-12.5	-6.4	0.0	319	0	714	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
420 to 435	-17.5	-11.4	0.0	319	0	745	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
435 to 450	-22.5	-16.4	0.0	319	0	776	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
450 to 465	-27.5	-21.4	0.0	319	0	807	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
465 to 480	-32.5	-26.4	0.0	319	0	838	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
480 to 495	-37.5	-31.4	0.0	319	0	869	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
495 to 510	-42.5	-36.4	0.0	319	0	900	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
510 to 525	-47.5	-41.4	0.0	319	0	931	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
525 to 540	-52.5	-46.4	0.0	319	0	962	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
540 to 555	-57.5	-51.4	0.0	319	0	993	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
555 to 570	-62.5	-56.4	0.0	319	0	1024	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
570 to 585	-67.5	-61.4	0.0	319	0	1055	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
585 to 600	-72.5	-66.4	0.0	319	0	1086	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
600 to 615	-77.5	-71.4	0.0	319	0	1117	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
615 to 630	-82.5	-76.4	0.0	319	0	1148	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
630 to 645	-87.5	-81.4	0.0	319	0	1179	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
645 to 660	-92.5	-86.4	0.0	319	0	1210	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
660 to 675	-97.5	-91.4	0.0	319	0	1241	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
675 to 690	-102.5	-96.4	0.0	319	0	1272	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
690 to 705	-107.5	-101.4	0.0	319	0	1303	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
705 to 720	-112.5	-106.4	0.0	319	0	1334	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
720 to 735	-117.5	-111.4	0.0	319	0	1365	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
735 to 750	-122.5	-116.4	0.0	319	0	1396	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
750 to 765	-127.5	-121.4	0.0	319	0	1427	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
765 to 780	-132.5	-126.4	0.0	319	0	1458	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
780 to 795	-137.5	-131.4	0.0	319	0	1489	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
795 to 810	-142.5	-136.4	0.0	319	0	1520	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
810 to 825	-147.5	-141.4	0.0	319	0	1551	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
825 to 840	-152.5	-146.4	0.0	319	0	1582	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
840 to 855	-157.5	-151.4	0.0	319	0	1613	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
855 to 870	-162.5	-156.4	0.0	319	0	1644	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
870 to 885	-167.5	-161.4	0.0	319	0	1675	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
885 to 900	-172.5	-166.4	0.0	319	0	1706	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
900 to 915	-177.5	-171.4	0.0	319	0	1737	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
915 to 930	-182.5	-176.4	0.0	319	0	1768	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
930 to 945	-187.5	-181.4	0.0	319	0	1799	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
945 to 960	-192.5	-186.4	0.0	319	0	1830	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
960 to 975	-197.5	-191.4	0.0	319	0	1861	806	158	536	0	0	0	0	7.0	77	2	0	0	0	0	0
975 to 99																					

Purham County, NY
William Koehler Senior Center
Infiltration Reduction

TMY-3 Weather Data for Danbury, CT												
Operating Hours												
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology	10-16 Hours	17-24 Hours	Total Hrs	Occ On-Peak Hrs	UnOcc On- Peak Hrs	Occ Off-Peak Hrs	UnOcc Off- Peak Hrs	Total Crack Area (ft ²)	Average Wind Speed (MPH)
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	1.6	10.0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	1.6	10.0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	1.6	10.0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	1.6	10.0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	1.6	10.0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	1.6	10.0
75 to 80	77.5	0.3	0.0	35	108	359	359	0	0	0	1.6	10.0
70 to 75	72.5	0.2	0.0	83	267	524	524	0	0	0	1.6	10.0
65 to 70	67.5	0.0	0.0	221	316	798	798	0	0	0	1.6	10.0
60 to 65	62.5	0.0	0.0	279	344	912	912	0	0	0	1.6	10.0
Heating												
35 to 60	47.5	48.4	0.0	257	248	830	830	0	0	0	1.6	7.0
30 to 35	42.5	41.8	0.0	208	211	679	679	0	0	0	1.6	7.0
25 to 30	37.5	34.1	0.0	201	242	704	704	0	0	0	1.6	7.0
20 to 25	32.5	38.6	0.0	245	212	704	704	0	0	0	1.6	7.0
15 to 20	27.5	33.3	0.0	330	192	844	766	0	0	0	1.6	7.0
10 to 15	22.5	29.6	0.0	236	163	647	647	0	0	0	1.6	7.0
5 to 10	17.5	24.1	0.0	206	95	433	433	0	0	0	1.6	7.0
0 to 5	12.5	16.9	0.0	159	68	306	306	0	0	0	1.6	7.0
UnOcc												
15 to 20	17.5	0.0	0.0	67	51	191	191	0	0	0	1.6	7.0
10 to 15	12.5	0.0	0.0	45	48	150	150	0	0	0	1.6	7.0
5 to 10	7.5	0.0	0.0	20	20	63	63	0	0	0	1.6	7.0
0 to 5	2.5	0.0	0.0	8	21	23	23	0	0	0	1.6	7.0
UnOcc												
10 to 15	12.5	0.0	0.0	3	0	3	3	0	0	0	1.6	7.0
5 to 10	7.5	0.0	0.0	0	0	0	0	0	0	0	1.6	7.0
0 to 5	2.5	0.0	0.0	0	0	0	0	0	0	0	1.6	7.0
UnOcc												
20 to 25	22.5	0.0	0.0	0	0	0	0	0	0	0	1.6	7.0
15 to 20	17.5	0.0	0.0	0	0	0	0	0	0	0	1.6	7.0
10 to 15	12.5	0.0	0.0	0	0	0	0	0	0	0	1.6	7.0
5 to 10	7.5	0.0	0.0	0	0	0	0	0	0	0	1.6	7.0
0 to 5	2.5	0.0	0.0	0	0	0	0	0	0	0	1.6	7.0
UnOcc												
Heating				2,920	2,920	8,760	8,760	0	0	0		

Cell Ref	Comment	Value	Unit	CELL	Description
A-1	TMY-3 Weather Data for Danbury, CT				
L-1	Occupied hours as per the RTP data	2 (U)	(U)	P43	Exterior Doors
M	Total Crack Area of windows and doors	6 (U)		P44	Exterior Doors
N	Average wind speed during the cooling and heating seasons	10 (U)		P45	Perimeter of Windows at Instant
O	1 x total M [x] total N [x] 5286 = 69 x P70	3 (U)		P46	Cable End Wall Leakers
P	1.08 x total O [x] total Q [x] (Q76) + total B [x] - 1000 heating	0		P48	0
Q	1.08 x total O [x] total R [x] - 1000 cooling, 1.08 x total O [x] (Q76) + total B [x] - 1000 heating	0		P49	0
R	total P [x] total Q [x] total R [x] - 1000 x P69	0		P50	0
S	total P [x] total Q [x] total R [x] - 1000 x P69	0		P51	0
T	total P [x] total Q [x] total R [x] - 1000 x P69	0		P52	0
U	total P [x] total Q [x] total R [x] - 1000 x P69	0		P53	0
V	total P [x] total Q [x] total R [x] - 1000 x P69	0		P54	0
W	total P [x] total Q [x] total R [x] - 1000 x P69	0		P55	0
X	total P [x] total Q [x] total R [x] - 1000 x P69	0		P56	0
Y	total P [x] total Q [x] total R [x] - 1000 x P69	0		P57	0
Z	total P [x] total Q [x] total R [x] - 1000 x P69	0		P58	0
AA	total P [x] total Q [x] total R [x] - 1000 x P69	0		P59	0
AB	total P [x] total Q [x] total R [x] - 1000 x P69	0		P60	0
AC	total P [x] total Q [x] total R [x] - 1000 x P69	0		P61	0
AD	total P [x] total Q [x] total R [x] - 1000 x P69	0		P62	0
AE	total P [x] total Q [x] total R [x] - 1000 x P69	0		P63	0
AF	total P [x] total Q [x] total R [x] - 1000 x P69	0		P64	0
AG	total P [x] total Q [x] total R [x] - 1000 x P69	0		P66	Combination of all Types
AH	total P [x] total Q [x] total R [x] - 1000 x P69	76.0%		P67	
AI	total P [x] total Q [x] total R [x] - 1000 x P69	3.53 COP		P68	
AJ	total P [x] total Q [x] total R [x] - 1000 x P69	100.0%		P69	
AK	total P [x] total Q [x] total R [x] - 1000 x P69	100.0%		P70	
AL	total P [x] total Q [x] total R [x] - 1000 x P69	100.0%		P71	
AM	total P [x] total Q [x] total R [x] - 1000 x P69	25.0%		P72	

Average Space Temperatures - After Implementation of EXR		
Occupied	Cooling	Heating
Q76	72.0	Q76
UnOccupied	72.0	Q77
		72.0%
		72.0%

Putnam County, NY
Putnam Valley Senior Center
Infiltration Reduction

TMY-3 Weather Data for Danbury, CT												
		Operating Hours					Savings					
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology Bin Area	D	E	F	G	H	I	J	K	L
					0-16 Hrs	17-24 Hrs	Total Hrs	UnOcc Op- Peak Hrs	Occ Op- Peak Hrs	UnOcc Op- Peak Hrs	Acc Op- Peak Hrs	UnOcc Op- Peak Hrs
35 to 60	57.3	48.4	0.0	257	248	295	800	0	0	0	0	0
60 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0
105 to 110	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	17	2	19	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	17	2	19	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	306	13	319	0	0	0	0	0
75 to 80	77.5	0.3	0.0	8	167	50	225	0	0	0	0	0
70 to 75	72.5	0.2	0.0	35	216	108	359	0	0	0	0	0
65 to 70	67.5	0.0	0.0	83	267	174	524	0	0	0	0	0
60 to 65	62.5	0.0	0.0	221	316	251	798	0	0	0	0	0
55 to 60	57.5	0.0	0.0	279	289	344	912	0	0	0	0	0
50 to 55	52.5	0.0	0.0	287	248	295	830	0	0	0	0	0
45 to 50	47.5	0.0	0.0	201	188	211	599	0	0	0	0	0
40 to 45	42.5	0.0	0.0	201	188	211	599	0	0	0	0	0
35 to 40	37.5	0.0	0.0	244	212	237	704	0	0	0	0	0
30 to 35	32.5	0.0	0.0	310	192	244	766	0	0	0	0	0
25 to 30	27.5	0.0	0.0	206	95	132	433	0	0	0	0	0
20 to 25	22.5	0.0	0.0	159	68	79	306	0	0	0	0	0
15 to 20	17.5	0.0	0.0	67	51	73	191	0	0	0	0	0
10 to 15	12.5	0.0	0.0	45	20	27	119	0	0	0	0	0
5 to 10	7.5	0.0	0.0	23	10	13	46	0	0	0	0	0
0 to 5	2.5	0.0	0.0	8	4	5	17	0	0	0	0	0
-5 to 0	-2.5	0.0	0.0	3	0	0	3	0	0	0	0	0
-10 to -5	-7.5	0.0	0.0	0	0	0	0	0	0	0	0	0
-15 to -10	-12.5	0.0	0.0	0	0	0	0	0	0	0	0	0
-20 to -15	-17.5	0.0	0.0	0	0	0	0	0	0	0	0	0
-25 to -20	-22.5	0.0	0.0	0	0	0	0	0	0	0	0	0
				2,920	2,920	2,920	8,760	0	0	0	0	0

Cell Ref	Comment
Ax1	TMY-3 Weather Data for Danbury, CT
I-1	Occupied hours as per the RFP data
M	Total Crank Area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	1 cool M J S I col N x S286 = 69 x P70
P	1.08 x col O J S I col B I + O76 = 1003 cooling, 1.08 x col O J S I (Q76) + col B I = 1000 heating
Q	1.08 x col O J S I col B I + O77 = 1000 cooling, 1.08 x col O J S I (Q77) + col B I = 1000 heating
R	1.08 x col O J S I col B I + O78 = 1000 cooling, 1.08 x col O J S I (Q78) + col B I = 1000 heating
S	1.08 x col O J S I col B I + O79 = 1000 cooling, 1.08 x col O J S I (Q79) + col B I = 1000 heating
T	1.08 x col O J S I col B I + O80 = 1000 cooling, 1.08 x col O J S I (Q80) + col B I = 1000 heating
U	1.08 x col O J S I col B I + O81 = 1000 cooling, 1.08 x col O J S I (Q81) + col B I = 1000 heating

Assumptions:	Value	Unit	CELL	Description
Single Door - Sides, Top, Sweep (L.F.)	2 (U.I.)		P43	Exterior Doors
Single Door - Sweep (L.F.)	3 (U.I.)		P44	Exterior Doors
Double Door - Sweep (L.F.)	4 (U.I.)		P45	Exterior Doors
Interior Seal (L.F.)	648 (L.F.)		P46	Perimeter of Doors & Windows at Interior
	0		P47	0
	0		P48	0
	0		P49	0
	0		P50	0
	0		P51	0
	0		P52	0
	0		P53	0
	0		P54	0
	0		P55	0
	0		P56	0
	0		P57	0
	0		P58	0
	0		P59	0
	0		P60	0
	0		P61	0
	0		P62	0
	0		P63	0
	0		P64	0
Total Crank Area	1,031 SF		P66	Combination of all Types
Existing Boiler Plant Efficiency	75.0%		P67	
Existing Cooling Plant Efficiency	75.5% COP		P68	
Percent Building Cooled	75.0%		P69	
Average Annual Wind Speed	10.0 MPH		P70	
Average Summer Wind Speed	10.0 MPH		P71	
Crank Area Window Diversity	15.0%		P72	

Average Space Temperatures - After Implementation of EXR		
Assumed	Cooling	Heating
Q76	72.0	Q76
Q77	72.0	Q77
Q78	68.0	Q78
Q79	68.0	Q79
Q80	68.0	Q80
Q81	68.0	Q81
Q82	68.0	Q82
Q83	68.0	Q83
Q84	68.0	Q84
Q85	68.0	Q85
Q86	68.0	Q86
Q87	68.0	Q87
Q88	68.0	Q88
Q89	68.0	Q89
Q90	68.0	Q90
Q91	68.0	Q91
Q92	68.0	Q92
Q93	68.0	Q93
Q94	68.0	Q94
Q95	68.0	Q95
Q96	68.0	Q96
Q97	68.0	Q97
Q98	68.0	Q98
Q99	68.0	Q99
Q100	68.0	Q100

Putnam County, NY
Highway Department - Building 1 Admin
Infiltration Reduction

TMY-3 Weather Data for Danbury, CT																					
		Operating Hours					Savings														
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology Bin Binns	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
					0-16 Hrs	17-24 Hrs	Total Hrs	Occ On-Peak Hrs	UnAcc On- Peak Hrs	Acc Off-Peak Hrs	UnAcc Off- Peak Hrs	Average Wind Speed (MPH)	Total Crack Area (F ²)	Infiltration Flow Speed (CFM)	Occ Heating Cooling Savings (MMBTU)	UnAcc Heating Cooling Savings (MMBTU)	Occ Cooling Savings (MMBTU)	UnAcc Cooling Savings (MMBTU)	Occ Heating Savings (MMBTU)	UnAcc Heating Savings (MMBTU)	
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.4	119	3	5	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	4	4	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	3	3	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	3	3	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	2	2	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	1	1	0	0	0	0	0	0
75 to 80	77.5	0.3	0.0	35	216	108	359	359	0	0	0	1.4	119	1	1	0	0	0	0	0	0
70 to 75	72.5	0.2	0.0	83	267	174	524	524	0	0	0	1.4	119	0	0	0	0	0	0	0	0
65 to 70	67.5	0.0	0.0	221	316	251	798	798	0	0	0	1.4	119	0	0	0	0	0	0	0	0
60 to 65	62.5	0.0	0.0	279	289	344	912	912	0	0	0	1.4	119	0	0	0	0	0	0	0	0
Heating					2,920	2,920	8,760	8,760	0	0	0	7.0	84	2	2	0	0	0	0	2	0
35 to 60	57.5	48.4	0.0	257	248	295	800	800	0	0	0	1.4	119	84	2	2	0	0	0	2	0
30 to 35	52.5	41.8	0.0	208	211	278	697	697	0	0	0	1.4	119	84	2	2	0	0	0	3	0
25 to 30	47.5	34.9	0.0	201	204	270	675	675	0	0	0	1.4	119	84	2	2	0	0	0	3	0
20 to 25	42.5	28.0	0.0	245	212	237	704	704	0	0	0	1.4	119	84	3	3	0	0	0	3	0
15 to 20	37.5	33.3	0.0	330	192	244	766	766	0	0	0	1.4	119	84	4	4	0	0	0	4	0
10 to 15	32.5	29.6	0.0	236	163	248	647	647	0	0	0	1.4	119	84	4	4	0	0	0	4	0
5 to 10	27.5	24.1	0.0	206	95	132	433	433	0	0	0	1.4	119	84	4	4	0	0	0	4	0
0 to 5	22.5	21.6	0.0	159	68	79	306	306	0	0	0	1.4	119	84	5	5	0	0	0	4	0
UnAcc					51	73	191	191	0	0	0	1.4	119	84	3	3	0	0	0	1	0
15 to 20	17.5	16.9	0.0	67	51	48	150	150	0	0	0	1.4	119	84	6	6	0	0	0	1	0
10 to 15	12.5	10.5	0.0	45	37	48	110	110	0	0	0	1.4	119	84	6	6	0	0	0	1	0
5 to 10	7.5	6.4	0.0	33	20	27	80	80	0	0	0	1.4	119	84	7	7	0	0	0	1	0
0 to 5	2.5	0.0	0.0	18	9	21	53	53	0	0	0	1.4	119	84	7	7	0	0	0	1	0
UnAcc					3	0	3	3	0	0	0	1.4	119	84	8	8	0	0	0	0	0
15 to 40	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	84	8	8	0	0	0	0	0
20 to 45	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	84	9	9	0	0	0	0	0
25 to 50	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	1.4	119	84	9	9	0	0	0	0	0

Cell Ref	Comment
Ax1	TMY-3 Weather Data for Danbury, CT
I-1	Occupied hours as per the RTP data
M	Total Crack area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	1 cool M J S L N S S286 = 69 x P70
P	1.08 x cool O J S L S (cool B) + 0.06 x cooling 1.08 x cool O J S (Q76) + cool B J S - 1000 heating
Q	1.08 x cool O J S L S (cool B) + 0.06 x cooling 1.08 x cool O J S (Q77) + cool B J S - 1000 heating
R	1.08 x cool O J S L S (cool B) + 0.06 x cooling 1.08 x cool O J S (Q78) + cool B J S - 1000 heating
S	1.08 x cool O J S L S (cool B) + 0.06 x cooling 1.08 x cool O J S (Q79) + cool B J S - 1000 heating
T	1.08 x cool O J S L S (cool B) + 0.06 x cooling 1.08 x cool O J S (Q80) + cool B J S - 1000 heating
U	1.08 x cool O J S L S (cool B) + 0.06 x cooling 1.08 x cool O J S (Q81) + cool B J S - 1000 heating

Assumptions:	Value	Unit	CELL	Description
Block, Seal (L.F.)	0.02 (L.F.)		P43	Building at Perimeter
Single Door - Sides, Top, Sweep (U/F)	1 (U/F)		P44	Building at Exterior Doors
Single Door - Sweep (U/F)	1 (U/F)		P45	Building at Exterior Doors
Double Door - Sweep, Center (U/F)	1 (U/F)		P46	Building at Exterior Doors
Total Crack Area	1.36 SF		P66	Combination of all Types
Existing Boiler Plant Efficiency	71.0%		P67	
Existing Cooling Plant Efficiency	2.93 COP		P68	
Percent Building Cooled	100.0%		P69	
Average Annual Wind Speed	10.0 MPH		P70	
Average Summer Wind Speed	10.0 MPH		P71	
Crack Area Workload Diversity	10.0%		P72	
Average Space Temperatures - After Implementation of EAP				
Occupied	72.0	°F	Q76	average temperature for all areas
UnOccupied	72.0	°F	Q77	75.0%

Putnam County, NY
Highway Department - Building 2 Sign Shop
Infiltration Reduction

TMY-3 Weather Data for Danbury, CT												
Operating Hours												
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology Bin Binns	D	E	F	G	H	I	J	K	L
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0
75 to 80	77.5	0.3	0.0	35	216	108	359	359	0	0	0	0
70 to 75	72.5	0.0	0.0	83	267	174	524	524	0	0	0	0
65 to 70	67.5	59.5	0.0	221	316	251	798	798	0	0	0	0
60 to 65	62.5	54.9	0.0	279	289	344	912	912	0	0	0	0
Heating												
55 to 60	57.5	48.4	0.0	257	248	295	830	830	0	0	0	0
50 to 55	52.5	41.8	0.0	208	211	278	778	778	0	0	0	0
45 to 50	47.5	34.1	0.0	201	242	312	704	704	0	0	0	0
40 to 45	42.5	38.6	0.0	245	212	237	704	704	0	0	0	0
35 to 40	37.5	33.3	0.0	330	192	244	766	766	0	0	0	0
30 to 35	32.5	29.6	0.0	236	163	248	647	647	0	0	0	0
25 to 30	27.5	24.1	0.0	206	95	132	433	433	0	0	0	0
20 to 25	22.5	21.6	0.0	159	68	79	306	306	0	0	0	0
15 to 20	17.5	16.9	0.0	67	51	73	191	191	0	0	0	0
10 to 15	12.5	10.5	0.0	45	37	48	150	150	0	0	0	0
5 to 10	7.5	6.4	0.0	33	20	27	110	110	0	0	0	0
0 to 5	2.5	1.0	0.0	24	8	21	83	83	0	0	0	0
10 to 5	7.5	0.0	0.0	3	0	0	3	3	0	0	0	0
5 to 10	7.5	0.0	0.0	0	0	0	0	0	0	0	0	0
0 to 5	7.5	0.0	0.0	0	0	0	0	0	0	0	0	0
20 to 15	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0
15 to 20	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0
10 to 15	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0
5 to 10	(27.5)	0.0	0.0	0	0	0	0	0	0	0	0	0
0 to 5	(32.5)	0.0	0.0	0	0	0	0	0	0	0	0	0
Total: 2,920												

Cell Ref.	Comment:	Value	Unit	CELL	Description
A-1	TMY-3 Weather Data for Danbury, CT				
F-1	Occupied hours as per the RFP data	0	hrs	P43	0.00
M	Total Crnk Area of windows and doors	0	sq ft	P44	0
N	Average wind speed during the cooling and heating seasons	0	ft/min	P45	0
O	1 cool M J x 1 cool N J x 5286 = 69 x P70	0	BTU	P46	0
P	1.08 x 1 cool O J x 1 cool O J x (Q76 - 1 cool B J) x 1000 heating	0	BTU	P47	Building 2,14 Exhaust Doors
Q	1.08 x 1 cool O J x 1 cool B J x (Q76 - 1 cool B J) x 1000 heating	0	BTU	P48	Building 2,14 Exhaust Doors
R	1 cool E J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P49	0
S	1 cool B J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P50	0
T	1 cool B J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P51	0
U	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P52	0
V	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P53	0
W	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P54	0
X	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P55	0
Y	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P56	0
Z	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P57	0
AA	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P58	0
AB	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P59	0
AC	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P60	0
AD	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P61	0
AE	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P62	0
AF	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P63	0
AG	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P64	0
AH	1 cool Q J x 1 cool J J x 1 cool K J J = 1000 x P88 x P89	0	BTU	P66	Combination of all Types
AI	Existing Boiler Plant Efficiency	75.0%		P67	
AJ	Existing Cooling Plant Efficiency	2.93 COP		P68	
AK	Percent Building Coolest	30.0%		P69	
AL	Average Annual Wind Speed	10.0 MPH		P70	
AM	Average Summer Wind Speed	10.0 MPH		P71	
AN	Crnk Area Windowed Diversity	15.0%		P72	

Average Space Temperatures - After Implementation of EXR			
Assumed	Coolest	Heating	Description
UnOccupied	72.0	66.0	average temperature for all areas
UnOccupied	72.0	66.0	Q76
UnOccupied	72.0	66.0	Q77

Putnam County, NY
 Highway Department - Building 3 Dispatch/Garage
 Infiltration Reduction

TMY-3 Weather Data for Danbury, CT												
Operating Hours												
Savings												
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology	D	E	F	G	H	I	J	K	L
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0
75 to 80	77.5	0.3	0.0	35	216	108	359	359	0	0	0	0
70 to 75	72.5	62.4	0.0	83	207	174	524	524	0	0	0	0
65 to 70	67.5	59.5	0.0	221	316	251	798	798	0	0	0	0
60 to 65	62.5	54.9	0.0	279	289	344	912	912	0	0	0	0
Heating												
55 to 60	57.5	48.4	0.0	257	248	295	830	830	0	0	0	0
50 to 55	52.5	41.8	0.0	208	211	278	778	778	0	0	0	0
45 to 50	47.5	34.1	0.0	201	212	279	707	707	0	0	0	0
40 to 45	42.5	38.6	0.0	245	212	237	704	704	0	0	0	0
35 to 40	37.5	33.3	0.0	330	192	244	766	766	0	0	0	0
30 to 35	32.5	29.6	0.0	236	163	248	647	647	0	0	0	0
25 to 30	27.5	24.1	0.0	206	95	132	433	433	0	0	0	0
20 to 25	22.5	21.6	0.0	159	68	79	306	306	0	0	0	0
15 to 20	17.5	16.9	0.0	67	51	73	191	191	0	0	0	0
10 to 15	12.5	10.5	0.0	45	37	48	150	150	0	0	0	0
5 to 10	7.5	6.4	0.0	33	20	27	110	110	0	0	0	0
0 to 5	2.5	1.0	0.0	24	8	11	53	53	0	0	0	0
10 to 5	7.5	6.4	0.0	33	20	27	110	110	0	0	0	0
5 to 10	7.5	6.4	0.0	33	20	27	110	110	0	0	0	0
0 to 5	2.5	1.0	0.0	24	8	11	53	53	0	0	0	0
-5 to 0	-2.5	0.0	0.0	0	0	0	0	0	0	0	0	0
-10 to -5	-7.5	0.0	0.0	0	0	0	0	0	0	0	0	0
-15 to -10	-12.5	0.0	0.0	0	0	0	0	0	0	0	0	0
-20 to -15	-17.5	0.0	0.0	0	0	0	0	0	0	0	0	0
-25 to -20	-22.5	0.0	0.0	0	0	0	0	0	0	0	0	0
				2,920	2,920	2,920	8,760	8,760	0	0	0	0

Cell Ref.	Comment
A-1	TMY-3 Weather Data for Danbury, CT
F-1	Occupied hours as per the RFP data
M	Total Crnk Area of windows and doors
N	Average wind speed during the cooling and heating seasons
O	1 cool M J S L col N J S S286 = 69 x P70
P	1.08 x col O J S L col B J S (Q76) + col B J S - 1000 heating
Q	1.08 x col O J S L col B J S (Q77) + 1000 cooling, 1.08 x col O J S (Q76) + col B J S - 1000 heating
R	col E J S L col J J S col K J J S - 1000 x P88 x P89
S	col B J S L col J J S col K J J S - 1000 x P88 x P89
T	col Q J S L col J J S col K J J S - 1000 x P87

Assumptions:	Value	Unit	CELL	Description
0	0.0	0.0	P43	0.00
0	0.0	0.0	P44	0
0	0.0	0.0	P45	0
0	0.0	0.0	P46	0
Single Door - Sides, Top, Sweep (U)	2.0 (U)	1 (U)	P47	Building 3, 14 Exterior Doors
Overhead Door Weather Strip - Sides, Top	7.0 (U)	1 (U)	P48	Building 3, 14 Overhead Doors
0	0.0	0.0	P49	0
0	0.0	0.0	P50	0
0	0.0	0.0	P51	0
0	0.0	0.0	P52	0
0	0.0	0.0	P53	0
0	0.0	0.0	P54	0
0	0.0	0.0	P55	0
0	0.0	0.0	P56	0
0	0.0	0.0	P57	0
0	0.0	0.0	P58	0
0	0.0	0.0	P59	0
0	0.0	0.0	P60	0
0	0.0	0.0	P61	0
0	0.0	0.0	P62	0
0	0.0	0.0	P63	0
0	0.0	0.0	P64	0
Total Crnk Area	2,109 SF		P66	Combination of all Types
Existing Boiler Plant Efficiency	79.0%		P67	
Existing Cooling Plant Efficiency	2.93 COP		P68	
Percent Building Cooled	100.0%		P69	
Average Annual Wind Speed	10.0 MPH		P70	
Average Summer Wind Speed	10.0 MPH		P71	
Crnk Area Workload Diversity	2.5 (0%)		P72	
Average Space Temperatures - After Implementation of EXR				
Occupied	72.0	0%	Q76	Heating average temperature for all areas
UnOccupied	72.0	0%	Q77	0.0%

Putnam County, NY
Highway Department - Building 4 Garage
Infiltration Reduction

AMV-3 Weather Data for Danbury, CT		Operating Hours										Savings									
Amb. Temp Bin Deg. F	Avg Temp deg. F	M.C. Wh deg. F	M.C. Pathology	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	253	9	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	253	8	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	253	7	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	253	6	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	253	5	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	10.0	253	4	0	0	0	0	0
75 to 80	77.5	0.3	0.0	35	216	108	359	359	0	0	0	0	1.1	10.0	233	3	0	0	0	0	0
70 to 75	72.5	0.2	0.0	83	207	174	524	524	0	0	0	0	1.1	10.0	233	2	0	0	0	0	0
65 to 70	67.5	0.0	0.0	221	316	251	798	798	0	0	0	0	1.1	10.0	253	1	0	0	0	0	0
60 to 65	62.5	0.0	0.0	279	289	344	912	912	0	0	0	0	1.1	10.0	233	0	0	0	0	0	0
55 to 60	57.5	0.0	0.0	287	248	295	830	830	0	0	0	0	1.1	7.0	163	3	2	0	0	0	0
50 to 55	52.5	0.0	0.0	288	211	248	778	778	0	0	0	0	1.1	7.0	163	3	3	0	0	0	0
45 to 50	47.5	0.0	0.0	291	201	241	704	704	0	0	0	0	1.1	7.0	163	4	4	0	0	0	0
40 to 45	42.5	0.0	0.0	244	212	232	704	704	0	0	0	0	1.1	7.0	163	5	5	0	0	0	0
35 to 40	37.5	0.0	0.0	244	212	244	766	766	0	0	0	0	1.1	7.0	163	6	6	0	0	0	0
30 to 35	32.5	0.0	0.0	236	163	248	647	647	0	0	0	0	1.1	7.0	163	7	7	0	0	0	0
25 to 30	27.5	0.0	0.0	206	95	132	433	433	0	0	0	0	1.1	7.0	163	8	8	0	0	0	0
20 to 25	22.5	0.0	0.0	159	68	79	306	306	0	0	0	0	1.1	7.0	163	9	9	0	0	0	0
15 to 20	17.5	0.0	0.0	67	51	73	191	191	0	0	0	0	1.1	7.0	163	10	10	0	0	0	0
10 to 15	12.5	0.0	0.0	45	37	48	150	150	0	0	0	0	1.1	7.0	163	11	11	0	0	0	0
5 to 10	7.5	0.0	0.0	20	20	21	119	119	0	0	0	0	1.1	7.0	163	12	12	0	0	0	0
0 to 5	2.5	0.0	0.0	8	8	8	58	58	0	0	0	0	1.1	7.0	163	13	13	0	0	0	0
-5 to 0	-2.5	0.0	0.0	3	3	3	33	33	0	0	0	0	1.1	7.0	163	14	14	0	0	0	0
-10 to -5	-7.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	163	15	15	0	0	0	0
-15 to -10	-12.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	163	16	16	0	0	0	0
-20 to -15	-17.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	163	17	17	0	0	0	0
-25 to -20	-22.5	0.0	0.0	0	0	0	0	0	0	0	0	0	1.1	7.0	163	18	18	0	0	0	0

Cell Ref.	Comment	Value	Unit	CELL	Description
A-1	AMV-3 Weather Data for Danbury, CT			R43	
A-1	Occupied hours as per the RFP data	0	0.00	R43	0.00
M	Total Crsck area of windows and doors	0	0.0	R44	0
N	Average wind speed during the cooling and heating seasons	0	0.0	R45	0
O	1 cool M J x L cool N J x S286 = 69 x P70	0	0.0	R46	0
Q	1.08 x L cool J x L cool B J x O76 + 1.08 x L cool B J x O76 = 1000 heating	3 (117)	3 (117)	R47	Building 2, 14 Exhaust Doors
R	1.08 x L cool J x L cool B J x O77 + 1.08 x L cool B J x O77 = 1000 heating	3 (117)	3 (117)	R48	Building 2, 14 Exhaust Doors
S	1.08 x L cool J x L cool B J x O78 + 1.08 x L cool B J x O78 = 1000 heating	0	0	R49	0
T	1.08 x L cool J x L cool B J x O79 + 1.08 x L cool B J x O79 = 1000 heating	0	0	R50	0
U	1.08 x L cool J x L cool B J x O80 + 1.08 x L cool B J x O80 = 1000 heating	0	0	R51	0
V	1.08 x L cool J x L cool B J x O81 + 1.08 x L cool B J x O81 = 1000 heating	0	0	R52	0
W	1.08 x L cool J x L cool B J x O82 + 1.08 x L cool B J x O82 = 1000 heating	0	0	R53	0
X	1.08 x L cool J x L cool B J x O83 + 1.08 x L cool B J x O83 = 1000 heating	0	0	R54	0
Y	1.08 x L cool J x L cool B J x O84 + 1.08 x L cool B J x O84 = 1000 heating	0	0	R55	0
Z	1.08 x L cool J x L cool B J x O85 + 1.08 x L cool B J x O85 = 1000 heating	0	0	R56	0
AA	1.08 x L cool J x L cool B J x O86 + 1.08 x L cool B J x O86 = 1000 heating	0	0	R57	0
AB	1.08 x L cool J x L cool B J x O87 + 1.08 x L cool B J x O87 = 1000 heating	0	0	R58	0
AC	1.08 x L cool J x L cool B J x O88 + 1.08 x L cool B J x O88 = 1000 heating	0	0	R59	0
AD	1.08 x L cool J x L cool B J x O89 + 1.08 x L cool B J x O89 = 1000 heating	0	0	R60	0
AE	1.08 x L cool J x L cool B J x O90 + 1.08 x L cool B J x O90 = 1000 heating	0	0	R61	0
AF	1.08 x L cool J x L cool B J x O91 + 1.08 x L cool B J x O91 = 1000 heating	0	0	R62	0
AG	1.08 x L cool J x L cool B J x O92 + 1.08 x L cool B J x O92 = 1000 heating	0	0	R63	0
AH	1.08 x L cool J x L cool B J x O93 + 1.08 x L cool B J x O93 = 1000 heating	0	0	R64	0
AI	1.08 x L cool J x L cool B J x O94 + 1.08 x L cool B J x O94 = 1000 heating	0	0	R65	0
Summary	Total Crsck Area	1.00 SE		R66	Combination of all Types
	Existing Boiler Plant Efficiency	85.1%		R67	
	Existing Cooling Plant Efficiency	2.93 COP		R68	
	Percent Building Cooldown	50.0%		R69	
	Average Annual Wind Speed	10.0 MPH		R70	
	Average Summer Wind Speed	10.0 MPH		R71	
	Crack Area Workload Diversity	2.540%		R72	
Average Space Temperatures - After Implementation of EXF					
Occupied	Cooling	72.0	Q76	Q76	average temperature for all areas
UnOccupied	Heating	72.0	Q77	Q77	average temperature for all areas

**Putnam County, NY
Board of Elections
Infiltration Reduction**

TABLE 3 Weather Data for Danbury, CT																		
Operating Hours											Savings							
Appl. Temp Bindeg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Bindeg. F	M.C. Bindeg. F	09-16 Hours	17-24 Hours	Total Hrs	Use One-Peak Hrs.	Use One-Peak Peak Hrs.	Use One-Peak Peak Hrs.	Average Wind Speed (MPH)	Infiltration Flow Rate (CFM)	Use Heating Savings (MMBTU)	Use Cooling Savings (MMBTU)	Use Heating Savings (MMBTU)	Use Cooling Savings (MMBTU)		
A	B	C	D	E	F	G	H	I	J	K	N	O	P	Q	R	S	T	U
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	7	7	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
90 to 95	92.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
85 to 90	87.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
80 to 85	82.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
75 to 80	77.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
70 to 75	72.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
65 to 70	67.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
60 to 65	62.5	0.0	0.0	0	0	0	0	0	0	0	10.0	171	0	0	0	0	0	0
Heating																		
55 to 60	57.5	48.4	0.0	287	248	295	830	0	0	0	7.0	119	2	2	0	0	2	0
50 to 55	52.5	44.8	0.0	209	188	211	597	0	0	0	7.0	119	3	3	0	0	3	0
45 to 50	47.5	41.2	0.0	209	188	211	597	0	0	0	7.0	119	4	4	0	0	4	0
40 to 45	42.5	38.0	0.0	245	212	237	704	0	0	0	7.0	119	4	4	0	0	4	0
35 to 40	37.5	33.3	0.0	340	302	344	966	0	0	0	7.0	119	5	5	0	0	5	0
30 to 35	32.5	29.6	0.0	246	163	248	647	0	0	0	7.0	119	5	5	0	0	5	0
25 to 30	27.5	24.1	0.0	200	05	132	433	0	0	0	7.0	119	6	6	0	0	6	0
20 to 25	22.5	21.0	0.0	159	08	79	306	0	0	0	7.0	119	7	7	0	0	7	0
15 to 20	17.5	16.9	0.0	67	51	73	191	0	0	0	7.0	119	7	7	0	0	7	0
10 to 15	12.5	10.5	0.0	45	37	48	150	0	0	0	7.0	119	8	8	0	0	8	0
5 to 10	7.5	6.4	0.0	55	20	37	100	0	0	0	7.0	119	9	9	0	0	9	0
0 to 5	2.5	0.0	0.0	58	0	21	83	0	0	0	7.0	119	10	10	0	0	10	0
5 to 10	7.5	0.0	0.0	3	0	3	8	0	0	0	7.0	119	10	10	0	0	10	0
10 to 15	12.5	0.0	0.0	3	0	3	8	0	0	0	7.0	119	11	11	0	0	11	0
15 to 20	17.5	0.0	0.0	0	0	0	0	0	0	0	7.0	119	12	12	0	0	12	0
20 to 25	22.5	0.0	0.0	0	0	0	0	0	0	0	7.0	119	13	13	0	0	13	0
25 to 30	27.5	0.0	0.0	0	0	0	0	0	0	0	7.0	119	13	13	0	0	13	0
Average Space Temperatures - After Implementation of FME											Cooling		Heating		Description			
Decoupled											Q76	73.0	Q76	73.0	Average temperature for all areas			
ImfAccomp											Q77	70.0	Q77	70.0	Average temperature for all areas			

Cell Ref	Comment
A-1	TMY3 Weather Data for Danbury, CT
I-1	Occupied hours as per the RFP data
M	Total Crack Area of window and door
N	Average wind speed during the cooling and heating seasons
O	1 cool M, 1 cool R, 1 cool S, 5286 = 60 x P70
P	1.08 x [cool O] x [cool B] + 1.09 cooling, 1.08 x [cool O] x [cool B] + 1.09 heating
Q	1.08 x [cool O] x [cool B] + 1.09 heating, 1.08 x [cool O] x [cool B] + 1.09 heating
R	1.08 x [cool O] x [cool B] + 1.09 heating, 1.08 x [cool O] x [cool B] + 1.09 heating
S	1.08 x [cool O] x [cool B] + 1.09 heating, 1.08 x [cool O] x [cool B] + 1.09 heating
T	1.08 x [cool O] x [cool B] + 1.09 heating, 1.08 x [cool O] x [cool B] + 1.09 heating
U	1.08 x [cool O] x [cool B] + 1.09 heating, 1.08 x [cool O] x [cool B] + 1.09 heating

Assumptions:	Value	Unit	CELL	Description
Double Door - Sides, Top, Sweep (U/F)	1 (U/F)		P42	Exterior Door
Single Door - Sides, Top, Sweep (U/F)	2 (U/F)		P44	Exterior Door
Block Seal (U/F)	80 (U/F)		P47	Building Verneber
	0		P48	
	0		P49	
	0		P50	
	0		P51	
	0		P52	
	0		P53	
	0		P54	
	0		P55	
	0		P56	
	0		P57	
	0		P58	
	0		P59	
	0		P60	
	0		P61	
	0		P62	
	0		P63	
	0		P64	
Total Crack Area	1,290 SF		P66	Combustion air all Types
Existing Boiler Plant Efficiency	87.0%		P67	
Existing Cooling Plant Efficiency	2.93 COP		P68	
Percent Building Cooled	100.0%		P69	
Average Summer Wind Speed	10.0 MPH		P70	
Average Winter Wind Speed	10.0 MPH		P71	
Crack Area Windward Exposure	18.0%		P72	

Putnam County, NY
Burchetta Building (Law Dept) - 48 Gleneid.
Infiltration Reduction

TMY-3 Weather Data for Danbury, CT																				
Operating Hours																				
Savings																				
Month	Ave Temp [deg. F]	M.C.U.W.I [deg. F]	M.C. [ft/yr]	09-16 Hours	17-24 Hours	7 total Hrs	Use One-Peak Hrs.	Use One-Peak Peak Hrs.	Use One-Peak Peak Hrs.	Use One-Peak Peak Hrs.	Average Wind Speed [MPH]	Infiltration Flow Rate [CFM]	Use Heating Savings [MMBTU]	Use Cooling Savings [MMBTU]	Use Heating Savings [MMBTU]	Use Cooling Savings [MMBTU]				
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
10/5 to 11/1	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0.8	136	3	5	0	0	0	0	0
11/2 to 12/31	102.3	0.0	0.0	0	0	0	0	0	0	0	0	0.8	136	4	4	0	0	0	0	0
1/1 to 2/28	92.8	0.0	0.0	0	0	0	0	0	0	0	0	0.8	136	4	4	0	0	0	0	0
3/1 to 4/30	52.2	56.2	0.0	0	17	2	19	0	0	0	0	0.8	136	2	4	0	0	0	0	0
5/1 to 6/30	87.5	73.2	0.0	0	80	13	93	0	0	0	0	0.8	136	2	2	0	0	0	0	0
7/1 to 8/31	87.5	87.5	0.0	8	167	50	225	0	0	0	0	0.8	136	2	2	0	0	0	0	0
9/1 to 10/31	82.3	63.3	0.0	15	216	108	359	0	0	0	0	0.8	136	1	1	0	0	0	0	0
11/1 to 12/31	72.8	62.4	0.0	8.5	267	174	524	0	0	0	0	0.8	136	0	0	0	0	0	0	0
1/1 to 2/28	67.4	59.5	0.0	22.1	316	261	798	0	0	0	0	0.8	136	0	0	0	0	0	0	0
3/1 to 4/30	67.4	54.9	0.0	279	209	344	912	0	0	0	0	0.8	136	0	0	0	0	0	0	0
5/1 to 6/30	77.2	48.4	0.0	287	248	295	830	0	0	0	0	0.8	95	1	1	0	0	0	0	0
7/1 to 8/31	77.2	44.8	0.0	287	248	295	830	0	0	0	0	0.8	95	2	2	0	0	0	0	0
9/1 to 10/31	72.8	41.8	0.0	209	211	219	719	0	0	0	0	0.8	95	2	2	0	0	0	0	0
11/1 to 12/31	67.4	38.0	0.0	245	212	237	704	0	0	0	0	0.8	95	3	3	0	0	0	0	0
1/1 to 2/28	62.0	33.3	0.0	340	192	244	766	0	0	0	0	0.8	95	3	3	0	0	0	0	0
3/1 to 4/30	57.0	29.6	0.0	236	163	248	647	0	0	0	0	0.8	95	4	4	0	0	0	0	0
5/1 to 6/30	52.2	21.6	0.0	200	95	132	433	0	0	0	0	0.8	95	4	4	0	0	0	0	0
7/1 to 8/31	47.0	16.9	0.0	67	51	73	191	0	0	0	0	0.8	95	5	5	0	0	0	0	0
9/1 to 10/31	42.0	12.3	0.0	45	37	48	150	0	0	0	0	0.8	95	6	6	0	0	0	0	0
11/1 to 12/31	37.0	6.4	0.0	55	20	37	110	0	0	0	0	0.8	95	6	6	0	0	0	0	0
1/1 to 2/28	32.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	7	7	0	0	0	0	0
3/1 to 4/30	27.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	7	7	0	0	0	0	0
5/1 to 6/30	22.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	8	8	0	0	0	0	0
7/1 to 8/31	17.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	8	8	0	0	0	0	0
9/1 to 10/31	12.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0
11/1 to 12/31	7.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0
1/1 to 2/28	2.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0
3/1 to 4/30	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0
5/1 to 6/30	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0
7/1 to 8/31	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0
9/1 to 10/31	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0
11/1 to 12/31	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0.8	95	9	9	0	0	0	0	0

Cell Ref	Comment	Value	Unit	CELL REF	Description
A-1	TMY-3 Weather Data for Danbury, CT				
F-1	Occupied hours as per the RFP data	4 (117)		P42	External Doors
M	Total Crank area of windows and doors			P43	External Doors
N	Average wind speed during the cooling and heating seasons	11 (117)		P45	Roofed Windows
O	1 cool M, 1 cool R, 1 cool S, 286 = 60 x P70				
P	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P47	
Q	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P48	
R	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P49	
S	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P50	
T	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P51	
U	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P52	
V	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P53	
W	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P54	
X	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P55	
Y	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P56	
Z	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P57	
AA	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P58	
AB	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P59	
AC	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P60	
AD	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P61	
AE	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P62	
AF	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P63	
AG	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P64	
AH	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P66	Combustion oil all types
AI	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P67	
AJ	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P68	
AK	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P69	
AL	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P70	
AM	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P71	
AN	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P72	
AO	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P73	
AP	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P74	
AQ	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P75	
AR	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P76	
AS	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P77	
AT	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P78	
AV	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P79	
AW	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P80	
AX	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P81	
AY	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [cool Y] + 1.09 x [cool Z]			P82	
AZ	1.08 x [cool O] x [cool B] + 1.09 x [cool Q] x [cool R] + 1.09 x [cool S] + 1.09 x [cool T] + 1.09 x [cool U] + 1.09 x [cool V] + 1.09 x [cool W] + 1.09 x [cool X] + 1.09 x [

Energy Savings Calculations for ECM 15: Pipe Insulation

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	15
Measure Name:	Pipe Insulation
Measure Location:	
Engineers:	

Site Name:	Units	Court Savings	Bruen Savings	Court/1812 Savings	Golf Savings	EOC Savings	KoehlerSr Savings	PutnamSr Savings	Hwy1 Savings	Vets Savings	Law Savings	Summary
Electricity												
Energy On-Peak	kWh											0
Energy Off-Peak	kWh											0
Energy Total	kWh	0	0	0	0	0	0	0	0	0	0	0
Demand On-Peak, Monthly	kW											0.0
Demand On-Peak, Annual	kW											0.0
Demand Off-Peak, Monthly	kW											0.0
Demand Off-Peak, Annual	kW											0.0
Fossil Fuel												0
Natural Gas (NG)	CCF	128					104			355	340	927
Liquid Propane Gas (LPG)	Gallons											0
Steam	Mlbs											0
Fuel Oil, #2	Gallons		883	182	272	231		308	90			1,966
Fuel Oil, #4	Gallons											0
Fuel Oil, #6	Gallons											0
Solar Value Stack	\$											0
Water												0
Water Savings	kGallons											0
Sewer												0
Sewer Savings	kGallons											0

Location	Existing Piping Details										Existing Insulation Detail					Proposed Insulation Detail						
	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft-°F)	Cold Fluid Temperature (°F)	Cold Fluid Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Existing Heat Loss (MBtu)	Proposed Heat Loss (MBtu)	Existing Heat Loss (MBtu)	Proposed Heat Loss (MBtu)	Savings (MBtu)	
MTHW In-Line Pump	2	Water	185.0	20.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	25,826	4,586	25,826	4,586	0	
MTHW Strainer	2	Water	185.0	10.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	12,912	2,293	12,912	2,293	0	
MTHW 90 Degree Elbow	4	Water	185.0	1.8	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	3,224	413	3,224	413	1,912	
MTHW Bonnet	4	Water	185.0	1.8	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2,524	344	2,524	344	1,593	
MTHW End Cap	4	Water	185.0	1.5	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	1,937	274	1,937	274	1,593	
MTHW Straight Pipe	4	Water	185.0	3.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	3,874	688	3,874	688	3,186	
MTHW Bonnet	5	Water	185.0	1.8	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2,324	413	2,324	413	0	
MTHW Centrifugal Pump	5	Water	185.0	10.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	12,913	2,293	12,913	2,293	0	
MTHW Flex Fitting	5	Water	185.0	6.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	7,748	1,376	7,748	1,376	6,372	
MTHW Strainer	5	Water	185.0	5.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	3,408	747	3,408	747	0	
MTHW Suction Diffuser	5	Water	185.0	8.8	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	5,998	1,314	5,998	1,314	0	
Totals																		81,590	14,879	81,590	14,879	13,063

Item	Value	Units	Cell Ref	Remarks
Heating System Efficiency	70.0%		P65	From Baseline
Saving Adjustment Factor	60%		P65	

Cell Ref.	Comment
A	Location of Pipe
B-K	Piping properties
L-M	Cold fluid properties, typically air
N-P	Existing insulation details
Q-S	Proposed insulation details
T	=(Existing Transmission + Radiation Heat Loss) x [col E] + [P65] + 1,000
U	=(Proposed Transmission + Radiation Heat Loss) x [col E] + [P65] + 1,000
V	=[col T] - [col U]



Location	Pipe Size		Fluid Type (Water or Steam)	Fluid Temp (°F)	Heating Hours	Fluid Velocity (ft/s)	Length (ft)	Existing Piping Details			Existing Insulation Details						Proposed Insulation Details						Savings (MBtu)
	inches	ft						Outside Diameter (inches)	Inside Pipe Diameter (inches)	Insulation Thickness (inches)	Insulation Emissivity	Pipe Conductivity (Btu/hr-ft-°F)	Cold Fluid Temperature (°F)	Cold Fluid Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Existing Heat Loss (MBtu)	Proposed Heat Loss (MBtu)	
Location	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	
LPS 90 Degree Elbow	3/4		Steam	205.0	3,817	5.0	1.8	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	316	89	0	
LPS Straight Pipe	3/4		Steam	205.0	3,817	5.0	3.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	351	98	0	
LPS 90 Degree Elbow	1		Steam	205.0	3,817	5.0	3.6	1.05	1.33	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	879	246	633	
LPS Straight Pipe	1		Steam	205.0	3,817	5.0	5.4	1.05	1.33	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	702	197	505	
LPS 90 Degree Elbow	1		Steam	205.0	3,817	5.0	4.0	1.05	1.32	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	1,188	206	893	
LPS Straight Pipe	1		Steam	205.0	3,817	5.0	6.0	1.05	1.32	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	880	219	0	
LPS 45 Degree Elbow	1 1/4		Steam	205.0	3,817	5.0	1.0	1.38	1.66	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	278	62	216	
LPS Straight Pipe	1 1/4		Steam	205.0	3,817	5.0	9.0	1.38	1.66	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	2,500	555	1,945	
LPS 90 Degree Elbow	1 1/2		Steam	205.0	3,817	5.0	5.4	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	1,677	370	0	
LPS Straight Pipe	1 1/2		Steam	205.0	3,817	5.0	10.8	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	1,717	358	1,359	
LPS 90 Degree Elbow	1 1/2		Steam	205.0	3,817	5.0	9.0	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	3,434	716	2,718	
LPS Straight Pipe	1 1/2		Steam	205.0	3,817	5.0	11.0	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	2,862	597	2,265	
LPS T Intersection	1 1/2		Steam	205.0	3,817	5.0	3.6	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	3,498	729	2,768	
LPS 45 Degree Elbow	2		Steam	205.0	3,817	5.0	2.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	1,143	239	906	
LPS Straight Pipe	2		Steam	205.0	3,817	5.0	8.4	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	795	150	644	
LPS 90 Degree Elbow	2		Steam	205.0	3,817	5.0	16.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	2,146	400	1,746	
LPS Straight Pipe	2		Steam	205.0	3,817	5.0	10.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	6,359	1,204	5,155	
LPS 45 Degree Elbow	2 1/2		Steam	205.0	3,817	5.0	1.0	2.47	2.88	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	481	84	397	
LPS Straight Pipe	2 1/2		Steam	205.0	3,817	5.0	5.4	2.47	2.88	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	3,596	456	3,142	
LPS 90 Degree Elbow	2 1/2		Steam	205.0	3,817	5.0	16.0	2.47	2.88	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	866	152	714	
LPS Straight Pipe	2 1/2		Steam	205.0	3,817	5.0	2.4	2.47	2.88	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	7,698	1,350	6,348	
LPS 90 Degree Elbow	3		Steam	205.0	3,817	5.0	5.4	3.07	3.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	1,135	203	932	
LPS Straight Pipe	3		Steam	205.0	3,817	5.0	18.0	3.07	3.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	3,163	516	2,647	
LPS Flange	3		Steam	205.0	3,817	5.0	15.0	3.07	3.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	1,054	172	882	
LPS Straight Pipe	3		Steam	205.0	3,817	5.0	2.4	3.07	3.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.5	0.93	0.0225	8,786	1,434	7,352	
LPS T Intersection	4		Steam	205.0	3,817	5.0	1.8	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	1,406	229	1,176	
LPS 90 Degree Elbow	4		Steam	205.0	3,817	5.0	3.6	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	1,355	182	1,174	
LPS Straight Pipe	4		Steam	205.0	3,817	5.0	7.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	2,711	363	2,348	
LPS 90 Degree Elbow	5		Steam	205.0	3,817	5.0	1.8	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	1,355	182	1,174	
LPS Straight Pipe	5		Steam	205.0	3,817	5.0	3.6	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	2,711	363	2,348	
LPS 90 Degree Elbow	5		Steam	205.0	3,817	5.0	7.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	1,355	182	1,174	
LPS Straight Pipe	5		Steam	205.0	3,817	5.0	14.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	3,271	707	2,564	
LPS 45 Degree Elbow	3/4		Water	165.0	3,817	5.0	2.4	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	6,777	908	5,869	
LPS Straight Pipe	3/4		Water	165.0	3,817	5.0	5.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	3.0	0.93	0.0225	1,807	242	1,565	
Cond 45 Degree Elbow	3/4		Water	165.0	3,817	5.0	8.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	587	215	0	
Cond Straight Pipe	3/4		Water	165.0	3,817	5.0	7.2	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	959	345	0	
Cond 90 Degree Elbow	3/4		Water	165.0	3,817	5.0	23.4	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	845	310	535	
Cond Steam Trap	3/4		Water	165.0	3,817	5.0	4.4	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	2,746	1,008	1,738	
Cond Straight Pipe	3/4		Water	165.0	3,817	5.0	4.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	516	190	0	
Cond 90 Degree Elbow	3/4		Water	165.0	3,817	5.0	36.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	469	172	0	
Cond Straight Pipe	3/4		Water	165.0	3,817	5.0	18.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	4,224	1,351	0	
Cond 90 Degree Elbow	1		Water	165.0	3,817	5.0	7.0	1.05	1.32	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	264	88	177	
Cond Straight Pipe	1		Water	165.0	3,817	5.0	14.0	1.05	1.32	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	1,029	341	0	
Cond T Intersection	2		Water	165.0	3,817	5.0	2.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	705	234	472	
Cond 90 Degree Elbow	2		Water	165.0	3,817	5.0	10.8	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	531	119	412	
Cond Straight Pipe	2		Water	165.0	3,817	5.0	9.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2,866	643	2,223	
Cond 90 Degree Elbow	2		Water	165.0	3,817	5.0	10.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2,388	516	1,872	
Cond Straight Pipe	2		Water	165.0	3,817	5.0	9.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2,654	595	2,059	
Cond 90 Degree Elbow	2		Water	165.0	3,817	5.0	9.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	1,103	210	893	
Cond Straight Pipe	2		Water	165.0	3,817	5.0	9.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	1,327	298	1,029	
Cond 90 Degree Elbow	2 1/2		Water	165.0	3,817	5.0	7.2	2.47	2.88	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2						

Location	Existing Piping Details										Existing Insulation Details				Proposed Insulation Details						
	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Heating Hours	Fluid Velocity (ft/s)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft²-°F)	Cold Fluid Temperature (°F)	Cold Fluid Conductivity (Btu/hr-ft²-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft²-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft²-°F)	Existing Heat Loss (MBtu)	Proposed Heat Loss (MBtu)	Savings (MBtu)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]	[P]	[Q]	[R]	[S]	[T]	[U]	[V]
Existing insulation details																					
N - P																					
O - S																					
T																					
U																					
V																					
Proposed insulation details = (Existing Transmission + Radiation Heat Loss) x [col E] - [P78] = 1,000 = (Proposed Transmission + Radiation Heat Loss) x [col E] - [P78] = 1,000 = [col T] - [col U]																					

Location	Existing Piping Details						Existing Insulation Details						Proposed Insulation Details						Proposed Heat Loss (MBtu)	Existing Heat Loss (MBtu)	Savings (MBtu)
	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft-°F)	Cold Fluid Temperature (°F)	Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity			
	[B]	[C]	[D]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]	[P]	[Q]	[R]	[S]	[T]	[U]	[V]		
MTHW Flange	2	Water	185.0	30.6	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	7.725	1.692	0		
MTHW In-Line Pump	2	Water	185.0	25.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	6.511	1.383	4.929		
MTHW Straight Pipe	2	Water	185.0	5.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	.757	.166	.591		
MTHW Strainer	2	Water	185.0	15.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	5.787	830	2.957		
MTHW Suction Diffuser	2	Water	185.0	8.8	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2.222	.487	1.735		
MTHW Air Separator Tank	12 20/21	Water	185.0	13.0	11.94	12.75	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	17.547	2.528	15.018		
Totals				95.4													38,349	7,085	25,231		

Item	Value	Units	Cell Ref	Remarks
Heating System Efficiency	75.0%		[P65]	From BaseLine
Saving Adjustment Factor	50%		[P65]	

Cell Ref.	Comment
A	Location of Pipe
B-K	Piping properties
L-M	Cold fluid properties, typically air
N-P	Existing insulation details
Q-S	Proposed insulation details
T	= (Existing Transmission + Radiation Heat Loss) x [col E] + [P65] * 1,000
U	= (Proposed Transmission + Radiation Heat Loss) x [col E] + [P65] * 1,000
V	= [col T] - [col U]

Location	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Existing Piping Details				Existing Insulation Details				Proposed Insulation Details				Savings (MBtu)		
							Pipe Size (inches)	Fluid Temperature (°F)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft²-°F)	Cold Fluid Temperature (°F)	Centrifugal Conductivity (Btu/hr-ft²-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft²-°F)		Insulation Thickness (inches)	Insulation Emissivity
MTHW In-Line Pump	1-1/2	Water	185.0	50.0	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	2.0	0.93	0.0225	27,266	6,532	20,734
MTHW Bypass	3	Water	185.0	1.8	3.07	3.50	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	2.0	0.93	0.0225	1,808	346	1,462
MTHW Flange	3	Water	185.0	1.8	3.07	3.50	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	2.0	0.93	0.0225	1,808	346	1,462
MTHW In-Line Pump	3	Water	185.0	5.0	3.07	3.50	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	2.0	0.93	0.0225	5,022	961	4,061
MTHW Air Separator Tank	6-7/25	Water	185.0	6.3	6.07	6.63	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	2.0	0.93	0.0225	11,938	1,927	10,011
Totals				64.9															47,841	10,112	37,729

Cell Ref.	Comment	Value	Units	Cell Ref.	Remarks
A	Location of Pipe			P65 I	From Baseline
B-K	Piping properties			P65 I	
L-M	Cold fluid properties, typically air			P65 I	
N-P	Existing insulation details			P65 I	
Q-S	Proposed insulation details			P65 I	
T	=(Existing Transmission + Radiation Heat Loss) x col E = P65 I + 1,000				
U	=(Proposed Transmission + Radiation Heat Loss) x col E = P65 I + 1,000				
V	= col T - col U				

Location	Existing Piping Details										Existing Insulation Detail					Proposed Insulation Detail					Proposed Heat Loss (MBtu)	Existing Heat Loss (MBtu)	Savings (MBtu)
	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft-°F)	Cold Fluid Temperature (°F)	Cold Fluid Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Existing Heat Loss (MBtu)	Proposed Heat Loss (MBtu)	Savings (MBtu)				
MTHW In-Line Pump	2	Water	185.0	10.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	6,076	1,331	4,745				
MTHW Centrifugal Pump	4	Water	185.0	10.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	11,511	2,044	9,467				
MTHW Strainer	4	Water	185.0	10.0	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	11,511	2,044	9,467				
MTHW Suction Diffuser	4	Water	185.0	8.8	4.03	4.50	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	10,130	1,799	8,331				
Totals				38.8													39,229	7,218	32,011				

Item	Value	Units	Cell Ref	Remarks
Heating System Efficiency	78.5%		P65	From Baseline
Saving Adjustment Factor	60%		P65	

Comment
 Location of Pipe
 Piping properties
 Cold fluid properties, typically air
 Existing insulation details
 Proposed insulation details
 $\text{E} = (\text{Existing Transmission} + \text{Radiation Heat Loss}) \times [\text{cool E}] + [\text{P65}] + 1,000$
 $\text{P} = (\text{Proposed Transmission} + \text{Radiation Heat Loss}) \times [\text{cool E}] + [\text{P63}] + 1,000$
 $\text{S} = [\text{cool T}] + [\text{cool U}]$



Location	Existing Piping Details										Existing Insulation Details						Proposed Insulation Details					
	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Heating Hours	Fluid Velocity (ft/s)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft²-°F)	Cold Fluid Temperature (°F)	Cold Fluid Conductivity (Btu/hr-ft²-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft²-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft²-°F)	Existing Heat Loss (MBtu)	Proposed Heat Loss (MBtu)	Savings (MBtu)	
	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]	[P]	[Q]	[R]	[S]	[T]	[U]	[V]	
MTHW 90 Degree Elbow	1. 1/2	Water	185.0	5,830	5.0	3.6	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	1,936	464	1,472	
MTHW Straight Pipe	1. 1/2	Water	185.0	5,830	5.0	7.0	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	3,765	902	2,863	
MTHW 90 Degree Elbow	2	Water	185.0	5,830	5.0	3.6	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2,420	530	1,890	
MTHW Straight Pipe	2	Water	185.0	5,830	5.0	12.0	2.07	2.38	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	8,968	1,768	7,200	
Totals						26.2													16,190	3,664	12,526	

Cell Ref.	Item	Value	Units	Cell Ref	Remarks
A	Location of Pipe			P65	From Baseline
B-K	Piping properties			P65	
L-M	Cold fluid properties, typically air			P65	
N-P	Existing insulation details			P65	
Q-S	Proposed insulation details			P65	
T	=(Existing Transmission + Radiation Heat Loss) x (col E) - (P65) = 1,000				
U	=(Proposed Transmission + Radiation Heat Loss) x (col E) - (P65) = 1,000				
V	=(col T) - (col U)				



Location	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Heating Hours	Fluid Velocity (ft/s)	Length (ft)	Existing Piping Details				Existing Insulation Details				Proposed Insulation Details				Savings (MBtu)	
							Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft²-°F)	Cold Fluid Temperature - Air (°F)	Cold Fluid Conductivity (Btu/hr-ft²-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft²-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft²-°F)		Existing Heat Loss (MBtu)
MTHW 90 Degree Elbow	3/4	Water	185.0	5,830	5.0	16.2	0.82	1.05	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	4.161	1,493	2,668
MTHW Straight Pipe	3/4	Water	185.0	5,830	5.0	24.0	0.82	1.05	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	6.164	2,111	0
MTHW 45 Degree Elbow	1	Water	185.0	5,830	5.0	26.0	1.05	1.32	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	8.162	2,708	0
MTHW 90 Degree Elbow	1	Water	185.0	5,830	5.0	36.0	1.05	1.32	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	11.579	5,149	7,530
MTHW Straight Pipe	1	Water	185.0	5,830	5.0	119.0	1.05	1.32	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	38.274	17,302	0
MTHW 90 Degree Elbow	1 1/4	Water	185.0	5,830	5.0	7.2	1.38	1.66	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	2.923	859	2,065
MTHW Straight Pipe	1 1/4	Water	185.0	5,830	5.0	9.0	1.38	1.66	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	3.654	1,073	3,381
MTHW 45 Degree Elbow	1 1/2	Water	185.0	5,830	5.0	4.0	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	1.859	445	1,413
MTHW 90 Degree Elbow	1 1/2	Water	185.0	5,830	5.0	9.0	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	4.182	1,002	3,180
MTHW Straight Pipe	1 1/2	Water	185.0	5,830	5.0	18.0	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	8.365	2,004	6,361
MTHW T Intersection	1 1/2	Water	185.0	5,830	5.0	18.0	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	2.0	0.93	0.0225	8.365	2,004	6,361
DHW 90 Degree Elbow	1 1/4	Water	125.0	8,760	5.0	10.8	1.38	1.66	0.65	227.0	70.0	1.00	0.93	0.0225	1.0	0.93	0.0225	2.923	1,128	0
DHW Straight Pipe	1 1/4	Water	125.0	8,760	5.0	11.0	1.38	1.66	0.65	227.0	70.0	1.00	0.93	0.0225	1.0	0.93	0.0225	2.977	1,149	0
DHW 45 Degree Elbow	1 1/2	Water	125.0	8,760	5.0	3.0	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	929	277	653
DHW 90 Degree Elbow	1 1/2	Water	125.0	8,760	5.0	5.4	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	1,673	498	1,175
DHW Straight Pipe	1 1/2	Water	125.0	8,760	5.0	18.0	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	5,576	1,661	0
DHW T Intersection	1 1/2	Water	125.0	8,760	5.0	2.4	1.61	1.90	0.65	227.0	70.0	1.00	0.93	0.0225	1.5	0.93	0.0225	743	221	522
Totals						341.0												114,568	35,318	36,221

Item	Value	Units	Cell Ref	Remarks
Heating System Efficiency	82.1%		P65	From Baseline
Source Adjustment Factor	60%		P65	

Comment
Location of Pipe
Piping properties
Cold fluid properties, typically air
Existing insulation details
Proposed insulation details
= (Existing Transmission + Radiation Heat Loss) X [col E] + [P65] = 1,000
= (Proposed Transmission + Radiation Heat Loss) X [col E] = [P65] = 1,000
= [col T] - [col U]

Cell Ref.	Comment
A	Location of Pipe
B - K	Piping properties
L - M	Cold fluid properties, typically air
N - P	Existing insulation details
Q - S	Proposed insulation details
T	= (Existing Transmission + Radiation Heat Loss) X [col E] + [P65] = 1,000
U	= (Proposed Transmission + Radiation Heat Loss) X [col E] = [P65] = 1,000
V	= [col T] - [col U]



Location	Existing Piping Details										Existing Insulation Details				Proposed Insulation Details				Savings (MBtu)		
	Pipe Size (inches)	Fluid Type (Water or Steam)	Fluid Temperature (°F)	Heating Hours	Fluid Velocity (ft/s)	Length (ft)	Inside Pipe Diameter (inches)	Outside Pipe Diameter (inches)	Piping Emissivity	Pipe Conductivity (Btu/hr-ft-°F)	Cold Fluid Temperature (°F)	Cold Fluid Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)	Insulation Thickness (inches)	Insulation Emissivity	Insulation Conductivity (Btu/hr-ft-°F)		Existing Heat Loss (MBtu)	Proposed Heat Loss (MBtu)
	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]	[P]	[Q]	[R]	[S]	[T]	[U]	[V]
MTHW 45 Degree Elbow	3/4	Water	185.0	5,830	5.0	6.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	1,543	553	0
MTHW 90 Degree Elbow	3/4	Water	185.0	5,830	5.0	7.2	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	1,851	664	1,187
MTHW 90 Degree Elbow	3/4	Water	185.0	5,830	5.0	34.2	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	8,793	3,154	5,639
MTHW Ball Valve	3/4	Water	185.0	5,830	5.0	32.8	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	8,433	3,053	5,380
MTHW Straight Pipe	3/4	Water	185.0	5,830	5.0	6.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	1,543	553	0
MTHW Straight Pipe	3/4	Water	185.0	5,830	5.0	89.0	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	22,883	8,309	0
MTHW T Intersection	3/4	Water	185.0	5,830	5.0	4.8	0.82	1.05	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	1,314	443	0
MTHW Pipe-Check	J	Water	185.0	5,830	5.0	16.4	1.05	1.32	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	5,281	1,710	3,571
MTHW In-Line Pump	J	Water	185.0	5,830	5.0	40.0	1.05	1.32	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	1.5	0.93	0.0225	12,880	4,170	8,710
MTHW 90 Degree Elbow	1 1/2	Water	185.0	5,830	5.0	1.8	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	837	201	637
MTHW 90 Degree Elbow	1 1/2	Water	185.0	5,830	5.0	3.6	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	1,675	401	1,274
MTHW Straight Pipe	1 1/2	Water	185.0	5,830	5.0	7.0	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	3,457	780	2,676
MTHW Straight Pipe	1 1/2	Water	185.0	5,830	5.0	3.0	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	1,396	334	1,061
MTHW T Intersection	1 1/2	Water	185.0	5,830	5.0	7.2	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	3,150	802	2,347
MTHW T Intersection	1 1/2	Water	185.0	5,830	5.0	6.0	1.61	1.90	0.65	227.0	70.0	1.00	0.0	0.93	0.0225	2.0	0.93	0.0225	2,791	669	2,123
Totals						265.0													77,746	25,609	34,632

Item	Value	Units	Cell Ref	Remarks
Heating System Efficiency	82.1%		[P65]	From Baseline
Saving Adjustment Factor	60%		[P65]	

Comment
Location of Pipe
Piping properties
Cold fluid properties, typically air
Existing insulation details
Proposed insulation details
= (Existing Transmission + Radiation Heat Loss) x [col E] ÷ [P65] + 1,000
= (Proposed Transmission + Radiation Heat Loss) x [col E] ÷ [P65] + 1,000
= [col T] - [col U]

Energy Savings Calculations for ECM 16: Boiler Replacements

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	16
Measure Name:	Boiler Replacements
Measure Location:	
Engineers:	

Site Name:	Units	Hwy3 Savings	Summary
Electricity			
Energy On-Peak	kWh		0
Energy Off-Peak	kWh		0
Energy Total	kWh	0	0
Demand On-Peak, Monthly	kW		0.0
Demand On-Peak, Annual	kW		0.0
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			
Natural Gas (NG)	CCF		0
Liquid Propane Gas (LPG)	Gallons		0
Steam	Mlbs		0
Fuel Oil, #2	Gallons	352	352
Fuel Oil, #4	Gallons		0
Fuel Oil, #6	Gallons		0
Solar Value Stack	\$		0
Water			
Water Savings	kGallons		0
Sewer			
Sewer Savings	kGallons		0

Putnam County, NY
Highway Department - Building 3 Dispatch/Garage
Boiler Replacements

TMY-3 Weather Data for Danbury, CT		Existing Occupancy Schedule												Proposed EMS Operating Hours					Proposed				Savings																					
Amb. Temp Bin deg. F	Ave Temp deg. F	M.C. WB deg. F	M.C. Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W																						
Cooling																							UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																					
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																					
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																					
90 to 95	92.5	76.2	0.0	0	17	2	19	5	14	0	0	7	12	0	0	0	0	0	0	0	0	0	0																					
85 to 90	87.5	73.2	0.0	0	80	13	93	22	71	0	0	36	57	0	0	0	0	0	0	0	0	0	0																					
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	87	138	0	0	0	0	0	0	0	0	0	0																					
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	139	229	0	0	0	0	0	0	0	0	0	0																					
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	203	321	0	0	0	0	0	0	0	0	0	0																					
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	309	489	0	0	0	0	0	0	0	0	0	0																					
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	353	559	0	0	0	0	0	0	0	0	0	0																					
Heating																							UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)	UnOcc. Heating Load (MBH)
55 to 60	57.5	48.4	0.0	287	248	295	830	198	632	0	0	321	509	0	0	0	0	0	0	0	0	0	0																					
50 to 55	52.5	44.8	0.0	280	288	311	879	209	670	0	0	340	539	0	0	0	0	0	0	0	0	0	0																					
45 to 50	47.5	41.5	0.0	291	168	242	701	167	534	0	0	271	430	0	0	0	0	0	0	0	0	0	0																					
40 to 45	42.5	38.0	0.0	255	212	237	704	168	536	0	0	272	432	0	0	0	0	0	0	0	0	0	0																					
35 to 40	37.5	33.3	0.0	330	192	244	766	182	584	0	0	296	470	0	0	0	0	0	0	0	0	0	0																					
30 to 35	32.5	29.6	0.0	236	163	248	647	154	493	0	0	250	397	0	0	0	0	0	0	0	0	0	0																					
25 to 30	27.5	24.1	0.0	206	95	132	433	103	330	0	0	168	265	0	0	0	0	0	0	0	0	0	0																					
20 to 25	22.5	21.6	0.0	159	68	79	306	73	233	0	0	118	188	0	0	0	0	0	0	0	0	0	0																					
15 to 20	17.5	16.9	0.0	67	51	73	191	45	146	0	0	74	117	0	0	0	0	0	0	0	0	0	0																					
10 to 15	12.5	10.5	0.0	45	57	48	150	36	114	0	0	58	92	0	0	0	0	0	0	0	0	0	0																					
5 to 10	7.5	6.4	0.0	53	20	37	110	26	84	0	0	43	67	0	0	0	0	0	0	0	0	0	0																					
-0 to 5	2.5	1.9	0.0	58	6	21	85	20	65	0	0	33	52	0	0	0	0	0	0	0	0	0	0																					
-5 to 0	(2.5)	0.0	0.0	24	0	1	25	6	19	0	0	10	15	0	0	0	0	0	0	0	0	0	0																					
-10 to -5	(7.5)	0.0	0.0	3	0	0	3	1	2	0	0	1	2	0	0	0	0	0	0	0	0	0	0																					
-15 to -10	(12.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																					
-20 to -15	(17.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																					
-25 to -20	(22.5)	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																					

Cell Ref.	Comment	Value	Unit	CELL	Description
A-H	TMY-3 Weather Data for Danbury, CT			REF	
I-L	Occupied hours as per the RFP data			R43	Baseline Boiler Efficiency
M-P	Equipment operating hours after EMS is installed	79.0%		R44	Proposed Boiler Efficiency
Q	Interacted Occupied Heating Loads (MBH)	88.0%			
R	Interacted Unoccupied Heating Loads (MBH)				
S	Heating = -(MIN((col I) + [col K] * [col M] + [col O]) * MIN([col Q] + internal gains, 0) + IF([col I] + [col K] > [col M] + [col O], ([col I] + [col K] - [col M] - [col O]) * MIN([col Q] + internal gains, 0) + IF([col I] + [col K] < [col M] + [col O], ([col I] + [col K] - [col M] - [col O]) * MIN([col Q] + internal gains, 0) + IF([col I] + [col K] > [col M] + [col O], ([col I] + [col K] - [col M] - [col O]) * MIN([col Q] + internal gains, 0) + IF([col I] + [col K] < [col M] + [col O], ([col I] + [col K] - [col M] - [col O]) * MIN([col Q] + internal gains, 0))) * 1,000) - R43				
T	Heating = -(MIN((col N) + [col P] * [col M] + [col O]) * MIN([col Q] + internal gains, 0) + IF([col N] + [col P] > [col M] + [col O], ([col N] + [col P] - [col M] - [col O]) * MIN([col Q] + internal gains, 0) + IF([col N] + [col P] < [col M] + [col O], ([col N] + [col P] - [col M] - [col O]) * MIN([col Q] + internal gains, 0))) * 1,000) - R43				
U	Heating = -(MIN((col I) + [col K] * [col M] + [col O]) * MIN([col Q] + internal gains, 0) + IF([col I] + [col K] > [col M] + [col O], ([col I] + [col K] - [col M] - [col O]) * MIN([col Q] + internal gains, 0) + IF([col I] + [col K] < [col M] + [col O], ([col I] + [col K] - [col M] - [col O]) * MIN([col Q] + internal gains, 0))) * 1,000) - R44				
V	Heating = -(MIN((col N) + [col P] * [col M] + [col O]) * MIN([col Q] + internal gains, 0) + IF([col N] + [col P] > [col M] + [col O], ([col N] + [col P] - [col M] - [col O]) * MIN([col Q] + internal gains, 0) + IF([col N] + [col P] < [col M] + [col O], ([col N] + [col P] - [col M] - [col O]) * MIN([col Q] + internal gains, 0))) * 1,000) - R44				
W	Heating = -(MIN((col S) + [col T] * [col U] + [col V]) * MIN([col Q] + internal gains, 0) + IF([col S] + [col T] > [col U] + [col V], ([col S] + [col T] - [col U] - [col V]) * MIN([col Q] + internal gains, 0) + IF([col S] + [col T] < [col U] + [col V], ([col S] + [col T] - [col U] - [col V]) * MIN([col Q] + internal gains, 0))) * 1,000) - R44				

Energy Savings Calculations for ECM 17: Window Replacements

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Putnam County, NY
Energy and Demand Savings Summary
Measure ID: 17
Measure Name: Window Replacements
Measure Location:
Engineers:

Site Name:	Units	Golf Savings	Summary
Item			
Electricity			
Energy On-Peak	kWh	252	252
Energy Off-Peak	kWh		0
Energy Total	kWh	252	252
Demand On-Peak, Monthly	kW		0.0
Demand On-Peak, Annual	kW		0.0
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			
Natural Gas (NG)	CCF		0
Liquid Propane Gas (LPG)	Gallons		0
Steam	Mlbs		0
Fuel Oil, #2	Gallons	397	397
Fuel Oil, #4	Gallons		0
Fuel Oil, #6	Gallons		0
Solar Value Stack	\$		0
Water			
Water Savings	kGallons		0
Sewer			
Sewer Savings	kGallons		0

Energy Savings Calculations for ECM 18: Solar PV Array

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	18
Measure Name:	Solar PV Array
Measure Location:	
Engineers:	

Site Name:		Bruen	Gov1	Gov2	Gov3	Kern	Summary
Item	Units	Savings	Savings	Savings	Savings	Savings	
Electricity							
Energy On-Peak	kWh	53,013	33,689	76,419	98,568	53,968	315,658
Energy Off-Peak	kWh						0
Energy Total	kWh	53,013	33,689	76,419	98,568	53,968	315,658
Demand On-Peak, Monthly	kW						0.0
Demand On-Peak, Annual	kW	32.2	31.9	69.1	92.0	32.5	257.7
Demand Off-Peak, Monthly	kW						0.0
Demand Off-Peak, Annual	kW						0.0
Fossil Fuel							
Natural Gas (NG)	CCF						0
Liquid Propane Gas (LPG)	Gallons						0
Steam	Mlbs						0
Fuel Oil, #2	Gallons						0
Fuel Oil, #4	Gallons						0
Fuel Oil, #6	Gallons						0
Solar Value Stack	\$	382	2,041	4,100	5,769	352	12,644
Water							
Water Savings	kGallons						0
Sewer							
Sewer Savings	kGallons						0

Putnam County, NY
Solar PV Array
David D. Bruen County Office Building

Month	Production	Gen. kWh	% consumed onsite	Consumed kWh	Onsite Energy Savings	Exported kWh	Value Stack Credit	Total Savings
January	4%	2,592	98%	2,553	\$187	40	\$3	\$190
February	5%	3,086	90%	2,778	\$203	308	\$24	\$227
March	8%	4,829	94%	4,517	\$330	312	\$24	\$354
April	10%	5,611	93%	5,214	\$381	398	\$31	\$412
May	11%	6,666	90%	5,973	\$437	693	\$53	\$490
June	13%	7,293	90%	6,530	\$477	762	\$59	\$536
July	13%	7,264	90%	6,560	\$480	704	\$54	\$534
August	11%	6,312	95%	6,004	\$439	308	\$24	\$463
September	9%	5,403	86%	4,630	\$338	773	\$59	\$398
October	7%	4,028	94%	3,772	\$276	256	\$20	\$295
November	5%	2,810	89%	2,495	\$182	315	\$24	\$207
December	4%	2,090	95%	1,988	\$145	102	\$8	\$153
Total		57,985		53,013	\$3,875	4,972	\$382	\$4,257

91%

9%

Item	Value	Units	Remarks
Size	45.6	kW	cell ref
Generation	57,985	kWh	[C23]
Consumption	230,400	kWh	[C24]
Onsite Solar Value (kWh portion of bill)	\$ 0.0731	\$/kWh	[C25]
Value Stack	\$ 0.0768	\$/kWh	[C26]
			From Bills
			From ValueStack Calc
			[C27]
			[C28]

Putnam County, NY
Solar PV Array
Donald B. Smith Government Campus - Building 1

Month	Production	Gen. kWh	% consumed onsite	Consumed kWh	Onsite Energy Savings	Exported kWh	Value Stack Credit	Total Savings
January	4%	2,558	85%	2,186	\$160	372	\$32	\$192
February	5%	3,049	71%	2,153	\$157	896	\$77	\$234
March	8%	4,783	59%	2,816	\$206	1,967	\$169	\$375
April	10%	5,557	51%	2,860	\$209	2,697	\$232	\$441
May	12%	6,604	50%	3,292	\$241	3,312	\$285	\$525
June	13%	7,230	52%	3,771	\$276	3,459	\$297	\$573
July	13%	7,200	56%	4,005	\$293	3,195	\$275	\$568
August	11%	6,252	60%	3,769	\$276	2,483	\$213	\$489
September	9%	5,350	54%	2,900	\$212	2,450	\$211	\$423
October	7%	3,984	59%	2,362	\$173	1,622	\$139	\$312
November	5%	2,780	67%	1,856	\$136	924	\$79	\$215
December	4%	2,072	83%	1,717	\$126	354	\$30	\$156
Total		57,420		33,689	\$2,463	23,731	\$2,041	\$4,503

59%

41%

Item	Value	Units	Remarks
Size	45.3	kW	cell ref
Generation	57,420	kWh	[C23]
Consumption	75,293	kWh	[C24]
Onsite Solar Value (kWh portion of bill)	\$ 0.0731	\$/kWh	[C25]
Value Stack	\$ 0.0860	\$/kWh	[C26]
			From Bills
			From ValueStack Calc
			[C27]
			[C28]



Putnam County, NY
 Solar PV Array
 Donald B. Smith Government Campus - Building 2

Month	Production	Gen. kWh	% consumed onsite	Consumed kWh	Onsite Energy Savings	Exported kWh	Value Stack Credit	Total Savings
January	5%	5,618	87%	4,901	\$358	718	\$61	\$420
February	5%	6,673	72%	4,824	\$353	1,848	\$158	\$511
March	8%	10,455	61%	6,402	\$468	4,053	\$347	\$815
April	10%	11,894	55%	6,506	\$476	5,388	\$461	\$937
May	11%	14,175	53%	7,504	\$549	6,671	\$571	\$1,119
June	12%	15,487	56%	8,620	\$630	6,867	\$587	\$1,218
July	12%	15,524	59%	9,128	\$667	6,396	\$547	\$1,214
August	11%	13,536	63%	8,567	\$626	4,969	\$425	\$1,051
September	9%	11,638	57%	6,587	\$482	5,051	\$432	\$914
October	7%	8,728	61%	5,366	\$392	3,362	\$288	\$680
November	5%	6,086	69%	4,184	\$306	1,903	\$163	\$469
December	4%	4,536	84%	3,830	\$280	706	\$60	\$340
Total		124,350		76,419	\$5,586	47,931	\$4,100	\$9,687

39%

61%

Item	Value	Units	Remarks
Size	99.3	kW	cell ref
Generation	124,350	kWh	[C23]
Consumption	174,259	kWh	[C24]
Onsite Solar Value (kWh portion of bill)	\$ 0.0731	\$/kWh	[C25]
Value Stack	\$ 0.0855	\$/kWh	[C26]
			From Bills
			From ValueStack Calc
			[C27]
			[C28]

Putnam County, NY
 Solar PV Array - 400W
 Kern Building - Health Dept/DMV/WIC

Month	Production	Gen. kWh	% consumed onsite	Consumed kWh	Onsite Energy Savings	Exported kWh	Value Stack Credit	Total Savings
January	4%	2,317	99%	2,300	\$168	17	\$1	\$169
February	5%	2,906	91%	2,654	\$194	252	\$19	\$213
March	8%	4,821	94%	4,543	\$332	278	\$21	\$353
April	10%	5,843	94%	5,465	\$400	378	\$29	\$429
May	12%	6,958	90%	6,285	\$459	673	\$52	\$511
June	13%	7,652	90%	6,888	\$504	764	\$59	\$562
July	13%	7,584	91%	6,908	\$505	676	\$52	\$557
August	11%	6,544	96%	6,266	\$458	277	\$21	\$479
September	9%	5,517	87%	4,774	\$349	743	\$57	\$406
October	7%	3,931	94%	3,710	\$271	221	\$17	\$288
November	4%	2,585	91%	2,340	\$171	245	\$19	\$190
December	3%	1,893	97%	1,835	\$134	57	\$4	\$139
Total		58,550		53,968	\$3,945	4,582	\$352	\$4,297

8%

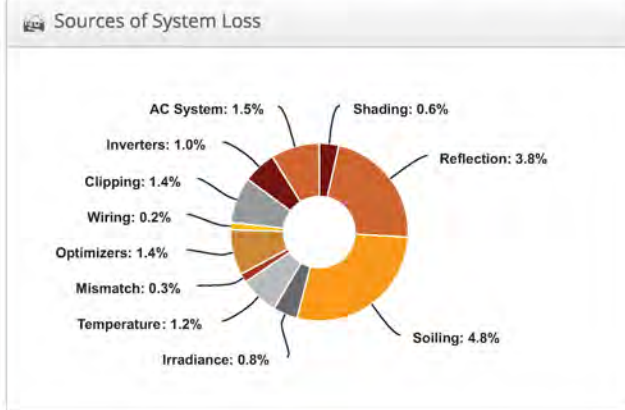
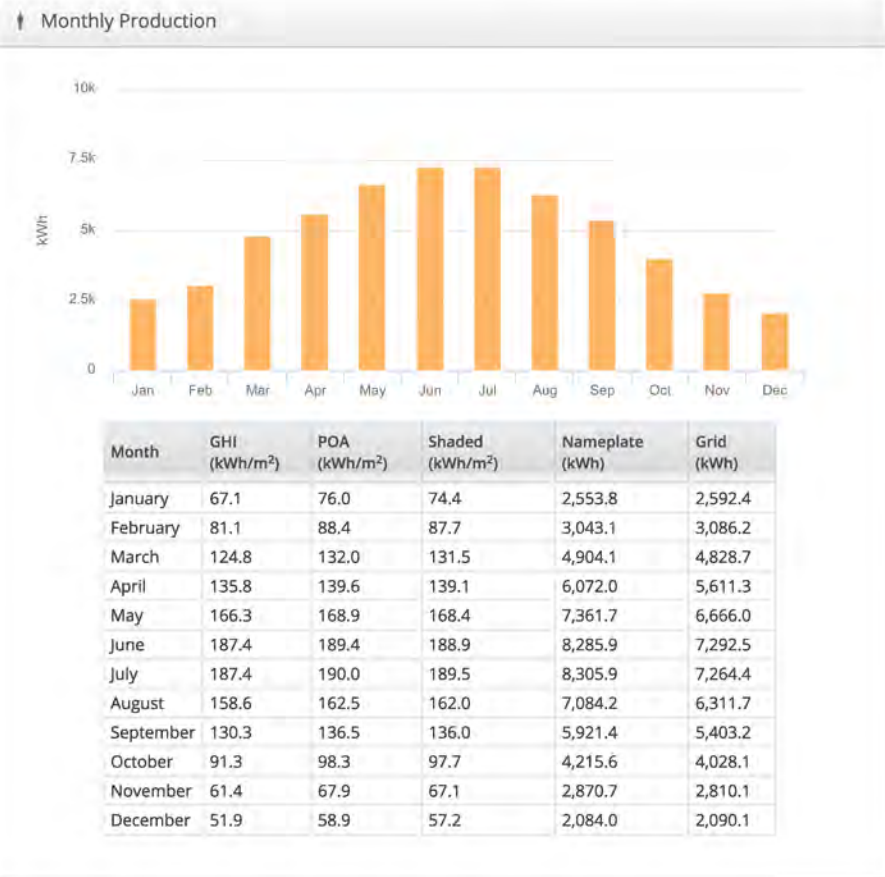
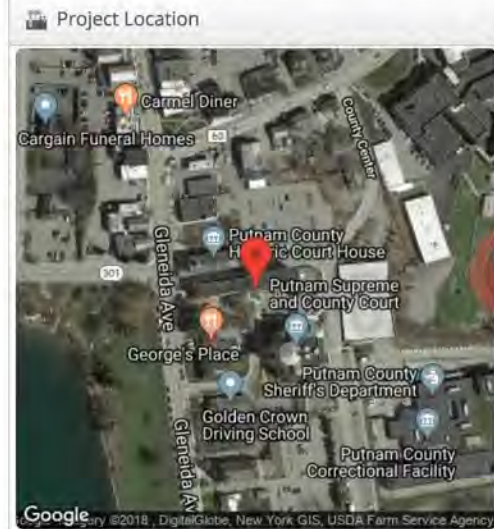
92%

Item	Value	Units	Remarks
Size	47.6	kW	cell ref
Generation	58,550	kWh	[C23]
Consumption	260,550	kWh	[C24]
Onsite Solar Value (kWh portion of bill)	\$ 0.0731	\$/kWh	[C25]
Value Stack	\$ 0.0769	\$/kWh	[C26]
			From Bills
			From ValueStack Calc
			[C27]
			[C28]

Design 1 Putnam County - David D. Bruen County Office Building, 3 county center, carmel, ny

Report	
Project Name	Putnam County - David D. Bruen County Office Building
Project Address	3 county center, carmel, ny
Prepared By	Eric Anderson eanderson@ameresco.com

System Metrics	
Design	Design 1
Module DC Nameplate	45.6 kW
Inverter AC Nameplate	40.0 kW Load Ratio: 1.14
Annual Production	57.98 MWh
Performance Ratio	84.3%
kWh/kWp	1,270.9
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)
Simulator Version	02438dc84d-15065d270a-ca63df14a5-d5d7833a30



Annual Production			
	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,443.5	
	POA Irradiance	1,508.4	-4.5%
	Shaded Irradiance	1,499.4	-0.6%
	Irradiance after Reflection	1,442.6	-3.8%
	Irradiance after Soiling	1,373.9	-4.8%
	Total Collector Irradiance	1,373.9	0.0%
Energy (kWh)	Nameplate	62,702.4	
	Output at Irradiance Levels	62,229.2	-0.8%
	Output at Cell Temperature Derate	61,488.5	-1.2%
	Output After Mismatch	61,320.7	-0.3%
	Optimizer Output	60,462.2	-1.4%
	Optimal DC Output	60,329.7	-0.2%
	Constrained DC Output	59,470.6	-1.4%
	Inverter Output	58,867.7	-1.0%
	Energy to Grid	57,984.6	-1.5%
	Temperature Metrics		
	Avg. Operating Ambient Temp		12.5 °C
	Avg. Operating Cell Temp		19.5 °C
Simulation Metrics			
	Operating Hours	4692	
	Solved Hours	4692	

Condition Set												
Description	Condition Set 1											
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)											
Solar Angle Location	Meteo Lat/Lng											
Transposition Model	Perez Model											
Temperature Model	Sandia Model											
Temperature Model Parameters	Rack Type	a	b	Temperature Delta								
	Fixed Tilt	-3.56	-0.075	3°C								
	Flush Mount	-2.81	-0.0455	0°C								
	East-West	-3.56	-0.075	3°C								
	Carport	-3.56	-0.075	3°C								
Soiling (%)	J	F	M	A	M	J	J	A	S	O	N	D
	20	20	15	1	1	1	1	1	1	1	1	15
Irradiation Variance	3%											
Cell Temperature Spread	4° C											
Module Binning Range	-2% to 2%											
AC System Derate	1.50%											
Module Characterizations	Module	Characterization										
	JKM365M-72 (Jinkosolar)	Jinko_JKM365M_72_RET_C_20170207.pan, PAN										
Component Characterizations	Device	Characterization										
	P730 (SolarEdge)	Mfg Spec Sheet										
	SE10000H-US (SolarEdge)	Spec Sheet										

Components		
Component	Name	Count
Inverters	SE10000H-US (SolarEdge)	4 (40.0 kW)
Strings	10 AWG (Copper)	9 (520.5 ft)
Optimizers	P730 (SolarEdge)	63 (46.0 kW)
Module	Jinkosolar_JKM365M-72 (365W)	125 (45.6 kW)

Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	7-14	Along Racking

Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	5°	172.346°	0.6 ft	1x1	34	34	12.4 kW
Field Segment 2	Fixed Tilt	Landscape (Horizontal)	5°	172.346°	0.7 ft	1x1	16	16	5.84 kW
Field Segment 3	Fixed Tilt	Landscape (Horizontal)	5°	172.346°	0.7 ft	1x1	75	75	27.4 kW

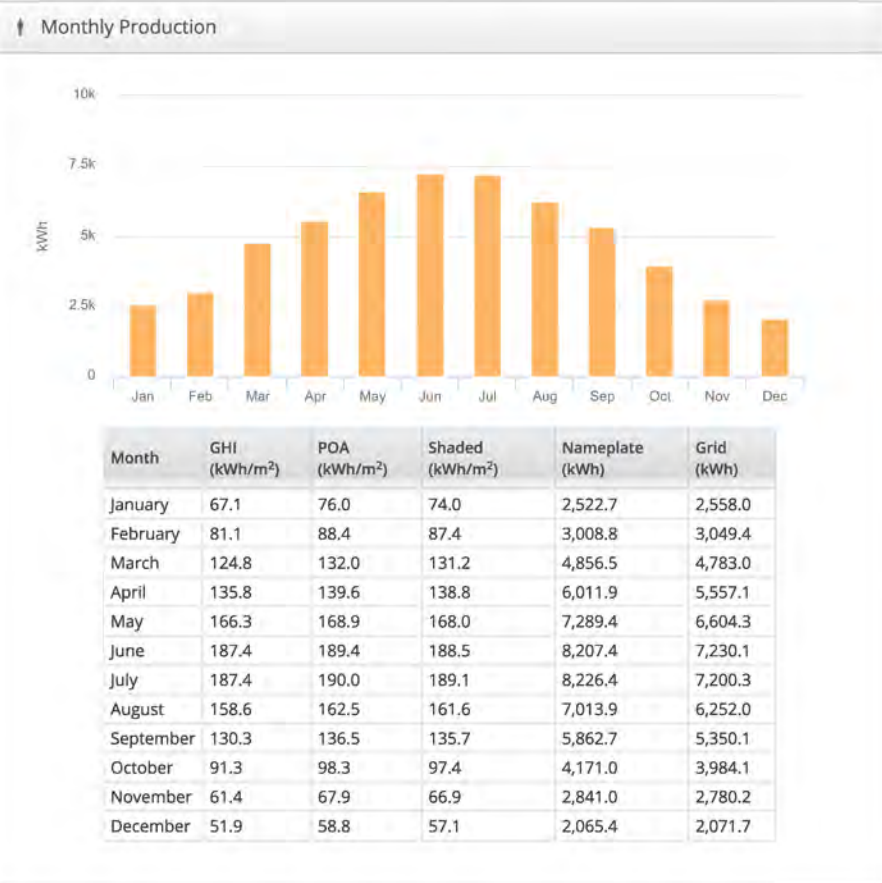
Detailed Layout



Design 1 Putnam County - Donald B. Smith Government Campus - Building 1, 110 old route 6, carmel, ny

Report	
Project Name	Putnam County - Donald B. Smith Government Campus - Building 1
Project Address	110 old route 6, carmel, ny
Prepared By	Eric Anderson eanderson@ameresco.com

System Metrics	
Design	Design 1
Module DC Nameplate	45.3 kW
Inverter AC Nameplate	40.0 kW Load Ratio: 1.13
Annual Production	57.42 MWh
Performance Ratio	84.1%
kWh/kWp	1,268.7
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)
Simulator Version	02438dc84d-15065d270a-ca63df14a5-d5d7833a30



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,443.5	
	POA Irradiance	1,508.3	-4.5%
	Shaded Irradiance	1,495.9	-0.8%
	Irradiance after Reflection	1,439.7	-3.8%
	Irradiance after Soiling	1,371.1	-4.8%
	Total Collector Irradiance	1,371.1	0.0%
Energy (kWh)	Nameplate	62,077.2	
	Output at Irradiance Levels	61,606.9	-0.8%
	Output at Cell Temperature Derate	60,873.9	-1.2%
	Output After Mismatch	60,673.0	-0.3%
	Optimizer Output	59,823.5	-1.4%
	Optimal DC Output	59,740.6	-0.1%
	Constrained DC Output	58,892.1	-1.4%
	Inverter Output	58,294.9	-1.0%
	Energy to Grid	57,420.5	-1.5%
Temperature Metrics			
	Avg. Operating Ambient Temp		12.5 °C
	Avg. Operating Cell Temp		19.5 °C
Simulation Metrics			
	Operating Hours	4692	
	Solved Hours	4692	

Condition Set

Description	Condition Set 1												
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)												
Solar Angle Location	Meteo Lat/Lng												
Transposition Model	Perez Model												
Temperature Model	Sandia Model												
Temperature Model Parameters	Rack Type	a	b	Temperature Delta									
	Fixed Tilt	-3.56	-0.075	3°C									
	Flush Mount	-2.81	-0.0455	0°C									
	East-West	-3.56	-0.075	3°C									
Soiling (%)	Carport	-3.56	-0.075	3°C									
		J	F	M	A	M	J	J	A	S	O	N	D
		20	20	15	1	1	1	1	1	1	1	1	15
Irradiation Variance	3%												
Cell Temperature Spread	4° C												
Module Binning Range	-2% to 2%												
AC System Derate	1.50%												
Module Characterizations	Module	Characterization											
	JKM365M-72 (Jinkosolar)	Jinko_JKM365M_72_RET_C_20170207.pan, PAN											
Component Characterizations	Device	Characterization											
	P730 (SolarEdge)	Mfg Spec Sheet											
	SE10000H-US (SolarEdge)	Spec Sheet											

Components

Component	Name	Count
Inverters	SE10000H-US (SolarEdge)	4 (40.0 kW)
Strings	10 AWG (Copper)	9 (336.1 ft)
Optimizers	P730 (SolarEdge)	63 (46.0 kW)
Module	Jinkosolar_JKM365M-72 (365W)	124 (45.3 kW)

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	7-14	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	5°	171.367°	0.7 ft	1x1	124	124	45.3 kW

Detailed Layout



Design 1 Putnam County - Donald B. Smith Government Campus - Building 2, 110 old route 6, carmel, ny

Report

Project Name	Putnam County - Donald B. Smith Government Campus - Building 2
Project Address	110 old route 6, carmel, ny
Prepared By	Eric Anderson eanderson@ameresco.com

System Metrics

Design	Design 1
Module DC Nameplate	99.3 kW
Inverter AC Nameplate	80.0 kW Load Ratio: 1.24
Annual Production	124.4 MWh
Performance Ratio	83.0%
kWh/kWp	1,252.5
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)
Simulator Version	02438dc84d-15065d270a-ca63df14a5-d5d7833a30

Project Location

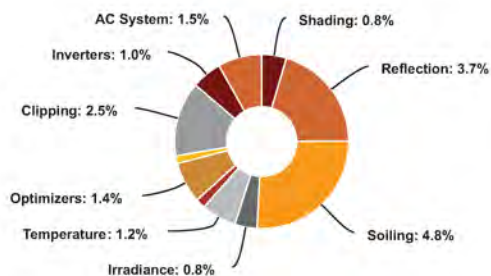


Monthly Production



Month	GHI (kWh/m ²)	POA (kWh/m ²)	Shaded (kWh/m ²)	Nameplate (kWh)	Grid (kWh)
January	67.1	76.0	74.1	5,541.5	5,618.3
February	81.1	88.4	87.3	6,592.3	6,672.5
March	124.8	132.0	131.1	10,651.3	10,454.8
April	135.8	139.6	138.8	13,186.3	11,893.9
May	166.3	168.9	168.0	15,996.8	14,174.9
June	187.4	189.4	188.6	18,007.6	15,487.1
July	187.4	190.0	189.1	18,049.4	15,524.0
August	158.6	162.5	161.6	15,388.6	13,536.1
September	130.3	136.5	135.6	12,855.8	11,638.3
October	91.3	98.3	97.4	9,152.8	8,727.5
November	61.4	67.9	66.9	6,227.6	6,086.4
December	51.9	58.8	57.1	4,529.2	4,535.7

Sources of System Loss



Annual Production			
	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,443.5	
	POA Irradiance	1,508.3	-4.5%
	Shaded Irradiance	1,495.6	-0.8%
	Irradiance after Reflection	1,439.8	-3.7%
	Irradiance after Soiling	1,371.2	-4.8%
	Total Collector Irradiance	1,371.2	0.0%
Energy (kWh)	Nameplate	136,179.3	
	Output at Irradiance Levels	135,149.1	-0.8%
	Output at Cell Temperature Derate	133,538.0	-1.2%
	Output After Mismatch	133,094.8	-0.3%
	Optimizer Output	131,231.3	-1.4%
	Optimal DC Output	130,883.5	-0.3%
	Constrained DC Output	127,551.1	-2.5%
	Inverter Output	126,243.0	-1.0%
	Energy to Grid	124,350.0	-1.5%
	Temperature Metrics		
	Avg. Operating Ambient Temp		12.5 °C
	Avg. Operating Cell Temp		19.5 °C
Simulation Metrics			
	Operating Hours	4692	
	Solved Hours	4692	

Condition Set													
Description	Condition Set 1												
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)												
Solar Angle Location	Meteo Lat/Lng												
Transposition Model	Perez Model												
Temperature Model	Sandia Model												
Temperature Model Parameters	Rack Type	a	b	Temperature Delta									
	Fixed Tilt	-3.56	-0.075	3°C									
	Flush Mount	-2.81	-0.0455	0°C									
	East-West	-3.56	-0.075	3°C									
Soiling (%)	Carport	-3.56	-0.075	3°C									
		J	F	M	A	M	J	J	A	S	O	N	D
	20	20	15	1	1	1	1	1	1	1	1	1	15
Irradiation Variance	3%												
Cell Temperature Spread	4° C												
Module Binning Range	-2% to 2%												
AC System Derate	1.50%												
Module Characterizations	Module	Characterization											
	JKM365M-72 (Jinkosolar)	Jinko_JKM365M_72_RETC_20170207.pan, PAN											
Component Characterizations	Device	Characterization											
	P730 (SolarEdge)	Mfg Spec Sheet											
	SE10000H-US (SolarEdge)	Spec Sheet											

Components		
Component	Name	Count
Inverters	SE10000H-US (SolarEdge)	8 (80.0 kW)
Strings	10 AWG (Copper)	20 (1,898.7 ft)
Optimizers	P730 (SolarEdge)	140 (102.2 kW)
Module	Jinkosolar, JKM365M-72 (365W)	272 (99.3 kW)

Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	7-14	Along Racking

Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	5°	171.742°	0.7 ft	1x1	272	272	99.3 kW

Detailed Layout



Design 2 Putnam County - Donald B. Smith Government Campus - Building 3, 110 old route 6,

Report

Project Name	Putnam County - Donald B. Smith Government Campus - Building 3
Project Address	110 old route 6,
Prepared By	Eric Anderson eanderson@ameresco.com

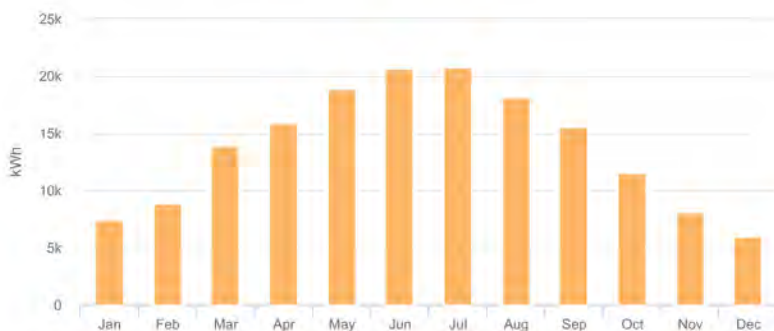
System Metrics

Design	Design 2
Module DC Nameplate	131.4 kW
Inverter AC Nameplate	99.9 kW Load Ratio: 1.32
Annual Production	165.7 MWh
Performance Ratio	83.6%
kWh/kWp	1,261.2
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)
Simulator Version	b23dcd9a40-f126e51428-69d73c5df3-e2a081a8ea

Project Location

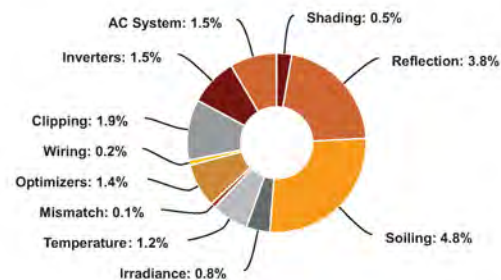


Monthly Production



Month	GHI (kWh/m ²)	POA (kWh/m ²)	Shaded (kWh/m ²)	Nameplate (kWh)	Grid (kWh)
January	67.1	76.0	74.4	7,361.3	7,448.8
February	81.1	88.4	87.8	8,771.5	8,866.2
March	124.8	132.0	131.7	14,144.7	13,913.5
April	135.8	139.6	139.3	17,504.6	15,888.3
May	166.3	168.9	168.5	21,214.7	18,895.6
June	187.4	189.4	189.0	23,879.5	20,691.5
July	187.4	190.0	189.6	23,939.0	20,732.6
August	158.6	162.5	162.1	20,415.0	18,069.7
September	130.3	136.5	136.1	17,068.2	15,530.2
October	91.3	98.3	97.9	12,158.5	11,594.5
November	61.4	67.9	67.2	8,278.3	8,076.1
December	51.9	58.9	57.4	6,019.0	6,016.7

Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,443.5	
	POA Irradiance	1,508.4	4.5%
	Shaded Irradiance	1,501.1	-0.5%
	Irradiance after Reflection	1,444.1	-3.8%
	Irradiance after Soiling	1,375.3	-4.8%
	Total Collector Irradiance	1,375.3	0.0%
Energy (kWh)	Nameplate	180,754.3	
	Output at Irradiance Levels	179,393.3	-0.8%
	Output at Cell Temperature Derate	177,264.7	-1.2%
	Output After Mismatch	177,000.9	-0.1%
	Optimizer Output	174,522.5	-1.4%
	Optimal DC Output	174,247.6	-0.2%
	Constrained DC Output	170,858.0	-1.9%
	Inverter Output	168,247.0	-1.5%
	Energy to Grid	165,724.0	-1.5%
	Temperature Metrics		
	Avg. Operating Ambient Temp		12.5 °C
	Avg. Operating Cell Temp		19.6 °C
Simulation Metrics			
	Operating Hours	4692	
	Solved Hours	4692	

Condition Set

Description	Condition Set 1											
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)											
Solar Angle Location	Meteo Lat/Lng											
Transposition Model	Perez Model											
Temperature Model	Sandia Model											
Temperature Model Parameters	Rack Type	a	b	Temperature Delta								
	Fixed Tilt	-3.56	-0.075	3°C								
	Flush Mount	-2.81	-0.0455	0°C								
	East-West	-3.56	-0.075	3°C								
	Carport	-3.56	-0.075	3°C								
Soiling (%)	J	F	M	A	M	J	J	A	S	O	N	D
	20	20	15	1	1	1	1	1	1	1	1	15
Irradiation Variance	3%											
Cell Temperature Spread	4° C											
Module Binning Range	-2% to 2%											
AC System Derate	1.50%											
Module Characterizations	Module	Characterization										
	JKM365M-72 (Jinkosolar)	Jinko_JKM365M_72_RETC_20170207.pan, PAN										
Component Characterizations	Device	Characterization										
	SE33.3KUS (deprecated) (SolarEdge)	CEC										
	P730 (SolarEdge)	Mfg Spec Sheet										

Components

Component	Name	Count
Inverters	SE33.3KUS (deprecated) (SolarEdge)	3 (99.9 kW)
Strings	10 AWG (Copper)	11 (939.2 ft)
Optimizers	P730 (SolarEdge)	184 (134.3 kW)
Module	Jinkosolar, JKM365M-72 (365W)	360 (131.4 kW)

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	13-34	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	5°	172.02°	0.7 ft	1x1	439	360	131.4 kW

Detailed Layout



Design 1 - 400W Half Putnam County - Kern Building - Health Dept DMV WIC, 1 geneva road, brewster, ny

Report

Project Name	Putnam County - Kern Building - Health Dept DMV WIC
Project Address	1 geneva road, brewster, ny
Prepared By	Ameresco Northeast Region 2 jhicks@ameresco.com



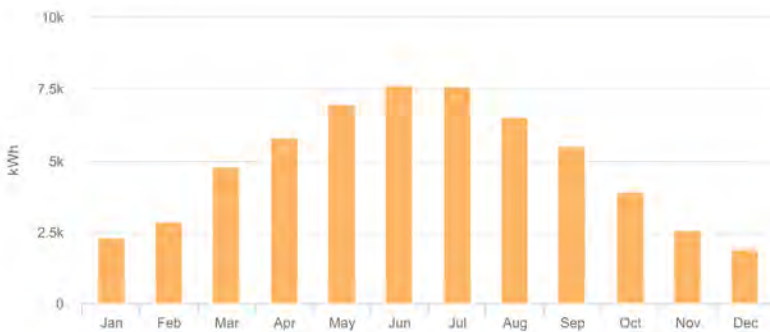
System Metrics

Design	Design 1 - 400W Half
Module DC Nameplate	47.6 kW
Inverter AC Nameplate	43.2 kW Load Ratio: 1.10
Annual Production	58.55 MWh
Performance Ratio	81.6%
kWh/kWp	1,230.1
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)
Simulator Version	a721496c3a-208a66d7f1-b582af6697-77987d21ec

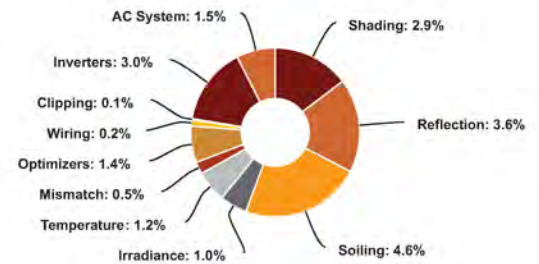
Project Location



Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m ²)	Annual Global Horizontal Irradiance	1,443.5	
	POA Irradiance	1,507.2	4.4%
	Shaded Irradiance	1,462.8	-2.9%
	Irradiance after Reflection	1,409.8	-3.6%
	Irradiance after Soiling	1,344.7	-4.6%
	Total Collector Irradiance	1,344.7	0.0%
Energy (kWh)	Nameplate	64,059.0	
	Output at Irradiance Levels	63,387.6	-1.0%
	Output at Cell Temperature Derate	62,616.2	-1.2%
	Output After Mismatch	62,326.5	-0.5%
	Optimizer Output	61,453.7	-1.4%
	Optimal DC Output	61,311.5	-0.2%
	Constrained DC Output	61,280.5	-0.1%
	Inverter Output	59,442.0	-3.0%
Energy to Grid	58,550.4	-1.5%	
Temperature Metrics			
	Avg. Operating Ambient Temp		12.5 °C
	Avg. Operating Cell Temp		19.4 °C
Simulation Metrics			
	Operating Hours	4692	
	Solved Hours	4692	

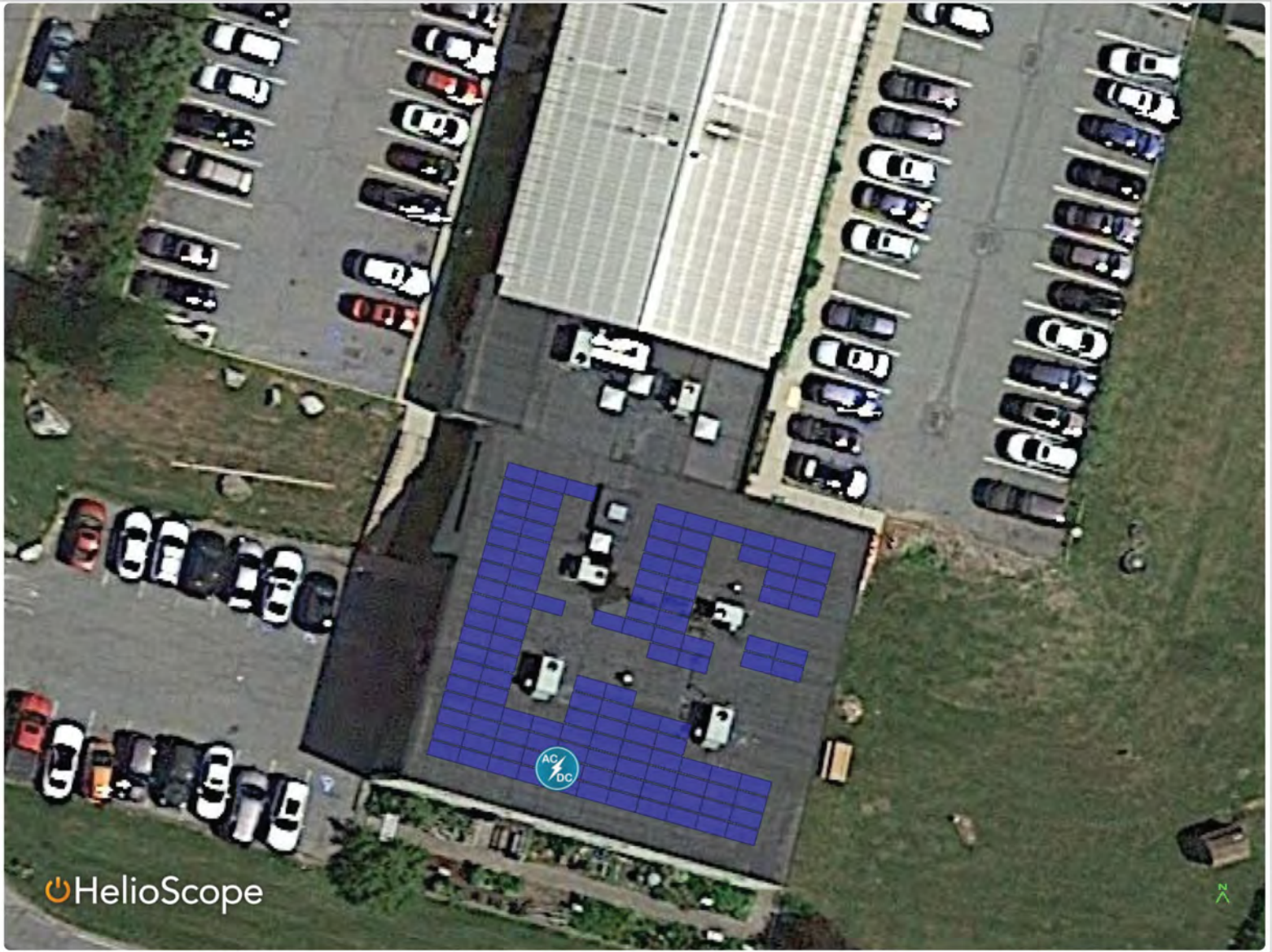
Condition Set												
Description	Condition Set 1											
Weather Dataset	TMY, 10km grid (41.45,-73.65), NREL (prospector)											
Solar Angle Location	Meteo Lat/Lng											
Transposition Model	Perez Model											
Temperature Model	Sandia Model											
Temperature Model Parameters	Rack Type	a	b	Temperature Delta								
	Fixed Tilt	-3.56	-0.075	3°C								
	Flush Mount	-2.81	-0.0455	0°C								
	East-West	-3.56	-0.075	3°C								
	Carport	-3.56	-0.075	3°C								
Soiling (%)	J	F	M	A	M	J	J	A	S	Q	N	D
	20	20	15	1	1	1	1	1	1	1	1	15
Irradiation Variance	3%											
Cell Temperature Spread	4° C											
Module Binning Range	-2% to 2%											
AC System Derate	1.50%											
Module Characterizations	Module	Uploaded By		Characterization								
	JKM400M-72HL-V (Jinko Solar)	Folsom Labs		Spec Sheet Characterization, PAN								
Component Characterizations	Device	Uploaded By		Characterization								
	SE43.2K (SolarEdge)	Folsom Labs		Spec Sheet								
	P850 (SolarEdge)	Folsom Labs		Mfg Spec Sheet								

Components		
Component	Name	Count
Inverters	SE43.2K (SolarEdge)	1 (43.2 kW)
Strings	10 AWG (Copper)	7 (680.3 ft)
Optimizers	P850 (SolarEdge)	63 (53.6 kW)
Module	Jinko Solar, JKM400M-72HL-V (400W)	119 (47.6 kW)

Wiring Zones			
Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	7-18	Along Racking

Field Segments									
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 3	Fixed Tilt	Landscape (Horizontal)	5°	195.59235609135771°	0.4 ft	1x1	133	119	47.6 kW

Detailed Layout



Energy Savings Calculations for ECM 19: AHU Replacements

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	19
Measure Name:	AHU Replacements
Measure Location:	
Engineers:	

Site Name:	Units	Golf		Gov2		Gov3		KoehlerSr		Fam1808		Summary
		Savings		Savings		Savings		Savings		Savings		
Electricity												
Energy On-Peak	kWh	11,429		5,966		5,965		6,388		21,781		51,528
Energy Off-Peak	kWh	0		0		0		0		0		0
Energy Total	kWh	11,429		5,966		5,965		6,388		21,781		51,528
Demand On-Peak, Monthly	kW	7.8		8.6		8.5		4.9		15.0		44.8
Demand On-Peak, Annual	kW	31.2		34.2		34.2		19.5		60.2		179.3
Demand Off-Peak, Monthly	kW											
Demand Off-Peak, Annual	kW											
Fossil Fuel												
Natural Gas (NG)	CCF											
Liquid Propane Gas (LPG)	Gallons											
Steam	Mlbs											
Fuel Oil, #2	Gallons											
Fuel Oil, #4	Gallons											
Fuel Oil, #6	Gallons											
Solar Value Stack	\$											

Putnam County, NY
Putnam National Golf Club - Clubhouse - AHU-1, 2
AHU Replacements

TMY-3 Weather Data for Danbury, CT																					
Existing																					
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
Amb Temp Bin deg. F	Ave Temp deg. F	M C WB deg. F	M C WB Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occ On-Peak Hrs	UnDec On-Peak Hrs	Occ Off-Peak Hrs	UnDec Off-Peak Hrs	Occ Heat Load (MBH)	UnDec Heat Load (MBH)	On-Peak Electric Cooling Demand (kW)	Peak Electric Cooling Consump. (kWh)	Off-Peak Electric Cooling Consump. (kWh)	On-Peak Electric Cooling Demand (kW)	Peak Electric Cooling Consump. (kWh)	Off-Peak Electric Cooling Consump. (kWh)	Peak Electric Cooling Savings (kWh)	Off-Peak Electric Cooling Savings (kWh)
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	624	477	62	0	0	50	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	561	429	56	0	0	45	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	499	381	50	0	0	40	0	0	0	0
90 to 95	92.5	76.2	0.0	0	17	2	19	10	10	0	0	437	334	44	732	0	35	590	0	142	0
85 to 90	87.5	73.2	0.0	0	80	13	93	47	47	0	0	374	286	37	3,070	0	30	2,476	0	594	0
80 to 85	82.5	69.5	0.0	8	167	50	225	113	113	0	0	312	238	31	6,190	0	25	4,992	0	1,198	0
75 to 80	77.5	65.3	0.0	35	216	108	359	180	180	0	0	249	191	25	7,901	0	20	6,372	0	1,529	0
70 to 75	72.5	62.4	0.0	83	267	174	524	262	262	0	0	187	143	19	8,650	0	15	6,976	0	1,674	0
65 to 70	67.5	59.5	0.0	221	316	261	798	399	399	0	0	125	95	12	8,782	0	10	7,082	0	1,700	0
60 to 65	62.5	54.9	0.0	279	289	344	912	456	456	0	0	62	48	6	5,018	0	5	4,047	0	971	0
				2,920	2,920	2,920	8,760	4,380	4,380	0	0				40,343	0		32,535	0	7,808	0

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	13,035	SF	P43	Existing Worthington units
Existing Cooling Efficiency	10.0	EER	P44	Existing Worthington units
Proposed Cooling Efficiency	12.4	EER	P45	Based on Manufacturer's Specs
Affected Cooling Capacity	30.0	Ton	P46	
Total Cooling Capacity	86.0	Ton	P47	

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I-L	Occupied hours as per the RFP data
M	Occupied Cooling loads (MBH)
N	Unoccupied Cooling loads (MBH)
O	$=(\text{col M}] \times 1,000 - 3413 - (\text{P44} = 3413)$
P	$=(\text{col M}] \times [\text{col K}] + [\text{col J}] + [\text{col N}] \times [\text{col J}] \times 1,000 - 3,413 - (\text{P44} = 3,413)$
Q	$=(\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}] \times 1,000 - 3,413 - (\text{P44} = 3,413)$
R	$=(\text{col M}] \times 1,000 - 3413 - (\text{P45} = 3413)$
S	$=(\text{col M}] \times [\text{col I}] + [\text{col N}] \times [\text{col J}] \times 1,000 - 3,413 - (\text{P45} = 3,413)$
T	$=(\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}] \times 1,000 - 3,413 - (\text{P45} + 3,413)$
U	$=(\text{col P}] - [\text{col S}]$
V	$=(\text{col Q}] - [\text{col T}]$

Putnam County, NY
Putnam National Golf Club - Clubhouse - AHU-5
AHU Replacements

TMY-3 Weather Data for Danbury, CT																						
Existing																						
Amb. Temp. Bin deg. F	Ave Temp deg. F	M C W B deg. F	M C W B Enthalpy Btu/lbma	E 01-08 Hours	F 09-16 Hours	G 17-24 Hours	H Total Bin Hours	I Ose On-Peak Hrs	J UnDec On-Peak Hrs	K Ose Off-Peak Hrs	L UnDec Off-Peak Hrs	M Occ Heat Load (MBH)	N UnDec Heat Load (MBH)	O On-Peak Electric Cooling Demand (kW)	P Peak Electric Cooling Consump. (kWh)	Q Off-Peak Electric Cooling Consump. (kWh)	R On-Peak Electric Cooling Demand (kW)	S Peak Electric Cooling Consump. (kWh)	T Off-Peak Electric Cooling Consump. (kWh)	U Peak Electric Cooling Savings (kWh)	V Off-Peak Electric Cooling Savings (kWh)	
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	156	119	16	0	0	0	10	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	140	107	14	0	0	0	9	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	125	95	12	0	0	0	8	0	0	0	0
90 to 95	92.5	76.2	0.0	17	2	19	10	10	10	0	0	109	83	11	183	0	7	117	0	0	66	0
85 to 90	87.5	73.2	0.0	80	13	93	47	47	47	0	0	94	72	9	768	0	6	492	0	0	276	0
80 to 85	82.5	69.5	0.0	8	167	50	225	113	113	0	0	78	60	8	1,548	0	5	992	0	0	556	0
75 to 80	77.5	65.3	0.0	35	216	108	359	180	180	0	0	62	48	6	1,975	0	4	1,266	0	0	709	0
70 to 75	72.5	62.4	0.0	83	267	174	524	262	262	0	0	47	36	5	2,162	0	3	1,386	0	0	776	0
65 to 70	67.5	59.5	0.0	221	316	261	798	399	399	0	0	31	24	3	2,195	0	2	1,407	0	0	788	0
60 to 65	62.5	54.9	0.0	279	289	344	912	456	456	0	0	16	12	2	1,255	0	1	804	0	0	450	0
				2,920	2,920	2,920	8,760	4,380	4,380	0	0				10,086	0		6,465	0		3,621	0

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	13,035	SF	P43	Existing units
Existing Cooling Efficiency	10.0	EER	P44	Based on Manufacturer's Specs
Proposed Cooling Efficiency	15.6	EER	P45	Pro Shop Only
Affected Cooling Capacity	7.5	Ton	P46	
Total Cooling Capacity	86.0	Ton	P47	

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I-L	Occupied hours as per the RFP data
M	Occupied Cooling loads (MBH)
N	Unoccupied Cooling loads (MBH)
O	$=[\text{col M}] \times 1,000 - 3413 - (\text{P44} = 3413)$
P	$=([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col J}]) \times 1,000 - 3,413 - (\text{P44} = 3,413)$
Q	$=([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}]) \times 1,000 - 3,413 - (\text{P44} = 3,413)$
R	$=[\text{col M}] \times 1,000 - 3413 - (\text{P45} = 3413)$
S	$=([\text{col M}] \times [\text{col I}] + [\text{col N}] \times [\text{col J}]) \times 1,000 - 3,413 - (\text{P45} = 3,413)$
T	$=([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}]) \times 1,000 - 3,413 - (\text{P45} + 3,413)$
U	$=[\text{col P}] - [\text{col S}]$
V	$=[\text{col Q}] - [\text{col T}]$

Putnam County, NY
 Donald B. Smith Government Campus - Building 2
 AHU Replacements

TMY-3 Weather Data for Danbury, CT																				
Existing																				
Amb. Temp. Bin deg. F	Ave Temp deg. F	M C WB deg. F	M C WB Enthalpy Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	UnDec On- Peak Hrs	UnDec Off- Peak Hrs	Occ On- Peak Hrs	Occ Off- Peak Hrs	UnDec On- Peak Hrs								
B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
Proposed																				
Savings																				
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	1,274	777	127	0	0	116	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	1,146	699	115	0	0	104	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	1,019	621	102	0	0	93	0	0	0	0
90 to 95	92.5	76.2	0.0	17	2	19	5	14	0	0	892	544	89	1,190	0	81	1,082	0	108	0
85 to 90	87.5	73.2	0.0	80	13	93	22	71	0	0	764	466	76	4,994	0	69	4,540	0	454	0
80 to 85	82.5	69.5	0.0	8	167	50	225	54	0	0	637	388	64	10,069	0	58	9,153	0	915	0
75 to 80	77.5	65.3	0.0	35	216	108	359	85	0	0	509	311	51	12,852	0	46	11,684	0	1,168	0
70 to 75	72.5	62.4	0.0	83	267	174	524	399	0	0	382	233	38	14,069	0	35	12,790	0	1,279	0
65 to 70	67.5	59.5	0.0	221	316	261	798	608	0	0	255	155	25	14,284	0	23	12,986	0	1,299	0
60 to 65	62.5	54.9	0.0	279	289	344	912	695	0	0	127	78	13	8,162	0	12	7,420	0	742	0
				2,920	2,920	2,920	8,760	6,674	0	0				65,621	0		59,655	0	5,966	0

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I-L	Occupied hours as per the RFP data
M	Occupied Cooling loads (MBH)
N	Unoccupied Cooling loads (MBH)
O	$=(\text{col M}] \times 1,000 - 3413 - (P44 = 3413)$
P	$=(\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col J}] \times 1,000 - 3,413 - (P44 = 3,413)$
Q	$=(\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}] \times 1,000 - 3,413 - (P44 = 3,413)$
R	$=(\text{col M}] \times 1,000 - 3413 - (P45 = 3413)$
S	$=(\text{col M}] \times [\text{col I}] + [\text{col N}] \times [\text{col J}] \times 1,000 - 3,413 - (P45 = 3,413)$
T	$=(\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}] \times 1,000 - 3,413 - (P45 + 3,413)$
U	$=(\text{col P}] - [\text{col S}]$
V	$=(\text{col Q}] - [\text{col T}]$

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	15,900	SF	P43	Area of Ballroom
Existing Cooling Efficiency	10.0	EER	P44	Existing Worthington units
Proposed Cooling Efficiency	11.0	EER	P45	Based on Manufacturer's Specs
Affected Cooling Capacity	50.0	Ton	P46	
Total Cooling Capacity	53.5	Ton	P47	

Putnam County, NY
 Donald B. Smith Government Campus - Building 3
 AHU Replacements

TMY-3 Weather Data for Danbury, CT																						
Existing																						
Amb. Temp. Bin deg. F	Ave Temp deg. F	M C W B deg. F	M C Enthality Btu/lbma	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Ose On- Peak Hrs	UnDec On- Peak Hrs	Ose Off- Peak Hrs	UnDec Off- Peak Hrs	Occ Heat Load (MBH)	UnDec Heat Load (MBH)	On-Peak Electric Cooling Demand (kW)	Peak Electric Cooling Consump. (kWh)	Off-Peak Electric Cooling Consump. (kWh)	On-Peak Electric Cooling Demand (kW)	Peak Electric Cooling Consump. (kWh)	Off-Peak Electric Cooling Consump. (kWh)	Peak Electric Cooling Savings (kWh)	Off-Peak Electric Cooling Savings (kWh)	
Proposed																						
Savings																						
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	1,273	777	127	0	0	116	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1,146	699	115	0	0	104	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	1,019	621	102	0	0	93	0	0	0	0	0
90 to 95	92.5	76.2	0.0	17	2	19	5	14	0	0	0	891	544	89	1,190	0	81	1,082	0	108	0	0
85 to 90	87.5	73.2	0.0	80	13	93	22	71	0	0	0	764	466	76	4,993	0	69	4,539	0	454	0	0
80 to 85	82.5	69.5	0.0	8	167	50	225	54	171	0	0	637	388	64	10,067	0	58	9,152	0	915	0	0
75 to 80	77.5	65.3	0.0	35	216	108	359	85	274	0	0	509	311	51	12,850	0	46	11,682	0	1,168	0	0
70 to 75	72.5	62.4	0.0	83	267	174	524	125	399	0	0	382	233	38	14,067	0	35	12,788	0	1,279	0	0
65 to 70	67.5	59.5	0.0	221	316	261	798	190	608	0	0	255	155	25	14,282	0	23	12,983	0	1,298	0	0
60 to 65	62.5	54.9	0.0	279	289	344	912	217	695	0	0	127	78	13	8,161	0	12	7,419	0	742	0	0
				2,920	2,920	2,920	8,760	2,086	6,674	0	0				65,610	0		59,645	0	5,965	0	0

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I-L	Occupied hours as per the RFP data
M	Occupied Cooling loads (MBH)
N	Unoccupied Cooling loads (MBH)
O	$=(\text{col M}) \times 1,000 \div (\text{P44} - 3.413)$
P	$=(\text{col M}) \times [\text{col K}] + [\text{col N}] \times [\text{col J}] \times 1,000 \div 3.413 \div (\text{P44} - 3.413)$
Q	$=(\text{col M}) \times [\text{col K}] + [\text{col N}] \times [\text{col L}] \times 1,000 \div 3.413 \div (\text{P44} - 3.413)$
R	$=(\text{col M}) \times 1,000 \div (\text{P45} - 3.413)$
S	$=(\text{col M}) \times [\text{col I}] + [\text{col N}] \times [\text{col J}] \times 1,000 \div 3.413 \div (\text{P45} - 3.413)$
T	$=(\text{col M}) \times [\text{col K}] + [\text{col N}] \times [\text{col L}] \times 1,000 \div 3.413 \div (\text{P45} - 3.413)$
U	$=(\text{col P}) - [\text{col S}]$
V	$=(\text{col Q}) - [\text{col T}]$

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	20,140	SF	P43	Area of Ballroom
Existing Cooling Efficiency	10.0	EER	P44	Existing Worthington units
Proposed Cooling Efficiency	11.0	EER	P45	Based on Manufacturer's Specs
Affected Cooling Capacity	45.0	Ton	P46	
Total Cooling Capacity	61.0	Ton	P47	

Putnam County, NY
William Koehler Senior Center
AHU Replacements

TMY-3 Weather Data for Danbury, CT																						
Existing																						
Amb. Temp. Bin deg. F	Ave Temp deg. F	M.C.W.B deg. F	M.C. Enthalpy Btu/lbma	E 01-08 Hours	F 09-16 Hours	G 17-24 Hours	H Total Bin Hours	I Ose On-Peak Hrs	J UnDec On-Peak Hrs	K Ose Off-Peak Hrs	L UnDec Off-Peak Hrs	M Occ Heat Load (MBH)	N UnDec. Heat Load (MBH)	O On-Peak Electric Cooling Demand (kW)	P Peak Electric Cooling Consump. (kWh)	Q Off-Peak Electric Cooling Consump. (kWh)	R On-Peak Electric Cooling Demand (kW)	S Peak Electric Cooling Consump. (kWh)	T Off-Peak Electric Cooling Consump. (kWh)	U Peak Electric Cooling Savings (kWh)	V Off-Peak Electric Cooling Savings (kWh)	
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	1,130	864	94	0	0	84	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	1,017	778	85	0	0	76	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	904	691	75	0	0	67	0	0	0	0	0
90 to 95	92.5	76.2	0.0	0	17	2	19	8	11	0	0	791	605	66	1,089	0	59	973	0	116	0	0
85 to 90	87.5	73.2	0.0	0	80	13	93	42	51	0	0	678	518	56	4,570	0	50	4,084	0	486	0	0
80 to 85	82.5	69.5	0.0	8	167	50	225	100	123	0	0	565	432	47	9,213	0	42	8,233	0	980	0	0
75 to 80	77.5	65.3	0.0	35	216	108	359	160	199	0	0	452	346	38	11,760	0	34	10,509	0	1,251	0	0
70 to 75	72.5	62.4	0.0	83	267	174	524	234	290	0	0	339	259	28	12,874	0	25	11,504	0	1,370	0	0
65 to 70	67.5	59.5	0.0	221	316	261	798	356	442	0	0	226	173	19	13,071	0	17	11,680	0	1,390	0	0
60 to 65	62.5	54.9	0.0	279	289	344	912	407	505	0	0	113	86	9	7,469	0	8	6,674	0	795	0	0
				2,920	2,920	2,920	8,760	3,911	4,849	0	0				60,046	0		53,658	0	6,388	0	0

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I-L	Occupied hours as per the RFP data
M	Occupied Cooling loads (MBH)
N	Unoccupied Cooling loads (MBH)
O	$=[\text{col M}] \times 1,000 - 3413 - (P44 = 3413)$
P	$=([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col J}]) \times 1,000 - 3,413 - (P44 = 3,413)$
Q	$=([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}]) \times 1,000 - 3,413 - (P44 = 3,413)$
R	$=[\text{col M}] \times 1,000 - 3413 - (P45 = 3413)$
S	$=([\text{col M}] \times [\text{col I}] + [\text{col N}] \times [\text{col J}]) \times 1,000 - 3,413 - (P45 = 3,413)$
T	$=([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}]) \times 1,000 - 3,413 - (P45 + 3,413)$
U	$=[\text{col P}] - [\text{col S}]$
V	$=[\text{col Q}] - [\text{col T}]$

Assumptions:	Value	Unit	CELL REF	Description
Occupied Area	17,976	SF	P43	Area of Ballroom
Existing Cooling Efficiency	12.0	EER	P44	Existing Worthington units
Proposed Cooling Efficiency	13.4	EER	P45	Based on Manufacturer's Specs
Affected Cooling Capacity	27.5	Ton	P46	
Total Cooling Capacity	37.5	Ton	P47	

Putnam County, NY
Putnam Family & Community Services - 1808
AHU Replacements

TMY-3 Weather Data for Danbury, CT																						
Existing																						
Amb. Temp. Bin deg. F	Ave Temp deg. F	M C W B deg. F	M C W B Enthalpy Btu/lbma	E 01-08 Hours	F 09-16 Hours	G 17-24 Hours	H Total Bin Hours	I Ose On-Peak Hrs	J UnDec On-Peak Hrs	K Ose Off-Peak Hrs	L UnDec Off-Peak Hrs	M Occ Heat Load (MBH)	N UnDec Heat Load (MBH)	O On-Peak Electric Cooling Demand (kW)	P Peak Electric Cooling Consump. (kWh)	Q Off-Peak Electric Cooling Consump. (kWh)	R On-Peak Electric Cooling Demand (kW)	S Peak Electric Cooling Consump. (kWh)	T Off-Peak Electric Cooling Consump. (kWh)	U Peak Electric Cooling Savings (kWh)	V Off-Peak Electric Cooling Savings (kWh)	
105 to 110	107.5	0.0	0.0	0	0	0	0	0	0	0	0	971	687	97	0	0	62	0	0	0	0	0
100 to 105	102.5	0.0	0.0	0	0	0	0	0	0	0	0	874	618	87	0	0	56	0	0	0	0	0
95 to 100	97.5	0.0	0.0	0	0	0	0	0	0	0	0	777	550	78	0	0	50	0	0	0	0	0
90 to 95	92.5	76.2	0.0	0	17	2	19	9	10	0	0	680	481	68	1,101	0	44	706	0	395	0	0
85 to 90	87.5	73.2	0.0	0	80	13	93	46	47	0	0	583	412	58	4,618	0	37	2,960	0	1,658	0	0
80 to 85	82.5	69.5	0.0	8	167	50	225	111	114	0	0	486	344	49	9,310	0	31	5,968	0	3,342	0	0
75 to 80	77.5	65.3	0.0	35	216	108	359	177	182	0	0	389	275	39	11,884	0	25	7,618	0	4,266	0	0
70 to 75	72.5	62.4	0.0	83	267	174	524	259	265	0	0	291	206	29	13,009	0	19	8,339	0	4,670	0	0
65 to 70	67.5	59.5	0.0	221	316	261	798	394	404	0	0	194	137	19	13,208	0	12	8,466	0	4,741	0	0
60 to 65	62.5	54.9	0.0	279	289	344	912	451	461	0	0	97	69	10	7,547	0	6	4,838	0	2,709	0	0
				2,920	2,920	2,920	8,760	4,328	4,432	0	0				60,676	0		38,895	0	21,781	0	0

Assumptions:	Value	Unit	CELL	Description
Occupied Area	11,333	SF	P43	Area of Ballroom
Existing Cooling Efficiency	10.0	EER	P44	Existing Worthington units
Proposed Cooling Efficiency	15.6	EER	P45	Based on Manufacturer's Specs
Affected Cooling Capacity	45.5	Ton	P46	
Total Cooling Capacity	45.5	Ton	P47	

Cell Ref.	Comment
A-H	TMY-3 Weather Data for Danbury, CT
I-L	Occupied hours as per the RFP data
M	Occupied Cooling loads (MBH)
N	Unoccupied Cooling loads (MBH)
O	$=[\text{col M}] \times 1,000 - 3413 - (P44 = 3413)$
P	$= ([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col J}]) \times 1,000 - 3,413 - (P44 = 3,413)$
Q	$= ([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}]) \times 1,000 - 3,413 - (P44 = 3,413)$
R	$= [\text{col M}] \times 1,000 - 3413 - (P45 = 3413)$
S	$= ([\text{col M}] \times [\text{col I}] + [\text{col N}] \times [\text{col J}]) \times 1,000 - 3,413 - (P45 = 3,413)$
T	$= ([\text{col M}] \times [\text{col K}] + [\text{col N}] \times [\text{col L}]) \times 1,000 - 3,413 - (P45 + 3,413)$
U	$= [\text{col P}] - [\text{col S}]$
V	$= [\text{col Q}] - [\text{col T}]$

Energy Savings Calculations for ECM 20: Plug Load Controllers

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Putnam County, NY
 Energy and Demand Savings Summary
 Measure ID: 20
 Plug Load Controllers
 Measure Name:
 Measure Location:
 Engineers:

Site Name:	Units	Jail Savings	Court Savings	Bruei Savings	Court1812 Savings	Main Savings	EOC Savings	Gov1 Savings	Gov2 Savings	Gov3 Savings	Kern Savings	Fam1808 Savings	Hwy1 Savings	Summary
Electricity														
Energy On-Peak	kWh	1,958	5,035	1,558	1,558	519	1,958	0	1,780	2,245	1,896	851	1,238	20,598
Energy Off-Peak	kWh													0
Energy Total	kWh	1,958	5,035	1,558	1,558	519	1,958	0	1,780	2,245	1,896	851	1,238	20,598
Demand On-Peak, Monthly	kW													0.0
Demand On-Peak, Annual	kW													0.0
Demand Off-Peak, Monthly	kW													0.0
Demand Off-Peak, Annual	kW													0.0
Fossil Fuel														
Natural Gas (NG)	CCF													0
Liquid Propane Gas (LPG)	Gallons													0
Steam	Mlbs													0
Fuel Oil, #2	Gallons													0
Fuel Oil, #4	Gallons													0
Fuel Oil, #6	Gallons													0
Solar Value Stack	\$													0
Water														
Water Savings	kGallons													0
Sewer														
Sewer Savings	kGallons													0

Project Total	kWh Rate	0.08		Totals
# of Berts	62	21	18	101
Total Annual Net kWh Savings	7,331	8,303	4,964	20,598
Total Annual Net \$ Savings	\$586	\$664	\$397	\$1,648

Device Type:	Med. Printer	Lg. Copier (110V)	Lg Coffee	
Watts:	18	60	42	
Baseline Hours ON:	8760	8760	8760	

Sheriff's Department/Correctional Facility

# of Berts	5	2	2	9
Scheduled ON Hours (Bert)	2100	2100	2100	
Annual Net Hours Savings	6,660	6,660	6,660	
Total Annual Net kWh Savings	599	799	559	1,958
Total Annual Net \$ Savings	\$48	\$64	\$45	\$157
Annual Net \$ Savings - Device	\$9.59	\$31.97	\$0.00	

New Putnam County Courthouse

# of Berts	15	6	3	24
Scheduled ON Hours (Bert)	2100	2100	2100	
Annual Net Hours Savings	6,660	6,660	6,660	
Total Annual Net kWh Savings	1,798	2,398	839	5,035
Total Annual Net \$ Savings	\$144	\$192	\$67	\$403
Annual Net \$ Savings - Device	\$9.59	\$31.97	\$0.00	

David D. Bruen County Office Building

# of Berts	4	2	1	7
Scheduled ON Hours (Bert)	2100	2100	2100	
Annual Net Hours Savings	6,660	6,660	6,660	
Total Annual Net kWh Savings	480	799	280	1,558
Total Annual Net \$ Savings	\$38	\$64	\$22	\$125
Annual Net \$ Savings - Device	\$9.59	\$31.97	\$0.00	

1812 Courthouse

# of Berts	4	2	1	7
------------	---	---	---	----------

Scheduled ON Hours (Bert)	2100	2100	2100	
Annual Net Hours Savings	6,660	6,660	6,660	
Total Annual Net kWh Savings	480	799	280	1,558
Total Annual Net \$ Savings	\$38	\$64	\$22	\$125
Annual Net \$ Savings - Device	\$9.59	\$31.97	\$0.00	

121 Main Street

# of Berts	2	0	1	3
Scheduled ON Hours (Bert)	2100	2100	2100	
Annual Net Hours Savings	6,660	6,660	6,660	
Total Annual Net kWh Savings	240	0	280	519
Total Annual Net \$ Savings	\$19	\$0	\$22	\$42
Annual Net \$ Savings - Device	\$9.59	#DIV/0!	\$0.00	

Emergency Operations Center/TOPS

# of Berts	5	2	2	9
Scheduled ON Hours (Bert)	2100	2100	2100	
Annual Net Hours Savings	6,660	6,660	6,660	
Total Annual Net kWh Savings	599	799	559	1,958
Total Annual Net \$ Savings	\$48	\$64	\$45	\$157
Annual Net \$ Savings - Device	\$9.59	\$31.97	\$22.38	

Donald B. Smith Government Campus - Building 2

# of Berts	4	2	2	8
Scheduled ON Hours (Bert)	2310	2310	2310	
Annual Net Hours Savings	6,450	6,450	6,450	
Total Annual Net kWh Savings	464	774	542	1,780
Total Annual Net \$ Savings	\$37	\$62	\$43	\$142
Annual Net \$ Savings - Device	\$0.00	\$30.96	\$0.00	

Donald B. Smith Government Campus - Building 3

# of Berts	8	2	2	12
Scheduled ON Hours (Bert)	2310	2310	2310	
Annual Net Hours Savings	6,450	6,450	6,450	
Total Annual Net kWh Savings	929	774	542	2,245
Total Annual Net \$ Savings	\$74	\$62	\$43	\$180
Annual Net \$ Savings - Device	\$9.29	\$30.96	\$0.00	

**Kern Building - Health
Dept/DMV/WIC**

# of Berts	5	2	2	9
Scheduled ON Hours (Bert)	2310	2310	2310	
Annual Net Hours Savings	6,450	6,450	6,450	
Total Annual Net kWh Savings	581	774	542	1,896
Total Annual Net \$ Savings	\$46	\$62	\$43	\$152
Annual Net \$ Savings - Device	\$9.29	\$30.96	\$0.00	

**Putnam Family &
Community Services -
1808**

# of Berts	5	0	1	6
Scheduled ON Hours (Bert)	2310	2310	2310	
Annual Net Hours Savings	6,450	6,450	6,450	
Total Annual Net kWh Savings	581	0	271	851
Total Annual Net \$ Savings	\$46	\$0	\$22	\$68
Annual Net \$ Savings - Device	\$9.29	#DIV/0!	\$21.67	

**Highway Department -
Building 1 Admin**

# of Berts	5	1	1	7
Scheduled ON Hours (Bert)	2310	2310	2310	
Annual Net Hours Savings	6,450	6,450	6,450	
Total Annual Net kWh Savings	581	387	271	1,238
Total Annual Net \$ Savings	\$46	\$31	\$22	\$99
Annual Net \$ Savings - Device	\$9.29	\$30.96	\$21.67	

Energy Savings Calculations for ECM 22: Chiller Replacement

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Putnam County, NY
Energy and Demand Savings Summary
Measure ID: 22
Measure Name: Chiller Replacement
Measure Location:
Engineers:

Site Name:			Court1812	Summary
Item	Units		Savings	
Electricity				
Energy On-Peak	kWh		40,000	40,000
Energy Off-Peak	kWh		0	0
Energy Total	kWh		40,000	40,000
Demand On-Peak, Monthly	kW		16.2	16.2
Demand On-Peak, Annual	kW		64.7	64.7
Demand Off-Peak, Monthly	kW			0.0
Demand Off-Peak, Annual	kW			0.0
Fossil Fuel				0
Natural Gas (NG)	Therms			0
Liquid Propane Gas (LPG)	Gallons			0
Steam	Mlbs			0
Fuel Oil, #2	Gallons			0
Fuel Oil, #4	Gallons			0
Fuel Oil, #6	Gallons			0
Miscellaneous	Misc			0
Water				0
Water Savings	kGallons			0
Sewer				0
Sewer Savings	kGallons			0

Energy Savings Calculations for ECM 23: Siding Replacement

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Putnam County, NY
Energy and Demand Savings Summary
Measure ID: 23
Measure Name: Siding Replacement
Measure Location:
Engineers:

Site Name:			Golf	Summary
Item	Units		Savings	
Electricity				
Energy On-Peak	kWh		62	62
Energy Off-Peak	kWh			0
Energy Total	kWh		62	62
Demand On-Peak, Monthly	kW			0.0
Demand On-Peak, Annual	kW			0.0
Demand Off-Peak, Monthly	kW			0.0
Demand Off-Peak, Annual	kW			0.0
Fossil Fuel				
Natural Gas (NG)	CCF			0
Liquid Propane Gas (LPG)	Gallons			0
Steam	Mlbs			0
Fuel Oil, #2	Gallons		133	133
Fuel Oil, #4	Gallons			0
Fuel Oil, #6	Gallons			0
Solar Value Stack	\$			0
Water				
Water Savings	kGallons			0
Sewer				
Sewer Savings	kGallons			0

Energy Savings Calculations for ECM 24: Roof Replacement

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	24
Measure Name:	Roof Replacement
Measure Location:	
Engineers:	

Site Name:		Golf	Gov2	Gov3	Kern	Summary
Item	Units	Savings	Savings	Savings	Savings	
Electricity						
Energy On-Peak	kWh	25	134	217	98	474
Energy Off-Peak	kWh					0
Energy Total	kWh	25	134	217	98	474
Demand On-Peak, Monthly	kW					0.0
Demand On-Peak, Annual	kW					0.0
Demand Off-Peak, Monthly	kW					0.0
Demand Off-Peak, Annual	kW					0.0
Fossil Fuel						
Natural Gas (NG)	CCF		484	872	322	1,678
Liquid Propane Gas (LPG)	Gallons					0
Steam	Mlbs					0
Fuel Oil, #2	Gallons	54				54
Fuel Oil, #4	Gallons					0
Fuel Oil, #6	Gallons					0
Solar Value Stack	\$					0
Water						
Water Savings	kGallons					0
Sewer						
Sewer Savings	kGallons					0

Energy Savings Calculations for ECM 25: Window Restoration

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Putnam County, NY
Energy and Demand Savings Summary
Measure ID: 25
Measure Name: Window Restoration
Measure Location:
Engineers:

Site Name:			Jail	Bruen	Kern	Summary
Item	Units	Savings	Savings	Savings	Savings	
Electricity						
Energy On-Peak	kWh	33	905	417	1,355	
Energy Off-Peak	kWh				0	
Energy Total	kWh	33	905	417	1,355	
Demand On-Peak, Monthly	kW				0.0	
Demand On-Peak, Annual	kW				0.0	
Demand Off-Peak, Monthly	kW				0.0	
Demand Off-Peak, Annual	kW				0.0	
Fossil Fuel						
Natural Gas (NG)	CCF	65		971	1,036	
Liquid Propane Gas (LPG)	Gallons				0	
Steam	Mlbs				0	
Fuel Oil, #2	Gallons		1,368		1,368	
Fuel Oil, #4	Gallons				0	
Fuel Oil, #6	Gallons				0	
Solar Value Stack	\$				0	
Water						
Water Savings	kGallons				0	
Sewer						
Sewer Savings	kGallons				0	

Putnam County, NY
David B. Bruen County Office Building
Energy Savings Analysis

TMY-2 Weather Data for Putnam County, NY

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Avg Temp deg F	31.5	34.5	39.5	45.5	51.5	57.5	61.5	61.5	57.5	51.5	45.5	39.5	45.5
Avg Temp deg C	4.7	7.5	4.0	7.5	10.8	14.2	16.4	16.4	13.1	10.8	7.5	4.0	7.5
Max Temp deg F	45.0	50.0	55.0	60.0	65.0	70.0	75.0	75.0	70.0	65.0	60.0	55.0	65.0
Max Temp deg C	7.2	10.0	12.8	15.6	18.3	21.1	23.9	23.9	21.1	18.3	15.6	12.8	18.3
Min Temp deg F	18.0	20.0	25.0	30.0	35.0	40.0	45.0	45.0	40.0	35.0	30.0	25.0	35.0
Min Temp deg C	8.3	9.4	13.9	16.7	19.4	22.2	25.0	25.0	22.2	19.4	16.7	13.9	19.4
Heating deg F	18.0	20.0	25.0	30.0	35.0	40.0	45.0	45.0	40.0	35.0	30.0	25.0	35.0
Heating deg C	8.3	9.4	13.9	16.7	19.4	22.2	25.0	25.0	22.2	19.4	16.7	13.9	19.4
Cooling deg F	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0	65.0
Cooling deg C	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3
Total Hb (hours)	100	100	100	100	100	100	100	100	100	100	100	100	100
Heating (17-24 hours)	100	100	100	100	100	100	100	100	100	100	100	100	100
Cooling (17-24 hours)	0	0	0	0	0	0	0	0	0	0	0	0	0

Component	Value	Unit	U.L.I.	Description
Window Replacement Area	1,857	SF	AC-44	
Existing Window U-value	0.85	Btu-obj-F-S	AC-45	
Proposed Window U-value	0.60	Btu-obj-F-S	AC-46	
Existing Window Crack Area	12.83	SF	AC-47	
Proposed Window Crack Area	2.00	SF	AC-48	
Average Summer Wind Speed	3.03	MPH	AC-50	
Average Winter Wind Speed	7.0	MPH	AC-51	
Proposed Heating Plant Efficiency	79.0%		AC-52	
Percent Building Coated	100%		AC-53	
Coating R-Value	1.8		AC-54	
Coating Film Efficiency	3.52	EQF	AC-55	- AC-54 + 3.113
Average Space Temperatures				
Occupied	72.0	AC-59		Description
Unoccupied	72.0	AC-60		

Component	Value	Unit	U.L.I.	Description
Window Replacement Area	1,857	SF	AC-44	
Existing Window U-value	0.85	Btu-obj-F-S	AC-45	
Proposed Window U-value	0.60	Btu-obj-F-S	AC-46	
Existing Window Crack Area	12.83	SF	AC-47	
Proposed Window Crack Area	2.00	SF	AC-48	
Average Summer Wind Speed	3.03	MPH	AC-50	
Average Winter Wind Speed	7.0	MPH	AC-51	
Proposed Heating Plant Efficiency	79.0%		AC-52	
Percent Building Coated	100%		AC-53	
Coating R-Value	1.8		AC-54	
Coating Film Efficiency	3.52	EQF	AC-55	- AC-54 + 3.113
Average Space Temperatures				
Occupied	72.0	AC-59		Description
Unoccupied	72.0	AC-60		

Energy Savings Calculations for ECM 26: Move Register

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Putnam County, NY	
Energy and Demand Savings Summary	
Measure ID:	26
Measure Name:	Move Register
Measure Location:	
Engineers:	

Site Name:	Units	KochlerSr Savings	Summary
Electricity			
Energy On-Peak	kWh		0
Energy Off-Peak	kWh	0	0
Energy Total	kWh	0	0
Demand On-Peak, Monthly	kW		0.0
Demand On-Peak, Annual	kW		0.0
Demand Off-Peak, Monthly	kW		0.0
Demand Off-Peak, Annual	kW		0.0
Fossil Fuel			
Natural Gas (NG)	CCF	932	932
Liquid Propane Gas (LPG)	Gallons	0	0
Steam	Mlbs	0	0
Fuel Oil, #2	Gallons	0	0
Fuel Oil, #4	Gallons	0	0
Fuel Oil, #6	Gallons	0	0
Solar Value Stack	\$	0	0
Water			
Water Savings	kGallons		0
Sewer			
Sewer Savings	kGallons		0

APPENDIX B: MANUFACTURER SPECIFICATION SHEETS

Manufacturer specification sheets are provided for the following ECMs

ECM No.	Title	Tab
1	Lighting System Improvements - Interior	1
2	Lighting System Improvements - Exterior	2
3	Recommission Energy Management Systems	3
4	Web-enabled Programmable Thermostats	4
5	Heat Timer & Thermostatic Radiator Valves	5
6	Fuel Oil to Natural Gas Conversion	6
8	Variable Frequency Drives for HW Pumps	8
10	Premium Efficiency Transformers	10
11	Vending Misers	11
12	Walk-in Refrigeration Controls	12
13	Steam Trap Replacements	13
14	Infiltration Reductions	14
15	Pipe Insulation	15
16	Boiler Replacements	16
17	Window Replacements	17
18	Solar PV Array	18
19	AHU Replacements	19
20	Plug Load Controllers	20
22	Chiller Replacement	22
23	Siding Replacement	23
24	Roof Replacement	24
25	Window Restoration	25

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Manufacturer Specification Sheets

ECM 1: Lighting System Improvements - Interior

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PHILIPS

Recessed

EvoKit LED Retrofit Kit Gen 4



Project: _____

Location: _____

Cat No: _____

Type: _____

Lamps: _____ Qty: _____

Notes: _____

Philips EvoKit LED retrofit kit gen 4 is an energy efficient LED alternative to traditional linear fluorescent troffers. Not only does it offer energy savings¹, it also helps reduce maintenance costs due to its long lifetime. Simple construction helps decrease the installation time meaning you can have an LED solution in your ceiling in just minutes. Additional information can be found at www.philips.com/evokit. Products can be found on the DLC QPL by searching the 6 digit product number.

Ordering guide

Product Number	12NC	Description	Watts ³	Volts	Lumen Maintenance (Hrs.) ²	Approx. Lumens ²	Color Temp. (K)	Efficacy	Diffusor
Dimming: 0-10V									
515692	929000781813	EvoKit 2x2 P 23L 17W 835 2 0-10 7 G4	17	120-277	70,000	2300	3500	134	Ribbed
515759	929000782213	EvoKit 2x2 P 23L 17W 840 2 0-10 7 G4	17	120-277	70,000	2300	4000	137	Ribbed
◆ 516005	929000783313	EvoKit 2x2 P 32L 24W 835 2 0-10 7 G4	24	120-277	70,000	3200	3500	132	Ribbed
◆ 515940	929000782713	EvoKit 2x2 P 32L 24W 840 2 0-10 7 G4	24	120-277	70,000	3200	4000	135	Ribbed
516237	929000785513	EvoKit 2x4 P 30L 22W 835 2 0-10 7 G4	22	120-277	70,000	3000	3500	135	Ribbed
516039	929000783613	EvoKit 2x4 P 30L 22W 840 2 0-10 7 G4	22	120-277	70,000	3000	4000	137	Ribbed
◆ 516286	929000786013	EvoKit 2x4 P 36L 27W 835 2 0-10 7 G4	27	120-277	70,000	3600	3500	135	Ribbed
◆ 516328	929000786413	EvoKit 2x4 P 36L 26W 840 2 0-10 7 G4	26	120-277	70,000	3600	4000	137	Ribbed
◆ 516427	929000787413	EvoKit 2x4 P 42L 32W 835 2 0-10 7 G4	32	120-277	70,000	4200	3500	134	Ribbed
◆ 516369	929000786813	EvoKit 2x4 P 42L 31W 840 2 0-10 7 G4	31	120-277	70,000	4200	4000	136	Ribbed
516534	929000788513	EvoKit 2x4 P 47L 36W 835 2 0-10 7 G4	36	120-277	70,000	4700	3500	132	Ribbed
516476	929000787913	EvoKit 2x4 P 47L 35W 840 2 0-10 7 G4	35	120-277	70,000	4700	4000	135	Ribbed
517482	929000798813	EvoKit 2x2 P 32L 24W 835 2 0-10 7 G4 SM	24	120-277	70,000	3200	3500	132	Smooth
517466	929000798613	EvoKit 2x2 P 32L 24W 840 2 0-10 7 G4 SM	24	120-277	70,000	3200	4000	135	Smooth
517508	929000799013	EvoKit 2x4 P 36L 27W 835 2 0-10 7 G4 SM	27	120-277	70,000	3600	3500	135	Smooth
517516	929000799113	EvoKit 2x4 P 36L 26W 840 2 0-10 7 G4 SM	26	120-277	70,000	3600	4000	137	Smooth
517540	929000799413	EvoKit 2x4 P 42L 32W 835 2 0-10 7 G4 SM	32	120-277	70,000	4200	3500	134	Smooth
517524	929000799213	EvoKit 2x4 P 42L 31W 840 2 0-10 7 G4 SM	31	120-277	70,000	4200	4000	136	Smooth
520098	929001747813	EvoKit 2x4 P 40L 29W 840 2 0-10 7 G4	29	120-277	70,000	4000	4000	140	Ribbed
515643	929000781613	EvoKit 2x2 P 23L 17W 850 2 0-10 7 G4	17	120-277	70,000	2300	5000	138	Ribbed
515981	929000783113	EvoKit 2x2 P 32L 24W 850 2 0-10 7 G4	24	120-277	70,000	3200	5000	135	Ribbed
516260	929000785813	EvoKit 2x4 P 36L 26W 850 2 0-10 7 G4	26	120-277	70,000	3600	5000	139	Ribbed
516401	929000787213	EvoKit 2x4 P 42L 31W 850 2 0-10 7 G4	31	120-277	70,000	4200	5000	138	Ribbed
516518	929000788313	EvoKit 2x4 P 47L 34W 850 2 0-10 7 G4	34	120-277	70,000	4700	5000	136	Ribbed

See footnotes on the last page.



interact
ready.

EvoKit LED retrofit kit gen 4

EvoKit Sensor Ready (SR) with Philips Advance Xitanium SR for connected lighting solutions

EvoKit SR is a new platform that allows users to choose different control platforms to suit their needs and budget: from simple occupancy and daylight sensing to cloud-connected data-reporting sensing. This empowers users to fine-tune their energy use for reduced energy costs. Various Interact, Philips SpaceWise, and other SR certified controls are available. Please refer to Philips.com/Evokit for details. Contact your Philips representative for a current list of additional approved sensors. Sensors are connected in the field with just a few simple steps:



Step 1: EvoKit SR is shipped with a plate covering the sensor hole. There are two wires secured to the back of the plate.



Step 2: The plate can be removed before or after you install EvoKit SR. Just gently slide the plate to one end and remove.



Step 3: Remove the two wires that were secured to the back of the plate.



Step 4: Take these two wires and insert them into the sensor. They are not polarity sensitive.



Step 5: Insert the sensor back into the hole. The sensor may or may not require a socket.

Product Number	12NC	Description	Watts ³	Volts	Lumen Maintenance (Hrs.) ²	Approx. Lumens ²	Color Temp. (K)	Efficacy	Diffusor
Dimming: SR									
521047	929001753813	EvoKit 2x2 P 26L 20W 835 2 SR 7 G4	20	120-277	70,000	2600	3500	130	Ribbed
521054	929001753913	EvoKit 2x2 P 26L 20W 840 2 SR 7 G4	20	120-277	70,000	2600	4000	132	Ribbed
521062	929001754013	EvoKit 2x2 P 26L 20W 850 2 SR 7 G4	20	120-277	70,000	2600	5000	134	Ribbed
516013	929000783413	EvoKit 2x2 P 32L 25W 835 2 SR 7 G4	25	120-277	70,000	3200	3500	129	Ribbed
◆ 515957	929000782813	EvoKit 2x2 P 32L 24W 840 2 SR 7 G4	24	120-277	70,000	3200	4000	132	Ribbed
521070	929001754113	EvoKit 2x2 P 32L 24W 850 2 SR 7 G4	24	120-277	70,000	3200	5000	136	Ribbed
516245	929000785613	EvoKit 2x4 P 30L 23W 835 2 SR 7 G4	23	120-277	70,000	3000	3500	131	Ribbed
516203	929000785213	EvoKit 2x4 P 30L 23W 840 2 SR 7 G4	23	120-277	70,000	3000	4000	133	Ribbed
516435	929000787513	EvoKit 2x4 P 42L 32W 835 2 SR 7 G4	32	120-277	70,000	4200	3500	132	Ribbed
◆ 516377	929000786913	EvoKit 2x4 P 42L 32W 840 2 SR 7 G4	32	120-277	70,000	4200	4000	134	Ribbed
521088	929001754213	EvoKit 2x4 P 42L 29W 835 2 SR 7 G4	29	120-277	70,000	4200	3500	137	Ribbed
521096	929001754313	EvoKit 2x4 P 42L 29W 840 2 SR 7 G4	29	120-277	70,000	4200	4000	140	Ribbed
521104	929001754413	EvoKit 2x4 P 42L 29W 850 2 SR 7 G4	29	120-277	70,000	4200	5000	142	Ribbed
516542	929000788613	EvoKit 2x4 P 47L 36W 835 2 SR 7 G4	36	120-277	70,000	4700	3500	130	Ribbed
516484	929000788013	EvoKit 2x4 P 47L 36W 840 2 SR 7 G4	36	120-277	70,000	4700	4000	132	Ribbed
517557	929000799513	EvoKit 2x4 P 42L 32W 835 2 SR 7 G4 SM	32	120-277	70,000	4200	3500	132	Smooth
517532	929000799313	EvoKit 2x4 P 42L 32W 840 2 SR 7 G4 SM	32	120-277	70,000	4200	4000	134	Smooth
517490	929000798913	EvoKit 2x2 P 32L 25W 835 2 SR 7 G4 SM	25	120-277	70,000	3200	3500	129	Smooth
517474	929000798713	EvoKit 2x2 P 32L 24W 840 2 SR 7 G4 SM	24	120-277	70,000	3200	4000	132	Smooth

Commercial Product Name	Order Code
EVO441 wireless transceiver for Evokit	541367

The Philips EVO441 fixture-mount transceiver enables InterAct Pro connectivity in a single, compact package for easy field assembly. EVO441 operates with the established Xitanium SR driver standard to make a simple two-wire connection between transceiver and driver. It can be easily attached to any EvoKit SR (sensor ready), thus eliminating the need for multiple components and auxiliary devices. The result is an InterAct Ready EvoKit.



Commercial Product Name	Order Code
EasySense EVO102	514877
EasySense EVO200	516575

The Philips EasySense fixture-mount sensor is the ideal solution for per-fixture control of new light fixtures. It combines occupancy sensing, daylight harvesting and task tuning in a single, compact package.



See footnotes on the last page.

EvoKit LED retrofit kit gen 4

EvoKit with SpaceWise DT technology

Product Number	12NC	Description	Watts ³	Volts	Lumen Maint (Hrs.) ²	Approx. Lumens ³	Color Temp. (K)	Efficacy	Diffusor
◆ 518332	929001709313	EvoKit 2x2 P 32L 25W 835 2 SWZDT 7 G4	25	120-277	70,000	3200	3500	129	Ribbed
◆ 518324	929001709213	EvoKit 2x2 P 32L 24W 840 2 SWZDT 7 G4	24	120-277	70,000	3200	4000	132	Ribbed
518407	929001710013	EvoKit 2x4 P 30L 23W 835 2 SWZDT 7 G4	23	120-277	70,000	3000	3500	131	Ribbed
518415	929001710113	EvoKit 2x4 P 30L 23W 840 2 SWZDT 7 G4	23	120-277	70,000	3000	4000	133	Ribbed
◆ 518423	929001710213	EvoKit 2x4 P 42L 32W 835 2 SWZDT 7 G4	32	120-277	70,000	4200	3500	132	Ribbed
◆ 518431	929001710313	EvoKit 2x4 P 42L 32W 840 2 SWZDT 7 G4	32	120-277	70,000	4200	4000	134	Ribbed
518449	929001710413	EvoKit 2x4 P 47L 36W 835 2 SWZDT 7 G4	36	120-277	70,000	4700	3500	130	Ribbed
518456	929001710513	EvoKit 2x4 P 47L 36W 840 2 SWZDT 7 G4	36	120-277	70,000	4700	4000	132	Ribbed
Air Return									
518316	929001709113	EvoKit 2x2 A 32L 25W 835 2 SWZDT 7 G4	25	120-277	70,000	3200	3500	130	Ribbed
518308	929001709013	EvoKit 2x2 A 32L 24W 840 2 SWZDT 7 G4	24	120-277	70,000	3200	4000	133	Ribbed
518357	929001709513	EvoKit 2x4 A 30L 23W 835 2 SWZDT 7 G4	23	120-277	70,000	3000	3500	132	Ribbed
518340	929001709413	EvoKit 2x4 A 30L 22W 840 2 SWZDT 7 G4	22	120-277	70,000	3000	4000	136	Ribbed
518373	929001709713	EvoKit 2x4 A 42L 32W 835 2 SWZDT 7 G4	32	120-277	70,000	4200	3500	132	Ribbed
518365	929001709613	EvoKit 2x4 A 42L 31W 840 2 SWZDT 7 G4	31	120-277	70,000	4200	4000	135	Ribbed
518399	929001709913	EvoKit 2x4 A 47L 36W 835 2 SWZDT 7 G4	36	120-277	70,000	4700	3500	131	Ribbed
518381	929001709813	EvoKit 2x4 A 47L 35W 840 2 SWZDT 7 G4	35	120-277	70,000	4700	4000	134	Ribbed

See footnotes on page 9. Please refer to www.usa.lighting.philips.com/systems/lighting-systems/spacewise for more detailed specification sheets as well as a full list of compatible wireless dimming switches.

Features

- Occupancy sensing, daylight harvesting and task tuning in one device
- Granular dimming (occupancy sharing)
- Dwell time
- Scene setting
- Configuration of sensor parameters – if desired – using NFC or IR via intuitive Android-based Philips field apps
- Quick task tuning in the field to optimize light and power levels
- Enables auto-off/manual-on and auto-off/partial-on application
- DLC qualified: Listed on the QPL for Networked Lighting Controls

Benefits

- Installation savings - integral wireless controls factory installed. No need to order separate components.
- Minimal startup and configuration expertise - savings on labor time & effort
- Deep energy savings & code compliance strategies
- Faster ROI with attractive payback periods (varies depending on luminaire choices)

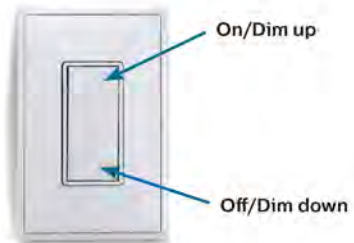
Applications

Conference rooms, individual offices, open offices, classrooms, storage and break areas, restrooms, lobbies

SpaceWise wireless switch

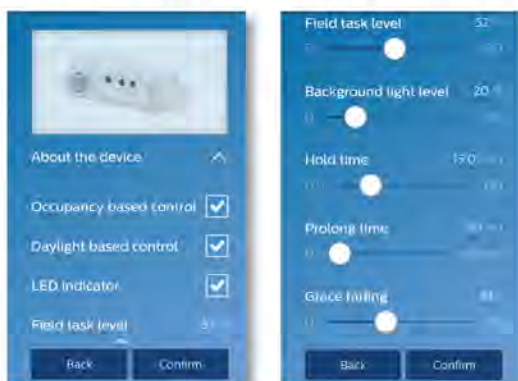
To complete the SpaceWise System a wireless switch may be added.

Ordering code: UID8451/10



New configuration tool

An Android phone is needed for commissioning the system. Please refer to www.usa.lighting.philips.com/systems/lighting-systems/spacewise for full list of compatible phones.



Refer to the website for registration details:

www.usa.lighting.philips.com/support/support/tools/

Sensor parameters can be configured via Philips field apps. Two versions are available:

1. NFC – This app allows configuring sensor parameters only when you can physically access the sensor with a smartphone.
2. IR – This app allows configuring sensor parameters plus enables grouping to a wireless switch, which can be done with the IR feature of applicable phones from floor level.

You must first register for the app to receive a username and password, then download Philips field apps from the Google Play Store.

EvoKit LED retrofit kit gen 4

Application

- A highly efficient, visually comfortable, architecturally styled LED retrofit kit designed to replace recessed linear fluorescent troffers.
- Unique modular design offers refreshing new look in the ceiling when compared to traditional fluorescent luminaires.
- Single light bar combined with slanted troffer helps reflect light to reduce glare and provide uniform light distribution making it ideal for applications such as offices, schools, healthcare and retail.
- Excellent color rendering with a CRI above 80.
- Extremely high efficacies up to 138 lumens per watt.
- LEDs are an excellent source for use with controls since dimming or frequent switching does not degrade the performance or life of the source.
- Designed for use with standard grid (NEMA "G") or Narrow Grid (NEMA "NFG") ceiling T-Grids.
- High efficiency source and luminaire design help significantly reduce energy consumption and more easily comply with known energy codes.
- Helps meet regulation requirements such as ASHRAE 90.1 and Title 24 when matched with suitable controls.

Construction/Finish

- Simple design allows for quick installation in existing luminaire without the need to break the ceiling plenum.

- Constructed using galvanized steel which helps fight rust and makes for more durable product.
- Integrated securement tabs for securement to existing troffer housing.
- Minimum depth of only 3" necessary to allow proper clearance and installation of the EvoKit.
- Retrofit kit is powder coated after fabrication with high quality, durable finish to ensure no unfinished edges and avoid future potential of corrosion.
- Components fit together easily without the need for tools during installation.

Electrical

- Multiple driver options available
 - Philips Advance Xitanium SR driver allows flexibility to integrate a range of control options.
 - 0-10V dimming satisfies universal voltage requirements
- 5-year limited warranty includes all components of the retrofit kit, including driver, LED board and nonelectrical components.¹
- Listed with UL and Design Lights Consortium¹ to ensure quality performance and safety standards are met.
- High efficiency LEDs have a minimum 70,000 hour rated life (L₇₀).

Enclosure

- Diffuser requires no frames or fasteners and can be easily removed from below without tools if needed.

Accessories

- Suitable for use with Philips 503441 emergency backup.
- Suitable for use with a wide range of control systems.
- Earthquake cables available for additional securement to the existing troffer for areas where required.

Prod. No.	Description
502435	Earthquake cable 317mm
517987	EvoKit 2x4 replacement lens ribbed
517748	EvoKit 2x4 replacement lens smooth
517979	EvoKit 2x2 replacement lens ribbed
517755	EvoKit 2x2 replacement lens smooth
503441	EvoKit field installed emergency battery backup (requires the use of bracket)
517730	EvoKit emergency battery backup bracket (brackets come in packs of 4). Two emergency brackets needed per battery pack.

EvoKit with new SimpleSet technology for wireless lumen level programming

EvoKit with new SimpleSet technology allows the maximum lumen level to be set prior to installation using a smartphone-based app without requiring power to the luminaire. Available in the 0-10V and SR versions only. The app can be downloaded at Google Play. Please contact your Philips representative for the current list of approved Android smartphones. Distributors can set lumen levels prior to shipping, and contractors can set lumen levels prior to installation. Lumen level is quickly and easily set in two steps:



Step 1: Place the smartphone next to the NFC antenna on the driver.

Step 2: Follow the on-screen instructions.



A collection of Philips InstantFit LED lamps in various shapes and sizes, including linear tubes and a U-shaped lamp, arranged on a white background.

PHILIPS

LED

InstantFit lamps

This is **real compatibility**

Other lamps claim compatibility, but only InstantFit has been proven to work with 50% more ballasts¹ delivering even light output, proven energy savings and a long average lifetime. That's true compatibility.

- **InstantFit works with over 200 ballasts** — more than any other lamp — so you know it's going to perform as expected and keep you from having to redo any jobs
- **Proven over 40% energy savings²** over fluorescent means a satisfied customer and no time wasted going back to a job
- **Lifetime delivered** — average life rating of 50,000 hours³, with up to 70,000 hours³ in the portfolio, means satisfied customers
- **Improved profit** and more time growing business instead of doing rework
- **Light quality and performance predictability**— consistent light output and no flicker means satisfied happy customers and no wasted time redoing a job
- **Proven product history** and a company with a long history of innovation and reliability in the lighting industry



QUICKTRONIC® T8 Instant Start

Universal Voltage Systems

High Efficiency Series



Lamp Striation Control
Low Ballast Factor

QHE T8 ISL

Lamp / Ballast Guide

- 32W T8 – OCTRON® lamps
 1-lamp QHE1x32T8/UNV ISL-SC
 2-lamp QHE2x32T8/UNV ISL-SC
 3-lamp QHE3x32T8/UNV ISL-SC
 4-lamp QHE4x32T8/UNV ISL-SC

Also operates:

- FB032, FB031, F025, FB024, F017, FB016, F030/SS (30W), FB030/SS (30W), FB029/SS (29W), F028/SS (28W) & F025/SS (25W)

F040T8 operation:

- 1 lamp on 2L ballast; 2 lamps on 3L ballast; 3 lamps on 4L ballast

Key System Features

- High Efficiency Systems over 90% efficient
- Lamp Striation Control (LSC)
- Over 100 LPW (lumens/watt) with OCTRON SUPERSAVER® lamps
- Lowest power T8 I.S. Systems
- Universal voltage (120-277)
- Small Can enclosure size
- 30-50% Energy savings
- Min. Starting Temp:
 - -20°F (-29°C) for T8 lamps
 - 60°F (16°C) for Energy Saving T8 lamps
 - 0°F (-18°C) for F040T8 lamps
- <10% THD
- Virtually eliminates lamp flicker
- RoHS compliant
- Lead-free solder and manufacturing process

Application Information

QUICKTRONIC High Efficiency ballasts

are ideally suited for:

- Any applications where the lowest power T8 systems are needed for maximum energy savings
- Energy Retrofits
- Commercial & Retail
- Hospitality & Institutional
- New Construction

OSRAM QUICKTRONIC High Efficiency, (QHE) energy-saving electronic T8 ballasts offer several advantages:

1. **Same Light, Less Power!**
 - Up to 6% in energy savings compared to standard T8 low power electronic ballasts without compromising light output
 - Maximum energy savings when compared to F40T12 magnetically ballasted systems
2. **Parallel Circuitry:** keeps remaining lamps lit if one or more go out.
3. **Lamp Striation Control (LSC):** T8 energy saving lamps should be operated above 60°F, but under certain conditions the lamps may striate. LSC circuitry may minimize or eliminate this condition; however there are limited applications where LSC circuitry may not entirely mitigate lamp striations

System Information

QUICKTRONIC High Efficiency (QHE)

System advantages:

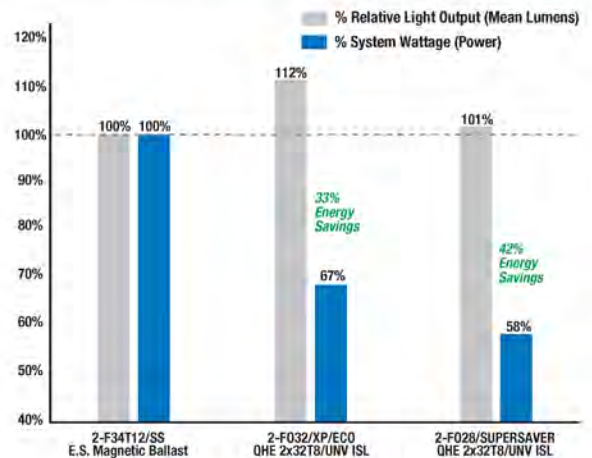
- Operate from 120V through 277V
 - Eliminates "wrong voltage" errors
 - Reduces inventory by 50%
- Utilizes Instant Start operation for
 - Highest System Efficacy
 - Low temperature starting capability
- Very low harmonic distortion (<10%)THD
- Operate at >42 kHz to reduce potential interference with infrared control systems



These ballasts are also RoHS compliant and feature lead-free solder and manufacturing process.

QUICKTRONIC High Efficiency (QHE) systems are covered by the QUICK 60+™ warranty, the first and most comprehensive lamp & ballast system warranty in the industry.

System Type (2-lamp)	Input Power (W)	Initial System Lumens	System Efficacy LPW	Mean System Lumens	Relative Mean Light Output	Energy Savings
F34T12 - E.S. Magnetic Ballast	72	4660	65	3960	Baseline	Baseline
F032/XP® - QHE2x32T8/UNV ISL-SC	48	4680	98	4440	112%	33%
F028/SS - QHE2x32T8/UNV ISL-SC	42	4250	101	3995	101%	42%



QUICKTRONIC® T8 Instant Start

Universal Voltage Systems
High Efficiency Series



Lamp Striation Control
Normal Ballast Factor

QHE T8 ISN

Lamp / Ballast Guide

- 32W T8 – OCTRON® lamps
 1-lamp QHE1x32T8/UNV ISN-SC
 2-lamp QHE2x32T8/UNV ISN-SC
 3-lamp QHE3x32T8/UNV ISN-SC
 4-lamp QHE4x32T8/UNV ISN-SC

Also operates:

- FB032, FB031, F025, FB024, F017, FB016, F030/SS (30W), FB030/SS (30W), FB029/SS (29W), F028/SS (28W) & F025/SS (25W)

F040T8 operation:

- 1 lamp on 2L ballast; 2 lamps on 3L ballast; 3 lamps on 4L ballast

Key System Features

- High Efficiency Systems over 90% efficient
- Lamp Striation Control (LSC)
- Over 100 LPW (lumens/watt) with OCTRON SUPERSAVER® lamps
- Lowest power T8 I.S. Systems
- Universal voltage (120-277V)
- Small Can enclosure size
- 30-50% Energy savings
- Min. Starting Temp:
 - -20°F(-29°C) for T8 lamps
 - 60°F (16°C) for Energy Saving T8 lamps
 - 0°F (-18°C) for F040T8 lamps
- <10% THD
- Virtually eliminates lamp flicker
- RoHS compliant
- Lead-free solder and manufacturing

process

Application Information

SYLVANIA QUICKTRONIC High Efficiency ballasts are ideally suited for:

- Any applications where the lowest power T8 systems are needed for maximum energy savings
- Energy Retrofits
- Commercial & Retail
- Hospitality & Institutional
- New Construction

Lamp Striation Control (LSC)

- General lighting applications where energy saving T8 lamps may striate, particularly for the F25 energy saving T8 lamps.

QUICKTRONIC High Efficiency, (QHE) energy-saving electronic T8 ballasts offer several advantages:

1. Same Light, Less Power!
 - Up to 6% in energy savings compared to standard T8 low power electronic ballasts without compromising light output
 - Maximum energy savings when compared to F40T12 magnetically ballasted systems
2. Parallel Circuitry: keeps remaining lamps lit if one or more go out.
3. Lamp Striation Control (LSC): T8 energy saving lamps should be operated above 60°F, but under certain conditions the lamps may striate. LSC circuitry may minimize or eliminate this condition; however there are limited applications where LSC circuitry may not entirely mitigate lamp striations
4. New Banded Packaging
 - Distributor-friendly for easy stocking and individual ballast sales
 - Reduced waste
 - Easy removable bands
 - No tangled wires



These ballasts are also RoHS compliant and feature lead-free solder and manufacturing process.

QUICKTRONIC High Efficiency (QHE) systems are also covered by the QUICK 60 +™ warranty, the first and most comprehensive lamp & ballast system warranty in the industry.

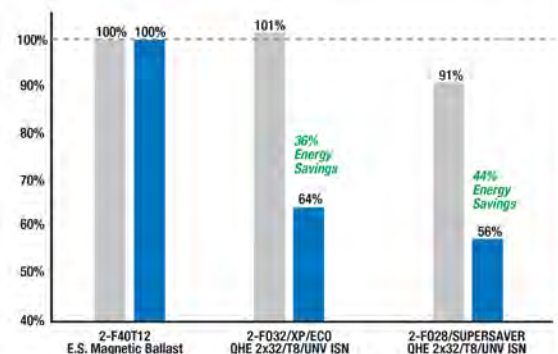
System Information

SYLVANIA QUICKTRONIC High Efficiency (QHE) System advantages:

- Operate from 120V through 277V
 - Eliminates “wrong voltage” errors
 - Reduces inventory by 50%
- Utilizes Instant Start operation for
 - Highest System Efficacy
 - Low temperature starting capability
- Very low harmonic distortion (<10%)THD
- Operate at >42 kHz to reduce potential interference with infrared control systems

System Type (2-lamp)	Input Power (W)	Initial System Lumens	System Efficacy LPW	Mean System Lumens	Relative Mean Light Output	Energy Savings
F40T12 – E.S. Magnetic Ballast	86	5795	67	4930	Baseline	Baseline
F34T12 – E.S. Magnetic Ballast	72	4660	65	3960	80%	16%
F032/XP® – QHE2x32T8/UNV ISN-SC	55	5280	96	4965	101%	36%
F028/SS – QHE2x32T8/UNV ISN-SC	48	4800	100	4510	91%	44%

■ % Relative Light Output (Mean Lumens)
 ■ % System Wattage (Power)



QUICKTRONIC® T8 Instant Start

Universal Voltage Systems
High Efficiency Series



Lamp Striation Control
High Ballast Factor

QHE T8 ISH

Lamp / Ballast Guide

32W T8 – OCTRON® lamps
3-lamp QHE3x32T8/UNV ISH-SC
4-lamp QHE4x32T8/UNV ISH

Also operates:

FBO32, FBO31, F030/SS (30W), FBO30/SS (30W), FBO29/SS (29W), F028/SS (28W) & F025/SS (25W)

Key System Features

- High Efficiency Systems over 90% efficient
- Lamp Striation Control (LSC)
- Over 100 LPW (lumens/watt) with OCTRON SUPERSAVER® lamps
- Lowest power T8 PLUS Systems
- Universal voltage (120-277V)
- 1.15-1.18 ballast factor
- 30-50% Energy savings
- Min. Starting Temp:
 - -20°F (-29°C) for T8 lamps
 - 60°F (16°C) for Energy Saving T8 lamps
- <10% THD
- Virtually eliminates lamp flicker
- RoHS compliant
- Lead-free solder and manufacturing process

Application Information

QUICKTRONIC High Efficiency ballasts are ideally suited for:

- Any applications where the highest light output for the lowest amount of power T8 systems are needed for maximum energy savings
- Energy Retrofits
- Commercial
- Retail
- Hospitality
- Institutional
- New Construction

QUICKTRONIC High Efficiency (QHE) energy-saving electronic T8 ISH (PLUS) ballasts offer several advantages:

1. Same Light, Less Power
 - Up to 6% in energy savings compared to standard T8 low power electronic ballasts without compromising light output
 - Maximum energy savings when compared to F40T12 magnetically ballasted systems
2. High Light Output:
 - Higher lumens per fixture
 - Fewer fixtures required for same light output
3. Parallel Circuitry: keeps remaining lamps lit if one or more go out.
4. Lamp Striation Control (LSC): T8 energy saving lamps should be operated above 60°F, but under certain conditions the lamps may striate. LSC circuitry may minimize or eliminate this condition; however there are limited applications where LSC circuitry may not entirely mitigate lamp striations.

System Information

QUICKTRONIC High Efficiency (QHE)

System advantages:

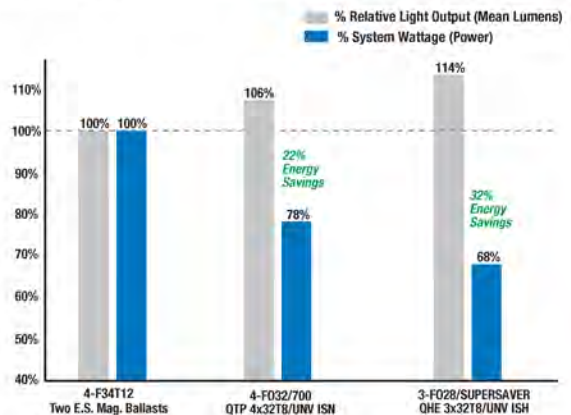
- Operate from 120V through 277V
 - Eliminates “wrong voltage” errors
 - Reduces inventory by 50%
- Utilizes Instant Start operation for
 - Highest System Efficacy
 - Low temperature starting capability
- Very low harmonic distortion (<10%) THD
- Operate at >42 kHz to reduce potential interference with infrared control systems



QUICKTRONIC High Efficiency (QHE) systems are covered by the QUICK 60+® warranty, the first and most comprehensive lamp & ballast system warranty in the industry.

These ballasts are also RoHS compliant and feature lead-free solder and manufacturing process.

System Type	Input Power (W)	Initial System Lumens	System Efficacy LPW	Mean System Lumens	Relative Mean Light Output	Energy Savings
4:F34T12 - Two E.S. Magnetic Ballasts	144	9330	65	7930	Baseline	Baseline
4:F032T8/700 - QTP4x32T8/UNV-ISH-SC	112	9150	82	8415	106%	22%
3:F032/XP® - QHE3x32T8/UNV-ISH-SC	111/109	10620	96/97	9985	126%	23%
3:F028/SS - QHE3x32T8/UNV-ISH-SC	98/96	9650	98/101	9070	114%	32%



The image shows three Philips InstantFit LED 4-pin lamps. One is a horizontal lamp with a rotatable end cap, and two are vertical lamps. A circular LED logo is in the top right corner. The background is white with a blue gradient on the left side.

PHILIPS

LED

InstantFit PL lamps

This is **real compatibility**

Philips InstantFit LED 4-pin lamps make the transition to LED from CFL 4-pin lamps as simple as replacing a lamp. With both vertical and horizontal options and a wide array of color temperatures, the InstantFit LED lamps can quickly and effectively replace compact fluorescent lamps. The horizontal version includes a rotatable end cap to ensure the light is correctly aimed.

Benefits

- **Proven over 40% energy savings²** over fluorescent means a satisfied customer and no time wasted going back to a job
- **Lifetime delivered** — average life rating of 50,000 hours³ means satisfied customers
- **Easy replacement** — Replace conventional 32W and 26W 4-pin (PL-C & PL-T) lamps

Features

- **Rotatable end cap** — ensures proper lamp alignment inside the fixture (Horizontal SKUs only)
- **Long life** — 50,000 hour life³ means less maintenance than fluorescent
- **Proven product history** and a company with a long history of innovation and reliability in the lighting industry



Omni-directional 3-way and dimmable A shape bulbs, **an energy saving alternative to popular incandescents**

Philips LED A-shape dimmable and 3-way lamps are a great alternative to standard incandescent lamps. The unique lamp design provides omni-directional light with excellent dimming performance.

These lamps are ideal for decorative and ambient lighting in retail outlets, hotels, restaurants, government buildings, and multi-unit residences.

PHILIPS

LED

Glass PAR lamps



A classic design for a familiar look

Philips LED glass PAR Lamps with single optic technology provide the familiar look and feel traditional halogen PARs while using a fraction of the energy.

Benefits

- Saves 85% energy When comparing a 13.5W PAR38 LED lamp to a 90W halogen PAR38 lamp[†]
- Long life lowers maintenance costs by reducing re-lamp frequency
- Will not fade colors, avoids inventory spoilage
- Contains no mercury
- Suitable for use in enclosed fixtures

Features

- 25,000-hour claimed lifetime for Energy Star[®] Qualified lamps*
- 50,000-hour LED lifetime**
- Glass finish for a look and feel replicating traditional halogen PARs
- 3-year limited warranty depending upon operating hours[‡]



Candle/Decorative LED

2.7B12/LED/827-22/E12/DIM 120V

Philips Candle Dimmable LED Lamps offer decorative energy saving ambience with the elegant effect of incandescent candles. Available in bent, blunt and flame tip candles, their unique design provides light in all directions, giving lighting designers a long life alternative to standard incandescent sources.

Product data

General Information	
Cap-Base	E12 [Candelabra Screw]
Nominal Lifetime (Nom)	25000 h
Switching Cycle	50000X
Technical Type	2.7-25W
Light Technical	
Color Code	822-827 [tunable warm white]
Initial lumen (Nom)	180 lm
Luminous Flux (Rated) (Nom)	180 lm
Color Designation	Warm Glow(WG)
Correlated Color Temperature (Nom)	2200-2700 K
Luminous Efficacy (rated) (Nom)	66.67 lm/W
Color Consistency	<6
Color Rendering Index (Nom)	80
LLMF At End Of Nominal Lifetime (Nom)	70 %
Operating and Electrical	
Input Frequency	60 Hz
Power (Rated) (Nom)	2.7 W

Lamp Current (Nom)	35 mA
Wattage Equivalent	25 W
Starting Time (Nom)	0.5 s
Warm Up Time to 60% Light (Nom)	0.5 s
Power Factor (Nom)	0.7
Voltage (Nom)	120 V
Temperature	
T-Case Maximum (Nom)	90 °C
Controls and Dimming	
Dimmable	Yes
Mechanical and Housing	
Bulb Finish	Clear (CL)
Approval and Application	
Energy Efficiency Label (EEL)	Not applicable
Suitable For Accent Lighting	No



GENERATION 2

HID REPLACEMENT LED LAMPS

A smaller, more versatile design to fit more fixtures

The G2 DirectDrive HID LED lamps are shorter and narrower, allowing them to fit into more fixtures than ever before.

Highest efficacy in the industry: Up to 150 lm/W

By separating the driver from directly connecting to the heat sink, we've maximized efficiency and protected the LED from overheating. This allows the G2 DirectDrive HID replacement LED lamps to have the highest lumens per watt in the industry.



Catalog Number	Rated Lamp Wattage	Lumens	Metal Halide Equivalent Wattage	Input Voltage	Base Type	CRI	IP Rating	Efficacy
NEW G2								
KT-LED12HID-E26-8xx-D*	12W	1,740	50W	120-277V	Medium E26	>80	IP64	145 lm/W
KT-LED18HID-E26-8xx-D**	18W	2,610	70W	120-277V	Medium E26	>80	IP64	145 lm/W
KT-LED27HID-E26-8xx-D /G2	27W	3,915	100W	120-277V	Medium E26	>80	IP64	145 lm/W
KT-LED27HID-EX39-8xx-D /G2	27W	3,915	100W	120-277V	Mogul EX39	>80	IP64	145 lm/W
KT-LED36HID-E26-8xx-D /G2	36W	5,400	150W	120-277V	Medium E26	>80	IP64	150 lm/W
KT-LED36HID-EX39-8xx-D /G2	36W	5,400	150W	120-277V	Mogul EX39	>80	IP64	150 lm/W
KT-LED45HID-E26-8xx-D /G2	45W	6,750	175W	120-277V	Medium E26	>80	IP64	150 lm/W
KT-LED45HID-EX39-8xx-D /G2	45W	6,750	175W	120-277V	Mogul EX39	>80	IP64	150 lm/W
KT-LED54HID-EX39-8xx-D /G2	54W	8,100	250W	120-277V	Mogul EX39	>80	IP64	150 lm/W
NEW! KT-LED63HID-EX39-8xx-D [†]	63W	9,450	250W/320W	120-277V	Mogul EX39	>80	IP64	150 lm/W
G1								
KT-LED80HID-EX39-8xx-D	80W	11,300	320W	120-277V	Mogul EX39	>85	IP64	141 lm/W
KT-LED100HID-EX39-8xx-D	100W	14,100	400W	120-277V	Mogul EX39	>85	IP64	141 lm/W

*Replaces KT-LED15HID-E26-8xx-D

**Replaces KT-LED19HID-E26-8xx-D

[†] Smaller case size

* 8xx denotes several color temperatures available. 80W and 100W lamps are not available in 3000K.

830 800 Series, 3000K **840** 800 Series, 4000K **850** 800 Series, 5000K



With SmartCool technology, a thermal sensor in the lamp activates during extreme high temperature conditions. Power to the lamp is reduced by up to 20% to cool the lamp and maintain lamp life. Once the sensor reaches an acceptable temperature, the lamp gradually returns to full light output. Included in 54W, 63W, 80W, and 100W DirectDrive HID LED lamps.

ULTRA LED™ RT5/6 HO

Recessed Downlight Kit



SYLVANIA ULTRA RT5/6 HO is a universal input voltage 5" and 6" compatible LED recessed downlight kit that creates high performing white light and is optimized for new construction and retrofit applications utilizing pin based compact fluorescent lamps. Installation is done quickly and easily in most standard six-inch frames.

The RT5/6 HO downlight is offered in 650 lumen, 700 lumen, 900 lumen and 1500 lumen options and achieves up to 88 lumens per watt.

The RT5/6 HO is designed to deliver light output comparable to traditional 1x13W, 1x18W, 1x26W and 2x26W pin based compact fluorescent luminaires.

Application Information

Application Notes

1. Operating temperature range between -4°F and +104°F (-20°C and +40°C).
2. Suitable for dry, damp or wet indoor or outdoor locations.
3. Compatible with Philips Bodine ELI-S-20 Emergency Lighting Micro Inverter.
4. Designed to install in standard 6" CFL mounting frame. For a list of compatible housings, please refer to www.sylvania.com/RT6.
5. For detailed warranty information, please see www.sylvania.com/RT6.
6. The RT5/6HO 650 and 700 lumen is compatible with 120V Phase cut dimmers and 277V Leviton Dimmer model IPX06-70Z .
7. The RT5/6 HO 900 and 1500 lumen are compatible with Leviton 0-10V dimmer model IP710-DL.
8. For installation in non-insulated ceilings: If insulation is present, it may be placed around the retrofit kit as long as a three-inch space is maintained around the kit.
9. Installation performed as a stand-alone kit (without frame) is recommended for hard ceiling. Installation of a recessed incandescent frame is recommended for tiled ceiling application for proper support of the retrofit kit.

Key Features & Benefits

- Three input voltages:
 - 120V
 - 120-277V Universal
 - 347V
- Lumen package:
 - 650 lumens @ 8 watts (line voltage dimmable)
 - 700 lumens @ 8 watts (line voltage dimmable)
 - 900 lumens @ 13 watts (0-10V Dimmable)
 - 1500 lumens @ 17 watts (0-10V Dimmable)
- Replacement for 13W, 18W, 26W and 32W CFL pin based lamps
- Fits in standard 5" and 6" CFL mounting frame
- CCT: 2700K, 3000K, 3500K & 4000K
- CRI of >80 and >90
- 35,000 and 50,000 hour life (L₇₀)
- Suitable for dry, damp and wet indoor or outdoor locations (650lm Indoor only)
- UL1598 Listed and Classified for stand-alone and retrofit applications
- Reduces energy consumption up to 34%
- Lasts up to 4 times longer than compact fluorescent lamps
- No warm-up time, instant-on with full light output and stable lamp to lamp color
- Integrated white trim and metal conduit adaptor (included) for direct replacement
- Suitable for use in 8" applications using optional trim extender accessory

Product Offering

Ordering Abbreviation	Wattage	CCT
LED/RT5/6/HO/650	8	3000K, 4000K
LED/RT5/6/HO/700	8	2700K, 3000K, 3500K, 4000K
LED/RT5/6/HO/900	13	2700K, 3000K, 3500K, 4000K
LED/RT5/6/HO/1500	17	3000K, 3500K, 4000K

Specifications and Certifications



the ultimate LED retrofit kit

RemPhos' LEDBARKIT universal retrofit kit for linear fluorescent luminaires is the perfect retrofit solution. Delivers better long-term reliability, longer life (10yr warranty), controllability (standard 0-10V dimmable driver) and faster paybacks (since Utility incentives are typically higher), when compared to LED tubes. Designed to easily fit into existing T5/T8/T12 linear fluorescent fixtures. Fast, "one-man" installation.



SIMPLE INSTALLATION

Retrofits existing fluorescent fixtures quickly with unique magnetic design and quick connector technology. Designed from an installer's point of view, convert existing fixtures fast with magnets on the back of the light bars that allow hands-free placement (self-tapping screws are provided for for secure install). Electrical quick connects for simple, error-free power connections. For videos showing the simple installation go to www.remphos.com/videos

FITS BETWEEN THE SOCKETS

No need to remove existing T5/T8/T12 sockets. The LEDBAR is sized to fit in between the existing sockets, further reducing install time.

PERFORMANCE-OPTIMIZED TECHNOLOGY

Provides high-efficacy light up to 130 lumens per watt along with a remarkable 10-year system warranty.

MAXIMUM VERSATILITY

Offered in 2ft, 3ft and 4ft lengths along with multiple lamp/driver combinations (1L,2L,3L,4L) providing a fit for any application.

MANY LIGHT OUTPUT CHOICES

Systems available in 10W (1300LM) all the way to 80W (10,400LM). See ordering guide for available systems.

STANDARD 10V DIMMABLE DRIVER

CODE-COMPLIANT APPLICABILITY

Meets typical foot candle requirements for office and commercial space.

HIGH QUALITY CONSTRUCTION & MATERIALS

Top tier LED diodes. Heatsink made from extruded 6063 T5 aluminum with substantial surface area for maximum cooling.

SUITABLE FOR DRY & DAMP LOCATIONS

UL 1598C CLASSIFIED RETROFIT KIT LISTED & DLC QPL LISTED

10 YEAR WARRANTY, L70 >100,000HRS

OPTIONAL "BAA" BUY AMERICA ACT

Compliant models available, assembled in our state-of-the-art Middleton, MA assembly center. (BAA SECTION 1605 COMPLIANT)

CUSTOM BRACKET DESIGNS AVAILABLE

Contact our engineering team to help design a low-cost bracket for easy mounting in direct/indirect fixture. Helps to provide up and down light with 1, 2, 3, 4 or more LED bars.

OPTIONAL HIGH/LOW MOTION SENSOR

Contact our engineering team to help choose the best low-cost integrated motion sensor which will easily install into the existing fixture, behind the lens. Our motion sensor technology can read through glass and plastic lenses. Also compatible with ZigBee wireless networks.



RemPhos by **Light Efficient Design**
lighting on target

Refit™ LED Door Kit

2' x 2' Refit Door Kit
2' x 4' Refit Door Kit



Project name _____

Date _____

Type _____

Product Description:

Ultimate refit solution serves as an upgrade to Linear Fluorescent Fixture that provides high uniformity, excellent efficiency and reduced glare in 2'x2' and 2'x4' applications. The lumen maintenance at L70 of initial lumens at 50,000 hours of operation, allows lower maintenance costs over time. It is suitable for indoor general lighting.

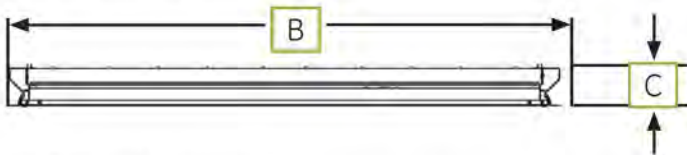
Performance Summary 2' x 2':

Delivered Lumen Output: 2000lm (4000K), 1950lm (3500K)
System Input Power: 21W
Standard Dimming Compatibility: 0-10V
Efficacy: 93 LPW (4000K), 91 LPW (3500K)
Input Voltage: 120-277V
CCT: 3500K, 4000K
Typical CRI: 80+
Color Consistency: 4 Step MacAdam Ellipse
Lifetime Rating: 50,000 Hours @ L70
Input Frequency (Hz): 50/60Hz
Power Factor: >0.9
Dimensions: 21.9" (L) x 22.5" (W) x 3.4" (H)
THD: <20%
Mounting: Fits most all 2' x 2' standard fixtures
Maximum Weight: 3 lbs
Limited Warranty: 5 Years Standard
Files Available: LM79, LM80, IES

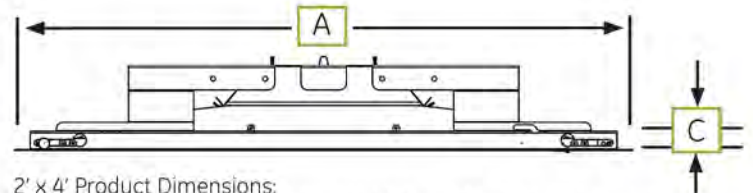
Performance Summary 2' x 4':

Delivered Lumen Output: 4100 lm (4000K), 3900 lm (3500K)
System Input Power: 36W
Standard Dimming Compatibility: 0-10V
Efficacy: 112 LPW (4000K), 106 LPW (3500K)
Input Voltage: 120-277V
CCT: 3500K, 4000K
Typical CRI: 80+
Color Consistency: 4 Step MacAdam Ellipse
Lifetime Rating: 50,000 Hours @ L70
Input Frequency (Hz): 50/60Hz
Power Factor: >0.9
Dimensions: 46.6" (L) x 22.5" (W) x 3.4" (H)
THD: <20%
Mounting: Fits most all 2' x 4' standard fixtures
Maximum Weight: 5 lbs
Limited Warranty: 5 Years Standard
Files Available: LM79, LM80, IES


Product Dimensions:



2' x 2' Product Dimensions:
A = 22.5 in (571.5 mm) B = 21.9 in (556.3 mm) C = 3.4 in (86.4 mm)



2' x 4' Product Dimensions:
A = 46.6 in (1183.6mm) B = 22.5 in (571.5mm) C = 3.4 in (86.4mm)

Certified by: 

Ordering Information:

PRODUCT CODE	DESCRIPTION CODE	DESCRIPTION	MODEL SERIES	CRI	COLOR TEMP (K)	TYPICAL LUMENS	SYSTEM WATTAGE
LED20/DK22/835/10/SO	208160	2x2 Refit Door Kit 835 0-10V SO	Refit 2x2	83	3500	1950	21W
LED20/DK22/840/10/SO	208161	2x2 Refit Door Kit 840 0-10V SO	Refit 2x2	82	4000	2000	21W
LED35/DK24/835/10/SO	208162	2x4 Refit Door Kit 835 0-10V SO	Refit 2x4	83	3500	3900	36W
LED35/DK24/840/10/SO	208163	2x4 Refit Door Kit 840 0-10V SO	Refit 2x4	82	4000	4100	36W

a product of
ecomagination



imagination at work

OCF Fluorescent Open Channel Fixture

APPLICATION

This economical strip light is ideal for use in all residential, commercial, and industrial areas where general area lighting is desired.

CONSTRUCTION

This fixture is formed in heavy gauge die formed metal, and is finished in baked white enamel or post powder paint for maximum reflectivity and durability. Socket bar, end plate, and ballast cover snap on for tool free assembly and component access when service is desired. End plate doubles as a joiner/aligner plate when fixtures are hung in continuous runs.

ELECTRICAL

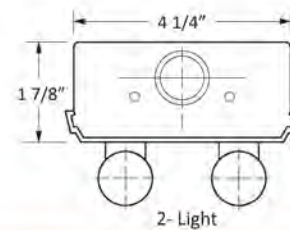
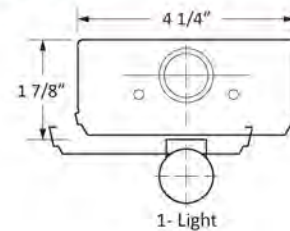
All units are supplied with UL Listed Class "P" thermally protected ballast. OCF fixtures meet or exceed all requirements for UL Luminaire Standard #1598. Additionally, each unit is in compliance with National Energy Standards.

MOUNTING

OCF fixtures are equipped with knockouts and holes for surface, pendant, chain, or cable mounting. This fixture can be mounted individually or in continuous runs. End plates have 7/8" knock-outs for electrical connection from the end if desired.



DIMENSIONS



ORDERING INFORMATION

EXAMPLE: OCF-4-232-EBUNI-NP-EMB

HOUSING	LENGTH	# LAMPS	LAMP TYPE	VOLTAGE	BALLAST	OPTIONS			
OCF	2'	1	T8			CO Convenience Outlet DM Dimming Ballast EMB Emergency Ballast NY 20 Gauge NYC Housing PS Pull Chain Switch REF Reflector (86%, 92%, 95%) symmetrical/asymmetrical WG Wire Guard			
			17	F17 T8	120		120V	NP	0.88 BF
	3'	2	25	F25 T8	277		277V	LP	0.77 BF
			32	F32 T8	EBUNI		Multi Volt	HP	1.18 BF
	4'	3	T5				NP	0.90 BF	
			14	F14 T5	EBUNI				Multi Volt
	6'	4	28	F28 T5					
			T5HO				EBUNI	Multi Volt	NP
	8'	6	54	F54 T5HO					

Consult factory for other options

LED tubes will be installed rather than T8 fluorescent lamps



Monmouth Lighting Corp. | 5-C Marlen Drive, Hamilton, NJ 08691
 T: 609-587-7900 | F: 609-613-5586 | www.monmouthlighting.com

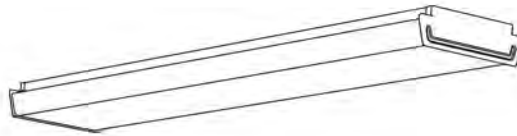
Day-Brite CFI

by  Signify

Linear

OW wraparound

Narrow, 4' or 8',
T5, T5HO, or T8



Project: _____
 Location: _____
 Cat. No: _____
 Type: _____
 Lamps: _____ Qty: _____
 Notes: _____

The Day-Brite / CFI OW wraparound narrow is a functional and economical lift-and-shift wrap, ideal for surface mount general illumination in light commercial and residential applications.

Ordering guide

Example: **OWN228-UNV-1/2-EB**

Series	Width	No. of Lamps per Cross Section	Lamp Type	Voltage	Options
	N	2			
OW Wraparound TOW Tandem (8')	N Narrow	(not included) 2	28 28WT5 (46") 32 32WT8 (48") 54HO 54WT5HO (46")	UNV Universal voltage 120/277V 120 120V 277 277V 347 347V	1/2 One 2-lamp ballast 1/4 One 4-lamp ballast 2/2 Two 2-lamp ballasts EB Electronic ballast, <10% THD EB10R T8 electronic ballast, program rapid start, <10% THD EBHE T8 electronic ballast, high efficiency, std. ballast factor EBLHE T8 electronic ballast, high efficiency, low ballast factor EBHHE T8 electronic ballast, high efficiency, high ballast factor EBSD T8 electronic step dimming ballast, .88 ballast factor EBD7 Advance Mark 7 dimming ballast, 0-10V (low voltage) control EBDX Advance Mark 10 dimming ballast, phase control EBD Electronic dimming ballast, customer specified E1 B100 emerg. ballast, T8, 350-450 lumens, 120/277V E1CAN B100-CAN emerg. ballast, Canada market, 350-450 lumens, 120/347V E7 B60 emerg. ballast, T8, 600-700 lumens, 120/277V E5 B50 emerg. ballast, US or Canada market, T8, 1100-1400 lumens, UNV ESCAN B50-CAN emerg. ballast, Canada market, 1100-1400 lumens, 120/347V ES5T B50ST emerg. ballast w/self test, T8, 1100-1400 lumens, UNV E7LP LP550 emerg. ballast, T5/T5HO, 430-700 lumens, 120/277V E6LP LP600 emerg. ballast, US or Canada market, T5/T5HO, 750-1325 lumens, 120/277V GLR Fusing, fast blow

See Section 1600-OA for Option Information,
 See Page 950-SS for Mounting Hardware.

Accessories (order separately)

- **CS-400** – Rigid Canopy
- **CS-500** – 42" Top Swivel Canopy
- **CS-12** – 12" Stem
- **CS-18** – 18" Stem
- **CS-24** – 24" Stem
- **CS-30** – 30" Stem
- **CS-36** – 36" Stem
- **CS-48** – 48" Stem

LED tubes will be installed rather than T8 fluorescent lamps



12" Round Flush Mount

LED

54074143

14 Watt 1000lms Round Flush Mount Specifications



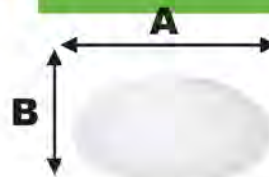
The ETi 14 watt 1000 lumen LED round flush mount fixture offers exceptional performance for precision lighting applications, while reducing energy and maintenance cost when compared with conventional light sources. Lasting over 10 times longer, these flush mount fixtures are high quality replacements for incandescent flush mount fixtures and is available in 4000°K. They are UL listed for use in damp and dry locations. ENERGY STAR rated. Suitable for installations from - 4° F to 95° F.

KEY FEATURES & BENEFITS

- 14 Watts
- Multi-volt 100-277V
- 1000 lumen, 4000K CCT
- Non-dimmable
- UL damp location rated
- No UV, IR or mercury
- Warranty 5 years or 50,000 hours



FIXTURE DIMENSIONS



SKU# 54074143

Dimension A = 11.8"

Dimension B = 3.7"

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. For FCC Part 15 user information, please see www.etiled.us/fcc15b

APPLICATION INFORMATION

Designed to be used anywhere a standard incandescent fixture is used. Typically used in bedrooms, hallways, kitchens, living rooms and recreational rooms. The LED round flush mount fixture carries a 5 year Warranty.



855-384-7754 www.etiled.us

PHILIPS
Day-Brite
CFI

Industrial

LED high bay FBX

8,000 to 72,000lm



Project: _____
 Location: _____
 Cat No.: _____
 Type: _____
 Lamps: _____ Qty: _____
 Notes: _____

The Philips Day-Brite / Philips CFI LED high bay FBX provides versatility in form and function. With a range of lumen packages, optical distributions, and accessories available, this luminaire can be used in many different applications ranging from warehouses to retail outlets. SpaceWise technology is optional for additional energy savings and control.

Ordering guide

Example: FBX24LL40-UNV

Family	Lumen Package	Source	Color Temperature	Voltage	Distribution	Options
FBX	<input type="checkbox"/>	L	<input type="checkbox"/> -	<input type="checkbox"/> -	<input type="checkbox"/> -	<input type="text"/>
FBX	08L 8,000 nominal delivered lumens 12L 12,000 nominal delivered lumens 16L 16,000 nominal delivered lumens 20L 20,000 nominal delivered lumens 24L 24,000 nominal delivered lumens 30L 30,000 nominal delivered lumens 36L 36,000 nominal delivered lumens 37L 37,000 nominal delivered lumens 45L 45,000 nominal delivered lumens 60L 60,000 nominal delivered lumens 72L 72,000 nominal delivered lumens	L LED	35 3500K (CRI 80) 40 4000K (CRI 80) 50 5000K (CRI 80)	UNV Universal voltage 120-277V 120 120V 208 208V 240 240V 277 277V 347 347V 480 480V	Blank General Distribution N Narrow M Medium W Wide A Aisle	WP6¹ Wired 6' 16/3 Cord & NEMA Twist lock plug WC6 Wired 6' 16/3 Cord WP6D¹ Wired 6' 16/3 Cord & NEMA Twist lock plug for line voltage and wired 6' purple and gray leads w/disconnect plug for dimming control WC6D Wired 6' 16/3 Cord for line voltage and wired 6' cord for dimming control MD360² 360' Motion detector (ON/OFF) MD360D² 360' Motion detector (ON/DIM) EMLED Emergency battery (0°C - 40°C) EMLEDC² Emergency battery cold temp (-20°C - 40°C) 50 High ambient (50°C) for SWI, 37,000lm, or 72,000lm 55^{2,5} High ambient (55°C) 65^{2,6} High ambient (65°C) LCA Clear acrylic lens LFA Frosted acrylic lens LCR Clear ribbed lens LFR Frosted ribbed lens LCP Clear polycarbonate lens SP1 Optional 10KV surge protector GLR¹ Fusing, fast blow SWI¹ SpaceWise wireless technology for integrated occupancy (50°C max.) ⁴ BSL310 Emergency battery (0°C-40°C) 24,000 lumen version maximum

Footnotes

1. GLR fusing not available for 347V or 480V
2. Not available with SpaceWise (SWI) option
3. Must specify line voltage
4. Must order **SWZ-REMOTE** SpaceWise handheld remote with each system order
5. Not available in 37,000lm or 72,000lm
6. Not available in 30,000lm, 37,000lm, 60,000lm, or 72,000lm

Predicted L70 Lifetime

- 40°C Ambient > 100,000 hours (based upon LED manufacturer's supplied LM-80 data and in-situ laboratory testing)

Wiring Notes

- Standard cords have 3 wires. Consult factory for other cord options.

General Notes

- All options factory installed.
- All accessories are field installed.
- Many luminaire components, such as reflectors, refractors, lenses, sockets, lampholders, and LEDs are made from various types of plastics which can be adversely affected by airborne contaminants. If sulfur based chemicals, petroleum based products, cleaning solutions, or other contaminants are expected in the intended area of use, consult factory for compatibility.
- **EMLED** and **EMLEDC** provide 3500 lumens



Emergensee Light



Features

- Compact, low-profile design in neutral finish
- Energy-efficient LED technology
- EZ snap-out chevron directional indicators
- UL listed for damp locations & meets UL924, NFPA 101 Life Safety Code, NEC, OSHA, Local and State Codes

Electrical

- Dual 120V/277V voltage
- Charge rate/power "ON" LED indicator light and push-to-test switch for mandated code compliance testing
- LVD (low voltage disconnect) prevents battery from deep discharge
- Long-life, maintenance-free, rechargeable NiCd battery (EM model)
- Internal solid-state transfer switch automatically connects the internal battery to LED board for minimum 90-minute emergency illumination
- Fully automatic solid-state, two-rate charger initiates battery charging to recharge a discharged battery in 24 hours.

Mounting

- Universal surface mount, wall or ceiling, with EZ-snap thermoplastic mounting canopy, which snaps into place making installation quick & easy.

Housing

- Injection-molded, engineering-grade, V-0 flame retardant, high-impact, thermoplastic in white or black finish

Options

- SDT: Self-Diagnostic (option SDT) continually diagnoses unit's performance and tests system (auto battery discharge once every 30 days and once every 12 months) to ensure reliable operation and to meet electrical and life safety codes
- DC: Dual Circuit option on the AC-only unit enables it to be connected to two different (primary and secondary, one acting as a back-up for the other) supplies at the same time (contact customer service).

Illumination

- Ultra-bright, energy efficient, long-life Red or Green LED



SALIDA faceplates also available.

Warranty

- Five Year Warranty on all electronics and housing. Batteries are pro-rated warranted for 5 years.

Dimensions



Special Wording Sign samples

ORDERING INFORMATION

Model	Face #	Letter Color	Housing Color	Battery	Options
SEEX	U2 - Universal Single/Double	R - Red G - Green	W - White B - Black	Blank - AC Only EM - NiCad Battery	SDT - Self Diagnostics 2C - 2 Circuit Operation (ONLY 1 HOT CIRCUIT AT A TIME) SW - Special Wording USA - ASSEMBLED IN THE U.S.A.
Model	Face #	Letter Color	Housing Color	Battery	Options





D-Series Size 2 LED Wall Luminaire



d"series

Specifications Luminaire

Width: 18-1/2"
(47.0 cm) **Weight:** 21 lbs
(9.5 kg)

Depth: 10"
(25.4 cm)

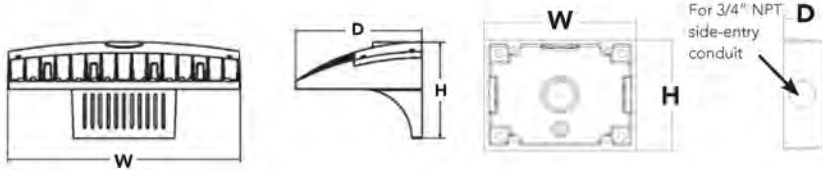
Height: 7-5/8"
(19.4 cm)

Back Box (BBW)

Width: 5-1/2"
(14.0 cm) **BBW Weight:** 1 lbs
(0.5 kg)

Depth: 1-1/2"
(3.8 cm)

Height: 4"
(10.2 cm)



Catalog Number
Notes
Type

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability¹
- This luminaire is part of an A+ Certified solution for ROAM® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background¹

To learn more about A+, visit www.acuitybrands.com/aplus.

1. See ordering tree for details.
2. A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: [Link to Roam](#); [Link to DTL DLL](#)

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: DSXW2 LED 30C 700 40K T3M MVOLT DDBTXD

DSXW2 LED							
Series	LEDs	Drive Current	Color temperature	Distribution	Voltage	Mounting	Control Options
DSXW2 LED	20C 20 LEDs (two engines)	350 350 mA 530 530 mA 700 700 mA	30K 3000 K 40K 4000 K 50K 5000 K	T2S Type II Short T2M Type II Medium T3S Type III Short T3M Type III Medium T4M Type IV Medium TFTM Forward Throw Medium	MVOLT ³ 120 ⁴ 208 ⁴ 240 ⁴ 277 ⁴ 347 ^{4,5} 480 ^{4,5}	Shipped included (blank) Surface mounting bracket Shipped separately⁶ BBW Surface-mounted back box (for conduit entry)	Shipped installed PE Photoelectric cell, button type ⁷ PER NEMA twist-lock receptacle only (control ordered separately) ⁸ PERS Five-wire receptacle only (control ordered separately) ^{8,9} PER7 Seven-wire receptacle only (control ordered separately) ^{8,9} DMG 0-10v dimming wires pulled outside fixture (for use with an external control, ordered separately) PIR 180° motion/ambient light sensor, <15' mtg ht ^{10,11} PIRH 180° motion/ambient light sensor, 15-30' mtg ht ^{10,11} PIR1FC3V Motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc ^{11,12} PIRH1FC3V Motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc ^{11,12}
	30C 30 LEDs (three engines)	1000 1000 mA ¹ (1A)	AMBPC Amber phosphor converted ²				

Other Options	Finish (required)
Shipped installed SF Single fuse (120, 277, 347V) ¹ DF Double fuse (208, 240, 480V) ¹ HS House-side shield ¹ SPD Separate surge protection ¹¹ Shipped separately¹¹ BSW Bird-deterrent spikes VG Vandal guard	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DSSXD Sandstone DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white DSSTXD Textured sandstone





d^{series}

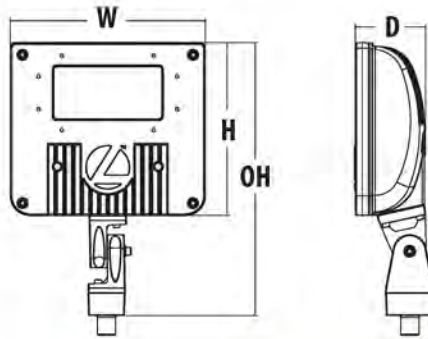
D-Series Size 1 LED Flood Luminaire



Catalog Number
Notes
Type

Specifications

EPA:	0.6 ft ² (0.05 m ²)
Depth:	3-1/8" (8.0 cm)
Width:	8-7/8" (22.4 cm)
Height:	7-3/4" (19.8 cm)
Overall Height:	12" (30.5 cm)
Weight:	7.2 lbs (3.3 kg)



Introduction

D-Series Size 1 Flood features advanced optics and precision illumination in a sleek and compact form that seamlessly blends with the environment. State of the art reflector design with cutting edge chip-on-board LED technology produces excellent uniformity using precision beam patterns. Provides long-life replacement for 70-150W metal halide floodlights offering up to 77% energy savings with expected service life of over 100,000 hours.

Ordering Information

EXAMPLE: DSXF1 LED P1 40K MSP MVOLT THK DDBXD

DSXF1 LED							
Series	Performance Package	Color Temperature	Distribution	Voltage	Mounting	Options	Finish (required)
DSXF1 LED	P1	30K 3000K	NSP Narrow spot	MVOLT ¹	Shipped included	Shipped installed PE Photocontrol, button style ^{4,5} PEX Photocontrol external threaded adjustable ⁵ SF Single fuse (120, 277, 347V) ² DF Double fuse (208, 240) ² DMG 0-10V dimming driver (no controls) Shipped separately⁴ UBV Upper/bottom visor (universal) FV Full visor VG Vandal guard	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White
		40K 4000K	MSP Medium spot	120 ²	THK Knuckle with 1/2" NPS threaded pipe		
		50K 5000K	MFL Medium flood	208 ²	IS Integral slipfitter (fits 2-3/8" O.D. tenon)		
		FL Flood	240 ²	YKC62 Yoke with 16-3 SO cord			
		WFL Wide flood	277 ²	Shipped separately¹			
		WFR Wide flood, rectangular	347 ²	DSXF1/2TS Tenon slipfitter (2-3/8" O.D. THK required)			
		WFM Wide flood, medium flood		FTS CG6 Tenon Slipfitter (fits 2-3/8" to 2-7/8" O.D. tenon. YKC62 required)			
		HMF Horizontal flood					

Accessories

Ordered and shipped separately.

DSXF1/2TS DDBXD U	Slipfitter for 1-1/4" to 2-3/8" O.D. tenons; mates with 1/2" threaded knuckle (specify finish)
FRWB DDBXD U	Radius wall bracket, 2-3/8" O.D. tenon (specify finish)
FSPB DDBXD U	Steel square pole bracket, 7-3/8" O.D. tenon (specify finish)
DSXF1UBV DDBXD U	Upper/bottom visor accessory (specify finish)
DSXF1FV DDBXD U	Full visor accessory (specify finish)
DSXF1VG U	Vandal guard accessory

For more mounting options, visit our [pages](#).

Stock configurations are offered for shorter lead times:

Standard Part Number	Stock Part Number	CI Code
DSXF1 LED P1 40K WFL MVOLT THK DDBXD	DSXF1 LED P1 40K	*240TJH
DSXF1 LED P1 50K WFL MVOLT THK DDBXD	DSXF1 LED P1 50K	*240TJG
DSXF1 LED P1 40K WFL MVOLT YKC62 DDBXD	DSXF1 LED P1 40K YK	*263KL9
DSXF1 LED P1 50K WFL MVOLT YKC62 DDBXD	DSXF1 LED P1 50K YK	*263UJE
DSXF1 LED P2 40K WFL MVOLT THK DDBXD	DSXF1 LED P2 40K	*240TJL
DSXF1 LED P2 50K WFL MVOLT THK DDBXD	DSXF1 LED P2 50K	*240TJJ
DSXF1 LED P2 40K WFL MVOLT YKC62 DDBXD	DSXF1 LED P2 40K YK	*263KLA
DSXF1 LED P2 50K WFL MVOLT YKC62 DDBXD	DSXF1 LED P2 50K YK	*263UJG
DSXF1/2 Slip-fitter Tenon Accessory DDBXD	DSXF1/2TS DDBXD U	*2166SK

NOTES

- MVOLT driver operates on line voltage from 120-277V.
- Single fuse (SF) requires 120V, 277V or 347V. Double fuse (DF) requires 208V, 240V or 480V.
- Also available as accessories; see Accessories information at left.
- Rated 25C maximum ambient for performance package P2. Specify PEX for higher ambient temperatures.
- Photocontrol (PE, PEX) requires 120, 208, 240, 277 or 347 voltage option.
- Must specify 120, 277 or 347 voltage option.



Manufacturer Specification Sheets

ECM 2: Lighting System Improvements - Exterior

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D-Series Size 0 LED Area Luminaire



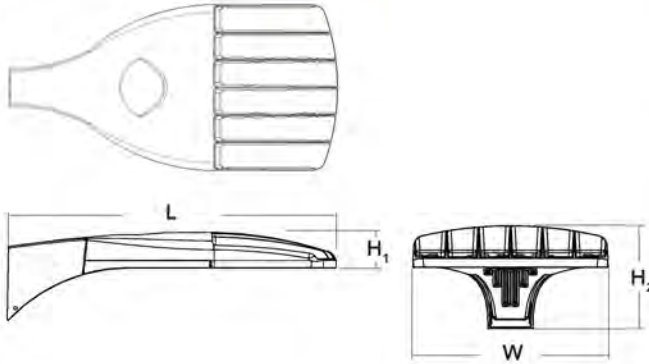
Catalog Number
Notes
Type

Introduction

The modern styling of the D-Series is striking yet unobtrusive - making a bold, progressive statement even as it blends seamlessly with its environment. The D-Series distills the benefits of the latest in LED technology into a high performance, high efficacy, long-life luminaire. The outstanding photometric performance results in sites with excellent uniformity, greater pole spacing and lower power density. It is ideal for replacing up to 400W metal halide with typical energy savings of 70% and expected service life of over 100,000 hours.

Specifications

EPA:	0.95 ft ² (.09 m ²)
Length:	26" (66.0 cm)
Width:	13" (33.0 cm)
Height ₁ :	3" (7.62 cm)
Height ₂ :	7" (17.8 cm)
Weight (max):	16 lbs (7.25 kg)



A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: DSX0 LED P6 40K T3M MVOLT SPA NLTAIR2 PIRHN DDBXD

DSX0 LED										
Series	LEDs	Color temperature		Distribution		Voltage	Mounting			
DSX0 LED	Forward optics		30K	3000 K	T1S	Type I short	T5S	Type V short	MVOLT ^{1,4} 120 ⁴ 208 ⁴ 240 ⁴ 277 ⁴ 347 ^{4,5} 480 ^{4,5}	Shipped included SPA Square pole mounting RPA Round pole mounting WBA Wall bracket SPUMBA Square pole universal mounting adaptor ⁶ RPUMBA Round pole universal mounting adaptor ⁶ Shipped separately KMA8 DDBXD U Mast arm mounting bracket adaptor (specify finish) ⁷
	P1	P4	40K	4000 K	T2S	Type II short	T5M	Type V medium		
	P2	P5	50K	5000 K	T2M	Type II medium	T5W	Type V wide		
	P3	P6			T3S	Type III short	BLC	Backlight control ¹		
	Rotated optics				T3M	Type III medium	LCCO	Left corner cutoff ⁸		
	P10 ¹	P12 ¹			T4M	Type IV medium	RCCO	Right corner cutoff ⁸		
	P11 ¹	P13 ¹			TFTM	Forward throw medium				
					T5VS	Type V very short				

Control options	Other options	Finish	
Shipped installed NLTAIR2 nLight AIR generation 2 enabled ⁹ PIRHN Network, high/low motion/ambient sensor ¹⁰ PER NEMA twist-lock receptacle only (control ordered separate) ¹¹ PER5 Five-pin receptacle only (control ordered separate) ^{11,12} PER7 Seven-pin receptacle only (leads exit fixture) (control ordered separate) ^{11,12} DMG 0-10V dimming extend out back of housing for external control (control ordered separate)	PIR High/low, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 5fc ^{13,14} PIRH High/low, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 5fc ^{13,14} PIR1FC3V High/low, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc ^{13,14} PIRH1FC3V High/low, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc ^{13,14} FAO Field adjustable output ¹⁵	Shipped installed HS House-side shield ¹⁶ SF Single fuse (120, 277, 347V) ⁴ DF Double fuse (208, 240, 480V) ⁴ L90 Left rotated optics ¹ R90 Right rotated optics ¹ DDL Diffused drop lens ¹⁰ Shipped separately BS Bird spikes ¹⁷ EGS External glare shield ¹¹	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white





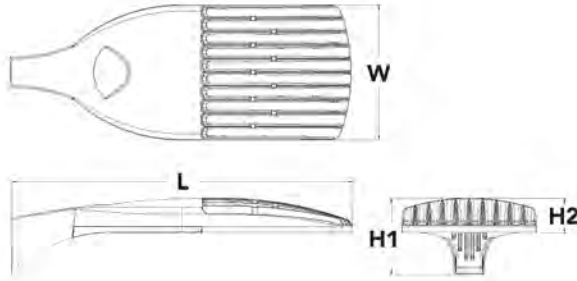
D-Series Size 1 LED Area Luminaire

d#series



Specifications

EPA:	1.01 ft ² (0.09 m ²)
Length:	33" (83.8 cm)
Width:	13" (33.0 cm)
Height H1:	7-1/2" (19.0 cm)
Height H2:	3-1/2"
Weight (max):	27 lbs (12.2 kg)




Catalog Number
Notes
Type

Introduction

The modern styling of the D-Series is striking yet unobtrusive - making a bold, progressive statement even as it blends seamlessly with its environment. The D-Series distills the benefits of the latest in LED technology into a high performance, high efficacy, long-life luminaire.

The outstanding photometric performance results in sites with excellent uniformity, greater pole spacing and lower power density. It is ideal for replacing up to 750W metal halide in pedestrian and area lighting applications with typical energy savings of 65% and expected service life of over 100,000 hours.

 A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: DSX1 LED P7 40K T3M MVOLT SPA NLTAIR2 PIRHN DDBXD

DSX1 LED						
Series	LEDs	Color temperature	Distribution	Voltage	Mounting	
DSX1 LED	Forward optics	30K 3000 K	T1S Type I short	T5VS Type V very short	MVOLT ¹	Shipped included
	P1 P4 P7	40K 4000 K	T2S Type II short	T5S Type V short	120 ⁴	SPA Square pole mounting
	P2 P5 P8	50K 5000 K	T2M Type II medium	T5M Type V medium	208 ⁴	RPA Round pole mounting
	P3 P6 P9		T3S Type III short	T5W Type V wide	240 ⁴	WBA Wall bracket
	Rotated optics		T3M Type III medium	BLC Backlight control ²	277 ⁴	SPUMBA Square pole universal mounting adaptor ⁶
	P10 ¹ P12 ¹		T4M Type IV medium	LCCO Left corner cutoff ²	347 ^{4,5}	RPUMBA Round pole universal mounting adaptor ⁶
	P11 ¹ P13 ¹		TFTM Forward throw medium	RCCO Right corner cutoff ⁴	480 ^{4,5}	Shipped separately
						KMA8 DDBXD U Mast arm mounting bracket adaptor (specify finish) ⁷

Control options	Other options	Finish ^{8,9,10,11}
<p>Shipped installed</p> <p>NLTAIR2 nLight AIR generation 2 enabled⁴</p> <p>PIRHN Network, high/low motion/ambient sensor²</p> <p>PER NEMA twist-lock receptacle only (controls ordered separate)¹⁰</p> <p>PER5 Five-pin receptacle only (controls ordered separate)^{10,11}</p> <p>PER7 Seven-pin receptacle only (controls ordered separate)^{10,11}</p> <p>DMG 0-10v dimming wires pulled outside fixture (for use with an external control, ordered separately)¹²</p> <p>DS Dual switching^{12,13,14}</p>	<p>PIR High/low, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 5fc^{15,16}</p> <p>PIRH High/low, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 5fc^{15,16}</p> <p>PIR1FC3V High/low, motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc^{15,16}</p> <p>PIRH1FC3V Bi-level, motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc^{15,16}</p> <p>FAO Field adjustable output¹⁴</p> <p>Shipped installed</p> <p>HS House-side shield¹⁷</p> <p>SF Single fuse (120, 277, 347V)⁴</p> <p>DF Double fuse (208, 240, 480V)⁴</p> <p>L90 Left rotated optics¹</p> <p>R90 Right rotated optics¹</p> <p>Shipped separately</p> <p>BS Bird spikes¹⁸</p> <p>EGS External glare shield¹⁸</p>	<p>DDBXD Dark bronze</p> <p>DBLXD Black</p> <p>DNAXD Natural aluminum</p> <p>DWHXD White</p> <p>DBBTXD Textured dark bronze</p> <p>DBLBXD Textured black</p> <p>DNATXD Textured natural aluminum</p> <p>DWHGXD Textured white</p>





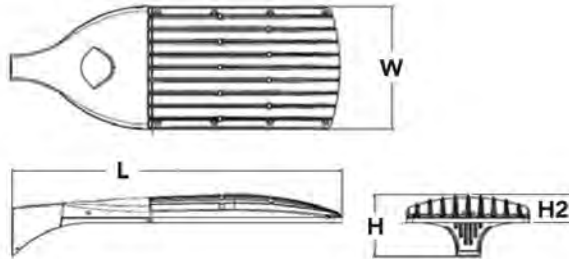
D-Series Size 2 LED Area Luminaire

d^{series}



Specifications

EPA:	1.1 ft ² (0.10 m ²)
Length:	40" (101.6 cm)
Width:	15" (38.1 cm)
Height 1:	7-1/4" (18.4 cm)
Height 2: (max):	3.5"
Weight:	36lbs



Catalog
Number

Notes

Type

Introduction

The modern styling of the D-Series is striking yet unobtrusive - making a bold, progressive statement even as it blends seamlessly with its environment.

The D-Series distills the benefits of the latest in LED technology into a high performance, high efficacy, long-life luminaire. The outstanding photometric performance results in sites with excellent uniformity, greater pole spacing and lower power density. The Size 2 is ideal for replacing 400-1000W metal halide in area lighting applications with energy savings of up to 80% and expected service life of over 100,000 hours.

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: DSX2 LED P7 40K T3M MVOLT SPA NLTAIR2 PIRHN DDBXD

DSX2 LED									
Series	LEDs	Color temperature		Distribution		Voltage	Mounting		
DSX2 LED	Forward optics	30K	3000 K	T1S	Type I Short	T5VS	Type V Very Short	MVOLT ⁴ Shipped included SPA Square pole mounting RPA Round pole mounting WBA Wall bracket SPUMBA Square pole universal mounting adaptor ⁵ RPUMBA Round pole universal mounting adaptor ⁵ Shipped separately KMA8 DDBXD U Mast arm mounting bracket adaptor (specify finish) ⁵	
	P1	P5	40K	4000 K	T2S	Type II Short	T5S		Type V Short
	P2	P6	50K	5000 K	T2M	Type II Medium	T5M		Type V Medium
	P3	P7			T3S	Type III Short	T5W		Type V Wide
	P4	P8			T3M	Type III Medium	BLC		Backlight control ⁶
	Rotated optics⁷				T4M	Type IV Medium	LCCO		Left corner cutoff ⁶
	P10	P13			TFTM	Forward Throw Medium	RCCO		Right corner cutoff ⁶
	P11	P14							
	P12								

Control options	Other options	Finish
Shipped installed NLTAIR2 nLight AIR generation 2 enabled ⁸ PIRHN Network, Bi-Level motion/ambient sensor ⁸ PER NEMA twist-lock receptacle only (no controls) ⁹ PERS Five-wire receptacle only (no controls) ^{9,10} PER7 Seven-wire receptacle only (no controls) ^{9,10} DMG 0-10V dimming extend out back of housing for external control (no controls) DS Dual switching ^{11,12}	Shipped installed HS House-side shield ¹³ SF Single fuse (120, 277, 347V) ⁴ DF Double fuse (208, 240, 480V) ⁴ L90 Left rotated optics ¹ R90 Right rotated optics ¹ Shipped separately BS Bird spikes ¹⁴ EGS External glare shield ¹⁵	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white
PIRH Bi-level, motion/ambient sensor, 15-30' mounting height, ambient sensor enable at 5fc ¹¹ FAO Field Adjustable Output ¹³		





D-Series Size 1 LED Wall Luminaire



Catalog
Number

Notes

Type

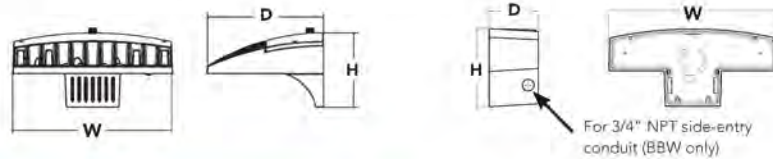
d^{series}

Specifications Luminaire

Width:	13-3/4" (34.9 cm)	Weight:	12 lbs (5.4 kg)
Depth:	10" (25.4 cm)		
Height:	6-3/8" (16.2 cm)		

Back Box (BBW, ELCW)

Width:	13-3/4" (34.9 cm)	BBW Weight:	5 lbs (2.3 kg)
Depth:	4" (10.2 cm)	ELCW Weight:	10 lbs (4.5 kg)
Height:	6-3/8" (16.2 cm)		



Introduction

The D-Series Wall luminaire is a stylish, fully integrated LED solution for building-mount applications. It features a sleek, modern design and is carefully engineered to provide long-lasting, energy-efficient lighting with a variety of optical and control options for customized performance.

With an expected service life of over 20 years of nighttime use and up to 74% in energy savings over comparable 250W metal halide luminaires, the D-Series Wall is a reliable, low-maintenance lighting solution that produces sites that are exceptionally illuminated.

Ordering Information

EXAMPLE: DSXW1 LED 20C 1000 40K T3M MVOLT DBBTD

DSXW1 LED

Series	LEDs	Drive Current	Color temperature	Distribution	Voltage	Mounting	Control Options
DSXW1 LED	10C 10 LEDs (one engine)	350 350 mA 530 530 mA	30K 3000 K 40K 4000 K 50K 5000 K	T2S Type II Short T2M Type II Medium T3S Type III Short T3M Type III Medium T4M Type IV Medium TFTM Forward Throw Medium ASYDF Asymmetric diffuse	MVOLT ² 120 ¹ 208 ³ 240 ³ 277 ³ 347 ^{3,4} 480 ^{3,4}	Shipped included (blank) Surface mounting bracket BBW Surface-mounted back box (for conduit entry) ⁵	Shipped installed PE Photoelectric cell, button type ⁶ DMG 0-10V dimming driver (no controls; wires pulled outside fixture) PIR 180° motion/ambient light sensor, <15' mtg ht ^{1,7} PIRH 180° motion/ambient light sensor, 15-30' mtg ht ^{1,7} PIR1FC3V Motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc ^{1,7} PIRH1FC3V Motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc ^{1,7} ELCW Emergency battery backup (includes external component enclosure), non CEC compliant ⁸
	20C 20 LEDs (two engines) ¹	700 700 mA 1000 1000 mA (1 A) ¹	AMBPC Amber phosphor converted				

Other Options

Finish (required)

Shipped installed

SF Single fuse (120, 277 or 347V) ^{1,9}	DF Double fuse (208, 240 or 480V) ^{1,9}	HS House-side shield ¹⁰	SPD Separate surge protection
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Shipped separately¹⁰

BSW Bind-deterrent spikes	WG Wire guard	VG Vandal guard	DDL Diffused drop lens
----------------------------------	----------------------	------------------------	-------------------------------

DDBXD Dark bronze	DSSXD Sandstone
DBLXD Black	DBBTD Textured dark bronze
DNAXD Natural aluminum	DBLBXD Textured black
DWHXD White	DNATXD Textured natural aluminum

DWHGXD Textured white
DSSTXD Textured sandstone

Accessories

Ordered and shipped separately.

DSXWHS U	House-side shield (one per light engine)
DSXWBSW U	Bind-deterrent spikes
DSXW1WG U	Wire guard accessory
DSXW1VG U	Vandal guard accessory

NOTES

- 20C 1000 is not available with PIR, PIRH, PIR1FC3V or PIRH1FC3V.
- MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).
- Single fuse (SF) requires 120, 277 or 347 voltage option. Double fuse (DF) requires 208, 240 or 480 voltage option.
- Only available with 20C, 700mA or 1000mA. Not available with PIR or PIRH.
- Back box ships installed on fixture. Cannot be field installed. Cannot be ordered as an accessory.
- Photocontrol (PE) requires 120, 208, 240, 277 or 347 voltage option. Not available with motion/ambient light sensors (PIR or PIRH).
- Reference Motion Sensor table on page 3.
- Cold weather (-20C) rated. Not compatible with conduit entry applications. Not available with BBW mounting option. Not available with fusing. Not available with 347 or 480 voltage options. Emergency components located in back box housing. Emergency mode IES files located on product page at www.lithonia.com
- Not available with ELCW.
- Also available as a separate accessory; see Accessories information.





D-Series Size 2 LED Wall Luminaire



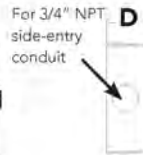
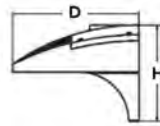
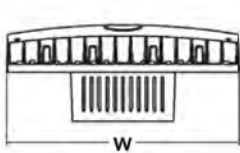
d"series

Specifications Luminaire

Width: 18-1/2" (47.0 cm)
Depth: 10" (25.4 cm)
Height: 7-5/8" (19.4 cm)
Weight: 21 lbs (9.5 kg)

Back Box (BBW)

Width: 5-1/2" (14.0 cm)
Depth: 1-1/2" (3.8 cm)
Height: 4" (10.2 cm)
BBW Weight: 1 lbs (0.5 kg)



Catalog Number
Notes
Type

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and system-level interoperability.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is A+ Certified when ordered with DTL® controls marked by a shaded background. DTL DLL equipped luminaires meet the A+ specification for luminaire to photocontrol interoperability¹
- This luminaire is part of an A+ Certified solution for ROAM® or XPoint™ Wireless control networks, providing out-of-the-box control compatibility with simple commissioning, when ordered with drivers and control options marked by a shaded background¹

To learn more about A+, visit www.acuitybrands.com/aplus.

- See ordering tree for details.
- A+ Certified Solutions for ROAM require the order of one ROAM node per luminaire. Sold Separately: [Link to Roam](#); [Link to DTL DLL](#)

A+ Capable options indicated by this color background.

Ordering Information

EXAMPLE: DSXW2 LED 30C 700 40K T3M MVOLT DDBTXD

DSXW2 LED							
Series	LEDs	Drive Current	Color temperature	Distribution	Voltage	Mounting	Control Options
DSXW2 LED	20C 20 LEDs (two engines)	350 350 mA 530 530 mA 700 700 mA	30K 3000 K 40K 4000 K 50K 5000 K	T2S Type II Short T2M Type II Medium T3S Type III Short T3M Type III Medium T4M Type IV Medium TFTM Forward Throw Medium	MVOLT ³ 120 ⁴ 208 ⁴ 240 ⁴ 277 ⁴ 347 ^{4,5} 480 ^{4,5}	Shipped included (blank) Surface mounting bracket Shipped separately⁶ BBW Surface-mounted back box (for conduit entry)	Shipped installed PE Photoelectric cell, button type ⁷ PER NEMA twist-lock receptacle only (control ordered separately) ⁸ PERS Five-wire receptacle only (control ordered separately) ^{8,9} PER7 Seven-wire receptacle only (control ordered separately) ^{8,9} DMG 0-10v dimming wires pulled outside fixture (for use with an external control, ordered separately) PIR 180° motion/ambient light sensor, <15' mtg ht ^{10,11} PIRH 180° motion/ambient light sensor, 15-30' mtg ht ^{10,11} PIR1FC3V Motion/ambient sensor, 8-15' mounting height, ambient sensor enabled at 1fc ^{11,12} PIRH1FC3V Motion/ambient sensor, 15-30' mounting height, ambient sensor enabled at 1fc ^{11,12}
	30C 30 LEDs (three engines)	1000 1000 mA ¹ (1A)	AMBPC Amber phosphor converted ²				

Other Options	Finish (required)
Shipped installed SF Single fuse (120, 277, 347V) ¹ DF Double fuse (208, 240, 480V) ¹ HS House-side shield ¹ SPD Separate surge protection ¹¹ Shipped separately¹¹ BSW Bird-deterrent spikes VG Vandal guard	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White DSSXD Sandstone DDBTXD Textured dark bronze DBLBXD Textured black DNATXD Textured natural aluminum DWHGXD Textured white DSSTXD Textured sandstone





TWR1 LED

LED Wall Luminaire



Catalog
Number

Notes

Type

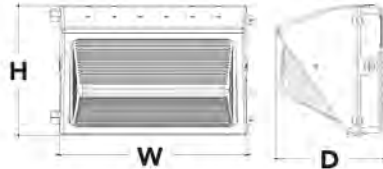
Specifications

Width: 12-15/16"
(32.9 cm)

Height: 9"
(22.9 cm)

Depth: 7-1/2"
(19 cm)

Weight: 11.95 lbs
(5.42kg)



Introduction

The popular TWR1 luminaire is now available with long-lasting, energy-efficient LED technology. Featuring a classic dayform, the TWR1 LED offers a traditional appearance and is powered by advanced LEDs.

The TWR1 LED luminaire is powerful yet energy efficient, capable of replacing up to a 250W metal halide luminaire while saving up to 86% in energy costs. Offering an expected service life of more than 20 years, the TWR1 LED eliminates frequent lamp and ballast replacements associated with traditional technologies.

Ordering Information

EXAMPLE: TWR1 LED P2 50K MVOLT DDBTXD

TWR1 LED						
Series	Performance Package	Color Temperature	Voltage	Controls	Finish	
TWR1 LED	P2	3,450 lumens	40K 4000 K ¹	MVOLT ²	(blank) No controls	DDBTXD Textured dark bronze
	P3	4,470 lumens	50K 5000 K ¹	347	PE Photo control	
	P4	5,550 lumens				

NOTES

1. Correlated color temperature (CCT) shown is nominal per ANSI C78, 377-2008.
2. MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).

FEATURES & SPECIFICATIONS

INTENDED USE

The TWR1 LED combines traditional wall pack design with high-output LEDs to provide an energy-efficient, low maintenance LED wall pack suitable for replacing up to 350W MH fixtures. The traditional shape helps maintain building aesthetics when replacing only a portion of your building's wall packs. TWR1 LED is ideal for outdoor applications such as carports, loading areas, driveways and parking areas.

CONSTRUCTION

Rugged cast-aluminum housing with bronze polyester powder paint for lasting durability. Door is hinged on the side so door swings out of the way during installation and service. Castings are sealed with a one-piece gasket to inhibit the entrance of external contaminants. MVOLT driver operates on any line voltage from 120-277V (50/60Hz). All luminaires have 6kV surge protection. Rated for outdoor installations, -40°C minimum ambient. Please consult factory for surge rating of photocells.

OPTICS

High-performance LEDs maintain up to 90% of light output at 100,000 hours of service life (L90/100,000 hours). Prismatic glass lens designed for superior lighting distribution, uniformity and fixture spacing. See Lighting Facts label and photometry reports for specific fixture performance.

INSTALLATION

Designed for wall mounting above four feet from ground. Housing is configured for mounting directly over a standard 4" outlet box (by others) or for surface wiring via any of three convenient 1/2" threaded conduit entry hubs.

LISTINGS

UL Listed to U.S. and Canadian safety standards for wet locations. Tested in accordance with IESNA LM-79 and LM-80 standards.

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified.

WARRANTY

5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/customerresources/terms_and_conditions.asp

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.





OLWX1 LED

LED Wall Luminaire



Catalog
Number

Notes

Type

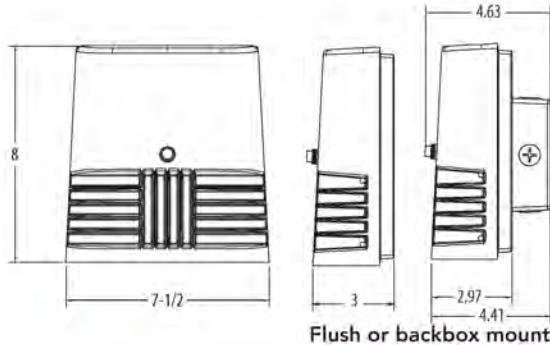
Specifications

Width: 7-1/2"
(19 cm)

Height: 8"
(20.3 cm)

Depth: 3"
(7.62 cm)

Weight: 5 lbs
(2.27 kg)



Flush or backbox mount

Introduction

The OLWX1 is versatile and energy efficient. It is designed to replace up to 250W metal halide while saving over 87% in energy costs. Whether you are mounting it to a recessed junction box, conduit/through wiring, as an up light, as a down light, or as a flood light – the OLWX1 has all applications covered.

Ordering Information

EXAMPLE: OLWX1 LED 20W 50K

OLWX1 LED

Series	Performance Package	Color Temperature	Voltage	Controls	Finish
OLWX1 LED	13W 13 watts	40K 4000 K ¹	(blank) MVOLT ²	(blank) None	(blank) Dark bronze
	20W 20 watts	50K 5000 K	120 120V ³	PE 120V button photocell ^{1,3}	
	40W 40 watts		347 347V		

Accessories

Ordered and shipped separately.

OLWX1TS	Slipfitter – size 1
OLWX1YK	Yoke – size 1
OLWX1THK	Knuckle – size 1

NOTES

- 1 Not available with 347V option.
- 2 MVOLT driver operates on any line voltage from 120-277V (50/60Hz).
- 3 Specify 120V when ordering with photocell (PE option).

FEATURES & SPECIFICATIONS

INTENDED USE

The versatility of the OLWX1 LED combines a sleek, low-profile wall pack design with energy efficient, low maintenance LEDs for replacing up to 250W metal halide fixtures. Mounting accessories are available to convert the OLWX1 LED into an energy efficient flood light.

OLWX1 LED is ideal for outdoor applications such as building perimeters, loading areas, driveways and sign and building flood lighting.

CONSTRUCTION

Cast-aluminum housing with textured dark bronze polyester powder paint for durability. Integral heat sinks optimize thermal management through conductive and convective cooling. LEDs are protected behind a glass lens. Housing is sealed against moisture and environmental contaminants (IP65 rated). See Lighting Facts label and photometry reports for details.

ELECTRICAL

Light engine consists of 1 high-efficiency Chip On Board (COB) LED with integrated circuit board mounted directly to the housing to maximize heat dissipation and promote long life (L73/100,000 hours at 25°C). Electronic drivers have a power factor >90% and THD <20% and a minimum 2.5kV surge rating. Flood light mounting accessories include an additional 6kV surge protection device. LEDs are available in 4000K and 5000K CCTs.

INSTALLATION

Easily mounts to recessed junction boxes with the included wall mount bracket, or for surface mounting and conduit entry - with the included junction box with five 1/2" threaded conduit entry hubs. Flood light mounting accessories (sold separately) include knuckle, integral slipfitter and yoke mounting options. Each flood mount accessory comes with a top visor and vandal guard. Luminaire may be wall or ground mounted in downward or upward orientation.

LISTINGS

UL Listed to U.S. and Canadian safety standards for wet locations. Rated for -40° C minimum ambient. Tested in accordance with IESNA LM-79 and LM-80 standards. DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.dlcqualify.org to confirm which versions are qualified.

WARRANTY

5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/Customers/Support/Terms_and_conditions.aspx.

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25°C. Specifications subject to change without notice.





d^{series}

D-Series Size 1 LED Flood Luminaire



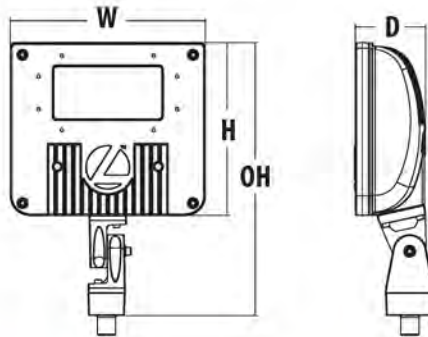
Catalog Number

Notes

Type

Specifications

EPA:	0.6 ft ² (0.05 m ²)
Depth:	3-1/8" (8.0 cm)
Width:	8-7/8" (22.4 cm)
Height:	7-3/4" (19.8 cm)
Overall Height:	12" (30.5 cm)
Weight:	7.2 lbs (3.3 kg)



Introduction

D-Series Size 1 Flood features advanced optics and precision illumination in a sleek and compact form that seamlessly blends with the environment. State of the art reflector design with cutting edge chip-on-board LED technology produces excellent uniformity using precision beam patterns. Provides long-life replacement for 70-150W metal halide floodlights offering up to 77% energy savings with expected service life of over 100,000 hours.

Ordering Information

EXAMPLE: DSXF1 LED P1 40K MSP MVOLT THK DDBXD

DSXF1 LED

Series	Performance Package	Color Temperature	Distribution	Voltage	Mounting	Options	Finish (required)
DSXF1 LED	P1	30K 3000K	NSP Narrow spot	MVOLT ¹	Shipped included	Shipped installed	DDBXD Dark bronze
		40K 4000K	MSP Medium spot	120 ²	THK Knuckle with 1/2" NPS threaded pipe	PE Photocontrol, button style ^{4,5}	DBLXD Black
		50K 5000K	MFL Medium flood	208 ²	IS Integral slipfitter (fits 2-3/8" O.D. tenon)	PEX Photocontrol external threaded adjustable ⁵	DNAXD Natural aluminum
	P2	50K 5000K	FL Flood	240 ²	YKC62 Yoke with 16-3 SO cord	SF Single fuse (120, 277, 347V) ²	DWHXD White
			WFL Wide flood	277 ²	Shipped separately³	DF Double fuse (208, 240) ²	
			WFR Wide flood, rectangular	347 ²	DSXF1/2TS Tenon slipfitter (2-3/8" O.D. THK required)	DMG 0-10V dimming driver (no controls)	Shipped separately⁴
			HMF Horizontal flood		FTS CG6 Tenon Slipfitter (fits 2-3/8" to 2-7/8" O.D. tenon. YKC62 required)	UBV Upper/bottom visor (universal)	
						FV Full visor	
				VG Vandal guard			

Accessories

Ordered and shipped separately.

DSXF1/2TS DDBXD U	Slipfitter for 1-1/4" to 2-3/8" O.D. tenons; mates with 1/2" threaded knuckle (specify finish)
FRWB DDBXD U	Radius wall bracket, 2-3/8" O.D. tenon (specify finish)
FSPB DDBXD U	Steel square pole bracket, 7-3/8" O.D. tenon (specify finish)
DSXF1UBV DDBXD U	Upper/bottom visor accessory (specify finish)
DSXF1FV DDBXD U	Full visor accessory (specify finish)
DSXF1VG U	Vandal guard accessory

For more mounting options, visit our [pages](#).

Stock configurations are offered for shorter lead times:

Standard Part Number	Stock Part Number	CI Code
DSXF1 LED P1 40K WFL MVOLT THK DDBXD	DSXF1 LED P1 40K	*240TJH
DSXF1 LED P1 50K WFL MVOLT THK DDBXD	DSXF1 LED P1 50K	*240TJG
DSXF1 LED P1 40K WFL MVOLT YKC62 DDBXD	DSXF1 LED P1 40K YK	*263KL9
DSXF1 LED P1 50K WFL MVOLT YKC62 DDBXD	DSXF1 LED P1 50K YK	*263UJE
DSXF1 LED P2 40K WFL MVOLT THK DDBXD	DSXF1 LED P2 40K	*240TJL
DSXF1 LED P2 50K WFL MVOLT THK DDBXD	DSXF1 LED P2 50K	*240TJJ
DSXF1 LED P2 40K WFL MVOLT YKC62 DDBXD	DSXF1 LED P2 40K YK	*263KLA
DSXF1 LED P2 50K WFL MVOLT YKC62 DDBXD	DSXF1 LED P2 50K YK	*263UJG
DSXF1/2 Slip-fitter Tenon Accessory DDBXD	DSXF1/2TS DDBXD U	*2166SK

NOTES

- MVOLT driver operates on line voltage from 120-277V.
- Single fuse (SF) requires 120V, 277V or 347V. Double fuse (DF) requires 208V, 240V or 480V.
- Also available as accessories; see Accessories information at left.
- Rated 25C maximum ambient for performance package P2. Specify PEX for higher ambient temperatures.
- Photocontrol (PE, PEX) requires 120, 208, 240, 277 or 347 voltage option.
- Must specify 120, 277 or 347 voltage option.





d²series

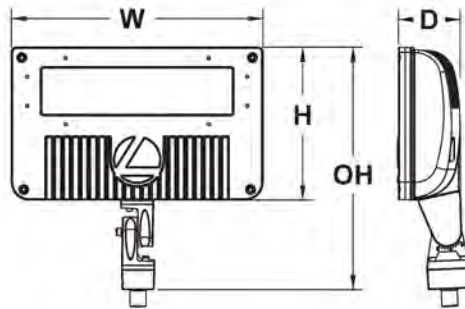
D-Series Size 2 LED Flood Luminaire



Catalog Number
Notes
Type

Specifications

EPA:	0.8 ft ² (0.05 m ²)
Depth:	3-1/8" (8.0 cm)
Width:	12-7/8" (32.6 cm)
Height:	7-3/4" (19.8 cm)
Overall Height:	12" (30.5 cm)
Weight:	10.5 lbs (4.8 kg)



Introduction

D-Series Size 2 Flood features advanced optics and precision illumination in a sleek and compact form that seamlessly blends with the environment. State of the art reflector design with cutting edge chip-on-board LED technology produces excellent uniformity using precision beam patterns. Provides long-life replacement for 150-250W metal halide floodlights offering up to 74% energy savings with expected service life of over 100,000 hours.

Ordering Information

EXAMPLE: DSXF2 LED P1 40K MSP MVOLT THK DDBXD

Series	Performance Package	Color Temperature	Distribution	Voltage	Mounting	Options	Finish (required)
DSXF2 LED	P1 P2 P3 ^{1,2,7}	30K 3000K 40K 4000K 50K 5000K	NSP Narrow spot MSP Medium spot MFL Medium flood FL Flood WFL Wide flood WFR Wide flood, rectangular HMF Horizontal flood	MVOLT ⁴ 120 ⁵ 208 ⁵ 240 ⁵ 277 ⁵ 347 ⁵ 480 ^{5,6}	Shipped included THK Knuckle with 1/2" NPS threaded pipe YKC62 Yoke with 16-3 SO cord IS Integral slipfitter (fits 2-3/8" O.D. tenon) Shipped separately DSXF1/2TS Tenon slipfitter (2-3/8" O.D. THK required) ¹ FTS CG6 Tenon slipfitter (2-7/8" O.D. YKC62 required) ¹	Shipped installed PE Photocontrol, button style ^{8,9} PEX Photocontrol external threaded adjustable ⁹ DMG 0-10v dimming wires pulled outside fixture (for use with an external control, ordered separately) SF Single fuse (120, 277, 347V) ⁵ DF Double fuse (208, 240, 480V) ⁵ SPD10KV Separate surge protection ¹⁰ Shipped separately UBV Upper/bottom visor (universal) FV Full visor VG Vandal guard	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White

Accessories

Ordered and shipped separately.

DSXF1/2TS DDBXD U	Slipfitter for 1-1/4" to 2-3/8" O.D. tenons; mates with 1/2" threaded knuckle (specify finish)
FTS CG6 DDBXD U	Slipfitter for 2-3/8" to 2-7/8" O.D. tenons; mates with yoke mount (specify finish)
FRWB DDBXD U	Radius wall bracket, 2-3/8" O.D. tenon (specify finish)
FSPB DDBXD U	Steel square yoke bracket, 2-3/8" O.D. tenon (specify finish)
DSXF2UBV DDBXD U	Upper/bottom visor accessory (specify finish)
DSXF2FV DDBXD U	Full visor accessory (specify finish)
DSXF2VG U	Vandal guard accessory

For more mounting options, visit our [Floodlighting Accessories](#) pages.

Stock configurations are offered for shorter lead times:

Standard Part Number	Stock Part Number	CI Code
DSXF2 LED P1 40K WFL MVOLT THK DDBXD	DSXF2 LED P1 40K	*240TJ9
DSXF2 LED P1 50K WFL MVOLT THK DDBXD	DSXF2 LED P1 50K	*240TJ8
DSXF2 LED P1 40K WFL MVOLT YKC62 DDBXD	DSXF2 LED P1 40K YK	*263KLF
DSXF2 LED P1 50K WFL MVOLT YKC62 DDBXD	DSXF2 LED P1 50K YK	*263UJK
DSXF2 LED P2 40K WFL MVOLT THK DDBXD	DSXF2 LED P2 40K	*240THT
DSXF2 LED P2 50K WFL MVOLT THK DDBXD	DSXF2 LED P2 50K	*240TJC
DSXF2 LED P2 40K WFL MVOLT YKC62 DDBXD	DSXF2 LED P2 40K YK	*263KLG
DSXF2 LED P2 50K WFL MVOLT YKC62 DDBXD	DSXF2 LED P2 50K YK	*263UJM
DSXF1/2 Slip-fitter Tenon Accessory DDBXD	DSXF1/2TS DDBXD U	*216GSK

NOTES

- Performance package P3 rated 35C maximum ambient.
- Not available with PE (use PEX).
- Rated 25C maximum ambient with SPD10KV.
- MVOLT driver operates on line voltage from 120-277V.
- Single fuse (SF) requires 120V, 277V or 347V. Double fuse (DF) requires 208V, 240V or 480V.
- Not available with PE and PEX.
- Also available as accessories; see accessories information at left.
- Rated 25C maximum ambient for performance package P2. Not available in performance package P3. Specify PEX for higher ambient temperatures.
- Photocontrol (PE, PEX) requires 120, 208, 240, 277 or 347 voltage option.
- Cannot exceed 25°C maximum ambient when used with P3 performance package.





GENERATION 2

HID REPLACEMENT LED LAMPS

A smaller, more versatile design to fit more fixtures

The G2 DirectDrive HID LED lamps are shorter and narrower, allowing them to fit into more fixtures than ever before.

Highest efficacy in the industry: Up to 150 lm/W

By separating the driver from directly connecting to the heat sink, we've maximized efficiency and protected the LED from overheating. This allows the G2 DirectDrive HID replacement LED lamps to have the highest lumens per watt in the industry.



BYPASS THE BALLAST



RoHS Compliant

5 YEAR WARRANTY

50,000 HOUR LIFETIME

Catalog Number	Rated Lamp Wattage	Lumens	Metal Halide Equivalent Wattage	Input Voltage	Base Type	CRI	IP Rating	Efficacy
NEW G2								
KT-LED12HID-E26-8xx-D*	12W	1,740	50W	120-277V	Medium E26	>80	IP64	145 lm/W
KT-LED18HID-E26-8xx-D**	18W	2,610	70W	120-277V	Medium E26	>80	IP64	145 lm/W
KT-LED27HID-E26-8xx-D /G2	27W	3,915	100W	120-277V	Medium E26	>80	IP64	145 lm/W
KT-LED27HID-EX39-8xx-D /G2	27W	3,915	100W	120-277V	Mogul EX39	>80	IP64	145 lm/W
KT-LED36HID-E26-8xx-D /G2	36W	5,400	150W	120-277V	Medium E26	>80	IP64	150 lm/W
KT-LED36HID-EX39-8xx-D /G2	36W	5,400	150W	120-277V	Mogul EX39	>80	IP64	150 lm/W
KT-LED45HID-E26-8xx-D /G2	45W	6,750	175W	120-277V	Medium E26	>80	IP64	150 lm/W
KT-LED45HID-EX39-8xx-D /G2	45W	6,750	175W	120-277V	Mogul EX39	>80	IP64	150 lm/W
KT-LED54HID-EX39-8xx-D /G2	54W	8,100	250W	120-277V	Mogul EX39	>80	IP64	150 lm/W
NEW! KT-LED63HID-EX39-8xx-D [†]	63W	9,450	250W/320W	120-277V	Mogul EX39	>80	IP64	150 lm/W
G1								
KT-LED80HID-EX39-8xx-D	80W	11,300	320W	120-277V	Mogul EX39	>85	IP64	141 lm/W
KT-LED100HID-EX39-8xx-D	100W	14,100	400W	120-277V	Mogul EX39	>85	IP64	141 lm/W

*Replaces KT-LED15HID-E26-8xx-D

**Replaces KT-LED19HID-E26-8xx-D

[†] Smaller case size

* 8xx denotes several color temperatures available. 80W and 100W lamps are not available in 3000K.

830 800 Series, 3000K **840** 800 Series, 4000K **850** 800 Series, 5000K



With SmartCool technology, a thermal sensor in the lamp activates during extreme high temperature conditions. Power to the lamp is reduced by up to 20% to cool the lamp and maintain lamp life. Once the sensor reaches an acceptable temperature, the lamp gradually returns to full light output. Included in 54W, 63W, 80W, and 100W DirectDrive HID LED lamps.

ULTRA LED™ RT5/6 HO

Recessed Downlight Kit



SYLVANIA ULTRA RT5/6 HO is a universal input voltage 5" and 6" compatible LED recessed downlight kit that creates high performing white light and is optimized for new construction and retrofit applications utilizing pin based compact fluorescent lamps. Installation is done quickly and easily in most standard six-inch frames.

The RT5/6 HO downlight is offered in 650 lumen, 700 lumen, 900 lumen and 1500 lumen options and achieves up to 88 lumens per watt.

The RT5/6 HO is designed to deliver light output comparable to traditional 1x13W, 1x18W, 1x26W and 2x26W pin based compact fluorescent luminaires.

Application Information

Application Notes

1. Operating temperature range between -4°F and +104°F (-20°C and +40°C).
2. Suitable for dry, damp or wet indoor or outdoor locations.
3. Compatible with Philips Bodine ELI-S-20 Emergency Lighting Micro Inverter.
4. Designed to install in standard 6" CFL mounting frame. For a list of compatible housings, please refer to www.sylvania.com/RT6.
5. For detailed warranty information, please see www.sylvania.com/RT6.
6. The RT5/6HO 650 and 700 lumen is compatible with 120V Phase cut dimmers and 277V Leviton Dimmer model IPX06-70Z .
7. The RT5/6 HO 900 and 1500 lumen are compatible with Leviton 0-10V dimmer model IP710-DL.
8. Installation performed as a stand-alone kit (without frame) is recommended for hard ceiling. Installation of a recessed incandescent frame is recommended for tiled ceiling application for proper support of the retrofit kit.

Key Features & Benefits

- Three input voltages:
 - 120V
 - 120-277V Universal
 - 347V
- Lumen package:
 - 650 lumens @ 8 watts (line voltage dimmable)
 - 700 lumens @ 8 watts (line voltage dimmable)
 - 900 lumens @ 13 watts (0-10V Dimmable)
 - 1500 lumens @ 17 watts (0-10V Dimmable)
- Replacement for 13W, 18W, 26W and 32W CFL pin based lamps
- Fits in standard 5" and 6" CFL mounting frame
- CCT: 2700K, 3000K, 3500K & 4000K
- CRI of >80 and >90
- 35,000 and 50,000 hour life (L70)
- Suitable for dry, damp and wet indoor or outdoor locations (650lm Indoor only)
- IC rated (except 650lm version)
- UL1598 Listed and Classified for stand-alone and retrofit applications
- Reduces energy consumption up to 34%
- Lasts up to 4 times longer than compact fluorescent lamps
- No warm-up time, instant-on with full light output and stable lamp to lamp color
- Integrated white trim and metal conduit adaptor (included) for direct replacement
- Suitable for use in 8" applications using optional trim extender accessory

Product Offering

Ordering Abbreviation	Wattage	CCT
LED/RT5/6/HO/650	8	3000K, 4000K
LED/RT5/6/HO/700	8	2700K, 3000K, 3500K, 4000K
LED/RT5/6/HO/900	13	2700K, 3000K, 3500K, 4000K
LED/RT5/6/HO/1500	17	3000K, 3500K, 4000K

Specifications and Certifications



ULTRA LED™ RT8

Recessed Downlight Kit



The SYLVANIA ULTRA LED RT8 unit is an eight-inch LED recessed downlight kit creating high performing white light which is optimized for new construction and retrofit applications. Installation is done quickly and easily in most standard eight-inch frames.

Quality of Light

The SYLVANIA ULTRA LED RT8 provides excellent color rendering (up to 90 CRI), and a wide selection of color temperatures (3000K, 3500K, 4000K, 5000K). LEDs have virtually no UV or infrared radiation to damage or fade furnishings, art or other objects.

Optical Design

Optical design efficiently directs light output in an 80° beam angle with low glare.

Application Information

Applications

- Healthcare
- Hospitality
- Office
- Property Management
- Residential
- Retail

Key Features & Benefits

- 0-10V Dimmable Lumen Packages:
 - 2000 lumens @ 24W (120/277V)
 - 3000 lumens @ 40W (120/277V)
 - 5000 lumens @ 54W (120/277V)
 - 8000 lumens @ 92W (120/277V)
- Non-Dimmable Lumen Packages:
 - 2000 lumens @ 23W (347V)
 - 5000 lumens @ 50W (347V)
- Replacement for 32W and 42W CFL pin base lamps
- Fits in standard 8" CFL mounting frame
- CCT: 3000K, 3500K, 4000K, 5000K (see offerings below)
- CRI of up to 90
- 50,000 hour life (L₇₀)
- Suitable for dry, damp and wet locations
- UL1598 Listed and Classified for stand-alone and retrofit applications
- Reduces energy consumption up to 50%
- 120-277V or 347V input voltage
- Lasts up to 3 times longer than CFL pin base lamps
- No warm-up time, instant-on with full light output and stable lamp to lamp color
- Integrated white trim, white baffle reflector and metal conduit adaptor (included) for direct replacement
- Suitable for use in 10" applications using optional trim extender accessory
- Conduit attached for easy installation
- 8000lm product has a remote driver

Product Offering

Ordering Abbreviation	Wattage	Color Temperature	CRI
LED/RT8/2000	24	3000K, 3500K, 4000K	82
LED/RT8/2000-347V	23	3000K, 4000K, 5000K	82
LED/RT8/3000	40	3000K, 3500K, 4000K	90
LED/RT8/5000	54	3000K, 3500K, 4000K	82
LED/RT8/8000	92	3000K, 3500K, 4000K	82
LED/RT8/5000-347V	50	4000K	82

Specifications and Certifications





Omni-directional 3-way and dimmable A shape bulbs, **an energy saving alternative to popular incandescents**

Philips LED A-shape dimmable and 3-way lamps are a great alternative to standard incandescent lamps. The unique lamp design provides omni-directional light with excellent dimming performance.

These lamps are ideal for decorative and ambient lighting in retail outlets, hotels, restaurants, government buildings, and multi-unit residences.

PHILIPS

LED

Glass PAR lamps



A classic design for a familiar look

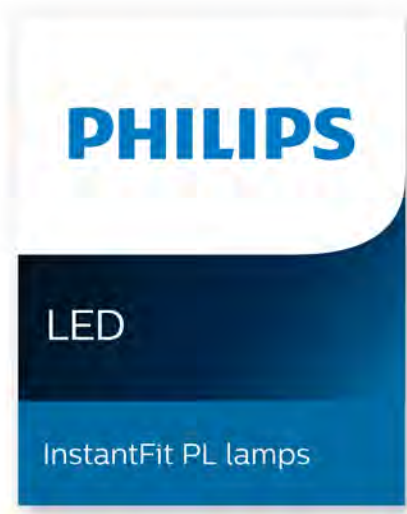
Philips LED glass PAR Lamps with single optic technology provide the familiar look and feel traditional halogen PARs while using a fraction of the energy.

Benefits

- Saves 85% energy When comparing a 13.5W PAR38 LED lamp to a 90W halogen PAR38 lamp[†]
- Long life lowers maintenance costs by reducing re-lamp frequency
- Will not fade colors, avoids inventory spoilage
- Contains no mercury
- Suitable for use in enclosed fixtures

Features

- 25,000-hour claimed lifetime for Energy Star[®] Qualified lamps*
- 50,000-hour LED lifetime**
- Glass finish for a look and feel replicating traditional halogen PARs
- 3-year limited warranty depending upon operating hours[‡]



This is **real compatibility**

Philips InstantFit LED 4-pin lamps make the transition to LED from CFL 4-pin lamps as simple as replacing a lamp. With both vertical and horizontal options and a wide array of color temperatures, the InstantFit LED lamps can quickly and effectively replace compact fluorescent lamps. The horizontal version includes a rotatable end cap to ensure the light is correctly aimed.

Benefits

- **Proven over 40% energy savings²** over fluorescent means a satisfied customer and no time wasted going back to a job
- **Lifetime delivered** — average life rating of 50,000 hours³ means satisfied customers
- **Easy replacement** — Replace conventional 32W and 26W 4-pin (PL-C & PL-T) lamps

Features

- **Rotatable end cap** — ensures proper lamp alignment inside the fixture (Horizontal SKUs only)
- **Long life** — 50,000 hour life³ means less maintenance than fluorescent
- **Proven product history** and a company with a long history of innovation and reliability in the lighting industry



CNY LED

LED Canopy/Ceiling Luminaire



Catalog Number

Notes

Type

Specifications

	CNY LED P0/P1/P2	CNY LED P3/P4
Width:	10"	14"
Height:	4.5"	6"
Depth:	10"	14"
Weight:	6.5lbs	13lbs

Introduction

The CNY LED canopy luminaires are energy efficient and budget friendly, perfect for replacing up to 400W metal halide luminaires while saving up to 80% energy costs. Quick mount mechanism significantly reduces the installation time. An LED array and translucent lens create uniform and visually comfortable illumination. CNY LED luminaires are DLC Premium listed and deliver quick payback!

Ordering Information

EXAMPLE: CNY LED P1 50K MVOLT DDB

CNY LED						
Series	Performance Package	Color Temperature ²	Voltage		Finish	
CNY LED	P0 3,500 lumens	40K 4000K	MVOLT ³	120-277V	DDB	Dark bronze
	P1 4,500 lumens ¹	50K 5000K				
	P2 6,600 lumens					
	P3 11,100 lumens					
	P4 14,000 lumens					
					WH ⁴	White

Accessories

Ordered and shipped separately

CNYBCP 14 Inch x 14 Inch Beauty Cover Plate

NOTES

1. Not available in 50K.
2. Correlated color temperature (CCT) shown is nominal per ANSI C78, 377-2008. Not available in P1 performance package.
3. MVOLT driver operates on any line voltage from 120-277V (50/60 Hz).
4. Available with P0 or P1 only.

FEATURES & SPECIFICATIONS

INTENDED USE

CNY LED luminaires are ideal, energy-efficient replacements for up to 400W MH canopy or ceiling luminaires. The CNY LED provides years of maintenance-free illumination for schools, malls, offices, parking areas, covered walkways and loading docks.

CONSTRUCTION

Cast-aluminum, corrosion-resistant housing with polyester powder paint for lasting durability. Castings are sealed with a one-piece gasket. Rated for outdoor installations, -40°C minimum ambient. Frosted lens is designed for uniform light distribution.

ELECTRICAL

Includes an MVOLT (120-277V) driver. LEDs maintain 70% of light output at 50,000 or more hours of service life (L70/50,000 hours).

INSTALLATION

Mounts to a recessed junction box or surface mount with three conduit entry points. Can be pendant mounted with ¾ NPT pendant stem provided by others. Quick mount mechanism significantly reduces installation time - no need to open the luminaire for installation.

LISTINGS

UL Listed to U.S. and Canadian safety standards for wet locations. Tested in accordance with IESNA LM-79 and LM-80 standards. DesignLights Consortium® (DLC) Premium qualified product. Not all versions of this product may be DLC Premium qualified or DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/DPL to confirm which versions are qualified. Can be used to comply with California Title 24 Part 6 High Efficacy LED light Source Requirements.

WARRANTY

Five-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.



Catalog Number
Notes
Type

FEATURES & SPECIFICATIONS

INTENDED USE — The JHBL is constructed to withstand moisture, dust, and chemical contact. Common applications for JHBL include demanding environments such as manufacturing, foundries, natatoriums, gymnasiums, automotive manufacturing, packaging, and cold storage. Ideal one-for-one replacement of conventional HID and fluorescent high bay systems. **Certain airborne contaminants can diminish the integrity of acrylic and/or polycarbonate. [Click here for Acrylic-Polycarbonate Compatibility table for suitable uses.](#)**

Certain airborne contaminants may adversely affect the functioning of LEDs and other electronic components, depending on various factors such as concentrations of the contaminants, ventilation, and temperature at the end-user location. **[Click here for a list of substances that may not be suitable for interaction with LEDs and other electronic components.](#)**

CONSTRUCTION — Electrical housing is off-set from the optical assembly for maximum heat dissipation. Rugged die-cast aluminum housing and corrosion resistance. Housing utilizes die cut rubber gasketing to seal the optical and electrical compartments from dust and moisture. Wire guard attachment points are pre-cast in optical housing. Housing and optics maintain IP65 rating with all internal components including optional integrated sensor.

Finish: Super durable TGIC thermoset powder coat finish provides 1500 hours salt/fog rating. CR (corrosion resistant) optional finish is a five stage pre-treating can painting process that yields over 5,000 hours salt rating per ASTM B117.

OPTICS — One piece precision molded .375" thick borosilicate glass that is silicone rubber gasketed. Optional non-silicone gasket available and recommended for automotive applications.

ELECTRICAL — Non-class 2 drivers standard for maximum life at high temperatures. Less than 10% THD and PF > 90. Luminaire Surge Protection Level: Designed to withstand up to 6kV/3kA per ANSI C82.77-5-2015. Lumen maintenance is 90% at 60,000 hours. L70 greater than 100,000 hours. 0-10V dimming standard for a dimming range of 100% to 10%.

WIRELESS NETWORKING — XPoint™ Wireless technology creates a mesh network to ensure communication between fixtures, sensors and wall stations facility-wide. This option provides superior lighting management capabilities including granular control, configuration and custom grouping for increased energy savings.

Integrated Bluetooth occupancy sensor: The SBG BTP is bluetooth enabled with dimming photocells. Allows you to change settings in the field using the VLP app.

INSTALLATION — 3/4 inch NPS threaded hub standard that is suitable for pendant, hook or loop mounting with appropriate mounting accessories. See accessories for available options.

LISTINGS — CSA certified to US and Canadian safety standards. Wet location listed. IP65 rated. Suitable for use in ambient temperatures from -40°F (-40°C) to 149°F (65°C). Covered ceiling not required to maintain wet location listing or IP ratings.

DesignLights Consortium™ (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/resources/terms-and-conditions

Note: Actual performance may differ as a result of end-user environment and application.

All values are design or typical values, measured under laboratory conditions at 25 °C.

Specifications subject to change without notice.

LED IP Rated High Bay

JHBL



A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® or XPoint™ Wireless control networks marked by a **shaded background***

To learn more about A+, visit www.acuitybrands.com/aplus.

*See ordering tree for details

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Manufacturer Specification Sheets

ECM 3: Recommission Energy Management Systems

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Niagara 4 +
JACE® 8000

our newest products
are open 4
innovation

TRIDIUM'S NIAGARA FRAMEWORK™

connecting minds
and machines™



For more than 15 years, Tridium's Niagara Framework has fundamentally changed the way devices and systems connect to people—and the ways people can control and optimize those machines.

With nearly half a million instances worldwide, Niagara is quickly becoming the operating system of the Internet of Things. Its open API, open distribution business model and open protocol support give you the freedom to choose how you work, what you build and with whom you partner. Niagara enables you to connect and control devices, while normalizing, visualizing and analyzing data from nearly anywhere or anything.

From buildings and data centers to manufacturing systems and smart cities, the Niagara Framework improves strategic decision-making, allowing for optimized performance and cost reductions that can help businesses be more competitive and more profitable. And with the release of Niagara 4 and the JACE® 8000 controller, the opportunity to achieve operational excellence is even greater than before.

*Niagara's truly open environment harnesses
the power of the Internet of Things in ways
never before imagined or possible*

NIAGARA 4 open 4 performance

Niagara 4 builds on the legacy of the Niagara Framework® in new and exciting ways. It's less reliant on browser plug-ins, faster and easier to use. Now end users can directly access, analyze and act on a wide range of operational data. A truly open framework, Niagara 4 delivers a variety of notable improvements to help businesses take full advantage of the Internet of Things, including advanced visualization and new search, security and navigation tools.

**Niagara 4 is less reliant on browser plug-ins,
featuring an intuitive HTML5 interface**

AN ALL-NEW USER INTERFACE

Niagara 4 features a bold and intuitive new interface. Modern and easy to use, the platform utilizes HTML5 to provide an array of rich features. Our powerful new UI framework makes the user experience simpler and more robust, giving users maximum control of their data and decisions.

The optimized workflow allows users to find and visualize data points quickly based on a powerful tagging system. New features include a built-in search function, customizable charting and visualization, role-based security, real-time troubleshooting and rapid navigation.

Niagara 4's use of HTML5 provides a user interface that makes it easier for systems integrators to create and maintain customized views for end users.



MORE DATA AT YOUR FINGERTIPS

Integrators can provide an interface that empowers users to do more on their own. Because devices, systems and data points can be tagged in Niagara 4, users can easily conduct a station-wide search of the most important elements in their operation.

This one-tool solution utilizes tag hierarchies to automatically integrate all data in a navigation tree. Using a standardized dictionary of tagged elements, users choose which points to monitor directly. Users can utilize the standardized dictionary to drive consistency in their building automation systems.

With a simple point-and-click or drag-and-drop, users can create customized charts, allowing them to instantly find and display critical information from their desktop, tablet or mobile device. Systems integrators no longer necessarily need to re-engineer new dashboards each time a customer requirement changes. Building real-time dashboards is straightforward, allows for immediate troubleshooting and quickly displays data with attractive visualizations.

POWERFUL SECURITY

Niagara 4 takes a "defense-in-depth" approach to Internet of Things security. Building on the security of previous Niagara versions, Niagara 4 is secure by default. Authentication requires users to choose strong credentials, and both data in motion and sensitive data at rest are encrypted. Niagara 4 also uses Role-Based Access Control (RBAC), making user permissions easy to configure and less error-prone. Niagara 4 also can be integrated with existing enterprise identity and access management systems, such as LDAP and Kerberos. All user actions and security-related events are recorded in Niagara's audit log for traceability.

EASIER INTEGRATION

Niagara 4's new templating feature enables tags to be applied to devices quickly, and allows applications to be prebuilt against a set of standardized templates which then can be quickly created and reused. In other words, once a template is made, it can be redeployed as often as needed in other instances. The result is not only a more functional design for users but also reduced integration time across the board.

FASTER, MORE POWERFUL DEVELOPMENT

Developers will find improved documentation, a rich open API library, BajaScript 2.0, semantic data modeling via tags and other ready-made tools to greatly speed and support development. In addition, the need for specialized training in the Niagara user interface is reduced—anyone familiar with open Web development can now create a custom UI in Niagara. Niagara 4's new features and public APIs make it easier to extend, develop and build upon the framework.

Niagara 4

key features

- Modern UX Framework and design language (HTML5)
- End users are able to easily customize dashboards
- Advanced charting and visualization
- Data tagging
- Tag-based navigation
- Device templating
- Data cleansing capabilities
- Niagara station search
- Workbench workflow improvements
- Role-Based Access Control (RBAC)
- Pluggable authentication schemes
- Improved UI developer experience (BajaScript 2.0)
- Station templating
- Niagara AX to Niagara 4 station migration tool

JACE 8000 CONTROLLER

a modular approach 4 global design

Optimized for Niagara 4, Tridium has created an all-new hardware platform: the JACE 8000 controller. This “next-generation” controller features a new global design that functions with legacy systems and has the ability to scale for future needs.

EFFICIENT GLOBAL DESIGN

The new, modular design of the JACE 8000 controller makes it easy to install, integrate and deploy. Tool-less installation with expansion capability reduces installation complexity and improves flexibility. Systems integrators can focus on engineering solutions, not assembling components. And their lives will be simplified with a global power supply and improved access to standard enclosures.

WIRELESS CAPABILITY

Standard Wi-Fi offers enhanced wireless capability when interfacing with the next generation of wireless sensors and devices. The JACE 8000 controller also is configurable as an access point so that mobile phones and tablets can display information and advanced graphics. Expansion also is available when interfacing with other wireless fieldbuses seen in connected buildings.

OPTIMIZED FOR NIAGARA 4

The JACE 8000 controller leverages the exciting new features of Niagara 4. It adds to the enhanced user experience, maximizing Niagara 4's key advantages: pure Web interface based on HTML5 with HTML5 views, charting and data visualization, a common design language, better reporting, robust security and improved device management.



With simple configuration, tool-less installation, low-cost integration and high-powered performance, the JACE 8000 controller is a dramatic evolution in connecting and controlling devices worldwide.

NIAGARA AX

seamless conversion

Tridium has engineered Niagara 4 and the new JACE 8000 controller to be easy to add to, or upgrade from, your current Niagara-based systems.

Our native Niagara Fox protocol will work between the Niagara AX and Niagara 4 software systems, and the Niagara 4 software will work with any currently available JACE hardware.

For those making the conversion to our most up-to-date products, Tridium offers a station conversion tool that will adapt Niagara AX stations to Niagara 4 stations. Converted stations will require third-party vendors to provide updated modules for Niagara 4 versions of their content. However, most modules will require only minor reformatting for developers to make the conversion. We are dedicated to making the conversion between systems as seamless as possible.

Niagara AX

compatibility summary

- Fox network compatibility between Niagara AX and Niagara 4
- Station conversion tool to convert Niagara AX stations to Niagara 4 stations (.bog files)
- Public APIs
- Niagara Driver Framework still supported
- Niagara 4 will run on any JACE with HotSpot VM (J5, J6, J6E, J7)
- Niagara 4 will run on any JACE 8000 controller



open 4

the internet of things

The reach of Tridium's Niagara Framework® is global—and growing daily. Our pioneering innovations have created a large and active community of innovative developers, integrators, consultants, manufacturers, resellers and end users who understand that Niagara is an essential part of the Internet of Things.

That's the power of open, and the future of innovation.

Niagara 4 and the JACE® 8000 controller are available through a wide variety of original equipment manufacturers. Our open distribution business model and open protocol support allow a vendor-neutral application compatible with devices and systems throughout the world.

To learn more about how to purchase, install and start using Niagara 4 and the JACE 8000 controller, or if you are an original equipment manufacturer and would like to add them to your suite of offerings, please contact us.



804.747.4771 Corporate HQ / 877.305.1745 Customer Support

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2015-0018

Andover Continuum™

Family of User Interfaces

Monitor, Control and Configure from anywhere!

The Andover Continuum™ system takes integration to the next level by controlling climate, security, lighting, and energy all from a single system. TAC has created a family of user interfaces for the Andover Continuum system that puts this powerful integrated control system in your hands from wherever you are.



Andover Continuum Family of User Interfaces Features



PRODUCT AT A GLANCE

- Powerful User Interfaces for controller climate, security, lighting and energy from a single system
- An interface for all users – Guards, Receptionists, Department Managers, Facility Managers, Building Owners, Technicians
- Support for IT environments – MS Windows XP, MS Windows Mobile, MS Internet Explorer, MS SQL, MS MSDE
- Support for open standards – XML, LDAP, ODBC, OLE, SNMP, BACnet
- Import and synchronize personnel records for HR databases with ease using LDAP or CSV files
- Monitor live and recorded video from a Digital Video Management System
- Support for wired and wireless Ethernet networks
- Support for Andover Continuum Infinet and BACnet networks – wired or wireless
- Powerful interfaces for graphics, schedules, trends, reports, alarms, personnel, programming and more

Whether you are viewing graphics from your office PC, checking alarms from a web browser at home or servicing equipment with a PocketPC, there's a TAC user interface that gives you access and control of the task at hand. Experience what thousands of other installations have enjoyed for years from TAC.

IT Friendly and Open

The Andover Continuum user interfaces are designed to participate within your existing corporate IT network. They support both wired and wireless TCP/IP connections and utilize the standard Microsoft products (e.g. MS Windows XP, MS Windows Mobile, MS Internet Explorer, MS Internet Information Server, MS SQL Server, MS MSDE). Installation is therefore simple and quick.

The workstations can exchange data using open communications standards (BACnet, XML, LDAP, ODBC, OLE, SNMP) permitting Andover Continuum to be synchronized with third party systems such as those for human resources, financial, utilities, reporting, and background checking.

For remote sites, the Andover Continuum workstations can optionally dial-out via modem or automatically answer a call from a remote site in alarm.

Secure Communications with 192-BIT IPSEC/IKE Encryption and SSL

To assure your building runs as planned without interruptions, the Andover Continuum system can be configured for a high level of encryption and authentication between workstations, controllers, servers and web browsers.

Communications between the workstations, controllers and database servers can utilize 192-bit Internet Security Protocol (IPSec) and Internet Key Exchange Protocol (IKE) to assure confidential and tamper-proof communications over the Ethernet. Web communications are also secure when Secure Socket Layers (SSL) between the web browser and the web server are configured.

Andover Continuum Family of User Interfaces Features (continued)

TAC takes security seriously with these secure authentication and encryption methods. Combined with a user logon system that partitions access to the system so the user can only view and edit the equipment and data they are in charge of, the Andover Continuum system protects your building and your investment.

CyberStation Full-Featured Interface

As a complete user interface for the Andover Continuum system CyberStation™ can be used to commission, configure, program, and monitor every Andover Continuum Infinet and BACnet field device, sensor and output attached to the network. CyberStation provides true integration of security (access control, intrusion monitoring and digital surveillance), power monitoring, life safety and climate control equipment within a single user interface.

Monitoring, Video Integration and Reporting

When it comes to monitoring and reporting, CyberStation really shines. Its graphics system is fully featured and provides dynamic updates of point values for any object on the system. Schedules, Trends, Reports and other tools can be launched from a graphic which provides quick, easy access to manage your whole system. Monitoring is further enhanced with the video integration features allowing the user to view live and recorded video from a "Video Layout" matrix. CyberStation's graphical reports can display raw log data in many output formats: html text reports, scalable vector graphic (SVG) bar, pie, and line charts, or as Adobe Acrobat PDF file. Furthermore, data can be represented statistically (e.g. the top 10 alarms, the highest temperature values). Reports can be run manually or executed on an alarm or schedule event and emailed to a predefined recipient list.

Alarms & Events

CyberStation serves as a powerful engine for collecting alarms and events and taking automatic actions (e.g. display the active alarm view, send as email, play an audio clip, launch a graphic, launch a live video layout). Users may be required to add a comment and sign off on alarm acknowledgments as an electronic signature of their action.



Andover Continuum Family of User Interfaces Features (continued)

CyberStation is equipped to make use of the other powerful services provided within the BACnet protocol including scheduling, trending, and alarming. Andover Continuum and third party BACnet Devices may be backed-up and restored using the BACnet backup and restore services providing for quick disaster recovery.

web.Client Browser Interface

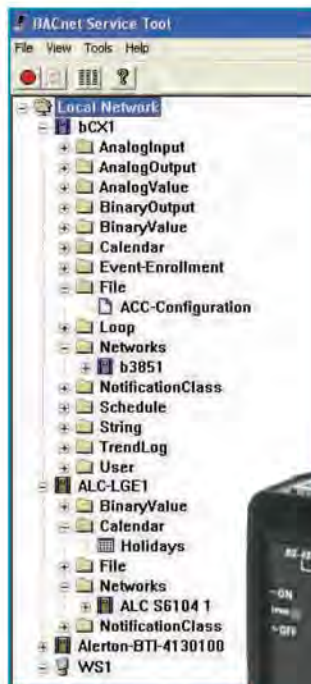
web.Client extends the Andover Continuum system to the web. Using the same database as CyberStation, web.Client gives the operator the freedom to access the Andover Continuum system from anywhere on the network or over Internet. Many of CyberStation's editors and features are available in web.Client as you would use them in CyberStation. web.Client even uses the same graphics as CyberStation so there is no need to create or convert a specific graphic for web use. Furthermore, ad hoc reports may be created while connected to Andover Continuum via web.Client.

Embedded Web Server

Every Andover Continuum controller that resides on an IP Ethernet network contains an embedded web server. The embedded web server provides a simple interface for custom web pages that contain Andover Continuum data. A custom web page can permit a user to edit point values and display log data, as well as displaying present values of object properties. The embedded web server also comes with default web pages for controller configuration.

RoamIO₂ Service Tool

The RoamIO₂ service tool is the ideal interface for project commissioning and day-to-day maintenance. RoamIO₂ may be used with either a Pocket PC or a laptop and can connect to an Andover Continuum system's Infinet or BACnet/IP or MS/TP network. Furthermore, the RoamIO₂ unit can connect wirelessly to the Pocket PC or laptop using a Bluetooth interface. This tool allows the technician to view an Andover Continuum or BACnet point (and its properties) along with many editing capabilities. A user can disable a fan for maintenance or download a new application to a controller. Since the RoamIO₂ supports BACnet backup and restore, even a third party controller that supports backup and restore



Andover Continuum Family of User Interfaces Specifications

Specifications	CyberStation	web.Client	Embedded Web Server	RoamIO ₂
Native BACnet	Yes	Yes	Yes	Yes
BACnet/IP	Yes	Yes	Yes	Yes
BBMD	Yes	-	bCX1 only	-
Schedules	Yes - Full	Yes - Full	-	View
Trends	Yes - Full	Yes - Full	-	View
Alarms	Yes - Full	Yes - Full	-	-
Backup & Restore	Yes	-	-	Yes
Graphics	Yes - Full	Yes - Full	Yes - HTML	-
Configuration	Yes - Full	Yes - Some	Yes - Some	Yes - Some
Programming	Yes - Full	-	-	-
Reporting	Yes - Full	Yes - Full	Yes - HTML	-
User Security	Yes	Yes	Yes	Yes
Personnel Manager	Yes	Yes	-	-
Badging	Yes	-	-	-
LDAP	Yes	-	-	-
Encryption	IPSec/PKE	SSL	-	-

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On October 1st, 2009, TAC became the Buildings Business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

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SDS-C-USERINTERFACE-A4.BU.N.EN.8.2008.0.00.CC

August 2008 pdw

Andover Continuum™ Infinet II

i2850 Series

The i2850, i2851, and i2853 controllers provide cost-effective DDC control of individual terminal units (e.g. VAV boxes, fan-powered induction units, unit ventilators, heat pumps).



Andover Continuum Infinet II i2850 Series Terminal Controllers Features



PRODUCT AT A GLANCE

- Compact Terminal Controllers Provide VAV Control for a Broad Range of Applications
- Compatible with Both Andover Continuum and Infinity Systems
- Expandable I/O Meets Additional Point Count Needs
- Universal Inputs with Form A and Form K Outputs for Flexible Control Options
- Non-Volatile Flash Memory Provides Utmost Reliability – Stores Both Application Program and Operating System
- Flash Memory Allows Easy On-Line Software Updates
- On-Board Airflow Sensor
- Optional Display/Keypad Provides Easy Operator Interface (Mounted Separately)
- View and Modify Information with Optional Andover Continuum Smart Sensor Display
- Local On-Board Service Port



The i2850 Series is a perfect fit for your VAV applications where external damper actuators are used. And because all i2850 Series controllers feature a built-in expansion port for additional I/O, these controllers are perfect for your more demanding control applications.

Choose the i2850 Series controller with the input configuration that matches your application:

- The i2850 has four full range universal inputs plus a fifth input for an on-board air flow sensor for VAV airflow measurement.
- The i2851 contains four universal inputs as well, but does not have the on-board air flow sensor and is perfect for applications not requiring airflow measurement, such as heat pumps and fan coils.
- The i2853 is for dual-duct VAV applications. It contains two onboard airflow sensors and four universal inputs.

All three models feature an additional room sensor input, which supports Andover Continuum Smart Sensor, or any standard room temperature sensor; plus three Form A relays and one Form K Tri-state relay output.

Similar to all i2 controllers, the i2850 Series features Flash memory, increased user memory, and a fast (32-bit) processor for faster scan times, with plenty of additional memory available for data logging of your critical data.

The i2850 Series communicates with the entire Andover Continuum Infinet RS-485 field bus (i.e. both Andover Continuum Infinet and Andover Continuum Infinet II controllers) and is compatible with both the Andover Continuum CyberStation and Infinity SX 8000 front-ends. Up to 254 Andover Continuum Infinet devices can be networked to any Andover Continuum network controller.

Andover Continuum Infinet II i2850 Series Terminal Controllers Features (continued)

Increased Reliability with Flash Memory

The i2850's non-volatile Flash memory stores your operating system and application programs, so that in the event of a power loss, your application will be restored when power is returned. In addition, the Flash memory allows for easy upgrades of your operating system via software downloads, eliminating the need to swap out proms. The i2850 controllers include an on-board battery to safeguard your runtime data — protecting all point data and log data from being lost if power is removed.

Inputs

The input configuration on the i2850 Series consists of four full range universal inputs that accept voltage (0-5VDC), digital (on/off), counter signals (up to 4Hz), or temperature signals. The i2850 features one on-board air flow sensor; the i2853 provides two. All models offer an additional input to support the Andover Continuum Smart Sensor, or any standard room temperature sensor.

Outputs

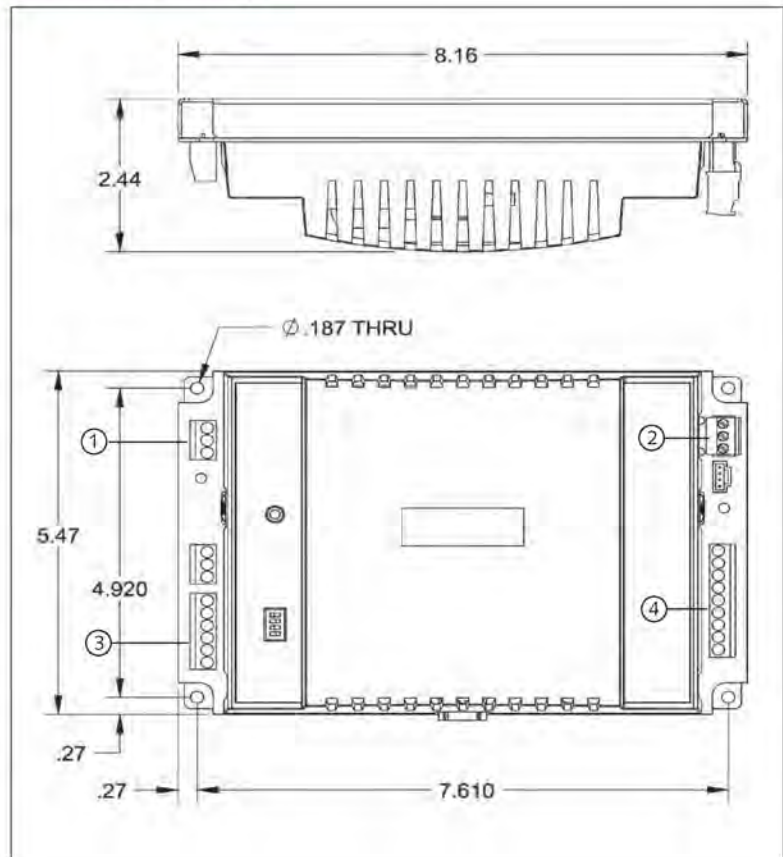
The i2850 Series contains three Form A relay outputs and one Form K Tri-state output. Each relay is rated for 24 VAC/VDC, 3 amp. These outputs can be used separately for on/off or pulsed control of lighting, heat, and fan units. The pre-configured Form K Tri-state output can be used for bi-directional control of dampers and valves.

(Note: Any two consecutive Form A outputs can be configured to form an additional Form K output.)

I/O Expansion

The i2850 Series contains an I/O expansion port for the addition of up to two xP expansion modules directly on the bottom of the controller. The i2 family of modules includes the xPD18, xPUI4, xPDO2, xPDO4, xPAO2, and xPAO4. In addition, the I/O bus supports the xP Display Module, which allows the user to view and change point values.

Dimensional Drawings



Andover Continuum Infinet II i2850 Series Terminal Controllers

Features (continued)

Software Capabilities

The dynamic memory of the i2850 Series can be allocated for any combination of programs, scheduling, alarming, and data logging using the powerful Andover Continuum Plain English™ programming language. Our object-oriented Plain English language with intuitive keywords provides an easy method to tailor the controller to meet your exact requirements. Programs are entered into the i2850 Series using the Andover Continuum CyberStation, Infinity SX 8000 Workstation, or local user terminal. Programs are then stored in, and executed by, the i2850 Series controllers.

Programming multiple i2850 Series controllers is inherently easy with Plain English. A complete copy of one i2850 controller's programs can be loaded directly into other i2850 controllers without changing any point names or programs.

Smart Sensor Interface

The i2850 Series provides a built-in connection for Andover Continuum Smart Sensor. The Smart Sensor provides a 2-character LED display and a 6-button programmable keypad that enables operators and occupants to change setpoints, balance VAV boxes, monitor occupancy status, and turn equipment on and off. An enhanced version of the Smart Sensor is also available with a 4-digit custom LCD that provides the following icons: PM, %, °, Setpoint, Cool, Heat, CFM, Fan, OA, and SP.

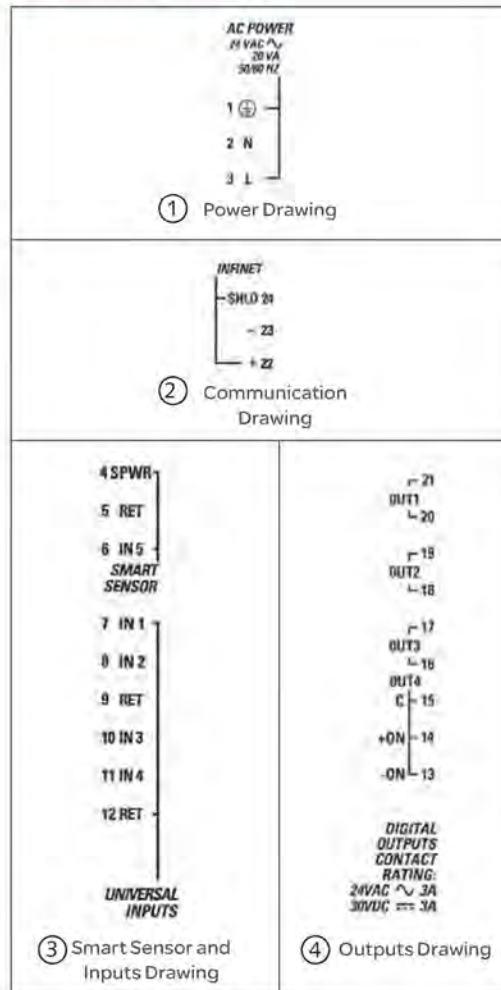
Local Display

The local display with keypad (xP-Display) allows for the addition of a fully programmable local display module that can be mounted within 10 feet (3 meters) of the controller. Connected via a ribbon cable, the xP-Display easily allows the Operator Interface to be mounted on the door of an enclosure or on a wall below or next to the controller.

Optional Wireless Andover Continuum Infinet

The i2850 Series Andover Continuum Infinet controllers can also communicate using a wireless mesh network. Simply plug Andover Continuum Wireless Adapters into the service ports of these controllers with wireless compatible firmware to create a wireless mesh network that sends and receives Andover Continuum Infinet messages.

Dimensional Drawings



Andover Continuum Infinet II i2850 Series Terminal Controllers Specifications

i2850 Series Terminal Controllers

Electrical

Power

24 VAC, +10% -15%, 50/60 Hz

Power Consumption

20 VA

Overload Protection

Fused with 2 amp fuse. MOV protected.

Software Real-Time Clock

Synchronized through Andover Continuum Infinet by network controller

Mechanical

Operating Environment

32°–120°F (0–49°C),

10–95% RH (non-condensing)

Size

5.47" H x 8.16" W x 2.44" D

(139H x 207W x 62) mm

Weight

1.08 lbs. (.50 kg)

Enclosure Type

UL Open class, IP 10.

Flammability rating of UL94-5V

Mounting

Panel mount

Battery

Battery Backup

Replaceable, non-rechargeable, lithium battery. Provides 5 years typical accumulated power failure backup of RAM memory

Communications

Communications Interface

Through Andover Continuum Infinet RS-485 field bus to network controller

Communications Speed

1200 to 19.2K baud

Bus Length

4,000 ft. (1,220m) standard for Andover Continuum Infinet, i2 Infilink module allows extension to longer distances and is required after every group of 32 units on the network.

Bus Media

Andover Continuum Infinet: twisted, shielded pair, low capacitance cable

RS-485 port for implementing Wireless

Infinet II connection, including:

Standard service port, four-position shrouded connector

Comm. Error Checking

International Standard CRC 16

Compatibility

Andover Continuum Cyberstation and Infinity SX 8000 systems

Inputs

4 Universal inputs: Voltage (0-5.115 VDC); Temperature -30°F to 230°F

(-34°C to 110°C), Digital (on/off), Counter (up to 4Hz at 50% duty cycle, 125 ms min. pulse width). Supervised Alarm (single or double resistor), Current input (0 - 20 mA) using external 250 ohm resistor

1 Smart Sensor Temperature Input

(32°F to 105°F) (0°C to 41°C)

Airflow sensor (0 to 2" W.C.)

(i2850- qty 1; i2853-qty 2)

Input Voltage Range

0-5.115 volts DC

Input Impedance

10K ohm to 5.120V or 5M ohm

with pull-up resistor disabled

Input Protection

24 VAC or 24 VDC temporarily

on any single channel, ±1000V transients

(Tested according to EN61000-4-4)

Input Resolution

5.0 mV

Input Accuracy

±15mV (±0.56°C from -23°C to +66°C or

±1°F from -10°F to +150°F)

Airflow Input

Range: 0 to 2" W.C. (0-500 Pa)

Resolution: 0.005" W.C. (1.25 Pa) @

23° C (73° F)

Accuracy: ±0.05" W.C. (6.25 Pa)

@23°C (73°F)

Andover Continuum Infinet II i2850 Series Terminal Controllers

Specifications (continued)



i2850 Series Terminal Controllers

Outputs

3 single pole single throw (SPST)
Form A relays
1 Form K Tri-state relay output
(Any two consecutive Form A outputs can be configured as one Form K Tri-state)

Output Rating

Maximum 3A, 24VAC/VDC,
±1500V transients
(Tested according to EN61000-4-4)

Output Accuracy

0.1 sec. for pulse width modulation

Expansion Bus

Interfaces to optional xP I/O
Expansion Modules

Connections

Power

3-position fixed screw terminal connector

Inputs

6-position fixed screw terminal connector

Outputs

9-position fixed screw terminal connector

Smart Sensor

3-position fixed screw terminal connector

Communications

3-position removable screw
terminal connector

Expansion Port

6-position shrouded connector

Service Port

4-position shrouded connector

User LEDs/Switches

Status Indicator LEDs:

CPU	CPU Active
TD	Transmit Data
RD	Receive Data
Output	Output Status (per output) (Digital only)

EXPANSION

PORT PWR Power Status

Switches

RESET
Input Pull-up Resistor Switch (per input)

General

Memory

128K SRAM, 1MB FLASH

Processor

Motorola 32-bit Coldfire

Agency Listings

UL/CUL 916, FCC CFR 47 Part 15,
ICES-003, EN55022, AS/NZS 3548,
Class A, CE

Options

UL864, Smoke Control System Equipment,
UUKL (i2850-S, i2851-S, i2853-S)

Models

i2850

Infinet II i2850 Terminal Controller

i2850-S

Infinet II i2850 Terminal Controller
with Smoke-Control option

i2850-WL

Wireless Infinet II i2850 Terminal Controller

i2851

Infinet II i2851 Terminal Controller

i2851-S

Infinet II i2851 Terminal Controller
with Smoke-Control option

i2851-WL

Wireless Infinet II i2851 Terminal Controller

i2853

Infinet II i2853 Terminal Controller
i2853-S

Infinet II i2853 Terminal Controller
with Smoke-Control option

i2853-WL

Wireless Infinet II i2853 Terminal Controller

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On October 1st, 2009, TAC became the Buildings Business of its parent company Schneider Electric. This document reflects the visual identity of Schneider Electric, however there remains references to TAC as a corporate brand in the body copy. As each document is updated, the body copy will be changed to reflect appropriate corporate brand changes.

Schneider Electric One High Street, North Andover, MA 01845 USA Telephone: +1 978 975 9600 Fax: +1 978 975 9674 www.schneider-electric.com/buildings

SDS-i2850-A4.BU.N.EN.11.2007.0.01.CC

November 2007 pow

Manufacturer Specification Sheets

ECM 4: Web-enabled Programmable Thermostats

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ecobee EMS Si



Compatibility

- Conventional (2H/2C)
- Heat pump (3H/2C)
incl. 1-stage auxiliary heat
- Gas, oil, electric
- Dual fuel

Wire terminals

- | | | |
|-------|----------|---------|
| • R2- | • W2 AUX | • Rc |
| • R2+ | • Y2 | • G |
| • R1- | • C | • W O/B |
| • R1+ | • Rh | • Y |

Powering method

24VAC (3VA minimum)

Power consumption

Less than 3.5VA

Connectivity & security

ecobee uses the latest encryption technologies to ensure that data is protected both in transmission and network access. The ecobee EMS Si is designed to support:

- 802.11 b/g/n wireless routers
- WEP 64, WEP 128, WPA and WPA2 encryption methods
- DHCP (dynamic) or Static IP addressing
- 168 bit SSL encryption

Bandwidth

15-20 MB/month

Green

- Recyclable packaging
- Mercury free
- Arsenic free
- PVC free
- ROHS compliant

Temperature range

Set point: 45° to 92°F (7° to 33°C)
 Display: 40° to 100°F (5° to 37°C)
 Sensitivity: +/- 1°F (+/- 0.5°C)
 Operating: 32° to 130°F (0° to 55°C)

Humidity range

Display: 20% to 90% RH
 Sensitivity: +/- 5% RH
 Operating: 5% to 95% RH (non-condensing)

Automation

Two dry contact inputs and/or 10K resistive temp sensors that can be programmed to:

- Adjust the heat and or cool set temperatures
- Switch the system to occupied or unoccupied mode
- Shut down the compressor
- Shut down AC
- Turn fan on
- Disable auxiliary heat
- Disable all heat

Mechanical specifications

- Easy to access battery compartment
- Decorative trim plate included
- 94VO (flame resistant) plastic

What's in the box

- ecobee EMS Si Thermostat
- Installation Manual

Additional features

- Fahrenheit or Celsius display
- 365 day scheduling
- Automatic daylight saving time adjustment
- Adjustable Auto change-over dead-band
- Installer programmable options including:
 - Heat and cool differential temperature
 - Minimum compressor off time
 - Heat and cool fan dissipation time
 - Display temperature offset
- Outdoor temperature detection (requires internet connection)
- Reminders & alerts on screen or via email

Product Dimensions

Height: 3.25 in / 82.5 mm
 Width: 5.5 in / 139.5 mm
 Depth: 1 in / 25 mm

Warranty

3-year warranty

Languages

English

Display

2.5" full-color LCD non-touch screen
 320 x 240 pixel display



Manufacturer Specification Sheets

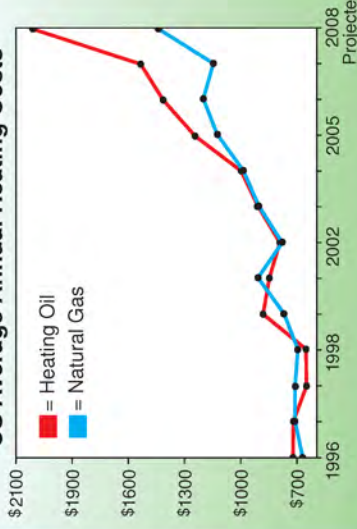
ECM 5: Heat Timer & Thermostatic Radiator Valves

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Save on Home Heating Bills

For more information about **Outdoor Reset**, download the Essay E007 from the literature section of tekmarcontrols.com

US Average Annual Heating Costs



With Today's Rising Fuel Prices & Environmental Concerns, it is More Important Than Ever to Conserve Energy!

tekmar®
Controls
Can Help!



- ✓ Lower Heating Costs
- ✓ Reduced Expansion Noises
- ✓ More Comfort with Fewer Temperature Swings
- ✓ Less CO₂ Emissions for a Greener Environment
- ✓ Manufactured in North America
- ✓ Full Warranty Backed by Professionals



● = tekmar Representative
● = tekmar Headquarters

Contact your local tekmar representative or heating contractor and ask for tekmar by name.

tekmar Control Systems Head Office: 5100 Silver Star Road, Vernon, B.C. Canada V1B 3K4, 250-545-7749, Fax. 250-545-0650
Web Site: www.tekmarcontrols.com

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Keep More \$\$\$
In Your Wallet

tekmar®

tekmar®

Outdoor Reset Controls Offer an Easy Way to Save 5 to 30% With Your Existing Heating System!

Running Your Boiler Too Hot is Like Driving Your Car Too Fast!

Even though your car is designed to operate at a high speed, most of the time you drive slower, adjusting your speed to match the current conditions. This improves fuel economy, comfort & safety.

In the same way, your boiler is designed to operate at a high temperature to match your home's heat loss on the coldest day of the year. Most North American locations have less than 10 days in a year that actually require this high temperature. A tekmar outdoor reset control continuously adjusts the boiler temperature to match current outdoor conditions. Lowering the boiler temperature for most of the year substantially reduces fuel consumption while improving comfort & safety.

Is Your Boiler Running Too Hot?



Savings from 5 to 30%

- = 5% savings
- = 18% savings
- = 30% savings

Up to 30% savings can be achieved by adding outdoor reset & cut-out control to your existing heating system.

mncee.org

Based on \$1000 Annual Heating Bill



Without Outdoor Reset boilers operate at a set temperature without regard to outdoor conditions or how much heat is actually required.

With Outdoor Reset the boiler temperature is lowered as the outdoor temperature rises. This matches boiler operation to how much heat your home needs, reducing fuel consumption while improving comfort.

tekmar Reset Control Facts:

- Outdoor reset control has been mandated for both new & existing boilers in European countries since the 1990's.
- The 1998 LEED® for Homes Rating Systems offers credit for systems with outdoor reset control.
- Outdoor reset works for both traditional & condensing boilers so you can keep your old boiler and still save.
- To save even more, Warm Weather Shut Down (cut-out) automatically turns the system off during warm weather.
- Baseboard heaters, radiators, and in-floor heating systems all benefit from outdoor reset control.
- tekmar has provided energy saving controls to North American residential and commercial buildings for over 20 years.

How a tekmar Outdoor Reset Control Works



The control monitors the current outdoor temperature with an external sensor.



When the room temperature drops, the thermostat requests heat from the tekmar control.



The control intelligently calculates the required temperature, providing heat without waste.



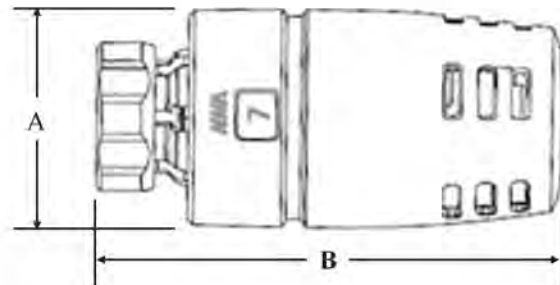
Your heating bills are lower.

Description

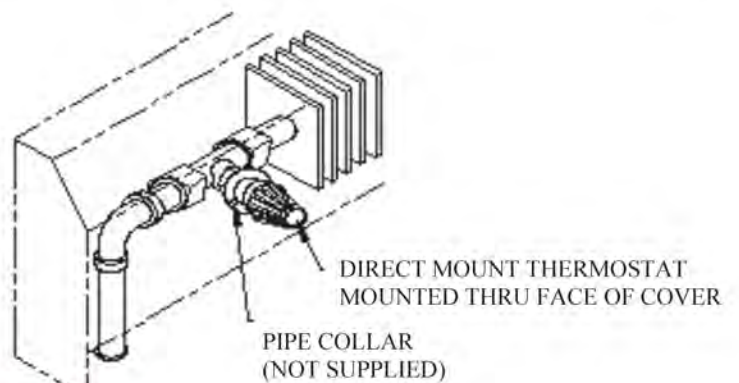
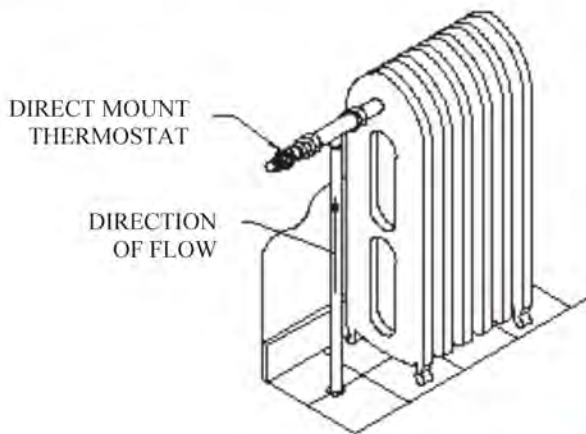
EVO is a self-acting, adjustable, non-electric thermostatic operator. It has adjustable max./min. temperature, selected temperature locking feature and can be shutoff completely if required. The symbol * protects against frost damage. Each EVO thermostatic operator is individually calibrated and conforms to ASHRAE standardization rules for temperature regulation. The EVO's smooth shape and narrow air gaps gives a nice operation and makes it easy to keep clean. They can be mounted on all Macon NT series valves.



NON-ELECTRIC OPERATORS



TECHNICAL DATA					
Temperature Setting Range	50°F to 82°F	Material	Engineered heat resistant thermoplastic (PBT,POM)		
Maximum Storage & Ambient Temp.	122°F				
Maximum Water Temp.	250°F			Nut	Low Lead Brass
Maximum Steam Pressure	15 psig			Weight	4.16 oz.
Maximum Differential Pressure	20 psi			Color	White
Suggested Differential Pressure	0.5 to 2.9 psi			Width (A)	1.73"
Max. Movement	0.125"			Height (B)	3.66"
Nominal Opening	0.018 (3.6°F)				
Long Term Test	5000 Cycles (1.3°F)				



NON-ELECTRIC OPERATORS

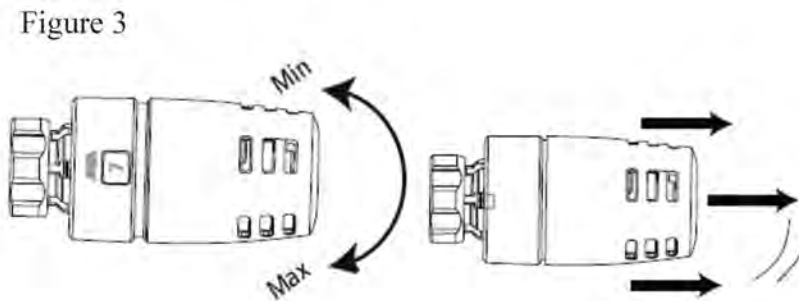
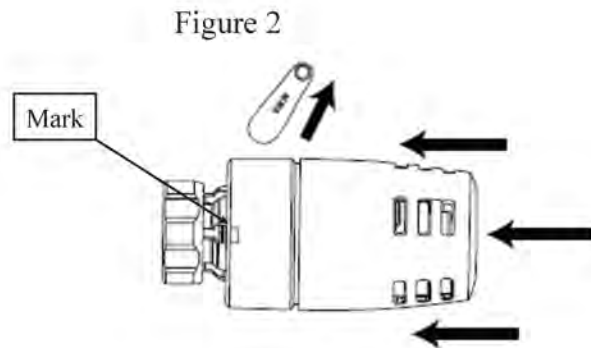
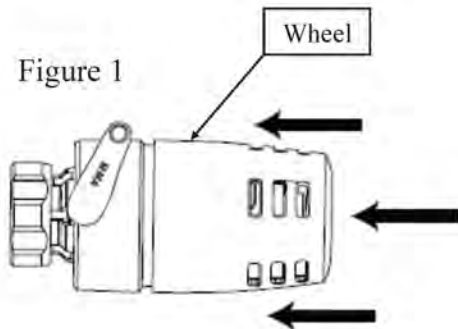
Maximum & Minimum Setting

Maximum setting

1. Turn the wheel to maximum.
2. Push the mark in with limit tool (located opposite the dial setting window) and press in the wheel handle 1-2 mm until it stops. (Figure 1)
3. Remove the limit tool and press in the wheel handle until it stops. (Figure 2)
4. Set the required temperature according to the chart below.
5. Pull the wheel handle out and the maximum temperature is set. (Figure 3)

Minimum setting

1. Turn the wheel to minimum
2. Push the mark in with limit tool (located opposite the dial setting window) and press in the wheel handle 1-2 mm until it stops.
3. Remove the limit tool and press in the wheel handle until it stops.
4. Set the required temperature according to the chart below.
5. Pull the wheel handle out and the minimum temperature is set.



DIAL SETTINGS								
0	*	1	3	5	6	7	8	9
Off	50	54	61	68	72	75	79	82
	Frost Protection							

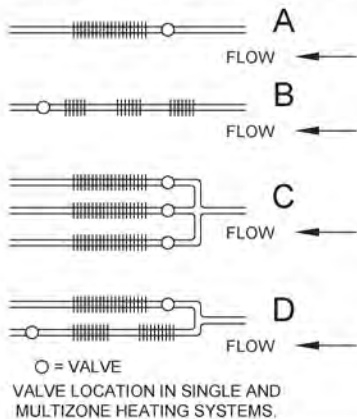


Operation

The *Macon* valve is designed to save energy by controlling hot water or low pressure steam heat in freestanding radiators, convectors, baseboards, fan coil units and the like in a loop, a zone or a unit. The valve, coupled with a *Macon* operator, provides a reliable automatic modulating unit. As room temperature drops, the *Macon* valve opens to allow more hot water or steam to flow through the radiator, thus allowing more heat into the room. When the room approaches the selected temperature, the operator causes the valve to begin closing off the flow of hot water or steam. This continued monitoring of the temperature is fully automatic, using no electricity whatsoever. The *Macon* valve can be equipped with any wide variety of *Macon* operators.

Features

- Compact dimensions
- Replaceable insert
- Stainless steel spindle
- Individual room control
- Easy one-trade installation
- Fuel savings up to 30%
- Prevents over- and under-heating
- Helps balance the heating system
- Same valve used for hot water or low pressure steam
- All NPT are forged brass nickel-plated
- Minimizes or eliminates expansion noises
- Suitable for nearly any hydronic heating application
- Operators can be changed without draining the system
- Shipped with a protective cap that can be used to control heating during the installing period



Vertical angle valve with straight nipple. NPT - female inlet, male union outlet.



- N10637 - 1/2"
- N10657 - 3/4"
- N10677 - 1"
- N10697 - 1-1/4"

Straight valve with straight nipple. NPT - female inlet, male union outlet.



- N10737 - 1/2"
- N10757 - 3/4"
- N10777 - 1"
- N10797 - 1-1/4"

Horizontal angle valve with straight nipple. NPT - female inlet, male union outlet.



- N10837 - 1/2"
- N10857 - 3/4"
- N10877 - 1"
- N10897 - 1-1/4"

Sweat valve with female inlet and outlet.



- N10930 - 1/2"
- N10950 - 3/4"
- N10970 - 1"

Fail closed valves also available, consult factory. All Macon valves and thermostats conform to ASHRAE Standard 102P-1983 and European Standard EN 215/1215. We are also ISO 9001 certified (1994) and ISO 14001 certified (1998).



DATA - Macon Valves for NT Series

Disc Material: EPDM

Body Styles: Straightway or angle

Maximum steam pressure: 15 psig

Maximum static pressure: 145 PSI

Maximum water temperature: 250°F

Body tappings: Female inlet, male union outlet, Female sweat

Body Material: Forged brass, NPT valves are nickel-plated

Max. Differential pressure: 20 psi H₂O, refer to thermostat specs

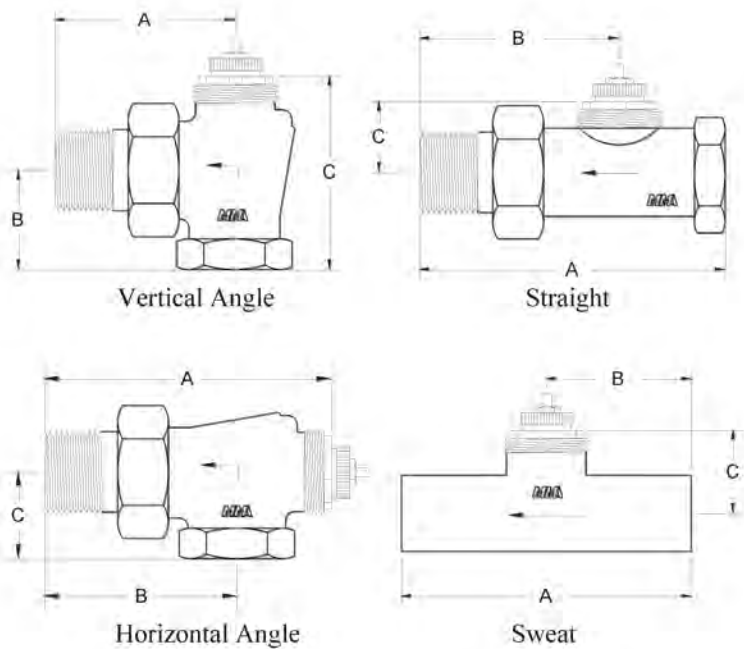
Suggested Differential Pressure = 0.5 to 2.9 psi

Overall Height: Add thermostat dimensions less 1/4"

Macon NT Series Valves are in an open position when no operator is attached.

CV:

1/2"	=	1.8
3/4"	=	2.5
1"	=	2.74
1-1/4"	=	3.5



DIMENSIONS & INSERTS					
VERTICAL ANGLE					
BODY #	SIZE	A	B	C	Insert
N10637	1/2"	2-3/4"	1"	1-3/4"	T23000
N10657	3/4"	2-1/2"	1-1/8"	2-1/8"	T23000
N10677	1"	3"	1-3/8"	2-1/4"	T25000 (LBLD)
N10697	1-1/4"	3-1/4"	1-3/4"	2-3/4"	T25000 (LBLD)
HORIZONTAL ANGLE					
BODY #	SIZE	A	B	C	Insert
N10837	1/2"	3-3/8"	2-3/16"	1-1/2"	T23000
N10857	3/4"	3-3/4"	2-1/2"	1-1/4"	T23000
N10877	1"	4-3/16"	3"	1-3/8"	T23000
N10897	1-1/4"	4-3/4"	3-1/4"	1-7/8"	T25000 (LBLD)
STRAIGHT					
BODY #	SIZE	A	B	C	Insert
N10737	1/2"	3-1/2"	2-1/16"	1"	T23000
N10757	3/4"	4"	2-1/2"	1"	T23000
N10777	1"	4-5/8"	2-15/16"	1"	T25000 (LBSD)
N10797	1-1/4"	5-1/4"	3-3/8"	1-1/8"	T25000 (LBLD)
SWEAT VALVES					
BODY #	SIZE	A	B	C	Insert
N10930	1/2"	2-3/16"	1-3/32"	1"	T23000
N10950	3/4"	2-11/16"	1-11/32"	7/8"	T23000
N10970	1"	3-5/32"	1-9/16"	1"	T25000 (LBSD)



Manufacturer Specification Sheets

ECM 6: Fuel Oil to Natural Gas Conversion

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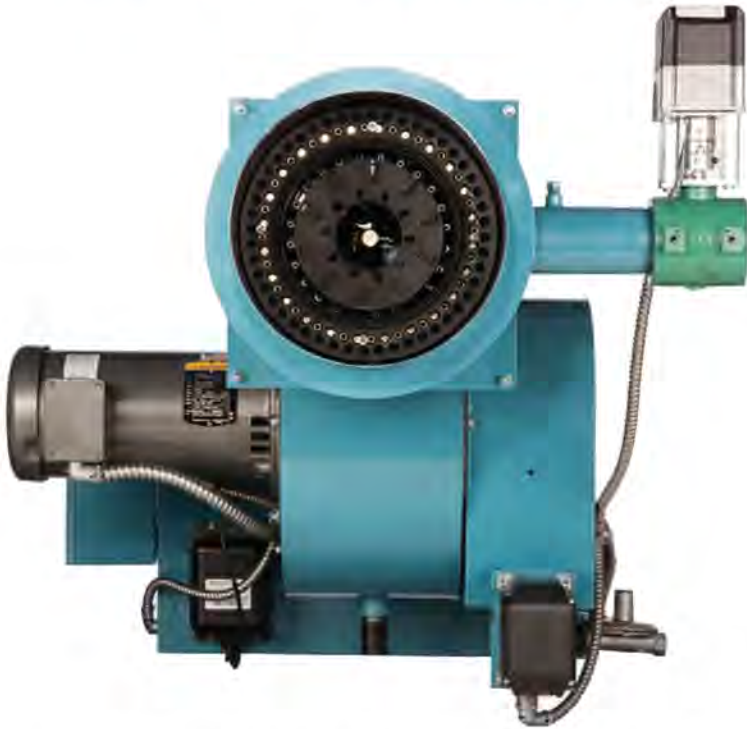
JB(X) Series Burners

**Efficient, Reliable, Safe Solutions For
Cast Iron, Firetube, Firebox, Watertube
And Process Applications**



10 BHP to 300 BHP Range

Benefits Of The JB And JBX Series Burners



Webster JB(X) series burners offer years of dependable and efficient operation. Designed with ease of serviceability in mind, Webster burners are equipped with a wide variety of the latest control and technology options available. When combined with the patented Webster Temp A Trim control system, the JB(X) burner is by far the most efficient option in the industry.

Versatility and flexibility are prime considerations in the

Webster JB(X) series design. JB(X) series units can be adapted to fire in most any furnace configuration or combustion environment, and Webster has years of proven experience firing a multitude of fuels including: Natural, LP, and Digester gas, No.2 through No. 6 oil, and other more exotic fuels.

Webster JB(X) burners are completely factory wired, assembled, and tested so they come to you ready for installation and connection to fuel and electrical supplies. Typical JB(X) series burners are installed and ready for start-up in a minimal amount of time, saving valuable time and money at your installation.

When it comes to low emission requirements, Webster should be your choice. The JB(X) series burner offers optional low NO_x configurations. Depending on the application, the JB(X) is available with and without Induced Flue Gas Recirculation for 30ppm requirements. Webster has been providing low emission units for more than 25 years and understands what it takes to meet your compliance requirements.

JB and JBX Features

Versatile

- Available in multiple housing and control panel configurations
- Fires multiple fuels
- Designed for all types of boilers, heaters and furnaces
- Proven performance in all types of applications

Reliable

- Outstanding flame stability
- High combustion efficiency
- Designed for ease of service
- Quiet operation
- UL & ULC Listed

Adaptable

- Standard or inverted housing
- Burner mounted or remote control panels
- Standard or low NOx designs available

Efficient

- Linkageless control options
- Add Temp A Trim for most efficient operation and quick payback



Webster Combustion has the best lead times in the industry. To configure the perfect JB(X) burner for your application and obtain current scheduling information, contact Webster or visit www.webster-engineering.com to locate a sales office in your area.

JB(X) Series Maximum Input Capacity Ratings

Burner Model	Min Req'd Gas Press	Std Gas Train Size	Max Firing Rate (MBH) Std	Max Firing Rate (MBH) w/FGR	Fan Motor HP
JB(X)1*-02	6"wc	1"	1000	800	1/4
JB(X)1*-03	8"wc	1-1/4"	1500	1200	1/3
JB(X)1*-05	8"wc	1-1/2"	2100	1680	1/2
JB(X)1*-07	11"wc	1-1/2"	2500	2000	3/4
JB(X)2*-07	13"wc	1-1/2"	2800	2240	3/4
JB(X)2*-10	14"wc	2"	3500	2800	1
JB(X)2*-15	14"wc	2"	3500	2800	1-1/2
JB(X)2*-20	14"wc	2"	4200	3360	2
JB(X)2*-30	14"wc	2-1/2"	5300	4240	3
JB(X)2*-50	18"wc	2-1/2"	6000	4800	5
JB(X)3*-30	1 psig	2-1/2"	6300	5040	3
JB(X)3*-50	1 psig	3"	8300	6640	5
JB(X)3*-75	1 psig	3"	10,500	8400	7-1/2
JB(X)3*-100	1.5 psig	3"	12,600	10,080	10

* Can be "G" (Gas), "O" (Oil) or "C" (Combination Gas/Oil)

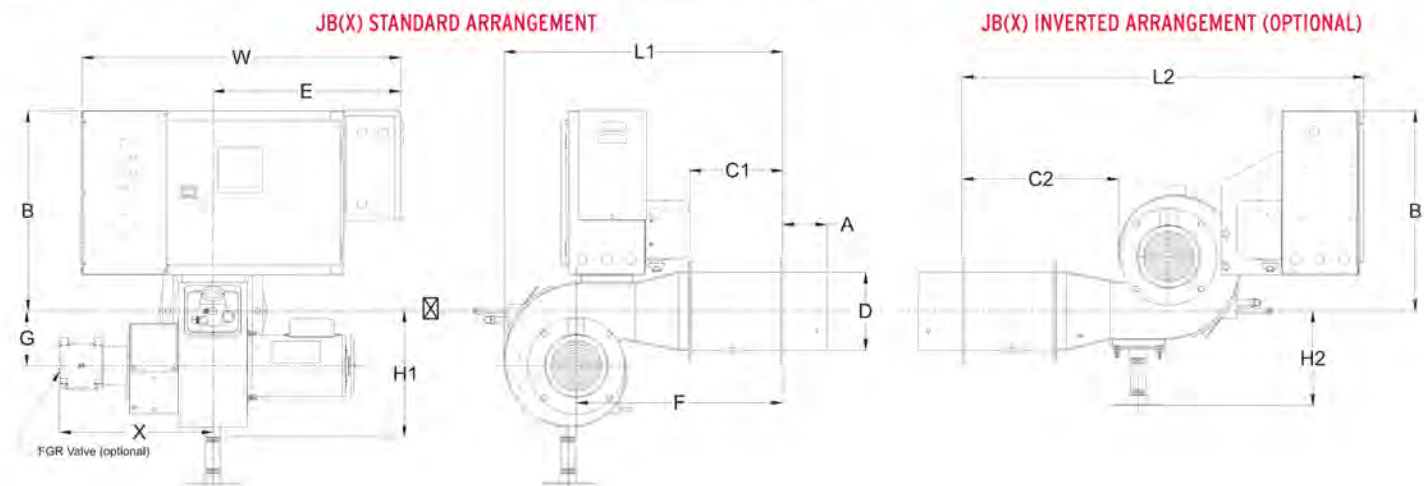
JB(X) Series Typical Dimensions (Inches)

Model	A	B1	B2	C1	C2	D	E	F**	G**	H1***	H2***	L1*	L2	W***	X**
JB(X)1	4	18 ^{3/8}	18 ^{3/8}	8 ^{1/4}	14 ^{3/8}	7 ^{1/4}	11 ^{7/16}	18 ^{15/16}	5	15 ^{11/16}	11 ^{3/8}	26 ^{5/8}	36 ^{15/16}	21 ^{7/8}	13 ^{3/4}
JB(X)2	4	19 ^{1/16}	18 ^{1/2}	9 ^{1/2}	14	9 ^{1/8}	17 ^{3/4}	20	6 ^{5/8}	19	12 ^{1/8}	28 ^{5/8}	39 ^{1/4}	30 ^{11/16}	24 ^{1/4}
JB(X)3	4	19 ^{15/16}	19 ^{3/16}	15 ^{5/16}	19 ^{1/4}	11 ^{1/4}	23 ^{1/4}	26 ^{15/16}	8 ^{5/16}	22 ^{1/2}	14 ^{3/4}	38 ^{1/4}	48	36 ^{3/4}	29 ^{1/2}

* Add 1/4" to Dimension L1 for heavy oil burners. Use Dimension L2 for alternate control cabinet location.

** On units with FGR for NOx reduction, FGR valve will emerge from side of burner opposite blower motor.

*** Extra ground clearance & width may be required for the addition of FGR. Consult factory for details.



The Better Boiler Burner.

Represented By

619 Industrial Road, Winfield, KS 67156 / Phone: 620-221-7464 / Fax: 620-221-9447
www.webster-engineering.com / sales@webster-engineering.com



KNIGHT FIRE TUBE BOILERS - FLOOR AND WALL MOUNT MODELS

Job Name:

Engineer:

Contractor:

Model #:

Location:

Agent/Wholesaler:

Type Gas:

Equipment Tag(s):

JOB NOTES:

Smart System Features

- › **Smart System Digital Operating Control**
Multi-Color Graphic LCD Display w/Navigation Dial, Soft Keys and Loch-N-Link USB programming
- › **Three Boiler Setpoint Temperature Inputs**
Plus Domestic Hot Water Prioritization
- › **Built-in Cascading Sequencer for up to 8 Boilers, with Cascade Redundancy**
Multiple Size Boiler Cascade
Lead Lag
Efficiency Optimization
Front End Loading Capability
- › **Outdoor Reset Control with Outdoor Air Sensor**
Programmable for Three Reset Temperature Inputs
- › **Programmable System Efficiency Optimizers**
SH Night Setback
DHW Night Setback
Anti-Cycling
Outdoor Air Reset Curve
Ramp Delay
Modulation Factor Control
Boost Temperature & Time

Standard Features

- › **95% DOE AFUE Efficiency (55-285)**
- › **Modulating Burner with up to 10:1 Turndown****
Direct Spark Ignition
Low NOx Operation
- › **ASME Stainless Steel Heat Exchanger**
30 PSI ASME Relief Valve
- › **Top and bottom water connections (MNPT, WHB 55-285 Only)**
- › **Vertical & Horizontal Direct Vent**
PVC, CPVC, Polypropylene or SS Venting up to 100 ft.
- › **Universal Vent Adapter**
Built-in Combustion Analyzer Port
- › **SMART SYSTEM™ Control**
- › **Condensate Trap**
- › **ECM Variable Speed Boiler Circulating Pump**
- › **110V Convenience Outlet**
- › **High Altitude Models Available**
- › **Other Features**
Automatic Reset High Limit
Adjustable High Limit w/Manual Reset
Zero Clearances to Combustible Materials
15-Year Limited Warranty (See Warranty for Details)
5-Year Limited Parts Warranty

- › **Four Pump Control**
System Pump with Parameter for Continuous Operation
Boiler Pump with Variable Speed Control
Domestic Hot Water Pump
Domestic Hot Water Recirculation
- › **Domestic Hot Water Prioritization**
DHW tank piped with priority in the boiler loop
DHW tank piped as a zone in the system with the pumps controlled by the SMART SYSTEM
DHW Modulation Limiting
Separately Adjustable Space Heat/DHW Switching Times
- › **Building Management System Integration**
0-10 VDC Input to Control Modulation or Setpoint
0-10 VDC Modulation Rate Output
0-10 VDC Input to Enable/Disable Call for Heat
- › **Access to BMS Settings through Graphic LCD Display**
- › **High-Voltage Terminal Strip**
120 VAC / 60 Hertz / 1 Phase Power Supply
Three Sets of Pump Contacts
- › **Low-Voltage Terminal Strip**
DHW Recirculation Pump Start/Stop
24 VAC Device Relay
Configurable Proving Contacts
Flow Switch Contacts
Alarm on Any Failure Contacts
Runtime Contacts
DHW Thermostat Contacts
3 Space Heat Thermostat Contacts
System Sensor Contacts
DHW Tank Sensor Contacts
Outdoor Air Sensor Contacts
Cascade Contacts



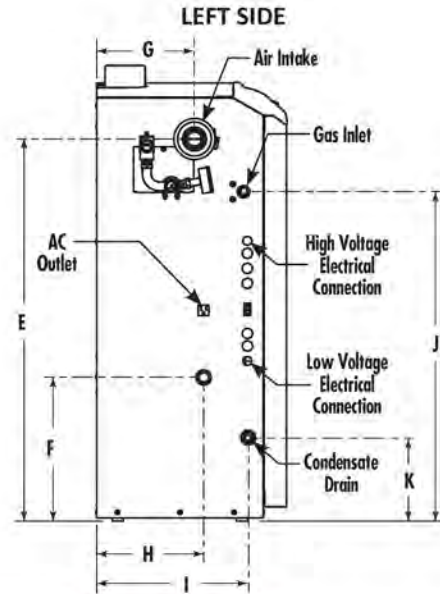
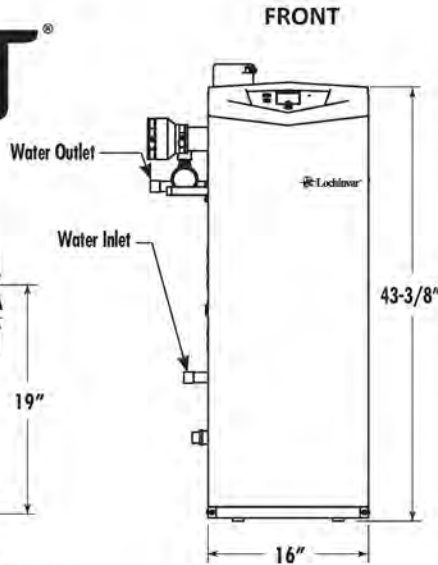
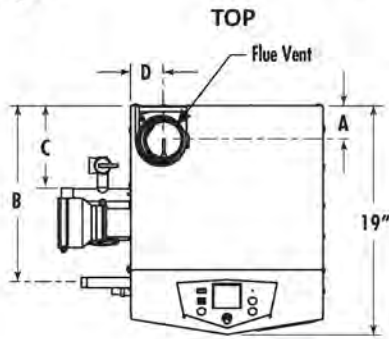
- 0-10 VDC BMS External Control Contact
- 0-10 VDC Boiler Rate Output Contacts
- 0-10 VDC Variable Speed System Pump Signal Input
- 0-10 VDC Signal to Control Variable Speed Boiler Pump
- Modbus Contacts

- › **Time Clock**
- › **Data Logging**
Hours Running, Space Heating
Hours Running, Domestic Hot Water
Ignition Attempts
Last 10 Lockouts
- › **Maintenance Reminder**
Custom Maintenance Reminder with Contractor Contact Information
Installer Ability to De-activate Service Reminder
- › **Low-Water Flow Safety Control & Indication**
- › **Password Security**
- › **Customizable Freeze Protection Parameters**

Optional Equipment

- CON-X-US Remote Connectivity
- Modbus Communication
- BACnet MSTP
- Flow Switch
- Low-Water Cutoff w/Manual Reset & Test
- Alarm Bell
- Concentric Vent Kit
- Condensate Neutralization Kit
- BMS Gateway to LON or BACnet IP
- Multi-Temperature Loop Control
- Sidewall Vent Termination
- Wireless Outdoor Sensor
- LP Gas Conversion Kit
- › **Firing Codes**
- M9 Standard Construction

**5:1 on WHB399

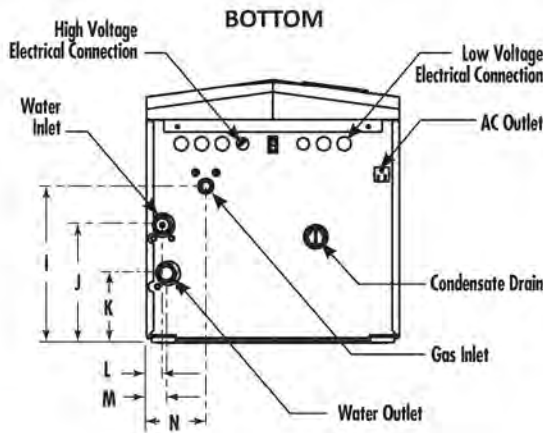
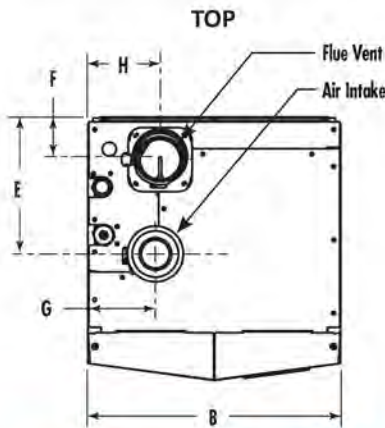


FLOOR MOUNT

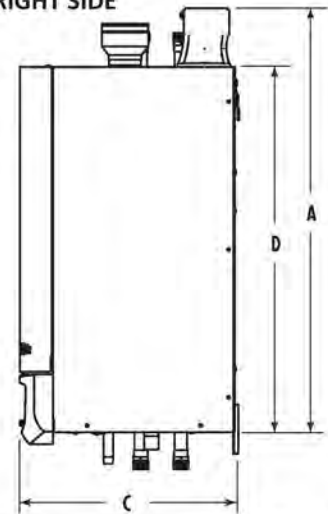


Model Number	Input MBH		AFUE%	Heating Capacity MBH	Net AHRI Rating MBH	A	B	C	D	E	F	G	H	I	J	K	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Shipping Weight (lbs.)
	Min	Max																			
○ KHB055N	8.3	55	95	51	44	3-1/2"	13-1/4"	6"	2-3/4"	37-2/3"	13-1/2"	8-1/3"	10-1/2"	15"	32-1/2"	8-1/3"	1/2"	1"	2"	2"	160
○ KHB085N	8.5	85	95	79	69	3-1/2"	13-1/4"	6"	2-3/4"	37-2/3"	13-1/2"	8-1/3"	10-1/2"	15"	32-1/2"	8-1/3"	1/2"	1"	2"	2"	165
○ KHB110N	11	110	95	102	89	2-3/4"	14-3/4"	7-1/2"	2-3/4"	38"	14-1/3"	9-3/4"	10-1/2"	15"	33"	8-1/3"	1/2"	1"	3"	3"	170
○ KHB155N	15.5	155	95	144	125	2-3/4"	14-3/4"	7-1/2"	2-1/2"	38"	14-1/3"	9-3/4"	10-1/2"	15"	33"	8-1/3"	1/2"	1"	3"	3"	175
○ KHB199N	19.9	199.9	95	185	161	3"	15-1/2"	7-1/2"	2-1/2"	38-1/3"	14-1/3"	10-1/2"	11-1/2"	15"	33"	8-1/3"	1/2"	1-1/4"	3"	3"	195
○ KHB285N	28.5	285	95	264	229	3"	15-1/2"	7-1/2"	2-1/2"	38-1/3"	14-1/3"	10-1/2"	11-1/2"	15"	33"	8-1/3"	1/2"	1-1/4"	3"	3"	205

* Information subject to change without notice. Change "N" to "L" for LP gas models. * The Net AHRI Water Ratings shown are based on a piping and pickup allowance of 1.15. * Lochinvar should be consulted before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping systems, etc. * The ratings have been determined under the provisions governing forced draft burners.



RIGHT SIDE



WALL MOUNT



Model Number	Input MBH		AFUE %	Heating Capacity MBH	Net AHRI Rating MBH	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Gas Conn.	Water Conn.	Air Inlet	Vent Size	Shipping Wt. (lbs.)
	Max.	Min.																						
○ WHB055N	55	8.3	95	51	44	40"	18-3/4"	16"	31-1/8"	8-1/2"	3-3/4"	4-1/2"	6-1/2"	7-1/4"	8-7/8"	3-1/2"	1-1/2"	1-1/2"	6"	1/2"	1"	2"	2"	139
○ WHB085N	85	8.5	95	79	69	39-3/4"	18-3/4"	16"	31-1/8"	8-1/2"	3-3/4"	4-1/2"	6-1/2"	7-1/4"	8-7/8"	3-1/2"	1-1/2"	1-1/2"	6"	1/2"	1"	2"	2"	142
○ WHB110N	110	11	95	102	89	41-1/4"	18-3/4"	19"	31-1/8"	10"	2-3/4"	5"	5-1/4"	11-1/2"	8-1/2"	5"	1"	1"	4-1/2"	1/2"	1"	3"	3"	159
○ WHB155N	155	15.5	95	144	125	41-1/4"	18-3/4"	19-1/8"	31-1/8"	10"	2-3/4"	5"	5-1/4"	11-1/2"	8-1/2"	5"	1"	1"	4-1/2"	1/2"	1"	3"	3"	166
○ WHB199N	199.9	19.9	95	185	161	41-1/4"	18-3/4"	19-1/8"	31-1/8"	10-1/2"	3"	5-1/4"	6"	11"	9-1/2"	6-1/4"	1-1/2"	1-1/2"	4-1/2"	1/2"	1-1/4"	3"	3"	175
○ WHB285N	285	28.5	95	264	229	41-3/4"	18-3/4"	21-1/8"	31-1/8"	15"	3"	3-3/4"	5-1/4"	12-1/4"	11"	6-1/4"	1-1/2"	1-1/2"	6-1/2"	1/2"	1-1/4"	3"	3"	184
○ WHB399N	399	80	94.4*	377†	328	43-1/4"	25-1/4"	21-7/8"	34"	3-1/2"	4-1/4"	22-1/2"	3-7/8"	8-7/8"	12-1/2"	9-1/4"	2"	2"	21-1/2"	3/4"	1-1/2"	4"	4"	213

* Thermal Efficiency%
 † Gross Output MBH
 **10:1 Turndown ratio and top and bottom water connections are not included on WHB399.
 WHB399 operates with a 5:1 turndown.

* Information subject to change without notice. Change "N" to "L" for LP gas models. * The Net AHRI Water Ratings shown are based on a piping and pickup allowance of 1.15. * Lochinvar should be consulted before selecting a boiler for installations having unusual piping and pickup requirements, such as intermittent system operation, extensive piping systems, etc. * The ratings have been determined under the provisions governing forced draft burners.



Lochinvar, LLC
 300 Maddox Simpson Parkway
 Lebanon, Tennessee 37090
 P: 615.889.8900 / F: 615.547.1000
 Lochinvar.com



CYCLONE® HE POWER VENT

The Cyclone® HE is a light-duty, power vent, fully condensing commercial gas water heater with an internal helical heat exchanger, similar to the design of A. O. Smith's industry-leading Cyclone® models. This helical heat exchanger helps Cyclone® HE achieve 94% thermal efficiency and deliver outstanding hot water output.

INTELLI-VENT™* GAS CONTROL WITH SILICON NITRIDE HOT SURFACE IGNITOR

- Premium-grade hot surface ignitor eliminates standing pilot.
- Electronic circuitry provides superior system diagnostics capabilities plus extremely precise temperature control.
- Temperature control up to 181°F.

POWER VENT DESIGN FOR INSTALLATION VERSATILITY

- Modular blower, with 6-foot cord and standard 3-prong connector.
- Combined vertical and horizontal runs terminating through an outside wall, using Schedule 40 PVC, CPVC or polypropylene pipe: Canadian installations require ULC S636 approved pipe for venting.
 - 2" pipe allows vent runs up to 25 equivalent feet
 - 3" pipe allows vent runs up to 65 equivalent feet
 - 4" pipe allows vent runs up to 128 equivalent feet

HIGH OUTPUT WITH SMALL FOOTPRINT

- 22" diameter, combined with 94% efficiency, 50-gallon tank and 76,000 BTU input means Cyclone® HE can be installed in less space than a larger 75-gallon unit, with equal or better performance.
- Total height is 71 1/8" to top of blower outlet.

GREEN CHOICE® GAS BURNER

- Patented eco-friendly burner design reduces NOx emissions by up to 33% and complies with Low-NOx emission requirements of less than 40 ng/J.

SIDE-MOUNTED TAPS FOR RECIRCULATING SYSTEMS

- Hot and cold side taps allow Cyclone® Power Vent to be used for combination systems for water heating plus space heating, radiant floor heating or other applications requiring a recirculating hot water loop.

BLUE DIAMOND® GLASS COATING WITH TWO HEAVY DUTY ANODE RODS

- Provides superior corrosion resistance compared to industry standard glass lining.

DYNACLEAN™ DIFFUSER DIP TUBE

MAXIMUM HYDROSTATIC WORKING PRESSURE: 150 PSI

STANDARDS AND CERTIFICATIONS

- Meets UBC, CEC and ICC National Codes.
- Meets the thermal efficiency and standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IES 90.1.
- Design certified by Underwriters Laboratories Inc. under American National Standard/CSA Standard for Gas Water Heaters ANSI Z21.10.3 - CSA 4.3 (current edition).
- CSA certified and ASME rated T&P relief valve.
- Not recommended for sanitation rinse.

3-YEAR LIMITED TANK AND 1-YEAR LIMITED PARTS WARRANTY

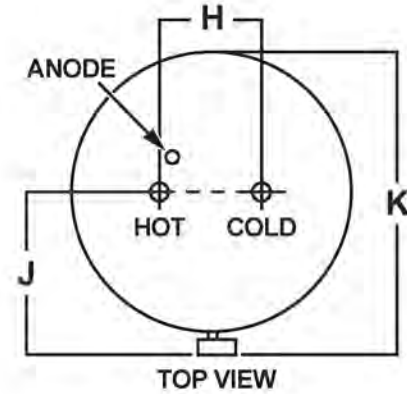
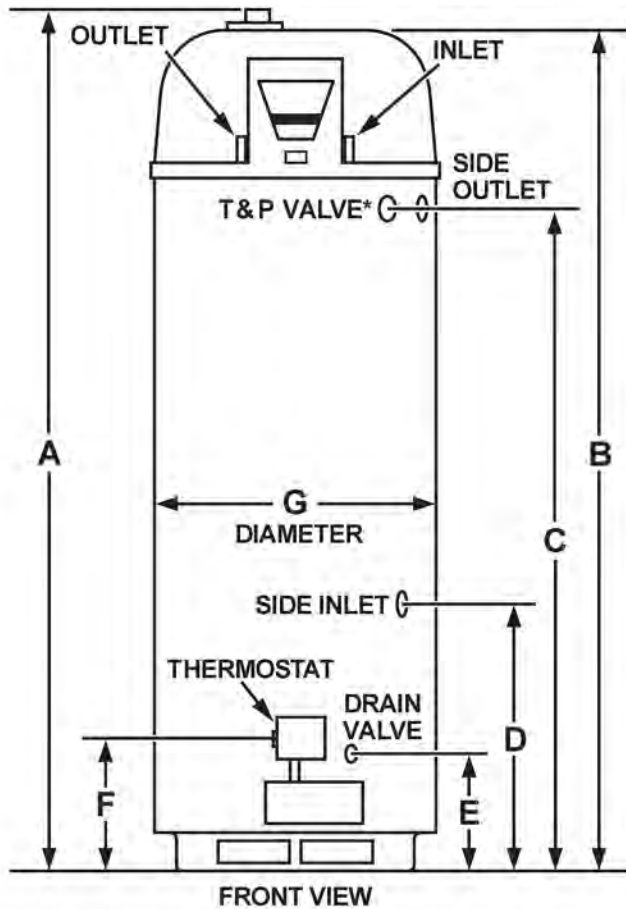
- For complete warranty information, consult written warranty or go to hotwater.com.

*Intelli-Vent™ is a trademark of Emerson Electric Company



SERIES 120





*INSTALL IN ACCORDANCE WITH LOCAL CODES

Model Number	Gallon/Litre Capacity	Recovery @ 90°F Rise Gallon Per Hour	BTU Input Per Hour	Dimensions	A	B	C	D	E	F	G	H	J	K	Approx. Shipping Weight (lbs/kg)
					Inches	68 3/4	51 7/8	20 7/8	9-1/8	12	22	8	15-3/4	27	
BTX-80	50/189	95	76,000	Inches	71-1/8	68 3/4	51 7/8	20 7/8	9-1/8	12	22	8	15-3/4	27	225/102
				cm	181	175	132	53	23	30	56	20	40	68	

Available in natural gas only.
 Top inlet and outlet connections: 1/2" male NPT.
 Circulation loop connections: 3/4" female NPT.
 Standard model certified for sea level to 5,300 ft. elevation. Order SMR K30 for elevations to 10,100 ft.
 Optional Condensate Neutralizer Kit available (Part Number 100112380).
 Electrical characteristics: 120 volt, 60 Hz <5 amps

Model Number	Recovery Capacities													
	Temperature Rise	°F	30	40	50	60	70	80	90	100	110	120	130	140
		°C	17	22	28	33	39	44	50	56	61	67	72	78
BTX-80	GPH		286	215	172	143	123	107	95	86	78	72	66	61
	LPH		1084	813	651	542	465	407	361	325	296	271	250	232

For Technical Information, call 800-527-1953. A. O. Smith Corporation reserves the right to make product changes or improvements without prior notice.

Manufacturer Specification Sheets

ECM 8: Variable Frequency Drives for HW Pumps

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Altivar 212 & S-Flex enclosed variable speed drives

for 3-Phase asynchronous motors from 1 to 100 hp, 0.75 to 75 kW

eCatalog
2014





Altivar 212 variable speed drives

Altivar 212 variable speed drives

Introduction



[Product Webpage](#)

[Quick Look Video](#)

Introduction

The **Altivar™ 212** drive is a frequency inverter for **1-100 HP, 0.75-75 kW three-phase asynchronous motors**.

It has been designed for the most common HVAC (Heating, Ventilation and Air Conditioning) systems.

Its design is based on eco-energy with a reduction in energy consumption of up to 70% compared to a conventional control system.

It is eco-friendly and complies with directives such as RoHS, WEEE, etc. relating to environmental protection.

The Altivar 212 is operational from the moment the power is turned on; it can be used to achieve your building's maximum energy efficiency.

Applications

Ventilation



Heating & Air conditioning



Pumping



Optimization of building management

The Altivar 212 drive considerably improves building management by:

- Simplifying circuits by removing flow control valves and dampers,
- Offering flexibility and ease of adjustment for installations, thanks to its compatibility with building management system connectivity
- Reducing noise pollution (noise caused by air flow and motor)

Its various standard versions make it possible to reduce installation costs by integrating EMC filters, categories C1 to C3 depending on the model, which has the following advantages:

- Compact size
- Simplified wiring

The Altivar 212 offer helps to reduce equipment costs while optimizing its performance.

Compliance with international standards & certifications

The Altivar 212 conforms to international standards and is in accordance with recommendations relating to electrical industrial control devices, including the Low Voltage Directive and IEC/EN 61800-5-1. It takes into account observing requirements in respect of electromagnetic compatibility and conforms to international standard IEC/EN 61800-3 (immunity and conducted and radiated EMC emissions).

The entire range has obtained CE marking according to the European Low Voltage (2006/95/EC) and EMC (2004/108/EC) Directives. The range is UL 508C, CSA, C-Tick and NOM certified.

Flexible communication adapted to building management

The Altivar 212 drive is easily adapted to building management systems thanks to its numerous functions and communication protocols integrated as standard: Modbus, METASYS N2®, APOGEE FLN P1® and BACnet®. With these protocols offered as standard and the LonWorks® communication card offered as an option, the Altivar 212 drive is optimized for the building market (HVAC).

Quick and easy dialogue to make your installations easier to use

Numerous programming tools are also included in the Altivar 212 offer, making installations quick, easy and cost-effective.

Altivar 212 variable speed drives

Introduction



ATV 212H075M3X



ATV 212HD22N4



ATV 212W075N4,
ATV 212W075N4C

Applications (continued)

The Altivar 212 range of variable speed drives extends across a range of motor power ratings from 1 HP to 100 HP, 0.75 kW to 75 kW with the following types of power supply:

- 200...240 V three-phase, 1 HP to 40 HP, 0.75 kW to 30 kW, IP 21
(ATV 212H●●●M3X)
- 380...480 V three-phase, 1 HP to 100 HP, 0.75 kW to 75 kW, IP 21
(ATV 212H●●●N4)
- 380...480 V three-phase, 1 HP to 100 HP, 0.75 kW to 75 kW, UL Type 12/IP 55
(ATV 212W●●●N4 and ATV 212W●●●N4C)

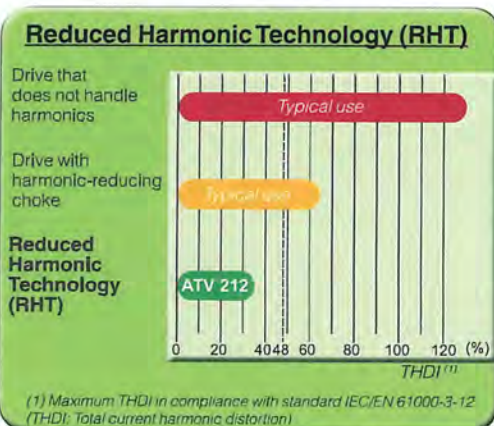
Altivar 212 drives are compact IP 21 or UL Type 12/IP 55 products which meet electromagnetic compatibility requirements and reduce current harmonics, causing minimal temperature rise in the cables.

Compliance with electromagnetic compatibility (EMC) requirements for the protection of equipment

The built-in EMC filters in **ATV 212●●●●N4** and **ATV 212W●●●N4C** drives and compliance with EMC requirements simplify installation and provide a very economical means of ensuring devices meet the criteria to receive the CE mark.

The EMC filters can be used to meet the requirements of the IEC/EN 61800-3, category C2 or C3 for **ATV 212●●●●N4**, category C1 for **ATV 212W●●●●N4C**.

ATV 212H●●●M3X drives have been designed without an EMC filter. Filters are available as an option and can be installed by the user to reduce emission levels.



An innovative technology for managing current harmonics: cable temperature rise reduction technology

Innovative technology for managing harmonics

Thanks to its Reduced Harmonic Technology (RHT), the Altivar 212 drive offers immediate, disturbance-free operation. This technology avoids having to resort to additional options such as a line choke or DC choke to deal with current harmonics. This makes it possible to obtain a THDI⁽¹⁾ of less than 35%, a much lower value than the 48% level of THDI imposed by standard IEC/EN 61000-3-12.

With the Altivar 212 range, you avoid the cost of adding a line choke or DC choke, you reduce the time spent on wiring, you optimize the enclosure size and you reduce the losses.

This technology can also triple the service life of the DC capacitors.

White Paper -
"RHT"

Better management of motor disturbance

The Altivar 212 offers optional motor chokes which can increase the maximum cable lengths between the drive and the motor and limit disturbance at the motor terminals.

Altivar 212 variable speed drives

Introduction



Side-by-side mounting of Altivar 212 drives

Product

The compact nature of the Altivar 212 range simplifies installation and reduces costs by optimizing the size of enclosures (whether floor-standing or wall-mounted).

Altivar 212 drives can be mounted in a variety of ways to adapt to the needs of an installation. They can be mounted side by side, and can also be wall-mounted in compliance with UL Type 1 requirements using kits **VW3A3181** and **VW3A920**. They are designed to operate in an enclosure at an ambient temperature of +40°C or +50°C depending on the model, without derating, or from +50°C or +60°C depending on the model, with derating.

The Altivar 212 drive includes 3 logic inputs, 2 analog inputs, 1 analog output and 2 relay outputs (with 1 NO and 1 NO/NC contacts). It also includes an integrated 4 digit, 7 segment LED display with 7 button keypad, as well as RJ45 Modbus™ port, plus a 4 screw removable terminal block for software selectable BACnet, Modbus, METASYS N2 or APOGEE P1 communication protocols. LonWorks is available in an option card.

Numerous configuration tools

The Altivar 212 range offers a wide range of dialogue and configuration tools that make it quick, easy and cost-effective to install.

LCD Keypad (3)

The Altivar 212 drive (1) can be used with the remote graphic display keypad, common to all Schneider Electric's variable speed drive ranges.

This keypad is very user-friendly when performing startup and maintenance operations thanks to its full-text screen, online help screens and text in the user's language (6 factory-installed languages available).

It can be remotely mounted on an enclosure door with IP 54 or IP 65 degree of protection.

SoMove software (2)

SoMove software is a PC based application. It can be used to edit the Altivar 212 drive parameters, save configurations, import them from a PC and export them to a PC.

Multi-Loader configuration tool (4)

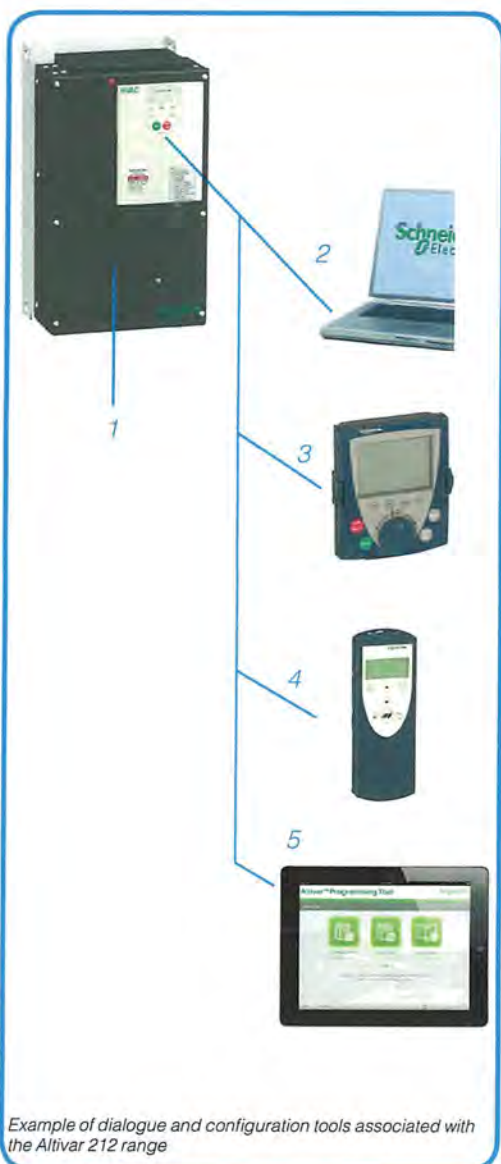
The Multi-Loader tool enables configurations to be copied from a PC or a drive and duplicated on another drive. The Altivar 212 drives must be powered-up.

Quick menu tool

The Altivar 212 drive offers a quick setup function in the form of its Quick menu, which includes the 10 key installation parameters (acceleration, deceleration, motor parameters, etc.).

Free iPad® app (5)

The Altivar 212 drive can be connected directly to an iPad with optional 30-pin mobile to RS485 with RJ45 connector converter cable (model VW3A8151R20U).



Example of dialogue and configuration tools associated with the Altivar 212 range



Example of an application requiring the use of dedicated building functions

Programming Manual

Functions

Dedicated functions for ventilation applications

- Noise reduction due to the switching frequency, which is adjustable up to 16 kHz during operation
- Automatic catching of a spinning load with speed detection
- Adaptation of current limiting according to speed
- Reference calibration and limitation

Protection functions

- Smoke purge system (forced operation with fault inhibition)
- Damper control with end switch interlock
- Machine protection via skip frequency function (resonance suppression).

Dedicated functions for pumping applications

- Sleep/wake-up

Protection functions

- Protection against overloads and overcurrents in continuous operation (pump jamming)
- Machine mechanical protection with control of operating direction
- Protection of the installation by means of underload and overload detection

Universal functions designed specifically for building applications

- Energy saving ratio
- Auto-tuning
- Integrated PID regulator with preset references and automatic/manual ("Auto/Man.") mode
- Automatic ramp adaptation, ramp switching, ramp profile
- Switching between sets of motor rating data (Multimotor)
- Switching of references and run command using the LOC/REM key
- Preset speeds
- Monitoring, measurement of energy consumption
- kWh and elapsed run time meters

Protection functions

- Motor and drive thermal protection, via a built-in PTC thermistor probe
- Protection via management of multiple detected faults and configurable alarms

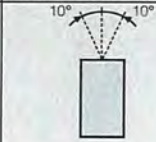
Altivar 212 variable speed drives

Specifications Electrical & Environmental

Electrical Specifications

Input power	Voltage	V	200 - 15% to 240 + 10% three-phase for drives ATV212H●●●M3X 380 - 15% to 480 + 10% three-phase for drives ATV212H●●●N4, W●●●N4, W●●●N4C
	Frequency	Hz	50...60 ± 5%
Drive output voltages		V	200...240 three-phase for drives ATV212H●●●M3X 380...480 three-phase for drives ATV212H●●●N4, W●●●N4, W●●●N4C
Output frequency range		Hz	0.5...200
Configurable switching frequency		kHz	The switching frequency can be set between 6 and 16 kHz for all ratings. These values are given for a nominal switching frequency of: <ul style="list-style-type: none"> ■ 12 kHz up to ATV212HD15M3X and up to ATV212HD15N4 ■ 8 kHz for ATV212HD18M3X...HD30M3X and ATV212HD18N4...HD75N4 drives ■ 6 kHz for ATV212HD22N4S for use in continuous operation at 40°C (104 °F) ambient. In general, derate is 10% for every 2kHz increase in carrier frequency. Refer to the Installation Manual for derating curves for each Altivar 212 drive.
Speed range			1...10 for asynchronous motors
Transient overtorque			Transient overload: 110% of the nominal drive current for 60 seconds
Braking torque			DC Injection only
Maximum transient current			110% of the nominal drive current for 60 seconds, 180% for 2 seconds
Motor control profiles			"For asynchronous motors: Sensorless flux vector, 2 point volts/hertz, quadratic volts/hertz, energy savings mode: a optimization motor algorithm that automatically optimizes voltage based on load."
Maximum length of motor cable (including tap links)	Shielded cable	m	50
	Unshielded cable	m	100
Drive noise level	All drives	dBA	54 dB conforming to 86/188/EEC
Electrical isolation			Galvanic isolation between power and control (inputs, outputs and power supplies)

Environmental Specifications

Vibration resistance	Drive not DIN rail mounted		According to IEC/EN 60068-2-6: <ul style="list-style-type: none"> ■ 1.5 mm peak from 3 to 13 Hz According to IEC/EN 60068-2-8: <ul style="list-style-type: none"> ■ 1 gn from 13 to 200 Hz
Shock resistance			15 gn for 11 ms conforming to EN/IEC 60068-2-27
Maximum ambient pollution	Definition of insulation		1 HP to 25 HP @ 200/240 V, 1 HP to 5 HP @ 380/480 V: <ul style="list-style-type: none"> ■ Pollution degree 2 per IEC/EN 61800-5-1, 30 HP to 40 HP @ 200/240 V, 30 HP to 100 HP @ 380/480 V: <ul style="list-style-type: none"> ■ Pollution degree 3 per IEC/EN 61800-5-1
Environmental conditions Use			IEC 60721-3-3 classes 3C1 and 3S2
Relative humidity		%	up to 95% non-condensing , IEC 60068-2-3
Ambient air temperature	Operation	°C	0 to + 40C operational without de-rating, up to 50C with de-rating. See Installation manual for deratings
	Storage around the device ATV12●●●●●●	°C	- 25...+ 70
Maximum operating altitude		m	Up to 3,300 ft (1,000 meters) without de-rating, de-rate nominal current by 1% for each additional 330 ft (100m) up to 10,000 ft (3,000 m) Limit to 6,600 ft (2,000 m) if supplied by corner grounded distribution system
Operating position	Maximum permanent angle in relation to the normal vertical mounting position		

Consultant
Specifications

White Paper -
"Improve Efficiency"

Altivar 212 variable speed drives

Specifications Certifications & Compliance

Certifications and Compliance

Conformity to standards	Altivar 212 drives have been developed to conform to international standards and the recommendations relating to electrical industrial control equipment (IEC, EN), in particular: IEC/EN 61000-3-12 THDI harmonic standard, IEC 61800-5-1.
EMC Immunity	<p>Conducted radio-frequency immunity test level 3 conforming to IEC 61000-4-6</p> <p>Radiated radio-frequency electromagnetic field immunity test level 3 conforming to IEC 61000-4-3</p> <ul style="list-style-type: none"> ■ Voltage dips and interruptions immunity test conforming to IEC 61000-4-11 ■ 1.2/50 μs - 8/20 μs surge immunity test level 3 IEC 61000-4-5 ■ Electrical fast transient/burst immunity test level 4 conforming to IEC 61000-4-4 ■ Electrostatic discharge immunity test level 3 conforming to IEC 61000-4-2
Conducted & Radiated EMC emissions for drives	<p>ATV212 H and W N4 range:</p> <ul style="list-style-type: none"> ■ Integrated Class 2 EMC filter for radiated and conducted emissions, IEC 61800-3, category C2 and C3 <p>ATV212 W N4C range:</p> <ul style="list-style-type: none"> ■ Integrated Class 2 EMC filter for radiated and conducted emissions, IEC 61800-3, category C1 <p>ATV212H M3X range:</p> <ul style="list-style-type: none"> ■ No integrated EMC filter (use optional filters to reduce emission levels)
CE marking	The drives are marked CE according to the European low voltage (2006/95/EC) and EMC (2004/108/EC) directives
Product certifications	UL File E116875, CSA 2278406, UL508C, Plenum rated per UL508C for UL1995 installations, C-Tick, NOM 117, CE marked
Degree of protection	<p>ATV212H range:</p> <ul style="list-style-type: none"> ■ IP20, Conformal coating per IEC 60721-3-3 classes 3C2 and 3S2, Type 1 with optional conduit entrance kit <p>ATV212W range:</p> <ul style="list-style-type: none"> ■ IP54 / Type 12, Conformal coating per IEC 60721-3-3 classes 3C2 and 3S2

I/O and Control Specifications

Available internal supplies	P24	Short-circuit and overload protection: <ul style="list-style-type: none"> 24 Vdc supply (min. 21 Vdc, max. 27 Vdc), maximum current: 200 mA
Configurable Analog input	VIB	Voltage analog input, configurable as an analog input or as a PTC probe input. Voltage analog input: <ul style="list-style-type: none"> 0–10 Vdc, impedance 30 kW max, voltage 24 Vdc Max. sampling time: 22 ms ±0.5 ms Resolution: 10 bits Accuracy: ±0.6% for a temperature variation of 140 °F (60 °C) Linearity: ±0.15% of the maximum value PTC probe input: <ul style="list-style-type: none"> 6 probes max. mounted in series Nominal value < 1.5 kW Trip resistance 3 kW, reset value 1.8 kW Short-circuit detection threshold < 50 W
Configurable Analog output	FM	1 switch-configurable (SW101) voltage or current analog output: <ul style="list-style-type: none"> Voltage analog output 0–10 Vdc, minimum load impedance 7.62 kW Current analog output X–Y mA by programming X and Y from 0 to 20 mA, maximum load impedance: 970 Ω Max. sampling time: 2 ms ±0.5 ms Resolution: 10 bits Accuracy: ±1 % for a temperature variation of 140 °F (60 °C) Linearity: ±0.2%
Configurable Relay outputs	FLA, FLB, FLC	1 relay logic output, 1 N/O contact, and 1 N/C contact with common point Minimum switching capacity: <ul style="list-style-type: none"> 10 mA for 5 Vdc Maximum switching capacity: <ul style="list-style-type: none"> On resistive load (cos φ = 1): 5 A for 250 Vac or 30 Vdc On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 Vac or 30 Vdc Max. response time: 10 ms
	RYA, RYC	1 relay logic output, 1 N/O contact Minimum switching capacity: <ul style="list-style-type: none"> 3 mA for 24 Vdc Maximum switching capacity: <ul style="list-style-type: none"> On resistive load (cos φ = 1): 3 A for 250 Vac or 30 Vdc On inductive load (cos φ = 0.4 and L/R = 7 ms): 2 A for 250 Vac or 30 Vdc Max. response time: 7 ms ± 0.5 ms
LI logic inputs	F, R, RES	3 programmable logic inputs, 24 Vdc, compatible with level 1 PLC, IEC 65A-68 standard <ul style="list-style-type: none"> Impedance: 4.7 kW Maximum voltage: 30 Vdc Max. sampling time: 2 ms ±0.5 ms Multiple assignment makes it possible to configure several functions on one input Positive logic (Source): State 0 if ≤ 5 Vdc or logic input not wired, state 1 if ≥ 11 Vdc Negative logic (Sink): State 0 if ≥ 16 Vdc or logic input not wired, state 1 if ≤ 10 Vdc
Configurable Analog/Logic output	VIA	Switch-configurable voltage or current analog input: <ul style="list-style-type: none"> Voltage analog input: 0–10 Vdc, impedance 30 kW maximum voltage: 24 Vdc Analog current input: X–Y mA by programming X and Y from 0 to 20 mA, impedance = 250 W Max. sampling time: 3.5 ms ±0.5 ms Resolution: 10 bits Accuracy: ±0.6% for a temperature variation of 140 °F (60 °C) Linearity: ±0.15% of the maximum value *This analog input is also configurable as a logic input. Consult the Altivar 212 Programming Manual for more information.

Altivar 212 variable speed drives

Specifications I/O & Control

I/O and Control Specifications (continued)

Protocol		Modbus
Structure	Connector	1 RJ45 connector
	Physical interface	2-wire RS 485
	Transmission mode	RTU
	Transmission speed	Configurable via the Human-Machine interface, remote graphic display keypad or SoMove setup software: 4800 bps, 9600 bps, 19200 bps or 38400 bps
	Number of subscribers	31 maximum
	Polarization	No polarization impedance. This must be provided by the wiring system (for example, in the master)
	Address	1 to 247, configurable via the Human-Machine interface, remote display terminal or SoMove setup software
Embedded Communications		<ul style="list-style-type: none"> ■ RJ45 port for remote keypad connection ■ Multi-loader ■ PC software ■ Bluetooth dongle <p>Embedded four screw removable terminal for daisy chain connection for these communication networks:</p> <ul style="list-style-type: none"> ■ Modbus ■ BACnet ■ Metesys N2 ■ Apogee P1
Diagnostics	Via the on board interface or remote graphic display keypad	On display unit: 4 digit, 7 segment LED display
Maximum I/O wire size and tightening torque		<p>Screw Terminals</p> <ul style="list-style-type: none"> ■ Wire size: 0.75 to 2.5 mm² (AWG 18 to 14) ■ Tightening Torque: 0.5 to 0.6 N•m (4.4 to 5.3 lb-in) <p>Spring Terminals</p> <ul style="list-style-type: none"> ■ 0.2 to 1 mm² (AWG 24 to 16)
Acceleration and deceleration ramps		<p>Ramp profile:</p> <ul style="list-style-type: none"> ■ Linear from 0 to 3200 s ■ S ramp ■ U ramp <p>Automatic adaptation of deceleration ramp time if braking capacities exceeded, although this adaptation can be disabled (use of braking unit)</p>
Internal braking		By DC injection: automatically as soon as the estimated output frequency drops to < 0.2 Hz, period adjustable from 0.1 to 30 s or continuous, current adjustable from 0 to 1.2 In
Main drive protection features		<ul style="list-style-type: none"> ■ Thermal protection against overheating ■ Protection against short-circuits between motor phases ■ Overcurrent protection between motor phases and ground protection in the event of line overvoltage and undervoltage ■ Input phase loss protection, in three-phase
Motor protection		Class 10 thermal protection integrated in the drive by continuous calculation of the I ² t
Frequency resolution		Display unit: 0.1 Hz Analog inputs: 10-bit A/D converter
Response time on a change of setpoint		<p>22 ms ± 0.5 ms (VIB) - analog input(s)</p> <p>3.5 ms ± 0.5 ms (VIA) - analog input(s)</p> <p>2 ms ± 0.5 ms (RES) - discrete input(s)</p> <p>2 ms ± 0.5 ms (R) - discrete input(s)</p> <p>2 ms ± 0.5 ms (F) - discrete input(s)</p>

Additional Information

Integrated Fan and Pump Functionality	<ul style="list-style-type: none"> ■ Run command Input to drive by remote contact from the BAS, 24 vdc supplied by VFD ■ Speed command Input to drive from the BAS; typically 4-20mAdc or 0-10 Vdc ■ Run status Output contact from drive to the BAS; 1 N.O. contact on drive ■ Speed feedback Analog output from drive to the BAS; typically 4-20mAdc, or assignable to meter values ■ Detected Fault Output contact from drive to the BAS; 1 N.O. & 1 N.C. contact on drive ■ Loss of Speed Configuration to run at last speed or a pre-defined speed on loss of speed command ■ Automatic Restart Selectable configuration to automatically restart after cause of the detected fault is cleared ■ Skip Frequency Bands Three skip frequency settings with adjustable bandwidth to tune out resonating frequencies in piping or ductwork ■ Local/Remote Control Keypad selectable: local keypad control for Run, Stop and speed control or from remote signal from BAS ■ Catch on the fly configuration to initiate speed and direction search to provide smooth start of windmilling fans ■ Damper Control Relay Output on the drive to control damper opening sequence, and wait for feedback to start the motor ■ Smoke Purge Override Logic Input on the drive configured to run the motor at configured speed for forced ventilation ■ Broken Belt Detection Configuration to detect under load condition and initiate alarm sequence ■ PID Control Set point and feedback inputs for proportional, integral, and derivative control ■ Sleep/Wake-up Configuration in the drive to stop the pump at low or no flow and re-start on demand for flow ■ Pump Jam Management Configuration to manage blocked pump impeller ■ Motor direction protection Configuration to avoid operation in reverse direction
Typical Air Handling Applications	<ul style="list-style-type: none"> ■ HVAC supply and return fans ■ Exhaust and ventilation fans ■ Cooling tower fans ■ Energy recovery wheels ■ Typical pumping
Harmonic Abatement	<p>Embedded reduced harmonic technology provides <35% THDI at VFD input terminals, which is equivalent to a 3% line reactor or DC choke.</p>
Power Factor	<p>Above 99 %</p>
Efficiency	<p>Above 96% at full load</p>

Altivar 212 variable speed drives

Selection Table IP 21 drives



ATV 212H075M3X
EMC plate not mounted



ATV 212HD15N4
EMC plate not mounted



ATV 212HD55N4
EMC plate not mounted

IP 21 drives (frequency range from 0.5 to 200 Hz)

Motor Power	Line supply			Altivar 212					Part number	Frame size	Weight	
	Line current ⁽¹⁾	Maximum prospective line Isc	Max. continuous output current (In) ⁽²⁾	Maximum transient current for 60 s	Dissipated power at maximum output current	THDI ⁽³⁾	240 V				lbs	kg
							200 V	240 V				
HP	kW	A	A	kA	A	A	W	%			lbs	kg
Three-phase supply voltage: 200...240 V 50/60 Hz, without EMC filter⁽⁴⁾												
1	0.75	3.3	2.7	5	4.6	5.1	63	31.3	ATV212H075M3X	1	4.0	1.8
2	1.5	6.1	5.1	5	7.5	8.3	101	31.6	ATV212HU15M3X	1	4.0	1.8
3	2.2	8.7	7.3	5	10.6	11.7	120	30.7	ATV212HU22M3X	1	4.0	1.8
-	3	-	10	5	13.7	15.1	146	32.4	ATV212HU30M3X	2	6.7	3.1
5	4	14.6	13	5	18.7	19.3	193	31.1	ATV212HU40M3X	2	6.7	3.1
7.5	5.5	20.8	17.3	22	24.2	26.6	249	30.7	ATV212HU55M3X	3	13.5	6.1
10	7.5	27.9	23.3	22	32	35.2	346	30.8	ATV212HU75M3X	3	13.5	6.1
15	11	42.1	34.4	22	46.2	50.8	459	35.5	ATV212HD11M3X	4	25.4	11.5
20	15	56.1	45.5	22	61	67.1	629	33.3	ATV212HD15M3X	4	25.4	11.5
25	18.5	67.3	55.8	22	74.8	82.3	698	32	ATV212HD18M3X	4	25.4	11.5
30	22	80.4	66.4	22	88	96.8	763	35	ATV212HD22M3X	5	60.6	27.4
40	30	113.3	89.5	22	117	128.7	1085	32.1	ATV212HD30M3X	7	85.4	38.7
				380 V 480 V		(5)		380 V				
HP	kW	A	A	kA	A	A	W	%			lbs	kg
Three-phase supply voltage: 380...480 V 50/60 Hz, with integrated category C2 or C3 EMC filter												
1	0.75	1.7	1.4	5	2.2	2.4	55	32.8	ATV212H075N4	1	4.4	2.0
2	1.5	3.2	2.5	5	3.7	4	78	30.9	ATV212HU15N4	1	4.4	2.0
3	2.2	4.6	3.6	5	5.1	5.6	103	30.5	ATV212HU22N4	1	4.4	2.0
-	3	6.2	4.9	5	7.2	7.9	137	31.2	ATV212HU30N4	2	7.4	3.4
5	4	8.1	6.4	5	9.1	10	176	30.6	ATV212HU40N4	2	7.4	3.4
7.5	5.5	10.9	8.6	22	12	13.2	215	30.5	ATV212HU55N4	2	7.4	3.4
10	7.5	14.7	11.7	22	16	17.6	291	30.9	ATV212HU75N4	3	14.2	6.5
15	11	21.1	16.8	22	22.5	24.8	430	30.4	ATV212HD11N4	3	14.2	6.5
20	15	28.5	22.8	22	30.5	33.6	625	30.9	ATV212HD15N4	4	25.7	11.7
25	18.5	34.8	27.8	22	37	40.7	603	30.5	ATV212HD18N4	4	25.7	11.7
30	22	41.1	32.6	22	43.5	47.9	723	31.9	ATV212HD22N4S	4	25.7	11.7
30	22	41.6	33.1	22	43.5	47.9	626	30.7	ATV212HD22N4	5	58.3	26.4
40	30	56.7	44.7	22	58.5	64.4	847	30	ATV212HD30N4	5	58.3	26.4
50	37	68.9	54.4	22	79	86.9	976	30.3	ATV212HD37N4	6	84.0	38.1
60	45	83.8	65.9	22	94	103.4	1253	30.2	ATV212HD45N4	6	84.0	38.1
75	55	102.7	89	22	116	127.6	1455	32.7	ATV212HD55N4	7	122.1	55.4
100	75	141.8	111.3	22	160	176	1945	31.1	ATV212HD75N4	7	122.1	55.4

Installation Manual

CAD Drawings

Product Data Sheets

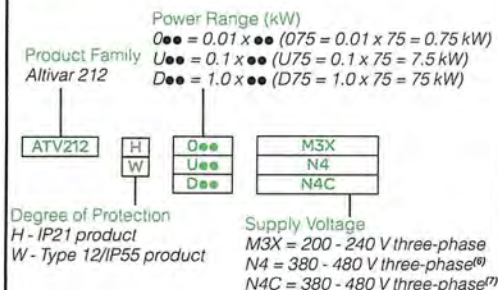
Swivel Shots

Dimensions (overall)

Frame size	W x H x D			
	EMC plate mounted		EMC plate not mounted	
	inches	mm	inches	mm
1	4.2 x 7.6 x 5.9	107 x 192 x 150	4.2 x 5.6 x 5.9	107 x 143 x 150
2	16.2 x 9.1 x 5.9	142 x 232 x 150	16.2 x 7.2 x 5.9	142 x 184 x 150
3	7.1 x 12.1 x 6.7	180 x 307 x 170	7.1 x 9.1 x 6.7	180 x 232 x 170
4	9.6 x 15.9 x 7.5	245 x 405 x 190	9.6 x 13 x 7.5	245 x 330 x 190
5	9.4 x 21.3 x 8.4	240 x 542 x 214	9.4 x 16.5 x 8.4	240 x 420 x 214
6	9.4 x 26.1 x 9.6	240 x 663 x 244	9.4 x 21.7 x 9.6	240 x 550 x 244
7	12.6 x 28.5 x 11.4	320 x 723 x 290	12.6 x 23.8 x 11.4	320 x 605 x 290

- (1) Typical value for the indicated motor power and for the maximum prospective line Isc.
 (2) Values given for nominal switching frequency of 12 kHz up to ATV212HD15M3X and up to ATV212HD15N4 or 8 kHz for ATV21HD18M3X...HD30M3X and ATV212HD18N4...HD75N4, for use in continuous operation. Switching frequency can be set between 6 and 16 kHz for all ratings. Above 8 kHz or 12 kHz, depending on the rating, drives will reduce switching frequency automatically in the event of an excessive temperature rise. For continuous operation above the nominal switching frequency, derate nominal drive current. Nominal motor current must not exceed this derating value. See the derating curves on our website www.schneider-electric.com.
 (3) Total current harmonic distortion in accordance with IEC/EN 61000-3-12.
 (4) Drives are supplied with an EMC plate, for customer assembly.
 (5) Value given at 380 V (IEC)/460 V (NEC).
 (6) with integrated EMC filter C2, C3
 (7) with integrated C1 EMC filter for UL Type 12/IP55 products ATV212W.....

Part Number Explanation



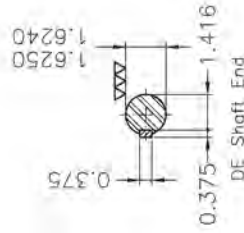
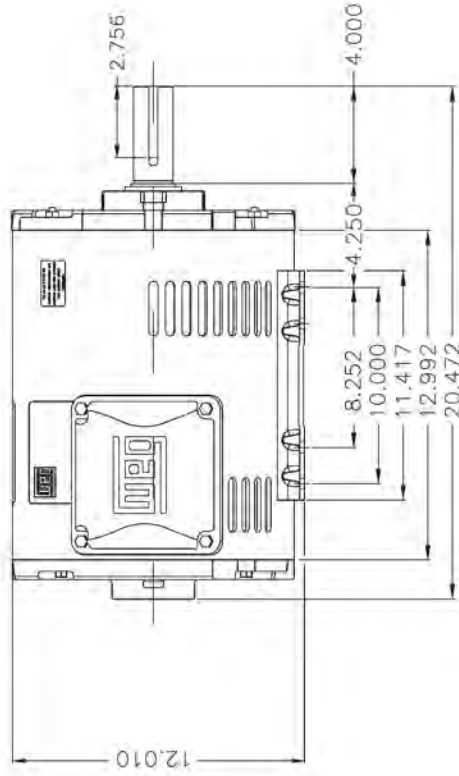
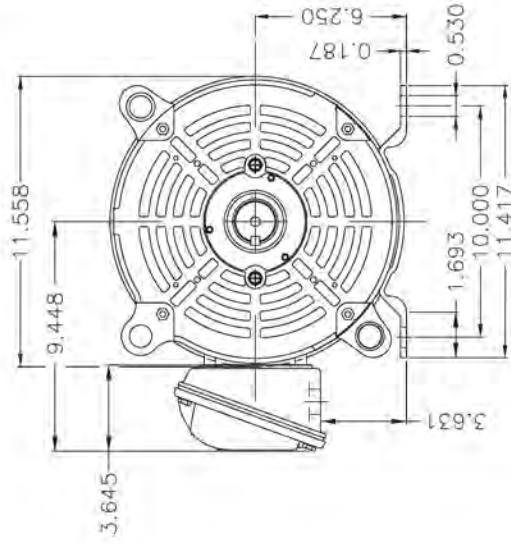
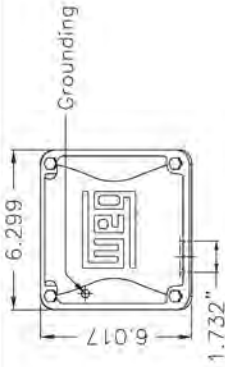
DATA SHEET



Three Phase Induction Motor - Squirrel Cage

Customer					
Product line		: Rolled Steel NEMA Premium Efficiency Three-Phase		Product code : 12687686	
				Catalog # : 02018OT3E256T-SG	
Frame	: 254/6T	Cooling method	: IC01 - ODP		
Insulation class	: F	Mounting	: F-1		
Duty cycle	: Cont.(S1)	Rotation ¹	: Both (CW and CCW)		
Ambient temperature	: -20°C to +40°C	Starting method	: Direct On Line		
Altitude	: 1000 m.a.s.l.	Approx. weight ³	: 97.2 kg		
Design	: B	Moment of inertia (J)	: 0.0939 kgm ²		
Output [HP]	20		20		
Poles	4		4		
Frequency [Hz]	60		60		
Rated voltage [V]	208-230/460		190/380		
Rated current [A]	55.3-50.0/25.0		59.8/29.9		
L. R. Amperes [A]	348-315/158		311/155		
LRC [A]	6.3x(Code G)		5.2x(Code F)		
No load current [A]	19.7-22.9/11.4		22.4/11.2		
Rated speed [RPM]	1770		1460		
Slip [%]	1.67		2.67		
Rated torque [kgfm]	8.09		9.81		
Locked rotor torque [%]	240		180		
Breakdown torque [%]	290		220		
Service factor	1.15		1.15		
Temperature rise	80 K		80 K		
Locked rotor time	27s (cold) 15s (hot)		0s (cold) 0s (hot)		
Noise level ²	64.0 dB(A)		62.0 dB(A)		
Efficiency (%)	25%	91.7	93.0		
	50%	92.4	91.8		
	75%	92.4	91.2		
	100%	93.0	89.7		
Power Factor	25%	0.38	0.46		
	50%	0.63	0.72		
	75%	0.74	0.82		
	100%	0.81	0.85		
Bearing type	: Drive end 6309 Z C3 Non drive end 6208 Z C3	Foundation loads			
Sealing	: Without Without	Max. traction : 372 kgf			
	: Bearing Seal Bearing Seal	Max. compression : 469 kgf			
Lubrication interval	: 20000 h 20000 h				
Lubricant amount	: 13 g 8 g				
Lubricant type	: Mobil Polyrex EM				
Notes					
This revision replaces and cancel the previous one, which must be eliminated.					
(1) Looking the motor from the shaft end.					
(2) Measured at 1m and with tolerance of +3dB(A).					
(3) Approximate weight subject to changes after manufacturing process.					
(4) At 100% of full load.					
These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.					
Rev.	Changes Summary		Performed	Checked	Date
Performed by					
Checked by				Page	Revision
Date	08/05/2019			1 / 11	

Dimensões em polegada
Dimensions in inches



THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.

Internal AEGIS ground ring on the DE

Bearing cap

Color Munsell N.1. matte black

Painting plan 207N

Mounting F-1/B3R(D)

ECM	LOC	SUMMARY OF MODIFICATIONS	EXECUTED	CHECKED	RELEASED	DATE	VER
EXECUTED	USERADMIN	THREE P. MOTOR OPEN ROLLED STEEL NEMA PREM					
CHECKED		FRAME 254GT ODP					
RELEASED		WEG code: 12887886					
REL DT	06.05.2019	WMO	Jangui do Sul	Product Engineering	SHEET	1 / 1	

20 HP 04 Poles 60Hz

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Manufacturer Specification Sheets

ECM 10: Premium Efficiency Transformers

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E-SAVER OPAL™ Series

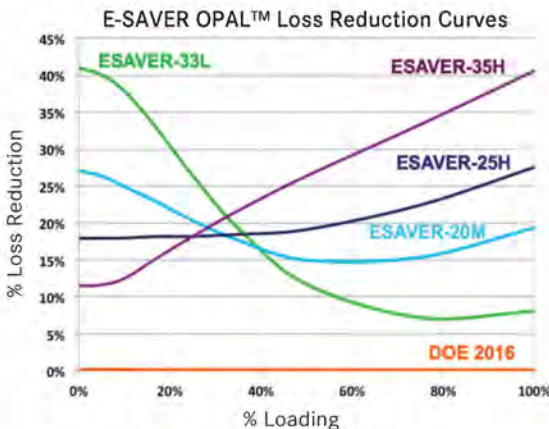
HIGH PERFORMANCE TRANSFORMERS OPTIMIZED TO DELIVER 25 - 50% LESS LOSSES THAN DOE 2016 MINIMUM EFFICIENCY REQUIREMENT

APPLICATION

The E-SAVER OPAL™ Series is a family of ultra-efficient dry-type isolation transformers that has been optimized for different application load profiles, to maximize energy savings and ensure electrical system compatibility. These energy optimized units are perfect for Net Zero, LEED® and High Performing Buildings.

OPAL™ OPTIMIZED PERFORMANCE FOR THE APPLICATION LOAD

To achieve 25-50% more savings than the DOE 2016 requirement, Powersmiths' developed and implemented a design best practice called OPAL™ - Optimized Performance for the Application Load. Recognizing that the transformer has much more impact in an electrical system than just efficiency, OPAL considers the system as a whole, including goals like managing impedance, arc flash, fault level, inrush, harmonics, and more. OPAL™ is possible thanks to the tight feedback loop between design, onsite manufacturing, and extensive ongoing real world operating performance verification. The result is more savings for the same dollar.



DOE 2016 IDENTIFIES BILLIONS IN SAVINGS BEYOND NEW LEGAL MINIMUM

Most manufacturers have designed their low-voltage transformers to just meet the new U.S. Dept. of Energy law (DOE 2016), setting minimum efficiency at a single required 35% load point, under an ideal sine wave factory test profile, sacrificing performance elsewhere. The DOE quantifies savings for going beyond DOE 2016 in billions of dollars. Furthermore, the DOE states that lifecycle savings can be maximized by optimizing for real-world loading. Powersmiths OPAL™ enables customers to access these savings - backed by real-world performance verification.

EXPANDED KVA SELECTION ENABLES RIGHT-SIZING

Powersmiths enables right-sizing of electrical infrastructure by offering a much broader selection of transformer kVA sizes. The capital cost, operating cost and footprint reductions can be dramatic - on the order of 30-50%, through smaller transformers, breakers, conductors, and distribution panels.

GUARANTEED PERFORMANCE FOR 32 YEARS

Powersmiths guarantees that every transformer we manufacture meets our published technical data, and furthermore, that this performance is met over the full term of the 32-year pro-rated warranty. Being able to trust that savings are both real and long-term is part of why organizations choose Powersmiths.



75kVA E-Saver OPAL™ Series shown with Cyberhawk TX™, hinged door and Rotatable IR Port™

K-RATING IS A MODERN REQUIREMENT

Many general purpose transformers are purchased and installed because they have the lowest first cost, however, they carry a UL label on the basis of feeding only linear loads. Since most connected loads today are electronic with nonlinear profiles, a low-voltage isolation transformer needs to be K-rated in order to have a valid UL listing for most applications today. E-Savers are appropriately K-rated.

ENVIRONMENTAL/GREEN BUILDING/LEED®/NET ZERO

By going meaningfully beyond the DOE 2016 baseline efficiency, the E-Saver™ contributes to green building, LEED®, Net Zero and carbon footprint reduction goals. Additional benefits of Powersmiths products include our ISO14001 certified manufacturing, integrated metering options and ability to integrate with the Powersmiths WOW™ Sustainability Management Platform.

CERTIFICATIONS & TESTING

Powersmiths certifications include ISO 9001 (Quality), ISO 14001 (Environment), ISO 17025 (Efficiency Test Lab), UL and CSA. Powersmiths has a production integrated nonlinear load test program that enables efficiency verification under real-world conditions, as well as IPMVP compliant field measurement of losses and efficiency, and Certified Test Lab Load Profile Test Reports.

METERING & ARC FLASH OPTIONS

Integrated metering can provide information about capacity utilization, load profiles, power quality and energy use. The lockable hinged door option, as well as our patented 360° Rotatable IR Port™ option enable quick and safe access to internal transformer connections, and reduces arc flash risk. Powersmiths also offers transformers with Integrated Power Distribution. For details see the Energy Station TX™ product information.

E-SAVER OPAL MODEL COMPARISON MATRIX²

Model	Optimized Load Range	Saving beyond DOE 2016*	Temp. Rise	Winding Material***	Continuous Overload Capacity	K-Rating **/****	Applications
E-Saver-33L	0-25%	33%	<130°C	CU	5%	K7	Most Applications - office, education, healthcare, most other institutional, commercial (light load feeding electronic equipment).
E-Saver-20M	0-100%	20%	<115°C	CU	15%	K1, K9, K13	Where equipment or process loading varies widely, or where the load is expected to change significantly over time.
E-Saver-25H	75-100%	25%	<105°C	CU/AL CU opt.	20%	K13	Dedicated equipment (fans, pumps, elevators, etc.), labs, broadcast, datacenter, industrial where loading is significant.
T1000-30H	50-100%	30%	<105°C	CU	20%	K20	Harmonic Mitigation Transformer - for heavy, harmonic-rich loads, high densities of electronic equipment, where voltage distortion could become excessive.
E-Saver-35H	75-100%	35%	<80°C	CU/AL CU opt.	33%	K20	Heavy loading for extended hours, and need for lower losses & operating costs, overload capacity, faster payback if high energy rate.
E-Saver-50H	75-100%	50%	<65°C	CU	50%	K30	For Special Applications close to full continuous load, where full load losses & heat output must be minimized, significant overload capacity.
E-Saver-S0L	0-100%	30%	<105°C	CU/AL CU opt.	20%	K20 <small>(85 kVA requires kVA app)</small>	Solar Applications - to avoid solar production waste - minimize transformer idling and full load losses, continuous overload capacity for longer life.

* Estimated average savings vs. DOE 2016 reference for the application load profile

** K-Rating per IEEE-C57.110

*** CU - Copper, AL Aluminum, CU/AL Copper primary with Aluminum Secondary

**** The high K-factor rating is not the goal of the design, but a consequence of the low current densities used to achieve the high loading efficiency goals

¹ U.S. Department of Energy, 10 CFR Part 431, [Docket No. EERE-2010-BT-STD-0046] Energy Conservation Program: Energy Conservation Standards for Distribution Transformers: Final Rule, April 16, 2013

TECHNICAL SPECIFICATIONS

The E-Saver™ is an ultra-efficient low-voltage dry-type isolation transformer that meaningfully exceeds the U.S. Dept. of Energy's new minimum efficiency law, commonly referred to as DOE 2016. Each model is optimized to maximize energy savings and electrical system compatibility in each target application, and has a K-factor listing per UL 1561 and an application appropriate K-rating per C57.110 (see Comparison Matrix). For models with an 'H' designation, K-rating is reduced by one level for 400kVA and larger, reflecting lower harmonic content reality at heavy loading for large kVA transformers (ex.K30->K20, K20->K13, K13->K9) to avoid overbuilding and associated unnecessary cost. See table for individual model attributes.

E-Savers have a common-core (3-phase models), 10kV BIL, 200% rated neutral, are 60Hz rated (std), built to NEMA ST-20 and other applicable ANSI, IEEE standards and are UL listed and CSA approved. Both primary and secondary terminals and voltage taps (typically six 2.5%) are all front-accessible. E-Savers have a 220°C class insulation system that is NOMEX-based with an Epoxy Co-polymer impregnant with technical performance characteristics that embed lower environmental impact, long term reliability and long life expectancy. E-Savers carry OSHPD and IBC Seismic Certification. The seismic bracing option provides a higher 2.28g certification. All E-Saver models come standard in a Type 2 ventilated drip-proof indoor enclosure made of heavy gauge steel finished with epoxy powder coating for durability and low environmental impact, and are UL Listed for 2" rear clearance - a significant improvement over the typical industry 6" limit. A wide variety of enclosures and options are available.

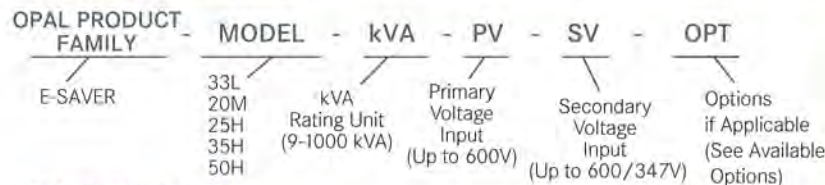
Low Noise: Keeping audible noise at a minimum is key. While the NEMA ST-20 standard sets levels referenced by industry only a type test, not a production test, is required - so transformers on actual projects may be noisy. NEMA ST-20 also allows K13 transformers to be even noisier. Powersmiths builds 3dB quieter than NEMA standard values, and 6dB quieter than the K13+ allowance. Furthermore, every unit is tested to ensure quiet operation. For very sensitive environments, an additional 2dB lower noise option is available.

Management of Impedance, Inrush, Fault Level, Arc Flash: Powersmiths' OPAL™ design best practice includes addressing key transformer attributes like impedance, inrush, fault level, arc flash, to ensure smooth integration into an electrical system, avoiding the negative impacts often associated with high efficiency transformers. See individual technical data sheets for comprehensive values for all parameters.

Impedance: For 33L, 20M, 25H, 35H models, impedance is kept at or above 4.0% in order to manage downstream fault current and arc flash levels, and stay within interrupting capacity (kAIC) ratings. Higher impedance is available to meet specific project needs. 50H models are optimized to project specific requirements.

Inrush: Inrush currents are managed in order to avoid nuisance tripping of the primary breaker and to enable design engineers to use standard 125% rated primary protection, thereby avoiding expensive design changes that otherwise may be needed. Very low inrush designs are available as specific projects may require, for example some datacenter and medical applications.

ORDERING INFORMATION



TECHNICAL DATA

kVA	Audible Noise	33L, 20M, 25H Model Weight Range (lbs)	Standard Case Size (in)	Alternate Smaller Case Size (in)*
15	42 dB	260-340	17.5W x 17D x 27.5H	17.5W x 14.5D x 25H
20	42 dB	300-380	25.5W x 18D x 30H	23W x 15.5D x 27.5H
25	42 dB	340-420	25.5W x 18D x 30H	23W x 15.5D x 27.5H
30	42 dB	380-470	25.5W x 18D x 30H	23W x 15.5D x 27.5H
45	42 dB	490-590	25.5W x 18D x 30H	No Alternate
50	42 dB	540-600	31.5W x 21.5D x 40H	No Alternate
63	47 dB	600-720	31.5W x 21.5D x 40H	26.5W x 20D x 33H
75	47 dB	650-800	31.5W x 21.5D x 40H	26.5W x 20D x 33H
100	47 dB	800-900	31.5W x 21.5D x 40H	No Alternate
112	47 dB	900-1000	31.5W x 21.5D x 40H	No Alternate
125	47 dB	1050-1150	37.5W x 26.5D x 48H	33W x 23D x 38H
150	47 dB	1170-1300	37.5W x 26.5D x 48H	33W x 23D x 38H
175	52 dB	1260-1450	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
200	52 dB	1375-1550	37.5W x 26.5D x 48H	34.5W x 26.5D x 42H
225	52 dB	1500-1700	37.5W x 31.5D x 52H	34.5W x 26.5D x 42H
250	52 dB	1650-1850	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
300	52 dB	1850-2000	37.5W x 31.5D x 52H	37.5W x 26.5D x 48H
400	57 dB	2150-2350	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
450	57 dB	2400-2650	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
500	59 dB	2800-3000	51.5W x 38D x 61H	43.5W x 33.5D x 55.5H
600	59 dB	3500-3800	64W x 47D x 67H	51.5W x 38D x 61H
750	61 dB	4000-4300	64W x 47D x 67H	Contact Factory
850	61 dB	4300-4850	64W x 47D x 67H	Contact Factory
1000	61 dB	4800-5500	64W x 53D x 67H	Contact Factory

* Typically the min cases are available for the standard models of 33L, 20M, 25H only.

NOTE: The above data applies to the standard configuration of each kVA. Selection of some options may change enclosure size and/or transformer weight. Some options may be mutually exclusive. Consult factory for detailed product data sheet for these and other configurations. Efficiencies tested according to U.S. Dept. of Energy's 10 CFR Part 431, a linear load test at 35% of nameplate capacity. Refer to technical data sheet for comprehensive information for each specific model, kVA, and option selected.

As design optimization is continuous, technical data is updated over time. Please check with Powersmiths for latest revision.

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WWW.POWERSMITHS.COM

AVAILABLE OPTIONS

Metering: Express Logger™, SMART™ or Cyberhawk TX™ (see product cut sheets for details)

CC: Core & Coils available for OEM integration

3R: Type 3R, sprinkler proof/ outdoor ventilated enclosure

OSEC: Enclosure for outdoor public areas

SS: Painted stainless steel enclosure

NVI: Non-ventilated indoor enclosure

IRP: 360° Rotatable IR Port™

HD: Hinged Door

F50: 50 Hz design

1S: Single electrostatic shield

2S: Dual electrostatic shields

3S: Triple electrostatic shields

SPD: (120/208 V OR 277/480V)

PRO80: 80kA, 7 mode, Filter

PRO120: 120kA, 7 mode, Filter

PRO200: 200kA, 7 mode, Filter

PRO240: 240kA, 7 mode Filter

PROXX: Where XX is custom ID

LKS: Lug kit, screw-type

LKC: Lug kit, compression type

VLI: Very Low Inrush

IMP: Custom Impedance

COL: Custom color

TS: Thermal sensors at 170°C and 200°C

RTR: Routine Test Report

NLT: Nonlinear Load Test with Certificate

2016TR: DOE 2016 Test Report

CTL: ISO 17025 Certified Test Lab, load profile test

SE: Sensitive environment, extra low noise

SB: Certified Seismic Bracing for 2.28g

(for Certificate details contact Powersmiths)

WM: Wall-mount kit up to 75kVA is available (sold separately)

Manufacturer Specification Sheets

ECM 11: Vending Misers

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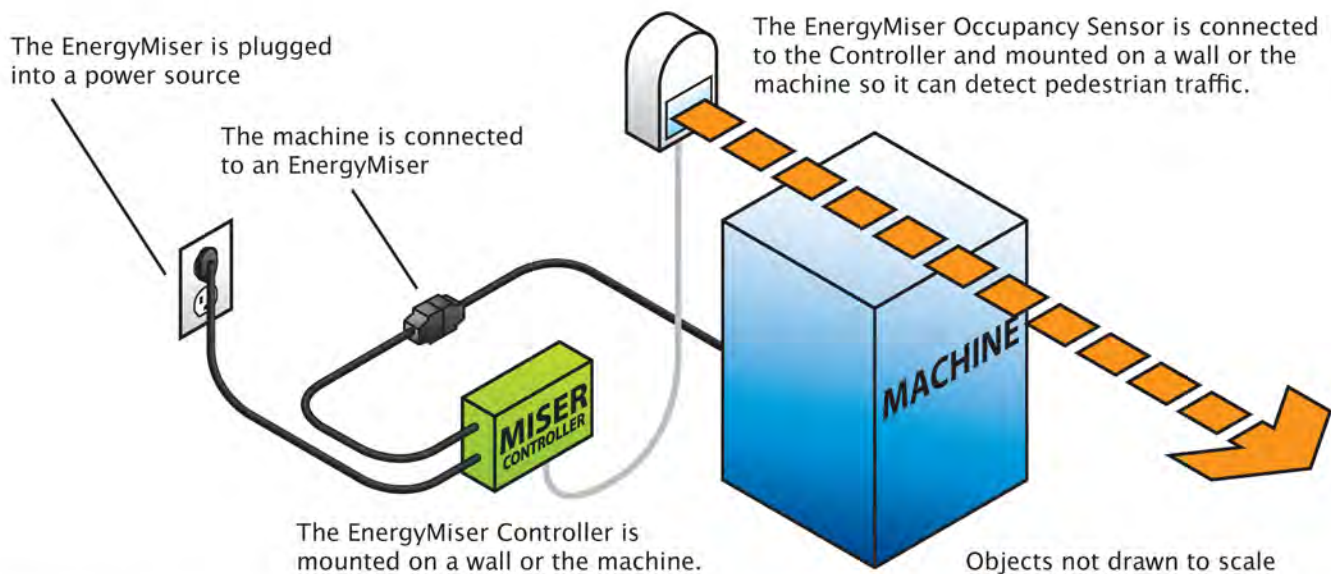


EnergyMiser® Products are easy to install devices designed to lower the energy consumption of vending machines, commercial coolers, and other “always on” machines and appliances. No other technology can compete with its price and ease of installation for the immediate energy savings that can be achieved.

- Win and retain accounts by offering energy-efficient technology
- Save clients up to \$150 per machine, per year
- Typical return on investment in 12 months
- Easy retrofit field installation
- Reduction in machine energy use an average of 35-45%
- Reduced machine maintenance and longer machine lifespans
- Environmental benefits such as reducing pollution and natural resource use

How EnergyMisers Work

External EnergyMisers use a controller and a machine mounted sensor to monitor room occupancy and temperature. If 15 minutes pass without any pedestrian traffic, the EnergyMiser will power down the machine. The machine is powered back up when people return and at regular intervals to keep the product cold. External controllers are best suited for low traffic areas.



Internal EnergyMisers use sales based intelligence to power down the cooling system while leaving lighting and controller electronics on. While the cooling system is powered down, the internal EnergyMiser monitors the room's temperature and automatically re-powers the cooling system at regular intervals to keep the product cold. Internal controllers are best suited for high traffic areas.

Who Uses EnergyMisers

Several large retailers such as Wal-Mart and Kroger have installed EnergyMiser Products at their locations. Educational facilities along with the US Government have purchased EnergyMisers through GSA. Also, many utilities offer rebates on the purchase of EnergyMiser products and several have provided customers with EnergyMiser Products at no cost through Turnkey Programs.

USA Technologies 100 Deerfield Lane, Suite 140, Malvern, PA 19355 • 800.633.0340 • www.usatech.com

Shop for Miser products online at: www.VendingMiserStore.com 1.888.610.7664

EnergyMiser Products

VendingMiser® - for cold drink vending machines

- VM150 - Indoor Wall Mount Controller with Occupancy Sensor
- VM151 - Indoor Wall Mount Controller with 10' Repeater Cable
- VM160 - Outdoor Wall Mount Controller with Occupancy Sensor and Weather-proof Enclosure
- VM161 - Outdoor Wall Mount Controller with 10' Repeater Cable and Weather-proof Enclosure
- VM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
- VM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable
- VM180 - Outdoor Controller with EZ Mount Z-Bracket, Occupancy Sensor, and Weatherproof Enclosure
- VM181 - Outdoor Controller with EZ Mount L-Bracket, 10' Repeater Cable and Weatherproof Enclosure
- VM2iQ - Internal VendingMiser

CoolerMiser™ - for commercial glass-front coolers

- CM150 - Indoor Wall Mount Controller with Occupancy Sensor
- CM151 - Indoor Wall Mount Controller with 10' Repeater Cable
- CM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
- CM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable
- CM2iQ - Internal CoolerMiser

SnackMiser® - for snack vending machines

- SM150 - Indoor Wall Mount Controller with Occupancy Sensor
- SM151 - Indoor Wall Mount Controller with 10' Repeater Cable
- SM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
- SM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable

PlugMiser™ - for most major electrical equipment

- PM150 - Indoor Wall Mount Controller with Occupancy Sensor
- PM151 - Indoor Wall Mount Controller with 10' Repeater Cable
- PM190 - Indoor Controller with Leg Mount and Occupancy Sensor



Visit www.energymisers.com for more information.



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Shop for Miser products online at: www.VendingMiserStore.com

1.888.610.7664

VendingMiser®

VM150 / VM151 Installation Instructions

VendingMiser® is designed to operate as an intelligent power controller for cold product vending machines. Note that VendingMiser may not be used on any vending machine which contains perishable products.

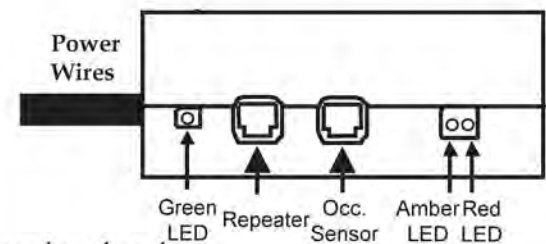
General Theory of Operation

Using a Passive Infrared (PIR) occupancy sensor, VendingMiser will automatically shut down the controlled vending machine when the area around it has been vacant for 15 minutes. However, VendingMiser will periodically re-power the machine automatically to ensure that the vended product stays cold. In addition, VendingMiser contains a current sensor which determines if the vending machine's compressor is operating, and will delay power-down of the vending machine until the compressor has completed its cooling cycle.

To install the VendingMiser, follow these simple steps:

Locating and Mounting the VendingMiser

1. Unplug the vending machine's power cord from the outlet. If it is necessary to move the machine, be careful as it can be heavy. Note- Each vending machine should remain on the same outlet/circuit breaker at the end of installation.
2. Identify a suitable mounting location for VendingMiser, most likely on the wall behind the vending machine. VendingMiser must be located so that the machine's power cord can reach VendingMiser, and VendingMiser's power cord can reach the power outlet.
3. VendingMiser should be oriented so that the operational lights are viewable by maintenance personnel.
4. Using screws appropriate for the wall material, attach VendingMiser's steel mounting bracket to the identified location with the UP arrow facing towards the ceiling. "Snap" the VendingMiser DOWNWARDS onto the mounting bracket. (To remove VendingMiser later, "Snap" the unit UPWARDS.)
5. Plug the vending machine's power cord into the VendingMiser. Do not yet plug the VendingMiser into the wall outlet at this stage of the installation.



Occupancy Sensor or Sensor Repeater Installation

6. If the controlled vending machine is a single unit, or the first in a bank of machines, a PIR sensor must be installed as described below to create a Primary VendingMiser. If this VendingMiser is not the first bank unit, skip to Step 10 to install a Secondary VendingMiser.
7. The PIR sensor must be located so it can "See" anyone approaching the vending machine. Ideally, the sensor should be mounted on the wall behind the vending machine, about two feet above the machine. Note the picture on reverse side of this document - ensure that the TOP of the sensor is facing the ceiling. If low ceiling height above the vending machine does not allow wall mounting, mount on the ceiling in front of the vending machine. This requires that the "TOP" of the sensor points towards the vending machine to ensure proper operation. Always avoid sensor placement near air ducts which can falsely trigger the sensor.

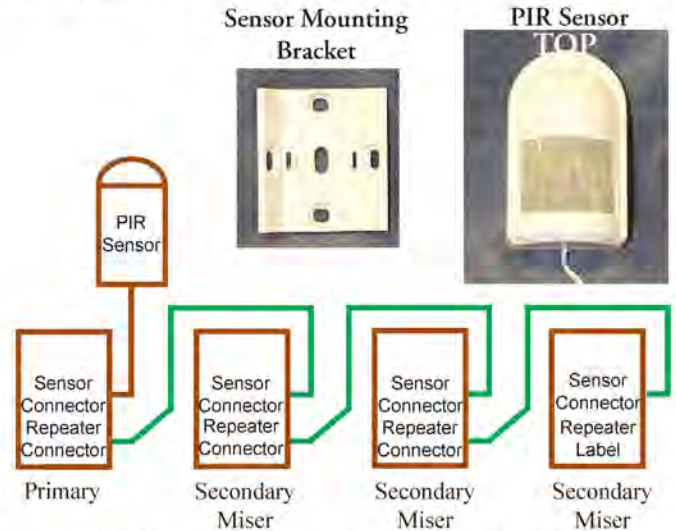


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VendingMiser®

VM150 / VM151 Installation Instructions (cont'd.)

- To mount the sensor, use the supplied plastic mounting bracket shown below. Use appropriate fasteners to secure it to the selected surface. Then snap the sensor over the bracket. To remove the sensor at a later date, snap the sensor off the bracket by pulling the sensor straight out.
- The occupancy sensor cable has a telephone style connector at its end. Plug this connector into the center socket on the VendingMiser. The sensor cable should be secured to the wall or ceiling by covering it with plastic low voltage wire raceway.
- If a Secondary VendingMiser is being installed, use the supplied 3 Meter (10 feet) phone style cable to connect the OCCUPANCY SENSOR connector on this VendingMiser to the REPEATER connector on the Primary VendingMiser. Only remove the yellow label covering the REPEATER connector on the previous unit in the chain. Additional Secondary VendingMisers can be daisy-chained using the same techniques shown in the diagram to the right. A maximum of four Misers can be daisy-chained in this fashion. It is acceptable to mix VendingMisers with SnackMisers, PlugMisers, and/or CoolerMisers provided the sensor coverage is acceptable for all devices sharing the sensor.



Power-Up Testing and Install Validation

Plug the VendingMiser into the wall outlet. The following should occur:

- The vending machine should power up immediately.
- The Green LED should flash twice to indicate that the temperature sensor is functional.
- The Amber LED should then come on as the VendingMiser attempts to synchronize with the compressor's operation. This typically will require that the compressor cycle on and off.
- The Red LED should come on, indicating occupancy detection.

The PIR sensor must be allowed to stabilize for several minutes before its placement can be verified. Once the sensor is warmed up, it will flash at the slightest movement within its field of view. Validate that the sensor can "See" an occupant at, or approaching, the vending machine. If necessary, relocate the sensor and repeat the coverage test. The Red LED on the VendingMiser will mirror the state of the PIR sensor, with an additional 3 second delay. This verifies that VendingMiser is communicating with the PIR sensor.

As a final functional test, the VendingMiser will power-down the first time only after installation approximately two minutes after the area around the machine is vacant and the compressor is determined to be not running. Covering the PIR sensor or temporarily setting it to face the wall will allow validation of the power-down operation if so desired. Following this initial power-down, the VendingMiser will operate with standard time-outs.

NOTE: The VendingMiser will flash all three LEDs simultaneously and light a RED LED in the PIR sensor if the vending machine has failed and will not shut down its compressor after several hours of use. Since this prohibits the VendingMiser from shutting down the machine, please call the machine owner service line for machine service.



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Manufacturer Specification Sheets

ECM 12: Walk-in Refrigeration Controls

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National Resource Management DATA SHEET

Integrated Refrigeration Controls

Evaporator fans operate 25%-80% less, saving electricity and reducing compressor run time. In areas with winter temperatures, the compressor and fans can also utilize cold, outside air to run less.

Door and Frame Heater Control

Heaters are controlled based on store dew point, reducing run times by up to 95% in coolers and 50% in freezers.

Cooler Load/Shutdown Button

Safely shuts off the refrigeration when the cooler is being stocked, which lessens the risk of damage to the system and lowers the energy costs during loading.

Service Bypass Button

Allows users and technicians to bypass the control system to service the cooler or freezer and then safely reset the system when finished.

Alarm/Reset Button

Strobe lights, as well as optional alert-to-device notifications, signal when pre-determined high or low temperature limits are exceeded. This helps reduce, and in some cases, even eliminate product spoilage and loss.

CoolTrol[®] CCS2



Smart Defrost

Defrost cycles are based on coil temperature and refrigeration run time instead of timed cycling for unparalleled optimization.

Built-in Intelligence

The CoolTrol system logs and provides historical usage patterns, which extends the life of the equipment by exposing potential problematic refrigeration areas.

Novelty Cooler Shutoff

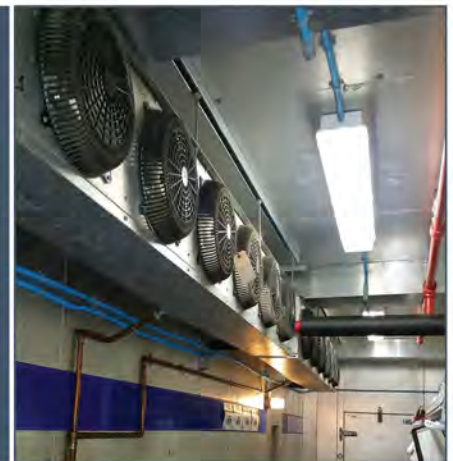
Safely and automatically shuts off novelty (Coke/Pepsi/Sports Drinks) and non-perishable product coolers when the store is closed.

Additional Features

- Simplified display and push-button control panel gives you more adjustment options and greater flexibility.
- Built-in Ethernet port offers easier connection to local network for existing EMS or to monitor and control system over CoolTrol LAN Portal.
- Ability to access NRM's Remote Site Manager, a web-based control system.
- Log data and user settings are stored on a removable 8GB SD card - ideal for M+V or compliance reporting.



NRM's CoolTrol[®] CCS2 cooler and freezer control system is an energy-enhancing solution that optimizes the performance of your refrigeration's components through integrated controls and sensors. See a reduction of up to 50% of the energy used by your equipment and recapture that wasted energy as profit.



■ Visit: www.nrminc.com

■ Call: 800.377.5439

■ Address: 480 Neponset St., Building 2, Canton, MA 02021

■ Email: sales@nrminc.com



National Resource Management, Inc.

Manufacturer Specification Sheets

ECM 13: Steam Trap Replacements

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Established 1958

Float & Thermostatic Steam Traps Series TUN Double Inlet / Outlet

Operation

Tunstall Corporation produces a full line of Float & Thermostatic Steam Traps containing a float valve mechanism which modulates to discharge condensate continuously, while non-condensable gases are released by a separate internal balanced pressure thermostatic air vent (The Tunstall Capsule®).

The “H” pattern body on all ¾”, 1”, 1-1/4” & 1-1/2” (15, 30, 75 & 125 psig) has been designed to offer maximum installation flexibility.

All Tunstall Series TUN float & thermostatic traps can be serviced without disturbing system piping.

Features

- Variety of piping connections.
- Stainless steel balanced pressure thermostatic air vent (Tunstall Capsule®).
- Stainless steel internal components
- Wide selection ¾”-1-1/2” @ 15, 30, 75 & 125 psig differential pressures.
- Designed to withstand water hammer & high load demands.
- Designed for In-line repair.

Construction

Tunstall float and thermostatic traps feature all stainless steel interiors, heavy duty trap housings, easy access to internal parts and convenient piping connections.



Materials of Construction

Body & Cover	Cast Iron-ASTMA 126CI B
Valve Head	Stainless Steel
Valve Seat	Stainless Steel
Valve Seat Gasket	Non-Asbestos
Float	Stainless Steel
Bracket & Lever Assembly	Stainless Steel
Thermostatic Air Vent	Tunstall Capsule® Stainless Steel
Cover Bolts	Carbon Steel Grade 5
Cover Gasket	Non-Asbestos



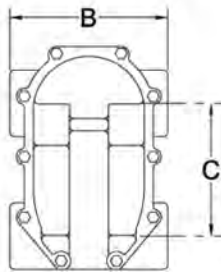
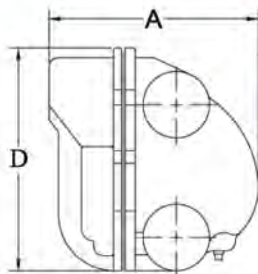
Float & Thermostatic Steam Traps - *Series TUN*

Engineering Specifications

Capacities lbs. Condensate per hour			Differential Pressure (PSI)														
			1/4	1/2	1	2	5	10	15	20	25	30	40	50	75	100	125
Model	Size NPT	PSIG Orifice															
TUN-215	3/4"	.313	600	825	1000	1225	1575	1875	2175								
TUN-415	1"	.313	600	825	1000	1225	1575	1875	2175								
TUN-515	1-1/4"	.344	750	1000	1200	1400	1900	2300	2700								
TUN-715	1-1/2"	.391	980	1365	1855	2410	3150	3750	4075								
TUN-230	3/4"	.250	425	600	750	900	1250	1500	1725	1900	2050	2300					
TUN-430	1"	.250	425	600	750	900	1250	1500	1725	1900	2050	2300					
TUN-530	1-1/4"	.313	600	825	1000	1225	1575	1875	2175	2500	2750	3000					
TUN-730	1-1/2"	.391	800	1100	1450	1800	2400	2900	3400	3750	4050	4300					
TUN-275	3/4"	.141	300	375	425	500	625	725	825	900	975	1000	1200	1350	1650		
TUN-475	1"	.141	300	375	425	500	625	725	825	900	975	1000	1200	1350	1650		
TUN-575	1-1/4"	.188	375	500	600	710	935	1050	1225	1375	1525	1675	1825	1950	2400		
TUN-775	1-1/2"	.219	400	525	675	825	1075	1250	1425	1575	1725	1850	2000	2200	2700		
TUN-2125	3/4"	.109	275	310	350	390	450	500	540	600	660	725	850	1000	1280	1500	1650
TUN-4125	1"	.109	275	310	350	390	450	500	540	600	660	725	850	1000	1280	1500	1650
TUN-5125	1-1/4"	.141	300	375	425	525	625	725	825	900	975	1100	1200	1350	1650	1900	2100
TUN-7125	1-1/2"	.172	350	450	550	650	800	950	1050	1150	1275	1400	1500	1625	1950	2275	2500

Capacities in lbs of condensate per hour according to ASME.

All 3/4", 1", 1-1/4" & 1-1/2"



Model	Size	DIMENSIONS (Inches)				Weight (lbs.)	Repair Kit
		A	B	C	D		
TUN-215	3/4"	5.75	4.875	3.375	5.6875	12	TUN-1FP-DB-215
TUN-415	1"	5.75	4.875	3.375	5.6875	12	TUN-2FP-DB-415
TUN-515	1-1/4"	6.375	5.375	3.00	5.75	17	TUN-3FP-DB-515
TUN-715	1-1/2"	6.375	5.375	3.00	5.75	17	TUN-4RK-DB-715
TUN-230	3/4"	5.75	4.875	3.375	5.6875	12	TUN-1FP-DB-230
TUN-430	1"	5.75	4.875	3.375	5.6875	12	TUN-2FP-DB-430
TUN-530	1-1/4"	6.375	5.375	3.00	5.75	17	TUN-3FP-DB-530
TUN-730	1-1/2"	6.375	5.375	3.00	5.75	17	TUN-4RK-DB-730
TUN-275	3/4"	5.75	4.875	3.375	5.6875	12	TUN-1FP-DB-275
TUN-475	1"	5.75	4.875	3.375	5.6875	12	TUN-2FP-DB-475
TUN-575	1-1/4"	6.375	5.375	3.00	5.75	17	TUN-3RK-DB-575
TUN-775	1-1/2"	6.375	5.375	3.00	5.75	17	TUN-4RK-DB-775
TUN-2125	3/4"	5.75	4.875	3.375	5.6875	12	TUN-1FP-DB-2125
TUN-4125	1"	5.75	4.875	3.375	5.6875	12	TUN-2FP-DB-4125
TUN-5125	1-1/4"	6.375	5.375	3.00	5.75	17	TUN-3RK-DB-5125
TUN-7125	1-1/2"	6.375	5.375	3.00	5.75	17	TUN-4RK-DB-7125



Tunstall Corporation
118 Exchange Street · Chicopee, MA 01013

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www.tunstall-inc.com

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We reserve the right to alter designs, specifications and information without notice.

Bulletin-TA-Series-TUN-0715
Float & Thermostatic Traps

Tunstall Steam Trap Capsules®

Submittal Data

Project:

Engineer:

Contractor:

Representative/Supplier:



Post & Spring Style



Thread Type



Installation Tool

Features:

- 100% Stainless Steel Thermostatic Capsule, TIG Welded Construction
- Stainless Steel Spring (If Required)
- Stainless Steel Seat
- Stainless Steel Bellows
- EPDM Gasket Rated to 300°F (Saturated Steam)
- 24 Month Warranty

Specifications

Spring Type

For low pressure steam radiator traps vacuum to 45 psig. Stainless steel bellows with corrosion resistant stainless steel plug and seat. All parts calibrated inside a heavy duty stainless steel capsule (housing) with a stainless steel spring inserted on a stainless steel post at the top of capsule (housing). The seat projection to be unthreaded to facilitate easy installation where the orifice in the trap body has no threads.

Thread Type

For low pressure steam radiator traps vacuum to 45 psig. Stainless steel bellows with corrosion resistant stainless steel plug and seat. All parts calibrated inside a heavy duty stainless steel capsule (housing). The seat projection to be threaded to facilitate easy installation where the orifice in the trap body is threaded. TC Tool to be provided for ease of installation.

Manufacturer Specification Sheets

ECM 14: Infiltration Reductions

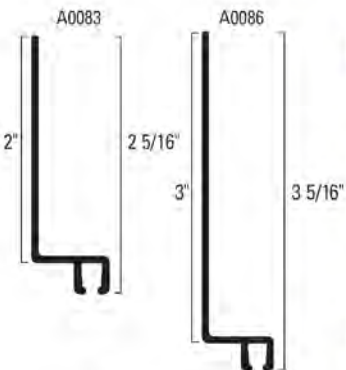
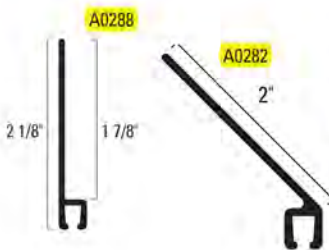
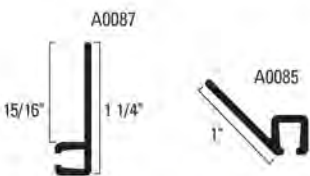
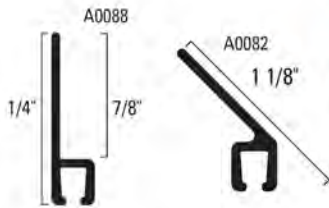
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MATERIAL LIST - BUILDING ENVELOPE MEASURES

Task	Manufacturer/ Product	Material Description
Attic Access Hatch (Retrofit, Install)	Dow/ Thermax Sheathing	polyisocyanurate rigid board insulation
	Plywood/ CDX plywood/ Lumber	standard plywood (no Data Sheet included)
	Visco Products/ DXL1000 Door Weather Stripping	aluminum extrusion with Q-Lon soft cell foam insert
Attic Bypass Air Sealing	Dow/ Froth-Pak Foam Insulation	2-part spray polyurethane foam
	Dow/ Great Stuff Pro Gaps and Cracks	1-part polyurethane foam sealant
	Dow/ Thermax Sheathing	polyisocyanurate rigid board insulation
Attic Insulation	Cellpak Cellulose/ Cellpak Cellulose Insulation Supreme	cellulose insulation - void of ammonium sulfate
	National Fiber/ Cel-Pak Cellulose Insulation	cellulose insulation - void of ammonium sulfate
Buck Frame Sealing	Dow/ Great Stuff Pro Gaps and Cracks	1-part polyurethane foam sealant
	DuPont/ Airtite Siliconized Acrylic Caulk	siliconized acrylic latex caulk
	J&K Foam Fabricating Inc./ Standard Backer Rod	closed-cell low-density polyethylene foam backer rod
	Sascho/ Big Stretch	elastomeric sealant
Caulking (Exterior, Interior)	DuPont/ Airtite Siliconized Acrylic Caulk	siliconized acrylic latex caulk
	J&K Foam Fabricating Inc./ Standard Backer Rod	closed-cell low-density polyethylene foam backer rod
	Sascho/ Big Stretch	elastomeric sealant
Door Weather Stripping	C R. Lawrence/ Vangaurd Astragal Replacement	pile weatherstrip insert
	Schlegel Systems (Visco)/ PF-102 Polyflex Weatherseal	surface mount weather strip
	Schlegel Systems (Visco)/ PF-114 Polyflex Weatherseal	surface mount weather strip
	Schlegel Systems (Visco)/ PF-512 Polyflex Weatherseal	surface mount weather strip
	Visco Products/ FS325 Door Weather Stripping	aluminum extrusion with wool pile brush/ fin insert
	Visco Products/ FS300 Door Weather Stripping	aluminum extrusion with wool pile brush/ fin insert
	Visco Products/ TS100 Door Triple Sweep	aluminum extrusion with 3/4" vinyl insert
	Visco Products/ DXL1000 Door Weather Stripping	aluminum extrusion with Q-Lon soft cell foam insert
Visco Products/ DXL320 Door Weather Stripping	aluminum extrusion with Q-Lon soft cell foam insert	
Garage Door Weather Stripping	Action Industries/ Standard Aluminum Retainers - A0288	aluminum retainers for weather strip
	Action Industries/ Standard Aluminum Retainers - A0282	aluminum retainers for weather strip
	Action Industries/ Standard Rubber - V0036-00-W, V0056-00-W	rubber weather strip inserts/ seals
	Action Industries/ Standard Brush Seals - B07772-RI-W	brush weather strip inserts/ seals
	Action Industries/ Aluminum Bottom Seal Retainers - A2020	aluminum retainers for bottom weather strip
	Action Industries/ Bottom Rubber Seals - T2564-00-W	rubber weather strip inserts/ seals
	Action Industries/ Standard Rolling Steel Guide Seal - PL035-00-W	rigid and flexible vinyl roll-up door clip-on weather strip
Overhang Air Sealing	Convenience Products/ Touch 'n Seal All Seasons	1-part polyurethane foam sealant
	Dow/ Froth-Pak Foam Insulation	2-part spray polyurethane foam
	Dow/ Great Stuff Pro Gaps and Cracks	1-part polyurethane foam sealant
	Dow/ Thermax Sheathing	polyisocyanurate rigid board insulation
	DuPont/ Airtite Siliconized Acrylic Caulk	siliconized acrylic latex caulk
	Sascho/ Big Stretch	elastomeric sealant
Roof-Wall Intersection Air Sealing	Convenience Products/ Touch 'n Seal All Seasons	1-part polyurethane foam sealant
	Dow/ Froth-Pak Foam Insulation	2-part spray polyurethane foam
	Dow/ Great Stuff Pro Gaps and Cracks	1-part polyurethane foam sealant
	Dow/ Thermax Sheathing	polyisocyanurate rigid board insulation
	DuPont/ Airtite Siliconized Acrylic Caulk	siliconized acrylic latex caulk
	Sascho/ Big Stretch	elastomeric sealant
Window Weatherization	Schlegel Systems (Visco)/ PF-102 Polyflex Weatherseal	surface mount weather strip
	Schlegel Systems (Visco)/ PF-114 Polyflex Weatherseal	surface mount weather strip
	Schlegel Systems (Visco)/ PF-512 Polyflex Weatherseal	surface mouni weather strip

Note: Product Data Sheets are included in this Submittal Report in alphabetical order by the company name of the material manufacturer.

STANDARD SEALS



STANDARD ALUMINUM RETAINERS

Made of high-strength aluminum ore and designed to hold any 1/2" to 3" standard brush, rubber or vinyl seal (see pages 3, 4 & 5). Custom fabrication and secondary options include punching and assembly.

STANDARD MILL LENGTHS: 8'-2", 9'-2", 10'-2", 12'-4", 14'-4", 16'-4", 18'-4"

STANDARD BROWN & WHITE LENGTHS: 16'-4", 18'-4"

PART NUMBER	COLOR
1" STR	
A0088-MI-W	Mill
A0088-BR-W	Brown
A0088-WH-W	White
1" 45°	
A0082-MI-W	Mill
A0082-BR-W	Brown
A0082-WH-W	White
1" 90°	
A0087-MI-W	Mill
1" Reverse 45°	
A0085-MI-W	Mill
2" STR	
A0288-MI-W	Mill
A0288-BR-W	Brown
A0288-WH-W	White
2" 45°	
A0282-MI-W	Mill
A0282-BR-W	Brown
A0282-WH-W	White
2" OFFSET	
A0083-MI-W	Mill
A0083-BR-W	Brown
A0083-WH-W	White
3" OFFSET	
A0086-MI-W	Mill

STANDARD ROLLING STEEL GUIDE SEAL

Designed to clip onto guides up to 1/4" thick. Compatible with standard brush, rubber and vinyl seals (see pages 3, 4 & 5).

STANDARD LENGTHS: 8'-2", 9'-2", 10'-2", 12'-4", 14'-4", 16'-4", 18'-4"

PART NUMBER	COLOR
PL035-00-W	Gray

STANDARD & ZEBRA BRUSH SEALS

Both our Standard and Zebra Brush™ Seals are made of versatile and long-lasting filaments that will not hold water or freeze at sub-zero temperatures. Bristles are wrapped around a steel rod to prevent "pull-out." Standard Brush Seals fit all Standard Aluminum Retainers (see page 2) or Standard Rolling Steel Clip-On Retainers (see page 21). STANDARD LENGTHS: 6', 7', 8', 9', 10'.

PART NUMBER BRISTLE

STANDARD BRUSH SEAL

B0766-00-W	1/2"
B0767-00-W	3/4"
B0768-00-W	1"
B0769-00-W	1 1/2"
B0770-00-W	1 3/4"
B0771-00-W	2"
B0772-00-W	3"

ZEBRA BRUSH SEAL*

B0768-ZB-W	1"
B0771-ZB-W	2"
B0772-ZB-W	3"

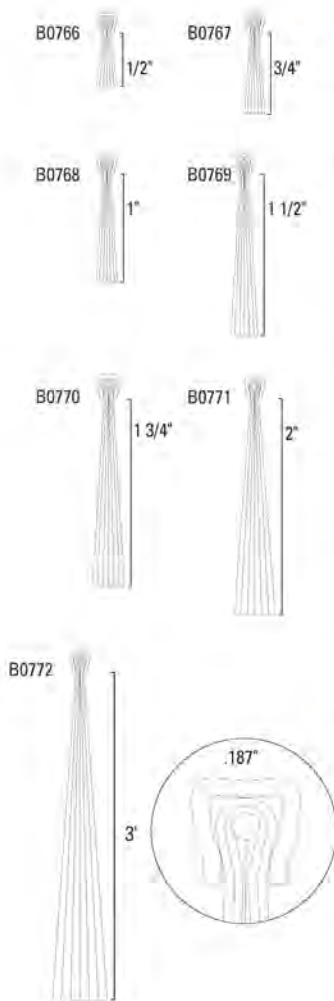
*Colors are alternating yellow and black filament for high visibility.

GASKETING MATERIALS FOR FIRE DOORS

Classified to U.S. and Canadian standards by Underwriters Laboratories Inc. for application to hollow metal, steel covered composite, rolling steel and passenger elevator type fire doors rated up to three hours only. GVWZ.RI8008.

All Action Industries Slim-Line, Standard and Large Brush Weatherseals from 1/2" to 6" are UL Listed to U.S. and Canadian safety standards.

Softening Point: 240°F, Melting Point: 320°F



weatherBLOCK WEATHERSEAL

WEATHERBLOCK WEATHERSEAL

Action Industries' new standard weatherblock weatherseal ensures a secure seal and barrier against smoke, air infiltration and extreme weather. A single durable EPDM rubber insert provides an excellent seal. Fits all Standard Aluminum Retainers (see page 2). Standard Lengths: 8', 10'.



PART NUMBER DESCRIPTION

BRUSH WEATHERSEAL

B0766-RI-W	Standard 1/2" Brush
B0767-RI-W	Standard 3/4" Brush
B0768-RI-W	Standard 1" Brush
B0769-RI-W	Standard 1 1/2" Brush
B0770-RI-W	Standard 1 3/4" Brush
B0771-RI-W	Standard 2" Brush
B0772-RI-W	Standard 3" Brush

STANDARD RUBBER SEALS

Designed for applications where extreme temperature changes (-50° – 350°F) may occur. Designed to fit in our Standard Aluminum Retainers (see page 2) or Standard Rolling Steel Clip-On Retainers (see page 21). AVAILABLE IN ROLLS OR INSTALLED.

PART NUMBER	DESCRIPTION
V0036-00-W	1 3/8" Black
V0056-00-W	2 1/2" Black



STANDARD VINYL SEALS

These seals possess excellent memory for shape retention under various conditions at a reasonable cost. Designed to fit in our Standard Aluminum Retainers (see page 2) or Standard Rolling Steel Clip-On Retainers (see page 21). AVAILABLE IN ROLLS OR INSTALLED.

PART NUMBER	COLOR
V0021-GR-W	Gray
V0023-WH-W	White
V0024-BL-W	Black



PART NUMBER	COLOR
V0031-GR-W	Gray
V0033-WH-W	White
V0034-BL-W	Black



PART NUMBER	COLOR
V0041-GR-W	Gray
V0043-WH-W	White
V0044-BL-W	Black



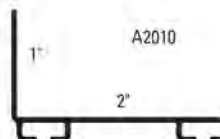
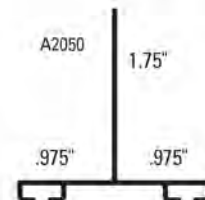
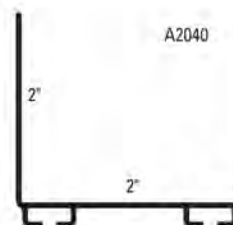
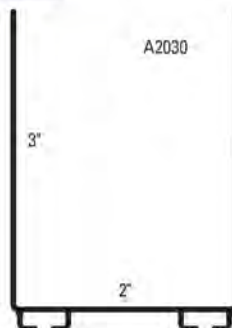
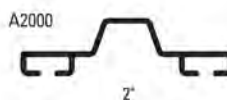
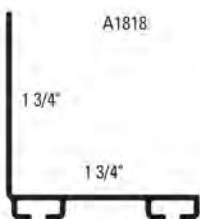
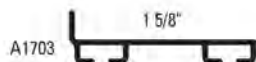
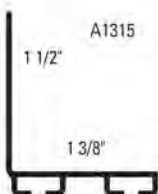
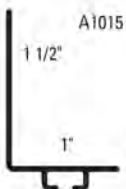
BOTTOM SEALS

ALUMINUM BOTTOM SEAL RETAINERS

Longer-lasting, versatile retainer that will accept 1/4" T-Style rubber, vinyl or bulb seals from pages 13 – 17.

Available in Mill finish.

STANDARD LENGTHS: 8'-2", 9'-2", 10'-2", 12'-4", 14'-4", 16'-4", 18'-4"

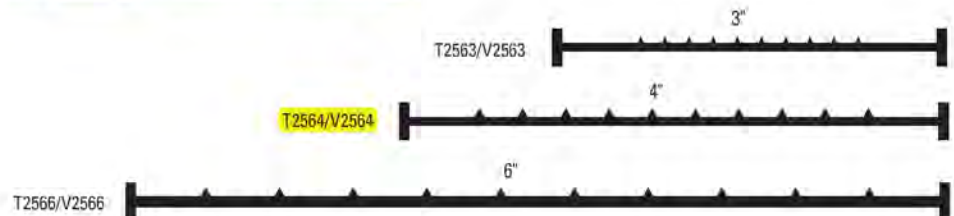


PART NUMBER	DESCRIPTION
A1015-01-W	1" x 1 1/2" L-Shaped
A1250-00-W	1 1/4" Flat
A1315-01-W	1 3/8" x 1 1/2" L-Shaped
A1330-01-W	1 3/8" x 3" U-Shaped
A1330-02-W	1 3/8" x 3" L-Shaped
A1700-00-W	1 5/8" Flat
A1703-00-W	1 5/8" L-Shaped
A1818-01-W	1 3/4" x 1 3/4" L-Shaped
A1830-01-W	1 3/4" x 3" U-Shaped
A2000-TG-W	2" Tongue & Groove Panel
A2010-01-W	2" x 1" L-Shaped
A2020-01-W	2" x 2" L-Shaped
A2030-01-W	2" x 3" U-Shaped
A2040-01-W	2" x 2" U-Shaped
A2050-01-W	2" x 1 5/8" T-Shaped

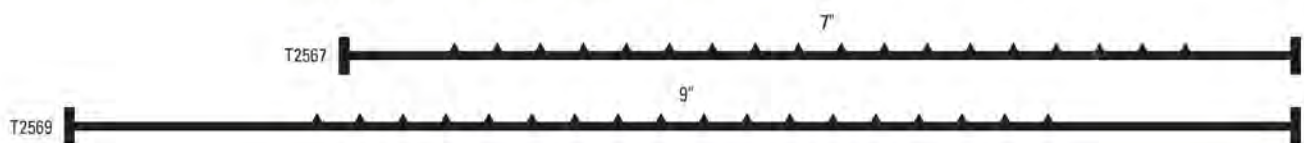
BOTTOM "T" RUBBER SEALS

Made of durable, black EPDM synthetic rubber, excellent in extreme temperature conditions (-50° – 350°F). Designed with a 1/4" "T" to fit the popular T-style bottom retainers.

PART NUMBER	DESCRIPTION
T2563-00-W	3" T-Rubber, Black, 150' Reel
T2564-00-W	4" T-Rubber, Black, 150' Reel
T2566-00-W	6" T-Rubber, Black, 100' Reel



PART NUMBER	DESCRIPTION
T2567-00-W	7" T-Rubber, Black, 100' Roll
T2569-00-W	9" T-Rubber, Black, 100' Roll



BOTTOM "T" VINYL SEALS

This high-quality vinyl astragal series provides an economical option for your bottom seal needs. The material is specially engineered for better performance at low temperatures, and the universal 1/4" "T" construction fits almost any retainer.

PART NUMBER	DESCRIPTION
V2563-BL-W	3" T-Vinyl, Black, 200' Reel
V2563-GR-W	3" T-Vinyl, Gray, 200' Reel

PART NUMBER	DESCRIPTION
V2564-BL-W	4" T-Vinyl, Black, 200' Reel
V2564-GR-W	4" T-Vinyl, Gray, 200' Reel
V2564-YL-W	4" T-Vinyl, Yellow, 200' Reel

PART NUMBER	DESCRIPTION
V2566-BL-W	6" T-Vinyl, Black, 200' Reel
V2566-GR-W	6" T-Vinyl, Gray, 200' Reel



TECH DATA SHEET

1. PRODUCT NAME

Touch 'n Seal All Seasons Gun Foam Sealant 24 ounce (680 gm)
Item # 4004529812

2. MANUFACTURER

Convenience Products
866 Horan Dr., Fenton, MO 63026 USA
(636) 349-5855
(800) 325-6180
FAX (636) 349-5335
E-mail support@touch-n-seal.com
Website: www.touch-n-seal.com

3. PRODUCT DESCRIPTION

Touch 'n Seal All Seasons one-component, moisture curing polyurethane foam sealant is uniquely formulated to perform under difficult low temperature conditions where traditional polyurethane foam sealants fail to cure. All Seasons Gun Foam cures at temperatures as low as 20°F (-7°C) and as high as 120°F (49°C). All Seasons Gun Foam meets the insulating and air sealing requirements of professional commercial, industrial, agricultural and residential contractors who must work in extreme temperatures. All Seasons Gun Foam is non-toxic, fire-retardant, non-shrinking and permanently fills and seals cracks and gaps.

Basic Use

Use Touch 'n Seal All Seasons Gun Foam when an application must be made during extreme low or high temperatures. All Seasons Gun Foam seals cracks and gaps up to ½ inch (12mm) wide, providing a permanent insulating and air sealing solution to most building component materials, including: wood, concrete, insulating foam boards, metal, plastics and sheetrock.

The Touch 'n Seal All Seasons Gun Foam protects against both vapor migration and energy robbing air infiltration, helps to improve indoor air quality and provides superior insulation performance.

Composition & Materials

Touch 'n Seal All Seasons Gun Foam is permanent and dries within minutes of application.

Sizes

All Seasons Gun Foam – Item #
4004529812 - 24 ounce (680 gm)

Benefits

- Use in temperatures as low as 20°F (-7°C) and as high as 120°F (49°C)
- Provides a permanent seal against air, moisture and insect infiltration
- Permanent installation; does not shrink or settle as do many caulk type sealants
- Compatible with all fiber insulation systems including cellulose, fiberglass and rockwool
- Bonds to common building materials, including: wood, concrete, insulating foam boards, metal, plastics and sheetrock
- Expands to fill gaps up to ½" (12mm) wide reducing air exchanges
- Reduces energy loss by as much as 40%
- Reduces use of fossil fuels and improves air quality
- No Ozone Depleting Chemicals
- Helps to reduce Greenhouse Gas Emissions
- Closed cell structure
- Allows for down sized HVAC systems; uses less energy, fewer cycle times, more consistent "comfort level", reduces equipment maintenance
- Outperforms fiberglass
- Fire retardant

Limitations

- Do not expose to temperatures above 250°F (121°C), open flames or sparks.
- Not for exposure to ultraviolet light.
- Chemicals must be 60°F (16°C) - 90°F (32°C) prior to dispensing.
- Do not store in temperatures above 120°F.
- Always refer to local building code regulations.
- Do not leave product exposed – cover with approved facings.
- Flammable propellant. Read MSDS and do not use near high heat, sparks or open flame.

4. TECHNICAL DATA

Applicable Standards

- ASTM E84 Surface Burning Characteristics
- ASTM C518 R-Value
- ASTM D1622 Density
- ASTM D2856 Closed Cell Content



Approvals/Certifications

- International Building Code
- International Residential Code
- BOCA National Building Code
- 1999 Standard Building Code
- 1997 Standard Building Code
- ICC-Evaluation Services

Physical/Chemical Properties

See Table. Test data available upon request.

Shelf Life

12 months in unopened container when stored between 60°-90°F (16°-32°C), in a dry, well ventilated area.

Storage & Disposal

Keep containers tightly closed in a cool, well ventilated area. Ideal storage temperature is 60°-90°F (16°-32°C). Storage above 90°F (32°C) will reduce shelf life. Do not store at temperatures above 120°F (49°C). Do not expose containers to conditions that may damage, puncture, or burst the containers. Dispose of leftover material/containers in accordance with Federal, state and local regulations. See Material Safety Data Sheet for more information.

5. INSTALLATION/APPLICATION

Always refer to local building codes prior to application of Touch 'n Seal foam.

The Touch 'n Seal All Seasons Gun Foam can be applied to and will adhere to almost any traditional construction surfaces, including: wood, concrete, polystyrene, gypsum board, fiberboard, masonry and metal.

Surfaces to receive Touch 'n Seal All Seasons Gun Foam must be dry, clean and free of dust, dirt, grease and other substances that may inhibit proper adhesion. Fill application area about 1/3 full, leaving room for foam to expand.





TECH DATA SHEET

For best results apply Touch 'n Seal All Seasons Gun Foam when surface and ambient temperatures are between 60°-90°F (16°-32°C). Touch 'n Seal All Seasons Gun Foam may be applied to ambient and surface temperatures as low as 20°F (-7°C) and as high as 120°F (49°C). Chemical contents must be between 70°- 90°F (21°- 32°C) before dispensing. Use all chemical contents within 30 days of initial dispensing. Clean uncured foam from applicator tools with Touch 'n Seal Poly-Clean.

Keep out of reach of children.

Always wear proper personal protective equipment, including gloves, clothing and eyewear. Use in well ventilated area.

See material safety data sheet for additional warnings and information.

Please refer to manufacturers' instructions or request a faxed set of instructions from

Convenience Products by calling Customer Service at 800-325-6180.

6. Availability & Cost

Availability

Touch 'n Seal polyurethane foams are available throughout the U.S., Canada, Mexico and the world. Contact Convenience Products Customer Service at 800-325-6180 or FAX 636-349-1708 for distributor information.

Cost

Contact Convenience Products for local distributors who can provide cost and delivery information.

7. Warranty

Convenience Products warrants All Seasons Gun Foam to be free of defects in workmanship and function.

Convenience Products is not liable for any incidental, consequential or any other damages or remedies. There are no

Warranties that extend beyond the description herein, however, certain states have specific laws regarding limitation on incidental or consequential damages, in which case, and you may have other legal rights.

8. Maintenance

None.

9. Technical Services

Technical assistance, including more detailed information, product literature, test results, assistance with preparing project specifications and application training is available by contacting Convenience Products Customer Service.

10. Filing Systems

Additional information is available from the manufacturer upon request.

TYPICAL PROPERTIES OF TOUCH 'N SEAL ALL SEASONS GUN FOAM

Shelf Life	1 year; unopened container
Dry time/Tack Free Time	10 minutes
Fully Cured	Approximately 1 hour
Cuttable	30 minutes
ASTM E84 Surface Burning Characteristics	
Flame Spread	5
Smoke Development	10
ASTM C518 R-Value	7.12 /in.
ASTM C1536 Yield for Aerosol Foam Sealants	2,200 ft (670m) @ ¼" (6mm)
ASTM D1622 Density	1.9 ± .10 pcf
International Building Code	Conforms
International Residential Code	Conforms
BOCA National Building Code	Conforms
1999 Standard Building Code	Conforms
1997 Standard Building Code	Conforms
ICC-ES	Listed ESR 1926





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Catalog Number: **W562B**

- Stops Air, Water, and Dust from Infiltrating the Joint Between Pairs of Doors
- Designed to Replace Worn Pile Weatherstrips on U.S. Aluminum Doors with Vanguard Security Astragals
- Resists Mold, Mildew, and Corrosion

This **CRL Pile Weatherstrip** is installed by simply sliding it into the pile channel of the existing U.S. Aluminum Vanguard Security Astragal frame. The polypropylene black fiber pile resists mold, mildew, and corrosion, and has exceptional resistance to abrasion. It is silicone treated to repel water, and stabilized against ultraviolet and ozone. The backing strip is polypropylene and lasts longer than plastic weatherseals.



CLICK HERE TO VIEW
MORE CHOICES

CRL Vanguard Security Astragal Replacement Pile Weatherstrip - 1500' Bulk Roll

Other Products/Finishes:

CATALOG NUMBER	DESCRIPTION
W562B	CRL Vanguard Security Astragal Replacement Pile Weatherstrip - 1500' Bulk Roll
W562C	CRL .625" Vanguard Security Astragal Replacement Pile Weatherstrip

More Details:

Catalog Number:	W562B
Also Available in These Catalogs:	CRL83R Door and Window Replacement, PAGE 651W CRL93G Doors and Windows, PAGE DW143
Bulk Roll Length:	1500' (457.2 m)
Ship Via:	Can Ship UPS

Additional Product Information:

No additional product information available at this time.

Important Notes:

Most shipping weights are approximate and have not been verified. If the exact weight is needed in order to determine shipping costs, and shipping costs are required in order for you to complete your order, please request this prior to submitting your order by contacting [CRL Customer Service](#). Product images shown are of the actual product or a close representation. Colors can vary depending on your computer's video card and on how your monitor's color is adjusted.

Related Items:

No related items.

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FROTH-PAK™ FOAM INSULATION

1. PRODUCT NAME

FROTH-PAK™ Foam Insulation

2. MANUFACTURER

The Dow Chemical Company
 Dow Building Solutions
 200 Larkin
 Midland, MI 48674
 1-866-583-BLUE (2583)
 Fax 1-989-832-1465
www.dowbuildingsolutions.com

3. PRODUCT DESCRIPTION

BASIC USE

FROTH-PAK™ Foam Insulation is a two-component, quick-cure polyurethane foam that fills cavities, penetrations, cracks and expansion joints. Unlike one-component foam, FROTH-PAK™ Foam Insulation is a chemically cured foam, significantly reducing curing time.

FROTH-PAK™ Foam Insulation dispenses, expands and becomes tack-free in seconds. The product will skin over in 30-40 seconds and will be completely cured in minutes.*

The Class-A rating (flame spread of 25 or less) of FROTH-PAK™ Foam Insulation allows its use in a wide range of interior and exterior industrial, commercial, institutional and residential settings. Check with local codes prior to use. If used in an exterior setting, a coating must be applied for ultraviolet (UV) protection.

SIZES

FROTH-PAK™ Foam Insulation is typically sold as a complete 42 lb (FROTH-PAK™ 200) portable kit that includes pressurized "A" and "B" cylinders, plus dispensing gun/hose assembly and accessories. FROTH-PAK™ Foam Insulation is also available in refillable, returnable cylinders for commercial applications requiring a large amount of foam. See Table 1 for yield and size information.

4. TECHNICAL DATA

APPLICABLE STANDARDS

- ASTM International
- C203 – Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
 - C273 – Standard Test Method for Shear Properties of Sandwich Core Materials
 - C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics
 - D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics
 - D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
 - D2842 – Standard Test Method for Water Absorption of Rigid Cellular Plastics
 - E96 – Standard Test Methods for Water Vapor Transmission of Materials
 - E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
 - E2178 – Standard Test Method for Air Permeance of Building Materials

PHYSICAL PROPERTIES

FROTH-PAK™ Foam Insulation exhibits the typical properties and characteristics indicated in Table 2 when tested as represented.

FIRE PROTECTION

Cured FROTH-PAK™ foam is combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose to temperatures above 240°F.

CODE COMPLIANCES

FROTH-PAK™ Foam Insulation complies with the following codes:

- Underwriters Laboratories, Inc. (UL) Classified, see Classification Certificate R7813
- National Fire Protection Association – per NFPA 286 testing, can be left exposed in non-fire-resistant rated roof/wall junctures, maximum 6" high and 2" deep (unlimited width)

Contact your Dow sales representative or local authorities for state and local building code requirements and related acceptances.

5. INSTALLATION

Complete operating instructions are provided with each FROTH-PAK™ Foam Insulation purchase. Read all information and cautions before application. **Note: Avoid overfilling restricted spaces. Chemicals exert force during reaction, and expansion of foam may result in substrate deformation.**

TABLE 1: SIZES AND THEORETICAL YIELDS FOR FROTH-PAK™ FOAM INSULATION

PRODUCT	THEORETICAL YIELD ⁽¹⁾ , BOARD FT
<i>Kits</i>	
FROTH-PAK™ 200	200
FROTH-PAK™ 620	620
<i>Refillable Cylinders (commercial use)</i>	
FROTH-PAK™ 17 (gal)	2,060
FROTH-PAK™ 60 (gal)	6,860
FROTH-PAK™ 120 (gal)	15,430
FROTH-PAK™ 350 (gal)	43,890

(1) The theoretical yield has become an industry standard for identifying certain sizes of two-component kits. Theoretical yield calculations are performed in perfect laboratory conditions, without taking into account the loss of blowing agent or the variations in application methods and types.

SAFETY AND CONDITIONS OF USE

- Read the instructions and Material Safety Data Sheets carefully before use.
- FROTH-PAK™ spray polyurethane foam contains isocyanate, hydrofluorocarbon blowing agent and polyol. Do not breathe vapor or mist. Use only in well-ventilated areas or with proper respiratory protection. Supplied air or an approved air-purifying respirator equipped with an organic vapor sorbent and a P100 particulate filter may be required to maintain exposure levels below

- ACGIH, OSHA, WEEL or other applicable limits. For situations where the atmospheric levels may exceed the level for which an air-purifying respirator is effective, use a positive-pressure, air-supplying respirator (air line or self-contained breathing apparatus).
- Isocyanate is irritating to the eyes, skin and respiratory system, and may cause sensitization by inhalation or skin contact.
 - FROTH-PAK™ foam will adhere to most surfaces and skin. Do not get foam on skin. Wear protective clothing (including long sleeves),

- gloves, and goggles or safety glasses. Cured foam must be mechanically removed or allowed to wear off in time.
- The contents are under pressure.
 - FROTH-PAK™ foam should not be used around heaters, furnaces, fireplaces, recessed lighting fixtures or other applications where the foam may come in contact with heat-conducting surfaces. Cured FROTH-PAK™ foam is combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose to temperatures above 240°F.

TABLE 2: TYPICAL PHYSICAL PROPERTIES OF FROTH-PAK™ FOAM INSULATION

PROPERTY AND TEST METHOD	VALUE
Flame Spread/Smoke Developed ⁽¹⁾⁽²⁾ , ASTM E84/UL 723	25/350
Nominal Density, ASTM D1622, lb/ft ³	1.75
Thermal Resistance ⁽³⁾ per inch, ASTM C518, ft ² •h•°F/Btu, R-value, min.	
Initial	6.6
Aged 90 days at 140°F	5.6
Air Leakage, ASTM E283, cfm/ft ² @ 1.57 psf	0
ASTM E2178, L/s/m ² @ 75 Pa	0
Water Vapor Permeance, ASTM E96	
perm @ 1" thick	3.9
perm @ 2" thick	2.0
Water Absorption, ASTM D2842, % by volume	2.17
Dimensional Stability, ASTM D2126, % volume change	
100°F/100% RH @ 1wk	4.6
100°F/100% RH @ 2wks	5.0
158°F/100% RH @ 1wk	6.5
158°F/100% RH @ 2wks	5.1
-40°F/amb RH @ 1wk	0.9
-40°F/amb RH @ 2wks	0.9
158°F/amb RH @ 1wk	3.1
158°F/amb RH @ 2wks	2.3
Compressive Strength, ASTM D1621, lb/in ² , parallel	21.1
Flexural Strength, ASTM C203, lb/in ² , parallel	22.7
Tensile Strength, ASTM D1623, lb/in ² , parallel	26.7
Shear Strength, ASTM C273, lb/in ² , parallel	16.7
Maximum Service Temperature, °F	240

(1) Tested at 2" thickness, full coverage.

(2) This numerical flame spread rating is not intended to reflect hazards presented by this or any other material under actual fire conditions.

(3) R means resistance to heat flow. The higher the R-value, the greater the insulating power.

Visit www.dowbuildingsolutions.com or contact a local Dow representative for more specific instructions.

6. AVAILABILITY

FROTH-PAK™ Foam Insulation is distributed through an extensive network. For more information, call 1-800-232-2436.

7. WARRANTY

Not applicable.

8. MAINTENANCE

Not applicable.

9. TECHNICAL SERVICES

Dow can provide technical information to help address questions when using FROTH-PAK™ Foam Insulation. Technical personnel are available to assist with any insulation project. For technical assistance, call 1-866-583-BLUE (2583).

10. FILING SYSTEMS

- www.dowbuildingsolutions.com
- www.sweets.com

www.dowbuildingsolutions.com

Technical Information
1-866-583-BLUE (2583)
Sales Information
1-800-232-2436

THE DOW CHEMICAL COMPANY
200 Larkin
Midland, MI 48674

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Dow Polyurethane Foam Insulation and Sealants

CAUTION: When cured, these products are combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose to temperatures above 240°F. For more information, consult MSDS, call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400.

FROTH-PAK™ spray polyurethane foam contains isocyanate, hydrofluorocarbon blowing agent and polyol. Read the instructions and Material Safety Data Sheets carefully before use. Wear protective clothing (including long sleeves), gloves, goggles or safety glasses, and proper respiratory protection. Supplied air or an approved air-purifying respirator equipped with an organic vapor sorbent and a P100 particulate filter may be required to maintain exposure levels below ACGIH, OSHA, WEEL or other applicable limits. Provide adequate ventilation. Contents under pressure.

Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mold formation. No material supplier including Dow can give assurance that mold will not develop in any specific system.





GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant

1. PRODUCT NAME

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant

2. MANUFACTURER

The Dow Chemical Company
Dow Building Solutions
200 Larkin
Midland, MI 48674
1-866-583-BLUE (2583)
Fax 1-989-832-1465

Dow Chemical Canada ULC
Dow Building Solutions
450 – 1st St. SW, Suite 2100
Calgary, AB T2P 5H1
1-866-583-BLUE (2583) (English)
1-800-363-6210 (French)

www.dowbuildingsolutions.com

3. PRODUCT DESCRIPTION

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant is a minimal-expanding, single component polyurethane foam sealant for general purpose building envelope air sealing.

In the United States, the sealant is easily identified by its bright orange color. It has led the way in the industry by being recognized as a fireblock, which means it resists the free passage of flames to other areas of the building through concealed spaces.

Basic Use

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant fills and seals gaps up to 3" (75 mm).* GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant:

- expands to take the shape of cracks and voids, forming an airtight and water-resistant bond to wood, metal, masonry, glass and most plastics
- reduces pathways where insects can enter
- installs in minutes (tack-free in 5-10 minutes**, trims within 60 minutes)

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant is both cost-effective and effective as an air sealant.

Sizes

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant is available in 24 oz (680 g) and 30 oz (850 g) gun- and reusable straw-applied versions.

Accessories

Using one of several PRO Series foam dispensing guns simplifies the application of GREAT STUFF PRO™ Gaps & Cracks. In addition to enabling pinpoint application control, an airtight and moisture tight seal between the gun and the can prevents the foam from curing and blocking the dispensing valve, allowing a can to be reused up to one month later.

GREAT STUFF PRO™ Gun Cleaner is a solution to simplify cleanup of uncured polyurethane foam from dispensing guns and work areas. Cured foam must be mechanically removed or allowed to wear off in time.

4. TECHNICAL DATA

Applicable Standards

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant meets the following standards:

- ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM E814 (modified) – Standard Test Method for Fire Tests of Through-Penetration Fire Stops
- CAN/ULC S102 – Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

Code Compliances

GREAT STUFF PRO™ Gaps & Cracks complies with Underwriters Laboratories, Inc. (UL) Classification, Classified as a sealant: see UL R13655.

Evaluation Reports

- ICC-ES ESR-1961 (US only)
- CCMC R13074 (CAN only)

Contact your Dow sales representative or local authorities for state/provincial and local building code requirements and related acceptances.

Physical Properties

GREAT STUFF PRO™ Gaps & Cracks is a polyurethane-based foam with a minimal-expansion formulation. It cures quickly and has a moisture-resistant skin. GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant exhibits the typical properties indicated in Table 1 when tested as represented.

5. INSTALLATION

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant is easy to use. Complete installation instructions are provided on each can. Application surface should be free of dust and dirt. Damp surfaces will not impair the bond. PRO Series foam dispensing guns provide clean and precise dispensing with professional results.

Safety And Conditions Of Use

- Read all instructions and (Material) Safety Data Sheet ((M)SDS).
- GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant contains isocyanate and a flammable blowing agent. Vapors may travel to other rooms. Ensure adequate ventilation and shut off all pilot lights and open flames; eliminate all sources of ignition before use. Do not smoke or use lighters or matches while dispensing foam.
- Do not breathe vapor or mist. Use in well-ventilated areas or wear proper respiratory protection. Isocyanate is irritating to the eyes, skin and respiratory system, and may cause sensitization by inhalation or skin contact.

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*For cavities, cracks and penetrations larger than 3" (75 mm), Dow recommends FROTH-PAK™ Foam Sealant or FROTH-PAK™ Foam Insulation (US only). For window and door framework, minimal-expanding GREAT STUFF PRO™ Window & Door Insulating Foam Sealant is proven not to distort or bow the framework, when properly applied.

**70 ± 5 °F and 50 ± 5 %RH, 1 inch bead diameter, 6 inch length. Cure rate is dependent on temperature, humidity, and size of foam bead.

- GREAT STUFF PRO™ foam is very sticky and will adhere to most surfaces and skin. Do not get foam on skin. Cover all skin, wear long sleeves, gloves, and goggles or safety glasses. Cured foam must be mechanically removed or allowed to wear off in time.
- The contents are under pressure. Not to be used for filling closed cavities or voids such as behind walls and under tub surrounds. The can may burst if left in areas susceptible to high temperatures, such as motor vehicles, or near radiators, stoves or other sources of heat. Do not place can in hot water. Do not puncture, incinerate or store at temperatures above 120°F (49°C).
- GREAT STUFF PRO™ foam should not be used around heaters, furnaces, fireplaces, recessed lighting fixtures or other applications where the foam may come in contact with heat-conducting surfaces. GREAT STUFF PRO™ foam is combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose to temperatures above 240°F (116°C).

Visit www.dowbuildingsolutions.com or contact a local Dow representative for more specific instructions.

6. AVAILABILITY

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant is distributed through an extensive network. For more information, call:
1-800-232-2436 (English)
1-800-565-1255 (French)

TABLE 1: Typical Physical Properties¹ Of GREAT STUFF PRO™ Gap & Cracks Insulating Foam Sealant

Property and Test Method	Value
Flexural Strength, ASTM C203, parallel to rise, psi (kPa), min.	8.8 (60.7)
K-factor (Thermal Resistance) per inch (25mm), ASTM C518 @75°F (24°C) mean temp., Btu•in/ft ² •hr•°F (W/m•°C), min.	0.26 (0.037)
Compressive Strength, ASTM D1621, parallel to rise, psi (kPa)	9.3 (64.1)
Apparent Core Density, ASTM D1622, pcf (kg/m ³)	1.01 (16)
Dimensional Stability, ASTM D2126, % volume change	
100°F/100%RH@2wks	14.31
-40°F/ambRH@2wks	0.41
Closed Cell Content, ASTM D2856, %	80
Tensile Strength, ASTM D1623, parallel to rise, psi (kPa)	14.4 (99.3)

¹Not to be considered sales specifications

7. WARRANTY

Not applicable.

8. MAINTENANCE

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant has a shelf life of 12 months when stored at 75°F (24°C). Contents of the can are under pressure. Can may burst if left in areas susceptible to high temperatures, such as motor vehicles, or near radiators, stoves or other sources of heat. Do not place can in hot water. Do not puncture, incinerate or store at temperatures above 120°F (49°C).

9. TECHNICAL SERVICES

Dow can provide technical information to help address questions when using GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant. For technical assistance, call:
1-866-583-BLUE (2583) (English)
1-800-363-6210 (French)

10. FILING SYSTEMS

www.dowbuildingsolutions.com



In the United States

The Dow Chemical Company
Dow Building Solutions

200 Larkin Center
Midland, MI 48674

In Canada

Dow Chemical Canada ULC
Dow Building Solutions

450 – 1st St. SW
Suite 2100
Calgary, AB T2P 5H1

For Technical Information:

1-866-583-BLUE (2583) (English)
1-800-363-6210 (French)

For Sales Information:

1-800-232-2436 (English)
1-800-565-1255 (French)

dowbuildingsolutions.com

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Dow Polyurethane Foam Insulation and Sealants

CAUTION: When cured, these products are combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose to temperatures above 240°F (116°C). For more information, consult (Material) Safety Data Sheet ((M)SDS), call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400 in the U.S. or 1-519-339-3711 in Canada. When air sealing buildings, ensure that combustion appliances, such as furnaces, water heaters, wood burning stoves, gas stoves and gas dryers are properly vented to the outside. See website: <http://www.epa.gov/iaq/homes/hip-ventilation.html>. In Canada visit <http://archive.nrc-cnrc.gc.ca/eng/ibp/irc/bsi/83-house-ventilation.html>.

GREAT STUFF PRO™ Insulating Foam Sealants contain isocyanate and a flammable blowing agent. Read all instructions and (Material) Safety Data Sheet ((M)SDS) carefully before use. Eliminate all sources of ignition before use. Cover all skin. Wear long sleeves, gloves, and goggles or safety glasses. Provide adequate ventilation or wear proper respiratory protection. Contents under pressure. Not to be used for filling closed cavities or voids such as behind walls and under tub surrounds.

GREAT STUFF PRO™ Gun Cleaner is flammable and contains acetone and propane. Read all instructions and (M)SDS carefully before use. Eliminate all sources of ignition before use. Cover all skin. Wear gloves, and goggles or safety glasses. Provide adequate ventilation or wear proper respiratory protection. Contents under pressure.

Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mold formation. No material supplier including Dow can give assurance that mold will not develop in any specific system.

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Printed in the U.S.A.
Form No. 179-07323-0515 CDP
178-00752-0515 CDP
CDP 56398



THERMAX™ SHEATHING

1. PRODUCT NAME

THERMAX™ Sheathing

2. MANUFACTURER

The Dow Chemical Company
Dow Building Solutions
200 Larkin
Midland, MI 48674
1-866-583-BLUE (2583)
Fax 1-989-832-1465

www.dowbuildingsolutions.com

3. PRODUCT DESCRIPTION

THERMAX™ Sheathing is a non-structural, rigid board insulation consisting of a glass-fiber-infused polyisocyanurate foam core laminated between 1.0 mil smooth, reflective aluminum facers on both sides. The glass-fiber reinforcement contributes to improved fire performance and dimensional stability. THERMAX™ Sheathing can be installed exposed to the interior without a thermal barrier.

THERMAX™ Sheathing offers high, long-term R-value. Used in conjunction with the appropriate joint closure system for the application, THERMAX™ Sheathing with its low perm rating helps to reduce moisture condensation within and behind the insulation.

BASIC USE

THERMAX™ Sheathing is specially designed to have a Class A fire rating and can be used in a range of concealed and exposed applications, above and below grade, and can be used in exterior walls. Because of its improved fire performance, THERMAX™ Sheathing is especially appropriate for hourly rated assemblies. THERMAX™ Sheathing is approved for use, per Section 2603.5 of the International Building Code, in Exterior Walls of Types I,II,III and IV construction. THERMAX™ Sheathing is designed for use as continuous insulation in both interior and exterior applications to assist in meeting and exceeding both the most current IECC and the ASHRAE 90.1 energy standards. Maximum length is 30 ft. (9.1 m) and maximum thickness is 4.25" (108 mm).

4. TECHNICAL DATA

APPLICABLE STANDARDS

THERMAX™ Sheathing meets ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, Type I, Class 2. Applicable standards include:

- C203 – Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
- C209 – Standard Test Methods for Cellulosic Fiber Insulating Board
- C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics
- D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- E96 – Standard Test Method for Water Vapor Transmission of Materials
- D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics

TYPICAL PHYSICAL PROPERTIES

THERMAX™ Sheathing exhibits the typical physical properties and characteristics indicated in Table 2 when tested as represented.

ENVIRONMENTAL DATA

THERMAX™ Sheathing is manufactured with a zero ozone depleting potential. The use of THERMAX™ Sheathing helps reduce the carbon footprint of commercial buildings.

FIRE INFORMATION

THERMAX™ Sheathing products should be used only in strict accordance with product application instructions. THERMAX™ products are combustible and when used in a building containing combustible materials, may contribute to the spread of fire. For more information, consult MSDS and/or call Dow

at 1-866-583-BLUE (2583). In an emergency, call 1-989-636-4400.

CODE COMPLIANCES

THERMAX™ Sheathing complies with the following codes:

- ASTM E2178 Standard Test Method for Air Permeance of Building Materials - leakage rates less than 0.001 L/s/m² at a test pressure of 75 Pa.
- ASTM E283 Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under specified Pressure differences across the specimen. Results were <0.02 L/s/m²
- ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies - no leakage
- ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference - no leakage
- 2009 International Residential Code (IRC) Section 316
- 2009 International Building Code (IBC) Section 2603
- ICC-ES ESR-1659
- FM 4880 – Wall-Ceiling Construction Metal-Faced – Class 1 Fire Rated to Max. 30' Exposure High, 4.25" Thick, 4' Wide, When Installed as Described in the Current Edition of FMRC Approval Guide
- FM 4450 Approval Standard for Class 1 Insulated - Steel Deck Roofs
- THERMAX™ products are covered under Underwriters Laboratories Inc. (UL) File R5622
- UL 1256 – Fire Test of Roof Deck Constructions, Roof Deck Construction No. 120 and No. 123
- UL 723 (ASTM E84) Surface Burning Characteristics of Building Materials
- The following designs are 1, 2, 3 or 4 hour wall rated assemblies as listed in the UL Fire Resistance Directory: U026, U326, U330, U354, U355, U424, U425, U460, U902, U904, U905, U906, U907, V454, V482, V499

- Fire Performance Evaluation of an Exterior Masonry Wall System Incorporating THERMAX™ Insulation Tested in Accordance With NFPA 285, 2006 Edition (UBC 26.9, intermediate scale – multistory testing)
- FMVSS No. 302 – Flammability of Interior Materials – Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses (Docket No. 3-3; Notice 4)
- Miami-Dade NOA 08-0320.01 Interior Insulation on CMU Block

Contact your Dow sales representative or local authorities for state and local building code requirements and related acceptances.

5. INSTALLATION

Boards of THERMAX™ Sheathing are lightweight and can be sawed or cut with a knife. They install quickly to walls (girts, steel stud, tilt-up, block, wood) and ceilings – inside and outside of purlins, trusses or bar joints. Butt joints must be installed over structural members. “Best

practice” recommendations for high-humidity environments include continuously sealing the surface of the insulation at all joints with a Dow joint closure system. Contact a local Dow representative or access the literature library at www.dowbuildingsolutions.com for more specific instructions.

6. AVAILABILITY

THERMAX™ Sheathing is manufactured in several locations and is distributed through an extensive network. For more information, call 1-800-232-2436.

7. WARRANTY

Fifteen-year limited warranty is available. Contact your Dow representative for details.

8. MAINTENANCE

Not applicable.

9. TECHNICAL SERVICES

Dow can provide technical information to help address questions when using THERMAX™ Sheathing. Technical personnel are available to assist with any insulation project. For technical assistance, call 1-866-583-BLUE (2583).

10. FILING SYSTEMS

- www.dowbuildingsolutions.com
- www.DowMetalBuilding.com

TABLE 1: SIZES, R-VALUES AND EDGE TREATMENTS FOR THERMAX™ SHEATHING

NOMINAL BOARD THICKNESS ⁽¹⁾ , IN.	R-VALUE ⁽²⁾⁽³⁾	BOARD SIZE, FT	EDGE TREATMENT
.50	3.3	4 x 8, 4 x 9, 4 x 10	Square Edge
.75	5.0	4 x 8, 4 x 9, 4 x 10	Square Edge
1.0	6.5	4 x 8, 4 x 9, 4 x 10	Square Edge
1.5	9.8	4 x 8, 4 x 9, 4 x 10	Square Edge, Shiplap
2.0	13.0	4 x 8, 4 x 9, 4 x 10	Square Edge, Shiplap

(1) Contact your Dow seller for information at different R-values and other sizes and lead time requirements. Not all product sizes are available in all regions.
 (2) R means resistance to heat flow. The higher the R-value, the greater the insulating power. Stabilized R-values @ 75°F mean temperature determined in accordance with ASTM C518. R-values expressed in ft²•h•°F/Btu.
 (3) An additional 2.77 R-value may be added to the system R-value, when a minimum 3/4" ideal air space and horizontal heat flow are present in accordance with the ASHRAE Fundamentals Handbook on FTC, 16 CFR Part 460.

TABLE 2: TYPICAL PHYSICAL PROPERTIES OF THERMAX™ SHEATHING

PROPERTY AND TEST METHOD	VALUE
Compressive Strength ⁽¹⁾ , ASTM D1621, psi, min.	25
Flexural Strength, ASTM C203, psi, min.	40
Water Absorption, ASTM C209, % by volume, max.	0.1
Water Vapor Permeance, ASTM E96, perm, max.	<0.03
Maximum Use Temperature, °F	250

(1) Vertical compressive strength is measured at 10 percent deformation or at yield, whichever occurs first.

www.dowbuildingsolutions.com
www.thermaxbydow.com

Technical Information
 1-866-583-BLUE (2583)
Sales Information
 1-800-232-2436

IN THE U.S.
 THE DOW CHEMICAL COMPANY
 200 Larkin
 Midland, MI 48674

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CAUTION: This product is combustible and shall only be used as specified by the local building code with respect to flame spread classification and to the use of a suitable thermal barrier. For more information, consult MSDS, call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400.

WARNING: Rigid foam insulation does not constitute a working walkable surface or qualify as a fall protection product.

Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mold formation. No material supplier including Dow can give assurance that mold will not develop in any specific system.



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DuPont™ AIRTITE® Siliconized Acrylic Caulk with Weather-Tight Seal technology

DuPont™ AIRTITE® Siliconized Acrylic Caulk with Weather-Tight Seal technology is ideal for sealing gaps around windows, doors, trim, and a variety of other interior and exterior surfaces. With this new technology, DuPont™ AIRTITE® Siliconized Acrylic Caulk forms a weather-tight seal that has been tested by accepted standards for adhesion, low temperature flexibility, extension/recovery, and weathering. Reduce air leaks in your home and increase energy efficiency by caulking or sealing with an acrylic sealant.

DuPont™ AIRTITE® Siliconized Acrylic Caulk can help eliminate air infiltration into a home when used around doors and windows. The Department of Energy - ENERGY STAR® Home Sealing guidelines and the NAHB Green Home Building Guidelines recommend the use of caulk to increase the energy efficiency of a home. Using DuPont™ Caulk may also help contribute towards U.S. Green Building Council's LEED® (Leadership in Energy and Environmental Design) points.

DuPont™ AIRTITE® Siliconized Acrylic Caulk with Weather-Tight Seal technology comes in both a convenient squeeze tube and cartridge, which requires a caulk gun for application.

For interior and exterior acrylic sealant, choose the name that has brought you quality products for more than 200 years - DuPont.

Product Features:

- Exceeds ASTM C-834, Grade -18° C
- 40-year guarantee
- Interior / Exterior
- Paintable
- Water-resistant seal
- Airtight seal
- VOC less than 1.5%
- Cured bead is mildew resistant

Available colors and packaging:

- 10.1 oz. cartridges & 5.5 oz. squeeze tubes available in: White and Clear

Is Your Home Energy Efficient?

Air-seal your home with DuPont™ AIRTITE® Siliconized Acrylic Caulk to increase energy efficiency and comfort. Download the ENERGY STAR® Do-It-Yourself Guide to get started.

» [Download Now](#)

DuPont™ AIRTITE® Siliconized Acrylic Caulk

DuPont™ AIRTITE® Siliconized Acrylic Caulk with Weather-Tight Seal technology is now available at Lowe's Home Improvement Stores nationwide and online.



Let's Build Something Together™

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[DuPont™ Residential Sealant](#)

Testing Standards:

- ASTM C-834, Type OP, Grade -18°C, White
- ASTM C-834, Type C, Grade 0°C, Clear

Adheres to:

- Concrete
- Wood
- Metal
- Marble
- Glass
- Porcelain
- Ceramic tile
- Masonry

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BACKER ROD

Basic Use:

Standard Backer Rod is an ideal non absorbent compressible backup material inserted into a joint to control sealant depth, creating a backstop to allow proper sealant tooling. It can also be used as a temporary joint seal.

Specific Uses:

Commonly used in glazing operation, window and door applications, expansion joints, curtain wall joints, partitions, log construction, pavement joints, and repair, precast units and copings.

Compatibility:

Standard Backer Rod is compatible with butyl, polysulfide, acrylic, polyurethane, silicone and most other cold sealants.

Composition and Material:

Standard Backer Rod is an extruded round, closed cell, low density polyethylene foam material with skin-like outer texture. It is highly flexible and compressible for easy installation.

Chemical Resistance:

Standard Backer Rod meets a wide range of chemical resistance. Please call for specific applications and conditions.

Installation:

Joint or opening must be kept clean, dry and free of obstructions. Select proper rod diameter and cut to length or use directly from spool. With a blunt instrument or roller, uniformly install rod at the level recommended by the sealant manufacturer, specifier or architect involved. Generally the depth of the joint after the Backer Rod is installed is one half the width. Very large and very small joints vary in terms of this depth to width ratio.

(Do not puncture, Stretch, or overly Compress)



Tech Data and Physical Properties

Density	1.5 PCF	ASTM-D-1622
Deflection	4 PSI @ 25%	ASTM-D-1621
Water Absorption	0.02% by vol.	ASTM-C-1016
Temperature Range	-45° F to 160° F	ASTM-C-1330
Out gassing	>1	ASTM-C-1253
Compression Recovery	% min. >90%	ASTM-D-5243
Tensile Strength	24 PSI	ASTM-D-1623

Meets ASTM-D-5249 Type III

Rod Size to Joint Width Chart			
Joint Width	Rod Size	Joint Width	Rod Size
3/16"	1/4"	1"	1 1/4"
1/4"	3/8"	1 1/8"	1 1/2"
3/8"	1/2"	1 5/8"	2"
1/2"	5/8"	2"	2 1/2"
5/8"	3/4"	2 1/2"	3"
3/4"	7/8"	3 1/2"	4"
7/8"	1"		

Big Stretch®

Won't Crack. . . It Just Stretches

DESCRIPTION:

Big Stretch® is a high-performance water-based elastomeric sealant with powerful adhesion and superior elasticity. It spans gaps up to 2" wide and stretches up to 500% of original joint size without cracking. Big Stretch won't crack...it just stretches.

WHERE TO USE:

Interior and exterior applications, including:

- Windows
- Doors
- Siding
- Vents
- Soffits
- Baseboards
- Eaves
- Crown Moulding
- Sound-proofing interior walls

ADHERES TO: (all conform to ASTM C794)

Most building materials including:

Metals

- Aluminum
- Brass
- Steel
- Anodized Windows

Plastics

- ABS
- Lexan®*
- Acrylic Sheet
- Plexiglass
- PVC
- Fiberglass
- Urethane
- Vinyl
- Polycarbonate
- Polystyrene
- Nylon

Other Surfaces

- Asphalt
- Tile
- Cinder Block
- Corian®*
- Wood
- Formica®*
- Glass
- Mortar
- Hot melt Butyl
- Stucco
- Brick
- Concrete
- Stone
- EIFS
- Fiber Cement
- Drywall

COLORS:

- White
- Redwood
- Woodtone
- Dark Brown
- Pine Green
- Limestone
- Almond
- Tan
- Gray
- Clear
- Black
- Ironstone
- Slate Gray

Visit www.sashco.com for a color compatibility chart that matches Big Stretch colors to various vinyl window manufacturers' colors.

PACKAGING:

- 10.5 oz. plastic cartridges
- 29 oz. fiber cartridges (white only)

COVERAGE:

A 10.5 oz. cartridge will yield approx. 26 lineal feet with a 1/4" (6 mm) bead.

PAINTABILITY:

Paintable with exterior latex paints/stains after 4 hours and interior latex paints/stains after 24-48 hours (more for humid conditions). Paintable with most exterior oil-based paints/stains after 1 week. Note: some low-end, flat latex paints may crack, regardless of cure time.

* Corian®, Lexan®, and Formica® are registered trademarks of their respective owners.

FEATURES

- Super elastic, moves instead of tears
- Spans gaps up to 2" wide with no slump
- Powerful adhesion
- High durability
- Water-based
- Low VOC

BENEFITS

- Eliminates costly call backs
- Stays where it's applied
- Won't tear or pull away
- Performs well in most any type of climate
- Easy to tool and clean up
- Meets strictest VOC requirements; environmentally friendly
- Compatible with latex paint and most oil-based paints, sealers and stains
- Simply thaw & apply, no wasted product
- Have confidence that you're using the right product
- More for your money
- No more shiny caulk lines
- Less waste, less mess

- Superb paintability

- Freeze-thaw stable
- Limited Lifetime Warranty

- Full 10.5 oz. in every cartridge
- Won't cause paint gloss
- Exclusive stop flow plunger



WHERE NOT TO USE:

- Areas of water submersion or frequent, prolonged puddling
- Areas with high foot and/or vehicle-traffic (driveways, sidewalks, decks, patios, etc.)
- Roofs exposed to prolonged dampness (use Sashco's Through the Roof!® instead)
- Big Stretch Clear should not be used on copper flashing. Colored Big Stretch, Sashco's Lexel® or Sashco's Through the Roof!® are best for this application.
- Will not adhere to or is incompatible with Kynar®*, Polypropylene, Waxes, Polyethylene, and Silicone.

APPLICATION:

- Lower temperatures and higher humidity will slow cure time. Allow 1-3 days curing before exposure to direct rainfall. Use plastic sheeting with good airflow underneath to protect the product if rain is expected sooner.
- Natural shrinkage will give the joint a concave appearance; multiple applications may be needed to fill the joint flat.
- If dirt or oils are present on the substrate, wash with any household cleaner, rinse to remove and allow to thoroughly dry.
- Remove any old caulk, especially silicone and all silicone residue. Use a silicone remover such as McKanica®* Silicone Caulk Remover.
- Insert backer rod into joints deeper than 1/2" to provide for proper sealant depth and a stronger, longer lasting seal.
- Choose bead size and cut the nozzle. Puncture the inner seal.
- Gun Big Stretch into the joint.
- Tool for a smoother bead using a damp foam or paint brush with a light, skimming touch, or use a bead-ing tool.

STORAGE AND CLEAN-UP:

- Clean up tools and hands with warm water and soap.
- Leftover Big Stretch can be stored if the nozzle is tightly wrapped with plastic wrap and a rubber band.



800-767-5656 • www.sashco.com
10300 E. 107th Pl., Brighton, CO 80601
Made in the USA

TYPICAL PROPERTIES:

PROPERTY	VALUE
Joint Size	Maximum 2"
Application Range	40°F to 120°F (4°C to 49°C) surface temperature
Service Range	-30°F to 250°F (-34°C to 121°C)
Tensile Properties	Recovery at 50% stretch: 100% in 3 minutes Recovery at 100% stretch: 96% in 5 minutes
VOC	59.8 g/L < 1.5% by weight

TEST DATA:

PROPERTY	RESULTS	TEST METHOD
Durability	25% total joint movement (10 cycles @ -15°F (-26°C))	ASTM C719
Hardness, Shore A	32 (21-day cure)	ASTM C661
Slump	< 1/8"	ASTM D2202
Solids	83.8% by weight (pigmented) 61.2% by weight (clear)	ASTM C1250
Extrusion Rate	750 g/min (1/8" orifice at 40 psi)	ASTM C603
Freeze-Thaw Stability	Passes 10 cycles 0°F to 70°F (-18°C to 21°C)	ASTM C731
Low Temp. Flexibility	Pass (not artificially weathered)	ASTM C734
Tack-free	Less than 30 minutes	ASTM C679
Cured	4-5 days (dependent on temperature, humidity and bead size)	ASTM C679
Adhesion-in-peel Passing Substrates	See "ADHERES TO" section on front page	ASTM C794

SPECIFICATIONS:

- Meets FHA requirements.
- Meets or exceeds Federal Specification:
 - TT-S-00230 C
 - ASTM C834
 - ASTM C920, Type S, NS, Class 25, Use NT, M, A. Exceeds 10% weight loss.

The data reported here are believed to be reliable.

No warranty is made concerning the accuracy of or the results obtained from their use.

* Kynar® and McKanica® are registered trademarks of their respective owners.

Keep out of reach of children.

Limited Lifetime Warranty: Sashco warrants this product will substantially meet published specifications on the date of sale. If it fails to do so, return unused portion with original sales receipt for replacement or refund, at Sashco's sole option. These are purchaser's sole and exclusive remedies for any breach of warranty. Purchaser must determine suitability of product for purchaser's specific needs and assumes all risk associated with its use. Sashco will not be liable for direct or indirect damages.

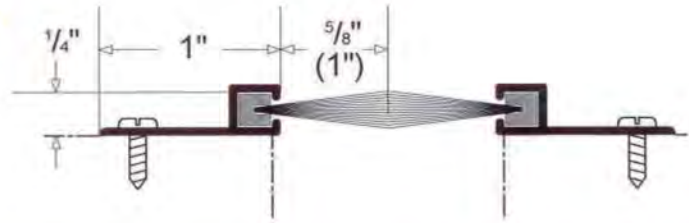
Except as stated above there are no warranties for this product. **The foregoing express warranty is in lieu of all other warranties, express or implied, including without limitation implied warranties of merchantability or fitness for a particular purpose, which warranties are specifically excluded and disclaimed.** This Limited Warranty gives you specific legal rights. You may have other rights which vary from state to state. Some states do not allow exclusion of implied warranties in consumer or other sales, limitations on the duration of implied warranties, or exclusion or limitation of incidental or consequential damages. Thus, the limitations or exclusions contained above may not apply to you depending upon your specific circumstances.

Visit www.sashco.com for information on other Sashco high performance products.

door ASTRAGALS

FS325 - Wool Pile Brush Astragal With Fin

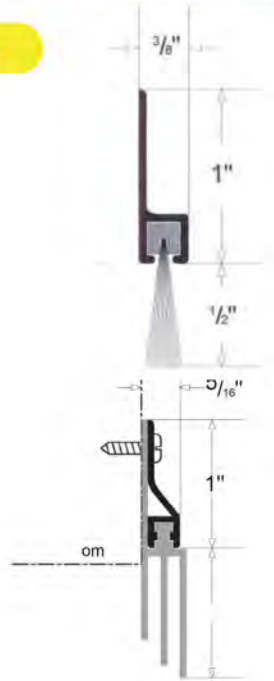
Construction: Extruded Aluminum
Insert: .500" or .880" Wool Pile Brush.
Finish: Black
Standard Lengths: 7ft. or 8ft. pieces, 2 piece set.
 Custom lengths also available.



door BOTTOMS & SWEEPS

FS300 - Wool Pile Brush Sweep With Fin

Construction: Extruded Aluminum
Insert: .500" or .880" Wool Pile Brush.
Finish: Black
Standard Lengths: 36, 42, 48 inches.
 Custom lengths also available.



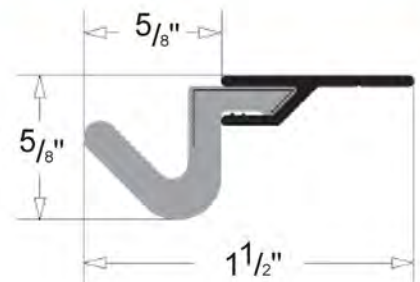
TS100 Door Triple Sweep

Construction: Extruded Aluminum
Insert: 3/4" Vinyl Insert
Finish: Black
Lengths: 36", 42", or 48", or by the linear foot

door WEATHERSTRIPPING

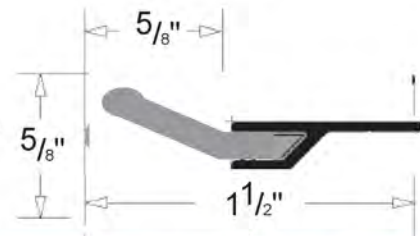
DXL1000 - Door Weatherstripping

Construction Q-Lon: Extruded aluminum. Mitered corners ensure a secure fit with slotted mounting holes for easy adjustment.
Insert: Soft cell foam insert. Foam has thermoplastic cover and will not deteriorate.
Finish: Black
Set: 1-3' piece and 2-7' pieces. Custom lengths also available.



DXL320 - Door Weatherstripping

Construction Q-Lon: Extruded aluminum. Mitered corners ensure a secure fit with slotted mounting holes for easy adjustment.
Insert: Soft cell foam insert. Foam has thermoplastic cover and will not deteriorate.
Finish: Black



Manufacturer Specification Sheets

ECM 15: Pipe Insulation

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- SSL II® All-Service Jacket (ASJ), Self-Sealing Lap**
- SSL® I ASJ**
- No-Wrap**

Description

Owens Corning Fiberglas® pipe insulations are molded of heavy density resin bonded inorganic glass fibers. These one-piece, 36" (914mm) long, hinged sections are opened, placed over the pipe, closed and secured by means specific to the type as described below.

Fiberglas SSL II® Pipe Insulation is jacketed with a smooth, reinforced, wrinkle-resistant all-service (ASJ) vapor retarder jacket. Factory applied DOUBLESURE† double pressure sensitive adhesive closure provides positive mechanical and vapor sealing of the longitudinal jacket seam. Pressure sensitive butt strip seals complete the positive closure. Available in the most popular sizes.

In larger sizes *Fiberglas* Pipe Insulation is furnished with SSL® I, a single adhesive lap seal.

Fiberglas "No-Wrap" Pipe Insulation is also available without a jacket. It is intended for field installation of jacketing appropriate to the vapor control, damage or corrosion resistance requirements of the application.

Uses

Insulation of hot, cold, concealed and exposed piping operating at temperatures from 0°F (-18°C) to 850°F (454°C) in commercial buildings, industrial facilities and process or power plants.

†DOUBLESURE is a registered trademark of Morgan Adhesives Company.

Features/Benefits

SSL II Positive Closure System

Effective long-term vapor sealing of both longitudinal and butt joints. With double-adhesive lap seal, plus two-part butt strip seal, positive closure is fast, neat and foolproof. No need for staples and mastic, promoting unexcelled jobsite productivity.

Jacket and Lap Shipped Adhered

Short pieces of insulation can be cut without jacket loss; it won't come apart in handling. No "dog-ears" in or out of the carton. Dust and

moisture can't reach the seal. Butt strips come in sealed bags inside the carton, staying clean until the moment of use.

Excellent Thermal Performance

Fiberglas Pipe Insulation's low thermal conductivity contributes to lower operating costs of heating and cooling equipment.

Meets Model Code Fire Ratings

Flame spread rating of 25 or less, and smoke developed rating of 50 or less, usually means that *Fiberglas* Pipe Insulation will be granted immediate building code approval.

Availability

Fiberglas Pipe Insulations are available in thicknesses and for pipe sizes as follows:

Insulation Thickness, in.	Insulation Thickness, (mm)	Nominal Pipe Sizes, NPS, in. (DN, mm)					
		SSL II Pipe Insulation		SSL I* Pipe Insulation*		No-Wrap** Pipe Insulation**	
1/2	(13)	1/2-6	(15-150)			1/2-6	(15-150)
1	(25)	1/2-15	(15-375)	16-33	(400-825)	1/2-33	(15-825)
1 1/2	(38)	1/2-14	(15-350)	15-33	(375-825)	1/2-33	(15-825)
2	(51)	1/2-12	(15-300)	14-33	(350-825)	1/2-33	(15-825)
2 1/2	(64)	2-11	(50-275)	12-26	(300-650)	1/2-32	(15-800)
3	(76)	3-10	(75-250)	11-26, 30	(275-650, 750)	1/2-31	(15-900)
3 1/2	(89)	4 1/2-9	(115-225)	10-18, 20-22, 24	(250-450, 500-550, 600)	1/2-30	(15-750)
4	(102)	4 1/2-8	(115-200)	9-21, 24, 25	(225-525, 600, 625)	1/2-29	(15-725)
4 1/2	(114)	6-7	(150-175)	8-10, 12, 14, 16, 18, 20, 24	(200-250, 300, 350, 400, 450, 500, 600)	1/2-28	(15-700)
5	(127)	6	(150)	7-14, 16-24	(175-350, 400-600)	1/2-27	(15-675)
5 1/2	(140)					6-26	(150-650)
6	(152)					6-25	(150-625)

* SSL I all made-to-order except 14" x 2" (350mm x 51mm) and 16" x 1", 11/2" and 2" (400mm x 25mm, 38mm and 51mm).
** Consult Packaging Data Supplement (PPI.P5) available upon request for standard and made-to-order sizes.

Specification Compliance

- ASTM C 547, Mineral Fiber Pre-Formed Pipe Insulation, Type I to 850°F (454°C)
- ASTM C 1136, Flexible Low Permeance Vapor Retarders for Thermal Insulation: All Types
- ASTM C 795, Thermal Insulation for Use Over Austenitic Stainless Steel*
- Mil. Spec. MIL-I-22344D, Insulation, Pipe, Thermal, Fibrous Glass
- Nuclear Regulatory Commission Guide 1.36, Non-Metallic Thermal Insulation*
- U.S. Coast Guard Approval No. 164.009, Noncombustible Materials (no-wrap)
- New York City MEA No. 344-83
- CAN/CGSB-51.9 - Type 1, Class 2
- NFPA 90A

* Preproduction qualification testing complete and on file. Chemical analysis of each production lot required for total conformance.

Fiberglas® Pipe Insulation

Physical Property Data

Property	Test Method	Value
Operating temperature range	ASTM C 411	0 to 850°F* (-18°C to 454°C)*
Jacket temperature limitation	ASTM C 1136	-20°F to 150°F (-29°C to 66°C)
Jacket permeance	ASTM E 96, Proc.A	0.02 perm
Puncture resistance	ASTM D 781	50 units
Composite surface burning characteristics	UL 723,** ASTM E 84** or CAN/ULC-S102-M**	Flame spread 25** Smoke developed 50

*Limited to single layer applications above 650°F (343°C), but not greater than 6" (152mm) thickness.

**The surface burning characteristics of these products have been determined in accordance with UL 723, ASTM E 84 or CAN/ULC-S102-M. These standards should be used to measure and describe the properties of materials, products or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use. Values are reported to the nearest 5 rating.

Thermal Performance, ASTM C 680

Insulation NPS x Thk. (DN x Thk.) in. mm	Pipe Operating Temperature, °F (°C)					
	300 (149)		500 (280)		700 (371)	
	HL	ST	HL	ST	HL	ST
2 x 1/2 (50 x 13)	77 (74)	128 (53)				
4 x 1 (100 x 25)	78 (75)	109 (43)				
8 x 1 (200 x 25)	140 (135)	112 (44)				
12 x 1 (300 x 25)	199 (191)	113 (45)				
2 x 1 1/2 (50 x 38)			88 (85)	116 (47)		
4 x 1 1/2 (100 x 38)			142 (137)	123 (51)		
8 x 1 1/2 (200 x 38)			242 (233)	128 (53)		
12 x 1 1/2 (300 x 38)			330 (317)	129 (54)		
2 x 2 (50 x 51)					139 (134)	127 (53)
4 x 2 1/2 (100 x 64)					188 (181)	125 (52)
8 x 2 1/2 (200 x 64)					295 (284)	129 (54)
12 x 3 (300 x 76)					359 (345)	125 (52)

Heat Loss (HL), Btu/hr•ft (W/m); Surface Temperature (ST), °F (°C).

Design Conditions: Horizontal piping, 80°F (27°C) average ambient temperature, 0 mph wind speed, ASJ jacket.

Thickness to Prevent Surface Condensation

Owens Corning ASJ Jacket for up to 16" NPS (400mm DN)⁽¹⁾, in. (mm)

Ambient Temperature, °F (°C)	Relative Humidity ⁽²⁾	System Operating Temperatures		
		35°F (2°C)	45°F (7°C)	55°F (13°C)
110 (43)	50%-70%	1 (25)	1 (25)	1 (25)
	80%	1 1/2 (38)	1 1/2 (38)	1 (25)
	90%	3 1/2 (89)	3 (76)	2 1/2 (64)
100 (38)	50%-70%	1 (25)	1 (25)	1 (25)
	80%	1 1/2 (38)	1 1/2 (38)	1 (25)
	90%	3 (76)	3 (76)	2 1/2 (64)
90 (32)	50%-70%	1 (25)	1 (25)	1 (25)
	80%	1 1/2 (38)	1 (25)	1 (25)
	90%	3 (76)	2 1/2 (64)	2 (51)
80 (27)	50%-80%	1 (25)	1 (25)	1 (25)
	90%	2 1/2 (64)	2 (51)	1 1/2 (38)
70 (21)	50%-80%	1 (25)	1 (25)	1 (25)
	90%	1 1/2 (38)	1 1/2 (38)	1 (25)

(1) For NPS (DN) greater than 16" (400mm), please contact your local Owens Corning Representative.

(2) If humidity exceeds 90%, some condensation is to be expected; therefore, a coating of a mastic or PVC jacket overwrap is recommended as repeated or continual wetting of the ASJ jacket will degrade its vapor retarder performance.



OWENS CORNING WORLD HEADQUARTERS

ONE OWENS CORNING PARKWAY
TOLEDO, OHIO, USA 43659

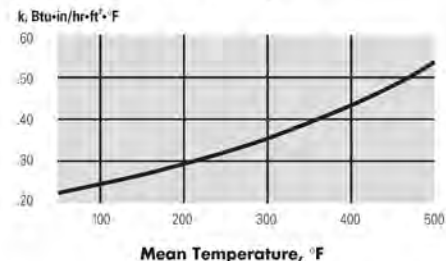
1-800-GET-PINK

www.owenscorning.com

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Thermal Conductivity



Apparent thermal conductivity curve determined in accordance with ASTM Practice C 1045 with data obtained by ASTM Test Method C 335. Values are nominal, subject to normal testing and manufacturing tolerances.

Mean Temp. °F	k Btu•in/hr•ft²•°F	Mean Temp. °C	λ W/m•°C
50	0.22	10	0.032
75	0.23	25	0.034
100	0.24	50	0.037
150	0.27	100	0.043
200	0.29	125	0.047
250	0.32	150	0.051
300	0.35	175	0.056
350	0.39	200	0.062
400	0.43	225	0.068
450	0.48	250	0.075
500	0.54	275	0.082

Application Recommendations

The hinged sections of *Fiberglas* Pipe Insulation are opened, placed over the pipe, carefully aligned, and sealed or jacketed as required by the form of the insulation and the application.

Fiberglas SSL II Pipe Insulation is shipped with the jacket and longitudinal lap closed, the two adhesives separated by a release strip. The insulation is opened by pulling the release strip from between the two adhesive strips. The insulation is placed on the pipe, carefully aligned, and the two adhesives rubbed firmly together to close and seal. The two part butt strip seal completes the positive closure. Application may be at ambient temperatures from 25°F (-4°C) to 110°F (43°C).

Fiberglas "No-Wrap" Pipe Insulation is designed for field-jacketing with pipe covering secured by wires or bands, vapor sealed where required.

Outdoor applications must be protected from weather. If painting is required, use only water base latex paint.

Manufacturer Specification Sheets

ECM 16: Boiler Replacements

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**80 Commercial Boiler
Weil-McLain**

Series 1
Gas, Oil & Gas/Oil
Water or Steam
MBH: 346-1,674
Combustion Eff.: 85%



- **Weil-McLain captured seal design**
- **For Light Oil, Gas and Dual Fuel Combustion**
- **Packaged, Assembled Block or Knock-down**
- **Available for Water and Steam Heating Systems**
- **Available as Forced or Chimney draft venting**



 **WEIL-McLAIN®**
www.weil-mclain.com

MADE IN THE


80 Output 278-1348 MBH (8-40 HP)

Oil Gas

Combustion 85% 82%
Thermal 83% 80%



- Top or Rear outlet flexibility
- Easy access jacket

Ratings

Boiler Model	I=B=R			I=B=R Net Rating									
	Oil Input GPH	Gas Input MBH	Gross Output MBH	Boiler H.P.	Steam MBH	Steam Sq. Ft.	Water MBH	Flue Outlet Dia.	Net Firebox Volume Cu/Ft	Stack Gas Volume CFM	Positive Pressure in firebox	Water Boiler Content Gallons	Operating Weight Pounds
380	2.4	346	278	8.3	208	867	242	8	2.61	139	0.28	37.5	1170
480	3.4	491	396	11.8	297	1238	344	8	3.97	198	0.28	49	1411
580	4.45	639	515	15.4	386	1608	448	8	5.33	259	0.28	60.5	1752
680	5.5	787	634	18.9	476	1983	551	8	6.69	320	0.27	72	2093
780	6.5	935	753	22.5	565	2354	655	10	8.05	378	0.27	83.5	2434
880	7.5	1082	872	26	654	2725	758	10	9.41	436	0.27	95	2774
980	8.5	1230	991	29.6	743	3096	862	10	10.77	494	0.27	106.5	3115
1080	9.6	1378	1110	33.2	833	3471	965	10	12.13	558	0.26	118	3456
1180	10.6	1526	1229	36.7	922	3842	1069	10	13.49	616	0.26	129.5	3697
1280	11.6	1674	1348	40.3	1018	4242	1172	12	14.85	675	0.26	141	4038

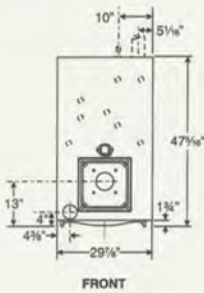
Notes

- Burner input based on maximum of 2,000 feet altitude. For higher altitudes consult local Weil-McLain representative.
- NO.2 fuel oil Commercial Standard Spec. CS75-56. Heat value of oil-140,000 Btu/Gal.
- Consult Weil-McLain Burner Specifications and Data Sheet for gas pressures required. Gross I=B=R ratings have been determined under the I=B=R provision forced draft boiler-burner units.

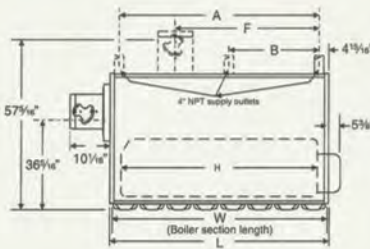
- Net I=B=R ratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pickup. Water ratings are based on a piping and pickup allowance of 115. Steam ratings are based on the following allowances: 380 thru 1180 - 1.333; 1280 - 1.321. An additional allowance should be made for gravity hot water systems or for unusual piping and pickup loads. Consult local Weil-McLain representative.
- Stack gas volume at outlet temperature.
- With 0.10" W.C. positive pressure at flue collar.

Dimensions

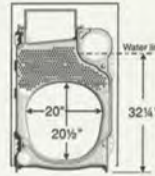
Boiler Model	Supply Tappings Qty - Size		Return Tappings Qty - Size		Dimensions (Inches) - Reference Drawings						
	Water	Steam	Water	Steam	A	B	D	F	H	L	W
380	2-4"	2-4"	2-3"	2-3"	13-1/8	-	8	12-7/16	13-1/2	21-5/8	20-3/8
480	2-4"	2-4"	2-3"	2-3"	20-1/8	-	8	13-5/8	20-1/2	28-5/8	27-3/8
580	2-4"	2-4"	2-3"	2-3"	27-1/8	-	8	13-5/8	27-1/2	35-5/8	34-3/8
680	2-4"	2-4"	2-3"	2-3"	34-1/8	-	8	13-5/8	34-1/2	42-5/8	41-3/8
780	2-4"	2-4"	2-3"	2-3"	41-1/8	-	10	27-5/8	41-1/2	49-5/8	48-3/8
880	2-4"	2-4"	2-3"	2-3"	48-1/8	-	10	27-5/8	48-1/2	56-5/8	55-3/8
980	2-4"	2-4"	2-3"	2-3"	55-1/8	-	10	41-5/8	55-1/2	63-5/8	62-3/8
1080	2-4"	3-4"	2-3"	2-3"	62-1/8	27-9/16	10	41-5/8	62-1/2	70-5/8	69-3/8
1180	2-4"	3-4"	2-3"	2-3"	69-1/8	34-9/16	10	55-5/8	69-1/2	77-5/8	76-3/8
1280	2-4"	3-4"	2-3"	2-3"	76-1/8	34-9/16	12	55-5/8	76-1/2	84-5/8	83-3/8



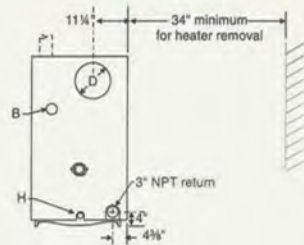
FRONT



SIDE



INTERMEDIATE



BACK

Standard Equipment

All Boilers

- Cast iron sections
- Insulated steel jacket
- Flame retention burner (except H-80)
- Burner mounting plate with refractory (except H-80)
- Aluminized steel flue collector assembly
- Steel flue collar and breeching damper
- Observation ports on front and rear sections
- Refractory blanket and target wall in combustion area
- Side cleanout plates
- Flue brush

Water Boilers

- 30 PSIG ASME safety relief valve (sections tested for 80 PSIG maximum working pressure)
- Combination high limit/low limit control
- Combination pressure/temperature gauge
- Built-in air eliminator

Steam Boilers

- 15 PSIG ASME safety valve (side outlet)
- Low limit and high limit pressure controls
- Steam pressure gauge
- Gauge glass, gauge cocks and gauge guards

Optional Equipment

- Low water cut-offs (probe or float type)
- Tankless heaters
- Burner mounting plate (for H-80 boilers)
- Factory-assembled sections
- Fire-tested packaged boiler (with low water cut-off)

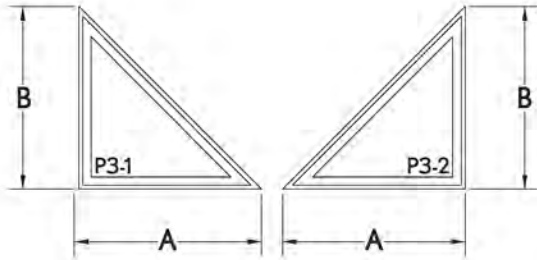


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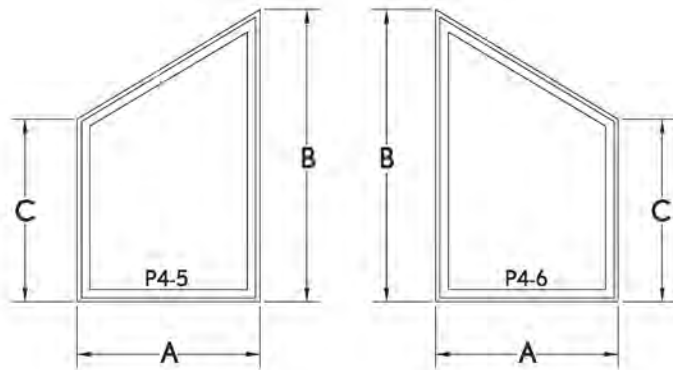
Manufacturer Specification Sheets

ECM 17: Window Replacements

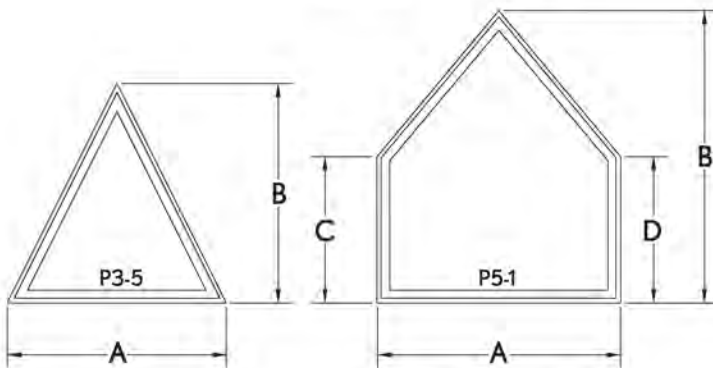
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90° TRIANGLE

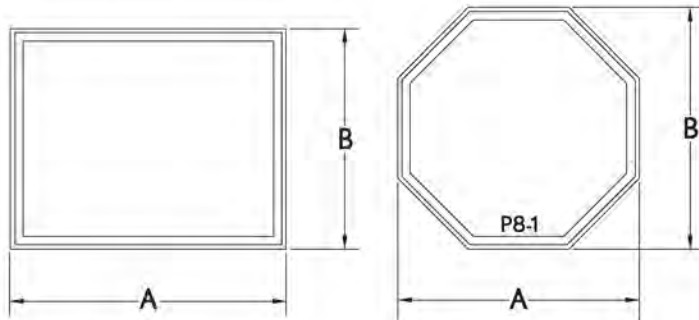


TRAPEZOID



ISOSCELES TRIANGLE

PENTAGON



90° RECTANGLE

OCTAGON

How to Specify

When ordering a Trapezoid, Triangle, or Rectangle window, provide a sketch of the unit as viewed from the exterior, also include key Rough Opening dimensions.

Example: To order a window of a Trapezoid opening provide the measurements of A, B, and C as indicated. For other shapes, give the dimensions shown.

Specification Notes:

All units are subject to validation.

Maximum/Minimum Guidelines

Maximum Square Footage: 49 sq. ft. of Rough Opening

Maximum Width: 114" Rough Opening

Maximum Height: 114" Rough Opening

Minimum (RECT, P3, P4, P5): 12" x 12" Rough Opening

Minimum (P8): 18" x 18" Rough Opening

Minimum Short Leg (P4, P5): 8" Rough Opening

P3 Pitch: 3/12 to 36/12 Pitch Available

P4 Pitch: 36/12 Maximum Pitch Available

P5 Pitch: 36/12 Maximum Pitch Available

Multiple Assemblies

Multiple assemblies can be factory mullied.

MAXIMUM ROUGH OPENING: not to exceed 114" X 78".

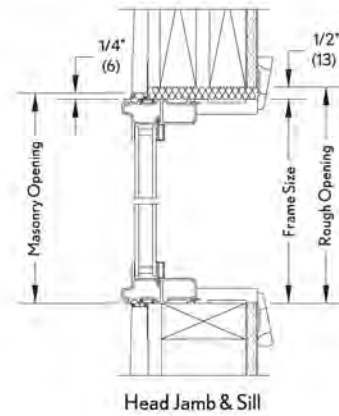
Maximum up to 6 units wide by 1 unit high.

MAXIMUM ROUGH OPENING: not to exceed 96" X 96".

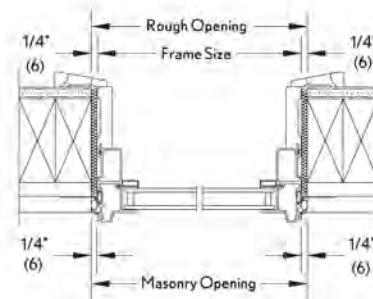
Maximum up to 5 units wide by 5 units high.

NOTE: Units with Rough Opening larger than 37.75 sq. ft. will be standard tempered.

Construction Details









































































Head Jamb & Sill



Jambs

DOUBLE HUNG







































































Operator Units

MO (mm)	1'-6" (457)	2'-0" (610)	2'-6" (762)	2'-8" (813)	3'-0" (914)	3'-6" (1067)	4'-0" (1219)
RO (mm)	1'-6" (457)	2'-0" (610)	2'-6" (762)	2'-8" (813)	3'-0" (914)	3'-6" (1067)	4'-0" (1219)
FS (mm)	1'-5 1/2" (445)	1'-11 1/2" (597)	2'-5 1/2" (749)	2'-7 1/2" (902)	2'-11 1/2" (902)	3'-5 1/2" (1054)	3'-11 1/2" (1207)
DLO (mm)	12 9/16" (319)	18 9/16" (471)	24 9/16" (624)	26 9/16" (675)	30 9/16" (776)	36 9/16" (929)	42 9/16" (1081)
1'-11 3/4" (603) 2'-0" (610) 2'-11 1/2" (597) 8 5/16" (211)	 IFDH1620	 IFDH2020	 IFDH2620	 IFDH2820	 IFDH3020	 IFDH3620	 IFDH4020
2'-5 3/4" (756) 2'-8" (762) 2'-5 1/2" (749) 11 5/16" (287)	 IFDH1626	 IFDH2026	 IFDH2626	 IFDH2826	 IFDH3026	 IFDH3626	 IFDH4026
2'-11 3/4" (908) 3'-0" (914) 2'-11 1/2" (902) 14 5/16" (363)	 IFDH1630	 IFDH2030	 IFDH2630	 IFDH2830	 IFDH3030	 IFDH3630	 IFDH4030
3'-5 3/4" (1060) 3'-6" (1067) 3'-5 1/2" (1054) 17 5/16" (440)	 IFDH1636	 IFDH2036	 IFDH2636	 IFDH2836	 IFDH3036	 IFDH3636	 IFDH4036
3'-11 3/4" (1213) 4'-0" (1219) 3'-11 1/2" (1207) 20 5/16" (516)	 IFDH1640	 IFDH2040	 IFDH2640	 IFDH2840	 IFDH3040	 IFDH3640	 IFDH4040
4'-5 3/4" (1365) 4'-6" (1372) 4'-5 1/2" (1359) 23 5/16" (592)	 IFDH1646	 IFDH2046	 IFDH2646	 IFDH2846	 IFDH3046	 IFDH3646	 IFDH4046
4'-11 3/4" (1518) 5'-0" (1524) 4'-11 1/2" (1511) 26 5/16" (668)	 IFDH1650	 IFDH2050	 IFDH2650	 IFDH2850	 IFDH3050 E	 IFDH3650 E	 IFDH4050 E
5'-5 3/4" (1670) 5'-6" (1676) 5'-5 1/2" (1664) 29 5/16" (744)	 IFDH1656	 IFDH2056	 IFDH2656	 IFDH2856	 IFDH3056 E	 IFDH3656 E	 IFDH4056 E
5'-11 3/4" (1822) 6'-0" (1829) 5'-11 1/2" (1816) 32 5/16" (821)	 IFDH1660	 IFDH2060	 IFDH2660 E	 IFDH2860 E	 IFDH3060 E	 IFDH3660 E	 IFDH4060 E
6'-5 3/4" (1975) 6'-6" (1981) 6'-5 1/2" (1969) 35 5/16" (897)	 IFDH1666	 IFDH2066	 IFDH2666 E	 IFDH2866 E	 IFDH3066 E	 IFDH3666 E	 IFDH4066 E

DOUBLE HUNG








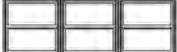






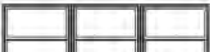



































INTEGRITY® FROM MARVIN®
ALL ULTREX® SERIES

2 Wide Operator Units

MO (mm)	3'-0" (914)	4'-0" (1219)	5'-0" (1524)	5'-4" (1626)	6'-0" (1829)	7'-0" (2134)	8'-0" (2438)
RO (mm)	3'-0" (914)	4'-0" (1219)	5'-0" (1524)	5'-4" (1626)	6'-0" (1829)	7'-0" (2134)	8'-0" (2438)
FS (mm)	2'-11 1/2" (902)	3'-11 1/2" (1207)	4'-11 1/2" (1511)	5'-3 1/2" (1600)	5'-11 1/2" (1816)	6'-11 1/2" (2121)	7'-11 1/2" (2426)
1'-7 3/4" (603) 2'-0" (601) 1'-11 1/2" (597)	 IFDH1620	 IFDH2020	 IFDH2620	 IFDH2820	 IFDH3020	 IFDH3620	 IFDH4020
2'-5 3/4" (756) 2'-6" (762) 2'-5 1/2" (749)	 IFDH1626	 IFDH2026	 IFDH2626	 IFDH2826	 IFDH3026	 IFDH3626	 IFDH4026
2'-11 3/4" (908) 3'-0" (914) 2'-11 1/2" (902)	 IFDH1630	 IFDH2030	 IFDH2630	 IFDH2830	 IFDH3030	 IFDH3630	 IFDH4030
3'-5 3/4" (1050) 3'-6" (1067) 3'-5 1/2" (1054)	 IFDH1636	 IFDH2036	 IFDH2636	 IFDH2836	 IFDH3036	 IFDH3636	 IFDH4036
3'-11 3/4" (1213) 4'-0" (1219) 3'-11 1/2" (1207)	 IFDH1640	 IFDH2040	 IFDH2640	 IFDH2840	 IFDH3040	 IFDH3640	 IFDH4040
4'-5 3/4" (1365) 4'-6" (1372) 4'-5 1/2" (1359)	 IFDH1646	 IFDH2046	 IFDH2646	 IFDH2846	 IFDH3046	 IFDH3646	 IFDH4046
4'-11 3/4" (1518) 5'-0" (1524) 4'-11 1/2" (1511)	 IFDH1650	 IFDH2050	 IFDH2650	 IFDH2850	 IFDH3050 E	 IFDH3650 E	 IFDH4050 E
5'-5 3/4" (1670) 5'-6" (1676) 5'-5 1/2" (1664)	 IFDH1656	 IFDH2056	 IFDH2656	 IFDH2856	 IFDH3056 E	 IFDH3656 E	 IFDH4056 E
5'-11 3/4" (1822) 6'-0" (1829) 5'-11 1/2" (1816)	 IFDH1660	 IFDH2060	 IFDH2660 E	 IFDH2860 E	 IFDH3060 E	 IFDH3660 E	 IFDH4060 E
6'-5 3/4" (1975) 6'-6" (1981) 6'-5 1/2" (1969)	 IFDH1666	 IFDH2066	 IFDH2666 E	 IFDH2866 E	 IFDH3066 E	 IFDH3666 E	 IFDH4066 E

DOUBLE HUNG





















3 Wide Operator Units

MO (mm)	4'-6" (1372)	6'-0" (1829)	7'-6" (2286)	8'-0" (2438)	9'-0" (2743)
RO (mm)	4'-6" (1372)	6'-0" (1829)	7'-6" (2286)	8'-0" (2438)	9'-0" (2743)
FS (mm)	4'-5 1/2" (1359)	5'-11 1/2" (1816)	7'-5 1/2" (2273)	7'-11 1/2" (2413)	8'-11 1/2" (2731)
1'-11 3/4" (603) 2'-0" (610) 1'-11 1/2" (597)	 IFDH1620	 IFDH2020	 IFDH2620	 IFDH2820	 IFDH3026
2'-5 3/4" (756) 2'-6" (762) 2'-5 1/2" (749)	 IFDH1626	 IFDH2026	 IFDH2626	 IFDH2826	 IFDH3026
2'-11 3/4" (908) 3'-0" (914) 2'-11 1/2" (902)	 IFDH1630	 IFDH2030	 IFDH2630	 IFDH2830	 IFDH3030
3'-5 3/4" (1060) 3'-6" (1067) 3'-5 1/2" (1054)	 IFDH1636	 IFDH2036	 IFDH2636	 IFDH2836	 IFDH3036
3'-11 3/4" (1213) 4'-0" (1219) 3'-11 1/2" (1207)	 IFDH1640	 IFDH2040	 IFDH2640	 IFDH2840	 IFDH3040
4'-5 3/4" (1365) 4'-6" (1372) 4'-5 1/2" (1359)	 IFDH1646	 IFDH2046	 IFDH2646	 IFDH2846	 IFDH3046
4'-11 3/4" (1518) 5'-0" (1524) 4'-11 1/2" (1511)	 IFDH1650	 IFDH2050	 IFDH2650	 IFDH2850	 IFDH3050 E
5'-5 3/4" (1670) 5'-6" (1676) 5'-5 1/2" (1664)	 IFDH1656	 IFDH2056	 IFDH2656	 IFDH2856	 IFDH3056 E
5'-11 3/4" (1822) 6'-0" (1829) 5'-11 1/2" (1816)	 IFDH1660	 IFDH2060	 IFDH2660 E	 IFDH2860 E	 IFDH3060 E
6'-5 3/4" (1975) 6'-6" (1981) 6'-5 1/2" (1969)	 IFDH1666	 IFDH2066	 IFDH2666 E	 IFDH2866 E	 IFDH3066 E

DOUBLE HUNG

INTEGRITY® FROM MARVIN®
ALL ULTREX® SERIES

4 Wide Operator Units

MO (mm)	6'-0" (1829)	8'-0" (2438)
RO (mm)	6'-0" (1829)	8'-0" (2438)
FS (mm)	5'-11 1/2" (1816)	7'-11 1/2" (2426)
1'-11 3/4" (603) 2'-0" (610) 1'-11 1/2" (597)	 IFDH1620	 IFDH2020
2'-5 3/4" (756) 2'-6" (762) 2'-5 1/2" (749)	 IFDH1626	 IFDH2026
2'-11 3/4" (908) 3'-0" (914) 2'-11 1/2" (902)	 IFDH1630	 IFDH2030
3'-5 3/4" (1060) 3'-6" (1067) 3'-5 1/2" (1054)	 IFDH1636	 IFDH2036
3'-11 3/4" (1213) 4'-0" (1219) 3'-11 1/2" (1207)	 IFDH1640	 IFDH2040
4'-5 3/4" (1365) 4'-6" (1372) 4'-5 1/2" (1359)	 IFDH1646	 IFDH2046
4'-11 3/4" (1518) 5'-0" (1524) 4'-11 1/2" (1511)	 IFDH1650	 IFDH2050
5'-5 3/4" (1670) 5'-6" (1676) 5'-5 1/2" (1664)	 IFDH1656	 IFDH2056
5'-11 3/4" (1822) 6'-0" (1829) 5'-11 1/2" (1816)	 IFDH1660	 IFDH2060
6'-5 3/4" (1975) 6'-6" (1981) 6'-5 1/2" (1969)	 IFDH1666	 IFDH2066

GBG available in standard Rectangular lite cut, shown. Other GBG lite cuts shown on page 3.

E = These windows (in equal sash) meet National Egress Codes for fire evacuation. Local codes may differ.

Details and Elevations not to scale.

Available in equal, cottage, and reverse cottage sash configurations. Cottage and reverse cottage sash configurations are not available on 20, 60, and 66 call number heights.

Obscure Glass option available on all units.

Units may optionally include a window opening control device tested to ASTM F2090-10, which can be released from the inside without the use of a key, tool, special knowledge, or force greater than that required for normal unit operation.

Special sized units available within product size matrix. See your Integrity retailer.

See page 52 for specific PG Ratings.

Multiple Assemblies

Multiple assemblies can be factory mullied.

MAXIMUM ROUGH OPENING not to exceed 114" X 78". Maximum up to 6 units wide by 1 unit high.

MAXIMUM ROUGH OPENING not to exceed 96" X 96". Maximum up to 5 units wide by 5 units high.

Field mull kits are available. Structural mullion reinforcement is required for some assemblies.

Please consult your local Integrity from Marvin representative for more information.

DOUBLE HUNG - Transoms and Multiple Assemblies

In-Sash Transom Muller Over Double Hung – Operator Unit

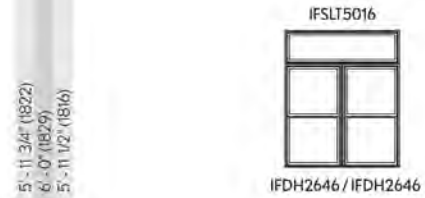
MO (mm)	2' - 6" (762)
RO (mm)	2' - 6" (762)
FS (mm)	2' - 5 1/2" (749)



5' - 11 3/4" (1822)
6' - 0" (1829)
5' - 11 1/2" (1816)

In-Sash Transom Muller Over Double Hung – 2 Wide Operator Unit

MO (mm)	5' - 0" (1524)
RO (mm)	5' - 0" (1524)
FS (mm)	4' - 11 1/2" (1511)



5' - 11 3/4" (1822)
6' - 0" (1829)
5' - 11 1/2" (1816)

Double Hung Flankers with Picture Center Unit*

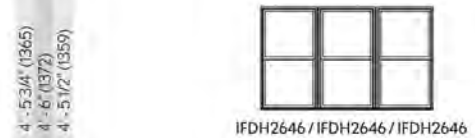
MO (mm)	10' - 0" (3048)
RO (mm)	10' - 0" (3048)
FS (mm)	9' - 11 1/2" (3035)



4' - 5 3/4" (1365)
4' - 6" (1372)
4' - 5 1/2" (1359)

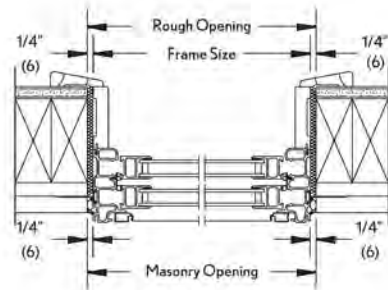
Double Hung Flankers with Operator Center Unit

MO (mm)	7' - 6" (2286)
RO (mm)	7' - 6" (2286)
FS (mm)	7' - 5 1/2" (2273)

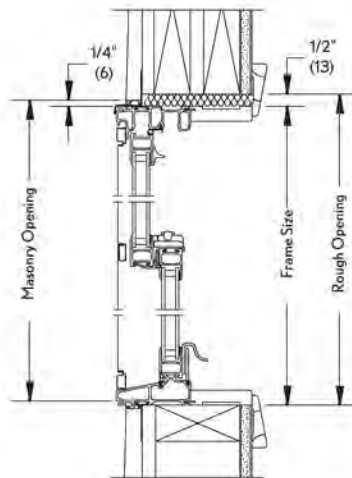


4' - 5 3/4" (1365)
4' - 6" (1372)
4' - 5 1/2" (1359)

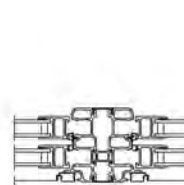
Construction Details



Jambs



Head Jamb & Sill



Vertical Mullion



Horizontal Mullion Transom/Operator

* This product is only available field muller.

Details and Elevations not to scale.

Available in equal, cottage, and reverse cottage sash configurations. Cottage and reverse cottage sash configurations are not available on 20, 60, and 66 call number heights.

Obscure Glass option available on all units.

Units may optionally include a window opening control device tested to ASTM F2090-10, which can be released from the inside without the use of a key, tool, special knowledge, or force greater than that required for normal unit operation.

Special sized units available within product size matrix. See your Integrity® retailer.

See page 52 for specific PG Ratings.

Multiple Assemblies

Multiple assemblies can be factory muller.

MAXIMUM ROUGH OPENING not to exceed 114" X 78". Maximum up to 6 units wide by 1 unit high.

MAXIMUM ROUGH OPENING not to exceed 96" X 96". Maximum up to 5 units wide by 5 units high.

Field mull kits are available. Structural mullion reinforcement is required for some assemblies.

Please consult your local Integrity from Marvin® representative for more information.

190, 350 and 500 Standard Entrances

Single Source
Packages
Generate Versatile
First Impressions



Garland Special Events Center, Garland, TX
Architect: HKS, Inc., Dallas, TX
Glazing Contractor: B & B Glass, Inc., Dallas, TX

Tough yet attractive, the clean lines of Kawneer's Standard Entrances are designed as a single-source package of door, door frame and hardware that is easily adaptable to custom requirements. Designed to complement new or remodel construction, modern or traditional architecture, they are engineered, constructed and tested to make good first impressions while withstanding the rigors of constant use by occupants and visitors.

Performance

To resist both lever arm and torsion forces that constantly act on any door, all three entrances feature welded corner construction with Sigma deep penetration and fillet welds plus mechanical fastenings at each corner – a total of 16 welds per door. Each door corner comes with a Limited Lifetime Warranty, good for the life of the door under normal use operation. It is transferable from building owner to owner and is in addition to the standard two-year warranty covering material and workmanship of each Kawneer Door.



1. Thermoplastic elastomer weatherstrip in blade-stop of frame jambs, header or transom bar.
2. Integral polymeric fin is attached to adjustable astragal creating an air barrier between pairs of doors.
3. Optional surface-applied bottom weatherstrip with flexible blade gasket. Extruded raised lip on threshold to provide a continuous contact surface for bottom weatherstrip.
4. Standard 1/4" beveled glass stops sheet water and dirt off without leaving residue.
5. Available in all finishes offered by Kawneer.

The 190 Narrow Stile Entrance

- Is engineered for moderate traffic in applications such as stores, offices and apartment buildings
- Vertical stile measures 2-1/8"; top rail 2-1/4" and bottom rail 3-7/8"
- Results in a slim look that meets virtually all construction requirements

The 350 Medium Stile Entrance

- Provides extra strength for applications such as schools, institutions and other high traffic applications
- Vertical stiles and top rails measure 3-1/2"
- Bottom rail measures 6-1/2" for extra durability

The 500 Wide Stile Entrance

- Creates a monumental visual statement for applications such as banks, libraries and public buildings
- Vertical stiles and top rail are 5"; bottom rail measures 6-1/2"
- Results in superior strength for buildings experiencing heavy traffic conditions

Economy

Kawneer's Sealair® bulb neoprene weatherstripping forms a positive seal around the door frame and provides a substantial reduction in air infiltration, resulting in improved comfort and economies in heating and cooling costs. The system is wear and temperature-resistant and replaces conventional weathering. Bottom weatherstrip at the interior contains a flexible blade gasket to meet and contact the threshold, enhancing the air and water infiltration performance characteristics.

For the Finishing Touch

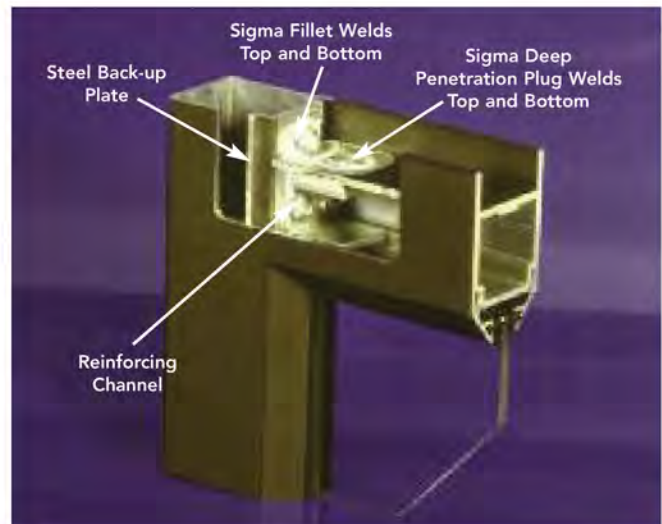
Permanodic® Anodized finishes are available in Class I and Class II in seven different colors.

Painted Finishes, including fluoropolymer that meet or exceed AAMA 2605, are offered in many standard choices and an unlimited number of specially-designed colors.

Solvent-free powder coatings add the "green" element with high performance, durability and scratch resistance that meet the standards of AAMA 2604.

General

- Heights vary to 10'; widths range from approximately 3' to 4'
- Door frame face widths range to a maximum of 4", while depths range to 6"
- Door operation is single or double-acting with maximum security locks or Touch Bar Panics standard
- Architect's Classic one inch round, bent bar push/pull hardware is available in various finishes and sizes
- Infills range from under 1/4" to more than 1"



Kawneer Company, Inc.
Technology Park / Atlanta
555 Guthridge Court
Norcross, GA 30092

kawneer.com
770 . 449 . 5555

KAWNEER
AN ALCOA COMPANY



Manufacturer Specification Sheets

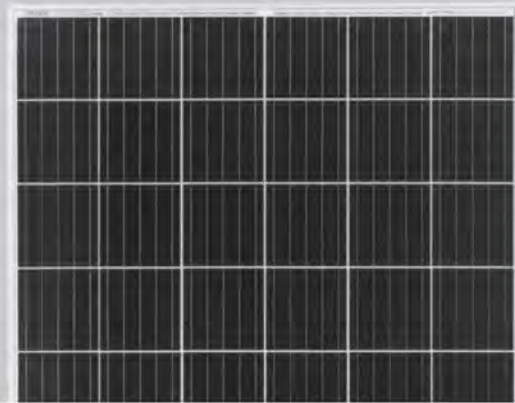
ECM 18: Solar PV Array

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Eagle 72M G2 370-390 Watt

MONO PERC MODULE

Positive power tolerance of 0~+3%



KEY FEATURES



Diamond Cell Technology

Uniquely designed high performance 5 busbar mono PERC cell



High Voltage

UL and IEC 1500V certified; lowers BOS costs and yields better LCOE



PID Free

World's 1" PID Free module



Low-Light Performance

Advanced glass technology improves light absorption and retention



Strength and Durability

Certified for high snow (5400Pa) and wind (2400Pa) loads



Weather Resistance

Certified for salt mist and ammonia resistance

- ISO9001:2008 Quality Standards
- ISO14001:2004 Environmental Standards
- OHSAS18001 Occupational Health & Safety Standards
- IEC61215, IEC61730 certified products
- UL1703 certified products

Nomenclature:

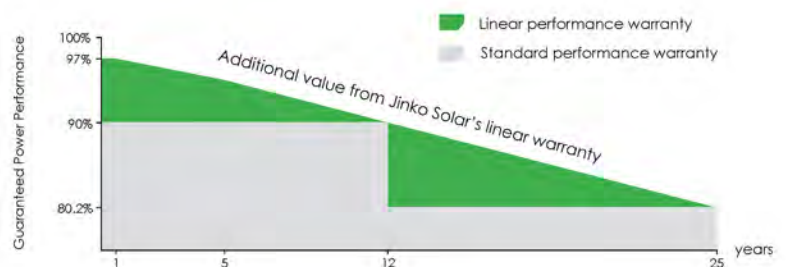
JKM390M - 72L - V

Code	Cell	Code	Certification
null	Normal	null	1000V
L	Diamond	V	1500V

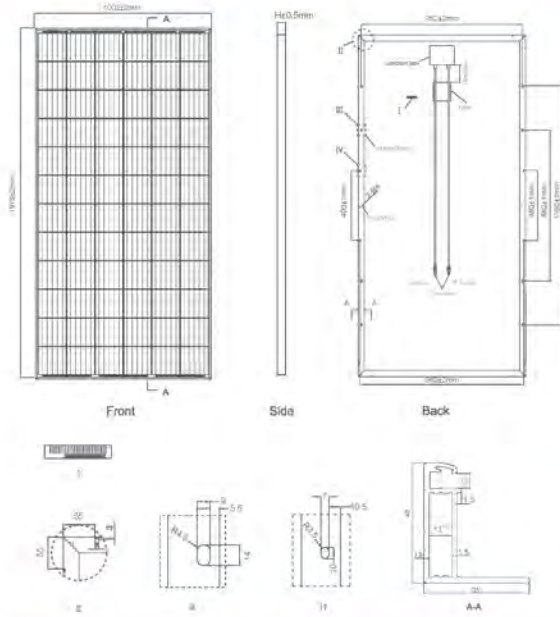


LINEAR PERFORMANCE WARRANTY

10 Year Product Warranty • 25 Year Linear Power Warranty



Engineering Drawings

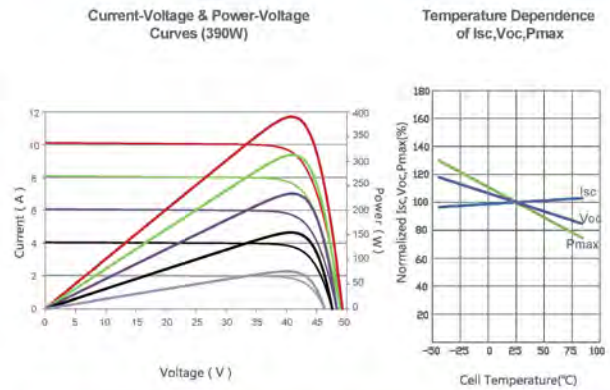


Packaging Configuration

(Two pallets = One stack)

26pcs/pallet, 52pcs/stack, 572pcs/40'HQ Container

Electrical Performance & Temperature Dependence



Mechanical Characteristics

Cell Type	Mono PERC Diamond Cell (158.75 × 158.75 mm)
No. of Cells	72 (6×12)
Dimensions	1979×1002×40mm (77.91×39.45×1.57 inch)
Weight	22.5 kg (49.6 lbs.)
Front Glass	3.2mm, Anti-Reflection Coating, High Transmission, Low Iron, Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	IP67 Rated
Output Cables	12 AWG, Length 1200mm or Customized Length
Fire Type	Type 1

SPECIFICATIONS

Module Type	JKM370M-72L-V		JKM375M-72L-V		JKM380M-72L-V		JKM385M-72L-V		JKM390M-72L-V	
	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Maximum Power (Pmax)	370Wp	278Wp	375Wp	282Wp	380Wp	286Wp	385Wp	290Wp	390Wp	294Wp
Maximum Power Voltage (Vmp)	39.9V	38.1V	40.2V	38.3V	40.5V	38.6V	40.8V	38.8V	41.1V	39.1V
Maximum Power Current (Imp)	9.28A	7.30A	9.33A	7.36A	9.39A	7.42A	9.44A	7.48A	9.49A	7.54A
Open-circuit Voltage (Voc)	48.5V	47.0V	48.7V	47.2V	48.9V	47.5V	49.1V	47.7V	49.3V	48.0V
Short-circuit Current (Isc)	9.61A	7.75A	9.68A	7.82A	9.75A	7.88A	9.92A	7.95A	10.12A	8.02A
Module Efficiency STC (%)	18.66%		18.91%		19.16%		19.42%		19.67%	
Operating Temperature (°C)	-40°C~+85°C									
Maximum System Voltage	1500VDC(UL)/1500VDC(IEC)									
Maximum Series Fuse Rating	20A									
Power Tolerance	0~+3%									
Temperature Coefficients of Pmax	-0.39%/°C									
Temperature Coefficients of Voc	-0.29%/°C									
Temperature Coefficients of Isc	0.048%/°C									
Nominal Operating Cell Temperature (NOCT)	45±2°C									

STC: Irradiance 1000W/m² Cell Temperature 25°C AM=1.5

NOCT: Irradiance 800W/m² Ambient Temperature 20°C AM=1.5 Wind Speed 1m/s

* Power measurement tolerance: ± 3%

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

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US-MKT-390M-72L-V_1.0_rev2018

Three Phase Inverter with Synergy Technology

for the 277/480V Grid for North America

SE66.6KUS / SE100KUS



Specifically designed to work with power optimizers

- Easy two-person installation – each unit mounted separately, equipped with cables for simple connection between units
- Balance of System and labor reduction compared to using multiple smaller string inverters
- Independent operation of each unit enables higher uptime and easy serviceability
- No wasted ground area: wall/rail mounted, or horizontally mounted under the modules (10° inclination)
- Integrated arc fault protection and rapid shutdown for NEC 2014 and 2017, per article 690.11 and 690.12
- Built-in module-level monitoring with Ethernet or cellular GSM
- Fixed voltage inverter for superior efficiency (98.5%) and longer strings
- Integrated DC Safety Switch
- Built-in RS485 Surge Protection, to better withstand lightning events

/ Three Phase Inverter with Synergy Technology for the 277/480V Grid for North America

SE66.6KUS / SE100KUS

	SE66.6KUS	SE100KUS	
OUTPUT			
Rated AC Power Output	66600	100000	VA
Maximum AC Power Output	66600	100000	VA
AC Output Line Connections	4-wire WYE (L1-L2-L3-N) plus PE		
AC Output Voltage Minimum-Nominal-Maximum ⁽¹⁾ (L-N)	244 - 277 - 305		Vac
AC Output Voltage Minimum-Nominal-Maximum ⁽¹⁾ (L-L)	422.5 - 480 - 529		Vac
AC Frequency Min-Nom-Max ⁽¹⁾	59.3 - 60 - 60.5		Hz
Maximum Continuous Output Current (per Phase) @277V	80	120	A
GFDI Threshold	1		A
Utility Monitoring, Islanding Protection, Configurable Power Factor, Country Configurable Thresholds	Yes		
INPUT			
Maximum DC Power (Module STC) / Unit	90000 / 45000	135000 / 45000	W
Transformer-less, Ungrounded	Yes		
Maximum Input Voltage DC to Gnd	500		Vdc
Maximum Input Voltage DC+ to DC-	1000		Vdc
Nominal Input Voltage DC to Gnd	425		Vdc
Nominal Input Voltage DC+ to DC-	850		Vdc
Maximum Input Current	80	120	Adc
Maximum Input Short Circuit Current	120		Adc
Reverse-Polarity Protection	Yes		
Ground-Fault Isolation Detection	350k Ω Sensitivity per Unit		
CEC Weighted Efficiency	98.5		%
Nighttime Power Consumption	< 12		W
ADDITIONAL FEATURES			
Supported Communication Interfaces	RS485, Ethernet, Cellular GSM (optional)		
Rapid Shutdown	NEC2014 and NEC2017 compliant/certified, upon AC Grid Disconnect		
RS485 Surge Protection	Built-in		
DC SAFETY SWITCH			
DC Disconnect	1000V / 2 x 40A	1000V / 3 x 40A	
STANDARD COMPLIANCE			
Safety	UL1741, UL1741 SA, UL1699B, UL1998, CSA 2.22		
Grid Connection Standards	IEEE 1547, Rule 21, Rule 14 (H)		
Emissions	FCC part15 class A		
INSTALLATION SPECIFICATIONS			
Number of units	2	3	
AC Output Conduit Size / Max AWG / Max PE AWG	1.5" / 2/0 / 6	2" / 4/0 / 4	
DC Output Conduit Size / Terminal Block AWG Range / Number of Strings ⁽²⁾	2 x 1.25" / 6-14 / 6 strings	2 x 1.25" / 6-14 / 9 strings	
Dimensions (H x W x D)	Primary Unit: 37 x 12.5 x 10.5 / 940 x 315 x 260; Secondary Unit: 21 x 12.5 x 10.5 / 540 x 315 x 260		in / mm
Weight	Primary Unit: 105.8 / 48; Secondary Unit 99.2 / 45		lb / kg
Operating Temperature Range	-40 to +140 / -40 to +60 ⁽³⁾		$^{\circ}$ F / $^{\circ}$ C
Cooling	Fan (user replaceable)		
Noise	< 60		dBA
Protection Rating	NEMA 3R		
Mounting	Bracket provided		

⁽¹⁾ For other regional settings please contact SolarEdge support

⁽²⁾ Single input option per unit (up to 3AWG) available

⁽³⁾ De-rating from 50 $^{\circ}$ C

Manufacturer Specification Sheets

ECM 19: AHU Replacements

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QUALITY IS SOMETHING WE TAKE PERSONALLY



We design and build YORK® Predator® split-systems here in North America, where we can closely monitor and improve processes that directly affect quality. It's this commitment to excellence that allows us to offer outstanding warranties, meet the highest industry standards and deliver energy-saving comfort that lasts. That's why, when it comes to commercial comfort, your confidence is our commitment.

Predator® Split System Air Conditioners/Heat Pumps (YC/YD/PC/PD)

MODEL	NOMINAL CAPACITY (TONS)	EER	IEER	LBS.
YC090/N0396	7.8	11.2	13.0	387
YC090/N0390	8	11.9	13.0	387
YC120/N0420	10	11.4	12.5	497
YC150/N0450	10	11.2	11.2	490
YC150/N0450	12.5	11.0	13.3	497
YC150/N0450	12.5	11.0	12.1	490
YC150/N0450	15	11.2	12.2	909
YC180/N0480	16	11.7	12.7	894
YC180/N0480	15	11.2	11.6	894
YC180/N0480	16	11.2	N/A	894
YC180/N0480	16	11.2	N/A	894
YC180/N0480	16	11.7	13.4	894
YC240/N0540	20	11.3	13.6	942
YC240/N0540	20	11.3	11.9	927
YC400/N0920	20	11.6	N/A	927
YC400/N0920	25	10.2	12.2	942
YC400/N0920	7.5	11.0	11.4	430
PC120/N0360	10	11.0	11.4	574
PC180/N0540	15	10.6	11.5	969
PD150/N0450	15	10.6	11.5	942
PD240/N0540	20	10.6	11.7	1,126

Predator® Split System Evaporator Blowers (NC/ND)

MODEL	ELECTRIC HEAT (KW)	CFM	LBS.
NC180	10, 16, 26, 36	3000	498
NC180	10, 16, 26, 36	4000	539
NC120	10, 16, 26, 36	4000	541
NC180	10, 16, 26, 36, 50	6000	737
ND180	10, 16, 26, 36, 50	6000	765
NC240	20, 32, 52	8000	873
ND240	20, 32, 52	8000	873
NC300	—	10,000	1,130



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PREDATOR® SERIES SPLIT SYSTEM AIR CONDITIONERS AND HEAT PUMPS

Limited warranties for YC, YD, PD, PC models:



Limited warranties for NC, ND models:



BENEFITS TO COUNT ON

Easy installation
Compact Predator® series units install easily on rooftops or even ground level, thanks to sub-cooling capacity that accommodates locations three or more stories below the evaporator coil.

Reliable performance
Industrial-grade scroll compressors ensure reliable operation in the toughest conditions. Condenser coils are constructed of MicroChannel aluminum tubing for durability and efficient operation.

Quiet operation
Scroll compressors are mounted on rubber isolators to reduce vibration transmission, while vertical discharge condenser fans direct sound up and away from surrounding structures.



PREDATOR® SERIES 7.5-25 TONS

SMART SOLUTIONS FOR CHALLENGING CONDITIONS

For more than 140 years, YORK® commercial systems have provided heating and cooling solutions for some of the world's most demanding applications. Today, smart YORK® Predator® light commercial split systems deliver the simplicity, efficiency and long-term reliability that give you a competitive advantage for challenging projects.



PREDATOR® SPLIT SYSTEM AIR CONDITIONERS AND HEAT PUMPS

- Meets EPACT 2005 and ASHRAE 90.1-2013 efficiency standards
- Inherently protected condenser fan motors
- Two-pipe and four-pipe configurations available
- Five-minute, anti-short cycle timer and minimum compressor runtime
- Factory-installed disconnects, convenience outlet and technicoated coil option
- Advanced scroll compressors provide both high efficiency and reliability
- Condenser coils are constructed of MicroChannel aluminum tubing and fins for durability and long-lasting, efficient operation
- Crankcase heaters that de-energize when the compressor is operating
- Self-contained high- and low-pressure controls
- Solid-state or internal line break compressor motor protection
- Class 2, 24-volt thermostat control circuit
- Filter-drier is shipped in the unit's control box for field installation in the liquid line
- Copper stub-outs are factory-mounted on the suction and liquid lines to simplify the field piping connections

THE ADVANCED PREDATOR® SPLIT SYSTEM PRODUCT LINE

Compact design, clean styling and quiet operation make these units suitable for almost any commercial application.



Predator® split system outdoor units use Simplicity® Smart Equipment controls and advanced evaporator coils and blower motors to provide quiet, reliable operation in a range of commercial environments.

Predator® condensing units fit almost any outdoor location. And unlike single package units, they work particularly well on rooftops as a result of their reduced weight.



Evaporator blower units are designed with two distinct modules to provide maximum application flexibility. The blower module can be repositioned to meet almost any installation requirement and includes the blower wheels, the drives and a factory-installed motor of your choice.

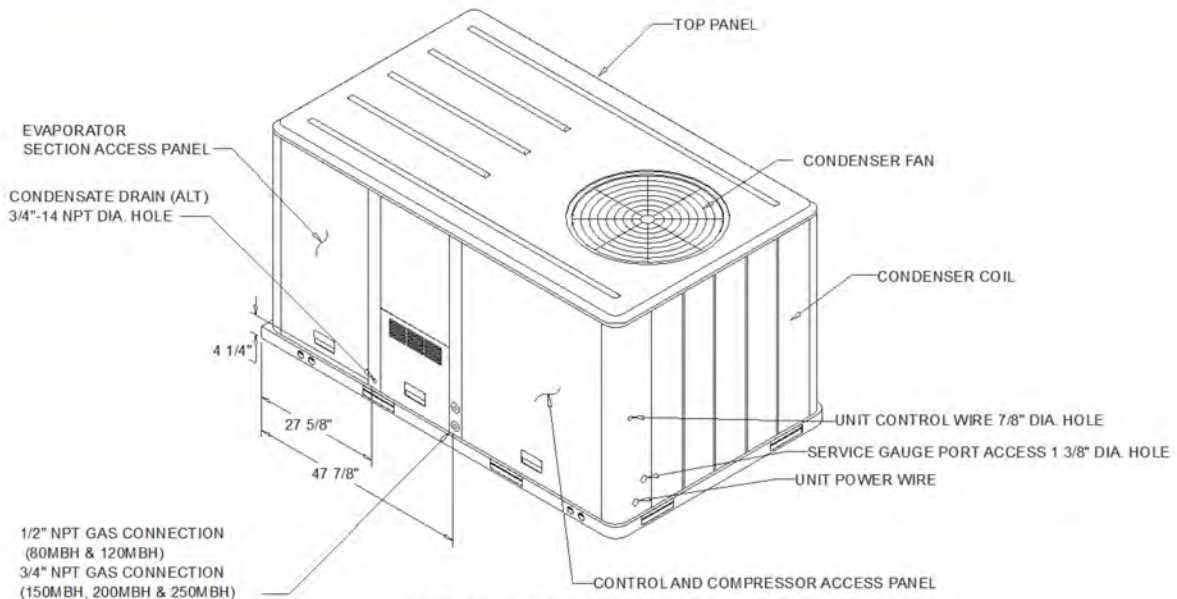


Simplicity® Smart Equipment controls put performance in the palm of your hand

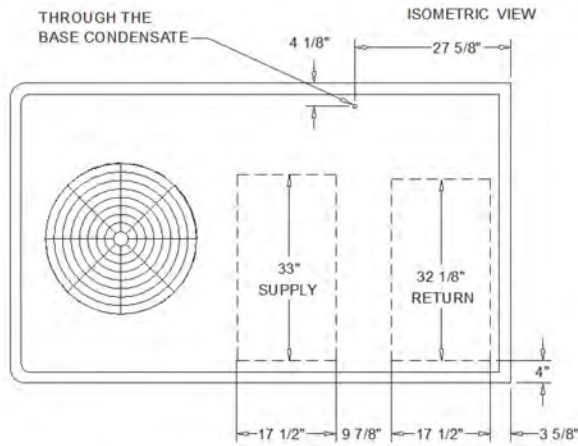
With the Simplicity® Smart Equipment control system, all alarm and diagnostic data can be transmitted directly to an on-site PC or over a local Wi-Fi® connection – you can even monitor the system over the Internet using a Web browser.

- Thermostat ready – No configuration required
- Wi-Fi® and Ethernet communications via optional Mobile Access Portal (MAP) Gateway
- Onboard LCD
- Plug and Play Feature additions in the field
- Auto-Configuration
- Factory-configured and Tested – No field programming required
- Self-Test Diagnostic Startup Report
- Data Logging to removable memory (USB)
- Multi-Protocol Capability
- SMART Device Tools (Mobile-Access Portal Gateway)
- Fault "messages" instead of fault "codes"
- Single-zone VAV, VFD, IntelliSPEED™ functionality
- BTL Control



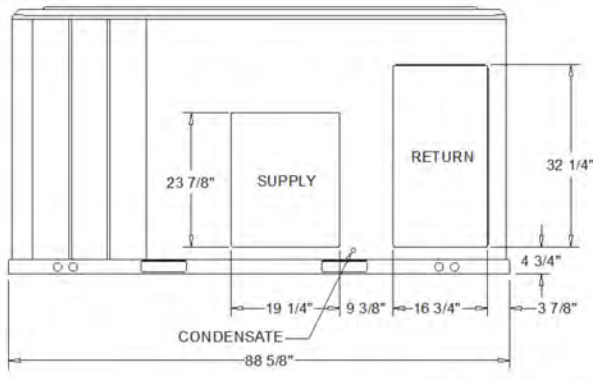


PACKAGED GAS / ELECTRICAL

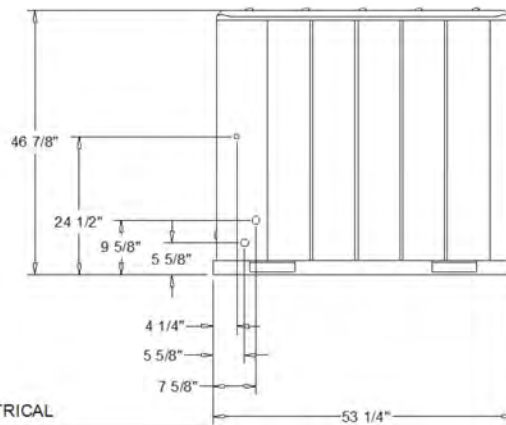


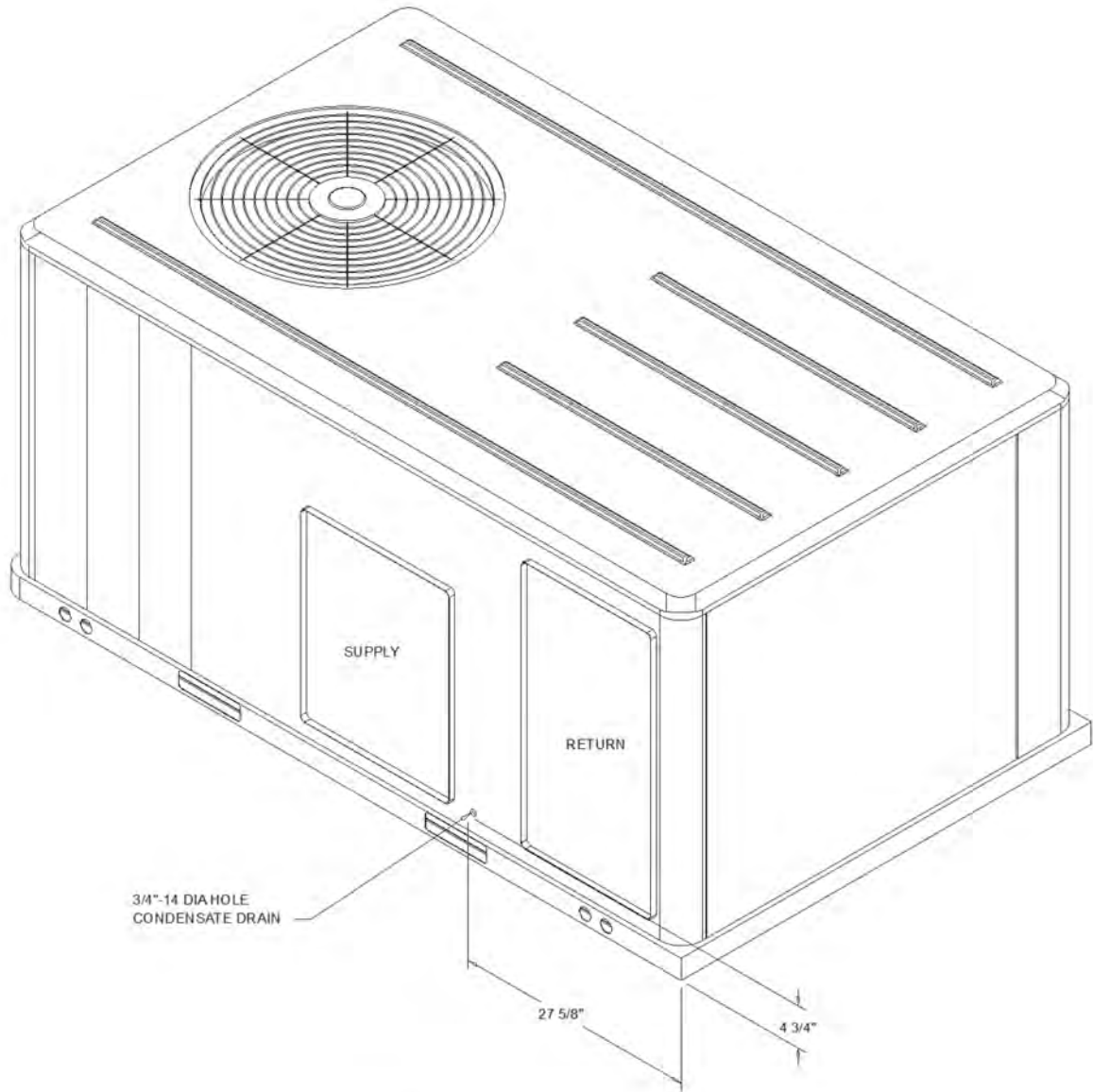
- NOTES:
 1. THRU -THE -BASE ELECTRICAL IS NOT STANDARD ON ALL UNITS.
 2. VERIFY ALL DIMENSIONS WITH INSTALLER DOCUMENTS BEFORE INSTALLATION.

**PLAN VIEW UNIT
 DIMENSION DRAWING**



**PACKAGED GAS / ELECTRICAL
 DIMENSION DRAWING**





ISOMETRIC-PACKAGED COOLING



ELECTRICAL / GENERAL DATA

GENERAL (2)(4)(6) Model: YHC092F Oversized Motor Unit Operating Voltage: 187-253 MCA: N/A Unit Primary Voltage: 208 MFS: N/A Unit Secondary Voltage: 230 MCB: N/A Unit Hertz: 60 Unit Phase: 3 EER Standard Motor MCA: 42.0 MCA: N/A MFS: 50.0 MFS: N/A MCB: 50.0 MCB: N/A Field Installed Oversized Motor		HEATING PERFORMANCE HEATING - GENERAL DATA Heating Model: Low Heating Input (BTU): 120,000 Heating Output (BTU): 96,000 No. Burners: 3 No. Stages: 1 Gas Inlet Pressure Natural Gas (Min/Max): 4.5/14 LP (Min/Max): 11"/14" Gas Pipe Connection Size: 1/2"																						
INDOOR MOTOR <table border="0" style="width:100%"> <tr> <td style="width:33%">Standard Motor</td> <td style="width:33%">Oversized Motor</td> <td style="width:33%">Field Installed Oversized Motor</td> </tr> <tr> <td>Number: 1</td> <td>Number: N/A</td> <td>Number: N/A</td> </tr> <tr> <td>Horsepower: 2.75</td> <td>Horsepower: N/A</td> <td>Horsepower: N/A</td> </tr> <tr> <td>Motor Speed (RPM): -</td> <td>Motor Speed (RPM): N/A</td> <td>Motor Speed (RPM): N/A</td> </tr> <tr> <td>Phase: 3</td> <td>Phase: N/A</td> <td>Phase: N/A</td> </tr> <tr> <td>Full Load Amps: 7.3</td> <td>Full Load Amps: N/A</td> <td>Full Load Amps: N/A</td> </tr> <tr> <td>Locked Rotor Amps: -</td> <td>Locked Rotor Amps: N/A</td> <td>Locked Rotor Amps: N/A</td> </tr> </table>				Standard Motor	Oversized Motor	Field Installed Oversized Motor	Number: 1	Number: N/A	Number: N/A	Horsepower: 2.75	Horsepower: N/A	Horsepower: N/A	Motor Speed (RPM): -	Motor Speed (RPM): N/A	Motor Speed (RPM): N/A	Phase: 3	Phase: N/A	Phase: N/A	Full Load Amps: 7.3	Full Load Amps: N/A	Full Load Amps: N/A	Locked Rotor Amps: -	Locked Rotor Amps: N/A	Locked Rotor Amps: N/A
Standard Motor	Oversized Motor	Field Installed Oversized Motor																						
Number: 1	Number: N/A	Number: N/A																						
Horsepower: 2.75	Horsepower: N/A	Horsepower: N/A																						
Motor Speed (RPM): -	Motor Speed (RPM): N/A	Motor Speed (RPM): N/A																						
Phase: 3	Phase: N/A	Phase: N/A																						
Full Load Amps: 7.3	Full Load Amps: N/A	Full Load Amps: N/A																						
Locked Rotor Amps: -	Locked Rotor Amps: N/A	Locked Rotor Amps: N/A																						
COMPRESSOR Circuit 1/2 Number: 2 Horsepower: 4.1/2.4 Phase: 3 Rated Load Amps: 15.9/10.0 Locked Rotor Amps: 110.0/71.0		OUTDOOR MOTOR Number: 1 Horsepower: 0.75 Motor Speed (RPM): 1100 Phase: 1 Full Load Amps: 4.0 Locked Rotor Amps: 9.3																						
POWER EXHAUST ACCESSORY (3) (Field Installed Power Exhaust) Phase: 1 Horsepower: 0.87 Motor Speed (RPM): 1075 Full Load Amps: 5.7 Locked Rotor Amps: 13.6		FILTERS Type: Throwaway Furnished: Yes Number: 4 Recommended: 20"x25"x2"																						
REFRIGERANT (2) Type: R-410 Factory Charge Circuit #1: 5.5 lb Circuit #2: 4.2 lb																								

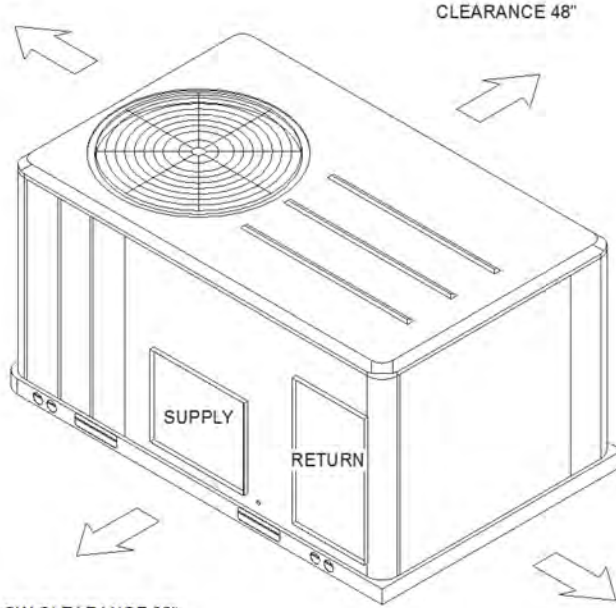
NOTES:

1. Maximum (HACR) Circuit Breaker sizing is for installations in the United States only.
2. Refrigerant charge is an approximate value. For a more precise value, see unit nameplate and service instructions.
3. Value does not include Power Exhaust Accessory.
4. Value includes oversized motor.
5. Value does not include Power Exhaust Accessory.
6. EER is rated at AHRI conditions and in accordance with DOE test procedures.



CLEARANCE 36"

CLEARANCE FROM TOP OF UNIT 72"

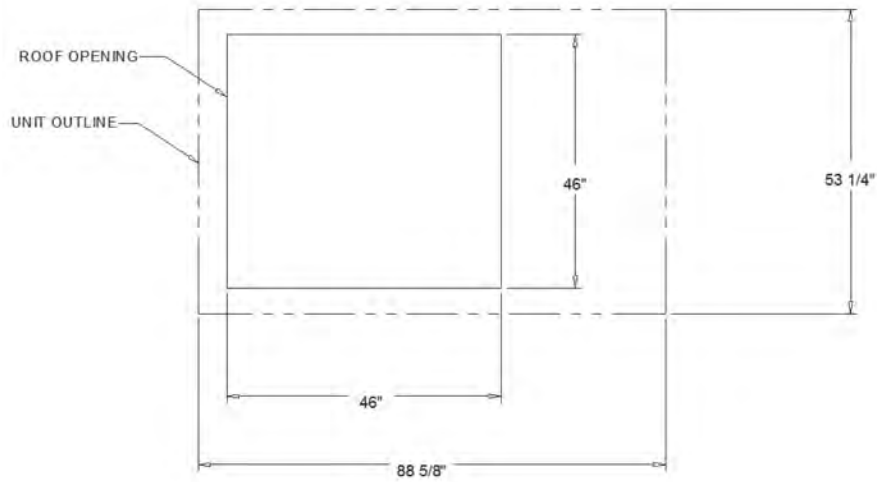


DOWNFLOW CLEARANCE 36"
HORIZONTAL CLEARANCE 18"

CLEARANCE 36"

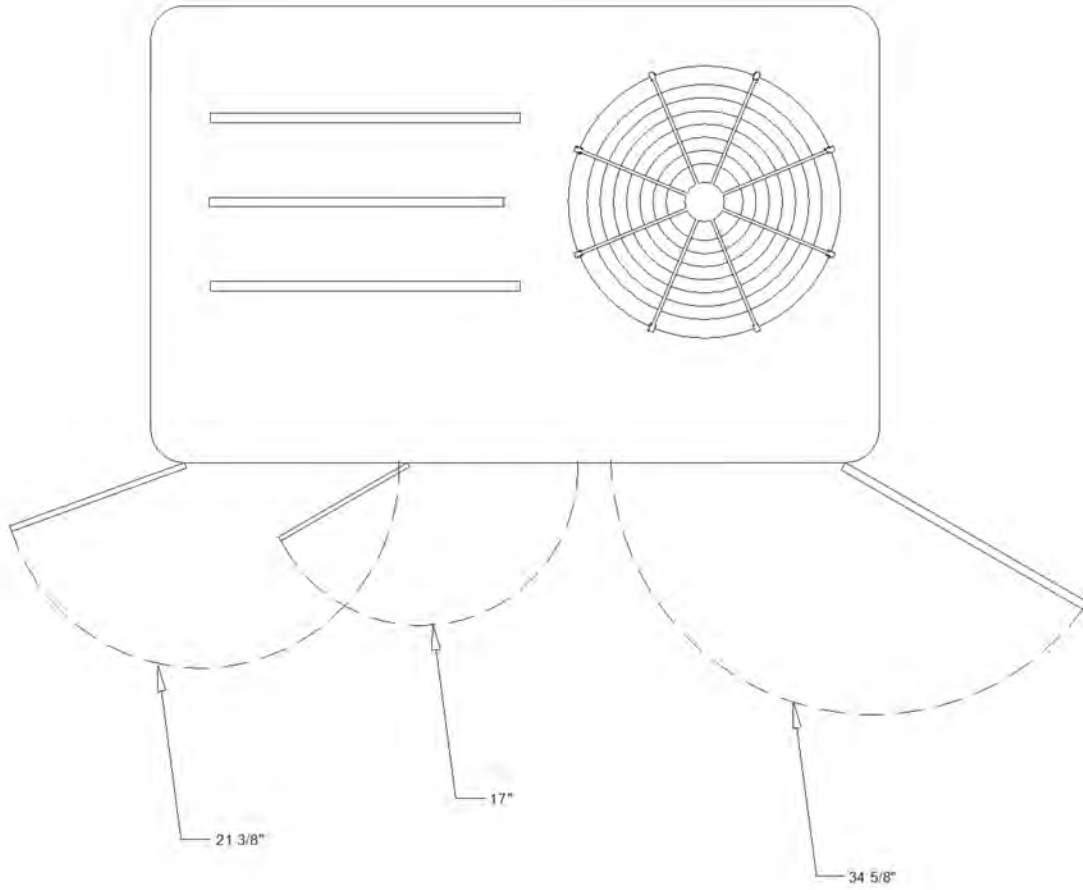
PACKAGED GAS / ELECTRIC

CLEARANCE

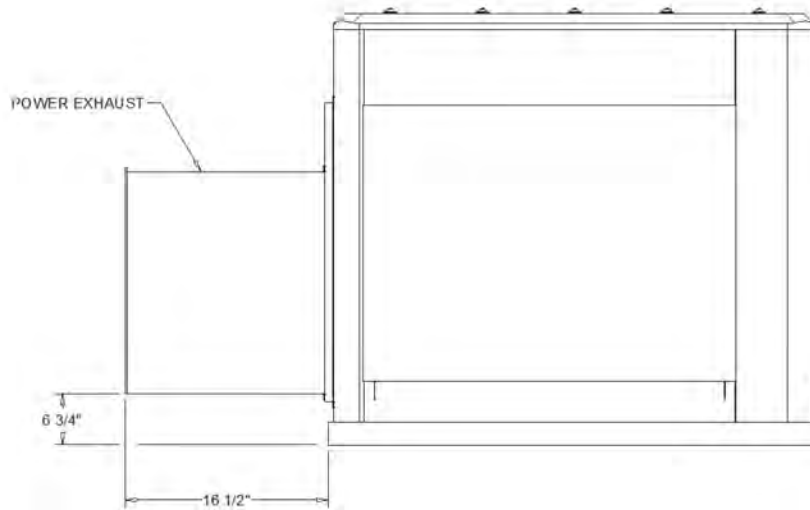
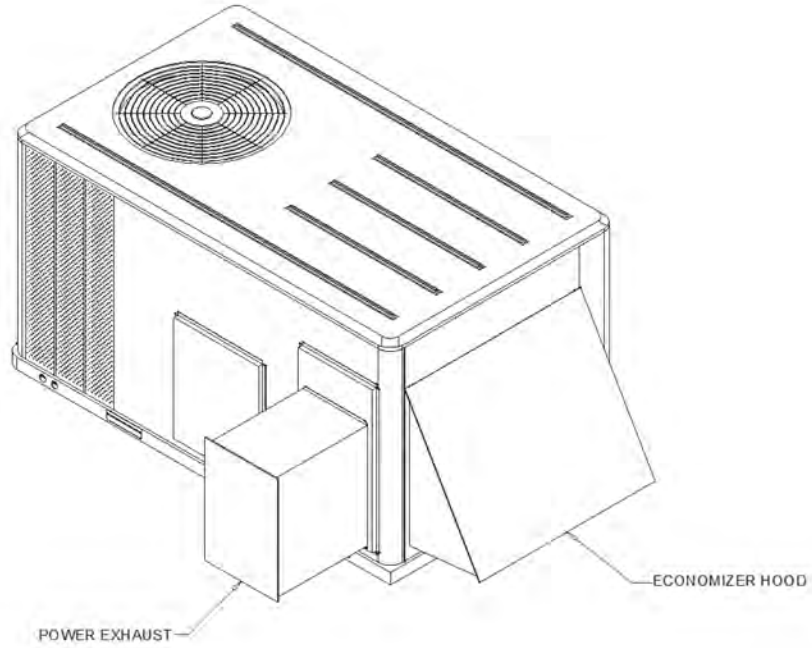


PACKAGED GAS / ELECTRIC

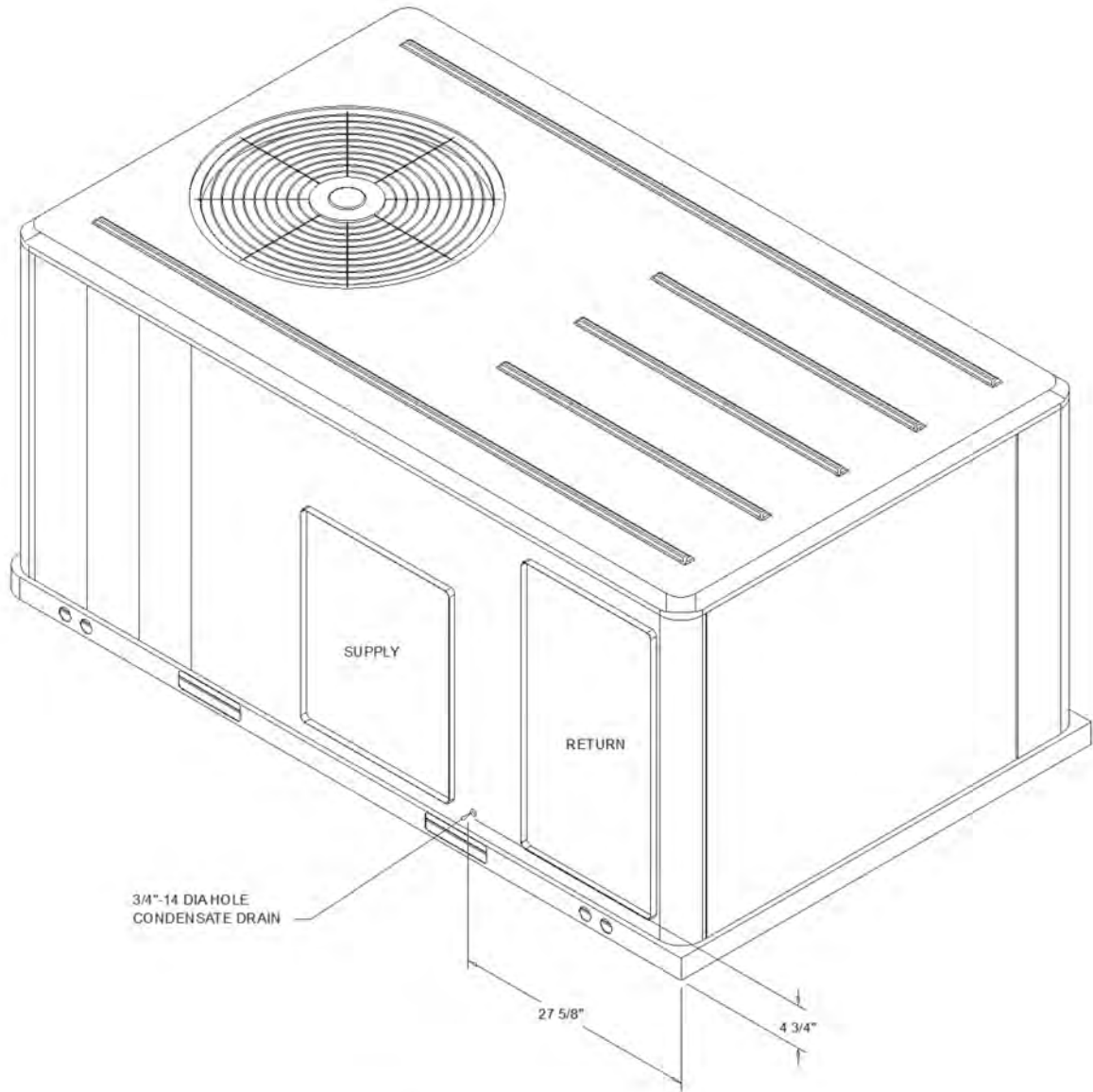
DOWNFLOW TYPICAL ROOF OPENING



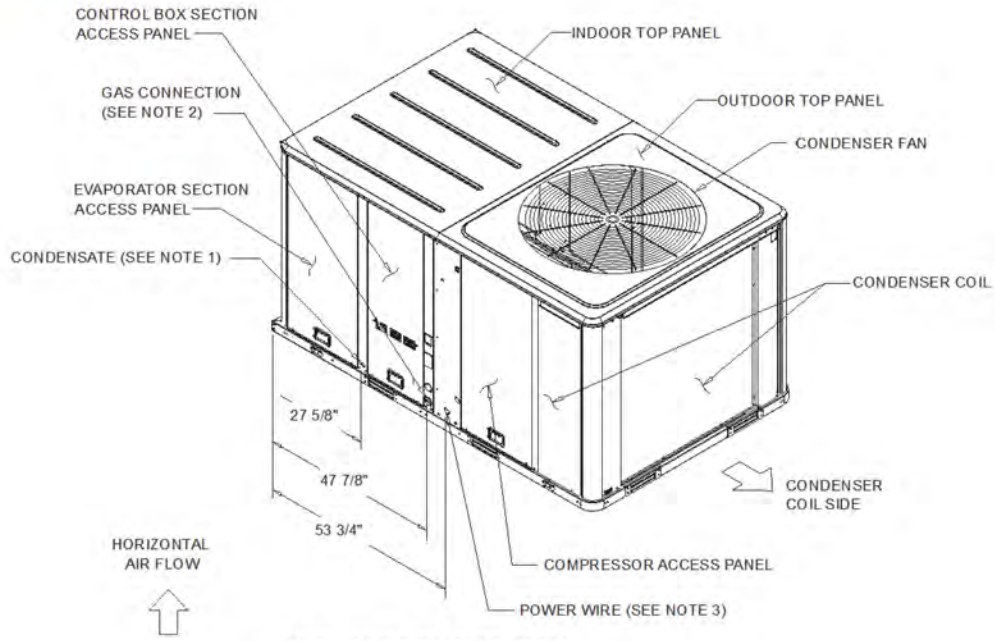
SWING DIAMETER - HINGED DOOR(S) OPTION
ACCESSORY



POWER EXHAUST AND HOOD
ACCESSORY

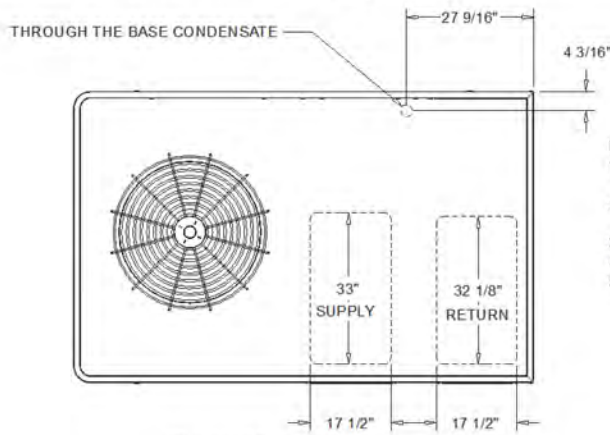


ISOMETRIC-PACKAGED COOLING



PACKAGED GAS / ELECTRICAL

ISOMETRIC VIEW

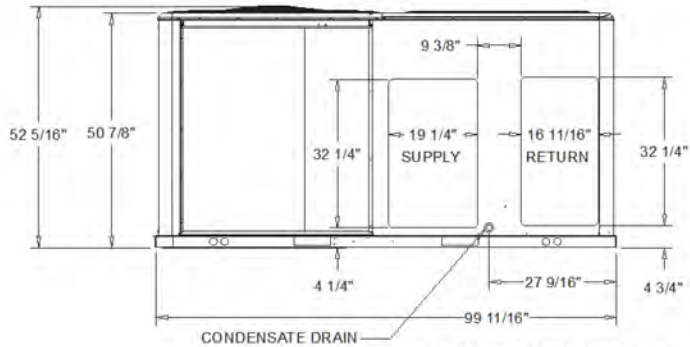


NOTES:

1. ALTERNATE CONDENSATE DRAIN CONNECTION
3/4" - 14 NPT DIA. HOLE
2. 1/2" NPT GAS CONNECTION (80 mbh, 120 mbh);
3/4" NPT GAS CONNECTION (150mbh, 200mbh, 250mbh)
3. UNIT POWER WIRE 1 3/8" DIA. HOLE.
4. THRU -THE -BASE ELECTRICAL AND GAS IS NOT STANDARD ON ALL UNITS.
5. VERIFY WEIGHT, CONNECTION, AND ALL DIMENSION WITH
INSTALLER DOCUMENTS BEFORE INSTALLATION

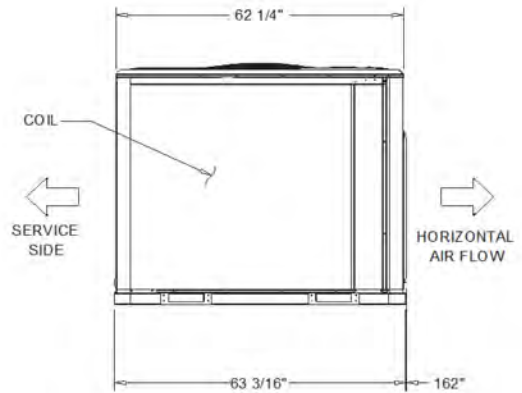
PLAN VIEW UNIT

DIMENSION DRAWING



PACKAGED GAS / ELECTRICAL

DIMENSION DRAWING





ELECTRICAL / GENERAL DATA

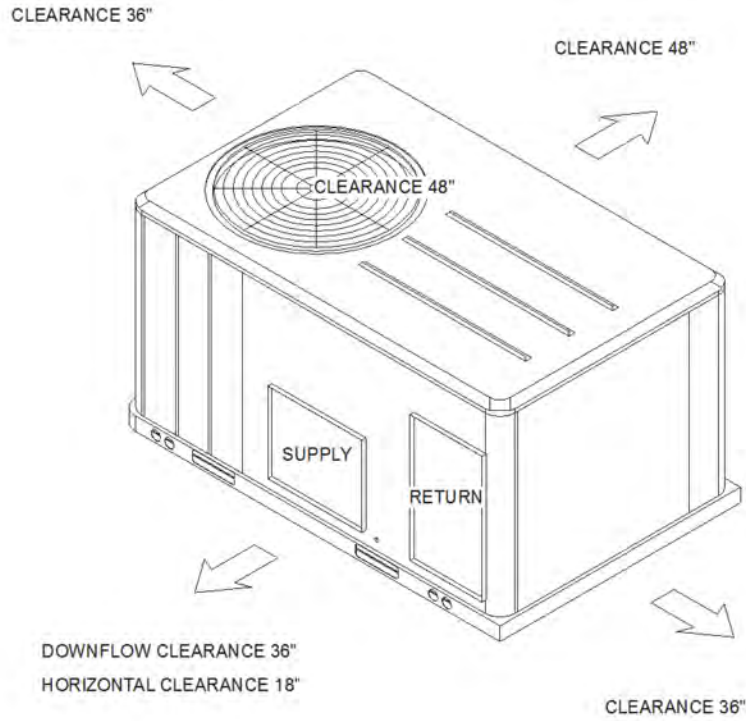
GENERAL (2)(4)(6) Model: YHC120F Oversized Motor Unit Operating Voltage: 187-253 MCA: N/A Unit Primary Voltage: 208 MFS: N/A Unit Secondary Voltage: 230 MCB: N/A Unit Hertz: 60 Unit Phase: 3 EER Standard Motor MCA: 48.0 MCA: N/A MFS: 60.0 MFS: N/A MCB: 60.0 MCB: N/A		HEATING PERFORMANCE HEATING - GENERAL DATA Heating Model: Low Heating Input (BTU): 150,000/105,000 Heating Output (BTU): 120,000/84,000 No. Burners: 3 No. Stages: 2 Gas Inlet Pressure Natural Gas (Min/Max): 4.5/14 LP (Min/Max): 10"/14" Gas Pipe Connection Size: 3/4"																						
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COMPRESSOR Circuit 1/2 Number: 2 Horsepower: 5.1/3.0 Phase: 3 Rated Load Amps: 19.6/13.2 Locked Rotor Amps: 136.0/88.0		OUTDOOR MOTOR Number: 1 Horsepower: 0.75 Motor Speed (RPM): 1100 Phase: 3 Full Load Amps: 2.7 Locked Rotor Amps: 9.8																						
POWER EXHAUST ACCESSORY (3) (Field Installed Power Exhaust) Phase: 1 Horsepower: 0.87 Motor Speed (RPM): 1075 Full Load Amps: 5.7 Locked Rotor Amps: 13.6		FILTERS Type: Throwaway Furnished: Yes Number: 3 / 2 Recommended: 20"x25"x2" 20"x30"x2"																						
REFRIGERANT (2) Type: R-410 Factory Charge Circuit #1: 7.1 lb Circuit #2: 5.0 lb																								

NOTES:

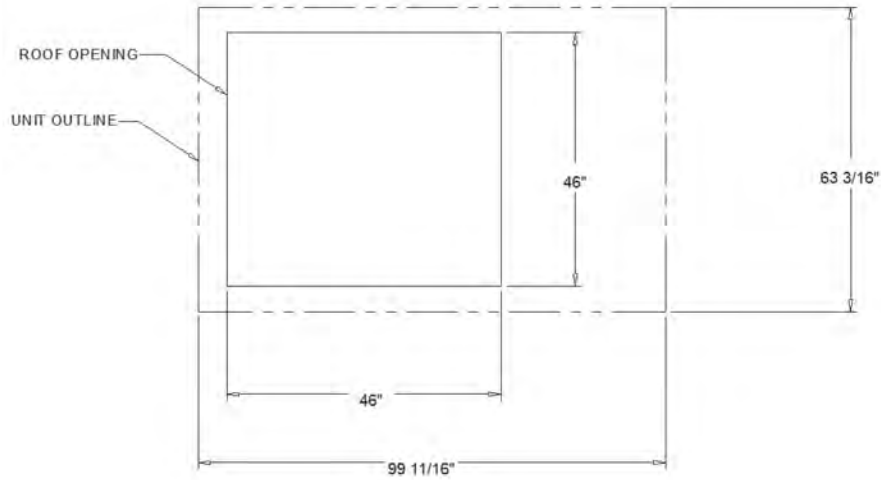
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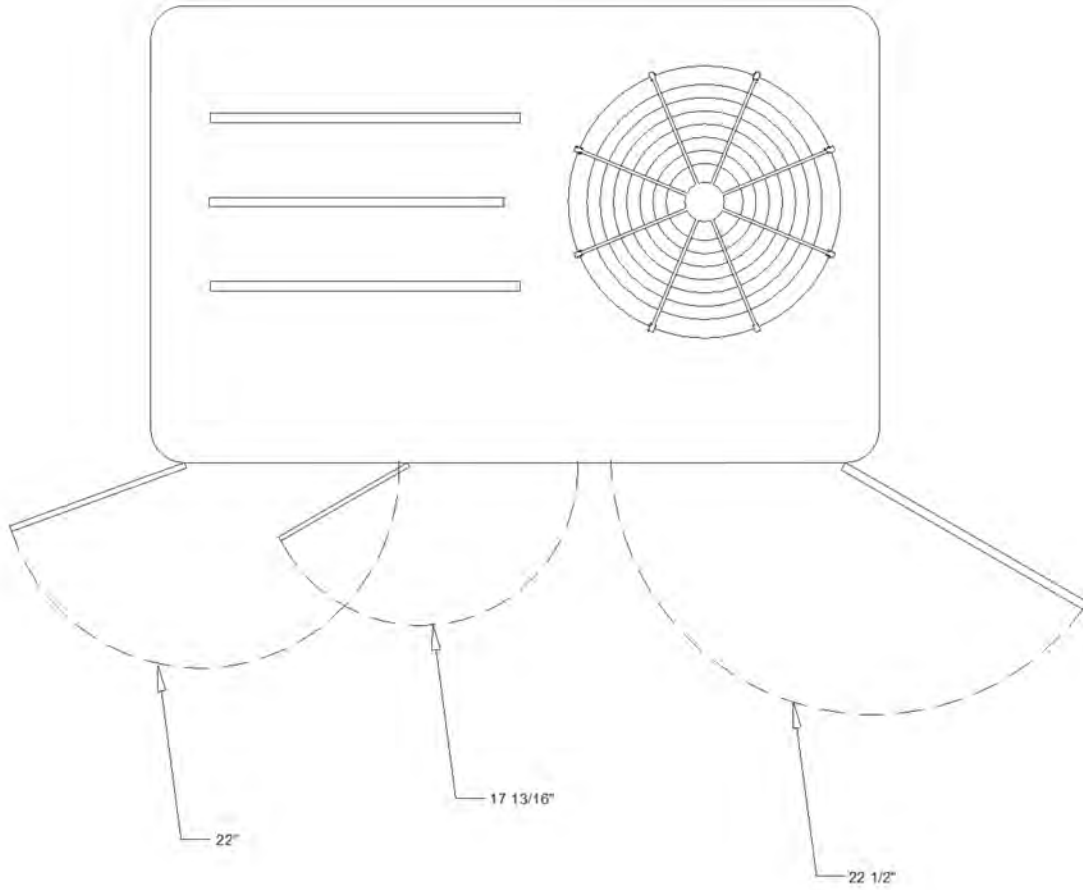
CLEARANCE FROM TOP OF UNIT 72"



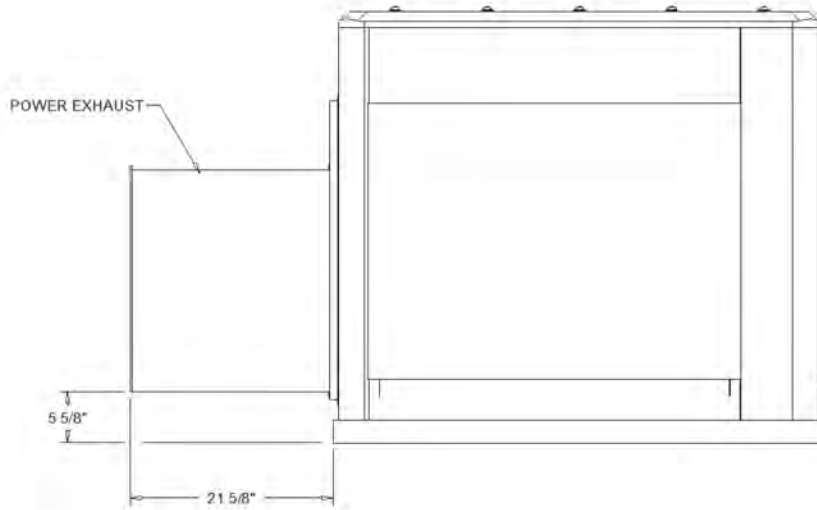
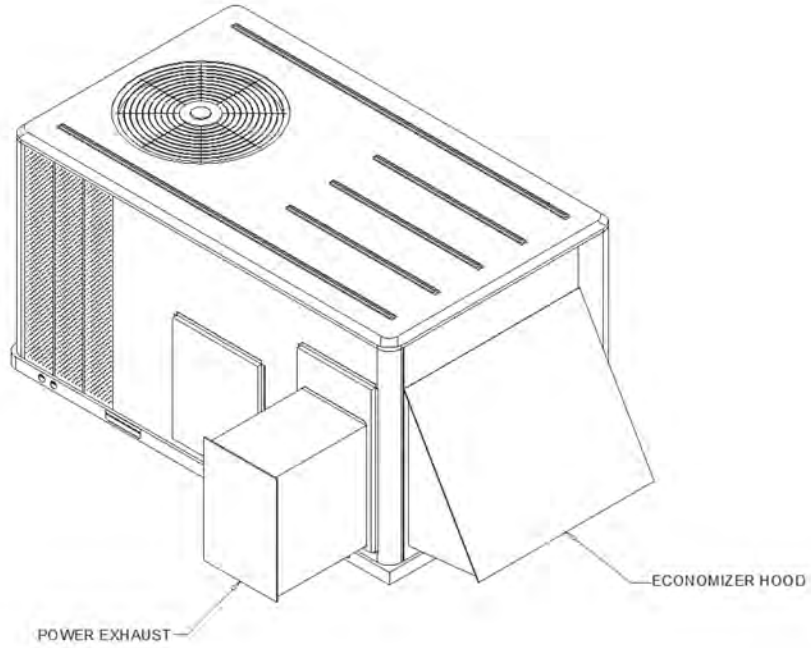
PACKAGED GAS / ELECTRIC
CLEARANCE



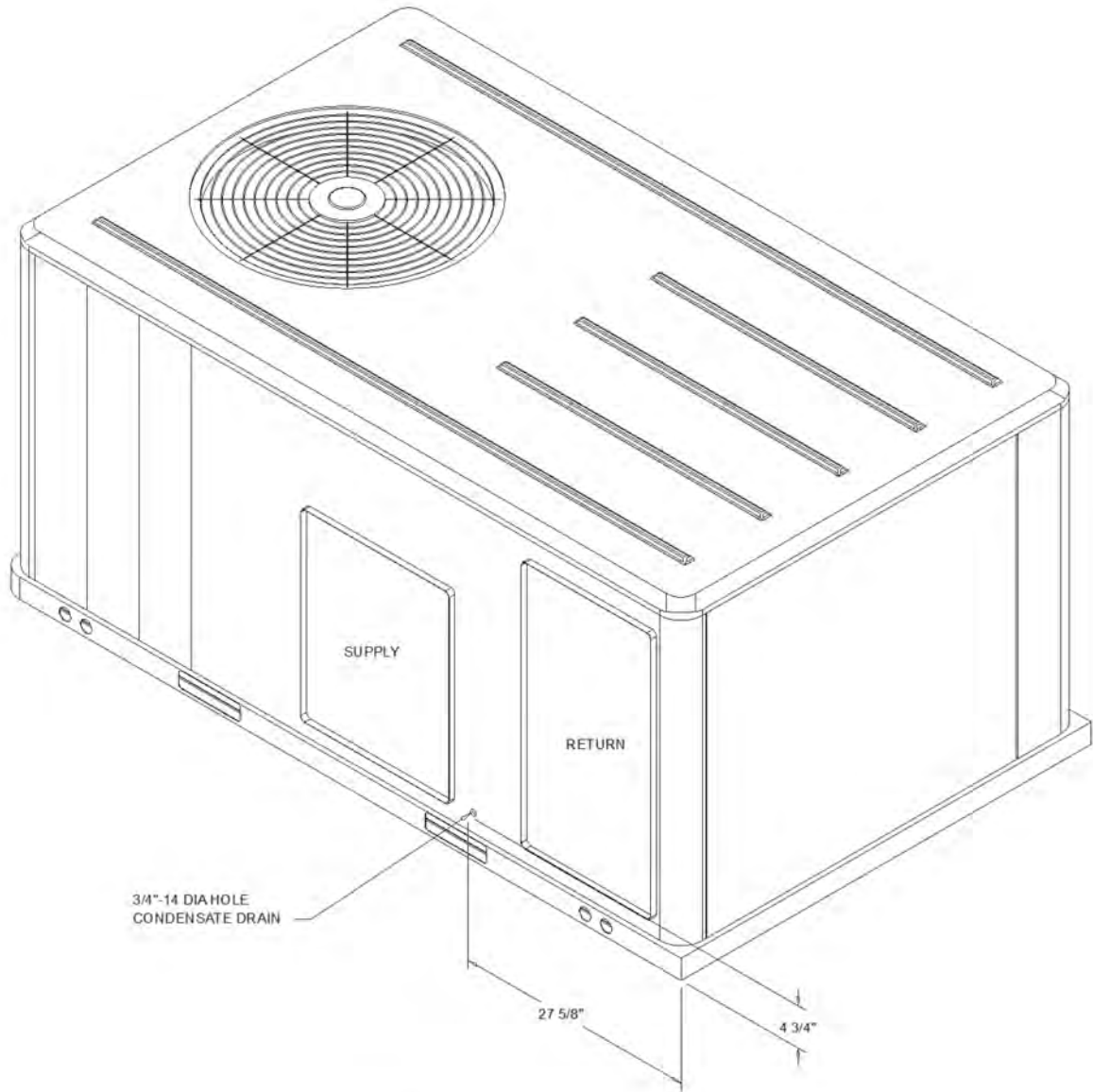
PACKAGED GAS / ELECTRIC
DOWNFLOW TYPICAL ROOF OPENING



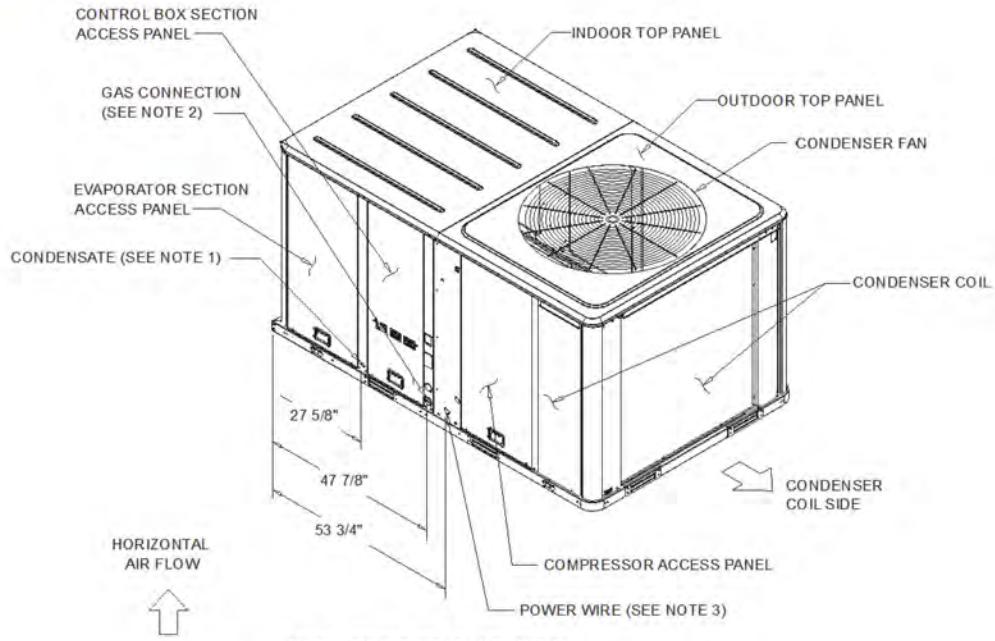
SWING DIAMETER - HINGED DOOR(S) OPTION
ACCESSORY



POWER EXHAUST AND HOOD
ACCESSORY

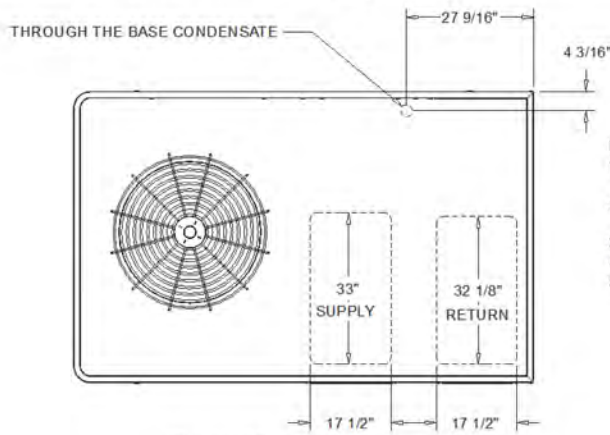


ISOMETRIC-PACKAGED COOLING



PACKAGED GAS / ELECTRICAL

ISOMETRIC VIEW

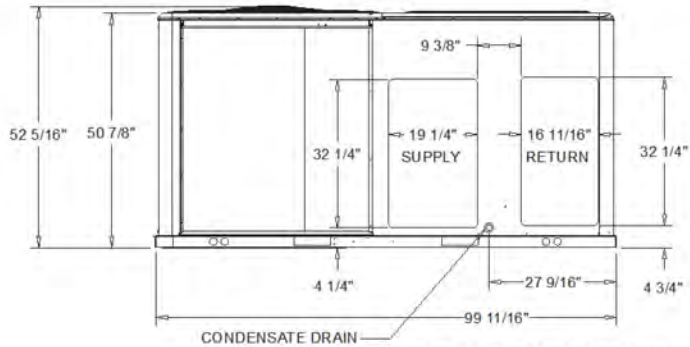


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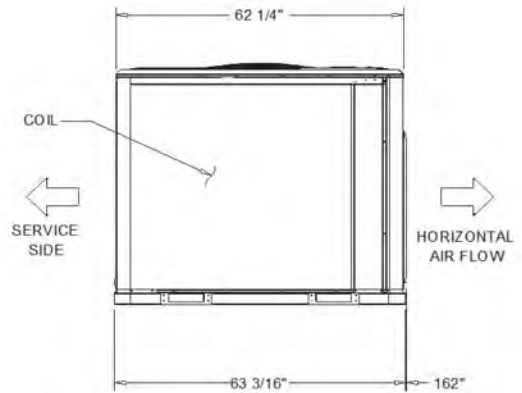
PLAN VIEW UNIT

DIMENSION DRAWING



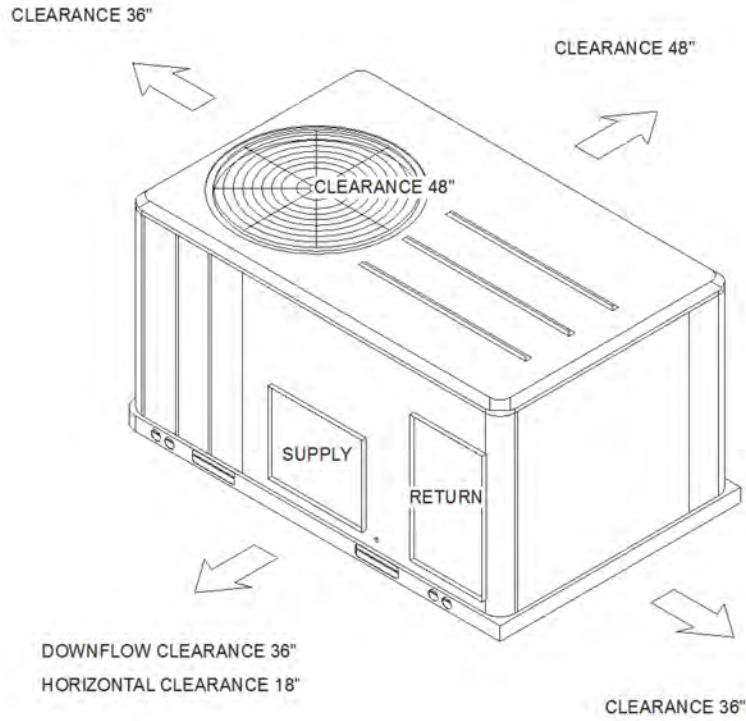
PACKAGED GAS / ELECTRICAL

DIMENSION DRAWING

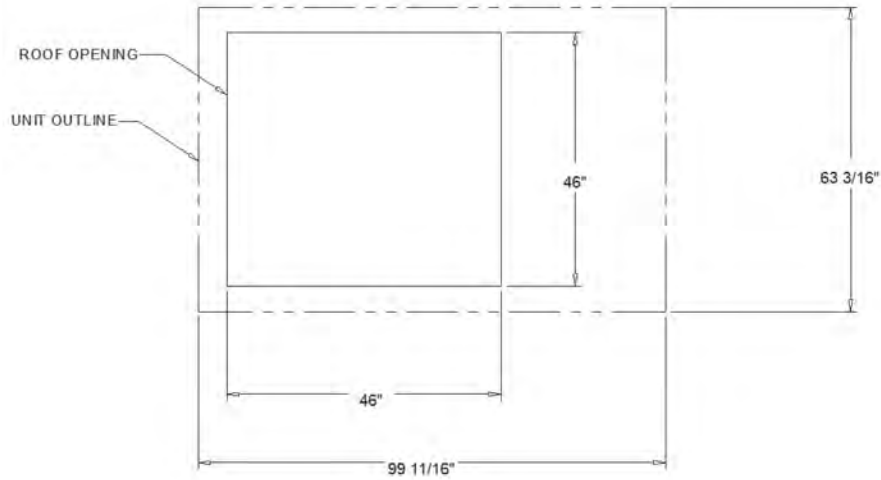




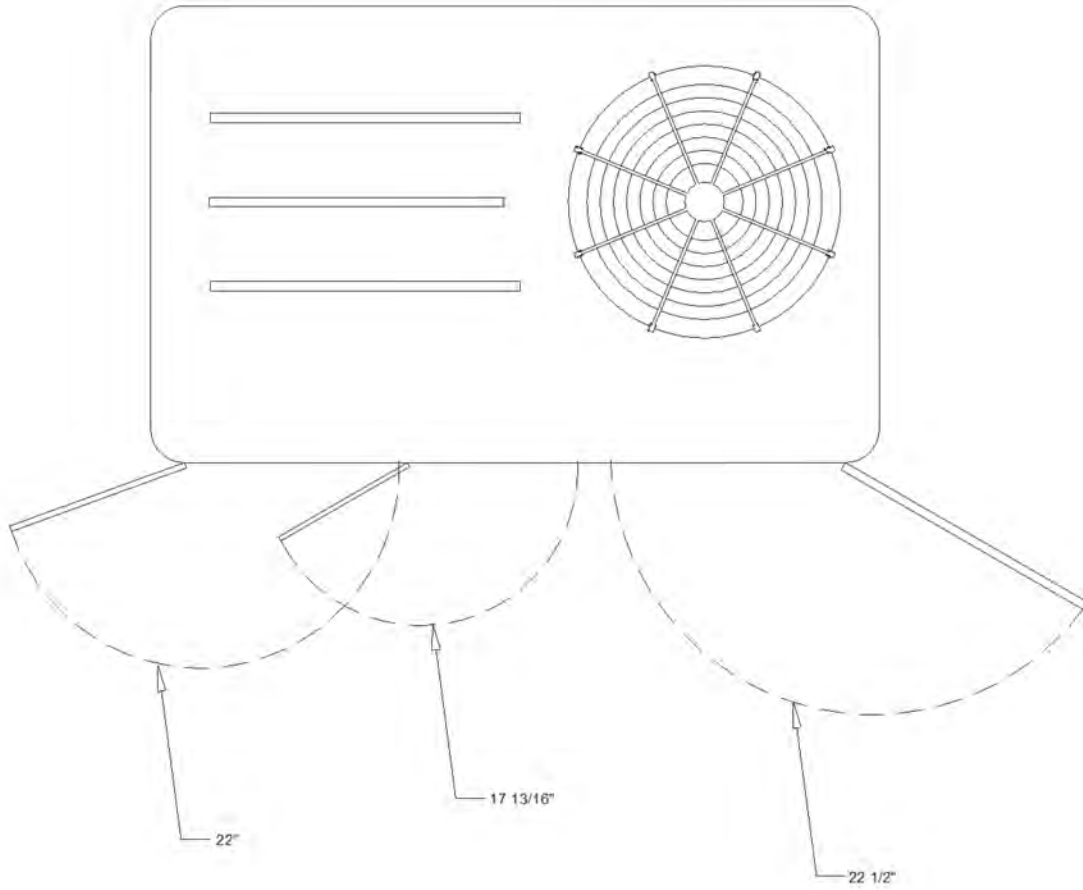
CLEARANCE FROM TOP OF UNIT 72"



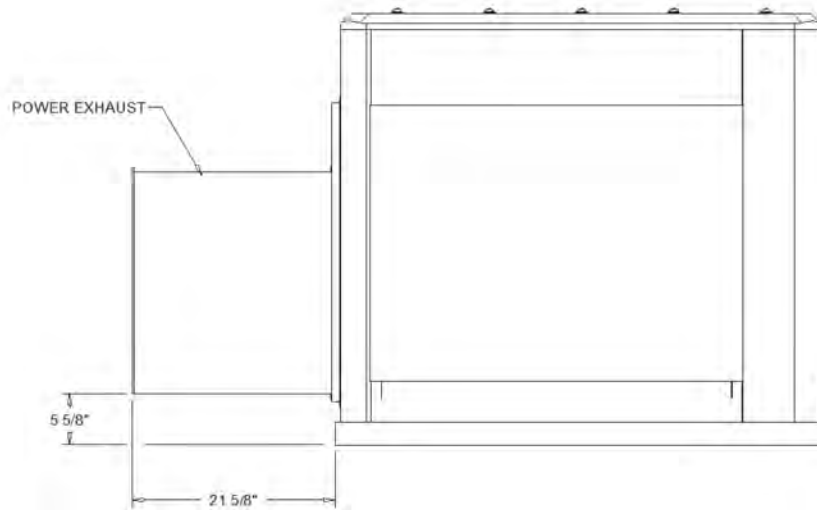
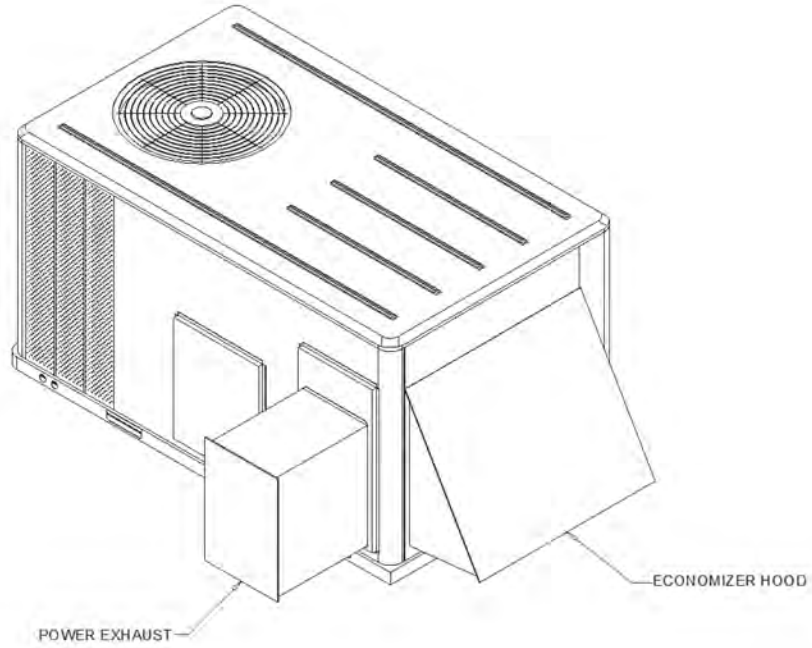
PACKAGED GAS / ELECTRIC
CLEARANCE



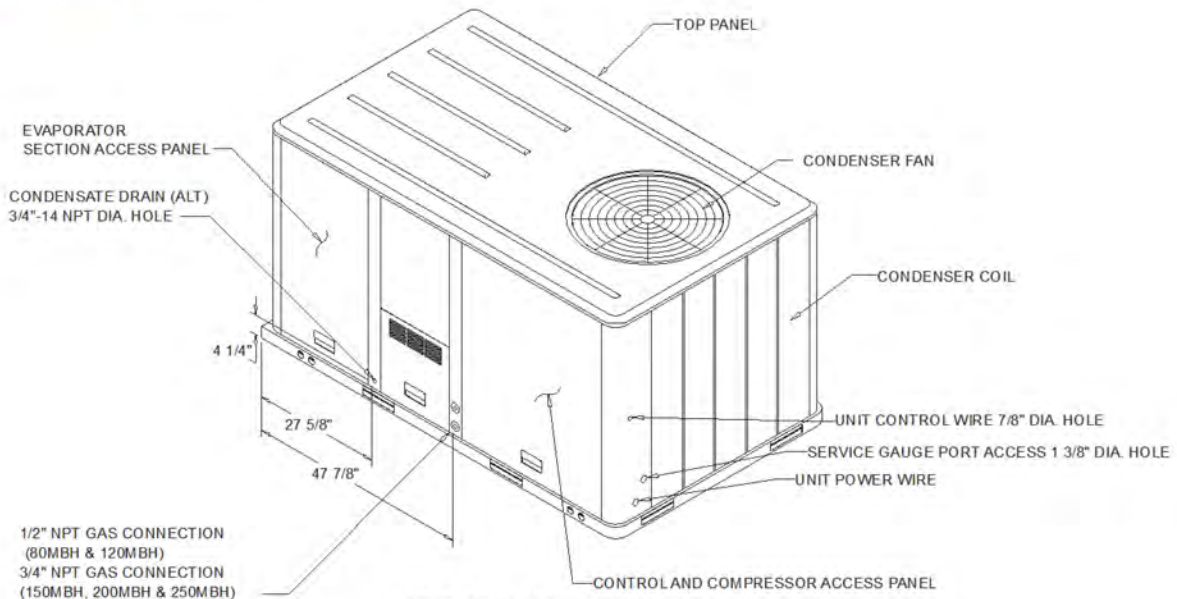
PACKAGED GAS / ELECTRIC
DOWNFLOW TYPICAL ROOF OPENING



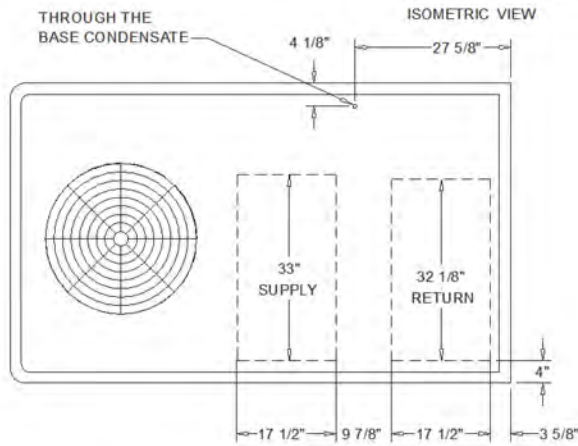
SWING DIAMETER - HINGED DOOR(S) OPTION
ACCESSORY



POWER EXHAUST AND HOOD
ACCESSORY

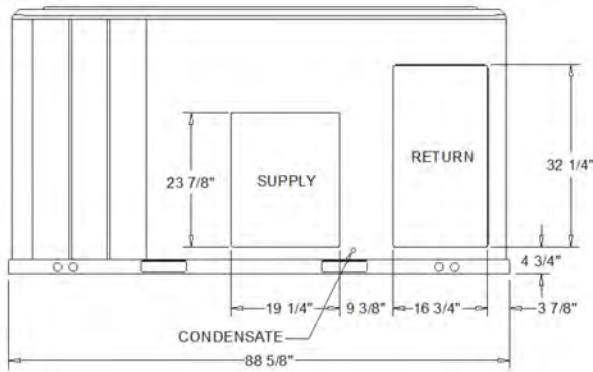


PACKAGED GAS / ELECTRICAL

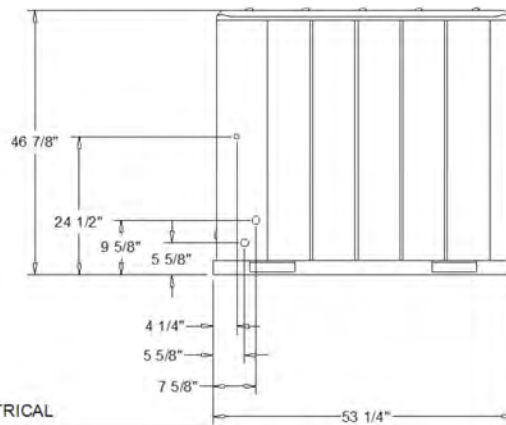


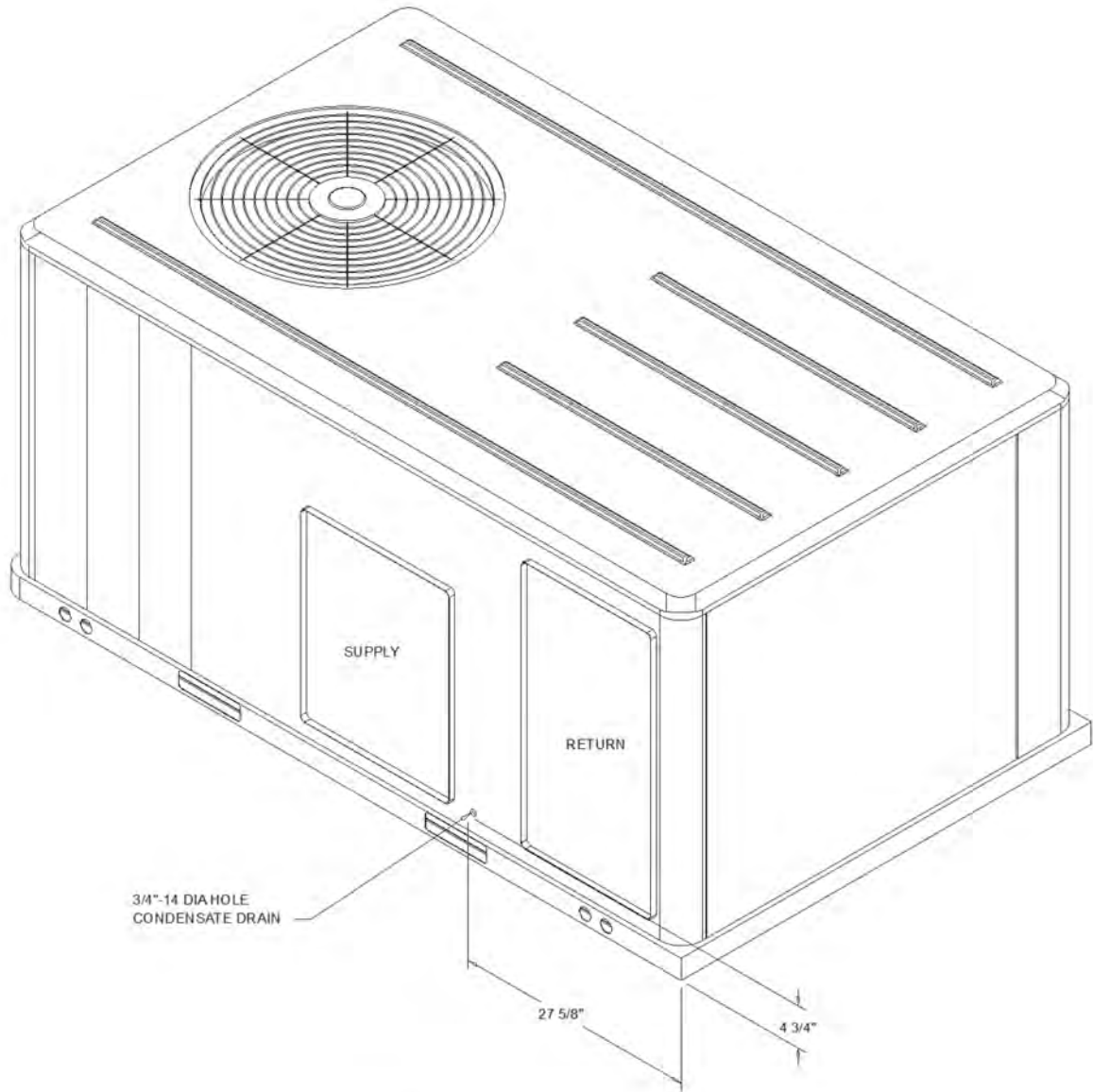
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**PLAN VIEW UNIT
 DIMENSION DRAWING**



**PACKAGED GAS / ELECTRICAL
 DIMENSION DRAWING**





ISOMETRIC-PACKAGED COOLING



ELECTRICAL / GENERAL DATA

GENERAL ⁽²⁾⁽⁴⁾⁽⁶⁾ Model: YHC092F Oversized Motor Unit Operating Voltage: 187-253 MCA: N/A Unit Primary Voltage: 208 MFS: N/A Unit Secondary Voltage: 230 MCB: N/A Unit Hertz: 60 Unit Phase: 3 EER Standard Motor MCA: 42.0 MCA: N/A MFS: 50.0 MFS: N/A MCB: 50.0 MCB: N/A		HEATING PERFORMANCE HEATING - GENERAL DATA Heating Model: Low Heating Input (BTU): 120,000 Heating Output (BTU): 96,000 No. Burners: 3 No. Stages: 1 Gas Inlet Pressure Natural Gas (Min/Max): 4.5/14 LP (Min/Max): 11"/14" Gas Pipe Connection Size: 1/2"																						
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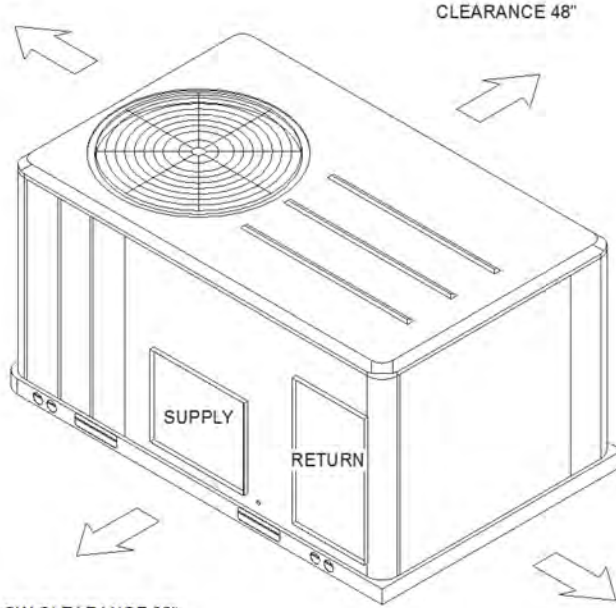
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CLEARANCE 36"

CLEARANCE FROM TOP OF UNIT 72"

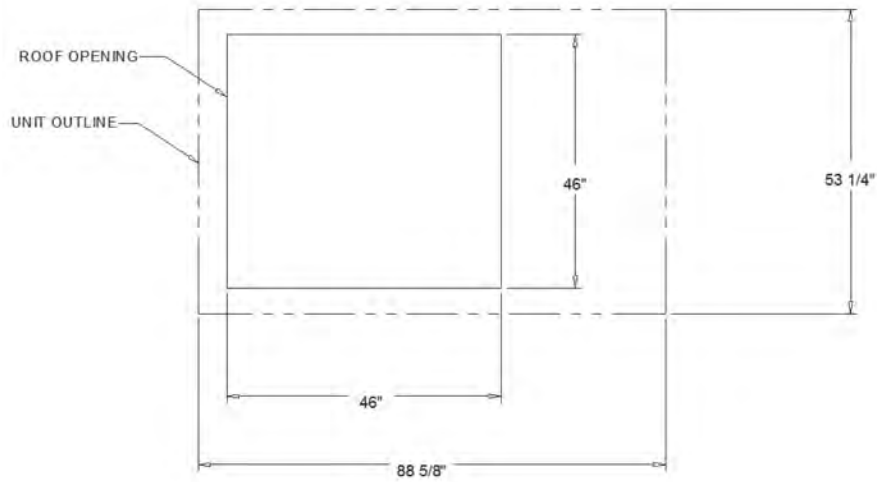


DOWNFLOW CLEARANCE 36"
HORIZONTAL CLEARANCE 18"

CLEARANCE 36"

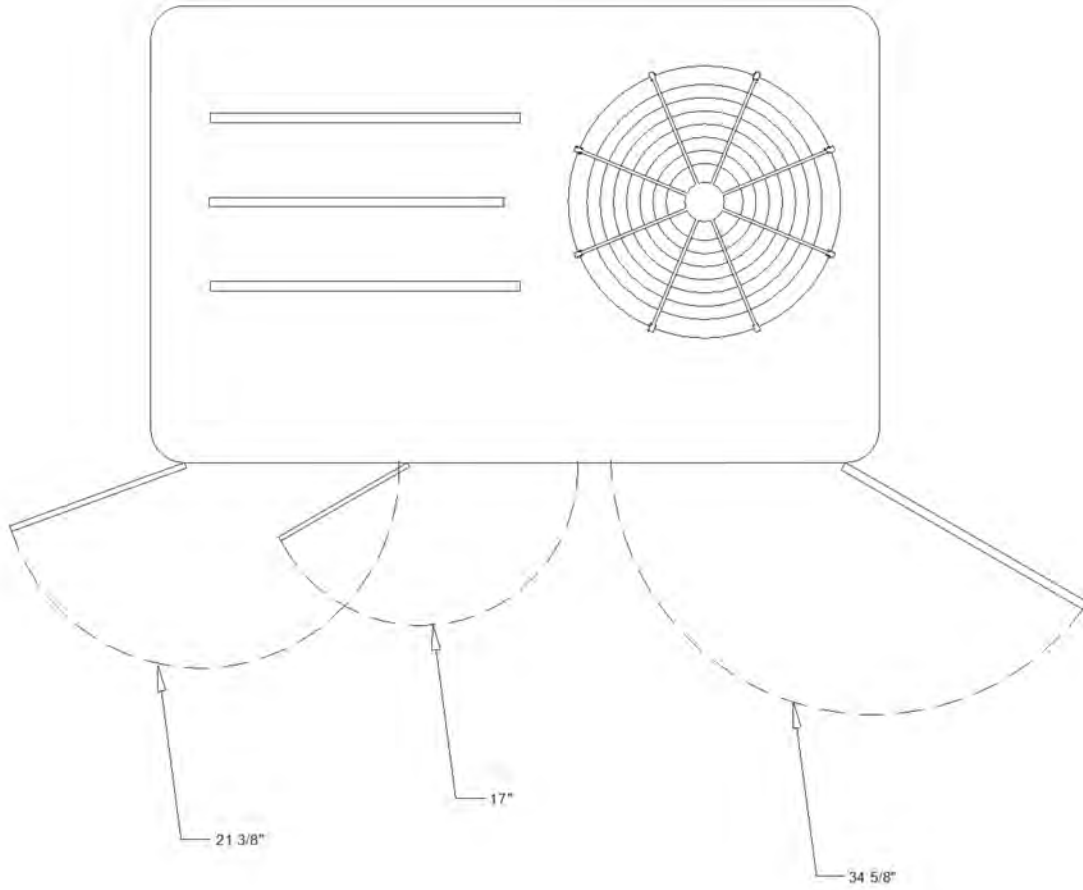
PACKAGED GAS / ELECTRIC

CLEARANCE

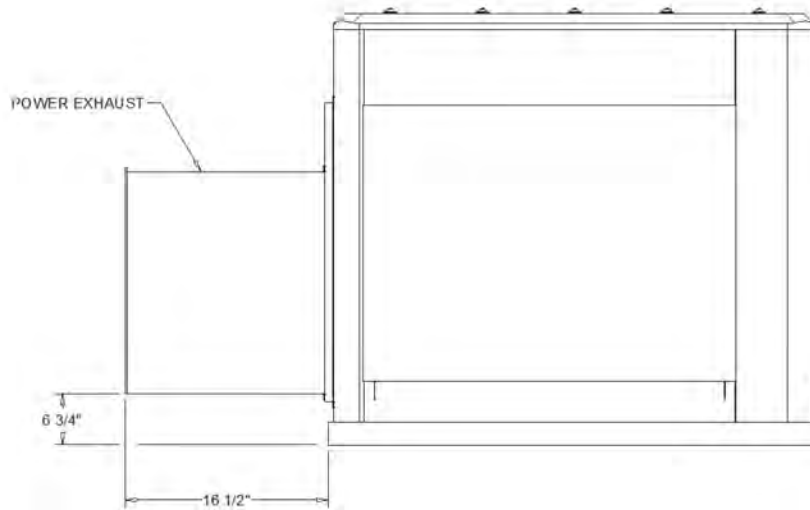
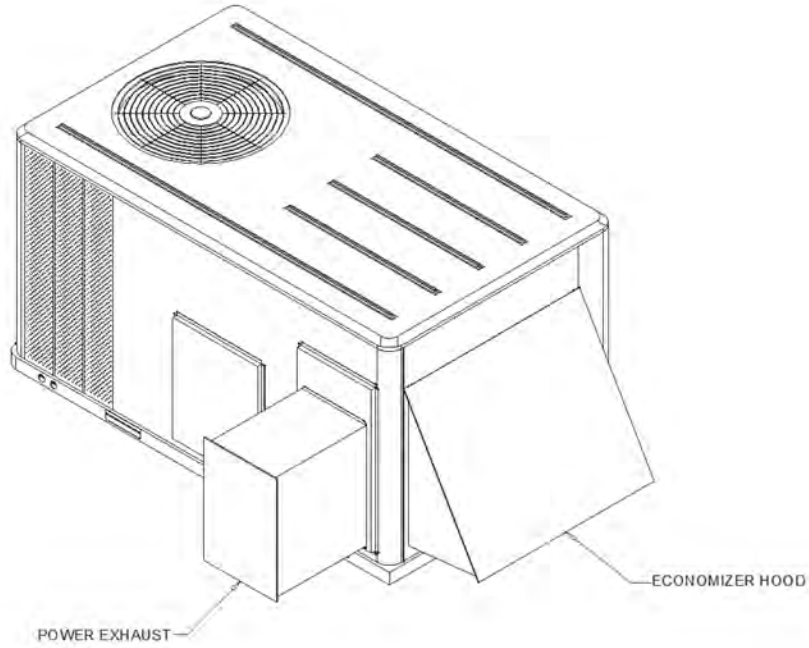


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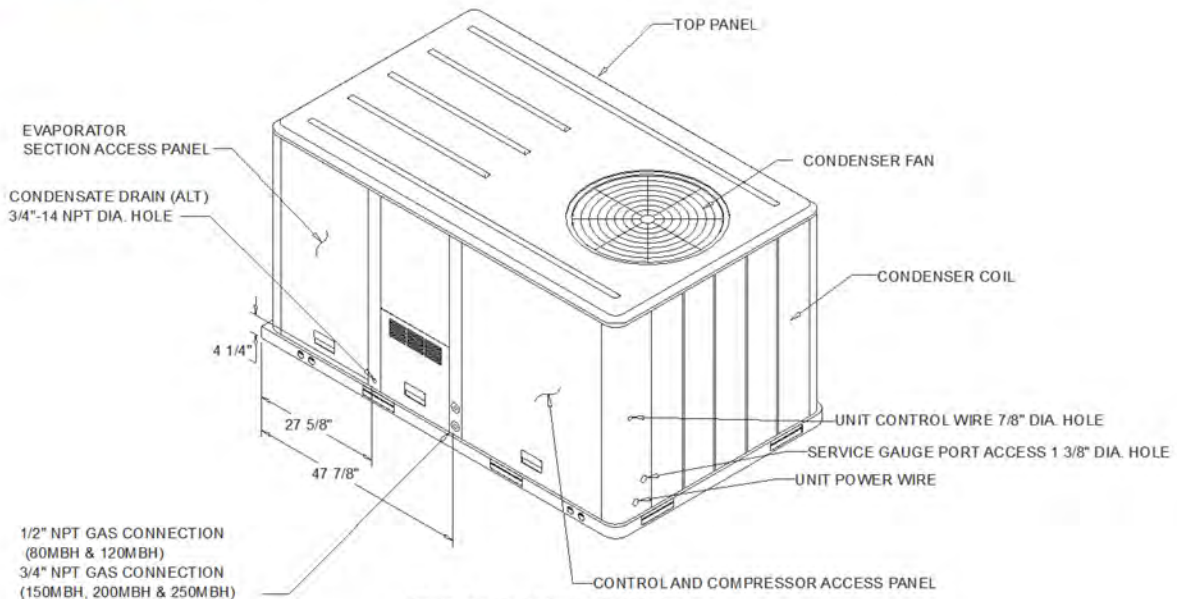
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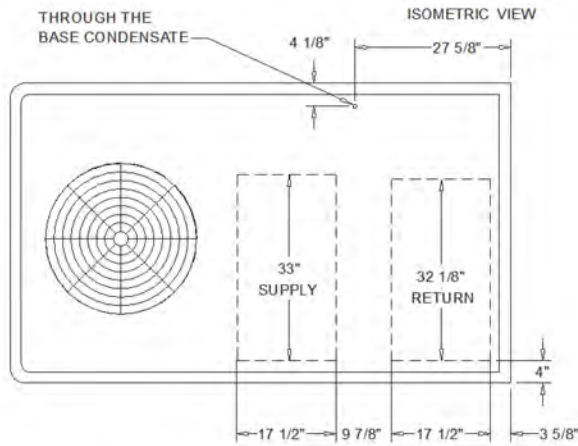
SWING DIAMETER - HINGED DOOR(S) OPTION
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POWER EXHAUST AND HOOD
ACCESSORY

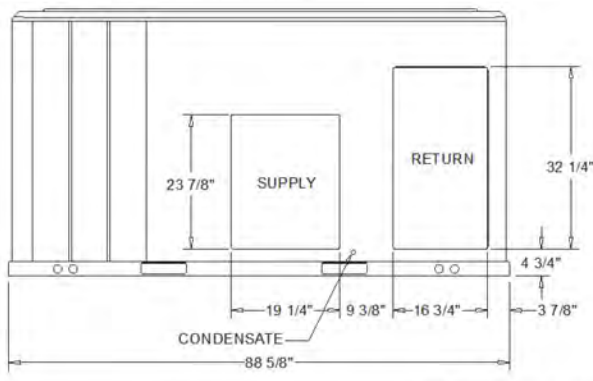


PACKAGED GAS / ELECTRICAL

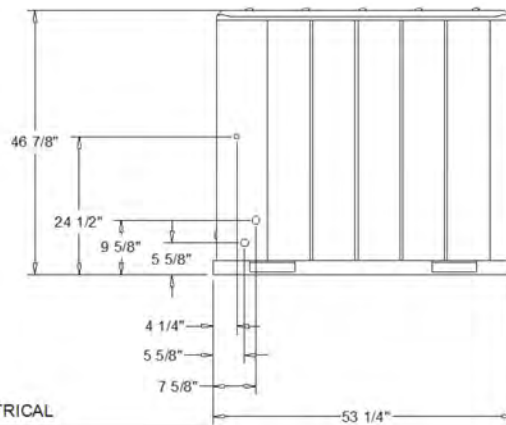


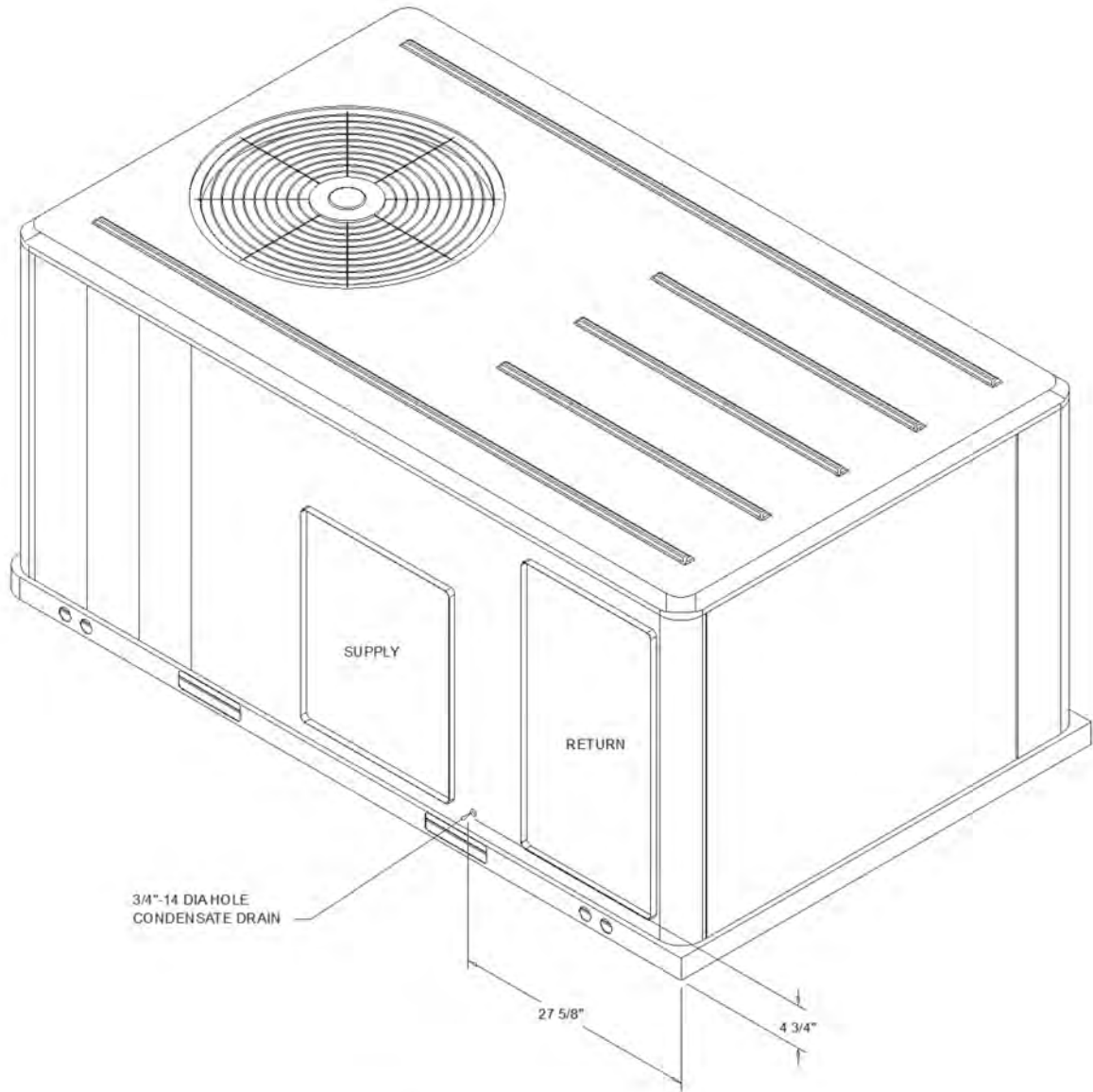
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**PLAN VIEW UNIT
 DIMENSION DRAWING**



**PACKAGED GAS / ELECTRICAL
 DIMENSION DRAWING**





ISOMETRIC-PACKAGED COOLING



ELECTRICAL / GENERAL DATA

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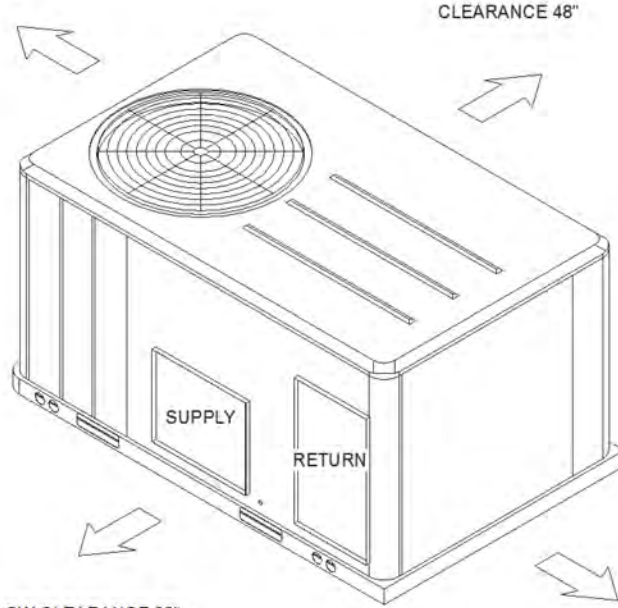
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CLEARANCE 36"

CLEARANCE FROM TOP OF UNIT 72"

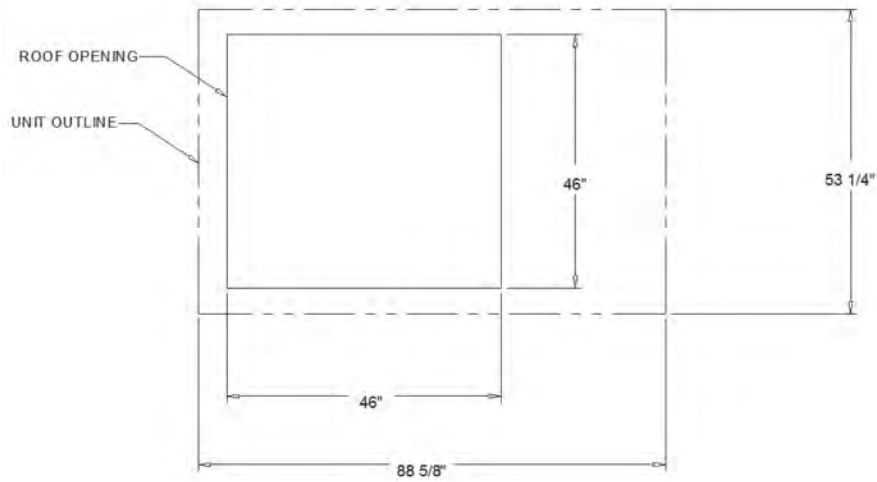


DOWNFLOW CLEARANCE 36"
HORIZONTAL CLEARANCE 18"

CLEARANCE 36"

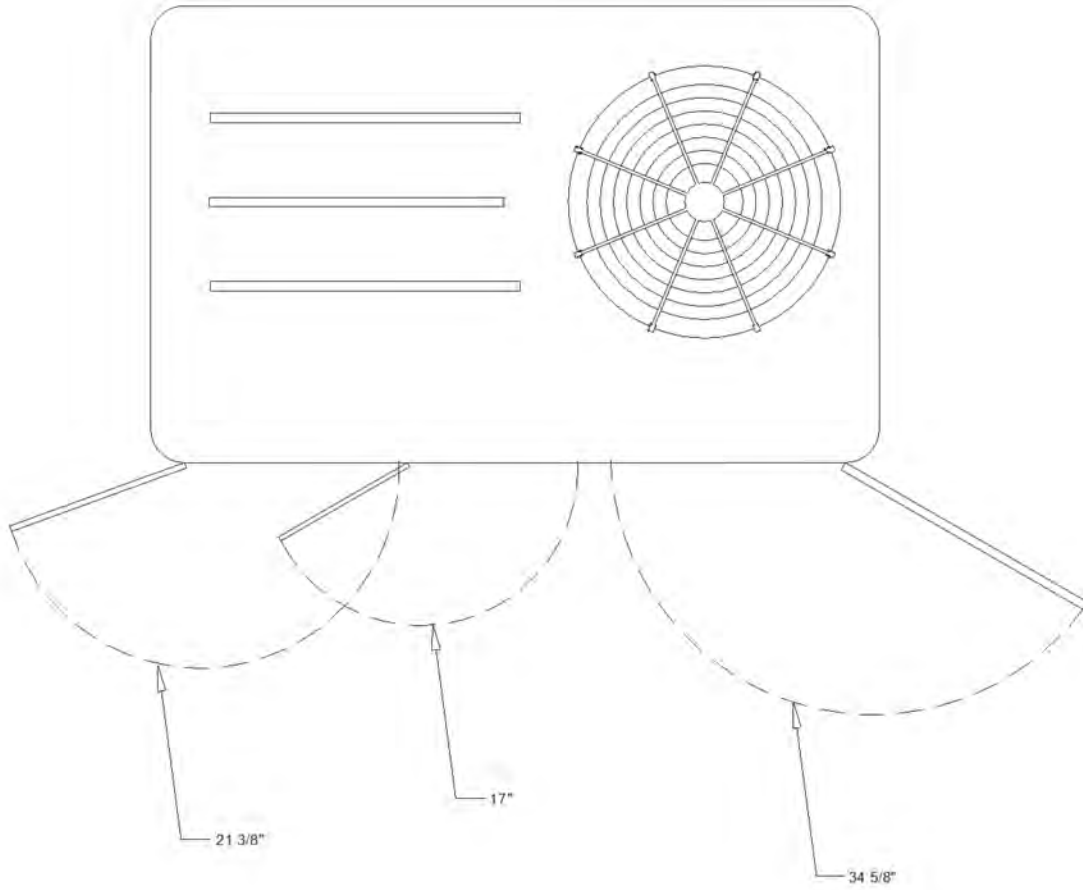
PACKAGED GAS / ELECTRIC

CLEARANCE

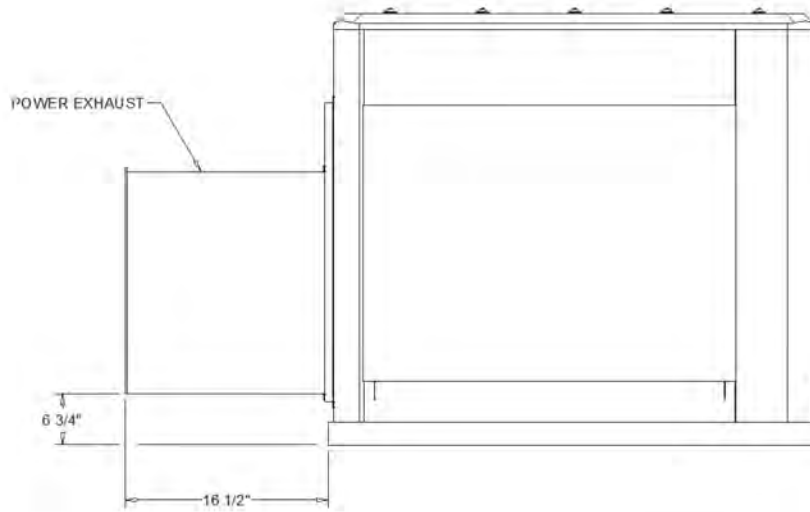
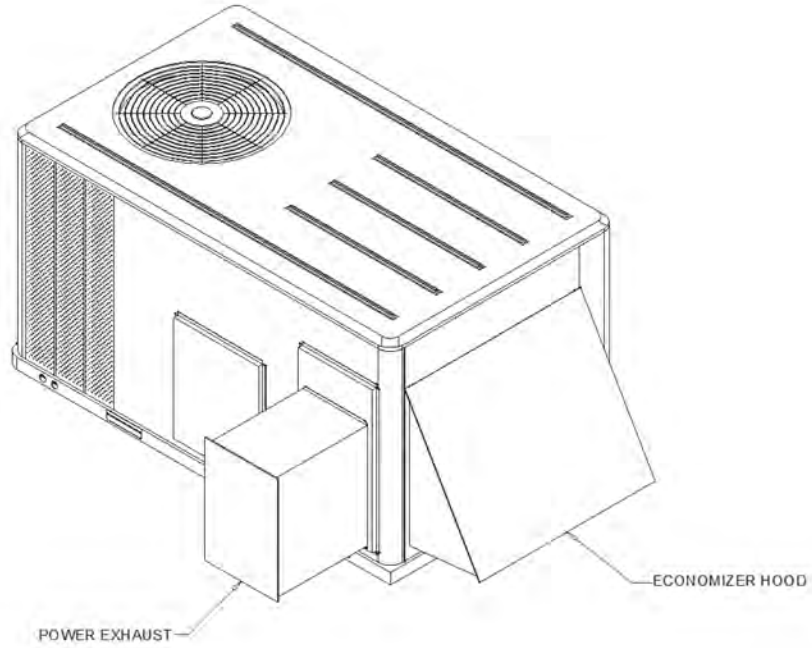


PACKAGED GAS / ELECTRIC

DOWNFLOW TYPICAL ROOF OPENING



SWING DIAMETER - HINGED DOOR(S) OPTION
ACCESSORY



POWER EXHAUST AND HOOD
ACCESSORY

Product Data

AIR HANDLER TECHNOLOGY AT ITS FINEST



A10082

The FB4C fan coil combines the proven technology of Carrier fan coil units with the flexibility to handle both Puron® refrigerant and R-22, as well as vertical and horizontal applications. The design features contoured condensate pans with rugged drain connections, ensuring that little water is left in the unit at the end of the cooling duty cycle. The lack of standing condensate and corrosion free pans improves IAQ and product life, features homeowners appreciate.

Standard features include grooved copper tubing and louvered aluminum fins. Coil circuiting has also been updated to make the most of all Carrier heat pumps and air conditioners. Units come with solid state fan controls, 1-inch (25mm) thick insulation with R-value of 4.2, multi-speed motors, and fully-wettable coils. Units can accommodate factory- and/or field-installed heaters from 3 to 30 kW.

It also should be noted that the unique cabinet design of these fan coils meet new stringent regulations for cabinet air leakage – a requirement of 2% cabinet leakage rate when tested at 1.0 inches of static pressure.

The FB4C fan coil design is loaded with popular features. These fan coils utilize the latest in electronic commutation motor (ECM) technology through the use of high efficiency, X13, blower motors, allowing reliable air delivery with increased static pressure. It comes in a pre-painted (taupe metallic) galvanized steel casing and a factory-supplied power plug for ease of installation. ArmorCoat™ provides a tin plating of the indoor coil's copper hairpins. This creates a barrier between the corrosion-causing elements and the coil. The FB4C unit is shipped with a factory-installed Teflon-ring piston (018 thru 048) or a Puron refrigerant TXV (060).

STANDARD FEATURES

- High efficiency ECM (electronic commutating motor) X13 motors - all sizes
- Integrated motor controls have replaced integrated circuit board
- Five available speed tags to meet a wide range of applications
- Large, grooved tube, louvered fin coils
- Efficient, quiet, time-tested blower housings and diffusers
- Sturdy, drainable condensate pans
- Cabinet construction features innovations designed to prevent cabinet sweating
- Tested for condensate disposal in much tougher conditions than Air Conditioning and Refrigeration Institute requirements
- Super-thick R-4.2 insulation with vapor barrier
- Pre-painted galvanized steel cabinet (taupe metallic)
- Cabinet design meets stringent regulations for 2% cabinet leakage rate when tested at 1.0 inches static pressure
- Installation-flexible, multipoise units
- Horizontal hanging provisions on cabinet
- No tools required to access filter
- Newly improved filter rack area filter door insulation added for improved air seal
- Factory-installed heater packages available (5- through 15-kW)
- 3- through 30-kW accessory heaters - field installed
- Factory-supplied power plug
- Easy plug-in provisions for heater installation
- Entry options for high and low voltage wiring hook-up
- Easy coil inspection (removable, snap-in plug on A-coil models)
- Leak-preventing sweat connections
- Puron refrigeration factory-installed Teflon-ring pistons (18 thru 048) or thermostatic expansion valve, TXV, (060)
- Designed for manufactured housing applications.

ADDITIONAL FEATURES

- Factory-installed heater packages available
- ArmorCoat™ coil protection available

MODEL NUMBER NOMENCLATURE

	1	2	3	4	5	6	7	8	9	10	11	12
	F	B	4	C	N	F	0	1	8	0	0	0
Product Fan Coil												
Type E = Infinity, Variable speed, Puron V = Performance, Variable speed, Puron X = Comfort, Puron B = Base, Puron – Piston Y = Base – Puron – Piston F = Through – the – wall H = Electric Furnace							Heating Size 00 = No Heat 05 = 5 kW 75 = 7,5 kW 08 = 8 kW 10 = 10 kW 11 = 11 kW 15 = 15 kW					
Position 1 = Upflow 4 = Multipoise 5 = Upflow/downflow							Coil Coating 0 = Standard T = ArmorCoat™					
Series A, B, C, D, E							Capacity 018/019 = 18,000 024/025 = 24,000 030/031 = 30,000 036/037 = 36,000 042/043 = 42,000 048/049 = 48,000 060/061 = 60,000 001 = 18,000 – 36,000 002 = 18,000 – 36,000 003 = 24,000 – 42,000 004 = 24,000 – 42,000 005 = 30,000 – 48,000 006 = 36,000 – 60,000					
Electrical N – 208/230v, 1 ph, 60 Hz S = 230v, 1 ph, 50 Hz												
Cabinet Style B – Modular Cabinet (2 piece) F – Single Piece												

FB4C



Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.



DIMENSIONS

UNIT	A	B	C	D	E	F	G	H	J	COIL CONFIGURATION		SHIPPING WT (LBS) NON TIN-COATED	SHIPPING WT (LBS) TIN-COATED
										SLOPE	"A"		
FB4CNF018	42 11/16"	14 5/16"	12 7/16"	12 5/16"	10 7/16"	18 1/8"	18 5/8"	-	12"	X	-	112	112
FB4CNF024	42 11/16"	14 5/16"	12 7/16"	12 5/16"	10 7/16"	18 1/8"	18 5/8"	-	12"	X	-	112	112
FB4CNF030	49 5/8"	17 5/8"	15 3/4"	15 5/8"	15 3/8"	23 1/8"	23 5/8"	-	17"	X	-	122	122
FB4CNF036	49 5/8"	17 5/8"	15 3/4"	15 5/8"	15 3/8"	23 1/8"	23 5/8"	-	17"	X	-	122	122
FB4CNF042	49 5/8"	21 1/8"	19 1/4"	19 1/8"	15 11/16"	23 7/16"	23 1/8"	-	-	-	X	157	157
FB4CNF048	49 5/8"	21 1/8"	19 1/4"	19 1/8"	15 11/16"	23 7/16"	23 1/8"	-	-	-	X	157	157
FB4CNF060	53 7/16"	21 1/8"	19 1/4"	19 1/8"	19 1/2"	27 1/4"	26 15/16"	-	-	-	X	175	175

NOTE:

- SERIES DESIGNATION IS THE 14TH POSITION OF UNIT PRODUCT NUMBER
- ALL DIMENSIONS ARE IN "INCHES" UNLESS NOTED.

NOTE: ALLOW 21" FROM FRONT FOR SERVICE

UNIT CONNECTION SIZES

SUCTION: 018 & 024 - 5/8" I.D. SWEAT
 030 & 036 - 3/4" I.D. SWEAT
 042 THRU 060 - 7/8" I.D. SWEAT
 LIQUID: 3/8" I.D. SWEAT
 CONDENSATE: 3/4" FPT

FB4C

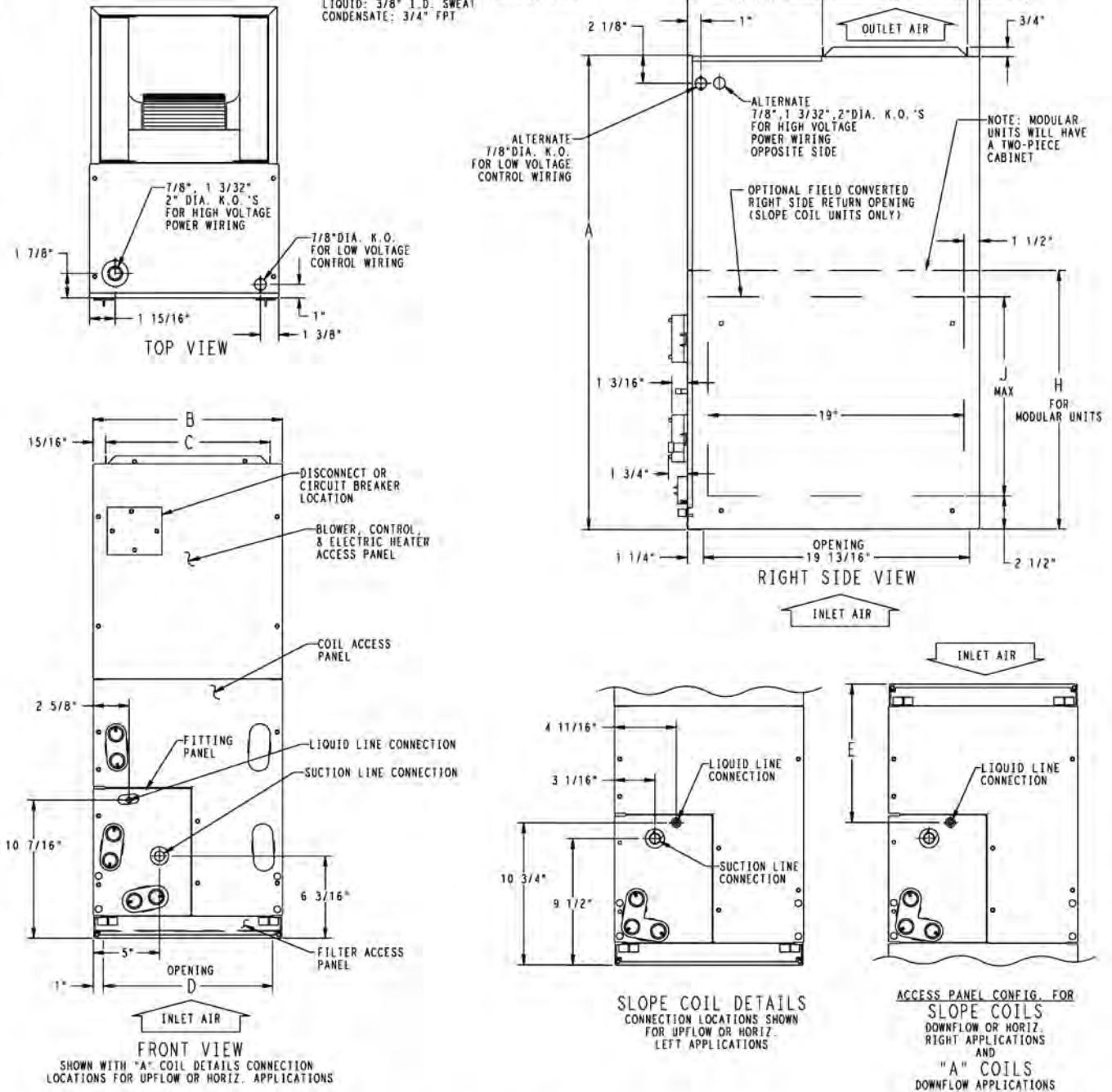


Fig. 1 - FB4CNF - English

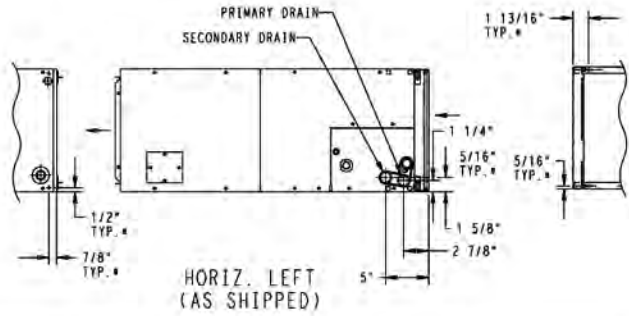
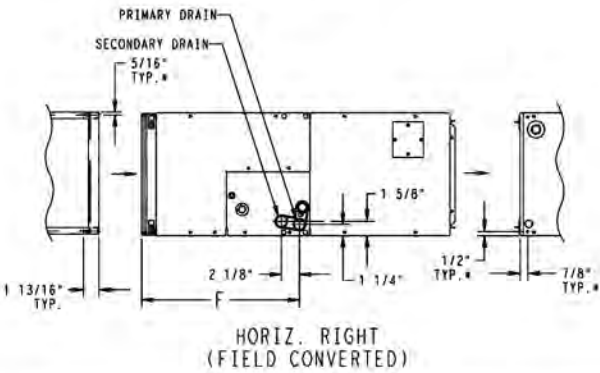
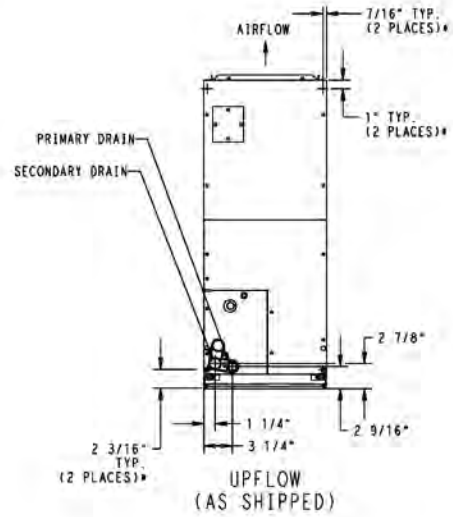
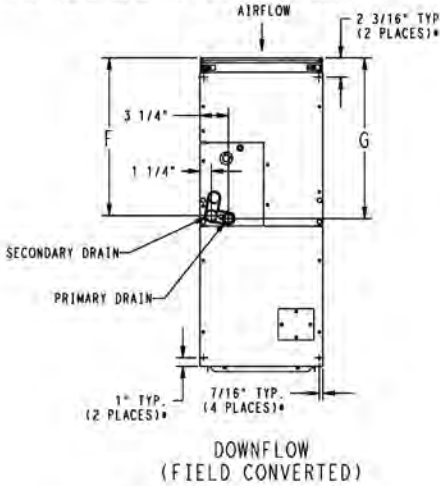
A10005

DIMENSIONS (cont.)

SLOPE COIL

NOTES:

- CONDENSATE PAN DRAIN CAPS NOT SHOWN FOR CLARITY.
- ALL DIMENSIONS ARE IN "INCHES" UNLESS NOTED.



- HORIZONTAL MOUNT LOCATIONS - DIMPLES PROVIDED IN TOP PANEL, AND BACK OF CABINET. IN CABINET BOTTOM, HOLES PROVIDED .136" DIA. HORIZONTAL HANGING HARDWARE TO BE FIELD SUPPLIED.

A-COIL

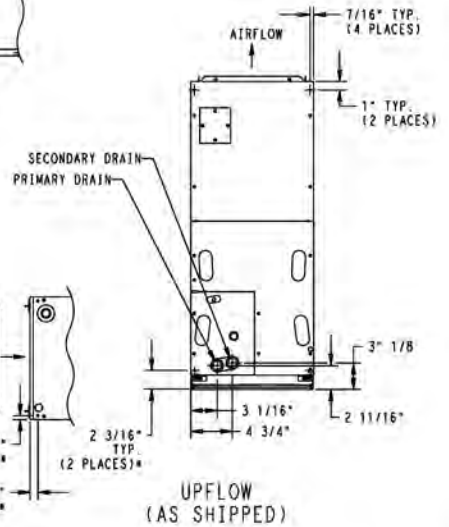
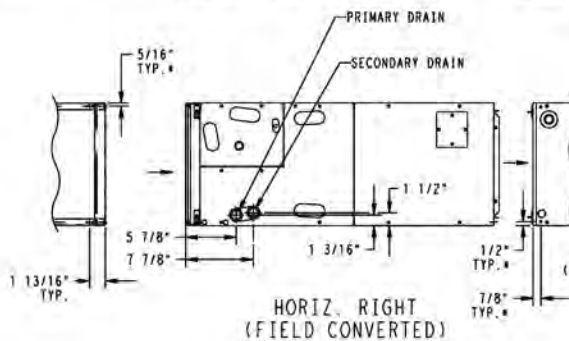
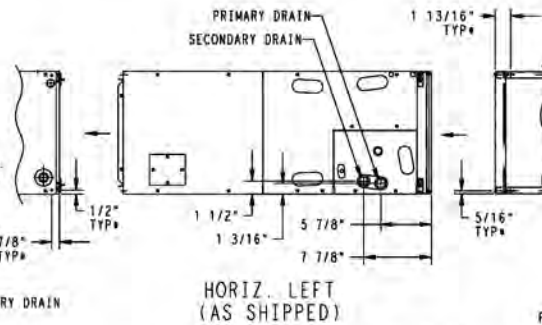
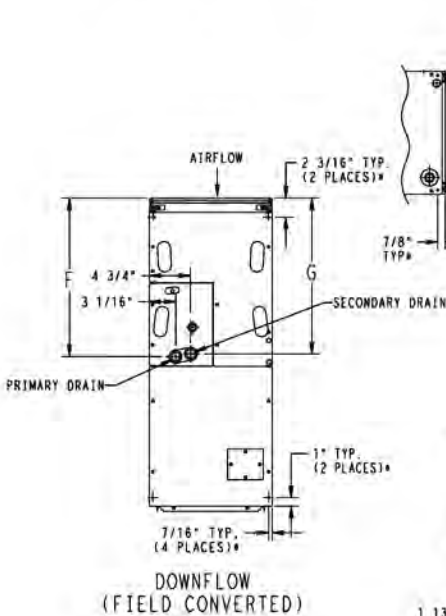


Fig. 2 - FB4CNF - English

A10006

FB4C

DIMENSIONS (cont.)

UNIT	A	B	C	D	E	F	G	H	J	COIL CONFIGURATION		SHIPPING WT (Kgs) NON TIN-COATED	SHIPPING WT (Kgs) TIN-COATED
										SLOPE	"A"		
FB4CNF018	1084.3	363.6	315.9	312.8	265.1	460.4	473.1	-	304.8	X	-	50.8	50.8
FB4CNF024	1084.3	363.6	315.9	312.8	265.1	460.4	473.1	-	304.8	X	-	50.8	50.8
FB4CNF030	1260.5	447.7	400.0	396.9	390.5	587.4	600.1	-	431.8	X	-	55.3	55.3
FB4CNF036	1260.5	447.7	400.0	396.9	390.5	587.4	600.1	-	431.8	X	-	55.3	55.3
FB4CNF042	1260.5	536.6	489.0	485.8	398.5	595.3	587.4	-	-	-	X	71.2	71.2
FB4CNF048	1260.5	536.6	489.0	485.8	398.5	595.3	587.4	-	-	-	X	71.2	71.2
FB4CNF060	1357.3	536.6	489.0	485.8	495.3	692.2	684.2	-	-	-	X	79.4	79.4

NOTE:

- SERIES DESIGNATION IS THE 14TH POSITION OF UNIT PRODUCT NUMBER.
- ALL DIMENSIONS ARE IN "MM" UNLESS NOTED.

NOTE: ALLOW 533.4 FROM FRONT FOR SERVICE

UNIT CONNECTION SIZES

SUCTION: 018 & 024 - 15.88 I.D. SWEAT
 030 & 036 - 19.05 I.D. SWEAT
 042 THRU 060 - 22.23 I.D. SWEAT
 LIQUID: 9.53 I.D. SWEAT
 CONDENSATE: 19.0 FPT

FB4C

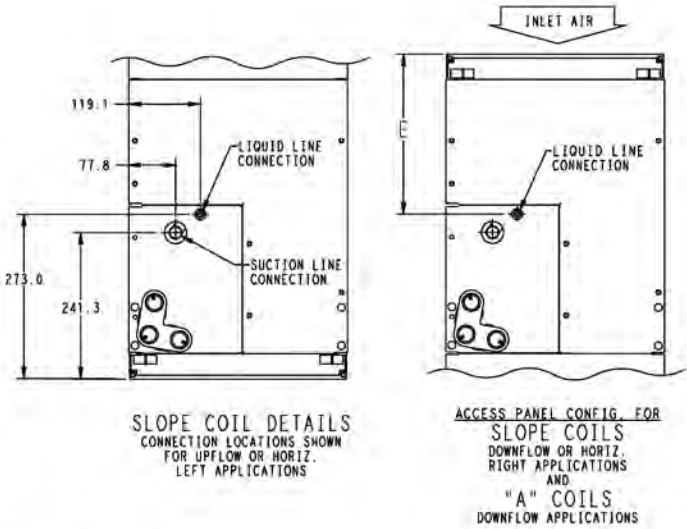
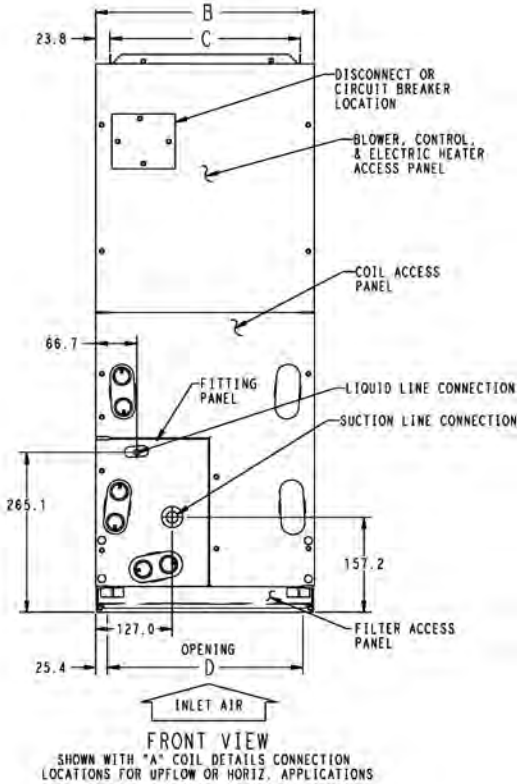
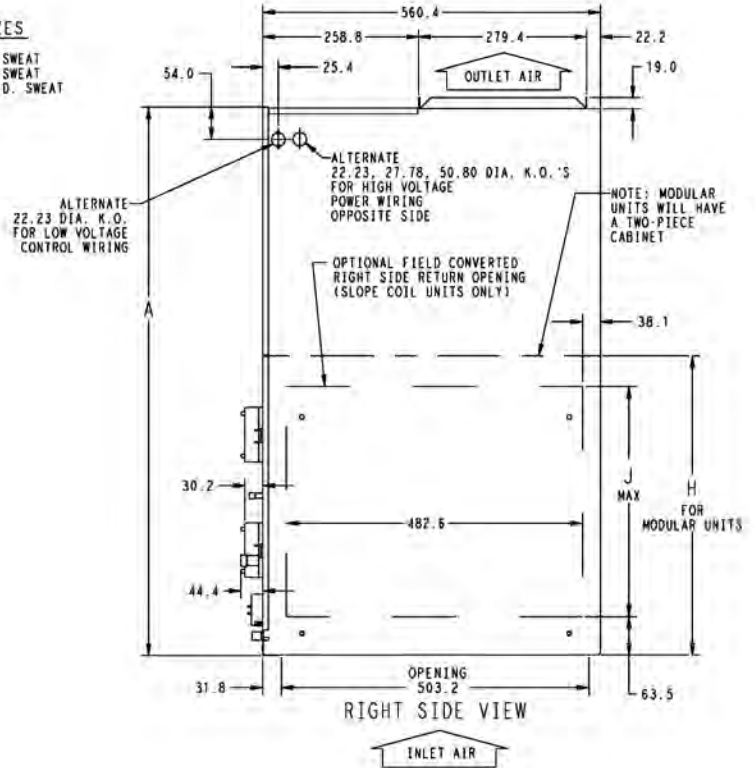
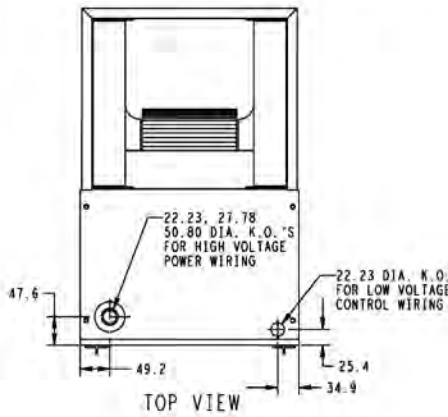


Fig. 3 - FB4CNF - Metric

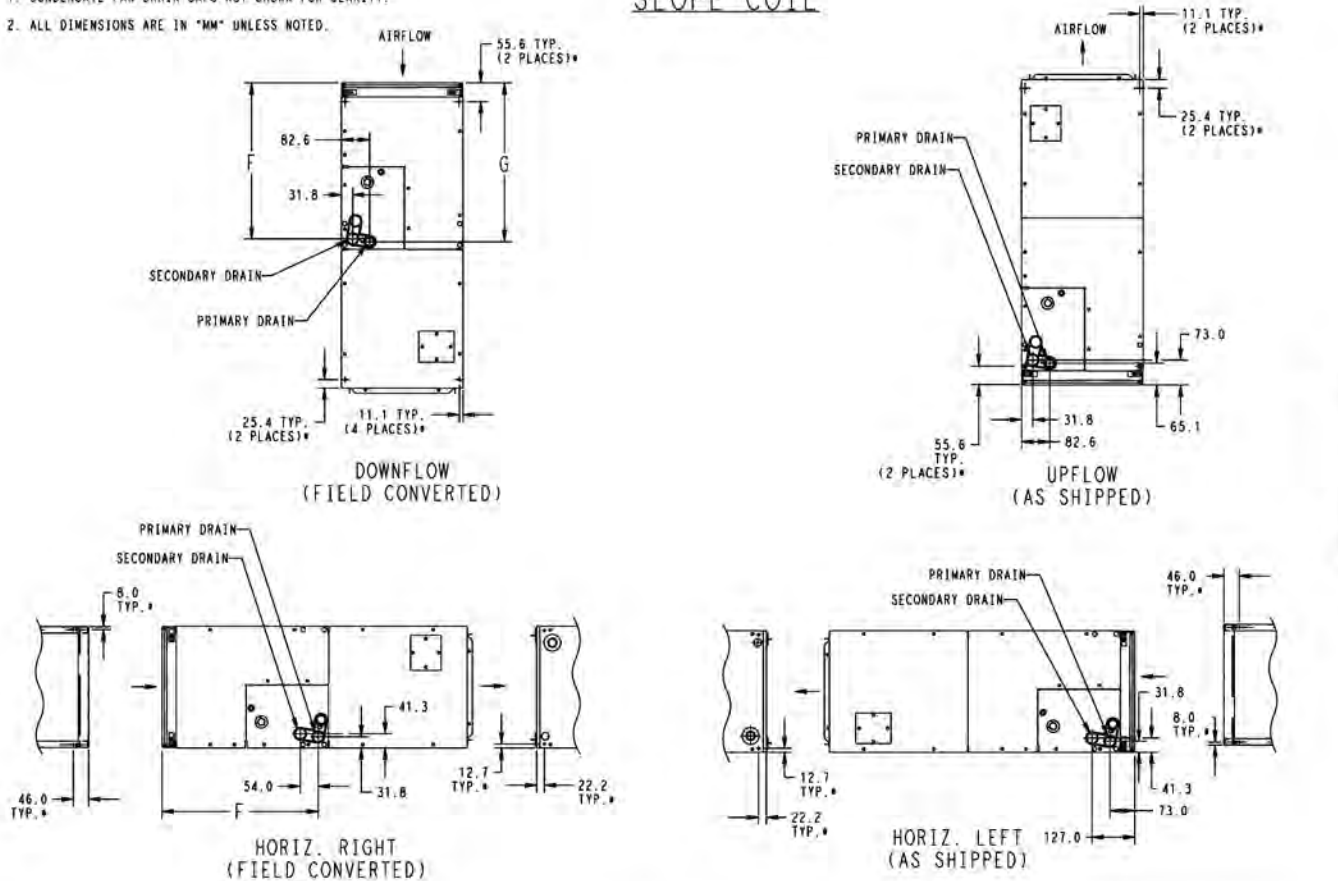
A10007

DIMENSIONS (cont.)

NOTES:

- 1. CONDENSATE PAN DRAIN CAPS NOT SHOWN FOR CLARITY.
- 2. ALL DIMENSIONS ARE IN "MM" UNLESS NOTED.

SLOPE COIL



FB4C

A-COIL

- * HORIZONTAL MOUNT LOCATIONS - DIMPLES PROVIDED IN TOP PANEL, AND BACK OF CABINET. IN CABINET BOTTOM, HOLES PROVIDED 3.45 DIA. HORIZONTAL HANGING HARDWARE TO BE FIELD SUPPLIED.

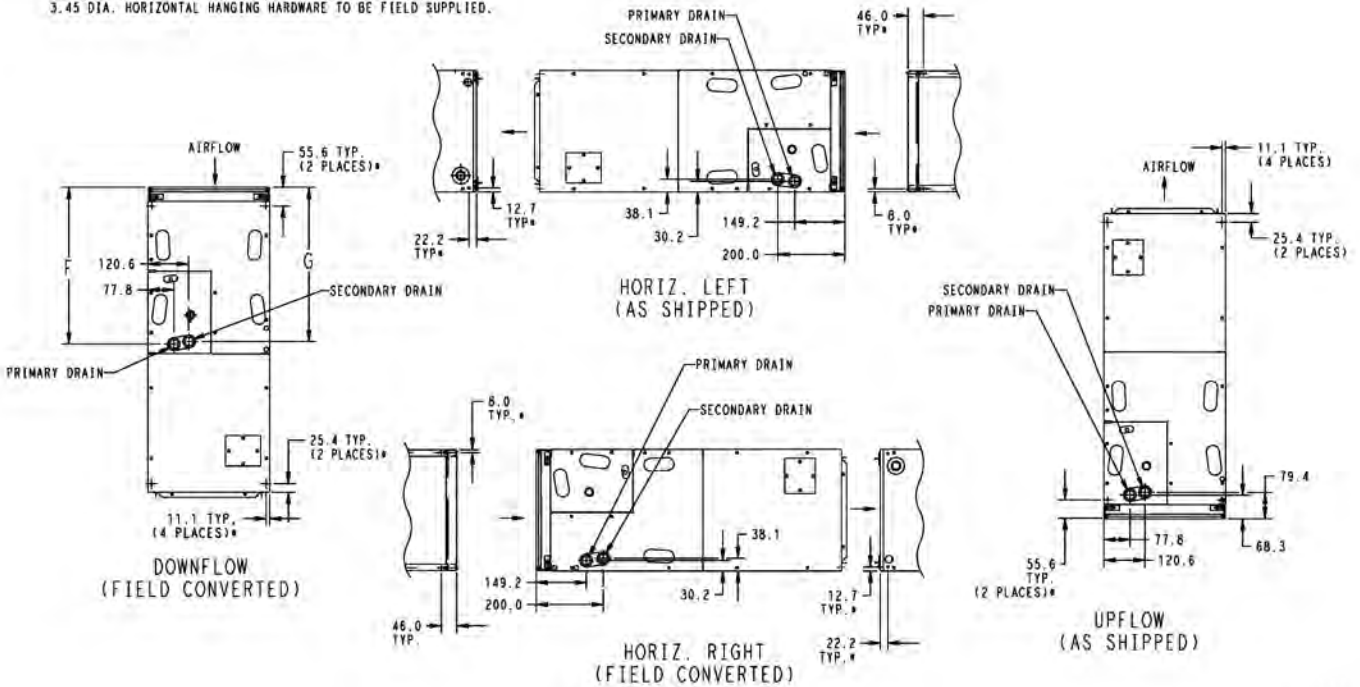


Fig. 4 - FB4CNE - Metric

A10008

PHYSICAL DATA

ORDERING NO.	FACTORY INSTALLED HEAT (kW)	NOMINAL COOLING CAPACITY (Btuh)	DIMENSIONS			SHIPPING WEIGHT
			Height	Width	Depth	
FB4CNF018(0,T)00	—	18,000	42–11/16 in. 1084mm	14–5/16 in. 363mm	22–1/16 in. 560mm	112 lb 51 kg
FB4CNF018(0,T)05	5					
FB4CNF018(0,T)08	8					
FB4CNF024(0,T)00	—	24,000	42–11/16 in. 1084mm	14–5/16 in. 363mm	22–1/16 in. 560mm	112 lb 51 kg
FB4CNF024(0,T)05	5					
FB4CNF024(0,T)10	10					
FB4CNF030(0,T)00	—	30,000	49–5/8 in. 1260mm	17–5/8 in. 447mm	22–1/16 in. 560mm	122 lb 55 kg
FB4CNF030(0,T)08	8					
FB4CNF030(0,T)10	10					
FB4CNF036(0,T)00	—	36,000	49–5/8 in. 1260mm	17–5/8 in. 447mm	22–1/16 in. 560mm	122 lb 55 kg
FB4CNF036(0,T)10	10					
FB4CNF036(0,T)15	15					
FB4CNF042(0,T)00	—	42,000	49–5/8 in. 1260mm	21–1/8 in. 536mm	22–1/16 in. 560mm	157 lb 71 kg
FB4CNF042(0,T)10	10					
FB4CNF042(0,T)15	15					
FB4CNF048(0,T)00	—	48,000	49–5/8 in. 1260mm	21–1/8 in. 536mm	22–1/16 in. 560mm	157 lb 71 kg
FB4CNF048(0,T)10	10					
FB4CNF048(0,T)15	15					
FB4CNF060(0,T)00	—	60,000	53–7/16 in. 1357mm	21–1/8 in. 536mm	22–1/16 in. 560mm	175 lb 79 kg
FB4CNF060(0,T)15	15					

SPECIFICATIONS

FB4C	18	24	30	36	42	48	60
EVAPORATOR COIL							
Face Area (sq. ft)	2.23		2.97		4.45		5.93
Configuration	Slope				A		
Metering Device (Teflon–ring piston) Puron Refrigerant	EA52PT052	EA52PT057	EA52PT067	EA52PT070	EA52PT076	EA52PT080	TXV
FILTER*							
21–1/2–in (546 mm) X	13–in (330 mm)		16–3/8–in (417 mm)		19–7/8–in (505 mm)		
BLOWER ASSEMBLY							
Blower Motor (X13)	HD42AR225	HD44AR240	HD42AR226	HD44AR241	HD44AR242	HD46AR250	HD46AR251
HP	1/3	1/2	1/3	1/2	1/2	3/4	3/4
CFM	600	800	1000	1200	1400	1600	1750

*Filter must be field–supplied for FB4C units.

FB4C

PERFORMANCE DATA

FB4C AIRFLOW PERFORMANCE (CFM)

MODEL & SIZE	BLOWER SPEED	0.10	0.20	0.30	0.40	0.50	0.60
FB4C 018	Tap 5	767	739	702	669	620	565
	Tap 4	614	569	534	486	436	398
	Tap 3	701	660	616	581	537	499
	Tap 2	614	569	534	486	436	398
	Tap 1	614	569	534	486	436	398
FB4C 024	Tap 5	969	936	892	835	763	676
	Tap 4	826	795	766	743	706	660
	Tap 3	826	795	766	743	706	660
	Tap 2	701	660	616	581	537	499
	Tap 1	617	592	552	507	472	420
FB4C 030	Tap 5	1108	1090	1065	1034	1009	974
	Tap 4	1026	1000	969	938	899	865
	Tap 3	1026	1000	969	938	899	865
	Tap 2	909	873	842	799	762	724
	Tap 1	825	795	757	722	674	634
FB4C 036	Tap 5	1301	1276	1245	1218	1176	1121
	Tap 4	1227	1191	1169	1143	1105	1074
	Tap 3	1227	1191	1169	1143	1105	1074
	Tap 2	1087	1062	1030	1001	966	930
	Tap 1	1026	1000	969	938	899	865
FB4C 042	Tap 5	1560	1544	1507	1464	1424	1358
	Tap 4	1419	1397	1358	1320	1279	1239
	Tap 3	1419	1397	1358	1320	1279	1239
	Tap 2	1249	1220	1184	1142	1093	1052
	Tap 1	1242	1205	1158	1110	1069	1026
FB4C 048	Tap 5	1743	1712	1679	1642	1610	1574
	Tap 4	1669	1634	1599	1564	1531	1499
	Tap 3	1669	1634	1599	1564	1531	1499
	Tap 2	1452	1413	1377	1339	1308	1271
	Tap 1	1300	1256	1221	1182	1142	1101
FB4C 060	Tap 5	1897	1867	1836	1808	1774	1736
	Tap 4	1817	1785	1757	1724	1693	1655
	Tap 3	1817	1785	1757	1724	1693	1655
	Tap 2	1657	1621	1589	1557	1518	1474
	Tap 1	1443	1412	1377	1332	1286	1243

FB4C

■ – Airflow outside 450 cfm/ton.

NOTES:

- Airflow based upon dry coil at 230v with factory-approved filter and electric heater (2 element heater sizes 018 through 036, 3 element heater sizes 042 through 060). For FB4C models, airflow at 208 volts is approximately the same as 230 volts because the X13 motor is a constant torque motor. The torque doesn't drop off at the speeds the motor operates.
- To avoid potential for condensate blowing out of drain pan prior to making drain trap:
Return static pressure must be less than 0.40 in. wc.
Horizontal applications of 042 – 060 sizes must have supply static greater than 0.20 in. wc.
- Airflow above 400 cfm/ton on 048–060 size could result in condensate blowing off coil or splashing out of drain pan.

PERFORMANCE DATA (cont.)

GROSS COOLING CAPACITIES (MBH) - PURON® REFRIGERANT

UNIT SIZE	INDOOR COIL AIR		SATURATED TEMPERATURE LEAVING EVAPORATOR (°F / °C)														
			35 / 2			40 / 4			45 / 7			50 / 10			55 / 13		
	CFM	EWB	TC	SHC	BF	TC	SHC	BF	TC	SHC	BF	TC	SHC	BF	TC	SHC	BF
FB4C 018	525	72 / 22	41	20	0.00	37	17	0.00	32	15	0.00	27	13	0.02	21	11	0.03
		67 / 19	33	20	0.03	29	18	0.03	24	16	0.03	19	13	0.03	13	11	0.04
		62 / 17	26	20	0.03	22	18	0.03	18	16	0.04	14	14	0.10	11	11	0.26
	600	72 / 22	45	22	0.00	40	19	0.00	35	17	0.01	30	15	0.03	23	12	0.04
		67 / 19	37	22	0.04	32	20	0.04	27	17	0.04	21	15	0.04	15	12	0.05
		62 / 17	29	22	0.04	24	20	0.04	19	18	0.05	15	15	0.12	13	13	0.28
	675	72 / 22	49	24	0.00	44	21	0.00	38	19	0.03	32	16	0.04	25	13	0.05
		67 / 19	40	24	0.05	35	22	0.05	29	19	0.05	23	16	0.05	16	14	0.06
		62 / 17	32	25	0.05	27	22	0.05	21	19	0.06	17	17	0.14	14	14	0.29
FB4C 024	700	72 / 22	43	22	0.00	38	20	0.00	33	17	0.03	28	15	0.04	22	12	0.05
		67 / 19	35	23	0.05	30	20	0.05	25	18	0.05	20	15	0.05	14	13	0.06
		62 / 17	28	23	0.06	23	21	0.06	18	18	0.06	15	15	0.14	12	12	0.29
	800	72 / 22	47	24	0.00	42	22	0.01	36	19	0.04	31	17	0.06	24	14	0.06
		67 / 19	38	25	0.06	33	22	0.06	28	20	0.07	22	17	0.07	15	14	0.08
		62 / 17	30	26	0.07	25	23	0.07	20	20	0.08	16	16	0.17	13	13	0.31
	900	72 / 22	51	26	0.00	45	24	0.03	40	21	0.06	33	18	0.07	26	15	0.07
		67 / 19	41	27	0.07	36	25	0.08	30	22	0.08	24	19	0.08	17	16	0.09
		62 / 17	33	28	0.08	28	25	0.08	22	22	0.09	18	18	0.19	15	15	0.33
FB4C 030	875	72 / 22	62	31	0.00	56	28	0.00	49	24	0.02	41	21	0.04	32	17	0.04
		67 / 19	51	32	0.04	44	28	0.05	37	25	0.05	29	21	0.05	21	18	0.05
		62 / 17	40	32	0.05	34	29	0.05	27	25	0.06	21	21	0.13	18	18	0.28
	1000	72 / 22	68	34	0.00	61	31	0.00	53	27	0.04	45	23	0.05	35	19	0.06
		67 / 19	56	35	0.06	49	31	0.06	41	28	0.06	32	24	0.06	22	20	0.07
		62 / 17	44	36	0.06	37	32	0.06	29	28	0.07	24	24	0.16	20	20	0.30
	1125	72 / 22	74	37	0.00	66	33	0.02	58	29	0.05	48	25	0.06	38	21	0.07
		67 / 19	60	38	0.07	53	34	0.07	44	30	0.07	35	26	0.07	24	22	0.08
		62 / 17	48	39	0.07	40	35	0.07	32	31	0.09	26	26	0.18	21	21	0.32
FB4C 036	1050	72 / 22	68	34	0.00	61	31	0.00	53	27	0.04	45	23	0.05	35	20	0.06
		67 / 19	56	36	0.06	49	32	0.06	41	28	0.06	32	24	0.07	22	20	0.07
		62 / 17	44	36	0.07	37	33	0.07	30	29	0.08	24	24	0.17	20	20	0.31
	1200	72 / 22	75	38	0.00	67	34	0.03	58	30	0.06	49	26	0.07	38	22	0.07
		67 / 19	61	39	0.07	53	35	0.08	45	31	0.08	35	27	0.08	25	22	0.09
		62 / 17	49	40	0.08	41	36	0.08	32	32	0.09	26	26	0.19	22	22	0.33
	1350	72 / 22	81	41	0.00	72	37	0.05	63	32	0.07	53	28	0.08	41	23	0.09
		67 / 19	66	43	0.08	58	38	0.09	48	34	0.09	38	29	0.09	27	25	0.10
		62 / 17	53	44	0.09	44	40	0.09	35	35	0.11	29	29	0.22	24	24	0.35
FB4C 042	1225	72 / 22	89	44	0.00	80	40	0.00	70	35	0.02	58	30	0.03	46	25	0.04
		67 / 19	73	45	0.04	63	41	0.04	53	36	0.04	42	31	0.04	29	25	0.05
		62 / 17	58	46	0.04	48	41	0.04	38	36	0.05	30	30	0.12	25	25	0.28
	1400	72 / 22	98	49	0.00	88	44	0.00	77	39	0.03	64	33	0.04	50	28	0.05
		67 / 19	80	50	0.05	70	45	0.05	58	39	0.05	46	34	0.05	32	28	0.06
		62 / 17	64	51	0.06	53	46	0.06	42	40	0.06	34	34	0.14	28	28	0.29
	1575	72 / 22	106	53	0.00	95	48	0.00	83	42	0.04	69	36	0.05	54	30	0.06
		67 / 19	87	55	0.06	76	49	0.06	63	43	0.06	50	37	0.07	35	31	0.07
		62 / 17	69	56	0.07	58	50	0.07	46	44	0.08	37	37	0.17	31	31	0.31
FB4C 048	1400	72 / 22	88	46	0.00	79	42	0.00	69	37	0.03	58	31	0.04	45	26	0.05
		67 / 19	72	48	0.05	63	43	0.05	52	37	0.05	41	32	0.05	29	27	0.06
		62 / 17	57	49	0.06	48	43	0.06	38	38	0.06	30	30	0.14	25	25	0.29
	1600	72 / 22	97	51	0.00	87	46	0.01	75	40	0.04	63	35	0.06	49	29	0.06
		67 / 19	79	52	0.06	69	47	0.06	57	41	0.07	45	36	0.07	32	30	0.08
		62 / 17	63	54	0.07	53	48	0.07	42	42	0.08	34	34	0.17	28	28	0.31
	1800	72 / 22	105	55	0.00	94	50	0.03	82	44	0.06	68	38	0.07	54	31	0.07
		67 / 19	86	57	0.07	75	51	0.08	62	45	0.08	49	39	0.08	34	33	0.09
		62 / 17	68	59	0.08	57	53	0.08	45	47	0.09	37	37	0.19	30	30	0.33
FB4C 060	1600	72 / 22	106	54	0.00	95	49	0.00	82	43	0.01	69	37	0.03	54	31	0.04
		67 / 19	86	56	0.04	75	50	0.04	63	44	0.04	49	37	0.04	35	31	0.05
		62 / 17	68	56	0.04	57	50	0.04	45	44	0.05	36	36	0.12	29	29	0.28
	1750	72 / 22	113	58	0.00	101	52	0.00	88	46	0.02	74	39	0.04	58	33	0.04
		67 / 19	92	59	0.04	80	53	0.05	67	47	0.05	53	40	0.05	37	33	0.05
		62 / 17	73	61	0.05	61	54	0.05	49	48	0.06	39	39	0.13	32	32	0.28
	2000	72 / 22	124	64	0.00	111	57	0.00	97	50	0.04	81	43	0.05	63	36	0.06
		67 / 19	101	66	0.06	88	59	0.06	74	52	0.06	58	44	0.06	41	37	0.07
			62 / 17	80	67	0.06	67	60	0.06	53	53	0.07	43	43	0.16	35	35

See Notes following table.

PERFORMANCE DATA (cont.)

CFM – Cubic Ft per Minute
SHC – Gross Sensible Capacity 1000 Btuh

EWB – Entering Wet Bulb °F (°C)
BF – Bypass Factor

LWB – Leaving Wet Bulb °F (°C) **TC** – Gross Cooling Capacity 1000 Btuh
MBH – 1000 Btuh

NOTES:

1. Contact manufacturer for cooling capacities at conditions other than shown in table.
2. Formulas:
 Leaving db = entering db - $\frac{\text{sensible heat cap.}}{1.09 \times \text{CFM}}$
 Leaving wb = wb corresponding to enthalpy of air leaving coil (h_{lwb})
 $h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{CFM}}$
 where h_{ewb} = enthalpy of air entering coil. Direct interpolation is permissible. Do not extrapolate.
3. SHC is based on 80°F (27°C) db temperature of air entering coil. Below 80°F (27°C) db, subtract (Correction Factor x CFM) from SHC. Above 80°F (27°C) db, add (Correction Factor x CFM) to SHC.
4. Bypass Factor = 0 indicates no psychometric solution. Use bypass factor of next lower EWB for approximation.

SHC CORRECTION FACTOR

BYPASS FACTOR	ENTERING AIR DRY-BULB TEMPERATURE (°F)					
	79	78	77	76	75	Under 75
	81	82	83	84	85	Over 85
	ENTERING AIR DRY-BULB TEMPERATURE (°C)					
	26	25	25	24	24	Under 75
	27	28	28	29	29	Over 85
Correction Factor						
0.10	.098	1.96	2.94	3.92	4.91	Use formula shown below
0.20	0.87	1.74	2.62	3.49	4.36	
0.30	0.76	1.53	2.29	3.05	3.82	

Interpolation is permissible.
 Correction Factor = $1.09 \times (1 - \text{BF}) \times (\text{db} - 80)$

FB4C

FB4C AIR DELIVERY PERFORMANCE CORRECTION COMPONENT PRESSURE DROP (in wc) AT INDICATED AIRFLOW (DRY TO WET COIL)

UNIT SIZE	CFM															
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
018	0.034	0.049	0.063	--	--	--	--	--	--	--	--	--	--	--	--	--
024	0.034	0.049	0.063	0.076	0.089	--	--	--	--	--	--	--	--	--	--	--
030	--	--	--	0.049	0.059	0.070	0.080	--	--	--	--	--	--	--	--	--
036	--	--	--	--	--	0.070	0.080	0.090	0.099	--	--	--	--	--	--	--
042	--	--	--	--	--	--	--	0.049	0.056	0.063	0.070	--	--	--	--	--
048	--	--	--	--	--	--	--	--	--	0.063	0.070	0.076	0.083	0.090	--	--
060	--	--	--	--	--	--	--	--	--	--	--	0.049	0.054	0.059	0.065	0.070

ELECTRIC HEATER STATIC PRESSURE DROP (in wc)

FB4C 018 – 036			FB4C 042 – 060		
HEATER ELEMENTS	kW	EXTERNAL STATIC PRESSURE CORRECTION	HEATER ELEMENTS	kW	EXTERNAL STATIC PRESSURE CORRECTION
0	0	+02	0	0	+04
1	3, 5	+01	2	8, 10	+02
2	8, 10	0	3	9, 15	0
3	9, 15	-02	4	20	-02
4	20	-04	6	18, 24, 30	-10

The airflow performance data was developed using fan coils with 10-kW electric heaters (2 elements) in the 018 through 036 size units and 15-kW heaters (3 elements) in the 042 through 060 size units. For fan coils with heaters of a different number of elements, the external available static at a given CFM from the curve may be corrected by adding or subtracting available external static pressure as indicated above.

MINIMUM CFM AND MOTOR SPEED SELECTION

FB4C	HEATER kW									
	3	5	8	9	10	15	18	20	24	30
018	525	525	525	--	600	--	--	--	--	--
024	700	700	700	--	700	775	--	--	--	--
030	--	875	875	--	875	875	--	1060	--	--
036	--	1050	970	970	970	920	--	1040	--	--
042	--	--	1225	1225	1225	1225	1225	1225	--	--
048	--	--	1400	1400	1400	1400	1400	1400	1400	1400
060	--	--	1750	1750	1750	1750	1750	1750	1750	1750

Speed Tap 4 (white wire) is used for electric heat only. White wire must remain on tap 4.

PERFORMANCE DATA (cont.)

FIELD-INSTALLED FILTER STATIC PRESSURE DROP (in wc)

FB4C	CFM								
	400	600	800	1000	1200	1400	1600	1800	2000
018	0.02	0.044	0.075	—	—	—	—	—	—
024, 030	—	0.022	0.048	0.072	0.100	—	—	—	—
036, 042, 048	—	—	—	0.051	0.070	0.092	0.120	0.152	—
060	—	—	—	—	—	—	0.086	0.105	0.130

ACCESSORY ELECTRIC HEATERS

HEATER PART NO.	kW @ 240V	VOLTS/PH	STAGES (kW OPERATING)	INTERNAL CIRCUIT PROTECTION	FAN COIL SIZE USED WITH	HEATING CAP.** @ 230V
KFCEH0401N03	3	230/1	3	None	018-024	9,400
KFCEH0501N05	5	230/1	5	None	018-060	15,700
KFCEH0801N08	8	230/1	8	None	018-060	25,100
KFCEH0901N10	10	230/1	10	None	018-060	31,400
KFCEH3201F20	20	230/1	5, 20	Fuse†	030-060	62,800
KFCEH1601315	15	230/3	5, 15	None	036-060	47,100
KFCEH2001318	18	230/3	6, 12, 18	None	042-060	56,500
KFCEH3401F24	24	230/3*	8, 16, 24	Fuse	048, 060	78,300
KFCEH3501F30	30	230/3*	10, 20, 30	Fuse	048, 060	94,100
KFCEH2401C05	5	230/1	5	Circuit Breaker	018-060	15,700
KFCEH2501C08	8	230/1	8	Circuit Breaker	018-060	25,100
KFCEH2601C10	10	230/1	10	Circuit Breaker	018-060	31,400
KFCEH3301C20	20	230/1	5, 20	Circuit Breaker	030-060	62,800
KFCEH2901N09	9	230/1†	3, 9	None	036-060	28,200
KFCEH3001F15	15	230/1	5, 15	Fuse‡	024-060	47,100
KFCEH3101C15	15	230/1	5, 15	Circuit Breaker	024-060	47,100

* Field convertible to 1 phase.

† Field convertible to 3 phase.

‡ Single point wiring kit required for these heaters in Canada.

** Blower Motor heat not included.

ESTIMATED SOUND POWER LEVEL (dBA)

FB4C	CONDITIONS		OCTAVE BAND CENTER FREQUENCY*						
	CFM	Ext Static Pressure	63	125	250	500	1000	2000	4000
018	600	0.25	64.7	60.7	56.7	53.7	51.7	49.7	45.7
024	800	0.25	66.0	62.0	58.0	55.0	53.0	51.0	47.0
030	1000	0.25	67.0	63.0	59.0	56.0	54.0	52.0	48.0
036	1200	0.25	67.8	63.8	59.8	56.8	54.8	52.8	48.8
042	1400	0.25	68.4	64.4	60.4	57.4	55.4	53.4	49.4
048	1600	0.25	69.0	65.0	61.0	58.0	56.0	54.0	50.0
060	2000	0.25	70.0	66.0	62.0	59.0	57.0	55.0	51.0

* Estimated sound power levels have been derived using the method described in the 1987 ASHRAE HVAC Systems & Applications Handbook, Chapter 52, p. 52.7.

FB4C

PERFORMANCE DATA (cont.)

ELECTRICAL DATA FOR UNITS WITH FACTORY-INSTALLED HEAT

FB4CNF	MTR HP	MTR FLA	VOLTS / PH / HZ	HEAT PACK INSTALLED	SINGLE CIRCUIT			DUAL CIRCUIT						
					HEATER AMPS	MCA	MOCP	HTR. AMPS	MCA	MOCP	HTR. AMPS	MCA	MOCP	
								L1/L2	L1/L2	L1/L2	L3/L4	L3/L4	L3/L4	
018(0,T)05	1/3	2.8	208/230/1/60	MKFCEH0501N05	18.1/20.0	26.1/28.5	30/30	N/A	N/A	N/A	N/A	N/A	N/A	N/A
018(0,T)08	1/3	2.8	208/230/1/60	MKFCEH0801N08	28.9/32.0	39.6/43.5	40/45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
024(0,T)05	1/2	4.1	208/230/1/60	MKFCEH0501N05	18.1/20.0	27.8/30.0	30/30	N/A	N/A	N/A	N/A	N/A	N/A	N/A
024(0,T)10	1/2	4.1	208/230/1/60	MKFCEH0901N10	36.2/40.0	50.4/55.1	60/60	N/A	N/A	N/A	N/A	N/A	N/A	N/A
030(0,T)08	1/3	2.8	208/230/1/60	MKFCEH0801N08	28.9/32.0	39.6/43.5	40/45	N/A	N/A	N/A	N/A	N/A	N/A	N/A
030(0,T)10	1/3	2.8	208/230/1/60	MKFCEH0901N10	36.2/40.0	48.8/53.5	50/60	N/A	N/A	N/A	N/A	N/A	N/A	N/A
036(0,T)10	1/2	4.1	208/230/1/60	MKFCEH0901N10	36.2/40.0	50.4/55.1	60/60	N/A	N/A	N/A	N/A	N/A	N/A	N/A
036(0,T)15	1/2	4.1	208/230/1/60	MKFCEH1501F15	54.2/59.9	72.9/80.0	80/80	36.2/40.0	50.4/55.2	50/60	18.1/20.0	22.6/25.0	25/25	
042(0,T)10	1/2	4.1	208/230/1/60	MKFCEH0901N10	36.2/40.0	50.4/55.1	60/60	N/A	N/A	N/A	N/A	N/A	N/A	
042(0,T)15	1/2	4.1	208/230/1/60	MKFCEH1501F15	54.2/59.9	72.9/80.0	80/80	36.2/40.0	50.4/55.2	50/60	18.1/20.0	22.6/25.0	25/25	
048(0,T)10	3/4	6.0	208/230/1/60	MKFCEH0901N10	36.2/40.0	52.8/57.5	60/60	N/A	N/A	N/A	N/A	N/A	N/A	
048(0,T)15	3/4	6.0	208/230/1/60	MKFCEH1501F15	54.2/59.9	75.3/82.4	80/90	36.2/40.0	52.8/57.5	60/60	18.1/20.0	22.6/25.0	25/25	
060(0,T)15	3/4	6.0	208/230/1/60	MKFCEH1501F15	54.2/59.9	75.3/82.4	80/90	36.2/40.0	52.8/57.5	60/60	18.1/20.0	22.6/25.0	25/25	

FB4C

ELECTRICAL DATA FOR UNITS WITHOUT ELECTRICAL HEAT

MODEL NO.	MTR HP	MTR FLA	VOLTS/PH/HZ	SINGLE CIRCUIT		BRANCH CIRCUIT MIN WIRE SIZE* AWG
				MCA	MAXIMUM OVERCURRENT PROTECTION	
FB4CNF018(0,T)00	1/3	2.8	208/230/1/60	3.5	15	14
FB4CNF024(0,T)00	1/2	4.1	208/230/1/60	5.1	15	14
FB4CNF030(0,T)00	1/3	2.8	208/230/1/60	3.5	15	14
FB4CNF036(0,T)00	1/2	4.1	208/230/1/60	5.1	15	14
FB4CNF042(0,T)00	1/2	4.1	208/230/1/60	5.1	15	14
FB4CNF048(0,T)00	3/4	6.0	208/230/1/60	7.5	15	14
FB4CNF060(0,T)00	3/4	6.0	208/230/1/60	7.5	15	14

* Use copper wire only. Use 75°C only in this application. When using non-metallic (NM) sheathed cable, wire size required should be based on that of 60°C conductors, instead of wire sizes shown in table above per NEC Article 336-26.

NOTE: If branch circuit wire length exceeds 100 ft (30 m), consult NEC 215-2 to determine maximum wire length. Use 2% voltage drop.

FLA – Full Load Amps

HEATER ELECTRICAL DATA

FACTORY-INSTALLED HEATER OPTIONS*

MODEL	018	024	030	036	042	048	060
FB4CNF	5 / 8	5 / 10	8 / 10	10 / 15	10 / 15	10 / 15	15

* For field-installed heater/fan coil combinations, see Accessory Electric Heaters Table.

ELECTRIC HEATER INTERNAL PROTECTION

HEATER kW	PHASE	FUSE QTY/SIZE	CKT BKR* QTY/SIZE
5	1	—	1/60
8	1	—	1/60
9	1/3	—	—
10	1	—	1/60
15	1	2/30-2/60	2/60
15	3	—	—
18	3	—	—
20	1	4/60	2/60
24	1/3	6/60	—
30	1/3	6/60	—

* All circuit breakers are 2 pole.

When using units with 20-, 24-, and 30-kW electric heaters, maintain a 1-in. (25mm) clearance from combustible materials to discharge plenum and ductwork and maintain a distance of 36-in. (914mm) from the unit. Use an accessory downflow base to maintain proper clearance on downflow installations. Use flexible connectors between ductwork and unit to prevent transmission of vibration. When electric heater is installed, use heat resistant material for flexible connector between ductwork and unit at discharge connection. Ductwork passing through unconditioned space must be insulated and covered with vapor barrier

ACCESSORIES

ITEM	ACCESSORY PART NO.*	FAN COIL SIZE USED WITH
1. Disconnect Kit	KFADK0201DSC	Cooling controls and heaters 3- through 10-kW
2. Downflow Base Kit	KFACB0101CFB	018, 024
	KFACB0201CFB	030, 036
	KFACB0301CFB	042, 048, 060
3. Downflow Conversion Kit †	KFADC0201SLP	Slope Coil Units—018, 024, 030, 036
	KFADC0401ACL	A- Coil Units—042, 048, 060
4. Downflow/Horizontal Conversion Gasket Kit	KFAHD0101SLP	All
5. Horizontal Water Management Kit (25 pack) ‡	KFAHC0125AAA	All
6. Single-Point Wiring Kit	KFASP0101SPK	Only with 15- and 20-kW Fused Heaters
7. Filter Kit (12 Pack)	KFAFK0112SML	018, 024
	KFAFK0212MED	030, 036
	KFAFK0312LRG	042, 048, 060
8. Fan Coil Filter Cabinet (Fan Coil Filter Media)	FNCCABCC0014 (FILXXFNC0014)	018, 024
	FNCCABCC0017 (FILXXFNC0017)	030, 036
	FNCCABCC0021 (FILXXFNC0021)	042, 048, 060
9. PVC Condensate Trap Kit (50 pack)	KFAET0150ETK	All
10. Air Cleaner 240-volt Conversion Kit	KEAVC0201240	All
11. TXV Kit Puron R-410A	KSATX0201PUR	018, 024, 030
	KSATX0301PUR	036, 042
	KSATX0401PUR	048
12. TXV Kit R-22	KSATX0601HSO	018, 024, 030, 036, 042
	KSATX0701HSO	048
	KSATX1001HSO	060

* Factory authorized and listed, field-installed.

† KFAHD0101SLP must also be purchased for downflow applications.

‡ KFAHD0101SLP must also be purchased for downflow or horizontal applications.

FB4C

ACCESSORIES (cont.)

Accessory Kits Description Suggested and Required Use

1. Disconnect Kit

The kit is used to disconnect electrical power to the fan coil so service or maintenance may be performed safely.
SUGGESTED USE: Units for 3- through 10-kW electric resistance heaters and cooling controls.

2. Downflow Base Kit

This kit is designed to provide a 1-in. (25mm) minimum clearance between unit discharge plenum, ductwork, and combustible materials. It also provides a gap-free seal with the floor.
REQUIRED USE: This kit must be used whenever fan coils are used in downflow applications.

3. Downflow Conversion Kit

Fan coils are shipped from the factory for upflow or horizontal-left applications. Downflow conversion kits provide proper condensate water drainage and support for the coil when used in downflow applications. Separate kits are available for slope coils and A-coils.
REQUIRED USE: This kit must be used whenever fan coils are used in downflow applications.

4. Downflow/Horizontal Conversion Gasket Kit

This kit provides the proper gasketing of units when applied in either a downflow or horizontal application.
REQUIRED USE: Fan coils in either downflow or horizontal applications.

5. Horizontal Applications - Water Management Kit

This kit provides proper installation of fan coils under conditions of high static pressure and high relative humidity.
SUGGESTED USE: All fan coils.

6. Single Point Wiring Kit

The single point wiring kit acts as a jumper between L1 and L3 lugs, and between the L2 and L4 lugs. This allows the installer to run two heavy-gauge, high-voltage wires into the fan coil rather than 4 light-gauge, high-voltage wires.
SUGGESTED USE: Fan coils with 15- and 20-kW fused heaters only.

7. Filter Kit (12 pack)

The kit consists of 12 fan coil framed filters. These filters collect large dust particles from the return air entering the fan coil and prevents them from collecting on the coil. This process helps to keep the coil clean, which increases heat transfer and, in turn, the efficiency of the system.
SUGGESTED USE: To replace filters in fan coils.
REQUIRED USE: All units unless a filter grille is used.

8. Fan Coil Filter Cabinet

This cabinet is mounted to the fan coil on the return air end and designed to slip over the outer fan coil casing. The cabinets are insulated using the same insulation as production fan coils. They are designed for the removal of particulates from indoor air using FILXXFNC00(14, 17, 21, 24) media filter cartridges. These fan coil media filter cartridge kits are designed for the removal of particles from indoor air. The cartridge is installed in the return air duct next to the air handler or further upstream.
SUGGESTED USE: All fan coils.

9. Condensate Drain Trap Kit

This kit consists of 50 PVC condensate traps. Each trap is pre-formed and ready for field installation. This deep trap helps the system make and hold proper condensate flow even during blower initiation.
SUGGESTED USE: All fan coils.

10. Air Cleaner 240-volt Conversion Kit

The AIRA electronic air cleaner comes ready for 115-v operation.
REQUIRED USE: This kit is required when running 240-volt circuit to air cleaner.



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Ultra-high efficiency means ultra-low operating costs

Voyager ultra-high-efficiency models continue the Trane tradition of leadership in energy efficiency with Trane eFlex™ variable-speed compressors and fans (available fall 2013), which deliver the performance building occupants need, while also delivering the efficiency building owners want. By precisely matching output to the cooling demands of the space, Trane eFlex compressors and fans operate at their fastest levels when demand is high, and modulate to slower levels when demand is less, for an ultra-high Energy Efficiency Ratio (EER, which measures efficiency at peak output) and Integrated Energy Efficiency Ratio (IEER, a measurement of efficiency at variable workloads). The result: lower energy use and smaller energy bills.

Customized to fit your unique needs and delivered quickly

Because Trane recognizes that every building is different, we offer a wide range of factory-installed options on Voyager rooftop units, such as coated condenser coils, stainless steel drain pans, unit-mounted circuit breakers and more. Every Voyager unit can be customized to meet your exact needs, so you don't have to compromise.

Factory-installed options are rigorously tested to dramatically reduce the amount of time and money spent installing and commissioning units in the field, as well as the chances for installation errors. Even the most highly configured Voyager units are ready in as few as two weeks—the fastest delivery time in the industry. You'll spend less time waiting for your new Voyager rooftop unit and more time enjoying its cooling performance.

The Trane Human Interface Panel: More information, more effectively delivered

The optional Trane Human Interface Panel (available fall 2013) represents a breakthrough in unit controls, delivering comprehensive information about system performance on a large, easy-to-read color touchscreen display. Unlike competing displays, information shown on the Human Interface Panel is understandable at a glance—without requiring time-consuming decoding. Technicians can quickly and easily monitor important system operating parameters in real time, and compare current information with past performance—information that can be invaluable in keeping your Voyager rooftop unit working optimally. The Human Interface Panel also allows technicians to change certain system set points right from the panel, aiding in start-up, preventive maintenance tasks and troubleshooting.

Trane Intelligent Services for 24/7 peace of mind

The available Trane Intelligent Services (TIS) can monitor and evaluate real-time data from Voyager units around the clock, 365 days a year. If an immediate or potential problem is detected, Trane can notify the building operator or dispatch technicians to the equipment's location. Continuous monitoring and expert data analysis can allow problems to be addressed quickly, reducing the likelihood that building occupant comfort will be impacted.

Comfort and low cost of ownership

Trane combines technological innovation with legendary reliability and performance to create the lowest cost of ownership. Trane® Voyager™ rooftop units not only offer the lowest installed cost, they also can reduce utility bills and maintenance requirements to create the lowest total cost of ownership in units that can operate at peak performance for as long as 20 to 30 years.

A Trane eFlex variable-speed compressor and fan technology (Available fall 2013)

Trane eFlex™ variable-speed compressors and fans deliver the performance building occupants need, while also delivering the efficiency building owners want. By precisely matching output to the cooling demands of the space, Trane eFlex compressors and fans operate at their fastest levels when demand is high, and modulate to slower levels when demand is less, for an ultra-high Energy Efficiency Ratio (EER, which measures efficiency at peak output) and Integrated Energy Efficiency Ratio (IEER, a measurement of efficiency at variable workloads). The result: lower energy use and smaller energy bills.

Variable air volume (VAV) option (Not shown)

Voyager rooftop systems offer both single-zone and multi-space VAV. ReliaTel™ controls can integrate with existing VAV solutions to interface with both Tracer™ and Tracker™ control platforms. Together, they deliver energy-efficient solutions for every building need—and require minimal setup and commissioning. With the single-zone VAV option, the system modulates indoor fan and stage compressors as space temperature changes, for increased part-load efficiency and more precise temperature control.

B Trane Human Interface Panel (Available fall 2013)

A large, easy-to-read color touchscreen display delivers important system information at a glance—without requiring time-consuming decoding. This factory-installed



option allows technicians to quickly and easily monitor important system operating parameters in real time, and compare current information with past performance—information that can be invaluable in keeping your Voyager rooftop unit working optimally. The Human Interface Panel also allows technicians to change certain system set points right from the panel, aiding in start-up, preventive maintenance tasks and troubleshooting.

C Factory-installed high short circuit current (SCCR) option

A factory-installed high-SCCR solution is available to help equipment meet the requirements of applicable building codes. Factory installation saves time and money, and ensures code compliance for a smoother installation process.



D **MERV 8 and MERV 13 filters**
High-efficiency filtration for better indoor air quality and occupant comfort. Using a MERV 13 air filter, Voyager can remove contaminants as small as 0.3 microns in size, which can include bacteria, cooking oil, smoke, insecticide dust and paint pigments.

E **All-aluminum microchannel (MCHE) condenser coil**
A more environmentally friendly condenser coil features improved durability and reliability. A recessed design protects fins from incidental damage, while increased coil rigidity enhances durability. The coil's design dramatically reduces the opportunity for leaks, and all-aluminum construction minimizes corrosion and eliminates formicary corrosion. An optional coil coating can further safeguard

against corrosion. The coil also uses less refrigerant, making it more environmentally friendly and meeting the requirements of LEED EA Credit 4.

Hot gas reheat (*Not shown*)

Heat energy is recycled from the compressor to reduce indoor air humidity, eliminating the need for a separate heat source to do the job—which saves energy and money. Maintaining proper indoor humidity levels improves indoor comfort and can eliminate costly moisture-related damage to the building.

Foil-faced insulation (*Not shown*)

Foil-faced insulation edges are captured and sealed, reducing the chance for insulation fibers to enter the air stream and clog filters, which reduces maintenance needs and costs.

F **Hinged access doors**
Easy entry to the unit's service access areas reduces maintenance time—and reduces the opportunity for roof damage, too.

G **Color-coded, numbered wiring**
Faster identification of wires helps save time and money when servicing and diagnosing the unit.

Trane solutions: Making buildings better for life



Performance

Trane® products are designed, engineered, built and tested to be solid performers, quietly doing their jobs year after year with minimal need for maintenance and repairs. The Trane Voyager™ light-commercial rooftop units build on a long history of efficient, durable, high-performance HVAC products. And Trane has the Building Information Modeling (BIM) objects to support your building design. Trane BIM objects represent your exact specifications and are pre-populated with data unique to each product configuration, saving time, increasing accuracy and improving how buildings are constructed.

Innovation

Founded a century ago on the belief that imagination and inspiration can overcome any obstacle, the Trane legacy of technological breakthroughs has made it an industry legend. Today's Trane Voyager rooftop units contain numerous innovative solutions to boost performance and efficiency while maintaining high levels of reliability.



Commitment

The Trane commitment to our customers' satisfaction begins before a product is installed and lasts for that product's entire life. As a company, our livelihood depends on the Trane reputation—and the Trane reputation depends both on our products' performance as well as our relationships with customers. We want every Trane customer to stay a Trane customer. Our commitment to those customers reflects that wish.

Knowledge

To become and remain an industry leader requires a full understanding of existing knowledge and a never-ending quest for new discoveries. For one hundred years, Trane has built and maintained its leadership status in the HVAC industry by employing the brightest and most inquisitive scientists, engineers and design experts—all of whom share a singular passion to know and explore the ever-evolving technology that improves the lives of our customers.

Visit Trane.com/LCU for more information on Trane Voyager light-commercial units—or contact your local Trane account manager to learn more.

Scan the code or visit
Trane.com/LCU
to learn more about
Trane® Voyager™
rooftop units.



Ingersoll Rand (NYSE:IR) advances the quality of life by creating and sustaining safe, comfortable and efficient environments. Our people and our family of brands—including Club Car®, Ingersoll Rand®, Schlage®, Thermo King® and Trane®—work together to enhance the quality and comfort of air in homes and buildings; transport and protect food and perishables; secure homes and commercial properties; and increase industrial productivity and efficiency. We are a \$14 billion global business committed to a world of sustainable progress and enduring results.



ingersollrand.com

Manufacturer Specification Sheets

ECM 20: Plug Load Controllers

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The Bert® 110 M:

Plug Load Management with Measurement

If you're like most facility managers, you suspect that there are large potential savings from plug based loads —but you lack an easy way to document actual energy savings needed to create proven savings reports. The Bert® Plug Load Management System, with measurement-enabled Bert® 110M units, is a brilliant solution.



- **Measure** energy use with Bert's real-time measurement features.
- **Analyze** energy use, establishing optimal schedules and documenting savings.
- **Control** plug based devices throughout your facility.

The Plug Load Problem:

Studies show that plug based load is a large and growing source of energy use- estimated at 20% of energy use for offices and 25% of electricity for schools. Yet many schools, offices and retail locations are closed for nearly as many hours per year as they are open. Bert® provides the simple, sophisticated tools to turn equipment on when buildings are occupied and off when they're not.

How Bert® Works

Each Bert® contains a microprocessor that can communicate with the Bertbrain 1000/M control software across your wireless network. Bert® can store 7-day on/off schedules with multiple on/off commands each day. This allows you to set schedules that mirror the actual operating hours of your facility and easily modify schedules throughout the year.



Manufacturer Specification Sheets

ECM 22: Chiller Replacement

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Unit Overview

Chiller Model	CGAM
Unit Nominal Tonnage	80 tons
Refrigeration Capacity	73.04 tons
Cooling Efficiency	9.539 EER
IPLV/IP	14.60 EER (Btu/W-h)
NPLV/IP	14.35 EER (Btu/W-h)
Elevation	0.000 ft
Unit Frequency	60. hertz
Unit Voltage	460. volt 3 phases
Refrigerant Type	R410A
Number of compressor	4
Number of circuits	2
Number of capacity steps	4
Agency Listing	UL/CUL



Evaporator Information

Evaporator Application			
Std cooling			
Fluid Temperatures		Flow Rate	
Evaporator Leaving	44.00 F	Design Flow	185.2 gpm
Evaporator Entering	54.00 F	Min Flow	91.80 gpm
Fluid Properties		Max Flow	275.3 gpm
Fluid Type	Propylene glycol	Fluid Pressure Drop	
Fluid Concentration	30.00 %	Total PD evap+strainer	19.7 ft H2O
Freeze Point	9.19 F	Design Evap PD	16.5 ft H2O
		Min PD	5.14 ft H2O
		Max PD	42.2 ft H2O
		Freeze protection	With freeze protection
		Fouling factor	0.000100 hr-sq ft-deg F/ Btu
		Flow switch set point	Flow switch set point 15 cm/sec
		Water connection size	4.000 in

Condenser Information

Unit Application	High ambient	Fin Material	Microchannel	
Ambient Air Temp.	95.0 F	Total airflow	56645 cfm	Number of Fans 6

Unit Electrical

Unit				RLA	LRA
Compressor Starter	Across the line	Incoming Power Line Conn. Type	Single point	Compressor A	33.00 A 215.00 A
Total Power	91.89 kW	Short Circuit Current Option	High	Compressor B	33.00 A 215.00 A
Compressor Power	84.44 kW	Short Circuit Current Rating	65000.00 A	Compressor D	33.00 A 215.00 A
Fan Power	7.130 kW	Single Point Power MCA	162.20 A	Compressor E	33.00 A 215.00 A
Total Fan FLA	20.20 A	Single Point Power MOP	175.00 A		

Physical Information

Dimensions		Weights		Refrigerant Charge	Oil Charge
Length	143.100 in	Operating Weight	4898.7 lb	Circuit 1	45.0 lb 2.91 gal
Width	89.000 in	Shipping Weight	4887.6 lb	Circuit 2	45.0 lb 2.91 gal
Height	92.400 in				

Unit Acoustics (A-Weighted)

A-Weighted	Sound Power	Sound Pressure*	Unit Sound Package
100%	91 dBA	64 dBA	Comprehensive package

Note: In Accordance with AHRI 370

*Note: at 30 feet in free field

Warranty

Standard Warranty

Information for LEED Projects

ASHRAE 90.1/CSA compliance	ASHRAE 2010
Rated refrigeration capacity (AHRI)	75.20 tons
Rated efficiency (AHRI)	9.750 EER (Btu/W-h)
IPLV/IP	14.60 EER (Btu/W-h)
Cooling Efficiency	9.539 EER
Compress Power	84.44 kW
Fan Power	7.130 kW
Refrigerant (R410A) - ckt 1	45.0 lb
Refrigerant (R410A) - ckt 2	45.0 lb

Certified in accordance with the AHRI Air-Cooled Water-Chilling Packages Certification Program, which is based on AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI). Unit contains freeze protection fluids in the evaporator with a leaving chilled fluid temperature above 32°F [0°C] and is certified when rated per the Standard with water. Certified units may be found in the AHRI Directory at www.ahridirectory.org.



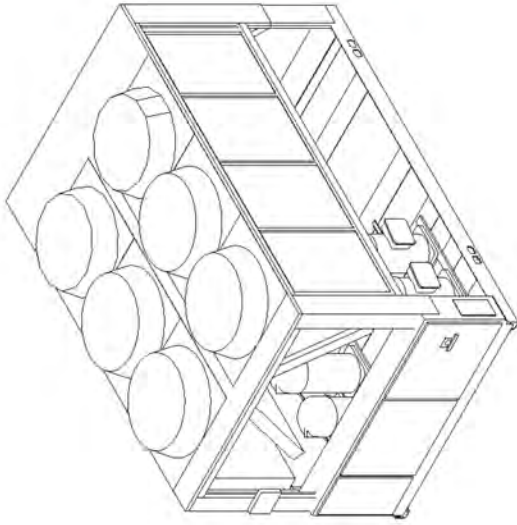
TOPSS Version Number: 227
 Data Generation Date: 8/20/2019



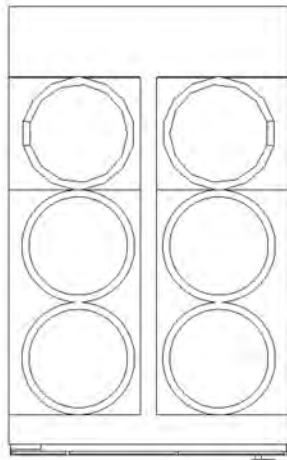
INLET/OUTLET WATER CONNECTION SIZE

BRAZE PLATE WATER VOLUME/STORAGE

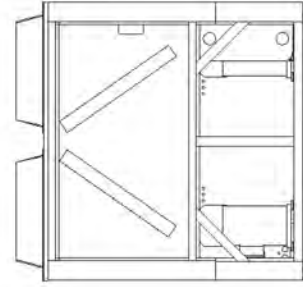
7.0 GAL (26.5 LITERS)



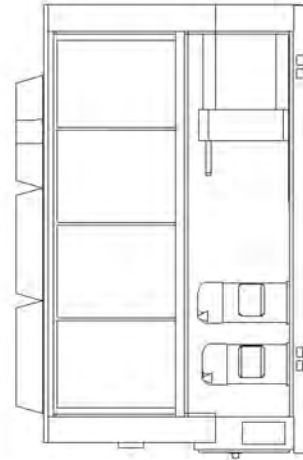
ISOMETRIC VIEW



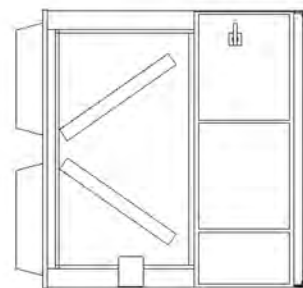
TOP VIEW



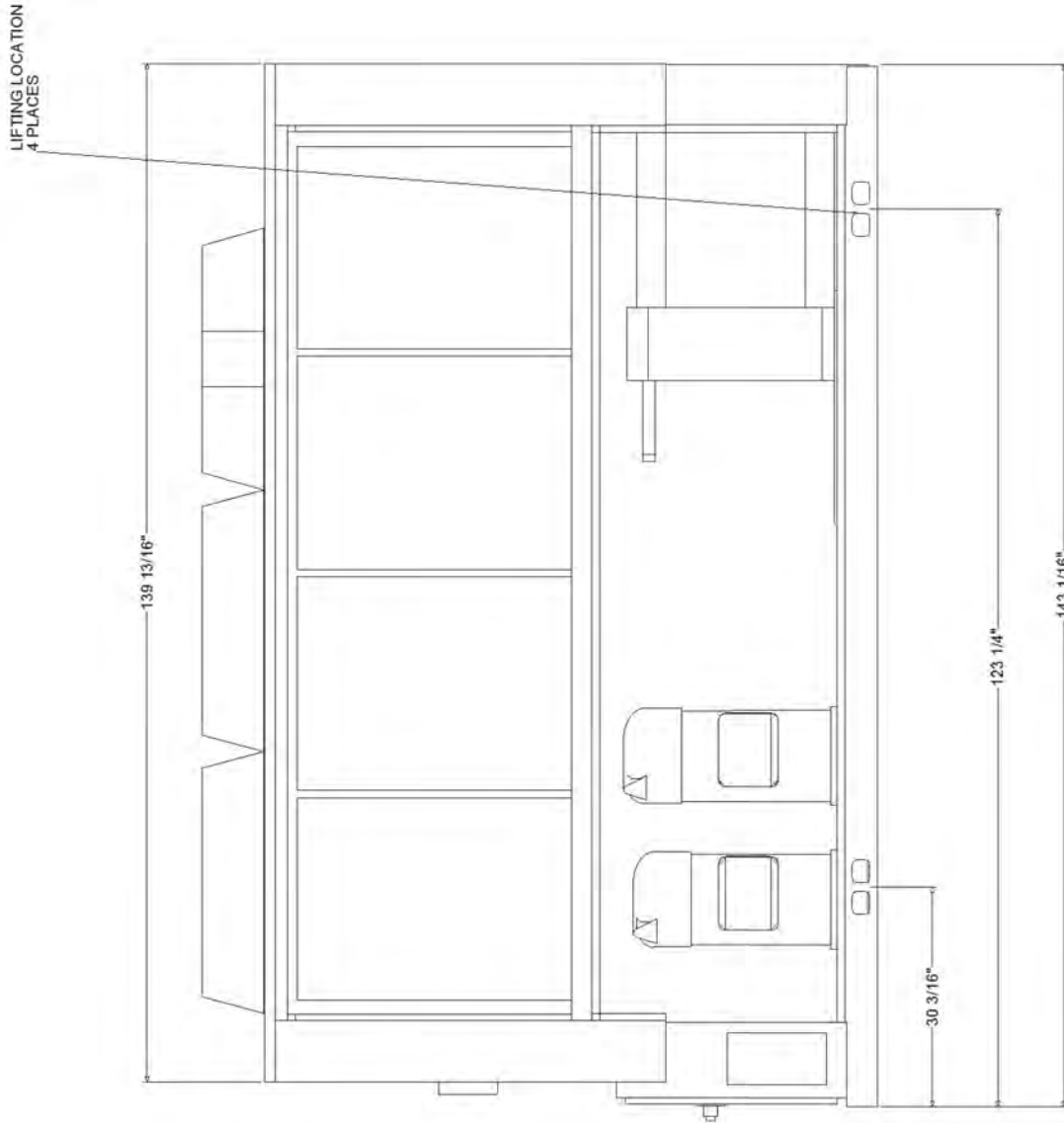
BACK VIEW



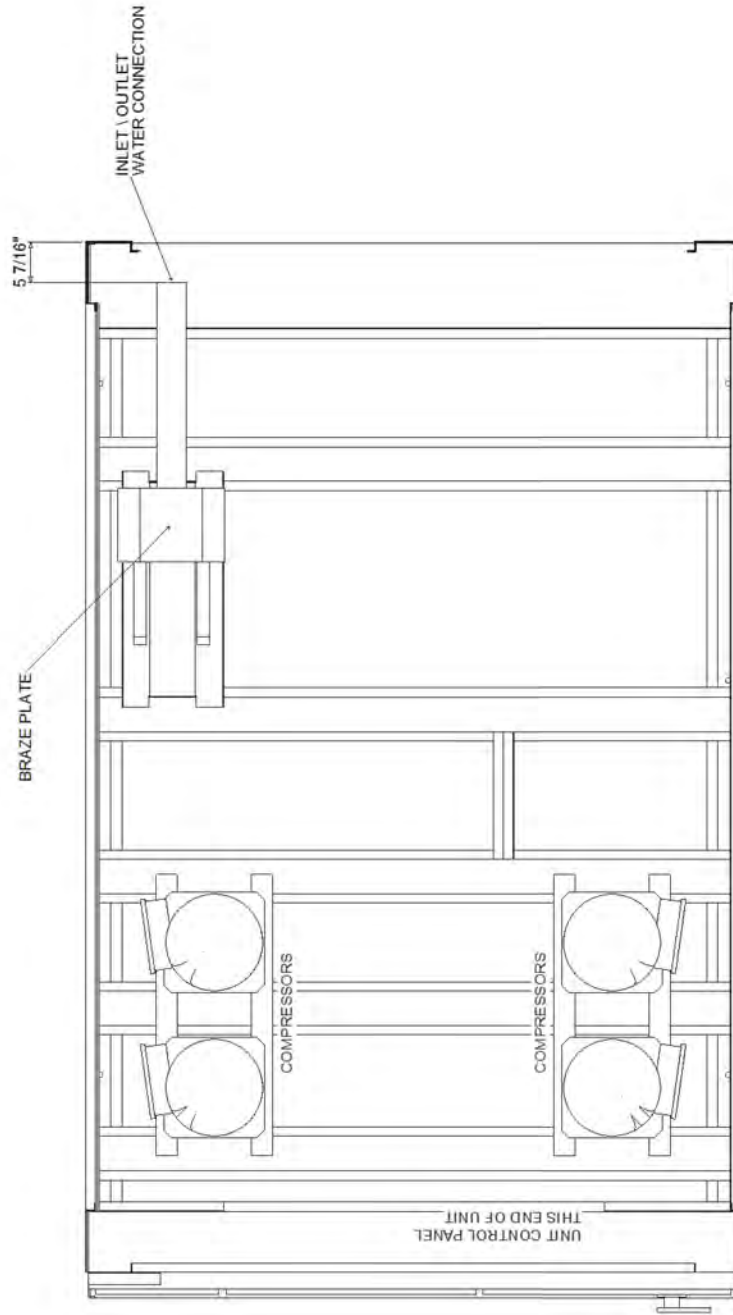
RIGHT SIDE VIEW



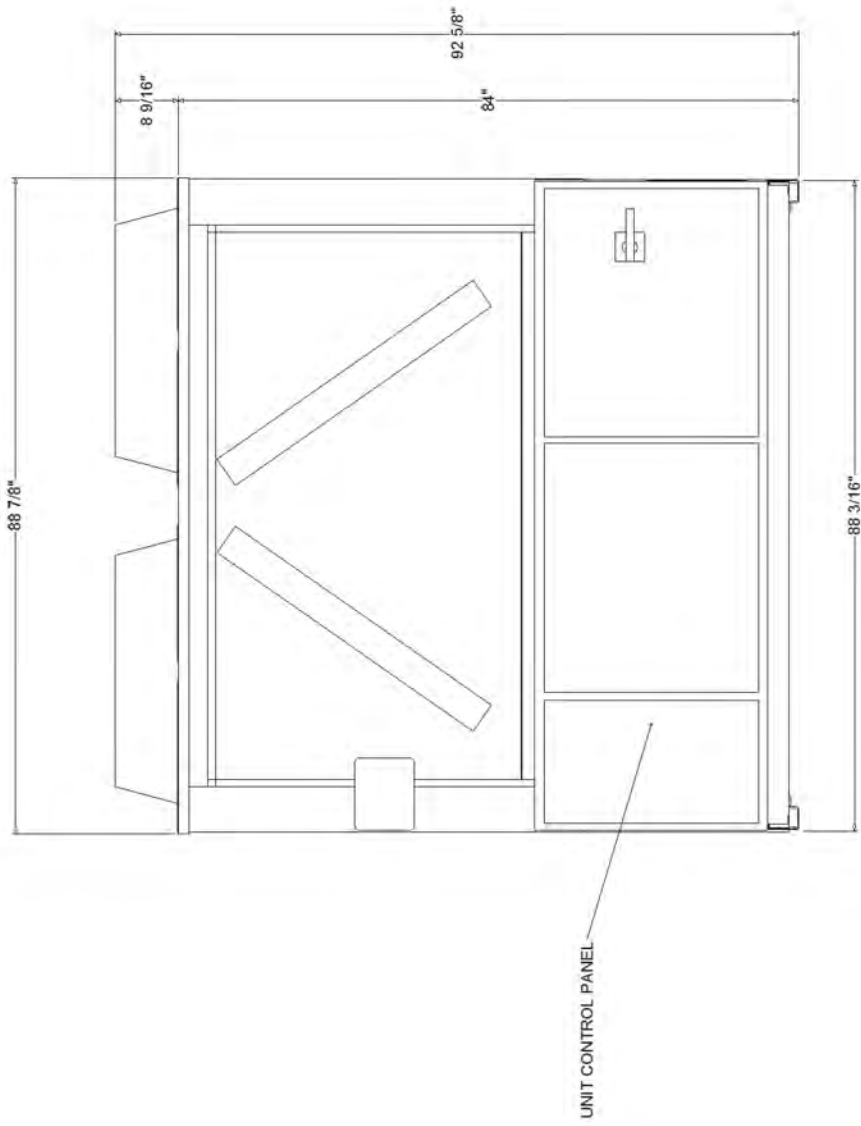
FRONT VIEW



RIGHT SIDE VIEW

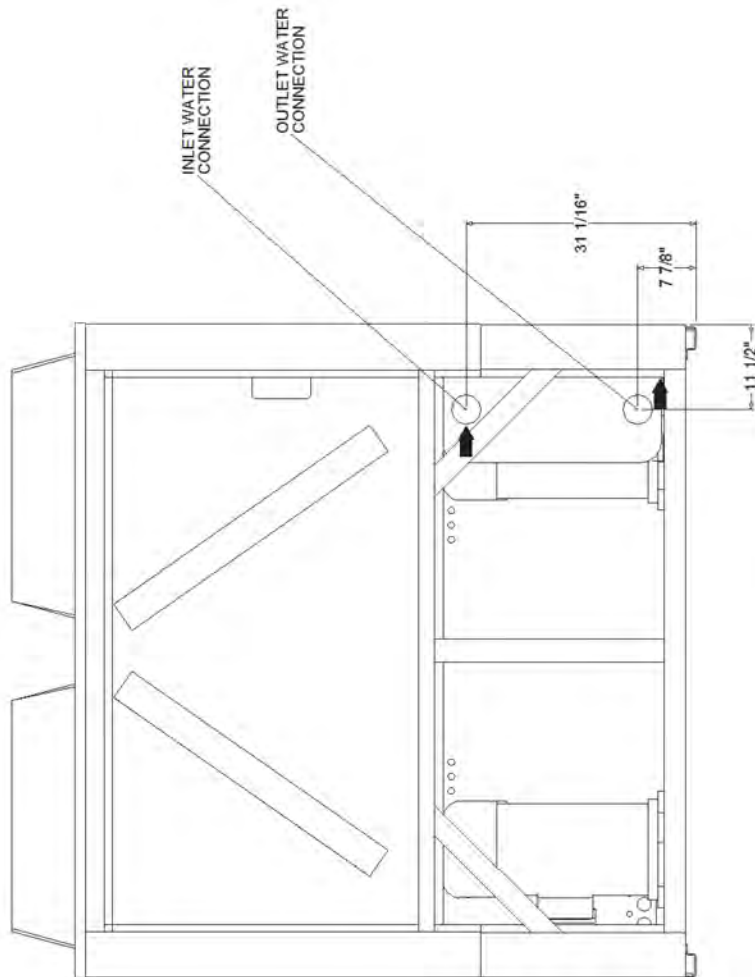


TOP VIEW
CONDENSER, CONTROL PANEL AND
VSD (WHEN ORDERED) REMOVED FOR CLARITY

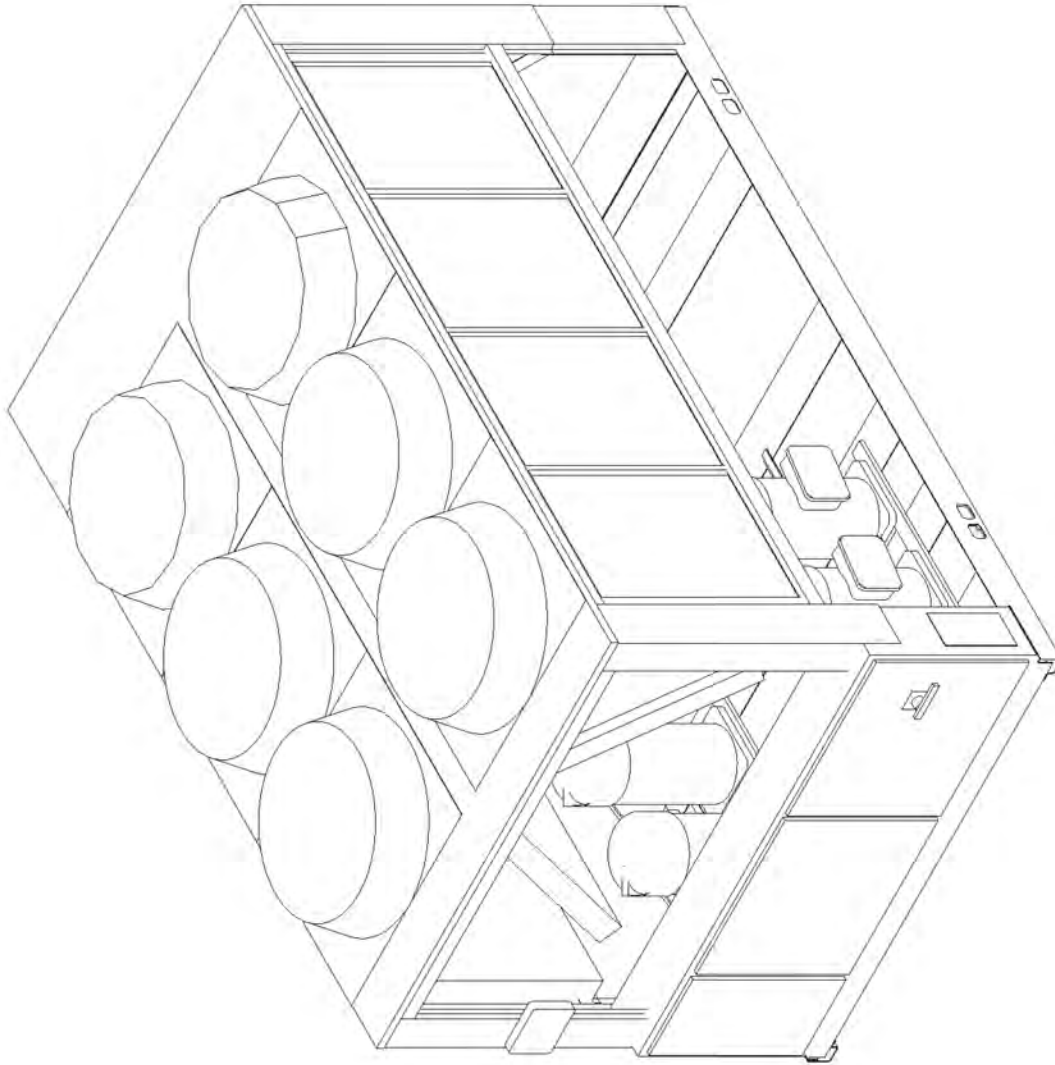


FRONT VIEW

LOUVERED PANELS NOT SHOWN
OVER CONTROL PANEL FOR CLARITY



BACK VIEW

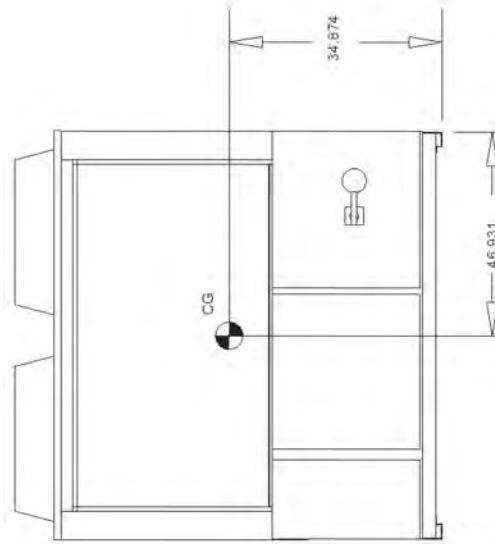


ISOMETRIC VIEW

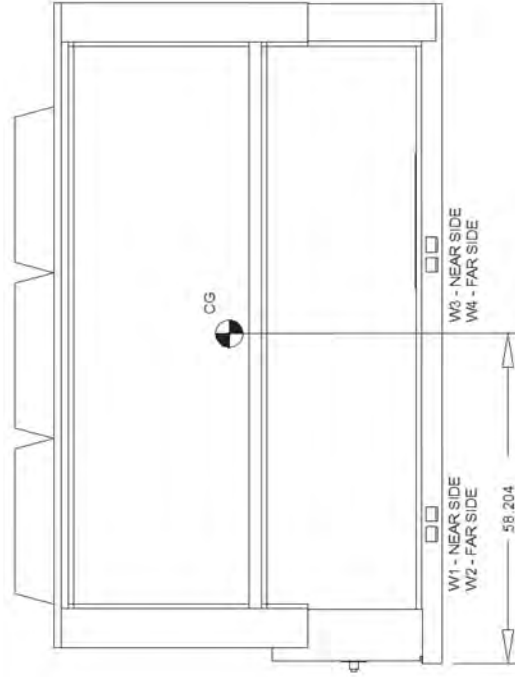
LOUVERED PANELS NOT SHOWN
OVER CONTROL PANEL FOR CLARITY

UNIT CENTER OF GRAVITY

LIFTING WEIGHTS				
W1	W2	W3	W4	SHIPPING WEIGHT
1,625.0	1,791.9	695.7	771.6	4,887.6



FRONT VIEW
CONTROL PANEL END

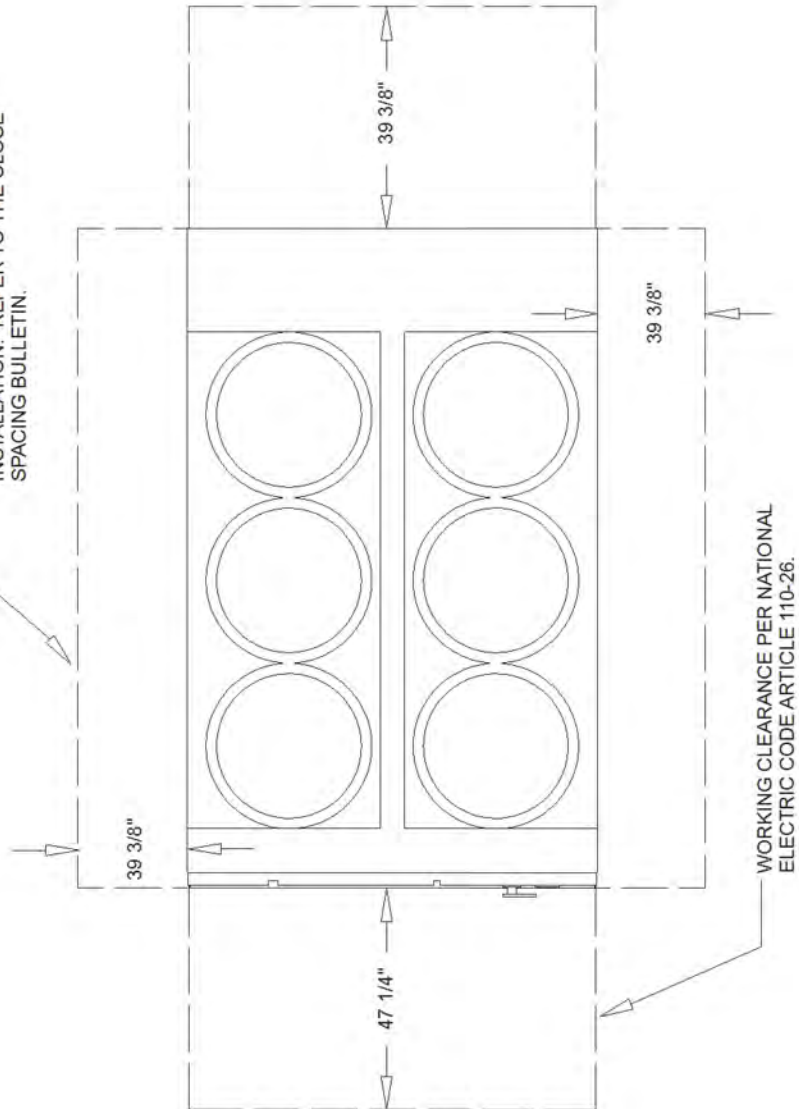


SIDE VIEW

UNIT CLEARANCE

NO OBSTRUCTIONS ABOVE THE CONDENSER

- NO OBSTRUCTIONS RECOMMENDED. Area Required for unit operation, maintenance, and access panel.
- MORE CLEARANCE MAY BE NEEDED FOR AIRFLOW DEPENDING UPON THE INSTALLATION. REFER TO THE CLOSE SPACING BULLETIN.



WORKING CLEARANCE PER NATIONAL ELECTRIC CODE ARTICLE 110-26.

TOP VIEW

UNIT RIGGING

LIFTING A UNIT WITH EQUAL LENGTH STRAPS WILL NOT PRODUCE A LEVEL UNIT DURING THE LIFT BECAUSE THE CG WILL NOT BE AT THE MIDPOINT BETWEEN THE BASE LIFTING HOLES. THE FOLLOWING ADJUSTMENTS MUST BE MADE TO PRODUCE A LEVEL LIFT:

- SINGLE SPREADER BAR LIFTING METHOD
IF THE UNIT CG IS CLOSER TO THE CONTROL PANEL, THE STRAPS ON THE CONTROL PANEL SIDE OF THE SPREADER BAR MUST BE ADJUSTED TO BE SHORTER THAN THOSE ON THE OPPOSITE SIDE OF THE SPREADER BAR, ALLOWING THE SPREADER BAR TO MOVE TOWARD THE CONTROL PANEL AND OVER THE UNIT CG. SEVERAL ADJUSTMENTS OF THE STRAP LENGTH MAY BE REQUIRED TO PRODUCE A LEVEL UNIT DURING LIFT.
- H-TYPE SPREADER BAR LIFTING METHOD
IF THE STRAPS FROM THE H BAR TO THE UNIT BASE ARE THE SAME LENGTH, THE CRANE LIFTING POINT ON THE CENTER WEB OF THE H BAR MUST BE ADJUSTED TO PRODUCE A LEVEL UNIT LIFT.

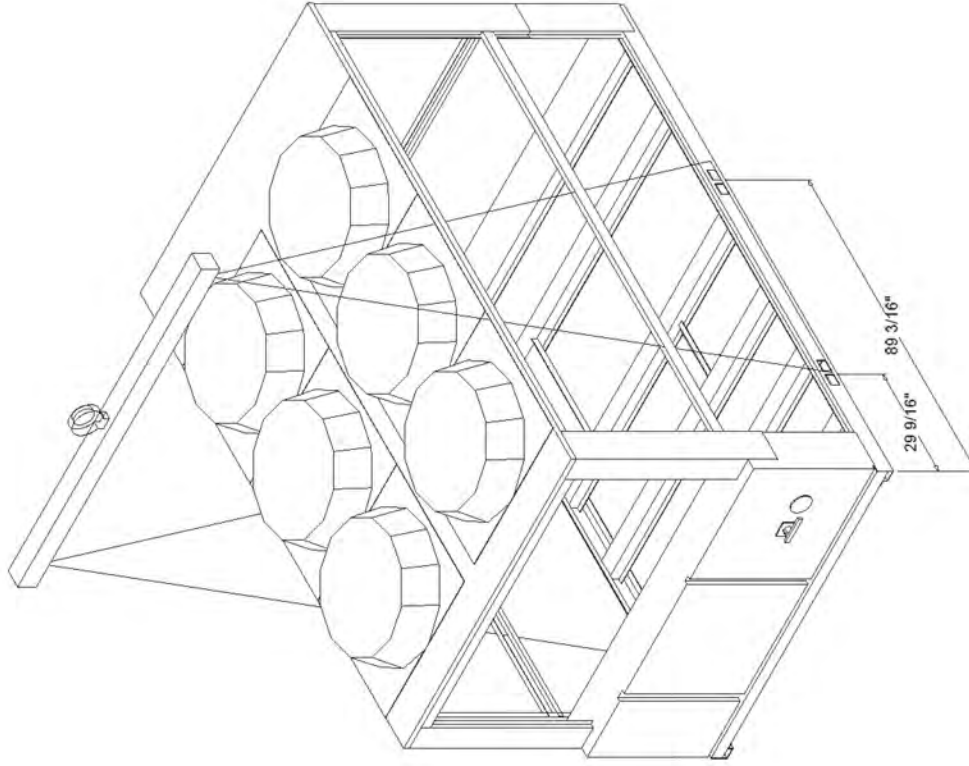
WARNING

IMPROPER LIFTING AND MOVING!

USE SPREADER BAR AS SHOWN IN DIAGRAM. REFER TO INSTALLATION MANUAL OR NAMEPLATE FOR UNIT WEIGHT. REFER TO INSTALLATION INSTRUCTIONS LOCATED INSIDE CONTROL PANEL FOR FURTHER RIGGING INFORMATION.

OTHER LIFTING ARRANGEMENTS COULD RESULT IN DEATH, SERIOUS INJURY OR EQUIPMENT DAMAGE.

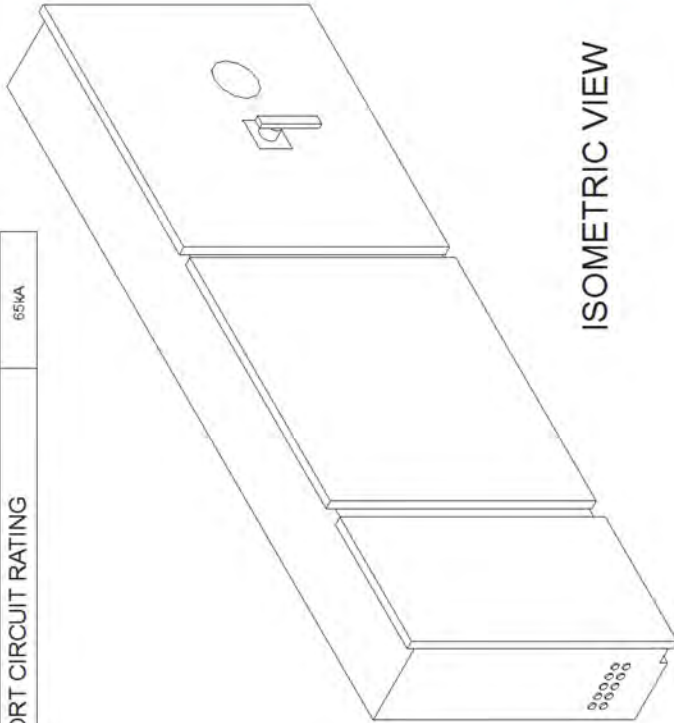
DO NOT ALLOW LIFTING STRAPS TO CONTACT UNIT DURING LIFT!



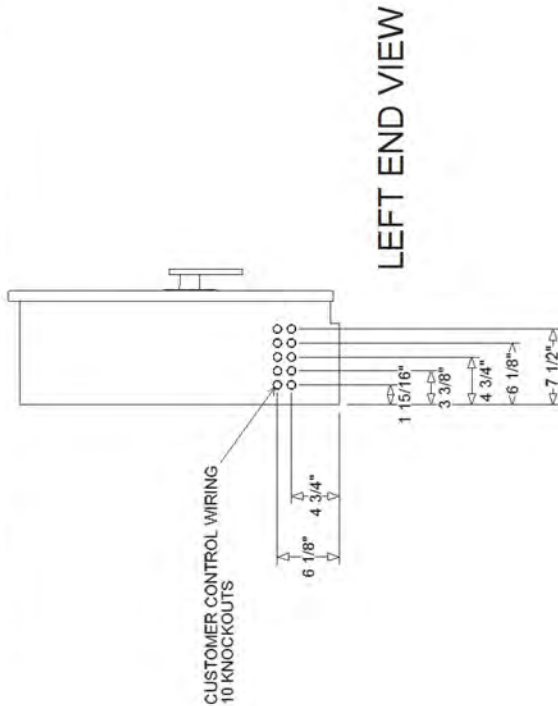
ISOMETRIC VIEW

SHORT CIRCUIT RATING 65KA

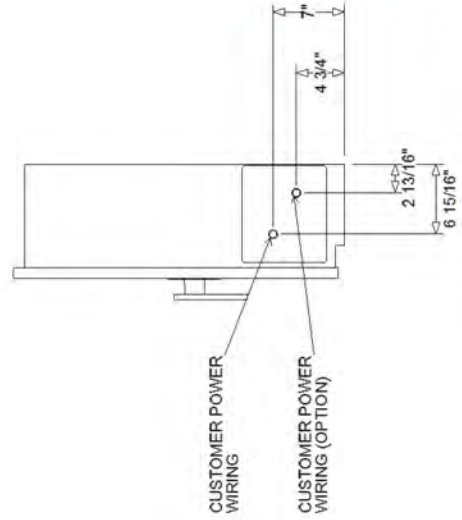
CUSTOMER WIRE SELECTION TABLE			
POWER WIRE CONNECTION TO CIRCUIT BREAKER (1Q1)			
UNIT SIZE	UNIT EFF	VOLTAGE	CIR 1 & 2 (SINGLE POINT POWER) LUG WIRE SIZE RANGE (PER PHASE) (1 MAX Conductor per phase) 3/0-350MCM
080	HIGH	460	



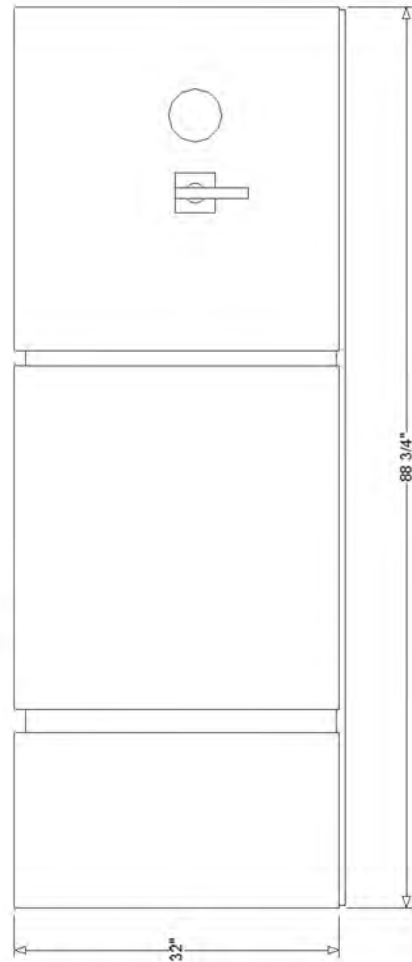
ISOMETRIC VIEW



LEFT END VIEW



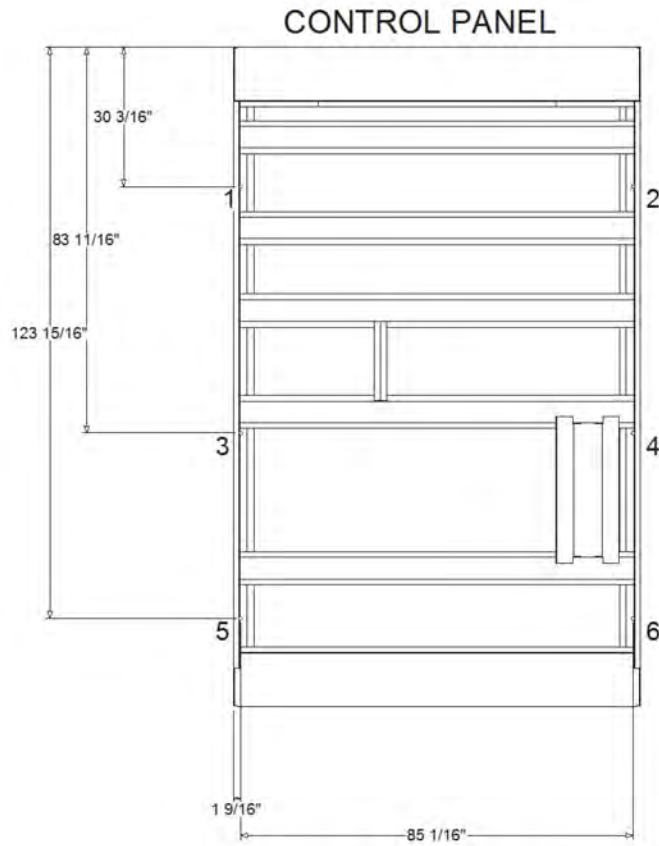
RIGHT END VIEW



FRONT VIEW

UNIT SIZE	MOUNTING LOCATIONS & POINT LOAD WEIGHTS								TOTAL OPERATING WEIGHT
	1	2	3	4	5	6	7	8	
080	1,159.9	1,613.3	754.9	713.0	339.1	319.0	N/A	N/A	4,898.7

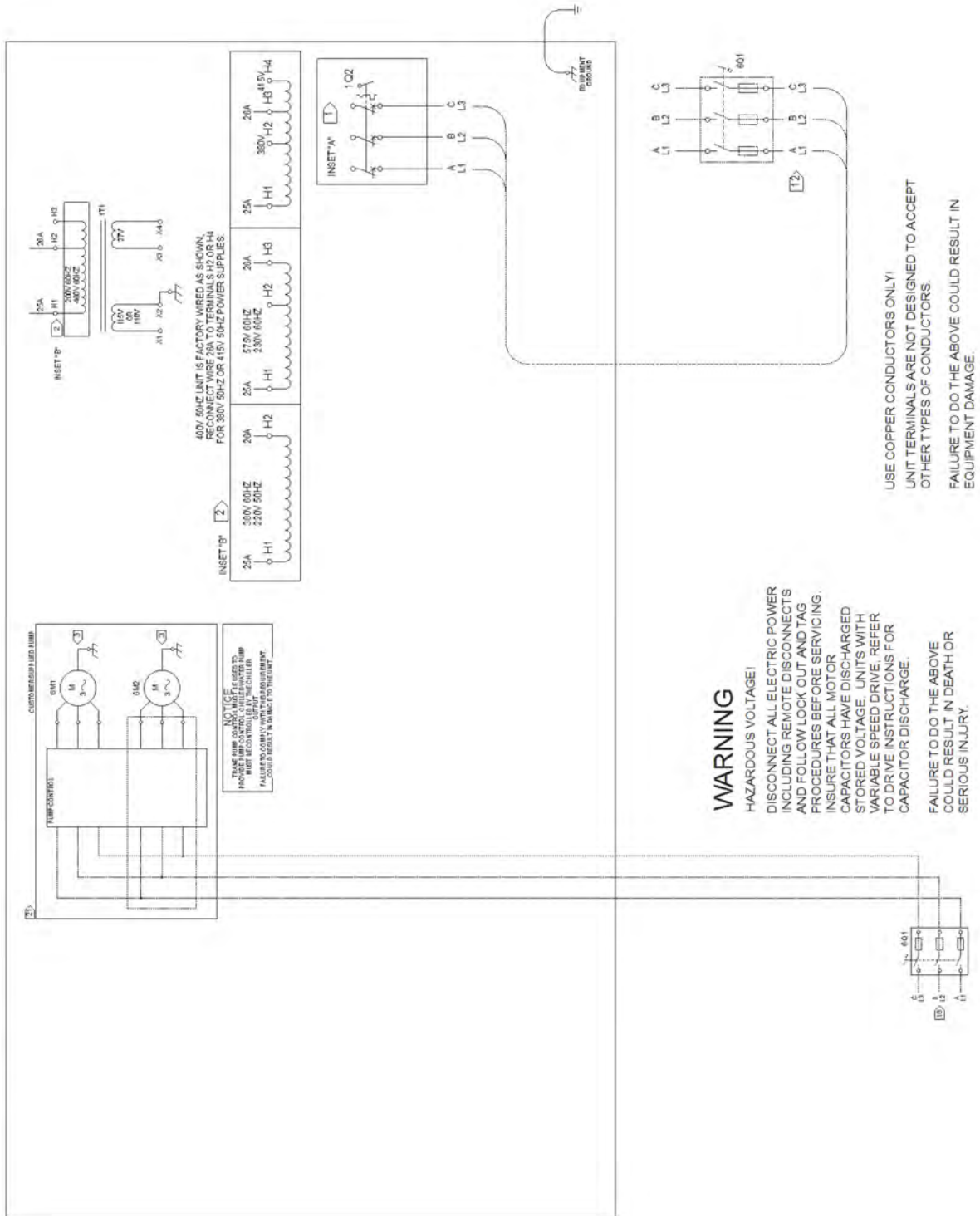
MOUNTING HOLE DIAMETER 3/4"



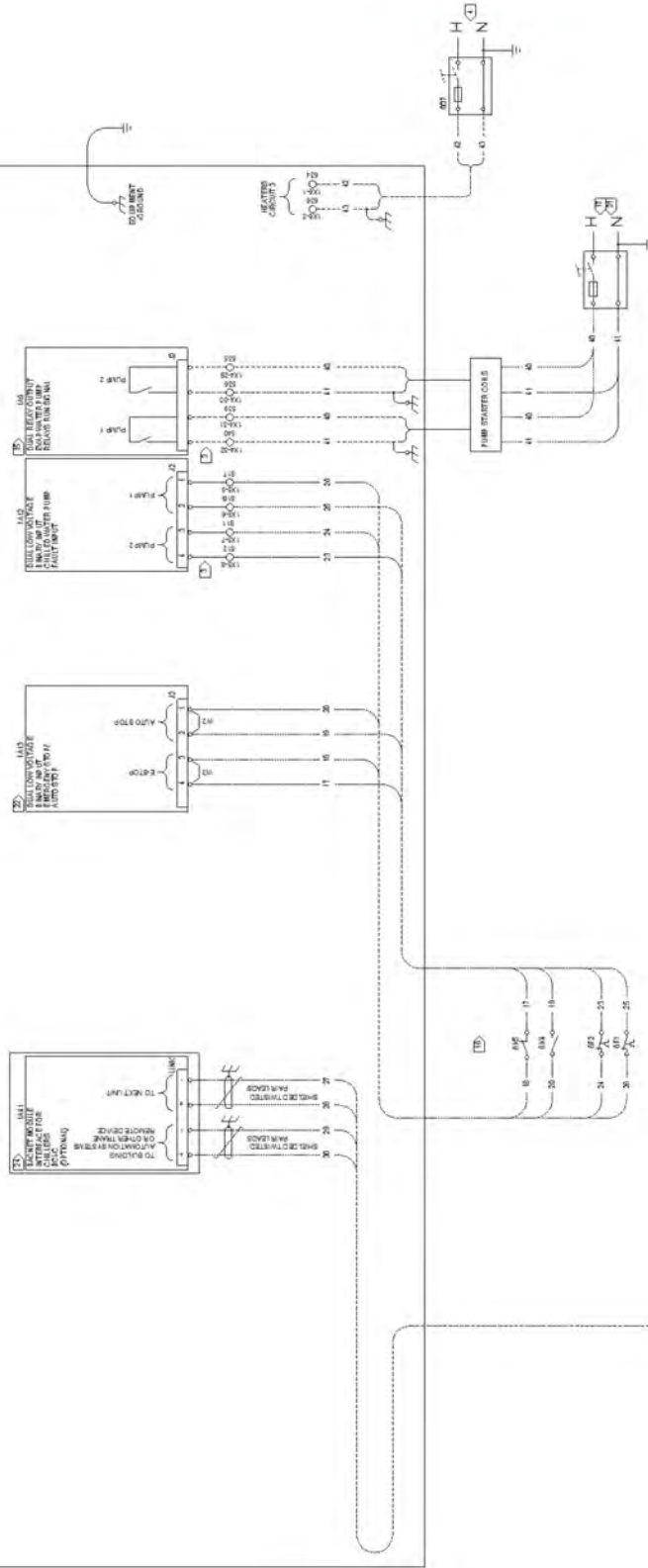
TOP VIEW

DIMENSIONS ARE REFERENCED FROM
THE END AND SIDE OF THE UNIT BASE

CONTROL PANEL
 PAGE 1 OF 2



CONTROL PANEL
 PAGE 2 OF 2



WARNING

HAZARDOUS VOLTAGE!
 DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE.
 FAILURE TO DO THE ABOVE COULD RESULT IN DEATH OR SERIOUS INJURY.

USE COPPER CONDUCTORS ONLY!
 UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.
 FAILURE TO DO THE ABOVE COULD RESULT IN EQUIPMENT DAMAGE.

- 1 SINGLE SOURCE POWER IS PROVIDED AS STANDARD ON THESE PRODUCTS, FIELD CONNECTIONS ARE MADE TO 1X1, OR 1Q2.
- 2 FOR VOLTAGES 200V/60HZ, 220V/50HZ, 380V/60HZ, 460V/60HZ, WIRE 26A SHALL BE CONNECTED TO H2. FOR VOLTAGES 230V/60HZ & 575V/60HZ, WIRE 26A SHALL BE CONNECT TO H3. 400V/50HZ UNIT IS FACTORY WIRED WITH 26A CONNECTED TO H3 - RECONNECT WIRE 26A TO H2 FOR 380V/50HZ, OR H4 FOR 415V/50HZ. H4 IS ONLY AVAILABLE WITH 400V/50HZ PANELS.
- 3 FIELD CONNECTIONS ARE ONLY MADE IN A CUSTOMER PROVIDED PUMP (PTYP=NONE), THESE CONNECTIONS WILL BE MADE BY THE FACTORY WHEN THE PUMP IS PROVIDED BY THE FACTORY (PTYP=DHHP).
- 4 CUSTOMER SUPPLIED POWER 115/60/1 OR 220/50/1 TO POWER RELAYS. MAX FUSE SIZE IS 20 AMPS. GROUND ALL CUSTOMER SUPPLIED POWER SUPPLIES AS REQUIRED BY APPLICABLE CODES. GREEN GROUND SCREWS ARE PROVIDED IN UNIT CONTROL PANEL.
- 5 WIRED TO NEXT UNIT. 22 AWG SHIELDED COMMUNICATION WIRE EQUIVALENT TO HELIX LF22P0014216 RECOMMENDED. THE SUM TOTAL OF ALL INTERCONNECTED CABLE SEGMENTS NOT TO EXCEED 4500 FEET. CONNECTION TOPOLOGY SHOULD BE DAISY CHAIN. REFER TO BUILDING AUTOMATION SYSTEM (BAS) COMMUNICATION INSTALLATION LITERATURE FOR END OF LINE TERMINATION RESISTOR REQUIREMENTS.
- 6 WIRED TO TRACER OR OTHER TRANE REMOTE DEVICE. 22 AWG SHIELDED COMMUNICATION WIRE EQUIVALENT TO HELIX LF22P0014216 RECOMMENDED. THE SUM TOTAL OF ALL INTERCONNECTED CABLE SEGMENTS NOT TO EXCEED 4500 FEET. CONNECTION TOPOLOGY SHOULD BE DAISY CHAIN. REFER TO BUILDING AUTOMATION SYSTEM (BAS) COMMUNICATION INSTALLATION LITERATURE FOR END OF LINE TERMINATION RESISTOR REQUIREMENTS.
- 7 WIRED TO CUSTOMER CHILLED WATER SET POINT 2-10V OR 4-20mA.
- 8 WIRED TO CUSTOMER EXTERNAL DEMAND LIMIT 2-10V OR 4-20mA.
- 9 WIRED TO CUSTOMER 2-10V OR 4-20mA % CAPACITY ANNUNCIATOR.
- 10 WIRED TO TRACER OR OTHER REMOTE DEVICE.
- 11 REFER TO CGAM ELECTRICAL SCHEMATIC FOR SPECIFIC ELECTRICAL CONNECTION INFORMATION AND NOTES PERTAINING TO WIRING INSTALLATION.
- 12 ALL UNIT POWER WIRING MUST BE 600 VOLT COPPER CONDUCTORS ONLY AND HAVE A MINIMUM TEMPERATURE INSULATION RATING OF 90 DEGREE C. REFER TO UNIT NAMEPLATE FOR MINIMUM CIRCUIT AMPACITY AND MAXIMUM OVERCURRENT PROTECTION DEVICE. PROVIDE AN EQUIPMENT GROUND IN ACCORDANCE WITH APPLICABLE ELECTRIC CODES. REFER TO WIRE RANGE TABLE FOR LUG SIZES.
- 13 ALL FIELD WIRING MUST BE IN ACCORDANCE WITH NATIONAL ELECTRIC CODE AND LOCAL REQUIREMENTS.
- 14 ALL CUSTOMER CONTROL CIRCUIT WIRING MUST BE COPPER CONDUCTORS ONLY AND HAVE A MINIMUM INSULATION RATING OF 300 VOLTS. EXCEPT AS NOTED, ALL CUSTOMER WIRING CONNECTIONS ARE MADE TO CIRCUIT BOARD MOUNTED BOX LUGS WITH A WIRE RANGE OF 14 TO 18 AWG OR DIN RAIL MOUNTED SPRING FORCE TERMINALS.
- 15 UNIT PROVIDED DRY CONTACTS FOR THE CONDENSER/CHILLED WATER PUMP CONTROL. RELAYS ARE RATED FOR 7.2 AMPS RESISTIVE, 2.88 AMPS PILOT DUTY, OR 1/2 HP, 7.2 FLA AT 120 VOLTS 60 HZ, CONTACTS ARE RATED FOR 5 AMPS GENERAL PURPOSE DUTY 240 VOLTS.
- 16 CUSTOMER SUPPLIED CONTACTS FOR ALL LOW VOLTAGE CONNECTIONS MUST BE COMPATABLE WITH DRY CIRCUIT 24 VOLTS DC FOR A 12 mA RESISTIVE LOAD. SILVER OR GOLD PLATED CONTACTS RECOMMENDED.
- 17 FIELD CONNECTIONS ARE ONLY MADE IN A CUSTOMER PROVIDED PUMP. THESE CONNECTIONS WILL BE MADE BY THE FACTORY WHEN THE PUMP IS PROVIDED BY THE FACTORY. CUSTOMER SUPPLIED POWER 115V, 60Hz, 1PH.
- 18 CUSTOMER SUPPLIED 3 PHASE POWER.
- 19 OPTIONAL FIELD ASSIGNED PROGRAMMABLE RELAYS (STAT=PRLY). CLASS 1 FIELD WIRED MODULE, RELAY AT 120V: 7.2A RESISTIVE 2.88A PILOT DUTY, 1/2 HP 7.2FLA, AT 240VAC: 5 AMPS GENERAL PURPOSE.
- 20 WIRED TO CUSTOMER 0-10 VDC PUMP SPEED SIGNAL.
- 21 WHEN FACTORY PROVIDED PUMP IS NOT SELECTED. CUSTOMER MUST SUPPLY SUITABLE PUMP SYSTEM. REFER TO PUMP MANUFACTURER FOR WIRING REQUIREMENTS.
- 22 THE CONTACTS FOR AUTO STOP AND EMERGENCY STOP SWITCHES ARE JUMPERED AT THE FACTORY BY JUMPERS W2 & W3 TO ENABLE UNIT OPERATION. IF REMOTE CONTROL IS DESIRED, REMOVED THE JUMPERS AND CONNECT TO THE DESIRED CONTROL CIRCUIT.
- 23 1A15, LCI MODULE USED WHEN (COMM = LCI).
- 24 1A41, BACNET INTERFACE MODULE USED WHEN (COMM = BCNT).

Manufacturer Specification Sheets

ECM 23: Siding Replacement

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James Hardie® Building Products

Transform Your Home Into Your Dream Home

Siding

Trim

Soffit

Weather Barrier

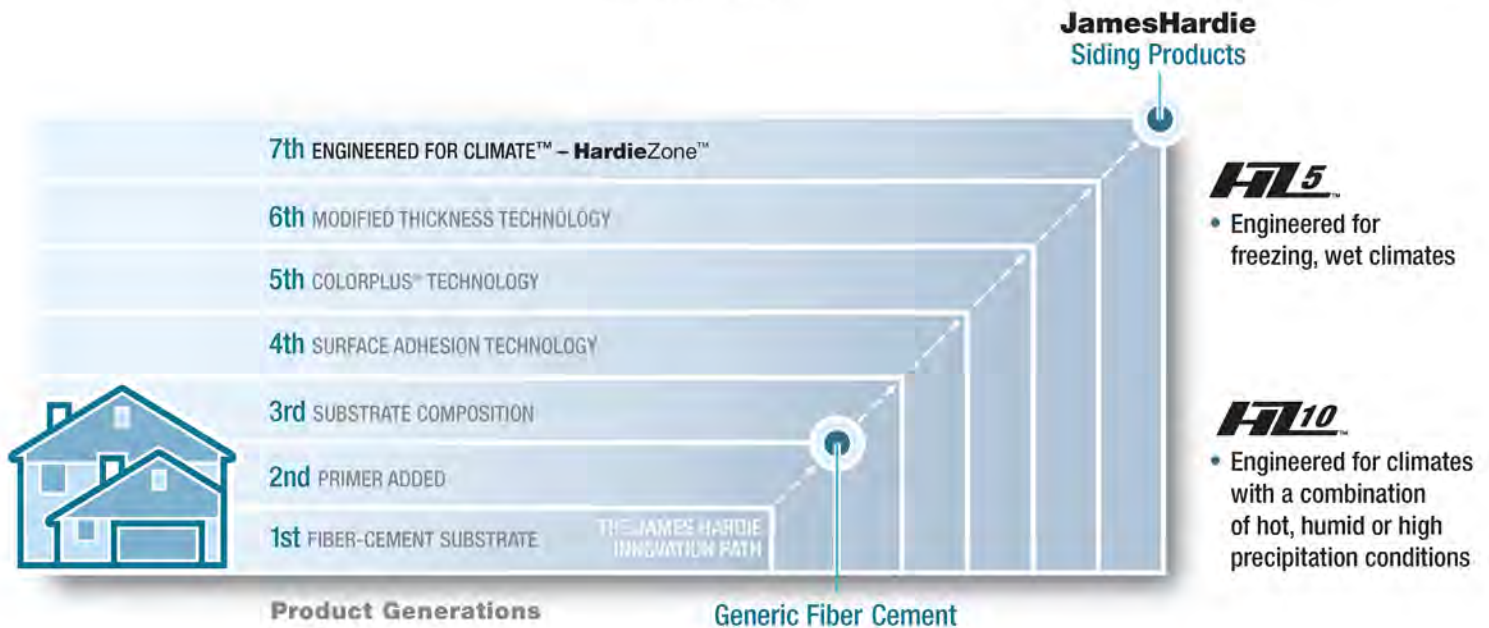


James Hardie® Siding Products

HardieZone™ System

Your home's exterior says a lot about you. Unfortunately, Mother Nature doesn't care. Whether it's sheets of rain, dry heat, freezing temperatures, ice and snow, or hurricane force winds, siding is under constant attack. That's why for more than three decades, James Hardie has continued to push back on everything Mother Nature could dish out. Four million beautiful homes stand as a testament to our persistence. And as the most trusted brand of siding in America, James Hardie has taken that level of defense to an even higher level, with siding that's engineered for climate. We call it The HardieZone™ System.

James Hardie has always been ahead of the siding curve. With the development of the HardieZone™ System, that gap has grown wider. James Hardie's commitment to Research & Development has led to our seventh generation of product advancement, which is the highest performing fiber cement siding in the industry. The HardieZone™ System represents a logical extension of Hardie technology: "one size does not fit all."



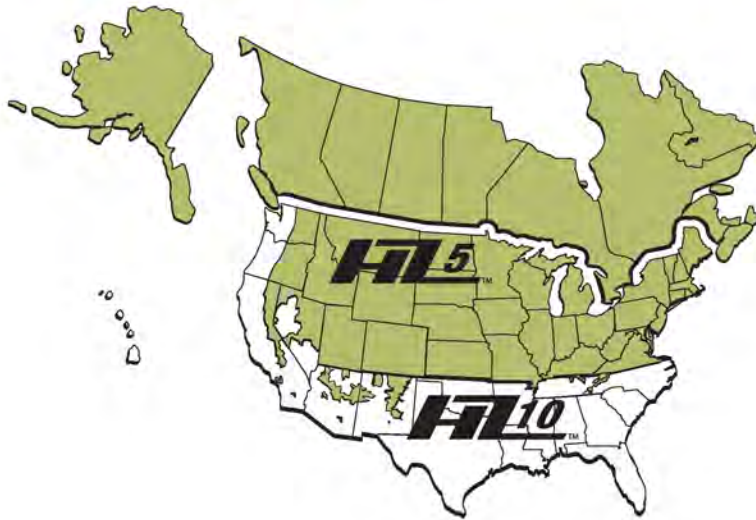
Our best warranty ever. Unprecedented peace of mind.

We're so confident The HardieZone™ System can withstand the rigors of the North American climate we're offering our strongest warranty. This outstanding 30-year limited, transferable warranty offers non-prorated product coverage for the entire 30 years. That's the type of peace of mind homeowners have asked for.

James Hardie® Siding Products

HardieZone™ System

For the first time ever, you can have the ideal home exterior for your local climate. So say goodbye to the days of one-siding-fits-all. It's a given that siding must stand up to the elements. That's why we based the HardieZone™ System on the eight individual climatic variables that primarily affect long-term performance of siding.



- Zones 1-5
- Zones 6-10

Using these factors we arrived at these distinct climatic zones. Though different, we found common variables in certain regions, allowing us to engineer one product line for zones 1 through 5, and another product line for zones 6 through 10.

HZ5™ Products

The HZ5™ product line is right at home in climates with freezing temperatures, extreme seasonal temperature variations, and snow and ice. To ensure its beauty matches its durability, we've engineered the surface for higher performance, giving it superior paint adhesion and moisture resistance. So you aren't getting an exterior that just performs well in cold, nasty climates. You're getting an exterior engineered just for it.

HZ10™ Product

Even when Mother Nature isn't very motherly, the HZ10™ product line delivers legendary James Hardie durability. This siding was engineered for areas with hurricane-force winds, salty sea air of the coast, and the brutal, humid heat of the Deep South. Engineered specifically for this climate, HZ10™ boards resist cracking, splitting, rotting and swelling season after hot, humid, tropical storm season. Our latest breakthrough in performance enhancement is our new distinctive primer. The unique primer outperforms generic fiber cement primer with improved paint adhesion and moisture resistance and is developed for the wide range of field paint products that are available. The new look of the primer will also distinguish your job sites and separate you from builders who use generic fiber cement. Standard manufacturer recommended field paint application methods will be able to sufficiently hide the primer and it will not affect the appearance of your paint.

James Hardie® Complete Exterior



Would you ever buy half a home?

Of course not. While there are other options of siding, only James Hardie provides a complete line of siding products including soffit, trim, and fascia that are all engineered for your specific climate. Each component kept beautiful for decades with a factory-applied, baked-on coating of paint that was engineered to stand up to the high UV levels that fade most field-applied paints in just a few short years. Only James Hardie siding with ColorPlus® Technology offers you this kind of complete siding solution. It's beauty without a timetable. It's character with low maintenance. It's peace of mind you won't find anywhere else.

James Hardie® Siding Products with ColorPlus® Technology



Your home should reflect your personal style and taste. That's why architectural design and color have become more important when building or re-siding a home. Utilizing James Hardie® siding with ColorPlus® Technology on your home allows you to maximize these opportunities. James Hardie siding with ColorPlus Technology is an innovative product with a baked-on finish, providing unprecedented color consistency in a wide range of colors. When the painting of your home is left to painting on-site you can not be assured of a quality and consistent finish. However products with ColorPlus Technology provide you years of lasting beauty and peace of mind with a 15-year finish warranty.

ColorPlus® Technology	Painting On-Site
Fully engineered complete coating system	Paint out of a can
Color coating specifically formulated for use with James Hardie siding products – Revolutionary formulation unlike anything available in stores	Paint generically formulated for any surface or weather conditions reduces performance
Environmentally controlled, baked on finish applied in the factory	Field spray impacted by weather conditions – Temperature, moisture, dirt, wind. Too many variables
Multi-coat (more than 2) complete coating system	Generally 1 or 2 coats
Fade resistant – Up to 30% better than field spray*	Fades at a greater rate – Dependant upon quality of paint used
Highest level of consistency – Colors computer matched more precisely than the auto re-finishing industry! Twice as good as the human eye, 3 times better than paint off the shelf	5 cans of paint = 5 slightly different shades
Single source warranty – Siding and color coating	Separate warranty that varies by paint manufacturer
Saves approximately \$5000 over next 8 years	Typically repainted in 7-8 years

*James Hardie accelerated QUV test results compared to nationally available premium paint in lab environment.

Here's to a Lifetime of Beautiful First Impressions.

James Hardie combines innovative solutions with a relentless commitment to increase the value and character of your home, so that we can give you confidence to make your vision possible.

Whether you prefer a traditional exterior with HardiePlank® lap siding, or the unique look of HardieShingle® siding or Board & Batten, James Hardie will provide the design options you need to increase curb appeal and create a lasting impression.



*HardiePlank® Siding & HardieShingle® Siding
(Plank-Chestnut Brown & Countrylane Red)*



*HardiePanel® Siding & HardieTrim® Boards
(Panel-Countrylane Red, Trim-Arctic White)*



*HardiePlank® Siding & HardieTrim® Boards
(Plank-Heathered Moss, Trim-Arctic White)*



*HardieShingle® Siding -
Straight Edge & HardiePlank®
Siding (Plank-Tuscan Gold,
Shingle-Monterey Taupe)*

Whether you are considering building a new home or remodeling your current home, make sure you consider James Hardie® Siding with ColorPlus® Technology – The #1 Return on Your Remodeling Investment.



*HardiePanel® Siding &
HardieTrim® Batten Boards
(Navajo Beige)*



*HardiePlank® Siding & HardieTrim® Boards
(Plank-Woodland Cream, Trim-Arctic White)*



*HardiePlank® Lap Siding
(Woodstock Brown)*



*HardieShingle® Siding -
Staggered Edge
(Boothbay Blue)*



James Hardie® Siding Products are rare in that they combine beauty and durability and also are considered “Green and Sustainable” by industry professionals.




NAHB NATIONAL GREEN BUILDING PROGRAM™



To find your HardieZone™ visit www.hardiezone.com or call 1-866-9HARDIE (1-866-942-7343)



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Printed in the U.S.A.

HS0933

James Hardie® Siding Comparison Chart

For real value, wood and wood composite siding products don't cut it.

Wood makes a great first impression. But what you really want is a great first impression that lasts. While all wood and wood composite siding starts out looking good, they don't stay that way.

That's why more and more homeowners across America are turning to James Hardie® siding products with ColorPlus® Technology, which combine the beauty and character of wood with the durability and low maintenance of fiber-cement.

Which Siding Would You Rather Have Protecting Your Home?

James Hardie® Siding Products with ColorPlus® Technology

vs.

Wood and Wood Composite Siding

James Hardie siding is non-combustible. Approved for fire-rated construction.



Flame Resistance



Wood based siding will burn when exposed to a significant source of heat or flame.

The only siding product engineered for your local climate. Resists rotting, warping, cracking, hail, and high winds up to 150 mph.



Weather Resistance



Rot caused by moisture exposure is a common problem in wood based siding.

Factory applied, baked on paint finish provides up to 30% better fade resistance than competitive products. †



Paint Durability



Wood based siding shrinks and swells when exposed to moisture which causes paint to crack and flake. Requires frequent painting, caulking and spot repairs to maintain its original appearance.

James Hardie siding is resistant to woodpeckers, termites and other pests known to cause damage to wood siding.



Pest Resistance



Wood based siding is easily damaged by woodpeckers, termites and other pests.

† James Hardie accelerated QUV tests results compared to nationally available premium paint in lab environment.



James Hardie® Siding Comparison Chart

Why Settle for Vinyl?

Don't let vinyl siding companies pull the plastic over your eyes. Thin, unnatural vinyl siding can't provide the rich wood grain finishes that give your home real lasting curb appeal.

To give your home the beauty and charm of a natural wood texture with unsurpassed durability, choose James Hardie® fiber cement siding with ColorPlus® Technology.

Which Siding Would You Rather Have Protecting Your Home?

James Hardie® Siding Products with ColorPlus® Technology

vs.

Vinyl Siding

James Hardie siding is noncombustible. Approved for fire-rated construction.



Flame Resistance



Vinyl siding will melt or burn when exposed to a significant source of heat or flame.

Factory applied, baked on paint finish provides up to 30% better fade resistance than competitive products.†



Fade Resistance



Color can't be changed and is susceptible to fading. Fades at noticeably different rates, creating color inconsistency.

Resists rotting, warping, cracking, hail, and high winds up to 150 mph.



Weather Resistance



Can become brittle when exposed to extremely cold weather. Easily damaged by hail, limbs, and other flying debris.

James Hardie siding is twice as thick as vinyl, providing deeper shadow lines and a more natural wood grain texture.



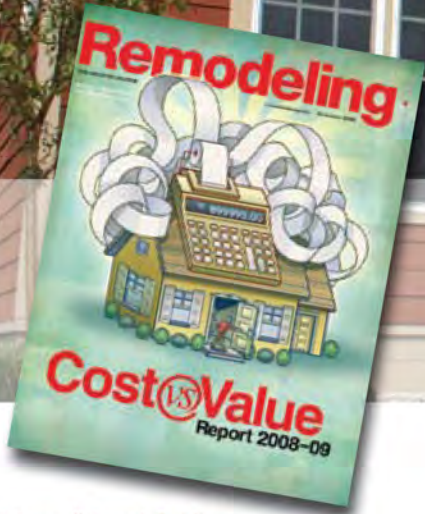
Appearance



Even premium vinyl siding is only 5/100" thick. Unnatural, imitation-wood look completely lacks character and curb appeal.

† James Hardie accelerated QUV tests results compared to nationally available premium paint in lab environment.





Names "Upscale" siding
 Your #1 Investment
 - *Remodeling* magazine

#1 Return on Investment

For the 4th Year in a Row, Re-Siding Your Home with James Hardie® Fiber Cement is the #1 Return on Investment

Re-side with James Hardie® Fiber Cement Siding— The Best Choice.

Project	2008 Rank	2007 Rank	2006 Rank	2005 Rank
Siding Replacement - Fiber Cement	1	1	1	1
Mid Range Bathroom Remodel (Update an existing 5' x 7' bathroom)	11	6	4	2
Minor Kitchen remodel (replace wall oven and cook top with energy efficient models)	5	3	7	3
Two-Story Addition (Add a first-floor family room and a second-floor bedroom with full bath)	16	10	6	5

2008 Hanley Wood, LLC. Excerpted by permission. Complete data from the Remodeling 2008 Cost vs. Value Report is available at www.costvsvalue.com



A Smart Investment

The Pros Know

There are many other projects you can tackle, but only re-siding with fiber cement gives you the best return on your investment 4 years in a row.

- Residing with fiber cement gives a 31% better return than adding a bathroom and costs \$61k less to complete
- Minor kitchen remodel gives you a 10% less return on investment than re-siding with fiber cement
- Adding a second story addition nets you 23% less return on investment than fiber cement re-siding

Remodeling magazine is the industry's leading home improvement magazine. Since 1988, Remodeling magazine's Cost vs. Value Report has compared construction costs for common remodeling projects with the value they add to a home at resale in the current real estate market. The results – upscale siding projects using fiber-cement return the highest value at resale.

Manufacturer Specification Sheets

ECM 24: Roof Replacement

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Meets the requirements of ASTM D 4637, Type I

Features and Components

Membrane: Nonreinforced, cured EPDM (ethylene propylene diene monomer).

Fully Extruded: Produces fewer air voids, more uniform thickness and smoother sheets.

Vulcanization Process: Combines two layers of membrane to produce a fully cross-linked monolithic membrane.

Membrane Formulation: Performs in extreme temperature climates and withstands differential movement (elongation).

UV-Stabilization Properties: Offers outstanding ozone and weather resistance delivering one of the longest service lives available.

Technical Expertise: Backed by 30+ years of EPDM experience and installations.



Component

M
Membrane

Single Ply

Color

Black

System Compatibility *This product may be used as a component in the following systems. Please reference product application for specific installation methods and information.*

Multi-Ply	HA	CA	HW	SA	MF	FA	BA
	HA	CA	HW	SA	MF	FA	BA

Do not use with Multi-Ply systems

Single Ply	HA	CA	HW	SA	MF	FA	BA
	HA	CA	HW	SA	MF	FA	BA

Compatible with the selected Single Ply systems above

Key: HA = Hot Applied CA = Cold Applied HW = Heat Weldable SA = Self Adhered MF = Mechanically Fastened FA = Fully Adhered BA = Ballasted

Energy and the Environment

Property	Value
Reflectivity* (ASTM C 1549)	0.06
Emissivity* (ASTM C 1371)	0.88
Post-consumer Recycled Content	0%
Pre-Consumer Recycled Content	0%

*Test methods for reflectivity and emissivity are LEED®- and CRRC®-approved.

Peak Advantage® Guarantee Information

Enhanced guarantees are now available on certain systems for wind and puncture. Consult your local sales representative for more information and for specific guarantee terms and costs.

Product	Guarantee Term
When used in most JM EPDM Systems*	Up to 20 years

*Contact JM Technical Services for specific systems.

Codes and Approvals



Installation/Application



Refer to JM EPDM Application Guides and Detail Drawings for instructions.

Packaging and Dimensions

Roll Size	Roll Coverage
10' x 50' (3.05 m x 15.24 m)	500 ft ² (46.5 m ²)
10' x 100' (3.05 m x 30.48 m)	1000 ft ² (92.9 m ²)
16' 8" x 100' (5.08 m x 30.48 m)	1667 ft ² (154.8 m ²)
20' x 50' (6.1 m x 15.24 m)	1000 ft ² (92.9 m ²)
20' x 100' (6.1 m x 30.48 m)	2000 ft ² (185.8 m ²)
30' x 100' (9.14 m x 30.48 m)	3000 ft ² (278.7 m ²)
40' x 100' (12.19 m x 30.48 m)	4000 ft ² (371.9 m ²)
Extruded in:	Milan, OH

Meets the requirements of ASTM D 4637, Type I

Tested Physical Properties

Physical Properties		ASTM Test Method	Standard for ASTM D 4637, Type I	JM EPDM – NR 60 mil
Strength	Tensile Strength (psi)	D 412	> = 1305	1456
	Elongation, Ultimate (%)	D 412	> = 300	411
	Tensile Set (%)	D 412	< = 10	0.5
	Tear Resistance (lbf/in.)	D 624	> = 150	181
	Dynamic Puncture Resistance, 5J, Type I	D 5635	pass	pass
	Static Puncture Resistance, 44.1 lbf, Type I	D 5602	pass	pass
Longevity	Overall Sheet Thickness (in.)	D 751	+/- 10%	pass
	Brittleness Point (°F)	D 2137	< = -49	pass
	Ozone Resistance	D 1149	pass	pass
	Water Absorption (mass %)	D 471	< = 8	0.3
Heat Aged Performance	Heat Aged 670 hrs @ 240°F	D 573		
	Tensile Strength (psi)	D 412	> = 1205	1450
	Elongation, Ultimate (%)	D 412	> = 200	403
	Tear Resistance (lbf/in.)	D 624	> = 125	170
	Linear Dimensional Change (%)	D 1204	< +/- 1	0.4
Weathering Performance	Weathering Resistance, 5040 KJ/(m ² -nm) @ 340 nm	D 4637 / G 151 / G 155		
	Visual Inspection	-	pass	pass
	Elongation, Ultimate (%)	D 412	> = 200	351

Find this product in:
[Shingles \(/en-us/roofing-products/residential-roofing-products/shingles\)](https://www.gaf.com/en-us/roofing-products/residential-roofing-products/shingles)

Royal Sovereign® Specs

ABOUT
([HTTPS://WWW.GAF.COM/EN-US/PRODUCTS/ROYAL-SOVEREIGN](https://www.gaf.com/en-us/products/royal-sovereign))

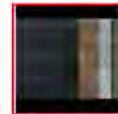
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VIDEOS
([HTTPS://WWW.GAF.COM/EN-US/PRODUCTS/ROYAL-SOVEREIGN/VIDEOS](https://www.gaf.com/en-us/products/royal-sovereign/videos))

SPECIFICATIONS

AWARDS & RECOGNITION	Good Housekeeping Rated
DIMENSIONS (SP)	12" x 36" (304.8 mm x 914.4 mm)
STAINGUARD®	Yes
ALGAE STAIN PROTECTION	StainGuard® Protection
BUNDLE COVERAGE	3 bundles per square
APPROX. NAILS/SQ	316
\$ - \$\$\$\$	\$
DURABILITY & TOUGHNESS	Advanced Protection Shingle with GAF Dura Grip Adhesive
EXPOSURE	5" (127 mm)
EXTREME WEATHER IMPACT RATED	No
FIRE RATING	Highest Rating - Class A
MATERIAL	Fiberglass Asphalt Construction
WIND WARRANTY	60 mph
WIND RATING	60 mph
ARCHITECTURAL STYLE	Three-Tab
SHINGLE STYLE	3-Tab Shingles
SHINGLE TYPE	3-Tab Shingles
AWARDS & RECOGNITION:	Good Housekeeping Rated
DIMENSIONS (SP):	12" x 36" (304.8 mm x 914.4 mm)



SPECIFICATIONS

STAINGUARD®:Yes

ALGAE STAIN PROTECTION:StainGuard® Protection

BUNDLE COVERAGE:3 bundles per square

APPROX. NAILS/SQ:316

\$ - \$\$\$:\$

DURABILITY & TOUGHNESS:Advanced Protection Shingle with GAF Dura Grip Adhesive

EXPOSURE:5" (127 mm)

EXTREME WEATHER IMPACT RATED:No

FIRE RATING:Highest Rating - Class A

MATERIAL:Fiberglass Asphalt Construction

WIND WARRANTY:60 mph

WIND RATING:60 mph

ARCHITECTURAL STYLE:Three-Tab

SHINGLE STYLE:3-Tab Shingles

SHINGLE TYPE:3-Tab Shingles

CODES & APPLICABLE STANDARDS

FBC State of Florida approved

ICC ESR-1475

MIAMI-DADE COUNTY Miami-Dade County Product Control approved

TDI Texas Department of Insurance listed

FBC:State of Florida approved

ICC :ESR-1475

MIAMI-DADE COUNTY:Miami-Dade County Product Control approved

TDI:Texas Department of Insurance listed

TESTING METHODS

ASTM D3018 Type 1

TESTING METHODS

ASTM D3161	Class F
ASTM D3462	Yes - Meets ASTM D3462
ASTM D7158	Class H
TAS 100-95	Yes
UL 790	Class A
ASTM D3018	Type 1
ASTM D3161	Class F
ASTM D3462	Yes - Meets ASTM D3462
ASTM D7158	Class H
TAS 100-95	Yes
UL 790	Class A

ENERGY RATING

ENERGY STAR® CERTIFIED (U.S. ONLY)	No
TITLE 24 (CALIFORNIA ENERGY COMMISSION)	No
CRRC	Yes (White, Desert Sand only)
LA GREEN BUILDING CODE	Yes (White, Desert Sand only) - Meets the Los Angeles Green Building Code
MIAMI 21 (FLORIDA BUILDING CODE)	Yes (White, Desert Sand only)
ENERGY STAR® CERTIFIED (U.S. ONLY)	No
TITLE 24 (CALIFORNIA ENERGY COMMISSION)	No
CRRC	Yes (White, Desert Sand only)
LA GREEN BUILDING CODE	Yes (White, Desert Sand only) - Meets the Los Angeles Green Building Code
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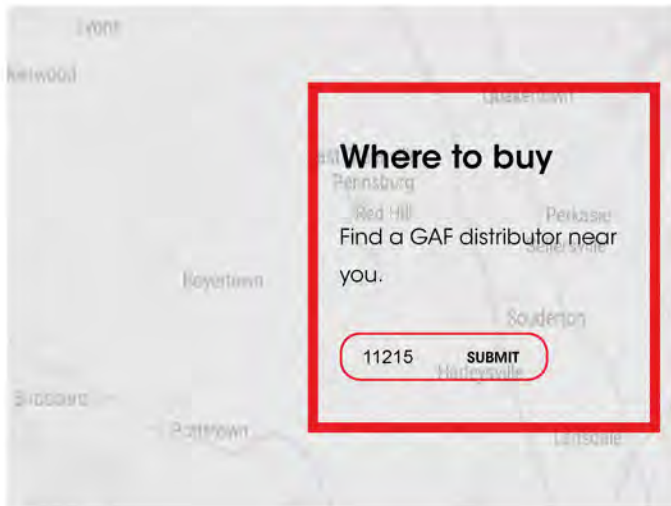
SHIPPING AND PACKAGING

APPROX. PIECES/SQ	79
APPROX. BUNDLES/SQ	3

SHIPPING AND PACKAGING

APPROX. PIECES/SQ:79

APPROX. BUNDLES/SQ:3



Find a contractor

Find a GAF certified contractor near you.

11215 SUBMIT



Get automatic Lifetime Protection on your entire GAF roofing system

When you install any GAF Lifetime Shingle and at least 3 qualifying GAF accessories, you'll automatically get a Lifetime limited warranty on your shingles and all qualifying GAF accessories*.



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