Updated June 2015

Application for Sustainability Funds
Alliant Energy Center
Exhibition Hall High Speed Doors

Department: Alliant Energy Center Address: 1919 Alliant Energy Center Way Madison, WI 53713	Total project costs: $160,000 Funding amount in current budget: $0 Funding amount requested: $160,000
Project Title: Exhibition Hall High Speed Doors	
Project Location: Exhibition Hall Loading Dock	
Project Description: This project will replace the four original 20'x20' exterior loading dock doors with energy efficient high speed doors. Because the existing doors open and close at such a slow speed, they are left in the upright position during show ingress and egress hours.	
• Assuming that the existing exterior doors are left open an average of two days per week for 8 hours each day, this project is estimated to save approximately 23,366 therms of natural gas and 20,261 kWh of electricity on an annual basis using the Ashrae Handbook of Fundamentals. For purposes of the savings calculations the doors are assumed to be open between the hours of 8 AM and 4 PM. Also, there is no savings assumed when the temperature is between 50 and 60 degrees. • This project is estimated to result in annual heating cost savings of $11,683.14 and air conditioning cost savings of $2,836.50. • The total annual energy savings is estimated to be $14,519.64. This results in a payback period of approximately 11 years. • This project should also result in decreased maintenance costs as well, but those savings are difficult to quantify. The manufacturer of the existing doors is no longer in business, making replacement parts very difficult to find. In most cases, replacement parts need to be custom fabricated.	
The County could use the results of this project to estimate the savings related to replacing other slow speed exterior doors in other county-owned buildings.	
The outcomes of this project will be measured by savings in the Alliant Energy Center's gas and electric costs. Savings from this project will be difficult to measure given the annual changes in events held on campus. That being said, the overall number of events in Exhibition Hall that utilize the loading dock doors is relatively stable from year to year.	
Contact person: Bill Franz	Phone: (608) 267-3985 E-mail: franz@alliantenergycenter.com

SPIRAL®

HIGH PERFORMANCE RIGID ROLLING DOOR

High Security, High Speed, with Architectural Style - All in One Door

With an opening speed of up to 60 inches per second, the Spiral door offers the speed you need for high-traffic situations. Rigid, aluminum slat construction eliminates any need for a second overnight security door.

Crisp lines give the Spiral door a stylish look that's great for all kinds of commercial, institutional, as well as industrial applications. Because its anodized aluminum will not corrode, you can count on that look to last for many years under even the worst weather conditions.

Shown with optional vision slat

High Security - Rigid, aluminum slat construction and optional, integral locking system provides unparalleled security.

Fast - Opens at up to 60 inches per second for improved traffic flow.

Whisper Quiet - The unique Spiral roll-up design features no metal-to-metal contact, therefore offering whisper quiet operations.

High Performance - The variable speed AC Drive system, with soft acceleration and deceleration, smooths out routine stops and starts, virtually eliminating the clunking gear engagements associated with typical overhead door operation.

Energy Efficient and Tight Seal - Aluminum slats, along with a durable rubber membrane which covers their aluminum connecting hinges, provide a 100% seal against dust pollution, drafts, and inclement weather. Optional insulation simply adds to the energy savings.

RYTEC
HIGH PERFORMANCE DOORS

SPIRAL®

HIGH PERFORMANCE RIGID ROLLING DOOR

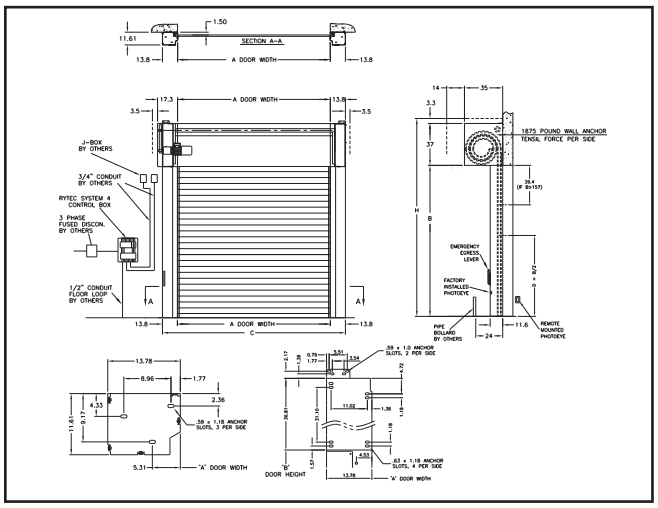
Model Name
- Rytec® Spiral® Door

Size and Dimensions
- Up to 26'2"W x 22'11"H
- Multiple door configurations based on door size.

Safety
- Thru-beam photo eyes
- Control-reliable electronic reversing edge

Available Options
- Insulated slats
- Ventilated slats
- Vision slats
- Hood and motor covers

Warranty
- Five-year limited warranty on mechanical components.
- Two-year limited warranty on electrical components.

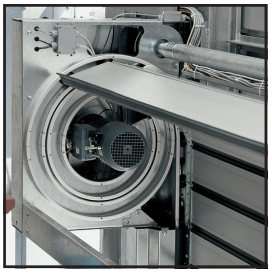


Architectural Styling

Shown with optional vision slats

- Double walled aluminum slats are 6 inches high with an integral weatherseal between each panel.
- Slats are available in anodized aluminum or optional custom paint colors.

Spiral Technology
- Unique spiral design results in no metal to metal contact, resulting in less wear and tear on the panel.
- Whisper quiet and low maintenance operation.
- Utilizes a compact AC drive motor with variable speeds to allow for soft acceleration and deceleration.



Compact AC Drive Motor

Electrical Controls

System 4 shown with optional rotary disconnect

- System 4™ controller housed in a NEMA 4X rated enclosure with factory set parameters.
- Intelligent processor monitors and controls power consumption.
- Advanced self-diagnostics for troubleshooting.

Panel Design
- Integral rubber weatherseal between the anodized aluminum slats provides a tight weatherseal across the entire panel.
- Rubber weatherseal is replaceable for easy maintenance.
- Patented hinge design allows for removal and replacement of single slat without disassembling the door panel.

Integral rubber weatherseal

Counterbalance System
- Up to six extension springs in each side column, depending on the size of the door.
- The springs assist the motor in opening, reducing motor wear and increasing the longevity of mechanical components.
- Mechanical egress lever on the side column allows the door to be opened in the event of a power failure.

Travel Speed
- Opens at up to 60 inches per second.

RYTEC HIGH PERFORMANCE DOORS
888-GO-RYTEC RytecDoors.com
Tel 262-677-9046 Fax 262-677-2058
One Cedar Parkway Jackson, WI 53037-0403

ALLIANT ENERGY CENTER
ENERGY LOSS THRU DOOR OPENING

GIVEN CONDITIONS

FROM 2001 ASHRAE HANDBOOK OF FUNDAMENTALS, PAGE. 26.11,
Eqn. 30, ENERGY FLOW DUE TO THERMAL FORCES:
$Q = 60*C_D*A*\sqrt{(2*g*H_{NPL}*(T_i-T_o)/T_i)}$
WHERE $C_D = ABS(T_i-T_o)*0.0025 + 0.4$
(IN Eqn. 30, IF $T_o > T_i$, SUBSTITUTE $(T_o-T_i)/T_o$)

g =	32.2 ft/sec^2
A =	240 ft^2
H_{NPL} =	10 ft
$T_{i(WINTER)}$ =	68 °F
$T_{i(SUMMER)}$ =	75 °F
ENTHALPY @ 75 °F & 50% RH =	28.1 BTU/#$_M$

CALCULATIONS ASSUME THAT THE DOOR IS OPENED MAINLY BETWEEN 8 AM AND 4 PM, 2 Day/Wk, FOR APPROXIMATELY 696 HOURS PER YEAR.
THE CALCULATIONS ALSO ASSUME NO SAVINGS BETWEEN 5O °F AND 60 °F DUE TO ECONOMIZER OPERATION. THE CALCULATION PROCESS FIRST DETERMINES FROM BIN DATA THE NUMBER OF HOURS IN EACH 5 DEGREE BIN. THEN HEATING AND COOLING ENERGY IS CALCULATED.

HOURS ADJUSTMENT / GENERAL CALCULATIONS / HEATING CALCULATION / AIR CONDITIONING CALCULATION

BIN TEMP., °F			ADJUSTED HOURS, 2 Days/Wk 8am - 4pm	ADJUSTED TO 696 HOURS	C_D	Q, CFM		MBH	MBH/YR	COINCIDENT ENTHAPLY, 8am - 4 pm	MBH	MBH/YR
97.5												
92.5			9	8	0.44	78,331	4			40.3	4,300	32,338
87.5			30	25	0.43	64,337	3			37.9	2,837	71,119
82.5			56	47	0.42	48,391	2			34.3	1,350	63,171
77.5			73	61	0.41	27,104	1			31.5	415	25,294
72.5			73	61	0.41	27,104	1			29.2	134	8,183
67.5			64	53	0.42	48,391	2			25.7	523	27,947
62.5			56	47	0.43	64,337	3			22.5	1,621	75,860
57.5			46	*	ECONOMIZER OPERATION			ECONOMIZER OPERATION		ECONOMIZER OPERATION		
52.5			41	*								
47.5			44	37	0.45	90,541	4	2,005	73,695			
42.5			46	38	0.46	103,778	5	2,858	109,848			
37.5			60	50	0.48	116,556	6	3,839	192,475			
32.5			69	58	0.49	129,048	6	4,948	285,245			
27.5			57	48	0.50	141,362	7	6,183	294,477			
22.5			38	32	0.51	153,571	7	7,546	239,603			
17.5			25	21	0.53	165,725	8	9,039	188,803			
12.5			19	16	0.54	177,863	8	10,661	169,246			
7.5			13	11	0.55	190,010	9	12,415	134,854			
2.5			8	7	0.56	202,189	10	14,303	95,604			
-2.5			4	3	0.58	214,416	10	16,326	54,562			
-7.5			2	2	0.59	226,702	11	18,485	30,890			
-12.5			0	0	0.60	239,058	11	20,784	0			
-17.5			0	0	0.61	251,493	12	23,223	0			
-22.5			0	0	0.63	264,012	13	25,804	0			
			833	623					1,869,302			303,911

* HOURS NOT INCLUDED DUE TO ECONOMIZER OPERATION

@ 80% EFFICIENCY = **23,366 THERMS**
$0.50 Therm Rate
$11,683.14

@ 12,000 BTUs/TON & 0.8 kW/TON = **20,261 kWh**
$0.14 kWh Rate
$2,836.50

$14,519.64 Combined Annual Savings

$160,000.00 Project Cost

11.02 Payback Period

BIN HRS Madison, WI 2 Days/Wk 8am - 4 pm

Deg	BIN HR
97	6
92	9
87	30
82	56
77	73
72	73
67	64
62	56
57	46
52	41
47	44
42	46
37	60
32	69
27	57
22	38
17	25
12	19
7	13
2	8
-3	4
-8	2
-13	0
-18	0
-23	0
-28	0
	839

ASHRAE DATA

TEMP BIN	BIN MIDPOINT	1-4	5-8	9-12	13-16	17-20	21-24	TOTAL
95 / 99	97.5							
90 / 94	92.5	0	0	0	3	0	0	3
85 / 89	87.5	0	0	7	40	10	0	57
80 / 84	82.5	0	0	63	147	65	0	275
75 / 79	77.5	1	8	127	144	117	17	414
70 / 74	72.5	47	61	155	128	133	86	610
65 / 69	67.5	92	135	121	97	118	150	713
60 / 64	62.5	142	141	100	95	101	111	690
55 / 59	57.5	113	99	98	104	97	115	626
50 / 54	52.5	122	112	77	49	82	127	569
45 / 49	47.5	109	97	73	90	82	97	548
40 / 44	42.5	111	87	87	85	64	99	533
35 / 39	37.5	97	103	120	123	128	87	658
30 / 34	32.5	172	170	117	91	141	174	865
25 / 29	27.5	134	127	83	95	94	124	657
20 / 24	22.5	124	110	76	83	79	93	565
15 / 19	17.5	51	40	55	31	45	45	267
10 / 14	12.5	28	48	43	25	48	43	235
5 / 9	7.5	39	38	24	17	22	34	174
0 / 4	2.5	52	48	31	13	29	47	220
-5 / -1	-2.5	22	32	2	0	5	10	71
-10 / -6	-7.5	4	2	1	0	0	1	8
-15 / -11	-12.5	0	1	0	0	0	0	1
-20 / -16	-17.5	0	1	0	0	0	0	1
-25 / -21	-22.5	0	0	0	0	0	0	0
								8760

MADISON

ASHRAE DATA

TEMP BIN	BIN MIDPOINT	1-4		5-8		9-12		13-16		17-20		21-24		TOTAL		COINCIDENT ENTHAPLY, 8am - 4 pm
		HOURS	MCWB	HOURS	MCWB	HOURS	MCWB	HOURS	MCWB	HOURS	MCWB	HOURS	MCWB	HOURS	MCWB	
95 / 99	97.5															
90 / 94	92.5	0	0	0	0	0	0	3	77	0	0	0	0	3	77	40.3
85 / 89	87.5	0	0	0	0	7	75	40	74	10	73	0	0	57	74	37.9
80 / 84	82.5	0	0	0	0	63	71	147	70	65	71	0	0	275	70	34.3
75 / 79	77.5	1	70	8	70	127	68	144	66	117	68	17	74	414	68	31.5
70 / 74	72.5	47	69	61	68	155	65	128	63	133	65	86	67	610	65	29.2
65 / 69	67.5	92	64	135	64	121	60	97	58	118	61	150	64	713	62	25.7
60 / 64	62.5	142	60	141	59	100	55	95	53	101	56	111	59	690	57	22.5
55 / 59	57.5	113	55	99	55	98	51	104	49	97	51	115	53	626	52	
50 / 54	52.5	122	49	112	49	77	47	49	47	82	46	127	49	569	48	
45 / 49	47.5	109	44	97	44	73	42	90	41	82	43	97	44	548	43	
40 / 44	42.5	111	40	87	40	87	38	85	37	64	39	99	40	533	39	
35 / 39	37.5	97	36	103	36	120	34	123	34	128	34	87	34	658	35	
30 / 34	32.5	172	31	170	31	117	31	91	30	141	30	174	31	865	31	
25 / 29	27.5	134	26	127	26	83	25	95	25	94	25	124	26	657	26	
20 / 24	22.5	124	21	110	21	76	21	83	20	79	20	93	21	565	21	
15 / 19	17.5	51	15	40	17	55	16	31	15	45	15	45	15	267	16	
10 / 14	12.5	28	12	48	11	43	11	25	10	48	11	43	11	235	11	
5 / 9	7.5	39	6	38	6	24	7	17	5	22	6	34	6	174	6	
0 / 4	2.5	52	0	48	0	31	0	13	0	29	0	47	0	220	0	
-5 / -1	-2.5	22	-7	32	-7	2	-6	0	0	5	-6	10	-7	71	-7	
-10 / -6	-7.5	4	-10	2	-12	1	-9	0	0	0	0	1	-9	8	-10	
-15 / -11	-12.5	0	0	1	-16	0	0	0	0	0	0	0	0	1	-16	
-20 / -16	-17.5	0	0	1	-20	0	0	0	0	0	0	0	0	1	-20	
-25 / -21	-22.5	0		0		0		0		0		0		0		

ENTHALPY @ DESIGN CONDITIONS (75 0F, 50% RH): 28.1 BTU/#

	Day of Week	Date	Event Name	Room Name
Month 1	Monday	31-Jan-05	Madison Boat & Consumer Show	Hall A-D
	Tuesday	1-Feb-05		
	Wednesday	2-Feb-05		
	Thursday	3-Feb-05	Madison RV & Camper Show	Hall A-D
	Friday	4-Feb-05	Madison RV & Camper Show	Hall A-D
	Saturday	5-Feb-05	Madison RV & Camper Show	Hall A-D
	Sunday	6-Feb-05	Madison RV & Camper Show	Hall A-D
	Monday	7-Feb-05		
	Tuesday	8-Feb-05		
	Wednesday	9-Feb-05		
	Thursday	10-Feb-05	Garden Expo	Hall A-D
	Friday	11-Feb-05	Garden Expo	Hall A-D
	Saturday	12-Feb-05	Garden Expo	Hall A-D
	Sunday	13-Feb-05	Garden Expo	Hall A-D
	Monday	14-Feb-05	Garden Expo	Hall A-D
	Tuesday	15-Feb-05		
	Wednesday	16-Feb-05		
	Thursday	17-Feb-05		
	Friday	18-Feb-05	Model Railroad Show	Hall A-B
	Saturday	19-Feb-05	Model Railroad Show	
	Sunday	20-Feb-05	Model Railroad Show/MWSRA	Hall A, B, C, D
	Monday	21-Feb-05	MWSRA	Hall A, B, C, D
	Tuesday	22-Feb-05	MWSRA	Hall A, B, C, D
	Wednesday	23-Feb-05	MWSRA	Hall A, B, C, D
	Thursday	24-Feb-05	MWSRA	Hall A, B, C, D
	Friday	25-Feb-05	Fishing Expo	Hall A, B, C, D
	Saturday	26-Feb-05	Fishing Expo	Hall A, B, C, D
	Sunday	27-Feb-05	Fishing Expo	Hall A, B, C, D
	Monday	28-Feb-05		
Month 2	Tuesday	1-Mar-05		
	Wednesday	2-Mar-05	Home Products Show	Hall A, B, C, D
	Thursday	3-Mar-05	Home Products Show	Hall A, B, C, D
	Friday	4-Mar-05	Home Products Show	Hall A, B, C, D
	Saturday	5-Mar-05	Home Products Show	Hall A, B, C, D
	Sunday	6-Mar-05	Home Products Show	Hall A, B, C, D
	Monday	7-Mar-05	Home Products Show	Hall A, B, C, D
	Tuesday	8-Mar-05	Professional Dairy	Hall B-D
	Wednesday	9-Mar-05	Professional Dairy	Hall B-D
	Thursday	10-Mar-05	Canoecopia	Hall A-D
	Friday	11-Mar-05	Canoecopia	Hall A-D
	Saturday	12-Mar-05	Canoecopia	Hall A-D
	Sunday	13-Mar-05	Canoecopia	Hall A-D
	Monday	14-Mar-05		
	Tuesday	15-Mar-05		
	Wednesday	16-Mar-05		
	Thursday	17-Mar-05		
	Friday	18-Mar-05	Art Glass & Bead Show/Madison Golf	Hall D & Hall A-B
	Saturday	19-Mar-05	Art Glass & Bead Show/Madison Golf	Hall D & Hall A-B
	Sunday	20-Mar-05	Art Glass & Bead Show/Madison Golf	Hall D & Hall A-B
	Monday	21-Mar-05		

	Tuesday	22-Mar-05		
	Wednesday	23-Mar-05	Chambers & Owen	Hall A&B
	Thursday	24-Mar-05	Chambers & Owen	Hall A&B
	Friday	25-Mar-05		
	Saturday	26-Mar-05		
	Sunday	27-Mar-05		
	Monday	28-Mar-05		
	Tuesday	29-Mar-05		
	Wednesday	30-Mar-05		
	Thursday	31-Mar-05		
Month 3	Friday	1-Apr-05	Jewerlry Expo	Hall A-D
	Saturday	2-Apr-05	Jewerlry Expo	Hall A-D
	Sunday	3-Apr-05		
	Monday	4-Apr-05		
	Tuesday	5-Apr-05		
	Wednesday	6-Apr-05		
	Thursday	7-Apr-05	Deer & Turkey Expo	Hall A-D
	Friday	8-Apr-05	Deer & Turkey Expo	Hall A-D
	Saturday	9-Apr-05	Deer & Turkey Expo	Hall A-D
	Sunday	10-Apr-05	Deer & Turkey Expo	Hall A-D
	Monday	11-Apr-05		
	Tuesday	12-Apr-05		
	Wednesday	13-Apr-05		
	Thursday	14-Apr-05	Midwest Horsefair	Hall A-D
	Friday	15-Apr-05	Midwest Horsefair	Hall A-D
	Saturday	16-Apr-05	Midwest Horsefair	Hall A-D
	Sunday	17-Apr-05	Midwest Horsefair	Hall A-D
	Monday	18-Apr-05		
	Tuesday	19-Apr-05		
	Wednesday	20-Apr-05		
	Thursday	21-Apr-05		
	Friday	22-Apr-05	Kid's Expo	Hall A-D
	Saturday	23-Apr-05	Kid's Expo	Hall A-D
	Sunday	24-Apr-05	Kid's Expo	Hall A-D
	Monday	25-Apr-05		
	Tuesday	26-Apr-05		
	Wednesday	27-Apr-05	Career Fair	Hall A-D
	Thursday	28-Apr-05	Career Fair	Hall A-D
	Friday	29-Apr-05	EPIC Anniversary Dinner	Hall A-C
	Saturday	30-Apr-05	Sysco	Hall B-D
	Sunday	1-May-05	Sysco	Hall B-D
	Monday	2-May-05	Sysco	Hall B-D
	Tuesday	3-May-05	Sysco	Hall B-D
	Wednesday	4-May-05		
	Thursday	5-May-05	Kennel Club	Hall A-D
	Friday	6-May-05	Kennel Club	Hall A-D
	Saturday	7-May-05	Kennel Club	Hall A-D
	Sunday	8-May-05	Kennel Club	Hall A-D
	Monday	9-May-05		
	Tuesday	10-May-05		
	Wednesday	11-May-05		
	Thursday	12-May-05		

Month 4				
	Friday	13-May-05	Police Auction	Hall B
	Saturday	14-May-05	Police Auction	Hall B
	Sunday	15-May-05		
	Monday	16-May-05		
	Tuesday	17-May-05		
	Wednesday	18-May-05		
	Thursday	19-May-05	All Baby Expo	Hall A&B
	Friday	20-May-05	All Baby Expo	Hall A&B
	Saturday	21-May-05	All Baby Expo	Hall A&B
	Sunday	22-May-05		
	Monday	23-May-05		
	Tuesday	24-May-05		
	Wednesday	25-May-05		
	Thursday	26-May-05		
	Friday	27-May-05		
	Saturday	28-May-05		
	Sunday	29-May-05		
	Monday	30-May-05	Madison Drum & Bugle	Hall D
	Tuesday	31-May-05		

Style	Approx. # Hrs for Style
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8

In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8

In/Egress	8
In/Egress	8
In/Egress	8
In/Egress	8
TOTAL	232
Quarterly Hrs:	232
Annual Hrs:	696

Explanation of photograph (from Bill Franz to Mark Clarke):

The attached picture was taken during Fishing Expo move in. The outside temperature was 10 degrees with a -10 to -20 wind chill. The interior high speed door had to be locked in the up position because of the wind which in fairly common during move in. The doors were both in the up position for approximately 6 hrs., the Exhall was being heated during this entire time. The interior track is not designed to with stand higher winds and it is common to blow off the track. Because of the type of ingress with this show the outside door needed to be in the up position. A normal double door entrance design does not have a large slow operating external doors with a high speed internal door. A high speed external door would allow for one door to be closed at all times and eliminating the need to have both in the up position at the same time.

SERVICE
DESK
ENTRANCE