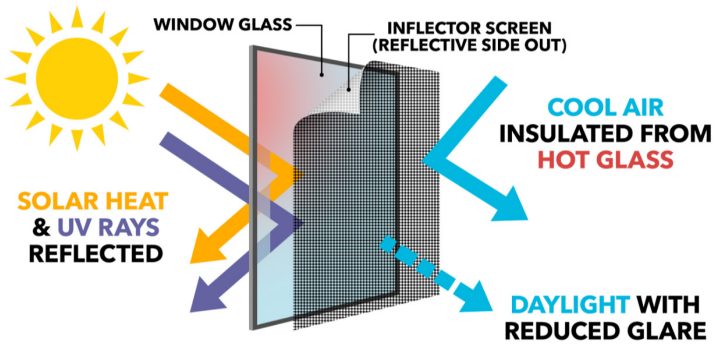
INFLECTOR

Design Specifications

INFLECTOR DESIGN SPECIFICATIONS

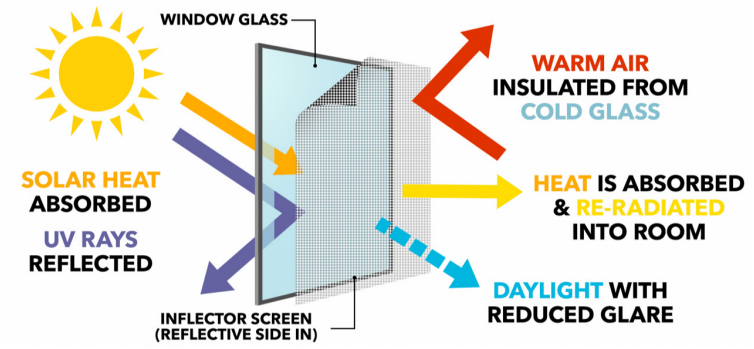
ENERGY PERFORMANCE - INFLECTOR

SUMMER RESULTS - SOLAR REJECTION MODE



U Factor* 1.89	SHGC* 0.39
Air Leakage 0	Solar Reflectance 0.51
VT* 0.26	Solar Absorbance 0.25

WINTER RESULTS - SOLAR ABSORPTION MODE



Solar Reflectance 0.07	VT* 0.26
Air Leakage 0	Solar Absorbance 0.254

Tested 2018 - LBNL - SUHO ESD - Complies to ISO 14500; 2008, NCC 2019 Section JV3

ROI: RETURN ON INVESTMENT
2.5 - 4.5 Years expected payback

Based on glass properties, building orientation, air conditioning loads and electricity costs

*Refer to page 14

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COMPLEX GLAZING DATABASE REGISTRATION - INFLECTOR WINDOWS INSULATORS

INFLECTOR WINDOWS INSULATORS			
ID	12000	12001	12002
Name	In'Flector Radiant Barrier Window	Solar Selective Window Insulator	Solar Selective Window Insulator (FLIPPED
Type	BSD File	BSD File	BSD File
DB Ver #	12	12	12
Cert	@	@	@
XML Filename	SA99-_Inflector-CGDB12000.xml	2011-SB13.XML	SA99-Flip_LowEOut_Inflector-CGdb12002.xml
t (mm)*	0	1	0
k(W/m-K)*	0.15	0.15	0.15
ε_f*	0.71	0.718	0.59
ε_b	0.59	0.718	0.71
T_{ir}	0.17	0.2027	0.17
Perm	0	0	0
T_{visF}*	0.253	0.171	0.255
T_{visB}*	0.255	0.171	0.253
R_{visF}*	0.079	39.71	0.508
R_{visB}*	0.079	39.71	0.508
T_{solF}*	0.254	0.254	0.253
T_{solfB}*	0.25	0.254	0.25
R_{solF}*	0.08	0.061	0.51
R_{solB}*	0.512	0.061	0.078

*Refer to page 14

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NATA
WORLD RECOGNISED ACCREDITATION

NSF
Contents Tested & Certified

AERC
Attachments Energy Rating Council

FIRE TESTING

SAMPLE DESCRIPTION

Clients Ref: "Inflector" Mesh Fabric
Colour: Silver / Black (back) side
Approx Thickness: 1mm
End Use: Window Insulation

These results must be considered in conjunction with the comments on the following page(s).

MATERIAL SPECIFICATION PROVIDED BY CLIENT:

Nominal Composition: Outer Layer: Metallised Polyster Film
Inner Layer: Carbon Graphite/PVC

AS/NZS 1530.3 - 1999
Simultaneous determination of Ignitability, Flame Propagation, Heat Release and Smoke Release

Results: Face Tested: Silver Face
Date Tested: 02.03.2011

	Mean	Standard Error
Ignition Time	0 mins	0
Flame Propagation Time	0 s	0
Heat Release Integral	0 kJ/m2	0
Smoke Release, log d	-1.0464	0.0318
Optical Density, d	0.0910/m	

Number of Specimens Ignited: 0
Number of Specimens Tested: 6

Regulatory Indices: Ignitability Index: 0 Range 0-20
Spread of Flame Index: 0 Range 0-10

ESD - SIMULATION TESTING SUHO 2018

NATIONAL CONSTRUCTION CODE PERFORMANCE 2019 SECTION J V3 (NCC PERFORMANCE)
(DTS) DEEMED TO SATISFY TO NCC 2019 CODE SECTION J3

TABLE A1.0 – COMPARISON OF IMPACT OF INFLECTOR ON GLAZING SYSTEM HEAT TRANSFER

Summer	Thermal heat flux through glazing (conduction, convection) (MWh) with 50mm air gap			SHGC Solar gain from external windows (MW.hr) light/radiation			Total through window reduction Thermal MW.hrs (Solar gain + Heat Flux)					Thermal	BCA Table 2b	3 months approx. electricity saving			
	Without Inflector	With Inflector	Reduction	Without Inflector	With Inflector	Reduction	Without Inflector	With Inflector	Combined Reduction	Combined Reduction	Window area m²	kW.hrs/m²	COP	kW.hrs/m2 Electricity	$/kW.hr	$/m² of glazing	$
Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8 = Col 2 + Col 5	Col 9 = Col 3 + Col 6	Col 10 = Col 9 – Col 8	Col 11 = Col 10/Col 8	Col 12	Col 13 Col 10/Col 12	Col 14	Col 15 Col 13/Col14	Col 16	Col 17	Col 18
Darwin	7.44	0.27	96%	24.85	13.69	44.90%	32.29	13.96	18.33	57%	201.6	90.9	2.9	31.4	$0.30	$9.4	$1,896
Brisbane	10.83	3.26	70%	28.58	16.11	43.60%	39.41	19.37	20.04	51%	201.6	99.4	2.9	34.3	$0.30	$10.3	$2,073
Perth	13.27	4.21	68%	33.7	19.26	42.80%	46.97	23.47	23.5	50%	201.6	116.6	2.9	40.2	$0.30	$12.1	$2,431
Sydney	12.92	5.22	60%	28.44	16.3	42.70%	41.36	21.52	19.84	48%	201.6	98.4	2.9	33.9	$0.30	$10.2	$2,052
Adelaide	15.86	6.15	61%	33.81	18.48	45.30%	49.67	24.63	25.04	50%	201.6	124.2	2.9	42.8	$0.30	$12.8	$2,590
Canberra	15.51	6.91	55%	32.09	18.5	42.30%	47.6	25.41	22.19	47%	201.6	110.1	2.9	38.0	$0.30	$11.4	$2,296
Melbourne	15.87	7.5	53%	29.68	16.52	44.30%	45.55	24.02	21.53	47%	201.6	106.8	2.9	36.8	$0.30	$11.0	$2,227
Hobart	16.98	9.12	46%	29.16	16.91	42.00%	46.14	26.03	20.11	44%	201.6	99.8	2.9	34.4	$0.30	$10.3	$2,080

NOTES:

- Columns 2-4 are to do with heat transfer through the window/glazing system only by conduction and convection. You can see that inflector is quit effective [col 4]
- Columns 5-6 are to do with solar gain [sunglight + daylight] through the window/glazing. Inflector is less effective [col 7]
- We then need to combine the effects which we do through Columns 8 - 11. Column 11 gives a weighted reduction of the combined effects of heat flux and solar gain reduction to give an overall reduction of 47 - 57% depending upon location. This is not as high as you were expecting.
- Column 12 is the total glaz area used in the model [includes all orientations]
- Column 13 gives the thermal reduction in kW.hrs due to inflector in the summer. [1 December to 28th February]
- Column 14 is a national/assumed seasonal COP. It is one commonly used in the BCA/NCC
- Column 15 uses the COP to estimate the electricity savings per m2 of glazing. The COP is taken from Table 2b from the NCC/BCA.
- Column 16 is the electricity cost
- Column 17 then gives the $/m2 saving on electricity averaged across all facade glazing
- Column 18 gives the $ saving for the national model building across some 202m² of glazing

The above analysis still relies on output from Design Builder, but we have focused on energy/heat flux through the glazed areas with and without inflector. Using the data in this way means that the construction of the building [walls, floor, roof etc] are not relevant.

ESD - SIMULATION TESTING SUHO 2018

SPECIFICATION J5.2E - ENERGY EFFICIENCY RATIOS

1. Scope

(a) This specification contains the requirements for the energy efficiency ratios of:

(i) refrigerant chillers used as part of an air-conditioninig system; and
(ii) packaged air-conditioning equipment

2. Energy Efficient Ratios

(a) An air-conditioning system refrigerant chiller with a capacity not more than 350kWr must have an energy efficiency ratio complying with Table 2a when determined in accordance with AHRI 550/590

Table 2a. MINIMUM ENERGY EFFICIENCY RATIO FOR REFRIGERANT CHILLERS

Equipment	Minimum Energy Efficiency Ratio (W,/W input power)	
	Full Load Operation	For Integrated Part Load
Water Cooled Chiller	4.2	5.2
Air Cooled or Evaporatively Cooled Chiller	2.5	3.4

(b) Package air-conditioning equipment with a capacity of not less than 65kWr, including a split unit and a heat pump, must have a minimum energy efficiency ratio when cooling comply with Table 2b when tested in accordance with AS/NZS 3823.1.2 at test condition T1.

Table 2b. MINIMUM ENERGY EFFICIENCY RATIO FOR PACKAGED AIR-CONDITIONING EQUIPMENT

Equipment	Minimum Energy Efficiency Ratio (W,/W input power)	
	65 kWr - 95 kWr Capacity	More than 95 kWr Capacity
Air-Conditioner: Cooling	2.70	2.80
Heat Pump: Cooling	2.60	2.70

ESD - SIMULATION TESTING SUHO 2018

Table 4.9 **COMPARISON OF REDUCTION IN THERMAL COOLING DEMAND IN LOCATIONS STUDIED**

Trial	Glass	Duration	Portion of Building	Inflector	Improvement from inflector (5)							
					Hobart	Melbourne	Canberra	Adelaide	Sydney	Perth	Brisbane	Darwin
1	A	Whole Year	Whole Building	No								
2				Yes	27.2%	22.9%	22.5%	21.8%	17.7%	17.8%	14.5%	8.2%
3			East Zones	No								
4				Yes	28.8%	25.1%	23.5%	23.8%	19.3%	19.4%	15.5%	9.6%
5			North Zones	No								
6				Yes	31.5%	26.1%	26.6%	25.2%	20.8%	20.4%	16.9%	9.0%
7			West Zones	No								
8				Yes	26.7%	22.8%	22.4%	21.7%	17.8%	18.2%	15.7%	9.1%
9		Summer Only	Whole Building	No								
10				Yes	21.1%	17.1%	15.0%	16.2%	11.2%	11.7%	9.8%	5.7%
11			East Zones	No								
12				Yes	23.5%	20.2%	18.2%	19.4%	12.9%	13.4%	11.4%	6.5%
13			North Zones	No								
14				Yes	21.5%	16.7%	13.6%	15.6%	10.8%	11.1%	9.5%	5.0%
15			West Zones	No								
16				Yes	20.5%	17.0%	15.4%	16.8%	12.1%	13.0%	12.0%	5.9%

2. Input Parameters

The input parameters have been based upon the schedules given in the current version of the BCA/ NCC when modelling a reference building for the means of demonstrating compliance with the BCA/ NCC under section JV3.

All schedule: BCA07 2B - Class 5 Profile (NCC 2016 (BCA) Volume 1 / Specification JV - Table 2b Occupancy and Operation of class 5 building)

ACOUSTIC

Noise testing by Acoustic Logic 204. **METHOD ISO 17025**

DISCUSSION

The test results indicated overall acoustic sound insulation performance improved by +3 points with Inflector window insulator installed onto existing façade/glazing assembly. There was a significant improvement in the reverberation characteristics of the subject spaces with the Inflector insulator installed. Refer AL measured reverberation times with and without the Inflector.

TABLE 2 – ARAMEX HQ – MEASURED REVERBERATION TIMES – 8TH JANUARY 2014

Test Orientation	AL Measured Reverberation Times (sec)				
	12Hz	250Hz	500Hz	1000Hz	2000Hz
Existing glazing subject test area [**Without** 'Inflector window Insulator]	0.75	0.91	0.84	0.56	0.53
Existing glazing subject test area [**With** 'Inflector window Insulator]	0.61	0.56	0.76	0.54	0.54

From the above table i.e. Table 2; it can be seen that there was significant improvement in internal reverberation times with inflector window insulator at 125Hz upto 1000Hz. This improvement has been reflected in overall acoustic performance of the existing façade/glazing assembly D_{nTw} Table 1 above.

MANUFACTURING

Tensile testing. **ISO TEST METHOD – 1421:1998**

Here is the tensile test results following the ISO procedures, the measurements are not an exact to the quoted units. These area in mm squared where number is daN/5cm.

ISO TEST METHOD 1421:1998 STRIP TEST METHOD (METHOD 1):

WO 1900199-01 In'Flector Standard Material	MD Jaw Seperation (Units mm)	MD Maximum Load (Units daN)	MD Tensile Stress At Maximum Load (Units daN / mm^2)	MD Tensile Strain At Break (Elongation) (Units%)
Sample 1	200	27.7	2.42	**79.23***
Sample 2	100	28.8	2.52	60.35
Sample 3	100	25.6	2.24	36.25
Sample 4	100	26.9	2.36	44.14
Sample 5	100	30.4	2.66	96.48
Average	--	**27.9**	**2.44**	**62.69**

*Test method 1421:1998 specifies that if the elongation is above 75% at 200mm jaw seperation then the jaw seperation needs to be decreased to 100mm and continue testing

WO 1900199-01 In'Flector Standard Material	TD	TD Maximum Load (Units daN)	TD Tensile Stress At Maximum Load (Units daN / mm^2)	TD Tensile Strain At Break (Elongation) (Units%)
Sample 1	200	28.5	2.49	37.75
Sample 2	200	28.7	2.51	30.09
Sample 3	200	29.4	2.57	42.81
Sample 4	200	28.7	2.51	41.36
Sample 5	200	27.6	2.41	35.53
Average	--	**28.6**	**2.50**	**39.30**

MATERIAL SAFETY DATA SHEET [MSDS]

CHEMICAL PRODUCT & COMPANY IDENTIFICATION

Manufacturer's Name:	FLEXcon COMPANY, INC.
Address:	FLEXcon Industrial Park
City, State, and ZIP:	Spencer, MA 01562
Emergency Telephone Number:	(508) 885-3973
Other Information Calls:	(508) 885-3973
Date Prepared:	December 4, 2008

PRODUCT NAME: MMVM-1450 S/BK INFLECTOR

COMPOSITION/INFORMATION ON INGREDIENTS

Individual components of this product do not contribute to any known hazards

CAS REGISTRY #
N/A

OSHA HAZARDOUS COMPONENTS (29 CFR1910.1200): NONE

HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:	None
ACUTE:	No significant toxic hazard. When burned may produce toxic
CHRONIC:	fumes

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA, or ACGIH as a carcinogen.

MATERIAL SAFETY DATA SHEET [MSDS]

FIRST AID MEASURES

Emergency and First Aid Procedures:
ROUTES OF ENTRY-

1. **Inhalation:** N/A
2. **Eyes:** N/A
3. **Skin:** N/A
4. **Ingestion:** N/A

FIRST AID MEASURES

Flash Point	N/A
Method Used	N/A
Auto-Ignition Temperature	N/A
Flammable Limits in Air % by Volume:	
LEL:	N/A
UEL:	N/A
Extinguishing Media:	Use Multi-rated ABC extinguisher / water
Special Fire Fighting Procedures:	In case of fire, use self-contained breathing apparatus and full protective equipment - all fires liberate toxic gases. None

ACCIDENTAL RELEASE MEASURES

N/A

MATERIAL SAFETY DATA SHEET [MSDS]

HANDLING AND STORAGE

No special handling required, other than storing away form excessive heat sources

EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection:	None required
Skin Protection:	No precautions required
Eye Protection:	None required
Exposure Guidelines:	None established
Engineering Controls:	None required

PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point:	N/A	**Specific gravity [H 0=1]:**	N/A
Vapor Pressure [mm Hg]:	N/A	**Vapor Density [air = 1]:**	N/A
Solubility in water:	N/A	**Reactivity of water:**	N/A
Appearance & Odor:	N/A	**Melting Point:**	N/A

STABILITY AND REACTIVITY

STABILITY:	N/A
CONDITIONS TO AVOID:	Fire or excessive heat
INCOMPATIBILITY:	None
HAZARDOUS DECOMPOSITION PRODUCTS:	None
HAZARDOUS POLYMERIZATION	Will not occur

MATERIAL SAFETY DATA SHEET [MSDS]

TOXICOLOGICAL INFORMATION

Carcinogen Status ... NTP: NONE ... IARC: NONE ... OSHA: NONE

ECOLOGICAL INFORMATION

No data available

DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Dispose of in accordance with local State and Federal regulations.

TRANSPORT INFORMATION

TRANSPORTATION AND HAZARDOUS MATERIALS DESCRIPTION: Not a hazardous material for DOT shipping

REGULATORY INFORMATION

OSHA STANDARD CFR 29, PART 1910.1200: This product is considered to be an "article" under this standard.
SARA 313 INFORMATION: This product contains no substances at or above the reporting threshold subject to the reporting requirement of section 313 of Title III of the Superfund Amendements and Reauthorization Act of 1986 and 40 CFR Part 371, based on available data.
CALIFORNIA PROPOSITION 65: The following statement is made in order to comply with the California Safe Drinking Water and Toxic Enforcement Act of 1986. WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm

OTHER INFORMATION

The information contained herein is based on the data available to FLEXcon COMPANY, INC. and is believed to be correct. However, the FLEXcon COMPANY, INC. makes no warranty, expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. FLEXcon COMPANY, INC. assumes no responsibility for injury from the use of the product described herein.

APPENDIX

U-Value

Thermal transmittance (also known as U-factor) of system [units: W/(m^2-K)]
= heat transfer rate per m2 per Kelvin (degree C), driven by a temperature difference

SHFC

Solar heat gain coefficienty (also known as g-value in Europe)
= fraction of incident solar energy directly transmitted
+ fraction of absorbed solar energy transffered inward by conduction, convection and radiation

VT

Visual transmittance
= fraction of visible solar energy transmitted, adjusted for wavelength sensitivity curve of human eye (eye is less sensitive to blue and red; more sennsitive to green)

CGDB

t(mm) Lay thickness (mm)

k(W/m-K) Bulk thermal conductivity of layer

ε_f Emissivity of front (outdoor-facing) side of layer

ε_f Emissivity of back (indoor-facing) side of layer

T_{ir} Infrared (longwave) transmittance of layer

Perm Air permeability (openness) of layer

T_{visF} Visible transmittance in forward direction (outdoor to indoor)

T_{visB} Visible transmittance in backward direction (indoor to outdoor)

R_{visF} Visible reflectance in forward direction (outdoor-facing surface)

R_{visB} Visibile reflectance in backward direction (indoor-facing surface)

T_{solF} Solar transmittance in forward direction (outdoor to indoor)

T_{solB} Solar transmittance in backward directon (indoor to outdoor)

R_{solF} Solar reflectance of front surface (outdoor-facing)
= albedo
= 0.51 (from CGDB ID#12002 and WINDOW 7 results; includes holes). Albedo of metallised surface alone (before accounting for holes) may be calculated if drawing is provided

R_{solB} Solar reflectance of back surface (room-facing)

NOTES