

**AGC**



**アトッチ**

**ATTOCH™**

# ABOUT US



Energy conservation and improvement of the indoor environment by renovating the operational building. It provides new life to the existing building.

## Why Replace? Just Upgrade!

ATTOCH™ is a retrofitting solution which transforms existing single pane glass facade into energy-saving double glazing glass with improved comfort and convenience for existing building occupants, without replacing the existing glass facade. As ATTOCH solution can be done without scaffoldings and sash replacement, it is a cost effective way to improve glass performance.

**So, don't just replace, upgrade with ATTOCH™!**

- Improved Comfort
- Energy Saving
- Reduction in dew condensation
- Noise Reduction
- Easy Installation
- Good Aesthetics
- Increases Property Value
- Less Maintenance

## Specification

**Glass type and thickness:**  
Heat Strengthened Glass, thickness of ATTOCH™ glass depends on the size of the existing glass.

**Thickness of the Air Layer:**  
12 MM

**Colour Variations:**  
Clear, Blue, Green, Blue Green, Grey or as requested by the customers.

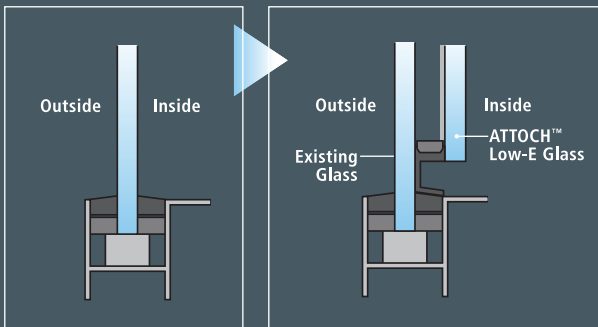
**Standard Weight:**  
20kg/m<sup>2</sup> for 8mm thick glass, the weight varies for different glass thickness.



# LOW-E GLASS

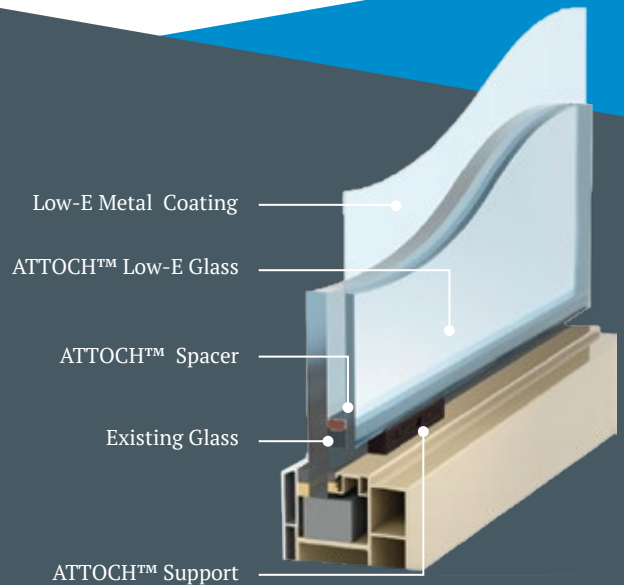
## On-site conversion of existing Window/Facade glass to Low-E D.G.U / I.G.U

Low-E glass is a glass coated with special metal coating which prevents solar radiation. It passes the visible light but reflects far-infrared radiation from solar radiation and heat, and thus, provides comfortable indoor space.



Existing Window/Facade

ATTOCH™ Attached Window/ Facade (Standard Design)

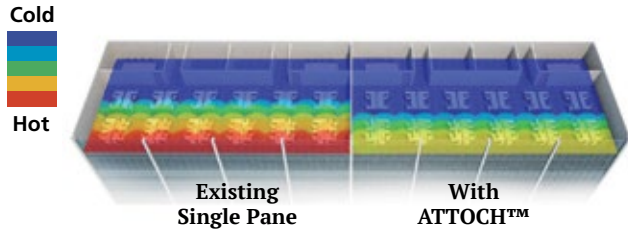


\*Please be aware that the basic specifications and design may be changed for improvement without prior notice.

# COMPARISON OF COMFORT

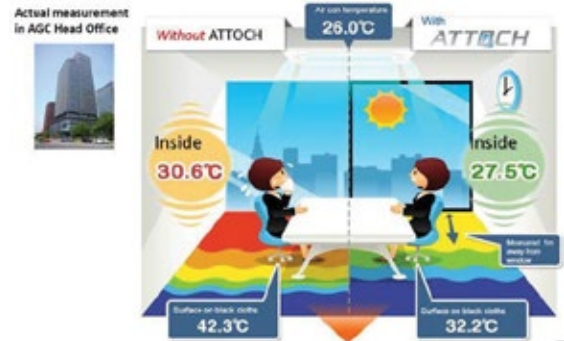
## 1 Comparison of Comfort

**Summer** Hotness comparison beside window



ATTOCH™ can improve comfort especially besides window  
 ATTOCH™ can reduce sizzling hotness in summer

AGC Headquarters - JAPAN



# Comparison of Thermal/Light Performance

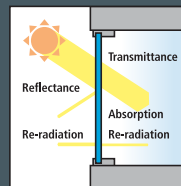
	Shading Coefficient (SC)	Thermal insulation (U-value: W/(m <sup>2</sup> ·K))	Visible Light transmittance (Tv)
6mm Clear Float Glass	<b>0.94</b>	<b>5.7</b>	<b>88</b>
6mm Clear Float Glass +12mm Air Gap + 6mm Sunergy Clear (#3)	<b>0.74</b>	<b>2.1</b>	<b>62</b>
6mm Clear Float Glass + 12mm Air Gap + 6mm Sunergy Blue Green (#3)	<b>0.69</b>	<b>2.2</b>	<b>42</b>

### Measure against Solar Radiation

#### Shading Coefficient (S.C)

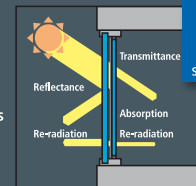
Shading Coefficient is the ratio of solar heat gain (SHGC=SF) through the glass relative to that through a 3mm clear glass. Lower the figure, the cooler room inside.

S.C  
**0.94**



6mm Clear Float Glass

S.C  
**0.69**



6mm Clear Float Glass + Air Gap 12mm + 6mm Sunergy Blue Green

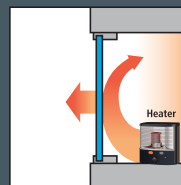
**1.36** times as low as single pane

### Measure against Heat Transfer

#### U-value

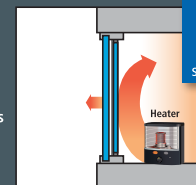
This indicates the level of heat loss, and is expressed in W/(m<sup>2</sup>·K) (Watts per square meter per Kelvin). The lower the U-Value, the higher the level of insulation.

U-value  
**5.7** W/(m<sup>2</sup>·K)



6mm Clear Float Glass

U-value  
**2.2** W/(m<sup>2</sup>·K)



6mm Clear Float Glass + Air Gap 12mm + 6mm Sunergy Blue Green

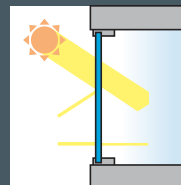
**2.6** times as low as single pane

### Day Light for the Building

#### Visible Light Transmission (Tv)

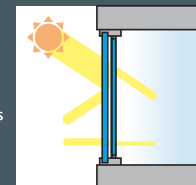
Transmittance of visible light coming from outside to inside. This is expressed from 0% to 100%. The higher figure, the brighter room inside.

Tv  
**88%**



6mm Clear Float Glass

Tv  
**42%**



6mm Clear Float Glass + Air Gap 12mm + 6mm Sunergy Blue Green

## 1 Energy Conservation

### ENERGY SIMULATION

[Conducted by: A\*STAR's Experimental Power Grid Centre (EPGC), Singapore, 2018]

Table: List of thermal and optical glass properties for simulated configurations.

Glass Type	Composition	U-Value	SC	Tvis	Tsol
		W/m2K	Shading Coefficient	Visible Light Transmission	Direct Energy Transmission
1. Baseline	6mm AGC Float Glass Gray	5.79	0.68	0.45	0.43
2. ATTOCH Gray	6mm AGC Float Glass Gray +12mm air gap + SUNERGY Gray 8mm, #3	2.17	0.44	0.12	0.11
3. ATTOCH Cool	6mm AGC Float Glass Gray +12mm air gap + SUNERGY Cool 8mm, #3	2.27	0.45	0.23	0.17

The annual cooling energy usage and costs are modelled for 2 types of glass and 3 orientations. Energy savings and cost savings of different types of ATTOCH are computed with respect to the baseline glass. The monthly and annual results of each city (Singapore, Kuala Lumpur, Manila and Bangkok) are presented below in the corresponding order.

The simulation settings are given as:

- ASHARE International Weather for Energy Calculations (IWEC) weather data of various cities are used in the simulations: Singapore (latitude 1.37°, longitude -103.98°), Kuala Lumpur (latitude 3.12°, longitude -101.55°), Manila (latitude 14.52°, longitude -121.00°) and Bangkok. (latitude 13.92°, longitude 100.60°).
- The occupancy schedule is set according to the typical office hours, i.e. 0800hrs to 1800hrs on weekday and 0900hrs to 1300hrs on Saturday. The occupancy schedule aligns with the operation schedule of the chillers.
- It is presumed that the room is vacant and the occupant density is set to a near null value of 10,000m<sup>2</sup>/person.
- The cooling set point is 25°C.
- The COP adopts a fixed value of 2.5.
- The chiller capacity is presumed to be unlimited.

Simulated Yearly Saving Cost (USD/m <sup>2</sup> )			Before ATTOCH	After ATTOCH	
			Yearly Energy Expenses (US\$)	Simulated Yearly Cooling Energy Cost Savings (US\$)	
				ATTOCH Gray	ATTOCH Cool
SINGAPORE	Commercial	West-facing glazing façade	342.23	97.90	93.02
	Residential	glazing façade	390.90	111.82	106.25
	Commercial	East-facing glazing façade	330.13	94.53	89.79
	Residential	glazing façade	377.08	107.97	102.56
	Commercial	South-facing glazing façade	189.70	23.46	22.35
	Residential	glazing façade	216.67	26.79	25.52

\*Commercial electrical energy cost of US\$0.1519/kWh and residential electrical energy cost of US\$0.1735/kWh are used for estimation of energy cost in Singapore.

KUALA LUMPUR (MALAYSIA)	Commercial	West-facing glazing façade	329.32	96.00	91.42
	Residential	glazing façade	376.15	109.65	104.42
	Commercial	East-facing glazing façade	316.50	91.81	87.38
	Residential	glazing façade	361.51	104.86	99.80
	Commercial	South-facing glazing façade	182.37	22.59	21.57
	Residential	glazing façade	208.31	25.80	24.64

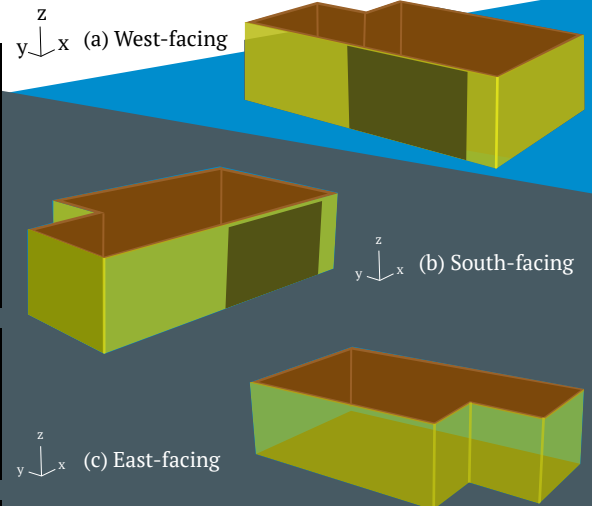
\*Commercial electrical energy cost of US\$0.0914/kWh and residential electrical energy cost of US\$0.1362/kWh are used for estimation of energy cost in Kuala Lumpur.

MANILA (PHILIPPINES)	Commercial	West-facing glazing façade	413.52	117.26	111.41
	Residential	glazing façade	391.17	110.92	105.39
	Commercial	East-facing glazing façade	399.47	112.64	106.96
	Residential	glazing façade	377.87	106.55	101.18
	Commercial	South-facing glazing façade	232.23	30.25	28.87
	Residential	glazing façade	219.67	28.61	27.31

\*Commercial electrical energy cost of US\$0.1868/kWh and residential electrical energy cost of US\$0.1767/kWh are used for estimation of energy cost in Manila.

BANGKOK (THAILAND)	Commercial	West-facing glazing façade	319.00	93.06	88.72
	Residential	glazing façade	368.76	107.58	102.56
	Commercial	East-facing glazing façade	309.69	90.26	86.03
	Residential	glazing façade	358.00	104.34	99.45
	Commercial	South-facing glazing façade	180.30	24.07	23.04
	Residential	glazing façade	208.42	27.83	26.63

\*Commercial electrical energy cost of US\$0.1186/kWh and residential electrical energy cost of US\$0.1371/kWh are used for estimation of energy cost in Bangkok.



For annual analysis, the geometry of the Viewing Gallery is modified such that only one glazing (4.7m width x 2.6m height) from the original North-West facing façade is retained and all shading structures are removed. The thermal model of the room comprises of flattened polygonal surfaces. The window surface overlaps with the wall surface, without cutting a hole in the wall in compliance with the geometry requirements of EnergyPlus. The room is oriented such that the glazing is facing West, South and East directions.



## 2 Installation Cost Reduction

No Scaffolding. No disposal of existing glass. Short installation period realize cost reduction

Before Installation



Existing Glass

During Installation

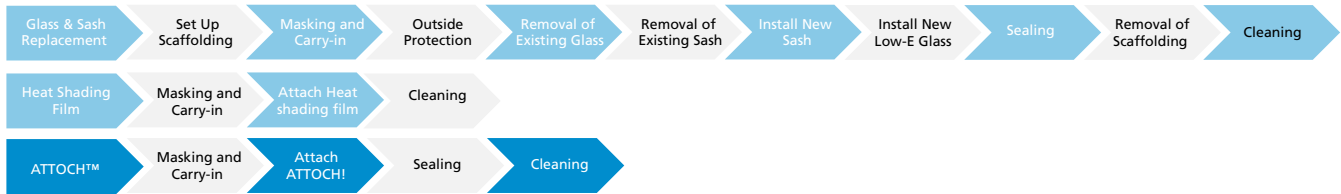


Attached ATTOCH™ to existing glass

After Installation



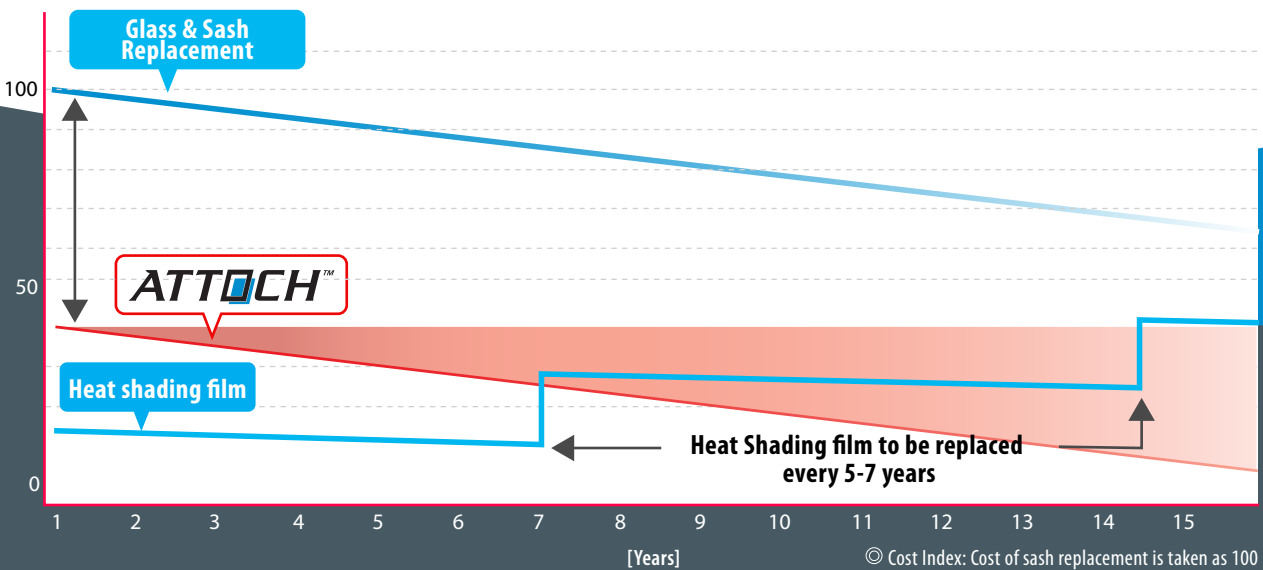
Sealing the Edge, Done!



## 3 Long Life

Better Cost Reduction with ATTOCH™ in long term period!

Image: Total Cost Comparison for Renovation Solution



## Running Cost Reduction

No Periodical Replacement. No Special Maintenance.

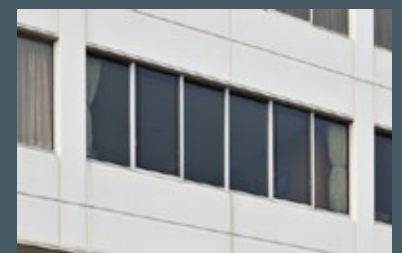
Rough Indication of Renovation	
Glass & Sash Replacement	Long Term Durability
Heat Shading Film	5~7 Years
ATTOCH™	Long Term Durability

Before Installation



Haze occur due to film's deterioration

After Installation

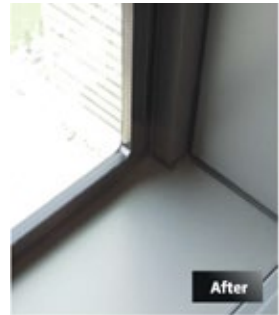
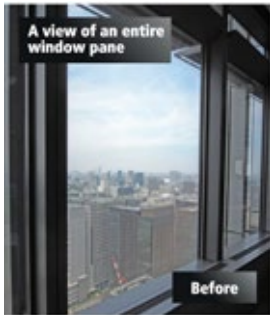


Smart looking with ATTOCH™. No deterioration will occur

# PROJECT REFERENCES

## Office

The Head Office of AGC in Shin-Marunouchi Building



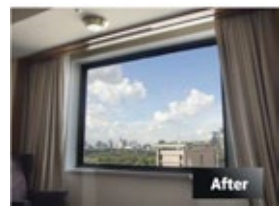
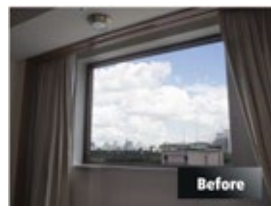
## Office

Meeting Room in Japan



## Hotel

Hotel in Tokyo



## Restaurant

Interior of Restaurant



## Store

Honda Car Showroom (Hyogo)



## Reliable Installation by ATTOCH™ CLUB

ATTOCH CLUB is AGC certified installation professional. ATTOCH™ is installed by ATTOCH CLUB. Please approach AGC for the contact of AGC ATTOCH Club member in your country.

ATTOCH  
CLUB

アトッチ・クラブ

## Disclaimer Attention

•The figure and specification on this catalogue will be changed for improvement without notice. •Please note that the edge of glass may look thinner and the inside reflection on glass surface during night time may stand out, and room inside get slightly darker during daytime. •ATTOCH can't be installed in the following cases •If the existing glass is tempered glass or wired glass. •Glass with protective film. •Shopfront Glazing with Spider fittings. •Structure Silicone Glazing. •If the existing Framing is very weak & if there is some leakage through the facade. • We might judge if installation can be done by on-site investigation. • ATTOCH offer five-years warranty against internal condensation (condensation between existing glass & ATTOCH glass). • If you wish to remove ATTOCH, it can be removed by fees. • Cleaning on the inside surface of existing glass will be conducted with greatest care. However slight dirt may remain on the surface. •The light performance & thermal performance on the catalogue is calculated based on ISO 9050:2003/10292:1994 standards. • Specifications, technical and other data are based on information available at the time of preparation of this document and are subject to change without notice. • AGC Group will not be held responsible for any deviation between the data introduced and the condition on site.

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