Comparing the Effectiveness of Reducing Interior Overheating with High Performance Low-E versus Smart Shading Glass (Paper #54)

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Agenda

- Background
- Trial Procedure
- Results
- Conclusions

Background

- A glazing replacement trial was conducted at a 28-storey, residential rental, high-rise tower in Coal Harbour, Vancouver.
- Tower has ongoing interior heating issues during the summer months, particularly at higher floor levels, at the south west elevation.
- Owners currently address overheating issues by providing portable air conditioning units to the tenants during the summer, but the a/c units create large demands on the building's energy use, and require a lot of effort to move and maintain.
- Owners looking for alternative options to address overheating and glazing replacement is one of their considerations.

Trial Procedure

- Two suites were selected for the trial
- 26th (Suite 2608) floor south west suite was replaced with smart shading glass
- 23rd (Suite 2308) floor south west suites was replaced with higher performance low-e glass
- Trial glass properties were as follows:

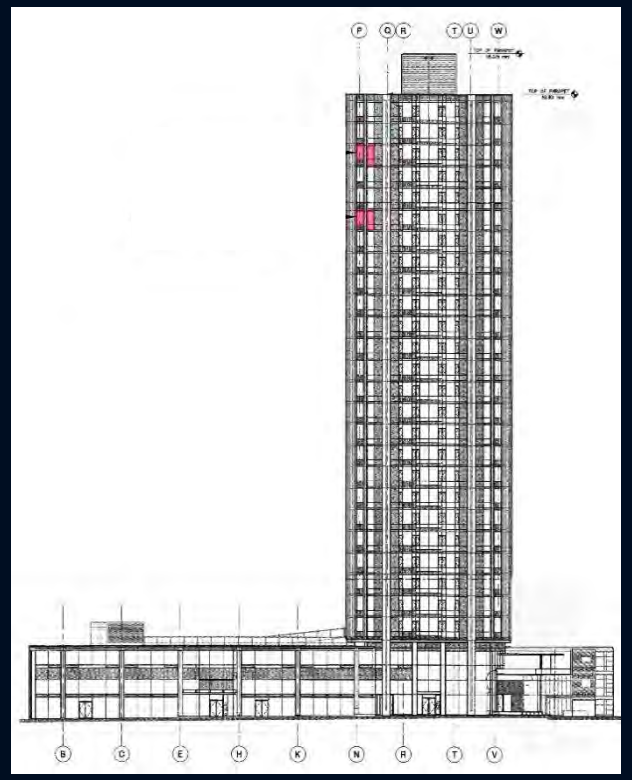
Properties	High Performance Low-E Glass	Smart Shading Glass
Solar Heat Gain Coefficient	0.272	0.09 to 0.41
Visual Light Transmittance	64%	1% to 58%
Spacer Material	Stainless steel warm edge	T shaped, black silicone foam
Gas Type	90% argon	>90% argon, >10% air
Centre of Glass U-value	0.239	0.290
Type of Coating and Location	Triple-silver, magnetic sputter vacuum deposition Low-e coating on #2 surface	Electro-chromatic coating on #2 surface
Thickness of Glass and Air Space	6mm tempered inboard and outboard glass with 12mm air space	6mm tempered inboard and outboard glass with 12.7mm air space

Trial Procedure

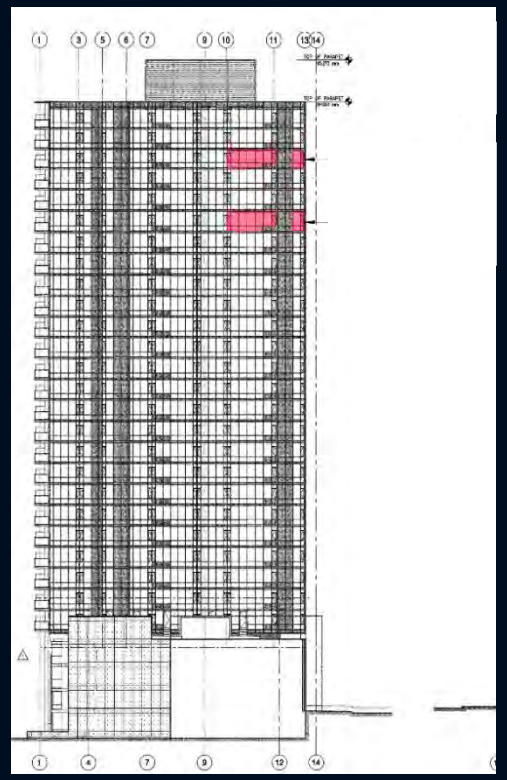
- Data loggers placed in the suites to measure temperature, relative humidity, and lighting levels during the trial period
- Data loggers also placed in an occupied 20th floor, south west suite with portable a/c unit installed, to compare trial results with an occupant controlled suite.
- Trial period: July and August 2016
- Operable windows closed for month of July
- Operable windows open and kitchen and bathroom fans running for month of August

Trial Procedure

Typical Trial Suite Layout



South Elevation Glazing Replacement Locations



West Elevation Glazing Replacement Locations

Trial Procedure

- Trial data graphed to show how interior temperatures related to outside temperature (outside temp. from Environment Canada historical weather data)
- Trial data also compared with ASHRAE Standard 55-2015 Comfort Zones range

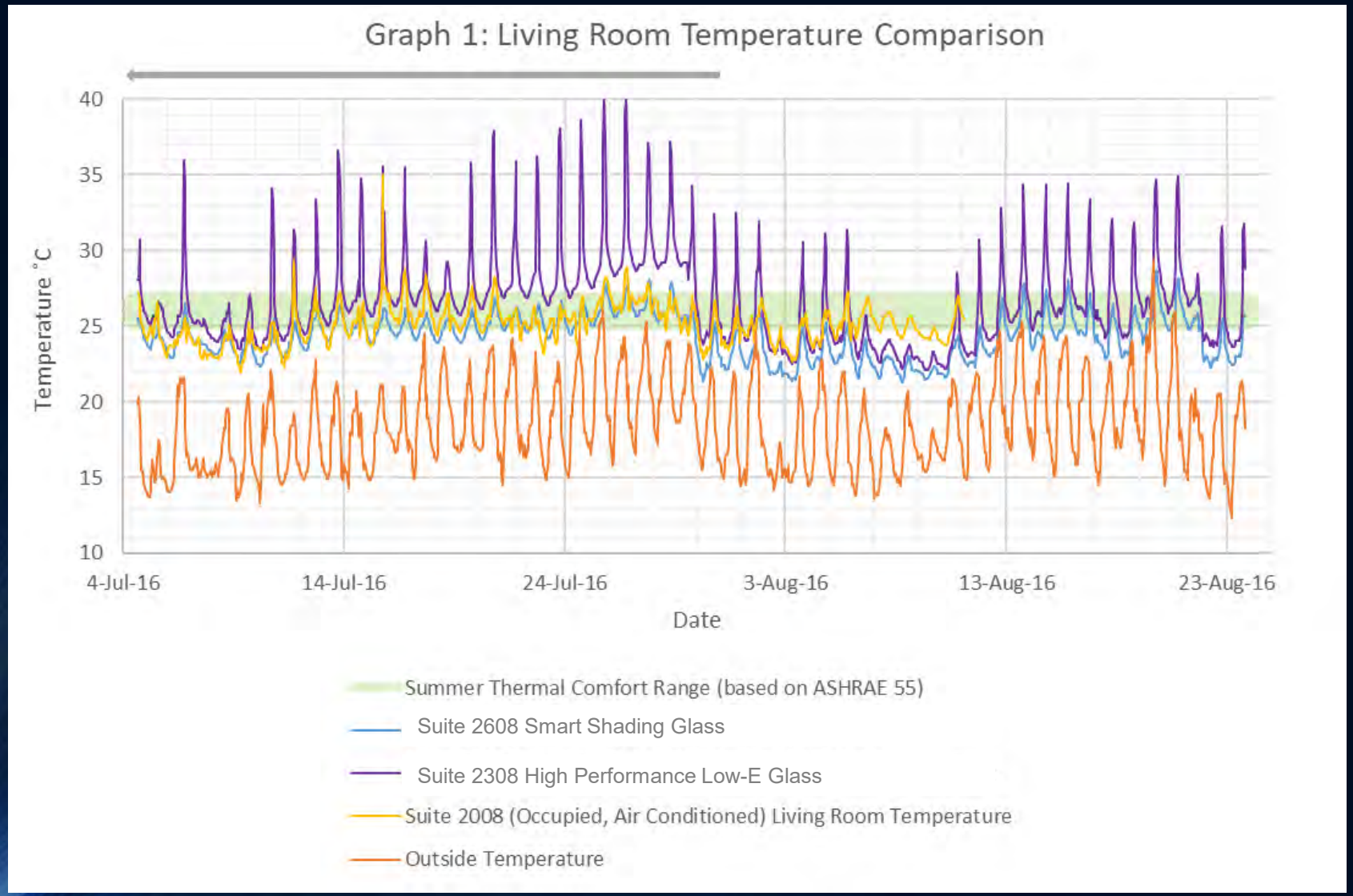
Results

	Suite 2008 (Occupied air-conditioned suite)	Suite 2306 (High Performance Low-E Glass)	Suite 2608 (Smart Shading Glass)
Peak July Temperature (period of non-ventilated trail suites)	35.0˚C (on July 15 at 6:00pm)	40.1˚C (on July 25, 2016 at 7:00pm)	28.0 ˚C (on July 27, 2016 at 8:00pm)
Average Peak July Temperature (period of non-ventilated trial suites)	26.5˚C	34.1˚C	25.9˚C
Peak August Temperature (period of ventilated trial suites)	27˚C (on August 10, 2016 at 8:00pm)	35.0˚C (on August 20, 2016 at 7:00pm)	28.7˚C (on August 19, 2016 at 7:00pm)
Average Peak August Temperature (period of ventilated trial suites)	25.8˚C	30.9˚C	26.3˚C

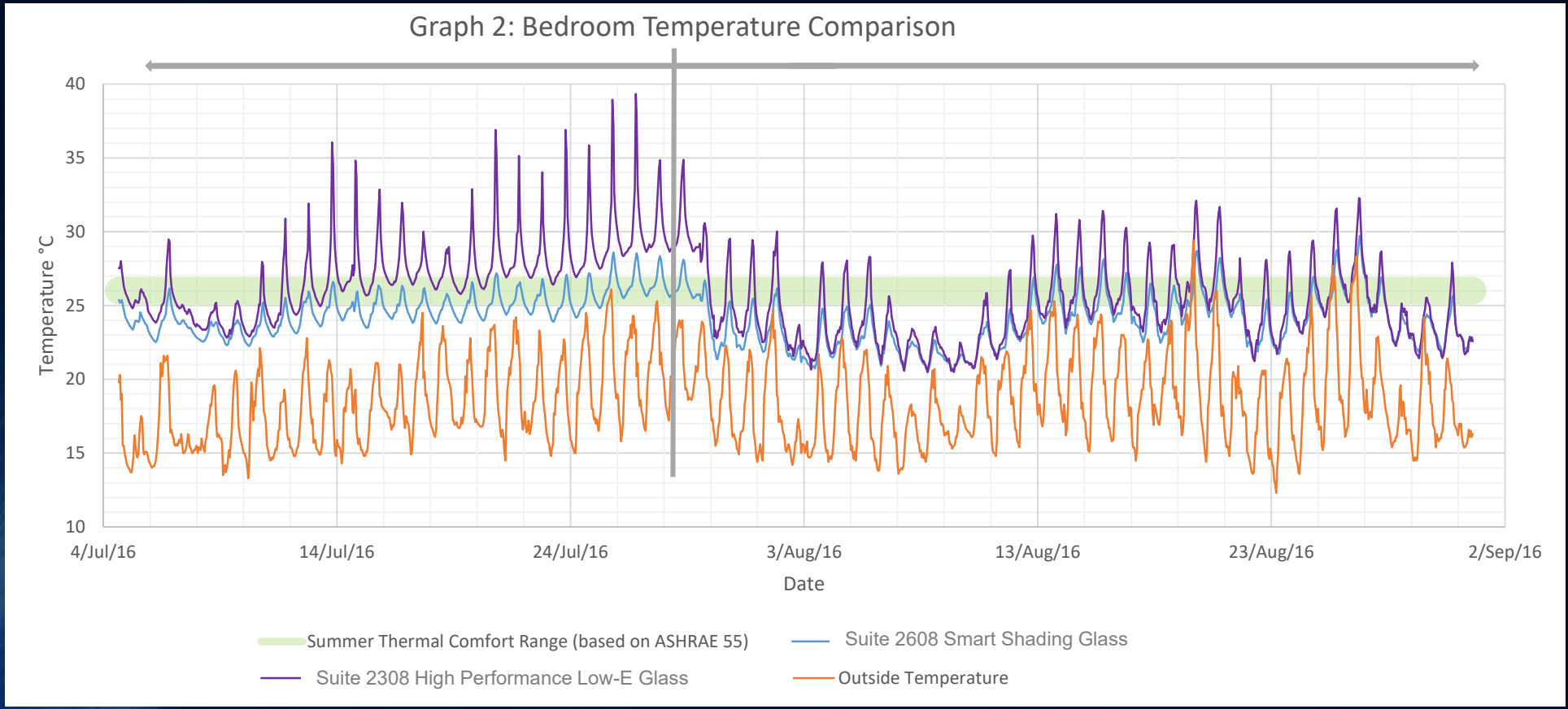
Results

- Interior temp warmest between 5:30pm to 7:30pm
- Warmest outside temp between 4:00pm to 6:00pm, highest temp usually around 4:00pm daily.
- Inside and outside warming and cooling patterns were similar, except outside peak temp about 2 hours before inside peak temp
- Smart shading glass reduced interior temps to similar temps of the occupied air conditioned suite and thermal comfort range
- High performance low-e glass did not effectively reduce interior temps to a comfortable range

Graph 1 Note:
1. Suite 2008 temperature increased to over 35˚C at 6:00pm. The Resident(s) may have been out during this time and the A/C unit was likely not turned on.



Graph 2 Note:
2. Data was collected between July 4, 2016 and August 11, 2016 in Suite 2008, the data collection period in this suite was reduced due to error issues with the data logger, likely from the suite occupants moving the data logger.



Conclusions

- Installing smart shading glass could be an effective solution to reducing interior overheating
- Thermal comfort can range between individuals, supplemental cooling might still be needed to keep some people happy

TIME FOR QUESTIONS